NDOT STATEWIDE TSMO PROGRAM

# Welcome to Transportation Systems Management and Operations Training

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Transportation Systems Management and Operations Training

# The Business Case for TSMO

TSMO Training Module 201

ATKINS

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## Module 201

# Transportation Systems Management and Operations


- Section 01 / **Business Case for TSMO**
- Section 02 / **TSMO Business Case for Divisions**
- Section 03 / **Final Assessment**


Previous Slide

NEXT

Section 01

# Business Case for TSMO

Main Menu | Previous Slide | NEXT

# Statewide Challenges

- Population growth
- Congestion
- Safety
- Increase in vehicles miles traveled
- Tourism-based economy
- Deficient roads & bridges
- Trucks and freight movement

# Population Growth

- Increased demand for roads results in congestion
- 2022 population – 3.2 million up from 2.7 million as of 2010

**Example TSMO Integration and Strategies**

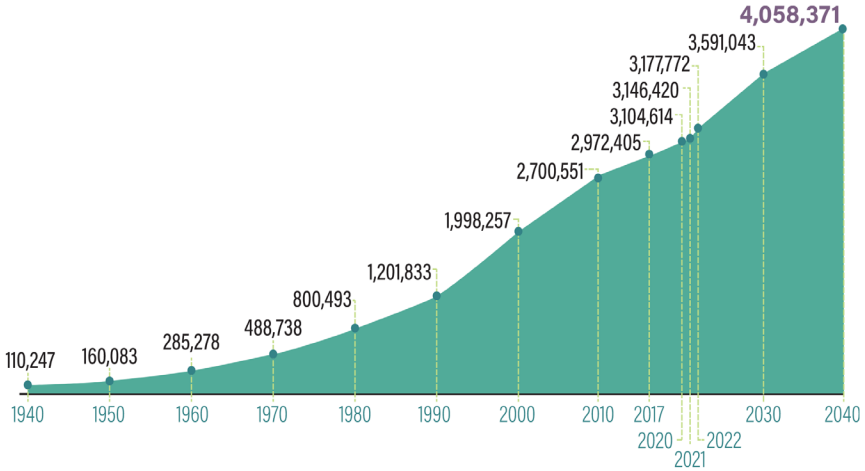
- Traffic Incident Management
- Work Zone Management
- Special Event Management
- Road Weather Management

**↑133%** 1990—2008, fastest growing State in the nation.

**3 Million** Population in 2018, fastest growing in the nation based on U.S. Census Bureau.

**4.1 Million**

Projected population by 2040




*Source: U.S. Census Bureau Press Release Wednesday, December 19, 2018 Nevada and Idaho Are the Nation's Fastest-Growing States.*

Main Menu | Previous Slide | NEXT

# Example TSMO Integration and Strategies

**Traffic Incident Management**

Consists of a planned and coordinated multi-disciplinary process to detect, respond to, and clear traffic incidents and restore traffic flow as safely and quickly as possible.

**Work Zone Management**

Manage traffic during construction to minimize traffic delays, maintain motorist and worker safety, complete roadwork in a timely manner, and maintain access for businesses and residents.

**Special Event Management**

For managing a public activity with a scheduled time, location, and duration that may impact the normal operation of the surface transportation system due to increased travel demand and/or reduced capacity.

**Road Weather Management**

Strives to sustainably strengthen the resiliency of the highway system by mitigating the impacts that weather can have on it and the environment.

# Congestion

- 40% of Nevada's urban interstates experience congestion during peak hour
- Congestion results in about losing $984 (46 hours) for a Las Vegas driver and $383 (18 hours) for a Reno driver in fuel and time

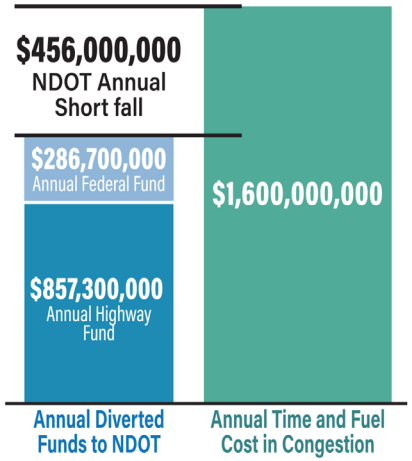
**Example TSMO Integration and Strategies**

- Adaptive Ramp Meters are traffic signals installed on freeway on-ramps to control the frequency at which vehicles enter the flow of traffic on the freeway.
- Adaptive Ramp Metering can decrease delay and improve trip reliability, which also reduces traffic crashes.

**$101 B** In wasted time and fuel cost in U.S. per year.

**$1,400 & 60 hrs** Cost of congestion to average driver in Nevada annually.

**$1.6 Billion**
Value of lost time and fuel in Nevada




Roadway incidents account for:

**25%** of travel delay,

**4 minutes** for every minute of congestion, and

**2.8%** increased chance of secondary incident

*Note: The Annual Highway Fund does not include the Annual Federal Fund. (NDOT, 2021 Facts and Figures).*
*Source: 2021 Nevada Transportation Facts and Figures*

# Safety

**Traffic results in extended delays and congestion**

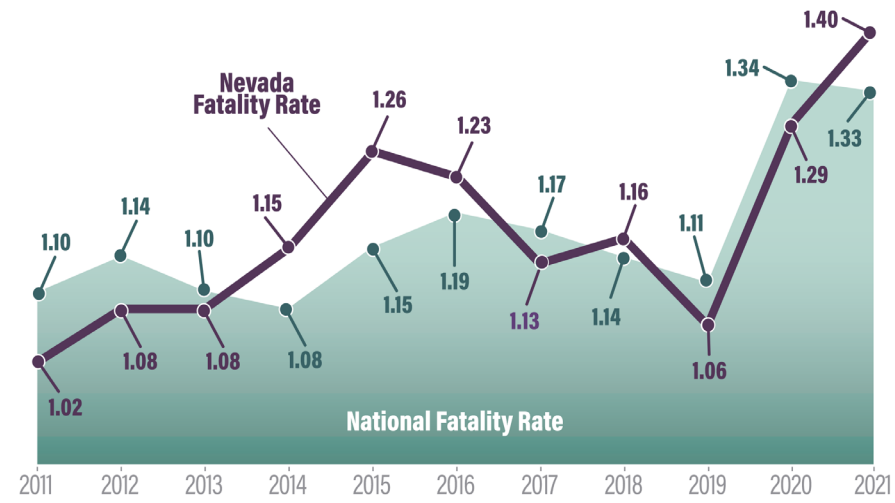
- For each minute a lane is blocked during a peak hour, there is a 2.8% increased chance for a secondary crash
- Secondary crashes are responsible for 18% of overall fatalities

**Example TSMO Integration and Strategies**

- Integrated Corridor Management
- Wrong Way Driver Detection
- Active Traffic Management

**386** People died in Nevada in 2021.

**$2.6 B** Economic cost of traffic crashes in 2021.




*Sources: Nevada Traffic Safety Crash Facts*
*NDOT 2022 Performance Management Report*

Main Menu | Previous Slide | NEXT

# Example TSMO Integration and Strategies

**Integrated Corridor Management**

Defined as the coordination of individual network operations between adjacent facilities that creates an interconnected system capable of cross-network travel management.

**Wrong-way Driver Detection**

Alerts drivers that they are entering the freeway in the wrong direction so that they can self-correct before causing a collision.

**Active Traffic Management**

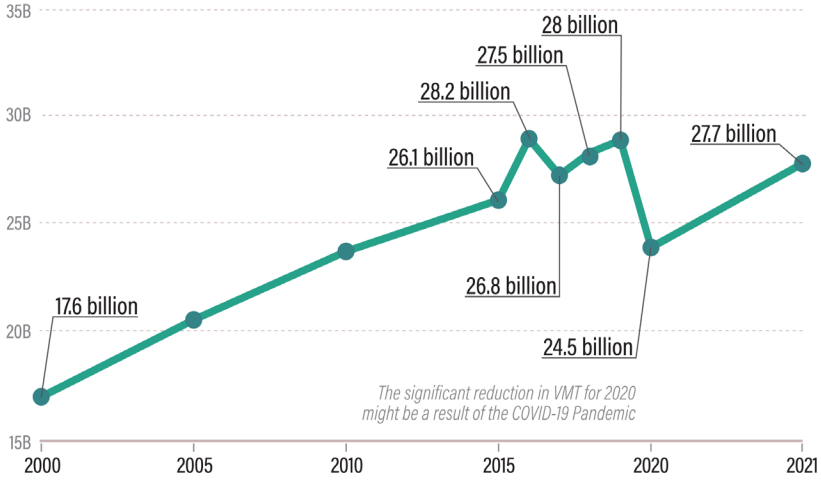
The ability to dynamically manage recurrent and non-recurrent congestion based on prevailing and predicted traffic conditions.

# Vehicle Miles Traveled

**Example TSMO Integration and Strategies**

- Improved non-motorized facilities (pedestrian and bicycle paths)
- Switching mode choices (bus rider or ride share)
- Real-time information for trip pre-planning or trip re-routing

**57%** From 17.6 billion in 2000 to 27.7 billion in 2021.




*Sources: Nevada Transportation by the Numbers TRIP Report October 2016*
*Nevada Transportation Facts and Figures 2016-2021*

Main Menu | Previous Slide | NEXT

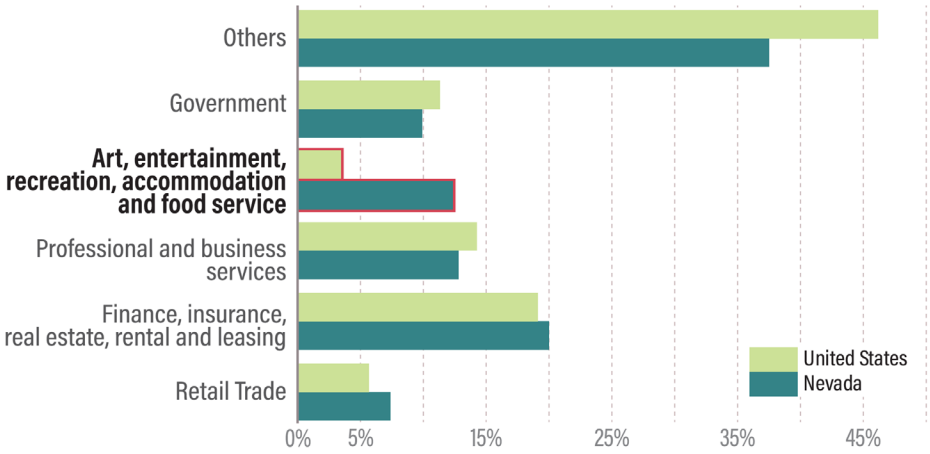
# Tourism-Based Economy

**Example TSMO Integration and Strategies**

- Real-time traveler information
- Promoting public transport
- Providing pedestrian and bicycle paths

Service sector employs about
**half of Nevada's workers**

Tourism sustains
**22.4%**
of all jobs in Nevada



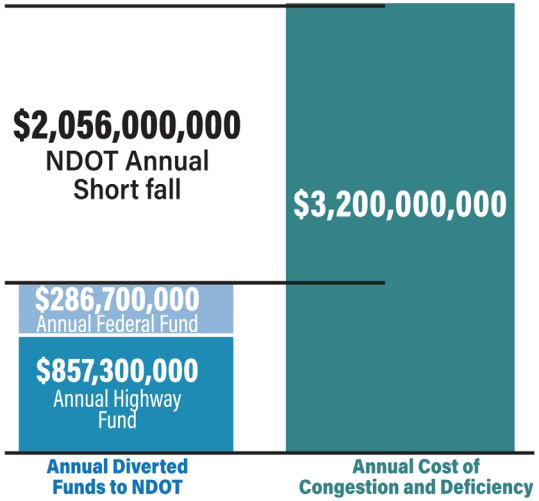

*Source: Bureau of Economic Analysis, 2021*

Main Menu | Previous Slide | NEXT

# Deficient Roads and Bridges

- Performance based approach facilitates collaboration to ensure NDOT efficiently responds to growing demand
- Focused on low-cost high return solutions to implement strategies within budget

**$3.2 Billion** Annual cost to Nevada motorists due to inadequate roads.




**$24 M** Deficit has been projected in bridge preservation by 2020

*Note: The Annual Highway Fund does not include the Annual Federal Fund. (NDOT, 2018 Facts and Figures)*
*Source: Source: 2021 Nevada Transportation Facts and Figures*

Main Menu | Previous Slide | NEXT

# Trucks And Freight Movement

- NDOT's goal is to improve its roadway system to increase truck and freight efficiency
- Nevada's economy depends largely on imports and exports in state
- Smart TSMO strategies can assist  with delay, parking and route selection for reliable and efficient journey

The efficiency of the transportation system is critical to the health of the state's economy in Nevada. The key to success is the level of access and convenience for customers and markets.

**$169.4 Billion**

Goods and products are shipped mostly by truck to and from the state of Nevada

**73%**

of goods and products are carried by trucks annually.

*Source: Nevada Transportation by the Numbers 2020*

Main Menu | Previous Slide | NEXT

Section 02

# TSMO Business Case for Divisions

Main Menu | Previous Slide | NEXT

# TSMO Business Case for Divisions Fact Sheets

Main Menu | Previous Slide | NEXT

# Planning

The Planning Division plays a critical role in shaping the state's current and future transportation system, given the division's wide scope of responsibilities and relevance to TSMO.

Examples of NDOT TSMO strategies currently integrated into Planning Division activities include:

- NDOT Strategic Plan (2020):
  - Goal 1—Safety first
  - Goal 3—Efficiently operate and maintain the transportation system in Nevada
  - Goal 6—Consistent and effective data management
- NV2X Office of Innovation
- Benefit-Cost Analysis
- Performance Measurement and System Monitoring

Main Menu | Previous Slide | NEXT

# Design

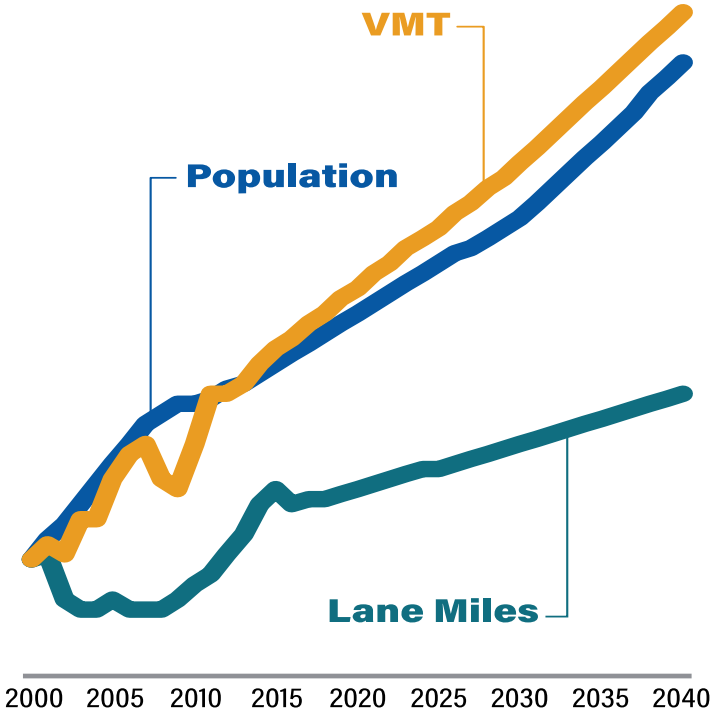
- NDOT's design division is a sub section within its engineering division
- Responsible for developing high-quality plans, specifications and estimates
- TSMO strategies inclusion results in developing more safer and more efficient design in compliance with Nevada's economic and intermodal transportation requirements
- TSMO integration in design projects is done by TSMO evaluation tool which is completed by traffic operations division representatives

## Around the Nation

- Caltrans recommends input from different departments for project development
- Pennsylvania DOT has design checklists for ITS elements to be completed during design phase
- Colorado DOT requires all projects to undergo TSMO evaluation during scoping review phase

# Construction

- Responsible for construction and maintenance for more than 5000 lane-miles of roadway
- Constantly increasing demand
- NDOT will require TSMO strategies to carry out construction activities to maintain safe and reliable travel
- TSMO strategies under 3 main categories:
  - Mobility
  - Incident Management
  - Work Zone Management




*Source: One Nevada Transportation Plan, 2020*

# Mobility

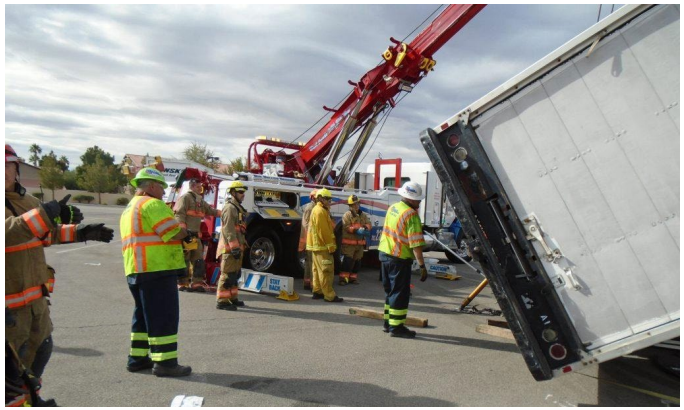
NDOT Active Traffic Management Systems:

- Providing advance warning
- Monitoring traffic
- Collecting data
- Detecting queues
- Harmonizing speeds

*Source: Federal Highway Administration (FHWA)*

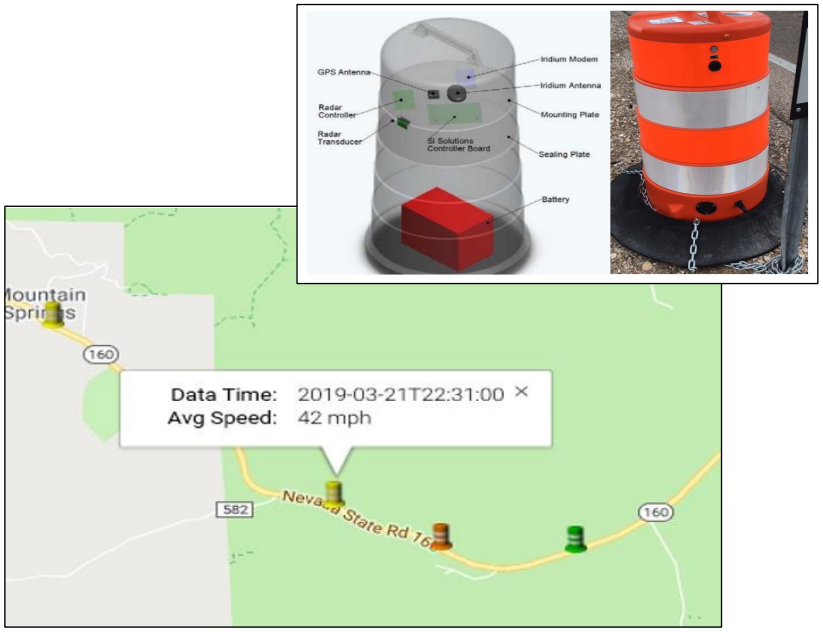
# Incident Management

- Stationing law enforcement officers within work zones to encourage compliance with construction speed limits
- Implementing portable rumble strips within work zones to alert inattentive drivers to changing roadway conditions
- Ensuring coordination among stakeholders through regular construction updates at TIM Coalition meetings



# Work Zone Management

- NDOT has implemented multiple Smart Work Zone projects within the state. An example is the deployment of devices on State Route (SR) 160 to address traffic disruptions cause by a widening project.

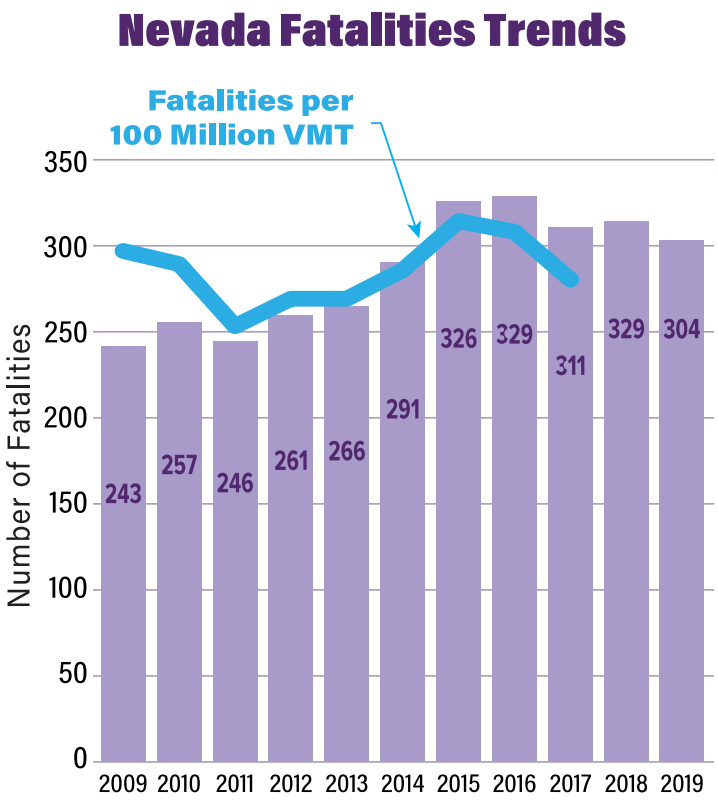


# Traffic Safety Engineering

- 31% crashes resulted to fatalities between 2014 and 2018 in Nevada
- The division is promoting innovative traffic safety projects
- Traffic safety office administers programs such as joining forces, traffic records, and Nevada rider

**NDOT Visions Zero**

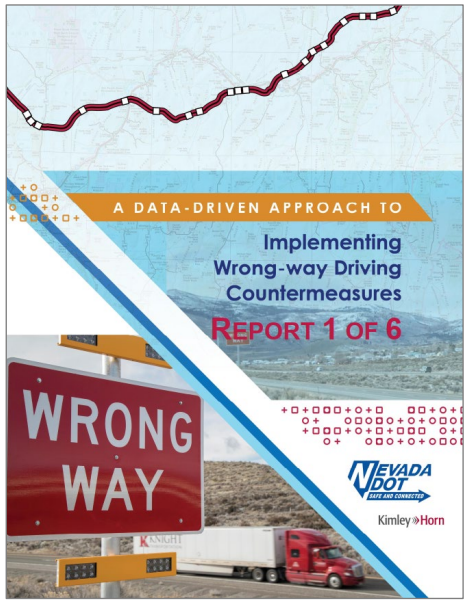
The State of Nevada has implemented Vision Zero as a commitment to achieving zero fatalities on Nevada's roadways.




*Source: Nevada Traffic Safety Crash Facts (Nevada Office of Traffic Safety, 2020)*

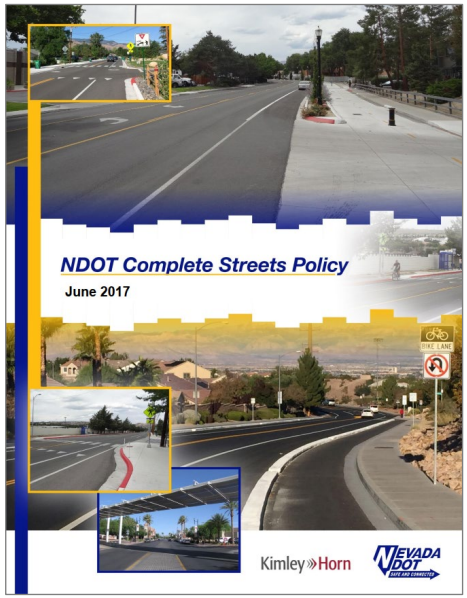
# Wrong Way Driver Detection

- Red rectangular rapid flashing beacons installed on exit ramps, activated when wrong way vehicle is detected.
- Designed to alert drivers to the fact that they are about to enter the freeway in the wrong direction.



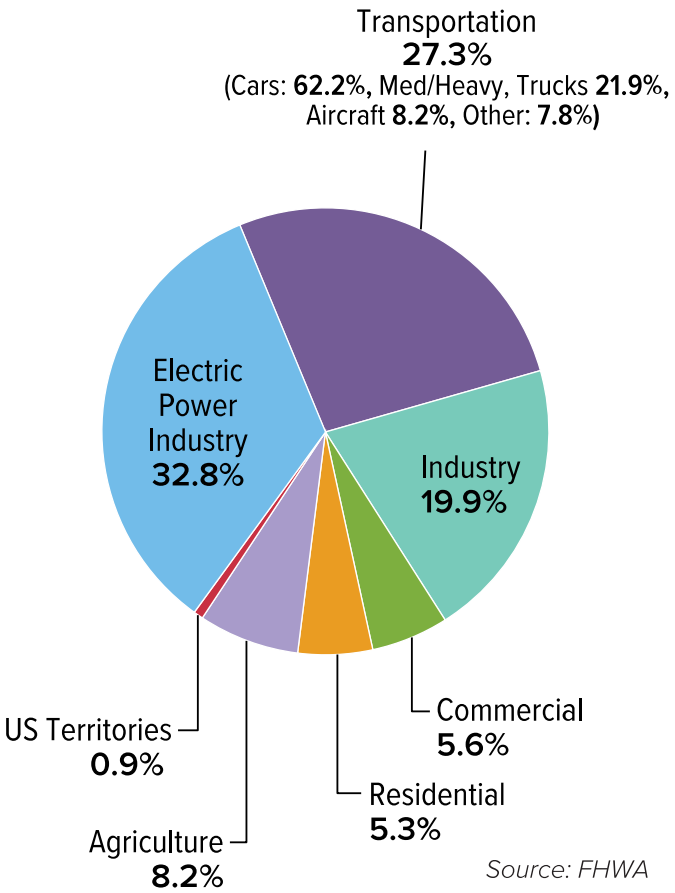

# NDOT Complete Streets

- Development of the NDOT Complete Streets Policy.
- An approach or policy used to promote street networks for all modes of transportation.
- Include enhanced accommodation for people riding bicycles, walking, using transit, and other users, in addition to the traditional accommodation for vehicles.



# Environmental Initiatives

- Committed to provide balanced and environmentally friendly design
- Committed to reduce the green house emissions generated through transportation sector




*Source: FHWA*

Main Menu | Previous Slide | NEXT

# Nevada Carlin Tunnels Adaptive Lighting

- Goals were to lower energy consumption, have an effective control system and meet applicable tunnel lighting standards.
- New system monitors outside ambient conditions and adjust tunnel lighting accordingly.

**Cost Comparison Between the Previous Lighting System and the New Lighting System**

| | Previous HPS Lighting System | New LED Lighting System |
|---|---|---|
| 20-year lifecycle cost | $16,085,855 | $7,050,511 |
| Average annual energy cost | $387,673 | $120,995 |
| Average annual maintenance cost per luminaire | $2,567 | $2,153 |
| Benefit-cost ratio | — | 1.3 |

# Nevada Alternative Fuels Corridor

- FAST ACT promoted deploying fueling corridors along major national roadways which support plug-in electric vehicle charging and hydrogen and natural gas refueling with existing or planned infrastructure.
- Currently NDOT has completed deploying AFCs along I-15 along with I-580 between Interstate I-80 and US-50.

**The environmental benefits of charging so far is equivalent to...**

**Greenhouse gas emissions from:**

**56,305.00** Miles driven by an average passenger vehicle

*or*

**CO2 emissions from:**

**2,553** Gallons of gasoline consumed

**Greenhouse gas emissions avoided by:**

**7.7** Tons of waste recycled instead of landfilled

*or*

**862** Incandescent lights switched to LEDs

**Carbon squestered by:**

**375** Tree seedlings grown for 10 years

*or*

**29.6** Acres of U.S. forest in one year

*Conversions: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator*

Main Menu | Previous Slide | NEXT

# Human Resources

NDOT's Human Resources department supports TSMO by:

- Providing recruitment specialists
- Determining when and where to recruit
- Determining incentives
- Performing screening and interview process and procedures
- Developing work performance standards

**TSMO Highlights:**

- Traffic operation division has undertaken specific action items to update job descriptions and work performance standards.
- The division designed a phased approach to review and update the division's organizational structure to include new TSMO positions.
- The division developed a TSMO Staffing and Workforce Development Plan.

# Maintenance and Asset Management

- Asset management is a strategic and systematic process of operating, maintaining, and improving physical assets.
- NDOT developed a Transportation Asset Management Plan which lists all its assets and details a risk-based approach to maximize the asset's life cycle.
- It summarizes the quantity and condition of certain assets including:
  - ITS assets
  - Pavements
  - Bridges

**Types of Maintenance:**

- Routine Maintenance
- Capital improvement
- Emergency activities

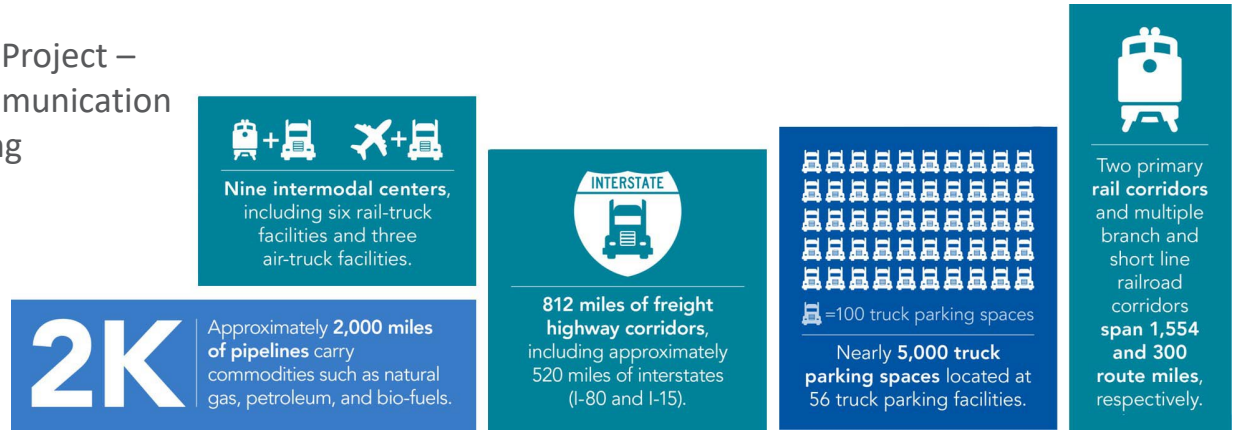
Main Menu | Previous Slide | NEXT

# Freight Planning

- Nevada has multimodal freight system maintained through highways, air and rail
- Freight transportation is an essential business investment factor
- NDOT Initiatives supporting freight safety
- Corridor-specific truck parking plans – to expand truck parking and safety
- NDOT Fright Advisory Committee – maximize collaboration and coordination
- I-15 Dynamic Mobility Project – improve real time communication and information sharing

**Nevada in Freight Numbers:**

- In 2015 more than $156 billion worth of goods were served in and out of Nevada
- International exports from Nevada accounted for more that $12 billion worth of products which supported 40,000 jobs as of 2016
- Of all movements, 77% rely on truck which requires a reliable highway system



Section 03

# Final Assessment

Click to access the
Final Assessment Quiz

Main Menu

Previous Slide

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

# Module 201 / The Business Case for TSMO

1. **The Business Case for TSMO was developed as part of the Strategic Elements within the NDOT TSMO Program Plan.**

   ◯ True

   ◯ False

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

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- (●) True
- ( ) False

**Correct!** Click for next question.

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- ◯ True
- ⊗ False

**Incorrect.** *Try again*

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

# Module 201 / The Business Case for TSMO

**2. Which one of the following topics was NOT included as a statewide transportation challenge on the Business Case for TSMO?**

- ◯ Congestion
- ◯ Reliability
- ◯ Deficient Roads and Bridges
- ◯ Safety

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

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**2. Which one of the following topics was NOT included as a statewide transportation challenge on the Business Case for TSMO?**

- ⊗ Congestion
- ◯ Reliability
- ◯ Deficient Roads and Bridges
- ◯ Safety

**Incorrect.** *Try again*

FINAL QUIZ

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**Incorrect.** *Try again*

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

# Module 201 / The Business Case for TSMO

**3. Which one of the following is an example of a TSMO strategy that can help address increase in Vehicle Miles Traveled (VMT)?**

- ◯ Freight Management
- ◯ Ramp Management
- ◯ Road Weather Management
- ◯ Improved Bicycle and Pedestrian Crossings

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

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- ⊗ Freight Management
- ◯ Ramp Management
- ◯ Road Weather Management
- ◯ Improved Bicycle and Pedestrian Crossings

**Incorrect.** *Try again*

FINAL QUIZ

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TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

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FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

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- ⊗ Road Weather Management
- ◯ Improved Bicycle and Pedestrian Crossings

**Incorrect.** *Try again*

FINAL QUIZ

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- ○ Ramp Management
- ○ Road Weather Management
- ● Improved Bicycle and Pedestrian Crossings

**Correct!** Click for next question.

# Module 201 / The Business Case for TSMO

**4. The TSMO performance-based approach facilitates and enhances collaboration between stakeholders to ensure a focus on low-cost, high-return solutions on implementing TSMO strategies within budget.**

- ◯ True
- ◯ False

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

## Module 201 / The Business Case for TSMO

**4. The TSMO performance-based approach facilitates and enhances collaboration between stakeholders to ensure a focus on low-cost, high-return solutions on implementing TSMO strategies within budget.**

- (●) True
- ( ) False

**Correct!** Click for next question.

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

# Module 201 / The Business Case for TSMO

**4. The TSMO performance-based approach facilitates and enhances collaboration between stakeholders to ensure a focus on low-cost, high-return solutions on implementing TSMO strategies within budget.**

- ◯ True
- ⊗ False

**Incorrect.** *Try again*

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

# Module 201 / The Business Case for TSMO

**5. As part of the TSMO Implementation Plan, NDOT has developed a TSMO Business Case for Divisions to further elaborate on how TSMO strategies are utilized by NDOT Divisions.**

- ◯ True
- ◯ False

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

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**5. As part of the TSMO Implementation Plan, NDOT has developed a TSMO Business Case for Divisions to further elaborate on how TSMO strategies are utilized by NDOT Divisions.**

- (●) True
- ( ) False

**Correct!** Click for next question.

FINAL QUIZ

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- ◯ True
- ⊗ False

**Incorrect.** *Try again*

FINAL QUIZ

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TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

# Module 201 / The Business Case for TSMO

**6. Which one of the following is NOT an example of TSMO strategies utilized by the Planning Division?**

- ◯ Traffic Incident Management
- ◯ Benefit-Cost Analysis
- ◯ Performance Measurement and System Monitoring
- ◯ NV2X Office of Innovation

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

# Module 201 / The Business Case for TSMO

**6. Which one of the following is NOT an example of TSMO strategies utilized by the Planning Division?**

- (●) Traffic Incident Management
- ( ) Benefit-Cost Analysis
- ( ) Performance Measurement and System Monitoring
- ( ) NV2X Office of Innovation

**Correct!** Click for next question.

FINAL QUIZ

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- ◯ Traffic Incident Management
- ⊗ Benefit-Cost Analysis
- ◯ Performance Measurement and System Monitoring
- ◯ NV2X Office of Innovation

**Incorrect.** *Try again*

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- ◯ Benefit-Cost Analysis
- ⊗ Performance Measurement and System Monitoring
- ◯ NV2X Office of Innovation

**Incorrect.** *Try again*

FINAL QUIZ

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TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

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- ◯ Benefit-Cost Analysis
- ◯ Performance Measurement and System Monitoring
- ⊗ NV2X Office of Innovation

**Incorrect.** *Try again*

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

# Module 201 / The Business Case for TSMO

7. **Select the relevant TSMO strategy for the following statement:**
   *This strategy provides the ability to dynamically manage congestion on prevailing traffic conditions by providing advance warning, monitoring traffic, collecting data and detecting queues.*

   - ◯ Connected and Automated Vehicles
   - ◯ Access Management
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FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

# Module 201 / The Business Case for TSMO

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**Incorrect.** *Try again*

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**Correct!** Click for next question.

FINAL QUIZ

NDOT STATEWIDE TSMO PROGRAM

TRANSPORTATION SYSTEMS MANAGEMENT AND OPERATIONS TRAINING

# Module 201 / The Business Case for TSMO

**8. Select the relevant TSMO strategy for the following statement:**
*In 2019, NDOT published work zone safety and mobility implementation guide to establish fundamental principles, roles, responsibilities, and procedures for systematically addressing the safety and mobility impacts.*

- ◯ Congestion Pricing
- ◯ Work Zone Management
- ◯ Traffic Incident Management
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**Correct!** Congratulations you're done. Click to continue.

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# THANK YOU

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TSMO TRAINING MODULE 201

**THE BUSINESS CASE FOR TSMO**

DATE: September 12, 2023

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