

# Systems Engineering Checklist & Instructions

## Background

On January 8, 2001 the Final Rule on Intelligent Transportation Systems (ITS) Architecture and Standards Conformity (Final Rule) and the Final Policy on Architecture and Standards Conformity (Final Policy) were enacted by the FHWA and FTA respectively. The Final Rule/Final Policy ensures that ITS projects or ITS elements within a project carried out using funds from the Highway Trust Fund including the Mass Transit Account conform to the National ITS Architecture and applicable ITS standards.

The Final Rule requires that all ITS projects or ITS elements within a project that use Federal Funds be developed using a systems engineering analysis. Section 23 CFR 940.11 specifies seven activities that are to be preformed to accomplish a systems engineering analysis. These seven activities are identified on the attached Systems Engineering (SE) Checklist under the column labeled "Systems Engineering Element".

Project managers are required to complete a systems engineering analysis for "...any project in whole or in part that funds the acquisition of technologies or systems of technologies, that provide or significantly contribute to the provision of one or more ITS [user services](#), as defined in the [National ITS Architecture](#). In other words, an ITS project is any project that may provide an opportunity for integration at any point during its life." This applies to all projects or portions of projects. Systems that stand alone, that are not and will not integrate with another system is not subject to a systems engineering analysis.

## Instructions for Completing the Systems Engineering Checklist

Project managers are required to use the attached SE Checklist to demonstrate that their ITS project(s) or ITS element within a project were developed using a systems engineering approach. (This checklist is a required Appendix to Design Study Report for projects with ITS elements that require a DSR. See section 450.5.2 of the Preconstruction Manual.

The SE checklist can be found at <http://iways.alaska.gov> or <http://web.dot.state.ak.us> The Checklist is also included in this document for convenience.

For larger projects, there may be separate documents that cover one or more of the systems engineering requirements. In those cases, a summary of the relevant information should be included in the SE Checklist and the document should be referenced. References should include: the full name of the plan or document; date and year the document was prepared; and the heading/heading number of the section



within the document where the information is provided. Upon entering the reference, enter the date the information was verified in the far right column.

If documents or plans do not exist for the necessary information, all the relevant information must be entered in the SE Checklist. For minor or straightforward projects, the required information may only be one or two paragraphs for each of the seven required systems engineering elements. For complex projects, documentation for some of the elements will likely be much longer and a separate document that can be attached to the checklist may be in order.

Two example SE Checklists are available on the Department's intranet (<http://web.dot.state.ak.us>). More detailed instructions for documenting each of the required systems engineering elements is provided in this package, on the pages following the checklist.

**Questions? Alaska DOT&PF, Transportation Data Services**

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	<b>Date:</b>		
<b>Alaska Iways Architecture</b>	<b>Project Name:</b>		
<b>Systems Engineering Checklist</b>	<b>Project No.:</b>		
	<b>Project Manager:</b>		
<b><u>Systems Engineering Element</u></b>	<b><u>How Element is Met/Fulfilled</u></b>		<b><u>Date Completed</u></b>
1. Portions of the Regional ITS or Statewide Iways Architecture being implemented. Must identify the Program Area(s) and a brief description of the functional needs to meet that Program Area(s).			
2. Participating agencies roles and responsibilities.			
3. Requirements definitions.			
4. Analysis of alternative system configurations and technology options to meet requirements.			
5. Procurement option(s).			
6. Applicable ITS standards that are being implemented and testing procedures that will be used upon project implementation.			
7. Procedures and resources necessary for operations and management of the system.			

### **1) Identify portions of the Regional ITS or Statewide Iways Architecture being implemented.**

Summarize and reference the document(s) that describe the new ITS project or elements and how they meet the functional needs of one or more of the ITS Program Areas identified in the ITS Architecture. Chapter 4 (Operational Concept), and more specifically Section 4.6 of the AIA Update may provide an initial starting point for meeting this requirement. Also, check to see if there is a project level or system concept of operations that might include a discussion of the portions of the architecture being implemented.

If there are no existing documents that describe new ITS project or elements and how they meet the functional needs of one or more of the ITS Program Areas identified in the ITS Architecture, then this section of the Systems Engineering Checklist should provide this description.

### **2) Identify participating agencies roles and responsibilities.**

Summarize and reference the document(s) that define agency roles and responsibilities as they pertain to ITS system design, purchase, installation, operation, maintenance, and modification. Chapters 4 and 5 of the latest version of the Alaska Iways Architecture (Operational Concept and Physical ITS Architecture respectively) may provide an initial starting point for satisfying this requirement. Also, check to see if there is a project level or system concept of operations that might discussion of participating roles and responsibilities.

If there are no existing documents that define agency roles and responsibilities as they pertain to ITS system design, purchase, installation, operation, maintenance, and modification, then this section of the Systems Engineering Checklist should provide this description.

### **3) Identify requirements definitions**

Summarize and reference the documents(s) that define “what” the subject ITS project or element is required to do. This includes all items necessary to complete a fully operational system including hardware, software, installation, training, etc. For many projects, there may be a formal requirements document that is developed. For example, you might have a requirements list included with an RFP. If there is no existing requirements document, this section should identify high-level requirements for the project. Please note that requirements are “what” statements. They are later further developed into “how” statements (or specifications) during the design process. Refer to the U.S. Department of Transportation report titled [Developing Functional Requirements for ITS Projects](#) for specific guidance on developing functional requirements.



**4) Conduct analysis of alternative system configurations and technology options to meet requirements.**

Summarize and reference the document(s) that list the alternatives that were considered during the development of the ITS project or element. Such a document should list strengths and weaknesses, technical feasibility, institutional compatibility, and life cycle costs of each alternative, and the preferred alternative. If there is a project level or system concept of operations that covers this project, it should include an alternatives analysis that could be referenced here.

If there are no existing documents that list the alternatives that were considered, then this section of the Systems Engineering Checklist should provide this listing.

**5) Identify procurement options.**

Summarize and reference the document(s) that identify procurement options for the ITS project or element, or list the procurement method used on the attached Systems Engineering Checklist.

If there are no existing documents that identify procurement options, then this section of the Systems Engineering Checklist should describe the procurement options.

**6) Identify applicable ITS standards that are being implemented and testing procedures that will be used upon project implementation.**

Summarize and reference the document(s) that identify the ITS standards that apply to new ITS projects or elements. A list of standards applicable to projects identified in the Alaska Iways Architecture can be found in Appendix E (ITS Standards). Depending on the elements of the new ITS project, additional ITS standards may have been approved since the initial development of the AIA. Also, check to see if there is a project level or system concept of operations that might include a discussion of standards.

If there are no existing documents that identify the ITS standards that apply, then this section of the Systems Engineering Checklist should identify the applicable standards.

**7) Identify procedures and resources necessary for operations and management of the system.**

Summarize and reference the document(s) that identify the internal policies or procedures necessary to recognize and incorporate the new system into current operations and decision processes. Resources that support continued operations, including staffing and training should also be referenced.



If there are no existing documents that identify the procedures and resources necessary to operate and manage the ITS elements of the project, then this section of the Systems Engineering Analysis form should identify the needed O&M procedures and resources.

