

ADDENDUM CORRIDOR ANALYSIS



For I-526 Between North Charleston and West Ashley

May 2014 - Addendum











PREPARED BY STANTEC CONSULTING



IN ASSOCIATION WITH
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ADDENDUM CORRIDOR ANALYSIS FOR I-526 Between North Charleston and West Ashley

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1.0 Introduction

In an effort to address the existing and future congestion and operational issues of the Interstate 526 (I-526) corridor in Charleston County, the South Carolina Department of Transportation commissioned a study to develop a long-range plan for the corridor. I-526 has been identified by SCDOT as one of the most congested corridors in the State, being one of three corridors that have been designated as a "Mega Project" in the State Long-Range Interstate Plan, signifying that construction costs for corridor improvements exceeds the funding of the entire South Carolina Interstate program for multiple years.

The purpose of the study was to look at potential improvement strategies for the corridor in a holistic manner, and not just wholesale widening. Four categories of improvement strategies are considered, consisting of: Travel Demand Management strategies, Modal strategies including Transit and Freight improvements, Traffic Operations strategies, and Capacity Improvement strategies. The study was completed in October 2013, which resulted in a menu of short-term and long-range projects by level of investment and ease of implementation in the four improvement strategy categories. A significant portion of the I-526 study recommendations have been programmed in the State Transportation Improvement Program (STIP) with additional interstate funding approved in the 2013 legislative session for SCDOT and the State Infrastructure Bank.

1.1 Addendum Study Description

During the course of developing the October 2013 study recommendations, two projects associated with the Charleston International Airport were proposed that would impact the analyses of the I-526 corridor, specifically at the International Boulevard and Montague Avenue interchanges. The projects include an expansion of existing Boeing-related facilities and a new roadway serving the Airport via Montague Avenue.

Due to the nature of the proposed projects, the purpose of this report is to document the evaluation of the impacts of the proposed projects, including transportation planning analyses and conceptual engineering design, as an addendum to the final October 2013 documents of the I-526 Corridor Analysis.

The project study area for the addendum is the I-526 interchanges with International Boulevard, Montague Avenue, and Dorchester Road. The study area also extends outward along the crossing arterials to capture the area of influence for the three study interchanges.

1.2 Airport Area Infrastructure Improvements

The two projects that impact the analyses of the I-526 corridor include an expansion of existing Boeing-related facilities and a new roadway serving the Airport via Montague Avenue.

1.2.1 Boeing Expansion

Boeing currently employs approximately 6,600 employees at their North Charleston 787 plant adjacent to the Charleston International Airport. In addition, Boeing has committed to an additional 2,000 employees at the facility by 2020. It is anticipated that Boeing will continue to grow beyond 2020; however, specific employment projections beyond 2020 are not available from Boeing at this time.

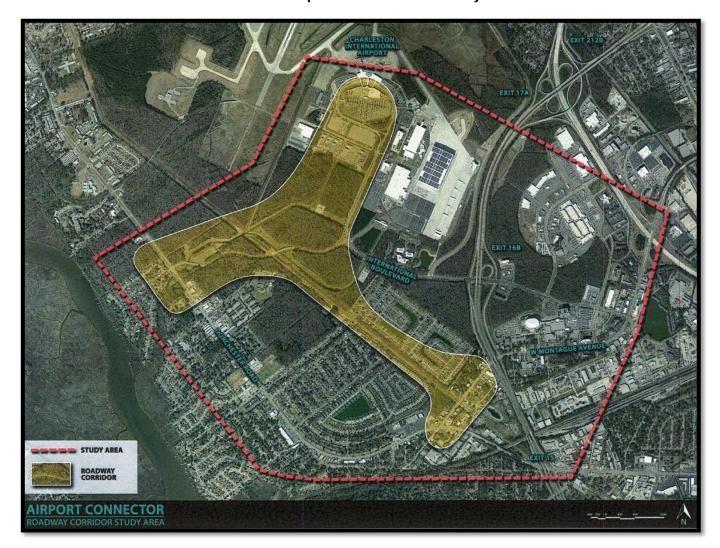
Therefore, a greater annual growth factor was utilized in the addendum analyses to account for potential future Boeing growth to provide for a conservative analysis of the I-526 corridor.

1.2.2 Airport Connector Road

Charleston County has initiated a project to provide an alternate access route to Charleston International Airport. A large percentage of the existing Michaux Parkway and International Boulevard traffic, which are both owned by the Federal Aviation Administration, accommodates commuter traffic between Dorchester Road and I-526. The new Airport Connector Road is expected to generally follow an existing power line easement and provide access to/from I-526 via the Montague Avenue interchange, which will allow for future expansion for Boeing along International Boulevard. Exhibit 1-1 illustrates the approximate location of the Airport Connector Road corridor.

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1.3 **Data Collection**

Additional vehicle turning movement counts were conducted at the intersections of International Boulevard & Michaux Parkway and Dorchester Road & Michaux Parkway during the weekday AM peak period (from 7:00 to 9:00 AM) and the weekday PM peak period (from 4:00 to 6:00 PM) for use in the addendum analyses. The counts were conducted in September 2013 while the local school district was in session and were added to the VISSIM traffic analysis models.

1.4 **Traffic Growth Rates**

For the initial I-526 Corridor Analysis modeling, growth rates were developed to project future-year conditions. These growth rates considered historical growth over the past 10 years, growth projections of the Charleston Area Transportation Study (CHATS) model between the 2008 base year and 2035 future year, and growth projections from the two scenarios of the Mark Clark Extension project analysis conducted by Wilbur Smith Associates, Inc. This growth rate development effort resulted in annual growth rates of 3.0% for International Boulevard, 1.5% for Montague Avenue, and 1.2% for I-526 between I-26 and Paul Cantrell Boulevard.

Based upon the additional employee projections from Boeing, the annual growth for Montague Avenue was increased to 3.0% and the projected growth rates along International Boulevard and I-526 were maintained.

Traffic Assignment

With these new projections of future-year traffic (for 2020 and 2035 conditions) due to Boeing expansion, reassignment of existing traffic patterns due to the new Airport Connector Road was then considered. Existing traffic was reassigned considering the following assumptions:

- Existing commuter traffic between Dorchester Road and I-526 currently utilizing Michaux Parkway and International Boulevard was reassigned to the new Airport Connector Road via Montague Avenue; and
- Existing traffic destined to Charleston International Airport was reassigned to the new Airport Connector Roadway from I-526 via Montague Avenue.

These reassignments result in the traffic along International Boulevard west of South Aviation Avenue being Boeing-related traffic only for the future-year analysis scenarios.

The traffic volumes resulting from the new projections for 2035 conditions are illustrated in Appendix A. The 2011 existing and 2035 projected traffic volumes from the original October 2013 analysis are also provided in Appendix A for reference.





2.0 Capacity Improvement Strategies

Capacity Improvement Strategies for the I-526 corridor are improvements to the roadways within the corridor that are highly effective at solving congestion issues but come at a higher cost than other improvement strategies. Capacity Improvement strategies considered for this addendum include interchange improvement alternates for the three I-526 study interchanges with International Boulevard, Montague Avenue, and Dorchester Road.

It should be noted that this addendum focused on interchange configurations only. The recommendations for the I-526 mainline from the October 2013 study, including Interstate widening and braided entrance/exit ramps, were maintained as givens in this analysis. This chapter summarizes the recommended

2.1 Interchange Improvements

Several improvement scenarios were considered at the interchange to address existing and projected congestion issues related to modified airport traffic patterns. These scenarios are summarized herein, and include consideration of the *Synchro* and *VISSIM* traffic analyses.

2.1.1 I-526 & International Boulevard

The existing I-526 & International Boulevard interchange is a split diamond with CD roads that connect south to Montague Avenue. I-526 eastbound and westbound traffic exits at Montague Avenue and International Boulevard, respectively, to signalized intersections; traffic can then pass through the first signalized intersection to a second signalized intersection with the other roadway via the CD road. Additionally, there is a slip ramp to I-526 westbound from International Boulevard, and there is a loop for I-526 eastbound traffic to International Boulevard westbound (towards the Charleston International Airport).

The International Boulevard corridor will experience lower future traffic volumes than in the October 2013 study due to the impact of the Airport Connector Road project. The original recommendations for the interchange included a diverging diamond interchange (DDI) with a six-lane International Boulevard cross section. Improvements were considered to address future traffic growth as a result of the Airport Connector Road diverting traffic to the Montague Avenue interchange.

Alternate 1 – Turn Lane Additions: This alternate, illustrated in Exhibit 2-1, provides dual left-turn
lanes from International Boulevard westbound to I-526 westbound and from International Boulevard
eastbound to I-526 eastbound, which also requires an additional receiving lane to both interchange
ramps. The I-526 eastbound loop ramp to International Boulevard westbound is removed. The results

of the *VISSIM* analyses indicate acceptable LOS being achieved at both of the interchange intersections for 2035 projected volumes.

Exhibit 2-1: International Boulevard Alternate 1 – Turn Lane Additions



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Alternate 2 - DDI: This alternate, Exhibit 2-2, is a DDI consisting of two International Boulevard through lanes in each direction. The design is appropriate due to the high volumes of left-turn traffic at the interchange and can be constructed within the existing footprint of the interchange. The results of the VISSIM analyses indicate acceptable LOS being achieved at both of the interchange intersections for 2035 projected volumes.

Exhibit 2-2: International Boulevard Alternate 2 - DDI



A summary of the analysis criteria for each alternate of the I-526 & International Boulevard interchange is provided in Table 2-1. Alternate 1 – Turn Lane Additions is recommended at this location due to the lower costs.

Table 2-1: I-526 & International Boulevard Evaluation Summary

SUMMARY OF CRITERIA	ALTERNATE				
SUMMARY OF CRITERIA	1*	2			
Utility Impacts	Low	Low			
Right-of-Way Impacts	Low	Low			
Environmental Impact	Low	Low			
Estimated Construction Costs	Low	Medium			

^{*}Recommended Alternate

2.1.2 I-526 & Montague Avenue

The existing I-526 & Montague Avenue interchange is a split diamond with CD roads that connect north to International Boulevard. I-526 eastbound and westbound traffic exits at Montague Avenue and International Boulevard, respectively, to signalized intersections; traffic can then pass through the first signalized intersection to a second signalized intersection with the other roadway via the CD road.

The Montague Avenue corridor will experience higher future traffic volumes than in the October 2013 study due to the impact of the Airport Connector Road project and widening of this roadway to six lanes through the I-526 interchange will be necessary. No improvements to the Montague Avenue corridor were considered in the original recommendations. Improvements were considered to address future traffic growth with the Airport Connector Road at the interchange.

• Alternate 1 – Loop Configuration: This alternate, illustrated in Exhibit 2-3, provides a new loop ramp for Montague Avenue traffic to access I-526 eastbound. The design would require a new bridge for the new loop ramp and new bridges for the I-526 mainline due to widening of Montague Avenue. However, the results of the VISSIM analyses indicate an undesirable LOS for several area intersections with this configuration and the 2035 projected volumes.

Exhibit 2-3: Montague Avenue Alternate 1 – Loop Configuration



Alternate 2 – Flyover: This alternate, illustrated in Exhibit 2-4, considers a flyover ramp for eastbound
Montague Avenue traffic accessing I-526 eastbound. The alternate would result in several new bridges
for the flyover ramp and new bridges for the I-526 mainline due to widening of Montague Avenue. The
results of the VISSIM analyses indicate undesirable LOS for several area intersections with this
configuration and the 2035 projected volumes.

Exhibit 2-4: Montague Avenue Alternate 2 – Flyover





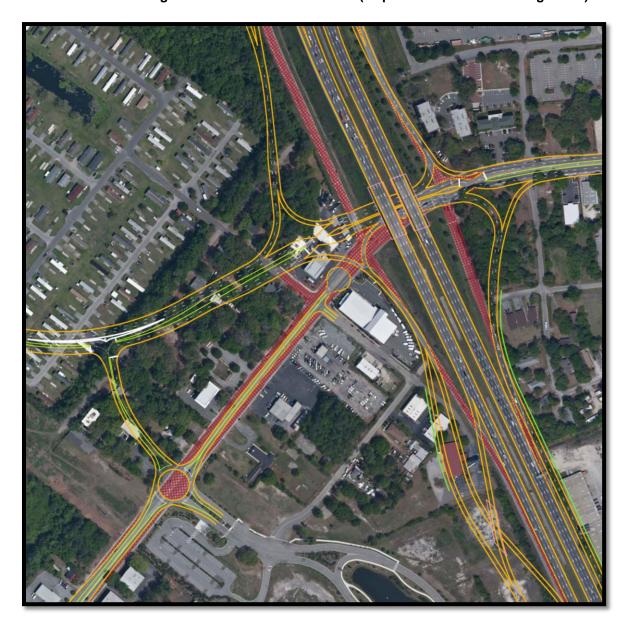
• Alternate 3A – DDI: This alternate, illustrated in Exhibit 2-5, considers a six-lane DDI for the interchange, which is appropriate due to the high volumes of left-turn traffic at the interchange and can be constructed within the existing footprint of the interchange. Furthermore, results of the VISSIM analyses indicate acceptable LOS being achieved for the Montague Avenue corridor considering 2035 projected volumes.

Exhibit 2-5: Montague Avenue Alternate 3A - DDI



Alternate 3B – DDI (Airport Connector Road Alignment): This alternate, illustrated in Exhibit 2-6, considers a six-lane DDI for the interchange, with the west side of the interchange considering the potential Montague Avenue alignment directly to the proposed Airport Connector Road. The ultimate need for the Montague Avenue alignment will be determined through Charleston County studies of the Airport Connector Road and the associated SCDOT encroachment permit application. The results of the VISSIM analyses indicate acceptable LOS being achieved for the study area considering 2035 projected volumes.

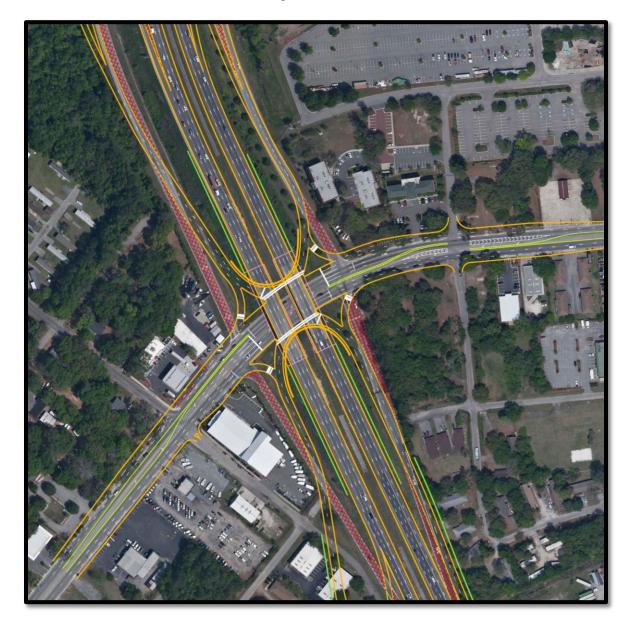
Exhibit 2-6: Montague Avenue Alternate 3B – DDI (Airport Connector Road Alignment)





• Alternate 4 – SPUI: This alternate, illustrated in Exhibit 2-7, considers a single-point urban interchange (SPUI) at the interchange. The design would require new bridges for the I-526 mainline due to SPUI configuration. Synchro analyses indicate that acceptable LOS can be potentially achieved for the projected 2035 traffic volumes, but with eastbound triple left-turn lanes along Montague Avenue.

Exhibit 2-7: Montague Avenue Alternate 4 – SPUI



A summary of the analysis criteria for each alternate of the I-526 & Montague Avenue interchange is provided in Table 2-2. Alternate 3A – DDI and Alternate 3B – DDI (Airport Connector Road Alignment) are recommended at this location due to the lower costs and impacts of construction and the ability to accommodate the high future-year traffic volumes. The ultimate need for the Montague Avenue DDI alignment will be determined through Charleston County studies of the Airport Connector Road and the associated SCDOT encroachment permit application.

It should be noted that the analysis of Alternate 3B generally considered the properties adjacent to Fargo Street; there will be additional impacts west of Fargo Street that will need to be considered in the Charleston County analyses.

Table 2-2: I-526 & Montague Avenue Evaluation Summary

SUMMARY OF CRITERIA	ALTERNATE						
SUMMARY OF CRITERIA	1	2	3A*	3B*	4		
Utility Impacts	Low	Low	Low	Low	Low		
Right-of-Way Impacts	High	High	Medium	High	Low		
Environmental Impact	Low	Low	Low	Low	Low		
Estimated Construction Costs	High	High	Medium	High	High		

^{*}Recommended Alternate

2.1.3 I-526 & Dorchester Road/Paramount Drive

The I-526 & Dorchester Road/Paramount Drive interchange is a split diamond serving Dorchester Road and Paramount Drive. I-526 eastbound and westbound traffic exits at Paramount Drive and Dorchester Road, respectively, to signalized intersections; traffic can then pass through the first signalized intersection to a second signalized intersection with the other roadway. Additionally, there is a slip ramp to I-526 westbound from an adjacent subdivision.

With the consideration of the proposed Airport Connector Road and future Boeing employment projections, no additional congestion was identified for the interchange; therefore, no capacity improvements were identified, which is similar to the original October 2013 study recommendations. It should be noted that the braided ramps between Dorchester Road and Montague Avenue begin in the interchange area, but they do not immediately impact the interchange.



2.2 Environmental Review

Using the recommend conceptual improvements for the I-526 interchanges with International Boulevard and Montague Avenue, potential impacts to human and natural environments were evaluated based upon a similar methodology as the original October 2013 study.

Table 2-3 provides a brief summary of the potential impacts of the recommended conceptual improvements on the adjacent human and natural environments. Additional detailed studies within the project corridor will be required to determine the presence and/or likely impact to wetlands, threatened and endangered species, and cultural/historic resources. The potential required detailed studies are detailed herein, along with a more detailed summary for each of the seven project segments that do not impact the I-26 & I-526 interchange area.

Table 2-3: Environmental Impact Summary

LOCATION	POTENTIAL WETLAND	POTENTIAL FLOODPLAIN	POTENTIAL RELOCATIONS		POTENTIAL NOISE	THREATENED & ENDANGERED	POTENTIAL CULTURAL	
LOCATION	IMPACTS	IMPACTS	RESID.	Сомм.	RECEPTORS	SPECIES IMPACTS	RESOURCE IMPACTS	
I-526 & International Boulevard	Yes	No	0	0	5	Unlikely	Unlikely	
I-526 & Montague Avenue	No	No	8	7	15	Unlikely	Unlikely	

2.2.1 International Boulevard Interchange (Segment 5 of the October 2013 study)

This segment includes the I-526 & International Boulevard interchange and the I-526 mainline and ramp approaches extending approximately 4,100 feet east (north) of the interchange to approximately 2,000 feet west (south) of the interchange. The adjacent land uses are primarily undeveloped forests as this section of I-526 is adjacent to and includes portions of the Charleston International Airport and Joint Base Charleston.

The USFWS NWI maps indicate that freshwater wetland communities border the eastern and western sides of the I-526 mainline. New ramp construction associated with the proposed braided ramp configuration would likely impact wetlands in this section. However, a review of the FEMA FIRMs indicates that no floodplains exist within or adjacent to the project corridor. The recommended improvements would not likely result in any potential relocations between the International Boulevard and I-26 interchanges. A

review of this section of the project corridor indicates that approximately five noise receptors exist within 300 feet of the I-526 mainline.

2.2.2 Montague Avenue Interchange (Segment 4 of the October 2013 study)

This segment includes the I-526 & Montague Avenue interchange and the I-526 mainline and ramp approaches extending approximately 400 feet east (north) of the interchange to approximately 1,800 feet west (south) of the interchange. The adjacent land uses include a mixture of commercial, residential and industrial warehousing.

Being a previously urbanized and developed area, the USFWS NWI maps indicate that there are no wetlands present in this section; therefore, no wetland impacts are anticipated. A review of the FEMA FIRMs for this section indicates that no floodplains exist within or adjacent to the project corridor.

The proposed improvements would likely result in four potential relocations due to the installation of the braided ramps between the Dorchester Road and International Boulevard interchanges and 11 potential relocations due to the proposed DDI and Montague Avenue widening improvements at the interchange with alternate 3A. With consideration of alternate 3B, there would potentially be 23 relocations due to the new alignment of Montague Avenue on the west side of the interchange, which generally consists of the properties adjacent to Fargo Street; there will likely be additional relocations west of Fargo Street that will need to be considered in the Charleston County analyses.

A review of this section of the project corridor indicated that approximately 15 noise receptors exist within 300 feet of the I-526 mainline.



2.3 Summary – Capacity Improvement Strategies

Conceptual plans illustrating the recommended improvement alternates for the I-526 interchanges with International Boulevard and Montague Avenue are provided in Appendix B.

For the capacity improvement strategies, the measure of effectiveness was based upon the *VISSIM* analyses results, which are documented in Chapter 3. Based upon the recommendations of the capacity improvements for the I-526 study interchanges with International Boulevard and Montague Avenue detailed in this chapter, a review of the costs associated with this addendum as compared to the costs documented in the original October 2013 study was undertaken.

Table 2-4 summarizes the Capacity Improvement strategies considered in the addendum analysis, including approximate implementation costs. The improvements at these interchanges fall under the CAP 7 improvements from the original October 2013 study, which also considered braided ramp improvements between I-26 and Dorchester Road. The bolded costs indicate a difference from the original October 2013 study. The costs of Alternates 3A and 3B generally consist of improvements along Montague Avenue from the I-526 interchange to the Fargo Street area; additional costs for the connection to the Airport Connector Road will be required.

Table 2-4 also includes the recommended timing of the CAP 7 improvement strategies, which is expected to be 2020 based upon the increased growth of Boeing and the proposed Airport Connector Road. The original timing of the CAP 7 improvements from the original October 2013 study was 2025.

Table 2-4: Capacity Improvement Summary

LADE	LABEL STRATEGY DESCRIPTION		May 2014 Addendum Study Cost			
LABEL	STRATEGY DESCRIPTION	TIMING	MONTAGUE AVENUE ALT. 3A	MONTAGUE AVENUE ALT. 3B		
	Improve I-526 & International Boulevard Interchange		\$5,600,000	\$5,600,000		
	Improve I-526 & Montague Avenue Interchange		\$23,700,000	\$36,200,000		
CAP 7	Construct Braided ramps along I-526 EB and WB between Dorchester Road and Montague Avenue	2020	\$50,300,000	\$50,300,000		
(Addendum)	Construct Braided ramps along I-526 WB between Montague Avenue and International Boulevard		\$5,800,000	\$5,800,000		
	Construct Braided ramps along I-526 EB and WB between International Boulevard and I-26		\$30,300,000	\$30,300,000		
	CA	AP 7 Total:	\$115,700,000	\$128,200,000		



3.0 Recommendations

This chapter describes the overall measures of effectiveness (MOE) utilized for the Capacity Improvement strategies for the I-526 interchanges with International Boulevard and Montague Avenue based upon the results of the *VISSIM* Build analyses. The costs of the strategies were also evaluated and documented.

3.1 *VISSIM* Build Analyses

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 *VISSIM* analysis methodology for this addendum was the same as the October 2013, with network modifications completed to add in the additional two study intersections, to reflect the new travel demand due to the Boeing expansion, and to reflect the new routing due to the Airport Connector Road.

A number of scenarios were modeled for the build alternates of this addendum by adding proposed improvements to the 2035 No-Build models. Multiple scenarios at each of the three study interchanges 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. These improvements were discussed in the previous chapter.

3.1.1 Future-Year 2035 Build Conditions

The following sections show the *VISSIM* simulation results for the future-year 2035 AM and PM peak hours of this addendum analysis. The MOE data were calculated by the *VISSIM* modeling software, any further calculations were done using conventional HCM methodology.

3.1.1.1 Freeway Analysis

AM Peak Hour

Tables 3-1 and 3-2 show the freeway density and speed output data provided by the *VISSIM* modeling software for the AM peak hour.

Table 3-1: 2035 Build AM Peak Hour Eastbound Freeway LOS

		N	O BUILD		Build		
INTERSTATE	SEGMENT	DENSITY	AVG. SPEED	LOS	DENSITY	AVG. SPEED	LOS
	US 17 to Paul Cantrell Blvd	15.3	62.2	В	14.9	61.8	В
	Paul Cantrell Blvd to Leeds Ave	38.2	52.5	Е	24.7	60.1	С
	Leeds Ave to Paramount Dr	55.4	33.3	F	14.4	62.8	В
	Paramount Dr to Montague Ave	108.5	9.6	F	13.2	62.9	В
I-526	Montague Ave to International Blvd	16.0	56.9	В	14.7	58.4	В
1-526	International Blvd to I-26	14.5	56.8	В	13.3	61.1	В
	I-26 to Rivers Ave	29.1	46.1	D	9.1	57.9	Α
	Rivers Ave to Rhett Ave	34.4	49.7	D	15.7	61.2	В
	Rhett Ave to Virginia Ave	20.7	57.5	С	29.6	42.8	D
	Virginia Ave to East End	15.2	62.6	В	18.3	61.8	С

Table 3-2: 2035 Build AM Peak Hour Westbound Freeway LOS

		N	O BUILD		Build		
INTERSTATE	SEGMENT	DENSITY	AVG. SPEED	LOS	DENSITY	AVG. SPEED	LOS
	US 17 to Paul Cantrell Blvd	10.7	62.3	Α	13.2	61.0	В
	Paul Cantrell Blvd to Leeds Ave	22.3	58.5	С	21.1	52.8	С
	Leeds Ave to Paramount Dr	17.4	60.2	В	17.1	57.8	В
	Paramount Dr to Montague Ave	25.4	51.9	С	17.3	60.8	В
I-526	Montague Ave to International Blvd	39.1	52.5	Е	21.2	61.0	С
1-320	International Blvd to I-26	39.4	42.2	Е	12.8	52.4	В
	I-26 to Rivers Ave	24.0	48.2	С	14.8	52.1	В
	Rivers Ave to Rhett Ave	31.5	48.9	D	11.3	56.9	В
	Rhett Ave to Virginia Ave	85.5	13.2	F	23.4	58.8	С
	Virginia Ave to East End	109.6	9.5	F	31.4	53.8	D

The freeway LOS operates at LOS D or better for both the eastbound and westbound directions in the 2035 AM peak hour with consideration of the updated capacity improvements at the I-526 interchanges with International Boulevard and Montague Avenue, similar to the results of the original October 2013 study.

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Tables 3-3 and 3-4 show the comparison between Build and No-Build travel times in the eastbound and westbound directions, respectively, for the 2035 AM peak hour. The travel times reflect the improvement in traffic conditions just as the levels of service did with consideration of the updated capacity improvements at the I-526 interchanges with International Boulevard and Montague Avenue, similar to the results of the October 2013 study.

Table 3-3: 2035 Build AM Peak Hour Eastbound Travel Times

		No	BUILD	Build		
INTERSTATE	SEGMENT	TRAVEL TIME (S)	AVERAGE SPEED (MPH)	TRAVEL TIME (S)	AVERAGE SPEED (MPH)	
	Paul Cantrell to Leeds	219.4	47.2	173.3	59.8	
	Leeds to Dorchester	173.1	20.1	58.1	59.9	
	Dorchester to Montague	150.3	12.9	31.3	61.9	
	Montague to International	76.9	25.6	34.6	56.9	
	International to I-26	63.4	53.2	156.4	21.6	
I-526	I-26 to Rivers	68.3	50.2	59.3	57.8	
	Rivers to Rhett	107.2	42.2	76.3	59.3	
	Rhett to Virginia	30.5	57.9	29.9	59.2	
	Total Travel Time (s)	889.1		619.2		
	Total Travel Time (min)	14.8		10.3		
	Total Travel Time (hr)	0.25		0.17		

Table 3-4: 2035 Build AM Peak Hour Westbound Travel Times

		No	BUILD	Build		
INTERSTATE	SEGMENT	TRAVEL TIME (S)	AVERAGE SPEED (MPH)	TRAVEL TIME (S)	AVERAGE SPEED (MPH)	
	Virginia to Rhett	138.0	12.8	30.8	57.6	
	Rhett to Rivers	104.8	43.4	78.8	57.8	
	Rivers to I-26	66.2	52.3	62.1	55.8	
	I-26 to International	63.9	53.5	59.8	57.2	
	International to Montague	38.7	51.0	33.5	59.0	
I-526	Montague to Dorchester	32.9	58.9	32.6	59.5	
	Dorchester to Leeds	56.3	60.6	55.9	61.1	
	Leeds to Paul Cantrell	170.6	61.0	174.4	59.7	
	Total Travel Time (s)	671.5		527.8		
	Total Travel Time (min)	11.2		8.8		
	Total Travel Time (hr)	0.19		0.15		

PM Peak Hour

Tables 3-5 and 3-6 show the freeway density and speed output data provided by the *VISSIM* modeling software for the PM peak hour.

Table 3-5: 2035 Build PM Peak Hour Eastbound Freeway LOS

		N	o Build		BUILD		
INTERSTATE	SEGMENT	DENSITY	AVG. SPEED	LOS	DENSITY	AVG. SPEED	LOS
	US 17 to Paul Cantrell Blvd	19.8	60.8	С	34.8	47.6	D
	Paul Cantrell Blvd to Leeds Ave	97.3	26.0	F	21.5	60.9	С
	Leeds Ave to Paramount Dr	146.5	5.6	F	19.0	61.1	С
	Paramount Dr to Montague Ave	126.1	8.1	F	16.7	62.7	В
I-526	Montague Ave to International Blvd	16.0	58.8	В	18.0	59.5	В
1-526	International Blvd to I-26	31.9	48.4	D	20.3	58.2	С
	I-26 to Rivers Ave	37.2	35.2	Е	18.1	57.1	С
	Rivers Ave to Rhett Ave	50.9	33.2	F	21.5	56.8	С
	Rhett Ave to Virginia Ave	63.7	21.8	F	22.3	58.4	С
	Virginia Ave to East End	17.2	61.7	В	27.9	59.2	D

Table 3-6: 2035 Build PM Peak Hour Westbound Freeway LOS

		N	o Build		Build		
INTERSTATE	SEGMENT	DENSITY	AVG. SPEED	LOS	DENSITY	AVG. SPEED	LOS
	US 17 to Paul Cantrell Blvd	12.8	54.4	В	18.6	61.2	С
	Paul Cantrell Blvd to Leeds Ave	123.2	9.5	F	25.9	57.5	С
	Leeds Ave to Paramount Dr	13.6	53.7	В	15.7	61.8	В
	Paramount Dr to Montague Ave	19.3	50.9	С	16.0	61.6	В
I-526	Montague Ave to International Blvd	9.2	58.9	Α	13.7	62.1	В
1-526	International Blvd to I-26	136.5	5.2	F	11.8	51.5	В
	I-26 to Rivers Ave	116.3	16.5	F	14.8	51.5	В
	Rivers Ave to Rhett Ave	69.1	36.5	F	10.9	57.1	Α
	Rhett Ave to Virginia Ave	95.9	13.5	F	24.9	54.7	С
	Virginia Ave to East End	109.6	9.5	F	28.7	54.1	D

The freeway LOS operates at LOS D or better for both the eastbound and westbound directions in the 2035 PM peak hour with consideration of the updated capacity improvements at the I-526 interchanges with International Boulevard and Montague Avenue, similar to the results of the original October 2013 study.



Tables 3-7 and 3-8 show the comparison between Build and No-Build travel times in the eastbound and westbound directions, respectively, for the 2035 PM peak hour. The travel times reflect the improvement in traffic conditions just as the levels of service did with consideration of the updated capacity improvements at the I-526 interchanges with International Boulevard and Montague Avenue, similar to the results of the October 2013 study.

Table 3-7: 2035 Build PM Peak Hour Eastbound Travel Times

		No	BUILD	Build		
INTERSTATE	SEGMENT	TRAVEL TIME (S)	AVERAGE SPEED (MPH)	TRAVEL TIME (S)	AVERAGE SPEED (MPH)	
	Paul Cantrell to Leeds	669.3	15.5	175.8	58.9	
	Leeds to Dorchester	490.3	7.1	57.9	60.1	
	Dorchester to Montague	221.0	8.8	32.2	60.1	
	Montague to International	84.1	23.4	32.1	61.3	
	International to I-26	81.2	41.6	64.9	52.0	
I-526	I-26 to Rivers	92.5	37.0	60.3	56.9	
	Rivers to Rhett	172.5	26.2	78.3	57.8	
	Rhett to Virginia	94.0	18.8	33.1	53.5	
	Total Travel Time (s)	1904.8		534.5		
	Total Travel Time (min)	31.7		8.9		
	Total Travel Time (hr	0.53		0.15		

Table 3-8: 2035 Build PM Peak Hour Westbound Travel Times

		No	BUILD	Build		
INTERSTATE	SEGMENT	TRAVEL TIME (S)	AVERAGE SPEED (MPH)	TRAVEL TIME (S)	AVERAGE SPEED (MPH)	
	Virginia to Rhett	129.3	13.7	31.6	56.1	
	Rhett to Rivers	282.1	16.1	80.0	56.9	
	Rivers to I-26	352.9	9.8	61.2	56.6	
	I-26 to International	131.1	26.1	58.0	59.0	
	International to Montague	33.4	59.1	32.5	60.7	
I-526	Montague to Dorchester	31.3	61.9	31.7	61.1	
	Dorchester to Leeds	165.3	20.6	55.9	61.1	
	Leeds to Paul Cantrell	735.0	14.2	176.0	59.2	
	Total Travel Time (s)	1860.4		527.0		
	Total Travel Time (min)	31.0		8.8		
	Total Travel Time (hr)	0.52		0.15		

3.1.1.2 Intersection Analysis

AM Peak Hour

The following tables summarize the intersection delay and LOS for the intersections in the study area for both the AM peak hour. Table 3-9 shows the intersection delay and LOS for the AM peak hour of the signalized study intersections.

Table 3-9: 2035 Build AM Peak Hour Signalized Intersection LOS

	No Build			Build		
Intersection	VOLUME	Avg. Delay	LOS	VOLUME	Avg. Delay	LOS
US 17 @ Ashley Town Center Dr	4796	41.1	D	5389	26.3	С
US 17 @ Sam Rittenberg	4612	23.8	С	5232	29.7	С
US 17 @ Skylark Dr	3624	15.9	В	3699	2.5	Α
US 17 @ Orleans Rd.	3345	3.0	Α	3606	3.9	Α
Sam Rittenberg @ Mark Clark WB	2015	13.7	В	2507	11.0	В
Sam Rittenberg @ Skylark	1822	12.2	В	1756	8.4	Α
Paul Cantrell @ Magwood	4897	159.8	F			
Magwood @ Paul Cantrell WB Ramps				2863	19.9	В
Magwood @ Paul Cantrell EB Ramps				2449	13.0	В
Paul Cantrell @ I-526	9676	52.4	D	5744	36.3	D
Paul Cantrell @ Tobias Gadson	3358	44.4	D	4223	27.5	С
Leeds @ I-526 WB	3747	5.7	Α			
Leeds @ I-526 EB	4237	8.2	Α			
Leeds @ Bridge View	1604	5.0	Α	1913	5.7	Α
Paramount @ I-526 WB	1061	16.1	В	1112	13.7	В
Paramount @ I-526 EB	1419	15.9	В	1188	12.2	В
Dorchester @ I-526 WB	3216	42.2	D	3165	25.6	С
Dorchester @ I-526 EB	3148	34.3	С	4197	11.1	В
Dorchester @ Paramount / Oscar Johnson	2492	15.7	В	2875	5.3	Α
Montague @ Dorchester	3119	134.1	F	3058	42.6	D
Montague @ I-526 WB	2645	65.9	Е	4156	10.7	В
Montague @ I-526 EB	2583	64.0	Е	3525	14.1	В
Montague @ International	3535	59.6	Е	2895	34.7	С
International @ Tanger Outlet	2587	25.0	С	1645	12.3	В
International @ Centre Pointe	2272	30.6	С	1934	13.0	В
International @ I-526 EB	4253	43.8	D	2375	13.5	В
International @ I-526 WB	5465	50.8	D	2725	19.1	В
International @ Aviation	1396	16.1	В	1863	12.8	В



		No Build			Build		
Intersection	VOLUME	AVG. DELAY	LOS	VOLUME	AVG. DELAY	LOS	
Montague @ I-26 WB	11158	14.9	В	3918	14.3	В	
Montague @ Mall / Goer	2519	13.1	В	3282	24.5	С	
Remount @ Core	774	2.6	Α	898	2.3	Α	
Remount @ I-26 EB Off-Ramp / Vector	1028	17.4	В	1127	14.3	В	
Remount @ I-26 WB Off-Ramp	3790	38.6	D	1478	12.3	В	
Remount @ Rivers	5046	158.8	F	5140	52.2	D	
Aviation @ Core / Fain	1462	12.7	В	1721	12.2	В	
Aviation @ I-26 WB	1449	161.9	F	1165	3.7	Α	
Aviation @ I-26 EB	1098	45.0	D	1971	9.4	Α	
Aviation @ Rivers	4403	68.5	Е	5076	19.0	В	
Rivers @ Harley	3898	14.3	В	3668	5.3	Α	
Rivers @ I-526 WB	1884	11.5	В	1947	8.0	Α	
Rivers @ I-526 EB	1300	12.1	В	5238	2.3	Α	
Rivers @ Mall	2330	8.6	Α	2451	10.8	В	
Rhett @ Remount	3180	135.7	F	4491	78.5	Е	
Rhett @ I-526 WB	2826	55.2	Е	4169	32.8	С	
Rhett @ I-526 EB	1606	10.9	В	1999	15.6	В	
Rhett @ Braddock	1101	5.3	Α	1374	5.4	Α	
Montague @ Tanger Outlet Extension	2152	18.3	В	1622	6.2	Α	
Montague @ Airport Connector	2552	66.6	Е	4114	18.0	В	
Michaux @ Airport Connector	1768	122.8	F	2449	13.0	В	
Dorchester @ Michaux	2760	66.6	Е	4487	28.7	С	

The signalized intersection operations were substantially improved with consideration of the updated capacity improvements at the I-526 interchanges with International Boulevard and Montague Avenue, similar to the results of the original October 2013 study.

PM Peak Hour

The following tables summarize the intersection delay and LOS for the intersections in the study area for both the PM peak hour. Table 3-10 shows the intersection delay and LOS for the PM peak hour of the signalized study intersections.

Table 3-10: 2035 Build PM Peak Hour Signalized Intersection LOS

	No Build			Build		
Intersection	VOLUME	AVG. DELAY	LOS	VOLUME	AVG. DELAY	LOS
US 17 @ Ashley Town Center Dr	4327	80.3	F	6265	23.5	С
US 17 @ Sam Rittenberg	4162	43.8	D	6086	22.6	С
US 17 @ Skylark Dr	3082	69.2	Е	4745	22.1	С
US 17 @ Orleans Rd.	2750	63.4	Е	4691	20.9	С
Sam Rittenberg @ Mark Clark WB	2735	47.5	D	3790	19.4	В
Sam Rittenberg @ Skylark	3305	74.9	Е	3776	27.3	С
Paul Cantrell @ Magwood	5807	96.0	F			
Magwood @ Paul Cantrell WB Ramps				3620	23.5	С
Magwood @ Paul Cantrell EB Ramps				2532	31.9	С
Paul Cantrell @ I-526	8579	99.7	F	5608	34.6	С
Paul Cantrell @ Tobias Gadson	3595	93.0	F	4991	75.0	Е
Leeds @ I-526 WB	3028	28.1	С			
Leeds @ I-526 EB	3152	59.8	Е			
Leeds @ Bridge View	1323	175.5	F	2130	12.2	В
Paramount @ I-526 WB	1114	88.3	F	1419	18.2	В
Paramount @ I-526 EB	1203	83.6	F	1175	16.0	В
Dorchester @ I-526 WB	2501	60.1	Е	3922	12.1	В
Dorchester @ I-526 EB	2344	97.3	F	4841	8.6	Α
Dorchester @ Paramount / Oscar Johnson	2026	98.9	F	3290	9.7	Α
Montague @ Dorchester	3135	133.6	F	4757	41.0	D
Montague @ I-526 WB	2863	76.5	Е	5439	22.1	С
Montague @ I-526 EB	2475	81.8	F	4054	40.0	D
Montague @ International	3319	117.5	F	4637	77.2	Е
International @ Tanger Outlet	2964	123.7	F	3748	41.0	D
International @ Centre Pointe	2948	131.4	F	4387	39.3	D
International @ I-526 EB	4597	38.5	D	4459	14.2	В
International @ I-526 WB	3885	107.4	F	4765	23.4	С
International @ Aviation	1257	376.4	F	2780	13.2	В
Montague @ I-26 WB	11388	108.8	F	5107	25.1	С
Montague @ Mall / Goer	2040	233.6	F	4209	30.6	С
Remount @ Core	1011	22.6	С	1258	4.5	Α
Remount @ I-26 EB Off-Ramp / Vector	1272	33.4	С	1429	13.2	В
Remount @ I-26 WB Off-Ramp	7108	24.2	С	1932	6.0	Α
Remount @ Rivers	4041	208.9	F	5173	40.6	D
Aviation @ Core / Fain	2232	57.1	Е	2521	15.6	В





		No Build			Build			
INTERSECTION	VOLUME	Avg. Delay	LOS	VOLUME	Avg. Delay	LOS		
Aviation @ I-26 WB	1691	117.7	F	2109	4.2	Α		
Aviation @ I-26 EB	2021	29.1	С	2067	7.1	Α		
Aviation @ Rivers	4208	53.8	D	5383	33.1	С		
Rivers @ Harley	3213	99.9	F	4222	14.7	В		
Rivers @ I-526 WB	1120	31.6	С	1310	10.2	В		
Rivers @ I-526 EB	1857	49.8	D	5370	3.1	Α		
Rivers @ Mall	2677	14.4	В	3281	8.4	Α		
Rhett @ Remount	3746	138.1	F	5194	67.2	Е		
Rhett @ I-526 WB	2769	54.9	D	4541	23.0	С		
Rhett @ I-526 EB	1912	9.9	Α	2547	17.9	В		
Rhett @ Braddock	1556	5.1	Α	1827	4.7	Α		
Montague @ Tanger Outlet Extension	2066	32.8	С	2780	13.0	В		
Montague @ Airport Connector	2778	77.9	Е	5259	33.0	С		
Michaux @ Airport Connector	1565	350.5	F	2532	31.9	С		
Dorchester @ Michaux	3073	63.9	Е	5303	28.9	С		

The signalized intersection operations were substantially improved with consideration of the updated capacity improvements at the I-526 interchanges with International Boulevard and Montague Avenue, similar to the results of the original October 2013 study.

3.1.2 VISSIM Build Analysis Summary

Based on the analysis presented in this report as well as observations of the *VISSIM* simulation, it is clear that the proposed improvements along the I-526 corridor will have a very positive impact on traffic operations in the area. Thorough evaluations were completed to identify specific areas where various improvements may help. From there, multiple variations and iterations of possible designs were analyzed in *VISSIM* to ensure that the most beneficial design was recommended.

Freeway level of service is significantly improved in the Build scenario. Similarly, travel times during the PM peak hour are reduced from more than 30 minutes to less than 10 minutes. Finally, isolated intersection improvements also worked to improve arterial conditions, which in some cases also aided the freeway operations.

3.2 Cost Comparison

Table 3-11 summarizes a comparison of the costs between the original October 2013 study and this addendum for I-526 braided ramp improvements between International Boulevard and Dorchester Road and improvements to the I-526 interchanges at International Boulevard and Montague Avenue. The improvements are comprised by the CAP 3 and CAP 7 improvements from the original October 2013 study.

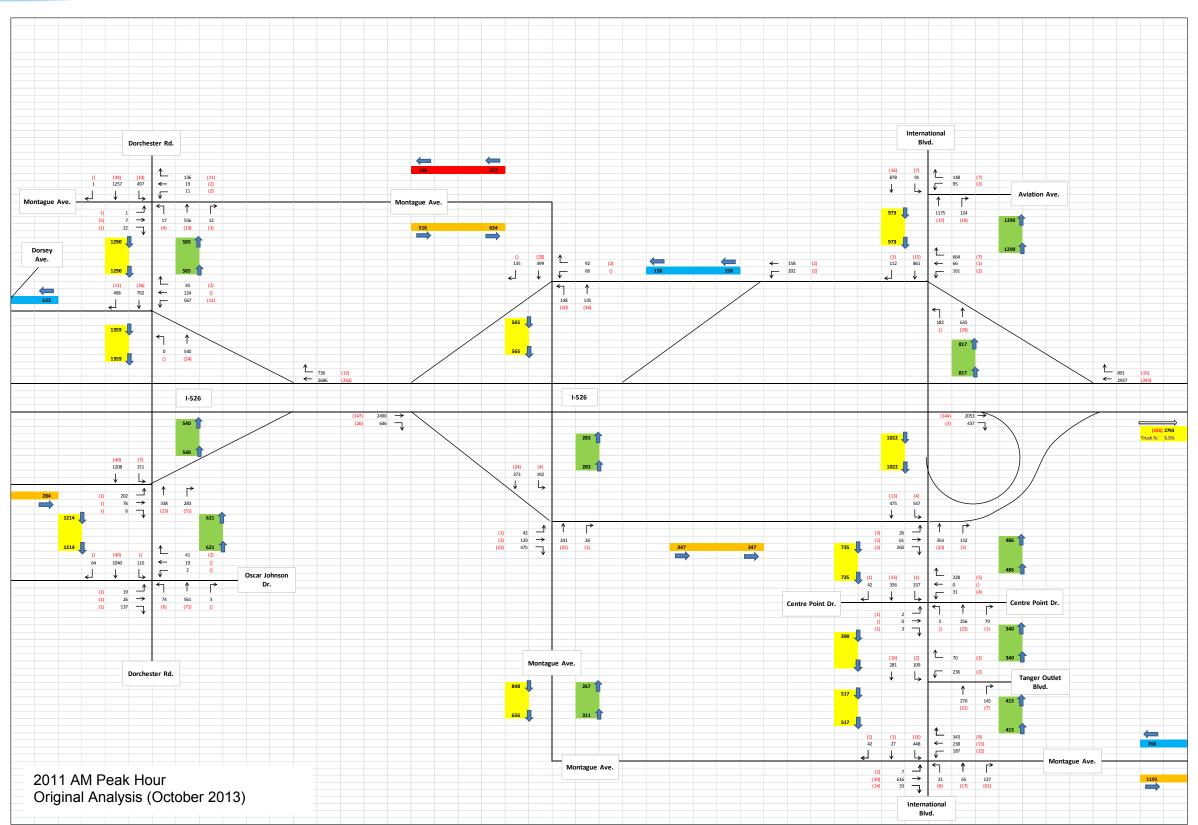
As previously noted, the costs of Alternates 3A and 3B generally consist of improvements along Montague Avenue from the I-526 interchange to the Fargo Street area; additional costs for the connection to the Airport Connector Road will be required.

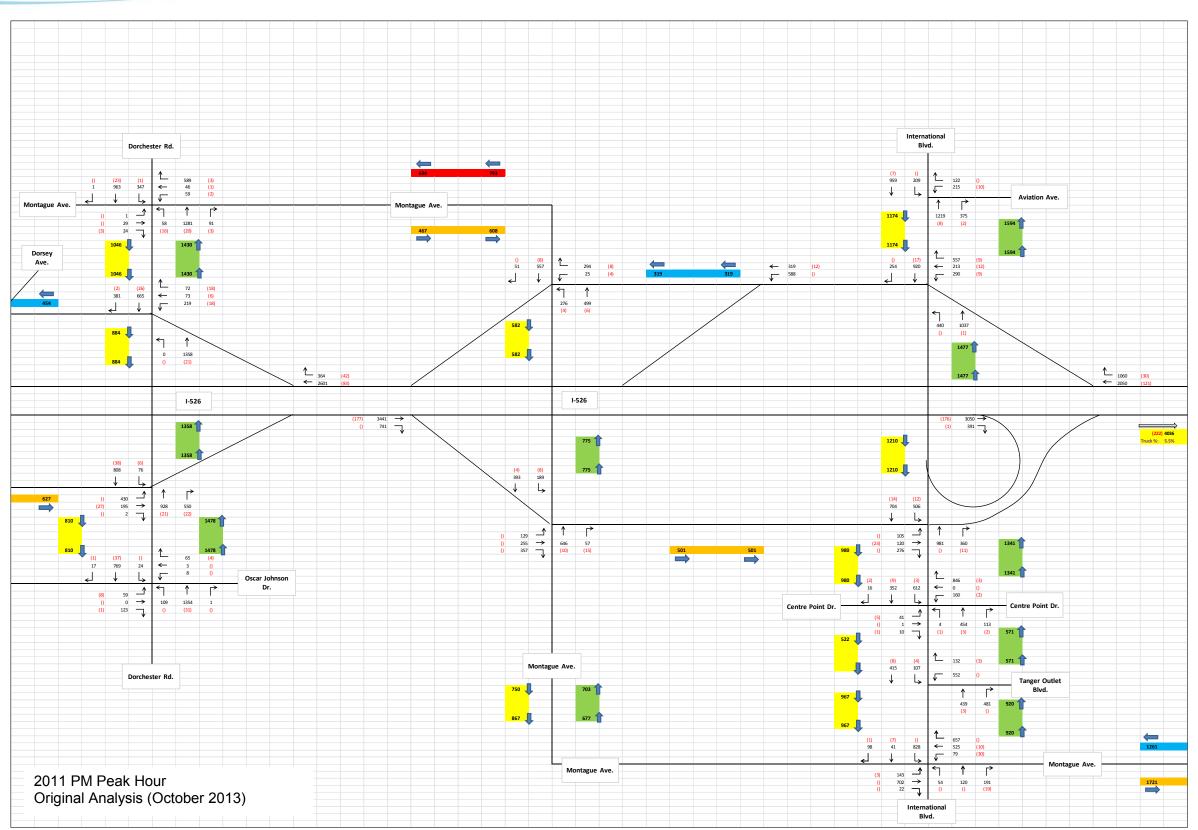
The bolded costs indicate a difference from the original October 2013 study. The costs of Montague Avenue – Alternate 3B generally consist of a new alignment to the Fargo Street area; additional costs for the connection to the Airport Connector Road will be likely.

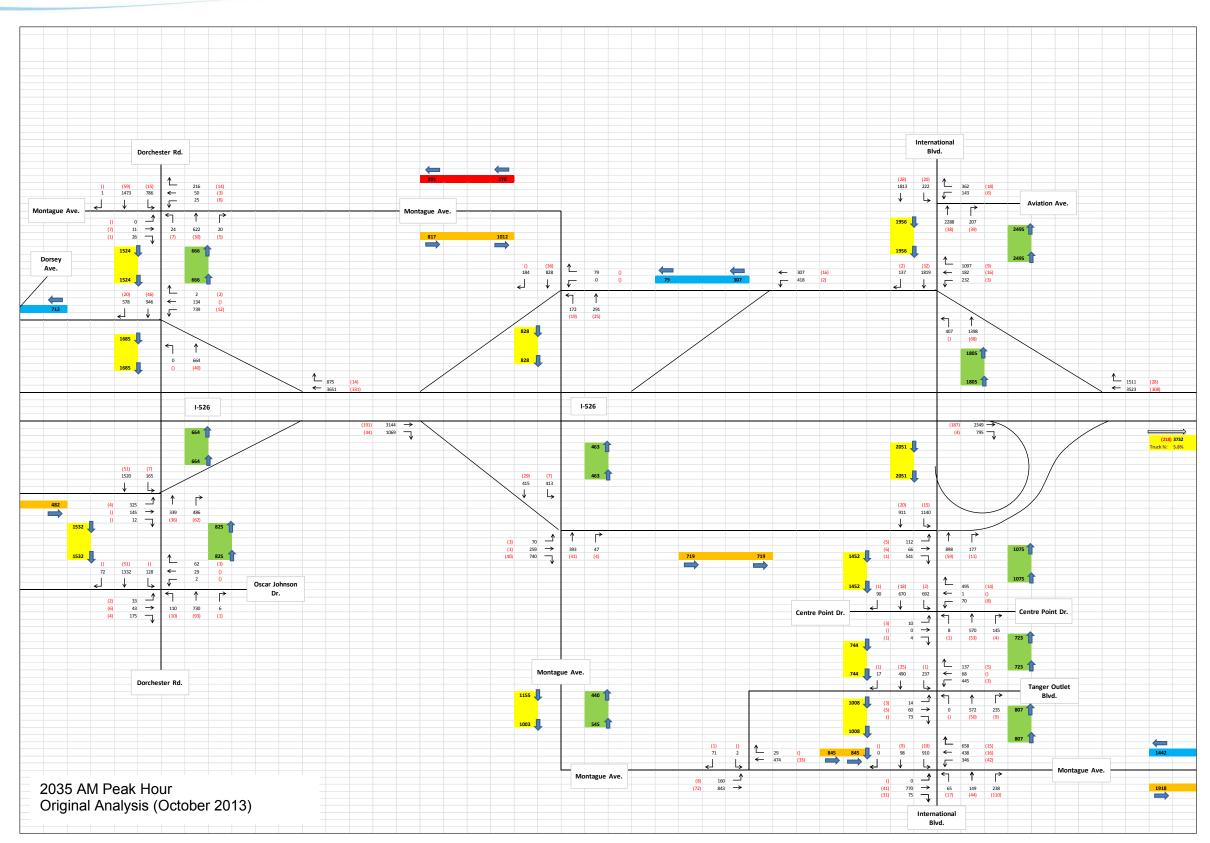
Table 3-11: Capacity Improvement Summary

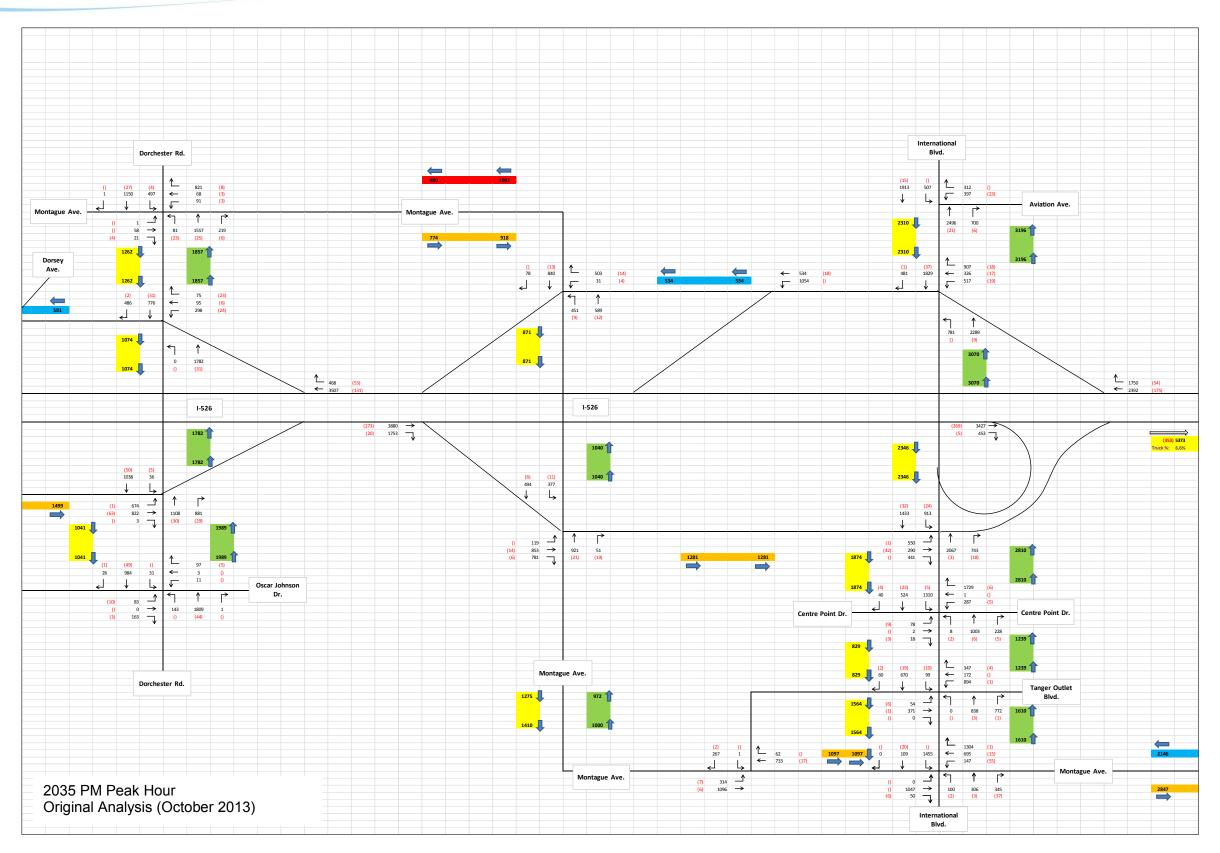
1	Con Assert Decomposition	Остовек 2013	May 2014 Addendum Study Cost		
LABEL	STRATEGY DESCRIPTION	ORIGINAL STUDY COST	MONTAGUE AVENUE ALT. 3A	MONTAGUE AVENUE ALT. 3B	
CAP 3	Construct Braided ramps along I-526 EB between Montague Avenue and International Boulevard	\$5,800,000	\$5,800,000	\$5,800,000	
	Improve I-526 & International Boulevard Interchange	\$22,900,000	\$5,600,000	\$5,600,000	
	Improve I-526 & Montague Avenue Interchange	\$0	\$23,700,000	\$36,200,000	
CAP 7	Construct Braided ramps along I-526 EB and WB between Dorchester Road and Montague Avenue	\$50,300,000	\$50,300,000	\$50,300,000	
(Addendum)	Construct Braided ramps along I-526 WB between Montague Avenue and International Boulevard	\$5,800,000	\$5,800,000	\$5,800,000	
	Construct Braided ramps along I-526 EB and WB between International Boulevard and I-26	\$30,300,000	\$30,300,000	\$30,300,000	
	CAP 7 Total:	\$109,300,000	\$115,700,000	\$128,200,000	
	Difference in Total due to the Airport Area Infrastructure Improvement projects:		+\$6,400,000	+\$18,900,000	

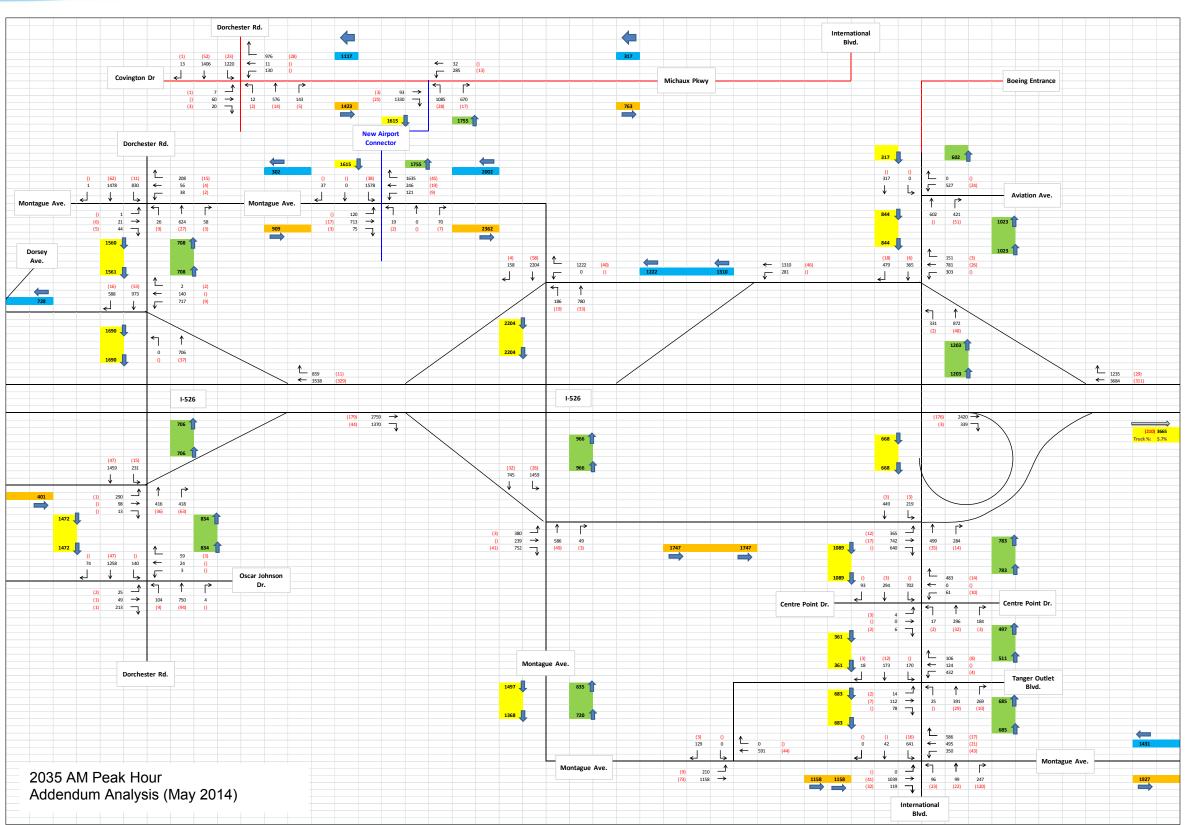
APPENDIX A – TRAFFIC VOLUMES

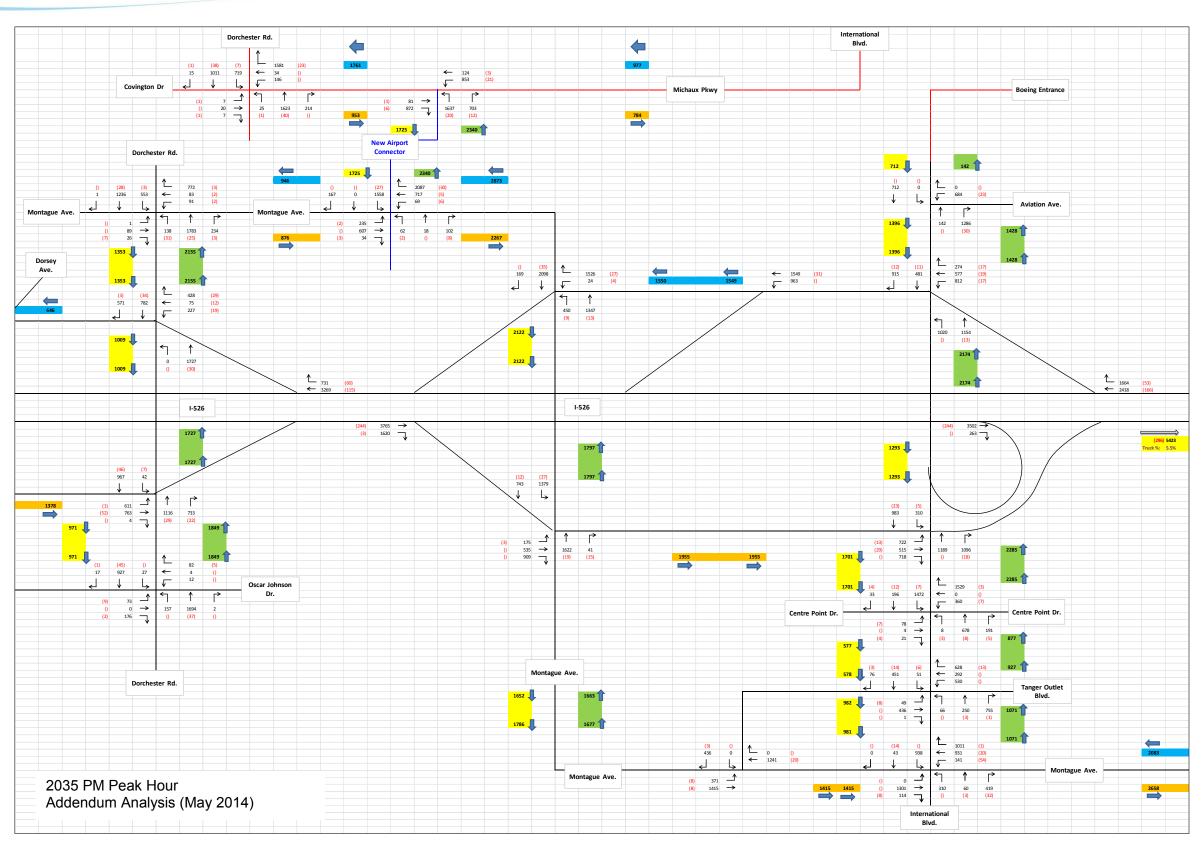












APPENDIX B - ADDENDUM INTERCHANGE CONCEPT PLANS

