

4.0 Existing Corridor Travel Data

To quantify the existing congestion issues along the I-526 corridor and in the Charleston area, a review of existing travel statistics and operations was conducted.

4.1 Existing Socioeconomic Data

U.S. Census Data

Based upon information from the U.S. Census Bureau, Charleston County is the third most populous county in South Carolina with an estimated 2010 population 351,482. Charleston County contains the City of Charleston (the second largest city in South Carolina), portions of the City of North Charleston (the third largest city in South Carolina), and the Town of Mount Pleasant (the fifth largest municipality in South Carolina).

A review of the U.S. Census Bureau's *2006 – 2010 American Community Survey 5-Year Estimates* was also conducted to determine the existing travel trends in and around the study area. The *American Community Survey* provides statistical information and changes over shorter time spans than the decennial census. The survey is distributed annually to approximately three million housing unit addresses in all counties located in the United States, and asks for details such as age, race, commute time, employment information, and other data. The survey breaks down data in one-year, three-year, and five-year estimates annually based upon geographical interest and population. Table 4-1 reveals normal driver commute patterns for Charleston County, the City of North Charleston, and the City of Charleston, as well as comparative information for Columbia, Greenville, Charlotte, and Raleigh for the past five years.

The review indicates that the travel characteristics for the Charleston area are similar with other nearby cities. In Charleston County, the data indicates that 79% workers drive alone, 10% carpool, 2% take public transportation, and 4% work at home, with a mean travel time to work being 22 minutes.

Table 4-1: Existing Travel Characteristics

	CHARLESTON COUNTY	NORTH CHARLESTON	CHARLESTON	COLUMBIA	GREENVILLE	CHARLOTTE	RALEIGH
Drive Alone	79%	76%	78%	66%	77%	76%	79%
Carpool	10%	15%	8%	8%	8%	12%	11%
Public Transportation	2%	2%	3%	2%	1%	4%	2%
Work at Home	4%	2%	3%	18%	5%	5%	5%
Other	5%	4%	8%	6%	10%	3%	4%
Mean Travel Time to Work	22 minutes	23 minutes	21 minutes	18 minutes	17 minutes	24 minutes	22 minutes

Urban Mobility Report Data

The *2011 Urban Mobility Report* developed by the Texas Transportation Institute (TTI) describes congestion problems on a national level and also provides congestion related numbers at the city level based upon travel time information. The travel time information is provided by INRIX, a company that provides travel time information for travelers and shippers, provides TTI with travel time information on most major roadways in urban settings in the United States.

The Charleston/North Charleston area is classified as a medium urban area, with a population between 500,000 and 1,000,000. The report provides several area-wide congestion-related statistics specific to the Charleston region, which can provide an understanding of congestion-related problems in the overall area.

Based upon data from the report, there are 274 freeway lane miles and 3,631,000 vehicle miles traveled (VMT) daily on freeways in the Charleston/North Charleston area, which are 51% and 50% congested, respectively, during peak travel times. This congestion results in approximately 4.25 hours of rush hour traffic, time when the system may be congested, on a daily basis.

Finally, the travel time index, defined as the ratio of the actual travel time divided by the travel time under free flow conditions FHWA's *Recurring Traffic Bottlenecks: A Primer reference*, for the area is 1.16, ranking 37th highest out of the 101 urban areas. As an example, a trip that takes 45 minutes in rush hour traffic that would take 30 minutes at free-flow conditions would have a TTI of 1.50.

4.2 Existing Traffic Conditions

I-526 in the study area extends in an eastward direction (towards Mount Pleasant) and a westward direction (towards Savannah), generally consisting of a four-lane, divided expressway. I-26 in the study area is oriented in an eastbound (towards Charleston) and a westbound (towards Summerville and Columbia) direction, generally consisting of a six-lane section, with the segments just west of I-526 having eight lanes. The study area includes the I-26 & I-526 system-to-system interchange, and the adjacent interchanges located nearby on all four legs. These closely spaced adjacent interchanges present short weaving sections less than ¼ mile in length to the east (US 52/Rivers Avenue) and the south (Montague Avenue) and less than ½ mile in length to the north (Remount Road and Aviation Avenue) and the west (International Boulevard).

A summary of the existing I-526 and I-26 Interstate segment lengths and 2011 AADTs are provided in Table 4-2, and a summary of the exit numbers for the I-526 and I-26 interchanges in the study area are summarized in Table 4-3.

Table 4-2: Existing Segment Lengths & AADTs

INTERSTATE SEGMENT		SEGMENT LENGTH	2011 AADT
I-526	East of Virginia Avenue	--	62,400
	Virginia Avenue to Rhett Avenue	0.75 miles	71,800
	Rhett Avenue to Rivers Avenue	1.58 miles	69,000
	Rivers Avenue to I-26	0.62 miles	72,700
	I-26 to Montague Avenue	1.59 miles	79,900
	Montague Avenue to Dorchester Road	0.64 miles	73,400
	Dorchester Road to Leeds Avenue	0.91 miles	71,900
	Leeds Avenue to Paul Cantrell Boulevard	2.52 miles	71,900
	Paul Cantrell Boulevard to US 17	1.40 miles	37,600
I-26	West of Remount Road	--	123,700
	Remount Road to I-526	1.02 miles	134,300
	I-526 to Montague Avenue	0.92 miles	86,600
	East of Montague Avenue	--	86,600

Table 4-3: Existing Interchange Exit Numbers

INTERSTATE	INTERCHANGE	EASTBOUND EXIT NUMBERS	WESTBOUND EXIT NUMBERS
I-526	Paul Cantrell Boulevard Eastbound	11A	11A
	Paul Cantrell Boulevard Westbound	11B	11B
	Leeds Avenue	14	14
	Dorchester Road/Paramount Drive	15	15
	International Boulevard/Montague Avenue	16A	16
	International Boulevard Westbound	16B	
	I-26 Eastbound	17	17A
	I-26 Westbound		17B
	Rivers Avenue Eastbound	18A	18A
	Rivers Avenue Westbound	18B	18B
	Rhett Avenue	19	19
	Virginia Avenue	20	--
I-26	West Aviation Avenue	211A	211A
	Remount Road	211B	211B
	I-526 Westbound	212B	212B
	I-526 Eastbound	212C	212C
	Tanger Outlet Boulevard	213A	--
	Montague Avenue Westbound	213A	213
	Montague Avenue Eastbound	213B	

To quantify existing traffic conditions and develop future travel projections along the I-526 study corridor, numerous data sources were consulted. This data consisted of historical traffic count information, including historical traffic volumes growth trends and projections, existing traffic count information, and existing origin-destination information, which are all detailed in the following sections.

4.2.1 Historical Traffic Trends

A review was conducted of the historical traffic data along I-526 to determine the representative average traffic conditions along the corridor. The historical data was also used to determine the degree to which traffic conditions vary by hour, day and time of year throughout the study area. Available count data from two SCDOT permanent traffic count stations along I-526, P-34 located near the Ashley River and P-46 located near the Cooper River, was obtained for the three-year period of 2008 through 2010. This data was broken down by hour of the day, day of the week and week of the year for the three-year period, and the traffic trends for the two count stations are summarized herein.

Exhibits 4-1 and 4-2 detail the typical variation in hourly traffic volumes for the average weekday. Weekend data was not included as travel patterns vary during the weekends, and the weekday periods are more representative of the peak traffic conditions. There are distinct AM and PM peak periods at both count locations. Due in part to the fact that I-526 is a circumferential roadway around the Charleston area, I-526 traffic is relatively evenly distributed in both directions throughout the day, rather than an inbound/outbound travel pattern that would be expected for a radial roadway into a major city, such as I-26 into downtown Charleston.

Exhibits 4-3 and 4-4 detail the typical variation in daily traffic volumes based on the day of the week. These graphs show that at both count locations, traffic volumes build throughout the week from Monday through Friday and then decrease on Saturday and again on Sunday.

Exhibits 4-5 and 4-6 detail the typical variation in traffic volumes along I-526 based on the week of the year. While the Charleston area does experience some seasonal variation in traffic volumes due to tourist activity increasing in the Spring and Summer months, these variations are less pronounced along I-526. The Ashley River count location experienced more of a seasonal decline in traffic volumes during the Fall and Winter months than did the Cooper River count location. The lowest traffic volumes were observed during the weeks of major holidays, indicating that I-526 traffic is more closely tied to commercial activities and commuter traffic rather than tourist traffic that may peak during holiday weeks, such as July 4th.

Exhibits 4-7 and 4-8 detail the typical variation in monthly traffic volumes. These graphs show that at both count locations, the peak month for travel along the I-526 corridor is April.

Exhibit 4-1: I-526 at Ashley River – Average Hourly Distribution

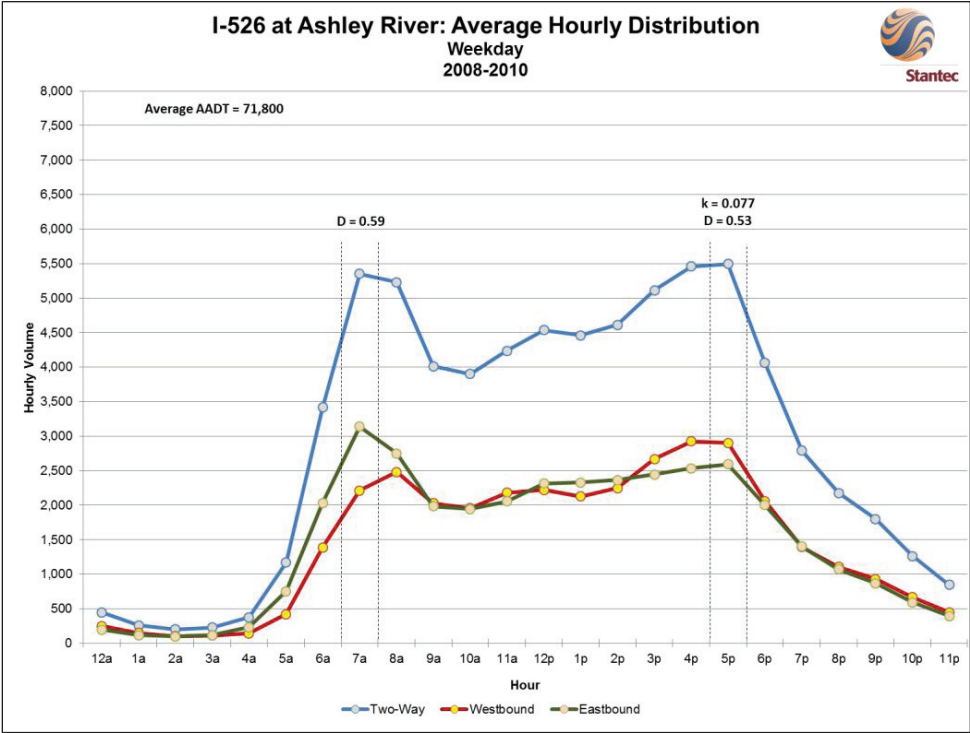


Exhibit 4-2: I-526 at Cooper River – Average Hourly Distribution

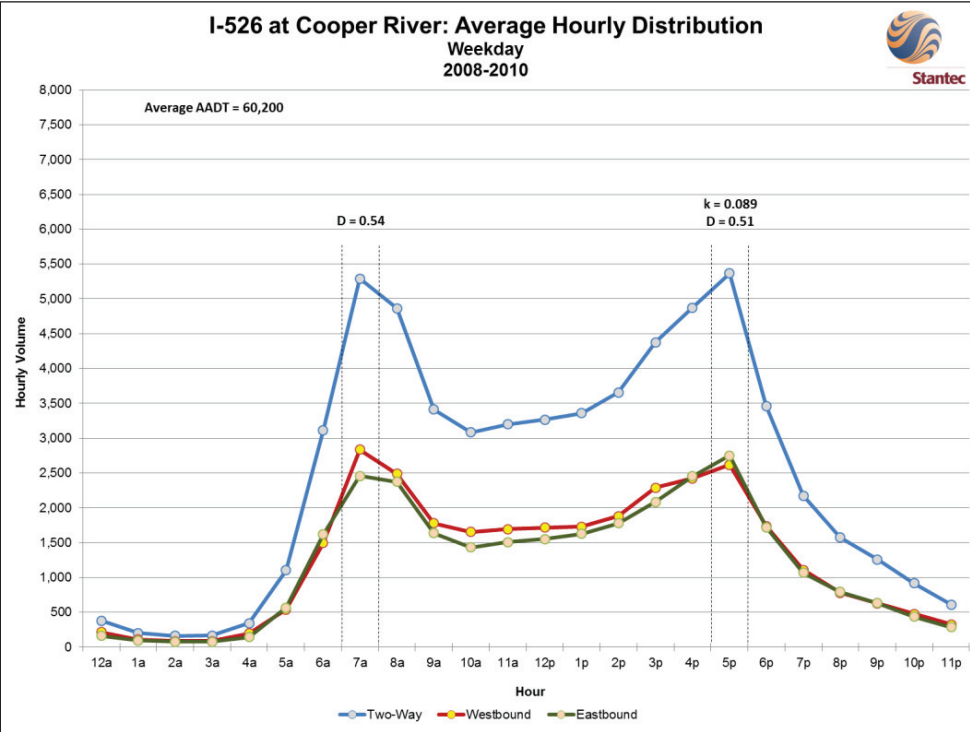


Exhibit 4-3: I-526 at Ashley River – Average Daily Distribution

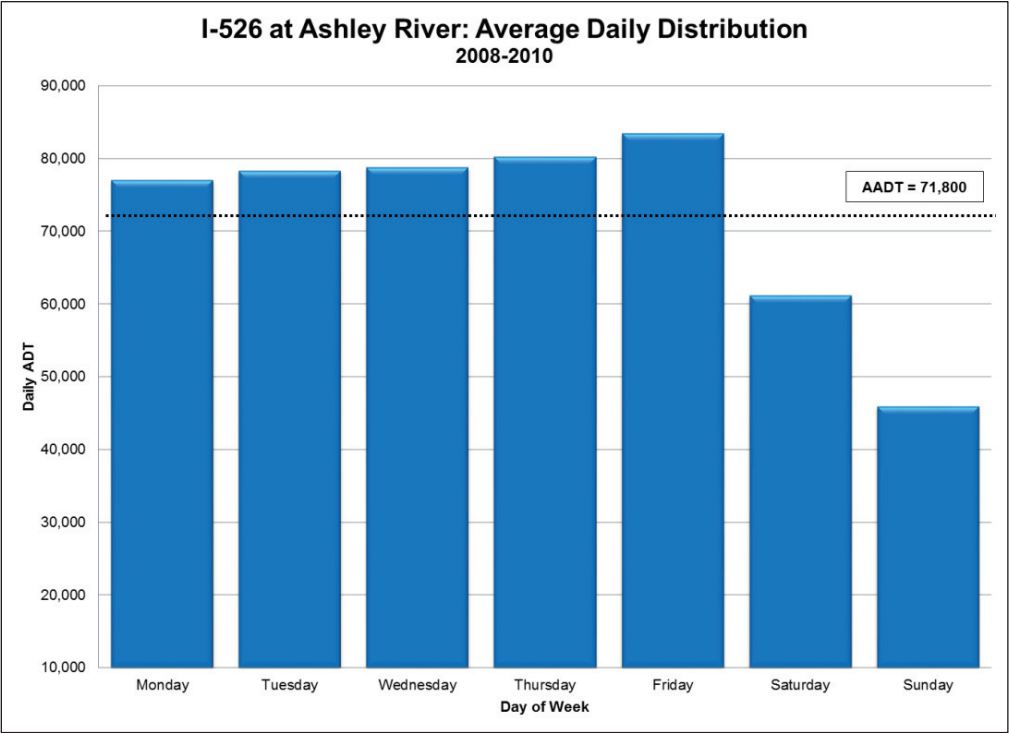


Exhibit 4-5: I-526 at Ashley River – Average Weekly Distribution

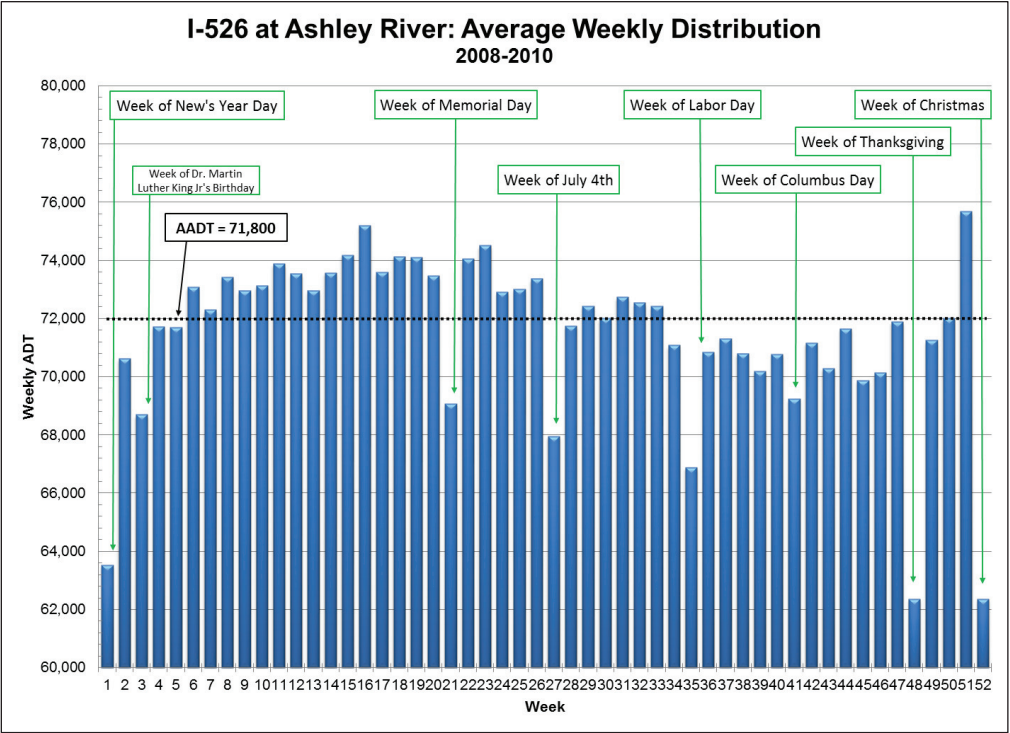


Exhibit 4-4: I-526 at Cooper River – Average Daily Distribution

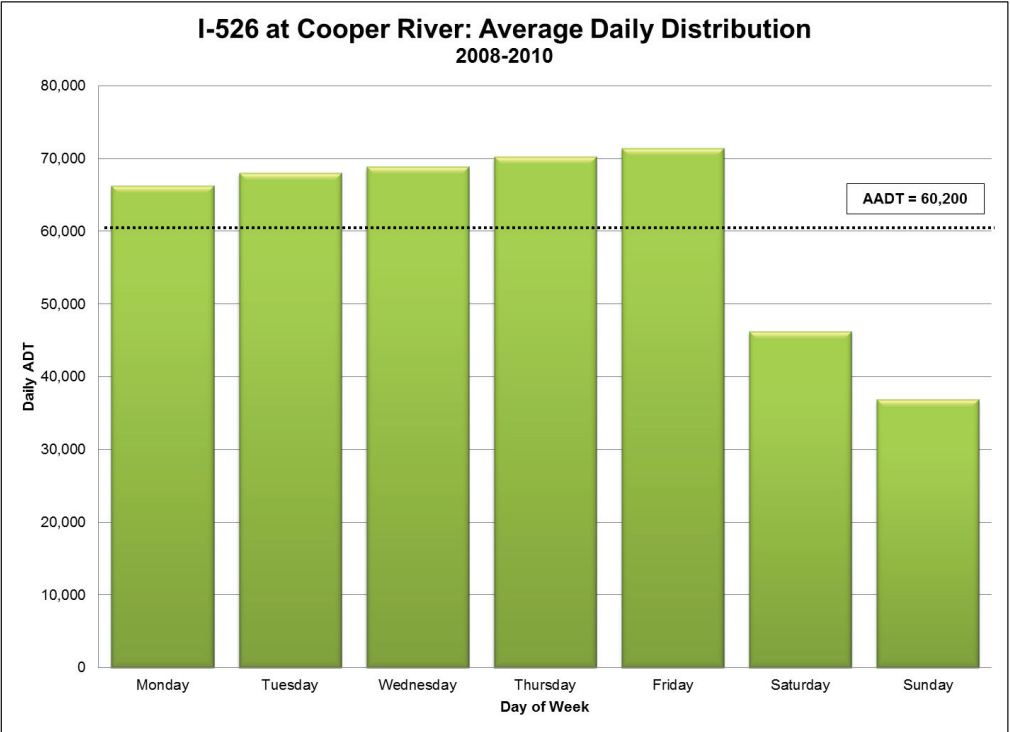


Exhibit 4-6: I-526 at Cooper River – Average Weekly Distribution

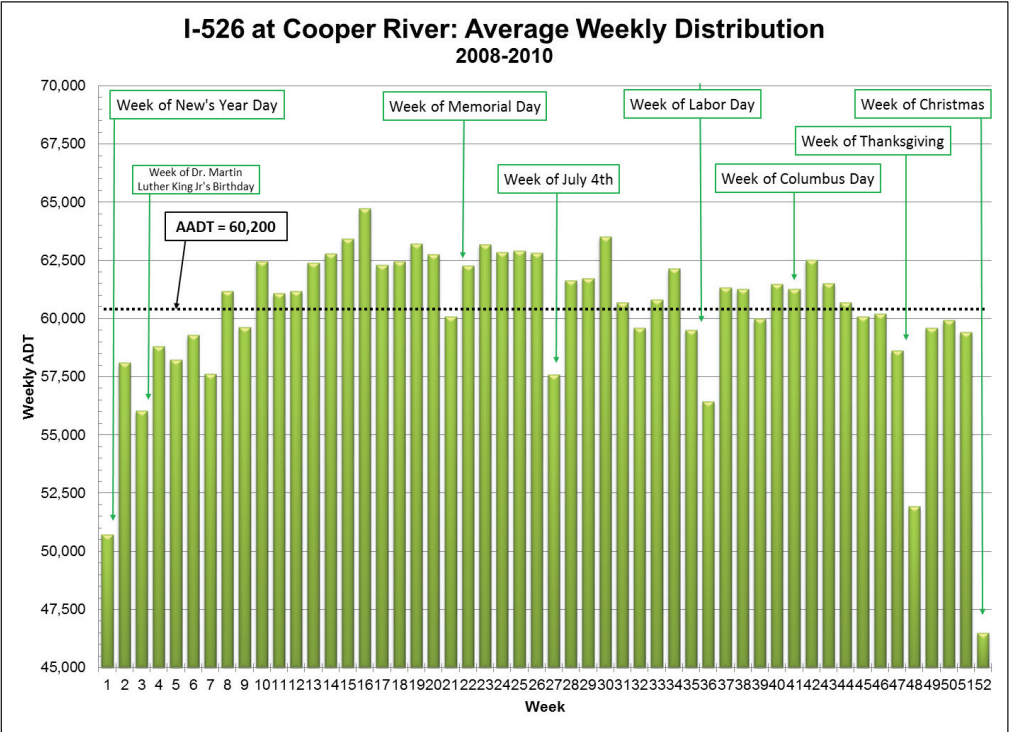


Exhibit 4-7: I-526 at Ashley River – Average Monthly Distribution

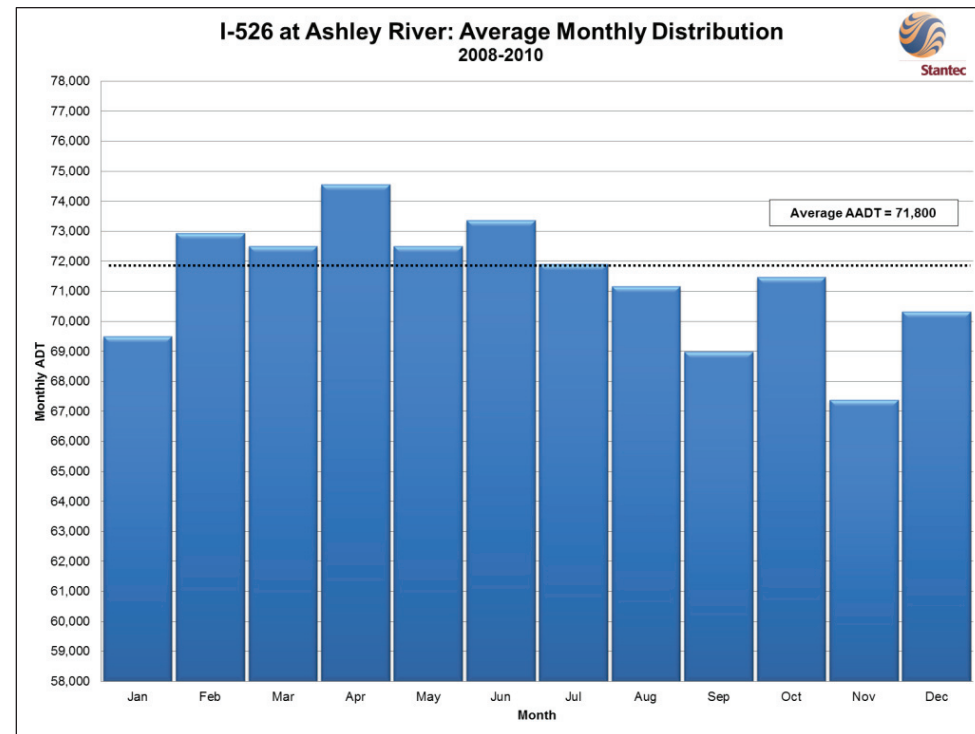
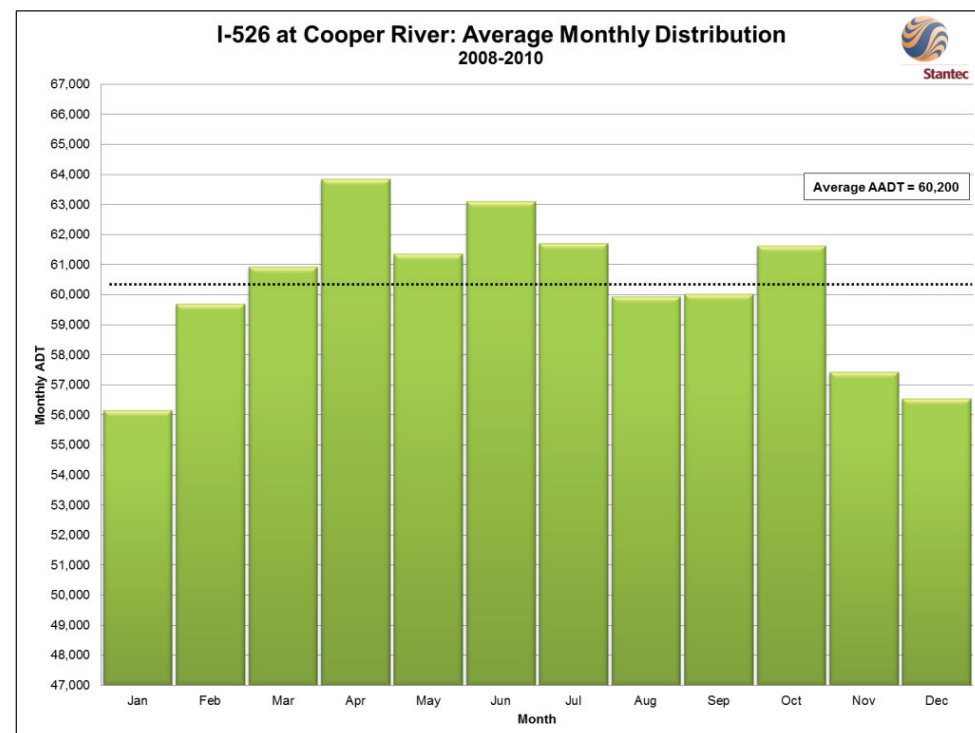


Exhibit 4-8: I-526 at Cooper River – Average Monthly Distribution



4.2.2 Traffic Growth Rates

To calculate the future year traffic volumes along I-526, I-26, and the surface streets in the study area, annual growth rates were determined using a number of sources. The growth rates were developed with and agreed upon by SCDOT and BCDCOG staff for use in the study. Those sources include the following:

- Historical growth over the past 10 years;
- CHATS model growth projections;
- Growth projections from Mark Clark Extension analysis (No Build scenario); and
- Growth projections from Mark Clark Extension analysis (Alternate G scenario).

A minimum annual growth rate of 1.0% was assumed. The I-526 corridor was broken up into three separate segments, one from US 17 to Paul Cantrell Boulevard, one from Paul Cantrell Boulevard to I-26, and one from I-26 to the Cooper River. I-26 was broken up into two segments at the I-526 interchange.

The growth rates generally ranged from 1.0% to 2.0% for the Interstate segments, and from 1.0% to 3.0% for arterials. Exhibits 4-9 and 4-10 show the recommended growth rates for each section of the study area.

Exhibit 4-9: Interstate Growth Rates

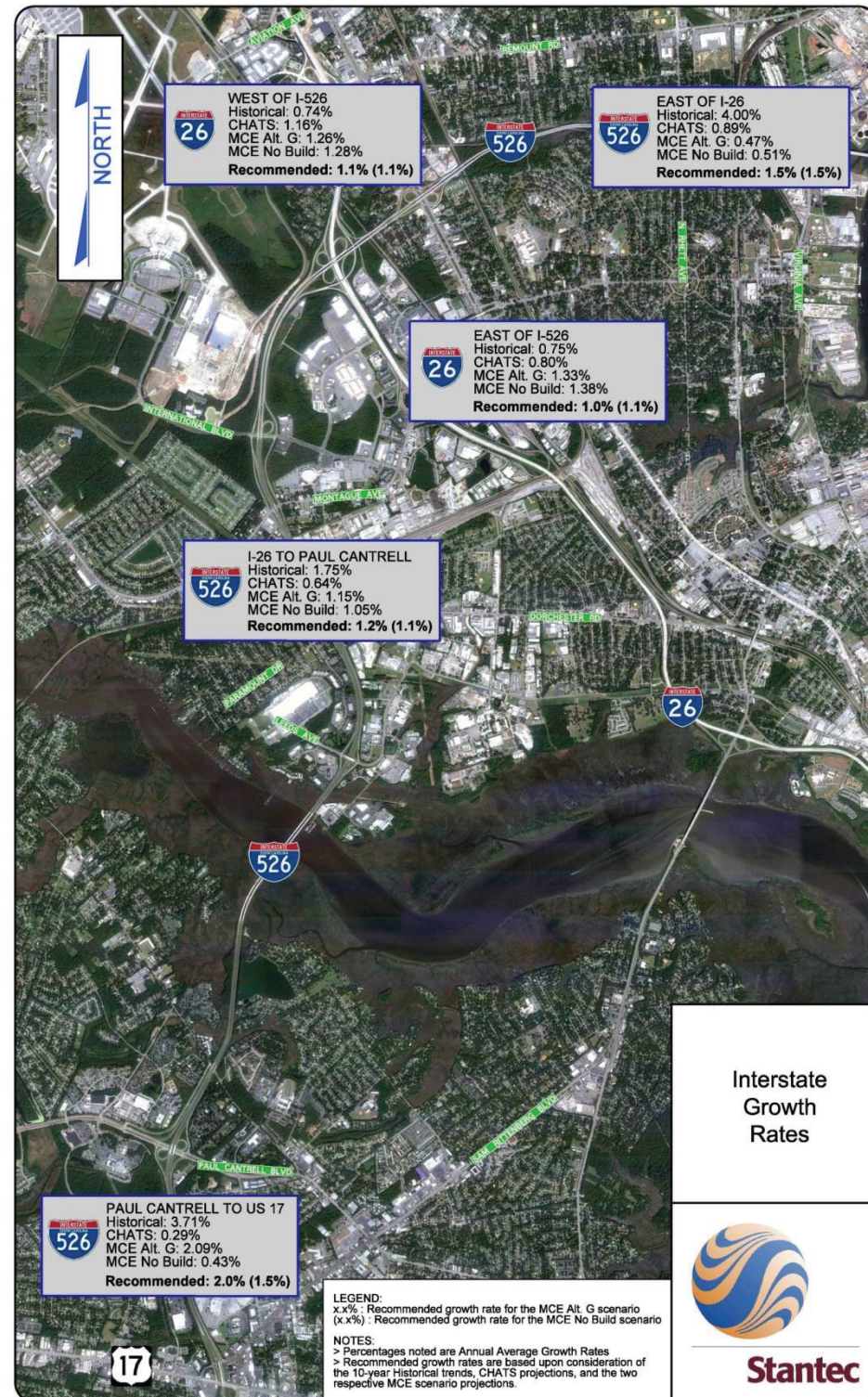
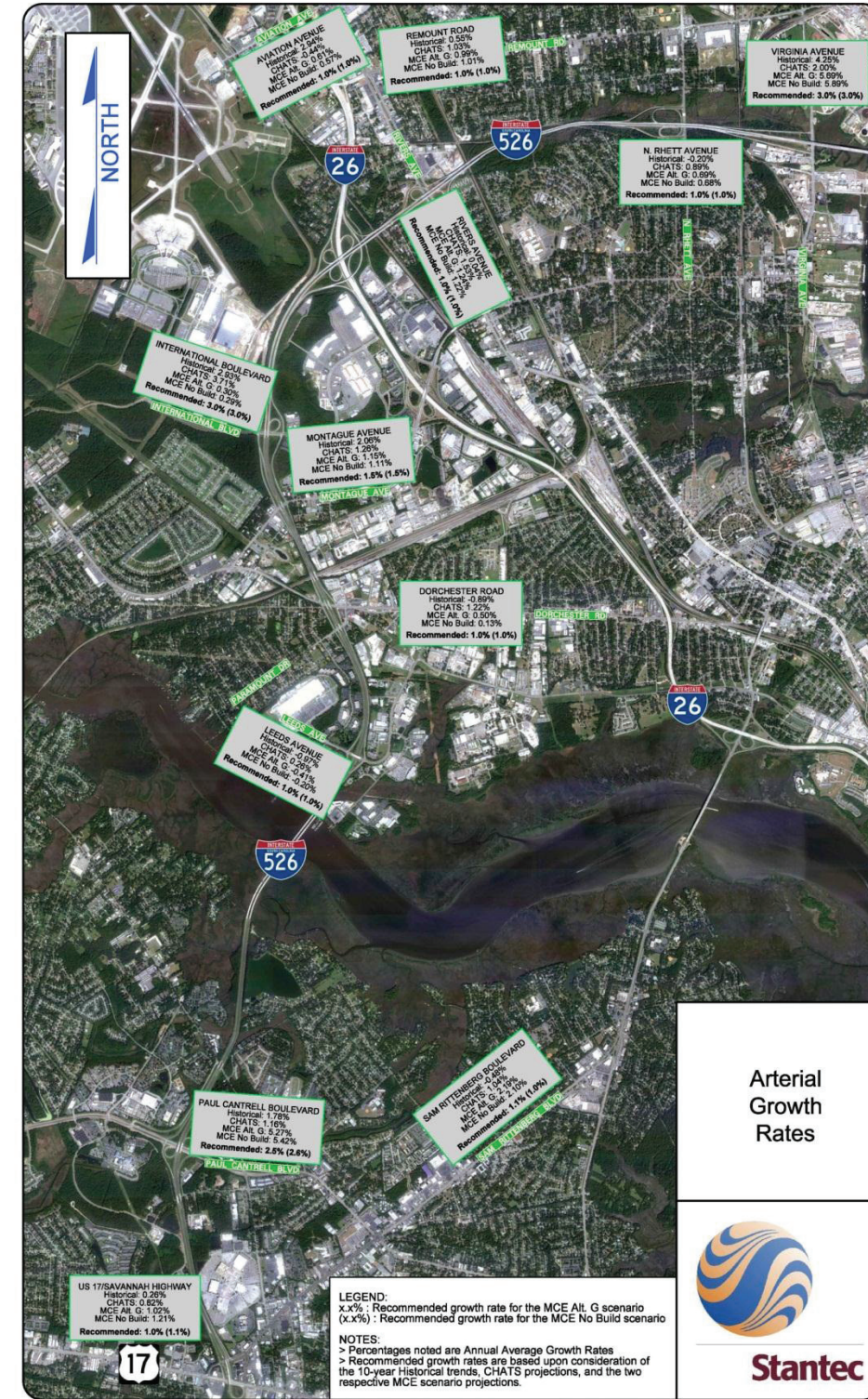


Exhibit 4-10: Arterial Growth Rates



4.2.3 Existing Traffic Information

Existing traffic information was collected along the I-526 study corridor, including turning movement counts and machine counts, intersection signal timing and phasing plans, and geometric data.

Turning movement counts were collected at 53 intersections from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM on a Tuesday, Wednesday, or Thursday during April 2011. The 53 intersections consisted of the interchange intersections along the study corridor and at least one intersection away in both directions from each interchange. The turning movement counts were collected in 15-minute increments and were classified by vehicle type. 24-hour machine counts were also conducted at the I-26 & I-526 interchange for all four mainline approaches and departures, as well as the eight interchange ramps.

It should be noted that April is the peak month for I-526 traffic, and area schools were in session when the counts were taken to capture the maximum demand. The AM peak hour occurs in the study area occurs between 7:00 AM and 8:00 AM and the PM peak hour occurs between 5:00 PM and 6:00 PM.

The existing traffic data indicates daily heavy vehicle percentages of 7.6% and 11.8% for I-526 west and east of I-26 respectively, and 7.1% and 3.8% for I-26 west and east of I-526 respectively.

Intersection signal timing and phasing plans were obtained from SCDOT and the local municipalities. It should be noted that for the first phase of the associated study analyses (existing year scenarios); no signal timing optimization was performed.

Geometric data such as link distance, number of lanes, turning lane storage length, lane widths, and vertical curvature were obtained through various site visits and using the aerial photography developed for the project, which was taken in the April 2011.

4.2.4 Existing Origin-Destination Information

As part of the analyses for the I-526 corridor, actual origin-destination data was needed to accurately model existing vehicle paths for use in the study *VISSIM* micro-simulation model. After evaluating available methods for collecting origin-destination data, the project team decided on an innovative approach using Bluetooth technology. The results of the Bluetooth data collection were very valuable in the analyses, as several additional uses for the data were utilized as the analyses moved forward.

Bluetooth sensors were deployed along the study corridor between interchanges to track vehicles traveling the corridor. The unique identifier for each Bluetooth device detected could be compared across the rest of

the sensors to determine the number of vehicles traveling to/from various portions of the network, including the travel time between sensors.

4.2.4.1 Bluetooth Data Collection

Traffax, Inc.'s BluFax technology was selected to collect the Bluetooth origin-destination data for the I-526 Corridor Analysis project. The data collected was utilized in several ways in the I-526 analyses:

- Development of an origin-destination matrix for use in the study *VISSIM* micro-simulation models,
- Determination of existing corridor travel times to calibrate the existing *VISSIM* models,
- Determination of weaving movements on all legs of the I-26 & I-526 interchange (adjacent interchanges are located less than a mile away on all four legs of the system-to-system interchange), and
- Planning of potential new transit routes.

Bluetooth wireless signals are emitted by a variety of devices today, including mobile phones, computers, personal digital assistants, car radios, and other digital devices. Every Bluetooth device has a unique 48-bit address called a MAC ID. The first half of the address is representative of the manufacturer code and the second half of the address is specific to the individual device. Devices must have their Bluetooth capability enabled to transmit the MAC ID for the purpose of identifying a device to communicate with, and to establish a link with the responding devices.

The BluFax sensors record MAC ID detections, recording spatially-based time and location data for a passing device. Travel times and space mean speed can then be calculated by matching the detections of common IDs at two sensor locations and subtracting the times of detection. Each BluFax sensor contains an internal GPS that synchronizes with a common time reference, a battery, a SD card, and a Bluetooth radio antenna. The BluFax sensors have an approximately 130-foot detection radius in all directions.

For the data collection along I-526, 13 sensors were deployed between interchanges at Interstate locations and five sensors were deployed along arterial roadways in the study network. Five days of data were collected between Saturday April 9, 2011 and Wednesday, April 13, 2011. Due to the approximately 50-pound sensor device weight, the sensors were primarily secured onto existing poles with mounting brackets.

4.2.4.2 Bluetooth Data Processing

The Bluetooth data recorded from the BluFax sensors were processed utilizing Traffax, Inc.'s BluSTATs software. The data processing consists of two steps: 1) processing the individual detections of MAC IDs and 2) calculating matches of the individual detections. The software allows the flexibility to analyze the

data by any desired time period (AM or PM peak hour, daily, etc.) and by any desired day (weekday, weekend, etc.).

From the individual detection matches, origin-destination and travel time matrices can then be developed. The travel time matrices report the following travel time information for the selected analysis period:

- Mean and median travel times;
- Minimum and maximum travel times; and
- 15th percentile, 25th percentile, and 75th percentile travel times.

The software allows the ability to filter the data as necessary and to generate summaries of the data in numerous ways, including various graphic tools and CSV file generation for both station (individual detections) and segment (detection matches) data.

4.2.4.3 I-526 Bluetooth Data Results

Over the five days of Bluetooth data collected along I-526, the 13 sensors placed at the Interstate locations recorded over 450,000 total detections representing an overall detection rate of approximately 6.5% of AADT. From those detections, over 300,000 matched pairs were calculated for the weekday period.

Origin-destination and travel time matrices were developed from the data for several time periods. The origin-destination matrices were utilized in the development of the study *VISSIM* micro-simulation models and the travel time matrices were utilized in calibration of the existing *VISSIM* base models. Exhibit 4-11 through 4-14 graphically illustrate the daily origin-destination percentages from the four endpoints of the study area, I-26 West, I-26 East, US 17/I-526 West End, and I-526 East, respectively.

The origin-destination matrices were also utilized to determine the weaving movements approaching and departing the I-26 & I-526 interchange. Due to the closely-spaced interchanges and existing and projected future traffic congestion, weaving issues were identified as a significant deficiency for a number of movements around the I-26 & I-526 interchange. The utilization of the origin-destination data was vital in the determination of existing weaving movements around the I-26 & I-526 interchange. The data aided in the development of improvement recommendations to address the weaving deficiencies, including braided ramps, the addition of ramp lanes, and/or increased weaving lengths.

Finally, the origin-destination matrices were also utilized in the planning of where new transit routes may be appropriate to remove vehicles from the study corridors.

Exhibit 4-11: Origin-Destination Percentages from I-26 West

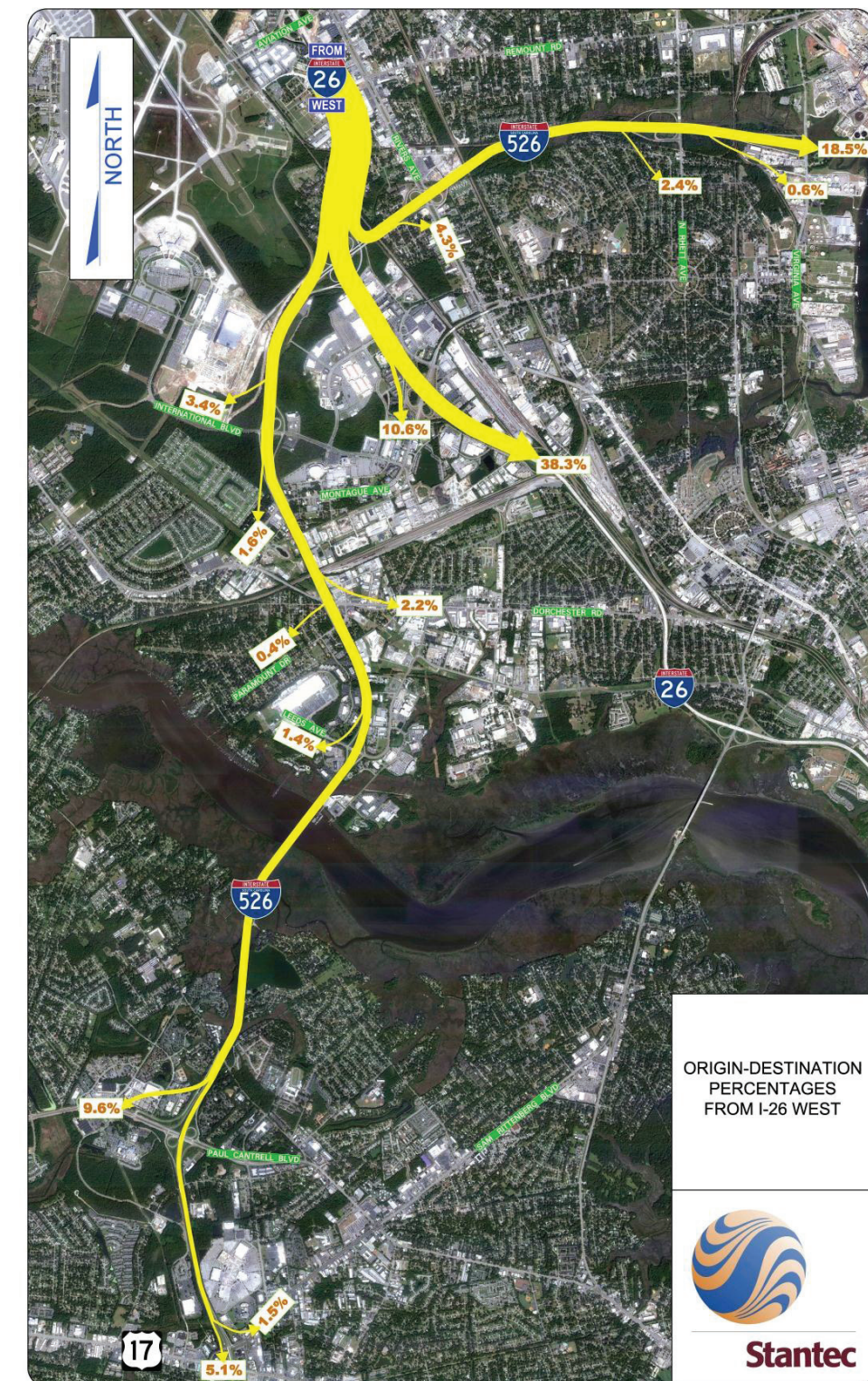


Exhibit 4-12: Origin-Destination Percentages from I-26 East

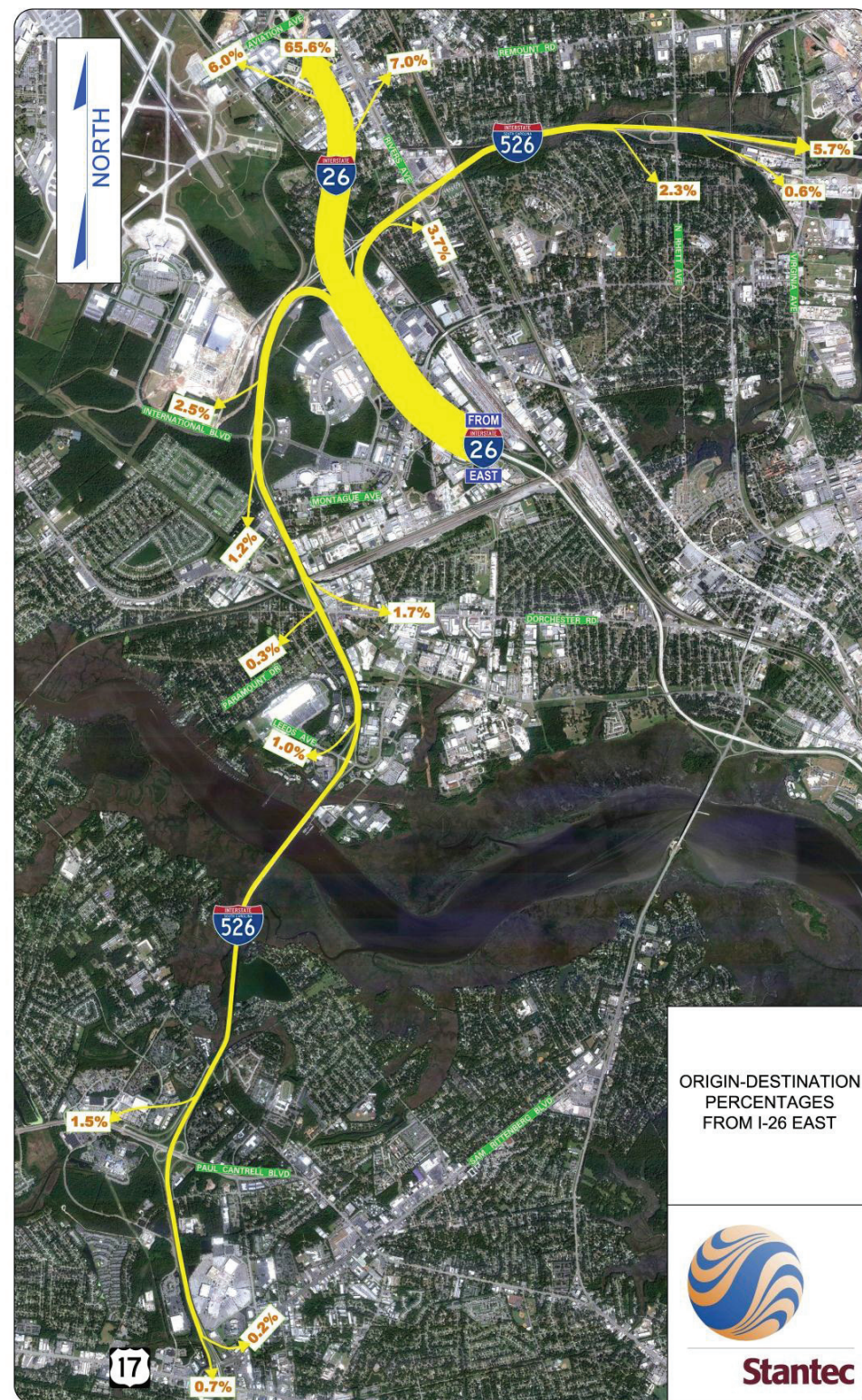


Exhibit 4-13: Origin-Destination Percentages from US 17/I-526 West

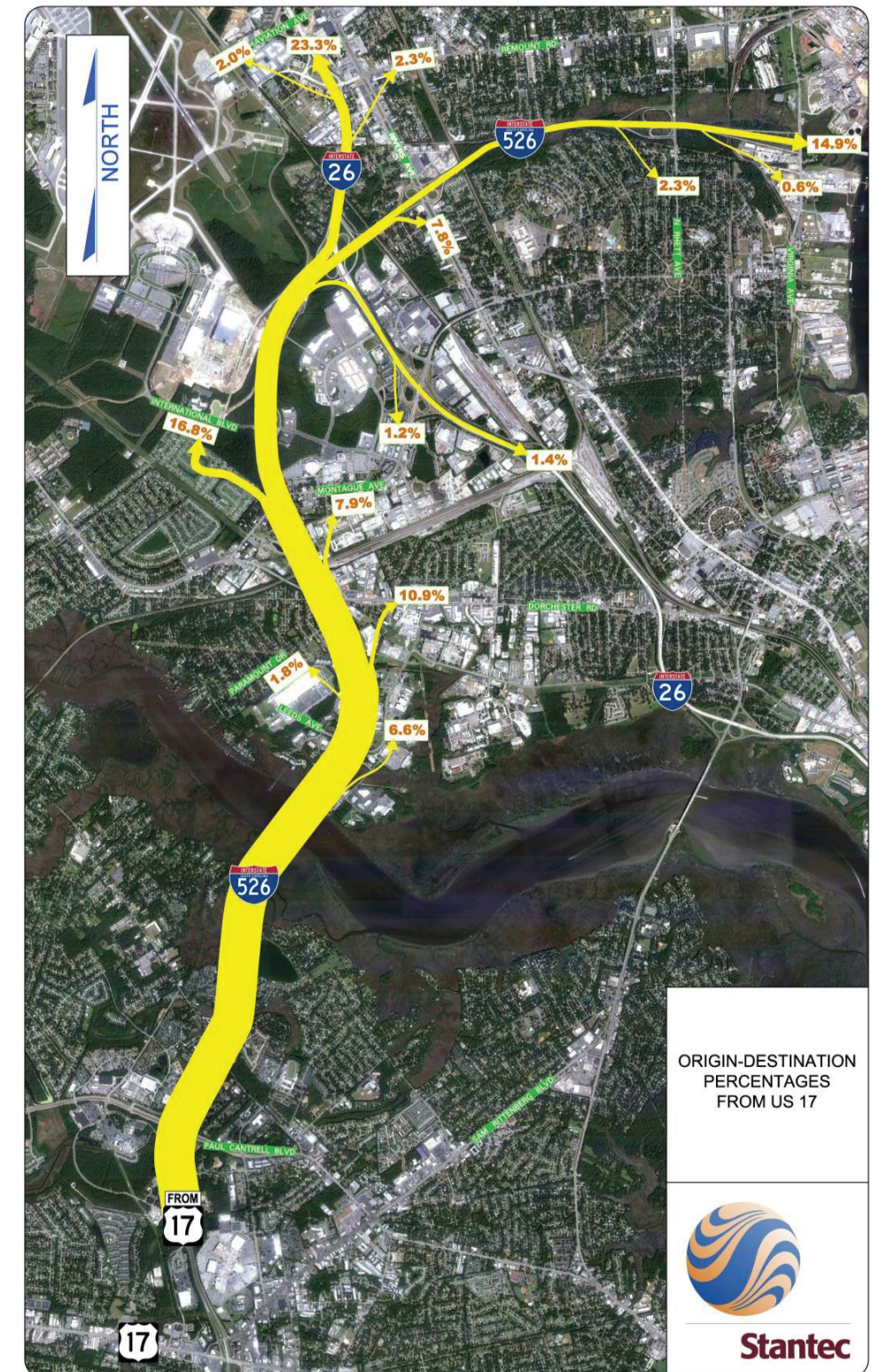
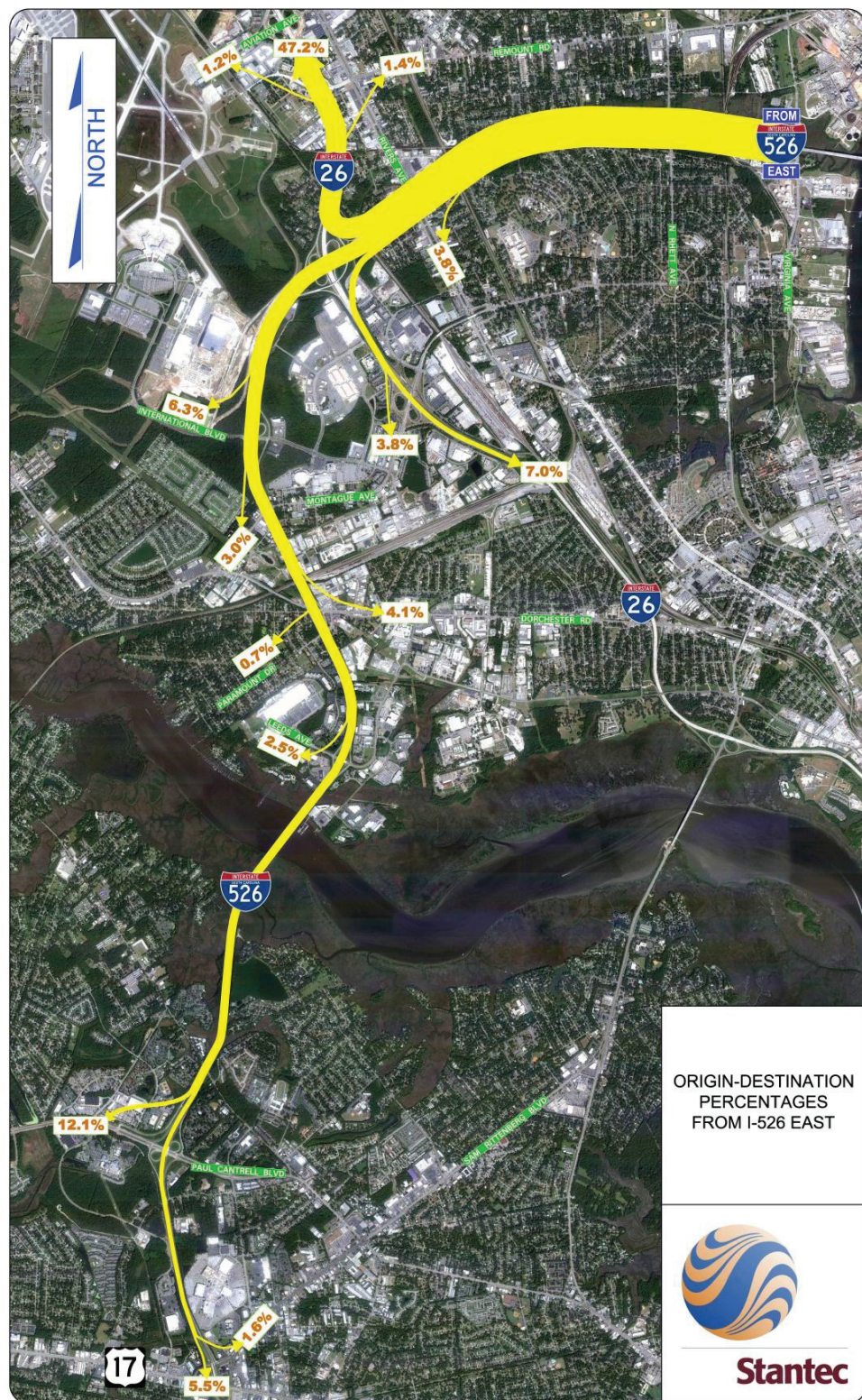


Exhibit 4-14: Origin-Destination Percentages from I-526 East



4.3 Site Visit/Observed Traffic Conditions

A visit to the site and the SCDOT District 6 Traffic Management Center (TMC) was conducted on Tuesday, May 24, 2011 and Wednesday, May 25, 2011. The site visits were done while local public schools were still in session, so as to capture the congestion from school traffic, and were done on days where congestion was considered to be normal. Discussions with TMC operators provided insight into where the major problem areas are located and what are possible solutions, as well as additional information needed to calibrate the corridor models.

Tables 4-4, 4-5, and 4-6 summarize the congestion observations for I-26, I-526, and the side streets.

Table 4-4: Congestion Observations – I-26 Corridor

INTERSTATE SEGMENT		EASTBOUND OBSERVATIONS	WESTBOUND OBSERVATIONS
I-26	Ashley Phosphate Road to Aviation Avenue	AM Peak: Congested after the merges from US 52 and Ashley Phosphate Road, but traffic is not typically stop and go. Traffic moves less than the free-flow speed, approximately 30-40 mph, with the slowest traffic in the right lane.	Congested, but traffic is not typically stop and go. Traffic moves less than the free-flow speed, approximately 40-50 mph, with the slowest traffic in the right lane.
I-26	Aviation Avenue to Remount Road	AM Peak: Congested, but traffic is not typically stop and go. Traffic moves less than the free-flow speed, approximately 30-40 mph, with the slowest traffic in the right lane.	Heavy congestion approaching the merge from Remount Road. After the merge, traffic moves less than the free-flow speed, approximately 40-50 mph, with the slowest traffic in the right lane. Congestion usually occurs through 6:30 PM.
I-26	Remount Road to I-526	AM Peak: Congested, but traffic is not typically stop and go. Traffic moves less than the free-flow speed, approximately 30-40 mph, with the slowest traffic in the right lane due to the weaving between the on ramp from Remount Road and the off ramp to I-526. PM Peak: Ramp to I-526 EB can back up to the I-26 mainline due to the merge onto I-526.	Heavy congestion, with stop and go traffic. Travel speeds less than 20 mph due to the merge of the on ramps from I-526 and the weaving to the Remount Road off ramp. Congestion usually occurs through 6:30 PM.
I-26	I-526 to Montague Avenue	--	Heavy Congestion, with stop and go traffic due to downstream friction. Travel speeds less than 20 mph.
I-26	Montague Avenue to Dorchester Road	--	Congestion typically begins one-to-two miles east of Montague Avenue. Travel speeds approximately 30-40 mph.

Table 4-5: Congestion Observations – I-526 Corridor

INTERSTATE SEGMENT		EASTBOUND OBSERVATIONS	WESTBOUND OBSERVATIONS
I-526	Cooper River to Virginia Avenue	--	--
I-526	Virginia Avenue to Rhett Avenue	Congested, but traffic is not typically stop and go. Traffic moves less than the free-flow speed, approximately 30-40 mph.	--
I-526	Rhett Avenue to Rivers Avenue	Congested, but traffic is not typically stop and go. Traffic moves less than the free-flow speed, approximately 30-40 mph.	Congested, but traffic is not typically stop and go, due to the on ramp merge from Rhett Avenue and the downstream weaving area at Rivers Avenue. Traffic moves less than the free-flow speed, approximately 30-40 mph, with the slowest traffic in the right lane.
I-526	Rivers Avenue to I-26	Congested, but traffic is not typically stop and go. Traffic moves less than the free-flow speed, approximately 30-40 mph due to the weaving between the on ramps from I-26 and the off ramps to Rivers Avenue.	Congested, with stop and go traffic in the right lane due to the weaving between the on ramp from Rivers Avenue and the off ramp to I-26 WB.
I-526	I-26 to International Blvd	Ramp to I-26 WB typically backs up to the gore of the diverge area, but does not usually impact the I-526 mainline.	--
I-526	International Blvd to Montague Avenue	--	--
I-526	Montague Avenue to Dorchester Road	--	--
I-526	Dorchester Road to Leeds Avenue	--	Congestion begins approximately one mile west of Leeds Avenue, but traffic is not typically stop and go, due to the on ramp merge from Leeds Avenue and the downstream congestion at Glenn McConnell Parkway. Traffic moves less than the free-flow speed, approximately 30-40 mph, with the slowest traffic in the right lane.
I-526	Leeds Avenue to Glenn McConnell Pkwy	--	Congested, with stop and go traffic in the right lane due to the off ramp to WB Glenn McConnell Parkway.
I-526	Glenn McConnell Pkwy to Sam Rittenberg Blvd	--	Right-lane (turning) traffic, destined for US 17 SB, backs up approximately one half mile due to the signal at Sam Rittenberg Blvd.
I-526	Sam Rittenberg Blvd to US 17/Savannah Hwy	--	--

Table 4-6: Congestion Observation – Arterials

ROADWAY	OBSERVATIONS
Virginia Avenue	No significant congestion issues.
Rhett Avenue	I-526 EB and WB ramp intersections are congested in the PM. Both EB and WB off-ramp traffic from I-526 backs up on the ramps, sometimes affecting mainline traffic. Typically takes two cycles to clear the ramps.
Rivers Avenue	Congestion in the NB direction in the PM peak hour. On-ramp to I-526 WB can back up to Rivers Avenue due to weaving on I-526.
International Blvd	Congestion around the I-526 interchange throughout the day. Both directions experience backups beyond the interchange due to spill-over and blocking from the left-turn lanes to I-526 EB and WB.
Montague Avenue (around I-526)	No significant congestion issues.
Dorchester Road	No significant congestion issues.
Leeds Avenue	No significant congestion issues. There is a large business park to the west of the interchange that likely results in a high directional split.
Glenn McConnell Pkwy	Congestion around the intersection with Magwood Drive, especially the SB queues backing up beyond the Food Lion driveway in the PM peak hour. The eastbound left-turn to I-526 EB is generally heavy throughout the day, but doesn't back up to the through lanes.
Sam Rittenberg Blvd	Potential lack of coordination between the I-526 signal with the adjacent signals on US 17 creates backups onto I-526 WB.
US 17/Savannah Hwy	Heavy traffic experienced throughout the day, with congestion in the PM peak hour mainly in the WB direction.
Aviation Avenue	No significant congestion issues.
Remount Road	No significant congestion issues.
Montague Avenue (around I-26)	Congestion in the WB direction in the PM peak hour between I-26 and International Blvd, mainly in the right lane due to the signal at International Blvd.

4.4 Travel Demand Management

In addition to the U.S. Census data that was described previously, a questionnaire was developed as part of the I-526 Corridor analysis to determine, in part, the extent of existing TDM and transit programs that area employers have implemented for their employees. The questionnaire is described in detail in Chapter 5 – Travel Demand Management Strategies and Chapter 6 – Modal Strategies. The response of the questionnaire for the Charleston area indicated that approximately 97% of employees drive alone to work, with the remaining employees being dropped off, using transit, using carpools, or bike or walk to work.

The results of the questionnaire seems to be more conservative than the U.S. Census data results, and indicates that there is room for improvement around the I-526 corridor and the Charleston area in general.

There are a number of existing TDM programs that are currently in operation in the Charleston area that can be built upon.

- BCDCOG's Trident Rideshare is an online carpool/vanpool rideshare matching program, which includes a guaranteed/emergency ride home program. BCDCOG staff also developed a marketing campaign to promote the use of the online website.
- CARTA and TriCounty Link have numerous Park & Ride locations around the Charleston area, and both include the use of shuttles and marketing campaigns.
- Boeing includes staggered shifts in its operations.
- The City of North Charleston currently utilizes and encourages carpools and compressed work weeks for certain employees, and provides preferred parking spaces.
- Roper St. Francis Hospital implements work flextime and staggered shifts for certain employees.
- Tanger Outlet Mall has used direct mail gift certificates worth \$25 which can only be redeemed during the midday hours.
- Trident Technical College encourages student carpools.
- SCDOT allows compressed work week for certain employees. SCDOT also enforces access management standards and implements the Safe Routes to School program providing for sidewalk connectivity to numerous local schools in the area.
- Medical University of South Carolina (MUSC) currently utilizes and encourages carpools, provides for preferred parking spaces, and utilizes shuttles in downtown Charleston.
- The Federal Highway Administration (FHWA) in Columbia utilizes telecommuting for their employees.

4.5 Alternate Travel Modes

The I-526 corridor study area is served by both of the area's regional transit providers; CARTA and TriCounty Link. The Charleston Area Regional Transportation Authority (CARTA) provides Fixed-route, Flex Service, Express commuter service, and Paratransit service throughout the urbanized areas of Charleston, North Charleston, and the adjacent urban areas. TriCounty Link (Berkeley-Charleston-Dorchester Regional Transportation Management Association (RTMA)) provides fixed route and demand-

response services to the outlying rural areas. The TriCounty Link provides four routes within the study area and passengers are able to transfer to CARTA routes at designated bus stops.

The efficient movement of freight is also a critical consideration for the overall operation of the I-526 corridor. The I-526 Corridor is not only used by numerous trucking firms and businesses that deliver goods and services to commercial and retail facilities but also provides direct access to the Port of Charleston, one of the busiest ports in the southeastern United States.

4.5.1 Existing CARTA Ridership

CARTA and TriCounty Link both provide services within the I-526 corridor study area. Their network of park-and-ride facilities, Express Routes, fixed and demand-responsive routes provide a vital link to employment, medical, transportation, and retail centers throughout the corridor for both residents and visitors alike.

CARTA currently operates three Express Service Routes which pass through the I-526 corridor. These routes provide limited stop service between N. Charleston-Charleston-James Island (Route 1), W. Ashley-Charleston-Mt. Pleasant (Route 2), and Summerville-N. Charleston-Charleston (Route 3). Express Route #1, which connects North Charleston to the City of Charleston via the US 52 corridor is one of CARTA's most successful routes as it serves 80,000 – 90,000 passengers per month. Due to the popularity of this route, in June 2012 CARTA added an additional bus to this route to accommodate the increasing ridership demands. Riders on the Express Routes are able to transfer to CARTA fixed route bus service or TriCounty Link at the K-Mart and Citadel Mall Park-n-Ride facilities.

In addition to the Express Routes, CARTA also provides eight fixed routes which serve the I-526 corridor study area. These fixed routes generally run along the main regional roadways which cross the I-526 corridor and complement the Express Routes by providing connectivity to the residential communities as well as major employment and retail centers in the West Ashley and North Charleston areas. The combination of Express Routes and flex/demand route services throughout the area has been successful in attracting ridership and relieving roadway congestion. Since 2005, CARTA ridership has steadily increased and reached record levels of 4,170,207 passengers in 2010. The June 2012 CARTA director's report indicates that year-to-date ridership is up 13.66% from last year's ridership.

In addition to the CARTA services, TriCounty Link also plays a critical role in providing transit services in the corridor. TriCounty link provides three bus routes which provide service between the outlying areas of Johns Island, Wadmalaw Island, Hollywood, and Edisto Island and the CARTA bus service at the Citadel

Mall. Once at the Citadel Mall, TriCounty Link passengers can transfer to the CARTA buses and get to their final destinations in the greater Charleston area. In addition, TriCounty Link also provides a route linking Moncks Corner, Goose Creek, and North Charleston. As indicated above, the North Charleston stop located at the K-Mart Park-n-Ride facility on Rivers Avenue allows riders to transfer to the CARTA bus system. The ridership on the TriCounty Link system is approximately 200,000 per year.

4.5.2 Existing Freight Measures

The existing freight traffic along the I-526 Corridor can generally be broken down into Port-related and commercial based shipments which account for approximately 11.8% of the overall volume on the east side of I-26 near the Rivers Avenue interchange and 7.6% of the total traffic volume on I-526 at the Ashley River (Westmoreland Bridge). The Port related freight and commercial freight movement account for approximately 59% and 41% of the total truck traffic, respectively.

The Port of Charleston currently operates four terminals in the Charleston area of which two terminals (North Charleston and Wando Welch) are dedicated to containerized shipments. The N. Charleston terminal includes three berths and has on-dock rail service provided by the SC Public Railroad (SCPR). The SCPR has connections to both CSX and NS railroads. The Wando Welch terminal is the largest port terminal and includes four berths and over 240 acres of container storage. In addition, it contains on-site facilities for US Customs and US Dept. of Agriculture inspections. Containers shipped from the N. Charleston and Wando Welch terminals are generally shipped via I-526 to local warehouses, railroad facilities, or to other local and regional destinations. The container shipments are generally distributed as follows:

- ~20% stay in the Charleston area (local deliveries)
- ~20% are imported / exported via rail
- ~55% enter or leave Charleston via the I-26 Corridor (providing access to I-95, I-20, I-77, and I-85)
- ~5% enter or leave Charleston via US 17

Commercial based freight movements include all non-containerized cargo along the I-526 Corridor. These shipments include a variety of deliveries to areas such as retail / wholesale stores, convenience stores, mail / parcel services, petroleum deliveries, etc. While many of these truck operators use the I-526 corridor to reach their designated routes, the majority of their time is spent on the local road and street networks.

Commercial freight deliveries typically originate at an area warehouse and drivers are assigned a specific route with specific delivery destinations. While traffic congestion (commuter peaks), total mileage, and truck

idle times are considered when establishing the truck routes, the deliveries must also accommodate the customer's store hours and receiving schedules. Work schedules for the commercial truck operators generally begin in the early morning hours (5-6 AM) and conclude in the mid to late afternoon hours (2-6 PM).

4.6 Crash Data Review

Crash data was provided by SCDOT and collected within the project area over a three year period from 2008 to 2011. Exhibits 4-15 and 4-16 illustrate the areas along the study corridor where a relatively high number of crashes have occurred, with the wider bands widths indicating a greater number of crashes and are located at interchange areas.

A total of 1,014 crashes were tabulated for the three-year review period. Of those crashes, over half (58.7%) were either right angle (118) or rear end (477) crashes. These types of accidents are generally associated with vehicular turning movements and stop and go conditions, respectively. Side swipe accidents (152) accounted for 15.0% of the accidents and are attributed to poor weave conditions. The 0.7% of fatal accidents is comprised of seven accidents involving eight fatalities.

Exhibit 4-15: I-526 Crash Data (North)

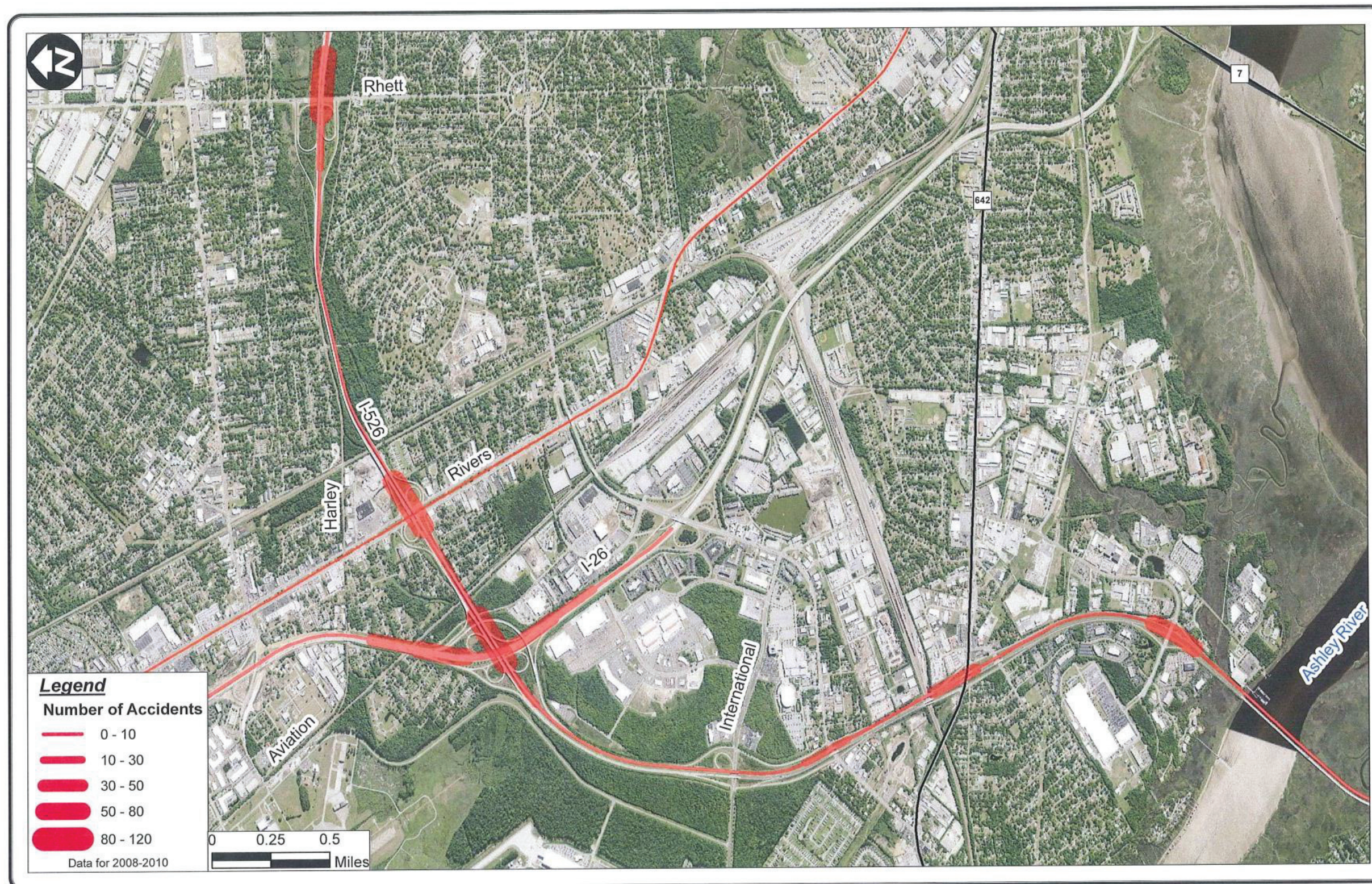
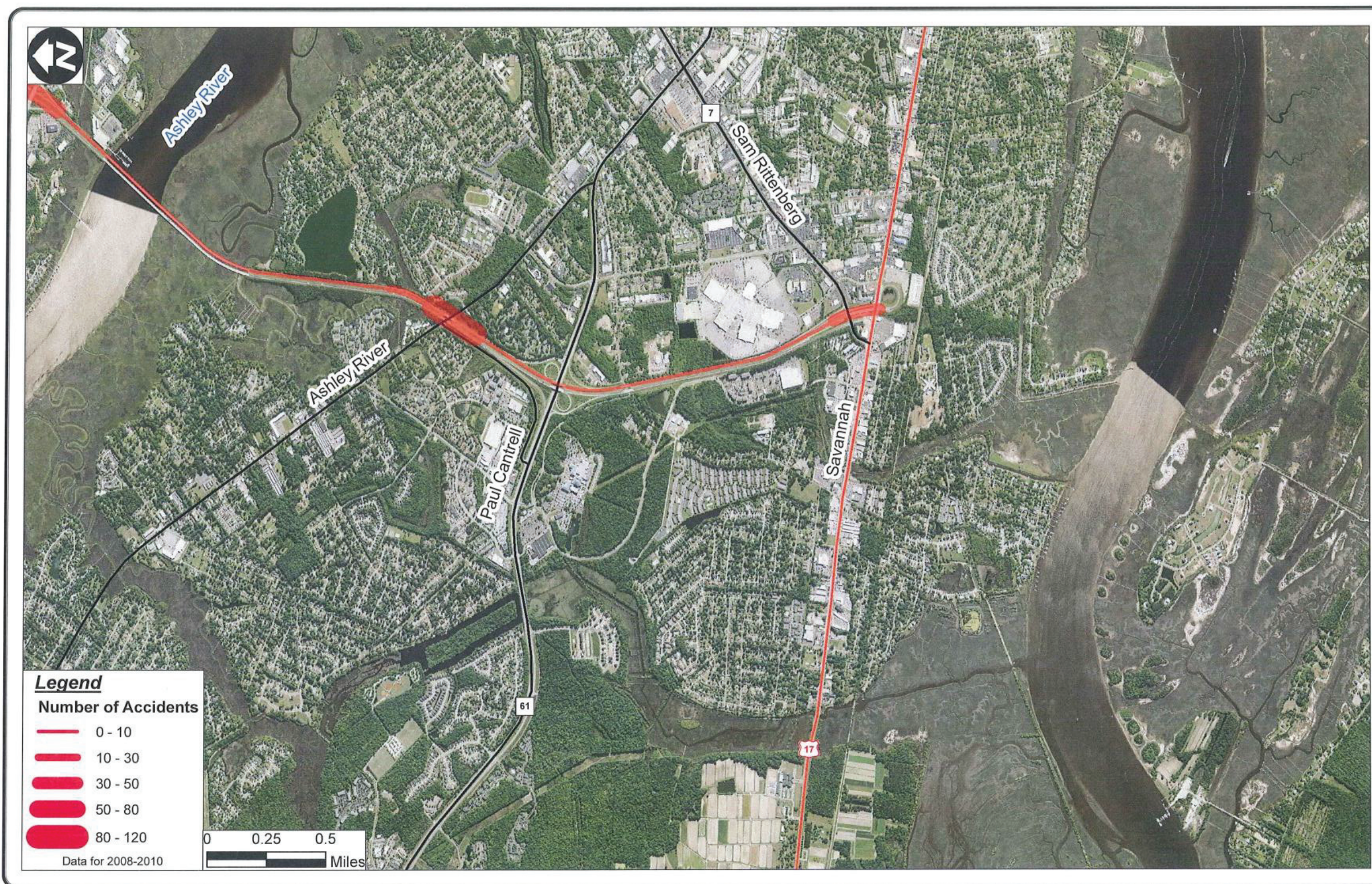


Exhibit 4-16: I-526 Crash Data (South)



4.7 INRIX Travel Speed Information

SCDOT has developed travel speed graphs depicting average annual hourly speeds for Interstates around South Carolina, including I-526, using INRIX travel time information. The graphs provide a means of pinpointing congestion areas along I-526, as well as speed trends back from 2009. Exhibits 4-17 through 4-20 illustrate the travel speed graphs of I-526 Eastbound and Westbound for the available hourly speed information of 2009, 2010, 2011, and 2012.

The travel speed graph for I-526 Westbound illustrates a significant drop in speed, to 39 mph, at Leeds Avenue for the 5:00 PM hour. This drop in speed is consistent with the spiral graphs for previous years, and validates the field observations between Dorchester Road and Leeds Avenue previously discussed in this Chapter. There is also a noticeable decrease in speed, to 49 mph, between the Don Holt Bridge and I-26 in the 5:00 PM hour. However, the 2012 hourly speed is greater than the previous few years, likely due to the completion of the I-26 widening improvements at the Aviation Avenue and Remount Road interchanges.

In the I-526 Eastbound direction, the travel speed graphs reveal minor congestion issues, but no significant speed drops throughout the day. There are minor dips in speed, to the 50s mph, between Rivers Avenue and I-26 for the 8:00 AM and 5:00 PM hours. The I-526 Eastbound speed data appears to be consistent back to 2009.

Exhibit 4-17: 2009 I-526 Eastbound & Westbound Hourly Speeds

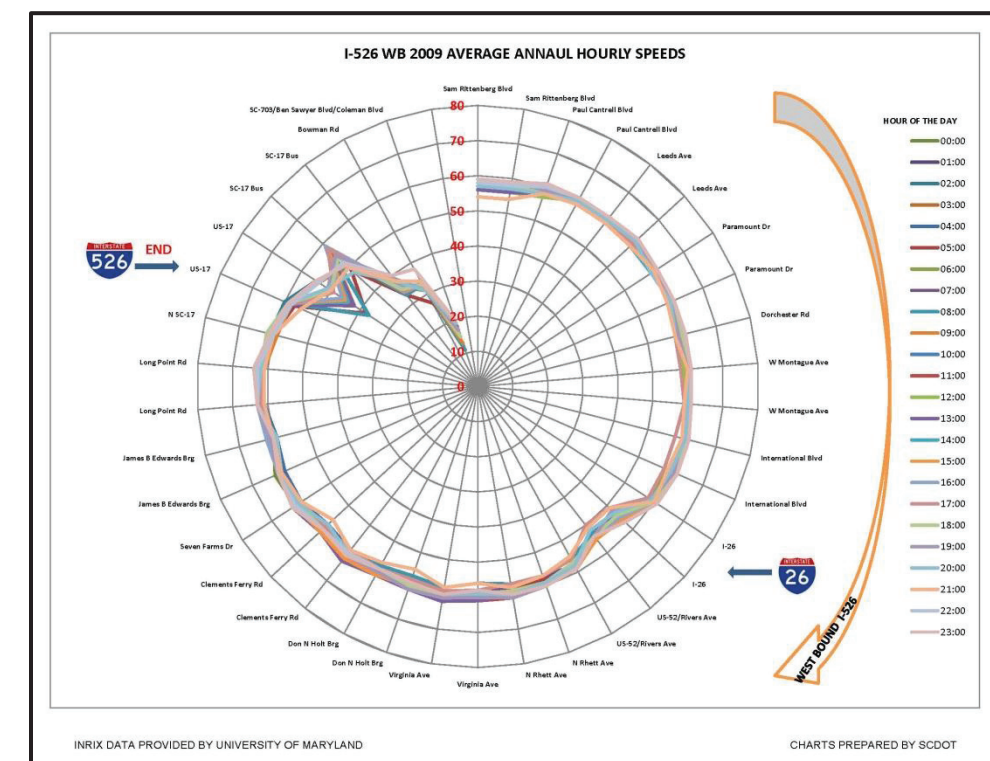
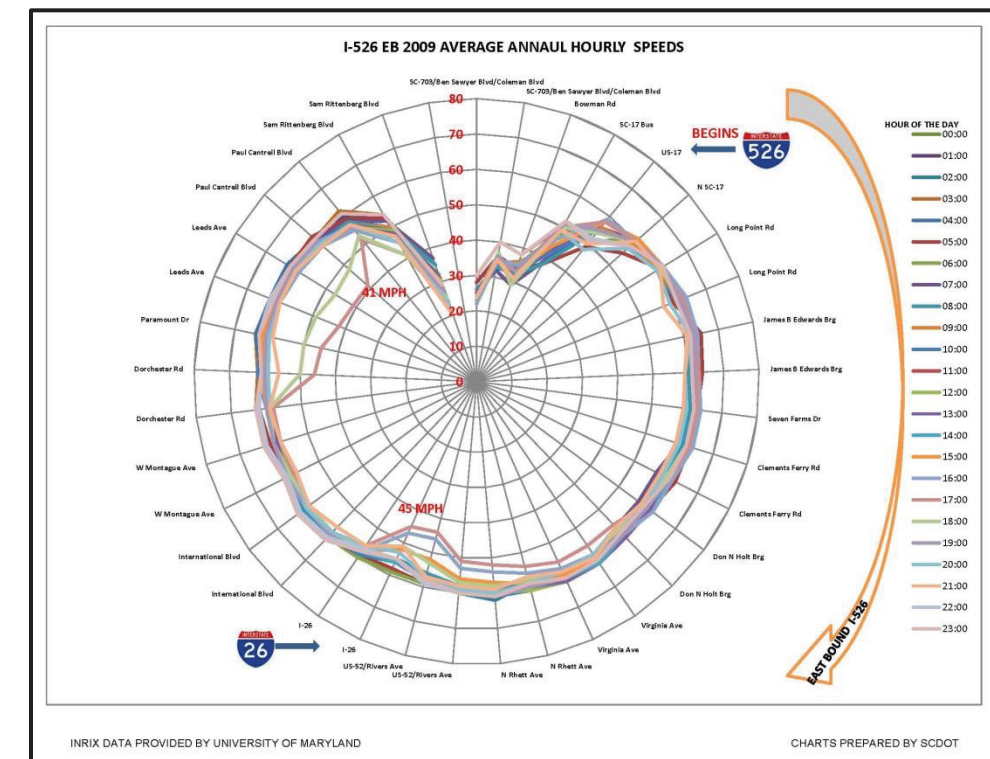


Exhibit 4-18: 2010 I-526 Eastbound & Westbound Hourly Speeds

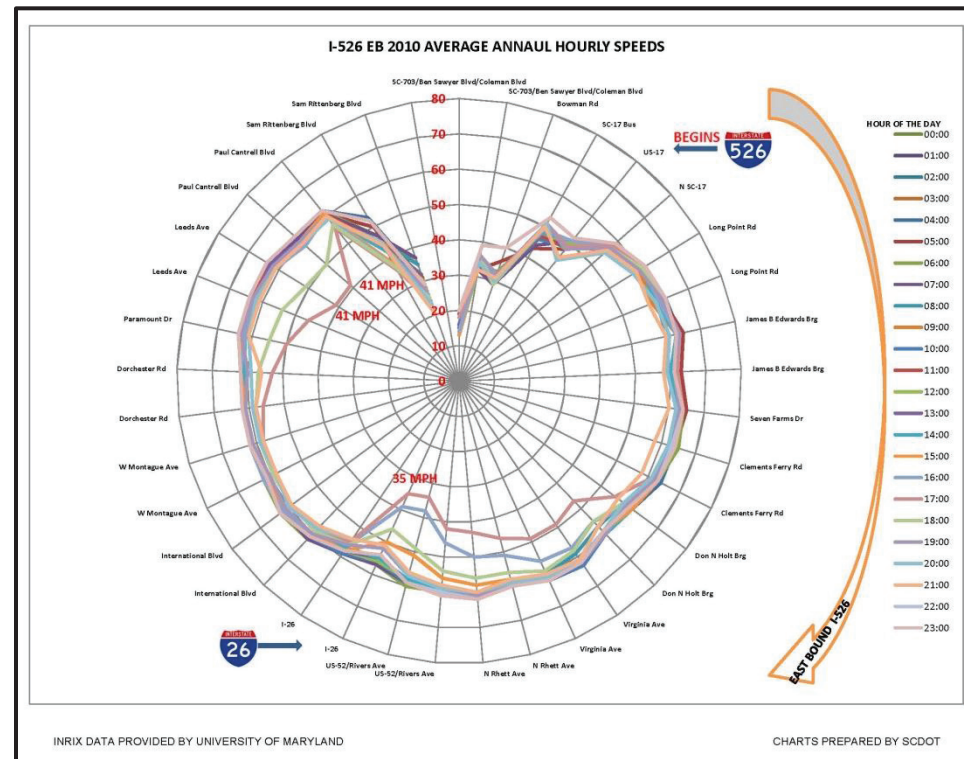


Exhibit 4-19: 2011 I-526 Eastbound & Westbound Hourly Speeds

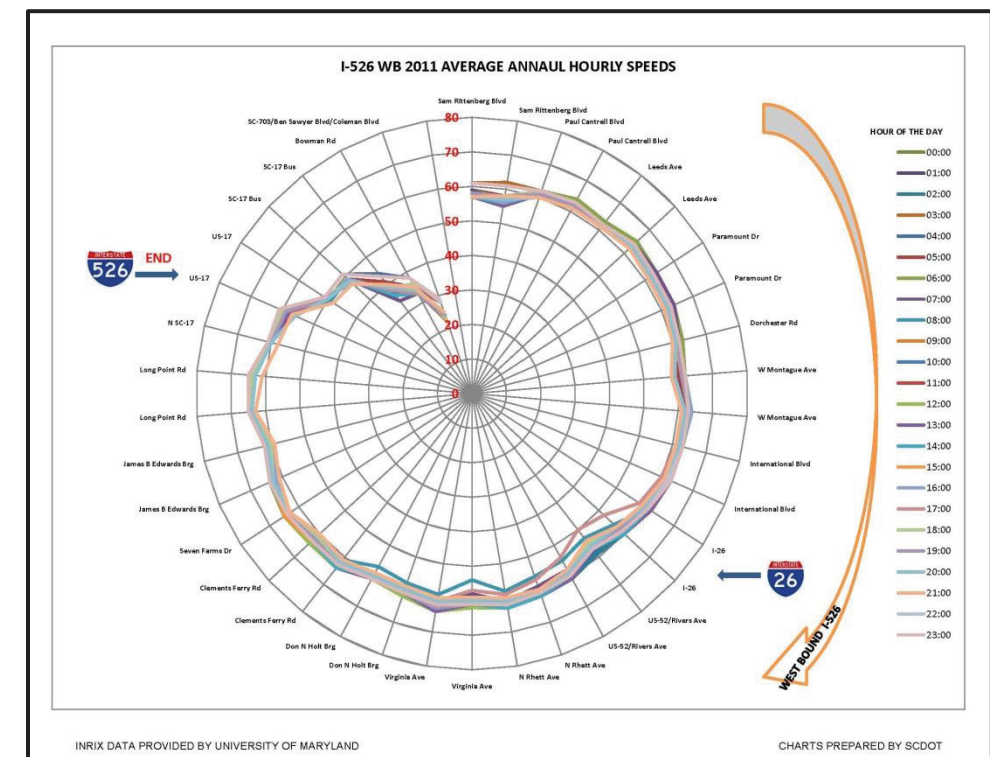
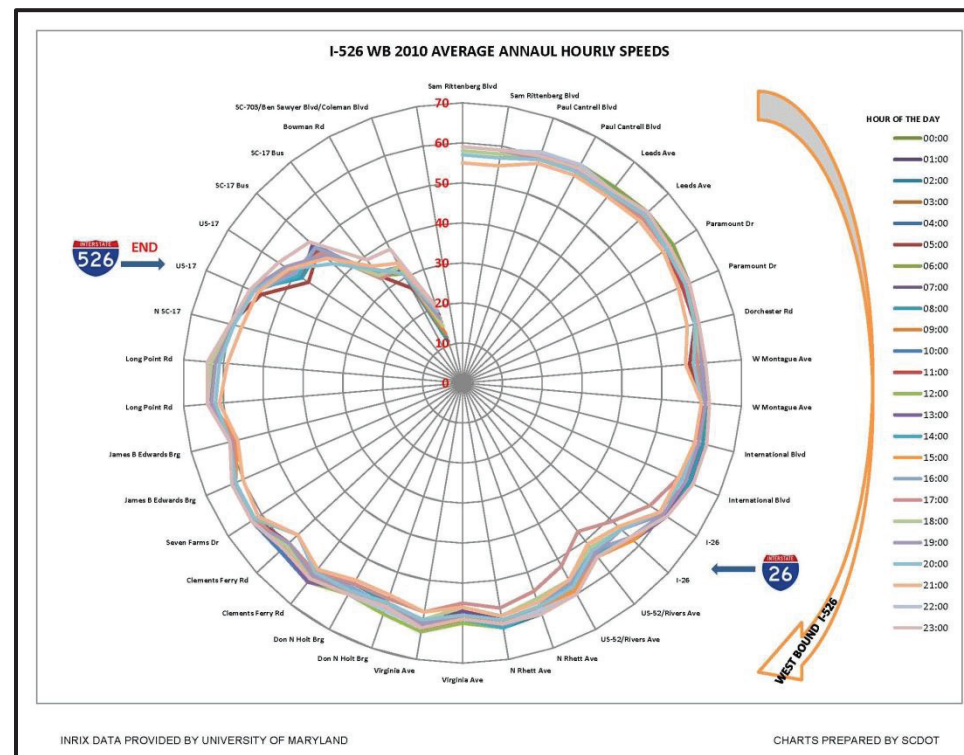
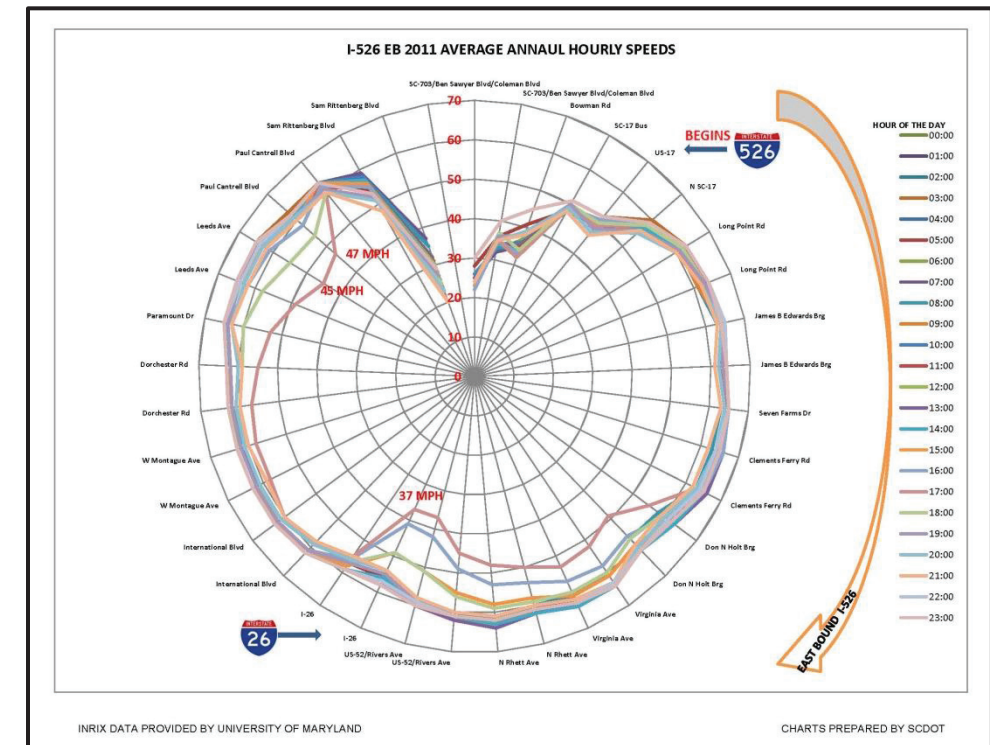
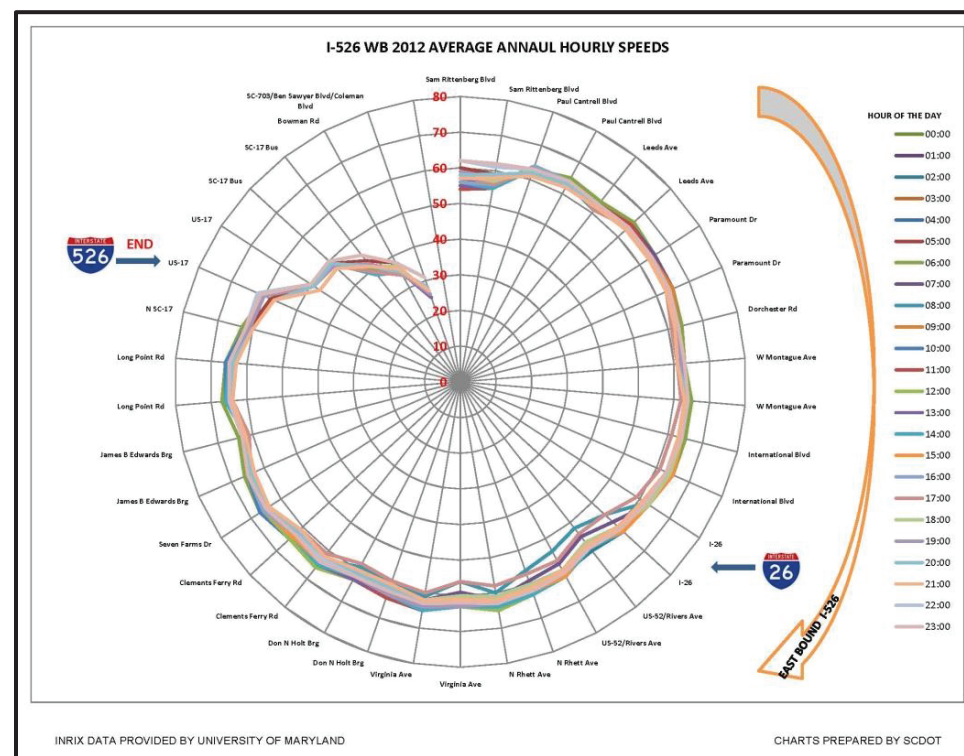
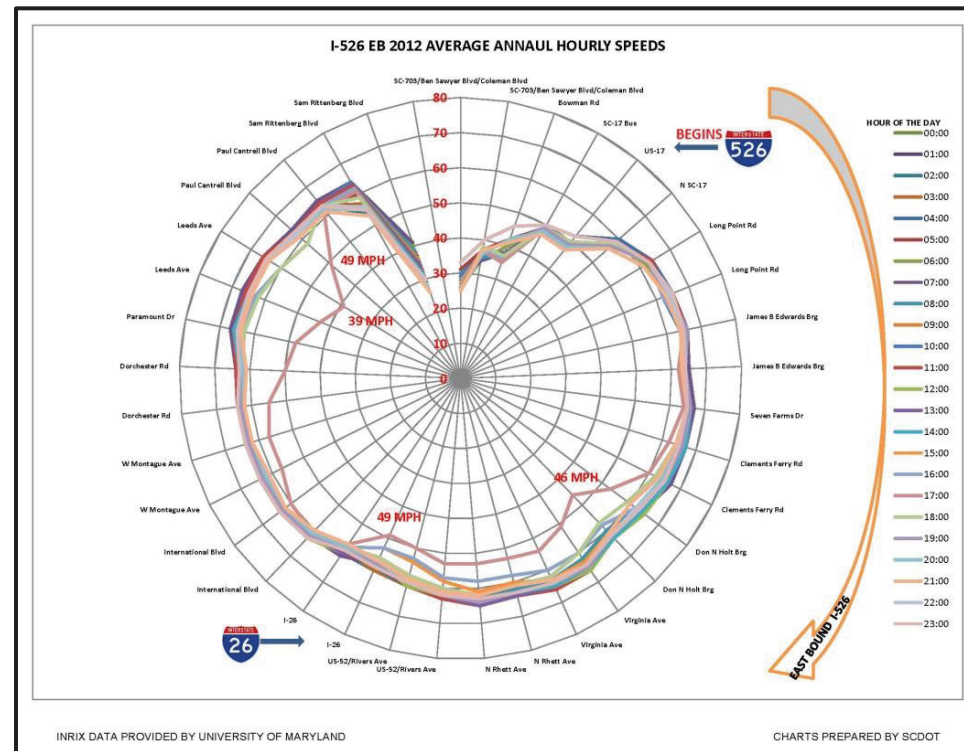


Exhibit 4-20: 2012 I-526 Eastbound & Westbound Hourly Speeds



4.8 VISSIM Corridor Model Development

The analyses for the I-526 study corridor were conducted using the *VISSIM* traffic modeling software. *VISSIM* is a microscopic simulation software package which analyzes multi-modal traffic flows with the flexibility of modeling all types of geometries and traffic control schemes. The research which supports the algorithms used in *VISSIM* has been utilized for over 20 years and the software itself has been in use since the early 1990s. The detailed summary of the *VISSIM* model development for the project is documented in the *VISSIM Model Development and Calibration Report*, November 2011; a summary is provided herein.

4.8.1 Origin-Destination Matrix Development

In modeling traffic operations with any traffic micro-simulation model, the travel demand patterns are important factors. Traffic can appear to operate at a high level of service if there are many short trips in the travel demand matrix. These short trips enter the freeway, stay in the right lane, and exit the freeway at the downstream interchange. Longer trips tend to change lanes or weave, creating turbulence on the freeway. For this reason, the first step in the model development was to estimate the travel demand in an origin-destination (OD) matrix format.

The seed OD trip table was estimated based on the travel pattern extracted from the CHATS regional model and observed OD pattern from the BluFax survey. The CHATS model provided the travel pattern for truck and non-truck vehicles for AM and PM. The observed traffic count data includes the AM and PM turning movement count data collected at all the intersections in the network and the observed traffic volumes for all four mainline approaches and departures of the I-26 & I-526 interchange. The observed traffic count data were checked and balanced against each other for consistency.

The OD estimation process involved a series of trip assignment and OD trip table adjustment performed by the TFlow Fuzzy module. After trips were assigned to the highway network, the assigned volumes were compared against the observed traffic count data. The OD trip table was adjusted until the assigned volumes were close to the observed count data. Exhibits 4-21 through 4-24 show the comparison of simulated I-526 travel times to BluFax travel times that were measured in the field.

Exhibit 4-21: Existing (2011) AM Peak Hour I-526 Eastbound Travel Time Graph

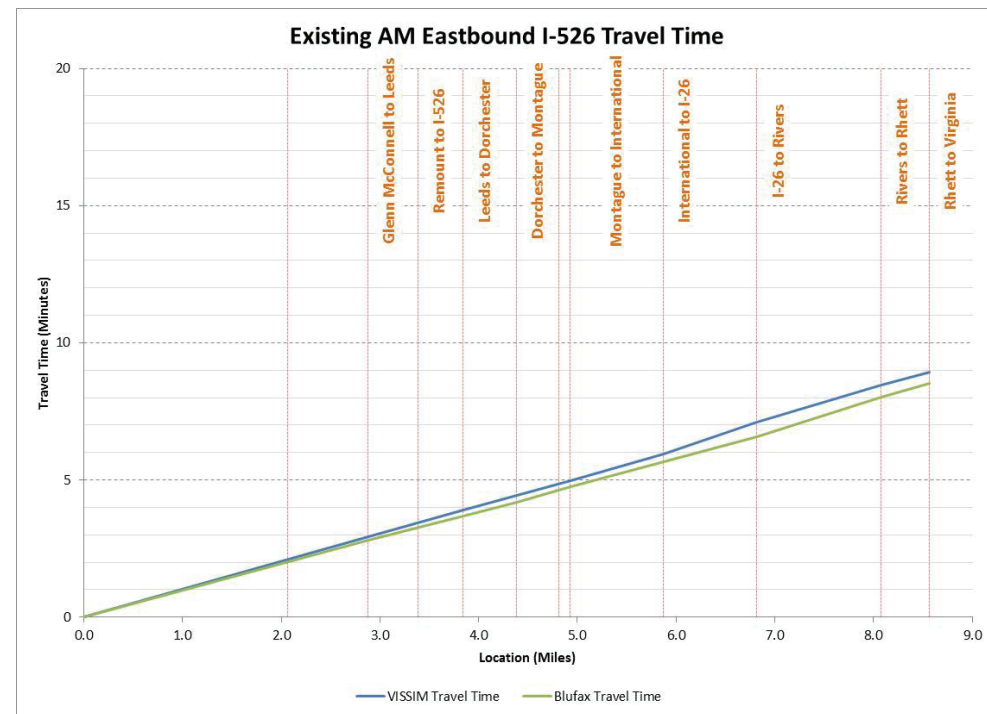


Exhibit 4-23: Existing (2011) PM Peak Hour I-526 Westbound Travel Time Graph

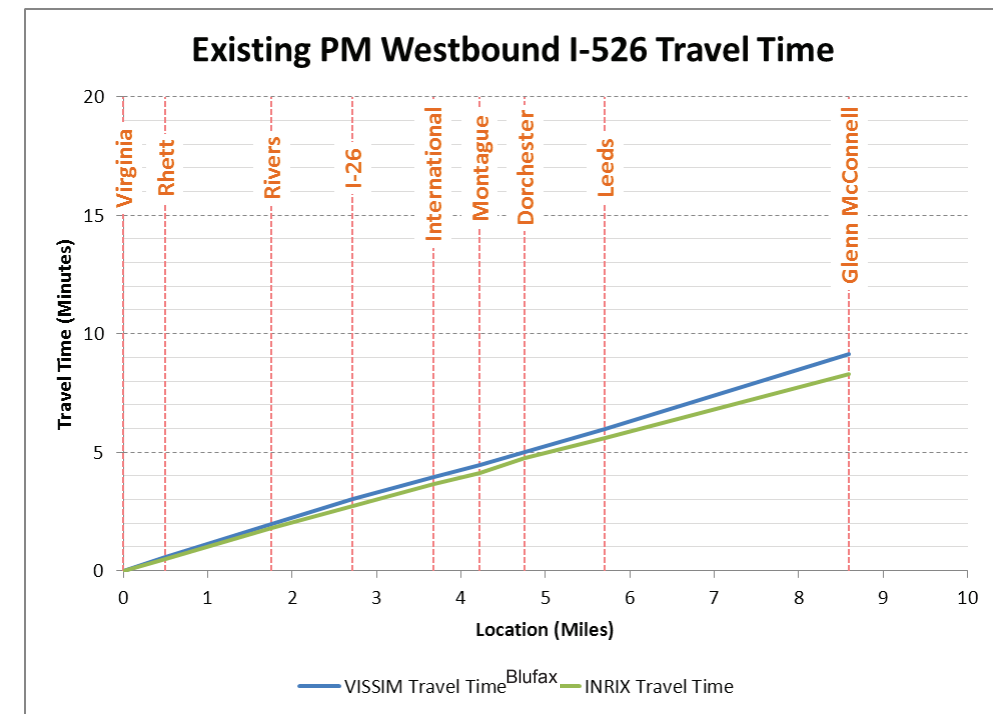


Exhibit 4-22: Existing (2011) AM Peak Hour I-526 Westbound Travel Time Graph

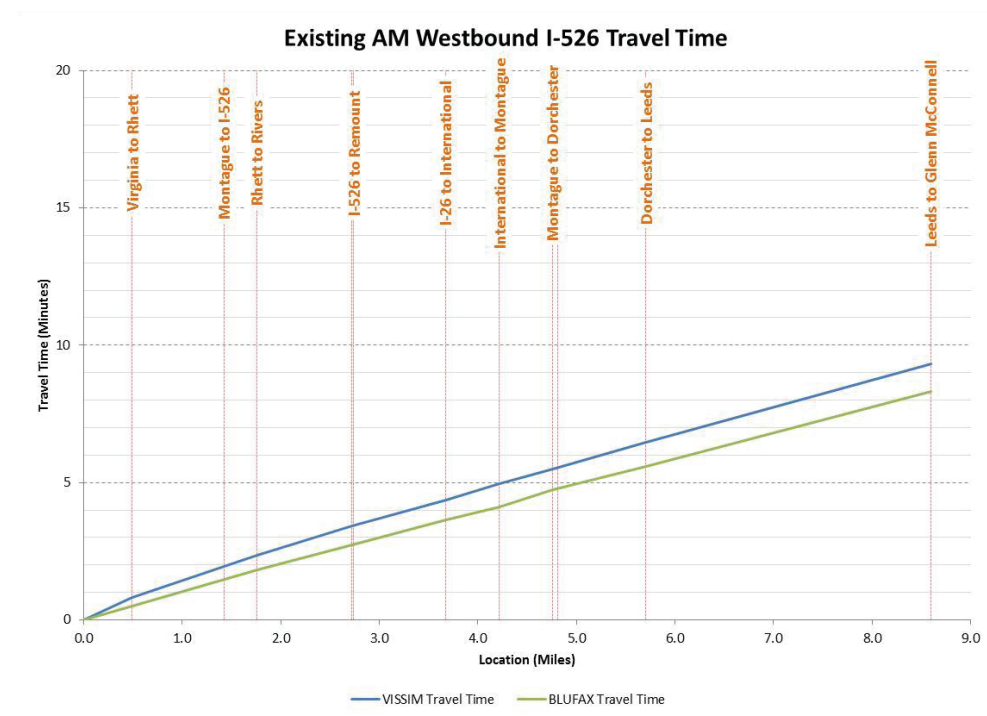
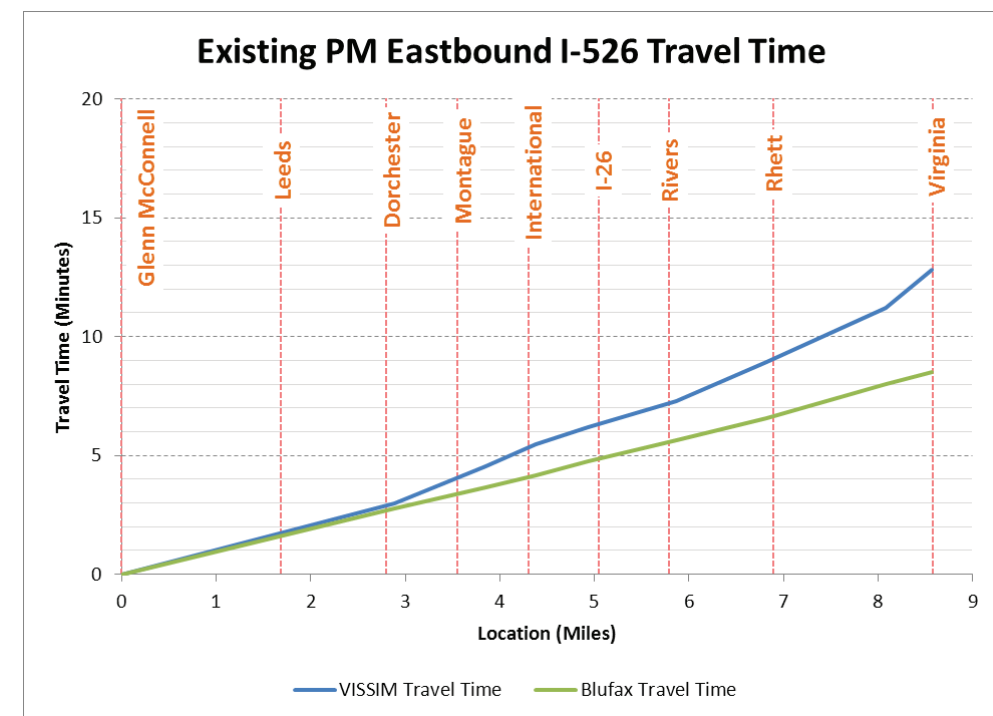


Exhibit 4-24: Existing (2011) PM Peak Hour I-526 Eastbound Travel Time Graph



4.8.2 VISSIM Summary

As these exhibits show, the travel times in both the eastbound and westbound directions of I-526 increase considerably in the 2035 design year, especially in the PM peak hour where travel times for the 8.5-mile I-526 corridor are upwards of 30 minutes. The area between Leeds Avenue and I-26 appears to be an issue in both directions.

The VISSIM base models with the application of 2020 and 2035 traffic volume projections (2020 No-Build and 2035 No-Build) serve as the basis for comparison of major improvements that may be implemented in the future. These comparisons are used in this report to provide an evaluation of the major improvements along the I-526 corridor.

A number of scenarios were modeled for the build alternates by adding proposed improvements to the 2020 and 2035 No-Build models. Multiple scenarios at each problem interchange were evaluated individually and then compared against each other. Based on the results of this comparison, a recommended alternate was chosen and loaded into the overall build model. Once major improvements were made at key interchanges, minor arterial improvements were evaluated to determine their effect on the network performance. These improvements are discussed in the following chapters.