



Infrastructure to Support CAV – MDOT Perspective

Laura Mester (MDOT)

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Infrastructure Support of Automated Vehicles

Digital Infrastructure

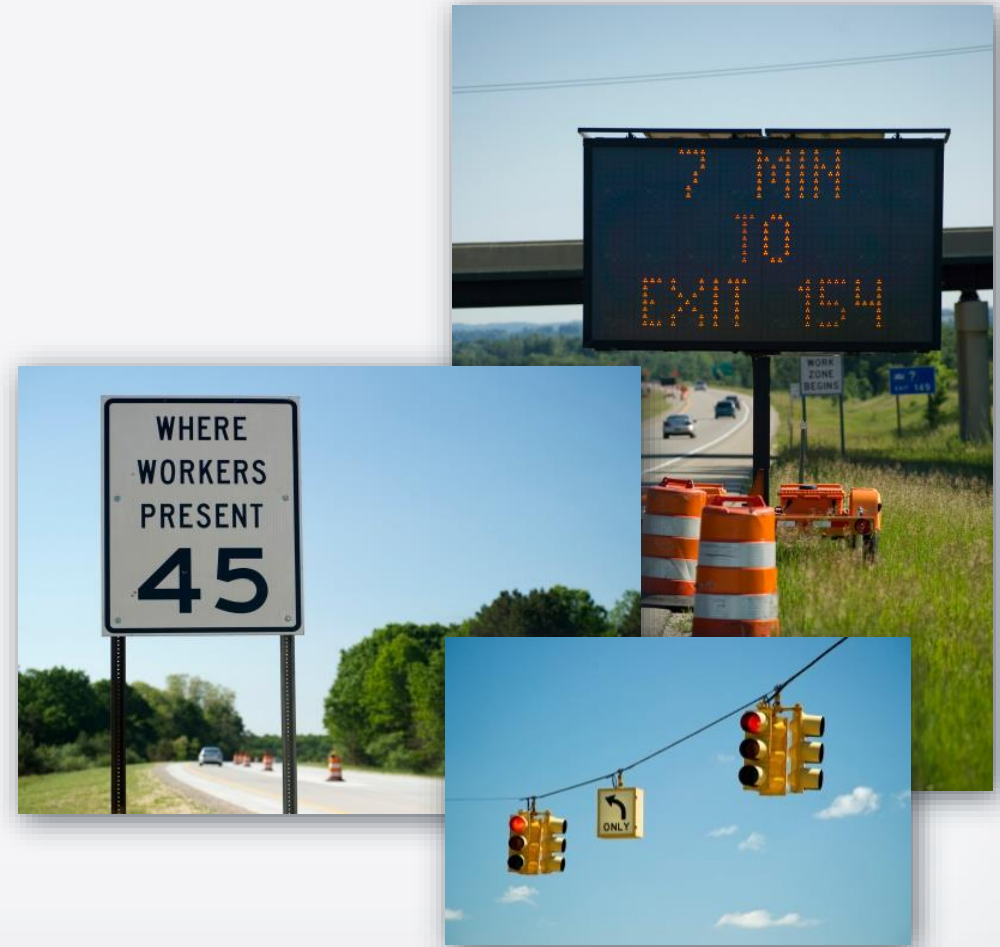
- Surveying / Digital Mapping
- Vehicle-to-Infrastructure Connection
 - SPaT
 - Traveler Info
 - V2I Applications

Physical Infrastructure

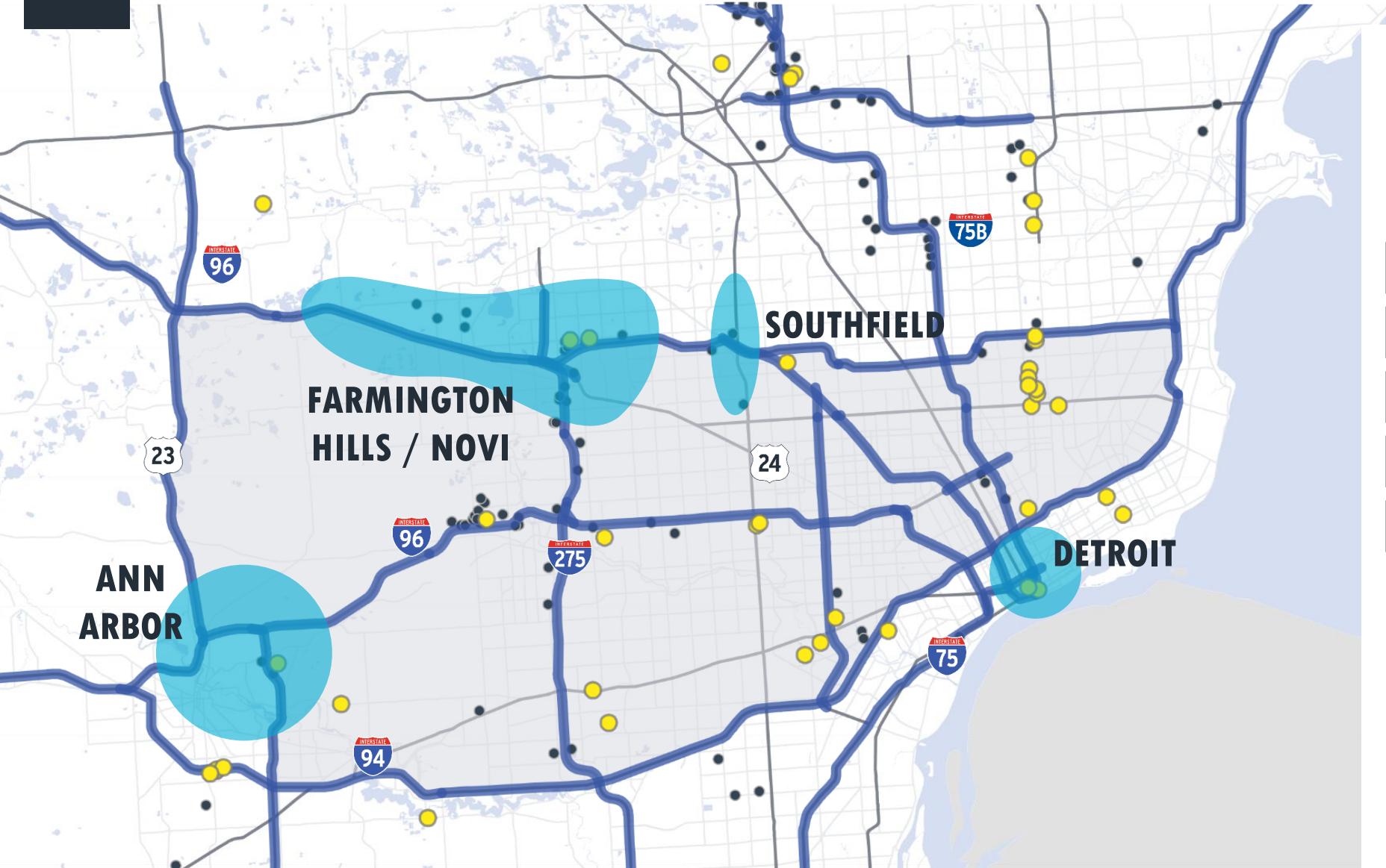
- Pavement Markings
- Roadway Signage
- Geometric Design

Regulatory Frameworks

- Senate Bills/Public Acts



Southeast Michigan Connected Vehicle Assets



-  Connected Vehicle Environment
-  Connected Vehicle Test Beds
-  Tier 1 Automotive Suppliers
-  Major OEM Facilities
-  MDOT Roadway ITS Coverage

SOUTHEAST MI DEPLOYMENTS

MDOT's CAV Program connects the entire state's mobility. Expansion of our deployments covers urban and rural areas.



LANSING

Legend

- Installed Corridor
 - County Lines
 - Macomb County Deployments
- | Deployments By Year | |
|---------------------|------|
| — | 2018 |
| — | 2019 |
| — | 2020 |
| — | 2021 |
| — | 2022 |
| — | 2023 |



Initial Pilot Applications



**Red Light Violation
Warning**



**Work Zone Warning/
Management**



**Road Weather
Management**



**Pavement
Condition**

Red Light Violation Warning



Vehicle approaching intersection too fast, signal is turning red

Approaching vehicle receives SPaT message, identifies threat



Driver Vehicle Interface (DVI) alerts driver to brake

Smart signal broadcasting Signal Phase and Timing (SPaT)



RED LIGHT VIOLATION WARNING



Updating Standards - Connected Signals Policy

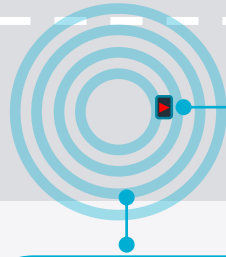


- **All new or upgraded traffic signals on the MDOT system will be CV-enabled going forward**
- **Coordinated effort with Signals Division to update traffic signal controller specification standards**
- **Streamline the management of all 3,100+ MDOT traffic signals to improve safety, enhance reliability, and reduce congestion through active and remote management by implementing a central signal control software.**

Work Zone Warning/ Management



Portable RSU sends
work zone info to
vehicle



Vehicle is
approaching work
zone too fast

Approaching
vehicle receives
message
from RSU with
work zone
information



Driver Vehicle
Interface (DVI)
provides warning
of lane closure





YOUR CONNECTED WORK ZONE

INJURE/
KILL A
WORKER
\$ 7500 +
15 YEARS



ROAD
WORK
AHEAD



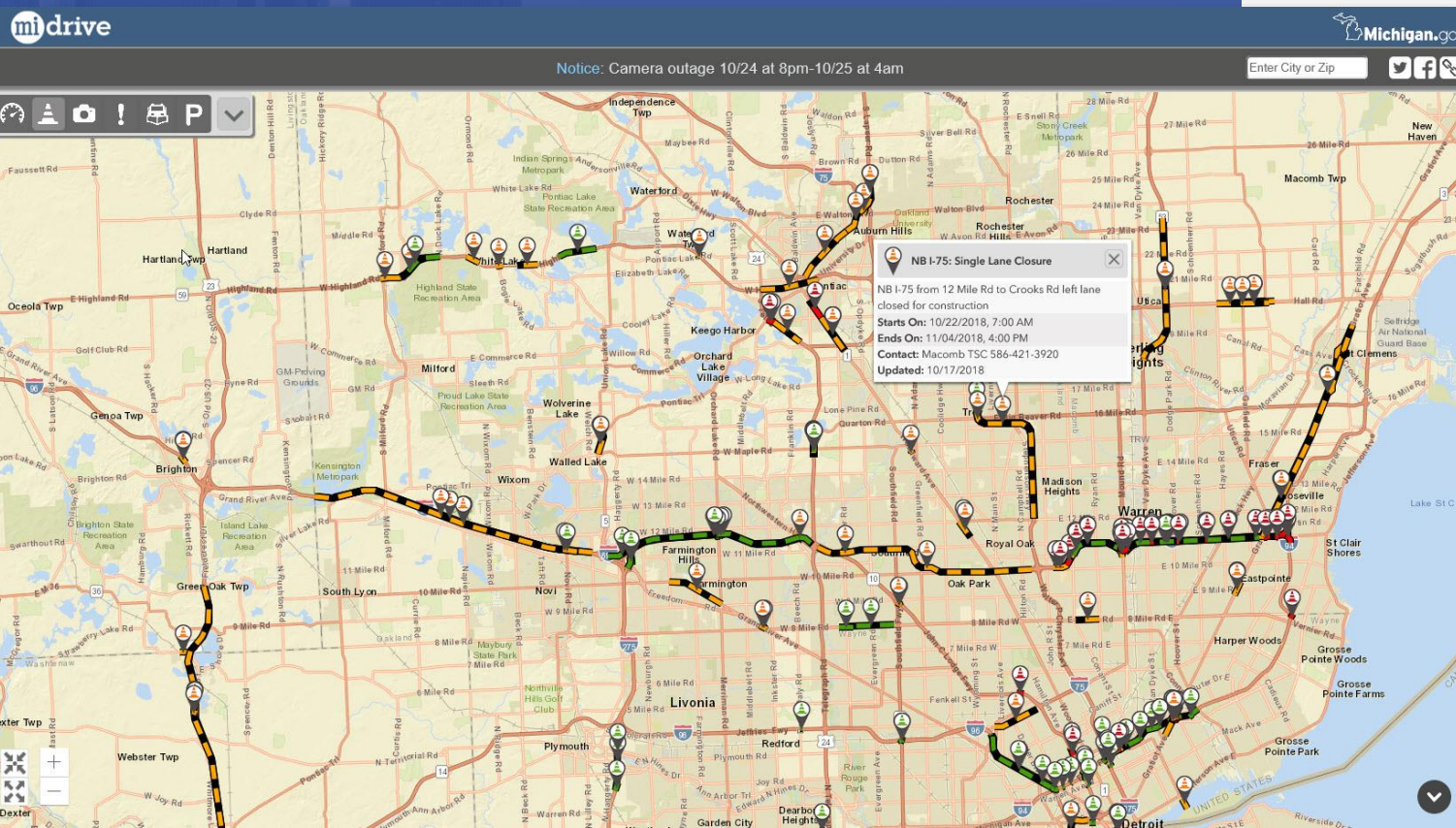
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ROAD
WORK
AHEAD

TFR

(LCAR Replacement)

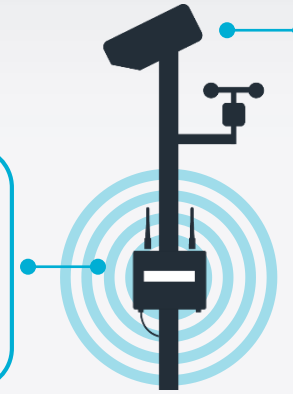
- Improve work zone data collection
- Replaced End of Life System
- Developed in TFM (DUAP) System
- Newly developed system to support:



- Data Collection
- Data Management
- Data Distribution
 - Mi Drive Website
 - 3rd Party Traveler Info Providers
 - Connected Vehicle (CV) Messages

Road Weather Management

Portable Road Side Unit (RSU) sends weather warning to vehicle



Road weather station detects icing conditions, reports conditions to weather office

Vehicle is approaching hazardous weather conditions area

Approaching vehicle receives message of road ice in area from RSU and/or cellular network

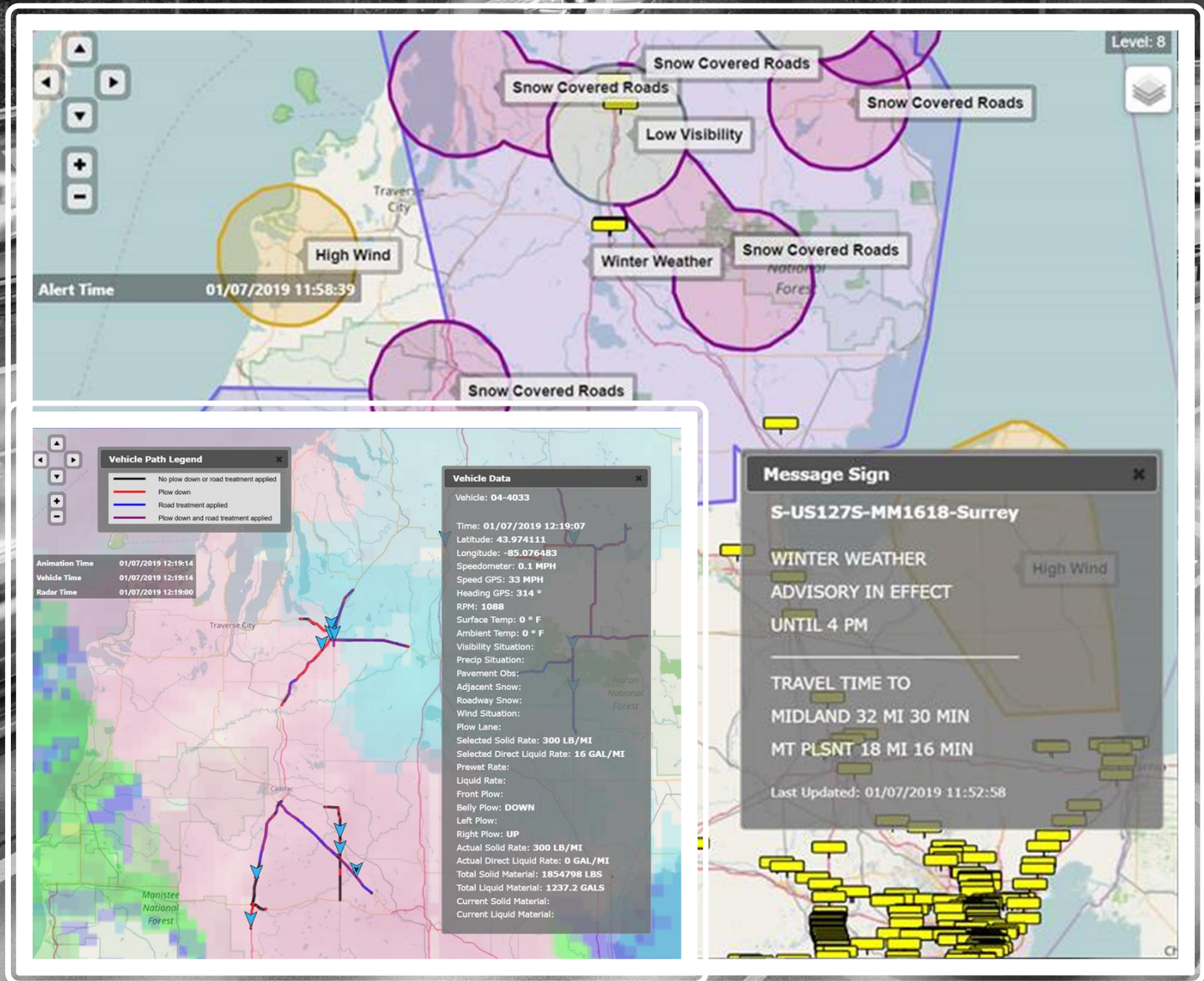


Driver Vehicle Interface (DVI) example

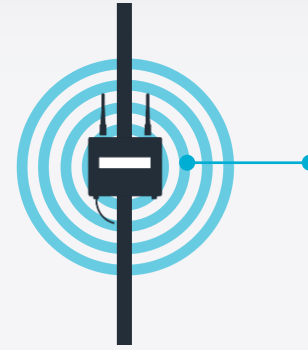
Driver reduces speed in response to warning

Operations - Weather

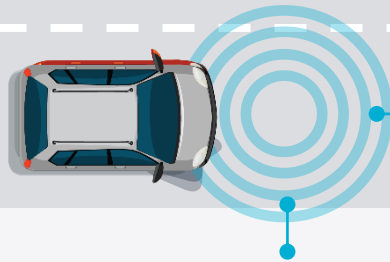
- **ESS continue to be deployed with an enhanced consideration for alternative technologies**
- **Outlined in 2017 RWIS Strategic Plan**



Pavement Condition Monitoring



roadside unit sends pothole data to operations center



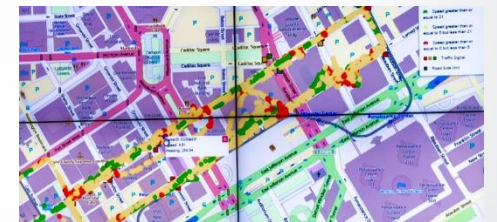
Vehicle drives over pothole in pavement

Sensors in vehicle detect sharp acceleration at that location, stores the pothole strike, stores fix

Maintenance crews respond to pothole

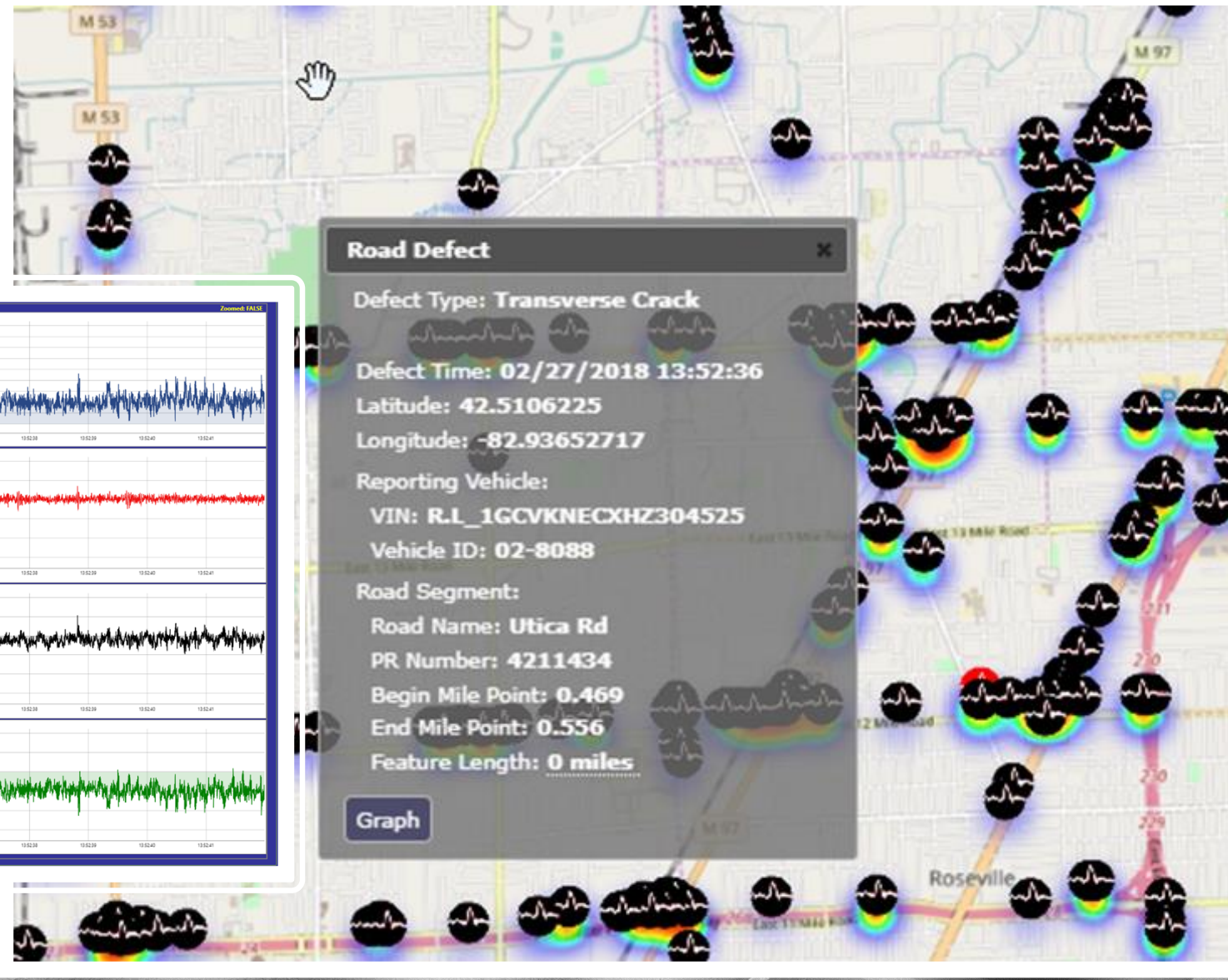
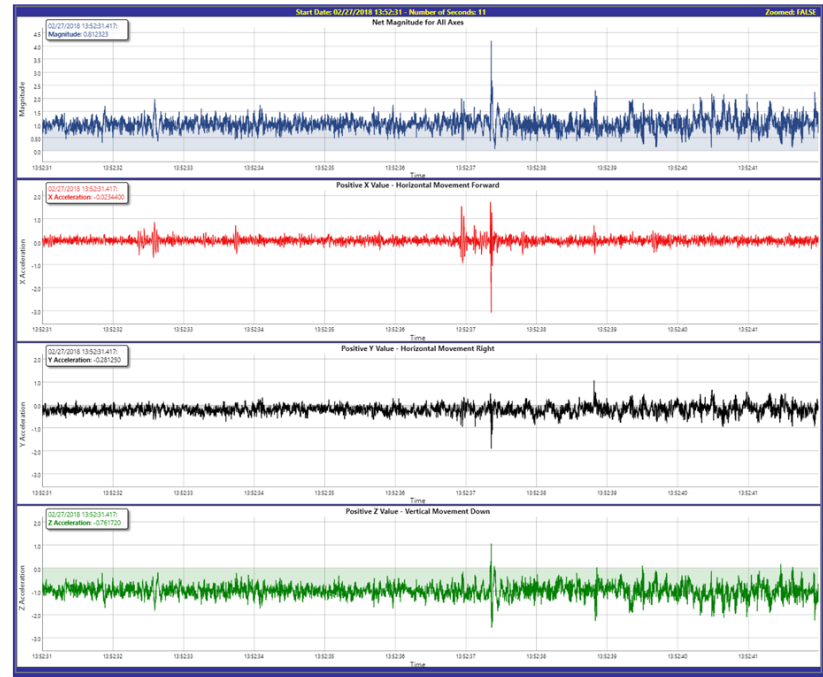
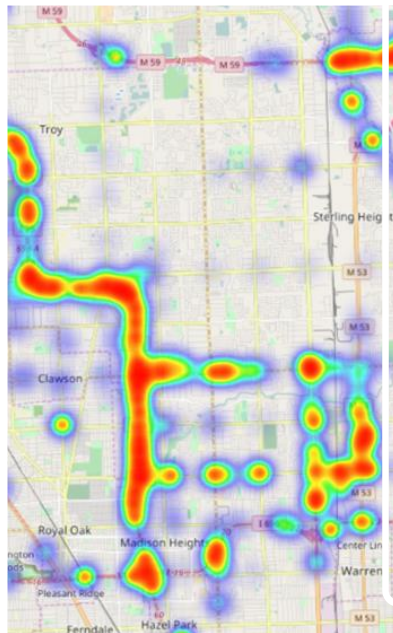
Vehicle broadcasts message to roadside unit as it drives

DOT receives data from vehicle (and lots of others), dispatches maintenance crew



Heat map of pavement conditions

Operations – Pavement Analysis

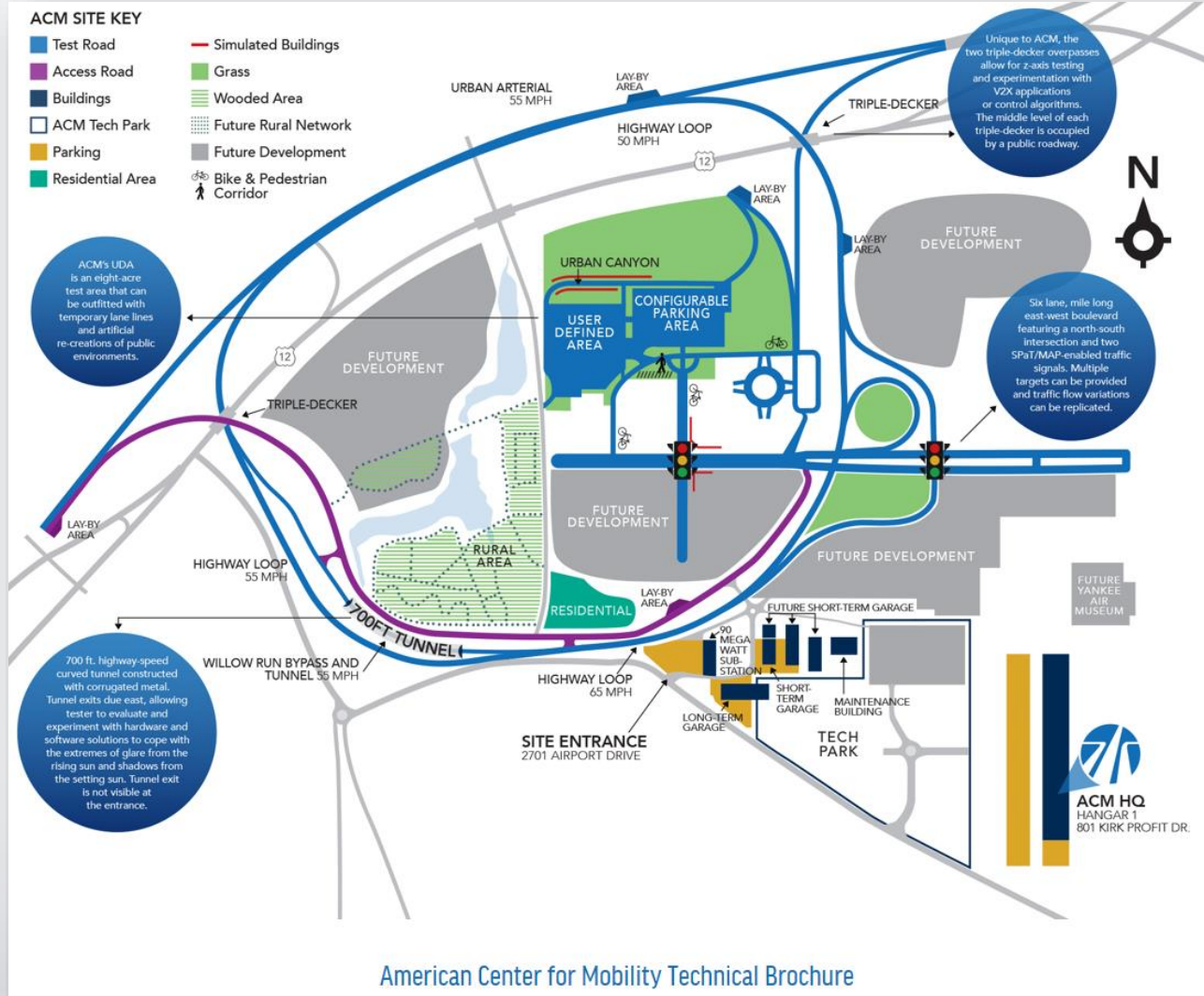


Updated Pavement Marking Policy

- **Increasing width of lane lines on freeways from 4 – 6 inches**
 - To support increasing use of lane departure warning and lane keeping technologies
- **On and off ramp dotted line extensions included in the annual contract**
 - Guide both vehicles and drivers to stay in their lane with traversing the freeway
- **Both changes will be included in 2021 construction program**



American Center for Mobility (ACM)



American Center for Mobility Technical Brochure





Mcity



The \$8M Michigan Mobility Challenge

- \$8 million to fund multiple innovative pilot transportation projects of varying sizes that can solve mobility gaps for seniors, persons with disabilities and veterans in urban, rural and suburban communities throughout the state of Michigan.
- A collaborative effort that includes the Michigan Department of Transportation (MDOT), PlanetM/MEDC, the Michigan Department of Health and Human Services, the Michigan Veterans Affairs Agency, The Bureau of Services for Blind Persons, and the Michigan Department of Civil Rights – Division on Deaf, Deafblind, and Hard of Hearing.



\$8 Million Challenge Requirements

- Innovative
- Coordinated
 - Mobility Companies
 - Public transportation agencies in or near to the service area
 - Transportation planning agencies in the service region
 - Social service agencies that provide services to seniors, persons with disabilities and/or veterans in the service area
 - Advocacy groups that have knowledge of the needs of seniors, persons with disabilities or veterans
- Supplemental
- Sustainable

NAIAS 2020 Michigan Mobility Challenge

- Calls upon industry innovators to propose new and dynamic technology deployments that embody how autonomous, connected and electric vehicle technology can transform how we live, work and play.
- Demonstrate innovative solutions and cutting-edge technologies that can showcase autonomous vehicle capabilities
- Provide innovative, dynamic AV technology deployments, further solidifying the NAIAS and the Motor City as the preeminent environment for new transportation solutions.
- Operational during 2020 North American International Auto Show – June 2020

PURE MOBILITY



planet  M

In spring 2016, the PlanetM **brand** was born to represent collective mobility efforts and assets across the state.

Michigan. Where big ideas in mobility are born.

A year later, the State built on the early success of PlanetM by growing beyond its awareness-focused advertising campaign into a full-service statewide **business development** program.

Michigan. Leading the transportation revolution.



By the end of 2019, PlanetM will be involved in over **50 pilots**.

We have an opportunity and responsibility to advance our state's automotive and technology landscape in a way that also improves the quality of life for all Michigan residents.

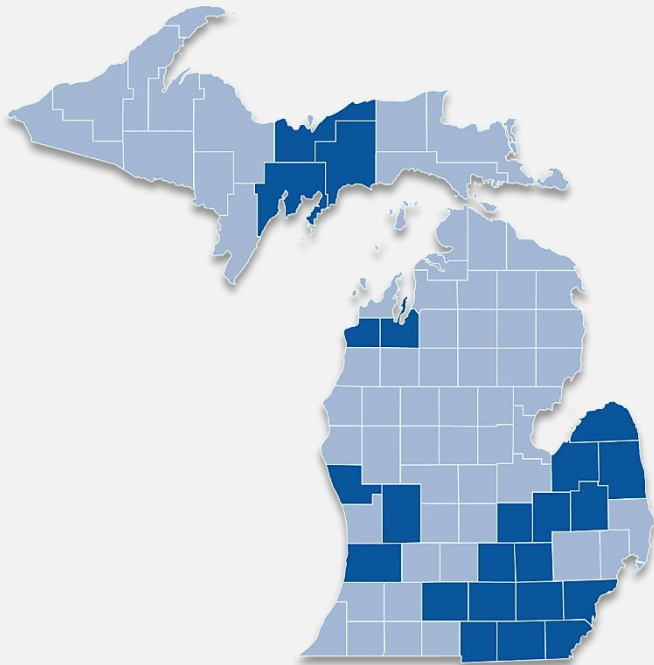


GRANTS



Technology Activation Grants

50 activations in the counties below have been facilitated through MEDC/PlanetM and MDOT.



Ann Arbor:

Bus driver alerts for predicting vulnerable actions



Grand Rapids:

First-ever digital alerts between fire, police, EMS



Detroit:

Road condition evaluation & early crack detection



Detroit:

Intersection safety in front of RenGen, City Hall using AI



Detroit:

AV paratransit shuttle at DMC Hospital Campus



Dearborn:

Automated RX delivery inside hospital



Battle Creek:

Secure RX delivery in rural area with under-utilized vans



Rochester Hills:

AV shuttle at Oakland University, as part of STEM program



SE Michigan:

Safe carpool app for schools, teams and families



Ypsilanti (ACM):

Self-driving car company without



SW Michigan:

Electric school bus deployment in multiple school districts



Ortonville:

Automated power line inspections in rural communities



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PLANET M Website

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