South Dakota Variable Speed Limit Development

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for North/West Passage Technicians Forum

August 25, 2021

The Problem

- Winter Storms
- Snow, Blowing Snow
- Drifting / Icy Roads
- Low Visibility
- Excessive Speed
- Fast/Slow Traffic Mix
- Crashes
- Secondary Crashes & Pileups
- Fatalities
- Road Closures

Winter Storm Pileups

- Wyoming
  https://www.youtube.com/watch?v=IxlvxvG8zOE
- Iowa
  https://www.youtube.com/watch?v=hcSC-HittRM
- Wisconsin
  https://www.youtube.com/watch?v=9kj6f2iSkrI

A Solution to the Problem

An effective way to

- reduce crashes
- reduce deaths
- reduce road closures
- maintain mobility during adverse conditions

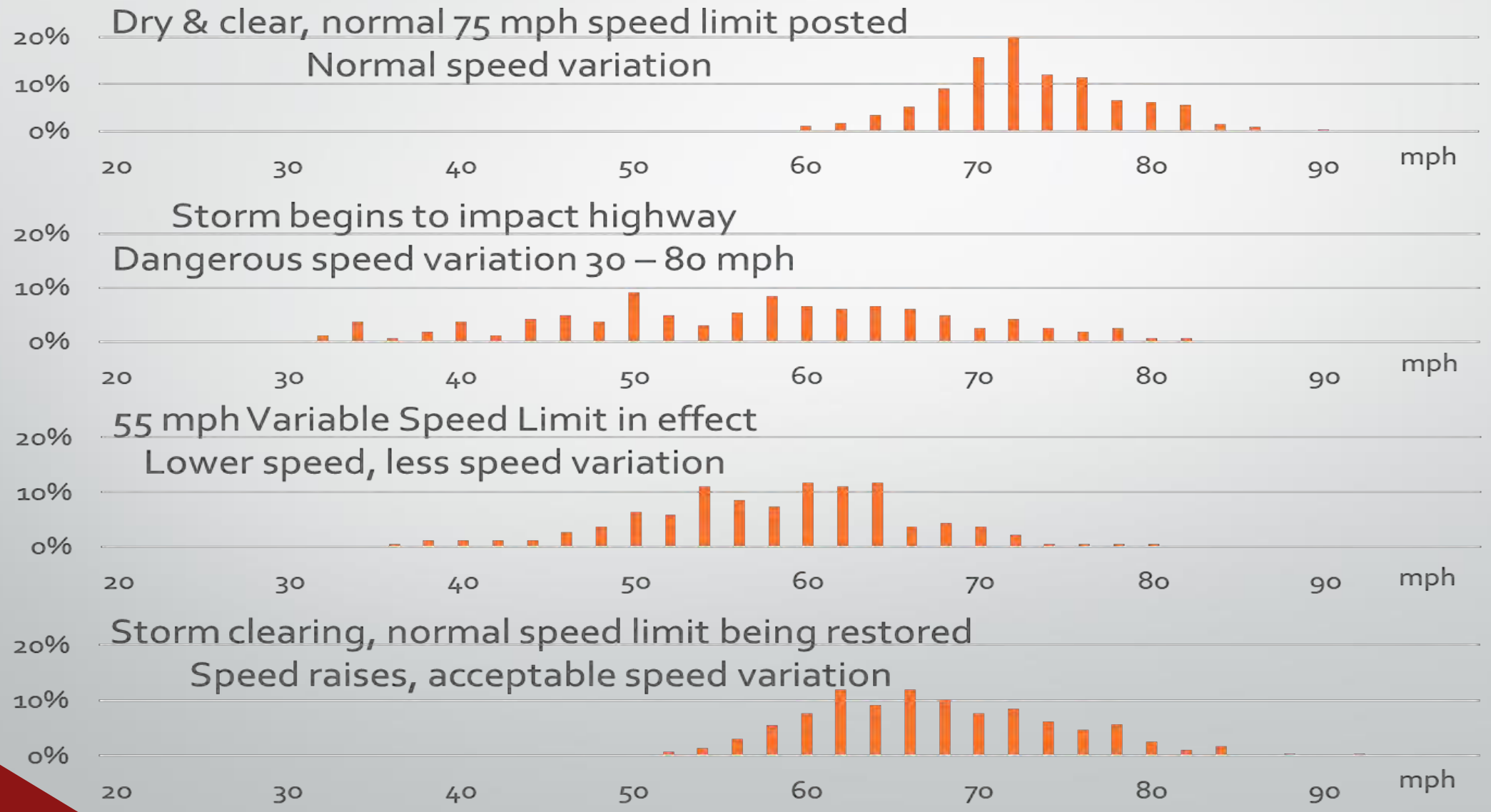
NOT

- a winter speed trap
- a way to restrict speed during normal driving conditions

Variable Speed Process

- Assess conditions
  - weather
  - visibility
  - road surface
  - vehicle speeds
- Determine appropriate speed (step down & back up)
- Display & publish speed limit
- No undue enforcement
- Measure & evaluate results

Wyoming I-80 Storm Example



Condition Observation & Validation for VSL Decision Support

- Weather Sensors
  - Air temperature
  - Relative humidity
  - Wind speed & direction
  - Visibility
- Road Sensors
  - Surface temperature
  - Water & ice thickness
  - Friction
- Traffic Sensors
  - Vehicle speed

- Cameras

- Human Observers
  - SDDOT maintenance
  - SDHP troopers

Posting & Publishing VSL

- Electronic Speed Limit Signs

- Dynamic Message Signs

- Traveler Information

511 Travel Info

- Third-party apps
- Media
- State and Local Agencies
  - Dispatch
  - Law enforcement

Variable Speed Limit Goals

Goals	Expectation
• Reduce speed when conditions warrant	• Average speed drops ~70-80% of posted reduction
• Reduce speed variability among traffic stream	• Range and standard deviation decrease sharply
• Reduce crashes	• Reduced ~1/2 in WY
• Reduce fatalities	• Reduced ~1/2 in WY
• Reduce road closures	• Reduced ~1/3 in WY
• Economic benefit (safety & reliability)	• Road user savings ≫ cost

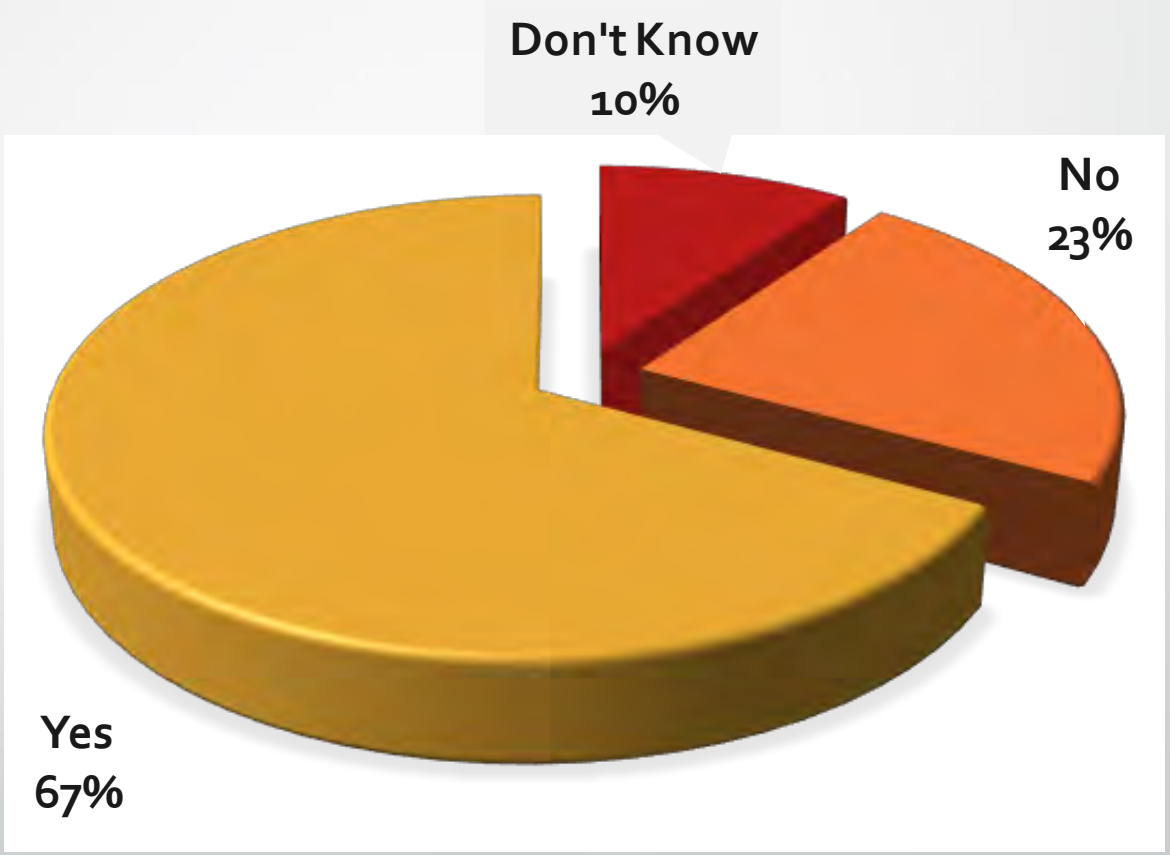
Additional Safety Benefit of VSL

Expected reduction in:

- collisions with snowplows
- secondary crashes with law enforcement, fire, emergency medical, and towing

South Dakota
Public Receptivity to Variable Speed Limits

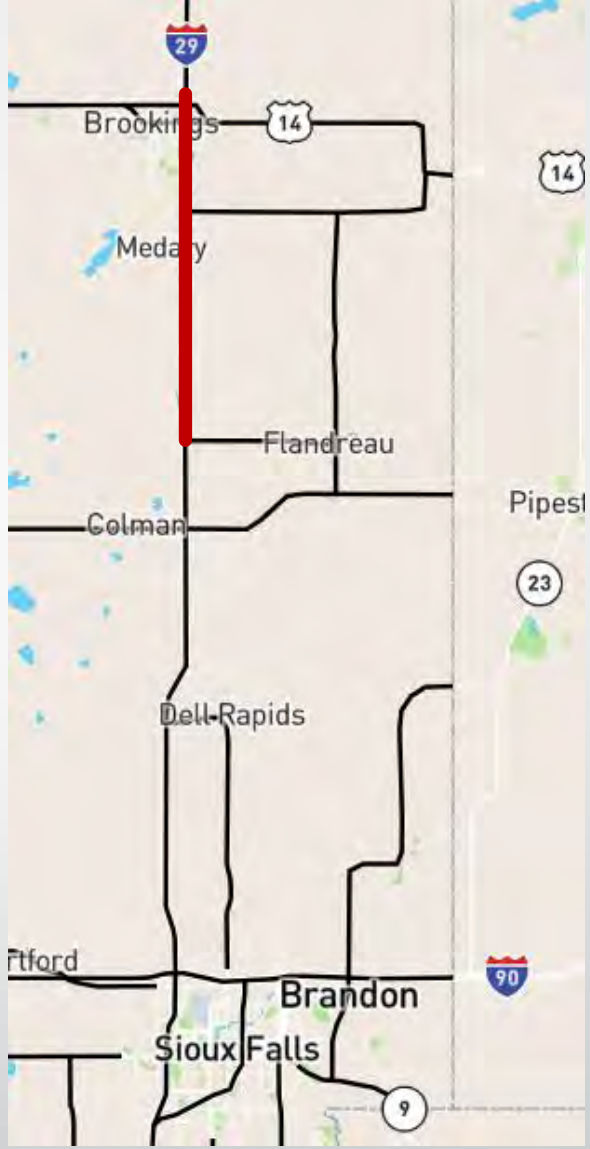
"Would you favor temporarily lowering speed limits to match road conditions during severe winter weather in an attempt to improve safety and reduce road closure time on sections of Interstate highways?



Source: ETC Institute, 2018

Initial South Dakota Projects

I-90 Sturgis to Tilford



I-29 SD32 to Brookings

- Severe weather
- Elevated winter crash rates
- Enabling Legislation 2020
- Accelerated Innovation Deployment Grant
- 14:1 benefit/cost ratio

VSL Project Approach

- Build on other states' experience
- Feasibility assessment (done)
- Secure funding
- Systems engineering
  - Concept of operations
  - Requirements definition
  - Design
  - Testing & validation plan
- Contract award, installation
- Formal evaluation (operation, effectiveness)
- Possible future expansion to other Interstate segments

I-90 Variable Speed Limits

Sturgis to Tilford

Corridor Challenges

- High Speed Crashes, Incidents
- Hazardous Winter Driving Snow, Sleet, Low Visibility
- Challenging Road Geometrics
- 11% Truck Traffic, Truck Safety, Wind Gust Tip Over
- Special Events/Sturgis Rally 739,000 Bikers (2015)
- Animal Intrusions – Elk, Deer 131 incidents in 4 years
- Incident Management

Incident Management

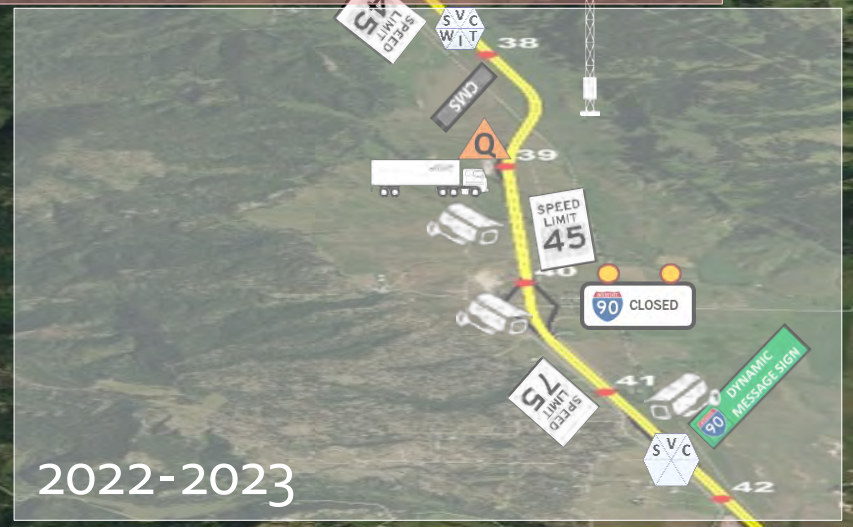
- Camera Surveillance
- Vehicle Detection for Traffic Monitoring
- Dynamic Message Signs for Incident Management Information
- Environmental Sensor Data Hazardous Conditions Alert
- Secure and Reliable Communications Fiber Optics
- Traffic Management Functions

Variable Speed Limits

- SD Legislation 2020
- Regulatory Speed Limit
- Roadway Sensors
  - Surface Condition
  - Visibility
  - Traffic Speed, Volume
- Electronic Speed Limit Signs at Entrance Ramps
- Reduce Winter Crashes, Fatalities by One-Half

System Elements

- Variable Speed Limits
- Environmental Sensors
- Traffic Detection
- Dynamic Message Signs
- Full Corridor Surveillance
- Mainline & Ramp Closure Gates
- Off-Ramp Queue Detection
- Commercial Vehicle Electronic Screening with Tire Anomaly & Thermal Brake Checking



Challenges

- Grading, Surfacing, Structures
  - East End 2022-2023
  - Middle 2024-2025
- Active Traffic Management System
- Traffic Management Center

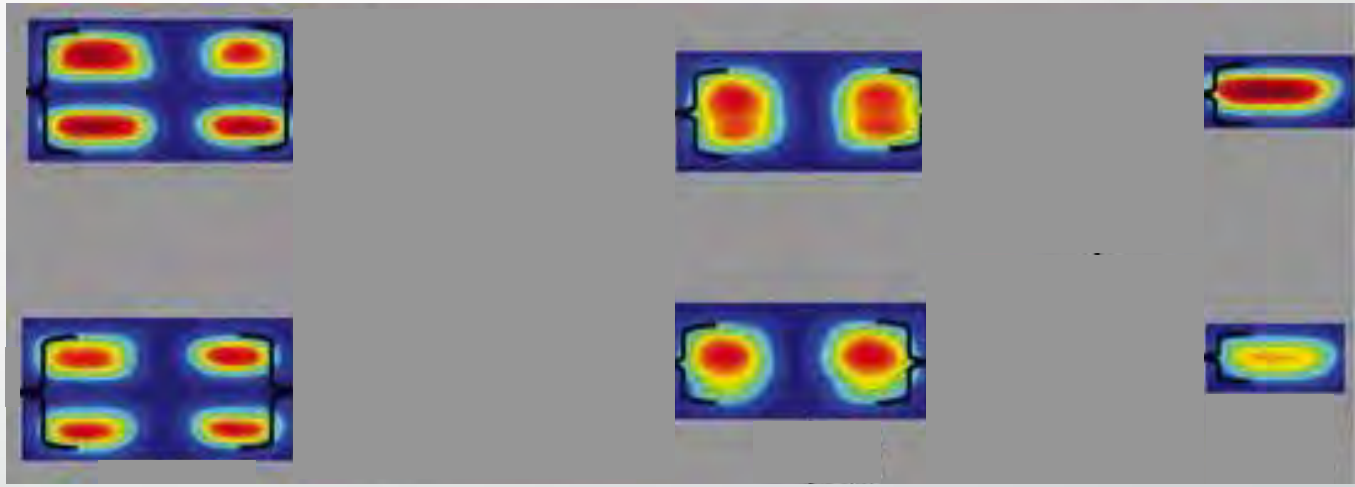
Communications

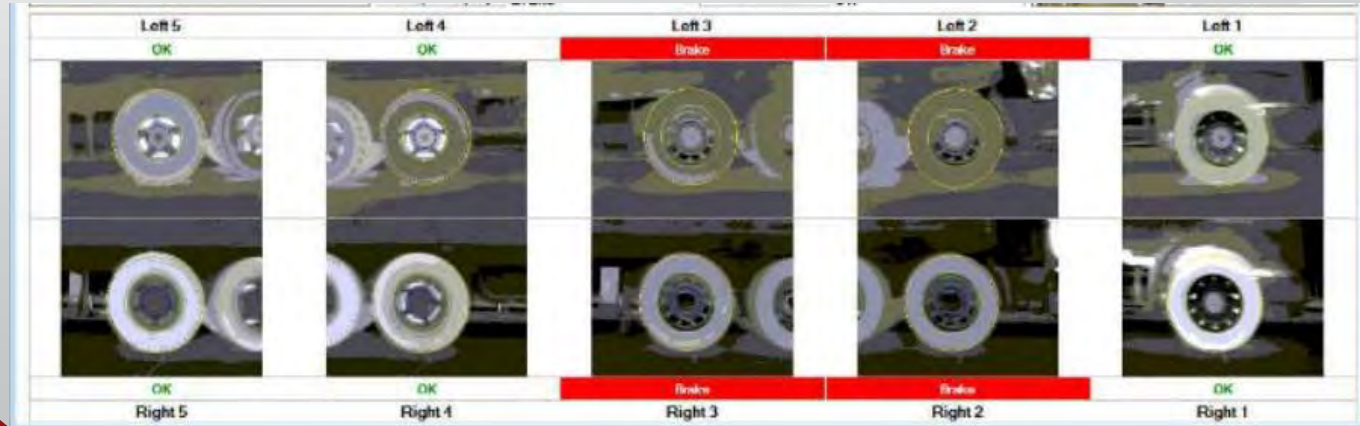
- Dedicated SDDOT Fiber (96-strand backbone)
- Connect to SDN commercial fiber at SDDOT Sturgis Shop and Tilford Port of Entry
- Dedicated SDDOT Fiber (E-Screening)
- Some wireless during construction phase

Electronic Screening at Tilford Port of Entry

$2.50 per minute savings to carriers

Tire Anomaly Checking & Thermal Brake Inspection





The Point of It All

- Safety
- Mobility
- Efficiency
- Economic vitality
- Reliable service for road users

“Better life through better transportation”

Questions?

Contact

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Thank You!!