Project Management Plan (PMP) for the
Advanced Transportation Controller (ATC)
Application Programming Interface (API)
Reference Implementation Project

January 3, 2014

PMP in support of: USDOT Contract # DTFH61-11-D-00052, Task Order # T-13-003
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## CHANGE HISTORY

<table>
<thead>
<tr>
<th>DATE</th>
<th>NOTE</th>
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<tbody>
<tr>
<td>12/04/13</td>
<td>Initial Draft Project Management Plan (PMP) v01.00.</td>
</tr>
<tr>
<td>01/03/14</td>
<td>Project Management Plan v01.01 with changes based on USDOT review and API Reference Implementation Project Kick-off Meeting. Changed references to “ITS JPO Project Representative” to “COR.”</td>
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1 PURPOSE OF THE PROJECT MANAGEMENT PLAN

This document defines a Project Management Plan (PMP) for the project named “Reference Implementation of ATC 5401 Application Programming Interface (API) Standard Version 2” under the United States Department of Transportation (USDOT) Contract Number DTFH61-11-D-00052, Work Order T-13003 (referred to as the APIRI Project). This PMP establishes a common understanding of the management of the project for:

a) The USDOT Intelligent Transportation Systems (ITS) Joint Program Office (JPO) who is sponsoring the work;

b) The Standard Development Organizations (SDOs) overseeing the development;

c) The consulting team contracted to perform the work; and

d) The consultants, manufacturers, and public transportation professionals who participate in the ATC Joint Committee (JC) and Working Groups (WGs) which will use the deliverable items specified in this PMP.

This PMP conforms to the Project Management Plan Template found in Appendix D of the Task Order Proposal Request (TOPR) for the project. It includes plans for scope management; communications; deliverables and milestones; quality management; human resource management; and risk management. Portions of this PMP may be updated during the course of the project if the management team or the USDOT determines that modification would significantly facilitate the project management functions. The PMP is not intended to be a progress tracking tool or to be modified for minor changes in schedule once the project has started.

1.1 Background of Project

The Advanced Transportation Controller (ATC) standards program has been developed to meet the current and future needs for transportation field equipment. At the heart of this program are the ATC 5201 Advanced Transportation Controller Standard and the ATC 5401 Application Programming Interface Standard. These standards are characterized as being open architecture, modular, multi-process, multi-application, designed to leverage new technologies, able to operate in legacy transportation field cabinet systems (TFCSs) and to be central to developing new TFCS designs.

ATC 5201 specifies a controller architecture where the computational components reside on a single (5" x 4") printed circuit board (PCB), called the “Engine Board,” with standardized connectors and pinout. It is made up of a central processing unit (CPU), a Linux operating system (O/S) and device drivers, memory, external and internal interfaces, and other associated hardware necessary to create an embedded transportation computing platform. ATC 5401 defines both user interface facilities and programmatic interfaces for ATC controller units that are not provided through ATC 5201 or the standard Linux O/S. The user interface facilities of ATC 5401 include a windowing system that allows operational users to interact with concurrently operating application programs (which in turn have their own user interfaces) and system-wide configuration management utilities. The programmatic interfaces of ATC 5401 provide C language function definitions that allow software developers to create application programs that share resources of the ATC controller unit including the front panel, field I/O equipment and real-time clock. When used with the Linux O/S and device drivers of the Engine Board, ATC 5401 provides a software environment that allows application programs to be portable (runs on any ATC manufacturer's equipment), compatible (will run concurrently with other application programs), and interchangeable (assuming they perform the same function) on a single ATC controller unit.
The ATC 5401 Standard was developed by the API WG a technical subcommittee of the ATC JC. The API WG is made up of technical experts in transportation applications, software development and hardware development from both the public and private sectors (including manufacturers).

The primary objectives of this project are to: a) establish and maintain cohesive project management and implementation plan; b) develop an API Reference Implementation (APIRI) which is software representative of the ATC 5401 Standard; c) develop an API Validation Suite (APIVS) which is to test software and hardware capable of validating the APIRI on an ATC Engine Board; d) perform integrated testing of the APIRI and APIVS; e) establish an open source software (OSS) environment for the software and documents produced during the project; and f) deliver final versions of the software, test documentation and test results.

2 SCOPE MANAGEMENT PLAN

2.1 Purpose of the Scope Management Plan

This Scope Management Plan establishes the scope management approach and processes as they pertain to scope description, verification and control measures. It establishes the processes which ensure the APIRI Project includes all of the work required to complete the project while excluding all work that is unnecessary.

2.2 Scope Statement

2.2.1 Project Scope Description

The subsections below describe the project activities listed in the Gantt Chart in Section 4.3 Project Schedule. The project follows a systems engineering process and explicitly incorporates layers of review and modification of the deliverable documents corresponding to the ATC Standards consensus process. Each of the major project tasks are listed below with the objectives, approach and deliverables identified. Specific TOPR tasks are identified in brackets (i.e. [TOPR Task #]). Specific TOPR deliverables are identified as such (i.e. [TOPR Deliverable]).

2.2.1.1 Task 1 Project Management [TOPR Task 1]

Objectives

- To develop an implementation plan consisting of a Project Management Plan, Systems Engineering Management Plan and MS Project Schedule.

Approach

The ITE project team will participate in a “kick-off” meeting with the USDOT and its representatives to ensure that all parties have a clear understanding of the requirements of this SOW and what the USDOT’s expectations are. The kick-off meeting will take place within 45 working days of the Task Order Award Date.

ITE will develop an Implementation Plan which contains a Project Management Plan (PMP) and a Systems Engineering Management Plan (SEMP) that integrates the three development areas of the project.

The PMP describes the overall approach to managing the efforts described in this SOW, and coordinating the work performed by any and all subcontractors. The PMP will be consistent with the...
template included in Appendix 1 of the TOPR containing the following:

- **Human Resource Management Plan.** The PMP will contain a Human Resources Management Plan that includes project team resumes (reflecting revisions or substitutions since contract signature) representing domain experts and a qualified technical editor. ITE will describe the overall structure of the project team, explain the roles and responsibilities of all key individuals, and describe the reporting relationships. The Human Resource Management Plan and team members are subject to USDOT approval as part of the overall approval of the PMP.

- **Quality Management.** ITE will describe its Quality Management and how it will ensure that the documents submitted as deliverables herein, will:
  - contain suitable material for the target audience
  - be organized in presentation
  - contain proper word use and English diction
  - contain detailed illustrations
  - be comprehensive, complete and correct
  - be edited for grammatical and editorial errors

The Quality Management section is subject to USDOT approval as part of the overall approval of the PMP.

- **Communications Management Plan.** ITE will describe how they will coordinate their efforts with the USDOT, particularly the Contracting Officer’s Task Manager (COTM) and the Contracting Officer’s Representative (COR).

- **Detailed Project Schedule.** ITE will prepare a detailed project schedule, in Microsoft Project 2003 format, that lists all of the planned tasks and milestones for the project. The Project Schedule will address all project management and systems engineering management activities. The detailed project schedule will reflect a work breakdown structure (WBS) comprised of at least three levels. ITE will provide an updated Project Schedule, reflecting actual work performed, with every Monthly Progress Report that it submits. The monthly updated Project Schedule will reflect both the base lined task start and end dates and the actual start and end dates for each task in the Project Schedule. The project schedule will be provided in both Microsoft Project 2003 and Adobe Acrobat format backwards compatible to Adobe Acrobat version 6.0.

ITE will develop the PMP based on a PMP template attached as Appendix 1 of the TOPR. If a variation of the PMP structure is used, this alternate structure will be subject to USDOT approval.

ITE will develop a Systems Engineering Management Plan (SEMP). INCOSE Systems Engineering Handbook v3.1, or later, is the document that will be used for guidance in this area, and IEEE Std 1220-2005 may be used for additional guidance. The SEMP will include the following sections:

  a) Configuration Management Plan
  b) Verification and Validation Plan and a
  c) Risk Management Plan.

The Risk Management Plan will document risks that might affect the project and the characteristics of the risk. Types of risks that must be considered include risks potentially impacting: technical, project schedule, scope, and costs. A Risk Management Log will be maintained on an on-going basis during the entire period of performance to track risks, mitigation plans, and status. Each risk will have a unique number, probability of occurrence and impact of occurrence rating. An example Risk Log is provided in Appendix 2 of the TOPR.

ITE may revise the approved version of the PMP, SEMP, and schedule only with pre-approval from the COR and COTM and will deliver, to the COR and COTM, any modified version within 20 working days after receiving COR and COTM approval.
Once the draft PMP, SEMP, and schedule are ready for review, ITE will schedule a kick-off meeting with the USDOT and its representatives to review each document and ensure that all parties are in agreement on the overall approach to project execution.

ITE will place the revised version of each contract deliverable (including the detailed project schedule) under document configuration control, with version numbers assigned to each document. All documents submitted to, and approved by, USDOT will be assigned a unique version number.

Authorization to proceed to the remaining tasks is pursuant to COR's written approval of the revised PMP, SEMP, and schedule.

Deliverables

- Draft Implementation Plan (consists of PMP, SEMP, MS Project Schedule) [TOPR Deliverable]
- Implementation Plan (consists of PMP, SEMP, MS Project Schedule) [TOPR Deliverable]

2.2.1.2 Task 2 Develop APIRI Software (Test Version) [TOPR Tasks 2.1, 2.2 and 2.4]

Overall Objectives

- To integrate any existing software with newly developed software for the APIRI.
- To use the concept of operations and requirements defined in the ATC 5401 v02 standard for this software development.

2.2.1.2.1 Task 2.1 Develop APIRI Software Design Description (SDD) [TOPR Tasks 2.1]

Objectives

- To develop a SDD based on the ConOps and requirements found in the ATC 5401 v02 standard conformant to IEEE Std 1016-1998.

Approach

The SDD will specify the content, constraints on formats, timing, and other factors needed by the implementation. ITE will include a Requirements Traceability Matrix (RTM) in the SDD. The RTM is a table that provides a mapping from each requirement to its associated design content. ITE will deliver a draft version of the SDD section to stakeholders at least two weeks prior to the SDD walkthrough described below. ITE will invite stakeholders to participate in a review of the draft SDD section.

Also in consultation with the COR, COTM and the API Working Group, ITE will determine the date and time, and procure a facility for the walkthrough, if necessary. The duration of the walkthrough is anticipated to be no more than five (5) days. ITE will be responsible for invitations, distributing advance material including the SDD, ConOps, SRS and walkthrough workbook, and coordination of the walkthrough.

IEEE Std 1028-1997 is the document that will be used for guidance in planning the walkthrough. As part of this task, ITE will deliver a “Walkthrough Comment Resolution” report which details each walkthrough comment and the ITE’s recommended resolution.

ITE will address all USDOT and stakeholder walkthrough comments and revise the APIRI SDD. The SDD will be considered a “living” document (i.e., one that may be modified as needed). ITE will place the “revised” version of the SDD under document configuration control.
2.2.1.2.2 Task 2.2 Develop Draft APIRI Software [TOPR Task 2.2]

Objectives

- ITE will develop the APIRI software for the ATC 5401 v02 standard.
- The APIRI software will be based on the ATC 5401 v02 standard ConOps and requirements, and the APIRI SDD.

Approach

The software will represent a reference implementation of ATC 5401 v02 that can be used as a definitive interpretation for that standard. The APIRI should serve as the baseline from which all other implementations are measured, and to which all improvements are added. ITE will deliver a draft version of the implemented API via an open source software environment, discussed in Task 5 (see Section 2.2.1.5). In this context, "open source" means modifiable software code.

ITE will participate in bi-weekly meetings with the USDOT and/or its representatives to provide an update on the development of the APIRI, review action items, and their resolution. New risks will be added to the risk log at each review meeting – if necessary – to ensure that key actions/events with the potential to impact cost, schedule, or overall progress are identified, assigned to an individual for resolution, and then tracked to completion. During the bi-weekly meetings, ITE will provide a regular report on defects detected/reported with the software as it moves into the production stage, prior to acceptance testing.

Additionally, ITE will establish software licensing as agreed upon by the USDOT. Software licensing will be an instrument governing the use or redistribution of software. Software licensing will document end-user permission to use one or more copies of software in ways where such a use would otherwise potentially constitute copyright infringement of the software owner's exclusive rights under copyright law. In addition to granting rights and imposing restrictions on the use of software, the software license may contain provisions which allocate liability and responsibility between the parties entering into the license agreement.

Deliverables

- APIRI Draft Software [TOPR Deliverable]

2.2.1.2.3 Task 2.3 Develop APIRI User’s Manual [TOPR Task 2.4]

Objectives


Approach
This user documentation will assist in the use of the APIRI software. A draft User’s Manual will be provided to the USDOT and representatives of the API Working Group for review and comments. A final version of the User’s Manual will be delivered no later than two weeks after receipt of USDOT and API Working Group comments.

**Deliverables**

- Draft 1 APIRI User’s Manual [TOPR Deliverable]
- Draft 2 APIRI User’s Manual
- APIRI User’s Manual [TOPR Deliverable]

### 2.2.1.3 Task 3 Develop API Validation Suite (APIVS) (Test Version) [TOPR Tasks 3.1, 3.2, 3.3, 3.4, 3.5 and 3.7]

**Overall Objectives**

- To develop a testing environment for the APIRI software.

#### 2.2.1.3.1 Task 3.1 Develop APIVS Concept of Operations (ConOps) [TOPR Tasks 3.1]

**Objectives**

- To develop a Concept of Operations for the APIVS.

**Approach**

The IEEE Standard 1362-1998 is the document that will be used for guidance.

ITE will review the existing documentation from the ATC 5401 v02 standard, other ATC standards, and other relevant ongoing research related projects related to the standard, as well as inputs that may be provided by participants during the development process, to gain a clear understanding of the work.

ITE will develop a list of stakeholders that reflect a diversity of stakeholder interests, with expertise reflecting a comprehensive understanding of the operational needs for the APIVS. ITE will provide the list of stakeholders to the COR for written approval, containing representatives of the following:

a) The ATC 5401 v02 Working Group members hereinafter referred to as “API Working Group”;
b) Appropriate industry representatives from traffic controller suppliers and other relevant SDOs and/or working groups; and
c) USDOT staff.

In consultation with the COR, ITE will arrange to conduct:

- On-site observational interviews with a limited number of stakeholders that operate advanced transportation controllers, and
- Telephone interviews with manufacturing stakeholders.

These interviews will result in a written report from which user needs are extractable. ITE will then develop a draft ConOps that provides a description of the user needs needed to fulfill the APIVS. The ConOps will provide an overview of the user needs. User needs documented in the ConOps will meet the test of being “well-written” needs. Appendix 3 provides the definition of a “well-written” need. The document will also provide, or expand as appropriate, software concepts (including a high-level discussion of technical and non-technical requirements), operational scenarios, constraints on the...
APIVS, and the rationale for key concept decisions. A technical editor will review the ConOps as part of this process.

ITE will deliver a draft version of the ConOps to the COR, COTM, stakeholders, and itsprojects@dot.gov at least two weeks prior to the ConOps walkthrough described below.

Con-Ops Walkthrough Description:
- In consultation with the COR and COTM, ITE will prepare a list of stakeholders to invite to participate in a review of the draft ConOps.
- Also in consultation with the COR, COTM and the API Working Group, ITE will determine the date and time, and procure a facility for the walkthrough, if necessary. The duration of the walkthrough is anticipated to be no more than five (5) days. ITE will be responsible for invitations, distributing advance material including the ConOps document and walkthrough workbook, and registrations.
- IEEE Std 1028-1997 is the document that will be used for guidance in planning the walkthrough. As part of this task, ITE will deliver a “Walkthrough Comment Resolution” report.
- ITE will address all stakeholder walkthrough comments, and develop and deliver the ConOps. The ConOps will be considered a “living” section (i.e., one that may be modified as needed).
- ITE will place the version of each contract deliverable under document configuration control, with a unique version number assigned to the document.

Deliverables
- APIVS Interview Report [TOPR Deliverable].
- Draft 1 APIVS ConOps [TOPR Deliverable]
- Draft 1 APIVS ConOps Walkthrough Workbook [TOPR Deliverable]
- Draft 2 APIVS ConOps
- APIVS ConOps Walkthrough Comment Resolution Report [TOPR Deliverable]
- APIVS ConOps [TOPR Deliverable]

2.2.1.3.2 Task 3.2 Develop APIVS Software Requirements Specification (SRS) [TOPR Tasks 3.2]

Objectives
- To develop a Software Requirements Specification (SRS) based on IEEE 830-1998 for the APIVS.

Approach
ITE will develop a Software Requirements Specification (SRS) based on the ConOps and based on IEEE 830-1998. The SRS will contain a Protocol Requirements List (PRL). The PRL is a table that provides a mapping from each need to its associated requirement. The requirements documented in the SRS section will meet the test of being “well-formed” requirements. See Appendix B for the definition of a “well-formed” requirement. A technical editor will review the draft SRS as part of this process.

ITE will deliver a draft version of the SRS to stakeholders at least two weeks prior to the SRS walkthrough described below. ITE will invite stakeholders to participate in a review of the draft SRS and the revised ConOps.

Also in consultation with the COR, COTM, and the API Working Group, ITE will determine the date and time, and procure a facility for the walkthrough, if necessary. The duration of the walkthrough is anticipated to be no more than five (5) days. ITE will be responsible for invitations, distributing
advance material including the ConOps, SRS, walkthrough workbook, and coordination of the walkthrough.

IEEE Std 1028-1997 is the document that will be used for guidance in planning the walkthrough. As part of this task, ITE will deliver a ‘Walkthrough Comment Resolution” report which details each walkthrough comment and ITE’s recommended resolution.

ITE will address all USDOT and stakeholder walkthrough comments, and develop and deliver the updated SRS and ConOps. The SRS will be considered a “living” section (i.e., one that may be modified as needed).

ITE will put the version of each contract deliverable under document configuration control, with a unique version number assigned to the document.

Deliverables

- Draft 1 APIVS SRS [TOPR Deliverable]
- Draft 1 APIVS SRS Walkthrough Workbook [TOPR Deliverable]
- Draft 2 APIVS SRS
- APIVS SRS Walkthrough Comment Resolution Report [TOPR Deliverable]
- APIVS SRS [TOPR Deliverable]
- APIVS ConOps Update [TOPR Deliverable]

2.2.1.3.3 Task 3.3 Develop APIVS Software Design Description (SDD)  
[TOPR Tasks 3.3]

Objectives

- To develop a Software Design Description Document (SDD) based on IEEE Std 1016-1998 for the APIVS.

Approach

ITE will develop a Software Design Description (SDD) based on the revised ConOps and SRS conformant to IEEE Std 1016-1998. ITE will document the design solution for each requirement developed in the previous tasks. The SDD will specify the content, constraints on formats, timing, and other factors needed by the APIVS. The SDD will contain a description of the hardware environment necessary for the APIVS. ITE will include a Requirements Traceability Matrix (RTM) in the SDD. The RTM is a table that provides a mapping from each requirement to its associated design content.

ITE will deliver a draft version of the SDD to stakeholders at least two weeks prior to the SDD walkthrough described below. ITE will invite stakeholders to participate in a review of the draft SDD.

Also in consultation with the COR, COTM and the API Working Group, ITE will determine the date and time, and procure a facility for the walkthrough, if necessary. The duration of the walkthrough is anticipated to be no more than five (5) days. ITE will be responsible for invitations, distributing advance material including the SDD, ConOps and SRS, walkthrough workbook, and coordination of the walkthrough.

IEEE Std 1028-1997 is the document that will be used for guidance in planning the walkthrough. As part of this task, ITE will deliver a ‘Walkthrough Comment Resolution” report which details each walkthrough comment and ITE’s recommended resolution.
ITE will address all USDOT and stakeholder walkthrough comments and revise the APIVS ConOps, SRS, and SDD documents accordingly. The SDD will be considered a “living” document (i.e., one that may be modified as needed). ITE will place the “revised” version of the APIVS SDD, ConOps, and SRS under document configuration control, with a unique number assigned to the document.

**Deliverables**

- Draft 1 APIVS SDD [TOPR Deliverable]
- Draft 1 APIVS SDD Walkthrough Workbook [TOPR Deliverable]
- Draft 2 APIVS SDD
- APIVS SDD Walkthrough Comment Resolution Report [TOPR Deliverable]
- APIVS SDD [TOPR Deliverable]
- APIVS ConOps, SRS Updates [TOPR Deliverable]

2.2.1.3.4 Task 3.4 Develop Draft APIVS Software and Preliminary Test Scripts [TOPR Tasks 3.4]

**Objectives**

- To develop APIVS Software that will be used to test implementations of the ATC 5401 Standard.

**Approach**

ITE will develop the APIVS software. The software will be based on the ConOps, SRS, and SDD documents developed herein. ITE will deliver a draft version of the APIVS via an open source software environment, discussed in Task 5. ITE will develop preliminary test scripts for APIVS test cases. The test scripts may be used to set up for the test case and to interpret test case output. These test scripts may not be fully developed until Task 4 (see Section 2.2.1.4).

ITE will participate in bi-weekly meetings with the USDOT and/or its representatives to provide an update on the development of the APIVS, review action items, and their resolution. New risks will be added to the risk log at each review meeting – if necessary – to ensure that key actions/events with the potential to impact cost, schedule, or overall progress are identified, assigned to an individual for resolution, and then tracked to completion. During the bi-weekly meetings, ITE will provide a regular report on defects detected/reported with the software as it moves into the production stage, prior to acceptance testing.

Additionally, ITE will establish software licensing as agreed upon by the USDOT. Software licensing will be an instrument governing the use or redistribution of software. Software licensing will document end-user permission to use one or more copies of software in ways where such a use would otherwise potentially constitute copyright infringement of the software owner's exclusive rights under copyright law. In addition to granting rights and imposing restrictions on the use of software, the software license may contain provisions which allocate liability and responsibility between the parties entering into the license agreement.

**Deliverables**

- Draft APIVS Software [TOPR Deliverable]
- Preliminary Test Scripts [TOPR Deliverable]

2.2.1.3.5 Task 3.5 Develop Test Fixtures for APIVS [TOPR Tasks 3.5]

**Objectives**
• To develop a test fixture that is used with the APIVS Software that will be used to test implementations of the ATC 5401 Standard.

*Approach*

ITE will develop the necessary test fixture to test and execute the APIRI and APIVS. The Test Fixture description will define the operating system and hardware specifications necessary to run the APIRI and APIVS. This draft Test Fixture description will be delivered to USDOT prior to beginning Integrated APIRI and APIVS testing (Task 4, Section 2.2.1.4). The description will be incorporated as a section of the APIVS User Manual (Task 3.6, Section 2.2.1.3.6).

*Deliverables*

• Draft APIVS Test Fixture Description [TOPR Deliverable]
• Test Fixture Description
• Test Fixtures (5-6)

2.2.1.3.6 Task 3.6 Develop APIVS User’s Manual [TOPR Task 3.7]

*Objectives*

• To develop APIVS User’s Manual.

*Approach*

ITE will develop a draft APIVS User’s Manual based on IEEE Std 1063-2001. This user documentation will assist in the use of the APIVS software. This document will include the APIVS Test Fixture description developed in Subtask 3.5 above. A draft User’s Manual will be provided to the USDOT and the API Working Group for review and comments. A final version of the User’s Manual will be delivered no later than two weeks after receipt of USDOT and API Working Group comments.

*Deliverables*

• Draft 1 APIVS User’s Manual [TOPR Deliverable]
• Draft 2 APIVS User’s Manual
• APIVS User’s Manual [TOPR Deliverable]

2.2.1.4 Task 4 Integrated APIRI and APIVS Testing [TOPR Tasks 2.3 and 3.6]

*Overall Objectives*

• To integrate the APIRI and APIVS software on the APIVS Test Fixture
• Develop test plans and test documents in accordance with IEEE Std 829-1998 for the APIRI software.
• Develop test plans and test documents in accordance with IEEE Std 829-1998 for the APIVS software.
• Update APIRI software as necessary.
• Update APIVS software as necessary.
• Formal Testing and Reporting
2.2.1.4.1 Task 4.1 Integrated APIRI Testing [TOPR Task 2.3]

Objectives

- To integrate and test the APIRI software on the APIVS Test Fixture.

Approach

As part of this task, ITE will integrate the APIVS software with the APIRI software using the Test Fixture as part of the software development effort.

ITE will develop testing documentation in accordance with IEEE Std 829-1998. Testing documentation will identify the verification methods that will be used to ensure that the developed software satisfies the software’s requirements. (The verification methods are: analysis, demonstration, inspection, and testing.) Testing documentation may be developed in parallel with the SDD and should describe a reasonable approach to ensuring that the design fulfills the requirements. Testing documentation will include:

- **Test Plan and Test Design Specification** – These two documents can be combined into one. The Test Plan defines the scope, approach, resources, and schedule of the testing activities. The Test Design Specification refines the approach to testing, identifies the features to be tested, and associates the test cases to these features.
- **Test Cases** – Each test case is a set of test inputs, execution conditions, and expected results developed for a particular objective, such as to exercise a particular path within a system or a software application or to verify compliance with a specific requirement or set of requirements.
- **Test Procedures** – Test procedures should spell out exactly how one verifies and validates that the component of the software actually functions as intended and as desired. If test data are going to be used as part of the verification and validation process in this step, the test procedures should also spell out how one will determine that the software actually performed the correct transformations on the data entered. One or more test procedures will be associated with each test case.

ITE will develop all necessary test scripts for the APIRI test cases. The test scripts may be used to set up for the test case and to interpret test case output. Draft testing documentation will be delivered to the USDOT for review and approval prior to testing.

Upon USDOT approval of the testing documentation, ITE will perform a test of the APIRI software. In consultation with the COR, COTM and the API Working Group, ITE will determine the date and time, and procure a facility for testing. The duration of each session (consisting of one or more rounds of testing) of testing is anticipated to be no more than five (5) days; ITE will recommend the number of sessions they anticipate. ITE will be responsible for invitations, distributing advance material including testing documentation. ITE will accommodate USDOT witnesses to all testing sessions, at the discretion of USDOT.

Prior to testing, a test readiness review (TRR) will be held with the USDOT and representative(s) of the API Working Group to confirm that all parts of the APIRI software planning to undergo a test are in a state that permits them to undergo said test. Every predecessor activity that must have been performed prior to conducting the test must be successfully completed and all parties to the testing process must agree that the test should proceed.

Upon completion of the testing, ITE will deliver test reports that describe the results of each test conducted. If multiple tests are conducted at the same time, they should all be covered by the same test report.
ITE will update the APIRI software based on the test results. A final version of the APIRI software will be delivered to USDOT that satisfies the software's requirements.

**Deliverables**

- Draft APIRI Test Plan and Test Design Specifications (TDSs) [TOPR Deliverable]
- Draft APIRI Test Case Specifications (TCSs) [TOPR Deliverable]
- Draft APIRI Test Procedure Specifications (TPSs) [TOPR Deliverable]
- Draft Test Scripts [TOPR Deliverable]
- APIRI Test Report [TOPR Deliverable]

2.2.1.4.2 Task 4.2 Integrated APIVS Testing [TOPR Task 3.6]

**Objectives**

- To integrate and test the APIVS software on the APIVS Test Fixture.

**Approach**

As part of this task, ITE will integrate the APIVS software with the APIRI software using the Test Fixture as part of the software development effort.

ITE will develop testing documentation in accordance with IEEE Std 829-1998. Testing documentation will identify the verification methods that will be used to ensure that the developed software satisfies the software's requirements. (The verification methods are: analysis, demonstration, inspection, and testing.) Testing documentation may be developed in parallel with the APIVS SDD and should describe a reasonable approach to ensuring that the design fulfills the requirements. Testing documentation must be traceable to the SRS (see Subtask 3.2) and the SDD (see Subtask 3.3). Testing documentation will include:

- **Test Plan and Test Design Specification** – These two documents can be combined into one. The Test Plan defines the scope, approach, resources, and schedule of the testing activities. The Test Design Specification refines the approach to testing, identifies the features to be tested, and associates the test cases to these features.
- **Test Cases** – Each test case is a set of test inputs, execution conditions, and expected results developed for a particular objective, such as to exercise a particular path within a system or a software application or to verify compliance with a specific requirement or set of requirements.
- **Test Procedures** – Test procedures should spell out exactly how one verifies and validates that the component of the software actually functions as intended and as desired. If test data are going to be used as part of the verification and validation process in this step, the test procedures should also spell out how one will determine that the software actually performed the correct transformations on the data entered.

Draft testing documentation will be delivered to the USDOT for review and approval prior to testing.

Upon USDOT approval of the testing documentation, ITE will perform a test of the APIVS software. ITE will propose an approach on how to validate the APIVS and how to verify and validate the APIRI software as part of the testing documentation. In consultation with the COR, COTM and the API Working Group, ITE will determine the date and time, and procure a facility for testing. The duration of each session (consisting of one or more rounds of testing) of testing is anticipated to be no more than five (5) days; ITE will recommend the number of sessions they anticipate. ITE will be responsible for
invitations, distributing advance material including testing documentation. ITE will accommodate USDOT witnesses to all testing sessions, at the discretion of USDOT.

Prior to testing, a test readiness review (TRR) will be held with the USDOT and representative(s) of the API Working Group to confirm that all parts of the APIVS software planning to undergo a test are in a state that permits them to undergo said test. Every predecessor activity that must have been performed prior to conducting the test must be successfully completed and all parties to the testing process must agree that the test should proceed.

Upon completion of the testing, ITE will deliver test reports that describe the results of each test conducted. If multiple tests are conducted at the same time, they should all be covered by the same test report.

ITE will update the APIVS software based on the test results. A final version of the APIVS software will be delivered to the USDOT satisfies the software’s requirements.

**Deliverables**

- Draft APIVS Test Plan and Test Design Specifications (TDSs) [TOPR Deliverable]
- Draft APIVS Test Case Specifications (TCSs) [TOPR Deliverable]
- Draft APIVS Test Procedure Specifications (TPSs) [TOPR Deliverable]
- Draft APIVS Test Scripts [TOPR Deliverable]
- APIVS Test Report [TOPR Deliverable]

2.2.1.5 Task 5 Establish Open Source Software (OSS) Environment [TOPR Task 4]

**Overall Objectives**

- To create an OSS Environment for the APIRI and the APIVS.
- To provide outreach to the community including a demonstration workshop.

2.2.1.5.1 Task 5.1 Develop Concept Paper [TOPR Task 4.1a]

**Objectives**

- To develop a concept paper for the APIRI and APIVS OSS Environment.

**Approach**

ITE will develop a draft concept paper that describes the OSS Environment for the APIRI and APIVS. This concept paper is intended for USDOT, ITE and the developers. The concept paper will describe:

- Organization set up: ITE will establish an API Software Administrator and develop written processes and procedures for using the collaborative environment. The Open Source Data Environment will be maintained by ITE through the duration of this task. The maintenance of this software will be determined by USDOT and will be covered under a separate task order after completion of this task order.
- A description of the configuration control procedures and board that will administrate change control of the software.
- A plan for the distribution of the APIRI and APIVS software and manuals. ITE will establish an OSS Environment for distribution of the APIRI and APIVS. The OSS Environment must be approved by the USDOT and include as a minimum:
  - A secure server providing a common place to store and access the API software;
  - Registration capabilities for authorized users;
- Source code management tools;
- Online bug/issue tracking capabilities; and
- Collaboration tools.

ITE will provide a revised Concept Paper to USDOT within two weeks of receiving USDOT comments on the draft Concept Paper.

Authorization to proceed to the subsequent task is pursuant to COR’s written approval of the revised Concept Paper.

*Deliverables*

- Draft OSS Environment Concept Paper [TOPR Deliverable]
- OSS Environment Concept Paper [TOPR Deliverable]

### 2.2.1.5.2 Task 5.2 Implement OSS Environment [TOPR Task 4.1b]

**Objectives**

- Establish the OSS Environment for the APIRI, APIVS and project documentation according to the Concept Paper.

**Approach**

Establish the OSS Environment and develop the processes and procedures for the API WG to sustain the APIRI and APIVS Software.

*Deliverables*

- Processes and Procedures for Sustaining APIRI and APIVS Software
- OSS Environment

### 2.2.1.5.3 Task 5.3 APIRI and APIVS Outreach [TOPR Task 4.2]

**Objectives**

- To prepare and hold a demonstration workshop for users of the APIRI and APIVS.

**Approach**

ITE will also hold a demonstration workshop for users of the APIRI and APIVS. ITE will develop workshop plans or documents that describe how users will be trained, when they will be trained, where they will be trained, and what workshop materials will be used in the demonstration workshop. Workshop materials will be developed. These materials should be the actual materials to be used in training users of the software. Demonstration workshop materials will include such items as:
  - User Manuals
  - Demonstration workshop materials
  - Tools that individuals would need to use as part of their duties when using the software

In consultation with the COR, COTM and the API Working Group, ITE will determine the date and time, and procure a facility for demonstration workshop. The duration of the workshop is anticipated to be one (1) day. ITE will be responsible for invitations, distributing advance material including testing documentation.
ITE will develop advertisement material for USDOT to provide to the ITS community. This material will be in the form of a brochure that USDOT can distribute at conferences. The brochure will also be posted on the USDOT ITS Standards website.

**Deliverables**

- Draft Demonstration Workshop Plan [TOPR Deliverable]
- Demonstration Workshop Plan [TOPR Deliverable]
- Briefing Materials [TOPR Deliverable]
- Advertisement Materials [TOPR Deliverable]

### 2.2.1.6 Task 6 Deliver Software and Final Testing Documentation [TOPR Task 5]

**Objective**

- Deliver final versions of the APIRI software, APIVS software, and final versions of all project deliverable documentation.

**Approach**

ITE will deliver the final versions of the tested APIRI and APIVS software. No changes to the software are to be done after final acceptance testing. The testing documentation is to be finalized and delivered to USDOT.

**Deliverables**

- APIRI Software [TOPR Deliverable]
- APIRI Test Plan & TDSs [TOPR Deliverable]
- APIRI Test TCSs [TOPR Deliverable]
- APIRI Test TPSs [TOPR Deliverable]
- APIVS Software [TOPR Deliverable]
- Test Scripts [TOPR Deliverable]
- APIVS Test Plan & TDSs [TOPR Deliverable]
- APIVS TCSs [TOPR Deliverable]
- APIVS TPSs [TOPR Deliverable]

### 2.2.2 Project Acceptance Criteria

Overall project acceptance is based on acceptance of the deliverables. Table 1 identifies the acceptance criteria and the accepting entity for each type of deliverable in the APIRI Project.

<table>
<thead>
<tr>
<th>Deliverable Type</th>
<th>Acceptance Criteria</th>
<th>Acceptance By</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation Plan</td>
<td>• Meets Implementation Plan criteria in Section 2.2.1.1.</td>
<td>ITS JPO</td>
</tr>
<tr>
<td></td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>Interview Report</td>
<td>• Criteria to be established by the API WG.</td>
<td>API WG</td>
</tr>
<tr>
<td></td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>Deliverable Type</td>
<td>Acceptance Criteria</td>
<td>Acceptance By</td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Concept of Operation</td>
<td>• Meets ConOps criteria in Section 2.2.1.3.1.</td>
<td>API WG</td>
</tr>
<tr>
<td></td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>Software Requirements Specification</td>
<td>• Meets SRS criteria in Section 2.2.1.3.2.</td>
<td>API WG</td>
</tr>
<tr>
<td></td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>Software Design Description</td>
<td>• Meets SDD criteria in Section 2.2.1.2.1 and Section 2.2.1.3.3 as appropriate.</td>
<td>API WG</td>
</tr>
<tr>
<td></td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>Walkthrough Workbook</td>
<td>• Based on IEEE Std 1028-1997.</td>
<td>API WG</td>
</tr>
<tr>
<td></td>
<td>• Meets quality control standards as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>Walkthrough Comment Resolution Report</td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td>API WG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User Manual</td>
<td>• Meets User Manual criteria in Section 2.2.1.2.3 and Section 2.2.1.3.6 as appropriate.</td>
<td>API WG</td>
</tr>
<tr>
<td></td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>Test Plan, Test Design Specification, Test Case Specification, Test Procedure Specification</td>
<td>• Meets Test Plan, TDS, TCS, TPS criteria in Section 2.2.1.4.1 and 2.2.1.4.2 as appropriate.</td>
<td>API WG and ITS JPO (Test Readiness Review)</td>
</tr>
<tr>
<td></td>
<td>• Criteria to be established by the API WG.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>Test Scripts</td>
<td>• Criteria to be established by the API WG.</td>
<td>API WG</td>
</tr>
<tr>
<td></td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>Test Report</td>
<td>• Criteria to be established by the API WG.</td>
<td>API WG</td>
</tr>
<tr>
<td></td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>Test Fixture Description</td>
<td>• Criteria to be established by the API WG.</td>
<td>API WG</td>
</tr>
<tr>
<td></td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>Test Fixtures</td>
<td>• Criteria to be established by the API WG.</td>
<td>API WG</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Software</td>
<td>• Passes testing in Section 2.2.1.4.1 and Section 2.2.1.4.2 as appropriate.</td>
<td>API WG</td>
</tr>
<tr>
<td></td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>OSS Environment Concept Paper</td>
<td>• Meets OSS Environment criteria in Section 2.2.1.5.1.</td>
<td>API WG and ITS JPO</td>
</tr>
<tr>
<td></td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>OSS Environment</td>
<td>• Meets criteria for OSS Environment in Section 2.2.1.5.2.</td>
<td>API WG</td>
</tr>
<tr>
<td>Processes and Procedures for Sustaining APIRI and APIVS Software</td>
<td>• Meets criteria in Section 2.2.1.5.1 and adapted for OSS Environment established in Section 2.2.1.5.2.</td>
<td>API WG</td>
</tr>
<tr>
<td></td>
<td>• Meets quality control criteria as described in Section 5.3.</td>
<td></td>
</tr>
<tr>
<td>Deliverable Type</td>
<td>Acceptance Criteria</td>
<td>Acceptance By</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
</tbody>
</table>
| Demonstration Workshop Plan      | • Meets workshop planning criteria in Section 2.2.1.5.3.  
• Meets quality control criteria as described in Section 5.3.                                                                                                                 | ITE           |
| Briefing Materials               | • Meets briefing material criteria in Section 2.2.1.5.3.  
• Meets quality control criteria as described in Section 5.3.                                                                                                                 | ITE           |
| Advertisement Materials          | • Meets advertisement criteria in Section 2.2.1.5.3.  
• Meets quality control criteria as described in Section 5.3.                                                                                                                 | ITE           |

2.2.3 Project Exclusions

No exclusions have been identified.

2.2.4 Project Constraints

The following constraints have been established for the APIRI Project:
  a) The project schedule may not extend beyond September 30, 2015.
  b) Capital expenditures are contractually limited and must be preapproved by ITE.
  c) Project travel costs are contractually limited and must be preapproved by ITE.
  d) Funding for the APIRI project has been split into two parts: 1) the initial funding which covers the majority of the project and 2) the remainder of the funding to be allocated at a time (to be determined) later in the project.

2.2.5 Project Assumptions

The following assumptions are being made for the APIRI Project:
  a) Additional teleconferences will be used as needed to meet the project goals.
  b) Site visits by the PM not in the schedule may be necessary to meet project goals.
  c) Time has been built in to many of the tasks due to the API WG reviews and process.
  d) ITS JPO will have a representative participating in the API WG as a non-voting member.
  e) Documents produced for this project are to be suitable for purpose as determined by the API WG.
  f) Throughout the project, there will be various versions of the project schedule produced to take advantage of economies discovered or to account for anomalies unforeseen. As long as there is no change in scope, this PMP does not need to be modified.
  g) The project team has the physical resources and equipment to complete the project such as computers, ATC controllers and transportation field cabinet systems.
  h) Companies that are participating in the API WG will provide testing assistance of their own ATC equipment at their own facilities.

2.3 Scope Verification

The scope description found in Section 2.2.1 has been developed by the APIRI Project Manager using the scope provided in the TOPR ensuring that all tasks and deliverables identified in the TOPR are included in this PMP. Project tasks in the scope description are mapped to TOPR tasks using the form “[TOPR Task #].” Deliverable items in the scope description are mapped to TOPR deliverables using the form “[TOPR Task Deliverable].” Acceptance of this PMP by the ITS JPO verifies the initial scope of the APIRI Project.
It is the responsibility of the Project Manager to verify interim project deliverables against the original scope as defined in the scope description (see Section 2.2.1). If there is a proposed change of scope (see Section 2.4), ITS JPO must formally accept the change prior to its incorporation into the project.

2.4 Scope Control

The Project Manager and the Contractor Team will work together to control the scope of the project. The contractor team will leverage the project scope description (see Section 2.2.1) and the project schedule (see Section 4.4) as a statement of work for each task. The Contractor Team will ensure that they perform only the work described in the project scope description and generate the deliverables identified. The Project Manager will oversee the Contractor Team and the progression of the project to ensure that this scope control process is followed.

A change in scope is defined by a change in the overall budget, a change that extends the overall schedule, or a change in the work to be performed. Any member of the Project Management Team, the Contractor Team, the API WG, or the ITS JPO may propose a change in scope. The proposed change is assessed by the Project Management Team and Contractor Team. If the Project Management Team and Contractor Team determine that a change in scope is warranted, formal approval from ITS JPO is required. This PMP is to be updated in the case of an approved change in scope.

3 COMMUNICATIONS PLAN

3.1 Purpose of the Communications Plan

This Communications Management Plan sets the communications framework for the administration of the APIRI Project. It identifies representatives of the key stakeholders for the project, their roles, and contact information.

3.2 Stakeholder Points of Contact

ITS JPO Contracting Officer’s Representative

Acts on behalf of the Contracting Officer's Task Manager (COTM).

Steve Sill, ITS Architecture & Standards Program Manager
RITA ITS JPO
United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590
Phone: 202-366-1603
Email: steve.sill@dot.gov

Project Administrator/Coordinator

(Primary)
Siva R. K. Narla, Senior Director, Transportation Technology
Institute of Transportation Engineers
1627 I (“Eye”) Street, NW, Suite 600
Washington, DC 20006
Phone: 202-785-0060 x119
Email: snarla@ite.org
(Deputy)
Edward R. Stollof, Senior Director, Safety Programs
Institute of Transportation Engineers
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Washington, DC 20006
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Email: estollof@ite.org

Project Manager

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Email: rboaz@pillarinc.com

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Phone: 760-734-5045
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ATC Joint Committee Chair

Dave Miller, Director of Research and Development
Siemens Mobility
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ATC Standards Development Organization Liaisons

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Phone: 202-624-5817
Email: wbrownlow@aashto.org
3.3 ATC Cooperation and Coordination

The APIRI Project is being performed as part of the ATC Standards Program under the sponsorship of ITS JPO. Three SDOs support the ATC Standards Program through a Memorandum of Understanding (MOU). The SDOs are the American Association of State Highway and Transportation Officials (AASHTO), the Institute of Transportation Engineers (ITE) and the National Electrical Manufacturers Association (NEMA). ATC standards are developed and maintained under the direction of the ATC Joint Committee (JC) which made up of six members from each SDO. The ATC JC has three technical subgroups, called working groups (WGs), which are made up of subject matter experts including those from public agencies, manufacturers, software providers, and consulting firms. The three working groups are the Controller WG, the API WG and the Cabinet WG. Generally, WGs carry out the development of the ATC standards, the ATC JC decides if a proposed standard is "acceptable" for distribution to the SDOs, and the SDOs comment, ballot and approve standards. See the ATC standards program organization in Figure 1.

![Figure 1. ATC Standards Program Organization.](image)

The ATC JC is led by a single chairperson (chair) appointed by the members of the ATC JC under the rules of the MOU. The WGs have co-chairs, one from the public sector and one from the private sector, appointed by the ATC JC. The voting membership of the ATC WGs is managed by the WG Chairs with final approval by the ATC JC Chair. There are staff members from each SDO to support the ATC JC activities and to provide point of contact for the SDOs they represent. ITE is the lead SDO for the ATC Standards Program.

The APIRI Project is a software development effort to create software conforming to the ATC 5401 Standard. The ATC 5401 Standard itself was developed by the API WG. The API WG’s expertise regarding the ATC 5401 Standard is essential to the APIRI Project’s success. Throughout the project the
API WG will provide technical guidance, document reviews, and manufacturer testing of the software developed. Coordination between the Project Manager and the API WG Chairs will be on a weekly basis via teleconferences and progress reports (see Section 4.2). The Project Manager and API WG Chairs will work to ensure that API WG meetings and teleconferences are carried out according to the project needs.

Communications regarding the ATC JC and API WG activities are to be made through email distribution. Anyone may participate in this distribution by registering for the “ATC List Serve” (see http://list.ite.org/cgi-bin/wa.exe?A0=ATC). APIRI Project progress and major milestones are to be tracked via the ITE standards website (see http://www.ite.org/standards/index.asp). The API WG Chairs will provide progress reports, as requested by the ATC JC Chair, in support of ATC JC meetings and teleconferences. The Project Administrator/Coordinator will communicate with the ATC SDO Liaisons and the ATC JC Chair on an as needed basis.

3.4 Communications with ITS JPO

Communications between the project team and ITS JPO will formally take place once monthly as described in Section 3.3 and as deliverables occur as described in Section 4. It is anticipated that ITS JPO will have one or more technical staff participating in the API WG where they will have extemporaneous and informal communication with the project team. Official communications between ITS JPO and the project team should be made through the Project Administrator/Coordinator and the COR (see Section 3.2).

4 DELIVERABLES AND MILESTONES

4.1 Monthly Progress Reports

4.2 Weekly Progress Reports
4.3 Deliverable Summary

Documents and software deliverables are to be sent electronically to the COR. In the case of the delivery of the APIVS Test Fixture or establishment of the OSS environment, a notification of completion will be sent to the COR. Table 2 identifies the deliverables based on the project tasks.

Table 2. Deliverables by Project Task

<table>
<thead>
<tr>
<th>Task</th>
<th>Deliverable Item</th>
<th>Delivery Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Draft Implementation Plan (consists of PMP, SEMP, MS Project Schedule) [TOPR Deliverable]</td>
<td>12/04/13</td>
</tr>
<tr>
<td></td>
<td>Implementation Plan (consists of PMP, SEMP, MS Project Schedule) [TOPR Deliverable]</td>
<td>12/20/13</td>
</tr>
<tr>
<td>2.1</td>
<td>Draft 1 APIRI Software Design Description (SDD) [TOPR Deliverable]</td>
<td>02/18/14</td>
</tr>
<tr>
<td></td>
<td>Draft 1 APIRI SDD Walkthrough Workbook [TOPR Deliverable]</td>
<td>02/25/14</td>
</tr>
<tr>
<td></td>
<td>Draft 2 APIRI SDD</td>
<td>03/21/14</td>
</tr>
<tr>
<td></td>
<td>APIRI SDD Walkthrough Comment Resolution Report [TOPR Deliverable]</td>
<td>04/24/14</td>
</tr>
<tr>
<td></td>
<td>APIRI SDD [TOPR Deliverable]</td>
<td>04/24/14</td>
</tr>
<tr>
<td>2.2</td>
<td>APIRI Draft Software [TOPR Deliverable]</td>
<td>08/14/14</td>
</tr>
<tr>
<td></td>
<td>Draft 1 APIRI User’s Manual [TOPR Deliverable]</td>
<td>08/28/14</td>
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<td>2.3</td>
<td>Draft 2 APIRI User’s Manual</td>
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<td></td>
<td>APIIS Interview Report [TOPR Deliverable]</td>
<td>02/18/14</td>
</tr>
<tr>
<td></td>
<td>Draft 1 APIVS ConOps [TOPR Deliverable]</td>
<td>03/04/14</td>
</tr>
<tr>
<td></td>
<td>Draft 1 APIVS ConOps Walkthrough Workbook [TOPR Deliverable]</td>
<td>03/11/14</td>
</tr>
<tr>
<td></td>
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<td>04/04/14</td>
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<tr>
<td></td>
<td>APIVS ConOps Walkthrough Comment Resolution Report [TOPR Deliverable]</td>
<td>05/08/14</td>
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<tr>
<td>3.1</td>
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<td>05/22/14</td>
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<td></td>
<td>Draft 1 APIVS SRS Walkthrough Workbook [TOPR Deliverable]</td>
<td>05/30/14</td>
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<td>Draft 2 APIVS SRS</td>
<td>06/25/14</td>
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<tr>
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<td>APIVS SRS Walkthrough Comment Resolution Report [TOPR Deliverable]</td>
<td>07/30/14</td>
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<td>APIVS SRS [TOPR Deliverable]</td>
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<td>Draft 1 APIVS SDD [TOPR Deliverable]</td>
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<td></td>
<td>APIVS SDD [TOPR Deliverable]</td>
<td>11/24/14</td>
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<tr>
<td></td>
<td>APIVS ConOps, SRS Updates [TOPR Deliverable]</td>
<td>11/26/14</td>
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<td>3.3</td>
<td>Draft APIVS Software [TOPR Deliverable]</td>
<td>03/10/15</td>
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<tr>
<td></td>
<td>Preliminary Test Scripts [TOPR Deliverable]</td>
<td>03/31/15</td>
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<td>Draft APIVS Test Fixture Description [TOPR Deliverable]</td>
<td>08/13/14</td>
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<td>Test Fixture Description</td>
<td>09/15/14</td>
</tr>
<tr>
<td></td>
<td>Test Fixtures (5-6)</td>
<td>09/29/14</td>
</tr>
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<td>3.6</td>
<td>Draft 1 APIVS User’s Manual [TOPR Deliverable]</td>
<td>04/21/15</td>
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<tr>
<td>Task</td>
<td>Deliverable Item</td>
<td>Delivery Date</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td></td>
<td>Draft 2 APIVS User’s Manual</td>
<td>05/21/15</td>
</tr>
<tr>
<td>4.1</td>
<td>Draft APIRI Test Plan and Test Design Specifications (TDSs) [TOPR Deliverable]</td>
<td>01/21/15</td>
</tr>
<tr>
<td></td>
<td>Draft APIRI Test Case Specifications (TCSs) [TOPR Deliverable]</td>
<td>01/21/15</td>
</tr>
<tr>
<td></td>
<td>Draft APIRI Test Procedure Specifications (TPSs) [TOPR Deliverable]</td>
<td>01/21/15</td>
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<td></td>
<td>Draft Test Scripts [TOPR Deliverable]</td>
<td>01/21/15</td>
</tr>
<tr>
<td></td>
<td>APIRI Test Report [TOPR Deliverable]</td>
<td>01/21/15</td>
</tr>
<tr>
<td>4.2</td>
<td>Draft APIVS Test Plan and Test Design Specifications (TDSs) [TOPR Deliverable]</td>
<td>06/18/15</td>
</tr>
<tr>
<td></td>
<td>Draft APIVS Test Case Specifications (TCSs) [TOPR Deliverable]</td>
<td>06/18/15</td>
</tr>
<tr>
<td></td>
<td>Draft APIVS Test Procedure Specifications (TPSs) [TOPR Deliverable]</td>
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<tr>
<td></td>
<td>Draft APIVS Test Scripts [TOPR Deliverable]</td>
<td>06/18/15</td>
</tr>
<tr>
<td></td>
<td>APIVS Test Report [TOPR Deliverable]</td>
<td>06/18/15</td>
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<tr>
<td>5.1</td>
<td>Draft OSS Environment Concept Paper [TOPR Deliverable]</td>
<td>02/10/14</td>
</tr>
<tr>
<td></td>
<td>OSS Environment Concept Paper [TOPR Deliverable]</td>
<td>03/20/14</td>
</tr>
<tr>
<td>5.2</td>
<td>Processes and Procedures for Sustaining APIRI and APIVS Software</td>
<td>07/14/14</td>
</tr>
<tr>
<td></td>
<td>OSS Environment</td>
<td>03/10/15</td>
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<tr>
<td>5.3</td>
<td>Draft Demonstration Workshop Plan [TOPR Deliverable]</td>
<td>06/25/15</td>
</tr>
<tr>
<td></td>
<td>Demonstration Workshop Plan [TOPR Deliverable]</td>
<td>07/21/15</td>
</tr>
<tr>
<td></td>
<td>Briefing Materials [TOPR Deliverable]</td>
<td>08/04/15</td>
</tr>
<tr>
<td></td>
<td>Advertisement Materials [TOPR Deliverable]</td>
<td>07/24/15</td>
</tr>
<tr>
<td>6</td>
<td>APIRI Software [TOPR Deliverable]</td>
<td>07/17/15</td>
</tr>
<tr>
<td></td>
<td>APIRI Test Plan &amp; TDSs [TOPR Deliverable]</td>
<td>07/17/15</td>
</tr>
<tr>
<td></td>
<td>APIRI Test TCSs [TOPR Deliverable]</td>
<td>07/17/15</td>
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<tr>
<td></td>
<td>APIRI Test TPSs [TOPR Deliverable]</td>
<td>07/17/15</td>
</tr>
<tr>
<td></td>
<td>APIVS Software [TOPR Deliverable]</td>
<td>07/17/15</td>
</tr>
<tr>
<td></td>
<td>Test Scripts [TOPR Deliverable]</td>
<td>07/17/15</td>
</tr>
<tr>
<td></td>
<td>APIVS Test Plan &amp; TDSs [TOPR Deliverable]</td>
<td>07/17/15</td>
</tr>
<tr>
<td></td>
<td>APIVS TCSs [TOPR Deliverable]</td>
<td>07/17/15</td>
</tr>
<tr>
<td></td>
<td>APIVS TPSs [TOPR Deliverable]</td>
<td>07/17/15</td>
</tr>
</tbody>
</table>

### 4.4 Project Schedule

The Gantt Chart in Figures 2 through 6 provides the APIRI project schedule. Project tasks and deliverables that correspond to an explicit task included in the TOPR are identified. Deliverables are identified by a diamond shape (◆). Teleconferences are identified by a diamond shape within a circle (◇). Face-to-face meetings are identified by solid circle (●).
**Figure 2. ATC APIRI Project Schedule (Part 1 of 5).**
Figure 3. APIRI Project Schedule (Part 2 of 5).
Figure 4. APIRI Project Schedule (Part 3 of 5).
Figure 5. APIRI Project Schedule (Part 4 of 5).
<table>
<thead>
<tr>
<th>ID</th>
<th>Project Task</th>
<th>Task Name</th>
<th>Duration</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>158</td>
<td>5.3</td>
<td>APIRI and API/V Outreach [TOPR Task 4.2]</td>
<td>67 days</td>
<td>Fri 6/15/15</td>
<td>Wed 9/23/15</td>
</tr>
<tr>
<td>159</td>
<td>5.3.1</td>
<td>Develop Draft Demonstration Workshop Plan</td>
<td>5 days</td>
<td>Fri 6/19/15</td>
<td>Thu 6/25/15</td>
</tr>
<tr>
<td>160</td>
<td>5.3.2</td>
<td>Deliver Draft Demonstration Workshop Plan [TOPR Deliverable]</td>
<td>0 days</td>
<td>Thu 6/25/15</td>
<td>Thu 6/25/15</td>
</tr>
<tr>
<td>161</td>
<td>5.3.3</td>
<td>WG Review and Comment on Draft Demonstration Workshop Plan</td>
<td>10 days</td>
<td>Fri 6/26/15</td>
<td>Fri 7/10/15</td>
</tr>
<tr>
<td>162</td>
<td>5.3.4</td>
<td>Convene WG Teleconference to Review Draft Demonstration Workshop Plan</td>
<td>2 days</td>
<td>Mon 7/13/15</td>
<td>Tue 7/14/15</td>
</tr>
<tr>
<td>163</td>
<td>5.3.5</td>
<td>Update Demonstration Workshop Plan</td>
<td>5 days</td>
<td>Wed 7/15/15</td>
<td>Tue 7/21/15</td>
</tr>
<tr>
<td>164</td>
<td>5.3.6</td>
<td>Deliver Demonstration Workshop Plan [TOPR Deliverable]</td>
<td>0 days</td>
<td>Tue 7/21/15</td>
<td>Tue 7/21/15</td>
</tr>
<tr>
<td>165</td>
<td>5.3.7</td>
<td>Prepare Workshop Briefing Materials</td>
<td>10 days</td>
<td>Wed 7/22/15</td>
<td>Tue 8/4/15</td>
</tr>
<tr>
<td>166</td>
<td>5.3.8</td>
<td>Deliver Workshop Briefing Materials [TOPR Deliverable]</td>
<td>0 days</td>
<td>Tue 8/4/15</td>
<td>Tue 8/4/15</td>
</tr>
<tr>
<td>167</td>
<td>5.3.9</td>
<td>Prepare Workshop Advertisement Materials</td>
<td>10 days</td>
<td>Mon 7/13/15</td>
<td>Fri 7/24/15</td>
</tr>
<tr>
<td>168</td>
<td>5.3.10</td>
<td>Deliver Workshop Advertisement Materials [TOPR Deliverable]</td>
<td>0 days</td>
<td>Fri 7/24/15</td>
<td>Fri 7/24/15</td>
</tr>
<tr>
<td>169</td>
<td>5.3.11</td>
<td>Convene Demonstration Workshop</td>
<td>2 days</td>
<td>Tue 9/22/15</td>
<td>Wed 9/23/15</td>
</tr>
<tr>
<td>170</td>
<td>6</td>
<td>Deliver Software and Final Testing Documentation [TOPR Task 6]</td>
<td>20 days</td>
<td>Fri 6/19/15</td>
<td>Fri 7/17/15</td>
</tr>
<tr>
<td>171</td>
<td>6.1</td>
<td>Package APIRI and APWS for USDOT Delivery</td>
<td>10 days</td>
<td>Wed 6/24/15</td>
<td>Wed 7/8/15</td>
</tr>
<tr>
<td>172</td>
<td>6.2</td>
<td>Finalize Testing Documentation</td>
<td>20 days</td>
<td>Fri 6/19/15</td>
<td>Fri 7/17/15</td>
</tr>
<tr>
<td>173</td>
<td>6.3</td>
<td>Deliver Software and Final Testing Documentation (APIRI SW/PT/SDs/TC/SS/TP/SS/Test Scripts and API/V SW/PT/SDs/TC/SS/TP/SS/Test Scripts) [TOPR Deliverable]</td>
<td>0 days</td>
<td>Fri 7/17/15</td>
<td>Fri 7/17/15</td>
</tr>
</tbody>
</table>

Figure 6. APIRI Project Schedule (Part 5 of 5).
5 QUALITY MANAGEMENT PLAN

5.1 Purpose of the Quality Management Plan

This Quality Management Plan how quality will be managed throughout the life of the project. It includes processes and practices for ensuring quality planning, quality control and quality assurance.

5.2 Quality Planning

In order to be successful, this PMP has integrated a quality system into the project tasks, project schedule, project deliverables and project team. The project relies heavily on the API WG to perform the role of a quality review team. The API WG is made up of subject matter experts including those from public agencies, manufacturers, software providers, and consulting firms. The API WG includes operational users which provide quality input from the user's perspective. The API WG also includes one or more technical staff from ITS JPO. This allows the ITS JPO to have quality input early in the development of project deliverables. It is the responsibility of the API WG Chairs and the Project Manager to ensure that the API WG is made up of individuals appropriate for the quality aspects of the project. The Project Manager and Contractor team have been selected for their experience with the ATC Standards Program, their depth of knowledge concerning all of the ATC standards, their particular expertise with the ATC 5401 Standard and their proven track record producing quality products and software compatible with ATC standards.

There are two types of quality addressed by this plan: product quality and process quality. Product quality focuses on the project deliverables. The project scope description (see Section 2.2.1) identifies well-known industry standards for all document deliverables. The ATC 5401 Standard establishes software standards for the APIRI software. A software requirements specification will be developed to establish the quality standards for the APIVS software. Process quality focuses on how the project deliverables will be produced. The APIRI Project employs a formal systems engineering process. The project scope description and schedule defines task and process deliverables such as document walkthroughs and multiple cycles of API WG review, comment and comment resolution periods all directed at the aspect of quality.

5.3 Quality Control

This section describes the process for monitoring and recording the results of executing the quality activities. It applies to the project’s products as opposed to its processes.

It is intended that each document and element of deliverable software will be maintained under an electronic configuration management system which includes issue tracking as part of the Open Source Software (OSS) Environment described in the project scope description (see Section 2.2.1.5). Until this system is operational, change control will be performed through a document oriented process. Each document produced as a part of this PMP will maintain a Comment Matrix with a unique comment identifier, the name of the commenter, the date of the comment, the version of the document that the comment pertains to, the comment type (Editorial or Technical), the page number, the section number, the issue, the proposed solution, API WG conclusions and the disposition (Open/Closed). For all software products of this PMP, issue/change tracking will be provided through the OSS.

API WG reviews of all project deliverables will be held according to the project schedule. Additional reviews may be meet project needs. Documents will be compared to the industry standards from which they are based to ensure that critical information is not missing. Reviewers will verify that deliverable documents:
   a) contain suitable material for the target audience;
   b) are organized in presentation;
c) contain proper word use and English diction;
d) contain detailed illustrations;
e) are comprehensive, complete and technically correct; and
f) are edited for grammatical and editorial errors.

Software designs will be verified against software requirements to ensure that all aspects of the requirements are covered. Technical guidance will be given to designers to ensure that best practices are employed. Software source code will be written using the GNU Coding Standards. Software will be validated using a Test Plan, Test Design Specifications, Test Case Specifications and Test Procedures.

Project deliverables will be judged on a “suitable for purpose” basis. The API WG may identify more items or make suggestions for changes to a document than are needed to meet the project goals. In some cases, gaining consensus on technical matters within the API WG can be difficult and time consuming. If any undertaking by the API WG may jeopardize the project schedule, the API WG Chairs will make decisions and recommendations on the WG’s behalf.

5.4 Quality Assurance

A Quality Checklist will be established and maintained by the Project Manager to assist in identifying specific items to be reviewed by the API WG. A Project Issue Log will be established and maintained by the Project Manager to capture any issue regarding the project that should be addressed by the project management team including items that pertain to quality. Items for the Quality Checklist and Project Issue Log may be proposed by any member of the project team. It is up to the project management team to determine if these items should be included on these lists and if any action should be taken. The Project Management Team will discuss any quality items on a weekly basis.

6 HUMAN RESOURCES MANAGEMENT PLAN

6.1 Purpose of the Human Resources Management Plan

This Human Resources Management Plan is a tool which aides in the management of the human resources throughout the APIRI Project. It contains the roles, responsibilities and reporting on the project and an organizational chart. Estimated work efforts for the team members, arranged by their organization, are found in Appendix D.
### 6.2 Roles, Responsibilities and Reporting

Table 3 identifies the entire APIRI project team, their roles within the project, their project responsibilities and their reporting responsibilities.

<table>
<thead>
<tr>
<th>Name</th>
<th>Project Role</th>
<th>Responsibilities</th>
<th>Reporting</th>
</tr>
</thead>
</table>
| Birdsall, Michelle | Technical Editor           | • Ensures project documents contain suitable material for the target audience.  
• Ensures project documents are organized in presentation.  
• Reviews project documents for grammatical and editorial errors.  
• Reviews project documents for proper word use and English diction. |
| Boaz, Ralph        | Project Manager            | • Part of the Project Management Team.  
• Works with the ITE program manager to maintain project reporting required by the USDOT.  
• Prepares and maintains the PMP and MS Project schedule.  
• Plays a quality management function on deliverables.  
• Provides leadership for the rest of the consulting team.  
• Prepares project policies and procedures.  
• Organizes meetings and keeps records.  
• Coordinates with the Chairs of the API WG.  
• Maintains communication and consensus building within the WG. |
| Chen, George       | Systems Engineer           | • Provides the rigor required to verify that a complete and correct product is being developed.  
• Prepares and maintains the SEMP.  
• Develops ConOps, Requirements documents.  
• Assists with systems engineering portions of design documents.  
• Leads walkthroughs of documents at various stages of the project. |
| Chen, George       | API WG Co-Chair            | • Part of the Project Management Team.  
• Provides leadership of the API WG to carry out the work items assigned by the ATC JC.  
• Considered part of the project management team.  
• Presides over API WG teleconferences and meetings.  
• Focuses the effort of the API WG to review documents and provide feedback to the contractor team in a timely fashion.  
• Builds consensus with the WG members. |
<table>
<thead>
<tr>
<th>Name</th>
<th>Project Role</th>
<th>Responsibilities</th>
<th>Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crawford, Doug</td>
<td>Software Engineer</td>
<td>• Develops software for APIVS that is resident on a personal computer.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Prepares the software design documentation and produces software manuals.</td>
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<tr>
<td></td>
<td></td>
<td>• Assists in developing the OSS environment for the APIVS.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Embedded Software Engineer</td>
<td>• Develops all APIRI software that is to be resident on an ATC engine board. This includes the APIRI itself and any onboard portions of the APIVS that may be required for testing.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Prepares the software design documentation and produces software manuals.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Assists in developing the OSS environment for the APIRI Project.</td>
<td></td>
</tr>
<tr>
<td>Gallagher, Michael</td>
<td>Embedded Software Engineer</td>
<td>• Develops all APIRI software that is to be resident on an ATC engine board. This includes the APIRI itself and any onboard portions of the APIVS that may be required for testing.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Prepares the software design documentation and produces software manuals.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Assists in developing the OSS environment for the APIRI Project.</td>
<td></td>
</tr>
<tr>
<td>Gardner, Craig</td>
<td>Software Engineer</td>
<td>• Develops software for APIVS that is resident on a personal computer.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Prepares the software design documentation and produces software manuals.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Assists in developing the OSS environment for the APIVS.</td>
<td></td>
</tr>
<tr>
<td>Gardner, Grant</td>
<td>Embedded Software Engineer (Intelight Team Lead)</td>
<td>• Develops all APIRI software that is to be resident on an ATC engine board. This includes the APIRI itself and any onboard portions of the APIVS that may be required for testing.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Prepares the software design documentation and produces software manuals.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Assists in developing the OSS environment for the APIRI Project.</td>
<td></td>
</tr>
<tr>
<td>Kinnard, James</td>
<td>Hardware Engineer</td>
<td>• Develops APIVS test fixture description.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Produces APIVS test fixtures.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Test Engineer</td>
<td>• Develops Test Plan, TDSs, TCSs and TPSs.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Performs integrated testing on the APIRI and APIVS.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Prepares test reports.</td>
<td></td>
</tr>
<tr>
<td>Narla, Siva</td>
<td>Project Administrator/Coordinator</td>
<td>• Part of the Project Management Team.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Official administration and coordination of the project from a contracts perspective.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Monitors project expenditures in labor, travel expenses and capital expenses.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Official project communications channel to the COR.</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Project Role</td>
<td>Responsibilities</td>
<td>Reporting</td>
</tr>
<tr>
<td>--------------------</td>
<td>----------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
</tbody>
</table>
| Stollof, Edward    | Deputy Project Administrator/    | • Part of the Project Management Team.  
• Official administration and coordination of the project from a contracts perspective.  
• Monitors project expenditures in labor, travel expenses and capital expenses.  
• Official project communications channel to the COR. |           |
| ITE                | Coordinator                      |                                                                                           |           |
|                    |                                  |                                                                                           |           |
| Tarico, Douglas    | API WG Co-Chair                  | • Part of the Project Management Team.  
• Provides leadership of the API WG to carry out the work items assigned by the ATC JC.  
• Presides over API WG teleconferences and meetings.  
• Focuses the effort of the API WG to review documents and provide feedback to the contractor team in a timely fashion.  
• Builds consensus with the WG members. |           |
| McCain             |                                  |                                                                                           |           |
|                    |                                  |                                                                                           |           |
6.3 Organizational Chart

Figure 7 shows an organizational chart for APIRI Project. The chart shows the project team including the API Working Group due to its critical role in providing industry expertise and quality control. The project management team consists of the Project Administrator/Coordinator(s), the Project Manager and the API Working Group Chairs. Supporting roles from the ATC program are shown but they are not considered a part of the project team.

![Organizational Chart](image)

Figure 7. APIRI Project Organization

7 RISK MANAGEMENT PLAN

The Risk Management Plan for the APIRI Project is found in the APIRI Project Systems Engineering Management Plan (SEMP) (see Section 1.3 for reference).
APPENDIX A – REFERENCES

http://www.gnu.org/prep/standards/

http://standards.ieee.org/index.html

http://standards.ieee.org/index.html

http://standards.ieee.org/index.html

http://standards.ieee.org/index.html

http://standards.ieee.org/index.html

http://standards.ieee.org/index.html

http://standards.ieee.org/index.html

Institute of Transportation Engineers, Application Programming Interface (API) Standard for the Advanced Transportation Controller (ATC) v02.17. ATC Joint Committee, 1 September 2011.
http://www.ite.org/standards/index.asp

Institute of Transportation Engineers, ATC 5201 Advanced Transportation Controller (ATC) Standard Version 06. ATC Joint Committee, 30 July 2012.
http://www.ite.org/standards/index.asp

Institute of Transportation Engineers, ATC 5401 Application Programming Interface (API) Standard for the Advanced Transportation Controller (ATC) v02. ATC Joint Committee, 15 September 2013.
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Institute of Transportation Engineers, ATC APIRI SEMP v01.00 Systems Engineering Management Plan (SEMP) for the Advanced Transportation Controller (ATC) Application Programming Interface (API) Reference Implementation Project. ATC Joint Committee, 4 December 2013.
http://www.ite.org/standards/index.asp

http://www.incose.org/ProductsPubs/products/sehandbook.aspx


http://www.fhwa.dot.gov/cadiv/segb/

APPENDIX B – GLOSSARY, ACRONYMS AND ABBREVIATIONS

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AASHTO</td>
<td>American Association of State Highway and Transportation Officials</td>
</tr>
<tr>
<td>API</td>
<td>Application Programming Interface</td>
</tr>
<tr>
<td>API Managers</td>
<td>API software that manages an ATC resource for use by concurrently running application programs.</td>
</tr>
<tr>
<td>API Utilities</td>
<td>API software not included in the API Managers that is used for configuration purposes.</td>
</tr>
<tr>
<td>APIRI</td>
<td>API Reference Implementation (software)</td>
</tr>
<tr>
<td>APIRI Project</td>
<td>Entire project managed by this PMP including software, hardware and documentation.</td>
</tr>
<tr>
<td>APIVS</td>
<td>API Validation Suite (software and fixture)</td>
</tr>
<tr>
<td>Application Program</td>
<td>Any program designed to perform a specific function directly for the user or, in some cases, for another application program. Examples of application programs include word processors, database programs, Web browsers and traffic control programs. Application programs use the services of a computer's O/S and other supporting programs such as an application programming interface.</td>
</tr>
<tr>
<td>ATC</td>
<td>Advanced Transportation Controller</td>
</tr>
<tr>
<td>ATC Device Drivers</td>
<td>Low-level software not included in a typical Linux distribution that is necessary for ATC-specific devices to operate in a Linux O/S environment.</td>
</tr>
<tr>
<td>ATP</td>
<td>Authorization to Proceed</td>
</tr>
<tr>
<td>Board Support Package</td>
<td>Software usually provided by processor board manufacturers which provides a consistent software interface for the unique architecture of the board. In the case of the ATC, the Board Support Package also includes the O/S</td>
</tr>
<tr>
<td>BSP</td>
<td>See Board Support Package</td>
</tr>
<tr>
<td>ConOps</td>
<td>Concept of Operations</td>
</tr>
<tr>
<td>CO</td>
<td>Contracting Officer</td>
</tr>
<tr>
<td>COR</td>
<td>Contract Officer’s Representative</td>
</tr>
<tr>
<td>COTM</td>
<td>Contract Officer’s Task Manager</td>
</tr>
<tr>
<td>CPU</td>
<td>Central Processing Unit. A programmable logic device that performs the instruction, logic and mathematical processing in a computer.</td>
</tr>
<tr>
<td>Device Driver</td>
<td>A software routine that links a peripheral device to the operating system. It acts like a translator between a device and the application programs that use it.</td>
</tr>
<tr>
<td>FHWA</td>
<td>Federal Highway Administration</td>
</tr>
<tr>
<td>FIO</td>
<td>Field Input and Output</td>
</tr>
<tr>
<td>FPUI</td>
<td>Front Panel User Interface</td>
</tr>
<tr>
<td>H/W</td>
<td>Hardware</td>
</tr>
<tr>
<td>I/O</td>
<td>Input/Output</td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers</td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
</tr>
<tr>
<td>ITE</td>
<td>Institute of Transportation Engineers</td>
</tr>
<tr>
<td>ITS</td>
<td>Intelligent Transportation Systems</td>
</tr>
<tr>
<td>JC</td>
<td>Joint Committee</td>
</tr>
<tr>
<td>JPO</td>
<td>Joint Program Office</td>
</tr>
<tr>
<td>Linux</td>
<td>Low-level software that is freely available in the Linux community for use with common hardware components operating in a standard fashion.</td>
</tr>
<tr>
<td>Linux Kernel</td>
<td>The Unix-like operating system kernel that was begun by Linus Torvalds in 1991. The Linux Kernel provides general O/S functionality. This includes functions for things typical in any computer system such as file I/O, serial I/O, interprocess communication and process scheduling. It also includes Linux utility functions necessary to run programs such as shell scripts and console commands. It is generally available as open source (free to the public). The Linux Kernel referenced in this standard is defined in the ATC Controller Standard Section 2.2.5, Annex A and Annex B.</td>
</tr>
<tr>
<td>N/A</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Operational User</td>
<td>A technician or transportation engineer who uses the controller to perform its operational tasks.</td>
</tr>
<tr>
<td>O/S</td>
<td>Operating System</td>
</tr>
<tr>
<td>OSS</td>
<td>Open Source Software</td>
</tr>
<tr>
<td>PCB</td>
<td>Printed Circuit Board</td>
</tr>
<tr>
<td>PMP</td>
<td>Project Management Plan</td>
</tr>
<tr>
<td>POP</td>
<td>Period of Performance</td>
</tr>
<tr>
<td>PRL</td>
<td>Protocol Requirements List</td>
</tr>
<tr>
<td>Programmatic</td>
<td>Having to do with a computer program or software.</td>
</tr>
<tr>
<td>RI</td>
<td>Reference Implementation</td>
</tr>
<tr>
<td>RITA</td>
<td>Research and Innovative Technology Administration</td>
</tr>
<tr>
<td>RTC</td>
<td>Real-Time Clock</td>
</tr>
<tr>
<td>RTM</td>
<td>Requirements Traceability Matrix</td>
</tr>
<tr>
<td>SDD</td>
<td>Software Design Document or Software Design Descriptions</td>
</tr>
<tr>
<td>SDO</td>
<td>Standards Development Organization</td>
</tr>
<tr>
<td>SE</td>
<td>Systems Engineer</td>
</tr>
<tr>
<td>SEP</td>
<td>Systems Engineering Process</td>
</tr>
<tr>
<td>SEMP</td>
<td>Systems Engineering Management Plan</td>
</tr>
<tr>
<td>SOW</td>
<td>Statement of Work</td>
</tr>
<tr>
<td>SRS</td>
<td>Software Requirements Specification</td>
</tr>
<tr>
<td>S/W</td>
<td>Software</td>
</tr>
<tr>
<td>Term</td>
<td>Definition</td>
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<td>---------</td>
<td>---------------------------------------------------------------------------</td>
</tr>
<tr>
<td>TBD</td>
<td>To Be Determined</td>
</tr>
<tr>
<td>TOD</td>
<td>Time of Day</td>
</tr>
<tr>
<td>TOPR</td>
<td>Task Order Proposal Request</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
</tr>
<tr>
<td>USDOT</td>
<td>United States Department of Transportation</td>
</tr>
<tr>
<td>User Developer</td>
<td>A software developer that designs and develops programs for controllers.</td>
</tr>
<tr>
<td>Walkthrough</td>
<td>A step-by-step presentation by the author of a document in order to gather information and to establish a common understanding of its content.</td>
</tr>
<tr>
<td>WBS</td>
<td>Work Breakdown Structure</td>
</tr>
<tr>
<td>WG</td>
<td>Working Group</td>
</tr>
</tbody>
</table>
APPENDIX C – PROJECT TEAM RESUMES

See Appendices C1 through C11.
APPENDIX D – WORK EFFORT BY ORGANIZATION AND INVOICING TEMPLATES

The level of effort (labor hours for each subcontractor) and the Prime Contractor for Task 13-003 are set for in Appendices D1 through D5, by WBS.

By Subcontractor:
1. Resources by labor classification
2. Total number of hours for each subcontractor,
3. An estimated number of hours for each resource,
4. Total number of estimated hours for each WBS-Sub-deliverable;
5. % of total hours for each WBS-Sub-deliverable compared to the total Number of hours in the subcontractor’s budget. This % is developed by using the number of hours for each WBS Sub-deliverable and the total hours dedicated for subcontractor. For example, if total hours in subcontract= 1,000 hours and there is 100 in a WBS deliverable, 100/1,000=10%.
6. % Total Budget. The % total budget is calculated by taking #5 above, the % total hours and multiplying this by the total subcontract amount. Thus, if the contract is valued at $100,000 and the WBS Sub-deliverable is valued at 10%, the value of the subcontractor’s sub-deliverable is valued at $10,000 when completed and accepted by the client.

Sample Composite Invoice

A sample subcontractor composite invoice is shown in Appendix D4. It provides sample invoices for a calendar period for Intelight, Adaptive Solutions, Pillar and a Composite Invoice. The composite invoice shows the percentage total invoiced, for all WBS sub-deliverables and the end of the invoice, shows, and the bottom-line, in terms of the percentage completion in terms of dollars for invoiced for the project and total percentage completion. Based on the schedule, it is the intent for ITE to develop an “earned value lite” or performance index for each invoicing period once the project is underway.

Progress will measured by the criteria shown in the PMP and repeated again:
1. A sub-deliverable may be invoiced to the USDOT when a first draft is completed and submitted. The value agreed upon by all parties to this Contract is 35%.
2. A sub-deliverable may be invoiced to the USDOT when comments are incorporated in a subsequent draft or drafts of a deliverable. These subsequent drafts are to be completed and submitted to the USDOT. The comprehensive value agreed upon by all parties to this Contract is 65%. The incremental value is 30% (65% minus 35%).
3. A sub-deliverable may be invoiced to the USDOT when a final deliverable is acceptable and approved in writing by the USDOT. The comprehensive value agreed upon by all parties to this Contract is 100%. The incremental value is 35% (100% minus 65%).

Subcontractor agreements to ITE will be performance-based. They will be fixed-fee and will be billed based on the percentage completion of each deliverable noted in the Appendices incorporated herein. As discussed in the kick-off meeting of 18 December 2013, ITE and the subcontractors may mutually agree to modify the allocation of hours between WBS’s if they do not materially change the nature of the Task. If there appears for a material modification in the allocation of WBS level of effort, ITE will seek guidance from USDOT COR and CO on how to best handle the situation.