

Probe Data Analytics (PDA) Suite Applications for Measuring Road Performance in Washington DC

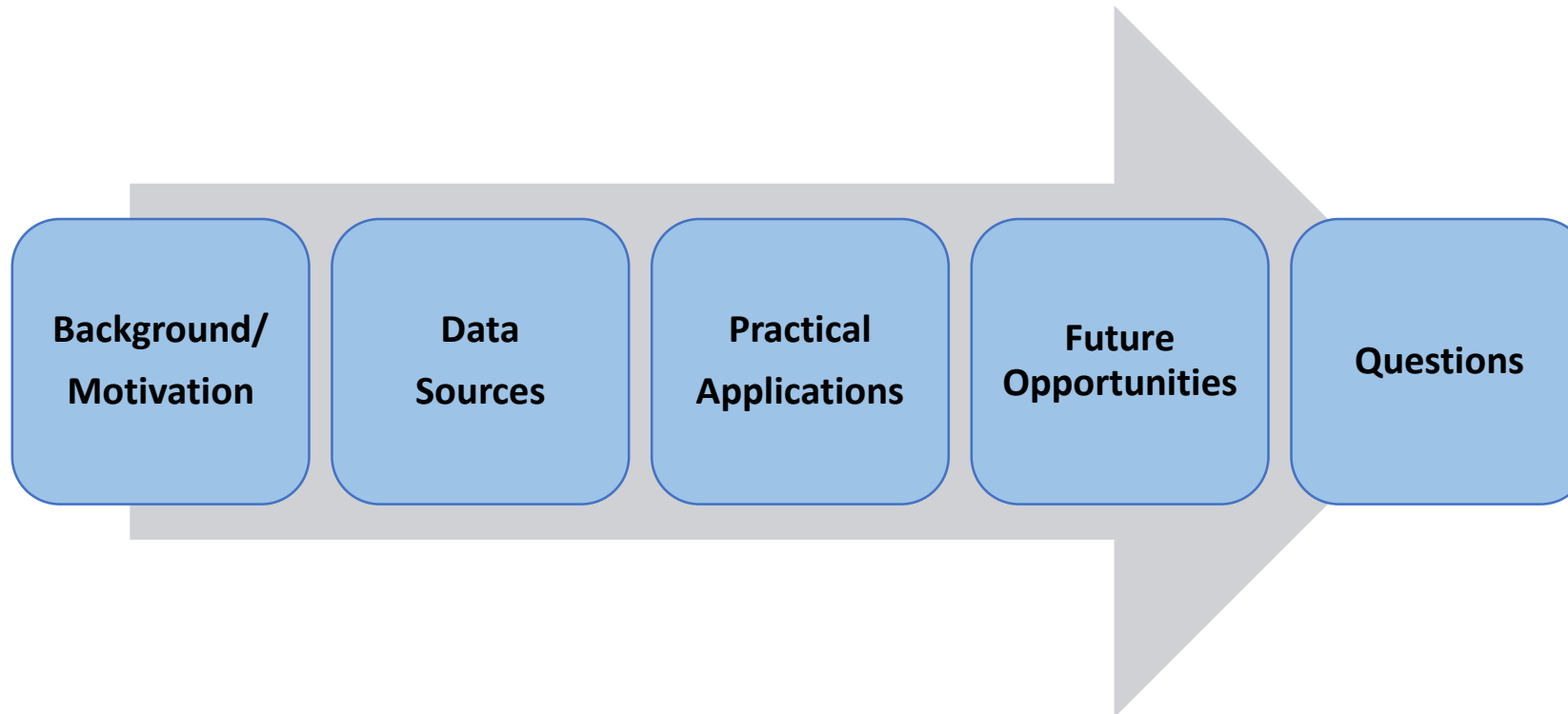
NOCOE

FHWA EDC-5 Adventures in Crowdsourcing Webinar

February 27, 2020



Agenda



Background

Citywide Signal Optimization

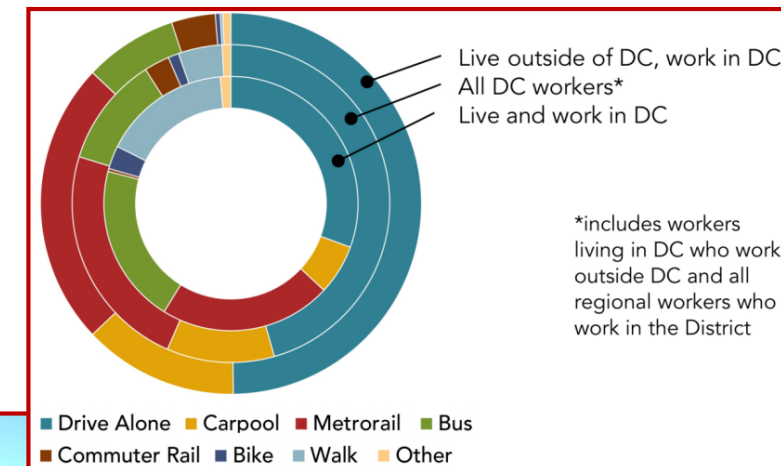
- › How do we *efficiently* evaluate benefits for all roadway users?

Quick Response to Citizen Concerns

Major Special Events

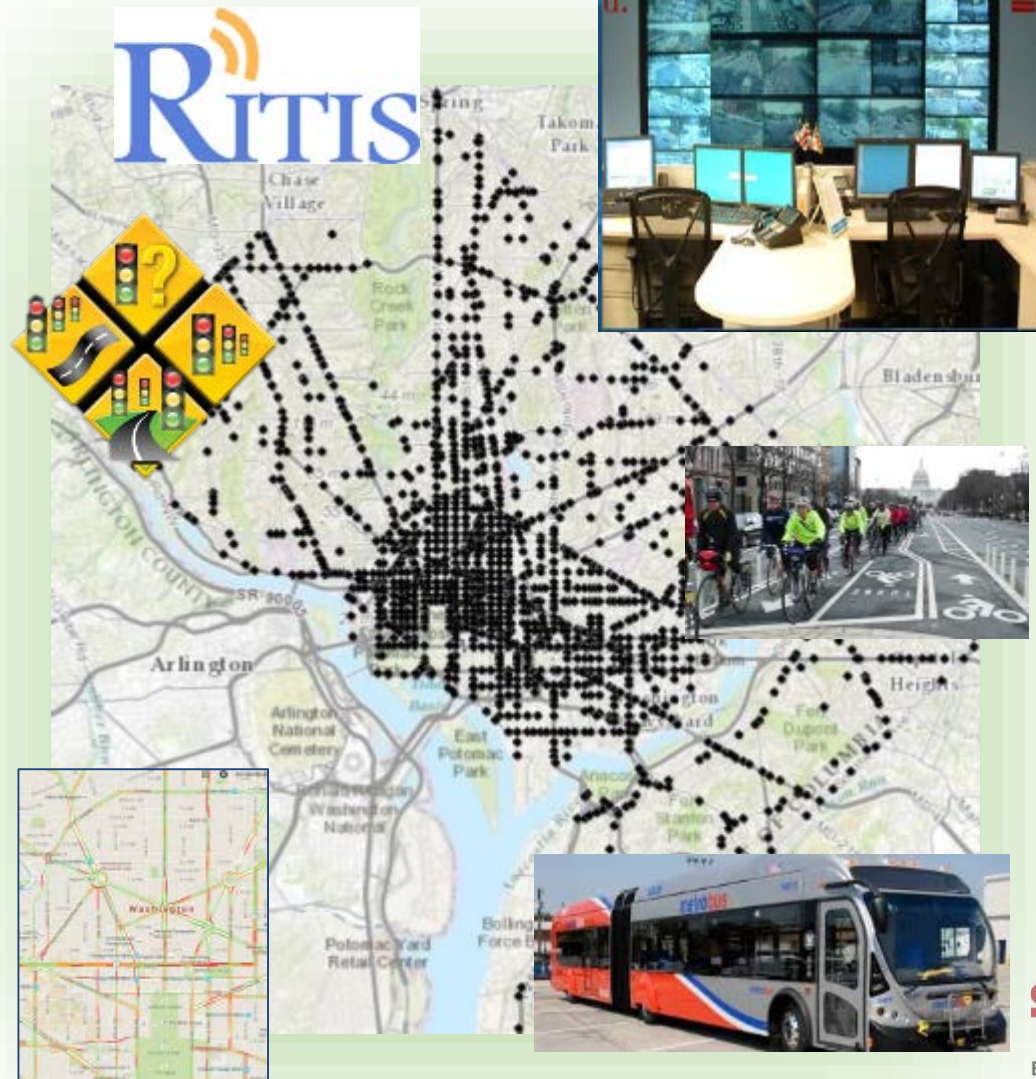
- › How to predict, mitigate and monitor?

How good is the data?



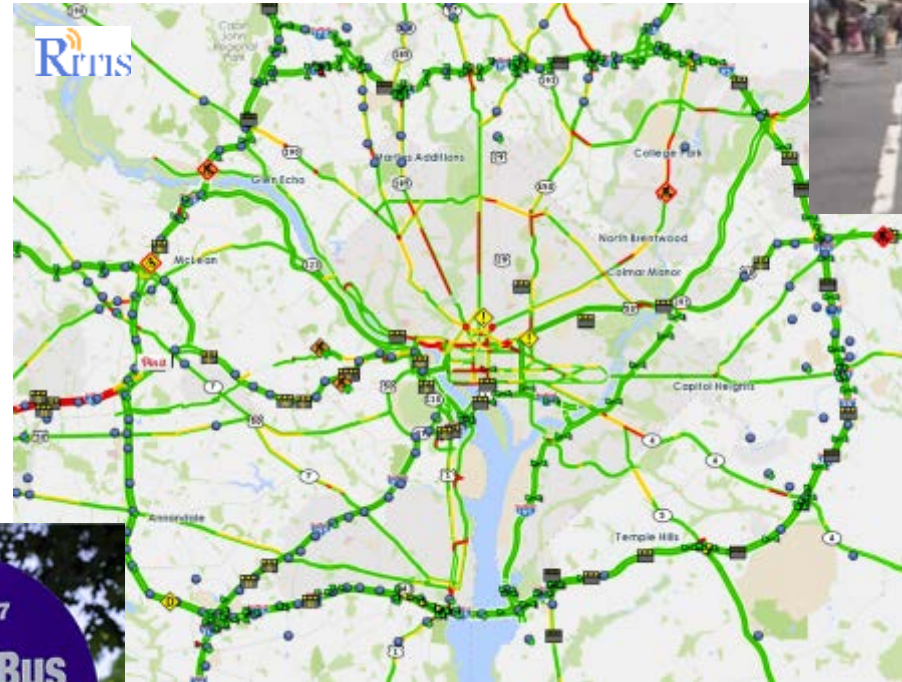
Motivation

- › What data is available?
- › How are we using it?
- › What have we learned along the way?
- › Where do we go from here?



Data Sources

- › RITIS - INRIX
 - Live System Status
 - Historical Data/PDA Suite
- › WMATA AVL
- › Google Traffic
 - Live/Typical
 - Waze
- › Floating Car/GPS
- › Bicycle Travel Time
- › CCTV



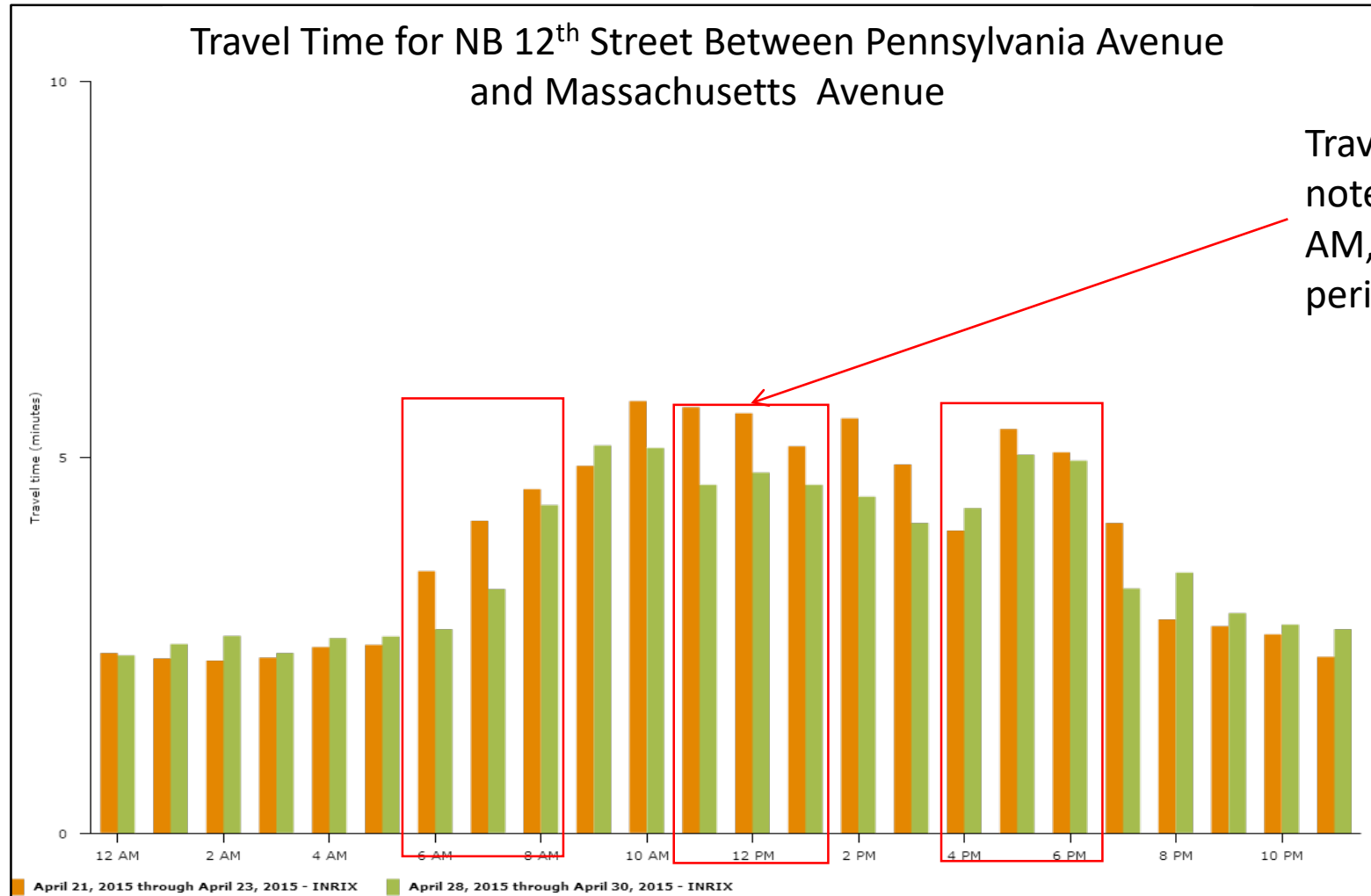
Practical Applications

Downtown Optimization

- › 600+ Signal Grid Network
- › Overnight Implementation
- › Cars, Buses, Peds, Bikes
 - 49 Travel Time Routes
 - 40+ Bus Routes
 - 1,500+ Signalized Crosswalks
 - 7,000+ Cycle Trips per Day



Downtown Results – Vehicle Probe Project (VPP) Travel Time

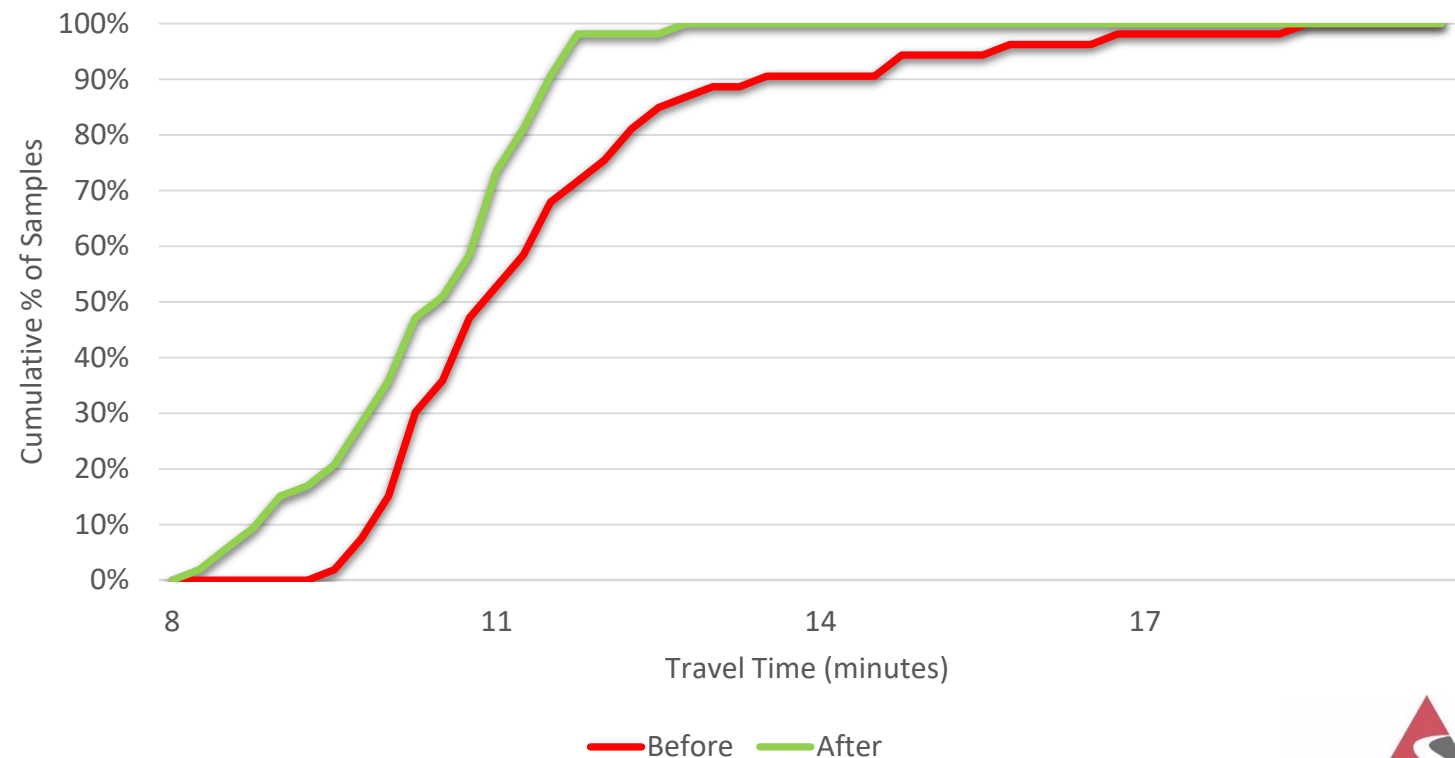


Travel Time Savings noted during 'after' AM, Midday and PM period

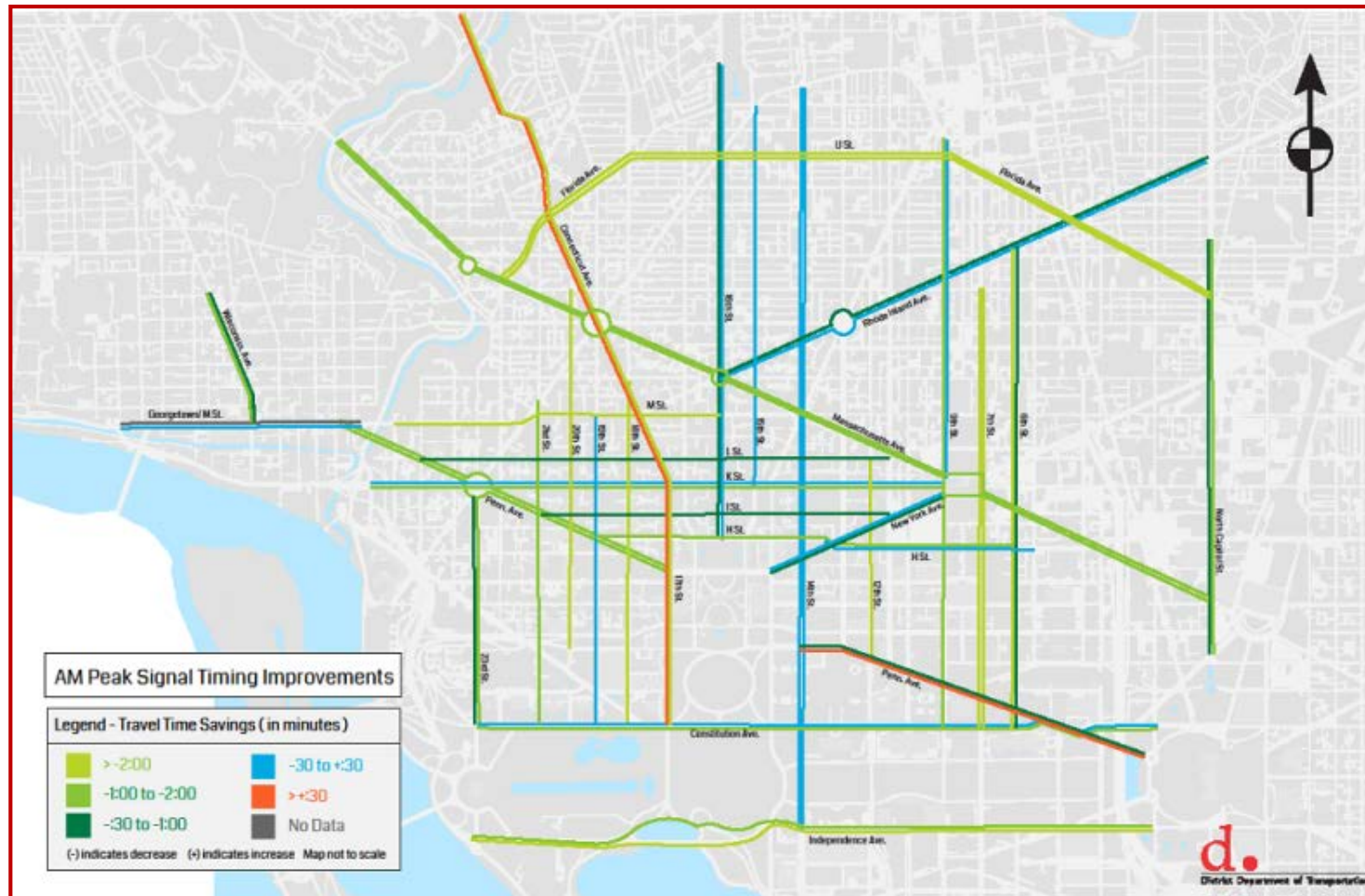
Downtown Results – VPP Travel Time as CDFs

- CDFs provide a visual representation of travel time reliability
- Possible since PDA Suite provides many travel time data points
- With traditional floating car data (~6 runs per corridor) this is not possible

Rhode Island Avenue Travel Time Cumulative Distribution

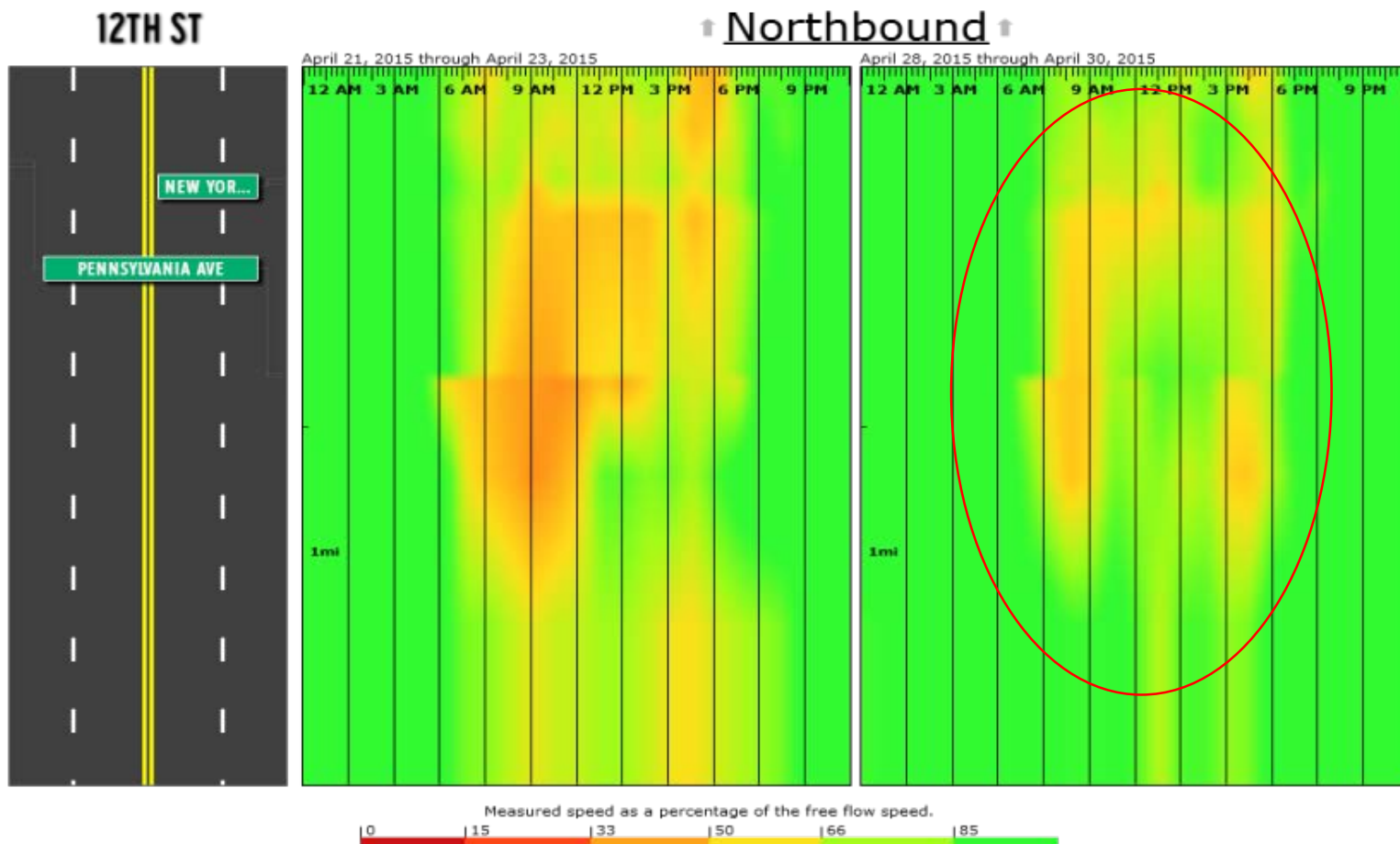


Downtown Results – VPP Travel Times Mapped



Downtown Results – VPP Congestion

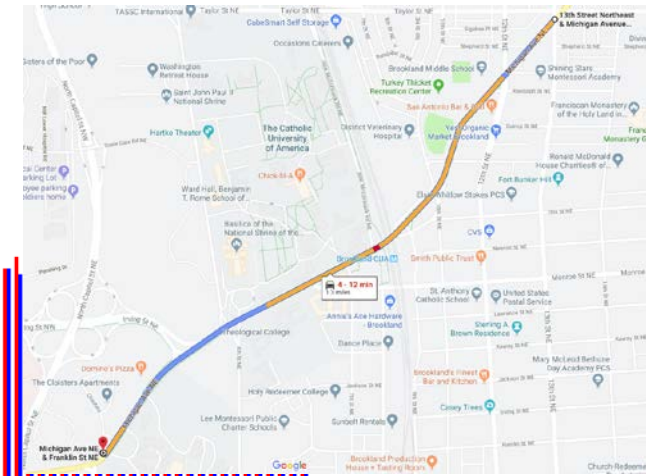
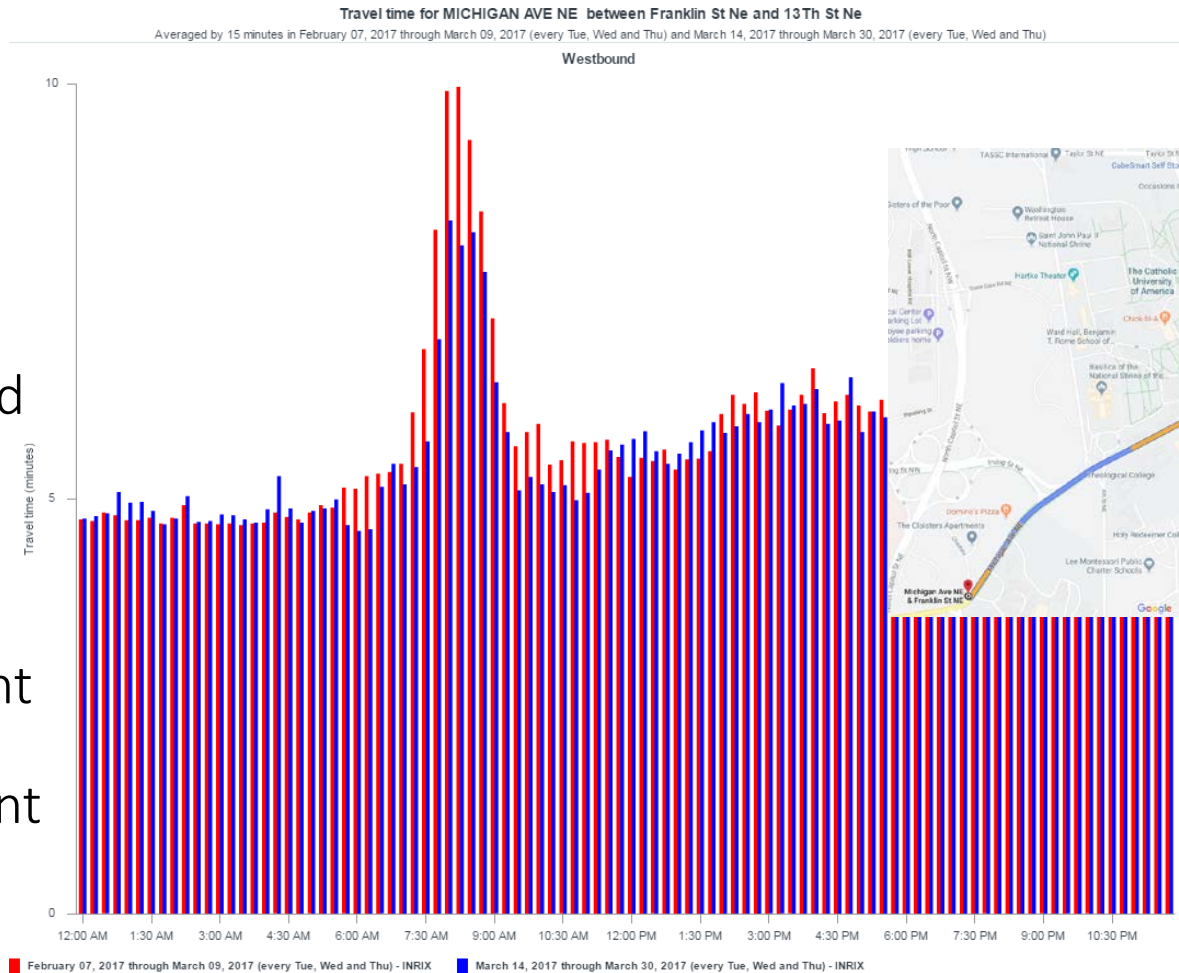
Congestion on 12TH ST between Independence Ave and Massachusetts Ave
Averaged by 1 hour for April 21, 2015 through April 23, 2015 and for April 28, 2015 through April 30, 2015



Significantly reduced queuing and increased speeds noted during 'after' AM, Midday and PM period

Citizen Requests – Rapid Before/After Evaluations

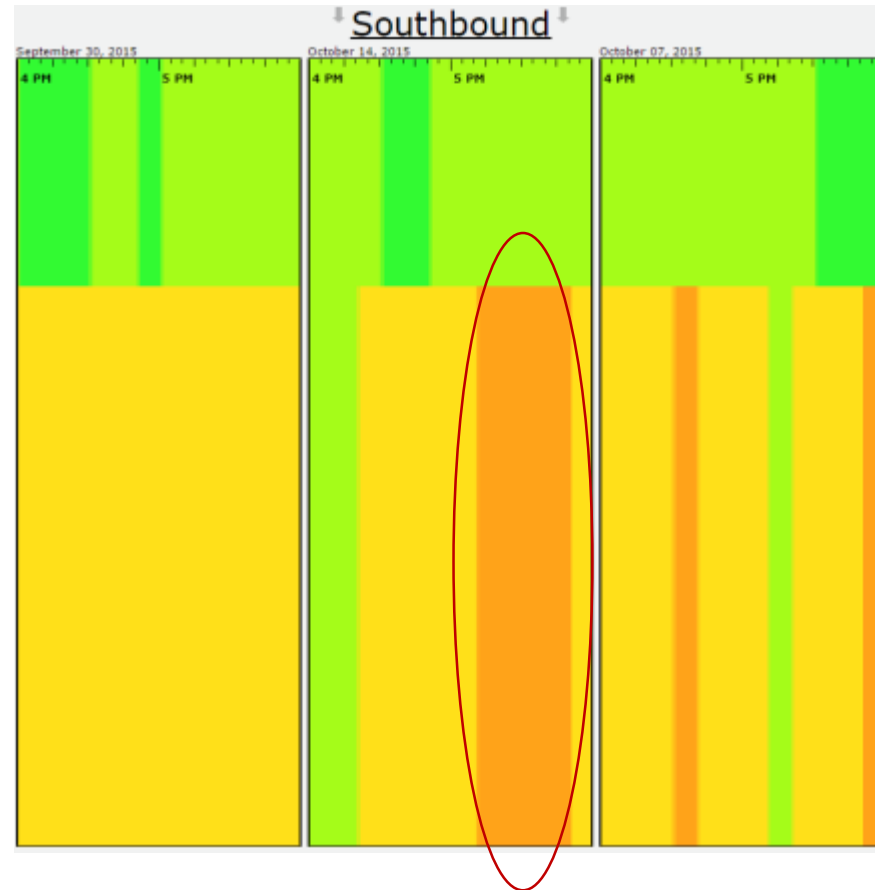
- Early March 2017 Report from citizen of congestion along Michigan Avenue during AM
- Not optimized since 2005; network optimization scheduled for Fall 2017
- Quickly reviewed and updated timings for 4 intersections
- Achieved approximately 2 minute travel time improvement on 1.3 mile corridor
- Extremely low cost improvement & minimal before/after data collection cost to demonstrate benefits



Citizen Requests – Rapid Validation

Citizens note increase in congestion/travel time on a Wednesday

- › Field Observations performed on following Tuesday show typical conditions.
- › So, what happened?



What happened?

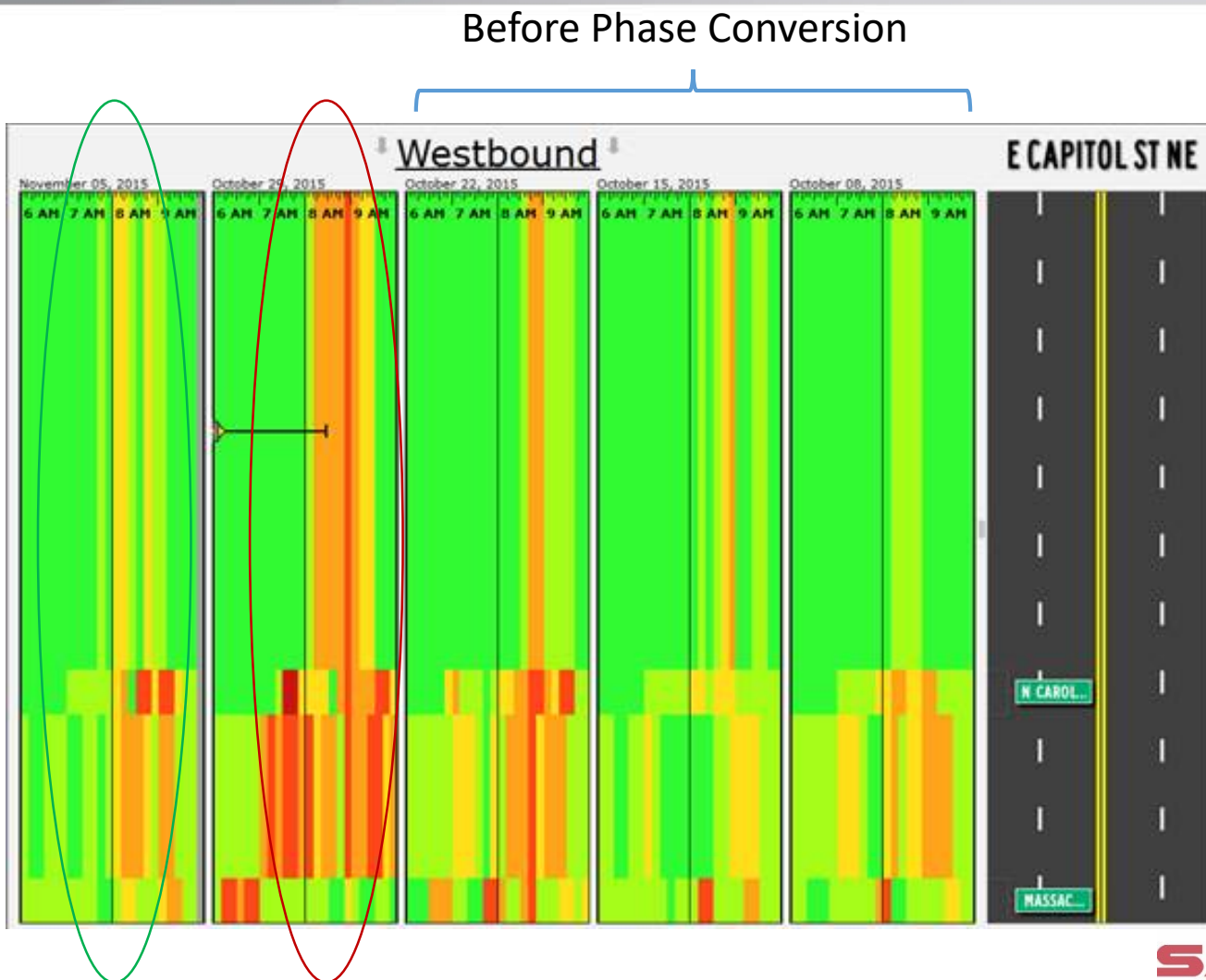
- › Checked RITIS incident data
- › Checked RITIS construction data
- › Checked signal timing data
- › Checked signal trouble calls
- › Checked for special events in the area
- › Etc.

RITIS can tell us that *something* happened but not necessarily why or what.

Citizen Requests – Rapid Validation

Citizens note increase in congestion/travel after Phase Conversion

- Used RITIS data to validate the concern
- Resolved, and then rechecked the data



Analysis Results – User Costs

PDA Suite User Delay Cost Tool

› Considered mainline traffic only

US 1 (Rhode Island Ave)	Delay Costs
Average Day Before	\$41,797
Average Day After	\$32,116
Daily Savings	\$9,681 (23%)
Annual Savings	\$2,420,250

Synchro-based Intersection Delay

› Considered all traffic approaches

US 1 (Rhode Island Ave)	Delay (hours)
“Before”	772,900
“After”	556,880
Daily Benefit	216,020 (28%)
Annual Benefit	\$5,839,021

Papal Visit - Background

2015 Papal Visit to DC (Pope Francis)

- › September 22nd through September 24th, 2015

D.C. Braces for Pope Francis Frenzy (Updated)

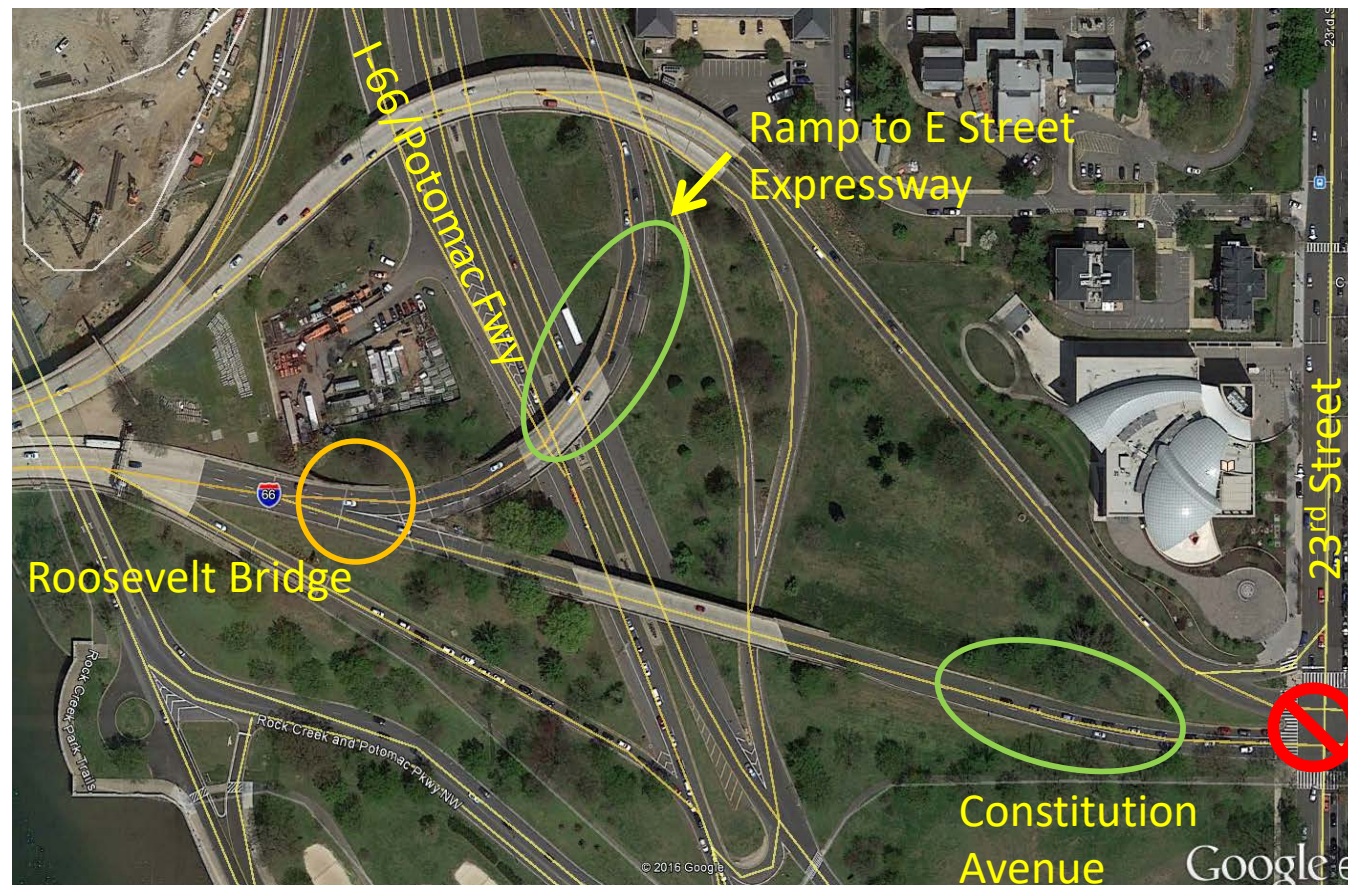


Officials blended the pope's visit to a presidential inauguration. (CO Roll Call File Photo)

- › Sabra & Associates notified of need for traffic analysis and operations services 22 business days before arrival:
 - Microsimulation of entire network for upper management
 - Report identifying impacts within 7 days
 - Possible detour/alternate routes
 - Signal re-timing/mitigation
 - Traffic Control Officer (TCO) deployment
 - Variable Message Sign (VMS) locations

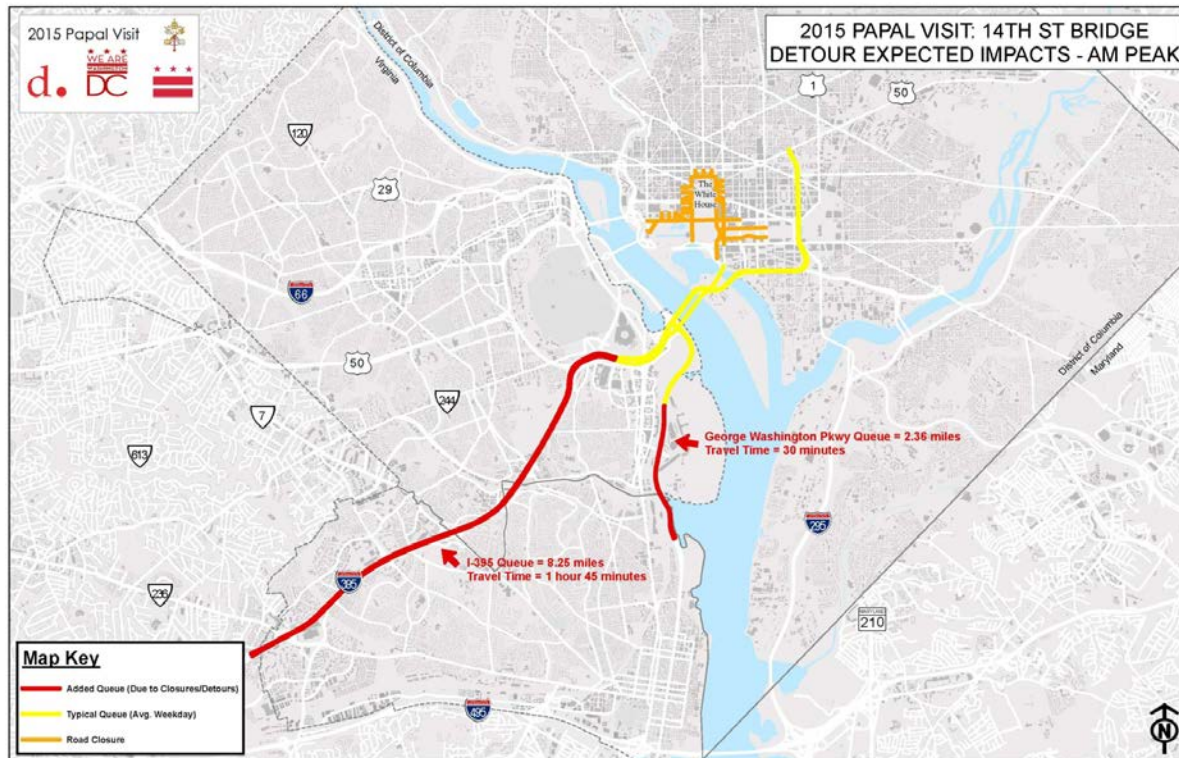
Papal Visit – Impact Analysis

- RITIS/INRIX/Google to observe typical maximum queue lengths
- Estimate typical bottleneck capacity
- Estimate typical jam density
- Identify closure-induced bottleneck location and estimate capacity
- Calculate maximum static queue length

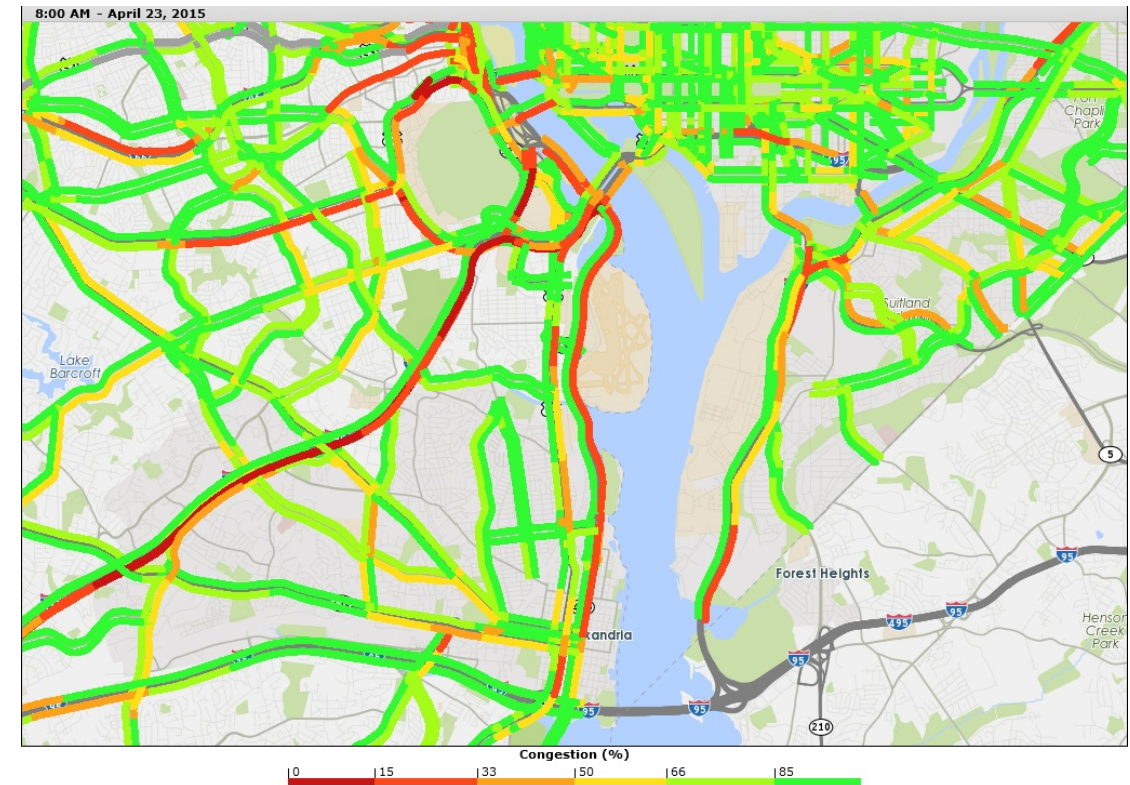


Papal Visit – Impact Analysis Validation

Anticipated Impacts due to 14th Street Closure



Historical Unplanned Closure of 14th Street incident



Papal Visit – Mitigation Measures

Seriously, You Should Not Drive When the Pope Is Here

It could take more than an additional hour to drive into DC next week, officials say.

By Benjamin Freed on September 14, 2015



D.C.: Telecommute During Papal Visit, But Use Metro if You Can't

ANDREW GIAMBRONE — SEP 14, 2015 7 PM



District Line Daily: Pope-mageddon 2015

ANDREW GIAMBRONE — SEP 15, 2015 11 AM



THE DAILY CALLER NEWS FOUNDATION

Six Reasons Why The Pope's Visit Will Be A Disaster For DC Residents



JOSH FATZICK
Reporter

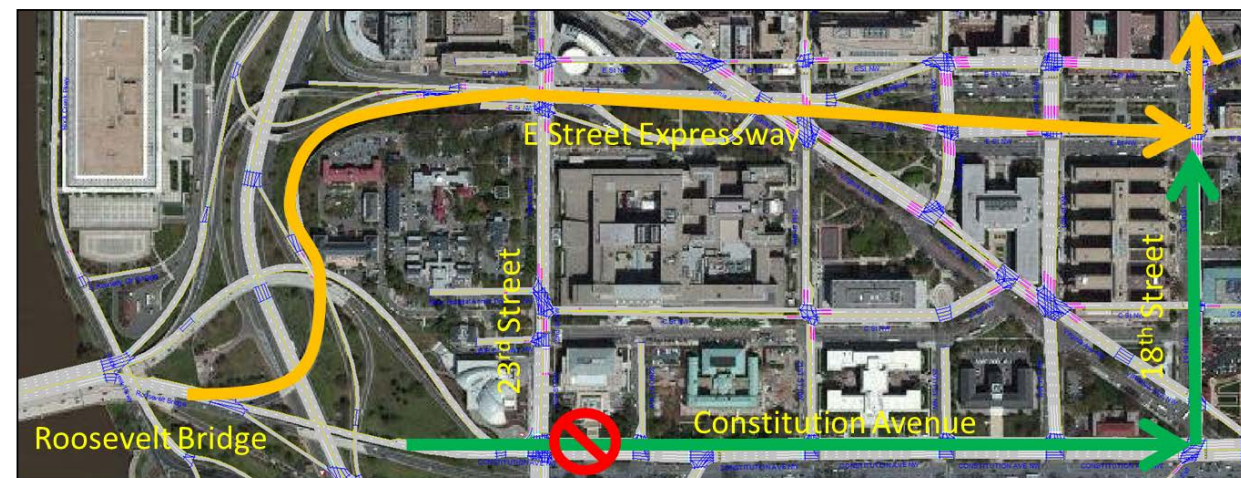
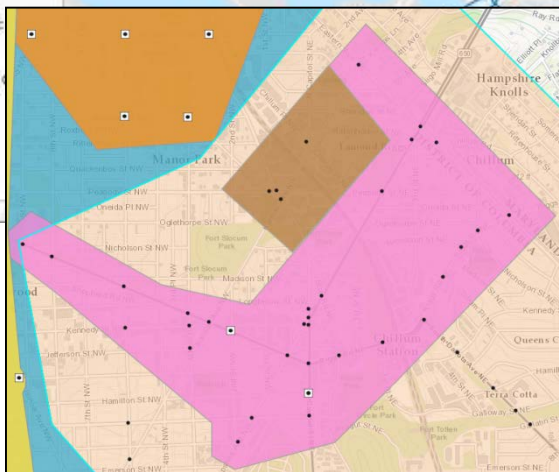
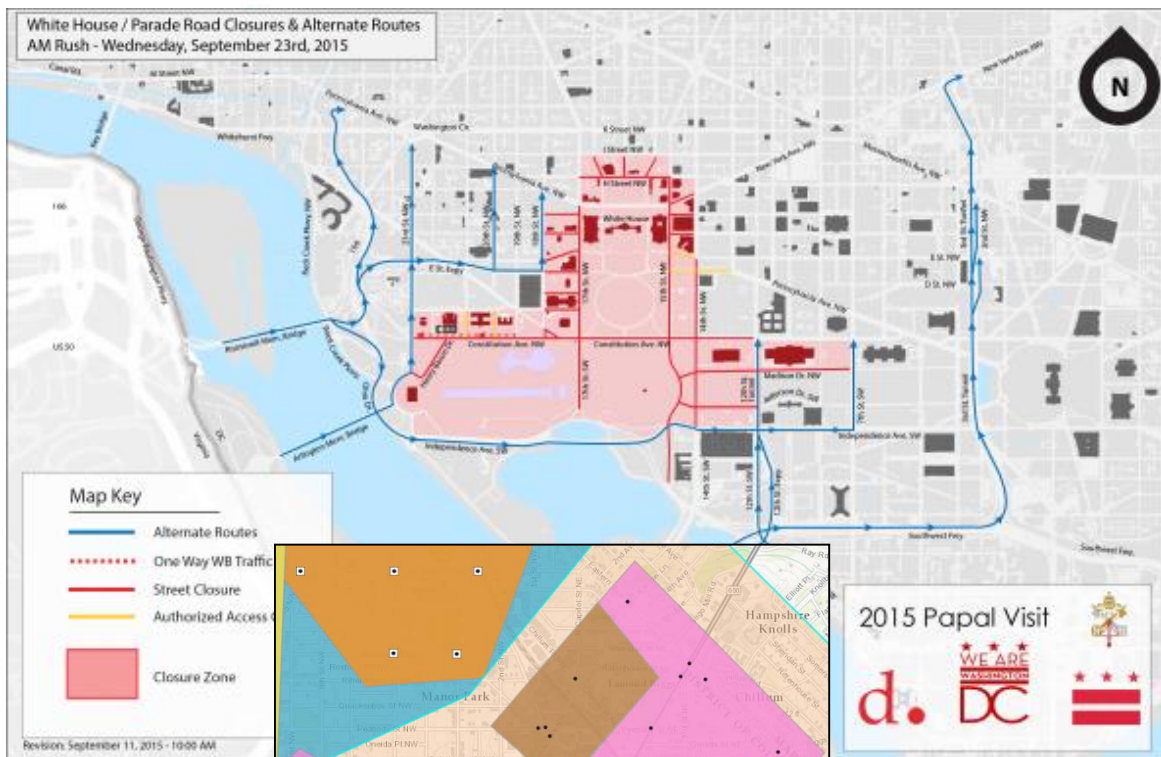
7:45 PM 09/17/2015



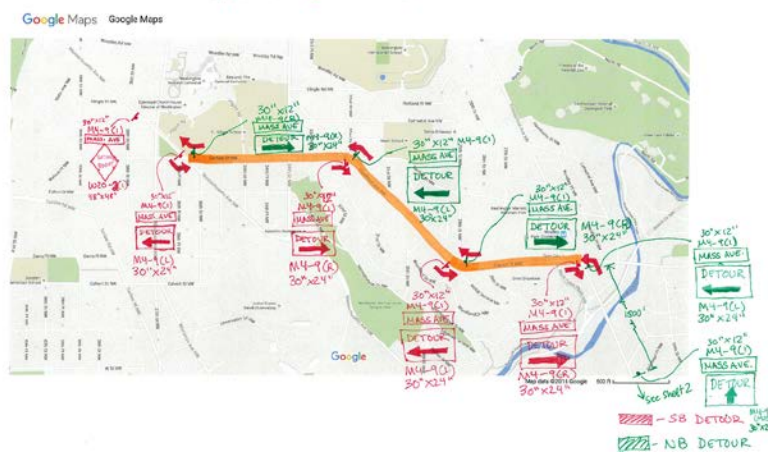
The papal visit is already causing headaches for residents in the District of Columbia, and he won't even be in town until next week.



Papal Visit – Mitigation Measures



NUNCIATURE DETOUR (P. 1 of 2)



Papal Visit - Outcomes

Metro says traffic light for Pope's first morning in DC

Why Popemageddon Traffic Jams Didn't Happen (But Still Could)

What Pope Francis did for D.C. traffic

oved a few years ago, congestion alerts can be they wear off.

p 23, 2015 | 6 Comments

Tweet in

Most Read

Save for Later Reading List

2015 Follow @RT_Thomson



AP Photo

Pope's arrival fails to bring traffic apocalypse

The pontiff's arrival in D.C. hasn't delivered an anticipated traffic and transit nightmare - yet.

By KEVIN ROBILLARD | 09/23/15 12:44 PM EDT

Study: Papal visit had miraculous impact on traffic

wtop



By Ari Ashe | @ariasheWTOP
October 24, 2015 6:40 pm

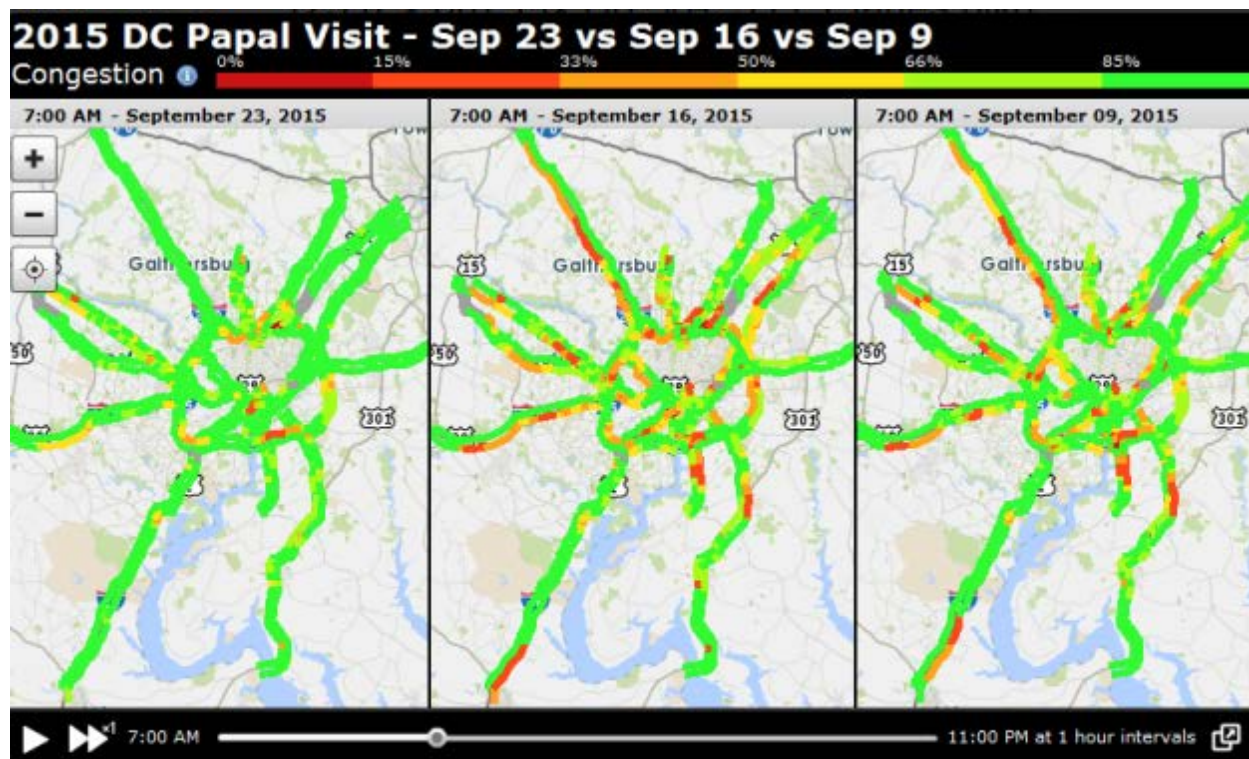
f t e +

WASHINGTON — When Pope Francis visited D.C. in September, he did more than offer blessings to true believers. He may have also delivered a miracle to the region with the worst traffic in the country.

A recent study found that the papal visit resulted in a relatively non-existent rush hour. The National Capital Region Transportation Planning Board used traffic speed data from INRIX to determine how fast people were travelling on Sept. 23 and Sept. 24, when the pope was in town.

Papal Visit - Outcomes

RITIS Comparison Tweeted by MATOC



MATOC Alerts @MATOC · Sep 24

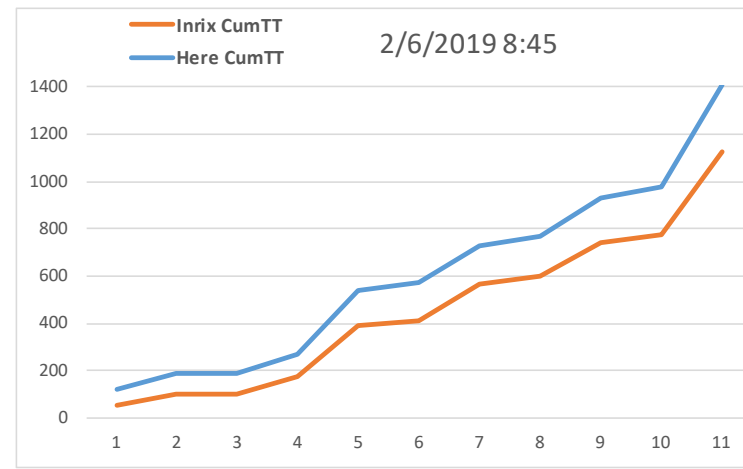
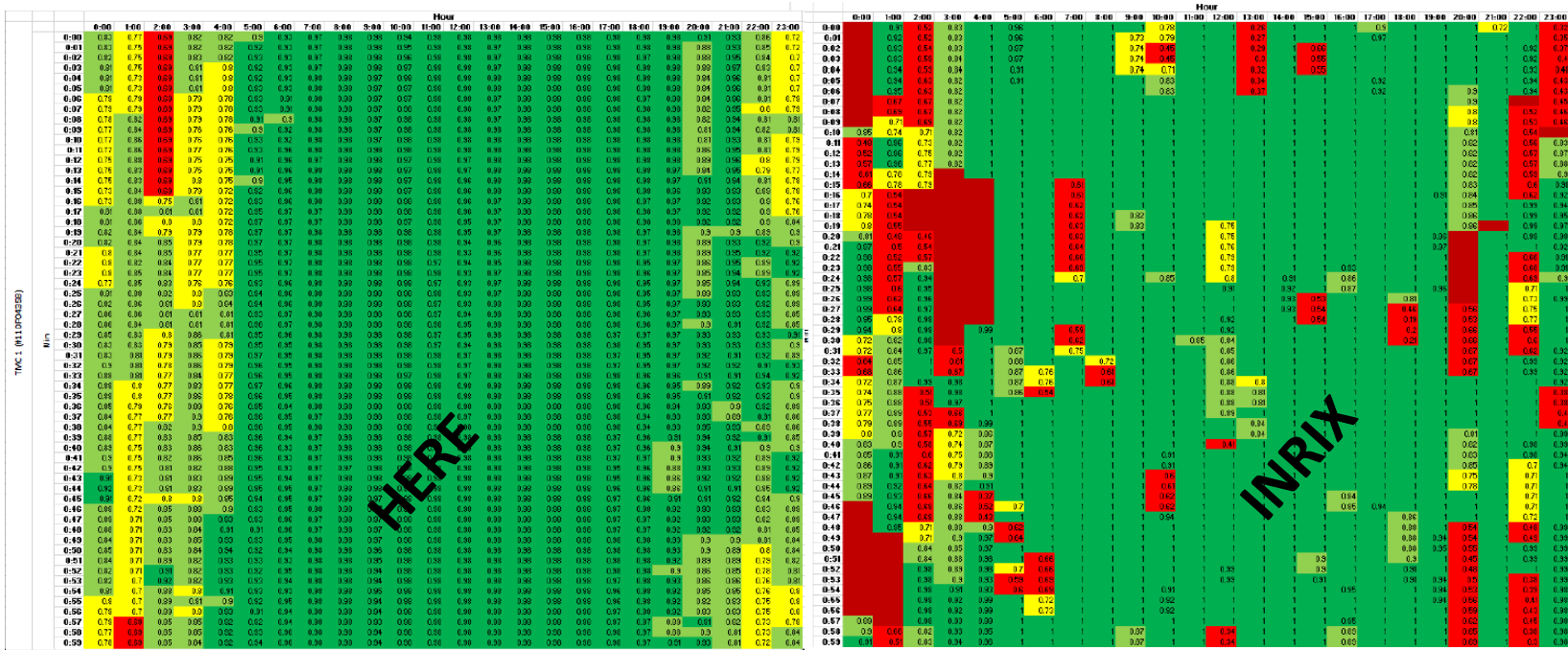
Compare yesterday's congestion with the previous two Weds goo.gl/FqajSF #dctrffic #mdtraffic #vattraffic

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Data Quality – How good is it?

Like any other tool – you need to know how and when to use it!

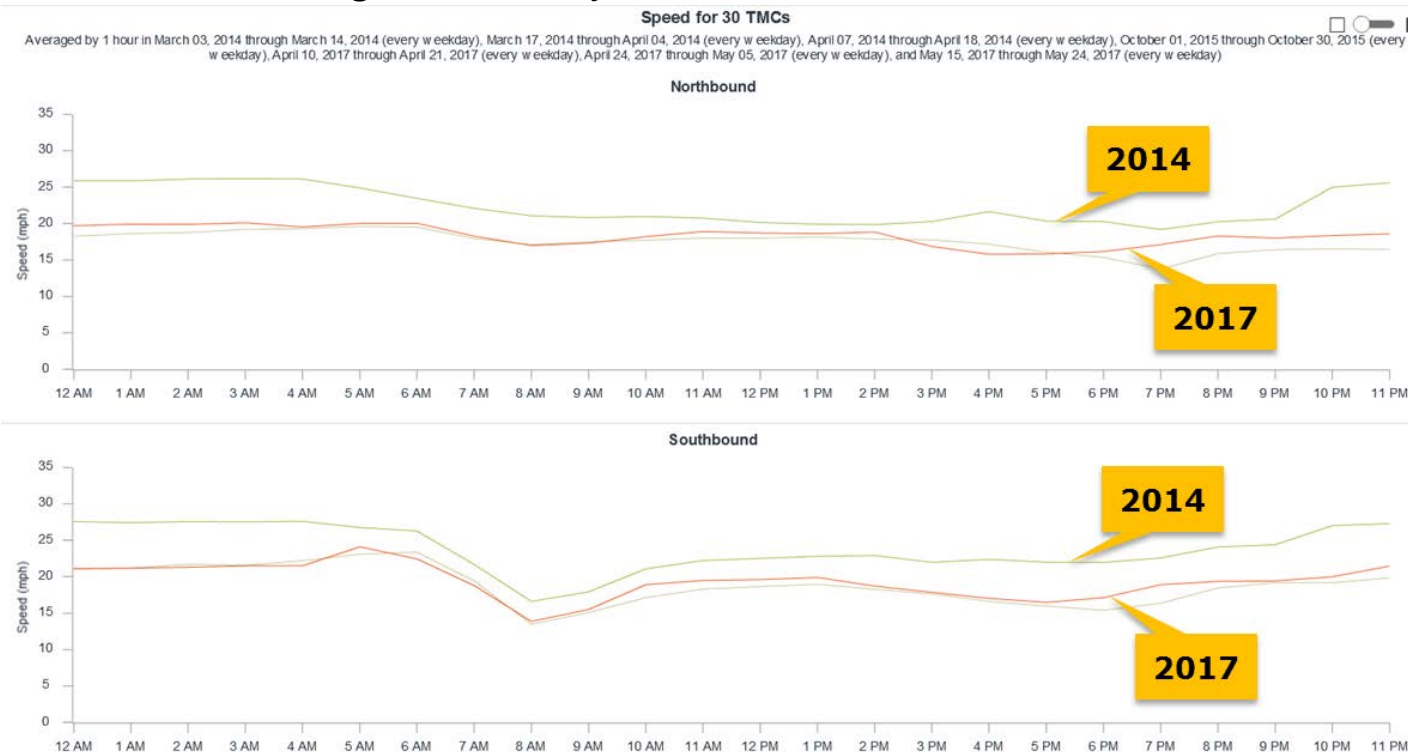
- Baltimore City PDA Data Quality:



Data Quality – How good is it?

Like any other tool – you need to know how and when to use it!

- Long-term analysis:

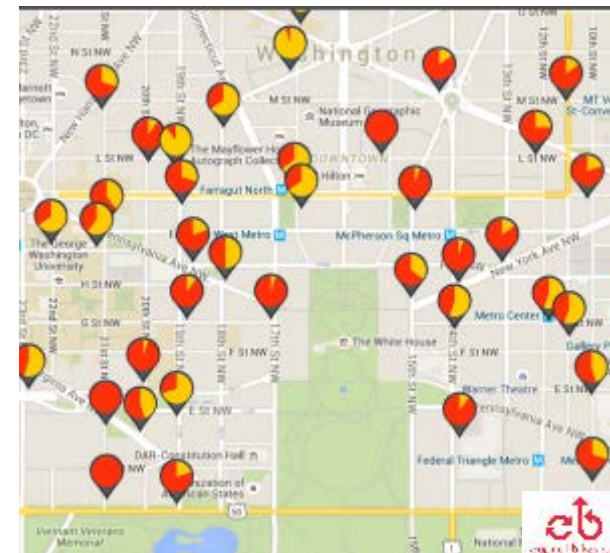


I-95 Corridor Coalition Validation of Arterial Probe Data Report (2015):

*Probe data consistently errored toward faster speeds during congested periods. The extent of slowdown measured in terms of reduction in speed was consistently underestimated as evidence by SEB measurements as well as by the distribution analysis. Even for events classified as fully captured, any error in the extent of slowdown was biased toward faster speeds. **This systematic bias towards higher speeds will have programmatic significance if probe data is used in long term performance monitoring.** As probe data quality improves, the data will more accurately report the full extent of slowdowns. As a result **congestion may appear to grow worse when in actuality, it is only the quality of the probe data that is improving.** This scenario has been corroborated by early adopters of probe data for arterial performance measures.*

Where do we go from here?

- › Heavier reliance on PDA Suite travel time data for analysis
- › Bluetooth/WiFi/TPMS travel time data when PDA data is poor (e.g. Baltimore City)
- › Field-collected travel time data for validation
- › Heavier use of Transit AVL data for TSP and Signal Optimization evaluation
- › Leverage available Bike data from bike-share services?
- › Pedestrians? Crowdsourced GPS?



d.

Thank You

