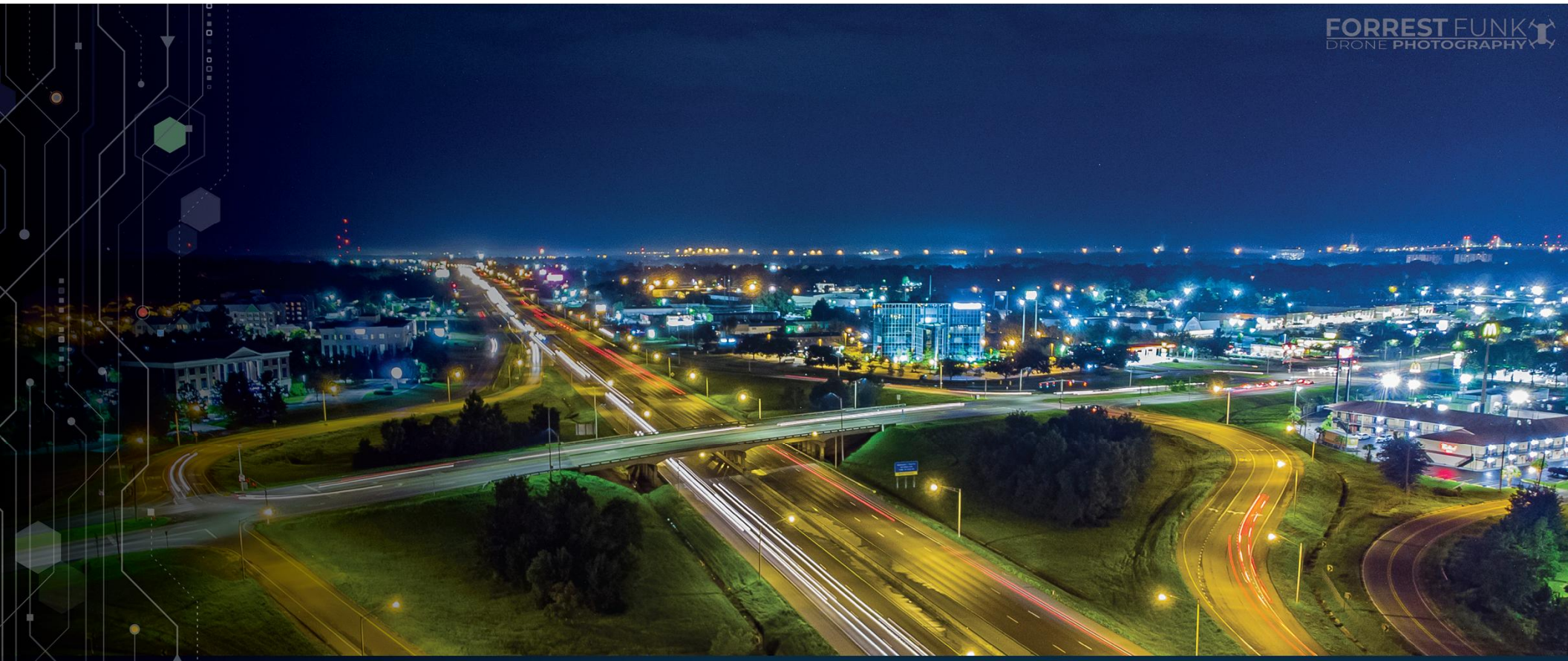



Kimley»Horn

ALABAMA DEPARTMENT OF TRANSPORTATION

# ALDOT STATEWIDE TSMO Master Plan

May 15, 2019

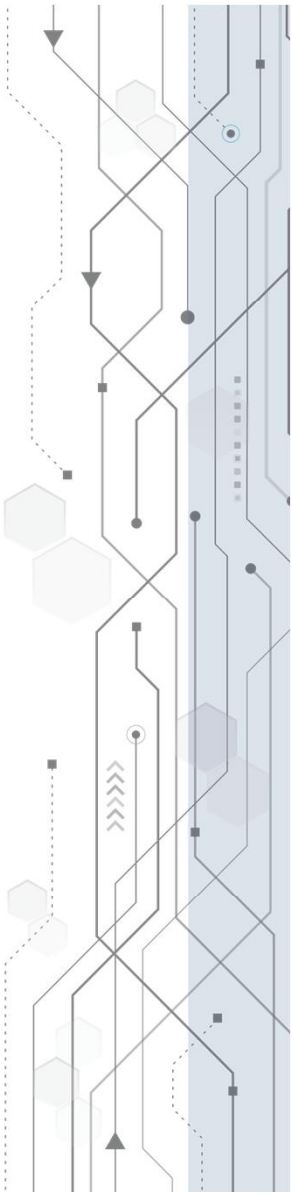
# Overview

Why TSMO – Need for a New Perspective

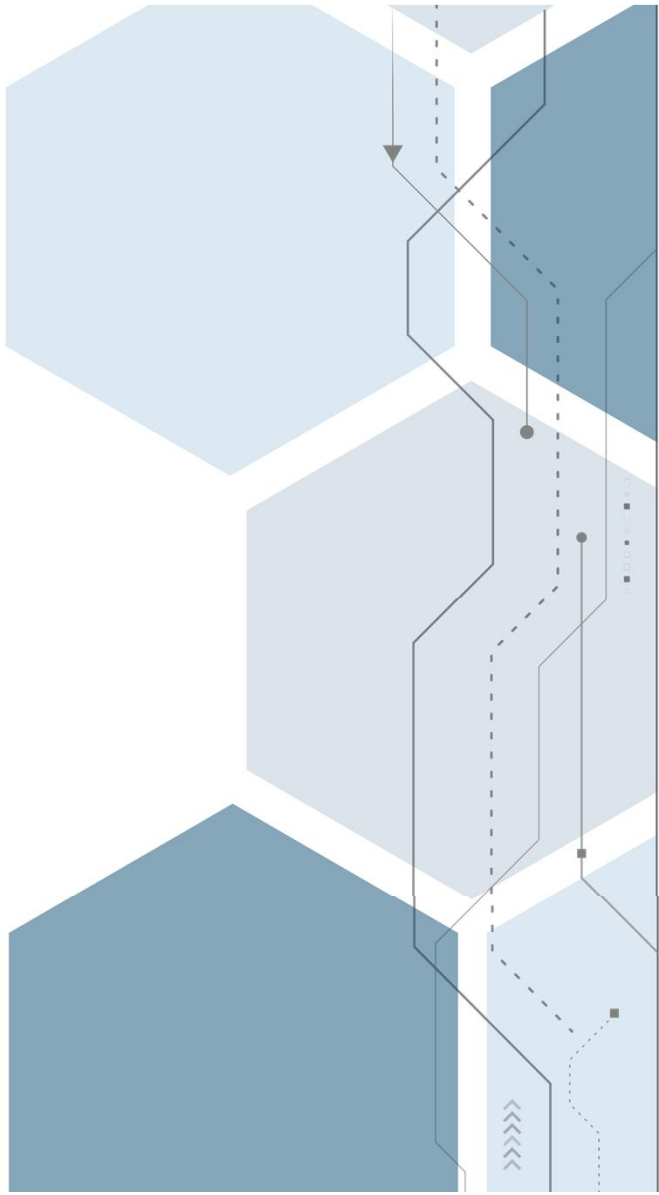
Master Plan Overview

- Strategic Plan
- Program Plan
- Service Layer Brochures

Next Steps

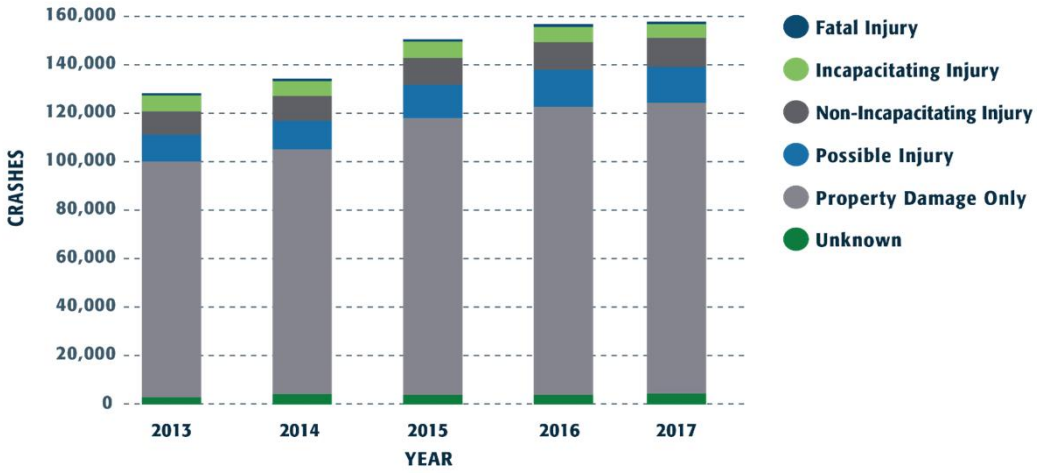


# Why TSMO – Need for a New Perspective



# Challenges we face:

## Safety | Congestion | Funding




Crashes are Increasing

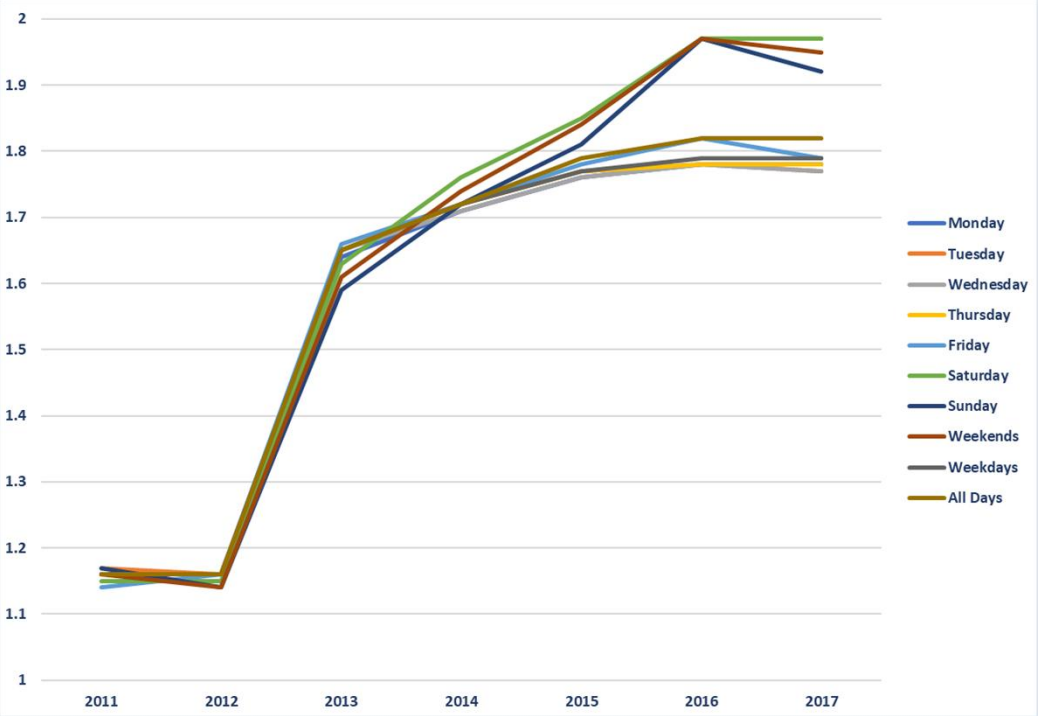
In 2016, fatality rate = 1.56 fatalities per 100 million VMT vs 1.19 national average (FHWA, 2018)

# Challenges we face:

Safety | Congestion | Funding

Congestion is Increasing

TTI went from 1.16 in 2011 to 1.82 in 2017 (NPMRDS)



# Challenges we face:

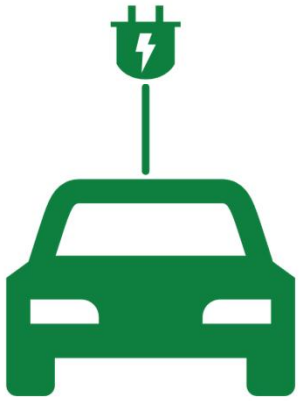
## Safety | Congestion | Funding

Fuel Economy Goals

2016 – 35.5 mpg
2025 – 54.4 mpg

+

Electric and Hybrid Vehicles



Pay little / no gas tax

=

Gas Tax is unsustainable funding model

# Gas Tax for Transportation Funding – HB2

Recent extra 10 cent per gallon tax will provide approximately $380 million annually.


*http://www.aldailynews.com/ivey-signs-gas-tax-increase-into-law/*

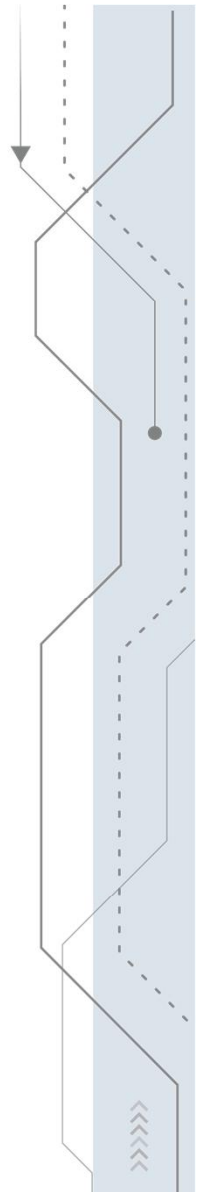
GREAT START – NOW, WE HAVE TO WORK SMARTER

# Change Your Perspective

# Need for a New Perspective

- Focus on CITIZEN needs not agency needs
- Promote INNOVATION
- OPTIMIZE existing infrastructure
- Create PARTNERSHIPS

Consistent with HB1 – Joint Transportation Committee



# Need for a New Perspective – Transportation Bill (HB1)

*"…to operate at maximum efficiency with greater returns in highway benefits for the amount of public funds expended…"*

*"…effective highway state plans are well organized with defined processes for identifying all potential sources of innovation, including by not limited to, broad stakeholder engagement and partnerships, shared performance metrics and evidenced-based practices, adoption of the most cost effective technology in materials and components of road and bridge construction, and cost effective and efficient organizational structures and operations…"*

# ~~Spending~~ vs Investing

# A Different Perspective: Focus on OPERATIONS

*"Transportation is a utility, essential for our access to basic necessities, i.e., food, shelter, public safety and security, education, and recreation. It should be treated like … water, electricity, waste disposal, natural gas, telephone, etc."*

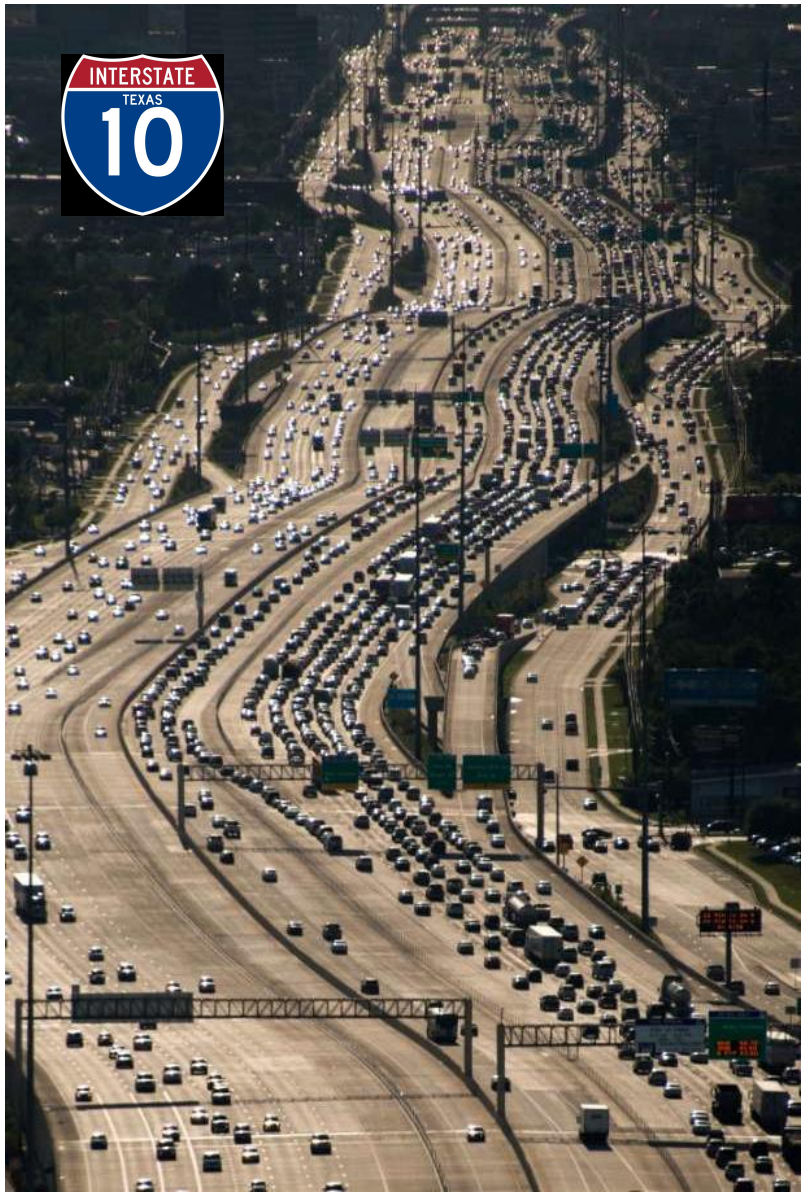
*– Eric Peterson, Former Deputy Administrator of the Research and Innovative Technology Administration at the U.S. DOT, Eno Board of Advisors*

# Building more can't be the only answer

Avoid situations like this…

*Transportation Systems Management and Operations (TSMO)*

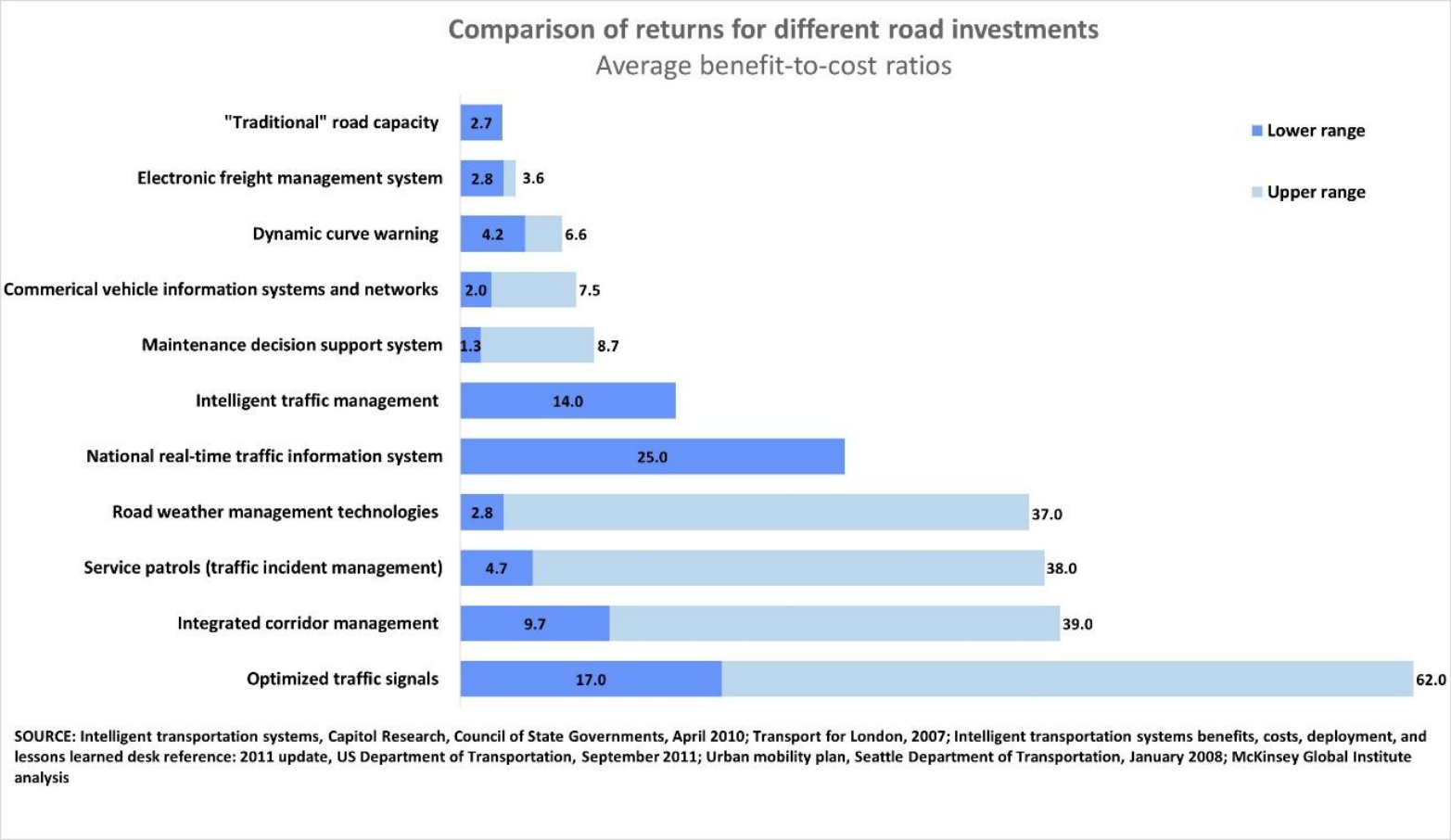
*An integrated set of strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system.* MAP-21, SECTION 1103 (a) (30) (A)



# So really, what is TSMO?

- Optimizing the use of existing facility
- Maximizing performance of the system
- Targeted solutions to safety/congestion causes
- Complement to capacity projects

# Increased Return on Investment, Reduced Costs

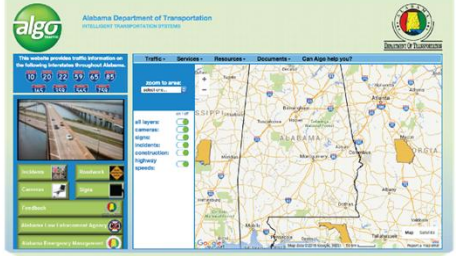



SOURCE: Intelligent transportation systems, Capitol Research, Council of State Governments, April 2010; Transport for London, 2007; Intelligent transportation systems benefits, costs, deployment, and lessons learned desk reference: 2011 update, US Department of Transportation, September 2011; Urban mobility plan, Seattle Department of Transportation, January 2008; McKinsey Global Institute analysis

# SIGNIFICANT Safety Benefits

Examples include:

- Traffic Incident Management
  - 30 – 40% reduced incident duration
- Traffic Signal Optimization
  - 30% crash reduction
- Traveler Information
  - 4 – 10% driver stress reduction

# Better Customer Service – Work Zone Management

- TMC Operations
- Safety Service Patrols
- Traveler Information
- Traffic Signal Coordination

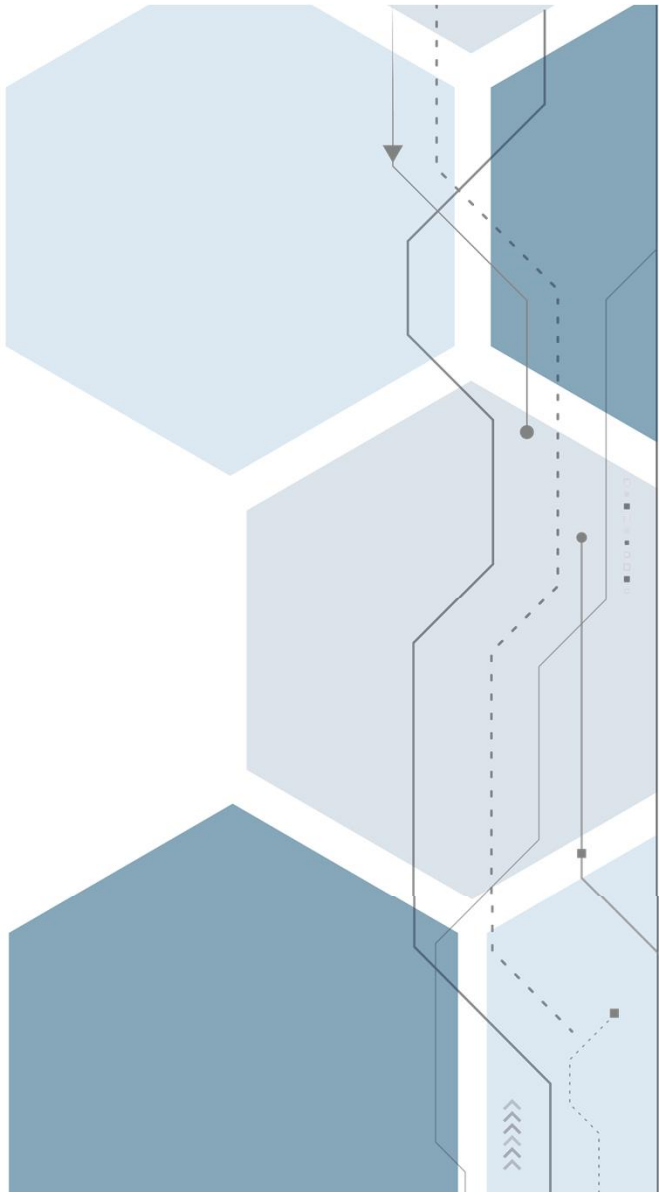
# Better Customer Service – Special Event Management

- TMC Operations
- Safety Service Patrols
- Traveler Information
- Traffic Signals Optimization
- Regional Traffic Operations Program – Tuscaloosa

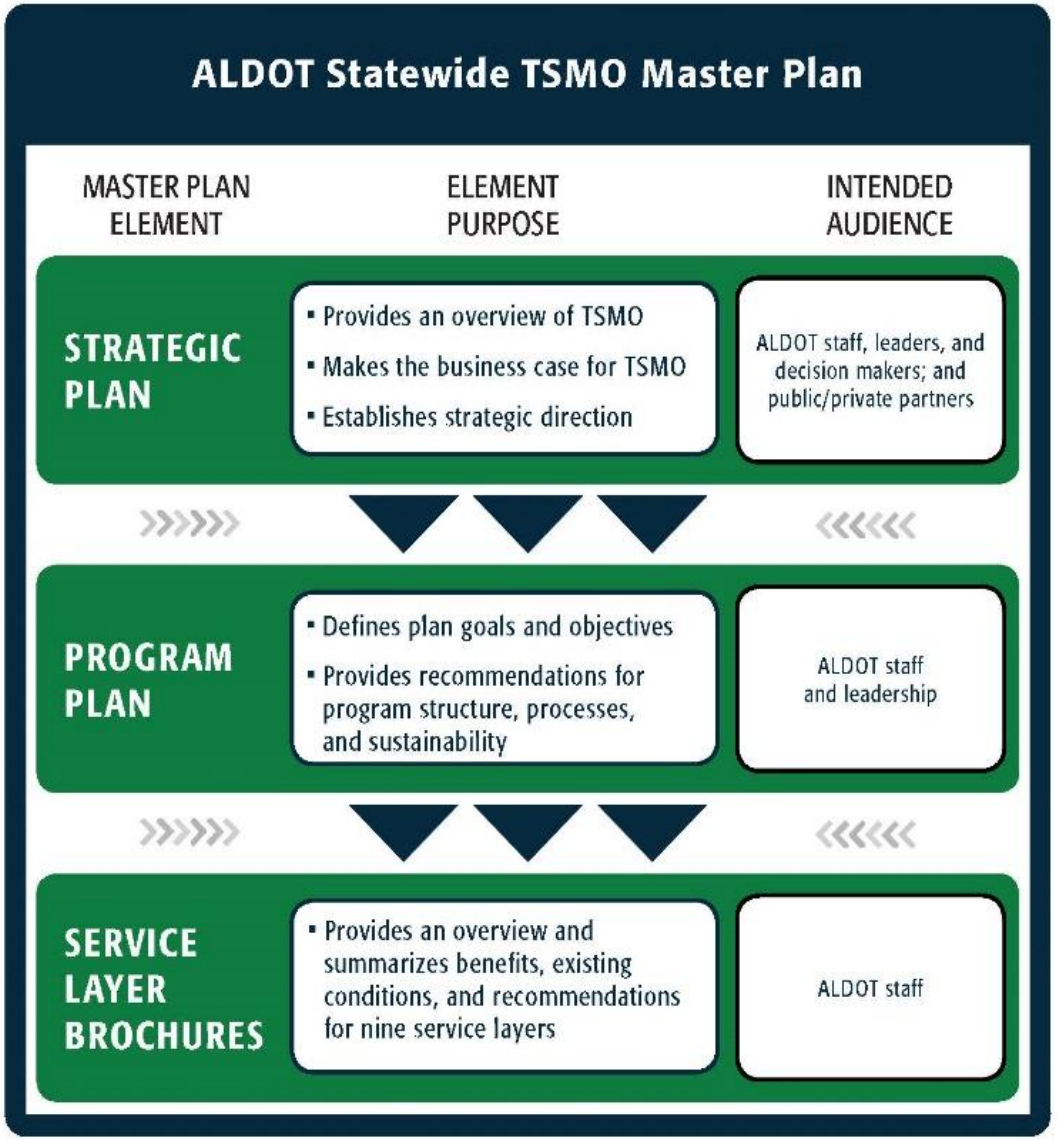
Tuscaloosa TMC

*Source: Gresham Smith*

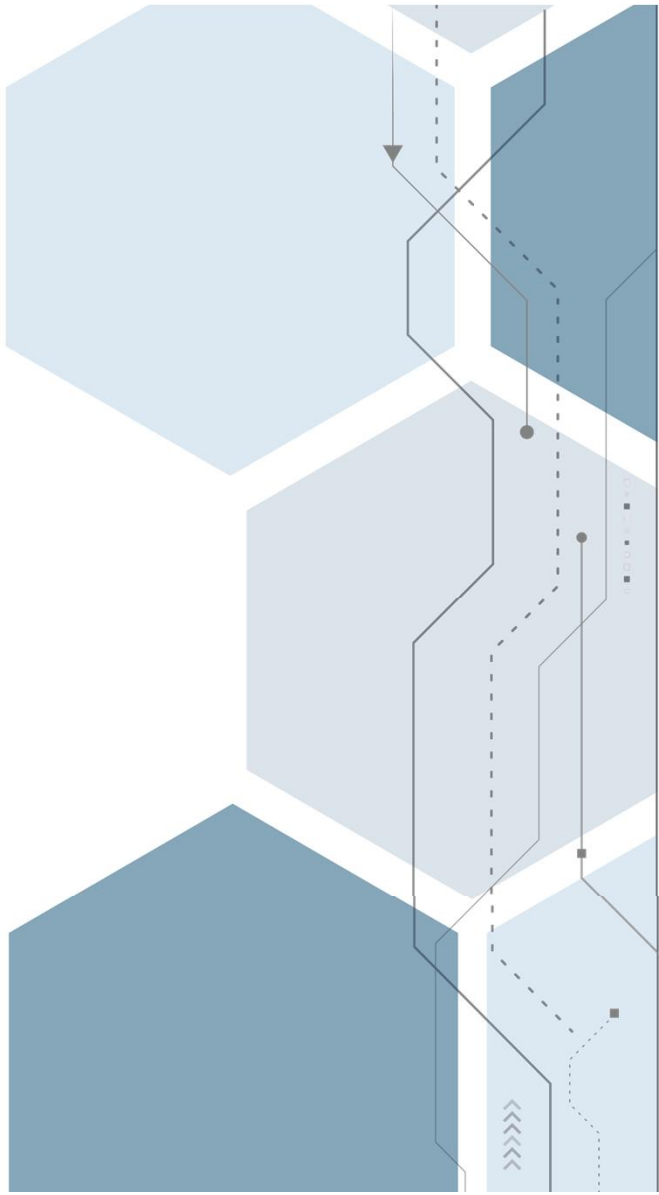
# Master Plan Overview



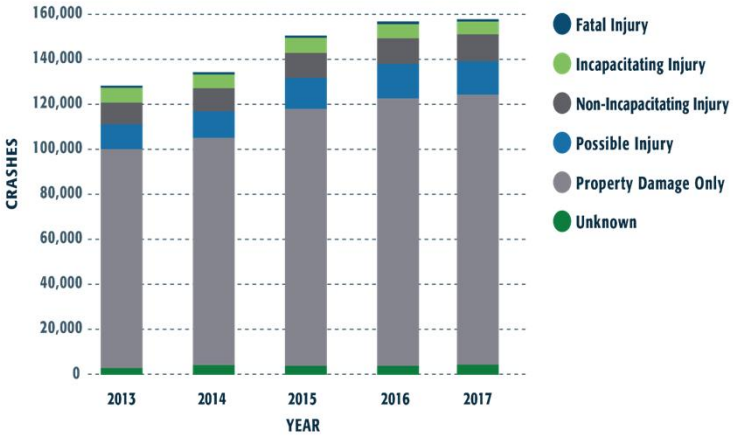
# Master Plan Overview



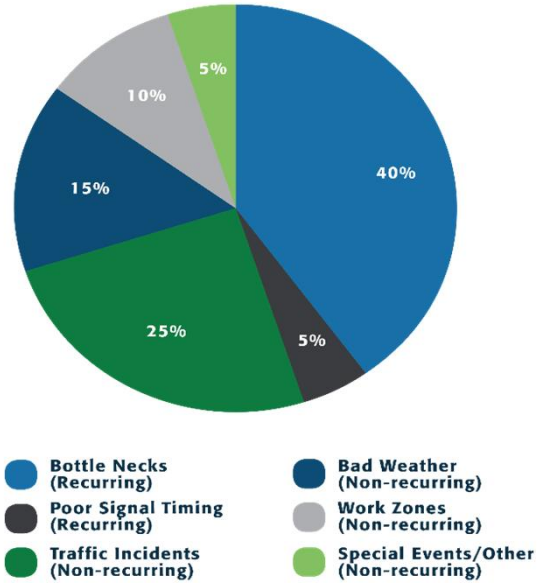
# Strategic Plan



# Strategic Plan – Business Case for TSMO




*Alabama Crash Severity, 2013–2017 (ADVANCE, 2018)*





Safety | Congestion | Funding

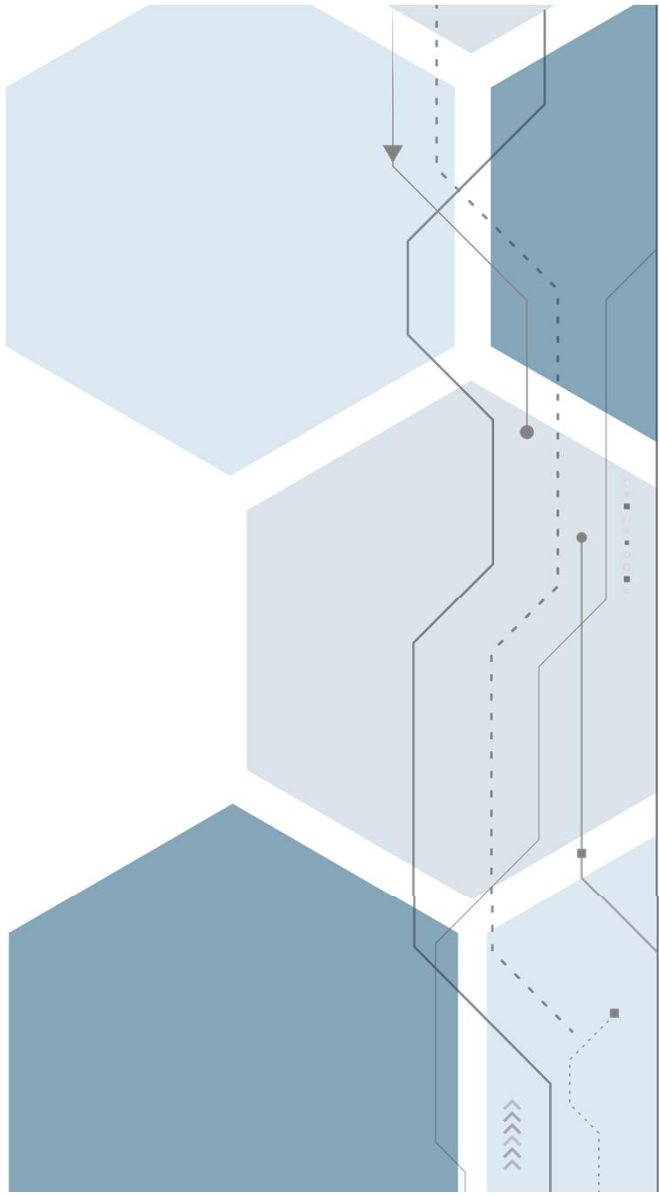
# Strategic Plan – TSMO Vision

*Manage and operate a safe, reliable, optimized transportation system for all users through the collaborative efforts of stakeholders, technology-based solutions, and innovative strategies.*

# Strategic Plan – Goals and Objectives

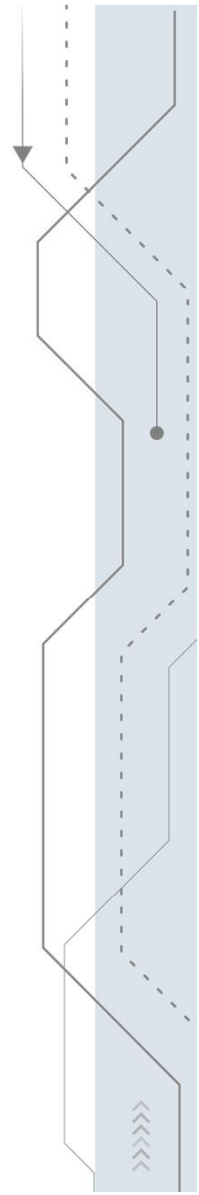
| | GOAL | OBJECTIVE |
|---|---|---|
| MOVE | SAFETY | Reduce the number of overall crashes (including secondary) as well as severity |
| | | Reduce work zone-related crashes |
| | | Increase the resiliency of the transportation system to extreme weather events |
| | | Enhance and expand TIM program |
| | | Increase safety of freight corridors |
| | MOBILITY | Improve travel time reliability |
| | | Provide timely information and mobility choices to the public |
| | | Reduce congestion and bottlenecks |
| | | Work with partners to actively manage traffic during large-scale special events |
| | | Enhance freight route mobility |
| MANAGE | ACCOUNTABILITY | Demonstrate fiscal responsibility |
| | | Increase sustainability and minimize environmental impacts |
| | | Integrate TSMO solutions into ALDOT policies, plans, and procedures |
| | | Create and implement project prioritization methodology based on data-driven decisions |
| | | Develop performance measures to make the TSMO business case |
| MOTIVATE | COLLABORATION | Develop system standards to promote data sharing, coordination, and integration |
| | | Elevate TSMO through leadership buy-in of the benefits and innovative technology |
| | | Identify where to engage with conventional silos to promote collaboration |
| | | Create a forward-thinking environment with continuous quality improvement practices |
| | | Establish formal career paths to encourage retention and develop workforce |
| | | Increase efficiency by seeking internal and external partnership opportunities |
| | | Realize opportunities with P3 (public-private partnerships) |
| | INNOVATION | Provide training and foster growth and sharing of knowledge |
| | | Seek strategic pilot project deployment opportunities |
| | | Integrate consideration of innovative solutions for all modes |

# Program Plan



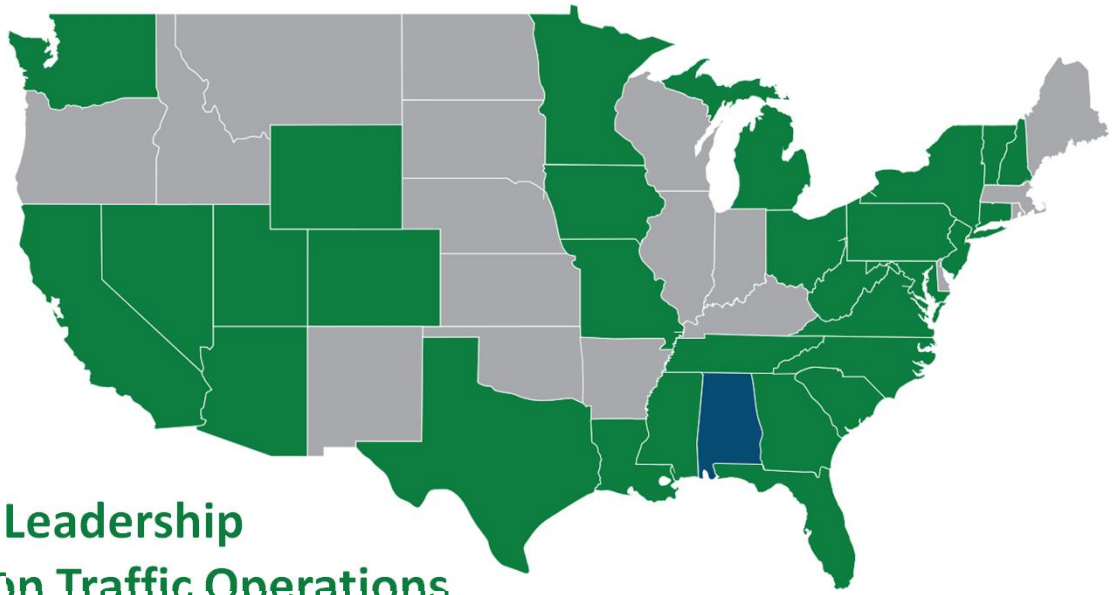
# Program Plan Recommendations

- TSMO Program Structure
- TSMO Programmatic Processes
- TSMO Program Success



# Program Structure: Leadership and Organizational

- Creation of a State TSMO Engineer and Regional Supporting Staff

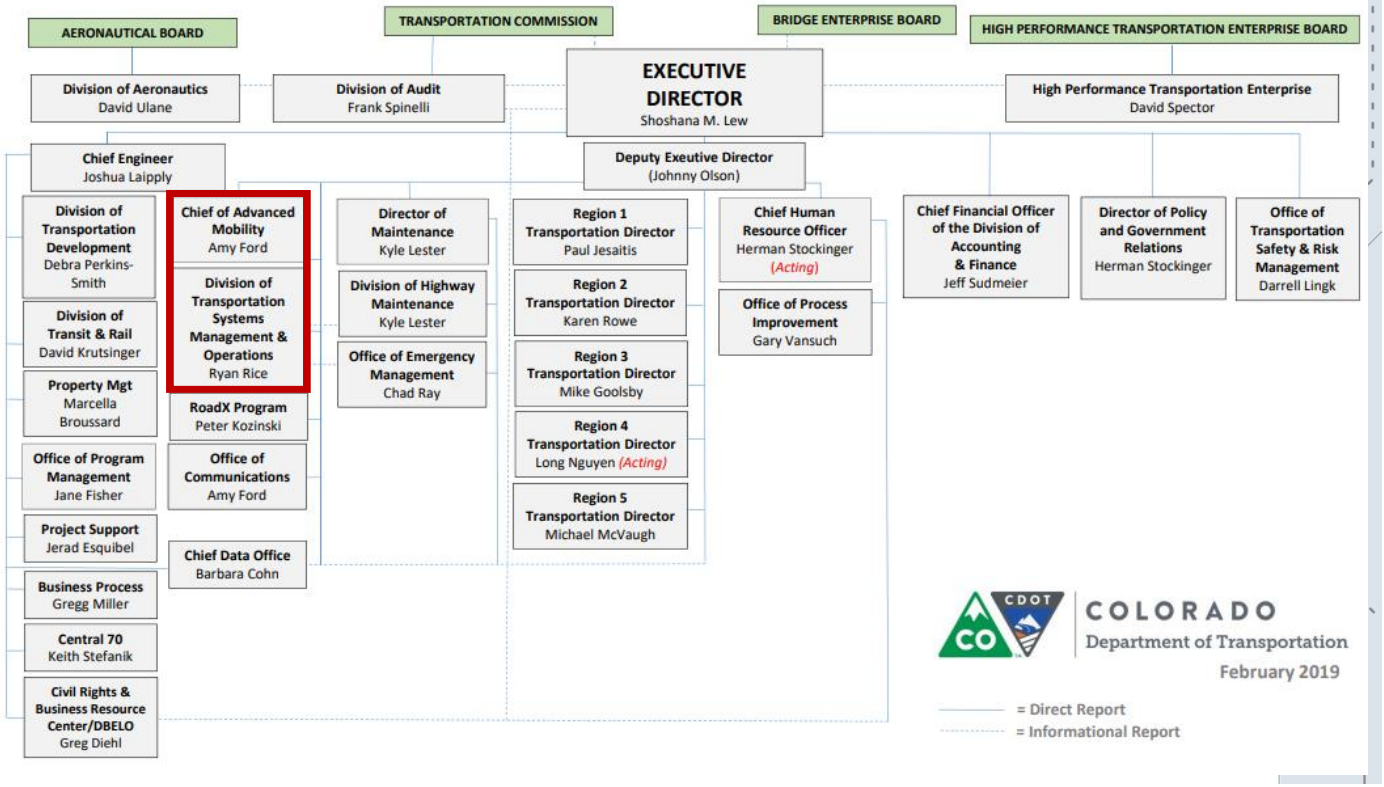


States with Senior **Leadership**
Positions focused **on Traffic Operations**

# Program Structure: Leadership and Organizational

- Example work chart:

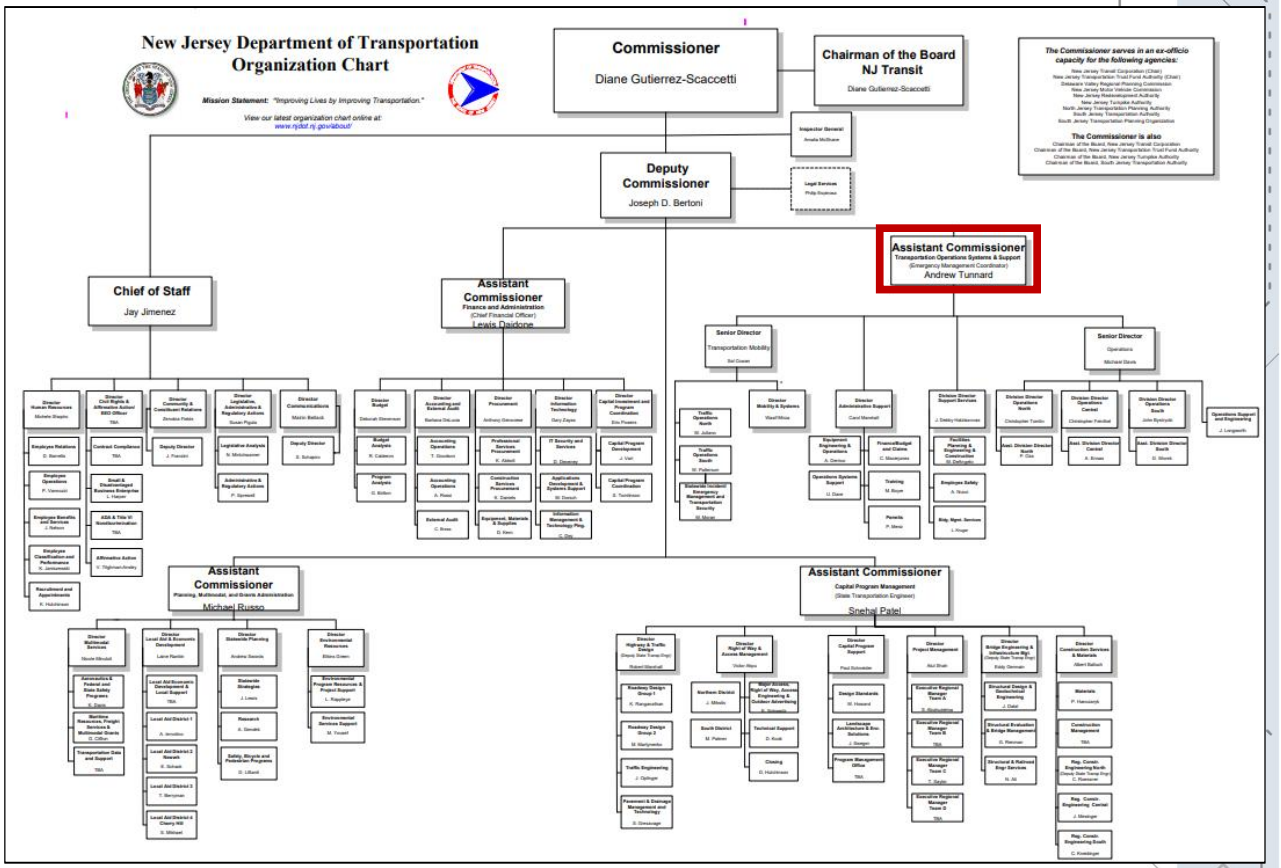
## Colorado DOT



# Program Structure: Leadership and Organizational

- Example work chart:

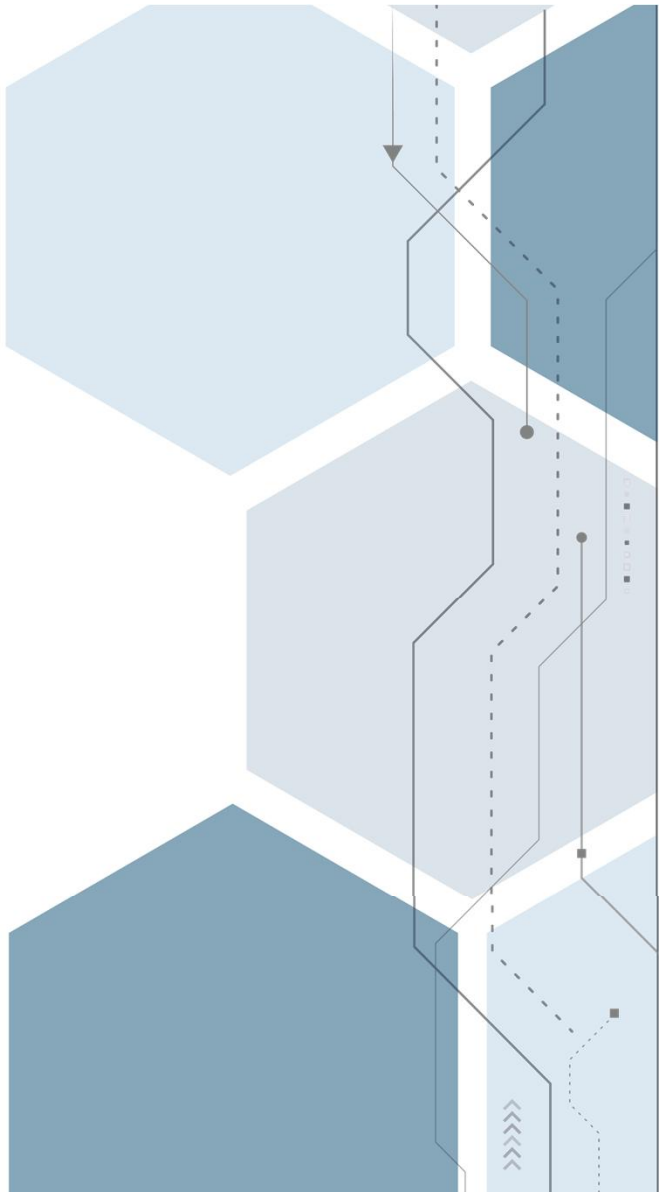
## New Jersey DOT



# Program Structure: Program Support

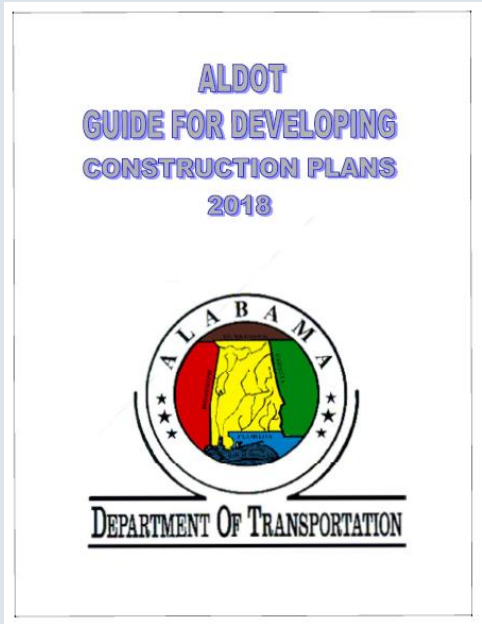
Dedicated funding for:

- Capital,
- Operations, and
- Maintenance.

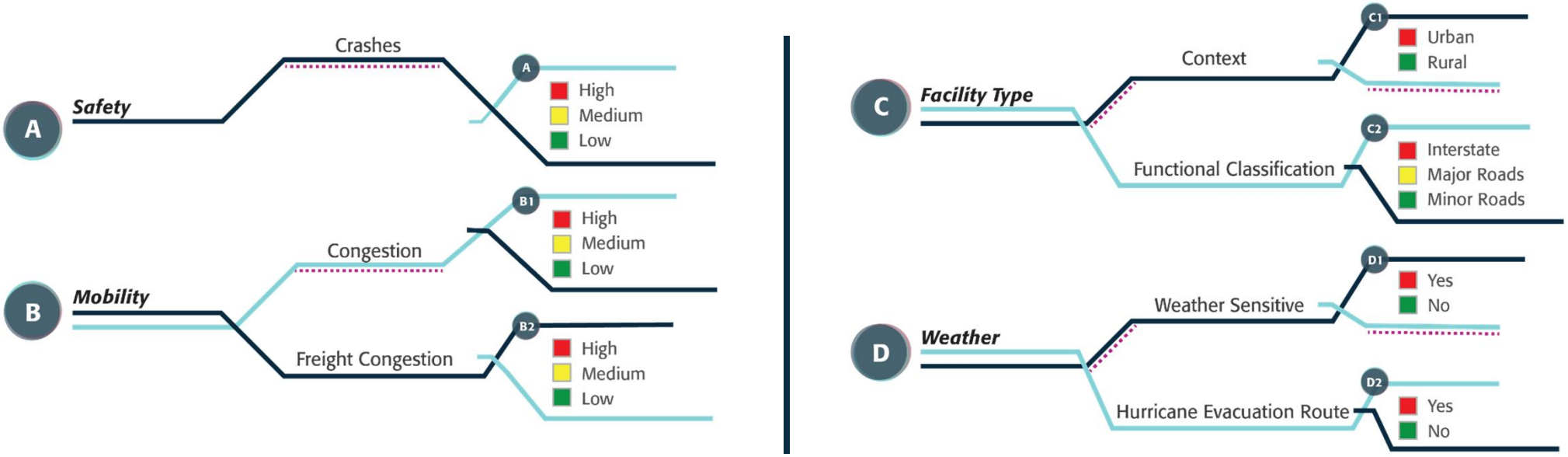


# Programmatic Processes: Integration

- Revise Guide for Developing Construction Plans (GDCP) to include TSMO representation
- Integrate TSMO strategies into STIP process
- Work with MPOs/RPOs/local jurisdictions to integrate TSMO strategies into their planning processes



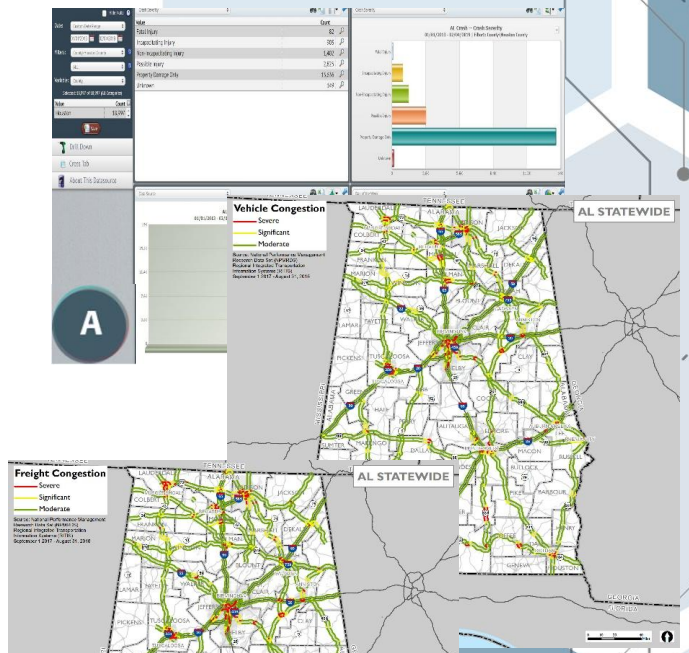
# Programmatic Processes:
# Project Development Methodology

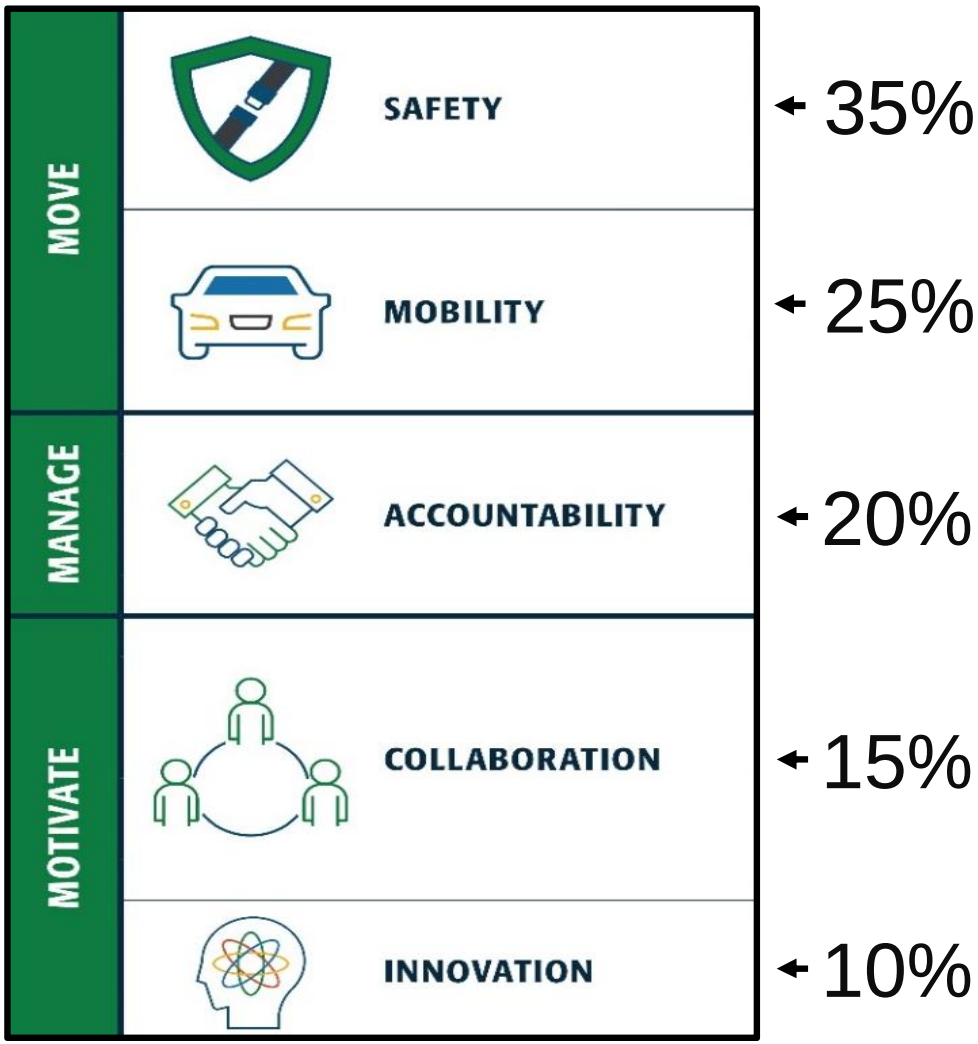



DATA DRIVEN NEEDS IDENTIFICATION

# Programmatic Processes: Project Prioritization Methodology

- Demonstrates fiscal responsibility
- Consistent methodology
- Data driven approach






# Programmatic Processes: Project Prioritization Methodology

# Programmatic Processes: Project Prioritization Methodology

| SAFETY (35%) | | | | |
|---|---|---|---|---|
| Criteria | Data Source | Response | Score | Aggregate Weight |
| **Crash** | Map - eCrash data | High/Med/Low | 3/2/1 | 28% |
| **Evacuation Routes** | Map/Routes | Y/N | 1/0 | 2% |
| **Weather Sensitive** | Map/State Report | Y/N | 1/0 | 2% |
| **Freight Corridor** | Map - NTAD | Y/N | 1/0 | 3% |

| MOBILITY (25%) | | | | |
|---|---|---|---|---|
| Criteria | Data source | Response | Score | Aggregate Weight |
| **Organizational Impact** | Known by applicant | Statewide/ Regional/ Local | 3/2/1 | 2% |
| **Congestion** | Map - RITIS (AADT) | High/Med/Low | 3/2/1 | 23% |
| **Urban vs. Rural** | Map | Urban/Rural | 2/1 | 1% |
| **Freight** | Map - RITIS (TAADT) | High/Med/Low | 3/2/1 | 5% |

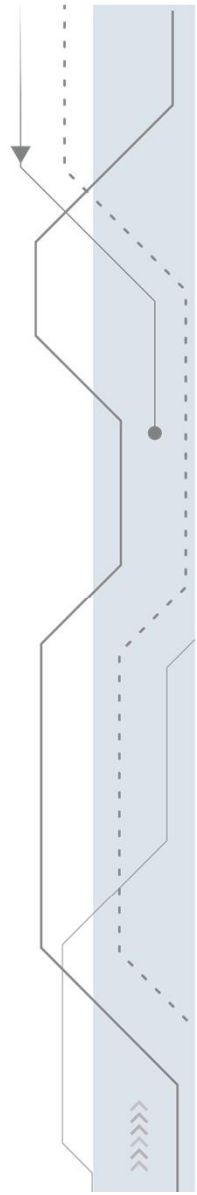
| ACCOUNTABILITY (20%) | | | | |
|---|---|---|---|---|
| Criteria | Data source | Response | Score | Aggregate Weight |
| **Benefit/Cost** | Develop Guidance | High/Med/Low | 3/2/1 | 6% |
| **Maintenance and Operations** | Known by applicant/App. process | Resource Identified/ Funding Available Rubric | 2/1/0 | 6% |
| **Performance Measures** | Known by applicant | Y/N | 1/0 | 3% |

| COLLABORATION (15%) | | | | |
|---|---|---|---|---|
| Criteria | Data source | Response | Score | Aggregate Weight |
| **Hubs*** | Known by applicant/Maps | Y/N (maybe points for multiple types) | 1/0 | 4% |
| **Public Partnership**** | Known by applicant | Y/N (maybe points for Cross-regional/ Statewide/ Multi-agency) | 1/0 | 3% |
| **Private Partnership**** | Known by applicant | Y/N | 1/0 | 3% |

| INNOVATION (10%) | | | | |
|---|---|---|---|---|
| Criteria | Data source | Response | Score | Aggregate Weight |
| **Traffic Management System Support** | Known by applicant | Y/N (does it support Statewide Communications Infrastructure Plan) | 1/0 | 4% |
| **Multimodal** | Known by applicant | Y/N | 1/0 | 3% |
| **CAV Support** | Known by applicant | Y/N | 1/0 | 3% |

# Program Success

- Culture of Collaboration
- Performance Measurement
- Innovation

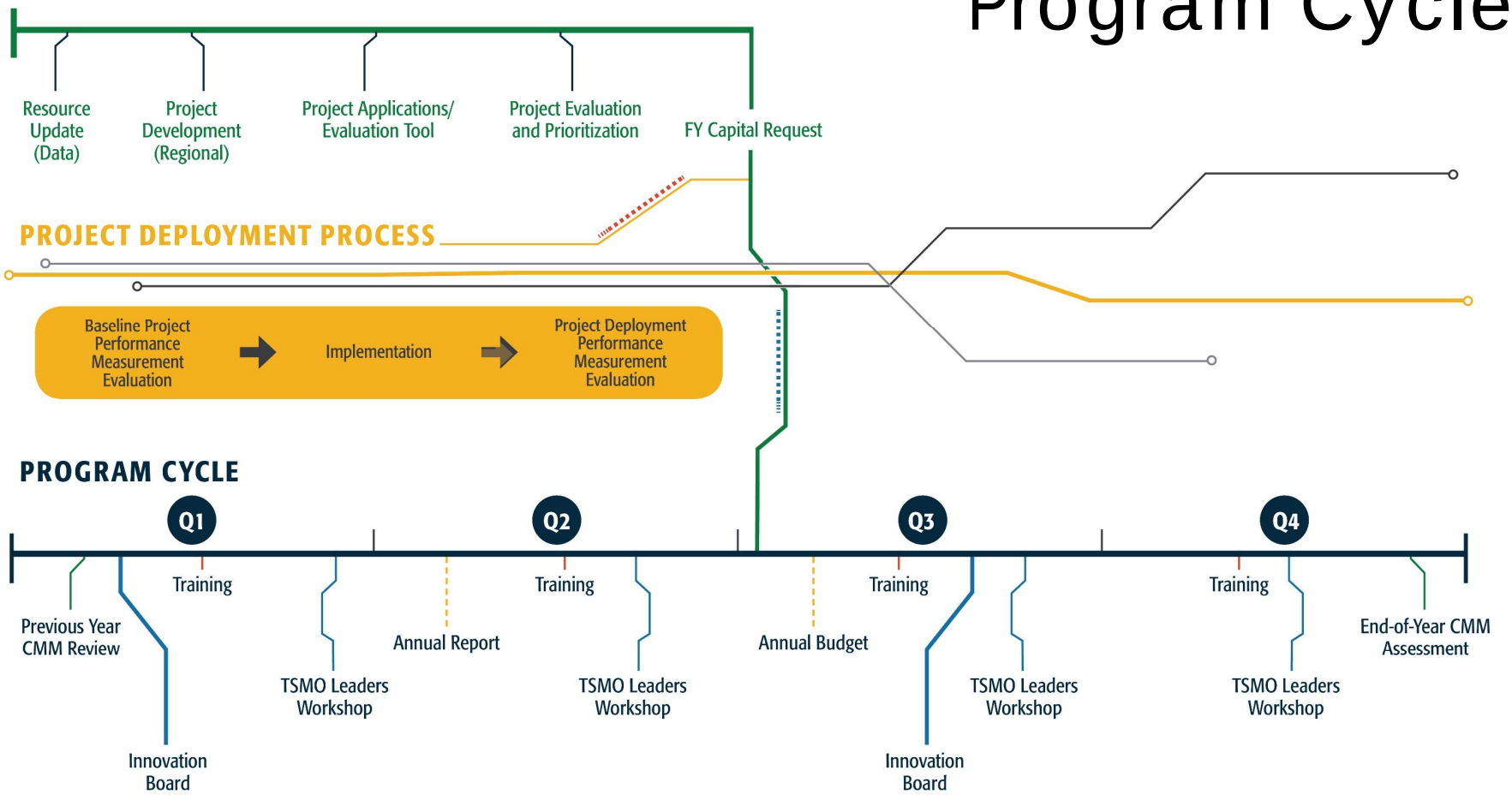


# Program Plan Implementation

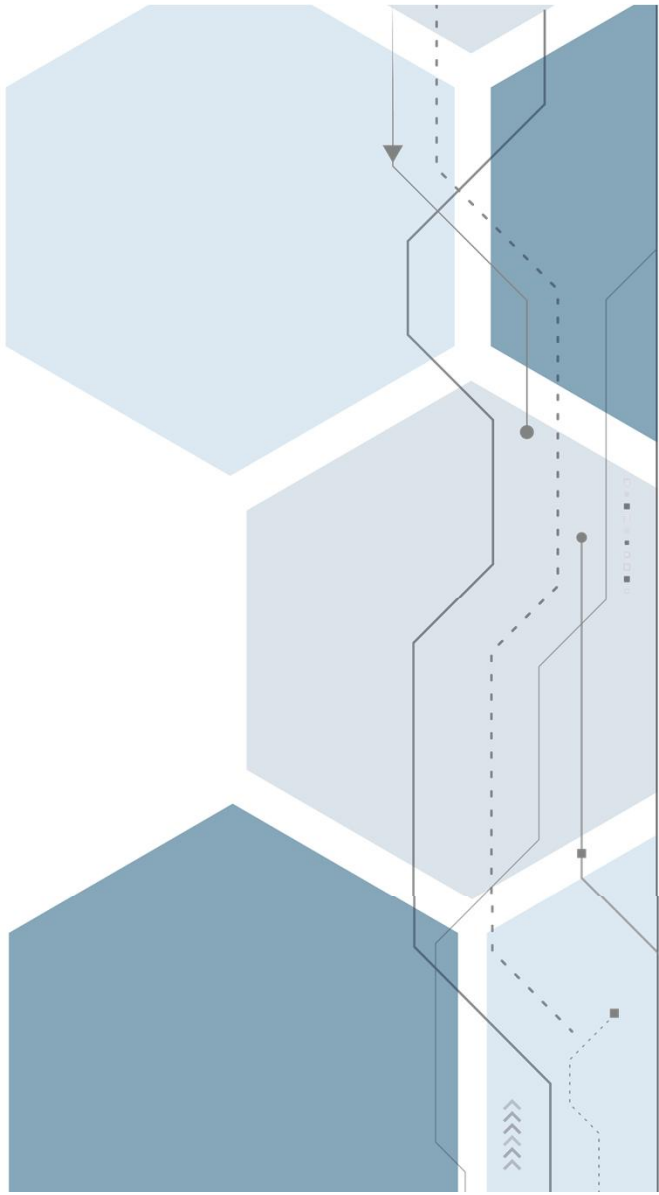
- Near Term – FY20
- Short Term – FY21-22
- Mid Term – FY23-25

| | | | | |
|---|---|---|---|---|
| 31 | Review data practices annually for enhancement, quality improvements, and efficiencies. | | | |
| 32 | Develop simplified benefits analysis resources. | | | |
| 33 | Develop simplified sustainability analysis resources. | | | |
| 34 | Demonstrate program success through an annual report providing status related to program maturity, performance measures, benefits and sustainability analysis, etc. | | | |
| **Innovation** | | **Near Term (FY20)** | **Short Term (FY21-22)** | **Mid Term (FY23-24)** |
| 35 | Convene Innovation Board made up of ALDOT, local agencies, research partners, industry professionals, and private industry. | | | |
| 36 | Identify and task technology leads to follow national research and opportunities. | | | |
| 37 | Prepare Connected and Automated Vehicle Preparedness Roadmap. | | | |
| 38 | Integrate academia to stay current with innovation. | | | |
| 39 | Create an atmosphere to cultivate pilot projects for innovative ideas. | | | |

# Program Cycle



# Service Layer Brochures

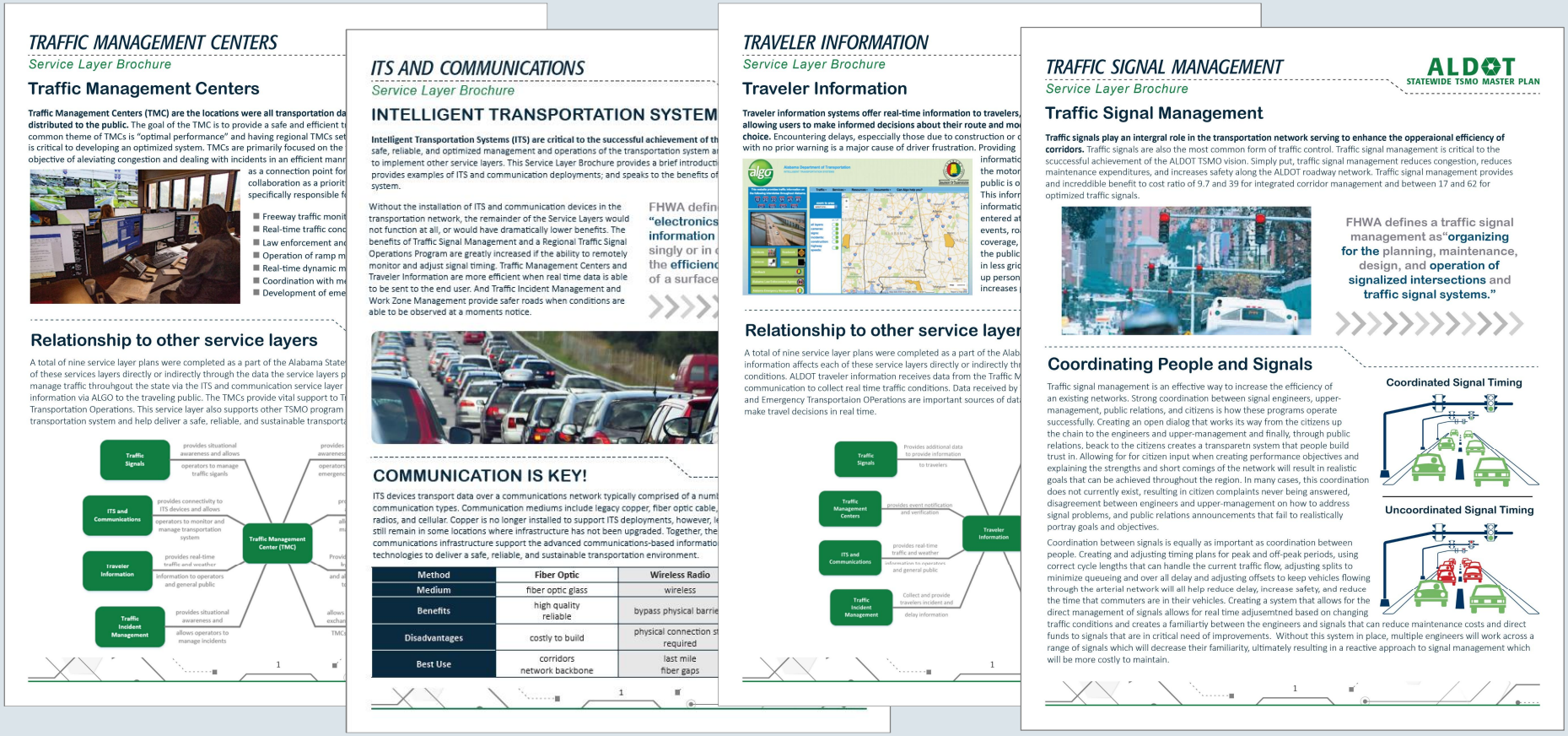


# Service Layer Brochures

- General Overview
- Layman's Terms
- Brief Discussion of Benefits

| SERVICE LAYER | DESCRIPTION | EXAMPLE |
|---|---|---|
| ITS AND COMMUNICATIONS | A systematic and encompassing program that combines advanced communications-based information and electronic technologies to deliver a safe, reliable, and sustainable transportation environment | Fixed and mobile traffic detectors, non-enforcement traffic cameras, fiber-optic communications infrastructure |
| TRAFFIC SIGNAL MANAGEMENT | Proactive operation, planning, and maintenance of traffic signal systems to deliver targeted solutions that improve efficiency, safety, and reliability of signalized intersection operations | Incident management signal adjustments, traffic signal emergency response plan, preventative maintenance, traffic signal coordination |
| TRAFFIC MANAGEMENT CENTERS | Serves as the nerve center of DOT roadway management where data is collected, processed, and analyzed to aid in monitoring and implementing control strategies which improve the safety and efficiency of the roadway network | State TMC, Regional TMCs (RTMC) – Birmingham, Huntsville, Mobile, Montgomery, and Tuscaloosa |
| TRAVELER INFORMATION | A range of ALDOT and partner agency managed technology solutions that provide traveler information and mobility choices to the public | 511, Dynamic Messaging Signs (DMS), ALGO |
| TRAFFIC INCIDENT MANAGEMENT | Systematic and coordinated program process to detect, respond to, and clear traffic incidents safely and efficiently | Alabama Service Assistance Patrol (ASAP) program integration with TMCs, TIM training program, ITS technology, coordination with partner public safety agencies |
| EMERGENCY TRANSPORTATION OPERATIONS | Coordination of response to non-recurring large-scale events (e.g. flooding, hurricanes) that interrupt or overwhelm transportation operations to improve public/first responder safety and transportation network efficiency | TMC/EOC (Emergency Operations Center) coordination, ITS integrating into response plans, partnerships with public safety agencies |
| WORK ZONE MANAGEMENT | Planned and coordinated process to manage traffic during roadway construction zones to improve worker and motorist safety and minimize traffic delay | Work zone ITS technology for dynamic management (dynamic queuing, variable speed limits, dynamic lane merge, entering/existing construction vehicle notification) and work zone traffic signal adjustments |
| ACTIVE TRANSPORTATION AND DEMAND MANAGEMENT | Advanced technical solutions and innovative strategies to increase efficiency and safety to maximize the capacity of the existing roadway network | Adaptive ramp metering, dynamic speed limits, adaptive traffic signal control |
| CONNECTED AND AUTOMATED VEHICLES | Connected and autonomous vehicles are an emerging generation of vehicles and have the potential to technology applications on the transportation network | Efficient platooning using intelligent speed adaptation (variable cruise control), event and traffic incident notifications and re-routing, and eco-driving |

# SERVICE LAYER BROCHURES



*TRAFFIC MANAGEMENT CENTERS*

Service Layer Brochure

**Traffic Management Centers**

**Traffic Management Centers (TMC) are the locations were all transportation da distributed to the public.** The goal of the TMC is to provide a safe and efficient t common theme of TMCs is "optimal performance" and having regional TMCs set is critical to developing an optimized system. TMCs are primarily focused on the objective of aleviating congestion and dealing with incidents in an efficient manr as a connection point for collaboration as a priorit specifically responsible f

- Freeway traffic monit
- Real-time traffic cond
- Law enforcement and
- Operation of ramp m
- Real-time dynamic m
- Coordination with m
- Development of eme

**Relationship to other service layers**

A total of nine service layer plans were completed as a part of the Alabama State of these services layers directly or indirectly through the data the service layers p manage traffic throuhgout the state via the ITS and communication service layer information via ALGO to the traveling public. The TMCs provide vital support to T Transportation Operations. This service layer also supports other TSMO program transportation system and help deliver a safe, reliable, and sustainable transporta

Traffic Signals — provides situational awareness and allows operators to manage traffic signals

ITS and Communications — provides connectivity to ITS devices and allows operators to monitor and manage transportation system

Traveler Information — provides real-time traffic and weather information to operators and general public

Traffic Incident Management — provides situational awareness and allows operators to manage incidents

Traffic Management Center (TMC)

*ITS AND COMMUNICATIONS*

Service Layer Brochure

**INTELLIGENT TRANSPORTATION SYSTEM**

**Intelligent Transportation Systems (ITS) are critical to the successful achievement of th** safe, reliable, and optimized management and operations of the transportation system a to implement other service layers. This Service Layer Brochure provides a brief introducti provides examples of ITS and communication deployments; and speaks to the benefits of system.

Without the installation of ITS and communication devices in the transportation network, the remainder of the Service Layers would not function at all, or would have dramatically lower benefits. The benefits of Traffic Signal Management and a Regional Traffic Signal Operations Program are greatly increased if the ability to remotely monitor and adjust signal timing. Traffic Management Centers and Traveler Information are more efficient when real time data is able to be sent to the end user. And Traffic Incident Management and Work Zone Management provide safer roads when conditions are able to be observed at a moments notice.

FHWA defin "electronics information singly or in the efficienc of a surface



**COMMUNICATION IS KEY!**

ITS devices transport data over a communications network typically comprised of a num communication types. Communication mediums include legacy copper, fiber optic cable, radios, and cellular. Copper is no longer installed to support ITS deployments, however, l still remain in some locations where infrastructure has not been upgraded. Together, the communications infrastructure support the advanced communications-based informatio technologies to deliver a safe, reliable, and sustainable transportation environment.

| Method | Fiber Optic | Wireless Radio |
|---|---|---|
| Medium | fiber optic glass | wireless |
| Benefits | high quality reliable | bypass physical barrie |
| Disadvantages | costly to build | physical connection s required |
| Best Use | corridors network backbone | last mile fiber gaps |

*TRAVELER INFORMATION*

Service Layer Brochure

**Traveler Information**

**Traveler information systems offer real-time information to travelers, allowing users to make informed decisions about their route and mo choice.** Encountering delays, especcially those due to construction or c with no prior warning is a major cause of driver frustration. Providing informatic the motor public is o This inform informatic entered at events, ro coverage, the public in less gric up person increases



**Relationship to other service layer**

A total of nine service layer plans were completed as a part of the Alab information affects each of these service layers directly or indirectly th conditions. ALDOT traveler information receives data from the Traffic M communication to collect real time traffic conditions. Data received by and Emergency Transportaion OPerations are important sources of dat make travel decisions in real time.

Traffic Signals — Provides additional data to provide information to travelers

Traffic Management Centers — provides event notification and verification

ITS and Communications — provides real-time traffic and weather information to operators and general public

Traffic Incident Management — Collect and provide travelers incident and delay information

Traveler Information

*TRAFFIC SIGNAL MANAGEMENT*

ALDOT STATEWIDE TSMO MASTER PLAN

Service Layer Brochure

**Traffic Signal Management**

**Traffic signals play an intergral role in the transportation network serving to enhance the opperaional efficiency of corridors.** Traffic signals are also the most common form of traffic control. Traffic signal management is critical to the successful achievement of the ALDOT TSMO vision. Simply put, traffic signal management reduces congestion, reduces maintenance expenditures, and increases safety along the ALDOT roadway network. Traffic signal management provides and increddible benefit to cost ratio of 9.7 and 39 for integrated corridor management and between 17 and 62 for optimized traffic signals.



FHWA defines a traffic signal management as"**organizing for the** planning, maintenance, design, and **operation of signalized intersections** and **traffic signal systems.**"

**Coordinating People and Signals**

Traffic signal management is an effective way to increase the efficiency of an existing networks. Strong coordination between signal engineers, upper-management, public relations, and citizens is how these programs operate successfully. Creating an open dialog that works its way from the citizens up the chain to the engineers and upper-management and finally, through public relations, beack to the citizens creates a transparetn system that people build trust in. Allowing for for citizen input when creating performance objectives and explaining the strengths and short comings of the network will result in realistic goals that can be achieved throughout the region. In many cases, this coordination does not currently exist, resulting in citizen complaints never being answered, disagreement between engineers and upper-management on how to address signal problems, and public relations announcements that fail to realistically portray goals and objectives.

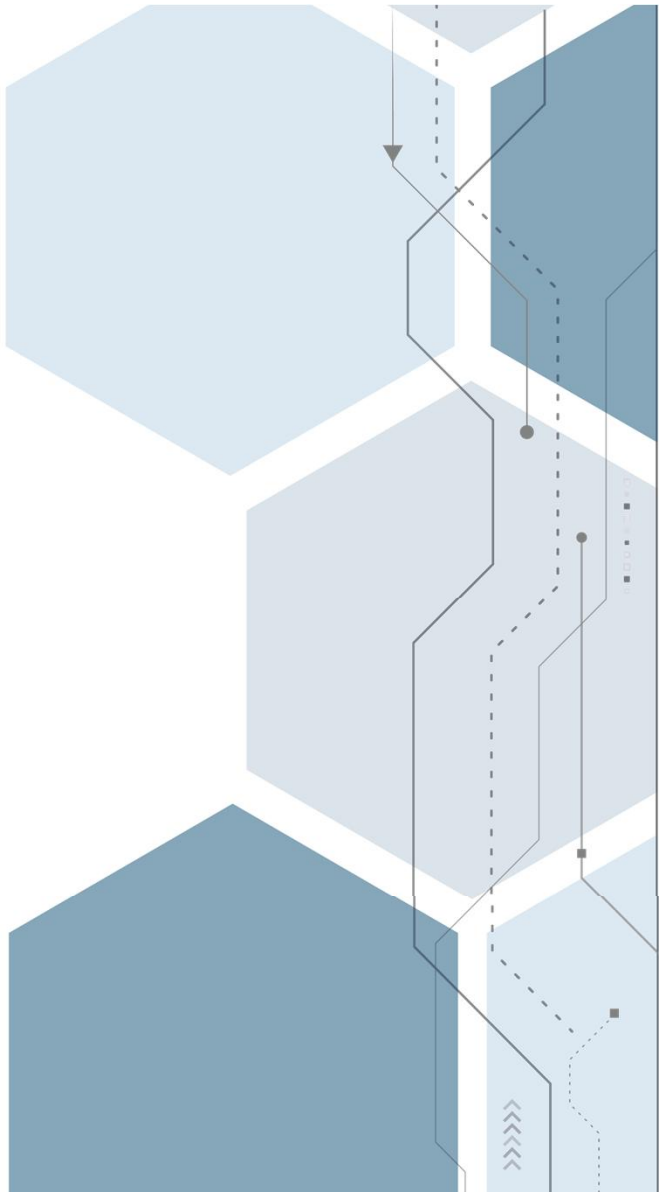
Coordination between signals is equally as important as coordination between people. Creating and adjusting timing plans for peak and off-peak periods, using correct cycle lengths that can handle the current traffic flow, adjusting splits to minimize queueing and over all delay and adjusting offsets to keep vehicles flowing through the arterial network will all help reduce delay, increase safety, and reduce the time that commuters are in their vehicles. Creating a system that allows for the direct management of signals allows for real time adjusemtned based on changing traffic conditions and creates a familiartiy between the engineers and signals that can reduce maintenance costs and direct funds to signals that are in critical need of improvements. Without this system in place, multiple engineers will work across a range of signals which will decrease their familiarity, ultimately resulting in a reactive approach to signal management which will be more costly to maintain.

Coordinated Signal Timing



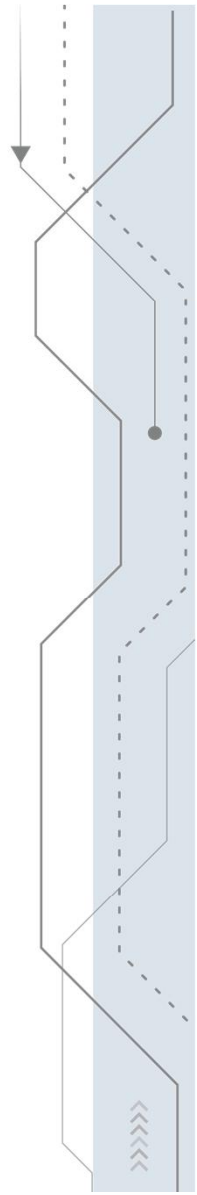
Uncoordinated Signal Timing

# Next Steps

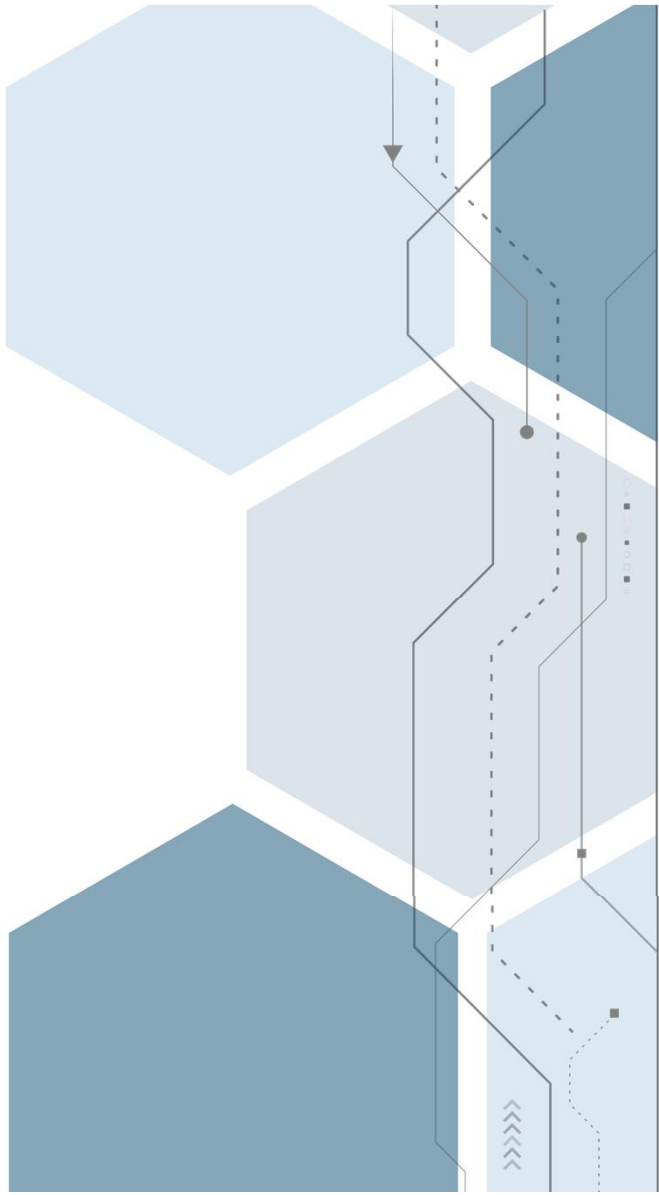


# What Next?

- Programmatic Organizational Changes
- Program Support – Budget
- Process Integration and Implementation
- Culture of Collaboration



# ALDOT STATEWIDE TSMO Master Plan



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