

July 17, 2012

Mr. Robert Jastrzebski
NOVA District Traffic Engineering
VDOT Northern Virginia District
4975 Alliance Drive
Fairfax, VA 22030

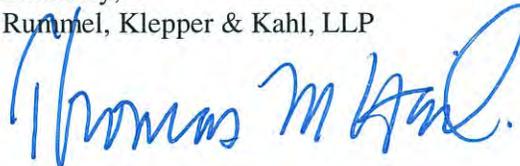
Dear Mr. Jastrzebski:

Please find attached the draft final technical memorandum for the I-395 Southbound Congestion Relief Feasibility Study. This report documents the operational analyses, conceptual geometric design, and conceptual cost estimates for improvements to the I-395 southbound general purpose lanes between Duke Street / Little River Turnpike and Edsall Road.

As discussed previously, because accurate survey was not available to confirm several of the existing geometric conditions, the report has not been signed and sealed at this time. RK&K is prepared to assist with updating the conceptual designs and cost estimates when updated survey information becomes available.

We look forward to opportunities to continue working with Northern Virginia District staff on this and other important transportation projects. If you have any comments or questions, please let me know.

Sincerely,
Rummel, Klepper & Kahl, LLP



Thomas M. Heil
Director, Transportation

810-089
Enclosure

cc: project file

I-395 Southbound between Duke Street & Edsall Road: Congestion Relief Feasibility Study



Operational & Geometrical Analysis – Technical Memorandum

Task Order #92

July 17, 2012

Prepared by:

Rummel, Klepper & Kahl, LLP



Prepared for:

Virginia Department of Transportation



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| Rummel, Klepper & Kahl, LLP Fairfax, Virginia Traffic Engineer |

Executive Summary

Rummel, Klepper & Kahl, LLP (RK&K) is assisting the Virginia Department of Transportation (VDOT) to evaluate the operational and geometric feasibility of various options to relieve recurring daily congestion within the southbound I-395 general purpose (GP) lanes between the Duke Street / Little River Turnpike (Route 236) and Edsall Road (Route 648) interchanges.

This feasibility study included a traffic operational analysis and the development preliminary design concepts and cost estimates for a number of potential improvements for the along I-395 Southbound and at the two interchanges along I-395 Southbound at Duke Street and Edsall Road. In coordination with Virginia Department of Transportation (VDOT), six (6) design options were identified for inclusion in the study:

1. I-395 SB Mainline – Provide New 4th Travel Lane and Full-Depth Shoulder
2. I-395 SB Mainline – Provide Full Depth Shoulder for Use as 4th Peak Period Travel Lane
3. Duke Street Interchange – NW Parclo
4. Duke Street Interchange – Diamond
5. Edsall Road Interchange – SW Parclo
6. Edsall Road Interchange – Diamond

The mainline options each would provide an additional general purpose lane along southbound I-395; either full-time or during the PM peak period only. The interchange options (Options 3 through 6) each involve the removal of one or both existing loop ramps along the I-395 Southbound GP lanes to eliminate existing weaving segments and reduce the potential impacts to bridges over I-395. The movements served by those loop ramps would be replaced by signalized left-turn movements along the cross-street.

Traffic Operational Analysis: I-395 Southbound is the peak direction of travel during the PM peak period. Hence, the operational analysis was focused on the PM peak hour conditions. The Highway Capacity Software (HCS 2010) Version 6.1 was used to perform operational analyses for existing, future No Build and Build conditions along the I-395 Southbound general purpose lanes. Synchro Version 8.0 was used to evaluate the operations of proposed signalized intersections along Duke Street and Edsall Road which are associated with Options 3 through 6. The results of the operational analysis indicate that most segments of I-395 southbound would operate at LOS D or better (assumed to be acceptable operations for the purposes of this study) in the PM peak hour with four (4) GP lanes. Additionally, lane configurations were identified which would provide acceptable operations for the proposed at-grade intersections along Duke Street and Edsall Road.

Conceptual Designs and Cost Estimates: Conceptual design options and cost estimates were prepared for each of the six (6) design options. These designs and cost estimates reflect the preferred lane configurations and other improvements identified during the traffic operational analysis. It is to be noted that a detailed survey of the Study Area is currently being conducted by VDOT. An updated survey is needed to verify the information used in the development of these design concepts. While developing the conceptual designs for the congestion relief along the study segment, a consistent set of design criteria was considered. **Table S-1** presents a summary of the design criteria used as part of this study. For each design option, potential deviations from these design criteria which would require a Design Exception or Design Waiver were identified.

Preliminary cost estimates were developed following a consistent procedure. These preliminary cost estimates include key unit cost items, allowances for critical elements (including Maintenance of Traffic), and contingencies. The cost estimates are intended to serve as overall project costs and thus include preliminary engineering, construction, and construction engineering and inspection.

Recommendations: Based on the findings of the operational and geometric evaluations, the Options in Table S-2 are recommended for more detailed evaluation. Additional options would also provide improved operations compared to the No Build conditions and were found to be geometrically feasible, but the three options in **Table S-2** represent the best combination of operations, safety, and value.

| Design Criteria | I-395 Mainline | Ramps |
|---|-----------------------|---|
| Functional Classification | Interstate – | Interchange Ramp |
| Geometric Design Standard | GS-5 | GS-R |
| Terrain Type | Rolling | Rolling |
| Design Speed | 60 mph | 30 mph |
| Existing Posted / Advisory Speeds [As observed from Google Earth Street View Images] | 55 mph | I-395 Southbound to Duke St WB: 35mph I-395 Southbound to Duke St EB: 20mph I-395 Southbound to Edsall Rd WB: 35mph I-395 Southbound to Edsall Rd EB: 25mph Edsall Rd WB to I-395 Southbound: 35mph |
| Min. Radius | 1204 ft | 251 ft |
| Min. Stopping Sight Distance | 570 ft | 200 ft |
| Min. Width of Lane (Min. Ramp Pvmnt. Width) | 12 ft | (16 ft) |
| Min. Width of Graded Shoulders | 14 ft | 11 ft |
| Paved Shoulder Width RT | 12 ft | 8 ft |
| Min. Width of Ditch Front Slope | 12 ft | 10 ft |
| Slope | CS-4 or CS-4B | N/A |

Reference: VDOT Road Design Manual, Appendix A

| Option | AM | PM | Cost |
|--|-----------------|-----------------|----------------|
| Option 1: I-395 SB Mainline – 4 Travel Lanes | LOS D or better | LOS D or better | \$13.6M |
| Option 3b: Duke Street – Partial Cloverleaf NW with Double-Left Turn Lane from I-395 SB Off-Ramp | LOS C | LOS C | \$19.8M |
| Option 5a: Edsall Road Partial Cloverleaf SW with Single Left-Turn Lane from WB Edsall Road | LOS C | LOS B | \$15.8M |
| Total | | | \$49.2M |

1.0 Background

Purpose of Study: As part of its open-end contract with the Northern Virginia Traffic Engineering Division, Rummel, Klepper & Kahl, LLP (RK&K) is assisting the Virginia Department of Transportation (VDOT) to evaluate the operational and geometric feasibility of various options to relieve recurring daily congestion within the southbound I-395 general purpose (GP) lanes between the Duke Street / Little River Turnpike (Route 236) and Edsall Road (Route 648) interchanges. The 2.5-mile study segment is primarily located in Fairfax County, with the northern terminus of the study area at the interchange of I-395 with Duke Street / Little River Turnpike (Route 236) partially located in the City of Alexandria. **Figure 1** presents the location map.

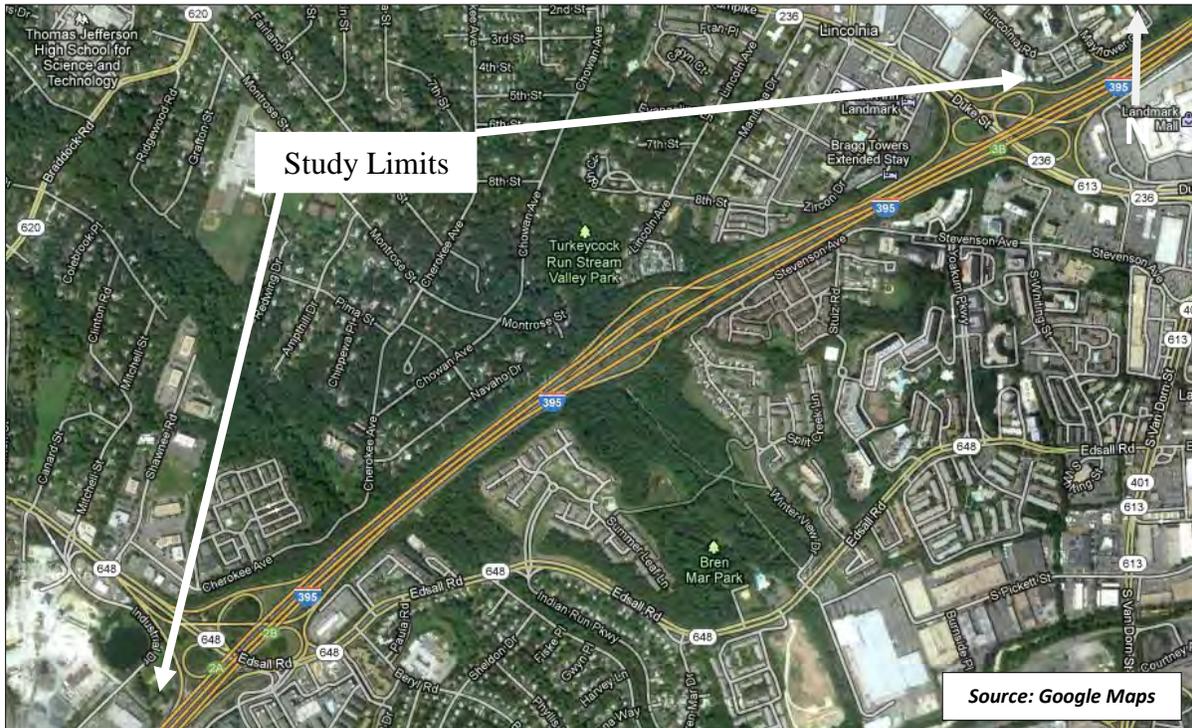


Figure 1: Location Map

The methodology of this feasibility study included existing and future traffic operational analysis, crash analysis and field observations along I-395 Southbound. The results of these analyses were used to develop conceptual design options for the I-395 Southbound general purpose lanes and at the two interchanges within the study area.

a. **Traffic Volumes:** The existing and future year traffic volumes utilized to conduct the operational analysis for this study were obtained from several sources:

- Existing (2009) and Design Year (2035) traffic volumes for I-395 Southbound and interchange ramp volumes were obtained from the I-95 HOV / HOT Lanes IJR prepared by VA Mega Projects staff.
- Existing (2009) and Design Year (2035) through traffic volumes along Duke Street were obtained from the I-395 / Seminary Road HOV Ramp Environmental Assessment (EA) traffic technical report.

- Existing (2010) traffic volumes along Edsall Road were obtained from VDOT's 2010 Traffic Summary publication for Fairfax County. Design Year (2035) volumes along Edsall Road were developed by applying a growth factor (1% per year) to the existing traffic volumes.

The volumes used in the analyses are summarized in **Figures 2, 3, and 4**.

b. Existing Operations:

Field Observations of Existing Traffic Operations: A windshield survey was performed along I-395 southbound during the PM peak period on a typical weekday in order to observe the existing traffic patterns and identify potential sources of congestion within the I-395 Southbound general purpose (GP) lanes. I-395 Southbound is the peak direction of travel during the PM peak period.

Overall, the traffic was observed to be moving substantially slower than the posted speed limit. The traffic in the right lanes was observed slowing down approaching the Duke Street interchange where there is a lane drop from four (4) lanes to three (3) GP lanes. This resulted in congested operations (reduced travel speeds, increased density) along I-395 north of the Duke Street interchange. These congested operations extended back at a minimum to the upstream Seminary Road interchange (field observations were not conducted north of this location for this study).

Additionally, friction between through traffic and exiting / entering traffic was observed during at Edsall Road interchange, particularly within the weaving segment between the on-ramp from westbound Edsall Road and the off-ramp to eastbound Edsall Road.

In addition to the field observations, INRIX travel time data for the study segment of I-395 SB between Route 236 (Duke St/Little River Turnpike Rd) and Route 648 (Edsall Rd) was obtained from the Regional Integrated Transportation Information System (RITIS) maintained by the University of Maryland CATT Lab. Hourly travel time data from October 11, 2011 through October 13, 2011 for the INRIX travel time segments covering the study area was reviewed for the purpose of this study.

Figure 5 and **Figure 6** present the hourly average travel time and hourly average speed, respectively, spread across three days for each of the three TMC locations in the study area. Analysis results indicate that the average weekday travel time is approximately 2.6 minutes for the study corridor, with a corresponding average speed of approximately 58 miles per hour. However, the average travel time during the PM peak period between 3:00 PM to 6:00 PM was observed as 3.2 minutes with a corresponding average speed of approximately 47 miles per hour. Additionally, the maximum travel time for the study corridor in the PM peak period was observed as 3.9 minutes between 5:00 PM and 6:00 PM, with an average speed of 39 miles per hour. **Table 1** provides a summary of the average speed and average travel time for the three TMC locations covering the study area.

Further, it may be noted that out of the data reviewed from the three TMCs covering the study area, the readings corresponding to TMC -110N04122 located near the Duke Street interchange indicate a thirty-five (35%) percent reduction in the speed during the PM peak periods. This combined with the field observations indicate that the effect of the bottleneck extends upstream i.e., further north of Duke Street interchange beyond the study area, increasing the average travel time of the commuters in the corridor during the PM peak period.

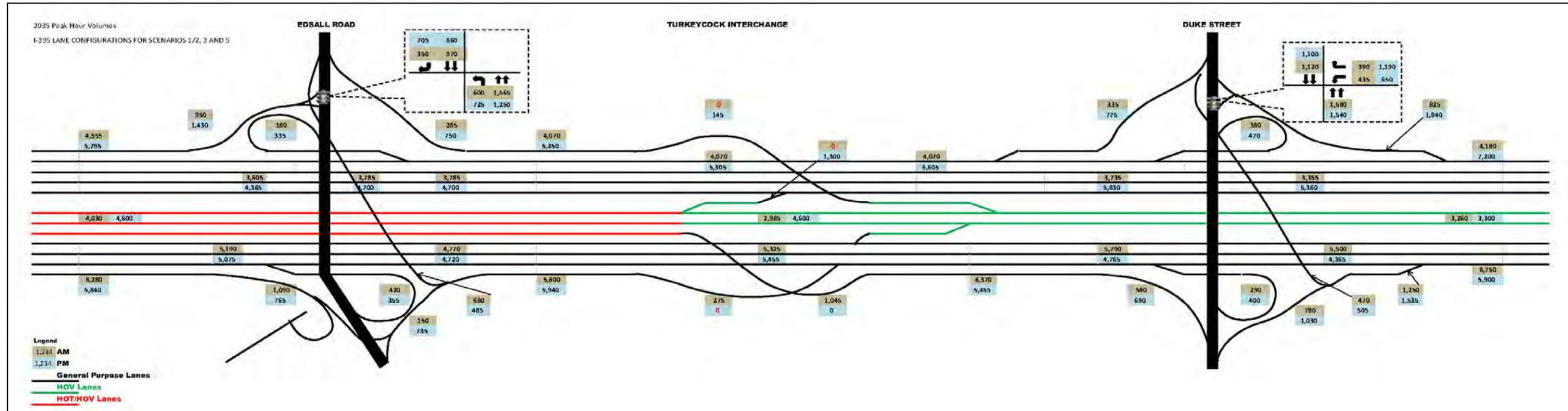


Figure 2: Existing Lane Configuration and Peak Hour Volumes

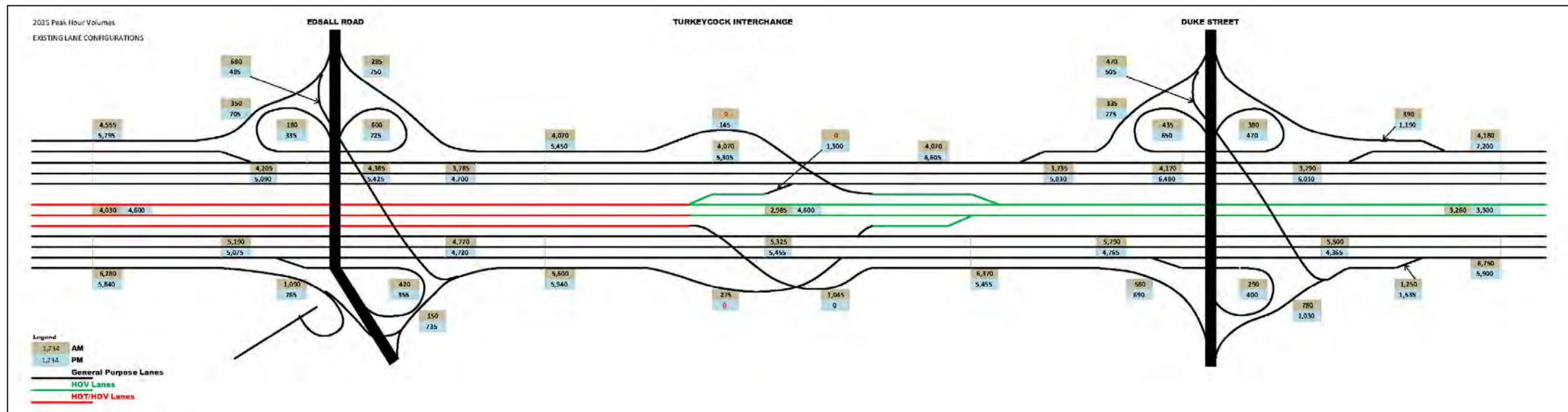


Figure 3: Design Year 2035 Peak Hour Volumes – Parclo Interchanges

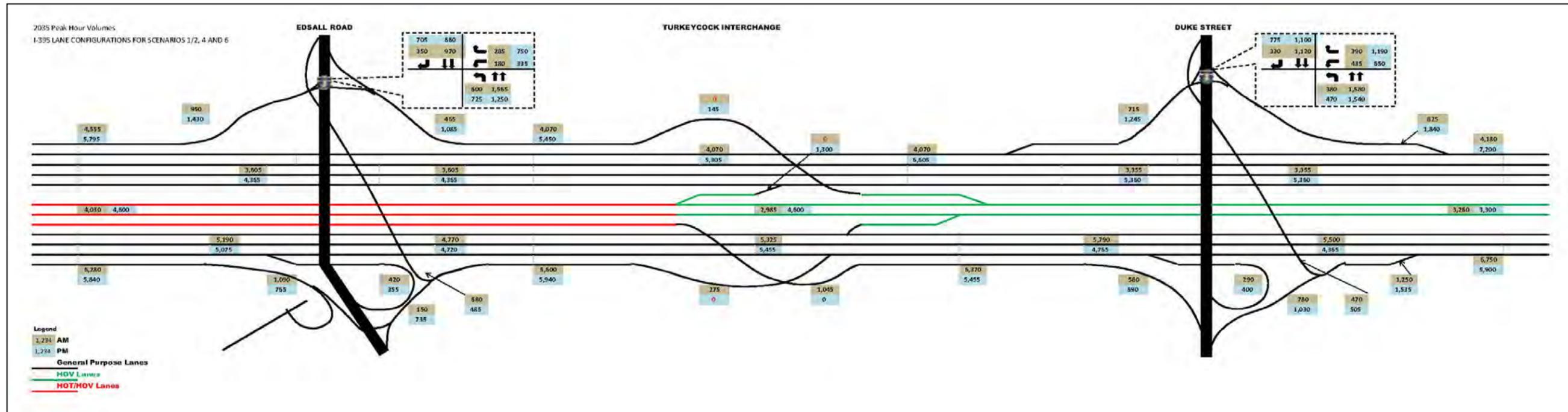
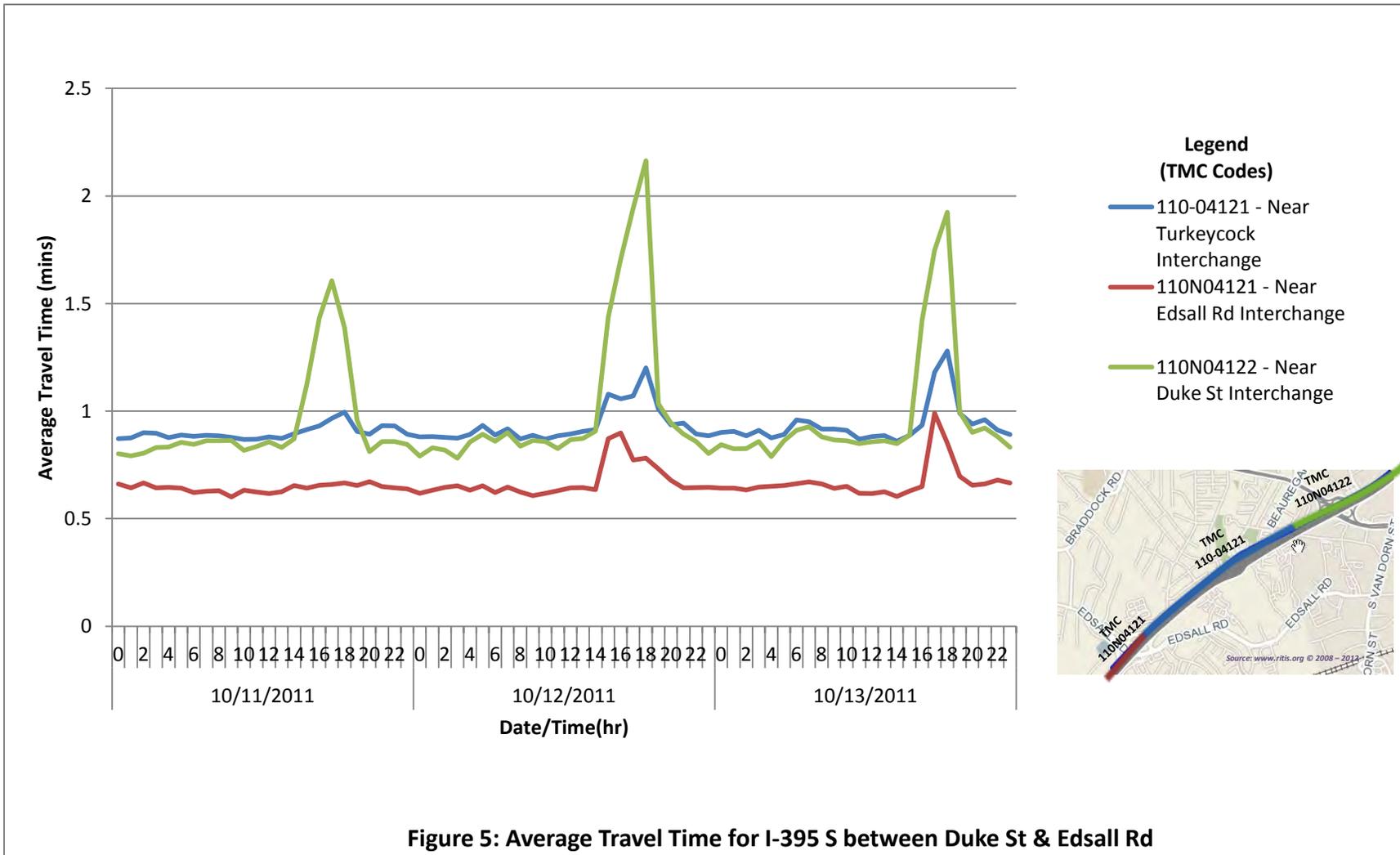
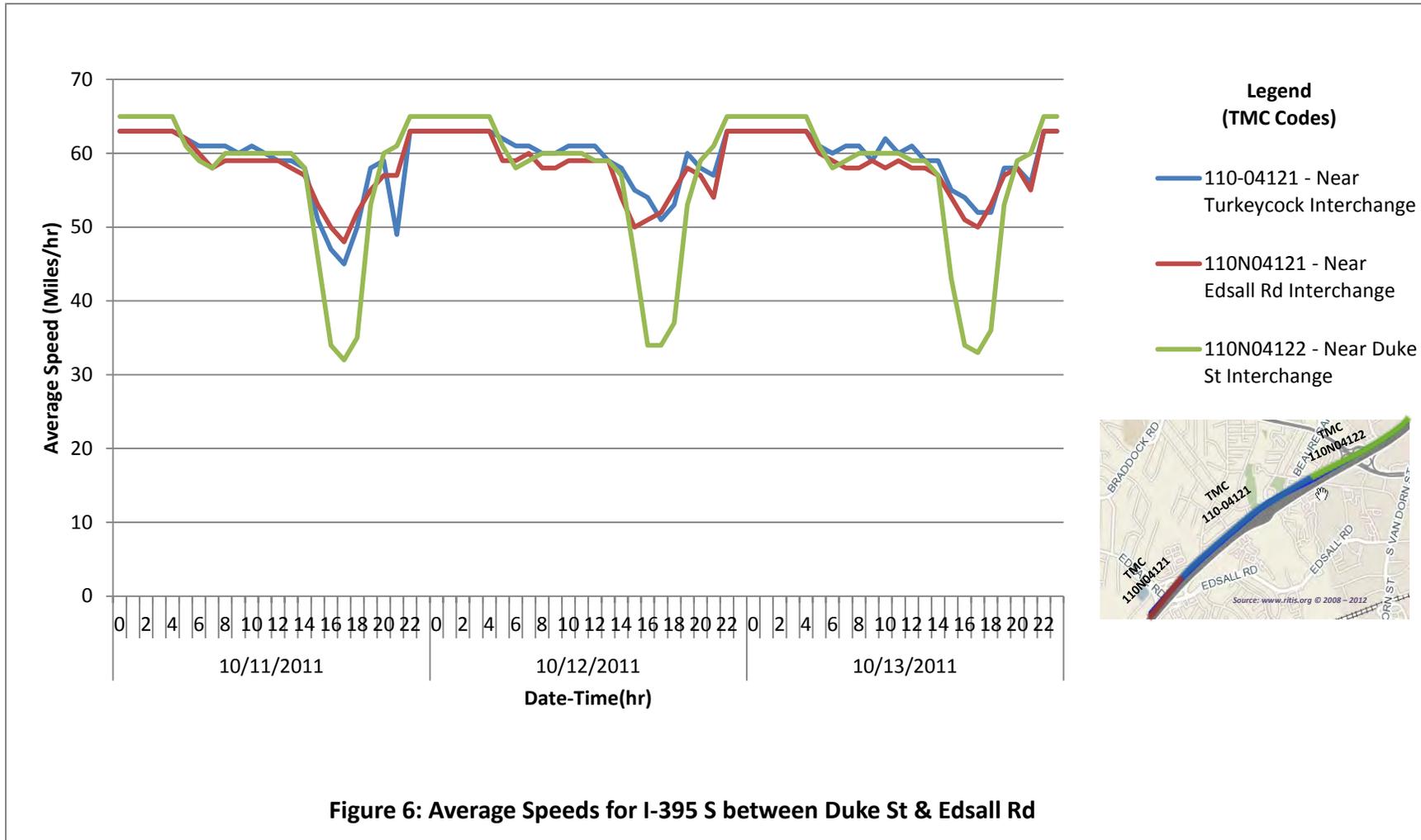


Figure 4: Design Year 2035 Peak Hour Volumes – Diamond Interchanges

| Table 1 : Comparison Of Average Travel Time And Speed Per Segments In The Study Area | | | | | | | | | |
|---|-----------------|-------------|--------------------|-------------|--------------------|-------------|--------------------|---------------|--------------------|
| TMC Location & Details | Day/Time* | 10/11/2011 | | 10/12/2011 | | 10/13/2011 | | 3 Day Average | |
| | | Speed (mph) | Travel Time (mins) | Speed (mph) | Travel Time (mins) | Speed (mph) | Travel Time (mins) | Speed (mph) | Travel Time (mins) |
| 110-04121 - 0.92 miles Near Turkeycock Interchange | Daily Average | 58.4 | 0.9 | 59.8 | 0.9 | 59.5 | 0.9 | 59.2 | 0.9 |
| | PM Peak Average | 47.7 | 0.9 | 53.3 | 1.1 | 53.7 | 1.0 | 51.6 | 1.0 |
| 110N04121 - 0.64 miles Near Edsall Rd Interchange | Daily Average | 58.4 | 0.6 | 58.4 | 0.7 | 58.5 | 0.7 | 58.5 | 0.7 |
| | PM Peak Average | 50.3 | 0.7 | 51.0 | 0.8 | 51.7 | 0.8 | 51.0 | 0.8 |
| 110N04122 - 0.85 miles Near Duke St Interchange | Daily Average | 57.1 | 0.9 | 57.3 | 1.0 | 56.9 | 1.0 | 57.1 | 1.0 |
| | PM Peak Average | 37.3 | 1.4 | 38.0 | 1.7 | 36.7 | 1.4 | 37.3 | 1.5 |
| Total Study Area - 2.41 miles (Approximately 2500 ft North of Duke St Interchange to 1000 ft South of Edsall Rd Interchange) | Daily Average | 58.0 | 2.5 | 58.5 | 2.6 | 58.3 | 2.6 | 58.3 | 2.6 |
| | PM Peak Average | 45.1 | 3.0 | 47.4 | 3.6 | 47.3 | 3.1 | 46.6 | 3.2 |

* PM Peak period for the purpose of reviewing the travel time(s)/speed(s) in the study area was considered to be between 3:00 PM and 6:00 PM





Existing Traffic Operations Analysis: The most recent version (6.1) of the *Highway Capacity Software (HCS)* was used to evaluate the mainline I-395 southbound operations based on the existing 2009 volumes obtained from the HOT Lanes IJR. I-395 southbound was divided into discrete analysis segments consisting of basic freeway segments, ramp junctions (merges and diverges), and weaving segments. These results are summarized in **Figure 7**. The results indicate that all the segments along study corridor operate at LOS D or better during AM peak hour. However, during the PM peak hour, multiple segments operate at LOS E and one weaving segment operates at LOS F. Based on the results, the problem areas during PM peak hour are listed below:

- At the interchange of Duke Street, the segments between the exit ramp to WB Duke Street and the on-ramp from EB Duke Street operate at LOS E. The majority of this segment consists of 3GP lanes currently and an additional GP lane could improve the operations.
- The weaving segment between the on-ramp from EB Duke Street to the left exit ramp to HOV/HOT lanes operates at LOS F.
- All segments south of the left exit on-ramp to HOV/HOT lanes within the study corridor operate at LOS E except for the basic freeway segment south of EB Edsall Road on-ramp which operates at LOS D. Within this segment, I-395 southbound widens to five (5) GP lanes approaching the interchange with I-95 / I-495.

Crash Summary: VDOT provided crash data reported during a 5-year year period from January, 2006 to December 2010 for this study section along I-395 Southbound. **Table 2** presents the crash summary of the intersection and **Figure 8** presents the crash diagram. The list of crashes is included in the Appendix.

| Table 2: Reported Crash Summary (2006-2010) | | | | | | | | | | | | |
|---|------------|-----------|-----------|-------------|----------------|-----------|--------------|-----------|---------------|------------------|-----------|------------|
| Year | Light | | Severity | | Collision Type | | | | Time/ Day | | | Total |
| | Day | Night | Injury | No Injuries | Rear End | Sideswipe | Fixed Object | Other | Weekday Peak* | Weekday Off-Peak | Weekend | |
| 2006 | 28 | 29 | 19 | 38 | 34 | 13 | 5 | 12 | 12 | 35 | 10 | 57 |
| 2007 | 20 | 10 | 8 | 22 | 9 | 8 | 10 | 3 | 7 | 15 | 8 | 30 |
| 2008 | 17 | 13 | 9 | 21 | 12 | 3 | 9 | 6 | 3 | 20 | 7 | 30 |
| 2009 | 20 | 6 | 5 | 21 | 11 | 6 | 6 | 3 | 8 | 12 | 6 | 26 |
| 2010 | 23 | 9 | 9 | 23 | 17 | 2 | 5 | 8 | 12 | 10 | 10 | 32 |
| Total | 108 | 67 | 50 | 125 | 83 | 24 | 43 | 25 | 42 | 92 | 41 | 175 |

*Peak period defined as 6:00-9:00 and 15:30-18:00

Analysis of the crash data for the study section revealed the following trends during the 5-year study period from 2006-2010.

- One hundred and seventy five (175) crashes were reported along this section during the study period. There were no reported fatalities.

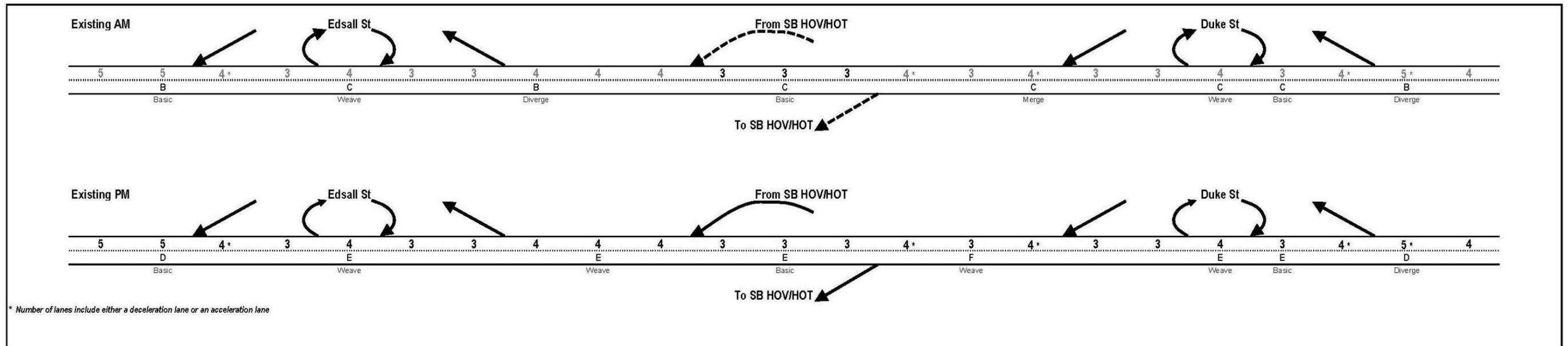


Figure 7: I-395 SB –Existing year Level of Service Information - AM and PM peak hours

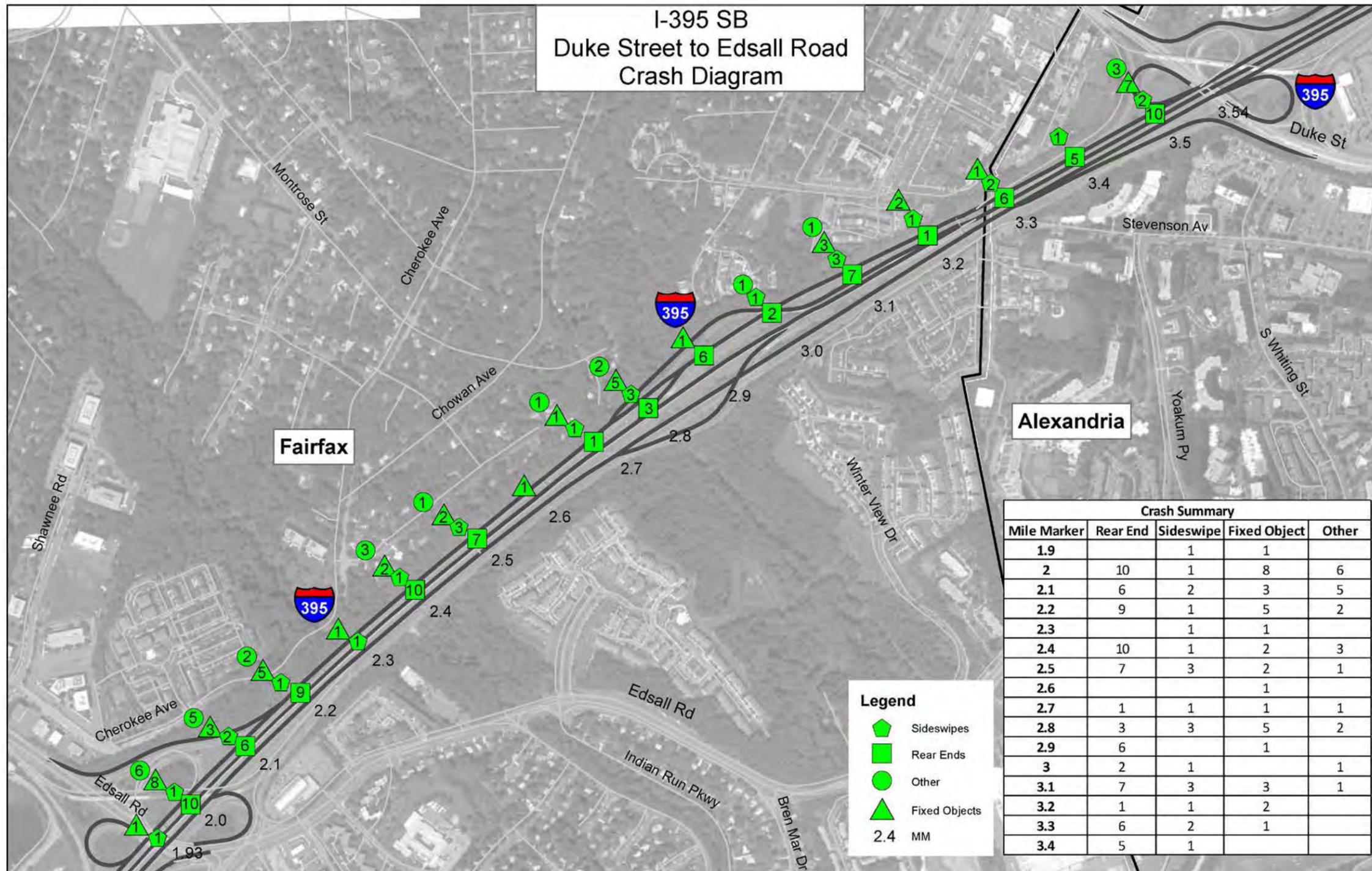


Figure 8: Crash Diagram: I-395 SB Between Duke Street to Edsall Road

- One hundred and seventy five (175) crashes resulted in injuries to sixty-five (65) vehicle occupants.
- Thirty-eight percent (38%) of the crashes occurred at night and twenty-four percent (24%) occurred during the weekday peak period.
- Rear-end crashes accounted for forty-seven percent (47%) of all crashes. The second most common collision type was were fixed object crashes, accounting for twenty-five percent (25%). The remaining crashes were split equally between “other” crashes and sideswipes; each accounted for fourteen percent (14%).
- There were sixty (60) crashes, representing thirty-four percent (34%) of the total crashes in the corridor, which occurred in the vicinity of Edsall Road interchange:
 - Eighteen (18) of these crashes occurred within 550 ft north of the off-ramp to WB Edsall Road. Fifty-six percent (56%) of these crashes in the observed cluster are noted to be rear end crashes.
 - Another forty-two (42) crashes occurred between the off-ramp to WB Edsall Road and the EB off-ramp to Edsall Road. Thirty-six percent (36%) of these crashes were rear end crashes and twenty-nine percent (29%) were fixed object crashes.
- There were twenty-two (22) crashes reported within the immediate vicinity of Duke Street interchange:
 - Nine (9) of these crashes occurred between the on-ramp from WB Duke Street and the off-ramp to EB Duke Street; this weaving segment is approximately 500 feet in length.
 - Another thirteen (13) crashes occurred immediately south of the off-ramp to EB Duke Street; Sixty-two percent (62%) of these are rear-end crashes.
- Twenty-five (25) crashes were observed approximately within 200 to 700 feet north of the beginning of the exit only lane marking for the off-ramp to WB Edsall Road; Sixty-eight percent (68%) of these are observed to be rear end crashes.
- Seventeen (17) crashes were observed within 500 feet of the HOV off-ramp at the Turkeycock Interchange; Thirty-five percent (35%) of these are fixed object crashes.

2.0 Design Criteria

While developing the options to be considered and the conceptual designs for those options, a consistent set of criteria were applied.

Traffic Operations: The most recent version (6.1) of the *Highway Capacity Software (HCS)* was used to evaluate the mainline I-395 southbound operations. In addition, the most recent version (8) of *Synchro* was used to evaluate the operations of the proposed signalized intersections for the following configurations. The traffic operations were a key factor for this feasibility study in terms of identifying feasible options and ultimately determining which options should be recommended to be carried forward. The target level of service for each preferred option was LOS D or better for all segments/intersections studied. The details of the operational analysis for each option considered are discussed in Sections 3 through 5 of this report.

Geometric Design Criteria: **Table 3** presents the summary of the geometric design criteria used for this study. Generally, the concepts were developed to minimize the number of potential Design Exceptions and/or Design Waivers, but at certain locations, exceptions or waivers may be required to avoid right-of-way impacts and substantially reduce potential project costs. The potential DE/DWs have been identified in **Section 3.0** through **Section 5.0** in the detailed discussion of each design option. For the bridges within the study area, a preliminary structural review was undertaken to determine feasibility of

modifying existing bridge structures. It is important to note that a detailed survey of the study limits is currently being conducted by VDOT. An updated survey is needed to verify the information/assumptions used in development of these design concepts. These conceptual designs should be reviewed and modified as necessary based on that updated information when it becomes available.

Cost Estimate Methodology: Cost estimates were developed for each of six design options evaluated for this study. The following section describes the methodology used to develop these cost estimates.

The unit costs used to develop the cost estimate were obtained from the VDOT District Averages dated October 2009 through December 2011. For each item, the average price in the NOVA district was used. Drainage and erosion control were assumed to be 5% each of the grading, pavement, and incidental items. Due to the likely long term and complex nature of construction, a lump sum MOT was estimated to be 100% of the grading, pavement and incidental items. A planning level cost of \$350/sf was applied to bridge spans that would need to be rebuilt due to conflict with proposed interchange modifications. Each cost estimate includes a general contingency of 25%, a CEI of 19% and Engineering and Surveying cost of 15%.

Pavement Sections: For areas of full depth reconstruction, a pavement section was used consisting of 2" Asphalt Concrete Surface, Type SM-12.5E @ 236 lbs/sy; 2" Asphalt Concrete Intermediate, Type IM-19.0A @ 244 lbs/sy; 11" Asphalt Concrete Base, Type 25.0A (assumed 1210 lbs/sy); and 8" Aggregate Base Material, Type I, Size 21B (assumed 145 lbs/cf). Due to a lane shift that would likely be needed during construction, it was assumed that the mainline lanes throughout the limits of the project would need to be resurfaced following the completion of the interchange modifications. This resurfacing consists of milling and repaving with 2" of Asphalt Concrete Surface, Type SM-12.5E @ 236 lbs/sy.

Table 3: Design Criteria

| Design Criteria | I-395 Mainline | Ramps |
|---|-----------------------|--|
| Functional Classification | Interstate – Divided | Interchange Ramp |
| Geometric Design Standard | GS-5 | GS-R |
| Terrain Type | Rolling | Rolling |
| Design Speed | 60 mph | 30 mph |
| Existing Posted / Advisory Speeds [As observed from Google Earth Street View Images] | 55 mph | I-395 Southbound to Duke St WB: 35 mph I-395 Southbound to Duke St EB: 20 mph I-395 Southbound to Edsall Rd WB: 35 mph I-395 Southbound to Edsall Rd EB: 25 mph Edsall Rd WB to I-395 Southbound: 35 mph |
| Min. Radius | 1204 ft | 251 ft |
| Min. Stopping Sight Distance | 570 ft | 200 ft |
| Min. Width of Lane (Min. Ramp Pvm. Width) | 12 ft | (16 ft) |
| Min. Width of Graded Shldrs (w/ GR) | 14 ft (17 ft) | 11 ft |
| Paved Shoulder Width RT | 12 ft | 8 ft |
| Min. Width of Ditch Front Slope | 12 ft | 10 ft |
| Slope | CS-4 or CS-4B | |

Reference: VDOT Road Design Manual, Appendix A

3.0 I-395 Mainline: Two design options (Options 1 and 2) were considered for upgrading the I-395 southbound general purpose lanes. The most recent version (6.1) of the *Highway Capacity Software (HCS)* was used to evaluate the mainline I-395 southbound operations. I-395 southbound was divided into discrete analysis segments consisting of basic freeway segments, ramp junctions (merges and diverges), and weaving segments. Additionally, conceptual designs were developed for each option, based on the available information, and critical design issues were identified. Lastly, preliminary project cost estimates (including preliminary engineering, construction, and CEI) were developed for each option.

The details of each Option are listed below along with the recommended configuration:

- a. Option 1: Widen to Provide 4GP Lanes and a Full Width Shoulder - Option 1 would increase the number of GP lanes from three (3) to four (4) between the Duke Street / Little River Turnpike (Route 236) and Edsall Road (Route 648) interchanges by replacing the existing shoulder with a new general purpose travel lane and constructing a new full width / full depth shoulder along I-395 southbound.

Traffic Operations Summary: The mainline analysis results for I-395 are summarized in **Figures 9 and 10**. The results indicate that most segments of I-395 southbound would operate at LOS D or better in the PM peak hour with four (4) GP lanes. Two (2) locations were identified which the preliminary analyses indicated would operate at LOS E or worse:

- I-395 SB Diverge to Duke Street EB / WB: Maintaining the current single-lane parallel-type exit ramp at this location results in LOS E operations in the PM peak with either of the proposed configurations for the Duke Street interchange (Options 3 or 5). The total volume exiting at this location would be approaching 1,900 vehicles per hour during the Design Year PM peak hour. To achieve LOS D or better operations at this location, a two-lane exit ramp would need to be provided. This could be accomplished by providing an “option” lane (exit to Duke or through to I-395 Southbound) adjacent to the current deceleration lane. With this configuration, this diverge would operate at LOS B during the PM peak hour. The preliminary design concept for this project includes this “option” lane configuration.
- I-395 Southbound, Two-Sided Weave between On-Ramp from Duke Street and Off-Ramp to I-395 HOV / HOT Lanes (at Turkeycock Interchange): Analysis of this segment as a two-sided weave was conducted by assigning the ramp-to-ramp volumes proportionally based on the freeway and on-ramp flows. Based on this approach, this weaving segment is projected to operate at LOS E during the PM peak hour in the Design Year. A sensitivity analysis was conducted to determine if there was a level of ramp-to-ramp weaving traffic which resulted in LOS D operations. However, even if the ramp-to-ramp traffic volume was reduced to 0, the HCM weaving methodology still produced an LOS E result. For the sake of comparison, this segment was also analyzed as separate merge, freeway, and diverge segments. Each of those segments was found to operate at LOS D or better. *Note: No origin-destination data was acquired to determine the volume of traffic making the ramp-to-ramp movement through this two-sided weaving segment.*

Critical Design Issues: A roll plot of the conceptual design for Option 1 (combined with Options 3b and 5a) is provided in the Appendix. For this Option, the following critical design issues were identified:

- A Design Exception would be required to eliminate the shoulder on I-395 to avoid affecting the existing bridge structure for the flyover ramp near Turkeycock Run from the I-395 HOV Lanes to I-395 Southbound.

Estimated Cost: The estimated cost for this configuration is **\$13.6M**, this cost includes:

- An additional 12' full depth travel lane and 12' partial depth shoulder.
 - Replacement of 4 OH sign structures.
- b. Option 2: Maintain the existing 3GP Lanes and rebuild the shoulder to provide a full-depth shoulder (Shoulder Lane Use in PM Peak): Operationally, Option 2 would maintain three (3) GP lanes throughout the day, except for the PM peak period, between the Duke Street / Little River Turnpike (Route 236) and Edsall Road (Route 648) interchanges. During the PM peak period, the shoulder lane would be used as an additional (4th) southbound general purpose travel lane. This configuration is similar to how I-66 currently operates between I-495 and Route 50. It should be noted that no examples of shoulder use segments could be identified which are similar in length (2.5 miles) to the study segment. Generally, part-time use of the shoulder lane is applied along longer project corridors where adding additional full-time capacity would be impractical.

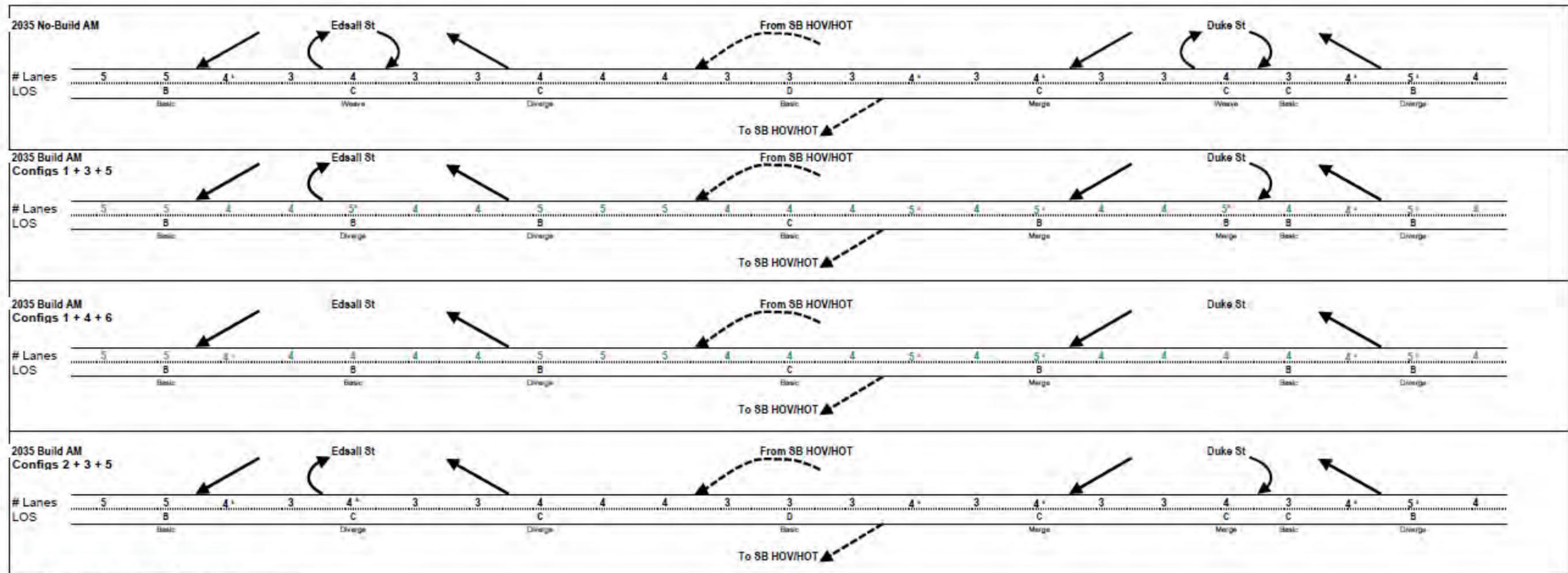
Traffic Operations Summary: The mainline analysis results for I-395 are summarized in **Figures 9 and 10**. The results indicate that most segments of I-395 southbound would operate at LOS D or better in the PM peak hour with four (4) GP lanes, including the shoulder use lane. The same two critical locations identified for Option 1 would also operate at LOS E for Option 2 in the Design Year. Critical Design Issues: The conceptual design for Option 2 is provided in the Appendix. For this Option, the following critical design issues were identified:

- A Design Exception would be required to eliminate the shoulder on I-395 to avoid affecting the existing bridge structure for the flyover ramp near Turkeycock Run from the I-395 HOV Lanes to I-395 Southbound.

Estimated Cost: The estimated cost for this configuration is **\$11.0M**, this cost includes:

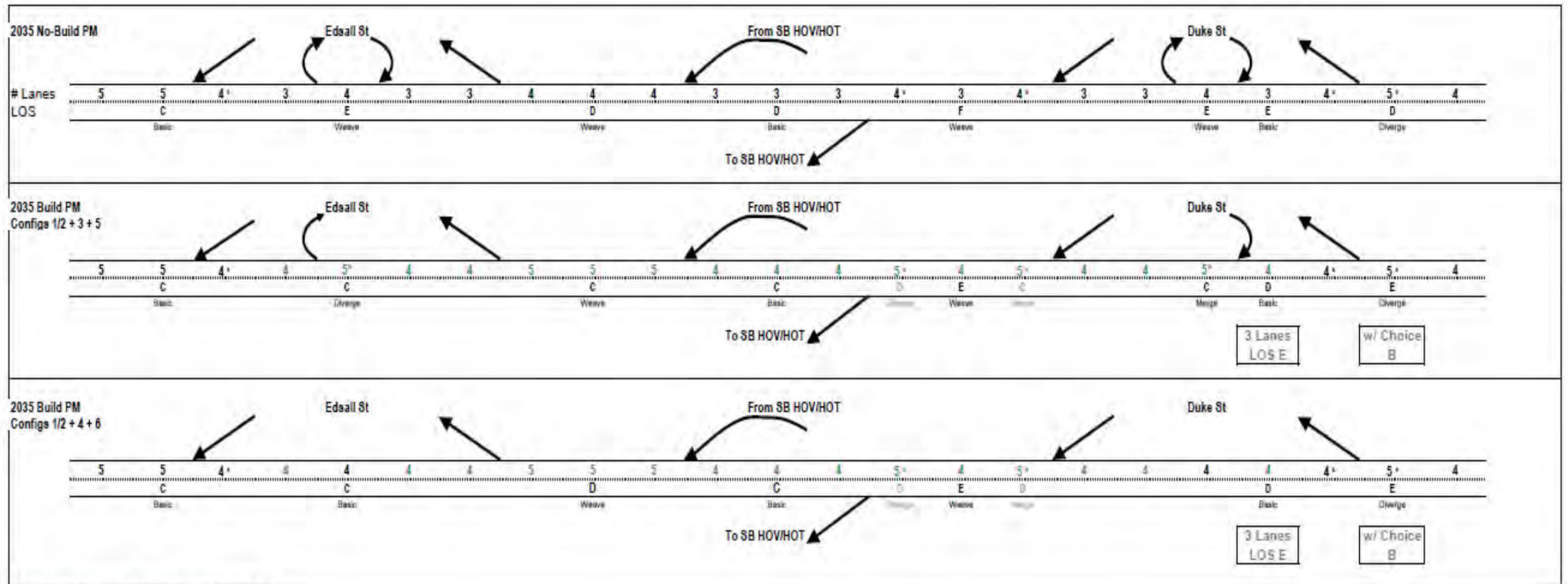
- An additional 12' full depth travel lane and 12' partial depth shoulder.
- Replacement of 2 OH sign structures.
- Note: This option would require the use of overhead lane control signs for, at a minimum, the shoulder travel lane. Given the complex lane use through this segment, which includes a continuous auxiliary lane between the flyover on-ramp from the I-395 HOV lanes and the off-ramp to Edsall Road westbound, it may ultimately be necessary to provide lane control signals spanning all the I-395 southbound GP lanes. This has not been assumed as part of this preliminary cost estimate. Additional evaluation would be needed if Option 2 is advanced.

- c. Recommended Configuration: The most beneficial design configuration which would enhance safety and operations along the study corridor is **Option 1: 4 Lanes and a Full Width Shoulder (Estimated Cost = \$13.6 Million)**.



* Number of lanes include either a deceleration lane or an acceleration lane
 † Number of lanes denoted in green includes an additional lane

Figure 9: I-395 SB – Capacity Analysis Results - AM Peak Hour



* Number of lanes include either a deceleration lane or an acceleration lane
 † Number of lanes shown in green includes an additional lane

Figure 10: I-395 SB – Capacity Analysis Results - PM Peak Hour

4.0 Duke Street Interchange: Two design options (Options 3 and 4) were considered for modifying the Duke Street interchange to accommodate the proposed modifications to the I-395 mainline to provide additional capacity (particularly during the PM peak period). These options were developed to eliminate the existing weaving segment between the on-ramp from westbound Duke Street and the off-ramp to eastbound Duke Street and therefore reduce the number of lanes which need to be provided beneath the existing Duke Street overpass of I-395.

The most recent version (8) of *Synchro* was used to evaluate the operations of the proposed signalized intersections along Duke Street. All design options are discussed below:

- a. Option 3 – Partial Cloverleaf (NW) Interchange: Removal of the existing Southbound to Eastbound loop-ramp and replacing it with a left-turn spur from the existing Southbound to Westbound directional ramp. A new signalized intersection (two-phase signal) would be created along Duke Street, west of I-395 to serve left-turns from the I-395 Southbound off-ramp to EB Duke Street.

Traffic Operations Summary: For this design alternative, two turn lane layouts were assumed for the ramp terminal intersection, Options 3a and 3b as follows:

- a. Single-Left Turn Lane from I-395 Southbound Off-Ramp.
- b. Double-Left Turn Lane from I-395 Southbound Off-Ramp.

The analysis results, including HCM delay, LOS, v/c-ratios, and *Synchro* 95th-percentile queues are summarized in **Table 4**. The results indicate that Option 3a would operate at LOS C overall, whereas Option 3b would operate at LOS B overall during PM peak hour. The critical movement at this signalized intersection is left-turn movement from the SB I-395 Off-ramp. The estimated delay for this movement under the design Options 3a and 3b are 70 seconds and 64 seconds per vehicle, respectively. However, the required 95th percentile queue length under Option 3a is approximately twice as high as Option 3b (approximately 400ft).

Supplementary Option: I-395 Southbound, between Off-Ramp to Duke Street EB/WB and On-Ramp from Duke Street – Option 3 would provide one exit from I-395 Southbound for all Duke Street traffic (1,800+ vph in the PM peak hour). With this volume of traffic exiting I-395 Southbound, an analysis was conducted to assess whether a short section of three (3) GP lanes could be provided between the exit ramp and the on-ramp from westbound Duke Street and provide satisfactory operations. This basic freeway segment was analyzed with both three (3) and four (4) GP lanes. Assuming a consistent free-flow speed (FFS) of 55 mph, the segment would operate at LOS E (Density = 35.1 pc/mi/ln) with three (3) GP lanes and LOS D with four (4) GP lanes. It should be noted that the density for the three (3) lane segment exceeds the LOS E threshold of 35 pc/mi/ln by only 0.1 pc/mi/ln.

| Table 4: Configuration 3 - I-395 SB Ramps at Duke Street | | | | | | | | | | | |
|--|----------------------------|----------------|------|---|----------------|------|---|---------------------|---|------|---------|
| AM Peak Hour | | | | | | | | | | | |
| Option | MOE | EB Duke Street | | | WB Duke Street | | | SB - I-395 Off-Ramp | | | Overall |
| | | L | T | R | L | T | R | L | T | R | |
| A | LOS | - | B | - | - | C | - | E | - | A | C |
| | Delay (sec) | - | 18.4 | - | - | 25.2 | - | 70.8 | - | 0.4 | 25.9 |
| | V/C-Ratio | - | 0.55 | - | - | 0.78 | - | 0.9 | - | 0.27 | n/a |
| | 95th-Percentile Queue (Ft) | - | 461 | - | - | 818 | - | 556 | - | 0 | n/a |
| B | LOS | - | A | - | - | B | - | E | - | A | B |
| | Delay (sec) | - | 8.3 | - | - | 11.2 | - | 69.9 | - | 0.4 | 16.4 |
| | V/C-Ratio | - | 0.46 | - | - | 0.65 | - | 0.8 | - | 0.27 | n/a |
| | 95th-Percentile Queue (Ft) | - | 300 | - | - | 532 | - | 282 | - | 0 | n/a |
| PM Peak Hour | | | | | | | | | | | |
| Option | MOE | EB Duke Street | | | WB Duke Street | | | SB - I-395 Off-Ramp | | | Overall |
| | | L | T | R | L | T | R | L | T | R | |
| A | LOS | - | D | - | - | C | - | E | - | A | C |
| | Delay (sec) | - | 45.2 | - | - | 30 | - | 69.6 | - | 4.8 | 34.3 |
| | V/C-Ratio | - | 0.93 | - | - | 0.67 | - | 0.97 | - | 0.82 | n/a |
| | 95th-Percentile Queue(Ft) | - | #981 | - | - | 536 | - | #928 | - | 0 | n/a |
| B | LOS | - | B | - | - | B | - | E | - | A | B |
| | Delay (sec) | - | 17.6 | - | - | 13.3 | - | 64.1 | - | 4.8 | 19.9 |
| | V/C-Ratio | - | 0.7 | - | - | 0.5 | - | 0.85 | - | 0.82 | n/a |
| | 95th-Percentile Queue(Ft) | - | 668 | - | - | 386 | - | 392 | - | 0 | n/a |

A = Single-left turn lane from I-395 SB Off-Ramp
 B = Double Left turn lanes from I-395 SB Off-Ramp
 # - Volume for 95th- Percentile Exceeds Capacity

Critical Design Issues: The conceptual design for Option 3 is provided in the Appendix. For this Option, the following critical design issues were identified:

- An existing bridge pier would need to be removed to provide an integral straddle bent beam for existing flyover ramp for Duke Street EB to I-395 NB over the proposed spur ramp from I-395 Southbound. This option would need to be checked for adequate vertical clearance during design once more accurate survey information is available.
- A Design Exception would be required for 10' shoulder width on I-395 Southbound from the Duke Street overpass over I-395 to flyover ramp from Duke Street EB to I-395 Southbound.
- A Design exception would be required for reduced shoulder widths along loop ramp from Duke Street WB to I-395 Southbound under the existing Duke Street bridge over I-395 and the flyover ramp from Duke Street EB to I-395 NB.
- A 20 mph curve would be required on the loop ramp from Duke Street to I-395 Southbound (proposed DS = 30 mph).
- The 3 GP Supplementary Option would require a Design Exception for 10' shoulder width on I-395 Southbound from the Duke Street bridge over I-395 to the flyover ramp from Duke Street EB to I-395 Southbound, but would eliminate the need for the Design Exception for reduced shoulder widths along loop ramp from Duke Street WB to I-395 Southbound under the existing Duke Street bridge over I-395 and the flyover ramp from Duke Street EB to I-395 NB. This option not only eliminates the need for 20 mph curve on loop ramp from Duke Street to I-395 Southbound (proposed DS = 30 mph) but also the need to modify existing abutment and rebuild deck for Duke Street Bridge over I-395.

Estimated Cost: The estimated costs for the Options 3a and 3b are approximately \$19.5M and \$19.8M, respectively. The estimated cost for the 3GP lanes Supplementary Option is \$14.1M which represents a savings of \$5.4M and \$5.7M, respectively, compared to the 4GP lane configuration (3a and 3b) assumed for this segment. These costs include the following:

- Removal of existing bridge pier and providing integral straddle bent beam for existing flyover ramp for Duke Street EB to I-395 NB over proposed spur ramp from I-395 Southbound.
 - Modifying existing abutment and rebuilding deck for Duke Street Bridge over I-395.
 - Replacement of 2 existing OH sign structures.
- b. Option 4 – Diamond Interchange: Removal of existing SB to WB and WB to SB loop ramps and replacing them with new directional ramps to/from I-395 southbound. In addition, the existing EB to SB directional ramp would be removed and the EB to SB movement would be served by a right-turn movement at the proposed signalized intersection along Duke Street, west of I-395 to serve left-turns from the I-395 Southbound off-ramp to EB Duke Street.

Traffic Operations Summary: For this design alternative, three turn lane layouts were assumed for the ramp terminal intersection, Options 4a, 4b, and 4c as follows:

- a. Single-Left Turn Lane from I-395 Southbound Off-Ramp + Single-Left Turn Lane from WB Duke Street
- b. Double-Left Turn Lane from I-395 Southbound Off-Ramp + Single-Left Turn Lane from WB Duke Street
- c. Double-Left Turn Lane from I-395 Southbound Off-Ramp + Double-Left Turn Lane from WB Duke Street

The analysis results, including HCM delay, LOS, v/c-ratios, and Synchro 95th-percentile queues are summarized in **Table 5**. The results indicate that Option 4a would operate at LOS E overall, whereas Option 4b and 4c would operate at LOS C overall during PM peak hour. All left-turn movements are critical at this signalized intersection, especially the left-turn from the SB I-395 Off-ramp. The estimated delay for this movement under the design Options 4a, 4b and 4c are 122sec, 80sec and 71sec, respectively. The 95th percentile queue length for the left-turn movement under Option 4c is the lowest (~420ft) compared to the other options.

Critical Design Issues: The conceptual design for Option 4 is provided in the Appendix. For this Option, the following critical design issues were identified:

- Removal of the existing bridge pier is needed to provide an integral straddle bent beam for the existing flyover ramp from Duke Street EB to I-395 NB over the proposed spur ramp. This option will need to be checked for adequate vertical clearance during design once more accurate survey information is available.
- A Design Exception would be required for the 10' shoulder width on I-395 Southbound from the Duke Street bridge over I-395 to the flyover ramp from Duke Street EB to I-395 northbound.
- The existing Duke Street bridge over I-395 should be investigated for additional loading due to addition of two left turn lanes from Duke Street WB to the on-ramp to I-395 Southbound.
- A Design Exception maybe required for reduced shoulder width on Duke Street near the existing bridge pier for the flyover ramp from Duke Street EB to I-395 NB.

Estimated Cost: The estimated costs for the three configurations 4a, 4b, and 4c are \$17.6M, \$ 17.8M, \$18.0M, respectively. These costs include:

- Removal of existing bridge piers and providing integral straddle bent beam for existing flyover ramp for Duke Street EB to I-395 NB.
 - Replacement of 2 existing OH sign structures.
- c. Recommended Configuration: The most beneficial design configuration which would enhance safety and operations of the Duke Street Interchange along the study corridor is **Option 3b: Partial Cloverleaf with Double-Left Turn Lane from I-395 Southbound Off-Ramp (Estimated Cost = \$19.8M)**. This cost could potentially be reduced by approximately \$5.7M if the 3 GP Supplementary Option were selected. Additional analysis, potentially including microsimulation, may be necessary to fully evaluate operations for that supplementary option.

| Table 4: Configuration 5 - I-395 SB Ramps at Duke Street | | | | | | | | | | | |
|--|---------------------------|----------------|------|------|---------|------|---|---------------------|---|------|---------|
| AM Peak Hour | | | | | | | | | | | |
| Option | MOE | EB Duke Street | | | WB Duke | | | SB - I-395 Off-Ramp | | | Overall |
| | | L | T | R | L | T | R | L | T | R | |
| A | LOS | - | D | B | F | C | - | F | - | A | D |
| | Delay (sec) | - | 51.7 | 13.3 | 83.9 | 21.8 | - | 83.8 | - | 0.4 | 39.0 |
| | V/C-Ratio | - | 0.88 | 0.47 | 0.97 | 0.76 | - | 0.96 | - | 0.27 | n/a |
| | 95th-Percentile Queue(Ft) | - | #695 | 176 | #573 | 692 | - | #668 | - | 0 | n/a |
| B | LOS | - | C | A | D | B | - | E | - | A | C |
| | Delay (sec) | - | 33.2 | 8.8 | 45 | 10.3 | - | 74.7 | - | 0.4 | 25.1 |
| | V/C-Ratio | - | 0.69 | 0.39 | 0.83 | 0.64 | - | 0.84 | - | 0.27 | n/a |
| | 95th-Percentile Queue(Ft) | - | 636 | 144 | 382 | 466 | - | 294 | - | 0 | n/a |
| C | LOS | - | C | A | E | B | - | E | - | A | C |
| | Delay (sec) | - | 25.6 | 5.5 | 71.7 | 11.1 | - | 70.5 | - | 0.4 | 25.1 |
| | V/C-Ratio | - | 0.62 | 0.36 | 0.78 | 0.65 | - | 0.8 | - | 0.27 | n/a |
| | 95th-Percentile Queue(Ft) | - | 564 | 104 | 254 | 522 | - | 284 | - | 0 | n/a |
| PM Peak Hour | | | | | | | | | | | |
| Option | MOE | EB Duke Street | | | WB Duke | | | SB - I-395 Off-Ramp | | | Overall |
| | | L | T | R | L | T | R | L | T | R | |
| A | LOS | - | F | D | F | C | - | F | - | A | E |
| | Delay (sec) | - | 98.9 | 48.5 | 149.8 | 31.5 | - | 121.7 | - | 4.8 | 61.2 |
| | V/C-Ratio | - | 1.08 | 0.99 | 1.2 | 0.83 | - | 1.13 | - | 0.82 | n/a |
| | 95th-Percentile Queue(Ft) | - | #825 | #737 | #787 | 793 | - | #1047 | - | 0 | n/a |
| B | LOS | - | D | C | E | B | - | F | - | A | C |
| | Delay (sec) | - | 49.1 | 25.9 | 78.1 | 14.3 | - | 80.3 | - | 4.8 | 33.3 |
| | V/C-Ratio | - | 0.86 | 0.88 | 0.98 | 0.67 | - | 0.95 | - | 0.82 | n/a |
| | 95th-Percentile Queue(Ft) | - | 667 | #650 | #678 | 524 | - | #472 | - | 0 | n/a |
| C | LOS | - | C | B | E | B | - | E | - | A | C |
| | Delay (sec) | - | 34.8 | 13.6 | 74.9 | 15.9 | - | 70.6 | - | 4.8 | 28.0 |
| | V/C-Ratio | - | 0.71 | 0.78 | 0.86 | 0.69 | - | 0.89 | - | 0.82 | n/a |
| | 95th-Percentile Queue(Ft) | - | 598 | 396 | 317 | 578 | - | 418 | - | 0 | n/a |

A = Single left turn from I-395 SB Off-ramp + Single-left turn from WB Duke Street)
 B = Double Left turn from I-395 SB Off-ramp + Single-left turn from WB Duke Street
 C = Double Left turn from I-395 SB Off-ramp + Double-left turn from WB Duke Street
 # - Volume for 95th- Percentile Exceeds Capacity

5.0 Edsall Road Interchange: Two design options were considered for Edsall Road interchange along the mainline I-395 Southbound. The most recent version (8) of *Synchro* was used to evaluate the operations of the proposed signalized intersections at this interchange.

- a. Option 5: Partial Cloverleaf (SW) Interchange - Modify the interchange of I-395 at Edsall Road (Route 648) by removing of the existing WB to SB loop-ramp and replacing it with a left-turn spur from Edsall Road WB to the existing EB to SB directional ramp. In addition, the existing EB to SB directional ramp would be removed and the EB to SB movement would be served by a right-turn movement at the proposed signalized intersection (two-phase signal) along Edsall Road.

Traffic Operations Summary: For this design alternative, two turn lane layouts were assumed for the ramp terminal intersection, Options 5a and 5b as follows:

- a. Single-Left Turn Lane from WB Edsall Road
- b. Double-Left Turn Lane from WB Edsall Road

The analysis results, including HCM delay, LOS, v/c-ratios, and Synchro 95th-percentile queues are summarized in **Table 6**. The results indicate that Option 5a would operate at LOS B overall, whereas Option 5b would operate at LOS C during PM peak hour. The critical movement at this signalized intersection is the left-turn movement along WB Edsall Road. The estimated delay for this movement under the Options 5a and 5b is 25sec and 63sec, respectively, making Option 5a slightly better than Option 5b. The 95th percentile queue length under Option 5a is approximately 370ft.

Critical Design Issues: During the development of this design concept, the following critical design constraints were identified:

1. A Design Exception would be required for the 8' shoulders on I-395 between the Edsall Road bridge over I-395 and the flyover ramp for Edsall Road EB to I-395 NB.
2. A Design Exception may be required for reduced shoulder width on Edsall Road near the existing bridge pier for the flyover ramp from Edsall Road EB to I-395 NB.
3. A Design exception would be required for reduced shoulder width on the loop ramp from I-395 SB to Edsall Road EB to avoid existing bridge piers for the Edsall Road bridge over I-395 SB and the flyover ramp from Edsall Road EB to I-395 NB.
4. Modifications to the existing abutments maybe needed along with the replacement of the decks for the Edsall Road Bridge over I-395 EB to accommodate the modified loop ramp from I-395 SB to Edsall Road EB. The entire loop ramp needs to be reconstructed up to tie-in with Edsall Road in order to meet 30mph design speed.
5. Additional ROW may be required for the proposed ramp from Edsall Road to I-395 SB.
6. Existing Edsall Road Bridge over I-395 should be investigated for additional loading due to addition of left turn lane from Edsall Road WB to ramp to I-395 SB.

| Table 6: Configuration 5 - I-395 SB Ramps at Edsall Road | | | | | | | | | | | |
|--|---------------------------|-----------|------|------|-----------|------|---|---------------------|---|---|---------|
| AM Peak Hour | | | | | | | | | | | |
| Option | MOE | EB Edsall | | | WB Edsall | | | SB - I-395 Off-Ramp | | | Overall |
| | | L | T | R | L | T | R | L | T | R | |
| A | LOS | - | B | A | C | A | - | | | | C |
| | Delay (sec) | - | 19.8 | 7.2 | 27.9 | 0.5 | - | | | | 11.2 |
| | V/C-Ratio | - | 0.49 | 0.36 | 0.82 | 0.48 | - | | | | n/a |
| | 95th-Percentile Queue(Ft) | - | 455 | 150 | 399 | 0 | - | | | | n/a |
| B | LOS | - | B | A | E | A | - | | | | B |
| | Delay (sec) | - | 11.7 | 8 | 63.2 | 0.5 | - | | | | 15.1 |
| | V/C-Ratio | - | 0.43 | 0.34 | 0.82 | 0.48 | - | | | | n/a |
| | 95th-Percentile Queue(Ft) | - | 314 | 175 | 362 | 0 | - | | | | n/a |
| PM Peak Hour | | | | | | | | | | | |
| Option | MOE | EB Edsall | | | WB Edsall | | | SB - I-395 Off-Ramp | | | Overall |
| | | L | T | R | L | T | R | L | T | R | |
| A | LOS | - | B | B | C | A | - | | | | B |
| | Delay (sec) | - | 11.9 | 16.5 | 25.3 | 0.3 | - | | | | 11.4 |
| | V/C-Ratio | - | 0.3 | 0.67 | 0.91 | 0.38 | - | | | | n/a |
| | 95th-Percentile Queue(Ft) | - | 251 | 676 | 364 | 0 | - | | | | n/a |
| B | LOS | - | B | C | E | A | - | | | | C |
| | Delay (sec) | - | 12.2 | 22.6 | 62.6 | 0.3 | - | | | | 20.9 |
| | V/C-Ratio | - | 0.31 | 0.73 | 0.86 | 0.38 | - | | | | n/a |
| | 95th-Percentile Queue(Ft) | - | 209 | 704 | 436 | 0 | - | | | | n/a |

A = Single-left turn lane from WB Edsall Road

B = Double Left turn lanes from WB Edsall Road

- Volume for 95th- Percentile Exceeds Capacity

Estimated Cost: The estimated cost for configurations 5a and 5b are \$15.8M and \$16.1M, respectively. These costs include:

- Modifications to the existing bridge abutment and rebuild deck for Edsall Road Bridge over I-395 and flyover ramp from Edsall Road WB to I-395 NB.
- Replacement of 3 existing OH sign structures.

Note: The estimated cost does not include cost for additional ROW for the ramp from Edsall Road to I-395 SB.

- b. Option 6: Diamond Interchange - Remove the existing WB to SB loop-ramp and replace it with a left-turn spur from Edsall Road WB to the existing EB to SB directional ramp. In addition, the existing EB to SB directional ramp would be removed and the EB to SB movement would be served by a right-turn movement at the proposed signalized intersection along Edsall Road, west of I-395 to serve left-turns from WB Edsall Road to Southbound I-395. Also, eliminate the existing SB to WB loop ramp and replace it with a new left-turn spur from the existing WB to WB directional ramp.

Traffic Operations Summary: For this design alternative, three turn lane layouts were assumed for the ramp terminal intersection, Options 6a, 6b, and 6c as follows:

- a. Single-Left Turn from I-395 Southbound Off-Ramp + Single-Left Turn Lane from Westbound Edsall Road
- b. Single-Left Turn from I-395 Southbound Off-Ramp + Double-Left Turn Lane from Westbound Edsall Road
- c. Double-Left Turn from I-395 Southbound Off-Ramp + Double-Left Turn Lane from Westbound Edsall Road

The analysis results, including HCM delay, LOS, v/c-ratios, and Synchro 95th-percentile queues are summarized in **Table 7**. The results indicate that Option 6c would operate at LOS C overall, where as Options 6a and 6b would operate at LOS D overall during PM peak hour. The critical movement at this signalized intersection is left-turn movement from SB I-395 off-ramp; estimated to operate at LOS F under all three design options. The 95th-percentile queue length under Option 6c is approximately 300ft with an estimated delay of 97sec, the lowest of all three options.

Critical Design Issues: The conceptual design for Option 6 is provided in the Appendix. For this Option, the following critical design issues were identified:

- Removal of an existing bridge pier would be needed along with providing an integral straddle bent beam for the existing flyover ramp from Edsall Road EB to I-395 NB over proposed spur ramp. This option will need to be checked for adequate vertical clearance during design once more accurate survey information is available.
- A Design Exception would be required for 8' shoulders on I-395 SB between the Edsall Road bridge over I-395 and the flyover ramp for Edsall Road EB to I-395 NB.

- A Design Exception may be required for reduced shoulder widths on Edsall Road near the existing bridge pier for the flyover ramp from Edsall Road EB to I-395 NB.

Estimated Cost: The estimated costs for Options 6a, 6b and 6c are \$10.3M, \$11M and \$14M, respectively. These costs include:

- Removal of existing bridge piers and providing integral straddle bent beam for existing flyover ramp for Edsall Road EB to I-395 NB over spur ramp from I-395 SB to Edsall Road.
 - Replacement of 2 OH sign structures.
- c. Recommended Configuration: The most beneficial design configuration which would enhance safety and operations of the Duke Street Interchange along the study corridor is **Option 5a: Partial Cloverleaf with Single-Left Turn Lane from Westbound Edsall Road (Estimated Cost = \$15.8M)**

| Table 7: Configuration 6 - I-395 SB Ramps at Edsall Road | | | | | | | | | | | |
|--|---------------------------|-----------|------|-------|-----------|------|---|---------------------|---|------|---------|
| AM Peak Hour | | | | | | | | | | | |
| Option | MOE | EB Edsall | | | WB Edsall | | | SB - I-395 Off-Ramp | | | Overall |
| | | L | T | R | L | T | R | L | T | R | |
| A | LOS | - | D | C | D | A | - | F | - | A | C |
| | Delay (sec) | - | 44.9 | 24.1 | 52.7 | 7.7 | - | 93.9 | - | 0.3 | 28.5 |
| | V/C-Ratio | - | 0.76 | 0.53 | 0.91 | 0.61 | - | 0.85 | - | 0.2 | n/a |
| | 95th-Percentile Queue(Ft) | - | 591 | 289 | #717 | 374 | - | #313 | - | 0 | n/a |
| B | LOS | - | C | B | E | A | - | F | - | A | C |
| | Delay (sec) | - | 29.1 | 17.4 | 65.4 | 9 | - | 81 | - | 0.3 | 25.9 |
| | V/C-Ratio | - | 0.58 | 0.43 | 0.84 | 0.62 | - | 0.77 | - | 0.2 | n/a |
| | 95th-Percentile Queue(Ft) | - | 526 | 270 | 367 | 471 | - | 266 | - | 0 | n/a |
| C | LOS | - | C | B | E | A | - | E | - | A | C |
| | Delay (sec) | - | 23.1 | 17.6 | 64.6 | 5.4 | - | 74.3 | - | 0.3 | 22.6 |
| | V/C-Ratio | - | 0.53 | 0.41 | 0.83 | 0.58 | - | 0.62 | - | 0.2 | n/a |
| | 95th-Percentile Queue(Ft) | - | 458 | 283 | 365 | 318 | - | 137 | - | 0 | n/a |
| PM Peak Hour | | | | | | | | | | | |
| Option | MOE | EB Edsall | | | WB Edsall | | | SB - I-395 Off-Ramp | | | Overall |
| | | L | T | R | L | T | R | L | T | R | |
| A | LOS | - | D | F | F | A | - | F | - | A | D |
| | Delay (sec) | - | 35.4 | 110.6 | 90.3 | 9.5 | - | 134.8 | - | 1.2 | 50.6 |
| | V/C-Ratio | - | 0.51 | 1.12 | 1.10 | 0.52 | - | 1.10 | - | 0.51 | n/a |
| | 95th-Percentile Queue(Ft) | - | 338 | #1068 | #923 | 320 | - | #610 | - | 0 | n/a |
| B | LOS | - | C | E | F | B | - | F | - | A | D |
| | Delay (sec) | - | 28.5 | 73.4 | 100.3 | 10.5 | - | 112.8 | - | 1.2 | 44.1 |
| | V/C-Ratio | - | 0.44 | 1.01 | 1.04 | 0.53 | - | 1.03 | - | 0.51 | n/a |
| | 95th-Percentile Queue(Ft) | - | 302 | #1014 | #559 | 338 | - | #586 | - | 0 | n/a |
| C | LOS | - | C | D | E | A | - | F | - | A | C |
| | Delay (sec) | - | 22.2 | 49.2 | 76.4 | 5.2 | - | 97.2 | - | 1.2 | 32.7 |
| | V/C-Ratio | - | 0.39 | 0.92 | 0.95 | 0.48 | - | 0.94 | - | 0.51 | n/a |
| | 95th-Percentile Queue(Ft) | - | 265 | #958 | #511 | 216 | - | #284 | - | 0 | n/a |

A = Single left turn from I-395 SB Off-ramp + Single-left turn from WB Edsall Road
 B = Double Left turn from I-395 SB Off-ramp + Single-left turn from WB Edsall Road
 C = Double Left turn from I-395 SB Off-ramp + Double-left turn from WB Edsall Road
 # - Volume for 95th- Percentile Exceeds Capacity

6.0 Conclusions and Recommendations:

Based on the findings of the operational and geometric evaluations, the Options in Table 8 are recommended for more detailed evaluation. Additional options would also provide improved operations compared to the No Build conditions and were found to be geometrically feasible, but the three options in Table 8 represent the best combination of operations, safety, and value.

| Table 8: Recommended Configurations | | | |
|--|-----------------|-----------------|----------------|
| Option | AM | PM | Cost |
| Option 1: I-395 SB Mainline – 4 Travel Lanes | LOS D or better | LOS D or better | \$13.6M |
| Option 3b: Duke Street – Partial Cloverleaf NW with Double-Left Turn Lane from I-395 SB Off-Ramp | LOS C | LOS C | \$19.8M |
| Option 5a: Edsall Road Partial Cloverleaf SW with Single Left-Turn Lane from WB Edsall Road | LOS C | LOS B | \$15.8M |
| | | Total | \$49.2M |

The recommended improvements would be expected to address the existing recurring congestion which occurs within this segment of I-395 southbound. The existing lane drop (from four lanes to three lanes) within the Duke Street interchange would be eliminated, as well as the weaving segments between the loop on and off-ramps at Duke Street and Edsall Road. The recommended improvements would also be expected to improve safety along this segment primarily by removing sources of congestion which are contributing to rear-end, sideswipe, and fixed object collisions. The recommended mainline configuration (4 travel lanes + full width shoulder) would provide shoulders throughout the project limits during all travel periods (including the PM peak) which would provide refuge for disabled vehicles and a recovery area for vehicles attempting to avoid collisions.

APPENDIX

Crash Data Summary for I-395 SB between Duke St and Edsall Rd intersections

| Number | Document Number | Physical Jurisdiction | Mile Post | Year | Crash Date | Crash Time | Probable Light Conditions* | Time of Day | Day Of Week | Crash Severity | Non Pedestrian Fatality Count | Non Pedestrian Injury Count | Work Zone Related | Collision Type |
|--------|-----------------|-----------------------|-----------|------|------------|------------|----------------------------|-------------|-------------|-----------------------|-------------------------------|-----------------------------|-------------------|-------------------------------|
| 1 | 93270024 | Fairfax County | 1.94 | 2009 | 8/19/2009 | 12:41 | Daylight | Day | Wed | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 2 | 80071958 | Fairfax County | 1.95 | 2007 | 12/23/2007 | 3:50 | Daylight | Day | Sun | Injury crash | 0 | 1 | 2. No | 4. Sideswipe - Same Direction |
| 3 | 70103692 | Fairfax County | 1.95 | 2006 | 12/18/2006 | 3:20 | Daylight | Day | Mon | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 4 | 91055323 | Fairfax County | 1.95 | 2008 | 8/29/2008 | 13:40 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 2. Angle |
| 5 | 91340845 | Fairfax County | 1.95 | 2008 | 10/20/2008 | 1:25 | Daylight | Day | Mon | Property damage crash | 0 | 0 | 2. No | 10. Deer |
| 6 | 92080369 | Fairfax County | 1.95 | 2009 | 2/10/2009 | 3:09 | Daylight | Day | Tue | Property damage crash | 0 | 0 | 2. No | 10. Deer |
| 7 | 102920555 | Fairfax County | 1.96 | 2010 | 9/21/2010 | 9:12 | Daylight | Day | Tue | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 8 | 62422382 | Fairfax County | 1.96 | 2006 | 8/18/2006 | 2:55 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 1. Yes | 9. Fixed Object - Off Road |
| 9 | 93490684 | Fairfax County | 1.97 | 2009 | 10/14/2009 | 18:25 | Dark | Dusk | Wed | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 10 | 82145141 | Fairfax County | 1.97 | 2008 | 4/8/2008 | 4:05 | Daylight | Day | Tue | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 11 | 82685047 | Fairfax County | 1.97 | 2008 | 4/17/2008 | 9:15 | Daylight | Day | Thu | Property damage crash | 0 | 0 | 2. No | 2. Angle |
| 12 | 92090344 | Fairfax County | 1.97 | 2009 | 2/13/2009 | 9:25 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 13 | 92880355 | Fairfax County | 1.97 | 2009 | 6/20/2009 | 18:50 | Daylight | Day | Sat | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 14 | 101320408 | Fairfax County | 1.97 | 2010 | 3/9/2010 | 15:35 | Daylight | Day | Tue | Injury crash | 0 | 1 | 2. No | 9. Fixed Object - Off Road |
| 15 | 102590044 | Fairfax County | 1.97 | 2010 | 8/3/2010 | 14:09 | Daylight | Day | Tue | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 16 | 93390567 | Fairfax County | 1.98 | 2009 | 9/8/2009 | 10:25 | Daylight | Day | Tue | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 17 | 60740514 | Fairfax County | 1.99 | 2006 | 2/21/2006 | 14:57 | Daylight | Day | Tue | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 18 | 61580717 | Fairfax County | 1.99 | 2006 | 5/11/2006 | 17:17 | Daylight | Day | Thu | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 19 | 93160943 | Fairfax County | 1.99 | 2009 | 8/6/2009 | 6:57 | Daylight | Day | Thu | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 20 | 63410315 | Fairfax County | 2.00 | 2006 | 11/12/2006 | 18:45 | Dark | Dusk | Sun | Property damage crash | 0 | 0 | 2. No | 8. Non-Collision |
| 21 | 62000854 | Fairfax County | 2.02 | 2006 | 7/11/2006 | 18:30 | Daylight | Day | Tue | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 22 | 62701239 | Fairfax County | 2.02 | 2006 | 9/12/2006 | 22:45 | Dark | Night | Tue | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 23 | 62701359 | Fairfax County | 2.02 | 2006 | 9/19/2006 | 20:05 | Dark | Night | Tue | Injury crash | 0 | 2 | 2. No | 9. Fixed Object - Off Road |
| 24 | 63451062 | Fairfax County | 2.02 | 2006 | 11/27/2006 | 22:30 | Dark | Night | Mon | Property damage crash | 0 | 0 | 1. Yes | 1. Rear End |
| 25 | 73112867 | Fairfax County | 2.02 | 2007 | 10/25/2007 | 7:35 | Daylight | Day | Thu | Injury crash | 0 | 1 | 2. No | 9. Fixed Object - Off Road |
| 26 | 110410298 | Fairfax County | 2.03 | 2010 | 12/18/2010 | 9:04 | Daylight | Day | Sat | Injury crash | 0 | 3 | 2. No | 2. Angle |
| 27 | 73510364 | Fairfax County | 2.04 | 2007 | 12/5/2007 | 14:08 | Daylight | Day | Wed | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 28 | 60950612 | Fairfax County | 2.05 | 2006 | 3/22/2006 | 21:42 | Dark | Night | Wed | Injury crash | 0 | 2 | 2. No | 9. Fixed Object - Off Road |
| 29 | 73371975 | Fairfax County | 2.05 | 2007 | 11/5/2007 | 21:50 | Dark | Night | Mon | Property damage crash | 0 | 0 | 2. No | 2. Angle |
| 30 | 81195003 | Fairfax County | 2.05 | 2008 | 3/22/2008 | 18:05 | Daylight | Day | Sat | Property damage crash | 0 | 0 | 2. No | 2. Angle |
| 31 | 81425055 | Fairfax County | 2.05 | 2008 | 4/3/2008 | 19:12 | Dark | Dusk | Thu | Injury crash | 0 | 1 | 2. No | 9. Fixed Object - Off Road |
| 32 | 90075159 | Fairfax County | 2.05 | 2008 | 12/12/2008 | 12:30 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 33 | 91800233 | Fairfax County | 2.05 | 2009 | 1/1/2009 | 8:50 | Daylight | Day | Thu | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 34 | 101450759 | Fairfax County | 2.05 | 2010 | 4/10/2010 | 17:00 | Daylight | Day | Sat | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 35 | 102320313 | Fairfax County | 2.05 | 2010 | 4/10/2010 | 17:00 | Daylight | Day | Sat | Property damage crash | 0 | 0 | 2. No | 2. Angle |
| 36 | 101960279 | Fairfax County | 2.05 | 2010 | 5/26/2010 | 16:30 | Daylight | Day | Wed | Injury crash | 0 | 1 | 2. No | 16. Other |
| 37 | 73180323 | Fairfax County | 2.06 | 2007 | 10/25/2007 | 19:10 | Daylight | Day | Thu | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 38 | 90405089 | Fairfax County | 2.06 | 2008 | 7/2/2008 | 11:05 | Daylight | Day | Wed | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 39 | 91701191 | Fairfax County | 2.06 | 2008 | 12/27/2008 | 18:35 | Dark | Night | Sat | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 40 | 102860081 | Fairfax County | 2.07 | 2010 | 9/9/2010 | 17:30 | Daylight | Day | Thu | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 41 | 83375244 | Fairfax County | 2.10 | 2008 | 5/31/2008 | 16:51 | Daylight | Day | Sat | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 42 | 63610186 | Fairfax County | 2.12 | 2006 | 12/7/2006 | 14:05 | Daylight | Day | Thu | Property damage crash | 0 | 0 | 2. No | 16. Other |
| 43 | 103350430 | Fairfax County | 2.15 | 2010 | 9/25/2010 | 20:05 | Dark | Night | Sat | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 44 | 91195531 | Fairfax County | 2.15 | 2008 | 9/21/2008 | 13:28 | Daylight | Day | Sun | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 45 | 93360268 | Fairfax County | 2.15 | 2009 | 7/16/2009 | 14:59 | Daylight | Day | Thu | Injury crash | 0 | 1 | 2. No | 4. Sideswipe - Same Direction |
| 46 | 83235018 | Fairfax County | 2.16 | 2008 | 5/18/2008 | 9:30 | Daylight | Day | Sun | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 47 | 92240467 | Fairfax County | 2.16 | 2008 | 2/20/2009 | 15:25 | Daylight | Day | Fri | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 48 | 61790476 | Fairfax County | 2.17 | 2006 | 6/7/2006 | 22:00 | Dark | Night | Wed | Property damage crash | 0 | 0 | 2. No | 1. Rear End |

Crash Data Summary for I-395 SB between Duke St and Edsall Rd intersections

| Number | Document Number | Physical Jurisdiction | Mile Post | Year | Crash Date | Crash Time | Probable Light Conditions* | Time of Day | Day Of Week | Crash Severity | Non Pedestrian Fatality Count | Non Pedestrian Injury Count | Work Zone Related | Collision Type |
|--------|-----------------|-----------------------|-----------|------|------------|------------|----------------------------|-------------|-------------|-----------------------|-------------------------------|-----------------------------|-------------------|-------------------------------|
| 49 | 110120289 | Fairfax County | 2.17 | 2010 | 9/27/2010 | 11:40 | Daylight | Day | Mon | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 50 | 60180514 | Fairfax County | 2.18 | 2006 | 1/3/2006 | 22:15 | Dark | Night | Tue | Injury crash | 0 | 2 | 2. No | 8. Non-Collision |
| 51 | 62540373 | Fairfax County | 2.18 | 2006 | 8/24/2006 | 22:30 | Dark | Night | Thu | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 52 | 70311984 | Fairfax County | 2.18 | 2007 | 1/18/2007 | 11:00 | Daylight | Day | Thu | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 53 | 71431702 | Fairfax County | 2.18 | 2007 | 5/12/2007 | 22:25 | Dark | Night | Sat | Injury crash | 0 | 1 | 2. No | 9. Fixed Object - Off Road |
| 54 | 73110240 | Fairfax County | 2.18 | 2007 | 10/21/2007 | 8:40 | Daylight | Day | Sun | Property damage crash | 0 | 0 | 2. No | 10. Deer |
| 55 | 91115225 | Fairfax County | 2.21 | 2008 | 9/4/2008 | 15:10 | Daylight | Day | Thu | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 56 | 61372433 | Fairfax County | 2.23 | 2006 | 4/23/2006 | 20:15 | Dark | Night | Sun | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 57 | 61580713 | Fairfax County | 2.23 | 2006 | 5/10/2006 | 0:00 | Dark | Night | Wed | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 58 | 63611398 | Fairfax County | 2.23 | 2006 | 12/7/2006 | 15:30 | Daylight | Day | Thu | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 59 | 70100426 | Fairfax County | 2.23 | 2006 | 12/15/2006 | 15:40 | Daylight | Day | Fri | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 60 | 70103500 | Fairfax County | 2.23 | 2006 | 12/15/2006 | 15:40 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 61 | 72820778 | Fairfax County | 2.33 | 2007 | 9/19/2007 | 10:20 | Daylight | Day | Wed | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 62 | 80141715 | Fairfax County | 2.33 | 2007 | 12/27/2007 | 7:25 | Daylight | Day | Thu | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 63 | 80985055 | Fairfax County | 2.35 | 2008 | 2/13/2008 | 21:38 | Dark | Night | Wed | Injury crash | 0 | 1 | 2. No | 9. Fixed Object - Off Road |
| 64 | 93420916 | Fairfax County | 2.35 | 2009 | 9/20/2009 | 13:05 | Daylight | Day | Sun | Property damage crash | 0 | 0 | 2. No | 2. Angle |
| 65 | 91810928 | Fairfax County | 2.40 | 2009 | 1/7/2009 | 20:45 | Dark | Night | Wed | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 66 | 60300920 | Fairfax County | 2.43 | 2006 | 1/10/2006 | 7:40 | Daylight | Day | Tue | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 67 | 60590764 | Fairfax County | 2.43 | 2006 | 2/13/2006 | 13:25 | Daylight | Day | Mon | Injury crash | 0 | 2 | 2. No | 1. Rear End |
| 68 | 60740516 | Fairfax County | 2.43 | 2006 | 2/17/2006 | 16:30 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 69 | 60672168 | Fairfax County | 2.43 | 2006 | 2/23/2006 | 19:00 | Dark | Night | Thu | Injury crash | 0 | 1 | 1. Yes | 1. Rear End |
| 70 | 60861680 | Fairfax County | 2.43 | 2006 | 3/1/2006 | 22:00 | Dark | Night | Wed | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 71 | 61163625 | Fairfax County | 2.43 | 2006 | 4/7/2006 | 18:15 | Daylight | Day | Fri | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 72 | 62140706 | Fairfax County | 2.43 | 2006 | 7/19/2006 | 22:35 | Dark | Night | Wed | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 73 | 62540385 | Fairfax County | 2.43 | 2006 | 8/21/2006 | 18:10 | Daylight | Day | Mon | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 74 | 62910751 | Fairfax County | 2.43 | 2006 | 10/6/2006 | 20:00 | Dark | Night | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 75 | 63101897 | Fairfax County | 2.43 | 2006 | 10/26/2006 | 3:00 | Dark | Night | Thu | Property damage crash | 0 | 0 | 2. No | 10. Deer |
| 76 | 63520134 | Fairfax County | 2.43 | 2006 | 11/29/2006 | 17:57 | Dark | Night | Wed | Injury crash | 0 | 1 | 2. No | 4. Sideswipe - Same Direction |
| 77 | 70100424 | Fairfax County | 2.43 | 2006 | 12/18/2006 | 17:45 | Dark | Night | Mon | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 78 | 80090163 | Fairfax County | 2.43 | 2007 | 12/8/2007 | 22:35 | Dark | Night | Sat | Injury crash | 0 | 2 | 2. No | 8. Non-Collision |
| 79 | 93450775 | Fairfax County | 2.45 | 2009 | 9/29/2009 | 15:47 | Daylight | Day | Tue | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 80 | 101400980 | Fairfax County | 2.45 | 2010 | 3/26/2010 | 17:55 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 81 | 101830186 | Fairfax County | 2.45 | 2010 | 5/18/2010 | 17:04 | Daylight | Day | Tue | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 82 | 102530027 | Fairfax County | 2.45 | 2010 | 7/4/2010 | 13:04 | Daylight | Day | Sun | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 83 | 102090444 | Fairfax County | 2.45 | 2010 | 6/24/2010 | 15:35 | Daylight | Day | Thu | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 84 | 80655143 | Fairfax County | 2.46 | 2008 | 2/5/2008 | 21:42 | Dark | Night | Tue | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 85 | 81225160 | Fairfax County | 2.46 | 2008 | 3/20/2008 | 17:59 | Daylight | Day | Thu | Injury crash | 0 | 1 | 2. No | 4. Sideswipe - Same Direction |
| 86 | 91940528 | Fairfax County | 2.46 | 2009 | 1/22/2009 | 20:53 | Dark | Night | Thu | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 87 | 92330082 | Fairfax County | 2.46 | 2009 | 3/25/2009 | 3:15 | Daylight | Day | Wed | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 88 | 92600594 | Fairfax County | 2.46 | 2009 | 5/8/2009 | 15:40 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 89 | 103640155 | Fairfax County | 2.47 | 2010 | 10/25/2010 | 20:45 | Dark | Night | Mon | Property damage crash | 0 | 0 | 2. No | 10. Deer |
| 90 | 70312182 | Fairfax County | 2.53 | 2007 | 1/18/2007 | 2:20 | Dark | Night | Thu | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 91 | 72971181 | Fairfax County | 2.53 | 2007 | 10/17/2007 | 1:10 | Dark | Night | Wed | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 92 | 101320376 | Fairfax County | 2.64 | 2010 | 3/8/2010 | 6:10 | Dark | Dawn | Mon | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 93 | 81445274 | Fairfax County | 2.71 | 2008 | 4/8/2008 | 21:40 | Dark | Night | Tue | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 94 | 82845274 | Fairfax County | 2.71 | 2008 | 5/29/2008 | 10:35 | Daylight | Day | Thu | Injury crash | 0 | 1 | 1. Yes | 2. Angle |
| 95 | 90635049 | Fairfax County | 2.71 | 2008 | 7/25/2008 | 15:14 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 96 | 72340542 | Fairfax County | 2.73 | 2007 | 8/14/2007 | 3:30 | Dark | Night | Tue | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |

Crash Data Summary for I-395 SB between Duke St and Edsall Rd intersections

| Number | Document Number | Physical Jurisdiction | Mile Post | Year | Crash Date | Crash Time | Probable Light Conditions* | Time of Day | Day Of Week | Crash Severity | Non Pedestrian Fatality Count | Non Pedestrian Injury Count | Work Zone Related | Collision Type |
|--------|-----------------|-----------------------|-----------|------|------------|------------|----------------------------|-------------|-------------|-----------------------|-------------------------------|-----------------------------|-------------------|-------------------------------|
| 97 | 110320693 | Fairfax County | 2.77 | 2010 | 11/27/2010 | 4:15 | Dark | Night | Sat | Property damage crash | 0 | 0 | 2. No | 2. Angle |
| 98 | 110390951 | Fairfax County | 2.77 | 2010 | 12/5/2010 | 15:04 | Daylight | Day | Sun | Property damage crash | 0 | 0 | 2. No | 2. Angle |
| 99 | 93010170 | Fairfax County | 2.83 | 2009 | 7/9/2009 | 20:55 | Daylight | Dusk | Thu | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 100 | 101020097 | Fairfax County | 2.84 | 2010 | 1/28/2010 | 15:40 | Daylight | Day | Thu | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 101 | 62280132 | Fairfax County | 2.84 | 2006 | 8/2/2006 | 10:10 | Daylight | Day | Wed | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 102 | 62282740 | Fairfax County | 2.84 | 2006 | 8/4/2006 | 12:45 | Daylight | Day | Fri | Injury crash | 0 | 2 | 2. No | 1. Rear End |
| 103 | 62421004 | Fairfax County | 2.84 | 2006 | 8/12/2006 | 8:55 | Daylight | Day | Sat | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 104 | 62861640 | Fairfax County | 2.84 | 2006 | 9/30/2006 | 14:15 | Daylight | Day | Sat | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 105 | 63540910 | Fairfax County | 2.84 | 2006 | 12/3/2006 | 3:28 | Dark | Night | Sun | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 106 | 71861458 | Fairfax County | 2.84 | 2007 | 6/12/2007 | 14:23 | Daylight | Day | Tue | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 107 | 72470314 | Fairfax County | 2.84 | 2007 | 8/17/2007 | 15:30 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 108 | 91005226 | Fairfax County | 2.84 | 2008 | 8/23/2008 | 2:31 | Dark | Night | Sat | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 109 | 91205841 | Fairfax County | 2.84 | 2008 | 9/25/2008 | 1:49 | Dark | Night | Thu | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 110 | 70103197 | Fairfax County | 2.93 | 2006 | 12/16/2006 | 17:20 | Dark | Night | Sat | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 111 | 70100417 | Fairfax County | 2.93 | 2006 | 12/22/2006 | 14:23 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 112 | 73390435 | Fairfax County | 2.93 | 2007 | 11/9/2007 | 18:39 | Dark | Dusk | Fri | Property damage crash | 0 | 0 | 1. Yes | 1. Rear End |
| 113 | 72690965 | Fairfax County | 2.94 | 2007 | 9/13/2007 | 15:20 | Daylight | Day | Thu | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 114 | 93140542 | Fairfax County | 2.95 | 2009 | 8/1/2009 | 18:05 | Daylight | Day | Sat | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 115 | 101411207 | Fairfax County | 2.95 | 2010 | 3/30/2010 | 17:31 | Daylight | Day | Tue | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 116 | 101820197 | Fairfax County | 2.95 | 2010 | 5/13/2010 | 23:01 | Dark | Night | Thu | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 117 | 91700556 | Fairfax County | 2.96 | 2008 | 12/23/2008 | 18:07 | Dark | Night | Tue | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 118 | 92520063 | Fairfax County | 2.96 | 2009 | 4/24/2009 | 8:24 | Daylight | Day | Fri | Injury crash | 0 | 2 | 2. No | 4. Sideswipe - Same Direction |
| 119 | 102080729 | Fairfax County | 2.96 | 2010 | 6/23/2010 | 15:12 | Daylight | Day | Wed | Injury crash | 0 | 2 | 2. No | 1. Rear End |
| 120 | 110130458 | Fairfax County | 3.02 | 2010 | 11/11/2010 | 0:00 | Dark | Night | Thu | Injury crash | 0 | 1 | 2. No | 2. Angle |
| 121 | 60462263 | Fairfax County | 3.10 | 2006 | 2/3/2006 | 22:45 | Dark | Night | Fri | Injury crash | 0 | 3 | 2. No | 9. Fixed Object - Off Road |
| 122 | 61163633 | Fairfax County | 3.10 | 2006 | 4/7/2006 | 16:40 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 123 | 61560276 | Fairfax County | 3.10 | 2006 | 5/21/2006 | 6:30 | Daylight | Day | Sun | Injury crash | 0 | 1 | 2. No | 4. Sideswipe - Same Direction |
| 124 | 61862200 | Fairfax County | 3.10 | 2006 | 6/23/2006 | 0:15 | Dark | Night | Fri | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 125 | 62282732 | Fairfax County | 3.10 | 2006 | 8/4/2006 | 1:20 | Dark | Night | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 126 | 71202048 | Fairfax County | 3.10 | 2007 | 4/13/2007 | 11:00 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 127 | 72971158 | Fairfax County | 3.10 | 2007 | 10/15/2007 | 17:53 | Daylight | Day | Mon | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 128 | 80845101 | Fairfax County | 3.10 | 2008 | 1/8/2008 | 18:20 | Dark | Night | Tue | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 129 | 90845383 | Fairfax County | 3.10 | 2008 | 8/9/2008 | 3:18 | Dark | Night | Sat | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 130 | 91035130 | Fairfax County | 3.10 | 2008 | 8/25/2008 | 15:44 | Daylight | Day | Mon | Injury crash | 0 | 2 | 2. No | 1. Rear End |
| 131 | 91630177 | Fairfax County | 3.10 | 2008 | 12/8/2008 | 2:12 | Dark | Night | Mon | Injury crash | 0 | 1 | 2. No | 9. Fixed Object - Off Road |
| 132 | 92580137 | Fairfax County | 3.10 | 2009 | 4/19/2009 | 4:24 | Dark | Night | Sun | Injury crash | 0 | 2 | 2. No | 1. Rear End |
| 133 | 63312099 | Fairfax County | 3.11 | 2006 | 11/4/2006 | 1:40 | Dark | Night | Sat | Property damage crash | 0 | 0 | 2. No | 10. Deer |
| 134 | 100420069 | Fairfax County | 3.13 | 2010 | 1/4/2010 | 17:35 | Dark | Night | Mon | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 135 | 70990890 | Fairfax County | 3.15 | 2007 | 3/29/2007 | 16:25 | Daylight | Day | Thu | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 136 | 62421742 | Fairfax County | 3.20 | 2006 | 8/8/2006 | 15:15 | Daylight | Day | Tue | Injury crash | 0 | 1 | 2. No | 9. Fixed Object - Off Road |
| 137 | 71360887 | Fairfax County | 3.20 | 2007 | 5/2/2007 | 7:55 | Daylight | Day | Wed | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 138 | 62481732 | Fairfax County | 3.23 | 2006 | 8/20/2006 | 10:20 | Daylight | Day | Sun | Injury crash | 0 | 1 | 2. No | 9. Fixed Object - Off Road |
| 139 | 62260434 | Fairfax County | 3.25 | 2006 | 7/21/2006 | 16:46 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 140 | 63611411 | Fairfax County | 3.25 | 2006 | 12/11/2006 | 17:27 | Dark | Night | Mon | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 141 | 62630138 | City of Alexandria | 3.27 | 2006 | 9/13/2006 | 5:28 | Dark | Dawn | Wed | Property damage crash | 0 | 0 | 1. Yes | 1. Rear End |
| 142 | 71431657 | City of Alexandria | 3.28 | 2007 | 4/14/2007 | 9:45 | Daylight | Day | Sat | Injury crash | 0 | 1 | 2. No | 4. Sideswipe - Same Direction |
| 143 | 92440144 | City of Alexandria | 3.30 | 2009 | 4/9/2009 | 22:43 | Dark | Night | Thu | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 144 | 60322468 | City of Alexandria | 3.33 | 2006 | 1/14/2006 | 5:20 | Dark | Dawn | Sat | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |

Crash Data Summary for I-395 SB between Duke St and Edsall Rd intersections

| Number | Document Number | Physical Jurisdiction | Mile Post | Year | Crash Date | Crash Time | Probable Light Conditions* | Time of Day | Day Of Week | Crash Severity | Non Pedestrian Fatality Count | Non Pedestrian Injury Count | Work Zone Related | Collision Type |
|--------|-----------------|-----------------------|-----------|------|------------|------------|----------------------------|-------------|-------------|-----------------------|-------------------------------|-----------------------------|-------------------|-------------------------------|
| 145 | 61790449 | City of Alexandria | 3.33 | 2006 | 6/13/2006 | 23:30 | Dark | Night | Tue | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 146 | 72040971 | City of Alexandria | 3.33 | 2007 | 7/9/2007 | 18:08 | Daylight | Day | Mon | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 147 | 73530378 | City of Alexandria | 3.34 | 2007 | 12/8/2007 | 14:50 | Daylight | Day | Sat | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 148 | 91420850 | City of Alexandria | 3.36 | 2008 | 11/4/2008 | 15:13 | Daylight | Day | Tue | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 149 | 92330087 | City of Alexandria | 3.36 | 2009 | 3/25/2009 | 8:45 | Daylight | Day | Wed | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 150 | 102670068 | City of Alexandria | 3.36 | 2010 | 7/12/2010 | 10:00 | Daylight | Day | Mon | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 151 | 72040957 | City of Alexandria | 3.37 | 2007 | 7/3/2007 | 16:04 | Daylight | Day | Tue | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 152 | 60320935 | City of Alexandria | 3.40 | 2006 | 1/6/2006 | 15:20 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 153 | 92990472 | City of Alexandria | 3.40 | 2009 | 7/6/2009 | 18:00 | Daylight | Day | Mon | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 154 | 70100415 | City of Alexandria | 3.47 | 2006 | 12/19/2006 | 19:40 | Dark | Night | Tue | Property damage crash | 0 | 0 | 1. Yes | 1. Rear End |
| 155 | 110460832 | City of Alexandria | 3.47 | 2010 | 12/19/2010 | 17:08 | Dark | Night | Sun | Injury crash | 0 | 1 | 2. No | 2. Angle |
| 156 | 93530585 | City of Alexandria | 3.48 | 2009 | 9/27/2009 | 14:00 | Daylight | Day | Sun | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 157 | 101020726 | City of Alexandria | 3.48 | 2010 | 1/30/2010 | 16:40 | Daylight | Day | Sat | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 158 | 101130188 | City of Alexandria | 3.48 | 2010 | 2/12/2010 | 3:30 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 159 | 60932090 | City of Alexandria | 3.50 | 2006 | 3/17/2006 | 14:13 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 160 | 62850030 | City of Alexandria | 3.50 | 2006 | 9/22/2006 | 15:15 | Daylight | Day | Fri | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 161 | 63191186 | City of Alexandria | 3.50 | 2006 | 10/31/2006 | 15:00 | Daylight | Day | Tue | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 162 | 63312090 | City of Alexandria | 3.50 | 2006 | 11/10/2006 | 17:45 | Dark | Night | Fri | Injury crash | 0 | 1 | 2. No | 1. Rear End |
| 163 | 80675395 | City of Alexandria | 3.50 | 2008 | 1/15/2008 | 18:51 | Dark | Night | Tue | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 164 | 80565213 | City of Alexandria | 3.50 | 2008 | 1/30/2008 | 17:15 | Dark | Dusk | Wed | Property damage crash | 0 | 0 | 2. No | 2. Angle |
| 165 | 92720771 | City of Alexandria | 3.50 | 2009 | 5/31/2009 | 3:10 | Dark | Night | Sun | Property damage crash | 0 | 0 | 2. No | 10. Deer |
| 166 | 92870203 | City of Alexandria | 3.50 | 2009 | 6/17/2009 | 14:44 | Daylight | Day | Wed | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 167 | 92591483 | City of Alexandria | 3.52 | 2009 | 4/27/2009 | 15:50 | Daylight | Day | Mon | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 168 | 102160360 | City of Alexandria | 3.53 | 2010 | 7/7/2010 | 8:10 | Daylight | Day | Wed | Injury crash | 0 | 1 | 2. No | 9. Fixed Object - Off Road |
| 169 | 110110058 | City of Alexandria | 3.54 | 2010 | 11/7/2010 | 7:15 | Daylight | Day | Sun | Property damage crash | 0 | 0 | 2. No | 4. Sideswipe - Same Direction |
| 170 | 110060396 | City of Alexandria | 3.54 | 2010 | 11/4/2010 | 20:03 | Dark | Night | Thu | Property damage crash | 0 | 0 | 2. No | 1. Rear End |
| 171 | 71360881 | City of Alexandria | 3.54 | 2007 | 4/22/2007 | 4:05 | Dark | Night | Sun | Injury crash | 0 | 2 | 2. No | 9. Fixed Object - Off Road |
| 172 | 72130613 | City of Alexandria | 3.54 | 2007 | 7/12/2007 | 2:58 | Dark | Night | Thu | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 173 | 72200620 | City of Alexandria | 3.54 | 2007 | 7/21/2007 | 7:50 | Daylight | Day | Sat | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 174 | 72531117 | City of Alexandria | 3.54 | 2007 | 8/21/2007 | 2:23 | Dark | Night | Tue | Property damage crash | 0 | 0 | 2. No | 9. Fixed Object - Off Road |
| 175 | 102140350 | City of Alexandria | 3.54 | 2010 | 6/30/2010 | 17:25 | Daylight | Day | Wed | Property damage crash | 0 | 0 | 2. No | 1. Rear End |

* Probable lighting conditions for the crashes have been estimated based on the website www.sunrisesunset.com from the recorded crash time
Please Note: The pavement and weather conditions for the crashes were not available

TASK ORDER 92
CONGESTION RELIEF FEASIBILITY STUDY
I-395 SOUTHBOUND FROM LITTLE RIVER TURNPIKE/DUKE STREET TO EDSALL ROAD
Roadway Quantities - Configuration 1
7/17/2012

| DESCRIPTION | Unit | Qty. | * Unit Cost | Total Cost |
|--|------|--------|-----------------|-------------------------|
| <u>GRADING ITEMS</u> | | | | |
| Mobilization | LS | 1 | \$ 429,712.11 | \$ 429,712.11 |
| Construction Surveying | LS | 1 | \$ 79,942.42 | \$ 79,942.42 |
| Clearing & Grubbing | LS | 1 | \$ 20,000.00 | \$ 20,000.00 |
| Regular Excavation | CY | 5,725 | \$ 20.26 | \$ 115,988.50 |
| Borrow Excavation | CY | 859 | \$ 20.24 | \$ 17,386.16 |
| <u>DRAINAGE ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 142,102.12 | \$ 142,102.12 |
| <u>PAVEMENT ITEMS</u> | | | | |
| Aggr. Base Matl. Ty. I No. 21B | TON | 7,474 | \$ 25.76 | \$ 192,530.24 |
| Asphalt Concrete Ty. IM-19.0A | TON | 2,096 | \$ 71.25 | \$ 149,340.00 |
| Asphalt Concrete Ty. BM-25.0A | TON | 10,390 | \$ 64.05 | \$ 665,479.50 |
| Asphalt Concrete Ty. SM-12.5E (76-22) | TON | 6,424 | \$ 83.26 | \$ 534,862.24 |
| Flexible Pave. Planning 0"-2" | SY | 27,218 | \$ 1.49 | \$ 40,554.82 |
| Sawcut (Full Depth) | LF | 5,854 | \$ 6.99 | \$ 40,919.46 |
| <u>INCIDENTAL ITEMS</u> | | | | |
| Guardrail GR-2 | LF | 5,925 | \$ 15.54 | \$ 92,074.50 |
| Fixed Object Attach. GR-FOA-2 TY. I | EA | 1 | \$ 2,100.44 | \$ 2,100.44 |
| Fixed Object Attach. GR-FOA-2 TY. II | EA | 1 | \$ 816.32 | \$ 816.32 |
| Median Barrier MB-7F | LF | 202 | \$ 66.54 | \$ 13,441.08 |
| Conc. Class A3 Retaining Wall | CY | 1,714 | \$ 558.08 | \$ 956,549.12 |
| <u>PROTECTIVE ITEMS</u> | | | | |
| Demo. Of Pavement (Flexible) | SY | 1,327 | \$ 4.89 | \$ 6,489.03 |
| Remove Existing Guardrail | LF | 5,989 | \$ 3.25 | \$ 19,464.25 |
| <u>EROSION CONTROL ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 142,102.12 | \$ 142,102.12 |
| <u>TRAFFIC ITEMS</u> | | | | |
| Lump Sum-Traffic Signal | LS | 2 | \$ 200,000.00 | \$ 400,000.00 |
| Lump Sum-Lighting | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-Pavement Markings | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing (4 OH signs @ \$250k/ea) | LS | 1 | \$ 1,000,000.00 | \$ 1,000,000.00 |
| Lump Sum-MOT (100% of Grading, Pavement, Incidental) | LS | 1 | \$ 2,842,042.38 | \$ 2,842,042.38 |
| TOTAL | | | | \$ 8,503,896.81 |
| GENERAL CONTINGENCY (25%) | | | | \$ 2,125,974.20 |
| CEI (19%) | | | | \$ 1,615,740.39 |
| Survey and Design (15%) | | | | \$ 1,275,584.52 |
| TOTAL CONSTRUCTION COST | | | | \$ 13,600,000.00 |

* Unit Cost Reference: <http://www.virginiadot.org/business/resources/const/DistrictAverages.pdf>

TASK ORDER 92
CONGESTION RELIEF FEASIBILITY STUDY
I-395 SOUTHBOUND FROM LITTLE RIVER TURNPIKE/DUKE STREET TO EDSALL ROAD
Roadway Quantities - Configuration 2
7/17/2012

| DESCRIPTION | Unit | Qty. | * Unit Cost | Total Cost |
|--|------|--------|-----------------|-------------------------|
| <u>GRADING ITEMS</u> | | | | |
| Mobilization | LS | 1 | \$ 354,184.47 | \$ 354,184.47 |
| Construction Surveying | LS | 1 | \$ 64,836.89 | \$ 64,836.89 |
| Clearing & Grubbing | LS | 1 | \$ 30,000.00 | \$ 30,000.00 |
| Regular Excavation | CY | 3,871 | \$ 20.26 | \$ 78,426.46 |
| Borrow Excavation | CY | 581 | \$ 20.24 | \$ 11,759.44 |
| <u>DRAINAGE ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 116,343.92 | \$ 116,343.92 |
| <u>PAVEMENT ITEMS</u> | | | | |
| Aggr. Base Matl. Ty. I No. 21B | TON | 5,052 | \$ 25.76 | \$ 130,139.52 |
| Asphalt Concrete Ty. IM-19.0A | TON | 1,411 | \$ 71.25 | \$ 100,533.75 |
| Asphalt Concrete Ty. BM-25.0A | TON | 6,996 | \$ 64.05 | \$ 448,093.80 |
| Asphalt Concrete Ty. SM-12.5E (76-22) | TON | 4,569 | \$ 83.26 | \$ 380,414.94 |
| Flexible Pave. Planning 0"-2" | SY | 27,148 | \$ 1.49 | \$ 40,450.52 |
| Sawcut (Full Depth) | LF | 5,849 | \$ 6.99 | \$ 40,884.51 |
| <u>INCIDENTAL ITEMS</u> | | | | |
| Guardrail GR-2 | LF | 5,748 | \$ 15.54 | \$ 89,323.92 |
| Fixed Object Attach. GR-FOA-2 TY. I | EA | 3 | \$ 2,100.44 | \$ 6,301.32 |
| Fixed Object Attach. GR-FOA-2 TY. II | EA | 3 | \$ 816.32 | \$ 2,448.96 |
| Median Barrier MB-7F | LF | 182 | \$ 66.54 | \$ 12,110.28 |
| Conc. Class A3 Retaining Wall | CY | 1,713 | \$ 558.08 | \$ 955,991.04 |
| <u>PROTECTIVE ITEMS</u> | | | | |
| Demo. Of Pavement (Flexible) | SY | 7,953 | \$ 4.89 | \$ 38,890.17 |
| Remove Existing Guardrail | LF | 5,989 | \$ 3.25 | \$ 19,464.25 |
| <u>EROSION CONTROL ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 116,343.92 | \$ 116,343.92 |
| <u>TRAFFIC ITEMS</u> | | | | |
| Lump Sum-Traffic Signal | LS | 2 | \$ 200,000.00 | \$ 400,000.00 |
| Lump Sum-Lighting | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-Pavement Markings | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing (2 OH signs @ \$250k/ea) | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-MOT (100% of Grading, Pavement, Incidental) | LS | 1 | \$ 2,326,878.46 | \$ 2,326,878.46 |
| TOTAL | | | | \$ 6,863,820.55 |
| GENERAL CONTINGENCY (25%) | | | | \$ 1,715,955.14 |
| CEI (19%) | | | | \$ 1,304,125.90 |
| Survey and Design (15%) | | | | \$ 1,029,573.08 |
| TOTAL CONSTRUCTION COST | | | | \$ 11,000,000.00 |

* Unit Cost Reference: <http://www.virginiadot.org/business/resources/const/DistrictAverages.pdf>

TASK ORDER 92
CONGESTION RELIEF FEASIBILITY STUDY
I-395 SOUTHBOUND FROM LITTLE RIVER TURNPIKE/DUKE STREET TO EDSALL ROAD
Roadway Quantities - Configuration 3a
7/17/2012

| DESCRIPTION | Unit | Qty. | * Unit Cost | Total Cost |
|--|------|--------|-----------------|-------------------------|
| <u>GRADING ITEMS</u> | | | | |
| Mobilization | LS | 1 | \$ 460,667.34 | \$ 460,667.34 |
| Construction Surveying | LS | 1 | \$ 86,133.47 | \$ 86,133.47 |
| Clearing & Grubbing | LS | 1 | \$ 10,000.00 | \$ 10,000.00 |
| Regular Excavation | CY | 12,399 | \$ 20.26 | \$ 251,203.74 |
| Borrow Excavation | CY | 1,860 | \$ 20.24 | \$ 37,646.40 |
| <u>DRAINAGE ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 163,835.62 | \$ 163,835.62 |
| <u>PAVEMENT ITEMS</u> | | | | |
| Aggr. Base Matl. Ty. I No. 21B | TON | 12,323 | \$ 25.76 | \$ 317,440.48 |
| Asphalt Concrete Ty. IM-19.0A | TON | 2,520 | \$ 71.25 | \$ 179,550.00 |
| Asphalt Concrete Ty. BM-25.0A | TON | 17,139 | \$ 64.05 | \$ 1,097,752.95 |
| Asphalt Concrete Ty. SM-12.5E (76-22) | TON | 5,607 | \$ 83.26 | \$ 466,838.82 |
| Flexible Pave. Planning 0"-2" | SY | 18,943 | \$ 1.49 | \$ 28,225.07 |
| Sawcut (Full Depth) | LF | 4,752 | \$ 6.99 | \$ 33,216.48 |
| <u>INCIDENTAL ITEMS</u> | | | | |
| STD. CURB CG-3 | LF | 50 | \$ 17.01 | \$ 850.50 |
| Guardrail GR-2 | LF | 8,400 | \$ 15.54 | \$ 130,536.00 |
| GUARDRAIL TERMINAL GR-11 | EA | 4 | \$ 673.68 | \$ 2,694.72 |
| ALT.BREAKAWAY CABLE TERM.(GR-9) | EA | 3 | \$ 2,261.26 | \$ 6,783.78 |
| Fixed Object Attach. GR-FOA-2 TY. I | EA | 7 | \$ 2,100.44 | \$ 14,703.08 |
| Fixed Object Attach. GR-FOA-2 TY. II | EA | 3 | \$ 816.32 | \$ 2,448.96 |
| Median Barrier MB-7F | LF | 1,312 | \$ 66.54 | \$ 87,300.48 |
| Conc. Class A3 Retaining Wall | CY | 1,049 | \$ 558.08 | \$ 585,425.92 |
| IMPACT ATTEN.SER.TY.1A(TL-2,45 MPH MAX) | EA | 2 | \$ 5,957.50 | \$ 11,915.00 |
| IMPACT ATTEN.(TL-3,>45MPH DES.SP.) | EA | 1 | \$ 12,180.00 | \$ 12,180.00 |
| <u>PROTECTIVE ITEMS</u> | | | | |
| Demo. Of Pavement (Flexible) | SY | 19,371 | \$ 4.89 | \$ 94,724.19 |
| Remove Existing Guardrail | LF | 6,585 | \$ 3.25 | \$ 21,401.25 |
| <u>EROSION CONTROL ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 163,835.62 | \$ 163,835.62 |
| <u>TRAFFIC ITEMS</u> | | | | |
| Lump Sum-Traffic Signal | LS | 2 | \$ 200,000.00 | \$ 400,000.00 |
| Lump Sum-Lighting | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-Pavement Markings | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing (2 OH sign @ \$250k/ea) | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-MOT (100% of Grading, Pavement, Incidental) | LS | 1 | \$ 3,276,712.38 | \$ 3,276,712.38 |
| <u>BRIDGE ITEMS</u> | | | | |
| Integral Straddle Bent for I-395 Ramp over Duke Street | LS | 1 | \$ 1,600,000.00 | \$ 1,600,000.00 |
| Duke Street Abutment over I-395 | LS | 1 | \$ 1,600,000.00 | \$ 1,600,000.00 |
| TOTAL | | | | \$ 12,244,022.25 |
| GENERAL CONTINGENCY (25%) | | | | \$ 3,061,005.56 |
| CEI (19%) | | | | \$ 2,326,364.23 |
| Survey and Design (15%) | | | | \$ 1,836,603.34 |
| TOTAL CONSTRUCTION COST | | | | \$ 19,500,000.00 |

* Unit Cost Reference: <http://www.virginia.gov/business/resources/const/DistrictAverages.pdf>

TASK ORDER 92
CONGESTION RELIEF FEASIBILITY STUDY
I-395 SOUTHBOUND FROM LITTLE RIVER TURNPIKE/DUKE STREET TO EDSALL ROAD
Roadway Quantities - Configuration 3b
7/17/2012

| DESCRIPTION | Unit | Qty. | * Unit Cost | Total Cost |
|--|------|--------|-----------------|-------------------------|
| <u>GRADING ITEMS</u> | | | | |
| Mobilization | LS | 1 | \$ 469,651.02 | \$ 469,651.02 |
| Construction Surveying | LS | 1 | \$ 87,930.20 | \$ 87,930.20 |
| Clearing & Grubbing | LS | 1 | \$ 10,000.00 | \$ 10,000.00 |
| Regular Excavation | CY | 12,652 | \$ 20.26 | \$ 256,329.52 |
| Borrow Excavation | CY | 1,898 | \$ 20.24 | \$ 38,415.52 |
| <u>DRAINAGE ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 168,113.56 | \$ 168,113.56 |
| <u>PAVEMENT ITEMS</u> | | | | |
| Aggr. Base Matl. Ty. I No. 21B | TON | 12,420 | \$ 25.76 | \$ 319,939.20 |
| Asphalt Concrete Ty. IM-19.0A | TON | 3,484 | \$ 71.25 | \$ 248,235.00 |
| Asphalt Concrete Ty. BM-25.0A | TON | 17,274 | \$ 64.05 | \$ 1,106,399.70 |
| Asphalt Concrete Ty. SM-12.5E (76-22) | TON | 5,605 | \$ 83.26 | \$ 466,672.30 |
| Flexible Pave. Planning 0"-2" | SY | 18,943 | \$ 1.49 | \$ 28,225.07 |
| Sawcut (Full Depth) | LF | 4,752 | \$ 6.99 | \$ 33,216.48 |
| <u>INCIDENTAL ITEMS</u> | | | | |
| STD. CURB CG-3 | LF | 50 | \$ 17.01 | \$ 850.50 |
| Guardrail GR-2 | LF | 8,400 | \$ 15.54 | \$ 130,536.00 |
| GUARDRAIL TERMINAL GR-11 | EA | 4 | \$ 673.68 | \$ 2,694.72 |
| ALT.BREAKAWAY CABLE TERM.(GR-9) | EA | 3 | \$ 2,261.26 | \$ 6,783.78 |
| Fixed Object Attach. GR-FOA-2 TY. I | EA | 7 | \$ 2,100.44 | \$ 14,703.08 |
| Fixed Object Attach. GR-FOA-2 TY. II | EA | 3 | \$ 816.32 | \$ 2,448.96 |
| Median Barrier MB-7F | LF | 1,312 | \$ 66.54 | \$ 87,300.48 |
| Conc. Class A3 Retaining Wall | CY | 1,049 | \$ 558.08 | \$ 585,425.92 |
| IMPACT ATTEN.SER.TY.1A(TL-2,45 MPH MAX) | EA | 2 | \$ 5,957.50 | \$ 11,915.00 |
| IMPACT ATTEN.(TL-3,>45MPH DES.SP.) | EA | 1 | \$ 12,180.00 | \$ 12,180.00 |
| <u>PROTECTIVE ITEMS</u> | | | | |
| Demo. Of Pavement (Flexible) | SY | 19,371 | \$ 4.89 | \$ 94,724.19 |
| Remove Existing Guardrail | LF | 6,585 | \$ 3.25 | \$ 21,401.25 |
| <u>EROSION CONTROL ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 168,113.56 | \$ 168,113.56 |
| <u>TRAFFIC ITEMS</u> | | | | |
| Lump Sum-Traffic Signal | LS | 2 | \$ 200,000.00 | \$ 400,000.00 |
| Lump Sum-Lighting | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-Pavement Markings | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing (2 OH sign @ \$250k/ea) | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-MOT (100% of Grading, Pavement, Incidental) | LS | 1 | \$ 3,362,271.23 | \$ 3,362,271.23 |
| <u>BRIDGE ITEMS</u> | | | | |
| Integral Straddle Bent for I-395 Ramp over Duke Street | LS | 1 | \$ 1,600,000.00 | \$ 1,600,000.00 |
| Duke Street Abutment over I-395 | LS | 1 | \$ 1,600,000.00 | \$ 1,600,000.00 |
| TOTAL | | | | \$ 12,434,476.25 |
| GENERAL CONTINGENCY (25%) | | | | \$ 3,108,619.06 |
| CEI (19%) | | | | \$ 2,362,550.49 |
| Survey and Design (15%) | | | | \$ 1,865,171.44 |
| TOTAL CONSTRUCTION COST | | | | \$ 19,800,000.00 |

* Unit Cost Reference: <http://www.virginia.gov/business/resources/const/DistrictAverages.pdf>

TASK ORDER 92
CONGESTION RELIEF FEASIBILITY STUDY
I-395 SOUTHBOUND FROM LITTLE RIVER TURNPIKE/DUKE STREET TO EDSALL ROAD
Roadway Quantities - Configuration 3b - 3 Lane Alternative
7/17/2012

| DESCRIPTION | Unit | Qty. | * Unit Cost | Total Cost |
|--|------|--------|-----------------|-------------------------|
| <u>GRADING ITEMS</u> | | | | |
| Mobilization | LS | 1 | \$ 375,227.38 | \$ 375,227.38 |
| Construction Surveying | LS | 1 | \$ 69,045.48 | \$ 69,045.48 |
| Clearing & Grubbing | LS | 1 | \$ 10,000.00 | \$ 10,000.00 |
| Regular Excavation | CY | 6,963 | \$ 20.26 | \$ 141,070.38 |
| Borrow Excavation | CY | 1,045 | \$ 20.24 | \$ 21,150.80 |
| <u>DRAINAGE ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 129,772.86 | \$ 129,772.86 |
| <u>PAVEMENT ITEMS</u> | | | | |
| Aggr. Base Matl. Ty. I No. 21B | TON | 9,913 | \$ 25.76 | \$ 255,358.88 |
| Asphalt Concrete Ty. IM-19.0A | TON | 2,780 | \$ 71.25 | \$ 198,075.00 |
| Asphalt Concrete Ty. BM-25.0A | TON | 13,786 | \$ 64.05 | \$ 882,993.30 |
| Asphalt Concrete Ty. SM-12.5E (76-22) | TON | 4,925 | \$ 83.26 | \$ 410,055.50 |
| Flexible Pave. Planning 0"-2" | SY | 18,943 | \$ 1.49 | \$ 28,225.07 |
| Sawcut (Full Depth) | LF | 4,752 | \$ 6.99 | \$ 33,216.48 |
| <u>INCIDENTAL ITEMS</u> | | | | |
| STD. CURB CG-3 | LF | 50 | \$ 17.01 | \$ 850.50 |
| Guardrail GR-2 | LF | 7,234 | \$ 15.54 | \$ 112,416.36 |
| GUARDRAIL TERMINAL GR-11 | EA | 3 | \$ 673.68 | \$ 2,021.04 |
| ALT.BREAKAWAY CABLE TERM.(GR-9) | EA | 1 | \$ 2,261.26 | \$ 2,261.26 |
| Fixed Object Attach. GR-FOA-2 TY. I | EA | 5 | \$ 2,100.44 | \$ 10,502.20 |
| Fixed Object Attach. GR-FOA-2 TY. II | EA | 3 | \$ 816.32 | \$ 2,448.96 |
| Median Barrier MB-7F | LF | 340 | \$ 66.54 | \$ 22,623.60 |
| Conc. Class A3 Retaining Wall | CY | 785 | \$ 558.08 | \$ 438,092.80 |
| IMPACT ATTEN.SER.TY.1A(TL-2,45 MPH MAX) | EA | 2 | \$ 5,957.50 | \$ 11,915.00 |
| IMPACT ATTEN.(TL-3,>45MPH DES.SP.) | EA | 1 | \$ 12,180.00 | \$ 12,180.00 |
| <u>PROTECTIVE ITEMS</u> | | | | |
| Demo. Of Pavement (Flexible) | SY | 17,352 | \$ 4.89 | \$ 84,851.28 |
| Remove Existing Guardrail | LF | 5,290 | \$ 3.25 | \$ 17,192.50 |
| <u>EROSION CONTROL ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 129,772.86 | \$ 129,772.86 |
| <u>TRAFFIC ITEMS</u> | | | | |
| Lump Sum-Traffic Signal | LS | 2 | \$ 200,000.00 | \$ 400,000.00 |
| Lump Sum-Lighting | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-Pavement Markings | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing (1 OH sign @ \$250k/ea) | LS | 1 | \$ 250,000.00 | \$ 250,000.00 |
| Lump Sum-MOT (100% of Grading, Pavement, Incidental) | LS | 1 | \$ 2,595,457.13 | \$ 2,595,457.13 |
| <u>BRIDGE ITEMS</u> | | | | |
| Integral Straddle Bent for I-395 Ramp over Duke Street | LS | 1 | \$ 1,600,000.00 | \$ 1,600,000.00 |
| Duke Street Abutment over I-395 | LS | 1 | \$ | \$ - |
| TOTAL | | | | \$ 8,846,776.60 |
| GENERAL CONTINGENCY (25%) | | | | \$ 2,211,694.15 |
| CEI (19%) | | | | \$ 1,680,887.55 |
| Survey and Design (15%) | | | | \$ 1,327,016.49 |
| TOTAL CONSTRUCTION COST | | | | \$ 14,100,000.00 |

* Unit Cost Reference: <http://www.virginia.gov/business/resources/const/DistrictAverages.pdf>

TASK ORDER 92
CONGESTION RELIEF FEASIBILITY STUDY
I-395 SOUTHBOUND FROM LITTLE RIVER TURNPIKE/DUKE STREET TO EDSALL ROAD
Roadway Quantities - Configuration 4a
7/17/2012

| DESCRIPTION | Unit | Qty. | * Unit Cost | Total Cost |
|--|------|--------|-----------------|-------------------------|
| <u>GRADING ITEMS</u> | | | | |
| Mobilization | LS | 1 | \$ 474,336.75 | \$ 474,336.75 |
| Construction Surveying | LS | 1 | \$ 88,867.35 | \$ 88,867.35 |
| Clearing & Grubbing | LS | 1 | \$ 20,000.00 | \$ 20,000.00 |
| Regular Excavation | CY | 8,724 | \$ 20.26 | \$ 176,748.24 |
| Borrow Excavation | CY | 1,308 | \$ 20.24 | \$ 26,473.92 |
| <u>DRAINAGE ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 172,836.84 | \$ 172,836.84 |
| <u>PAVEMENT ITEMS</u> | | | | |
| Aggr. Base Matl. Ty. I No. 21B | TON | 12,058 | \$ 25.76 | \$ 310,614.08 |
| Asphalt Concrete Ty. IM-19.0A | TON | 3,192 | \$ 71.25 | \$ 227,430.00 |
| Asphalt Concrete Ty. BM-25.0A | TON | 15,828 | \$ 64.05 | \$ 1,013,783.40 |
| Asphalt Concrete Ty. SM-12.5E (76-22) | TON | 5,324 | \$ 83.26 | \$ 443,276.24 |
| Flexible Pave. Planning 0"-2" | SY | 18,943 | \$ 1.49 | \$ 28,225.07 |
| Sawcut (Full Depth) | LF | 4,752 | \$ 6.99 | \$ 33,216.48 |
| <u>INCIDENTAL ITEMS</u> | | | | |
| STD. CURB CG-3 | LF | 1,027 | \$ 17.01 | \$ 17,469.27 |
| Guardrail GR-2 | LF | 8,775 | \$ 15.54 | \$ 136,363.50 |
| ALT.BREAKAWAY CABLE TERM.(GR-9) | EA | 2 | \$ 2,261.26 | \$ 4,522.52 |
| Fixed Object Attach. GR-FOA-2 TY. I | EA | 8 | \$ 2,100.44 | \$ 16,803.52 |
| Fixed Object Attach. GR-FOA-2 TY. II | EA | 4 | \$ 816.32 | \$ 3,265.28 |
| Median Barrier MB-7F | LF | 940 | \$ 66.54 | \$ 62,547.60 |
| Conc. Class A3 Retaining Wall | CY | 1,634 | \$ 558.08 | \$ 911,902.72 |
| IMPACT ATTEN.SER.TY.1A(TL-2,45 MPH MAX) | EA | 2 | \$ 5,957.50 | \$ 11,915.00 |
| IMPACT ATTEN.(TL-3,>45MPH DES.SP.) | EA | 1 | \$ 12,180.00 | \$ 12,180.00 |
| <u>PROTECTIVE ITEMS</u> | | | | |
| Demo. Of Pavement (Flexible) | SY | 20,748 | \$ 4.89 | \$ 101,457.72 |
| Remove Existing Guardrail | LF | 8,040 | \$ 3.25 | \$ 26,130.00 |
| <u>EROSION CONTROL ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 172,836.84 | \$ 172,836.84 |
| <u>TRAFFIC ITEMS</u> | | | | |
| Lump Sum-Traffic Signal | LS | 2 | \$ 200,000.00 | \$ 400,000.00 |
| Lump Sum-Lighting | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-Pavement Markings | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing (2 OH sign @ \$250k/ea) | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-MOT (100% of Grading, Pavement, Incidental) | LS | 1 | \$ 3,456,736.84 | \$ 3,456,736.84 |
| <u>BRIDGE ITEMS</u> | | | | |
| Integral Straddle Bent for I-395 Ramp over Duke Street | LS | 1 | \$ 1,600,000.00 | \$ 1,600,000.00 |
| TOTAL | | | | \$ 11,049,939.19 |
| GENERAL CONTINGENCY (25%) | | | | \$ 2,762,484.80 |
| CEI (19%) | | | | \$ 2,099,488.45 |
| Survey and Design (15%) | | | | \$ 1,657,490.88 |
| TOTAL CONSTRUCTION COST | | | | \$ 17,600,000.00 |

* Unit Cost Reference: <http://www.virginiadot.org/business/resources/const/DistrictAverages.pdf>

TASK ORDER 92
CONGESTION RELIEF FEASIBILITY STUDY
I-395 SOUTHBOUND FROM LITTLE RIVER TURNPIKE/DUKE STREET TO EDSALL ROAD
Roadway Quantities - Configuration 4b
7/17/2012

| DESCRIPTION | Unit | Qty. | * Unit Cost | Total Cost |
|--|------|--------|-----------------|-------------------------|
| <u>GRADING ITEMS</u> | | | | |
| Mobilization | LS | 1 | \$ 480,719.99 | \$ 480,719.99 |
| Construction Surveying | LS | 1 | \$ 90,144.00 | \$ 90,144.00 |
| Clearing & Grubbing | LS | 1 | \$ 20,000.00 | \$ 20,000.00 |
| Regular Excavation | CY | 9,035 | \$ 20.26 | \$ 183,049.10 |
| Borrow Excavation | CY | 1,355 | \$ 20.24 | \$ 27,425.20 |
| <u>DRAINAGE ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 175,876.48 | \$ 175,876.48 |
| <u>PAVEMENT ITEMS</u> | | | | |
| Aggr. Base Matl. Ty. I No. 21B | TON | 12,058 | \$ 25.76 | \$ 310,614.08 |
| Asphalt Concrete Ty. IM-19.0A | TON | 3,307 | \$ 71.25 | \$ 235,623.75 |
| Asphalt Concrete Ty. BM-25.0A | TON | 16,393 | \$ 64.05 | \$ 1,049,971.65 |
| Asphalt Concrete Ty. SM-12.5E (76-22) | TON | 5,434 | \$ 83.26 | \$ 452,434.84 |
| Flexible Pave. Planning 0"-2" | SY | 18,943 | \$ 1.49 | \$ 28,225.07 |
| Sawcut (Full Depth) | LF | 4,752 | \$ 6.99 | \$ 33,216.48 |
| <u>INCIDENTAL ITEMS</u> | | | | |
| STD. CURB CG-3 | LF | 1,027 | \$ 17.01 | \$ 17,469.27 |
| Guardrail GR-2 | LF | 8,775 | \$ 15.54 | \$ 136,363.50 |
| ALT.BREAKAWAY CABLE TERM.(GR-9) | EA | 2 | \$ 2,261.26 | \$ 4,522.52 |
| Fixed Object Attach. GR-FOA-2 TY. I | EA | 8 | \$ 2,100.44 | \$ 16,803.52 |
| Fixed Object Attach. GR-FOA-2 TY. II | EA | 4 | \$ 816.32 | \$ 3,265.28 |
| Median Barrier MB-7F | LF | 940 | \$ 66.54 | \$ 62,547.60 |
| Conc. Class A3 Retaining Wall | CY | 1,634 | \$ 558.08 | \$ 911,902.72 |
| IMPACT ATTEN.SER.TY.1A(TL-2,45 MPH MAX) | EA | 2 | \$ 5,957.50 | \$ 11,915.00 |
| IMPACT ATTEN.(TL-3,>45MPH DES.SP.) | EA | 1 | \$ 12,180.00 | \$ 12,180.00 |
| <u>PROTECTIVE ITEMS</u> | | | | |
| Demo. Of Pavement (Flexible) | SY | 20,748 | \$ 4.89 | \$ 101,457.72 |
| Remove Existing Guardrail | LF | 8,040 | \$ 3.25 | \$ 26,130.00 |
| <u>EROSION CONTROL ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 175,876.48 | \$ 175,876.48 |
| <u>TRAFFIC ITEMS</u> | | | | |
| Lump Sum-Traffic Signal | LS | 2 | \$ 200,000.00 | \$ 400,000.00 |
| Lump Sum-Lighting | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-Pavement Markings | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing (2 OH sign @ \$250k/ea) | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-MOT (100% of Grading, Pavement, Incidental) | LS | 1 | \$ 3,517,529.58 | \$ 3,517,529.58 |
| <u>BRIDGE ITEMS</u> | | | | |
| Integral Straddle Bent for I-395 Ramp over Duke Street | LS | 1 | \$ 1,600,000.00 | \$ 1,600,000.00 |
| TOTAL | | | | \$ 11,185,263.83 |
| GENERAL CONTINGENCY (25%) | | | | \$ 2,796,315.96 |
| CEI (19%) | | | | \$ 2,125,200.13 |
| Survey and Design (15%) | | | | \$ 1,677,789.57 |
| TOTAL CONSTRUCTION COST | | | | \$ 17,800,000.00 |

* Unit Cost Reference: <http://www.virginiadot.org/business/resources/const/DistrictAverages.pdf>

TASK ORDER 92
CONGESTION RELIEF FEASIBILITY STUDY
I-395 SOUTHBOUND FROM LITTLE RIVER TURNPIKE/DUKE STREET TO EDSALL ROAD
Roadway Quantities - Configuration 4c
7/17/2012

| DESCRIPTION | Unit | Qty. | * Unit Cost | Total Cost |
|--|------|--------|-----------------|-------------------------|
| <u>GRADING ITEMS</u> | | | | |
| Mobilization | LS | 1 | \$ 484,956.67 | \$ 484,956.67 |
| Construction Surveying | LS | 1 | \$ 90,991.33 | \$ 90,991.33 |
| Clearing & Grubbing | LS | 1 | \$ 20,000.00 | \$ 20,000.00 |
| Regular Excavation | CY | 9,240 | \$ 20.26 | \$ 187,202.40 |
| Borrow Excavation | CY | 1,386 | \$ 20.24 | \$ 28,052.64 |
| <u>DRAINAGE ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 177,893.95 | \$ 177,893.95 |
| <u>PAVEMENT ITEMS</u> | | | | |
| Aggr. Base Matl. Ty. I No. 21B | TON | 12,058 | \$ 25.76 | \$ 310,614.08 |
| Asphalt Concrete Ty. IM-19.0A | TON | 3,382 | \$ 71.25 | \$ 240,967.50 |
| Asphalt Concrete Ty. BM-25.0A | TON | 16,770 | \$ 64.05 | \$ 1,074,118.50 |
| Asphalt Concrete Ty. SM-12.5E (76-22) | TON | 5,507 | \$ 83.26 | \$ 458,512.82 |
| Flexible Pave. Planning 0"-2" | SY | 18,943 | \$ 1.49 | \$ 28,225.07 |
| Sawcut (Full Depth) | LF | 4,752 | \$ 6.99 | \$ 33,216.48 |
| <u>INCIDENTAL ITEMS</u> | | | | |
| STD. CURB CG-3 | LF | 1,027 | \$ 17.01 | \$ 17,469.27 |
| Guardrail GR-2 | LF | 8,775 | \$ 15.54 | \$ 136,363.50 |
| ALT.BREAKAWAY CABLE TERM.(GR-9) | EA | 2 | \$ 2,261.26 | \$ 4,522.52 |
| Fixed Object Attach. GR-FOA-2 TY. I | EA | 8 | \$ 2,100.44 | \$ 16,803.52 |
| Fixed Object Attach. GR-FOA-2 TY. II | EA | 4 | \$ 816.32 | \$ 3,265.28 |
| Median Barrier MB-7F | LF | 940 | \$ 66.54 | \$ 62,547.60 |
| Conc. Class A3 Retaining Wall | CY | 1,634 | \$ 558.08 | \$ 911,902.72 |
| IMPACT ATTEN.SER.TY.1A(TL-2,45 MPH MAX) | EA | 2 | \$ 5,957.50 | \$ 11,915.00 |
| IMPACT ATTEN.(TL-3,>45MPH DES.SP.) | EA | 1 | \$ 12,180.00 | \$ 12,180.00 |
| <u>PROTECTIVE ITEMS</u> | | | | |
| Demo. Of Pavement (Flexible) | SY | 20,748 | \$ 4.89 | \$ 101,457.72 |
| Remove Existing Guardrail | LF | 8,040 | \$ 3.25 | \$ 26,130.00 |
| <u>EROSION CONTROL ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 177,893.95 | \$ 177,893.95 |
| <u>TRAFFIC ITEMS</u> | | | | |
| Lump Sum-Traffic Signal | LS | 2 | \$ 200,000.00 | \$ 400,000.00 |
| Lump Sum-Lighting | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-Pavement Markings | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing (2 OH sign @ \$250k/ea) | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-MOT (100% of Grading, Pavement, Incidental) | LS | 1 | \$ 3,557,878.90 | \$ 3,557,878.90 |
| <u>BRIDGE ITEMS</u> | | | | |
| Integral Straddle Bent for I-395 Ramp over Duke Street | LS | 1 | \$ 1,600,000.00 | \$ 1,600,000.00 |
| TOTAL | | | | \$ 11,275,081.41 |
| GENERAL CONTINGENCY (25%) | | | | \$ 2,818,770.35 |
| CEI (19%) | | | | \$ 2,142,265.47 |
| Survey and Design (15%) | | | | \$ 1,691,262.21 |
| TOTAL CONSTRUCTION COST | | | | \$ 18,000,000.00 |

* Unit Cost Reference: <http://www.virginiadot.org/business/resources/const/DistrictAverages.pdf>

TASK ORDER 92
CONGESTION RELIEF FEASIBILITY STUDY
I-395 SOUTHBOUND FROM LITTLE RIVER TURNPIKE/DUKE STREET TO EDSALL ROAD
Roadway Quantities - Configuration 5a
7/17/2012

| DESCRIPTION | Unit | Qty. | * Unit Cost | Total Cost |
|--|------|--------|-----------------|-------------------------|
| <u>GRADING ITEMS</u> | | | | |
| Mobilization | LS | 1 | \$ 363,245.91 | \$ 363,245.91 |
| Construction Surveying | LS | 1 | \$ 66,649.18 | \$ 66,649.18 |
| Clearing & Grubbing | LS | 1 | \$ 10,000.00 | \$ 10,000.00 |
| Regular Excavation | CY | 5,993 | \$ 20.26 | \$ 121,418.18 |
| Borrow Excavation | CY | 899 | \$ 20.24 | \$ 18,195.76 |
| <u>DRAINAGE ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 112,792.29 | \$ 112,792.29 |
| <u>PAVEMENT ITEMS</u> | | | | |
| Aggr. Base Matl. Ty. I No. 21B | TON | 7,821 | \$ 25.76 | \$ 201,468.96 |
| Asphalt Concrete Ty. IM-19.0A | TON | 2,194 | \$ 71.25 | \$ 156,322.50 |
| Asphalt Concrete Ty. BM-25.0A | TON | 10,876 | \$ 64.05 | \$ 696,607.80 |
| Asphalt Concrete Ty. SM-12.5E (76-22) | TON | 3,542 | \$ 83.26 | \$ 294,906.92 |
| Flexible Pave. Planning 0"-2" | SY | 12,030 | \$ 1.49 | \$ 17,924.70 |
| Sawcut (Full Depth) | LF | 2,877 | \$ 6.99 | \$ 20,110.23 |
| <u>INCIDENTAL ITEMS</u> | | | | |
| STD. CURB CG-3 | LF | 1,199 | \$ 17.01 | \$ 20,394.99 |
| Guardrail GR-2 | LF | 5,193 | \$ 15.54 | \$ 80,699.22 |
| GUARDRAIL TERMINAL GR-11 | EA | 2 | \$ 673.68 | \$ 1,347.36 |
| ALT.BREAKAWAY CABLE TERM.(GR-9) | EA | 1 | \$ 2,261.26 | \$ 2,261.26 |
| Fixed Object Attach. GR-FOA-2 TY. I | EA | 7 | \$ 2,100.44 | \$ 14,703.08 |
| Fixed Object Attach. GR-FOA-2 TY. II | EA | 6 | \$ 816.32 | \$ 4,897.92 |
| Median Barrier MB-7F | LF | 1,548 | \$ 66.54 | \$ 103,003.92 |
| Conc. Class A3 Retaining Wall | CY | 837 | \$ 558.08 | \$ 467,112.96 |
| IMPACT ATTEN.SER.TY.1A(TL-2,45 MPH MAX) | EA | 2 | \$ 5,957.50 | \$ 11,915.00 |
| IMPACT ATTEN.(TL-3,>45MPH DES.SP.) | EA | 1 | \$ 12,180.00 | \$ 12,180.00 |
| FENCE FE-W1 | LF | 75 | \$ 5.00 | \$ 375.00 |
| <u>PROTECTIVE ITEMS</u> | | | | |
| Demo. Of Pavement (Flexible) | SY | 15,068 | \$ 4.89 | \$ 73,682.52 |
| Remove Existing Guardrail | LF | 4,658 | \$ 3.25 | \$ 15,138.50 |
| <u>EROSION CONTROL ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 112,792.29 | \$ 112,792.29 |
| <u>TRAFFIC ITEMS</u> | | | | |
| Lump Sum-Traffic Signal | LS | 2 | \$ 200,000.00 | \$ 400,000.00 |
| Lump Sum-Lighting | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-Pavement Markings | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing (3 OH sign @ \$250k/ea) | LS | 1 | \$ 750,000.00 | \$ 750,000.00 |
| Lump Sum-MOT (100% of Grading, Pavement, Incidental) | LS | 1 | \$ 2,255,845.76 | \$ 2,255,845.76 |
| <u>BRIDGE ITEMS</u> | | | | |
| Edsall Road Abutment over I-395 | LS | 1 | \$ 2,200,000.00 | \$ 2,200,000.00 |
| I-395 Ramp Abutment over I-395 | LS | 1 | \$ 700,000.00 | \$ 700,000.00 |
| TOTAL | | | | \$ 9,905,992.20 |
| GENERAL CONTINGENCY (25%) | | | | \$ 2,476,498.05 |
| CEI (19%) | | | | \$ 1,882,138.52 |
| Survey and Design (15%) | | | | \$ 1,485,898.83 |
| TOTAL CONSTRUCTION COST | | | | \$ 15,800,000.00 |

* Unit Cost Reference: <http://www.virginiadot.org/business/resources/const/DistrictAverages.pdf>

TASK ORDER 92
CONGESTION RELIEF FEASIBILITY STUDY
I-395 SOUTHBOUND FROM LITTLE RIVER TURNPIKE/DUKE STREET TO EDSALL ROAD
Roadway Quantities - Configuration 5b
7/17/2012

| DESCRIPTION | Unit | Qty. | * Unit Cost | Total Cost |
|--|------|--------|-----------------|-------------------------|
| <u>GRADING ITEMS</u> | | | | |
| Mobilization | LS | 1 | \$ 370,932.47 | \$ 370,932.47 |
| Construction Surveying | LS | 1 | \$ 68,186.49 | \$ 68,186.49 |
| Clearing & Grubbing | LS | 1 | \$ 10,000.00 | \$ 10,000.00 |
| Regular Excavation | CY | 6,290 | \$ 20.26 | \$ 127,435.40 |
| Borrow Excavation | CY | 944 | \$ 20.24 | \$ 19,106.56 |
| <u>DRAINAGE ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 116,452.56 | \$ 116,452.56 |
| <u>PAVEMENT ITEMS</u> | | | | |
| Aggr. Base Matl. Ty. I No. 21B | TON | 8,208 | \$ 25.76 | \$ 211,438.08 |
| Asphalt Concrete Ty. IM-19.0A | TON | 2,304 | \$ 71.25 | \$ 164,160.00 |
| Asphalt Concrete Ty. BM-25.0A | TON | 11,414 | \$ 64.05 | \$ 731,066.70 |
| Asphalt Concrete Ty. SM-12.5E (76-22) | TON | 3,649 | \$ 83.26 | \$ 303,815.74 |
| Flexible Pave. Planning 0"-2" | SY | 12,030 | \$ 1.49 | \$ 17,924.70 |
| Sawcut (Full Depth) | LF | 2,877 | \$ 6.99 | \$ 20,110.23 |
| <u>INCIDENTAL ITEMS</u> | | | | |
| STD. CURB CG-3 | LF | 1,499 | \$ 17.01 | \$ 25,497.99 |
| Guardrail GR-2 | LF | 5,193 | \$ 15.54 | \$ 80,699.22 |
| GUARDRAIL TERMINAL GR-11 | EA | 2 | \$ 673.68 | \$ 1,347.36 |
| ALT.BREAKAWAY CABLE TERM.(GR-9) | EA | 1 | \$ 2,261.26 | \$ 2,261.26 |
| Fixed Object Attach. GR-FOA-2 TY. I | EA | 7 | \$ 2,100.44 | \$ 14,703.08 |
| Fixed Object Attach. GR-FOA-2 TY. II | EA | 6 | \$ 816.32 | \$ 4,897.92 |
| Median Barrier MB-7F | LF | 1,548 | \$ 66.54 | \$ 103,003.92 |
| Conc. Class A3 Retaining Wall | CY | 837 | \$ 558.08 | \$ 467,112.96 |
| IMPACT ATTEN.SER.TY.1A(TL-2,45 MPH MAX) | EA | 2 | \$ 5,957.50 | \$ 11,915.00 |
| IMPACT ATTEN.(TL-3,>45MPH DES.SP.) | EA | 1 | \$ 12,180.00 | \$ 12,180.00 |
| FENCE FE-W1 | LF | 75 | \$ 5.00 | \$ 375.00 |
| <u>PROTECTIVE ITEMS</u> | | | | |
| Demo. Of Pavement (Flexible) | SY | 15,068 | \$ 4.89 | \$ 73,682.52 |
| Remove Existing Guardrail | LF | 4,658 | \$ 3.25 | \$ 15,138.50 |
| <u>EROSION CONTROL ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 116,452.56 | \$ 116,452.56 |
| <u>TRAFFIC ITEMS</u> | | | | |
| Lump Sum-Traffic Signal | LS | 2 | \$ 200,000.00 | \$ 400,000.00 |
| Lump Sum-Lighting | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-Pavement Markings | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing (3 OH sign @ \$250k/ea) | LS | 1 | \$ 750,000.00 | \$ 750,000.00 |
| Lump Sum-MOT (100% of Grading, Pavement, Incidental) | LS | 1 | \$ 2,329,051.12 | \$ 2,329,051.12 |
| <u>BRIDGE ITEMS</u> | | | | |
| Edsall Road Abutment over I-395 | LS | 1 | \$ 2,200,000.00 | \$ 2,200,000.00 |
| I-395 Ramp Abutment over I-395 | LS | 1 | \$ 700,000.00 | \$ 700,000.00 |
| TOTAL | | | | \$ 10,068,947.34 |
| GENERAL CONTINGENCY (25%) | | | | \$ 2,517,236.83 |
| CEI (19%) | | | | \$ 1,913,099.99 |
| Survey and Design (15%) | | | | \$ 1,510,342.10 |
| TOTAL CONSTRUCTION COST | | | | \$ 16,100,000.00 |

* Unit Cost Reference: <http://www.virginiadot.org/business/resources/const/DistrictAverages.pdf>

TASK ORDER 92
CONGESTION RELIEF FEASIBILITY STUDY
I-395 SOUTHBOUND FROM LITTLE RIVER TURNPIKE/DUKE STREET TO EDSALL ROAD
Roadway Quantities - Configuration 6a
7/17/2012

| DESCRIPTION | Unit | Qty. | * Unit Cost | Total Cost |
|--|------|--------|-----------------|-------------------------|
| <u>GRADING ITEMS</u> | | | | |
| Mobilization | LS | 1 | \$ 333,162.55 | \$ 333,162.55 |
| Construction Surveying | LS | 1 | \$ 60,632.51 | \$ 60,632.51 |
| Clearing & Grubbing | LS | 1 | \$ 10,000.00 | \$ 10,000.00 |
| Regular Excavation | CY | 1,311 | \$ 20.26 | \$ 26,560.86 |
| Borrow Excavation | CY | 2,639 | \$ 20.24 | \$ 53,413.36 |
| <u>DRAINAGE ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 106,268.44 | \$ 106,268.44 |
| <u>PAVEMENT ITEMS</u> | | | | |
| Aggr. Base Matl. Ty. I No. 21B | TON | 7,223 | \$ 25.76 | \$ 186,064.48 |
| Asphalt Concrete Ty. IM-19.0A | TON | 2,027 | \$ 71.25 | \$ 144,423.75 |
| Asphalt Concrete Ty. BM-25.0A | TON | 10,046 | \$ 64.05 | \$ 643,446.30 |
| Asphalt Concrete Ty. SM-12.5E (76-22) | TON | 3,366 | \$ 83.26 | \$ 280,253.16 |
| Flexible Pave. Planning 0"-2" | SY | 11,892 | \$ 1.49 | \$ 17,719.08 |
| Sawcut (Full Depth) | LF | 2,876 | \$ 6.99 | \$ 20,103.24 |
| <u>INCIDENTAL ITEMS</u> | | | | |
| STD. CURB CG-3 | LF | 677 | \$ 17.01 | \$ 11,515.77 |
| Guardrail GR-2 | LF | 4,903 | \$ 15.54 | \$ 76,192.62 |
| GUARDRAIL TERMINAL GR-11 | EA | 3 | \$ 673.68 | \$ 2,021.04 |
| ALT.BREAKAWAY CABLE TERM.(GR-9) | EA | 4 | \$ 2,261.26 | \$ 9,045.04 |
| Fixed Object Attach. GR-FOA-2 TY. I | EA | 8 | \$ 2,100.44 | \$ 16,803.52 |
| Fixed Object Attach. GR-FOA-2 TY. II | EA | 5 | \$ 816.32 | \$ 4,081.60 |
| Median Barrier MB-7F | LF | 732 | \$ 66.54 | \$ 48,707.28 |
| Conc. Class A3 Retaining Wall | CY | 1,009 | \$ 558.08 | \$ 563,102.72 |
| IMPACT ATTEN.SER.TY.1A(TL-2,45 MPH MAX) | EA | 2 | \$ 5,957.50 | \$ 11,915.00 |
| <u>PROTECTIVE ITEMS</u> | | | | |
| Demo. Of Pavement (Flexible) | SY | 17,120 | \$ 4.89 | \$ 83,716.80 |
| Remove Existing Guardrail | LF | 5,003 | \$ 3.25 | \$ 16,259.75 |
| <u>EROSION CONTROL ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 106,268.44 | \$ 106,268.44 |
| <u>TRAFFIC ITEMS</u> | | | | |
| Lump Sum-Traffic Signal | LS | 2 | \$ 200,000.00 | \$ 400,000.00 |
| Lump Sum-Lighting | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-Pavement Markings | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing (2 OH sign @ \$250k/ea) | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-MOT (100% of Grading, Pavement, Incidental) | LS | 1 | \$ 2,125,368.82 | \$ 2,125,368.82 |
| <u>BRIDGE ITEMS</u> | | | | |
| Integral Straddle Bent for I-395 Ramp over Edsall Road | LS | 1 | \$ | \$ - |
| TOTAL | | | | \$ 6,457,046.14 |
| GENERAL CONTINGENCY (25%) | | | | \$ 1,614,261.53 |
| CEI (19%) | | | | \$ 1,226,838.77 |
| Survey and Design (15%) | | | | \$ 968,556.92 |
| TOTAL CONSTRUCTION COST | | | | \$ 10,300,000.00 |

* Unit Cost Reference: <http://www.virginiadot.org/business/resources/const/DistrictAverages.pdf>

TASK ORDER 92
CONGESTION RELIEF FEASIBILITY STUDY
I-395 SOUTHBOUND FROM LITTLE RIVER TURNPIKE/DUKE STREET TO EDSALL ROAD
Roadway Quantities - Configuration 6b
7/17/2012

| DESCRIPTION | Unit | Qty. | * Unit Cost | Total Cost |
|--|------|--------|-----------------|-------------------------|
| <u>GRADING ITEMS</u> | | | | |
| Mobilization | LS | 1 | \$ 353,024.79 | \$ 353,024.79 |
| Construction Surveying | LS | 1 | \$ 64,604.96 | \$ 64,604.96 |
| Clearing & Grubbing | LS | 1 | \$ 10,000.00 | \$ 10,000.00 |
| Regular Excavation | CY | 7,838 | \$ 20.26 | \$ 158,797.88 |
| Borrow Excavation | CY | 2,676 | \$ 20.24 | \$ 54,162.24 |
| <u>DRAINAGE ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 115,726.65 | \$ 115,726.65 |
| <u>PAVEMENT ITEMS</u> | | | | |
| Aggr. Base Matl. Ty. I No. 21B | TON | 7,546 | \$ 25.76 | \$ 194,384.96 |
| Asphalt Concrete Ty. IM-19.0A | TON | 2,117 | \$ 71.25 | \$ 150,836.25 |
| Asphalt Concrete Ty. BM-25.0A | TON | 10,495 | \$ 64.05 | \$ 672,204.75 |
| Asphalt Concrete Ty. SM-12.5E (76-22) | TON | 3,453 | \$ 83.26 | \$ 287,496.78 |
| Flexible Pave. Planning 0"-2" | SY | 11,892 | \$ 1.49 | \$ 17,719.08 |
| Sawcut (Full Depth) | LF | 2,876 | \$ 6.99 | \$ 20,103.24 |
| <u>INCIDENTAL ITEMS</u> | | | | |
| STD. CURB CG-3 | LF | 997 | \$ 17.01 | \$ 16,958.97 |
| Guardrail GR-2 | LF | 4,903 | \$ 15.54 | \$ 76,192.62 |
| GUARDRAIL TERMINAL GR-11 | EA | 3 | \$ 673.68 | \$ 2,021.04 |
| ALT.BREAKAWAY CABLE TERM.(GR-9) | EA | 4 | \$ 2,261.26 | \$ 9,045.04 |
| Fixed Object Attach. GR-FOA-2 TY. I | EA | 8 | \$ 2,100.44 | \$ 16,803.52 |
| Fixed Object Attach. GR-FOA-2 TY. II | EA | 5 | \$ 816.32 | \$ 4,081.60 |
| Median Barrier MB-7F | LF | 732 | \$ 66.54 | \$ 48,707.28 |
| Conc. Class A3 Retaining Wall | CY | 1,009 | \$ 558.08 | \$ 563,102.72 |
| IMPACT ATTEN.SER.TY.1A(TL-2,45 MPH MAX) | EA | 2 | \$ 5,957.50 | \$ 11,915.00 |
| <u>PROTECTIVE ITEMS</u> | | | | |
| Demo. Of Pavement (Flexible) | SY | 17,120 | \$ 4.89 | \$ 83,716.80 |
| Remove Existing Guardrail | LF | 5,003 | \$ 3.25 | \$ 16,259.75 |
| <u>EROSION CONTROL ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 115,726.65 | \$ 115,726.65 |
| <u>TRAFFIC ITEMS</u> | | | | |
| Lump Sum-Traffic Signal | LS | 2 | \$ 200,000.00 | \$ 400,000.00 |
| Lump Sum-Lighting | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-Pavement Markings | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing (2 OH sign @ \$250k/ea) | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-MOT (100% of Grading, Pavement, Incidental) | LS | 1 | \$ 2,314,532.97 | \$ 2,314,532.97 |
| <u>BRIDGE ITEMS</u> | | | | |
| Integral Straddle Bent for I-395 Ramp over Edsall Road | LS | 1 | \$ | \$ |
| TOTAL | | | | \$ 6,878,125.53 |
| GENERAL CONTINGENCY (25%) | | | | \$ 1,719,531.38 |
| CEI (19%) | | | | \$ 1,306,843.85 |
| Survey and Design (15%) | | | | \$ 1,031,718.83 |
| TOTAL CONSTRUCTION COST | | | | \$ 11,000,000.00 |

* Unit Cost Reference: <http://www.virginiadot.org/business/resources/const/DistrictAverages.pdf>

TASK ORDER 92
CONGESTION RELIEF FEASIBILITY STUDY
I-395 SOUTHBOUND FROM LITTLE RIVER TURNPIKE/DUKE STREET TO EDSALL ROAD
Roadway Quantities - Configuration 6c
7/17/2012

| DESCRIPTION | Unit | Qty. | * Unit Cost | Total Cost |
|--|------|--------|-----------------|-------------------------|
| <u>GRADING ITEMS</u> | | | | |
| Mobilization | LS | 1 | \$ 380,183.85 | \$ 380,183.85 |
| Construction Surveying | LS | 1 | \$ 70,036.77 | \$ 70,036.77 |
| Clearing & Grubbing | LS | 1 | \$ 10,000.00 | \$ 10,000.00 |
| Regular Excavation | CY | 18,084 | \$ 20.26 | \$ 366,381.84 |
| Borrow Excavation | CY | 2,713 | \$ 20.24 | \$ 54,911.12 |
| <u>DRAINAGE ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 128,659.53 | \$ 128,659.53 |
| <u>PAVEMENT ITEMS</u> | | | | |
| Aggr. Base Matl. Ty. I No. 21B | TON | 7,867 | \$ 25.76 | \$ 202,653.92 |
| Asphalt Concrete Ty. IM-19.0A | TON | 2,207 | \$ 71.25 | \$ 157,248.75 |
| Asphalt Concrete Ty. BM-25.0A | TON | 10,941 | \$ 64.05 | \$ 700,771.05 |
| Asphalt Concrete Ty. SM-12.5E (76-22) | TON | 3,538 | \$ 83.26 | \$ 294,573.88 |
| Flexible Pave. Planning 0"-2" | SY | 11,892 | \$ 1.49 | \$ 17,719.08 |
| Sawcut (Full Depth) | LF | 2,876 | \$ 6.99 | \$ 20,103.24 |
| <u>INCIDENTAL ITEMS</u> | | | | |
| STD. CURB CG-3 | LF | 997 | \$ 17.01 | \$ 16,958.97 |
| Guardrail GR-2 | LF | 4,903 | \$ 15.54 | \$ 76,192.62 |
| GUARDRAIL TERMINAL GR-11 | EA | 3 | \$ 673.68 | \$ 2,021.04 |
| ALT.BREAKAWAY CABLE TERM.(GR-9) | EA | 4 | \$ 2,261.26 | \$ 9,045.04 |
| Fixed Object Attach. GR-FOA-2 TY. I | EA | 8 | \$ 2,100.44 | \$ 16,803.52 |
| Fixed Object Attach. GR-FOA-2 TY. II | EA | 5 | \$ 816.32 | \$ 4,081.60 |
| Median Barrier MB-7F | LF | 732 | \$ 66.54 | \$ 48,707.28 |
| Conc. Class A3 Retaining Wall | CY | 1,009 | \$ 558.08 | \$ 563,102.72 |
| IMPACT ATTEN.SER.TY.1A(TL-2,45 MPH MAX) | EA | 2 | \$ 5,957.50 | \$ 11,915.00 |
| <u>PROTECTIVE ITEMS</u> | | | | |
| Demo. Of Pavement (Flexible) | SY | 17,120 | \$ 4.89 | \$ 83,716.80 |
| Remove Existing Guardrail | LF | 5,003 | \$ 3.25 | \$ 16,259.75 |
| <u>EROSION CONTROL ITEMS</u> | | | | |
| Lump Sum (5% of Grading, Pavement, Incidental) | LS | 1 | \$ 128,659.53 | \$ 128,659.53 |
| <u>TRAFFIC ITEMS</u> | | | | |
| Lump Sum-Traffic Signal | LS | 2 | \$ 200,000.00 | \$ 400,000.00 |
| Lump Sum-Lighting | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-Pavement Markings | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing | LS | 1 | \$ 50,000.00 | \$ 50,000.00 |
| Lump Sum-Signing (2 OH sign @ \$250k/ea) | LS | 1 | \$ 500,000.00 | \$ 500,000.00 |
| Lump Sum-MOT (100% of Grading, Pavement, Incidental) | LS | 1 | \$ 2,573,190.67 | \$ 2,573,190.67 |
| <u>BRIDGE ITEMS</u> | | | | |
| Integral Straddle Bent for I-395 Ramp over Edsall Road | LS | 1 | \$ 1,300,000.00 | \$ 1,300,000.00 |
| TOTAL | | | | \$ 8,753,897.57 |
| GENERAL CONTINGENCY (25%) | | | | \$ 2,188,474.39 |
| CEI (19%) | | | | \$ 1,663,240.54 |
| Survey and Design (15%) | | | | \$ 1,313,084.64 |
| TOTAL CONSTRUCTION COST | | | | \$ 14,000,000.00 |

* Unit Cost Reference: <http://www.virginiadot.org/business/resources/const/DistrictAverages.pdf>