

# Transportation Technical Appendix

## **PenPlace**

Arlington, VA

**December 20, 2021**  
**(Revised January 19, 2022)**

**GOROVE SLADE**  
Transportation Planners and Engineers

## CONTENTS

**(Note: Click on heading to navigate directly to each section of the Technical Attachments)**

- A. Signed Scoping Document
- B. Site Visit Notes
- C. Access and Loading Memo
- D. Existing Turning Movement Counts
- E. Approved VISSIM Calibration Memo
- F. 2020 Existing VISSIM Delay and Queue Results
- G. Background Development Trips
- H. 2025 Re-Routed Peak Hour Volumes
- I. 2025 Background VISSIM Delay and Queue Results
- J. 2025 Mitigated Future VISSIM Delay and Queue Results
- K. 2031 Re-Routed Peak Hour Volumes
- L. 2031 Background VISSIM Delay and Queue Results
- M. 2031 Mitigated Future VISSIM Delay and Queue Results

## A. Signed Scoping Document

# PRE-SCOPE OF WORK MEETING FORM

## Information on the Project Traffic Impact Analysis Base Assumptions

The applicant is responsible for entering the relevant information and submitting the form to VDOT and the locality no less than three (3) business days prior to the meeting. If a form is not received by this deadline, the scope of work meeting may be postponed.

| <b>Contact Information</b>  |   |                                     |  |  |
|---|---|-------------------------------------|--|--|
| Consultant Name:<br>Tele:<br>E-mail:  | Dan VanPelt, Gorove/Slade Associates, Inc.<br>202-540-1924<br><a href="mailto:dan.vanpelt@goroveslade.com">dan.vanpelt@goroveslade.com</a>  |                                     |  |  |
| Developer/Owner Name:<br>Tele:<br>E-mail:   | JBG Smith<br>240-333-3731<br><a href="mailto:tlawch@jbgsmith.com">tlawch@jbgsmith.com</a>   |                                     |  |  |
| <b>Project Information</b>  |   |                                     |  |  |
| Project Name:   | PenPlace<br>(2754-021)  | Locality/County:                    | Arlington County   |  |
| Project Location:<br>(Attach regional and site specific location map)   | The site is bordered 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 is located in the Pentagon City area of Arlington, VA. Figure 1 shows the regional context of the site and Figure 2 shows the local context of the site. Figure 3 shows an aerial of the site.   |                                     |  |  |
| Submission Type   | Comp Plan <input type="checkbox"/>  | Rezoning <input type="checkbox"/>   | Site Plan <input checked="" type="checkbox"/>  | Subd Plat <input type="checkbox"/>     |
| Project Description:<br>(Including details on the land use, acreage, phasing, access location, etc. Attach additional sheet if necessary) | The proposed mixed-use development will be comprised of 4 buildings containing a total of approximately 2.8 million sf of office, 388,300 sf of amenity uses, 14,500 sf of daycare, 82,600 sf of retail, and 20,000 sf of community space. A site plan is shown in Figure 4.<br><br>The 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 GLUP. |                                     |  |  |
| Proposed Use(s):<br>(Check all that apply; attach additional pages as necessary)<br>(see note 5)  | Residential <input type="checkbox"/>  | Commercial <input type="checkbox"/> | Mixed Use <input checked="" type="checkbox"/>  | Other <input type="checkbox"/>         |
|   | <b>Office Use(s)</b><br>ITE LU Code(s): <u>710</u> (General Office)<br>Square Ft or Other Variable: <u>2,777,079 sf</u>   |                                     | <b>Other Use(s)</b><br>ITE LU Code(s): <u>565</u> (Day Care Center)<br>Square Ft or Other Variable: <u>14,527 sf</u> |  |
|   | <b>Commercial Uses(s)</b><br>ITE LU Code(s): <u>820</u> (Shopping Center)<br>Square Ft or Other Variable: <u>82,608 sf</u>  |                                     | ITE LU Code(s): <u>580</u> (Amenity Uses)<br>Square Ft or Other Variable: <u>388,272 sf</u>                          |  |
|   |   |                                     | ITE LU Code(s): <u>495</u> (Community Space)<br>Square Ft or Other Variable: <u>20,000 sf</u>                        |  |
| Total Peak Hour Trip Projection:<br>(See note 5 on p.4-5, Table 8)  | Less than 100 <input type="checkbox"/>  | 100 – 499 <input type="checkbox"/>  | 500 – 999 <input checked="" type="checkbox"/>  | 1,000 or more <input type="checkbox"/> |



| <b>Traffic Impact Analysis Assumptions</b>  |  |  |  |                       |
|---|--|--|--|-----------------------|
| <b>Study Period</b>   | Existing Year:<br>2020   | Build-out Year:<br>2025                                | Design Year:<br>2031   | Planning Year:<br>N/A |
| <b>Study Area Boundaries</b><br>(Attach map)  | <b>North:</b> Army Navy Drive  | <b>South:</b> 15 <sup>th</sup> Street S                |  |                       |
|   | <b>East:</b> Richmond Highway  | <b>West:</b> S Hayes Street                            |  |                       |
| <b>External Factors That Could Affect Project</b><br>(Planned road improvements, other nearby developments)         | <ul style="list-style-type: none"> <li>• S Eads Street Complete Street</li> <li>• S Eads Street Protected Bike Lanes Extension to Army Navy Drive (through coordination with developments)</li> <li>• Army Navy Complete Street</li> <li>• 12<sup>th</sup> Street Complete Street between S Eads Street and Clark Street:                             <ul style="list-style-type: none"> <li>○ Dedicated center-running transit lanes</li> <li>○ Shared bicycle lanes west of Army Navy Drive</li> <li>○ Two-way cycle track east of Army Navy Drive</li> </ul> </li> <li>• 15<sup>th</sup> Street Realignment</li> <li>• Route 1 Conversion                             <ul style="list-style-type: none"> <li>○ Intersections of Route 1 with 18<sup>th</sup> Street and 15<sup>th</sup> Street will become at-grade intersections (will be included in 2031 analysis scenario)</li> </ul> </li> <li>• I-395 HOT Lanes</li> <li>• PDSP Study</li> <li>• ANC Expansion (2045) – Not included in analysis</li> </ul> |  |  |                       |
| <b>Consistency With Comprehensive Plan</b><br>(Land use, transportation plan)                                       | The site is shown as a mix of high-medium residential and medium office-apartment-hotel land uses in the GLUP.   |  |  |                       |
| <b>Available Traffic Data</b><br>(Historical, forecasts)  | VDOT Historical AADT Data; see Table 9   |  |  |                       |
| <b>Trip Distribution</b><br>(Please refer to Figure 14 and Figure 15)   |  |  |  |                       |
|   |  |  |  |                       |
|   |  |  |  |                       |
|   |  |  |  |                       |
|   |  |  |  |                       |
| <b>Annual Vehicle Trip Growth Rate:</b><br>(See note 10 for proposed growth rates and Table 9 for Historical AADTs) | 0.0%   | <b>Peak Period for Study</b><br>(check all that apply) | <input checked="" type="checkbox"/> AM <input checked="" type="checkbox"/> PM <input type="checkbox"/> SAT (See note 12)   |                       |
|   |  | <b>Peak Hour of the Generator</b>                      | see Table 7 and Table 8  |                       |
| <b>Study Intersections and/or Road Segments</b><br>(Please refer to Figure 5)                                       | 1. Army Navy Drive / S Hayes Street / I-395 Ramp<br>2. Army Navy Drive / S Fern Street<br>3. Army Navy Drive / Parking Lot<br>4. Army Navy Drive / S Eads Street<br>5. Army Navy Drive / VA 110 Off-Ramp   |  | 14. 13 <sup>th</sup> Street S / S Eads Street<br>15. 14 <sup>th</sup> Street S / S Fern Street<br>16. 15 <sup>th</sup> Street S / S Fern Street<br>17. 15 <sup>th</sup> Street S / S Elm Street<br>18. 15 <sup>th</sup> Street S / S Eads Street<br>19. S Eads Street / I-395 HOT Lanes (South Node) |                       |

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

|   |   |  |
|---|---|--|
|   | 6. 11 <sup>th</sup> Street S / S Eads Street<br>7. 12 <sup>th</sup> Street S / S Hayes Street<br>8. 12 <sup>th</sup> Street S / S Fern Street<br>9. 12 <sup>th</sup> Street S / S Elm Street<br>10. 12 <sup>th</sup> Street S / S Eads Street<br>11. 12 <sup>th</sup> Street S / Army Navy Drive<br>12. 12 <sup>th</sup> Street S / Long Bridge Drive / S Clark Street<br>13. 13 <sup>th</sup> Street S / S Fern Street   | 20. S Eads Street / I-395 HOT Lanes (North Node)<br>21. 14 <sup>th</sup> Street S / S Eads Street (Planned)<br>22. S Fern Street / Site Driveway (Planned) |
| <b>Trip Adjustment Factors</b><br>(See Table 5, Table 6)  | <b>Internal allowance:</b><br><input type="checkbox"/> Yes <input type="checkbox"/> No<br>TDM/Mode Split Reduction:<br>See Table 6  | <b>Pass-by allowance:</b> <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No<br><b>Reduction:</b>   |
| <b>Software Methodology</b>   | <input type="checkbox"/> Synchro <input type="checkbox"/> HCS (v.2000/+) <input type="checkbox"/> aaSIDRA <input type="checkbox"/> CORSIM <input checked="" type="checkbox"/> Other <u>VISSIM</u>   |  |
| <b>Traffic Signal Proposed or Affected</b><br>(Analysis software to be used, progression speed, cycle length) | <ol style="list-style-type: none"> <li>1) Army Navy Drive / S Hayes Street</li> <li>2) Army Navy Drive / S Fern Street</li> <li>3) Army Navy Drive / S Eads Street</li> <li>4) 12<sup>th</sup> Street S / S Hayes Street</li> <li>5) 12<sup>th</sup> Street S / S Fern Street</li> <li>6) 12<sup>th</sup> Street S / S Eads Street</li> <li>7) 12<sup>th</sup> Street S / Long Bridge Drive / S Clark Street</li> <li>8) 15<sup>th</sup> Street S / S Fern Street</li> <li>9) 15<sup>th</sup> Street S / S Eads Street</li> <li>10) S Eads Street / I-395 HOT Lanes (south node)</li> <li>11) S Eads Street / I-395 HOT Lanes (north node)</li> <li>12) S Eads Street / 13<sup>th</sup> Street S (Proposed with Metropolitan Park 6, 7, 8)</li> <li>13) S Eads Street / 14<sup>th</sup> Street S (Proposed with Metropolitan Park 6, 7, 8)</li> <li>14) 15<sup>th</sup> Street S / S Elm Street (Proposed with Metropolitan Park 6, 7, 8)</li> </ol> Analysis Software: VISSIM 11.00-14    Results: See Note 12 |  |
| <b>Improvement(s) Assumed or to be Considered</b>   | <ul style="list-style-type: none"> <li>• S Eads Street Complete Street</li> <li>• S Eads Street Protected Bike Lanes Extension to Army Navy Drive (through coordination with developments)</li> <li>• Army Navy Complete Street</li> <li>• 12<sup>th</sup> Street Complete Street between S Eads Street and Clark Street:             <ul style="list-style-type: none"> <li>○ Dedicated center-running transit lanes</li> <li>○ Shared bicycle lanes west of Army Navy Drive</li> <li>○ Two-way cycle track east of Army Navy Drive</li> </ul> </li> <li>• 15<sup>th</sup> Street Realignment</li> <li>• Route 1 Conversion             <ul style="list-style-type: none"> <li>○ Intersections of Route 1 with 18<sup>th</sup> Street and 15<sup>th</sup> Street will become at-grade intersections (will be included in 2031 analysis scenario)</li> </ul> </li> <li>• I-395 HOT Lanes</li> </ul>   |  |

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

|  |   |   |
|--|---|---|
|  | <ul style="list-style-type: none"> <li>• PDSP Study</li> <li>• Potential improvements:             <ul style="list-style-type: none"> <li>○ New signals at Army Navy Drive and Parking Lot/Site Driveway, 11<sup>th</sup> Street S and S Eads Street, S Fern Street and Site Driveway, and 12<sup>th</sup> Street S and S Elm Street</li> </ul> </li> </ul>   |   |
| <p><b>Background Traffic Studies Considered</b><br/>(see note 2)</p> | <p><u>2025 Scenario</u></p> <ul style="list-style-type: none"> <li>• Crystal Drive Central District Retail/1770 Crystal Drive Office - Approved</li> <li>• Century Center – Approved</li> <li>• 1900 S Eads (Crystal House) - Approved (798 Units)</li> <li>• The Altaire (400 Army Navy Drive)</li> <li>• 241 18<sup>th</sup> Street / 1800 S Bell Street – Occupied</li> <li>• Pentagon Centre Phase 1 – Approved</li> <li>• Verizon Site</li> <li>• Metropolitan Park 6, 7, and 8</li> <li>• 1900 Crystal Drive</li> </ul> | <p><u>2031 Scenario</u></p> <ul style="list-style-type: none"> <li>• Crystal Drive Central District Retail/1770 Crystal Drive Office - Approved</li> <li>• Century Center – Approved</li> <li>• 1900 S Eads (Crystal House) - Approved (798 Units)</li> <li>• The Altaire (400 Army Navy Drive)</li> <li>• 241 18<sup>th</sup> Street / 1800 S Bell Street – Occupied</li> <li>• Pentagon Centre Phase 1 – Approved</li> <li>• Verizon Site</li> <li>• Metropolitan Park 6, 7, and 8</li> <li>• 1900 Crystal Drive</li> </ul> |
| <p><b>Plan Submission</b></p>  | <p> <input type="checkbox"/> Master Development Plan (MDP)    <input type="checkbox"/> Generalized Development Plan (GDP)<br/> <input type="checkbox"/> Preliminary/Sketch Plan            <input checked="" type="checkbox"/> Other Plan type (Final Site, Subd. Plan)         </p>  |   |
| <p><b>Additional Issues to be Addressed</b></p>                      | <p> <input checked="" type="checkbox"/> Queuing analysis    <input type="checkbox"/> Actuation/Coordination    <input type="checkbox"/> Weaving analysis<br/> <input type="checkbox"/> Merge analysis    <input checked="" type="checkbox"/> Bike/Ped Accommodations    <input checked="" type="checkbox"/> Intersection(s)<br/> <input checked="" type="checkbox"/> TDM Measures    <input checked="" type="checkbox"/> Other <u>Curbside Management Review</u> </p>   |   |

**NOTES on ASSUMPTIONS:**

1. Synchro files/signal timings will be obtained from Arlington County.
  2. The scenarios to be included in the study are Existing (2020), Future without Development (2025), Future with Development (2025), Future without Development (2031), and Future with Development (2031).
    - a. Existing (2020) will analyze the roadway network as it is using existing traffic volumes
    - b. Future without Development (2025) will analyze existing traffic volumes plus inherent growth on the roadway (representing regional traffic growth) and approved background developments with a construction completion date prior or close to 2025.
    - c. Future with Development (2025) will analyze traffic volumes from the Future without Development (2025) scenario with the addition of traffic volumes generated by the proposed development. We will recommend mitigations at study area intersections for this scenario where appropriate.
    - d. Future without Development (2031) will analyze existing traffic volumes plus inherent growth on the roadway (representing regional traffic growth) and approved background developments with a construction completion date prior or close to 2031.
    - e. Future with Development (2031) will analyze traffic volumes from the Future without Development (2031) scenario with the addition of traffic volumes generated by the proposed development. We will recommend mitigations at study area intersections for this scenario where appropriate.
  3. Typically, the peak hour of commuter traffic is used for both weekday morning and afternoon rush hours. Other hours of analysis may be appropriate given the overall trip generation of the proposed development and the expected hours of vehicular demand to and from the site. Land use may also determine the appropriate hours of analysis as some uses
- It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

experience their peak demand on weekends and off-peak from the typical uses. For this project, we propose to analyze the weekday morning and afternoon commuter peak hours using the system peak at all study area intersections.

Weekday TMCs, including pedestrians, will be provided by Arlington County for the intersections noted above. Counts were conducted on a “typical weekday” when Arlington public schools and Congress are in session.

4. Signal timing adjustments would be considered as an acceptable mitigation measure.
5. Weekday trip generation for the site will be determined based on the methodology outlined in ITE’s *Trip Generation*, 10<sup>th</sup> Edition. As part of this methodology, person trips are allocated to modes of travel based on mode split assumptions (see Table 6) then converted to vehicle trips using average vehicle occupancy factors. The attached Revised Trip Generation memo (see page 34) provides additional data for trip generation methodology and assumptions.
  - a. Office trip generation calculations for the proposed development will be based on ITE’s baseline person trips for General Office Building (LU 710) using the setting/location of Center City Core. An auto mode split of 30% will be assumed for the office use. This mode split is comparable to the mode splits used in Metropolitan Park 6, 7, 8 and is consistent with the Transportation Management Plan (TMP) anticipated for the site.
  - b. Daycare trip generation calculations for the proposed development will be based on ITE’s baseline vehicular trips for Day Care Center (LU 565) using the setting/location of General Urban/Suburban.
  - c. The amenity uses will include support space for the applicant and is anticipated to generate minimal additional trips during the morning and afternoon peak hours. The amenity use will primarily be used off-peak and by office users already on-site. Amenity use trip generation calculations for the proposed development will be based on ITE’s baseline vehicular trips for Museum (LU 580) using the setting/location of General Urban/Suburban.
  - d. Retail trip generation calculations for the proposed development will be based on ITE’s baseline vehicular trips for Shopping Center (LU 820) using the setting/location of General Urban/Suburban (limited data is available for person trips for peak hour of adjacent street).  
ITE vehicle trip generation rates typically presume a stand-alone retail building with customer parking provided on-site, a characteristic common throughout the county except in more urban areas. The proposed development will include neighborhood serving retail where a nominal amount of ancillary ground-floor retail is provided in a mixed-use building that is predominantly office. In addition, little to no dedicated retail parking is being provided. An auto mode split of 5% will be assumed for the neighborhood serving retail use.
  - e. Community space trip generation calculations for the proposed development will be based on ITE’s baseline vehicular trips for Recreational Community Center (LU 495) using the setting General Urban/Suburban.
6. Vehicular trip generation for the proposed PenPlace development is similar or lower than the approved PenPlace development that was analyzed as part of the approved Pen Place TIA dated May 3, 2012:
  - a. Table 1 details the previously approved and analyzed PenPlace vehicular trip generation. This trip generation was analyzed as part of the PenPlace TIA dated May 3, 2012. As part of the previous approval, the analyzed trip generation was determined based on the rates and methodology outlined in ITE’s *Trip Generation*, 8th Edition.

**Table 1: Approved and Analyzed PenPlace Vehicular Trip Generation - TIA Dated 5/3/12**

| Land Use                       | Auto Mode Split | ITE Code | Size      | ----- Week day ----- |            |            |              |            |              |               |
|--------------------------------|-----------------|----------|-----------|----------------------|------------|------------|--------------|------------|--------------|---------------|
|                                |                 |          |           | AM Peak Hour         |            |            | PM Peak Hour |            |              | Weekday Total |
|                                |                 |          |           | In                   | Out        | Total      | In           | Out        | Total        |               |
| Hotel                          | 35%             | 310      | 300 rooms | 34                   | 22         | 56         | 33           | 29         | 62           | 809           |
| General Office                 | 44%             | 710      | 1,800 kSF | 733                  | 100        | 833        | 157          | 765        | 922          | 5,435         |
| Specialty Retail <sup>12</sup> | 35%             | 814      | 50 kSF    | 5                    | 4          | 9          | 16           | 21         | 37           | 582           |
| <b>Total Vehicular Trips</b>   |                 |          |           | <b>772</b>           | <b>126</b> | <b>898</b> | <b>206</b>   | <b>815</b> | <b>1,021</b> | <b>6,826</b>  |

<sup>1</sup> For AM Peak Hour, Specialty Retail is 25% of PM Peak Hour Total

<sup>2</sup> Included 25% Pass-by reduction

- b. Table 2 details the total vehicular trip generation for the entire block, including both the previously approved and analyzed PenPlace and the existing hotel in the northwest corner of the block. The hotel was not included in the previous approval but will be redeveloped as part of the proposed PenPlace development. The trip generation for the existing hotel is included to provide a 1:1 comparison of trips generated by the entire block.

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

**Table 2: Approved and Analyzed PenPlace Trip Generation plus Existing Hotel**

| Land Use                     | Size      | AM Peak Hour |            |            | PM Peak Hour |            |             |
|------------------------------|-----------|--------------|------------|------------|--------------|------------|-------------|
|                              |           | In           | Out        | Total      | In           | Out        | Total       |
| Existing Hotel <sup>12</sup> | 299 rooms | 30           | 20         | 50         | 35           | 35         | 70          |
| Approved Pen Place           | --        | 772          | 126        | 898        | 206          | 815        | 1021        |
| <b>Total Vehicular Trips</b> |           | <b>802</b>   | <b>146</b> | <b>948</b> | <b>241</b>   | <b>850</b> | <b>1091</b> |

<sup>1</sup> Existing hotel trip generation using ITE’s Trip Generation, 10<sup>th</sup> Edition

<sup>2</sup> Assumes 35% auto mode split consistent with approved PenPlace TIA dated 5/3/12

- c. Table 3 details the vehicular trip generation for the proposed PenPlace development. Detailed trip generation assumptions are outlined in Note 5 above, with detailed calculations provided in Table 6, Table 7, and Table 8.

**Table 3: Proposed PenPlace Vehicular Trip Generation**

| Land Use                     | ITE Code | Auto Mode Split | Size         | AM Peak Hour |            |            | PM Peak Hour |            |            |
|------------------------------|----------|-----------------|--------------|--------------|------------|------------|--------------|------------|------------|
|                              |          |                 |              | In           | Out        | Total      | In           | Out        | Total      |
| Office                       | 710      | 30%             | 2,777,079 SF | 635          | 94         | 729        | 108          | 565        | 673        |
| Helix                        | 580      | 30%             | 388,272 SF   | 28           | 5          | 33         | 3            | 18         | 21         |
| Daycare                      | 565      | 50%             | 14,527 SF    | 43           | 37         | 80         | 38           | 43         | 81         |
| Retail                       | 820      | 5%              | 82,608 SF    | 2            | 2          | 4          | 8            | 8          | 16         |
| Community                    | 495      | 50%             | 20,000 SF    | 11           | 7          | 18         | 11           | 12         | 23         |
| <b>Total Vehicular Trips</b> |          |                 |              | <b>719</b>   | <b>145</b> | <b>864</b> | <b>168</b>   | <b>646</b> | <b>814</b> |

- d. Table 4 details the net vehicular trip generation between the approved and analyzed PenPlace development (including the existing hotel) and the proposed PenPlace development. The vehicular trip generation for the proposed project is similar or lower than what was previously analyzed and approved, for several reasons:
- 1) The rates outlined in ITE’s Trip Generation, 8th Edition are higher and more conservative than the rates outlined in the 10th Edition.
  - 2) The previously analyzed PenPlace was approved at a 1:1,200 parking ratio. The proposed PenPlace will be providing an especially low parking ratio for the site compared to other sites in the area (approximately 1:1,386 parking ratio). Given this, the auto mode split for the office uses were reduced appropriately to 30%.

**Table 4: Net Vehicular Trip Generation - Approved (with Existing Hotel) and Proposed PenPlace**

| Land Use   | AM Peak Hour |            |            | PM Peak Hour |             |             |
|--|--------------|------------|------------|--------------|-------------|-------------|
|  | In           | Out        | Total      | In           | Out         | Total       |
| <b>Approved and Analyzed PenPlace (with Existing Hotel)</b>    |              |            |            |              |             |             |
| <b>Subtotal</b>  | <b>802</b>   | <b>146</b> | <b>948</b> | <b>241</b>   | <b>849</b>  | <b>1091</b> |
| <b>Proposed PenPlace</b>                                       |              |            |            |              |             |             |
| <b>Subtotal</b>  | <b>719</b>   | <b>145</b> | <b>864</b> | <b>168</b>   | <b>646</b>  | <b>814</b>  |
| <b>Difference in Vehicular Trips (Proposed minus Approved)</b> | <b>-83</b>   | <b>-1</b>  | <b>-84</b> | <b>-73</b>   | <b>-203</b> | <b>-277</b> |

7. Trip distribution for the site was determined based on: (1) Census Transportation Planning Products (CTPP) Transportation Analysis Districts (TAD) flow data, (2) the Crystal City Multimodal Transportation Study, (3) existing traffic volumes and travel patterns in the study area, and primarily (4) StreetLight origin and destination data.
- a. 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. Please note that the Origin-Destination (OD) analysis is based on existing travel

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

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 9.

b. Existing Local and Regional Distribution:

Using StreetLight Insight LBS data (December 2017 to November 2018), we were able to map the general home locations for commuters to the Pentagon City area and the general work locations for residents that live in the Pentagon City area. The results of the Home and Work Analysis are shown in Figure 10 and Figure 11. 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 12 shows the inbound distribution results for the morning and afternoon peak hours, and Figure 13 shows the outbound distribution results for the morning and afternoon peak hours.

c. Existing Trip Assignment

Trip assignment for proposed project 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.

d. 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 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.

e. Based on the methodology outline above, Figure 14 shows the assumed inbound trip distribution for the proposed development during the AM and PM peak hours and Figure 15 shows the assumed outbound trip distribution for the proposed development during the AM and PM peak hours.

f. Pedestrian and transit distributions will be provided in the MMTA.

8. Distributions for the 2031 analysis horizon will be adjusted to account for the Route 1 To-Grade project.
9. Due to the type of data available traffic signal warrants will be performed in accordance with MUTCD Warrant 3 (Peak Hour) and Warrant 4 (Pedestrian Volume).
10. It is assumed that background developments (approved but unbuilt developments) will account for growth along local roadways in the study area in the future (2025 and 2031) horizon years.
11. A multimodal analysis will be provided in the study which will include the following information (as shown in Figure 6):
  - a. Multimodal trip generation
  - b. Curbside management information
  - c. Transit Facilities

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

- d. Transit Ridership (As available, to be provided by Arlington County)
- e. Bike/pedestrian facilities
- f. Multimodal Initiatives
- g. Bus services within the study area
- h. Pedestrian pathways to major generators and destinations of pedestrian activity

## 12. VISSIM

- a. The base coded VISSIM model, provided by Arlington County, will be reviewed to ensure the compliance with *TOSAM Version 2* and existing network characteristics. MOEs will be reported at the following signalized intersections from the VISSIM model:
  - 1) Army Navy Drive & S Hayes Street / I-395 Ramp
  - 2) Army Navy Drive & S Fern Street
  - 3) Army Navy Drive & Parking Lot
  - 4) Army Navy Drive & S Eads Street
  - 5) 12th Street S & S Hayes Street
  - 6) 12th Street S & S Fern Street
  - 7) 12th Street S & S Eads Street
  - 8) 12th Street S & Long Bridge Drive / S Clark Street
  - 9) 15th Street S & S Fern Street
  - 10) 15th Street S & S Eads Street
  - 11) S Eads Street & I-395 HOT Lanes (South Node)
  - 12) S Eads Street & I-395 HOT Lanes (North Node)
  - 13) Army Navy Drive & 12<sup>th</sup> Street S (Planned Signal – Future Scenario Only)
  - 14) S Elm Street & 15<sup>th</sup> Street (Planned Signal – Future Scenario Only)
  - 15) S Eads Street & 13<sup>th</sup> Street S (Planned Signal – Future Scenario Only)
  - 16) S Eads Street & 14<sup>th</sup> Street S (Planned Signal – Future Scenario Only)
  - 17) S Fern Street & Site Driveway (Proposed Signal – Future Scenario Only)
  - 18) 12th Street S & S Elm Street (Proposed Signal – Future Scenario Only)
  - 19) S Eads Street & Site Driveway (Proposed Signal – Future Scenario Only)
- b. The existing (Year 2020) conditions VISSIM model will be established by coding the vehicle inputs and routing decisions using the peak hour traffic volumes provided by Arlington county, as well as other resources available to Gorove Slade. The data collection points and travel time segments will be coded/adjusted where required. The field-measured travel times will be provided by the Arlington County. VISSIM analysis will be conducted based on the vehicle fleet for North America.
- c. The seeding period and number of simulation runs will be calculated based on TOSAM Version 2 and existing network characteristics, and will be incorporated into the existing conditions VISSIM model.
- d. VISSIM 11.00-14 will be used.
- e. The available field data including the field-measured travel times and traffic volumes (provided by Arlington County) will be used to calibrate the existing conditions VISSIM model based on the VDOT calibration targets and criteria (TOSAM Version 2, Sections 5.3) as shown below:

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

VISSIM Calibration Thresholds

| <b>Simulated Measure *</b>   | <b>Calibration Threshold</b>   |
|--|--|
| <b>Simulated Traffic Volume (vehicles per hour)</b><br>85% of the network links and/or turning movement and a select number of critical links and/or turning movements | Within $\pm 20\%$ for $< 100$ vph<br>Within $\pm 15\%$ for $\geq 100$ vph to $< 1,000$ vph<br>Within $\pm 10\%$ for $\geq 1,000$ vph to $< 5,000$ vph<br>Within $\pm 500$ vph for $\geq 5,000$ vph |
| <b>Simulated Travel Time (seconds)</b><br>85% of the travel time routes and segments or a select number of critical routes and segments                                | Within $\pm 30\%$ for average observed travel times  |

*\* The model calibration and MOE reports will be based on the data provided by the Arlington County. Gorove Slade will not perform any additional data collection or travel demand forecasting.*

As part of the calibration process, the following measures of effectiveness (MOEs) will be utilized to compare the model outputs with the field data:

- Vehicular volumes (throughputs) at signalized intersections
  - Vehicular travel times along coded measurement segments
- f. Based on the analysis results, the following MOEs will be reported for each scenario:
- 1) Vehicular volumes (throughputs) at signalized intersections
  - 2) Vehicular travel times along established measurement segments
  - 3) Transit travel time along 12th Street S transit route
  - 4) Pedestrian and bicycle delay at signalized intersections
- g. A document including the calibration process and results will be submitted to Arlington County for review before proceeding to the next steps. The document will include following elements:
- Description of study area characteristics
  - Overview of the existing traffic patterns in the study area
  - Overview of the base coded and existing conditions VISSIM model
  - Calibration criteria, procedure and results
  - Justification that the model is sufficiently calibrated
  - Justification of any deviation from the calibration criteria
- h. Arlington County will provide comments on the calibrated VISSIM model within two (2) weeks of submission. If needed, Gorove Slade will address any comments and resubmit the calibrated VISSIM model and accompanying document within a week of receiving comments from the County.
- i. Once the calibrated existing conditions model has been accepted by the County’s review, the existing conditions’ MOEs will be documented and the model will be updated to analyze future scenarios including:
- Future without Development (Year 2025)
  - Future with Development (Year 2025) (If needed based on results of other scenarios)
  - Future with Development (Year 2025) - Mitigated
  - Future without Development (Year 2031)
  - Future with Development (Year 2031) (If needed based on results of other scenarios)
  - Future with Development (Year 2031) - Mitigated
- j. The model calibration and MOE reports will be based on the data provided by the Arlington County. Gorove Slade will not perform any additional data collection or travel demand forecasting. The future demand for all analyzed scenarios/modes will be based on applying growth rates to the existing data provided by the Arlington County. Growth rates for pedestrian and bicycle volumes will be based on the overall growth in vehicular demand increase in

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.



the network, apart from pedestrian and bicycle volumes applied to the model from the Metropolitan Park 6, 7, 8 and 400 11th St. S. (Verizon Site) projects.


- k. A document including the modeling/calibration approach and VISSIM analysis results for the existing and future scenarios will be submitted to Arlington County. The document will outline the following:
- Previously mentioned items as part of the existing conditions VISSIM model development and calibration
  - Overview of the future traffic patterns in the study area
  - Overview of the future demand development for different modes
  - The MOEs for the future scenarios
  - Description of any modification to the future traffic network including the improvements outlined in Pen Place MMTA as well as required improvement based on the microsimulation analysis
- Note: A document including the model/calibration and VISSIM analysis results for the 2025 horizon year will be submitted to the County and a supplemental document with the 2031 horizon year analysis will be submitted once it is complete.
- l. Arlington County will provide comments within three (3) weeks of final document submission. The model and corresponding documents will be adjusted as needed and will be finalized based on the County’s review.
- m. The final VISSIM model will be provided to VDOT for reference.

SIGNED:  DATE: 9/30/21  
Applicant or Consultant

PRINT NAME: Dan VanPelt, Gorove/Slade Associates, Inc.  
Applicant or Consultant

SIGNED:  DATE: 10/04/2021  
Local Government Representative

PRINT NAME: Sergio Viricochea  
Local Government Representative

SIGNED:  DATE: 10/22/2021  
VDOT Representative

PRINT NAME: David N. Jordan  
VDOT Representative

It is important for the applicant to provide sufficient information to county and VDOT staff so that questions regarding geographic scope, alternate methodology, or other issues can be answered at the scoping meeting.

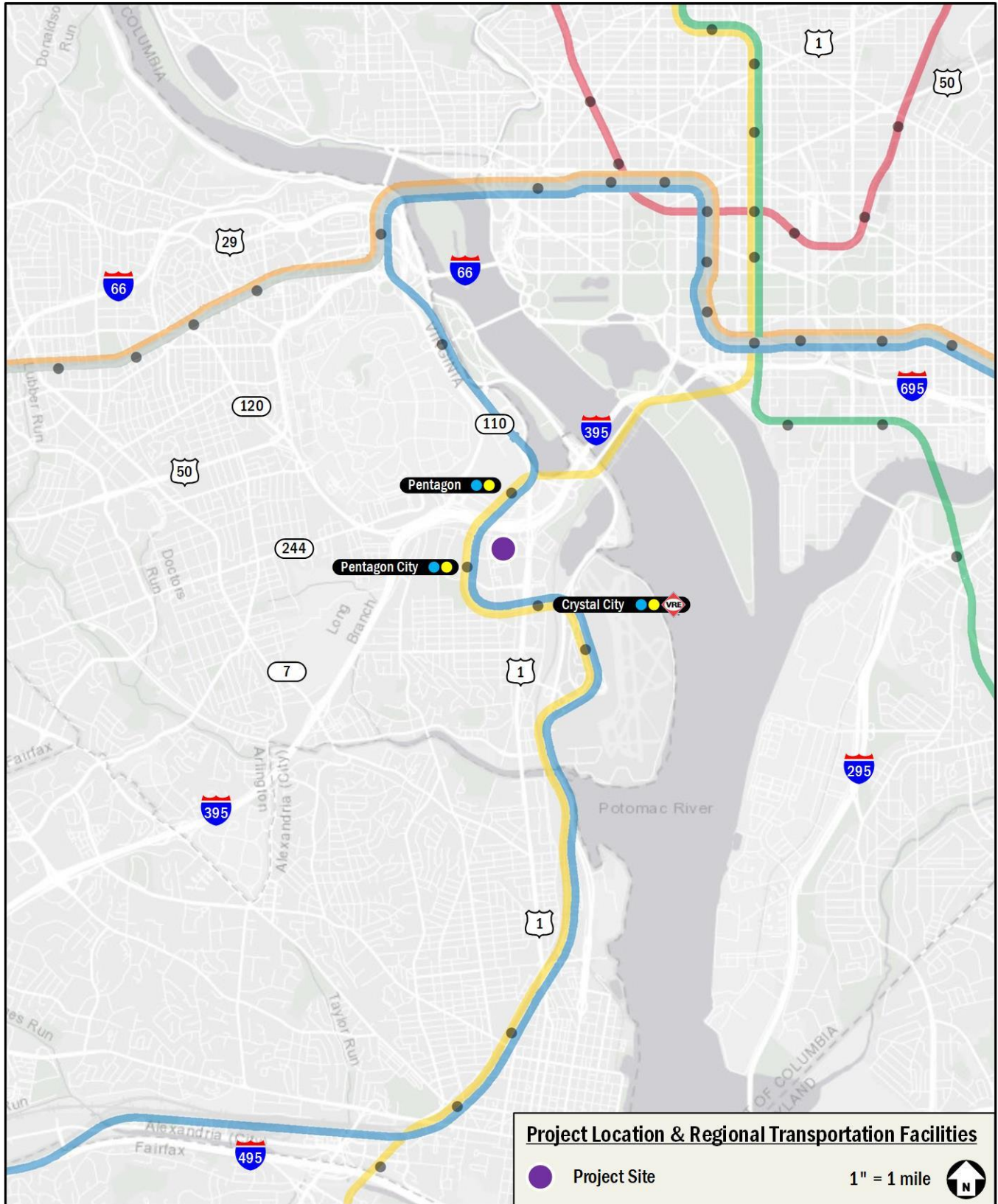


Figure 1: Regional Location



Figure 2: Site Location



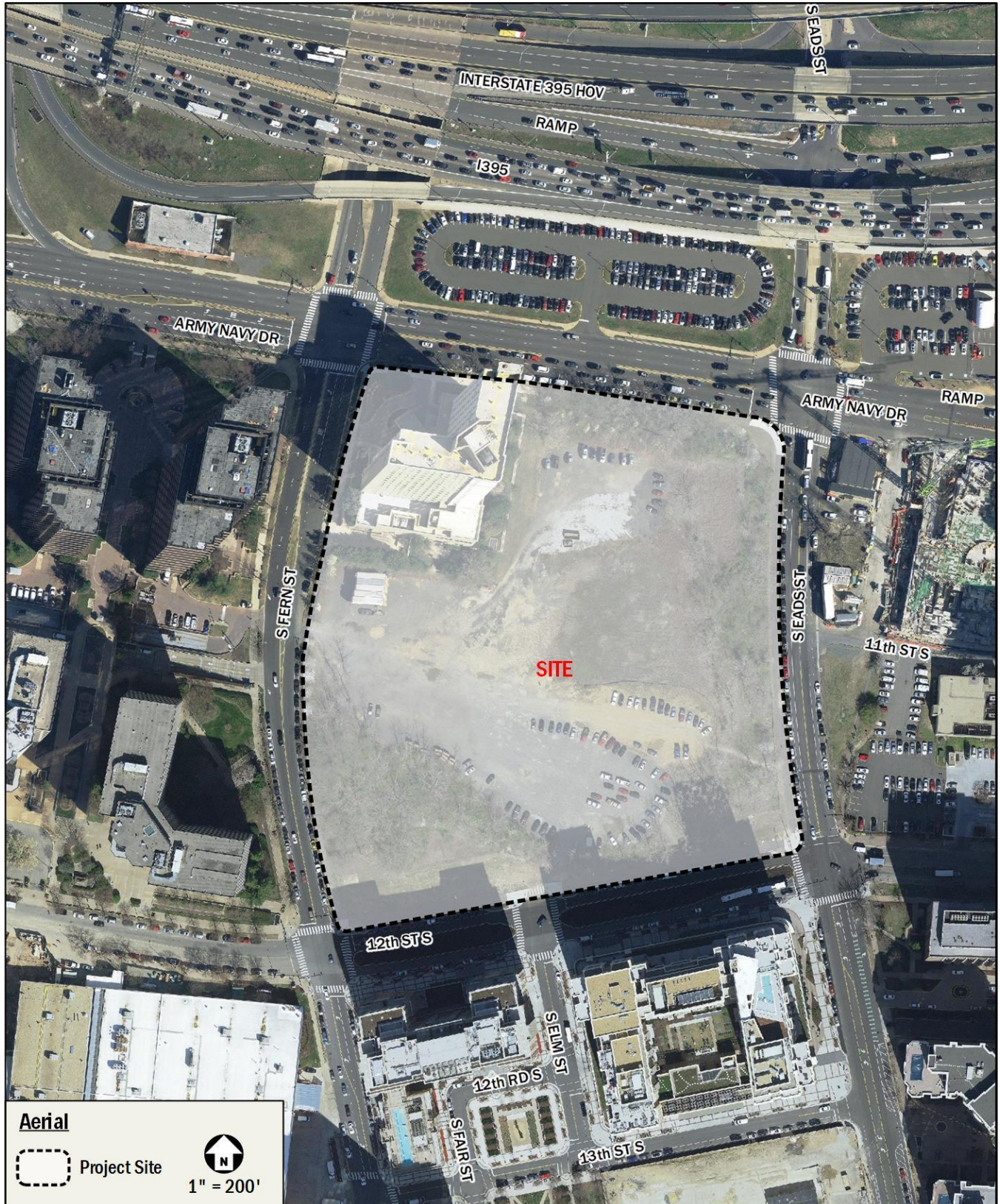


Figure 3: Aerial



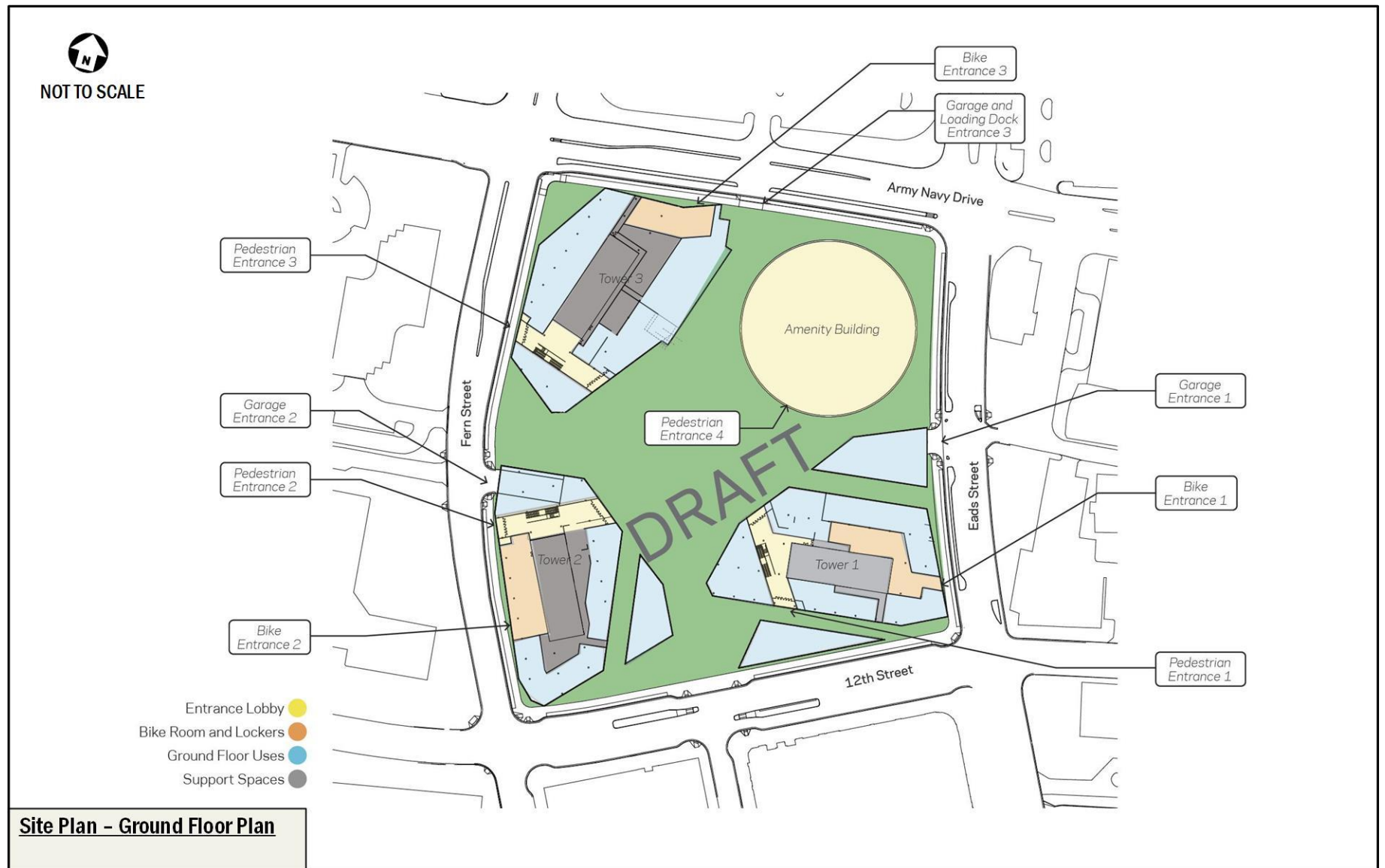


Figure 4: Site Plan - Ground Floor Plan

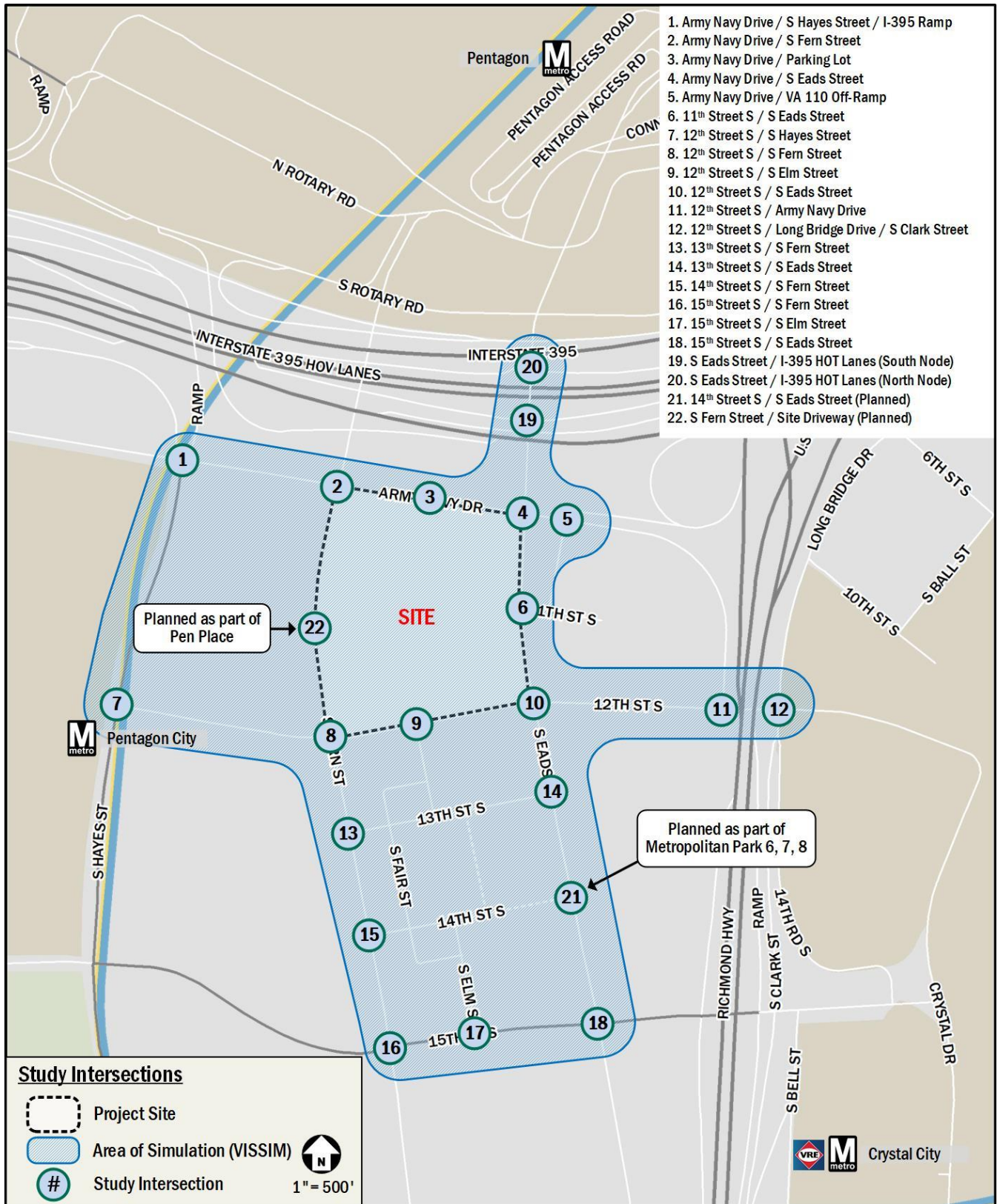


Figure 5: Study Intersections



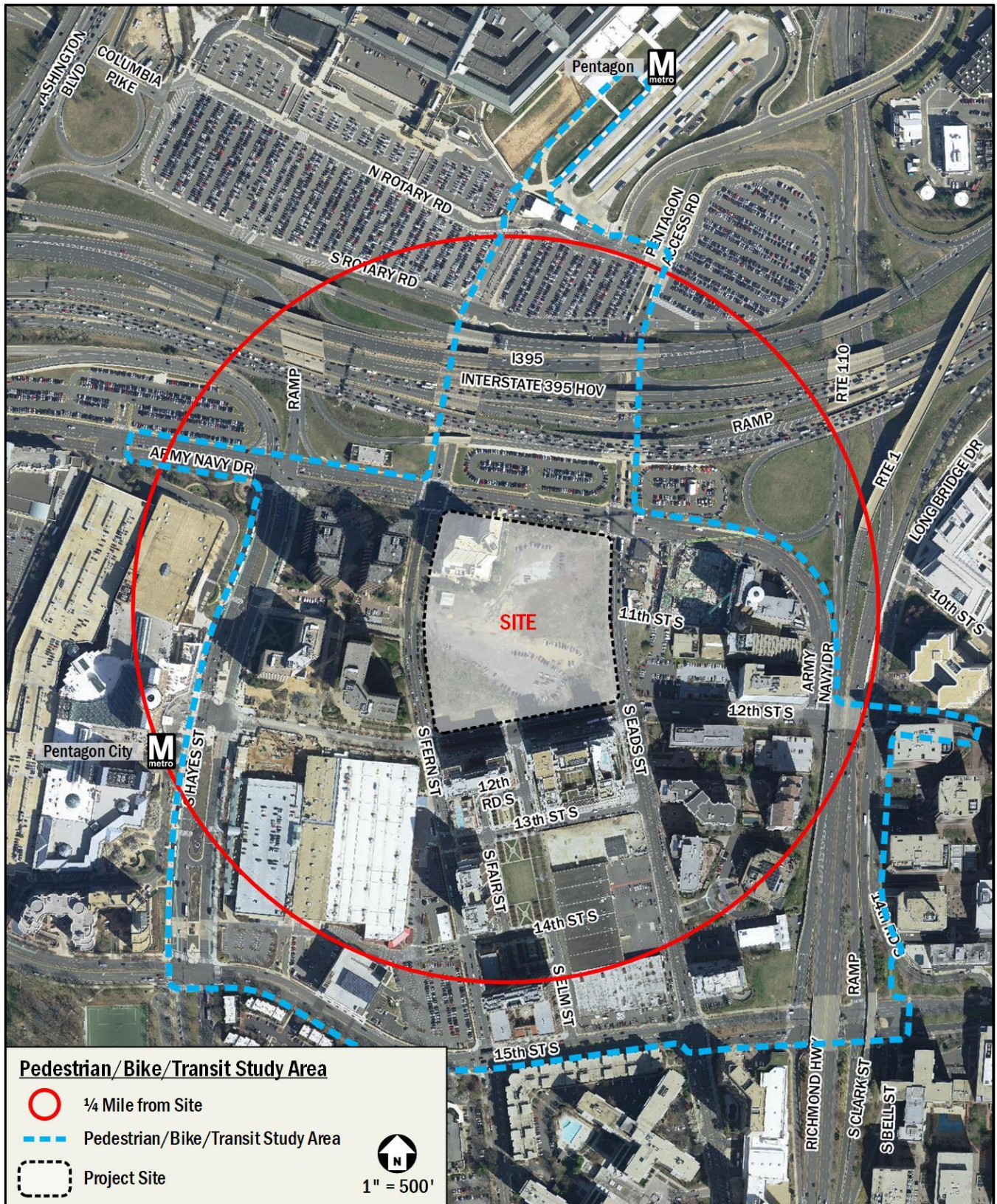


Figure 6: Pedestrian/Bike/Transit Study Area



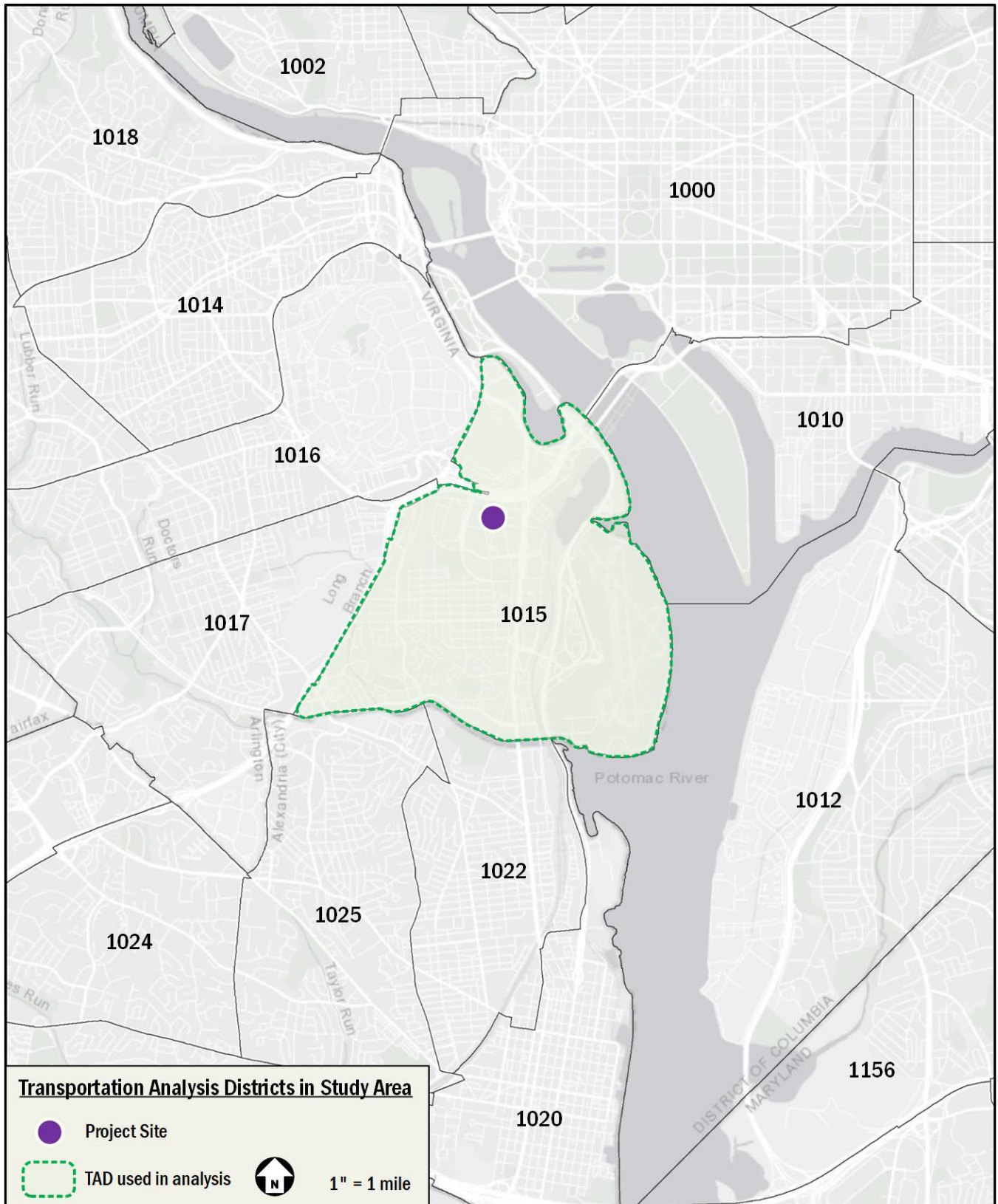
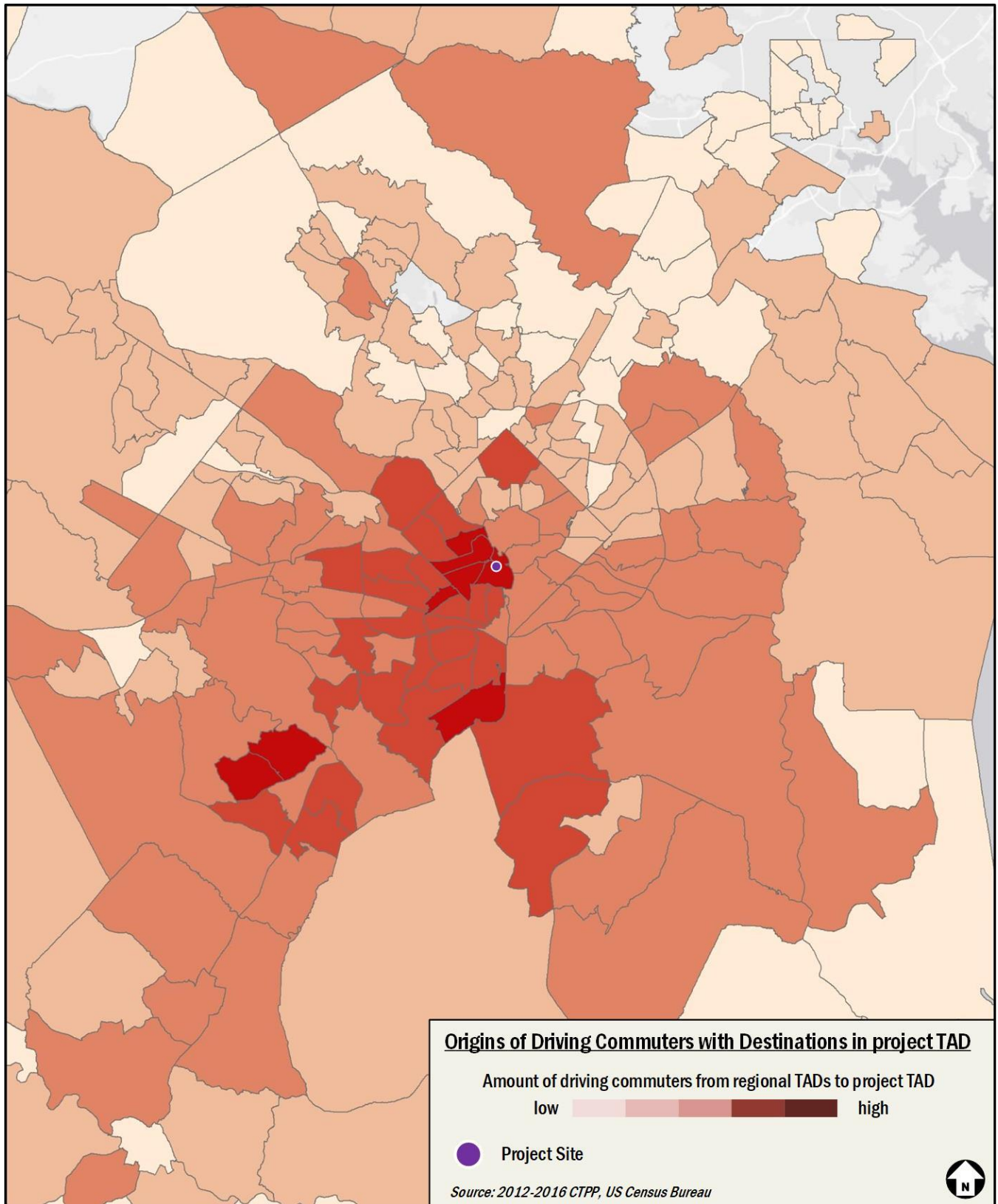


Figure 7: Transportation Analysis Districts (TAD) in Study Area





**Figure 8: Origins of Driving Commuters with Destinations in project TAD**

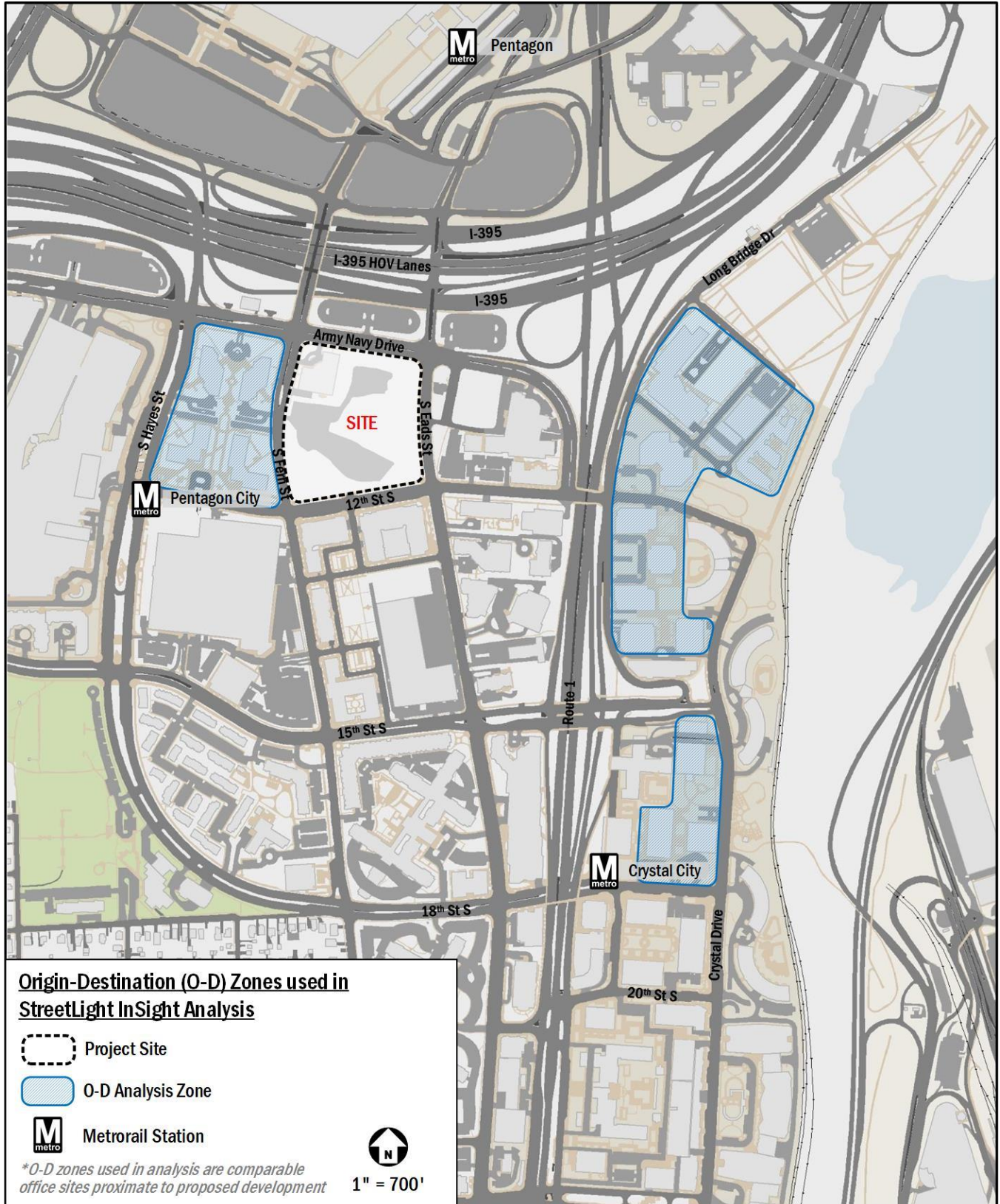


Figure 9: Origin-Destination Zones Used in StreetLight InSight Analysis



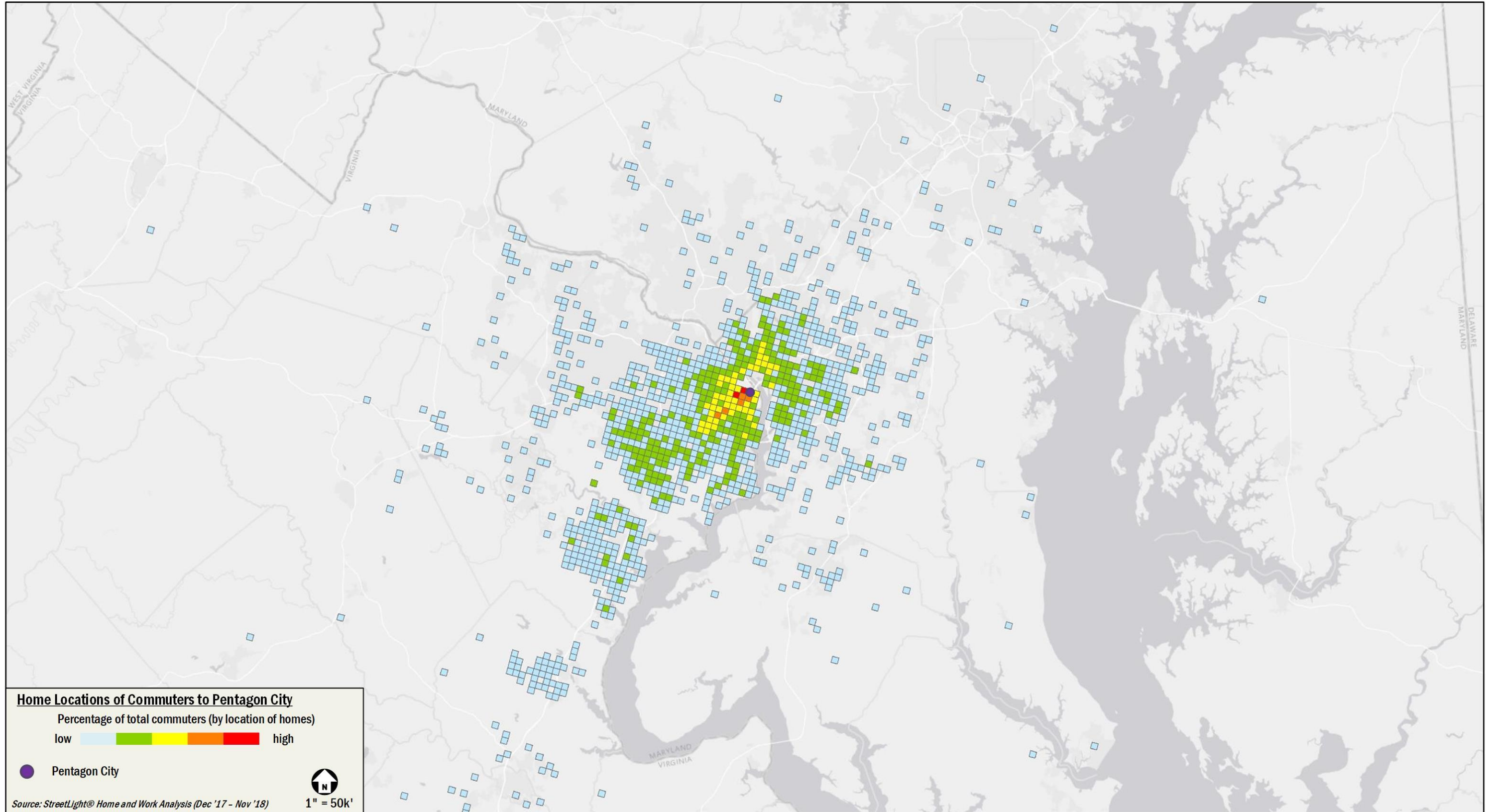


Figure 10: Home Locations of Commuters to Pentagon City (distribution based on StreetLight InSight Data)

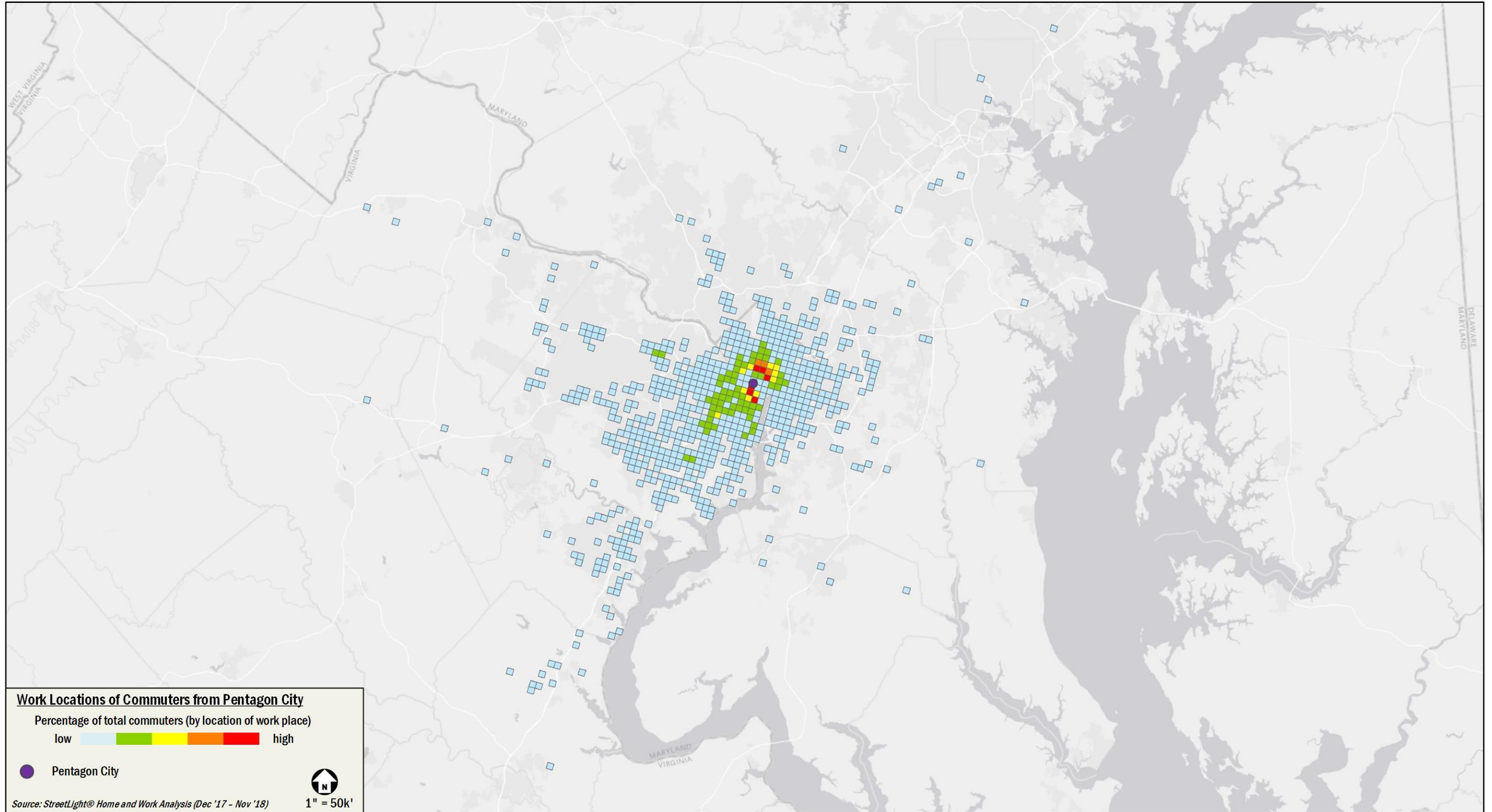


Figure 11: Work Locations of Commuters from Pentagon City (distributions based on StreetLight InSight data)



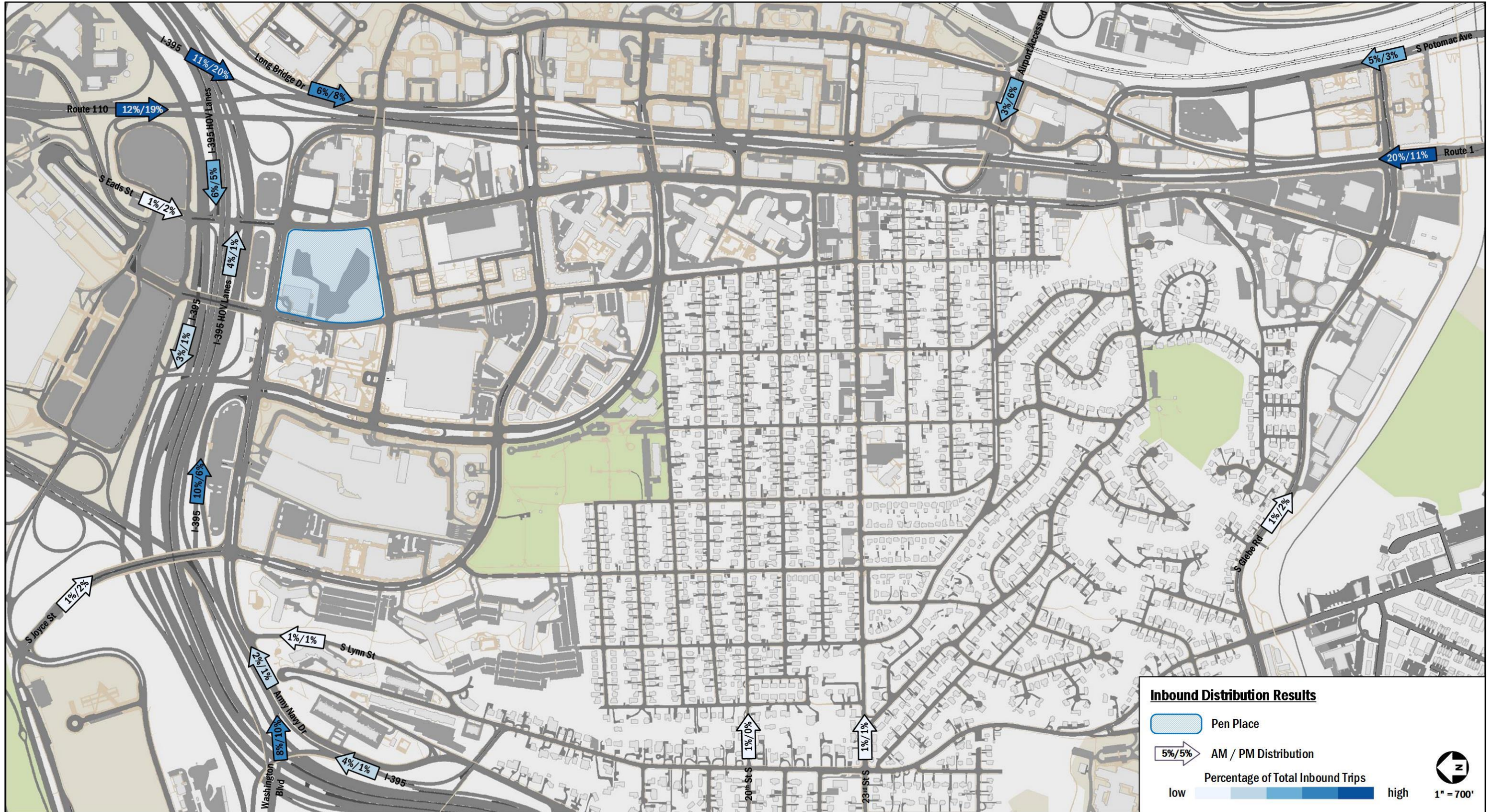


Figure 12: Inbound Distribution Results (distributions based on StreetLight InSight data)







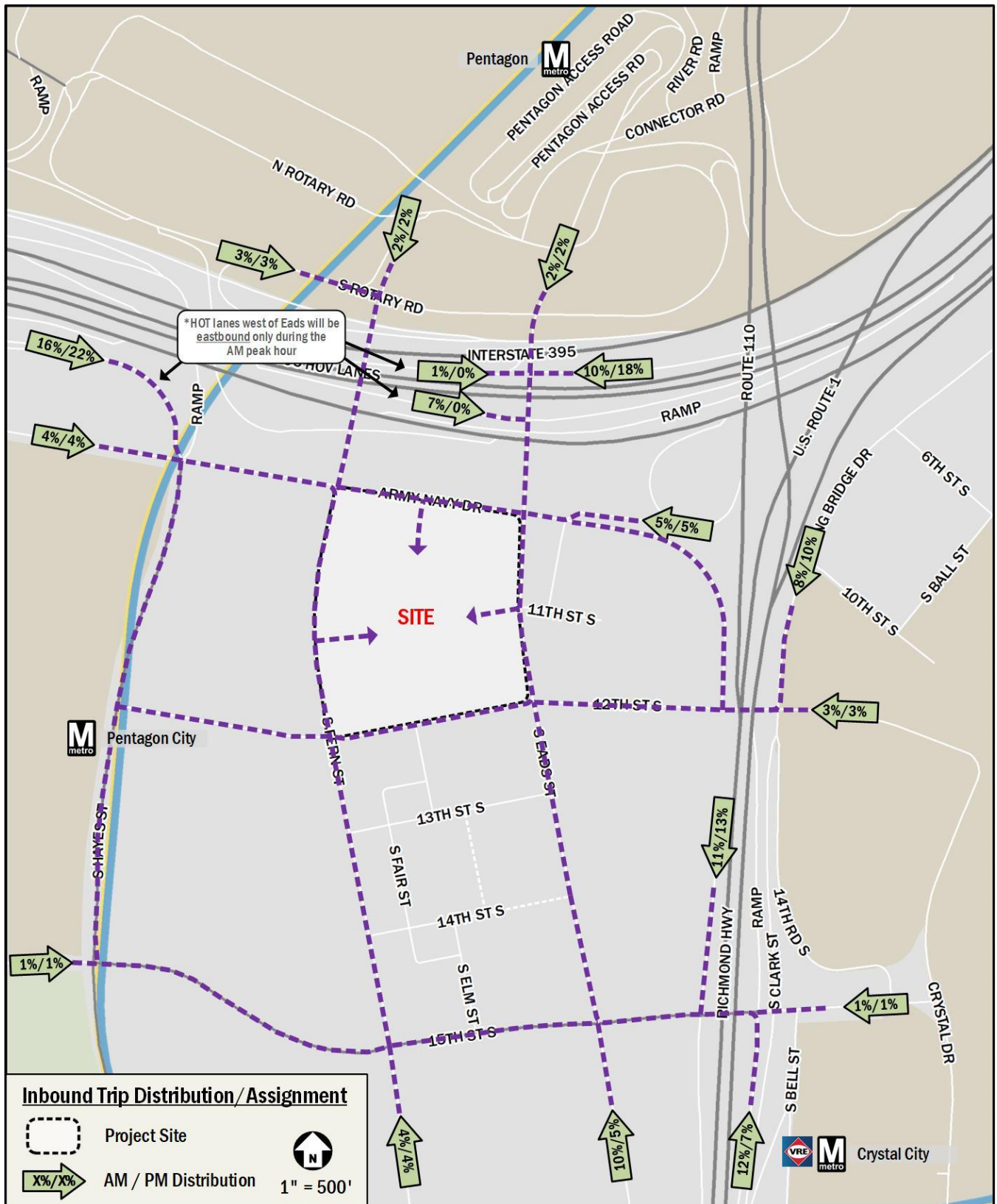


Figure 14: Inbound Trip Distribution

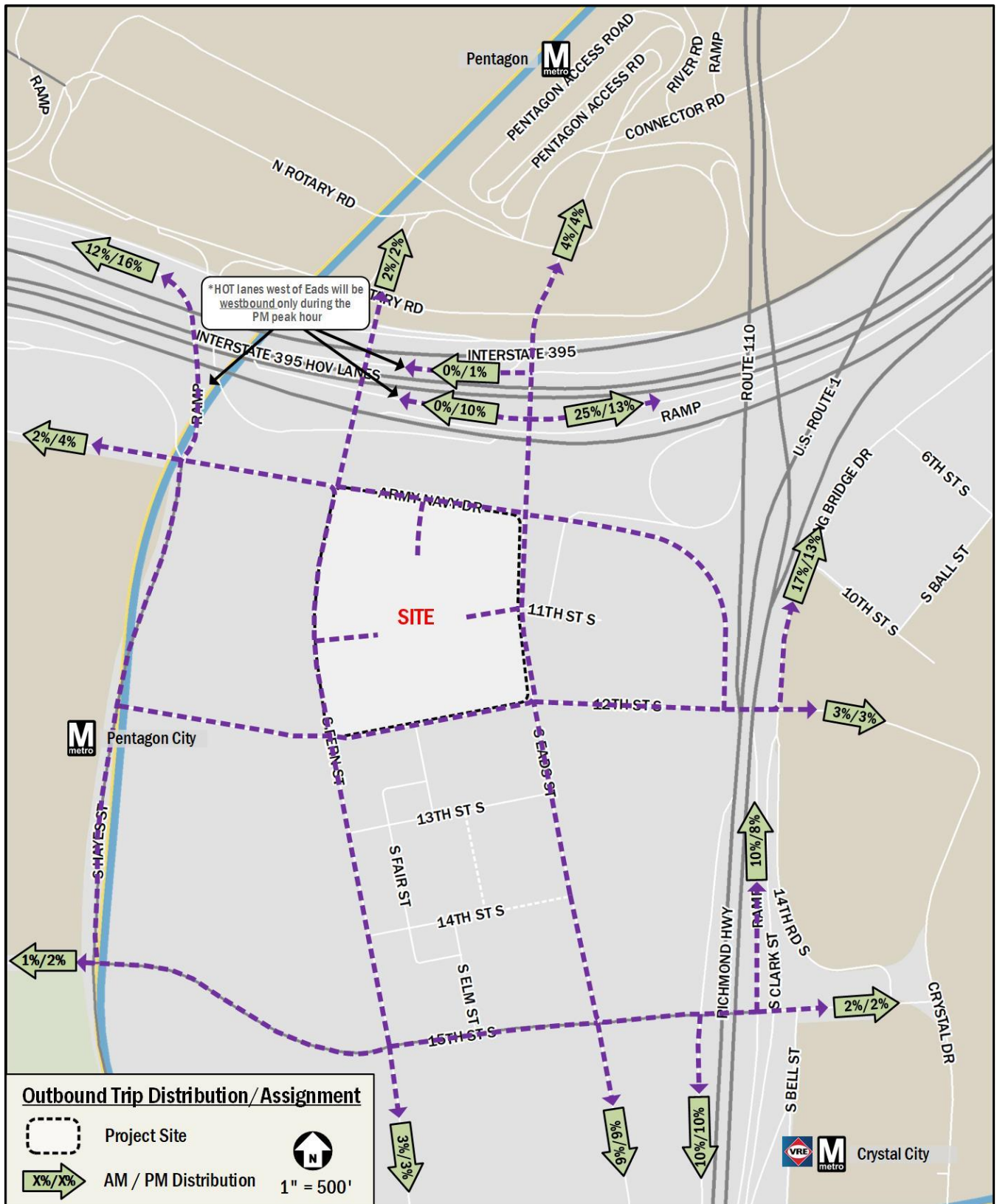


Figure 15: Outbound Trip Distribution



**Table 5: Mode Split Assumptions**

**Office - Pertinent Mode Split data from other sources:**

| Information Source   | Mode               |         |              |      |      |             |       |
|--|--------------------|---------|--------------|------|------|-------------|-------|
|  | SOV                | Carpool | Transit      | Bike | Walk | Telecommute | Other |
| State of the Commute 2016<br>(of District employees)         | 38%                | 6%      | 45%          | 6%   |      | 5%          |       |
| Crystal City Multimodal Transportation<br>Study (Table 3.7)  | 39% AM / 50%<br>PM |         | 27%          | 28%  |      | ---         |       |
| Crystal City Multimodal Transportation<br>Study (Figure 3.4) | ---                |         | 46% -<br>50% | ---  |      | ---         |       |
| WMATA Ridership Survey<br>(Suburban Inside the Beltway)      | 66%                |         | 30%          | 6%   |      | ---         |       |
| WMATA Ridership Survey<br>(Suburban Outside the Beltway)     | 89%                |         | 11%          | 0%   |      | ---         |       |

**Retail - Pertinent Mode Split data from other sources:**

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

**Table 6: Mode Split Proposed for MMTA**

| Land Use                       | Mode  |         |      |      |                   |
|--------------------------------|-------|---------|------|------|-------------------|
|                                | Drive | Transit | Bike | Walk | Telecommute/Other |
| Office Mode Split              | 30%   | 54%     | 6%   | 10%  | ---               |
| Amenity Mode Split             | 30%   | 54%     | 6%   | 10%  | ---               |
| Daycare Mode Split             | 50%   | 20%     | 5%   | 25%  | ---               |
| Neighborhood Retail Mode Split | 5%    | 15%     | 5%   | 75%  | ---               |
| Community Mode Split           | 50%   | 20%     | 5%   | 25%  | ---               |

**Table 7: Peak Hour Trip Generation for Proposed Uses**

**PenPlace Trip Generation**

Approximately 2,777,079 sf office

Step 1: Base trip generation using ITEs' **person Trip Generation** (10th Edition)

| Land Use                    | Land Use Code | Quantity (x) | AM Peak Hour |            |                     | PM Peak Hour |             |                     | Daily                       |
|-----------------------------|---------------|--------------|--------------|------------|---------------------|--------------|-------------|---------------------|-----------------------------|
|                             |               |              | In           | Out        | Total               | In           | Out         | Total               | Total                       |
| Office                      | 710           | 2,777,079 sf | 2495 ppl/hr  | 373 ppl/hr | 2868 ppl/hr         | 423 ppl/hr   | 2223 ppl/hr | 2646 ppl/hr         | 21645 ppl                   |
| <i>Calculation Details:</i> |               |              | 87%          | 13%        | =1.01(X/1000)+62.71 | 16%          | 84%         | =0.92(X/1000)+90.81 | $Ln(T)=0.67Ln(X/1000)+4.67$ |

Note: Setting used for trip generation is Center City Core

Step 2: Split between modes, per assumed mode splits

| Land Use | Mode    | Split | AM Peak Hour |            |             | PM Peak Hour |             |             | Daily     |
|----------|---------|-------|--------------|------------|-------------|--------------|-------------|-------------|-----------|
|          |         |       | In           | Out        | Total       | In           | Out         | Total       | Total     |
| Office   | Auto    | 30%   | 749 ppl/hr   | 111 ppl/hr | 860 ppl/hr  | 127 ppl/hr   | 667 ppl/hr  | 794 ppl/hr  | 6494 ppl  |
| Office   | Transit | 54%   | 1347 ppl/hr  | 202 ppl/hr | 1549 ppl/hr | 228 ppl/hr   | 1201 ppl/hr | 1429 ppl/hr | 11688 ppl |
| Office   | Bike    | 6%    | 150 ppl/hr   | 22 ppl/hr  | 172 ppl/hr  | 25 ppl/hr    | 134 ppl/hr  | 159 ppl/hr  | 1299 ppl  |
| Office   | Walk    | 10%   | 250 ppl/hr   | 37 ppl/hr  | 287 ppl/hr  | 42 ppl/hr    | 223 ppl/hr  | 265 ppl/hr  | 2165 ppl  |

Step 3: Convert person auto trips to vehicles/hour

| Land Use | People/Car<br>(from 2017 NHTS, Table 16) | AM Peak Hour |           |            | PM Peak Hour |            |            | Daily    |
|----------|--|--------------|-----------|------------|--------------|------------|------------|----------|
|          |  | In           | Out       | Total      | In           | Out        | Total      | Total    |
| Office   | 1.18 ppl/veh                             | 635 veh/hr   | 94 veh/hr | 729 veh/hr | 108 veh/hr   | 565 veh/hr | 673 veh/hr | 5503 veh |

**Office Trip Gen for PenPlace**

| Mode    | AM Peak Hour |            |             | PM Peak Hour |             |             | Daily     |
|---------|--------------|------------|-------------|--------------|-------------|-------------|-----------|
|         | In           | Out        | Total       | In           | Out         | Total       | Total     |
| Auto    | 635 veh/hr   | 94 veh/hr  | 729 veh/hr  | 108 veh/hr   | 565 veh/hr  | 673 veh/hr  | 5503 veh  |
| Transit | 1347 ppl/hr  | 202 ppl/hr | 1549 ppl/hr | 228 ppl/hr   | 1201 ppl/hr | 1429 ppl/hr | 11688 ppl |
| Bike    | 150 ppl/hr   | 22 ppl/hr  | 172 ppl/hr  | 25 ppl/hr    | 134 ppl/hr  | 159 ppl/hr  | 1299 ppl  |
| Walk    | 250 ppl/hr   | 37 ppl/hr  | 287 ppl/hr  | 42 ppl/hr    | 223 ppl/hr  | 265 ppl/hr  | 2165 ppl  |

Note: New office buildings likely to reduce AM Peak outbound and PM Peak Inbound trips from/to 22202 as employees replace some existing tenants who currently commute out of market.

Approximately 388,272 sf meeting center

Step 1: Base trip generation using ITEs' **vehicular** Trip Generation (10th Edition)

| Land Use                    | Land Use Code | Quantity (x) | AM Peak Hour |           |               | PM Peak Hour |           |               |
|-----------------------------|---------------|--------------|--------------|-----------|---------------|--------------|-----------|---------------|
|                             |               |              | In           | Out       | Total         | In           | Out       | Total         |
| Museum                      | 580           | 388,272 sf   | 94 veh/hr    | 15 veh/hr | 109 veh/hr    | 11 veh/hr    | 59 veh/hr | 70 veh/hr     |
| <i>Calculation Details:</i> |               |              | 86%          | 14%       | =0.28(X/1000) | 16%          | 84%       | =0.18(X/1000) |

Note: Setting used for trip generation is General Urban/Suburban

Step 2A: Convert to people per hour, before applying mode splits

| Land Use | People/Car<br>(from 2017 NHTS, Table 16) | AM Peak Hour |           |            | PM Peak Hour |           |            |
|----------|--|--------------|-----------|------------|--------------|-----------|------------|
|          |  | In           | Out       | Total      | In           | Out       | Total      |
| Museum   | 1.67 ppl/veh                             | 157 ppl/hr   | 25 ppl/hr | 182 ppl/hr | 18 ppl/hr    | 99 ppl/hr | 117 ppl/hr |

Step 2B: Split between modes, per assumed Mode Splits

| Land Use | Mode    | Split | AM Peak Hour |           |           | PM Peak Hour |           |           |
|----------|---------|-------|--------------|-----------|-----------|--------------|-----------|-----------|
|          |         |       | In           | Out       | Total     | In           | Out       | Total     |
| Museum   | Auto    | 30%   | 47 ppl/hr    | 8 ppl/hr  | 55 ppl/hr | 5 ppl/hr     | 30 ppl/hr | 35 ppl/hr |
| Museum   | Transit | 54%   | 85 ppl/hr    | 13 ppl/hr | 98 ppl/hr | 10 ppl/hr    | 53 ppl/hr | 63 ppl/hr |
| Museum   | Bike    | 6%    | 9 ppl/hr     | 2 ppl/hr  | 11 ppl/hr | 1 ppl/hr     | 6 ppl/hr  | 7 ppl/hr  |
| Museum   | Walk    | 10%   | 16 ppl/hr    | 2 ppl/hr  | 18 ppl/hr | 2 ppl/hr     | 10 ppl/hr | 12 ppl/hr |

Step 3: Convert person auto trips to vehicles/hour

| Land Use | People/Car<br>(from 2017 NHTS, Table 16) | AM Peak Hour |          |           | PM Peak Hour |           |           |
|----------|--|--------------|----------|-----------|--------------|-----------|-----------|
|          |  | In           | Out      | Total     | In           | Out       | Total     |
| Museum   | 1.67 ppl/veh                             | 28 veh/hr    | 5 veh/hr | 33 veh/hr | 3 veh/hr     | 18 veh/hr | 21 veh/hr |

**Meeting Center Trip Gen for Pen Place**

| Mode    | AM Peak Hour |           |           | PM Peak Hour |           |           |
|---------|--------------|-----------|-----------|--------------|-----------|-----------|
|         | In           | Out       | Total     | In           | Out       | Total     |
| Auto    | 28 veh/hr    | 5 veh/hr  | 33 veh/hr | 3 veh/hr     | 18 veh/hr | 21 veh/hr |
| Transit | 85 ppl/hr    | 13 ppl/hr | 98 ppl/hr | 10 ppl/hr    | 53 ppl/hr | 63 ppl/hr |
| Bike    | 9 ppl/hr     | 2 ppl/hr  | 11 ppl/hr | 1 ppl/hr     | 6 ppl/hr  | 7 ppl/hr  |
| Walk    | 16 ppl/hr    | 2 ppl/hr  | 18 ppl/hr | 2 ppl/hr     | 10 ppl/hr | 12 ppl/hr |

Note: The amenity uses will include support space for the applicant. Trip generation for these buildings is anticipated to generate minimal additional trips during the morning and afternoon peak hour.

Approximately 14,527 sf daycare

Step 1: Base trip generation using ITEs' **vehicular** Trip Generation

| Land Use                    | Land Use Code | Quantity (x) | AM Peak Hour |           |             | PM Peak Hour |           |                | Daily          |
|-----------------------------|---------------|--------------|--------------|-----------|-------------|--------------|-----------|----------------|----------------|
|                             |               |              | In           | Out       | Total       | In           | Out       | Total          | Total          |
| Daycare                     | 565           | 14,527 sf    | 85 veh/hr    | 75 veh/hr | 160 veh/hr  | 76 veh/hr    | 86 veh/hr | 162 veh/hr     | 692 veh        |
| <i>Calculation Details:</i> |               |              | 53%          | 47%       | =11(X/1000) | 47%          | 53%       | =11.12(X/1000) | =47.62(X/1000) |

Note: Setting used for trip generation is General Urban/Suburban

Step 2: Convert to people per hour, before applying mode splits

| Land Use | People/Car<br>(from 2017 NHTS, Table 16) | AM Peak Hour |            |            | PM Peak Hour |            |            | Daily    |
|----------|--|--------------|------------|------------|--------------|------------|------------|----------|
|          |  | In           | Out        | Total      | In           | Out        | Total      | Total    |
| Daycare  | 1.82 ppl/veh                             | 155 ppl/hr   | 136 ppl/hr | 291 ppl/hr | 138 ppl/hr   | 157 ppl/hr | 295 ppl/hr | 1259 ppl |

Step 3: Split between modes, per assumed Mode Splits

| Land Use | Mode    | Split | AM Peak Hour |           |            | PM Peak Hour |           |            | Daily   |
|----------|---------|-------|--------------|-----------|------------|--------------|-----------|------------|---------|
|          |         |       | In           | Out       | Total      | In           | Out       | Total      | Total   |
| Daycare  | Auto    | 50%   | 78 ppl/hr    | 68 ppl/hr | 146 ppl/hr | 69 ppl/hr    | 79 ppl/hr | 148 ppl/hr | 630 ppl |
| Daycare  | Transit | 20%   | 31 ppl/hr    | 27 ppl/hr | 58 ppl/hr  | 28 ppl/hr    | 31 ppl/hr | 59 ppl/hr  | 252 ppl |
| Daycare  | Bike    | 5%    | 8 ppl/hr     | 7 ppl/hr  | 15 ppl/hr  | 7 ppl/hr     | 8 ppl/hr  | 15 ppl/hr  | 63 ppl  |
| Daycare  | Walk    | 25%   | 39 ppl/hr    | 34 ppl/hr | 73 ppl/hr  | 35 ppl/hr    | 39 ppl/hr | 74 ppl/hr  | 315 ppl |

Step 4: Convert person auto trips back to vehicles/hour

| Land Use | People/Car<br>(from 2017 NHTS, Table 16) | AM Peak Hour |           |           | PM Peak Hour |           |           | Daily   |
|----------|--|--------------|-----------|-----------|--------------|-----------|-----------|---------|
|          |  | In           | Out       | Total     | In           | Out       | Total     | Total   |
| Daycare  | 1.82 ppl/veh                             | 43 veh/hr    | 37 veh/hr | 80 veh/hr | 38 veh/hr    | 43 veh/hr | 81 veh/hr | 346 veh |

**Daycare Trip Gen for PenPlace**

| Mode    | AM Peak Hour |           |           | PM Peak Hour |           |           | Daily   |
|---------|--------------|-----------|-----------|--------------|-----------|-----------|---------|
|         | In           | Out       | Total     | In           | Out       | Total     | Total   |
| Auto    | 43 veh/hr    | 37 veh/hr | 80 veh/hr | 38 veh/hr    | 43 veh/hr | 81 veh/hr | 346 veh |
| Transit | 31 ppl/hr    | 27 ppl/hr | 58 ppl/hr | 28 ppl/hr    | 31 ppl/hr | 59 ppl/hr | 252 ppl |
| Bike    | 8 ppl/hr     | 7 ppl/hr  | 15 ppl/hr | 7 ppl/hr     | 8 ppl/hr  | 15 ppl/hr | 63 ppl  |
| Walk    | 39 ppl/hr    | 34 ppl/hr | 73 ppl/hr | 35 ppl/hr    | 39 ppl/hr | 74 ppl/hr | 315 ppl |

Approximately 82,608 square feet of retail

Step 1: Base trip generation using ITEs' **vehicular Trip Generation**

| Land Use                    | Land Use Code | Quantity (x) | AM Peak Hour |           |               | PM Peak Hour |            |               | Daily          |
|-----------------------------|---------------|--------------|--------------|-----------|---------------|--------------|------------|---------------|----------------|
|                             |               |              | In           | Out       | Total         | In           | Out        | Total         | Total          |
| Retail                      | 820           | 82,608 sf    | 48 veh/hr    | 30 veh/hr | 78 veh/hr     | 151 veh/hr   | 164 veh/hr | 315 veh/hr    | 3118 veh       |
| <i>Calculation Details:</i> |               |              | 62%          | 38%       | =0.94(X/1000) | 48%          | 52%        | =3.81(X/1000) | =37.75(X/1000) |

Note: Rates used for neighborhood retail instead of equation, because size is much lower than average data point

Step 2: Convert to people per hour, before applying mode splits

| Land Use | People/Car<br>(from 2017 NHTS, Table 16) | AM Peak Hour |           |            | PM Peak Hour |            |            | Daily    |
|----------|--|--------------|-----------|------------|--------------|------------|------------|----------|
|          |  | In           | Out       | Total      | In           | Out        | Total      | Total    |
| Retail   | 1.82 ppl/veh                             | 87 ppl/hr    | 55 ppl/hr | 142 ppl/hr | 275 ppl/hr   | 298 ppl/hr | 573 ppl/hr | 5675 ppl |

Step 3: Split between modes, per assumed Mode Splits

| Land Use | Mode    | Split | AM Peak Hour |           |            | PM Peak Hour |            |            | Daily    |
|----------|---------|-------|--------------|-----------|------------|--------------|------------|------------|----------|
|          |         |       | In           | Out       | Total      | In           | Out        | Total      | Total    |
| Retail   | Auto    | 5%    | 4 ppl/hr     | 3 ppl/hr  | 7 ppl/hr   | 14 ppl/hr    | 15 ppl/hr  | 29 ppl/hr  | 284 ppl  |
| Retail   | Transit | 15%   | 13 ppl/hr    | 8 ppl/hr  | 21 ppl/hr  | 41 ppl/hr    | 45 ppl/hr  | 86 ppl/hr  | 851 ppl  |
| Retail   | Bike    | 5%    | 4 ppl/hr     | 3 ppl/hr  | 7 ppl/hr   | 14 ppl/hr    | 15 ppl/hr  | 29 ppl/hr  | 284 ppl  |
| Retail   | Walk    | 75%   | 65 ppl/hr    | 42 ppl/hr | 107 ppl/hr | 206 ppl/hr   | 224 ppl/hr | 430 ppl/hr | 4256 ppl |

Step 4: Convert person auto trips back to vehicles/hour

| Land Use | People/Car<br>(from 2017 NHTS, Table 16) | AM Peak Hour |          |          | PM Peak Hour |          |           | Daily   |
|----------|--|--------------|----------|----------|--------------|----------|-----------|---------|
|          |  | In           | Out      | Total    | In           | Out      | Total     | Total   |
| Retail   | 1.82 ppl/veh                             | 2 veh/hr     | 2 veh/hr | 4 veh/hr | 8 veh/hr     | 8 veh/hr | 16 veh/hr | 156 veh |

**Retail Trip Gen for PenPlace**

| Mode    | AM Peak Hour |           |            | PM Peak Hour |            |            | Daily    |
|---------|--------------|-----------|------------|--------------|------------|------------|----------|
|         | In           | Out       | Total      | In           | Out        | Total      | Total    |
| Auto    | 2 veh/hr     | 2 veh/hr  | 4 veh/hr   | 8 veh/hr     | 8 veh/hr   | 16 veh/hr  | 156 veh  |
| Transit | 13 ppl/hr    | 8 ppl/hr  | 21 ppl/hr  | 41 ppl/hr    | 45 ppl/hr  | 86 ppl/hr  | 851 ppl  |
| Bike    | 4 ppl/hr     | 3 ppl/hr  | 7 ppl/hr   | 14 ppl/hr    | 15 ppl/hr  | 29 ppl/hr  | 284 ppl  |
| Walk    | 65 ppl/hr    | 42 ppl/hr | 107 ppl/hr | 206 ppl/hr   | 224 ppl/hr | 430 ppl/hr | 4256 ppl |

Approximately 20,000 square foot community center

Step 1: Base trip generation using ITEs' **vehicular** Trip Generation

| Land Use                      | Land Use Code | Quantity (x) | AM Peak Hour |           |               | PM Peak Hour |           |               | Daily          |
|-------------------------------|---------------|--------------|--------------|-----------|---------------|--------------|-----------|---------------|----------------|
|                               |               |              | In           | Out       | Total         | In           | Out       | Total         | Total          |
| Recreational Community Center | 495           | 20,000 sf    | 23 veh/hr    | 12 veh/hr | 35 veh/hr     | 22 veh/hr    | 24 veh/hr | 46 veh/hr     | 576 veh        |
| <i>Calculation Details:</i>   |               |              | 66%          | 34%       | =1.76(X/1000) | 47%          | 53%       | =2.31(X/1000) | =28.82(X/1000) |

Note: Setting used for trip generation is General Urban/Suburban

Step 2: Convert to people per hour, before applying mode splits

| Land Use                      | People/Car (from 2017 NHTS, Table 16) | AM Peak Hour |           |           | PM Peak Hour |           |           | Daily    |
|-------------------------------|---------------------------------------|--------------|-----------|-----------|--------------|-----------|-----------|----------|
|                               |                                       | In           | Out       | Total     | In           | Out       | Total     | Total    |
| Recreational Community Center | 2.10 ppl/veh                          | 48 ppl/hr    | 26 ppl/hr | 74 ppl/hr | 46 ppl/hr    | 51 ppl/hr | 97 ppl/hr | 1210 ppl |

Step 3: Split between modes, per assumed Mode Splits

| Land Use                      | Mode    | Split | AM Peak Hour |           |           | PM Peak Hour |           |           | Daily   |
|-------------------------------|---------|-------|--------------|-----------|-----------|--------------|-----------|-----------|---------|
|                               |         |       | In           | Out       | Total     | In           | Out       | Total     | Total   |
| Recreational Community Center | Auto    | 50%   | 24 ppl/hr    | 13 ppl/hr | 37 ppl/hr | 23 ppl/hr    | 26 ppl/hr | 49 ppl/hr | 605 ppl |
| Recreational Community Center | Transit | 20%   | 10 ppl/hr    | 5 ppl/hr  | 15 ppl/hr | 9 ppl/hr     | 10 ppl/hr | 19 ppl/hr | 242 ppl |
| Recreational Community Center | Bike    | 5%    | 2 ppl/hr     | 2 ppl/hr  | 4 ppl/hr  | 2 ppl/hr     | 3 ppl/hr  | 5 ppl/hr  | 61 ppl  |
| Recreational Community Center | Walk    | 25%   | 12 ppl/hr    | 7 ppl/hr  | 19 ppl/hr | 12 ppl/hr    | 12 ppl/hr | 24 ppl/hr | 303 ppl |

Step 4: Convert person auto trips back to vehicles/hour

| Land Use                      | People/Car (from 2017 NHTS, Table 16) | AM Peak Hour |          |           | PM Peak Hour |           |           | Daily   |
|-------------------------------|---------------------------------------|--------------|----------|-----------|--------------|-----------|-----------|---------|
|                               |                                       | In           | Out      | Total     | In           | Out       | Total     | Total   |
| Recreational Community Center | 2.10 ppl/veh                          | 11 veh/hr    | 7 veh/hr | 18 veh/hr | 11 veh/hr    | 12 veh/hr | 23 veh/hr | 288 veh |

**Community Center Trip Gen for PenPlace**

| Mode    | AM Peak Hour |          |           | PM Peak Hour |           |           | Daily   |
|---------|--------------|----------|-----------|--------------|-----------|-----------|---------|
|         | In           | Out      | Total     | In           | Out       | Total     | Total   |
| Auto    | 11 veh/hr    | 7 veh/hr | 18 veh/hr | 11 veh/hr    | 12 veh/hr | 23 veh/hr | 288 veh |
| Transit | 10 ppl/hr    | 5 ppl/hr | 15 ppl/hr | 9 ppl/hr     | 10 ppl/hr | 19 ppl/hr | 242 ppl |
| Bike    | 2 ppl/hr     | 2 ppl/hr | 4 ppl/hr  | 2 ppl/hr     | 3 ppl/hr  | 5 ppl/hr  | 61 ppl  |
| Walk    | 12 ppl/hr    | 7 ppl/hr | 19 ppl/hr | 12 ppl/hr    | 12 ppl/hr | 24 ppl/hr | 303 ppl |

**Table 8: Trip Generation Summary**

| Mode           | Land Use         | ITE Code | Mode Split | Development Size | AM Peak Hour       |                   |                    | PM Peak Hour      |                    |                    |
|----------------|------------------|----------|------------|------------------|--------------------|-------------------|--------------------|-------------------|--------------------|--------------------|
|                |                  |          |            |                  | In                 | Out               | Total              | In                | Out                | Total              |
| <b>Auto</b>    | 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%        | 20,000 SF        | 11 veh/hr          | 7 veh/hr          | 18 veh/hr          | 11 veh/hr         | 12 veh/hr          | 23 veh/hr          |
|                | <b>Total</b>     |          |            |                  | <b>719 veh/hr</b>  | <b>145 veh/hr</b> | <b>864 veh/hr</b>  | <b>168 veh/hr</b> | <b>646 veh/hr</b>  | <b>814 veh/hr</b>  |
| <b>Transit</b> | 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%        | 20,000 SF        | 10 ppl/hr          | 5 ppl/hr          | 15 ppl/hr          | 9 ppl/hr          | 10 ppl/hr          | 19 ppl/hr          |
|                | <b>Total</b>     |          |            |                  | <b>1486 ppl/hr</b> | <b>255 ppl/hr</b> | <b>1741 ppl/hr</b> | <b>316 ppl/hr</b> | <b>1340 ppl/hr</b> | <b>1656 ppl/hr</b> |
| <b>Bike</b>    | 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%         | 20,000 SF        | 2 ppl/hr           | 2 ppl/hr          | 4 ppl/hr           | 2 ppl/hr          | 3 ppl/hr           | 5 ppl/hr           |
|                | <b>Total</b>     |          |            |                  | <b>173 ppl/hr</b>  | <b>36 ppl/hr</b>  | <b>209 ppl/hr</b>  | <b>49 ppl/hr</b>  | <b>166 ppl/hr</b>  | <b>215 ppl/hr</b>  |
| <b>Walk</b>    | 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%        | 20,000 SF        | 12 ppl/hr          | 7 ppl/hr          | 19 ppl/hr          | 12 ppl/hr         | 12 ppl/hr          | 24 ppl/hr          |
|                | <b>Total</b>     |          |            |                  | <b>382 ppl/hr</b>  | <b>122 ppl/hr</b> | <b>504 ppl/hr</b>  | <b>297 ppl/hr</b> | <b>508 ppl/hr</b>  | <b>805 ppl/hr</b>  |

**Table 9: Historical AADT Volumes**

| Route           | From                 | To                    | AADT   |        |        |        |        |        | Annual %<br>Change (2015 -<br>2019) |
|-----------------|----------------------|-----------------------|--------|--------|--------|--------|--------|--------|-------------------------------------|
|                 |                      |                       | 2015   | 2016   | 2017   | 2018   | 2019   | 2020** |                                     |
| Route 1         | SR 233 DCA           | SR 100, I-395<br>Ramp | 48,000 | 48,000 | 49,000 | 50,000 | 47,000 | 39,000 | -0.5%                               |
| S Eads Street   | 20th Street S        | I-395                 | 9,100  | 9,100  | 9,200  | 10,000 | 7,300  | 5,500  | -5.4%                               |
| 12th Street S*  | Crystal Drive        | S Eads Street         | 2,800  | 5,200  | 5,300  | 5,300  | 6,100  | 4,600  | 21.5%                               |
| 15th Street S   | S Hayes Street       | Route 1               | 14,000 | 14,000 | 14,000 | 15,000 | 12,000 | 8,800  | -3.8%                               |
| Army Navy Drive | S Hayes Street/I-395 | 12th Street S         | 6,500  | 7,300  | 7,500  | 7,300  | 7,800  | 5,800  | 4.7%                                |
| S Hayes Street  | 18th Street S        | I-395                 | 9,400  | 10,000 | 11,000 | 10,000 | 11,000 | 8,300  | 4.0%                                |
| S Fern Street   | 23rd Street S        | Army Navy Drive       | 4,500  | 6,400  | 6,900  | 6,300  | 5,800  | 4,400  | 6.6%                                |
|                 |                      |                       |        |        |        |        |        |        | -0.2%                               |

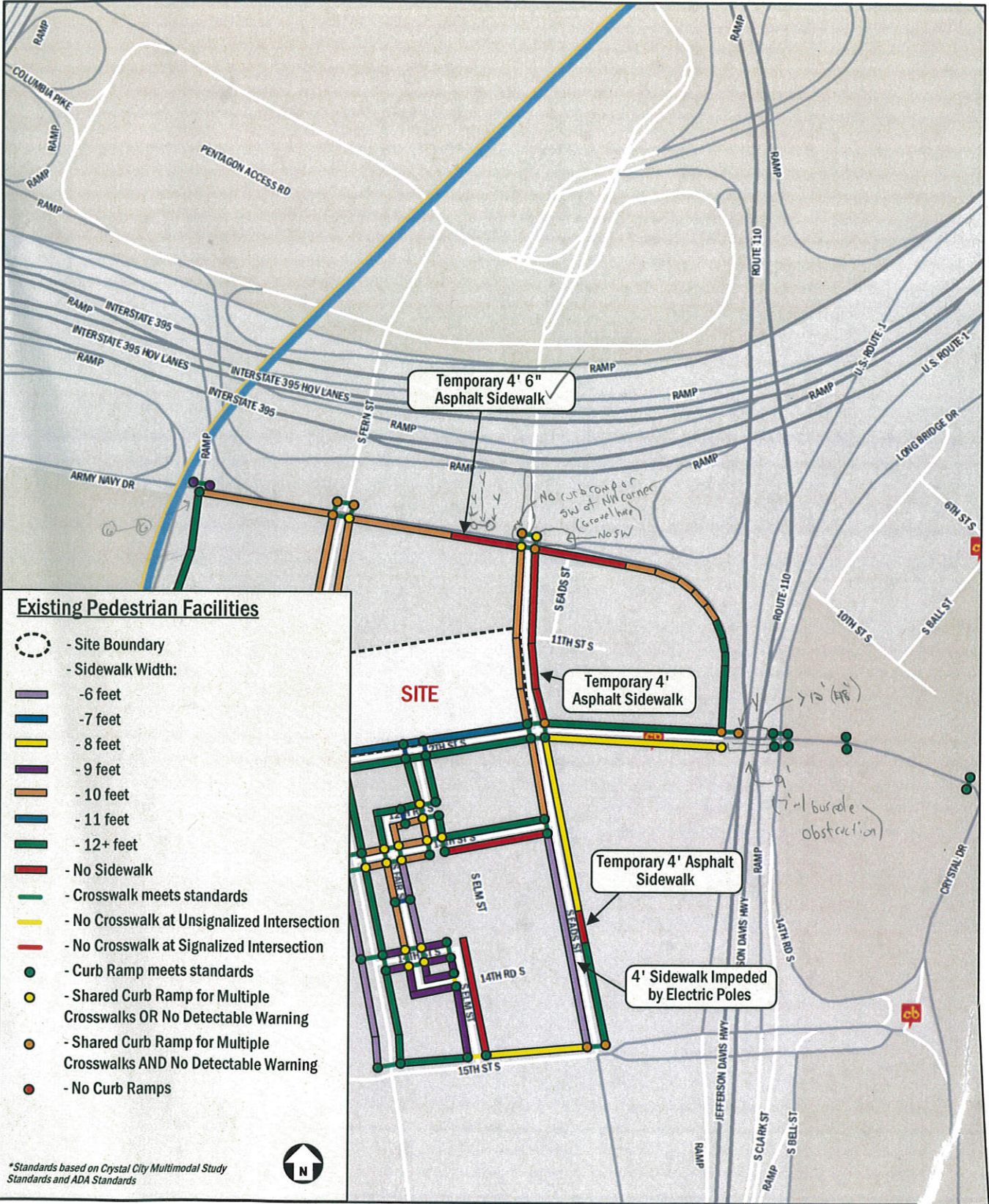
\*12th Street S excluded from calculation. 12th Street S was reconfigured to connect S Eads Street and S Fern Street in 2016, skewing results of growth rate calculations

\*\*2020 AADT excluded from calculation due to non-typical traffic patterns due to the COVID-19 pandemic, skewing results of growth rate calculations

Source: VDOT Traffic Data 2015 to 2020 (<http://www.virginiadot.org/info/ct-trafficcounts.asp>)

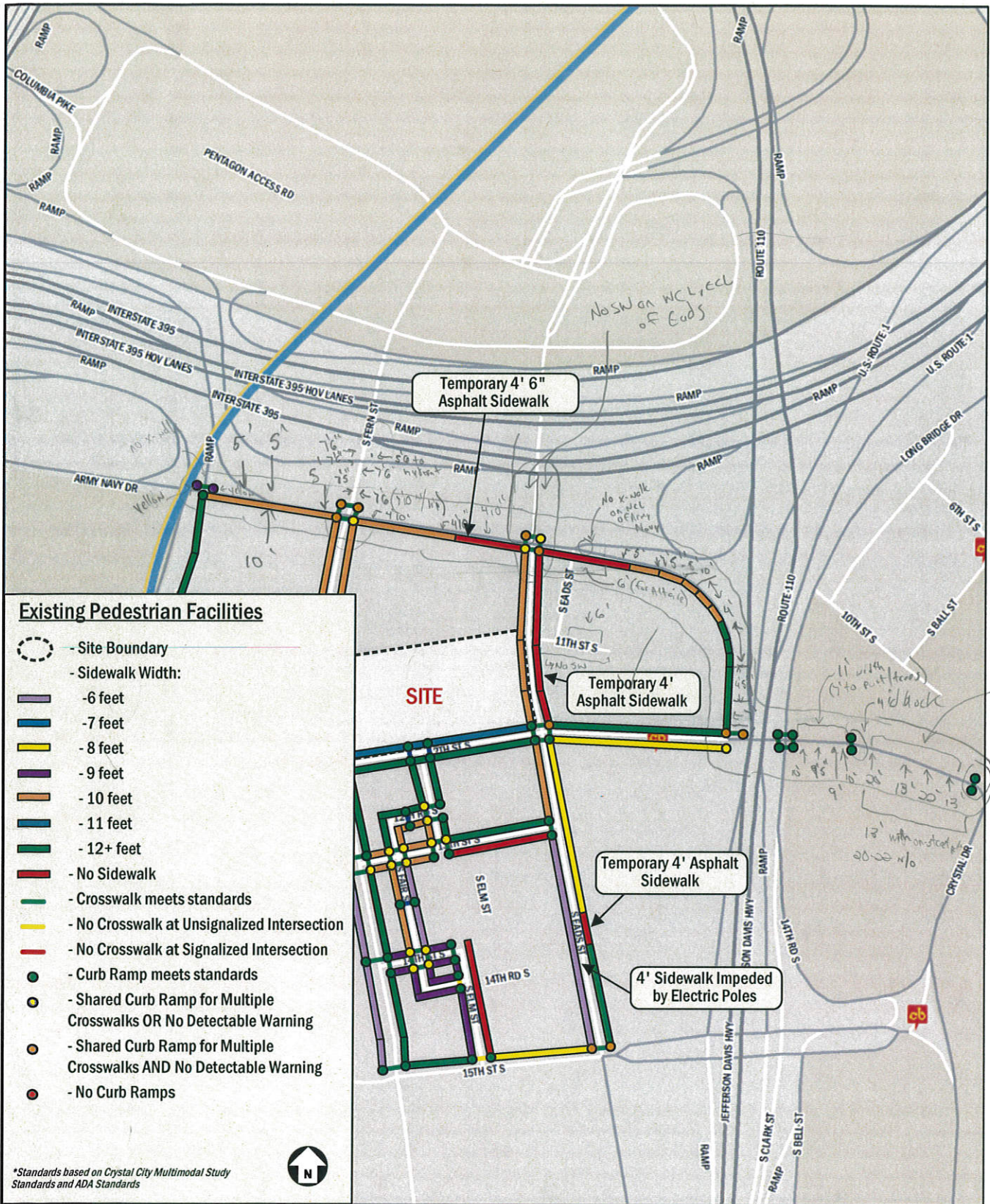


## B. Site Visit Notes





# Ped Facilities

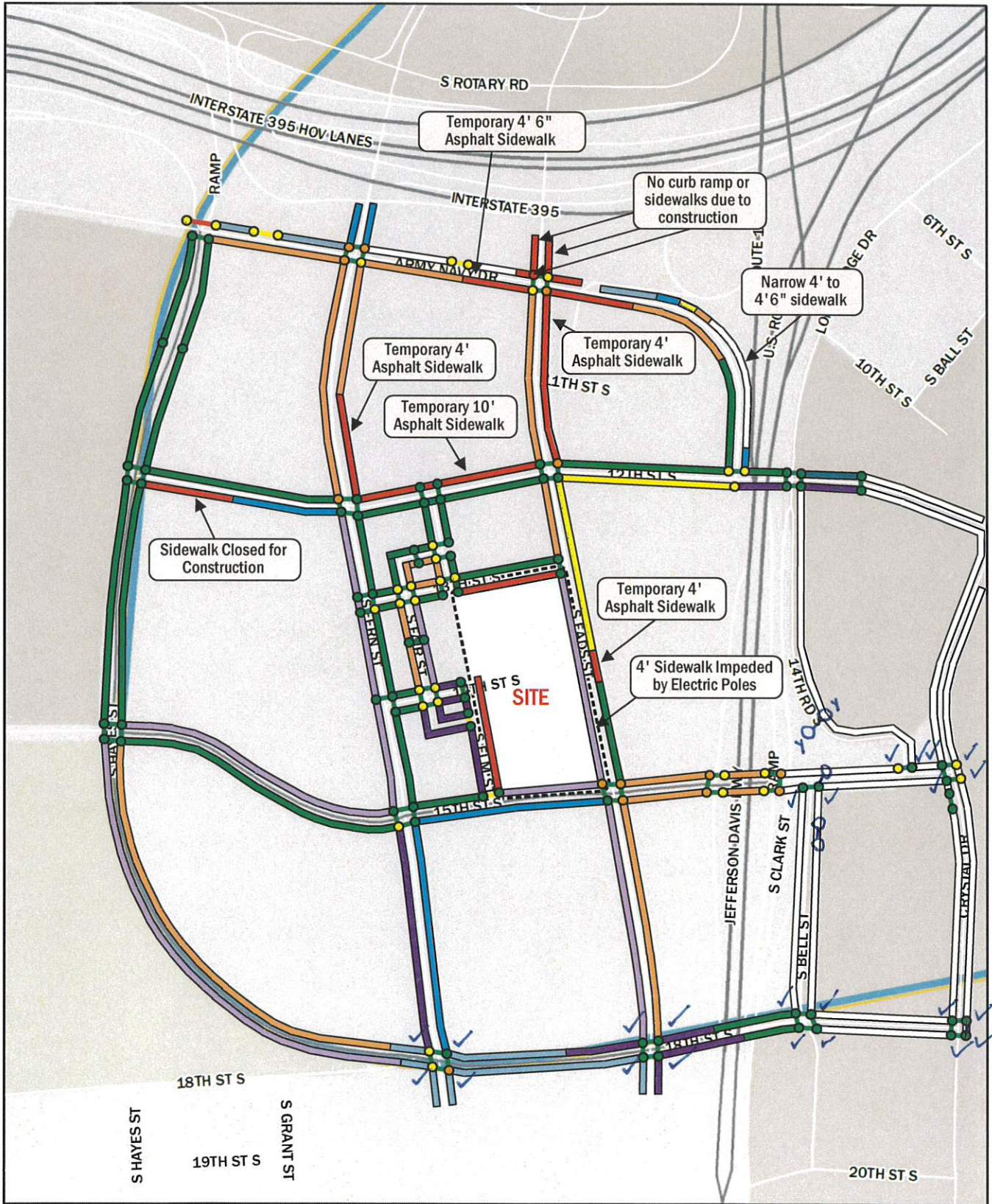








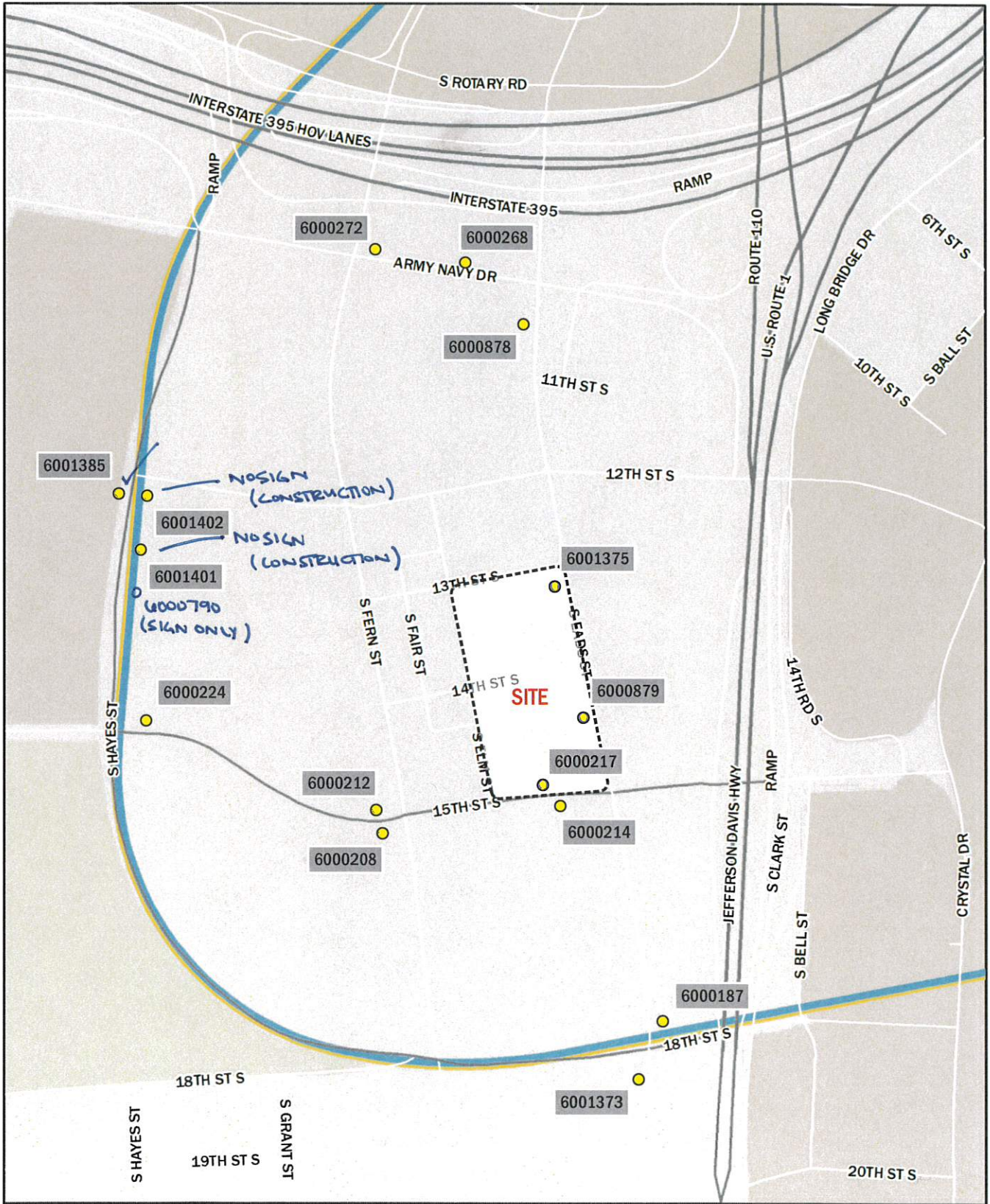
CURB RAMP & CROSSWALKS



5/20/19

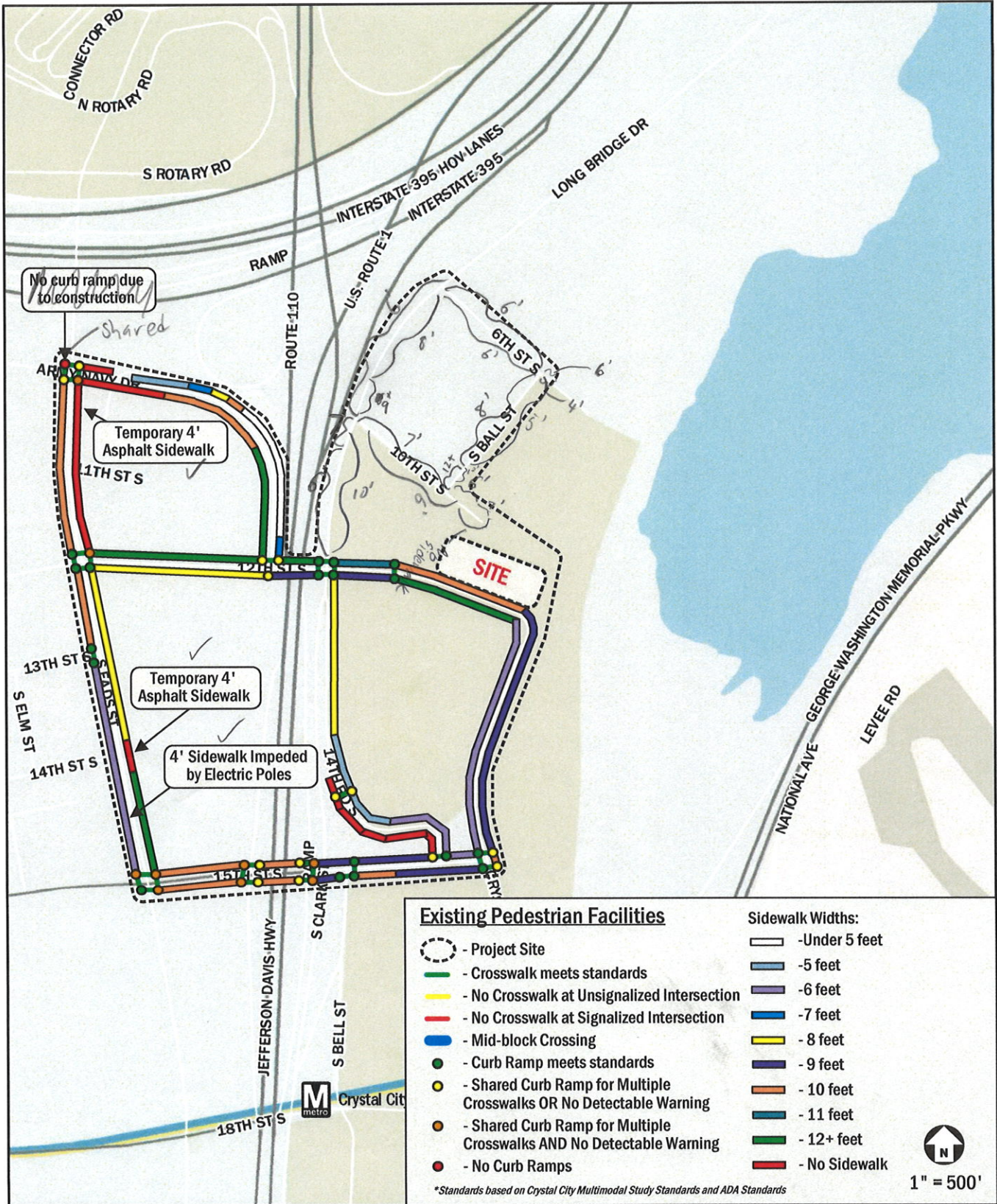


### BUS STOPS





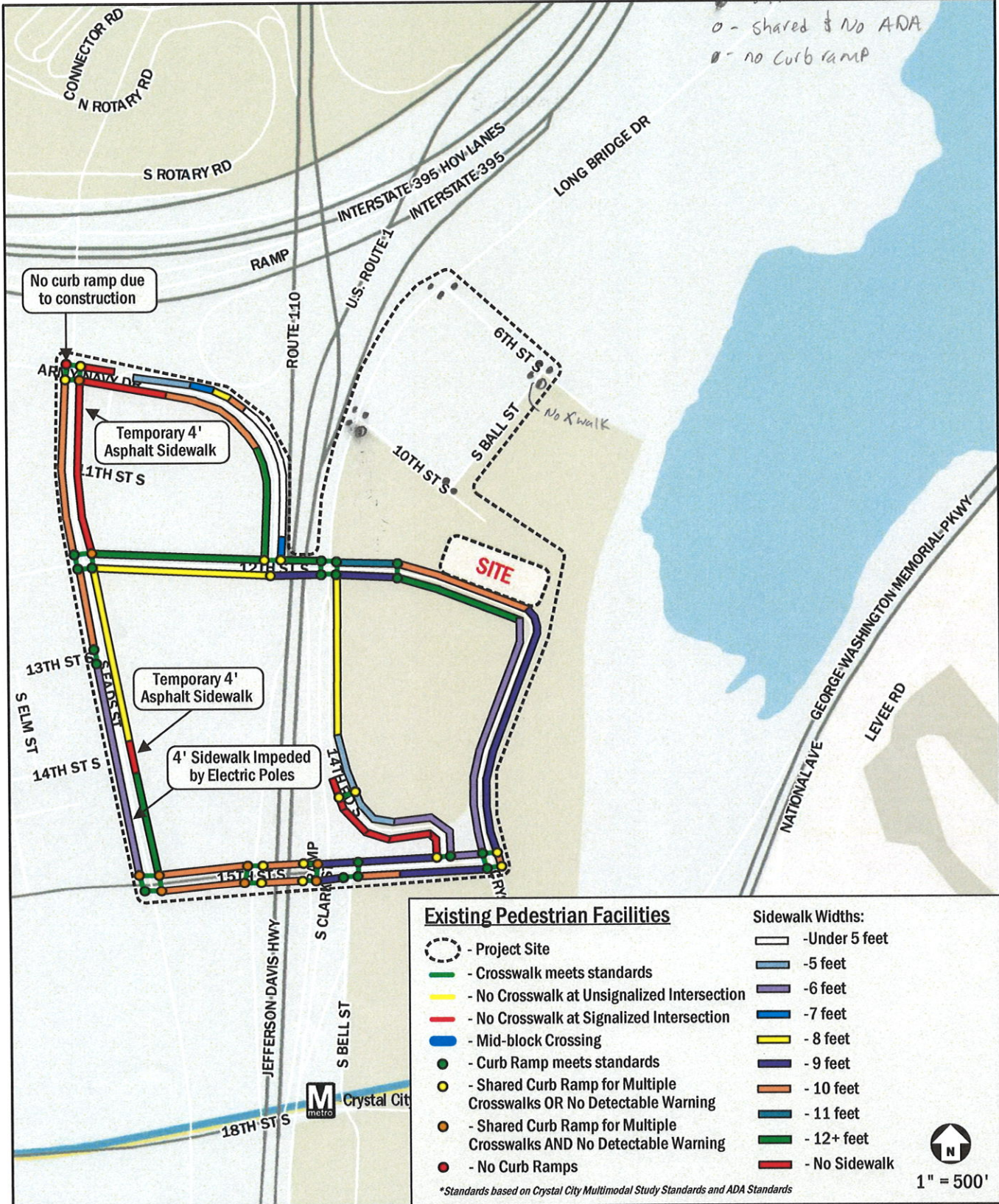
# Sidewalks





Cross walks

- - meets standard
- - shared or no ADA
- - shared & No ADA
- - no curb ramp



No curb ramp due to construction

Temporary 4' Asphalt Sidewalk

Temporary 4' Asphalt Sidewalk

4' Sidewalk Impeded by Electric Poles

SITE

No Xwalk





## C. Access and Loading Memo

## TECHNICAL MEMORANDUM

To: Joanne Gabor  
Arlington County DES

Cc: Todd Leber  
Seneca Group  
Taylor Lawch  
JBG Smith

From: Daniel B. VanPelt, P.E., PTOE  
Felice Brychta, P.E.  
Sasha Redmon

Date: December 22, 2021

Subject: PenPlace – Access and Loading **DRAFT**

The purpose of this memorandum is to provide an update on the loading garage access and truck turning maneuvers at the Army Navy Drive access point for the PenPlace development in Arlington, Virginia.

### ***Army Navy Drive***

There will be one (1) access point along Army Navy Drive. This will be a signalized access point that serves both the below-grade garage, which serves office, daycare, and retail uses on a typical weekday, and the internal loading area that serves the entire site. Garage traffic will be able to access the parking garage from the Army Navy Drive access point at all hours.

Vehicles 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 to the site 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.

Two lanes will be provided for ingress into the garage/loading area. The center lane will serve as the main lane for trucks to access the loading area and the outer lane will serve as a screening lane. For security purposes, all delivery vehicles will be scheduled in advance, and all scheduled trucks will continue down the ramp into the loading area uninterrupted. By requiring trucks to move to a separate area for further screening, this allows garage traffic and scheduled trucks to continue down the ramp unimpeded using the bypass lane.

It is anticipated that trucks will only require screening if they are unscheduled. If a truck arrives unscheduled, it will be required to pull off into a separate screening lane and wedge barriers will be raised to prevent the truck from proceeding down the ramp and into the loading 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. It is anticipated that 60 to 90 seconds will be required for truck screening. Trucks that exceed the under-truck scanner length provided may require an additional 60 seconds for manual inspection.

If a truck is rejected during screening, it will continue down the ramp into the loading area at which point it will turn around and exit towards Army Navy Drive. The only exception to this would be in the event of a truck being deemed a security threat and there is a need to involve law enforcement.

Truck loading dock use at six (6) comparable sites in Seattle, WA was collected by Heffron Transportation in 2017 and used to estimate the loading demand expected for the proposed PenPlace development. The data included the number of truck visits per day and size of vehicle for each comparable site and showed a linear correlation between building size and daily truck visits. Based on the rates included in the memo and the proposed office square footage (excluding the Helix building), it is estimated that the PenPlace development will generate approximately 102 trips on an average day (49 van/passenger vehicles, 37 parcel delivery trucks, 12 medium trucks, and 4 large trucks) and 132 trips on a peak day (63 van/passenger vehicles, 48 parcel delivery trucks, 16 medium trucks, and 5 large trucks). The estimated daily loading demand is summarized in Table 1 below. Seven (7) large berths and six (6) van parking stalls will be provided in the loading dock.

**Table 1: Estimated Daily Loading Trips by Vehicle Type**

| Daily Demand               |            | Size of Loading Vehicles |                                |                        |                       |
|----------------------------|------------|--------------------------|--------------------------------|------------------------|-----------------------|
|                            |            | Van/Passenger Vehicle    | Parcel Delivery Truck (<25 ft) | Medium Trucks (<35 ft) | Large Trucks (>35 ft) |
|                            |            | 48%                      | 36%                            | 12%                    | 4%                    |
| <b>Average Daily Trips</b> | <b>102</b> | 49                       | 37                             | 12                     | 4                     |
| <b>Maximum Daily Trips</b> | <b>132</b> | 63                       | 48                             | 16                     | 5                     |

The attached AutoTURN exhibits show the turning paths of trucks as they enter and exit the ramp to the internal, below-grade loading area. As shown, the ramp has been designed to accommodate a variety of delivery vehicles, ranging from vans and small single-unit trucks up to tractor trailers. While the loading dock and ramp have been designed to accommodate a WB-67, trucks of this size are not expected to be a regular daily occurrence. The arrival of a WB-67 would be scheduled and permitted during off-peak only. The WB-67 will need to encroach into the opposing lanes in order to access the ramp; however, this movement would be monitored and controlled by the dock manager, as needed.

# TECHNICAL MEMORANDUM

**Project:** Amazon Transportation Audit

**Subject:** Loading Dock and On-Street Load Zone Utilization

**Date:** June 11, 2017

**Author:** Marni C. Heffron, P.E., P.T.O.E. 

Loading dock activity was surveyed for seven Amazon-occupied buildings in the Denny Triangle / South Lake Union neighborhoods. The purpose of this survey was to determine usage and activity for the loading docks, information that can be used to improve the design of future buildings and to better manage existing building loading dock operations.

Loading dock use information was collected for the buildings listed in Table 1. Two of the sites surveyed have a shared loading dock; therefore, the building information is presented for the combined sites. Data were collected from Monday, March 20, 2017 through Friday, March 24, 2017. Five additional days of data (starting on March 15) were collected for the Day One building, which is now used as the headquarters office. Data were also collected on Saturday for one of the buildings, but showed a fraction of the activity compared to weekdays, so no further analysis of Saturday utilization was performed.

Table 1. Surveyed Amazon-Occupied Buildings

| Building Name      | Code      | Address                      | Size (gsf) <sup>a</sup> | Loading Dock Parameters <sup>b</sup>                                  |
|--------------------|-----------|------------------------------|-------------------------|---|
| Doppler            | SEA40     | 2021-7 <sup>th</sup> Avenue  | 968,929 <sup>e</sup>    | 2 large bays, 2 small bays, 4 van bays; 7 bays available <sup>c</sup> |
| Day One            | SEA41     | 2121-7 <sup>th</sup> Avenue  | 1,085,742 <sup>f</sup>  | 2 large bays, 2 small bays, 5 van bays; 6 bays available <sup>d</sup> |
| Cricket / Invictus | SEA20/22  | 440 Terry Avenue N           | 325,970                 | 5 small bays; 4 bays available + 8 other parking stalls <sup>g</sup>  |
| Bigfoot / Nessie   | SEA 38/39 | 515 9 <sup>th</sup> Avenue N | 394,579                 | 3 small bays; 3 bays available  |
| Arizona            | SEA29     | 207 Boren Avenue N           | 339,820                 | 4 large bays; 4 bays available  |
| Varzea             | SEA30     | 2201 Westlake Avenue         | 309,715                 | 4 small bays; 3 bays available <sup>h</sup>                           |

- a. Building areas provided by CBRE, Hines, and Seneca Group. Includes gross square footage of office, restaurant, retail, and other space that is used for commercial activities.
- b. Large = 33' or more, Small = 24' or more, Van = less than 24'
- c. Three Cedar Grove dumpsters occupy a van bay; it is considered unavailable.
- d. Three total van bays reported as unavailable; 2 available bays contain dumpsters.
- e. Excludes 95,251 sf for the Meeting Center, as deliveries occur primarily on-street
- f. Excludes 55,577 sf for the spheres, which were not open during the study period
- g. 1 bay contains shelving for Garage Café deliveries; 2 stalls for Bon Appetite, 1 AV stall, 1 Authorized Vehicle stall, 4 unreserved stalls
- h. 1 bay contains recycling receptacles

## 1. Loading Dock Activity

Detailed records of loading dock visits were compiled for the survey week. Information about each vehicle was recorded including:

- Arrival time;
- Departure time;
- Vendor name; and
- Vehicle size.

Key metrics compiled from these data are presented in the sections below.

### 1.1. Number of Visits per Day to Loading Docks

The number of vehicles per day that visited each loading dock is summarized in Table 2. It is noted that during the week, substantial activity at the Day One building involved new furniture and other services association with moving into the building. This building was still relatively new (with the spheres building component still under construction) during the survey and such activity is likely to decline as that is completed and employees are settled.

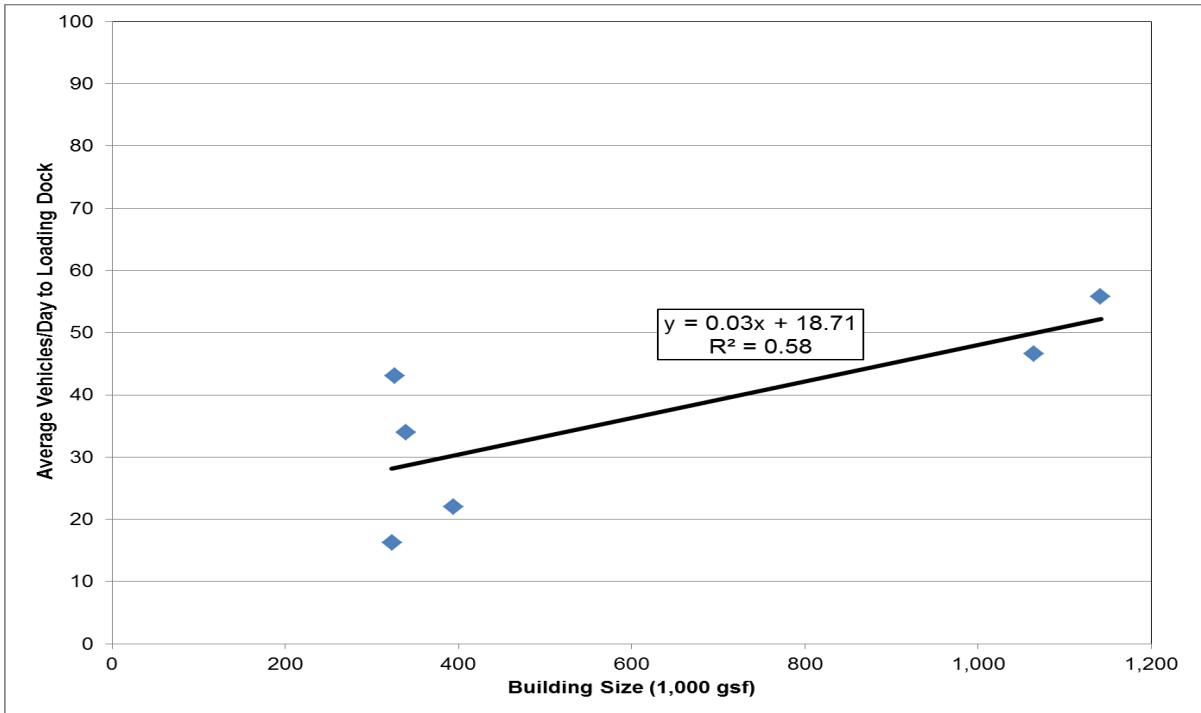
Table 2. Number of Loading Dock Visits per Day

| Building         | Number of Loading Dock Visits |                   |                  |                    |                  |                  | Total for Week | Average Weekday |
|------------------|-------------------------------|-------------------|------------------|--------------------|------------------|------------------|----------------|-----------------|
|                  | Mon<br>3/20/2017              | Tues<br>3/21/2017 | Wed<br>3/22/2017 | Thurs<br>3/23/2017 | Fri<br>3/24/2017 | Sat<br>3/25/2017 |                |                 |
| Arizona          | 18                            | 31                | 47               | 32                 | 42               | n/a              | 170            | 34.0            |
| Bigfoot/Nessie   | 25                            | 22                | 26               | 18                 | 19               | n/a              | 110            | 22.0            |
| Cricket/Invictus | 47                            | 43                | 46               | 42                 | 37               | n/a              | 215            | 43.0            |
| Day One          | 54                            | 56                | 59               | 84                 | 26               | n/a              | 279            | 55.8            |
| Doppler          | 46                            | 52                | 51               | 47                 | 37               | 2                | 235            | 46.6            |
| Varzea           | 13                            | 24                | 19               | 9                  | 16               | n/a              | 81             | 16.2            |

Source: Data collected by loading dock master at each building.

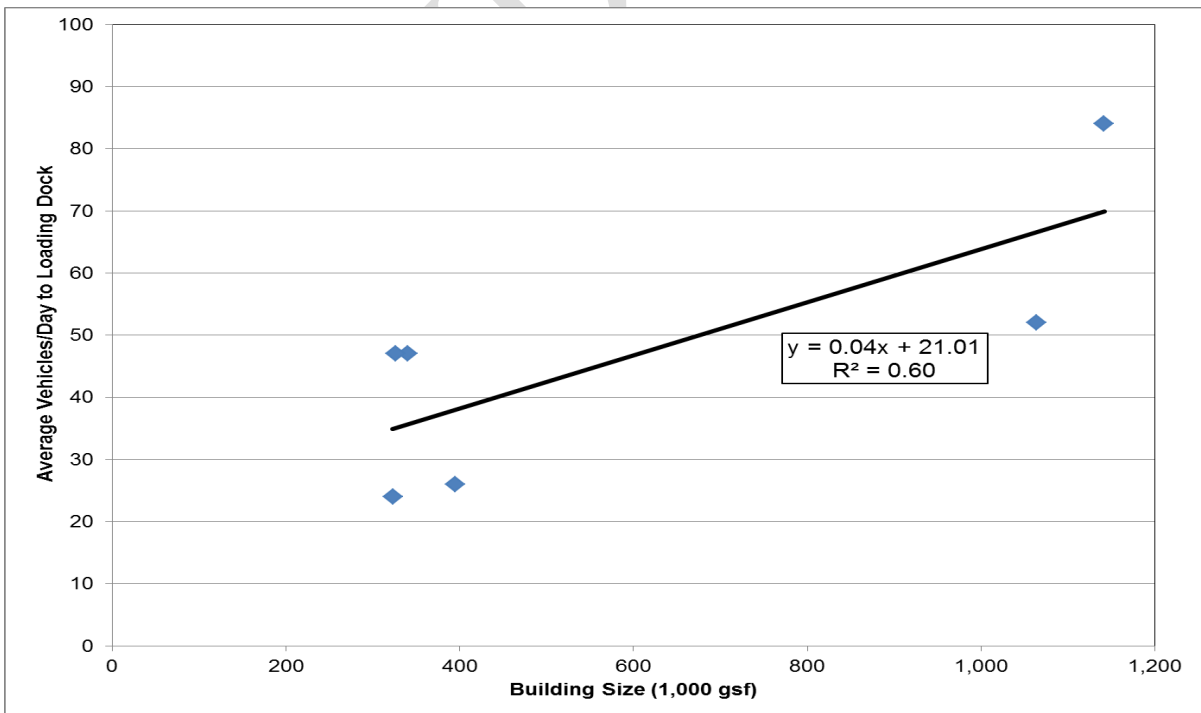
The average visits per day and maximum visits per day were plotted for each building's size, and are shown on Figure 1 and Figure 2, respectively. These show a linear correlation between building size and visits. As would be expected, the equations suggest that even the smallest of buildings would generate some truck trips on a daily basis. The regressed equations could be used to estimate loading dock activity for future buildings. For example, a 400,000-sf building would generate about 30 visits to the loading dock on an average day and 37 visits on a peak day.

Figure 1. Average Loading Dock Visits versus Building Size



Source: Data from Amazon compiled by Heffron Transportation, Inc., Average visits derived for the weekdays from Monday, March 20, 2017 through Friday, March 24, 2017.

Figure 2. Maximum Loading Dock Visits versus Building Size

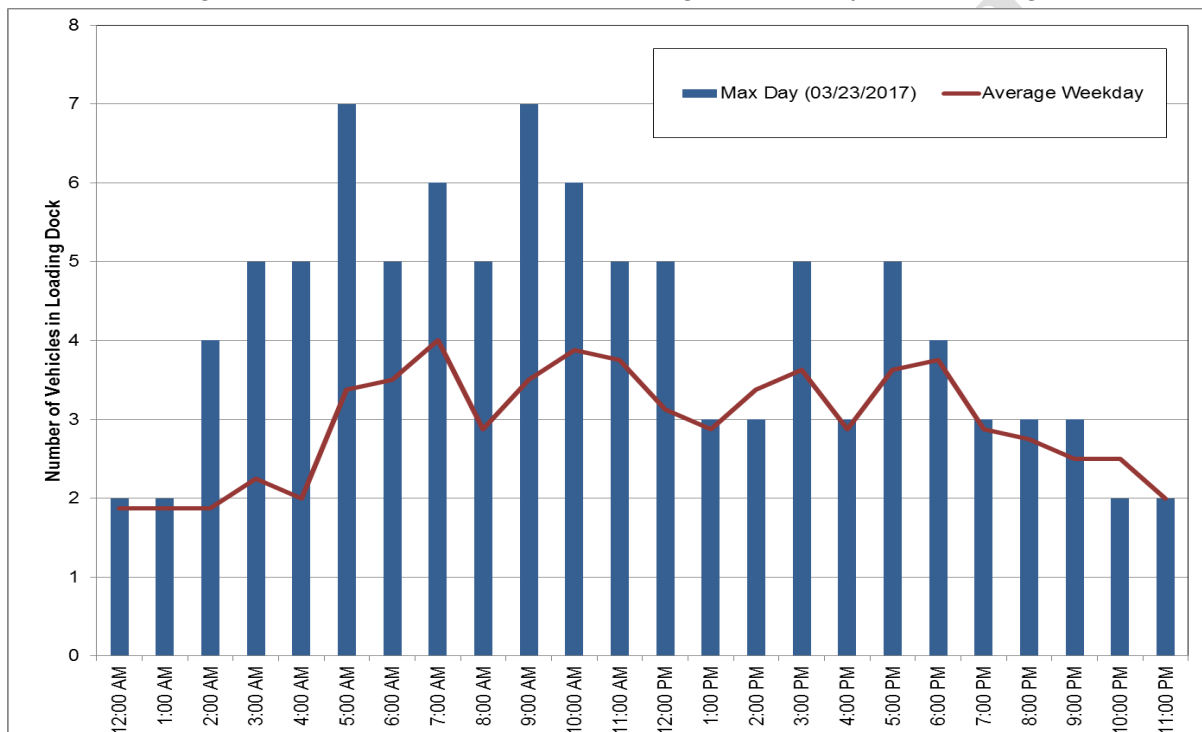


Source: Data from Amazon compiled by Heffron Transportation, Inc., Maximum daily visits derived for the weekdays from Monday, March 20, 2017 through Friday, March 24, 2017.

## 1.2. Peak Activity by Time of Day

Additional analysis was performed to determine the number of visits per hour and the peak number of vehicles in the loading dock simultaneously. Ten days of data were collected for the Day One building, which is the largest of the buildings surveyed, and had the highest number of daily visits to the loading dock. As previously noted, a high proportion of the activity related to move-in and construction services and likely reflects a worst-case condition. As shown on Figure 3, peak use of the loading dock occurs in the morning between 5:00 A.M. and about 9:00 A.M.

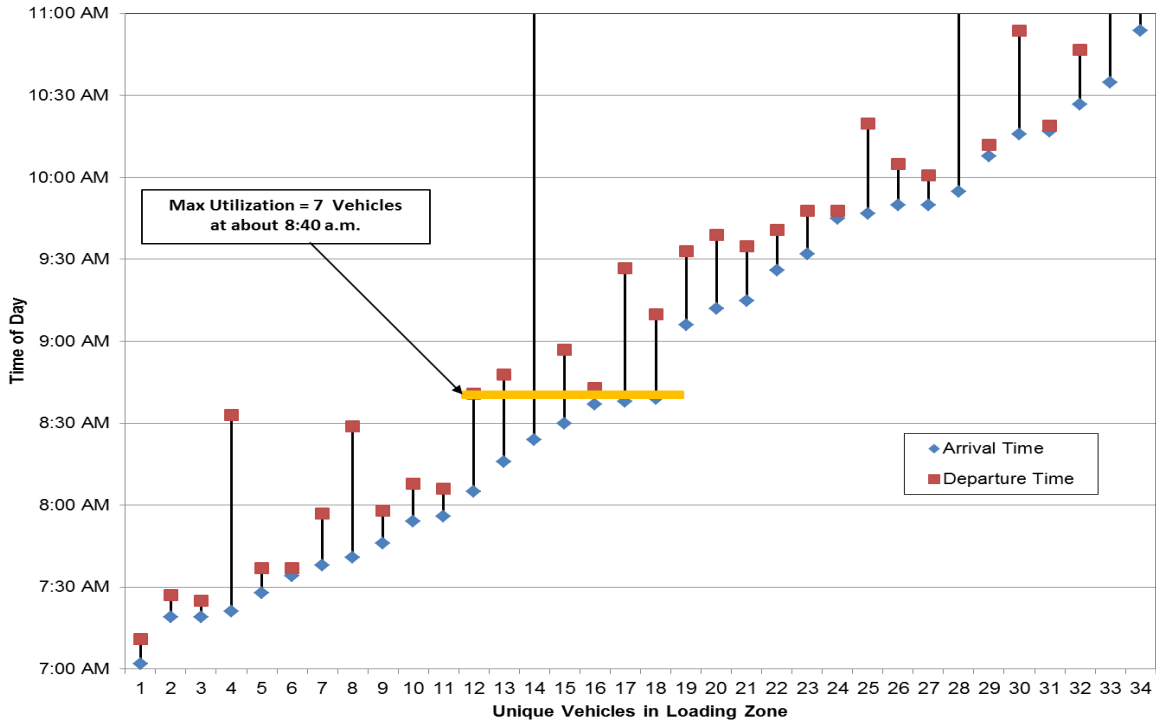
Figure 3. Number of Vehicles in Loading Dock at Day One Building



Source: Data from Amazon compiled by Heffron Transportation, Inc., Average and maximum daily visits derived from weekdays in the period from March 15, 2017 through March 24, 2017.

Further analysis was performed for the peak day (March 23) to show the arrival and departure times of individual vehicles (see Figure 4), which shows the pulse of the loading dock and when the peak occurs (indicated by the maximum bars that can be crossed by a horizontal line). Peak use occurred at about 8:40 A.M. with seven vehicles in the loading dock simultaneously; the dock has nine loading bays available. As noted, on an average day, the number of vehicles at one time peaked at about four vehicles during any hour. Maximum occupancy of the dock reflects about 8% of the peak day's visits.

Figure 4. Number of Vehicles in Loading Dock at Day One Building – Peak Morning (3/23/17)



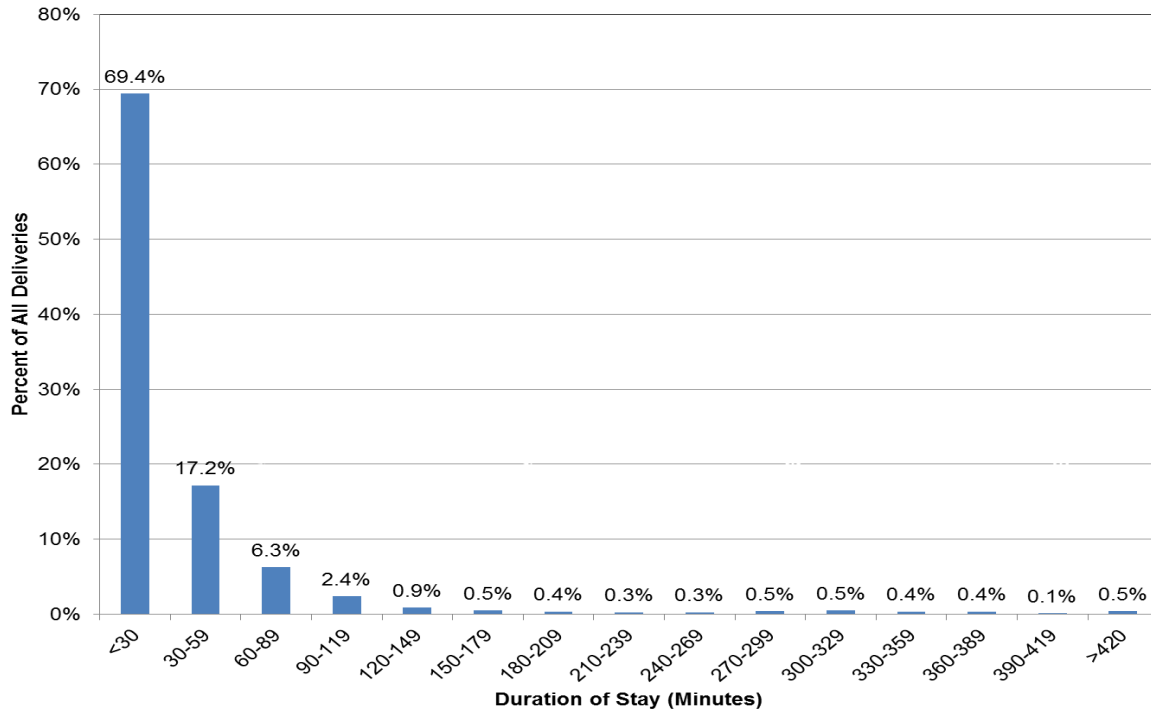
Source: Data from Amazon compiled by Heffron Transportation, Inc., Data for morning of March 23, 2017.

### 1.3. Duration of Stay

The entire data set from all surveyed buildings was used to determine the duration of stay. As shown on Figure 5, the vast majority of deliveries take less than 30 minutes. Those that take less than one hour account for about 87% of all deliveries. Vehicles that stayed longer than 3 hours (180 minutes) accounted for about 3% of all deliveries and typically resulted when a vendor had to perform both a delivery and an in-building service (such as Canteen).



Figure 5. Duration of Stay in Loading Dock

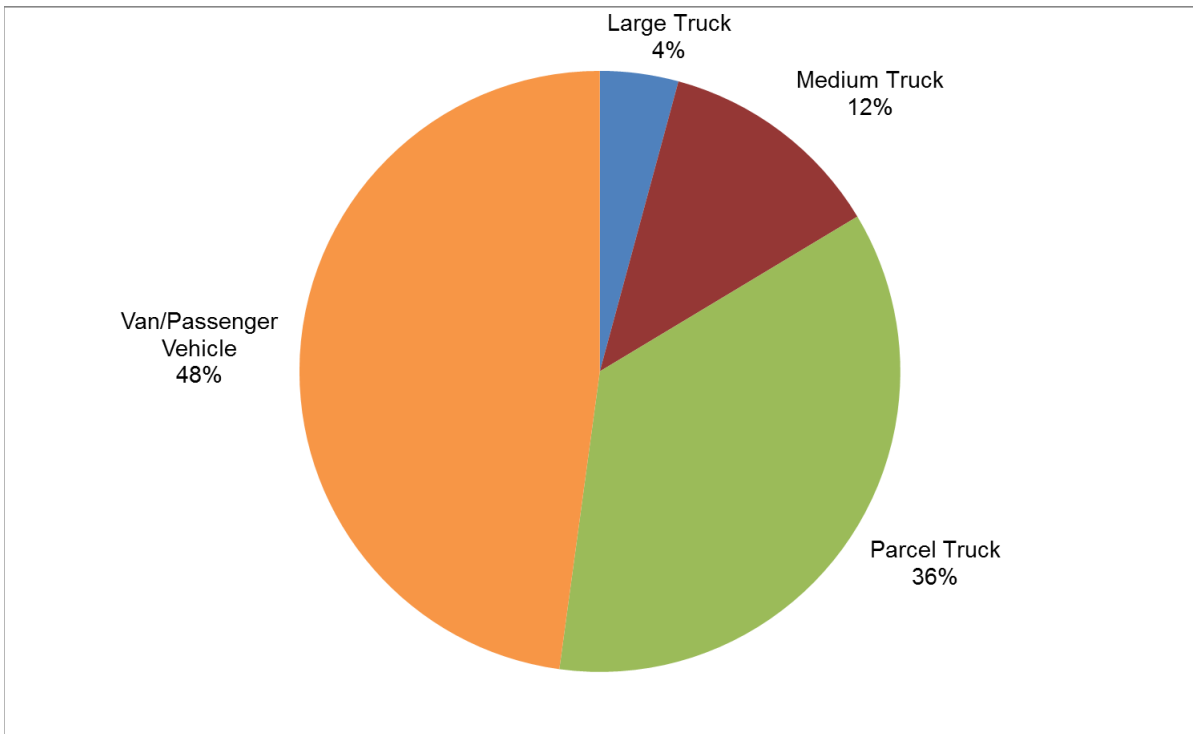


Source: Data from Amazon compiled by Heffron Transportation, Inc., Reflects visits to all buildings surveyed Monday, March 20 through Friday, March 24, 2017. Percentages based on 1,093 visits to the loading docks in which the arrival and departure times were recorded.

#### 1.4. Type and Size of Vehicles

The entire data set from all surveyed buildings was used to determine the size of vehicles that visit the loading docks. As shown, large and medium size trucks account for 16% of all visits. The remaining 84% of the visits are by smaller vehicles such as parcel delivery trucks (e.g., UPS and FedEx vehicles) and vans or passenger vehicles.

Figure 6. Size of Vehicles in Loading Docks



Source: Data from Amazon compiled by Heffron Transportation, Inc., Reflects visits to all buildings surveyed Monday, March 20, 2017 through Friday, March 24, 2017. Percentages based on 1,068 visits to the loading docks for which vehicle type was recorded.

### 1.5. Types of Deliveries

The entire data set from all surveyed buildings were used to determine the types of deliveries based on the vendor. The findings are summarized in Table 3. As shown, food is the most common type of delivery representing 30% of the loading dock activity. Activity related to moves and interior services is next highest representing 26% of the deliveries.

Table 3. Deliveries by Vendor Type

| Vendor Type                            | Examples   | %   |
|--|--|-----|
| Food                                   | Bon Appetit, Gourmondo, Charlie's Produce            | 30% |
| Building furnishing/moves/interiors    | Open Square, Catalyst                                | 26% |
| Parcel Delivery                        | UPS, FedEx, general shipping such as JB Hunt, Penske | 19% |
| Equipment/Office Supplies and Services | Ricoh, Avisys, Apex                                  | 13% |
| Maintenance                            | Eastside Glass, Tri-Mechanical, Sequoyah             | 6%  |
| Commercial Services                    | ABM, Cintas, Waxie Sanitary                          | 4%  |
| Waste/Recycling/Compost                | CleanScapes, Cedar Grove,                            | 2%  |

Source: Data from Amazon compiled by Heffron Transportation, Inc., Reflects visits to all buildings surveyed Monday, March 20, 2017 through Friday, March 24, 2017. Percentages based on 1,078 total visits to the loading docks for which vendor was recorded.

## 2. On-Street Loading Activity

A one-day survey of the curb-side commercial load zone adjacent to the Day One building was performed on March 21, 2017. This survey was performed to determine how commercial vehicles use the commercial-vehicle load only spaces and whether they are serving non-commercial vehicles such as passenger drop-off and pick-up. The location is on south side of Blanchard Street between 6<sup>th</sup> Avenue and 7<sup>th</sup> Avenue. As shown on the image to the right, loading and stops along this segment are prohibited during the AM and PM peak periods (6 - 9 AM and 3 - 7 PM). However, the signage indicating the permitted overnight loading had a typographical error (its stated commercial loading is permitted 7 AM - 6 PM, but should have stated 7 PM - 6 AM), which likely confused drivers who used the curb-side area. Therefore, the data collected should assume that no restrictions were in effect. The sign has since been replaced.



Table 4 summarizes use of the on-street load zone by time of day. As shown, more than half of all vehicles using the load zone were passenger vehicles, with the majority of those using the curb lane between 8:00 A.M. and 11:00 A.M. Approximately 30 commercial vehicles used the loading zone during the day. The type of deliveries or vendors were not recorded during the survey, and it is unknown if the deliveries were made to the adjacent Day One building or other buildings in the neighborhood (including nearby construction sites). As previously described, there was capacity in the Day One loading dock during all hours during the survey period.

Table 4. On-Street Load Zone Utilization (South curb of Blanchard St btwn 6<sup>th</sup> & 7<sup>th</sup> Avenue)

| Hour Begin   | Commercial Vehicles |              |             |           | Parking Enforce. | Pass. Vehicle | Shuttle Bus | Total     |
|--------------|---------------------|--------------|-------------|-----------|------------------|---------------|-------------|-----------|
|              | Large Truck         | Medium Truck | Small Truck | Van       |                  |               |             |           |
| 7 AM         | --                  | 2            | 1           | 2         | --               | 3             | --          | 8         |
| 8 AM         | --                  | 3            | --          | 1         | 1                | 6             | --          | 11        |
| 9 AM         | --                  | 1            | 1           | 1         | --               | 8             | --          | 11        |
| 10 AM        | --                  | 1            | --          | 1         | --               | 6             | 1           | 9         |
| 11 AM        | --                  | 2            | --          | 4         | --               | 2             | --          | 8         |
| 12 PM        | --                  | 3            | --          | --        | --               | 2             | --          | 5         |
| 1 PM         | --                  | --           | --          | --        | --               | 1             | --          | 1         |
| 2 PM         | --                  | 1            | 1           | --        | --               | 2             | --          | 4         |
| 3 PM         | --                  | 1            | --          | 1         | --               | 2             | --          | 4         |
| 4 PM         | 1                   | --           | --          | --        | --               | --            | --          | 1         |
| 5 PM         | --                  | --           | --          | 1         | --               | 1             | --          | 2         |
| 6 PM         | --                  | 1            | --          | --        | --               | 4             | --          | 5         |
| <b>Total</b> | <b>1</b>            | <b>15</b>    | <b>3</b>    | <b>11</b> | <b>1</b>         | <b>37</b>     | <b>1</b>    | <b>69</b> |
| Percent      | 1%                  | 22%          | 4%          | 16%       | 1%               | 54%           | 1%          |           |

Source: Load zone utilization survey performed by Idax, Inc., March 21, 2017. Data compiled by Heffron Transportation, Inc.

**Amazon Transportation Audit**  
**Loading Dock and On-Street Load Zone Utilization**

Table 5 summarizes the average duration for the vehicles that used the loading zone. The medium size trucks typically had the longest duration at the curb, many of which exceeded the 30-minute time limit for the zone. The average passenger vehicle used the zone for less than 2 minutes.

Table 5. On-Street Load Zone Duration (South curb of Blanchard St btwn 6<sup>th</sup> & 7<sup>th</sup> Avenue)

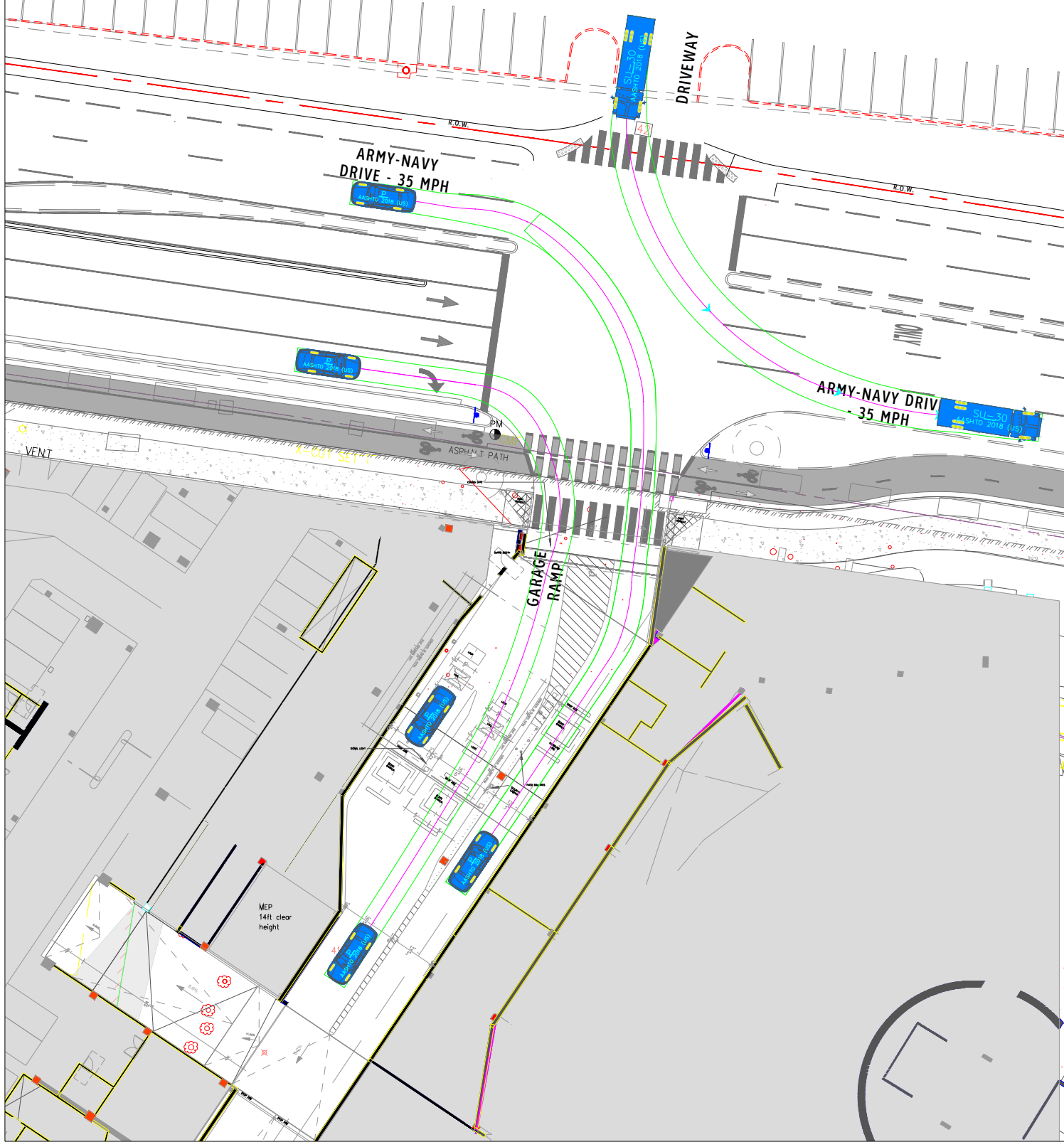
| Hour Begin     | Commercial Vehicles |              |             |             | Parking Enforce. | Pass. Vehicle | Shuttle Bus | Total       |
|----------------|---------------------|--------------|-------------|-------------|------------------|---------------|-------------|-------------|
|                | Large Truck         | Medium Truck | Small Truck | Van         |                  |               |             |             |
| 7 AM           |                     | 0:05         | 0:06        | 0:06        |                  | 0:00          |             | 0:04        |
| 8 AM           |                     | 0:25         |             | 0:04        | 0:01             | 0:01          |             | 0:08        |
| 9 AM           |                     | 0:10         |             | 0:06        |                  | 0:01          |             | 0:03        |
| 10 AM          |                     | 1:30         |             | 0:02        |                  | 0:05          | 0:17        | 0:16        |
| 11 AM          |                     | 1:20         |             | 0:15        |                  | 0:00          |             | 0:27        |
| 12 PM          |                     | 0:46         |             |             |                  | 0:05          |             | 0:30        |
| 1 PM           |                     |              |             |             |                  | 0:02          |             | 0:02        |
| 2 PM           |                     | 0:20         | 0:10        |             |                  | 0:02          |             | 0:08        |
| 3 PM           |                     | 0:25         |             | 0:03        |                  | 0:00          |             | 0:07        |
| 4 PM           | 0:01                |              |             |             |                  |               |             | 0:01        |
| 5 PM           |                     |              |             | 0:03        |                  | 0:02          |             | 0:03        |
| 6 PM           |                     | 0:02         |             |             |                  | 0:00          |             | 0:01        |
| <b>Average</b> | <b>0:01</b>         | <b>0:36</b>  | <b>0:08</b> | <b>0:08</b> | <b>0:01</b>      | <b>0:02</b>   | <b>0:17</b> | <b>0:11</b> |

Source: Load zone utilization survey performed by Idax, Inc., March 21, 2017. Data compiled by Heffron Transportation, Inc.

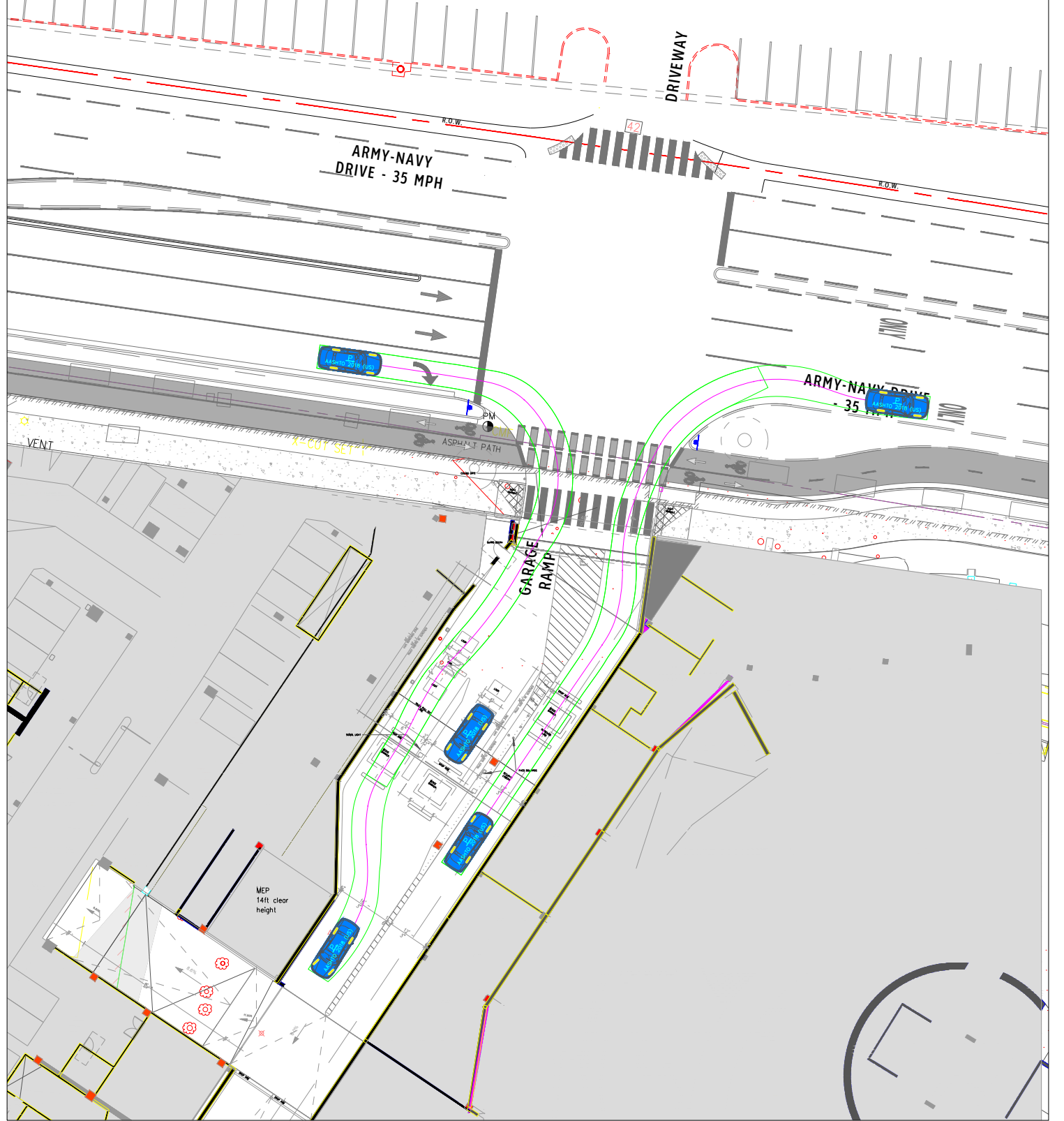
MCH/mch

Loading Dock Utilization - 06-11-2017.docx

P Vehicle - Inbound/Outbound

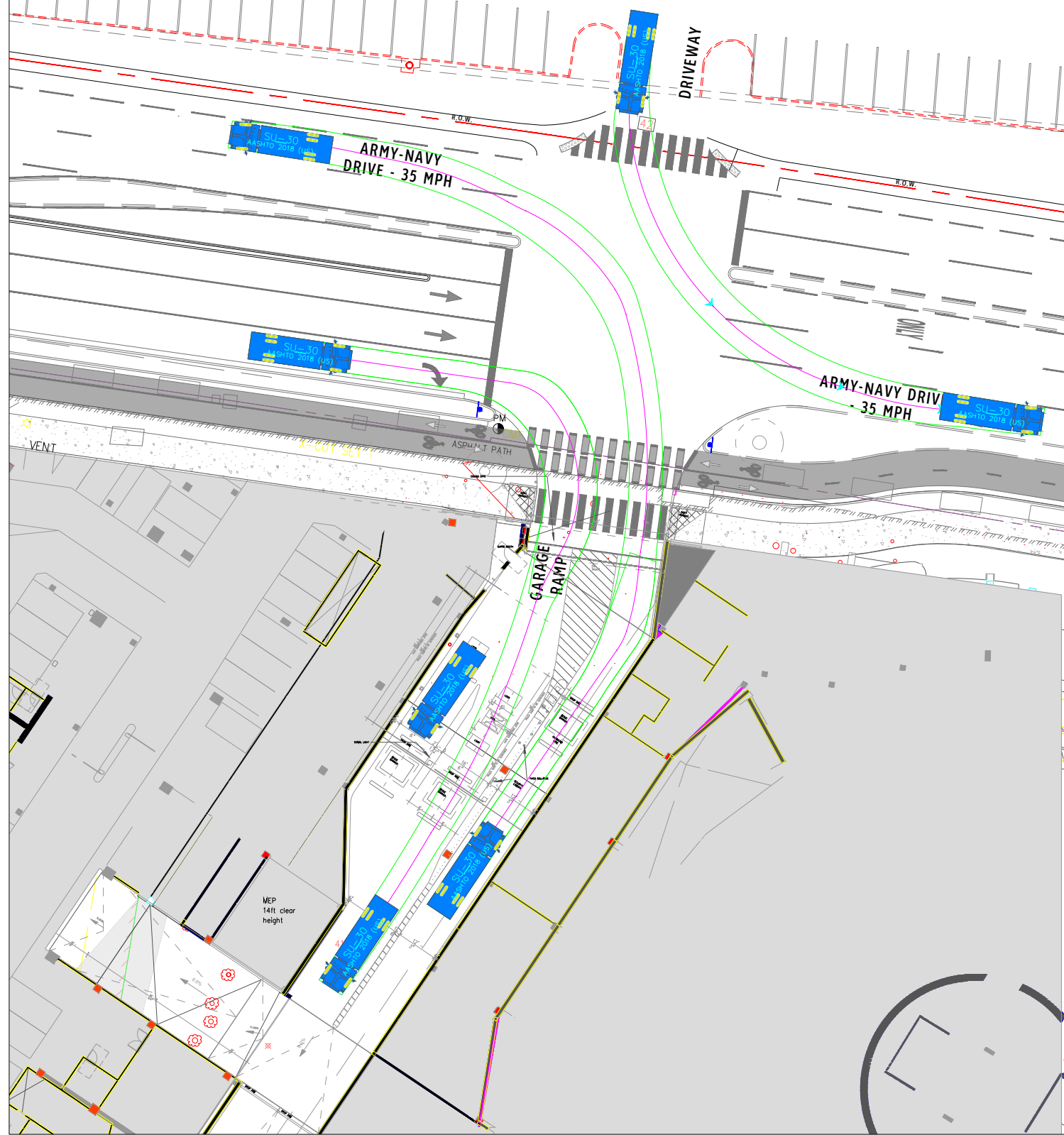


P Vehicle - Inbound/Outbound

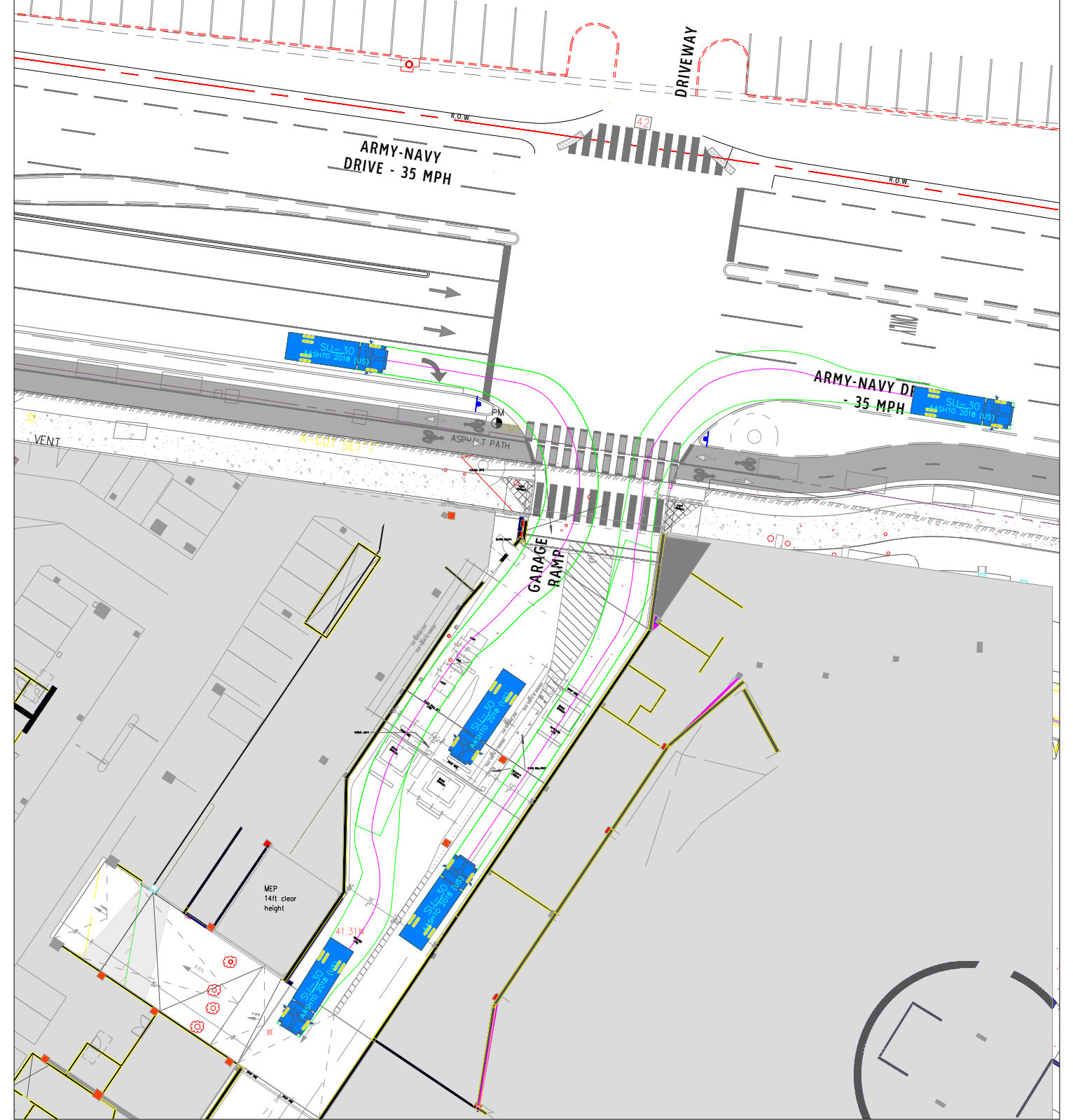




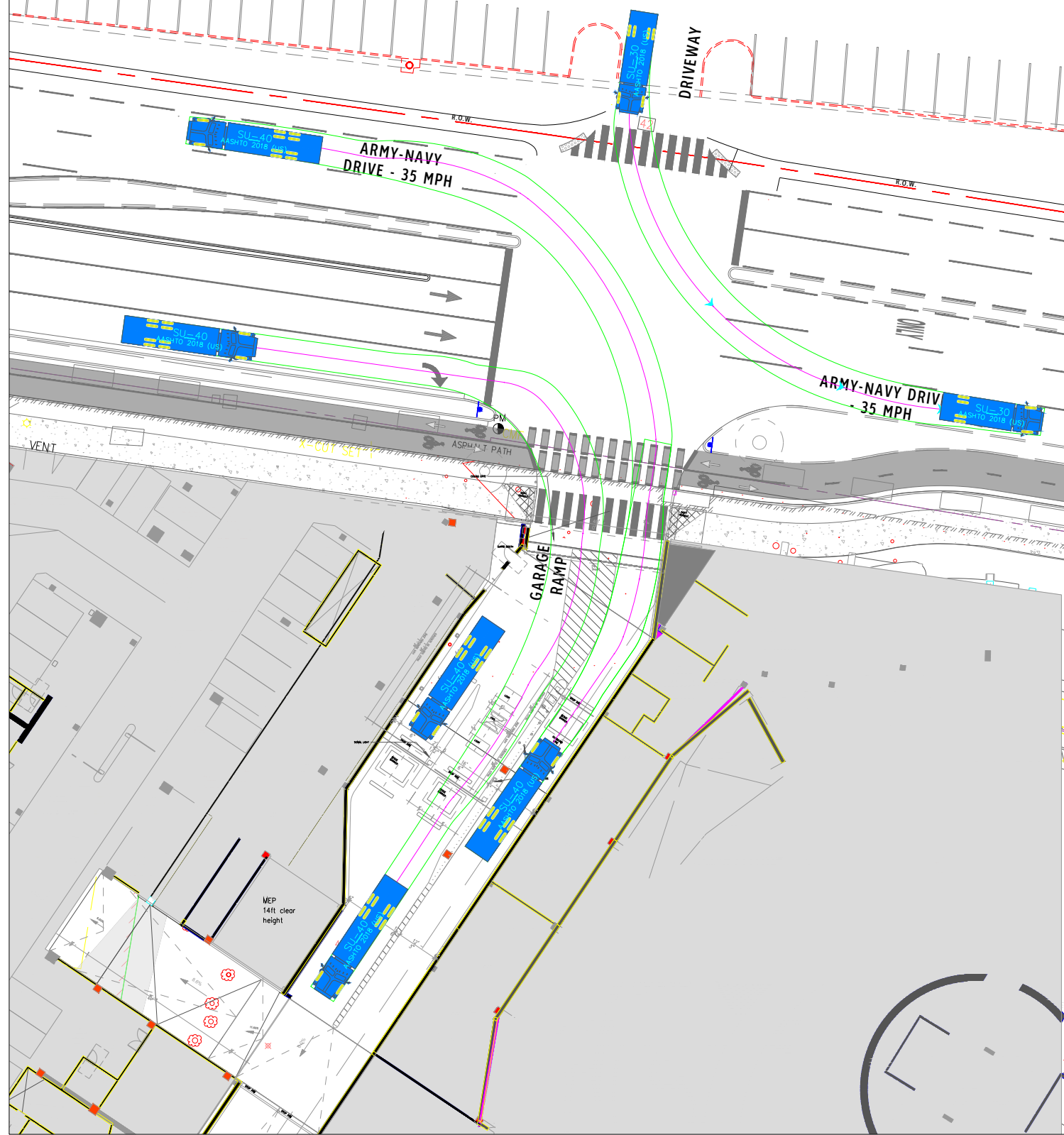
SU-30 - Inbound/Outbound



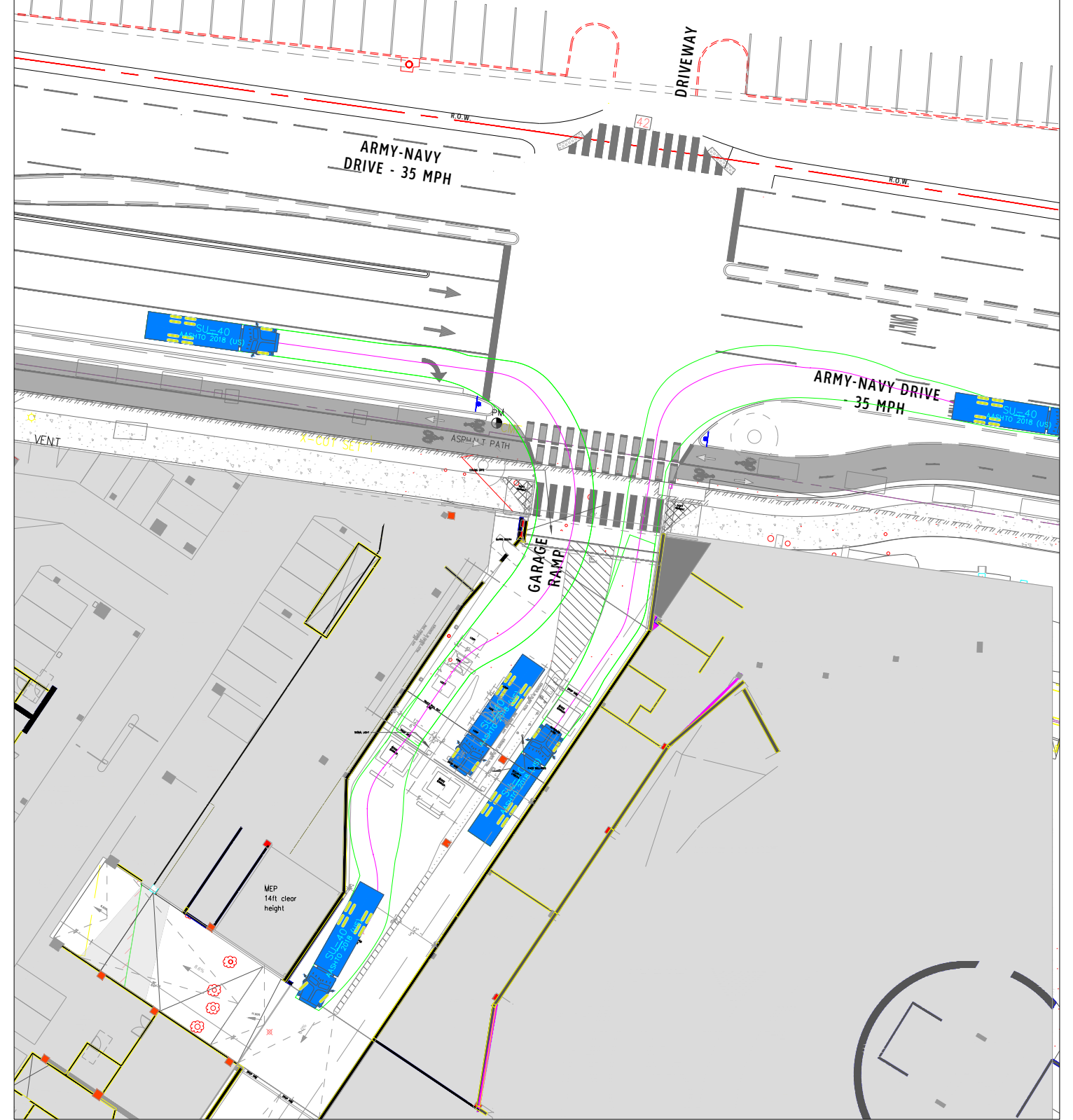
SU-30 - Inbound/Outbound



SU-40 - Inbound/Outbound

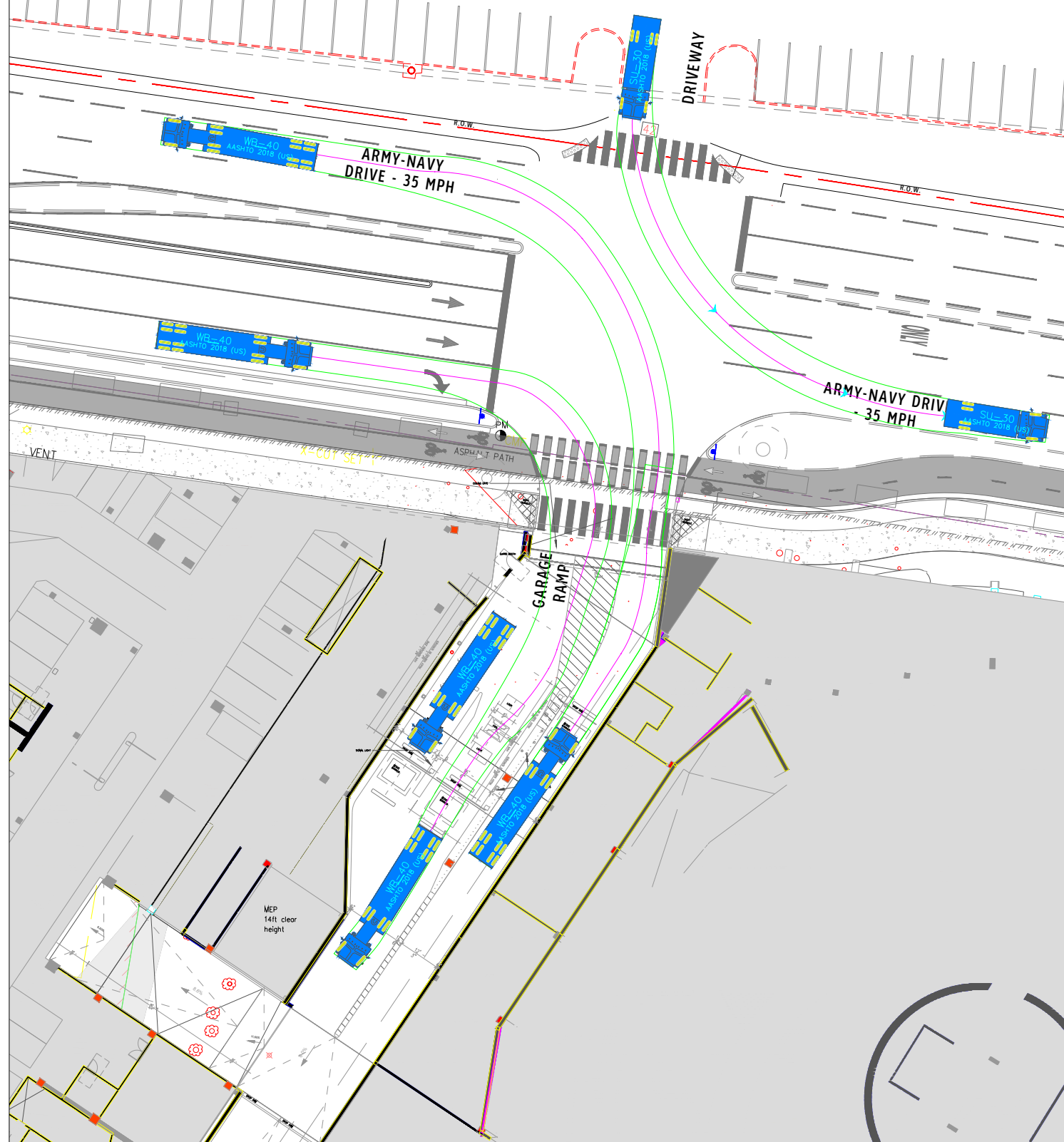


SU-40 - Inbound/Outbound

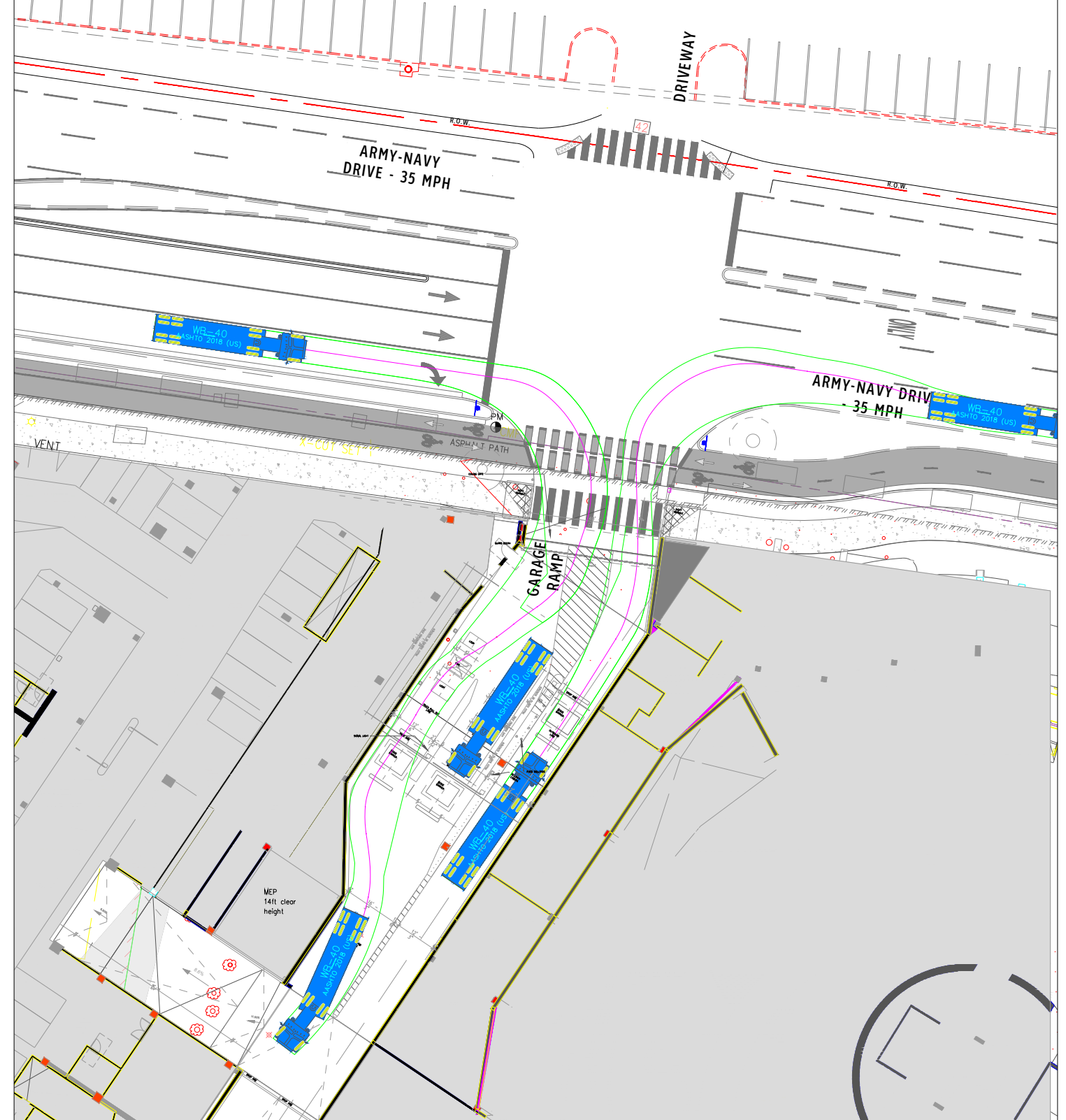




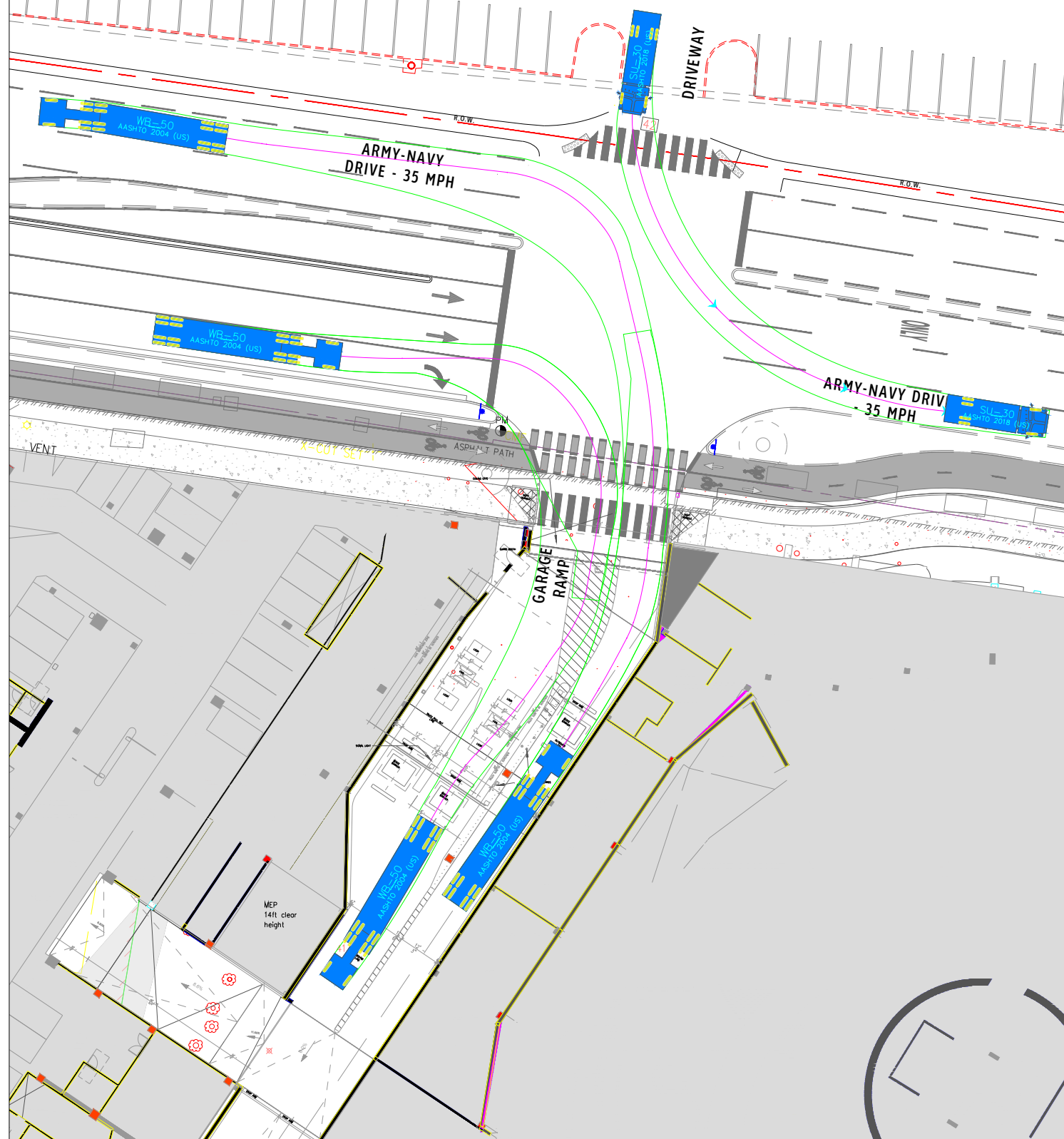
WB-40 - Inbound/Outbound



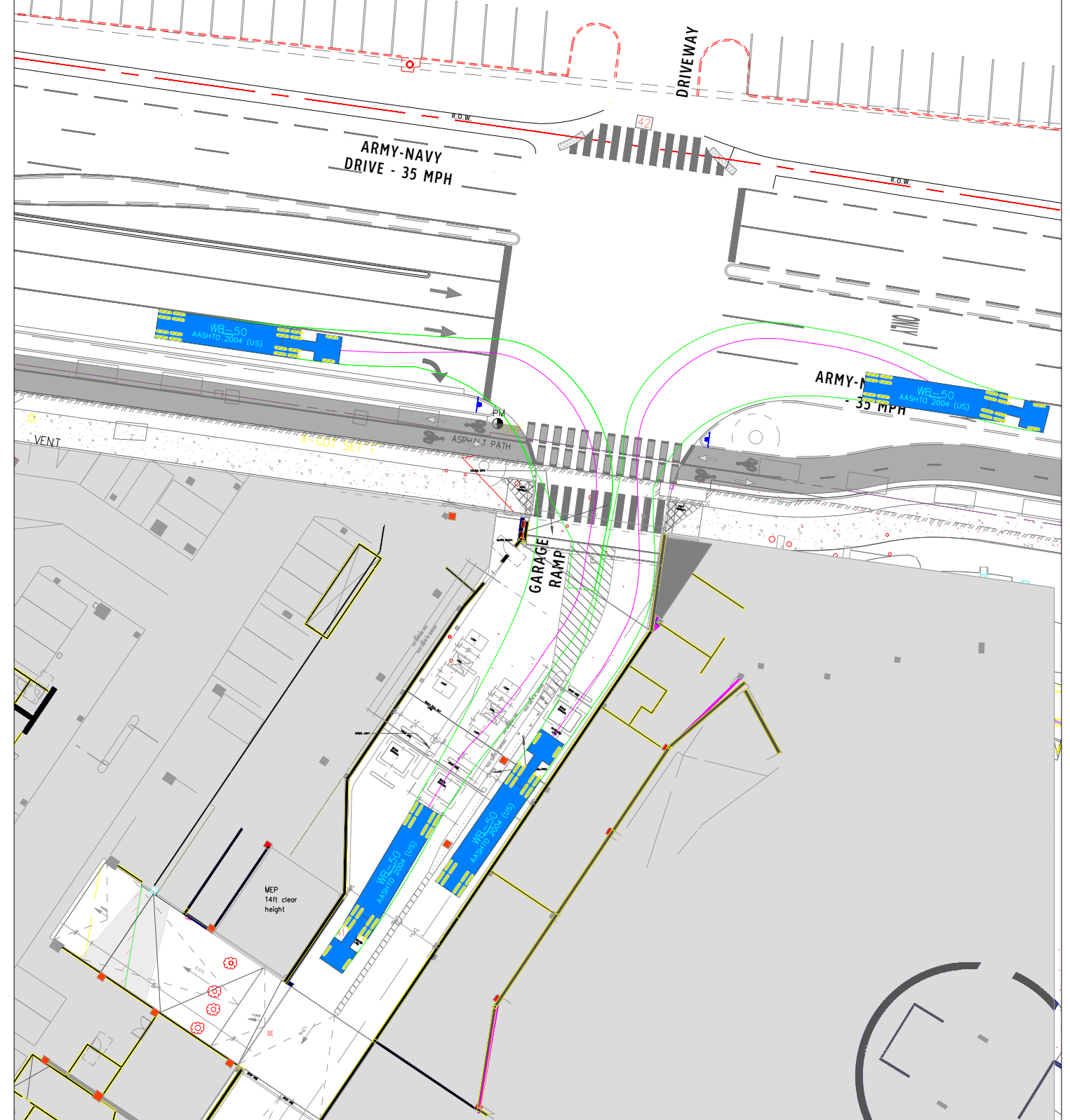
WB-40 - Inbound/Outbound



WB-50 - Inbound/Outbound

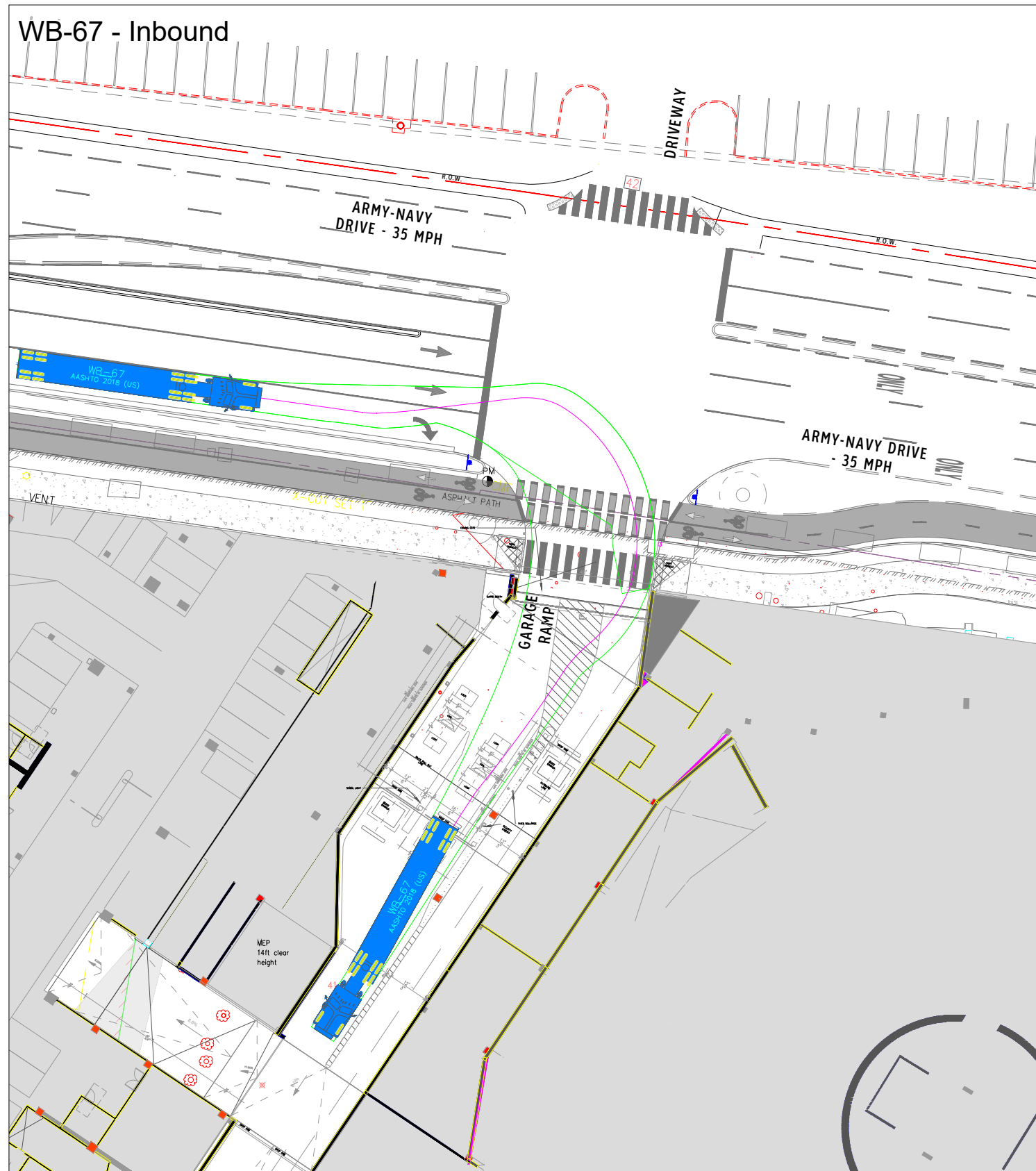


WB-50 - Inbound/Outbound





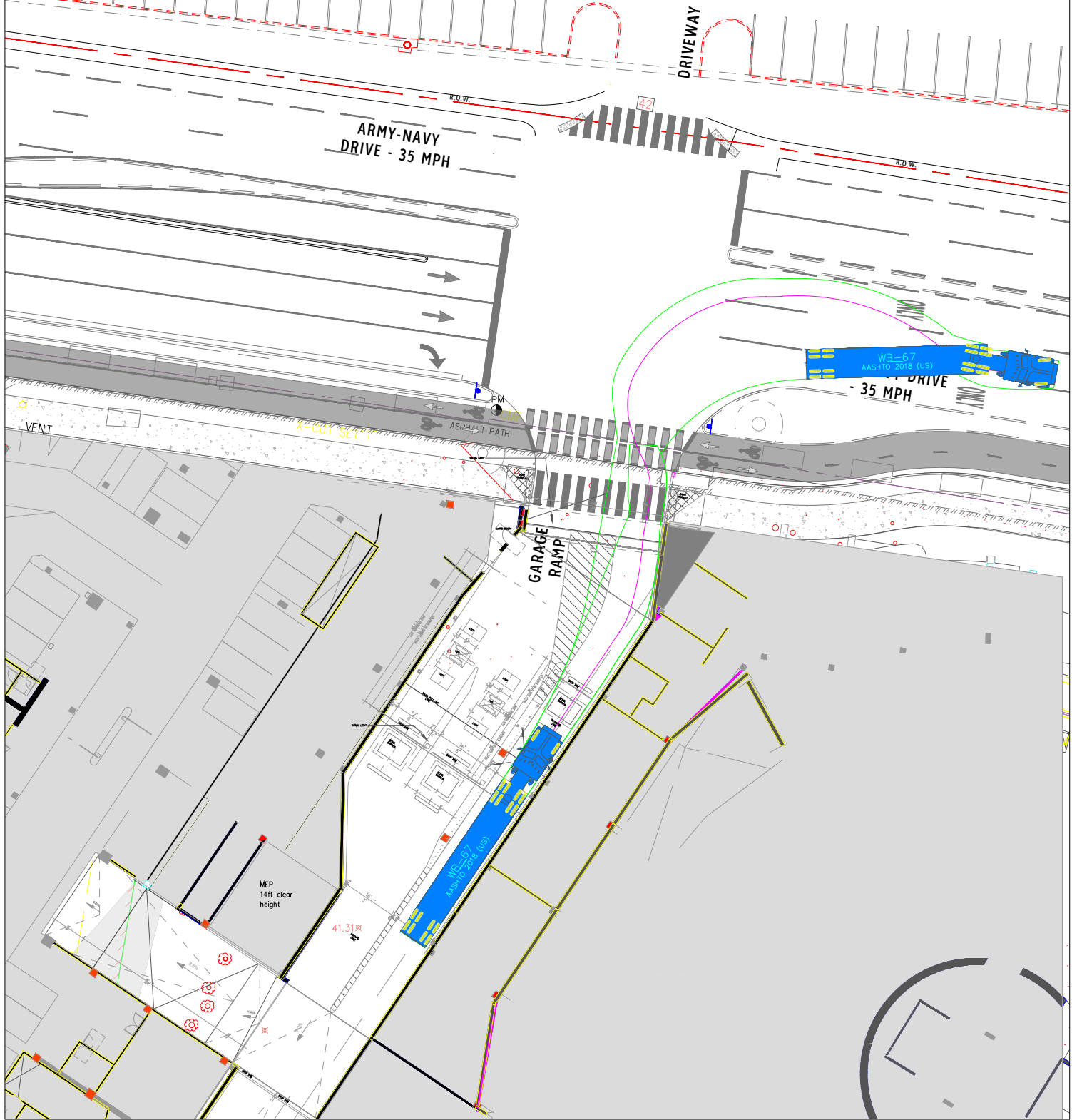
WB-67 - Inbound



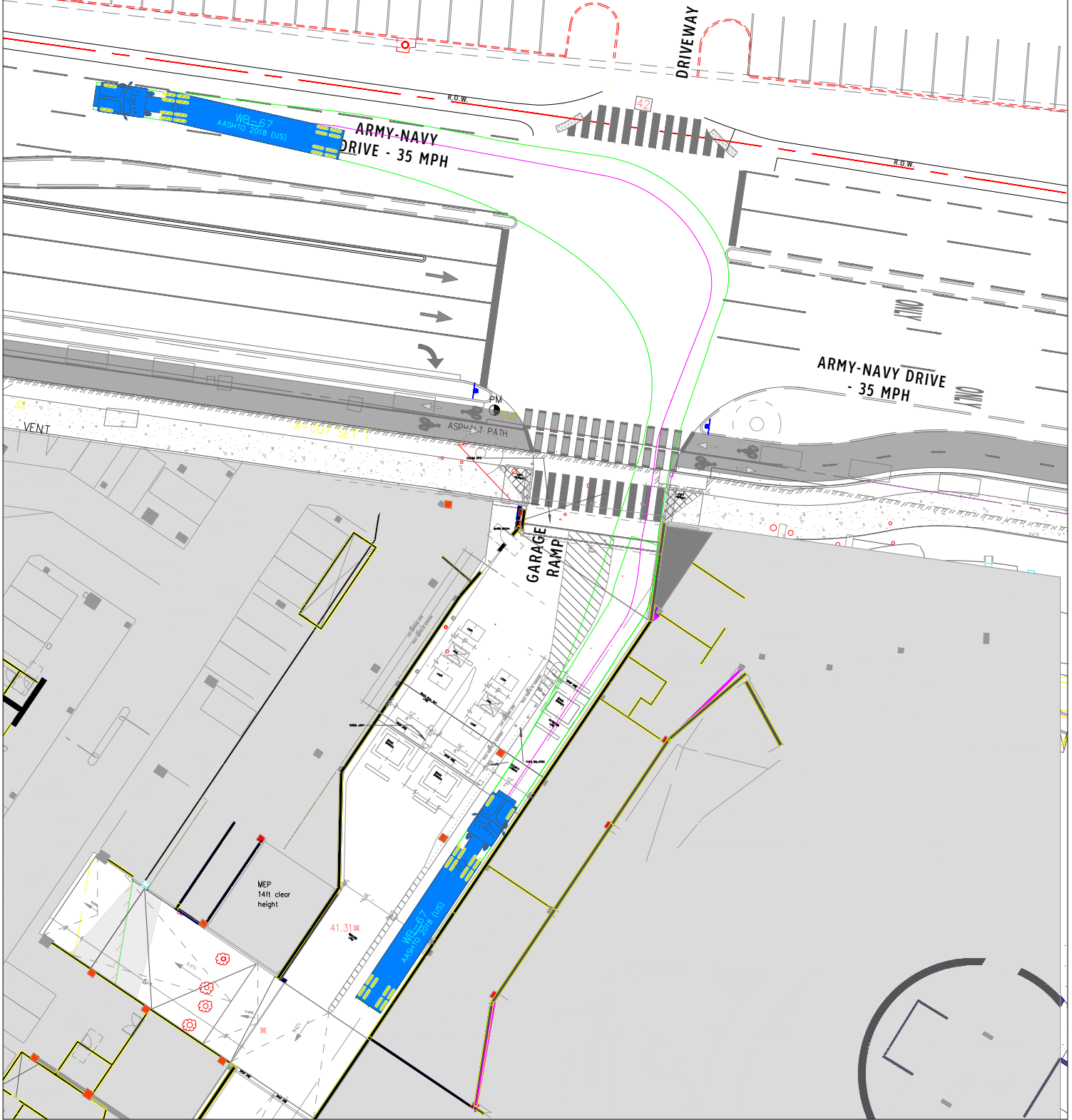
INTENTIONALLY LEFT BLANK

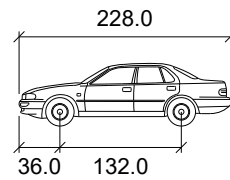


WB-67 - Outbound  
to the East



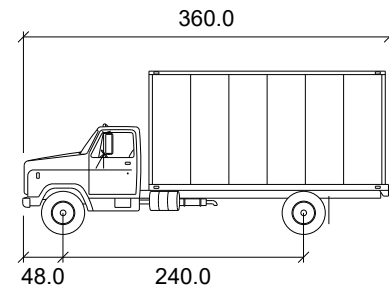
WB-67 - Outbound  
to the West





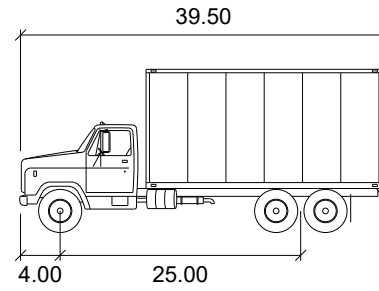
**P**

|                   |        |
|-------------------|--------|
|                   | inches |
| Width             | : 84.0 |
| Track             | : 72.0 |
| Lock to Lock Time | : 6.0  |
| Steering Angle    | : 31.6 |



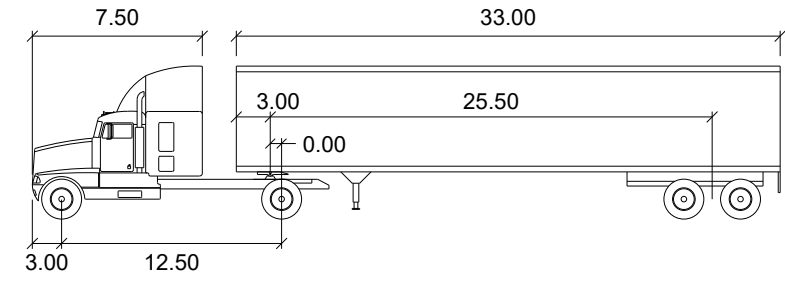
**SU-30**

|                   |        |
|-------------------|--------|
|                   | inches |
| Width             | : 96.0 |
| Track             | : 96.0 |
| Lock to Lock Time | : 6.0  |
| Steering Angle    | : 31.8 |



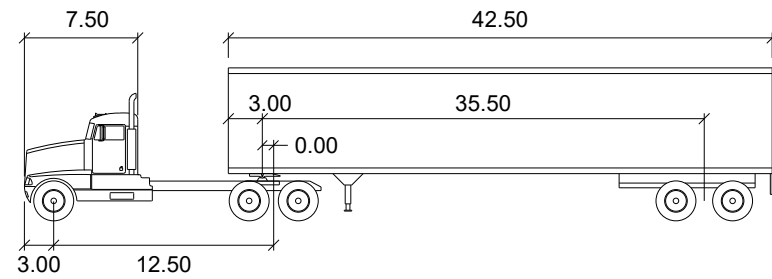
**SU-40**

|                   |        |
|-------------------|--------|
|                   | feet   |
| Width             | : 8.00 |
| Track             | : 8.00 |
| Lock to Lock Time | : 6.0  |
| Steering Angle    | : 31.8 |



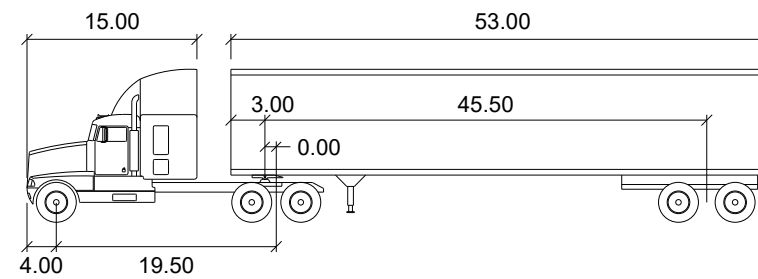
**WB-40**

|               |        |                    |        |
|---------------|--------|--------------------|--------|
|               | feet   |                    |        |
| Tractor Width | : 8.00 | Lock to Lock Time  | : 6.0  |
| Trailer Width | : 8.00 | Steering Angle     | : 20.3 |
| Tractor Track | : 8.00 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.00 |                    |        |



**WB-50**

|               |        |                    |        |
|---------------|--------|--------------------|--------|
|               | feet   |                    |        |
| Tractor Width | : 8.00 | Lock to Lock Time  | : 6.0  |
| Trailer Width | : 8.50 | Steering Angle     | : 17.7 |
| Tractor Track | : 8.00 | Articulating Angle | : 70.0 |
| Trailer Track | : 8.50 |                    |        |

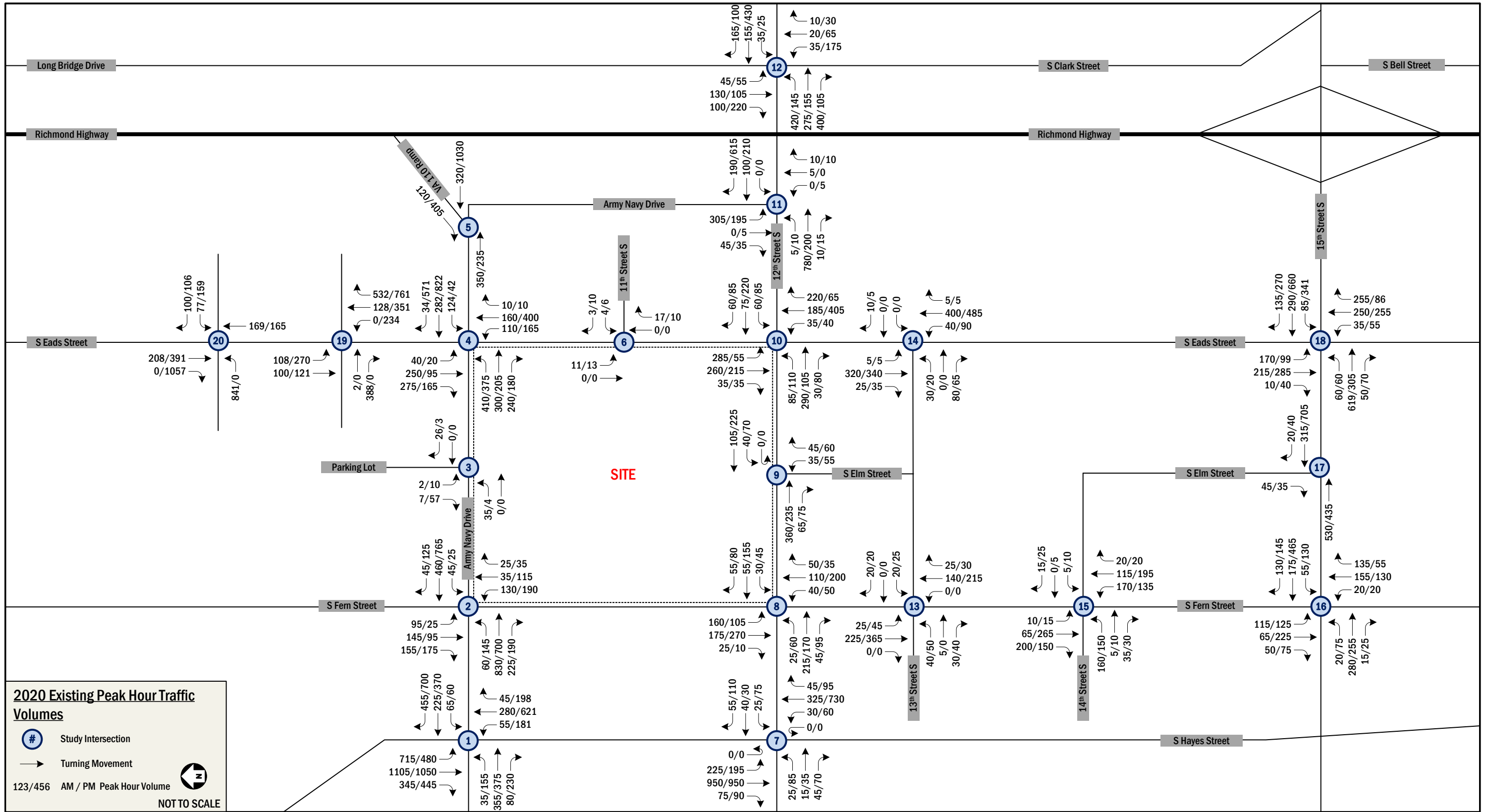


**WB-67**

|               |        |                    |        |
|---------------|--------|--------------------|--------|
|               | feet   |                    |        |
| Tractor Width | : 8.00 | Lock to Lock Time  | : 6.0  |
| Trailer Width | : 8.50 | Steering Angle     | : 28.4 |
| Tractor Track | : 8.00 | Articulating Angle | : 75.0 |
| Trailer Track | : 8.50 |                    |        |

## D. Existing Turning Movement Counts





## E. Approved VISSIM Calibration Memo

## TECHNICAL MEMORANDUM

To: Joanne Gabor  
Arlington County DES

Cc: Todd Leber  
Seneca Group  
Taylor Lawch  
JBG Smith

From: Ali Moradkhany, Ph.D., P.E., PTOE  
Niraja Chandrapu, P.E., PTOE  
Daniel Solomon, AICP  
Daniel B. VanPelt, P.E., PTOE

Date: March 18, 2021

Subject: PenPlace – VISSIM Model Recalibration

The following memorandum outlines the assumptions and parameters used to recalibrate the VISSIM network provided by Arlington County for the proposed PenPlace development in Arlington, VA. Attached to this memorandum are copies of the recalibrated VISSIM network files. Per the agreed upon scope with Arlington County, we are requesting that the County review the attached documents and provide feedback on the recalibrated VISSIM network prior to documentation of existing conditions and development of the networks for future conditions.

### ***Study Area Overview***

The proposed PenPlace development site is located in the Pentagon City area of Arlington, VA, and is bordered 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 study area of the analysis is the set of intersections where detailed capacity analyses will be performed for future scenarios. The following intersections were identified for inclusion in the VISSIM simulation, as shown in **Figure 1**.

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)

The set of intersections included are those intersections most likely to have potential impacts or require changes to traffic operations to accommodate the proposed Pen Place development. The scope of analysis was extensively discussed with and approved by Arlington County.

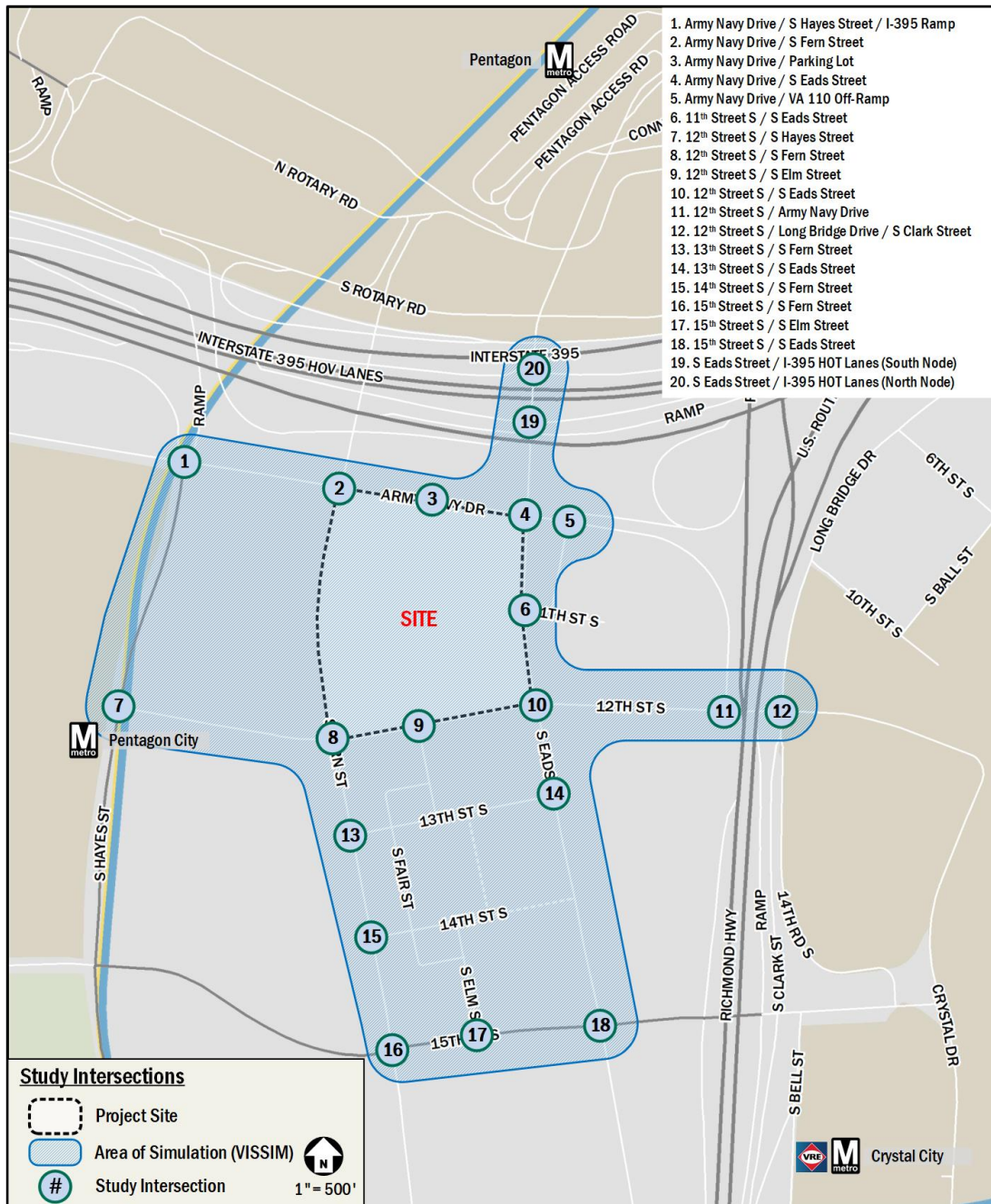


Figure 1: Existing Study Intersections

---

## ***Simulation Model Development***

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 summary of VISSIM network inputs used for the simulation model development is as follows:

- Roadway Geometry – The roadway geometry including the intersection lane configurations and storage lengths were reviewed and verified to match the current field conditions;
- Traffic Signals – Signal timings/phasing were reviewed and verified based on the most recent timing sheets provided by Arlington County;
- Link Speed Distribution – The inputs for desired speed decisions were verified based on the posted speed limits along the corridor. The inputs for reduced speed areas for left turns and right turns were reviewed to be consistent with VDOT TOSAM guidelines;
- Traffic Volumes – The turning movement volumes provided by Arlington County (collected in 2019 and early 2020) were balanced upwardly, where appropriate, and inputted into the model for the AM and PM peak periods. Based on the location of midblock streets and driveways, additional links were created to route the vehicles in and out of the network during the balancing process. Use of dummy links (which does not represent an actual street or driveway and is defined only for balancing purpose) was limited to one case inside the PM model along the northbound approach of Army Navy Drive, north of 12<sup>th</sup> Street S which was required to address the significant volume difference between the Army Navy Drive intersection with 12<sup>th</sup> Street S and S Eads Street.
- Public Transportation – The departure time of public transport lines were updated to be consistent with pre-covid bus schedules. The sources for updated bus departure times are provided in **Appendix A**. Pre-covid bus schedules for WMATA 10A and ART 84 bus lines were obtained from WMATA and ART websites, respectively. For other bus lines, the pre-covid data was not available and therefore departure times from <https://transitfeeds.com/> were utilized. Note that the bus lines which are outside the study area were removed from the model (e.g. NW1 NB).
- Vehicle Composition – The North America vehicle fleet was used;
- Simulation Duration – Overall simulation duration was set to two (2) hours. Each model run is seeded for a 1-hour period and followed by a 1-hour analysis/recording period;
- Number of Simulation Runs – Initial ten (10) simulation runs were performed for the AM and PM peak periods. *VDOT Sample Size Determination Tool* was then utilized to verify the adequacy of ten (10) simulation runs. *VDOT Sample Size Determination Tool* worksheets are provided in **Appendix B**;
- Simulation Resolution – The simulation results are based on a simulation resolution of ten (10) time steps per simulation second;
- Simulation Speed – The simulation results are based on a simulation speed of ten (10) simulation seconds per second; and,
- Driver Behavior – Driver behavior parameters were updated, where appropriate, during the calibration process as noted in the Model Calibration section.

## ***Model Calibration***

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. Travel time field measurements were

conducted in 2019 along both directions of Army Navy Drive, between S Joyce Street and 12<sup>th</sup> Street S. The existing peak hour turning movement counts, balanced traffic volumes, and travel time field measurements are provided in **Appendix C**. Note that the data provided by Arlington County did not include the turning movement counts for the intersections of Army Navy Drive/Parking Lot and S Eads Street/11<sup>th</sup> Street S. The turning movement counts for these intersections are provided separately in Appendix C.

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. **Table 1** shows the VISSIM defaults along with the aggressive driving behavior parameters in the base VISSIM model and the new aggressive driving behavior parameters used for the calibration. Note that the new aggressive driving behavior parameters were applied on case-by-case basis to some of the model links to better replicate the drivers' car following and lane change behavior, as well as the link capacity utilization. The locations with modified driving behavior parameters are as follows:

- SB approach of the Army Navy Drive and S Hayes Street/I-395 Ramp intersection: Modified from base model urban aggressive to new urban aggressive during the AM peak period. Assigning more aggressive behavior to drivers at this segment was done for volume calibration purpose to increase the link capacity utilization and accommodate high SB left-turn traffic volumes (with only one left-turn lane), as well as significant lane change maneuvers.
- EB direction of Army Navy Drive between S Hayes Street and S Eads Street: Modified from base model urban aggressive to new urban aggressive during the AM peak period. Assigning more aggressive behavior to drivers at this segment was done for volume and travel time calibration purpose to control significant lane change maneuvers and queue spillbacks.
- EB direction of Army Navy Drive between S Eads Street and 12<sup>th</sup> Street S: Modified from base model urban aggressive to new urban aggressive during the AM peak period. Assigning more aggressive behavior to drivers at this segment was done for volume and travel time calibration purpose to increase the link capacity utilization and consequently reduce queue lengths (so the link can accommodate more vehicles traveling SB on Army Navy Drive). During some simulation runs, high SB left-turn volumes at 12<sup>th</sup> Street S resulted in long queueing along this segment which was observed to have significant impact on travel time calibration.
- EB direction of 15<sup>th</sup> Street S between S Eads Street and Route 1 Ramps (West): Modified from default urban to new urban aggressive during the AM peak period. Assigning more aggressive behavior to drivers at this segment allows to increase the link capacity utilization to control spillback from Route 1 ramp intersections along the EB direction of 15<sup>th</sup> Street S to the study intersections and was necessary to calibrate the traffic volumes.
- WB direction of Army Navy Drive adjacent to the merge area of VA-110 Off-Ramp: Modified from base model urban aggressive to new urban aggressive during the PM peak period. Assigning more aggressive behavior to drivers at this segment allows to increase the link capacity utilization to accommodate significant lane change maneuvers and calibrate the travel time along the WB direction of Army Navy Drive.
- SB approach of S Hayes Street from Army Navy Drive to 15<sup>th</sup> Street S: Modified from default urban to base model urban aggressive during the PM peak period. Assigning more aggressive behavior to drivers at this segment allows to increase the link capacity utilization and control the spillback along the SB direction of S Hayes Street to Army Navy Drive intersection and was done for traffic volume calibration purpose.



- NB approach of S Hayes Street from 15<sup>th</sup> Street S to 12<sup>th</sup> Street S: Modified from default urban to base model urban aggressive during the PM peak period. Assigning more aggressive behavior to drivers at this segment allows to increase the link capacity utilization and accommodate the spillback along the NB direction of S Hayes Street to Army Navy Drive intersection and was done for traffic volume calibration purpose.

The previously defined driving behavior parameters as part of the original base VISSIM model network were maintained for other locations. The values utilized for Additive Part of Safety Distance and Multiplicative Part of Safety Distance parameters for New Urban Aggressive driving behavior are outside the suggested ranges outlined in Appendix B of VDOT VISSIM User Guide, Version 2. However, per VDOT VISSIM User Guide, these ranges are not provided as steadfast boundaries. These parameters were modified during the calibration process to meet the volume and travel time calibration thresholds. Note that the deviation from suggested ranges were applied on case-by-case basis and were required to calibrate travel time and accommodate the existing traffic volumes provided by Arlington County. In addition to the driving behavior parameters noted in Table 1, the lane change distance parameter was also updated for some connectors to account for queue spillbacks to upstream intersections and line-ups to enter turn lanes during congested conditions.

**Table 1: New Driving Behavior Parameters**

| Car Following and Lane Change Parameters | Default Urban            | Base Model Urban Aggressive | New Urban Aggressive     |
|--|--------------------------|-----------------------------|--------------------------|
| Average Standstill Distance              | 6.56 ft                  | 3.00 ft                     | 3.00 ft                  |
| Additive Part of Safety Distance         | 2.0                      | 2.0                         | 1.0 – 1.5                |
| Multiplic. Part of Safety Distance       | 3.0                      | 3.0                         | 2.0 – 2.5                |
| Maximum Deceleration of Own Vehicle      | -13.12 ft/s <sup>2</sup> | -13.12 ft/s <sup>2</sup>    | -15.00 ft/s <sup>2</sup> |
| Maximum Deceleration of Trailing Vehicle | -9.84 ft/s <sup>2</sup>  | -9.84 ft/s <sup>2</sup>     | -12.00 ft/s <sup>2</sup> |
| Minimum Headway                          | 1.64 ft                  | 1.64 ft                     | 1.50 ft                  |
| Safety Distance Reduction Factor         | 0.60                     | 0.20                        | 0.20                     |

**Table 2** shows the summary of the VISSIM modeling calibration criteria and results. The VISSIM modeling calibration used in this analysis met the calibration acceptance targets in 100% of cases, which is consistent with VDOT TOSAM guidance. **Table 3** shows the travel time calibration results. The volume calibration results along with the summary of movement MOEs are provided in **Appendix D**.

**Table 2: 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

**Table 3: VISSIM Travel Time Calibration Results**

| Peak Hour | Travel Time Segment Name                                | Simulated Travel Time (sec) | Field Measured Travel Time Data (sec) <sup>1</sup> | Percentage Difference in Travel Times | Calibration Threshold for Travel Times <sup>2</sup> | Satisfy Calibration Threshold for Travel Times? |
|-----------|---|-----------------------------|--|---------------------------------------|---|---|
| AM        | EB Army-Navy Drive from 12th Street S to S Joyce Street | 339                         | 357  | -5%                                   | 30%   | YES   |
|           | WB Army-Navy Drive from S Joyce Street to 12th Street S | 159                         | 143  | 11%                                   | 30%   | YES   |
| PM        | EB Army-Navy Drive from 12th Street S to S Joyce Street | 178                         | 142  | +25%                                  | 30%   | YES   |
|           | WB Army-Navy Drive from S Joyce Street to 12th Street S | 185                         | 161  | +15%                                  | 30%   | YES   |

Source: VISSIM 11.00 Travel Time Evaluation. Compiled by Gorove/Slade Associates based on the average of 10 VISSIM model runs.

2) Based on the travel time field measurements provided by Arlington County

3) Based on the VDOT TOSAM Version 2 Criteria

## F. 2020 Existing VISSIM Delay and Queue Results



| Pen Place - VISSIM Delay & Queue Results |   |          |   |   |                     |  |              |  |              |                                      |                                    |
|--|---|----------|---|---|---------------------|--|--------------|--|--------------|--------------------------------------|------------------------------------|
| 2020 Existing AM Peak Conditions         |   |          |   |   |                     |  |              |  |              |                                      |                                    |
| Intersection #                           | Intersection Name                             | Movement | Input Vehicular Volume (vph) <sup>1</sup> | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Maximum Queue Length (ft) | Average Pedestrian Delay (sec/ped) |
| 1  | Army-Navy Drive and S Hayes Street/I-395 Ramp | EBL      | 35  | 38  | 260                 | 30.8                                       | C            |  |              | 84                                   |                                    |
|  |   | EBT      | 375                                       | 383                                       | 450                 | 36.0                                       | D            | 34.9                                       | C            | 232                                  | 46.5                               |
|  |   | EBR      | 80  | 90  | 450                 | 32.1                                       | C            |  |              | 256                                  |                                    |
|  |   | WBL      | 75  | 72  | 190                 | 24.9                                       | C            |  |              | 116                                  |                                    |
|  |   | WBT      | 261                                       | 271                                       | 430                 | 35.7                                       | D            | 13.5                                       | B            | 136                                  | 0.0                                |
|  |   | WBR      | 529                                       | 524                                       | 430                 | 0.5  | A            |  |              | 58                                   |                                    |
|  |   | NBL      | 55  | 55  | 210                 | 47.0                                       | D            |  |              | 133                                  |                                    |
|  |   | NBT      | 280                                       | 284                                       | 750                 | 56.8                                       | E            | 45.8                                       | D            | 153                                  | ---                                |
|  |   | NBR      | 88  | 87  | 115                 | 9.0  | A            |  |              | 99                                   |                                    |
|  |   | SBL      | 804                                       | 775                                       | 2,070               | 52.7                                       | D            |  |              | 952                                  |                                    |
|  |   | SBT      | 1,105                                     | 1,098                                     | 1,930               | 33.8                                       | C            | 36.5                                       | D            | 952                                  | ---                                |
|  |   | SBR      | 345                                       | 339                                       | 1,930               | 8.3  | A            |  |              | 353                                  |                                    |
|  |   | Overall  | 4,032                                     | 4,057                                     | ---                 | 32.3                                       | C            | ---  | ---          | ---                                  | ---                                |
|  |   | 2        | Army-Navy Drive and S Fern Street         | EBL                                       | 60                  | 59   | 160          | 26.8                                       | C            |                                      |                                    |
| EBT                                      | 929   |          |   | 928                                       | 430                 | 26.5                                       | C            | 22.2                                       | C            | 421                                  | 49.4                               |
| EBR                                      | 278   |          |   | 268                                       | 215                 | 6.2  | A            |  |              | 153                                  |                                    |
| WBL                                      | 65  |          |   | 64  | 530                 | 52.6                                       | D            |  |              | 312                                  |                                    |
| WBT                                      | 543   |          |   | 550                                       | 530                 | 21.1                                       | C            | 23.8                                       | C            | 312                                  | 49.6                               |
| WBR                                      | 53  |          |   | 53  | 530                 | 17.2                                       | B            |  |              | 317                                  |                                    |
| NBL                                      | 167   |          |   | 172                                       | 205                 | 45.8                                       | D            |  |              | 231                                  |                                    |
| NBT                                      | 46  |          |   | 44  | 785                 | 27.5                                       | C            | 37.4                                       | D            | 67                                   | 51.3                               |
| NBR                                      | 36  |          |   | 34  | 300                 | 7.5  | A            |  |              | 75                                   |                                    |
| SBL                                      | 105   |          |   | 100                                       | 75                  | 31.8                                       | C            |  |              | 185                                  |                                    |
| SBT                                      | 179   |          |   | 177                                       | 560                 | 27.0                                       | C            | 24.8                                       | C            | 208                                  | 50.0                               |
| SBR                                      | 155   |          |   | 148                                       | 560                 | 17.4                                       | B            |  |              | 215                                  |                                    |
| Overall                                  | 2,616   |          |   | 2,779                                     | ---                 | 26.1                                       | C            | ---  | ---          | ---                                  | ---                                |
| 4  | Army-Navy Drive and S Eads Street             |          |   | EBL                                       | 480                 | 476  | 530          | 24.2                                       | C            |                                      |                                    |
|  |   | EBT      | 315                                       | 309                                       | 530                 | 16.7                                       | B            | 18.2                                       | B            | 331                                  | 52.4                               |
|  |   | EBR      | 242                                       | 236                                       | 530                 | 7.9  | A            |  |              | 359                                  |                                    |
|  |   | WBL      | 124                                       | 123                                       | 100                 | 48.9                                       | D            |  |              | 181                                  |                                    |
|  |   | WBT      | 287                                       | 293                                       | 1,100               | 30.6                                       | C            | 34.5                                       | C            | 181                                  | 50.4                               |
|  |   | WBR      | 39  | 38  | 1,100               | 18.0                                       | B            |  |              | 191                                  |                                    |
|  |   | NBL      | 113                                       | 109                                       | 100                 | 35.4                                       | D            |  |              | 299                                  |                                    |
|  |   | NBT      | 199                                       | 195                                       | 550                 | 32.1                                       | C            | 33.2                                       | C            | 299                                  | 49.6                               |
|  |   | NBR      | 10  | 10  | 550                 | 32.1                                       | C            |  |              | 302                                  |                                    |
|  |   | SBL      | 40  | 44  | 220                 | 30.2                                       | C            |  |              | 298                                  |                                    |
|  |   | SBT      | 250                                       | 250                                       | 220                 | 32.9                                       | C            | 19.6                                       | B            | 298                                  | 50.7                               |
|  |   | SBR      | 280                                       | 284                                       | 110                 | 6.3  | A            |  |              | 298                                  |                                    |
|  |   | Overall  | 2,379                                     | 2,474                                     | ---                 | 24.9                                       | C            | ---  | ---          | ---                                  | ---                                |
|  |   | 7        | 12th Street S and S Hayes Street          | EBL                                       | 25                  | 24   | 460          | 30.3                                       | C            |                                      |                                    |
| EBT                                      | 15  |          |   | 15  | 460                 | 27.8                                       | C            | 16.1                                       | B            | 95                                   | 51.6                               |
| EBR                                      | 45  |          |   | 48  | 65                  | 5.3  | A            |  |              | 94                                   |                                    |
| WBL                                      | 33  |          |   | 36  | 100                 | 31.6                                       | C            |  |              | 161                                  |                                    |
| WBT                                      | 40  |          |   | 41  | 600                 | 27.8                                       | C            | 21.9                                       | C            | 161                                  | 49.7                               |
| WBR                                      | 69  |          |   | 63  | 600                 | 12.5                                       | B            |  |              | 171                                  |                                    |
| NBL                                      | 30  |          |   | 29  | 75                  | 59.2                                       | E            |  |              | 125                                  |                                    |
| NBT                                      | 354   |          |   | 361                                       | 775                 | 21.1                                       | C            | 21.5                                       | C            | 125                                  | 50.6                               |
| NBR                                      | 50  |          |   | 60  | 75                  | 5.8  | A            |  |              | 129                                  |                                    |
| SBL                                      | 248   |          |   | 246                                       | 250                 | 71.0                                       | E            |  |              | 499                                  |                                    |
| SBT                                      | 972   |          |   | 974                                       | 750                 | 7.1  | A            | 18.9                                       | B            | 499                                  | 0.0                                |
| SBR                                      | 75  |          |   | 76  | 750                 | 1.9  | A            |  |              | 506                                  |                                    |
| Overall                                  | 1,956   |          |   | 2,203                                     | ---                 | 22.9                                       | C            | ---  | ---          | ---                                  | ---                                |
| 8  | 12th Street S and S Fern Street               |          |   | EBL                                       | 25                  | 25   | 600          | 31.4                                       | C            |                                      |                                    |
|  |   | EBT      | 215                                       | 224                                       | 600                 | 28.6                                       | C            | 28.2                                       | C            | 373                                  | 35.0                               |
|  |   | EBR      | 73  | 70  | 600                 | 26.0                                       | C            |  |              | 379                                  |                                    |
|  |   | WBL      | 48  | 46  | 100                 | 31.7                                       | C            |  |              | 126                                  |                                    |
|  |   | WBT      | 56  | 57  | 225                 | 19.3                                       | B            | 19.9                                       | B            | 126                                  | 34.9                               |
|  |   | WBR      | 56  | 60  | 225                 | 11.5                                       | B            |  |              | 135                                  |                                    |
|  |   | NBL      | 61  | 63  | 120                 | 21.0                                       | C            |  |              | 257                                  |                                    |
|  |   | NBT      | 168                                       | 166                                       | 250                 | 10.6                                       | B            | 12.6                                       | B            | 257                                  | 34.6                               |
|  |   | NBR      | 77  | 75  | 250                 | 10.1                                       | B            |  |              | 257                                  |                                    |
|  |   | SBL      | 160                                       | 154                                       | 790                 | 19.3                                       | B            |  |              | 415                                  |                                    |
|  |   | SBT      | 282                                       | 282                                       | 790                 | 15.5                                       | B            | 16.7                                       | B            | 415                                  | 34.9                               |
|  |   | SBR      | 25  | 24  | 790                 | 14.0                                       | B            |  |              | 420                                  |                                    |
|  |   | Overall  | 1,246                                     | 1,974                                     | ---                 | 24.9                                       | C            | ---  | ---          | ---                                  | ---                                |
|  |   | 10       | 12th Street S and S Eads Street           | EBL                                       | 89                  | 86   | 150          | 38.3                                       | D            |                                      |                                    |
| EBT                                      | 307   |          |   | 309                                       | 310                 | 40.4                                       | D            | 39.7                                       | D            | 413                                  | 50.0                               |
| EBR                                      | 32  |          |   | 38  | 310                 | 36.8                                       | D            |  |              | 417                                  |                                    |
| WBL                                      | 60  |          |   | 57  | 140                 | 63.7                                       | E            |  |              | 231                                  |                                    |
| WBT                                      | 89  |          |   | 89  | 575                 | 33.8                                       | C            | 43.4                                       | D            | 231                                  | 48.3                               |
| WBR                                      | 60  |          |   | 62  | 575                 | 38.4                                       | D            |  |              | 231                                  |                                    |
| NBL                                      | 35  |          |   | 35  | 100                 | 17.6                                       | B            |  |              | 195                                  |                                    |
| NBT                                      | 187   |          |   | 185                                       | 250                 | 11.2                                       | B            | 11.3                                       | B            | 195                                  | 51.0                               |
| NBR                                      | 220   |          |   | 223                                       | 200                 | 10.3                                       | B            |  |              | 199                                  |                                    |
| SBL                                      | 299   |          |   | 294                                       | 560                 | 20.5                                       | C            |  |              | 343                                  |                                    |
| SBT                                      | 273   |          |   | 267                                       | 560                 | 19.1                                       | B            | 19.7                                       | B            | 343                                  | 25.3                               |
| SBR                                      | 37  |          |   | 37  | 560                 | 18.2                                       | B            |  |              | 342                                  |                                    |
| Overall                                  | 1,688   |          |   | 2,178                                     | ---                 | 31.0                                       | C            | ---  | ---          | ---                                  | ---                                |

| Pen Place - VISSIM Delay & Queue Results |  |          |   |   |                     |  |              |  |              |                                      |                                    |
|--|--|----------|---|---|---------------------|--|--------------|--|--------------|--------------------------------------|------------------------------------|
| 2020 Existing AM Peak Conditions         |  |          |   |   |                     |  |              |  |              |                                      |                                    |
| Intersection #                           | Intersection Name                                | Movement | Input Vehicular Volume (vph) <sup>1</sup> | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Maximum Queue Length (ft) | Average Pedestrian Delay (sec/ped) |
| 12                                       | 12th Street and Long Bridge Drive/S Clark Street | EBL      | 432                                       | 424                                       | 110                 | 23.0                                       | C            |  |              | 259                                  |                                    |
|  |  | EBT      | 282                                       | 268                                       | 110                 | 13.5                                       | B            | 14.8                                       | B            | 259                                  | 34.8                               |
|  |  | EBR      | 412                                       | 417                                       | 110                 | 7.2  | A            |  |              | 260                                  |                                    |
|  |  | WBL      | 35  | 34  | 100                 | 15.3                                       | B            |  |              | 64                                   |                                    |
|  |  | WBT      | 169                                       | 176                                       | 1,500               | 13.5                                       | B            | 13.5                                       | B            | 365                                  | 34.3                               |
|  |  | WBR      | 165                                       | 167                                       | 1,500               | 13.2                                       | B            |  |              | 368                                  |                                    |
|  |  | NBL      | 40  | 48  | 100                 | 26.7                                       | C            |  |              | 86                                   |                                    |
|  |  | NBT      | 20  | 23  | 1,200               | 20.6                                       | C            | 23.1                                       | C            | 67                                   | 35.5                               |
|  |  | NBR      | 10  | 9   | 1,200               | 10.4                                       | B            |  |              | 69                                   |                                    |
|  |  | SBL      | 45  | 44  | 425                 | 24.0                                       | C            |  |              | 195                                  |                                    |
|  |  | SBT      | 130                                       | 126                                       | 425                 | 22.1                                       | C            | 16.3                                       | B            | 195                                  | 31.7                               |
|  |  | SBR      | 115                                       | 117                                       | 160                 | 7.1  | A            |  |              | 80                                   |                                    |
|  |  | Overall  |   |   | 1,855               | 2,103                                      | ---          | 17.4                                       | B            | ---                                  | ---                                |
| 16                                       | 15th Street S and S Fern Street                  | EBL      | 20  | 19  | 130                 | 21.2                                       | C            |  |              | 338                                  |                                    |
|  |  | EBT      | 388                                       | 388                                       | 970                 | 29.7                                       | C            | 28.9                                       | C            | 338                                  | 34.8                               |
|  |  | EBR      | 15  | 15  | 970                 | 17.2                                       | B            |  |              | 340                                  |                                    |
|  |  | WBL      | 55  | 55  | 140                 | 21.1                                       | C            |  |              | 114                                  |                                    |
|  |  | WBT      | 175                                       | 181                                       | 230                 | 11.8                                       | B            | 11.2                                       | B            | 114                                  | 38.0                               |
|  |  | WBR      | 130                                       | 133                                       | 230                 | 6.2  | A            |  |              | 116                                  |                                    |
|  |  | NBL      | 20  | 21  | 740                 | 19.8                                       | B            |  |              | 266                                  |                                    |
|  |  | NBT      | 155                                       | 159                                       | 740                 | 16.9                                       | B            | 12.7                                       | B            | 266                                  | 36.8                               |
|  |  | NBR      | 188                                       | 186                                       | 60                  | 8.4  | A            |  |              | 272                                  |                                    |
|  |  | SBL      | 159                                       | 153                                       | 100                 | 30.2                                       | C            |  |              | 214                                  |                                    |
|  |  | SBT      | 65  | 68  | 320                 | 16.0                                       | B            | 23.0                                       | C            | 214                                  | 35.2                               |
|  |  | SBR      | 50  | 52  | 320                 | 10.8                                       | B            |  |              | 229                                  |                                    |
|  |  | Overall  |   |   | 1,420               | 1,563                                      | ---          | 20.3                                       | C            | ---                                  | ---                                |
| 18                                       | 15th Street S and S Eads Street                  | EBL      | 60  | 58  | 170                 | 31.1                                       | C            |  |              | 345                                  |                                    |
|  |  | EBT      | 625                                       | 608                                       | 350                 | 46.8                                       | D            | 42.8                                       | D            | 413                                  | 33.6                               |
|  |  | EBR      | 50  | 52  | 130                 | 8.6  | A            |  |              | 418                                  |                                    |
|  |  | WBL      | 85  | 85  | 280                 | 38.1                                       | D            |  |              | 169                                  |                                    |
|  |  | WBT      | 290                                       | 291                                       | 280                 | 15.8                                       | B            | 18.7                                       | B            | 169                                  | 32.7                               |
|  |  | WBR      | 135                                       | 130                                       | 280                 | 12.7                                       | B            |  |              | 181                                  |                                    |
|  |  | NBL      | 35  | 40  | 125                 | 24.0                                       | C            |  |              | 335                                  |                                    |
|  |  | NBT      | 252                                       | 255                                       | 760                 | 20.1                                       | C            | 20.6                                       | C            | 335                                  | 39.1                               |
|  |  | NBR      | 255                                       | 251                                       | 125                 | 20.5                                       | C            |  |              | 399                                  |                                    |
|  |  | SBL      | 170                                       | 178                                       | 100                 | 89.7                                       | F            |  |              | 377                                  |                                    |
|  |  | SBT      | 229                                       | 215                                       | 300                 | 27.0                                       | C            | 54.8                                       | D            | 345                                  | 35.3                               |
|  |  | SBR      | 10  | 9   | 300                 | 26.9                                       | C            |  |              | 348                                  |                                    |
|  |  | Overall  |   |   | 2,196               | 2,365                                      | ---          | 34.0                                       | C            | ---                                  | ---                                |
| 19                                       | S Eads Street and I-395 HOT Lanes (South Node)   | EBT      | 2   | 2   | 900                 | 34.5                                       | C            |  |              | 199                                  |                                    |
|  |  | EBR      | 419                                       | 416                                       | 900                 | 12.1                                       | B            | 12.2                                       | B            | 243                                  |                                    |
|  |  | NBT      | 171                                       | 180                                       | 250                 | 19.3                                       | B            |  |              | 148                                  |                                    |
|  |  | NBR      | 547                                       | 533                                       | 250                 | 10.8                                       | B            | 12.9                                       | B            | 206                                  |                                    |
|  |  | SBL      | 145                                       | 142                                       | 100                 | 33.8                                       | C            |  |              | 197                                  |                                    |
|  |  | SBT      | 151                                       | 162                                       | 100                 | 9.0  | A            | 20.6                                       | C            | 194                                  |                                    |
| Overall                                  |  |          | 1,435                                     | 1,433                                     | ---                 | 14.3                                       | B            | ---  | ---          | ---                                  | ---                                |
| 20                                       | S Eads Street and I-395 HOT Lanes (North Node)   | EBL      | 841                                       | 805                                       | 875                 | 120.2                                      | F            | 120.2                                      | F            | 1,217                                |                                    |
|  |  | WBL      | 80  | 83  | 1,000               | 57.5                                       | E            | 39.1                                       | D            | 177                                  |                                    |
|  |  | WBR      | 100                                       | 98  | 400                 | 23.5                                       | C            |  |              | 224                                  |                                    |
|  |  | NBT      | 171                                       | 178                                       | 100                 | 12.0                                       | B            | 12.0                                       | B            | 178                                  |                                    |
|  |  | SBT      | 216                                       | 222                                       | 100                 | 37.6                                       | D            | 37.6                                       | D            | 151                                  |                                    |
| Overall                                  |  |          | 1,408                                     | 222                                       | ---                 | 37.6                                       | D            | ---  | ---          | ---                                  | ---                                |

Source: VISSIM 11.0 Node Evaluation. Compiled by Gorove/Slade Associates based on the average of 10 VISSIM model runs.

| Pen Place - VISSIM Delay & Queue Results |   |          |                                 |                                 |                     |                         |              |                          |              |                                      |                                    |
|--|---|----------|---------------------------------|---------------------------------|---------------------|-------------------------|--------------|--------------------------|--------------|--------------------------------------|------------------------------------|
| 2020 Existing PM Peak Conditions         |   |          |                                 |                                 |                     |                         |              |                          |              |                                      |                                    |
| Intersection #                           | Intersection Name                             | Movement | Input Volume (vph) <sup>1</sup> | Average Simulated Volumes (vph) | Storage Length (ft) | Average Delay (sec/veh) | Movement LOS | Approach Delay (sec/veh) | Approach LOS | Average of Maximum Queue Length (ft) | Average Pedestrian Delay (sec/ped) |
| 1  | Army-Navy Drive and S Hayes Street/I-395 Ramp | EBL      | 155                             | 155                             | 260                 | 40.1                    | D            |                          |              | 223                                  |                                    |
|  |   | EBT      | 375                             | 373                             | 450                 | 37.1                    | D            | 37.3                     | D            | 460                                  | 49.9                               |
|  |   | EBR      | 230                             | 236                             | 450                 | 35.8                    | D            |                          |              | 483                                  |                                    |
|  |   | WBL      | 73                              | 71                              | 190                 | 33.7                    | C            |                          |              | 101                                  |                                    |
|  |   | WBT      | 447                             | 444                             | 430                 | 32.1                    | C            | 12.9                     | B            | 239                                  | 0.2                                |
|  |   | WBR      | 846                             | 852                             | 430                 | 1.1                     | A            |                          |              | 206                                  |                                    |
|  |   | NBL      | 181                             | 173                             | 210                 | 234.0                   | F            |                          |              | 366                                  |                                    |
|  |   | NBT      | 648                             | 652                             | 750                 | 47.2                    | D            | 72.4                     | E            | 345                                  | ---                                |
|  |   | NBR      | 198                             | 194                             | 115                 | 13.1                    | B            |                          |              | 208                                  |                                    |
|  |   | SBL      | 480                             | 468                             | 2,070               | 37.7                    | D            |                          |              | 716                                  |                                    |
|  |   | SBT      | 1020                            | 995                             | 1,930               | 44.4                    | D            | 34.4                     | C            | 716                                  | ---                                |
|  |   | SBR      | 445                             | 436                             | 1,930               | 7.9                     | A            |                          |              | 274                                  |                                    |
|  |   | Overall  |                                 | 5098                            | 5103                | ---                     | 36.4         | D                        | ---          | ---                                  | ---                                |
| 2  | Army-Navy Drive and S Fern Street             | EBL      | 148                             | 150                             | 160                 | 33.5                    | C            |                          |              | 218                                  |                                    |
|  |   | EBT      | 712                             | 703                             | 430                 | 20.4                    | C            | 19.6                     | B            | 303                                  | 46.9                               |
|  |   | EBR      | 193                             | 184                             | 215                 | 5.0                     | A            |                          |              | 96                                   |                                    |
|  |   | WBL      | 32                              | 35                              | 530                 | 18.2                    | B            |                          |              | 383                                  |                                    |
|  |   | WBT      | 1001                            | 1015                            | 530                 | 18.0                    | B            | 18.9                     | B            | 383                                  | 47.2                               |
|  |   | WBR      | 164                             | 166                             | 530                 | 24.5                    | C            |                          |              | 388                                  |                                    |
|  |   | NBL      | 190                             | 189                             | 205                 | 35.5                    | D            |                          |              | 274                                  |                                    |
|  |   | NBT      | 192                             | 194                             | 785                 | 25.0                    | C            | 28.6                     | C            | 140                                  | 50.7                               |
|  |   | NBR      | 35                              | 35                              | 300                 | 10.8                    | B            |                          |              | 148                                  |                                    |
|  |   | SBL      | 25                              | 25                              | 75                  | 47.6                    | D            |                          |              | 73                                   |                                    |
|  |   | SBT      | 95                              | 99                              | 560                 | 24.0                    | C            | 21.3                     | C            | 174                                  | 49.5                               |
|  |   | SBR      | 175                             | 167                             | 560                 | 15.7                    | B            |                          |              | 181                                  |                                    |
|  |   | Overall  |                                 | 2962                            | 3172                | ---                     | 22.6         | C                        | ---          | ---                                  | ---                                |
| 4  | Army-Navy Drive and S Eads Street             | EBL      | 375                             | 369                             | 530                 | 59.5                    | E            |                          |              | 354                                  |                                    |
|  |   | EBT      | 214                             | 209                             | 530                 | 20.7                    | C            | 37.5                     | D            | 354                                  | 51.1                               |
|  |   | EBR      | 189                             | 194                             | 530                 | 13.8                    | B            |                          |              | 382                                  |                                    |
|  |   | WBL      | 42                              | 41                              | 100                 | 32.0                    | C            |                          |              | 212                                  |                                    |
|  |   | WBT      | 822                             | 845                             | 1,100               | 30.4                    | C            | 29.3                     | C            | 212                                  | 50.9                               |
|  |   | WBR      | 571                             | 572                             | 1,100               | 27.4                    | C            |                          |              | 229                                  |                                    |
|  |   | NBL      | 165                             | 158                             | 100                 | 31.2                    | C            |                          |              | 325                                  |                                    |
|  |   | NBT      | 433                             | 437                             | 550                 | 31.8                    | C            | 31.5                     | C            | 325                                  | 51.8                               |
|  |   | NBR      | 10                              | 11                              | 550                 | 24.2                    | C            |                          |              | 331                                  |                                    |
|  |   | SBL      | 20                              | 21                              | 220                 | 58.4                    | E            |                          |              | 167                                  |                                    |
|  |   | SBT      | 95                              | 92                              | 220                 | 27.3                    | C            | 16.7                     | B            | 167                                  | 49.4                               |
|  |   | SBR      | 166                             | 175                             | 110                 | 6.1                     | A            |                          |              | 177                                  |                                    |
|  |   | Overall  |                                 | 3102                            | 3233                | ---                     | 31.3         | C                        | ---          | ---                                  | ---                                |
| 7  | 12th Street S and S Hayes Street              | EBL      | 85                              | 82                              | 460                 | 99.5                    | F            |                          |              | 281                                  |                                    |
|  |   | EBT      | 35                              | 35                              | 460                 | 97.5                    | F            | 68.5                     | E            | 281                                  | 49.7                               |
|  |   | EBR      | 70                              | 70                              | 65                  | 17.8                    | B            |                          |              | 291                                  |                                    |
|  |   | WBL      | 82                              | 82                              | 100                 | 43.5                    | D            |                          |              | 302                                  |                                    |
|  |   | WBT      | 30                              | 33                              | 600                 | 33.6                    | C            | 29.5                     | C            | 302                                  | 50.7                               |
|  |   | WBR      | 122                             | 123                             | 600                 | 19.1                    | B            |                          |              | 313                                  |                                    |
|  |   | NBL      | 60                              | 61                              | 75                  | 93.1                    | F            |                          |              | 529                                  |                                    |
|  |   | NBT      | 730                             | 731                             | 775                 | 44.1                    | D            | 43.3                     | D            | 529                                  | 48.5                               |
|  |   | NBR      | 113                             | 123                             | 75                  | 13.8                    | B            |                          |              | 533                                  |                                    |
|  |   | SBL      | 210                             | 200                             | 250                 | 78.9                    | E            |                          |              | 606                                  |                                    |
|  |   | SBT      | 1023                            | 1004                            | 750                 | 35.5                    | D            | 40.4                     | D            | 607                                  | 0.0                                |
|  |   | SBR      | 90                              | 88                              | 750                 | 9.5                     | A            |                          |              | 607                                  |                                    |
|  |   | Overall  |                                 | 2650                            | 3087                | ---                     | 43.1         | D                        | ---          | ---                                  | ---                                |
| 8  | 12th Street S and S Fern Street               | EBL      | 60                              | 59                              | 600                 | 46.7                    | D            |                          |              | 533                                  |                                    |
|  |   | EBT      | 177                             | 183                             | 600                 | 43.8                    | D            | 43.1                     | D            | 533                                  | 34.4                               |
|  |   | EBR      | 121                             | 117                             | 600                 | 40.2                    | D            |                          |              | 540                                  |                                    |
|  |   | WBL      | 57                              | 56                              | 100                 | 39.2                    | D            |                          |              | 261                                  |                                    |
|  |   | WBT      | 155                             | 164                             | 225                 | 24.6                    | C            | 25.9                     | C            | 261                                  | 34.5                               |
|  |   | WBR      | 80                              | 85                              | 225                 | 19.5                    | B            |                          |              | 271                                  |                                    |
|  |   | NBL      | 69                              | 69                              | 120                 | 21.7                    | C            |                          |              | 324                                  |                                    |
|  |   | NBT      | 277                             | 268                             | 250                 | 12.8                    | B            | 14.5                     | B            | 324                                  | 34.3                               |
|  |   | NBR      | 51                              | 46                              | 250                 | 14.0                    | B            |                          |              | 329                                  |                                    |
|  |   | SBL      | 110                             | 107                             | 790                 | 20.1                    | C            |                          |              | 383                                  |                                    |
|  |   | SBT      | 344                             | 347                             | 790                 | 15.7                    | B            | 16.7                     | B            | 383                                  | 34.2                               |
|  |   | SBR      | 10                              | 10                              | 790                 | 13.5                    | B            |                          |              | 388                                  |                                    |
|  |   | Overall  |                                 | 1511                            | 2294                | ---                     | 27.8         | C                        | ---          | ---                                  | ---                                |
| 10                                       | 12th Street S and S Eads Street               | EBL      | 118                             | 112                             | 150                 | 69.6                    | E            |                          |              | 350                                  |                                    |
|  |   | EBT      | 113                             | 114                             | 310                 | 39.1                    | D            | 47.7                     | D            | 350                                  | 34.9                               |
|  |   | EBR      | 85                              | 91                              | 310                 | 31.4                    | C            |                          |              | 354                                  |                                    |
|  |   | WBL      | 85                              | 87                              | 140                 | 55.6                    | E            |                          |              | 497                                  |                                    |
|  |   | WBT      | 230                             | 245                             | 575                 | 55.1                    | E            | 57.7                     | E            | 497                                  | 36.0                               |
|  |   | WBR      | 85                              | 88                              | 575                 | 67.2                    | E            |                          |              | 510                                  |                                    |
|  |   | NBL      | 40                              | 43                              | 100                 | 19.4                    | B            |                          |              | 369                                  |                                    |
|  |   | NBT      | 405                             | 405                             | 250                 | 20.5                    | C            | 18.7                     | B            | 369                                  | 34.9                               |
|  |   | NBR      | 65                              | 64                              | 200                 | 6.9                     | A            |                          |              | 374                                  |                                    |
|  |   | SBL      | 55                              | 56                              | 560                 | 25.4                    | C            |                          |              | 296                                  |                                    |
|  |   | SBT      | 229                             | 231                             | 560                 | 18.5                    | B            | 19.4                     | B            | 296                                  | 34.7                               |
|  |   | SBR      | 35                              | 34                              | 560                 | 15.9                    | B            |                          |              | 299                                  |                                    |
|  |   | Overall  |                                 | 1545                            | 2132                | ---                     | 35.2         | D                        | ---          | ---                                  | ---                                |



| Pen Place - VISSIM Delay & Queue Results |  |          |                                 |                                 |                     |                         |              |                          |              |                                      |                                    |
|--|--|----------|---------------------------------|---------------------------------|---------------------|-------------------------|--------------|--------------------------|--------------|--------------------------------------|------------------------------------|
| 2020 Existing PM Peak Conditions         |  |          |                                 |                                 |                     |                         |              |                          |              |                                      |                                    |
| Intersection #                           | Intersection Name                                | Movement | Input Volume (vph) <sup>1</sup> | Average Simulated Volumes (vph) | Storage Length (ft) | Average Delay (sec/veh) | Movement LOS | Approach Delay (sec/veh) | Approach LOS | Average of Maximum Queue Length (ft) | Average Pedestrian Delay (sec/ped) |
| 12                                       | 12th Street and Long Bridge Drive/S Clark Street | EBL      | 145                             | 144                             | 110                 | 34.9                    | C            | 19.5                     | B            | 191                                  | 34.3                               |
|  |  | EBT      | 163                             | 158                             | 110                 | 15.0                    | B            |                          |              | 191                                  |                                    |
|  |  | EBR      | 105                             | 108                             | 110                 | 5.4                     | A            |                          |              | 192                                  |                                    |
|  |  | WBL      | 25                              | 26                              | 100                 | 28.0                    | C            | 25.5                     | C            | 43                                   | 34.8                               |
|  |  | WBT      | 436                             | 450                             | 1,500               | 25.7                    | C            |                          |              | 509                                  |                                    |
|  |  | WBR      | 100                             | 100                             | 1,500               | 23.7                    | C            | 28.5                     | C            | 513                                  | 34.7                               |
|  |  | NBL      | 177                             | 199                             | 100                 | 35.8                    | D            |                          |              | 263                                  |                                    |
|  |  | NBT      | 65                              | 66                              | 1,200               | 16.2                    | B            |                          |              | 116                                  |                                    |
|  |  | NBR      | 30                              | 34                              | 1,200               | 9.4                     | A            | 14.2                     | B            | 118                                  | 35.7                               |
|  |  | SBL      | 55                              | 59                              | 425                 | 21.2                    | C            |                          |              | 177                                  |                                    |
|  |  | SBT      | 105                             | 112                             | 425                 | 17.1                    | B            | 11.1                     | B            | 177                                  | ---                                |
|  |  | SBR      | 222                             | 242                             | 160                 | 11.1                    | B            |                          |              | 169                                  |                                    |
|  |  | Overall  | 1628                            | 2169                            | ---                 | 24.6                    | C            | ---                      | ---          | ---                                  | ---                                |
| 16                                       | 15th Street S and S Fern Street                  | EBL      | 75                              | 69                              | 130                 | 23.2                    | C            | 14.6                     | B            | 121                                  | 35.2                               |
|  |  | EBT      | 255                             | 252                             | 970                 | 12.8                    | B            |                          |              | 121                                  |                                    |
|  |  | EBR      | 25                              | 25                              | 970                 | 9.4                     | A            |                          |              | 121                                  |                                    |
|  |  | WBL      | 130                             | 135                             | 140                 | 16.5                    | B            | 11.1                     | B            | 297                                  | 34.5                               |
|  |  | WBT      | 475                             | 476                             | 230                 | 9.9                     | A            |                          |              | 297                                  |                                    |
|  |  | WBR      | 145                             | 142                             | 230                 | 10.1                    | B            | 16.5                     | B            | 300                                  | 34.8                               |
|  |  | NBL      | 20                              | 20                              | 740                 | 25.7                    | C            |                          |              | 203                                  |                                    |
|  |  | NBT      | 132                             | 132                             | 740                 | 18.5                    | B            |                          |              | 203                                  |                                    |
|  |  | NBR      | 55                              | 58                              | 60                  | 8.9                     | A            | 16.5                     | B            | 209                                  | 34.6                               |
|  |  | SBL      | 125                             | 124                             | 100                 | 21.9                    | C            |                          |              | 365                                  |                                    |
|  |  | SBT      | 225                             | 226                             | 320                 | 15.3                    | B            | 11.7                     | B            | 365                                  | ---                                |
|  |  | SBR      | 75                              | 80                              | 320                 | 11.7                    | B            |                          |              | 379                                  |                                    |
|  |  | Overall  | 1737                            | 2027                            | ---                 | 16.8                    | B            | ---                      | ---          | ---                                  | ---                                |
| 18                                       | 15th Street S and S Eads Street                  | EBL      | 60                              | 61                              | 170                 | 46.5                    | D            | 22.4                     | C            | 162                                  | 35.2                               |
|  |  | EBT      | 305                             | 305                             | 350                 | 20.5                    | C            |                          |              | 244                                  |                                    |
|  |  | EBR      | 70                              | 68                              | 130                 | 9.1                     | A            |                          |              | 227                                  |                                    |
|  |  | WBL      | 341                             | 346                             | 280                 | 43.8                    | D            | 26.7                     | C            | 395                                  | 35.8                               |
|  |  | WBT      | 660                             | 664                             | 280                 | 20.8                    | C            |                          |              | 395                                  |                                    |
|  |  | WBR      | 270                             | 266                             | 280                 | 19.1                    | B            | 12.8                     | B            | 408                                  | 34.8                               |
|  |  | NBL      | 55                              | 57                              | 125                 | 21.6                    | C            |                          |              | 193                                  |                                    |
|  |  | NBT      | 255                             | 259                             | 760                 | 13.1                    | B            |                          |              | 193                                  |                                    |
|  |  | NBR      | 86                              | 80                              | 125                 | 5.7                     | A            | 18.9                     | B            | 62                                   | 34.4                               |
|  |  | SBL      | 99                              | 105                             | 100                 | 22.9                    | C            |                          |              | 212                                  |                                    |
|  |  | SBT      | 305                             | 309                             | 300                 | 17.7                    | B            | 17.8                     | B            | 278                                  | ---                                |
|  |  | SBR      | 40                              | 40                              | 300                 | 17.8                    | B            |                          |              | 282                                  |                                    |
|  |  | Overall  | 2546                            | 2912                            | ---                 | 24.0                    | C            | ---                      | ---          | ---                                  | ---                                |
| 19                                       | S Eads Street and I-395 HOT Lanes (South Node)   | NBL      | 234                             | 227                             | 150                 | 30.6                    | C            | 16.7                     | B            | 335                                  | ---                                |
|  |  | NBT      | 384                             | 379                             | 250                 | 16.4                    | B            |                          |              | 335                                  |                                    |
|  |  | NBR      | 761                             | 768                             | 250                 | 12.8                    | B            |                          |              | 393                                  |                                    |
|  |  | SBL      | 270                             | 266                             | 100                 | 14.1                    | B            | 9.6                      | A            | 160                                  | ---                                |
|  |  | SBT      | 281                             | 290                             | 100                 | 5.5                     | A            |                          |              | 157                                  |                                    |
|  |  | Overall  | 1930                            | 1930                            | ---                 | 14.7                    | B            | ---                      | ---          | ---                                  | ---                                |
| 20                                       | S Eads Street and I-395 HOT Lanes (North Node)   | WBL      | 159                             | 164                             | 1,000               | 24.1                    | C            | 24.9                     | C            | 270                                  | ---                                |
|  |  | WBR      | 106                             | 101                             | 400                 | 26.3                    | C            |                          |              | 339                                  |                                    |
|  |  | NBT      | 384                             | 380                             | 100                 | 8.6                     | A            | 4.2                      | A            | 179                                  | ---                                |
|  |  | SBT      | 392                             | 392                             | 100                 | 13.8                    | B            |                          |              | 217                                  |                                    |
|  |  | SBR      | 1057                            | 1055                            | 100                 | 0.7                     | A            |                          |              | 139                                  |                                    |
|  |  | Overall  | 2098                            | 2093                            | ---                 | 7.7                     | A            | ---                      | ---          | ---                                  | ---                                |

Source: VISSIM 11.0 Node Evaluation. Compiled by Gorove/Slade Associates based on the average of 10 VISSIM model runs.

## G. Background Development Trips



## TRIP GENERATION

This section outlines the transportation demand of the proposed Central District Retail Phase I and 1770 Crystal Drive development. It summarizes the projected trip generation of the site by land use and by mode, which forms the basis for the chapters that follow.

Traditionally, weekday peak hour trip generation is calculated based on the methodology outlined in the Institute of Transportation Engineers' (ITE) *Trip Generation*, 9<sup>th</sup> Edition. This methodology was supplemented to account for the urban nature of the site (*Trip Generation* provides data for non-urban, low transit uses) to generate trips for multiple modes. Additionally, the Crystal City Multimodal Transportation Study, published in February 2010, includes detailed mode split information for the area. Office trip generation was calculated based on ITE Land Use 710, retail trip generation was calculated based on ITE Land Use 826, Specialty Retail, theater trip generation was calculated based on ITE Land Use 443, Movie Theater, grocery trip generation was calculated based on ITE Land Use 850, Supermarket, and residential trip generation was calculated based on ITE Land Use 222, High-

Rise Apartment. The calculations shown below are consistent with the data provided in the Multimodal Study.

The existing office building at 1770 Crystal Drive is also planned to be converted from office to residential, as part of a separate project. Therefore, two development scenarios were considered:

- **Scenario A**  
With only the addition of new retail, grocery, theater, and office space as part of the Central District Retail Phase I project, and 1770 Crystal Drive remaining office.
- **Scenario B**  
With the addition of new retail, grocery, theater, and office as part of the Central District Retail Phase I project, and 1770 Crystal Drive converted to residential units.

Table 8 shows the vehicular trips expected to be generated by Scenario A and Table 9 shows the vehicular trips expected to be generated by Scenario B.

| Land Use                                     | ITE Code                                     | Size       | ----- Weekday ----- |           |           |              |            |            |            |          |              |
|--|--|------------|---------------------|-----------|-----------|--------------|------------|------------|------------|----------|--------------|
|  |  |            | AM Peak Hour        |           |           | PM Peak Hour |            |            | Daily      |          |              |
|  |  |            | In                  | Out       | Total     | In           | Out        | Total      |            |          |              |
| General Office                               | 710  | 5.208 ksf  | 16                  | 2         | 18        | 14           | 70         | 84         | 139        |          |              |
| <i>Multimodal Reduction (39% AM/50% PM)*</i> |  |            | -6                  | -1        | -7        | -7           | -35        | -42        | -62        |          |              |
| <i>Subtotal (Office vehicle trips)</i>       |  |            | 10                  | 1         | 11        | 7            | 35         | 42         | 77         |          |              |
| Movie Theater without Matinee**              | 443  | 940 seats  | 5                   | 4         | 9         | 108          | 193        | 301        | 1,654      |          |              |
| <i>Multimodal Reduction (Retail)*- 50%</i>   |  |            | -3                  | -2        | -5        | -54          | -97        | -151       | -827       |          |              |
| <i>Subtotal (Theater vehicle trips)</i>      |  |            | 2                   | 2         | 4         | 54           | 96         | 150        | 827        |          |              |
| Supermarket                                  | 850  | 17.500 ksf | 37                  | 23        | 60        | 94           | 120        | 214        | 2,563      |          |              |
| <i>Multimodal Reduction (Retail)*- 50%</i>   |  |            | -19                 | -11       | -30       | -47          | -60        | -107       | -1,282     |          |              |
| <i>Retail Pass-by Trips**- 25%</i>           |  |            | -5                  | -3        | -8        | -12          | -15        | -27        | -320       |          |              |
| <i>Subtotal (Grocery vehicle trips)</i>      |  |            | 13                  | 9         | 22        | 35           | 45         | 80         | 961        |          |              |
| Specialty Retail***                          | 826  | 10.304 ksf | 12                  | 11        | 23        | 20           | 26         | 46         | 478        |          |              |
| <i>Multimodal Reduction (Retail)*- 50%</i>   |  |            | -6                  | -6        | -12       | -10          | -13        | -23        | -239       |          |              |
| <i>Retail Pass-by Trips**- 25%</i>           |  |            | -2                  | -1        | -3        | -3           | -3         | -6         | -60        |          |              |
| <i>Subtotal (Retail vehicle trips)</i>       |  |            | 4                   | 4         | 8         | 7            | 10         | 17         | 179        |          |              |
| 1770 Crystal Drive (Office)                  | <i>Already assumed in Background Volumes</i> |            |                     |           |           |              |            |            |            |          |              |
| <i>Total Proposed Site External Trips</i>    |  |            | 29                  | 16        | 45        | 0            | 103        | 186        | 289        | 0        | 2044         |
| <i>Total Site External Trips</i>             |  |            | 29                  | 16        | 45        | 0            | 103        | 186        | 289        | 0        | 2044         |
| <i>Total Pass-by Trips</i>                   |  |            | 7                   | 4         | 11        | 0            | 15         | 18         | 33         | 0        | 380          |
| <b><i>Total New Site Trips</i></b>           |  |            | <b>36</b>           | <b>20</b> | <b>56</b> | <b>0</b>     | <b>118</b> | <b>204</b> | <b>322</b> | <b>0</b> | <b>2,424</b> |

\*Table 3.6 & 3.7 from Crystal City Multimodal Transportation Study.

Daily trip transit reduction assumed to be an average of AM and PM transit splits for office (44.5%)

\*\*Trip generation for PM Peak Hour calculated using Weekday PM Peak Hour of Generator

\*\*\*For AM Peak Hour, Specialty Retail is 50% of PM Peak Hour Total



**1770 Crystal Drive - Office**

Approximately 272,000 sf office

Step 1: Base trip generation using ITEs' **person Trip Generation** (10th Edition)

| Land Use             | Land Use Code | Quantity (x) | AM Peak Hour |           |                     | PM Peak Hour |            |                     | Daily                      |
|----------------------|---------------|--------------|--------------|-----------|---------------------|--------------|------------|---------------------|----------------------------|
|                      |               |              | In           | Out       | Total               | In           | Out        | Total               | Total                      |
| Office               | 710           | 272,000 sf   | 293 ppl/hr   | 44 ppl/hr | 337 ppl/hr          | 55 ppl/hr    | 286 ppl/hr | 341 ppl/hr          | 4564 ppl                   |
| Calculation Details: |               |              | 87%          | 13%       | =1.01(X/1000)+62.71 | 16%          | 84%        | =0.92(X/1000)+90.81 | $h(T)=0.67Ln(X/1000)+4.67$ |

Note: Setting used for trip generation is Center City Core

Step 2: Split between modes, per assumed Mode Splits

| Land Use | Mode    | Split | AM Peak Hour |           |            | PM Peak Hour |            |            | Daily    |
|----------|---------|-------|--------------|-----------|------------|--------------|------------|------------|----------|
|          |         |       | In           | Out       | Total      | In           | Out        | Total      | Total    |
| Office   | Auto    | 30%   | 88 ppl/hr    | 13 ppl/hr | 101 ppl/hr | 17 ppl/hr    | 85 ppl/hr  | 102 ppl/hr | 1369 ppl |
| Office   | Transit | 54%   | 158 ppl/hr   | 24 ppl/hr | 182 ppl/hr | 30 ppl/hr    | 154 ppl/hr | 184 ppl/hr | 2465 ppl |
| Office   | Bike    | 6%    | 18 ppl/hr    | 2 ppl/hr  | 20 ppl/hr  | 3 ppl/hr     | 17 ppl/hr  | 20 ppl/hr  | 274 ppl  |
| Office   | Walk    | 10%   | 29 ppl/hr    | 5 ppl/hr  | 34 ppl/hr  | 6 ppl/hr     | 28 ppl/hr  | 34 ppl/hr  | 456 ppl  |

Step 3: Convert person auto trips to vehicles/hour

| Land Use | People/Car<br>(from 2017 NHTS, Table 16) | AM Peak Hour |           |           | PM Peak Hour |           |           | Daily    |
|----------|--|--------------|-----------|-----------|--------------|-----------|-----------|----------|
|          |  | In           | Out       | Total     | In           | Out       | Total     | Total    |
| Office   | 1.18 ppl/veh                             | 75 veh/hr    | 11 veh/hr | 86 veh/hr | 14 veh/hr    | 72 veh/hr | 86 veh/hr | 1160 veh |

**Office Trip Gen for Met Park 6, 7, 8**

| Mode    | AM Peak Hour |           |            | PM Peak Hour |            |            | Daily    |
|---------|--------------|-----------|------------|--------------|------------|------------|----------|
|         | In           | Out       | Total      | In           | Out        | Total      | Total    |
| Auto    | 75 veh/hr    | 11 veh/hr | 86 veh/hr  | 14 veh/hr    | 72 veh/hr  | 86 veh/hr  | 1160 veh |
| Transit | 158 ppl/hr   | 24 ppl/hr | 182 ppl/hr | 30 ppl/hr    | 154 ppl/hr | 184 ppl/hr | 2465 ppl |
| Bike    | 18 ppl/hr    | 2 ppl/hr  | 20 ppl/hr  | 3 ppl/hr     | 17 ppl/hr  | 20 ppl/hr  | 274 ppl  |
| Walk    | 29 ppl/hr    | 5 ppl/hr  | 34 ppl/hr  | 6 ppl/hr     | 28 ppl/hr  | 34 ppl/hr  | 456 ppl  |

**241 18th Street S Office**

Approximately 330,700 sf office

Step 1: Base trip generation using ITEs' **person Trip Generation** (10th Edition)

| Land Use             | Land Use Code | Quantity (x) | AM Peak Hour |           |                     | PM Peak Hour |            |                     | Daily                      |
|----------------------|---------------|--------------|--------------|-----------|---------------------|--------------|------------|---------------------|----------------------------|
|                      |               |              | In           | Out       | Total               | In           | Out        | Total               | Total                      |
| Office               | 710           | 125,666 sf   | 165 ppl/hr   | 25 ppl/hr | 190 ppl/hr          | 33 ppl/hr    | 173 ppl/hr | 206 ppl/hr          | 2720 ppl                   |
| Calculation Details: |               |              | 87%          | 13%       | =1.01(X/1000)+62.71 | 16%          | 84%        | =0.92(X/1000)+90.81 | $h(T)=0.67Ln(X/1000)+4.67$ |

Note: Setting used for trip generation is Center City Core

Step 2: Split between modes, per assumed Mode Splits

| Land Use | Mode    | Split | AM Peak Hour |           |            | PM Peak Hour |           |            | Daily    |
|----------|---------|-------|--------------|-----------|------------|--------------|-----------|------------|----------|
|          |         |       | In           | Out       | Total      | In           | Out       | Total      | Total    |
| Office   | Auto    | 30%   | 50 ppl/hr    | 7 ppl/hr  | 57 ppl/hr  | 10 ppl/hr    | 52 ppl/hr | 62 ppl/hr  | 816 ppl  |
| Office   | Transit | 54%   | 89 ppl/hr    | 14 ppl/hr | 103 ppl/hr | 18 ppl/hr    | 93 ppl/hr | 111 ppl/hr | 1469 ppl |
| Office   | Bike    | 6%    | 10 ppl/hr    | 1 ppl/hr  | 11 ppl/hr  | 2 ppl/hr     | 10 ppl/hr | 12 ppl/hr  | 163 ppl  |
| Office   | Walk    | 10%   | 17 ppl/hr    | 2 ppl/hr  | 19 ppl/hr  | 3 ppl/hr     | 18 ppl/hr | 21 ppl/hr  | 272 ppl  |

Step 3: Convert person auto trips to vehicles/hour

| Land Use | People/Car<br>(from 2017 NHTS, Table 16) | AM Peak Hour |          |           | PM Peak Hour |           |           | Daily   |
|----------|--|--------------|----------|-----------|--------------|-----------|-----------|---------|
|          |  | In           | Out      | Total     | In           | Out       | Total     | Total   |
| Office   | 1.18 ppl/veh                             | 42 veh/hr    | 6 veh/hr | 48 veh/hr | 8 veh/hr     | 45 veh/hr | 53 veh/hr | 692 veh |

**Office Trip Gen for Met Park 6, 7, 8**

| Mode    | AM Peak Hour |           |            | PM Peak Hour |           |            | Daily    |
|---------|--------------|-----------|------------|--------------|-----------|------------|----------|
|         | In           | Out       | Total      | In           | Out       | Total      | Total    |
| Auto    | 42 veh/hr    | 6 veh/hr  | 48 veh/hr  | 8 veh/hr     | 45 veh/hr | 53 veh/hr  | 692 veh  |
| Transit | 89 ppl/hr    | 14 ppl/hr | 103 ppl/hr | 18 ppl/hr    | 93 ppl/hr | 111 ppl/hr | 1469 ppl |
| Bike    | 10 ppl/hr    | 1 ppl/hr  | 11 ppl/hr  | 2 ppl/hr     | 10 ppl/hr | 12 ppl/hr  | 163 ppl  |
| Walk    | 17 ppl/hr    | 2 ppl/hr  | 19 ppl/hr  | 3 ppl/hr     | 18 ppl/hr | 21 ppl/hr  | 272 ppl  |

## Site Generated Traffic

The Institute of Transportation Engineers (ITE) Trip Generation, 9<sup>th</sup> Edition, was used to determine the future trips generated by the proposed development. Additionally, the Crystal City Multimodal Study includes detailed trip generation and mode split information for the area. The calculations shown below are consistent with the data provided in the Multimodal Study.

The Multimodal Study also includes mode split projections for both 2007 (existing) and 2030. Since the build-out for the proposed site is expected to occur in 2019, the existing mode split percentages were assumed. In order to account for the close proximity of the site to transit, and to be consistent with the Multimodal Study, a non-auto reduction of 65% was assumed. These assumptions were vetted with Arlington County during the scoping process. **Table 5** shows the mode split for Crystal City. **Table 6** shows the trips generated by the site.

**Table 5: Mode Split Summary**

| Mode                                 | Use        |
|--------------------------------------|------------|
| <b>Auto (Total)</b>                  | <b>35%</b> |
| Drove Alone                          | 31%        |
| Carpool                              | 4%         |
| <b>Public Transportation (Total)</b> | <b>42%</b> |
| Bus                                  | 1%         |
| Subway                               | 40%        |
| Taxi                                 | 1%         |
| <b>Walk</b>                          | <b>19%</b> |
| <b>Other Mode</b>                    | <b>1%</b>  |
| <b>Worked at Home</b>                | <b>4%</b>  |

Source: US Census 2000, Journey to Work Summary, Crystal City residents journey to work, Table 3.6

**Table 6: Site Trip Generation**

| Land Use                            | ITE Code | Size   | ----- Week day ----- |           |           |              |           |           |            |
|-------------------------------------|----------|--------|----------------------|-----------|-----------|--------------|-----------|-----------|------------|
|                                     |          |        | AM Peak Hour         |           |           | PM Peak Hour |           |           | Daily      |
|                                     |          |        | In                   | Out       | Total     | In           | Out       | Total     | Total      |
| <b>Proposed Use</b>                 |          |        |                      |           |           |              |           |           |            |
| Apartment Bldg 1                    | 220      | 300 DU | 30                   | 121       | 151       | 119          | 64        | 183       | 1,942      |
| TDM/Transit Reduction (Residential) | 65%      |        | -20                  | -78       | -98       | -77          | -42       | -119      | -1,262     |
| <b>Total Site Trips</b>             |          |        | <b>10</b>            | <b>43</b> | <b>53</b> | <b>42</b>    | <b>22</b> | <b>64</b> | <b>680</b> |

The proposed residential development will generate approximately 53 trips in the AM peak hour and 64 trips in the PM peak hour.

## Site Trip Distribution

The Crystal City Multimodal Study also provides detailed traffic distribution data based on the Metropolitan Washington Council of Governments (MWCOG) Regional Travel Demand Model. Table 3.9 of the Multimodal Study shows the traffic distribution for 2007 and 2030 for both the AM and PM peak hours. Since the anticipated build-out of the Century Center site is anticipated to be complete in 2019, the 2007 data was used to determine a traffic distribution specific to the site. The peak



Table 3-4  
Crystal Houses  
Site Trip Generation Analysis <sup>1</sup>

| Land Use                             | Land Use Code                               | Size | Units | AM Peak Hour |              |              | PM Peak Hour |             |              | Daily Traffic <sup>2</sup> |
|--------------------------------------|---|------|-------|--------------|--------------|--------------|--------------|-------------|--------------|----------------------------|
|                                      |   |      |       | In           | Out          | Total        | In           | Out         | Total        |                            |
| Mid-Rise Apartment                   | 223/220                                     | 654  | DU    | 79           | 176          | 255          | 176          | 127         | 303          | 4,087                      |
|                                      | <i>60% Non-Auto Mode Split <sup>3</sup></i> |      |       | <u>(47)</u>  | <u>(106)</u> | <u>(153)</u> | <u>(106)</u> | <u>(76)</u> | <u>(182)</u> | <u>(2,452)</u>             |
|                                      |   |      |       | 32           | 70           | 102          | 70           | 51          | 121          | 1,635                      |
| Condominiums                         | 230   | 144  | DU    | 12           | 57           | 69           | 54           | 27          | 81           | 883                        |
|                                      | <i>60% Non-Auto Mode Split <sup>3</sup></i> |      |       | <u>(7)</u>   | <u>(34)</u>  | <u>(41)</u>  | <u>(32)</u>  | <u>(17)</u> | <u>(49)</u>  | <u>(530)</u>               |
|                                      |   |      |       | 5            | 23           | 28           | 22           | 10          | 32           | 353                        |
| <b>Total with non-auto reduction</b> |   |      |       | <b>37</b>    | <b>93</b>    | <b>130</b>   | <b>92</b>    | <b>61</b>   | <b>153</b>   | <b>1,988</b>               |

Notes:

1. Trip generation estimates calculated using ITE's Trip Generation Manual, 9th Edition.
2. Land use code 220 was used to calculate Average Daily Traffic.
3. Non-Auto mode split percentages based distance to metro and availability of other non-auto facilities in the immediate site area.

Table 3-5  
Crystal Houses  
Multi-modal Site Trip Generation Analysis 1,2

| Mode                    | Percent Trip | AM Peak Hour |            |            | PM Peak Hour |            |            | Daily Traffic |
|-------------------------|--------------|--------------|------------|------------|--------------|------------|------------|---------------|
|                         |              | In           | Out        | Total      | In           | Out        | Total      |               |
| Auto                    | 40%          | 37           | 93         | 130        | 92           | 61         | 153        | 1,988         |
| Transit                 | 45%          | 43           | 107        | 150        | 106          | 72         | 178        | 2,238         |
| Walk                    | 7%           | 5            | 15         | 20         | 15           | 10         | 25         | 347           |
| Bike/Other              | 8%           | 6            | 18         | 24         | 17           | 11         | 28         | 397           |
| <b>Total Site Trips</b> |              | <b>91</b>    | <b>233</b> | <b>324</b> | <b>230</b>   | <b>154</b> | <b>384</b> | <b>4,970</b>  |

Notes:

1. Trip generation estimates calculated using ITE's Trip Generation Manual, 9th Edition.
2. Based on 2011-2015 American Community Survey 5-Year Estimate Data from the U.S. Census Bureau.

## FUTURE CONDITIONS WITH DEVELOPMENT (2017)

The proposed development would replace the existing office building at 400 Army Navy Drive with a 452-unit multifamily residential building with garage parking.

### Site Access

The site is located at the southeast corner of Army Navy Drive and S Eads Street, east of an existing parking lot that may become a maintenance facility for the proposed streetcar. Vehicular access to the parking garage is provided via an alley connecting Army Navy Drive and 11<sup>th</sup> Street S. The site location is shown in Figure 1.

The proposed site plan for the redevelopment is shown in Figure 4.

### Site Generated Traffic

The Institute of Transportation Engineers (ITE) Trip Generation, 9<sup>th</sup> Edition, was used to determine the future trips generated by the proposed development.

The site is located on bus corridors on S Eads Street and Army Navy Drive, and there are two Metro stations within a half mile of the site. It is expected that a significant portion of the residents will travel by Metrorail, bus, cab or on foot/by bicycle during the peak hours, rather than by personal vehicle. Based on data from Table S-3 of the *WMATA Development-Related Ridership Survey* (WMATA, 2005), residential sites inside the Beltway (but not within a Central Business District) have an average non-auto mode share of 63% as shown in Table 4. Therefore, a 60% reduction rate was applied to the peak hour vehicular trip generation to reflect the non-auto modes for the proposed development.

Table 5 shows the vehicular trips expected to be generated by the proposed project.

**Table 4: Non-Auto Mode Share for Non-CBD Sites Inside the Beltway**

| Travel Mode                      | Mode Share |
|----------------------------------|------------|
| Metrorail                        | 43%        |
| Metrobus & Other Transit         | 6%         |
| Walking/Biking/Other             | 14%        |
| <b>Total Non-Auto Mode Share</b> | <b>63%</b> |

Source: WMATA Development-Related Ridership Survey (WMATA 2005)

**Table 5: Trip Generation (Adjacent Street Peak Hour)**

| Development  | ITE Code | Quantity             | AM Peak Hour |           |            | PM Peak Hour |            |            | Weekday      |
|--|----------|----------------------|--------------|-----------|------------|--------------|------------|------------|--------------|
|  |          |                      | In           | Out       | Total      | In           | Out        | Total      | Total        |
| <b>Previous On-Site Office Development</b>               |          |                      |              |           |            |              |            |            |              |
| Office   | 710      | 235,000 sf           | 334          | 45        | 379        | 58           | 284        | 342        | 2,513        |
| <i>Transit/TDM Reduction</i>                             | 56%      |                      | -187         | -25       | -212       | -32          | -159       | -192       | -1,407       |
| <b>Total Trips Generated by Previous Office Building</b> |          |                      | <b>147</b>   | <b>20</b> | <b>167</b> | <b>26</b>    | <b>125</b> | <b>150</b> | <b>1,106</b> |
| <b>Proposed Development</b>                              |          |                      |              |           |            |              |            |            |              |
| Multifamily Residential                                  | 220      | 452 du               | 45           | 180       | 225        | 173          | 93         | 266        | 2,863        |
| <i>Transit/TDM Reduction</i>                             | 60%      |                      | -27          | -108      | -135       | -104         | -56        | -160       | -1,718       |
| <b>Total New Trips</b>                                   |          |                      | <b>18</b>    | <b>72</b> | <b>90</b>  | <b>69</b>    | <b>37</b>  | <b>106</b> | <b>1,145</b> |
|  |          | <b>Net New Trips</b> | <b>-129</b>  | <b>52</b> | <b>-77</b> | <b>44</b>    | <b>-88</b> | <b>-44</b> | <b>39</b>    |

**1800 S Bell**

Approximately 221,000 sf office

Step 1: Base trip generation using ITEs' **person Trip Generation** (10th Edition)

| Land Use             | Land Use Code | Quantity (x) | AM Peak Hour |           |                     | PM Peak Hour |            |                     | Daily                      |
|----------------------|---------------|--------------|--------------|-----------|---------------------|--------------|------------|---------------------|----------------------------|
|                      |               |              | In           | Out       | Total               | In           | Out        | Total               | Total                      |
| Office               | 710           | 176,800 sf   | 210 ppl/hr   | 31 ppl/hr | 241 ppl/hr          | 40 ppl/hr    | 213 ppl/hr | 253 ppl/hr          | 3420 ppl                   |
| Calculation Details: |               |              | 87%          | 13%       | =1.01(X/1000)+62.71 | 16%          | 84%        | =0.92(X/1000)+90.81 | $h(T)=0.67Ln(X/1000)+4.67$ |

Note: Setting used for trip generation is Center City Core

Step 2: Split between modes, per assumed Mode Splits

| Land Use | Mode    | Split | AM Peak Hour |           |            | PM Peak Hour |            |            | Daily    |
|----------|---------|-------|--------------|-----------|------------|--------------|------------|------------|----------|
|          |         |       | In           | Out       | Total      | In           | Out        | Total      | Total    |
| Office   | Auto    | 30%   | 63 ppl/hr    | 9 ppl/hr  | 72 ppl/hr  | 12 ppl/hr    | 64 ppl/hr  | 76 ppl/hr  | 1026 ppl |
| Office   | Transit | 54%   | 113 ppl/hr   | 17 ppl/hr | 130 ppl/hr | 22 ppl/hr    | 115 ppl/hr | 137 ppl/hr | 1847 ppl |
| Office   | Bike    | 6%    | 13 ppl/hr    | 1 ppl/hr  | 14 ppl/hr  | 2 ppl/hr     | 13 ppl/hr  | 15 ppl/hr  | 205 ppl  |
| Office   | Walk    | 10%   | 21 ppl/hr    | 3 ppl/hr  | 24 ppl/hr  | 4 ppl/hr     | 21 ppl/hr  | 25 ppl/hr  | 342 ppl  |

Step 3: Convert person auto trips to vehicles/hour

| Land Use | People/Car<br>(from 2017 NHTS, Table 16) | AM Peak Hour |          |           | PM Peak Hour |           |           | Daily   |
|----------|--|--------------|----------|-----------|--------------|-----------|-----------|---------|
|          |  | In           | Out      | Total     | In           | Out       | Total     | Total   |
| Office   | 1.18 ppl/veh                             | 53 veh/hr    | 8 veh/hr | 61 veh/hr | 10 veh/hr    | 54 veh/hr | 64 veh/hr | 869 veh |

**Office Trip Gen for Met Park 6, 7, 8**

| Mode    | AM Peak Hour |           |            | PM Peak Hour |            |            | Daily    |
|---------|--------------|-----------|------------|--------------|------------|------------|----------|
|         | In           | Out       | Total      | In           | Out        | Total      | Total    |
| Auto    | 53 veh/hr    | 8 veh/hr  | 61 veh/hr  | 10 veh/hr    | 54 veh/hr  | 64 veh/hr  | 869 veh  |
| Transit | 113 ppl/hr   | 17 ppl/hr | 130 ppl/hr | 22 ppl/hr    | 115 ppl/hr | 137 ppl/hr | 1847 ppl |
| Bike    | 13 ppl/hr    | 1 ppl/hr  | 14 ppl/hr  | 2 ppl/hr     | 13 ppl/hr  | 15 ppl/hr  | 205 ppl  |
| Walk    | 21 ppl/hr    | 3 ppl/hr  | 24 ppl/hr  | 4 ppl/hr     | 21 ppl/hr  | 25 ppl/hr  | 342 ppl  |





## TRIP GENERATION

This chapter outlines the transportation demand of the proposed Verizon Site development. It summarizes the projected trip generation of the site by land use and by mode, which forms the basis for the chapters that follow.

The Site has multiple bus stops surrounding it and two Metro stations near the site. It is expected that a significant portion of the residents will travel by Metrorail, bus, bicycle or on foot during the peak hours, rather than by personal vehicle. The proposed mode splits were vetted and approved by Arlington County during the scoping process. Table 7 shows the mode split for the development. The multi-modal trip generation for the development is shown in Table 8.

Traditionally, 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. This methodology was supplemented to account for the urban nature of the site (Trip Generation provides data for non-urban,

low transit uses) to generate trips for multiple modes.

Residential trip generation was calculated based on ITE Land Use 222, Multifamily Housing (High-Rise), using the setting/location of Center City Core. The residential trip generation is based on the development program of 306 dwelling units. Retail trip generation was calculated based on ITE Land Use 820, Shopping Center, using the setting/location of General Urban/Suburban (limited data is available for person trips). The retail trip generation is based on the development program of 10,908 square feet of ground floor retail.

The proposed mixed-use development will generate approximately 42 trips in the AM peak hour and 40 trips in the PM peak hour.

**Table 7: Mode Split by Land Use**

| Land Use            | Mode |         |      |      |
|---------------------|------|---------|------|------|
|                     | Auto | Transit | Bike | Walk |
| Residential         | 25%  | 55%     | 6%   | 14%  |
| Neighborhood Retail | 5%   | 15%     | 5%   | 75%  |

**Table 8: Multi-Modal Trip Generation**

| Mode    | Land Use     | Development Size | AM Peak Hour     |                  |                   | PM Peak Hour     |                  |                   |
|---------|--------------|------------------|------------------|------------------|-------------------|------------------|------------------|-------------------|
|         |              |                  | In               | Out              | Total             | In               | Out              | Total             |
| Auto    | Residential  | 306 du           | 11 veh/hr        | 30 veh/hr        | 41 veh/hr         | 22 veh/hr        | 16 veh/hr        | 38 veh/hr         |
|         | Retail       | 10,908 sf        | 1 veh/hr         | 0 veh/hr         | 1 veh/hr          | 1 veh/hr         | 1 veh/hr         | 2 veh/hr          |
|         | <b>Total</b> |                  | <b>12 veh/hr</b> | <b>30 veh/hr</b> | <b>42 veh/hr</b>  | <b>23 veh/hr</b> | <b>17 veh/hr</b> | <b>40 veh/hr</b>  |
| Transit | Residential  | 306 du           | 28 ppl/hr        | 78 ppl/hr        | 106 ppl/hr        | 56 ppl/hr        | 42 ppl/hr        | 98 ppl/hr         |
|         | Retail       | 10,908 sf        | 2 ppl/hr         | 1 ppl/hr         | 3 ppl/hr          | 5 ppl/hr         | 6 ppl/hr         | 11 ppl/hr         |
|         | <b>Total</b> |                  | <b>30 ppl/hr</b> | <b>79 ppl/hr</b> | <b>109 ppl/hr</b> | <b>61 ppl/hr</b> | <b>48 ppl/hr</b> | <b>109 ppl/hr</b> |
| Bike    | Residential  | 306 du           | 3 ppl/hr         | 9 ppl/hr         | 12 ppl/hr         | 6 ppl/hr         | 5 ppl/hr         | 11 ppl/hr         |
|         | Retail       | 10,908 sf        | 1 ppl/hr         | 0 ppl/hr         | 1 ppl/hr          | 2 ppl/hr         | 2 ppl/hr         | 4 ppl/hr          |
|         | <b>Total</b> |                  | <b>4 ppl/hr</b>  | <b>9 ppl/hr</b>  | <b>13 ppl/hr</b>  | <b>8 ppl/hr</b>  | <b>7 ppl/hr</b>  | <b>15 ppl/hr</b>  |
| Walk    | Residential  | 306 du           | 7 ppl/hr         | 20 ppl/hr        | 27 ppl/hr         | 14 ppl/hr        | 11 ppl/hr        | 25 ppl/hr         |
|         | Retail       | 10,908 sf        | 8 ppl/hr         | 6 ppl/hr         | 14 ppl/hr         | 27 ppl/hr        | 30 ppl/hr        | 57 ppl/hr         |
|         | <b>Total</b> |                  | <b>15 ppl/hr</b> | <b>26 ppl/hr</b> | <b>41 ppl/hr</b>  | <b>41 ppl/hr</b> | <b>41 ppl/hr</b> | <b>82 ppl/hr</b>  |



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.

A summary of the multi-modal trip generation for the overall development for the 2021, 2027, and 2040 analysis years is shown in Table 10 for the weekday morning and weekday afternoon peak hours. Detailed trip generation calculations are included in the Technical Appendix.

**Table 10: Multi-Modal Trip Generation (2021, 2027, 2040 Analysis Years)**

| Mode    | Land Use     | Development Size | AM Peak Hour       |                   |                    | PM Peak Hour      |                   |                    |
|---------|--------------|------------------|--------------------|-------------------|--------------------|-------------------|-------------------|--------------------|
|         |              |                  | In                 | Out               | Total              | In                | Out               | Total              |
| Auto    | Office       | 2.1 mil sf       | 483 veh/hr         | 72 veh/hr         | 555 veh/hr         | 82 veh/hr         | 432 veh/hr        | 514 veh/hr         |
|         | Retail       | 55,000 sf        | 2 veh/hr           | 1 veh/hr          | 3 veh/hr           | 5 veh/hr          | 5 veh/hr          | 10 veh/hr          |
|         | <b>Total</b> |                  | <b>485 veh/hr</b>  | <b>73 veh/hr</b>  | <b>558 veh/hr</b>  | <b>87 veh/hr</b>  | <b>437 veh/hr</b> | <b>524 veh/hr</b>  |
| Transit | Office       | 2.1 mil sf       | 1026 ppl/hr        | 153 ppl/hr        | 1179 ppl/hr        | 175 ppl/hr        | 917 ppl/hr        | 1092 ppl/hr        |
|         | Retail       | 55,000 sf        | 9 ppl/hr           | 5 ppl/hr          | 14 ppl/hr          | 28 ppl/hr         | 29 ppl/hr         | 57 ppl/hr          |
|         | <b>Total</b> |                  | <b>1035 ppl/hr</b> | <b>158 ppl/hr</b> | <b>1193 ppl/hr</b> | <b>203 ppl/hr</b> | <b>946 ppl/hr</b> | <b>1149 ppl/hr</b> |
| Bike    | Office       | 2.1 mil sf       | 114 ppl/hr         | 17 ppl/hr         | 131 ppl/hr         | 19 ppl/hr         | 102 ppl/hr        | 121 ppl/hr         |
|         | Retail       | 55,000 sf        | 3 ppl/hr           | 2 ppl/hr          | 5 ppl/hr           | 9 ppl/hr          | 10 ppl/hr         | 19 ppl/hr          |
|         | <b>Total</b> |                  | <b>117 ppl/hr</b>  | <b>19 ppl/hr</b>  | <b>136 ppl/hr</b>  | <b>28 ppl/hr</b>  | <b>112 ppl/hr</b> | <b>140 ppl/hr</b>  |
| Walk    | Office       | 2.1 mil sf       | 190 ppl/hr         | 28 ppl/hr         | 218 ppl/hr         | 32 ppl/hr         | 170 ppl/hr        | 202 ppl/hr         |
|         | Retail       | 55,000 sf        | 44 ppl/hr          | 27 ppl/hr         | 71 ppl/hr          | 138 ppl/hr        | 149 ppl/hr        | 287 ppl/hr         |
|         | <b>Total</b> |                  | <b>234 ppl/hr</b>  | <b>55 ppl/hr</b>  | <b>289 ppl/hr</b>  | <b>170 ppl/hr</b> | <b>319 ppl/hr</b> | <b>489 ppl/hr</b>  |



## TRAVEL DEMAND ASSUMPTIONS

This chapter outlines the transportation demand of the proposed 1900 Crystal Drive development. It summarizes the projected trip generation of the site by land use and by mode, which forms the basis for the chapters that follow.

### MODE SPLIT

The site has multiple bus and BRT stops surrounding it and is adjacent to a Metrorail station. It is expected that a significant portion of the residents will travel by Metrorail, bus, bicycle, rideshare or on foot during the peak hours, rather than by personal vehicle. The proposed mode splits were vetted and approved by Arlington County during the scoping process. Table 7 shows the mode split for the development. Table 8 shows the proposed multi-modal trip generation for the proposed land uses.

### PROJECTED FUTURE TRIP GENERATION

Traditionally, 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. This methodology was supplemented to account for the urban nature of the site (*Trip Generation* provides data for non-urban, low transit uses) to generate trips for multiple modes.

Residential trip generation calculations for the proposed development were based on ITE’s *Trip Generation* (10<sup>th</sup> Edition) baseline person trips for Multifamily Housing (High-Rise) (LU 222) using the setting/location of Center City Core. The residential trip generation is based on the development program of 790 residential units. Retail trip generation calculations for the proposed development were based on ITE’s *Trip Generation* (10<sup>th</sup> Edition) baseline vehicular trips for Shopping Center (LU 820) using the setting/location of General Urban/Suburban (limited data is available for person trips). The retail trip generation is based on the development program of 40,598 square feet of ground floor retail.

The proposed mixed-use development will generate approximately 109 vehicular trips in the AM peak hour and 137 vehicular trips in the PM peak hour.

**Table 7: Proposed Mode Split**

| Land Use    | Mode  |         |      |      |
|-------------|-------|---------|------|------|
|             | Drive | Transit | Bike | Walk |
| Residential | 25%   | 55%     | 6%   | 14%  |
| Retail      | 20%   | 40%     | 5%   | 35%  |

**Table 8: Proposed Multi-Modal Trip Generation**

| Mode    | Land Use     | Development Size | AM Peak Hour     |                   |                   | PM Peak Hour      |                   |                   |
|---------|--------------|------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
|         |              |                  | In               | Out               | Total             | In                | Out               | Total             |
| Auto    | Residential  | 790 Units        | 26 veh/hr        | 75 veh/hr         | 101 veh/hr        | 60 veh/hr         | 46 veh/hr         | 106 veh/hr        |
|         | Retail       | 40,598 sf        | 5 veh/hr         | 3 veh/hr          | 8 veh/hr          | 15 veh/hr         | 16 veh/hr         | 31 veh/hr         |
|         | <b>Total</b> |                  | <b>31 veh/hr</b> | <b>78 veh/hr</b>  | <b>109 veh/hr</b> | <b>75 veh/hr</b>  | <b>62 veh/hr</b>  | <b>137 veh/hr</b> |
| Transit | Residential  | 790 Units        | 68 ppl/hr        | 193 ppl/hr        | 261 ppl/hr        | 156 ppl/hr        | 118 ppl/hr        | 274 ppl/hr        |
|         | Retail       | 40,598 sf        | 18 ppl/hr        | 10 ppl/hr         | 28 ppl/hr         | 54 ppl/hr         | 59 ppl/hr         | 113 ppl/hr        |
|         | <b>Total</b> |                  | <b>86 ppl/hr</b> | <b>203 ppl/hr</b> | <b>289 ppl/hr</b> | <b>210 ppl/hr</b> | <b>177 ppl/hr</b> | <b>387 ppl/hr</b> |
| Bike    | Residential  | 790 Units        | 7 ppl/hr         | 21 ppl/hr         | 28 ppl/hr         | 17 ppl/hr         | 13 ppl/hr         | 30 ppl/hr         |
|         | Retail       | 40,598 sf        | 2 ppl/hr         | 1 ppl/hr          | 3 ppl/hr          | 7 ppl/hr          | 7 ppl/hr          | 14 ppl/hr         |
|         | <b>Total</b> |                  | <b>9 ppl/hr</b>  | <b>22 ppl/hr</b>  | <b>31 ppl/hr</b>  | <b>24 ppl/hr</b>  | <b>20 ppl/hr</b>  | <b>44 ppl/hr</b>  |
| Walk    | Residential  | 790 Units        | 17 ppl/hr        | 49 ppl/hr         | 66 ppl/hr         | 40 ppl/hr         | 30 ppl/hr         | 70 ppl/hr         |
|         | Retail       | 40,598 sf        | 15 ppl/hr        | 9 ppl/hr          | 24 ppl/hr         | 47 ppl/hr         | 52 ppl/hr         | 99 ppl/hr         |
|         | <b>Total</b> |                  | <b>32 ppl/hr</b> | <b>58 ppl/hr</b>  | <b>90 ppl/hr</b>  | <b>87 ppl/hr</b>  | <b>82 ppl/hr</b>  | <b>169 ppl/hr</b> |



## H. 2025 Re-Routed Peak Hour Volumes

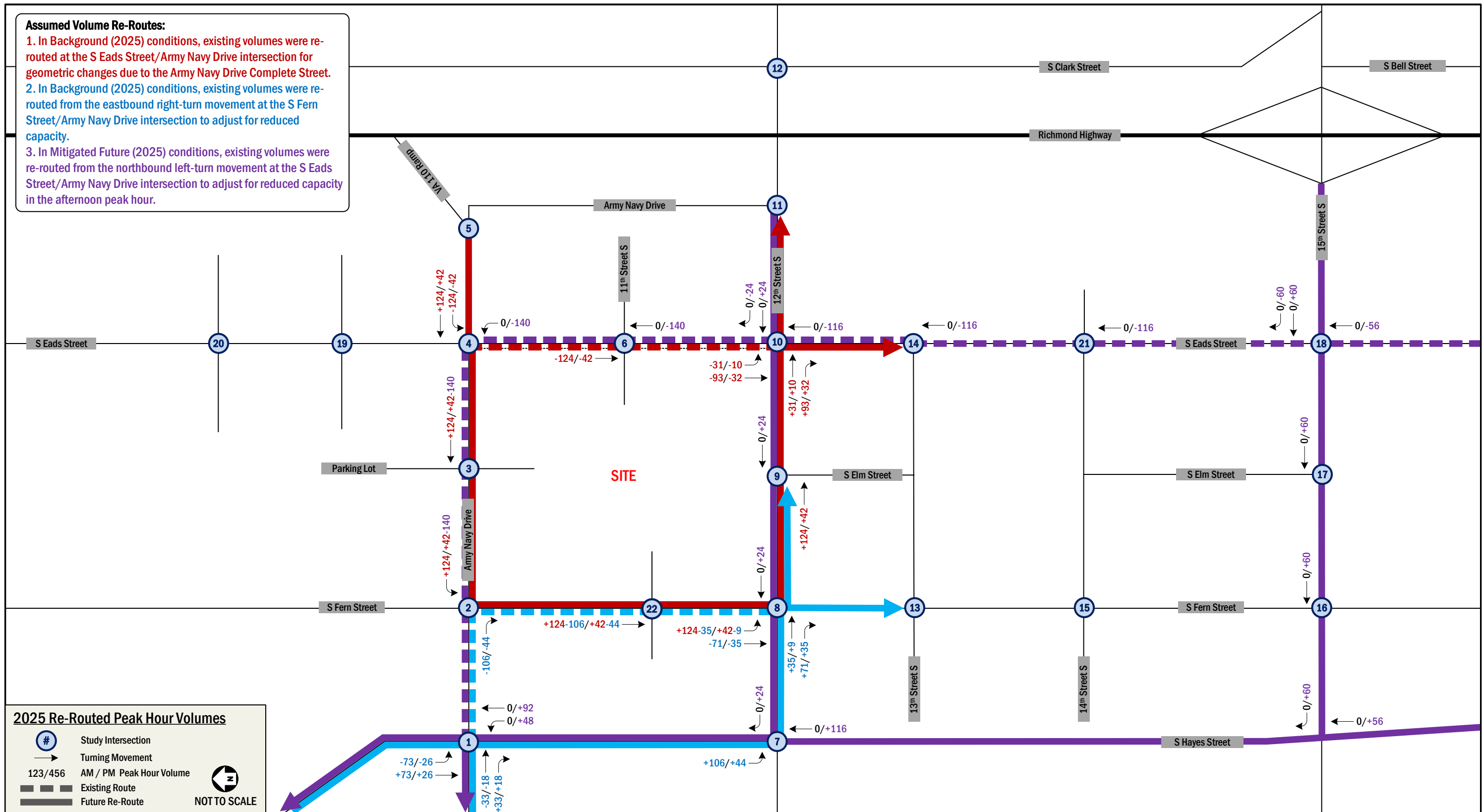
**Assumed Volume Re-Routes:**

1. In Background (2025) conditions, existing volumes were re-routed at the S Eads Street/Army Navy Drive intersection for geometric changes due to the Army Navy Drive Complete Street.
2. In Background (2025) conditions, existing volumes were re-routed from the eastbound right-turn movement at the S Fern Street/Army Navy Drive intersection to adjust for reduced capacity.
3. In Mitigated Future (2025) conditions, existing volumes were re-routed from the northbound left-turn movement at the S Eads Street/Army Navy Drive intersection to adjust for reduced capacity in the afternoon peak hour.

**2025 Re-Routed Peak Hour Volumes**

- # Study Intersection
- Turning Movement
- 123/456 AM / PM Peak Hour Volume
- Existing Route
- Future Re-Route

NOT TO SCALE



## I. 2025 Background VISSIM Delay and Queue Results



| Pen Place - VISSIM Delay & Queue Results |   |          |                                 |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |  |  |  |
|--|---|----------|---------------------------------|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|--|--|--|
| 2025 Future No-Build AM Peak Conditions  |   |          |                                 |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |  |  |  |
| Intersection #                           | Intersection Name                             | Movement | Input Vehicular Volume (vph)    | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |  |  |  |
| 1  | Army-Navy Drive and S Hayes Street/I-395 Ramp | EBL      | 35                              | 38  | 260                 | 0.5   | 82.6                                       | F            |  |              | 18                                | 104                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | EBT      | 359                             | 366                                       | 450                 | 0.4   | 52.1                                       | D            | 53.0                                       | D            | 77                                | 252                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | EBR      | 113                             | 130                                       | 450                 | 1.5   | 47.0                                       | D            |  |              | 77                                | 252                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBL      | 77                              | 81  | 190                 | 0.5   | 185.4                                      | F            |  |              | 102                               | 334                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBT      | 243                             | 242                                       | 430                 | 0.1   | 43.3                                       | D            | 31.2                                       | C            | 37                                | 199                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBR      | 504                             | 511                                       | 430                 | 0.3   | 1.0  | A            |  |              | 0                                 | 28                                   |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBL      | 58                              | 67  | 200                 | 1.1   | 77.0                                       | E            |  |              | 38                                | 213                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBT      | 304                             | 311                                       | 750                 | 0.4   | 37.6                                       | D            | 42.8                                       | D            | 32                                | 185                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBR      | 113                             | 114                                       | 115                 | 0.1   | 36.8                                       | D            |  |              | 26                                | 192                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBL      | 760                             | 539                                       | 2,050               | 8.7   | 131.0                                      | F            |  |              | 3,428                             | 3,785                                |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBT      | 1,269                           | 1,268                                     | 1,950               | 0.0   | 30.6                                       | C            | 53.5                                       | D            | 3,428                             | 3,785                                |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBR      | 345                             | 358                                       | 1,950               | 0.7   | 17.9                                       | B            |  |              | 3,427                             | 3,784                                |                               |  |                                    |                         |                                      |                                  |  |  |  |
| Overall                                  | 4,180   | 4,025    |                                 | 2.4                                       | 47.5                | D     |  |              |  |              | 43                                | 41                                   | 69.0                          | 74   | 78                                 | 81.9                    |                                      |                                  |  |  |  |
| 2  | Army-Navy Drive and S Fern Street             | EBL      | 85                              | 69  | 160                 | 1.8   | 32.5                                       | C            |  |              | 8                                 | 132                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | EBT      | 943                             | 779                                       | 430                 | 5.6   | 42.2                                       | D            | 40.0                                       | D            | 153                               | 414                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | EBR      | 204                             | 172                                       | 180                 | 2.3   | 33.1                                       | C            |  |              | 39                                | 254                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBL      | 81                              | 80  | 80                  | 0.1   | 121.3                                      | F            |  |              | 96                                | 346                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBT      | 494                             | 503                                       | 540                 | 0.4   | 31.7                                       | C            | 43.1                                       | D            | 96                                | 346                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBR      | 48                              | 45  | 540                 | 0.4   | 32.1                                       | C            |  |              | 94                                | 350                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBL      | 174                             | 184                                       | 225                 | 0.7   | 68.5                                       | E            |  |              | 72                                | 299                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBT      | 30                              | 32  | 785                 | 0.4   | 50.0                                       | D            | 63.7                                       | E            | 15                                | 105                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBR      | 36                              | 36  | 300                 | 0.0   | 51.6                                       | D            |  |              | 15                                | 105                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBL      | 112                             | 115                                       | 75                  | 0.3   | 44.2                                       | D            |  |              | 37                                | 253                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBT      | 191                             | 188                                       | 560                 | 0.2   | 45.5                                       | D            | 41.5                                       | D            | 59                                | 277                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBR      | 156                             | 151                                       | 560                 | 0.4   | 34.4                                       | C            |  |              | 63                                | 284                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| Overall                                  | 2,554   | 2,354    |                                 | 4.0                                       | 43.7                | D     |  |              |  |              | 185                               | 196                                  | 65.5                          | 72   | 74                                 | 10.3                    |                                      |                                  |  |  |  |
| 4  | Army-Navy Drive and S Eads Street             | EBL      | 480                             | 404                                       | 420                 | 3.6   | 21.3                                       | C            |  |              | 50                                | 310                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | EBT      | 321                             | 275                                       | 530                 | 2.7   | 10.9                                       | B            | 16.9                                       | B            | 52                                | 309                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | EBR      | 257                             | 215                                       | 530                 | 2.7   | 16.3                                       | B            |  |              | 36                                | 297                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBL      | 60                              | 57  | 100                 | 0.4   | 11.8                                       | B            | 27.9                                       | C            | 29                                | 170                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBT      | 235                             | 234                                       | 1,100               | 0.1   | 31.8                                       | C            |  |              | 32                                | 180                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBR      | 60                              | 57  | 100                 | 0.4   | 11.8                                       | B            |  |              | 32                                | 180                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBL      | 125                             | 123                                       | 100                 | 0.2   | 36.4                                       | D            |  |              | 55                                | 321                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBT      | 241                             | 243                                       | 550                 | 0.1   | 25.9                                       | C            | 29.2                                       | C            | 55                                | 321                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBR      | 24                              | 27  | 550                 | 0.6   | 26.1                                       | C            |  |              | 55                                | 321                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBL      | 48                              | 47  | 550                 | 0.1   | 35.2                                       | D            |  |              | 179                               | 352                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBT      | 360                             | 354                                       | 550                 | 0.3   | 41.4                                       | D            | 32.3                                       | C            | 179                               | 352                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBR      | 282                             | 289                                       | 550                 | 0.4   | 20.6                                       | C            |  |              | 179                               | 352                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| Overall                                  | 2,433   | 2,268    |                                 | 3.4                                       | 25.1                | C     |  |              |  |              | 126                               | 127                                  | 70.2                          | 98   | 93                                 | 26.3                    |                                      |                                  |  |  |  |
| 7  | 12th Street S and S Hayes Street              | EBL      | 25                              | 29  | 450                 | 0.8   | 51.3                                       | D            |  |              | 25                                | 145                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | EBT      | 15                              | 16  | 450                 | 0.3   | 42.6                                       | D            | 48.1                                       | D            | 25                                | 145                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | EBR      | 45                              | 45  | 65                  | 0.0   | 47.9                                       | D            |  |              | 24                                | 143                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBL      | 33                              | 33  | 100                 | 0.0   | 73.5                                       | E            |  |              | 50                                | 240                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBT      | 40                              | 41  | 620                 | 0.2   | 65.1                                       | E            | 68.3                                       | E            | 50                                | 240                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBR      | 73                              | 71  | 620                 | 0.2   | 67.8                                       | E            |  |              | 50                                | 240                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBL      | 30                              | 26  | 75                  | 0.8   | 73.3                                       | E            |  |              | 35                                | 172                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBT      | 402                             | 401                                       | 775                 | 0.0   | 24.0                                       | C            | 26.0                                       | C            | 35                                | 172                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBR      | 25                              | 26  | 75                  | 0.2   | 10.0                                       | A            |  |              | 33                                | 176                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBL      | 395                             | 388                                       | 250                 | 0.4   | 57.7                                       | E            |  |              | 223                               | 497                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBT      | 1,023                           | 1,036                                     | 770                 | 0.4   | 26.7                                       | C            | 34.8                                       | C            | 223                               | 497                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBR      | 75                              | 75  | 770                 | 0.0   | 28.5                                       | C            |  |              | 223                               | 497                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| Overall                                  | 2,181   | 2,187    |                                 | 0.1                                       | 35.8                | D     |  |              |  |              | 557                               | 565                                  | 63.4                          |  |                                    |                         |                                      |                                  |  |  |  |
| 8  | 12th Street S and S Fern Street               | EBT      | 268                             | 264                                       | 640                 | 0.2   | 33.0                                       | C            |  |              | 124                               | 551                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | EBR      | 167                             | 160                                       | 640                 | 0.5   | 31.3                                       | C            | 32.4                                       | C            | 129                               | 560                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBL      | 78                              | 74  | 75                  | 0.5   | 83.9                                       | F            |  |              | 42                                | 193                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBT      | 45                              | 44  | 225                 | 0.1   | 15.1                                       | B            | 46.6                                       | D            | 42                                | 193                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBR      | 38                              | 36  | 225                 | 0.3   | 8.4  | A            |  |              | 42                                | 202                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBL      | 76                              | 78  | 100                 | 0.2   | 43.5                                       | D            |  |              | 112                               | 403                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBT      | 242                             | 252                                       | 280                 | 0.6   | 34.1                                       | C            | 34.8                                       | C            | 90                                | 370                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBR      | 77                              | 80  | 280                 | 0.3   | 28.3                                       | C            |  |              | 90                                | 369                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBL      | 142                             | 139                                       | 790                 | 0.3   | 70.4                                       | E            |  |              | 217                               | 517                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBT      | 255                             | 239                                       | 790                 | 1.0   | 59.6                                       | E            | 63.2                                       | E            | 217                               | 517                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | SBR      | 25                              | 22  | 790                 | 0.6   | 56.0                                       | E            |  |              | 221                               | 523                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | Overall  | 1,413                           | 1,388                                     |                     | 0.7   | 43.5                                       | D            |  |              |                                   |                                      | 1,244                         | 1,225                                      | 64.3                               |                         |                                      |                                  |  |  |  |
| 9  | 12th Street S and S Elm Street                | EBT      | 378                             | 375                                       | 225                 | 0.2   | 15.3                                       | B            |  |              | 36                                | 398                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | EBR      | 109                             | 108                                       | 225                 | 0.1   | 8.1  | A            | 13.7                                       | B            | 33                                | 390                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBT      | 161                             | 155                                       | 325                 | 0.5   | 1.2  | A            | 1.2  | A            | 1                                 | 67                                   |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | NBR      | 45                              | 44  | 270                 | 0.1   | 59.5                                       | E            | 59.5                                       | E            | 15                                | 125                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | Overall  | 693                             | 682                                       |                     | 0.4   | 13.8                                       | B            |  |              |                                   |                                      | 530                           | 524  | 24.6                               |                         |                                      |                                  |  |  |  |
|  |   | 10       | 12th Street S and S Eads Street | EBL                                       | 92                  | 89    | 150  | 0.3          | 112.5                                      | F            |                                   |                                      | 190                           | 380  |                                    |                         |                                      |                                  |  |  |  |
| EBT                                      | 304   |          |                                 | 299                                       | 320                 | 0.3   | 66.9                                       | E            | 76.9                                       | E            | 190                               | 380                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| EBR                                      | 27  |          |                                 | 26  | 320                 | 0.2   | 70.8                                       | E            |  |              | 190                               | 380                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| WBL                                      | 85  |          |                                 | 81  | 200                 | 0.4   | 85.3                                       | F            |  |              | 78                                | 244                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| WBT                                      | 89  |          |                                 | 87  | 575                 | 0.2   | 65.3                                       | E            | 73.5                                       | E            | 78                                | 244                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| WBR                                      | 66  |          |                                 | 60  | 575                 | 0.8   | 69.4                                       | E            |  |              | 78                                | 244                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| NBL                                      | 35  |          |                                 | 34  | 100                 | 0.2   | 24.7                                       | C            |  |              | 31                                | 341                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| NBT                                      | 235   |          |                                 | 242                                       | 270                 | 0.5   | 17.0                                       | B            | 14.2                                       | B            | 31                                | 341                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| NBR                                      | 235   |          |                                 | 241                                       | 200                 | 0.4   | 9.8  | A            |  |              | 33                                | 345                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| SBL                                      | 257   |          |                                 | 242                                       | 550                 | 0.9   | 23.6                                       | C            |  |              | 89                                | 339                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| SBT                                      | 330   |          |                                 | 307                                       | 550                 | 1.3   | 21.4                                       | C            | 22.3                                       | C            | 89                                | 339                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| SBR                                      | 37  |          |                                 | 33  | 550                 | 0.7   | 20.9                                       | C            |  |              | 91                                | 344                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
| Overall                                  | 1,792   | 1,741    |                                 | 1.2                                       | 39.6                | D     |  |              |  |              | 718                               | 705                                  | 64.7                          | 77   | 74                                 | 14.9                    |                                      |                                  |  |  |  |
| 11                                       | 12th Street S and Army Navy Drive             | EBT      | 786                             | 785                                       | 575                 | 0.0   | 21.7                                       | C            |  |              | 85                                | 598                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | EBR      | 10                              | 11  | 575                 | 0.3   | 17.6                                       | B            | 21.6                                       | C            | 91                                | 609                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBT      | 175                             | 181                                       | 120                 | 0.4   | 11.7                                       | B            |  |              | 36                                | 236                                  |                               |  |                                    |                         |                                      |                                  |  |  |  |
|  |   | WBR      | 198                             | 200                                       | 120                 | 0.1   | 16.0                                       | B            | 14.0                                       | B            | 3                                 |                                      |                               |  |                                    |                         |                                      |                                  |  |  |  |

| Pen Place - VISSIM Delay & Queue Results |  |          |                              |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |
|--|--|----------|------------------------------|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|
| 2025 Future No-Build AM Peak Conditions  |  |          |                              |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |
| Intersection #                           | Intersection Name                              | Movement | Input Vehicular Volume (vph) | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |
| 16                                       | 15th Street S and S Fern Street                | EBL      | 20                           | 20  | 130                 | 0.0   | 23.5                                       | C            |  |              | 40                                | 280                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | EBT      | 419                          | 421                                       | 630                 | 0.1   | 24.7                                       | C            | 24.6                                       | C            | 40                                | 280                                  | 41                            | 41   | 68.4                               | ---                     | ---                                  | ---                              |
|  |  | EBR      | 15                           | 16  | 630                 | 0.3   | 22.4                                       | C            |  |              | 41                                | 282                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBL      | 61                           | 64  | 120                 | 0.4   | 14.7                                       | B            |  |              | 10                                | 122                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBT      | 184                          | 184                                       | 260                 | 0.0   | 8.2  | A            | 8.2  | A            | 10                                | 122                                  | 21                            | 20   | 65.7                               | ---                     | ---                                  | ---                              |
|  |  | WBR      | 131                          | 133                                       | 260                 | 0.2   | 5.2  | A            |  |              | 10                                | 124                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBL      | 22                           | 22  | 750                 | 0.0   | 49.9                                       | D            |  |              | 96                                | 467                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBT      | 212                          | 211                                       | 750                 | 0.1   | 47.0                                       | D            | 34.6                                       | C            | 96                                | 467                                  | 41                            | 43   | 67.7                               | ---                     | ---                                  | ---                              |
|  |  | NBR      | 199                          | 198                                       | 75                  | 0.1   | 19.7                                       | B            |  |              | 99                                | 472                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBL      | 162                          | 156                                       | 160                 | 0.5   | 64.6                                       | E            |  |              | 67                                | 295                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBT      | 59                           | 58  | 300                 | 0.1   | 42.3                                       | D            | 51.4                                       | D            | 67                                | 295                                  | 41                            | 43   | 66.1                               | ---                     | ---                                  | ---                              |
|  |  | SBR      | 51                           | 49  | 300                 | 0.3   | 19.9                                       | B            |  |              | 78                                | 309                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | Overall  |                              |   | 1,535               | 1,532 | ---  | 0.1          | 27.9                                       | C            | ---                               | ---                                  | ---                           | ---  | 144                                | 147                     | 67.1                                 | ---                              |
| 17                                       | 15th Street S and S Elm Street                 | EBL      | 31                           | 33  | 60                  | 0.4   | 12.0                                       | B            |  |              | 41                                | 359                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | EBT      | 749                          | 748                                       | 270                 | 0.0   | 13.7                                       | B            | 13.6                                       | B            | 41                                | 359                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBT      | 326                          | 328                                       | 300                 | 0.1   | 4.0  | A            |  |              | 9                                 | 145                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBR      | 209                          | 211                                       | 300                 | 0.1   | 4.7  | A            | 4.3  | A            | 9                                 | 145                                  | 33                            | 34   | 63.0                               | ---                     | ---                                  | ---                              |
|  |  | SBL      | 19                           | 18  | 250                 | 0.2   | 43.5                                       | D            |  |              | 4                                 | 55                                   |                               |  |                                    |                         |                                      |                                  |
|  |  | SBT      | 50                           | 52  | 250                 | 0.3   | 8.2  | A            | 17.3                                       | B            | 2                                 | 66                                   | 12                            | 12   | 61.4                               | ---                     | ---                                  | ---                              |
|  |  | SBR      | 5                            | 5   | 250                 | 0.3   | 8.2  | A            |  |              | 2                                 | 66                                   |                               |  |                                    |                         |                                      |                                  |
| Overall                                  |  |          | 1,384                        | 1,390                                     | ---                 | 0.2   | 10.2                                       | B            | ---  | ---          | ---                               | ---                                  | 45                            | 46   | 62.6                               | ---                     | ---                                  | ---                              |
| 18                                       | 15th Street S and S Eads Street                | EBL      | 65                           | 67  | 170                 | 0.2   | 27.6                                       | C            |  |              | 9                                 | 271                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | EBT      | 648                          | 649                                       | 300                 | 0.0   | 17.7                                       | B            | 18.8                                       | B            | 57                                | 369                                  | 265                           | 271  | 64.6                               | ---                     | ---                                  | ---                              |
|  |  | EBR      | 55                           | 55  | 300                 | 0.0   | 21.1                                       | C            |  |              | 57                                | 369                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBL      | 89                           | 87  | 300                 | 0.2   | 75.4                                       | E            |  |              | 76                                | 374                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBT      | 442                          | 449                                       | 300                 | 0.3   | 25.7                                       | C            | 33.8                                       | C            | 76                                | 374                                  | 134                           | 137  | 65.0                               | ---                     | ---                                  | ---                              |
|  |  | WBR      | 169                          | 166                                       | 300                 | 0.2   | 33.8                                       | C            |  |              | 76                                | 374                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBL      | 84                           | 83  | 130                 | 0.1   | 46.2                                       | D            |  |              | 291                               | 895                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBT      | 299                          | 299                                       | 760                 | 0.0   | 57.9                                       | E            | 44.6                                       | D            | 291                               | 895                                  | 314                           | 303  | 186.4                              | 33                      | 32                                   | 37.5                             |
|  |  | NBR      | 277                          | 278                                       | 130                 | 0.1   | 29.8                                       | C            |  |              | 112                               | 836                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBL      | 195                          | 188                                       | 250                 | 0.5   | 41.3                                       | D            |  |              | 66                                | 322                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBT      | 208                          | 193                                       | 300                 | 1.1   | 34.0                                       | C            | 37.1                                       | D            | 66                                | 322                                  | 124                           | 125  | 190.3                              | 60                      | 53                                   | 38.5                             |
|  |  | SBR      | 9                            | 8   | 75                  | 0.3   | 12.5                                       | B            |  |              | 60                                | 326                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | Overall  |                              |   | 2,540               | 2,522 | ---  | 0.4          | 32.5                                       | C            | ---                               | ---                                  | ---                           | ---  | 837                                | 836                     | 127.6                                | 93                               |
| 19                                       | S Eads Street and I-395 HOT Lanes (South Node) | EBT      | 2                            | 2   | 1,000               | 0.0   | 80.6                                       | F            | 167.2                                      | F            | 680                               | 973                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | EBR      | 475                          | 466                                       | 1,000               | 0.4   | 167.6                                      | F            |  |              | 680                               | 973                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBT      | 179                          | 161                                       | 170                 | 1.4   | 9.8  | A            |  |              | 10                                | 193                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBR      | 602                          | 539                                       | 170                 | 2.6   | 7.1  | A            | 7.7  | A            | 26                                | 250                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBL      | 145                          | 144                                       | 100                 | 0.1   | 3.1  | A            |  |              | 22                                | 197                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBR      | 215                          | 223                                       | 100                 | 0.5   | 29.7                                       | C            | 19.3                                       | B            | 21                                | 194                                  |                               |  |                                    |                         |                                      |                                  |
| Overall                                  |  |          | 1,618                        | 1,535                                     | ---                 | 2.1   | 59.1                                       | E            | ---  | ---          | ---                               | ---                                  | ---                           | ---  | ---                                | ---                     | ---                                  |                                  |
| 20                                       | S Eads Street and I-395 HOT Lanes (North Node) | EBL      | 841                          | 828                                       | 875                 | 0.5   | 49.3                                       | D            | 49.3                                       | D            | 138                               | 480                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBL      | 132                          | 130                                       | 1,250               | 0.2   | 69.8                                       | E            |  |              | 59                                | 233                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBR      | 100                          | 105                                       | 1,250               | 0.5   | 60.4                                       | E            | 65.6                                       | E            | 59                                | 233                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBT      | 179                          | 163                                       | 100                 | 1.2   | 16.1                                       | B            |  |              | 12                                | 183                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBT      | 228                          | 235                                       | 100                 | 0.5   | 16.7                                       | B            | 16.7                                       | B            | 15                                | 121                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | Overall  |                              |   | 1,480               | 1,461 | ---  | 0.5          | 43.0                                       | D            | ---                               | ---                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
| 21                                       | 14th Street S and S Eads Street                | EBL      | 6                            | 5   | 200                 | 0.4   | 78.5                                       | E            |  |              | 3                                 | 43                                   |                               |  |                                    |                         |                                      |                                  |
|  |  | EBT      | 0                            | 0   | 200                 | 0.0   | 0.0  | A            | 78.5                                       | E            | 3                                 | 43                                   |                               |  |                                    |                         |                                      |                                  |
|  |  | EBR      | 0                            | 0   | 200                 | 0.0   | 0.0  | A            |  |              | 3                                 | 42                                   |                               |  |                                    |                         |                                      |                                  |
|  |  | WBL      | 20                           | 21  | 150                 | 0.2   | 49.4                                       | D            |  |              | 18                                | 96                                   |                               |  |                                    |                         |                                      |                                  |
|  |  | WBT      | 0                            | 0   | 150                 | 0.0   | 0.0  | A            | 75.2                                       | E            | 18                                | 96                                   | 286                           | 289  | 65.3                               | ---                     | ---                                  | ---                              |
|  |  | WBR      | 25                           | 27  | 150                 | 0.4   | 95.3                                       | F            |  |              | 18                                | 96                                   |                               |  |                                    |                         |                                      |                                  |
|  |  | NBL      | 0                            | 0   | 100                 | 0.0   | 0.0  | A            |  |              | 9                                 | 219                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBT      | 508                          | 510                                       | 350                 | 0.1   | 3.5  | A            | 3.5  | A            | 9                                 | 219                                  | 359                           | 354  | 52.6                               | 34                      | 33                                   | 0.7                              |
|  |  | NBR      | 25                           | 24  | 350                 | 0.2   | 3.7  | A            |  |              | 11                                | 232                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBL      | 25                           | 28  | 100                 | 0.6   | 68.6                                       | E            |  |              | 23                                | 313                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBT      | 392                          | 371                                       | 290                 | 1.1   | 6.3  | A            | 10.2                                       | B            | 23                                | 313                                  | 74                            | 74   | 60.5                               | 32                      | 29                                   | 6.2                              |
|  |  | SBR      | 40                           | 38  | 290                 | 0.3   | 5.8  | A            |  |              | 24                                | 316                                  |                               |  |                                    |                         |                                      |                                  |
| Overall                                  |  |          | 1,041                        | 1,024                                     | ---                 | 0.5   | 10.1                                       | B            | ---  | ---          | ---                               | ---                                  | 719                           | 717  | 58.5                               | 66                      | 62                                   | 3.3                              |

Source: VISSIM 11.0 Node Evaluation. Compiled by Gorove/Slade Associates based on the average of 10 VISSIM model runs.

\* GEH statistic is computed as follows. GEH<5 indicates good fit.

$$GEH = \sqrt{\frac{(\text{Simulated Volume} - \text{Input Volume})^2}{(\text{Simulated Volume} + \text{Input Volume})/2}}$$

| Pen Place - VISSIM Delay & Queue Results |   |          |                                  |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |      |      |
|--|---|----------|----------------------------------|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|------|------|
| 2025 Future No-Build PM Peak Conditions  |   |          |                                  |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |      |      |
| Intersection #                           | Intersection Name                             | Movement | Input Vehicular Volume (vph)     | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |      |      |
| 1  | Army-Navy Drive and S Hayes Street/I-395 Ramp | EBL      | 155                              | 156                                       | 260                 | 0.1   | 66.6                                       | E            |  |              | 66                                | 313                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | EBT      | 362                              | 374                                       | 450                 | 0.6   | 62.0                                       | E            | 55.1                                       | E            | 104                               | 358                                  |                               |  | 54                                 | 65.1                    | 49                                   | 49                               | 43.3 |      |
|  |   | EBR      | 248                              | 258                                       | 450                 | 0.6   | 38.0                                       | D            |  |              | 104                               | 358                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | WBL      | 79                               | 74  | 190                 | 0.6   | 74.7                                       | E            |  |              | 33                                | 162                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | WBT      | 393                              | 379                                       | 430                 | 0.7   | 65.8                                       | E            | 26.5                                       | C            | 81                                | 348                                  |                               |  | 4                                  | 67.8                    | 31                                   | 32                               | 63.4 |      |
|  |   | WBR      | 783                              | 743                                       | 430                 | 1.4   | 1.6  | A            |  |              | 1                                 | 162                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | NBL      | 192                              | 204                                       | 200                 | 0.9   | 56.2                                       | E            | 28.2                                       | C            | 78                                | 334                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | NBT      | 714                              | 697                                       | 750                 | 0.6   | 28.3                                       | C            |  |              | 53                                | 327                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | NBR      | 258                              | 256                                       | 115                 | 0.1   | 5.4  | A            |  |              | 5                                 | 203                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | SBL      | 482                              | 383                                       | 2,050               | 4.8   | 164.7                                      | F            |  |              | 2,568                             | 2,911                                |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | SBT      | 1,087                            | 1,093                                     | 1,950               | 0.2   | 42.4                                       | D            | 62.9                                       | E            | 2,568                             | 2,911                                |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | SBR      | 445                              | 440                                       | 1,950               | 0.2   | 25.2                                       | C            |  |              | 2,567                             | 2,910                                |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | Overall  |                                  | 5,198                                     | 5,057               |       | 2.0  | 45.1         |  |              |                                   |                                      |                               |  | 60                                 | 58                      | 65.3                                 | 80                               | 81   | 51.2 |
| 2  | Army-Navy Drive and S Fern Street             | EBL      | 208                              | 191                                       | 160                 | 1.2   | 36.4                                       | D            |  |              | 37                                | 334                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | EBT      | 727                              | 666                                       | 430                 | 2.3   | 29.2                                       | C            | 27.4                                       | C            | 95                                | 472                                  |                               |  | 44                                 | 65.6                    | 41                                   | 42                               | 4.2  |      |
|  |   | EBR      | 167                              | 163                                       | 180                 | 0.3   | 9.2  | A            |  |              | 6                                 | 135                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | WBL      | 28                               | 29  | 80                  | 0.2   | 87.2                                       | F            |  |              | 152                               | 402                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | WBT      | 831                              | 819                                       | 540                 | 0.4   | 34.8                                       | C            | 37.0                                       | D            | 152                               | 402                                  |                               |  | 25                                 | 58.6                    | 31                                   | 33                               | 9.2  |      |
|  |   | WBR      | 133                              | 136                                       | 540                 | 0.3   | 39.6                                       | D            |  |              | 154                               | 406                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | NBL      | 247                              | 211                                       | 225                 | 2.4   | 45.8                                       | D            |  |              | 56                                | 273                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | NBT      | 169                              | 195                                       | 785                 | 1.9   | 28.9                                       | C            | 37.2                                       | D            | 28                                | 138                                  |                               |  | 60                                 | 60.9                    |                                      |                                  |      |      |
|  |   | NBR      | 35                               | 30  | 300                 | 0.9   | 30.0                                       | C            |  |              | 28                                | 138                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | SBL      | 34                               | 34  | 75                  | 0.0   | 40.6                                       | D            |  |              | 9                                 | 171                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | SBT      | 100                              | 99  | 560                 | 0.1   | 41.3                                       | D            | 32.7                                       | C            | 39                                | 241                                  |                               |  | 93                                 | 63.1                    |                                      |                                  |      |      |
|  |   | SBR      | 177                              | 166                                       | 560                 | 0.8   | 25.9                                       | C            |  |              | 43                                | 248                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | Overall  |                                  | 2,856                                     | 2,739               |       | 2.2  | 33.0         |  |              |                                   |                                      |                               |  | 222                                | 233                     | 62.5                                 | 72                               | 75   | 6.4  |
| 4  | Army-Navy Drive and S Eads Street             | EBL      | 375                              | 341                                       | 420                 | 1.8   | 65.0                                       | E            |  |              | 204                               | 340                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | EBT      | 222                              | 203                                       | 530                 | 1.3   | 11.0                                       | B            | 36.7                                       | D            | 202                               | 338                                  |                               |  | 32                                 | 75.6                    | 41                                   | 42                               | 2.3  |      |
|  |   | EBR      | 205                              | 188                                       | 530                 | 1.2   | 13.3                                       | B            |  |              | 106                               | 334                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | WBT      | 572                              | 555                                       | 1,100               | 0.7   | 30.8                                       | C            | 30.8                                       | C            | 80                                | 196                                  |                               |  | 51                                 | 63.8                    | 25                                   | 24                               | 3.2  |      |
|  |   | WBR      | 477                              | 469                                       | 100                 | 0.4   | 20.5                                       | C            |  |              | 86                                | 206                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | NBL      | 206                              | 191                                       | 100                 | 1.1   | 26.1                                       | C            |  |              | 122                               | 335                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | NBT      | 560                              | 526                                       | 550                 | 1.5   | 26.4                                       | C            | 26.4                                       | C            | 122                               | 335                                  |                               |  | 18                                 | 68.9                    | 31                                   | 32                               | 26.4 |      |
|  |   | NBR      | 29                               | 26  | 550                 | 0.6   | 28.3                                       | C            |  |              | 122                               | 335                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | SBL      | 28                               | 30  | 550                 | 0.4   | 20.5                                       | C            |  |              | 30                                | 222                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | SBT      | 136                              | 135                                       | 550                 | 0.1   | 31.2                                       | C            | 16.9                                       | B            | 30                                | 222                                  |                               |  | 21                                 | 70.7                    |                                      |                                  |      |      |
|  |   | SBR      | 170                              | 175                                       | 550                 | 0.4   | 5.3  | A            |  |              | 30                                | 222                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | Overall  |                                  | 2,980                                     | 2,839               |       | 2.6  | 27.8         |  |              |                                   |                                      |                               |  | 122                                | 125                     | 69.0                                 | 97                               | 98   | 10.4 |
|  |   | 7        | 12th Street S and S Hayes Street | EBL                                       | 85                  | 90    | 450  | 0.5          | 46.2                                       | D            |                                   |                                      | 20                            | 212  |                                    |                         |                                      |                                  |      |      |
| EBT                                      | 35  |          |                                  | 33  | 450                 | 0.3   | 41.7                                       | D            | 29.5                                       | C            | 40                                | 210                                  |                               |  | 626                                | 644                     | 64.6                                 |                                  |      |      |
| EBR                                      | 70  |          |                                  | 70  | 65                  | 0.0   | 2.2  | A            |  |              | 39                                | 208                                  |                               |  |                                    |                         |                                      |                                  |      |      |
| WBL                                      | 82  |          |                                  | 77  | 100                 | 0.6   | 54.3                                       | D            |  |              | 64                                | 402                                  |                               |  |                                    |                         |                                      |                                  |      |      |
| WBT                                      | 30  |          |                                  | 35  | 620                 | 0.9   | 49.1                                       | D            | 51.9                                       | D            | 64                                | 402                                  |                               |  | 94                                 | 60.8                    |                                      |                                  |      |      |
| WBR                                      | 140   |          |                                  | 132                                       | 620                 | 0.7   | 51.2                                       | D            |  |              | 64                                | 402                                  |                               |  |                                    |                         |                                      |                                  |      |      |
| NBL                                      | 60  |          |                                  | 59  | 75                  | 0.1   | 76.6                                       | E            |  |              | 73                                | 282                                  |                               |  |                                    |                         |                                      |                                  |      |      |
| NBT                                      | 849   |          |                                  | 847                                       | 775                 | 0.1   | 27.6                                       | C            | 29.9                                       | C            | 73                                | 282                                  |                               |  | 81                                 | 63.0                    |                                      |                                  |      |      |
| NBR                                      | 53  |          |                                  | 51  | 75                  | 0.3   | 13.4                                       | B            |  |              | 72                                | 286                                  |                               |  |                                    |                         |                                      |                                  |      |      |
| SBL                                      | 249   |          |                                  | 248                                       | 250                 | 0.1   | 79.0                                       | E            |  |              | 126                               | 412                                  |                               |  |                                    |                         |                                      |                                  |      |      |
| SBT                                      | 1,075   |          |                                  | 1,075                                     | 770                 | 0.0   | 10.2                                       | B            | 22.2                                       | C            | 126                               | 412                                  |                               |  | 0                                  | 0.0                     |                                      |                                  |      |      |
| SBR                                      | 90  |          |                                  | 91  | 770                 | 0.1   | 9.6  | A            |  |              | 126                               | 412                                  |                               |  |                                    |                         |                                      |                                  |      |      |
| Overall                                  |   |          |                                  | 2,818                                     | 2,808               |       | 0.2  | 27.9         |  |              |                                   |                                      |                               |  | 801                                | 820                     | 64.0                                 |                                  |      |      |
| 8  | 12th Street S and S Fern Street               | EBT      | 181                              | 182                                       | 640                 | 0.1   | 50.3                                       | D            |  |              | 139                               | 573                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | EBR      | 156                              | 149                                       | 640                 | 0.6   | 45.6                                       | D            | 50.3                                       | D            | 146                               | 583                                  |                               |  | 1,016                              | 1,029                   | 64.6                                 |                                  |      |      |
|  |   | WBL      | 115                              | 109                                       | 75                  | 0.6   | 112.8                                      | F            |  |              | 136                               | 352                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | WBT      | 128                              | 126                                       | 225                 | 0.2   | 46.2                                       | D            | 69.2                                       | E            | 136                               | 352                                  |                               |  | 94                                 | 65.1                    |                                      |                                  |      |      |
|  |   | WBR      | 62                               | 62  | 225                 | 0.0   | 39.3                                       | D            |  |              | 139                               | 361                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | NBL      | 114                              | 111                                       | 100                 | 0.3   | 27.8                                       | C            |  |              | 73                                | 372                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | NBT      | 363                              | 350                                       | 280                 | 0.7   | 19.2                                       | B            | 20.9                                       | C            | 73                                | 372                                  |                               |  | 104                                | 65.4                    |                                      |                                  |      |      |
|  |   | NBR      | 51                               | 51  | 280                 | 0.0   | 17.2                                       | B            |  |              | 72                                | 372                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | SBL      | 111                              | 110                                       | 790                 | 0.1   | 42.9                                       | D            |  |              | 115                               | 503                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | SBT      | 318                              | 315                                       | 790                 | 0.2   | 33.6                                       | C            | 35.8                                       | D            | 115                               | 503                                  |                               |  | 86                                 | 64.4                    |                                      |                                  |      |      |
|  |   | SBR      | 10                               | 10  | 790                 | 0.0   | 27.7                                       | C            |  |              | 118                               | 509                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | Overall  |                                  | 1,609                                     | 1,575               |       | 0.9  | 39.9         |  |              |                                   |                                      |                               |  | 1,300                              | 1,313                   | 64.6                                 |                                  |      |      |
|  |   | 9        | 12th Street S and S Elm Street   | EBT                                       | 251                 | 250   | 225  | 0.1          | 6.3  | A            |                                   |                                      | 12                            | 239  |                                    |                         |                                      |                                  |      |      |
| EBR                                      | 92  |          |                                  | 89  | 225                 | 0.3   | 4.1  | A            | 5.7  | A            | 10                                | 231                                  |                               |  | 548                                | 528                     | 70.2                                 |                                  |      |      |
| WBT                                      | 305   |          |                                  | 293                                       | 325                 | 0.7   | 23.4                                       | C            | 23.4                                       | C            | 41                                | 298                                  |                               |  |                                    |                         |                                      |                                  |      |      |
| NBR                                      | 60  |          |                                  | 60  | 270                 | 0.0   | 14.1                                       | B            | 14.1                                       | B            | 4                                 | 101                                  |                               |  | 157                                | 152                     | 69.4                                 |                                  |      |      |
| Overall                                  | 708   |          |                                  | 692                                       |                     | 0.6   | 13.9                                       |              |  |              |                                   |                                      |                               |  | 705                                | 680                     | 70.0                                 |                                  |      |      |
| 10                                       | 12th Street S and S Eads Street               | EBL      | 124                              | 126                                       | 150                 | 0.2   | 65.4                                       | E            |  |              | 87                                | 328                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | EBT      | 107                              | 107                                       | 320                 | 0.0   | 45.2                                       | D            | 54.1                                       | D            | 87                                | 328                                  |                               |  | 395                                | 392                     | 66.0                                 |                                  |      |      |
|  |   | EBR      | 80                               | 81  | 320                 | 0.1   | 48.1                                       | D            |  |              | 87                                | 328                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | WBL      | 98                               | 97  | 200                 | 0.1   | 90.4                                       | F            |  |              | 194                               | 514                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | WBT      | 230                              | 228                                       | 575                 | 0.1   | 65.2                                       | E            | 71.7                                       | E            | 194                               | 514                                  |                               |  | 174                                | 65.0                    |                                      |                                  |      |      |
|  |   | WBR      | 94                               | 97  | 575                 | 0.3   | 68.1                                       | E            |  |              | 194                               | 514                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | NBL      | 40                               | 35  | 100                 | 0.8   | 46.8                                       | D            |  |              | 173                               | 388                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | NBT      | 590                              | 530                                       | 270                 | 2.5   | 36.4                                       | D            | 33.4                                       | C            | 173                               | 388                                  |                               |  | 209                                | 63.5                    | 27                                   | 27                               | 35.3 |      |
|  |   | NBR      | 96                               | 87  | 200                 | 0.9   | 10.0                                       | A            |  |              | 173                               | 389                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | SBL      | 50                               | 45  | 550                 | 0.7   | 62.4                                       | E            |  |              | 112                               | 337                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | SBT      | 246                              | 228                                       | 550                 | 1.2   | 45.3                                       | D            | 47.4                                       | D            | 112                               | 337                                  |                               |  | 95                                 | 63.7                    | 62                                   | 57                               | 20.2 |      |
|  |   | SBR      | 35                               | 35  | 550                 | 0.0   | 41.4                                       | D            |  |              | 116                               | 343                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | Overall  |                                  | 1,790                                     | 1,696               |       | 2.3  | 49.3         |  |              |                                   |                                      |                               |  | 873                                | 866                     | 64.9                                 | 89                               | 84   | 25.1 |
| 11                                       | 12th Street S and Army Navy Drive             | EBT      | 238                              | 234                                       | 575                 | 0.3   | 32.4                                       | C            |  |              | 36                                | 181                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | EBR      | 15                               | 13  | 575                 | 0.5   | 20.4                                       | C            | 32.4                                       | C            | 41                                | 192                                  |                               |  | 140                                | 138                     | 65.6                                 | 28                               | 32   | 49.7 |
|  |   | WBT      | 241                              | 243                                       | 120                 | 0.1   | 13.2                                       | B            |  |              | 48                                | 245                                  |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | WBR      | 656                              | 629                                       | 120                 | 1.1   | 8.3  | A            | 13.2                                       | B            | 48                                | 245                                  |                               |  | 233                                | 237                     | 63.6                                 | 43                               | 42   | 50.9 |
|  |   | NBL      | 5                                | 5   | 50                  | 0.0   | 49.1                                       | D            |  |              | 4                                 | 58                                   |                               |  |                                    |                         |                                      |                                  |      |      |
|  |   | NBT      | 0                                | 0   | 50                  |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |      |      |

| Pen Place - VISSIM Delay & Queue Results |  |          |                                 |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |    |      |
|--|--|----------|---------------------------------|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|----|------|
| 2025 Future No-Build PM Peak Conditions  |  |          |                                 |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |    |      |
| Intersection #                           | Intersection Name                              | Movement | Input Vehicular Volume (vph)    | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |    |      |
| 16                                       | 15th Street S and S Fern Street                | EBL      | 75                              | 77  | 130                 | 0.2   | 33.1                                       | C            |  |              | 21                                | 159                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | EBT      | 271                             | 270                                       | 630                 | 0.1   | 12.3                                       | B            | 16.4                                       | B            | 21                                | 159                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | EBR      | 25                              | 26  | 630                 | 0.2   | 9.7  | A            |  |              | 19                                | 161                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBL      | 146                             | 127                                       | 120                 | 1.6   | 55.5                                       | E            |  |              | 115                               | 363                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBT      | 512                             | 442                                       | 260                 | 3.2   | 44.2                                       | D            | 45.6                                       | D            | 115                               | 363                                  | 73                            | 76   | 64.5                               |                         |                                      |                                  |    |      |
|  |  | WBR      | 149                             | 126                                       | 260                 | 2.0   | 40.3                                       | D            |  |              | 116                               | 367                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBL      | 21                              | 19  | 750                 | 0.4   | 22.2                                       | C            |  |              | 22                                | 252                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBT      | 160                             | 158                                       | 750                 | 0.2   | 19.3                                       | B            | 16.5                                       | B            | 22                                | 252                                  | 112                           | 117  | 65.7                               |                         |                                      |                                  |    |      |
|  |  | NBR      | 60                              | 54  | 75                  | 0.8   | 6.3  | A            |  |              | 22                                | 258                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBL      | 127                             | 121                                       | 160                 | 0.5   | 21.9                                       | C            |  |              | 33                                | 343                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBT      | 223                             | 218                                       | 300                 | 0.3   | 16.0                                       | B            | 17.0                                       | B            | 33                                | 343                                  | 55                            | 56   | 64.1                               |                         |                                      |                                  |    |      |
|  |  | SBR      | 80                              | 79  | 300                 | 0.1   | 12.5                                       | B            |  |              | 39                                | 357                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | Overall  |                                 |   | 1,849               | 1,717 |  | 3.1          | 28.4                                       | C            |                                   |                                      |                               |  | 304                                | 317                     | 64.6                                 |                                  |    |      |
| 17                                       | 15th Street S and S Elm Street                 | EBL      | 5                               | 4   | 60                  | 0.5   | 2.7  | A            |  |              | 8                                 | 193                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | EBT      | 453                             | 439                                       | 270                 | 0.7   | 5.1  | A            | 5.1  | A            | 8                                 | 193                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBT      | 737                             | 611                                       | 300                 | 4.9   | 7.6  | A            | 7.3  | A            | 12                                | 164                                  | 33                            | 34   | 45.0                               |                         |                                      |                                  |    |      |
|  |  | WBR      | 67                              | 52  | 300                 | 1.9   | 3.5  | A            |  |              | 12                                | 168                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBL      | 81                              | 76  | 250                 | 0.6   | 56.8                                       | E            |  |              | 26                                | 146                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBR      | 70                              | 72  | 250                 | 0.2   | 18.3                                       | B            | 38.1                                       | D            | 24                                | 149                                  | 10                            | 9  | 75.5                               |                         |                                      |                                  |    |      |
|  |  | Overall  |                                 |   | 1,413               | 1,254 |  | 4.4          | 10.1                                       | B            |                                   |                                      |                               |  | 43                                 | 43                      | 51.4                                 |                                  |    |      |
|  |  | 18       | 15th Street S and S Eads Street | EBL                                       | 65                  | 59    | 170  | 0.8          | 101.4                                      | F            |                                   |                                      | 35                            | 267  |                                    |                         |                                      |                                  |    |      |
| EBT                                      | 376  |          |                                 | 365                                       | 300                 | 0.6   | 18.7                                       | B            | 29.0                                       | C            | 48                                | 326                                  | 333                           | 340  | 64.9                               |                         |                                      |                                  |    |      |
| EBR                                      | 93   |          |                                 | 91  | 300                 | 0.2   | 23.4                                       | C            |  |              | 48                                | 326                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| WBL                                      | 350  |          |                                 | 278                                       | 300                 | 4.1   | 24.4                                       | C            |  |              | 216                               | 474                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| WBT                                      | 705  |          |                                 | 570                                       | 300                 | 5.3   | 36.6                                       | D            | 49.4                                       | D            | 216                               | 474                                  | 205                           | 209  | 64.2                               |                         |                                      |                                  |    |      |
| WBR                                      | 311  |          |                                 | 253                                       | 300                 | 3.5   | 105.5                                      | F            |  |              | 216                               | 474                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| NBL                                      | 60   |          |                                 | 56  | 130                 | 0.5   | 78.6                                       | E            |  |              | 407                               | 882                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| NBT                                      | 302  |          |                                 | 287                                       | 760                 | 0.9   | 88.6                                       | F            | 77.1                                       | E            | 407                               | 882                                  | 412                           | 416  | 185.5                              | 43                      | 43                                   | 43.5                             |    |      |
| NBR                                      | 99   |          |                                 | 92  | 130                 | 0.7   | 40.2                                       | D            |  |              | 30                                | 378                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| SBL                                      | 196  |          |                                 | 193                                       | 250                 | 0.2   | 83.8                                       | F            |  |              | 234                               | 474                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| SBT                                      | 340  |          |                                 | 334                                       | 300                 | 0.3   | 67.7                                       | E            | 71.4                                       | E            | 234                               | 474                                  | 165                           | 173  | 186.9                              | 34                      | 34                                   | 24.8                             |    |      |
| SBR                                      | 39   |          |                                 | 37  | 75                  | 0.3   | 40.4                                       | D            |  |              | 234                               | 474                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| Overall                                  |  |          |                                 |   | 2,936               | 2,615 |  | 6.1          | 54.7                                       | D            |                                   |                                      |                               |  | 1,115                              | 1,138                   | 127.4                                | 77                               | 77 | 35.3 |
| 19                                       | S Eads Street and I-395 HOT Lanes (South Node) | NBL      | 288                             | 265                                       | 150                 | 1.4   | 28.0                                       | C            |  |              | 50                                | 281                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBT      | 363                             | 349                                       | 170                 | 0.7   | 7.3  | A            | 16.2                                       | B            | 50                                | 281                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBR      | 761                             | 725                                       | 170                 | 1.3   | 7.8  | A            |  |              | 49                                | 330                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBL      | 270                             | 266                                       | 100                 | 0.2   | 3.1  | A            |  |              | 15                                | 224                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBT      | 334                             | 345                                       | 100                 | 0.6   | 5.2  | A            | 3.1  | A            | 14                                | 221                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | Overall  |                                 |   | 2,016               | 1,950 |  | 1.5          | 9.4  | A            |                                   |                                      |                               |  |                                    |                         |                                      |                                  |    |      |
| 20                                       | S Eads Street and I-395 HOT Lanes (North Node) | WBL      | 210                             | 218                                       | 1,250               | 0.5   | 33.2                                       | C            |  |              | 38                                | 211                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBR      | 106                             | 106                                       | 1,250               | 0.0   | 25.9                                       | C            | 33.2                                       | C            | 38                                | 211                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBT      | 363                             | 349                                       | 100                 | 0.7   | 5.7  | A            | 5.7  | A            | 8                                 | 186                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBT      | 394                             | 394                                       | 100                 | 0.0   | 4.8  | A            | 4.8  | A            | 7                                 | 158                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBR      | 1,057                           | 1,056                                     | 100                 | 0.0   | 0.3  | A            |  |              | 5                                 | 154                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | Overall  |                                 |   | 2,130               | 2,123 |  | 0.2          | 6.7  | A            |                                   |                                      |                               |  |                                    |                         |                                      |                                  |    |      |
| 21                                       | 14th Street S and S Eads Street                | EBL      | 40                              | 39  | 200                 | 0.2   | 73.3                                       | E            |  |              | 22                                | 124                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | EBT      | 0                               | 0   | 200                 | 0.0   | 0.0  | A            | 74.3                                       | E            | 22                                | 124                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | EBR      | 9                               | 8   | 200                 | 0.3   | 79.0                                       | E            |  |              | 22                                | 124                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBL      | 35                              | 35  | 150                 | 0.0   | 59.4                                       | E            |  |              | 26                                | 119                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBT      | 0                               | 0   | 150                 | 0.0   | 0.0  | A            | 86.6                                       | F            | 29                                | 123                                  | 303                           | 307  | 65.9                               |                         |                                      |                                  |    |      |
|  |  | WBR      | 25                              | 28  | 150                 | 0.6   | 120.6                                      | F            |  |              | 26                                | 119                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBL      | 0                               | 0   | 100                 | 0.0   | 0.0  | A            |  |              | 173                               | 462                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBT      | 648                             | 567                                       | 350                 | 3.3   | 38.7                                       | D            | 38.6                                       | D            | 173                               | 462                                  | 326                           | 330  | 65.6                               | 43                      | 42                                   | 1.8                              |    |      |
|  |  | NBR      | 30                              | 26  | 350                 | 0.8   | 37.2                                       | D            |  |              | 183                               | 476                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBL      | 15                              | 16  | 100                 | 0.3   | 84.8                                       | F            |  |              | 129                               | 380                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBT      | 531                             | 512                                       | 290                 | 0.8   | 35.6                                       | D            | 37.0                                       | D            | 129                               | 380                                  | 65                            | 62   | 65.3                               | 29                      | 30                                   | 2.6                              |    |      |
|  |  | SBR      | 7                               | 7   | 290                 | 0.0   | 30.2                                       | C            |  |              | 131                               | 382                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | Overall  |                                 |   | 1,340               | 1,238 |  | 2.8          | 41.7                                       | D            |                                   |                                      |                               |  | 694                                | 699                     | 65.7                                 | 72                               | 72 | 2.1  |

Source: VISSIM 11.0 Node Evaluation. Compiled by Gorove/Slade Associates based on the average of 10 VISSIM model runs.

\* GEH statistic is computed as follows. GEH<5 indicates good fit.

$$GEH = \sqrt{\frac{(\text{Simulated Volume} - \text{Input Volume})^2}{(\text{Simulated Volume} + \text{Input Volume})/2}}$$



## J. 2025 Mitigated Future VISSIM Delay and Queue Results

| Pen Place - VISSIM Delay & Queue Results<br>2025 Future Mitigated Build AM Peak Conditions |  |          |                                |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |      |      |     |
|--|--|----------|--------------------------------|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|------|------|-----|
| Intersection #   | Intersection Name                                | Movement | Input Vehicular Volume (vph)   | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |      |      |     |
| 1  | Army-Navy Drive and S Hayes Street/I-395 Ramp    | EBL      | 35                             | 38  | 260                 | 0.5   | 77.8                                       | E            |  |              |                                   | 17                                   | 110                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | EBT      | 387                            | 394                                       | 450                 | 0.4   | 51.6                                       | D            |  | 54.0         | D                                 | 87                                   | 278                           |  | 115                                | 76.5                    | 69                                   | 66                               | 52.3 |      |     |
|  |  | EBR      | 113                            | 134                                       | 450                 | 1.9   | 54.3                                       | D            |  |              |                                   | 87                                   | 278                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBL      | 77                             | 80  | 190                 | 0.3   | 79.7                                       | E            |  |              |                                   | 39                                   | 182                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBT      | 247                            | 244                                       | 430                 | 0.2   | 37.2                                       | D            |  | 18.7         | B                                 | 34                                   | 188                           | 2  | 2                                  | 96.9                    | 54                                   | 55                               | 51.7 |      |     |
|  |  | WBR      | 519                            | 518                                       | 430                 | 0.0   | 0.5  | A            |  |              |                                   | 0                                    | 38                            |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBL      | 58                             | 68  | 200                 | 1.3   | 74.9                                       | E            |  |              |                                   | 30                                   | 120                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBT      | 304                            | 308                                       | 750                 | 0.2   | 65.5                                       | E            |  | 56.0         | E                                 | 76                                   | 300                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBR      | 113                            | 112                                       | 115                 | 0.1   | 18.4                                       | F            |  |              |                                   | 8                                    | 176                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBL      | 875                            | 838                                       | 2,050               | 1.3   | 110.9                                      | F            |  |              |                                   | 1,882                                | 2,625                         |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBT      | 1,269                          | 1,198                                     | 1,950               | 2.0   | 51.9                                       | D            |  | 70.2         | E                                 | 1,882                                | 2,625                         |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBR      | 345                            | 343                                       | 1,950               | 0.1   | 34.9                                       | C            |  |              |                                   | 1,879                                | 2,622                         |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | Overall  |                                | 4,342                                     | 4,275               | ---   | 1.0  | 56.3         | E  | ---          | ---                               | ---                                  | ---                           | ---  | 120                                | 117                     | 76.8                                 | 123                              | 121  | 52.0 |     |
| 2  | Army-Navy Drive and S Fern Street                | EBL      | 85                             | 90  | 160                 | 0.5   | 31.0                                       | C            |  |              |                                   | 9                                    | 138                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | EBT      | 1,052                          | 1,024                                     | 430                 | 0.9   | 40.2                                       | D            |  | 40.4         | D                                 | 206                                  | 597                           | 263  | 259                                | 66.6                    | 69                                   | 65                               | 23.7 |      |     |
|  |  | EBR      | 238                            | 218                                       | 180                 | 1.3   | 45.1                                       | D            |  |              |                                   | 69                                   | 544                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBL      | 117                            | 118                                       | 80                  | 0.1   | 125.3                                      | F            |  |              |                                   | 95                                   | 311                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBT      | 509                            | 506                                       | 260                 | 0.1   | 9.5  | A            |  | 30.0         | C                                 | 95                                   | 311                           | 179  | 175                                | 64.8                    | 73                                   | 70                               | 4.5  |      |     |
|  |  | WBR      | 48                             | 45  | 260                 | 0.4   | 10.4                                       | B            |  |              |                                   | 69                                   | 315                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBL      | 178                            | 183                                       | 280                 | 0.4   | 67.1                                       | E            |  |              |                                   | 63                                   | 275                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBT      | 33                             | 33  | 390                 | 0.0   | 24.8                                       | C            |  | 55.8         | E                                 | 5                                    | 53                            | 221  | 225                                | 64.5                    | 23                                   | 23                               | 15.2 |      |     |
|  |  | NBR      | 45                             | 43  | 80                  | 0.3   | 31.4                                       | C            |  |              |                                   | 7                                    | 70                            |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBL      | 116                            | 115                                       | 75                  | 0.1   | 51.8                                       | D            |  |              |                                   | 45                                   | 388                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBT      | 224                            | 220                                       | 560                 | 0.3   | 54.2                                       | D            |  | 56.3         | E                                 | 109                                  | 433                           | 355  | 362                                | 65.2                    | ---                                  | ---                              | ---  | ---  |     |
|  |  | SBR      | 156                            | 157                                       | 560                 | 0.1   | 62.4                                       | E            |  |              |                                   | 108                                  | 432                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | Overall  |                                | 2,801                                     | 2,752               | ---   | 0.9  | 42.1         | D  | ---          | ---                               | ---                                  | ---                           | ---  | 1,018                              | 1,021                   | 65.3                                 | 165                              | 158  | 14.0 |     |
| 3  | Army-Navy Drive and Parking Lot                  | EBL      | 35                             | 37  | 120                 | 0.3   | 2.6  | A            |  |              |                                   | 33                                   | 376                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | EBT      | 1,094                          | 1,064                                     | 260                 | 0.9   | 2.5  | A            |  | 6.5          | A                                 | 33                                   | 376                           | 61   | 63                                 | 65.8                    | 56                                   | 52                               | 4.2  |      |     |
|  |  | EBR      | 84                             | 82  | 225                 | 0.2   | 60.0                                       | E            |  |              |                                   | 33                                   | 376                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBL      | 655                            | 649                                       | 230                 | 0.2   | 3.7  | A            |  | 3.7          | A                                 | 7                                    | 215                           | 12   | 11                                 | 32.1                    | 110                                  | 107                              | 0.8  |      |     |
|  |  | WBT      | 26                             | 24  | 230                 | 0.4   | 4.6  | A            |  |              |                                   | 8                                    | 232                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBR      | 12                             | 14  | 100                 | 0.6   | 75.3                                       | E            |  |              |                                   | 10                                   | 86                            |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBL      | 0                              | 0   | 100                 | 0.0   | 0.0  | A            |  | 74.5         | E                                 | 12                                   | 89                            |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBT      | 14                             | 11  | 100                 | 0.8   | 73.4                                       | E            |  |              |                                   | 10                                   | 86                            |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBR      | 2                              | 2   | 100                 | 0.0   | 71.9                                       | E            |  |              |                                   | 1                                    | 51                            |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBL      | 0                              | 0   | 100                 | 0.0   | 0.0  | A            |  | 27.7         | C                                 | 1                                    | 51                            |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBT      | 7                              | 8   | 100                 | 0.4   | 16.7                                       | B            |  |              |                                   | 1                                    | 56                            |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBR      |                                |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | Overall  |                                | 1,929                                     | 1,891               | ---   | 0.9  | 6.5          | A  | ---          | ---                               | ---                                  | ---                           | ---  | 73                                 | 74                      | 60.8                                 | 166                              | 159  | 1.9  |     |
| 4  | Army-Navy Drive and S Eads Street                | EBL      | 489                            | 466                                       | 220                 | 1.1   | 20.5                                       | C            |  |              |                                   | 57                                   | 235                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | EBT      | 335                            | 333                                       | 220                 | 0.1   | 12.8                                       | B            |  | 17.5         | B                                 | 62                                   | 236                           | 24   | 23                                 | 68.5                    | 56                                   | 52                               | 12.0 |      |     |
|  |  | EBR      | 286                            | 274                                       | 220                 | 0.7   | 18.0                                       | B            |  |              |                                   | 57                                   | 234                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBL      | 272                            | 272                                       | 1,100               | 0.0   | 55.5                                       | E            |  |              |                                   | 55                                   | 184                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBT      | 60                             | 59  | 100                 | 0.1   | 20.3                                       | C            |  | 49.2         | D                                 | 61                                   | 194                           | 46   | 46                                 | 67.2                    | 103                                  | 99                               | 29.4 |      |     |
|  |  | WBR      | 127                            | 127                                       | 100                 | 0.0   | 71.3                                       | E            |  |              |                                   | 58                                   | 262                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBL      | 274                            | 274                                       | 240                 | 0.0   | 14.5                                       | B            |  | 14.3         | B                                 | 29                                   | 274                           | 19   | 21                                 | 63.8                    | 64                                   | 65                               | 26.6 |      |     |
|  |  | NBT      | 24                             | 23  | 240                 | 0.2   | 11.4                                       | B            |  |              |                                   | 29                                   | 274                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBR      | 48                             | 48  | 140                 | 0.0   | 26.9                                       | C            |  |              |                                   | 173                                  | 357                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBL      | 503                            | 493                                       | 140                 | 0.4   | 37.2                                       | D            |  | 26.4         | C                                 | 173                                  | 357                           | 37   | 39                                 | 65.8                    | ---                                  | ---                              | ---  | ---  |     |
|  |  | SBT      | 282                            | 275                                       | 110                 | 0.4   | 7.0  | A            |  |              |                                   | 180                                  | 367                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBR      |                                |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | Overall  |                                | 2,700                                     | 2,644               | ---   | 1.1  | 26.4         | C  | ---          | ---                               | ---                                  | ---                           | ---  | 126                                | 129                     | 66.5                                 | 223                              | 216  | 24.4 |     |
| 5  | Army-Navy Drive and VA110 Off-Ramp               | EBT      | 407                            | 404                                       | ---                 | 0.1   | 0.1  | A            |  | 0.1          | A                                 | 0                                    | 0                             |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBT      | 203                            | 203                                       | 1,000               | 0.0   | 3.2  | A            |  | 3.2          | A                                 | 1                                    | 111                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBR      | 129                            | 123                                       | 900                 | 0.5   | 2.1  | A            |  | 2.1          | A                                 | 0                                    | 0                             |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | Overall  |                                | 739                                       | 730                 | ---   | 0.3  | 1.3          | A  | ---          | ---                               | ---                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  | ---  |     |
| 6  | S Eads Street and 11th Street S/Pen Place Access | EBL      | 36                             | 35  | 200                 | 0.2   | 56.9                                       | E            |  |              |                                   | 17                                   | 105                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | EBT      | 0                              | 0   | 200                 | 0.0   | 0.0  | A            |  | 55.1         | E                                 | 17                                   | 105                           | 74   | 69                                 | 65.1                    | ---                                  | ---                              | ---  |      |     |
|  |  | EBR      | 36                             | 35  | 200                 | 0.2   | 53.2                                       | D            |  |              |                                   | 17                                   | 105                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBL      | 21                             | 22  | 300                 | 0.2   | 60.7                                       | E            |  |              |                                   | 15                                   | 112                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBT      | 0                              | 0   | 300                 | 0.0   | 0.0  | A            |  | 59.1         | E                                 | 15                                   | 112                           | 57   | 54                                 | 63.6                    | ---                                  | ---                              | ---  | ---  |     |
|  |  | WBR      | 25                             | 25  | 300                 | 0.0   | 57.6                                       | E            |  |              |                                   | 15                                   | 112                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBL      | 184                            | 186                                       | 100                 | 0.1   | 17.4                                       | B            |  |              |                                   | 15                                   | 254                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBT      | 364                            | 359                                       | 250                 | 0.3   | 9.2  | A            |  | 11.8         | B                                 | 19                                   | 243                           | 70   | 68                                 | 66.1                    | 61                                   | 62                               | 0.5  |      |     |
|  |  | NBR      | 28                             | 27  | 250                 | 0.2   | 7.3  | A            |  |              |                                   | 20                                   | 246                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBL      | 14                             | 14  | 250                 | 0.0   | 11.7                                       | B            |  |              |                                   | 50                                   | 362                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBT      | 602                            | 584                                       | 250                 | 0.7   | 10.3                                       | B            |  | 9.5          | A                                 | 50                                   | 362                           | 95   | 93                                 | 67.6                    | 79                                   | 73                               | 8.2  |      |     |
|  |  | SBR      | 173                            | 171                                       | 25                  | 0.2   | 6.5  | A            |  |              |                                   | 41                                   | 365                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | Overall  |                                | 1,483                                     | 1,458               | ---   | 0.7  | 14.2         | B  | ---          | ---                               | ---                                  | ---                           | ---  | 296                                | 284                     | 65.9                                 | 140                              | 135  | 4.7  |     |
| 7  | 12th Street S and S Hayes Street                 | EBL      | 25                             | 29  | 450                 | 0.8   | 53.5                                       | D            |  |              |                                   | 25                                   | 134                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | EBT      | 15                             | 16  | 450                 | 0.3   | 39.8                                       | D            |  | 49.1         | D                                 | 25                                   | 134                           | 705  | 726                                | 64.1                    | ---                                  | ---                              | ---  |      |     |
|  |  | EBR      | 45                             | 45  | 65                  | 0.0   | 49.6                                       | D            |  |              |                                   | 24                                   | 132                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBL      | 33                             | 34  | 100                 | 0.2   | 60.0                                       | E            |  |              |                                   | 37                                   | 191                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBT      | 40                             | 39  | 620                 | 0.2   | 51.5                                       | D            |  | 53.7         | D                                 | 37                                   | 191                           | 371  | 379                                | 64.9                    | ---                                  | ---                              | ---  | ---  |     |
|  |  | WBR      | 73                             | 70  | 620                 | 0.4   | 51.9                                       | D            |  |              |                                   | 37                                   | 191                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBL      | 30                             | 26  | 75                  | 0.8   | 75.7                                       | E            |  |              |                                   | 39                                   | 182                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBT      | 402                            | 399                                       | 775                 | 0.1   | 28.4                                       | C            |  | 30.1         | C                                 | 39                                   | 182                           | 51   | 52                                 | 64.4                    | ---                                  | ---                              | ---  | ---  |     |
|  |  | NBR      | 25                             | 26  | 75                  | 0.2   | 11.3                                       | B            |  |              |                                   | 39                                   | 187                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBL      | 395                            | 372                                       | 250                 | 1.2   | 65.6                                       | E            |  |              |                                   | 219                                  | 497                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBT      | 1,023                          | 985                                       | 770                 | 1.2   | 13.7                                       | B            |  | 27.3         | C                                 | 219                                  | 497                           | 285  | 272                                | 62.3                    | ---                                  | ---                              | ---  | ---  |     |
|  |  | SBR      | 75                             | 73  | 770                 | 0.2   | 15.9                                       | B            |  |              |                                   | 219                                  | 497                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | Overall  |                                | 2,181                                     | 2,114               | ---   | 1.4  | 30.6         | C  | ---          | ---                               | ---                                  | ---                           | ---  | 1,412                              | 1,429                   | 64.0                                 | ---                              | ---  | ---  | --- |
| 8  | 12th Street S and S Fern Street                  | EBT      | 268                            | 259                                       | 640                 | 0.6   | 30.5                                       | C            |  |              |                                   | 115                                  | 589                           | 1,015                                      | 990                                | 64.5                    | ---                                  | ---                              | ---  |      |     |
|  |  | EBR      | 167                            | 156                                       | 640                 | 0.9   | 28.7                                       | C            |  | 29.8         | C                                 | 120                                  | 598                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBL      | 78                             | 77  | 75                  | 0.1   | 87.3                                       | F            |  |              |                                   | 47                                   | 238                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | WBT      | 45                             | 42  | 225                 | 0.5   | 4.8  | A            |  | 39.7         | D                                 | 45                                   | 242                           | 885  | 857                                | 64.5                    | ---                                  | ---                              | ---  | ---  |     |
|  |  | WBR      | 68                             | 70  | 225                 | 0.2   | 8.3  | A            |  |              |                                   | 50                                   | 241                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBL      | 76                             | 76  | 100                 | 0.0   | 42.3                                       | D            |  |              |                                   | 266                                  | 425                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | NBT      | 386                            | 384                                       | 280                 | 0.1   | 50.1                                       | D            |  | 48.4         | D                                 | 233                                  | 383                           | 482  | 484                                | 64.0                    | ---                                  | ---                              | ---  | ---  |     |
|  |  | NBR      | 77                             | 72  | 280                 | 0.6   | 45.7                                       | D            |  |              |                                   | 232                                  | 383                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBL      | 142                            | 138                                       | 180                 | 0.3   | 55.2                                       | E            |  |              |                                   | 59                                   | 345                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | SBT      | 285                            | 283                                       | 275                 | 0.1   | 18.2                                       | B            |  | 17.9         | B                                 | 43                                   | 426                           | 774  | 782                                | 65.3                    | ---                                  | ---                              | ---  | ---  |     |
|  |  | SBR      | 25                             | 26  | 275                 | 0.2   | 14.9                                       | B            |  |              |                                   | 43                                   | 426                           |  |                                    |                         |                                      |                                  |      |      |     |
|  |  | Overall  |                                | 1,617                                     | 1,583               | ---   | 0.9  | 37.1         | D  | ---          | ---                               | ---                                  | ---                           | ---  | 3,156                              | 3,113                   | 64.6                                 | ---                              | ---  | ---  | --- |
|  |  | 9        | 12th Street S and S Elm Street | EBT                                       | 378                 | 365   | 225  | 0.7          | 17.3                                       | B            |                                   |                                      |                               | 44   | 349                                | 343                     | 349                                  | 3.5                              | ---  | ---  | --- |
| EBR  | 109  |          |                                | 105                                       | 225                 | 0.4   | 14.5                                       | B            |  | 16.7         | B                                 | 45                                   | 351                           |  |                                    |                         |                                      |                                  |      |      |     |
| WBT  | 191  |          |                                | 189                                       | 325                 | 0.1   | 0.9  | A            |  | 0.9          | A                                 | 1                                    | 56                            |  |                                    |                         |                                      |                                  |      |      |     |

| Pen Place - VISSIM Delay & Queue Results<br>2025 Future Mitigated Build AM Peak Conditions |  |          |                              |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |     |      |
|--|--|----------|------------------------------|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|-----|------|
| Intersection #   | Intersection Name                                | Movement | Input Vehicular Volume (vph) | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |     |      |
| 12   | 12th Street and Long Bridge Drive/S Clark Street | EBL      | 479                          | 470                                       | 120                 | 0.4   | 5.4  | A            |  |              | 15                                | 215                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | EBT      | 252                          | 248                                       | 120                 | 0.3   | 2.5  | A            | 3.9  | A            | 15                                | 215                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | EBR      | 434                          | 437                                       | 120                 | 0.1   | 3.1  | A            |  |              | 15                                | 215                                  | 110                           | 110  | 64.2                               |                         |                                      |                                  |     |      |
|  |  | WBL      | 35                           | 35  | 100                 | 0.0   | 21.5                                       | C            |  |              | 3                                 | 74                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | WBT      | 192                          | 206                                       | 1,500               | 1.0   | 26.0                                       | C            | 19.0                                       | B            | 37                                | 323                                  | 157                           | 160  | 64.1                               |                         |                                      |                                  |     |      |
|  |  | WBR      | 180                          | 184                                       | 1,500               | 0.3   | 10.6                                       | B            |  |              | 40                                | 334                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBL      | 50                           | 51  | 100                 | 0.1   | 69.3                                       | E            |  |              | 23                                | 138                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBT      | 22                           | 22  | 1,200               | 0.0   | 46.2                                       | D            | 57.1                                       | E            | 23                                | 138                                  | 62                            | 65   | 62.8                               | 34                      | 32                                   | 32.7                             |     |      |
|  |  | NBR      | 10                           | 10  | 1,200               | 0.0   | 18.8                                       | B            |  |              | 26                                | 143                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBL      | 58                           | 58  | 450                 | 0.0   | 82.7                                       | F            |  |              | 255                               | 870                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBT      | 149                          | 150                                       | 450                 | 0.1   | 80.2                                       | F            | 85.7                                       | F            | 255                               | 870                                  | 18                            | 18   | 64.2                               | 25                      | 28                                   | 57.3                             |     |      |
|  |  | SBR      | 197                          | 188                                       | 150                 | 0.6   | 91.1                                       | F            |  |              | 255                               | 870                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | Overall  |                              |   | 2,058               | 2,059 |  | 0.0          | 24.9                                       | C            |                                   |                                      |                               |  | 347                                | 353                     | 63.9                                 | 59                               | 60  | 44.2 |
| 14   | 13th Street S and S Eads Street                  | EBL      | 47                           | 44  | 350                 | 0.4   | 72.6                                       | E            | 61.7                                       | E            | 42                                | 198                                  | 53                            | 51   | 67.6                               |                         |                                      |                                  |     |      |
|  |  | EBR      | 96                           | 96  | 350                 | 0.0   | 56.7                                       | E            |  |              | 42                                | 198                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBL      | 81                           | 80  | 150                 | 0.1   | 8.9  | A            |  |              | 120                               | 427                                  |                               |  |                                    |                         | 73                                   | 72                               | 0.2 |      |
|  |  | NBT      | 596                          | 602                                       | 300                 | 0.2   | 23.4                                       | C            | 21.7                                       | C            | 120                               | 427                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBT      | 382                          | 372                                       | 280                 | 0.5   | 5.6  | A            |  |              | 11                                | 167                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBR      | 81                           | 73  | 280                 | 0.9   | 3.0  | A            | 5.2  | A            | 12                                | 169                                  | 147                           | 144  | 58.8                               | 41                      | 36                                   | 1.3                              |     |      |
|  |  | Overall  |                              |   | 1,283               | 1,267 |  | 0.4          | 20.3                                       | C            |                                   |                                      |                               |  | 200                                | 195                     | 61.1                                 | 114                              | 108 | 0.5  |
|  |  | Overall  |                              |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |     |      |
| 16   | 15th Street S and S Fern Street                  | EBL      | 35                           | 34  | 130                 | 0.2   | 43.6                                       | D            |  |              | 61                                | 297                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | EBT      | 419                          | 421                                       | 630                 | 0.1   | 38.1                                       | D            | 38.3                                       | D            | 61                                | 297                                  | 41                            | 42   | 64.9                               |                         |                                      |                                  |     |      |
|  |  | EBR      | 15                           | 16  | 630                 | 0.3   | 31.0                                       | C            |  |              | 62                                | 299                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | WBL      | 61                           | 60  | 120                 | 0.1   | 34.5                                       | C            |  |              | 40                                | 243                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | WBT      | 185                          | 187                                       | 260                 | 0.1   | 23.8                                       | C            | 23.4                                       | C            | 40                                | 243                                  | 21                            | 22   | 63.0                               |                         |                                      |                                  |     |      |
|  |  | WBR      | 236                          | 235                                       | 260                 | 0.1   | 20.2                                       | C            |  |              | 42                                | 246                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBL      | 22                           | 21  | 750                 | 0.2   | 62.9                                       | E            |  |              | 222                               | 840                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBT      | 237                          | 235                                       | 750                 | 0.1   | 68.2                                       | E            | 53.2                                       | D            | 222                               | 840                                  | 41                            | 41   | 68.2                               |                         |                                      |                                  |     |      |
|  |  | NBR      | 199                          | 201                                       | 75                  | 0.1   | 34.7                                       | C            |  |              | 226                               | 845                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBL      | 186                          | 179                                       | 160                 | 0.5   | 41.6                                       | D            |  |              | 50                                | 331                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBT      | 62                           | 59  | 300                 | 0.4   | 25.7                                       | C            | 33.0                                       | C            | 50                                | 331                                  | 41                            | 43   | 66.1                               |                         |                                      |                                  |     |      |
|  |  | SBR      | 54                           | 51  | 300                 | 0.4   | 11.5                                       | B            |  |              | 50                                | 336                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | Overall  |                              |   | 1,711               | 1,699 |  | 0.3          | 37.2                                       | D            | 43.0                              |                                      |                               |  | 144                                | 148                     | 65.9                                 |                                  |     |      |
| 17   | 15th Street S and S Elm Street                   | EBL      | 31                           | 33  | 60                  | 0.4   | 9.1  | A            | 12.1                                       | B            | 35                                | 325                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | EBT      | 773                          | 773                                       | 270                 | 0.0   | 12.2                                       | B            |  |              | 35                                | 325                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | WBT      | 432                          | 433                                       | 300                 | 0.0   | 1.5  | A            | 1.7  | A            | 3                                 | 136                                  | 88                            | 91   | 66.3                               |                         |                                      |                                  |     |      |
|  |  | WBR      | 209                          | 208                                       | 300                 | 0.1   | 2.1  | A            |  |              | 3                                 | 136                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBL      | 19                           | 18  | 250                 | 0.2   | 44.5                                       | D            | 18.9                                       | B            | 4                                 | 61                                   | 12                            | 12   | 61.4                               |                         |                                      |                                  |     |      |
|  |  | SBR      | 50                           | 52  | 250                 | 0.3   | 10.0                                       | A            |  |              | 3                                 | 72                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | Overall  |                              |   | 1,514               | 1,517 |  | 0.1          | 8.0  | A            |                                   |                                      |                               |  | 100                                | 103                     | 65.8                                 |                                  |     |      |
| 18   | 15th Street S and S Eads Street                  | EBL      | 65                           | 67  | 170                 | 0.2   | 46.8                                       | D            |  |              | 29                                | 339                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | EBT      | 672                          | 673                                       | 300                 | 0.0   | 44.9                                       | D            | 45.0                                       | D            | 141                               | 411                                  | 340                           | 346  | 66.0                               |                         |                                      |                                  |     |      |
|  |  | EBR      | 55                           | 55  | 300                 | 0.0   | 44.5                                       | D            |  |              | 141                               | 411                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | WBL      | 89                           | 90  | 300                 | 0.1   | 33.1                                       | C            |  |              | 249                               | 489                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | WBT      | 547                          | 549                                       | 300                 | 0.1   | 43.5                                       | D            | 46.9                                       | D            | 249                               | 489                                  | 209                           | 213  | 65.8                               |                         |                                      |                                  |     |      |
|  |  | WBR      | 252                          | 253                                       | 300                 | 0.1   | 59.2                                       | E            |  |              | 249                               | 489                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBL      | 85                           | 83  | 130                 | 0.2   | 43.8                                       | D            |  |              | 349                               | 927                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBT      | 364                          | 361                                       | 760                 | 0.2   | 54.5                                       | D            | 43.2                                       | D            | 349                               | 927                                  | 389                           | 387  | 185.7                              | 87                      | 85                                   | 27.2                             |     |      |
|  |  | NBR      | 277                          | 276                                       | 130                 | 0.1   | 28.3                                       | C            |  |              | 89                                | 920                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBL      | 212                          | 211                                       | 250                 | 0.1   | 43.2                                       | D            |  |              | 67                                | 324                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBT      | 212                          | 205                                       | 300                 | 0.5   | 23.6                                       | C            | 33.1                                       | C            | 67                                | 324                                  | 199                           | 203  | 189.7                              | 66                      | 61                                   | 18.8                             |     |      |
|  |  | SBR      | 9                            | 8   | 75                  | 0.3   | 8.9  | A            |  |              | 57                                | 327                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | Overall  |                              |   | 2,839               | 2,831 |  | 0.2          | 43.4                                       | D            |                                   |                                      |                               |  | 1,137                              | 1,149                   | 128.1                                | 153                              | 146 | 23.7 |
| 19   | S Eads Street and I-395 HOT Lanes (South Node)   | EBT      | 2                            | 2   | 1,000               | 0.0   | 56.7                                       | E            | 102.4                                      | F            | 485                               | 934                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | EBR      | 533                          | 537                                       | 1,000               | 0.2   | 102.6                                      | F            |  |              | 485                               | 934                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBT      | 185                          | 187                                       | 170                 | 0.1   | 49.5                                       | D            | 17.1                                       | B            | 24                                | 226                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBR      | 638                          | 613                                       | 170                 | 1.0   | 7.2  | A            |  |              | 56                                | 285                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBL      | 145                          | 122                                       | 100                 | 2.0   | 11.0                                       | B            | 33.3                                       | C            | 90                                | 234                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBT      | 300                          | 281                                       | 100                 | 1.1   | 43.0                                       | D            |  |              | 90                                | 234                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | Overall  |                              |   | 1,803               | 1,742 |  | 1.4          | 47.2                                       | D            |                                   |                                      |                               |  |                                    |                         |                                      |                                  |     |      |
| 20   | S Eads Street and I-395 HOT Lanes (North Node)   | EBL      | 841                          | 823                                       | 875                 | 0.6   | 50.9                                       | D            | 50.9                                       | D            | 141                               | 481                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | WBL      | 204                          | 197                                       | 1,250               | 0.5   | 208.1                                      | F            | 152.4                                      | F            | 324                               | 701                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | WBR      | 100                          | 98  | 1,250               | 0.2   | 40.4                                       | D            |  |              | 324                               | 701                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBT      | 185                          | 190                                       | 100                 | 0.4   | 50.5                                       | D            | 50.5                                       | D            | 99                                | 267                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBT      | 241                          | 205                                       | 100                 | 2.4   | 111.3                                      | F            | 111.3                                      | F            | 128                               | 255                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | Overall  |                              |   | 1,571               | 1,513 |  | 1.5          | 78.8                                       | E            |                                   |                                      |                               |  |                                    |                         |                                      |                                  |     |      |
| 21   | 14th Street S and S Eads Street                  | EBL      | 6                            | 5   | 200                 | 0.4   | 85.4                                       | F            |  |              | 3                                 | 45                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | EBT      | 0                            | 0   | 200                 | 0.0   | 0.0  | A            | 85.4                                       | F            | 3                                 | 45                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | EBR      | 0                            | 0   | 200                 | 0.0   | 0.0  | A            |  |              | 3                                 | 45                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | WBL      | 20                           | 21  | 150                 | 0.2   | 50.7                                       | D            |  |              | 23                                | 98                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | WBT      | 0                            | 0   | 150                 | 0.0   | 0.0  | A            | 91.4                                       | F            | 23                                | 98                                   | 286                           | 290  | 66.4                               |                         |                                      |                                  |     |      |
|  |  | WBR      | 25                           | 27  | 150                 | 0.4   | 123.0                                      | F            |  |              | 23                                | 98                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBL      | 0                            | 0   | 100                 | 0.0   | 0.0  | A            |  |              | 78                                | 406                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBT      | 656                          | 656                                       | 350                 | 0.0   | 18.4                                       | B            | 18.4                                       | B            | 78                                | 406                                  | 509                           | 510  | 51.4                               | 73                      | 73                                   | 0.5                              |     |      |
|  |  | NBR      | 25                           | 25  | 350                 | 0.0   | 18.0                                       | B            |  |              | 81                                | 414                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBL      | 25                           | 27  | 100                 | 0.4   | 77.8                                       | E            |  |              | 31                                | 312                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | SBT      | 413                          | 402                                       | 290                 | 0.5   | 8.3  | A            | 12.2                                       | B            | 31                                | 312                                  | 170                           | 176  | 66.5                               | 40                      | 36                                   | 12.1                             |     |      |
|  |  | SBR      | 40                           | 40  | 290                 | 0.0   | 7.6  | A            |  |              | 32                                | 315                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | Overall  |                              |   | 1,210               | 1,203 |  | 0.2          | 19.2                                       | B            |                                   |                                      |                               |  | 965                                | 976                     | 58.6                                 | 113                              | 109 | 4.3  |
| 22   | S Fern Street and 11th Street S/Pen Place Access | EBL      | 2                            | 3   | 450                 | 0.6   | 68.8                                       | E            | 68.8                                       | E            | 2                                 | 73                                   | 96                            | 94   | 66.7                               |                         |                                      |                                  |     |      |
|  |  | EBT      | 0                            | 0   | 450                 | 0.0   | 0.0  | A            |  |              | 2                                 | 73                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | EBR      | 1                            | 0   | 450                 | 1.4   | 70.2                                       | E            |  |              | 2                                 | 73                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | WBL      | 31                           | 31  | 150                 | 0.0   | 52.1                                       | D            |  |              | 11                                | 70                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | WBT      | 0                            | 0   | 150                 | 0.0   | 0.0  | A            | 56.2                                       | E            | 11                                | 70                                   | 168                           | 160  | 65.7                               |                         |                                      |                                  |     |      |
|  |  | WBR      | 16                           | 14  | 150                 | 0.5   | 65.2                                       | E            |  |              | 11                                | 70                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBL      | 42                           | 42  | 75                  | 0.0   | 64.4                                       | E            |  |              | 24                                | 194                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|  |  | NBT      | 238                          | 239                                       | 275                 | 0.1   | 28.2                                       | C            | 32.3                                       | C            | 82                                | 347                                  | 78                            | 76   | 62.7                               | 29                      | 28                                   | 13.3                             |     |      |
|  |  | NBR      | 174                          | 175                                       | 275                 | 0.1   | 30.2                                       |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |     |      |

**Pen Place - VISSIM Delay & Queue Results  
2025 Future Mitigated Build PM Peak Conditions**

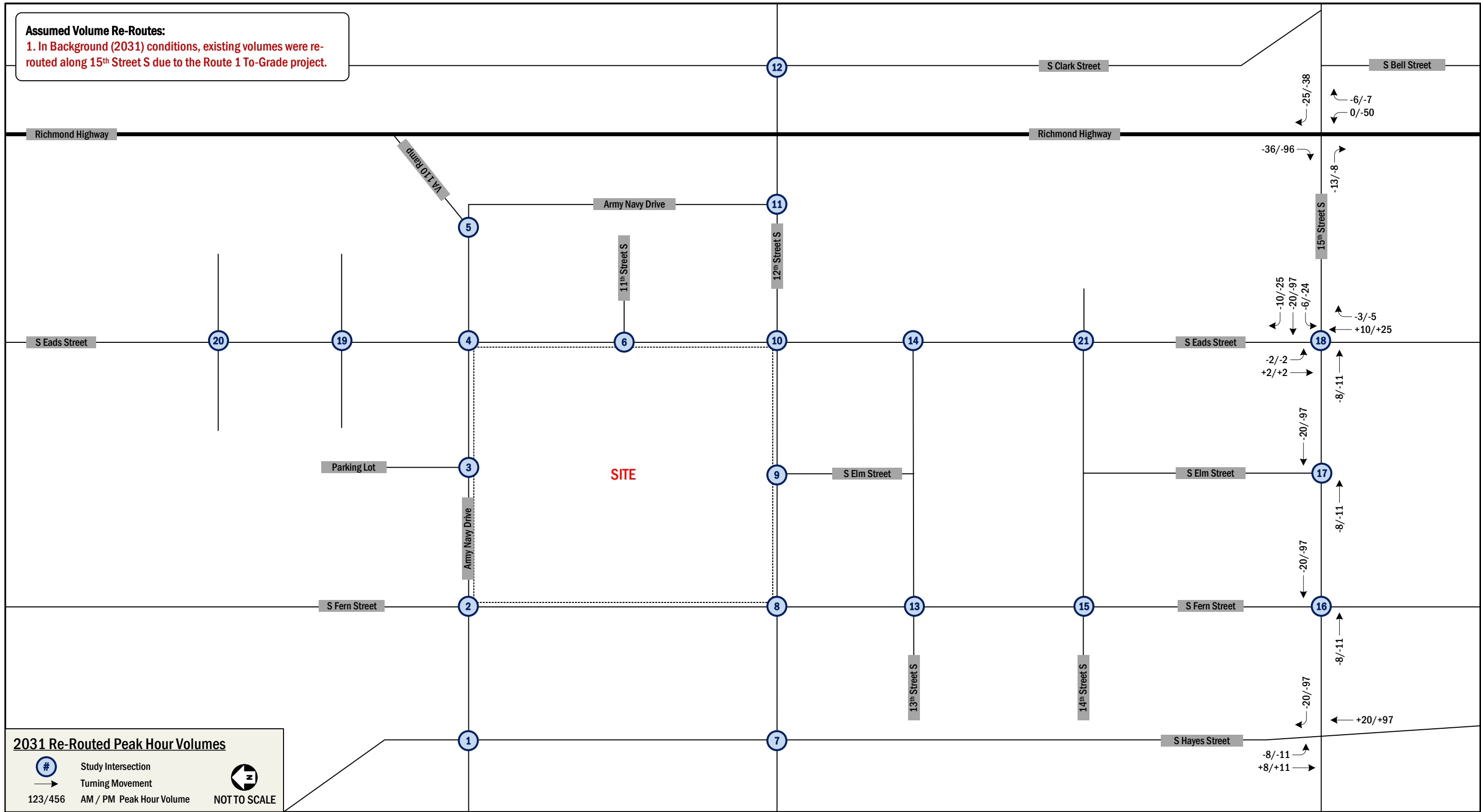
| Intersection # | Intersection Name                                | Movement | Input Vehicular Volume (vph) <sup>1</sup> | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |     |      |
|----------------|--|----------|---|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|-----|------|
| 1              | Army-Navy Drive and S Hayes Street/I-395 Ramp    | EBL      | 155                                       | 153                                       | 260                 | 0.2   | 74.3                                       | E            |  |              | 87                                | 399                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | EBT      | 368                                       | 377                                       | 450                 | 0.5   | 51.1                                       | D            | 74.2                                       | E            | 220                               | 525                                  | 183                           | 181  | 64.0                               | 58                      | 54                                   | 57.6                             |     |      |
|                |  | EBR      | 248                                       | 263                                       | 450                 | 0.9   | 107.3                                      | F            |  |              | 220                               | 525                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | WBL      | 79  | 75  | 190                 | 0.5   | 206.1                                      | F            |  |              | 115                               | 309                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | WBT      | 371                                       | 362                                       | 430                 | 0.5   | 53.9                                       | D            | 30.8                                       | C            | 70                                | 303                                  | 4                             | 4  | 50.4                               | 65                      | 63                                   | 53.9                             |     |      |
|                |  | WBR      | 790                                       | 753                                       | 430                 | 1.3   | 2.2  | A            |  |              | 1                                 | 131                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | NBL      | 240                                       | 257                                       | 200                 | 1.1   | 60.8                                       | E            |  |              | 61                                | 281                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | NBT      | 806                                       | 806                                       | 750                 | 0.0   | 35.4                                       | D            | 38.7                                       | D            | 107                               | 364                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | NBR      | 258                                       | 252                                       | 115                 | 0.4   | 26.8                                       | C            |  |              | 41                                | 341                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | SBL      | 520                                       | 494                                       | 2,050               | 1.2   | 164.9                                      | F            |  |              | 773                               | 1,421                                |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | SBT      | 1,087                                     | 1,075                                     | 1,950               | 0.4   | 47.2                                       | D            | 72.3                                       | E            | 773                               | 1,421                                |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | SBR      | 445                                       | 453                                       | 1,950               | 0.4   | 31.0                                       | C            |  |              | 769                               | 1,421                                |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | Overall  |   |   | 5,367               | 5,320 | ---  | 0.6          | 55.0                                       | E            | ---                               | ---                                  | ---                           | ---  | 187                                | 185                     | 63.7                                 | 123                              | 117 | 55.6 |
| 2              | Army-Navy Drive and S Fern Street                | EBL      | 208                                       | 206                                       | 160                 | 0.1   | 56.4                                       | E            |  |              | 71                                | 467                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | EBT      | 765                                       | 738                                       | 430                 | 1.0   | 34.4                                       | C            | 36.2                                       | D            | 125                               | 482                                  | 309                           | 304  | 66.1                               | 58                      | 55                                   | 21.5                             |     |      |
|                |  | EBR      | 173                                       | 165                                       | 180                 | 0.6   | 19.3                                       | B            |  |              | 18                                | 225                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | WBL      | 36  | 37  | 80                  | 0.2   | 91.0                                       | F            |  |              | 108                               | 349                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | WBT      | 771                                       | 719                                       | 260                 | 1.9   | 26.2                                       | C            | 30.1                                       | C            | 108                               | 349                                  | 184                           | 178  | 65.1                               | 69                      | 66                                   | 12.1                             |     |      |
|                |  | WBR      | 133                                       | 125                                       | 260                 | 0.7   | 34.4                                       | C            |  |              | 109                               | 353                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | NBL      | 292                                       | 291                                       | 280                 | 0.1   | 71.2                                       | E            |  |              | 125                               | 450                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | NBT      | 184                                       | 184                                       | 390                 | 0.0   | 21.4                                       | C            | 47.9                                       | D            | 22                                | 205                                  | 219                           | 223  | 64.4                               | 41                      | 40                                   | 14.4                             |     |      |
|                |  | NBR      | 84  | 82  | 80                  | 0.2   | 24.4                                       | C            |  |              | 10                                | 86                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | SBL      | 37  | 37  | 75                  | 0.0   | 36.7                                       | D            |  |              | 4                                 | 115                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | SBT      | 106                                       | 103                                       | 560                 | 0.3   | 40.8                                       | D            | 25.4                                       | C            | 30                                | 193                                  | 338                           | 343  | 64.5                               | ---                     | ---                                  | ---                              | --- |      |
|                |  | SBR      | 177                                       | 176                                       | 560                 | 0.1   | 14.0                                       | B            |  |              | 37                                | 204                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | Overall  |   |   | 2,966               | 2,863 | ---  | 1.9          | 35.4                                       | D            | ---                               | ---                                  | ---                           | ---  | 1,050                              | 1,048                   | 65.0                                 | 168                              | 161 | 15.9 |
| 3              | Army-Navy Drive and Parking Lot                  | EBL      | 4   | 5   | 120                 | 0.5   | 25.9                                       | C            |  |              | 53                                | 370                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | EBT      | 846                                       | 818                                       | 260                 | 1.0   | 10.9                                       | B            | 13.5                                       | B            | 53                                | 370                                  | 76                            | 75   | 64.6                               | 108                     | 107                                  | 7.9                              |     |      |
|                |  | EBR      | 36  | 38  | 225                 | 0.3   | 67.9                                       | E            |  |              | 53                                | 370                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | WBT      | 814                                       | 765                                       | 230                 | 1.7   | 8.4  | A            | 8.4  | A            | 25                                | 333                                  | 13                            | 13   | 49.3                               | 61                      | 57                                   | 0.2                              |     |      |
|                |  | WBR      | 3   | 2   | 230                 | 0.6   | 9.1  | A            |  |              | 28                                | 350                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | NBL      | 79  | 76  | 100                 | 0.3   | 81.3                                       | F            |  |              | 61                                | 237                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | NBT      | 0   | 0   | 100                 | 0.0   | 0.0  | A            | 83.1                                       | F            | 61                                | 237                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |     |      |
|                |  | NBR      | 41  | 39  | 100                 | 0.3   | 86.6                                       | F            |  |              | 61                                | 237                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | SBL      | 10  | 12  | 100                 | 0.6   | 74.8                                       | E            |  |              | 10                                | 156                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | SBT      | 0   | 0   | 100                 | 0.0   | 0.0  | A            | 37.3                                       | D            | 10                                | 156                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |     |      |
|                |  | SBR      | 47  | 45  | 100                 | 0.3   | 27.3                                       | C            |  |              | 10                                | 154                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | Overall  |   |   | 1,880               | 1,800 | ---  | 1.9          | 16.5                                       | B            | ---                               | ---                                  | ---                           | ---  | 89                                 | 88                      | 62.3                                 | 169                              | 164 | 5.2  |
|                |  | 4        | Army-Navy Drive and S Eads Street         | EBL                                       | 424                 | 413   | 220  | 0.5          | 34.5                                       | C            |                                   |                                      | 104                           | 292  |                                    |                         |                                      |                                  |     |      |
| EBT            | 265  |          |   | 254                                       | 220                 | 0.7   | 15.2                                       | B            | 29.7                                       | C            | 107                               | 292                                  | 32                            | 31   | 67.6                               | 108                     | 106                                  | 14.0                             |     |      |
| EBR            | 208  |          |   | 195                                       | 220                 | 0.9   | 38.6                                       | D            |  |              | 100                               | 292                                  |                               |  |                                    |                         |                                      |                                  |     |      |
| WBT            | 581  |          |   | 528                                       | 1,100               | 2.3   | 48.8                                       | D            |  |              | 114                               | 214                                  |                               |  |                                    |                         |                                      |                                  |     |      |
| WBR            | 477  |          |   | 459                                       | 100                 | 0.8   | 28.9                                       | C            | 39.5                                       | D            | 122                               | 224                                  | 51                            | 50   | 65.9                               | 47                      | 47                                   | 46.7                             |     |      |
| NBL            | 66   |          |   | 66  | 100                 | 0.0   | 37.6                                       | D            |  |              | 12                                | 238                                  |                               |  |                                    |                         |                                      |                                  |     |      |
| NBT            | 692  |          |   | 689                                       | 240                 | 0.1   | 29.0                                       | C            | 28.9                                       | C            | 93                                | 325                                  | 18                            | 20   | 68.9                               | 71                      | 70                                   | 11.9                             |     |      |
| NBR            | 29   |          |   | 28  | 240                 | 0.2   | 27.4                                       | C            |  |              | 93                                | 325                                  |                               |  |                                    |                         |                                      |                                  |     |      |
| SBL            | 28   |          |   | 27  | 140                 | 0.2   | 41.3                                       | D            |  |              | 79                                | 329                                  |                               |  |                                    |                         |                                      |                                  |     |      |
| SBT            | 169  |          |   | 171                                       | 140                 | 0.2   | 54.0                                       | D            | 28.8                                       | C            | 79                                | 329                                  | 21                            | 23   | 68.3                               | ---                     | ---                                  | ---                              |     |      |
| SBR            | 170  |          |   | 181                                       | 110                 | 0.8   | 3.2  | A            |  |              | 79                                | 329                                  |                               |  |                                    |                         |                                      |                                  |     |      |
| Overall        |  |          |   |   | 3,109               | 3,011 | ---  | 1.8          | 32.0                                       | C            | ---                               | ---                                  | ---                           | ---  | 122                                | 124                     | 67.2                                 | 226                              | 223 | 20.2 |
| 5              | Army-Navy Drive and VA110 Off-Ramp               |          |   | EBT                                       | 322                 | 310   | ---  | 0.7          | 0.1  | A            | 0.1                               | A                                    | 0                             | 0  | ---                                | ---                     | ---                                  | ---                              | --- | ---  |
|                |  | WBT      | 667                                       | 604                                       | 1,000               | 2.5   | 28.9                                       | C            | 28.9                                       | C            | 122                               | 649                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |     |      |
|                |  | SBR      | 391                                       | 379                                       | 900                 | 0.6   | 10.4                                       | B            | 10.4                                       | B            | 18                                | 258                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |     |      |
|                |  | Overall  | 1,380                                     | 1,293                                     | ---                 | 2.4   | 16.6                                       | B            | ---  | ---          | ---                               | ---                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |     |      |
| 6              | S Eads Street and 11th Street S/Pen Place Access | EBL      | 133                                       | 130                                       | 200                 | 0.3   | 57.8                                       | E            |  |              | 121                               | 407                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | EBT      | 0   | 0   | 200                 | 0.0   | 0.0  | A            | 78.5                                       | E            | 121                               | 407                                  | 79                            | 76   | 65.1                               | ---                     | ---                                  | ---                              |     |      |
|                |  | EBR      | 171                                       | 169                                       | 200                 | 0.2   | 94.5                                       | F            |  |              | 121                               | 407                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | WBL      | 12  | 13  | 300                 | 0.3   | 40.8                                       | D            |  |              | 12                                | 99                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | WBT      | 0   | 0   | 300                 | 0.0   | 0.0  | A            | 51.1                                       | D            | 10                                | 95                                   | 65                            | 64   | 64.1                               | ---                     | ---                                  | ---                              |     |      |
|                |  | WBR      | 25  | 27  | 300                 | 0.4   | 56.0                                       | E            |  |              | 10                                | 95                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | NBL      | 37  | 36  | 100                 | 0.2   | 21.9                                       | C            |  |              | 2                                 | 80                                   |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | NBT      | 629                                       | 619                                       | 250                 | 0.4   | 12.0                                       | B            | 12.3                                       | B            | 48                                | 345                                  | 84                            | 84   | 64.0                               | 67                      | 65                                   | 3.7                              |     |      |
|                |  | NBR      | 38  | 39  | 250                 | 0.2   | 8.8  | A            |  |              | 49                                | 347                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | SBL      | 22  | 21  | 250                 | 0.2   | 44.1                                       | D            |  |              | 104                               | 336                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | SBT      | 319                                       | 309                                       | 250                 | 0.6   | 41.9                                       | D            | 40.5                                       | D            | 104                               | 336                                  | 116                           | 115  | 62.0                               | 65                      | 63                                   | 12.5                             |     |      |
|                |  | SBR      | 36  | 33  | 25                  | 0.5   | 25.4                                       | C            |  |              | 77                                | 340                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | Overall  |   |   | 1,422               | 1,396 | ---  | 0.7          | 35.0                                       | C            | ---                               | ---                                  | ---                           | ---  | 344                                | 339                     | 63.6                                 | 132                              | 128 | 8.0  |
| 7              | 12th Street S and S Hayes Street                 | EBL      | 85  | 83  | 450                 | 0.2   | 64.7                                       | E            |  |              | 10                                | 190                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | EBT      | 35  | 35  | 450                 | 0.0   | 57.0                                       | E            | 38.4                                       | D            | 47                                | 234                                  | 911                           | 900  | 64.9                               | ---                     | ---                                  | ---                              |     |      |
|                |  | EBR      | 70  | 80  | 65                  | 1.2   | 2.9  | A            |  |              | 46                                | 232                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | WBL      | 82  | 79  | 100                 | 0.3   | 69.3                                       | E            |  |              | 95                                | 440                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | WBT      | 30  | 29  | 620                 | 0.2   | 67.4                                       | E            | 67.7                                       | E            | 95                                | 440                                  | 379                           | 378  | 66.0                               | ---                     | ---                                  | ---                              |     |      |
|                |  | WBR      | 164                                       | 160                                       | 620                 | 0.3   | 66.9                                       | E            |  |              | 95                                | 440                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | NBL      | 60  | 54  | 75                  | 0.8   | 65.9                                       | E            |  |              | 92                                | 360                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | NBT      | 965                                       | 974                                       | 775                 | 0.3   | 29.2                                       | C            | 30.5                                       | C            | 92                                | 360                                  | 81                            | 83   | 64.1                               | ---                     | ---                                  | ---                              |     |      |
|                |  | NBR      | 53  | 54  | 75                  | 0.1   | 19.0                                       | B            |  |              | 94                                | 364                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | SBL      | 249                                       | 250                                       | 250                 | 0.1   | 70.6                                       | E            |  |              | 147                               | 429                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | SBT      | 1,075                                     | 1,051                                     | 770                 | 0.7   | 15.8                                       | B            | 25.6                                       | C            | 147                               | 429                                  | 285                           | 283  | 66.1                               | ---                     | ---                                  | ---                              |     |      |
|                |  | SBR      | 90  | 92  | 770                 | 0.2   | 14.9                                       | B            |  |              | 147                               | 429                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | Overall  |   |   | 2,958               | 2,941 | ---  | 0.3          | 32.1                                       | C            | ---                               | ---                                  | ---                           | ---  | 1,656                              | 1,644                   | 65.3                                 | ---                              | --- | ---  |
| 8              | 12th Street S and S Fern Street                  | EBT      | 181                                       | 183                                       | 640                 | 0.1   | 59.7                                       | E            |  |              | 153                               | 537                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | EBR      | 156                                       | 153                                       | 640                 | 0.2   | 50.2                                       | D            | 55.4                                       | E            | 160                               | 546                                  | 1265                          | 1243                                       | 64.5                               | ---                     | ---                                  | ---                              |     |      |
|                |  | WBL      | 115                                       | 110                                       | 75                  | 0.5   | 95.1                                       | F            |  |              | 131                               | 368                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | WBT      | 152                                       | 143                                       | 225                 | 0.7   | 39.7                                       | D            | 59.2                                       | E            | 131                               | 368                                  | 806                           | 812  | 64.1                               | ---                     | ---                                  | ---                              |     |      |
|                |  | WBR      | 71  | 68  | 225                 | 0.4   | 42.1                                       | D            |  |              | 131                               | 368                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | NBL      | 114                                       | 115                                       | 100                 | 0.1   | 45.5                                       | D            |  |              | 197                               | 381                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | NBT      | 393                                       | 391                                       | 280                 | 0.1   | 42.9                                       | D            | 43.1                                       | D            | 197                               | 381                                  | 413                           | 413  | 63.7                               | ---                     | ---                                  | ---                              |     |      |
|                |  | NBR      | 51  | 53  | 280                 | 0.3   | 39.4                                       | D            |  |              | 197                               | 380                                  |                               |  |                                    |                         |                                      |                                  |     |      |
|                |  | SBL      | 111                                       | 109                                       | 180                 | 0.2   | 45.2                                       | D</          |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |     |      |



| Pen Place - VISSIM Delay & Queue Results       |  |          |   |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |     |     |
|--|--|----------|---|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|-----|-----|
| 2025 Future Mitigated Build PM Peak Conditions |  |          |   |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |     |     |
| Intersection #                                 | Intersection Name                                | Movement | Input Vehicular Volume (vph) <sup>1</sup> | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |     |     |
| 12   | 12th Street and Long Bridge Drive/S Clark Street | EBL      | 267                                       | 250                                       | 120                 | 1.1   | 19.1                                       | B            |  |              | 25                                | 187                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | EBT      | 182                                       | 177                                       | 120                 | 0.4   | 4.4  | A            | 10.6                                       | B            | 25                                | 187                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | EBR      | 120                                       | 125                                       | 120                 | 0.5   | 2.3  | A            |  |              | 25                                | 187                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | WBL      | 25  | 25  | 100                 | 0.0   | 58.2                                       | E            |  |              | 3                                 | 43                                   |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | WBT      | 484                                       | 470                                       | 1,500               | 0.6   | 65.8                                       | E            | 58.8                                       | E            | 613                               | 1,370                                | 349                           | 350  | 64.8                               |                         |                                      |                                  |     |     |
|  |  | WBR      | 134                                       | 125                                       | 1,500               | 0.8   | 32.6                                       | C            |  |              | 621                               | 1,380                                |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | NBL      | 177                                       | 177                                       | 100                 | 0.0   | 83.6                                       | F            |  |              | 91                                | 323                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | NBT      | 75  | 80  | 1,200               | 0.6   | 58.1                                       | E            | 72.2                                       | E            | 91                                | 323                                  | 76                            | 79   | 64.1                               | 25                      | 25                                   | 28.0                             |     |     |
|  |  | NBR      | 30  | 31  | 1,200               | 0.2   | 43.5                                       | D            |  |              | 95                                | 328                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | SBL      | 74  | 62  | 450                 | 1.5   | 158.5                                      | F            |  |              | 1,051                             | 1,151                                |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | SBT      | 114                                       | 96  | 450                 | 1.8   | 157.8                                      | F            | 137.7                                      | F            | 1,051                             | 1,151                                | 33                            | 34   | 66.6                               | 25                      | 27                                   | 54.1                             |     |     |
|  |  | SBR      | 253                                       | 209                                       | 150                 | 2.9   | 122.3                                      | F            |  |              | 1,045                             | 1,154                                |                               |  |                                    |                         |                                      |                                  |     |     |
| Overall  |  |          | 1,935                                     | 1,827                                     |                     | 2.5   | 62.2                                       | E            |  |              |                                   |                                      | 680                           | 687  | 64.8                               | 50                      | 52                                   | 41.5                             |     |     |
| 14   | 13th Street S and S Eads Street                  | EBL      | 126                                       | 120                                       | 350                 | 0.5   | 93.1                                       | F            | 129.4                                      | F            | 320                               | 940                                  | 60                            | 57   | 65.1                               |                         |                                      |                                  |     |     |
|  |  | EBR      | 165                                       | 158                                       | 350                 | 0.6   | 156.9                                      | F            |  |              | 320                               | 940                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | NBL      | 108                                       | 103                                       | 150                 | 0.5   | 9.6  | A            | 33.1                                       | C            | 163                               | 436                                  |                               |  |                                    | 39                      | 37                                   | 0.4                              |     |     |
|  |  | NBT      | 506                                       | 505                                       | 300                 | 0.0   | 37.9                                       | D            |  |              | 163                               | 436                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | SBT      | 504                                       | 495                                       | 280                 | 0.4   | 24.6                                       | C            |  |              | 101                               | 389                                  | 209                           | 207  | 61.6                               | 73                      | 71                                   | 2.8                              |     |     |
|  |  | SBR      | 36  | 34  | 280                 | 0.3   | 11.4                                       | B            | 23.8                                       | C            | 102                               | 392                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | Overall  |   |   | 1,445               | 1,415 |  | 0.8          | 48.5                                       | D            |                                   |                                      |                               |  | 269                                | 264                     | 62.4                                 | 112                              | 108 | 2.0 |
|  |  | 16       | 15th Street S and S Fern Street           | EBL                                       | 78                  | 79    | 130  | 0.1          | 48.2                                       | D            |                                   |                                      | 34                            | 167  |                                    |                         |                                      |                                  |     |     |
|  |  |          |   | EBT                                       | 271                 | 263   | 630  | 0.5          | 23.3                                       | C            | 28.3                              | C                                    | 34                            | 167  | 64                                 | 68                      | 64.7                                 |                                  |     |     |
|  |  |          |   | EBR                                       | 25                  | 27    | 630  | 0.4          | 18.3                                       | B            |                                   |                                      | 32                            | 168  |                                    |                         |                                      |                                  |     |     |
| WBL  | 146  |          |   | 145                                       | 120                 | 0.1   | 8.3  | A            |  |              | 21                                | 170                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| WBT  | 573  |          |   | 573                                       | 260                 | 0.0   | 5.9  | A            | 6.7  | A            | 21                                | 170                                  | 73                            | 75   | 65.9                               |                         |                                      |                                  |     |     |
| WBR  | 169  |          |   | 162                                       | 260                 | 0.5   | 7.9  | A            |  |              | 21                                | 171                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| NBL  | 21   |          |   | 18  | 750                 | 0.7   | 57.6                                       | E            |  |              | 74                                | 350                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| NBT  | 167  |          |   | 164                                       | 750                 | 0.2   | 54.6                                       | D            | 46.5                                       | D            | 74                                | 350                                  | 112                           | 112  | 64.6                               |                         |                                      |                                  |     |     |
| NBR  | 60   |          |   | 56  | 75                  | 0.5   | 19.0                                       | B            |  |              | 75                                | 355                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| SBL  | 205  |          |   | 195                                       | 160                 | 0.7   | 40.1                                       | D            |  |              | 93                                | 409                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| SBT  | 243  |          |   | 231                                       | 300                 | 0.8   | 31.6                                       | C            |  |              | 93                                | 409                                  | 55                            | 54   | 65.2                               |                         |                                      |                                  |     |     |
| SBR  | 93   |          |   | 91  | 300                 | 0.2   | 25.2                                       | C            | 33.7                                       | C            | 95                                | 415                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| Overall  |  |          | 2,051                                     | 2,004                                     |                     | 1.0   | 22.3                                       | C            |  |              |                                   |                                      | 304                           | 309  | 65.0                               |                         |                                      |                                  |     |     |
| 17   | 15th Street S and S Elm Street                   | EBL      | 5   | 5   | 60                  | 0.0   | 7.3  | A            | 7.8  | A            | 13                                | 166                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | EBT      | 531                                       | 511                                       | 270                 | 0.9   | 7.8  | A            |  |              | 13                                | 166                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | WBT      | 818                                       | 809                                       | 300                 | 0.3   | 2.8  | A            | 2.8  | A            | 8                                 | 173                                  | 122                           | 127  | 63.6                               |                         |                                      |                                  |     |     |
|  |  | WBR      | 67  | 63  | 300                 | 0.5   | 2.6  | A            |  |              | 9                                 | 177                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | SBL      | 81  | 73  | 250                 | 0.9   | 45.9                                       | D            |  |              | 21                                | 140                                  | 10                            | 9  | 65.2                               |                         |                                      |                                  |     |     |
|  |  | SBR      | 70  | 72  | 250                 | 0.2   | 12.4                                       | B            | 29.3                                       | C            | 18                                | 143                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | Overall  |   |   | 1,572               | 1,533 |  | 1.0          | 7.0  | A            |                                   |                                      |                               |  | 132                                | 136                     | 63.7                                 |                                  |     |     |
|  |  | 18       | 15th Street S and S Eads Street           | EBL                                       | 65                  | 58    | 170  | 0.9          | 46.1                                       | D            |                                   |                                      | 17                            | 305  |                                    |                         |                                      |                                  |     |     |
| EBT  | 454  |          |   | 444                                       | 300                 | 0.5   | 38.7                                       | D            | 40.0                                       | D            | 91                                | 412                                  | 426                           | 432  | 64.6                               |                         |                                      |                                  |     |     |
| EBR  | 93   |          |   | 87  | 300                 | 0.6   | 42.8                                       | D            |  |              | 91                                | 412                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| WBL  | 350  |          |   | 333                                       | 300                 | 0.9   | 38.1                                       | D            |  |              | 166                               | 406                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| WBT  | 786  |          |   | 772                                       | 300                 | 0.5   | 34.1                                       | C            | 37.5                                       | D            | 166                               | 406                                  | 298                           | 300  | 65.0                               |                         |                                      |                                  |     |     |
| WBR  | 270  |          |   | 264                                       | 300                 | 0.4   | 46.7                                       | D            |  |              | 166                               | 406                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| NBL  | 60   |          |   | 59  | 130                 | 0.1   | 65.7                                       | E            |  |              | 259                               | 785                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| NBT  | 254  |          |   | 251                                       | 760                 | 0.2   | 82.5                                       | F            | 67.6                                       | E            | 259                               | 785                                  | 505                           | 487  | 185.8                              | 55                      | 52                                   | 33.2                             |     |     |
| NBR  | 99   |          |   | 101                                       | 130                 | 0.2   | 31.7                                       | C            |  |              | 3                                 | 108                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| SBL  | 261  |          |   | 254                                       | 250                 | 0.4   | 107.2                                      | F            |  |              | 291                               | 472                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| SBT  | 391  |          |   | 376                                       | 300                 | 0.8   | 49.6                                       | D            |  |              | 291                               | 472                                  | 258                           | 262  | 188.3                              | 59                      | 55                                   | 9.9                              |     |     |
| SBR  | 39   |          |   | 39  | 75                  | 0.0   | 32.6                                       | C            |  |              | 282                               | 475                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| Overall  |  |          | 3,122                                     | 3,038                                     |                     | 1.5   | 49.3                                       | D            |  |              |                                   |                                      | 1,487                         | 1,481                                      | 126.4                              | 114                     | 107                                  | 21.2                             |     |     |
| 19   | S Eads Street and I-395 HOT Lanes (South Node)   | NBL      | 359                                       | 347                                       | 150                 | 0.6   | 6.1  | A            |  |              | 25                                | 323                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | NBT      | 389                                       | 383                                       | 170                 | 0.3   | 6.4  | A            | 5.1  | A            | 25                                | 323                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | NBR      | 845                                       | 833                                       | 170                 | 0.4   | 4.0  | A            |  |              | 25                                | 323                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | SBL      | 270                                       | 268                                       | 100                 | 0.1   | 10.7                                       | B            |  |              | 30                                | 205                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | SBR      | 367                                       | 379                                       | 100                 | 0.6   | 12.2                                       | B            | 11.6                                       | B            | 29                                | 198                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| Overall  |  |          | 2,230                                     | 2,210                                     |                     | 0.4   | 7.0  | A            |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |     |     |
| 20   | S Eads Street and I-395 HOT Lanes (North Node)   | WBL      | 240                                       | 251                                       | 1,250               | 0.7   | 88.7                                       | F            |  |              | 147                               | 551                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | WBR      | 106                                       | 106                                       | 1,250               | 0.0   | 51.5                                       | D            | 77.7                                       | E            | 147                               | 551                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | NBT      | 389                                       | 383                                       | 100                 | 0.3   | 7.4  | A            | 7.4  | A            | 16                                | 205                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | SBT      | 397                                       | 397                                       | 100                 | 0.0   | 12.3                                       | B            |  |              | 18                                | 193                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | SBR      | 1,057                                     | 1,060                                     | 100                 | 0.1   | 0.5  | A            | 3.7  | A            | 16                                | 190                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| Overall  |  |          | 2,189                                     | 2,197                                     |                     | 0.2   | 16.4                                       | B            |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |     |     |
| 21   | 14th Street S and S Eads Street                  | EBL      | 40  | 39  | 200                 | 0.2   | 113.1                                      | F            |  |              | 34                                | 164                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | EBT      | 0   | 0   | 200                 | 0.0   | 0.0  | A            | 114.7                                      | F            | 34                                | 164                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | EBR      | 9   | 8   | 200                 | 0.3   | 122.3                                      | F            |  |              | 34                                | 163                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | WBL      | 35  | 35  | 150                 | 0.0   | 211.5                                      | F            |  |              | 65                                | 165                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | WBT      | 0   | 0   | 150                 | 0.0   | 0.0  | A            | 213.9                                      | F            | 65                                | 165                                  | 303                           | 307  | 65.1                               |                         |                                      |                                  |     |     |
|  |  | WBR      | 25  | 27  | 150                 | 0.4   | 216.9                                      | F            |  |              | 65                                | 165                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | NBL      | 0   | 0   | 100                 | 0.0   | 0.0  | A            |  |              | 95                                | 418                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | NBT      | 559                                       | 543                                       | 350                 | 0.7   | 27.6                                       | C            | 27.3                                       | C            | 95                                | 418                                  | 512                           | 506  | 68.5                               | 54                      | 51                                   | 2.5                              |     |     |
|  |  | NBR      | 30  | 28  | 350                 | 0.4   | 20.7                                       | C            |  |              | 100                               | 428                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | SBL      | 15  | 17  | 100                 | 0.5   | 96.7                                       | F            |  |              | 133                               | 388                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | SBT      | 647                                       | 625                                       | 290                 | 0.9   | 32.9                                       | C            |  |              | 133                               | 388                                  | 162                           | 160  | 64.3                               | 66                      | 65                                   | 9.9                              |     |     |
|  |  | SBR      | 7   | 7   | 290                 | 0.0   | 20.9                                       | C            | 34.4                                       | C            | 135                               | 392                                  |                               |  |                                    |                         |                                      |                                  |     |     |
| Overall  |  |          | 1,367                                     | 1,329                                     |                     | 1.0   | 42.6                                       | D            |  |              |                                   |                                      | 977                           | 973  | 66.7                               | 120                     | 116                                  | 6.6                              |     |     |
| 22   | S Fern Street and 11th Street S/Pen Place Access | EBL      | 28  | 27  | 450                 | 0.2   | 353.0                                      | F            |  |              | 393                               | 540                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | EBT      | 0   | 0   | 450                 | 0.0   | 0.0  | A            | 360.4                                      | F            | 393                               | 540                                  | 115                           | 116  | 64.9                               |                         |                                      |                                  |     |     |
|  |  | EBR      | 95  | 89  | 450                 | 0.6   | 362.6                                      | F            |  |              | 393                               | 540                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | WBL      | 111                                       | 109                                       | 150                 | 0.2   | 51.7                                       | D            |  |              | 54                                | 256                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | WBT      | 0   | 0   | 150                 | 0.0   | 0.0  | A            | 58.1                                       | E            | 54                                | 256                                  | 199                           | 192  | 65.0                               |                         |                                      |                                  |     |     |
|  |  | WBR      | 108                                       | 101                                       | 150                 | 0.7   | 65.1                                       | E            |  |              | 54                                | 256                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | NBL      | 2   | 2   | 75                  | 0.0   | 28.0                                       | C            |  |              | 0                                 | 6                                    |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | NBT      | 424                                       | 420                                       | 275                 | 0.2   | 25.5                                       | C            | 25.2                                       | C            | 74                                | 334                                  | 93                            | 92   | 66.5                               | 41                      | 40                                   | 18.2                             |     |     |
|  |  | NBR      | 38  | 37  | 275                 | 0.2   | 21.9                                       | C            |  |              | 75                                | 336                                  |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | SBL      | 20  | 17  | 75                  | 0.7   | 31.9                                       | C            |  |              | 2                                 | 59                                   |                               |  |                                    |                         |                                      |                                  |     |     |
|  |  | SBT      | 344                                       | 337                                       | 390                 | 0.4   | 34.4                                       | C            |  |              | 69                                | 374                                  | 145                           | 146  | 65.0                               | 45                      | 41                                   | 17.8                             |     |     |
|  |  | SBR      | 3   | 4   | 390                 | 0.5   | 14.1                                       | B            |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |     |     |

## K. 2031 Re-Routed Peak Hour Volumes

**Assumed Volume Re-Routes:**  
 1. In Background (2031) conditions, existing volumes were re-routed along 15<sup>th</sup> Street S due to the Route 1 To-Grade project.



## L. 2031 Background VISSIM Delay and Queue Results



| Pen Place - VISSIM Delay & Queue Results |  |          |                                   |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |    |      |
|--|--|----------|-----------------------------------|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|----|------|
| 2031 Future No-Build AM Peak Conditions  |  |          |                                   |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |    |      |
| Intersection #                           | Intersection Name                                | Movement | Input Vehicular Volume (vph)      | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |    |      |
| 1  | Army-Navy Drive and S Hayes Street/I-395 Ramp    | EBL      | 35                                | 38  | 260                 | 0.5   | 82.5                                       | F            |  |              | 18                                | 104                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | EBT      | 359                               | 366                                       | 450                 | 0.4   | 53.9                                       | D            | 54.5                                       | D            | 78                                | 236                                  | 41                            | 39   | 70.9                               | 33                      | 30                                   | 86.8                             |    |      |
|  |  | EBR      | 113                               | 130                                       | 450                 | 1.5   | 47.8                                       | D            |  |              | 78                                | 236                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBL      | 77                                | 79  | 190                 | 0.2   | 181.0                                      | F            |  |              | 100                               | 294                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBT      | 243                               | 240                                       | 430                 | 0.2   | 41.0                                       | D            | 29.8                                       | C            | 33                                | 166                                  |                               | 2  | 57.9                               | 41                      | 48                                   | 61.6                             |    |      |
|  |  | WBR      | 504                               | 505                                       | 430                 | 0.0   | 0.9  | A            |  |              | 0                                 | 27                                   |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBL      | 58                                | 68  | 200                 | 1.3   | 67.8                                       | E            |  |              | 34                                | 190                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBT      | 304                               | 311                                       | 750                 | 0.4   | 61.1                                       | E            | 63.3                                       | E            | 54                                | 229                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBR      | 113                               | 114                                       | 115                 | 0.1   | 66.7                                       | E            |  |              | 48                                | 238                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBL      | 760                               | 535                                       | 2,050               | 8.8   | 132.5                                      | F            |  |              | 3,416                             | 3,781                                |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBT      | 1,269                             | 1,266                                     | 1,950               | 0.1   | 31.7                                       | C            | 54.3                                       | D            | 3,416                             | 3,781                                |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBR      | 345                               | 356                                       | 1,950               | 0.6   | 17.4                                       | B            |  |              | 3,416                             | 3,780                                |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | Overall  | 4,180                             | 4,008                                     |                     | 2.7   | 50.4                                       | D            |  |              |                                   |                                      |                               |  | 43                                 | 41                      | 70.3                                 | 74                               | 78 | 71.3 |
|  |  | 2        | Army-Navy Drive and S Fern Street | EBL                                       | 85                  | 69    | 160  | 1.8          | 30.6                                       | C            |                                   |                                      | 8                             | 112  |                                    |                         |                                      |                                  |    |      |
| EBT                                      | 943  |          |                                   | 770                                       | 430                 | 5.9   | 41.1                                       | D            | 41.4                                       | D            | 157                               | 443                                  | 31                            | 33   | 67.6                               | 31                      | 27                                   | 2.3                              |    |      |
| EBR                                      | 204  |          |                                   | 173                                       | 180                 | 2.3   | 47.1                                       | D            |  |              | 58                                | 318                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| WBL                                      | 81   |          |                                   | 80  | 80                  | 0.1   | 96.2                                       | F            |  |              | 75                                | 304                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| WBT                                      | 494  |          |                                   | 495                                       | 540                 | 0.0   | 27.7                                       | C            | 36.5                                       | D            | 75                                | 304                                  | 10                            | 10   | 66.5                               | 41                      | 48                                   | 24.1                             |    |      |
| WBR                                      | 48   |          |                                   | 44  | 540                 | 0.6   | 27.2                                       | C            |  |              | 72                                | 309                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| NBL                                      | 174  |          |                                   | 181                                       | 225                 | 0.5   | 22.6                                       | C            |  |              | 19                                | 221                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| NBT                                      | 30   |          |                                   | 31  | 785                 | 0.2   | 9.5  | A            | 19.1                                       | B            | 3                                 | 56                                   | 52                            | 53   | 65.7                               |                         |                                      |                                  |    |      |
| NBR                                      | 36   |          |                                   | 36  | 300                 | 0.0   | 9.7  | A            |  |              | 3                                 | 56                                   |                               |  |                                    |                         |                                      |                                  |    |      |
| SBL                                      | 112  |          |                                   | 115                                       | 75                  | 0.3   | 45.0                                       | D            |  |              | 37                                | 256                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| SBT                                      | 191  |          |                                   | 188                                       | 560                 | 0.2   | 45.6                                       | D            | 41.2                                       | D            | 57                                | 278                                  | 92                            | 96   | 64.6                               |                         |                                      |                                  |    |      |
| SBR                                      | 156  |          |                                   | 151                                       | 560                 | 0.4   | 32.9                                       | C            |  |              | 61                                | 285                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| Overall                                  | 2,554  |          |                                   | 2,333                                     |                     | 4.5   | 37.7                                       | D            |  |              |                                   |                                      |                               |  | 185                                | 192                     | 65.5                                 | 72                               | 75 | 16.3 |
| 4  | Army-Navy Drive and S Eads Street                |          |                                   | EBL                                       | 480                 | 401   | 420  | 3.8          | 21.9                                       | C            |                                   |                                      | 51                            | 287  |                                    |                         |                                      |                                  |    |      |
|  |  | EBT      | 321                               | 273                                       | 530                 | 2.8   | 9.1  | A            | 17.5                                       | B            | 54                                | 286                                  | 24                            | 23   | 90.3                               | 31                      | 27                                   | 29.5                             |    |      |
|  |  | EBR      | 257                               | 213                                       | 530                 | 2.9   | 20.0                                       | B            |  |              | 39                                | 272                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBL      | 60                                | 55  | 100                 | 0.7   | 11.5                                       | B            | 31.3                                       | C            | 31                                | 143                                  | 46                            | 44   | 69.5                               | 25                      | 24                                   | 1.0                              |    |      |
|  |  | WBT      | 235                               | 224                                       | 1,100               | 0.7   | 36.1                                       | D            |  |              | 34                                | 153                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBR      | 60                                | 55  | 100                 | 0.7   | 11.5                                       | B            |  |              | 34                                | 153                                  | 46                            | 44   | 69.5                               | 25                      | 24                                   | 1.0                              |    |      |
|  |  | NBL      | 125                               | 119                                       | 100                 | 0.5   | 29.0                                       | C            |  |              | 48                                | 317                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBT      | 241                               | 236                                       | 550                 | 0.3   | 23.9                                       | C            | 25.6                                       | C            | 48                                | 317                                  | 19                            | 21   | 64.1                               | 42                      | 42                                   | 22.9                             |    |      |
|  |  | NBR      | 24                                | 27  | 550                 | 0.6   | 25.1                                       | C            |  |              | 48                                | 317                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBL      | 48                                | 47  | 550                 | 0.1   | 34.6                                       | C            |  |              | 167                               | 351                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBT      | 360                               | 359                                       | 550                 | 0.1   | 39.6                                       | D            | 30.7                                       | C            | 167                               | 351                                  | 37                            | 39   | 62.1                               |                         |                                      |                                  |    |      |
|  |  | SBR      | 282                               | 293                                       | 550                 | 0.6   | 19.1                                       | B            |  |              | 167                               | 351                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | Overall  | 2,433                             | 2,247                                     |                     | 3.8   | 24.7                                       | C            |  |              |                                   |                                      |                               |  | 126                                | 127                     | 70.1                                 | 98                               | 93 | 19.1 |
|  |  | 7        | 12th Street S and S Hayes Street  | EBL                                       | 25                  | 29    | 450  | 0.8          | 50.2                                       | D            |                                   |                                      | 25                            | 153  |                                    |                         |                                      |                                  |    |      |
| EBT                                      | 15   |          |                                   | 15  | 450                 | 0.0   | 47.3                                       | D            | 47.8                                       | D            | 25                                | 153                                  | 420                           | 427  | 64.6                               |                         |                                      |                                  |    |      |
| EBR                                      | 45   |          |                                   | 44  | 65                  | 0.1   | 46.3                                       | D            |  |              | 24                                | 151                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| WBL                                      | 33   |          |                                   | 33  | 100                 | 0.0   | 40.2                                       | D            |  |              | 28                                | 184                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| WBT                                      | 40   |          |                                   | 40  | 620                 | 0.0   | 39.8                                       | D            | 40.1                                       | D            | 28                                | 184                                  | 86                            | 87   | 63.8                               |                         |                                      |                                  |    |      |
| WBR                                      | 73   |          |                                   | 69  | 620                 | 0.5   | 40.2                                       | D            |  |              | 28                                | 184                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| NBL                                      | 30   |          |                                   | 26  | 75                  | 0.8   | 77.5                                       | E            |  |              | 32                                | 147                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| NBT                                      | 402  |          |                                   | 410                                       | 775                 | 0.4   | 19.9                                       | B            | 22.5                                       | C            | 32                                | 147                                  | 51                            | 52   | 53.8                               |                         |                                      |                                  |    |      |
| NBR                                      | 25   |          |                                   | 26  | 75                  | 0.2   | 9.1  | A            |  |              | 28                                | 150                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| SBL                                      | 395  |          |                                   | 393                                       | 250                 | 0.1   | 63.9                                       | E            |  |              | 227                               | 496                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| SBT                                      | 1,023  |          |                                   | 1,041                                     | 770                 | 0.6   | 11.9                                       | B            | 25.5                                       | C            | 227                               | 496                                  | 0                             | 0  | 0.0                                |                         |                                      |                                  |    |      |
| SBR                                      | 75   |          |                                   | 75  | 770                 | 0.0   | 13.7                                       | B            |  |              | 227                               | 496                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| Overall                                  | 2,181  |          |                                   | 2,201                                     |                     | 0.4   | 26.7                                       | C            |  |              |                                   |                                      |                               |  | 557                                | 566                     | 63.5                                 |                                  |    |      |
| 8  | 12th Street S and S Fern Street                  |          |                                   | EBT                                       | 268                 | 271   | 640  | 0.2          | 10.6                                       | B            |                                   |                                      | 28                            | 431  |                                    |                         |                                      |                                  |    |      |
|  |  | EBR      | 167                               | 163                                       | 640                 | 0.3   | 7.8  | A            | 9.5  | A            | 31                                | 440                                  | 727                           | 736  | 63.9                               |                         |                                      |                                  |    |      |
|  |  | WBL      | 78                                | 76  | 75                  | 0.2   | 60.3                                       | E            |  |              | 31                                | 221                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBT      | 45                                | 43  | 225                 | 0.3   | 17.7                                       | B            | 37.3                                       | D            | 31                                | 221                                  | 172                           | 177  | 65.3                               |                         |                                      |                                  |    |      |
|  |  | WBR      | 38                                | 35  | 225                 | 0.5   | 11.6                                       | B            |  |              | 29                                | 230                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBL      | 76                                | 75  | 100                 | 0.1   | 37.9                                       | D            |  |              | 95                                | 406                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBT      | 242                               | 242                                       | 280                 | 0.0   | 27.3                                       | C            | 28.7                                       | C            | 74                                | 373                                  | 157                           | 148  | 65.8                               |                         |                                      |                                  |    |      |
|  |  | NBR      | 77                                | 77  | 280                 | 0.0   | 23.9                                       | C            |  |              | 73                                | 372                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBL      | 142                               | 136                                       | 790                 | 0.5   | 83.8                                       | F            |  |              | 267                               | 526                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBT      | 255                               | 233                                       | 790                 | 1.4   | 74.2                                       | E            | 77.4                                       | E            | 267                               | 526                                  | 188                           | 185  | 64.1                               |                         |                                      |                                  |    |      |
|  |  | SBR      | 25                                | 21  | 790                 | 0.8   | 71.1                                       | E            |  |              | 272                               | 533                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | Overall  | 1,413                             | 1,372                                     |                     | 1.1   | 37.4                                       | D            |  |              |                                   |                                      |                               |  | 1,244                              | 1,246                   | 64.4                                 |                                  |    |      |
|  |  | 9        | 12th Street S and S Elm Street    | EBT                                       | 378                 | 374   | 225  | 0.2          | 16.5                                       | B            |                                   |                                      | 43                            | 393  |                                    |                         |                                      |                                  |    |      |
|  |  |          |                                   | EBR                                       | 109                 | 108   | 225  | 0.1          | 10.5                                       | B            | 15.2                              | B                                    | 40                            | 386  | 343                                | 343                     | 3.3                                  |                                  |    |      |
| WBT                                      | 161  |          |                                   | 153                                       | 325                 | 0.6   | 6.4  | A            | 6.4  | A            | 5                                 | 125                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| NBR                                      | 45   |          |                                   | 44  | 270                 | 0.1   | 31.1                                       | C            | 31.1                                       | C            | 7                                 | 90                                   | 187                           | 181  | 65.0                               |                         |                                      |                                  |    |      |
| Overall                                  | 693  |          |                                   | 679                                       |                     | 0.5   | 14.2                                       | B            |  |              |                                   |                                      |                               |  | 530                                | 524                     | 24.6                                 |                                  |    |      |
| 10                                       | 12th Street S and S Eads Street                  | EBL      | 92                                | 90  | 150                 | 0.2   | 98.6                                       | F            |  |              | 169                               | 373                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | EBT      | 304                               | 306                                       | 320                 | 0.1   | 59.5                                       | E            | 68.0                                       | E            | 169                               | 373                                  | 343                           | 341  | 65.0                               |                         |                                      |                                  |    |      |
|  |  | EBR      | 27                                | 26  | 320                 | 0.2   | 62.2                                       | E            |  |              | 169                               | 373                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBL      | 85                                | 77  | 200                 | 0.9   | 94.3                                       | F            |  |              | 56                                | 202                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBT      | 89                                | 87  | 575                 | 0.2   | 28.9                                       | C            | 52.7                                       | D            | 56                                | 202                                  | 159                           | 160  | 64.7                               |                         |                                      |                                  |    |      |
|  |  | WBR      | 66                                | 57  | 575                 | 1.1   | 32.9                                       | C            |  |              | 56                                | 202                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBL      | 35                                | 33  | 100                 | 0.3   | 24.9                                       | C            |  |              | 22                                | 183                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBT      | 235                               | 232                                       | 270                 | 0.2   | 13.6                                       | B            | 11.4                                       | B            | 22                                | 183                                  | 169                           | 163  | 63.4                               | 40                      | 39                                   | 8.4                              |    |      |
|  |  | NBR      | 235                               | 233                                       | 200                 | 0.1   | 7.2  | A            |  |              | 23                                | 184                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBL      | 257                               | 237                                       | 550                 | 1.3   | 32.3                                       | C            |  |              | 140                               | 350                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBT      | 330                               | 301                                       | 550                 | 1.6   | 29.8                                       | C            | 30.8                                       | C            | 140                               | 350                                  | 47                            | 48   | 63.4                               | 37                      | 33                                   | 5.2                              |    |      |
|  |  | SBR      | 37                                | 33  | 550                 | 0.7   | 28.5                                       | C            |  |              | 143                               | 355                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | Overall  | 1,792                             | 1,712                                     |                     | 1.9   | 37.1                                       | D            |  |              |                                   |                                      |                               |  | 718                                | 712                     | 64.5                                 | 77                               | 72 | 6.9  |
|  |  | 11       | 12th Street S and Army Navy Drive | EBT                                       | 786                 | 771   | 575  | 0.5          | 25.6                                       | C            |                                   |                                      | 87                            | 609  |                                    |                         |                                      |                                  |    |      |
| EBR                                      | 10   |          |                                   | 11  | 575                 | 0.3   | 21.4                                       | C            | 25.5                                       | C            | 93                                | 620                                  | 127                           | 129  | 63.9                               | 25                      | 24                                   | 37.2                             |    |      |
| WBT                                      | 175  |          |                                   | 167                                       | 120                 | 0.6   | 13.6                                       | B            |  |              | 26                                | 216                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| WBR                                      | 198  |          |                                   | 167                                       | 120                 | 2.3   | 13.6                                       | B            | 13.6                                       | B            | 26                                | 216                                  | 170                           | 170  | 62.8                               | 27                      | 26                                   | 46.7                             |    |      |
| NBL                                      | 0  |          |                                   | 0   | 50                  | 0.0   | 0.0  | A            |  |              | 5                                 | 58                                   |                               |  |                                    |                         |                                      |                                  |    |      |
| NBT                                      | 5  |          |                                   | 4   | 50                  | 0.5   | 71.7                                       | E            | 67.7                                       | E            | 5                                 | 58                                   | 0                             | 0  | 0.0                                |                         |                                      |                                  |    |      |
| NBR                                      | 10   |          |                                   | 11  | 50                  | 0.3   | 66.2                                       | E            |  |              | 5                                 | 58                                   |                               |  |                                    |                         |                                      |                                  |    |      |
| SBL                                      | 341  |          |                                   | 313                                       | 1,000               | 1.5   | 47.7                                       | D            |  |              | 64                                | 286                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| SBT                                      | 0  |          |                                   | 0   | 1,000               | 0.0   | 0.0  | A            | 47.4                                       | D            | 64                                | 286                                  | 0                             | 0  | 0.0                                |                         |                                      |                                  |    |      |
| SBR                                      | 65   |          |                                   | 54  | 1,000               | 1.4   | 45.4                                       | D            |  |              | 64                                | 286                                  |                               |  |                                    |                         |                                      |                                  |    |      |
| Overall                                  | 1,590  | 1,498    |                                   | 2.3                                       | 28.6                | C     |  |              |  |              |                                   |                                      | 297                           | 299  | 63.3                               | 52                      | 50                                   | 42.2                             |    |      |
| 12                                       | 12th Street and Long Bridge Drive/S Clark Street | EBL      | 454                               | 438                                       | 120                 | 0.8   | 4.8  | A            |  |              | 13                                | 223                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | EBT      | 249                               | 237                                       | 120                 | 0.8   | 2.3  | A            | 3.5  | A            | 13                                | 223                                  | 110                           | 110  | 64.5                               |                         |                                      |                                  |    |      |
|  |  | EBR      | 434                               | 420                                       | 120                 | 0.7   | 2.8  | A            |  |              | 13                                | 223                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBL      | 35                                | 28  | 100                 | 1.2   | 22.7                                       | C            |  |              | 4                                 | 81                                   |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | WBT      | 185                               | 171                                       | 1,500               | 1.0   | 26.7                                       | C            | 23.6                                       | C            | 48                                | 250                                  | 118                           | 119  | 65.7                               |                         |                                      |                                  |    |      |
|  |  | WBR      | 180                               | 154                                       | 1,500               | 2.0   | 20.4                                       | C            |  |              | 54                                | 261                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBL      | 50                                | 51  | 100                 | 0.1   | 61.7                                       | E            |  |              | 19                                | 116                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | NBT      | 22                                | 21  | 1,200               | 0.2   | 34.6                                       | C            | 49.2                                       | D            | 19                                | 116                                  | 62                            | 65   | 68.4                               | 34                      | 32                                   | 31.2                             |    |      |
|  |  | NBR      | 10                                | 10  | 1,200               | 0.0   | 16.5                                       | B            |  |              | 21                                | 121                                  |                               |  |                                    |                         |                                      |                                  |    |      |
|  |  | SBL      |                                   |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |    |      |

| Pen Place - VISSIM Delay & Queue Results |  |          |                              |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |
|--|--|----------|------------------------------|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|
| 2031 Future No-Build AM Peak Conditions  |  |          |                              |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |
| Intersection #                           | Intersection Name                              | Movement | Input Vehicular Volume (vph) | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |
| 16                                       | 15th Street S and S Fern Street                | EBL      | 20                           | 20  | 130                 | 0.0   | 24.6                                       | C            |  |              | 39                                | 299                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | EBT      | 411                          | 410                                       | 630                 | 0.0   | 24.5                                       | C            | 24.4                                       | C            | 39                                | 299                                  | 41                            | 41   | 68.8                               | ---                     | ---                                  | ---                              |
|  |  | EBR      | 15                           | 17  | 630                 | 0.5   | 22.7                                       | C            |  |              | 40                                | 301                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBL      | 61                           | 59  | 120                 | 0.3   | 15.0                                       | B            |  |              | 7                                 | 131                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBT      | 164                          | 155                                       | 260                 | 0.7   | 6.5  | A            | 7.1  | A            | 7                                 | 131                                  | 21                            | 20   | 64.1                               | ---                     | ---                                  | ---                              |
|  |  | WBR      | 131                          | 125                                       | 260                 | 0.5   | 4.2  | A            |  |              | 7                                 | 133                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBL      | 22                           | 22  | 750                 | 0.0   | 52.6                                       | D            |  |              | 100                               | 501                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBT      | 212                          | 211                                       | 750                 | 0.1   | 48.0                                       | D            | 35.6                                       | D            | 100                               | 501                                  | 41                            | 43   | 67.7                               | ---                     | ---                                  | ---                              |
|  |  | NBR      | 199                          | 199                                       | 75                  | 0.0   | 20.6                                       | C            |  |              | 103                               | 506                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBL      | 162                          | 156                                       | 160                 | 0.5   | 60.0                                       | E            |  |              | 63                                | 331                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBT      | 59                           | 58  | 300                 | 0.1   | 35.1                                       | D            | 46.3                                       | D            | 63                                | 331                                  | 41                            | 43   | 66.1                               | ---                     | ---                                  | ---                              |
|  |  | SBR      | 51                           | 49  | 300                 | 0.3   | 16.0                                       | B            |  |              | 74                                | 346                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | Overall  |                              |   | 1,507               | 1,481 | ---  | 0.7          | 27.6                                       | C            | ---                               | ---                                  | ---                           | ---  | 144                                | 147                     | 67.1                                 | ---                              |
| 17                                       | 15th Street S and S Elm Street                 | EBL      | 31                           | 33  | 60                  | 0.4   | 13.9                                       | B            |  |              | 41                                | 374                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | EBT      | 741                          | 737                                       | 270                 | 0.1   | 13.8                                       | B            | 13.8                                       | B            | 41                                | 374                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBT      | 306                          | 287                                       | 300                 | 1.1   | 4.4  | A            |  |              | 10                                | 162                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBR      | 209                          | 192                                       | 300                 | 1.2   | 5.8  | A            | 5.0  | A            | 10                                | 162                                  | 33                            | 34   | 63.0                               | ---                     | ---                                  | ---                              |
|  |  | SBL      | 19                           | 18  | 250                 | 0.2   | 43.5                                       | D            |  |              | 4                                 | 55                                   |                               |  |                                    |                         |                                      |                                  |
|  |  | SBT      | 50                           | 52  | 250                 | 0.3   | 8.1  | A            | 17.2                                       | B            | 2                                 | 67                                   | 12                            | 12   | 61.4                               | ---                     | ---                                  | ---                              |
|  |  | SBR      | 9                            | 8   | 75                  | 0.3   | 22.1                                       | C            |  |              | 120                               | 392                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | Overall  |                              |   | 1,356               | 1,319 | ---  | 1.0          | 10.8                                       | B            | ---                               | ---                                  | ---                           | ---  | 45                                 | 46                      | 62.6                                 | ---                              |
| 18                                       | 15th Street S and S Eads Street                | EBL      | 65                           | 68  | 170                 | 0.4   | 24.3                                       | C            |  |              | 8                                 | 272                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | EBT      | 640                          | 639                                       | 300                 | 0.0   | 17.7                                       | B            | 18.4                                       | B            | 57                                | 378                                  | 265                           | 271  | 64.6                               | ---                     | ---                                  | ---                              |
|  |  | EBR      | 55                           | 56  | 300                 | 0.1   | 18.9                                       | B            |  |              | 57                                | 378                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBL      | 83                           | 70  | 300                 | 1.5   | 53.0                                       | D            |  |              | 78                                | 339                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBT      | 422                          | 390                                       | 300                 | 1.6   | 35.1                                       | D            | 38.9                                       | D            | 78                                | 339                                  | 134                           | 137  | 64.9                               | ---                     | ---                                  | ---                              |
|  |  | WBR      | 159                          | 145                                       | 300                 | 1.1   | 42.5                                       | D            |  |              | 78                                | 339                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBL      | 84                           | 81  | 130                 | 0.3   | 46.8                                       | D            |  |              | 337                               | 929                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBT      | 309                          | 304                                       | 760                 | 0.3   | 59.0                                       | E            | 47.0                                       | D            | 337                               | 929                                  | 314                           | 303  | 187.7                              | 33                      | 32                                   | 37.5                             |
|  |  | NBR      | 274                          | 271                                       | 130                 | 0.2   | 33.5                                       | C            |  |              | 173                               | 884                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBL      | 193                          | 182                                       | 250                 | 0.8   | 77.3                                       | E            |  |              | 122                               | 388                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBT      | 210                          | 192                                       | 300                 | 1.3   | 49.8                                       | D            | 62.3                                       | E            | 122                               | 388                                  | 124                           | 125  | 190.3                              | 60                      | 53                                   | 47.3                             |
|  |  | SBR      | 9                            | 8   | 75                  | 0.3   | 22.1                                       | C            |  |              | 120                               | 392                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | Overall  |                              |   | 2,503               | 2,406 | ---  | 2.0          | 38.3                                       | D            | ---                               | ---                                  | ---                           | ---  | 837                                | 836                     | 128.0                                | 93                               |
| 19                                       | S Eads Street and I-395 HOT Lanes (South Node) | EBT      | 2                            | 2   | 1,000               | 0.0   | 75.6                                       | E            | 159.1                                      | F            | 658                               | 962                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | EBR      | 475                          | 474                                       | 1,000               | 0.0   | 159.5                                      | F            |  |              | 658                               | 962                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBT      | 179                          | 159                                       | 170                 | 1.5   | 10.6                                       | B            | 7.9  | A            | 7                                 | 164                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBR      | 602                          | 531                                       | 170                 | 3.0   | 7.1  | A            |  |              | 24                                | 223                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBL      | 145                          | 144                                       | 100                 | 0.1   | 2.9  | A            | 17.3                                       | B            | 22                                | 211                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBR      | 215                          | 224                                       | 100                 | 0.6   | 26.6                                       | C            |  |              | 21                                | 208                                  |                               |  |                                    |                         |                                      |                                  |
| Overall                                  |  |          | 1,618                        | 1,534                                     | ---                 | 2.1   | 57.1                                       | E            | ---  | ---          | ---                               | ---                                  | ---                           | ---  | ---                                | ---                     | ---                                  |                                  |
| 20                                       | S Eads Street and I-395 HOT Lanes (North Node) | EBL      | 841                          | 827                                       | 875                 | 0.5   | 49.8                                       | D            | 49.8                                       | D            | 139                               | 472                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBL      | 132                          | 130                                       | 1,250               | 0.2   | 67.4                                       | E            |  |              | 56                                | 214                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | WBR      | 100                          | 105                                       | 1,250               | 0.5   | 59.6                                       | E            | 63.9                                       | E            | 56                                | 214                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBT      | 179                          | 161                                       | 100                 | 1.4   | 16.7                                       | B            | 16.7                                       | B            | 12                                | 207                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBT      | 228                          | 235                                       | 100                 | 0.5   | 17.0                                       | B            | 17.0                                       | B            | 15                                | 137                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | Overall  |                              |   | 1,480               | 1,458 | ---  | 0.6          | 43.1                                       | D            | ---                               | ---                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
| 21                                       | 14th Street S and S Eads Street                | EBL      | 6                            | 5   | 200                 | 0.4   | 78.5                                       | E            |  |              | 3                                 | 43                                   |                               |  |                                    |                         |                                      |                                  |
|  |  | EBT      | 0                            | 0   | 200                 | 0.0   | 0.0  | A            | 78.5                                       | E            | 3                                 | 43                                   |                               |  |                                    |                         |                                      |                                  |
|  |  | EBR      | 0                            | 0   | 200                 | 0.0   | 0.0  | A            |  |              | 3                                 | 42                                   |                               |  |                                    |                         |                                      |                                  |
|  |  | WBL      | 20                           | 21  | 150                 | 0.2   | 56.4                                       | E            |  |              | 19                                | 96                                   |                               |  |                                    |                         |                                      |                                  |
|  |  | WBT      | 0                            | 0   | 150                 | 0.0   | 0.0  | A            | 78.3                                       | E            | 19                                | 96                                   | 286                           | 289  | 65.3                               | ---                     | ---                                  | ---                              |
|  |  | WBR      | 25                           | 27  | 150                 | 0.4   | 95.3                                       | F            |  |              | 19                                | 96                                   |                               |  |                                    |                         |                                      |                                  |
|  |  | NBL      | 0                            | 0   | 100                 | 0.0   | 0.0  | A            |  |              | 7                                 | 179                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | NBT      | 508                          | 495                                       | 350                 | 0.6   | 3.0  | A            | 3.0  | A            | 9                                 | 179                                  | 359                           | 353  | 52.0                               | 34                      | 33                                   | 0.8                              |
|  |  | NBR      | 25                           | 23  | 350                 | 0.4   | 3.1  | A            |  |              | 9                                 | 192                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBL      | 25                           | 28  | 100                 | 0.6   | 74.2                                       | E            |  |              | 32                                | 188                                  |                               |  |                                    |                         |                                      |                                  |
|  |  | SBT      | 392                          | 367                                       | 290                 | 1.3   | 9.1  | A            | 13.2                                       | B            | 32                                | 188                                  | 74                            | 74   | 60.6                               | 32                      | 29                                   | 3.4                              |
| SBR                                      | 40   | 37       | 290                          | 0.5                                       | 7.8                 | A     |  |              | 33   | 191          |                                   |                                      |                               |  |                                    |                         |                                      |                                  |
| Overall                                  |  |          | 1,041                        | 1,003                                     | ---                 | 1.2   | 11.4                                       | B            | ---  | ---          | ---                               | ---                                  | 719                           | 716  | 58.2                               | 66                      | 62                                   | 2.0                              |

Source: VISSIM 11.0 Node Evaluation. Compiled by Gorove/Slade Associates based on the average of 10 VISSIM model runs.

\* GEH statistic is computed as follows. GEH<5 indicates good fit.

$$GEH = \frac{(\text{Simulated Volume} - \text{Input Volume})^2}{(\text{Simulated Volume} + \text{Input Volume})/2}$$

| Pen Place - VISSIM Delay & Queue Results |  |          |                                  |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |      |      |  |
|--|--|----------|----------------------------------|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|------|------|--|
| 2031 Future No-Build PM Peak Conditions  |  |          |                                  |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |      |      |  |
| Intersection #                           | Intersection Name                                | Movement | Input Vehicular Volume (vph)     | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |      |      |  |
| 1  | Army-Navy Drive and S Hayes Street/I-395 Ramp    | EBL      | 155                              | 157                                       | 260                 | 0.2   | 66.7                                       | E            |  |              | 68                                | 349                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | EBT      | 362                              | 375                                       | 450                 | 0.7   | 65.7                                       | E            | 56.6                                       | E            | 104                               | 365                                  |                               | 56   | 54                                 | 65.7                    | 49                                   | 49                               | 43.7 |      |  |
|  |  | EBR      | 248                              | 258                                       | 450                 | 0.6   | 37.3                                       | D            |  |              | 104                               | 365                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | WBL      | 79                               | 73  | 190                 | 0.7   | 76.5                                       | E            |  |              | 34                                | 176                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | WBT      | 393                              | 378                                       | 430                 | 0.8   | 66.5                                       | E            | 26.6                                       | C            | 82                                | 288                                  |                               | 4  | 4                                  | 67.7                    | 31                                   | 32                               | 63.2 |      |  |
|  |  | WBR      | 783                              | 742                                       | 430                 | 1.5   | 1.4  | A            |  |              | 1                                 | 169                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBL      | 192                              | 204                                       | 200                 | 0.9   | 59.2                                       | E            |  |              | 82                                | 329                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBT      | 714                              | 706                                       | 750                 | 0.3   | 29.3                                       | C            | 29.2                                       | C            | 57                                | 337                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBR      | 258                              | 259                                       | 115                 | 0.1   | 5.5  | A            |  |              | 5                                 | 215                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | SBL      | 482                              | 389                                       | 2,050               | 4.5   | 149.2                                      | F            |  |              | 2,484                             | 2,927                                |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | SBT      | 1,087                            | 1,084                                     | 1,950               | 0.1   | 41.3                                       | D            | 59.5                                       | E            | 2,484                             | 2,927                                |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | SBR      | 445                              | 437                                       | 1,950               | 0.4   | 24.8                                       | C            |  |              | 2,483                             | 2,926                                |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | Overall  |                                  |   | 5,198               | 5,062 |  | 1.9          | 44.3                                       | D            |                                   |                                      |                               |  | 60                                 | 58                      | 65.8                                 | 80                               | 81   | 51.4 |  |
| 2  | Army-Navy Drive and S Fern Street                | EBL      | 208                              | 191                                       | 160                 | 1.2   | 37.0                                       | D            |  |              | 28                                | 305                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | EBT      | 727                              | 675                                       | 430                 | 2.0   | 34.5                                       | C            | 31.1                                       | C            | 119                               | 505                                  |                               | 44   | 48                                 | 66.0                    | 41                                   | 42                               | 4.0  |      |  |
|  |  | EBR      | 167                              | 162                                       | 180                 | 0.4   | 9.7  | A            |  |              | 6                                 | 137                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | WBL      | 28                               | 29  | 80                  | 0.2   | 88.4                                       | F            |  |              | 141                               | 408                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | WBT      | 831                              | 819                                       | 540                 | 0.4   | 33.3                                       | C            | 35.5                                       | D            | 141                               | 408                                  |                               | 25   | 25                                 | 61.3                    | 31                                   | 33                               | 9.3  |      |  |
|  |  | WBR      | 133                              | 136                                       | 540                 | 0.3   | 37.5                                       | D            |  |              | 143                               | 412                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBL      | 247                              | 210                                       | 225                 | 2.4   | 44.8                                       | D            |  |              | 55                                | 263                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBT      | 169                              | 196                                       | 785                 | 2.0   | 28.7                                       | C            | 36.6                                       | D            | 28                                | 134                                  |                               | 60   | 63                                 | 61.3                    |                                      |                                  |      |      |  |
|  |  | NBR      | 35                               | 30  | 300                 | 0.9   | 31.2                                       | C            |  |              | 28                                | 134                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | SBL      | 34                               | 34  | 75                  | 0.0   | 41.1                                       | D            |  |              | 9                                 | 166                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | SBT      | 100                              | 99  | 560                 | 0.1   | 41.3                                       | D            | 32.4                                       | C            | 38                                | 245                                  |                               | 93   | 97                                 | 62.9                    |                                      |                                  |      |      |  |
|  |  | SBR      | 177                              | 167                                       | 560                 | 0.8   | 25.3                                       | C            |  |              | 42                                | 252                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | Overall  |                                  |   | 2,856               | 2,748 |  | 2.0          | 33.7                                       | C            |                                   |                                      |                               |  | 222                                | 233                     | 62.9                                 | 72                               | 75   | 6.3  |  |
| 4  | Army-Navy Drive and S Eads Street                | EBL      | 375                              | 342                                       | 420                 | 1.7   | 64.7                                       | E            |  |              | 208                               | 335                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | EBT      | 222                              | 205                                       | 530                 | 1.2   | 11.4                                       | B            | 35.4                                       | D            | 206                               | 333                                  |                               | 32   | 33                                 | 75.4                    | 41                                   | 42                               | 2.3  |      |  |
|  |  | EBR      | 205                              | 195                                       | 530                 | 0.7   | 9.3  | A            |  |              | 107                               | 327                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | WBT      | 572                              | 560                                       | 1,100               | 0.5   | 30.5                                       | C            |  |              | 80                                | 199                                  |                               | 51   | 50                                 | 63.8                    | 25                                   | 24                               | 3.3  |      |  |
|  |  | WBR      | 477                              | 469                                       | 100                 | 0.4   | 20.7                                       | C            | 30.5                                       | C            | 87                                | 209                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBL      | 206                              | 191                                       | 100                 | 1.1   | 25.7                                       | C            |  |              | 110                               | 330                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBT      | 560                              | 524                                       | 550                 | 1.5   | 24.6                                       | C            | 24.7                                       | C            | 110                               | 330                                  |                               | 18   | 19                                 | 72.9                    | 31                                   | 32                               | 27.1 |      |  |
|  |  | NBR      | 29                               | 26  | 550                 | 0.6   | 20.2                                       | C            |  |              | 110                               | 330                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | SBL      | 28                               | 30  | 550                 | 0.4   | 22.2                                       | C            |  |              | 21                                | 204                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | SBT      | 136                              | 136                                       | 550                 | 0.0   | 23.9                                       | C            | 14.1                                       | B            | 21                                | 204                                  |                               | 21   | 23                                 | 73.4                    |                                      |                                  |      |      |  |
|  |  | SBR      | 170                              | 175                                       | 550                 | 0.4   | 5.1  | A            |  |              | 21                                | 204                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | Overall  |                                  |   | 2,980               | 2,853 |  | 2.4          | 26.7                                       | C            |                                   |                                      |                               |  | 122                                | 125                     | 70.0                                 | 97                               | 98   | 10.6 |  |
|  |  | 7        | 12th Street S and S Hayes Street | EBL                                       | 85                  | 90    | 450  | 0.5          | 45.8                                       | D            |                                   |                                      | 20                            | 212  |                                    |                         |                                      |                                  |      |      |  |
| EBT                                      | 35   |          |                                  | 33  | 450                 | 0.3   | 41.0                                       | D            | 29.2                                       | C            | 40                                | 212                                  |                               | 626  | 644                                | 64.6                    |                                      |                                  |      |      |  |
| EBR                                      | 70   |          |                                  | 70  | 65                  | 0.0   | 2.3  | A            |  |              | 39                                | 210                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
| WBL                                      | 82   |          |                                  | 79  | 100                 | 0.3   | 56.5                                       | E            |  |              | 64                                | 381                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
| WBT                                      | 30   |          |                                  | 35  | 620                 | 0.9   | 47.2                                       | D            | 51.8                                       | D            | 64                                | 381                                  |                               | 94   | 94                                 | 60.8                    |                                      |                                  |      |      |  |
| WBR                                      | 140  |          |                                  | 133                                       | 620                 | 0.6   | 50.3                                       | D            |  |              | 64                                | 381                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
| NBL                                      | 60   |          |                                  | 59  | 75                  | 0.1   | 77.7                                       | E            |  |              | 64                                | 269                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
| NBT                                      | 849  |          |                                  | 856                                       | 775                 | 0.2   | 22.9                                       | C            | 25.7                                       | C            | 64                                | 269                                  |                               | 81   | 82                                 | 62.9                    |                                      |                                  |      |      |  |
| NBR                                      | 53   |          |                                  | 51  | 75                  | 0.3   | 11.7                                       | B            |  |              | 63                                | 273                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
| SBL                                      | 249  |          |                                  | 245                                       | 250                 | 0.3   | 77.4                                       | E            |  |              | 122                               | 392                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
| SBT                                      | 1,075  |          |                                  | 1,071                                     | 770                 | 0.1   | 10.2                                       | B            | 21.9                                       | C            | 122                               | 392                                  |                               | 0  | 0                                  | 0.0                     |                                      |                                  |      |      |  |
| SBR                                      | 90   |          |                                  | 91  | 770                 | 0.1   | 9.7  | A            |  |              | 122                               | 392                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
| Overall                                  |  |          |                                  |   | 2,818               | 2,813 |  | 0.1          | 26.3                                       | C            |                                   |                                      |                               |  | 801                                | 820                     | 64.0                                 |                                  |      |      |  |
| 8  | 12th Street S and S Fern Street                  | EBT      | 181                              | 181                                       | 640                 | 0.0   | 49.8                                       | D            |  |              | 136                               | 571                                  |                               | 1,016                                      | 1,031                              | 64.6                    |                                      |                                  |      |      |  |
|  |  | EBR      | 156                              | 149                                       | 640                 | 0.6   | 44.8                                       | D            | 49.8                                       | D            | 142                               | 580                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | WBL      | 115                              | 112                                       | 75                  | 0.3   | 115.4                                      | F            |  |              | 137                               | 357                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | WBT      | 128                              | 128                                       | 225                 | 0.0   | 42.9                                       | D            | 68.2                                       | E            | 137                               | 357                                  |                               | 94   | 97                                 | 65.1                    |                                      |                                  |      |      |  |
|  |  | WBR      | 62                               | 63  | 225                 | 0.1   | 35.9                                       | D            |  |              | 142                               | 367                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBL      | 114                              | 111                                       | 100                 | 0.3   | 26.9                                       | C            |  |              | 75                                | 373                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBT      | 363                              | 351                                       | 280                 | 0.6   | 19.5                                       | B            | 20.8                                       | C            | 75                                | 373                                  |                               | 104  | 100                                | 65.4                    |                                      |                                  |      |      |  |
|  |  | NBR      | 51                               | 51  | 280                 | 0.0   | 16.6                                       | B            |  |              | 75                                | 372                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | SBL      | 111                              | 110                                       | 790                 | 0.1   | 47.5                                       | D            |  |              | 129                               | 510                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | SBT      | 318                              | 315                                       | 790                 | 0.2   | 35.5                                       | D            | 38.4                                       | D            | 129                               | 510                                  |                               | 86   | 87                                 | 64.4                    |                                      |                                  |      |      |  |
|  |  | SBR      | 10                               | 10  | 790                 | 0.0   | 27.8                                       | C            |  |              | 131                               | 516                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | Overall  |                                  |   | 1,609               | 1,581 |  | 0.7          | 40.3                                       | D            |                                   |                                      |                               |  | 1,300                              | 1,315                   | 64.7                                 |                                  |      |      |  |
|  |  | 9        | 12th Street S and S Elm Street   | EBT                                       | 251                 | 252   | 225  | 0.1          | 8.3  | A            |                                   |                                      | 15                            | 212  |                                    |                         |                                      |                                  |      |      |  |
| EBR                                      | 92   |          |                                  | 89  | 225                 | 0.3   | 5.0  | A            | 7.4  | A            | 13                                | 204                                  |                               | 548  | 532                                | 65.2                    |                                      |                                  |      |      |  |
| WBT                                      | 305  |          |                                  | 298                                       | 325                 | 0.4   | 28.1                                       | C            | 28.1                                       | C            | 48                                | 336                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
| NBR                                      | 60   |          |                                  | 60  | 270                 | 0.0   | 12.7                                       | B            | 12.7                                       | B            | 4                                 | 93                                   |                               | 157  | 153                                | 65.5                    |                                      |                                  |      |      |  |
| Overall                                  |  |          |                                  |   | 708                 | 699   |  | 0.3          | 16.7                                       | B            |                                   |                                      |                               |  | 705                                | 685                     | 65.2                                 |                                  |      |      |  |
| 10                                       | 12th Street S and S Eads Street                  | EBL      | 124                              | 127                                       | 150                 | 0.3   | 62.7                                       | E            |  |              | 84                                | 338                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | EBT      | 107                              | 108                                       | 320                 | 0.1   | 46.7                                       | D            | 54.5                                       | D            | 84                                | 338                                  |                               | 395  | 393                                | 66.6                    |                                      |                                  |      |      |  |
|  |  | EBR      | 80                               | 81  | 320                 | 0.1   | 52.1                                       | D            |  |              | 84                                | 338                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | WBL      | 98                               | 99  | 200                 | 0.1   | 85.2                                       | F            |  |              | 179                               | 494                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | WBT      | 230                              | 231                                       | 575                 | 0.1   | 62.0                                       | E            | 68.3                                       | E            | 179                               | 494                                  |                               | 174  | 177                                | 65.2                    |                                      |                                  |      |      |  |
|  |  | WBR      | 94                               | 99  | 575                 | 0.5   | 66.0                                       | E            |  |              | 179                               | 494                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBL      | 40                               | 34  | 100                 | 1.0   | 37.2                                       | D            |  |              | 155                               | 388                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBT      | 590                              | 523                                       | 270                 | 2.8   | 34.0                                       | C            | 31.1                                       | C            | 155                               | 388                                  |                               | 209  | 204                                | 64.0                    | 27                                   | 27                               | 34.3 |      |  |
|  |  | NBR      | 96                               | 86  | 200                 | 1.0   | 10.7                                       | B            |  |              | 156                               | 389                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | SBL      | 50                               | 46  | 550                 | 0.6   | 57.4                                       | E            |  |              | 102                               | 334                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | SBT      | 246                              | 237                                       | 550                 | 0.6   | 42.4                                       | D            | 44.2                                       | D            | 102                               | 334                                  |                               | 95   | 92                                 | 64.2                    | 62                                   | 57                               | 19.7 |      |  |
|  |  | SBR      | 35                               | 37  | 550                 | 0.3   | 39.6                                       | D            |  |              | 105                               | 339                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | Overall  |                                  |   | 1,790               | 1,708 |  | 2.0          | 47.2                                       | D            |                                   |                                      |                               |  | 873                                | 866                     | 65.4                                 | 89                               | 84   | 24.4 |  |
| 11                                       | 12th Street S and Army Navy Drive                | EBT      | 238                              | 236                                       | 575                 | 0.1   | 33.4                                       | C            |  |              | 37                                | 186                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | EBR      | 15                               | 14  | 575                 | 0.3   | 20.9                                       | C            | 33.4                                       | C            | 43                                | 197                                  |                               | 140  | 138                                | 65.6                    | 28                                   | 32                               | 48.0 |      |  |
|  |  | WBT      | 241                              | 244                                       | 120                 | 0.2   | 15.2                                       | B            |  |              | 59                                | 250                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | WBR      | 656                              | 636                                       | 120                 | 0.8   | 10.0                                       | A            | 15.2                                       | B            | 59                                | 250                                  |                               | 233  | 237                                | 63.6                    | 43                                   | 43                               | 51.1 |      |  |
|  |  | NBL      | 5                                | 5   | 50                  | 0.0   | 54.4                                       | D            |  |              | 4                                 | 57                                   |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBT      | 0                                | 0   | 50                  | 0.0   | 0.0  | A            | 48.5                                       | D            | 4                                 | 57                                   |                               | 3  | 3                                  | 0.1                     |                                      |                                  |      |      |  |
|  |  | NBR      | 10                               | 10  | 50                  | 0.0   | 45.6                                       | D            |  |              | 4                                 | 57                                   |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | SBL      | 223                              | 201                                       | 1,000               | 1.5   | 36.7                                       | D            |  |              | 36                                | 203                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
| 12                                       | 12th Street and Long Bridge Drive/S Clark Street | EBL      | 183                              | 169                                       | 120                 | 1.1   | 18.9                                       | B            |  |              | 15                                | 141                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | EBT      | 168                              | 157                                       | 120                 | 0.9   | 1.7  | A            | 8.5  | A            | 15                                | 141                                  |                               | 222  | 225                                | 63.7                    |                                      |                                  |      |      |  |
|  |  | EBR      | 120                              | 120                                       | 120                 | 0.0   | 2.6  | A            |  |              | 15                                | 141                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | WBL      | 25                               | 23  | 100                 | 0.4   | 65.2                                       | E            |  |              | 218                               | 493                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | WBT      | 483                              | 476                                       | 1,500               | 0.3   | 89.7                                       | F            | 90.2                                       | F            | 833                               | 1,429                                |                               | 281  | 282                                | 64.4                    |                                      |                                  |      |      |  |
|  |  | WBR      | 134                              | 131                                       | 1,500               | 0.3   | 96.2                                       | F            |  |              | 844                               | 1,440                                |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBL      | 177                              | 179                                       | 100                 | 0.1   | 92.8                                       | F            |  |              | 113                               | 378                                  |                               |  |                                    |                         |                                      |                                  |      |      |  |
|  |  | NBT      | 75                               | 78  | 1,200               | 0.3   | 59.1                                       | E            | 79.0                                       | E            | 113                               | 378                                  |                               | 76   | 79                                 | 61.8</                  |                                      |                                  |      |      |  |

| Pen Place - VISSIM Delay & Queue Results |  |          |                              |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |  |
|--|--|----------|------------------------------|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|--|
| 2031 Future No-Build PM Peak Conditions  |  |          |                              |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |  |
| Intersection #                           | Intersection Name                              | Movement | Input Vehicular Volume (vph) | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |  |
| 16                                       | 15th Street S and S Fern Street                | EBL      | 75                           | 77  | 130                 | 0.2   | 26.0                                       | C            |  |              | 18                                | 147                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | EBT      | 260                          | 257                                       | 630                 | 0.2   | 12.9                                       | B            | 15.5                                       | B            | 18                                | 147                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | EBR      | 25                           | 25  | 630                 | 0.0   | 9.8  | A            |  |              | 17                                | 149                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | WBL      | 146                          | 116                                       | 120                 | 2.6   | 54.6                                       | D            |  |              | 82                                | 361                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | WBT      | 415                          | 341                                       | 260                 | 3.8   | 41.2                                       | D            | 42.6                                       | D            | 82                                | 361                                  | 73                            | 76   | 64.5                               |                         |                                      |                                  |  |
|  |  | WBR      | 149                          | 122                                       | 260                 | 2.3   | 35.1                                       | D            |  |              | 84                                | 364                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | NBL      | 21                           | 20  | 750                 | 0.2   | 25.9                                       | C            |  |              | 24                                | 270                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | NBT      | 160                          | 163                                       | 750                 | 0.2   | 19.7                                       | B            | 17.1                                       | B            | 24                                | 270                                  | 112                           | 117  | 65.7                               |                         |                                      |                                  |  |
|  |  | NBR      | 60                           | 55  | 75                  | 0.7   | 6.1  | A            |  |              | 24                                | 275                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | SBL      | 127                          | 121                                       | 160                 | 0.5   | 21.2                                       | C            |  |              | 34                                | 346                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | SBT      | 223                          | 219                                       | 300                 | 0.3   | 16.0                                       | B            | 17.0                                       | B            | 34                                | 346                                  | 55                            | 56   | 64.1                               |                         |                                      |                                  |  |
|  |  | SBR      | 80                           | 80  | 300                 | 0.0   | 13.5                                       | B            |  |              | 40                                | 360                                  |                               |  |                                    |                         |                                      |                                  |  |
| Overall                                  |  |          | 1,741                        | 1,596                                     |                     | 3.5   | 26.0                                       | C            |  |              |                                   |                                      | 304                           | 317  | 64.6                               |                         |                                      |                                  |  |
| 17                                       | 15th Street S and S Elm Street                 | EBL      | 5                            | 4   | 60                  | 0.5   | 2.7  | A            | 4.1  | A            | 6                                 | 173                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | EBT      | 442                          | 429                                       | 270                 | 0.6   | 4.1  | A            |  |              | 6                                 | 173                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | WBT      | 640                          | 498                                       | 300                 | 6.0   | 3.8  | A            | 3.7  | A            | 6                                 | 122                                  | 33                            | 34   | 44.9                               |                         |                                      |                                  |  |
|  |  | WBR      | 67                           | 49  | 300                 | 2.4   | 2.6  | A            |  |              | 7                                 | 125                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | SBL      | 81                           | 76  | 250                 | 0.6   | 57.2                                       | E            | 35.4                                       | D            | 26                                | 146                                  | 10                            | 9  | 75.4                               |                         |                                      |                                  |  |
|  |  | SBR      | 70                           | 72  | 250                 | 0.2   | 12.4                                       | B            |  |              | 22                                | 149                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | Overall  |                              |   | 1,305               | 1,128 |  | 5.1          | 8.0  | A            |                                   |                                      |                               |  | 43                                 | 43                      | 51.3                                 |                                  |  |
| 18                                       | 15th Street S and S Eads Street                | EBL      | 65                           | 59  | 170                 | 0.8   | 50.2                                       | D            |  |              | 17                                | 215                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | EBT      | 365                          | 355                                       | 300                 | 0.5   | 19.6                                       | B            | 24.1                                       | C            | 44                                | 289                                  | 333                           | 340  | 64.9                               |                         |                                      |                                  |  |
|  |  | EBR      | 93                           | 91  | 300                 | 0.2   | 24.5                                       | C            |  |              | 44                                | 289                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | WBL      | 326                          | 241                                       | 300                 | 5.0   | 27.3                                       | C            |  |              | 66                                | 364                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | WBT      | 608                          | 452                                       | 300                 | 6.8   | 20.4                                       | C            | 26.2                                       | C            | 66                                | 364                                  | 205                           | 209  | 64.0                               |                         |                                      |                                  |  |
|  |  | WBR      | 286                          | 206                                       | 300                 | 5.1   | 37.6                                       | D            |  |              | 66                                | 364                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | NBL      | 60                           | 58  | 130                 | 0.3   | 84.8                                       | F            |  |              | 490                               | 914                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | NBT      | 327                          | 320                                       | 760                 | 0.4   | 87.5                                       | F            | 77.9                                       | E            | 490                               | 914                                  | 412                           | 416  | 185.4                              | 43                      | 43                                   | 43.5                             |  |
|  |  | NBR      | 104                          | 99  | 130                 | 0.5   | 42.7                                       | D            |  |              | 21                                | 508                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | SBL      | 194                          | 192                                       | 250                 | 0.1   | 68.7                                       | E            |  |              | 213                               | 462                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | SBT      | 342                          | 337                                       | 300                 | 0.3   | 63.5                                       | E            | 63.8                                       | E            | 213                               | 462                                  | 165                           | 173  | 186.9                              | 34                      | 34                                   | 23.0                             |  |
|  |  | SBR      | 39                           | 38  | 75                  | 0.2   | 41.4                                       | D            |  |              | 213                               | 462                                  |                               |  |                                    |                         |                                      |                                  |  |
| Overall                                  |  |          | 2,809                        | 2,448                                     |                     | 7.0   | 44.5                                       | D            |  |              |                                   |                                      | 1,115                         | 1,138                                      | 127.3                              | 77                      | 77                                   | 34.5                             |  |
| 19                                       | S Eads Street and I-395 HOT Lanes (South Node) | NBL      | 288                          | 266                                       | 150                 | 1.3   | 27.6                                       | C            |  |              | 47                                | 309                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | NBT      | 363                          | 350                                       | 170                 | 0.7   | 6.1  | A            | 15.4                                       | B            | 47                                | 309                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | NBR      | 761                          | 724                                       | 170                 | 1.4   | 7.2  | A            |  |              | 47                                | 353                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | SBL      | 270                          | 266                                       | 100                 | 0.2   | 3.2  | A            |  |              | 13                                | 216                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | SBT      | 334                          | 344                                       | 100                 | 0.5   | 3.8  | A            | 3.2  | A            | 12                                | 213                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | Overall  |                              |   | 2,016               | 1,950 |  | 1.5          | 8.6  | A            |                                   |                                      |                               |  |                                    |                         |                                      |                                  |  |
| 20                                       | S Eads Street and I-395 HOT Lanes (North Node) | WBL      | 210                          | 218                                       | 1,250               | 0.5   | 33.4                                       | C            |  |              | 39                                | 212                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | WBR      | 106                          | 106                                       | 1,250               | 0.0   | 26.1                                       | C            | 33.4                                       | C            | 39                                | 212                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | NBT      | 363                          | 350                                       | 100                 | 0.7   | 5.7  | A            | 5.7  | A            | 8                                 | 174                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | SBT      | 394                          | 394                                       | 100                 | 0.0   | 4.9  | A            | 4.9  | A            | 7                                 | 161                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | SBR      | 1,057                        | 1,055                                     | 100                 | 0.1   | 0.3  | A            |  |              | 5                                 | 158                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | Overall  |                              |   | 2,130               | 2,123 |  | 0.2          | 6.7  | A            |                                   |                                      |                               |  |                                    |                         |                                      |                                  |  |
| 21                                       | 14th Street S and S Eads Street                | EBL      | 40                           | 39  | 200                 | 0.2   | 73.1                                       | E            |  |              | 22                                | 128                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | EBT      | 0                            | 0   | 200                 | 0.0   | 0.0  | A            | 73.4                                       | E            | 22                                | 128                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | EBR      | 9                            | 8   | 200                 | 0.3   | 74.7                                       | E            |  |              | 22                                | 127                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | WBL      | 35                           | 35  | 150                 | 0.0   | 57.5                                       | E            |  |              | 25                                | 121                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | WBT      | 0                            | 0   | 150                 | 0.0   | 0.0  | A            | 82.7                                       | F            | 27                                | 125                                  | 303                           | 307  | 66.0                               |                         |                                      |                                  |  |
|  |  | WBR      | 25                           | 28  | 150                 | 0.6   | 114.1                                      | F            |  |              | 25                                | 121                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | NBL      | 0                            | 0   | 100                 | 0.0   | 0.0  | A            |  |              | 94                                | 438                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | NBT      | 648                          | 555                                       | 350                 | 3.8   | 24.1                                       | C            | 24.0                                       | C            | 94                                | 438                                  | 326                           | 330  | 65.4                               | 43                      | 42                                   | 1.9                              |  |
|  |  | NBR      | 30                           | 26  | 350                 | 0.8   | 21.7                                       | C            |  |              | 101                               | 452                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | SBL      | 15                           | 16  | 100                 | 0.3   | 91.6                                       | F            |  |              | 115                               | 379                                  |                               |  |                                    |                         |                                      |                                  |  |
|  |  | SBT      | 531                          | 518                                       | 290                 | 0.6   | 30.7                                       | C            | 32.5                                       | C            | 115                               | 379                                  | 65                            | 62   | 65.4                               | 29                      | 30                                   | 2.4                              |  |
|  |  | SBR      | 7                            | 7   | 290                 | 0.0   | 28.0                                       | C            |  |              | 117                               | 382                                  |                               |  |                                    |                         |                                      |                                  |  |
| Overall                                  |  |          | 1,340                        | 1,232                                     |                     | 3.0   | 32.6                                       | C            |  |              |                                   |                                      | 694                           | 699  | 65.7                               | 72                      | 72                                   | 2.1                              |  |

Source: VISSIM 11.0 Node Evaluation. Compiled by Gorove/Slade Associates based on the average of 10 VISSIM model runs.

\* GEH statistic is computed as follows. GEH<5 indicates good fit.

$$GEH = \sqrt{\frac{(\text{Simulated Volume} - \text{Input Volume})^2}{(\text{Simulated Volume} + \text{Input Volume})/2}}$$



## M. 2031 Mitigated Future VISSIM Delay and Queue Results



| Pen Place - VISSIM Delay & Queue Results       |  |          |   |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |
|--|--|----------|---|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|
| 2031 Future Mitigated Build AM Peak Conditions |  |          |   |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |
| Intersection #                                 | Intersection Name                                | Movement | Input Vehicular Volume (vph) <sup>1</sup> | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |
| 14   | 13th Street S and S Eads Street                  | EBL      | 47  | 45  | 350                 | 0.3   | 63.4                                       | E            | 65.0                                       | E            | 48                                | 231                                  | 53                            | 51   | 67.4                               | ---                     | ---                                  | ---                              |
|  |  | EBR      | 96  | 94  | 350                 | 0.2   | 65.8                                       | E            | ---  | ---          | 48                                | 231                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | NBL      | 81  | 78  | 150                 | 0.3   | 7.6  | A            | ---  | ---          | 95                                | 425                                  | ---                           | ---  | ---                                | 73                      | 73                                   | 0.1                              |
|  |  | NBT      | 596                                       | 575                                       | 300                 | 0.9   | 20.7                                       | C            | 19.1                                       | B            | 95                                | 425                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBT      | 382                                       | 367                                       | 280                 | 0.8   | 8.9  | A            | 8.1  | A            | 19                                | 219                                  | 147                           | 144  | 58.9                               | 41                      | 35                                   | 1.3                              |
|  |  | SBR      | 81  | 73  | 280                 | 0.9   | 3.8  | A            | ---  | ---          | 20                                | 222                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | Overall  | 1,283                                     | 1,232                                     | ---                 | 1.4   | 20.4                                       | C            | ---  | ---          | ---                               | ---                                  | ---                           | 200  | 195                                | 61.1                    | 114                                  | 108                              |
| 16   | 15th Street S and S Fern Street                  | EBL      | 35  | 35  | 130                 | 0.0   | 35.5                                       | D            | ---  | ---          | 55                                | 287                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | EBT      | 411                                       | 408                                       | 630                 | 0.1   | 35.5                                       | D            | 35.4                                       | D            | 55                                | 287                                  | 41                            | 43   | 66.0                               | ---                     | ---                                  | ---                              |
|  |  | EBR      | 15  | 16  | 630                 | 0.3   | 32.5                                       | C            | ---  | ---          | 56                                | 289                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | WBL      | 61  | 57  | 120                 | 0.5   | 32.5                                       | C            | ---  | ---          | 26                                | 192                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | WBT      | 165                                       | 147                                       | 260                 | 1.4   | 19.5                                       | B            | 18.1                                       | B            | 26                                | 192                                  | 21                            | 22   | 66.1                               | ---                     | ---                                  | ---                              |
|  |  | WBR      | 236                                       | 213                                       | 260                 | 1.5   | 13.3                                       | B            | ---  | ---          | 26                                | 195                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | NBL      | 22  | 21  | 750                 | 0.2   | 61.4                                       | E            | ---  | ---          | 196                               | 773                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | NBT      | 237                                       | 234                                       | 750                 | 0.2   | 64.2                                       | E            | 49.6                                       | D            | 196                               | 773                                  | 41                            | 42   | 67.3                               | ---                     | ---                                  | ---                              |
|  |  | NBR      | 199                                       | 199                                       | 75                  | 0.0   | 31.3                                       | C            | ---  | ---          | 200                               | 778                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBL      | 186                                       | 174                                       | 160                 | 0.9   | 40.7                                       | D            | ---  | ---          | 51                                | 268                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBT      | 62  | 59  | 300                 | 0.4   | 31.8                                       | C            | 34.3                                       | C            | 51                                | 268                                  | 41                            | 43   | 67.2                               | ---                     | ---                                  | ---                              |
|  |  | SBR      | 54  | 52  | 300                 | 0.3   | 15.7                                       | B            | ---  | ---          | 52                                | 274                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | Overall  | 1,683                                     | 1,615                                     | ---                 | 1.7   | 34.7                                       | C            | ---  | ---          | ---                               | ---                                  | ---                           | 144  | 150                                | 66.7                    | ---                                  | ---                              |
| 17   | 15th Street S and S Elm Street                   | EBL      | 31  | 33  | 60                  | 0.4   | 7.5  | A            | 10.5                                       | B            | 28                                | 318                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | EBT      | 765                                       | 755                                       | 270                 | 0.4   | 10.6                                       | B            | ---  | ---          | 28                                | 318                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | WBT      | 412                                       | 367                                       | 300                 | 2.3   | 1.5  | A            | 1.8  | A            | 3                                 | 143                                  | 88                            | 91   | 65.5                               | ---                     | ---                                  | ---                              |
|  |  | WBR      | 209                                       | 186                                       | 300                 | 1.6   | 2.3  | A            | ---  | ---          | 3                                 | 143                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBL      | 19  | 18  | 250                 | 0.2   | 43.6                                       | D            | 17.5                                       | B            | 4                                 | 55                                   | 12                            | 12   | 61.4                               | ---                     | ---                                  | ---                              |
|  |  | SBR      | 50  | 52  | 250                 | 0.3   | 8.5  | A            | ---  | ---          | 2                                 | 66                                   | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | Overall  | 1,486                                     | 1,411                                     | ---                 | 2.0   | 7.4  | A            | ---  | ---          | ---                               | ---                                  | ---                           | 100  | 103                                | 65.1                    | ---                                  | ---                              |
| 18   | 15th Street S and S Eads Street                  | EBL      | 65  | 67  | 170                 | 0.2   | 32.7                                       | C            | ---  | ---          | 16                                | 325                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | EBT      | 664                                       | 657                                       | 300                 | 0.3   | 37.8                                       | D            | 37.7                                       | D            | 117                               | 410                                  | 340                           | 346  | 64.6                               | ---                     | ---                                  | ---                              |
|  |  | EBR      | 55  | 55  | 300                 | 0.0   | 42.5                                       | D            | ---  | ---          | 117                               | 410                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | WBL      | 83  | 70  | 300                 | 1.5   | 45.7                                       | D            | ---  | ---          | 164                               | 363                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | WBT      | 527                                       | 461                                       | 300                 | 3.0   | 53.3                                       | D            | 55.1                                       | E            | 164                               | 363                                  | 209                           | 212  | 64.7                               | ---                     | ---                                  | ---                              |
|  |  | WBR      | 242                                       | 211                                       | 300                 | 2.1   | 62.3                                       | E            | ---  | ---          | 164                               | 363                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | NBL      | 85  | 84  | 130                 | 0.1   | 41.4                                       | D            | ---  | ---          | 325                               | 928                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | NBT      | 374                                       | 371                                       | 760                 | 0.2   | 51.3                                       | D            | 42.5                                       | D            | 325                               | 928                                  | 389                           | 387  | 186.9                              | 87                      | 85                                   | 27.7                             |
|  |  | NBR      | 274                                       | 272                                       | 130                 | 0.1   | 30.9                                       | C            | ---  | ---          | 110                               | 926                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBL      | 210                                       | 205                                       | 250                 | 0.3   | 90.2                                       | F            | ---  | ---          | 139                               | 397                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBT      | 214                                       | 202                                       | 300                 | 0.8   | 25.3                                       | C            | 57.1                                       | E            | 139                               | 397                                  | 199                           | 201  | 189.4                              | 66                      | 60                                   | 18.5                             |
|  |  | SBR      | 9   | 8   | 75                  | 0.3   | 10.3                                       | B            | ---  | ---          | 125                               | 399                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | Overall  | 2,802                                     | 2,663                                     | ---                 | 2.7   | 46.9                                       | D            | ---  | ---          | ---                               | ---                                  | ---                           | 1,137                                      | 1,146                              | 127.8                   | 153                                  | 145                              |
| 19   | S Eads Street and I-395 HOT Lanes (South Node)   | EBT      | 2   | 2   | 1,000               | 0.0   | 55.5                                       | E            | 115.5                                      | F            | 559                               | 926                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | EBR      | 533                                       | 538                                       | 1,000               | 0.2   | 115.7                                      | F            | ---  | ---          | 559                               | 926                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | NBT      | 185                                       | 184                                       | 170                 | 0.1   | 54.6                                       | D            | 18.0                                       | B            | 26                                | 224                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | NBR      | 638                                       | 604                                       | 170                 | 1.4   | 6.9  | A            | ---  | ---          | 57                                | 283                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBL      | 145                                       | 115                                       | 100                 | 2.6   | 8.3  | A            | 40.1                                       | D            | 104                               | 237                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBT      | 300                                       | 271                                       | 100                 | 1.7   | 53.6                                       | D            | ---  | ---          | 104                               | 237                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | Overall  | 1,803                                     | 1,714                                     | ---                 | 2.1   | 53.7                                       | D            | ---  | ---          | ---                               | ---                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
| 20   | S Eads Street and I-395 HOT Lanes (North Node)   | EBL      | 841                                       | 823                                       | 875                 | 0.6   | 50.7                                       | D            | 50.7                                       | D            | 140                               | 484                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | WBL      | 204                                       | 192                                       | 1,250               | 0.9   | 271.0                                      | F            | 191.9                                      | F            | 465                               | 840                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | WBR      | 100                                       | 98  | 1,250               | 0.2   | 36.9                                       | D            | ---  | ---          | 465                               | 840                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | NBT      | 185                                       | 186                                       | 100                 | 0.1   | 56.3                                       | E            | 56.3                                       | E            | 110                               | 263                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBT      | 241                                       | 192                                       | 100                 | 3.3   | 130.4                                      | F            | 130.4                                      | F            | 129                               | 250                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBR      | 9   | 8   | 75                  | 0.3   | 10.3                                       | B            | ---  | ---          | ---                               | ---                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | Overall  | 1,571                                     | 1,491                                     | ---                 | 2.0   | 89.1                                       | F            | ---  | ---          | ---                               | ---                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
| 21   | 14th Street S and S Eads Street                  | EBL      | 6   | 5   | 200                 | 0.4   | 85.3                                       | F            | ---  | ---          | 3                                 | 45                                   | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | EBT      | 0   | 0   | 200                 | 0.0   | 0.0  | A            | 85.3                                       | F            | 3                                 | 45                                   | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | EBR      | 0   | 0   | 200                 | 0.0   | 0.0  | A            | ---  | ---          | 3                                 | 45                                   | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | WBL      | 20  | 21  | 150                 | 0.2   | 74.7                                       | E            | ---  | ---          | 24                                | 104                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | WBT      | 0   | 0   | 150                 | 0.0   | 0.0  | A            | 100.2                                      | F            | 24                                | 104                                  | 286                           | 290  | 66.4                               | ---                     | ---                                  | ---                              |
|  |  | WBR      | 25  | 27  | 150                 | 0.4   | 120.1                                      | F            | ---  | ---          | 24                                | 104                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | NBL      | 0   | 0   | 100                 | 0.0   | 0.0  | A            | ---  | ---          | 54                                | 382                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | NBT      | 656                                       | 626                                       | 350                 | 1.2   | 14.3                                       | B            | 14.2                                       | B            | 54                                | 382                                  | 509                           | 512  | 51.8                               | 73                      | 73                                   | 0.5                              |
|  |  | NBR      | 25  | 23  | 350                 | 0.4   | 12.6                                       | B            | ---  | ---          | 56                                | 390                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBL      | 25  | 27  | 100                 | 0.4   | 74.6                                       | E            | ---  | ---          | 59                                | 334                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBT      | 413                                       | 395                                       | 290                 | 0.9   | 17.9                                       | B            | 21.0                                       | C            | 59                                | 334                                  | 170                           | 176  | 66.4                               | 40                      | 36                                   | 12.0                             |
|  |  | SBR      | 40  | 39  | 290                 | 0.2   | 15.3                                       | B            | ---  | ---          | 61                                | 337                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | Overall  | 1,210                                     | 1,163                                     | ---                 | 1.4   | 20.8                                       | C            | ---  | ---          | ---                               | ---                                  | ---                           | 965  | 978                                | 58.8                    | 113                                  | 109                              |
| 22   | S Fern Street and 11th Street S/Pen Place Access | EBL      | 2   | 3   | 450                 | 0.6   | 68.7                                       | E            | ---  | ---          | 2                                 | 74                                   | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | EBT      | 0   | 0   | 450                 | 0.0   | 0.0  | A            | 68.7                                       | E            | 2                                 | 73                                   | 96                            | 94   | 66.6                               | ---                     | ---                                  | ---                              |
|  |  | EBR      | 1   | 0   | 450                 | 1.4   | 70.2                                       | E            | ---  | ---          | 2                                 | 73                                   | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | WBL      | 31  | 31  | 150                 | 0.0   | 54.5                                       | D            | ---  | ---          | 11                                | 74                                   | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | WBT      | 0   | 0   | 150                 | 0.0   | 0.0  | A            | 57.9                                       | E            | 11                                | 74                                   | 168                           | 160  | 65.7                               | ---                     | ---                                  | ---                              |
|  |  | WBR      | 16  | 14  | 150                 | 0.5   | 65.4                                       | E            | ---  | ---          | 11                                | 74                                   | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | NBL      | 42  | 42  | 75                  | 0.0   | 60.5                                       | E            | ---  | ---          | 20                                | 181                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | NBT      | 238                                       | 234                                       | 275                 | 0.3   | 25.6                                       | C            | 26.9                                       | C            | 64                                | 321                                  | 78                            | 76   | 62.7                               | 29                      | 28                                   | 13.4                             |
|  |  | NBR      | 174                                       | 169                                       | 275                 | 0.4   | 20.4                                       | C            | ---  | ---          | 64                                | 321                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBL      | 102                                       | 94  | 75                  | 0.8   | 29.1                                       | C            | ---  | ---          | 12                                | 346                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | SBT      | 420                                       | 411                                       | 390                 | 0.4   | 44.8                                       | D            | 40.8                                       | D            | 147                               | 532                                  | 114                           | 113  | 63.6                               | 43                      | 41                                   | 18.2                             |
|  |  | SBR      | 88  | 82  | 390                 | 0.7   | 34.5                                       | C            | ---  | ---          | 150                               | 536                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |
|  |  | Overall  | 1,114                                     | 1,080                                     | ---                 | 1.0   | 35.9                                       | D            | ---  | ---          | ---                               | ---                                  | ---                           | 456  | 443                                | 64.8                    | 72                                   | 69                               |

Source: VISSIM 11.0 Node Evaluation. Compiled by Gorove/Slade Associates based on the average of 10 VISSIM model runs.

Note: At the request of the County, results for Node 5 are provided.

\* GEH statistic is computed as follows. GEH<5 indicates good fit.

$$GEH = \frac{(|Simulated Volume - Input Volume|)}{\sqrt{(|Simulated Volume + Input Volume|)/2}}$$

| Pen Place - VISSIM Delay & Queue Results       |   |          |  |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |     |      |     |
|--|---|----------|--|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|-----|------|-----|
| 2031 Future Mitigated Build PM Peak Conditions |   |          |  |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |     |      |     |
| Intersection #                                 | Intersection Name                             | Movement | Input Vehicular Volume (vph) <sup>1</sup>        | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |     |      |     |
| 1  | Army-Navy Drive and S Hayes Street/I-395 Ramp | EBL      | 155  | 154                                       | 260                 | 0.1   | 66.4                                       | E            |  |              | 69                                | 366                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | EBT      | 368  | 379                                       | 450                 | 0.6   | 54.1                                       | D            | 71.8                                       | E            | 204                               | 560                                  | 183                           | 182  | 63.0                               | 58                      | 55                                   | 54.5                             |     |      |     |
|  |   | EBR      | 248  | 258                                       | 450                 | 0.6   | 101.1                                      | F            |  |              | 204                               | 560                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | WBL      | 79   | 76  | 190                 | 0.3   | 235.7                                      | F            |  |              | 130                               | 358                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | WBT      | 371  | 363                                       | 430                 | 0.4   | 47.7                                       | D            | 30.7                                       | C            | 75                                | 312                                  | 4                             | 4  | 54.6                               | 65                      | 63                                   | 44.2                             |     |      |     |
|  |   | WBR      | 790  | 761                                       | 430                 | 1.0   | 2.1  | A            |  |              | 0                                 | 106                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | NBL      | 240  | 251                                       | 200                 | 0.7   | 64.1                                       | E            |  |              | 61                                | 280                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | NBT      | 806  | 798                                       | 750                 | 0.3   | 37.8                                       | D            | 41.4                                       | D            | 116                               | 364                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              | --- |      |     |
|  |   | NBR      | 258  | 247                                       | 115                 | 0.7   | 30.2                                       | C            |  |              | 45                                | 361                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | SBL      | 520  | 475                                       | 2,050               | 2.0   | 212.5                                      | F            |  |              | 935                               | 1,499                                |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | SBT      | 1,087  | 1,080                                     | 1,950               | 0.2   | 47.5                                       | D            | 82.7                                       | F            | 935                               | 1,499                                | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              | --- |      |     |
|  |   | SBR      | 445  | 454                                       | 1,950               | 0.4   | 30.7                                       | C            |  |              | 934                               | 1,498                                |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | Overall  |  |   | 5,367               | 5,296 | ---  | 1.0          | 59.2                                       | E            | ---                               | ---                                  | ---                           | ---  | 187                                | 186                     | 62.8                                 | 123                              | 118 | 49.0 |     |
| 2  | Army-Navy Drive and S Fern Street             | EBL      | 208  | 198                                       | 160                 | 0.7   | 56.5                                       | E            |  |              | 62                                | 449                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | EBT      | 765  | 722                                       | 430                 | 1.6   | 45.2                                       | D            | 44.2                                       | D            | 169                               | 514                                  | 309                           | 305  | 65.6                               | 58                      | 54                                   | 35.8                             |     |      |     |
|  |   | EBR      | 173  | 163                                       | 180                 | 0.8   | 24.8                                       | C            |  |              | 21                                | 268                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | WBL      | 36   | 37  | 80                  | 0.2   | 99.2                                       | F            |  |              | 144                               | 367                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | WBT      | 771  | 726                                       | 260                 | 1.6   | 35.1                                       | D            | 39.0                                       | D            | 144                               | 367                                  | 184                           | 182  | 64.8                               | 69                      | 65                                   | 10.3                             |     |      |     |
|  |   | WBR      | 133  | 127                                       | 260                 | 0.5   | 44.0                                       | D            |  |              | 147                               | 372                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | NBL      | 292  | 287                                       | 280                 | 0.3   | 50.8                                       | D            |  |              | 84                                | 442                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | NBT      | 184  | 181                                       | 390                 | 0.2   | 17.8                                       | B            | 35.3                                       | D            | 19                                | 220                                  | 219                           | 223  | 64.2                               | 41                      | 40                                   | 6.4                              |     |      |     |
|  |   | NBR      | 84   | 81  | 80                  | 0.3   | 19.4                                       | B            |  |              | 7                                 | 111                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | SBL      | 37   | 37  | 75                  | 0.0   | 36.9                                       | D            |  |              | 4                                 | 124                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | SBT      | 106  | 102                                       | 560                 | 0.4   | 42.0                                       | D            | 25.0                                       | C            | 30                                | 207                                  | 338                           | 344  | 64.9                               | ---                     | ---                                  | ---                              | --- |      |     |
|  |   | SBR      | 177  | 176                                       | 560                 | 0.1   | 12.7                                       | B            |  |              | 37                                | 218                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | Overall  |  |   | 2,966               | 2,837 | ---  | 2.4          | 38.7                                       | D            | ---                               | ---                                  | ---                           | ---  | 1,050                              | 1,054                   | 65.0                                 | 168                              | 159 | 18.0 |     |
| 3  | Army-Navy Drive and Parking Lot               | EBL      | 4  | 5   | 120                 | 0.5   | 15.1                                       | B            |  |              | 48                                | 381                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | EBT      | 846  | 803                                       | 260                 | 1.5   | 10.6                                       | B            | 12.6                                       | B            | 48                                | 381                                  | 76                            | 75   | 63.4                               | 108                     | 108                                  | 8.6                              |     |      |     |
|  |   | EBR      | 36   | 38  | 225                 | 0.3   | 54.5                                       | D            |  |              | 48                                | 381                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | WBT      | 814  | 771                                       | 230                 | 1.5   | 13.5                                       | B            | 13.5                                       | B            | 38                                | 346                                  | 13                            | 13   | 50.0                               | 61                      | 57                                   | 0.4                              |     |      |     |
|  |   | WBR      | 3  | 2   | 230                 | 0.6   | 12.8                                       | B            |  |              | 42                                | 363                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | NBL      | 79   | 78  | 100                 | 0.1   | 85.5                                       | F            |  |              | 60                                | 245                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | NBT      | 0  | 0   | 100                 | 0.0   | 0.0  | A            | 85.2                                       | F            | 60                                | 245                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |     |      |     |
|  |   | NBR      | 41   | 41  | 100                 | 0.0   | 84.6                                       | F            |  |              | 60                                | 245                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | SBL      | 10   | 12  | 100                 | 0.6   | 67.2                                       | E            |  |              | 8                                 | 130                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | SBT      | 0  | 0   | 100                 | 0.0   | 0.0  | A            | 32.9                                       | C            | 8                                 | 130                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |     |      |     |
|  |   | SBR      | 47   | 46  | 100                 | 0.1   | 23.9                                       | C            |  |              | 8                                 | 129                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | Overall  |  |   | 1,880               | 1,796 | ---  | 2.0          | 18.4                                       | B            | ---                               | ---                                  | ---                           | ---  | 89                                 | 88                      | 61.4                                 | 169                              | 165 | 5.8  |     |
|  |   | 4        | Army-Navy Drive and S Eads Street                | EBL                                       | 424                 | 411   | 220  | 0.6          | 40.5                                       | D            |                                   |                                      | 104                           | 292  |                                    |                         |                                      |                                  |     |      |     |
| EBT  | 265   |          |  | 250                                       | 220                 | 0.9   | 21.3                                       | C            | 31.1                                       | C            | 106                               | 292                                  | 32                            | 31   | 65.9                               | 108                     | 108                                  | 16.3                             |     |      |     |
| EBR  | 208   |          |  | 194                                       | 220                 | 1.0   | 23.6                                       | C            |  |              | 101                               | 292                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
| WBT  | 581   |          |  | 532                                       | 1,100               | 2.1   | 48.9                                       | D            |  |              | 112                               | 207                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
| WBR  | 477   |          |  | 457                                       | 100                 | 0.9   | 27.4                                       | C            | 39.0                                       | D            | 120                               | 217                                  | 51                            | 50   | 65.9                               | 47                      | 47                                   | 47.0                             |     |      |     |
| NBL  | 66  |          |  | 63  | 100                 | 0.4   | 37.1                                       | D            |  |              | 10                                | 159                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
| NBT  | 692   |          |  | 659                                       | 240                 | 1.3   | 29.2                                       | C            | 29.1                                       | C            | 89                                | 327                                  | 18                            | 20   | 68.9                               | 71                      | 70                                   | 12.2                             |     |      |     |
| NBR  | 29  |          |  | 26  | 240                 | 0.6   | 27.2                                       | C            |  |              | 89                                | 327                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
| SBL  | 28  |          |  | 27  | 140                 | 0.2   | 32.9                                       | C            |  |              | 37                                | 283                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
| SBT  | 169   |          |  | 171                                       | 140                 | 0.2   | 30.4                                       | C            | 17.2                                       | B            | 37                                | 283                                  | 21                            | 23   | 68.2                               | ---                     | ---                                  | ---                              |     |      |     |
| SBR  | 170   |          |  | 181                                       | 110                 | 0.8   | 2.4  | A            |  |              | 37                                | 283                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
| Overall  |   |          |  |   | 3,109               | 2,971 | ---  | 2.5          | 30.8                                       | C            | ---                               | ---                                  | ---                           | ---  | 122                                | 124                     | 66.8                                 | 226                              | 225 | 21.5 |     |
| 5  | Army-Navy Drive and VA110 Off-Ramp            |          |  | EBT                                       | 322                 | 303   | ---  | 1.1          | 0.1  | A            | 0.1                               | A                                    | 0                             | 0  | ---                                | ---                     | ---                                  | ---                              | --- | ---  | --- |
|  |   | WBT      | 667  | 606                                       | 1,000               | 2.4   | 28.8                                       | C            | 28.8                                       | C            | 120                               | 638                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |     |      |     |
|  |   | SBR      | 391  | 380                                       | 900                 | 0.6   | 9.3  | A            | 9.3  | A            | 15                                | 298                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |     |      |     |
|  |   | Overall  |  |   | 1,380               | 1,289 | ---  | 2.5          | 16.3                                       | B            | ---                               | ---                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              | --- |      |     |
|  |   | 6        | S Eads Street and 11th Street S/Pen Place Access | EBL                                       | 133                 | 129   | 200  | 0.3          | 52.1                                       | D            |                                   |                                      | 86                            | 364  |                                    |                         |                                      |                                  |     |      |     |
|  |   |          |  | EBT                                       | 0                   | 0     | 200  | 0.0          | 0.0  | A            | 63.6                              | E                                    | 86                            | 364  | 79                                 | 76                      | 65.3                                 | ---                              | --- | ---  |     |
|  |   |          |  | EBR                                       | 171                 | 171   | 200  | 0.0          | 72.3                                       | E            |                                   |                                      | 86                            | 364  |                                    |                         |                                      |                                  |     |      |     |
|  |   |          |  | WBL                                       | 12                  | 13    | 300  | 0.3          | 33.7                                       | C            |                                   |                                      | 11                            | 92   |                                    |                         |                                      |                                  |     |      |     |
|  |   |          |  | WBT                                       | 0                   | 0     | 300  | 0.0          | 0.0  | A            | 47.7                              | D                                    | 10                            | 88   | 65                                 | 64                      | 63.2                                 | ---                              | --- | ---  |     |
|  |   |          |  | WBR                                       | 25                  | 27    | 300  | 0.4          | 54.4                                       | D            |                                   |                                      | 10                            | 88   |                                    |                         |                                      |                                  |     |      |     |
|  |   |          |  | NBL                                       | 37                  | 33    | 100  | 0.7          | 10.2                                       | B            |                                   |                                      | 1                             | 40   |                                    |                         |                                      |                                  |     |      |     |
|  |   |          |  | NBT                                       | 629                 | 584   | 250  | 1.8          | 9.4  | A            | 9.3                               | A                                    | 34                            | 332  | 84                                 | 85                      | 64.6                                 | 67                               | 65  | 3.4  |     |
|  |   |          |  | NBR                                       | 38                  | 37    | 250  | 0.2          | 7.7  | A            |                                   |                                      | 35                            | 334  |                                    |                         |                                      |                                  |     |      |     |
| SBL  | 22  |          |  | 21  | 250                 | 0.2   | 33.6                                       | C            |  |              | 62                                | 322                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
| SBT  | 319   |          |  | 312                                       | 250                 | 0.4   | 27.0                                       | C            | 26.1                                       | C            | 62                                | 322                                  | 116                           | 115  | 62.3                               | 65                      | 63                                   | 12.3                             |     |      |     |
| SBR  | 36  |          |  | 34  | 25                  | 0.3   | 13.7                                       | B            |  |              | 40                                | 322                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
| Overall  |   |          |  |   | 1,422               | 1,361 | ---  | 1.6          | 27.0                                       | C            | ---                               | ---                                  | ---                           | ---  | 344                                | 340                     | 63.7                                 | 132                              | 128 | 7.8  |     |
| 7  | 12th Street S and S Hayes Street              | EBL      | 85   | 89  | 450                 | 0.4   | 60.8                                       | E            |  |              | 12                                | 236                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | EBT      | 35   | 36  | 450                 | 0.2   | 52.1                                       | D            | 37.9                                       | D            | 47                                | 217                                  | 911                           | 900  | 64.7                               | ---                     | ---                                  | ---                              |     |      |     |
|  |   | EBR      | 70   | 73  | 65                  | 0.4   | 3.0  | A            |  |              | 45                                | 215                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | WBL      | 82   | 76  | 100                 | 0.7   | 70.7                                       | E            |  |              | 96                                | 404                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | WBT      | 30   | 28  | 620                 | 0.4   | 65.7                                       | E            | 67.5                                       | E            | 96                                | 404                                  | 379                           | 379  | 66.0                               | ---                     | ---                                  | ---                              |     |      |     |
|  |   | WBR      | 164  | 165                                       | 620                 | 0.1   | 66.4                                       | E            |  |              | 96                                | 404                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | NBL      | 60   | 61  | 75                  | 0.1   | 69.5                                       | E            |  |              | 82                                | 384                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | NBT      | 965  | 951                                       | 775                 | 0.5   | 24.7                                       | C            | 26.7                                       | C            | 82                                | 384                                  | 81                            | 83   | 66.0                               | ---                     | ---                                  | ---                              |     |      |     |
|  |   | NBR      | 53   | 60  | 75                  | 0.9   | 14.9                                       | B            |  |              | 83                                | 388                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | SBL      | 249  | 239                                       | 250                 | 0.6   | 54.5                                       | D            |  |              | 141                               | 460                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | SBT      | 1,075  | 1,061                                     | 770                 | 0.4   | 19.7                                       | B            | 25.7                                       | C            | 141                               | 460                                  | 285                           | 283  | 66.3                               | ---                     | ---                                  | ---                              |     |      |     |
|  |   | SBR      | 90   | 90  | 770                 | 0.0   | 19.7                                       | B            |  |              | 141                               | 460                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | Overall  |  |   | 2,958               | 2,929 | ---  | 0.5          | 30.7                                       | C            | ---                               | ---                                  | ---                           | ---  | 1,656                              | 1,645                   | 65.3                                 | ---                              | --- | ---  |     |
| 8  | 12th Street S and S Fern Street               | EBT      | 181  | 183                                       | 640                 | 0.1   | 42.9                                       | D            |  |              | 92                                | 477                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | EBR      | 156  | 152                                       | 640                 | 0.3   | 35.9                                       | D            | 39.7                                       | D            | 99                                | 487                                  | 1265                          | 1244                                       | 64.4                               | ---                     | ---                                  | ---                              |     |      |     |
|  |   | WBL      | 115  | 107                                       | 75                  | 0.8   | 94.4                                       | F            |  |              | 126                               | 369                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | WBT      | 152  | 145                                       | 225                 | 0.6   | 41.4                                       | D            | 60.5                                       | E            | 126                               | 369                                  | 806                           | 812  | 64.1                               | ---                     | ---                                  | ---                              |     |      |     |
|  |   | WBR      | 71   | 68  | 225                 | 0.4   | 48.0                                       | D            |  |              | 126                               | 369                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | NBL      | 114  | 114                                       | 100                 | 0.0   | 42.0                                       | D            |  |              | 166                               | 383                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | NBT      | 393  | 385                                       | 280                 | 0.4   | 38.0                                       | D            | 38.6                                       | D            | 166                               | 383                                  | 413                           | 413  | 64.2                               | ---                     | ---                                  | ---                              |     |      |     |
|  |   | NBR      | 51   | 52  | 280                 | 0.1   | 35.4                                       | D            |  |              | 165                               | 383                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |
|  |   | SBL      | 111  | 109                                       | 180                 | 0.2   | 37.0                                       | D            |  |              | 32                                | 163                                  |                               |  |                                    |                         |                                      |                                  |     |      |     |



| Pen Place - VISSIM Delay & Queue Results       |  |          |   |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |      |
|--|--|----------|---|---|---------------------|-------|--|--------------|--|--------------|-----------------------------------|--------------------------------------|-------------------------------|--|------------------------------------|-------------------------|--------------------------------------|----------------------------------|------|
| 2031 Future Mitigated Build PM Peak Conditions |  |          |   |   |                     |       |  |              |  |              |                                   |                                      |                               |  |                                    |                         |                                      |                                  |      |
| Intersection #                                 | Intersection Name                                | Movement | Input Vehicular Volume (vph) <sup>1</sup> | Average Simulated Vehicular Volumes (vph) | Storage Length (ft) | GEH * | Average Vehicular Movement Delay (sec/veh) | Movement LOS | Average Vehicular Approach Delay (sec/veh) | Approach LOS | Average of Mean Queue Length (ft) | Average of Maximum Queue Length (ft) | Input Pedestrian Volume (pph) | Average Simulated Pedestrian Volumes (pph) | Average Pedestrian Delay (sec/ped) | Input Bike Volume (bph) | Average Simulated Bike Volumes (bph) | Average Bicycle Delay (sec/bike) |      |
| 14   | 13th Street S and S Eads Street                  | EBL      | 126                                       | 123                                       | 350                 | 0.3   | 67.5                                       | E            | 59.5                                       | E            | 78                                | 336                                  | 60                            | 57   | 66.0                               | ---                     | ---                                  | ---                              |      |
|  |  | EBS      | 165                                       | 160                                       | 350                 | 0.4   | 53.3                                       | D            | ---  | ---          | 78                                | 336                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |      |
|  |  | NBL      | 108                                       | 90  | 150                 | 1.8   | 6.7  | A            | 28.7                                       | C            | ---                               | 115                                  | 423                           | ---  | ---                                | ---                     | 39                                   | 37                               | 0.1  |
|  |  | NBT      | 506                                       | 450                                       | 300                 | 2.6   | 33.1                                       | C            | ---  | ---          | ---                               | 115                                  | 423                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBT      | 504                                       | 509                                       | 280                 | 0.2   | 20.5                                       | C            | ---  | ---          | ---                               | 75                                   | 349                           | 209  | 210                                | 57.5                    | 73                                   | 71                               | 2.5  |
|  |  | SBR      | 36  | 34  | 280                 | 0.3   | 10.0                                       | A            | ---  | ---          | ---                               | 76                                   | 352                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | Overall  | 1,445                                     | 1,366                                     | ---                 | 2.1   | 31.6                                       | C            | ---  | ---          | ---                               | ---                                  | ---                           | 269  | 267                                | 59.3                    | 112                                  | 108                              | 1.7  |
| 16   | 15th Street S and S Fern Street                  | EBL      | 78  | 79  | 130                 | 0.1   | 32.0                                       | C            | ---  | ---          | 28                                | 159                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |      |
|  |  | EBS      | 260                                       | 254                                       | 630                 | 0.4   | 22.9                                       | C            | 24.4                                       | C            | ---                               | 28                                   | 159                           | 64   | 68                                 | 64.5                    | ---                                  | ---                              | ---  |
|  |  | NBL      | 25  | 25  | 630                 | 0.0   | 15.5                                       | B            | ---  | ---          | ---                               | 27                                   | 161                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | WBL      | 146                                       | 112                                       | 120                 | 3.0   | 7.3  | A            | ---  | ---          | ---                               | 10                                   | 167                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | WBT      | 476                                       | 367                                       | 260                 | 5.3   | 4.4  | A            | 5.0  | A            | ---                               | 10                                   | 167                           | 73   | 76                                 | 65.4                    | ---                                  | ---                              | ---  |
|  |  | WBR      | 169                                       | 129                                       | 260                 | 3.3   | 4.5  | A            | ---  | ---          | ---                               | 8                                    | 171                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | NBL      | 21  | 19  | 750                 | 0.4   | 53.9                                       | D            | ---  | ---          | ---                               | 72                                   | 376                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | NBT      | 167                                       | 162                                       | 750                 | 0.4   | 53.8                                       | D            | 45.7                                       | D            | ---                               | 72                                   | 376                           | 112  | 112                                | 65.1                    | ---                                  | ---                              | ---  |
|  |  | NBR      | 60  | 56  | 75                  | 0.5   | 19.3                                       | B            | ---  | ---          | ---                               | 73                                   | 381                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBL      | 205                                       | 195                                       | 160                 | 0.7   | 41.0                                       | D            | ---  | ---          | ---                               | 96                                   | 414                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBT      | 243                                       | 234                                       | 300                 | 0.6   | 32.5                                       | C            | 34.7                                       | C            | ---                               | 96                                   | 414                           | 55   | 54                                 | 65.2                    | ---                                  | ---                              | ---  |
|  |  | SBR      | 93  | 91  | 300                 | 0.2   | 27.0                                       | C            | ---  | ---          | ---                               | 98                                   | 420                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | Overall  | 1,943                                     | 1,723                                     | ---                 | 5.1   | 23.6                                       | C            | ---  | ---          | ---                               | ---                                  | ---                           | 304  | 310                                | 65.1                    | ---                                  | ---                              | ---  |
| 17   | 15th Street S and S Elm Street                   | EBL      | 5   | 5   | 60                  | 0.0   | 12.1                                       | B            | ---  | ---          | 13                                | 147                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |      |
|  |  | EBS      | 520                                       | 501                                       | 270                 | 0.8   | 7.4  | A            | 7.4  | A            | ---                               | 13                                   | 147                           | ---  | ---                                | ---                     | ---                                  | ---                              |      |
|  |  | WBT      | 721                                       | 536                                       | 300                 | 7.4   | 3.4  | A            | ---  | ---          | ---                               | 7                                    | 236                           | 122  | 127                                | 63.6                    | ---                                  | ---                              | ---  |
|  |  | WBR      | 67  | 47  | 300                 | 2.6   | 4.7  | A            | 3.5  | A            | ---                               | 7                                    | 239                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBL      | 81  | 73  | 250                 | 0.9   | 45.8                                       | D            | ---  | ---          | ---                               | 20                                   | 138                           | 10   | 9                                  | 65.2                    | ---                                  | ---                              | ---  |
|  |  | SBR      | 70  | 72  | 250                 | 0.2   | 8.9  | A            | 27.5                                       | C            | ---                               | 17                                   | 141                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | Overall  | 1,464                                     | 1,234                                     | ---                 | 6.3   | 7.9  | A            | ---  | ---          | ---                               | ---                                  | ---                           | 132  | 136                                | 63.7                    | ---                                  | ---                              | ---  |
| 18   | 15th Street S and S Eads Street                  | EBL      | 65  | 59  | 170                 | 0.8   | 17.4                                       | B            | ---  | ---          | 5                                 | 112                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |      |
|  |  | EBS      | 443                                       | 431                                       | 300                 | 0.6   | 24.2                                       | C            | 24.5                                       | C            | ---                               | 54                                   | 341                           | 426  | 433                                | 64.5                    | ---                                  | ---                              | ---  |
|  |  | NBL      | 93  | 89  | 300                 | 0.4   | 30.9                                       | C            | ---  | ---          | ---                               | 54                                   | 341                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | WBL      | 326                                       | 216                                       | 300                 | 6.7   | 24.5                                       | C            | ---  | ---          | ---                               | 80                                   | 313                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | WBT      | 689                                       | 479                                       | 300                 | 8.7   | 32.4                                       | C            | 31.7                                       | C            | ---                               | 80                                   | 313                           | 298  | 301                                | 64.9                    | ---                                  | ---                              | ---  |
|  |  | WBR      | 245                                       | 165                                       | 300                 | 5.6   | 39.3                                       | D            | ---  | ---          | ---                               | 80                                   | 313                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | NBL      | 60  | 58  | 130                 | 0.3   | 68.6                                       | E            | ---  | ---          | ---                               | 319                                  | 845                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | NBT      | 279                                       | 277                                       | 760                 | 0.1   | 83.7                                       | F            | 70.4                                       | E            | ---                               | 319                                  | 845                           | 505  | 508                                | 185.8                   | 55                                   | 53                               | 36.0 |
|  |  | NBR      | 104                                       | 102                                       | 130                 | 0.2   | 35.5                                       | D            | ---  | ---          | ---                               | 2                                    | 83                            | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBL      | 259                                       | 259                                       | 250                 | 0.0   | 65.4                                       | E            | ---  | ---          | ---                               | 228                                  | 472                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBT      | 393                                       | 390                                       | 300                 | 0.2   | 55.4                                       | E            | 58.0                                       | E            | ---                               | 228                                  | 472                           | 258  | 266                                | 187.5                   | 59                                   | 56                               | 42.3 |
|  |  | SBR      | 39  | 41  | 75                  | 0.3   | 35.2                                       | D            | ---  | ---          | ---                               | 225                                  | 475                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | Overall  | 2,995                                     | 2,566                                     | ---                 | 8.1   | 43.8                                       | D            | ---  | ---          | ---                               | ---                                  | ---                           | 1,487                                      | 1,508                              | 127.1                   | 114                                  | 109                              | 39.3 |
| 19   | S Eads Street and I-395 HOT Lanes (South Node)   | NBL      | 359                                       | 339                                       | 150                 | 1.1   | 5.7  | A            | ---  | ---          | 24                                | 325                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |      |
|  |  | NBT      | 389                                       | 376                                       | 170                 | 0.7   | 6.0  | A            | 4.8  | A            | ---                               | 24                                   | 325                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | NBR      | 845                                       | 813                                       | 170                 | 1.1   | 3.8  | A            | ---  | ---          | ---                               | 24                                   | 325                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBL      | 270                                       | 267                                       | 100                 | 0.2   | 10.6                                       | B            | ---  | ---          | ---                               | 12                                   | 177                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBT      | 367                                       | 378                                       | 100                 | 0.6   | 4.3  | A            | 6.9  | A            | ---                               | 11                                   | 174                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | Overall  | 2,230                                     | 2,173                                     | ---                 | 1.2   | 5.4  | A            | ---  | ---          | ---                               | ---                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
| 20   | S Eads Street and I-395 HOT Lanes (North Node)   | WBL      | 240                                       | 250                                       | 1,250               | 0.6   | 63.0                                       | E            | 60.1                                       | E            | 95                                | 384                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |      |
|  |  | WBR      | 106                                       | 106                                       | 1,250               | 0.0   | 53.4                                       | D            | ---  | ---          | ---                               | 95                                   | 384                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | NBT      | 389                                       | 376                                       | 100                 | 0.7   | 6.8  | A            | 6.8  | A            | ---                               | 13                                   | 198                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBT      | 397                                       | 396                                       | 100                 | 0.1   | 8.1  | A            | ---  | ---          | ---                               | 13                                   | 180                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBR      | 1,057                                     | 1,057                                     | 100                 | 0.0   | 0.4  | A            | 2.5  | A            | ---                               | 12                                   | 176                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | Overall  | 2,189                                     | 2,185                                     | ---                 | 0.1   | 12.6                                       | B            | ---  | ---          | ---                               | ---                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
| 21   | 14th Street S and S Eads Street                  | EBL      | 40  | 39  | 200                 | 0.2   | 79.7                                       | E            | ---  | ---          | 23                                | 133                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |      |
|  |  | EBS      | 0   | 0   | 200                 | 0.0   | 0.0  | A            | 81.6                                       | F            | ---                               | 23                                   | 133                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | EBS      | 9   | 8   | 200                 | 0.3   | 91.1                                       | F            | ---  | ---          | ---                               | 23                                   | 133                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | WBL      | 35  | 34  | 150                 | 0.2   | 205.9                                      | F            | ---  | ---          | ---                               | 58                                   | 165                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | WBT      | 0   | 0   | 150                 | 0.0   | 0.0  | A            | 184.3                                      | F            | ---                               | 62                                   | 169                           | 303  | 307                                | 65.7                    | ---                                  | ---                              | ---  |
|  |  | WBR      | 25  | 28  | 150                 | 0.6   | 158.0                                      | F            | ---  | ---          | ---                               | 58                                   | 165                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | NBL      | 0   | 0   | 100                 | 0.0   | 0.0  | A            | ---  | ---          | ---                               | 25                                   | 401                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | NBT      | 559                                       | 472                                       | 350                 | 3.8   | 10.5                                       | B            | 10.4                                       | B            | ---                               | 25                                   | 401                           | 512  | 503                                | 66.1                    | 54                                   | 51                               | 9.3  |
|  |  | NBR      | 30  | 24  | 350                 | 1.2   | 8.3  | A            | ---  | ---          | ---                               | 27                                   | 411                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBL      | 15  | 18  | 100                 | 0.7   | 91.3                                       | F            | ---  | ---          | ---                               | 95                                   | 367                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBT      | 647                                       | 641                                       | 290                 | 0.2   | 23.9                                       | C            | 25.7                                       | C            | ---                               | 95                                   | 367                           | 162  | 155                                | 65.2                    | 66                                   | 65                               | 15.9 |
|  |  | SBR      | 7   | 7   | 290                 | 0.0   | 24.2                                       | C            | ---  | ---          | ---                               | 97                                   | 371                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | Overall  | 1,367                                     | 1,271                                     | ---                 | 2.6   | 29.5                                       | C            | ---  | ---          | ---                               | ---                                  | ---                           | 977  | 965                                | 65.9                    | 120                                  | 116                              | 13.0 |
| 22   | S Fern Street and 11th Street S/Pen Place Access | EBL      | 28  | 25  | 450                 | 0.6   | 294.1                                      | F            | ---  | ---          | 242                               | 312                                  | ---                           | ---  | ---                                | ---                     | ---                                  | ---                              |      |
|  |  | EBS      | 0   | 0   | 450                 | 0.0   | 0.0  | A            | 294.8                                      | F            | ---                               | 242                                  | 312                           | 115  | 116                                | 64.8                    | ---                                  | ---                              | ---  |
|  |  | EBS      | 95  | 82  | 450                 | 1.4   | 295.0                                      | F            | ---  | ---          | ---                               | 242                                  | 312                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | WBL      | 111                                       | 109                                       | 150                 | 0.2   | 56.3                                       | E            | ---  | ---          | ---                               | 60                                   | 264                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | WBT      | 0   | 0   | 150                 | 0.0   | 0.0  | A            | 63.8                                       | E            | ---                               | 60                                   | 264                           | 199  | 192                                | 64.4                    | ---                                  | ---                              | ---  |
|  |  | WBR      | 108                                       | 100                                       | 150                 | 0.8   | 71.9                                       | E            | ---  | ---          | ---                               | 60                                   | 264                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | NBL      | 2   | 2   | 75                  | 0.0   | 27.7                                       | C            | ---  | ---          | ---                               | 0                                    | 7                             | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | NBT      | 424                                       | 414                                       | 275                 | 0.5   | 22.0                                       | C            | 21.9                                       | C            | ---                               | 63                                   | 305                           | 93   | 92                                 | 66.8                    | 41                                   | 40                               | 16.6 |
|  |  | NBR      | 38  | 36  | 275                 | 0.3   | 20.0                                       | B            | ---  | ---          | ---                               | 64                                   | 307                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBL      | 20  | 17  | 75                  | 0.7   | 43.8                                       | D            | ---  | ---          | ---                               | 3                                    | 68                            | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | SBT      | 344                                       | 335                                       | 390                 | 0.5   | 44.8                                       | D            | 44.5                                       | D            | ---                               | 92                                   | 416                           | 145  | 146                                | 64.2                    | 45                                   | 41                               | 10.6 |
|  |  | SBR      | 3   | 4   | 390                 | 0.5   | 25.9                                       | C            | ---  | ---          | ---                               | 93                                   | 419                           | ---  | ---                                | ---                     | ---                                  | ---                              | ---  |
|  |  | Overall  | 1,173                                     | 1,124                                     | ---                 | 1.4   | 62.8                                       | E            | ---  | ---          | ---                               | ---                                  | ---                           | 552  | 546                                | 65.2                    | 86                                   | 81                               | 13.6 |

Source: VISSIM 11.0 Node Evaluation. Compiled by Gorove/Slade Associates based on the average of 10 VISSIM model runs.

Note: At the request of the County, results for Node 5 are provided.

\* GEH statistic is computed as follows. GEH<5 indicates good fit.

$$GEH = \frac{(\text{Simulated Volume} - \text{Input Volume})^2}{(\text{Simulated Volume} + \text{Input Volume})^2}$$