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*** EXCERPT ***

Traffic Quality on the Metropolitan Washington Area Freeway System

Spring 2014 Report

Prepared by
Skycomp, Inc. (Columbia, Maryland)

Publication Date: November 18, 2014

DRAFT

NATIONAL CAPITAL REGION TRANSPORTATION PLANNING BOARD
METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS

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Skycomp

ABSTRACT

TITLE: Traffic Quality on the Metropolitan Area Freeway System, Spring 2014 Report

DATE: TBD

AGENCY: The Metropolitan Washington Council of Governments is the regional planning organization of the Washington area's major local governments. COG works on finding solutions to regional problems, especially those related to regional growth, transportation, housing, human services, and the environment.

ABSTRACT: This report presents findings of the Spring 2014 survey of the metropolitan Washington region's limited access highway system. The findings include the system performance represented by levels of service and the changes to the system performance over time by comparing the 2014 results with 1993, 1996, 1999, 2002, 2005, 2008 and 2011 survey data.

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EXECUTIVE SUMMARY

Findings of the FY 2014 Freeway Congestion Monitoring Program (SKYCOMP aerial survey)

The number of lane miles of congestion (level-of-service F) in the region in 2014 was slightly less than that recorded during the 2011 survey.

2014 (2249 congested lane miles)

2011 (2369 congested lane miles)

Improvements

There were two major capacity increases to the highway system since the 2011 aerial survey.

The completion of the Intercounty Connector (ICC) linking Prince George's County and Montgomery County provided an alternate east-west route for commuters. Levels-of-service A and B were documented on the ICC throughout the morning and evening survey periods.

On I-495 in Virginia, the HOV/HOT facility between the I-95/395 and VA 267 Interchanges was completed. This four-lane facility for the most part operated at levels of service A and B. Commuters in the non-HOV/HOT lanes appeared to benefit to some degree as an improvement in levels of congestion along the corridor were documented. In the evening, conditions on the outer loop along this corridor resembled those documented during the 2008 survey before construction began; severe congestion and extensive delays were found here during the 2011 survey while under construction.

Degradations

Degraded levels of service were found on several of the major facilities during the morning and evening commuter periods. In most cases, the primary cause was likely an increase in the volume of traffic.

Morning / I-495 (Beltway)

Traffic congestion on the northwest west side of the Beltway (Inner Loop) traveling from Virginia into Maryland was more severe; one factor contributing to the degradation was the left-side merge associated with the termination of the Beltway's HOV facility downstream of VA 267. Another significant increase in congestion on the Beltway was renewed congestion found on the Inner Loop in Maryland approaching to the rebuilt Woodrow Wilson Bridge; however, the level of service tables on page 106 show less severe congestion in 2014 vs. historical levels, likely resulting in reduced travel times. Note: Congestion was not found along this section of the Inner Loop during the 2011 aerial survey (see level-of-service table on page 106).

Morning / MD 295, DC 295

A significant decrease in levels of service was found in the southbound direction on DC/MD 295 between Bladensburg and the Anacostia River crossing at Pennsylvania Ave. Improved flow along this section of DC 295 was documented in the 2011 report (attributed to completed construction improvement projects); the 2014 findings show the return of level-of-service F conditions for each of the 3-hours surveyed.

Evening / I-495 (Beltway)

A new zone of congestion was found on the outer loop of the Beltway in Prince George's County, Maryland. After crossing into Maryland on the Woodrow Wilson Bridge, traffic flowed freely until encountering congestion in the vicinity of St Barnabas Rd; congestion typically persisted 4-6 miles downstream to MD 4 (Pennsylvania Ave).

Evening / I-95 Virginia

A significant degradation of level of service on I-95 in Virginia was documented during the evening surveys in 2014. This may have been partly attributable to a construction zone where the HOV facility was being extended from Dumfries Blvd to Garrisonville Rd (approximately 10 miles); while all lanes were open during the evening commuter period, the presence of Jersey Barriers may have exacerbated the congestion. Farther south in Stafford County, recurring congestion on the approach to the Rappahannock River increased in both severity and extent since the 2011 survey.

Note

Historically, the aerial survey program conducted every three years since 1993 included four morning and four evening flights covering each of the roadways in the region. In 2014 it was decided to allocate some resources to conduct a pilot study of selected locations in the region using Skycomp's WAV (wide area video) service. As a result, coverage of the highway system in 2014 included three morning and three evening flights.

TABLE OF CONTENTS

Chapter I

Introduction

a. BACKGROUND

The purpose of this ongoing mobility-monitoring program is to rate the performance of the regional Washington, D.C. highway system on a recurring basis, and provide the information it produces to regional planners, stakeholders, and decision-makers. This initiative began in the spring of 1993, at which time approximately 300 centerline miles of limited-access highway in the Washington, D.C. metropolitan area was surveyed. Coverage was repeated every three years (1996, 1999, 2002, 2005, 2008 and 2011), leading to an identification of locations experiencing both improved and degraded mobility. Most recently, coverage of the regional network was repeated in the spring of 2014. This document presents the findings of this last survey.

b. FEATURES OF THE AERIAL SURVEY PROGRAM

The aerial survey methodology takes advantage of the mobility and vantage point of fixed-wing aircraft, permitting data collection across a large highway network that would not be affordable using traditional ground-based survey methods. During the survey flights, overlapping photographic coverage was obtained of each designated highway, repeated once an hour over three morning and three evening commuter periods (this means that, altogether, there were 9 morning and 9 evening observations of each highway segment). The morning times of coverage were 6:00-9:00 a.m. outside the Capital Beltway and 6:30-9:30 a.m. inside the Capital Beltway. The evening times were 4:00-7:00 p.m. inside the Capital Beltway and 4:30-7:30 p.m. outside the Capital Beltway. Survey flights were conducted on weekdays, excluding Monday mornings, Friday evenings and mornings after holidays. Data were extracted from the aerial photographs to measure average recurring daily traffic conditions by link and by time period. Products of the aerial survey program include:

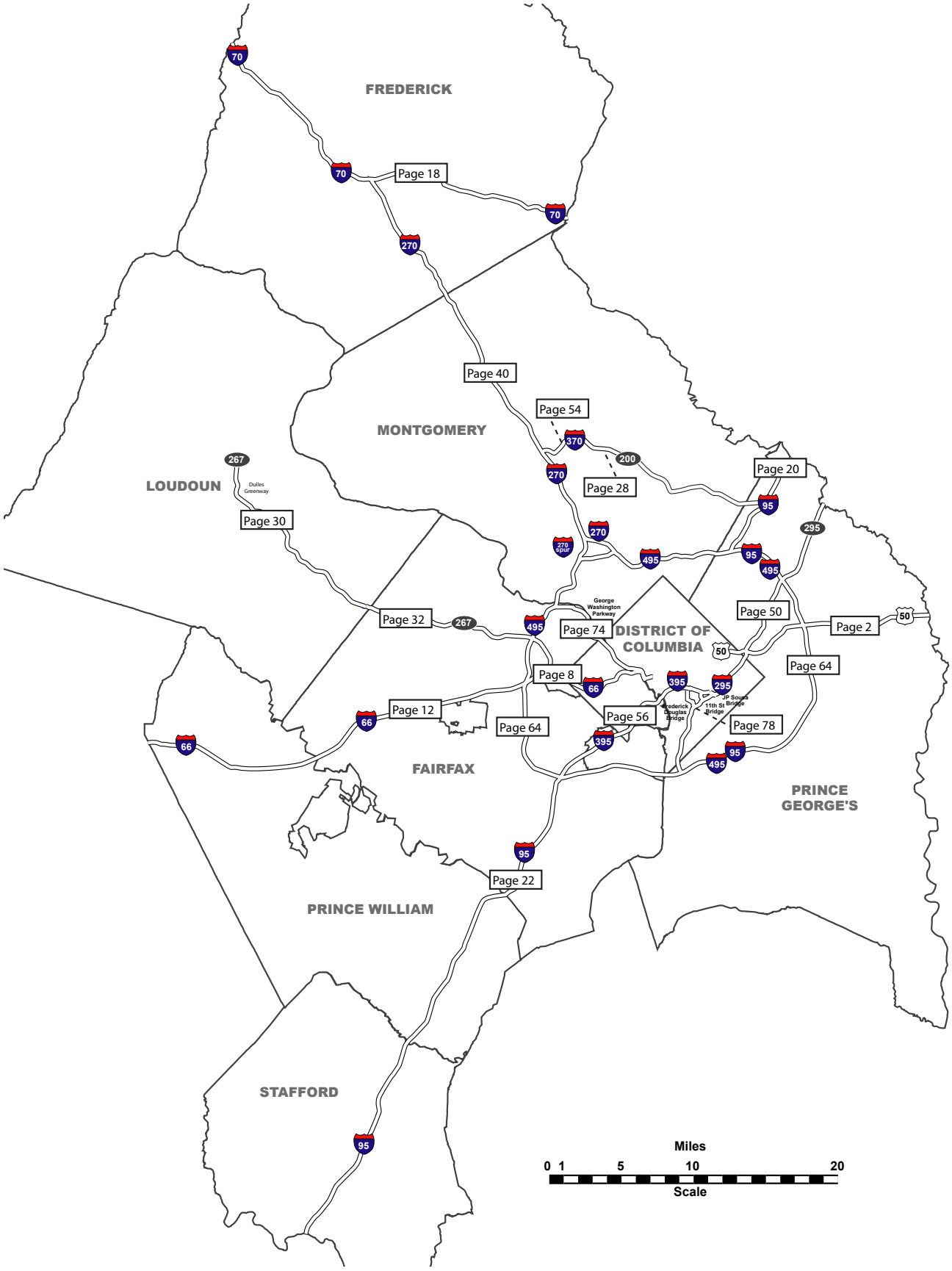
c. SURVEY DATABASE

A primary task for this project is to produce a 2014 Survey Database (built in the Microsoft Access format). This database contains all of the data collected from the 2014 aerial survey, from vehicle counts and road segmentation parameters to survey flight records.

d. PHOTO MATRIX

Another primary task is to assemble a photo matrix that includes all photography from the 2014 survey and the previous survey in 2011. The photo matrix is organized by highway, date and time. In the “pass” mode, the user can advance through overlapping photographs of any highway in the system. At any desired location on a highway, the user can switch to the “site” mode that allows viewing of the same location each and every time it was photographed over the two surveyed years (approximately 42 times).

Map of Surveyed Highways, Spring 2014



Chapter II

Report Layout

Traffic Quality on the Metropolitan Washington Area Freeway System, Spring 2014 report is made up of six chapters and three appendices.

Chapter I provides a background of the aerial survey program and discusses the features of the program.

Chapter II (this chapter) discusses the layout of the report.

Chapter III provides details of individual route levels of service along with narratives of congestion found on the freeway system. For segments with congested conditions, the severity of the congestion is indicated by density of traffic in passenger cars per lane per mile.

Chapter IV of the report provides the following information: 1) 2014 top 10 congested locations in terms of density; 2) a performance metric that indicates the top 5 corridors with the longest delay; and 3) a comparison of lane mile hours at LOS F by facility. Note: The 2011 top 10 congested locations and top 5 congested corridors are presented in Appendix C for reference.

Chapter V provides level-of-service and congestion summaries for the AM and PM peak periods as well as hourly displays for each of the survey periods.

Chapter VI discusses changes to the system over time by comparing 2014 data with prior years' survey data.

Appendix A discusses the methodology used for estimating level of service based on the highway capacity manual (HCM).

Appendix B documents the use of the locally calibrated Van Aerde model used to develop speed estimates from densities.

Appendix C presents graphics for the 2011 top 10 congested locations and top 5 congested corridors.

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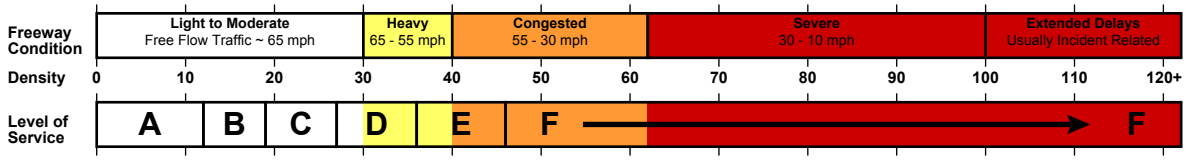
Chapter III

Metropolitan Washington Area Surveyed Highways - Spring 2014

Traffic Quality Rating Tables

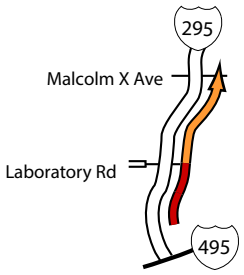
The following pages contain morning and evening traffic quality rating tables for all highways surveyed in the spring of 2014. Traffic quality ratings are presented by segment, hour and direction. Each rating is a composite reflecting all ratings for that hour – usually three –derived from survey flights on three different days, except that ratings affected by incidents or other unusual events were segregated and excluded from consideration.

Traffic Quality Ratings:



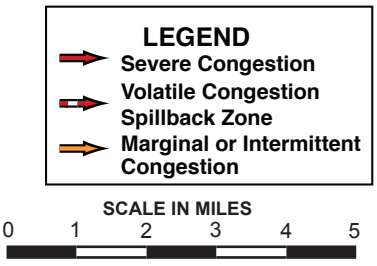
Congested Locations

Each level-of-service table includes arrowheads that depict locations where congestion was found. A narrative that clarifies the frequency and severity of the congestion accompanies each arrowhead; where evident, apparent causes of the problems are also described. See example below:



I-295 / D.C. 295 / Baltimore-Washington Parkway (Morning)

F
Congestion Type: Mainline Congestion
Frequency: Between 7:00 and 8:00 a.m.
Direction: Northbound
Location: Between I-495 and Malcolm X Ave
Queue Length: 2 to 3 miles
Estimated Speed: 30 to 50 mph
Note: The primary bottleneck was the series of lane drops (4 lanes to 3 and 3 lanes to 2) at the Laboratory Rd interchange.



A scale accompanies each rating table in this section of the report.

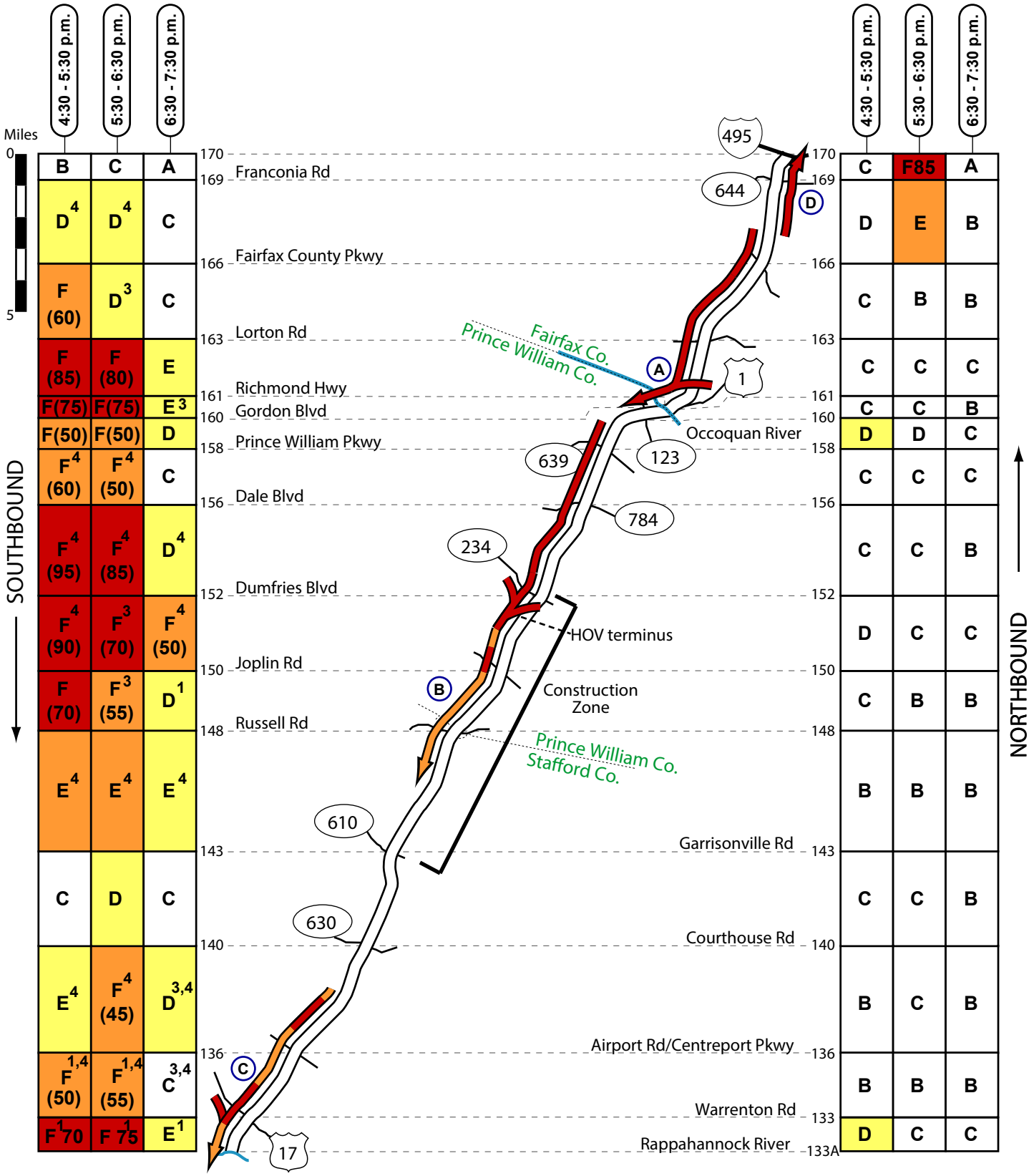
Nested Congestion

Level-of-Service data for some highway segments represent the mathematical average of densities that varied widely; these data have been tagged with a superscript number in the LOS tables. Four types of “nested” congestion that contributes to the variability have been identified as follows:

Descriptions

Type 1 - Congestion present on some days, but not others.
Type 2 - Congestion more severe in left or right-hand lanes.
Type 3 - Congestion present only in the first or second half-hour (hourly averages).
Type 4 - The length of the congested zone within the segment varies.

I-95 (Virginia) - Evening



Traffic Quality Rating

A	B	C	D	E	F	F	F
Density 10	Light 20	Moderate 30	Heavy 40	50	Congested 60	70	80 Severe 90

Superscripts: [1] Type 1 nested congestion (some days, not others). [3] Type 3 nested congestion (present only in the first or second half-hour period).
[2] Type 2 nested congestion (more severe in left or right-hand lanes). [4] Type 4 nested congestion (partial length of segment).

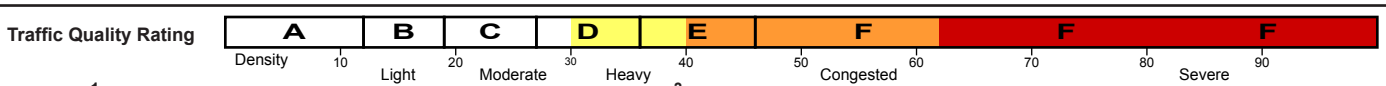
I-95 (Virginia) - Evening

A
Congestion Type: Mainline Congestion
Frequency: Most observations
Direction: Southbound
Location: Between Fairfax County Parkway & Gordon Blvd
Queue Length: 4 to 7 miles
Estimated Speed: 20 to 40 mph
Note: The primary bottlenecks were found where traffic entered the mainline from the interchanges at US Route 1 and Gordon Blvd.

B
Congestion Type: Mainline Congestion
Frequency: All observations before 7:00 p.m.
Direction: Southbound
Location: Between Prince William Parkway & Russell Rd
Queue Length: 6 to 10 miles
Estimated Speed: 20 to 50 mph
Note: Factors that contributed to the congestion included: 1) traffic entering at the series of interchanges along this section of I-95; 2) the merge into the left lane at the terminus of the HOV facility; 3) jersey barriers along the construction zone where the HOV facility was being extended.

C
Congestion Type: Mainline Congestion
Frequency: Most observations before 7:00 p.m.
Direction: Southbound
Location: Between Courthouse Rd and the Rappahannock River
Queue Length: 4 to 7 miles
Estimated Speed: 25 to 50 mph
Note: The primary bottleneck along this section of I-95 was found where traffic entered the mainline at US 17.

D
Congestion Type: Mainline Congestion
Frequency: Some days, not others
Direction: Northbound
Location: Between Fairfax County Parkway & I-495
Queue Length: 2 to 3 miles
Estimated Speed: 10 to 30 mph
Note: When congested, the head of this queue was found downstream on I-395. Construction on I-395 may have caused or exacerbated the congestion on I-95.



Superscripts: [1] Type 1 nested congestion (some days, not others). [2] Type 2 nested congestion (more severe in left or right-hand lanes). [3] Type 3 nested congestion (present only in the first or second half-hour period). [4] Type 4 nested congestion (partial length of segment).

Chapter IV

Summary of Congested Locations and Corridors

This chapter provides a summary of the 2014 “Top Ten Congested Locations” by ranking the densities of all segments and picking the top ten irrespective of whether they are congested during the AM or PM peak period. The 2011 Top Ten Congested locations are included for reference in Appendix C.

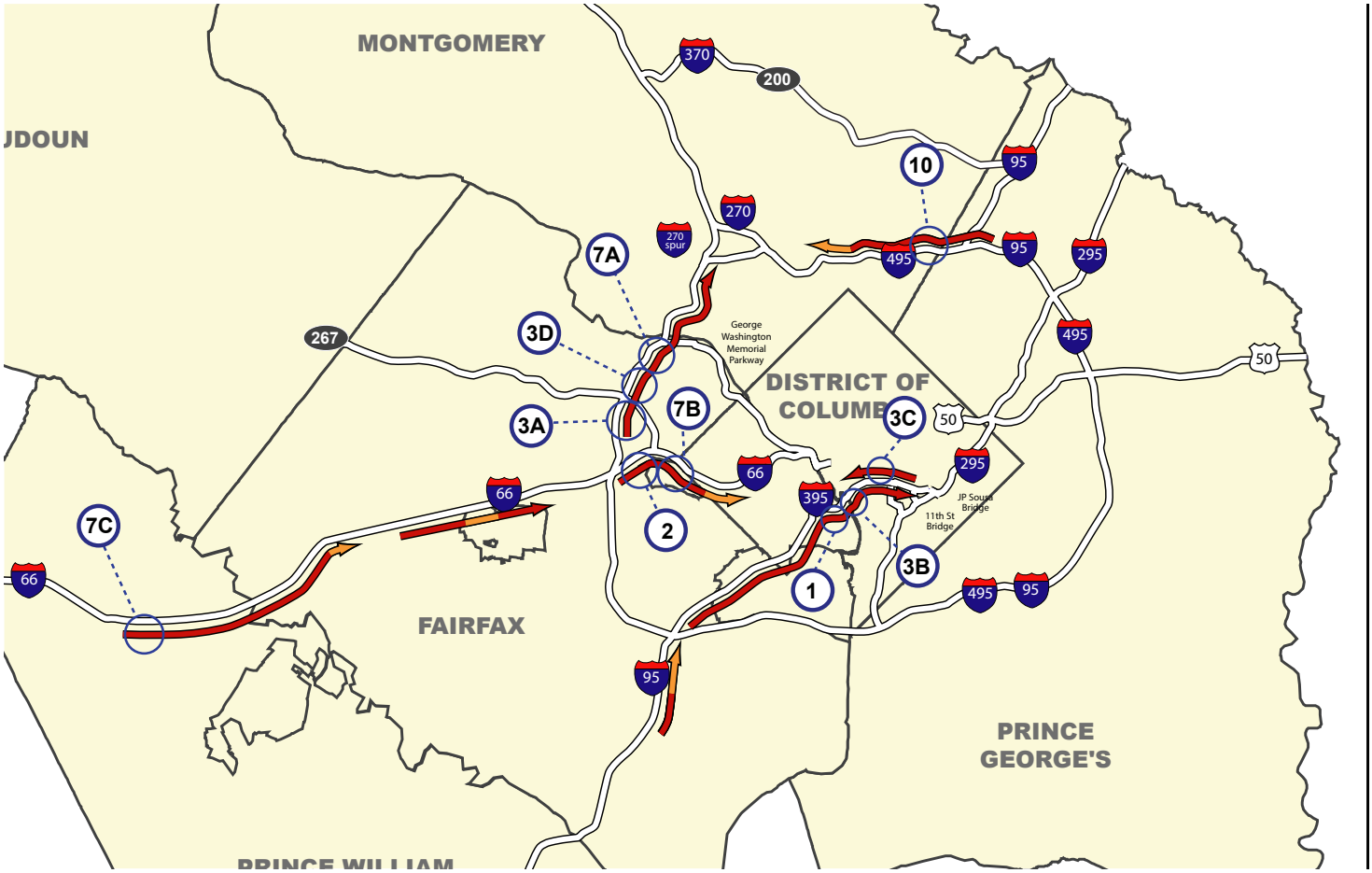
Corridors with the longest delay are also presented in this chapter. The purpose of this metric is to identify corridors which may not have bottlenecks in the Top Ten Congested Locations but are long congested corridors. Delay is calculated by estimating the additional travel time during congested conditions over the free flow travel time. Free flow speed is assumed to be 60 mph. This chapter lists the “Top Five Congested Corridors” in the AM and PM peak period. The 2011 Top Five Congested Corridors are presented in Appendix C for reference.

A comparison of lane mile hours at level-of-service F by facility (2014 vs. 2011) are also presented in this chapter.

Top Ten Congested Locations (2014) (AM and PM)

Criteria for the top ten congested locations are as follows:

- A location is defined as a congested freeway segment, by direction, between interchanges; this congested location is typically within a larger queue.
- Rankings for the top ten are based on the average hourly density value which corresponds to a speed (see table below).
- Construction-related congestion was not included in the rankings unless the location was historically congested in the absence of construction.
- Congestion caused by traffic signals was not included in the rankings.



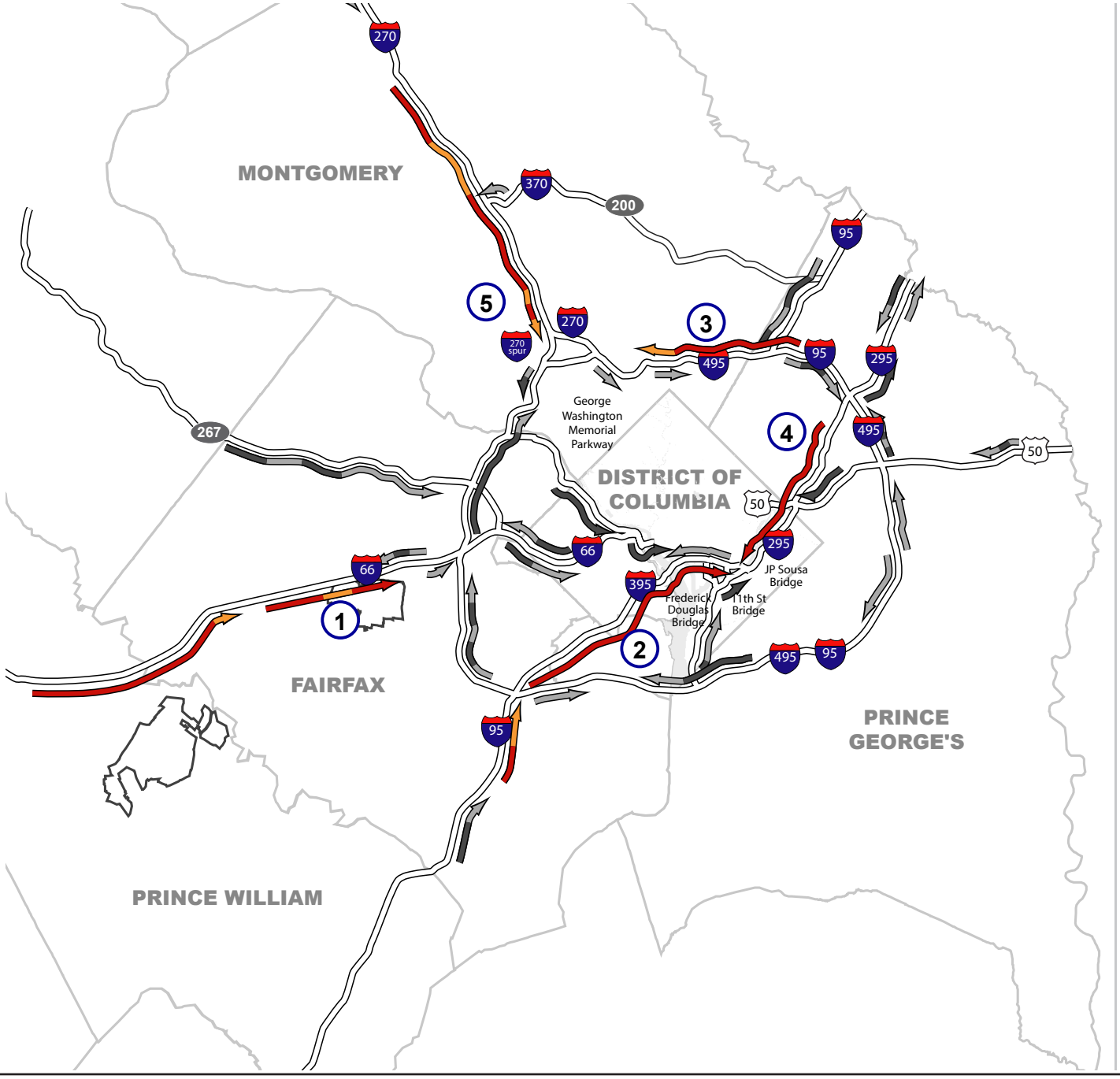
Top Ten Congested Segments on the Freeway System (2014)

Rank	Route	From	To	Density	Speed Range
1	NB I-395 (8:30-9:30 AM)	VA 27 (Washinton Blvd)	VA 110 (Jefferson Davis Hwy)	150	5 MPH
2	EB I-66 (6:00-7:00 PM)	VA 7 (Leesburgh Pike)	VA 267	140	5 MPH
3A	Inner Loop I-495 (4:30-5:30 PM)	VA 123 (Chain Bridge Rd)	VA 267	120	5-10 MPH
3B	NB I-395 (8:30-9:30 AM)	VA 110 (Jefferson Davis Hwy)	George Washington Memorial Pkwy	120	5-10 MPH
3C	SB I-395 (5:00-6:00 PM)	4th St	12th St	120	5-10 MPH
3D	Inner Loop I-495 (4:30-5:30 PM)	VA 267	VA 193 (Georgetown Pike)	120	5-10 MPH
7A	Inner Loop I-495 (5:30-6:30 PM)	VA 193 (Georgetown Pike)	George Washington Memorial Pkwy	110	10-15 MPH
7B	EB I-66 (6:00-7:00 PM)	VA 267	Westmoreland St	110	10-15 MPH
7C	EB I-66 (6:00-7:00 AM)	VA 234 Bypass	VA 234 (Sudley Rd)	110	10-15 MPH
10	Outer Loop I-495 (7:00-8:00 AM)	MD 650 (New Hampshire Ave)	MD 193 (University Ave)	105	10-15 MPH

Note: Due to construction at the terminus of the Southeast Freeway, eastbound densities along this corridor were not included in the Top Ten list above.

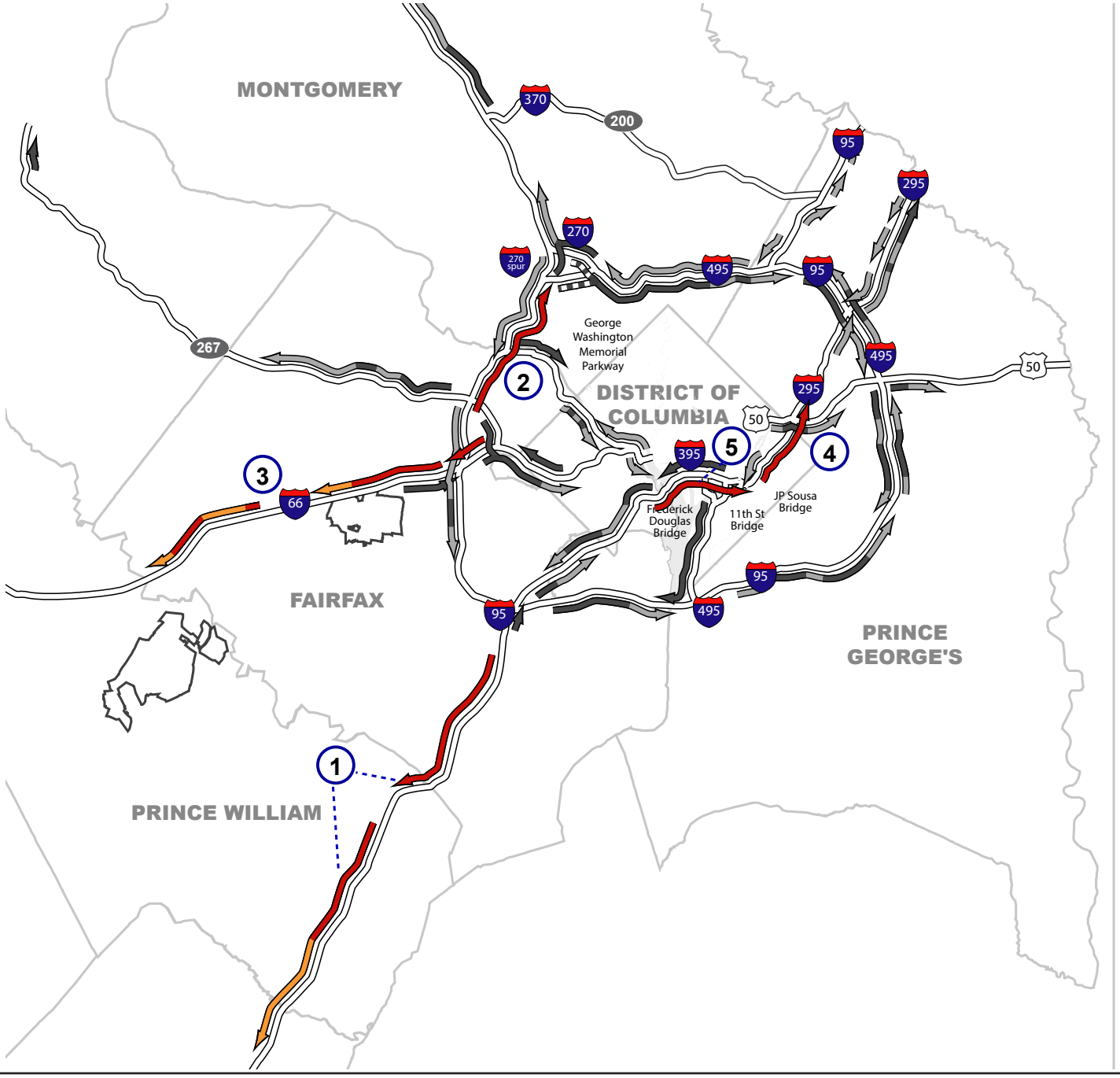
Longest Delay Corridors- Morning Peak Period (2014)

Site Name	Road Name	Time	Direction	From	To	Queue Length (miles)	Estimated Travel Time (minutes)	Estimated Speed (mph)	Estimated Delay (minutes)
Site #1	I-66	7:30 – 8:30	Eastbound	US 29 (Lee Highway)	VA 243 (Nutley St)	18.8	43.3	26	24.5
Site #2	I-95 / I-395	7:00 – 8:00	Northbound	US 1 (Richmond Highway)	George Washington Parkway	18.0	38.2	28	20.2
Site #3	I-495	7:00 – 8:00	Outerloop	I-95	MD 185 (Connectiucut Ave)	7.0	21.7	19	14.7
Site #4	DC 295	8:00 – 9:00	Southbound	MD 450 (Annapolis Rd)	MD 4 (Pennsylvania Ave)	5.7	19.9	17	14.2
Site #5	I-270	7:30 – 8:30	Southbound	Father Hurley Blvd	I-270 Western Spur	13.1	24.6	32	11.5

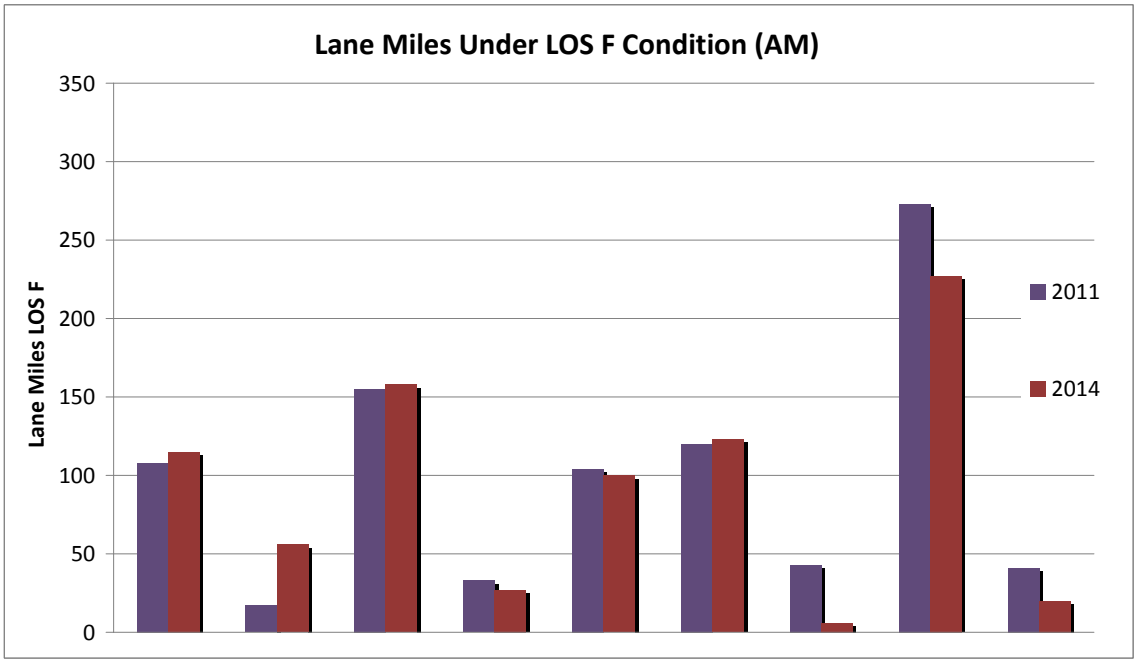


Longest Delay Corridors- Evening Peak Period (2014)

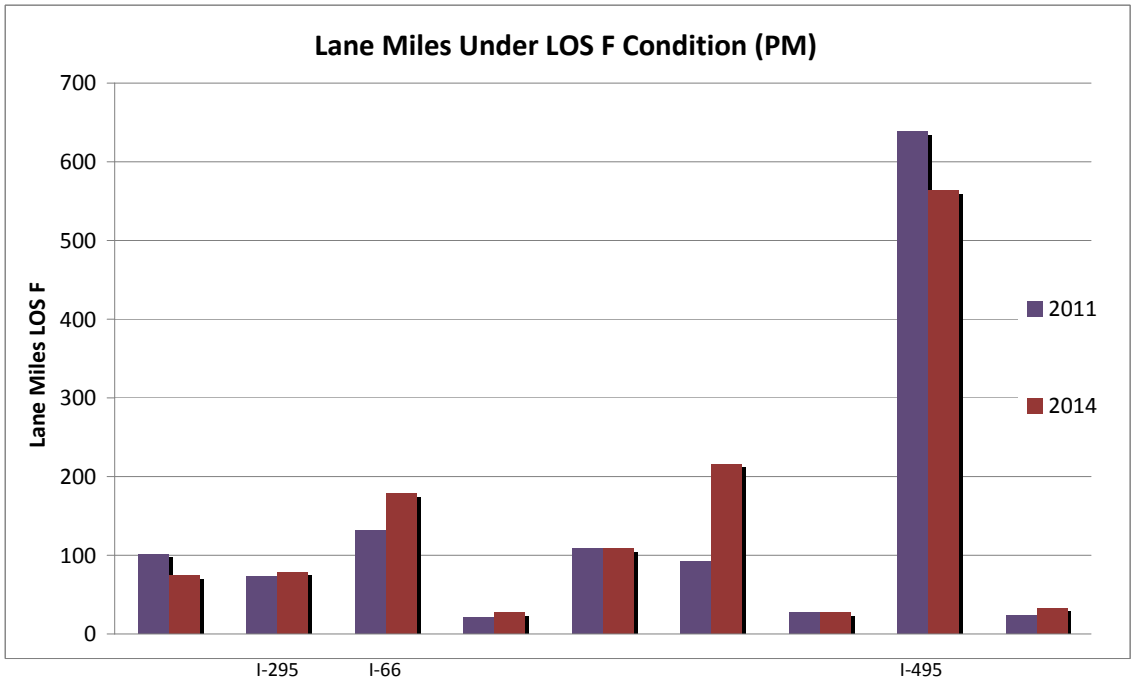
Site Name	Road Name	Time	Direction	From	To	Queue Length (miles)	Estimated Travel Time (minutes)	Estimated Speed (mph)	Estimated Delay (minutes)
Site #1	I-95	4:30 – 5:30	Southbound	Fairfax County Parkway	Garrisonvile Rd	23.0	51.5	27	28.5
Site #2	I-495	4:30 – 5:30	Innerloop	VA 7(Leesburg Pike)	I-270 Western Spur	8.4	35.1	14	26.7
Site #3	I-66	4:30 – 5:30	Westbound	VA 7 (Leesburg Pike)	VA 234 (Sudley Rd)	18.3	36.6	30	18.3
Site #4	DC 295	4:30 – 5:30	Northbound	11th Street Bridge	US 50	5.0	19.3	16	14.3
Site #5	I-395	5:00 – 6:00	Northbound	VA 110 (Jeff. Davis Hwy)	11th Street Bridge	3.7	17.5	13	13.8



Lane Miles of Congestion AM and PM Peak Period (2014)



	I-270	I-295 (Inside Beltway)	I-66 (Outside Beltway)	I-66 (Inside Beltway)	I-395	I-95 VA	I-95 MD	I-495 (Capital Beltway)	GW Parkway
2011 (6-9 AM)	108	17	155	33	104	120	43	273	41
2014 (6-9 AM)	115	56	158	27	100	123	6	227	20



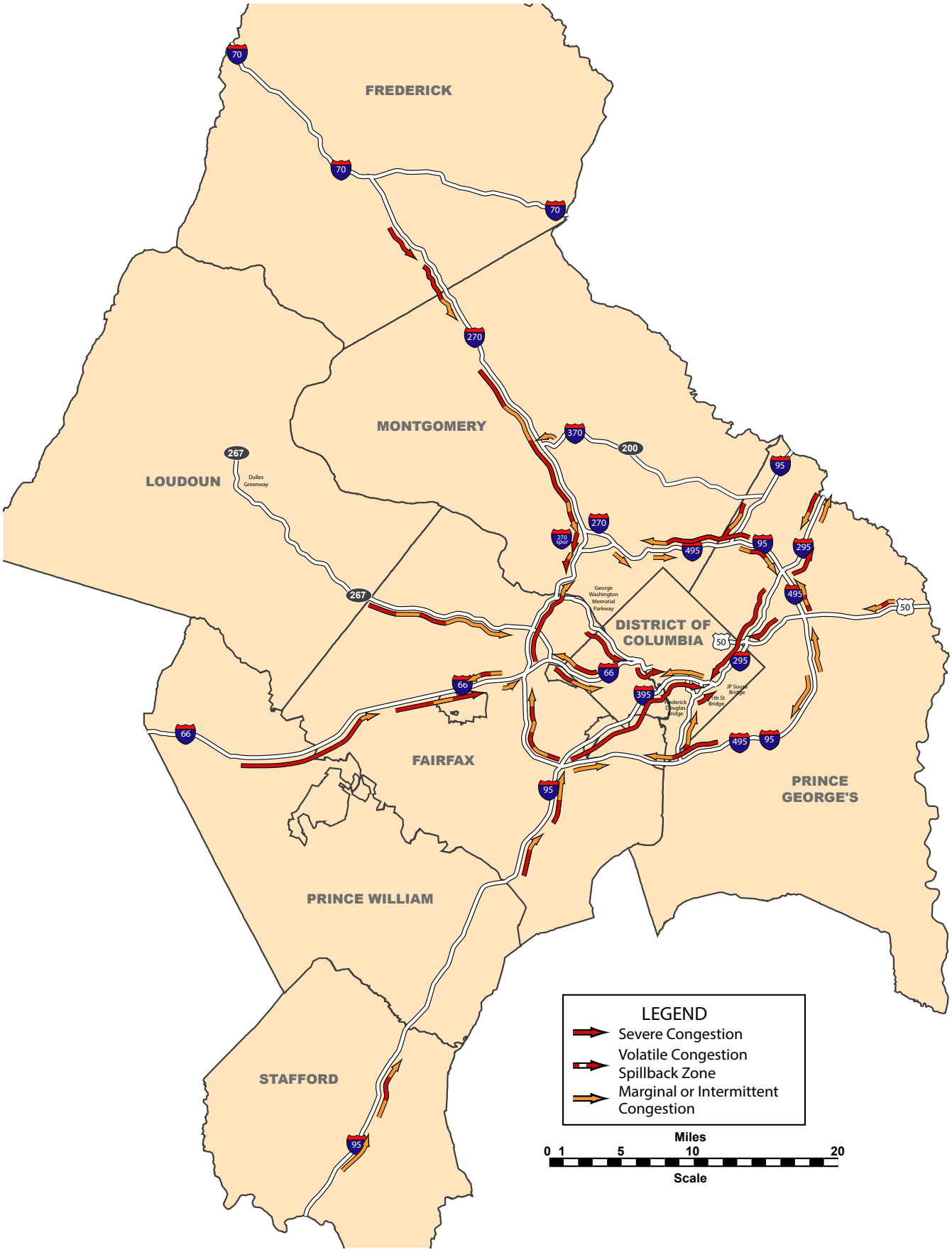
	I-270	I-295 (Inside Beltway)	I-66 (Outside Beltway)	I-66 (Inside Beltway)	I-395	I-95 VA	I-95 MD	I-495 (Capital Beltway)	GW Parkway
2011 (4-7 PM)	101	73	131	21	108	92	27	638	23
2014 (4-7 PM)	74	78	178	27	108	216	27	563	33

Chapter V

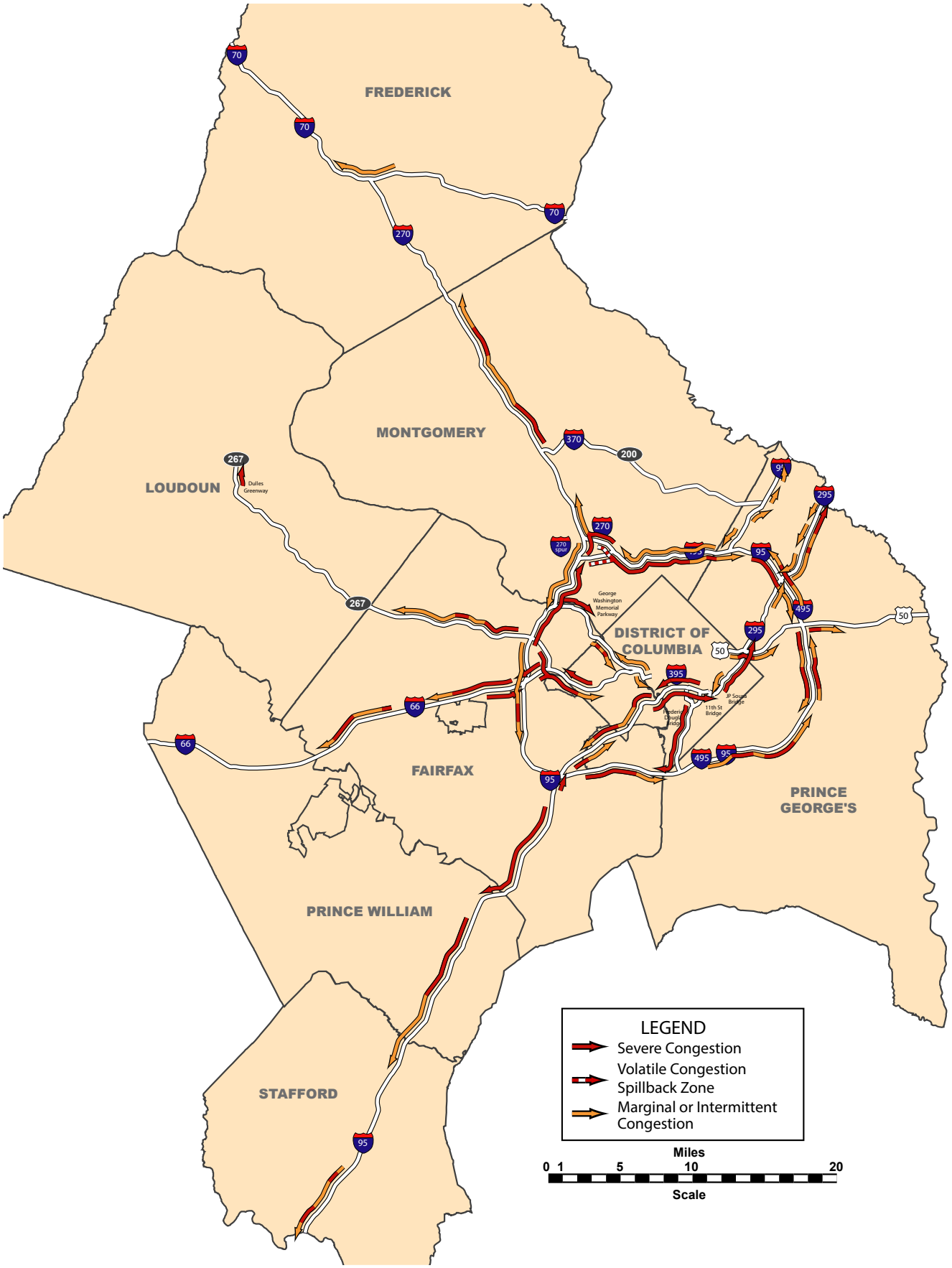
Regional Congestion Summary

This chapter shows summary maps of congestion in the region. The first set of maps summarizes all congestion that occurs within the three hour AM and PM peak period windows. If a segment is congested in two or three hours, the peak hour will be used. The second set of maps (six) illustrates congestion by the first hour, second hour and third hour during the AM and PM peak period; note that times vary for facilities located within the Beltway and outside the Beltway.

Morning Regional Congestion (Peak Period)-Spring 2014



Evening Regional Congestion (Peak Period)-Spring 2014



Chapter VI

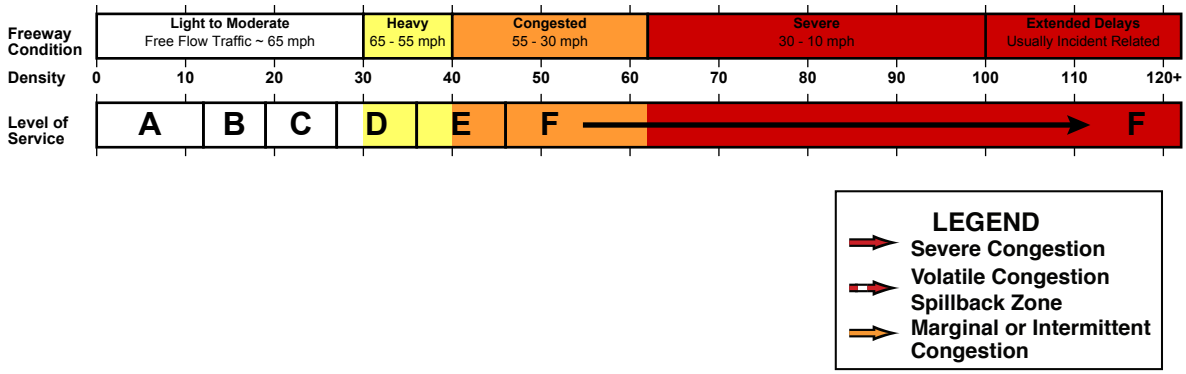
Major Trends and Changes in Traffic Conditions Between 1993 and 2014

This section of the report identifies locations on the highway system where major trends or changes in traffic conditions were found since the first aerial survey in 1993. On some highways, the absence or presence of construction contributed to the changed conditions. On other highways, added capacity contributed to improved flow; in some cases, no apparent cause could be attributed to the improvement or degradation of traffic flow.

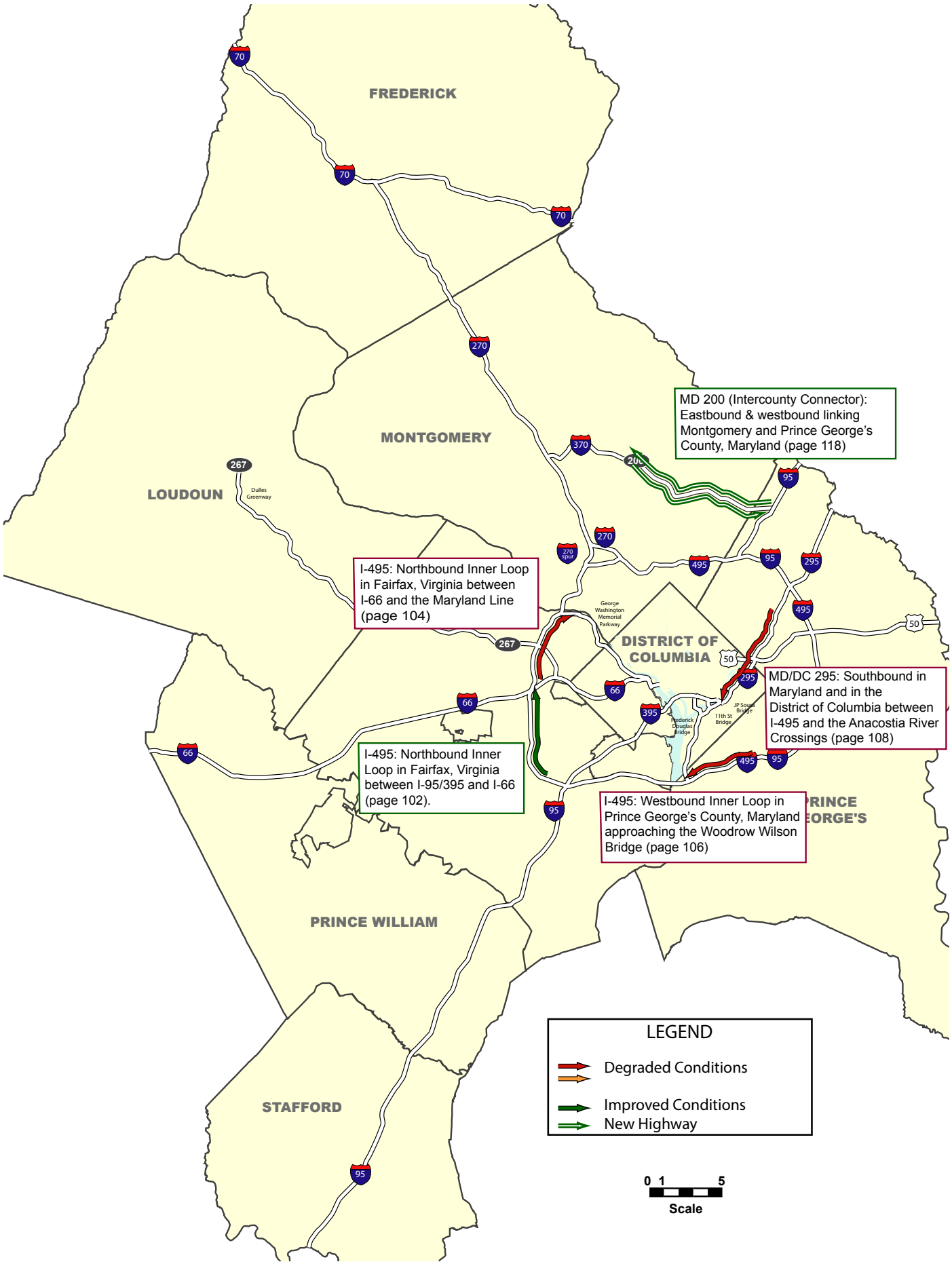
Excerpts from the level-of-service (LOS) tables contained in Chapter III have been used in this section of the report to depict the changes in traffic conditions.

A summary of traffic conditions for each level-of-service is provided below.

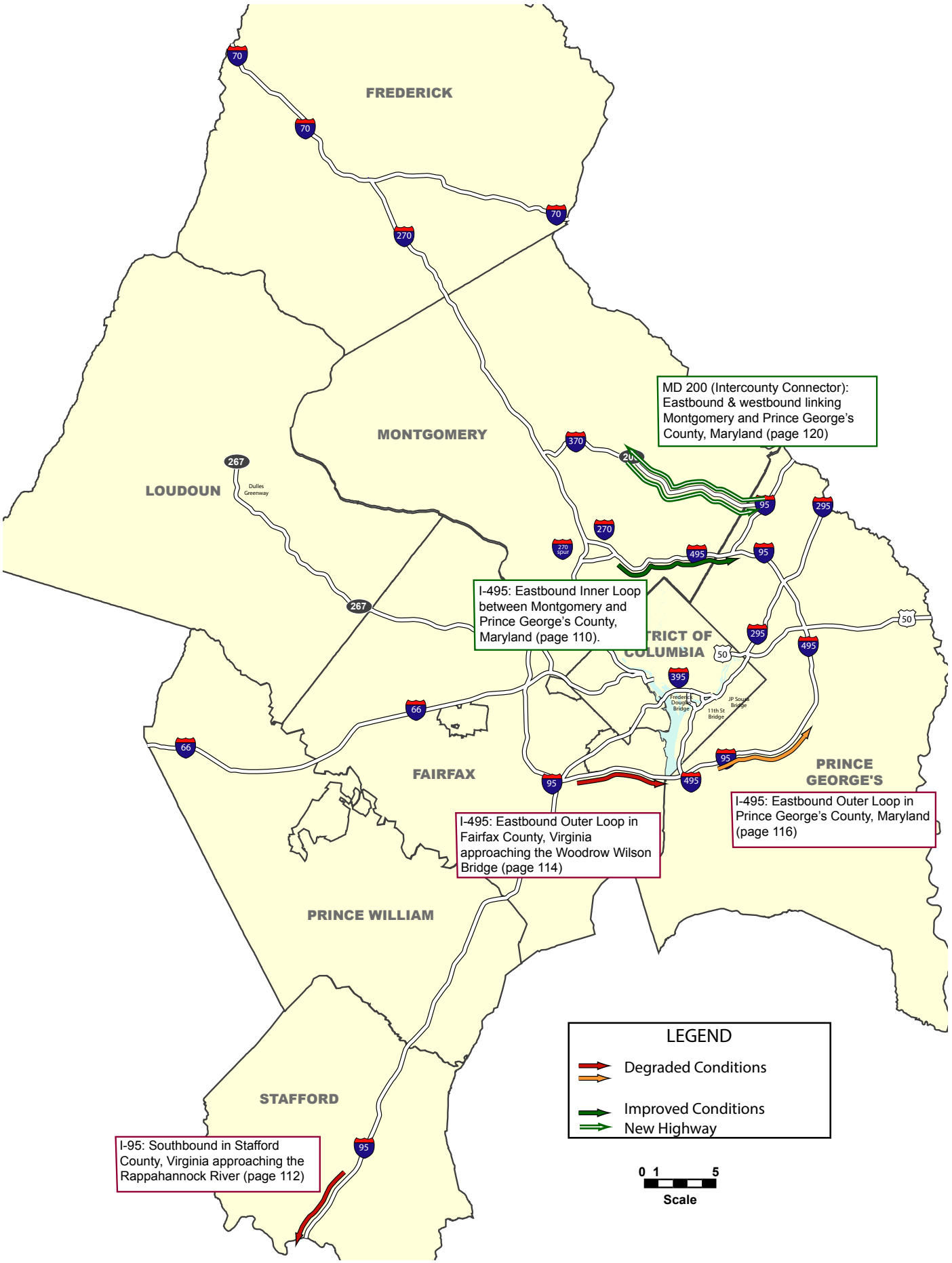
Traffic Quality Ratings:



Significant Changes (2008 - 2014) - Morning Peak Period



Significant Changes (2008 - 2014) - Evening Peak Period



I-495 VIRGINIA (FAIRFAX COUNTY) - MORNING

Location: I-495 Inner Loop in Virginia between I-95/395 and I-66

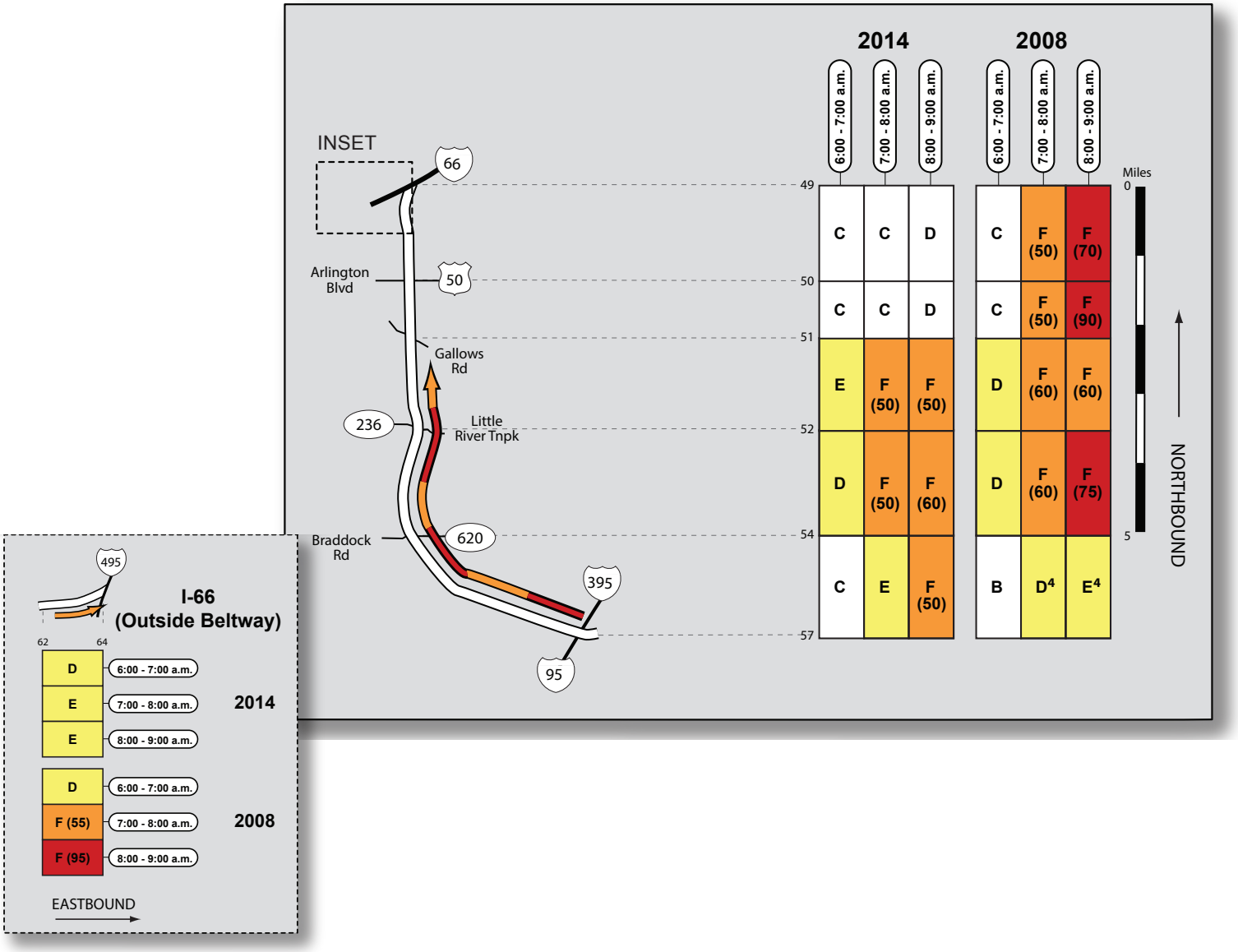
Time Period: Morning (7:00-9:00 a.m.)

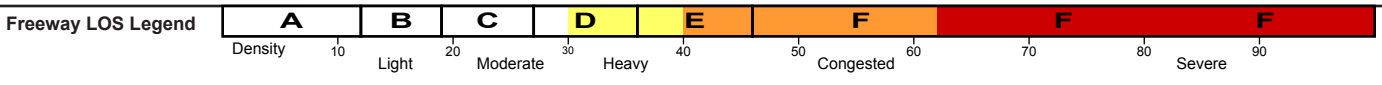
Type of Change: Improved

Potential Cause: New HOV/HOT Facility

On I-495, a new HOV/HOT facility in Virginia between the I-95/395 and VA 267 Interchanges was completed between the 2011 and 2014 surveys. For the most part, 2 lanes are available in each direction (Inner and Outer Loop). Level-of-service A and B were documented on this facility throughout the 2014 morning and evening surveys.

For morning commuters in the 4 general-purpose lanes along this corridor (Inner Loop – Northbound), a noticeable improvement was evident. The graphic below (pre vs. post construction) shows less severe congestion between I-95/395 and VA 236 (Gallows Rd), and a dramatic improvement on the approach to the I-66 Interchange where free-flow speeds were consistently found in 2014. Additionally, historical eastbound congestion on I-66 approaching I-495 was not found during the 2014 survey (see I-66 level-of-service data in the graphic below). The increased capacity of I-495 and Interchange reconstruction likely contributed to the improved conditions.





I-495 VIRGINIA (FAIRFAX COUNTY) - MORNING

2011

2014

Photographs:
The photo at the top shows typical/historical northbound congestion on the inner loop of the Beltway passing through the US 50 Interchange. The bottom photos shows free-flow conditions consistently found here during the morning surveys in 2014. Note the new HOV/HOT facility in the center of the highway (both directions).