



x7 Series Overview

Presented by Yi-Min Ha, PE

What is Bluemac x7?

- Collects anonymous MAC addresses to create data
- Triple Sensor
 - Bluetooth Classic
 - Bluetooth Low Energy
 - Wi-Fi
- Privacy – salt hashing, no packet sniffing
- Emphasis on arterial performance measures



What Bluemac gets you

Travel Time



Origin-Destination

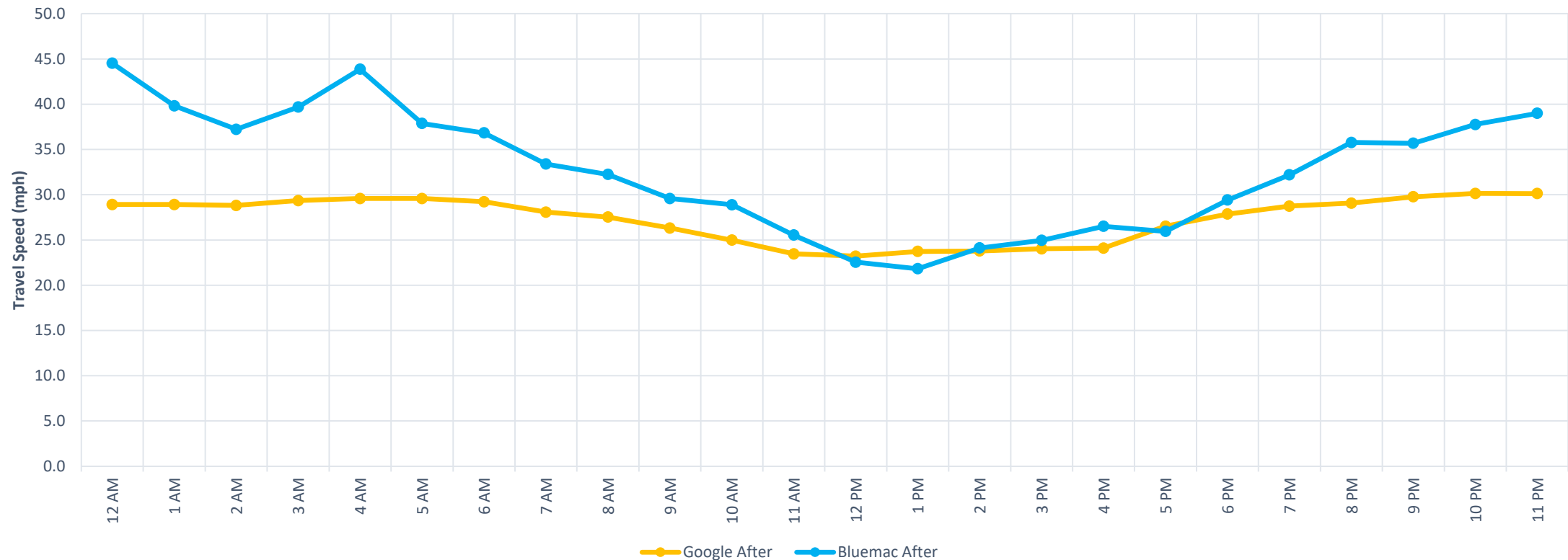


Different form factors to fit your need



Measured Data Matters

Bluemac vs Google Map API Median Speed Comparison

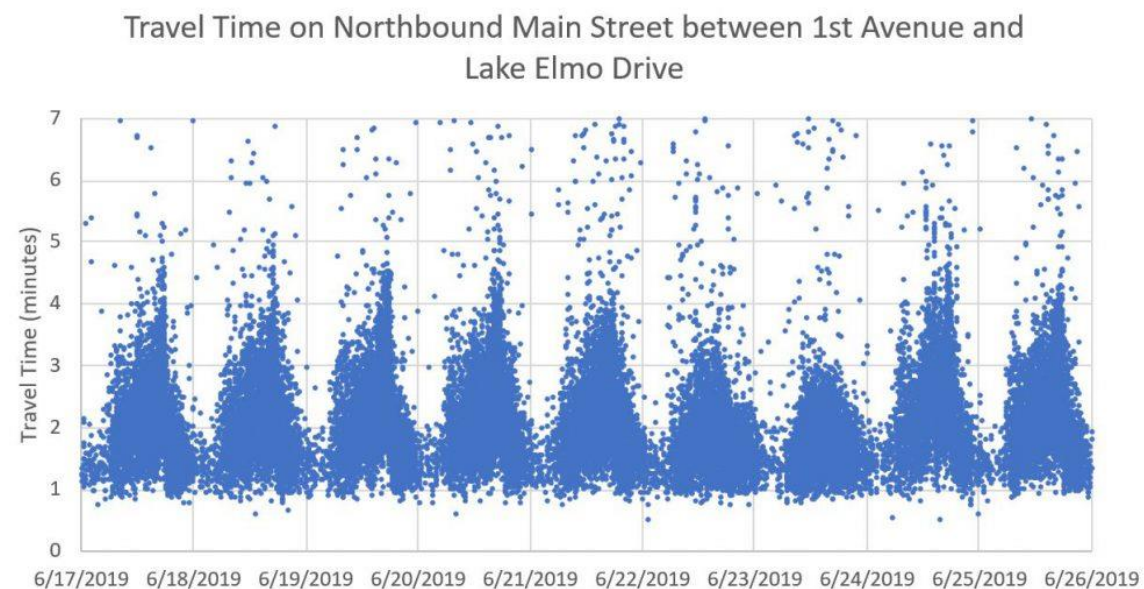
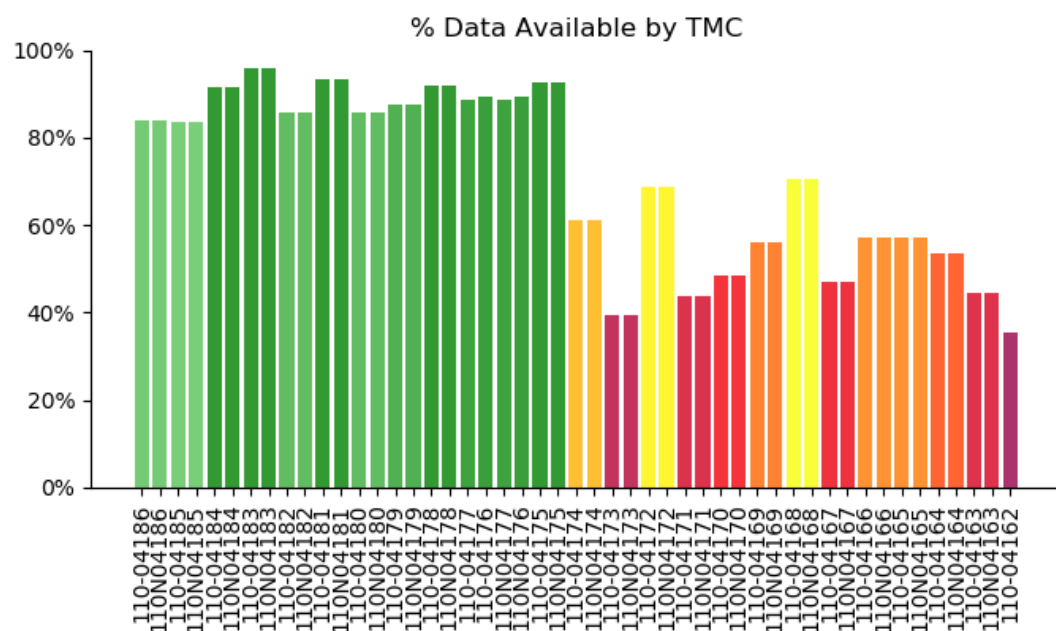


Based on data collected in Kalispell, MT along US 93 Southbound. Results may vary based on site.



Measured Data Matters

Bluemap and NPMRDS data availability



I-66 EB in Virginia is in an urban area with high volumes, where restrictions were in place that limit the passage of trucks on an HOV-only facility. The figure illustrates the availability of data over an entire day and shows that commercial vehicles represent a major source of probe data in the National Performance Management Research Data Set.



How Data is Captured

First Detection Recorded

Last Detection Recorded

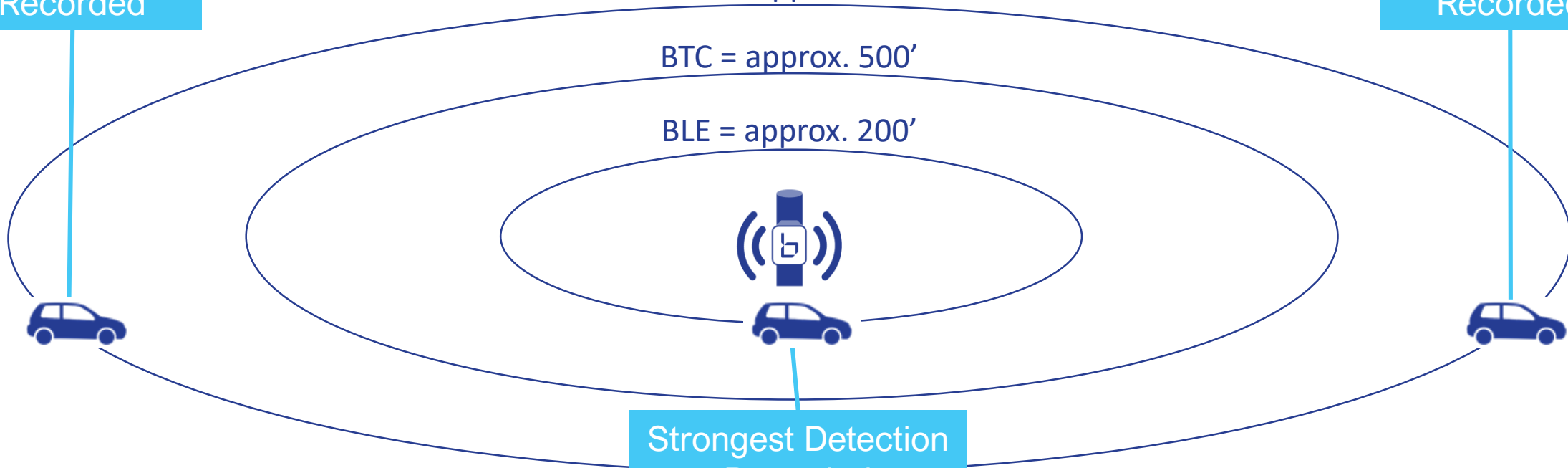
Wi-Fi = approx. 750'

BTC = approx. 500'

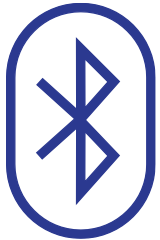
BLE = approx. 200'



Strongest Detection Recorded



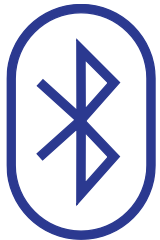
x7 Series captures more data



CLASSIC
MATCHES CAPTURED

439

(1.9%)
PER DAY



LOW ENERGY
MATCHES CAPTURED

6,619

(29.0%)
PER DAY



MATCHES CAPTURED

286

(1.3%)
PER DAY

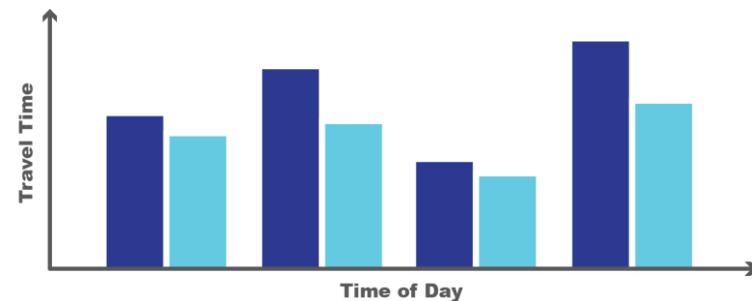
Based on data collected in Washington County, OR along NW Evergreen Road. Results may vary based on site.



Core Use Cases

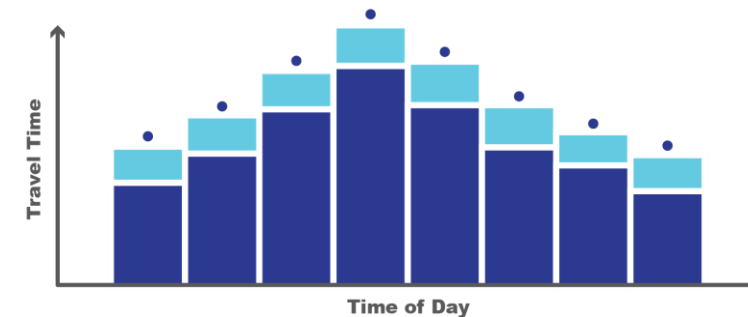
Before-After Evaluations

How have travel times changed on my route?



Travel Time Reliability Studies

How predictable are travel times on my route?



Origin-Destination Studies

How do cars circulate in and through my area?



Corridor Trip Length Studies

Is traffic on this road local or long-distance?



Advanced Applications

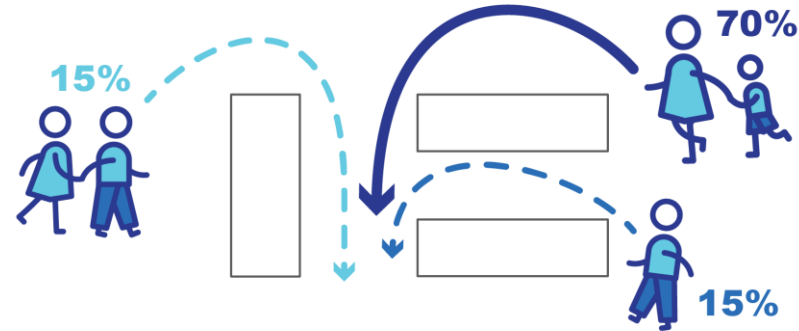
Pedestrian Dwell Times

Where are pedestrians waiting within my venue?



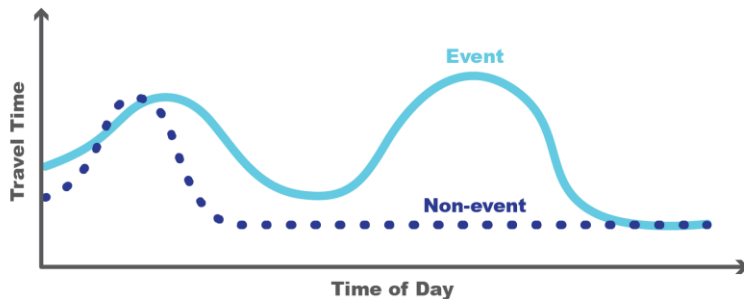
Pedestrian Flow Map

Where do pedestrians go within my campus?



Performance Monitoring

How is traffic changing over time?



ITS Triggers

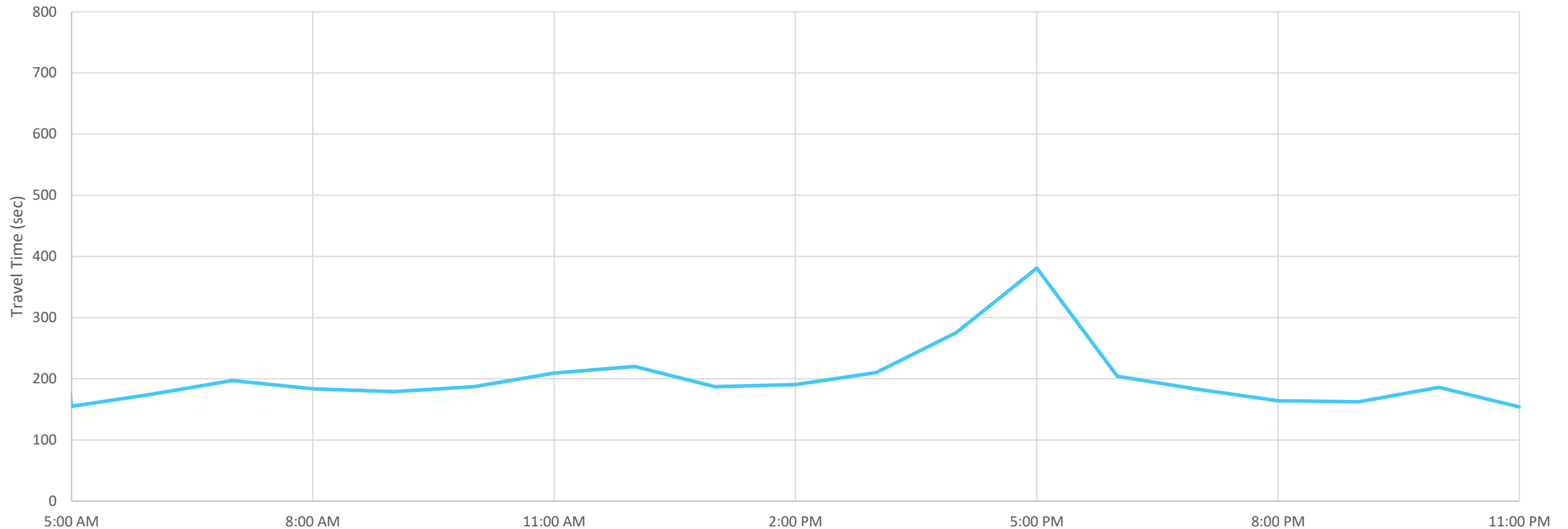
Integration with Dynamic Message Systems, Traffic Responsive Plans, Incident Alarms, etc.



What can Bluemac get you?

Travel Time Reliability

How consistent is travel along the corridor?

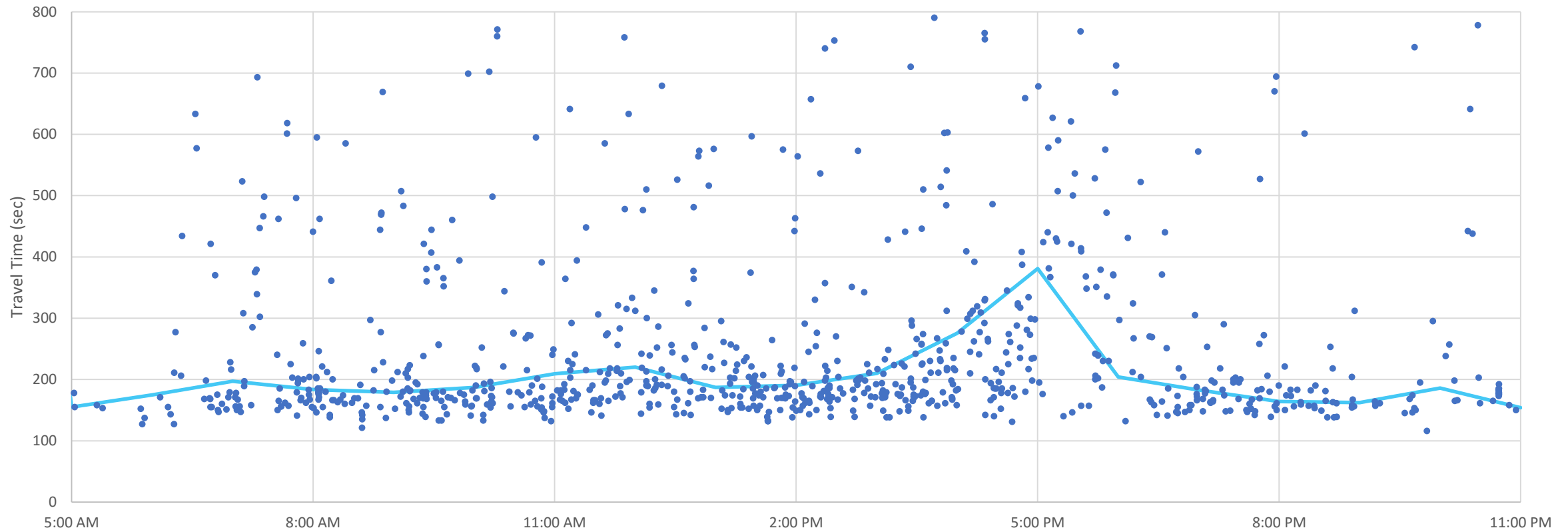


Based on data collected for EB approach at NE 25th Avenue & NE Cornell Road between September 1 – 8, 2018



Travel Time Reliability

How consistent is travel along the corridor?

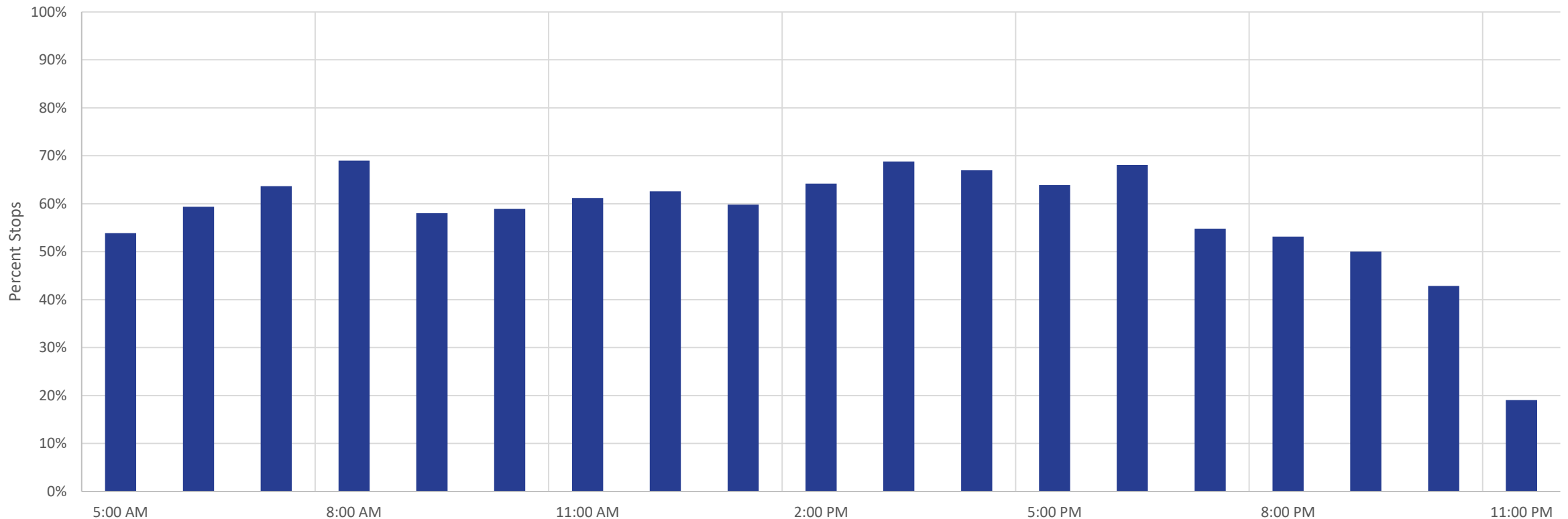


Based on data collected for EB approach at NE 25th Avenue & NE Cornell Road between September 1 – 8, 2018



Quality of Progression

How often does traffic stop on the corridor?

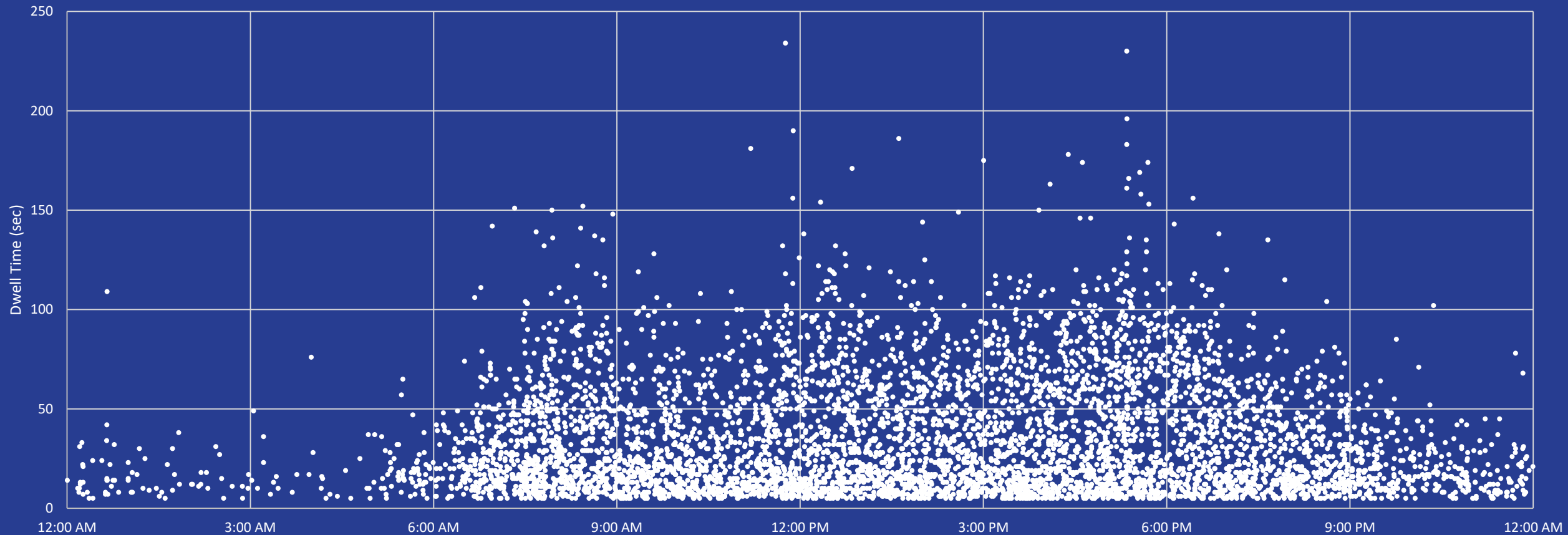


Based on data collected for EB approach at NE 25th Avenue & NE Cornell Road between September 1 – 8, 2018



Approach Dwell Time

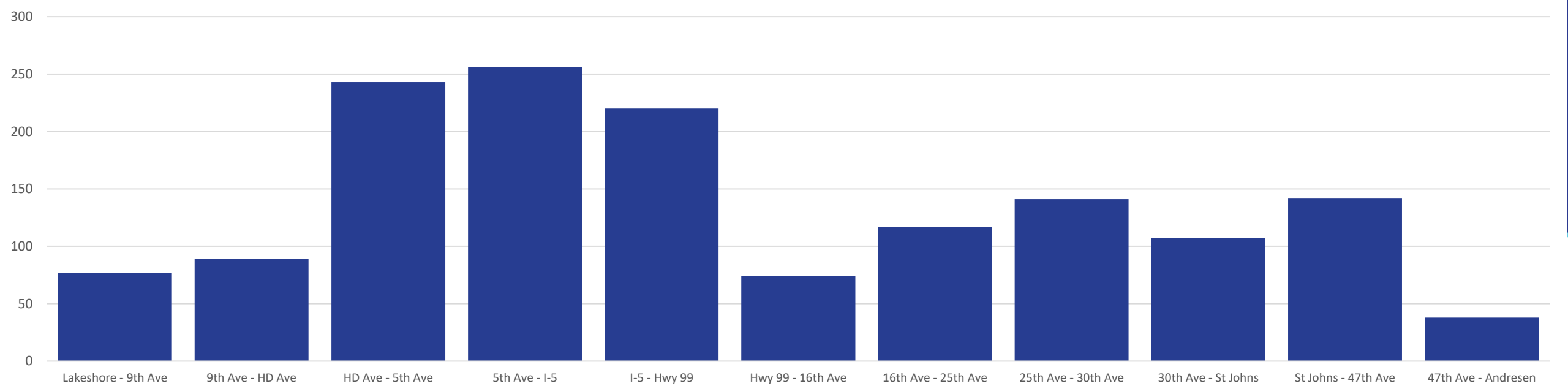
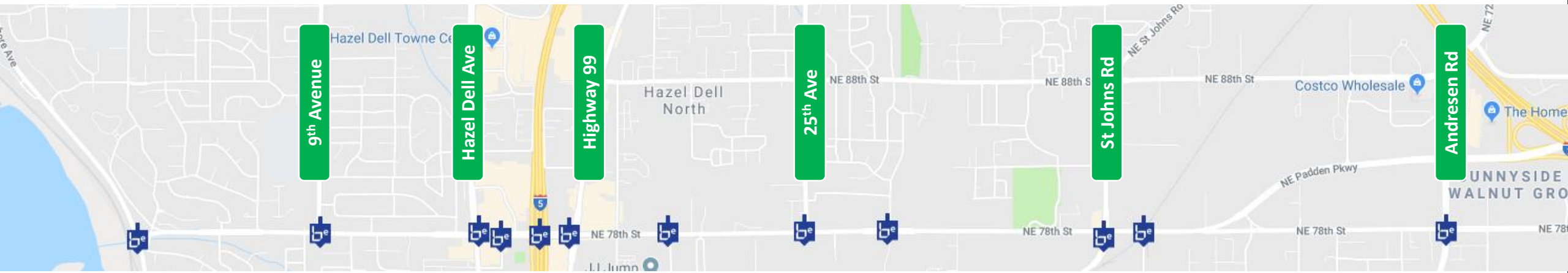
How long do drivers have to wait?



Based on data collected for EB approach at NE 25th Avenue & NE Cornell Road between September 1 – 8, 2018

Matches Detected

What are the travel patterns along my corridor?



Trip Length by Segment

Is my facility serving interregional travel?



Visualization courtesy of Florida Department of Transportation and Kittelson & Associates, Inc.



Identifying Trip Types

How are travelers using my facility?

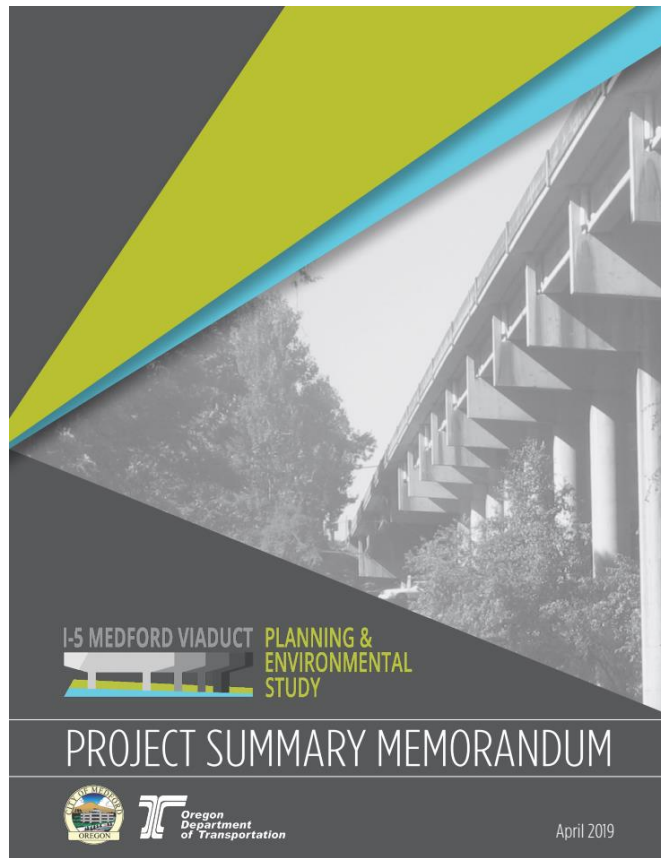
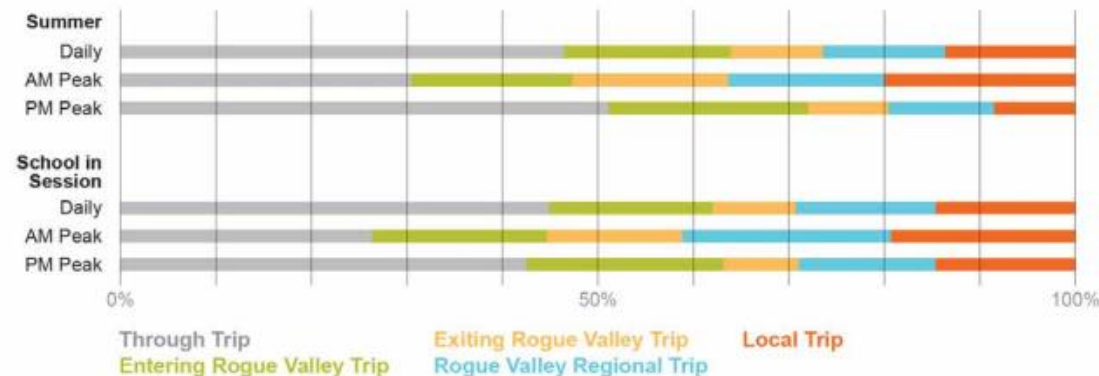
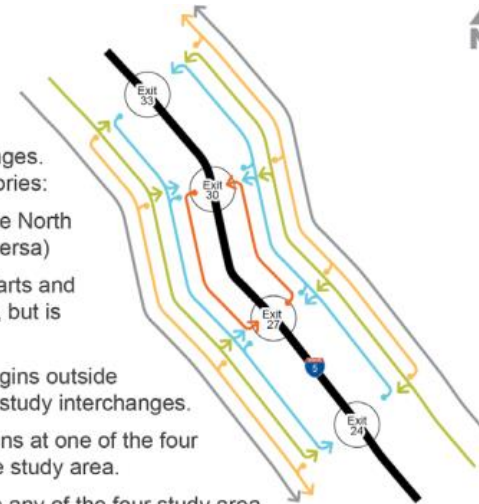


FIGURE 1
Trip Types Within Study Area

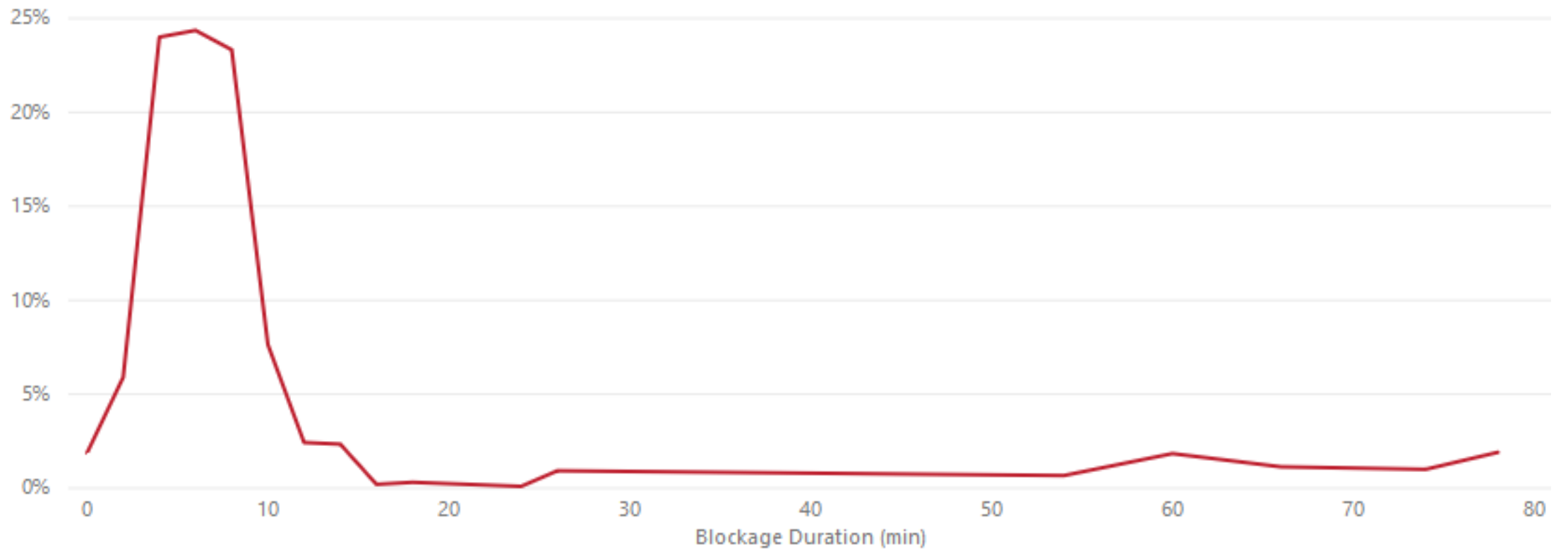
Interstate trips were examined as they interacted with Bluetooth™ readers located at and between the four study area interchanges. Trips were classified into the following categories:

- **Local Trip:** A trip that starts and ends at the North and South Medford interchanges (or vice versa)
- **Rogue Valley Regional Trip:** A trip that starts and ends at one of the four study interchanges, but is not a Local Trip.
- **Entering Rogue Valley Trip:** A trip that begins outside the study area and ends at one of the four study interchanges.
- **Exiting Rogue Valley Trip:** A trip that begins at one of the four study interchanges and ends outside of the study area.
- **Through Trip:** An I-5 trip that does not use any of the four study area interchanges.



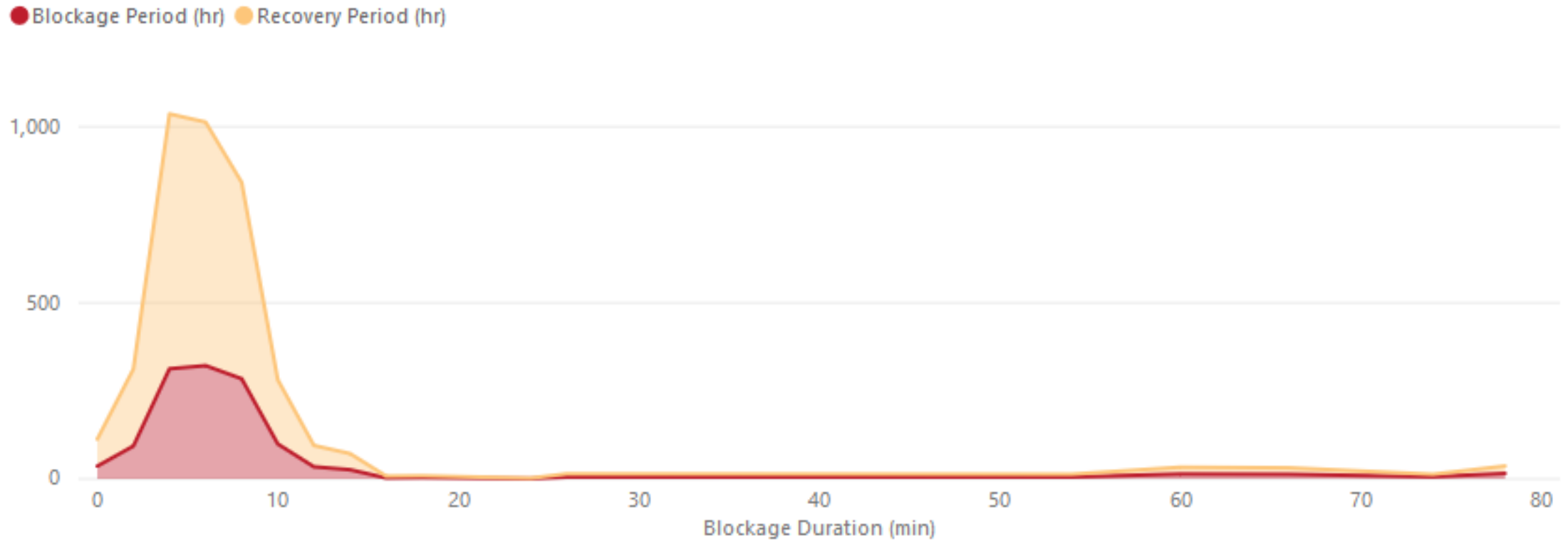
Railroad Crossing Blockage Duration

How long are vehicles blocked at a crossing?



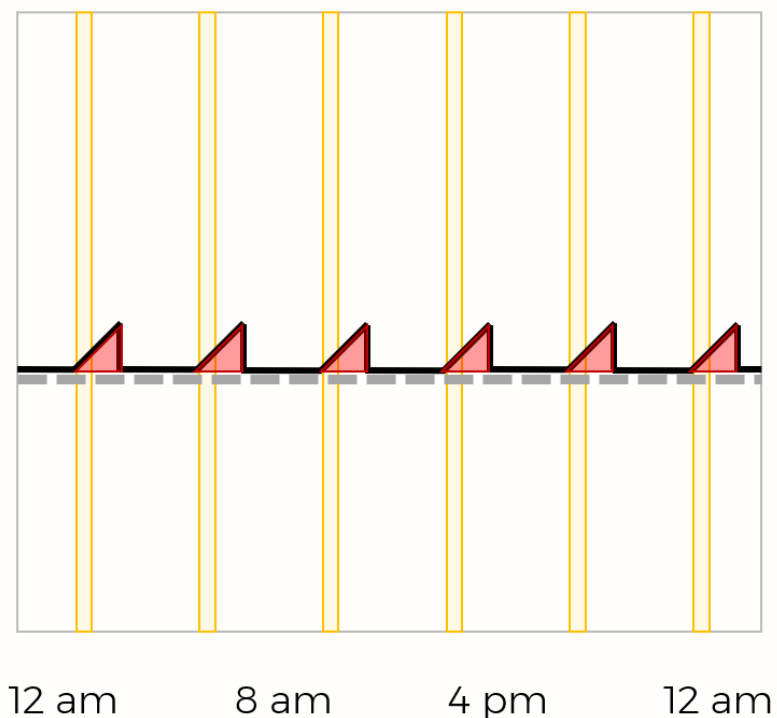
Railroad Crossing Recovery Period

What is the potential for traffic mitigations?

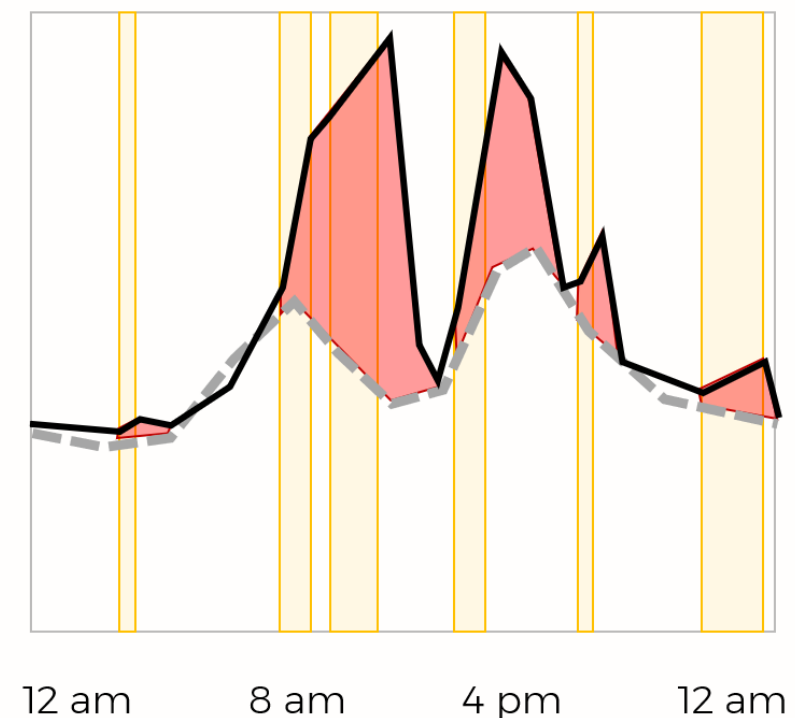


Measured Data Matters

Modeled



Measured



$$V_D = \left(\frac{1}{2}\right) \times \frac{qT_G^2}{(1 - q/d)}$$



- Expected travel time without a train
- Actual travel time with a train

- Train crossing blockage and duration
- Delay caused by train



Any questions? Reach out!

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