

**NCHRP 03-101**

**Costs and Benefits of Public Sector**

**Connected Vehicle Deployment**

Chicago

September 28, 2012

# Project Objective

## CONNECTED VEHICLES

(V2V & V2I)

EVALUATE & DOCUMENT  
AGENCY & SOCIETAL  
BENEFITS & COSTS

Why?

Help State/Local DOTs w/  
CV deployment decisions

# Project Objective

CONNECTED VEHICLES  
(V2V & V2I)

EVALUATE & DOCUMENT  
AGENCY & SOCIETAL  
BENEFITS & COSTS

Why?

Help State/Local DOTs w/  
CV deployment decisions

How?

- Assess DOT business practice impacts
- Focus on direct impacts of CV applications
- Use USDOT estimates for costs
- Quantify the costs and benefits

What?

CV  
Deployment  
Plan  
Template

# 4 Tasks w/ 12 Subtasks

2012				2013		
SEP	OCT	NOV	DEC	JAN	FEB	MAR

TO BE COMPLETED BY  
30MAR2013

- TASK 1 Project Management
- TASK 2 Conduct Transportation Analysis
- TASK 3 Cost Benefit Analysis
- TASK 4 Outreach & Final Report

- 2a Identify Connected Vehicle (CV) Applications
- 2b Select Case Study Sites
- 2c Conduct Structured Interviews
- 2d Document Impacts on DOTs
- 2e Prepare Deployment Plan Template
- 3a ID CV Cost Benefit Analysis (CBA) Needs
- 3b Document Cost Benefit Assumptions
- 3c Conduct Cost Benefit Analysis
- 4a Report on DOT Impacts
- 4b USDOT CV Deploy Plan Guidance
- 4c Final Report
- 4d Perform Outreach

Guidance  
"tool" to  
help DOTs  
make CV  
deployment  
decisions

# Task 2a – Identify CV Applications

## 25 Core CV Applications

- 11 apps could improve safety
- 7 apps could enhance mobility
- 3 apps could supply better data
- 2 apps could lower costs
  - Pothole Detection
  - Pavement Condition Monitor
- 2 apps could increase revenue
  - VMT-Based User Fees
  - HOT Lanes

TASK 1 Project Management	
TASK 2 Conduct Trans Analysis	2a
	2b
	2c
	2d
	2e
TASK 3 Cost Benefit Analysis	3a
	3b
	3c
TASK 4 Outreach & Final Report	4a
	4b
	4c
	4d

# Task 2b – Select Case Study Sites

Model Deployment  $\neq$  Real World Deployment

Pick sites that exemplify key concepts related to CV deployments

## Virginia

- Emphasizes a benefit-driven approach addressing a specific mobility challenge

## Maricopa County

- Emphasizes how to lower effective cost by leveraging planned deployments

TASK 1 Project Management	
TASK 2 Conduct Trans Analysis	2a
	2b
	2c
	2d
	2e
TASK 3 Cost Benefit Analysis	3a
	3b
	3c
TASK 4 Outreach & Final Report	4a
	4b
	4c
	4d

# Task 2c - Conduct DOT Interviews

Gathering info of impacts to DOT Operations and costs-benefits

TASK 1 Project Management	
TASK 2 Conduct Trans Analysis	2a 2b 2c 2d 2e
TASK 3 Cost Benefit Analysis	3a 3b 3c
TASK 4 Outreach & Final Report	4a 4b 4c 4d

- Deployment strategies
- Estimated deployment costs
- Impacts on DOT operations
  - Direct and indirect
- Data to support estimates of safety and mobility impacts

# Task 2d – Document DOT Impacts

TASK 1 Project Management	
TASK 2 Conduct Trans Analysis	2a 2b 2c 2d 2e
TASK 3 Cost Benefit Analysis	3a 3b 3c
TASK 4 Outreach & Final Report	4a 4b 4c 4d



## Direct Benefit-Cost Impacts

- Equipment maintenance
- Traffic data collection
- Roadside signage
- Pavement monitoring

## Indirect Benefit-Cost Impacts resulting from

- Decreased crashes
- Increased mobility

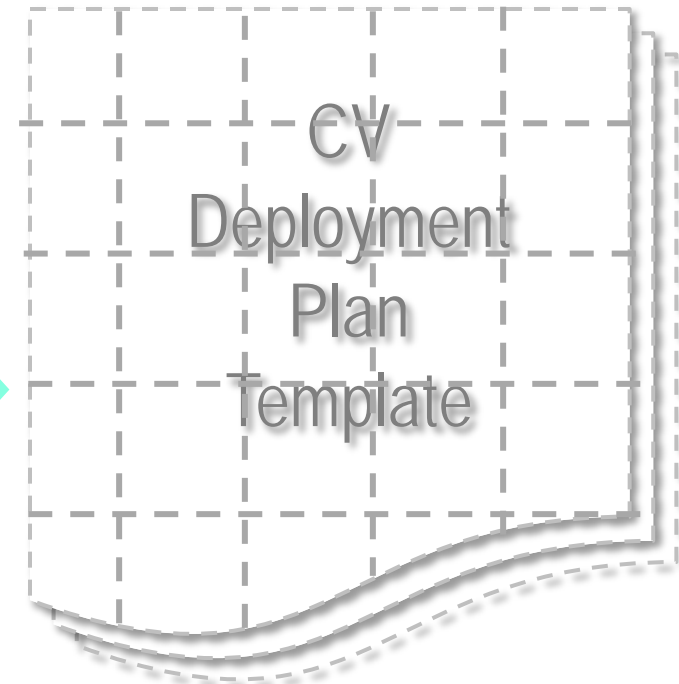


# Task 2e – Structure Deploy Plan Template

TASK 1	Project Management
TASK 2	Conduct Trans Analysis
2a	
2b	
2c	
2d	
2e	
TASK 3	Cost Benefit Analysis
3a	
3b	
3c	
TASK 4	Outreach & Final Report
4a	
4b	
4c	
4d	

- Planning the geographic deployment
- Planning the application deployment
  - Leveraging synergies between applications
- Estimate/present costs & benefits

Structured framework & building into it



# Task 3a – ID CV CBA Needs

TASK 1 Project Management	
TASK 2 Conduct Trans Analysis	2a 2b 2c 2d 2e
TASK 3 Cost Benefit Analysis	3a 3b 3c
TASK 4 Outreach & Final Report	4a 4b 4c 4d

## Cost Categories

- System costs
- Apps costs

## Benefit Categories

- Impacts on DOT operations
- Safety impacts
- Mobility impacts
- Environmental impacts

# Task 3b – Doc CV CBA Assumptions

TASK 1 Project Management

TASK 2 Conduct Trans Analysis

- 2a
- 2b
- 2c
- 2d
- 2e

TASK 3 Cost Benefit Analysis

- 3a
- 3b
- 3c

TASK 4 Outreach & Final Report

- 4a
- 4b
- 4c
- 4d

- Time horizons
- Discount rates
- Vehicle device market penetration
- Safety impacts
- Etc.



Describe Impacts if Assumptions Change

# Task 3c – Conduct CV CBA

TASK 1 Project Management

TASK 2 Conduct Trans Analysis

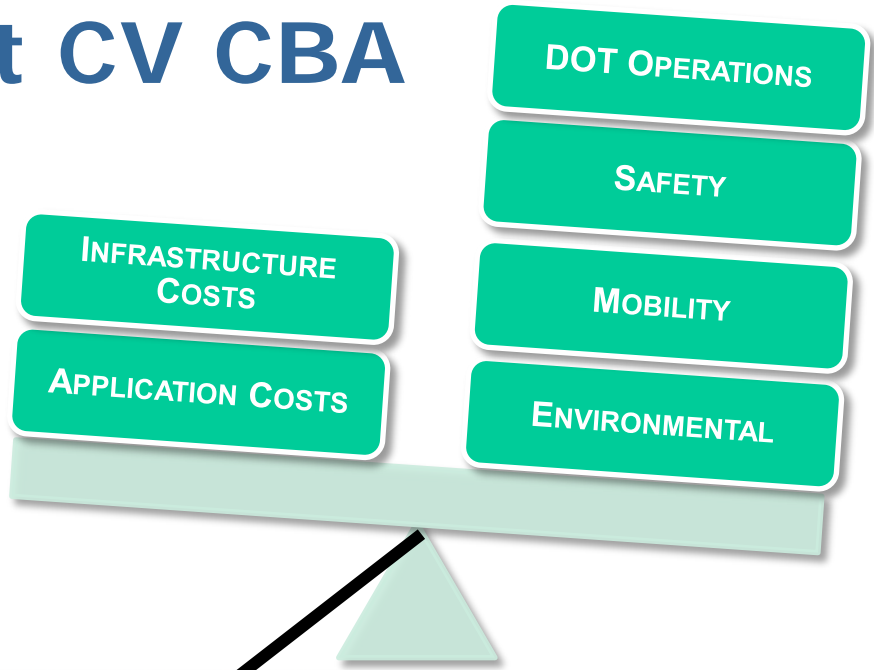
- 2a
- 2b
- 2c
- 2d
- 2e

TASK 3 Cost Benefit Analysis

- 3a
- 3b
- 3c

TASK 4 Outreach & Final Report

- 4a
- 4b
- 4c
- 4d



Item	Cost Category	Equipment
RSE (Single Antenna - Freeway)	Equipment	Equipment
RSE (Single Antenna - Freeway)	Installation Labor	Labor
RSE (Single Antenna - Freeway)	Maintenance - Labor	Labor
RSE (Single Antenna - Freeway)	Maintenance - Equipment	Equipment
RSE (Single Antenna - Freeway)	Network	Operating
RSE (Single Antenna - Freeway)	Power	Operating
RSE (Single Antenna - Freeway)	Security	Operating

Financial Metrics

# Task 4a – Report on DOT Impacts

TASK 1 Project Management

TASK 2 Conduct

2a

Trans Analysis

2b

2c

2d

2e

TASK 3 Cost Benefit Analysis

3a

3b

3c

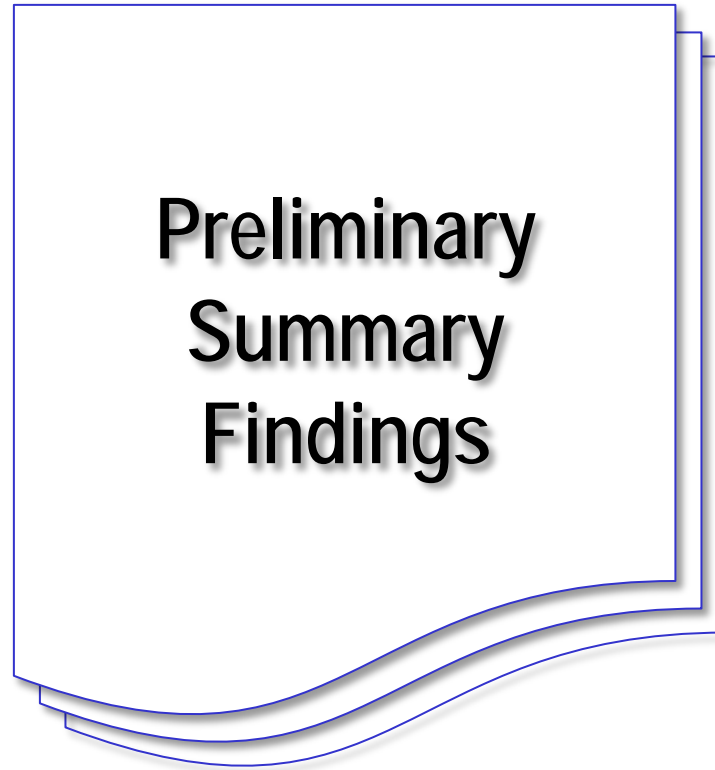
TASK 4 Outreach & Final Report

4a

4b

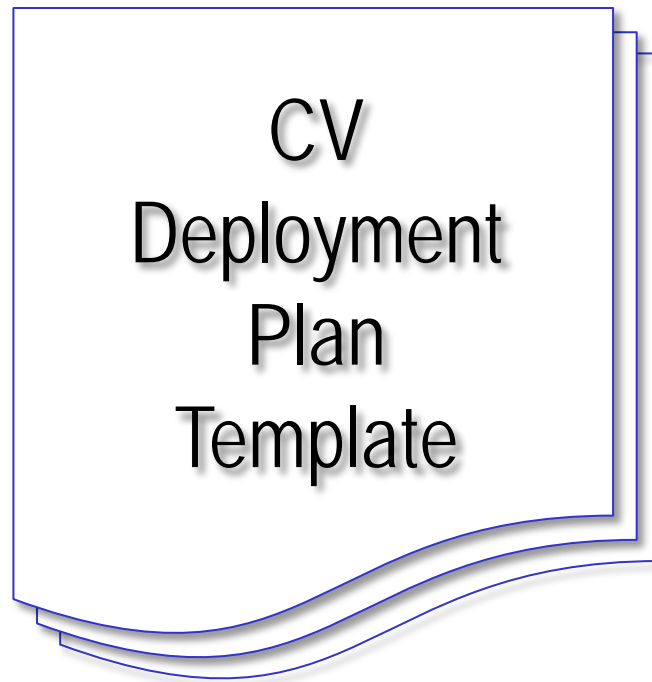
4c

4d



# Task 4b – Final CV Deploy Plan Template

TASK 1 Project Management	
TASK 2 Conduct Trans Analysis	2a 2b 2c 2d 2e
TASK 3 Cost Benefit Analysis	3a 3b 3c
TASK 4 Outreach & Final Report	4a 4b 4c 4d



- How to identify and bundle applications
- How to sequence deployments over time and geographically
- How to estimate deployment costs
- How to estimate deployment benefits

# Task 4c – Final Report

**TASK 1** Project Management

**TASK 2** Conduct Trans Analysis

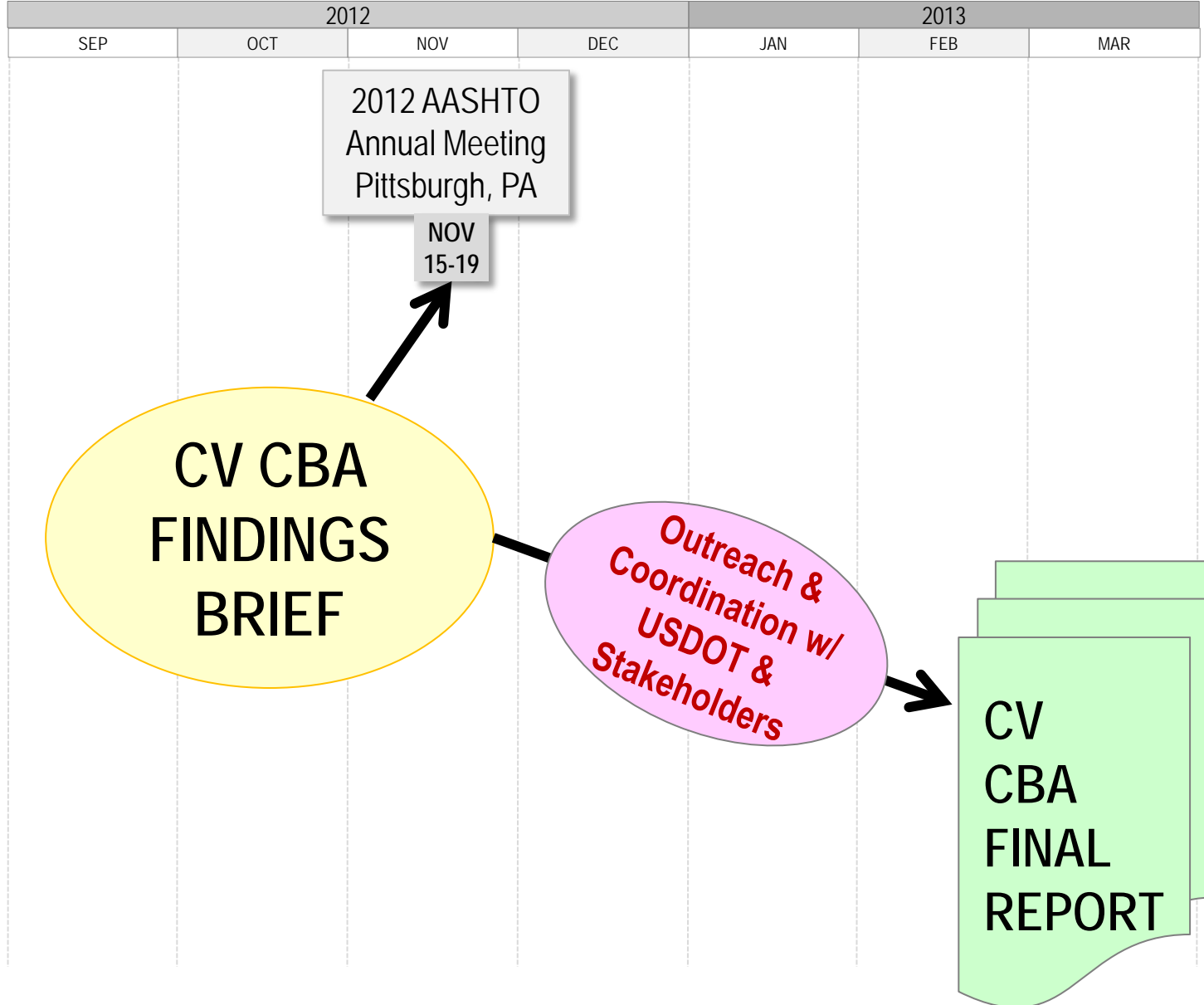
- 2a
- 2b
- 2c
- 2d
- 2e

**TASK 3** Cost Benefit Analysis

- 3a
- 3b
- 3c

**TASK 4** Outreach & Final Report

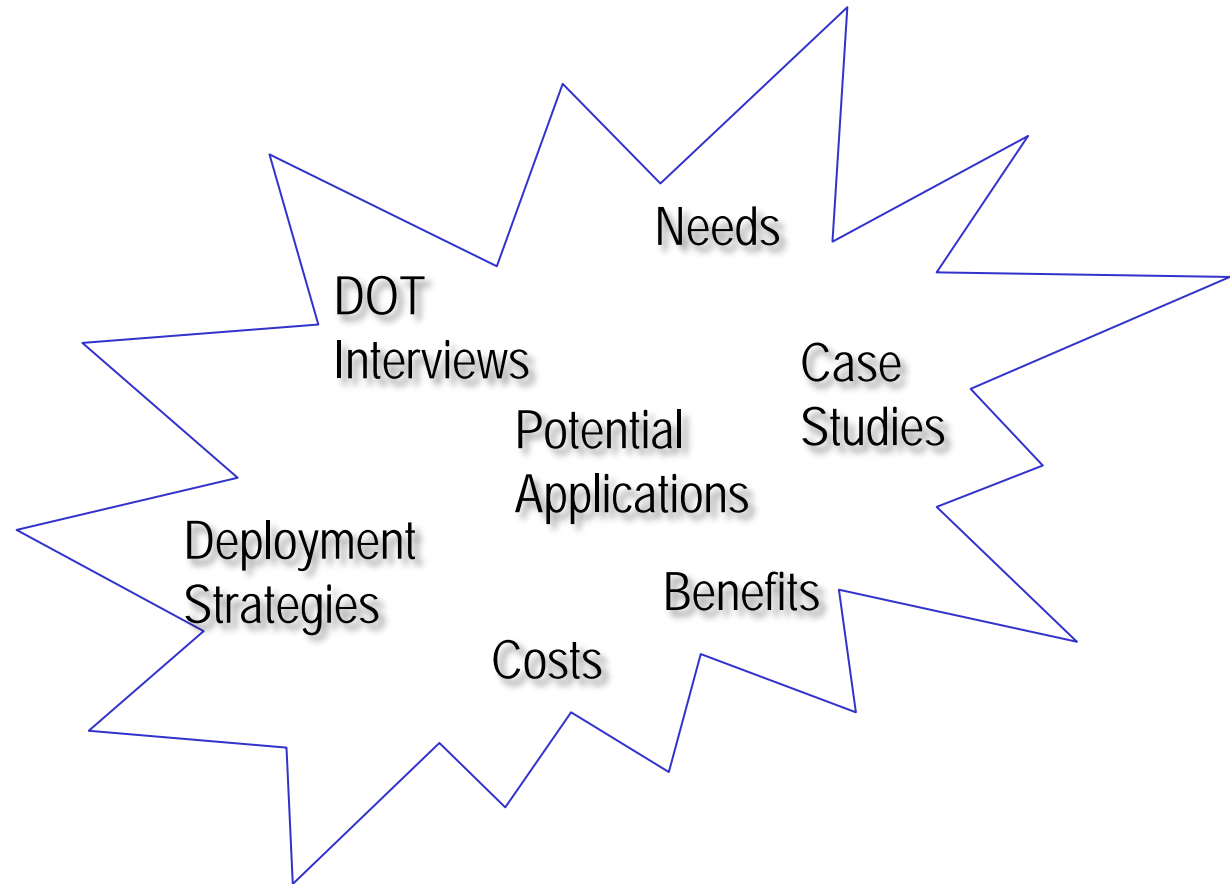
- 4a
- 4b
- 4c
- 4d



# Task 4d – Outreach

## Support Executive-level Decision Making

- Concise outreach materials
- Discuss CV impacts to the DOT



TASK 1 Project Management	
TASK 2 Conduct Trans Analysis	2a 2b 2c 2d 2e
TASK 3 Cost Benefit Analysis	3a 3b 3c
TASK 4 Outreach & Final Report	4a 4b 4c 4d

