CONNECTED VEHICLE PILOT
Deployment Program

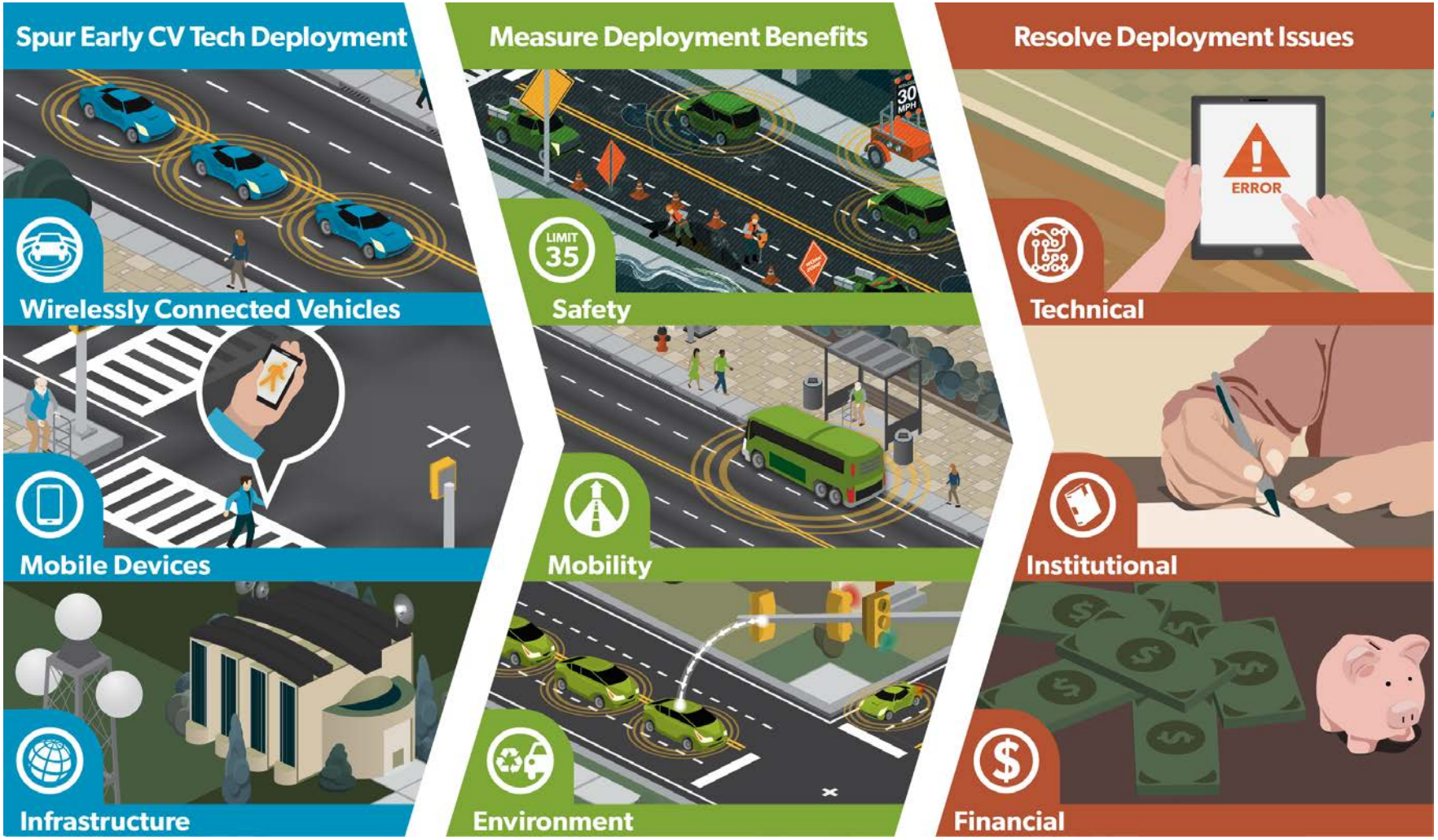
Kate Hartman, Program Manager

ITS Joint Program Office

OVERVIEW

- Connected Vehicles Pilot Deployment Program Overview
  - Program Goals
  - Organizing Principles
  - Deployment Requirements
  - Deployment Schedule
- Overview of 2015 CV Pilot Program Award Sites
  - ICF/Wyoming CV Pilot Deployment
  - New York City (NYC) CV Pilot Deployment
  - Tampa (THEA) CV Pilot Deployment
- How to Stay Connected

CV Pilot Deployment Program Goals



CV Pilot Organizing Principles

- CV Pilots are *pilot deployments*, that is, real-world environment deployments
  - The successful, deployed technologies are expected to remain as permanent operational elements

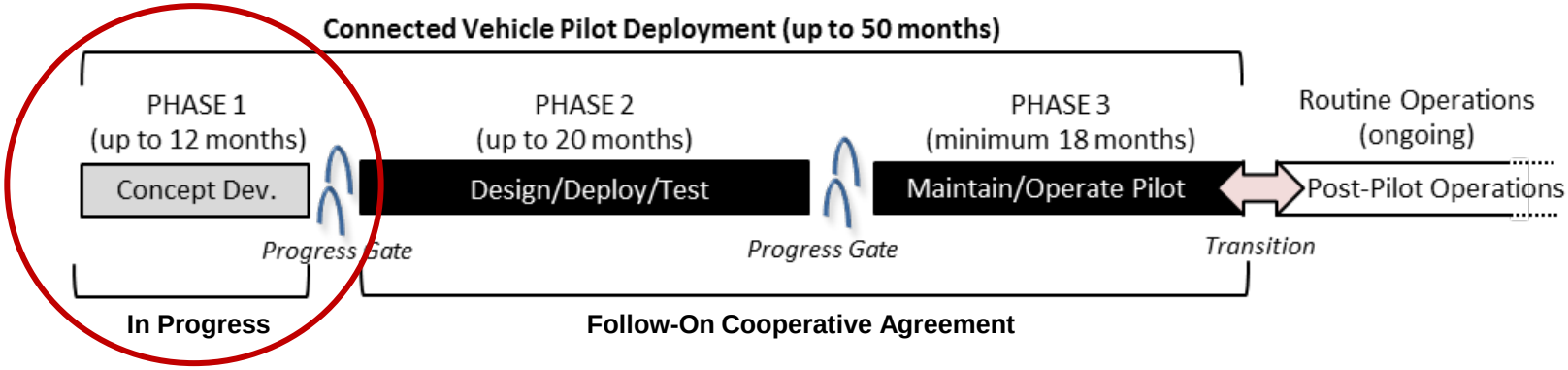
- Deployment concepts are needs-driven
  - Each site has different needs, focus and applications
    - That is, each pilot deployment will address critical problem(s)
    - The needs of each site will drive the deployment process

- Pilot deployments are expected to be both *large-scale with multiple applications*
  - *Large-scale* implies pilot deployments will have measureable impact, not a specific minimum geographic or vehicle fleet size
  - Sites will deploy *multiple applications* drawing on the products of USDOT and other connected vehicle research

CV Pilot Deployment Requirements

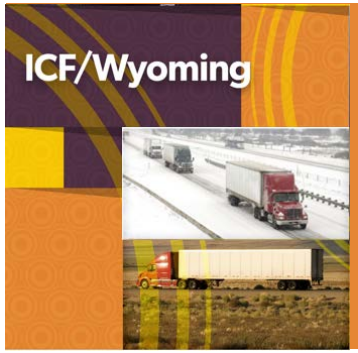
- Multiple connected vehicle applications will be deployed together
- Pilot deployments should leverage USDOT-sponsored research
- Pilot deployments include the capture of data from multiple sources
  - Integrated or carry-in devices for connected vehicles capable of generating an SAE J2735 Basic Safety Message (BSM)
  - Look to pilot deployment data while protecting privacy and intellectual property
- Dedicated Short Range Communications (DSRC) 5.9 GHz will be utilized as the communications technology
- Well-defined, focused, quantitative performance measures
  - Support an independent evaluation effort
- Security and credentialing management system

CV Pilot Deployment Schedule



- Phase 1: Concept Development (*Current Phase*)
  - Creates the foundational plan to enable further design and deployment
  - **Progress Gate: Is the concept ready for deployment?**
- Phase 2: Design/Deploy/Test
  - Detailed design and deployment followed by testing to ensure deployment functions as intended (both technically and institutionally)
  - Progress Gate: Does the system function as planned?
- Phase 3: Maintain/Operate
  - Focus is on assessing the performance of the deployed system
- Post Pilot Operations (CV tech integrated into operational practice)

Sites Selected – 2015 Awards

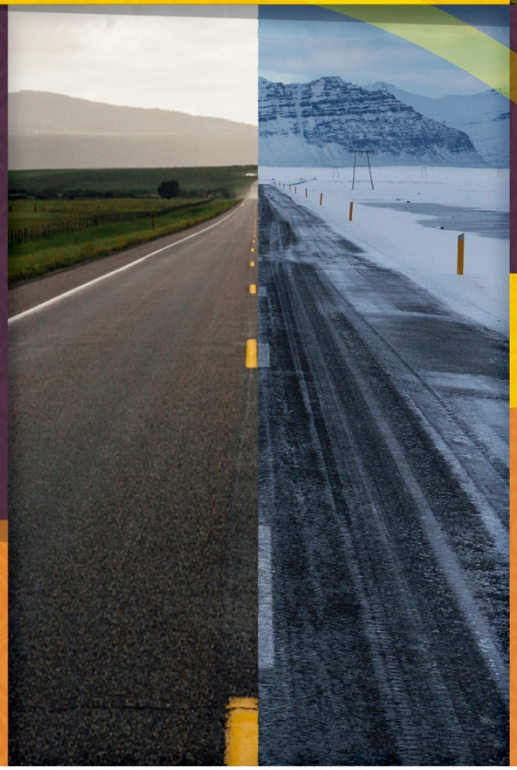


- Reduce the number and severity of adverse weather-related incidents in the I-80 Corridor in order to improve safety and reduce incident-related delays.
- Focused on the needs of commercial vehicle operators in the State of Wyoming.

- Improve safety and mobility of travelers in New York City through connected vehicle technologies.
- Vehicle to vehicle (V2V) technology installed in up to 10,000 vehicles in Midtown Manhattan, and vehicle to infrastructure (V2I) technology installed along high-accident rate arterials in Manhattan and Central Brooklyn.

- Alleviate congestion and improve safety during morning commuting hours.
- 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 transportation challenges.

ICF/Wyoming



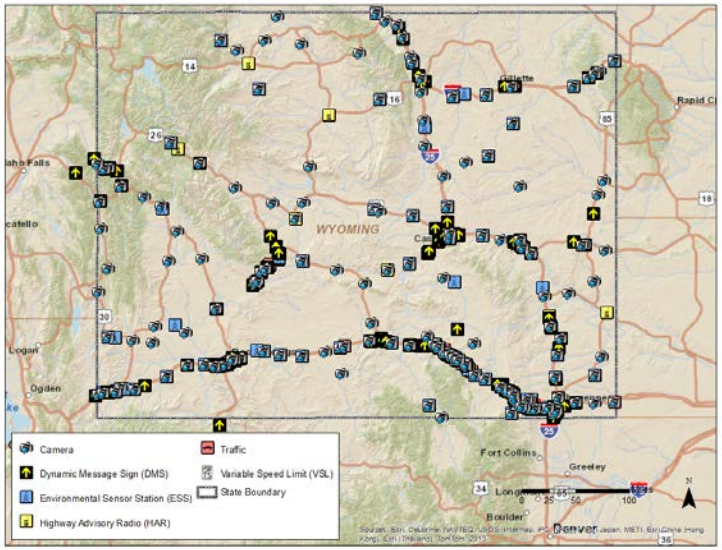
ICF/Wyoming Pilot Deployment Overview

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



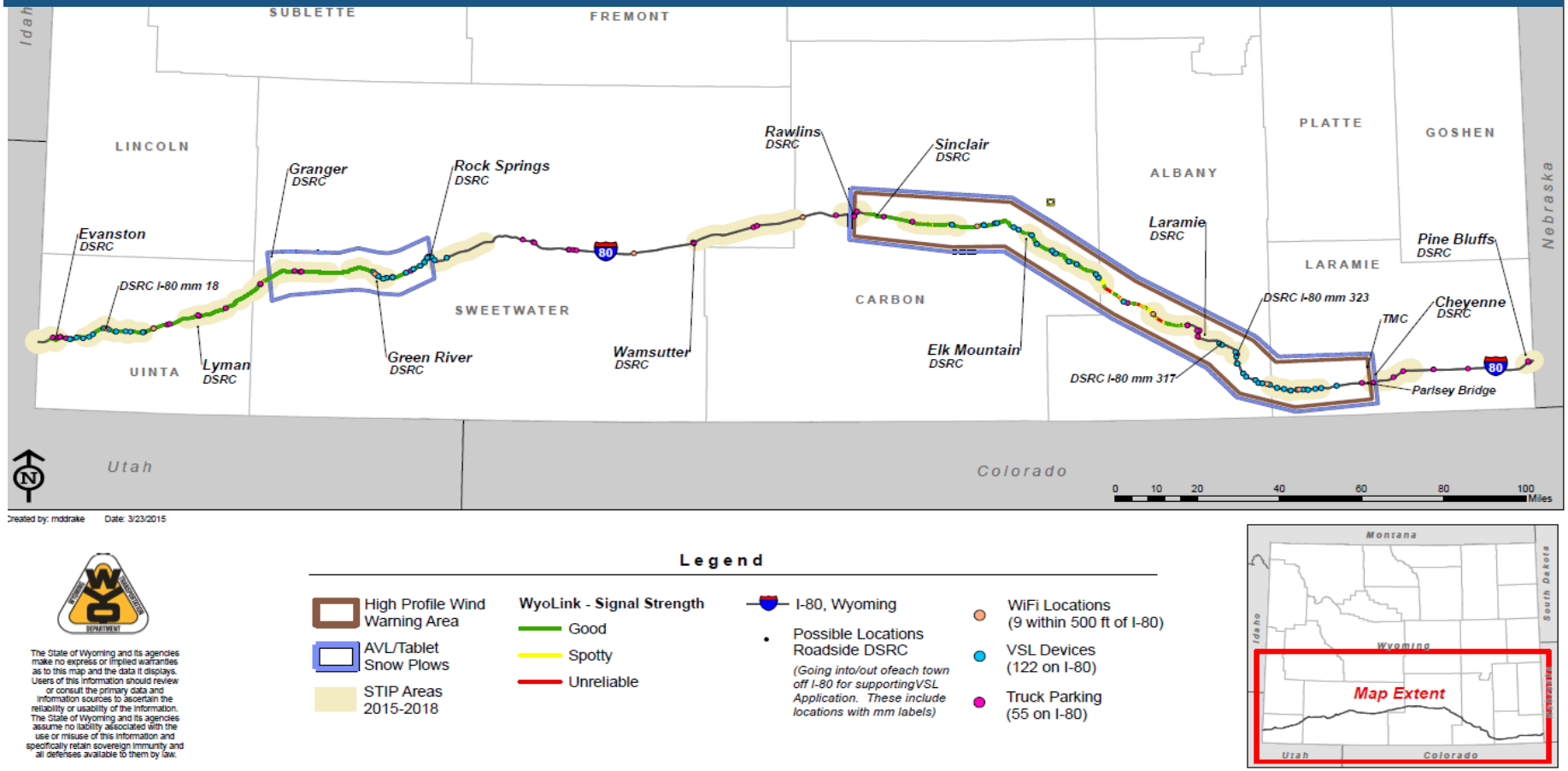
Source: Wyoming DOT

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/Wyoming Pilot Deployment Site: High Priority Corridor

Wyoming I-80 Corridor – Connected Vehicle Map



The State of Wyoming and its agencies make no express or implied warranties as to this map and the data it displays. Users of this information should review or consult the primary data and information sources to ascertain the reliability or usability of the information. The State of Wyoming and its agencies assume no liability associated with the use or misuse of this information and specifically retain sovereign immunity and all defenses available to them by law.

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 Roadside DSRC *(Going into/out ofeach town off I-80 for supportingVSL Application. These include locations with mm labels)*
- WiFi Locations (9 within 500 ft of I-80)
- VSL Devices (122 on I-80)
- Truck Parking (55 on I-80)

Source: Wyoming CV Pilot Deployment Team

ICF/Wyoming Pilot Deployment
Proposed CV Applications: Summary

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

ICF/Wyoming Pilot Deployment Vision

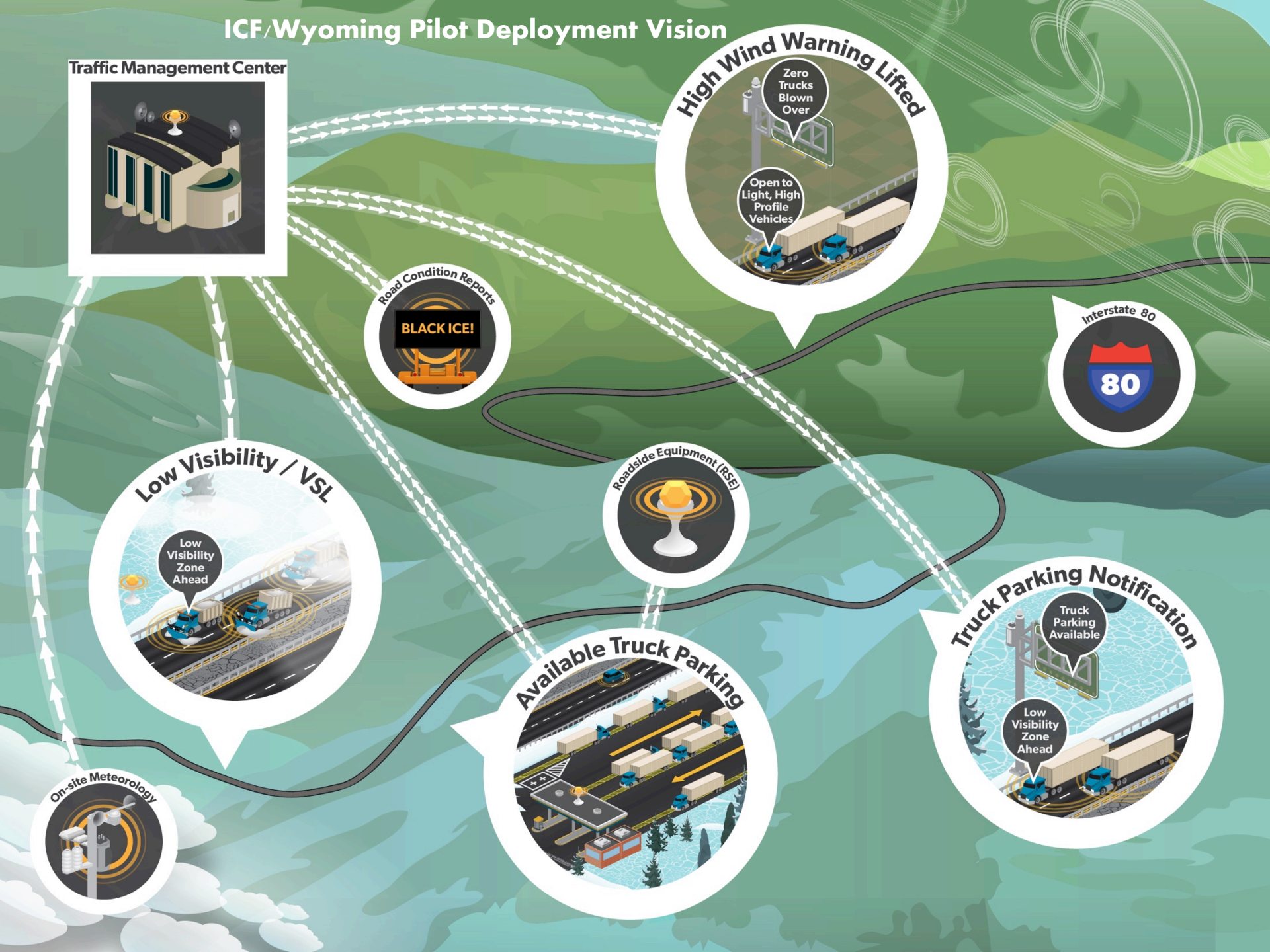
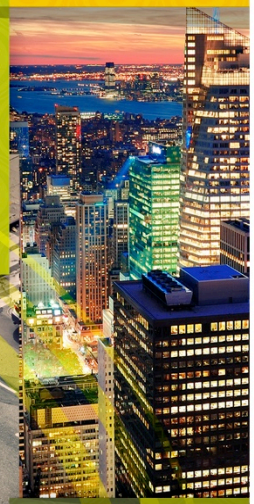


Photo Courtesy: MTA New York City Transit


Photo Courtesy of: MTA New York City Transit

New York City



New York City (NYC) Pilot Deployment Overview

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

Source: NYC DOT

Deployment Team:

- Prime Consultant: NYC DOT
- Sub Consultants: JHK Engineering, Battelle, Cambridge Systematics, KLD Engineering, Security Innovation and Region 2 University Transportation Research Center

NYC Pilot Deployment Site

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

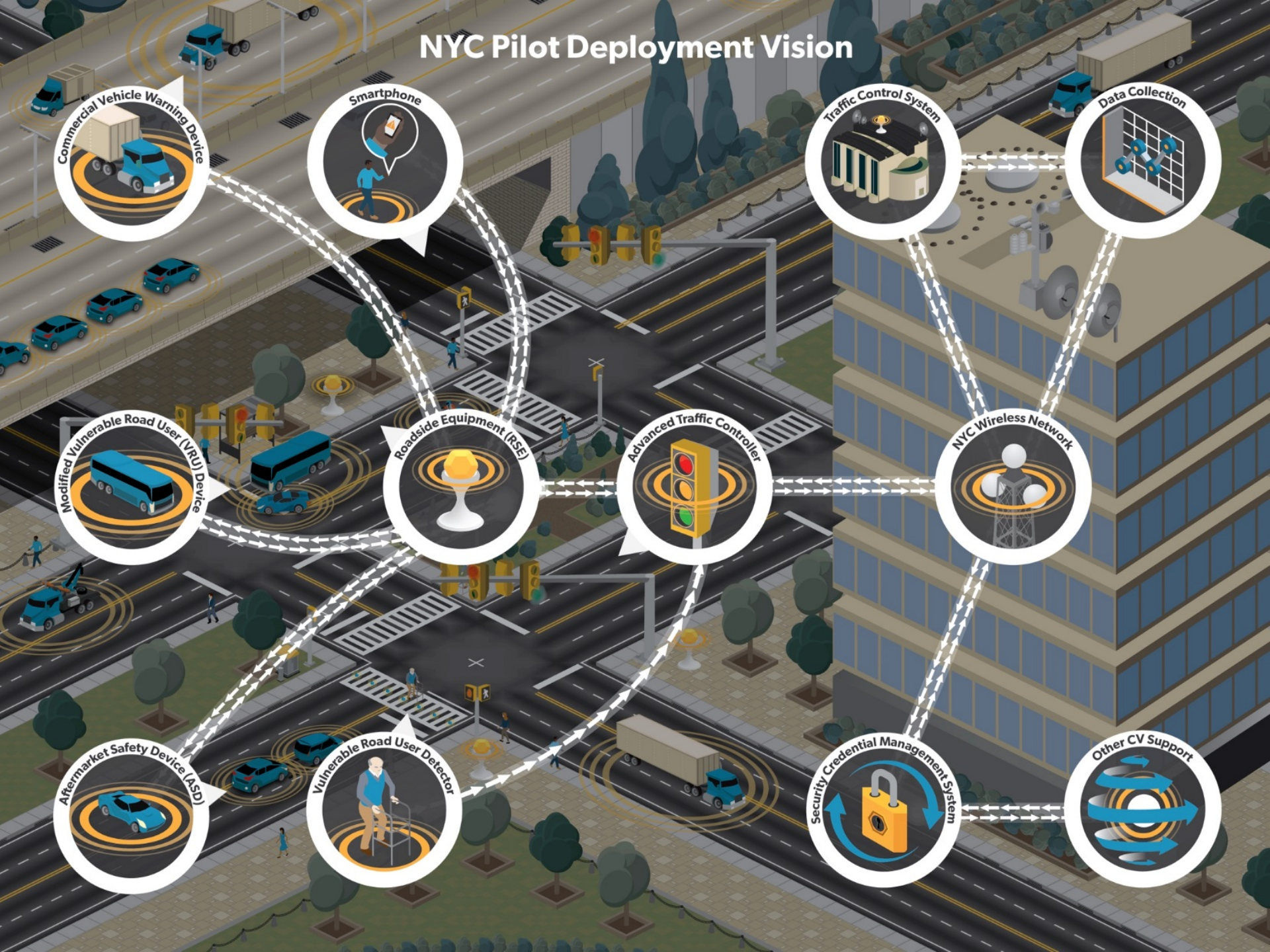
Manhattan – FDR Drive

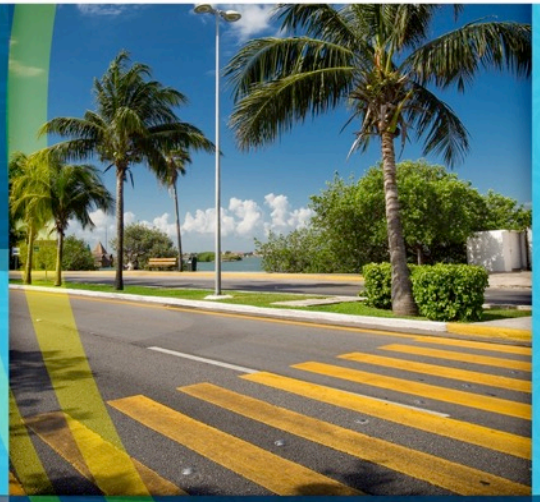
- Limited access highway
- Excludes trucks/buses
- Short radius of curvature
- Over-Height restrictions
- $1,958,497 in Over-Height incident delay costs (2014)
  - 24% of City-wide total

Source: NYC DOT

NYC Pilot Deployment Proposed CV Application-Fleet Distribution

CV Application	Taxi & Limousine	NYC DOT/ Sanitation	MTA/ NYCTA Buses	Commercial Vehicles	Pedestrian
	7500	500	1500	500	TBD
1. Mod. Eco-Speed Harmonization	✓	✓	✓	✓	
2. Red Light Violation Warning	✓	✓	✓	✓	
3. Ped. in Signalized Crosswalk Warn.	✓	✓	✓	✓	✓
4. RT Vehicle in Front of Bus Warning			✓		
5. Mobile Accessible Ped Signal Sys.					✓
6. Curve Speed Warning	✓	✓	✓	✓	
7. Freight Dynamic Travel Planning		✓	✓	✓	
8. Reduced Speed/Work Zone Warn.	✓	✓	✓	✓	
9. I-SIG	✓	✓	✓	✓	
10-15. V2V Applications (6)	✓	✓	✓	✓	
16. EVAC In-Vehicle Information	✓	✓	✓	✓	


NYC Pilot Deployment Vision
Commercial Vehicle Warning Device
Smartphone
Traffic Control System
Data Collection
Modified Vulnerable Road User (VRU) Device
Roadside Equipment (RSE)
Advanced Traffic Controller
NYC Wireless Network
Aftermarket Safety Device (ASD)
Vulnerable Road User Detector
Security Credential Management System
Other CV Support



Tampa (THEA)

Tampa Hillsborough Expressway Authority

TAMPA (THEA) PILOT DEPLOYMENT OVERVIEW

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.

Source: THEA

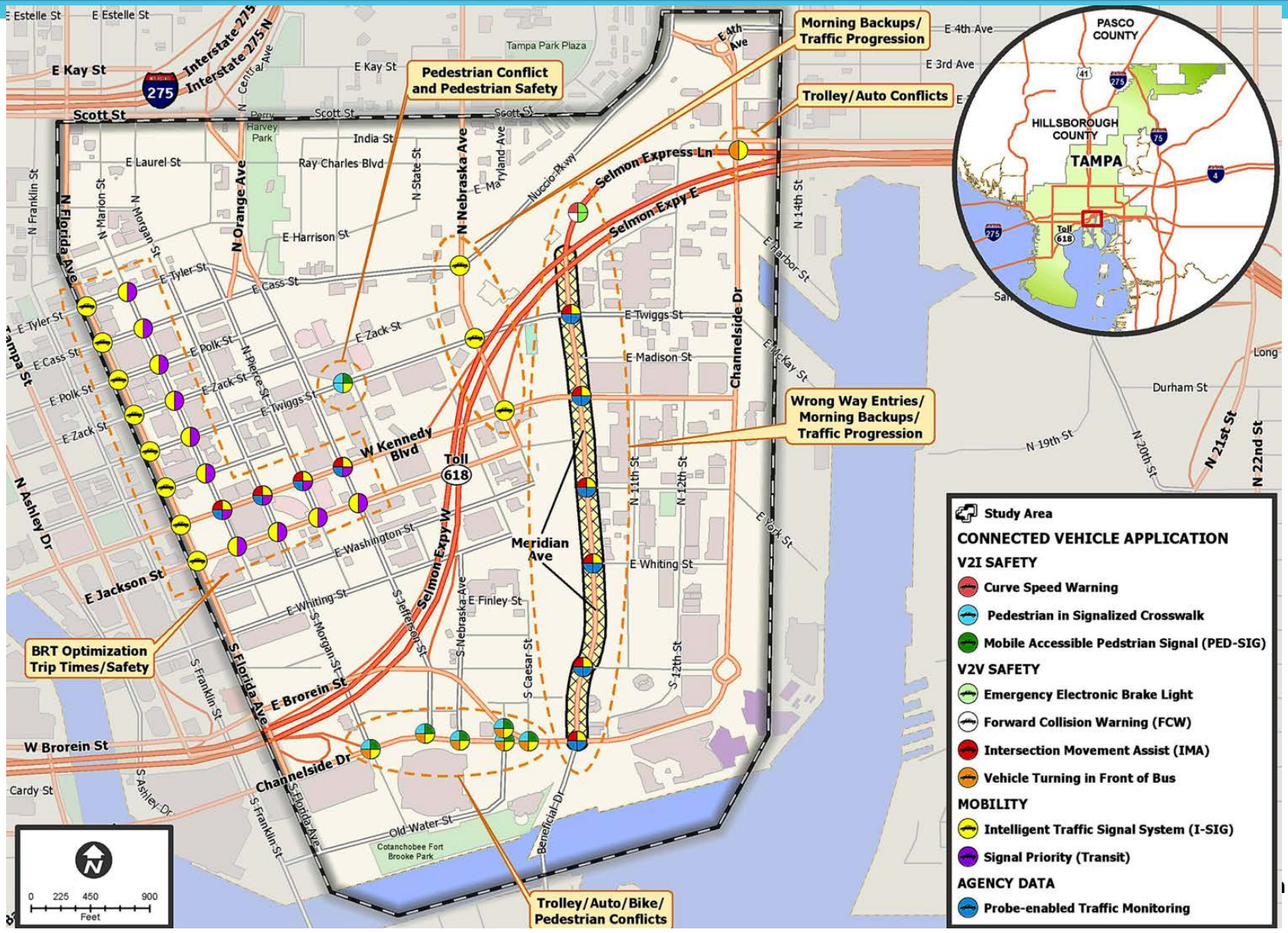
Approach:

- 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.

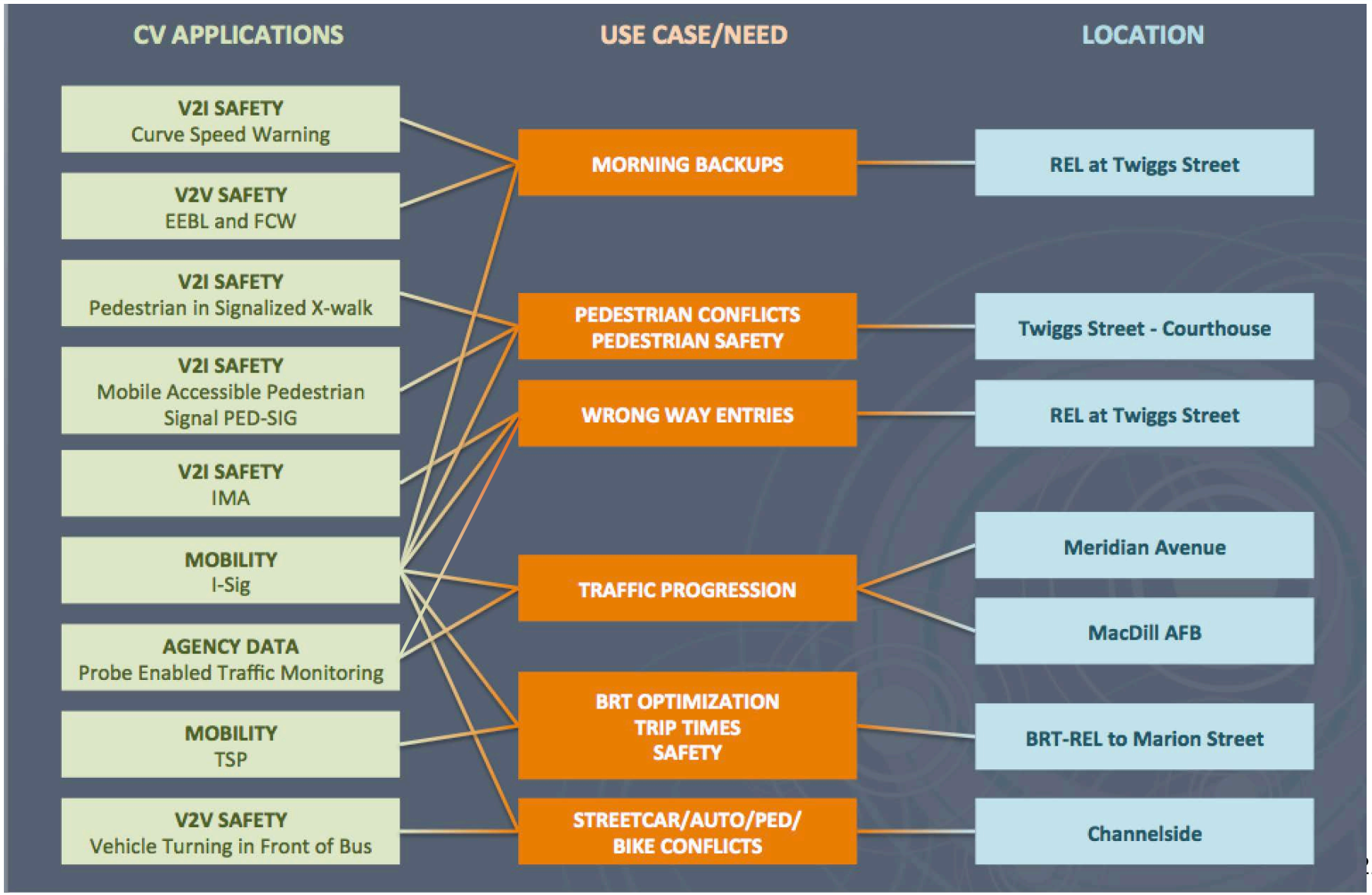
Deployment Team:

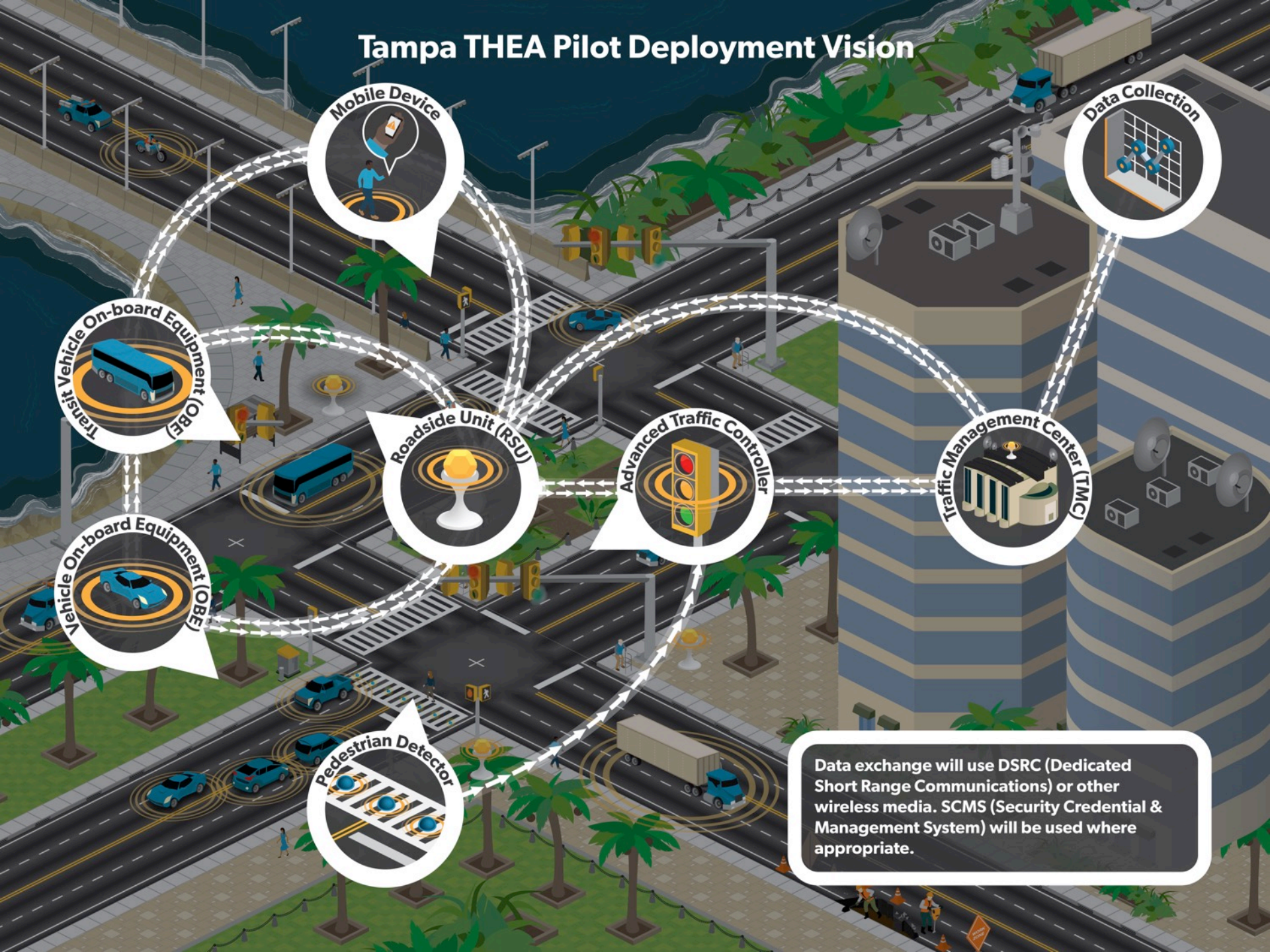
- Prime Consultant: Tampa Hillsborough Expressway Authority (THEA)
- Sub Consultants: HNTB Corporation, Siemens Industry, Inc., Booz Allen Hamilton, Center for Urban Transportation Research at University of South Florida and Global-5 Communications

Tampa (THEA) Pilot Deployment Site
An Overview of Downtown Tampa



Tampa (THEA) Pilot Deployment Site Needs: Issues and Applications Relationship




Tampa THEA Pilot Deployment Vision
Mobile Device
Data Collection
Transit Vehicle On-board Equipment (OBE)
Roadside Unit (RSU)
Advanced Traffic Controller
Traffic Management Center (TMC)
Vehicle On-board Equipment (OBE)
Pedestrian Detector
Data exchange will use DSRC (Dedicated Short Range Communications) or other wireless media. SCMS (Security Credential & Management System) will be used where appropriate.

Overview of Pilot Deployment Proposed CV Applications

ICF/Wyoming
Work Zone Warnings
Spot Weather Impact Warning
Situational Awareness
Freight-Specific Dynamic Travel Planning
Automatic Alerts for Emergency Responders
CV-enabled Weather-Responsive Variable Speed Limits
Road Weather Advisories for Trucks and Vehicles
Truck Parking Availability for Freight Carriers

Tampa (THEA)
Curve Speed Warning
Pedestrian in Signalized Crosswalk Warning (Transit)
Emergency Electronic Brake Lights (EEBL)
Forward Collision Warning (FCW)
Intersection Movement Assist (IMA)
Vehicle Turning Right in Front of Bus Warning (Transit)
Intelligent Traffic Signal System (I-SIG)
Mobile Accessible Pedestrian Signal System (PED-SIG)
Transit Signal Priority (TSP)
Probe-enabled Traffic Monitoring

New York City (NYC)
Curve Speed Warning
Pedestrian in Signalized Crosswalk Warning (Transit)
Red Light Violation Warning
Reduced Speed/Work Zone Warning
Blind Spot Warning (BSW) *
Emergency Electronic Brake Lights (EEBL) *
Forward Collision Warning (FCW) *
Intersection Movement Assist (IMA) *
Lane Change Assist (LCA) *
Stationary Vehicle Ahead (SVA) *
Vehicle Turning Right in Front of Bus Warning (Transit)
Advanced Traveler Information System
Emergency Communications and Evacuation (EVAC)
Freight-Specific Dynamic Travel Planning and Performance Measurement (F-ATIS)
Intelligent Traffic Signal System (I-SIG)
Mobile Accessible Pedestrian Signal System (PED-SIG)
Eco-Speed Harmonization

**Deployment of applications is dependent upon Final ConOps and funding*

Concept Development Activities and Public Events

Task	Sep 2015	Oct 2015	Nov 2015	Dec 2015	Jan 2016	Feb 2016	Mar 2016	Apr 2016	May 2016	Jun 2016	Jul 2016	Aug 2016	Sep 2016
Task 1 – Program Mgt.													
Task 2 – Concept of Oerations						◆◆	◆						
Task 3 – Security Concept													
Task 4 – Safety Plan													
Task 5 – Performance Measurement									◆	◆◆			
Task 6 – System Requirements													
Task 7 – App Planning													
Task 8 – Human Use Approval													
Task 9 – Training Plan													
Task 10 – Partnership													
Task 11 – Outreach Plan													
Task 12 – Deployment Plan												◆◆◆	
Task 13 – Readiness Summary													

◆ Public webinars to share the concept development activities from the three sites (see website for exact dates and times)

STAY CONNECTED

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

Website: http://www.its.dot.gov/pilots

Twitter: @ITSJPODirector

Facebook: https://www.facebook.com/DOTRITA

Contact for CV Pilots Program:

Kate Hartman, Program Manager

Kate.hartman@dot.gov

Contact for Pilot Sites:

- Kate Hartman, ICF/Wyoming Site COR Kate.Hartman@dot.gov
- Jonathan Walker, NYC Site COR Jonathan.b.Walker@dot.gov
- Govind Vadakpat, THEA Site COR G.Vadakpat@dot.gov