I-15 Integrated Corridor Management System

Project Management Plan

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16. Abstract The Project Management Plan (PMP) assists the San Diego ICM Team by defining a procedural framework for management and control of the I-15 Integrated Corridor Management Demonstration Project, and development and deployment of the ICM System. The PMP serves as a reference for information regarding project structure and procedures throughout the project life cycle. The PMP is a living document and will be updated at least twice in each year of the project.		
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Chapter 1. Introduction

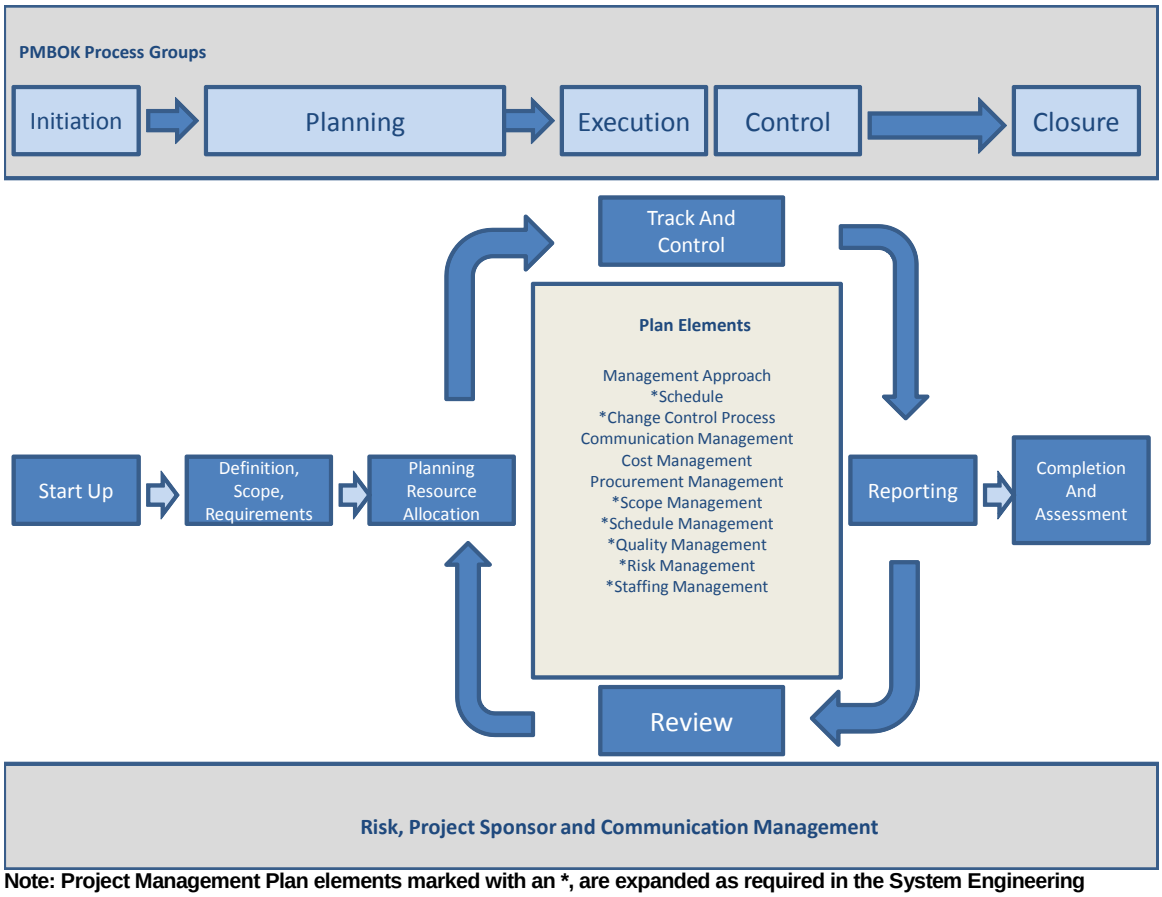
The San Diego region is one of two pioneer sites selected by the United States Department of Transportation (USDOT) to participate in the Integrated Corridor Management (ICM) Program's System Definition Stage III - Demonstration Project. The San Diego Team, led by the San Diego Association of Governments (SANDAG) and in partnership with California Department of Transportation (CALTRANS), the Cities of Escondido, Poway and San Diego, Metropolitan Transit System (MTS) and North County Transit District (NCTD) selected the Interstate 15 (I-15) Corridor between State Route 52 in San Diego and State Route 78 in Escondido, a distance of 21 miles. This multi-modal corridor employs a reconfigurable managed lanes concept with an integrated High Occupancy Toll system and direct access Bus Rapid Transit Ramps, and provides many opportunities to employ Intelligent Transportation Systems (ITS) technologies on the freeway, parallel arterials, and transit routes to efficiently manage the movement of people and goods.

The I-15 ICM system conceptually consists of information sharing and dissemination among the corridor's agencies; improving coordination at network junctions, especially at freeway on-ramps and off-ramps; promoting shifts between networks; and managing the needs of travelers given the capacity limits of available roadway facilities.

This Project Management Plan (PMP) has been developed to define the project management principles and procedures to be applied to the I-15 ICM III Project. Agreement, and adherence, to these procedures is one of the keys to successful project delivery. It is essential that the best project management practices are applied within the context of the project. To this end the Project Management Institute, Project Management Body of Knowledge (PMBOK) has been used as the primary reference source for developing this PMP. The PMBOK [1] represents a comprehensive collection of theory, learning and experience in project management best practices. The format and content of this PMP reflects the guidance provided in the PMBOK and explanatory guides, conforming to current best practice in project management, tailored to the needs of the I-15 ICM III Project.

The PMBOK provides both structure and content to guide the development and delivery of a successful project, through the definition of five process groups, nine knowledge areas and 44 project management processes. The latter represent essential activities for project management along PMBOK lines, while the process groups and knowledge areas provide a means to structure the activities coherently according to the phase of the project life cycle and the PMBOK knowledge area being tapped. The application of the process groups, knowledge areas and project management processes is accomplished through the development of a number of plan elements that comprise this PMP and the definition of a work flow process through which the elements are applied throughout the lifecycle of the project. Figure 1-1 below illustrates the proposed work flow for project management for the I-15 ICM Stage III – Demonstration Project.

Figure 1-1. Project Management Work Flow Process



Note: Project Management Plan elements marked with an *, are expanded as required in the System Engineering Management Plan (SEMP)

Source: San Diego Association of Governments

The five major process groups are as follows:

Initiation - these activities relate to the formal commitment to start the I-15 ICM Stage III Project, stating the scope and objectives, empowering and authorizing the delivery team and getting the project started

Planning - effective planning for the I-15 ICM Stage III Project entails the development and agreement of project plans, schedule, budget and the identification and definition of resources required and how they will be managed

Execution - getting it done and successfully delivering the project. This involves the practical application of the work products from project initiation and planning. In particular, the use of the various project plans to guide the day to day management activities associated with project delivery and resource coordination.

Control and Monitoring - establishing and managing the procedures, processes and mechanisms for monitoring and measuring progress, comparing progress to goals and guiding the project to a successful conclusion. This also involves managing unanticipated events, ensuring that commitments and agreed objectives are fully met.

Closing - the formal acknowledgement of completion and orderly conclusion to project activities. Confirming that each stage of the work has been completed satisfactorily and documenting that it is complete. In the case of the I-15 ICM Stage III Project this stage of the work will also include the definition of lessons learned and the capture of knowledge transfer information to communicate practical experience to other sites and practitioners.

1.1.1 Purpose and Intended Audience for the PMP

This PMP is intended to provide the project partners, participants and sponsoring organizations with detailed information on how the I-15 ICM Stage III Project will be managed at each stage in the project life cycle

1.1.2 Background and General Information

Definitions, terminology and acronyms

The following acronyms and abbreviations are used in this document.

AC	Actual Cost
AD	Activity Description
AF	Actual Finish date
AOA	Activity – On – Arrow
AS	Actual Start date
BAC	Budget At Completion
CA	Control Account
CAP	Control Account Plan
CCB	Change Control Board
CPI	Cost Performance Index
CPM	Critical Path Method
CV	Cost Variance
DUR	Duration
EV	Earned Value
EVM	Earned Value Management
EVT	Earned Value Technique
OD	Original Duration
PC	Percent Complete
PF	Planned Finish date

PM	Project Management
PM	Project Manager
PMBOK	Project Management Body Of Knowledge
PMIS	Project Management Information System
PMO	Project Management Office
PS	Planned Start Date
PV	Planned Value
QA	Quality Assurance
QC	Quality Control
RD	Remaining Duration
SF	Scheduled Finish date
SOW	Statement of Work
SPI	Scheduled Performance Index
SS	Scheduled Start date
SS	Start-to-Start

1.1.3 Project Objectives

Given the limited number of alternative routes, the peak-period delays currently being experienced (which range between 30-45 minutes) will be further exacerbated due to anticipated demands and or by incidents. As travel demand grows and transportation costs and revenues become constrained, and despite the planned Express Lanes and Bus Rapid Transit (BRT) operational improvements, the I-15 corridor is faced with the problem of maintaining and maximizing system efficiency and mobility to improve travel times and address overall congestion along the corridor

Accordingly, the purpose of the ICM project is to proactively manage congestion by serving as the tool for accommodating and integrating all transportation systems to work as a unified system in an effort to maximize overall corridor system efficiency and mobility

The I-15 ICM Stage III Project is intended to address a series of needs and objectives as defined in stages I and II of the program. These are captured in the following tables:

Table 1-1. Concept of Operations Issues and Needs

Issues and Needs
Congestion and Capacity—
Issue: Increasingly congested conditions on I-15 Issue: Increasingly congested conditions on corridor's arterial network Issue: Park and Ride facilities are not sufficient
Transit—
Need: Improved transit reliability Need: Real-time, comprehensive, accurate information to travelers Need: Frequent service Need: Competitive service
Transportation System Management—
Issue: Managing traffic flow between I-15 freeway ramps and adjacent arterials with ramp metering Issue: Managing traffic flow on I-15 (general purpose/managed lanes) Issue: Limited access to HOV/HOT facilities Issue: Coordination across multiple functional systems
Traveler Information Services—
Issue: Minimal ATIS coverage of the corridor
Inter-organizational Coordination—
Need: Inter-jurisdictional and inter-organizational coordination and integration among corridor stakeholders Need: Exchange and sharing of real-time data Need: Improved response times to non-recurring incidents

Table 1-2. Concept of Operations, Goals and Objectives

Goals	Objectives
The corridor's multi-modal and smart-growth approach shall improve accessibility to travel options and attain an enhanced level of mobility for corridor travelers.	▪ Reduce travel time for commuters within the corridor ▪ Increase transit ridership within the corridor ▪ Increase the use of HOVs (carpools and vanpools) for commuters ▪ Increase person and vehicle throughput within the corridor on general purpose and managed lanes ▪ Increase person and vehicle throughput on arterials ▪ Reduce delay time for corridor travel on the corridor's networks (e.g., I-15 and arterials) ▪ Increase percentage share of telecommuters from corridor commuter market ▪ Increase the use of established and effective TDM programs ▪ Promote development to encourage the use of transit (especially BRT)
The corridor's safety record shall be enhanced through an integrated multi-modal approach.	▪ Reduce incident rate ▪ Reduce injury rate ▪ Reduce fatality rate ▪ Reduce roadway hazards

1.1.3.1 Problem Statement

The original Issues and Needs along with a focused discussion on defining the I-15 problem statement were the subject of a detailed review during the USDOT System Requirements walk through workshop held from March 8th to March 12th 2010.

In the course of the system requirements walk though workshop the problem statements were revised to better reflect the issues and to be more concise. The resulting problem statements are as follows:

The I-15 corridor experiences recurrent traffic congestion during weekday rush hours and also is heavily traveled on weekends. Congestion on this corridor is a relevant issue because it is one of two corridors in the County that serve as a major north-south commuter trunk line. Further, the I-15 corridor is the primary inland north-south trunk line that connects and serves interregional travelers coming from Riverside County to downtown and other San Diego county destinations. The corridor is situated within a major interregional goods movement corridor, connecting Mexico with Riverside and San Bernardino counties, as well as Las Vegas, Nevada.

Demand for this vital north-south corridor is anticipated to grow. Traffic projections for a 2050 Regional Transportation Plan are being developed, however based on the most recent planning assumptions and corresponding traffic forecast estimated for 2030 conditions (October 2007), the 2030 traffic projection estimates show that just south of Miramar Road there would be approximately 420,000 ADT which represents a 20% increase from 2010 conditions. And for the northern segment of the corridor, 2030 traffic projection estimates show that just south of SR 78 there would be approximately 295,000 ADT which represents a 34% increase.

Also during the course of this review it was determined that a more concise and useful definition of the I-15 Corridor Problem Statement (included above) be produced. To address this, the problem statement was further defined through a set of 8 key issue statements that capture the nature of the problems to be addressed by the project.

1.1.3.2 Issue Statements

Five issue statements have been defined as follows:

Congestion in Arterials and Freeways

Congestion on the arterials and freeways that comprise the I-15 Corridor is the primary problem to be addressed through the I-15 ICMS Stage III project. Congestion occurs when demand for the travel along the corridor exceeds the capacity of the corridor. This can happen on a recurring basis at defined segments and intersections along the corridor network. It can also happen due to unanticipated events such as traffic crashes, wild fires and other events that reduce the capacity of the corridor in an unplanned and unexpected manner. The problem has multiple facets, including those related to defining effective responses to planned and unplanned events, publishing information to system users and managing demand and capacity for performance optimization.

Incomplete Transit Management

Regional transportation partners do not have a complete transit management capability. This issue has two dimensions – transit unreliability/capacity and lack of transit service coordination with other networks in the corridor. With respect to the former, one of the effects of congestion along the corridor is the inability to provide transit services with the desired travel time reliability. This has a significant effect on customer service.

The major value proposition of the I-15 BRT services will be travel time reliability and improved transit ridership throughput by using the I-15 Express Lanes facility. The unreliability of transit travel time is also a major factor in mode choice decisions taken by corridor users. Aspects of the issue relate to the publication of information to system users, coordination and implementation of supporting signal systems operational tools across agencies, incomplete situational awareness regarding the operating status of the corridor, and corridor system performance. The issue also relates to system documentation and user training. There is also a need for better management of transit demand and capacity in an effort to making the best possible use of the current system, assuring that it operates in harmony with the multiple transportation networks along the corridor. New abilities to manage capacity and demand are required to ensure that the optimum operational management arrangements are adopted.

With respect to the lack of transit service coordination with other networks in the corridor, current transit operations are focused on transit needs only. There is no coordination between the operational management of transit services and the operational management of the other transportation networks in the corridor – freeways, arterials and managed lanes. The strategies being employed for transit operations management are based on information relating to transit services only and take no account of the current status of the other networks. Consequently, the operational management strategies being employed cannot be optimized on a multi-modal, coordinated management basis.

Incomplete Situational and Operational Awareness

The current level of situational and operational awareness is not sufficient to support performance and operational management objectives. Real time information sharing is not available between all

agencies. There is a need to provide a clearinghouse that will support real time operational and situational awareness, status displays, and visualization from a corridor perspective. There is also an inability to comprehensively measure and publish corridor performance information, such as current congestion levels, travel times and service operating status.

Incomplete Strategy Management

The regional transportation partners need to have complete ability to define, select, communicate and implement strategies. Effective coordination of different operational systems such as ramp metering and local traffic signal systems will require the establishment of an agreed upon process where all local agency corridor partners will coordinate and come together to set corridor level performance measures. These need to be based on common operational philosophies, which will support the development of ICM operational and management functions. There is a rich history of cooperation and coordination for work efforts associated with the I-15 planned improvements. Current corridor management is relatively efficient and effective on a mode-by-mode basis. However, there is a lack of coordinated action with respect to corridor system operational management and strategy implementation. This prevents the realization of coordinated operational management benefits in the form of strategy enhancement and support. Current corridor management strategies are implemented on an independent basis for each mode, taking no account of the possible synergies between strategies that will be implemented through an ICM system.

The lack of coordination could also cause strategies to conflict with each other. Once the situational awareness issues have been addressed and current status information is available, the problem of defining what to do under different operational environments arises. The problem revolves around not having the ability for corridor operators and managers to retrieve current and historical information on the performance of their modal networks along the corridor. They are currently unable to develop appropriate integrated response strategies, and to communicate the impacts and benefits of ICM strategies.

The regional transportation partners also have limited or inappropriate tools in place and, because of that, cannot provide managers with the technical capability to implement corridor management strategies. They need additional capability to display current network status information, share and coordinate roadside device control and or real-time data, for managing and operating the I-15 corridor through the ICM system. System documentation and user training also has deficiencies that will need to be addressed as part of this issue.

Strategy management effectiveness also requires that the partners have the ability to learn from past experiences. Successful and effective management of the corridor requires an ability to learn from past experiences. Currently, there is incomplete support from an institutional perspective for the analysis of historical data and the assessment of corridor management strategies and actions. Corridor operations managers do not have a comprehensive ability to review past data and experiences and build these into future strategies and actions. They also lack the training and system documentation required to effectively support historical data analysis.

Lack of System Management, Maintenance and Health Monitoring

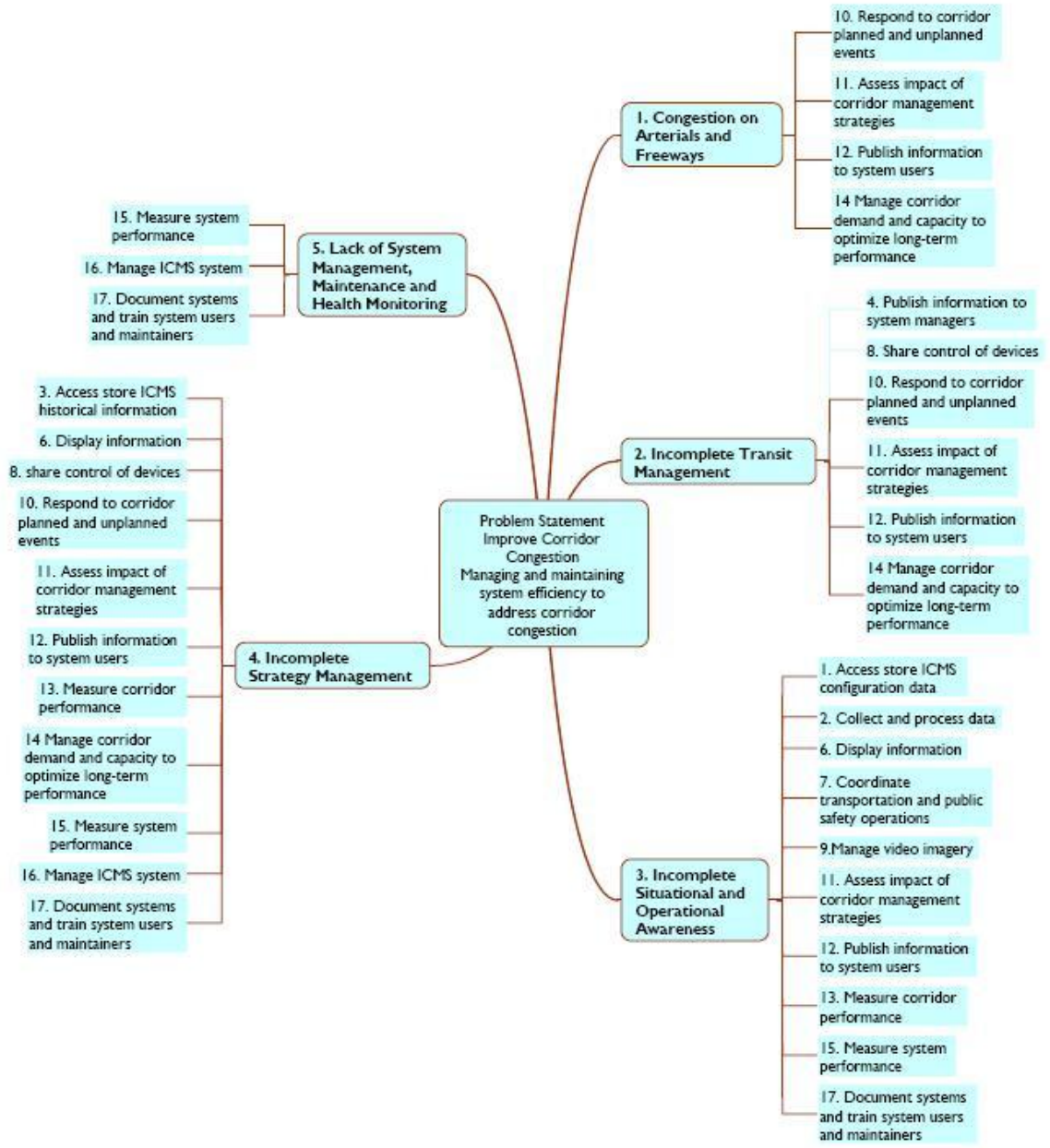
This problem relates to long-term system sustainability, application, use and maintenance. Currently, support for long-term operations and maintenance is achieved on an independent system level. To achieve a successful ICM project, extensive consideration will need to be given to system performance, monitoring, for these functions, to be defined.

1.1.3.3 Mind Map

As conveyed above, while there is a rich history of cooperation and coordination for work efforts associated with the I-15 planned improvements and its extensive track record for deploying individual system network improvements for managing the region's traffic signals, ramp meters, freeways, and transit services, the focus now turns to how can we bring the different systems together to work as a unified and integrated system to we can better maintain and maximize system efficiency and mobility to address anticipated congestion levels along the corridor. To address and resolve this problem, the San Diego region has embraced and has committed to the development and implementation of an ICM concept along the I-15 corridor.

Accordingly, the issue statements were then mapped to the 17 User Needs identified in Table 1-4 of the Concept of Operations [2], as shown in Figure 1-2. Note that the original user needs numbers have been shown to facilitate a trace back to the original User Needs as these represent the highest level starting point for the detailed system requirements.

Figure 1-2. User Needs mapped to I-15 ICM Issue Statements



Source: San Diego Association of Governments

The corridor as defined in the SANDAG corridor transportation model has the following baseline parameters:

Roadway Segments (1054 Links)

191.9	Road	Miles
77.5	Freeway	Miles
36.7	Ramp	Miles
77.7	Arterial	Miles

Intersection Types (872 Nodes)

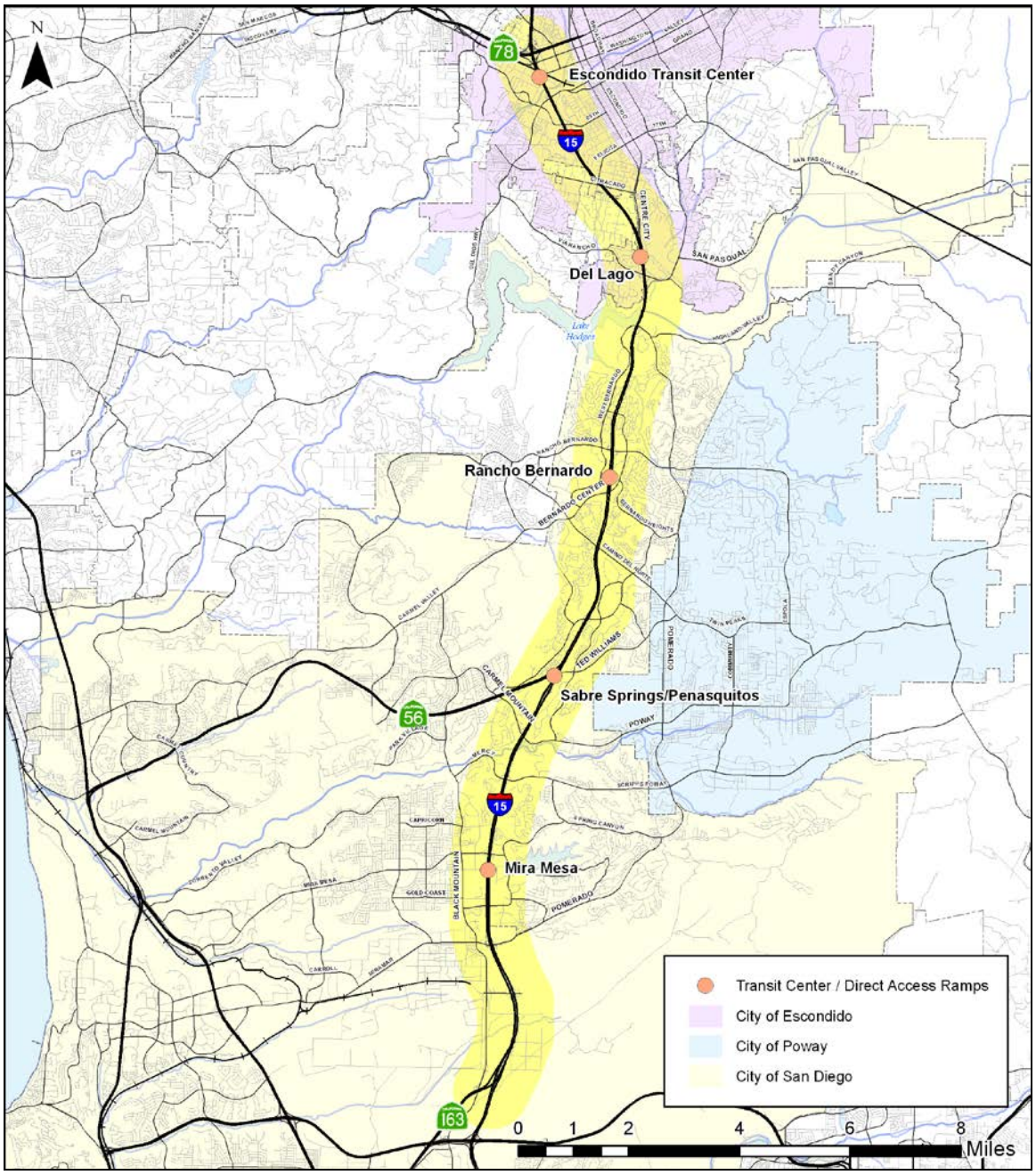
11	One-way Stop Controlled	
6	Two-way Stop Controlled	
8	All-way Stop Controlled	
1	Yield	
18	Ramp Meters	(southbound only)
191	Signalized Intersections	
637	Uncontrolled Intersections	

The above characteristics are the baseline parameters around which the I-15 ICM Stage III Project was developed. It is anticipated that as the project develops these parameters will change. The physical infrastructure of the corridor is currently under construction and will be dynamic through the process; as the modeling of the corridor progresses modifications to the parameters are anticipated to require changes to the zone of influence of the corridor; and finally, the operational characteristics of the corridor will change with additional field equipment, network and communications infrastructure deployment driven by operator feedback.

Refer to SEMP for more detailed description of System Elements schedule and approach.

The overall project area is shown in Figure 1-3 on the following page.

Figure 1-3. Project Area



[Source: SANDAG I-15 ICM Site Team]

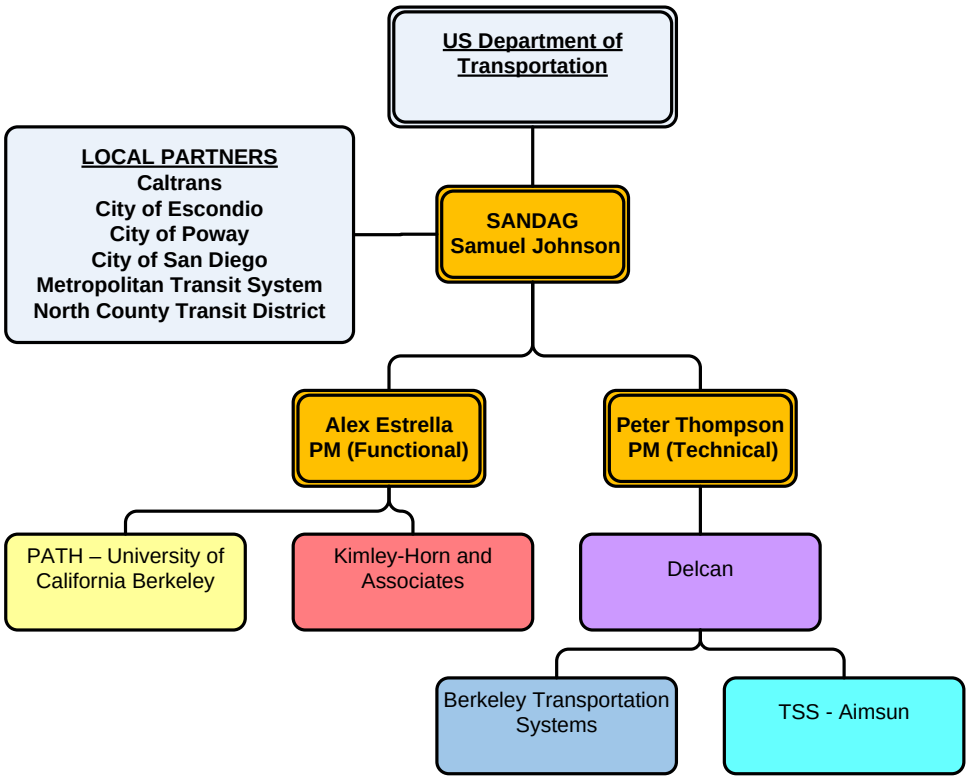
Chapter 2. Project Management Approach

The selected project management approach features dual management of the project with a specialist emphasis on the system development elements. The latter elements will be subject to further system specific management through the development of a Systems Engineering Management Plan (SEMP). System development, design and engineering elements and activities in the project will comply with the requirements set out in this PMP and the requirements defined in the SEMP. Both documents have been developed in a coordinated approach that makes use of common terminology and provides documents that can support dual compliance.

2.1 Organization Chart

The proposed project management approach blends together a combination of system, ITS, project management and transportation resources to address the needs of the project. There is a particular emphasis on the application of advanced information and communications technology in support of the modeling and decision support elements of the project. For this reason, a dual project management structure has been adopted, with co-project managers designated as shown in the organization chart below.

Figure 2-1. Project Organization Chart



[Source: SANDAG I-15 ICM Site Team]

The SANDAG co-project managers are supported by Kimley-Horn and Associates for overall management of project delivery, evaluation, operations; and by a team led by Delcan for the system design, integration, building and testing.

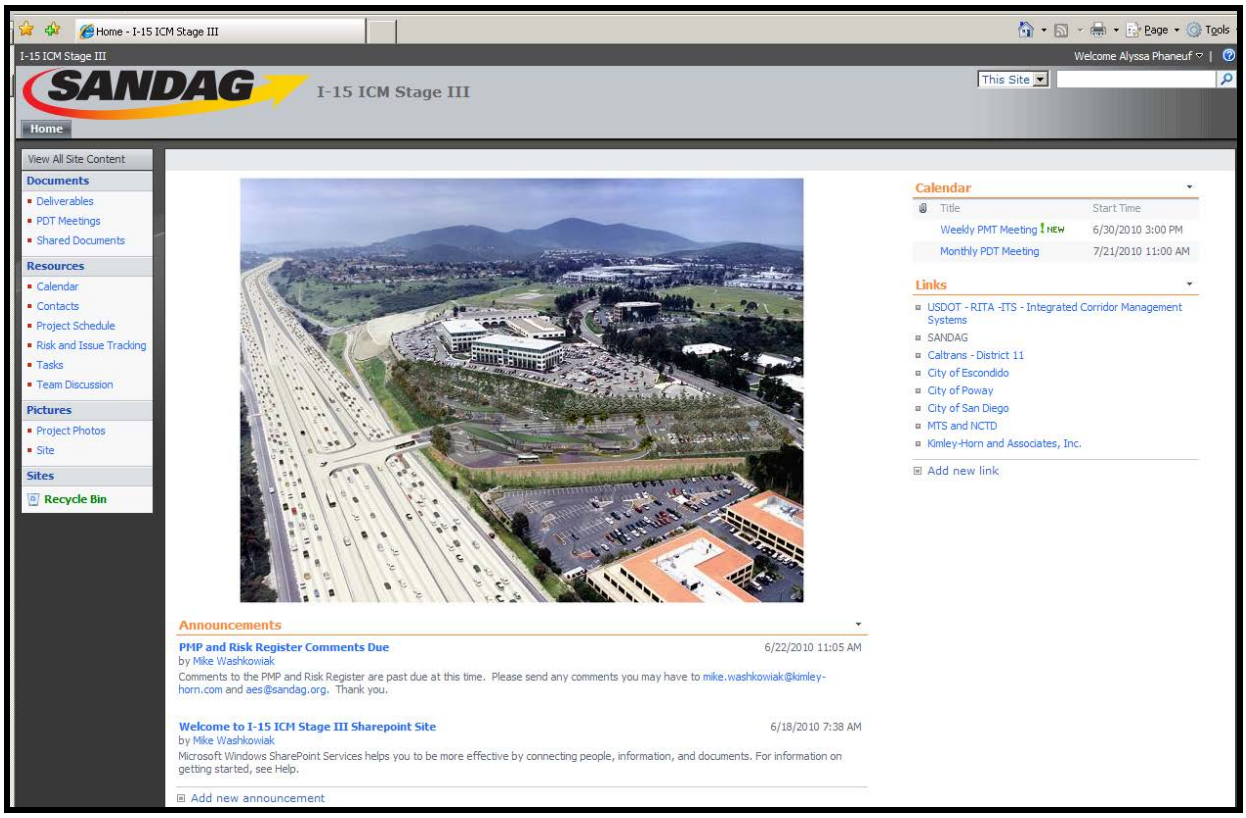
2.2 Project Collaboration Tool

Due to the number of project delivery team members and regional transportation partners involved and the desire to create a project management environment that supports knowledge transfer, the use of a project collaboration tool was deemed valuable. Research was conducted on the availability and suitability of a number of project management collaboration environments, leading to the selection of the projectmanager.com online service as the project scope. A project page was established with projectmanager.com; this tool was intended to allow the project team members to track the project schedule, identify and manage project risks, and control the flow of project documents.

In the course of an initial trial of projectmanager.com, constraints in document sharing and difficulties in Microsoft Project schedule conversion, led to a re-evaluation of the collaboration tool choice. In parallel, research uncovered further information on the availability of Microsoft SharePoint as a hosted service solution. The decision was made to adopt SharePoint as the selected collaboration tool.

A SharePoint web portal was established at www.sandagicm3.com. Figure 2-2 is a screen capture of the project web site established for this project.

Figure 2-2. I-15 ICMS Stage III Project SharePoint Site



[Source: SANDAG]

In addition, the document exchange will support the ability to report on the impact on corridor performance, and those metrics that were utilized to assess the performance. Each of these lessons learned will be documented to support future ICM adopters in ICM deployments.

The planned use of the collaboration tool includes support for interaction between regional transportation partners and the work product review process. Drafts of the work products, once approved by the Project Manager, will be posted on the SharePoint site to facilitate distribution of the documents, review and return of the comments. The tool will be used in combination with the scheduled PMT and PDT meetings to support an effective review approach. This will also provide a document repository to support subsequent Knowledge Transfer activities.

2.3 Work Breakdown Structure

The Work Breakdown Structure (WBS) has been established for the project and it is broken into eleven (11) primary tasks, which are further broken into a total of 331 activities. The following table

summarizes the major activities of the WBS, showing the breakdown of each primary task down to the second or third sublevel (the complete WBS is included in Appendix A).

Those items marked with an asterisk will be further broken down in the SEMP.

1	**Pre-Project Initiation Efforts**
1.1	USDOT ICM Award Notification
1.2	Manage SANDAG Contracts "Pre-Award Audit"
1.3	Complete/Execute Consultant Team Procurements
1.3.1	Project Mgmt Consultant
1.3.2	System Design Team
1.3.3	I-15 ICM Stage III Project Kick-off Meeting
2	**Project Management**
2.1	Project Management and Administration
2.1.1	Internal Kick-off Meeting
2.1.2	PDT Meeting
2.2	Project Initiation Documentation
2.2.1	Project Management Plan
2.2.2	Systems Engineering Management Plan (SEMP)
2.3	QA/QC
2.3.1	Weekly Project Status Reports
2.3.2	Monthly Project Development Team Stakeholder Reports
3	**System Requirements & Concept of Operations Review**
3.1	Conduct Requirements Walk-through Workshop
3.2	Update System Requirements Specification
3.3	Submit for Stakeholder Comment: SysReqs / ConOps [DRAFT]
3.4	Stakeholder Review: SysReqs / ConOps [DRAFT]
3.5	Incorporate Stakeholder review comments
3.6	Confirm PDT Acceptance of SysReqs/ConOps
3.7	Submit for Acceptance: Sys Reqs/Con Ops [FINAL]
3.8	Receive USDOT Concurrence to Proceed
4	**System Design**
4.1	Project Management Tracking - Summary
4.2	Interfaces Design*
4.3	Event Modeling Sub-System*
4.4	DSS & TPT*
4.5	Additional Field Elements
5	**System Build**
5.1	Management Tracking Summary Elements
5.2	Multi-Modal Interfaces*
5.3	Event Modeling Sub-System*
5.4	DSS & TPT*
5.5	Additional Field Element Construction

6	**System Acceptance Testing**
6.1	Prepare Draft Acceptance Test Plans
6.2	Conduct Acceptance Test Readiness Review
6.3	Submit for Comment: Acceptance Test Readiness Review [DRAFT]
6.4	USDOT review of Acceptance Test Readiness Review
6.5	Incorporate USDOT comments into final version of Acceptance Test Readiness Review
6.6	USDOT concurrence to proceed
6.7	Conduct Acceptance Testing
6.8	Produce Acceptance Test Reports
6.9	Submit for Approval: Acceptance test reports
6.10	USDOT review of testing arrangements and results
6.11	Receive USDOT concurrence to proceed
7	**Training**
7.1	Milestone Tracking
7.1.1	Submit for PDT Comment: Training Plan/Materials [DRAFT]
7.1.2	PDT Review: Training Plan/Materials [DRAFT]
7.1.3	Submit to SANDAG for USDOT Comment: Training Plan/Materials [DRAFT]
7.1.4	USDOT Review: Training Plan/Materials [DRAFT]
7.1.5	Submit for USDOT Approval: Training Plan/Materials [FINAL]
7.1.6	Receive USDOT concurrence to proceed
7.2	Conduct ICMS Training Analysis
7.3	Design ICMS Training Program
7.4	Develop ICMS Training Program Materials
7.5	Develop ICMS Training Plan
7.6	Incorporate PDT review comments into Training Plan/Materials [DRAFT]
7.7	Incorporate USDOT review comments
7.8	Implement ICMS Training Program
7.9	Completion of training
8	**System Operations and Maintenance**
8.1	Analyze Operations and Maintenance Needs of the ICMS
8.2	Conduct ICMS Training Program Evaluation
8.3	Develop Operations and Maintenance Plan
8.4	Develop Operations and Maintenance Reports
8.5	Operate and Manage System
9	**Participation in the AMS for the ICMS**
9.1	Pre-Deployment AMS Plan
9.2	Pre-Deployment Site Data Collection Plan
9.3	Conduct AMS Pre-deployment ("Before") site data collection
9.4	Post-Deployment AMS Plan
9.5	Post-Deployment Site Data Collection Plan
9.6	Conduct AMS Data Collection for ("After") Calibration
9.7	Post-Demonstration AMS Transition Plan
10	**Participation in the Evaluation of the System**

10.1	Coordination with National Evaluation Contractor
10.2	Demonstration Project Evaluation Plan (Outline, Evaluation Tools)
10.3	Demonstration Project Evaluation - Pre Implementation Data Collection Memorandum
10.4	Demonstration Project Pre- Evaluation - Baseline ("Before") Data Collection
10.5	Demonstration Project Evaluation - Post Implementation Data Collection Memorandum
10.6	Demonstration Project Post- Evaluation ("After") Data Collection
10.7	Draft Demonstration Project Evaluation Plan
10.8	Revised and Final Demonstration Project Evaluation Plan
11	**Participation in Outreach Programs**
11.1	Participation in Six Pioneer Workshops
11.2	Other National Outreach Activities
11.3	Demonstration Project Outreach Communications Plan - Draft
11.4	Demonstration Project Outreach Communications Plan - Draft and Final
11.5	Demonstration Project Local Outreach Activities
11.6	Demonstration Project Outreach Presentations/Lesson-Learned Updates As Appropriate
11.7	Participation in the Final National ICM Conference

2.3.1 Milestone List

Project milestones are a component of the WBS that define significant points in the project that can be used to track adherence to the project schedule. Many, but not all, milestones are also project deliverables. There are a total of 64 milestones defined for the ICM Stage III Project as follows:

1	**Pre-Project Initiation Efforts**
1.1	USDOT ICM Award Notification
1.3.3	I-15 ICM Stage III Project Kick-off Meeting
2	**Project Management**
2.1.1	Internal Kick-off Meeting
2.2.1.2	Submit for SANDAG Comment: PMP [DRAFT]
2.2.1.5	Submit for Stakeholder Comment: PMP [DRAFT]
2.2.1.8	Submit for Approval: PMP [FINAL]
2.2.2.2	Submit for SANDAG Comment: SEMP [DRAFT]
2.2.2.5	Submit for Stakeholder Commentl: SEMP [DRAFT]
2.2.2.8	Submit for Approval: SEMP [FINAL]
2.2.2.10	Receive USDOT concurrence to proceed
3	**System Requirements & Concept of Operations Review**
3.3	Submit for Stakeholder Comment: SysReqs / ConOps [DRAFT]
3.7	Submit for Acceptance: Sys Reqs/Con Ops [FINAL]
4	**System Design**
4.1.2.6	Receive USDOT Concurrence to Proceed [PRELIMINARY]
4.1.3.7	Receive USDOT Concurrence to Proceed [CRITICAL]
4.2.4	Submit to SANDAG for Stakeholder Review: Interface SDDD [40%]

4.2.7	Submit to SANDAG for Stakeholder Review: Interface SDDD [90%]
4.2.10	Submit to SANDAG for Stakeholder Review: Interface SDDD Chapter
4.3.4	Submit to SANDAG for Stakeholder Review: Modeling SDDD [40%]
4.3.7	Submit to SANDAG for Stakeholder Review: Modeling SDDD [90%]
4.3.10	Submit to SANDAG for Stakeholder Review: Modeling SDDD [FINAL]
4.4.11	Submit to SANDAG for Stakeholder Review: System SDDD [40%]
4.4.14	Submit to SANDAG for Stakeholder Review: System SDDD [90%]
4.4.17	Submit to SANDAG: Sub-System SDDD Chapter
4.5.4	Submit to SANDAG for Stakeholder Review: Field Elements SDDD [40%]
4.5.7	Submit to SANDAG for Stakeholder Review: Field Elements SDDD [90%]
4.5.9	Submit Field Elements [FINAL] for Construction
4.5.10	Submit to SANDAG: Field Element SDDD Chapter
5	**System Build**
5.1.6.3	Distribute System Documentation and BETA software FINAL.
5.2.7	Submit to SANDAG for Stakeholder Review: Software Development Plan, Design Diagrams, System Maintenance Manuals [40%]
5.2.12	Submit to SANDAG for Stakeholder Review: Software Development Plan, Design Diagrams, System Maintenance Manual [90%]
5.2.14	Submit to SANDAG for Acceptance: Software Development Plan, Design Diagrams, System Maintenance Manual [FINAL]
5.3.7	Submit to SANDAG for Stakeholder Review: Simulation Engine [40%] complete
5.3.13	Submit to SANDAG for Stakeholder Review: Software Development Plan, Design Diagrams, System Maintenance Manual [90%]
5.3.15	Submit to SANDAG for Stakeholder Review: Software Development Plan, Design Diagrams, System Maintenance Manual [FINAL]
5.4.2.1	Submit to SANDAG for Stakeholder Review: Software Development Plan & Software Beta Release [40%]
5.4.2.3	Submit to SANDAG for Stakeholder Review: Software Development Plan & Software Beta Release [90%]
5.4.2.5	Submit to SANDAG for Stakeholder Review: Software Development Plan & Software Beta Release [FINAL]
6	**System Acceptance Testing**
6.3	Submit for Comment: Acceptance Test Readiness Review [DRAFT]
6.6	USDOT concurrence to proceed
6.9	Submit for Approval: Acceptance test reports
6.11	Receive USDOT concurrence to proceed
7	**Training**
7.1.1	Submit for PDT Comment: Training Plan/Materials [DRAFT]
7.1.3	Submit to SANDAG for USDOT Comment: Training Plan/Materials [DRAFT]
7.1.5	Submit for USDOT Approval: Training Plan/Materials [FINAL]
7.9	Completion of training
8	**System Operations and Maintenance**

8.3	Develop Operations and Maintenance Plan
8.5	Operate and Manage System
9	**Participation in the AMS for the ICMS**
9.3	Conduct AMS Pre-deployment ("Before") site data collection
9.6	Conduct AMS Data Collection for ("After") Calibration
9.7	Post-Demonstration AMS Transition Plan
10	**Participation in the Evaluation of the System**
10.4	Demonstration Project Pre- Evaluation - Baseline ("Before") Data Collection
10.6	Demonstration Project Post- Evaluation ("After") Data Collection
10.8	Revised and Final Demonstration Project Evaluation Plan
11	**Participation in Outreach Programs**
11.4	Demonstration Project Outreach Communications Plan - Draft and Final
11.7	Participation in the Final National ICM Conference

2.3.1 Deliverable List

Project deliverables are a component of the WBS. They are defined as the products of work that are developed as a result of the project activities. There are a total of 49 deliverables defined for the ICM III Project as follows:

2	**Project Management**
2.2.1.2	Submit for SANDAG Comment: PMP [DRAFT]
2.2.1.5	Submit for Stakeholder Comment: PMP [DRAFT]
2.2.1.8	Submit for Approval: PMP [FINAL]
2.2.2.2	Submit for SANDAG Comment: SEMP [DRAFT]
2.2.2.5	Submit for Stakeholder Commentl: SEMP [DRAFT]
2.2.2.8	Submit for Approval: SEMP [FINAL]
2.3.1	Weekly Project Status Reports
2.3.2	Monthly Project Development Team Stakeholder Reports
3	**System Requirements & Concept of Operations Review**
1.3.3	Submit for Stakeholder Comment: SysReqs / ConOps [DRAFT]
1.3.7	Submit for Acceptance: Sys Reqs/Con Ops [FINAL]
4	**System Design**
4.2.4	Submit to SANDAG for Stakeholder Review: Interface SDDD [40%]
4.2.7	Submit to SANDAG for Stakeholder Review: Interface SDDD [90%]
4.2.10	Submit to SANDAG for Stakeholder Review: Interface SDDD Chapter
4.3.4	Submit to SANDAG for Stakeholder Review: Modeling SDDD [40%]
4.3.7	Submit to SANDAG for Stakeholder Review: Modeling SDDD [90%]
4.3.10	Submit to SANDAG for Stakeholder Review: Modeling SDDD [FINAL]
4.4.11	Submit to SANDAG for Stakeholder Review: System SDDD [40%]
4.4.14	Submit to SANDAG for Stakeholder Review: System SDDD [90%]

4.4.17	Submit to SANDAG: Sub-System SDDD Chapter
4.5.4	Submit to SANDAG for Stakeholder Review: Field Elements SDDD [40%]
4.5.7	Submit to SANDAG for Stakeholder Review: Field Elements SDDD [90%]
4.5.9	Submit Field Elements [FINAL] for Construction
5	**System Build**
5.2.7	Submit to SANDAG for Stakeholder Review: Software Development Plan, Design Diagrams, System Maintenance Manuals [40%]
5.2.12	Submit to SANDAG for Stakeholder Review: Software Development Plan, Design Diagrams, System Maintenance Manual [90%]
5.2.14	Submit to SANDAG for Acceptance: Software Development Plan, Design Diagrams, System Maintenance Manual [FINAL]
5.3.7	Submit to SANDAG for Stakeholder Review: Simulation Engine [40%] complete
5.3.13	Submit to SANDAG for Stakeholder Review: Software Development Plan, Design Diagrams, System Maintenance Manual [90%]
5.3.15	Submit to SANDAG for Stakeholder Review: Software Development Plan, Design Diagrams, System Maintenance Manual [FINAL]
5.4.2.3	Submit to SANDAG for Stakeholder Review: Software Development Plan & Software Beta Release [90%]
5.4.2.5	Submit to SANDAG for Stakeholder Review: Software Development Plan & Software Beta Release [FINAL]
6	**System Acceptance Testing**
6.3	Submit for Comment: Acceptance Test Readiness Review [DRAFT]
6.9	Submit for Approval: Acceptance test reports
7	**Training**
7.1.1	Submit for PDT Comment: Training Plan/Materials [DRAFT]
7.1.3	Submit to SANDAG for USDOT Comment: Training Plan/Materials [DRAFT]
7.1.5	Submit for USDOT Approval: Training Plan/Materials [FINAL]
8	**System Operations and Maintenance**
8.3	Develop Operations and Maintenance Plan
8.4	Develop Operations and Maintenance Reports
9	**Participation in the AMS for the ICMS**
9.1	Pre-Deployment AMS Plan
9.2	Pre-Deployment Site Data Collection Plan
9.4	Post-Deployment AMS Plan
9.5	Post-Deployment Site Data Collection Plan
9.7	Post-Demonstration AMS Transition Plan
10	**Participation in the Evaluation of the System**
10.2	Demonstration Project Evaluation Plan (Outline, Evaluation Tools)
10.3	Demonstration Project Evaluation - Pre Implementation Data Collection Memorandum
10.5	Demonstration Project Evaluation - Post Implementation Data Collection Memorandum
10.7	Draft Demonstration Project Evaluation Plan
10.8	Revised and Final Demonstration Project Evaluation Plan
11	**Participation in Outreach Programs**
11.3	Demonstration Project Outreach Communications Plan - Draft
11.4	Demonstration Project Outreach Communications Plan - Draft and Final

2.4 Project Schedule

In order to track successful completion of project tasks the baseline project schedule has been developed to align with the WBS of the project. The following is a summary of the project schedule identifying the start and end dates of the 11 primary project tasks. This is the baseline project schedule that the project will be tracked against throughout its duration. This baseline schedule was established on August 25, 2010.

Table 2-1. Baseline Schedule

Task	Name	Start	End
1	Pre-Project Initiation Efforts	January 2010	November 2010
2	Project Management	January 2010	May 2014
3	System Requirements & Concept of Operations Review	March 2010	November 2010
4	System Detailed Design	November 2010	April 2012
5	System Build	April 2011	September 2012
6	System Acceptance Testing	October 2011	November 2012
7	Training	April 2012	January 2013
8	System Operations and Maintenance	November 2012	July 2014
9	Participation in the AMS for the ICMS	October 2010	February 2013
10	Participation in the Evaluation of the System	October 2010	April 2014
11	Participation in Outreach Programs	April 2010	May 2014

Chapter 3. Project Change Control Process

All project changes shall be reviewed and tracked so that the direction of the project does not alter course from the stated project goals. Project changes can have a significant impact on scope, budget and/or schedule for the project; and therefore, shall be reviewed by the Change Control Board (CCB) for approval prior to implementation. The Change Control Board is a designated group which will regularly review project changes. The Change Control Board for the I-15 ICM consists of the following representatives, supported by Kimley-Horn and Associates:

- Samuel Johnson
- Alex Estrella
- Peter Thompson

The Change Control Board will typically meet on a weekly basis; however, the number and complexity of change requests will drive the regularity of these meetings.

The Change Control Process consists of four phases:

- Change Request,
- Initial Review of Change Request,
- Initial Impact Analysis; and,
- Recommendation.

Change Request – Anyone within the project team, user community, stakeholders, or contractors can submit a change request. This is to be done in writing either on paper or in automated format. The change request shall include the following information:

- Identification - Identifies the change request title, which will be used in subsequent communication, the date submitted, and the person and organization submitting the request.
- Proposed Change Description and References - Describes the change being proposed and clearly identifies whether the change is technical, system, organizational, or procedural in nature. Any reference material that will assist the reviewers should be identified and attached.
- Justification - A discussion of why the change is being proposed, including a cost benefit analysis. In other words, how will the customer and state organization benefit from the change?
- Impact Statement - If the change is not implemented, how will it adversely affect the customer and state organization?
- Alternatives - List at least one alternative (more if possible) to the change you are proposing, and indicate why the proposed change is better. Briefly indicate why the alternative is not the better choice.

The person, or persons, submitting the Change Request shall attach any supporting documentation that helps to clarify the proposed change. Change Requests shall be submitted to a centralized repository. A Change Request control number will be assigned to the submitted request so that it can be tracked to completion.

Initial Review of Change Request – The Change Control board will review the initial request and determine whether to proceed, reject, or defer the request. If determined to proceed, the change request will be assigned to an analyst for an initial impact analysis.

Initial Impact Analysis – The assigned analyst will make an initial assessment of the cost, schedule, and resources needed to implement the proposed change. If the requested change is complex, and an initial assessment cannot be made within two days, a Cost/Schedule Impact Analysis (CSIA) should be requested. The analyst will be required to determine the need for this analysis, and will estimate the cost, schedule, and resources needed to perform the CSIA.

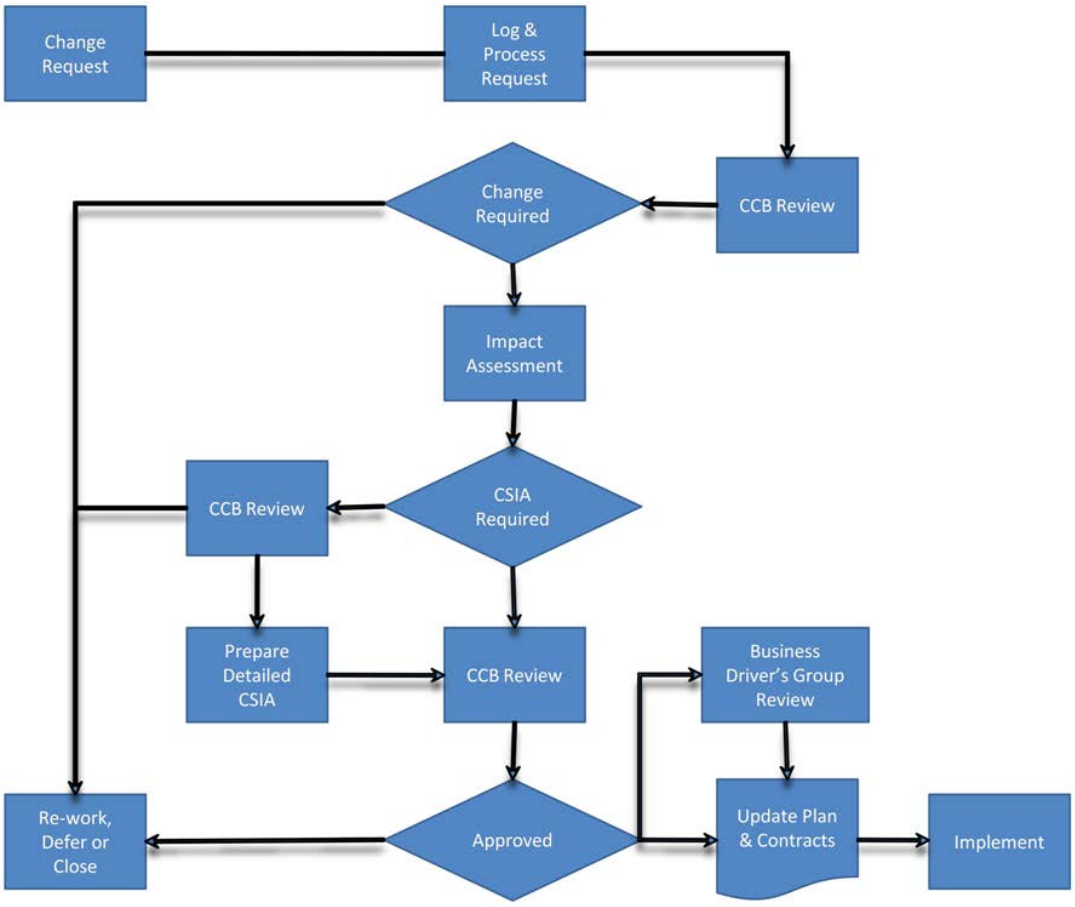
The Change Control Board will review the requested change and the resources need to complete the CSIA and will either accept, reject, or defer the CSIA.

Recommendation – Once the analysis has been completed and the impact to project scope, budget and schedule has been identified, the Change Control board will review the findings to recommend or reject the project change. If the change request is recommended for implementation, and there are no anticipated changes to the overall project scope, schedule and budget, the change will be communicated to the project partners for implementation. Recommended changes that have an impact to the overall project scope, schedule and budget will be submitted to the Business Driver's Group (as described in Section 4.3 of this document) for approval prior to implementation.

With recommendation and approval of a project change the appropriate processes will be followed with regard to project contracts and baseline documentation.

The following figure details the Change Control Process to be implemented for the I-15 ICM Stage III Project.

Figure 3-1. Change Control Process Flowchart



[Source: SANDAG ICM Team]

Chapter 4. Communication Management Plan

4.1 Introduction

This Communications Management Plan sets the communications framework for this project. It is intended to serve as a guide for effective communications throughout the life of the project and will be updated as communication needs change. This plan identifies and defines the roles of people involved in this project. It also includes a communications matrix which maps the communication requirements of this project. An in-depth guide for conducting meetings details the communications rules and how the meetings will be conducted, promoting successful meetings. A project team directory is included to provide contact information for all stakeholders directly involved in the project.

4.2 Communications Management Approach

The Project Management Team will take a proactive role in ensuring effective communications on this project. The communications requirements are documented in the Communications Matrix presented in this document. This will be used as a guide that defines what information is to be communicated, the people at both ends of the communication and when communication will take place.

4.3 Roles

Federal Project Sponsor – USDOT

The project sponsor is the champion of the project who serves as the project champion for the ICM initiative from a national perspective. The USDOT is responsible for stewardship of the funding for the ICM initiative and will work closely with SANDAG to assure that the ICM initiative goals are met. Since the Project Sponsor is at the executive level, typical communications will be presented in summary format unless the Project Sponsor requests more detailed communications. For the I-15 ICM Stage III Project the USDOT will receive stakeholder level detail and will have ultimate approval of completed task deliverables as identified in the WBS.

Regional Project Champion – SANDAG

Program Manager – Samuel Johnson

The Regional Project Champion oversees the project at the portfolio level and owns most of the resources assigned to the project. The Regional Project Champion is responsible for overall program costs and delivery, as well as for fostering involvement of the Key Stakeholders. The Regional Project Champion will The Program Manager assigned by the Regional Project Champion will be involved in

weekly updates on activities of the project, and will coordinate with oversight committees and local policy decision makers for each of the project partners.

Key Stakeholders

There are numerous Key Stakeholders for the I-15 ICM Stage III, these stakeholders are a subset of the total project stakeholders that have been involved in Stage I and II of the I-15 ICM. Those stakeholders currently identified for this phase of the project are as follows:

- USDOT
- SANDAG
- Metropolitan Transit System
- North County Transit District
- Caltrans
- City of San Diego
- City of Poway
- City of Escondido

It is feasible that as this phase of the project is implemented there may be additional stakeholders that are part of the implementation and operation of the system. These potential additional stakeholders include, but are not limited to, California Highway Patrol and Emergency Responders (other potential stakeholders are those partners identified in the I-15 ICM Concept of Operations). It is anticipated that as the I-15 ICM moves beyond Stage III that additional stakeholders will be identified and incorporated into the system.

The key stakeholders (regional transportation partners) are participants in the scheduled PDT meetings. These meetings will be utilized as an opportunity for focused interaction with the partners, active review of work products and information exchange on the progress of the project.

Change Control Board

The Change Control Board is a designated group which reviews technical specifications and authorizes changes within the organizations infrastructure. Technical design documents, user impact analysis and implementation strategies are typical of the types of communication this group requires.

The I-15 ICM Stage III Change Control Board, as identified previously, consists of the following representatives, with the support of Kimley-Horn and Associates:

- Samuel Johnson
- Alex Estrella
- Peter Thompson

Customer

The customer(s) for this project are the regional transportation partners, they will be the operators and users of the ICM System. Their needs are what this project and its associated systems are being developed to serve. Their input and approval will be necessary throughout the project for successful implementation, deployment and operations. The coordination, input and review processes with the partners agencies will be documented throughout the project; this documentation will provide context to the systems that are developed and how the operators use the tools that are developed. The

understanding of how the operators use the system will be critical as future ICM implementers identify those tools that are applicable to their own particular systems.

Project Managers – Alex Estrella (Functional), Peter Thompson (Technical)

The Project Managers have overall responsibility for the execution of the project. The Project Manager manages day to day resources, provides project guidance and monitors and reports on the projects metrics as defined in the Project Management Plan. As the persons responsible for the execution of the project, the Project Managers are the primary communicators for the project distributing information according to the Communications Management Plan.

Alex Estrella will serve as the Functional Project Manager for the ICM project and is responsible for planning, directing and overseeing the project, and ensuring that deliverables and functionality are achieved as defined in the Project Charter, funding documentation and subsequent project plans. The Functional Project Manager is also responsible for the management of all resources assigned to the project, serves as the primary liaison between the project and the USDOT, SANDAG Board, Transportation Committee and senior managers. He also escalates decisions and issues as needed.

The Functional Project Manager oversees and manages the generation of the RFP or RFO and other solicitation documents, and is responsible for integrating all the pieces and ensuring consistency and continuity throughout the entire procurement process and conforming to procurement standards, rules, and regulations. This includes managing the RFP or RFO development, preparing and maintaining procurement schedule, coordinating contract negotiations and managing evaluation of proposals or offers and selection of vendor.

Peter Thompson will serve as the Technical Project Manager for the project. He will be responsible for ensuring that all technical aspects of the project are addressed and that the project is implemented in a technically sound manner. The Technical Project Manager is responsible for all technical designs, overseeing the implementation of the designs and developing as-build documentation. The Technical Project Manager requires close communications with the Functional Project Manager and the Project Team to provide technical support to the team and execution of technical policies, processes, and procedures.

The Technical Project Manager is responsible for the day-to-day activities of SANDAG and vendor technical staff who are engaged in the technical management aspects of the project. The technical manager leads in the technical disciplines of the project.

The Technical Project Manager partners with other IT managers to acquire appropriate technical assistance for such areas as enterprise architecture, database, software development, security, testing, configuration management, change management, release management, and other technical areas of the new system. The Technical Project Manager, will provide leadership and support to technical staff that are augmented to the project throughout the project life cycle.

Technical Project Manager also provides technical leadership towards the development and tracking of the system business requirements and interfaces, assisting with technical analyses, and ensuring the final system meets all stated requirements. He is also responsible for the following: tracking and managing the requirements for the new system and any changes to the requirements, providing exposure to project stakeholders on new technologies and processes relevant to the project, providing training of the evaluation team, and holding technical simulations of the project as needed.

The Technical Project Manager is also responsible for the implementation of the systems portion of the project. He will provide implementation management leadership through planning, organizing, coordinating, and monitoring implementation activities. In addition, he will be responsible for effectively

managing all information technology resources assigned by the Project Manager, including implementation strategy, organizational change management, production support, IT training/knowledge transfer, defect/problem tracking, and Maintenance & Operation. He will coordinate SOWs and interface directly with contractors and consultants to ensure technical obligations satisfy all objectives and expectations.

SANDAG Transportation Committee

The SANDAG Transportation Committee (TC) is a subset of the SANDAG Board. This group will require executive level of communication and will receive quarterly status reports and updates of project r progress. The TC will be involved in activities that involve individual policy decisions and processes. Regional partner agencies are represented on this Committee.

Intelligent Transportation System (ITS) CEO Group

The ITS CEO Group provides executive oversight and policy for the region's ITS program. Members of this group include CEO's from SANDAG, Caltrans, MTS, NCTD and the City of San Diego Mayor's representative. The ITS CEO Group will receive an executive level of communication and will be involved in issue resolution and policy direction for issues that cannot be resolved at the Business Driver's Group level.

Business Drivers Group (BDG)

The Business Driver's Group will be comprised of representatives from SANDAG and each of the partner agencies. This group's representatives are as follows:

- Samuel Johnson – SANDAG ITS Chief Technology Officer
- Bill Valle – Caltrans Deputy Director for Maintenance and Traffic
- Ed Domingue – City of Escondido Engineering Services Director
- Frank Casteleneto – City of Poway City Engineer
- Patti Boekamp – City of San Diego Director of Engineering and Capital Projects
- Claire Spielberg – Metropolitan Transit System Chief Operating Officer
- Matt Tucker – North County Transit District Executive Director

The Business Driver's Group will receive executive level of communication and will be involved in issue resolution and policy direction for issues that cannot be resolved at either the Project Management Team or Project Development Team levels. This is intended to form part of the overall effort to effectively support the engagement of regional transportation partners throughout the project and at critical milestones. The active participation of regional transportation partners in the BDG will be encouraged and supported through the delivery of "executive level" communications. For example, the briefings delivered to the BDG will be succinct and to the point, explaining the background and context, the need for their consideration/action and an explanation of the actions required or options available.

Project Management Team

The Project Management Team (PMT) is comprised of SANDAG, KHA and System Design/Developer Team staff as follows:

- Samuel Johnson - SANDAG
- Alex Estrella – SANDAG Project Manger (Functional)

- Peter Thompson – SANDAG Project Manager (Technical)
- Kimley-Horn and Associates, Inc. (KHA) Project Manager
- System Design/Developer Team Project Manager

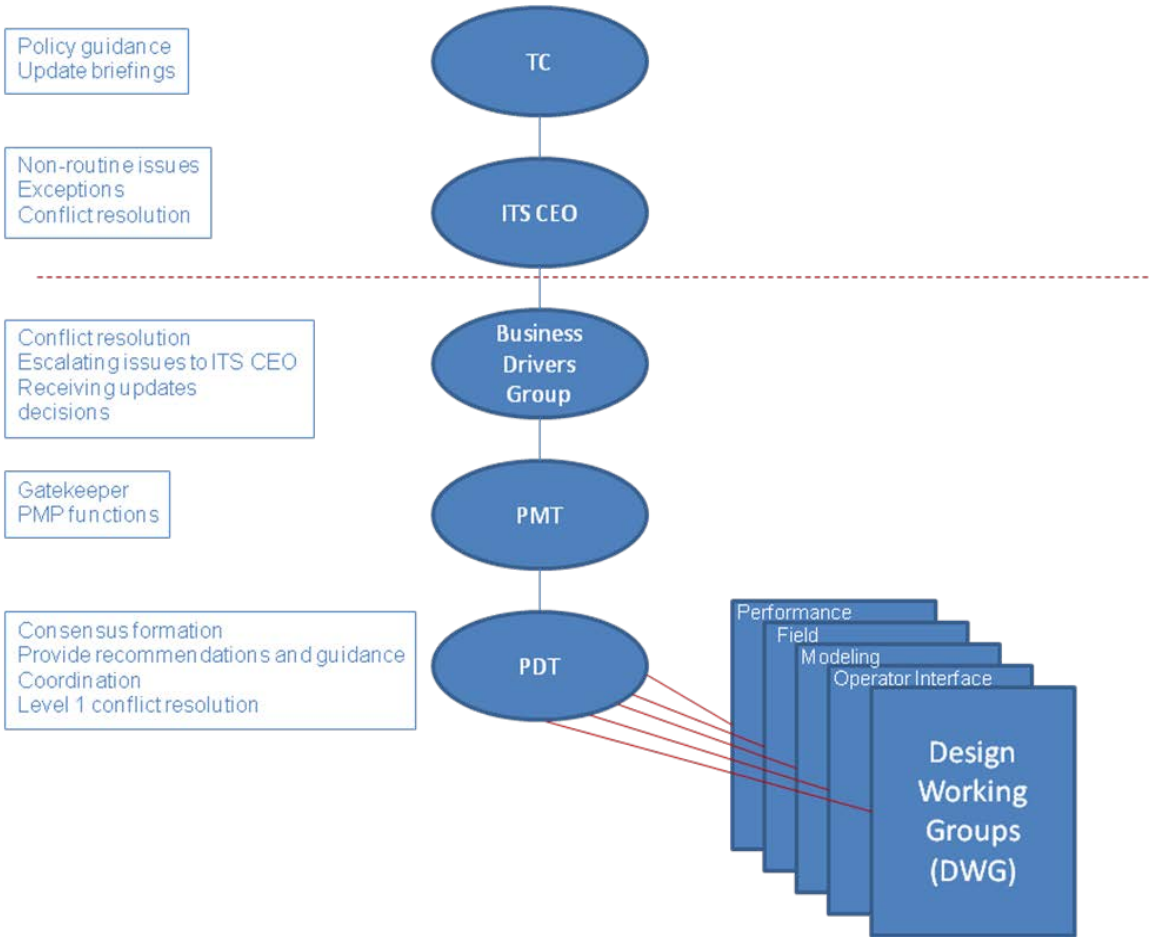
The PMT will be involved in day-to-day activities of the project with oversight of all project activities, coordination with each of the project stakeholders, maintenance of project schedule/scope/budget, submission of deliverables, and documentation of the project. This group has a clear understanding of the work to be completed and the framework in which the project is to be executed, they are responsible for communicating the expectations and directing the project to meet these objectives. The Project Management Team requires a detailed level of communications which is achieved through day to day interactions with the Project Manager and other team members along with weekly PMT meetings.

Project Development Team (PDT)

The PDT provides strategic oversight for changes that impact the overall project. The purpose of the PDT is to ensure that changes within the project are effected in such a way that it benefits the project as a whole. The PDT requires communication on matters which will change the scope of the project and its deliverables.

The PDT members represent the system users and they will be required to provide technical direction input, communicate how they use the system and to identify risks/issues that are specific to each of their own particular agencies.

Figure 4-1. Group Communication Structure



4.4 Project Team Directory

The following table presents contact information for all persons identified in this communications management plan. The email addresses and phone numbers in this table will be used to communicate with these people.

Name	Title	Organization	Phone	E-Mail
Alex Estrella	Senior Transportation Planner	SANDAG	619.699.1928	aes@sandag.org
Chiachi Rumbolo	ITS Project Coordinator	SANDAG	619.699.6922	cru@sandag.org
Chris Burke	ITS Business Analyst	SANDAG	619.699.1934	cbur@sandag.org
Ellison Alegre	Associate Transportation Planner	SANDAG	619.699.0729	eal@sandag.org
Mike Calandra	Senior Transportation Planning Modeler	SANDAG	619.699.6929	mca@sandag.org
Peter Thompson	ITS Technical Manager	SANDAG	619.699.4813	pth@sandag.org
Samuel Johnson	Chief Technology Officer	SANDAG	619.699.6958	sjo@sandag.org
Stan Glowacki	Senior ITS Information Systems Analyst	SANDAG	619.699.1913	sgl@sandag.org
Brent Boyd	Senior Transportation Planner	SANDAG	619.595.4983	brent.boyd@sdmts.com
Devin Braun	Senior Transportation Planner	SANDAG	619.595.4916	Devin.braun@sdmts.com
Anush Badii	Traffic Engineer	Caltrans	858.518.3760	Anush_badii@dot.ca.gov
Bill Valle	Deputy District Director, Maintenance and Operations	Caltrans	619.688.6709	William.valle@dot.ca.gov
Christy Le	Ramp Metering	Caltrans	858.467.3029	Christy_le@dot.ca.gov
Cindee Feaver	Assoc. Traffic Engineer – Signal Operations	Caltrans	858.467.3056	Cindee_feaver@dot.ca.gov
Dale Wilson	Senior Traffic Engineer	Caltrans	619.688.3248	Dale_wilson@dot.ca.gov
Everett Townsend	TMC Branch Chief	Caltrans	858.467.3204	Everett.Townsend@dot.ca.gov
Gurprit "Pete" Hansra		Caltrans		gurprit_hansra@dot.ca.gov
Gustavo Dallarda	I-15 Corridor Director	Caltrans	619.701.0472	Gustavo_Dallarda@dot.ca.gov
Harrison Makau	Traffic Engineer	Caltrans	858.467.3064	Harrison_makau@dot.ca.gov
Lawrence Emerson	Senior Transportation Engineer	Caltrans	858.467.3073	Lawrence.Emerson@dot.ca.gov
Lima Kopitch	TMC Operations	Caltrans	858.467.3203	Lima_Kopitch@dot.ca.gov
Rafael Reyes	Transportation Engineer	Caltrans	858.467.3068	Rafael.reyes@dot.ca.gov

Name	Title	Organization	Phone	E-Mail
Sandro Bermudez	Traffic Engineer	Caltrans	858.467.3038	Sandro_bermudez@dot.ca.gov
Shahin Sepassi	Senior Transportation Engineer	Caltrans	858.518.3912	SSepassi@dot.ca.gov
Tom Bouquin	Traffic Operations	Caltrans	858.467.4323	Thomas_bouquin@dot.ca.gov
Ali Shahzad	Associate Engineer	City of Escondido	760.839.4812	ashahzad@escondido.org
Ron Miller	Senior Transportation Engineer	City of Escondido	760.839.4651 (x3817)	rcmiller@ci.escondido.ca.us
Zoubir Ouadah	Senior Traffic Engineer	City of Poway	858.668.4640	zouadah@poway.org
Duncan Hughes	Senior Engineer	City of San Diego	619.533.3141	Drhughes@sandiego.gov
Bruce Churchill	Senior Project Manager	Delcan Corp.	714.562.5725 (x207)	b.churchill@delcan.com
Bob Sheehan	Transportation Specialist	FHWA	202.366.6817	Robert.Sheehan@dot.gov
Brian Cronin	RITA/JPO ICM Program Manager	FHWA	202.366.8841	Brian.Cronin@dot.gov
Dale Thompson	Transporation Research Specialist	FHWA	202.493.3420	Dale.Thompson@dot.gov
Ed Fok	Transportation Technology Specialist	FHWA	415.744.0113	edward.fok@dot.gov
Steve Mortensen	FTA ICM Program Manager	FTA	202.493.0459	Steven.Mortensen@dot.gov
Dave Sorenson	Project Principal	Kimley-Horn	619.744.0105	Dave.sorenson@kimley-horn.com
Mike Washkowiak	Project Engineer	Kimley-Horn	619.744.0130	Mike.Washkowiak@kimley-horn.com
Blake Christie	Principal Engineer	Noblis	202.488.5711	blake.christy@noblis.org
Dawn Hardesty	Lead Systems Engineer	Noblis	202.863.3648	dhardesty@noblis.org
Jeris White	Senior Principal	Noblis	202.488.5712	jeris.white@noblis.org
Mark Miller	Specialist	PATH/UC	415.250.5415	mamiller@path.berkeley.edu
Alex Gerodimos	Commercial Director	TSS		agerodimos@aimsun.com
Alex Torday	Consulting Director	TSS		torday@aimsun.com

4.5 Communications Matrix

The following table identifies the communication methods and the objective of the communication that will be utilized throughout the I-15 ICM Stage III project.

Communication Type	Objective of Communication	Medium	Frequency	Audience	Owner	Deliverable
Kickoff Meeting	Introduce the project team and the project. Review project objectives and management approach.	▪ Face to Face ▪ Conference Call	Once	▪ FHWA ▪ FTA ▪ Noblis ▪ SANDAG ▪ KHA ▪ Regional transportation partners	Alex Estrella	▪ KO meeting agenda ▪ KO meeting Minutes
I-15 ICM III Management Team Meetings	Review status of the project with the project management team.	▪ Face to Face ▪ Conference Call	Weekly	▪ Alex Estrella ▪ Peter Thompson ▪ KHA	Alex Estrella	▪ Management team meeting agenda ▪ Management team meeting minutes
Technical Design Session (Design Working Groups)	Discuss and develop technical design solutions for the project.	▪ Face to Face ▪ Conference Call	As Needed	▪ Project Technical Staff	Peter Thompson	▪ Technical design session agenda ▪ Technical design session minutes
Monthly Project Delivery Team (PDT) Meetings	Review and discuss project progress with the whole project team Provide recommendations/guidance and consensus building	▪ Face to Face	Monthly	▪ PDT	Alex Estrella	▪ PDT meeting agenda ▪ PDT meeting minutes
Project Status	Report the status of the project including activities, progress, costs	▪ Email	Monthly to match invoice	▪ SANDAG ▪ Quarterly to USDOT	Alex Estrella	▪ Weekly Project Status Report ▪ Monthly project

Communication Type	Objective of Communication	Medium	Frequency	Audience	Owner	Deliverable
	and issues.		cycle			status report to USDOT
USDOT Project Status Meeting	Report and review the status of the project with USDOT including activities, progress, costs and issues.	▪ Conference Call	Monthly	▪ FHWA ▪ FTA ▪ Noblis ▪ SANDAG ▪ KHA	Alex Estrella	▪ Monthly project status report to USDOT
ITS CEO Meetings (Policy Direction Group)	Report the status of the project including activities, progress, costs and issues.	▪ Face to face ▪ One on One	Every 2 months	▪ SANDAG ▪ MTS ▪ NCTD ▪ City of San Diego ▪ Caltrans ▪ City of Poway ▪ City of Escondido		
Senior Management Meetings (Business Driver's Group)	Report the status of the project including activities, progress, costs and issues.	▪ Face to face	Monthly	▪ SANDAG ITS Chief Technology Officer ▪ Caltrans Deputy Director for Maintenance and Traffic ▪ City of Escondido Engineering Services Director ▪ City of Poway City Engineer ▪ City of San Diego Director of Engineering and Capital Projects ▪ Metropolitan Transit System Chief Operating Officer ▪ North County Transit District Executive Director		
Presentations to SANTEC	Report the status of the project including activities, progress, costs and issues.	▪ Face to face	Every 3 months			

The regional transportation partners identified as part of the implementation and operations of the I-15 ICM Stage III project are defined as follows:

- Caltrans District 11
- City of Escondido
- City of Poway
- City of San Diego
- Metropolitan Transit System
- North County Transit District

4.6 Guidelines for Meetings

4.6.1 Meeting Agenda

Meeting Agendas will be distributed 2 business days in advance of the meeting. The Agenda will identify the presenter for each topic along with a time limit for that topic. The first item in the agenda will be a review of action items from the previous meeting.

4.6.2 Meeting Minutes

Meeting minutes will be distributed within 2 business days following the meeting. Meeting minutes will include the status of all items from the agenda along with new action items and the Parking Lot list of items that were not completely addressed and require further attention, discussion and action.

4.6.3 Action Items

Action Items will be recorded in both the meeting agenda and minutes. Action items will include both the action item along with the owner of the action item. Meetings will start with a review of the status of all action items from previous meetings and end with a review of all new action items resulting from the meeting. The review of the new action items will include identifying the owner for each action item.

4.6.4 Meeting Facilitator

The Meeting Facilitator is responsible for distributing the meeting agenda, facilitating the meeting and distributing the meeting minutes. The Meeting Facilitator will ensure that the meeting starts and ends on time and that all presenters adhere to their allocated time frames.

4.6.5 Note Taker

The Note Taker is responsible for documenting the status of all meeting items, maintaining a Parking Lot item list and taking notes of anything else of importance during the meeting. The Note Taker will give a copy of their notes to the Meeting Facilitator at the end of the meeting as the Meeting Facilitator will use the notes to create the Meeting Minutes.

4.6.6 Parking Lot

The Parking Lot will be used as a tool by the Meeting Facilitator to record and defer items that aren't on the meeting agenda or items that merit further discussion at a later time or through another forum. A parking lot record will be kept that identifies an owner for the item as that person will be responsible for ensuring follow-up. The Parking Lot list will be included in the meeting minutes.

Chapter 5. Cost Management Plan

5.1 Introduction

The KHA Project Manager will be responsible for managing and reporting on the project's cost throughout the duration of the project. During the appropriate PMT meeting, the KHA Project Manager will present and review the project's cost performance for the preceding month. The KHA Project Manager is responsible for accounting for cost deviations and presenting the PMT with options for getting the project back on budget if necessary. The PMT will make recommendations to the Business Drivers Group for changes to the project scope to maintain the project budget, or necessary modifications to the project budget to maintain the existing scope. Regional recommendations will be requested at the Business Drivers Group level, however, the USDOT will maintain authority for any modifications to the project scope and budget.

Dependent project stage and activities the relevant Project Manager responsible for reporting shall be as follows:

- System Design/Developer Team for System Integration, Event Planning Subsystem, GUI and Modeling
- Kimley-Horn and Associates for Field Element Design
- Job-order-Contractor for Field Element Implementation

5.2 Cost Management Approach

Costs for this project will be managed at the second level of the Work Breakdown Structure (WBS). Cost variances of +/- 10% in the cost and schedule performance indexes will change the status of the cost to cautionary; as such, those values will be changed to yellow in the project status reports. Cost variances of +/- 20% in the cost and schedule performance indexes will change the status of the cost to an alert stage; as such, those values will be changed to red in the project status reports. This will require corrective action from the PMT in order to bring the cost and/or schedule performance indexes below the alert level. Corrective actions will require a project change request and be must approved by the SANDAG Project Manager before it can become part of the scope of the project.

5.3 Measuring Project Costs

Performance of the project will be measured using Earned Value Management. The following four Earned Value metrics will be used to measure to projects cost performance:

- Schedule Variance (SV)
- Cost Variance (CV)
- Schedule Performance Index (SPI)
- Cost Performance Index (CPI)

The Schedule Performance Index (SPI) is defined as the ratio of Earned Value (EV) to the Planned Value (PV). Earned Value (EV) is the total value of all project work completed to date. The Cost Performance Index (CPI) is defined as the ratio of Earned Value (EV) to Actual Costs (AC).

If the Schedule Performance Index or Cost Performance Index has a variance of between 10% and 20% the relevant Project Manager will report the reason for the exception to the SANDAG Project Manager (Functional). If the SPI or CPI has a variance of greater than 20% the relevant Project Manager must provide a report to the PMT explaining the reason for the exception and provide a detailed corrective plan to bring the project performance back to acceptable levels.

Table 5-1. Cost Management Performance Measurement

Performance Measure	Yellow	Red
Schedule Performance Index (SPI)	Between 90% and 80% or Between 110% and 120%	Less Than 80% or Greater than 120%
Cost Performance Index (CPI)	Between 90% and 80% or Between 110% and 120%	Less Than 80% or Greater than 120%

5.4 Reporting Format

Reporting for cost management will be included in the monthly project status report. The Monthly Project Status Report will include a section labeled, “Cost Management”. This section will contain the Earned Value Metrics identified in the previous section. All cost variances outside of the thresholds identified in this Cost Management Plan will be reported on including any corrective actions which are planned. Change Requests that are triggered based upon project cost overruns will be identified and tracked in this report.

5.5 Cost Variance Response Process

The Control Thresholds for this project is a CPI or SPI of less than 80% or greater than 120%. If the project reaches one of these Control Thresholds a Cost Variance Corrective Action Plan is required. The relevant Project Manager will present the Project Manager with options for corrective actions within five business days from when the cost variance is first reported. Within three business days from when the Project Manager selects a corrective action option, the relevant Project Manager will present the Project Manager with a formal Cost Variance Corrective Action Plan. The Cost Variance Corrective Action Plan will detail the actions necessary to bring the project back within budget and the means by which the effectiveness of the actions in the plan will be measured. Upon acceptance of the Cost Variance Corrective Action Plan it will become a part of the project plan and the project will be updated to reflect the corrective actions.

5.6 Cost Change Control Process

The cost change control process will follow the established project change control process as detailed previously in this document.

5.7 Project Budget

The overall budget for this project is tracked and maintained by SANDAG.

Chapter 6. Procurement Management Plan

6.1 Introduction

This Procurement Management Plan describes the procurement framework for the services and products that SANDAG will acquire for this project. It will serve as a guide for managing procurement throughout the life of the project and will be updated as acquisition needs change. This plan identifies and defines the items to be procured, the types of contracts to be used in support of this project, the contract approval process, and decision criteria. The importance of coordinating procurement activities, establishing firm contract deliverables, and metrics in measuring procurement activities is included.

6.2 Procurement Management Approach

The Project Manager will provide oversight and management for all procurement activities under this project. The Project Manager will work with the PMT to identify all items to be procured for the successful completion of the project. Procurement of services and equipment for implementation of the project will be handled by the vendors as outlined below; vendor procurements must adhere to the same level of pre-award scrutiny that SANDAG maintains on all its procurements. This procurement requirement will be defined in the contractual agreement between SANDAG and the vendor.

6.3 Procurement Definition

The following table summarizes the project stage, the services to be contracted and the procurement process used to establish contractual agreements for the project delivery.

Table 6-1. Procurement Method Summary

Project Phase	Team Member	Procurement Method
Task 1 Project Initiation	SANDAG	n/a
Task 2 Project Management	Kimley-Horn	Existing On-call Contract
Task 3 Refinement of System Requirements	SANDAG	n/a
Task 4 System Design		
Software Elements	Delcan	Existing On-call Contract
- Real Time Modeling Subsystem	TSS - Aimsun	Sub to Delcan
- Event Planning Subsystem	Delcan	Existing On-call Contract
Field Infrastructure	Kimley-Horn	Existing On-call Contract
Task 5 System Build		
Software Elements	Delcan	Existing On-call Contract
- Real Time Modeling Subsystem	TSS - Aimsun	Sub to Delcan
- Event Planning Subsystem	Delcan	Existing On-call Contract
Field Infrastructure	Job Order Contractor	Existing Contract
Task 6 System Testing		
Task 7 Training		
Task 8 Systems Operation and Maintenance		
Task 9 Participation in the Analysis, Modeling, and Simulation of the System (AMS)	PATH/Kimley-Horn	
Task 10 Participation in the Evaluation of the System	PATH/Kimley-Horn	
Task 11 Participation in Outreach Programs	Kimley-Horn	

In addition to the above list of procurement processes, the following individuals are authorized to approve purchases for the project:

Name	Role
Alex Estrella	Co-Project Manager (Functional)
Peter Thompson	Co-Project Manager (Technical)

6.4 Type of Contract to be Used

All items and services to be procured for this project will be solicited under existing contractual arrangements as defined in Sections 6.2 and 6.3 above. These will typically be Task Order assignments under the auspices of existing on-call service contracts and will be on the basis of a lump sum per task, based on a pre agreed not to exceed budget and hours estimate.

6.5 Project Information Dissemination to Consultants and Contractors

In order to ensure that consultants and contractors have access to the most current and relevant information about the I-15 ICMS project, the SharePoint collaboration tool will be utilized. Work products and project information will be posted on the site and all consultants and contractors will be provided with login and access arrangements.

Chapter 7. Scope Management Plan

This plan documents the scope management approach; roles and responsibilities as they pertain to project scope; scope definition; verification and control measures; scope change control; and the project's work breakdown structure. Any project communication which pertains to the project's scope will adhere to the Scope Management Plan.

7.1 Scope Management Approach

For this project, scope management will be the sole responsibility of the Project Manager. The scope for this project is defined by the Scope Statement, Work Breakdown Structure (WBS) and WBS Dictionary. The Project Manager, Sponsor and Stakeholders will establish and approve documentation for measuring project scope which includes deliverable quality checklists and work performance measurements.

Proposed scope changes may be initiated by the Project Manager, Stakeholders or any member of the project team. All change requests will be submitted as identified in the Change Control Process. Upon acceptance of the scope change request the Project Manager will submit the scope change request to the Change Control Board for acceptance. Upon approval of scope changes by the Change Control Board the KHA Project Manager will update all project documents and communicate the scope change to all stakeholders. Based on feedback and input from the Project Manager and Stakeholders, the Project Manager is responsible for the acceptance of the final project deliverables and project scope.

7.2 Roles and Responsibilities

The Project Manager and PMT will play key roles in managing the scope of this project. As such, the project sponsor, manager, and team members must be aware of their responsibilities in order to ensure that work performed on the project is within the established scope throughout the entire duration of the project. The table below defines the roles and responsibilities for the scope management of this project.

Table 7-1. Scope Management Roles and Responsibilities

Name	Role	Responsibilities
Alex Estrella	SANDAG Project Manager (Functional)	▪ Contractual Responsibilities ▪ Evaluate need for project change requests ▪ Review of project deliverables ▪ Point of Contact and Oversight for AMS, Training, Operations/Maintenance, Evaluation and Outreach activities

Name	Role	Responsibilities
Peter Thompson	SANDAG Project Manager (Technical)	▪ Coordination with owners of external systems ▪ Evaluate need for project change requests ▪ Review of project deliverables ▪ Point of Contact and Oversight for System Requirements, System Design, System Build and Testing activities
Mike Washkowiak	KHA Project Manager	▪ Participate in impact assessments of scope change requests ▪ Communicate outcomes of scope change requests to team ▪ Facilitate team level change review process ▪ Update project documents upon approval of all scope changes

7.3 Scope Definition

The scope for this project was defined through a comprehensive requirements collection process that started in Stage II and resulted in the development of a Concept of Operations and a System Requirements Document. System requirements are currently under review as part of the USDOT system engineering management process and a system requirements walk through workshop has been held. The system requirements are currently being revised and refined as part of that activity. A requirement's traceability matrix is also being finalized that links requirements to needs.

7.4 Project Scope Statement

The project scope statement provides a detailed description of the project, deliverables, constraints, exclusions, assumptions, and acceptance criteria. Additionally, the scope statement includes what work should not be performed in order to eliminate any implied but unnecessary work which falls outside the of the project's scope.

This project includes the design, installation testing and operation of an integrated corridor management system for the I-15 corridor. This included the integration of existing systems and the development of new decision support software.

7.5 Scope Verification

As this project progresses the Project Manager will verify interim project deliverables against the original scope as defined in the scope statement and WBS. Once the Project Manager verifies that the scope meets the requirements defined in the project plan, the Project Manager and USDOT will meet for formal acceptance of the deliverable. During this meeting the Project Manager will present the deliverable to the USDOT for formal acceptance. The USDOT will, after a suitable review and revision process accept the deliverable by signing a project deliverable acceptance document. This

will ensure that project work remains within the scope of the project on a consistent basis throughout the life of the project.

7.6 Scope Control

The PMT will work together to control of the scope of the project. The PMT will leverage the WBS Dictionary by using it as a statement of work for each WBS element. The project team will ensure that they perform only the work described in the WBS dictionary and generate the defined deliverables for each WBS element. The Project Manager will oversee the project team and the progression of the project to ensure that this scope control process if followed.

If a change to the project scope is needed the process for recommending changes to the scope of the project must be carried out. Any PMT member can request changes to the project scope. All change requests must be submitted to the KHA Project Manager in the form of a project change request document. The KHA Project Manager will then formally submit the change request to the Change Control Board. If the Change Control Board approves the scope change the Project Manager will then formally accept the change by signing the project change control document. Upon acceptance of the scope change by the Change Control Board and Project Manager the KHA Project Manager will update all project documents and communicate the scope change to all project team members stakeholders.

Chapter 8. Schedule Management Plan

The project schedule is the roadmap for how the project will be executed. Schedules are an important part of the I-15 ICM Stage III Project as they provide the project team, sponsor, and stakeholders a picture of the project's status at any given time. The purpose of the schedule management plan is to define the approach the project team will use in creating the project schedule. This plan also includes how the team will monitor the project schedule and manage changes after the baseline schedule has been approved. This includes identifying, analyzing, documenting, prioritizing, approving or rejecting, and publishing all schedule-related changes.

8.1 Schedule Management Approach

Project schedules will be created using MS Project 2007 starting with the activities, milestones and deliverables identified in the project's Work Breakdown Structure (WBS). Activity definition will identify the specific work that must be performed to complete each deliverable. Activity sequencing will be used to determine the order of work packages and assign relationships between project activities. Activity duration estimating will be used to calculate the number of work periods required to complete work packages. Resource estimating will be used to assign resources to work packages in order to complete schedule development.

Once a preliminary schedule has been developed, it will be reviewed by the PMT and any resources tentatively assigned to project tasks. The PMT and resources must agree to the proposed work assignments, durations, and schedule. Once this is achieved the Project Manager review and approve the schedule and it will then be baselined. SANDAG will provide schedule updates and information regarding variances from this base line schedule to the USDOT in a timely fashion.

The following will be designated as milestones for the project schedule:

- Completion of scope statement and WBS
- Baselined project schedule
- Approval of final project budget
- Project kick-off
- Approval of roles and responsibilities
- Requirements definition approval
- Completion of data mapping/inventory
- Project implementation
- Acceptance of final deliverables

Roles and responsibilities for schedule development are as follows:

The KHA Project Manager will be responsible for facilitating work activity definition, sequencing, and estimating duration and resources with the project team. The KHA Project Manager will also create the project schedule using MS Project 2007 and validate the schedule with the PMT. The KHA Project Manager will obtain schedule approval from the PMT and baseline the schedule.

The PMT is responsible for participating in work activity definition, sequencing, and duration and resource estimating. The PMT will also review and validate the proposed schedule and perform assigned activities once the schedule is approved.

The PDT will participate in reviews of the proposed schedule and assist in its validation.

8.2 Schedule Control

The project schedule will be reviewed and updated as necessary on a monthly basis with actual start, actual finish, and completion percentages which will be provided by task owners.

The KHA Project Manager is responsible for holding monthly schedule updates/reviews; determining impacts of schedule variances; submitting schedule change requests; and reporting schedule status in accordance with the project's communications plan.

The PMT is responsible for participating in monthly schedule updates/reviews; communicating any changes to actual start/finish dates to the project manager; and participating in schedule variance resolution activities as needed.

The PMT will maintain awareness of the project schedule status and review/approve any schedule change requests submitted by the project manager.

8.3 Schedule Changes and Thresholds

If any member of the PMT determines that a change to the schedule is necessary, the PT will meet to review and evaluate the change. The project manager and PMT must determine which tasks will be impacted, variance as a result of the potential change, and any alternatives or variance resolution activities they may employ to see how they would affect the scope, schedule, and resources. If, after this evaluation is complete, the KHA Project Manager determines that any change will exceed the established boundary conditions, then a schedule change request must be submitted.

Submittal of a schedule change request to the Project Manager for approval is required if either of the two following conditions is true:

- The proposed change is estimated to reduce the duration of an individual work package by 10% or more, or increase the duration of an individual work activity by 10% or more.
- The change is estimated to reduce the duration of the overall baseline schedule by 10% or more, or increase the duration of the overall baseline schedule by 10% or more.

Any change requests that do not meet these thresholds may be submitted to the Project Manager for approval.

Once the change request has been reviewed and approved the KHA Project Manager is responsible for adjusting the schedule and communicating all changes and impacts to the PMT and PDT. The KHA Project Manager must also ensure that all change requests are archived in the project records repository.

8.4 Scope Change

Any changes in the project scope, which have been approved by the Project Manager, will require the PMT to evaluate the effect of the scope change on the current schedule. If the KHA Project Manager determines that the scope change will significantly affect the current project schedule, he may request that the schedule be re-baselined in consideration of any changes which need to be made as part of the new project scope. The Project Manager must review and approve this request before the schedule can be re-baselined.

Chapter 9. Quality Management Plan

9.1 Quality Management Plan Purpose

The purpose of the Quality Management Plan is to ensure that the project will satisfy the needs for which it was undertaken.

This Quality Management Plan includes all activities of the overall management function that determine the quality policy, quality standards, and responsibilities and implements them by means such as quality planning, quality control, quality assurance and quality improvement.

This document includes quality standards for the process and product, and has established plans to achieve these standards. The project has adjusted the overall project plan and schedule to satisfy these quality standards.

The goals of the project's Quality Management are:

1. The I-15 ICM Stage III Project quality management activities are planned.
2. The I-15 ICM Stage III Project defines measurable quality standards and their priorities for the project.
3. The I-15 ICM Stage III Project progress in achieving the quality standards is quantified and managed.

9.2 Quality Management Approach

Quality Management is defined as, "a subset of project management that includes the processes required to ensure that the project will satisfy the needs for which it was undertaken." It consists of quality planning, quality assurance, and quality control.

The approach for ensuring the appropriate Quality Management activities are conducted will be from the Project Management Institute's (PMI) Standard as described in the Project Management Book of Knowledge (PMBOK). This includes all activities of Quality Management that determine the quality policy, objectives, and responsibilities and implements them by means such as quality planning, quality control, quality assurance, and quality improvements.

For the purpose of this document the term "quality standards" shall refer to both "process" and "product" quality standards. "Process" quality standards will cover political influences, management support, decision drivers, project management, schedule, resourcing, experience, and others. "Product" quality standards will cover product content, development, deployment, environment, technology, maintainability and others.

The project's Quality Management approach adheres to and includes work activities in support of the following quality management processes:

9.2.1 Quality Planning

Identifying and/or verifying quality standards that are relevant to the project and determining how to satisfy them. Quality Planning will involve review of organizational policy, the complexity and uniqueness of the project, and quality templates to identify quality standards and measurements that are relevant to the project, and if not incorporated will result in low quality results creating significant risk to the project. In addition to identifying these quality standards, quality planning involves determining how to satisfy each quality standard via the project schedule, resourcing and internal procedures. The Quality Management plan must address how these quality standards will be implemented, inspected, controlled and reported.

9.2.2 Quality Control

Monitoring specific project results and deliverables to determine if they comply with relevant quality standards and identifying ways to eliminate causes of unsatisfactory performance. Quality Control involves monitoring both the process and products, to determine if the project is meeting the quality standards and identifying ways to mitigate risk or eliminate causes of unsatisfactory results.

9.2.3 Quality Assurance

This involves the periodic executive review and evaluation of the overall project performance to provide confidence that the project will satisfy the relevant quality standards. Quality assurance includes evaluating, identifying, and recommending adjustments to the activities or tasks (and associated resources) that must be performed in the project to provide confidence that the project will satisfy the relevant quality standards.

In support of this approach the project will implement Quality Management, based on the complexity and need of the project as part of the overall work of the project as described in this document. This will include a combination of responsibilities by the PMT and others to ensure quality in the process and products.

The project manager verifies that the Quality Management Plan (QMP) and the project plan, standards, processes and work tasks fit the project's needs, add value, reduce risk and will be usable for performing quality reviews, inspections, and uncovering quality problems throughout the life cycle of the project. The QMP will be implemented using the following tools and activities:

9.2.4 Quality Checklists

As part of the quality planning process the QA/QC Lead will guide the monitoring and measurement of quality standards through the use of Quality Checklists. These combine the selected quality standards with the expected monitoring activities to be used by the quality control process. The checklist is the projects tool to ensure that the quality standards are being met on the project. The checklist includes the following information:

- Schedule for review, who is responsible to perform the task and who is responsible to review,
- Specific review procedure to be followed, i.e. A procedure for schedule analysis, code walk-through, peer review, interviews, lessons learned, test methodology,
- Methodology, verify and record that a set of required inspections have been performed,
- Indicate that the minimum quality standard has or has not been met,

- Record the measurements,
- Identify the expected risk cue or measurement,
- Indicate the expected acceptability or tolerance,
- Indicate the rank of only the quality standards where risk was found unacceptable,
- Indicate change in risk rank since previous review, and
- Indicate a reference which will describe what was reviewed, who was interviewed, and the information or reasoning that this quality standard causes risk.

9.2.5 Quality Control

The assigned QA/QC Lead will review project activities, interview, and inspect specified work product deliverables throughout the life of the project to verify compliance and provide the SANDAG Project Manager, PMT and other management with visibility as to whether the project is adhering to its established plans, process and product quality standards, and associated quality work tasks.

The QA/QC Lead will identify, document, and track deviations to closure and verify that corrections have been made. The QA/QC Lead will address issues within the PMT first for resolution. Issues not resolvable within the PMT will be escalated to the SANDAG Project Manager for resolution.

9.2.6 QC Reviews

The QA/QC Lead will conduct scheduled periodic Quality Control Reviews by following the Quality Management Plan. The deliverable will be a checklist indicating that the reviews for the process and products in the current period have been completed, measured, ranked and reported by the reviewer(s). The completed checklist will be reviewed with the Project Management Team and the results will be the input to the Quality Status and Improvements Report.

9.2.7 Quality Control Change Requests and Tracking

The QA/QC Lead will develop and submit written recommendations for improvement, verify corrections have been made, and track and document to closure using the project's change management process, change request forms, and change tracking tool. The change request form will define the requested change, analyze the change impact in modified work descriptions, schedule, and cost values, and recommend a solution. The change-tracking tool will indicate the current status of all the recommendations, including those that the organization doesn't agree with. The SANDAG Project Manager will decide which recommendations to implement. If the change is to be implemented the KHA Project Manager will update the project plan and assign implementation responsibility. The QA/QC Lead will follow-up to verify that the change or correction was made and indicate status and closure on the finding.

9.2.8 Quality Assurance

The QA/QC Lead will provide overall quality consultation, periodically examine Quality Control Reviews results, checklists, change requests and tracking, and summarize the results for executive review and oversight throughout the life of the project. The QA/QC Lead will also participate in facilitated lessons-learned sessions with the PMT.

The facilitated lessons learned sessions will take place as part of the Risk Register reviews. These will be held on a bi-monthly basis as part of the scheduled PMT meetings. In reviewing the current risk management situation, the opportunity will be taken to identify, describe and define lessons learned. This will be considered in conjunction with current risk status as it is expected that many of the lessons learned will relate to the avoidance, mitigation and management of the risks identified in the Risk Register. The lessons learned sessions will be facilitated by the KHA Project Manager and will take the form of an open discussion of practical experiences and lessons learned to date. The facilitator will conduct the session in a manner that encourages discussion of lessons learned and consideration of the consequences for the current project and future ones.

The Risk Register will be amended to include a new column titled “lessons learned” and the information from the sessions will be captured there. USDOT staff will be invited to participate.

9.2.9 QA Status and Improvement Report

The QA/QC Lead will periodically create and deliver the - QA Status and Improvement Report which will contain the following elements:

- Executive Summary paragraph of the entire report, containing the following information;
  - A brief description the primary achievement in the last period.
  - A brief description of the highest ranked primary (if any) quality risks covered in the following detail of the report.
  - A brief description of the impact or consequence of the risk if left unresolved.
- Summary of the Current Progress Points followed by major milestones.
- Brief project effectiveness statements on all the high level activities. Activities where no risks were identified should simply be indicated in one line, for example, Decision Drivers – no risks currently identified, or not evaluated at this time.
- Risks Resolved Since Last Period. Provide the previous risk rank, and brief status or the actions taken on risks and results.

The QA Status and Improvements Report will be submitted to the PMT for review and determination of completeness and accuracy of facts, before presentation or delivery to others within the project and approval by the SANDAG Project Manager. The roles and responsibilities of each participant are summarized in Table 9-1.

Table 9-1. Roles and Responsibilities for QA/QC

Activity	Creation/action	Review	Approve
plan	QA/QC lead	PMT	SANDAG PM
checklists	QA/QC lead	PMT	SANDAG PM
control	QA/QC lead	PMT	SANDAG PM
reviews	QA/QC lead	PMT	SANDAG PM
change requests and tracking	QA/QC lead	PMT	SANDAG PM
assurance	QA/QC lead	PMT	SANDAG PM
status and improvement report	QA/QC lead	PMT	SANDAG PM

Chapter 10. Risk Management Plan

10.1 Introduction

The purpose of this plan is to document policies and procedures for identifying and handling uncommon causes of project variation (i.e. risk). Risk should be thought of as the possibility of suffering a negative impact to the project, whether it be through decreased quality, increased cost, delayed completion, or project failure.

10.1.1 Intended Audience

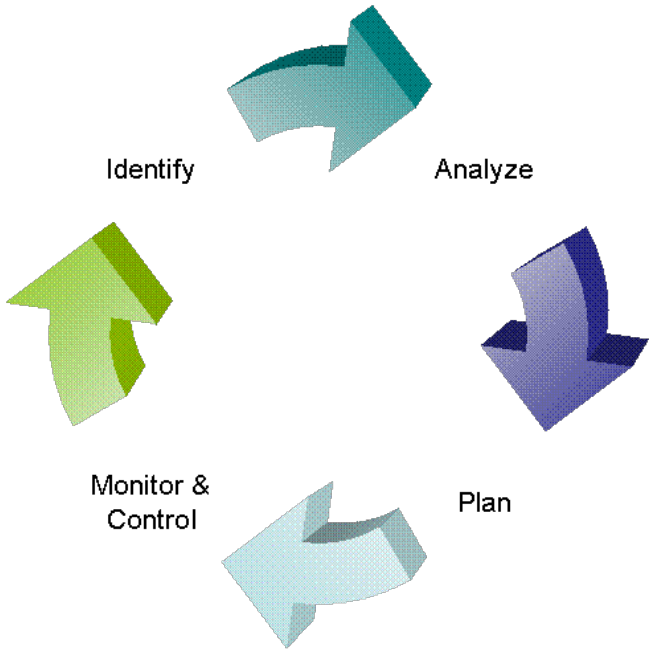
The intended audience for the risk management plan is as follows:

- Project Management Team
- Consulting/contractor teams
- Project Development Team
- Senior Managers

10.2 Risk Management Approach

The overall risk management approach follows the standard risk management model as show in the diagram on the following page.

Figure 10-1. Risk Management Approach



10.2.1 Risk Identification

During risk identification, the sources of risk, potential risk events, and symptoms of risk are identified.

10.2.2 Risk Analysis

During risk analysis, the value of opportunities to pursue vs. the threats to avoid, and the opportunities to ignore vs. the threats to accept are assessed.

10.2.3 Response Planning

During response planning, risk management and contingency plans are developed.

10.2.4 Risk Monitoring and Control

During risk monitoring and control, corrective action plans are developed, implemented, and monitored.

10.3 Roles and Responsibilities

10.3.1 Project Manager

The Project Manager is responsible for approval of the risk management plan (this document), leads and participates in the risk management process, and takes ownership of risk mitigation/contingency planning and execution. The Project Manager is ultimately responsible for the final decision on risk actions, in coordination with the project sponsors.

10.3.2 Project Management team (PMT)

PMT members participate in the risk identification process and discuss risk monitoring and mitigation activities at team meetings.

10.3.3 Quality Assurance Lead

The quality assurance (QA) lead is responsible for ensuring identified risks are being managed per the risk management plan. The QA lead also assist in identifying new risks and/or proposing mitigation strategies and contingency plans, along with proposing improvements to the risk management plan and processes. This role is assigned to David Sorenson, P.E. from Kimley-Horn and Associates Inc.

10.3.4 Project Development Team (PDT)

The PDT members assist in monitoring risk action effectiveness and participate in risk escalation, as necessary.

10.4 Risk Identification

10.4.1 Background

During risk identification potential sources of risk and potential risk events are developed. Pre-defined risk categories provide a structure that helps to ensure that a systematic process is followed to identify risks.

After identifying and categorizing the risk event, it is entered into the risk register.

10.4.2 Sources

Risk identification is done throughout the life-cycle of the project, although a majority of the risks have been identified early on so proper response planning and monitoring can occur. The following tools and techniques have been, and will continue to be utilized for risk identification:

- Development and agreement of a Risk Register
- Analysis of high-level deliverables
- Analysis of the WBS and project schedule
- Analysis of scope change requests
- Analysis of project assumptions
- Stakeholder and sponsor input
- Formal risk identification sessions as part of PMT meetings
- Previous lessons learned
- QA audits and reviews
- Performance and status reports

10.4.3 Documentation

All identified risks have been documented and entered into the Risk Register which is kept by the KHA Project Manager. During risk identification, the following information was documented:

- ID Number
- Description
- Risk Category
- Trigger
- Potential outcome
- Raised By
- Date Raised
- Source

The risk trigger is the event that would need to happen in order for the potential outcome to occur. Risk triggers are usually expressed with some sort of dependency, or qualifier. When the risk trigger occurs, the risk is no longer a risk, but has materialized into a problem/issue that needs resolution.

10.5 Risk Analysis

10.5.1 Background

After a risk or group of risks has been identified and documented, risk analysis was performed. During risk analysis, each potential risk event was analyzed for:

- The probability that the risk will occur
- The impact of the risk if it occurs

Each of the risks that have been identified were evaluated based upon the Project Management Team's understanding of the project team members, the existing working relationships and the systems identified for implementation. The probabilities of the risk occurring were ranked either very low, low, probable, high, and very high; while impacts of the risks were ranked either very low, low, moderate, high and very high. Each of these probability and impact rankings were assigned a numerical value which were multiplied together to establish the Risk Matrix Score.

10.5.2 Documentation

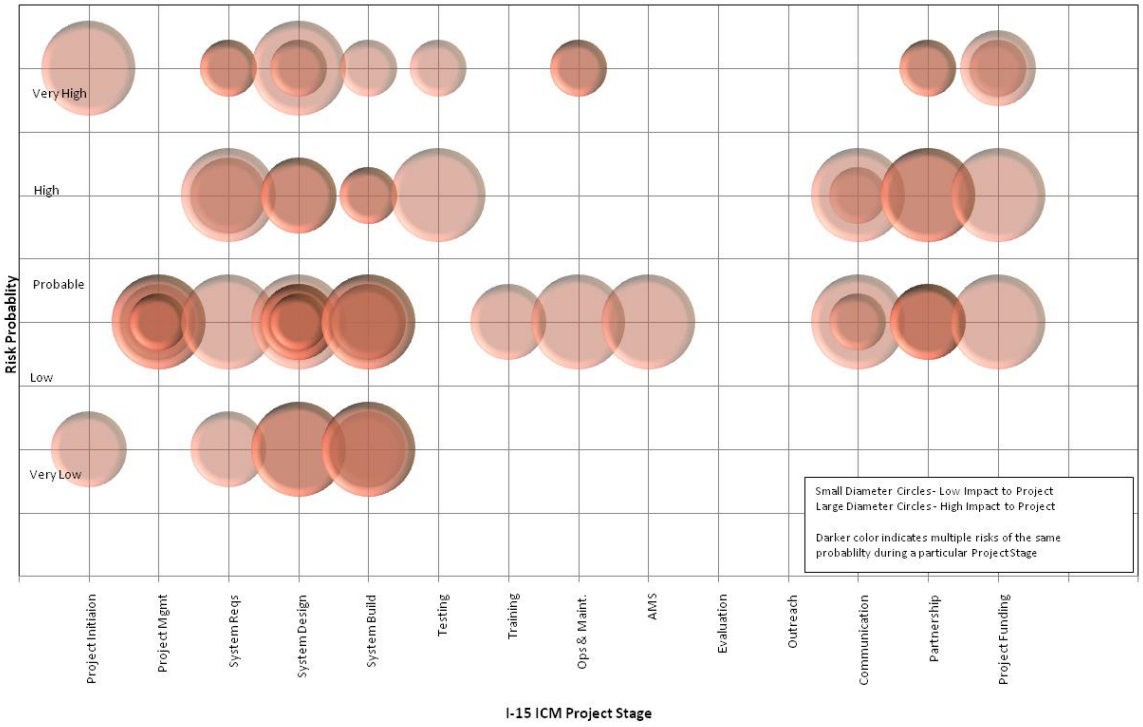
The results of risk analysis should be documented in the risk register. The following information shall be entered in the register:

- Risk impact
- Risk probability
- Risk matrix score – computed by the risk register spreadsheet after impact and probability are entered

The initial Risk Analysis has been completed for the project and is included in Risk Register contained in Appendix B. Figure 10-2 provides a summary of the project risks as they associate with the various stages of the project (x-axis). The vertical (y-axis) provides the anticipated probability that the risk will

be triggered; while the diameter of the circle identifies the impact the risk is anticipated to have on the project (small diameter = very low impact, large diameter = very high impact). Finally, instances of multiple circles atop one another identify locations where multiple risks share the project stage and the same probability of occurring.

Figure 10-2. Risk Probability and Impact Versus Project Stage



10.6 Response Planning

10.6.1 Background

During response planning, strategies and plans were developed to minimize the effects of the risk to a point where the risk can be controlled and managed. Higher priority risks received more attention during response planning than lower priority risks. Every risk threat was be assigned an owner during response planning.

10.6.1 Risk Strategies

There are several methods for responding to risks.

10.6.1.1 Avoid

Risk avoidance involves changing aspects of the overall project management plan to eliminate the threat, isolating project objective's from the risk's impact, or relaxing the objectives that are in threatened (e.g. extending the schedule or reducing the scope). Risks that are identified early in the

project can be avoided by clarifying requirements, obtaining more information, improving communications, or obtaining expertise.

10.6.1.2 Transfer

Risk transference involves shifting the negative impact of a threat (and ownership of the response) to a third party. Risk transference does not eliminate a threat, it simply makes another party responsible for managing it.

10.6.1.3 Mitigate

Risk mitigation involves reducing the probability and/or the impact of risk threat to an acceptable level. Taking early and pro-active action against a risk is often more effective than attempting to repair the damage a realized risk has caused. Developing contingency plans are examples of risk mitigation.

10.6.1.4 Accept

Acceptance is often taken as a risk strategy since it is very difficult to plan responses for every identified risk. Risk acceptance should normally only be taken for low-priority risks (see Section 4.1). Risk acceptance can be passive, where no action is taken at all, or active. The most common active approach to risk acceptance is to develop a cost and/or schedule reserve to accommodate known (or unknown) threats.

10.6.3 Documentation

The results of response planning are documented in the risk register. The following information was entered in the register:

- Response strategy (avoid, transfer, mitigate, or accept)
- Response notes (description of plan) – if a mitigation approach is taken, specific trigger points that require aspects of the contingency plan to be executed should be documented
- Risk owner

10.7 Risk Monitoring and Control

10.7.1 Background

Planned risk will be executed as required over the life-cycle of the project and the project will be continuously monitored for new and changing risks. During risk monitoring and control the following tasks were performed:

- Identification and analysis of new risks and appropriate planning for new risks
- Tracking of identified risks and monitoring of trigger conditions
- Review of project performance information (such as progress/status reports, issues, and corrective actions)
- Re-analysis of existing risks to see if the probability, impact, or proper response plan has changed

- Review of the execution of risk responses and analyze their effectiveness
- Ensuring proper risk management policies and procedures are being utilized

10.7.2 Documentation

The results of risk monitoring and control are documented in the risk register. The following information was entered in the register:

- Status
- Identified – Risk documented, but analysis not performed
- Analysis Complete – Risk analysis done, but response planning not performed
- Planning Complete – Response planning complete
- Triggered – Risk trigger has occurred and threat has been realized
- Resolved – Realized risk has been contained
- Retired – Identified risk no longer requires active monitoring (e.g. risk trigger has passed)
- Trigger Date – if the risk has been triggered
- Notes

Chapter 11. Staffing Management Plan

11.1 Introduction

The purpose of the Staff Management Plan is to capture 'how' the project manager will manage staff resources throughout the life of the project. The Staff Management Plan will help to ensure that the project has sufficient staff possessing the correct skill sets and experience to ensure a successful project completion.

11.2 Scope

The Staff Management Plan identifies the process and procedures used to manage staff throughout the project's life. It describes the planning and acquisition of both public agency staff and consulting staff, describes the responsibilities assigned to each staff, and discusses transition of staff to other assignments.

11.3 Staff Management Approach

The staff management process for the project consists of the following five elements: Staff Planning, Staff Acquisition, Staff Training, Staff Tracking, and Staff Transition.

11.3.1 Staff Planning

The activities and intended deliverables for the project were analyzed and a staffing plan depicted by the organization chart, was developed.

11.3.2 Staffing Estimates

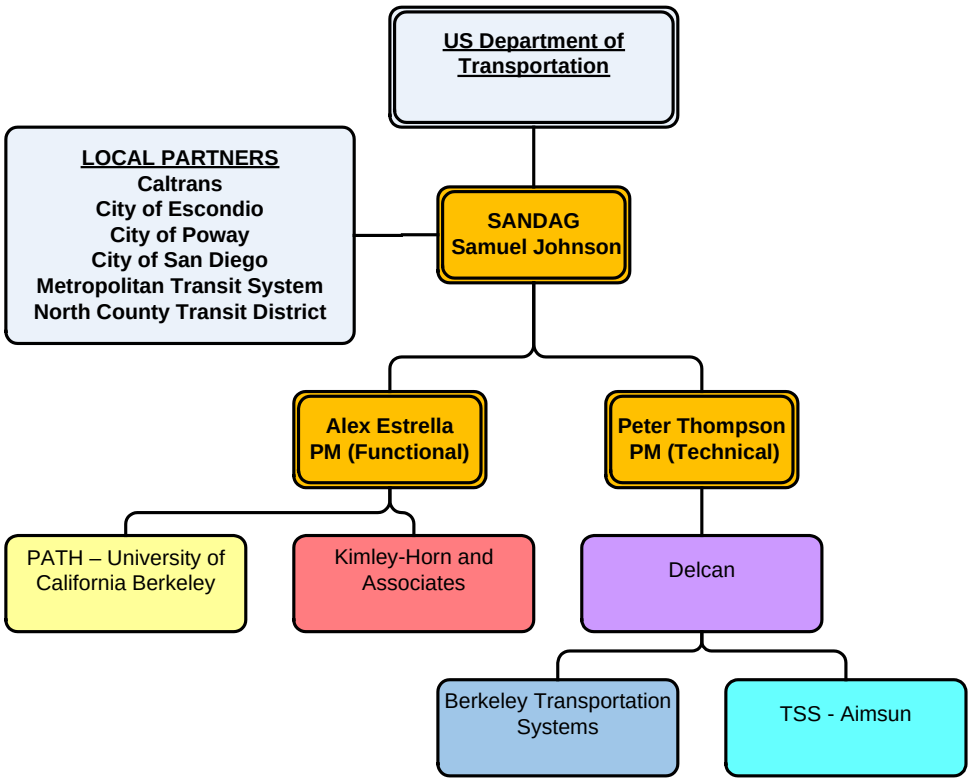
The project's estimated staff requirement by phase was defined and incorporated into a Microsoft Project WBS and resource plan for the project.

11.3.3 Staffing Assumptions and Constraints

A major element in the SANDAG approach to ICM Stage III is the use of significant external resources to satisfy the staffing and some of the management needs of the project. Internal resources to be utilized have been constrained to overall project management and certain key technical specialties such as simulation modeling.

The organization chart for the project was shown in Project Management Approach section of this document and is reproduced here for ease of reference.

Figure 11-1. Project Organization Chart



11.3.4 Staffing Acquisition

Staffing for the project will primarily be acquired through the procurement of external planning, design, system development and implementation resources as detailed in the Procurement Plan section of this PMP.

11.3.5 Staff Training

When new staff joins the project, the KHA Project Manager will provide an orientation to the project. The orientation will address the following topics:

- Background of the Project
- Current Status of the Project
- Specific Job Duties and Expectations
- Introduction to the staff and PMT
- Overview of the Facility and Infrastructure
- Overview of the Project Processes, time reporting, attendance, and status meetings
- Review of Confidentiality and Conflict of Interest

References

[1] Project Management Body of Knowledge (PMBOK), A Guide to the Project Management Body of Knowledge (Project Management Institute), Trade paperback (2009), by the Project Management Institute

[2] I-15 ICM Stage II Concept of Operations, USDOT

APPENDIX A. Work Breakdown Structure

1	**Pre-Project Initiation Efforts**
1.1	USDOT ICM Award Notification
1.2	Manage SANDAG Contracts "Pre-Award Audit"
1.3	Complete/Execute Consultant Team Procurements
1.3.1	Project Mgmt Consultant
1.3.2	System Design Team
1.3.3	I-15 ICM Stage III Project Kick-off Meeting
2	**Project Management**
2.1	Project Management and Administration
2.1.1	Internal Kick-off Meeting
2.1.2	PDT Meeting
2.1.2.1	PDT Meeting 1
2.1.2.2	PDT Meeting 2
2.1.2.3	PDT Meeting 3
2.1.2.4	PDT Meeting 4
2.1.2.5	PDT Meeting 5
2.1.2.6	PDT Meeting 6
2.1.2.7	PDT Meeting 7
2.1.2.8	PDT Meeting 8
2.1.2.9	PDT Meeting 9
2.1.2.10	PDT Meeting 10
2.1.2.11	PDT Meeting 11
2.1.2.12	PDT Meeting 12
2.1.2.13	PDT Meeting 13
2.1.2.14	PDT Meeting 14
2.1.2.15	PDT Meeting 15
2.1.2.16	PDT Meeting 16
2.1.2.17	PDT Meeting 17
2.1.2.18	PDT Meeting 18
2.1.2.19	PDT Meeting 19
2.1.2.20	PDT Meeting 20
2.1.2.21	PDT Meeting 21
2.1.2.22	PDT Meeting 22
2.1.2.23	PDT Meeting 23
2.1.2.24	PDT Meeting 24
2.1.2.25	PDT Meeting 25
2.1.2.26	PDT Meeting 26
2.1.2.27	PDT Meeting 27
2.1.2.28	PDT Meeting 28
2.1.2.29	PDT Meeting 29
2.1.2.30	PDT Meeting 30
2.1.2.31	PDT Meeting 31
2.1.2.32	PDT Meeting 32
2.1.2.33	PDT Meeting 33
2.1.2.34	PDT Meeting 34
2.1.2.35	PDT Meeting 35

2.1.2.36	PDT Meeting 36
2.1.2.37	PDT Meeting 37
2.1.2.38	PDT Meeting 38
2.2	Project Initiation Documentation
2.2.1	Project Management Plan
2.2.1.1	Develop PMP
2.2.1.2	Submit for SANDAG Comment: PMP [DRAFT]
2.2.1.3	SANDAG Review: PMP
2.2.1.4	Incorporate SANDAG review comments into PMP
2.2.1.5	Submit for Stakeholder Comment: PMP [DRAFT]
2.2.1.6	Stakeholder Review: PMP
2.2.1.7	Incorporate Stakeholder review comments into PMP
2.2.1.8	Submit for Approval: PMP [FINAL]
2.2.1.9	Receive USDOT concurrence to proceed
2.2.2	Systems Engineering Management Plan (SEMP)
2.2.2.1	Develop SEMP
2.2.2.2	Submit for SANDAG Comment: SEMP [DRAFT]
2.2.2.3	SANDAG Review: SEMP
2.2.2.4	Incorporate SANDAG review comments into SEMP
2.2.2.5	Submit for Stakeholder Commentl: SEMP [DRAFT]
2.2.2.6	Stakeholder Review: SEMP
2.2.2.7	Incorporate Stakeholder review comments into SEMP
2.2.2.8	Submit for Approval: SEMP [FINAL]
2.2.2.9	Stakeholder Review: SEMP [FINAL]
2.3.1	Weekly Project Status Reports
2.3.1.1	Weeks 1-52
2.3.1.2	Weeks 53 - 104
2.3.1.3	Weeks 105 - 157
2.3.2	Monthly Project Development Team Stakeholder Reports
2.3.2.1	Year 1
2.3.2.1.1	MSPY1M1-3
2.3.2.1.2	MSPY1M4-6
2.3.2.1.3	MSPY1M7-9
2.3.2.1.4	MSPY1M10-"Year End Summary Report"
2.3.2.2	Year 2
2.3.2.2.1	MSPY2M1-3
2.3.2.2.2	MSPY2M4-6
2.3.2.2.3	MSPY2M7-9
2.3.2.2.4	MSPY1M10-"Year End Summary Report"
2.3.2.3	Year 3
2.3.2.3.1	MSPY3M1-3
2.3.2.3.2	MSPY3M4-6
2.3.2.3.3	MSPY3M7-9
2.3.2.3.4	MSPY1M10-"Year End Summary Report"
3	**System Requirements & Concept of Operations Review**
1.3.1	Conduct Requirements Walk-through Workshop
1.3.2	Update System Requirements Specification
1.3.3	Submit for Stakeholder Comment: SysReqs / ConOps [DRAFT]
1.3.4	Stakeholder Review: SysReqs / ConOps [DRAFT]
1.3.5	Incorporate Stakeholder review comments

1.3.6	Confirm PDT Acceptance of SysReqs/ConOps
1.3.7	Submit for Acceptance: Sys Reqs/Con Ops [FINAL]
1.3.8	Receive USDOT Concurrence to Proceed
4	**System Design**
4.1	Project Management Tracking - Summary
4.1.1	Conduct "Development Team" Kick-Off Meeting (in - person)
4.1.2	Stakeholder Comment Period Begins: SDDD [PRELIMINARY]
4.1.2.1	PDT Review: Field Elements SDDD [40%]
4.1.2.2	SANDAG Review: SDDD [40%]
4.1.2.3	Conduct Stakeholder "Design Review" Overview Session: [SDDD 40%]
4.1.2.4	Stakeholder Review: SDDD [40%}
4.1.2.5	Conduct Stakeholder "Design Review" Walkthrough: [SDDD 40%]
4.1.2.6	Receive USDOT Concurrence to Proceed [PRELIMINARY]
4.1.3	Stakeholder Comment Period Begins: SDDD [CRITICAL]
4.1.3.1	SANDAG Review: SDDD [90%]
4.1.3.2	Conduct Stakeholder "Design Review" Overview Session: [SDDD 90%]
4.1.3.3	PDT Review: SDDD [90%]
4.1.3.4	PDT Review: Field Elements SDDD [90%]
4.1.3.5	USDOT Review: SDDD [90%]
4.1.3.6	Conduct USDOT Design Review Walkthrough: 90%
4.1.3.7	Receive USDOT Concurrence to Proceed [CRITICAL]
4.1.4	Stakeholder Acceptance Period Begins: SDDD [FINAL]
4.1.4.1	SANDAG review of consultant FINAL submissions
4.1.4.2	Distribute System Detailed Design Document [FINAL]
4.1.4.3	Receive USDOT Concurrence to Proceed [FINAL]
4.2	Interfaces Design
4.2.1	Analysis of ICM Related Systems
4.2.2	Develop Interface Gap Analysis / Architectural Alternatives Analysis
4.2.3	Develop Preliminary Detailed Design [40%]
4.2.4	Submit to SANDAG for Stakeholder Review: Interface SDDD [40%]
4.2.5	Incorporate review comments into Interface SDDD [40%]
4.2.6	Develop Critical Detailed Design [90%]
4.2.7	Submit to SANDAG for Stakeholder Review: Interface SDDD [90%]
4.2.8	Incorporate review comments into Interface SDDD [90%]
4.2.9	Develop Multi-Modal Interfaces System Detailed Design [FINAL]
4.2.10	Submit to SANDAG for Stakeholder Review: Interface SDDD Chapter
4.3	Event Modeling Sub-System
4.3.1	Analysis of ICM Related Systems
4.3.2	Conduct Scoping Analysis of AMS Network Calibration
4.3.3	Develop Preliminary Detailed Design [40%]
4.3.4	Submit to SANDAG for Stakeholder Review: Modeling SDDD [40%]
4.3.5	Incorporate review comments into Modeling SDDD [40%]
4.3.6	Develop Critical Detailed Design [90%]
4.3.7	Submit to SANDAG for Stakeholder Review: Modeling SDDD [90%]
4.3.8	Incorporate PDT review comments into Modeling SDDD [90%]
4.3.9	Develop Real-Time Modeling Sub-System Detailed Design [FINAL]
4.3.10	Submit to SANDAG for Stakeholder Review: Modeling SDDD [FINAL]
4.4	DSS & TPT
4.4.1	Conduct VCTMC "Use Case Workshops"
4.4.2	Develop Use Case Specification
4.4.3	Develop Use Case Model
4.4.4	"Update" Business Owners View
4.4.5	Generate Development Case

4.4.6	Create Deployment Plan
4.4.7	Create Domain Model
4.4.8	Create Design Model
4.4.9	Create Component Diagram
4.4.10	Develop Preliminary Detailed Design [40%]
4.4.11	Submit to SANDAG for Stakeholder Review: System SDDD [40%]
4.4.12	Incorporate review comments into System SDDD [40%]
4.4.13	Develop Critical Detailed Design [90%]
4.4.14	Submit to SANDAG for Stakeholder Review: System SDDD [90%]
4.4.15	Incorporate review comments into System SDDD [90%]
4.4.16	Develop System Detailed Design [FINAL]
4.4.17	Submit to SANDAG: Sub-System SDDD Chapter
4.5	Additional Field Elements
4.5.1	Conduct Field Inventory Surveys
4.5.2	Perform Technology Alternatives Analysis
4.5.3	Develop Preliminary Design [40%]
4.5.4	Submit to SANDAG for Stakeholder Review: Field Elements SDDD [40%]
4.5.5	Incorporate PDT review comments into Field Elements SDDD [40%]
4.5.6	Develop Detailed Design [90%]
4.5.7	Submit to SANDAG for Stakeholder Review: Field Elements SDDD [90%]
4.5.8	Develop Field Element Design [FINAL]
4.5.9	Submit Field Elements [FINAL] for Construction
4.5.10	Submit to SANDAG: Field Element SDDD Chapter
5	**System Build**
5.1	Management Tracking Summary Elements
5.1.1	Conduct "Development Team" Kick-Off Meeting
5.1.2	Stakeholder Comment Period Begins: [PRELIMINARY SUBMISSION]
5.1.2.1	SANDAG Review: Consultant 40% Submissions
5.1.2.2	Conduct Stakeholder Overview Session: System Documentation & BETA software 40%
5.1.2.3	PDT Review: System Documentation & BETA software release 40%
5.1.2.4	USDOT Review: System Documentation & BETA software release 40%
5.1.2.5	Conduct Stakeholder System Walkthrough 40%
5.1.2.6	Receive USDOT Concurrence to Proceed [PRELIMINARY]
5.1.4	Stakeholder Comment Period Begins: [CRITICAL SUBMISSION]
5.1.4.1	SANDAG Review: Consultant 90% Submissions
5.1.4.2	Conduct Stakeholder Overview Session: System Documentation & BETA software 90%
5.1.4.3	PDT Review: System Documentation & BETA software release 90%
5.1.4.4	USDOT Review: System Documentation & BETA software release 90%
5.1.4.5	Conduct Stakeholder System Walkthrough 90%
5.1.4.6	Receive USDOT Concurrence to Proceed [CRITICAL]
5.1.6	Stakeholder Comment Period Begins: [FINAL]
5.1.6.1	SANDAG Review of consultant FINAL submissions
5.1.6.2	Conduct Stakeholder Overview Session: System Documentation & BETA software 90%
5.1.6.3	Distribute System Documentation and BETA software FINAL.
5.1.6.4	PDT Review: System Documentation & BETA software release FINAL
5.1.6.5	USDOT Review: System Documentation & BETA software release FINAL
5.1.6.6	Conduct Stakeholder System Walkthrough FINAL
5.1.6.7	Receive USDOT Concurrence to Proceed
5.2	Multi-Modal Interfaces
5.2.1	Conduct "Development Sub-Team" Review Meeting

5.2.2	Create Phase Plan [Chapter Submission]
5.2.3	Create Measurement Plan [Chapter Submission]
5.2.4	Create Risk Plan [Chapter Submission]
5.2.5	Create Problem Resolution Plan [Chapter Submission]
5.2.6	Create Product Acceptance Plan [Chapter Submission]
5.2.7	Submit to SANDAG for Stakeholder Review: Software Development Plan, Design Diagrams, System Maintenance Manuals [40%]
5.2.8	Incorporate Stakeholder [40% submissions] comments
5.2.9	Code Multi-Modal Interfaces
5.2.10	Update Interface Control Documents
5.2.11	Develop System Maintenance Manuals
5.2.12	Submit to SANDAG for Stakeholder Review: Software Development Plan, Design Diagrams, System Maintenance Manual [90%]
5.2.13	Incorporate Stakeholder [FINAL] Comments
5.2.14	Submit to SANDAG for Acceptance: Software Development Plan, Design Diagrams, System Maintenance Manual [FINAL]
5.3	Event Modeling Sub-System
5.3.1	Conduct "Development Sub-Team" Review Meeting
5.3.2	Create Measurement Plan [Chapter Submission]
5.3.3	Create Risk Plan [Chapter Submission]
5.3.4	Create Problem Resolution Plan [Chapter Submission]
5.3.5	Create Product Acceptance Plan [Chapter Submission]
5.3.6	Data Preparation & Model Coding
5.3.6.1	Migrate Geometric Network Configuration
5.3.6.2	Import existing Demand and Control Data
5.3.6.3	Integrate with Data Bus for "Real-Time" data
5.3.6.4	Collect Calibration Data
5.3.6.5	Code Simulation Model for "Real-Time" data
5.3.6.6	Perform Error Checking
5.3.7	Submit to SANDAG for Stakeholder Review: Simulation Engine [40%] complete
5.3.8	Incorporate stakeholder review comments: [40%]
5.3.9	Response Plan Database Development
5.3.10	Model Calibration
5.3.10.1	Perform Validation, Verification and Calibration
5.3.10.2	First Stage: Error Checking
5.3.10.3	Second Stage: Error Checking
5.3.10.4	Third Stage: Error Checking
5.3.10.5	Fourth Stage: Overall Review
5.3.10.6	Update "Product Acceptance Plan" with Calibration Targets
5.3.10.7	Review Animation Output
5.3.10.8	Perform Validation Against Fundamental Traffic Flow Relationship
5.3.11	Develop System Maintenance Manuals
5.3.12	Develop Design Diagrams
5.3.13	Submit to SANDAG for Stakeholder Review: Software Development Plan, Design Diagrams, System Maintenance Manual [90%]
5.3.14	Incorporate stakeholder review comments: [90%]
5.3.15	Submit to SANDAG for Stakeholder Review: Software Development Plan, Design Diagrams, System Maintenance Manual [FINAL]
5.4	DSS & TPT
5.4.1	Conduct "Development Sub-Team" Review Meeting
5.4.2	Tracking
5.4.2.1	Submit to SANDAG for Stakeholder Review: Software Development Plan & Software Beta Release [40%]
5.4.2.2	Incorporate Review Comments: [40%] Submission

5.4.2.3	Submit to SANDAG for Stakeholder Review: Software Development Plan & Software Beta Release [90%]
5.4.2.4	Incorporate USDOT review comments: [90%] Submission
5.4.2.5	Submit to SANDAG for Stakeholder Review: Software Development Plan & Software Beta Release [FINAL]
5.4.3	Produce Software Development Plan
5.4.3.1	Create Phase Plan [Chapter Submission]
5.4.3.2	Create Measurement Plan [Chapter Submission]
5.4.3.3	Create Risk Plan [Chapter Submission]
5.4.3.4	Create Problem Resolution Plan [Chapter Submission]
5.4.3.5	Create Product Acceptance Plan [Chapter Submission]
5.4.3.6	Develop System Maintenance Manuals
5.4.3.7	Develop Design Diagrams
5.4.4	Develop DSS & BPRMS System
5.4.4.1	Code Graphical User Interface
5.4.4.2	Code Business Rules and Process Management Engine
5.4.5	Develop Traffic Prediction Tool
5.4.5.1	Data Preparation & Model Coding
5.4.5.1.1	Migrate Geometric Network Configuration
5.4.5.1.2	Import existing Demand and Control Data
5.4.5.1.3	Integrate with Data Bus for "Real-Time" data
5.4.5.1.4	Collect Calibration Data
5.4.5.1.5	Code Prediction Tool for "Real-Time" data
5.4.5.1.6	Perform Error Checking
5.4.5.2	Model Calibration
5.4.5.2.1	Perform Validation, Verification and Calibration
5.4.5.2.2	First Stage: Error Checking
5.4.5.2.3	Second Stage: Error Checking
5.4.5.2.4	Third Stage: Error Checking
5.4.5.2.5	Fourth Stage: Overall Review
5.4.5.2.6	Update "Product Acceptance Plan" with Calibration Targets
5.4.5.2.7	Perform Validation Against Fundamental Traffic Flow Relationship
5.5	Additional Field Element Construction
5.5.1	Obtain Contractor Bids
5.5.2	Establish Contract for Construction
5.5.3	Review of Contractor Shop Drawings
5.5.4	Permitting and Equipment Procurement
5.5.5	Construction of Field Elements
6	**System Acceptance Testing**
6.1	Prepare Draft Acceptance Test Plans
6.2	Conduct Acceptance Test Readiness Review
6.3	Submit for Comment: Acceptance Test Readiness Review [DRAFT]
6.4	USDOT review of Acceptance Test Readiness Review
6.5	Incorporate USDOT comments into final version of Acceptance Test Readiness Review
6.6	USDOT concurrence to proceed
6.7	Conduct Acceptance Testing
6.8	Produce Acceptance Test Reports
6.9	Submit for Approval: Acceptance test reports
6.10	USDOT review of testing arrangements and results
6.11	Receive USDOT concurrence to proceed
7	**Training**
7.1	Milestone Tracking

7.1.1	Submit for PDT Comment: Training Plan/Materials [DRAFT]
7.1.2	PDT Review: Training Plan/Materials [DRAFT]
7.1.3	Submit to SANDAG for USDOT Comment: Training Plan/Materials [DRAFT]
7.1.4	USDOT Review: Training Plan/Materials [DRAFT]
7.1.5	Submit for USDOT Approval: Training Plan/Materials [FINAL]
7.1.6	Receive USDOT concurrence to proceed
7.2	Conduct ICMS Training Analysis
7.3	Design ICMS Training Program
7.4	Develop ICMS Training Program Materials
7.5	Develop ICMS Training Plan
7.6	Incorporate PDT review comments into Training Plan/Materials [DRAFT]
7.7	Incorporate USDOT review comments
7.8	Implement ICMS Training Program
7.9	Completion of training
8	**System Operations and Maintenance**
8.1	Analyze Operations and Maintenance Needs of the ICMS
8.2	Conduct ICMS Training Program Evaluation
8.3	Develop Operations and Maintenance Plan
8.4	Develop Operations and Maintenance Reports
8.5	Operate and Manage System
9	**Participation in the AMS for the ICMS**
9.1	Pre-Deployment AMS Plan
9.2	Pre-Deployment Site Data Collection Plan
9.3	Conduct AMS Pre-deployment ("Before") site data collection
9.4	Post-Deployment AMS Plan
9.5	Post-Deployment Site Data Collection Plan
9.6	Conduct AMS Data Collection for ("After") Calibration
9.7	Post-Demonstration AMS Transition Plan
10	**Participation in the Evaluation of the System**
10.1	Coordination with National Evaluation Contractor
10.2	Demonstration Project Evaluation Plan (Outline, Evaluation Tools)
10.3	Demonstration Project Evaluation - Pre Implementation Data Collection Memorandum
10.4	Demonstration Project Pre- Evaluation - Baseline ("Before") Data Collection
10.5	Demonstration Project Evaluation - Post Implementation Data Collection Memorandum
10.6	Demonstration Project Post- Evaluation ("After") Data Collection
10.7	Draft Demonstration Project Evaluation Plan
10.8	Revised and Final Demonstration Project Evaluation Plan
11	**Participation in Outreach Programs**
11.1	Participation in Six Pioneer Workshops
11.2	Other National Outreach Activities
11.3	Demonstration Project Outreach Communications Plan - Draft
11.4	Demonstration Project Outreach Communications Plan - Draft and Final
11.5	Demonstration Project Local Outreach Activities
11.6	Demonstration Project Outreach Presentations/Lesson-Learned Updates As Appropriate
11.7	Participation in the Final National ICM Conference

APPENDIX B. Risk Register

The updated Risk Register is maintained on the Project SharePoint site at:
www.sandagicm3.com/Deliverables/Forms/Allitems.aspx

ID No.	Description	Risk Categories	Probability	Impact	Score
1-1	Procurement of development/integrator services is not achieved in a timely manner.	1 - Initiation	low	very high	0.24
1-2	USDOT is unable to or is delayed in providing funding because the demonstration project has not been included in the TIP.	1 - Initiation	low	high	0.12
2-1	Managing complexity of the project causes risk to the schedule, budget or operational performance of the ICMS.	2 - Project Management	low	very high	0.24
2-2	Development team is too remote for effective coordination and facilitation	2 - Project Management	low	high	0.12
2-3	Delay in an activity on the critical path has consequential delays to the whole project	2 - Project Management	low	very high	0.24
2-4	There are insufficient resources to complete the project successfully	2 - Project Management	low	moderate	0.06
2-5	Cost and time estimates for project planning and management are not accurate enough	2 - Project Management	low	moderate	0.06
3-1	The scope of the project is not clearly defined and ambiguities lead to cost and time over runs	3 - Requirements	probable	high	0.20
3-2	The system requirements are not clearly defined and agreed with all project partners	3 - Requirements	very low	high	0.04
3-3	System requirements are not related to the problems and needs addressed in the project	3 - Requirements	low	very high	0.24
3-4	The project plan proves to be unrealistic	3 - Requirements	low	very high	0.24

ID No.	Description	Risk Categories	Probability	Impact	Score
4-1	Quantity of the interface development work poses threat to project quality, schedule and budget.	4 - Design	very low	very high	0.08
4-2	Managing complexity of the project causes risk to the schedule, budget or operational performance of the ICMS.	4 - Design	high	very high	0.56
4-3	The scope of the project is not clearly defined and ambiguities lead to cost and time over runs	4 - Design	low	high	0.12
4-4	The scope of the project is significantly altered during the course of the project activities impacting schedule and budget	4 - Design	low	very high	0.24
4-5	Development team has insufficient resources assigned	4 - Design	probable	high	0.20
4-6	Development team is not familiar with existing technology and legacy systems	4 - Design	low	high	0.12
4-7	Development team does not follow a proven methodology for system development	4 - Design	low	high	0.12
4-8	System vendor subcontracts to other companies	4 - Design	probable	high	0.20
4-9	System vendor has other higher priority work	4 - Design	low	moderate	0.06
4-10	System vendor is acquired or goes bankrupt	4 - Design	very low	very high	0.08
4-11	System vendor significantly changes key staff	4 - Design	low	moderate	0.06
5-1	Failure to integrate existing or planned systems.	5 - Build	low	very high	0.24
5-2	Failure of planned infrastructure deployments to be implemented successfully	5 - Build	low	high	0.12
5-3	Failure of planned systems, or system updates, to be implemented successfully	5 - Build	low	high	0.12
5-4	Failure of planned infrastructure deployments to	5 - Build	probable	moderate	0.10

ID No.	Description	Risk Categories	Probability	Impact	Score
	be deployed in a timely manner.				
5-5	Failure of planned systems, or system upgrades, to be deployed in a timely manner.	5 - Build	probable	moderate	0.10
5-6	Implementation of the ICMS might interrupt or disrupt the operation of legacy systems	5 - Build	very low	high	0.04
5-7	The scope of the project is not clearly defined and ambiguities lead to cost and time over runs	5 - Build	very low	very high	0.08
5-8	The scope of the project is significantly altered during the course of the project activities impacting schedule and budget	5 - Build	very low	very high	0.08
5-9	Partners needs are not fully satisfied	5 - Build	low	very high	0.24
5-10	The operations planning for the project assumes operational changes that cannot be achieved with the systems and infrastructure	5 - Build	high	moderate	0.14
6-1	System acceptance testing does not identify failure of critical system components	6 - Testing	probable	very high	0.40
6-2	Time required to complete system testing poses threat to project schedule	6 - Testing	high	moderate	0.14
7-1	Users have insufficient training to operate the system	7 - Training	low	high	0.12
8-1	The operations planning for the project is completed without consideration for separate organizational arrangements	8 - O&M	high	moderate	0.14
8-2	The operations planning for the project does not consider significant operational impacts on other corridors or modes	8 - O&M	high	moderate	0.14
8-3	Insufficient partner commitment for operations and maintenance of the systems through the project	8 - O&M	low	very high	0.24

ID No.	Description	Risk Categories	Probability	Impact	Score
9-1	Specialized nature of modeling development work poses threat to project quality, schedule and budget.	9 - Modeling	low	very high	0.24
12-1	Development teams have difficulty aligning different project development methodologies	12 - Communication	probable	moderate	0.10
12-2	The project control processes between prime and sub are ineffective	12 - Communication	probable	very high	0.40
12-3	Ineffective communication	12 - Communication	low	very high	0.24
13-1	Lack of partner commitment and proactive participation in the project	13 - Partnership	probable	very high	0.40
13-2	Dispute with system vendor over payment delays schedule	13 - Partnership	low	high	0.12
13-3	Project partners don't maintain the level of commitment required to see the project through	13 - Partnership	low	high	0.12
13-4	Regional partners become uncomfortable with the project and stress levels rise	13 - Partnership	low	high	0.12
13-5	Insufficient partner commitment to continue long term operations and maintenance	13 - Partnership	high	moderate	0.14
13-6	Partners choose to only implement changes that improve their system	13 - Partnership	probable	very high	0.40
14-1	Insufficient funds for operations and maintenance of the systems through the project	14 - Funding	low	very high	0.24
14-2	Insufficient funding to continue long term operations and maintenance after completion of demonstration	14 - Funding	high	moderate	0.14

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