Puget Sound Regional Council

MAINSTREAMING INTELLIGENT TRANSPORTATION SYSTEMS (ITS) INTO THE TRANSPORTATION PLANNING PROCESS

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1. INTRODUCTION

The Transportation Equity Act for the 21st Century (TEA-21) requires that all intelligent transportation system (ITS) projects using highway trust funds (including the mass transit account) must "conform" to the National ITS Architecture and ITS technical standards. The implementation of this requirement is found in the Federal Highway Administration (FHWA) Rule[1] and the Federal Transit Administration (FTA) Policy[2], which took effect on April 8, 2001. While additional guidance from FHWA and FTA is forthcoming, the Puget Sound Regional Council is taking the lead in ensuring compliance with the new federal ITS requirements for the Puget Sound region, which includes King, Kitsap, Pierce, and Snohomish Counties. The purpose of the technical memorandum is to recommend the process by which the Regional Council will ensure compliance.

2. ITS ARCHITECTURE AND STANDARDS CONFORMITY: FHWA FINAL RULE AND FTA POLICY

The federal ITS requirements began as a Congressionally mandated requirement in TEA-21. This section provides an overview of the legal basis, policy intent, and summary of the new requirements and discusses the resulting regional requirements.

2.1 LEGAL BASIS OF FHWA RULE MAKING AND FTA POLICY

Section 5206(a) of TEA–21 requires that the Secretary of US Department of Transportation (US DOT) shall:

> "develop, implement, and maintain a national architecture and supporting standards and protocols to promote the widespread use and evaluation of intelligent transportation system technology as a component of the surface transportation systems of the United States[3]."

Direction for the implementation of this Congressional intent for deployment of a National ITS Architecture and related technical standards is found in Section 5206(e) of TEA–21. This section requires that the Secretary of US Department of Transportation (US DOT):

> "shall ensure that intelligent transportation system projects carried out using funds made available from the Highway Trust Fund, including funds made available under this subtitle to deploy intelligent transportation system technologies, conform to the national architecture, applicable standards or provisional standards, and protocols developed under subsection (a)[4]."

[1] Federal Highway Administration, 23 CFR Parts 655 and 940, Intelligent Transportation System Architecture and Standards; Final Rule, Federal Register, Vol. 66, No. 5, page 1446, January 8, 2001.
[2] Federal Transit Administration, National ITS Architecture Policy on Transit Projects, Federal Register, Vol. 66, No. 5, page 1455, January 8, 2001.
[3] Transportation Equity Act for the 21st Century, Public Law 105-178, 112 Stat. 456, Section 5206(a)
[4] Transportation Equity Act for the 21st Century, Public Law 105-178, 112 Stat. 457, Section 5206(e)

The FHWA Rule and FTA Policy are virtually identical in content. Separate agency actions were needed because of the differences in the way the two agencies administer projects.

2.2 PURPOSE

The overall purpose of the federal ITS requirements are to foster the integration (and proper consideration of integration) of ITS applications being deployed in a region through the use of the National ITS Architecture and the deployment of projects using ITS technical standards. The National ITS Architecture, adopted in 1996, provides a technical and institutional framework to guide the coordinated deployment of ITS by public agencies and private organizations alike. The National ITS Architecture is not a design, rather, it defines the framework around which multiple design approaches can be developed, each one specifically tailored to meet the unique needs of the region or project. The National ITS Architecture also defines the functions that must be performed to implement a given service, the physical entities or subsystems where these functions reside, the interfaces/information flows between subsystems, and the communication requirements for the information flows.

The federal ITS requirements call for a collaborative process to engage a wide range of regional stakeholders in the development of a Regional ITS Architecture based upon the National ITS Architecture. The National ITS Architecture is to be tailored to local requirements to ensure it meets local needs. This regional integration effort is expected to enable electronic information sharing, facilitate future ITS expansion, and provide for future interoperability of key ITS services at a national level.

2.3 POLICY INTENT

The policy statement of the federal ITS requirements consists of three distinct elements[5].

1. ITS projects shall conform to the National ITS Architecture and related ITS technical standards in accordance with the requirements contained in the federal ITS requirements.
2. Conformance with the National ITS Architecture is interpreted to mean the use of the National ITS Architecture to develop a Regional ITS Architecture.
3. Development of the Regional ITS Architecture should be consistent with the transportation planning process for statewide and metropolitan transportation planning.

2.4 RULE SUMMARY

The final FHWA Rule and FTA Policy were published on January 8, 2001 in the Federal Register and took effect on April 8, 2001. The federal ITS requirements call for the development of a Regional ITS Architecture. The requirements define applicability of the requirements to an individual ITS project and require that a systems engineering analysis be conducted for an applicable ITS project.

[5] Federal Highway Administration, ITS Architecture and Standards Conformity: FHWA Final Rule and FTA Policy, PowerPoint presentation, April 2001.

An ITS project is defined as any project which applies electronics, communications, or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system. Or it is a project that, in whole or in part, significantly contributes to the provision of one or more ITS user services as defined in the National ITS Architecture[6]. Examples include interconnecting traffic signals, transit signal priority systems, variable message signs, closed-circuit television cameras, automatic passenger counters, and traffic signal control software.

The ITS requirements apply to all projects using funds from the federal highway trust fund including the mass transit account. These include funds from such sources as the National Highway System (NHS) Program, Surface Transportation Program (STP), Congestion Management and Air Quality (CMAQ) Program, and Federal Transit Administration (FTA) Program.

The U.S. Transportation Secretary may authorize exceptions in the following circumstances:

> (1) Projects designed to achieve specific research objectives outlined in the National ITS Program Plan under section 5205 of the TEA-21, or the Surface Transportation Research and Development Strategic Plan developed under 23 U.S.C. 508; or
>
> (2) The upgrade or expansion of an ITS system in existence on the date of enactment of the TEA-21 (June 9, 1998), if the Secretary determines that the upgrade or expansion:
>
> > (i) Would not adversely affect the goals or purposes of Subtitle C (Intelligent Transportation Systems Act of 1998) of the TEA-21;
> >
> > (ii) Is carried out before the end of the useful life of such system; and
> >
> > (iii) Is cost-effective as compared to alternatives that would meet the conformity requirement of this rule[7].

Item (2) may be of interest to project sponsors who are updating existing systems. These provisions do not apply to funds used for operations and maintenance of an ITS system in existence on June 9, 1998. Any ITS project that has advanced to final design by April 8, 2001 will not be subject to the requirements of the FHWA Rule and FTA Policy.

The federal ITS requirements direct that ITS projects using federal funds be based on a systems engineering analysis. Systems engineering is a structured process that considers the total life cycle among alternatives. This involves considering technical merits, costs, and the relative value of alternatives. The federal ITS requirements indicate that the following seven activities are the minimum required for completing a systems engineering analysis:

1. Identification of portions of the Regional ITS Architecture being implemented.

[6] Federal Highway Administration, 23 CFR, Section 940.3, Intelligent Transportation System Architecture and Standards; Final Rule, Federal Register, Vol. 66, No. 5, page 1453, January 8, 2001.
[7] Federal Highway Administration, 23 CFR, Section 940.7, Intelligent Transportation System Architecture and Standards; Final Rule, Federal Register, Vol. 66, No. 5, page 1453-1454, January 8, 2001.

2. Identification of participating agencies' roles and responsibilities.
3. Requirements definitions.
4. Analysis of alternative system configurations and technology options to meet requirements.
5. Procurement options.
6. Identification of applicable ITS standards and testing procedures.
7. Procedures and resources necessary for operations and management of the system[8].

The design of all ITS projects funded with Highway Trust Funds in the region must accommodate the interface requirements and information exchanges as specified in the Regional ITS Architecture. If the final design of the ITS project is inconsistent with the Regional ITS Architecture, then the Regional ITS Architecture shall be updated to reflect the changes.

2.5 REGIONAL REQUIREMENTS

The federal ITS requirements imply that a series of actions will be undertaken by the appropriate organization that assumes responsibilities for implementing its provisions. The first item is the definition of the region. As the Metropolitan Planning Organization (MPO), the Puget Sound Regional Council is accepting lead responsibility for regional ITS planning for the four-county region, which includes King, Kitsap, Pierce, and Snohomish counties. Beyond this item, the following regional requirements are intended as part of the federal ITS requirements:

- **Incorporation of ITS Applications into the Regional Planning Process**: A key intent of the ITS requirements is to ensure that ITS applications are considered in the development of regional transportation plans and projects.
- **Regional ITS Architecture**: The Regional ITS Architecture is a framework for ensuring institutional agreement and technical integration for the implementation of ITS projects within a region. The FHWA Rule and FTA Policy require that a region that is currently implementing ITS projects must develop a Regional ITS Architecture to guide the deployment of ITS projects by April 8, 2005. The National ITS Architecture shall be used as a resource in developing the regional architecture. The Regional ITS Architecture shall be on a scale commensurate with ITS investments in the region.
- **Program Implementation**: Each ITS project in the region must be developed using systems engineering analysis techniques. Each project sponsor shall now be required to conduct this analysis for each ITS project for which the federal ITS requirements are applicable. The organization responsible for implementing the rule (in this case, the Regional Council) must be able to ensure that applicable projects meet the systems engineering analysis requirement and are compatible with the Regional ITS Architecture. The recommended approach to implementing this portion of the ITS requirements is described later in this memorandum.

[8] Federal Highway Administration, 23 CFR, Section 940.11, Intelligent Transportation System Architecture and Standards; Final Rule, Federal Register, Vol. 66, No. 5, page 1454, January 8, 2001.

- **Program Administration**: Prior to authorization of highway trust funds for construction or implementation of ITS projects, compliance with the federal ITS requirements will be demonstrated. Compliance will be monitored under established Federal-aid oversight procedures in effect in Washington State. The primary mechanism for regional project review that is available to the Regional Council is during the regional transportation improvement program (TIP) process. The Puget Sound Regional Council, again, will assume responsibility for ensuring compliance.

3. RECOMMENDED REGIONAL APPROACH FOR ENSURING COMPLIANCE WITH THE FHWA ITS RULE AND FTA ITS POLICY

With the finalization of the FHWA Rule and FTA policy, the Regional Council is taking responsibility for ensuring compliance with the federal ITS requirements for the Puget Sound region. The Regional Council has already started the process. Prior to the start of the federal rulemaking and policy development process, the Regional Council initiated a project to develop the Puget Sound Regional ITS Architecture and included ITS elements in the development of the region's long-range transportation plan - Destination 2030. Relevant stakeholders were consulted during these efforts and in the development of a recommended regional approach to implementing the federal ITS requirements.

The following sections describe the recommended approach for the implementation of the federal ITS requirements in the Puget Sound region. The three recommended components in the implementation are:

1. Incorporate ITS elements into Destination 2030
2. Develop a Puget Sound Regional ITS Architecture
3. Incorporate the ITS Rule Conformity into the Regional Transportation Improvement Program (TIP) Development Process

3.1 STAKEHOLDER CONSULTATION ON MAINSTREAMING

Stakeholders involved in the transportation planning and programming processes were consulted in the development of ways to mainstream ITS into the transportation planning and programming process in the region. In April 2001, the Regional Council held a workshop to explain to major stakeholders the requirements of the FHWA Rule and FTA Policy, and the implications for local project sponsors and project planning and programming. Opportunities for including ITS into this processes were presented. Participants in the meeting included representatives from the following organizations:

- FHWA
- FTA
- Sound Transit
- WSDOT Northwest Region
- WSDOT Advanced Technology Branch

- WSDOT Highways and Local Programs
- WSDOT Olympic Region
- Puget Sound Regional Council

Stakeholders emphasized that many of the details about the ITS elements of proposed projects are developed during design. The required systems engineering analysis would normally be part of the design process for such technology-based efforts. The provision of in-depth details about how the project complies with the Regional ITS Architecture would be better known at the end of the design phase when the systems engineering analysis would be complete. It was suggested that information concerning compliance with the ITS requirements be requested at two points in the project development cycle, once at the planning level and secondly at the end of the design level, prior to construction.

A primary concern of the stakeholders was developing a process that fostered the continued deployment of ITS in the region and would not significantly add additional administrative burden to both the Regional Council and the individual project sponsors. The concept of "self-certification" of compliance with the federal ITS requirements by the project sponsors was discussed. Under this concept, each project sponsor would demonstrate how their ITS project fit into the Puget Sound Regional ITS Architecture and certify that a systems engineering analysis was conducted.

This stakeholder input combined with the federal regulatory requirements form the basis for the recommendations presented in this memorandum in Section 3.4.

3.2 INCORPORATING ITS ELEMENTS INTO DESTINATION 2030

A primary goal of the federal ITS requirements is to foster the incorporation of ITS elements into the transportation planning process. The Regional Council has already met this goal by providing a more detailed ITS element in the Destination 2030, which is the 2001 update of the central Puget Sound Region's Metropolitan Transportation Plan (MTP). The ITS element in Destination 2030 was developed in cooperation with regional stakeholders and includes a series of implementation strategies that support the deployment of a regionally coordinated intelligent transportation system. These implementation strategies include references to the Regional ITS Architecture as the guide for deploying ITS projects in the region.

3.3 DEVELOP REGIONAL ITS ARCHITECTURE

The Regional ITS Architecture is a framework for ensuring institutional agreement and technical integration for the implementation of ITS projects in the region. As part of this overall project, the development of the Puget Sound Regional ITS Architecture[9] and detailed ITS Transit Architecture[10] is complete. The process used the National ITS Architecture as a resource. While the Regional ITS Architecture development process began before the federal ITS requirements

[9] Puget Sound Regional Council, Prepared by IBI Group in association with PB Farradyne, Pacific Rim Resources, and Battelle Memorial Institute, Puget Sound Regional ITS Architecture, May 2001.
[10] Puget Sound Regional Council, Prepared by PB Farradyne under contract to IBI Group in association with Pacific Rim Resources, and Battelle Memorial Institute, Puget Sound Regional Intelligent Transportation Systems Transit Architecture, May 2001.

became effective, the Puget Sound Regional ITS Architecture was developed to contain all of the elements required by the federal ITS requirements. These elements include:

- Description of the region
- Identification of participating agencies and other stakeholders
- Operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the systems included in the Regional ITS Architecture
- Any agreements (existing or new) required for operations, including at a minimum those affecting ITS project interoperability, utilization of ITS related standards, and the operation of the projects identified in the Regional ITS Architecture
- System functional requirements
- Interface requirements and information exchanges with planned and existing systems and subsystems (for example, subsystems and architecture flows as defined in the National ITS Architecture)
- Identification of ITS standards supporting regional and national interoperability
- Sequence of projects required for implementation

It is anticipated that the Regional Council's Transportation Policy Board will endorse the Regional ITS Architecture in June 2001. In the future, the Regional Council staff will work with regional stakeholders to periodically update the Regional ITS Architecture to reflect the incorporation of new ITS projects and additional regional requirements.

3.4 INCORPORATING ITS CONFORMITY INTO REGIONAL TIP PROCESS

Both the Regional Council and regional stakeholders desire to implement the new federal ITS requirements in a manner that fully supports the continued deployment of coordinated ITS projects within the region. As part of its current duties, the Regional Council reviews transportation projects of regional significance and all projects funded with state and/or federal Highway Trust Funds during the development of the regional Transportation Improvement Program (TIP). Both stakeholders and Regional Council believe that inserting the monitoring requirements of the new FHWA ITS Rule and FTA ITS Policy into the TIP development process is the most appropriate and efficient way to ensure conformance. In this section, the proposed approach for incorporating the new federal ITS requirements into the regional TIP process and the implications for project sponsors is described.

3.4.1 Overview of Regional TIP Process

Under TEA-21, the Regional Council is responsible for programming and maintenance of the region's three-year transportation improvement program. The regional TIP is a listing of:

- All federally funded transportation projects.
- All state (i.e., WSDOT) funded transportation projects.

- All regionally significant projects, regardless of funding sources, which must be included for regional level air quality conformity analysis.

In June, the Regional Council reviews the entire set of transportation projects submitted by project sponsors for inclusion in the regional TIP. Projects can be included in the TIP at all stages of development – planning, design, construction and implementation. The Regional Council staff currently screens projects to ensure all federal and state requirements are meet. These include: a) financial feasibility, b) consistency with the regional metropolitan transportation plan, and c) conformance with air quality regulations.

In August, after the projects have been screened and a regional air quality analysis completed, the draft regional TIP is made available for a period of public review and comment. Next, the Transportation Policy Board (TPB) approves the Draft TIP, and the Executive Board recommends approval of the TIP as a final action. In October, the regional TIP is forwarded to the WSDOT for inclusion in the State TIP (STIP). Final approval of the STIP by the US DOT (FHWA and FTA) usually takes place in December. Funds are eligible to be obligated for individual projects after final US DOT approval of the State TIP in January. Accordingly, if the project is not in the regional TIP, project funds will not be forthcoming.

On a monthly basis, project sponsors can request a modification to the TIP if the modification does not require a new regional air quality conformance analysis. These routine amendments can include deleting a project already in the TIP, adding a future phase to a project already in the TIP, changing the scope of a project, or adding new federal funds.

3.4.2 Recommended Changes to Regional TIP Process

The recommended change would be to incorporate checking for compliance with the federal ITS requirements into the regional TIP development process. The ITS compliance screening would only apply to projects that include ITS elements and meet the applicability requirements of the federal ITS requirements. The overall approach is based on "self-certification" by project sponsors affirming that they will comply with the ITS requirements. The project sponsor is taking responsibility for meeting the federal ITS requirements for their project. An official that could commit the organization to compliance (i.e., Public Works Director, Transportation Director) would be required to authorize the certification. The self-certification would take place at two points in the project development cycle.

1. **Planning**: At the planning level, the project sponsor would provide a short description of how their ITS project would fit into the Regional ITS Architecture and agree to conduct a systems engineering analysis for the project during the design phase. If the project were not currently addressed in the Regional ITS Architecture, the Regional Council would work with the project sponsor to modify the Regional ITS Architecture to encompass the project.
2. **Design (Prior to Construction)**: Many of the details about the ITS elements of a project are developed in greater detail during the design phase. Providing in-depth details about the project's compliance with the new federal ITS requirements is most appropriate during the design phase, prior to construction. The project sponsor would, again, "self-certify" that the systems engineering analysis was completed

and provide the Regional Council with information on the final project ITS architecture and its relationship with the Regional ITS Architecture for the purpose of maintaining the regional ITS architecture. FHWA or FTA may independently request additional documentation on the systems engineering analysis before funds are released for construction.

The recommended process is illustrated in Figure 1. The self-certification requirements would be in place for update to the 2001- 04 TIP.

3.4.3 Implications for Agencies Deploying ITS Applications

When planning an ITS project, project sponsors will be required to determine how their ITS applications fit within the Regional ITS Architecture. The Regional Council will provide access to reference material and guidance on its Website.

Systems engineering analysis and documentation as described in the federal ITS requirements will be required as part of the design process at a level of detail commensurate with the project. The analysis will be required to be completed prior to authorization of construction or implementation of an ITS project. Agencies deploying ITS applications will need to incorporate a systems engineering analysis into their design phases.

Guidance will be available on the Regional Council Website and will be added to WSDOT project development documentation in the future. The exact process used to meet the federal ITS requirements will continue to be dynamic because pending guidance is being developed by FTA and FHWA.

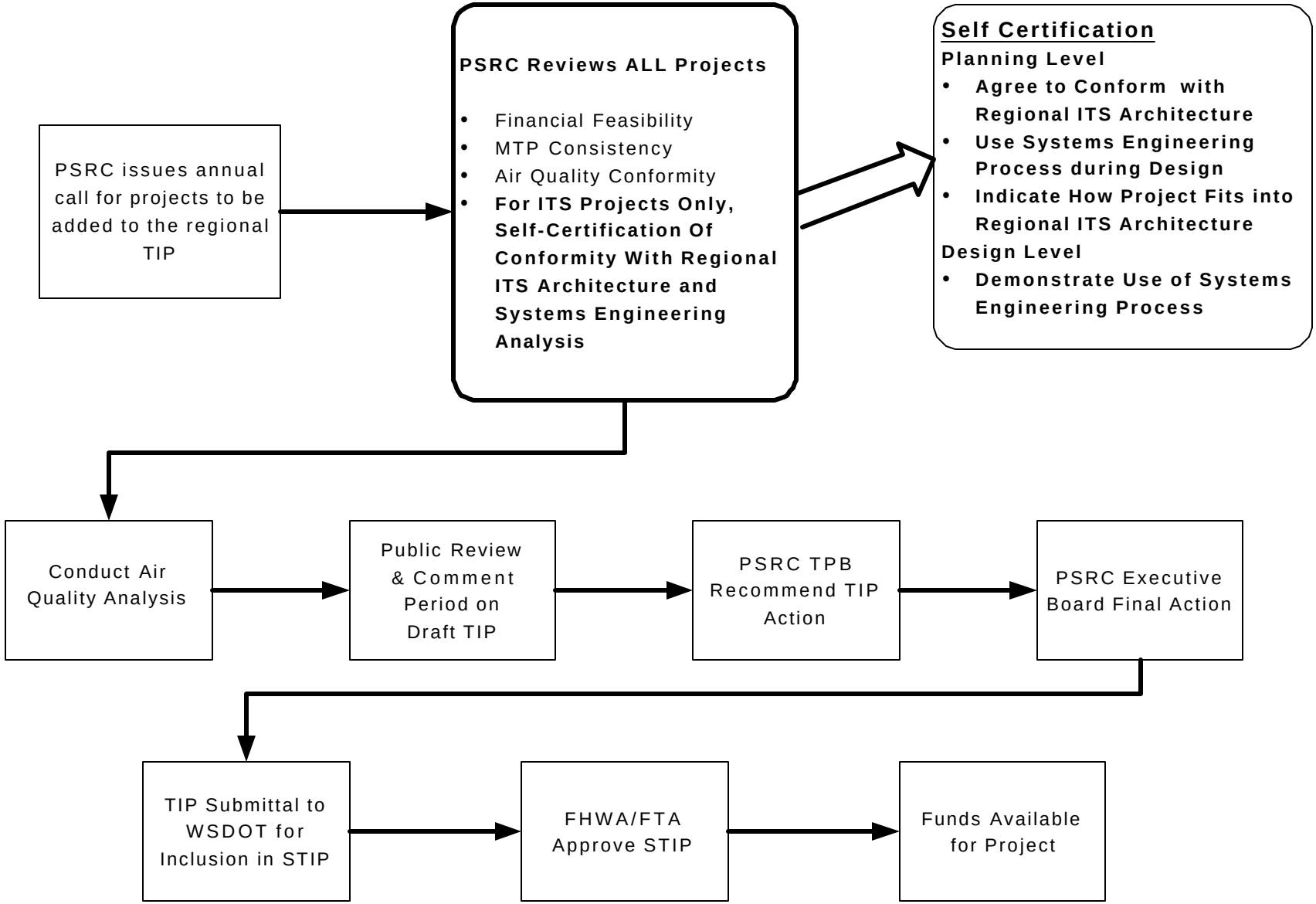

Figure 1: Flowchart For Proposed Incorporation of ITS Architecture Conformance in the Regional TIP Process