VDOT

Virginia Department of Transportation

Innovation and Technology Transportation Funded Projects and Programs

CTB Innovation and Technology Subcommittee

March 16, 2016

I-95/I-395 ICM Program: Multimodal Traveler Information

Project Description

Broad-based program to support multi-modal travel options in Northern Virginia. Project will include field equipment such as electronic signage comparing highway, alternate route and alternate mode travel time; parking management systems at VDOT Park and Ride lots; and dynamic destination travel time signs.

Proposed Signage

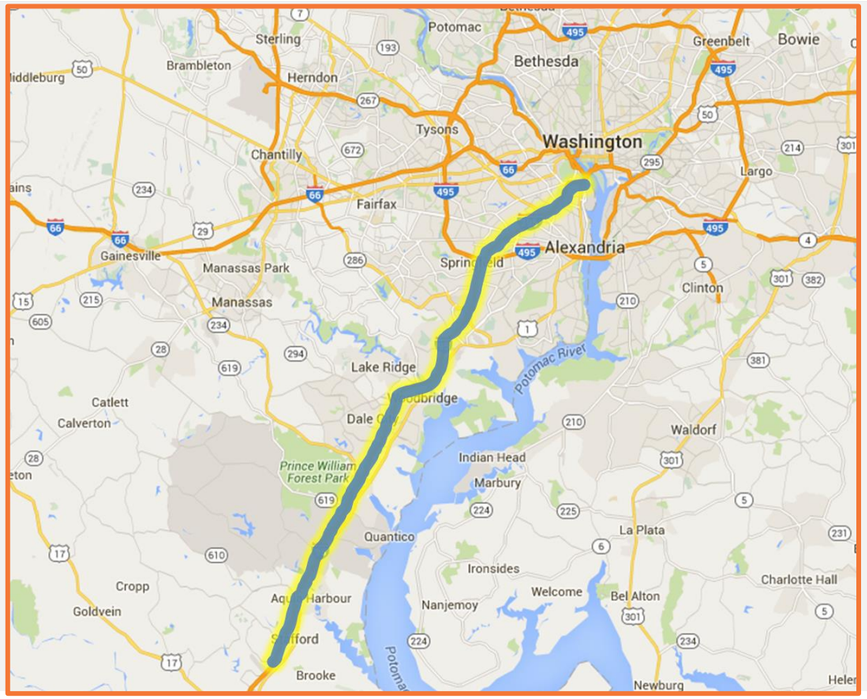
Planning Level Budget Estimate

Phase	Estimated Budget
Preliminary Engineering	$1,500,000
Construction	$4,200,000
Total =	**$5,700,000**

Project Benefits

Expected Project Benefits
Increased mode switch
Reduction in person-hours of delay
Increased facility throughput
Estimated 5-year economic benefit of $42,000,000 due to 3% reduction in delay

I-95/I-395 ICM Program: Multimodal Traveler Information



Corridor Characteristics

Washington to North Carolina Segment 3	
Annual Vehicle Hours of Delay (RITIS 2014)	5,749,832
Annual Buffer Time Index (RITIS 2014)	0.88
Average Median Incident Duration (VA Traffic 2015)	44

Project Score

Goal	Score
Supports multimodal travel	2/2
Minimizes Vehicle Hours of Delay	2/2
Reduces Buffer Time Index	2/2
Optimizes Corridor Throughput	2/2
Supports Incident Management	1/2
Project Readiness	1/2
Final Score	**10/12**

I-64 WB Integrated Over-height Vehicle Detection System

Project Description

Deployment of technology to detect and divert over-height vehicles in advance of HRBT tunnel; which will reduce the number of vehicles needing to turnaround requiring traffic stoppages. The project includes detectors, electronic signage and CCTV to monitor system performance.

HRBT

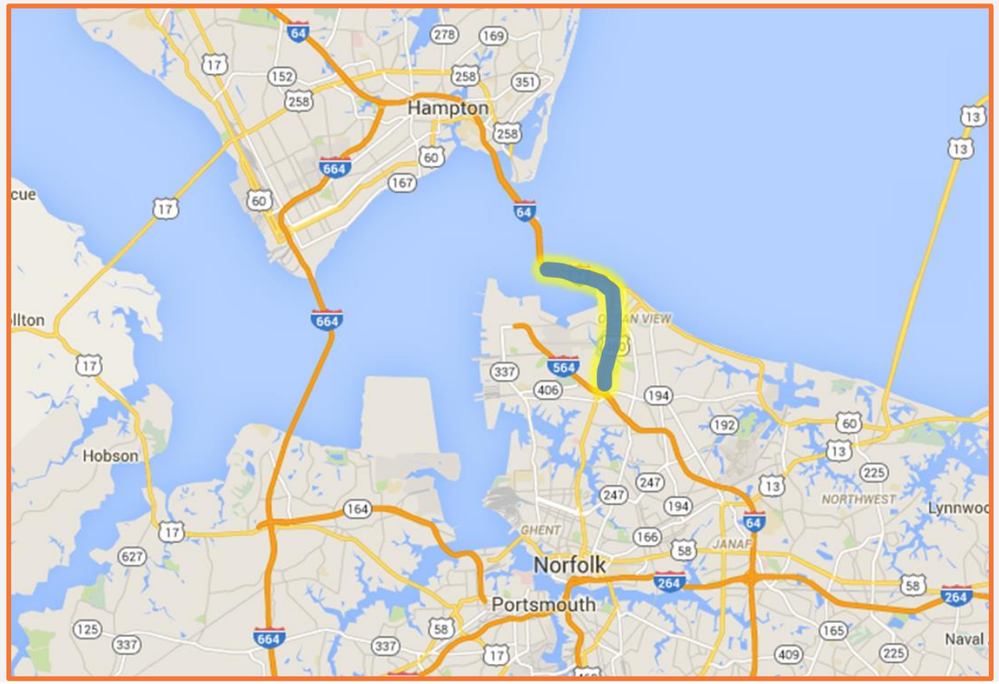
Planning Level Budget Estimate

Phase	Estimated Budget
Preliminary Engineering	Plans complete
Construction	$900,000
Total =	**$900,000**

Project Benefits

Expected Project Benefits
Reduction in number of trucks (2,000+) being stopped to turnaround at HRBT westbound
Increased facility reliability
Increased facility throughput
Estimated 5-year economic benefit of $5,100,000 due to 3% reduction in delay

I-64 Westbound: HRBT Integrated Over-height Vehicle Detection System



Corridor Characteristics

East-West Segment 5	
Annual Vehicle Hours of Delay (RITIS 2014)	2,880,509
Annual Buffer Time Index (RITIS 2014)	0.24
Average Median Incident Duration (VA Traffic 2015)	54

Project Score

Goal	Score
Supports multimodal travel	0/2
Minimizes Vehicle Hours of Delay	2/2
Reduces Buffer Time Index	2/2
Optimizes Corridor Throughput	2/2
Supports Incident Management	2/2
Project Readiness	2/2
Final Score	**10/12**

Arterial Operations Improvements: US60, US17, Rt. 143 & Rt. 199

Project Description

Deployment of advanced signal communications, monitoring and control technologies to improve travel on the parallel routes to I-64 around the Williamsburg area.

Rt. 199 & Rt. 60

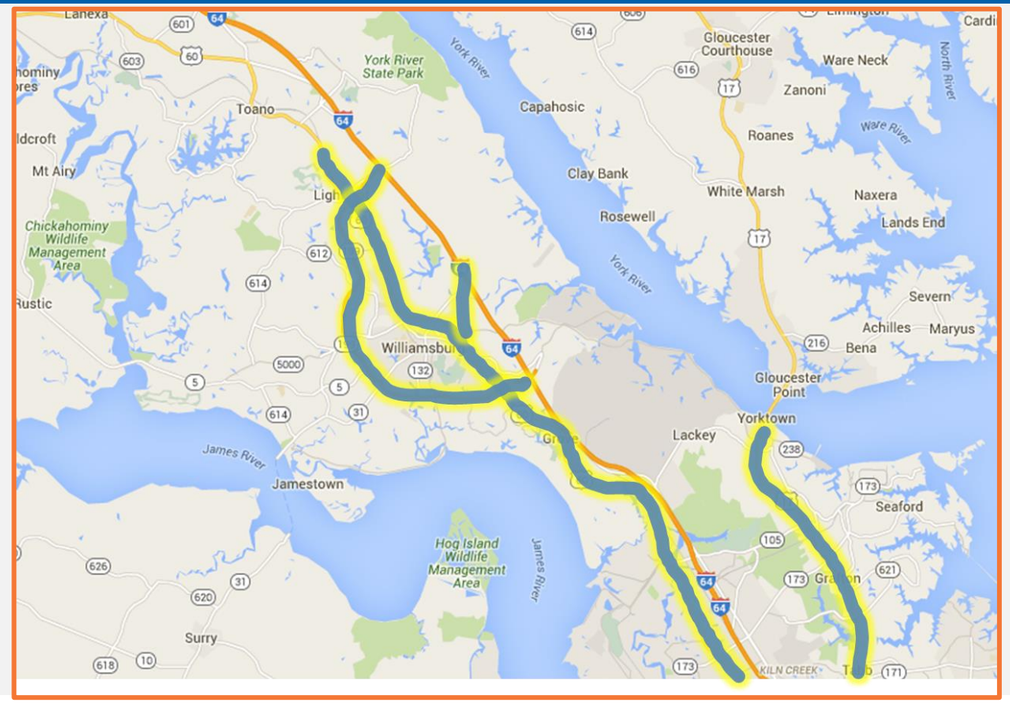
Planning Level Budget Estimate

Phase	Estimated Budget
Preliminary Engineering	$160,000
Construction	$1,400,000
Total =	**$1,560,000**

Project Benefits

Expected Project Benefits
Up to 30% reduction in corridor travel times due to coordinated traffic signal systems
Increased facility reliability
Increased facility throughput
Estimated 5-year economic benefit of $1,700,000 due to 5% reduction in delay

Arterial Operations Improvements: US60, US17, Rt. 143 & Rt. 199



Corridor Characteristics

East-West Segment 5	
Annual Vehicle Hours of Delay (RITIS 2014)	2,880,509
Annual Buffer Time Index (RITIS 2014)	0.24
Average Median Incident Duration (VA Traffic 2015)	54

Project Score

Goal	Score
Supports multimodal travel	1/2
Minimizes Vehicle Hours of Delay	2/2
Reduces Buffer Time Index	2/2
Optimizes Corridor Throughput	2/2
Supports Incident Management	1/2
Project Readiness	2/2
Final Score	**10/12**

ITTF CORRIDOR PROJECT #3

I-95 Southbound Hard/Dynamic Shoulder Running

Project Description

Implementation of hard/dynamic shoulder running on I-95 southbound from Exit 140, Rt. 630 to Exit 133, US17, a distance of approximately 5.4 miles.

Hard/Dynamic Shoulder Running

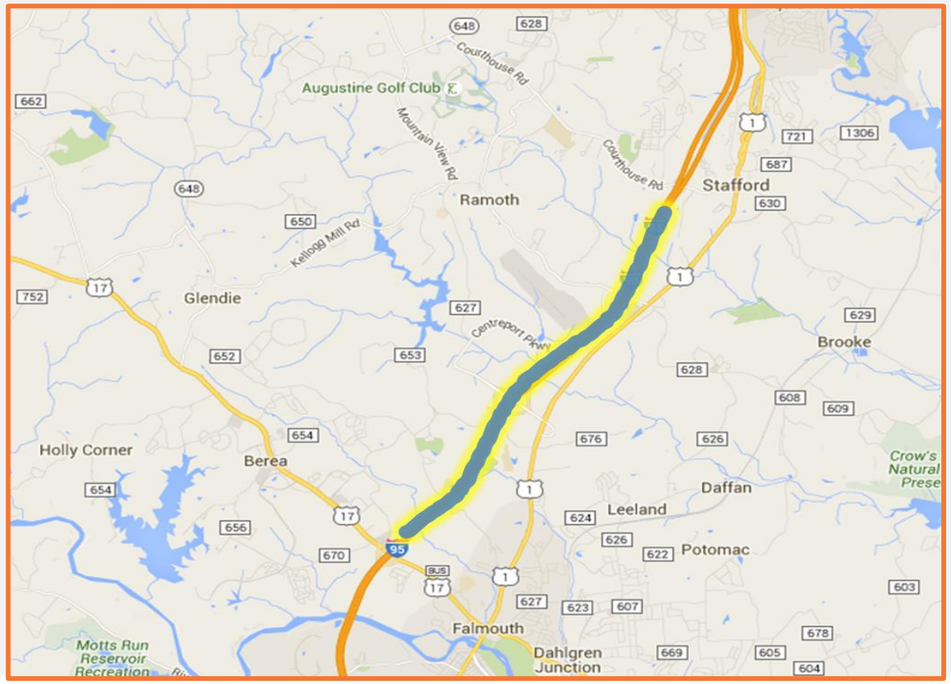
Planning Level Budget Estimate

Phase	Estimated Budget
Preliminary Engineering	$3,000,000
Construction	$17,000,000
Total =	**$20,000,000**

Project Benefits

Expected Project Benefits
Increased facility throughput
Reduction in person-hours of delay
Reduction in vehicle crashes
Decrease in road user costs by $10.97M per year

I-95 Hard/Dynamic Shoulder Running



Corridor Characteristics

Washington to North Carolina Segment 3	
Annual Vehicle Hours of Delay (RITIS 2014)	5,749,832
Annual Buffer Time Index (RITIS 2014)	0.88
Average Median Incident Duration (VA Traffic 2015)	46

Project Score

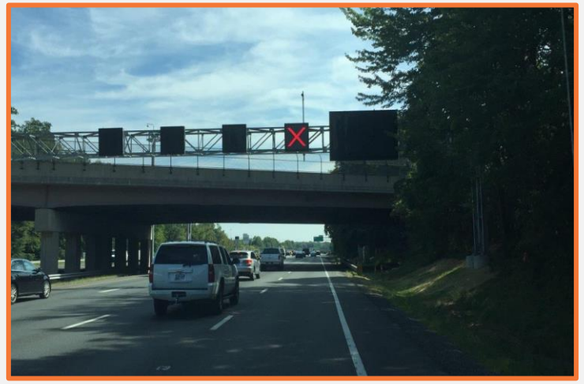
Goal	Score
Supports multimodal travel	1/2
Minimizes Vehicle Hours of Delay	2/2
Reduces Buffer Time Index	2/2
Optimizes Corridor Throughput	2/2
Supports Incident Management	2/2
Project Readiness	1/2
Final Score	**10/12**

ITTF CORRIDOR PROJECT #4

I-64 Hampton Roads Active Traffic Management System: Phase 1 Westbound

Project Description

Deployment of camera, sensor, lane control and variable speed limit technologies to actively manage westbound traffic approaching the HRBT facility.



I-66 Active Traffic Management

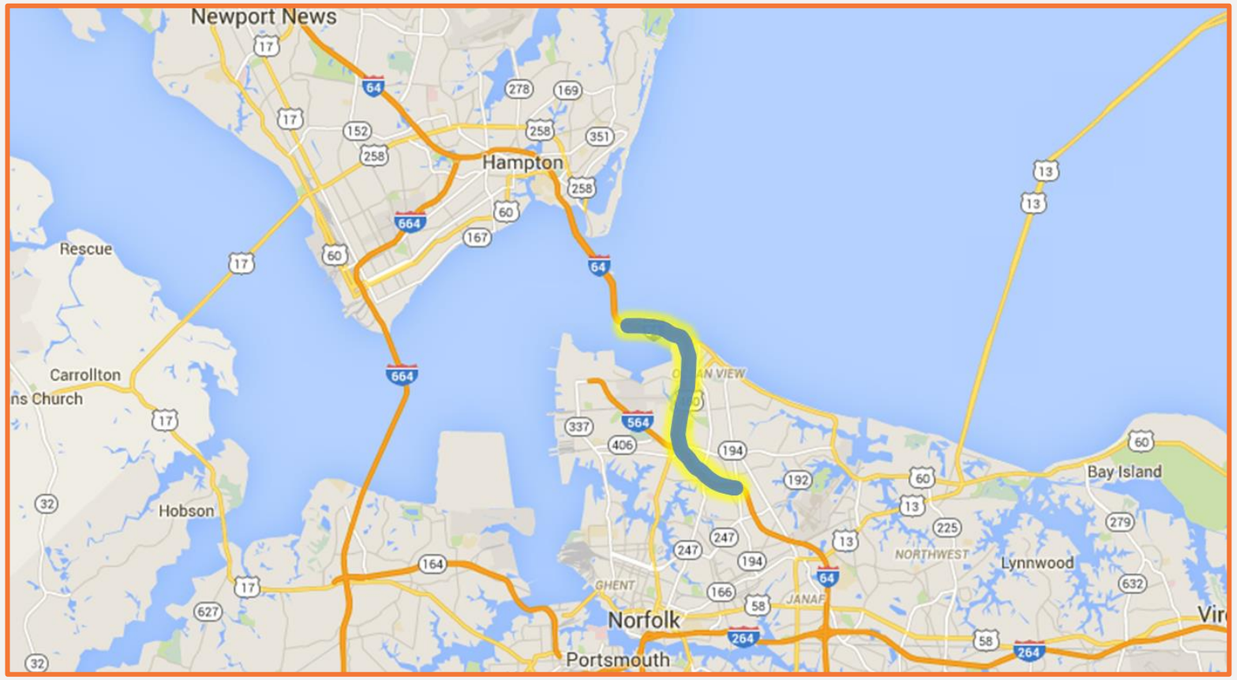
Planning Level Budget Estimate

Phase	Estimated Budget
Preliminary Engineering	$2,000,000
Construction	$12,500,000
Total =	**$14,500,000**

Project Benefits

Expected Project Benefits
1% - 5% reduction in delay
3% - 11% improvement in travel time reliability
40% - 50% decrease in secondary accidents
Estimated 5-year economic benefit of $15,000,000 using to 5% reduction in delay. Safety benefits are not included in this analysis.

I-64 Hampton Roads Active Traffic Management System: Phase 1 Westbound



Corridor Characteristics

East-West Segment 5	
Annual Vehicle Hours of Delay (RITIS 2014)	2,880,509
Annual Buffer Time Index (RITIS 2014)	0.24
Average Median Incident Duration (VA Traffic 2015)	54

Project Score

Goal	Score
Supports multimodal travel	0/2
Minimizes Vehicle Hours of Delay	2/2
Reduces Buffer Time Index	2/2
Optimizes Corridor Throughput	2/2
Supports Incident Management	2/2
Project Readiness	1/2
Final Score	**9/12**

Monitor-Merrimac Memorial Bridge-Tunnel Traffic and Safety Improvements

Project Description

Fiber optics, lane control and tunnel traffic safety systems to enhance incident management at a key Hampton Roads crossing. System will allow for reversible lanes through the tunnel tubes.

MMMBT

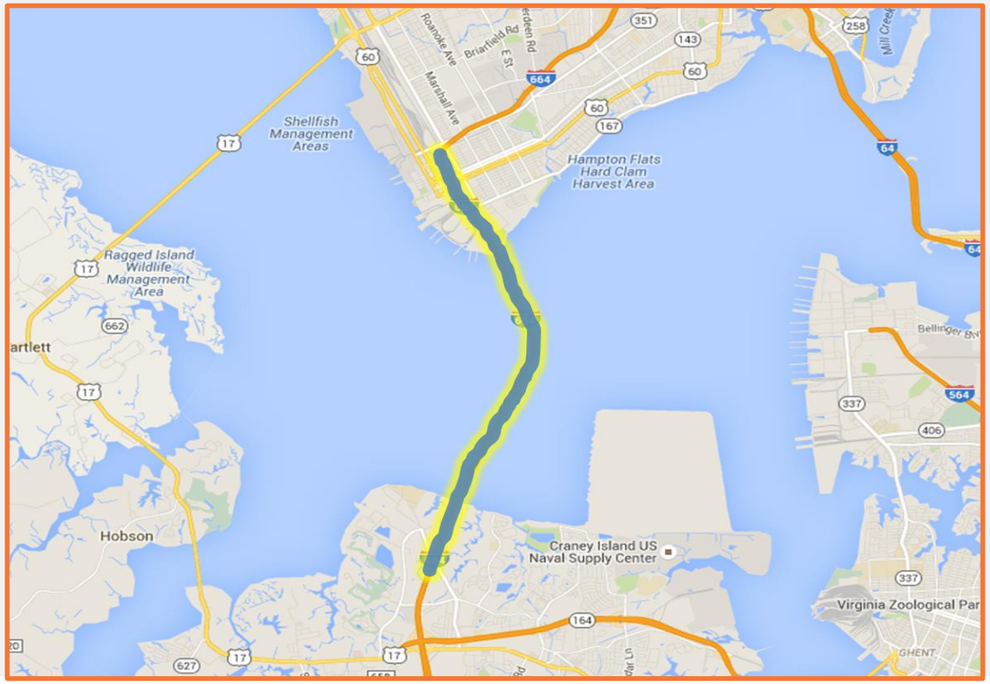
Planning Level Budget Estimate

Phase	Estimated Budget
Preliminary Engineering	$1,000,000
Construction	$6,000,000
Total =	**$7,000,000**

Project Benefits

Expected Project Benefits
1% - 5% reduction in delay
Reversible travel option for incident and emergency management
Estimated 5-year economic benefit of $1,200,000 due to 5% reduction in delay

MMMBT Traffic and Safety Improvements



Corridor Characteristics

East-West Segment 5	
Annual Vehicle Hours of Delay (RITIS 2014)	2,880,509
Annual Buffer Time Index (RITIS 2014)	0.24
Average Median Incident Duration (VA Traffic 2015)	54

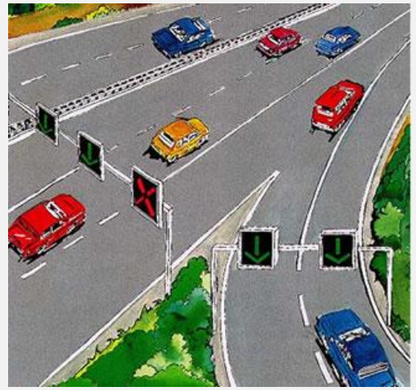
Project Score

Goal	Score
Supports multimodal travel	0/2
Minimizes Vehicle Hours of Delay	2/2
Reduces Buffer Time Index	2/2
Optimizes Corridor Throughput	2/2
Supports Incident Management	2/2
Project Readiness	1/2
Final Score	**9/12**

I-95 Richmond Active Traffic Management

Project Description

Deployment of dynamic lane control and dynamic ramp metering technologies to improve safety and throughput on the I-95 corridor in Richmond



Dynamic Ramp Metering and Merge Control

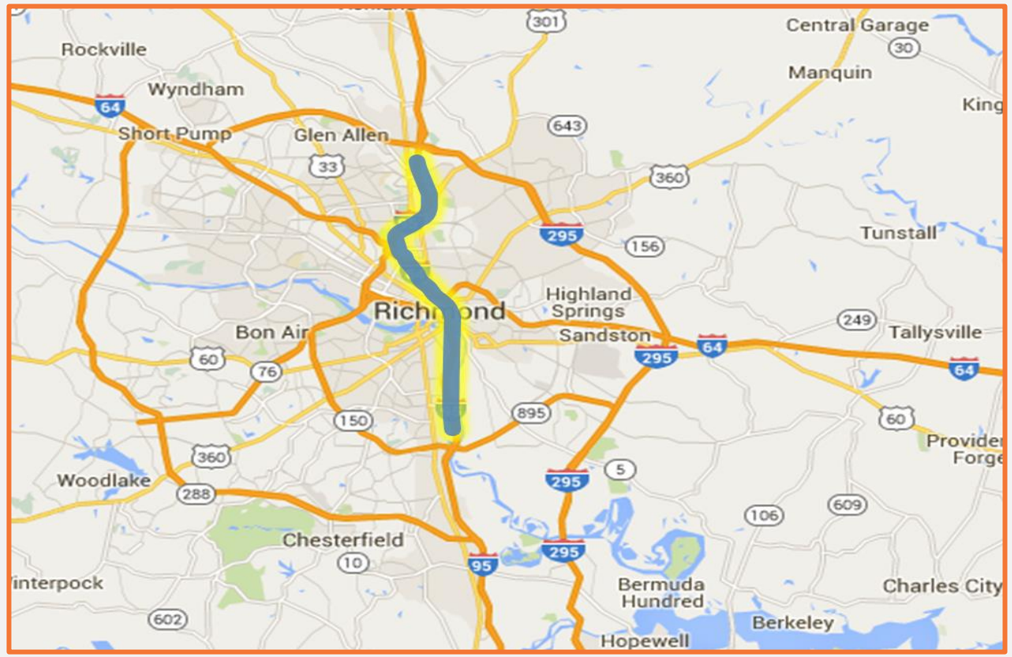
Planning Level Budget Estimate

Phase	Estimated Budget
Preliminary Engineering	$603,500
Construction	$5,431,500
Total =	**$6,035,000**

Project Benefits

Expected Project Benefits
3% to 22% increase in overall capacity
3% - 11% improvement in travel time reliability
40% - 50% decrease in secondary accidents
Estimated 5-year economic benefit of $6,000,000 due to 10% reduction in delay

I-95 Richmond Active Traffic Management



Corridor Characteristics

Washington to North Carolina Segment 2	
Annual Vehicle Hours of Delay (RITIS 2014)	838,918
Annual Buffer Time Index (RITIS 2014)	0.03
Average Median Incident Duration (VA Traffic 2015)	48

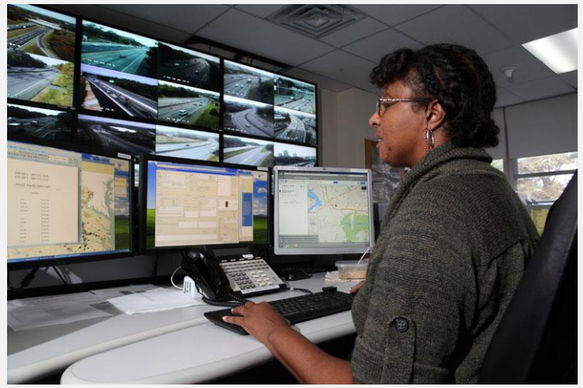
Project Score

Goal	Score
Supports multimodal travel	0/2
Minimizes Vehicle Hours of Delay	2/2
Reduces Buffer Time Index	1/2
Optimizes Corridor Throughput	2/2
Supports Incident Management	2/2
Project Readiness	1/2
Final Score	**8/12**

Richmond Traffic Operations Center Upgrade
(Capital Region Public Safety Operations Center)

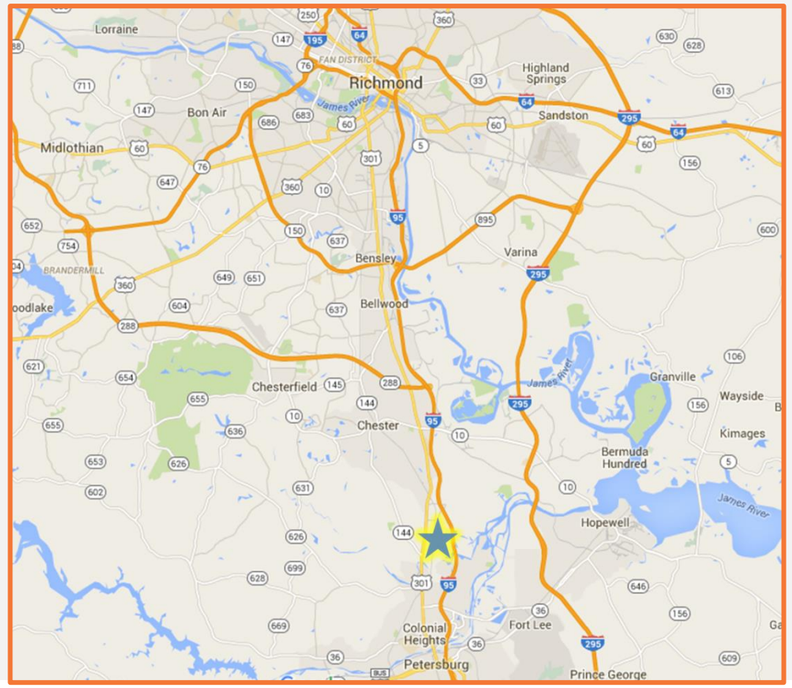
Project Description

Upgrade of VDOT Richmond Traffic Operations Center and co-location with Virginia State Police. This project will provide the necessary infrastructure and space to support any future traffic management systems in the Central Region. It is a pre-requisite for any additional operational improvements in the region.



Richmond TOC

Richmond Traffic Operations Center Upgrade



Planning Level Budget Estimate

Phase	Estimated Budget
Traffic Operations Center Construction (ITTF)	$10,000,000
Non-TOC VDOT Construction (Other funds)	$20,000,000
Total Building Construction =	**$30,000,000**

Corridor Characteristics

Washington to North Carolina Segment 2	
Annual Vehicle Hours of Delay (RITIS 2014)	838,918
Annual Buffer Time Index (RITIS 2014)	0.03
Average Median Incident Duration (VA Traffic 2015)	47

East-West Segment 4	
Annual Vehicle Hours of Delay (RITIS 2014)	468,394
Annual Buffer Time Index (RITIS 2014)	0.06
Average Median Incident Duration (VA Traffic 2015)	47

Project Benefits

Expected Project Benefits
3% to 22% increase in overall capacity
3% - 11% improvement in travel time reliability
40% - 50% decrease in secondary accidents

Project Score

Goal	Score
Supports multimodal travel	0/2
Minimizes Vehicle Hours of Delay	1/2
Reduces Buffer Time Index	1/2
Optimizes Corridor Throughput	2/2
Supports Incident Management	2/2
Project Readiness	2/2
Final Score	**8/12**

ITTF CORRIDOR PROJECT #8

Advanced Towing and Recovery (Emergency Relocation) Pilot Program

Project Description

Implementation of a large pilot program to partner with towing and recovery operators to stage and deploy assets quicker during peak period travel times. A limited temporary towing program was conducted at the HRBT in summer of 2015. This program contained VHD growth to 0% while VHD for the greater Hampton Roads region increased by 16%.

Heavy Recovery Vehicle

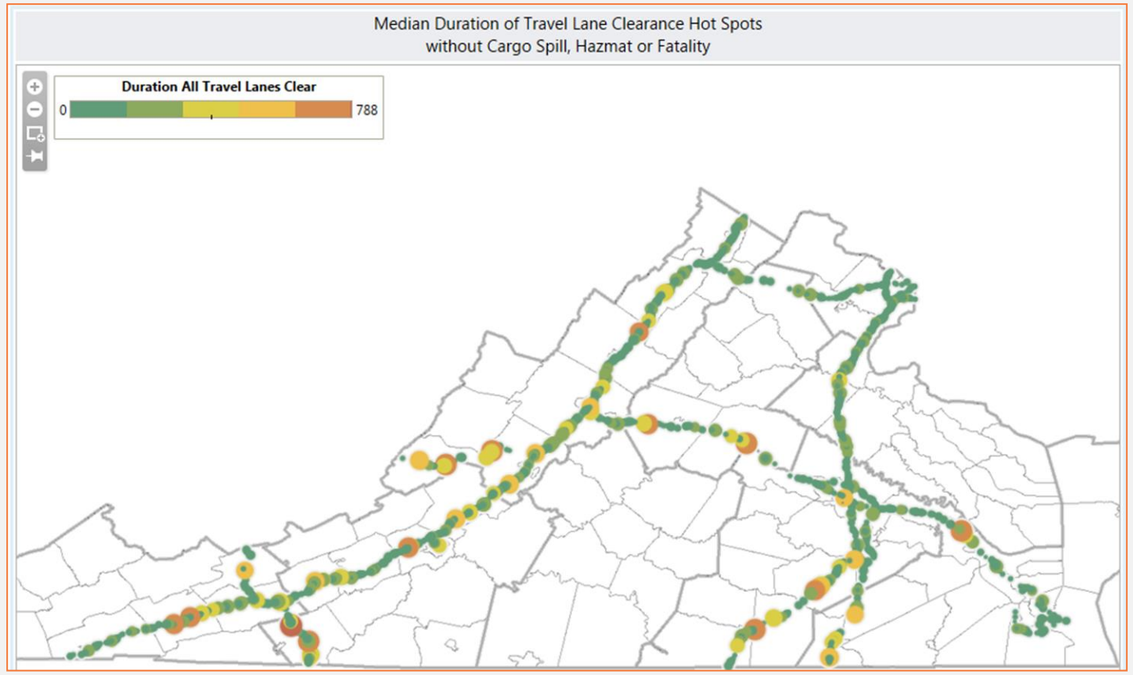
Planning Level Budget Estimate

Phase	Estimated Budget
Planning	$0
Implementation	$4,000,000
Total =	**$4,000,000**

Project Benefits

Expected Project Benefits
Incentive Tow: 50% reduction in incident duration
VSP Heavy Recovery List: 10% reduction in incident duration
Contract Tow: 15 minute reduction in incident duration
Program could reduce the cost of congestion on Virginia Interstate Highways by $30M.

Event Location Hot Spots by Median Duration



Heavy Recovery Vehicle In Action

Support for Program Goals

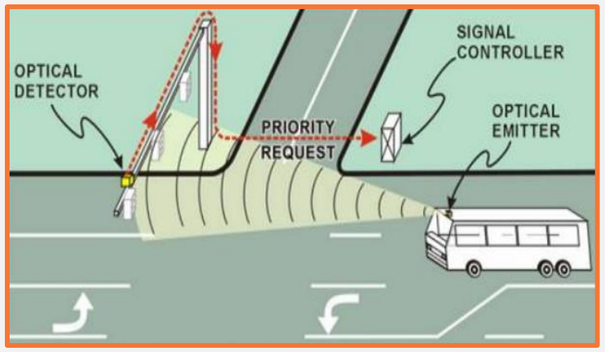
Goal	
Supports multimodal travel	
Minimizes Vehicle Hours of Delay	✓
Reduces Buffer Time Index	✓
Optimizes Corridor Throughput	✓
Supports Incident Management	✓
Project Readiness	✓

ITTF STATEWIDE PROGRAM: #1

Transit Efficiency-Enabling Technologies

Project Description

Deployment of technologies to support transit system reliability and improve travel times. VDOT to partner with DRPT and localities to identify most promising corridors and/or transit systems.



Transit Signal Priority

Planning Level Budget Estimate

Phase	Estimated Budget
Planning	TBD
Implementation	$2,500,000
Total =	**$2,500,000**

Project Benefits

Expected Project Benefits
Improved customer satisfaction
Improved travel times
Improved reliability
Increased transit usage
Up to 35% reduction in bus travel time variability

Support for Program Goals

Goal	
Supports multimodal travel	✓
Minimizes Vehicle Hours of Delay	
Reduces Buffer Time Index	
Optimizes Corridor Throughput	✓
Supports Incident Management	
Project Readiness	✓

Potential Transit Partners

Next Bus Signage

ITTF STATEWIDE PROGRAM: #2

Implement Emerging Technology Research

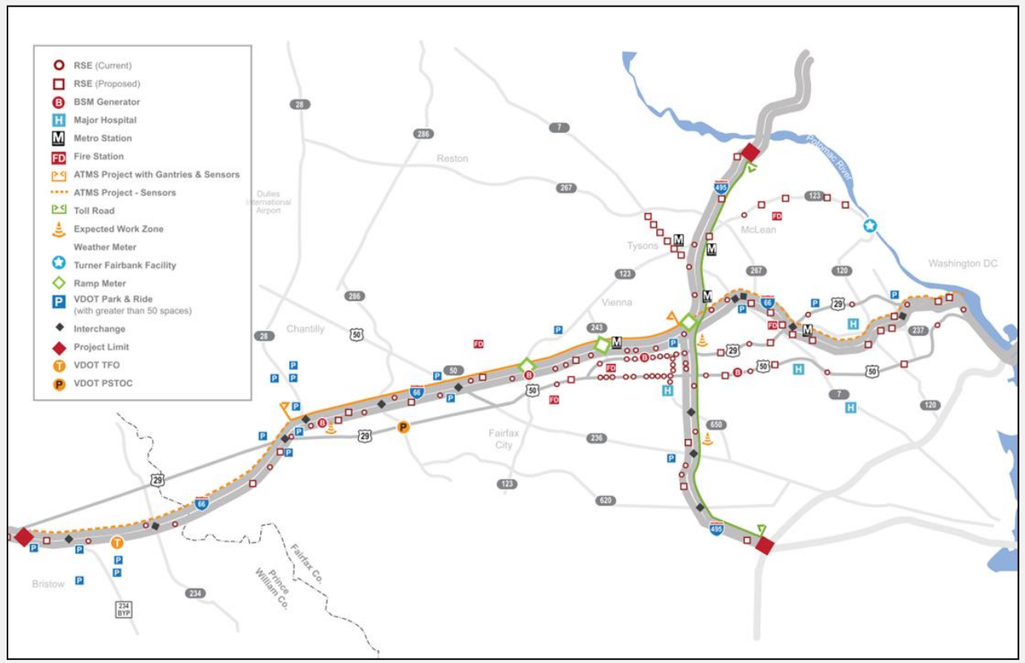
Project Description

Conduct and implement innovative research on advanced transportation technologies. Research partners include:

- Virginia Transportation Research Council
- University of Virginia
- Virginia Tech
- George Mason University
- Old Dominion University

Connected Vehicles

Virginia Connected Corridors Northern Virginia Test Bed



Current Research Projects

Project
Connected Vehicle Pooled Fund Study
Virginia Connected Corridors Program
Emergency Vehicle Priority Systems
Vehicle Probe Data Evaluation
Statewide Central Signal System
Quick Clearance Guidance
Hurricane Evacuation Scenarios
Arterial Performance Measures
Metro Silver Line Impact Analysis
HRBT Congestion Analysis
Work Zone Management Tools
I-95 Express Lanes Evaluation

Research Implementation Budget

Source	Budget
ITTF	**$2,500,000**

Support for Program Goals

Goal	
Supports multimodal travel	✓
Minimizes Vehicle Hours of Delay	✓
Reduces Buffer Time Index	✓
Optimizes Corridor Throughput	✓
Supports Incident Management	✓
Project Readiness	✓

VDOT 511 System Enhancements

Project Description

Deployment of new system features to promote multimodal options and advanced travel time estimation features. Promotes traffic demand management capabilities to control traffic volume.

511 Roadside Sign

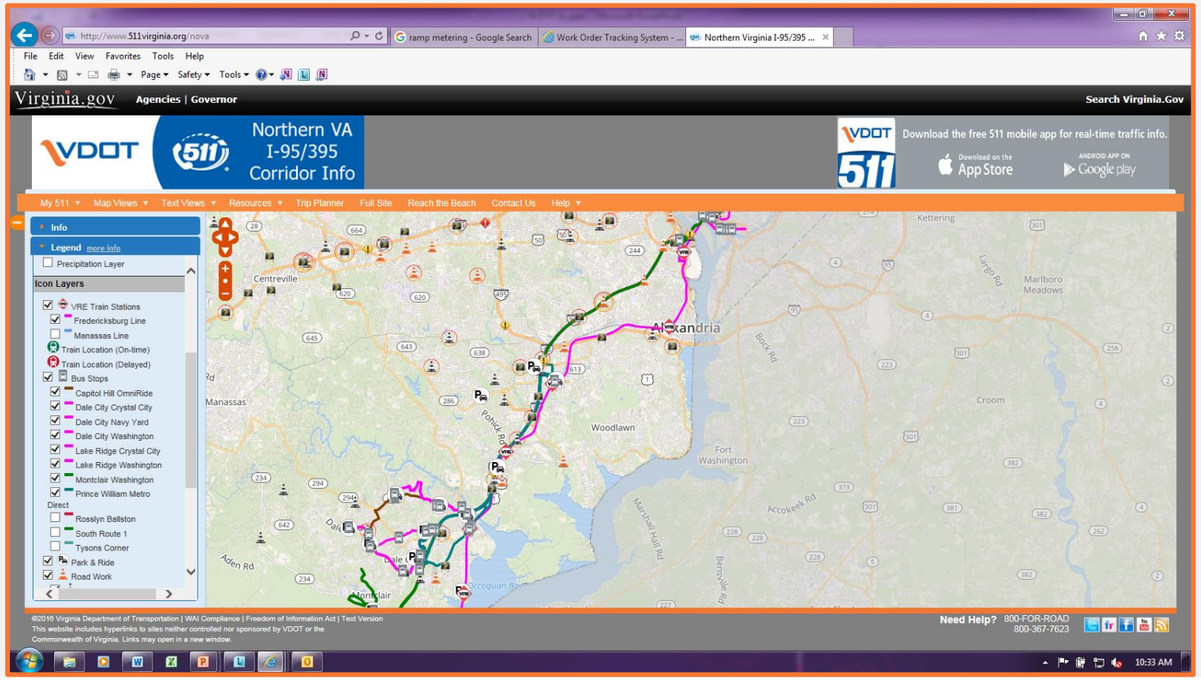
Planning Level Budget Estimate

Service Enhancements	Estimated Budget
Multimodal travel options	
Integration of crowd-sourced data	
Improve travel time for arterials	
Total	**$2,300,000**

Project Benefits

Estimated Project Benefits
Improved route choice
Improved travel time information
Increased customer satisfaction

511 VA Website



511 VA Android App

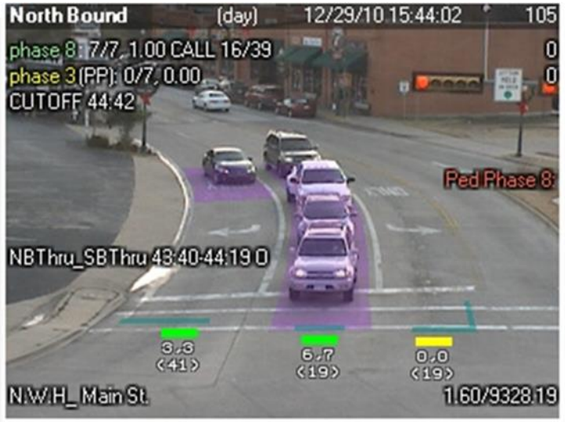
Support for Program Goals

Goal	
Supports multimodal travel	✓
Minimizes Vehicle Hours of Delay	✓
Reduces Buffer Time Index	✓
Optimizes Corridor Throughput	✓
Supports Incident Management	✓
Project Readiness	✓

Community-Wide Adaptive Signal System

Project Description

Deployment of adaptive traffic signal and centralized signal control technology on key arterial corridors to demonstrate / maximize the benefits of such technology. This is a pilot program to partner with localities to improve urban traffic flow.



Adaptive Signal Technology

Planning Level Budget Estimate

Location	Estimated Budget
TBD	**$3,000,000**

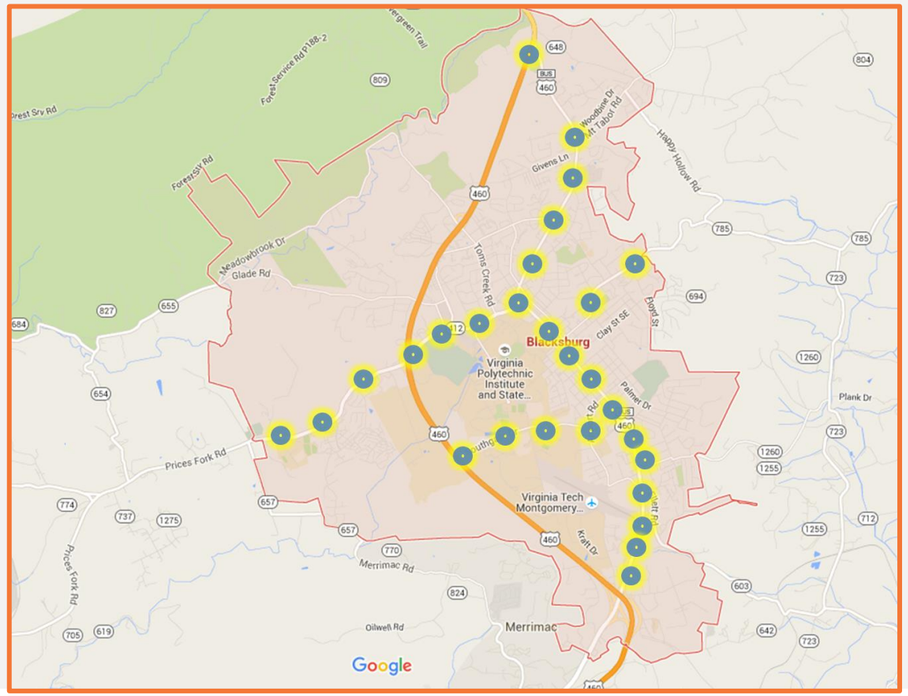
Project Benefits

Estimated Project Benefits
Up to 35% peak period travel time reduction
Up to 30% reduction in corridor travel times
Up to 90% reduction in number of stops
Pilot test of centralized signal control system

Support for Program Goals

Goal	
Supports multimodal travel	✓
Minimizes Vehicle Hours of Delay	✓
Reduces Buffer Time Index	✓
Optimizes Corridor Throughput	✓
Supports Incident Management	
Project Readiness	✓

Sample Deployment: Blacksburg, VA



Main Street, Blacksburg, VA

ITTF STATEWIDE PROGRAM: #5

Advanced Traffic Signal Controllers

Project Description

Deployment of new traffic signal controller technology to improve arterial throughput and reliability. The Advance Transportation Controller (ATC) allows application developers to create computer programs that work with the signal controller. This will be a critical component of all traffic signals as connected vehicle and autonomous vehicle technology begins to be deployed by the auto industry.

Intersection Communication with Connected Vehicles

Planning Level Budget Estimate

Program	Estimated Budget
Up to 1,500 signals statewide	**$3,000,000**

Project Benefits

Estimated Project Benefits
Improved arterial throughput
Improved arterial reliability
Ability to generate intersection performance metrics
Preparation for connected/autonomous vehicles

Support for Program Goals

Goal	
Supports multimodal travel	✓
Minimizes Vehicle Hours of Delay	✓
Reduces Buffer Time Index	✓
Optimizes Corridor Throughput	✓
Supports Incident Management	
Project Readiness	✓

Typical VDOT Traffic Signal Cabinet

Sample Solution: Econolite Cobalt ATSC

Case Study: Operations Management on Rt. 164

Project Description

Deployment of CCTV, electronic signage and safety service patrols on Rt. 164, a limited access highway from Portsmouth to I-664, in 2012. Previously, no traffic monitoring or SSP service existed on this route.

Rt. 164

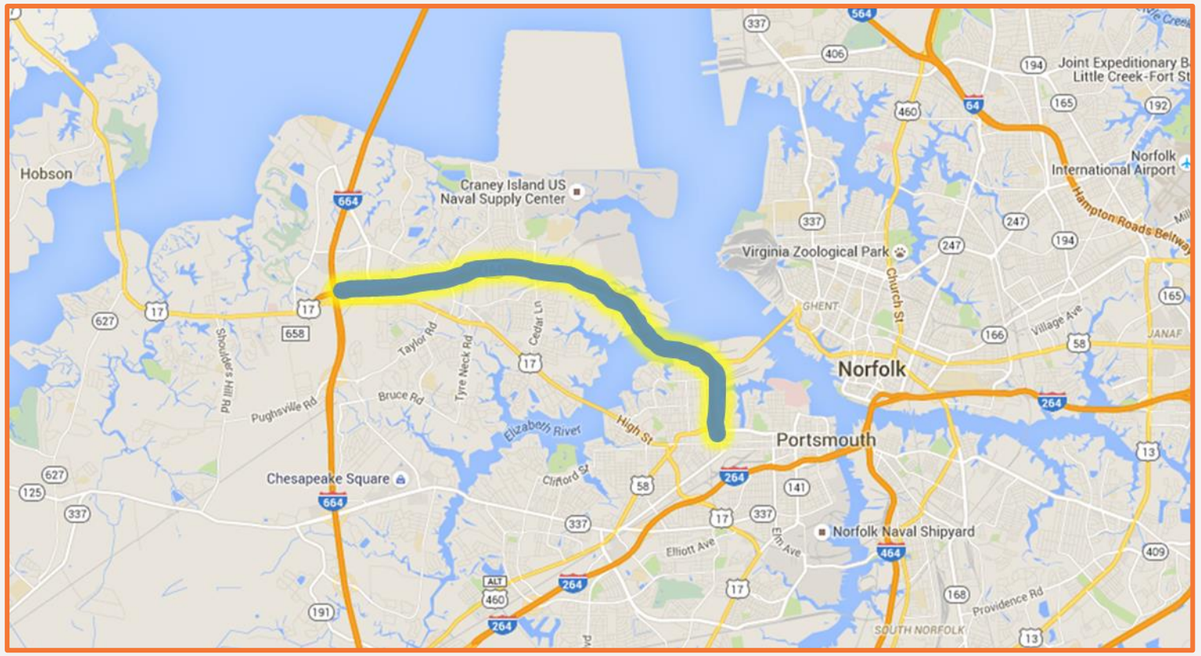
Technologies Deployed

Type	#
Cameras	6
DMS	5
Safety Service Patrol added	**1 route**

Project Results

Project Results
Reduced vehicle hours of delay by 17% from 2012 to 2014 while traffic volume increased 2.6%
Total Cost: $3 M **Annual Savings: $160k**

Operations Management on Rt. 164



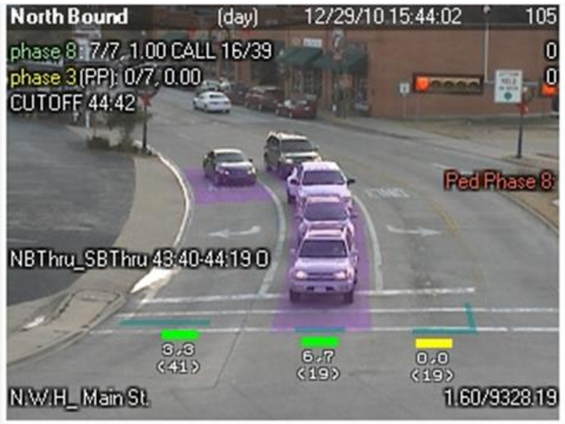
Support for Program Goals

Goal	
Supports multimodal travel	
Minimizes Vehicle Hours of Delay	✓
Reduces Buffer Time Index	✓
Optimizes Corridor Throughput	✓
Supports Incident Management	✓
Project Readiness	✓

Case Study: Adaptive Signal System Technology

Project Description

Adaptive signal control technology provides for real-time, automated signal timing adjustments. Virginia has installed adaptive signal systems on 16 corridors at approximately 132 intersections throughout the Commonwealth.



Adaptive Signal System Technology

Adaptive Signal System Technology: Detection Zones

Adaptive Signal Corridors

Location	# of intersections
US 29 Fauquier	6
US 11 Stephenson	6
US 25 Pantops	10
US 17 York	10
Rt. 277 Frederick	6
US17/50/522 Frederick	6
US 250 Staunton	10
Route 7 Winchester	12
Route 419 Roanoke	12
US 50 Winchester	5
US 29 Lynchburg	10
US 17 & Victory Blvd.	11
US 13 Exmore	6
US 13 Onley	8
Route 321 James City County	9
US 11 Exit 5 Bristol	5
Total	**132**

Project Results

Project Results
30% reduction in corridor travel times due to coordinated traffic signal systems
37% reduction in number of stops due to adaptive traffic signal control
17% reduction in total crashes due to adaptive traffic signal control
Total Cost: $4,700,000 **B/C Ratio: 8:1**

Support for Program Goals

Goal	
Supports multimodal travel	✓
Minimizes Vehicle Hours of Delay	✓
Reduces Buffer Time Index	✓
Optimizes Corridor Throughput	✓
Supports Incident Management	
Project Readiness	✓