Integrated Corridor Management Initiative: Demonstration Phase Evaluation

San Diego Institutional and Organizational Analysis Test Plan

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16. Abstract

This report presents the test plan for conducting the Institutional and Organizational Analysis for the United States Department of Transportation (U.S. DOT) evaluation of the San Diego Integrated Corridor Management (ICM) Initiative Demonstration. The ICM projects being deployed in San Diego include a suite of strategies aimed at balancing corridor transportation supply and demand to promote overall corridor efficiency and safety. Operational strategies to be deployed in the San Diego I-15 highway corridor include: simulations to predict travel conditions for improved incident response, interdependent response plans among agencies, traffic diversion to strategic arterials, traveler mode shift to the BRT system during major freeway incidents, and comparative travel time information to the public and operating agencies for freeway, HOT lanes, arterial streets, and BRT. Technologies that will be used to carry out these strategies include a Decision Support System, a 511 traveler information system (telephone and website), a regional center-to-center information exchange network, dynamic message signs, adaptive ramp metering, and responsive traffic signals. This Institutional and Organizational Data Test Plan is based on the ICM Initiative Demonstration National Evaluation Framework. This test plan provides an overview of the Institutional and Organizational Analysis and describes the specific qualitative and quantitative data that will be collected to support the analysis. Data analysis methodologies as well as risks and mitigations associated with this evaluation analysis are also discussed in this test plan.

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

Page

List of Tables

List of Figures

LIST OF ABBREVIATIONS

AMS	Analysis, Modeling and Simulation
CHP	California Highway Patrol
DMS	Dynamic Message Sign
DSS	Decision Support Systems
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GUI	Graphical User Interface
HOT	High-Occupancy Tolling
HOV	High-Occupancy Vehicle
I-15	Interstate-15
ICM	Integrated Corridor Management
ICMS	Integrated Corridor Management System
IMTMS	Intermodal Transportation Management System
iNET	Intelligent NETworks
ITS	Intelligent Transportation Systems
KTT	Knowledge and Technology Transfer
LRT	Light Rail Transit
MOE	Measure of Effectiveness
MTS	Metropolitan Transit System
NCTD	North County Transit District
OES	Office of Emergency Services
PDT	Project Development Team
R/T	Real-time

RITA	Research and Innovative Technology Administration
SANDAG	San Diego Association of Governments
SD SAFE	San Diego County Service Authority for Freeway Emergencies
S.R.	State Route
TMC	Transportation Management Center
TMDD	Traffic Management Data Dictionary
U.S. DOT	U.S. Department of Transportation
UPA/CRD	Urban Partnership Agreement/Congestion Reduction Demonstration
VMT	Vehicle-Miles Traveled
Volpe Center	John A. Volpe National Transportation System Center

1.0 INTRODUCTION

This report presents the plan for conducting the Institutional and Organizational Analysis, one of seven analyses that comprise the United States Department of Transportation (U.S. DOT) national evaluation of the San Diego Integrated Corridor Management (ICM) Initiative demonstration phase. The ICM demonstration phase includes multimodal deployments in the U.S. 75 corridor in Dallas, Texas and the Interstate 15 (I-15) corridor in San Diego, California. Separate evaluation test plan documents are being prepared for each site. This document, which focuses on San Diego, is referred to as a "test plan" because, in addition to describing the specific data to be collected, it describes how that data will be used to test various evaluation hypotheses and answer various evaluation questions.

The primary thrust of the national ICM evaluation is to thoroughly understand each site's ICM experience and impacts. However, it is expected that various findings from the two sites will be compared and contrasted as appropriate and with the proper caveats recognizing site differences.

The remainder of this introduction chapter describes the ICM program and elaborates on the hypotheses and objectives for the demonstration phase deployments in Dallas and San Diego, as well as the subsequent evaluation analyses. The remainder of the report is divided into five sections. Chapter 2 summarizes the Institutional and Organizational Analysis overall. Chapters 3 and 4 describe the quantitative and qualitative data that will be used in this analysis. Chapter 5 describes how the data will be analyzed. Chapter 6 presents the risks and mitigations associated with institutional and organizational data.

1.1 ICM Program[1]

Congestion continues to be a major problem, specifically for urban areas, costing businesses an estimated $200 billion per year due to freight bottlenecks and drivers nearly 4 billion hours of time and more than 2 billion gallons of fuel in traffic jams each year. ICM is a promising congestion management tool that seeks to optimize the use of existing infrastructure assets and leverage unused capacity along our nation's urban corridors.

ICM enables transportation managers to optimize use of all available multimodal infrastructure by directing travelers to underutilized capacity in a transportation corridor—rather than taking the more traditional approach of managing individual assets. Strategies include motorists shifting their trip departure times, routes, or modal choices, or transportation managers dynamically adjusting capacity by changing metering rates at entrance ramps or adjusting traffic signal timing plans to accommodate demand fluctuations. In an ICM corridor, travelers can shift to transportation alternatives—even during the course of their trips—in response to changing traffic conditions.

[1] This section has largely been excerpted from the U.S. DOT ICM Overview Fact Sheet, "Managing Congestion with Integrated Corridor Management," http://www.its.dot.gov/icms/docs/cs_over_final.pdf, developed by SAIC for U.S. DOT. At the direction of U.S. DOT, some of the original text has been revised to reflect updates and/or corrections.

The objectives of the U.S. DOT ICM Initiative are:

- Demonstrate how operations strategies and Intelligent Transportation Systems (ITS) technologies can be used to efficiently and proactively manage the movement of people and goods in major transportation corridors through integration of the management of all transportation networks in a corridor.
- Develop a toolbox of operational policies, cross-network operational strategies, integration requirements and methods, and analysis methodologies needed to implement an effective ICM system.
- Demonstrate how proven and emerging ITS technologies can be used to coordinate the operations between separate multimodal corridor networks to increase the effective use of the total transportation capacity of the corridor.

The U.S. DOT's ICM Initiative is occurring in four phases:

- Phase 1: Foundational Research – This phase researched the current state of corridor management in the United States as well as ICM-like practices around the world; conducted initial feasibility research; and developed technical guidance documents, including a general ICM concept of operations to help sites develop their own ICM concept of operations.
- Phase 2: Corridor Tools, Strategies and Integration – U.S. DOT developed a framework to model, simulate and analyze ICM strategies, working with eight Pioneer Sites to deploy and test various ICM components such as standards, interfaces and management schemes.
- Phase 3: Corridor Site Development, Analysis and Demonstration – This phase includes three activities:
    1) Concept Development – Eight ICM Pioneer Sites developed concepts of operation and requirements documents.
    2) Modeling – U.S. DOT selected Dallas, Minneapolis and San Diego to model their proposed ICM systems.
    3) Demonstration and Evaluation – Dallas and San Diego will demonstrate their ICM strategies; data from the demonstrations will be used to refine the analysis, modeling and simulation (AMS) models and methodology.
- Phase 4: Outreach and Knowledge and Technology Transfer (KTT) – U.S. DOT is packaging the knowledge and materials developed throughout the ICM Initiative into a suite of useful multimedia resources to help transportation practitioners implement ICM.

An on-going ICM Initiative activity, AMS is very relevant to the evaluation. AMS tools were developed in Phase 2 and used by the sites to identify and evaluate candidate ICM strategies. In Phase 3, the proposed Dallas and San Diego ICM deployments were modeled. As sites further refine their ICM strategies, AMS tools continue to be used and iteratively calibrated and validated, using key evaluation results, in part. The AMS tools are very important to the evaluation for two reasons. First, the evaluation will produce results that will be used to complete validation of the AMS tools, e.g., updating the AMS assumptions related to the percentage of travelers who change routes or modes in response to ICM traveler information. Second, the calibrated AMS tools will serve as a source of some evaluation data, namely the corridor-level, person-trip travel time and throughput measures that are difficult to develop using field data.

1.2 ICM Demonstration Phase Deployments[2]

This section summarizes the San Diego ICM deployment and briefly contrasts it with the Dallas deployment.

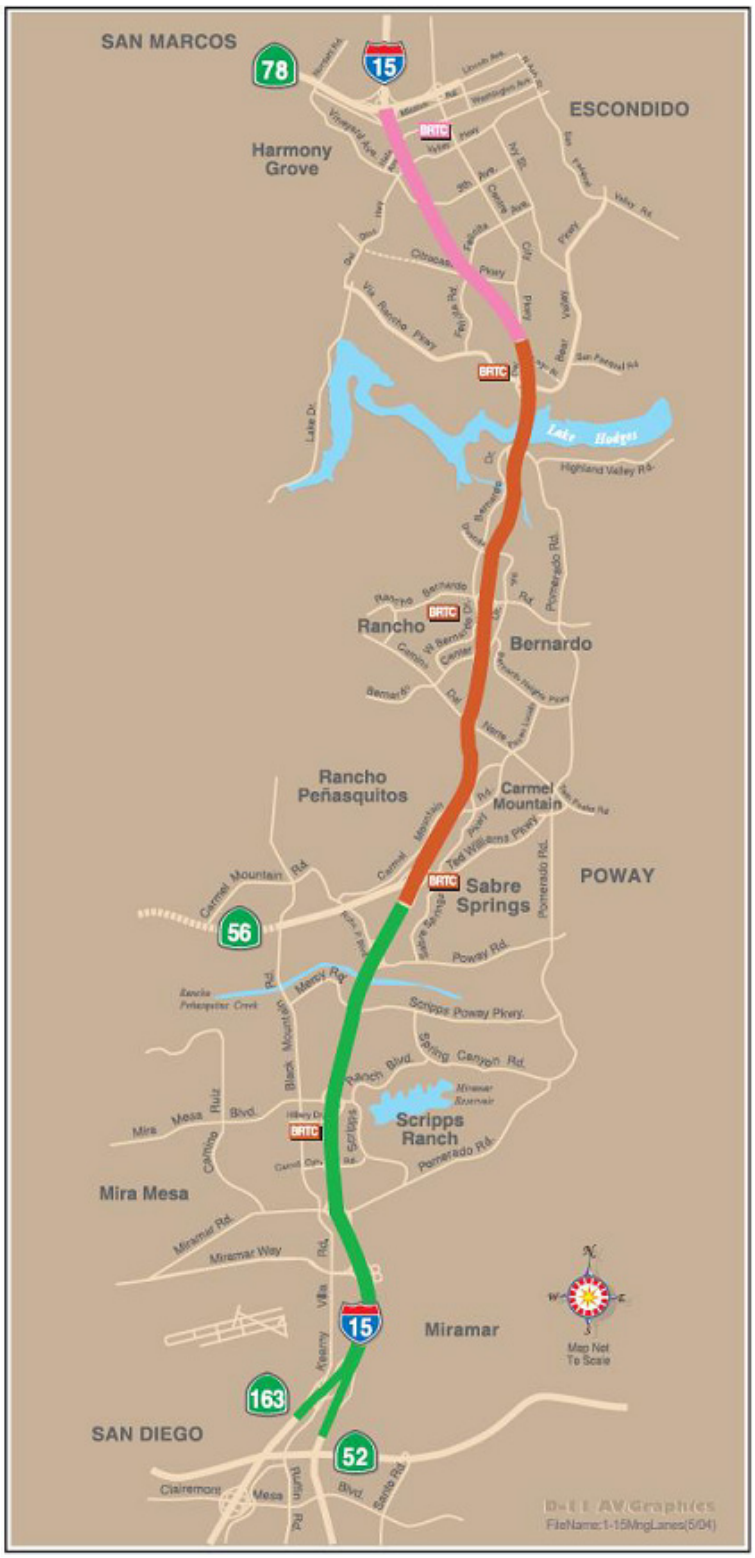
1.2.1 Overview of the San Diego ICM Deployment

The I-15 project is a collaboration led by the San Diego Association of Governments (SANDAG), along with U.S. DOT; the California Department of Transportation; Metropolitan Transit System (MTS); North County Transit District (NCTD); the cities of San Diego, Poway, and Escondido; San Diego County Service Authority for Freeway Emergencies (SD SAFE); County of San Diego Office of Emergency Services (OES); and California Highway Patrol (CHP), in addition to private sector support.

The San Diego ICM corridor includes the portion of I-15, a north-south facility, from state route (S.R.) 78 in the north to the S.R. 163 interchange in the south, as shown in Figure 1-1. I-15 is a primary artery for the movement of commuters, goods, and services from inland northern San Diego County to downtown San Diego. Weekday traffic volumes range from 170,000 to 290,000 vehicles on the general purpose lanes.

The corridor currently has a 20-mile, four-lane concurrent flow high-occupancy toll/managed lanes facility with two reversible center lanes, the "I-15 Express Lanes." Approximately 30,000 vehicles use the I-15 Express Lanes during weekdays, and the corridor experiences recurring congestion.

[2] Information in this section has been excerpted from "Integrated Corridor Management," published in the November/December 2010 edition of Public Roads magazine. The article was authored by Brian Cronin (RITA), Steve Mortensen (FTA), Robert Sheehan (FHWA), and Dale Thompson (FHWA). With the consent of the authors, at the direction of U.S. DOT some updates or corrections have been made to this material.



San Diego Association of Governments, January 2011

Figure 1-1. I-15 Corridor Boundaries of San Diego ICM Deployment

The San Diego ICM focuses on five primary ICM goals to augment technical management, software and systems development, and cutting-edge innovation:

1. The corridor's multimodal and smart-growth approach shall improve accessibility to travel options and attain an enhanced level of mobility for corridor travelers.
2. The corridor's safety record shall be enhanced through an integrated multimodal approach.
3. The corridor's travelers shall have the informational tools to make smart travel choices within the corridor.
4. The corridor's institutional partners shall employ an integrated approach through a corridor-wide perspective to resolve problems.
5. The corridor's networks shall be managed holistically under both normal operating and incident/event conditions in a collaborative and coordinated way.

To achieve these goals, SANDAG and its partnering agencies will contribute $2.2 million for the $10.9 million project. San Diego will use investments in ITS to implement a "smart" transportation management system that combines road sensors, transit management strategies, video, and traveler information to reduce congestion. The smart system will deliver information to commuters via the Internet and message signs, and will enable managers to adjust traffic signals and ramp meters to direct travelers to high-occupancy vehicle (HOV) and high-occupancy tolling (HOT) lanes, bus rapid transit, and other options. Specific examples of practices the San Diego site team intends to employ include the following:

- Provide corridor users with the operational condition of all corridor networks and components, such as comparative travel times, incident information, and expected delays.
- Use a decision support system with real-time simulation, predictive algorithms, and analysis modeling.
- Establish, improve, and automate joint agency action plans for traveler information, traffic signal timing, ramp metering, transit and Express Lanes.
- Identify means of enhancing corridor management across all networks, including shared control multi-jurisdictional coordination of field devices such as lane controls, traveler information messages, traffic signal timing plans, and transit priority.

Technology investments that are being implemented as part of the ICM deployment in San Diego and which will be used to carry out ICM operational strategies include:

- A Decision Support System (DSS) that will utilize incoming monitoring data to assess conditions, forecast conditions up to 30 minutes in the future, and then formulate recommended response plans (including selecting from pre-approved plans) for consideration by operations personnel. Table 1-1 summarizes expected San Diego DSS functionality.

- Enhancement of the Intermodal Transportation Management System (IMTMS) regional information exchange network, a system previously implemented using non-ICM funding and which is being enhanced using ICM funding, depicted in Figure 1-2.
- Adjustments to ramp meter timing to support diversions to or from the freeway
- Lane use modifications, namely the four configurable, managed (variably priced high-occupancy toll) lanes in the I-15 median.
- Upgrades to selected traffic signal systems, including new traffic signal coordination timings and responsive traffic signal control on two arterial streets paralleling I-15.
- Arterial street monitoring system, including additional traffic detectors.

Table 1-1. Summary of San Diego DSS Functionality

Functionality	Summary
Expert-System Based DSS	The Expert System combines a rule base using incident response parameters with knowledge base information on roadway geometry and field device locations to automatically generate response plans consisting of strategies such as dynamic message signing (DMS), signal timing, and ramp metering and incident checklists. The heart of the DSS subsystem within the Integrated Corridor Management System (ICMS) is the ability to analyze collected data, ascertain abnormal or scheduled events, determine appropriate responses, and suggest a set of actions that collectively form a "Response Plan." The Response Plan may be manually or automatically generated, but if automatically generated, will include the capability for human operator review and modification. This is particularly critical for field device (i.e., DMS and camera) control actions.
Real-Time Monitoring of Transportation System Conditions through the DATA-HUB (IMTMS)	The DSS – DATA HUB takes the data received from participating agencies and provides fused data to participating agencies as XML data feeds and to the general public through the regional 511 system. The DSS – DATA HUB will provide for a dynamic, Web-based Graphical User Interface (GUI) to selected agencies for the monitoring of corridor performance and operations. This portion of DSS functionality is the Intelligent NETworks (iNET) program
Real-Time Simulation modeling to help assess impacts of response plans	The DSS will use a micro/meso scale modeling tool to assess the impact of short-term responses to the planned and unplanned events in the corridor (such as the recent wildfires in San Diego). The real-time modeling component will use the DATA-HUB inputs, along with the DSS-Response Plans to generate corridor level impact assessments of response plans.
Offline simulation and modeling to help fine-tune response plans	Response plans will be reviewed periodically using offline simulation and modeling approaches to make changes to the rules of practices, generate modified rules of practice, and assess the performance retroactively of the DSS
DSS-Network prediction	DSS includes a network prediction capability that looks at capacity and demand conditions across the corridor up to an hour in advance in 15 minute slices. The network prediction looks at estimating demand and the consequent travel conditions across the various modes in the corridor. This information is shared with the corridor operators. The prediction will be refreshed every 3-5 minutes.

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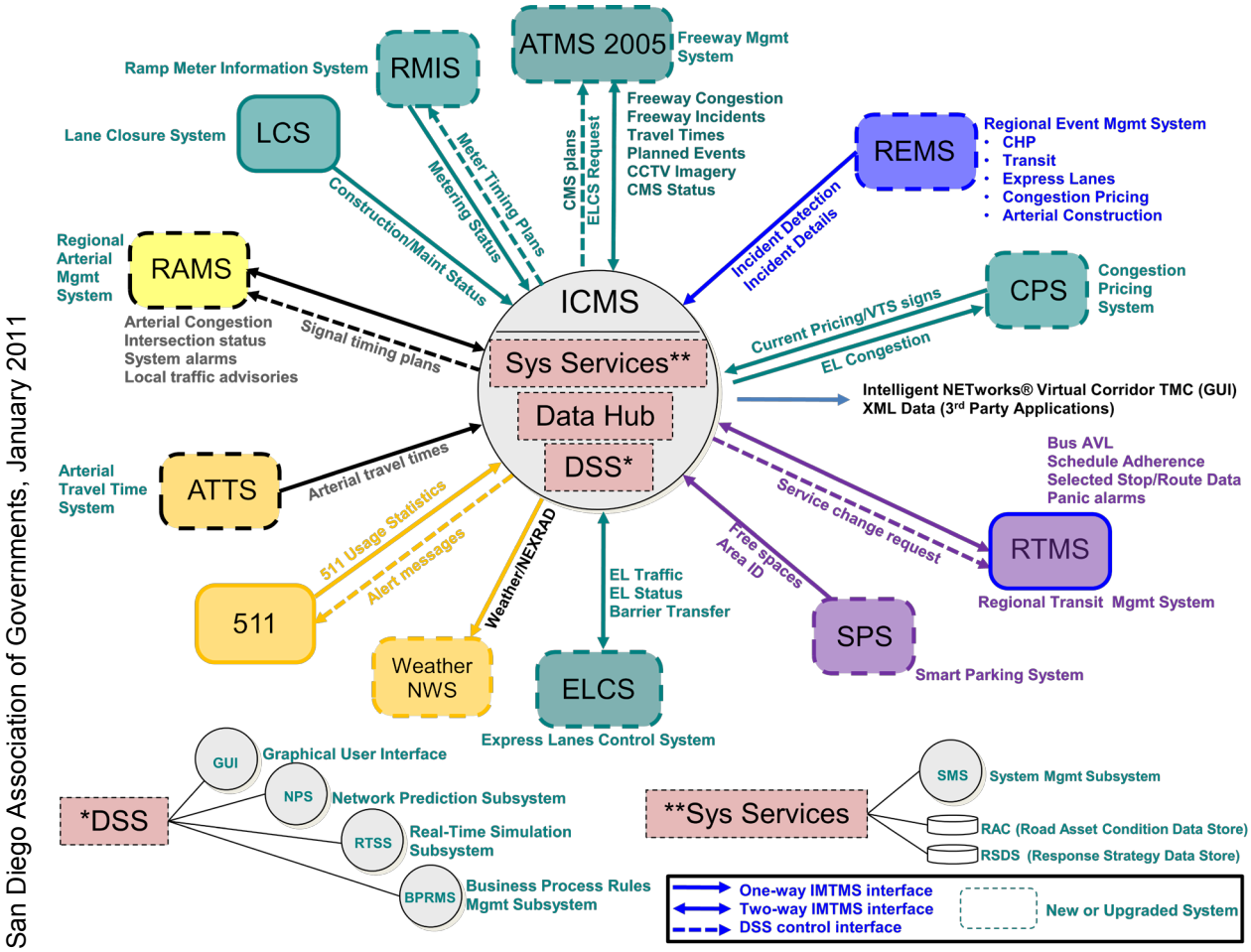

Figure 1-2. Context of San Diego ICM System Data Inputs and Outputs

It is expected that the various San Diego ICM system capabilities and strategies will be utilized in several different contexts and timeframes. These contexts and timeframes are expected to become more definitive and elaborated as the sites proceed with the design and implementation of their systems; various scenarios have been explored that consider the use of the ICM system as a response strategy for wildfires, a crash involving hazardous materials, and heavy congestion at different locations along the corridor. Further, these uses are expected to evolve as the sites work through their six-month "shakedown" periods following the initial system go-live dates, and possibly, continuing to some extent into the 12-month post-deployment data collection period. Currently, it is expected that the ICM systems will be applied in at least the following general contexts and timeframes:

1. In "real time" (or near real time), based on congestion levels
2. In advance, e.g., pre-planned:
    a. Anticipating a specific, atypical event, such as major roadway construction or a large sporting event; and

b. Periodic or cyclical (e.g., seasonal) adjustments to approaches based on lessons learned and evolution of the ICM strategies and/or in response to lasting changes in transportation conditions either directly related to ICM strategy utilization (e.g., drivers who may have switched to transit during a specific ICM-supported traffic incident choosing to continue to use transit on a daily basis) or other, non-ICM related changes such as regional travel demand.

1.2.2 San Diego ICM Deployment Schedule

Table 1-2 presents the San Diego ICM deployment schedule. As indicated in Table 1-2, individual components of the deployment will be completed in a phased manner, with full ICM system operations currently scheduled to commence in February 2013. The San Diego site team has indicated that they do expect, to at least some degree, to begin using individual components and associated ICM strategies as they become available prior to the overall system go-live. The approach to this analysis attempts to take that phasing into consideration. Since both the completion dates of the individual ICM components and the San Diego site team's utilization of them are expected to evolve as the ICM system design, implementation and shakedown periods progress, the approach presented in this test plan may flex somewhat in response.

Table 1-2. San Diego ICM Deployment Schedule

Activity	Completion Date
Complete Planning Phase	November 2010
Design/Build Phase (complete unit testing):	
Iteration 1: Intelligent NETworks (iNET) Integrated Corridor Management System (ICMS) configuration, new datahub interfaces, Traffic Management Data Dictionary (TMDD) v3.0 conversion, error-checked real-time (R/T) Traffic model, response plan data store design	April 2012
Iteration 2: R/T traffic model with response plans, iNET updates for response plan and event management	August 2012
Iteration 3: Predictive modeling, iNET update for predictive modeling, integration of all DSS capabilities in all subsystems	January 2013
Additional field element construction	January 2013
Complete Acceptance Testing	January 2013
Operations Go Live	February 2013
Complete Shakedown Period	July 2013
Complete Evaluation One Year Operational Period	July 2014

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1.2.3 Comparison to the Dallas ICM Deployment

The overall objectives of the San Diego ICM deployment are similar to those in Dallas and many of the same general operational strategies are planned, focusing on improving the balance between travel supply and demand across multiple modes and facilities, including highways, arterial streets and transit. The major distinctions in the ICM strategies to be utilized by each site generally flow from the differences in their transportation systems:

- The San Diego corridor includes extensive bus rapid transit whereas the U.S. 75 corridor in Dallas includes the Red Line Light Rail Transit (LRT) service.
- The San Diego corridor includes concurrent flow HOT/managed lanes whereas the Dallas corridor includes HOV lanes:
    - The San Diego corridor includes a recently expanded four-lane managed lane system in the I-15 median that is variably priced high occupancy tolling and includes two reversible center lanes. The San Diego site team does not expect ICM to impact their variable pricing decisions but it will impact their use of the four configurable managed lanes.
    - The Dallas U.S.-75 corridor includes access-controlled, HOV lanes located in the median, although, like San Diego with the HOT lanes, they do not expect ICM to impact their occupancy requirement decisions.
    - Both sites currently lift HOV restrictions during major incidents.
- Both sites include major arterials that run parallel with the freeways. However, while the arterial in Dallas is continuous for the length of the corridor, there is no single continuous arterial running parallel to I-15 in San Diego; Black Mountain Road, Pomerado Road, and Centre City Parkway are parallel arterials in the I-15 corridor.
- The Dallas corridor includes an extensive frontage road system, while the San Diego I-15 corridor includes auxiliary lanes between most freeway interchanges that function similarly, though with less capacity.
- The San Diego corridor includes ramp meters on I-15 and so their traffic signal timing strategies include ramp meter signals. Dallas does not use ramp meters.
- Both sites include changes to traffic signal timing plans during heavy demand and/or incidents. The Dallas deployment includes improved traffic signal timing response plans to adjust signal timing in response to real-time traffic demands along the major parallel arterial. The San Diego deployment includes responsive traffic signal control along Black Mountain and Pomerado Roads, both of which are major arterials that parallel I-15.

1.3 National Evaluation Objectives and Process

This section summarizes key aspects of the overall ICM national evaluation. A more comprehensive discussion is contained in the National Evaluation Framework document and the details of individual analyses are documented in this and other test plans.

1.3.1 U.S. DOT Hypotheses

The U.S. DOT has established the testing of eight "hypotheses" as the primary objective and analytical thrust of the ICM demonstration phase evaluation, as shown in Table 1-3. There are a number of cause-effect relationships among the U.S. DOT hypotheses; for example, enhanced response and control is dependent on enhanced situational awareness. These relationships will be examined through the evaluation in addition to testing the individual hypotheses. Another important relationship among the hypotheses is that DSS is actually a component of enhanced response and control and, depending on the specific role played by the DSS, may also contribute to improved situational awareness.

Table 1-3. U.S. DOT ICM Evaluation Hypotheses

Hypothesis	Description
The Implementation of ICM will:	
Improve Situational Awareness	Operators will realize a more comprehensive and accurate understanding of underlying operational conditions considering all networks in the corridor.
Enhance Response and Control	Operating agencies within the corridor will improve management practices and coordinate decision-making, resulting in enhanced response and control.
Better Inform Travelers	Travelers will have actionable multi-modal (highway, arterial, transit, parking, etc.) information resulting in more personally efficient mode, time of trip start, and route decisions.
Improve Corridor Performance	Optimizing networks at the corridor level will result in an improvement to multi-modal corridor performance, particularly in high travel demand and/or reduced capacity periods.
Have Benefits Greater than Costs	Because ICM must compete with other potential transportation projects for scarce resources, ICM should deliver benefits that exceed the costs of implementation and operation.
The implementation of ICM will have a positive or no effect on:	
Air Quality	ICM will affect air quality through changes in Vehicle Miles Traveled (VMT), person throughput, and speed of traffic, resulting in a small positive or no change in air quality measures relative to improved mobility.
Safety	ICM implementation will not adversely affect overall safety outcomes, and better incident management may reduce the occurrence of secondary crashes.
Decision Support Systems*	Decision support systems provide a useful and effective tool for ICM project managers through its ability to improve situational awareness, enhance response and control mechanisms and provide better information to travelers, resulting in at least part of the overall improvement in corridor performance.

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* For the purposes of this hypothesis, the U.S. DOT considers DSS functionality to include both those carried out by what the sites have labeled their "DSS" as well as some related functions carried out by other portions of the sites' ICM systems.

1.3.2 Evaluation Analyses

The investigation of the eight U.S. DOT evaluation hypotheses have been organized into seven evaluation "analyses," shown in Table 1-4, which generally correlate with the hypotheses. A separate analysis investigates institutional and organizational issues, which relate to all of the hypotheses since the ability to achieve any intended ICM benefits depends upon successful institutional coordination and cooperation.

Table 1-4. Relationship Between U.S. DOT Hypotheses and Evaluation Analyses

U.S.DOT Hypotheses	Evaluation Analysis Area
• Improve Situational Awareness • Enhance Response and Control	Technical Assessment of Operator Capability to Monitor, Control, and Report on the Status of the Corridor
• Better Inform Travelers	Traveler Response (also relates to Enhance Response and Control)
• Improve Corridor Performance	Quantitative Analysis of the Corridor Performance – Mobility
• Positive or No Impact on Safety	Quantitative Analysis of the Corridor Performance – Safety
• Positive or No Impact on Air Quality	Air Quality Analysis
• Have Benefits Greater than Costs	Benefit-Cost Analysis
• Provide a Useful and Effective Tool for ICM Project Managers	Evaluation of Decision Support Systems

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The evaluation features a "logic model" approach in which each link in the cause-effect sequence necessary to produce the desired impacts on transportation system performance is investigated and documented, beginning with the investments made ("inputs"), the capabilities acquired and their utilization ("outputs") and traveler and system impacts ("outcomes").

Collectively, the results of the eight evaluation analyses will provide a comprehensive understanding of the ICM demonstration phase experience:

- What ICM program-funded and other key ICM-supporting investments did the Dallas and San Diego site teams make, including hardware, software, and personnel (inputs)?
- What capabilities were realized through those investments; how were they exercised and to what extent did they enhance previous capabilities (outputs)?
- What were the impacts of the ICM deployments on travelers, transportation system performance, safety and air quality (outcomes)?
- What institutional and organizational factors explain the successes and shortcomings associated with implementation, operation and effectiveness (inputs, outputs and outcomes) of ICM and what are the implications for U.S. DOT policy and programs and for transportation agencies around the country (Institutional and Organizational Analysis)?

- How well did the DSS perform (DSS Analysis)?
- What is the overall value of the ICM deployment in terms of benefits versus costs (Benefit-Cost Analysis)?

1.3.3 Evaluation Process and Timeline

Figure 1-3 shows the anticipated sequence of evaluation activities. The evaluation will collect 12 months of baseline (pre-ICM deployment) data and, following a 6-month shakedown period, 12 months of post-deployment data.

The major products of the evaluation are two interim technical memoranda after the end of the baseline and post-deployment data collection efforts and a single final report documenting the findings at both sites as well as cross-cutting results. Two formal site visits are planned by the national evaluation team to each site: as part of evaluation planning during national evaluation framework development and test planning-related visits. Additional data collection trips will be made by various members of the national evaluation team during baseline and post-deployment data collection.

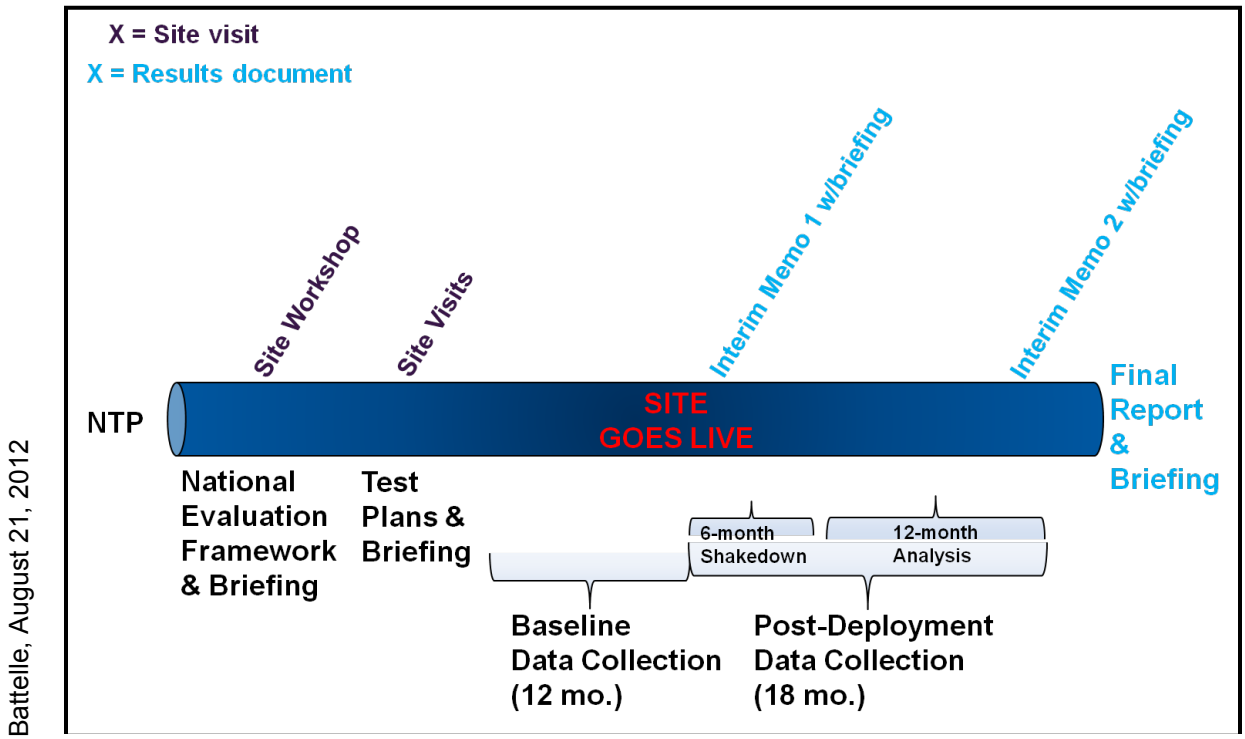

Figure 1-3. Sequence of Evaluation Activities

Based on current deployment schedules for both Dallas and San Diego, the anticipated schedule for major evaluation activities in San Diego is as follows:

- Finalize test plans – Summer 2012
- Collect baseline (pre-ICM deployment) data – Winter 2012 through Winter 2013
- Complete Interim Technical Memorandum on baseline data – Spring 2013
- Collect post-deployment data – Winter 2013 – Summer 2014
- Complete Interim Technical Memorandum on evaluation results – Fall 2014
- Complete Final Report – Spring 2015

1.3.4 Roles and Responsibilities

The U.S. DOT ICM Management Team is directing the evaluation and is supported by the Volpe National Transportation Systems Center (Volpe Center), Noblis and ITS America. The national evaluation team is responsible for leading the evaluation consistent with U.S. DOT direction and is responsible for collecting certain types of evaluation data—namely partnership documents and conducting workshops and interviews. The national evaluation team is also responsible for analyzing all evaluation data—including that collected by the national evaluation team as well as the Volpe Center and the San Diego site team—preparing reports and presentations documenting the evaluation results, and archiving evaluation data and analysis tools in a data repository that will be available to other researchers. The San Diego site team is responsible for providing input to the evaluation planning activities and for collecting and transmitting to the national evaluation team most of the evaluation data not collected directly by the national evaluation team. The national evaluation team will create and disseminate surveys to the San Diego site team, who will assist and coordinate with logistics. The Volpe Center is providing technical input to the evaluation and will carry out the traveler survey activities discussed in the Traveler Response Test Plan. The U.S. DOT Analysis, Modeling and Simulation contractor, Cambridge Systematics, will provide key AMS modeling results to the evaluation, namely person-trip measures that cannot be feasibly collected in the field, and will utilize certain evaluation outputs, such as those related to traveler response, to calibrate the AMS tools post-ICM deployment.

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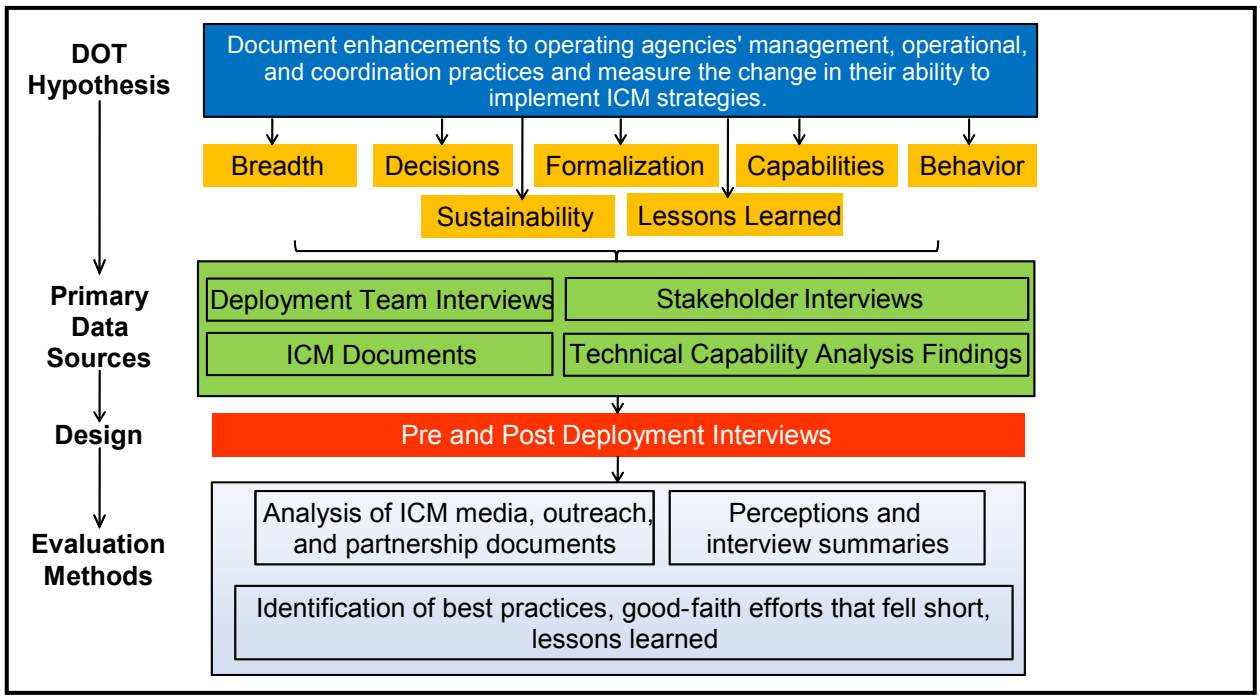
2.0 ANALYSIS OVERVIEW

This chapter provides a high-level overview of the approach to the Institutional and Organizational Analysis, including a discussion of evaluation hypotheses to be tested and measures of effectiveness (MOEs).

Figure 2-1 graphically summarizes the approach to this analysis. This analysis focuses on the U.S. DOT ICM evaluation hypothesis pertaining to how ICM-related enhancements to agencies' practices impact their ability to carry out ICM strategies. As indicated in the second tier of boxes in Figure 2-1, this high-level U.S. DOT hypothesis has been decomposed into more specific evaluation hypotheses focusing on areas such as increases in the breadth of agency partnerships and the sustainability of ICM-related agency coordination structures. Major data sources for this analysis (which are elaborated in detail in Chapter 3) include various San Diego site team partnering, outreach and media documents; interviews with San Diego site team members and impacted parties; and findings and conclusions from the Technical Capability Analysis. The overall analytical design for all parts of this analysis involves observations and tracking changes in a before vs. after comparison.



Battelle, August 21, 2012

Figure 2-1. Overview of Institutional and Organizational Analysis

Every data element being collected for Institutional and Organizational Analysis is listed in Table 2-1 with any associated MOEs and hypotheses. Not all data elements are associated with a specific MOEs or hypotheses; however, these data elements are expected to contribute pertinent information to the overall analysis, including lessons learned. Many hypotheses are listed more than once when more than one data source is utilized. However, as noted in Table 2-1, hypotheses tend to have more direct relationships with specific data elements.

Additionally, it is important to emphasize the importance of lessons learned to this analysis and the ICM evaluation, which is listed as a separate data element in Table 2-1. Many lessons learned are expected to be documented throughout the Institutional and Organizational Analysis, particularly during stakeholder interviews, which will allow for conversation and discussion in addition the structured list of questions. Every data element listed in Table 2-1 is expected to provide information for generating lessons learned. The documented lessons learned from this analysis will be used for knowledge and tech transfer activities.

Table 2-1. Institutional and Organizational Analysis Data Elements, MOEs, and Hypotheses

Data Element		MOE	Hypotheses
Quantitative Data			
This test plan utilizes no quantitative data			
Qualitative Data			
1. Stakeholder Interviews	1.1 The number and perceived nature of ICM-related agency agreements and participating agencies	• Change in the number of new agreements in the region • Change in the nature of new agreements between partnering agencies • Percentage of "total" and "active" agencies participating in ICM, based on the initial ICM proposal and day-to-day activities.	• Breadth and number of partnerships will increase over the course of the ICM project from project initiation
	1.2 San Diego site team and U.S. DOT opinion on quality and value of ICM and cooperative arrangements for improved coordination	• Changes in perceptions of deployment agencies on efficacy and satisfaction of cooperative arrangements	• DOT and the local deployment agencies will find new cooperative arrangements to be effective and to be implemented appropriately
		• Changes in perceptions of U.S. DOT on efficacy and satisfaction of cooperative arrangements	
		• Changes in agency perceptions of the ICM over the demonstration phase	• The ICM demonstration will be consistent with the expectations of each agency
		• Adoption of a regionally agreed upon shared vision	• A shared vision for the corridor will be adopted by the partners
	1.3 Perceived staff time utilization	• Reduction in the percentage of time spent on tasks during routine issues	• Resource allocation across the corridor will improve as a result of ICM
	1.4 View of agency structures and roles	• Changes in decision-making roles and responsibilities • Changes in organization and institutional structures	• Joint decision-making will improve in the corridor • New management structures will be developed for ICM, e.g., new personnel and/or changes in roles and responsibilities of personnel
	1.5 General lessons learned	• N/A	• N/A

Table 2-1. Institutional and Organizational Analysis Data Elements, MOEs, and Hypotheses (Continued)

Data Element		MOE	Hypotheses
Qualitative Data (Cont.)			
1. Stakeholder Interviews (cont.)	1.6 Level of comfort with, value of, and utilization of ICM coordinated strategies, systems and tools	• Level of comfort in the capacity to use ICM during complex situations	• Individual agencies' level of comfort in decision-making will increase throughout the evaluation
		• Perceptions and comfort level with inter-agency device control and sharing	• Resource allocation across the corridor will improve as a result of ICM
		• Systems and technologies developed for ICM will be used by agencies in day to day operations	• Participating agencies will accept and utilize the ICMS
		• Reliability and value assessment of ICMS and other tools	• ICM will be viewed as reliable and value-added by agencies
		• Changes in conflict identification, logging, and resolution approaches	• Agency conflicts in corridor management strategies will be reduced
	1.7 View of changes and quality of funding arrangements	• Incorporation of organizational structures and personnel requirements into agency budgets	• Organizational structures set-up for the ICM demonstration will be sustained
		• Changes in O&M practices to focus on corridor-critical resources	• O&M practices of individual agencies will change to accommodate corridor performance sustainability
		• Diversity and stability of funding beyond the demonstration phase for ICM	• ICM will be viewed as sustainable from a funding standpoint

Table 2-1. Institutional and Organizational Analysis Data Elements, MOEs, and Hypotheses (Continued)

Data Element		MOE	Hypotheses
Qualitative Data (Cont.)			
2. Analysis of ICM Documentation	2.1 Partnership documents	• Changes in perceptions of deployment agencies on efficacy and satisfaction of arrangements	• DOT and the local deployment agencies will find new arrangements to be effective and to implemented appropriately
		• Changes in perceptions of U.S. DOT on efficacy and satisfaction of arrangements	
		• Change in the number and level of new agreements in the region • Percentage of "total" and "active" agencies participating in ICM • Changes in the number of third parties, e.g., accessing data feed	• Breadth of partnerships will increase over the course of the ICM project
		• Changes in decision-making roles and responsibilities • Changes in organization and institutional structures	• Joint decision-making will improve in the corridor • New management structures will be developed for ICM, e.g., new personnel and/or changes in roles and responsibilities of personnel
	2.2 Outreach documents	• Change in the number and level of new public/user promotional and educational materials on ICM benefits and functions	• The ICM project will result in the development of new traveler information materials or interactive media that helps users understand how to use the ICM corridor
	2.3 Media coverage	• Local media coverage explains ICM objectives, improvements, and new user tools	• The ICM project will generate media coverage that explains the objectives, improvements, and new user tools

Table 2-1. Institutional and Organizational Analysis Data Elements, MOEs, and Hypotheses (Continued)

Data Element		MOE	Hypotheses
Qualitative Data (Cont.)			
3. Findings from Technical Capability Analysis	3.1 Findings pertaining to Situational Awareness Capabilities	• Changes in the situational awareness capabilities of partner agencies	• ICM will result in new capabilities to monitor, control, and report at each agency
	3.2 Findings pertaining to Agency Coordination and Communication	• Change in number and nature of communications between transportation partners for daily operations	• Agencies will enhance the nature and increase the number of communications in the corridor • Joint decision-making will improve in corridor operations
		• Number of predefined strategies for coordinated action	• Improved agency coordination and communication will result in a set of predefined, agreed-upon strategies for coordinated action
		• Reduction in the percentage of time spent on routine issues • Changes in conflict identification, logging, and resolution approaches	• Resource allocation across the corridor will improve as a result of ICM • Conflicts in corridor management strategies will be reduced

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3.0 QUANTITATIVE DATA

No quantitative data elements are currently required for use in the Institutional and Organizational Analysis Test Plan.

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4.0 QUALITATIVE DATA

This chapter identifies the qualitative data elements to be used in the Institutional and Organizational analysis. Table 4-1 summarizes key attributes of each data collection activity, e.g., interviews and ICM documentation, and the sections that follow provide additional detail for each activity, including interview questionnaires.

Table 4-1. Qualitative Data Summary

Data Collection Activity	Data Collection Periods		Data Collection Schedule		Data Collection Responsible Party	Data Transmittal
	Baseline	Post-Deployment	Baseline	Post-Deployment		
ICM Participants & Impacted Parties Interviews via Phone	X	X	Nov 2012 (shortly before expected overall ICMS go-live)	• Round 1: Aug 2013 (after shakedown period) • Round 2: July 2014 (near end of post-deployment operations period)	National Evaluation Team	National Evaluation Team will conduct interviews
Local Media Coverage Documents	X	X	From beginning of ICM project coalition building	July 2014 (Through end of one-year post-deployment evaluation period)	San Diego Site Team (SANDAG)	Quarterly (Email to National Evaluation Team)
Partnership Documents	X	X	From beginning of ICM project coalition building	July 2014 (Through end of one-year post-deployment evaluation period)	San Diego Site Team (SANDAG)	Quarterly (Email to National Evaluation Team)
Outreach Documents	X	X	From beginning of ICM project coalition building	July 2014 (Through end of one-year post-deployment evaluation period)	San Diego Site Team (SANDAG)	Quarterly (Email to National Evaluation Team)
Findings from Technical Capability Analysis	X	X	N/A	N/A	National Evaluation Team	National Evaluation Team will have the findings

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The Institutional and Organizational Analysis leverages and enhances the model used for the Urban Partnership Agreements/Congestion Reduction Demonstration (UPA/CRD) evaluation featuring pre- and post-deployment stakeholder interviews and analysis of partnership documents. As Table 2-1 shows, the bulk of the data collection is expected from pre- and post-deployment interviews with the site team, reviewing the content of the partnership agreements, and findings from the Technical Capability Analysis. The following paragraphs provide some details on the data collection approach for the data elements in Table 2-1.

4.1 ICM Participant and Impacted Parties Interviews

4.1.1 Purpose

Interviews will be conducted by phone with the San Diego site team (primarily the main project partners) and other stakeholders (other agencies who are part of the ICM effort) by the national evaluation team as part of the evaluation. These interviews will assist with gathering perceptions of agencies of pre- and post-ICM operations, and serve as a reference for not only the system's impact but also ICM tactics that should be adjusted in order to improve it.

4.1.2 Approach

Interviews will be conducted once in the pre-deployment phase and twice in the post-deployment phase. These will be one-on-one interviews or, in some cases, small group interviews, e.g., two or three people from a single agency. Large meetings will not be used due to the difficultly in scheduling them but also due to the loss of candor when discussing perceptions and opinions. Note that the time period intended to be covered by pre-deployment interview questions actually extends prior to the one-year baseline, pre-deployment period; in many cases, questions will cover a period extending to when the decision was made to engage in ICM.

The list of interviewees will include three levels of agency personnel:

1. Agency Decision-Makers: These include decision-makers in terms of agency budgets and other resources at each of the partner agencies. Interviews will focus on the sustainability of the ICMS, the partnerships and the degree of formalization due to the demonstration. The objective of the interviews is to assess how the decision-makers in the region view the demonstration and their support for such efforts.
2. Planners, implementers, and operators: This group represents the personnel who have been active in the planning and the operation of the ICMS including project partners, operating staff, and the U.S. DOT. Interviews in this group will ascertain the effectiveness of arrangements, the improvements in capabilities and decision-making, and the changes in behavior and roles and responsibilities.
3. Others indirectly impacted by ICM: The third group is important for seeing the spillover effects of ICMS on other groups such as maintenance, traffic engineering, construction, and the TDM community, and their perceptions of ICMS.

Overall, the national evaluation resources are sufficient to support about a dozen total interview sessions during each round of interviews. The length of interview will vary by group but is estimated to be about 30-60 minutes. Overall, the interviews are expected to be shorter in the baseline than in post-deployment, and will ultimately vary based on the amount of discussion, particularly as it pertains to lessons learned. SANDAG has provided a list of interview participants to represent all three levels of agency personnel, which is shown in Table 4-2. This interviewee list will ultimately be grouped and/or refined by eliminating individual interviewees so as to keep the number of total interviews manageable.

Table 4-2. Tentative List of Interview Participants

Agency	*Interviewee*
SANDAG	Samuel Johnson
SANDAG	Jim Linthicum
Caltrans D11	Tom Bouquin
Caltrans D11	Bill Valle
San Diego	Linda Marabian
Poway	Bob Manis
Escondido	Homi Namdari
MTS	Claire Spielberg
Planners, Implementers, and Operators	
Agency	*Interviewee*
SANDAG	Alex Estrella
SANDAG	Peter Thompson
Caltrans D11	Shahin Sepassi
Caltrans D11	Everett Townsend
Caltrans D11	Lawrence Emerson
Caltrans D11	Cindee Feaver
San Diego	Duncan Hughes
Poway	Zoubir Ouadah
Escondido	Ali Shahzad
MTS	Devin Braun
MTS	Mike Daney
MTS	Veolia – Contractor
Others Indirectly Impacted	
Agency	*Interviewee*
Caltrans, I-15 Corridor Director	Gustavo Dallarda
Poway	Diane Mann
Poway	Robert Wilcox
San Diego, Streets Division	Hasan Yousef

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4.1.3 Questionnaire

The list of interview questions will evolve over time to some extent based on how the San Diego ICM deployment progresses. Presented here is a proposed, initial list of questions, loosely sorted into categories for different types of interviewees. The questions asked of any given interviewee will be selected from this list based on the interviewee's specific role. No interviewee will be interviewed more than once per interview "round" (i.e., pre-deployment) and so, in cases where an interviewee represents multiple roles (i.e., "key agency decision maker " as well as "planner/implementor/operator") a single set of interview questions will be used that includes all of the relevant questions pertinent to each interviewee role, with no duplication of questions. Each interview session will include the following introductory information from the interviewer:

- Explain the ICM Evaluation purpose, scope, and sponsors.
- Describe the purpose and process for the stakeholder interviews.
- Note that the interviews are confidential. Responses will not be attributed to specific individuals.

Given the evolving and the continuous nature of institutional changes, if required, use the following rating scale to assist with answering questions:

Stage of Development	Establishing (1)	Functioning (2)	Maturing (3)	Sustaining (4)
Description	Initial formation with small leadership core working on mobilization and direction	Follows the completion of initial activities, focus on structure and more long range programming	Stabilized roles, structures, and functions; Confronted with conflicts to transform and "growing pains"	Established organization and operations, focus on higher level changes and institutionalizing efforts

Proposed Interview Questions Specific to Decision-Makers

Baseline

1. What were the factors that led to your agency's decision to invest in the ICM project?
2. What is your organizations' objective(s) in participating in the ICM? What were your expectations going into the ICM project? Did you have expectations regarding specific objectives, such as corridor performance or congestion? Have these expectations changed at all during the planning and pre-deployment process? If so, what has changed and why?
3. What would constitute success from the ICM project for you and your agency? Has your view of what constitutes success changed during the planning and pre-deployment process? If so, in what way and why?
4. Did you already have institutional agreements in place prior to ICM? If yes, please describe. What institutional agreements were necessary for the ICM project?

Post-Deployment

1. How would you rate the ICM demonstration? Very successful, somewhat successful, no impact. Why did you rate it at this level? Were some aspects more successful than others? If so, which ones and why? Were other aspects less successful? If so, which ones and why?
2. Do you see potential for the deployment of ICM on other corridors in your region?
3. How do you think ICM can be improved in this corridor? How could it be improved for future deployers in other parts of the country?
4. Would you continue to fund the operations and maintenance of ICM? Why or why not?
5. What changes to your organization, if any, were implemented as a result of ICM?
6. Based on your experiences to date on the ICM project, what are the major lessons learned from the ICM project?

Proposed Interview Questions Specific to Planners, Implementers and Operators

Baseline Only

1. Please describe your agency's role in the ICM project.
2. What is your organizations' objective(s) in participating in the ICM? What benefits did you expect to be realized when you decided to participate? Have these expectations changed at all during the planning and pre-deployment process? If so, what has changed and why?
3. What would constitute success from the ICM project for you and your agency? Has your view of what constitutes success changed during the planning and pre-deployment process? If so, in what way and why?
4. Looking at the provided list of ICM partner agencies, which of the partner agencies have you worked with prior to ICM and in what capacity? How would you characterize those past partnerships—successful, unsuccessful, mixed? How is an incident on I-15 managed (pre-ICM)? What level of coordination is present between agencies? Rate the nature and extent of communications between agencies.
5. What factors were most critical to successfully organizing the local ICM partnership team? What do you think will be the key factors to maintaining the partnerships?

Baseline and Post-Deployment[3]

1. For each ICM partnership agreement your agency currently has, list the partner agency and describe the stage of development in your own words. Select the rating that best describes the current stage of development: establishing, functioning, maturing, sustaining.
2. Rate how satisfied your agency is with the ICM-related agreements it has made: very satisfied, satisfied, neutral, dissatisfied, very dissatisfied. Explain. Are there aspects with which you are more satisfied with than others? Are there aspects that you are particularly dissatisfied with? Explain.
3. Rate how effective you think the ICM-related agreements will be in achieving the stated project goals (remind interviewee of project goals): Very effective, somewhat effective, not too effective, not at all effective.
4. Have your agency and partner agencies agreed upon a shared vision for the ICM corridor? If yes, are you pleased with that vision? If no, why not?
5. Have decision-making roles and responsibilities shifted as a result of ICM? If so, how? Also if so, rate the stage of development for these changes: establishing, functioning, maturing, sustaining.
6. Are new institutional and organizational structures being developed for ICM? If so, what is being changed? Also if so, rate the stage of development of the new institutional and organizational structures: establishing, functioning, maturing, sustaining. Did your

[3] Questions may be revised slightly based on whether they are asked in the baseline or post-deployment phase.

agency hire additional staff for ICM? If so, how many additional staff members were hired?

7. Based on your experiences to date on the ICM project, what are the major lessons learned from the ICM project in terms of institutional issues?
8. Based on your experiences to date on the ICM project, what are the major lessons learned from the ICM project in terms of technical issues?
9. How do you think ICM can be improved in this corridor? How could it be improved for others in the future?
10. What are or were the major challenges you faced with the ICM project? How have those challenges been addressed and have they been overcome?
11. How have you educated and engendered support for ICM among various audiences, including senior decision makers, travelers, and the media? What has been successful/ unsuccessful and why? Do you have plans for future outreach efforts of this nature? What level of effort would you say is being devoted to outreach? What types of resources are being devoted to outreach? Have you hired a contractor to perform outreach activities?
12. Based on your experience to date, would you do anything differently in planning, deployment and operating the ICMS? What if the project as a whole had twice the funding? What if the project as a whole had half the funding?

<u>Post-Deployment Only</u>

1. How would you rate the ICM demonstration? Very successful, somewhat successful, no impact. What factors are most responsible for the success or lack of success? Why did you rate it at this level? Were some aspects more successful than others? If so, which ones and why? Were other aspects less successful? If so, which ones and why?
2. [Based on the response to baseline and post-deployment question 2] Explain how your agency has or has not benefitted from each partnership agreement?
3. Rate the level of use of the ICMS in day to day operations: Frequently used, used sometimes, barely used.
4. Rate the reliability of ICMS: Extremely reliable, somewhat reliable, somewhat unreliable, very unreliable. Explain.
5. Do you think the ICMS was a valuable investment for your agency? Why or why not?
6. Looking at the list of ICM partner agencies provided you, which partner agencies do you work with in ICM and in what capacity? How would you characterize these partnerships—successful, unsuccessful, mixed? How is an incident on I-15 managed with ICM? What level of coordination is present between agencies? Rate the nature and extent of communications between agencies.
7. Do you think ICM-related corridor management strategies have reduced conflicts between your agency and other agencies? If no, why not?

8. Rate your agency's comfort level regarding allowing device control and sharing resources with partner agencies: very comfortable, somewhat comfortable, somewhat uncomfortable, not at all comfortable. Explain. Has the sharing of resources with partner agencies worked better for some situations or resources than for others? If yes, please explain.
9. Has ICM reduced the amount of time operators spend on tasks related to routine issues, e.g., for incident or congestion management?
10. Rate whether or not ICM has made it easier for your agency to make tough decisions involving other agency assets or in making proactive decisions, e.g., selection of different response options for other agencies, making decisions based on prediction of impacts etc: easier, no impact, harder. Explain.
11. Rate your agency's comfort level with using ICM during complex situations, e.g., major incident requiring interagency cooperation for diversion efforts: very comfortable, somewhat comfortable, somewhat uncomfortable, not at all comfortable. Explain. Are you comfortable using ICM for some situations more than others? Please explain.
12. Has your agency changed the way that it approaches performance assessment during a given incident as a result of ICM agreements? Explain.
13. Has your agency changed its O&M practices to focus on corridor-critical resources? Explain.
14. [Based on the response from baseline and post-deployment question 6] Have ICM-related changes in organizational structures, including personnel requirements, been incorporated into your agency's budget? If no, why not?
15. Have general ICM-related needs been incorporated into your agency's budget? If no, why not?

Proposed Interview Questions for Others Indirectly Impacted by ICM

Baseline

1. Are you aware of the ICM project? Yes/No
2. If yes, what are your expectations of the impacts that the ICM project will have in the corridor?
3. What impacts do you think this project will have on your role/operation? Positive Impacts (if any), Negative Impacts (if any)
4. What do you think of your agency's decision to commit resources to the ICM project? Please explain.
5. Are there any additional activities or responsibilities you have had to assume because of the ICM project? Please describe.

Post-Deployment

1. How would you rate the ICM demonstration? Very successful, somewhat successful, no impact. Why did you rate it at this level? Were some aspects more successful than others? If so, which ones and why? Were other aspects less successful? If so, which ones and why?
2. What impacts did this project have on your role/operation? Positive Impacts (if any), Negative Impacts (if any)
3. Have you changed any practices to focus on corridor-critical resources? Explain.
4. What do you think of your agency's decision to commit resources to the ICM project?
5. What do you think are some lessons learned from the ICM project?

4.2 Analysis of ICM Documentation

4.2.1 Purpose

The purpose of this analysis is to discern through archived documentation the efforts made by the partners to make their ICM projects successful. This documentation will assist with determining the keys to success and associated lessons learned to assist U.S. DOT and other state and local transportation agencies engage in similar programs in the future.

4.2.2 Approach

The analysis of documentation will be carried out using the overall approach directed by two key questions: 1) what did the partners do to try to make their ICM projects successful?; and 2) what were the keys to success and what are the associated lessons learned that will be useful to U.S. DOT and other state and local transportation agencies? Three key types of documentation are identified for analysis:

1. **Outreach Materials/Activities –** To the extent possible, all outreach materials related to the ICM project that are created and distributed by local partner agencies (or any marketing/ communications contractors) will be compiled, archived and transmitted by the San Diego project partners, specifically SANDAG, to the national evaluation team in electronic format during both baseline and post-deployment periods. In addition, any outreach activities conducted by the partner agencies and any marketing/communications conducted by contractors will be logged and reported by the project partners to the national evaluation team during these same periods.
2. **Partnership Documents** – To the extent possible, all ICM partnership documents will be archived and given by project partners to the national evaluation team in electronic format during the baseline stage. Partnership documents include the original proposal and teaming agreement obtained from U.S. DOT as well as communications among partners during the proposal development and project implementation stages (i.e., baseline). These communications include pre-proposal agreements with the site team, Project Development Team (PDT) meeting minutes/sign-in sheets, other operational agreements that have been developed as a part of the ICM demonstration, and

changes to agency policies/ procedures. Real-time operational actions will be monitored as part of the Technical Capability Analysis and are thus excluded, as are e-mail exchanges.

3. **Media Coverage –** From its first occurrence, all local, regional, and national media coverage of the ICM will be sought for the national evaluation. The primary source for the data will be the San Diego partners, specifically SANDAG, who will provide media clippings from local media sources pertaining to the ICM project. The national evaluation team will also capture online (Internet) coverage of the San Diego ICM project using Google Alerts.

The San Diego partners will provide this documentation throughout the course of the project on a quarterly basis. The national evaluation team will examine each of these three types of ICM documentation. In the case of the outreach and partnership documents, the emphasis will be on understanding and describing in the evaluation results report what the San Diego site team did and how those actions impacted the results that they obtained. In the case of media coverage, the national evaluation team's review of the material will be similar to, but somewhat less rigorous than, a formal "content analysis"—a social science technique in which various aspects of communication content (text or speech) are formally parsed and analyzed. The national evaluation team's review of media coverage will seek to understand trends such as the proportion of coverage that was supportive of ICM as well as identifying the specific aspects of the ICM deployment that received the most attention, but a formal content analysis framework yielding quantitative measures will not be utilized

4.3 Findings from the Technical Capability Analysis

4.3.1 Purpose

The Technical Capability Analysis investigates improvements in the ability to monitor, control and report on the corridor, which will serve as input to this analysis to assess situational awareness and the realization of new capabilities in the corridor and assess if the investments and inputs occurred as planned.

4.3.2 Approach

The Technical Capability Analysis incorporates surveys and analysis of interagency communications, strategies for coordinated action, and logged agency responses to various incidents using the ICMS. Findings and conclusions from that analysis will directly answer questions contained in the Institutional and Organizational Analysis, addressing specific hypotheses that investigate whether, how, and why operators used the ICMS.

To assess the ability to monitor, control, and report in the corridor, a variety of quantitative and qualitative data will be considered. Quantitative data will come from ICMS, from agencies responsible for operating traffic signal systems, and from SANDAG. These data records are expected to be large databases containing records of each of a variety of actions taken by transportation operators, while qualitative data to test response and control hypotheses will come from transit, local agency and transportation management center (TMC) operator surveys; San

Diego site team lead surveys; PDT surveys; and Commercial Traveler Information Provider interviews. The national evaluation team will parse through those data records, categorizing each record into its appropriate MOE, tabulate totals by MOE, and then compare baseline and post-deployment totals. Standard statistical practices shall be used in all calculations to ensure consistent comparisons across all MOEs. When changes are detected, statistical significance of the change shall be calculated to ensure the national evaluation team does not misrepresent the change as meaningful when it is not.

Regarding situational awareness, quantitative data to be used includes ICMS and SANDAG system data, while qualitative data consists of results from the operator and San Diego site team lead surveys. Data analysis methods for the respective types of data will be essentially the same as described above. Quantitative analysis will focus on tabulating MOEs based on individual system data records; qualitative analysis will entail typical survey analysis techniques such as calculation of average responses and response ranges. Results will be presented graphically and in hybrid graphical/report formats where key findings and outliers are highlighted and elaborated as appropriate.

More information can be found in the Technical Capability Analysis Test Plan.

5.0 DATA ANALYSIS

This section describes how the gathered institutional and organizational data will be analyzed. Specifically, the approach to testing the hypotheses relevant to the Institutional and Organizational Analysis and drawing conclusions will be discussed. Generally, the data will be analyzed for expected outcomes or changes on a qualitative scale or simple affirmation of hypotheses. No exogenous factors, i.e., external factors that may influence results, have been identified for the Institutional and Organizational Analysis.

As noted in Chapter 2, many of the hypotheses will draw upon more than one of the data sources that are utilized within the Institutional and Organizational Analysis. However, as Table 2-1 shows, hypotheses tend to have more direct relationships with a specific data element. Additionally, lessons learned are relevant to every data element, which the national evaluation team expects to generate for knowledge and tech transfer activities.

5.1 Analysis Methods

The Institutional and Organizational Analysis will use analysis methods appropriate to the textual, qualitative nature of the data. Those methods are not expected to include statistical analysis. In the case of the San Diego site team interviews, the national evaluation team will compile notes from the interviews and identify common themes, areas of agreement among different stakeholders, areas of disagreement, and key individual findings related to specific institutional or technical areas. The implications of the interview results will be identified for both the specific Institutional and Organizational Analysis hypotheses as well as for U.S. DOT, other researchers and ICM deployers (actual or potential, including the San Diego and other U.S. DOT ICM Pioneer sites).

Analysis of ICM documentation will be carried out in a similar fashion—documents will be carefully read and the implications for both the Institutional and Organizational Analysis hypotheses and knowledge and technology transfer will be identified. This will include identifying the degree of agency participation in the ICM demonstration and any changes made within agencies as a result of various agreements entered that helped contribute to the success of the ICM project. The review of partnership documents will focus on identifying key themes and individual findings pertaining to how the San Diego agencies were or were not able to establish the high level of agency coordination believed necessary for ICM success. Review of outreach materials will focus on how the San Diego partners educated and engendered support among a variety of audiences, including political representatives, travelers and the media. Review of media coverage will focus on how the ICM project was perceived by the media and the role of the media in advancing or impeding education and support-building among travelers and the general public.

The analysis of findings from the Technical Capability Analysis will center on reviewing and organizing those findings so that they may be aligned with various Institutional and Organizational hypotheses. Those findings directly address a couple of hypotheses related to use

of ICM to improve agency coordination but will also provide a general context in which to interpret a range of Institutional and Organizational Analysis results.

5.2 Relationship to Hypotheses

Many of the hypotheses will draw upon more than one of the data sources that are utilized within the Institutional and Organizational Analysis; Table 2-1 (presented previously) emphasizes some of the more direct relationships between specific data and individual hypotheses. Although not a hypothesis, all of the Institutional and Organizational Analysis data are expected to provide overall lessons learned for knowledge and technology transfer activities. The Institutional and Organizational Analysis will not seek to quantify the degree of success for each measure of effectiveness as much as identify whether expected changes took place, how, and why.

Interview responses, collected content, and findings and conclusions from the Technical Capability Analysis, as well as outreach documents and media coverage will be examined for lessons to be learned from this ICM deployment. Specifically, suggestions by interviewees, observations of good-intentioned efforts that were particularly successful or fell short, and the ability of agencies to guide media coverage will be assembled to indicate ways to improve ICM for future deployments for knowledge and tech transfer activities.

6.0 RISKS AND MITIGATIONS

No specific, significant challenges or issues have been identified. As with all of the analyses, the success of this analysis depends on the cooperation of the local partners in providing data (materials for the analysis of ICM documentation and making themselves available for interviews). That risk is being mitigated through the explicit identification, in this test plan, of the national evaluation data needs and expectations of the Dallas site team's role in this analysis.

One other specific risk associated with this analysis pertains to the inherent challenges in drawing conclusions based on the subjective and sometimes conflicting input received through interviews. That risk will be mitigated by carefully crafting interview questions, using good interview technique that avoids leading questions, and giving due consideration to areas of agreement and disagreement when presenting findings.

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