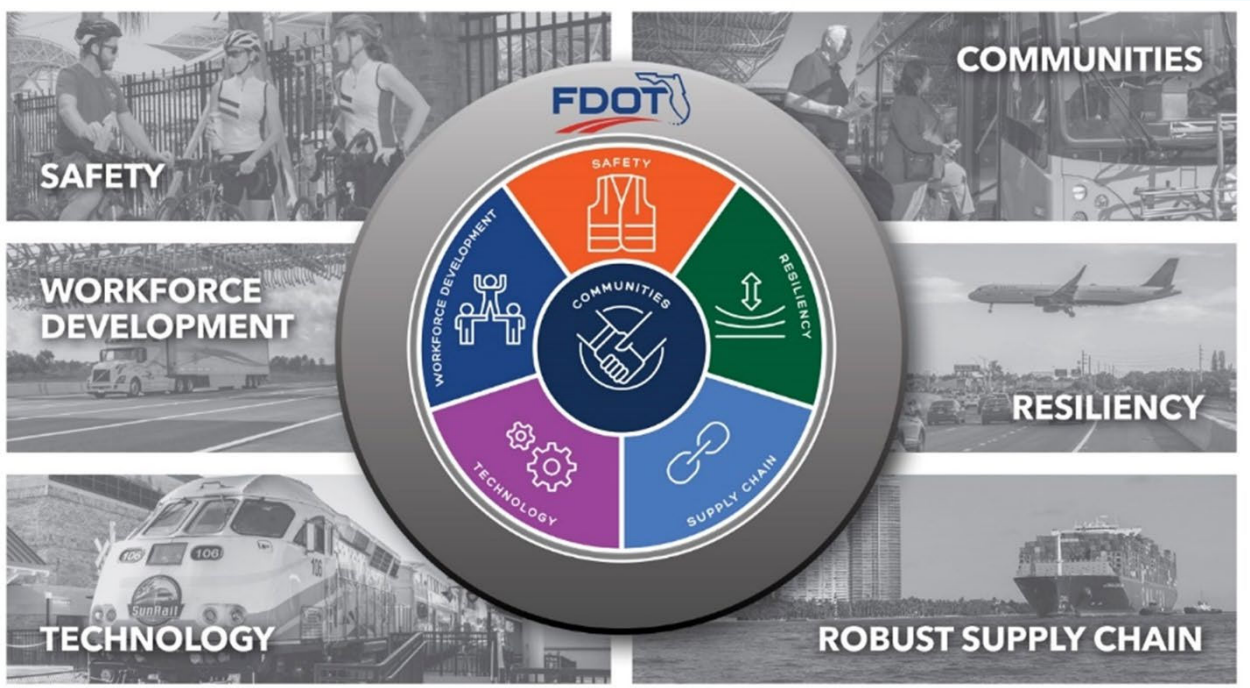
2023 FAV Summit: Florida's Transportation Technology Labs

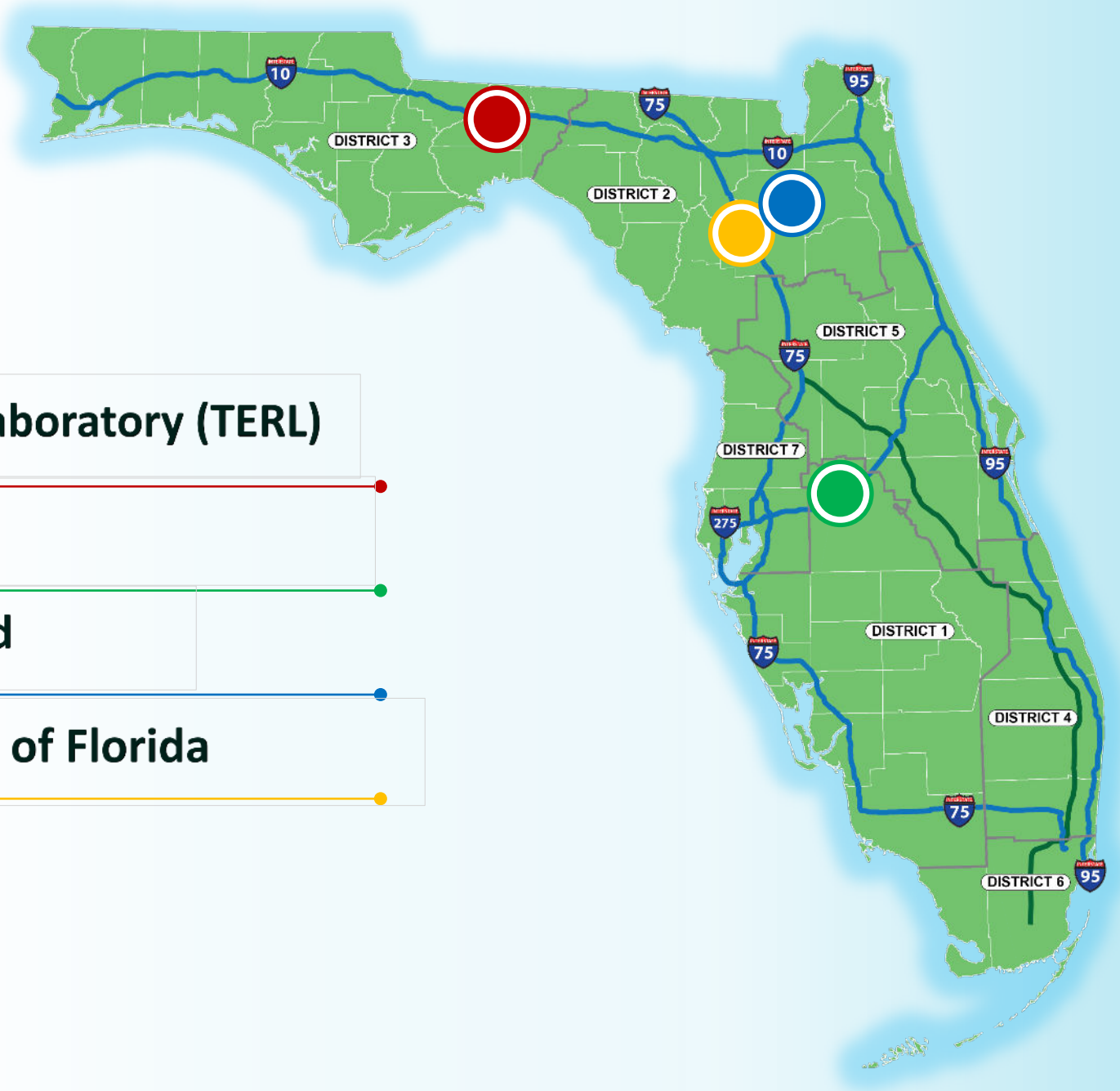
Moderator: Trey Tillander, P.E.
Executive Director
Transportation Technology Office
Florida Department of Transportation

Friday, September 7
10:30 am-12:00 pm


SAFETY
COMMUNITIES
WORKFORCE DEVELOPMENT
RESILIENCY
TECHNOLOGY
ROBUST SUPPLY CHAIN
FDOT
SAFETY
RESILIENCY
SUPPLY CHAIN
TECHNOLOGY
WORKFORCE DEVELOPMENT
COMMUNITIES


Promote
Inspire
Attract
Test
Implement

Research Facilities



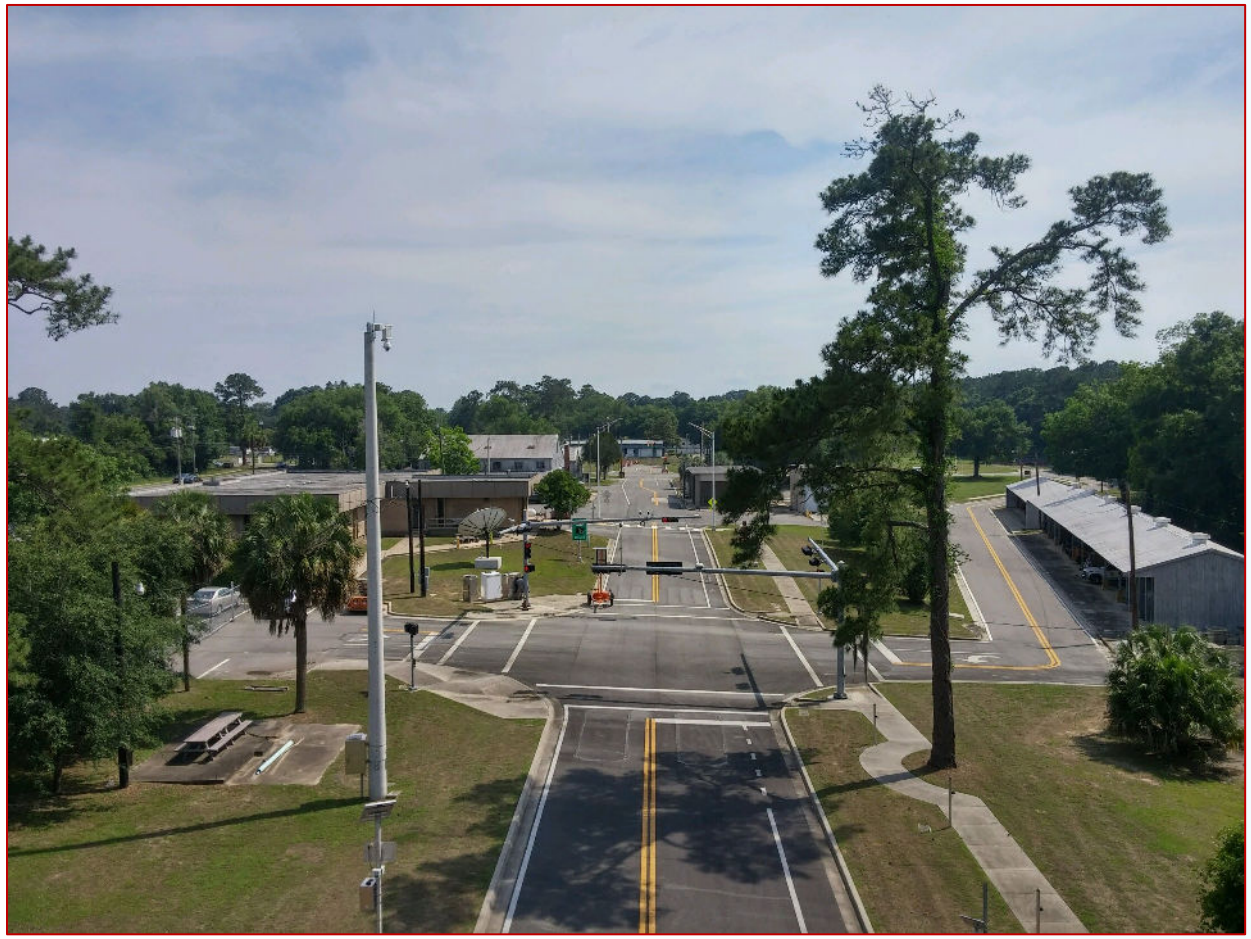
Traffic Engineering Research Laboratory (TERL)

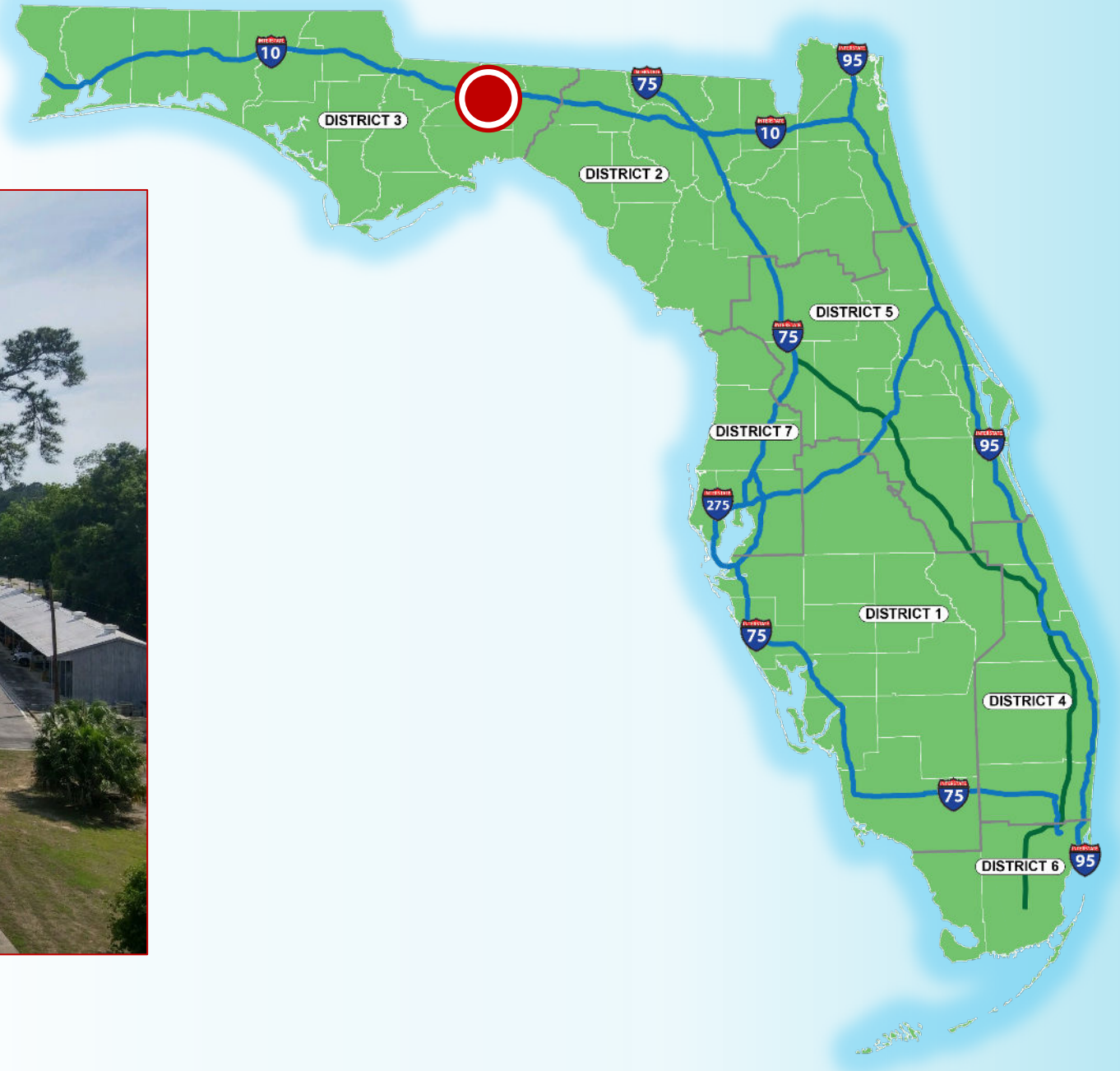
SunTrax

Concrete Test Road

I-STREET: University of Florida

Traffic Engineering Research Laboratory (TERL)



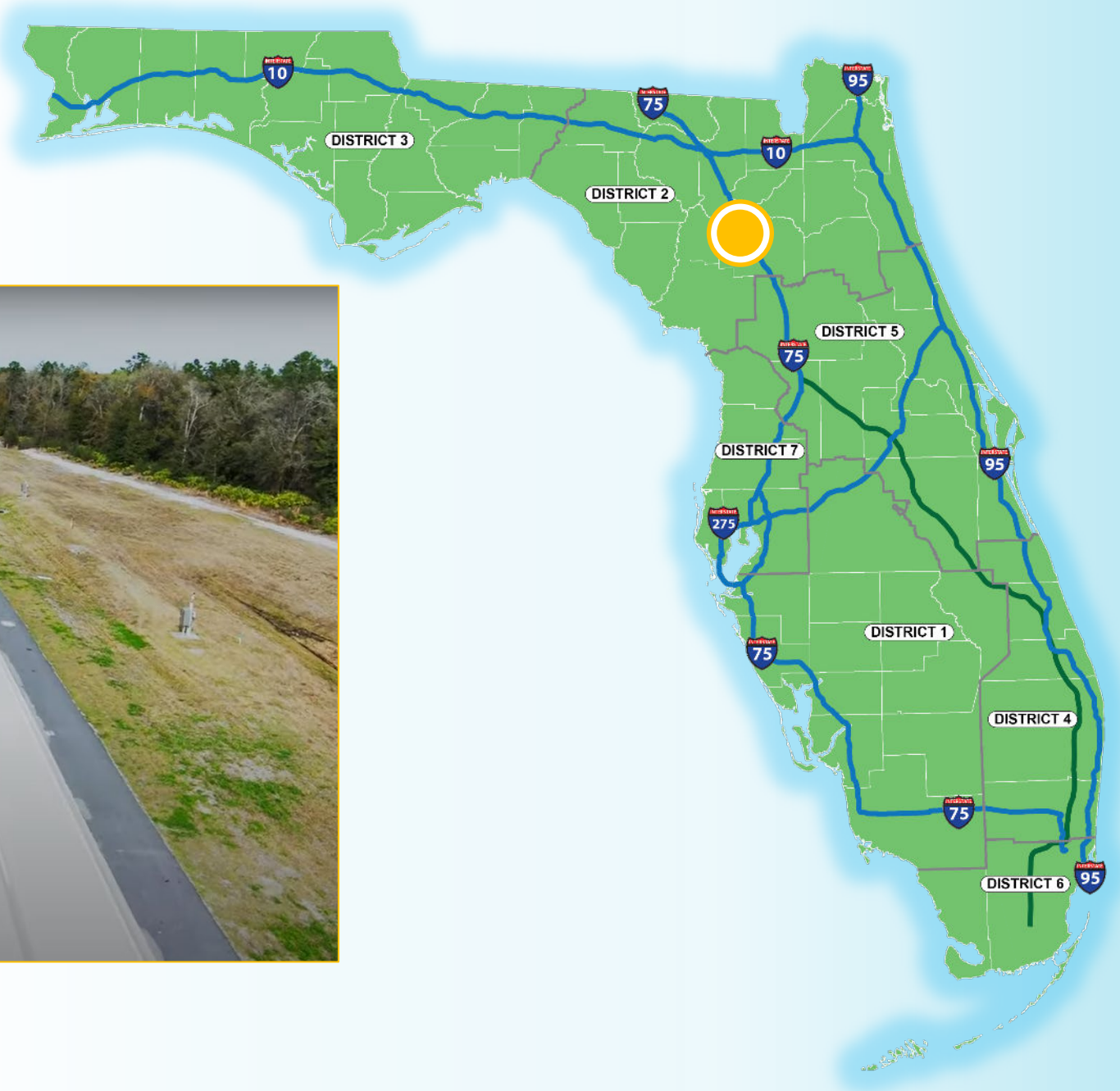


SunTrax


SUNTRAX


10
DISTRICT 3
75
DISTRICT 2
10
95
DISTRICT 5
75
DISTRICT 7
95
275
DISTRICT 1
75
DISTRICT 4
75
DISTRICT 6
95

Concrete Test Road



I-STREET: University of Florida

I-STREET

TRANSPORTATION INSTITUTE
UNIVERSITY OF FLORIDA

FDOT Traffic Engineering Research Lab: Testing for Implementation

Rudy Powell, P.E.
Director
State Traffic Engineering & Operations Office, Florida Department of Transportation

FLORIDA DEPARTMENT OF TRANSPORTATION TRAFFIC ENGINEERING RESEARCH LAB

TESTING FOR IMPLEMENTATION

Rudy Powell, Jr., PE

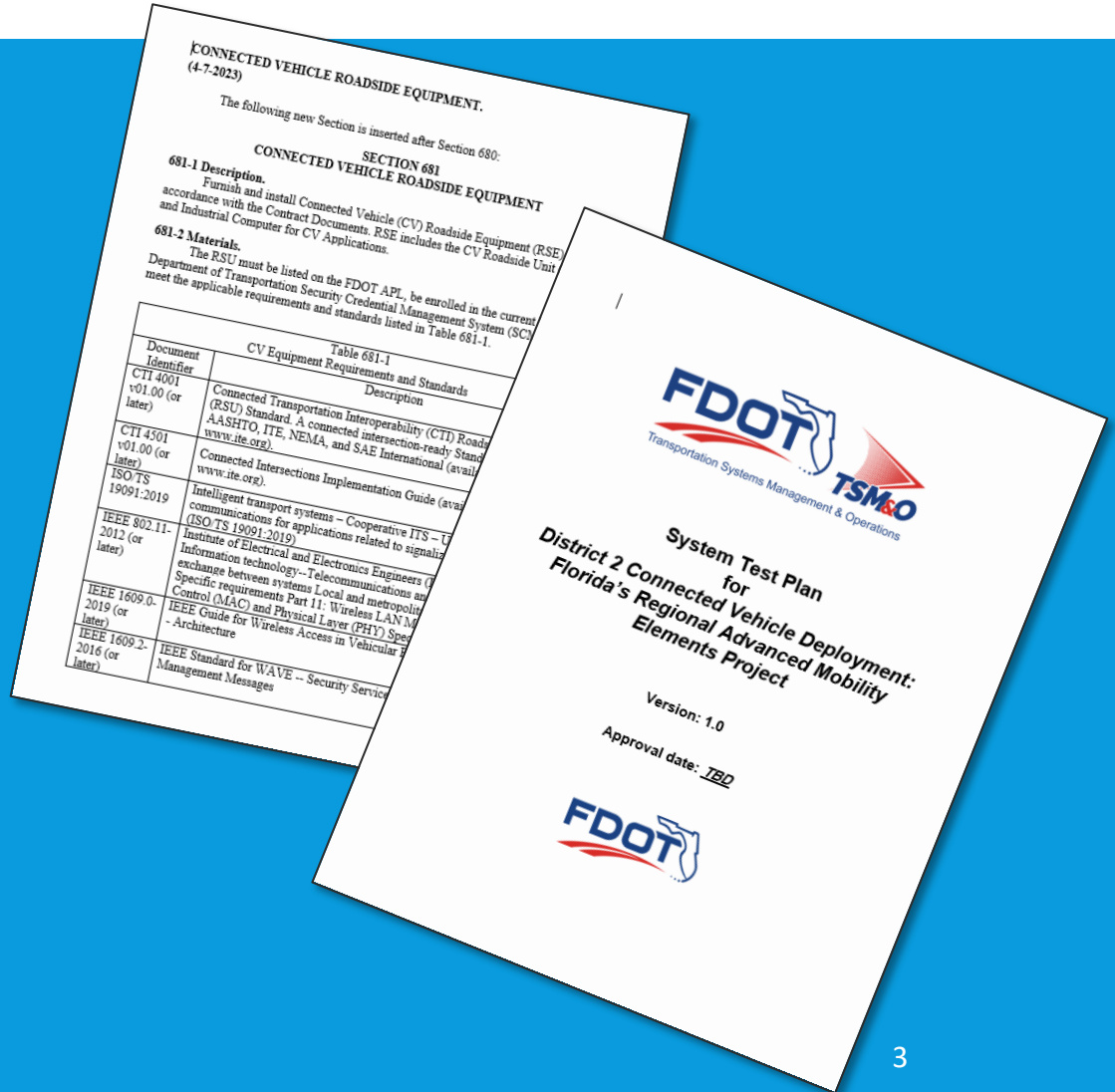
Director, FDOT Traffic Engineering and Operations

TRAFFIC ENGINEERING RESEARCH LAB

- Conducts evaluations of Traffic Control Devices for listing on the Approved Product List (APL)
- Develops statewide specifications for Traffic Control Devices
- Represents FDOT on National Standards Development Organizations
  - NTCIP National Committees
    - NTCIP 1218 – ITS Protocol Object Definitions for Roadside Units (RSUs)
- Supports research into new traffic technologies conducted by FDOT and University partners

SUPPORT FOR FDOT CAV PROGRAM

- Traffic Control Device Permit Process
- Statewide Specification Development
  - Developmental Specification 681
    - Requirements for CV Roadside Equipment (RSE)
      - RSUs (Roadside Units)
      - Edge Computing Devices
- FDOT CV Procurement Support


CONNECTED VEHICLE ROADSIDE EQUIPMENT.
(4-7-2023)

The following new Section is inserted after Section 680:

SECTION 681
CONNECTED VEHICLE ROADSIDE EQUIPMENT

681-1 Description.
Furnish and install Connected Vehicle (CV) Roadside Equipment (RSE) in accordance with the Contract Documents. RSE includes the CV Roadside Unit and Industrial Computer for CV Applications.

681-2 Materials.
The RSU must be listed on the FDOT APL, be enrolled in the current Department of Transportation Security Credential Management System (SCMS) and meet the applicable requirements and standards listed in Table 681-1.

Table 681-1
CV Equipment Requirements and Standards

Document Identifier	Description
CTI 4001 v01.00 (or later)	Connected Transportation Interoperability (CTI) Roadside Unit (RSU) Standard. A connected intersection-ready Standard by AASHTO, ITE, NEMA, and SAE International (available at www.ite.org).
CTI 4501 v01.00 (or later)	Connected Intersections Implementation Guide (available at www.ite.org).
ISO/TS 19091:2019	Intelligent transport systems – Cooperative ITS – Using V2I and I2V communications for applications related to signalized intersections (ISO/TS 19091:2019)
IEEE 802.11-2012 (or later)	Institute of Electrical and Electronics Engineers (IEEE) Standard for Information technology--Telecommunications and information exchange between systems Local and metropolitan area networks--Specific requirements Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications
IEEE 1609.0-2019 (or later)	IEEE Guide for Wireless Access in Vehicular Environments (WAVE) - Architecture
IEEE 1609.2-2016 (or later)	IEEE Standard for WAVE -- Security Services for Application and Management Messages

FDOT
Transportation Systems Management & Operations
TSM&O

System Test Plan
for
District 2 Connected Vehicle Deployment:
Florida's Regional Advanced Mobility Elements Project

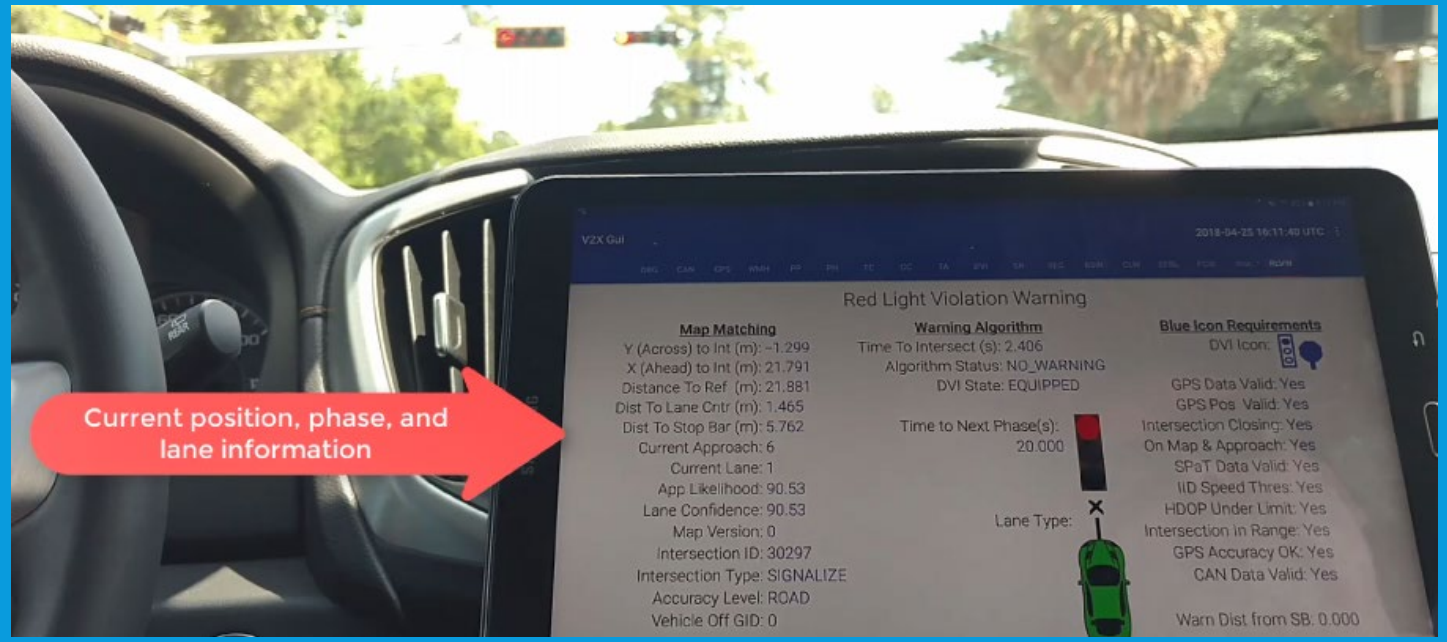
Version: 1.0

Approval date: TBD

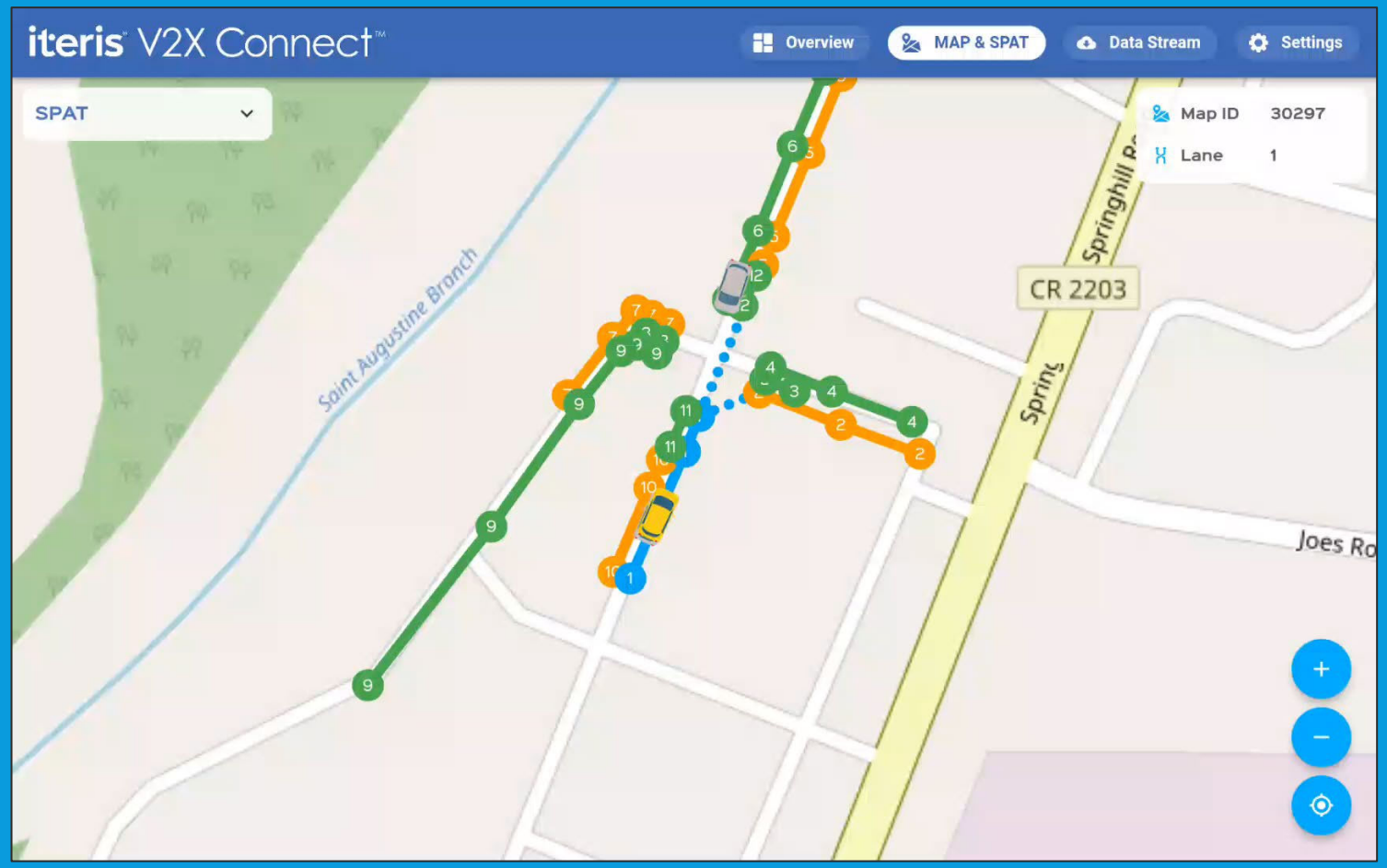
FDOT

TECHNOLOGY DEMONSTRATIONS AT THE TERL

- Gainesville Trapezium
- Gainesville & UF Bike-Ped
- D5 Ped-Safe/Greenway
- D5 Ped-Safe 2
- Tallahassee SPAT
- D2 I-75 FRAME

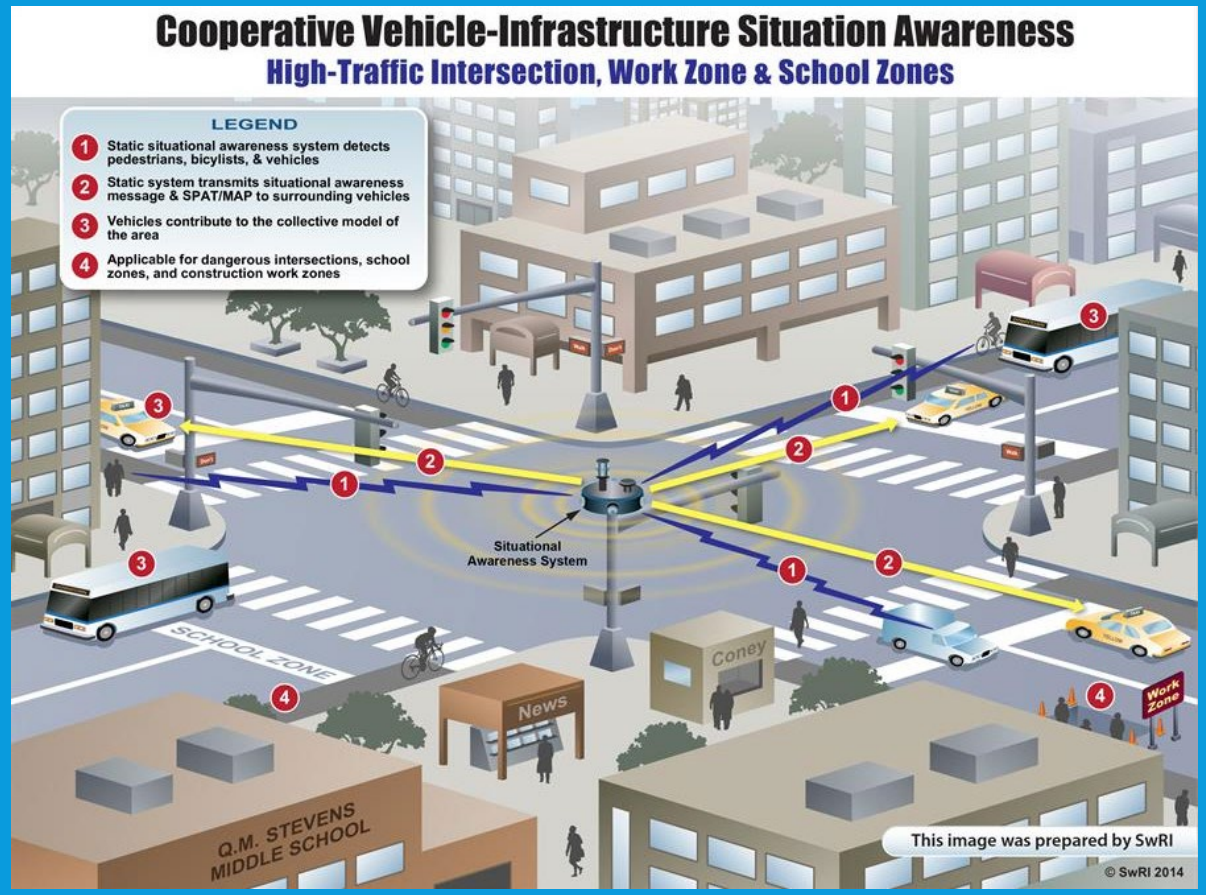


TECHNOLOGY DEMONSTRATIONS AT THE TERL



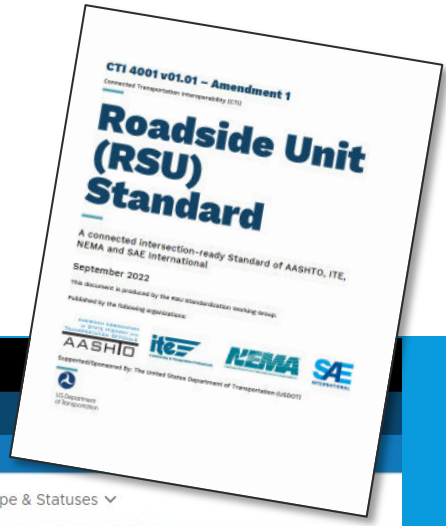
CV DEVICES AND DEVICES WITH CV FEATURES

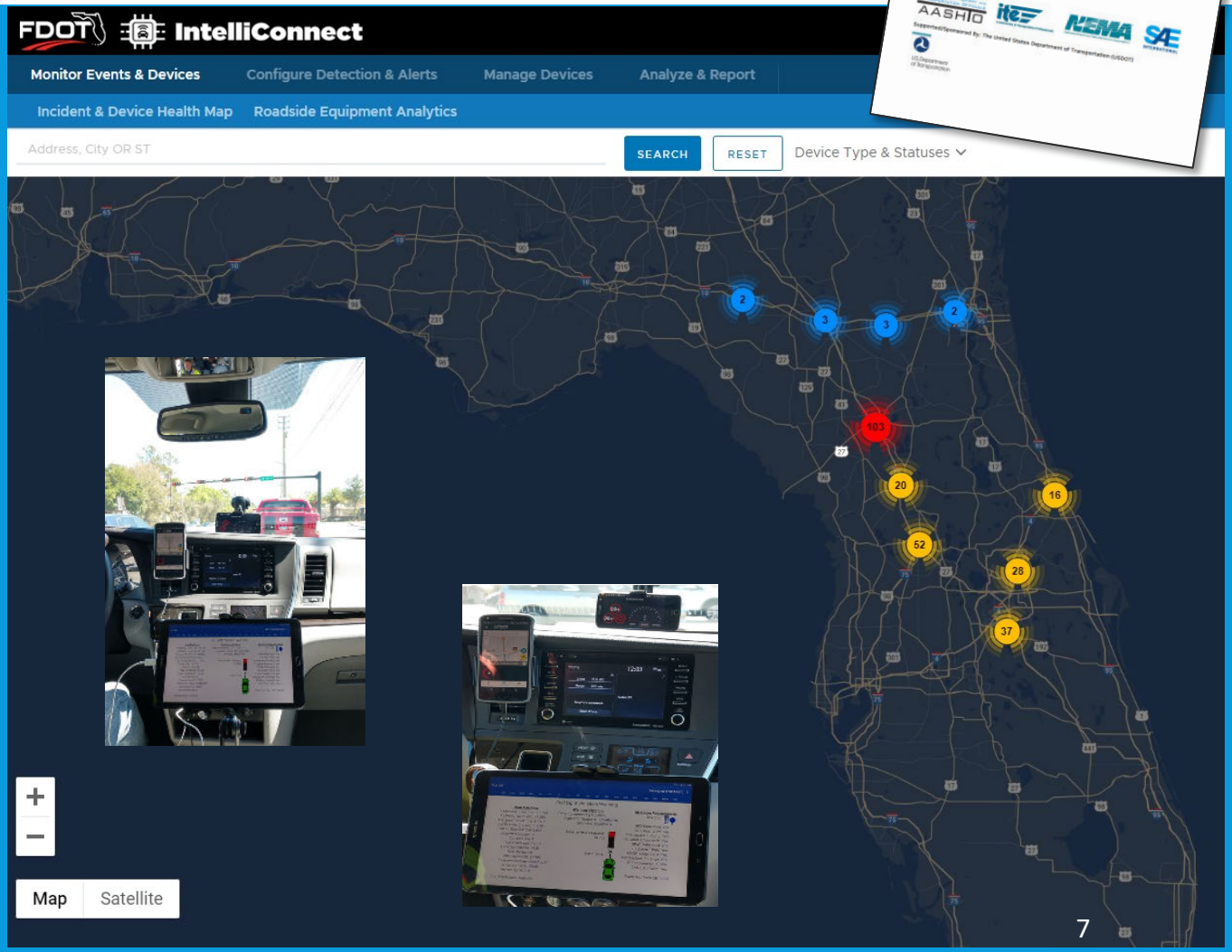
- Intersection Situational Awareness
  - ATC Signal Controllers and SPAT
  - Infrastructure generates data for unequipped users
- Roadside Infrastructure
  - RSUs
    - One listed under the FDOT Developmental Specification – Not APL Approved
    - Three RSUs currently under evaluation
  - OBUs
    - Focus on portable and semi-permanent aftermarket units for demonstration and validation of infrastructure



LOOKING FORWARD

- C-V2X Transition
- Developmental Specification Updates
- Promote System Maturity
  - System Integration
    - RSU Health Monitoring System
    - Statewide SCMS
  - Interoperability
    - Standards-based Communication
      - NTCIP
    - SDO Participation
  - Cybersecurity
  - Vendor Engagement
  - Research





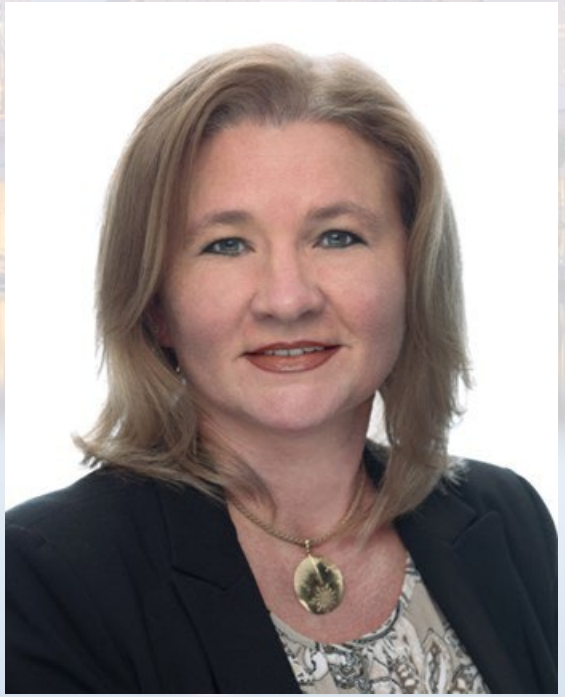
THANK YOU!

Rudy Powell, Jr., PE

Director, Traffic Engineering and Operations

Florida Department of Transportation
3185 South Blair Stone Road
Tallahassee, FL 32302
E-Mail: Rudy.Powell@dot.state.fl.us

SunTrax as the Center for Transportation Research, Development and Testing



Pamela Foster
SunTrax Strategic Development Manager
Florida Department of Transportation, FTE

SUNTRAX®

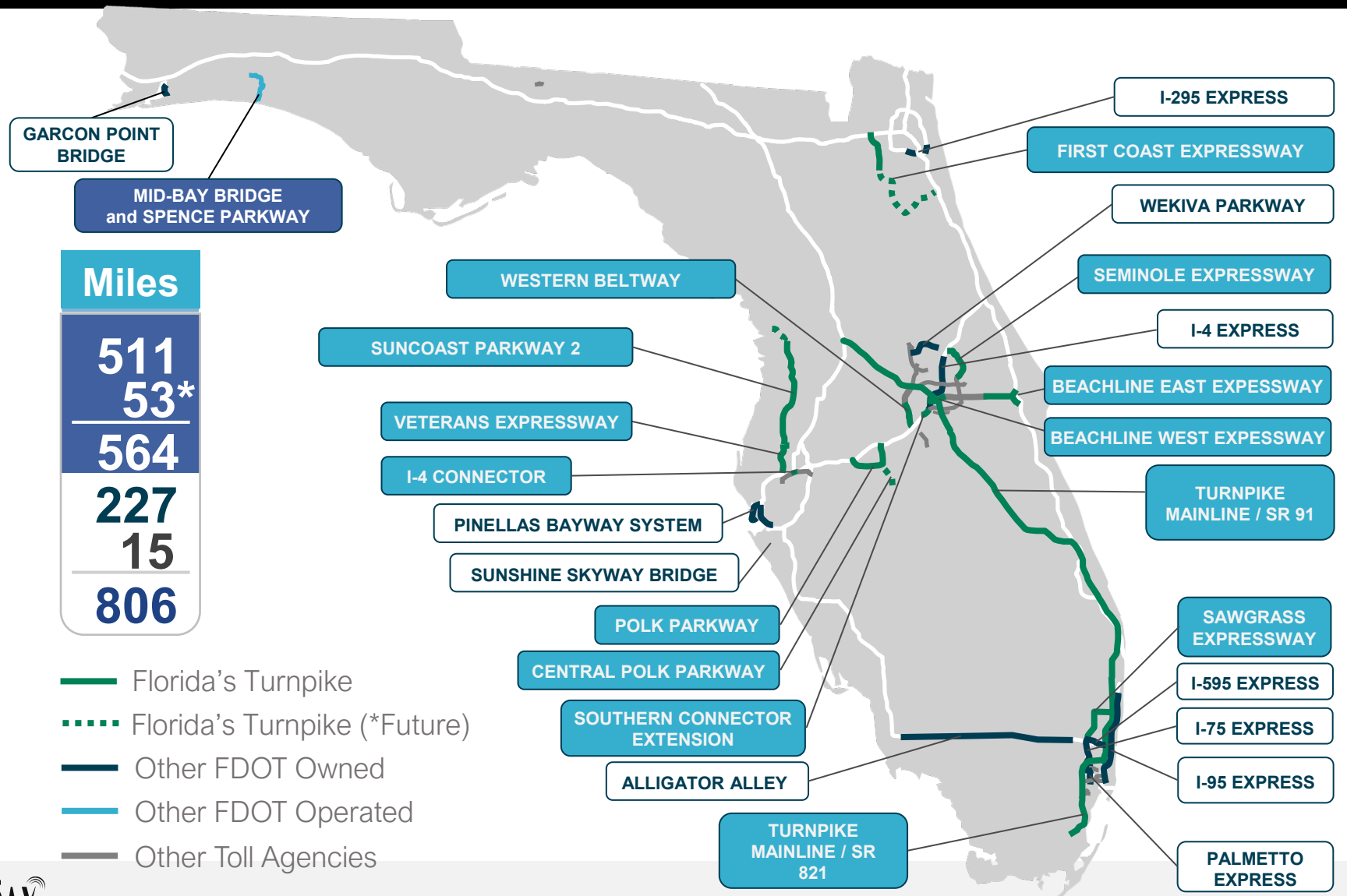
WELCOME TO AMERICA'S NEW CENTER FOR TRANSPORTATION INNOVATION

2023 Florida Automated Vehicle Summit

FDOT

FLORIDA'S TURNPIKE

FLORIDA'S TURNPIKE ENTERPRISE



FLORIDA'S TURNPIKE

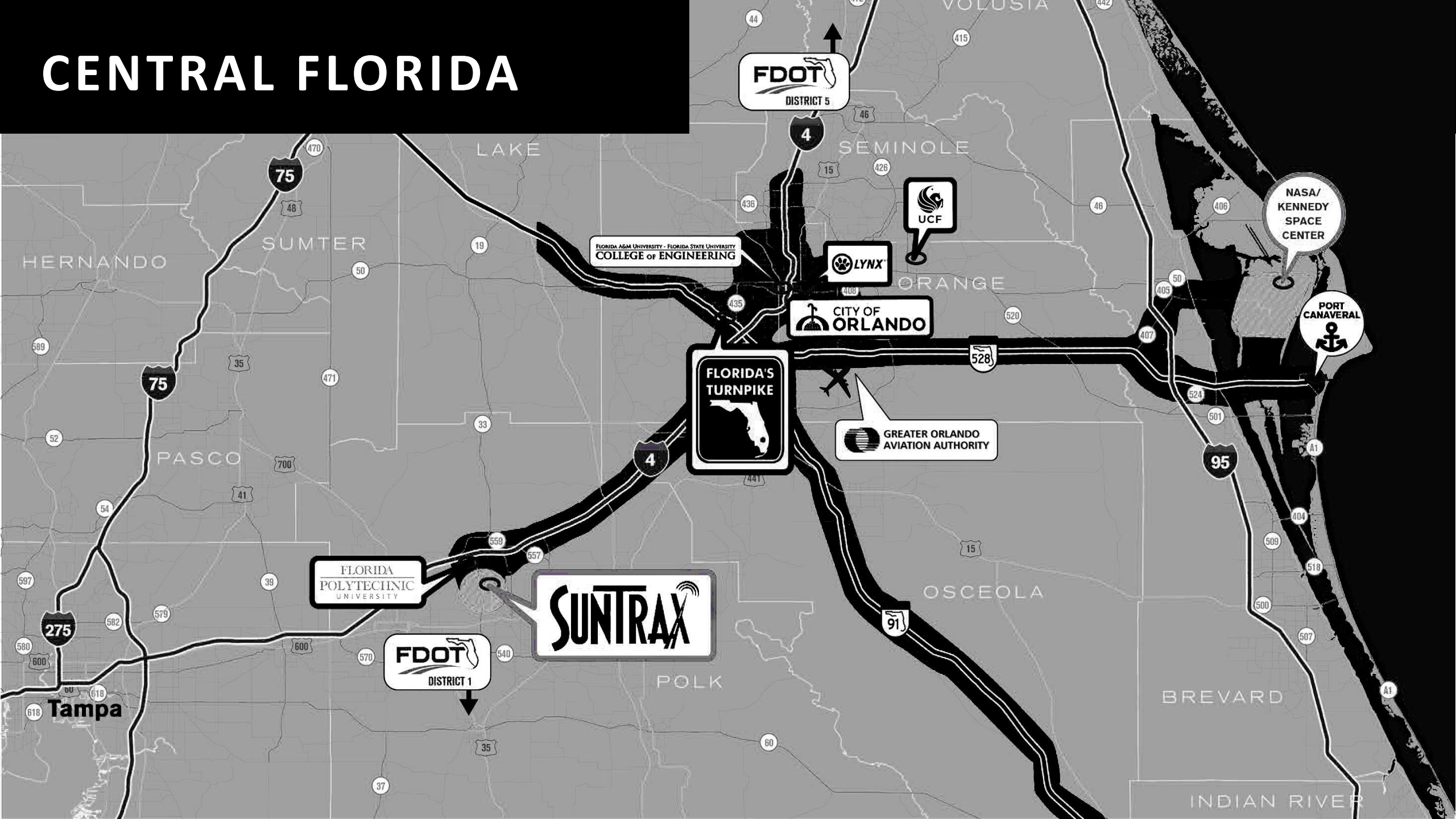
SERVING 29 COUNTIES

85%

OF FLORIDA'S POPULATION

SUNTRAX ACCELERATING THE FUTURE OF TRANSPORTATION

CENTRAL FLORIDA



OUR MISSION

To accelerate the future of transportation

OUR VISION

A continuously-evolving center for the development of innovative technologies that improve transportation safety, efficiency, and accessibility

ABOUT SUNTRAX

Originally conceived for the development of toll technology to help meet long-standing goals for national interoperability, SunTrax has evolved into an innovative testing ground for the development of emerging transportation solutions with a focus on Autonomous, Connected, and Electric Vehicles (ACES).

SunTrax is LEED Certified.

INFIELD FEATURES

1. Main Entry Campus
2. Workshops / Warehouses
3. Roadway Geometry Track
4. Loop Tracks
5. Oval Track
6. Urban / Suburban
7. Pick-Up / Drop-Off
8. Noise, Vibration, & Harshness
9. Technology Pad

Varied Environments

Diverse Scenarios

Highly Reconfigurable

WHY FLORIDA – OUR ADVANTAGE

- ✓ Autonomous-Friendly Regulatory Climate
- ✓ Transportation + Infrastructure Investment
- ✓ Business Development + Research

GRAND OPENING

On June 12, 2023, the Florida Department of Transportation's (FDOT) Turnpike Enterprise celebrated the official grand opening of SunTrax, with a ceremony attended by elected officials, local representatives, community leaders, and partners.

TOLLS TESTING AT SUNTRAX

SITE FEATURES

- *Multi-Lane, Reversible, Independent Straightaways*
- *4 Toll Sites / Gantries*
- *Single Location for All Scenarios*

TESTING TO DATE

- *FTE's 3 Current Toll Vendors*
- *Transponder Interoperability*
- *License Plate Recognition*
- *Wrong-Way Detection*

TECHNOLOGY TESTING

CARMA

BEEP / OXA

FLOCON

SECURITY AT SUNTRAX

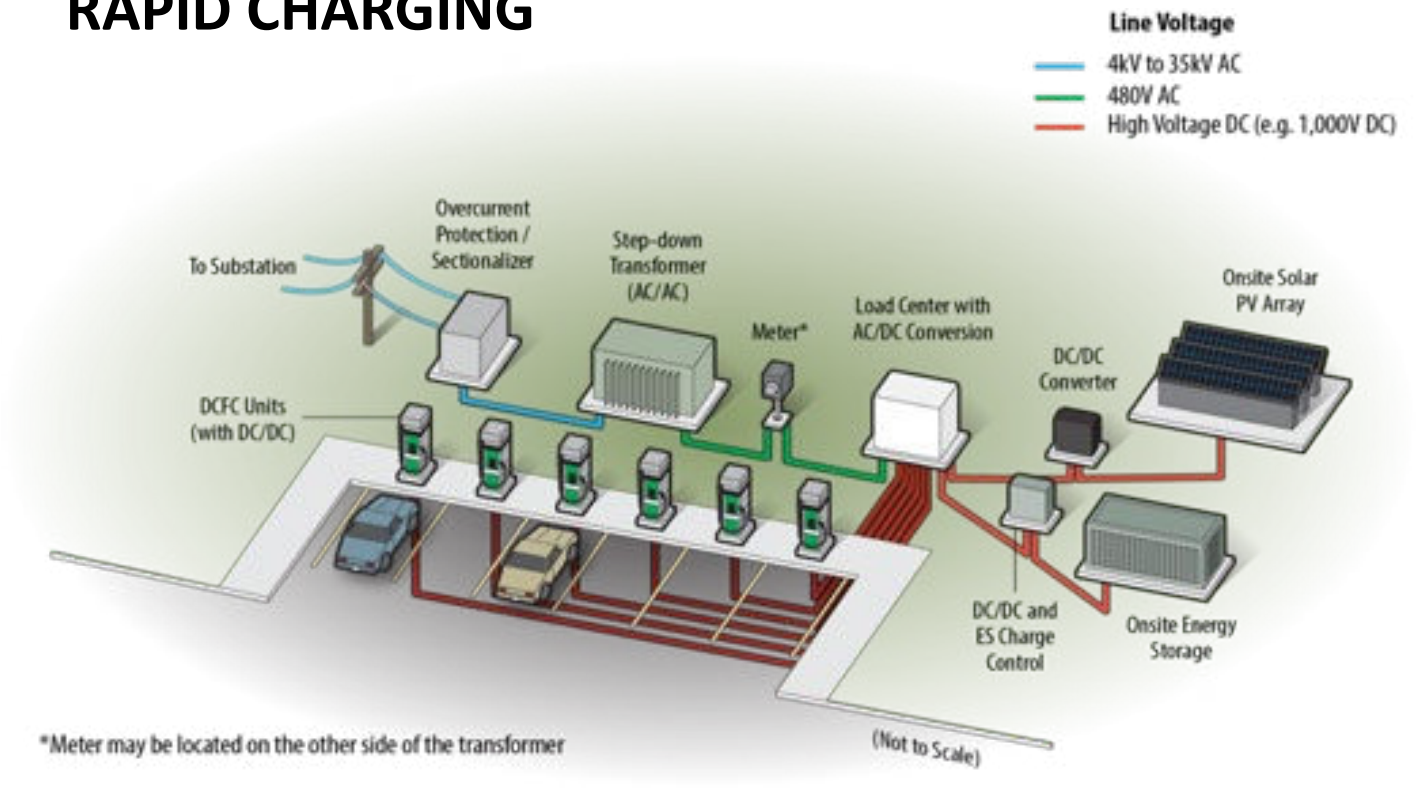
- Complex 24-hour Security
- Sector Security with Passcode Access Only
- Visual Barriers
- High Definition Monitoring

TRANSPORTATION ELECTRIFICATION

"THE WORLD IN 2030"

TRANSPORTATION ELECTRIFICATION

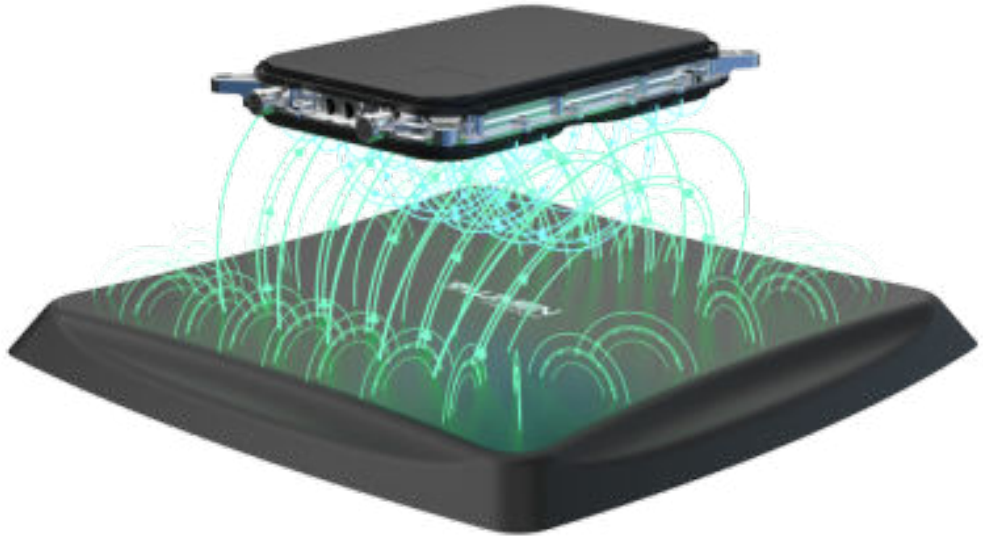
RAPID CHARGING



- ✓ Conventional paradigm
- ✓ Target: 15 min charge
- ✓ Costly infrastructure and demand charges
  - INL study: huge investment for “station” model
  - Anticipated $5-6 per gallon equivalent energy costs
- ✓ Rapid battery degradation with repeated fast charge
- ✓ Not as suitable for larger vehicles, fleet vehicles, or autonomous vehicles broader adoption among MDV, HDV, longer range/fleets (including LDV)

TRANSPORTATION ELECTRIFICATION

LUMEN FREEDOM



TRANSPORTATION ELECTRIFICATION

Inductive Wireless Charging Pavement Impacts

TRANSPORTATION ELECTRIFICATION

SUNTRAX®

Thank You

FDOT

FLORIDA'S TURNPIKE

The Hub for Innovative Materials – Concrete Test Road and More

Sue Zheng, PhD, PE
Director, Office of Materials
Florida Department of Transportation

Florida Department of TRANSPORTATION

The Hub for Innovative Materials

US 301 Concrete Test Road and More

Outline

- ✓ **FDOT Pavement Testing Facilities**
  - *HVS*
  - *Concrete Test Roads*
- ✓ **Pavement Marking Assessment**
  - *State of Practice Today*
  - *Future Focus – On-going Research*
- ✓ **Pavement Condition Assessment**
  - *Quality of "Bread and Butter" - LCMS*
  - *Data Interpretation and Reporting*

FDOT's APT Facilities: Overview

✓HVS Test Track Lanes (State Materials Office, Gainesville, FL)

- *Started in 2000*
- *10th Round (HVS 10) Studies Are Ongoing*

✓US-301 Concrete Test Road (Clay County, FL)

- *Test Road Opened to Traffic (March 14. 2023)*
- *First Performance Monitoring Completed (August 18. 2023)*

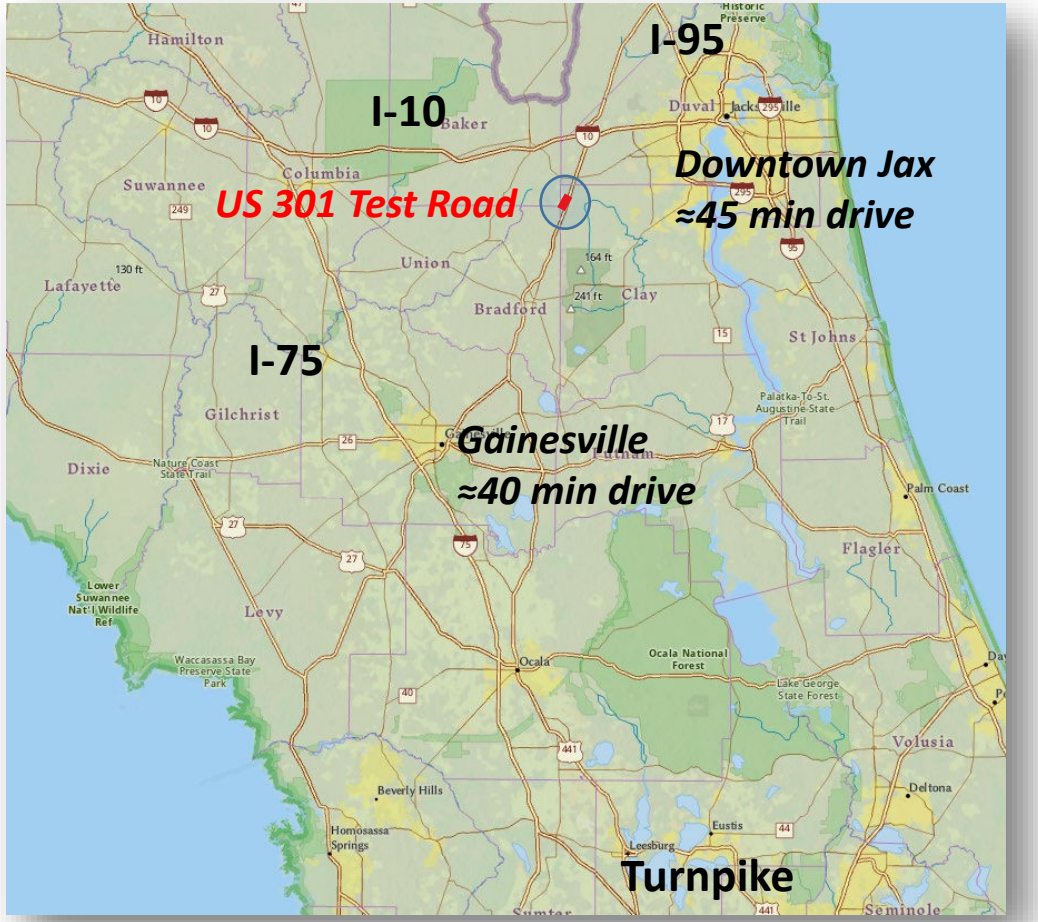
✓US-301 Asphalt Test Road (Clay County, FL)

- *Experimental Design Completed*
- *Construction Starts September 2023*

Concrete Test Road: Location

✓Location

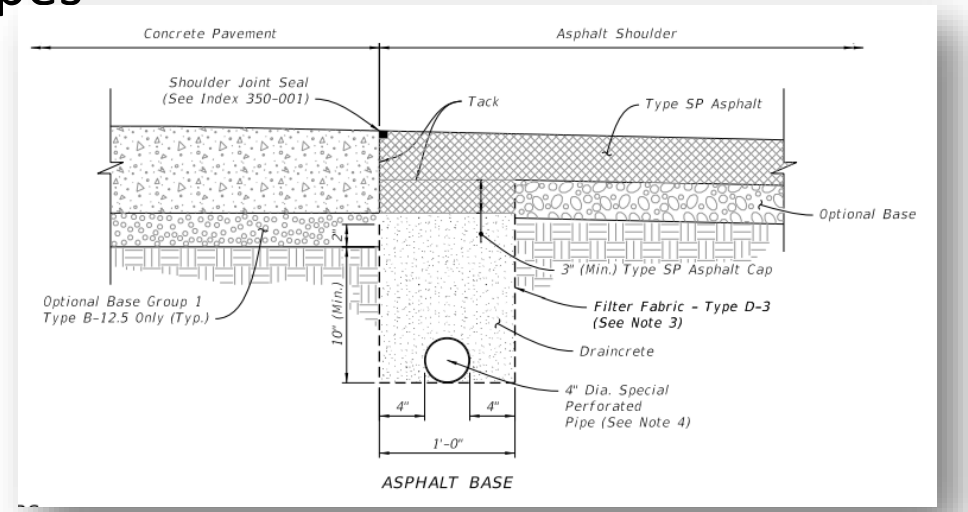
- *Clay County, US 301 (SR 200)*
- *Adjacent to Existing NB Lanes*
- *Significant Truck Corridor Connecting SW & NE Florida*
- *Interconnects Multiple Seaports and Rail Yards*



Concrete Test Road: Objectives

✓Objective

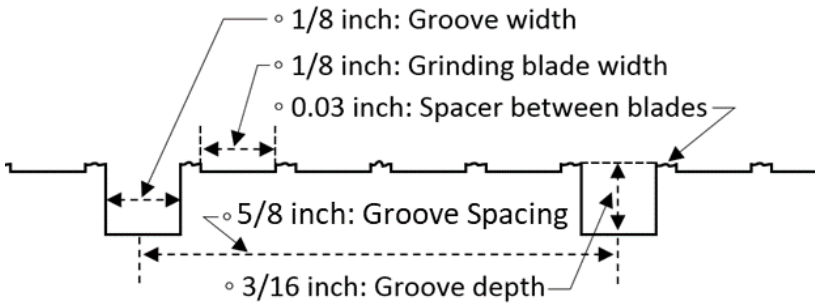
- ***Structural Experiment***
  - Identify Optimum Concrete Pavement Design in Florida
  - Evaluate the Performance of Alternative Base Types
- ***Drainage Experiment***
  - Identify the Effectiveness of Edge Drains
  - Should Be Required for All Concrete Pavements?
- ***Calibration Experiment***
  - Calibrate Pavement ME Cracking Models



Concrete Test Road: Surface Characteristics

✓Applied Texture Types

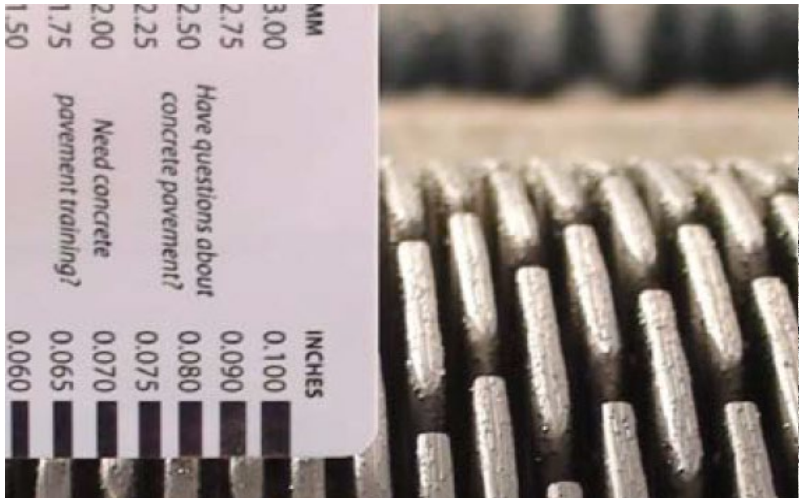
- Next Gen. Concrete Surface

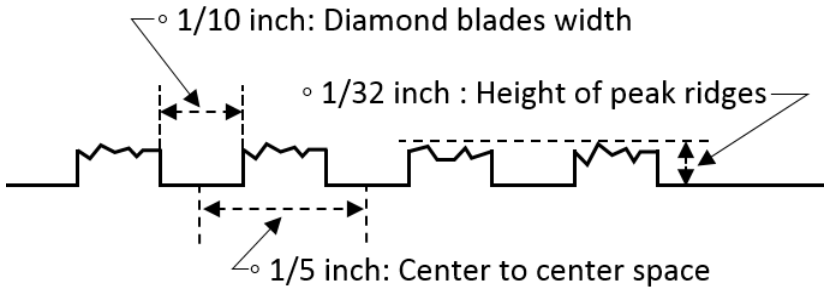


- Standard Bridge Deck Texture

L Grinding + T Grooving

- Longitudinal Diamond Grind





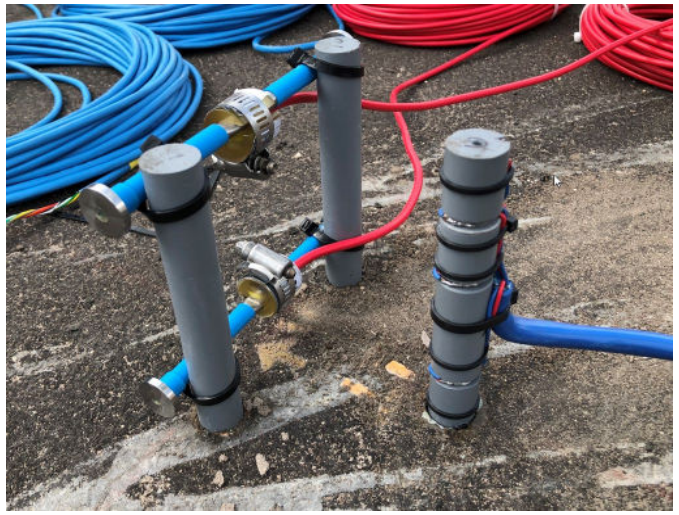
Concrete Test Road: Instrumentation

✓Pavement Response

- *760 Environmental Strain Gauges*
- *470 Dynamic Strain Gauges*
- *250 Fiber Optic Strain Gauges*

✓Temperature and Moisture

- *770 Thermocouples*
- *40 Moisture Probes*



Concrete Test Road: Instrumentation

- ✓ ***Environmental Condition***
  - *2 Weather Stations*
  - *4 Monitoring Wells*
- ✓ ***Effectiveness of Edge Drain***
  - *8 Edge Drain Sensors*
    - How Much Water Is Being Drained?
    - How Long Do They Remain Functional?

Concrete Test Road: Data Migration

✓Sensor Data Transfer

FDOT Network
SMO SQL Database

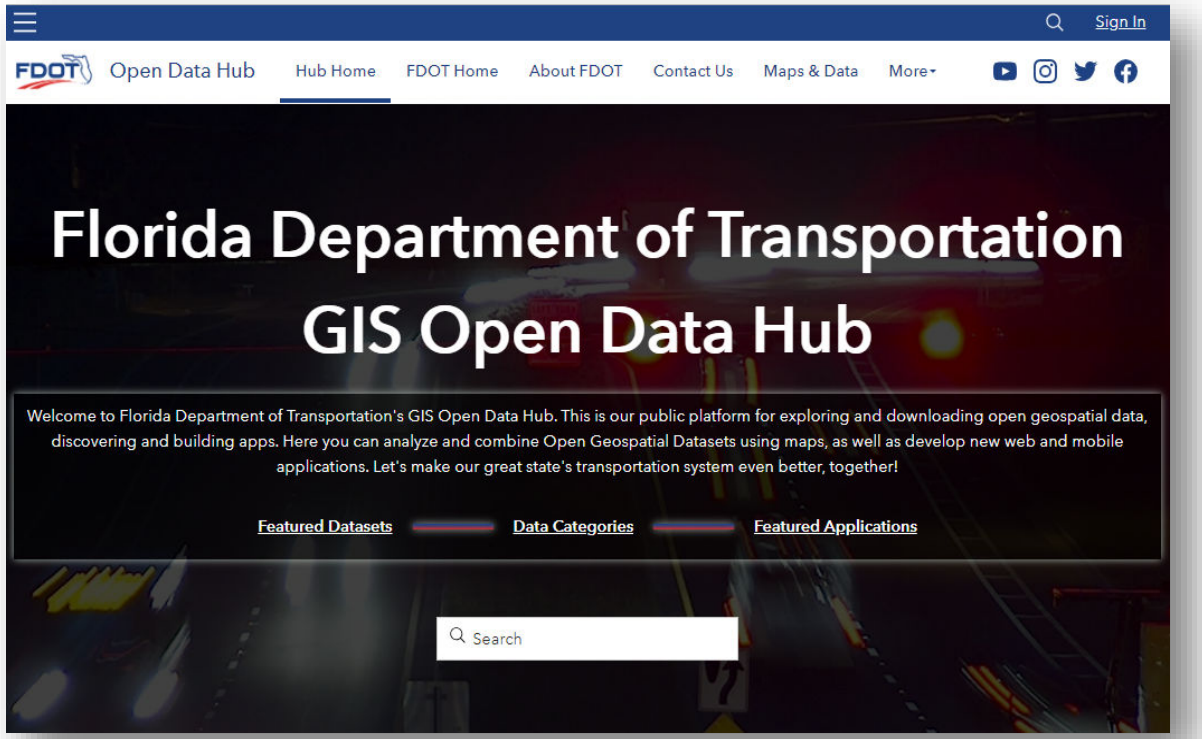
Concrete Test Road: Data Migration

✓SQL Server database (Internal)

- Construction History
- Material Test Results
- Performance Monitoring Data
- Instrumentation Data
- LTPP structure for tables/modules

✓FDOT Open Data Hub (Public)

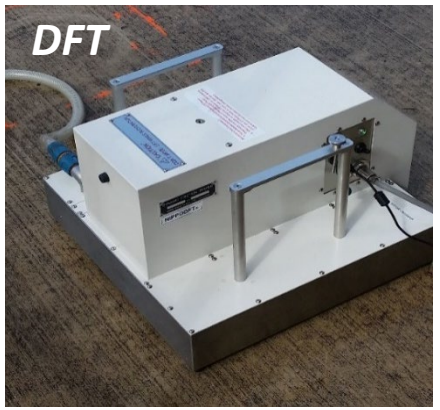
- Internet/ Web Access
- GIS Based Data



https://gis-fdot.opendata.arcgis.com/

Concrete Test Road: Performance Monitoring

✓Testing Equipment



And More: Pavement Marking Assessment

✓Statewide pavement marking retroreflectivity testing

- Mobile Retroreflectivity Unit (MRU)
- Improves safety for the traveling public and field personnel

✓On-Going Research

- Reflective pavement markings (RPM) assessment with MRU
- Pavement marking contrast assessment with MRU
- Wet weather marking material assessment (in the laboratory) with MRU

And More – Pavement Condition Assessment

- ✓ ***Quality of "Bread and Butter" – Introducing Laser Crack Measurement System***
  - From Human to Machine
  - From Qualitative to Quantitative
- ✓ ***Data Interpretation and Reporting***
  - From Data to Image
  - From Image to Rating

And More – Integration?

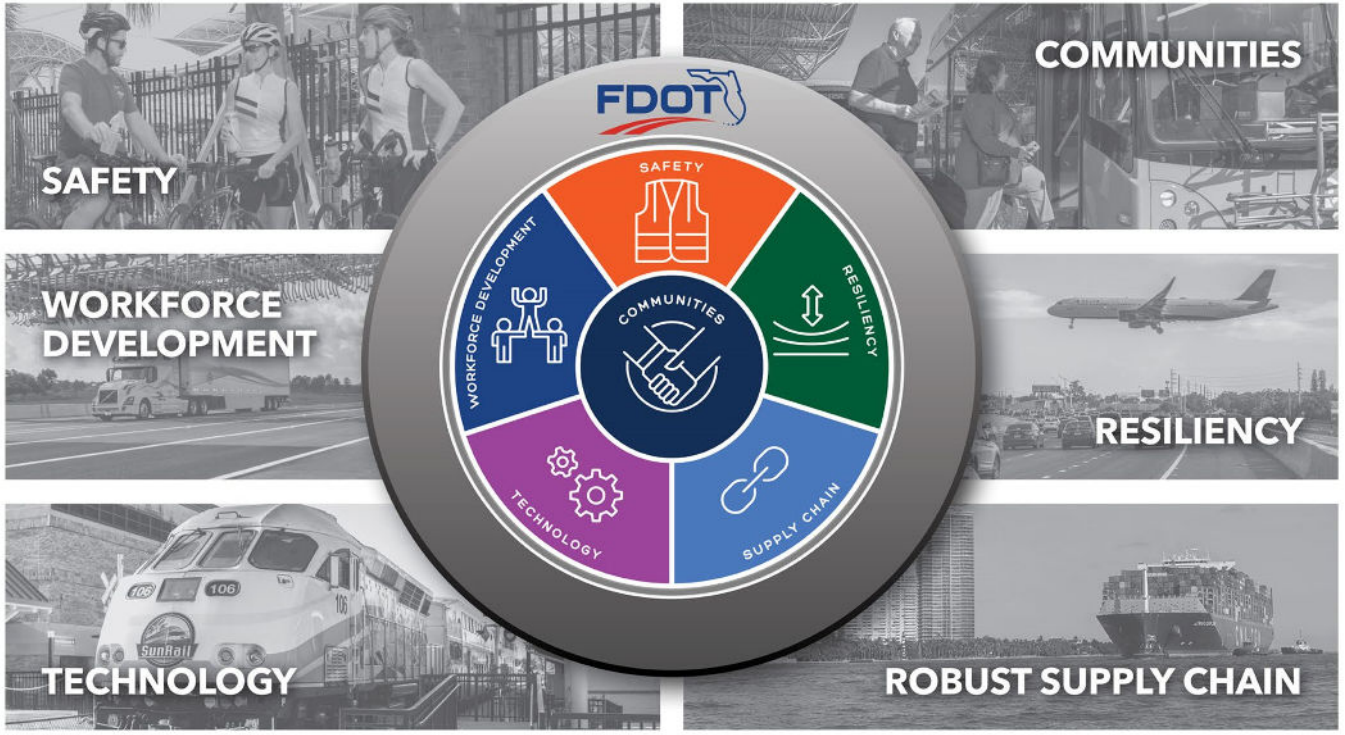
✓ ***Opportunities***

- Real-Time Road Condition Monitoring
- Enhanced Safety
- Cost Efficiency

✓ ***Challenges***

- Data Volume
- Interoperability
- Specialization and Generalizations

Questions?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TECHNOLOGY
SUPPLY CHAIN

The I-STREET Living Lab: A Resource for Testing, Innovation, and Workforce Development

Lily Elefteriadou, PhD

Barbara Goldsby Professor of Civil Engineering and Director of the UFTI

UF | Transportation Institute
UNIVERSITY of FLORIDA

The I-STREET Living Lab: A Resource for Testing, Innovation, and Workforce Development

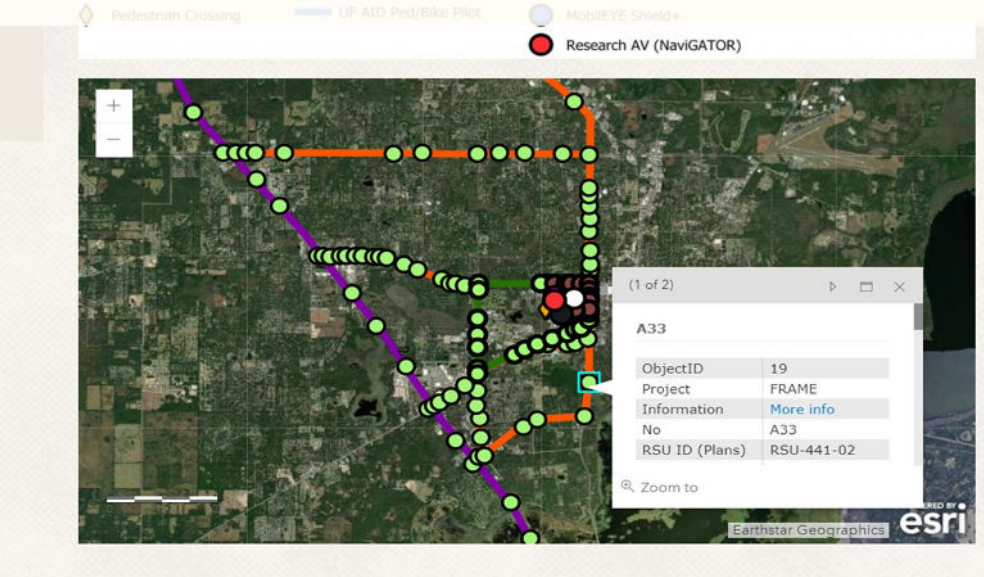
Dr. Lily Elefteriadou
Director, UFTI & Professor of Civil Eng.

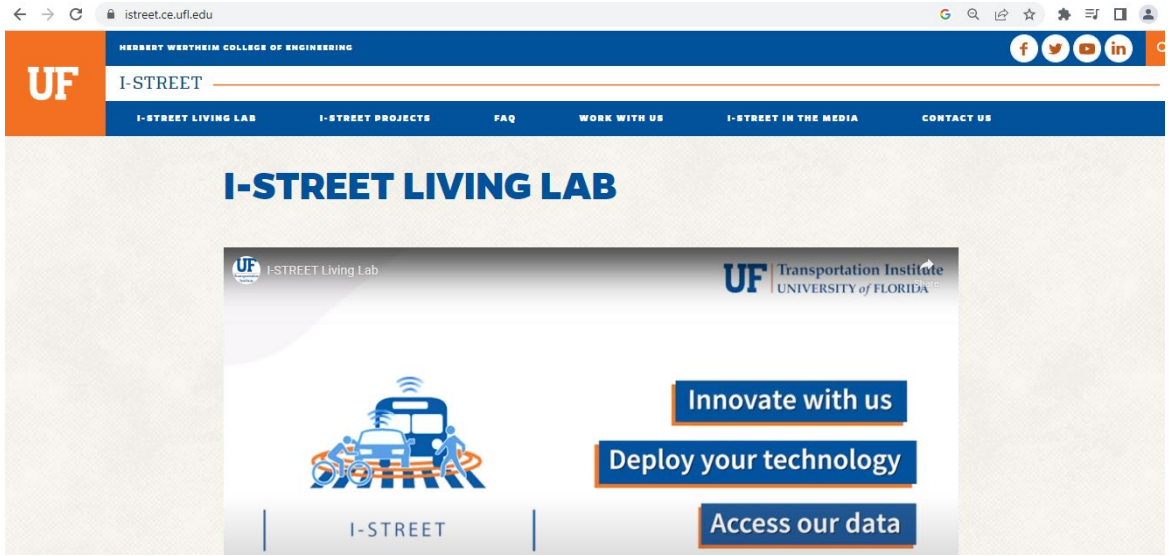
FAV Summit, September 8, 2023

I-STREET Living Lab

A Collaboration of the UFTI with FDOT, the City of Gainesville, and industry

istreet.ce.ufl.edu



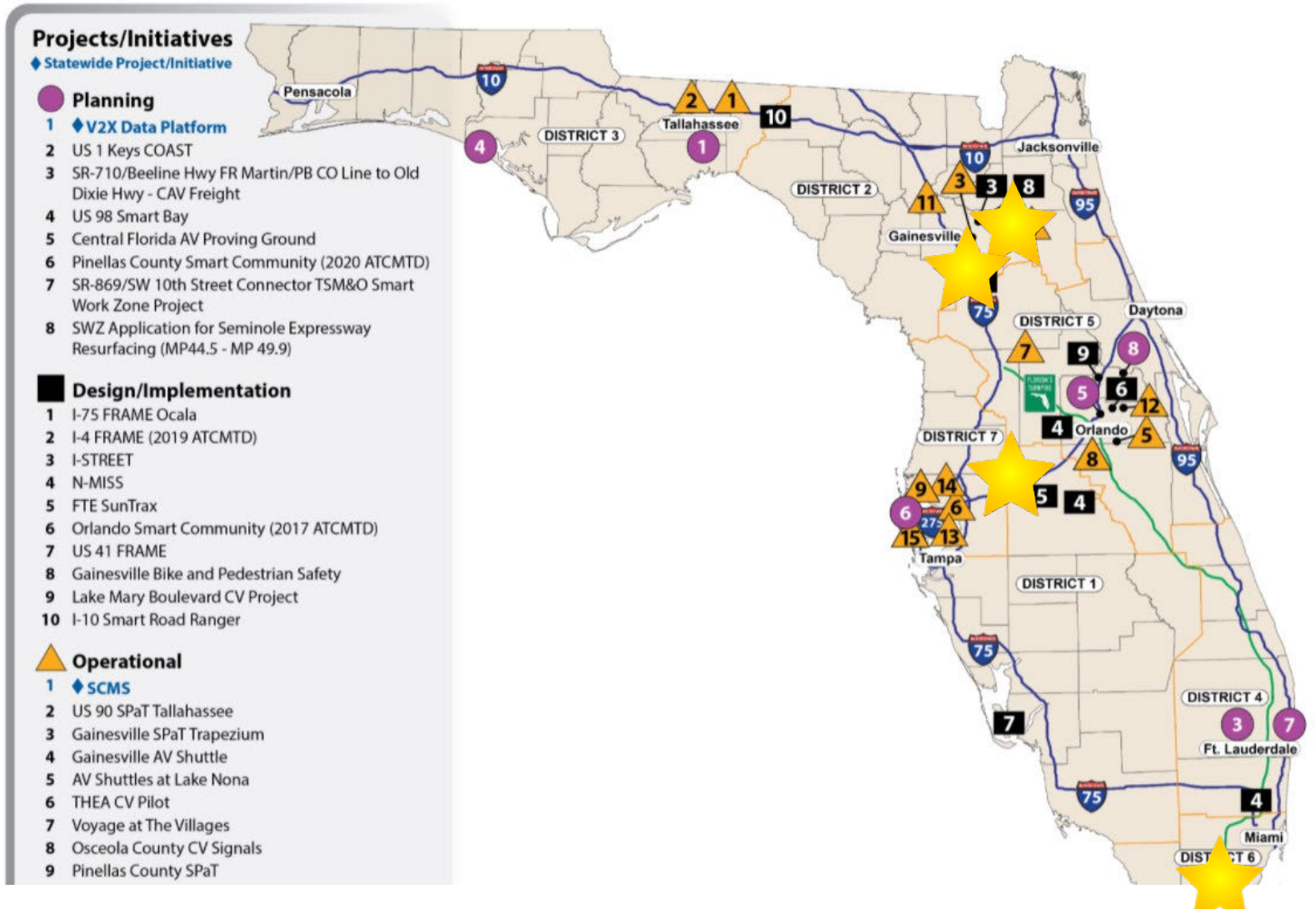


I-STREET (Implementing Solutions from Transportation Research and Evaluation of Emerging Technologies)

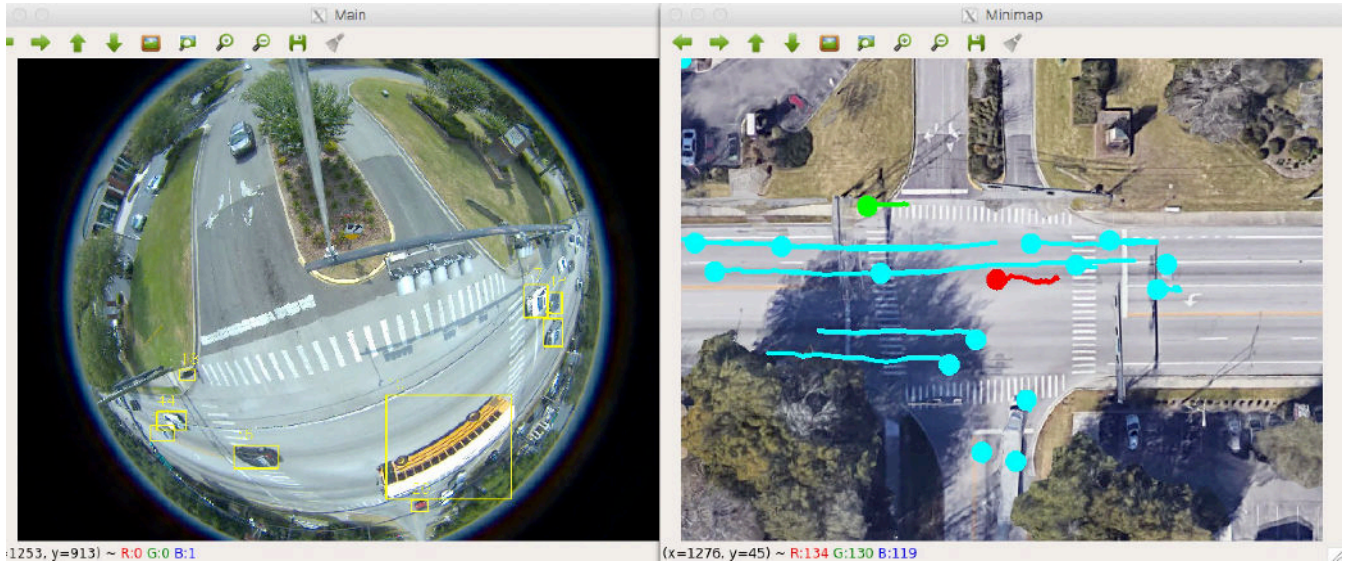
Research, Deployment, Education

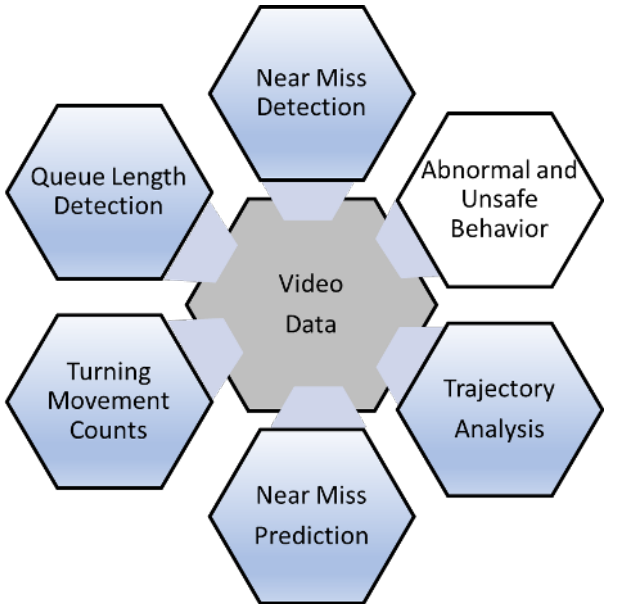
- **Collaboration** of UF, FDOT, City of Gainesville, industry partners
- Uses **advanced technologies** installed and embedded in the transportation infrastructure in Gainesville and across Florida.
- Examines **all modes** and evaluates the **system**
- Data, implementation, evaluations **across Florida**

The I-STREET Living Lab Across Florida



Artificial Intelligence-Based Video Processing

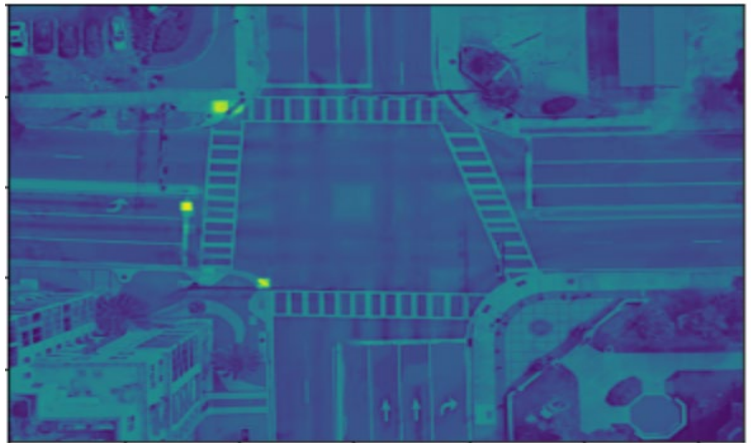




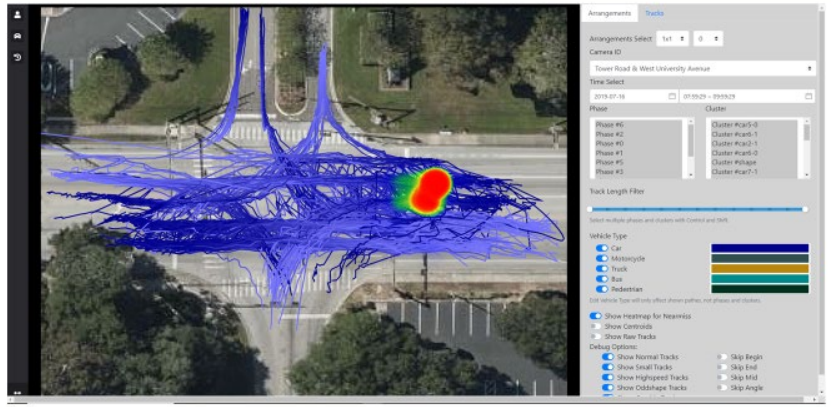
Real Time – 40 frames per second

Cyan: car Green: pedestrian Yellow: bus

Pedestrian to Vehicle Interactions



Vehicle to Vehicle Interactions



I-STREET DATA

Connected Vehicle Data

View Data

Autonomous Shuttle Data

View Data

Near-Miss Trajectory

View Data

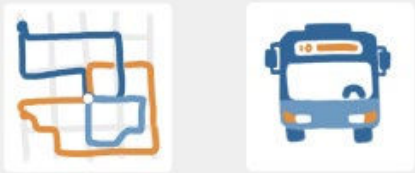
Freeway Speed Flow Data

View Data

Signalized Network Travel Time Data

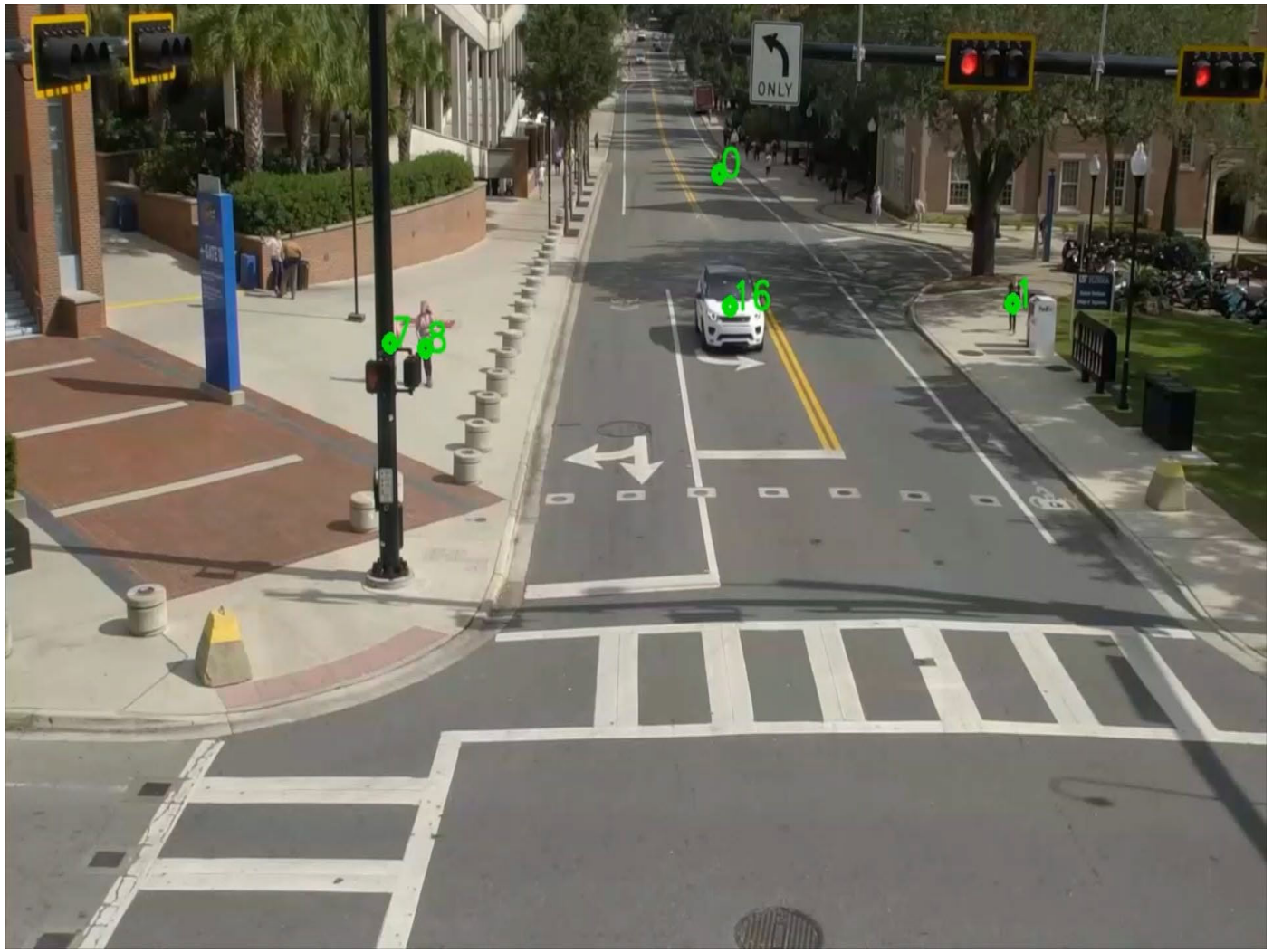
View Data

Transit Bus Data

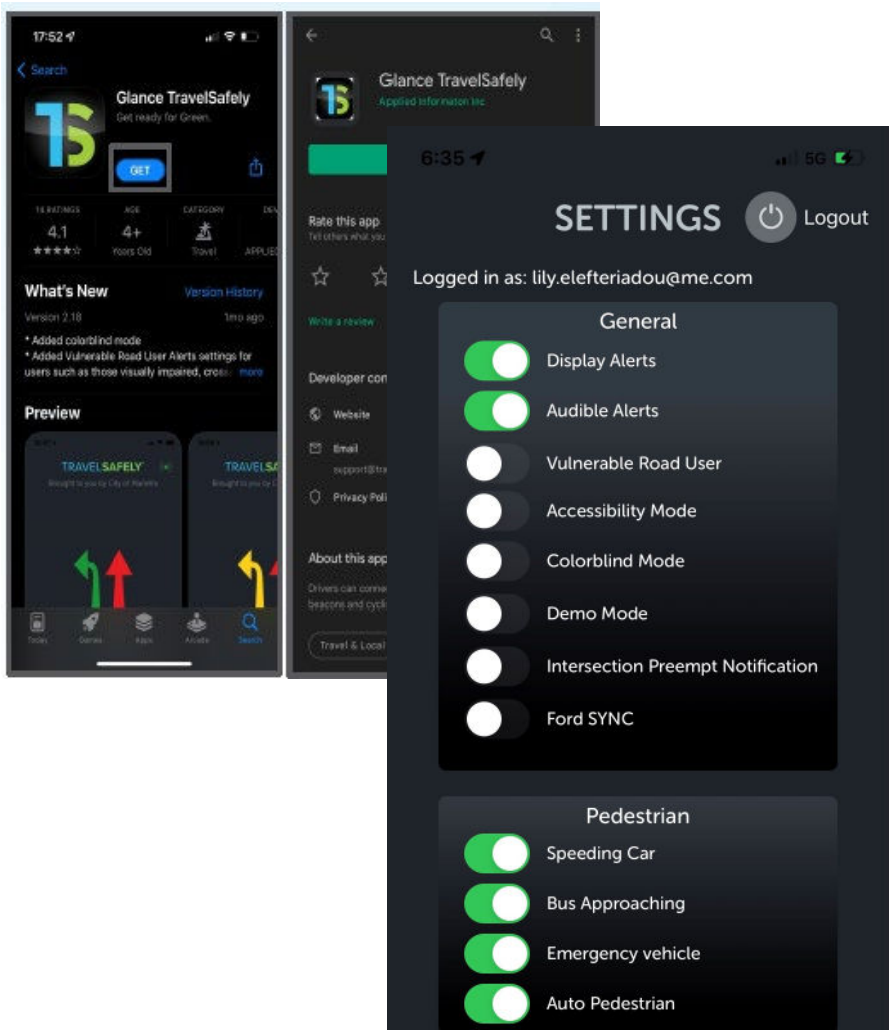


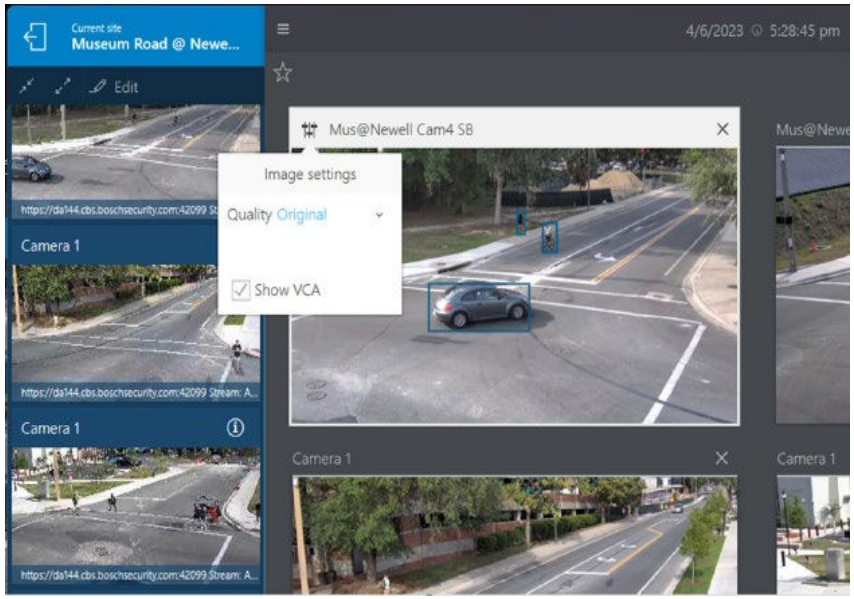
View Data

Sensor Fusion for Signal Control Optimization

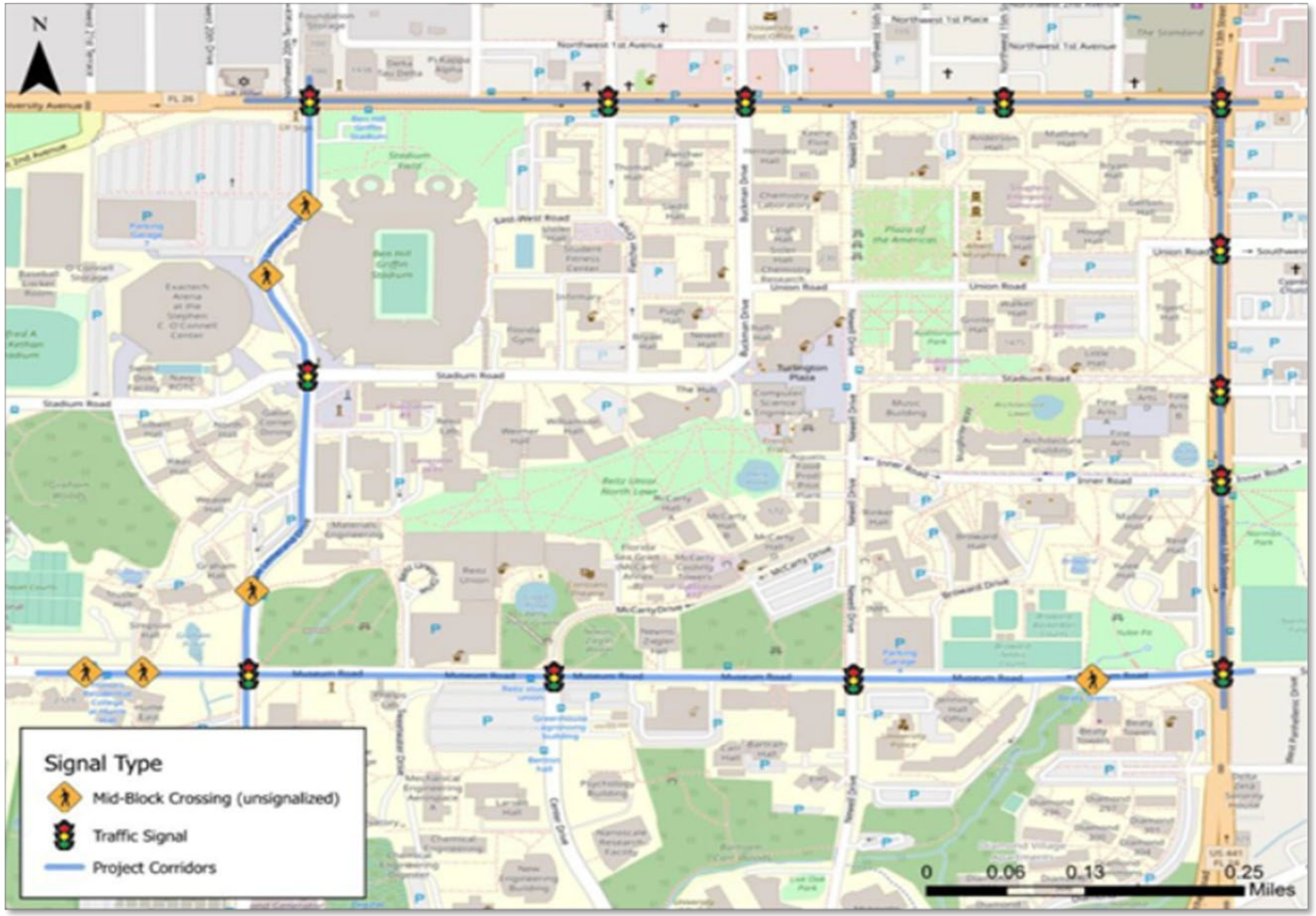


FDOT's UF–AID Project for Evaluating Pedestrian Detection and Warning





Development and Testing for Pedestrian Warnings



UF Transportation Institute

FDOT

City of Gainesville every path starts with passion Florida

applied INFORMATION

BOSCH

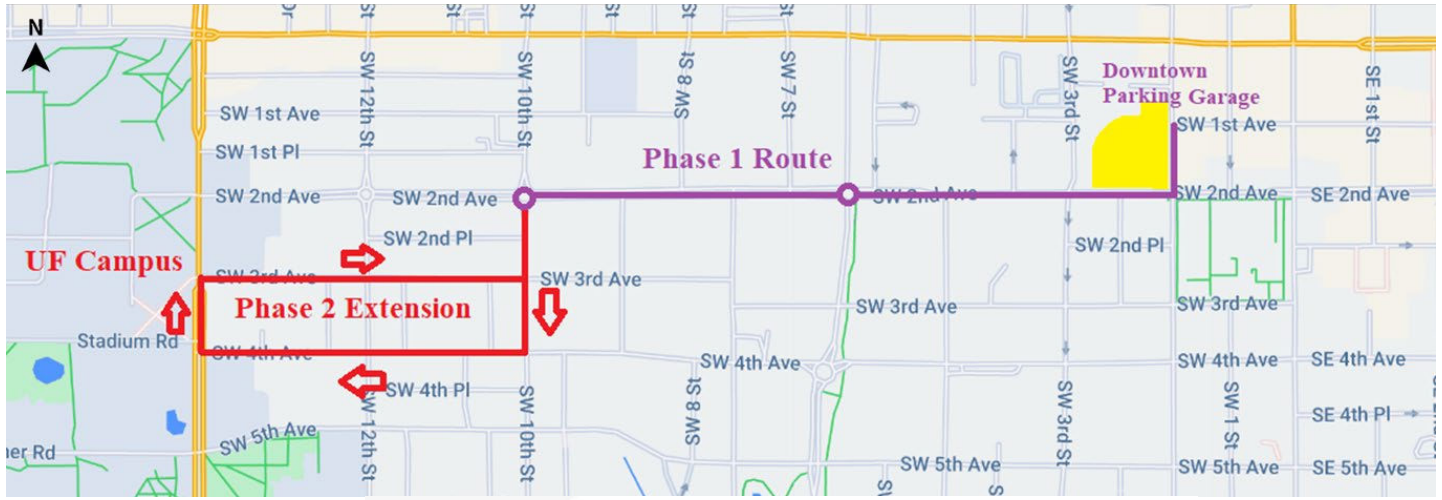
Temple

YUNEX TRAFFIC

BRANDMOTION SOLUTIONS

Testing at Suntrax during OmniAir's Plugfest (May 2023)

Gainesville Autonomous Shuttle



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I-STREET
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I-STREET Partners

What is next:

- Working with I-STREET Industry Council and Advisory Board to expand collaborations
- Developing data platform
- Expanding our workforce development efforts and disseminating results related to I-STREET

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