CV PILOT DEPLOYMENT PROGRAM GOALS

- Spur Early CV Tech Deployment
  - Wirelessly Connected Vehicles
  - Mobile Devices
  - Infrastructure

- Measure Deployment Benefits
  - Safety
  - Mobility
  - Environment

- Resolve Deployment Issues
  - Technical
  - Institutional
  - Financial
Pilot Sites

- ICF/WYDOT
- NYCDOT
- Tampa (THEA)

Overall Deployment Schedule

**Phase 1** (up to 12 months)
- Concept Dev.
- In Progress

**Phase 2** (up to 20 months)
- Design/Deploy/Test
- Progress Gate
- Follow-On Cooperative Agreement
- Transition

**Phase 3** (minimum 18 months)
- Maintain/Operate Pilot
- Post-Pilot Operations

Routine Operations (ongoing)

- Phase 1 – Creates the foundational plan to enable further design and deployment
- Phase 2 – Detailed design and deployment followed by testing to ensure deployment functions as intended (both technically and institutionally)
- Phase 3 – Focus is on assessing the performance of the deployed system
- Post Pilot Operations (CV tech integrated into operational practice)
Kate Hartman (ITS JPO), ICF/WYDOT CV Pilot Site COR
Objective:

- Reduce the number and severity of adverse weather-related incidents (including secondary incidents) in the I-80 Corridor in order to improve safety and reduce incident-related delays.
  - Focused on the needs of the commercial vehicle operator in the State of Wyoming

Approach:

- Equip fleet vehicles (combination of snow plows, maintenance fleet vehicles, emergency vehicles, and private trucks) that frequently travel the I-80 corridor to transmit basic safety messages (BSMs), collect vehicle and road condition data and provide it remotely to the WYDOT TMCs
- Deploy DSRC roadside equipment (RSE) to supplement existing assets and initiatives
- Road weather data shared with freight carriers who will transmit to their trucks using exiting in-vehicle systems

Deployment Team:

- Prime Consultant: ICF International; Partner State: Wyoming DOT
- Sub Consultants: Trihydro Corporation, National Center for Atmospheric Research, University of Wyoming, Catt Laboratory and McFarland Management
ICF/WYDOT PILOT DEPLOYMENT SITE: HIGH PRIORITY CORRIDOR

Wyoming I-80 Corridor – Connected Vehicle Map

Legend:
- High Profile Wind Warning Area
- AVL/Tablet Snow Plows
- STIP Areas 2015-2018
- WyoLink - Signal Strength
  - Good
  - Spotty
  - Unreliable
- I-80, Wyoming
- Possible Locations Roadsides DSRC
- Roadsides DSRC
- WiFi Locations (9 within 500 ft of I-80)
- YSL Devices (122 on I-80)
- Truck Parking (55 on I-80)

Source: Wyoming CV Pilot Deployment Team
## ICF/WYDOT Pilot Deployment

### Proposed CV Applications: Summary

<table>
<thead>
<tr>
<th>CV Application</th>
<th>WYDOT Snow Plows</th>
<th>WYDOT Maintenance Fleet Vehicles</th>
<th>Emergency Vehicles</th>
<th>Private Trucks/Commercial Vehicles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Road Weather Advisories for Trucks and Vehicles</td>
<td>✔</td>
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<td>2. Automatic Alerts for Emergency Responders</td>
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<td>3. CV-enabled Weather-Responsive Variable Speed Limits</td>
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<tr>
<td>4. Spot Weather Impact Warning</td>
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<tr>
<td>5. Work Zone Warnings</td>
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<tr>
<td>6. Situational Awareness</td>
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<td>✔</td>
<td>✔</td>
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<tr>
<td>7. Truck Parking Availability for Freight Carriers</td>
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<tr>
<td>8. Freight-Specific Dynamic Travel Planning</td>
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</table>
Objective:

- Improve safety and mobility of travelers in New York City through connected vehicle technologies
  - Aligned with the NYC’s Vision Zero initiative, which seeks to reduce crashes and pedestrian fatalities, and increase safety of travelers in all modes of transportation

Approach:

- Equip up to 10,000 vehicles (taxis, buses, commercial fleet delivery trucks, and City-owned vehicles) that frequently travel in Midtown Manhattan and Central Brooklyn to transmit and receive connected vehicle data
- Install V2I technology at high-accident rate arterials:
  - Upgrade 239 traffic signals along 1st, 2nd, 5th, and 6th Avenues in Manhattan and Flatbush Avenue in Central Brooklyn (emergency evacuation route)
  - Deploy Roadside equipment (RSE) along FDR Drive

Deployment Team:

- Prime Consultant: NYC DOT
- Sub Consultants: JHK Engineering, Battelle, Cambridge Systematics, KLD Engineering, Security Innovation and Region 2 University Transportation Research Center
**Manhattan Grid**
- Closely spaced intersections (600’ x 250’)
- Day vs. Night conditions
- Residential/commercial mix
- High accident rate (red dot) (2012-2014)
  - 20 fatalities
  - 5,007 injuries
- 204 intersections

**Central Brooklyn – Flatbush Ave**
- Over-Height restrictions
  - Tillary St.; Brooklyn Bridge
- High accident rate (red dots) (2012-14)
  - 1,128 injuries
  - 8 fatalities
- Average AM speed 15 mph
- 35 intersections

**Manhattan – FDR Drive**
- Limited access highway
- Excludes trucks/buses
- Short radius of curvature
- Over-Height restrictions
- $1,958,497 in Over-Height incident delay costs (2014)
  - 24% of City-wide total

Source: NYC DOT
<table>
<thead>
<tr>
<th>CV Application</th>
<th>Taxi &amp; Limousine</th>
<th>NYC DOT/ Sanitation</th>
<th>MTA/ NYCTA Buses</th>
<th>Commercial Vehicles</th>
<th>Pedestrian</th>
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<tbody>
<tr>
<td>1. Speed Compliance</td>
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<td>2. Red Light Violation Warning</td>
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<td>3. Ped. in Signalized Crosswalk Warn.</td>
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<td>4. RT Vehicle in Front of Bus Warning</td>
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<tr>
<td>5. Mobile Accessible Ped Signal Sys.</td>
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<tr>
<td>6. Curve Speed Compliance</td>
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<td>7. Oversize Vehicle Compliance</td>
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<tr>
<td>8. Work Zone Speed Compliance</td>
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<tr>
<td>9. I-SIG</td>
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<td>10-14. V2V Applications (5)</td>
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<td>15. Evacuation Information</td>
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</table>
Objective:

- The primary objective of this deployment is to alleviate congestion and improve safety during morning commuting hours.
  - Deploy a variety of vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) safety, mobility, and agency data applications to create reinforcing benefits for motorists, pedestrians, and transit operation.

Approach:

- Deploy a variety of connected vehicle technologies on and in the vicinity of reversible express lanes and three major arterials in downtown Tampa to solve the following transportation challenges:
  - Morning peak hour queues, wrong-way entries, pedestrian safety, bus rapid transit (BRT) signal priority optimization, trip time and safety, streetcar trolley conflicts, and enhanced signal coordination and traffic progression.

Deployment Team:

- Prime Consultant: Tampa Hillsborough Expressway Authority (THEA)
- Sub Consultants: HNTB Corporation, Siemens Industry, Inc., Booz Allen Hamilton, Center for Urban Transportation Research at University of South Florida and Global-5 Communications
Tampa (THEA) Pilot Deployment Site
An Overview of Downtown Tampa
Tampa (THEA) Pilot Deployment Site Needs: Issues and Applications Relationship

CV Applications:
- V2I Safety: Curve Speed Warning
- V2V Safety: EEBL and FCW
- V2I Safety: Pedestrian in Signalized X-walk
- V2I Safety: Mobile Accessible Pedestrian Signal PED-SIG
- V2I Safety: IMA
- Mobility: I-Sig
- Agency Data: Probe Enabled Traffic Monitoring
- Mobility: TSP
- V2V Safety: Vehicle Turning in Front of Bus

Use Case/Need:
- Morning Backups
- Pedestrian Conflicts
- Wrong Way Entries
- Traffic Progression
- BRT Optimization
- Trip Times
- Safety
- Streetcar/Auto/Ped/Bike Conflicts

Location:
- REL at Twiggs Street
- Twiggs Street - Courthouse
- REL at Twiggs Street
- Meridian Avenue
- MacDill AFB
- BRT-REL to Marion Street
- Channelside
CONNECTED VEHICLE PILOT
Deployment Program

Performance Measurement and Evaluation

ITS Joint Program Office
Performance Measurement

- Means of assessing the progress made towards attaining established goals
- Not just about data collection, verification, and cleaning but also about using the data to understand the system

Performance Monitoring

- Ongoing tracking of performance to assess if targets have been or likely to be met
- Enables system managers to take corrective and proactive actions to control and manage the system
- Allows system managers to understand the impacts of investments and policies

Performance Evaluation

- Systematic and objective examination of measures and outcomes to understand the impacts of investments and policies have on performance, thus improving current and future planning and investment decisions
- Conducted by an independent party who has no vested interest or stake in the project
LESSONS LEARNED IN CV PILOTS CONCEPT DEVELOPMENT PHASE

- Stakeholder interaction early and often leads to better concepts and more buy-in
- Sites are eager to consume USDOT technical assistance
  - Deployments are complex, requiring a lot of diverse elements to come together in an integrated system (technical, security, privacy, performance measurement, institutional, financial, etc.)
- Site-to-site coordination can be useful (since not set up as competitive)
  - Cooperation on security, vendor interaction, stakeholder coordination (UPS in WY and NYC)
  - Participation in virtual roundtables
- Building in performance measurement to a deployed system requires some serious thinking in the concept development phase
- We didn’t forget a key area in Phase 1 (so far), e.g., training or safety management
- The deliverables from the sites are creating examples for others to follow
  - E.g., good lessons learned from Safety Pilot Model Demonstration (SPMD) on installation planning/training
- Concept development takes some time to conduct – prior to procuring/designing/installing equipment
- Using standards (intelligently) can help to advance sites systems engineering
THE BIG PICTURE

**Smart City**

“A city that uses information and communications technology to enhance its livability, workability, and sustainability.”

*The Smart Cities Council*
Technology convergence will revolutionize transportation, dramatically improving safety and mobility, enhancing ladders of opportunity, and reducing environmental impacts.

**Benefits**
- Order of magnitude safety improvements
- Reduced congestion
- Reduced emissions and use of fossil fuels
- Improved access to jobs and services
- Reduced transportation costs for gov’t and users
- Improved accessibility and mobility
• Funding: $60 Million for each of fiscal years 2016-2020

• Federal share not to exceed 50% of project cost

• No more than 20% of the total amount in a fiscal year to a single recipient
Join us for the *Getting Ready for Deployment Series*

- Discover more about the 2015 CV Pilot Sites
- Learn the Essential Steps to CV Deployment
- Engage in Technical Discussion

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