U.S. Department of Transportation

COMPLETE TRIP

ITS4US

Task 4 Training:
Safety Management Plan

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Agenda

- **Brief Program Overview**
- **Safety Management**
  - Project Overview and Relationships
  - Safety Needs and Scenarios
  - Assessment of Safety Risks
  - Safety Operational Concept
  - Safety Management Summary
- **Resources**
  - Useful References
  - Stay Connected

Program Overview

Complete Trip - ITS4US Deployment Program

- A USDOT Multimodal Deployment effort, led by ITSJPO and supported by OST, FHWA and FTA
- Supports multiple large-scale replicable deployments to address the challenges of planning and executing all segments of a complete trip

Vision

*Innovative and integrated **complete trip deployments** to support seamless travel for all users across **all modes**, regardless of **location, income, or disability***

Program Goals

Spur high-impact integrated Complete Trip deployments nationwide

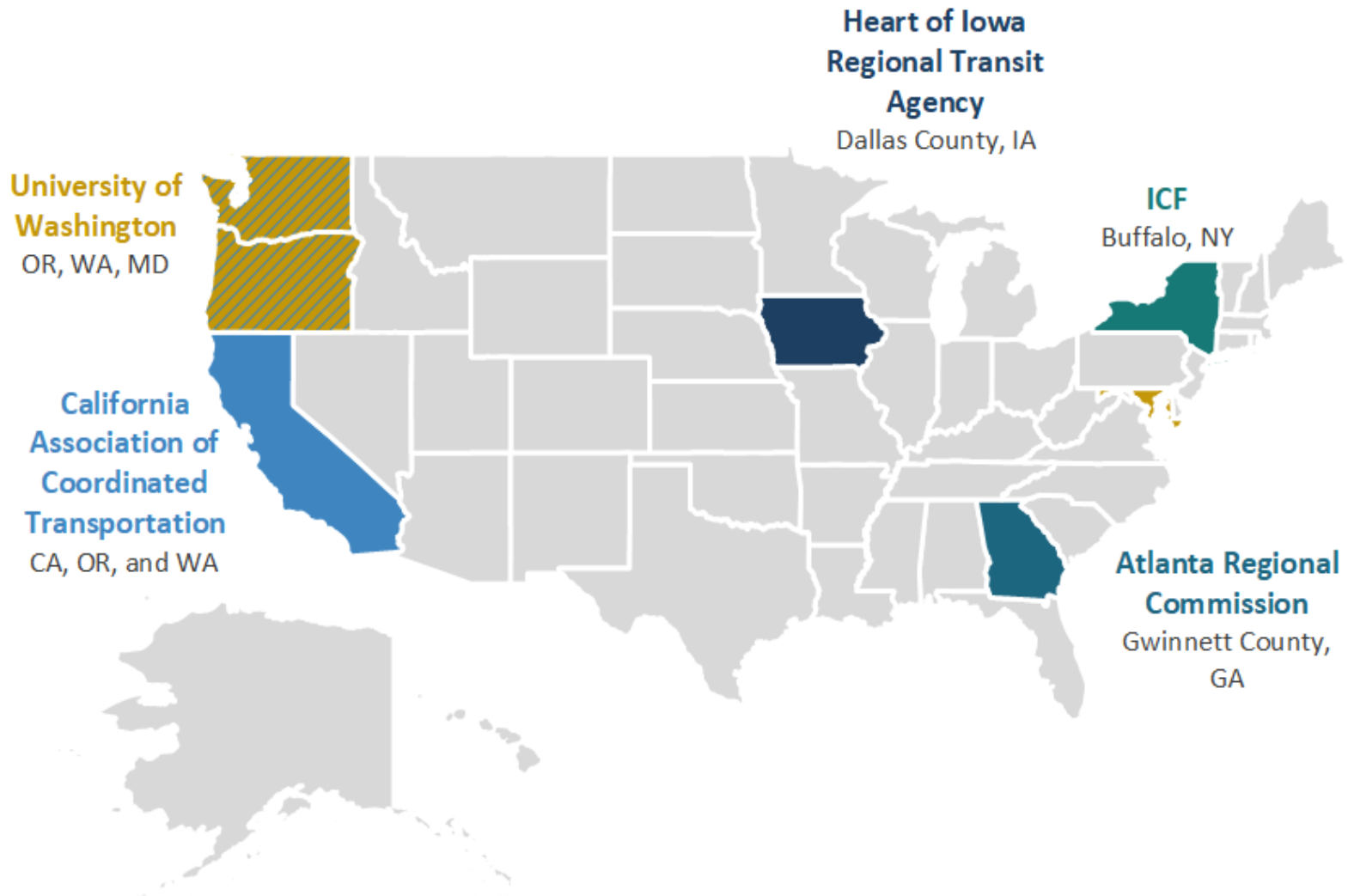
Identify needs and challenges by populations

Develop and deploy mobility solutions that meet user needs

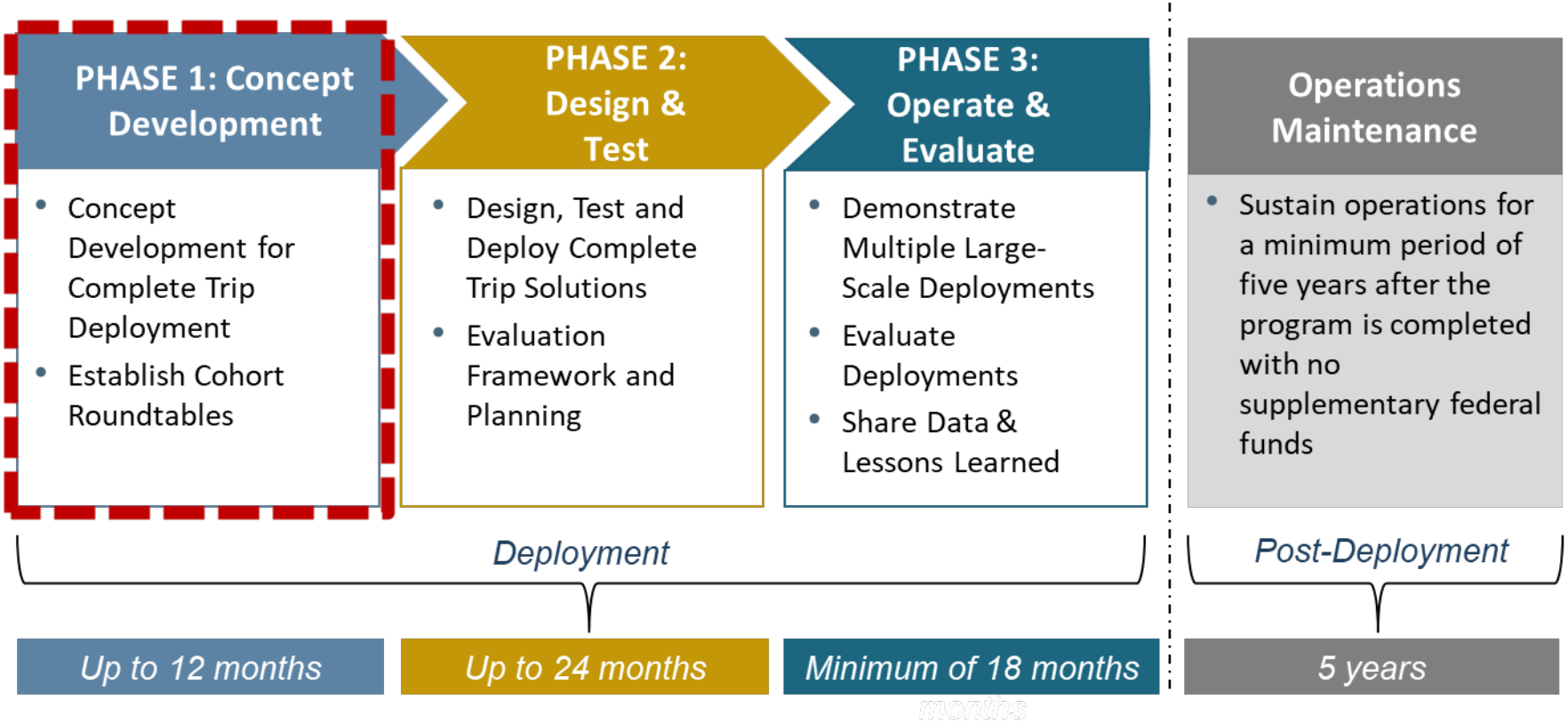
Measure impact of integrated deployments

Identify replicable solutions and disseminate lessons learned

Complete Trip Phase 1 Awardees



Deployment Phases



Safety Management Plan (SMP)

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Task 4

A Safety Management Plan:

- Reviews and assesses safety needs and risks in how travelers and others interact with the planned deployment.
- Develops strategies to minimize risks in design, development, and operation and respond to potential safety issues.
- Communicates overall safety management efforts to the end user, developer, agencies, organizations, and staff involved in the system.

Deliverables

1. Draft Safety Management Plan – Kick-Off + 22 weeks
2. Final Safety Management Plan – Kick-Off + 26 weeks

Safety Management Plan Major Components

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Safety Relationships	Safety-relevant stakeholders and processes to result in a tailored safety management approach
Safety Scenarios	Scenarios identified based on the applications and technologies selected for deployment
Safety Needs	Needs derived from an analysis of the scenarios, including likelihood and potential impact
Levels of Safety Risk	Levels of safety risk associated with the deployment, using established processes where possible
Safety Operational Concept	Requirements and actions to reduce the likelihood and impact in each safety scenario, and responses to safety-related events

Safety Management Plan Schedule

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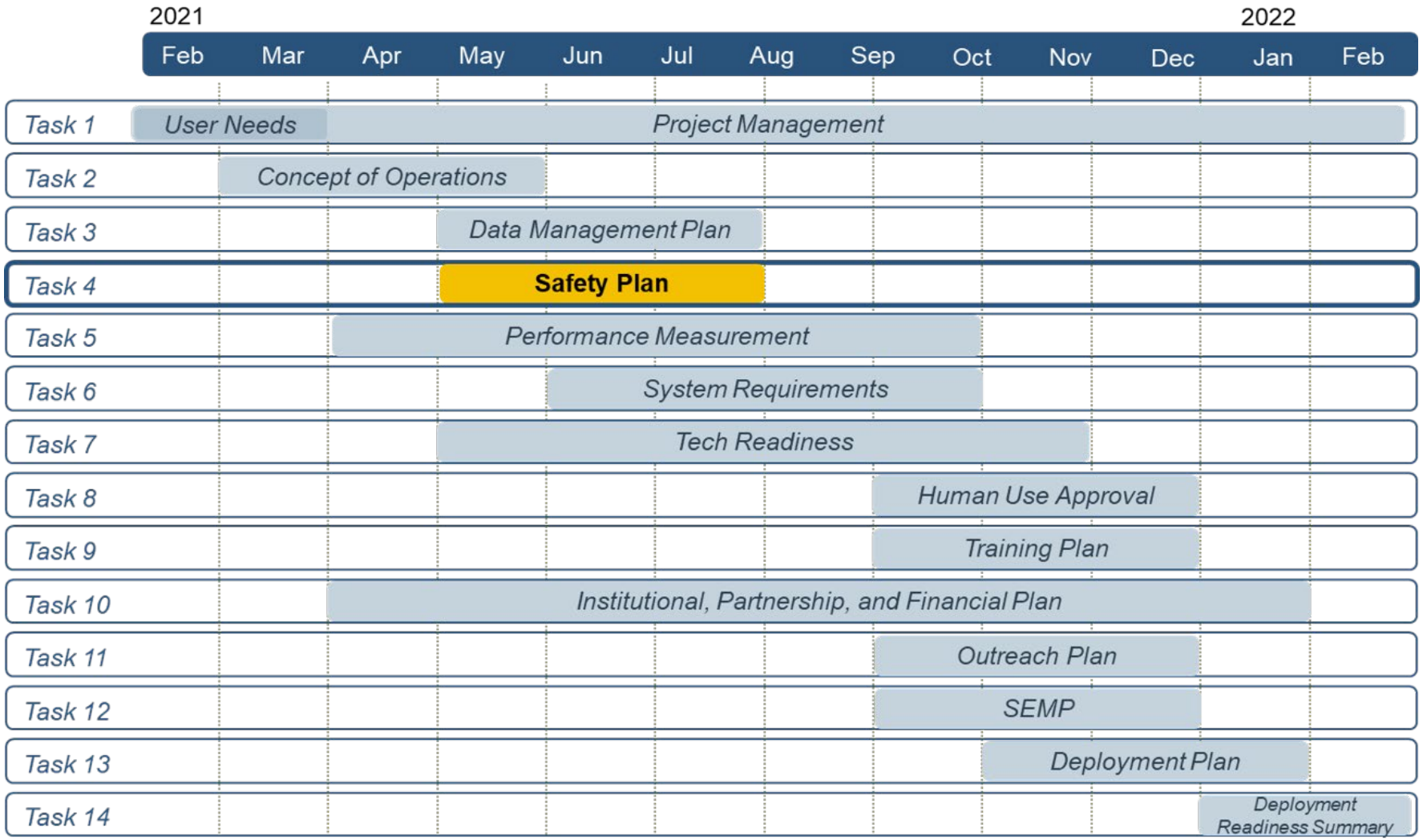

Safety Management Interdependencies

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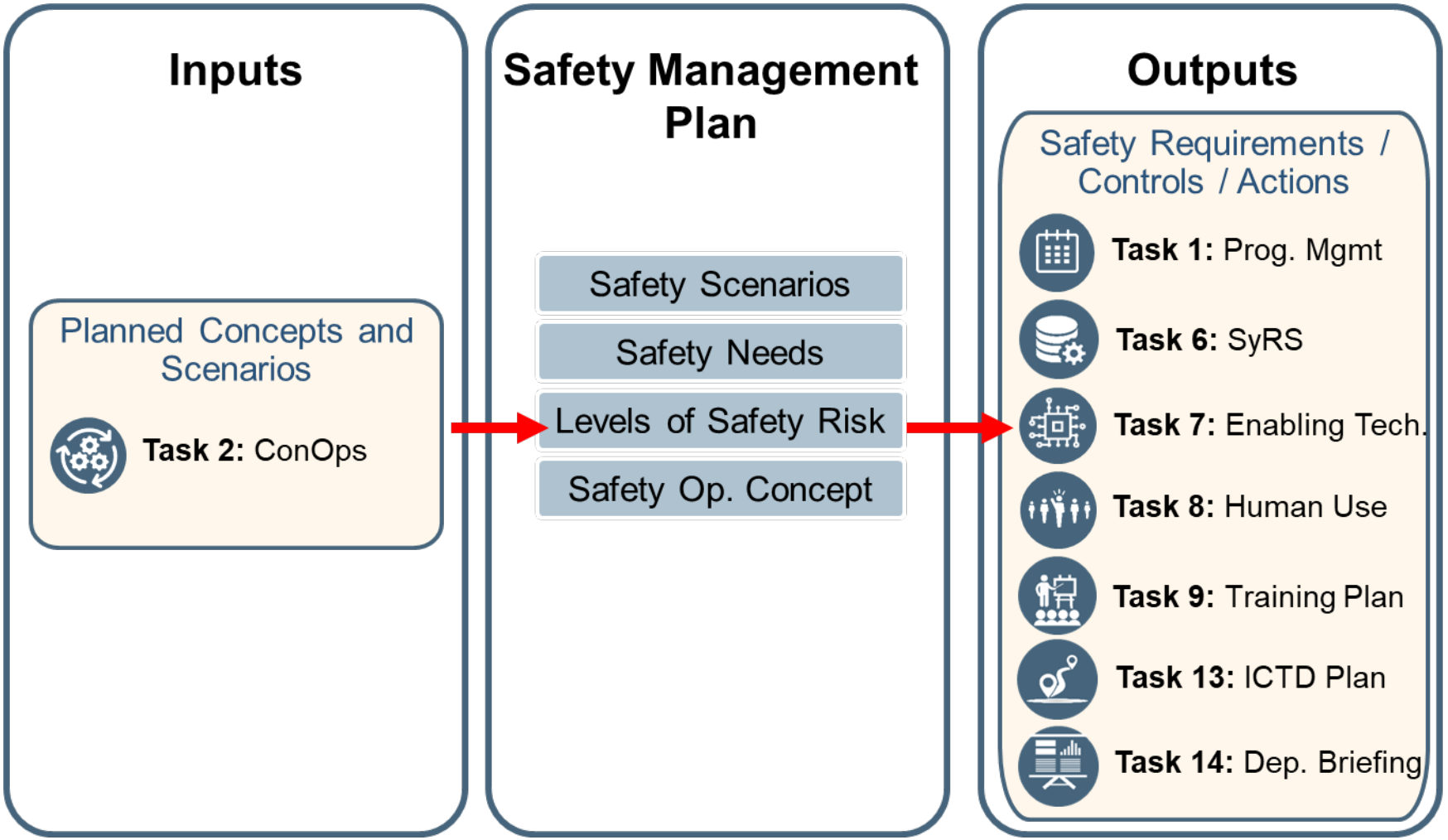


Safety Overview and Relationships

Project Background

- Summarize the project development
  - Goals
  - Intended outcomes
  - Major components
- Provide a project overview
  - Provide context for understanding potential safety needs
  - Various components depending on project
  - Take text from existing project material

The nature and extent of the planned deployment and users will help guide development of adequate and appropriate safety management processes.

Safety Stakeholders

List Safety Stakeholders by:

Name | Organization | Roles | Responsibilities

Include

- Personnel within the project team as well as external parties (e.g., affected infrastructure agencies)
- Individuals with safety responsibilities, and people with specific expertise and understanding of safety relating to underserved communities

Safety Risk Process and Approach

- Explain the overall approach being applied by the project to define, assess, and manage safety risks relating to the deployment.
- The approach should be tailored to the specific nature of the project and proposed components, users, and surrounding infrastructure environment.
- Leverage established processes (e.g., Public Transportation Agency Safety Plan, UL 4600, ISO 26262, ASIL, etc.) when appropriate.
- Validate with stakeholders and objective expertise.

Safety Needs and Scenarios

Build Upon ConOps Scenarios

Needs and **scenarios** should include input and feedback from safety stakeholders to ensure that complete and relevant information is included.

- Build upon the scenarios defined in the ConOps:
  - Describe the various components and users of the project
  - Use a systematic approach to define the safety needs and scenarios

Safety Needs and Scenarios

Safety Needs
Provide a description of the safety needs relating to each component.
Pay close attention to communities with specific needs that may warrant additional focus.

Safety Scenarios
Provide a description of the system- or application-level scenarios that cover the safety needs.
Provide sufficient detail to understand the hazard, impacts, potential exposure, and probabilities.
Particular attention should be given to new technologies and applications where prior assessments may not be available.

Discuss additional expertise / assistance utilized in defining the needs and scenarios and coordinating with external parties.

Assessment of Safety Risks

Safety Risk Assessment

Step 1	Step 2	Step 3
Apply safety management process to assess scenarios developed in ConOps	**Determine which scenarios may need countermeasures and controls**	**Create Safety Risk Assessment**
• Apply tailored process developed earlier in Safety Management Planning.	• Gather input from the relevant safety stakeholders and not solely based on vendor or project team decision.	• Provide supporting information to explain the assessment of safety risks.

Example Safety Risk Assessment - THEA

Level	Description	Safety Impacts	Prevention/ Mitigation Measures	Safety Incident Response Plans	QM Plan/ Response Agencies
Application Level	The Bus Rapid Transit Signal Priority and Progression malfunctions causing poor progression and increased route times.	Safety of the transit users. Riders may be stranded at bus stop locations longer than anticipated without alternate transportation options. This may result in riders stranded unexpectedly at night in a dangerous situation	Include lessons learned and best practices in the design. Perform reviews and verify communication software and equipment before deployment, including testing and checklists.	Bus driver participants will be provided a phone number to call any time to report issues and gain assistance. An estimated time of arrival will be provided to passengers as well as a phone number to call any time to report issues.	COT SOP 23.2 Vendor QM Plan (Section 6.1.1) HART, THEA, COT

Excerpt from Tampa (THEA) CV Pilot Safety Management Plan

Example Safety Risk Assessment - WYDOT

ID	Risk Reg. Ref.	Category	Safety Risk Description	Likely Impacts	Risk Response Plan	E	S	C	ASIL
3	27	Infrastr. Install.	The CV system negatively impacts the VSL algorithm to cause the roadside VSL system to go down.	The symptom is the same as if a lightning strike caused a power outage. There are failsafe already built into the VSL system and the default mode would be no variable speed limit posted similar to other roadway sections with no VSL system. Therefore, the Pilot Deployment does not increase the potential severity to a driver's normal day-to-day activities.	System monitoring will be used to reduce the length of time for failures. WYDOT maintenance and Network Operations Center (NOC) teams are available 24x7x365 for emergency repairs.	1	1	1	QM

Excerpt from WYDOT CV Pilot Safety Management Plan
E=Exposure, S=Severity, C=Controllability, Automotive Safety Integrity Level (ASIL)

Example Safety Risk Assessment – NYC DOT

ID	Description	ASIL	Type	Action
13	Audible messages are indistinguishable from other sounds.	B	Functional Safety Requirements	Develop vehicle-specific design guidelines, followed by testing in a realistic traffic environment

Excerpt from NYC DOT CV Pilot Safety Management Plan
ASIL = Automotive Safety Integrity Level

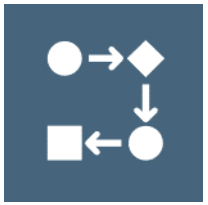
Safety Operational Concepts

Strategies to Address Safety Needs

- Based on safety risk assessment, select appropriate strategies
- Quality Management – Include continued monitoring and reassessment if information suggests need or if changes occur

Describe how the application or component will include **design elements** to avoid or prevent safety impacts.

- Example: Include requirement for wayfinding human interface to avoid causing distractions while in roadway.



Describe how the project will develop and execute **operational processes** to control safety risks.

- Example: Include additional input validation for location data relating to steps or areas where falls may occur.

Strategies to Address Safety Needs (Cont.)

Describe the **mitigation and fail-safe measures** to control severity of impacts if/when safety impacts occur.

- Example: Develop verification and notification mechanism to investigate if a participant's outdoor pickup is delayed or missed in severe weather conditions.

Describe the **processes to respond** to safety incidents.

- Example: Document technology-related response mechanisms (e.g., instructions for disabling automation) and inform emergency response services or infrastructure repair.

Describe the **processes to track and report** potential safety incidents.

- Example: Provide supporting tool to allow potential safety issues or incidents/near-incidents to be easily reported by electronic form to appropriate personnel, including external parties as appropriate.

Safety Management Summary

Safety Risk Summary

- Provide a summary table to facilitate understanding of overall areas of risk, structured based on the safety management approach described in section 2.4.

Summary table items:

ID	Safety Risk	Safety Assessment	Safety Operational Concept Strategies	Factors to Monitor	Overall Status

Summary table allows coordination with overall project risk management processes and external coordination as needed.

Continuing Safety Planning

Plan to Make Updates

- Describe the steps to be taken to continue the safety management processes beyond this document.
- Follow-up on actions taken to address risks

Example Updates

- Additional risks may be identified as the systems are developed and tested.
- Updates can be provided on working with local DOT to coordinate related infrastructure safety needs and improvements.
- Safety stakeholders may need to be added or removed over time.

Resources

Useful References

USDOT

- USDOT Guidance Summary for Connected Vehicle Deployments: Safety Management, July 2016 https://rosap.ntl.bts.gov/view/dot/31556
- National Public Transportation Safety Plan, January 2017 https://www.transit.dot.gov/sites/fta.dot.gov/files/docs/National%20Public%20Transportation%20Safety%20Plan_1.pdf
- FTA Public Transportation Agency Safety Plan Technical Assistance Center (Resource Library), https://www.transit.dot.gov/PTASP-TAC
- Hazard and Safety Analysis of Automated Transit Bus Applications, April 2020 https://rosap.ntl.bts.gov/view/dot/49126

International Organization for Standardization

- *ISO 26262 Road Vehicles - Functional Safety,* 2018 https://www.iso.org/standard/68384.html

US DoD

- Department of Defense, Standard Practice: System Safety, MIL-STD-882E, May 2012 https://quicksearch.dla.mil/qsDocDetails.aspx?ident_number=36027

Stay Connected

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Visit the Complete Trip - ITS4US Deployment Program Website and FAQs:
https://its.dot.gov/its4us/
https://its.dot.gov/its4us/htm/faqs.htm

Q&A

Any questions?