

**VP Data Users Group, February 12, 2015**  
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## 1. Uses

- **Traveler Information**
- **Holiday Travel Trends**
- **Congestion Management**
- **Challenges & Opportunities**

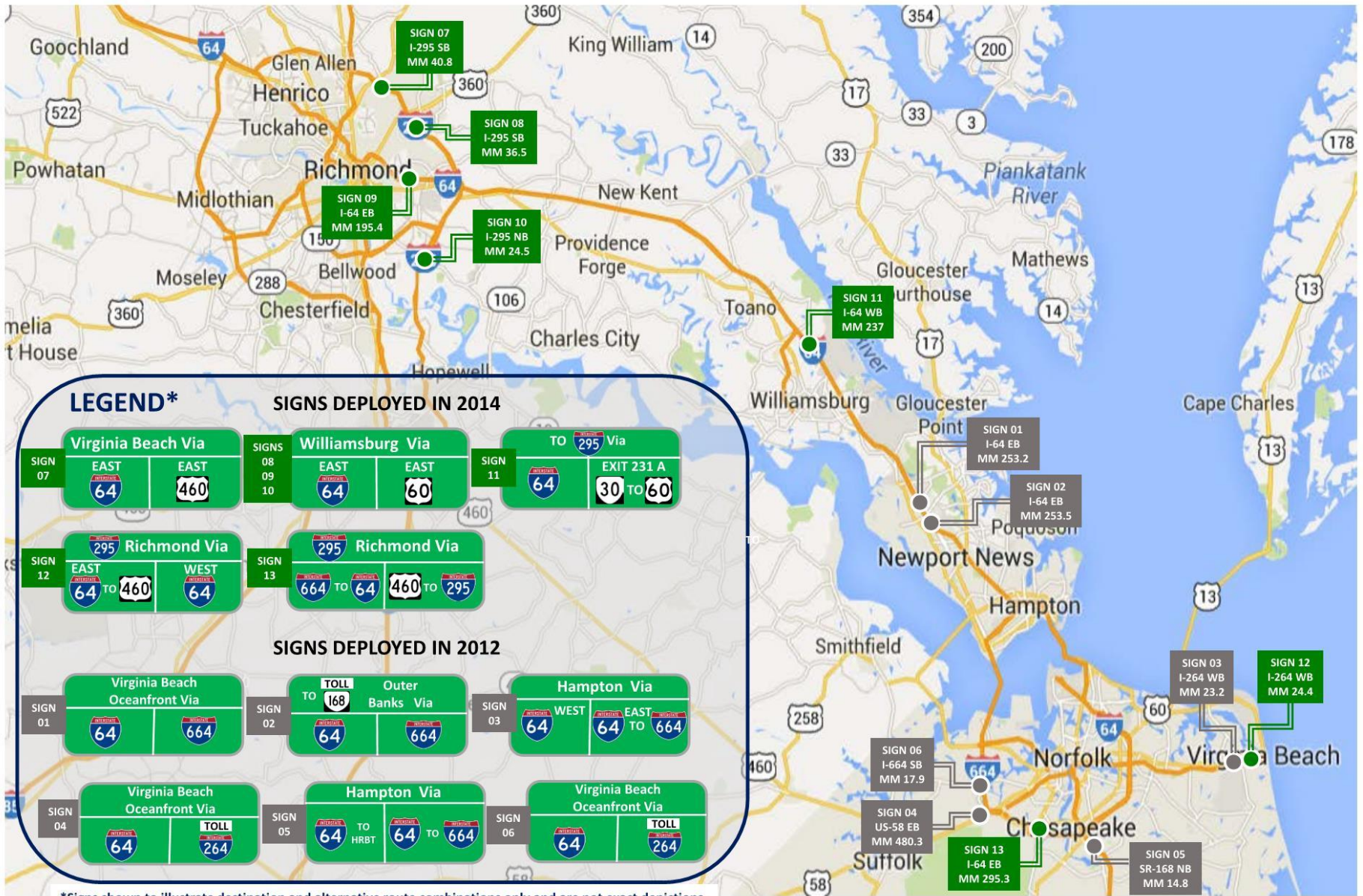
## 2. Evaluation

## 3. Questions

## TRAVEL TIME

- INRIX probe data to produce travel time
- VDOT began posting real time travel time messages on I-66 in August 2011 as a pilot
- Currently VDOT provides travel time on major interstate commuting routes





\*Signs shown to illustrate destination and alternative route combinations only and are not exact depictions.

**Travel Time Business Rules were established:**

- Average bias could not exceed  $\pm 5$  mph
- Average absolute error could not exceed 10 mph
- Signs would be blanked if  $< 85\%$  of TMCs reported real time information

**EVALUATION OF THE DATA:**

- VCTIR performed data quality evaluations
- Assess accuracy compared to Bluetooth
- Compare INRIX and point detector travel times
- Assess availability of INRIX real time data
- Determine bias in mountainous terrain

[Weather](#) [Log in to Customize](#)  
[Traffic Alerts](#)  
[Info](#)  
[Legend](#) [more info](#)  
**Quick Settings**  
 Default Preset [?](#)  
**Overlays**  
 Traffic Speeds Layer  
     80% or ↑   60-80%  
     40-60%   40% or ↓  
     Traffic Speed Transparency  
 Road Conditions Layer  
**Icon Layers**  
 Road Work  
 Inactive Road Work  
 Message Sign  
 High Priority Incidents  
 Other Incidents  
 Open Bridges  
 Special Events  
 Weather Closures  
 Other Weather Events  
 Cameras  
 Inactive Cameras

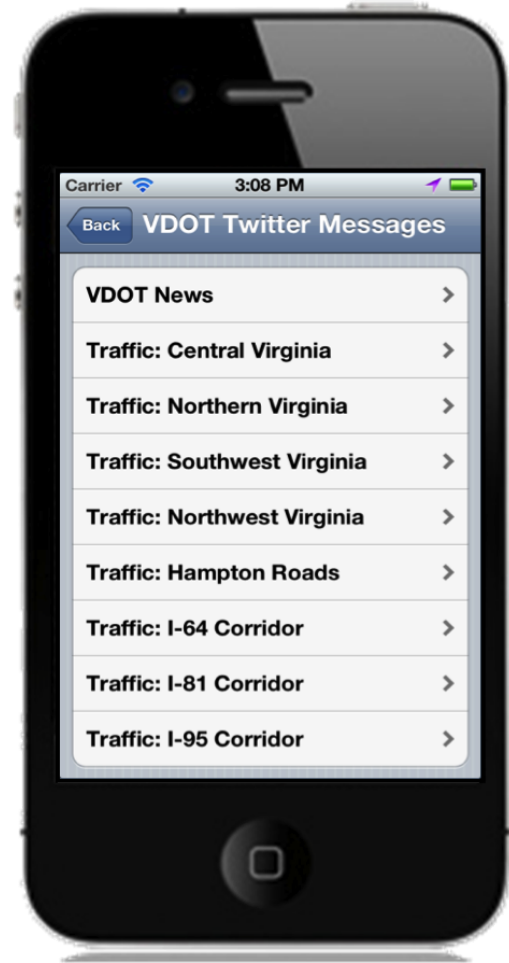
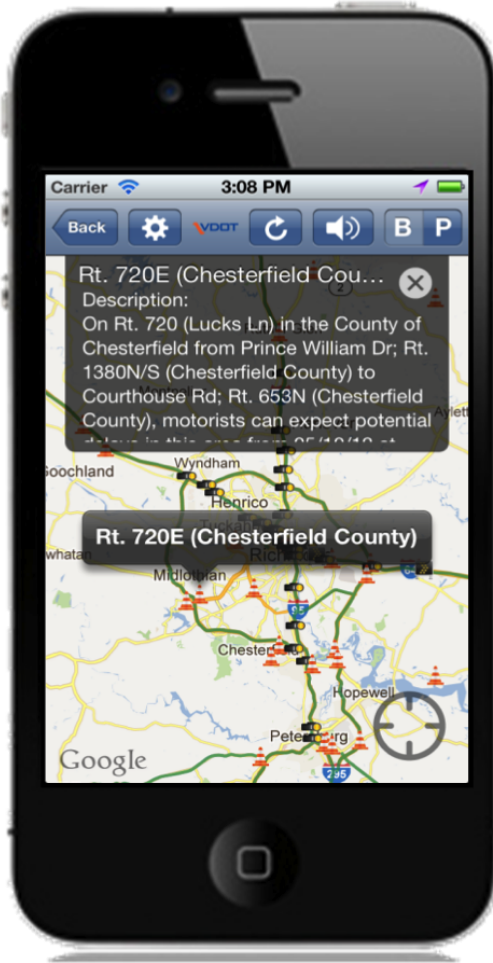
**Camera Viewer - I-95 / MM 143.7 / NB**

[I-95 / SB / MM 145.2](#)  
[US-1 / NB / Telegraph Rd \(VA-637\) - Aquia](#)  
[I-95 / MM 143.7 / SB](#)  
[I-95 / MM 143.7 / NB](#)  
[US-1 / SB / Garrisonville Rd \(VA-610\) - Aquia](#)

[Previous](#)    Camera 43 (of 91) on I-95    [Next](#)

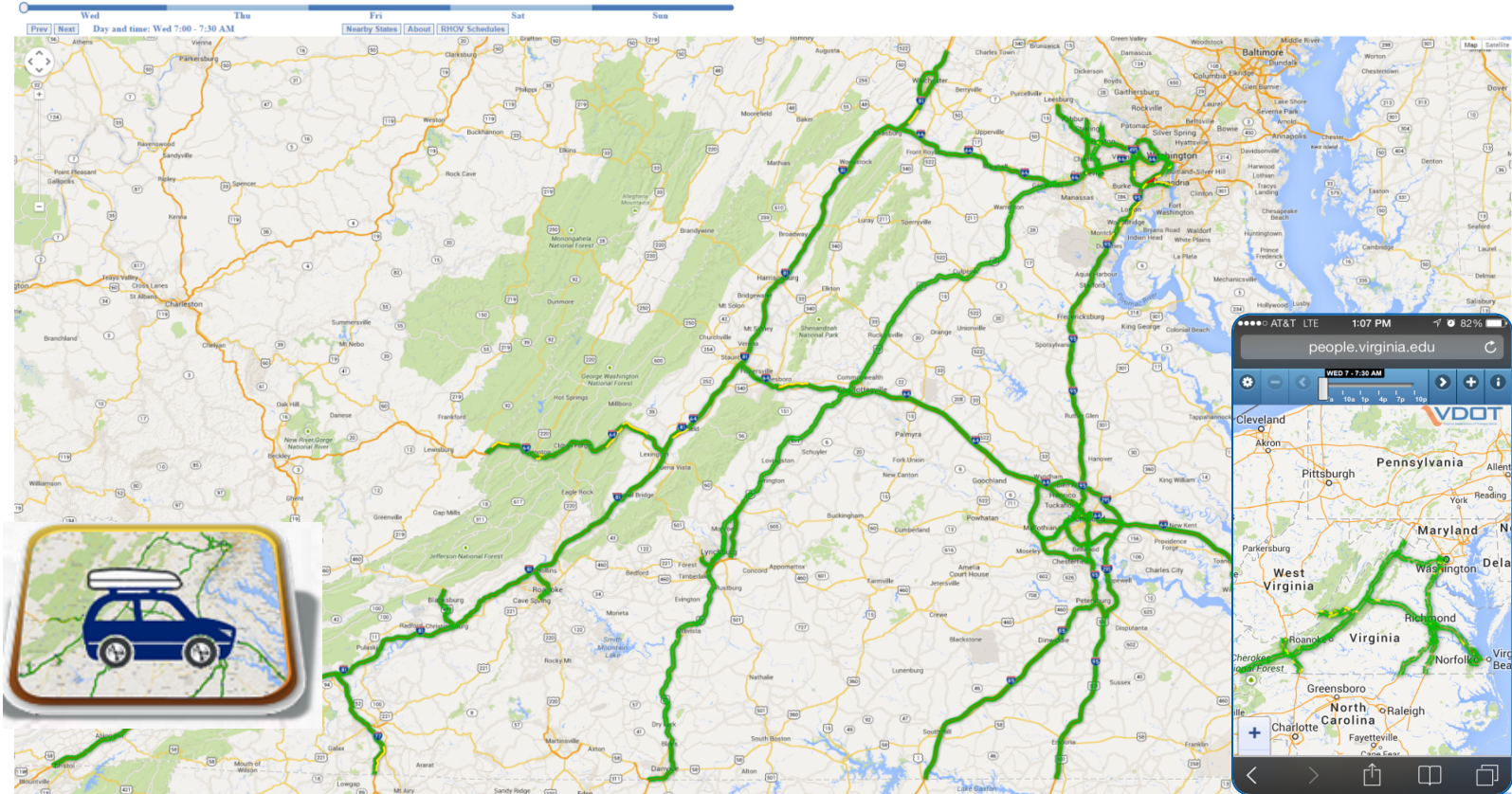
Traffic closest to the camera is **northbound**.  
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# HOLIDAY TRAVEL TRENDS

Virginia Thanksgiving Holiday Historic Travel Trends

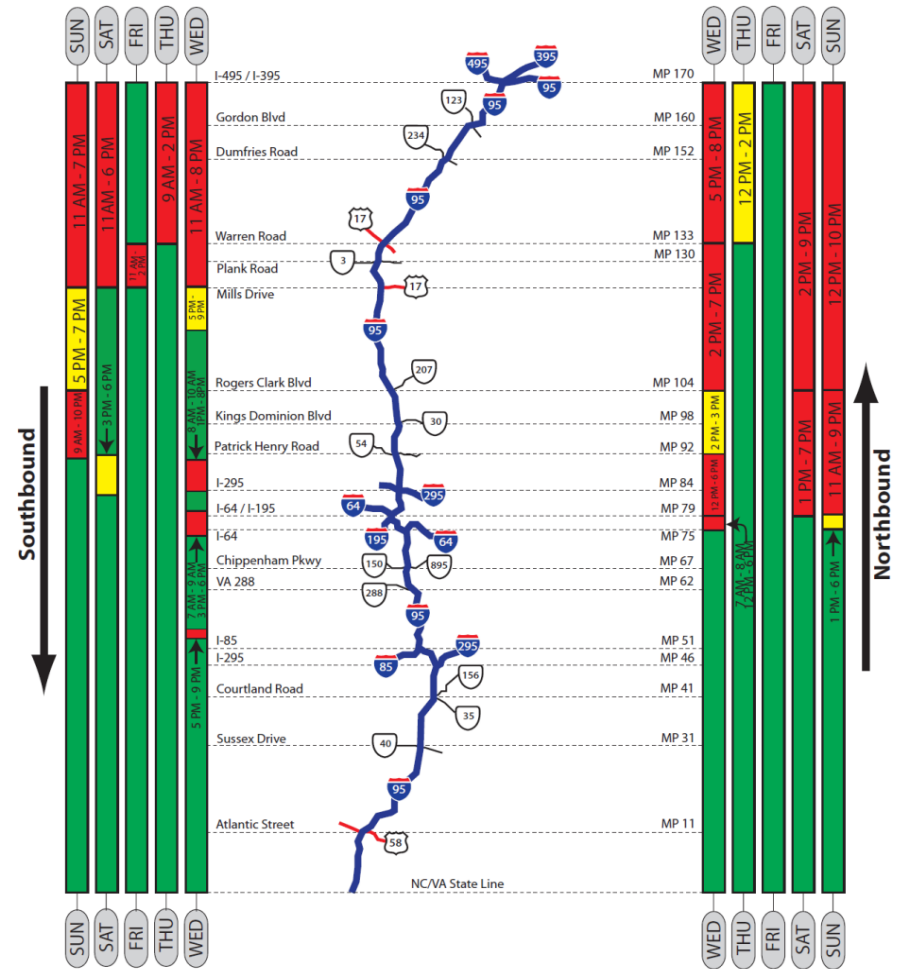


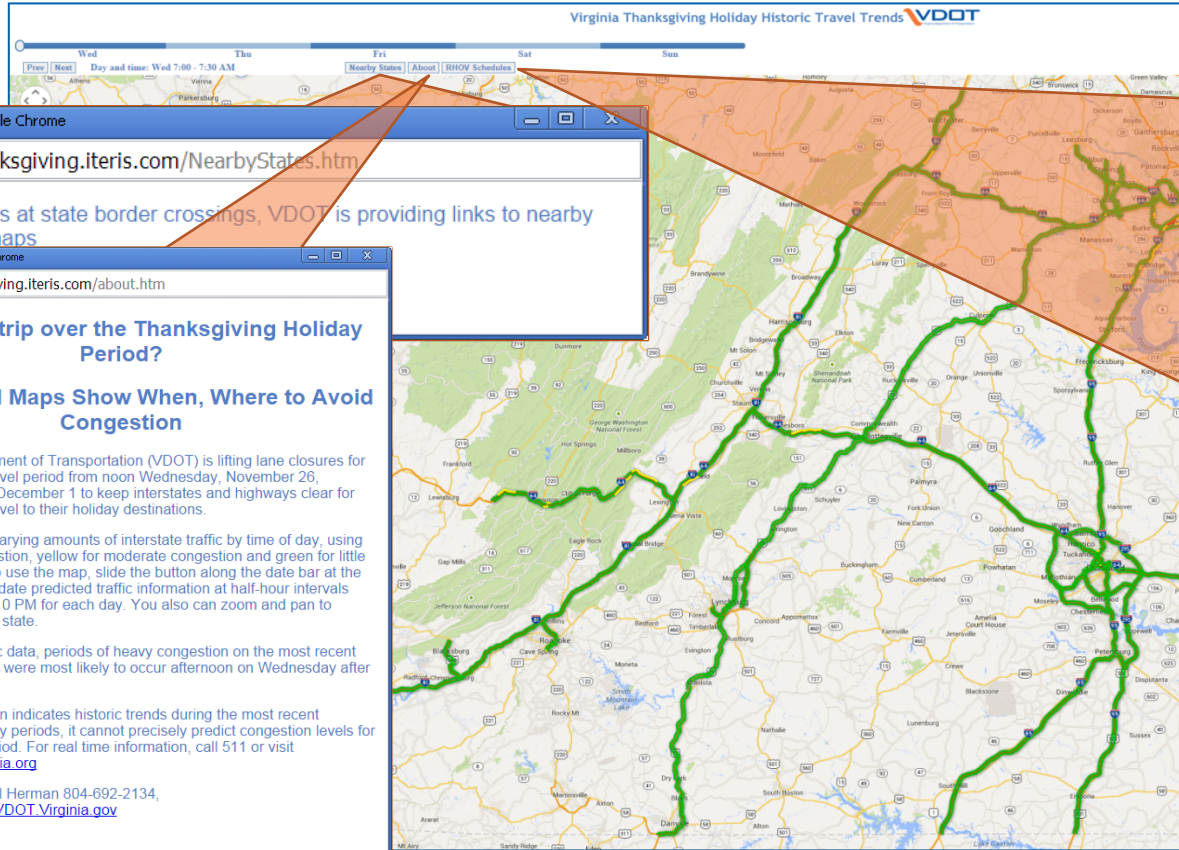


## Used Data from ~300 Continuous Count Stations

- Between interchanges
- Coverage limitations
- Large temporal aggregations
- 10 pages to show all Interstates

Thanksgiving Holiday Travel Trends  
I-95 in Virginia





- **3 YEARS OF Probe Data**
- **30 minute intervals**
- **One page to view all data**

VDOT

## Northern Virginia Reversible HOV (RHOV) Schedules

**Wednesday, November 26, 2014**

- HOV restrictions are in effect for I-95, I-395 and I-66
- Normal Weekday Operations
- I-395/95 Reversible HOV gate operations
  - Close Southbound by 12:00 AM
  - Open Northbound by 2:00 AM
  - Close Northbound at 11:00 AM
  - Open Southbound by 1:00 PM
- I-66 Monument Drive Ramp
  - Open to HOV-2 traffic Eastbound from 5:30 AM to 9:30 AM
  - Open to all Westbound traffic after 10:00 AM
- I-66 Stringfellow Road Ramp open to HOV-2 traffic Westbound from 3:00 PM to 7:00 PM
  - Open to all Westbound traffic from 10:00 AM to 3:00 PM
  - Open to all Westbound traffic after 7:00 PM

**Thursday, November 27, 2014**

- HOV RESTRICTIONS LIFTED on I-95, I-395 and I-66
- I-395/95 Reversible HOV gate operations
  - Close Southbound by 12:00 AM
  - Open Northbound by 2:00 AM
- I-66 Monument Drive and Stringfellow Road gates closed both directions

**Friday, November 28, 2014**

- HOV restrictions are in effect for I-95, I-395 and I-66
- Normal Weekday Operations
- I-395/95 Reversible HOV gate operations will begin at 11:00 AM
  - Close Northbound at 11:00 AM
  - Open Southbound by 1:00 PM
- I-66 Monument Drive Ramp
  - Open to HOV-2 traffic Eastbound from 5:30 AM to 9:30 AM
  - Open to all Westbound traffic after 10:00 AM
- I-66 Stringfellow Road Ramp open to HOV-2 traffic Westbound from 3:00 PM to 7:00 PM
  - Open to all Westbound traffic from 10:00 AM to 3:00 PM
  - Open to all Westbound traffic after 7:00 PM

**Saturday, November 29, 2014**

- Normal Weekend Operations
- I-95/395 Reversible HOV gate operations will begin at 2:00 PM
  - Close Southbound at 2:00 PM
  - Open Northbound by 4:00 PM
- I-66 Monument Drive and Stringfellow Road ramps open to all Westbound traffic

**Sunday, November 30, 2014**

- No I-95/395 RHOV gate operations
- I-395/I-95 Reversible lanes open to all Northbound traffic
- I-66 Monument Drive and Stringfellow Road ramps open to all Westbound traffic

## Hampton Roads HOV Schedule and Tunnel Information

- **Interstate 64/Interstate 264/Interstate 564 HOV lanes:** On Thursday, November 27, 2014 and Friday, November 28, 2014 HOV restrictions will be lifted on all HOV diamond lanes. HOV lanes are restricted 6 - 8 AM and 4 - 6 PM, Monday through Friday, except on federal holidays.
- I-64 reversible lanes will operate on the regular schedule with no HOV restrictions.
- HOV lanes will resume a restricted schedule at 6 AM on Monday, December 1, 2014.

- **Prepare Data for Averaging**
  - **Standard deviations (STDV) of speeds over latest 3 years are calculated and a threshold STDV is chosen based on the full data set**
  - **The threshold STDV is compared to STDV of each**
  - **If the SD exceeds the threshold, a process is performed to eliminate impact of atypical conditions like incident, weather conditions, work zone, special events, etc.**
- **Average into 30 minute intervals**
- **Assign Congestion Level based on pre-determined Speed Threshold**

# NETWORK COVERAGE

- **Interstates**
- **Ramps**
- **Limited Access Arterials. Arterials were selected based on :**
  - **AADT**
  - **Signal Density**
  - **US-1 was an exception yet was selected since it is a consistent alternative route for I-95**

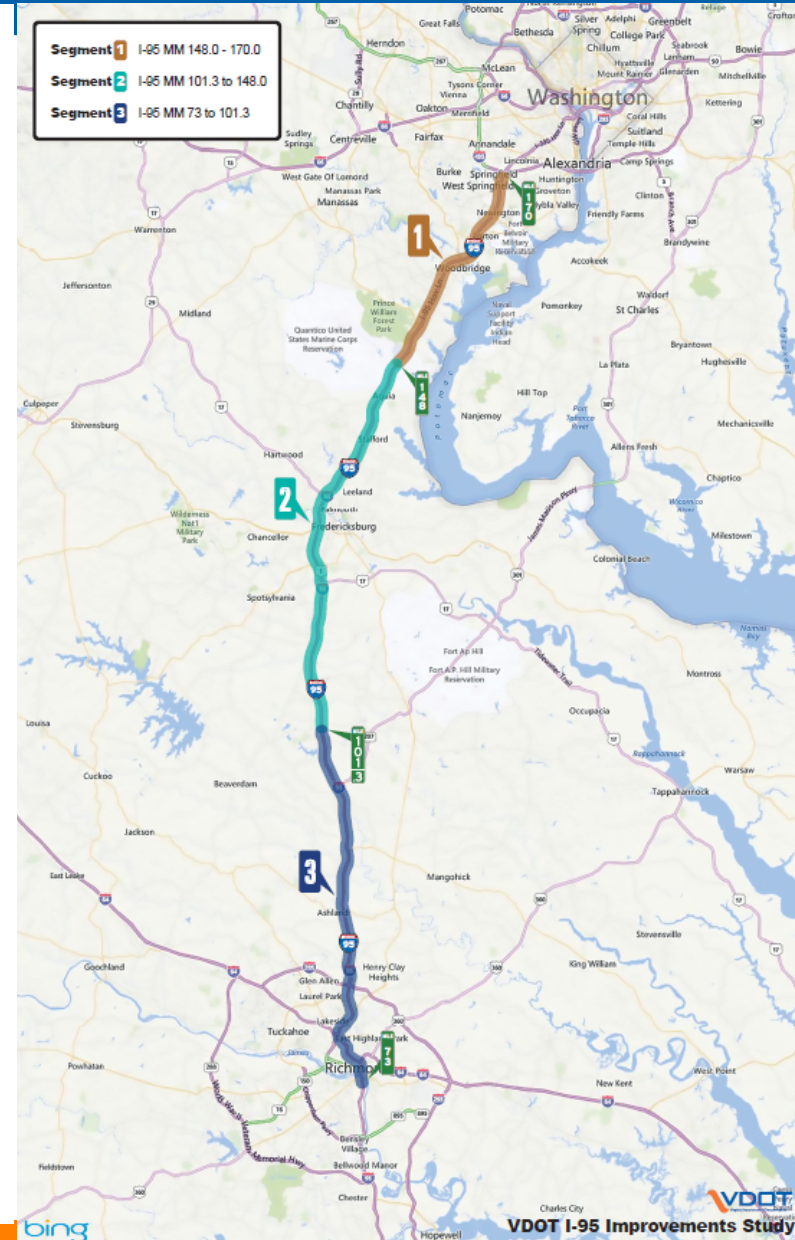
## Issues with data identified and manually adjusted

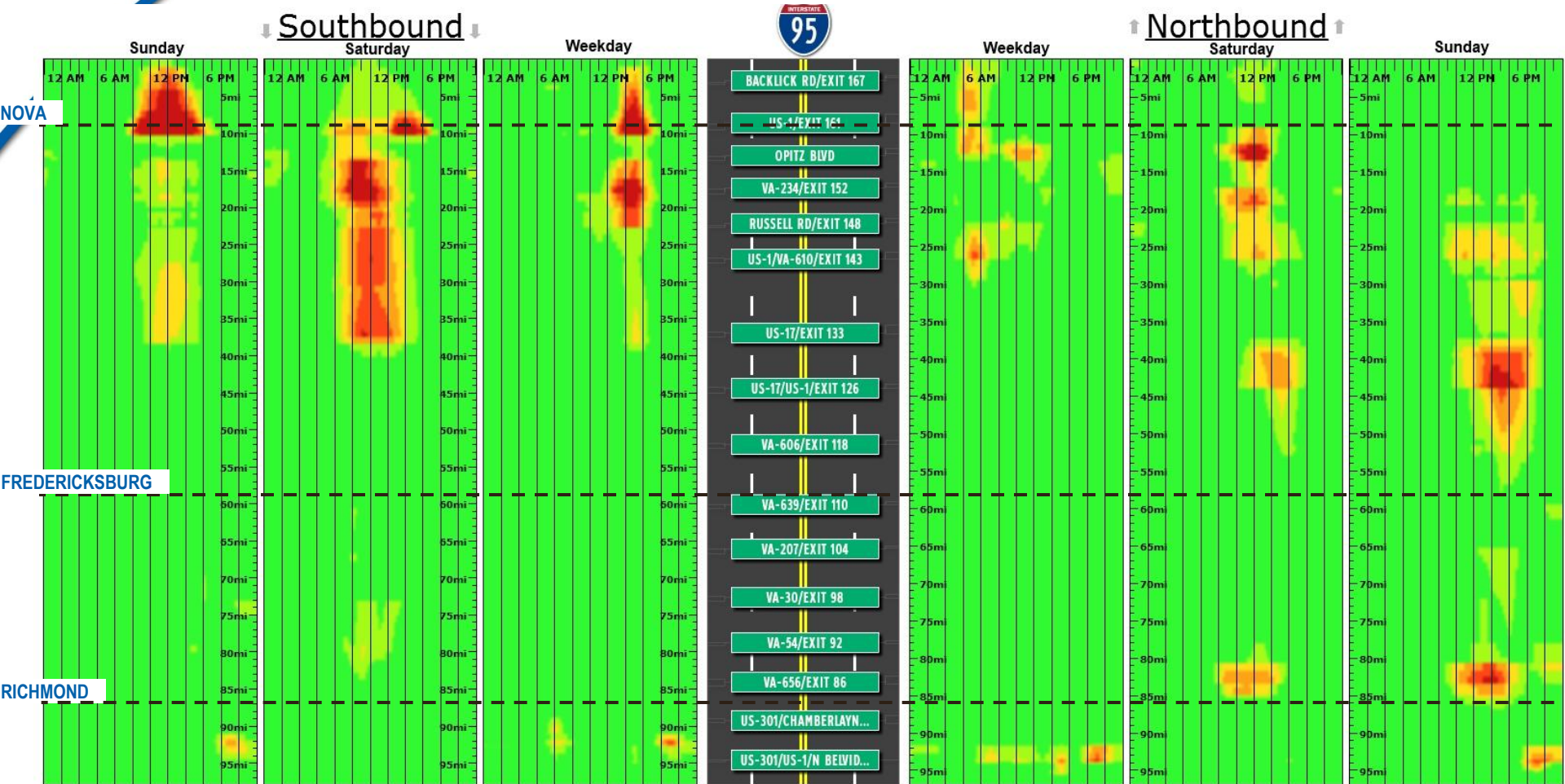
- ❖ **I-495 Express Lane Construction**
- ❖ **I-564 connecting I-64 to the Norfolk Naval Base**
- ❖ **I-581 in Roanoke**
- ❖ **I-264 Downtown Tunnel**
- ❖ **I-77 (Mountainous area)**
- ❖ **I-81 (Near Roanoke, Truck Climbing Lns, Bridge Rehabilitation Projects)**
- ❖ **Downtown Tunnel in Hampton Roads with Flashing Variable Speed Limits**



## I-95 Improvements Initiative Study Approach

- Study Corridor – 97 miles
- Vehicle Hours of Delay – 2013:
  - Total – 6.44M / \$206.92M
- Total Vehicle Miles of Travel (VMT) in 2013 : 4.3 B
- Analyze Mobility, Crash and Incident data
- Identify Crash Hotspots & Congestion Bottlenecks



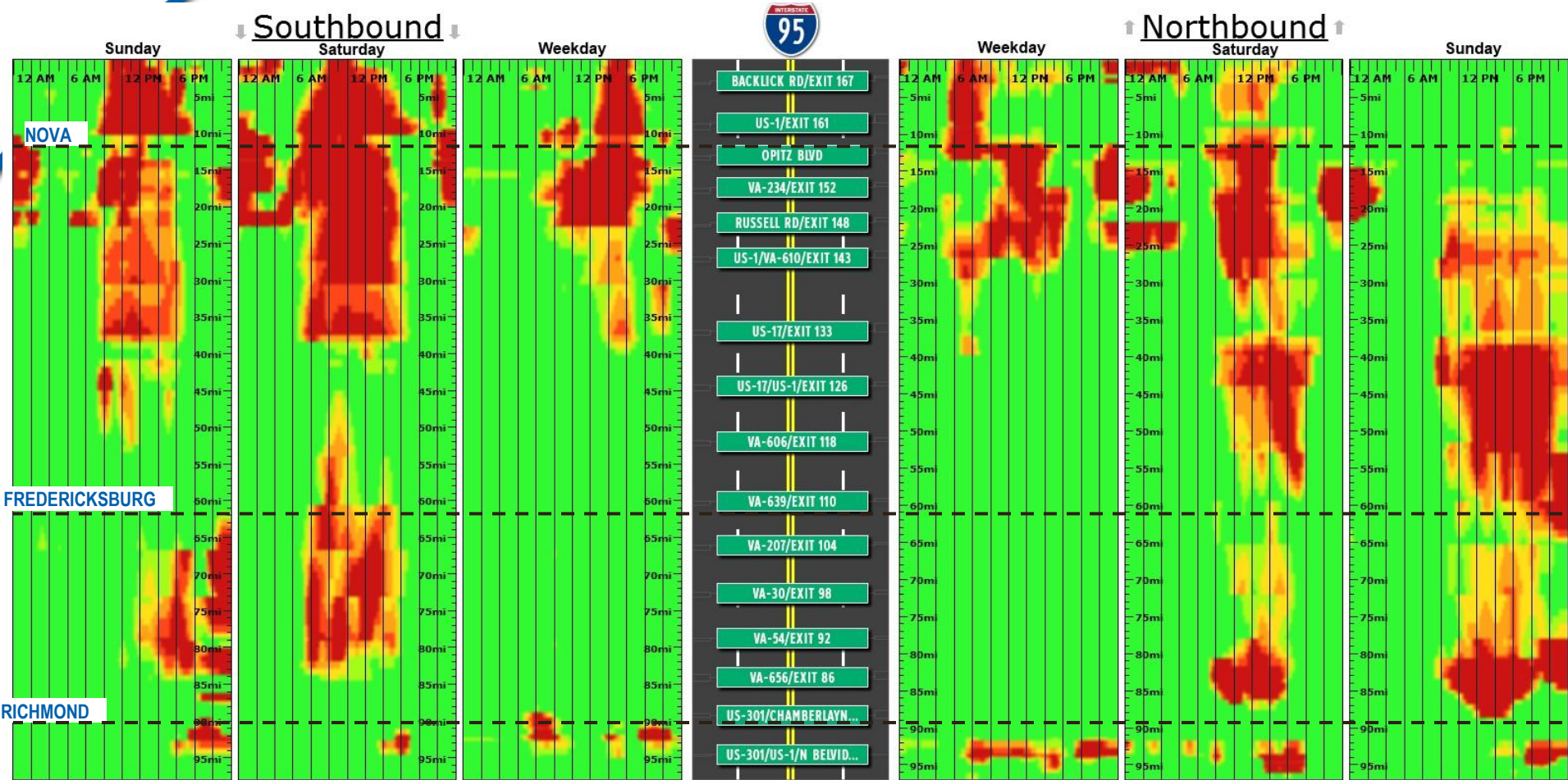


Travel time represented as a percentage of the ideal travel time (Travel Time / Free-flow Travel Time).



**Busiest Travel Seasons**  
**Weekdays: February – April**  
**Weekends: June – August**





The total travel time that should be planned when an adequate buffer time is included (95% Travel Time / Free-flow Travel Time).



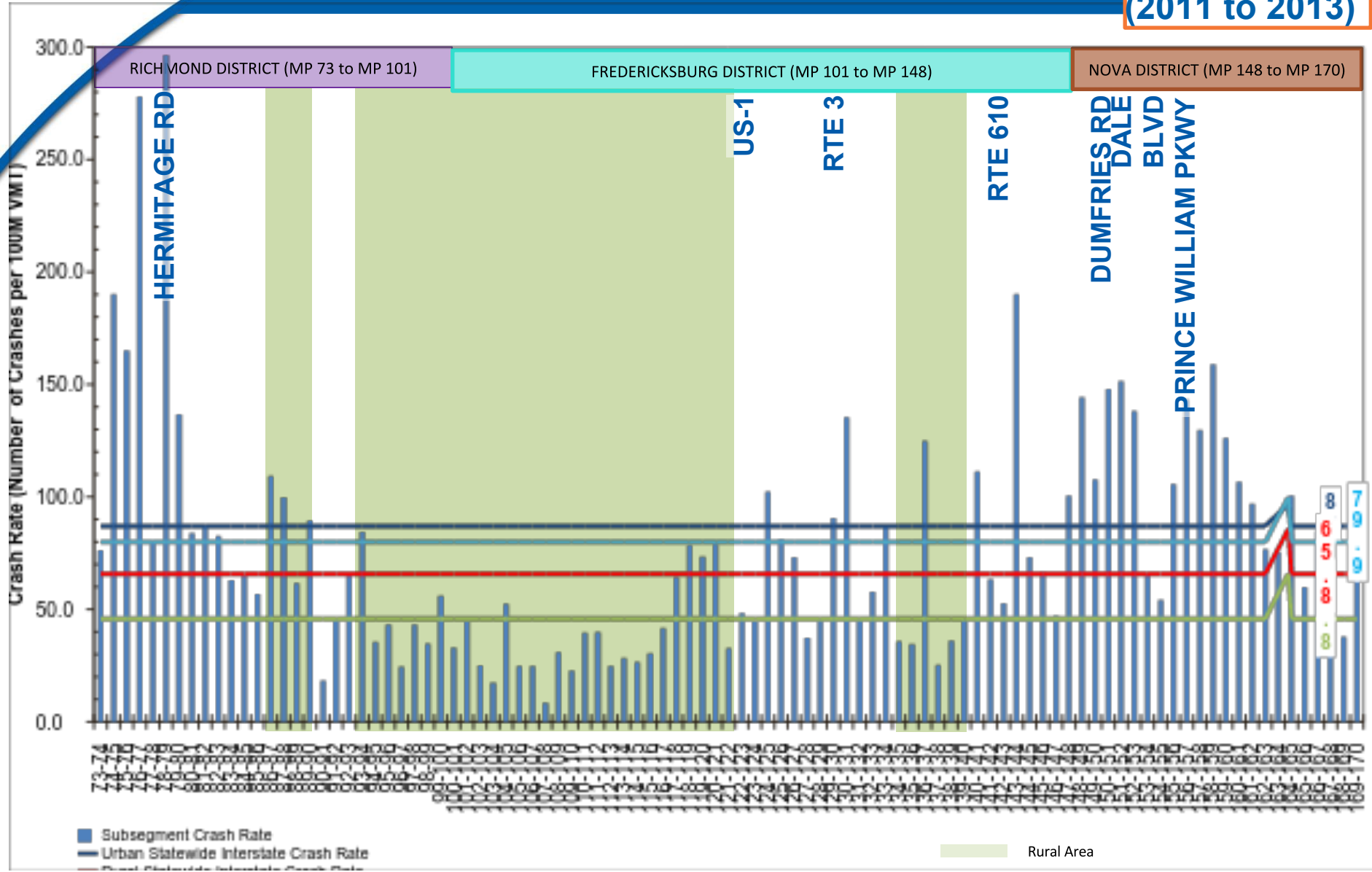
## Busiest Travel Seasons

Weekdays: February – April

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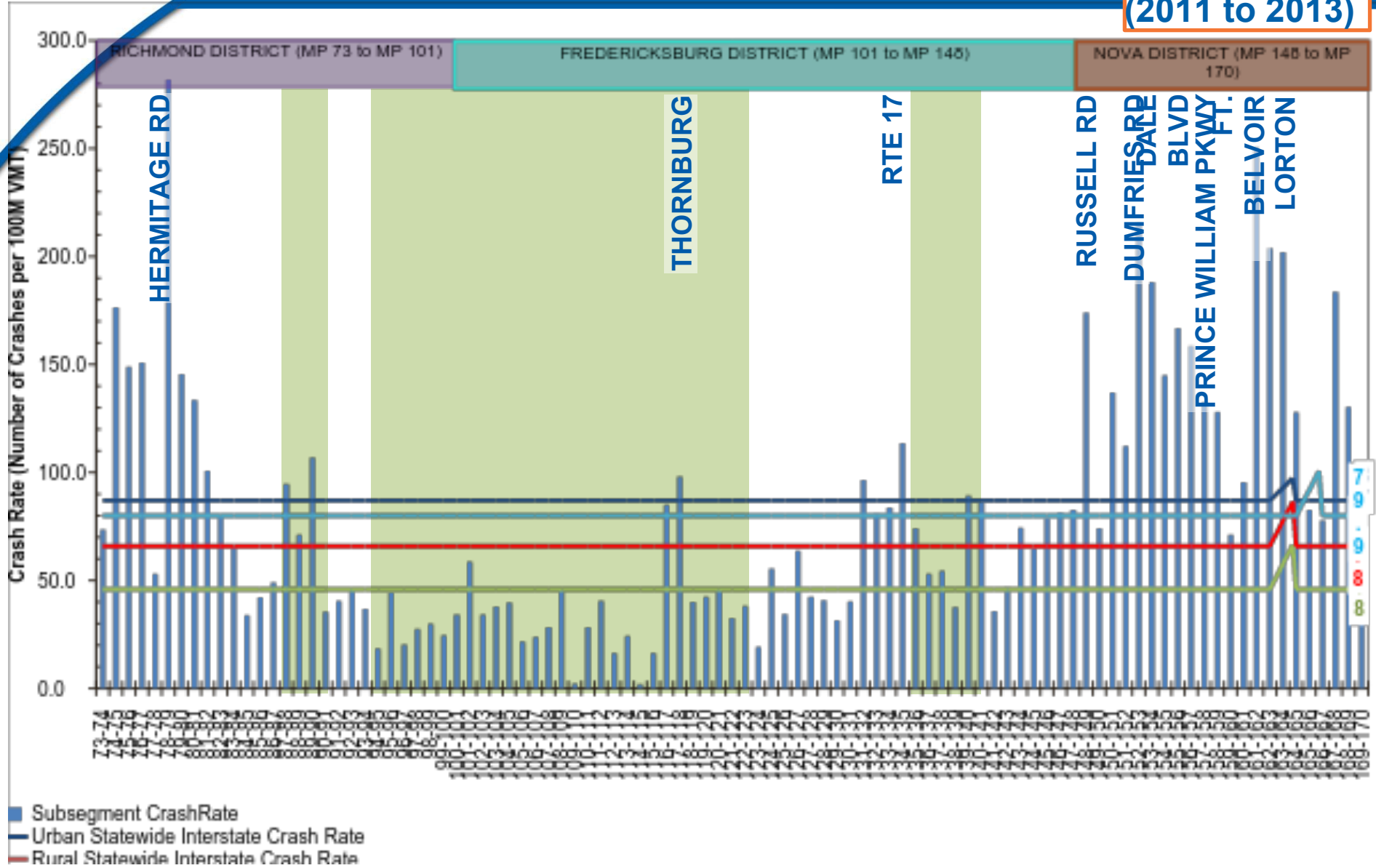
# I-95 NB Subsegment Crash Rates

(2011 to 2013)



# I-95 SB Subsegment Crash Rates

(2011 to 2013)



**LEGEND**

**Crash**

- Congestion Related  
*Rear-end, Side-swipe, etc*
- Not Related to Congestion  
*Overtuned, Jack-Knifed, Run-off The Road, Fixed Object, etc.*

**Bottleneck**

- Low
- Medium
- Extreme

Bottleneck

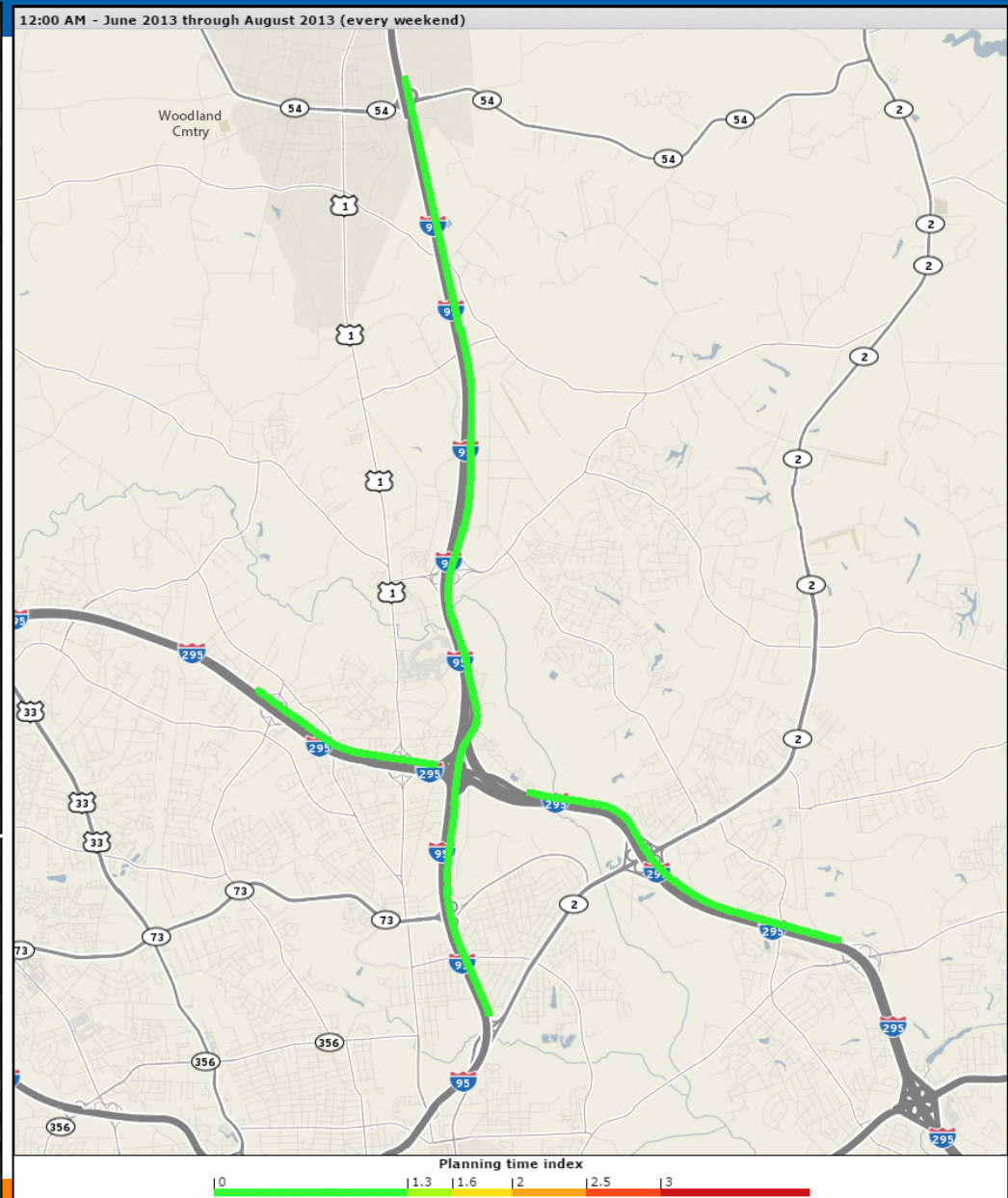
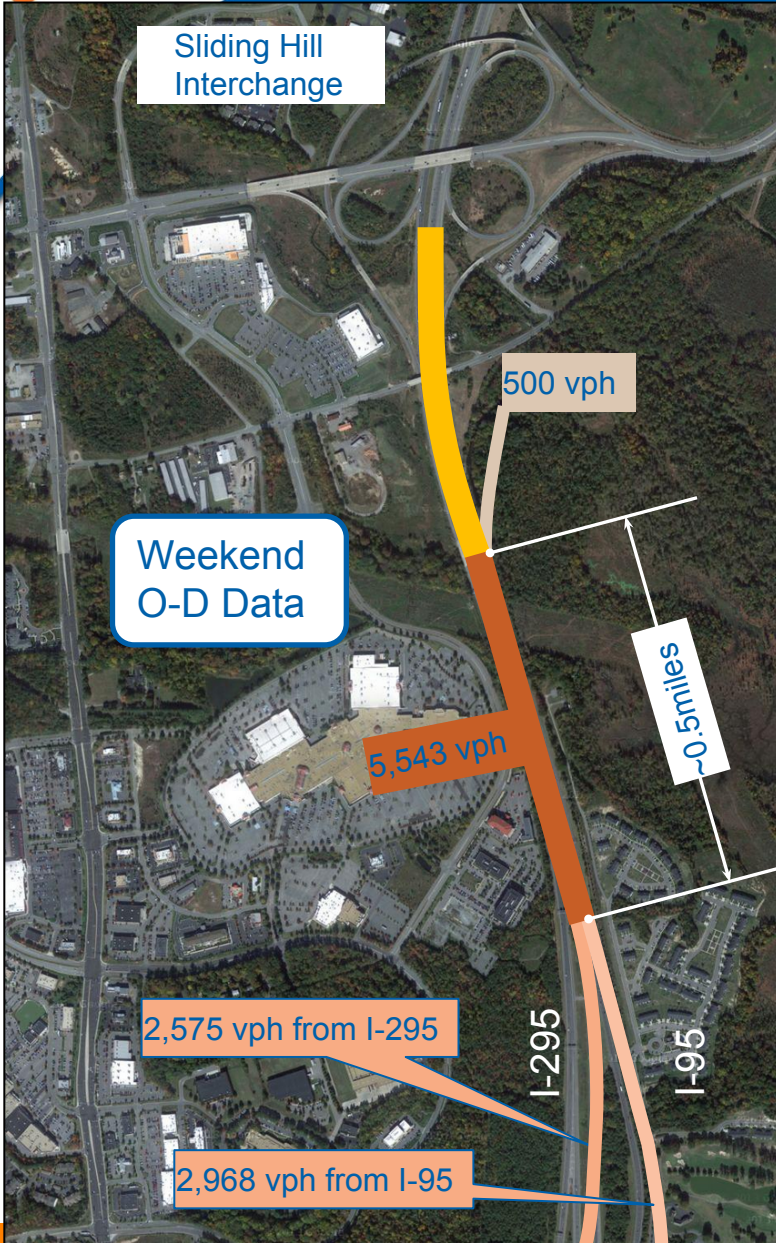


Bottleneck

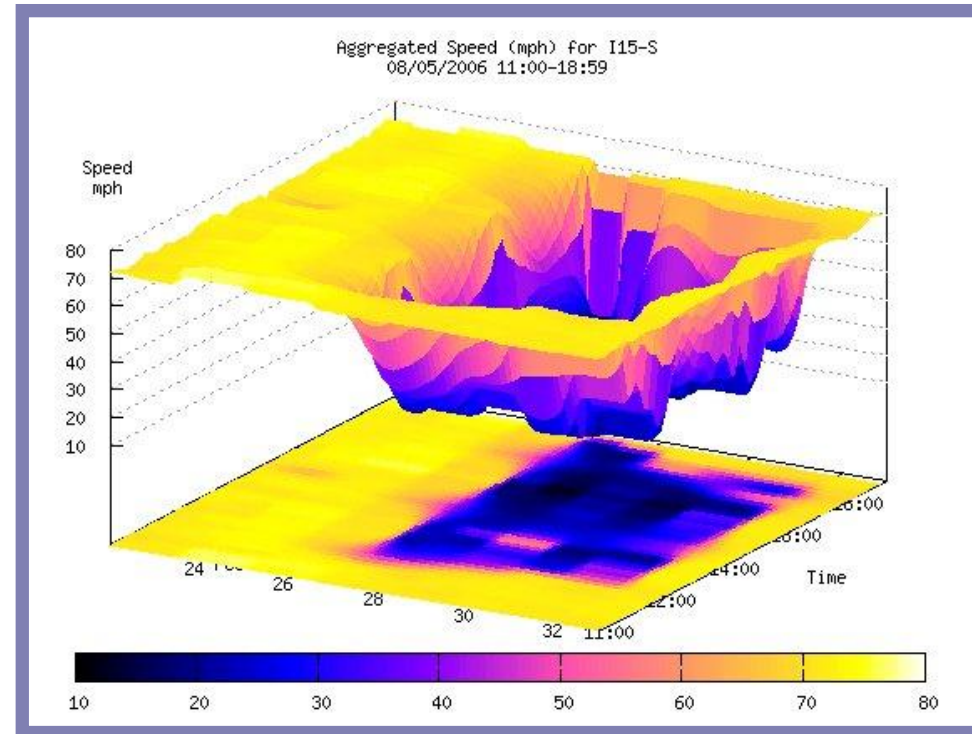
Bottleneck



# Priority Projects – I-295 to SR-54



- What is congestion?
- Arterials – when is data good enough to share?
- Improvements in probe data and TMC network
- Accountability and Transparency in Virginia
- Understanding Audience



VDOT's Process:

1. Quality Evaluation: **(UVA and VCTIR)**
  - INRIX, HERE, and TomTom real-time data is being compared side-by-side on 10 routes in Virginia (5 freeway/5 arterial).
  - Evaluation methodology is based on University Maryland VPP evaluation, including recent modifications for examining distributions of travel time on arterial roads
  - Portable Bluetooth readers, permanent readers, and WiFi address matching are being used to generate the “ground truth”. Data will be collected at each site for between 1 and 2 weeks.
  - Both TMC level and sub-TMC data is being evaluated. One route that is not on the TMC network (SR 419) is being evaluated.

## VDOT's Data Quality Validation Sites

Site	Facility Type	Start	End	Length (mi)	Directions Needed
I-95, downtown Richmond	Freeway	Maury St (Exit 73)	SR 161 (Exit 80)	6.1	NB and SB
I-64 at Hampton Roads Bridge Tunnel	Freeway	US 258 (Mercury Blvd, Exit 263)	I-264 (Exit 284)	20.7	EB and WB
I-66 inside I-495	Freeway	SR 7 (Exit 66)	Rosslyn Exit (Exit 73)	7.0	EB and WB
I-81 between Salem and Christiansburg	Freeway	US 460 (Exit 118)	SR 647 (Exit 132)	15.6	SB only
I-77, Fancy Gap	Freeway	SR 148 (Exit 8)	SR 69 (Exit 24)	15.4	NB only
SR 236 (Little River Turnpike), Fairfax	Arterial	SR 237 (Pickett Rd)	I-495	3.0	EB and WB
US 17, York County	Arterial	SR 105 (Ft Eustis Blvd)	Harpersville Rd	6.9	NB and SB
SR 3, Fredericksburg	Arterial	SR 620 (Spotswood Furnace Rd)	Carl D. Silver Parkway	3.6	EB and WB
SR 419, Salem	Arterial	US 221 (Brambleton Ave)	Penarth	2.5	EB and WB
US 11, Salem to Christiansburg	Arterial	US 460	SR 647	15.8	NB and SB



## 2. Other Criteria

- Coverage: arterials, managed lanes, ramps, refresh rate
- Identify incidents and road closures
- Sub-segmentation & ability to archive
- Availability of historic data/PM
- Team qualifications and approach
- Truck Data
- Data lag/latency
- Compatibility with other states/VA localities
- Costs

## Questions, Issues and Concerns:

- Confidence Values vary among providers in info provided
- VDOT will need to conflate once a provider is determined.
- TomTom rounds up if speed > 80% FF; FF capped at speed limit
- Will NPMRDS be sufficient truck data?
- Would like to know the number of probes that make up each piece of data

# Questions?

## Acknowledgements:

**Sanhita Lahiri, P.E., PTOE**  
*Virginia Department of Transportation*

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**Mike Fontaine, PE, PhD**  
*Virginia Center for Transportation Innovation and Research*

# Congestion Threshold

- ❖ Based on experience, posted speed limits, rural or urban area, roadway gradient, speed thresholds were assigned to different levels of congestion

Interstates		
Speed Limit	Threshold	Congestion Level
Urban (60 mph or 55 mph)	55 mph or above	Little to No Congestion
	between 45 and 54 mph	Moderate Congestion
	less than 45 mph	Heavy Congestion
Rural (65 mph or 70 mph)	63 mph or above	Little to No Congestion
	between 45 and 62 mph	Moderate Congestion
	less than 45 mph	Heavy Congestion
Limited Access Arterials		
Speed $\geq$ 85% of FFS		Little to No Congestion
85% of FFS > Speed $\geq$ 60% of FFS		Moderate Congestion
60% of FFS > Speed		Heavy Congestion

## Local Feedback - Manual Adjustments based on comments and special conditions

- ❖ **RHOV lanes**
- ❖ **I-495 Express Lane Construction**
- ❖ **I-564 connecting I-64 to the Norfolk Naval Base**
- ❖ **I-581 in Roanoke**
- ❖ **I-264 Downtown Tunnel**
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- ❖ **Downtown Tunnel in Hampton Roads with Flashing Variable Speed Limits**
- ❖ **George Washington Pkwy**