U.S. Department of Transportation
Federal Highway Administration
Research and Innovative Technology Administration

Project Management Plan

Dallas Integrated Corridor Management (ICM) Demonstration Project

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16. Abstract

The Dallas Integrated Corridor Management System Demonstration Project is a multi-agency, de-centralized operation which will utilize a set of regional systems to integrate the operations of the corridor. The purpose of the Dallas ICM System is to implement a multi-modal operations decision support tool enabled by real-time data pertaining to the operation of freeways, arterials, and public transit. The system will be shared between information systems and people involved in transportation operations and emergency response in the US-75 Corridor. The Dallas ICM System is intended to provide improved integration of operation procedures, including procedures that take advantage of the data sharing capabilities of the Dallas ICM System and facilitate improved emergency response, and traveler information.

The purpose of the Project Plan is to assist the Dallas ICM Team by defining a procedural framework for management and control of the US-75 Integrated Corridor Management Demonstration Project, and development and deployment of the ICM System. The Project Plan serves as a reference for information regarding project structure and procedures throughout the project life cycle. As such it is a living document and will be updated at least twice in each year of the project.

17. Key Words Integrated corridor management, Dallas, multi-modal operations, decision support tool, transportation operations, real-time data, project plan, procedural framework	**18. Distribution Statement** No restrictions.

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1.1 Introduction

The Dallas Integrated Corridor Management System Demonstration Project is a multi-agency, de-centralized operation which will utilize a set of regional systems to integrate the operations of the corridor. The purpose of the Dallas ICM System is to implement a multi-modal operations decision support tool enabled by real-time data pertaining to the operation of freeways, arterials, and public transit. The system will be shared between information systems and people involved in transportation operations and emergency response in the US-75 Corridor. The Dallas ICM System is intended to provide improved integration of operation procedures, including procedures that take advantage of the data sharing capabilities of the Dallas ICM System and facilitate improved emergency response, and traveler information.

A team headed by the Dallas Area Rapid Transit is providing technical and management services in support of the Dallas Integrated Corridor Management Demonstration Project.

1.2 Purpose

The purpose of the Project Plan is to assist the Dallas ICM Team by defining a procedural framework for management and control of the US-75 Integrated Corridor Management Demonstration Project, and development and deployment of the ICM System. The Project Plan serves as a reference for information regarding project structure and procedures throughout the project life cycle. As such it is a living document and will be updated at least twice in each year of the project.

1.3 Vision

The proposed demonstration Integrated Corridor Management (ICM) system will operate as a multi-modal operations decision support tool with a cooperative network of agencies which will operate the corridor in a coordinated manner to reduce congestion of the network, and improve the movement of people and goods within the corridor.

For the Demonstration Phase of the ICM Project, the Dallas team has reviewed the projects and systems which will be completed in the 24 month timeframe. We plan to have components of all the end stage systems deployed, tested, and accepted in the 24 month timeframe. An ATIS and 511 type systems will be deployed, along with the development of a Decision Support system and continuing development and improvement to our previously deployed SmartNET/ SmartFusion information exchange network.

Chapter 2. References

- Final Concept of Operations for the US-75 Integrated Corridor in Dallas, Texas, May 2009
- Final Systems Requirements Specification for the US-75 Integrated Corridor in Dallas, Texas, May 2009
- System Engineering Handbook: A Guide for System Life Cycle Processes and Activities, version 3.2, January 2010, International Council on Systems Engineering
- FHWA Rule 940, Federal Register/Vol. 66, No. 5/Monday, January 8, 2001/Rules and Regulations, Department of Transportation, Federal Highway Administration 23 CFR Parts 655 and 940, [FHWA Docket No. FHWA–99–5899] RIN 2125–AE65 Intelligent Transportation System Architecture and Standards.
- Project Management Body of Knowledge (PMBOK), Third Edition, 2004, Project Management Institute, Four Campus Boulevard, Newtown Square, PA.

Chapter 3. Initiating Project

The initiating process group consists of the processes that facilitate the formal authorization to start a new project or a project phase. Initiating processes includes the scope description and the resources that an organization is willing to invest.

3.1 Project Scope

The following scope is the Scope of Work for the Cooperative Agreement between FHWA/ US DOT and DART.

3.1.1 Overview

The Dallas Team is responsible for providing an ICM system as described in our proposal to US DOT. All services will be consistent with state and federal laws and regulations.

The technical solution will use a combination of existing products and customized software to provide a solution that meets the features and functions required of the Dallas ICM Demonstration project.

3.1.2 Project Management

The project is being led by the ICM Program Manager, Koorosh Olyai, and the Telvent Project Manager, Ahmad Sadegh. The Project Plan provides the roadmap for the execution of the project. Koorosh is supported by a team of stakeholders responsible for various components of this project. Ahmad is supported by Telvent senior management staff that will ensure that the project receives the resources and focused attention necessary to successfully meet the compressed project schedule.

To facilitate communications among project staff and between project staff and the Dallas ICM team a web-based tool, ProjectSolve^2 is being used. ProjectSolve^2 is a secure Internet-based collaboration tool that allows the team access to all project documents including progress and status reports, budget updates and schedule updates and revisions. The Dallas ICM Demonstration project management tool is available at www.projectsolve2.com. A Telvent administrator configures access for each individual and also establishes any access groups and access rights.

All team members are expected to ensure that any project documentation is copied to the website. The website includes the capability for automated notification when new documents are loaded or documents are updated. Each individual may configure automated notification as needed.

The site may also be used to host electronic discussions as needed to complement discussions that occur during meetings.

Deliverables provided will include:

- Quarterly and Annual Reports
- Meeting Minutes for Monthly Stakeholder meetings

3.1.3 Dallas ICM Demonstration Project - Project Plan

The Dallas Team's project management plan and systems engineering management plan for the deployment of the Dallas ICM Demonstration system ensures that the development and deployment of the ICM project is actively managed.

The Project Management Plan is a living document throughout the project life cycle and will be updated semi-annually to reflect changes in project status, or as needed to address project process and quality improvements.

Deliverables provided will include:

- Project Management Plan
- Systems Engineering Management Plan

3.1.4 Refinement of System Requirements

The Dallas ICM team will conduct a requirements walkthrough with the US DOT and its representatives to ensure that both have a common understanding of what will be built and what capabilities the proposed system will actually have. A single one-week walkthrough is included in our project schedule.

After this walkthrough is completed, the System Requirements Specification will be updated in order to provide enough information for the developer of the system to create it. The Concept of Operations will also be updated if any changes are identified during the walkthrough and update to the System Requirements Specification.

Once the System Requirements Specification is finalized, the Software Requirements Specification is produced for the individual new software development tasks. Software Requirements are derived from the System Requirements Specification by allocating functional requirements to specific software modules or subsystems and further decomposing these requirements to the software level. These documents will be controlled in a manner consistent with the configuration management plan, utilizing the web based management tool described above for sharing documents.

Deliverables provided will include:

- Revised System Requirements Specification
- Revised Concept of Operations, if necessary

3.1.5 Design

Once the System Requirements walkthrough has been completed, our conceptual design will be expanded and more thoroughly defined to complete a detailed system design for the ICM Project. Our first step is the development of the Logical and Physical Architectures. These steps take into account the functional requirements for the System Requirements Specification and group them into related sets. External interfaces are defined and internal high-level processes are identified. This process continues through several levels until subsystems are formed, and eventually, individual hardware, software, and data items are identified. Internal network needs are identified as well as the quantity and type of connectivity to external networks.

The inventory of existing assets is analyzed to see which functions in the System Architecture will be implemented by re-using existing items. Some of the existing systems will undergo minor modifications in order to fit into the new overall ICMS. Trade-offs on the cost to modify versus the cost to build new are also done. COTS products are investigated to see which functions can simply be purchased and integrated. These trade-off analyses consider system life cycle costs, not just initial investment.

In the Detailed Design phase the preliminary architectural design is refined until sufficient detail is documented to implement the design in software and hardware. This process will finalize the functional requirements including system upgrades; perform the final system design, and documentation of the results. The resulting System Design Document (SDD) will identify the system design and how it will be implemented. The software object models, data models, and dynamic models will be fully specified, including all data inputs and outputs, and software algorithms.

Deliverables provided will include:

- System Design Document

3.1.6 Build

The purpose of the two phases of System Build and System Testing is to code, test and integrate each system and software unit specified in the SDD. Code is generated base upon requirements based design. Each unit is coded and tested to ensure the algorithms and logic are correct and that the requirements are satisfied. Unit test procedures and the test results are recorded. Each unit is reviewed for compliance with the established coding standards prior to being placed under control and released for integration.

The final step is to finalize all design and development documentation to reflect what was actually built and delivered. All software build procedures and system configuration information is documented. All software code is commented to agreed upon standards and any development notes are collected in the programmer's "notebook."

If needed, additional software algorithms, or coding to provide new functionality to existing systems will be developed. Once evaluation of products is completed, and final solutions are designed, any additional logic or functionality will be developed.

In addition, as part of the build process an Operations and Maintenance manual will be developed to provide a reference for the operations of the system. This will include operator manuals, system administration manuals, and field technician manuals for the stakeholder team to operate and maintain the system once the system has been accepted.

Deliverables provided will include:

- Operations and Maintenance Manuals
- As-Built Design Diagrams for the system

3.1.7 System Testing

Testing is an activity embedded as an integral part of our software and system development methodology as well as final deployment and start of operations. Implementation includes unit coding, unit testing, unit integration, and integration testing. The software implementation followed by unit testing begins after successful completion of the Critical Design Review. Unit testing is a software developer responsibility.

Internal peer reviews with the Quality Assurance organization are performed to ensure the proper implementation of the software design and adherence to coding standards. The software unit testing process may be initiated for a specific software unit when its software interfaces have been defined and its detailed design has been peer reviewed, and the unit has been coded. The process is invoked for a given unit when there is sufficient information about the software unit and its relationship to other software units to initiate writing of the software unit test cases. In this process, the focus is on a particular testable unit, although previously tested units may be used. The unit testing process activities include:

- Reaffirm Unit Test Environment;
- Establish Unit Test Strategy;
- Develop Test Cases and Procedure;
- Development of simulation software, drivers and stubs;
- Conduct software unit testing.

The software integration testing process is invoked for a given group of software Configuration Items (CI's) upon completion of the software unit testing process for all software units of that group. The software integration testing process activities include:

- Re-affirming integration test environment;
- Establishing integration test strategy;
- Developing simulation software, drivers and stubs;
- Developing software integration procedures;
- Conducting peer review of the test procedures;

- Coordinating effort with other teams;
- Conducting the software integration testing.

The software integration testing process is complete for a given group of software Configuration Items when the test reports have been approved and the code is under configuration management control.

The final step in testing, once the Unit and Integration testing is complete is the System Acceptance Testing (SAT). The SAT plan and scripts will be developed by the consultant team, and reviewed and approved by the stakeholders. Once the SAT readiness review is completed, the SAT will be completed by a group identified by the stakeholders to test the system and "accept" it for operations.

Deliverables provided will include:

- Draft Testing Plan
- Final Testing Plan
- Test Reports

3.1.8 Training

The training will be provided as early as it can be scheduled after the implementation milestone is reached. Training materials will be provided to trainees to include an updated description of system functions, application procedures, and error troubleshooting guides including contingencies and/or alternative modes of operations (backup plan). This will include providing Updated End User Training Materials, and Updated Technical User Manuals. Each major subsystem will include training.

Deliverables provided will include:

- Training Plan
- Training Schedule
- Training Manuals

3.1.9 Operations & Maintenance

The Dallas ICM team will operate and maintain the ICM Demonstration system during the 18-month period O&M phase of the project. As discussed in our Concept of Operations, an operator at the Daltrans operations center will be dedicated as the "ICM Coordinator" in order to ensure coordination and response during the operations of the ICM project. In addition, maintenance on the ICM Systems will include both preventative and emergency maintenance.

Deliverables provided will include:

- Operations and Maintenance Plan

3.1.10 Participation in the Analysis, Modeling and Simulation

As part of this effort, the Dallas ICM team has:

- Collaborated on an Analysis, Modeling, and Simulation (AMS) plan for the US 75 corridor;
- Collected base year traffic and transit data; and
- Developed a mesoscopic corridor model.

This model is currently validated and calibrated for the base year of 2007. The analysis year for the US 75 corridor was proposed as 2010, the year the demonstration phase would be open for operation. The Dallas ICM team will work with the US DOT AMS contractor to develop pre- and post- deployment AMS and data collection plans. Based on those plans, the Dallas ICM team will also collect the necessary data for the AMS in demonstration stage.

As with Stage 2, the Dallas ICM team proposes to use automatic data collection systems, archived data, and manually collected data in combination to produce the comprehensive database needed to conduct the analysis, modeling, and simulation.

The Dallas ICM team will provide the following deliverables for this task:

- A pre-deployment AMS Plan (revised Stage 2 AMS Plan) (jointly developed with the US DOT contractor);
- US 75 Pre-Deployment Data Collection Plan for Stage 3 (both draft and final versions);
- Pre-Deployment "Before" Data Collection;
- A post-deployment AMS Plan (jointly developed with the US DOT contractor);
- A US 75 Post-Deployment Data Collection Plan for Stage 3 (both draft and final versions);
- Post-Deployment "After" Data Collection;
- Post-Demonstration AMS Transition Plan (both draft and final versions).

3.1.11 Participation in the Evaluation of the System

The Dallas ICM team will work with the US DOT National Evaluation Contractor to conduct the evaluation of the ICM. A key to a successful collaboration between the Pioneer Site and the US DOT contractor is a thorough evaluation plan that clearly identifies the roles and responsibilities of each of the parties involved.

The Dallas ICM team will collect traffic and transit data to support the evaluation. In the demonstration stage, the Dallas ICM team proposes to deploy additional systems for arterial street data and transit data sharing that will further enhance the available data for evaluation. Some of these systems are capable of collecting origin-destination data that will be important for the evaluation.

The Dallas region has also participated in the US DOT Value Pricing Pilot Program. Under this program, regional survey data has been collected on travel in various corridors (including US 75), attitudes on modal travel, and opinions on pricing. These survey instruments and tools as well as past data are available for use to assist the evaluation task. A third-party contractor, working with the USDOT, will conduct a before and after traveler behavior survey.

The Dallas ICM team will provide the following deliverables for this task:

- Archived and Manually-Collected Corridor Data for the US DOT Evaluation Contractor;
- Modeling Support for US 75 Corridor Performance Measures;
- Survey Support for travel decisions, traveler opinions, and longitudinal behavior.

3.1.12 Participation in Outreach Programs

The Dallas ICM team is committed to participating in local, state, and national outreach to transfer lessons learned on all stages of the ICM project. The Dallas ICM team conducted several outreach activities as part of ICM Stages 1 and 2. Members of the Dallas ICM team made presentations at local and state events (e.g., ITS Texas, ITS Heartland, and Dallas ITE Chapter). In addition, two articles were published in TTI's national research publication, *The Researcher*.

ICM outreach can be divided into: public outreach, political/decision maker outreach, and technology transfer to other transportation professionals. The Dallas ICM team will develop a local communications plan to be used for the US 75 corridor and the region as necessary. For communication with the public, DART's marketing department will be utilized for public outreach and marketing the ICM services which the ICM Demonstration project will provide to travelers in the US 75 corridor. In addition, the Dallas ICM team will submit papers and presentations to national transportation conferences (e.g., TRB, ITS America, ITE, AASHTO) to facilitate technology transfer to other transportation professionals. Lastly, because there was such high interest from the State of Texas in the ICM program, the Dallas ICM team proposes to a peer-to-peer technology transfer tour to the major metropolitan areas to assist with planning and implementation of ICM strategies in urban corridors.

The Dallas ICM team will provide the following deliverables for this task:

- Draft Local Communications Plan;
- Final Local Communications Plan;
- Briefings on the proposed Demonstration System (not to exceed six);
- Participation in the final National ICM Conference.

Chapter 4. Project Planning

The project management team uses the Planning Process Group and its constituent processes and interactions to plan and manage a successful project for the organization. The Planning Process Group helps gather information from many sources with each having varying levels of completeness and confidence. The planning processes develop the project management plan. These processes also identify, define, and mature the project scope, project cost, and schedule the project activities to occur within the project.

4.1 Project Schedule

The Dallas ICM Demonstration project schedule is divided into two phases; the first phase is the Design, Build phase, the second phase is Operations and Maintenance of the system. The project schedule is maintained separate from the PMP document, and is referenced as Attachment II to this document. The project schedule will be reviewed as part of the monthly status calls with Stakeholders, and an updated schedule will be provided on a Quarterly basis to US DOT.

4.1.1 Project Deliverables

The following list is a summary of specific project deliverable items by task as presented in the Request for Application. The Dallas ICM Team is responsible for ensuring that each of these requirements is addressed.

Name
Dallas ICM Demonstration Project
Task 1 - Project Management
Quarterly Progress Reports
Annual Progress Report
Final Report
Task 2 - Refinement of Systems Requirements
System Requirement Specifications (SysRS)
Concept of Operations
Task 3 – System Design
Preliminary Design Document(40% Design)
PDR - walkthrough
Critical Design Document (90% Design)
CDR - Walkthrough
Final Systems Design Document

Task 4 – System Build
Operations Manuals
As-Built Diagram
Task 5 – System Test Planning and Execution
System Test Plan
System Acceptance Test Plan and Scripts
System Test Readiness Review (TRR)
Test Results Reports
Task 6 - Training
Training Plan
Training Manuals
Task 7 - Operations & Maintenance
Operations & Maintenance Plan
Task 8 - Participation in the AMS
Pre-deployment AMS Plan
Pre-deployment Data Collection Plan
Data Collection – Pre-deployment
Post-deployment AMS Plan
Post-deployment Data Collection Plan
Data Collection – Post-deployment
AMS Transition Plan
Task 9 - Participation in the Evaluation of the System
Evaluation Report Assistance (on-going)
Data Collection – Pre-deployment
Data Collection – Post-deployment
Task 10 - Participation in Outreach Programs
Marketing Plan
Two briefings per year on the Demonstration System to National audiences.
Participation in the final National ICM Conference

4.2 Staffing Plan

The Staffing Plan describes the project organization and the management approach for establishing and maintaining the staffing necessary for operations and maintenance of the DART Integrated Corridor Management System.

4.2.1 Organization Structure

The staffing for the project will be broken into the following elements:

1. Program Management
2. Design
3. Systems Development and Delivery
4. Operations and Maintenance

The project will be organized as defined in the proposal submission and as shown in Figure 1.

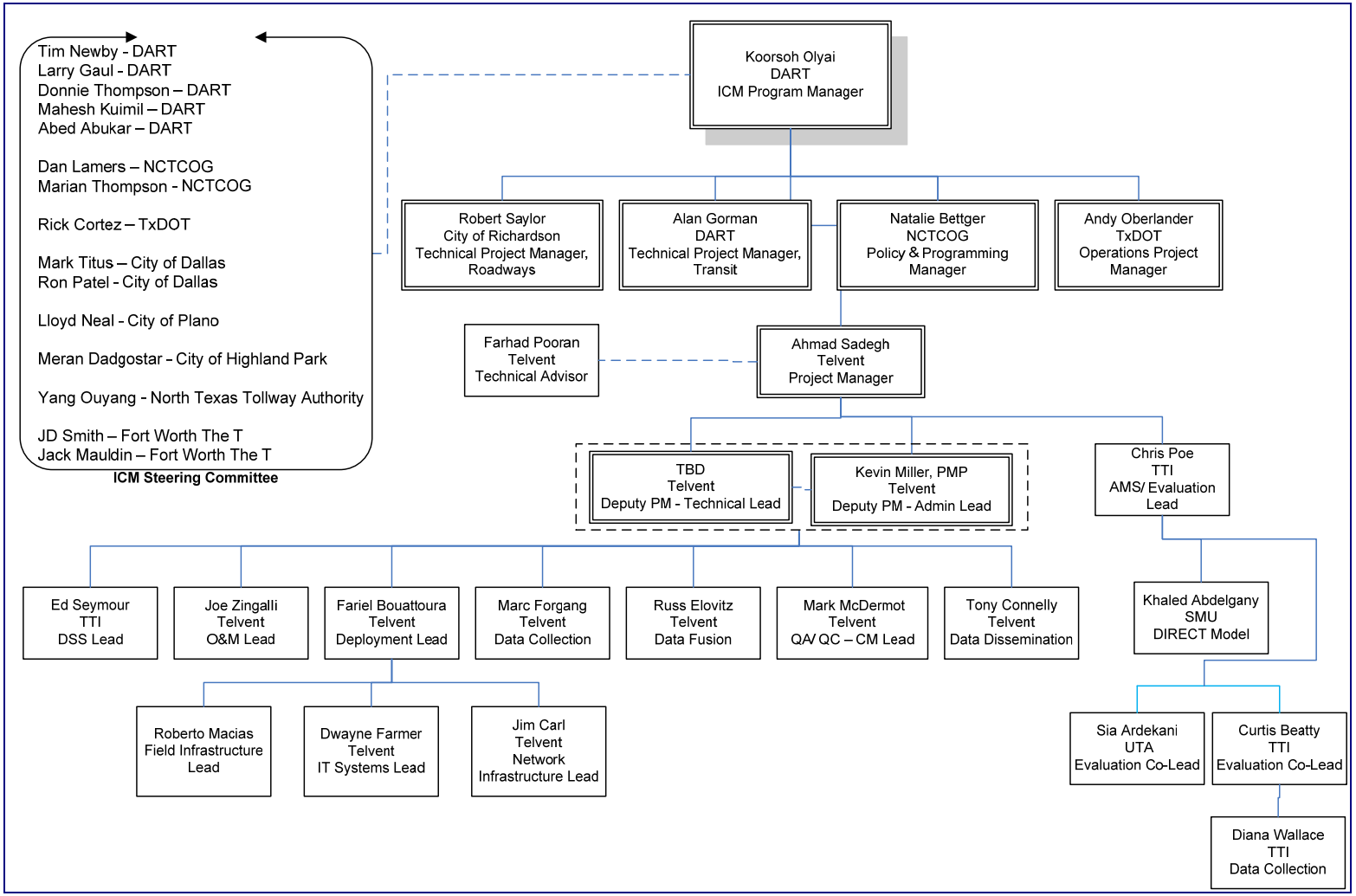

Figure 4-1. Project Organization

(Source: Dallas ICM Team)

4.2.1.1 Program Management

Table 4-1. Project Roles and Responsibilities

Staff	Role	Responsibility
DART		
Koorosh Olyai	Program Manager	Overall oversight of the Dallas ICM Program
Alan Gorman	Technical PM - Transit	Oversight of the Transit Components of the ICM Program
Stakeholder Agencies		
Natalie Bettger	Technical PM - Policy	Oversight of the Institutional Issues and Policy of the ICM Program
Robert Saylor	Technical PM - Roadways	Oversight of the Arterial Roadway Components of the ICM Program
Andy Oberlander	Technical PM - Operations	Oversight of the Freeway and Operations Components of the ICM Program
Committee Leads		
Koorosh Olyai	SmartNET Committee	Oversight of the SmartNET/ SmartFusion Subproject
Sia Ardekani	Decision Support Committee	Oversight of the Decision Support Subproject
Robert Saylor	Adaptive Signals Committee	Oversight of the Adaptive Signals Subproject
Ron Patel	Arterial Street Monitoring Committee	Oversight of the Arterial Street Monitoring (Bluetooth) Subproject
Lloyd Neal	Parking Management Committee	Oversight of the Parking Management Subproject
Natalie Bettger	Video Sharing Committee	Oversight of the Video Sharing Subproject
Alan Gorman Marian Thompson Alex Power	511 Committee	Oversight of the 511 Subprojects, including the IVR, Web and Alert systems
Alan Gorman	DART Data Committee	Oversight of identification and collection of the DART data required for the program
Natalie Bettger	C2C Committee	Oversight of the C2C coordination and integration
Alan Gorman	Transit Applications Committee	Oversight of the integration of transit application
Contractors		
Ahmad Sadegh	Telvent Project Manager	Overall project responsibility
TBD	Telvent Deputy PM – Technical	Overall Technical Development and Deployment responsibility
Kevin Miller	Telvent Deputy PM - Admin	Overall project coordination - tracking of scope, schedule and budget
Scot Love	Telvent – Regional Vice President	Corporate responsibility for project performance, ensure resources are available to execute project and resolve issues.

Staff	Role	Responsibility
Fariel Bouattoura	System Deployment Team Lead	Responsible for deployment activities for computer and software systems
Jim Carl	Network Integration Lead	Responsible for issues regarding computer and communications system hardware
Marc Forgang	Data Collection Lead	Responsible for data collection system implementation
Russ Elovitz	Data Fusion Lead	Responsible for data fusion system implementation
TBD	Data Dissemination Lead	Responsible for data dissemination implementation
Farhad Pooran	Technical Advisor	Responsible for oversight of Telvent's Systems and Infrastructure implementation
Roberto Macias	Field Infrastructure Lead	Responsible for field infrastructure implementation
Ed Seymour	DSS Lead	Responsible for Decision Support System implementation
Chris Poe	AMS Lead	Responsible for the Analysis, Modeling, and Simulation (AMS) and Evaluation activities
Mark McDermott	QA Lead	Responsible for the Quality Assurance and Quality Control and Configuration Management activities

4.2.2 Telvent Systems Delivery Lead Responsibility

Responsibilities for system deliverables have been assigned to individual project staff that is accountable for their project products as shown in Table 4-2.

Table 4-2. Project Deliverables and Responsibilities

Section / Task ID & Deliverable	Task Lead
Task 1 - Project Management	
Project Management Plan	Kevin Miller
Systems Engineering Management Plan	Telvent Deputy PM - Technical
Quarterly Progress Report	Kevin Miller/ DART
Annual Progress Report	Kevin Miller/ DART
Final Report	Kevin Miller/ DART
Task 2 - Refinement of Systems Requirements	
System Requirement Specifications (SysRS)	Telvent Deputy PM - Technical
Concept of Operations	Kevin Miller
Task 3 – System Design	
Preliminary Design Document(40% Design)	Telvent Deputy PM - Technical
PDR - walkthrough	Telvent Deputy PM - Technical
Critical Design Document (90% Design)	Telvent Deputy PM - Technical
CDR - Walkthrough	Telvent Deputy PM - Technical

Section / Task ID & Deliverable	Task Lead
Final Systems Design Document	Telvent Deputy PM - Technical
Task 4 – System Build	
Operations Manuals	Fariel Bouattoura
As-Built Diagrams	Fariel Bouattoura
Task 5 – System Test Planning and Execution	
System Test Plan	Mark McDermott
System Acceptance Test Plan and Scripts	Mark McDermott
System Test Readiness Review (TRR)	Telvent Deputy PM - Technical
Test Results Reports	Mark McDermott
Task 6 - Training	
Training Plan	Fariel Bouattoura
Training Manuals	Fariel Bouattoura
Task 7 - Operations & Maintenance	
Operations & Maintenance Plan	Fariel Bouattoura
Task 8 - Participation in the AMS	
Pre-deployment AMS Plan	Chris Poe
Pre-deployment Data Collection Plan	Chris Poe
Data Collection – Pre-deployment	Chris Poe
Post-deployment AMS Plan	Chris Poe
Post-deployment Data Collection Plan	Chris Poe
Data Collection – Post-deployment	Chris Poe
AMS Transition Plan	Chris Poe
Task 9 - Participation in the Evaluation of the System	
Evaluation Report Assistance (on-going)	Chris Poe
Data Collection – Pre-deployment	Chris Poe
Data Collection – Post-deployment	Chris Poe
Task 10 - Participation in Outreach Programs	
Marketing Plan	Dennis Mochon
Two briefings per year on the Demonstration System to National audiences.	Koorosh Olyai
Participation in the final National ICM Conference	Koorosh Olyai
Subsystems – ICM Project (Contractor Leads)	
SmartNET	Fariel Bouattoura
Interactive Voice Response subsystem	Russ Elovitz
511 Website	Fariel Bouattoura
511 Alert System	Russ Elovitz
Decision Support System	Ed Seymour

Section / Task ID & Deliverable	Task Lead
Arterial Street Monitoring System	Roberto Macias
Parking Management System	Kevin Miller
Transit Signal Priority	Kyle Irvin
Weather Information System	Fariel Bouattoura
IT Hardware/ Communications	Jim Carl

4.3 Project Cost

Our Project Budget activities will include establishing a baseline budget for the project once the project scope and schedule are documented and agreed to by the project management team. The Project will be managed utilizing an Earned Value methodology approach which manages the budget based on a cost to complete methodology which takes into account the earned value of the work completed to date based on the scope.

The project budget will be managed for three phases:

- Requirements and Design – a single budget will be monitored for this phase
- Implementation of each subsystem – a budget for each subsystem will be developed and managed.
- Operations and maintenance – a single budget for the 18 month O&M phase will be managed.

The earned value compares the cumulative value of the budgeted cost of work performed (earned) at the original allocated budget amount to both the budgeted cost of the work scheduled (planned) and to the actual cost of the work performed (actual). This technique is especially useful for cost control, resource management, and production.

Since we are utilizing an earned value process, percent complete of in-progress schedule activities can also be tracked and reported to project stakeholders to demonstrate the amount of work completed, budget expended, and cost to complete.

4.4 Work Breakdown Structure

The Work Breakdown Structure (WBS) dictionary is a grouping of project elements that organizes and defines the total scope of the project: work not in the WBS is outside the scope of the project. This WBS dictionary is intended to confirm a common understanding of project scope. Each descending level of the WBS dictionary represents an increasingly detailed description of the work required to manage the project and deliver the customers request.

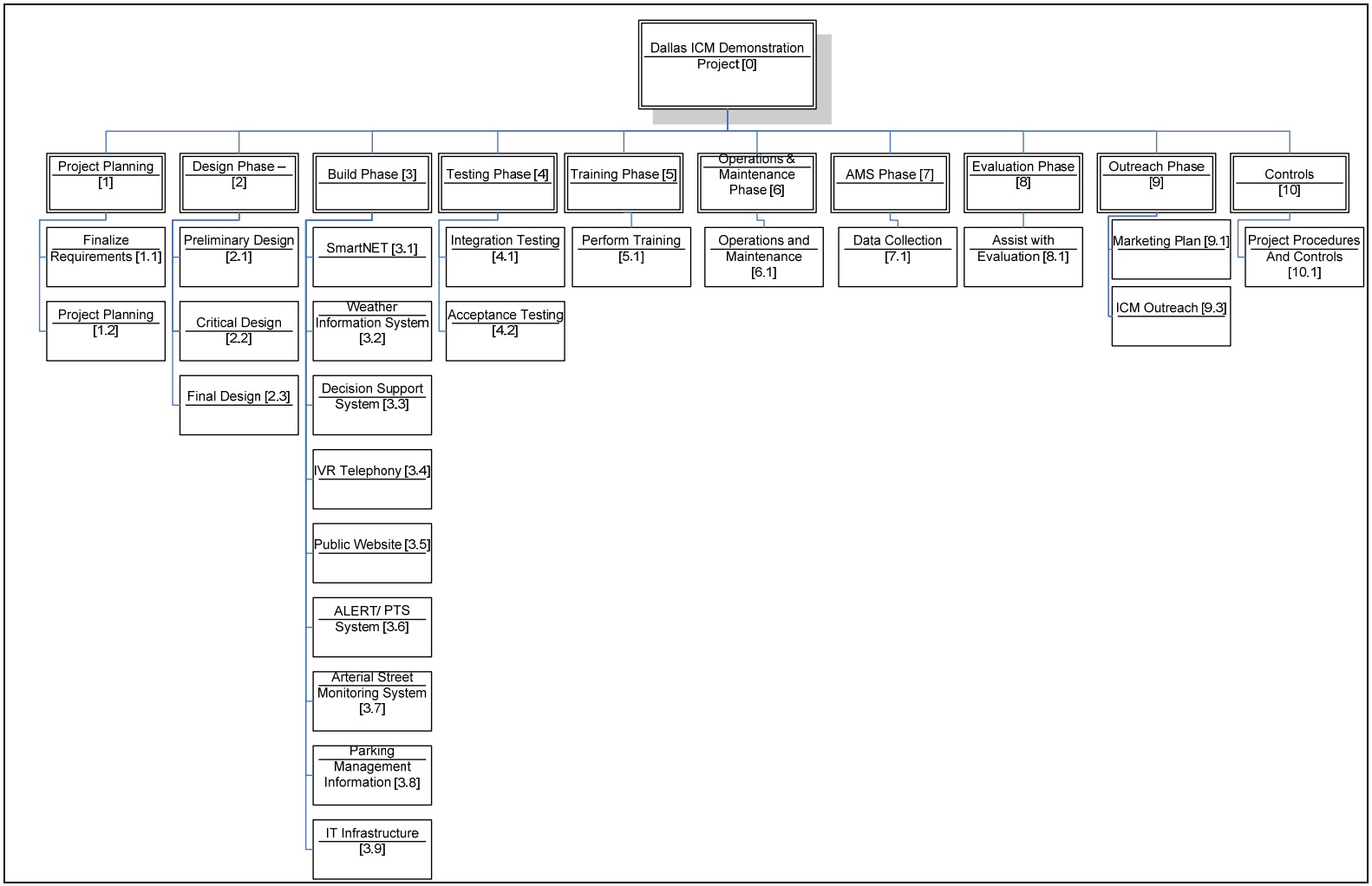

Figure 4-2. Work Breakdown Structure - Level 1

(Source: Dallas ICM Team)

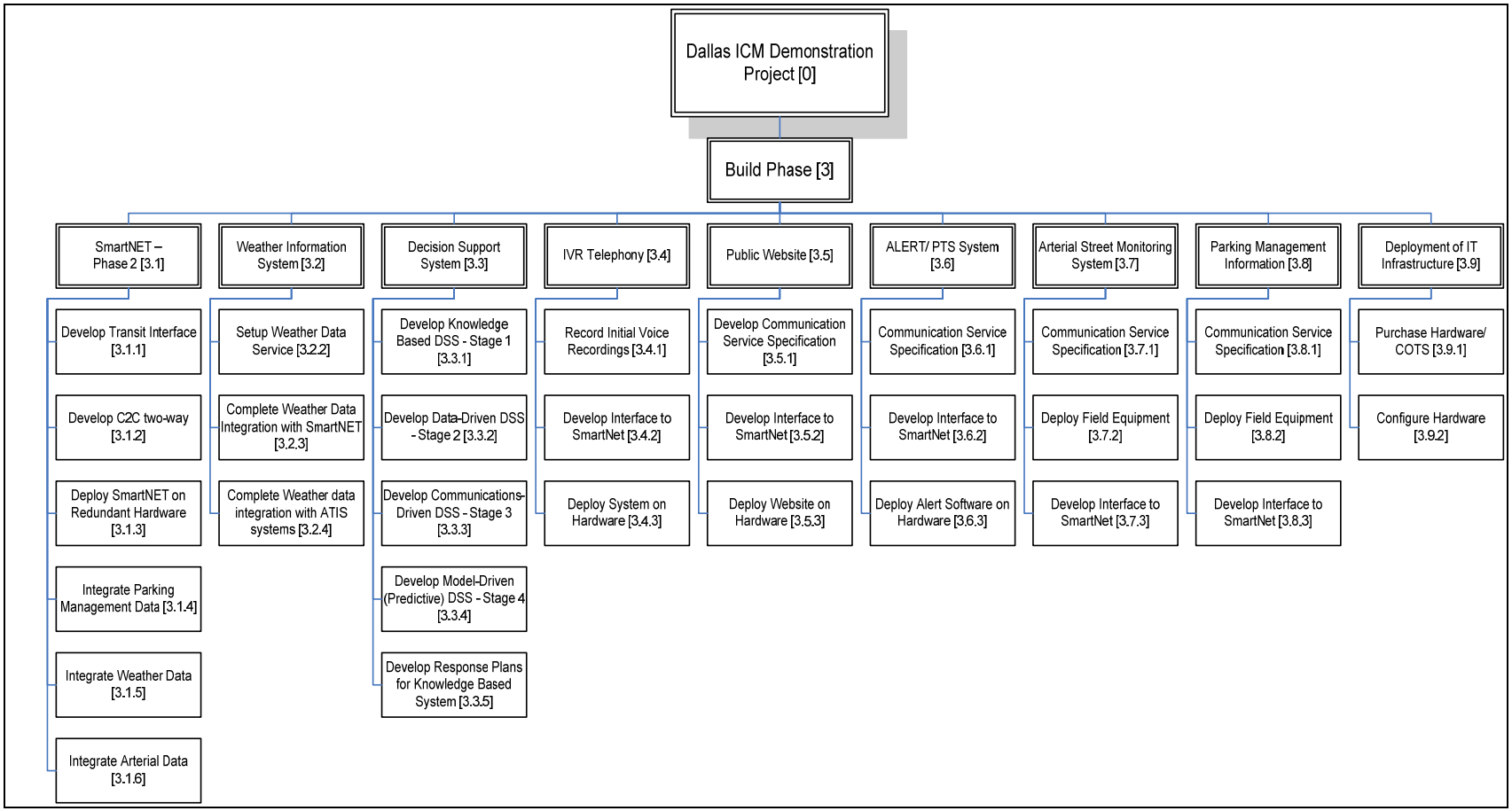

Figure 4-3. Work Breakdown Structure - Level 2 Deployment

(Source: Dallas ICM Team)

4.4.1 WBS Dictionary

The Work Breakdown Structure (WBS) is a grouping of project elements that organizes and defines the total scope of the project: work not in the WBS is outside the scope of the project. This WBS dictionary is intended to confirm a common understanding of project scope. Each descending level of the WBS dictionary represents an increasingly detailed description of the work required to manage the project and deliver the selected PMO functions.

The Layout or description of the template is as follows:

First Column – Indicates the WBS grouping and numbering convention. The groupings are a hierarchy of Phase, Activity, Task, and Milestone.

The numbering convention is standard engineering numbering.

The Phase level is represented by a single number (i.e. 1.).

The Activity level is represented by a 2 digit number (i.e. 1.1),

The Task level is represented by a 3 digit number (i.e. 1.1.1).

The Milestone is represented by a four-digit number (1.1.1.1)

Second Column – Indicates the Phase, Activity, Task, or Milestone name and a brief description that describes the work at each level. The activity level is the level for status and change control. The task and milestone level describe the specific work assignment to be accomplished.

Third Column – Indicates, at the task and milestone levels only, the assigned deliverable name.

Fourth Column – Indicates, at the task level only, the anticipated “effort in hours” to fully accomplish the defined task.

Fifth Column – Indicates, at the task and milestone levels only, the other tasks that this task or milestone is critically dependent on.

Sixth Column – Indicates, at the task and milestone levels only, the type of resource recommended or most likely to have the skills to complete the assignment.

The WBS dictionary will be revised to reflect changes and will be maintained in a current status throughout the life of the project on ProjectSolve.

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
1.0 Phase	Project Planning				
1.1 Activity	**Finalize Requirements**				PM, DPM, Technical Team
1.1.1 Task	**Develop Final Requirements Document -** Develop the project requirements with the customer that indicates an agreement on assumptions, criteria, functional requirements, constraints, performance objectives, and interfaces.	System Requirements Document	20 days		
1.1.1.1 Milestone	Systems Requirements Document				
1.1.2Task	**Requirements Walkthrough –** a formal review of the project requirements, including discussion of each requirement, traceability to user needs, and interfaces to new and legacy systems.	System Requirements Document	5 days		
1.1.2.1 Milestone	Updated Requirements Document		5 days	1.1.1, 1.1.2	
1.1.2.2 Milestone	Planning Phase Gate				
1.2 Activity	**Project Planning**				
1.2.1 Task	**Develop the Scope Statement** – Develop the scope statement with the customer that indicates an agreement on work scope, project objectives and measurements, hi-level deliverables, assumptions, and completion criteria.	Project Plan	3 days	1.1.1	PM, DPM

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
1.2.2 Task	**Develop the WBS** – Define the work Activities, sequencing (task dependencies), effort estimates, and deliverables. Indicate the type of resource (people, equipment, materials, facilities) needed to complete the work activities. Review and obtain agreement of the WBS work activities with the customer, sponsor, and management of other groups expected to support the project.	PMP & SEMP	2 days	1.2.1	PM, DPM
1.2.3 Task	**Develop the Project Schedule** – Develop approximate cost estimates of all the types of resources. Build a project schedule from the WBS and cost estimates. Produce a time-phased cost budget from the schedule.	PMP & SEMP	3 days	1.2.3	PM, DPM, Technical Team
1.2.4 Task	**Develop the Project Plan** – Integrating the results of the other planning activities into a coherent document to guide the project execution and control.	PMP & SEMP	5 days	1.2.1, 1.2.2, 1.2.3,	PM, DPM, Technical Team
1.2.5 Task	**Plan Integration** – Summarize and incorporate the outputs of the planning activities into a single reference document – the Dallas ICM Demonstration Project Plan. The plan is the reference document for work to be performed by all involved in the project and must be made easily accessible to all in electronic format.	PMP & SEMP	3 days	1.2.1, 1.2.2, 1.2.3, 1.2.4, 1.1.2	PM, DPM, Technical Team
1.2.6 Task	**Plan Presentation and Review** – Distribute, review and obtain approval of the project plan from the project directing authorities and managers who have staff assigned to the project.		3 days	1.1.2	
1.2.6.1 Milestone	Project Management Plan Complete			1.2.5	

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
1.2.6.2 Milestone	Systems Engineering Management Plan Complete			1.2.5	
2.0 Phase	Design Phase – This phase designs the technical elements of the project, the interfaces, and the functionality of the system.				
2.1 Activity	**Preliminary Design**	Preliminary Design	55 days	1.1.2	Task Leads, Development Team
2.1.1 Task	**Develop the Preliminary Design –** This activity includes developing the Draft Design, Providing the Draft to the Dallas team and USDOT for review and comment, and updating the Preliminary Design for the PDR				PM, DPM, Technical Team
2.1.1.1 Milestone	Draft Preliminary Design Document Complete				
2.1.2 Task	**PDR Walkthrough** – Once the 20% design has been completed and submitted to USDOT for review, a PDR Walkthrough will be done to review the progress and issues with the design**.**		2 days	2.1.1	
2.2 Activity	**Critical Design**	Critical Design		2.2	Task Leads, Development Team
2.2.1 Task	**Develop the Critical Design –** This activity includes developing the Draft Design, Providing the Draft to the Dallas team and USDOT for review and comment, and updating the Preliminary Design for the PDR		55 days		PM, DPM, Technical Team

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
2.2.1.1 Milestone	Draft Critical Design Document Complete				
2.2.2 Task	**System Prototyping –** This activity includes developing mock system interfaces (GUI design) through several working sessions with stakeholders.	Critical Design	35 days	2.2	Software Development
2.2.3 Task	**CDR Walkthrough** – Once the 80% design has been completed and submitted to USDOT for review, a CDR Walkthrough will be done to review the progress and issues with the design**.**	Critical Design	2 days	2.1	
2.3 Activity	**Final Design**	Final Design			
2.3.1 Task	**Develop the Final Design –** This activity includes developing the Draft Design, Providing the Draft to the Dallas team and USDOT for review and comment		45 days		PM, DPM, Technical Team
2.3.1.1 Milestone	Draft Final Design Document Complete				
2.3.2 Task	**Submit Final Design –** This activity includes updating the final design documents	Final Design	15 days		
2.3.2.1 Milestone	Design Phase Complete (Gate)				
3.0 Phase	Build Phase This phase implements the system designed in the Design Phase.				

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
3.1 Activity	**SmartNET**	SmartNET Subsystem	150 days		Software Development
3.1.1 Task	**Develop Transit Interface** – Transit data available from the DART Network will be integrated into SmartNET, in order to display transit information				Software Development
3.1.2 Task	**Develop C2C two-way** – The SmartNET Data Interface will be updated to publish events and transit data to the Regional Center to Center system				Software Development
3.1.3 Task	**Integrate Parking Information** – Parking data available from the new Parking Management system (3.8) will be integrated into SmartNET, in order to display real-time parking information for the 5 park & ride lots along the red line.			3.8.3	Software Development
3.1.4 Task	**Integrate Weather Data –** Weather data available from the new Weather Information system (3.2) will be integrated into SmartNET			3.2.1	Software Development
3.1.5 Task	**Integrate Arterial Data –** Arterial travel time data available from the new Arterial Street Monitoring system (3.7) will be integrated into SmartNET			3.7.3	Software Development
3.2 Activity	**Weather Information System**	Weather Information Subsystem	135 days		
3.2.1 Task	**Setup Weather Data Service –** The Weather links will be defined, designed and developed for use by the Dallas ICM project. This will include what weather data is needed.				

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
3.2.2 Task	**Complete Integration with SmartNET –** If task 3.1.4 requires any rework or effort on the weather provider side to integrate the data into SmartNET, this work will be defined and completed.				Software Development
3.2.3 Task	**Complete Integration with ATIS systems** – as part of the integration of the 511 systems, the weather data will potentially be provided to the IVR and website systems. This data would include weather alerts for the IVR and website, and weather radar maps for the website.			3.4.2, 3.5.2, 3.6.2	Software Development
3.3 Activity	**Decision Support System**	Decision Support Subsystem	170 days		
3.3.1 Task	**Develop Knowledge Based DSS – Stage 1** – for the first Stage of the DSS, A Rules Based Expert System will be developed to assist the stakeholders to identify the response plans appropriate for current incidents and network conditions.				Task Lead, Stakeholders
3.3.2 Task	**Develop Data-Driven DSS – Stage 2 -** for the second Stage of the DSS; the Rules Based Expert System will be further expanded to include integration of real-time data.				
3.3.3 Task	**Develop Communication Driven DSS – Stage 3 -** for the third Stage of the DSS, the Rules Based Expert System will be further expanded to include integration of a decision dialogue, which will provide a interactive communication element to the selection and approval of the DSS				Systems Engineering

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
3.3.4 Task	**Develop Model-Driven (Predictive) DSS – Stage 4 -** for the fourth Stage of the DSS, the Decision Support System will be further expanded to include integration of a predictive modeling system, which will provide the stakeholders with a prediction of the network 30 minutes into the future				Software Development
3.3.5 Task	**Develop Response Plan for Knowledge Based System -** tabletop exercises will be done by the stakeholders to identify the strategies and response plans which will be used by the DSS.				Task Lead, Stakeholders
3.4 Activity	**IVR Telephony**	IVR Subsystem	170 days		
3.4.1 Task	**Record Voice Recordings** – for the IVR subsystem, concatenated speech will be used for the majority of voice responses, the words specific to the Dallas area will be recorded and compiled for use in the IVR				
3.4.2 Task	**Develop Interface to SmartFusion** - The IVR subsystem will utilize the SmartNET subsystem to provide input for events, travel times, and other information which is provided in the IVR subsystem.				Software Development
3.4.3 Task	**Deploy IVR System** – This task includes the configuration, integration, and deployment of the IVR system.				System Engineering
3.5 Activity	**Public Website**	511 Website Subsystem	157 days		

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
3.5.1 Task	**Develop Communication Service** – This task includes developing the specification, ordering, and configuring the communication service.				System Engineering
3.5.2 Task	**Develop Interface to SmartNET** – The 511 Website subsystem will utilize the SmartNET subsystem to provide input for events, travel times, and other information which is will be displayed on the website				Software Development
3.5.3 Task	**Deploy Website** – This task includes the configuration, integration, and deployment of the 511 Website subsystems.				Software Development
3.6 Activity	**ALERT System**	511 Alert Subsystem	87 days		
3.6.1 Task	**Develop Communication Service** – This task includes developing the specification, ordering, and configuring the communication service.				System Engineering
3.6.2 Task	**Develop Interface to SmartFusion**– The 511 ALERT subsystem will utilize the SmartNET subsystem to provide input for events, travel times, and other information which is will be alerted to the public via the 511 ALERT subsystem				Software Development
3.6.3 Task	**Deploy ALERT System** - This task includes the configuration, integration, and deployment of the 511 ALERT subsystems.				Software Development
3.7 Activity	**Arterial Street Monitoring System**	Arterial Travel Time Information	105 days		

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
3.7.1 Task	**Develop Communication Service** – This task includes developing the specification, ordering, and configuring the communication service to get information from the field equipment to the central system.				System Engineering
3.7.2 Task	**Deploy Field Equipment** - This task includes installation, configuration, and integration of the field hardware				System Engineering
3.7.3 Task	**Develop Interface to SmartNET** – The ASMS server will be developed to ensure the data interface and data integration with SmartNET is complete and functional.				Software Development
3.8 Activity	**Parking Management Information**	Parking Lot Information	140 days		
3.8.1 Task	**Develop Communication Service** – This task includes developing the specification, ordering, and configuring the communication service to get information from the parking lot locations to the central system.				System Engineering
3.8.2 Task	**Deploy Field Equipment** - This task includes installation, configuration, and integration of the field hardware				System Engineering
3.8.3 Task	**Develop Interface to SmartFusion** - The Parking Information server will be developed to ensure the data interface and data integration with SmartNET is complete and functional.				Software Development
3.9 Activity	**IT Infrastructure**	ICM Hardware	202 days		

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
3.9.1 Task	**Purchase Hardware/ COTS** - This activity includes the procurement of the IT Hardware necessary to host the various software subsystems as part of the Dallas ICM project.				System Engineering
3.9.2 Task	**Configure Hardware** - This activity includes the configuration of the IT Hardware necessary to host the various software subsystems as part of the Dallas ICM project.				System Engineering
3.9.3 Task	**Install Software** - This activity includes the installation of the software on the IT Hardware as part of the Dallas ICM project.			3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8	System Engineering, Software Development
4.0 Phase	Testing Phase				
4.1 Activity	**Integration Testing**		192 days		
4.1.1 Task	Develop Test Plan **-** This includes the development of the test plans for Unit and Integration testing activities of the Software Development team.	Test Plan			QA
4.1.2 Task	Complete Unit Testing and Integration Testing **-** This activity includes the Unit and Integration testing activities of the Software Development team.				Software Development
4.1.3 Task	System Test Readiness Review – Prior to Formal Integration Testing, a System Test Readiness Review will be performed.				QA, Software Development
4.2 Activity	**Acceptance Testing**		163 days	3.9.3	

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
4.2.1 Task	Develop System Acceptance Test (SAT) Plan **-** This activity includes development of the draft SAT plan, review, and updates of the SAT Plan and Scripts, the SAT plan will be developed by the consultant team	SAT Plan and Scripts			QA/ Testing team
4.2.1.1 Milestone	SAT Plan and Scripts Complete				
4.2.2 Task	System Acceptance Test (SAT) Readiness Review – Prior to Formal Systems Acceptance Test a SAT Readiness Review will be performed; the consultant team will perform the readiness review and provide the results to the stakeholder team prior to conducting the SAT.			4.1.2, 4.2.1	PM, DPM, QA/ Testing team
4.2.3 Task	Conduct SAT – will be performed by the stakeholders				
5.0 Phase	Training Phase				
5.1 Activity	**Perform Training**				
5.1.1 Task	**Develop Training Plan** - This activity includes the training plan development, reviews and updates necessary to plan the training of the Agency Users of the ICM system	Training Plan	50 days		Trainers
5.1.1.1 Milestone	Training Plan Complete				
5.1.2 Task	**Develop Training Schedule** - This activity includes the training plan schedule development, reviews and updates necessary to schedule the training of the Agency Users of the ICM system	Training Schedule	17.5 days		PM, DPM, Trainers

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
5.1.2.1 Milestone	Training Schedule Complete				
5.1.3 Task	**Develop Training Manuals** - This activity includes the training manual development, reviews and updates necessary to perform the training of the Agency Users of the ICM system	Training Manuals	55 days		Trainers, System Engineering, Software Development
5.1.3.1 Milestone	Training Manuals Complete				
5.1.4 Task	**Perform Training** - This activity includes the training of the Agency Users of the ICM System.		15 days		Trainers
6.0 Phase	Operations & Maintenance Phase				
6.1 Activity	**Operations and Maintenance of the System**		380 days		
6.1.1 Task	**Develop As-Built Diagrams -** This activity includes the development, and routine updates of the As-built Diagrams	As-built diagrams			
6.1.1.1 Milestone	As-Built Diagrams Complete				
7.0 Phase	AMS Phase				
7.1 Activity	**Data Collection**	Data for Modeling	835 days		

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
7.1.1 Task	**Develop Data Collection Plan – Pre Deployment –** This activity includes the development of the data collection plan for the before case of the ICMS, and identifying what data is needed and from what sources for the AMS.				
7.1.1.1 Milestone	Data Collection Plan – Pre Deployment Complete				
7.1.2 Task	**Develop Data Collection Plan – Post Deployment –** This activity includes the development of the data collection plan for the after case of the ICMS, and identifying what data is needed and from what sources for the AMS.				
7.1.2.1 Milestone	Data Collection Plan – Post Deployment Complete				
7.1.3 Task	**Perform Data Collection – Pre Deployment** – Based on the Plan developed in task 7.1.1, the actual data collection identified in the plan will be collected.				
7.1.4 Task	**Perform Data Collection – Post Deployment** - Based on the Plan developed in task 7.1.2, the actual data collection identified in the plan will be collected.				
7.1.5 Task	**Provide AMS Plan and Report Assistance** – the Dallas Team will provide the AMS contractor with support and assistance in developing the AMS Plans and AMS Reports.				
8.0 Phase	Evaluation Phase				

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
8.1 Activity	**Assist with Evaluation**	Evaluation of ICM			
8.1.1 Task	**Develop Data Collection Plan – Pre Deployment –** This activity includes the development of the data collection plan for the before case of the ICMS, and identifying what data is needed and from what sources for the Evaluation.				
81.2 Task	**Develop Data Collection Plan – Post Deployment –** This activity includes the development of the data collection plan for the after case of the ICMS, and identifying what data is needed and from what sources for the Evaluation				
8.1.3 Task	**Perform Data Collection – Pre Deployment** – Based on the Plan developed in task 8.1.1, the actual data collection identified in the plan will be collected.				
8.1.4 Task	**Perform Data Collection – Post Deployment** - Based on the Plan developed in task 8.1.2, the actual data collection identified in the plan will be collected.				
8.1.5 Task	**Provide Evaluation Plan and Report Assistance** – the Dallas Team will provide the Evaluation contractor with support and assistance in developing the Evaluation Plans and Evaluation Reports.				
9.0 Phase	Outreach Phase				
9.1 Activity	**Marketing Plan**	Marketing Plan	225 days		Marketing

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
9.1.1 Task	**Develop Marketing Plan** – This includes the development of a draft marketing Plan, review, and updates for a ICM Marketing Plan				
9.1.1.1 Milestone	Marketing Plan Complete				
9.2 Activity	**ICM Outreach -** this activity includes the activities and tasks developed in the Marketing Plan.		393 days		
9.2.1 Task	**ICM Presentations** – This includes providing 2 presentations per year on the ICM demonstration project.				PM, DPM, Marketing
9.2.2 Task	**National ICM Conference** - This includes attending and participating in the National ICM Conference.				PM. DPM
10.0 Phase	Controls – Administer and manage work controls to ensure project performance.				
10.1 Activity	**Project Procedures and Controls**				
10.1.1 Task	**Risk Management** – Manage risks by responding to identified risk indicators as they occur.	Risk Id and Mgmt			
10.1.2 Task	**Change Management** – Identify, plan, and conduct ongoing change control of the project. Ensure that the requirements, budget, and schedule milestones remain in line with the current approved project plan or are changed officially providing new requirements, budget, or schedule milestones.	Chg Mgmt			

NUMBER	WBS DICTIONARY	DEL NAME & NUMBER	ESTIMATED DURATION	CRITICALLY DEPEND	SKILL
10.1.3 Task	**Project Standards, Approval, and Document Controls** – Conduct administration of approvals, project library, administrative filing, and securities.	Stds, Approvals, & Cntls			PM
10.1.4 Task	**Communication Management** – Deliver communications or facilitate communication delivery and conduct ongoing administration of communications	Comm. Plan & Mgmt			PM
10.1.5 Task	**Status Reporting** –Conduct ongoing project status reporting of work activities, budgets achievements and issues.	Status Rptg			PM, DPM – Admin
10.1.5.1 Milestone	Quarterly Status Report Complete				
10.1.5.2 Milestone	Annual Status Report Complete				
10.1.6 Task	**Procurements & Contracting Management** – obtain quotations, bids, offers, or proposals, choose from among potential vendors, administer the contract, and close.	Procurement & Contracting			PM
10.1.7 Task	**Quality Assurance** – monitor and identify way to eliminate causes of unsatisfactory quality performance.	QA			QA
10.1.8 Task	**Time Tracking** – administer the time tracking activities and team recording of individual time	Time Tracking			DPM – Admin
10.1.9 Task	**Issue and Decision Management** – Administer the issue and decision process.	Issue and Decision Mgmt			PM

Chapter 5. Project Execution

The Executing Process Group consists of the processes used to complete the work defined in the project management plan to accomplish the project's requirements. The project team should determine which of the processes are required for the team's specific project. The Process Group involves coordinating people and resources, as well as integrating and performing the activities of the project in accordance with the project management plan. The Process Group also addresses the scope defined in the project scope statement and implements approved changes.

5.1 Coordinating People and Resources

The ICM Program Manager, Koorosh Olyai, is the primary responsible person for the coordination of the personnel and resources necessary to complete the Dallas ICM Demonstration. His role includes assisting Stakeholder Committee Leads with coordination of issues, changes, and risks and ensuring that the Contractor Team, led by the Telvent Project Manager, completes the Scope of the project on-time, within budget while maintaining quality and minimizing risks.

5.2 Stakeholder Team Oversight

Stakeholders will serve as Subproject leads and Functional Committee leads. Each Committee will be responsible for assisting and managing the Contractor Team with scope, schedule, budget, quality and risks associated with their defined subprojects. The Committee Leads will coordinate with the Telvent Task Leads, the Telvent Project Manager and report any issues, risks, or quality concerns to the ICM Program Manager. The committee lead will supervise the project progress, deliveries and final acceptance.

The following Functional and Subproject Committees, Tables 5-1 and 5-2, have been identified:

Table 5-1. Functional Committees

Committee Name	Chair	Other Members
Outreach and Marketing	Dennis Mochon	Koorosh Olyai Natalie Bettger Robert Saylor Andy Oberlander Yang Ouyang Lloyd Neal Ron Patel Jahnae Stou Pamela Barns

Committee Name	Chair	Other Members
Policy Committee	Natalie Bettger	Koorosh Olyai Robert Saylor Andy Oberlander Yang Ouyang Lloyd Neal Ron Patel
Operations Committee	Andy Oberlander	Robert Saylor Marian Thompson Yang Ouyang Dan Loving Lloyd Neal Ron Patel Rick Cortez Larry Gaul Tim Newby
AMS	Behruz Paschai	Chris Poe Sia Ardekani Khaled Abdelghany Abed Abukar
Evaluation	Koorosh Olyai	Robert Saylor Andy Oberlander Chris Poe Marian Thompson Sia Ardekani Khaled Abdelghany Alex Power

Table 5-2. Subproject Committees

Committee Name	Chair	Other Members
SmartNET Committee	Koorosh Olyai	Alan Gorman Marian Thompson Ron Patel Rick Cortez Jimmey Bodiford
Decision Support Committee	Sia Ardekani	Alan Gorman Natalie Bettger Robert Saylor Andy Oberlander Yang Ouyang Roberto Macias Lloyd Neal Ron Patel Rick Cortez
Adaptive Signals Committee	Robert Saylor	Natalie Bettger Abed Abukar Lloyd Neal Ron Patel
Arterial Street Monitoring Committee	Ron Patel	Robert Saylor Marian Thompson Lloyd Neal

Committee Name	Chair	Other Members
Parking Management Committee	Lloyd Neal	Todd Plesko
Video Sharing Committee	Natalie Bettger	Alan Gorman Robert Saylor Andy Oberlander Yang Ouyang Lloyd Neal Ron Patel Rick Cortez
511 Committee	Alan Gorman Marian Thompson Alex Power	Natalie Bettger Robert Saylor Andy Oberlander Yang Ouyang Abed Abukar Lloyd Neal Ron Patel Rick Cortez Jimmey Bodiford D. Mark Sattler
DART Data Portal	Alan Gorman	Abed Abukar Donnie Thompson Larry Gaul Tim Newby
C2C	Natalie Bettger	Robert Saylor Yang Ouyang Alex Power Lloyd Neal Ron Patel Rick Cortez
Transit Applications	Alan Gorman	Abed Abukar Dan Loving Donnie Thompson Larry Gaul Todd Plesko Tim Newby

5.2.1 Standard Review and Approval Process

The stakeholders and committees have a generic review and approval process for all deliverables.

1. Contractor develops an internal draft, which is reviewed by the contractor team and ICM Stakeholder Management
2. Once comments are received and the document is updated, a Draft version is distributed to the appropriate Stakeholders for review and comment
3. Comments are provided to the Contractor, and updates to the deliverable are made, for a Final Draft version.
4. The Final Draft is provided to all Stakeholders and US DOT for review and comment

5. Once comments are received from US DOT, the deliverable is updated by the contractor and the draft document is provided to the stakeholders for review and comment
6. If additional corrections are needed, the contractor makes the updates, and a Final version is provided to the Stakeholder team and provided to the US DOT

5.3 Project Meetings

A monthly project stakeholder meeting will be held at DART facilities. The meetings are generally scheduled for the last Wednesday of each month and will be confirmed at the end of each meeting. Participants will be notified of any changes via email. This meeting is led by the ICM Program Manager, Koorosh Olyai. Each Stakeholder representative, and ICM committee members are expected to attend. Committee Leads and Subproject Stakeholder Leads will attend and provide reports on status of their groups activities. The secretary for the meeting will be the Telvent Deputy Project Manager – Admin, who will create and distribute minutes. Meeting minutes will be recorded and will be distributed via email as well as being stored on the www.projectsolve2.com site.

Technical meetings may be coordinated by the Telvent Deputy Project Manager - Technical, or by Contractor Task Leads as necessary. Stakeholder Subproject Leads will chair meetings for their responsible subprojects. Meeting minutes will be recorded and stored on the www.projectsolve2.com site. Any significant issues that are identified at these meetings, especially if they affect schedule, scope or budget, must be brought to the attention of the Telvent Team Project Managers and the ICM Program Manager as soon as possible.

5.4 Information Distribution

5.4.1 Lines of Communication

For the Dallas ICM Demonstration Project, multiple lines of communication are necessary to ensure successful completion of the program. The ICM Program Manager is the overall single point of contact for the program, and will coordinate with the Stakeholders, Telvent Project Manager, and US DOT to ensure appropriate items are communicated properly.

5.4.2 Dallas ICM Program Manager

The ICM Program Manager, Koorosh Olyai, is the single point of contact for all program issues and between the Dallas team and US DOT.

5.4.3 US DOT

Communication with the US DOT will be focused through Steve Mortensen for all program related issues.

5.4.4 Dallas Stakeholders

The Dallas Stakeholders will be involved through multiple communication lines. Each member will be included in the ProjectSolve website, and will receive communications and updates on deliverables through the website. Stakeholder Committee Leads will provide oversight of their responsible scope and report any contractor issues, performance, and risks to the Dallas ICM Program Manager.

5.4.5 Dallas ICM Contractors

The Dallas ICM Contractors are led by Telvent, with support from the Texas Transportation Institute, Southern Methodist University, and the University of Texas – Arlington. Additional subcontractors may be necessary during the execution of this project.

5.4.6 Telvent Project Manager

The Telvent Project Manager, Ahmad Sadegh, is the single point of contact for contractor project issues. He must be copied on all correspondence and meeting minutes and on any telephone conversation notes and faxes regarding significant project activities which affect the contractor scope of work. The Project Manager will be advised of any significant project events or issues and task leaders should use their best judgment in efficiently executing each task. Any activity that may impact the scope, schedule or budget of the project will require the Project Manager's approval.

The formal reporting consists of a scheduled, conference call with a set agenda for the purpose of keeping the ICM Program Manager and Dallas stakeholders informed, Telvent and sub-consultant technical staff apprised of progress and issues. Minutes of these meetings will be taken and posted to ProjectSolve. This technique is proven to provide clear communications and to minimize "surprises". Informal reporting will be provided via e-mails and project memos with follow-up meetings and phone calls as needed to communicate and discuss any major milestones reached, issues uncovered, or other items that may affect the project's progress.

5.4.7 Telvent Deputy Project Manager /Technical Lead

The Telvent Technical Lead, TBD, is responsible for all technical elements of the project, and will assist the Telvent Project Manager.

5.4.8 Telvent Deputy Project Manager/ Admin Lead

The Telvent Admin Lead, Kevin Miller, is providing support to the Project Manager for scope, schedule and budget issues as well as for difficult project management issues.

5.4.9 Task Leads

Task Leads are responsible for communications relating to their task assignments as shown in Table 5-3. Routine issues relating to the tasks for which they are responsible will be communicated in periodic reports. Urgent issues that may severely affect schedule, scope or budget will be immediately brought to the attention of the Telvent Project Manager by the Telvent Deputy Project Manager, Task Lead or their designee.

5.4.10 Technical Advisors

Technical Advisors will be called upon as needed by the Project Manager to assist with resolving especially difficult technical issues. They may provide support to the Project Manager or Task Leads as needed.

5.4.11 Project Contacts

Contact information for key project staff from the Dallas team and other project team members follows. The information is also available on the www.projectsolve2.com site.

5.4.12 Internet/E-mail

Project staff can also be reached through electronic mail (e-mail) via the Internet. E-mail addresses of key staff are included in Table 5-3 and the user's email program can typically be activated by clicking on the address in the table. This information is also available on the www.projectsolve2.com site. The project team is encouraged to make full use of the e-mail system and the www.projectsolve2.com website for project correspondence and minimize extraneous use of traditional mail.

Table 5-3. Project Contact Information

Staff	Role	Telephone	E-mail
DART			
Koorosh Olyai	Program Manager	214-749-2866	olyai@dart.org
Alan Gorman	Technical PM - Transit	214-749-3059	agorman@dart.org
Dan Loving	ICM Coordinator	214-749-3977	dloving@dart.org
Stakeholder Agencies			
Natalie Bettger	Technical PM – Policy	817-695-9280	nbettger@nctcog.org
Robert Saylor	Technical PM – Roadways	972-744-4324	Robert.saylor@cor.gov
Andy Oberlander	Technical PM – Operations	214-320-4438	Andrew.oberlander@txdot.gov
Mark Titus	Coordinating Committee	214-670-3123	Mark.titus@dallascityhall.com
Lloyd Neal	Coordinating Committee	972-941-7151	lloydn@plano.gov
Yang Ouyang	Coordinating Committee		youyang@ntta.org
Ron Patel	Coordinating Committee		Ron.patel@dallascityhall.com
Marian Thompson	Coordinating Committee		mthompson@nctcog.org
Rick Cortez	Coordinating Committee		Rick.cortez@txdot.gov

Staff	Role	Telephone	E-mail
Alex Power	Coordinating Committee		Alex.power@txdot.gov
Jack Mauldin	Coordinating Committee		jmauldin@the-t.com
JD Smith	Coordinating Committee		jdsmith@the-t.com
USDOT			
Steve Mortensen	FTA Lead	202-493-0459	Steven.mortensen@dot.gov
Brian Cronin	RITA lead	202-366-8841	Brian.cronin@dot.gov
Dale Thompson	FHWA Research Lead	202-493-3420	Dale.thompson@dot.gov
Robert Sheehan	FHWA Lead	202-366-6817	Robert.sheehan@dot.gov
Paul Olson	System Engineering Advisor	720-963-3239	Paul.r.olson@dot.gov
Jane Lappin	Evaluation Advisor	617-494-3692	Jane.lappin@dot.gov
Lee Biernbaum	Evaluation Advisor	617-494-2834	Lee.biernbaum@dot.gov
Contractors			
Ahmad Sadegh	Project Manager	215-704-7799	Ahmad.sadegh@telvent.com
Kevin Miller	Admin Lead	313-354-2126	Kevin.miller@telvent.com
TBD	Technical Lead		
Fariel Bouattoura	Deployment Lead		Fariel.bouattoura@telvent.com
Farhad Pooran	Technical Advisor	301-340-1192	Farhad.pooran@telvent.com
Ed Seymour	DSS Development Lead	972-994-0433	eseymour@tamu.edu
Sia Ardekani	Evaluation co-lead	817-272-3792	ardekani@uta.edu
Curtis Beatty	Evaluation co-lead	972-994-0433	cbeatty@tamu.edu
Chris Poe	AMS Lead	972-994-0433	cpoe@tamu.edu
Khaled Abdelghany	DIRECT Modeling	214-768-4309	khaled@engr.smu.edu
Mark McDermott	QA/QC & CM lead		Mark.mcdermott@telvent.com
Jim Carl	Network Integration Lead	301-354-1379	Jim.carl@telvent.com
Marc Forgang	Data Collection Lead	301-354-1383	Marc.forgang@telvent.com
Russ Elovitz	Data Fusion Lead	301-354-1397	Russ.elovitz@telvent.com
TBD	Data Dissemination Lead		
Scot Love	Telvent Regional Vice President	954-714-8081	Scot.love@telvent.com

5.4.13 Project Correspondence

The ICM Program Manager is the sole point of contact for all project correspondence with the US DOT. The Telvent Project Manager is the single point of contact for all contractor related issues. All project correspondence physical copies will be maintained in the project files. Electronic copies will be maintained in the Telvent electronic project files and on the www.projectsolve2.com site.

In the event that DART or the USDOT wishes to communicate an issue at a higher level than the Telvent Project Manager they may contact the Telvent Vice President or Telvent President.

Chapter 6. Project Monitoring and Controlling

The Monitoring and Controlling Process Groups consists of those processes performed to observe the project execution so that potential problems can be identified in a timely manner and corrective action can be taken, when necessary, to control the execution of the project. The Monitoring and Controlling process includes:

- Change Management
- Quality Management
- Issue and Decision Management
- Risk Management
- Procurement and Contracting Management

6.1 Change Management Process

6.1.1 Change Management

Change Management is the systematic proposal, justification, prioritization, evaluation, coordination, approval or disapproval, and implementation of all requested changes in the configuration of a system/Configuration Items (CI) after formal establishment of its baseline. In other words, it is how a system (and its CIs) change control process is executed and managed. Change Management provides management visibility, ensures all factors associated with a proposed change are evaluated, prevents unnecessary or marginal changes, and establishes change priorities.

6.1.1.1 Engineering Change Proposal (ECP)

An ECP, also known as a Change Request (CR), is documentation that describes and suggests a change to a configuration baseline. Separate ECPs are submitted for each change that has a distinct objective.

ECPs are identified as Class I or Class II. Class I changes require government approval before changing the configuration. These changes can result from problems with the baseline requirement, safety, interfaces, operating/servicing capability, preset adjustments, human interface including skill level, or training. Class I changes can also be used to upgrade already delivered systems to the new configuration through use of retrofit, mod kits, and the like. Class I ECPs are also used to change contractual provisions that do not directly impact the configuration baseline; for example, changes affecting cost, warranties, deliveries, or data requirements. Class I ECPs require the client Program Manager's

approval, which will be handled through a formal Configuration Control Board, chaired by ICM Program Manager, Koorosh Olyai.

Class II changes correct minor conflicts, typos, and other "housekeeping" changes that basically correct the documentation to reflect the current configuration. Class II applies only if the configuration is not changed when the documentation is changed.

Any member of the stakeholder or contractor team can submit an ECP to the CCB secretary, currently Kevin Miller, for review and consideration by the CCB. The Secretary reviews the ECP, classifies the ECP (Class I or Class II), and catalogs and collects the ECP for CCB reviews. The CCB will meet formally once a month to review and decide on Class I ECPs, at a minimum. ECP's which are high priority will be reviewed initially via e-mail by members of the CCB. Class II ECPs will be distributed via e-mail by the Secretary, and reviewed and decided upon by CCB members on an ad-hoc basis.

6.1.1.2 Configuration Control Board

For the Dallas Integrated Corridor Management Demonstration project, requirements and design changes identified prior to Production will be coordinated between the DART Project Management and Telvent Project Management. After the initial production implementation, a project Configuration Control Board (CCB) will be established to decide on any system requirements and software changes. The CCB is formed to review Class I ECPs for approval, and make a recommendation to approve or not to approve the proposed change. The CCB chair, Koorosh Olyai, makes the final decision. Members advise and recommend, but the authority for the decision rests with the chair. CCB membership represents the Stakeholder Project Managers, Stakeholder Committee Leads, the Telvent Project Manager, the Telvent Deputy Project Manager – Technical, the Configuration Accounting Manager, and the Telvent Deputy Project Manager – Admin will serve as the secretary of the CCB. The CCB Chair makes all final decisions, with input from CCB members.

6.1.1.3 CCB Documentation

Once the CCB makes a decision concerning an ECP, the CCB issues a Configuration Control Board Directive that distributes the decision and identifies key information relating to the implementation of the change:

- Implementation plan (who does what when);
- Contracts affected (prime and secondary);
- Dates of incorporation into contracts;
- Documentation affected (drawings, specifications, technical manuals, etc.), associated cost, explicit funding mechanism, and schedule completion date; and
- Identification of any orders or directives needed to be drafted and issued.

6.1.2 Cost Management

Project cost control searches out the causes of positive and negative variances, and is part of the Change Management process described above.

Project Cost Management during the controlling phase includes the processes used to control costs so that the project can be completed within the approved budget. Project cost controls include:

- Influencing the factors that create changes to the cost baseline;
- Ensuring requested changes are agreed upon;
- Managing the actual changes when and as they occur;
- Assuring that potential cost overruns do not exceed the authorized funding periodically and in total for the project;
- Monitoring cost performance to detect and understand variances from the cost baseline;
- Recording all appropriate changes accurately against the cost baseline;
- Preventing incorrect, inappropriate, or unapproved changes from being included in the reported cost or resource usage;
- Informing appropriate stakeholders of approved changes;
- Acting to bring expected cost overruns within acceptable limits.

As part of the Earned Value methodology, each subproject's budget will be tracked to measure the Actual Cost, Earned Value, Estimate to Complete and Estimate at Completion. These measurements will be reported as part of the monthly project status meeting. The Telvent Deputy Project Manager – Admin is responsible for tracking the subproject budgets and the overall program's budget for the contractors. The DART financial group is responsible for providing all financial reporting for the Cooperative Agreement to US DOT.

6.1.3 Scope Management

Similar to Cost Management, Scope Management is concerned with influencing the factors that create project scope changes and controlling the impact of those changes through the Change Management Process.

Scope control assures all requested changes and recommended corrective actions are processes through the Change Management process. Project scope control is also used to manage the actual changes when they occur and is integrated with the other control processes.

All changes to Scope with be managed through the Change Management system, documented, tracked, and approvals will be documented in the ProjectSolve system within a Change Management folder. The Telvent Deputy Project Manager – Technical will be the

person responsible for tracking scope and ensuring that all changes are identified and reviewed according to the change management process.

6.1.4 Schedule Management

Similar to Cost Management and Scope Management, Schedule Management is concerned with influencing the factors that create project schedule changes and controlling the impact of those changes through the Change Management Process.

Schedule control assures all requested changes and recommended corrective actions are processes through the Change Management process. Project schedule control is also used to manage the actual changes when they occur and is integrated with the other control processes.

All changes to Schedule with be managed through the Change Management system, documented, tracked, and approvals will be documented in the ProjectSolve system within a Change Management folder. The Telvent Deputy Project Manager – Admin will be the person responsible for tracking schedule and ensuring that all changes are identified and reviewed according to the change management process.

6.2 Quality Management Process

The Quality Management Process describes the steps, collectively known as quality assurance (QA), for ensuring that the correct products and services are delivered with the required level of quality.

6.2.1 Project Quality Objectives

The following objectives are to be the basis of project quality management during the project life cycle:

- Inform affected groups and individuals of QA activities and results;
- Provide appropriate levels of process visibility to management;
- Objectively verify adherence of activities and software products to the appropriate requirements, standards and procedures;
- Performance of audits and reviews according to the project schedule;
- Detecting and tracking issues and escalation;
- Document problems, issues, or impediments to project staff or QA agents in performing their activities during the project;
- Ensure that designs are documented and reviewed;
- Ensure that code conforms to standards and is reviewed by developers other than the author;
- Conduct formal testing of the system using staff independent of the project development team; and

- Ensure that specific policies and procedures are in place to ensure that ongoing operations and maintenance of the Dallas ICMS Demonstration Project meet project quality objectives and standards of practice.

6.2.2 Telvent Quality Management Organization

6.2.3 Duties and Responsibilities

The Telvent Project Managers and Task Leads have the primary responsibility for ensuring quality control and, specifically the implementation of the project quality control procedures. Each assigned staff member is individually responsible for controlling the quality of services within their area of performance. The QA/QC Manager is responsible for verifying that project quality procedures have been defined and are being adhered to.

6.2.4 Staff Assignments

The organization chart for the Dallas Integrated Corridor Management Demonstration project is shown in Figure 4-1, above and is the reporting structure for implementation of service and delivery of products as well as quality control. Roles and responsibilities for quality management are summarized in Table 6-2.

Table 6-1. Quality Roles and Responsibilities

Name	Project Position	Responsibilities
Ahmad Sadegh	Project Manager	• Manages the project in its entirety, responsible for overall project quality
Mark McDermott	QA/QC Manager	• Responsible for ensuring project quality policies and procedures are defined and followed • Perform project quality audits
Mark McDermott	Telvent-CM	• The primary Telvent Configuration Manager (CM) responsibilities involve supporting the change process as it affects existing product baselines, maintaining a status of all configuration items, and auditing the physical configuration of the developed software.
Roberto Macias Ed Seymour Sia Ardekani Curtis Beatty Chris Poe Marc Forgang Russ Elovitz Fariel Bouattoura	Task Leads	• Task Lead has overall responsibility for quality of products produced at the Task level. • Coordinate with staff, subcontractors, QA/QC Manager and Telvent PM regarding issues affecting quality.
TBD	Telvent Deputy PM	• The Project Coordinator may be invoked to address issues not resolvable at the Task Lead level
TBD	ITG	• Independent Test Group – responsible for testing software in Systems Test phase • Verifies that system software requirements have been fully met.

Name	Project Position	Responsibilities
Marc Forgang Russ Elovitz	Software Development	• Makes changes to controlled software work products • Develops/maintains the software code, unit test plans, technical documentation

6.2.5 Standards of Practice

6.2.6 Telvent Software Development & Systems Engineering

All project software will be developed using Telvent's Software coding standards, following the Systems Engineering Management Plan.

Table 6-3 is a summary of the major Quality Management Plan elements. The Technical Lead, TBD, is responsible for ensuring quality on this project, with extensive support from Telvent's QA/QC Manager Mark McDermott, O&M Lead Fariel Bouattoura and Project Manager Ahmad Sadegh.

Table 6-2. Quality Management Plan Elements

Quality Management Plan Elements
1. Requirements Analysis – Requirements will be gathered and analyzed through a series of documented interviews with stakeholders to ensure that all needs are properly documented and addressed as appropriate in designing and development of the resulting systems.
2. Requirements and Design Reviews – The Telvent Team will conduct requirements and design reviews with vendors and subcontractors to ensure all system requirements are properly accounted for and the design is robust to meet the established requirements.
3. Change Control / Configuration Management – The Telvent Team will staff and coordinate change control activities using a standard set of configuration management tools for deliverables, documentation, and source code control. A web-based tool, "Issue Tracker" will be used to track any system issues that are discovered.
4. Peer Reviews and Independent Testing – The Telvent Team will perform peer reviews and independent testing to verify that the system is working as designed and to ensure that all functional requirements are met. The Dallas team will provide an independent testing group.
5. Acceptance Testing – The Telvent Team will review Acceptance Test Plans/Procedures to verify all required functions and requirements are sufficiently tested. The Draft Acceptance Test Plan will be reviewed and approved by DART, the stakeholders and US DOT. The Final Acceptance Test Plan will be created by Telvent, and approved by DART. Deployed systems will undergo subsystem test, and full system integration test. The Telvent Team will participate in formal acceptance tests of the resulting systems to ensure that all established requirements have been met.
6. Periodic Project Team Meetings – The Telvent Team will conduct periodic project team meetings internally and with DART, USDOT, and vendors to review progress and upcoming plans, and collectively discuss any potential problems/issues that can be resolved by the group, along with suggested process improvements for upcoming efforts.
7. Pink Sheet Reviews – The Telvent Team deliverable reports will always be reviewed by at least one

Quality Management Plan Elements
additional staff member other than the writer through Telvent's Pink Sheet review process. This is in accordance with Telvent's ISO-9001 certified procedures. See pink sheet template in Appendix A.
8. Project Files – Project files will be organized and maintained in accordance with Telvent's ISO-9001 standards to provide for expeditious access to all project documents as needed. Periodic internal and formal ISO-9001 project file audits will be conducted to ensure standards are adhered to. Project files will also be stored in the web-based ProjectSolve repository that can be accessed by DART, USDOT, and project team members.

6.3 Issue Management Process

The ICM Program Manager, Koorosh Olyai, will be able to call upon a team of senior Technical Advisors for help with issue management as it relates to particularly thorny technical and programmatic issues, and will receive project management support from Ahmad Sadegh, Telvent Project Manager – who will primarily assist in ensuring that all aspects of the project are coordinated so that schedule and budget deadlines are met.

6.3.1 Issue Definition

Significant project issues that are not resolved within the ordinary scope of project activities may require the application of additional expertise or executive management coordination to achieve resolution.

6.3.2 Roles and Responsibilities

Table 6-4 lists roles and responsibilities for Issue Management.

Table 6-3. Issue Management Roles and Responsibilities

Staff	Role	Responsibility
Koorosh Olyai	Program Manager	Overall oversight of the projects
Alan Gorman	Transit Lead	Stakeholder lead for Transit Issues
Andy Oberlander	Highway Lead	Stakeholder lead for Highway Issues
Robert Saylor	Arterial Lead	Stakeholder lead for Arterial Issues
Natalie Bettger	Policy Lead	Stakeholder lead for Regional Policy and Planning Issues
Ahmad Sadegh	Telvent Project Manager	Overall project responsibility
TBD	Telvent Deputy PM – Technical	Overall Technical Development and Deployment responsibility
Kevin Miller	Telvent Deputy PM - Admin	Overall project tracking of scope, schedule and budget
Scot Love	Telvent Regional Vice President	Corporate responsibility for project performance, ensure resources are available to execute project and resolve issues.

Staff	Role	Responsibility
Fariel Bouattoura	System Engineering Lead	Responsible for deployment activities for computer and software systems
Jim Carl	System Hardware & Communications	Responsible for issues regarding computer and communications system hardware
Russ Elovitz	511 IVR System	Responsible for IVR system implementation
Joe Zingalli	Public Web Site Task Lead	Responsible for Website implementation
Roberto Macias	Field Infrastructure Lead	Responsible for field infrastructure implementation
Ed Seymour	DSS Lead	Responsible for Decision Support System implementation
Chris Poe	AMS Lead	Responsible for the Analysis, Modeling, and Simulation (AMS) activities
Jim Carl	Network Integration Lead	Responsible for issues regarding computer and communications system hardware
Farhad Pooran	Technical Advisor	Responsible for oversight of Telvent's Systems and Infrastructure implementation
Mark McDermott	QA Lead	Responsible for the Quality Assurance and Quality Control and Configuration Management activities

6.3.3 Issue Reporting

Issues that require special attention are inherently of significant importance and should be brought to the attention of the Telvent Project Manager as soon as possible. The Telvent Project Manager will coordinate with the ICM Program Manager as soon as is practical given the nature of the issue. Issues will be entered into an issue tracking database and their status reported during project meetings. Issues can be submitted by any stakeholder or team member to the Telvent Project Manager.

6.3.4 Issue Escalation

In the event that an issue cannot readily be resolved by the core project team the Telvent Project Manager will call upon the appropriate additional technical or management resources as defined in Table 6-3. There may also be unique circumstances where the ICM Program Manager may escalate an issue to the USDOT and Telvent Executive Management. In general, the order of ascending escalation for an issue to Telvent will be the Technical Lead, Project Manager, and Vice President. Difficult technical issues or issues requiring additional institutional coordination will be escalated to the ICM Steering Committee, as needed.

6.3.5 Issue Resolution

The Telvent Project Manager will coordinate with the ICM Program Manager, the USDOT and the appropriate stakeholder staff regarding significant details and any decisions pertinent to resolving project issues.

If an issue requires significant time and effort that is within the project scope it will be added to the project schedule. If an issue requires time and effort that are outside the project scope the Telvent Project Manager will coordinate with the ICM Program Manager, and USDOT to determine the desired course of action.

Once an issue is resolved details will be documented in the project record.

6.4 Risk Management Process

The Risk Management Process is an iterative process that continues for the duration of the Dallas Integrated Corridor Management Demonstration project. Figure 6-1 illustrates the cyclical nature of the process and the fact that communication is central to the Risk Management Process. Open communication is required to identify as many potential risks as possible. Communication among project personnel is required to analyze, quantify and prioritize risks. It is also required for the development and implementation of effective mitigation plans. Effective risk management requires the participation of all project staff and stakeholders, which is enabled by effective, constant communication.

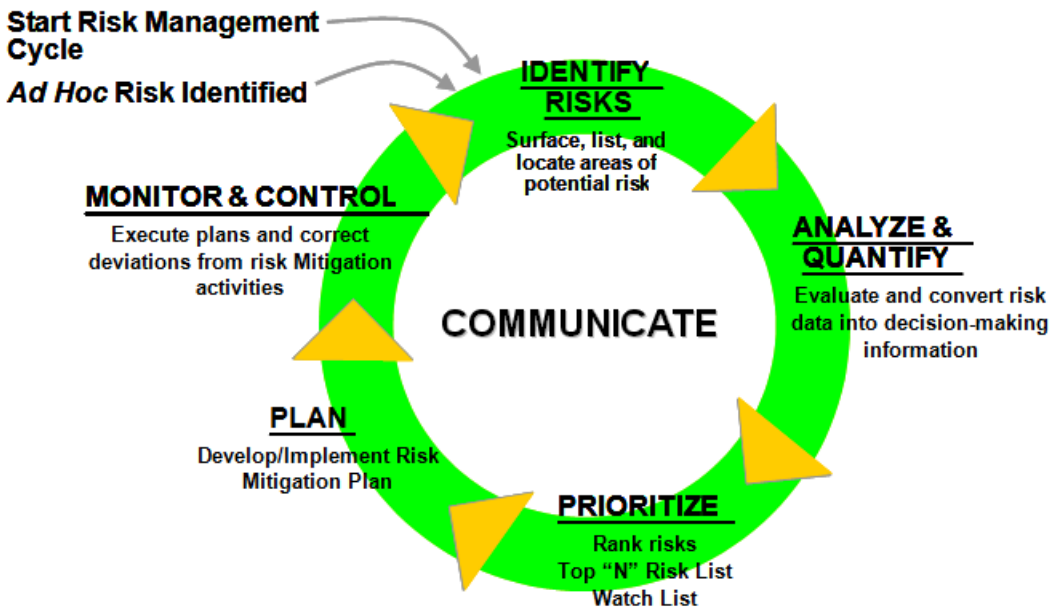

Figure 6-1. Risk Management Process

(Source: Telvent)

At an early stage of the project (preferably prior to 20% design completion), the Telvent Project Manager in consultation with the Telvent Deputy Project Manager –Technical, ICM Program Manager, Stakeholder Leads, and key project staff will review the initial list of potential risks, identify additional potential risks and modify or remove items in the initial list as needed. The Telvent Project Manager, ICM Program Manager, Stakeholder Leads, and key project staff will assess the probability of occurrence of each identified risk and its potential impact on the outcome of the project. If it is determined that the probability of a risk occurrence combined with its impact on the project is high, a mitigation action plan must be developed and implemented for that risk.

There are a number of approaches that may be used to develop the Risk Assessment Chart in Attachment I. A specific risk management meeting will be used to identify and analyze risks. Additionally, risks may be identified during monthly project meetings and added to a list for consideration at a planned risk management meeting. During the meeting brainstorming and analysis may be used to identify and characterize risks. Identified risks are to be recorded in the Risk Assessment Table maintained in ProjectSolve. Risk characteristics (probability, impact) must be assessed and recorded along with other risk information. For risks with high probability and impact, mitigation must be identified and implemented. Other risks are monitored and addressed as needed. Not all identified risks will be monitored and addressed, only those that in the judgment of the Telvent Project Manager and ICM Program Manager pose a realistic impact and likelihood will be tracked.

6.4.1 Records

The Risk Assessment Chart in Attachment I will be maintained as a living document for the life of the project in ProjectSolve. Risks will be reviewed and re-prioritized on a monthly basis, at a minimum.

6.5 Procurement and Contracting Management

Procurement and Contracting Management includes the processes to purchase or acquire the products, services, or results needed from outside the project team to perform the work. For the Dallas ICM Demonstration project, each contractor's procurement processes will be used.

Each contractor (Telvent, TTI, etc.) will procure the equipment, and services needed for the program. The ICM Program Manager will approve all purchases by contractors prior to purchase, to ensure any product standards (i.e. specific model/ brand of equipment) are used.

Chapter 7. Project Closing

The Closing Process Group includes the processes used to formally terminate all activities of a project or a project phase, hand off the completed product to others or close a cancelled project. This process group, when completed, verifies that the defined processes are completed within all the Process Groups to close the project or a project phase, as appropriate, and formally establishes that the project or project phase is finished.

7.1 Acceptance Management

7.1.1 Acceptance Test Scope

The Acceptance Management process occurs throughout the lifecycle of the project. It helps ensure that the system is being built according to the established requirements and with the proper level of quality.

The Acceptance Management process begins with the establishment of System Requirements, the development of the Design Document and Acceptance Test Plan and continues through the development and testing processes.

One aspect of Acceptance Management is document control and review process management. The ProjectSolve website is being used to facilitate these processes. The site provides easy access to draft and final documents and review. In order to keep the schedule on track deadlines must be met by all parties. To help achieve this Telvent will work with the Dallas ICM team and USDOT to facilitate its Design Document review process.

Acceptance testing for the Dallas Integrated Corridor Management Demonstration project is intended to test the Dallas ICM system components.

7.1.2 Problem Identification and Resolution

During acceptance testing, all test successes, failures or other results will be reported to the Dallas Team by the contractor team. All test cases reported as Failed, or appear to be working other than expected, will be verified by the contractor team, compiled and reported for further review and correction (as necessary).

There are four (4) possible outcomes for each test observation, and/or test script. These test results, along with any additional Dallas ICM agencies comments will be noted as reported by the Contractor team representatives. The test results will be recorded in the Test Script section of the Acceptance Test Plan. Those tests that are reported as “Pass” do not require any further comments; however, the Dallas ICM team may choose to provide additional comments that satisfy the understanding and/or disposition of the test. Each test case reported as “Failed”, must include sufficient detail, including a complete description of the activities done while executing the test (so that the problem can be repeated). Those tests reported as “Could not complete” must also include the reason in sufficient detail why

the test could not be executed/finished. There may be cases where a test could not be completed or did not complete in the expected way, but the Dallas ICM team is willing to pass it anyway. In this case, the "Accept as is" result is used and appropriate comments provided to explain why this result was selected.

Table 7-1 outlines the procedures for handling each outcome:

Table 7-1. Test Result Procedures

Test Result	Reason	Resolution
Pass	Test produced expected result as define in the test script.	Script is successful. Acceptance of the test is noted by signature of tester and initials of the Dallas ICM team observer.
Could not complete	Unknown or external factors prevented the completion of the test.	Report the problem in detail in the script's Comments field. Assign responsibility for the resolution of the problem, and create an action plan and schedule to resolve it and re-test.
Failed	Test did not produce the expected result or caused other failures (e.g., system crash, unexpected error).	The Tester reports the problem in detail in the script's Comments field. The Telvent Team Representative confirms the problem and logs a CR (Change Request). Telvent Team will review and make modifications to the software and/or database and re-test until successful.
Accept as is	Complete verification is not desired, or observed behavior is acceptable.	As appropriate, report any concerns in detail in the script's Comments field. Inform the Telvent Team representative. The Telvent Team representative confirms and reports the problem to Telvent Team and logs a CR (Change Request) if necessary.

7.1.3 Managing Software Changes

Software builds and version control will be handled by the Telvent Team Configuration Management (CM) group to ensure that testing is performed on the proper release of the software, and that all fixes and modifications are documented, and that all source code and build files are maintained in a secure environment. The processes and procedures for Software Changes are document in the Systems Engineering Management Plan.

7.1.4 Acceptance of the System

After all required tests have passed or been "accepted as-is", the Dallas ICM Team will indicate completion of the initial Acceptance Test of the Dallas ICM system by having the appropriate Dallas ICM Team representative sign the *Initial Acceptance Signature Sheet* that will be included in the Acceptance Test Plan.

7.1.5 Disposition of Signed Scripts and Final Acceptance Signature Sheet

The Telvent Team will retain the original Acceptance Test Plan and acceptance test procedure, along with all comments received from the Dallas ICM Team personnel during the course of executing the Systems Acceptance Testing. These will be saved in the ProjectSolve site. The Telvent Team will provide a copy of the completed acceptance testing result to the Dallas ICM Team Program Manager.

7.1.6 Responsibilities/Resources

The following test team roles will be involved with the acceptance test effort at various times, as required.

System Administrator	Provides the test environment and equipment specified in this acceptance test plan. Will also be needed to execute (or assist with) the test scripts.
Dallas ICM Team system users	Participates directly in the acceptance testing as the resource responsible for observing the behaviors of the system. The "user" in this case will be the system administrator or other designated technical personnel assigned by Dallas ICM Team. This person should be familiar with the Dallas ICM system requirements.
Dallas ICM Team oversight committee	Coordinate Dallas ICM Team personnel resources to provide at least one participant to test these functions (see *Training Needs* and *Testers* sections under Assumptions above).
Telvent Team System/Network Engineer	Set up related environment components; network, hardware, software and database configuration (including appropriate database population and simulator) in preparation for acceptance testing.
Telvent Team Technical Representative	Monitor activities associated with the acceptance test. Document and maintain a list of discrepancies occurring on site as well as, during testing. Report Change Requests (CRs) as necessary. Report confirmed discrepancies to Telvent Team development or system engineering staff.
Telvent Team Software Lead and Software Developers	Perform debugging and make coding changes.
Telvent Team CM Administrator	Provide Configuration Management and version control.
Telvent Team Project Manager	Monitor activities associated with the acceptance test.
Agency Project Managers	Review and approve Acceptance Test Plan. As appropriate, witness test execution, and accept the system. Provide signatory for system acceptance (Initial and Final Acceptance Signature Sheets).
Additional Dallas ICM Team Representatives	As appropriate, witness test execution, provide comments as appropriate, and otherwise support the ICM Stakeholders.

7.2 Project Close-Out

Completion of project close-out procedures will be required for each Task Leader. A sample project closeout worksheet is shown below. Each Task Leader is responsible for completion of the closeout worksheet and will submit the worksheet to the Project Manager at the completion of each Task.

Close-Out Task	***Assigned to***	***Date Started***	***Date***
Comments:			
Comment:			
Comment:			
Comment:			
Return All Client Materials			
Comments:			
Complete Accounting Tasks			
Comments:			
Project Write-Up			
Comments:			
Project Management Performance Report			
Comments:			
Exit Interview with Client			
Comments:			
Project Filing (hard and electronic copies)			
Collect/Consolidate All Files			
Comments:			
Organize Collected Project Files			
Comments:			
Purge Unnecessary Duplicates			
Comments:			
Label Files and Disks			
Comments:			
Document File Review Process			
Comments:			
Empty & Re-use 3-Ring Project Binders			
Comments:			
Project Team Close-Out Meeting			
Comments:			

7.3 Lessons Learned

As part of the Dallas ICM Demonstration project, a lessons learned document will be developed to document risks, issues, deployment, and operations and maintenance lessons learned during the project. These lessons learned will be included in the Dallas ICM Demonstration Project Final Report.

Chapter 8. Acronyms

AMS	Analysis, Modeling, and Simulation
ASMS	Arterial Street Monitoring System
ATIS	Advanced Traveler Information
AVI	Automatic Vehicle Identification
AVL	Automatic Vehicle Location
CCB	Configuration Control Board
CCTV	Closed Circuit Television
CDR	Critical Design Review
COTS	Commercial Off The Shelf
Daltrans	Dallas Transportation Management Center
DART	Dallas Area Rapid Transit
DMS	Dynamic Message Sign
DSS	Decision Support System
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
GDP	Gross Domestic Product
GPS	Global Position System
HAR	Highway Advisory Radio
ICD	Interface Control Document
ICM	Integrated Corridor Management
ITS	Intelligent Transportation Systems
IVR	Interactive Voice Response
NCTCOG	North Central Texas Council of Governments
NTTA	North Texas Tollway Authority
PDR	Preliminary Design Review
RCU	Roadside Communications Devices
RITA	Research and Innovative Technologies Administration
RFP	Request for Proposals
RTM	Requirements Traceability Matrix

SDR	Software Development Review
SRR	System Readiness Review
TIS	Travel Information System
TMC	Traffic Management Center
TMDD	Traffic Management Data Dictionary
TSP	Transit Signal Priority
TxDOT	Texas Department of Transportation

Appendix A. Pink Sheet Review Template

TELVENT SUBMISSION REVIEW FORM (Pink Sheet)

This form is required to be completed prior to sending any type of submission to a client. Submissions include draft reports; final reports; working papers; conference papers and any other document that includes any significant technical information or a project deliverable to an external client. Clients include prime contractors as well as the ultimate client.

The reviewers' comments are mandatory, not advisory. All recommended changes to the report must be made by the author. If there are unresolved issues these must be discussed and agreed upon between the author and the reviewer. Should a difference arise between author and reviewer, the project manager shall be consulted to provide resolution.

Unless otherwise directed by the Project Manager, the author is responsible for initiating the Pink Sheet process, and ensuring the Pink Sheet is completed and appropriately filed.

The project manager is responsible for determining the appropriate resource to conduct the review. The following shall be taken into consideration when assigning a reviewer:

- The reviewer should be able to review the deliverable with the client's requirements in mind. Since this review is conducted to ensure our deliverables are of the highest quality, it is essential that the reviewer has the background and experience to understand client requirements to meet and exceed our client's expectations. The review should consider the client's perspective. That is, how the deliverable is to be used, client standards and, in general, the context in which the client will use the deliverable. As the primary contact with the client, the project manager can provide valuable insight in this regard.
- Telvent Farradyne Inc. Grade Level - The reviewer shall be of appropriate grade level to conduct the review. A P-Grade of 12 or higher is preferable. Should a P12 or higher not be available, the following criteria should be considered:
- Technical Expertise and Background - Technical expertise in the domain related to the submission to sufficiently check for technical problems, inconsistencies, feasibility, conformance to project requirements and Telvent Farradyne Inc. standards.

This form has three sections; each section must be completed, signed or initialed and dated prior to submitting the report. This form must be attached to the final copy of the document that is kept in our company files. The file copy may be placed in the project file at the office in which the project and project files reside (i.e., Rockville, NY, Los Angeles…etc.) or on the

network drive housing the online project folder (i.e. the N: drive for most projects or O: drive for software development projects). Regardless of method (paper or online) the marked up copy shall be stored with the pink sheet and the final copy (i.e. with changes integrated and verified) in the project file or folder for paper and online copies respectively.

The reviewer shall review a paper copy of the report using a red pen for paper copies or inserted comments and change tracking for online copies. If changes are small (e.g. a comma) the amended page of print copies shall be either dog-eared or clearly marked on the top right with an asterisk (*). Place a vertical bar on the page near the location of the item requiring an edit.

1. To be Completed by Author	
Author	
Client	
Document Title	
Document Location	
Reviewer	
Job Number	
Task Number	
Budget (hours)	
Reviewer's deadline for delivery to Author	
Date:	
Time:	
Report submitted to reviewer	
Date:	
Time:	
Signature (print copy) or initials (online copy) of Author	
2. To be Completed by Reviewer	

Review completed and returned to author	
Date:	
Time:	
Signature (print copy) or initials (online copy) of Reviewer	
3. To be Completed by the Author	
Review comments verified	
Date:	
Time:	
Signature (print copy) or initials (online copy) of Author or resource verifying changes are implemented	

Attachment I – Risk Management Chart

The Risk Management Chart is a living document, which will be updated on at least a monthly basis, and will be version controlled. The current version of the Risk Management Chart is located in ProjectSolve (www.projectsolve.com) in the Project Management Folder.

Attachment II – Project Schedule

The Project Schedule is a living document, which will be updated on at least a monthly basis, and will be version controlled. The current version of the Project Schedule is available in ProjectSolve (www.projectsolve.com) in the Project Management folder.

Attachment III – Earned Value Charts

The Earned Value Charts are living documents, which will be updated on at least a monthly basis, and will be version controlled. Current versions of the Earned Value Charts are available in ProjectSolve (www.projectsolve.com)

U.S. Department of Transportation
ITS Joint Program Office-HOIT
1200 New Jersey Avenue, SE
Washington, DC 20590

Toll-Free “Help Line” 866-367-7487
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