­­­­

**Project Systems Engineering**

**Management Plan (PSEMP)**

***TEMPLATE***

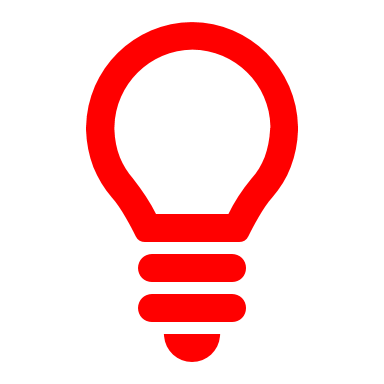
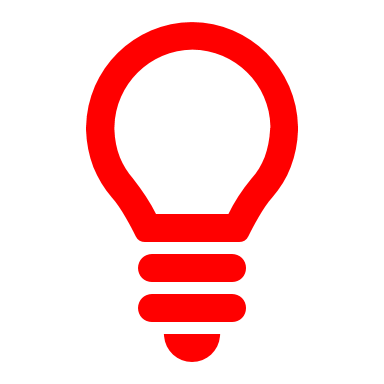
**TEMPLATE Version: *2.0***

**TEMPLATE Approval Date: *September 4, 2019***

**Procedure for Using this Template to Create a Deliverable:**

1. Enter your name, firm, and date in the author field document control panel.
2. Replace [bracketed text] and empty sections with your project information and/or document content.

Note that the bracketed text in blue italics identifies the information to provide within those brackets. When you remove or highlight the entire bracketed portion and replace with text, the text should appear in the desired text format of the document. Also, the Document Title is a property/field of the document visible from the file system and will appear differently than with blue italics and can utilize the “Update Field” functionality.

1. Each section contains instructions preceded with a check box  for that section in blue italics.Additional helpful information and description of the required content for that section will be indicated as well next to the lightbulb icon ****.
2. Some sections also contain boilerplate in a standard, non-italicized text to use as a starting point. Review and modify any existing boilerplate content and add additional content as necessary to fulfill the requirement of each section. Use the Styles *H1 – H5* for section headers, *Figure Caption* for captions below figures, and *Table Caption* for captions above tables so that the Table of Contents, List of Figures, and List of Tables can be automatically updated.
3. Define acronyms at the first usage in parenthesis after the expanded term and add to the List of Acronyms.
4. Delete the template title page, these instructions pages, all blue instructions, and the detailed instruction notes and examples that are identified with the lightbulb **** throughout the document.
5. Update the filename and file location in the document control panel by right-clicking the field, then clicking “Update Field.”
6. Update the Headers and Footers to have the appropriate document title and version.
7. Delete the List of Tables or List of Figures if they do not contain any items.
8. Update the Table of Contents, List of Tables, and List of Figures by right-clicking and selecting “Update Field,” then “Update entire table.”
9. Have the document modified and reviewed as appropriate, and have each reviewer and modifier enter their name, organization, and date in the document control panel.
10. Submit the document for approval and go through the review/revision needed to obtain approval to finalize the document.
11. Repeat the review cycle and resubmit for approval as needed to obtain approval to finalize the document.
12. Enter the approver’s name, organization, and date in the *approved by* section of the document control panel.
13. Enter the approval date on the title page and in the footer throughout the document and update the revision history at the end of the document.
14. Remove the DRAFT watermark on the title page and the content pages by entering the Edit Header and Footer mode of the document and deleting the DRAFT image.
15. Print the document to PDF and review it outside of the Microsoft Word application.
16. Submit the Word and PDF versions of the document as final.

**Template Revision History**

| Version | Date | Name | Description |
| --- | --- | --- | --- |
| 1.0 | 11/30/2015 | Derek Vollmer | Original template for compliance with Rule 940 |
| 1.1 | 6/1/2018 | Clay Packard | Added content sections for a level 2 project for compliance with Agency for State Technology |
| 2.0 | 6/7/2018 | Josie Sanchez | Overhauled the template format to distinguish instructions, example, and boilerplate text for clarity and user friendliness |
| 2.0 | 09/30/2018 | Victor Blue | Edits based on new draft RTVM Template |
| 2.0 | 02/18/2018 | Victor Blue | Edits based on new 750-040-003 covering AST interests and scaling of report to scope. |
| 2.0 | 03/27/2019 | Victor Blue | Edits for formatting and content |
| 2.0 | 04/09/2019 | Victor Blue | Edits for formatting and content |
| 2.0 | 04/24/2019 | Victor Blue | Edits to AST material, Project Management sections |
| 2.0 | 04/25/2019 | Steve Petty | Editorial review |
| 2.0 | 06/01/2019 | Victor Blue | Response to comments |
| 2.0 | 07/15/2019 | Schelley Cassidy | Review and compile final |
| 2.0 | 7/22/2019 | Victor Blue | Revisions to match Verification Template |
| 2.0 | 07/23/2019 | Schelley Cassidy | Review and compile final |



**Project Systems Engineering Management Plan (PSEMP) for [insert project name]**

**Version: [*insert version number*]**

**Approval Date:[*Insert Approval Date*]**

|  |  |  |
| --- | --- | --- |
| **DOCUMENT CONTROL PANEL** | | |
| File Name: | Project Systems Engineering Management Plan Template.docx | |
| File Location: | [*insert file location/path*] | |
| Version Number: | [*insert version #*] | |
| **Name** | | **Date** |
| Created By: | [*insert author name, organization*] | [*insert creation date*] |
|  |  |
| Reviewed By: | [*insert reviewer name, organization*] | [*insert review date*] |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Modified By: | [*insert modifier name, organization*] | [*insert modified date*] |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
| Approved By: | [*insert approver name, organization*] | [*insert approval date*] |

**Table of Contents**

[1. Overview 1](#_Toc18564222)

[1.1 Document Overview 1](#_Toc18564223)

[1.2 Need for a Project Systems Engineering Management Plan 2](#_Toc18564224)

[1.3 Project Identification 2](#_Toc18564225)

[1.4 Project Purpose and Scope 2](#_Toc18564226)

[1.5 Technical Project Summary Schedule 3](#_Toc18564227)

[1.6 Relationship to Other Plans 3](#_Toc18564228)

[1.6.1 Relationship to Florida’s Ten-Year ITS Cost Feasible Plan 3](#_Toc18564229)

[1.6.2 Relationship to the Regional ITS Architecture (RITSA) 4](#_Toc18564230)

[1.6.3 Relationship to Other “On-project” Plans 4](#_Toc18564231)

[1.7 Applicable Documents 4](#_Toc18564232)

[References 5](#_Toc18564233)

[2. Systems Engineering Processes 5](#_Toc18564234)

[2.1 Developing the Project ITS Architecture (PITSA) 6](#_Toc18564237)

[2.2 Identifying High-Level Functional Requirements (System) 6](#_Toc18564238)

[2.3 Developing Detailed Requirements 7](#_Toc18564239)

[2.4 Performing Trade-off Studies, Gap Analyses, or Technology Assessments 7](#_Toc18564240)

[2.5 Performing Technical Reviews 8](#_Toc18564241)

[2.6 Identifying, Assessing and Mitigating Risk 10](#_Toc18564242)

[2.6.1 Risk Planning 11](#_Toc18564243)

[2.6.2 Risk Sources and Parameters 11](#_Toc18564244)

[2.6.3 Identify and Analyze Risks 12](#_Toc18564245)

[2.6.4 Avoid, Mitigate, and Transfer Risks 12](#_Toc18564246)

[2.7 Creating the Requirements Traceability Verification Matrix (RTVM) 13](#_Toc18564247)

[2.7.1 System Verification 13](#_Toc18564248)

[2.8 Conducting System Testing, Integration, Verification, and Acceptance Planning 14](#_Toc18564249)

[2.9 System Validation 15](#_Toc18564250)

[3. Project Management and Control 15](#_Toc18564252)

[3.1 Organization Structure 17](#_Toc18564253)

[3.1.1 The Project Team 17](#_Toc18564254)

[3.1.2 CONTRACTOR Team 17](#_Toc18564255)

[3.2 Work Breakdown Structure (WBS) and Work Plan 17](#_Toc18564256)

[3.3 Managing the Schedule with the Project Evaluation and Review Technique (PERT) / Critical Path Method (CPM) 18](#_Toc18564257)

[3.4 Procurement Management 21](#_Toc18564258)

[3.5 Communications Management 21](#_Toc18564259)

[3.5.1 Communication Channel 21](#_Toc18564260)

[3.5.2 Meetings 22](#_Toc18564261)

[3.5.3 Central Project Documentation Repository 22](#_Toc18564262)

[3.5.4 Communications Tracking. 22](#_Toc18564263)

[3.5.5 Deliverable Management and Approval Process 23](#_Toc18564264)

[3.5.5.1 Phase 1 — Document Template Outline Approval 23](#_Toc18564265)

[3.5.5.2 Phase 2 —Document Submittal and Review Procedure 25](#_Toc18564266)

[3.6 Cost Management 25](#_Toc18564267)

[3.7 Risk Management 26](#_Toc18564268)

[3.8 Subcontractor Management 26](#_Toc18564269)

[3.9 Engineering Specialty Integration 26](#_Toc18564270)

[3.10 Integrated Logistics Support and Maintenance Engineering 26](#_Toc18564271)

[3.11 Project Status Reviews 27](#_Toc18564272)

[3.12 Change Management 27](#_Toc18564273)

[3.13 Quality Management 28](#_Toc18564274)

[3.14 Systems Acceptance 28](#_Toc18564275)

[3.15 Operations and Maintenance, Upgrade, and Retirement 29](#_Toc18564276)

[3.16 Lessons Learned 29](#_Toc18564277)

**List of Tables**

[Table 1: Referenced Documentation 4](#_Toc18564278)

[Table 2: Project Architectural Interfaces 6](#_Toc18564279)

[Table 3: Sample Risk Register 11](#_Toc18564280)

**List of Figures**

[Figure 1: Example of Overall Project Flow 9](#_Toc18564281)

[Figure 2: Project Stages for ITS Project 16](#_Toc18564282)

[Figure 3: Example of Project Evaluation and Review Technique Chart (PERT Chart) 20](#_Toc18564283)

**List of Acronyms and Abbreviations**

ARC-IT Architecture Reference for Cooperative and Intelligent Transportation

CDR Critical Design Review

CEI Construction Engineering and Inspection

CFP Cost Feasible Plan

CFR Code of Federal Regulations

CMB Change Management Board

ConOps Concept of Operations

CPM Critical Path Method

CV Connected Vehicle

ECO Engineering Change Order

FAC Florida Administrative Code

FCS Florida Cybersecurity Standards

FDOT Florida Department of Transportation

ICD Interface Control Document

ITS Intelligent Transportation System

MOE Measure of Effectiveness

MOP Measure of Performance

MTR Minimum Technical Requirement

O&M Operations and Maintenance

PERT Project Evaluation and Review Technique

PITSA Project Intelligent Transportation System (ITS) Architecture

PM Project Manager

PSEMP Project Systems Engineering Management Plan

QA Quality Assurance

QC Quality Control

QM Quality Management

RAD-IT Regional Architecture Development for Intelligent Transportation

RCTO Regional Concept for Transportation Operations

RITSA Regional Intelligent Transportation System Architecture

RTVM Requirements Traceability Verification Matrix

SEMP (Florida’s Statewide) Systems Engineering Management Plan

SEP Systems Engineering Process

SITSA Statewide Intelligent Transportation System Architecture

SwRI Southwest Research Institute

TSP Technical Special Provision

WBS Work Breakdown Structure

# 

# Overview

* Adjust the following sentence as appropriate for this Project Systems Engineering Management Plan (PSEMP).

The first section of the Project Systems Engineering Management Plan (PSEMP) document provides seven elements: an overview of the document, need for a PSEMP, project identification, purpose and scope, technical project summary schedule, relationship to other plans, and applicable documents. These elements are described in the following sections.

* *Per 23 United States Code, Part 940 (23 USC 940 or Rule 940), a Systems Engineering Analysis (SEA) is required for all Intelligent Transportation Systems (ITS) projects using federal funds. The Federal Highway Administration (FHWA) oversees compliance with Rule 940. The Florida Department of Transportation (FDOT) ensures compliance with Rule 940 by use of the FDOT Systems Engineering and Intelligent Transportation Systems (ITS) Architecture Procedure, 750-040-003.*
* *The ITS SEA should be on a scale commensurate with the project scope and risk. FDOT Procedure 750-040-003 gives criteria for determining low- and high-risk projects, leaning conservatively toward high risk, and instructs preparers in the use of three FDOT forms in project development:*
* *FDOT ITS Architecture Change Request Form (FDOT Form 750-040-04) for requesting changes to the Regional Intelligent Transportation System Architecture (RITSA) or Statewide Intelligent Transportation System Architecture (SITSA)*
* *FDOT Project Risk Assessment and Regulatory Compliance Checklist (FDOT Form 750-040-05) used to (a) assess if the project is low risk or high risk and (b) address all regulatory SE items in 23 CFR, Part 940.11*
* *FDOT Systems Engineering Project Checklist (FDOT Form 750-040-06) for all federally funded high-risk ITS projects*
* *These forms are available at the FDOT Forms Management website*.
* *If addressed at a scale commensurate with the project scope for high-risk and high complexity projects, such as projects with a high degree of information technology (IT), this PSEMP Template will contain the information required to meet all state requirements for IT and cybersecurity project management and oversight under Florida Administrative Code, Chapter 74-1 (FAC 74-1). Additionally, per FAC 74-1, cybersecurity risks should be addressed to meet Florida Cybersecurity Standards under FAC 74-2 or applicable law.*
* *While some elements of this template are instructional, the template does not specify how any specific ITS project will be done. It is up to the systems engineer and project manager to specify under what contractual process, when, and by whom the elements identified in this template will be accomplished.*

## Document Overview

* Review and if necessary, modify the description of the purpose for the document, including the project name.

This document is the PSEMP for the [insert project name]. This PSEMP is a plan that helps manage and control the project utilizing systems engineering processes (SEP). The PSEMP identifies what items are to be developed, delivered, integrated, installed, verified, and supported as a part of the project. It documents certain processes and procedures for the technical management, procurement, installation, and acceptance of the project. The document satisfies the requirement for a PSEMP for [insert risk level] Intelligent Transportation System (ITS) projects. The PSEMP details are scaled in proportion with the scope, risk, and complexity of the project.

* *See FDOT Project Risk Assessment and Regulatory Compliance Checklist (FDOT Form 750-040-05) and FDOT Procedure 750-040-003 for additional details on risk assessment and scaling or tailoring for the SEP and the PSEMP.*
* *This document is intended for stakeholders involved in the management and execution of the project as a reference. However, it may include a variety of people from multiple parties with various levels of technical knowledge. Therefore, it is important that the document be clearly written, define technical terms, and use layman’s English for most of the text.*

The document is organized as follows:

* Section 1 – Overview of the PSEMP document
* Section 2 – Systems Engineering Processes
* Section 3 – Project Management and Control

## Need for a Project Systems Engineering Management Plan

* Adjust the following paragraph, as appropriate, for this PSEMP.

This PSEMP is developed as required by FDOT Procedure 750-040-003. The PSEMP documents how systems engineering will be used for ITS project management.

* *Florida’s Statewide Systems Engineering Management Plan (SEMP) is another reference guide in the creation of a PSEMP.*

## Project Identification

* Provide the proper title, identification number, and abbreviation, if applicable, of the system or subsystem that the PSEMP applies to.

Project Name: [Insert the official project name].

Financial Project Identification: [Insert the financial project identification code].

Federal Aid Project Number: [Insert the federal aid project number].

* *The Financial Project Identification Number and Federal Aid Project Number will generally not be authorized until after acceptance of the Concept of Operations (ConOps) document by FHWA.*

## Project Purpose and Scope

* Provide a brief description of the project’s purpose and scope.
* Provide a list of project stakeholders, highlighting their systems engineering, management roles, or other involvement in the project.
* This list might be transferred or modified from the stakeholder list in the ConOps.
* Optionally provide a high‑level graphical overview of the system. This can be in the form of a physical layout diagram, a top‑level functional block diagram, or some other type of diagram that depicts the system and its environment.
* *Further details of the project can be obtained by reviewing other documents, such as the project ConOps, quality assurance (QA) plan, operations and maintenance (O&M) plan, etc., referenced in the Applicable Documents section (Section 1.7) that follows. This documentation can be used to copy figures or text, or just referenced here as appropriate. The Project Intelligent Transportation System Architecture (PITSA) will be discussed in Section 2.1.*
* *For Managed Lanes projects, include a conceptual layout of the managed lanes including access, egress, separation, system connections, and typical sections.*

## Technical Project Summary Schedule

* Provide an overview of the major events to give a general time perspective for the project’s schedule.
* Avoid providing a detailed schedule in this section – just provide an overview of the major events to give a general time perspective for the project. The detailed schedule will be available once the project evaluation and review technique (PERT) or Critical Path Method (CPM) chart is prepared as described in Section 3.3.

*EXAMPLE***:**

* *Advertisement February 2006*
* *Letting/Notice to Proceed March 2006*
* *Construction July 2006 to January 2007*
* *Fiber/Conduit Install July 2006 to October 2006*
* *Poles/Cameras Install October 2006 to January 2007*
* *Pole/Remote Traffic Microwave Sensor Install October 2006 to January 2007*
* *Dynamic Message Sign Structure Install October 2006 to January 2007*
* *Unit/Subsystem Tests July 2007 to October 2007*
* *System Acceptance Tests January 2008 to March 2008*

## Relationship to Other Plans

* Reference other plans and identify what parts are being implemented.
* At a minimum, refer to the FDOT Ten-Year ITS Cost Feasible Plan (CFP) if the project is identified in that document. Another reference plan includes the RITSA; specifically, identify what part of the RITSA is being implemented. Changes to the RITSA are more fully treated in Section 2.1. Include its relevance to the ITS Strategic Plan or ITS Master Plan. It is desirable, at this stage, that you mention what other project-specific plans, such as the Quality Assurance (QA) Plan, the O&M Plan, etc., are being prepared for this project. For express lanes projects, identify the Project Development and Environment (PD&E), Master Plan study, and Regional Concept for Transportation Operations (RCTO) documentation.

### Relationship to Florida’s Ten-Year ITS Cost Feasible Plan

* Delete this section if this project is not included in Florida’s Ten-Year ITS Cost Feasible Plan.

The Ten-Year ITS Cost Feasible Plan[[1]](#footnote-2) (CFP) is a 10-year program and resource plan that identifies ITS projects statewide. It represents a commitment of state- and district-managed ITS funds to provide a coordinated statewide program to develop ITS infrastructure on Florida’s major intrastate highways. This project [*is/is not*] included in the Ten-Year ITS CFP.

### Relationship to the Regional ITS Architecture (RITSA)

* Review and if necessary, modify the description of how this project is included in the RITSA or how it is related to a project in the RITSA. If it is not in the RITSA and is required to be, then indicate the plan for how and when the RITSA will be modified to include this project with its service packages, stakeholders, information flows, etc.

This project is included in the District [insert District number] RITSA.

* If the project is not in the RITSA, identify parts of the Statewide ITS Architecture (SITSA) and/or National Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) that are part of the project. For ARC-IT, see: <https://local.iteris.com/arc-it/>.

### Relationship to Other “On-project” Plans

* List other “on-project” plans in this section, such as the project QA plan, O&M plan, etc., that this PSEMP relates to; otherwise, delete this section.

## Applicable Documents

* Optionally, establish a centralized project repository to house and archive all project documentation and provide the location here: [Show file path in the document control panel].
* Cite all documentation that is relevant to the project.
* Documentation that might be cited includes, but is not limited to, project authorizations, relevant technical documentation, sources of design and communications standards, significant correspondence, documentation concerning related projects, risk analysis reports, feasibility studies, any earlier project ConOps or systems engineering documents, regional or corridor ITS Strategic Plan, RCTO, and/or RITSA. This list almost always includes the Feasibility Study (if one was written) and the ConOps.
* This section lists the publisher, document identification number, title, revision, date, and web address of documentation referenced in this document. This section should also identify a contact for all documents not available through standard channels.
* Use a table, as below (Table 1), or the Bibliography tool in Microsoft Word (see the example below the table). Do not use both. Microsoft Word requires entering the citation into References/Managed Sources. Enter the citation information and put the URL in the Publisher cell. Use the References/Style/APA. Then use the button in References/Bibliography to generate the list.

Table 1: Referenced Documentation

| **Document Name** | **ID, Revision, Date, etc.** | **Link, or Contact Info to Obtain** |
| --- | --- | --- |
| *Systems Engineering and ITS Architecture Procedure 750-040-003* | 2019 | FDOT Forms Management/Procedures  <https://fms.fdot.gov/> |
| *Florida's Statewide Systems Engineering Mangaement Plan: Deliverable 1-10: Technical Memorandum* | March 7, 2005, Version 2 | <https://www.fdot.gov/traffic/its/projects-deploy/semp.shtm> |

# References

FDOT. (2019). *Systems Engineering and ITS Architecture Procedure 750-040-003.* FDOT Forms Management/Procedures: https://fms.fdot.gov/.

FDOT. (March 7, 2005, Version 2). *Florida's Statewide Systems Engineering Mangaement Plan: Deliverable 1-10: Technical Memorandum.* https://www.fdot.gov/traffic/its/projects-deploy/semp.shtm.

# Systems Engineering Processes

* Review and modify as needed the introduction to this section below that describes the following:
  + Systems engineering processes needed to successfully complete the project.
  + The systems engineering tasks needed to be performed to achieve project goals.
  + The systems engineering responsibilities required for accountability in the project.
  + The tailoring process used in defining the risk (low to high) attributes of the project.
* *As stated in the FDOT Systems Engineering and Intelligent Transportation Systems (ITS) Architecture Procedure, 750-040-003, the extent of tailoring should be prescribed in the PSEMP. Summarize the tailoring done to meet the needs of the project scope according to the Tailoring Guide in Section 1.5 of the FDOT ITS Architecture Procedure. This discussion may be supplemented by the FDOT Regulatory Compliance Form (750-04-05) and/or Project Checklist Form (750-04-06).*
* *The successful completion of the SEPs described here in Section 2, form the backbone for project success. The System Engineer’s responsibility is to ensure that the ITS Service Packages and RITSA changes are all accounted for, the requirements are specified sufficiently to build the RTVM, technical reviews undertaken, risks are identified and ranked, and performance measures for verification and validation tasks are identified. The systems engineering tasks assist the Overall Project Manager to put proper controls in place that help achieve project success, as discussed in Section 3.*
* *As stated earlier, while some elements of this template are instructional, the template does not specify how any specific ITS project will be done. It is up to the Systems Engineer and Project Manager to specify under what contractual process, when, and by whom the elements identified in this template will be accomplished.*



## Developing the Project ITS Architecture (PITSA)

* Describe the service packages from the RITSA, SITSA, or ARC-IT that the PITSA will use in this section. If the service packages are not identified in the RITSA, also define the process by with they will be added to the applicable RITSA.
* Update the following, as necessary:

This project includes the following ITS service packages from the [RITSA, SITSA, ARC-IT].

* *Project architecture service packages from the Architecture Reference for Cooperative and Intelligent Transportation (ARC-IT) will most likely be identified in the RITSA and discussed in the ConOps. If that is the case, identify the service packages selected from the RITSA and the ConOps for the PITSA in this section. If for some reason a project’s architecture is not identified in the RITSA, an amendment to the RITSA should be made with the Regional Architecture Development for Intelligent Transportation (RAD-IT) tool to include the project’s service package(s) in the RITSA. Define the process used to create that architecture. Verify that all interfaces are defined in the project physical diagrams and that interface control documents (ICD) exist for all interfaces. If the ICDs do not exist, create those documents separately and refer to them here. More complex projects (e.g., connected vehicle [CV] projects) should show the system physical diagram with interfaces and communications media used between subsystem elements and a table listing interfaces with the source and destination elements, data flows, and communications media (e.g., Table 2).*
* *The process for adding project-related service packages to the RITSA is described in FDOT Procedure 750-040-003. The service package descriptions should include the reference number and name from the RITSA, SITSA, or ARC-IT.*
* Update Table 2 and the following sample data, as required:
* Table 2 lists the project’s architecture interfaces.

Table 2: Project Architectural Interfaces

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Service Package ID | Interface ID | Source Element | Destination Element | Data Flows | Comm. Media |
| TM03 | Interface 1 | RSU | OBU | SPaT, TIM | DSRC |
| TM03 | Interface 2 | OBU | RSU | BSM | DSRC |

## Identifying High-Level Functional Requirements (System)

* High level functional Requirements should be identified from ITS standards and services from the PITSA and from the ConOps.
* *The project ConOps is created as a separate document and referred to here as a source. The ConOps document describes high-level functions and user needs from a customer and stakeholder perspective. The ConOps, a feasibility study or similar planning study, done prior to the project kickoff, may provide useful high-level functional requirements. Functional requirements refer to what the system should do (e.g., the CCTV units will supply high-quality video of the roadway); non-functional requirements refer to what the system should be (e.g., the CCTV camera will be mounted on a pole). The emphasis here is on high-level functional requirements needed for the system to realize its user needs and high-level functions. Functional requirements are identified before non-functional requirements to create the means for the system to work.*

*For most ITS projects, the ConOps serves to identify high-level functional requirements for the system; however, for complicated ITS projects, another stage of functional requirements — the system/subsystem requirements — needs to be developed based on the ConOps. Detailed requirements, based on and traceable to the user needs, will follow in the Requirements Traceability Verification Matrix (RTVM) (Section 2.7) and will include functional and non-functional requirements*.

* If the high-level requirements of the system are not yet available, provide a plan to answer who will create them and when and how they will be created.

## Developing Detailed Requirements

* Review the detailed notes below and create a plan for who, when and how the detailed requirements will be created.
* *For 30% or 60% design/build projects, detailed requirements are referred to as minimum technical requirements (MTR). MTRs are developed based on user needs and high-level requirements, as treated in Section 2.2 herein, during normal design/bid/build or design/build processes. In either case, the lead agency or agencies typically use a Consultant to develop detailed specifications based on the MTRs. Identify the MTR document that was created.*

*For low-bid projects, the detailed requirements are referred to as the specifications and/or technical special provisions (TSP). Specifications and/or TSPs are developed based on user needs as stated in the ConOps, and high-level requirements, as mentioned in Section 2.2 for low-bid projects. Identify the specifications and/or the TSP document that has been created.*

*Section 2.7 considers what goes into the RTVM, which fills out the process of identifying the detailed requirements, functional and non-functional, and verifying how the detailed requirements will be tested.*

## Performing Trade-off Studies, Gap Analyses, or Technology Assessments

* For Trade-off studies, identify instances of desirable yet incompatible, competing features that require analysis. Indicate the options available to solve the problem.
* With respect to Gap Analysis, explain the technology gap that exists between existing system capabilities or existing technologies and the desired system to be implemented.
* For Technology Assessments, describe the technologies available and make a comparative analysis.
* *The level of detail for this section should reflect the overall complexity and risk of the project. For low-risk projects, these studies and assessments may not be needed or could simply reference previous studies or previous projects.*
* *As a formal decision analysis method,* ***trade-off studies*** *are used in situations where more than one alternative exists for a given product, system, or technology. For example, multiple detection units are available to detect vehicle’s presence and measure traffic parameters. Choosing the best detector in each situation will require a trade-off study. Trade-off studies can be done at several levels and at different times during the project. Trade-off studies should include performance impacts, schedule to implement, and identification of risks and costs.*

*A* ***gap analysis*** *focuses on determining the gap that exists between the existing system or technology capabilities and the desired system to be implemented.*

*When the same product or system can be built using different technologies, a* ***technology assessment*** *is completed to determine the optimal technology to use in the given situation.*

*These categories may not necessarily be entirely exclusive from one another. The important point is to identify where technology solutions are needed and to address them.*

*If the trade-off study, gap analysis, or technology assessment processes are very involved, create a separate document and refer to that document here; however, if the processes are simple, document the information in this section. Some of these studies may have been completed prior to the project kick-off date. If that is the case, mention those documents and results here.*

## Performing Technical Reviews

* Provide a detailed description and flow diagram of the overall project schedule showing timing of the systems engineering and technical reviews.
* *An SEP requires several system engineering and technical reviews to properly accomplish the various work items and project milestones that are to be completed in a project. Section 4.6.1.1 of Florida’s Statewide SEMP describes various systems engineering and technical reviews that can be performed for a project. Not all reviews are needed for all projects. Depending on the scope and scale of the project, only a few reviews may be necessary. The Overall Project Manager (PM), whose duties are further described in Section 3, should follow the district’s design review process for design/build and low-bid projects. System Engineers attend these reviews and document changes, which could be applicable to requirements and schedules. A requirement change that modifies stakeholder needs is reported to the Overall Project Manager for a decision. User needs, which are listed in the ConOps, can only be changed by the stakeholders. Scheduled changes are reported at the monthly project status review meetings as described in Section 3.11. Also, provide documentation of planned project reviews.*

*The overall project management model, showing timing of the technical reviews, is shown in the figure below.*



Figure 1: Example of Overall Project Flow

* *EXAMPLE*:

*The following technical reviews are planned for this project.*

* *Requirements Walkthrough – A one-week meeting in DEPARTMENT facilities to walk through the requirements to assure common understanding.*
* *40% or Preliminary Design Review – At the completion of the 40% Design phase, the CONTRACTOR shall perform a Preliminary Design Review (PDR) to obtain verification and approval of the system architecture design. The goals of the PDR are to:*

1. *Verify the technical content of the architectural design document and its interfaces are complete and traceable to requirements.*
2. *Ensure the selected design methodology has been followed in producing the architectural design.*
3. *Obtain approval from the DEPARTMENT Project Manager to proceed into detailed design.*

* *90% or Detailed Design Review —For each of the* ***four iterations****, after completion of the 90% detailed design and prior to system build, a Critical Design Review (CDR) shall be conducted by the CONTRACTOR to ensure the design fulfills the requirements. The CDR will serve as a baseline for all deliverables, and there will be no deviation from the final CDR without change requests being approved by the DEPARTMENT. The goals of the CDR are to:*

1. *Verify the technical content of the System Design Document is complete and its functions are traceable to requirements.*
2. *Ensure the selected design methodology has been followed in producing the detailed design.*
3. *Obtain approval from the DEPARTMENT Project Manager of the Detailed design and for the CONTRACTOR to proceed into the implementation phase.*

* *Test Readiness Review — The CONTRACTOR shall hold a two-hour, in-person, Test Readiness Review meeting prior to each major testing event. The purpose of the Test Readiness Review is to provide the DEPARTMENT with the assurance that the software has undergone a thorough integration process and is ready for the next test phase. The scope of the Test Readiness Review is to inspect the test products and test results from the completed integration phase for completeness and accuracy, and to verify that the test cases, test scenarios, test scripts, environment, and test data have been prepared for the next test phase. Each of the Iterations contributing to the overall R‑ICMS will hold Test Readiness Reviews for the Iteration.*
* *Hot Wash-Up Meeting — The CONTRACTOR shall attend a hot wash-up meeting in person at the conclusion of the test execution for each iteration. Unverified requirements will be discussed to facilitate the development of the Corrective Action Plan*
* *Document Deliverable Reviews – Each document is subject to a review of the outline prior to developing the document content, and then the completed draft document is subject to the FDOT review cycle.*

## Identifying, Assessing and Mitigating Risk

* Describe how risks will be identified, assessed, and mitigated. This includes identifying the source of the risk, the methodology used to categorize risks, and the parameters used to evaluate, bound, and control risks for effective handling. This strategy addresses the specific actions and management approach used to apply and control the risk management program.
* *Depending on the size, risk assessment, and needs of the project, a heavier- or lighter-weight risk management strategy, scaled to the project, can be employed and described in this section.* *If the project is high risk and high complexity, use the Risk Log spreadsheet in the Project Log, as described in Section 3.5.4. Use the following subsections, as necessary, to document the risk parameters used in the Risk Log spreadsheet.*
* Project risks can be identified by examination of risk sources and listed in a Risk Matrix (as shown in Table 3). Risks are assessed on a scale of 1-4 based on the risk’s probability of occurrence and the impact to the project, with 1 representing lowest risk and 4 representing the highest. Beginning with high-risk items, measures should be documented that can be taken to mitigate the risks in the table and assign each as a task. Completion of these tasks will help to resolve the risks. Risks are evaluated throughout a project’s life cycle until they are resolved, as risks may change during the project.

*The following areas are specifically considered for risk identification:*

* *Known problems in the existing system*
* *Dependencies on resources outside the control of the project*
* *Operational danger*
* *Current technology*
* *Cybersecurity*
* *Critical path tasks in the project schedule*
* *Budgetary*

*A much more elaborate risk management approach used on larger, more complex projects can also be considered.*

* *Scaled to the project, develop a risk register for the project. A risk register may have been developed in the ConOps and may be used and elaborated upon here.*
* *If the project is complex or has high risk, evaluate the risks and prioritize their importance. A sample risk register is shown below.*

Table 3: Sample Risk Register

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Risk # | Risk  Owner | Description of  Risk and Impact | Likelihood  (1-4) | Impact  (1-4) | Rating  (L + I)  (2-8) | Mitigation  Strategy | Status |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

* The table uses estimates of risk likelihood (1-4) and impact (1-4). When added, they become a risk rating (2-8), which can be used to rank the risks. Alternatively, qualitative measures can be used (low-medium-high). Low values are low likelihood and low impact. High values are high risk and high impact.

### Risk Planning

* Describe the risk plan.
* *Risk planning is the process of identifying possible sources of risks, defining the scales used to rate the impact and likelihood, and how they will be combined to identify and mitigate risks that need to be addressed.*

### Risk Sources and Parameters

* Describe risk sources.
* *Many sources of risk are accepted without adequate planning. Early identification of both internal and external risks can lead to early identification and mitigation of actual risks. The following are possible internal and external sources examined to identify risks.*
* *Uncertain requirements*
* *Continually changing requirements*
* *Continually changing FDOT priorities*
* *Poorly chosen and defined priorities*
* *Politically sensitive FDOT priorities*
* *Novel, groundbreaking efforts - estimates are unavailable*
* *Difficult design*
* *Unavailable technology*
* *Undefined or unaddressed cybersecurity and data privacy needs*
* *Unrealistic schedule estimates or allocation*
* *Inadequate staffing and skills*
* *Cost or funding issues*
* *Uncertain or inadequate subcontractor capability*
* *Uncertain or inadequate vendor capability*
* *Inadequate communication with actual or potential customers or with their representatives*
* *Disruptions to continuity of operations*
* Describe risk parameters.
* *Use the following subsections, as necessary, to document the risk parameters used in the Risk Table (Table 3) for evaluating, categorizing, and prioritizing risks.*

*The likelihood category of the risk shall be assigned a risk likelihood category below based on the change of occurrence as defined in the Risk Likelihood Category List below:*

* *4: High Likely: The risk has a 76% to 100% chance of occurring.*
* *3: Likely: The risk has a 51% to 75% chance of occurring.*
* *2: Somewhat likely: The risk has a 26% to 50% chance of occurring.*
* *1: Unlikely/Improbable: The risk has a 0% to 25% chance of occurring.*

*The risk impact category of the risk shall be determined based on the impact to the project or program as defined in the Risk Impact Category list below:*

* *4: Critical: Threatens the viability of the project*
* *3: Severe: Threatens project/severely reduces benefit*
* *2: Moderate: May delay project/reduce project benefits*
* *1: Minimal/ Minor: Minimal or no impact on project*

*The Risk Score is calculated as the sum of Risk Likelihood and Risk Impact. The Risk Score is tracked to help prioritize risks.*

*Risk Priority is determined by engineering judgement of Risk Probability and Risk Impact. The priority values are assigned as follows*:

* *Risks with a risk score of 6-8 have a high priority. Mitigation plans shall be explicitly discussed with the FDOT in the event the risk becomes a problem. During mitigation planning, resources are first allocated to high criticality risks to mitigate their threats.*
* *Risks with a risk score of 4-5 have a moderate priority. Mitigation plans will be discussed with FDOT.*
* *Risks with a risk score of 2-3 have a low priority. No action planning or risk tracking is necessary. However, the risk shall be periodically reviewed to ensure risk probability and risk impact conditions have not changed.*

### Identify and Analyze Risks

* Identify and analyze risks.
* *The following methods will be used to identify risks. Project staff will enter identified risks into the Risk Matrix (Table 3) upon identification.*
* *Team reviews*
* *Peer reviews*
* *Feasibility studies*
* *Prototypes*
* *Examining each element of the project work breakdown structure*
* *Interviewing subject matter experts*
* *Reviewing risk management efforts of similar projects*
* *Examining lessons-learned documents or databases*
* *Examining design specifications and agreement requirements*
* *Brainstorming*

### Avoid, Mitigate, and Transfer Risks

* Describe how to avoid, mitigate, and transfer risks.
* *Staff responsible for risks will work with the Contractor PM and other stakeholders to develop plans to handle identified risks. The Contractor will include the plans for avoidance, mitigation, and transference of risks in the Risk Matrix (Table 3) with a high and moderate priority.*

## Creating the Requirements Traceability Verification Matrix (RTVM)

* Once stakeholder needs and requirements have been defined in the ConOps, create the Requirements Traceability Verification Matrix (RTVM).
* Detailed requirements and their associated user needs and verification test cases should be listed in the RTVM, along with the other required information as described in the FDOT RTVM Guide. RTVM data fields include: user need, detailed requirement summary, detailed requirement source document, test cases, level of compliance, notes, Construction Engineering and Inspection (CEI) and FDOT reviewer initials.
* A System Verification Plan is used to discuss verification test procedures. For Connected Vehicle projects, a Systems Requirements Specification (SyRS) document may be necessary to fully address equipment and interface connections. For Agile or other software development, an Interface Control Document may be used instead. The RTVM may be built into the Verification Plan, SyRS, or Interface Control Document or supplied as a separate attachment to it, depending upon system complexity.
* The designed and built system will need to meet all requirements before approval. There are several key steps between creating the RTVM and performing the system verification. The verification should test that the built design realizes the requirements. The traceability goes from: user needs (1) to requirements (2) to design (3) to building the system (4) to testing and verifying that the built system works (operational verification) (5). Backward traceability works in reverse from (5) to (1). Design (2) and building (3) are not considered in the RTVM, except in the specifications of the requirements.
* *Among other items, the RTVM references all stakeholder/user needs typically identified in a ConOps document (and any other potential requirements sources). The RTVM lists detailed requirements based on the user and system needs. Detailed requirements specify what the system will do (functional requirements) or what the system will be (non-functional requirements); they are derived from and are directly traceable to user needs. Depending on the project type (e.g., design/build, low-bid), system requirements may include minimum technical requirements, specifications, or technical special provisions. Each user need will be met by at least one detailed requirement, and sometimes several, and each requirement should address a user need. If a new user need is necessary for a requirement that doesn’t have one, it is up to the stakeholders to add it to the ConOps before it is added to the RTVM. Only stakeholders can modify user needs in the ConOps.*

*System requirements must be verifiable and a verification test case to verify compliancy to each requirement is to be referenced in the RTVM with compliancy results. The purpose of this early assignment of a verification test case, long before the system requirements are actually verified, is to make sure thought is given to how the requirement will be verified from the very start. Subsystem requirements and high-level design components may also be referenced in the RTVM, depending on project needs.*

*The RTVM will provide backward and forward traceability, at a minimum, between user needs, system requirements, and verification test cases. The matrix can be maintained directly in a database or spreadsheet for small projects or generated and maintained with a requirements management tool for more complex projects. The Test Manager will use the RTVM to ensure that each requirement is properly tested. The organization that defines the detailed requirements also creates the RTVM.*

### System Verification

* Describe who will prepare the Systems Verification Plan as part of the systems engineering systems requirements phase.
* Describe the test cases that will be used in a System Verification Plan. The Test Manager will use these during system design acceptance.
* *Test cases will be defined in the System Verification Plan to meet the detailed requirements in the RTVM. Test cases are defined by a Test Method, Description, Objective, Data Needed, Pass/Fail Criteria, Test Configuration and Assumptions/Constraints. Test methods of verifying detailed-requirements include: analysis, APL, CEI checklist, deliverable, demonstration, inspection, and testing. At this stage, test cases may be considered on a higher level than when they are fit to the detailed requirements in the RTVM.*

## Conducting System Testing, Integration, Verification, and Acceptance Planning

* Describe the system test and evaluation methodology in this section and include the system integration testing methodology.
* Describe the process that will be used by the FDOT to accept the system. If the FDOT is the Systems Integrator, then describe how the FDOT will accept the subsystems.
* *The systems requirements stage of systems engineering includes preparation of three documents:* 
  + *RTVM*
  + *Systems Verification Plan*
  + *Systems Acceptance Plan*

*The RTVM stands alone. The RTVM includes the test cases from the Systems Verification Plan. Depending on the project’s tailoring, the Systems Verification Plan and the Systems Acceptance Plan may be done separately or as a combined document. They also may be done by the agency, the agency’s contractor, or split between them.*

*The Systems Validation Plan is related to the ConOps, either as part of it in a low-risk project or as a distinct plan in a high-risk project. Systems acceptance is to include satisfactory performance of the RTVM and Systems Verification Plan. Determine in this section how acceptance will be performed and by whom.*

* *Typically, this section includes the following:*
* *Test approach*
* *Test schedules*
* *Test tools*
* *Test facility*
* *In-process test plans*
* *System integration test plan*
* *System verification and validation plans*
* *System acceptance criteria*
* *Integration and testing organizational responsibilities*

*The Construction Consultant will provide the test plans. The CEI Consultant will use the RTVM and verification test cases to determine if a test result should be accepted or rejected. The Test Manager will oversee the system testing at both (a) the RTVM and (b) Systems Verification, and (c) Systems Acceptance phases.*

## System Validation

* System Validation performance measures are discussed in the ConOps, either as the essential elements of a System Validation Plan, for a low-risk project, or as preparation for a System Validation Plan, for a high-risk project. In this section, describe the efforts that will be needed to collect data that will be used to evaluate the project and to create a separate System Validation Plan, if needed. The Test Manager will use these plans during or after final system acceptance.
* *System validation, as opposed to system verification, falls outside the scope of the RTVM and will be part of a System Validation Plan, if a plan is undertaken. Measures of effectiveness (MOE) refer to statistical values that can validate whether the system meets user needs and goals, and that the system achieved the desired effect. MOEs refer to statistics such as the change in trip time or number of crashes before and after the system was built that validate that the right system was built. Preparations need to be made, for inclusion in the Request for Proposal (RFP), to collect before-data for comparison with after-data to evaluate if the project positively and sufficiently achieved its mobility and safety goals.*
* *The systems engineering team must define measures of effectiveness (MOE) of the system that reflect overall goals and objectives of the stakeholders, as stated in the ConOps.*

*The performance measures can be categorized as follows:*

* *Safety measures*
* *Travel measures*
* *Environmental measures*
* *Agency effectiveness measures.*

*The System Validation Plan, prepared as a complementary document to the Concept of Operations, if required, will develop parameters that measure the system’s effectiveness in meeting user needs and system goals. Before-after analysis is a common approach to using MOEs. Provisions must be made for collection of any before-data, in the TMC or in the field, prior to implementation. After-data may be accessible as an outgrowth of the system’s new equipment or may also need special consideration. Arrangements to collect comparable before-data and after-data needed to evaluate the system must be made prior to development of the RFP, otherwise the before-data may not be collected.*



# Project Management and Control

* Review and modify as needed the introduction to this section below that describes the following:
  + Project management and control needed to successfully complete the project.
  + The tasks needed to be performed to achieve project goals.
  + The organizational responsibilities required for accountability in the project.
* *The successful completion of SEPs described in Section 2 form the backbone for project success. The Overall Project Manager’s responsibility is to ensure that tasks are completed on schedule and at cost. Hence, the Overall Project Manager’s responsibility is to put proper controls in place that help achieve this goal.*
* *As stated earlier, while some elements of this template are instructional, the template does not specify how any specific ITS project will be done. It is up to the systems engineer and project manager to specify under what contractual process, when and by whom the elements identified in this template will be accomplished.*
* *Figure 2 shows potental project stages for an ITS project.*

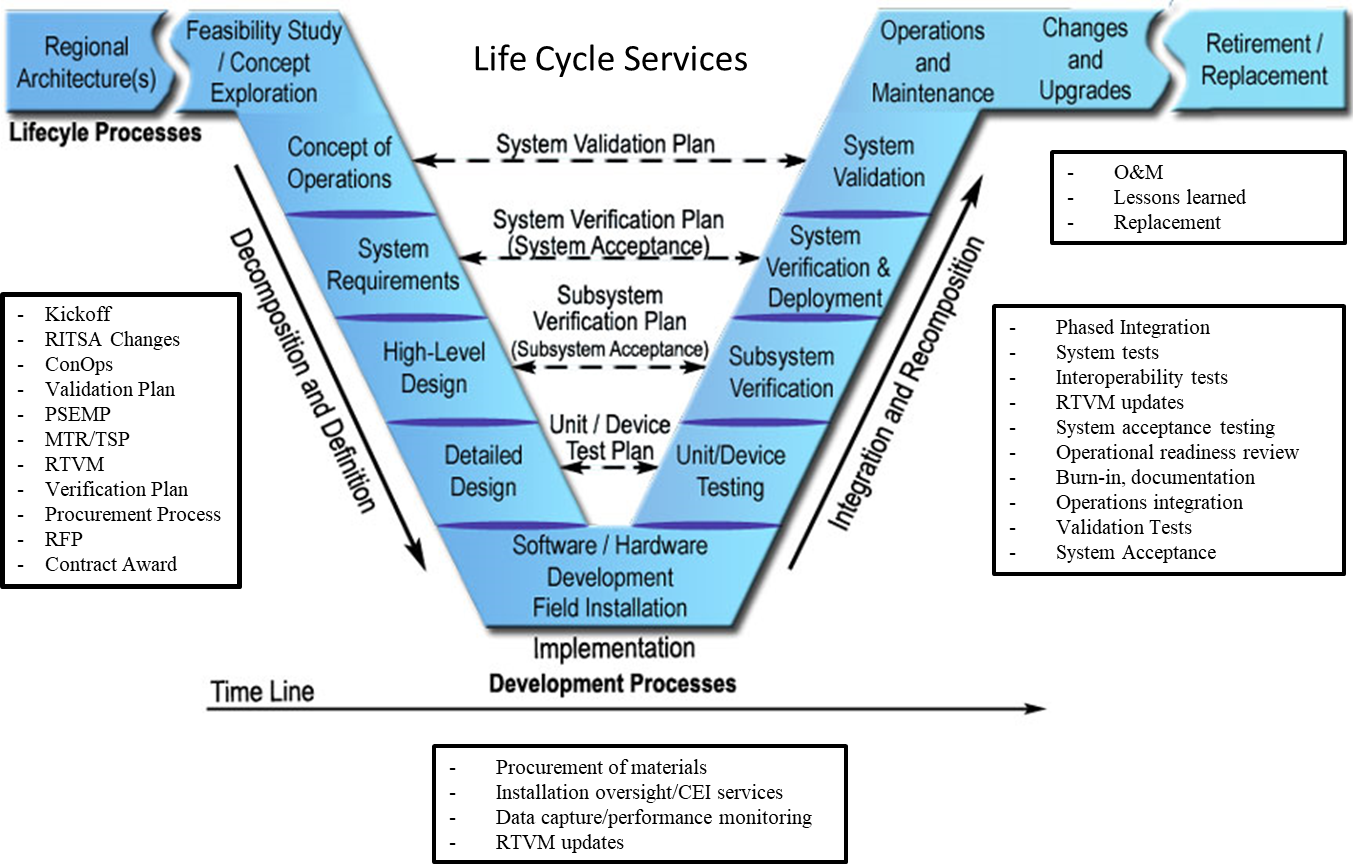


Figure 2: Project Stages for ITS Project

* *The Overall Project Manager’s responsibility starts with project kick off and ends with O&M. There will be various people and organizations that help throughout this process.*

*The Systems Engineer will typically select the RITSA service packages to define the PITSA. The Consultant will typically perform duties including, but not limited to, the high-level requirements analysis for publication of the MTRs/TSPs.*

*The district office will be responsible for the procurement process, and selection and award of the contract. A Consultant will perform construction/installation, which will be supervised by the Construction Project Manager on behalf of the Overall Project Manager. System acceptance will be supervised by the district office or an independent verification and validation team. The maintenance department will take over after the system has been accepted.*

*By following instructions in this section, the Overall Project Manager will describe how the project will be managed based on its degree of risk and complexity. The following areas will be covered in this section on Project Management:*

* *Organization structure*
* *Managing the schedule*
* *Procurement management*
* *Cost management*
* *Risk management*
* *Subcontractor management*
* *Engineering specialty integration*
* *Integrated logistics support and maintenance engineering*
* *Monthly project status reviews*
* *Change management*
* *Quality management (QM)*
* *Systems acceptance*
* *O&M/upgrade/retirement*
* *Lessons learned*

## Organization Structure

* Describe project organization and responsibilities as they relate to the specific tasks to be performed in this section.
* List the names of functional managers and delineate their responsibilities in this section.
* Provide a description and diagram of the interaction between functional organizations, including the structure of the systems engineering organization and the responsibilities of all organizations.
* *The Overall Project Manager oversees the entire project and may designate other people from time to time to manage certain aspects of the project on his/her behalf, but the responsibility still lies with the Overall Project Manager.*
* Describe the organizational structure of the project here and clearly define responsibilities.
* *Include items such as:*
* *Who will obtain environmental permits*
* *Who will perform surveying and geotechnical investigation*
* *Who will obtain roadway permits, etc.*

### The Project Team

* Provide a description of the project team and responsibilities. Add a flow diagram, if it is appropriate for the project scope.

### CONTRACTOR Team

* Provide a description of the Contractor team and responsibilities.

## Work Breakdown Structure (WBS) and Work Plan

* Describe the tasks including the required inputs, activities and outputs to the WBS and Work Plan.
* *Work items that might be included in an Overall Project Manager’s WBS follow:*

* ***Kick-off Meeting.***

***Inputs:*** *Notice to Proceed (NTP), Proposal, Contract.*

***Activities:*** *Coordinate meeting content, publish agenda, conduct meeting, publish minutes.*

***Outputs:*** *Meeting Agenda, Minutes, Presentation Slides*

* *Project Management*
* *PSEMP*
* *Risk Register*
* *Project Schedule*
* *Software Development Plan*
* *Software Coding Guidelines*
* *Manage Project*
* *Design*
* *Requirements Analysis*
* *Preliminary Design*
* *Develop 90% Design*
* *System Test Plan and System Test Procedure*
* *Test Readiness Review*
* *System Final Test*
* *Corrective Action Plan*
* *Deployment*
* *Develop Hardware Failure Resolution Plan*
* *Hardware/Commercial Off-the-Shelf (COTS) Software Deployment Activities*
* *Installation Verification*
* *System Training*
* *Develop Training Manuals*
* *Develop Training Plan*
* *Develop Training Schedule*
* *Training Workshops (Onsite)*
* *Operations, Maintenance and Support 3 Years*
* *System Acceptance/Start O&M*
* *Weekly O&M Status Meeting Year 1*
* *Weekly O&M Status Meeting Year 2*
* *Contract End*

## Managing the Schedule with the Project Evaluation and Review Technique (PERT) / Critical Path Method (CPM)

* Prepare a PERT/CPM chart that shows all project tasks, milestones, and task dependencies. Use a schedule tool such as Microsoft Project. If a separate deliverable, provide a reference to the separate deliverable.
* *Use of PERT/CPM is an essential tool where the risk analysis identifies the project schedule and delivery as high risk elements.*
* *As an example, if a detailed schedule for the project is to be provided and maintained as a separate deliverable, identify where it may be found in the project SharePoint site, as applicable. The project schedule shall show tasks that have corresponding items identified and are at a level consistent with the WBS.*
* *A PERT/CPM chart is one of the most effective methods available for managing a project schedule efficiently. Before a schedule can be prepared, high-level task items or product elements are broken down into smaller manageable units in a hierarchical fashion per the WBS.*

*It is critical that dependencies are identified accurately and that no task is left open ended. It is the Overall Project Manager’s responsibility to prepare this chart. Development of the chart should start after receiving task details (either in the form of a segment of the PERT chart, or as start and end dates for individual tasks, staffing requirements, and task dependencies) from each responsible member of the project team, including consultants and contractors. The Overall Project Manager may delegate the creation of the PERT chart to the District Scheduling Engineer or a Consultant. Figure 5 shows a sample PERT chart. Further details on how to create a PERT chart are provided in Section 4.6.1.2.1 of Florida’s Statewide SEMP.*

*The way a project schedule is managed is referred to as the critical path method (CPM). A critical path is the longest path in the PERT chart from start to finish. It is called the critical path because any delay in the activities on this path pushes out the project completion date. The tasks on the critical path have no slack time. This means that their early/late start dates are the same and so are the early/late finish dates. In Figure 5, this path is indicated by bold lines and shadowed task boxes. All tasks are reviewed in the project review process and any date changes are entered in the PERT chart. Any time there is a delay in any task on the critical path, a flag is raised indicating this issue needs to be addressed immediately because it signals a delay in the project completion date. For this reason, the tasks on the critical path are reviewed more frequently than other tasks that have useable slack time and are not on the critical path.*

*Create your project PERT chart as soon as possible. Refer to the document where this chart can be found or attach the chart to this document if it is not very elaborate.*

Prepare ITN Package

2/4/06 0 d 2/24/06

2/4/06 20 d 2/24/06

Early Start

Duration

Early Finish

Late Start

Slack Time

Late Finish

Gather Stakeholder Requirements

1/2/06 0 d 1/12/06

1/2/06 10 d 1/12/06

Prepare System Requirements

1/13/06 0 d 2/4/06

1/13/06 23 d 2/4/06

Prepare Scope of Services Document

1/20/06 7 d 2/4/06

1/13/06 15 d 1/28/06

Prepare Contract Terms and Conditions

1/23/06 10 d 2/4/06

1/13/06 10 d 1/23/06

Prepare Project SEMP

1/22/06 20 d 2/24/06

1/2/06 32 d 2/4/06

Figure 3: Example of Project Evaluation and Review Technique Chart (PERT Chart)

## Procurement Management

* Describe the planned management process for procurement of systems, products, and services in this section. Include all procurements related to this SEP.
* *The FDOT does not perform or develop software/hardware development or construction. For most projects, the FDOT will procure products or services from outside vendors and consultants. Therefore, an efficient procurement process is essential to overall project success. Section 4.4 of Florida’s Statewide SEMP describes this procurement process in detail. The process varies depending on the nature and cost of the products/services to be procured.*

*For high-risk projects, identify products and services to be purchased, the appropriate purchasing methods, and statutes affecting these activities. Procurement management on a project could include items such as DMS that require planning for long lag times to manufacture products and perform on site testing.*

## Communications Management

* Identify the project information requirements of stakeholders and detail what, when, and how information will be collected and reported. Document the responsibility, frequency, format, distribution method, and audience for all project communications and documentation (such as meeting minutes, project status reports, and documentation deliveries) and stakeholder communications including reporting variances in schedule, cost, scope, emerging risks, and other issues.
* Identify what communications will be tracked, and how.
* Identify what documentation standards and processes will be used.
* Identify the location of the central repository for all project documentation.
* Identify who and the communication channel based on “what” communications and process rules.
* *The subsections below are to be scaled according to the complexity and risk of the project. The following subsections serve as an example for the high-risk and high-complexity projects.*

### Communication Channel

* Describe the communications channel.
* *The Contractor PM and the Department PM will be the primary communication channel for the project. They will manage the communications. They may invite additional team members between the two organizations to communicate, but will approve the communications and be provided documentation of the communications in the form of being copied on emails or provided meeting notes. This invitation can be informal, implicit or assumed, but ultimately is under the authority of the respective PMs who will provide direction to clarifiy or fine-tune communication patterns and protocols when needed.*

### Meetings

* Describe the meetings to be held.
* *The project will have a kick-off meeting, a closeout meeting, monthly project status meetings, and additional specific purpose and ad hoc meetings. These meetings will have an agenda provided by the Contractor five business days prior to the meeting, and meeting notes provided by the Contractor within two business days after the meeting, unless agreed upon otherwise by the PMs. Each PM, or their delegate will invite participants to the meeting from their respective organizations. The kickoff meeting establishes the initial scope, cost, schedule, risks, and issues, while the project status meetings will cover variances of these items, and the close-out meeting discusses completion and resolution of these items.*

### Central Project Documentation Repository

* Describe the document repository.
* *The Department will provide a SharePoint project website for use by the project. This site contains collaboration features including a document library that will be used by the Department and the Contractor to host all related project documentation. This site is located here: [insert the location].*

### Communications Tracking

* Describe the communications tracking in a Project Log.
* *When software changes are part of the project, the Project Log should include communications with the FDOT software manager, who manages the Central System Software Developer, and the Southwest Research Institute (SwRI). The FDOT Software Manager approves funding of changes to SunGuide®, which are prioritized by the SunGuide Change Management Board (CMB). SwRI also fixes bugs identified by the SunGuide Software User Group.*
* *The Overall Project Manager will determine the need for use of a Project Log spreadsheet with tabs for the various logs described in this section. The Contractor will track and record in a Project Log spreadsheet the formal project communications between the Department and the SwRI team. The Project Log spreadsheet shall contain multiple tabs for the logs, each to record a different type of communication. In the case where it is not clear if an entry belongs in one tab or another, the Contractor PM will use best judgement to determine “best fit” for an entry in choice of tabs; i.e. an entry could easily be either an Action Item or an Issue.*
* *As needed for the scope, risk and complexity of the project, the Overall Project Manager will consider the use of Project Log spreadsheet tabs for:*
* *Risk Log – is used to record risks as they are exposed and defined by the project team. Section 2.6 describes the use of the Risk Log in the PSEMP, which may be built into the Project Log as a tab within it.*
* *Action Item Log – is used to record Action Items that need to be addressed outside the context in which they arise. An example of an Action Item might be to have the software manager develop and provide sizing estimates for a SQL Server database. The Action Item Log would have such fields as ID, Action Item, Owner, Importance (Low, Medium, High), Status (New, Open, Pending, Cloosed, Escalated), Date (Assigned, Planned for Completion, Actual Completion) and Linkage to Other Logs.*
* *Issues Log – is used to record Issues. Issues are topics that need discussion or consideration. An example of an Issue might be that access to a data stream has been delayed beyond the time that a driver for that data stream was to be developed. The Issues Log would have such fields as ID, Issue Description, Identified By, Priority (Low, Medium, High), Status (New, Open, Pending, Completed), Project Impact, Action Plan Resolution, Owner, Date (Assigned, Planned for Resolution, Actual Resolution) and Linkage to Other Logs.*
* *Decision Log – is used to record decisions made by the Department PM that affect execution of the contract. An example of a Decision is to modify the method with which document identifiers are formatted. The Decision Log would have such fields as ID, Question/Issue/Action Description, Date Entered, Entered By, Date When Decision Needed, Project Impact, Decision Made, Decision Maker, Date Decision Made, Status (New, Open, Pending, Closed, Escalated) and Linkage to Other Logs.*
* *Communication Log – is used to record official communications regarding deliverables, meeting schedules, or otherwise. An example of a Communication might be the delivery date of the PSEMP, receipt of Department PSEMP comments, etc. The Communications Log would have such fields as ID, Document Title, Description, Date Sent, Format/Method (email, etc.), Template Used, Owner, Recipient/Attendees, Feedback Expected?, Date Feedback Due, Date Feedback Received, and Linkage to Other Logs.*
* *Change Control Log – is used to record all proposed Engineering Change Orders (ECO) for the contract. Section 3.12 describes Change Control. The Change Control Log would have such fields as ID, Change Description, Priority (Low, Medium, High), Originator, Date Entered, Change Owner, Date Assigned, Due Date, Impact (Scope Change?, Cost Change?, Schedule Change?), Date Presented, Approval Authority, Date of Decision, Requires Contract Amendment?, Date of Contract Amendment, and Linkage to Other Logs.*

### Deliverable Management and Approval Process

* Describe the deliverable management and approval process.
* *The Contractor will follow the two phase process below for developing and submitting required document deliverables.*

#### Phase 1 — Document Template Outline Approval

* Describe Phase 1 of the deliverable management and approval process for the use of FDOT document templates.
* *Where document templates are available on the Department’s Systems Engineering website, the template shall be used and may be tailored by the software manager in developing the document unless an alternative is agreed to by the Department. Where a specific document template is not available, the Software Manager shall use the Department’s non-specific technical memorandum document template and include the sections and information specified in the scope item at a minimum.*

1. *The Contractor and the Department agree on deadlines for the document deliverable submittal activities (described below) that fit within the project schedule.*
2. *The Contractor submits a document shell or outline for the Department’s review, content, and approval following the submittal procedure below. The document shell shall contain the outline of the document and may contain notes to guide the development of the document content.*
3. *The Department shall email the Contractor that the outline has been accepted.*

#### Phase 2 —Document Submittal and Review Procedure

* Describe Phase 2 of the deliverable management and approval process for the submittal and review procedure.

*Where document templates are available on the Department’s Systems Engineering website, the template shall be used.*

1. *Once a document template has been accepted, the Contractor will develop a draft of the deliverable.*
2. *Draft documents shall use draft watermarks.*
3. *The Contractor delivers the draft deliverable to the Department by the draft deliverable due date.*
4. *The Department reviews the deliverable and provides comments to the Contractor by the deliverable review due date. Comments will be provided as comment balloons and tracked changes if using Microsoft Word; otherwise, a comments table will be provided that will track each comment’s text, reference location within the deliverable, and a place for the Contractor’s response, and a status of the comment.*
5. *The Contractor addresses comments by modifying the submittal and answering questions by the revision due date. Changes to the deliverable shall be tracked using the tracked changes feature of Microsoft Word if the deliverable is in that format, otherwise, a list of changes made to the deliverable shall be provided with the comments responses.*
6. *The Department reviews the Contractor’s comment responses and deliverable changes by the revision review due date. All comments shall be marked as completed using the “Mark as Completed” function of the comment balloon if using Microsoft Word, otherwise by indicating in a comments table’s status field.*
7. *Steps 3 and 4 will repeat until the Department marks all comments as completed.*

## Cost Management

* Describe the approach to how project costs will be incurred, approved, tracked, and controlled.
* *This section describes how this project will be managed to comply with the contract’s method of compensation, and can include cost tracking, scheduling of invoices and payments, and pre-approval and approval procedures of expenses and additional costs. Project reports should accompany invoices. For many projects, the method of compensation is a section of the contract that describes how the contractor is compensated and includes information related to project costs to the Department.*
* *EXAMPLE:*

*The method of compensation for this project is Lump Sum. The Contractor will invoice the FDOT according to the Milestone table included as part of Exhibit B of the contract. The Contractor and its subcontractors will monitor actual costs on a periodic basis (no less than monthly) but not report actual costs incurred to the Department.*

## Risk Management

* *The Overall Project Manager will apply oversight and ongoing reevaluation of risks after they have been originally identified and evaluated per Section 2.6.*
* *For low-risk projects, monitoring and controlling risk and the process to do so will be documented. For high-risk projects, document the process for examining the nature of any time sensitivity to risks that may impact the project. Identify the roles and responsibilities of individuals assigned to manage project risks. Identify and document the process to be used for tracking, periodic review, and update of risks. For high-risk and complexity projects, the Project Log spreadsheet (Section 3.5.4) has a Risk Log per Section 2.6.*

## Subcontractor Management

* Describe how the Overall Project Manager will manage the Subcontractor’s technical work to ensure product control and project compliance. This includes who will manage the project’s Subcontractor activities, as well as the scheduled reviews and how often the reviews are planned.
* *In most instances, a Prime Consultant or a Systems Integrator, not the FDOT, will manage Subcontractor activities. The Systems Integrator or Prime Consultant assigns appropriate people to coordinate with the Subcontractor working teams. These people will oversee design reviews, system testing, etc. The Overall Project Manager requests PERT charts for the major tasks to be completed, either from the Prime Consultant or the Systems Integrator, and uses them to better oversee the processes.*

## Engineering Specialty Integration

* Document the project’s engineering specialty activities in this section and identify who will manage the specialty activities.
* *Engineering specialties are the highly specialized engineering disciplines needed in projects because the Overall Project Manager may not be an expert in all disciplines of a project or in successfully maintaining the system throughout its life cycle.*

*The idea is to get members from different specialties involved in the project at an early stage and make them aware of their project responsibilities. There are various specialty engineering disciplines that may be required, depending on the complexity and nature of the project.*

*Section 6.1 of Florida’s Statewide SEMP details these engineering specialties. Most of the specialties described in Section 6.1 are needed in system/product/process development phases, so they are the responsibility of the Systems Integrator or Consultant.*

## Integrated Logistics Support and Maintenance Engineering

* Identify the support requirements, considerations, and needed resources in this section over the project’s life cycle.
* *This engineering specialty is responsible for determining the total support required for a system to ensure operational readiness and sustainability throughout its life cycle.*

*This specialty provides the following project input:*

* *Extant maintenance agreements and other support*
* *Defines support requirements – for example, the mean time to repair*
* *Supports considerations that influence requirements and design*
* *Provides the necessary support package*
* *Provides operational support at a minimum cost*

*For high-risk projects, document the human and equipment resources required to complete and maintain the project over its life cycle and how these resources will be acquired. For human resources – identify project roles, skills, number, licenses, and resource type required, and specify the method(s) for acquiring new personnel or incorporating and backfilling the current responsibilities of existing personnel. For equipment or materials ‒ identify types, quantities, and purpose, and specify the method(s) for acquiring equipment or materials. Software elements of projects may require IT contracts for computer system and network support and coordination, and/or software vendors that may have to update configuration tables or add software modules to existing software.*

## Project Status Reviews

* Describe how project status reviews are to be conducted in this section.
* *At monthly project status reviews, the Overall Project Manager assesses project health, based on technical progress, including systems engineering as discussed in Section 2.5, budget and schedule performance, and risk status. Information from Systems Engineers, Systems Integrators, and/or Consultants is gathered, depending on the nature of a project. Various issues may be discussed at these meetings, but the following items must be discussed in detail:*
* *Action item reviews and resolution*
* *Critical path item status reviews*
* *Major risk item reviews*

*After each review, the schedule should be updated to reflect the project’s latest status and minutes from the reviews and the PERT chart kept for reference.*

## Change Management

* Describe how change management is conducted in this section. *Define the various change management roles and responsibilities. Include specific levels of authority for approval of change at each escalation level.*
* *The Overall Project Manager addresses changes in schedule and the subsequent impacts by adjusting the PERT chart and cost metrics. Sometimes changes in task durations give rise to a new critical path for the project, which must be monitored as the project proceeds.*

*Changes in basic requirements require a formal review process that is documented. The Overall Project Manager informs stakeholders and contractors of changes to basic requirements and the subsequent outcomes. The Overall Project Manager decides if design changes will be accepted and the Construction Project Manager generally decides regarding construction changes. Changes that are substantial will require a review process to include the Overall Project Manager, the CEI Consultant, and the Construction Project Manager. The process for determining what is a basic change and a substantial change should also be documented.*

*When dealing with a software project or other standards-related issues that will have statewide impact, the Overall Project Manager presents the issue to the Change Management Board for resolution. Follow the normal change order process for all changes as used on construction projects.*

*Changes should be expected during a complex, high-risk project. These changes can result from a variety of sources, such as the realization of risks, externally imposed requirements, estimation errors, and leadership decisions. Regardless the source, it is important that changes be managed to minimize adverse impacts to the project. Any change affecting scope, schedule, or cost initiates the change management process. A Change Control Log can be built into the Project Log (Section 3.5.4).*

## Quality Management

* Describe the project’s Quality Management plan in this section.
* The Overall Project Manager must establish a quality management (QM) plan not only for internal project processes, but also for quality systems from vendors and consultants. A QM plan should contain both a plan to implement quality control (QC), and a plan to monitor and verify that quality standards are being achieved. QC is the process whereby quality is engineered into the products being deployed using inspection, testing, and audits of documentation. QA is the process of verifying that the product meets the quality standards established by the QM plan.
* For construction projects, follow the statewide and district-specific QC/QA process that has already been established.

## Systems Acceptance

* Document the process for FDOT to accept the system.
* Describe in detail where the system developer or supplier obligation ends, and the system transitions to operations and maintenance mode by the FDOT.
* *The systems acceptance process is critical because this is where the FDOT becomes responsible for the continued maintenance and management of the systems, products, and processes delivered.*

*The Overall Project Manager must assign a Test Manager right after the requirements have been written. For construction projects, the Test Manager is part of the CEI team. The Test Manager uses the verification and validation plans described in Section 2.9; the RTVM created in Section 2.7; and the MOEs and MOPs discussed in Sections 2.7.1 and 2.8 to supervise the entire testing process. The Test Manager provides the status of all tests in report form to the Overall Project Manager, who carefully reviews the reports and decides on the final system acceptance. The minimum time required for the Developer to notify and coordinate an acceptance test shall be identified.*

## Operations and Maintenance, Upgrade, and Retirement

* Provide a separate O&M plan for how to support system operations, maintenance, upgrade, and retirement of the system or provide the information in this section.
* *Once a system has been through the acceptance testing process and has been accepted, it moves into the O&M phase. In this phase, system problems could be resolved in one of many ways: an FDOT employee trained on the system could repair it; the manufacturer’s warranty could be used to get it fixed; or the FDOT could contract with an outside agency to maintain the system. The process to turn over any required warranties, contact information for support, and any system component documentation shall be included in the plan.*

*After a system has been in operation for some years, it may be upgraded. The need for an upgrade could be due to new technology that makes the existing system function better and extends its life. Refer to Section 7.2.5 of Florida’s Statewide SEMP for more details on this subject.*

*Finally, there comes a time when the system is no longer able to function as was intended. This could be caused by normal wear and tear on the system; the escalating cost of system maintenance; technological obsolescence as better and cheaper systems become available, or because the services or equipment are no longer supported by the manufacturer. When the time comes for the system to be retired, there will be expenses and logistics involved that need consideration at this PSEMP stage. Refer to Section 7.2.6 of Florida’s Statewide SEMP for more details on this subject.*

## Lessons Learned

* Describe how the lessons learned will be captured and recorded for this project.
* *In every project, there are lessons to be learned. Sometimes, it is feasible to have lessons learned from the project applied to the same project, but, usually, lessons learned during a project will be valuable guidance for future projects.*
* *Scan reports from similar projects for lessons learned. Include exceptions or agreement with this project.*

1. The FDOT’s current Ten-Year ITS CFP is available online at: <https://www.fdot.gov/traffic/its/projects-deploy/ten-year-cfp.shtm> [↑](#footnote-ref-2)