Development of a Framework for Collecting Traffic Data Using Anonymous Wireless Address Matching

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Agenda

- Background
- What it is
- What we did
- What is next
- Lessons Learned

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Houston Background

- Regional desire for expansion of existing traffic monitoring system.
- Exploration of more cost effective alternatives (AVI equip +$50k per site)
- Demonstration of address matching technologies
- Assessment of feasibility
- Field deployments for arterial networks

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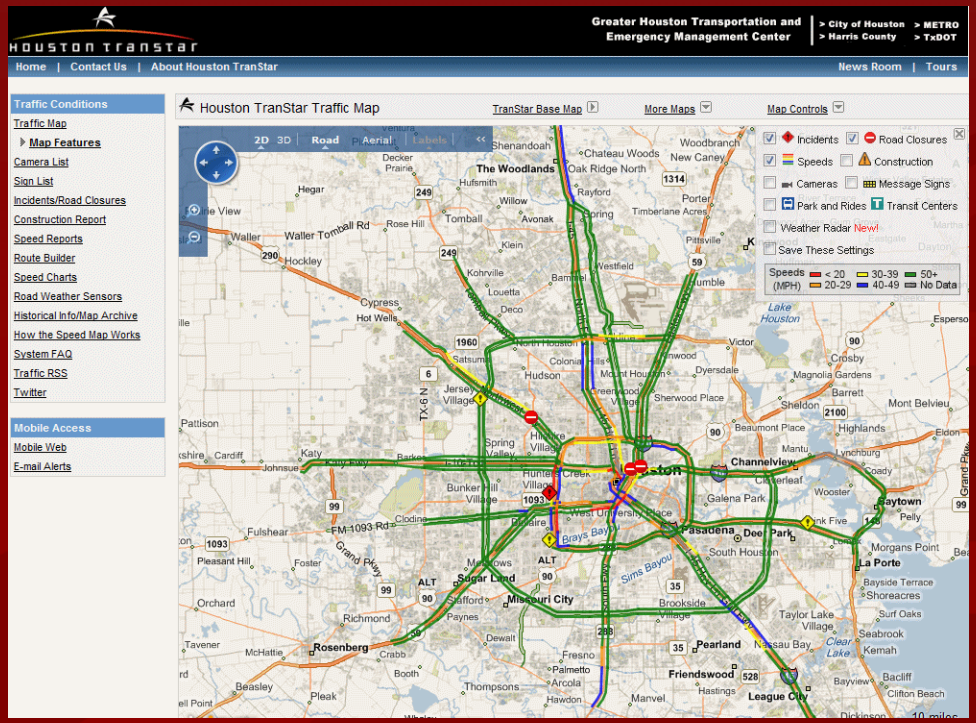
Existing TranStar Website

- Award winning website experiences over 10 million page accesses/500,000 users per month on average
- Freeway travel times are very well received by the public
- Display of arterial travel times are desired by the public
- Existing AVI technology may not be cost effective for wide area deployment on arterials



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Existing Technologies

TranStar system currently utilizes a combination of RFID (Transcore) and radar (Wavetronix) for travel time and speed information (over 450 combined)

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Why try anything else?

- Cost
- *Bluetooth*™ peripherals are becoming widespread
- Easier, non-intrusive field installation and maintenance
- Desire of complete ownership of traffic data samples by operating agencies

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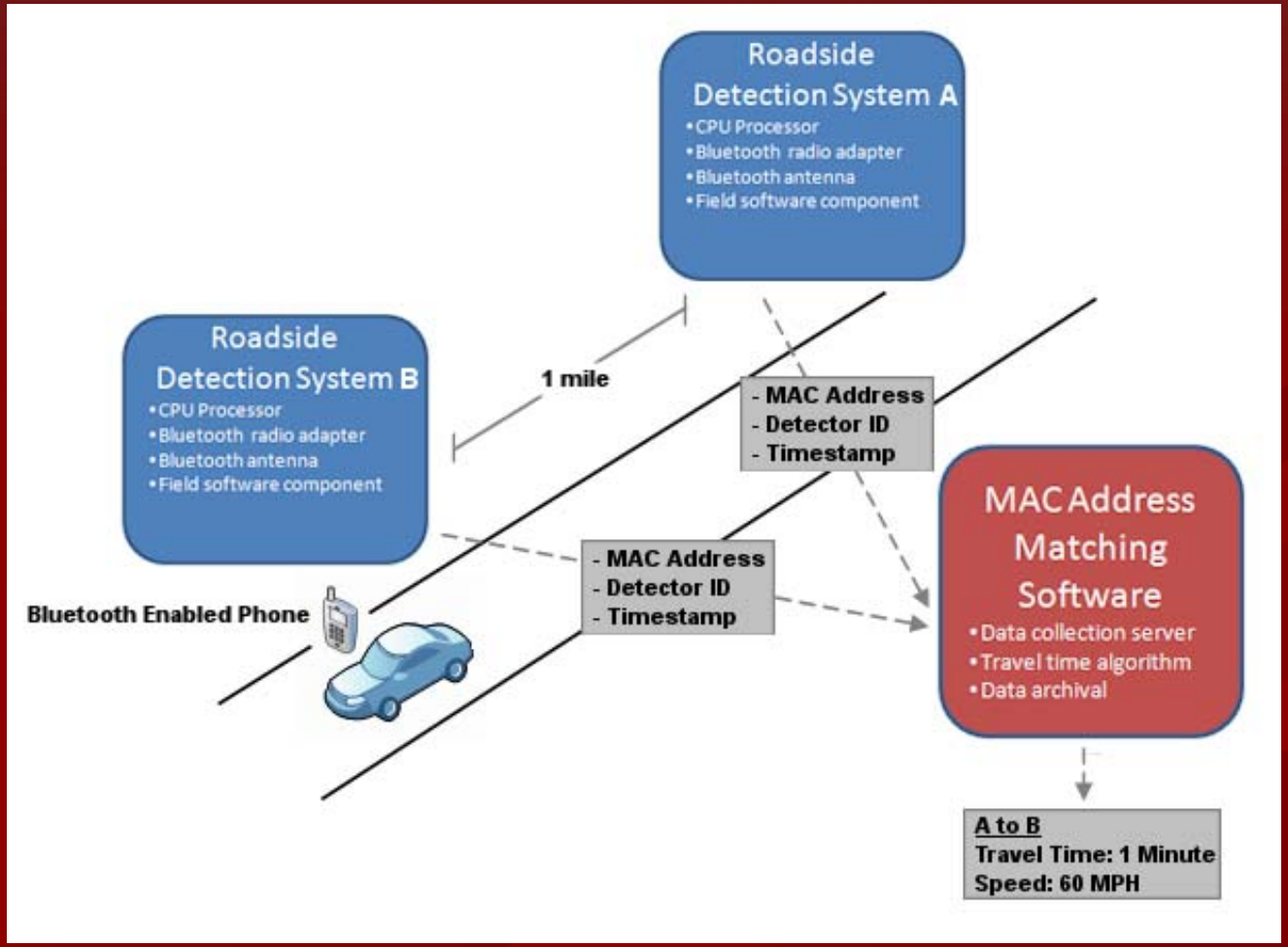
Address Matching Concept



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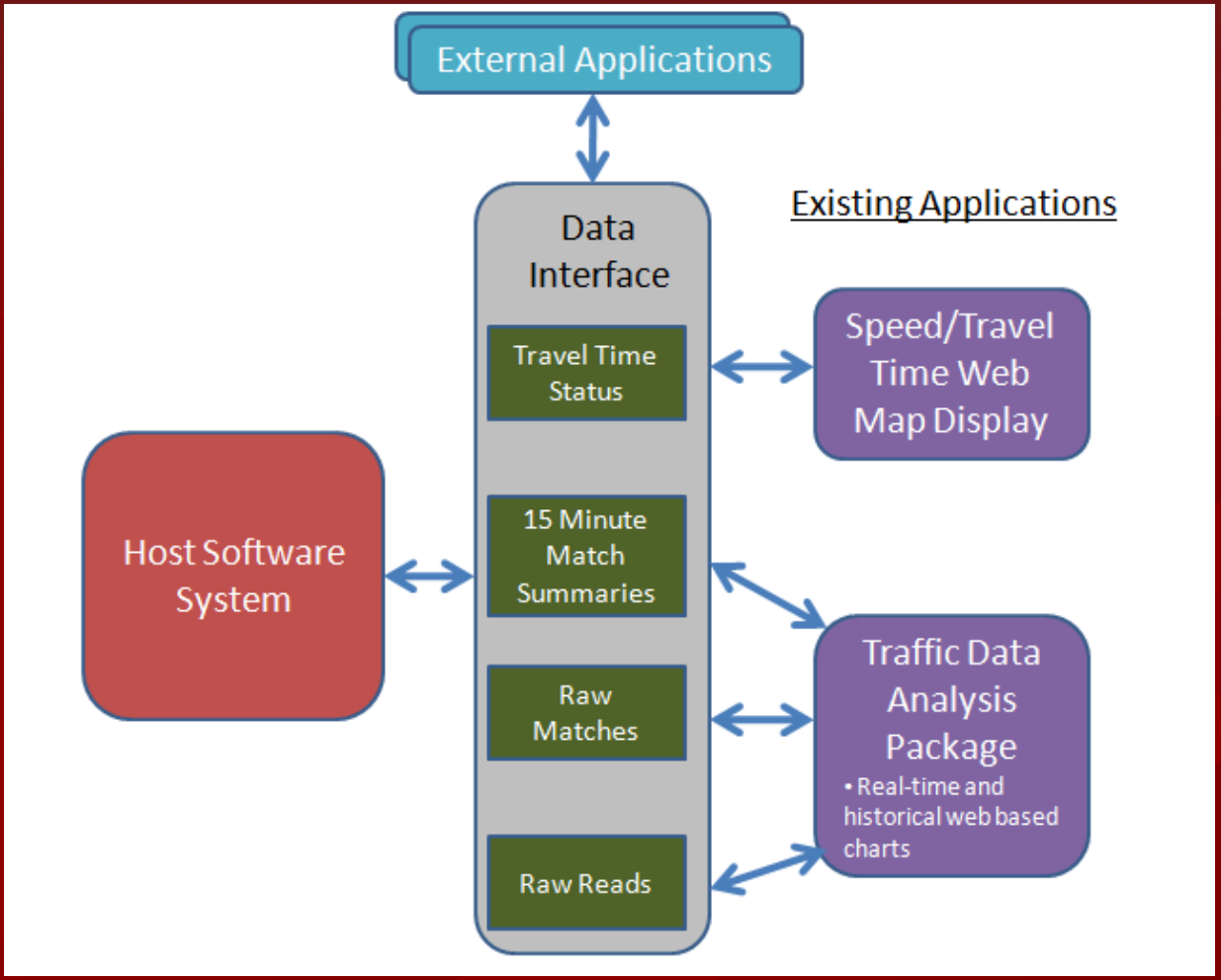
Host Software Interfaces



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City of Houston Study Fall 2008

- First phase of study determined that sufficient devices were in operation in the corridor, for travel time measurements.
- Subsequent phase proved that *Bluetooth* address matching was a viable technique for providing arterial travel time information.

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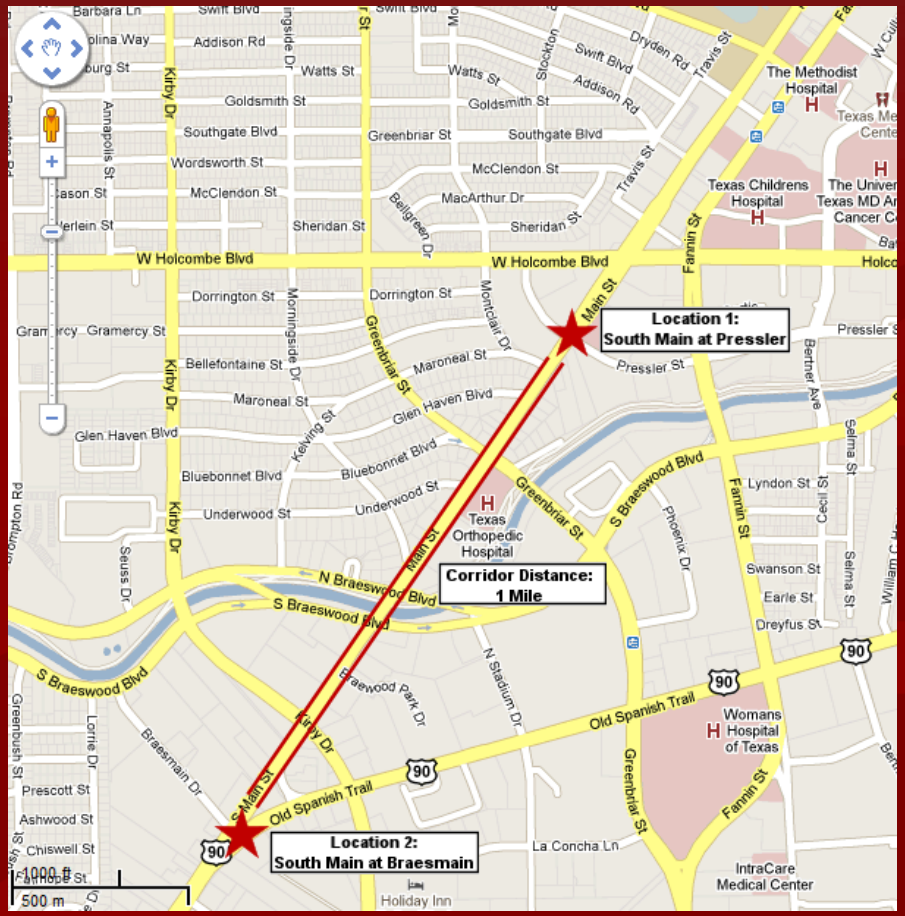
Previous Demonstrations

- License Plate Recognition (LPR) technologies were tested successfully in 2007 and 2008 as a potential alternative to toll tags.
- A successful demonstration showed *Bluetooth* Address Matching as a viable alternative.
- Further deployments extended coverage in the area



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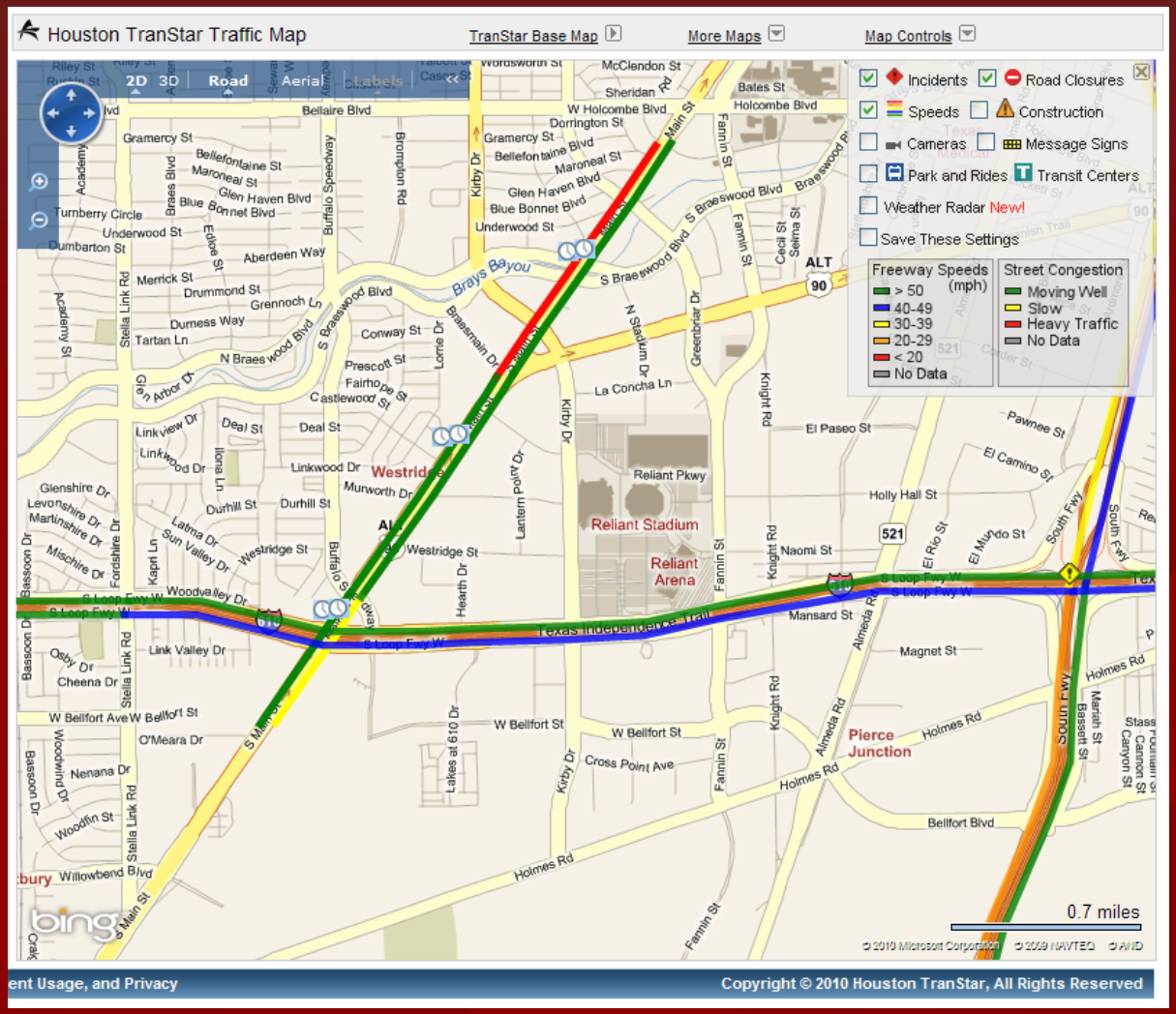
South Main Congestion Map



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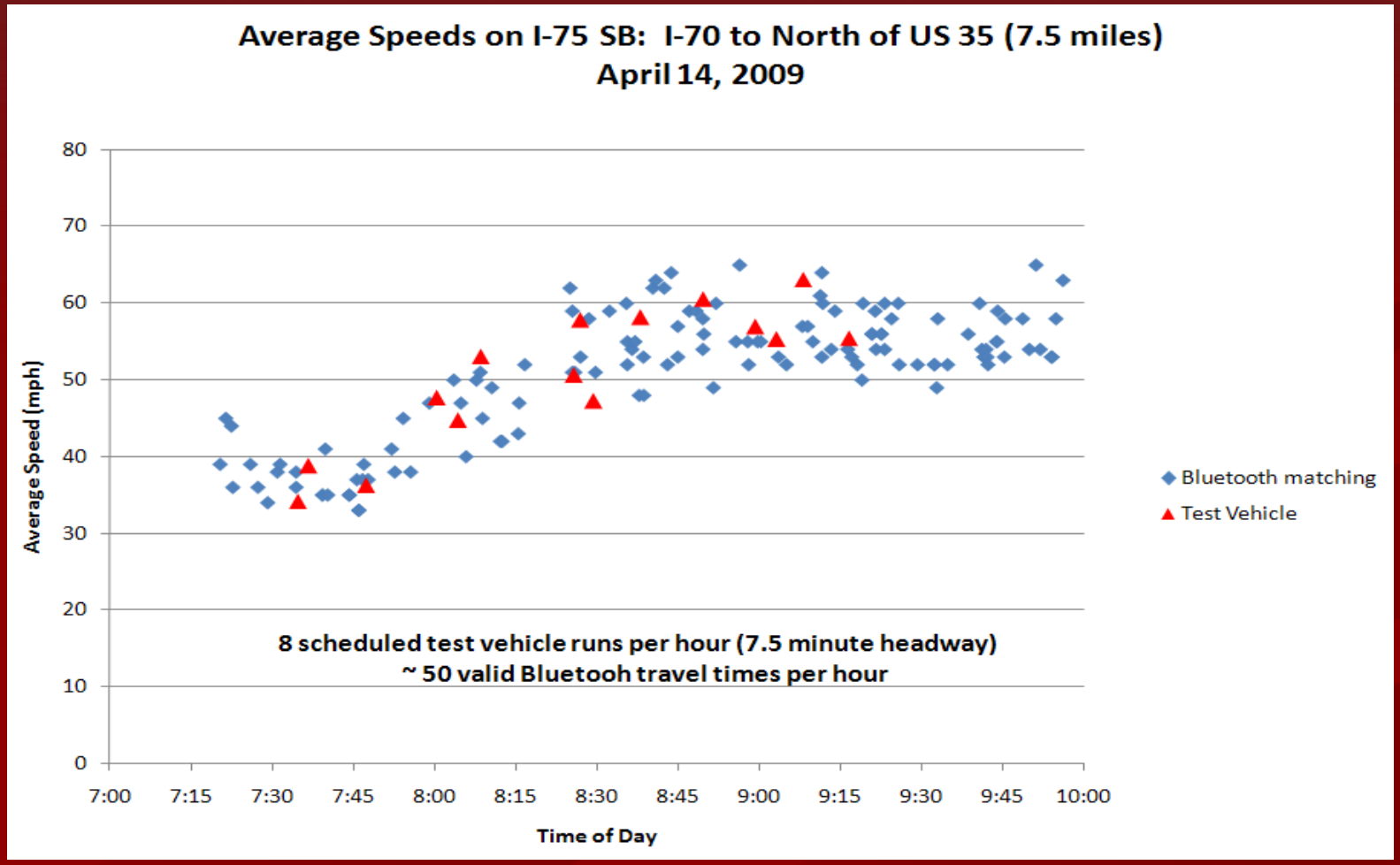
Ohio DOT Demo - Dayton



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Bluetooth Field Equipment

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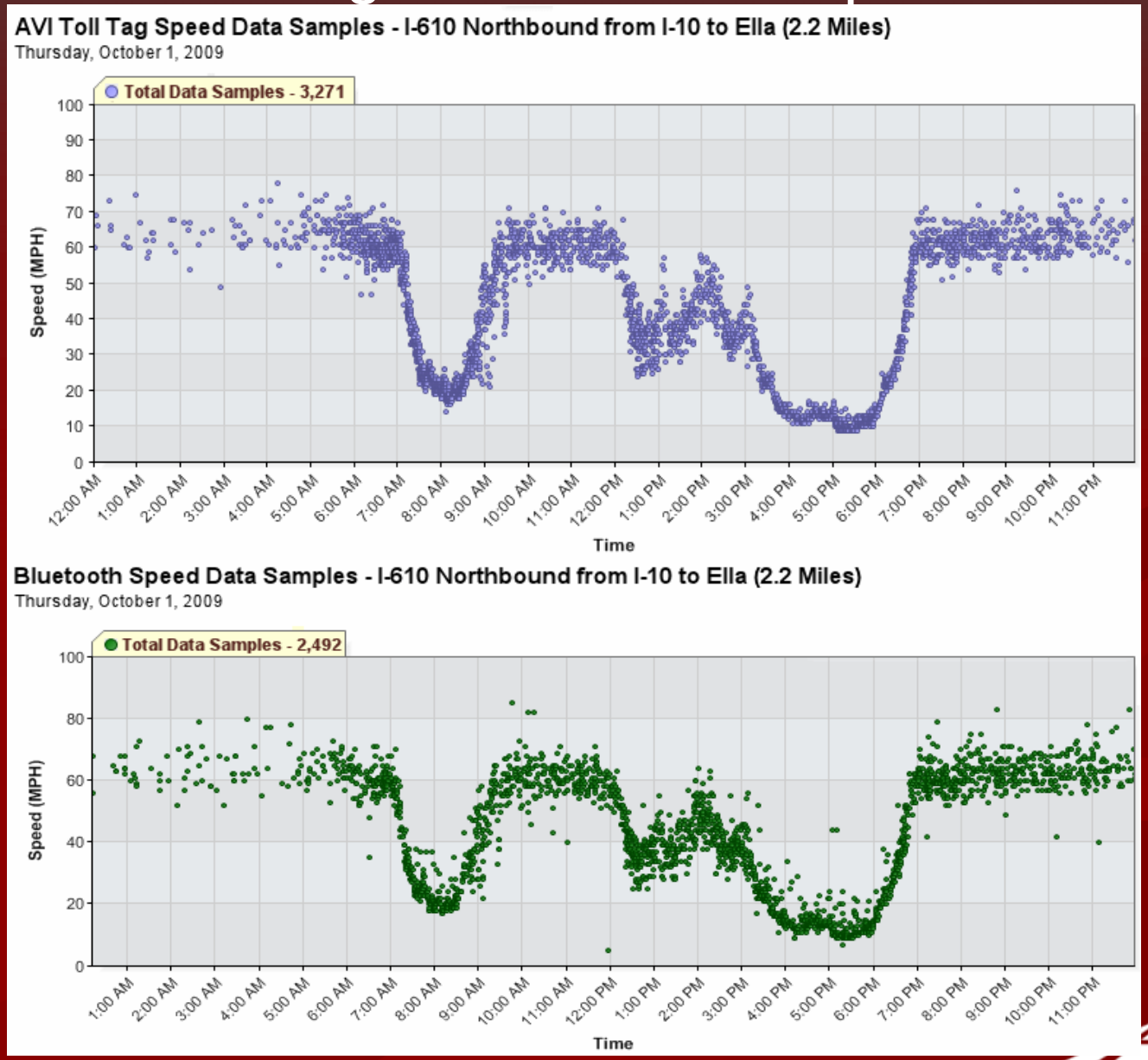
Toll Tag/Bluetooth Comparison



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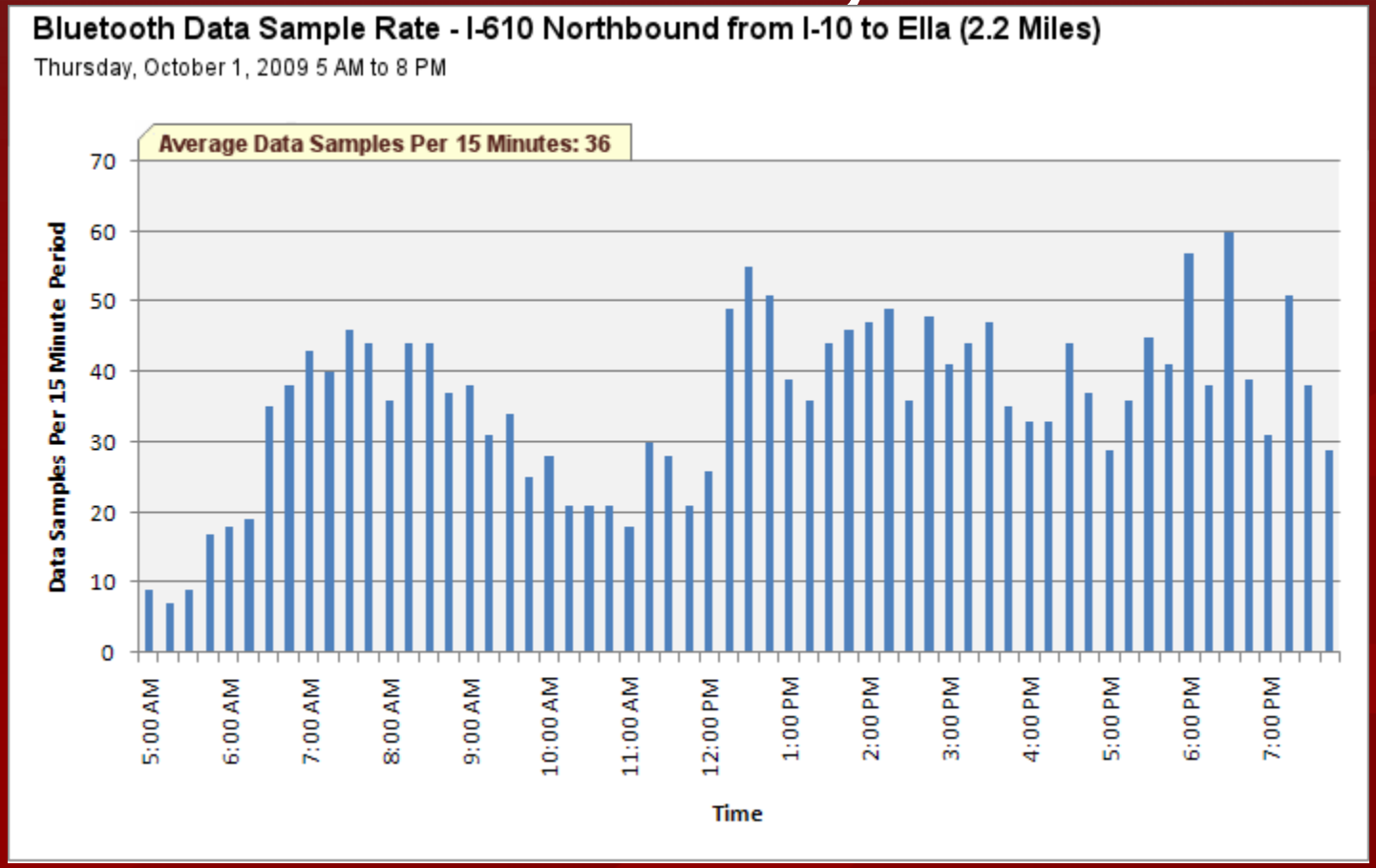
Bluetooth Data Sample Rate - Freeway



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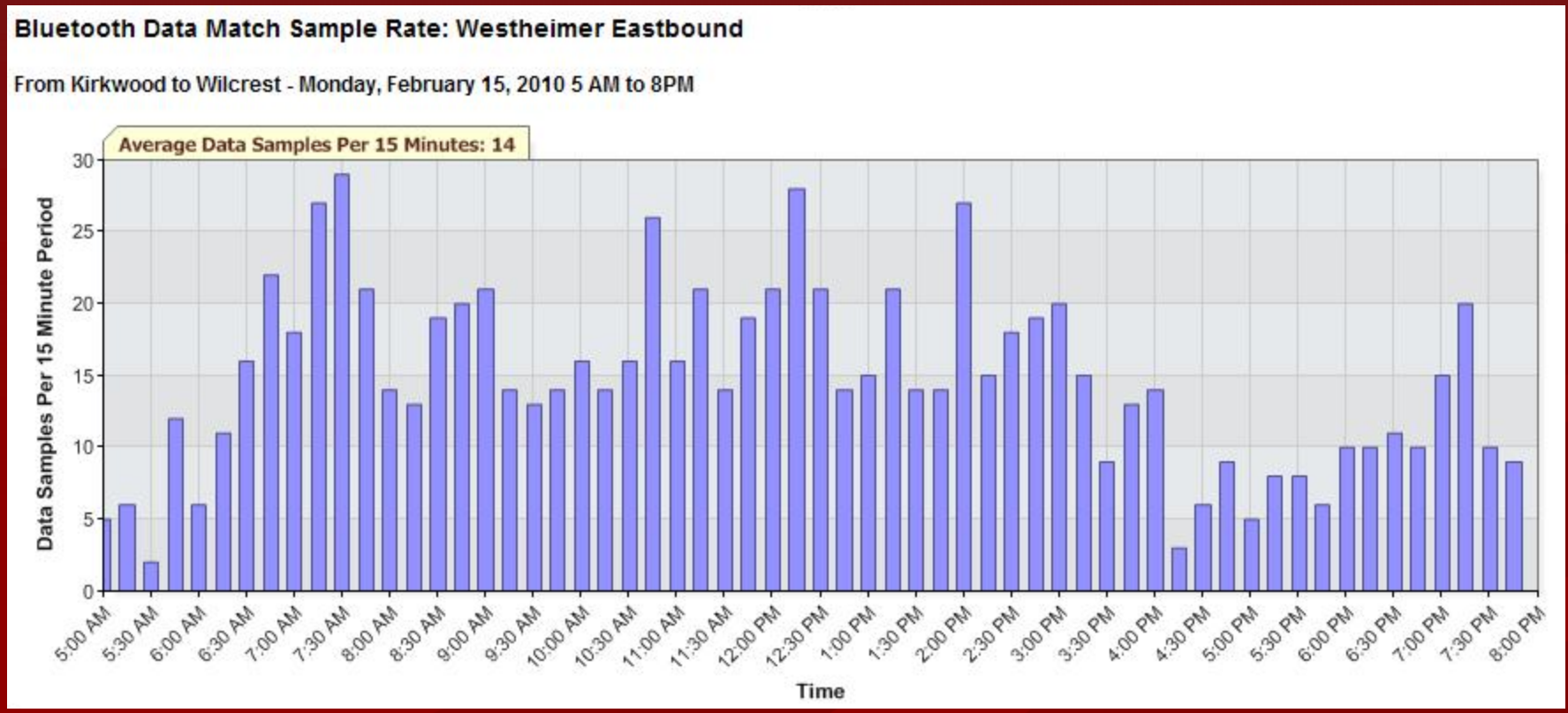
Bluetooth Data Sample Rate - Arterial



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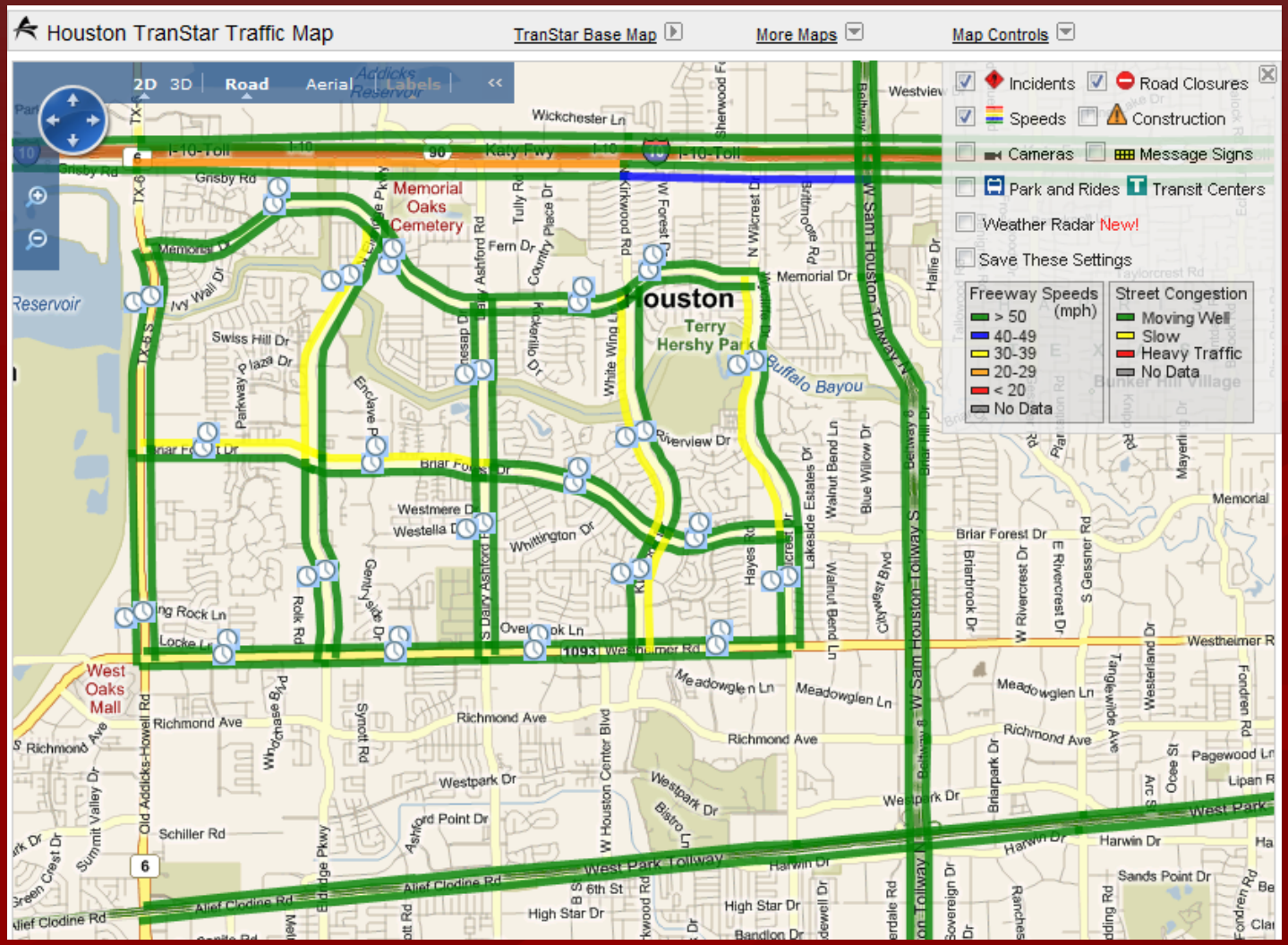
Prototype Congestion Map



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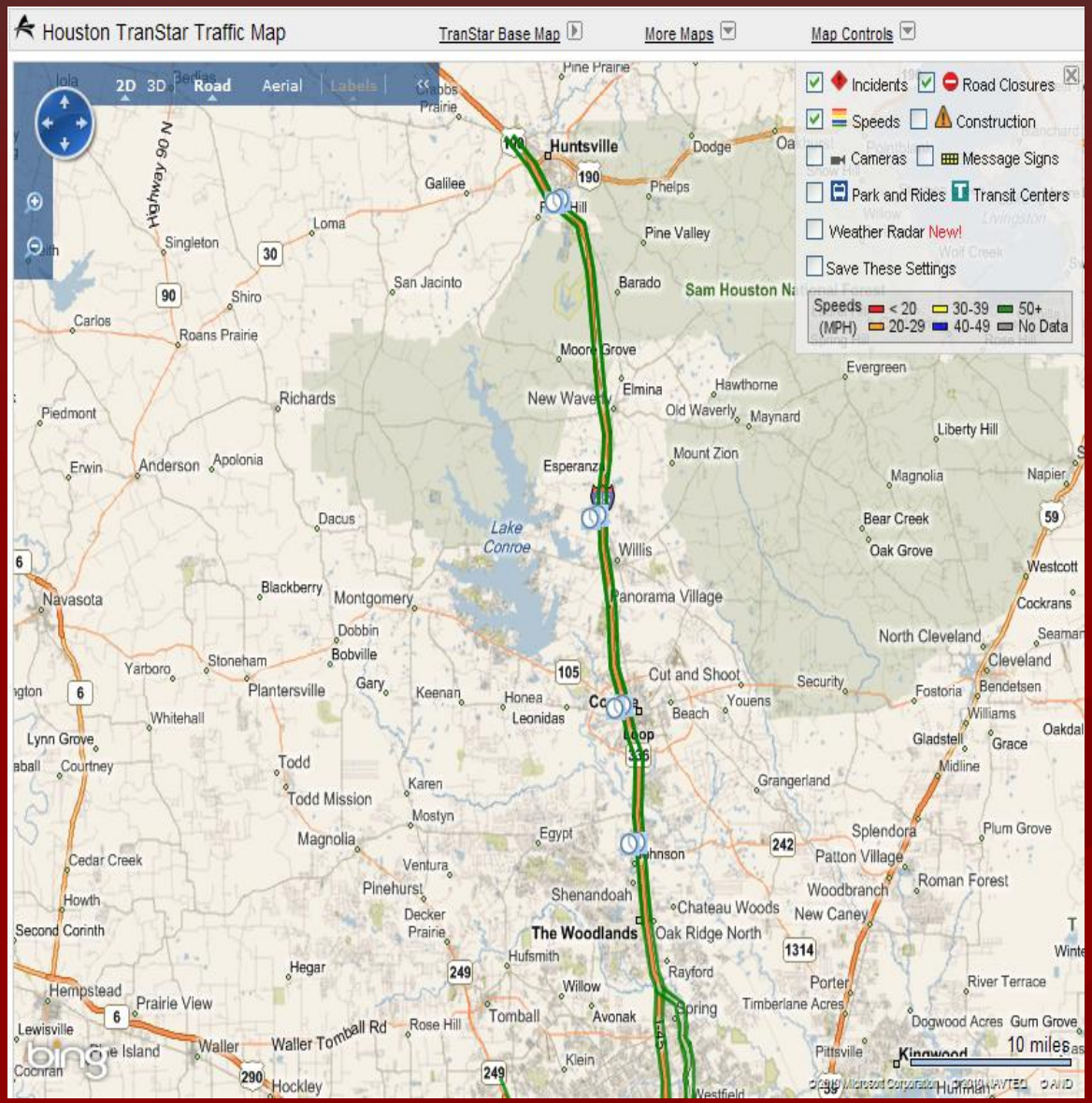
I-45 Current Deployments



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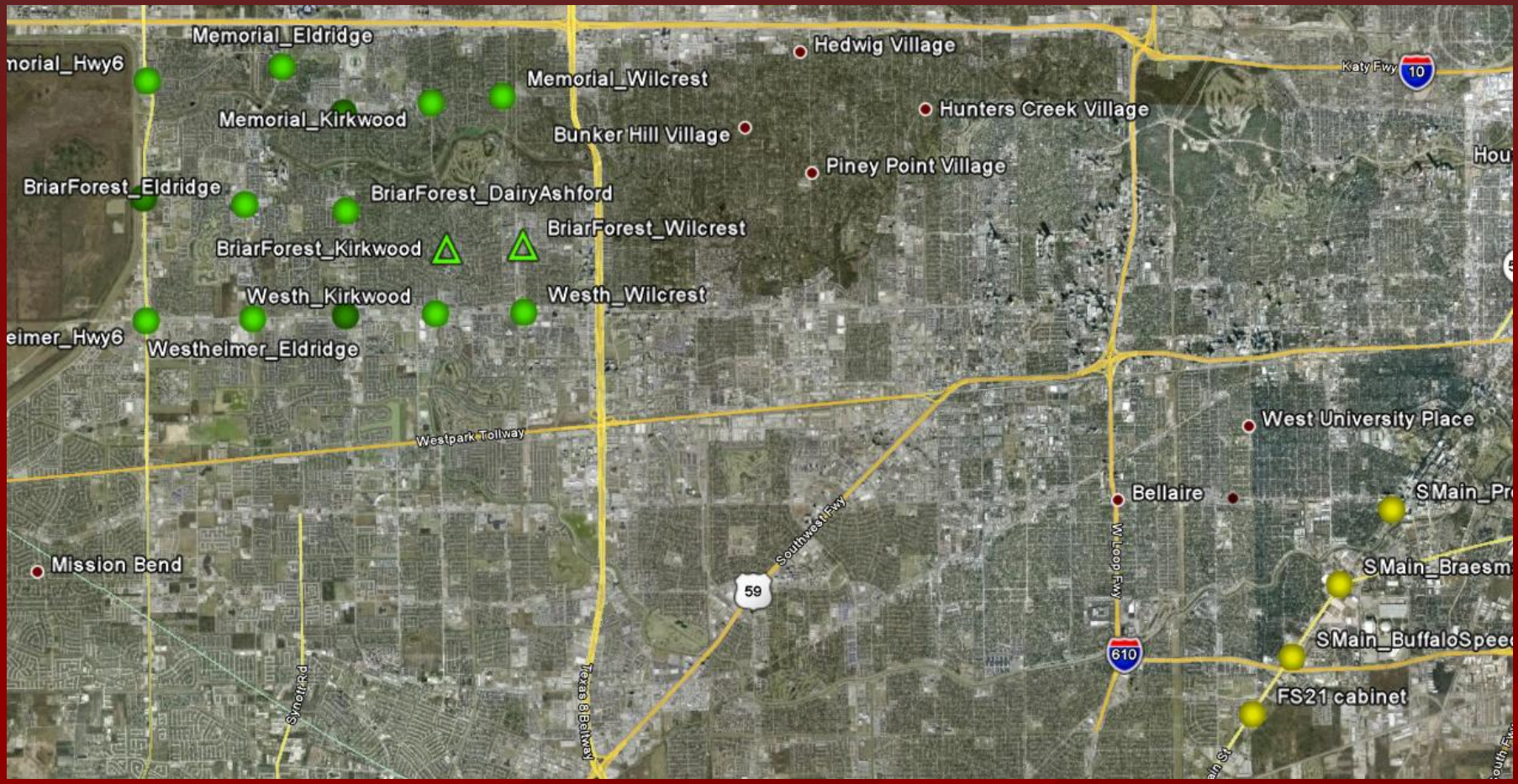
Current Houston Deployments



20 units installed in existing signal cabinets

Total coverage 48 directional miles

2 Traffax units

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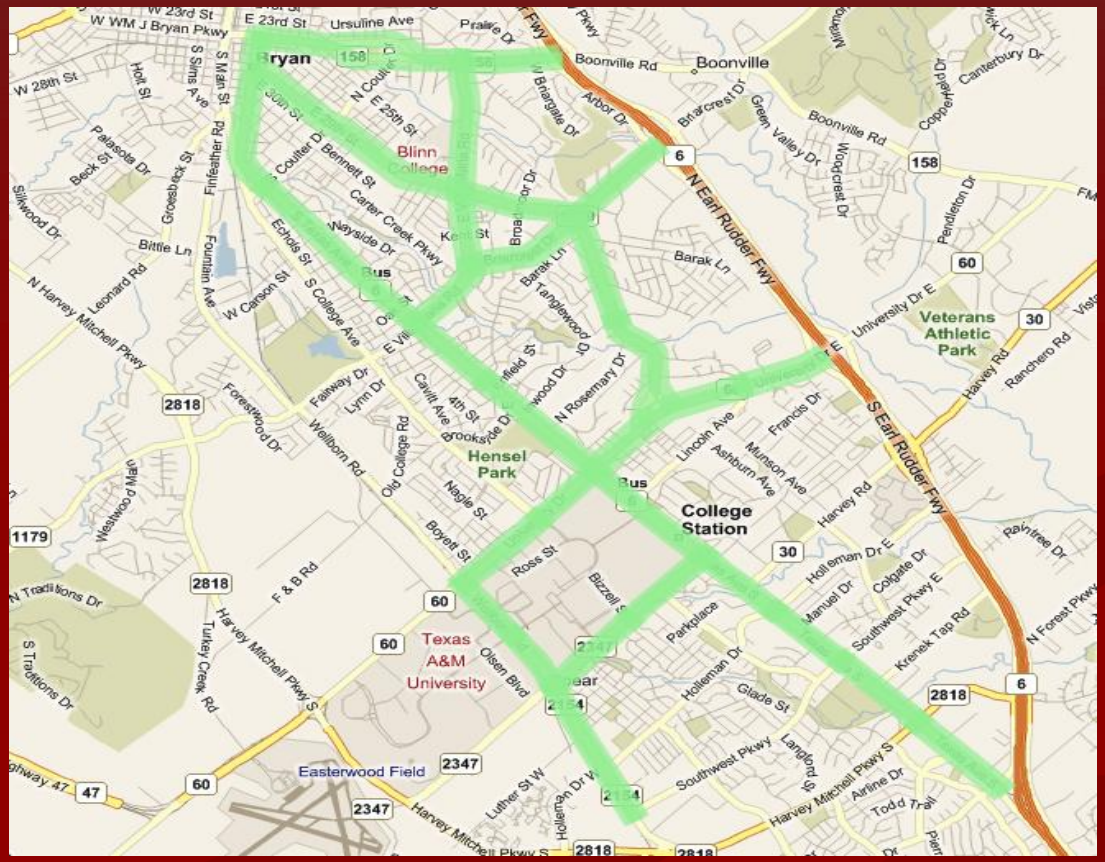
Bryan-College Station Deployments

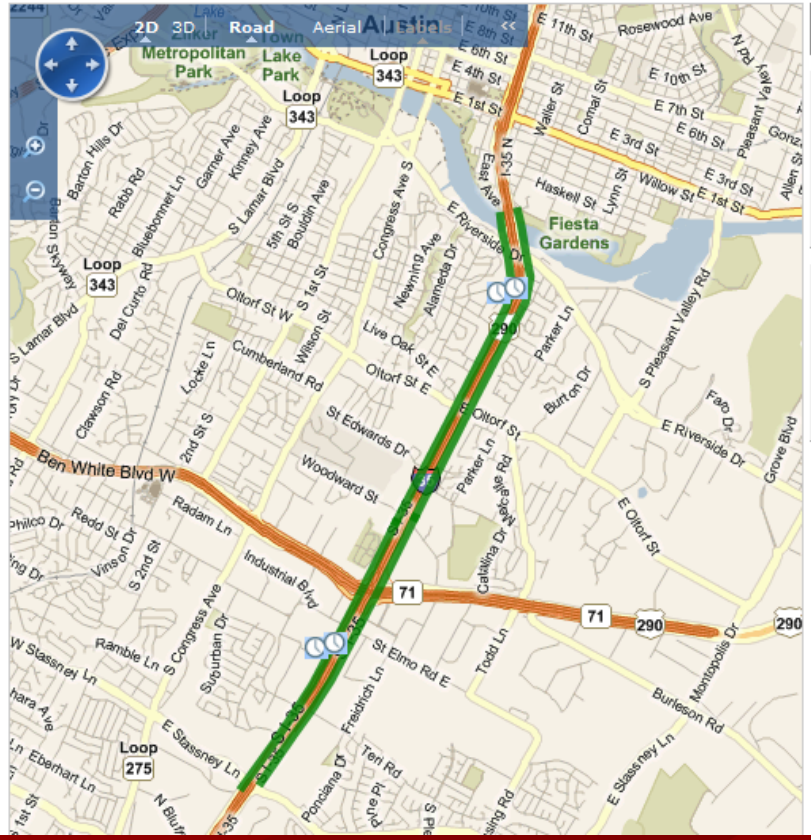


24 units installed in existing signal cabinets

Total coverage 36 directional miles

Austin, TX Deployments

TxDOT Austin Bluetooth Demonstration



Speeds (MPH) < 20 | 20-29 | 30-39 | 40-49 | 50+ | No Data

IH-35 Northbound				
Origin	Destination	Length (mi)	Travel Time	Speed (mph)
Stassney	Woodward St	2.11	1 minute 52 seconds	68
Woodward St	East Av	2.31	2 minutes 16 seconds	61

IH-35 Southbound				
Origin	Destination	Length (mi)	Travel Time	Speed (mph)
East Av	Woodward St	2.31	2 minutes 21 seconds	59
Woodward St	Stassney	2.11	1 minute 53 seconds	67

3 units installed in existing ITS traffic cabinets

Total coverage 8 directional miles on IH-35 Freeway.

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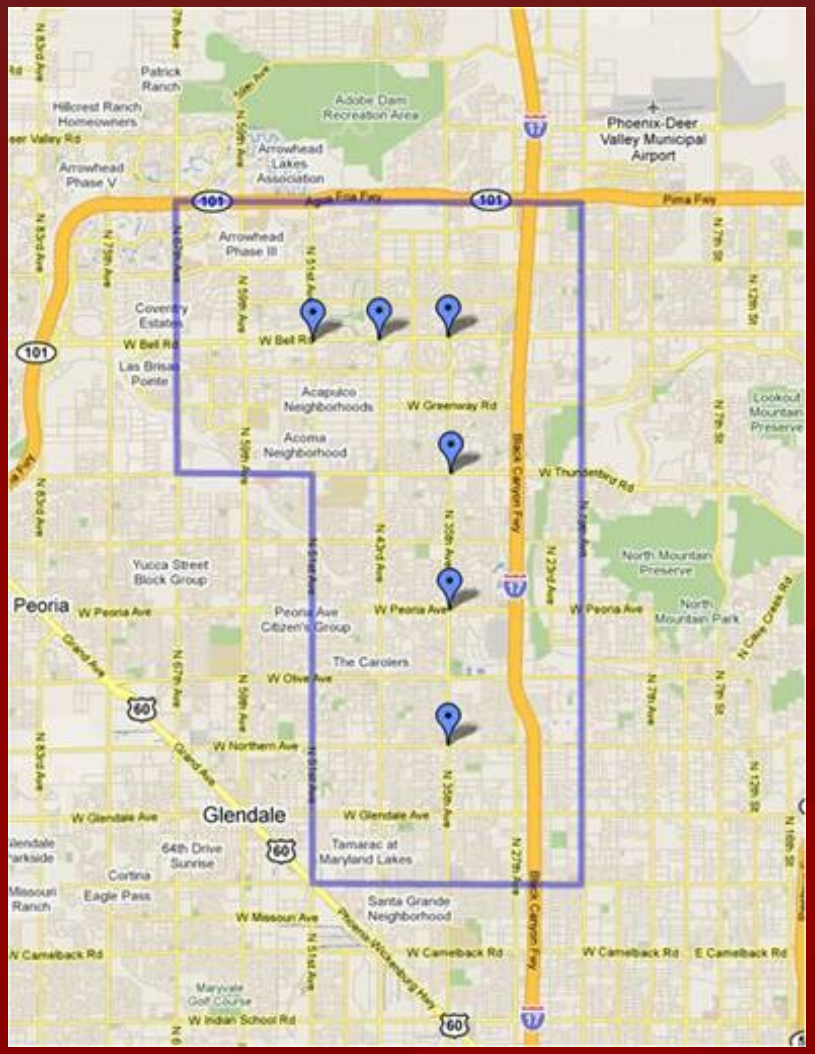
Phoenix, AZ Deployments



6 units installed in existing signal cabinets

Total coverage 16 directional miles

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Current Coverage Summary

Location	Number of Readers	Directional Mileage
City of Houston Arterials	20	48
Bryan-College Station, TX	24	36
TxDOT IH-45	4	76
TxDOT Austin IH-35	3	8
City of Phoenix Arterials	6	16
Total	**57**	**184**

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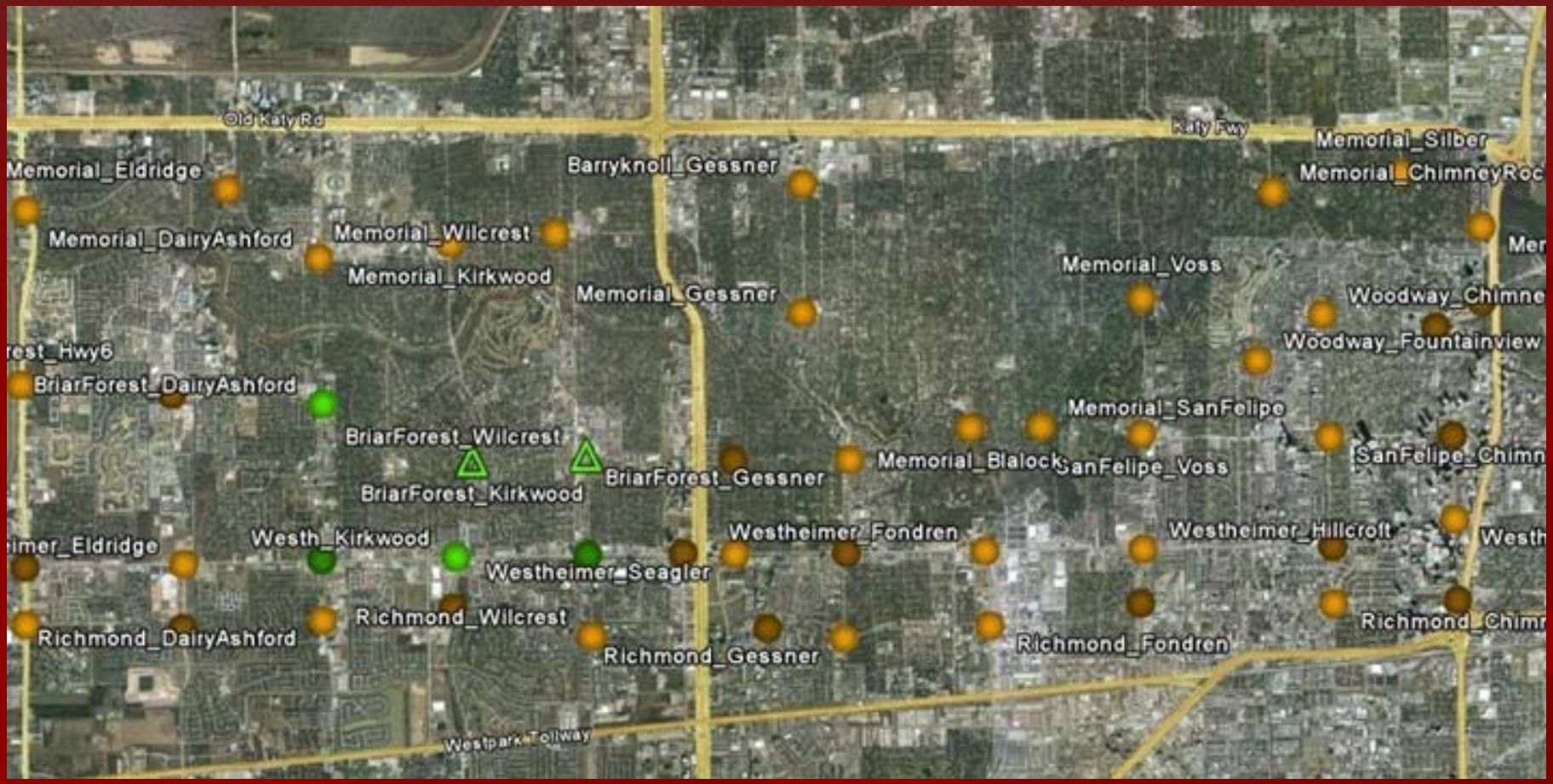
Next Step
City of Houston



50 locations, consistent with ATM deployments
170+ Directional Miles of coverage

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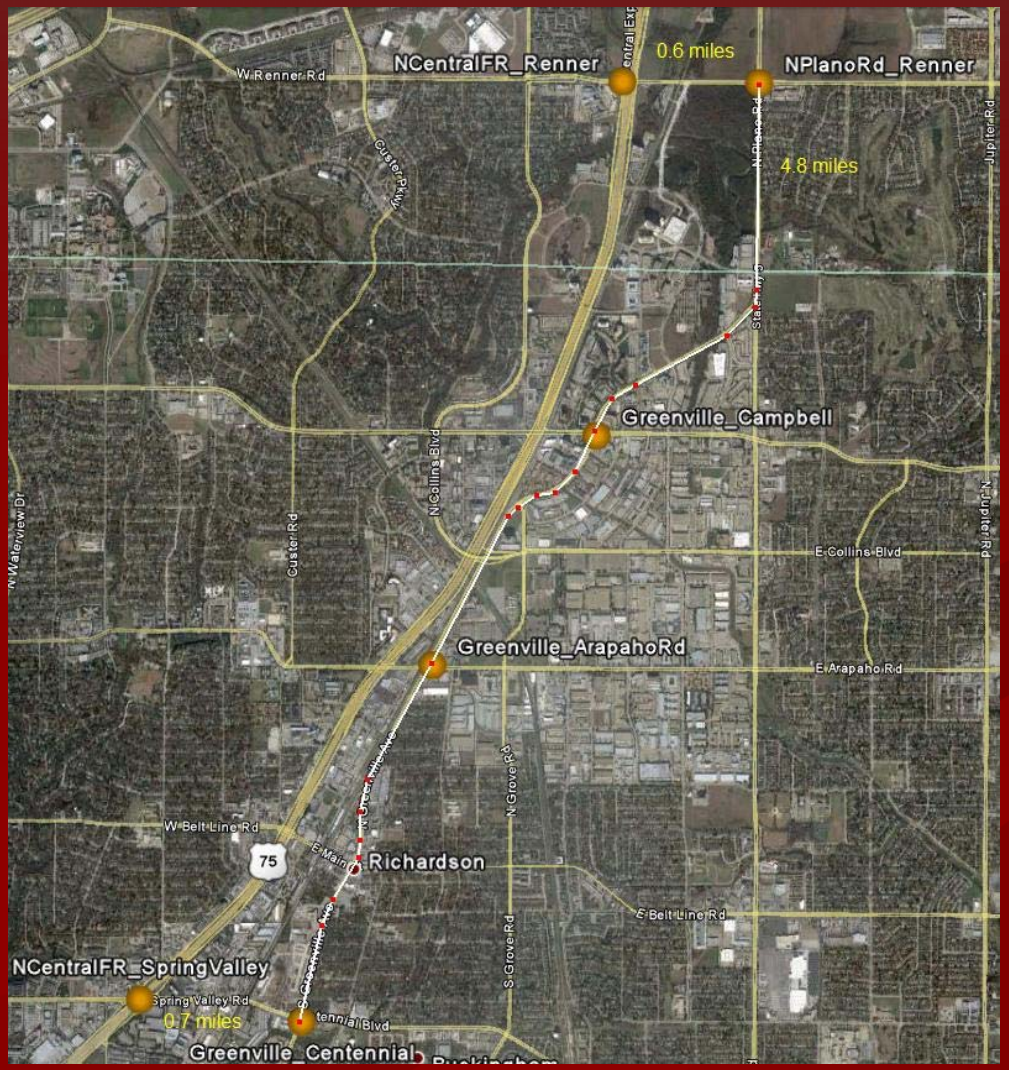
Next Step
Dallas, TX ICM Pilot



Originally proposed as RFID detection

6 Intersections with Bluetooth Readers
12+ Directional Miles

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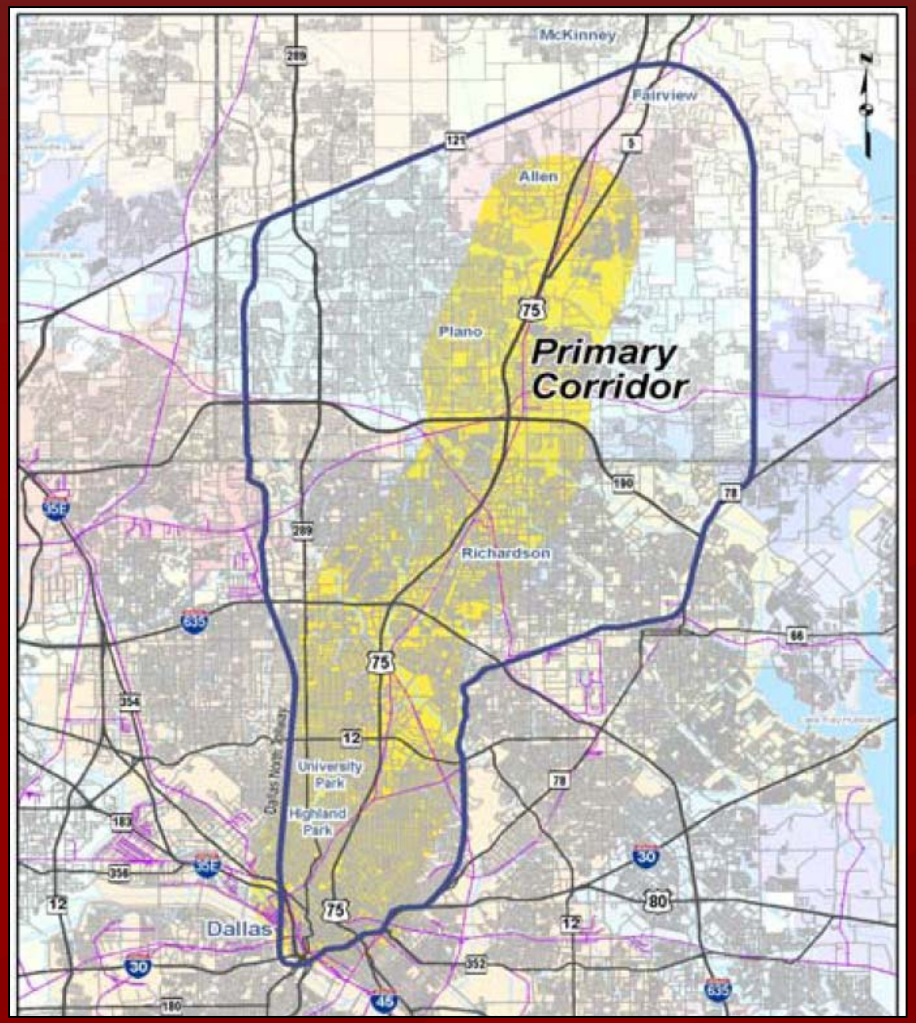
Ultimate Deployment
Dallas, TX ICM Demonstration



- US 75 Freeway with Continuous Frontage Roads
- HOV lanes on US 75 and IH-635
- Dallas North Tollway
- 167 Miles of Arterials
- DART Bus Network Including Express Service
- DART Light Rail
  - Red and Blue Lines

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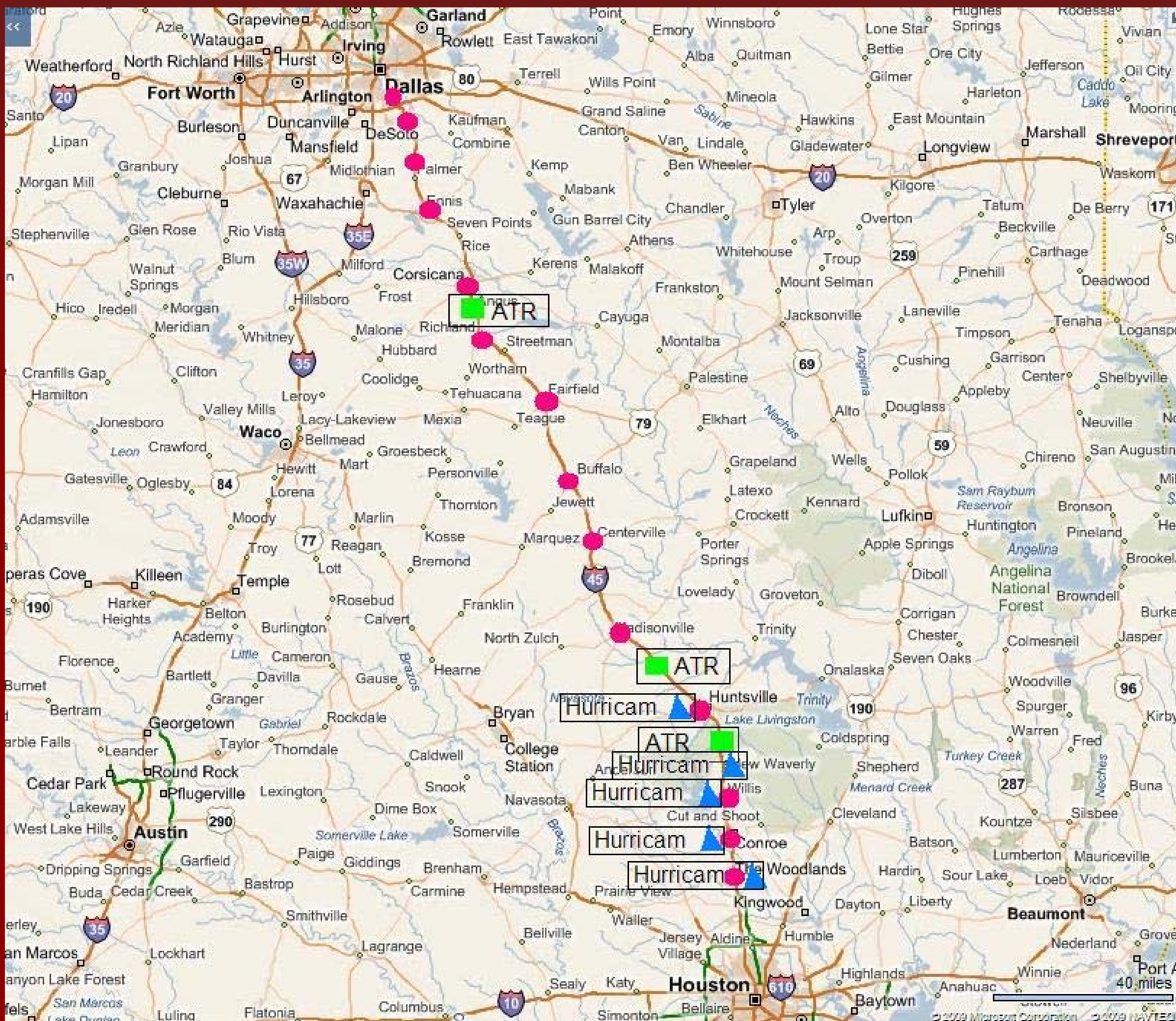
Next Step
TxDOT Evacuation Route



- Houston to Dallas
- 20+ locations
- Mix of power and equipment
- 400+ miles of Directional Coverage

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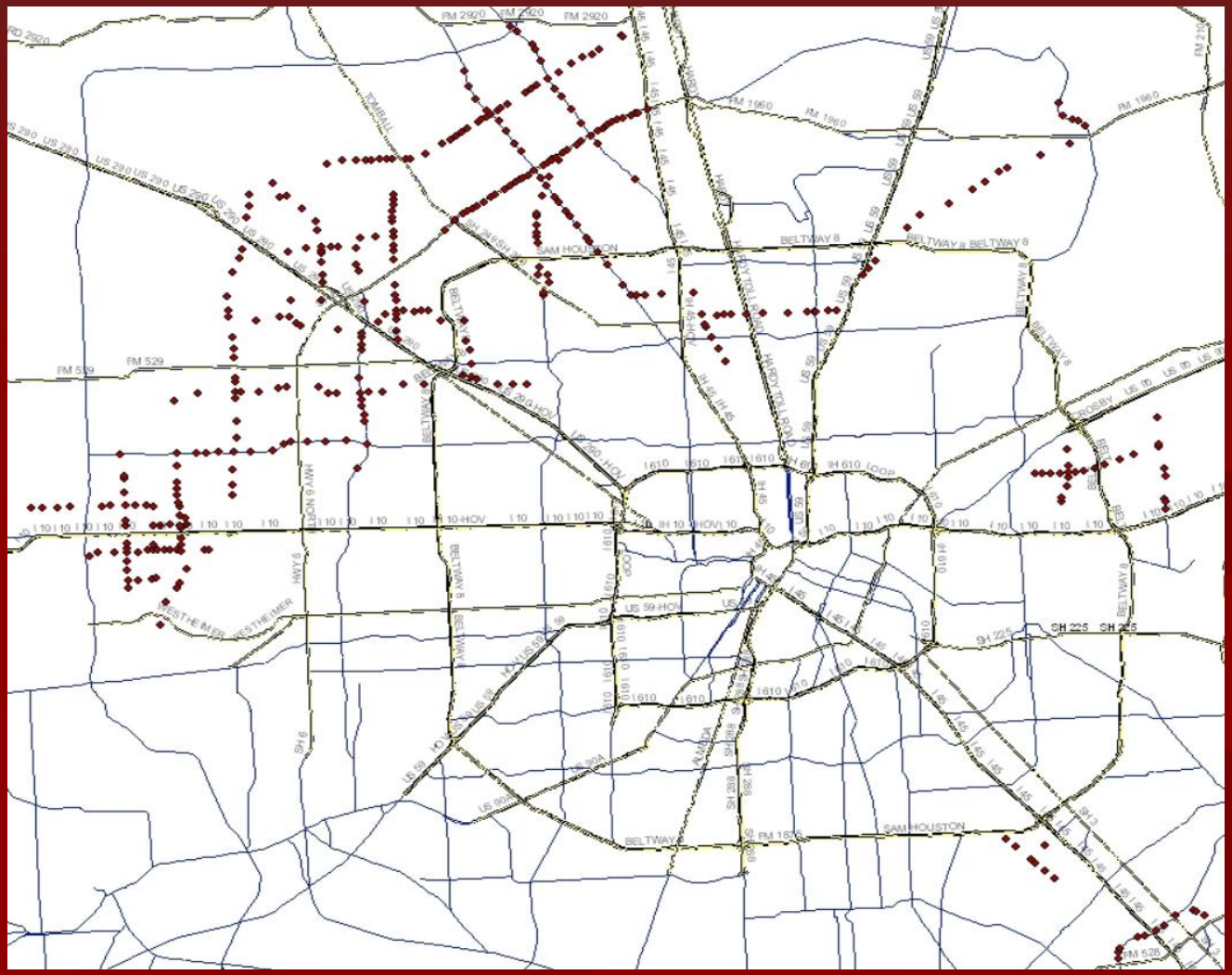
Next Step
Harris County



387 Intersections with Bluetooth Readers

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Lessons Learned

Consider the traffic volume

Roadway Segment	AADT	Average Daytime Hourly Matches
Westheimer EB – Kirkwood to Wilcrest (1 mile)	21,710	99
Kirkwood NB – Westheimer to Briar Forest (.7 miles)	10,825	24

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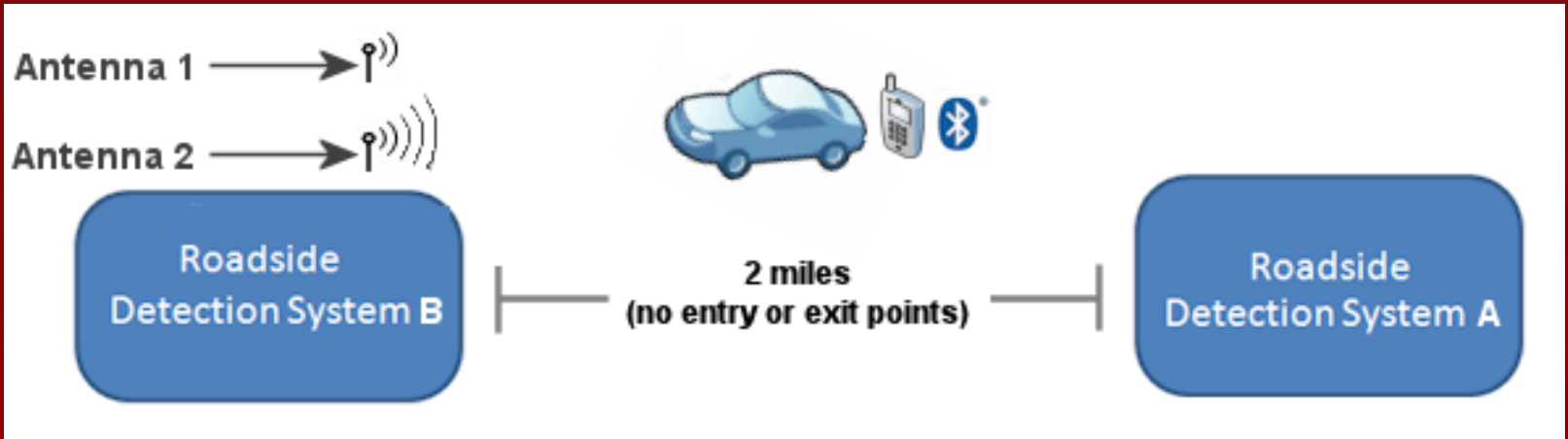
Lessons Learned

Choose the right antenna for reidentification



- Antenna 1 - 51% of MAC Addresses read at A & B
- Antenna 2 – 88% of MAC Addresses read at A & B

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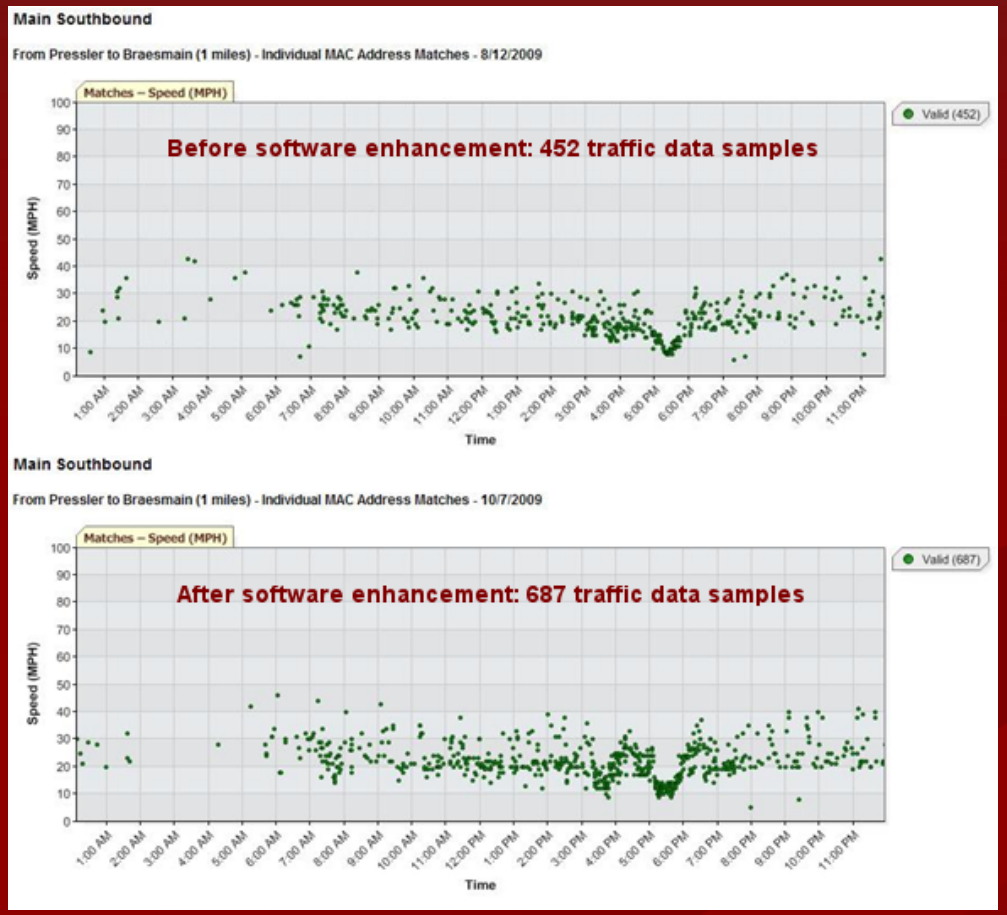
Lessons Learned

Choose the right field software



Improvement to field software inquiry process resulted in a 50% increase in daily traffic data samples.

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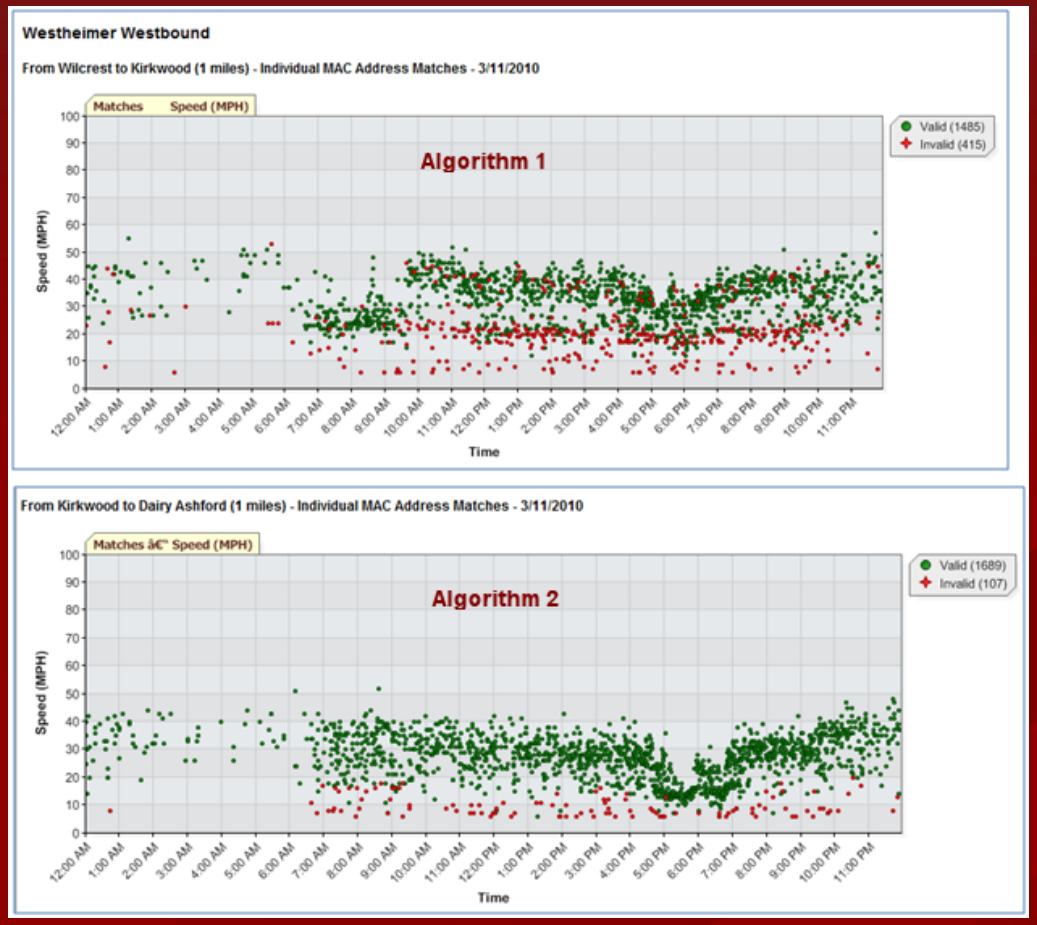
Lessons Learned

Choose the right travel time algorithm



- *One size fits all* approach may not work.
- Consider variance, volume, and roadway characteristics.

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Benefits

- Low cost, standards-based, non-proprietary equipment and protocols.
- Easy, non-intrusive field installation and maintenance.
- Large penetration of field devices and data samples.
- Real-time summary calculations.
- Complete ownership of data by operating agency.

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Questions ?

For more information:

http://ttihouston.tamu.edu/bluetooth

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