

# Intelligent Transportation Systems & Safety Analysis

Technical Report for the 2031 Long-Range Transportation Plan  
and Congestion Management System Update

Town of  
Ashland  
Counties of  
Charles City  
Chesterfield  
Goochland  
Hanover  
Henrico  
New Kent  
Powhatan  
City of  
Richmond



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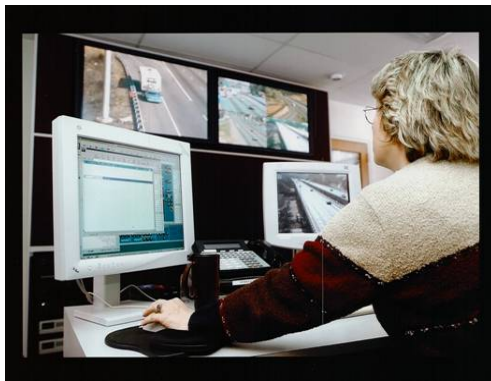
## What is ITS?

**ITS** is an acronym that stands for **Intelligent Transportation Systems**. The basic goal of ITS programs across the country is the use of modern computer and communications technologies to aid in the management of our existing transportation systems. When integrated into the transportation system infrastructure, and in vehicles themselves, these technologies help monitor and manage traffic flow, reduce congestion, provide alternate routes to travelers, enhance productivity, and save lives, time, and money.

Intelligent transportation systems provide the tools for skilled transportation professionals to collect, analyze, and archive data about the performance of the system during the hours of peak use. Having this data enhances traffic operators' ability to respond to incidents, adverse weather, or other capacity constricting events.

Examples of Intelligent transportations systems include:

**Advanced Traveler Information Systems** deliver data directly to travelers, empowering them to make better choices about alternate routes or modes of transportation. When archived, this historical data provides transportation planners with accurate travel pattern information.



**Advanced Traffic Management Systems** employ a variety of relatively inexpensive detectors, cameras, and communication systems to monitor traffic, optimize signal timings on major arterials, and control the flow of traffic.

**Incident Management Systems**, for their part, provide traffic operators with the tools to allow quick and efficient response to accidents, hazardous spills, and other emergencies. Redundant communications systems link data collection points, transportation operations centers, and travel information portals into an integrated network that can be operated efficiently and "intelligently."



# What are the benefits of ITS?

## **Better travel information**

Information centers provide up-to-date, real-time travel information through television in the home, kiosks in the workplace, on the Internet, and electronic messages at the bus stop.

## **Quicker emergency response**

Electronic accident detection allows trained operators to locate and quickly dispatch the right emergency personnel and equipment to the site.

## **Easier travel**

Navigation systems in the car or truck tell drivers exactly how to get to their destination.

## **Improved traffic flow**

A driver with a Smart Tag attached to their vehicle can travel through toll plazas without stopping. Other travel fare collection systems allow a variety of transportation fares and fees to be charged to one card.

## **Fewer traffic jams**

Traffic management centers reduce traffic jams and increase travel speed travel by continuously monitoring current conditions and adjusting speed limits, traffic signals and roadway ramp access.

## **Improved trucking management**

Bus, freight, and emergency vehicle tracking systems allow supervisors to track vehicles and to communicate directly with drivers.

## **Faster goods delivery**

ITS provides for electronic weighing and inspection of commercial vehicles while in motion and allows for electronic tracking of transportation permits, containers, shipments, and vehicles.

## **Safer travel**

ITS technologies warn drivers that there is an accident ahead or that they are in danger of running off the edge of the road. New traffic control systems can reduce the number of vehicle stops, minimize changes in vehicle speeds, and improve traffic flow.

## **ITS saves money**

Cost/benefit analyses show that over time ITS investments yield tremendous savings to taxpayers.

## **ITS helps to clean the air and save energy**

Decreased traffic and gridlock through ITS technology reduces energy use. Pollution can be decreased by smoother, more evenly distributed traffic flow, as well as by increases in the use of public transit.

## **Homeland security**

As both a possible target and a key to evacuation during an emergency, the transportation system plays a critical role in keeping a region secure. ITS plays a key role in enhancing transportation system security and developing the most effective strategies against major catastrophic events.

# ITS Technology in the Richmond Region

At the center of ITS use in the Richmond area is the Virginia Department of Transportation's (VDOT) Richmond District Smart Traffic Center, located in Chester. This facility is the newest of VDOT's Smart Traffic Centers, having commenced 24-hour, seven-day operations in March 2001. The Smart Traffic Center works with VDOT offices, state police, and the Transportation Emergency Operations Center to keep VDOT and the public informed of traffic incidents as they happen within the 14 counties and four cities that comprise the Richmond

District. The center also works with the media and uses radio, the Internet and variable message signs to provide real-time information to Virginia's motorists and to detour traffic when snarls block major arteries through Richmond.

The two-year old facility has traffic cameras along I-95 and I-64, permanent overhead changeable message signs along I-95, I-64, and I-295, several trailer-mounted changeable message signs, several highway advisory radio sites, and six pavement sensors.

What follows is an explanation of the function and the benefits derived from the use of the several ITS tools currently available throughout the Richmond metro area:

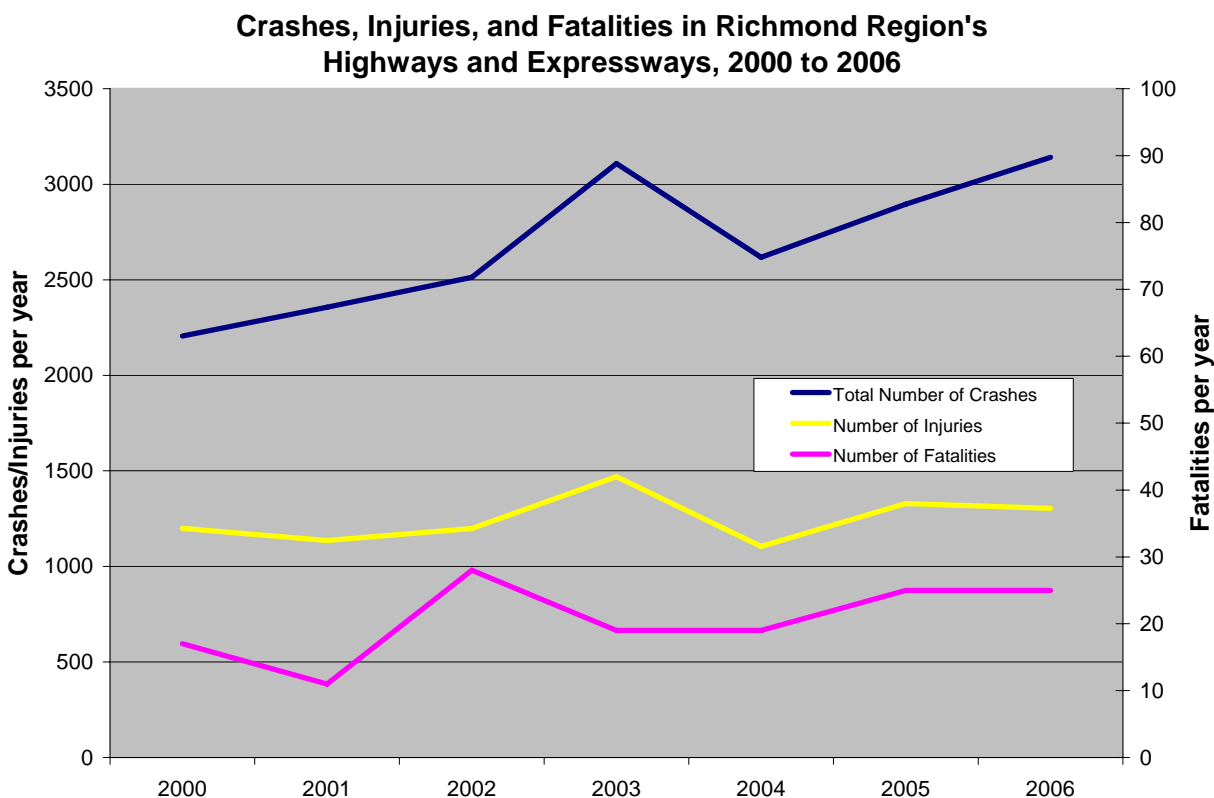
	<b>WHAT IT IS</b>	<b>WHAT IT DOES</b>	<b>BENEFITS TO TRAVEL</b>
<b>Closed-Circuit Cameras</b>	Video cameras are used to monitor traffic at accident-prone areas. These camera images are not available to the public as are those in Northern Virginia and Hampton Roads, but plans are to provide this information soon.	Monitors traffic conditions, accidents, breakdowns, and also helps in rerouting traffic away from congestion.	Quickens emergency response and breakdown assistance, saving lives and minimizing delays.
<b>Changeable Message Signs</b>	Electronic road signs, both portable and fixed, that display changeable messages. The signs are controlled remotely from the Smart Traffic Center and messages are changed to give real-time information to motorists.	Changeable message signs are used in emergency situations to notify motorists already on the road of upcoming incidents/delays, road work, and suggests other travel routes.	Enables drivers to make travel changes to avoid congestion, which also helps overall traffic flow.
<b>Traffic Signal Systems</b>	Computerized control systems that enable traffic signal timing to automatically adjust based on traffic conditions within the corridor.	Coordinates and adjusts traffic lights based on current traffic conditions.	Optimizes traffic flow, helps avoid repeated stops along the same roadway and reduces accidents.

	<b>WHAT IT IS</b>	<b>WHAT IT DOES</b>	<b>BENEFITS TO TRAVEL</b>
<b>Emergency Vehicle Pre-emption Devices</b>	Device carried on ambulances, fire trucks, and other emergency vehicles which works with comparably equipped traffic signals throughout the Richmond area.	Enables emergency vehicles to remotely change traffic signals for safe and speedy passage through intersections.	Improves both safety and response time in emergency events. Reduces response-related accidents and saves lives
<b>Smart Tag</b>	An automated toll system using pre-paid electronic "passes" for frequent toll users of the Downtown Expressway, Powhite Parkway, Pocohontas Parkway, and other toll roads found throughout the state.	Allows pre-paid motorists to pass quickly through special lanes, instead of stopping and paying every time they use the toll road	Keeps traffic flowing through toll plazas, reducing delays and congestion. Also provides safety benefits to motorists and toll facility employees.
<b>Traffic Incident Management (TIM) Program</b>	Designed to reduce incident durations and secondary accidents, and improve response and clearance times. The region is currently in the preliminary stages of developing a TIM.	Clearing roadway incidents requires the coordinated efforts of several entities. TIM sets in place a planned, coordinated approach to detect and remove incidents and restore traffic capacity safely and quickly.	Decreases incident duration through improved detection, response, clearance, and motorist information. TIM reduces delays and congestion, and improves accident survival rates and air quality.
<b>Roadway Sensors</b>	Sensors embedded in or near roadways. Sensors either monitor traffic or environmental (weather) conditions.	Monitors speed and volume of traffic. Also, Smart Traffic Center staff use these sensors to detect precipitation and monitor temperatures on certain bridges in the Richmond area.	Comparing real-time traffic data to historical data helps identify abnormal congestion and roadway incidents. Environmental sensors help VDOT quickly identify freezing conditions so crews can be dispatched to prevent unsafe conditions and ensure the safety of motorists.
<b>Automatic Vehicle Location</b>	A vehicle-tracking system. GRTC has recently implemented this technology to monitor transit vehicle locations.	Provides real-time location of transit, emergency, and other vehicles.	Helps keep buses on schedule and transfers time properly. Improves incident response strategy. Can be used to monitor traffic congestion.
<b>Highway Advisory Radio</b>	VDOT communication system broadcasting in the Richmond region on 1620 AM.	Provides the public with information on emergency highway and bridge traffic conditions. Local tourism messages broadcast during times of non-emergency.	Enables drivers to adjust travel plans and choose routes based on traffic conditions, which also helps overall traffic flow.
<b>#77 Cellular Call-In Program</b>	Dedicated phone number for reporting roadway emergencies to the Virginia State Police.	Allows motorists with cell phones to dial #77 to report incidents and accidents.	Provides motorists having cell phones with easy method to report accidents and incidents; helps promote timely incident detection and speed emergency response.

# SAFETY

In 2006, there were nearly 3,141 crashes<sup>1</sup> reported on Richmond region interstates and expressways with 1,304 injuries and 25 fatalities. The number of crashes grew by 42% in the Richmond region between 2000 and 2006. During this period, the number of injuries resulting from traffic crashes increased by 9% and the number of fatalities increased by 47%. This large increase in fatalities includes a big jump (155%) from 2001 to 2002. During this time period, the vehicle-miles of travel in Richmond region increased by 33% when the average annual growth rate of vehicle-miles of travel from 2000 to 2005 was only 9%.

In 2006, out of 3,141 crashes that took place in the region, 118 (3.8%) were alcohol related causing 78 injuries and 2 deaths.



*Source: Virginia Dept of Transportation, 2007. This data set is for VDOT maintained roads only and does not include Urban roadways(i.e. City of Richmond and Town of Ashland roads) and Henrico County secondary roads). Therefore, for the consistency purpose the analysis was limited to the interstates and expressways.*

<sup>1</sup> A reportable crash must have a fatality, injury or property damage of at least \$1,000.



*Traffic Incident on Interstate 95 in the region, 2006*

## **Regional Crash Locations**

Map 5-1 and Map 5-2 shows reportable crashes on interstates and expressways of the Richmond region in 2000 and 2006 respectively. The number of crashes in the region increased 42% from 2000 to 2006; however the data on the individual jurisdictions show that that New Kent has experienced the most increase (122%) in the number of crashes while Chesterfield has experienced the least (11%).

analyzed to determine specific location of fatalities, it is clear that fatalities have increased significantly on I-95 around I-295 east of I-95 in the City of Richmond.

Map 5-5 and 5-6 shows the total number of crashes in the region involving injuries in 2000 and 2006 respectively.

Map 5-3 and 5-4 indentifies location of crashes involving fatalities in 2000 and 2006 respectively. Although the data was not



*Traffic Incident on Interstate 95 in the region, 2006*

## APPENDIX

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**Crashes, Injuries and Fatalities in Richmond Region, 2000-2006**

	<b>Total Number of Crashes<sup>2</sup></b>	<b>Number of Fatalities</b>	<b>Number of Injuries</b>
2000	2206	17	1199
2001	2357	11	1135
2002	2513	28	1198
2003	3108	19	1470
2004	2617	19	1105
2005	2896	25	1329
2006	3141	25	1304

*Source: Virginia Dept of Transportation, 2007. This data set is for VDOT maintained roads only and does not include Urban roadways(i.e. City of Richmond and Town of Ashland roads) and Henrico County secondary roads). Therefore, for the consistency purpose the analysis was limited to the interstates and expressways.*

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