TSM&O STUDIES & IMPROVEMENT STRATEGIES IN MID-ATLANTIC

2017 TRAFFIC & SAFETY CONFERENCE

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Barry Brandt, PE, PTOE

Agenda

- Background
- Maryland Statewide TSM&O
  - *Methodology*
  - *Analysis*
  - *Hot Spot Identification*
  - *Evaluate Cause of Congestion*
  - *Identify Low Cost / Short Term Improvement Options*
  - *Evaluate Cost and Impacts*
  - *Benefit-Cost Analysis*
- Greater Richmond Mobility Study
  - *Methodology*
  - *Analysis*
  - *Evaluated Concepts*
  - *Installed Solutions*
- US 29 Corridor TSM&O Project
- Summary

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Statewide TSM&O Background

Goal 1.
Develop and implement a sustainable TSM&O program at SHA

Goal 2.
Improve travel time reliability for both people and freight

Goal 3.
Develop data- and performance-driven approaches to support TSM&O planning, programming, implementation and evaluation decisions

Goal 4.
Improve the travelling public's experience on Maryland highways

Statewide TSM&O Background

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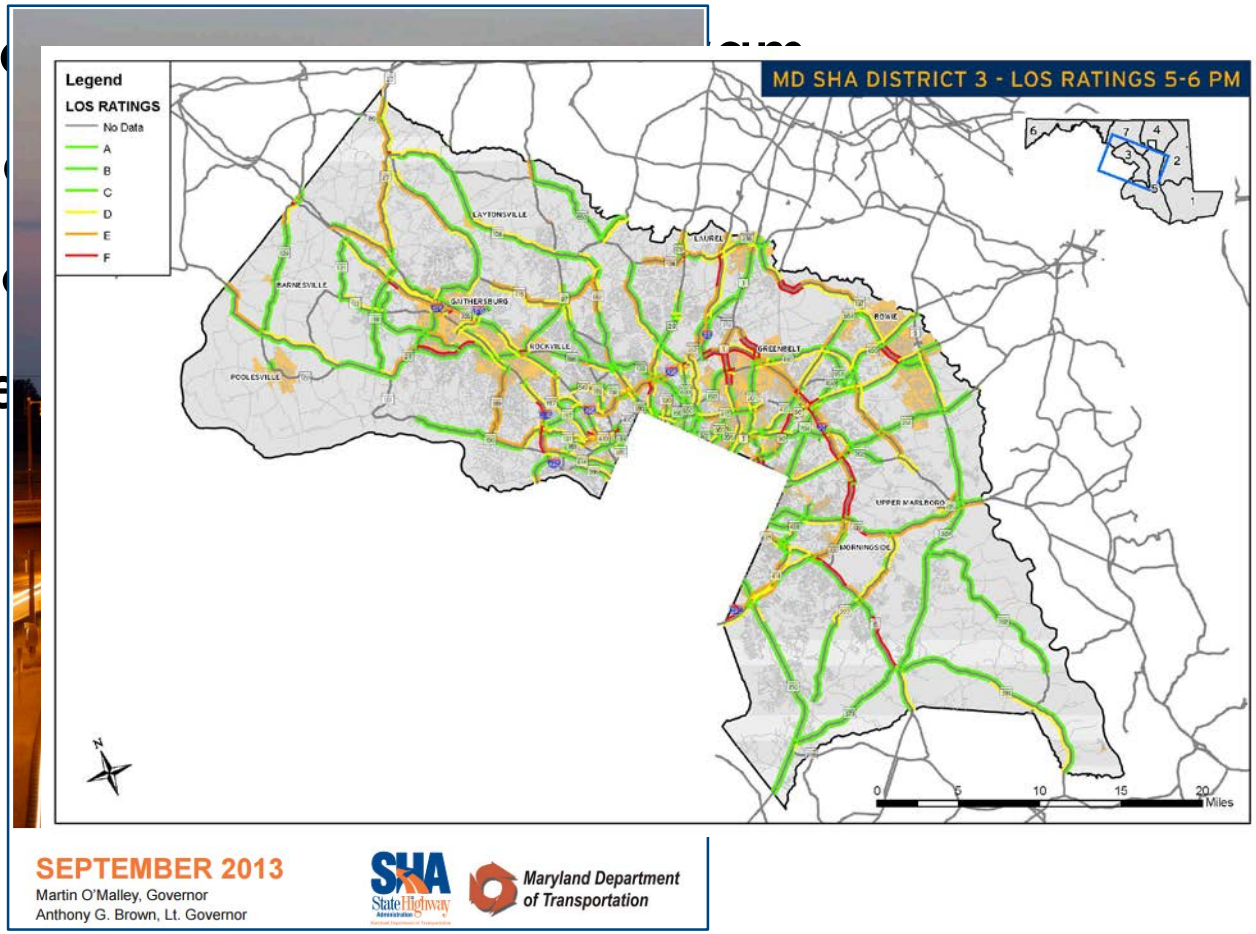

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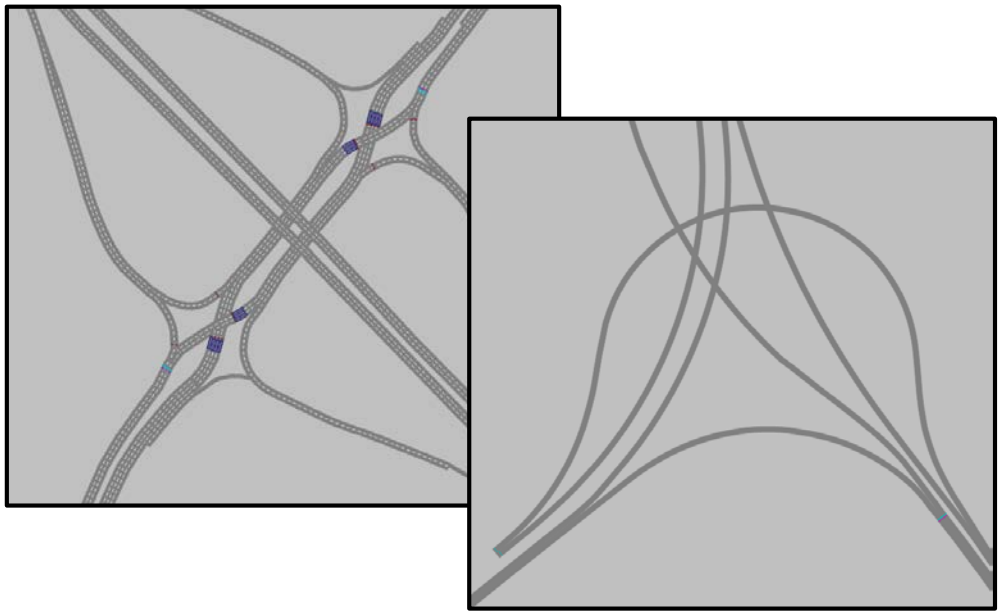
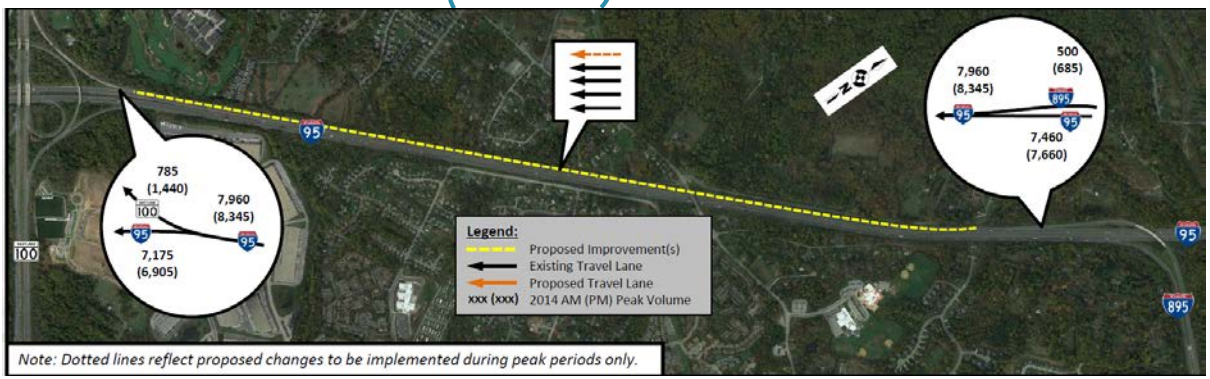
Statewide TSM&O- Analysis

- Traffic Analysis
  - *VISSIM*
    - *Corridor-wide*
  - *MOE's include*
    - *Density*
    - *Speed*
    - *Delay and LOS*
    - *Travel Time*
- *Safety analysis*
  - *Surrogate Safety Assessment Model (SSAM)*
- *Cost Analysis*
  - *Benefit-Cost Tool*





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Statewide TSM&O- Hot Spot Identification

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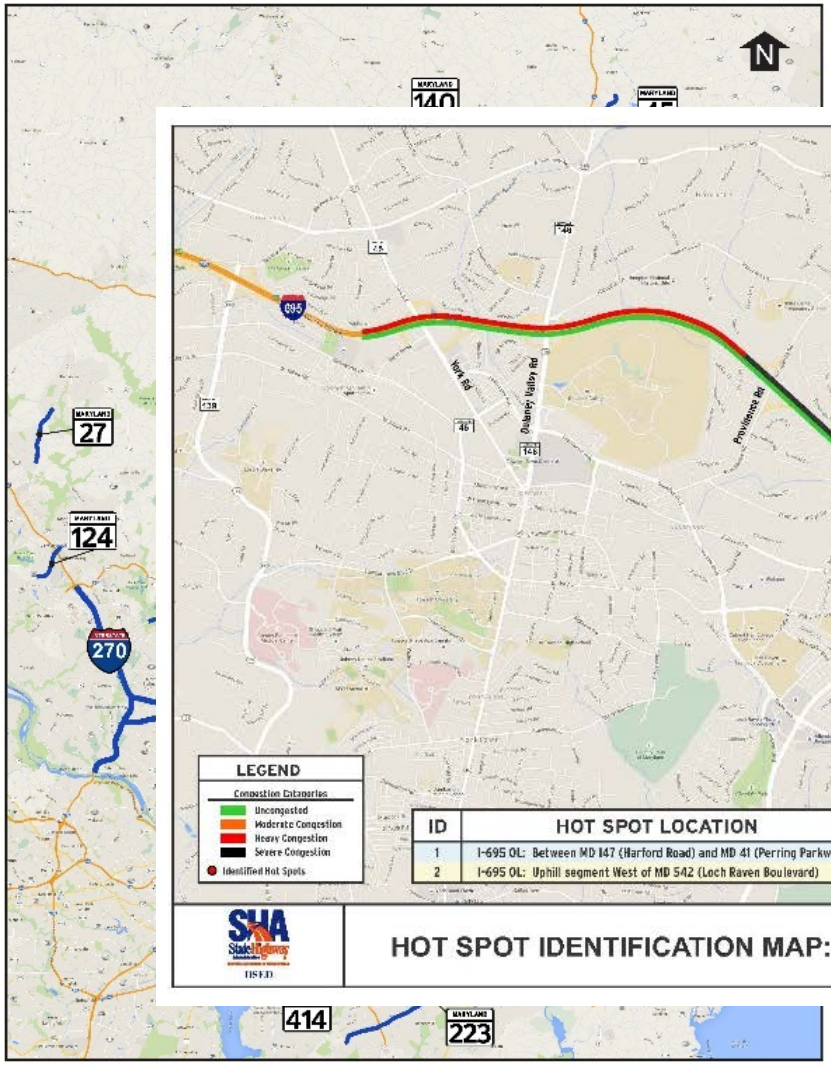

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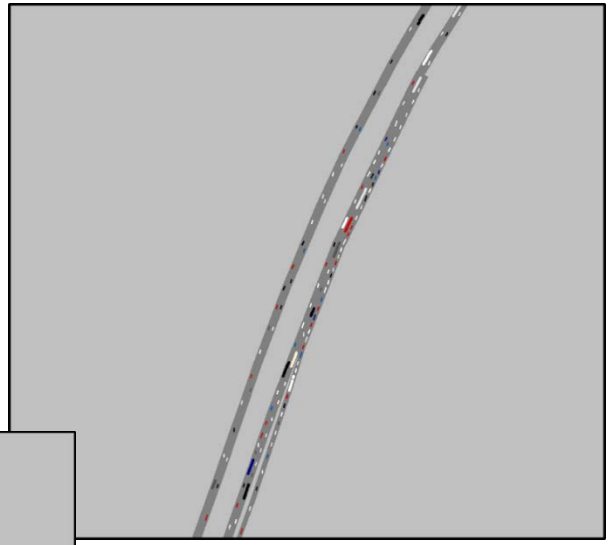
Statewide TSM&O- Hot Spot Identification

- Multiple factors including,
  - *Inadequate accel lane length*
  - *Ramp terminal control*
  - *Recurrent safety concern*
  - *Lack of capacity*



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Statewide TSM&O- Identify Low Cost Short Term Improvement Options

- Proposed multiple low cost and short term improvement options
- Objective- "Do more with existing infrastructure"
- Options Evaluated:
  - *Ramp Metering*
  - *Hard Shoulder Running*
  - *Auxiliary Lanes*
  - *Accel / Decel Lanes*

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Statewide TSM&O- Evaluate Cost and Impacts

- Cost estimation for all alternatives
- Significant environmental impacts considered
- Benefit-Cost Objective
  - *Rate and prioritize multiple improvement options*
  - *Incorporate primary and secondary parameters*
    - *Primary- operation, safety, construction cost*
    - *Secondary- reliability, life cycle cost analysis, user cost*

Benefit-Cost Analysis

Benefits

- *Delay*
- *Fuel Cost*
- *Reliability*
- *Crash Savings*

Costs

- *Construction*
- *Engineering*
- *Right-of-way*
- *O&M*
- *Salvage Value*
- *Net Cost*

Variables

- *Annual Traffic Growth*
- *Annual Inflation Rate*
- *Annual Discount Rate*

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Benefit-Cost Analysis

- Safety
  - *Crash types include*
    - *Fatal*
    - *Injury*
    - *PDO*
    - *Pedestrian Crashes*
- Reliability
  - *Travel Time*
  - *User Cost*

Benefit-Cost Analysis

- Tool I
  - *Life*
    - *F*
    - *I*
    - *C*
  - *Eva*
  - ***Imp***
  - *Too*

Default Values		Notes
Project	I-695 Baltimore Beltway Improvements - Southwest	-
Project Opening Year	2020	
Project Life Span (Years)	20	
Hours of AM and PM Peak	3	
Heavy Vehicle Percentage	10	
Annual Traffic Growth Factor (%)	1	
Annual Growth in Heavy Vehicle Percentage	2.0	
Working Days Per Year	250	
Average Vehicle Occupancy	1.2	
Auto Congestion Cost Per Hour ($)	25.68	
Truck Congestion Cost Per Hour ($)	66.08	
Reliability Ratio- AUTO	0.75	
Reliability Ratio- Heavy Vehicles	2.0	
Annual Deprciation in Travel Time Reliability (%)	3	
Fuel savings per hour of delay savings ($)	0.72	
Salvage Value (%)	10.00%	
Annual Inflation Rate (%)	2.30%	
Annual Discount rate (%)	2.32%	

Benefit-Cost Analysis *Updated February 2015*

BENEFIT-COST ANALYSIS TOOL USER GUIDE

The Benefit-Cost analysis spreadsheet tool is designed for computing and comparing benefits and costs of a project, facilitating the decision making process. This user guide includes instructions for using the tool including discussion of the methodologies involved in the computation of benefits and costs.

The following sections provide a detailed description of the different components of the spreadsheet.

Initial Input

This section allows the user to input basic project information and other related parameters. The general rule applicable throughout the spreadsheet is to fill out all the light blue cells, while all the light red cells are automated.

1. Project: Name/ Description of project

2. Project Opening Year: The year project is open for traffic

3. Project Life Span: The total life span of the project (Default value- 20)

4. Hours of AM and PM Peak: The number of hours during AM and PM period where congested traffic coditions are expected (Default value- 3 Hours)

5. Heavy Vehicle Percentage (%): Percentage of heavy vehicles (Class 4 and above) within the project area

6. Annual Traffic Growth Factor (%): Anticipated growth factor (expressed as a percentage) per year within the project area

7. Working Days per Year: Total number of working days per year (Default-250)

8. Average Vehicle Occupancy: Average number of people per vehicle at a given time (Default-1.2)

9. Auto Congestion Cost Per Hour ($/hour): The average cost incurred by an auto for an hour of delay due to congestion (Default value-25.68 $/hour, based on 2013 MDSHA Mobility Report)
http://sha.maryland.gov/OPPEN/2013_Maryland__Mobility.pdf

10. Truck Congestion Cost Per Hour ($/hour): The average cost incurred by a truck for an hour of delay due to congestion (Default value-66.08 $/hour, based on 2013 MDSHA Mobility Report)
http://sha.maryland.gov/OPPEN/2013_Maryland__Mobility.pdf

11. Value Of Reliability: Value of reliability as a fraction of auto congestion cost. The SHRP 2 Reliability Project L 17 results recommend a value of 0.8 for auto (Default value-0.8)
http://onlinepubs.trb.org/onlinepubs/shrp2/SHRP2_L17_Gap-Filling_Project_5_GuidebookPlacingAValueOnTimeReliability.pdf

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Benefit-Cost Analysis

- How BCA was used?

Summary										
			No-Build Analysis			Build Analysis				
Concept #	Location	Concept Description	No-Build Disbenefits ('000)	No-Build Costs ('000)	No-Build Benefit Cost Ratio	Cumilative Delay Cost Savings ('000)	Cumilative Fuel Cost Savings ('000)	Operations Benefit-Cost Ratio	Safety Benefit-Cost Ratio	Overall Benefit-Cost Ratio
1	1. MD 295 NB at MD 175	Convert MD 295 NB at MD 175 to partial signalized diamond interchange, and re-stripe MD 295 NB from 2 lanes to 3 lanes in this section. Ramps from MD 175 to MD 295 and Ramps to MD 295 NB from MD 175 will be signal controlled.	-$12,318.3	$6.2	-1,996.1	-$46,361.9	-$974.4	-0.9	0.3	-0.6
3A	3. Off-ramp from MD 295 SB to I-695 OL	a. Provide two-lane on-ramp with a choice lane on MD 295 SB, and merge the two-lane ramp to one-lane before joining I-695 OL.	-$10,229.4	$0.3	-33,708.6	$62,938.7	$1,322.8	43.0	-1.2	41.8
3B		b. Remove the loop ramp from I-695 OL to MD 295 NB to reduce weaving, which is a low volume ramp with less 100 vph during both AM and PM peak periods.	-$9,997.6	$0.1	-88,884.6	-$11,552.3	-$242.8	-12.3	0.3	-11.9
3C		c. Remove the loop ramp from I-695 OL to MD 295 NB and add a new lane to I-695 OL.	-$11,256.1	$1.1	-10,315.4	-$1,931.9	-$40.6	-0.2	0.2	0.0
4A	4. On-ramp from Canine Rd to MD 295 NB	a. Extend the acceleration lane extend from 350 feet to 1400 feet	#DIV/0!	$0.1	#DIV/0!	$2,056.6	$43.2	3.3	0.0	3.3
4B		b. Re-stripe the acceleration lane from 350 feet to 800 feet.	#DIV/0!	$0.0	#DIV/0!	$1,051.1	$22.1	20.0	0.0	20.0
4C		c. Implement ramp metering at On-ramp from Canine Rd to MD 295 NB.	#DIV/0!	$0.0	#DIV/0!	$38,690.2	$813.2	178.9	0.0	178.9

Greater Richmond Mobility Study

- Methodology
  - *Forecasting*
  - *Analysis*
  - *No Capacity Improvements*
- Regional Interstate System
  - *Focus on I-95 / I-64*
  - *How to shift traffic to Bypass*

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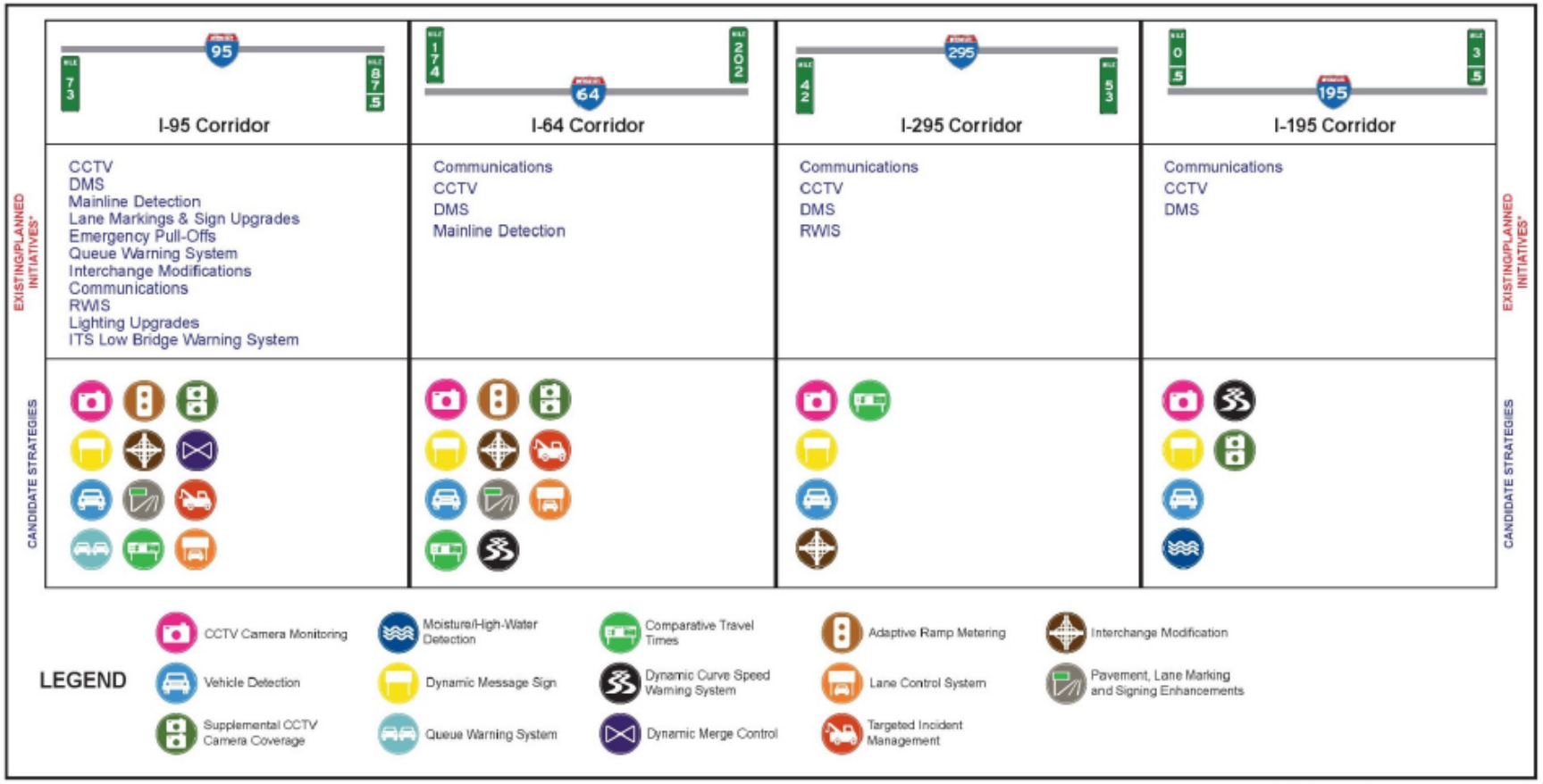
Greater Richmond Mobility Study



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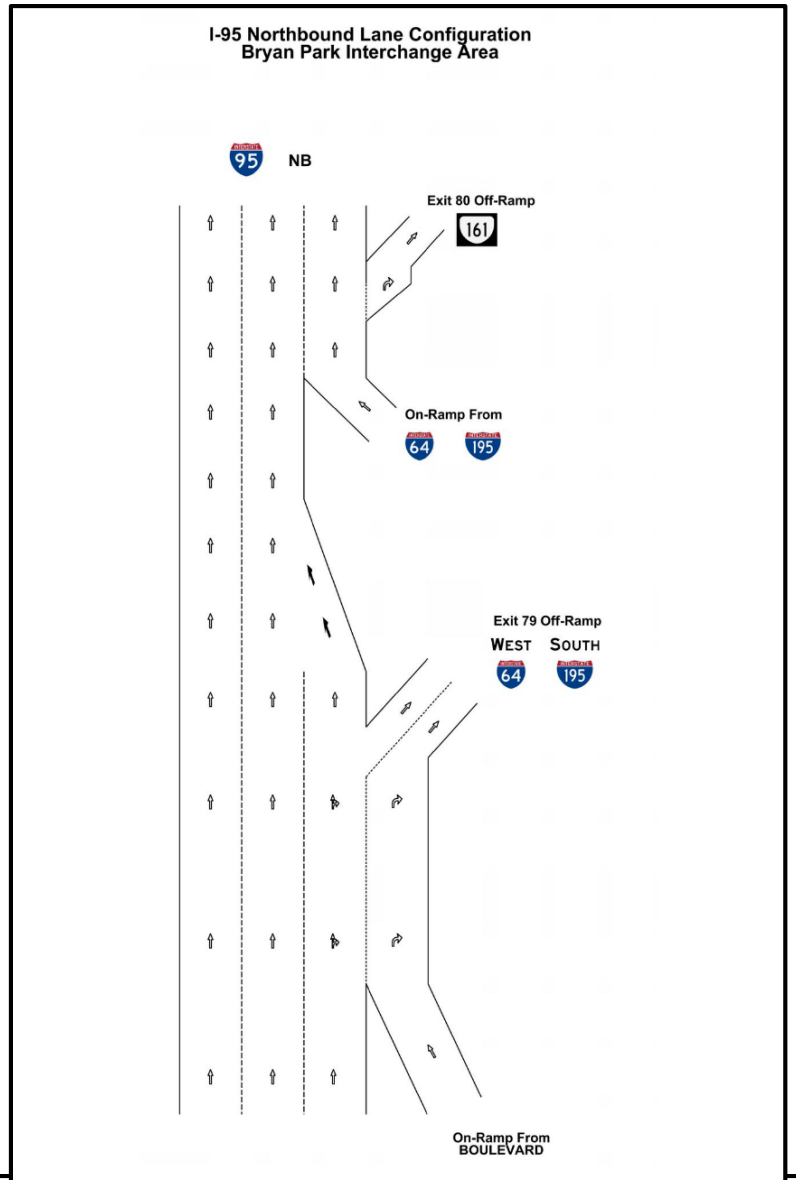
Greater Richmond Mobility Study



US 29 Corridor TSM&O

Route 29 Solutions

VDOT Virginia Department of Transportation

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US 29 Corridor TSM&O

- Before Construction Conditions:
  - *Average Annual Crashes (July 2012 – June 2015)*

Total Crashes	Injury Crashes	Severe Injury	Minor Injury	No Apparent Injury	No Injury
76	20	1	25	7	146

  - *Average Travel Time (April 9 – 10, 2014) (min:sec)*

Direction	Time Period	Average Travel Time
NB	AM Peak	10:20
	Midday	10:09
	PM Peak	12:22
SB	AM Peak	11:41
	Midday	11:01
	PM Peak	12:14

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US 29 Corridor TSM&O

- After Construction Conditions:
  - *July 2016 – June 2017 Crashes*

Total Crashes	Injury Crashes	Severe Injury	Minor Injury	No Apparent Injury	No Injury
41	7	1	8	1	84
-46%	-65%	0%	-68%	-86%	-42%

  - *Average Travel Time (August 9-10, 2017) (min:sec)*

Direction	Time Period	Average Travel Time	Travel Time Reduction
NB	AM Peak	8:08	-21%
	Midday	8:31	-16%
	PM Peak	9:59	-19%
SB	AM Peak	8:32	-27%
	Midday	9:17	-16%
	PM Peak	10:11	-17%

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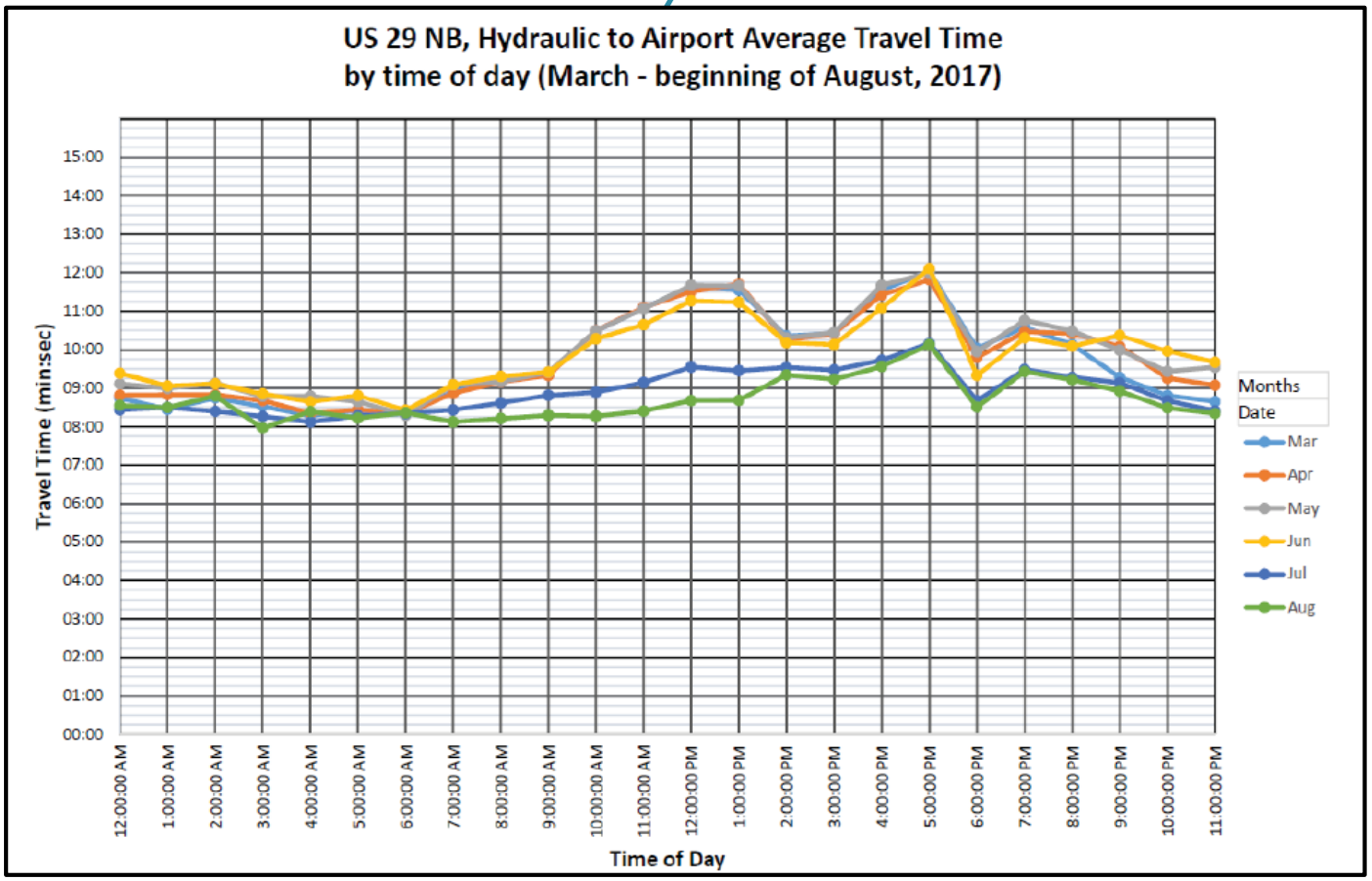
US 29 Corridor TSM&O

- After Construction Conditions:
  - *Enhanced Travel Time Reliability*



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Programmatic TSM&O

- Summary
  - *Meet the goals, vision and stakeholder desires of program*
  - *A lot of potential low-cost short-term improvement options*
  - *Utilize B-C analysis to obtain scope of costs*
  - *Evaluate traffic operations, safety, reliability and life cycle cost elements*
  - *Focus Statewide efforts on corridors which can relieve bottlenecks with greatest impact*
  - *Scoping down from Statewide to Regional allows for refined set of options to evaluate*
  - *Implementation on a corridor scale can alone provide substantial improvements*

THANK YOU!

QUESTIONS?

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