



# THEA CV PILOT

Walk. Ride. Drive. *Smarter.*





# CONNECTED VEHICLE PILOT DEPLOYMENT PROGRAM

PROGRAM GOALS

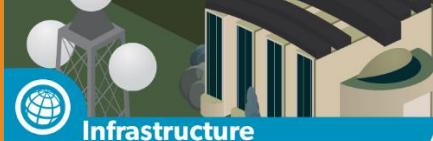
## Spur Early CV Tech Deployment



Wirelessly Connected Vehicles



Mobile Devices



Infrastructure

## Measure Deployment Benefits



Safety



Mobility



Environment

## Resolve Deployment Issues



Technical



Institutional



Financial

## PILOT SITES



ICF/Wyoming DOT

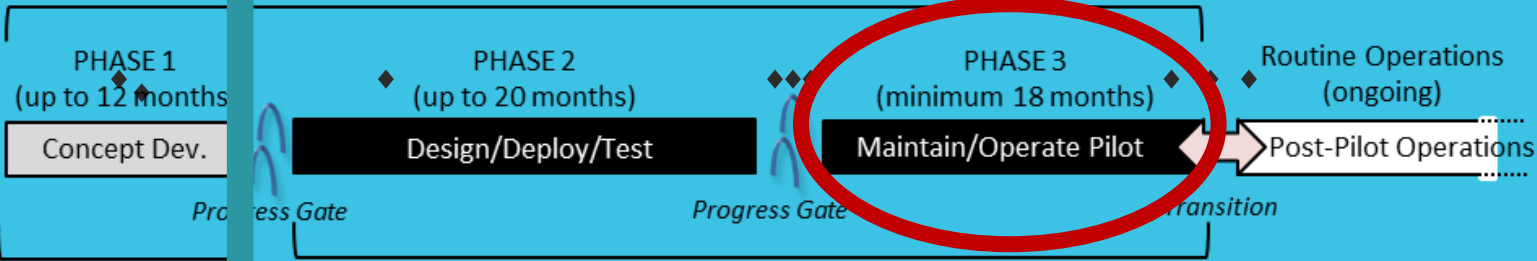


NYCDOT



Tampa (THEA)

## Connected Vehicle Pilot Deployment (up to 50 months)



PHASE 1  
(up to 12 months)

Concept Dev.

In Progress

PHASE 2  
(up to 20 months)

Design/Deploy/Test

Follow-On Cooperative Agreement

PHASE 3  
(minimum 18 months)

Maintain/Operate Pilot

Routine Operations  
(ongoing)

Post-Pilot Operations



# PARTICIPANTS AND INFRASTRUCTURE



PHOTO: THEA

**1,200**

**Privately Owned  
Vehicles**



PHOTO: THEA

**9**

**TECO Line  
Streetcar Trolleys**



PHOTO: THEA

**10**

**Hillsborough Area  
Regional Transit  
(HART) buses**



PHOTO: SIEMENS

**44**

**Roadside Units**



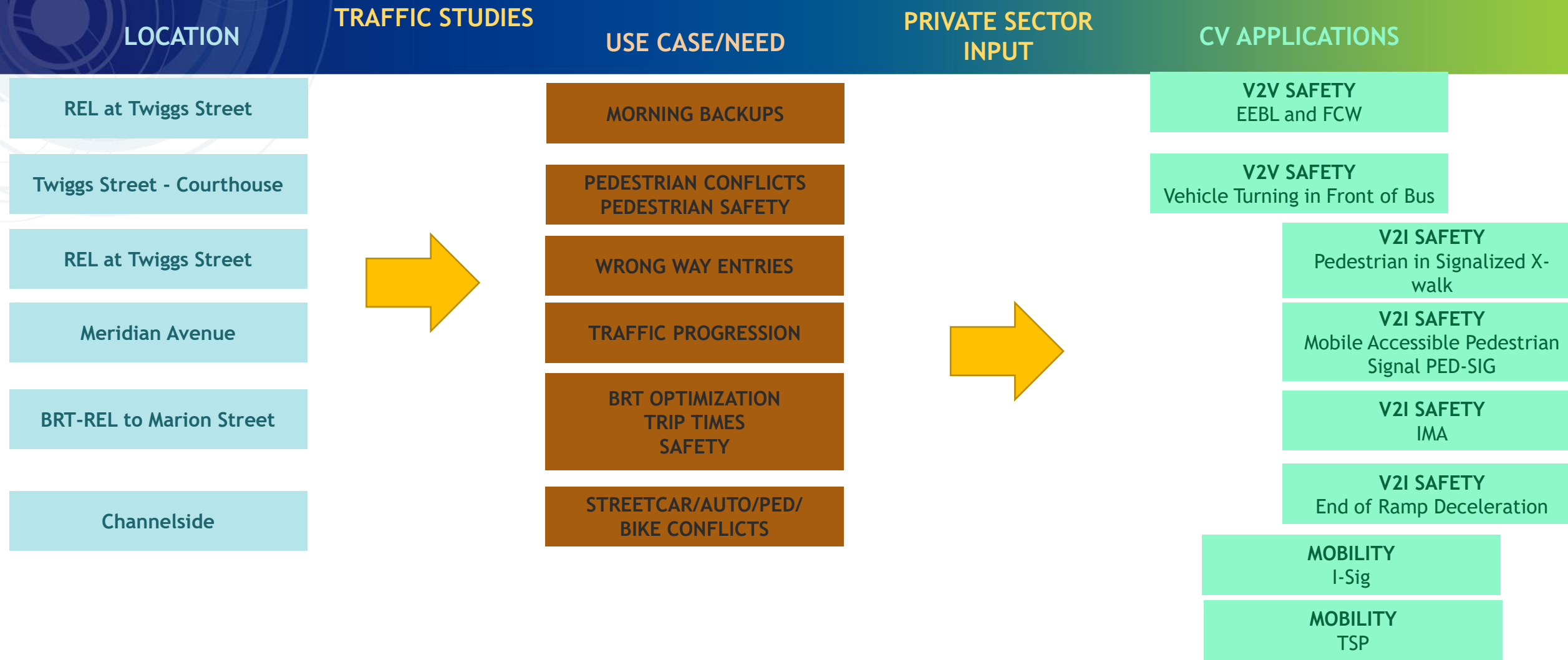
# DRIVER EXPERIENCE



Mirror display uses sticker to depict location and concept of warning.  
Actual image is still in development

Source: Brand Motion and Global 5

# SOLVING REAL PROBLEMS - PILOT DEPLOYMENT ISSUES AND APPLICATIONS RELATIONSHIPS



# FOCUSED DEPLOYMENT AREA





# TRACK RECORD SOLVING CHALLENGES

## Challenges

## Solutions



Lightning strikes disabled numerous RSUs

RSU required a direct ground, and there were no further issues.



CAMP developed several V2V and V2I Apps but was not cooperative and vendors oversold app readiness

THEA team shifted to develop necessary apps - with no additional cost or schedule impacts.



Lack of CV penetration

To compensate for the Pilot penetration rate, THEA used traditional ITS devices such as Radar and Cameras to simulate the additional vehicles such as vehicles in a queue.



THEA encountered interference twice during the CV Pilot: On one of the DSRC channels, and from a HAM Radio operator broadcasting on THEA channels

THEA team purchased 3M Sniffer to monitor DSRC channels for interference - this is an ongoing effort.



Cell phone GPS inaccuracies to identify pedestrians crossing the street

The THEA team switched gears from cell phone GPS to a lidar solution for pedestrian crossing to generate PSMs to the RSU. When lidar proved challenging, the team changed to camera based solution -under development.



ERDW worked inconsistently

Alternate solution implemented in software to detect last CV equipped vehicle to establish end of queue.

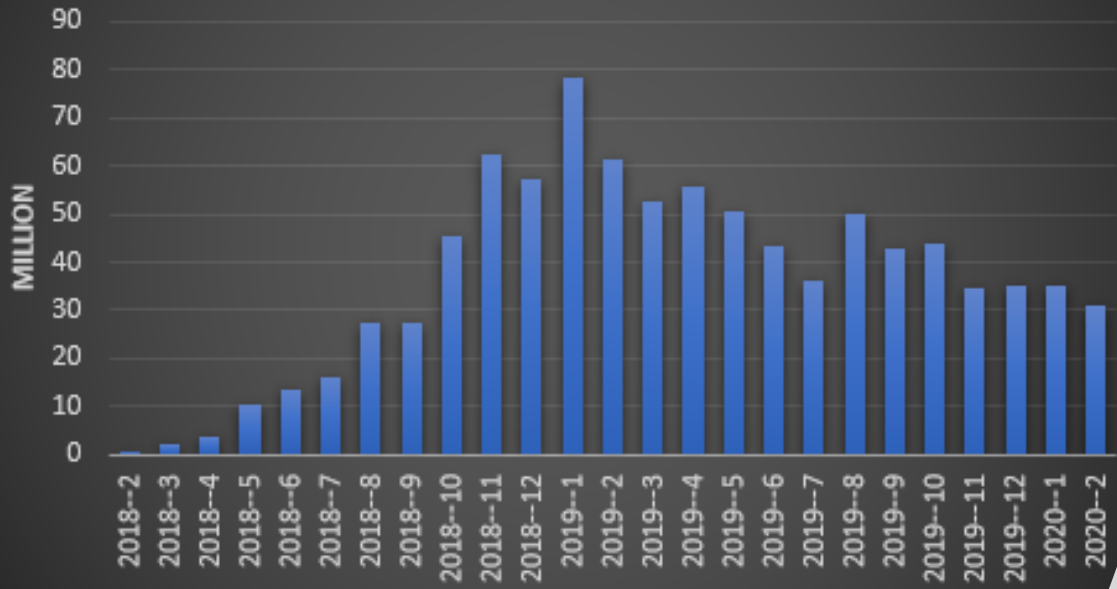


WWE worked inconsistently

Equipment was updated and moved to better location to detect vehicles.

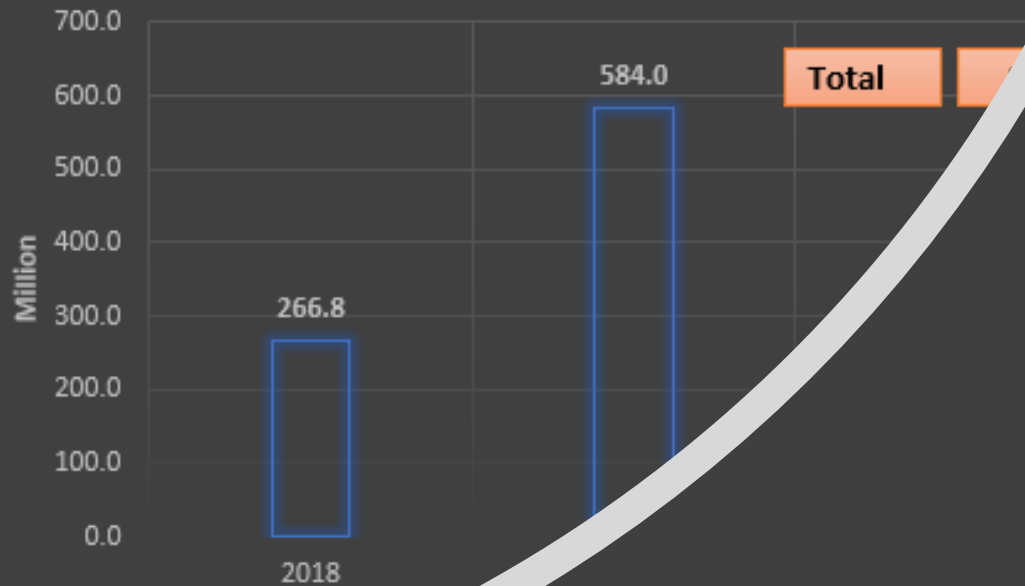


### BSMs per Month



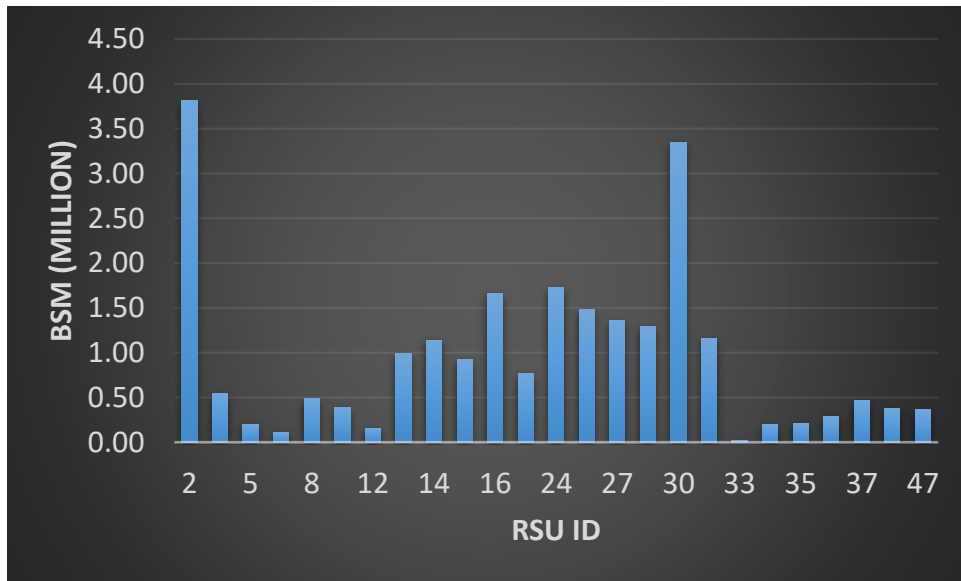
# Performance Measurement

### BSMs



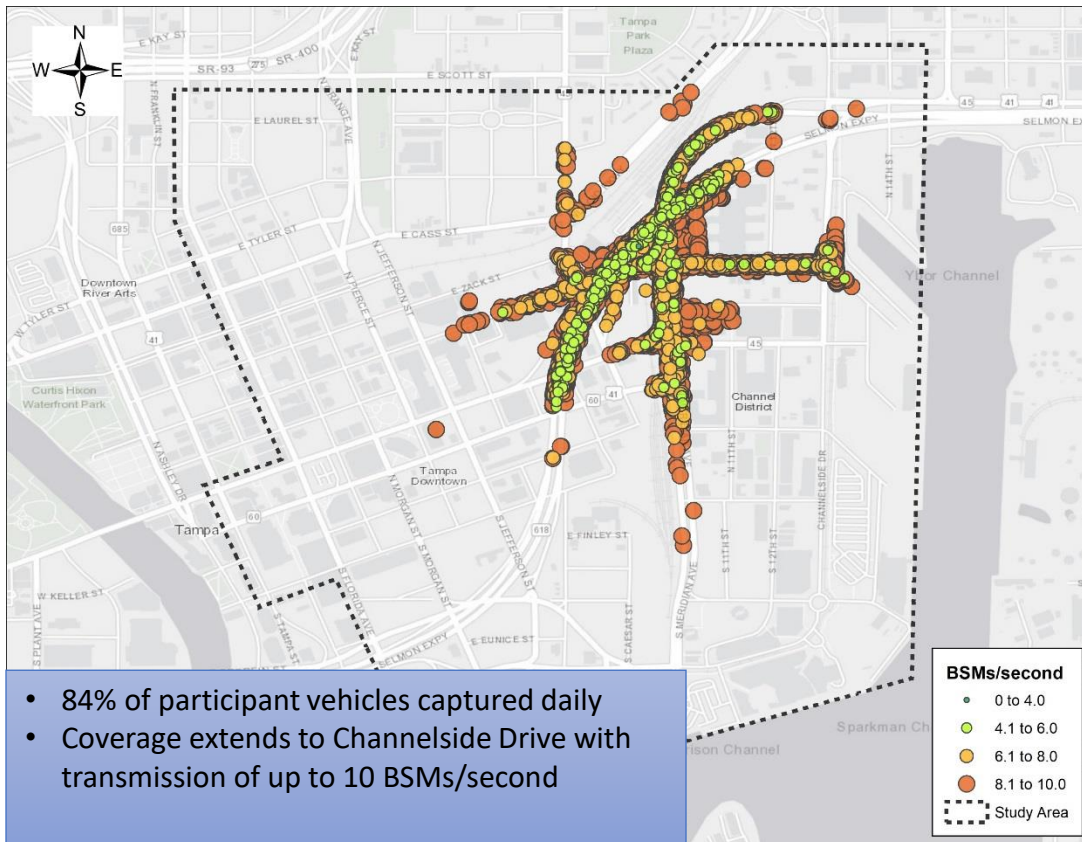


# Are the applications in operation? YES, We Have Connectivity...

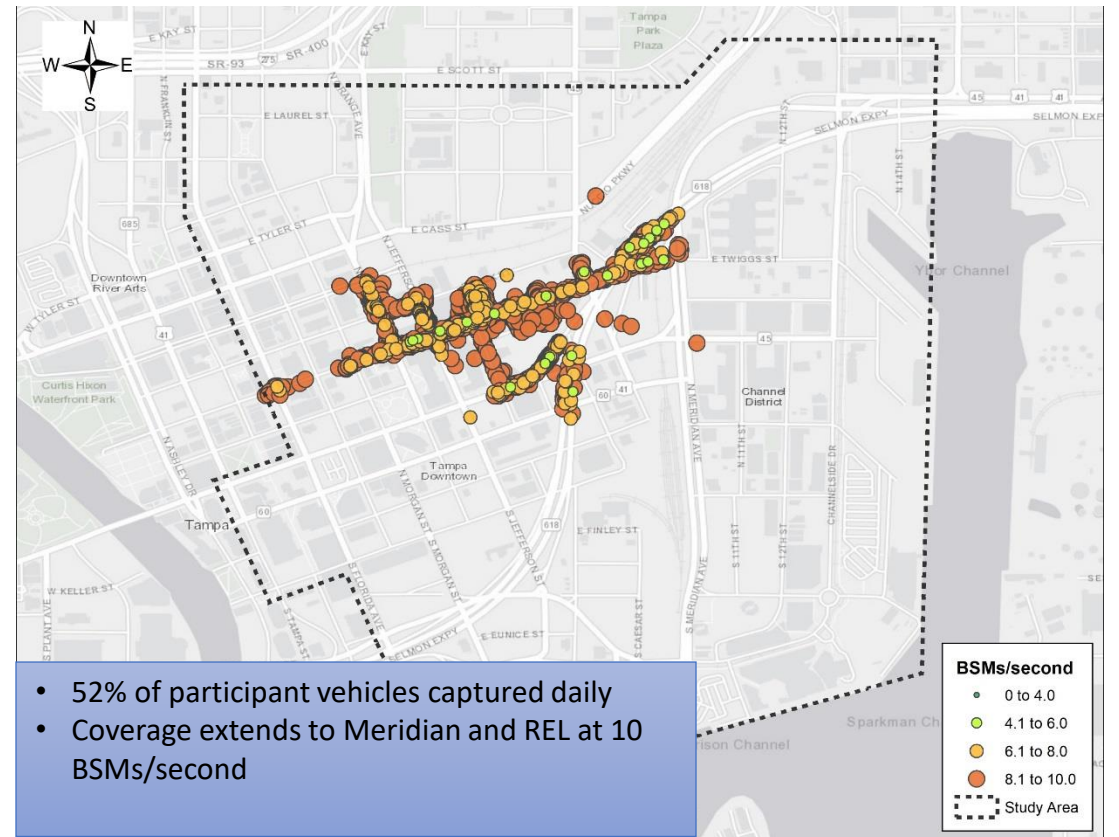


# Preliminary Analysis

## RSU 2 – Twiggs and Meridian



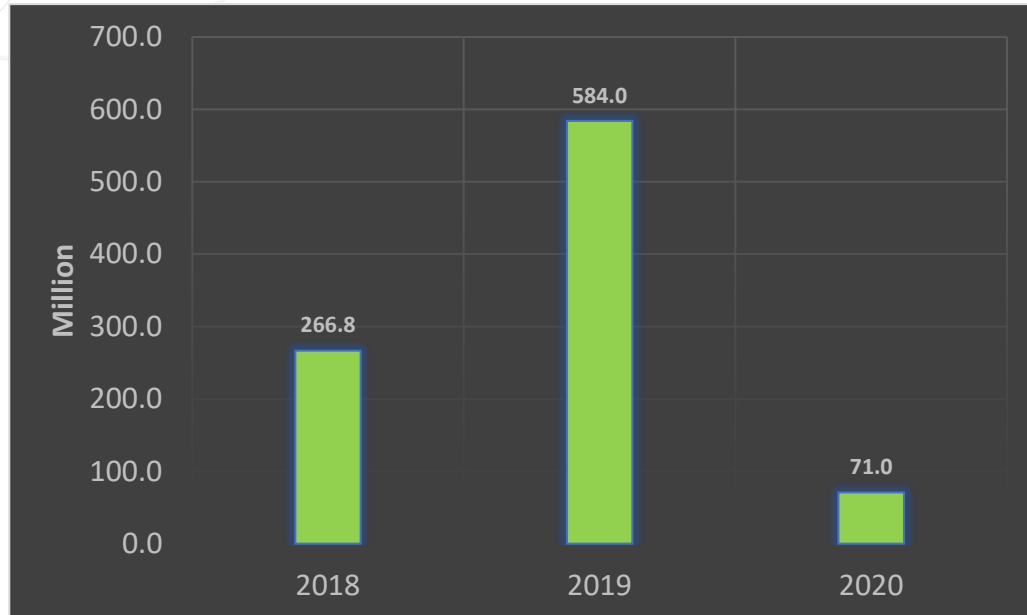
## RSU 3 – Twiggs and Courthouse



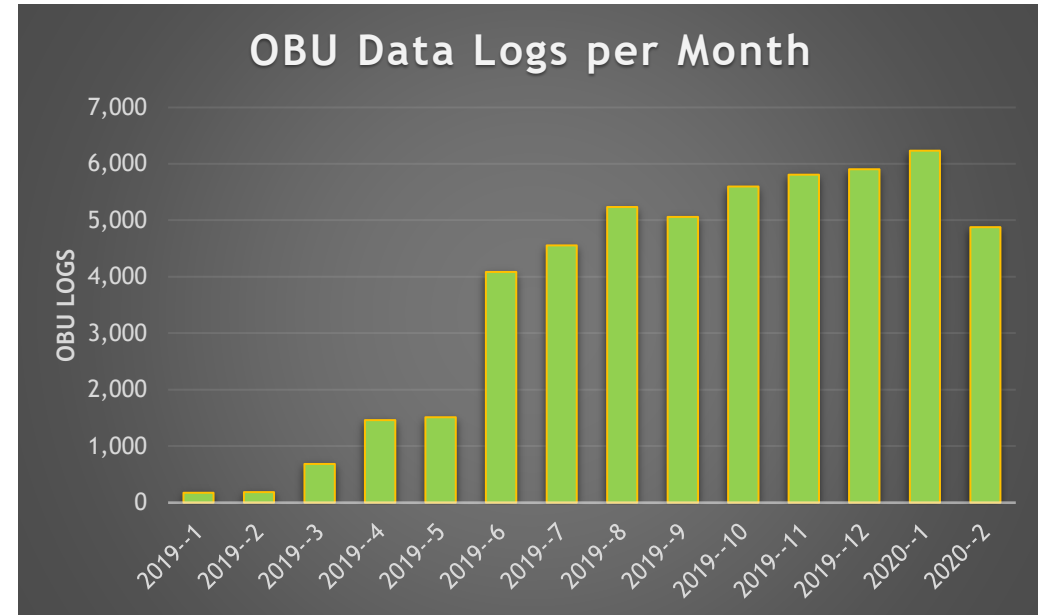
# DATA PROCESSING



Unique BSMs : 922 Million



Unique OBU Data Logs: 51,362



# DATA UPLOADS

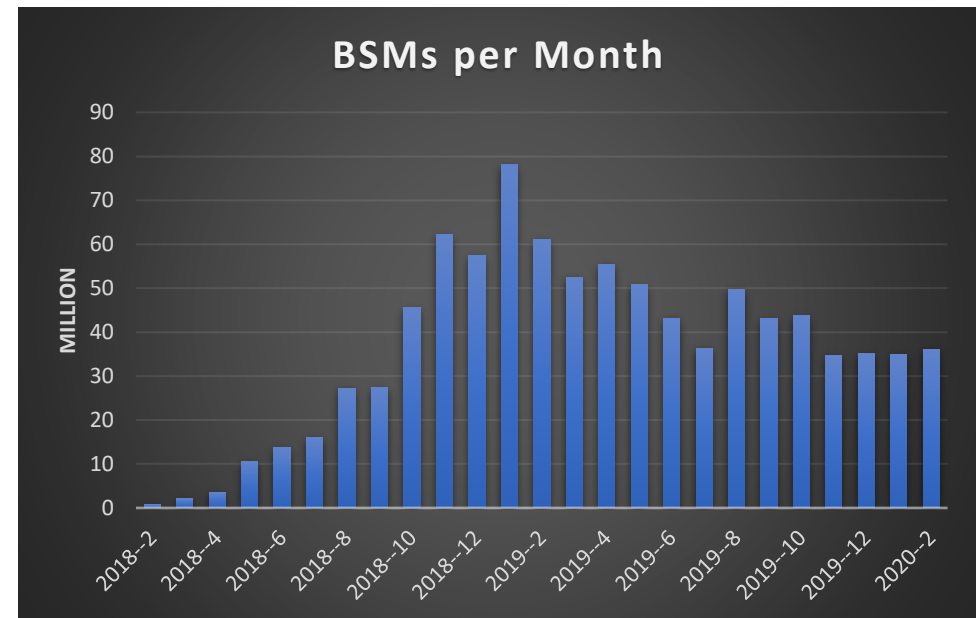


## SDC – Since Jan 2018

- BSM
- SPaT
- TIM
- MAP
- SRM
- SSM
- OBU Data Logs
- Transit GTFS
- Weather
- Bluetooth
- Special Events

## ITS Data Hub– Since July 2018

- BSM
- SPAT
- MAP





# USDOT PERFORMANCE DASHBOARD



PERFORMANCE  
MEASUREMENT  
DASHBOARD

## Log in

Please enter your credentials to proceed.

USER NAME

PASSWORD

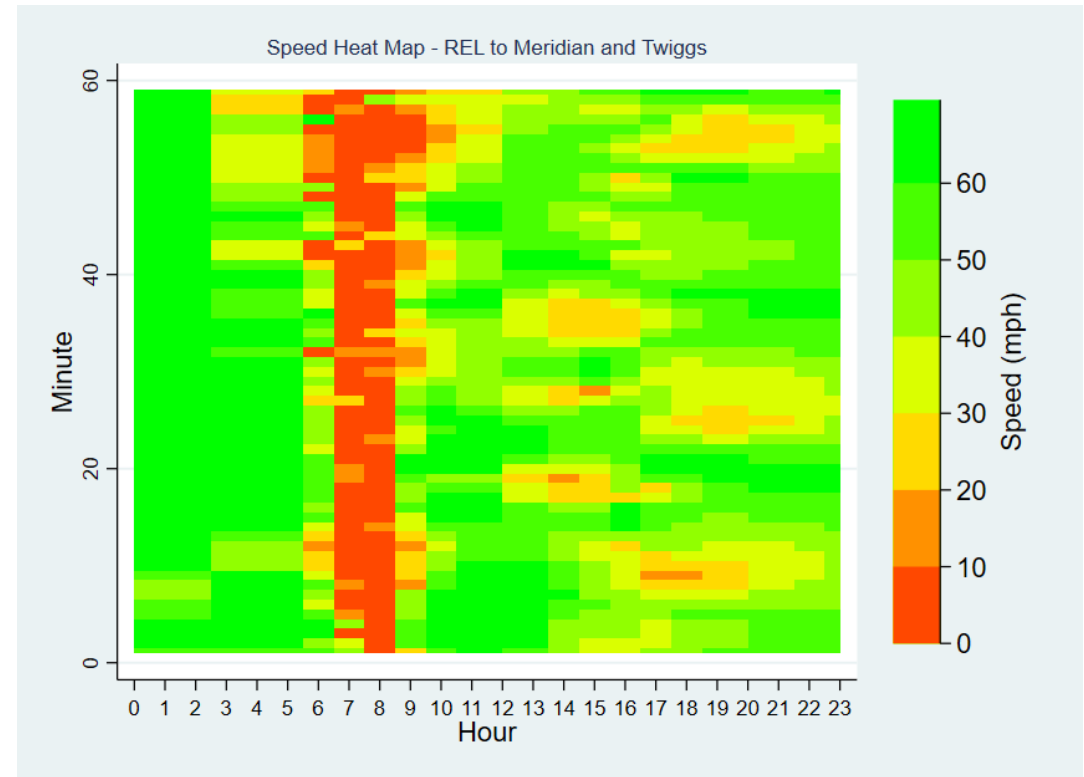
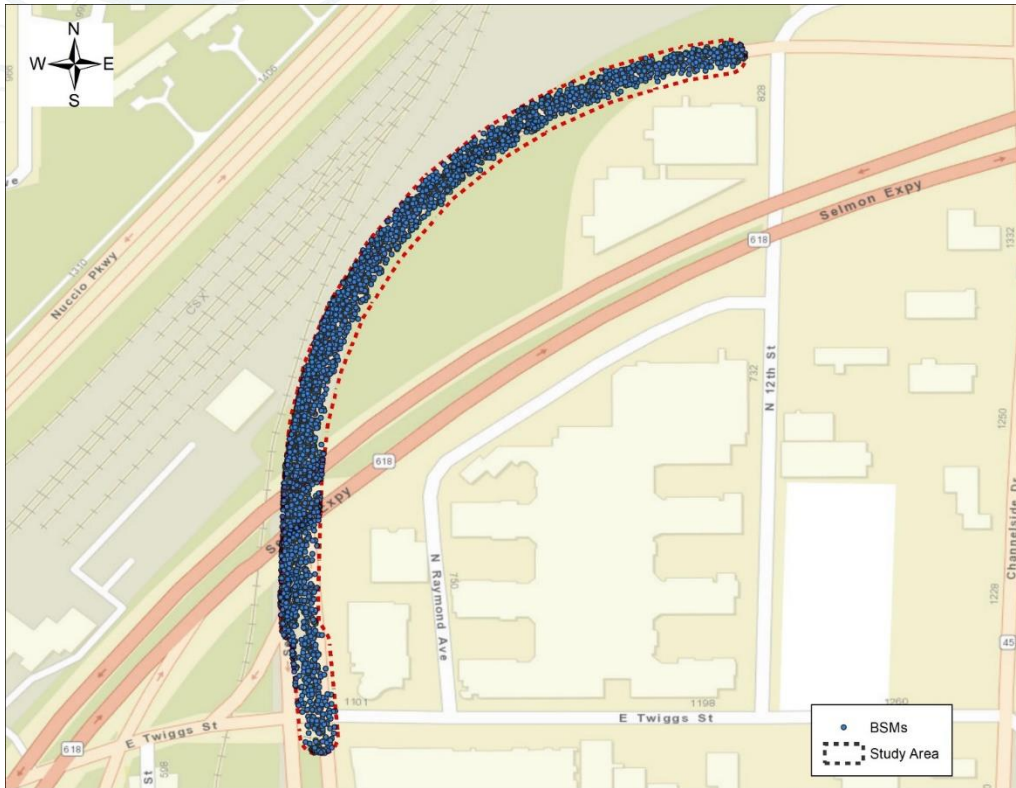
Log in

[Forgot your password? Click here](#)

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# USE CASE 1 – MOBILITY EVALUATION

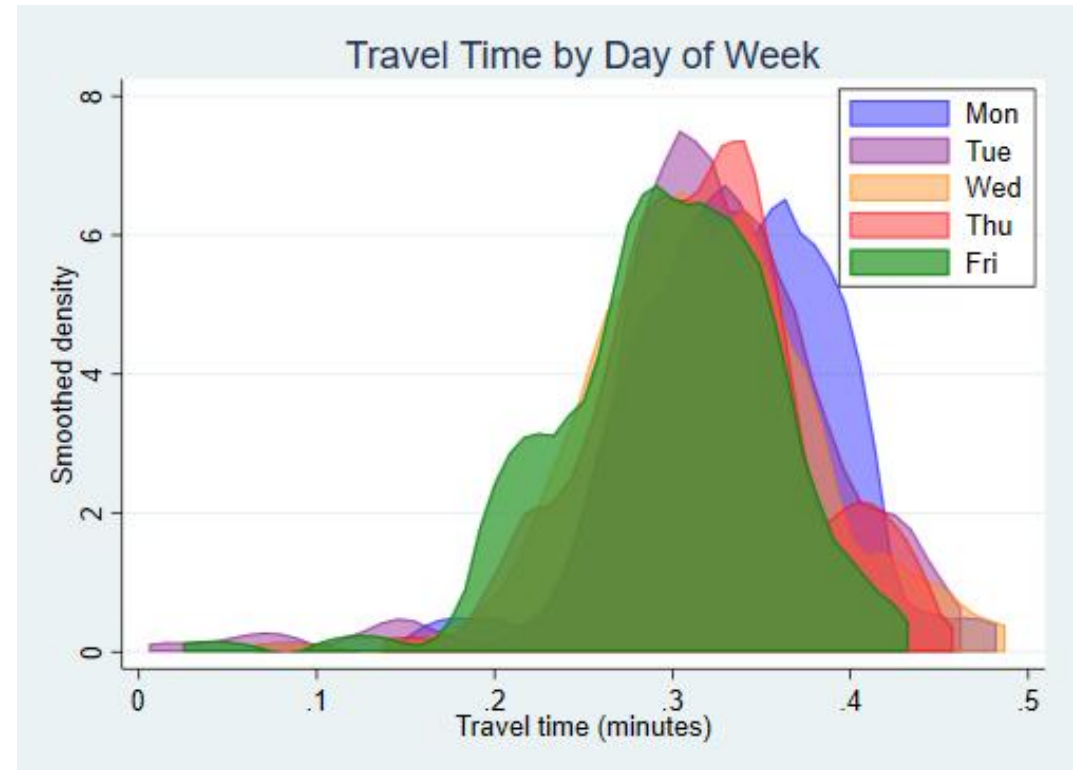
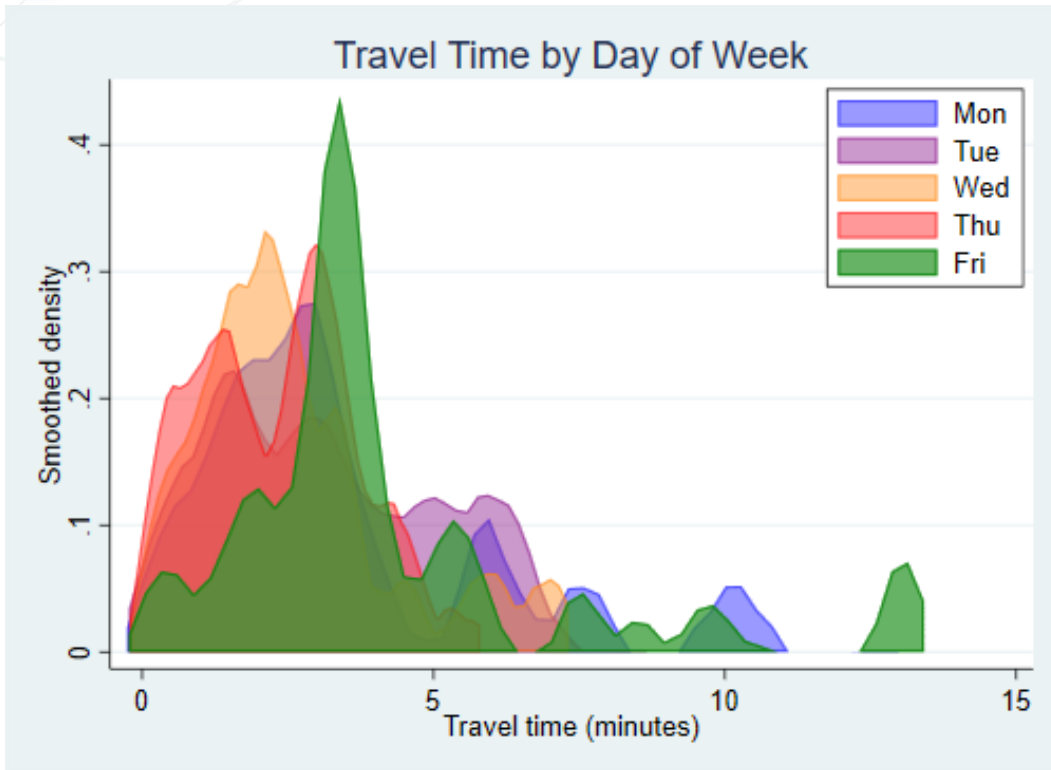


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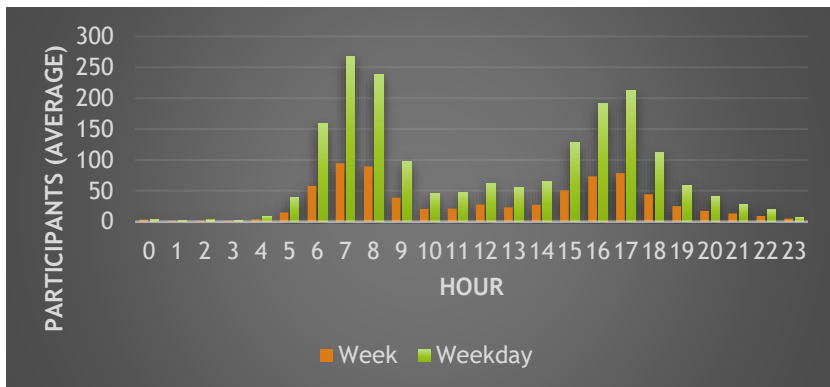
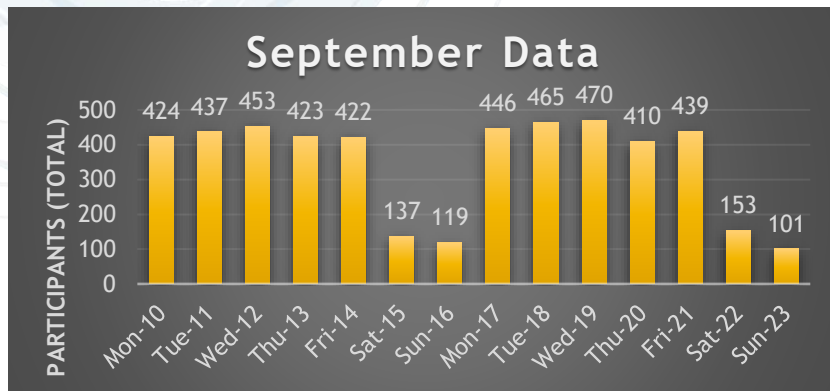


A.M. Peak

P.M. Peak



# OUR NETWORK PRODUCES... FREQUENCY



- Average of 1.7 million BSM/day
- About 0.9 million BSM/RSU
- Weekday travel patterns with a.m. and p.m. peak periods
- Up to 270 participants per hour on average at a.m. peak hour



# HOW DO WE CURRENTLY USE THE 5.9GHZ SPECTRUM AND WHAT ARE YOUR FUTURE PLANS

- **Existing- Transportation Safety Applications**

- DSRC - Available, Reliable, and Time Tested (Toll Use)
  - Road Side Units (46)
  - On Board Units - Test Vehicles (14); Busses (10); Trolley (9); Public Vehicle (1000 cv pilot)
  - Traffic Management Center - Workstation
  - Service Agreements (Under Negotiation)

- **Future -**

- Only thing certain is technology will change over time, setting ground rules important
- Technology Agnostic - functionality and return of investment will drive decisions
- New Technologies Under Development but Not Proven
  - C-V2x
- Connectivity and Interoperability Required
  - Maintain and Manage Infrastructure, Right of Way, and Roadway Network



# DATA OBSERVATIONS



V2I WWE alerted **14 drivers** of WWE onto an expressway off ramp.



Downtown streetcars equipped with CV equipment warned **9 drivers of an impending crash.**



In February 2020, the ERDW issued **1,280 speed advisories** to 538 equipped vehicles to reduce morning backups and improve flow into Downtown Tampa.



April 25, 2018 demonstration showed that **V2I can provide warnings** to drivers of potential ped/auto crashes **outside of driver's sightline.**



On **an average weekday**, out of 325 vehicles in the study area, V2V-based **FCW warns 10 drivers in older vehicles of possible collision** (with no OEM-provided safety application).



# BENEFITS OF CONNECTIVITY FOR LOCAL GOVERNMENTS



Improves operational efficiency of the system

“Security”

“Safety”

Ability for all residents to experience benefits of technology...

DSRC – Strong Track Record in Tolling

Entry level Technology to Smart Cities





# Questions

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