FHWA Office of Operations
Research and Development
and
American Association of State Highway and Transportation Officials (AASHTO)

AASHTO National Connected Vehicle Field Infrastructure Footprint Analysis – Project Status Update

September 25, 2013

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Agenda

- Project Background and Objectives
- Footprint Development Process
- Applications Analysis
- Deployment Concepts
- Scenarios
- Remaining Tasks

Background

- AASHTO was requested by DOT to form a team to conduct a national connected vehicle field infrastructure footprint analysis
  - Consider broad range of CV apps and scenarios
  - Include safety, mobility and environmental apps
  - Include light vehicles, transit, commercial vehicle and pedestrian apps
  - Include urban, rural, freeway, arterial, and freight/ intermodal facilities, and land border crossings

National Footprint Objectives

- Describe the justification for and value of deploying a connected vehicle infrastructure
- Assess the infrastructure, communication and data needs of priority applications
- Generate a set of generic (high-level) deployment concepts
- Identify scenarios leading to a preliminary national connected vehicle field infrastructure footprint
- Provide cost estimates and funding options
- Identify workforce, training, policy and guidance needs
- Identify implementation/institutional challenges and timing

Footprint Development Process

- Develop a Tech Memo to initiate engagement with State and local agencies (Task 3)
- Assess the range of CV applications to identify deployment bundles based on shared characteristics (Task 4)
- Develop deployment concepts (Task 5)
- Develop deployment scenarios, a preliminary national footprint, and cost estimates (Task 6)

Tech Memo

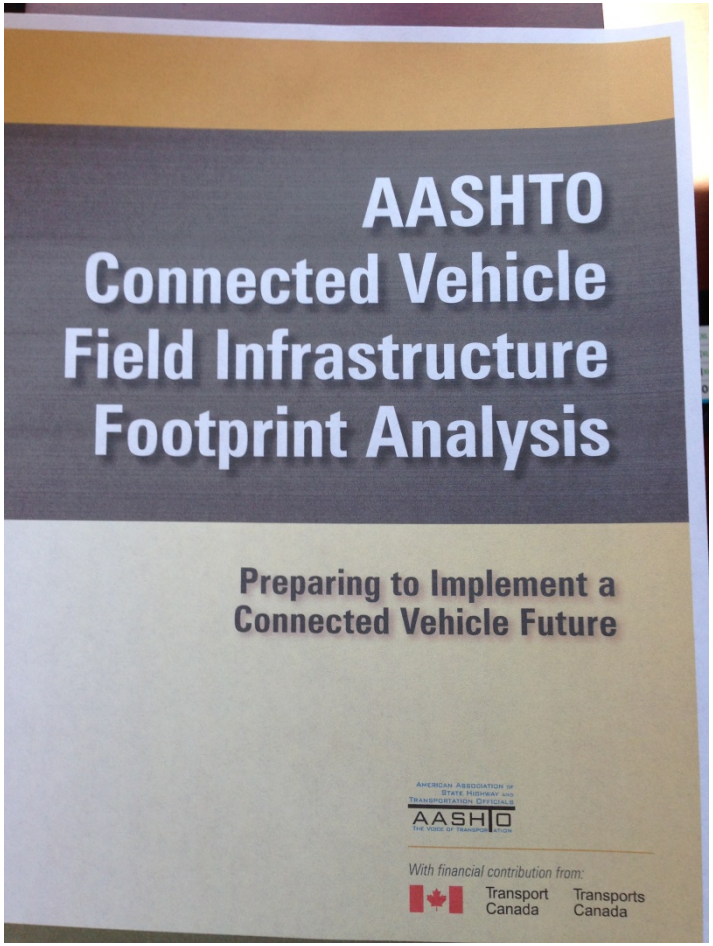
Completed

"This is a major undertaking for AASHTO, Transport Canada, and the United States as we prepare for a safer and more productive transportation environment."

Mike Lewis, AASHTO President and Director, Rhode Island DOT

"We are proud to invest in innovation and new opportunities to improve transportation safety and efficiency. By working together now we can lay the groundwork to align standards and regulations in North America and prevent barriers to cross-border travel and trade."

Susan Spencer, Director of ITS Programs, Transport Canada



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Footprint Applications Assessment

Completed

- **Application Packages**
  - V2I Safety
  - Mobility/Environment
  - Road Weather
  - Smart Roadside
  - Int. Border Crossings
  - Fee Payments
  - Agency Operations
- **Deployment Aspects**
  - RSU Requirements
  - Communications Requirements
  - Backhaul Requirements
  - Siting Issues
  - Data Needs
  - Mapping Needs

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Deployment Concepts

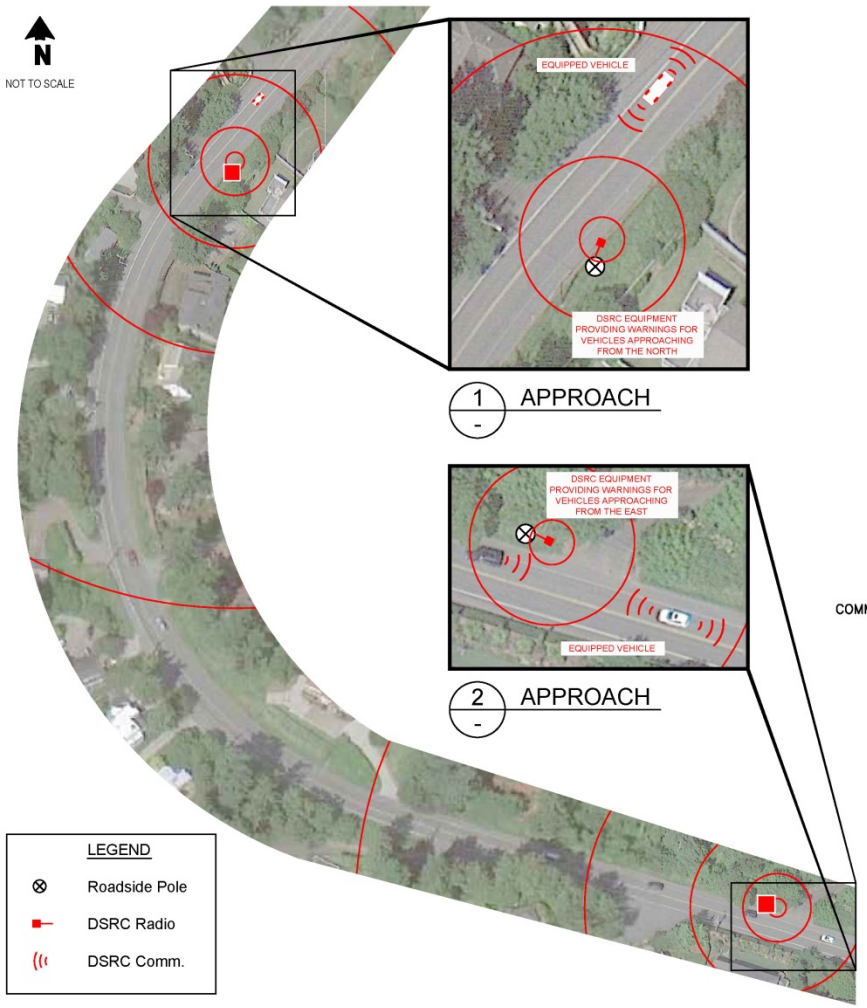
Completed*

- Selected to represent settings into which an agency might want to deploy CV applications
- Documented with conceptual plan sheets and supporting descriptions
- Include variations and alternatives to enable broader range of applications
- Identify example applications appropriate to that setting and concept

Deployment Concepts

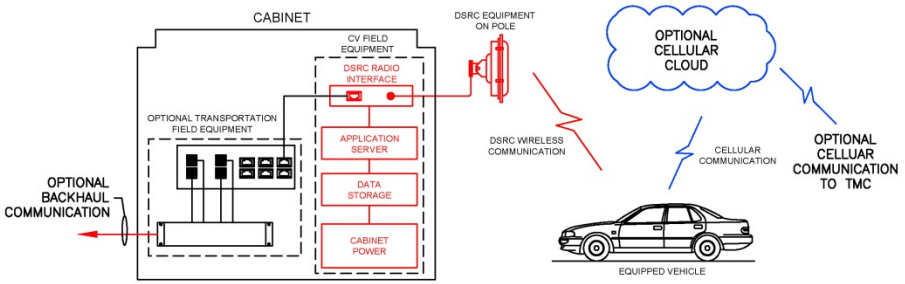
- Urban Intersection
- Urban Highway
- Urban Corridor
- Rural Roadway
- International Border Crossings
  - Canada & Mexico
- Smart Roadside
- DOT Operations
- Fee Payments
- Freight Facility

Rural Highway Example



3 - UTILITY INSTALLATION EXAMPLE

4 - STAND-ALONE INSTALLATION EXAMPLE



5 - COMMUNICATION AND POWER SCHEMATIC

TYPICAL SETTING FEATURES

Rural roadways typically have low traffic volumes and do not follow linear segments or incorporate grid systems.

CONCEPT EXAMPLE

DSRC communications for a curve speed warning application where advanced driver information is provided to help negotiate the downstream roadway conditions.

OTHER EXAMPLE APPLICATIONS

- Motorist Advisories and Warnings
- Stop Sign Assist
- Intersection Collision Warnings
- Dynamic Eco-routing based on roadway conditions or congestion issues

Rural Roadway Deployment Concept

NATIONAL CONNECTED VEHICLE FIELD INFRASTRUCTURE FOOTPRINT ANALYSIS

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CONCEPT 1

Urban Intersection Example

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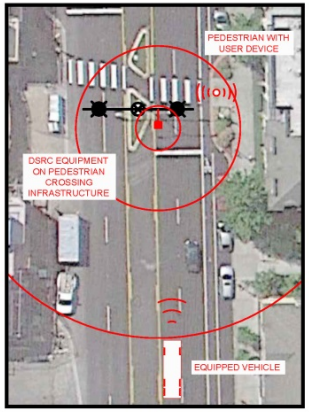
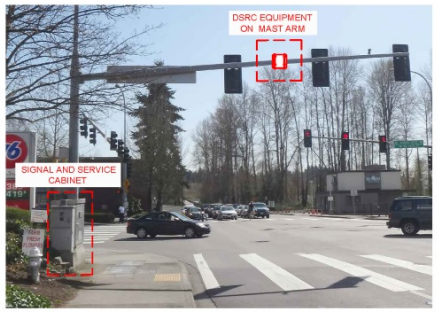
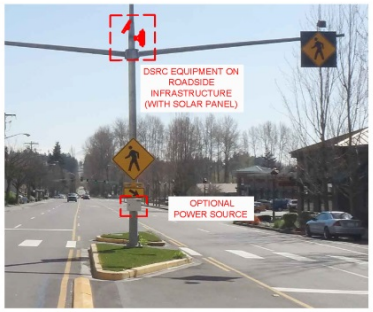
1 - INTERSECTION



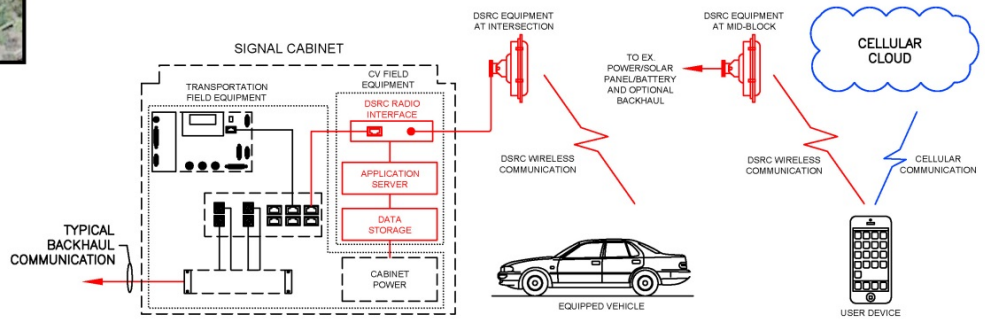
2 - MID-BLOCK (OPTIONAL)



1 - INTERSECTION INSTALLATION



2 - OPTIONAL MID-BLOCK PEDESTRIAN CROSSING



3 - COMMUNICATION AND POWER SCHEMATIC

LEGEND

- Existing Mast Arm
- Existing Cabinets
- DSRC Radio
- DSRC Comm.

TYPICAL SETTING FEATURES

urban intersections are junctions of two or more roads within a city setting which typically includes curbing, designated lane markings, and pedestrian crossings.

CONCEPT EXAMPLE

DSRC antennas communicate towards all approaches of the intersection and at a mid-block location to communicate with vehicles on the roadway.

OTHER EXAMPLE APPLICATIONS

- Red Light Violation Warning and Stop Sign Violation
- Driver Gap Assist at Signalized Intersections and Stop Signs
- Multimodal Intelligent Traffic Signal Systems
- Advanced Arterial Management and Operations
- Advanced Signal Operations

Urban Intersection Deployment Concept

NATIONAL CONNECTED VEHICLE FIELD INFRASTRUCTURE FOOTPRINT ANALYSIS

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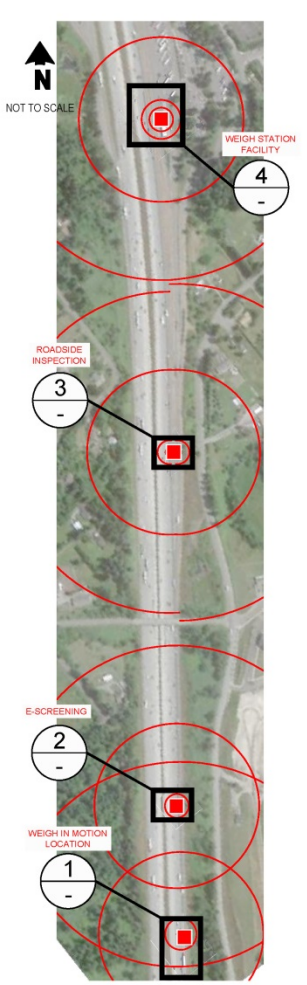
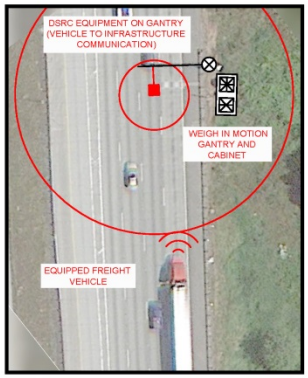
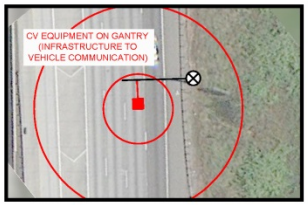
CONCEPT 3

Smart Roadside Example

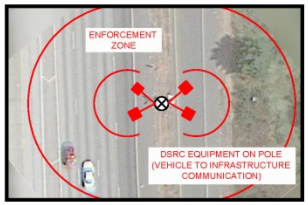




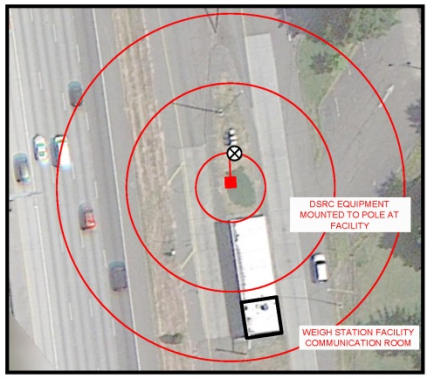
1 - WEIGH IN MOTION LOCATION



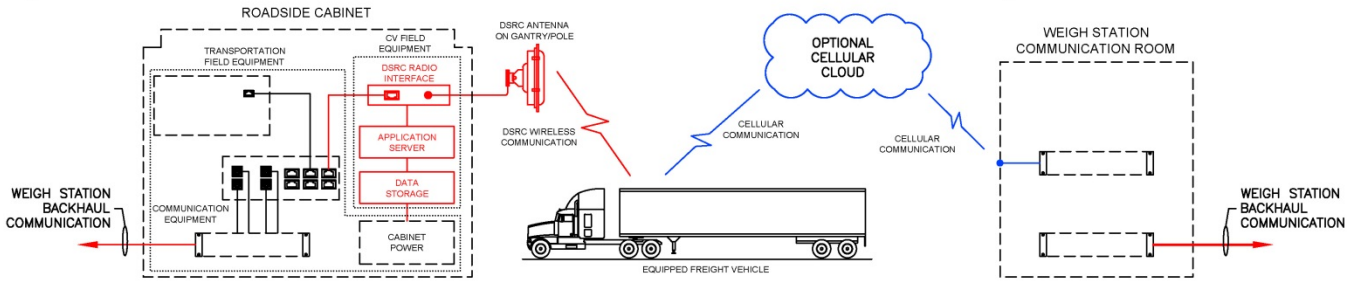
2 - E-SCREENING



3 - ROADSIDE INSPECTION



4 - WEIGH STATION FACILITY



5 - COMMUNICATION AND POWER SCHEMATIC

LEGEND

- Existing Mast Arm
- Existing Pole
- Existing Cabinets
- DSRC Radio
- DSRC Comm.

TYPICAL SETTING FEATURES

Truck weight station facilities for long-distance truck drivers are located close to major highway routes.

CONCEPT EXAMPLE

E-screening in this application notifies freight drivers about upcoming weigh stations.

OTHER EXAMPLE APPLICATIONS

- E-Permitting Verification / Wireless Roadside Inspection
- E-Screening / Virtual Weigh Station
- Smart Truck Parking

Smart Roadside Freight Corridor Deployment Concept

NATIONAL CONNECTED VEHICLE FIELD INFRASTRUCTURE FOOTPRINT ANALYSIS

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CONCEPT 7

Deployment Scenarios

In Process

- Discussions underway with agencies using application assessment and deployment concepts
- Identify how both well-informed and less familiar agencies would approach implementation
- Results will help prepare for
  - National launch footprint for infrastructure ~ 2020?
  - Extrapolate the launch footprint into a nationwide rollout ~ 2030?

Deployment Scenario Development

- Include agencies of all sizes and modes: states, MPOs, municipalities, rural areas, multi-state
- Accommodate agencies that have a range of familiarity with connected vehicle programs and technology
- Address both top-down program planning and opportunistic project development
- Address the full technology adoption curve

Potential Scenarios

- Urban metro integrated with legacy TMC/ITS
- Urban metro without integration constraints
- Statewide integrated with legacy ITS
- Statewide without integration constraints
- Multi-state corridor
- Rural deployment
- DOT system management & operations
- Commercial vehicle & freight systems
- Fee payment system conversions

Remaining Tasks

- Build-out from Scenarios to the National Footprint
- Describe deployment activities and timelines
- Develop estimates of capital investment and O&M costs
- Prepare and deliver final report

AASHTO Institutional Support[1]

- Create small executive group within AASHTO to develop BOD resolution
- Have implementation discussion within the ELT on cooperation
- Formalize AASHTO Deployment Coalition
  - ~ 511 Deployment Coalition
  - Peer Exchanges
  - Forum for Public & Private engagements
- AASHTO Subcommittee on Systems Operations & Management (SSOM)
  - Connected Vehicle emphasis area
  - Colorado DOT Director Interested & committed
- ITS World Congress
  - State DOT directors; from active states CA, FL, MI, AZ, CO
  - AASHTO leadership
- AASHTO Television
  - CEO, USDOT, OEM?

1. Assumes NHTSA Makes Clear Implementation Decision

For More Information

Location of National Footprint Documents on AASHTO Site: Task 3, 4 & 5 draft

- http://ssom.transportation.org/Pages/Connected-Vehicles.aspx

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