I-680 SMART CARPOOL LANE PROJECT
SYSTEM ENGINEERING MANAGEMENT PLAN

CONFIGURATION MANAGEMENT
PLAN GUIDELINES

PLAN GUIDELINE SECTIONS:

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1. GENERAL

The primary purpose of the Configuration Management Plan (CMP) guidelines is to establish and maintain the integrity and control of software/hardware products and documents supplied by the Integrator during the development life cycle of an Intelligent Transportation System and its operation and maintenance.

The CMP for the I-680 Smart Lane ETS contract will address the management and control of content, change, and status of shared information within the ETS development and implementation. This includes products such as performance requirements, functional and physical requirements, and design and operation information.

The CMP shall identify both technical and administrative direction for the control of change and integrity of the ETS product data and documentation. The CMP shall identify the configuration of the software and hardware, including commercially-off-the-shelf (COTS) products, at given points in time, systematically controlling changes to the configuration, and maintaining the integrity and traceability of the configuration throughout the project’s life cycle.

2. ROLES AND RESPONSIBILITIES

The Smart Lane CMP for the project implementation stage shall follow the configuration management guidelines presented in this document. The CMP shall be developed by the selected Integrator during the early part of the system design phase.
Listed below are suggested starting points for defining organizational responsibilities pertaining to the Configuration Management (CM) activities required to ensure program success.

2.1 JOINT POWERS AGENCY (JPA)

The JPA ED shall have full contractual responsibility for all Smart Lane configuration management activities and will work closely with the consultant staff to ensure that configuration management during the overall design, development, testing, installation, and deployment of the system. Configuration management will enable successful project completion and efficient ongoing support and maintenance for the duration of the Smart Lane Project. The JPA shall have final approval of the CMP.

2.2 PROJECT CONSULTANT STAFF

The JPA’s Smart Lane consultants will have the following roles and responsibilities:

- Review the CMP developed by the Integrator for completeness and compliancy with the functional requirements presented in the Request for Proposal (RFP) and other contract documents.
- Audit the CM process that has been developed by the Integrator to ensure that the process is correct and that there are built-in control mechanisms that will lead to a successful project.
- Establish a specific hierarchy of information for both project non-deliverables and deliverables.
- Create a CM process to support change evolution of the ETS software and hardware.
- Monitor the ETS application system delivery and release management procedures that shall be developed by the Integrator

2.3 INTEGRATOR SYSTEMS ENGINEER(S)

The Integrator engineering personnel for the Smart Lane Project shall have the following roles and responsibilities:

- Develop a comprehensive CMP for the Smart Lane project ETS design, build and deployment phases.
- Identify and document the functional and physical characteristics of the system, software, hardware, and operational components so that these relationships may be managed, maintained, controlled, and assured.
- Record and report the status of proposed changes consistent with the established CM process, approval of any proposed changes and the status of the implementation of approved changes.
- Disseminate baseline information to the project management (JPA/Consultant) personnel, and establish and maintain a status accounting and reporting system that records the baseline, authorized changes to the baseline, and verification of changes incorporated into the documentation and/or product.
3. CONFIGURATION MANAGEMENT PLAN COMPONENTS

The Software/Hardware Configuration Management Plan for the Smart Lane ETS project shall contain the following integrated activities, as reflected below in Figure 1.

Presented below is a description of each of the CMP elements that shall be developed and adhered to by the Integrator:

- **Configuration Identification** of work products that shall be developed and utilized by the Integrator.
- **Configuration Change Control** of information, including the impact of changes to ETS application development tasks, management schedules, budgets, technical or quality assurance activities, testing or retest requirements, and project status reporting mechanisms.
- **Status Accounting** of work products developed and used by the Integrator during the design, development, integration, testing, deployment, operations, and maintenance of the ETS application system.
- **Configuration Audits** that assess the status and acceptability of products controlled or released by the Integrator.
- **Interface Control** process to manage all external interface integrity and control procedures.
• **Integrator Management** to monitor ETS application system delivery and release management procedures.

The Integrator shall perform the work associated with these components that are consistent with the complexity of the Smart Lane ETS.

## 4. CONFIGURATION IDENTIFICATION

The configuration identification component of the Smart Lane ETS CMP shall specify what information has been approved for concurrent use on the project, who owns the information, how the information was approved for CM control, and what the latest approved release of the component is. The Configuration Identification elements are presented below in Figure 2.

![Configuration Identification Elements](image)

**Figure 2 – Configuration Identification Elements**

### 4.1 CONFIGURATION ITEM IDENTIFICATION

The CMP shall record the items to be controlled, the project Configurable Items (CIs), and their definitions as they evolve. The CMP shall also describe how the list of items and the structures are to be maintained for the project. At a minimum, all CIs that are to be delivered shall be listed.

Appropriate baselines shall be defined at control points within the project life cycle in terms of the following:

1. The event that creates the baseline;
2. The items that are to be controlled in the baseline;
3. The procedures used to establish and change the baseline; and
4. The authority required to approve changes to the approved baseline documents.

A means of identifying changes and associating them with the affected CIs and the related baseline shall be specified.

4.2 NAMING CONFIGURATION ITEMS

The CMP shall specify an identification system to assign unique identifiers to each CI. It shall also specify how different versions of each are to be uniquely identified. Identification methods shall include naming conventions and version numbers and letters.

The CMP shall describe the methods for naming controlled items for purposes of storage, retrieval, tracking, reproduction, and distribution. Activities may include version marking, labeling documentation and executable software, serialization, and altered item marking for executable code.

COTS software, vendor proprietary software, and support software may require special identification schemes and labeling.

4.3 ACQUIRING CONFIGURATION ITEMS

The CMP for the ETS project shall identify the controlled software libraries for the project and describe how the code, documentation, and data of the identified baselines are to be physically placed under control in the appropriate library. For each library the format, location, documentation requirements, receiving and inspection requirements, and access control procedures shall be specified.

Based on the RFP and other Contract requirements, the CMP shall specify procedures for the actual storage of documents and magnetic media, including the identification of software/hardware items. Data retention periods and disaster prevention and recovery procedures, which will be identified in the RFP, shall also be described.

Procedures shall describe how to retrieve and reproduce controlled items from library storage. These activities include verifying labeling, tracking controlled copies, and protecting proprietary and security information.

5. CONFIGURATION MANAGEMENT CHANGE CONTROL

The CMP shall define the configuration control process and procedures designating the level of control through which each software/hardware work product must pass (for example, author control, project-level control, acquirer control); identifying the persons or groups with authority to make changes at each level (for example, the programmer/analyst, the software/hardware lead, the project manager, the acquirer); and the steps to be followed to obtain required authorization for changes, to process change requests, to track changes, to distribute changes, and to maintain past versions.

The Integrator’s internal software modification control procedures that shall be used in support of the ETS software/hardware development and testing efforts shall be identified in the CMP. The CMP shall also include the various Integrator internal and external interface processes and procedures.
For each project software/hardware components of the ETS solution, the CMP shall describe the change controls imposed on the baseline CIs. The CMP shall identify the following sequence of configuration control specific steps when a change is required:

1. Request a change;
2. Evaluate the change request;
3. Approve or disapprove the request; and
4. Implement the change.

Presented below, in Figure 3, are the Configuration Control steps that shall be followed by the Integrator:

![Figure 3 - Configuration Control Process](image)

The CMP shall identify the records to be used for tracking and documenting this sequence of steps for each change. Any differences in handling changes based on the origin of the request shall be explicitly documented.

5.1 REQUESTING CHANGES

The CMP shall specify the procedures for requesting a change to a baseline CI and the information to be documented for the request. At a minimum, the information recorded for a proposed change shall contain the following:

- The name(s) and version(s) of the CIs for which a change is proposed;
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- Originator’s name and organization;
- Date of request;
- Indication of urgency;
- The need for the change; and
- Description of the requested change.

Additional information, such as priority or classification, must be included to clarify the significance of the request and to assist in its analysis and evaluation. Other information, such as change request number, status, and disposition, shall be recorded for change tracking.

5.2 EVALUATING CHANGES

The CMP shall specify the analysis required to determine the impact of the proposed change and the procedures for reviewing the results of the analysis. Changes should be evaluated to determine their effect on the deliverable, their impact on cost, project resources and potential impact on project schedule.

5.3 APPROVE OR DISAPPROVE CHANGES

The JPA ED, or their designee, shall serve as the configuration control person responsible for the approval or disapproval of the proposed changes. The ED shall document the decision, in writing, reflecting any changes to the Integrator’s scope of work regardless of whether it impacts the budget or schedule of the Smart Lane Project.

5.4 IMPLEMENT CHANGES

The CMP shall specify the activities for verifying and implementing an approved change. The information recorded for the completion of a change shall contain the following at a minimum:

- The change request(s);
- The names and versions of the affected items;
- Verification date and responsible party;
- Release or installation date and responsible party; and
- The identification of the new version.

Additional information, such as software fault metrics or identification of the supporting software used to implement the change, may be included.

The CMP may also specify activities for release planning and control, for example coordinating multiple changes, reconfiguring the CIs, and delivering a new baseline.

6. STATUS ACCOUNTING

The CMP shall define status accounting activities which record and report the status of ETS system CIs.

The Plan shall include, as a minimum, the following:
What data elements are to be tracked and reported for baselines and changes;
What types of status accounting reports are to be generated and their frequency;
How information is to be collected, stored, processed, and reported;
How access to the status data is to be controlled; and
If an automated system is used for any status accounting activity, its function shall be described or referenced.

The following minimum data elements shall be tracked and reported for each CI:
• Its initial approved version;
• The status of requested changes; and
• Implementation status of approved changes.

7. CONFIGURATION AUDITS

The CMP shall identify the ETS system implementation configuration audits that shall determine to what extent the actual software/hardware configuration items reflect the required physical and functional characteristics. Configuration reviews are management tools for establishing a baseline.

The CMP shall identify the configuration audits and reviews to be conducted on the project. At a minimum, a configuration audit shall be performed on all the software/hardware configuration items prior to its release.

For each planned configuration audit or review, the CMP shall define the following:
• The objective of the audit;
• The software/hardware CIs under audit or review;
• The schedule of audit or review tasks;
• The procedures for conducting the audit or review;
• The audit participants by job title;
• The documentation required to be available for review or to support the audit or review;
• The procedure for recording any discrepancies and reporting of corrective actions; and
• The approval criteria and the specific action(s) to occur upon approval.

8. INTERFACE CONTROLS

The CMP shall identify the Interface Control (IC) activities to support external interfaces to BATA and other entities within the Smart Lane end to end solution. The IC activities shall coordinate changes to the interfacing items outside the scope of the ETS system CIs.
Hardware, system software and support software, as well as other components and deliverables, should be examined for potential interfacing effects on the overall project.

The CMP shall identify the external items to which the project software/hardware interfaces. For each interface the CMP shall define, as a minimum, the following:

- The nature of the interface;
- The affected organizations;
- How the interface code, documentation, and data are to be controlled; and
- How the interface control documents are approved and released into a specified baseline.

9. INTEGRATOR MANAGEMENT

Integrator control activities described herein ensure that items developed for the ETS for the overall Smart Lane Project CIs meet the requirements of the RFP and the Contract documents and approved changes.

For both Integrator furnished and COTS software or hardware, the CMP shall define the activities to incorporate these items into the Smart Lane Project. For Integrator supplied software/hardware, the CMP shall describe, at a minimum, the following:

- What ETS requirements, including the system implementation plan, are to be part of the Integrator agreement;
- How the Integrator will be monitored for compliance;
- What configuration audits and reviews of Integrator items will be held;
- How external code, documentation, and data will be tested, verified, accepted, and merged with the overall project;
- How proprietary items will be handled for security of information and traceability of ownership (e.g., copyright and royalties); and
- How changes are to be processed, including the Integrator participation.

For COTS software, the CMP shall describe how the software will be received, tested, and placed under ETS Integrator control, how changes to these items will be processed, and how the Integrator will participate in the Smart Lane project change management process.