TN TDOT Department of Transportation

I-24 Smart Corridor
Iowa DOT ICM Peer Exchange

24 smart CORRIDOR

June 1, 2021

Iowa DOT ICM Peer Exchange
I-24 Smart Corridor

Agenda

- Mission & Goals
- Purpose & Need
- Our Solution: I-24 Smart Corridor
  - Short-Term, Intermediate, and Long-Term Deployments
- Project Schedule and Status
- Operations & Maintenance
  - Initial ICM Operation and Maintenance Needs
  - ICM Coordinator Role
  - Local Agency Operations Support
- ICM Maintenance Expectations
- Ramp Meter Selection
- ATCMTD Grant Project for ICM DSS
- ICM Decision Support System
- Public Outreach for Project
  - Media Campaigns and Parties involved
- Challenges for Initial ICM Deployment in Tennessee

Mission & Goals

TDOT Mission:

*To provide a **safe and reliable transportation system** that supports economic growth and quality of life.*

I-24 Smart Corridor Mission:

*To improve the **safety and reliability of all travel** along the corridor through the proactive management of intelligent and connected infrastructure, and the formation of strong operational partnerships between local and state agency stakeholders.*

I-24 Smart Corridor Goals:

Goal 1: Increase Travel Time Reliability

Goal 2: Increase Mobility of all Modes

Goal 3: Reduce the Concentration of Crashes

Goal 4: Develop Agency Coordination

I-24 Smart Corridor Purpose and Need

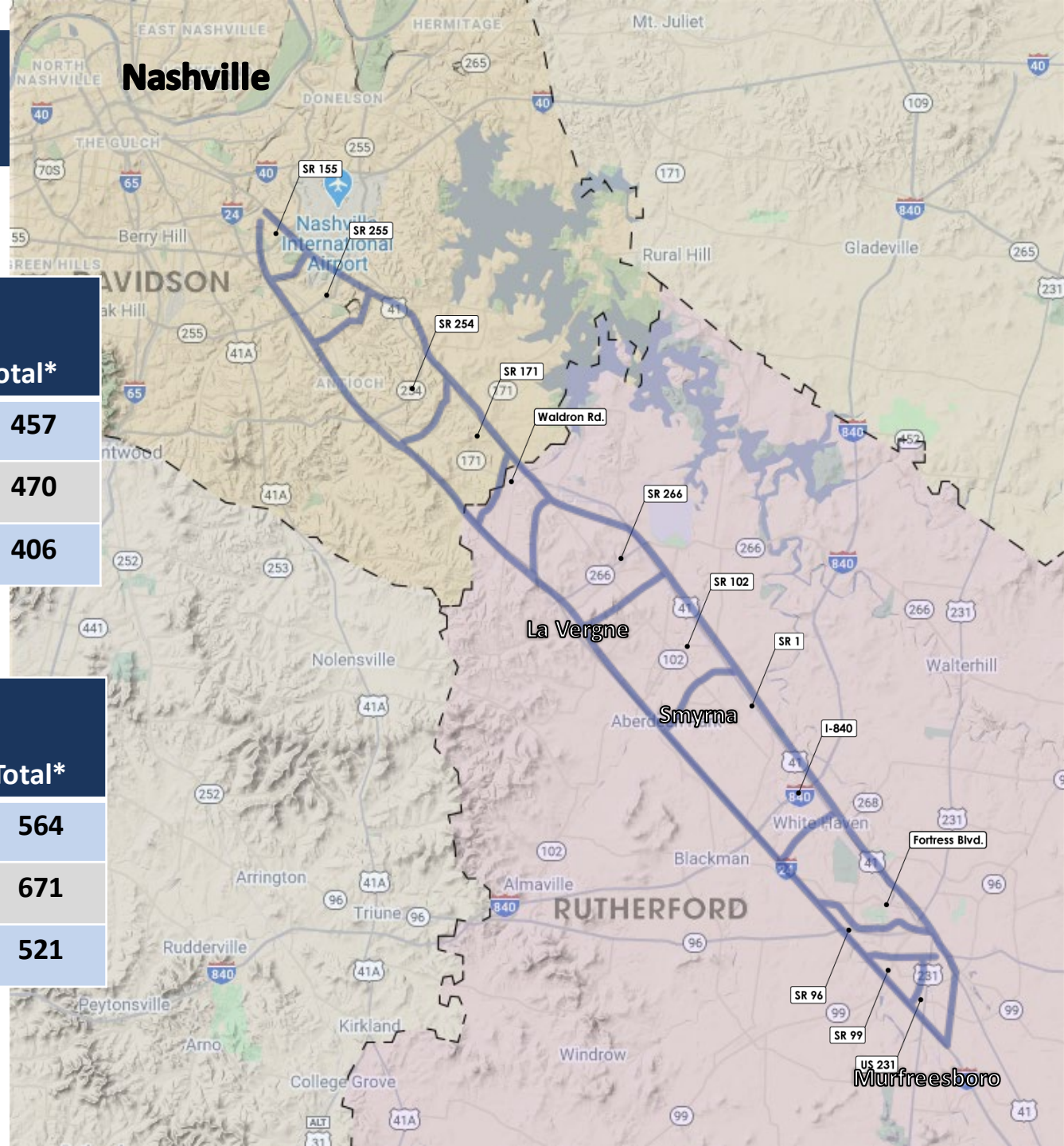
Safety

I-24	Fatal Crashes	Major Injury Crashes	Minor Injury Crashes	Prop Damage Crashes	Total	Total*
2018	5	26	184	567	**776**	**457**
2019	3	10	200	663	**876**	**470**
2020*	1	17	82	306		**406**

*Data as of mid-August 2020

SR-1	Fatal Crashes	Major Injury Crashes	Minor Injury Crashes	Prop Damage Crashes	Total	Total*
2018	2	14	223	764	**1003**	**564**
2019	4	23	261	802	**1090**	**671**
2020*	3	10	126	372		**521**

*Data as of mid-August 2020



I-24 Smart Corridor Purpose and Need

Reliability

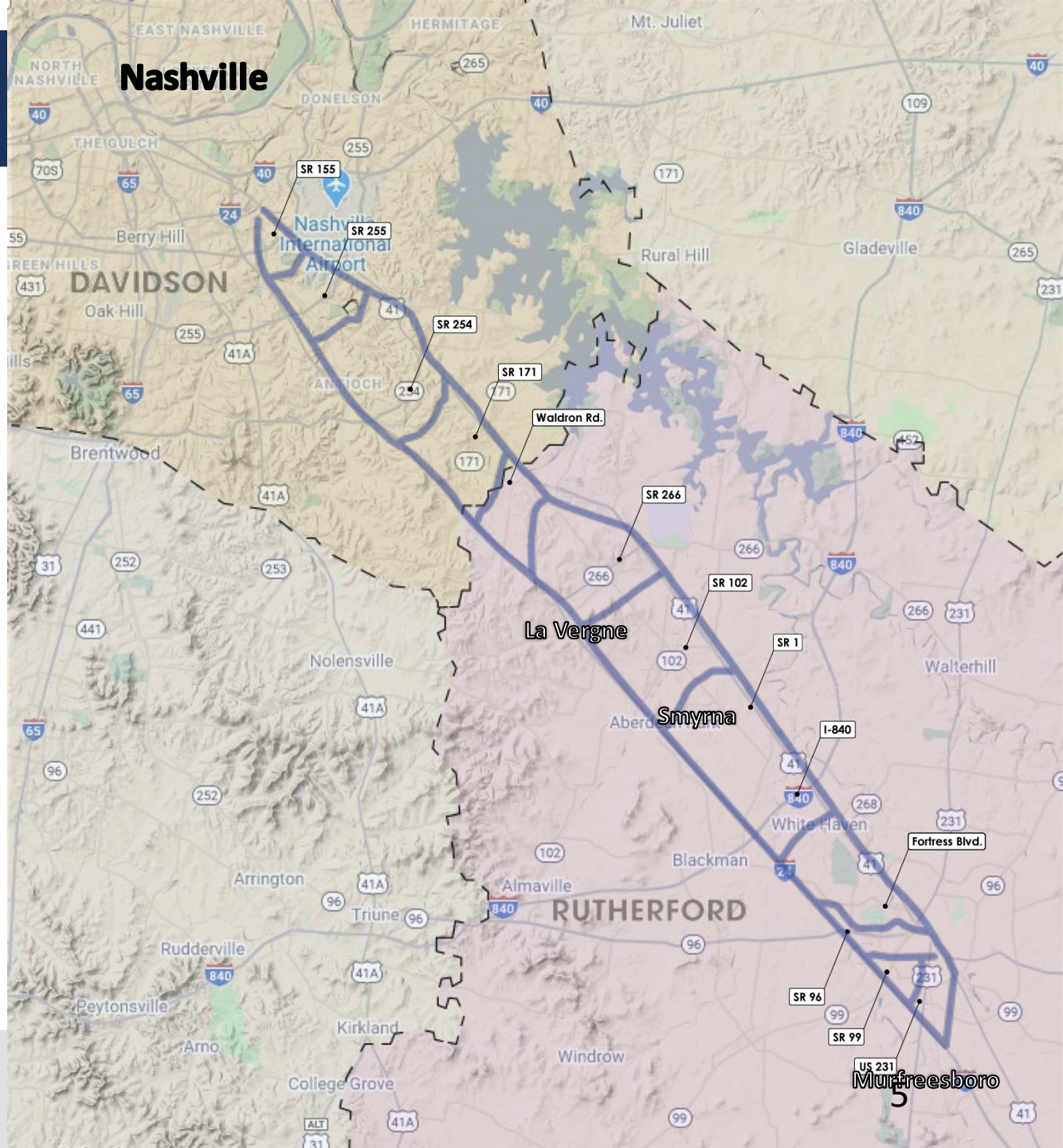
System Wide Peak Periods:

6:30 am – 8:30 am and **4:00 pm – 6:00 pm**

I-24	AM Peak Travel Time Index (TTI)	PM Peak Travel Time Index (TTI)
2018	1.52	1.35
2019	1.38	1.40

SR-1	AM Peak Travel Time Index (TTI)	PM Peak Travel Time Index (TTI)
2018	1.31	1.48
2019	1.19	1.39

Based on weekday averages (M-F)



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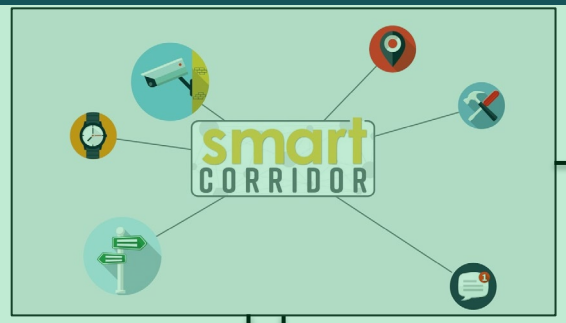
Our Solution: I-24 Smart Corridor

Integrated Corridor Management (ICM)



Incident Management

Traditional/Reactive

Traffic Management

Novel/Proactive

Improve Situational Awareness

Installation of Devices that **GET** information:

- CCTVs
- Radar
- DSRC
- Probe

Improve Communication with The Public

Installation of Devices that **GIVE** information:

- DMS (roadside)
- DMS (overhead/ over lane)
- DSRC

Improve Operations of the Corridor

Strategies that improve traffic flow:

- Ramp extensions
- Emergency pull-offs
- Active Lane Management
- Ramp meter system
- Upgraded signal equipment and software

Improve Management of the Corridor

- Improved processes for O&M
- Decision Support System (DSS)
- Interagency Coordination

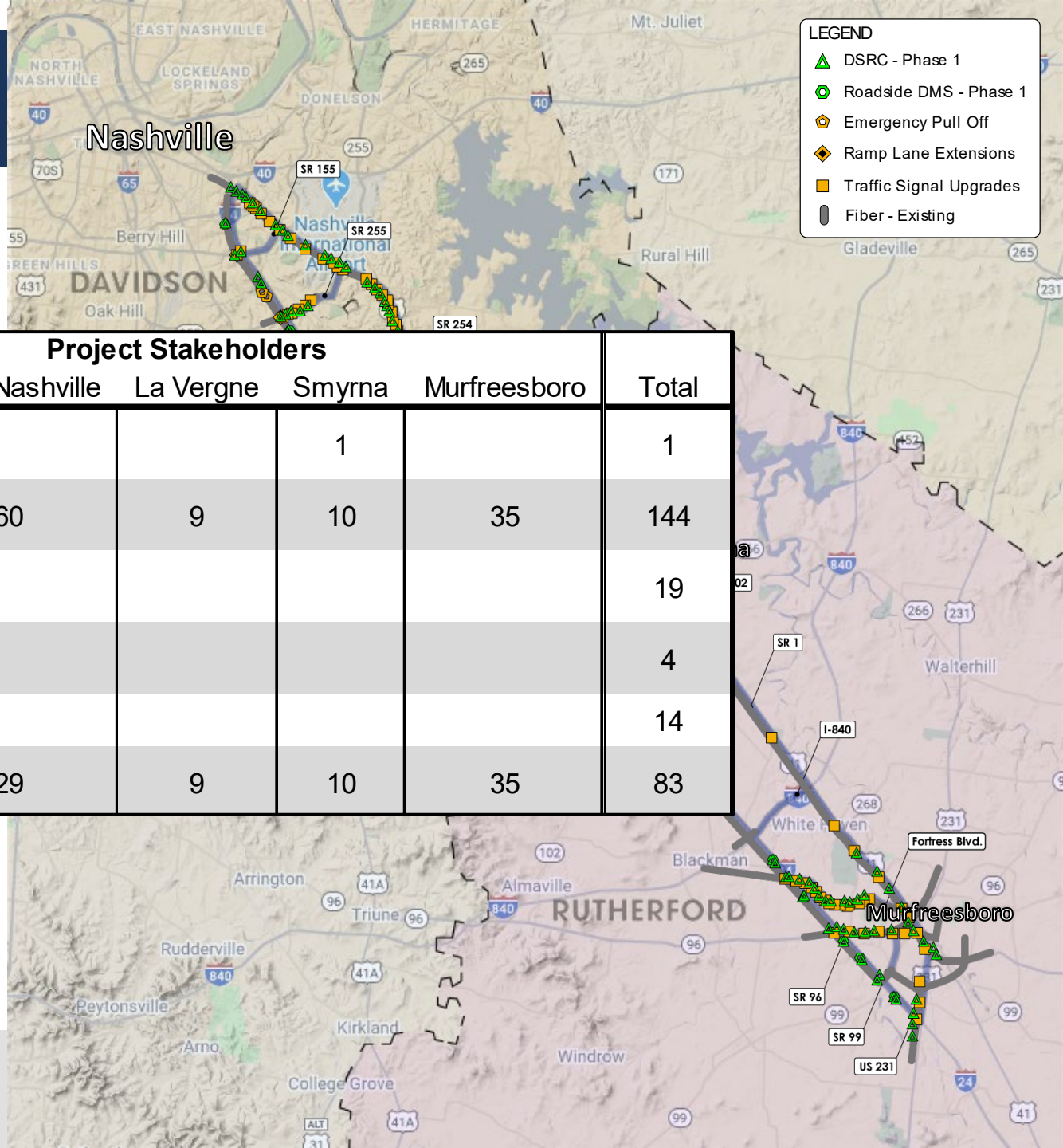
Short-Term Deployments

Physical improvements to be deployed with

I-24 Smart Corridor Phase 1 (CNS300)

- Communication Ne
  Gap Closures)
- Dedicated Short Ra
- Interstate Roadsid
- Interstate Ramp La
- Interstate Emerger
- Arterial Signal Syst
  Upgrades)

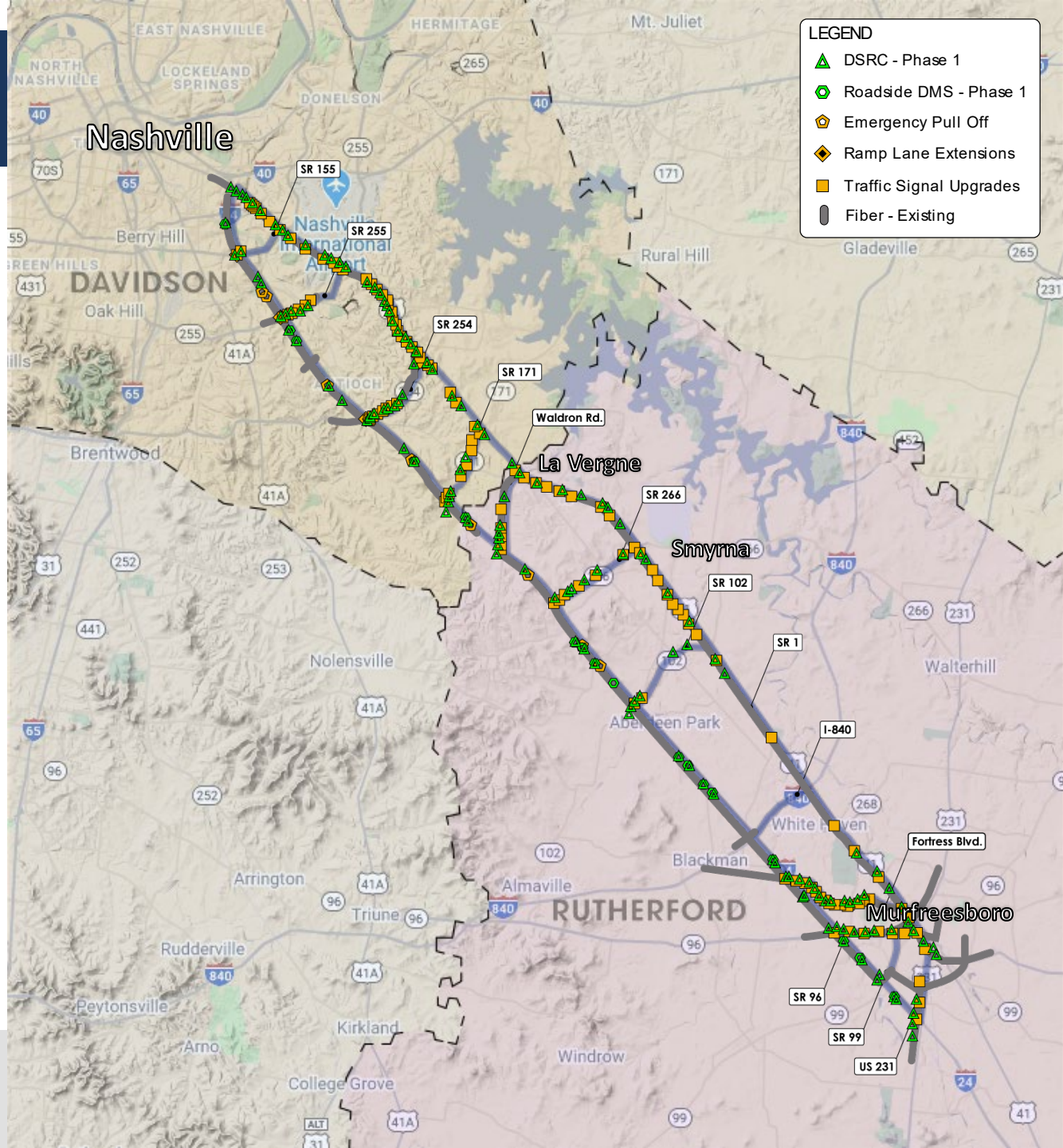
Improvement	Project Stakeholders					Total
	TDOT	Metro Nashville	La Vergne	Smyrna	Murfreesboro	
Communication Network Improvements				1		1
Dedicated Short Range Communications (DSRC)	30	60	9	10	35	144
Interstate Roadside Dynamic Message Signs	19					19
Interstate Ramp Lane Extensions	4					4
Interstate Emergency Pull-offs	14					14
Arterial Signal System Upgrade (Controller Upgrades)		29	9	10	35	83



Short-Term Deployments

Operational Improvements

- Signal Timing Optimization
- Update TDOT TMC Procedures
- Improve Operational Coordination for Incident Management
- MOEs, Bluetooth, Centracs tools for active arterial management



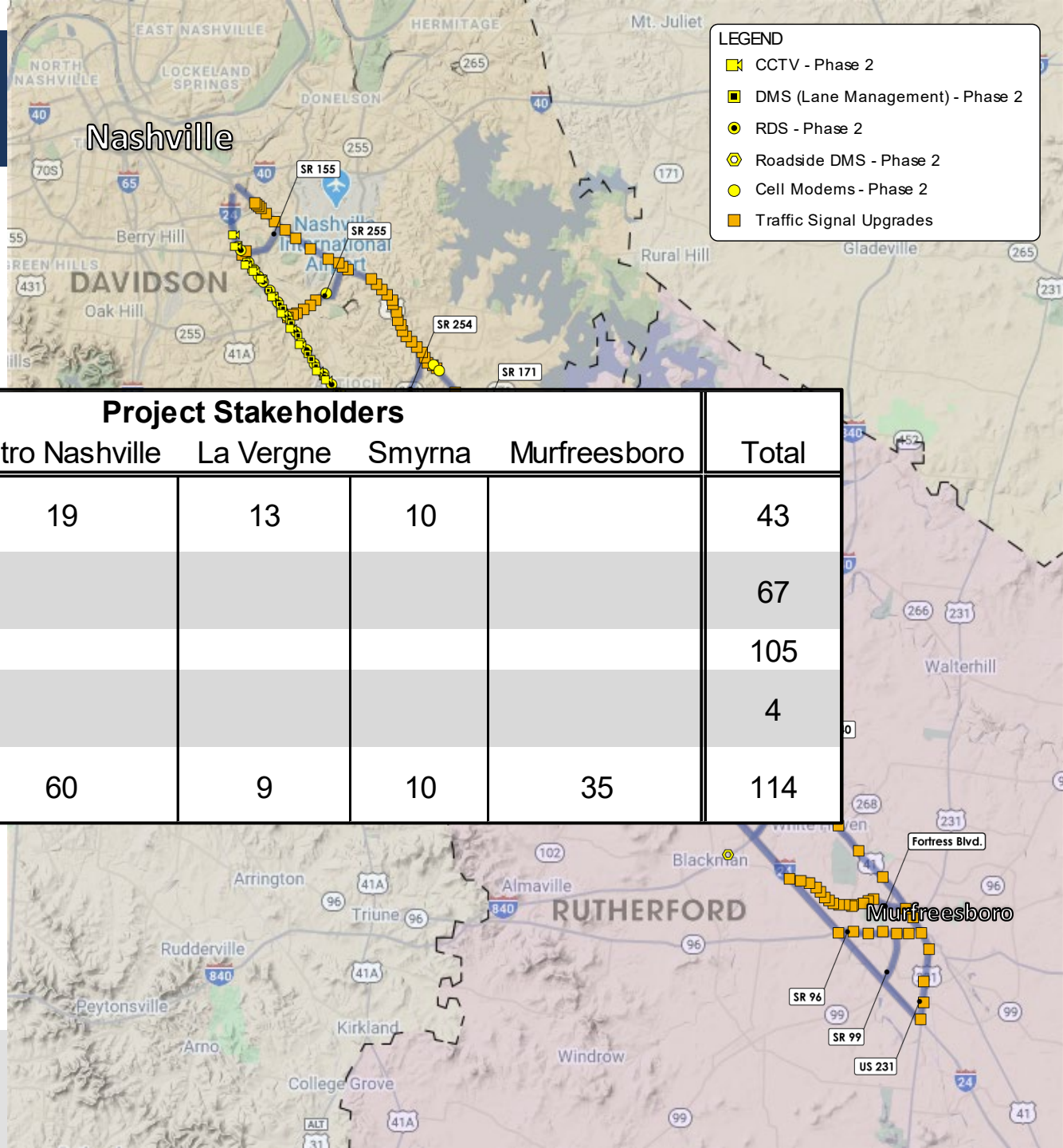
Intermediate-Term Deployments

Physical improvements to be deployed with

I-24 Smart Corridor Phase 2 (CNT356)

- Communication Network Improvements (Added Capacity to the I-24 Trunk Line)
- Interstate Overhe
  Lane Managemer
- Interstate Sensor
  Management 14.
- Interstate Roadsi
  Upgrade (Detecti
- **Contract was**
  - **The projec**
    acceptanc

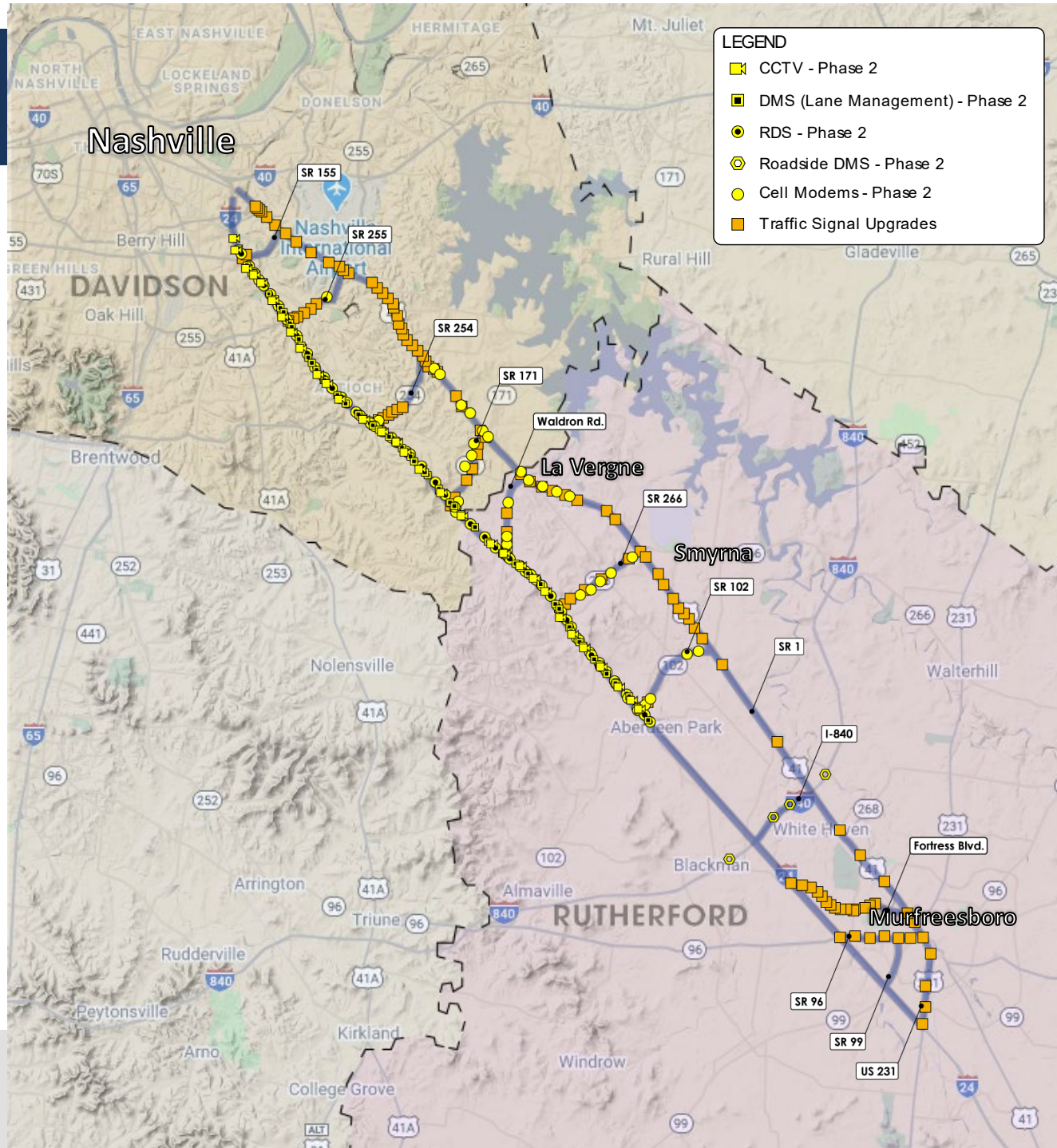
Improvement	Project Stakeholders					Total
	TDOT	Metro Nashville	La Vergne	Smyrna	Murfreesboro	
Communication Network Improvements (Fiber & Cell Modems)	1	19	13	10		43
I-24 Overhead / Overlane DMS	67					67
I-24 Sensor Upgrades	105					105
I-840 Roadside Dynamic Message Signs	4					4
Arterial Signal System Upgrade (Detection Upgrades)		60	9	10	35	114



Intermediate-Term Deployments

Operational Improvements

- Update Interstate Incident Management Response Plans
- Develop Active Lane Management Procedures
- Develop Arterial Flush Plans



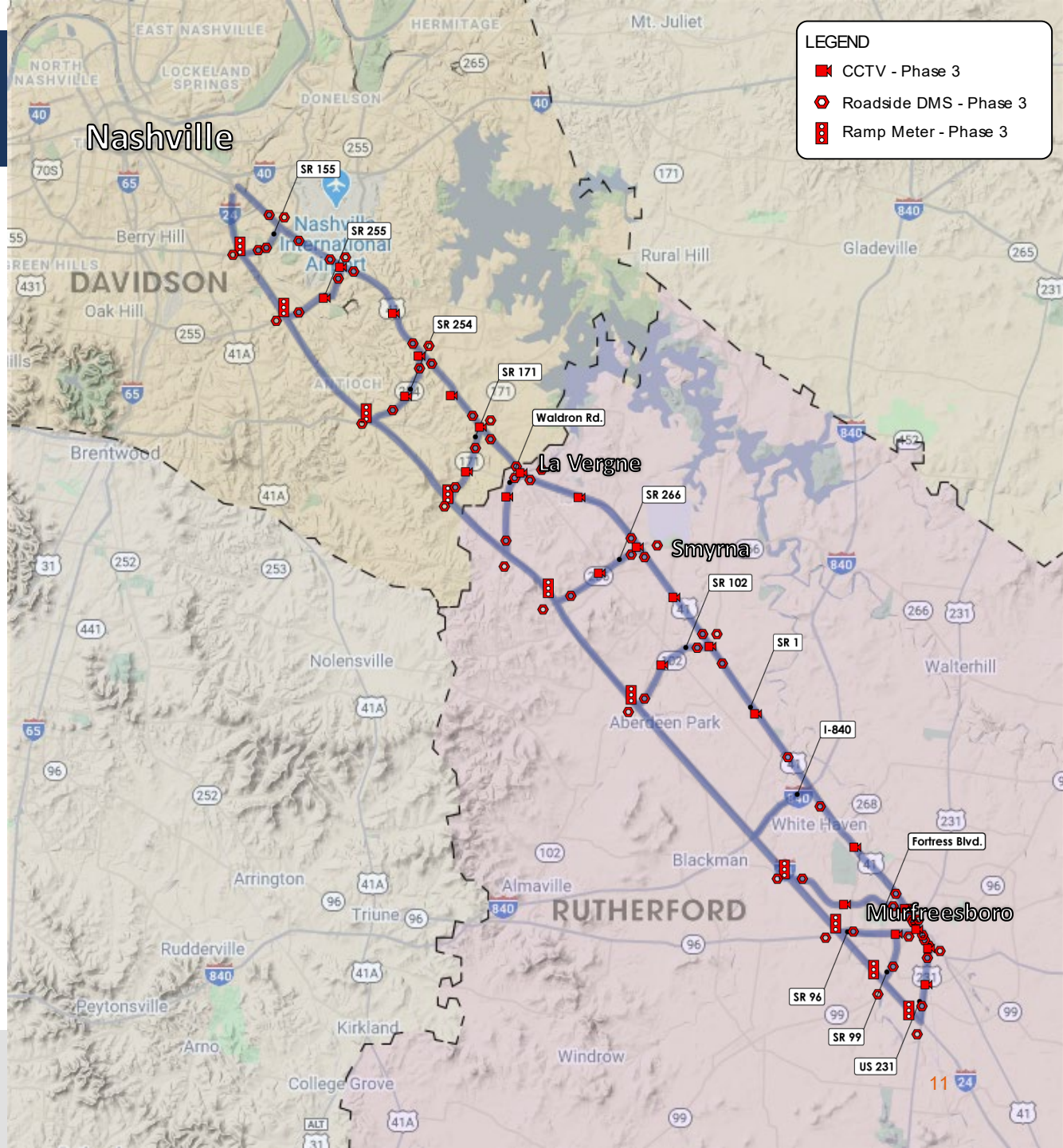
Long-Term Deployments

Proposed physical improvements (Phase 3)

- Communication Network Improvements (Complete Regional Network)
- Interstate Ramp Metering
- Arterial CCTVs, Arterial DMS
- Arterial Operational Improvements (Including ADA accommodations)
- **Phase 3 is projected to let in Fall of 2022**

Proposed operational improvements

- Develop Decision Support System (ATCMTD Grant)
- Interstate Bus on Shoulder (BOS)
- Integrate Staffing, Maintenance, and Operations Plan
- Provide Network Interface Enhancements



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Project Schedule – overall

Phase 1 *(CNS 300)*

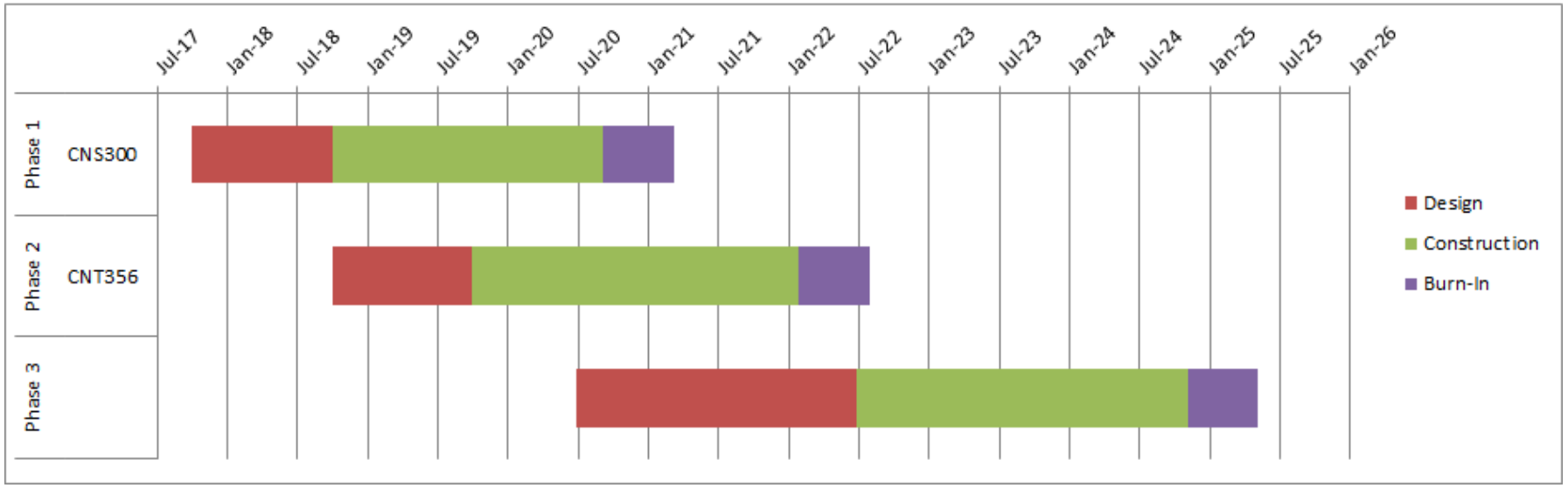
- Contract was awarded October 30, 2018 ($18,688,440.80)
- The project is currently on schedule for conditional acceptance in Spring of 2021

Phase 2 *(CNT 356)*

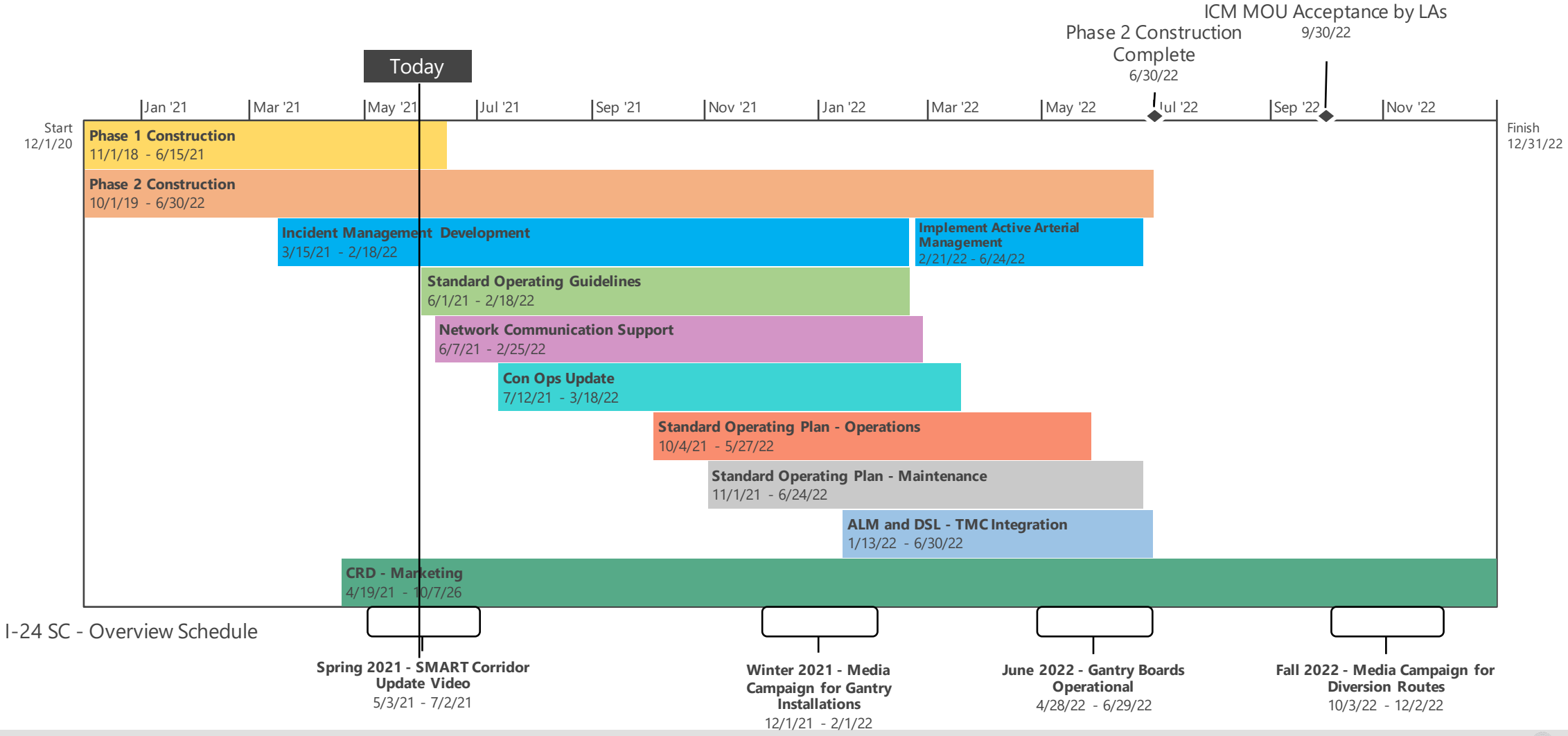
- October 2019 Letting
- Construction award: $45,778,075.30

Phase 3

- Projected Letting for Fall of 2022



Project Schedule – O&M Program



Project Status

- Active Lane Management and Variable Speed Limits
  - Development of Scenarios, Algorithms, and SOGs
- Development of Incident Management Plans
  - Incident Diversion Scenarios
  - Arterial incident management signal timing plans
  - Active Lane Management Response Plans
- Plan for Incremental Operations
  - Develop ICM Standard Operating Guidelines (SOG)
- Develop system Measures of Effectiveness (MOE's) – KPI reporting
- Peer ICM Agencies
  - Peer ICM Survey Underway
  - FHWA Peer to Peer Exchange Meetings
- Stakeholder engagement
  - Monthly TAC meetings
    - Individual meetings with locals
  - Diversion Scenario planning
  - Signal Equipment Standards for the corridor
  - Local Agency Leadership materials
  - Training for Project Components

Initial ICM Operation and Maintenance Needs

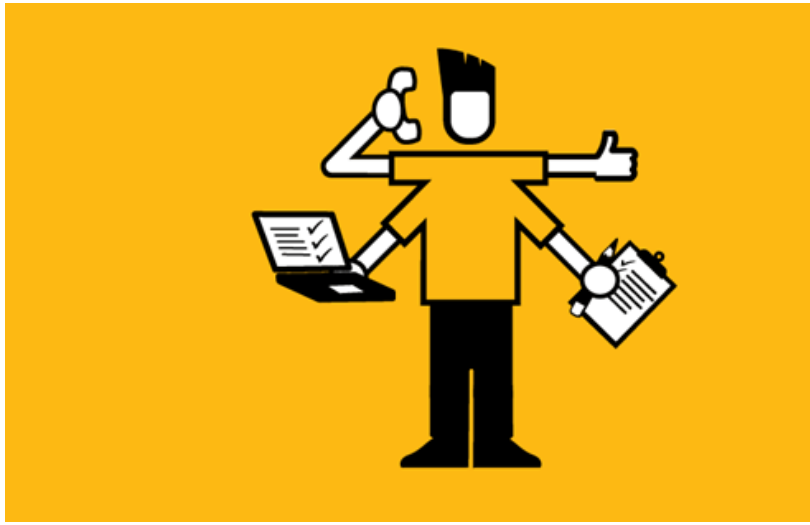
- Provides a way to manage operations through ICM as Phase 1 and 2 come online
  - Nearly doubling the number of devices
  - Introducing new technologies and strategies
  - Integrating and interfacing with local partners
  - Active traffic management

Table 1.2. Proposed Strategies by Short-, Intermediate-, and Long-Terms

Emergency Pull-Offs	
Short-Term	1. Emergency Pull-Offs
Inter-Term	2. Detection at Emergency Pull-Offs
Ramp Lane Extensions	
Short-Term	3. Ramp Lane Extensions
Ground-Mounted DMS	
Short-Term	4. Ground-Mounted DMS
Completion of Communications Network	
Short-Term	5. Select Locations on Arterials
Long-Term	6. Fiber Optic Cable Installation
Long-Term	7. Mobile API
DSRC/Connected Vehicle w/ BlueTOAD	

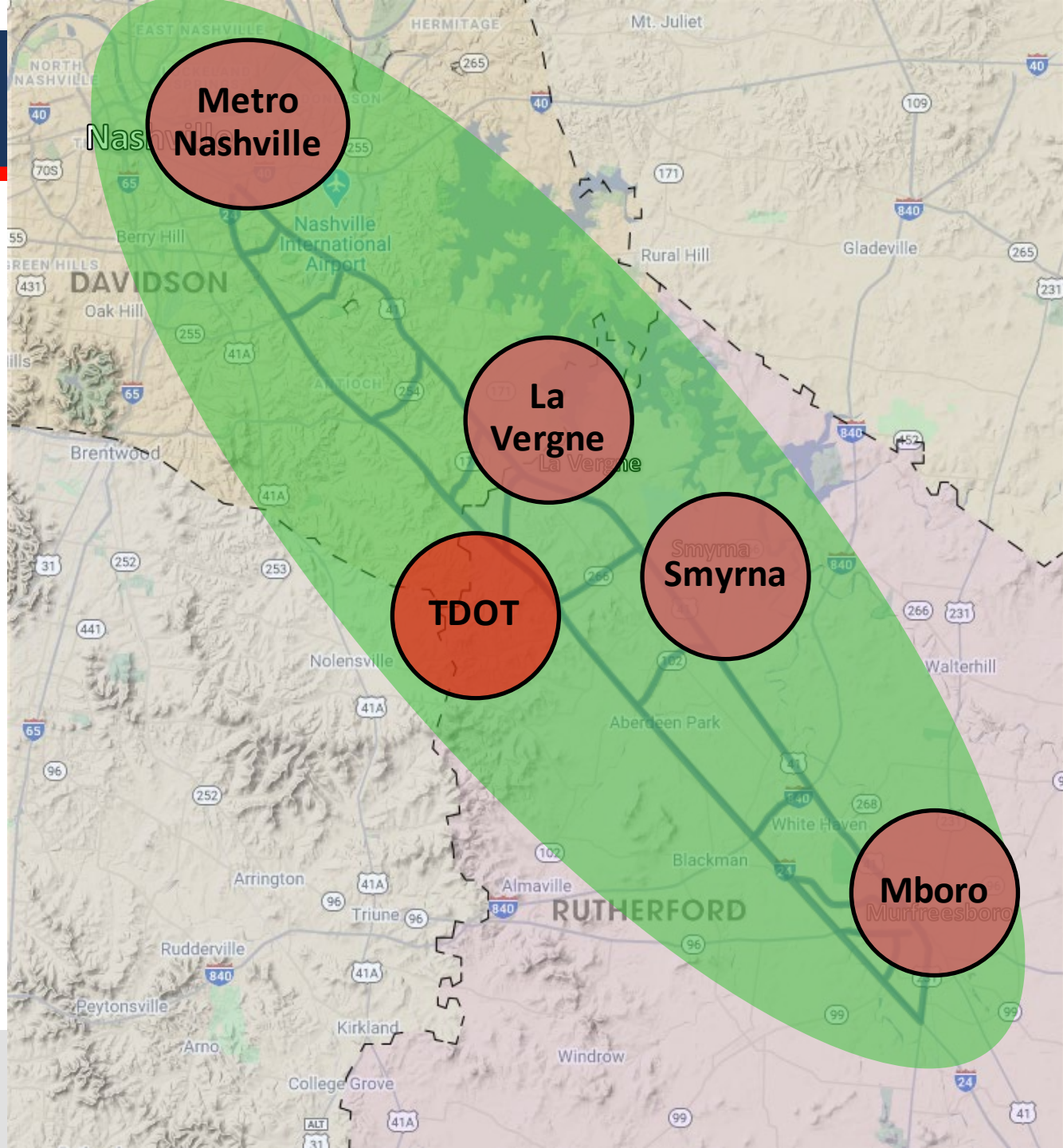
Initial ICM Operation and Maintenance Needs

- ICM Coordinator Roles
  - Defines and coordinate training needs
  - Support the TMC on active freeway and arterial management strategies
  - Support DSS Development based on lessons learned and TDOT SOPs
  - Define rules for implementation of diversion scenario plans
  - Coordinates with Local Agencies on the implementation of an incident management signal timing plans.
  - Corridor Specific TIM Coordination



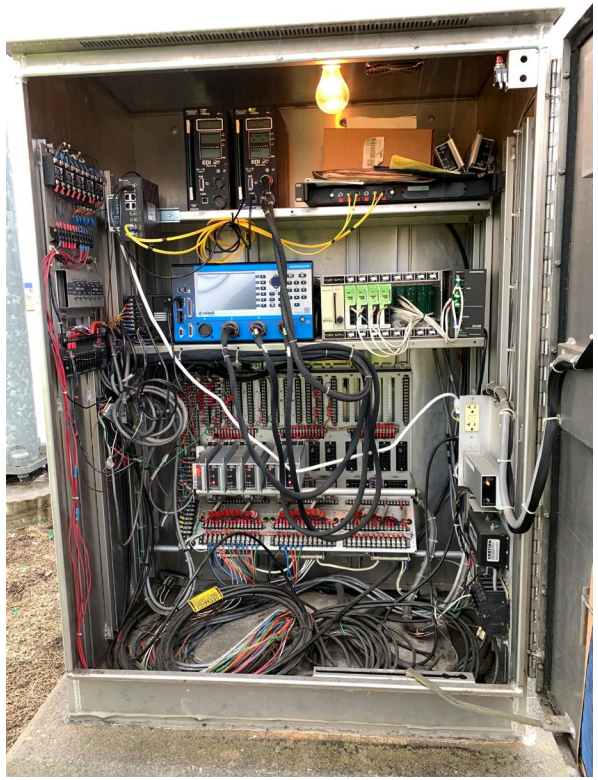
Initial ICM O&M Needs

- Local Agency Operations Support
  - Assists and trains Local Agencies on active arterial operation.
  - Assists local agencies in planning and execution of ICM strategies.
  - Assists and trains staff in maintenance of ICM components within their jurisdictions.
  - Provide supplemental TOC support.



Initial ICM Operation and Maintenance Needs

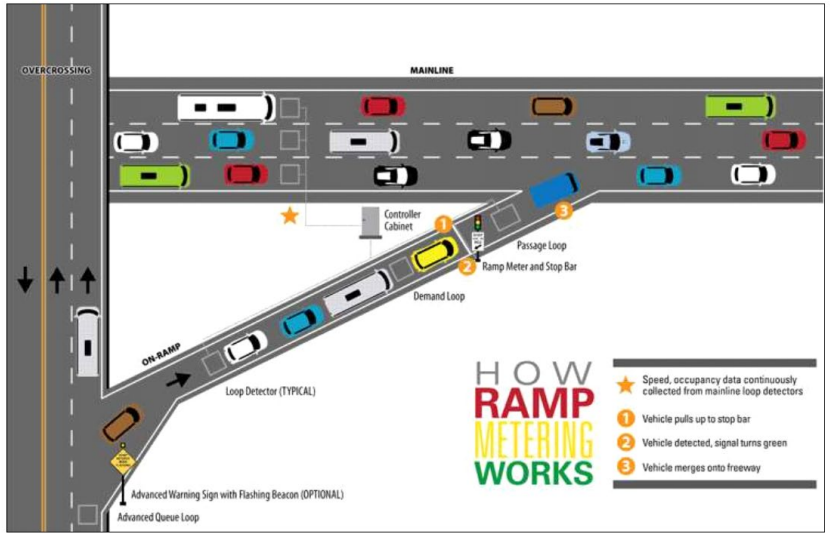
- ICM Maintenance Expectations
  - Set maintenance goals and expectations for the local agencies
    - Identify critical field assets
    - Define KPIs such as percent uptime
    - Establish expected repair times
  - Establish maintenance budgets
  - TDOT's role if local agency cannot repair critical asset within accepted duration
  - Paradigm Shift for Traffic Signal O&M in TN
    - TSM&M



Ramp Meter Selection

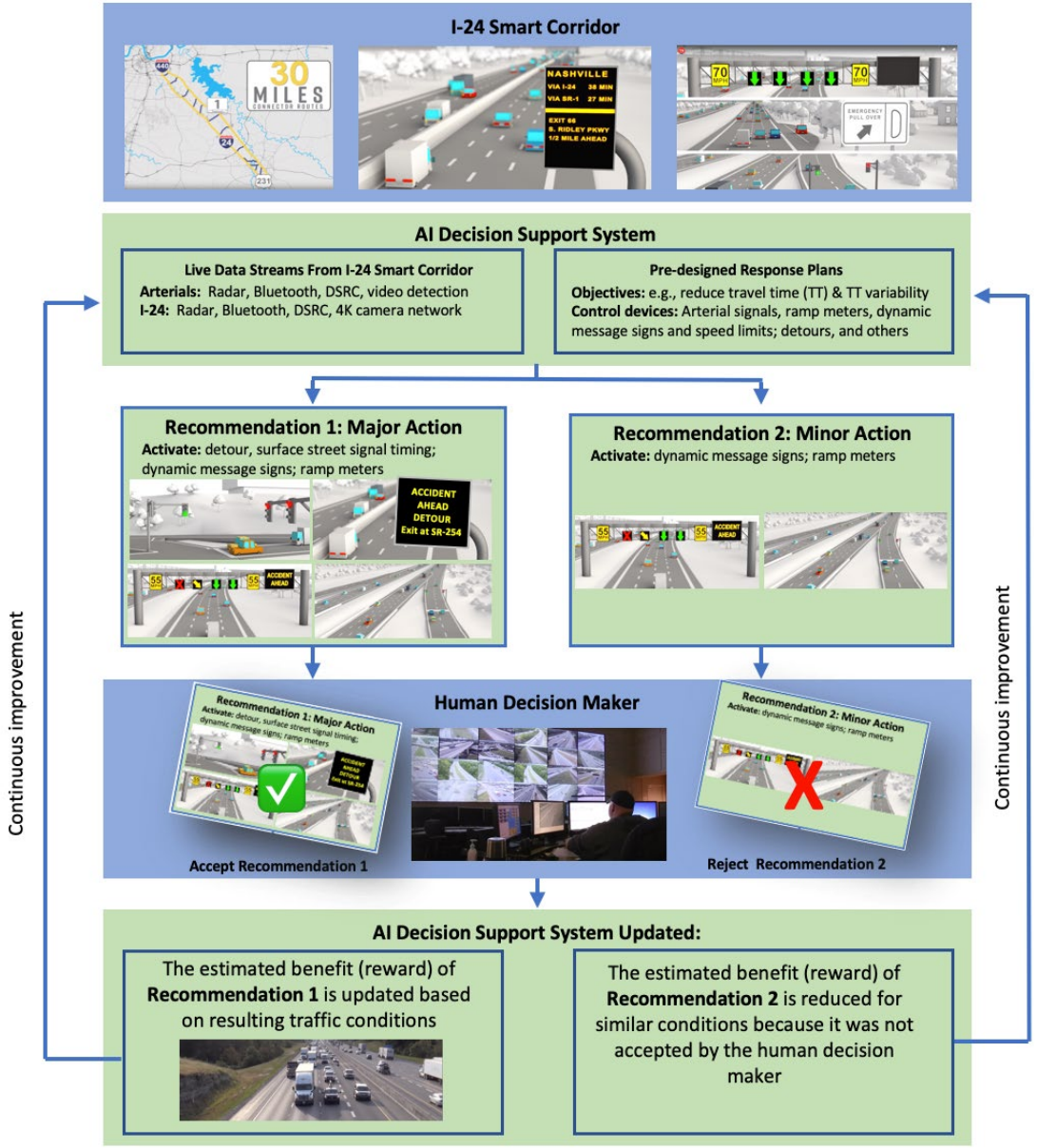
- Final ramp meter analysis report to be submitted this summer
  - HELPER Algorithm selected and will be optimized for the I-24 Smart Corridor.
  - Results will feed into development of Phase 3 preliminary design plans

Source: FHWA



ATCMTD Grant Project
ICM DSS

- Concept of Operations Workshop held May 6th & 7th
  - Example Scenarios were reviewed
    - Conduct a high-level identification of user needs and system capabilities
    - Develop a shared understanding of the who, what, where, and how of the system
    - How will stakeholders handle the scenarios using AI-DSS?
    - What data would be helpful for them to make decisions?
    - What information will there be to share with AI-DSS to suggest something?
  - Workshop input from stakeholders will be used to update Concept of Operations



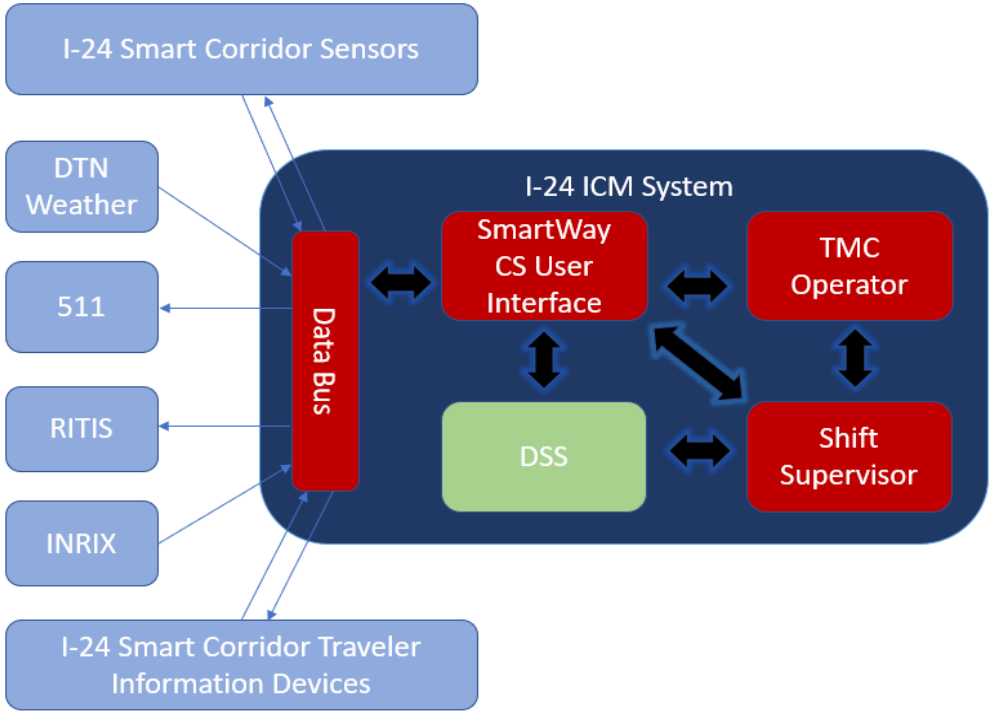
ICM DSS

Goal: Maximize the Performance of the I-24 ICM System

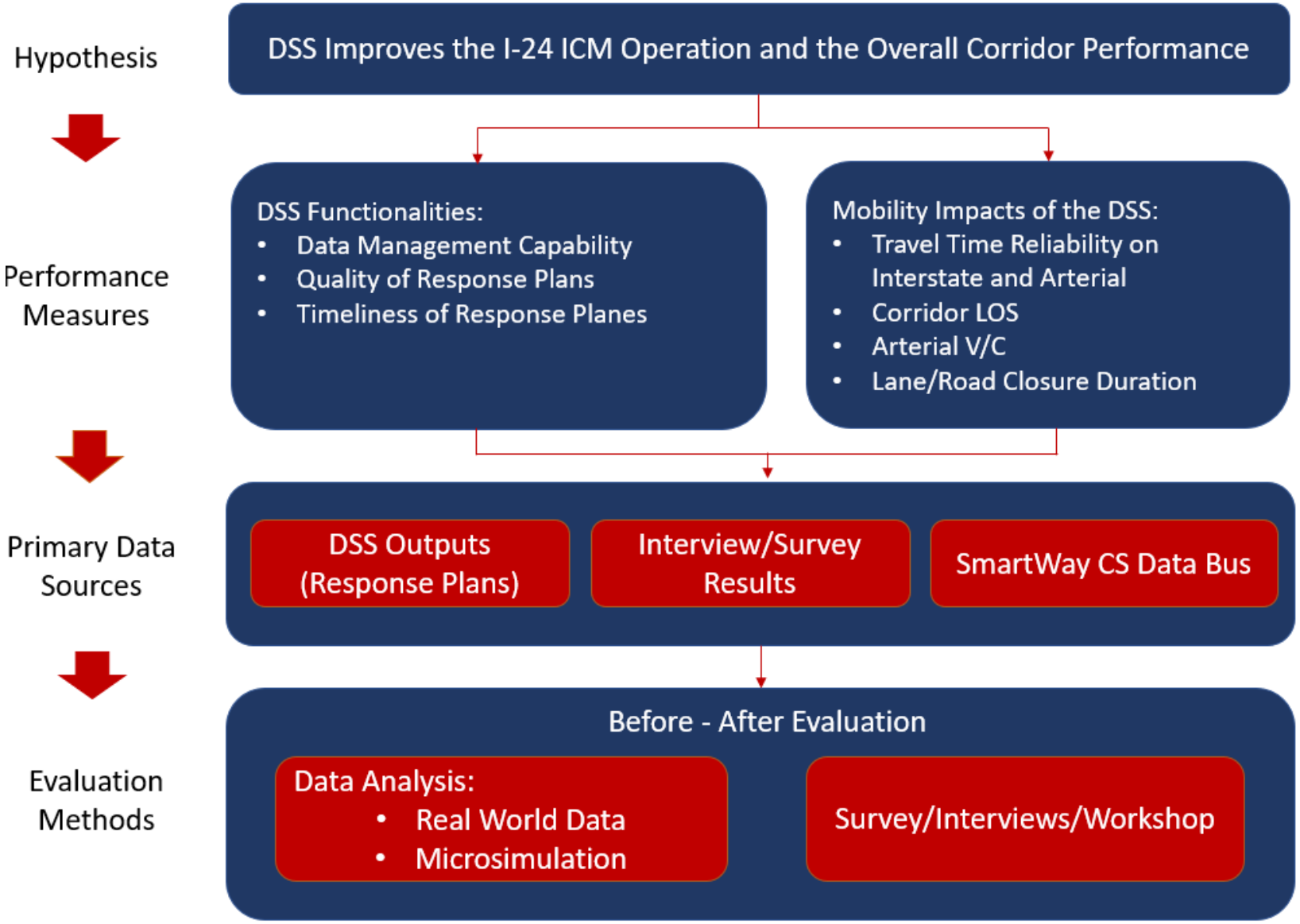
The ICM DSS:

- aggregates all relevant data generated about the corridor,
- fuses the data into its most meaningful and valuable representations, and
- provides actionable intelligence to the TMC Operators when appropriate and/or requested

Generates response plans with limited intervention!

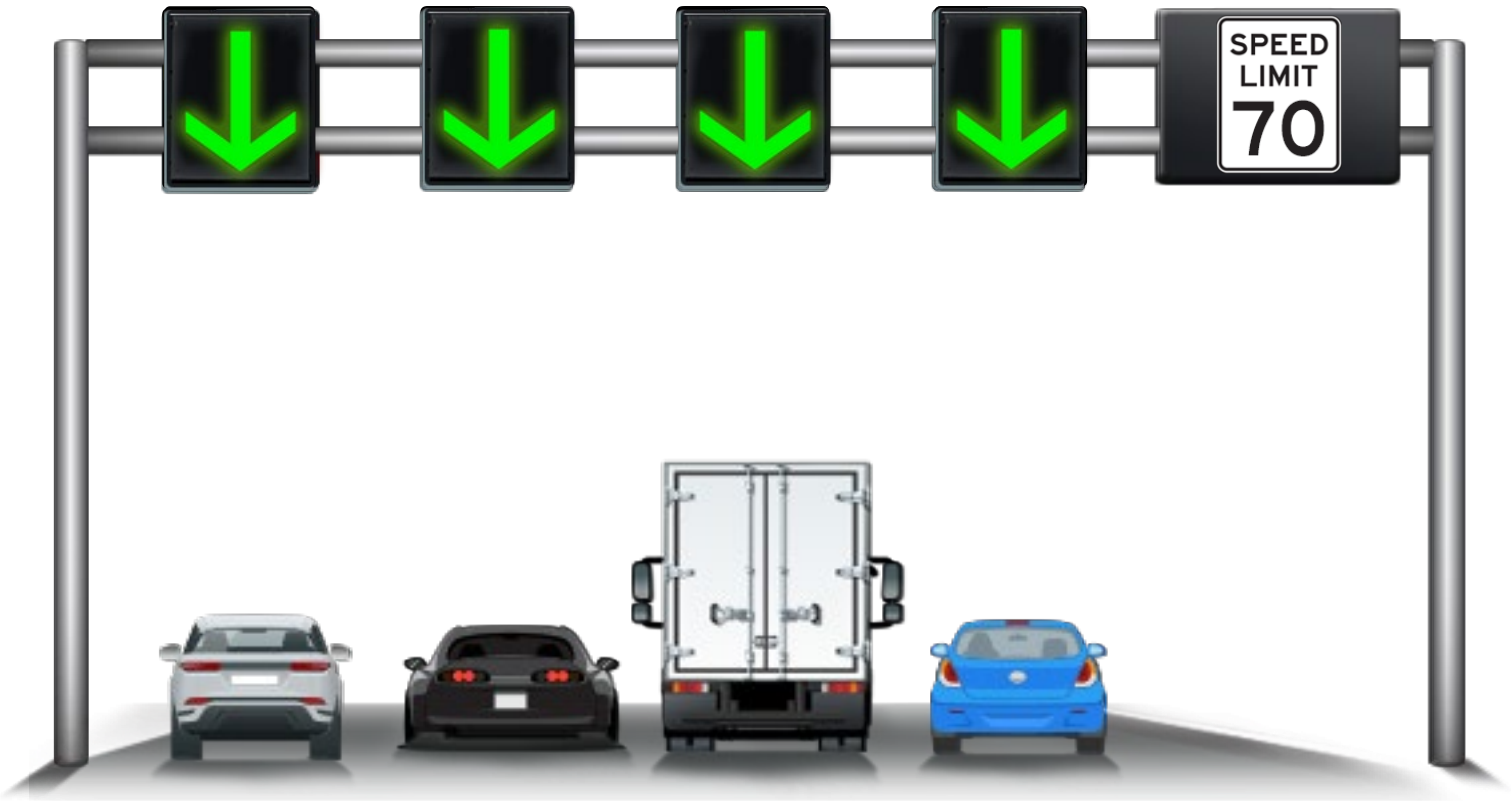


ICM DSS Evaluation Process



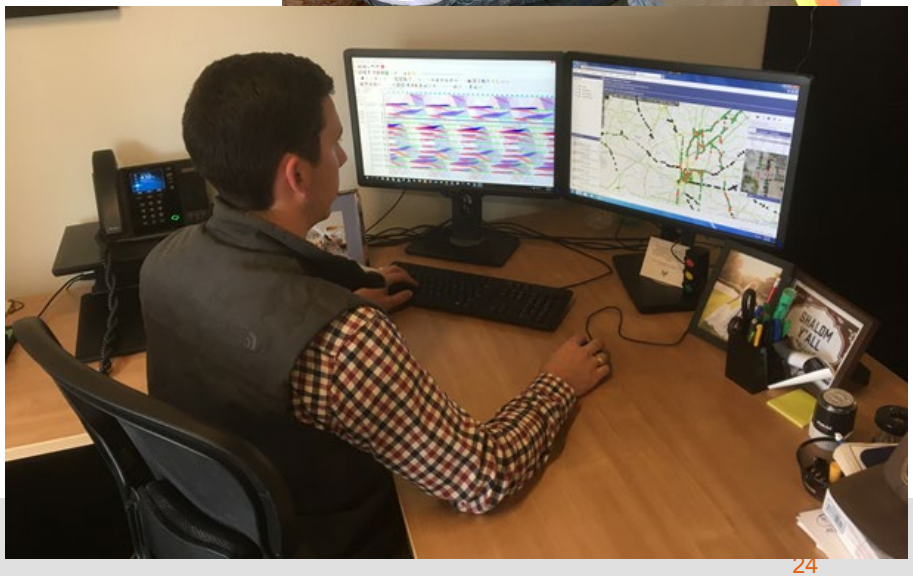
Public Outreach for Project

- Providing relevant and timely information to the public is critical to this project's success
  - Media campaigns in advance of project milestones
  - Update of the project website as well as Social Media Outlets.



Challenges for Initial ICM Deployment in Tennessee

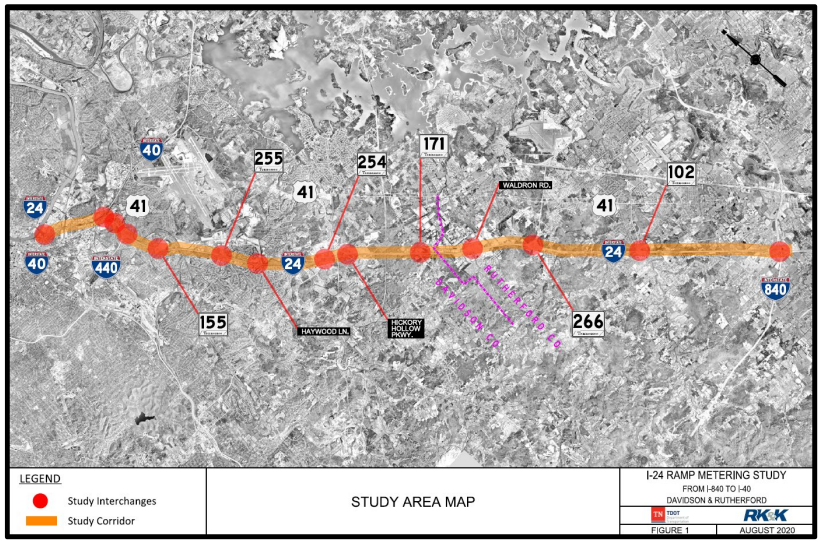
- Multiple TSMO / ICM Strategies deployed for the first time in Tennessee
  - AAM, ALM, VSL, Ramp Metering
  - Local Agency Coordination, Collaboration, Communication
  - Motorist Education
- TDOT's Expectations
  - I-24 ICM policies
  - Active Arterial Management during peak hours
  - Preventive / Routine Maintenance
  - Timely Detector, Communication, and Surveillance Repair
- Local Agency Expectations
  - Funding (Staffing + Capital improvements)
  - Training
  - Operational Priorities
- Maintenance requirements
- Measures of Effectiveness (MOE)
- Inter-agency MOUs
  - Communication protocols
  - Control of equipment
- Dedicated funding for:
  - Staffing
  - Infrastructure maintenance and improvements



Next Steps

- ALM and VSL Operations
  - Develop Scenarios, Algorithms, SOGs
- Continue Interagency Coordination
  - Upcoming TAC meeting: Individual meetings with the Local Agencies and First Responders group
- Gather ICM operations best practices
  - Peer Exchanges with FHWA: WsDOT (Seattle) and FDOT (Orlando)
  - Peer Agency Reviews with Arcadis: TxDOT (Dallas), and Caltrans (San Diego) with Arcadis

- I-24 Smart Corridor Phase 3 Design
  - Ramp meter design study with RK&K
  - Con Ops Update
  - Preliminary Plans Development



Thank You!

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Briley Pkwy / Thompson Ln.
SR 255
41
Harding Pl.
Nashville
SR 254
Bell Rd.
SR 171
Old Hickory Rd.
Waldron Rd.
La Vergne
SR 266
Sam Ridley Pkwy
Smyrna
SR 102
Lee Victory Pkwy
SR 1
840
Medical Center Pkwy
Murfreesboro
SR 96
Old Fort Pkwy
SR 99
New Salem Rd.
US 231
S. Church St.