Section VI.B
Statement of Work

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State of California
Department of Transportation
District 11

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Interstate 15
Reversible Lane Control System
RFP-DOT #2040

- - -

April 21, 2004

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1. Introduction

This Statement of Work document serves as the basis for the contractual agreement between the State of California and the contractor. It defines the tasks to be performed and the deliverables to be produced during the life of the contract. This Statement of Work is "performance-based" meaning that it contains a description of the tasks to be performed by the contractor in terms of the required deliverables, and includes methods of performance measurement. The contractor will manage the project and create the deliverables using their own management and technical methods, as described in their System Project Management Plan, but must produce, as a minimum, the deliverables to the specifications included within this Statement of Work.

The remainder of this document is organized in the following manner:

Section 2: Provides an overview of the project, including the purpose for the project, some background information, and scope (functionality and schedule).

Section 3: Discusses current documentation and project library.

Section 4: Describes the requirements in summary form, highlighting each of the major tasks and deliverables, and references Appendices A and B for detailed information about the minimum required tasks and deliverables, and the acceptance criteria for each deliverable. The section also references the technical specifications for the system.

Appendix A: Describes Minimum Contract Deliverables and Format - A listing of minimum required project deliverables is provided in Table A.1. The relationship between each deliverable and WBS elements is also provided. Tables A.2 through A.23 specify the required deliverable formats.

Appendix B: Shows tasks identified in a Preliminary Work Breakdown Structure (WBS) and includes the minimum required project tasks. Most tasks are mapped to a specific Contract Deliverable.

2. Overview

2.1. Project Summary

2.1.1. Purpose, Scope, and Objectives

This Statement of Work delineates the minimum activities, tasks, and methods required to develop, deliver, support, maintain, and provide training for a major upgrade to the California Department of Transportation (CA-DOT), San Diego District 11, Interstate 15 Reversible Lane Control System (I-15 RLCS).

This effort requires hardware, network/communications equipment, software, training, installation, and warranty services.

The goals of the I-15 RLCS Project are to:

- Upgrade the existing I-15 RLCS to an open and scalable platform that can accommodate planned I-15 construction, providing RLCS status to outside systems via an external server.
- Provide a simulation environment for training users and testing hardware and software after development and for future changes. This will improve worker and public safety when implementing future changes.
- Implement a high-level software environment with GUI, system log files, data stores, and program and management/incident reporting.

2.1.2. CA-DOT Responsibilities

Kickoff meeting: CA-DOT shall provide meeting space at the San Diego Transportation Management Center (TMC) facility and shall notify all attendees representing CA-DOT.

Deliverable Review: CA-DOT shall review all deliverables within 5 business days unless otherwise noted in Appendix A – Deliverable Specifications.

Equipment and Infrastructure: CA-DOT shall provide computer network communications connectivity in the field environment (a point of network presence at the TMC, FCU South and FCU North). CA-DOT will install the network media such as fiber and copper. CA-DOT will not provide the network equipment or connectivity for the simulator environment.

Security Access: CA-DOT shall authorize contractor staff to enter the required secure areas of the TMC facility and the FCU South and North Buildings.

Facility accommodations: CA-DOT shall not provide working space or accommodations to contractor staff until delivery of the simulator environment system.

Acceptance Testing: CA-DOT shall provide staff and facilities necessary to conduct system and acceptance testing in both the simulator and field environments. CA-DOT shall review results of acceptance testing to determine that the system requirements have been met. CA-DOT will assess the ability of the system to prevent unauthorized operations from occurring by testing all the possible operational scenarios to make sure that the software does not violate any safety rules.

2.1.3. Project Deliverables

The table of deliverables in Appendix A is the minimum required by CA-DOT. Appendix A also describes the required deliverable format, media, and distribution requirements. The contractor may add deliverables required by its standard practices, as defined in its proposal that aid in the successful implementation of the project.

The initial System Project Management Plan (B100M) and initial System Architectural Design Description (B311S) delivered with the contractor's proposal and incorporated into the contract will be the baseline documents for these two deliverables.

2.1.4. Schedule Summary

The major milestone tasks shown below correspond to the requirements described within Section 4 of this Statement of Work document. Depending on its development methodology the contractor may schedule the start of any milestone task before completing an earlier milestone, especially if using an iterative development methodology. The contractor must, however, complete each milestone in its entirety prior to completing a following milestone unless otherwise approved by CA-DOT. Contract payments will be based on deliverables. See Appendix B for the Preliminary Work Breakdown Structure.

1. Develop System (Design Phase) ***(Complete before completing milestone 2)***
   - Manage Project
   - Perform Supporting Processes
   - Refine System Design / Refine Software Requirements / Design Software

2. Develop System (Implementation Phase) ***(Complete before completing milestone 3)***
   - Manage Project
   - Perform Supporting Processes
   - Develop Device Emulator Software
   - Develop Application Software

3. Deliver, Test & Initialize Simulator System ***(Complete within 6 months of contract award)***
   - Manage Project
   - Perform Supporting Processes
   - Simulator Environment Delivery and Initialization
   - System and Acceptance Test in Simulator Environment
   - Simulator Environment Operational Use Readiness Report
   - Provide Training

4. Deliver & Initialize Development Environment ***(Complete before completing milestone 5)***
   - Manage Project
   - Perform Supporting Processes
   - Install and Configure Development Environment
   - Provide Training

5. Deliver, Test, and Initialize Field System ***(Complete within 12 months of contract award)***
   - Manage Project
   - Perform Supporting Processes
   - Deliver Field Environment Components
   - Integrate Field Environment
   - Conduct System and Acceptance Test in Field Environment
   - Field Environment Delivery, Initialization, and Cutover
   - Field Environment Operational Use Readiness Report
   - Provide Training
   - Provide System Warranty Services

2.1.5. Definition of Terms

Term	Meaning
Applications Software	All developed software and all associated software and source code documentation developed under contract for State ownership and use.
CA-DOT	California Department of Transportation
Contractor Software	Software owned and copyrighted by the Contractor.
Developed Software	Third-Party software products to be modified by the Contractor under contract.
IPOC	Independent Project Oversight Contractor
IV&V	Independent Verification and Validation
I15-RLCS	Interstate 15 Reversible Lane Control System
Software	Refers to software products, including, but not limited to, operating systems, languages, word processors, databases, spreadsheet processors, utility programs, standard device drivers, application generators, graphics utilities, and software libraries, programs and functions.
Third-Party Software or Commercial Off-the-Shelf (COTS) Software	Also known as Supplied Software. Software purchased for State's use and owned by a third party and acquired by the contractor under license or by purchase for State's use without being developed or modified.

3. Project Library

Documentation in this Statement of Work and following sections on technical requirements is deemed sufficient for the bidders to familiarize themselves with the current system, environment, and application. A separate pictorial summary of the Existing I-15 RLCS is provided at the following website for the Bidder's quick reference and understanding of the existing system and field conditions:

http://www.dot.ca.gov/dist11/operations/I15RLCS/index.htm

A Project Library of additional material on the existing I-15 RLCS, not included here, will be available as reference material for the selected bidder during project implementation.

4. Statement of Work

4.1. Manage Project

The contractor shall perform all tasks and produce all deliverables related to managing the project as documented in the Managerial Process Plan section of the System Project Management Plan (B100M).

4.1.1. Maintain Project Plan

The contractor shall maintain an integrated System Project Management Plan (B100M) based on the tasks and deliverables described in this Statement of Work. The initial System Project Management Plan (B100M) delivered with the contractor's proposal and incorporated into the contract will be the baseline document. See Appendix A for the required contents and format of the System Project Management Plan (B100M).

The contractor shall maintain a work plan contained within the System Project Management Plan (B100M). The contractor shall use **Microsoft Project** to maintain the work plan and track project progress. See Appendix B for a copy of the Work Breakdown Structure.

4.1.2. Start-Up Project

The contractor shall conduct a contract kickoff meeting with CA-DOT, a Department of General Services Procurement Representative, the Independent Project Oversight Contractor (IPOC), and Independent Verification and Validation (IV&V) contractor at CA-DOT within two weeks of contract award. The contractor shall submit a revised System Project Management Plan (B100M) and address project organization and responsibilities, project plans, including technical process plans and procedures (configuration management and problem reporting), project schedule, and field safety. In addition, submit plans for bi-weekly status review meetings. The contractor shall send a draft agenda for approval and comments seven days in advance of the meeting. The contractor shall prepare a Briefing Package (B105M) prior to the meeting for distribution to all attendees at least one day prior to the meeting.

4.1.3. Track and Control Project

4.1.3.1 Requirements Control

The contractor shall adhere to the Requirements Control Plan section of the System Project Management Plan (B100M) as proposed by the contractor and approved by CA-DOT.

The contractor shall procure a license and include documentation (for CA-DOT) for **AllFusion Harvest Change Manager**. This software shall be used to track changes to software and all system and sub-system requirements during development. The contractor shall provide access to the system to all internal and CA-DOT project team members.

Any proposed, approved, or denied changes will be recorded as individual Engineering Change Proposals or ECPs (B107M), and shall be placed under configuration management. The Change Review Board will review ECPs (B107M) at bi-weekly meetings or when needed as determined by Contractor and CA-DOT.

4.1.3.2 Schedule and Budget Control

The contractor shall adhere to the Schedule Plan and Budget Control Plan sections of the System Project Management Plan (B100M) as proposed by the contractor and approved by CA-DOT.

The contractor shall track the actual versus scheduled progress and costs of all tasks and deliverables included in the Work Plan section of the System Project Management Plan (B100M).

The contractor shall create and maintain the schedule and budget using Microsoft Project Plan.

The contractor shall submit a Status Report (B102M) every two weeks to CA-DOT program management that documents at the individual task level and at a project level the following project metrics:

Planned Value (PV)
Earned Value (EV)
Actual Costs (AC)
Budget At Completion (BAC)
Schedule Variance (SV)
Cost Variance (CV)
Estimate At Completion (EAC)

The contractor shall also provide the following additional deliverables with the bi-weekly status report:

Meeting Minutes (B106M) from meetings held since the previous status meeting, a current Configuration Status Report (B103M), a current Problem Report (B108M), and a current Issue/Action Items Report (B104M).

During the weeks when no status meeting is held, the contractor shall submit a Bi-Weekly Status Email (B101M) containing a current Configuration Status Report (B103M), a current Problem Report (B107M), and a current Issue/Action Items Report (B104M).

Information about the report formats and distribution requirements is included in Appendix A.

4.1.3.3 Quality Control

The contractor shall adhere to the Quality Control Plan section of the System Project Management Plan (B100M) as proposed by the contractor and approved by CA-DOT.

The contractor shall ensure that all deliverables and other project products are of high quality and meet contract requirements. “High quality” is defined as being free from defects that cause the deliverable to fail to meet its functional requirements in a material way. Non-material defects are cosmetic or trivial errors that do not affect the functional use of the deliverable. Contractor shall ensure that any trivial errors remaining in any

deliverables are reviewed and accepted for repair by contractor by a date agreed to by CA-DOT.

The contractor shall track the results of reviews and audits, and testing (unit, integration, system, and acceptance), and shall take corrective action according to the Quality Control Plan when the outcomes of the quality assurance processes indicate corrective action is needed.

The contractor shall also review bi-weekly Configuration Status Reports (B103M), and Issue/Action Items Reports (B104M) as part of its quality control efforts, and shall use these reports to make adjustments to technical or managerial processes in order to maintain quality.

4.1.3.4 Assess and Manage Risk

The contractor shall adhere to the Risk Management Plan section of the System Project Management Plan (B100M) as proposed by the contractor and approved by CA-DOT.

The contractor shall track the various risk factors evaluating changes in the levels of risk, and the responses to those changes, and shall periodically reassess project risk to identify new risk factors. The contractor shall review the Issue/Action Item Report (B104M) for issues relating to project risk, and shall include updated risk information in the BI-weekly Status Reports (B102M).

The contractor shall perform contingency planning, and shall respond to the various risk factors, should they become reality.

4.1.4. Close Out Project

The contractor shall adhere to the Closeout Plan section of the System Project Management Plan (B100M) as proposed by the contractor and approved by CA-DOT.

The project will be closed out after acceptance of the Field Environment Operational Use Readiness Report (F1390S). The contractor will then be required to provide a warranty for a two-year period.

4.2. Develop System

The contractor shall perform all tasks and produce all deliverables related to the technical development of the system as dictated by the System Project Management Plan as proposed by the contractor and approved by CA-DOT.

CA-DOT has already performed system requirements analysis and produced a System Requirements Specification, Version E (Section VI.C). CA-DOT has also partially completed software requirements analysis and produced an Application Software Requirements Specification, Version A (Section VI.D). The contractor shall meet the requirements in these technical specifications. Portions of the Application Software Requirements Specification relating to Architectural system interfaces (B510S) shall be completed by the contractor, based on the System Architectural Design Description (B311S) delivered with the contractor's proposal and incorporated into the contract.

4.2.1. Process Model

The contractor shall conduct the technical development aspects of the project in compliance with the Development Process section of IEEE/EIA 12207.0-1996, which divides the system development process into the activities shown below.

System requirements analysis
System architectural design
Process implementation
Software requirements analysis
Software architectural design
Software detailed design
Software coding and unit testing
Software integration
Software qualification testing (also known as acceptance testing)
System integration
System qualification testing (also known as acceptance testing)
Software installation
Software acceptance support

These processes are associated with the preliminary tasks and deliverables listed in the work breakdown structure in Appendix B. While the contractor is expected to follow the IEEE/EIA development process, the work breakdown structure in Appendix B is preliminary and should be edited to match those tasks and deliverables most suited to the proposed architectural solution.

Although testing is shown here as a development activity, the IEEE standard for Software Project Management (1058.1-1998) defines some testing, such as acceptance testing, as a supporting process. This Statement of Work also contains guidelines, policies, and procedures for Quality Assurance testing in Section 4.3.4 under Section 4.3 Perform Supporting Processes.

4.2.2. Methods, Tools, and Techniques

The contractor shall perform the process model activities using its standard methods, tools, and techniques as described in the Technical Process Plan section of the System Project Management Plan as proposed by the contractor and approved by CA-DOT.

4.2.3. Development Environment / Infrastructure

The contractor shall acquire and install the infrastructure necessary to establish and maintain the development environment, which includes hardware, software, office equipment, and other tools and supplies proposed by the contractor and approved by CA-DOT.

4.2.4. Product Acceptance

Contractor shall develop separate acceptance test plans for the simulator (S313S) and field environments (F313S).

4.3. Perform Supporting Processes

The contractor shall perform all tasks and produce all deliverables related to supporting processes as documented in the Supporting Process Plans section of the System Project Management Plan (B100M).

4.3.1. Configuration Management

4.3.1.1 The contractor shall maintain all project deliverables including document deliverables such as plans, specifications, and user documentation, under configuration management, and shall generate and deliver a Configuration Status Report (B103M) for Bi-weekly Status Meetings, and Weekly Status Emails (B101M), and as requested.

4.3.1.2 The contractor shall establish a Change Review Board whose membership includes CA-DOT and contractor staff and management. The Change Review Board shall establish policies and procedures for resolving Problem Reports (B108M) and for approving or denying Engineering Change Proposals (B107M).

4.3.1.3 Engineering Change Proposals (B107M) and Problem Reports (B108M) must be submitted to the Change Review Board for review and/or consideration at bi-weekly status meetings.

4.3.1.4 The contractor shall adhere to any additional procedures defined in the configuration management plan as proposed by the contractor and approved by CA-DOT.

4.3.1.5 The contractor shall use AllFusion **Harvest Change Manager** software for automated configuration management tasks. All items under CM shall be available to CA-DOT staff and IV&V contractor at all times.

4.3.2. Independent Verification and Validation (IV&V)

An independent IV&V contractor will perform verification and validation tasks. Contractor will provide project deliverables and any other work products to the IV&V contractor as requested.

4.3.3. Documentation

The contractor shall develop documentation on the Development, Simulator, Field and Office Environments for system users and system/database administrators. All such documentation shall initially be submitted in draft form. Sufficient time shall be given to allow for presentation, review, comments, and revision before the final versions are delivered. Documentation shall be consistent with the System Project Management Plan and include, but not be limited to, the following:

4.3.3.1 Develop a family of I-15 RLCS User Manuals (B603D), including reference and supplemental materials, that assist each different type of I-15 RLCS user in understanding how to perform their respective job functions using the system. Different types of users are defined in the System Requirements Specification, Version E.

4.3.3.2 Develop a System Administrator Manual (B600D) that addresses system installation, operation, administration, maintenance, troubleshooting, and any topic necessary for use of the system. Update as needed for each delivery of operational capability.

4.3.3.3 Develop Disaster Recover Checklists for both the simulator and field environments (S601D and F601D), that include troubleshooting guidelines.

4.3.3.4 Develop and provide Training Manuals (B604D) for use during training sessions. Training materials such as overheads and other items used to supplement the manuals must be delivered with the manuals.

4.3.3.5 Provide complete Software Documentation (B605D) including reference and supplemental manuals for third-party software development or maintenance tools.

4.3.3.6 Develop and provide Software Development Tools Documentation (B606D) for any contractor-developed software development tools.

4.3.3.7 Develop and provide Programmer Manuals (B607D) for any application or developed software.

4.3.4. Quality Assurance

4.3.4.1 System and Acceptance Testing

The contractor shall perform System and Acceptance test planning as follows and document the test planning activities and scripts in System Test Plans/Scripts for the simulator (S312S) and field (F312S) environments, and in Acceptance Test Plans/Scripts for the simulator (S313S) and field (F313S) environments.

4.3.4.1.1 The contractor shall define tests to verify all System Requirements Specification requirements.

4.3.4.1.2 The contractor shall define tests to demonstrate the system in the operational (hardware and data) environment including representative field units. The contractor will assess the ability of the system to prevent unauthorized operations from occurring by testing all the possible operational scenarios to make sure that the system does not violate any safety rules.

4.3.4.1.3 The contractor shall specify planned use of sample and actual I-15 RLCS data streams. The data streams consist of field device emulator inputs and outputs in the simulator, and actual device inputs and outputs in the field.

4.3.4.1.4 The contractor shall define the testing locations, identify facilities and resources needed from CA-DOT for planned testing and the dates needed, and planned execution dates of all tests.

4.3.4.1.5 The contractor shall perform a traceability analysis of the system and sub-system requirements specifications to planned tests to verify completeness of testing plans.

4.3.4.1.6 The contractor shall develop test scripts, tools, and data necessary to implement the planned testing.

4.3.4.2 Testing Policies and Procedures

4.3.4.2.1 For each failed test execution, determine the source of the failure: erroneous test procedure or test data, incorrect requirement, software error, hardware, network/communications system, or other source.

4.3.4.2.2 For any incorrect requirement, coordinate an appropriate requirement change with CA-DOT using an Engineering Change Proposal / ECP (B107M) and resubmit any impacted deliverables within 30 days of conclusion of testing.

4.3.4.2.3 For errors in test procedures or test data, make the appropriate test changes, and re-execute any tests impacted by the changes.

4.3.4.2.4 For any software, hardware, or network/communication system errors:

1) Document the problem within 24 hours of occurrence in a Problem Report (PR) containing the following:

- Problem report identifier
- Problem report date
- Problem title
- Problem report originator name, phone number, and email address
- Problem type (Engineering Change Proposal, Design Error, Coding error, Documentation Error, User error, and other types as defined by the contractor)
- Problem Symptom (system crash, program crash, error message-recoverable, display problem, file error, and other symptoms as defined by the contractor)
- Problem priority
- Affected items (system deliverable items only)
- Test Script number and step where problem occurred
- Problem description
- Impact due to the problem (Severity)
- Workaround, if any
- Recommended fix
- Problem report open approver name and date
- Problem report assigned to name, phone number, and email address
- Problem closure disposition
- Problem report closure approval name and date (once resolved)

2) Perform a regression analysis to determine the impact of the changes on formal testing already completed.

3) Provide the PR, regression analysis, and installation/retest plans to CA-DOT.

4) Develop, test, and install a fix for the problem.

5) Re-execute formal tests as indicated by regression analysis.

4.3.4.2.5 Document testing results in Test Reports. Update the Test Plan and Test Scripts as necessary to reflect the tests actually performed during formal testing. All test results

shall be maintained in hard copy and electronic format with all the test scripts and data used in the test.

4.3.4.3 Reviews and Audits

4.3.4.3.1 All deliverables must be presented at a meeting, or a formal review, if the deliverable is part of the review. All deliverables are subject to CA-DOT approval.

4.3.4.3.2 The contractor shall conduct and support technical requirements, design, and system readiness reviews and audits as scheduled, and for each shall prepare a Technical Review Briefing Package (B105M) and Meeting Minutes (B106M).

4.3.4.3.3 The contractor shall conduct bi-weekly status review meetings at CA-DOT addressing schedule status, deliverable submission status, Action Items, metrics, risks, contract issues, contract financial status, and the status of anything needed from CA-DOT. This meeting will also address topics such as preparation for formal test, preparation for delivery, and preparation for acceptance test.

4.3.4.3.4 The Change Review Board shall review configuration status reports (B103M) provided by the Configuration Manager at each of its meetings.

4.3.4.3.5 The contractor shall support scheduled technical interchange meetings at CA-DOT as required, but no less frequently than monthly. When possible, these meetings will be held in conjunction with a bi-weekly status review meeting.

4.3.4.3.6 The contractor shall support unscheduled technical interchange meetings at a contractor-proposed location or via conference call, as needed.

4.3.4.3.7 The contractor shall adhere to any additional procedures for reviews and audits as proposed by contractor and approved by CA-DOT.

4.3.5. Problem Resolution

4.3.5.1 The contractor shall initiate a conference call with CA-DOT, IV&V, and IPOC within 48 hours of identification or resolution of issues and concerns that could impact cost/schedule.

4.3.5.2 The contractor shall adhere to the problem resolution plan (part of the System Project Management Plan) as proposed by contractor and approved by CA-DOT.

4.3.5.3 When changes are required to document deliverables, the contractor shall incorporate agreed-to comments to submitted document deliverables in the next scheduled delivery, or re-submit for approval in the case of a final submission. If no comments or notification are provided within the agreed-to review period, usually 5 working days, the deliverable shall be considered acceptable as submitted.

4.3.5.4 For non-document deliverables such as source code or database components, the contractor shall correct Problem Reports (B108M) in the next scheduled build, or correct

within 5 working days if the problem was reported in the final system build and approved for correction.

4.3.5.5 For any action item or issue created during a meeting, or outside a meeting, document the following in an electronic file or database within 24 hours in an issue/action item (AI) containing the following:

- Issue/Action Item identifier
- Issue/Action Item report date
- Issue/Action Item title
- Issue/Action Item originator name, phone number, and email address
- Issue/Action Item priority
- Issue/Action Item type (Managerial, Technical, Administrative)
- Issue/Action item description
- Impact due to the problem (Severity)
- Recommended action
- Issue/Action item open approval name and date
- Issue/Action item assigned to name and phone number
- Issue/Action item closure/disposition
- Issue/Action item closure approval name and date

Action items and issues remain in the action item database after resolution, in order to track closed items. Reports from the issue/action item database (B104M) are submitted at bi-weekly status meetings.

4.3.6. Subcontractor Management

The contractor shall adhere to the Subcontractor Management Plan section of the System Project Management Plan (B100M) as proposed by contractor and approved by CA-DOT.

4.3.7. Safety Policies and Procedures

The contractor shall adhere to the Safety Plan section of the System Project Management Plan (B100M) as proposed by contractor and approved by CA-DOT.

The contractor shall specifically follow all CA-DOT safety procedures when working in the field.

4.3.8. Security Policies and Procedures

The contractor shall adhere to the Security Plan section of the System Project Management Plan (B100M) as proposed by contractor and approved by CA-DOT.

The contractor shall ensure that all project related hardware, equipment, software, and data are secured from access by unauthorized persons.

4.4. Deliver and Initialize System

The contractor shall perform all tasks and produce all deliverables related to the delivery and initialization of the system as documented in the Installation and Cutover Plan section of the System Project Management Plan (B100M).

The contractor shall create detailed System Cutover Procedures (F1400S) for cutover from the existing field environment system to the newly upgraded system. The contractor shall provide lists of project hardware and software for pre-approval, broken down separately for the Development Environment, Simulator Environment, Field Environment, and other.

4.4.1. Simulator Environment Delivery and Initialization

The contractor shall deliver, install, integrate, and initialize the system at the TMC simulator site as follows:

4.4.1.1 Provide CA-DOT with an Installation List of all purchased hardware, equipment and third-party software for the simulator environment (S316S).

4.4.1.2 Install and configure purchased hardware and network equipment (S726H) at the simulator site. The simulator will not be connected to the WAN. The contractor is responsible for setting up all the communications in the simulator to simulate the field system communications.

4.4.1.3 Provide CA-DOT all purchased third-party software media and licenses (S726C) for CA-DOT's use.

4.4.1.4 Install any purchased third-party software (such as Database Management Systems and Reporting Tools) and confirm their proper operation.

4.4.1.5 Confirm, with the support of CA-DOT-designated staff at the simulator site, the proper operation of all system hardware and operating system software, including the servers, network interfaces, and workstations for all planned system users. Document the results in the Simulator Environment Installation Report (S830S).

4.4.1.6 Install custom developed system and application software at the simulator site. Provide source and executable code (B526A). CA-DOT shall own and maintain copyrights to source code.

4.4.1.7 Initialize the simulator system so that it is ready for system and acceptance testing.

4.4.1.8 Perform any other initialization or preparation necessary to prepare the system for testing by CA-DOT at the simulator site. Final documentation and training shall have been completed by this time.

4.4.1.9 At the successful conclusion of system and acceptance testing, deliver the Simulator Environment Operational Use Readiness Report (S990S) that describes the

actual steps taken by this task, confirms that the simulator system has successfully completed all planned testing, and is ready for operational use.

4.4.2. Install and Configure Development Environment

The contractor shall deliver, install and configure the development environment hardware and software including all contractor-supplied documentation and operations/reference manuals.

4.4.2.1 The contractor shall provide third-party software media and licenses (D116C) for all purchased third-party development software. Including development software and any share-ware that is obtained for this project.

4.4.2.2 The contractor shall provide source and executable code for all contractor-developed software development tools (D117A). CA-DOT will own and maintain the copyrights to source code.

4.4.2.3 The contractor shall provide, install, and configure related hardware (D116H) and software for the development environment.

4.4.3. Field Environment Delivery, Initialization, and Cutover

The contractor shall deliver, install, integrate, and initialize the system at the central operational site (TMC) and all networked field units as follows:

4.4.3.1 Provide CA-DOT with an Installation List of all purchased hardware, equipment and third-party software for the field environment (F316S).

4.4.3.2 Install and configure purchased hardware and network equipment (F1126H) at the TMC and all field units. CA-DOT will install the network media such as fiber and copper.

4.4.3.3 Provide CA-DOT all purchased third-party software media and licenses (F1127C) for CA-DOT's use.

4.4.3.4 Install any purchased third-party software (such as Database Management Systems and Reporting Tools) and confirm their proper operation.

4.4.3.5 Install custom developed system and application software at the TMC central operational site and at all field units. Provide source and executable code (B526A). CA-DOT shall own and maintain copyrights to source code.

4.4.3.6 Confirm, with the support of CA-DOT-designated staff at the central operational site and field units, the proper operation of all system hardware and operating system software, including the servers, network interfaces, and workstations for all planned system users. Document the results in the Field Environment Installation Report (F1230S).

4.4.3.7 Perform all initialization or preparation necessary to prepare the system for system and acceptance testing operational use by CA-DOT at the central operational

site and all networked field units, and perform cutover upon satisfactory completion. Final documentation and training shall have been completed by this time.

4.4.3.8 At the successful conclusion of system and acceptance testing, deliver the Field Environment Operational Use Readiness Report (F1390S) that describes the actual steps taken by this task and confirms that the system has successfully completed all planned testing and is ready for cutover and operational use.

4.4.3.9 At the direction of CA-DOT, and on an agreed-upon date and time, contractor shall perform System Cutover Procedures (F1400S).

4.5. Provide Training

The contractor shall perform all tasks and produce all deliverables related to training as documented in the Training Plan section of the System Project Management Plan (B100M)

4.5.1. Application Software Training

The contractor shall develop a training program and conduct training for all types of I-15 RLCS users (in the simulator environment only) as follows:

4.5.1 1 Training will consist of some combination of lectures, student exercises, student self-tests, and on-the-job training, and will include an explanation of screens, reports, navigation between screens, and any other topics needed for successful system use.

4.5.1.2 Training materials shall include a student training manual (B604D) specific to each student's user type.

4.5.1.3 For commercial off-the-shelf software, training purchased from the software licensor may be substituted for contractor developed training.

4.5.1.4 Conduct training at CA-DOT or at a mutually agreeable site, at a mutually agreeable time. Training classes will be held twice to accommodate all shift schedules and will be limited to no more than 35 students in one class session. Training is anticipated for a total of 35 people.

- Twelve (12) operator staff at the TMC
- Six (6) application and system software maintenance staff at the TMC
- Twelve(12) hardware maintenance staff at the TMC
- Five(5) management staff at the TMC

4.5.1.5 Training classes may be recorded on videotape by CA-DOT.

4.5.1.6 Classroom training evaluations (B1000M) completed by CA-DOT staff must be returned to CA-DOT after review by the contractor, and must not be copied or distributed outside the CA-DOT.

4.5.2. System Hardware and Software Training

The contractor shall develop a technology transfer program that provides specific training needed by system level users in both the simulator and field environments.

4.5.2.1 Training will consist of some combination of lectures, student exercises, student self-tests, and on-the-job training, and will include an explanation of screens, reports, navigation between screens, system and software architecture, hardware configuration, troubleshooting and maintenance, software development methodology and standards, and any other topics needed for successful system hardware or software maintenance or configuration.

4.5.2.2 The contractor shall provide the training materials and conduct the training for CA-DOT custom system software.

4.5.2.3 For system hardware and commercial off-the-shelf system software, training purchased from the hardware vendor or software licensor may be substituted for contractor developed training.

4.5.3. Disaster Recovery Training

The contractor shall develop and demonstrate Disaster Recovery Checklists for both the simulator (S601D) and field (F601D) environments to bring the system back to full operational status in the event of a disaster, and shall train system and software maintainers in the procedures specified by the checklist, which include troubleshooting guidelines.

4.5.4. Development System Training

The contractor shall provide training materials and conduct training for the development environment including AllFusion Harvest Change Manager Software.

4.6. Provide System Warranty Services

The contractor shall perform all tasks and produce all deliverables related to warranty of the system for two years after acceptance of the Field Environment Operational Use Readiness Report (F1390S) as documented in the Warranty Plan section of the System Project Management Plan (B100M).

The contractor shall provide all materials and support necessary for CA-DOT to maintain the system in both the simulator and field environments upon initial delivery of operational capability and as needed.

4.6.1. Provide Help Desk Support

The contractor shall provide Help Desk support for 2 years. This support will be via telephone to answer user questions, troubleshoot reported problems, and develop temporary workarounds prior to permanent repairs.

4.6.2. Repair System

4.6.2.1 The contractor shall, at no charge to CA-DOT during the system warranty period (2 years after acceptance), fix all reported hardware and software defects.

4.6.2.2 CA-DOT may make system configuration changes within the defined operational uses of the system without violating the warranty.

4.6.2.3 The contractor shall fix all reported software defects as follows:

4.6.2.3.1 Isolate the source of the problem, generate an appropriate fix, test the fix, and first install and successfully test the updated system in the simulator environment before installing and testing in the field environment.

4.6.2.3.2 Update, as necessary, the Software Code, Programmer Manuals, User Manuals and Training Manuals, and any other documentation for consistency with system changes.

4.6.2.3.3 Update the Software Build Procedures as necessary.

4.6.2.3.4 Deliver a copy of the software fixes to CA-DOT.

4.6.3.4 The contractor shall fix all reported hardware defects as follows:

4.6.3.4.1 Isolate the source of the problem, deliver replacement hardware, and install and successfully test the replacement hardware in the simulator environment before installing and testing in the field environment.

4.6.3.4.2 Update, as necessary, the User Manuals, Training Manuals, and any other documentation for consistency with the hardware changes.

4.6.3.5 The contractor shall provide all upgrades and patches for all third-party software and replacements for defective hardware and equipment for a period of 2 years following acceptance.

4.6.3.6 The contractor shall establish service level agreements for all purchased hardware and software that provides for 30-minute telephone response, 4-hour on-site response, and problem resolution within 24 hours.

APPENDIX A – Deliverable Specifications

Most of the deliverable specifications listed in this appendix are documents. System deliverable specifications are found in the System Requirements Specification, Version E Minimum required project deliverables are listed here.

For document deliverables, the contractor shall distribute the designated number of copies of each document described in this section to the following recipients:

- CA-DOT: Up to 10 hard copies and one MS Word-readable electronic file.
- IV&V: One hard copy and one MS Word-readable electronic file.
- IPOC: One hard copy and one MS Word-readable electronic file.

The contractor shall complete and submit each document on the date designated in the project schedule. Each deliverable shall be presented at a meeting and the CA-DOT staff shall have **5 days** to review the document unless a longer or shorter review period is otherwise specified or agreed to for the specific deliverable. Deliverables with review periods **shorter than 5 days** (e.g. meeting minutes) are not required to be presented at a meeting. All review periods are to be noted in the project plan schedule.

Naming conventions for all deliverable types are as follows:**[B|F|S|D]–[### | ####]–[A|C|D|H|M|S|T]**

The first letter describes the environment:

B=*Both simulator and field environments*
F=*Field*
S=*Simulator*
D=*Development*

The 3-digit number assigns a unique identifier:

or #### = *Three- or 4- digit number assigned to each deliverable based on the process activity type:*

100s=Project Plan, Track/Control deliverables
(includes configuration management, quality assurance, and problem resolution)
300s= System Design Deliverables
400s=Device Emulator Software Deliverables
500s=Application Software Deliverables
600s=User Documentation Deliverables
700s= Simulator Components Installation Deliverables
800s= Simulator Environment Integration Deliverables
900s=Simulator System and Acceptance Test Deliverables
1000s= Training Deliverables
1100s=Field Installation Deliverables
1200s=Field Integration Deliverables
1300s=Field System and Acceptance Test Deliverables
1400s=Field System Cutover Deliverables

The last letter describes the system component:

A=*Application/Custom Software*
C=*Commercial-off-the-shelf Software*
D=*End user documentation*
H=*Hardware and Equipment*
M=*Management/Administrative Document*
S=*System Development Document*
T=*Database and Data*

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Table A.1: B100M – System Project Management Plan

Format: IEEE Standard for Software Project Management Plans (1058.1-1998)

Contents: Determined by IEEE standard (sample table of contents below):

- Title Page
- Signature Page
- Change History
- Preface
- Table of Contents
- List of Figures
- List of Tables
- Overview
  - Project Summary
    - Purpose, Scope, and Objectives
    - Assumptions and Constraints
    - Project Deliverables
    - Schedule and Budget Summary
  - Evolution of the Plan
- References
- Definitions
- Project Organization
  - External Interfaces
  - Internal Structure
  - Roles and Responsibilities
- Managerial Process Plans
  - Start-Up Plan
  - Estimation Plans
    - Cost and schedule Plan
    - Staffing Plan and Organization Chart
    - Resource Acquisition Plan
    - Project-Staff Training Plan
  - Work Plan
    - Work Activities
    - Schedule Allocation
    - Resource Allocation
    - Budget Allocation
  - Control Plan
    - Requirements Control Plan
    - Schedule Control Plan
    - Budget Control Plan
    - Quality Control Plan
    - Reporting Plan
    - Metrics Plan
  - Risk Management Plan
  - Closeout Plan
- Technical Process Plans
  - Process Model
  - Methods, Tools, and Techniques
  - Infrastructure Plan
  - Product Acceptance Plan
- Supporting Process Plans
  - Configuration Management Plan
  - Documentation Plan
  - Quality Assurance Plan
  - Reviews and Audits
  - Problem Resolution Plan
  - Subcontractor Management Plan (not applicable if no subcontractors) including address, phone, and email.
- Safety Plan
- Security Plan
- Installation and Cutover Plan
- Training Plan
- Warranty Services Plan

Table A.2: B101M – Weekly Status Emails

Format: Vendor format
Contents: Schedule, deliverable, and issue/action item status

Table A.3: B102M – Bi-weekly Status Reports

Format: Vendor format

Contents:

The report shall include the following information:

Project Title

Prepared/Submitted by (with contact information)

Reporting Period

On Plan/Ahead of Plan/Behind Plan check-offs

Current Activity Status

Telephone log of any significant telephone calls during period

Significant Accomplishments and Problems (if any)

Planned Activities Next Period

Financial Status (see PMBOK 2000 Section 10.3.2 Tools and Techniques for Performance Reporting)

Technical Status/Issues

Previous Status/Issues

Last Risk Update and Status

Summary of Contract Change Proposal status (include identification of proposed changes, approved changes, and implemented changes)

Also include a table that includes the following earned value metrics for each work package.

Planned Value (PV)
Earned Value (EV)
Actual Costs (AC)
Budget At Completion (BAC)
Schedule Variance (SV)
Cost Variance (CV)

Use a 50/50 earning rule for all work packages, or an alternative if approved by CA-DOT.

Plans for activities during the upcoming reporting period

Table A.4: B103M – Configuration Status Reports

Format: Vendor format as defined in the Configuration Management Plan
Contents: List all system components (configuration items) and their status

Table A.5: B104M – Issue/Action Item Reports

Format: Vendor defined
Contents: Summary status information for all issues/action items, and detailed information for all unresolved (open) top priority or severity items. Information for the report is stored in an electronic file or database of issues and action items.

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6.2: B105M – Preliminary System Design Review Briefing Package
6.3: B105M – Critical System Design Review Briefing Package
6.4: B105M – Device Emulation Software Requirements Review Briefing Package
6.5: B105M – Device Emulation Software Preliminary Design Review Briefing Package
6.6: B105M – Device Emulation Software Critical Design Review Briefing Package
6.7: B105M – Application Software Requirements Review Briefing Package
6.8: B105M – Application Software Preliminary Design Review Briefing Package
6.9: B105M – Application Software Critical Design Review Briefing Package
6.10: B105M – Simulator Environment System Operational Readiness Review Briefing Package
6.11: B105M – Field Environment Operational Readiness Review Briefing Package

Format: Vendor defined
Contents: Each briefing package contains materials to be presented at the review or meeting

Table A.7: B106M – Meeting Minutes

7.1: B106M – Kickoff Review Meeting Minutes
7.2: B106M – Bi-weekly Status Review Meeting Minutes
7.3: B106M – Change Review Board Meeting Minutes
7.4: B106M – Technical Interchange Meeting Minutes
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7.10: B106M – Application Software Requirements Review Meeting Minutes
7.11: B106M – Application Software Preliminary Design Review Meeting Minutes
7.12: B106M – Application Software Critical Design Review Meeting Minutes
7.13: B106M – Simulator Environment System Operational Readiness Review Meeting Minutes
7.14: B106M – Field Environment System Operational Readiness Review Meeting Minutes

Format: Vendor defined
Contents: Each of the meeting minutes contains an account of the meeting, including references to any new action items or issues, or problem reports and engineering change proposals.

Table A.8: B107M – Engineering Change Proposals

Format: Vendor defined
Review period: Reviewed during Change Control Board meetings
Contents: For any proposed change to requirements for software, hardware, or network/communication system components: Document as a Problem Report, with a problem report type of "ECP". Describe the expected impact of the changes on design, implementation, documentation, training, and formal testing already completed.

Table A.9: B108M – Problem Reports

Format: Vendor defined
Review period: Reviewed during Change Control Board meetings
Contents: • Problem report identifier • Problem report date • Problem title • Problem report originator name, phone number, and email address • Problem type (Engineering Change Proposal, Design Error, Coding error, Documentation Error, User error, and other types as defined by the contractor) • Problem Symptom (system crash, program crash, error message-recoverable, display problem, file error, and other symptoms as defined by the contractor) • Problem priority • Affected items (system deliverable items only) • Test Script number and step where problem occurred • Problem description • Impact due to the problem (Severity) • Workaround, if any • Recommended fix • Problem report open approver name and date • Problem report assigned to name, phone number, and email address • Problem closure disposition • Problem report closure approval name and date (once resolved)

Table A.10: B311S – System Architectural Design Description (Format and Content)

Format: 1471-2000: IEEE Recommended Practice for Architectural Description of Software-Intensive Systems

Contents: A "Decomposition and Allocation Viewpoint" of the system architectural design, as defined by IEEE Std. 1471-2000 includes the following:

- Identification of the system requirements
- Decomposition of the system into design items
- Allocation of the requirements to the design items
- Assurance that all requirements are allocated to items

The document will demonstrate that each of the System Requirements has been allocated to at least one design item, and that each design item satisfies one or more System Requirements. Each design item must contain and identify at minimum the following attributes:

Item ID: The name of the design item.

Item Classification/Type: Hardware, Firmware, Third-Party Software, Contractor Software, Applications Software, Developed Software, Data, or a combination of types.

Item Function: Describe what the item accomplishes—what inputs it uses, and the outputs it produces. For data items, describe the type of information stored or transmitted by the item.

Item Hierarchy: State if the item is composed of other items, or if it is part of a higher level item.

Item Dependency: Describe the relationship with other items.

Item Purpose/Requirements Allocated to Item: Reference paragraph number from System Requirements Specs.

Additionally, the items below will be used to evaluate the content of the selected design approach.

1. Provide a block diagram for proposed System Architecture Design, specific to the Simulator Environment, together with a description identifying the Hardware and Software components and their interaction.
2. Provide a block diagram for proposed System Architecture Design, specific to the Field Environment , together with a description identifying the Hardware and Software components and their interaction.
3. Identify the advantages or benefits of this particular design approach as related to Safety, Scalability, Maintainability, Reliability, Interoperability, and Security.
4. Explain what steps will be taken to insure that all the Public Safety Concerns in the System and Software System Specifications will be adequately addressed.
5. Designate each hardware by manufacturer and model number, and include mean time between failure rating for each item. If the hardware components are available from multiple sources, demonstrate maintainability and interoperability by listing other manufacturers and model number (no more than three).
6. Each third-party software item shall be designated by manufacturer and version number. If the software is available from multiple sources, demonstrate maintainability and interoperability by listing others manufacturers and version numbers (no more than three).
7. Provide a table similar to the Project Hardware and Software Preferences indicating the specific attribute of the design and highlighting any variances, with separate explanation as to why.

Each design item must also be represented in dependency/hierarchy and interface views showing its relationship with other design items. The bidder may include hierarchy charts, data flow diagrams, and/or other graphical means to express the relationships with other items.

Include a requirements traceability matrix that maps requirements to design items. Each row in the matrix shall reference one System Requirement in column one and one design item in column two as shown in the example below. If more than one design item is required for one requirement, additional rows will contain the design items for that requirement (as shown by the example for Requirement 2 below). If one design item satisfies two requirements, list the requirements for the same design item on separate rows (as shown by example for design item 1 below). Use any text editor to create the traceability matrix, or a tool capable of exporting the matrix to a comma or tab delimited text file.

Column 1	Column 2
Requirement 1	Design Item 1
Requirement 2	Design Item 1
Requirement 2	Design Item 2
Requirement 3	Design Item 3
Requirement 4	Design Item 4

Table A.11: System and Acceptance Test Plans, Scripts, and Reports

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11.3: F313S–Acceptance Test Plans/Scripts for Field Environment
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11.5: S315S–System Integration Test Plans/Scripts for Simulator Environment
11.6: F315S–System Integration Test Plans/Scripts for Field Environment
11.7: S412S–Device Emulation Software System Test Plans/Scripts for Simulator Environment
11.8: S413S–Device Emulation Software Acceptance Test Plans/Scripts for Simulator Environment
11.9:S415S–Device Emulation Software Integration Test Plans/Scripts for Simulator Environment
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11.11: S512S–Application Software System Test Plans/Scripts for Simulator Environment
11.12: F513S–Application Software Acceptance Test Plans/Scripts for Field Environment
11.13: S513S–Application Software Acceptance Test Plans/Scripts for Simulator Environment
11.14: S515S – Application Software Integration Test Plans/Scripts for Simulator Environment
11.15: B816S–Application Software Integration, System, and Acceptance Test Report
11.16: S815S–Device Emulation Software Integration, System, and Acceptance Test Report
11.17: S817S–Simulator Environment Integration Test Report
11.18: S912S–Simulator Environment System Test Report
11.19: S913S–Simulator Environment Acceptance Test Report
11.20: F1215S–Field Environment Integration Test Report
11.21: F1312S–Field Environment System Test Report
11.22: F1313S–Field Environment Acceptance Test Report

Format: IEEE Standard for Software Test Documentation 829-1998
Contents: Determined by IEEE standard (sample table of contents below): a) Test plan identifier; b) Introduction c) Test items d) Features to be tested e) Features not to be tested f) Approach g) Item pass/fail criteria h) Suspension criteria and resumption requirements i) Test deliverables j) Testing tasks k) Environmental needs l) Responsibilities m) Staffing and training needs n) Schedule o) Risks and contingencies p) Approvals q) Results

Table A.12: Installation Lists

12.1: D116S–Development Environment Hardware, Equipment, and Third-Party Software Installation List
12.2: S316S – Simulator Hardware, Equipment, and Third-Party Software Installation List
12.3: F316S – Field Hardware, Equipment, and Third-Party Software Installation List

Format: Vendor defined
Contents: • Each hardware and network/communications equipment item shall be designated by manufacturer and model number. • Each commercial off-the-shelf software item shall be designated by manufacturer and version number.

Table A.13: Software Requirements Specifications

13.1: S410S – Device Emulation Software Requirements Specification
13.2: B510S - Application Software Requirements Specification

Format: IEEE Recommended Practice for Software Requirements Specifications (830-1998)
Review period: 10 days for each specification

Contents: Determined by IEEE standard (sample table of contents below):
Purpose
Definitions, acronyms, and abbreviations
References
Overview
 Overall description
 Product perspective
 System Interfaces
 User Interfaces
 Hardware Interfaces
 Software Interfaces
 Communications Interfaces
 Memory constraints
 Operations
 Site adaptation requirements
 Product functions
 User characteristics
 Constraints
 Assumptions and dependencies
 Apportioning of the requirements
Specific Requirements
 External interface requirements
 User interface
 Hardware interfaces
 Software interfaces
 Communications interfaces
 Functional requirements
  Functions 1..n
   Inputs
   Processing
   Outputs
Performance requirements
Logical Database Requirements
Design Constraints
Standards Compliance
Software System Attributes
Reliability
Availability
Security
Maintainability
Portability
Appendices

Table A.14: Software Design Descriptions

14.1: S411S – Device Emulation Software High Level Design Description
14.2: S414S – Device Emulation Software Detailed Design Description
14.3: B511S – Application Software High Level Design Description
14.4: B514S – Application Software Detailed Design Description

Format: IEEE Standard for Software Design Descriptions (1016-2000)

Review period: 10 days for each detailed design description

Contents: Determined by IEEE standard (sample table of contents below):

- Introduction
  - Purpose
  - Scope
  - Definitions, acronyms, and abbreviations
  - References
  - Overview
- General Design Considerations
  - Overview of the System
    - Assumptions
    - Constraints
    - Major Decisions
    - Conventions
- Specific Design
  - Architectural Design (Decomposition view)
    - Design Entity 1-n
      - Identification
      - Type
      - Purpose
      - Function
      - Subordinates
  - Architectural Design (Dependency view)
    - Design Entity 1-n
      - Identification
      - Type
      - Purpose
      - Function
      - Subordinates
  - Architectural Design (Interface view)
    - Design Entity 1-n
      - Identification
      - Type
      - Purpose
      - Function
      - Subordinates
  - Architectural Design (Detail view added for detailed design deliverable)
    - Design Entity 1-n
      - Identification
      - Type
      - Purpose
      - Function
      - Subordinates
  - Requirements Traceability
- Appendices

Table A.15: Software Build Procedures

15.1: S427S – Device Emulator Software Build Procedure
15.2: B527S – Application Software Build Procedure

Format: Vendor Format
Contents: The software build procedure shall contain detailed step-by-step instructions to generate the executable software code.

Table A. 16: Disaster Recovery Checklists

16.1: S601D – Simulator Environment Disaster Recovery Checklist
16.2: F601D – Field Environment Disaster Recovery Checklist

Format: Vendor standards
Contents: • Steps/timelines for troubleshooting and acquisition of replacement of hardware • Steps/timelines for hardware replacement/configuration • Steps/timelines for checkout of reconfigured hardware • Steps/timelines for software installation/configuration • Steps/timelines for restoration of back-ups • Steps/timelines for checkout of restored system • Steps/timelines for return to operational status

Table A. 17: Manuals

17.1: B600D System Administrators Manual
17.2: B603D – User Manuals
17.3: B604D – Training Manuals
17.4: B605D – Third-party Software Manuals
17.5: B606D – Software Development Tools Documentation
17.6: B607D – Programmer Manuals for Developed and Application Software

Format: For developed and application software use the , IEEE Standard for Software User Documentation (1063-2001). For Programmer Manuals, use vendor format. For third-party software, provide manuals supplied by third party.
Contents: Determined by IEEE standard (sample table of contents below): Identification data (package label/title page) Table of contents List of illustrations Introduction Information for use of the documentation Concept of operations Procedures Information on software commands Error messages and problem resolution Glossary Related information sources Index Navigational features should be provided also, that permit the user to quickly find related information in the electronic copy of the documentation.

Draft Versions: All manuals and training materials shall initially be submitted in draft form. Sufficient time shall be given to allow for presentation, review, comments, and revision before the final versions are delivered.

Table A. 18: Installation Reports

18.1: S830S – Simulator Environment Installation Report
18.2: F1230S – Field Environment Installation Report

Format: Vendor defined
Contents: Determined by IEEE standard (sample table of contents below): • General description of the installation task including sites, software items, schedule, method and process • Contact person concerning installation related issues or problems • Installer names • Site specific information • Installation procedures followed in the actual installations • Data update procedures • Signed installation acknowledgement forms

Table A. 19: Operational Use Readiness Reports

19.1: S990S – Simulator Environment Operational Use Readiness Report
19.2: F1390S – Field Environment Operational Use Readiness Report

Format: Vendor standards
Contents: List of activities completed during delivery and initialization of system, and certification that system is ready for operational use.

Table A. 20: Software and Database

20.1: S426A – Device Emulator Software
20.2: B526A – Application Software
20.3: B526T – System Database
20.4: S726C – Simulator Third-Party Software
20.5: F1127C – Field Third-Party Software
20.6: D117A – Contractor-Developed software development tools
20.7: D116C – Development Environment Third-Party Software

Format: Source (except for Third-Party Software) and executable code for software, and database and data for Database
Review period: 30-day acceptance test period (except for D117A and D116C)
Contents: N/A

Table A. 21: Hardware and Equipment

21. 1: S726H – Simulator Controller and Non-controller hardware and equipment
21.2: F1126H – Field Controller and Non-controller hardware and equipment
21.3: D116H – Development Environment non-network hardware

Format: N/A
Review period: 30-day acceptance test period (except for D116H)
Contents: N/A

Table A. 22: B1000M – Training class evaluation forms

Format: Vendor standards
Contents: Feedback from training class attendees

Table A. 23: F1400S – Detailed Cutover Procedures

Format: Vendor standards
Contents: Detailed list of procedures to use for final cutover to upgraded system

APPENDIX B – Preliminary Work Breakdown Structure

This list of required tasks and deliverables is the starting point for the Work Plan, which is to be developed using Microsoft (MS) Project Software.

1. Manage Project
    - 1.1. Maintain Project Plan (B100M)
        - 1.1.1. Maintain Managerial Process Plans
            - 1.1.1.1. Maintain Schedule
            - 1.1.1.2. Maintain Resource Allocation (Budget and Staff)
        - 1.1.2. Maintain Technical Process Plans
            - 1.1.2.1. Maintain Process Model Plan
            - 1.1.2.2. Maintain Methods, Tools, and Techniques Plan
            - 1.1.2.3. Maintain Infrastructure Plan
            - 1.1.2.4. Maintain Product Acceptance Plan
        - 1.1.3. Maintain supporting process plans
            - 1.1.3.1. Maintain Configuration Management Plan
            - 1.1.3.2. Maintain Documentation Plan
            - 1.1.3.3. Maintain Quality Assurance Plan
            - 1.1.3.4. Maintain Reviews and Audits Plan
            - 1.1.3.5. Maintain Problem Resolution Plan
            - 1.1.3.6. Maintain Subcontractor Management Plan
        - 1.1.4. Maintain Additional Process Plans
            - 1.1.4.1. Maintain Safety Plan
            - 1.1.4.2. Maintain Installation and Cutover Plan
            - 1.1.4.3. Maintain Training Plan
            - 1.1.4.4. Maintain Warranty Services Plan
        - 1.1.5. Maintain/Resubmit Project Plan (B100M)
    - 1.2. Startup Project
        - 1.2.1. Prepare and Submit Kickoff Review Briefing Package (B105M)
        - 1.2.2. Conduct Kickoff Review
        - 1.2.3. Prepare and Submit Kickoff Review Meeting Minutes (B106M)
    - 1.3. Track and Control Project
        - 1.3.1.1. Prepare and Submit Weekly Status Email (B101M)
        - 1.3.1.2. Prepare and Submit Bi-Weekly Status Reports (B102M)
        - 1.3.1.3. Prepare and Submit Configuration Status Reports (B103M)
        - 1.3.1.4. Prepare and Submit Issue/Action Item Reports (B104M)
    - 1.4. Close Out Project and Transfer Upgraded System to CA-DOT
2. Develop System
    - 2.1. Design System
        - 2.1.1. Prepare and Submit System Architectural Design Description (B311S)
        - 2.1.2. Prepare and Submit System Test Plans/Scripts for Simulator Environment (S312S)
        - 2.1.3. Prepare and Submit Acceptance Test Plans/Scripts for Simulator Environment (S313S)
        - 2.1.4. Prepare and Submit System Test Plans/Scripts for Field Environments (F312S)
        - 2.1.5. Prepare and Submit Acceptance Test Plans/Scripts for Field Environment (F313S)
        - 2.1.6. Prepare and Submit System Detailed Design Description (B314S)
        - 2.1.7. Prepare and Submit System Integration Test Plans/Scripts for Simulator Environment (S315S)
        - 2.1.8. Prepare and Submit System Integration Test Plans/Scripts for Field Environment (F315S)
    - 2.2. Develop Device Emulator Software
        - 2.2.1. Finalize Device Emulator Requirements Specification (S410S)
        - 2.2.2. Prepare and Submit Device Emulator System Test Plans/Scripts for Simulator Environment (S412S)
        - 2.2.3. Prepare and Submit Device Emulator Acceptance Test Plans/Scripts for Simulator Environment (S413S)
        - 2.2.4. Prepare and Submit Device Emulator High Level Design (S411S)
        - 2.2.5. Prepare and Submit Traceability Matrix to Device Emulator Requirements Specification (S411S)
        - 2.2.6. Prepare and Submit Detailed Design Description for Device Emulator Software (S414S)

- 2.2.7. Prepare and Submit Integration Test Plan/Scripts for Device Emulator Software (S415S)
- 2.2.8. Code and Unit Test Device Emulator Software (S426A)
- 2.2.9. Prepare and Submit Device Emulator Software Build Procedure (S427S)
- 2.2.10. Submit Device Emulator Software Build Procedure (S427S)

2.3. Develop Application Software

- 2.3.1. Finalize and Submit Application Software Requirements Specification (B510S)
- 2.3.2. Prepare and Submit Matrix of Allowed and Prohibited Device Operations (Rule Base) (B510S)
- 2.3.3. Prepare and Submit Application Software System Test Plans/Scripts for Simulator Environment (S512S)
- 2.3.4. Prepare and Submit Application Software Acceptance Test Plans/Scripts for Simulator Environment (S513S)
- 2.3.5. Prepare and Submit Application Software System Test Plans/Scripts for Field Environment (F512S)
- 2.3.6. Prepare and Submit Application Software Acceptance Test Plans/Scripts for Field Environment (F513S)
- 2.3.7. Prepare and Submit Application Software High Level Design (B511S)
- 2.3.8. Prepare and Submit Application Software Detailed Design Specification, including physical data model (B514S)
- 2.3.9. Prepare and Submit Application Software Integration Test Plan/Scripts for Simulator Environment (S515S)
- 2.3.10. Prepare and Submit Application Software Integration Test Plan/Scripts for Field Environment (F515S)
- 2.3.11. Build Database for Simulator Environment (S526T)
- 2.3.12. Code and Unit Test Application Software (B526A)
- 2.3.13. Prepare and Submit Application Software Build Procedure (B527S)

2.4. Deliver Simulator Components

- 2.4.1. Prepare and Submit Simulator hardware, equipment, and third-party software installation list (S316S)
- 2.4.2. Deliver Simulator Controller and Non-controller Hardware, Equipment, and COTS Software (S726H)
- 2.4.3. Deliver Simulator COTS Software (S726C)

2.5. Integrate Simulator Environment

- 2.5.1. Install Simulator Environment (controller/non-controller hardware/equipment, COTS software, custom device emulation software)
- 2.5.2. Prepare and Submit Simulator Environment Installation Report (S830S)
- 2.5.3. Conduct Integration Test for Custom Device Emulator Software
- 2.5.4. Conduct Integration Test for System Hardware and Software
- 2.5.5. Install Application Software
- 2.5.6. Conduct Integration Test for Application Software
- 2.5.7. Prepare and Submit Problem Reports (B108M)
- 2.5.8. Prepare and Submit Custom Device Emulator Software Integration Test Report (S815S)
- 2.5.9. Prepare and Submit Application Software Integration Test Report (S816S)
- 2.5.10. Prepare and Submit Simulator Environment System Integration Test Report (S817S)

2.6. Conduct System and Acceptance Test in Simulator Environment

- 2.6.1. Conduct System and Acceptance Test in Simulator Environment
- 2.6.2. Prepare Simulator Environment System Test Report (S912S)
- 2.6.3. Submit Simulator Environment System Test Report (S912S)
- 2.6.4. Prepare Simulator Environment Acceptance Test Report (S913S)
- 2.6.5. Submit Simulator Environment Acceptance Test Report (S913S)

2.7. Deliver Field Environment Components

- 2.7.1. Prepare and Submit Field Hardware, Equipment, and Third-Party Software Installation List (F316S)
- 2.7.2. Deliver Field Controller and Non-controller Hardware and Equipment (F1126H)
- 2.7.3. Deliver Field COTS Software (F1127C)

2.8. Integrate Field Environment

- 2.8.1. Install Field Environment (Controller and non-controller hardware and equipment, and COTS software)
- 2.8.2. Install Custom Device Emulation Software
- 2.8.3. Install Application Software
- 2.8.4. Prepare and Submit Field Environment Installation Report (F1230S)
- 2.8.5. Conduct Integration Test for System Hardware and Software
- 2.8.6. Prepare and Submit Problem Reports (B108M)
- 2.8.7. Prepare and Submit Field Environment System Integration Test Report (F1215S)

2.9. Conduct System and Acceptance Test in Field Environment

- 2.9.1. Conduct System Test in Field Environment (Phase I-Saturday Test)
- 2.9.2. Conduct System Test in Field Environment (Phase II-Saturday Test)

- 2.9.3. Conduct Acceptance Test in Field Environment (Phase I-Saturday Test)
- 2.9.4. Conduct Acceptance Test in Field Environment (Phase II-Saturday Test)
- 2.9.5. Prepare Field Environment System Test Report (F1312S)
- 2.9.6. Submit Field Environment System Test Report (F1312S)
- 2.9.7. Prepare Field Environment Acceptance Test Report (F1313S)
- 2.9.8. Submit Field Environment Acceptance Test Report (F1313S)

3. Perform Supporting Processes
   - 3.1. Perform Configuration Management
   - 3.2. Create Documentation
     - 3.2.1. Create and Submit System Administrator Manual (B600D)
     - 3.2.2. Create and Submit Simulator Environment Disaster Recovery Checklist (S601D)
     - 3.2.3. Create and Submit Field Environment Disaster Recovery Checklist (F601D)
     - 3.2.4. Create and Submit User Manual (B603D)
     - 3.2.5. Create and Submit Training Manuals (B604D)
     - 3.2.6. Deliver Commercial Software Manuals for Simulator Environment (S605D)
     - 3.2.7. Deliver Commercial Software Manuals for Field Environment (F605D)
     - 3.2.8. Create and Submit Software Development Tools Documentation (B606D)
   - 3.3. Perform Quality Assurance
     - 3.3.1. CA-DOT and Contractor Review of Document Deliverables
       - 3.3.1.1. Project Plan (B100M)
       - 3.3.1.2. Kickoff Review Briefing Package (B105M)
       - 3.3.1.3. Kickoff Review Meeting Minutes (B106M)
       - 3.3.1.4. Bi-Weekly Status Meeting Minutes
       - 3.3.1.5. Weekly Status Email (B101M)
       - 3.3.1.6. Preliminary System Design Review Briefing Package (B105M)
       - 3.3.1.7. Preliminary System Design Review Meeting Minutes (B106M)
       - 3.3.1.8. Critical System Design Review Briefing Package (B105M)
       - 3.3.1.9. Critical System Design Review Meeting Minutes (B106M)
       - 3.3.1.10. Custom Device Emulation Software Requirements Review Briefing Package (B105M)
       - 3.3.1.11. Custom Device Emulation Requirements Review Meeting Minutes (B106M)
       - 3.3.1.12. Preliminary Custom Device Emulation Design Review Briefing Package (B105M)
       - 3.3.1.13. Preliminary Custom Device Emulation Design Review Meeting Minutes (B106M)
       - 3.3.1.14. Critical Custom Device Emulation Design Review Briefing Package (B105M)
       - 3.3.1.15. Critical Custom Device Emulation Design Review Meeting Minutes (B106M)
       - 3.3.1.16. Application Software Requirements Review Briefing Package (B105M)
       - 3.3.1.17. Application Software Requirements Review Meeting Minutes (B106M)
       - 3.3.1.18. Preliminary Application Software Design Review Briefing Package (B105M)
       - 3.3.1.19. Preliminary Application Software Design Review Meeting Minutes (B106M)
       - 3.3.1.20. Critical Application Software Design Review Briefing Package (B105M)
       - 3.3.1.21. Critical Application Software Design Review Meeting Minutes (B106M)
       - 3.3.1.22. Simulator Environment System Operational Readiness Review Briefing Package (B105M)
       - 3.3.1.23. Simulator Environment System Operational Readiness Review Meeting Minutes (B106M)
       - 3.3.1.24. Field Environment System Operational Readiness Review Briefing Package (B105M)
       - 3.3.1.25. Field Environment System Operational Readiness Review Meeting Minutes (B106M)
       - 3.3.1.26. Engineering Change Proposals (B107M)
       - 3.3.1.27. Problem Reports (B108M)
       - 3.3.1.28. Configuration Status Reports (B103M)
       - 3.3.1.29. Change Review Board Oversight Meeting Minutes (B106M)
       - 3.3.1.30. Technical Interchange Meeting Minutes (B106M)
       - 3.3.1.31. System Architectural Design Description and Traceability Matrix (B311S)
       - 3.3.1.32. System Test Plans/Scripts for Simulator Environment (S312S)
       - 3.3.1.33. Acceptance Test Plans/Scripts for Simulator Environment (S313S)
       - 3.3.1.34. System Test Plans/Scripts for Field Environments (F312S)
       - 3.3.1.35. Acceptance Test Plans/Scripts for Field Environment (F313S)
       - 3.3.1.36. System Detailed Design Description (B314S)
       - 3.3.1.37. System Integration Test Plans/Scripts for Simulator Environment (S315S)
       - 3.3.1.38. System Integration Test Plans/Scripts for Field Environment (F315S)
       - 3.3.1.39. Simulator Hardware, Equipment, and Third-Party Software Installation List (S316S)

3.3.1.40. Field Hardware, Equipment, and Third-Party Software Installation List (F316S)
3.3.1.41. Device Emulator Software System Test Plans/Scripts for Simulator Environment (S412S)
3.3.1.42. Device Emulator Software Acceptance Test Plans/Scripts for Simulator Environment (S413S)
3.3.1.43. Device Emulator Software High Level Design (B411S)
3.3.1.44. Device Emulator Software Detailed Design Description (S414S)
3.3.1.45. Device Emulator Software Integration Test Plan/Scripts (S415S)
3.3.1.46. Device Emulator Software Build Procedure (S427S)
3.3.1.47. Application Software Requirements Specification (B510S)
3.3.1.48. Application Software System Test Plans/Scripts for Simulator Environment (S512S)
3.3.1.49. Application Software Acceptance Test Plans/Scripts for Simulator Environment (S513S)
3.3.1.50. Application Software System Test Plans/Scripts for Field Environment (F512S)
3.3.1.51. Application Software Acceptance Test Plans/Scripts for Field Environment (F513S)
3.3.1.52. Application Software High Level Design (B511S)
3.3.1.53. Application Software Detailed Design Specification, including physical data model (B514S)
3.3.1.54. Application Software Integration Test Plan/Scripts for Simulator Environment (S515S)
3.3.1.55. Application Software Integration Test Plan/Scripts for Field Environment (F515S)
3.3.1.56. Application Software Build Procedure (B527S)
3.3.1.57. System Administrator Manual (B600D)
3.3.1.58. Simulator Disaster Recovery Checklist (S601D)
3.3.1.59. Field Environment Disaster Recovery Checklist (F601D)
3.3.1.60. User Manual (B603D)
3.3.1.61. Training Manuals (B604D)
3.3.1.62. Third-Party Software Manuals for Simulator Environment (S605D)
3.3.1.63. Third-Party Software Manuals for Field Environment (F605D)
3.3.1.64. Software Development Tools Documentation (B606D)
3.3.1.65. Simulator Environment Installation Report (S830S)
3.3.1.66. Device Emulator Software Integration Test Report (S815S)
3.3.1.67. Application Software Integration Test Report (S815S)
3.3.1.68. Simulator Environment System Integration Test Report (S815S)
3.3.1.69. Simulator Environment System Test Report (S912S)
3.3.1.70. Simulator Environment Acceptance Test Report (S913S)
3.3.1.71. Simulator Environment Operational Use Readiness Report (S990S)
3.3.1.72. Training Manuals (B604D)
3.3.1.73. User Manuals (B603D)
3.3.1.74. System Administrator Manual (B600D)
3.3.1.75. Software Development Tools Documentation (B606D)
3.3.1.76. Field Environment Installation Report (F1230S)
3.3.1.77. Field Environment System Integration Test Report (F1215S)
3.3.1.78. Field Environment System Test Report (F1312S)
3.3.1.79. Field Environment Acceptance Test Report (F1313S)
3.3.1.80. Field Environment Operational Use Readiness Report (F1390S)

3.3.2. Conduct Reviews and Audits
3.3.2.1. Conduct bi-Weekly Status Review
3.3.2.2. Prepare and Submit bi-Weekly Status Meeting Minutes
3.3.2.3. Conduct Requirements and Design Reviews
3.3.2.3.1 Prepare and Submit Preliminary System Design Review Briefing Package (B105M)
3.3.2.3.2 Conduct Preliminary System Design Review
3.3.2.3.3 Prepare and Submit Preliminary System Design Review Meeting Minutes (B106M)
3.3.2.3.4 Prepare and Submit Critical System Design Review Briefing Package (B105M)
3.3.2.3.5 Conduct Critical System Design Review
3.3.2.3.6 Prepare and Submit Critical System Design Review Meeting Minutes (B106M)
3.3.2.3.7 Prepare and Submit Custom Device Emulation Software Requirements Review Briefing Package (B105M)
3.3.2.3.8 Conduct Custom Device Emulation Software Requirements Review
3.3.2.3.9 Prepare and Submit Custom Device Emulation Requirements Review Meeting Minutes (B106M)
3.3.2.3.10 Prepare and Submit Preliminary Custom Device Emulation Design Review Briefing Package (B105M)

3.3.2.3.11 Conduct Preliminary Custom Device Emulation Design Review
3.3.2.3.12 Prepare and Submit Preliminary Custom Device Emulation Design Review Meeting Minutes (B106M)
3.3.2.3.13 Prepare and Submit Critical Custom Device Emulation Design Review Briefing Package (B105M)
3.3.2.3.14 Conduct Critical Custom Device Emulation Design Review
3.3.2.3.15 Prepare and Submit Critical Custom Device Emulation Design Review Meeting Minutes (B106M)
3.3.2.3.16 Prepare and Submit Application Software Requirements Review Briefing Package (B105M)
3.3.2.3.17 Conduct Application Software Requirements Review
3.3.2.3.18 Prepare and Submit Application Software Requirements Review Meeting Minutes (B106M)
3.3.2.3.19 Prepare and Submit Preliminary Application Software Design Review Briefing Package (B105M)
3.3.2.3.20 Conduct Preliminary Application Software Design Review
3.3.2.3.21 Prepare and Submit Preliminary Application Software Design Review Meeting Minutes (B106M)
3.3.2.3.22 Prepare and Submit Critical Application Software Design Review Briefing Package (B105M)
3.3.2.3.23 Conduct Critical Application Software Design Review
3.3.2.3.24 Prepare and Submit Critical Application Software Design Review Meeting Minutes (B106M)
3.3.2.4. Conduct System Readiness Reviews
3.3.2.4.1 Prepare and Submit Simulator Environment System Operational Readiness Review Briefing Package (B105M)
3.3.2.4.2 Conduct Simulator Environment System Operational Readiness Review
3.3.2.4.3 Prepare and Submit Simulator Environment System Operational Readiness Review Meeting Minutes (B106M)
3.3.2.4.4 Prepare and Submit Field Environment System Operational Readiness Review Briefing Package (B105M)
3.3.2.4.5 Conduct Field Environment System Operational Readiness Review
3.3.2.4.6 Prepare and Submit Field Environment System Operational Readiness Review Meeting Minutes (B106M)
3.3.2.5. Submit Engineering Change Proposals to Change Review Board (B107M)
3.3.2.6. Submit Problem Reports to Change Review Board (B108M)
3.3.2.7. Submit Configuration Status Reports to Change Review Board (B103M)
3.3.2.8. Conduct Change Review Board Oversight Meetings
3.3.2.9. Prepare and Submit Change Review Board Oversight Meeting Minutes (B106M)
3.3.2.10. Conduct Technical Interchange Meetings
3.3.2.11. Prepare and Submit Technical Interchange Meeting Minutes (B106M)

3.4. Perform Problem Resolution
3.5. Subcontractor Management
3.6. Perform Safety Procedures
3.7. Perform Security Procedures

4. Deliver and Initialize System
4.1. Simulator Environment Delivery and Initialization
4.1.1. Prepare and Submit Simulator Environment Operational Use Readiness Report (S990S)
4.2. Field Environment Delivery, Initialization, and Cutover
4.2.1. Prepare and Submit Field Environment Operational Use Readiness Report (F1390S)
4.3. Development Environment Delivery and Initialization
4.3.1. Prepare and Submit Development Environment Hardware, Equipment, and Software Installation List (D116S)
4.3.2. Install and Configure Development Environment

5. Provide Training (B1000M)
5.1. Conduct Training for Simulator Environment
5.1.1. Application Software Training
5.1.2. System Hardware and Software Training

- 5.1.3. Disaster Recovery Training
- 5.2. Conduct Training for Field Environment
  - 5.2.1. System Hardware and Software Training
  - 5.2.2. Disaster Recovery Training
- 5.3. Conduct Training for Development Environment

6. Provide System Warranty Services
   - 6.1. Provide Help Desk Support
   - 6.2. Repair System