June 19 - 20, 2025
Hollywood, FL

TRANSPORTATION SYMPOSIUM

Connected Work Zones:

Leveraging Technology For Safer and Smarter Roadways

Moderator:
Jeremy Dilmore, FDOT

Panelists:
David Feise, Arrive Alive Traffic Control (ATTC)
Todd Hartnett, Ver-Mac
Jason Lee, SmartCone

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Traditional Work Zone Practices

- **Growing Infrastructure Demands:** Increasing number of roadway projects causes traffic congestion and delays.
- **Higher Risk of Crashes and Injuries:** Motorists who are not familiar with the roadway are particularly vulnerable in work zones conditions.
- **Limited Real-Time Communication**: Motorists, workers, and transportation systems often lack coordination.
- **Safety Concerns**: Distraction and speeding continue to be major hazards in work zones across the nation.

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Infrastructure Is Evolving, so are Work Zones

- **Technology Integration**: Use of real-time data, sensors, mapping, and V2X (vehicle-to-everything) communication.
- **Growing Availability of Real-Time Data**: Smart signage, dynamic warnings, and geo-fencing improve work zone visibility.
- **Enhanced Coordination**: Contractors, DOTs, and motorists working more effectively together.
- **Safer Roads Through Information**: Well-informed motorists react better, reducing potential for crashes and non-recurring congestion.
- **WZ Safety and Mobility (Subpart J) Final Rule**: Data-driven assessment of work zone performance.

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Panel Session Objectives

- **FDOT Smart Work Zone Design Strategies**
- **Expectations of Systems and Data Collection**
- **Implementation Considerations**
- **Worker Presence Solutions to Improve Motorist Awareness and Behavior**
- **Where Are We Now: Update on SWIFTT Challenge-Winning WZ Safety Solution**

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FDOT Smart Work Zone Design Strategies

David Feise
President
Arrive Alive Traffic Control (AATC) LLC

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FDOT SWZ Strategies

FDOT has developed combinations of SWZ technologies to create ***strategies*** in response to work zone traffic impact scenarios. FDOT SWZ strategies covered in the SWZ Guidebook and Developmental Design Concept (DDC) include:

- Work Zone Data Exchange (WZDx)
- Dynamic End of Queue/Slow Speed Warning (DQW)
- Dynamic Lane Merge (DLM)
- Dynamic Speed Harmonization (DSH)

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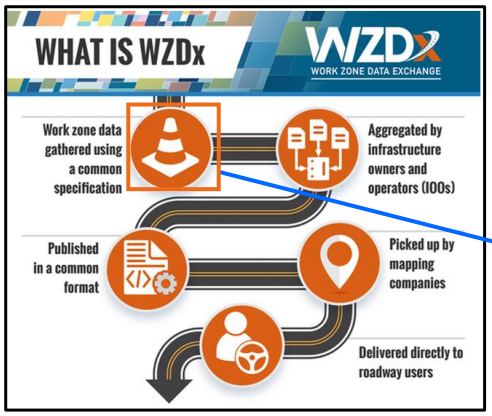
Work Zone Data Exchange (WZDx)



- ***Program Sponsor***: Federal Highway Administration (FHWA)
- ***Goal***: Safe work zone navigation for vehicles equipped with automated driving systems (ADS)
- ***Work Zone Data***: Near real-time work zone data for third party use
- ***Recommended***: Use for projects impacting traffic or when workers are adjacent to open traffic lanes
- ***Long Term***: Eventually use WZDx on all projects that potentially impact traffic

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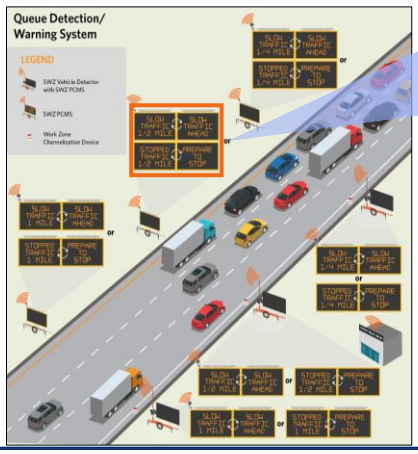
Dynamic Queue Detection / Slow Speed Warning (DQW)



- ***Goals***
  - Fewer work zone crashes
  - Increased throughput
- ***SWZ Vehicle Detectors***
  - Traffic speeds
  - Traffic volumes
- ***SWZ Central Processor***
  - Locate slower traffic
  - Locate stopped traffic
  - Locate end of queue
  - Selects messages from pre-approved library
  - Posts messages to PCMS
- ***Portable Changeable Message Signs (PCMS)***

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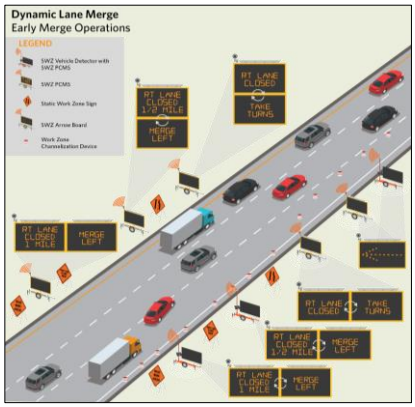
Dynamic Lane Merge (DLM)



- ***DLM Scenarios***
  - **Early Merge**: move traffic (≤1,500 vehicles/lane/hour) to open lanes as early as possible
  - **Late Merge / Zipper Merge**: keep traffic (>1,500 vehicles/lane/hour) in all lanes until the lane closure
- ***Goals***
  - Increase safety (hard braking, road rage)
  - Reduce queue length
  - Increase throughput
- ***SWZ Detectors***
  - Speed and volume approaching merge and through the work area
- ***SWZ Central Processor***
  - Determine applicability of ***early merge*** or ***late merge*** based on pre-determined algorithms
  - Select PCMS messages from pre-approved library
  - Post messages to PCMS
- ***SWZ PCMS***
  - Post early merge or late merge messages from Central Processor

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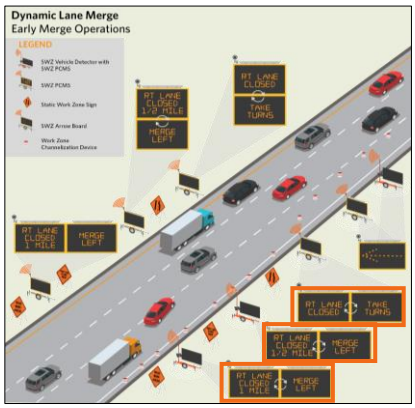
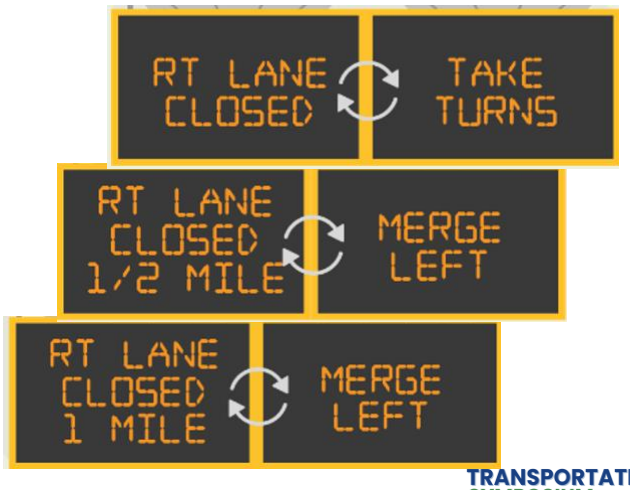
Dynamic Lane Merge (DLM)



PCMS for DLM

Early Merge Scenario



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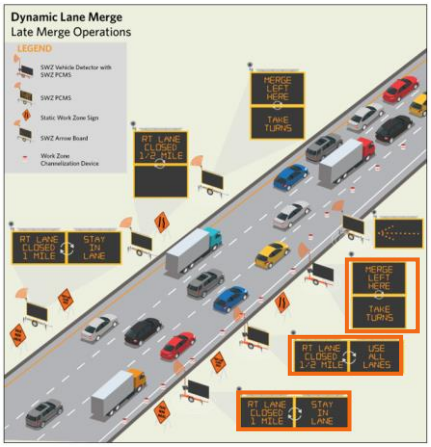
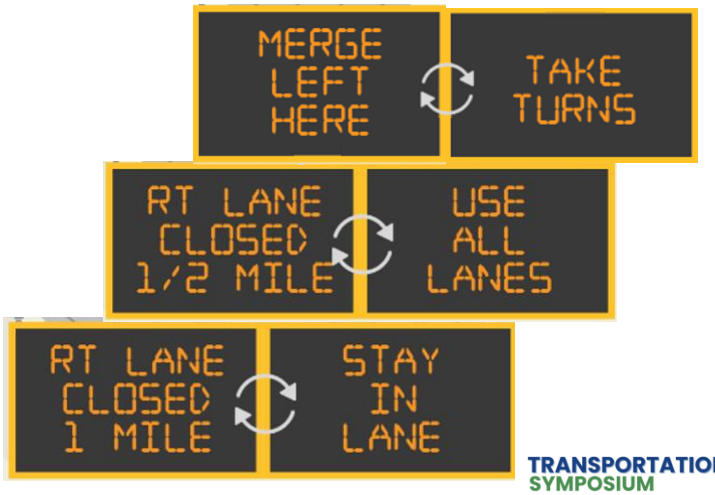
Dynamic Lane Merge (DLM)



PCMS for DLM

Late Merge Scenario



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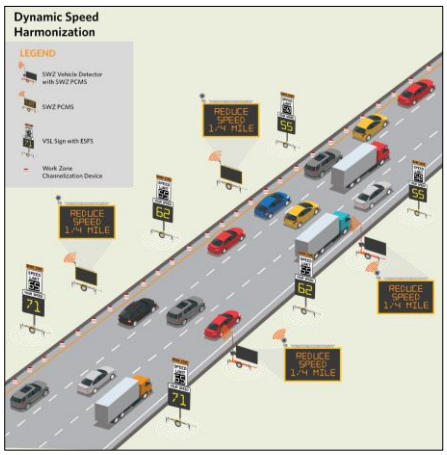
Dynamic Speed Harmonization (DSH)



- ***Goals***
  - Uniform speeds approaching and the through work zones
- ***SWZ Vehicle Detectors***
  - Vehicle speeds approaching and through work area
- ***SWZ Central Processor***
  - Locates slow traffic speed areas
  - Determines speed limits for traffic approaching slowed speed areas and posts speeds to SWZ VSL signs
  - Determines PCMS messages from pre-approved library and posts messages to SWZ PCMS
- ***SWZ PCMS***
  - Reduced speed ahead messages
- ***SWZ Variable Speed Limit (VSL) Signs*** with ***Electronic Speed Feedback Signs (ESFS)***
  - VSL: Current speed limit based on downstream traffic
  - ESFS: Displays speed of traffic passing the sign

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Dynamic Speed Harmonization (DSH)

SWZ PCMS and VSL with ESFS for DSH

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Resources to Support Design & Construction

- Smart Work Zone Design and Operations Guidebook
- Developmental Standard Plans for 102-600 series
- Developmental Design Criteria (DDC) for FDOT Design Manual (FDM) Section 240 Transportation Management Plan
- Developmental Specs (DevSpecs) for:
  - Section 102 Maintenance of Traffic
  - Section 990 Temporary Traffic Control Device Materials

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Considerations

- Reach out if you have questions – get answers to your questions and provide feedback to help improve FDOT SWZ Strategies.
- Read through Guidebook – it provides a great overview to anyone involved in FDOT SWZ Strategies and points to other important FDOT resources.
- Look at the other resources, in particular the FDM, to determine when and what SWZ strategies may be applicable to the project.

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Smart Work Zone Implementation Considerations

David Feise
President
Arrive Alive Traffic Control (AATC) LLC

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Implementation Strategies (ground level)

Implementing a Smart Work Zone (SWZ) involves integrating advanced technologies to enhance safety, efficiency, and traffic management in construction zones. Key considerations for successful SWZ implementation:

- Device Location selection
- Training and System Access
- Repair and Maintenance
- Performance Monitoring and Evaluation
- Environmental and Community Impact
- Adaptability to Work Zone Type (Phase changes)

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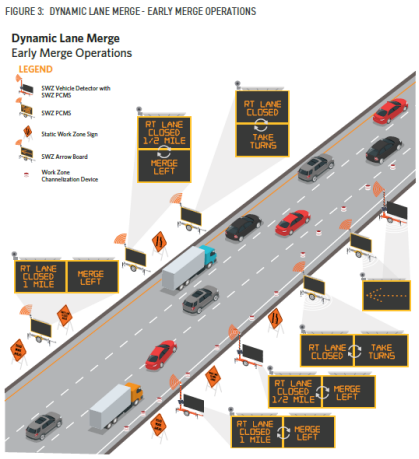
Implementation Strategies (ground level)

Dynamic Lane Merge (DLM)

Use DLM when traffic speeds and volumes typically and predictably change throughout the duration of the lane closure. When a lane closure is present, some drivers tend to move over immediately while others wait until the last possible moment to merge. This driver behavior causes speed differentials, hard braking, road rage, crashes, endangers workers, and reduces throughput in the lanes approaching the lane closure and in the open lanes past the closure.

Designers should consider these systems in long term deployments vs on nightly basis.

FIGURE 3: DYNAMIC LANE MERGE - EARLY MERGE OPERATIONS



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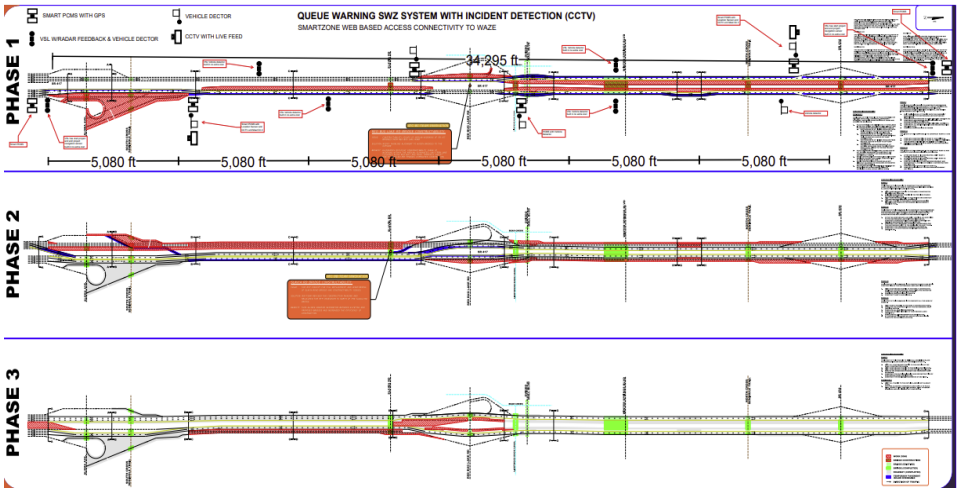
Implementation Strategies (ground level)



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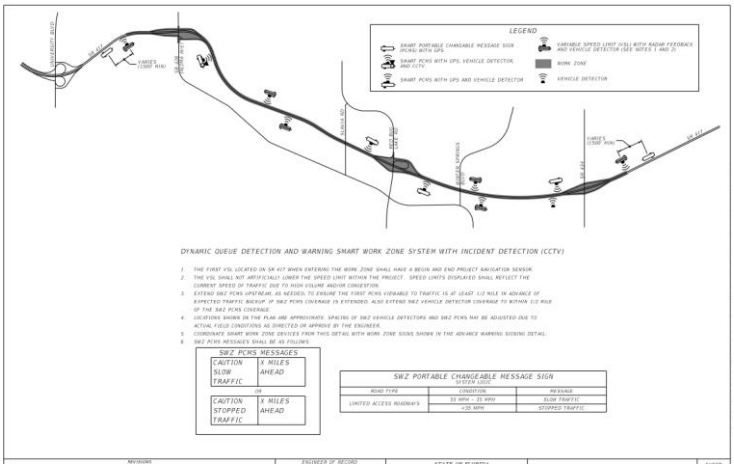
Implementation Strategies (ground level)



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Implementation Strategies (ground level)

- RFP specifies devices and device requirements; it would be helpful to have verbiage on the Engineers intent of data collected and use of the system.
- Allow for modifications to be made through the RFM process and flexibility with contractor and vendor input.
- Number of devices should be considered, harmonize devices to reduce device count.
- Practicality of daily use vs long term deployment.

Contact Us

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Worker Presence Alert System To Improve Motorist Awareness and Behavior

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Director – Business Development
Ver-Mac

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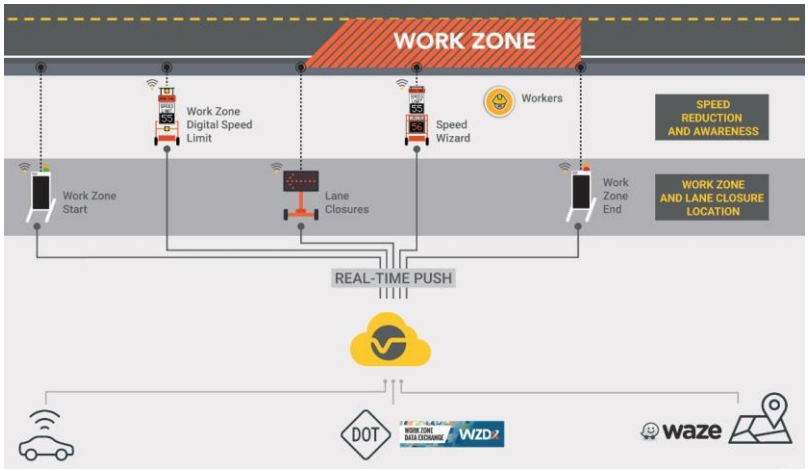
Smart. Connected. Digital.

Today, people are connected. Cars are connected. Work Zones are connected too.



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Protecting Workers

What we didn't know, **until now!**

Workers' safety cannot rely on analog solutions.

They need to be CONNECTED to save lives.

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Connect Workers

Connecting Workers Improves Safety

1. Digital Visibility and Alerts to Motorists of Worker Presence
2. Assisted management of existing Temporary Traffic Control equipment like PCMS or digital speed displays
3. Work Zone Status Monitoring

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Digital Visibility

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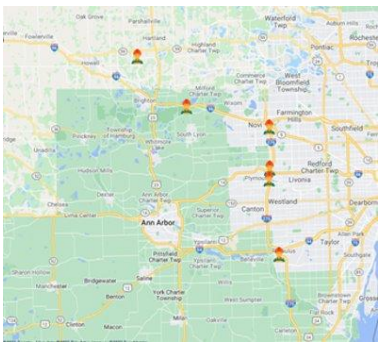
Digital Visibility

Publish Worker Presence Information

Navigation apps

In-car infotainment systems



Traffic management software

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Digital Visibility

Visual Awareness

Alert Motorists – Increase Awareness

MDOT Worker Presence Trailers

ACTIVATION METHODS:

- LOCALLY: V-TOUCH CONTROLLER (AT THE TRAILER)
- SCHEDULED: PRE-DEFINED DATES/TIMES
- REMOTELY: JAMLOGIC® SOFTWARE ON YOUR LAPTOP,SMARTPHONE OR TABLET
- AUTOMATIC: USING CONNECTED WORKER MODULES

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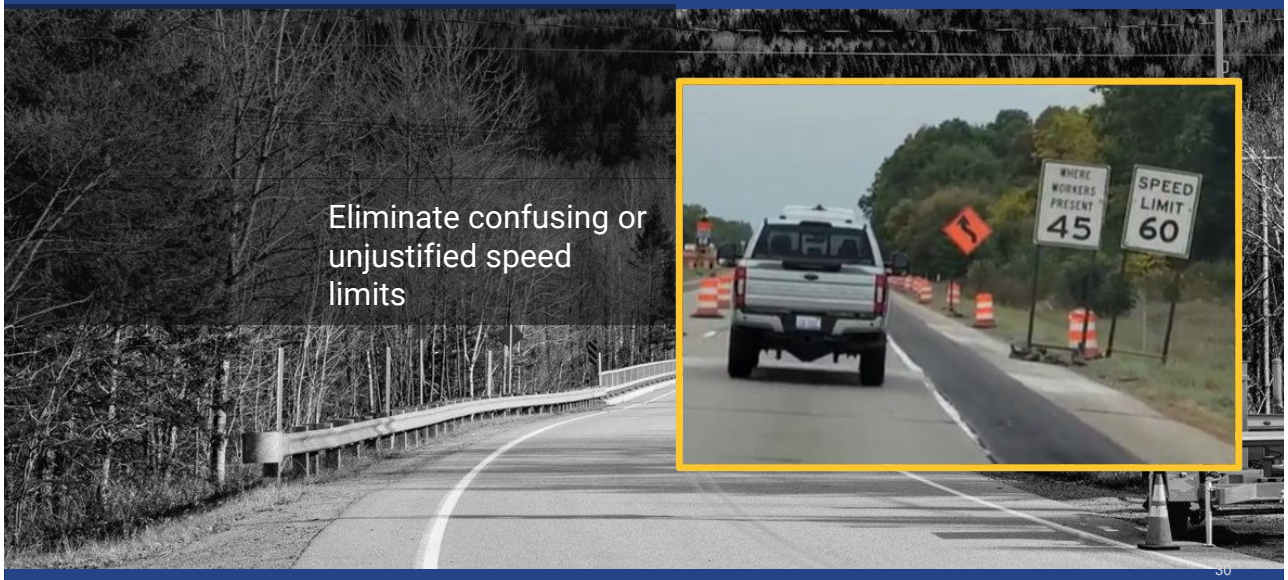
Appropriate Speeds When & Where Needed



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Appropriate Speeds When & Where Needed

Assisted Speed Management

- Adjusts displayed speed based on predetermined logic rules for when workers are actually present
- Clear distinction when workers are present vs when they are not

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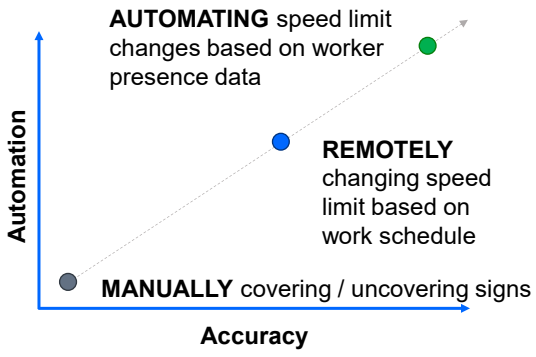
Appropriate Speeds When & Where Needed



Automation = Accuracy **= Worker Safety**

Automation boosted accuracy from 1% to 90%, ensuring safer, condition-based speed when workers are present.

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Appropriate Speeds When & Where Needed

Key Findings From Recent DOT Projects

- MN and WI
- Several dangerous events detected, i.e. high speeds were displayed when workers were present
- Average dangerous event lasted 54 minutes. Over the course of the project, it amounted to over two weeks' time!
- On average, slower speeds were enforced when workers were NOT present over 5 hours a day
- The wrong speed for the given conditions was displayed 40% of the time

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Appropriate Speeds When & Where Needed

Work Zone Speed Enforcement

When the work zone has a Speed Safety Camera (SSC), worker presence logs can be used as evidence to double fines when workers were present.

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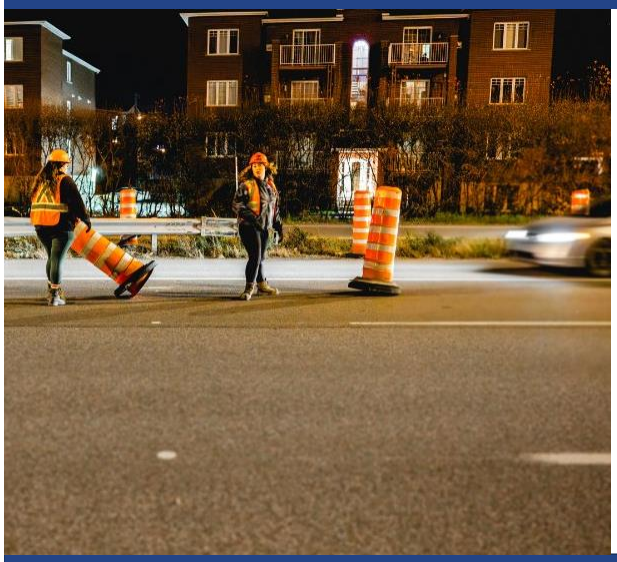
Key Takeaways



- Connect workers to the rest of your Connected Work Zone
- Lower speed limit only when and where needed, based on worker presence
- Increase compliance to speed displays and save time through automation
- Alert drivers of worker presence as they enter the work zone
- Send notifications to Waze and other navigational apps

Saving Workers' Lives!

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Contact Us

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Worker Presence Alert System: Update on SWIFTT Challenge-Winning WZ Safety Solution

Jason Lee
CEO
SmartCone

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2024 SWIFTT Challenge

- 2024 Safety Work Zone innovations for Today and Tomorrow (SWIFTT) Challenge Winner
- Product will be deployed on programmed construction project within the next 24-months.

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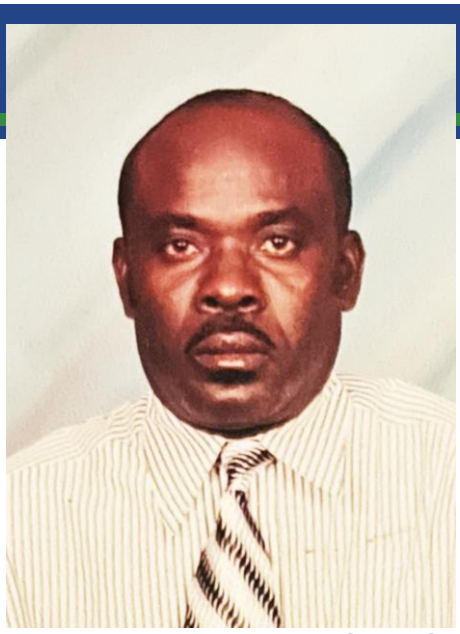

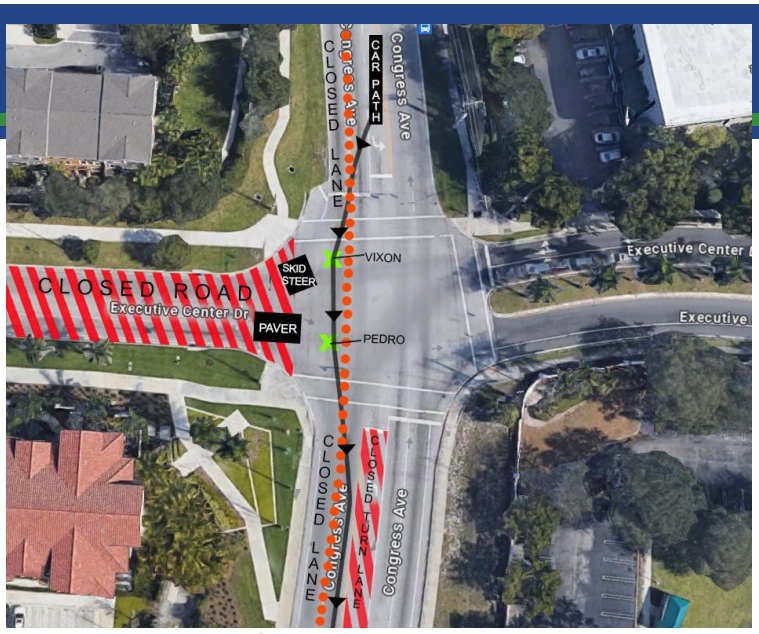

Vixon Louis. MOT Crew Ranger Construction.

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The Problem

According to the National Highway Traffic Safety Administration (NHTSA), 80% of accidents and 60% of highway deaths are the result of distracted drivers.

Vehicle Intrusions are the leading cause of worker fatalities with the road construction industry. In 2013, there were 67,523 crashes in work zones. In 2014, there were 669 fatalities from crashes in work zones.

Why is it so hard to pay attention?

Our Bodies are Designed to Conserve Energy

- Muscle Memory
- Day Dreaming
- Staring off Into Space
- Distracted Driving
- Complacent Workers

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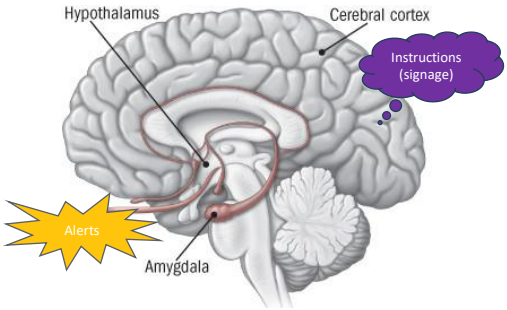
The Problem



HARVARD MEDICAL SCHOOL

When someone experiences a stressful event, the amygdala, an area of the brain that contributes to emotional processing, sends a distress signal to the hypothalamus. This area of the brain functions like a command center, communicating with the rest of the body through the nervous system so that the person has the energy to fight or flee.

Pre-Cue, Cue, Alarm

The stress response begins in the brain (see illustration). When someone confronts an oncoming car or other danger, the eyes or ears (or both) send the information to the amygdala, an area of the brain that contributes to emotional processing. The amygdala interprets the images and sounds. When it perceives danger, it instantly sends a distress signal to the hypothalamus.

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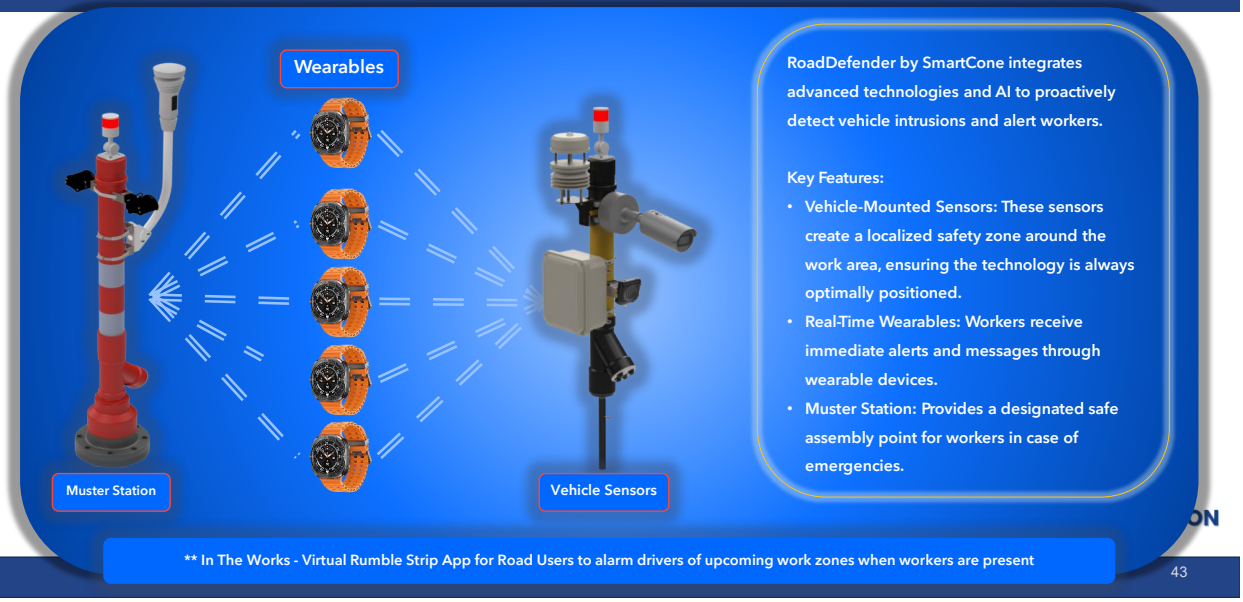
A Solution



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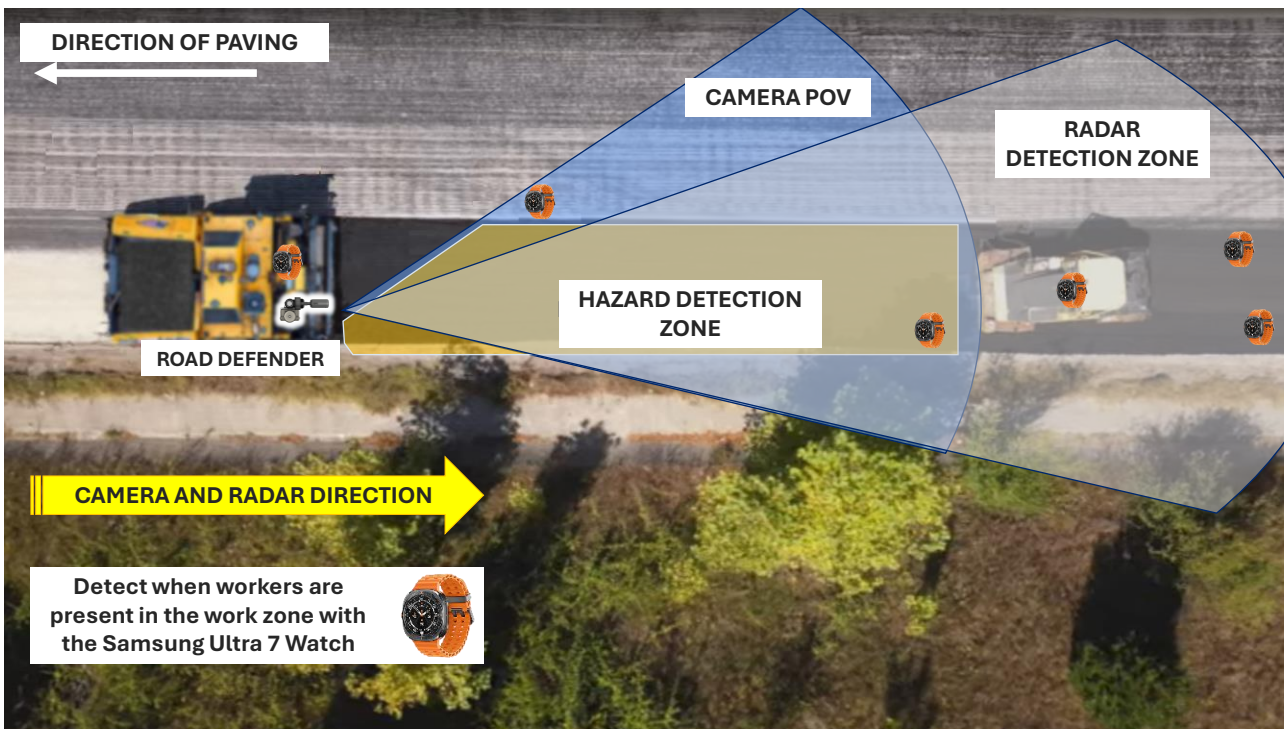

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Safety Message

June 1st to 30th: **Safe Summer Travel Month**

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SMARTCONE
LEADING THE EDGE

Thank You!

Jason Lee

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