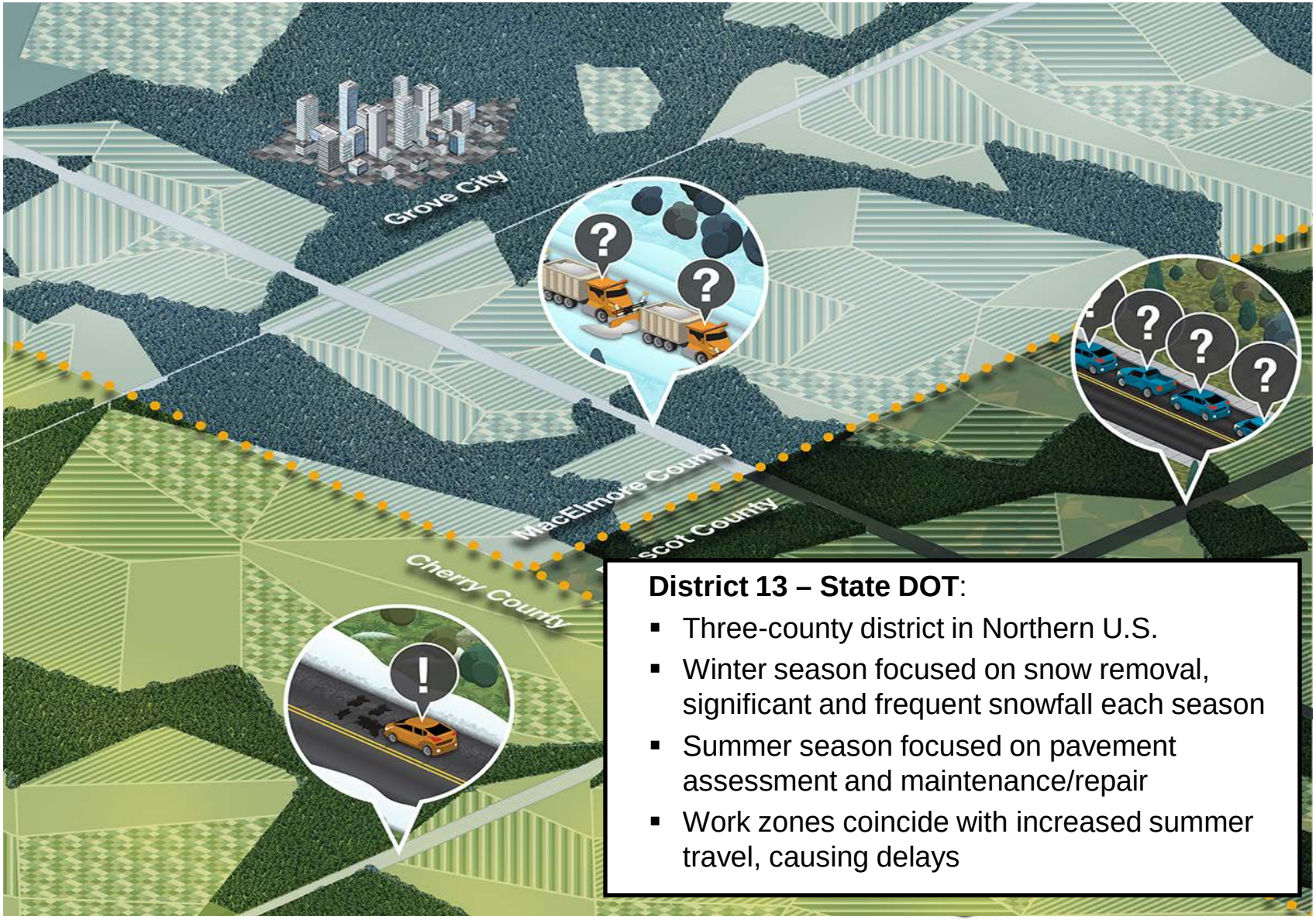
Example CV Pilot Deployment Concepts:

District 13 Operations

Gabe Guevara (FHWA)

District 13 Operations



District 13 – State DOT:

- Three-county district in Northern U.S.
- Winter season focused on snow removal, significant and frequent snowfall each season
- Summer season focused on pavement assessment and maintenance/repair
- Work zones coincide with increased summer travel, causing delays

Stakeholders Convene and Identify Key Transportation Challenges

- **Improve Efficiency of Snow and Ice Operations**
  - Frequent snow falls during winter season increasingly costly while maintenance budgets continue to shrink
    - Optimize the use of materials and resources
    - Improve LOS Improve “Regain-time”
    - Improve safety and mobility (WRTM)
    - Conduct winter maintenance operations in a sustainable fashion
  - Reduce fuel costs of plowing operations

- **Improve Pavement Maintenance**
  - Leverage technology to identify and classify pavement issues before they become critical without significant increases in operating costs

- **Improve Work Zone Planning and Management**
  - Unpredictable congestion during summer months due to concurrent roadwork and tourism
  - Plan work zones better to reduce delays
  - Improve traveler information on congestion resulting from work zones
  - Improve work zone safety of workers and travelers

Stakeholder Set Three Key Improvement Targets

Metrics	Targets
Increase snow removal efficiency	Reduce snow removal time by 10% while lowering plowing operations costs 10% (fuel, materials, labor, etc.)
Improve ridability experience	Reduce number of customer calls regarding dangerous pot holes on roads by 25%
Reduce work zone delay	Cut work zone crashes and delay by 80% and 30% respectively during summer season

Applications Considered for Improving Snow Removal

V2I Safety

- Red Light Violation Warning
- Curve Speed Warning
- Stop Sign Gap Assist
- Spot Weather Impact Warning
- Reduced Speed/Work Zone Warning
- Pedestrian in Signalized Crosswalk Warning (Transit)

V2V Safety

- Emergency Electronic Brake Lights (EEBL)
- Forward Collision Warning (FCW)
- Intersection Movement Assist (IMA)
- Left Turn Assist (LTA)
- Blind Spot/Lane Change Warning (BSW/LCW)
- Do Not Pass Warning (DNPW)
- Vehicle Turning Right in Front of Bus Warning (Transit)

Road Weather

- Motorist Advisories and Warnings (MAW)
- **Enhanced MDSS**
- Vehicle Data Translator (VDT)
- Weather Response Traffic Information (WxTINFO)

Environment

- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing
- Eco-Traffic Signal Priority
- Connected Eco-Driving
- Wireless Inductive/Resonance Charging
- Eco-Lanes Management
- Eco-Speed Harmonization
- Eco-Cooperative Adaptive Cruise Control
- Eco-Traveler Information
- Eco-Ramp Metering
- Low Emissions Zone Management
- AFV Charging / Fueling Information
- Eco-Smart Parking
- Dynamic Eco-Routing (light vehicle, transit, freight)
- Eco-ICM Decision Support System

Snow Removal

Agency Data

- Probe-based Pavement Maintenance
- Probe-enabled Traffic Monitoring
- Vehicle Classification-based Traffic Studies
- CV-enabled Turning Movement & Intersection Analysis
- CV-enabled Origin-Destination Studies
- Work Zone Traveler Information

Mobility

- Advanced Traveler Information System
- Intelligent Traffic Signal System (I-SIG)
- Signal Priority (transit, freight)
- Mobile Accessible Pedestrian Signal System (PED-SIG)
- Emergency Vehicle Preemption (PREEMPT)
- Dynamic Speed Harmonization (SPD-HARM)
- Queue Warning (Q-WARN)
- Cooperative Adaptive Cruise Control (CACC)
- Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)
- Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)
- Emergency Communications and Evacuation (EVAC)
- Connection Protection (T-CONNECT)
- Dynamic Transit Operations (T-DISP)
- Dynamic Ridesharing (D-RIDE)
- Freight-Specific Dynamic Travel Planning and Performance
- Drayage Optimization

Smart Roadside

- Wireless Inspection
- Smart Truck Parking

Applications Considered for Improving Pavement Maintenance

V2I Safety

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- War ning (Transit)

Situational Awareness/ Enhanced Ride Experience

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Applications Considered for Improving Work Zones

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V2V Safety

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Manage Work Zones

Road Weather

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Weather Response Traffic Information (WxTINFO)

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Connected Vehicle Applications Selected in Performance-Driven Approach

Improve Snow Removal

- Enhanced Maintenance Decision Support System

Improve Situational Awareness

- Probe-based Pavement Maintenance

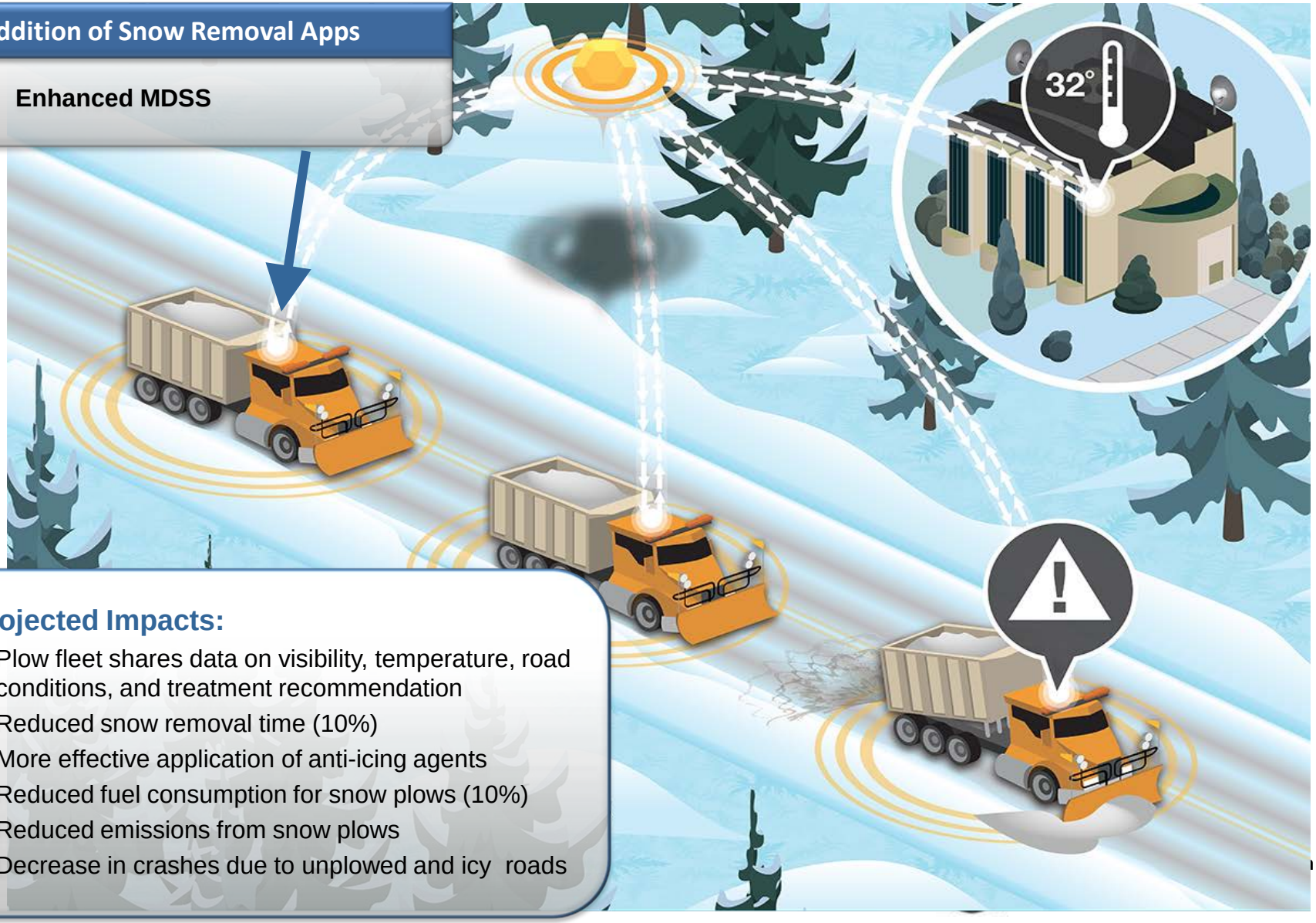
Improve Management of Work Zones

- Work Zone Traveler Information

Projected Synergies and Impacts from Snow Removal Applications in the Deployment Concept

Addition of Snow Removal Apps

- **Enhanced MDSS**



Projected Impacts:

- Plow fleet shares data on visibility, temperature, road conditions, and treatment recommendation
- Reduced snow removal time (10%)
- More effective application of anti-icing agents
- Reduced fuel consumption for snow plows (10%)
- Reduced emissions from snow plows
- Decrease in crashes due to unplowed and icy roads

Projected Synergies and Impacts from Pavement Management Applications in the Deployment Concept

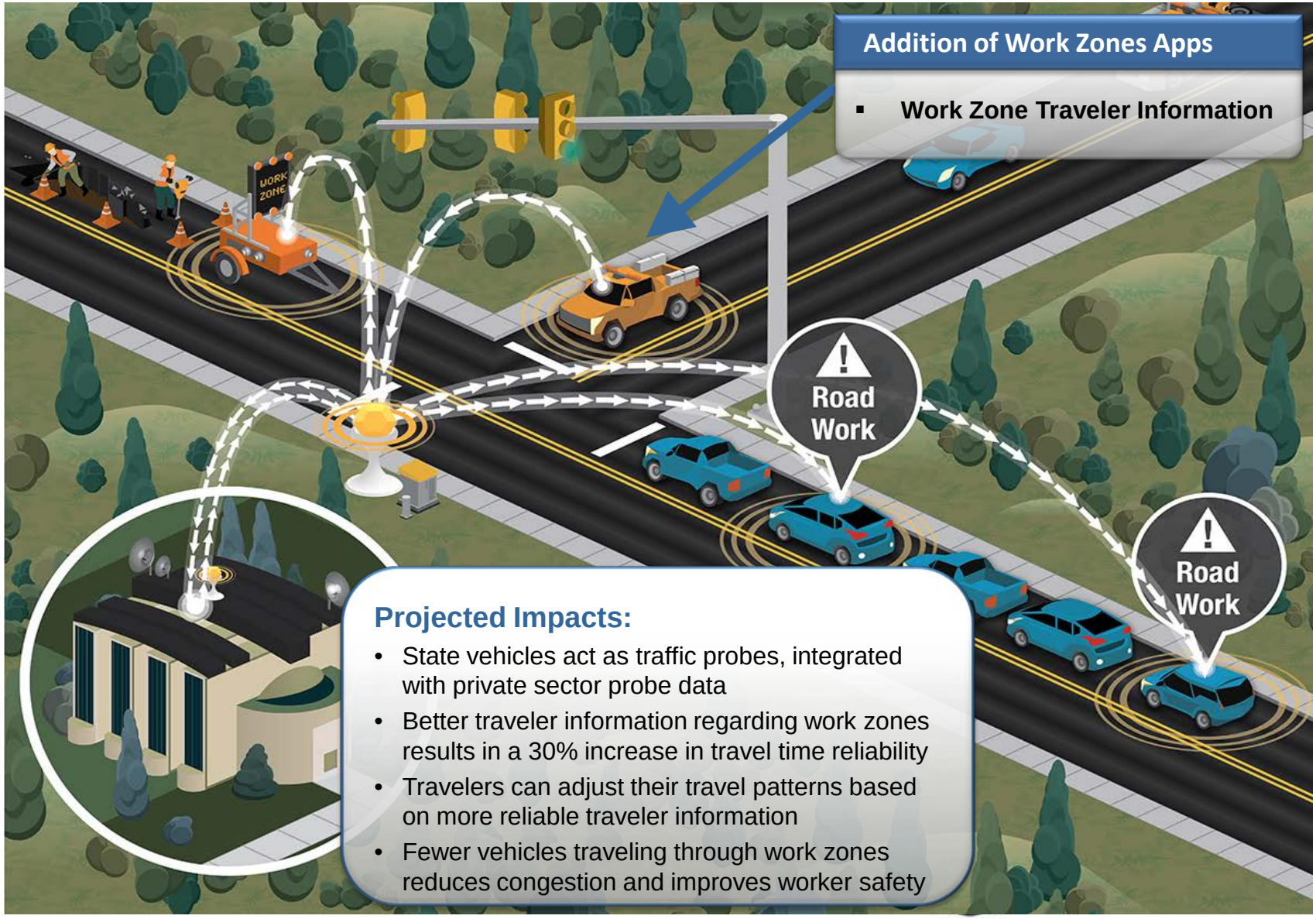
Projected Impacts:

- Automatic reporting of road maintenance needs decreases customer calls by 25%
- Decrease in crashes due to poor pavement conditions
- Better detection of pavement maintenance needs results in faster repairs and reduced lane closures
- Decreased time of lane closures, reduces congestion and worker safety concerns

Addition of Pavement Management Apps

- **Probe-based Pavement Maintenance**

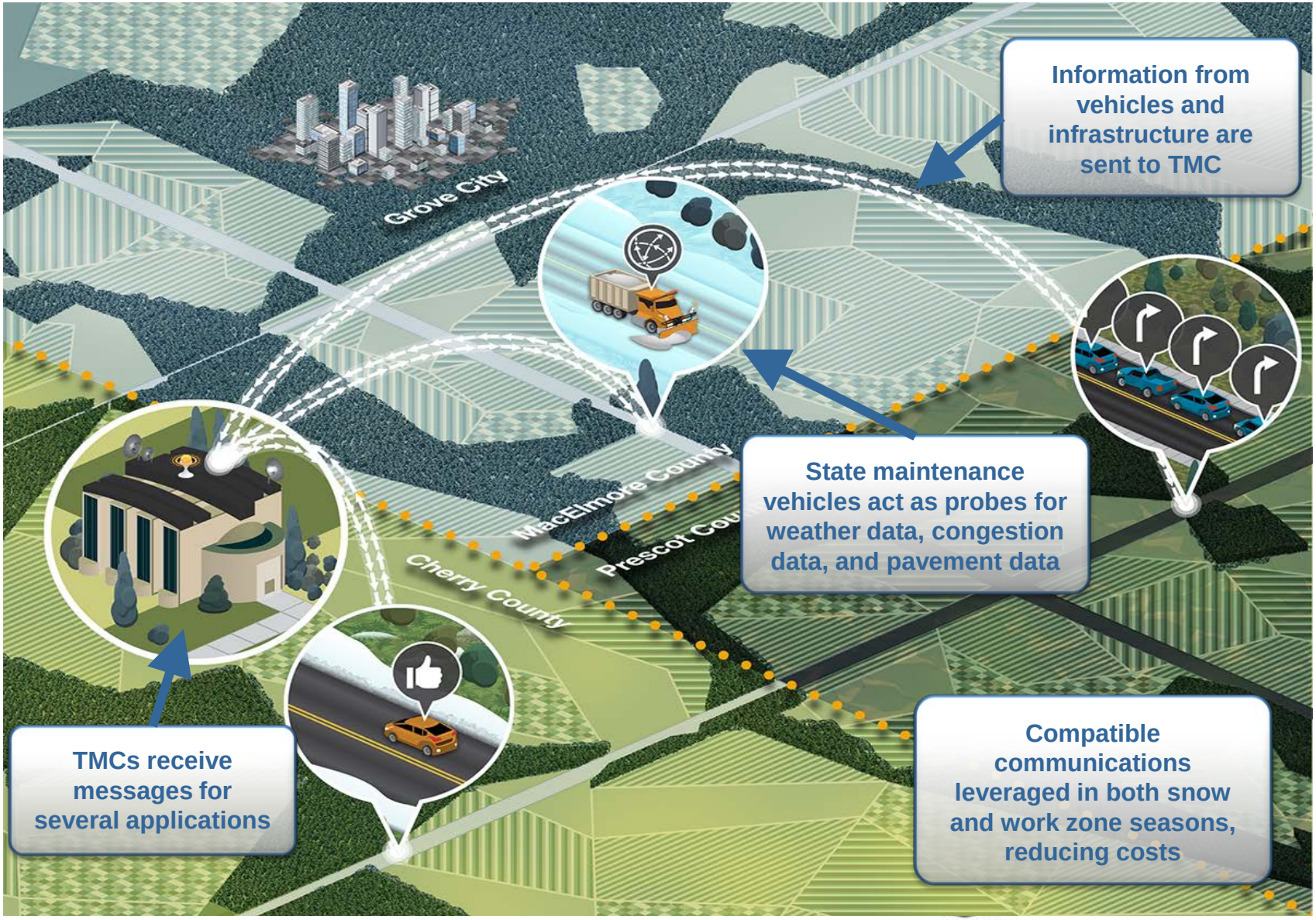
Projected Synergies and Impacts from Work Zone Applications in the Deployment Concept



Addition of Work Zones Apps

- **Work Zone Traveler Information**

Projected Impacts:

- State vehicles act as traffic probes, integrated with private sector probe data
- Better traveler information regarding work zones results in a 30% increase in travel time reliability
- Travelers can adjust their travel patterns based on more reliable traveler information
- Fewer vehicles traveling through work zones reduces congestion and improves worker safety

Integrated Concept for District 13 Operations