HOUSTON REGION
ITS ARCHITECTURE &
STRATEGIC PLAN
GUIDANCE DOCUMENT

prepared for

HGAC

Houston-Galveston Area Council

February 4, 2004

PBS&J

Battelle

DISCLAIMER

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The authors acknowledge the contributions of the steering committee for the project. The Steering Committee was comprised of members from the TranStar Leadership Team and includes the following:

The authors would like to thank the 2002 Houston Galveston Technical Advisory Committee (TAC), who served as the regional stakeholders throughout the project. The TAC is comprised of representatives from the following organizations/interests:

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1.0 INTRODUCTION

1.1 Background

In September 2003, an Intelligent Transportation System (ITS) Strategic Plan and ITS Architecture were completed and adopted by the Transportation Policy Council (TPC) for the Houston Region. Those documents provide the "road map" to guide the deployment of transportation projects that utilize advanced technologies, such as surveillance, detection, communications, and information management technologies. The objective in completing the plan and architecture was to promote appropriate coordination of ITS elements throughout the region, and the planning, implementation and operation of those ITS elements so that the region's needs are met. The benefit of many types of ITS projects is fully realized only when different agencies and jurisdictions coordinate their efforts.

The Houston-Galveston Area Council (H-GAC) administered the project under which the Houston Region ITS Strategic Plan and ITS Architecture were developed. Development of these products was conducted under the leadership of a Steering Committee composed of members from the Houston TranStar Leadership Team, representing H-GAC, the Texas Department of Transportation (TxDOT), Harris County Traffic, METRO, City of Houston Office of Emergency Management, Harris County Office of Emergency Management, and TranStar. A Technical Advisory Committee composed of representatives from additional counties and cities also provided input to the process.

The Houston region is comprised of eight counties including Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller counties (Figure 1). The Houston Region has been active for many years in deploying and operating ITS based systems.
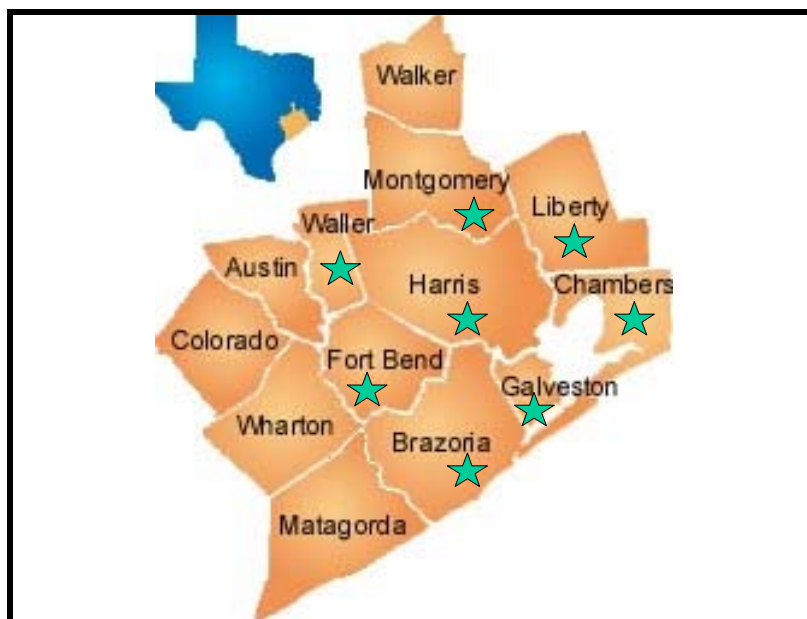
Figure 1-1: Counties Included in the Houston Region ITS Strategic Plan and Architecture (identified with a ★)

The ITS Architecture was the first of the two documents developed. The architecture is a foundation element for deploying and integrating ITS. Drawing upon a standardized set of ITS architecture terms and concepts identified by the United States Department of Transportation, the architecture defines how major elements of a comprehensive system are integrated. It identifies the major components of the regional ITS, their functions and the types of information that will flow between the components. Development of a Regional ITS Architecture, consisting of a specific set of required elements, is required by the Federal Highway Administration (FHWA) and Federal Transit Administration in order for state and local agencies to utilize federal funding for the implementation of ITS projects. So, the development of the architecture not only advances local objectives related to making the Houston Region ITS as effective as possible, but also satisfies a critical federal requirement.

The Houston Region ITS Strategic Plan presents a program for implementing portions of the regional ITS outlined in the architecture. The strategic plan identifies an overall mission and vision for ITS in the region, identifies the major existing (or "legacy") ITS systems, identifies needs and requirements that are to be addressed through ITS, outlines agency roles and responsibilities, and identifies a phased set of specific ITS projects.

1.2   Purpose of this Document

In addition to the FHWA and FTA requirements that regions implementing ITS develop a regional ITS architecture, implementers of ITS projects utilizing federal funds are also required to utilize the regional ITS architecture in the development of their projects, and that those projects be based on a "systems engineering analysis". This document provides guidance to Houston Region ITS project developers and implementers on how to satisfy those requirements, including specific guidance on how the Houston Region ITS Strategic Plan and Architecture can be used in meeting those requirements. The document also provides guidance for how to insert ITS projects into the regional Transportation Improvement Program (TIP) process.

2.0   DEFINITION OF AN ITS PROJECT

Federal ITS architecture requirements are contained in two documents, the FHWA ITS Architecture and Standards Final Rule and the nearly identical FTA National ITS Architecture Policy on Transit Projects (Federal Register, January 8, 2001). The full text of both the FHWA Rule and FTA Policy can be found at the USDOT web site on architecture conformity: http://www.its.dot.gov/aconform/aconform.htm.

Since ITS related requirements apply only to ITS projects that utilize federal funds, determination of whether a particular project is in fact an ITS project is the first and critical consideration when addressing the federal ITS requirements. The Rule and Policy both contain the same definition of ITS and an ITS project:

> "*Intelligent Transportation System (ITS)* means electronics, communications, or information processing used singly or in combination to improve the efficiency or safety of a surface transportation system. *ITS project* means any project that in whole or in part funds the acquisition of technologies that provide or significantly contribute to the provision of one or more ITS user services as defined in the National ITS Architecture" (Section 940.3 in the FHWA Final Rule, January 2001).

User services document what ITS should do from the user's perspective. A broad range of users are considered, including the traveling public as well as many different types of system operators. User services, including the corresponding user service requirements, form the basis for the National ITS Architecture development effort. The initial user services were jointly defined by USDOT and ITS America with significant stakeholder input and documented in the National Program Plan. The concept of user services allows system or project definition to begin by establishing the high level services that will be provided to address identified problems and needs. New or updated user services have been and will continue to be satisfied by the National ITS Architecture over time.

The latest version of the National ITS Architecture, version 5.0, was released in October 2003. The architecture identifies 33 ITS user services grouped into eight "bundles". Bundling of the user services is based on modal and other similarities among various services. Table 2-1 presents the National ITS Architecture user services. Definitions for user services can be found in the National ITS Architecture (http://itsarch.iteris.com/itsarch/). The list of user services presented in Table 2-1 is slightly different than the list that was in existence at the time the Houston Region ITS Architecture was completed. Specifically, the "Disaster Response and Evacuation" service is new in Version 5.0 of the National ITS Architecture.

Table 2-1
National ITS Architecture User Services

User Service Bundle	User Services
1. Travel And Traffic Management	1.1 Pre-trip Travel Information
	1.2 En-route Driver Information
	1.3 Route Guidance
	1.4 Ride Matching And Reservation
	1.5 Traveler Services Information
	1.6 Traffic Control
	1.7 Incident Management
	1.8 Travel Demand Management
	1.9 Emissions Testing And Mitigation
	1.10 Highway Rail Intersection
2. Public Transportation Management	2.1 Public Transportation Management
	2.2 En-route Transit Information
	2.3 Personalized Public Transit
	2.4 Public Travel Security
3. Electronic Payment	3.1 Electronic Payment Services
4. Commercial Vehicle Operations	4.1 Commercial Vehicle Electronic Clearance
	4.2 Automated Roadside Safety Inspection
	4.3 On-board Safety And Security Monitoring
	4.4 Commercial Vehicle Administrative Processes
	4.5 Hazardous Material Security And Incident Response
	4.6 Freight Mobility
5. Emergency Management	5.1 Emergency Notification And Personal Security
	5.2 Emergency Vehicle Management
	5.3 Disaster Response And Evacuation
6. Advanced Vehicle Safety Systems	6.1 Longitudinal Collision Avoidance
	6.2 Lateral Collision Avoidance
	6.3 Intersection Collision Avoidance
	6.4 Vision Enhancement For Crash Avoidance
	6.5 Safety Readiness
	6.6 Pre-crash Restraint Deployment
	6.7 Automated Vehicle Operation
7. Information Management	7.1 Archived Data Function
8. Maintenance And Construction Management	8.1 Maintenance And Construction Operations

Given the broad definition of "ITS" in the Federal Rule/Policy, and the wide range of transportation technology projects covered under National ITS Architecture User Services, it is reasonable to expect that many, if not most, transportation technology projects will be considered ITS projects. Examples of ITS projects include the following:

- Roadway or transit vehicle or facility real-time surveillance systems
- Centralized traffic signal control systems
- Traveler information systems (dynamic message signs, web sites, telephone systems, etc.)
- Various roadway detection systems (weather, vehicle height warning, etc.)
- Computer-aided dispatch (CAD) radio systems
- Vehicle tracking/fleet management systems (e.g., automatic vehicle location for transit or maintenance vehicle fleets)
- Fiber optic communications systems linking transportation management centers (including transit dispatch/operations centers) with one-another, or linking the centers to field equipment

In the "Frequently Asked Questions" section of the USDOT architecture conformity web site (http://www.its.dot.gov/aconform/faqs.htm) the USDOT has acknowledged the potential difficulty of determining whether some simpler and/or smaller scale projects are ITS projects. They offer the following advice to the question "Is any single traffic signal upgrade an 'ITS project'":

> "FHWA anticipates this will probably be the most difficult judgment regarding ITS projects that will have to be made. There are so many variations on how and when traffic signals were installed, that the answer may be yes or no. This decision must be made at the FHWA Division office level with considerable input from the affected State and local agencies. As a rule of thumb, consider the following:

> If the project entails upgrading a majority of the signals in a system or in a geographic area, then yes, it's an ITS Project. For instance, upgrading the hardware of 200 of 250 intersections would probably count as an ITS project. But so would upgrading 1 of 3 intersections, if that is all you have in your town. Consider asking yourself 'what is the percentage of the total intersections being upgraded?' If the answer is a high percentage, then it probably is an ITS project.

> It should be noted that the systems engineering (SE) process must be applied to all ITS projects or projects with ITS elements. However, as each of the steps in the SE process is applied, it is likely that only a few details will need to be addressed on most projects and quite often, standards will probably be the only step considered in detail. The real test is experience. Consider the scope of the project and use good judgment as to whether it should be considered an ITS project or not."

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3.0   FEDERAL AND REGIONAL ITS ARCHITECTURE REQUIREMENTS

Federal ITS architecture requirements are contained in two documents, the FHWA ITS Architecture and Standards Final Rule and the nearly identical FTA National ITS Architecture Policy on Transit Projects (Federal Register, January 8, 2001). The full text of both the FHWA Rule and FTA Policy can be found at the USDOT web site on architecture conformity: http://www.its.dot.gov/aconform/aconform.htm.

3.1   Federal ITS Architecture Requirements

The Rule and Policy require that regions implementing ITS projects that utilize Highway Trust Fund monies (which include nearly all types of federal transportation funding, including the Mass Transit Account), including projects on National Highway System (NHS) as well as non-NHS facilities, develop a regional ITS architecture. The Rule/Policy specifically identifies the various elements that must be included in that architecture. Through the completion of the Houston Region ITS Architecture and Strategic Plan in November 2002, and through the maintenance of the architecture and plan that will be performed, the Houston Region has satisfied the regional ITS architecture requirement.

3.2   Federal ITS Project Requirements

The Rule and Policy also contains requirements applicable to the implementation of *specific ITS projects*. These requirements apply to all federally-funded ITS projects, per the definition identified in Section 2 of this document. The requirements do not apply to funds used for operations and maintenance of an ITS system in existence on June 9, 1998. Aside from that exemption, the only other exceptions to the ITS project requirements require the approval of the Secretary of the USDOT, who may authorize exceptions for:

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, if the Secretary determines that the upgrade or expansion:
   a. Would not adversely affect the goals or purposes of Subtitle C (Intelligent Transportation Systems Act of 1998) of the TEA-21;
   b. Is carried out before the end of the useful life of such system; and
   c. Is cost-effective compared to alternatives that would meet the conformity requirements of this rule.

Assuming that the federally-funded ITS project does not constitute operations and maintenance of a pre-June 1998 ITS system and that no exception is obtained from the Secretary of the USDOT, the Federal Rule/Policy identifies two requirements for ITS projects:

1. **Adhere to the Regional ITS Architecture** – ITS projects shall conform to the National ITS Architecture and those ITS standards that have been formally adopted

by USDOT. Conformance with the National ITS Architecture is interpreted to mean the use of the National ITS Architecture to develop a regional ITS architecture, and the subsequent adherence of all ITS projects to that regional architecture. The only specific language provided pertaining to the definition of "regional architecture conformance" is the following: ITS projects "shall accommodate the interface requirements and information exchanges as specified in the regional ITS architecture" (Federal Rule, Section 940.11 (d)). The Rule/Policy also states that "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". (Section 940.11 (d))

2. **Perform a Systems Engineering Analysis** – In the development of an ITS project, a systems engineering analysis shall be conducted, on a scope and scale commensurate with the project scope. "Systems engineering is a structured process for arriving at a final design of a system. The final design is selected from a number of alternatives that would accomplish the same objectives and considers the total life-cycle of the project including not only the technical merits of potential solutions but also the costs and relative value of alternatives" (Federal ITS Rule, Section 940.3).

    The Federal ITS Rule/Policy requires that the system engineering analysis include, at a minimum include the following (remember, the extent of the analysis is always scaled based on the project scope):

    i. Identification of portions of the regional ITS architecture being implemented;
    ii. Identification of participating agencies roles and responsibilities;
    iii. Requirements definitions;
    iv. Analysis of alternative system configurations and technology options to meet requirements;
    v. Procurement options;
    vi. Identification of applicable ITS standards and testing procedures; and
    vii. Procedures and resources necessary for operations and management of the system.

Guidance on how to comply with the federal ITS requirements is provided in Section 4.2.

3.3   Regional ITS Requirements

In cases where an ITS project is exempt from the federal ITS requirements because it does not utilize federal funding, it may still be important, depending on the specific project, to perform some of all of the steps that would be performed to meet federal requirements. Section 4.0 of this report explains the circumstances under which those implementing non-federally funded ITS projects should use the regional strategic plan and architecture to develop a non-federally funded ITS project, and/or to perform all or portions of a systems engineering analysis.

4.0   HOUSTON REGION
ARCHITECTURE CONFORMITY PROCESS

This section presents the process for determining the applicability of, and meeting, federal or regional ITS requirements and presents recommendations for how ITS projects can be inserted in the regional TIP process.

4.1   Conformity Process Overview

The FHWA Rule and FTA Policy do not mandate a specific local process, or local agency roles, in insuring that federally-funded ITS projects comply with the Rule/Policy. The Rule/Policy states only that: (1) compliance will be self-certified by federal funding grantees, and (2) that monitoring of compliance will be done as part of normal oversight by FHWA/FTA.

In the Houston Region, the responsibility for demonstration of compliance with the Federal ITS requirements resides ultimately with the federal funding grantee. However, ITS project implementers are strongly encouraged to consult with H-HAC as they determine whether the federal requirements apply to their project, and as they work to meet those requirements. Non-federally funded ITS projects that entail integration with other ITS elements should still be developed using the regional architecture and a partial or complete systems engineering process may still be required, per Houston Region ITS requirements (see Section 3.3). It should be kept in mind that, formal "requirements" aside, use of the general systems engineering analysis to develop complex technology systems represents good engineering practice and contributes to successful project implementation and operation. The need for, and approach to, meeting local ITS requirements is one of the determinations that is best made in consultation with H-GAC.

H-GAC shall review ITS projects to ensure they meet the federal and regional ITS requirements. All ITS projects must be submitted to H-GAC for review. Once projects are approved they will become eligible for inclusion in the TIP process.

Coordination with H-GAC is especially important if it appears that the project design may be inconsistent with the regional architecture. As indicated in Section 3.0, the federal requirements indicate that the architecture may be changed in response to the project. Such a change must be coordinated with H-GAC, and before such a change is considered, H-GAC should be involved in deciding whether the deviation from the architecture compromises any important regional objectives.

Figure 4-1 graphically summarizes the Houston Region process for determining the applicability of Federal ITS project requirements.   The steps in the process are summarized following Figure 4-1.
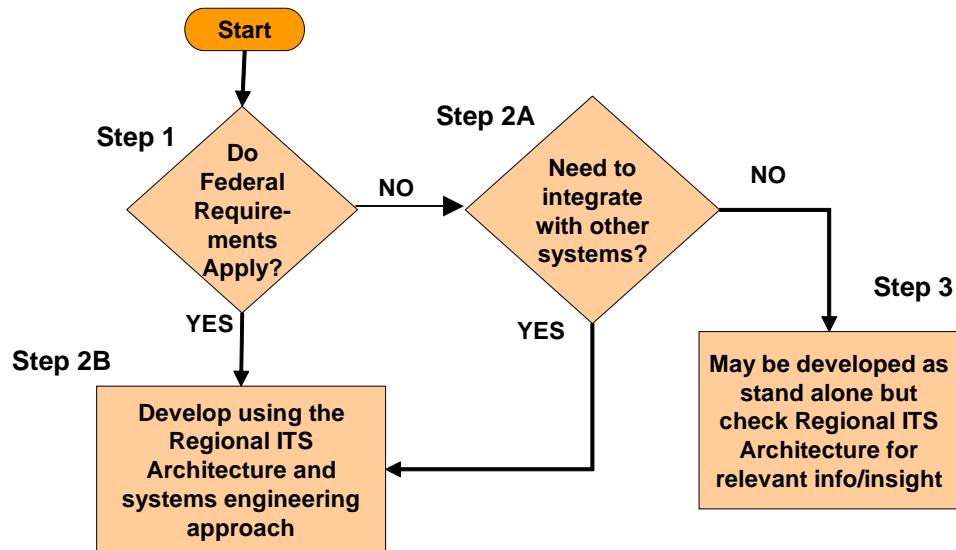
Figure 4-1: Architecture Conformity Determination Process

4.1.1 Step 1: Determine Applicability of Federal Requirements

The process begins with determining whether the FHWA Rule/FTA Policy are applicable to the project in question. This includes determination of whether the project is federally funded (i.e., utilizes Highway Trust Funds, including the Mass Transit Account), whether the project is an ITS project, and whether any of the possible USDOT Secretary-authorized exceptions may be applicable. If exceptions are applicable, or if the project is either not an ITS project or not federally funded, then the project is exempt from federal ITS requirements, but must still consider the need to comply with regional ITS requirements.

4.1.2 Step 2A - Determine Applicability of Local ITS Requirements

If federal requirements do not apply because the project is non-federally funded, a determination must be made as to whether and how the regional ITS architecture and strategic plan should be used to guide the development of the project, and whether, and how rigorous, a systems engineering analysis should be conducted. This determination will be based on to what extent the project is impacted, impacts, or will be integrated with, other ITS elements in the Houston Region.

If the project is truly a stand-alone effort, then it will be exempt from local ITS requirements. If the project does relate to or will be integrated to some extent with other ITS elements in the Houston region, then the same activities required of projects for which federal ITS requirements apply should be performed. The extent of those activities will be scaled depending on the extent of the project's integration. For major non-federally funded ITS projects that will be integrated with other regional ITS systems should essentially perform the same activities as projects for which the federal ITS requirements apply.

The determination of the degree of a non-federally funded project's integration with other ITS elements, and therefore the rationale for coordinating project development with the regional strategic plan and architecture and performing a systems engineering analysis, should consider the following factors.

1. **Is the project specifically identified in the regional ITS strategic plan?**

2. **Does the project represent a geographic expansion of a project identified in the ITS strategic plan; a pre-requisite to or subcomponent of a project in the ITS strategic plan; or an implementation at Location A of the same sort of type of project identified for implementation at Location B in the strategic plan?**

3. **Does the project exchange information with another regional ITS system?**

If the answer to any of these questions is "yes", then it is likely that the project entails integration and should adhere to the federal ITS requirements to some extent, with the level of effort scaled based on the extent of integration. In considering the extent of integration, project implementers should keep in mind the three conceptual levels of integration identified on page 5-1 of the Houston Region ITS Strategic Plan:

Level I, Peaceful Co-existence - involves no physical integrations between ITS sub systems. Information exchange takes place in the form of coordination typically based on requests via meetings or public communications media such as telephone, fax, e-mail, etc. Arguably, such institutional coordination is the basis of further integration of ITS systems.

Level II, Information Sharing but No Dependency - represents some level of physical integration among the ITS subsystems. Data networking (e.g., direct connection, modem, wide-area-network, internet) is involved to provide electronic data exchange among the ITS subsystems. The typical data sharing scheme is to periodically push (e.g., using File Transfer Protocol (FTP)) a copy of the selected system (e.g., signal timing plans) or operation data (e.g., traffic volumes, speeds, incidents) to a remote system. However, the data exchange does not affect the actual functionalities of the ITS subsystems. That is, no dependency exists that could adversely affect the operations of other ITS subsystems.

Level III, Information Sharing with Dependency - represents the highest level of integration which ITS subsystems share the common communications network, data servers, and control over the field devices. Often, the functionalities of a subsystem rely on data input or sharing of physical components (e.g., communication lines) from other subsystems. Dependency exists among the subsystems. The failure of a subsystem could adversely affect the functions and performance of other subsystems. The advantage of a fully integrated system is the provision of ultimate flexibility and efficiency of data and device control sharing. However, reliability and survivability are critical when the dependency between subsystems exists. It is important to identify the critical path and provide adequate redundancy to the critical components.

4.1.3 Step 2B – Comply with Federal or Regional ITS Requirements

If federal requirements do apply, the ITS project must adhere to the regional ITS architecture (or establish justification for deviating from the regional architecture and arrange for the regional ITS architecture to be modified) and a systems engineering analysis must be used in the development of the project. Guidance on how to meet these requirements and specific project examples are presented in Section 4.2.
As described in Step 2A, above, If the project is exempt from federal ITS requirements because it is non-federally funded, but entails integration with other Houston Region ITS sub systems, then some version of the federal requirement compliance activities should be performed. The extent of those activities should be commensurate with the extent of integration associated with the project.

4.1.4 Step 3 – Develop as a Stand Alone Project

If in Step 2A it is determined that the non-federally funded ITS project contains very little or no integration with other regional ITS sub systems, that is, it is entirely a "stand alone" project, then no formal requirements for "adhering" to the regional ITS architecture or coordinating with the ITS strategic plan apply, but the project implementer is encouraged to check those documents for relevant information or insight.

4.2 Demonstrating Architecture Conformity and Systems Engineering Process

Once the applicability of federal and regional ITS requirements has been determined (that is, once it has been decided to what extent the ITS project should be developed in adherence to the regional ITS architecture and using a systems engineering analysis), preferably in consultation with H-GAC, the project implementer (or funding grantee if they aren't the same entity) must perform the activities necessary to meet those requirements. This section provides examples of the information to be submitted to H-GAC for various types of ITS projects. These materials should be submitted by the agency that is proposing the ITS project.

Note that the examples shown here have been streamlined somewhat for illustrative purposes. In some cases, if these were real projects, it may be appropriate to include more extensive information. It should also be noted that, especially for more complex projects, the information provided in the self-certification form will not constitute the entirety of the documentation of architecture consistency; rather, it is merely a summary. Only the self-certification form will be submitted to H-GAC, but it will be assumed that more complete documentation of the systems engineering analysis exists. Such information would likely be needed if the FHWA were to make an inquiry into the architecture consistency of given project.

For each example, the project is briefly described and the following information is presented:

- **Contact Information** – name, organization and phone number of person submitting the form.
- **Date** – date that the form is submitted.
- **Project Owner** – the project sponsor/implementer.

- **Project Name** – name of the project.
- **Project Scope and Location** – brief description of the project and the specific location.
- **Applicability of ITS Conformity Requirements** – answer the questions: Is it an ITS Project? Is it Federally Funded? Is it identified in the Strategic Plan and/or the Architecture? Does FHWA Rule 940/FTA Policy Apply?
- **Systems Engineering Analysis**
  - Version of the regional architecture document referenced.
  - Version of the regional strategic plan document referenced.
  - Relevant portions of the regional architecture – identify the user services and market packages from the regional architecture which are implemented, in whole or in part, by the project.
  - Additional steps in systems engineering analysis – provide brief responses to the remaining six questions/steps in the system engineering analysis process (see page 3-2), e.g., Identification of Roles and Responsibilities, etc.
- **Systems to be Integrated with** – identify which ITS sub system(s) in the Houston Region the project will be integrated with, e.g., "TranStar CCTV System".

A total of three project examples are provided, illustrating federally-funded projects for which federal requirements apply; non-federally funded with significant integration and for which regional requirements apply (i.e., to perform some or all of the same actions as would be required if federally funded); and non-federally-funded projects without integration for which regional requirements do not apply (implementers still encouraged to consult architecture and strategic plan):

- Federally-Funded:
  1. Surveillance at Strategic Arterial Locations

- Locally-Funded but with Significant Integration:
  2. Road Weather Information Systems (RWIS)

- Locally-Funded without Significant Integration:
  3. Isolated Traffic Signal Field Hardware Modernization and Interconnection

As noted above, in the "identification of relevant portions of the regional architecture" step, ITS project proponents should identify which ITS market packages are represented by/impacted by the project. For reference, Table 4-1 provides a table of contents for the Houston region ITS market package descriptions and diagrams as they are presented in Appendix A of the Houston Region Architecture.

Step 6 of the systems engineering analysis includes identification of "applicable ITS standards". It should be noted that the USDOT has not formally adopted any ITS standards, and as such, no project grantee is under obligation to utilize standards. However, FHWA and FTA strongly encourage grantees to fully consider utilization of ITS standards. There is near universal agreement in the ITS community that standards will provide significant benefits, but to some extent, until standards are utilized by vendors and in real projects, they are unlikely to become mature enough to be formally adopted by USDOT. For this reason, FHWA and FTA are likely to take a keen interest in the standards related aspects of the architecture consistency self-certification. It should also be noted that in many cases, although there are no formally adopted national ITS

standards, or in some cases even any draft or interim standards, there will be state, regional or local ITS standards that should be utilized. For example, TxDOT has developed and utilizes a number of ITS standards. In cases where a project is identified as using a "standard technology or configuration as utilized by TxDOT", or if a project will integrate with an existing TxDOT system, the consideration of standards will likely begin, and potentially end, with the identification of existing state, local or regional standards.

Table 4-1
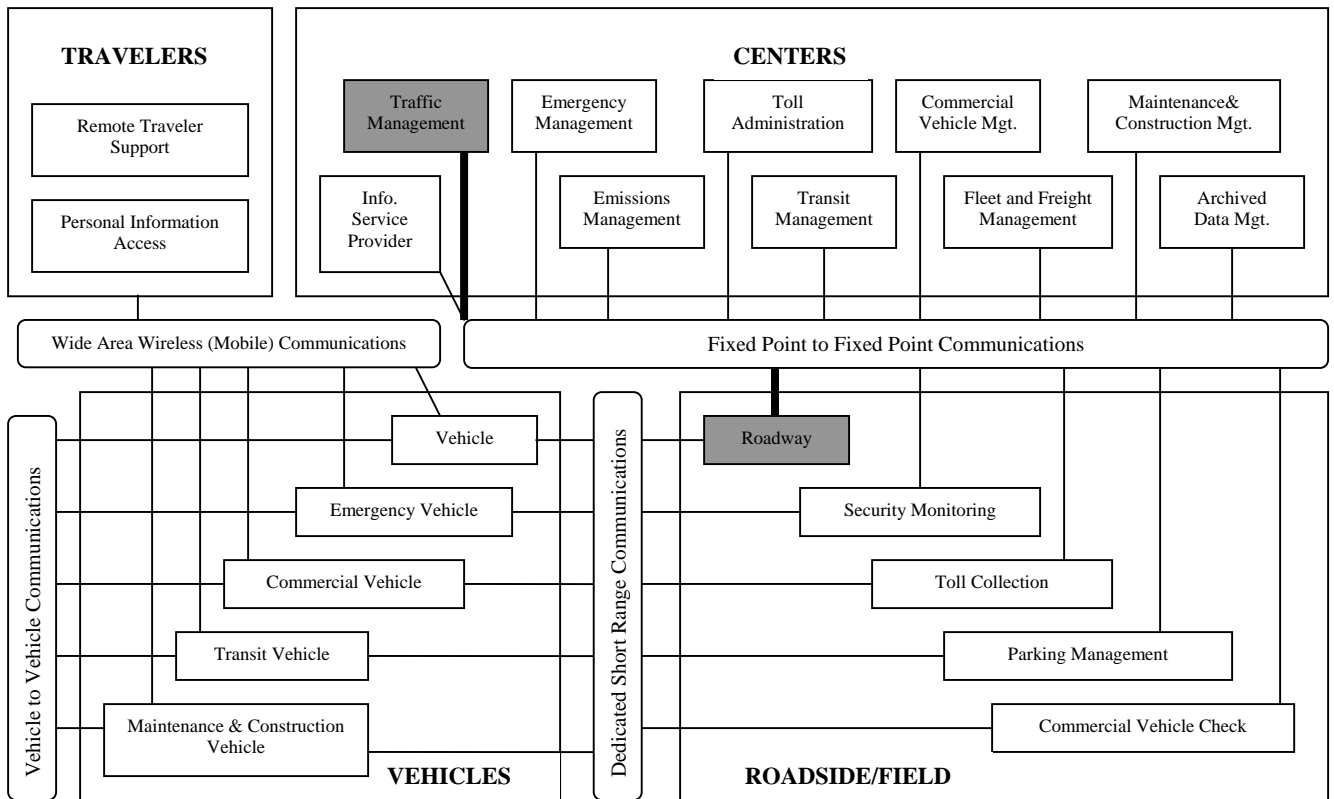**ITS Market Packages in Appendix A of the**
Houston Region ITS Architecture

Market Package	Page Number
ATMS1 – Network Surveillance	A-1
ATMS2 – Probe Surveillance	A-2
ATMS3 – Surface Street Control	A-3
ATMS4 – Freeway Control	A-5
ATMS5 – HOV Lane Management	A-6
ATMS6 – Traffic Information Dissemination	A-7
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CVO10 – HAZMAT Management	A-42
EM1 – Emergency Response	A-44

Table 4-1
ITS Market Packages in Appendix A of the
Houston Region ITS Architecture

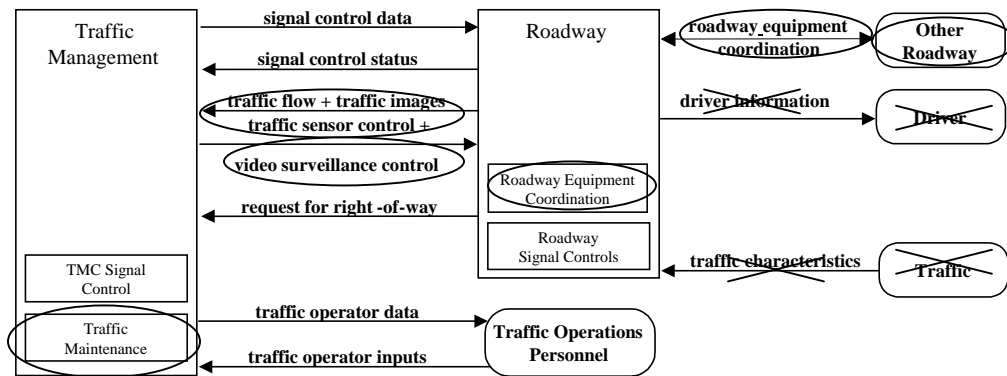| Market Package	Page Number
EM2 – Emergency Routing	A-46
AD1 – ITS Data Mart (NEW)	A-47
AD2 – ITS Data Warehouse	A-48
MC03 – Road Weather Data Collection (NEW)	A-50
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MC07 – Roadway Maintenance and Construction (NEW)	A-52
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Contact Information	Mr. John Doe, City of Bellaire, 281-555-5555
Date	February 4, 2004
Project Owner	**City of Bellaire**
Project Name	**Surveillance at Strategic Arterial Street Locations**
Project Scope & Geographic Location	The City of Bellaire is planning to implement closed circuit television (CCTV) surveillance systems at three locations (Bellaire Blvd and Bissonnet, Bellaire Blvd and West Loop North, and Bellaire Blvd and West Loop South) that will likely be, in the future, tied into a regional surveillance network. The CCTV cameras will be connected to a fiber optic cabling network to enable faster and reliable communications from the field to the city's centralized monitoring center. The city personnel will have the capability of controlling the cameras remotely to pan, tilt, and zoom and view both directions of travel at any of the specified locations. In the future, these cameras may be integrated with the other CCTV systems at TranStar, and this will allow the city to coordinate with TranStar on incident management, traffic detours from freeways onto arterial streets, special events, and major construction projects. Primary benefits of this project include reduction of accident severity by facilitating more effective incident management, reduction in vehicle delay and associated fuel consumption and emissions.
Applicability of ITS Requirements	**Is it an ITS Project?** Given the definition of ITS projects identified in the FHWA Policy and FTA Rule, this project is an ITS project. **Is it Federally Funded?** Yes. **Is it Identified in the Strategic Plan and/or the Architecture Report?** This project is identified in the Strategic Plan. **Does FHWA Rule 940/FTA Policy Apply?** Yes. This project must be developed using the regional ITS architecture (and strategic plan), and a system engineering approach must be utilized. The determination of how the regional architecture and plan should be used to guide the development of this project, as well as the required rigor of the systems engineering analysis, is a determination that local agencies are encouraged to make in consultation with H-GAC.
Systems Engineering Analyses	**Version of the Regional Architecture Document Referenced** • May 2003 **Version of the Regional Strategic Plan Document Referenced** • May 2003 **Identify Relevant Portions of Regional Architecture** • **Associated User Service(s)** - Support Traffic Control *(Note: Page 2-7 and 2-8 of the Regional Architecture Document).* • **Project "location" within the regional "sausage diagram"** (very high level depiction of major ITS systems and subsystems) – Roadside Subsystems and Traffic Management Subsystem (see figure next page on the highlighted subsystems and the communication links) (*Note - page 4-1, part of the Roadside Subsystems of the Regional Architecture*

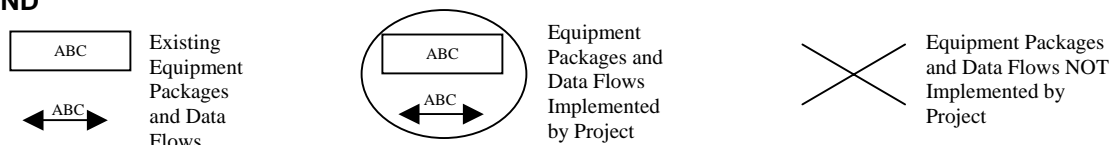|	
	Document). • **Associated Market Package(s),** including identification of the relevant data flows associated with the market package(s) – Surface Street Control and Regional Traffic Control (see Market Package figures with highlighted subsystems and data flows) (*Note – see page A5 and A9 of the Regional Architecture Document).* **<u>Additional Steps in Systems Engineering Analysis</u>** • **Identification of Roles and Responsibilities** – City of Bellaire will be responsible for operating, monitoring, and maintaining the cameras. *(Note: Section 6 of the ITS Strategic Plan)* • **Identification of Applicable ITS Standards** – Traffic Management (Center to Center) and Video Surveillance (Center to Roadside) standards. *(Note: Table 5-1 of the ITS Strategic Plan)* • **Analysis of alternative system configurations and technology options** – System will be consistent with other CCTV's deployed by TxDOT. • **Procurement options** –Request for Proposal (RFP) • **Procedures for operations and maintenance** – Operations will be conducted by the City of Bellaire. Maintenance will be provided by the vendor for the first 24 months after deployment and then will be included in the city's operating budget after the warranty period is over. • **Requirements definition** – The CCTV system shall provide traffic surveillance at the designated locations in both directions of travel. The cameras shall have the capability of tilt, pan, and zoom and provide full motion video images of the intersection to detect and verify traffic and incident related information.
Systems to be Integrated with	• TranStar CCTV System

Sausage Diagram *(Source: Fig. 4-1, Regional Architecture Document)*
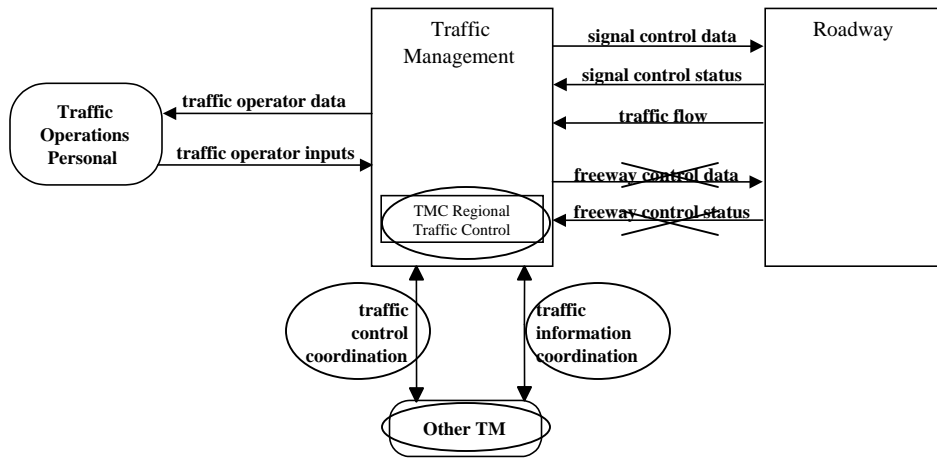
�

■ **Deployed Subsystem** ▬▬▬ **Deployed Communications**

Market Package: Surface Street Control
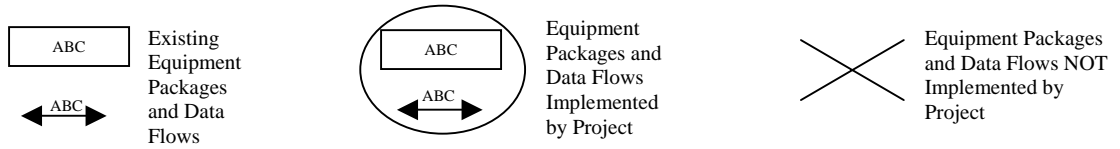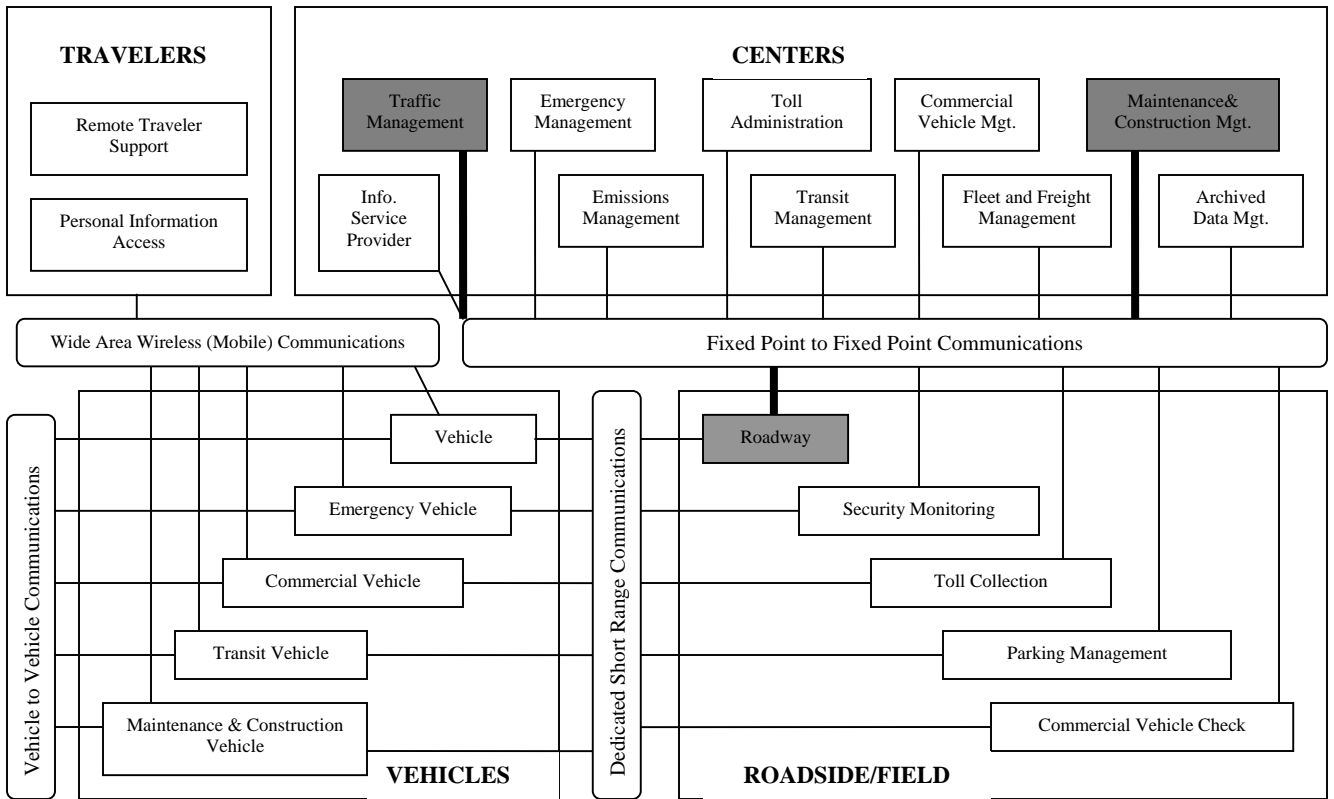*(Source: Fig. A-3, Regional Architecture Document)*

LEGEND

Market Package: Regional Traffic Control
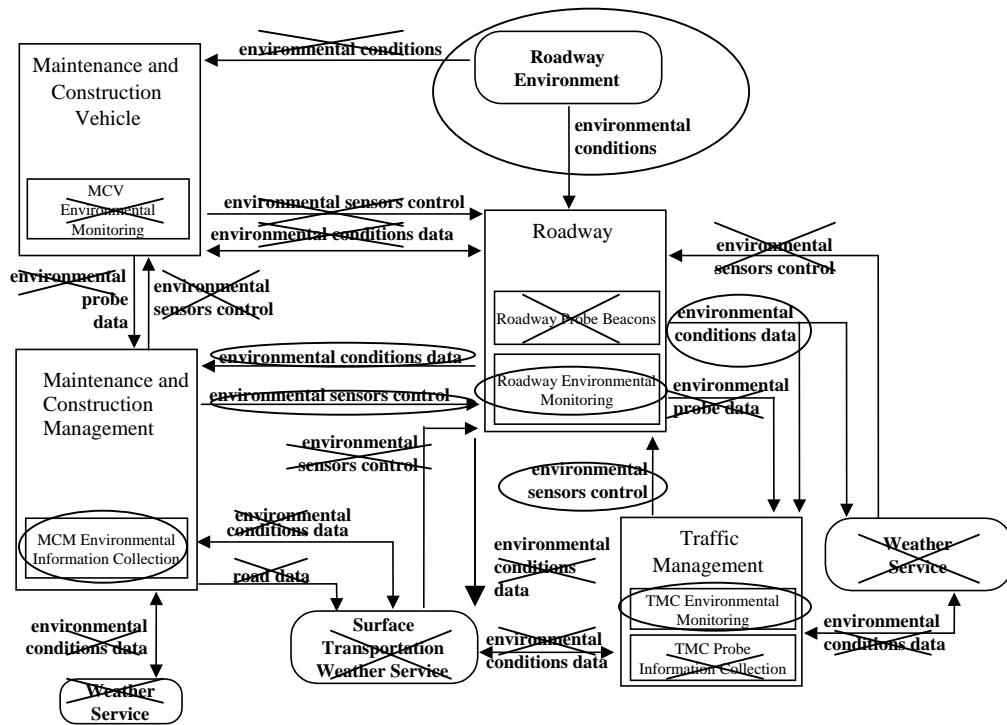*(Source: Fig. A-7, Regional Architecture Document)*

LEGEND

ABC — Existing Equipment Packages and Data Flows

ABC — Equipment Packages and Data Flows Implemented by Project

Equipment Packages and Data Flows NOT Implemented by Project

Contact Information	Ms. Jane Doe, Brazoria County Transportation Department, 281-999-9999
Date	February 4, 2004
Project Owner	Brazoria County
Project Name	Road Weather Information Systems (RWIS)
Project Scope & Geographic Location	Brazoria County is planning to implement a road weather information system by deploying pavement and weather sensors at strategic locations along flood prone roadways. The county will determine the locations of the sensors based on flood data, incident data and traffic volumes. The pavement and weather sensing equipment will consist of a remote processing unit (RPU) to detect the pavement conditions and relate that information to a central processing unit (CPU) that can track and monitor this information. Information collected from these sensors will be provided to the public through a variety of dissemination media and will be integrated with the Harris County Flood Alert System. The RWIS data will also be used by the county maintenance crews for forecasting and clearing weather related incidents and conditions.
Applicability of ITS Requirements	**Is it an ITS Project?** Given the definition of ITS projects identified in the FHWA Policy and FTA Rule, this project is an ITS project. **Is it Federally Funded?** No **Is it identified in the Strategic Plan/Architecture Report?** This project is not identified in the Strategic Plan. **Does FHWA Rule 90/FTA Policy Requirements Apply?** Yes. The scope of the project indicates that the sensors will be integrated with another regional existing system. It is recommended that the project is developed using the regional ITS architecture (and strategic plan), and a system engineering approach. The determination of how the regional architecture and plan should be used to guide the development of this project, as well as the required rigor of the systems engineering analysis, is a determination that local agencies are encouraged to make in consultation with H-GAC.
Systems Engineering Analyses	**Version of the Regional Architecture Document Referenced** • May 2003 **Version of the Regional Strategic Plan Document Referenced** • May 2003 **Identify Relevant Portions of Regional Architecture** • **Associated User Service(s)** – Maintenance and Construction Management *(Note: Page 2-7 and 2-9 of the Regional Architecture Document).* • **Project "location" within the regional "sausage diagram"** (very high level depiction of major ITS systems and subsystems) – Roadside Subsystem and Maintenance and Construction Management and Traffic Management – see figure next page *(Note: Page 4-2, RWIS – part of the Roadside Subsystems of the Regional Architecture Document).* • **Associated Market Package(s),** including identification of the relevant data flows associated with the market package(s) – Road Weather Data Collection and Weather Information Processing and Distribution – see diagrams next page

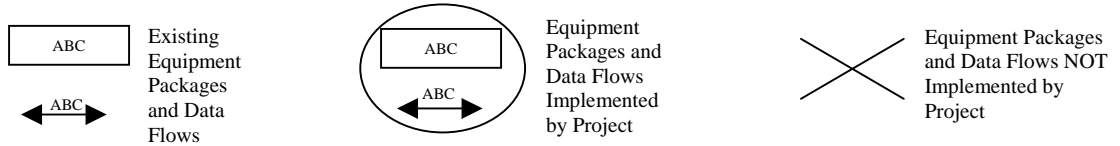|	
	Note: Road Weather Information Systems (version 3.0 of the Architecture) – Page A-19 and A-20 and Road Weather Data Collection (A-43), Weather Information Processing and Distribution (A-44) – Regional Architecture Document). **Additional Steps in Systems Engineering Analysis** • **Identification of Roles and Responsibilities** – Brazoria County will deploy the system, integrate with Harris County, and maintain the system. Harris County at TranStar will monitor the data. *(Note: Section 6 of the ITS Strategic Plan)* • **Identification of Applicable ITS Standards** – Data Collection and Monitoring (Center to Roadside) Standards. *(Note: Table 5-1 of the ITS Strategic Plan)* • **Analysis of alternative system configurations and technology options** – The RWIS shall be equivalent to the existing sensors being operated by Harris County. • **Procurement options** – Sole Source • **Procedures for operations and maintenance**– Once the system is integrated with the Harris County Flood Alert system, TranStar will be responsible for the operations. Brazoria county will maintain the system after the vendor warranty and maintenance contract expires. • **Requirements definition –** The system shall provide Maintenance and Construction Operations (MCO) functions to support monitoring, operating, maintaining, improving and managing the physical condition of roadways, the associated infrastructure equipment, and the required resources. The RWIS shall monitor and forecast conditions and manage treatment of roadways during various travel conditions. The sensors shall be integrated with the Harris County Alert System.
Systems to be Integrated with	Harris County Flood Alert System

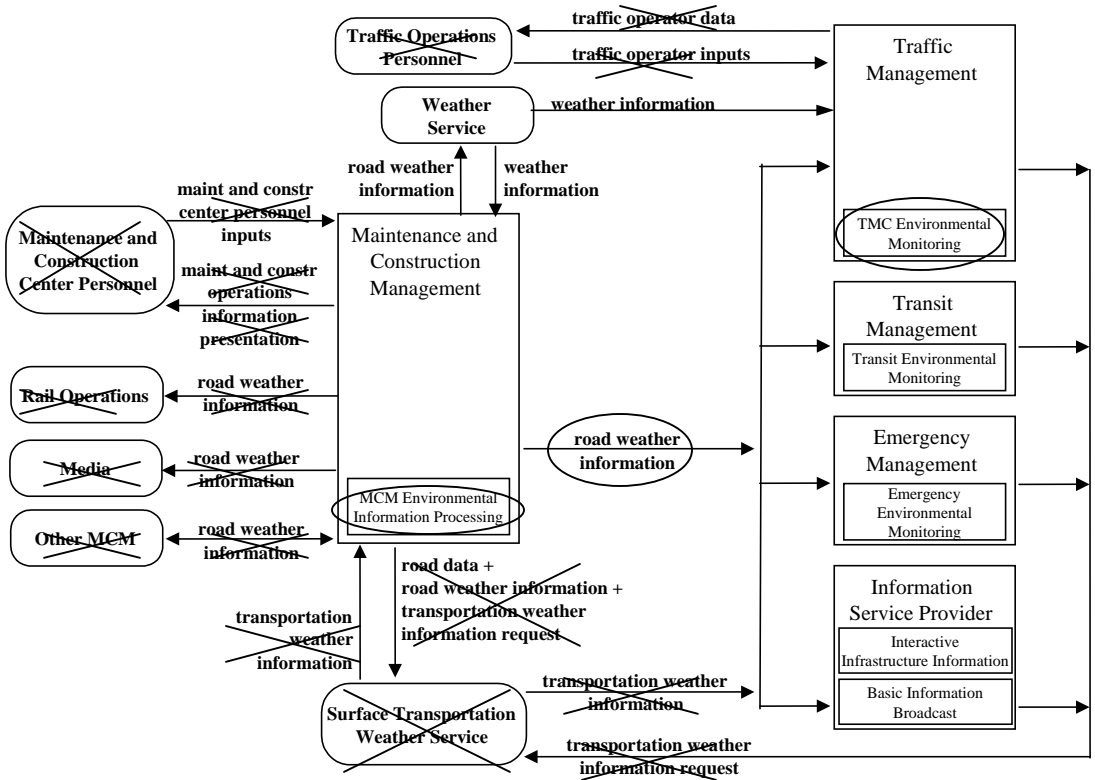**Sausage Diagram** *(Source: Fig. 4-1, Regional Architecture Document)*

▨ **Deployed Subsystem** ▬▬▬ **Deployed Communications**

Market Package: Road Weather Data Collection
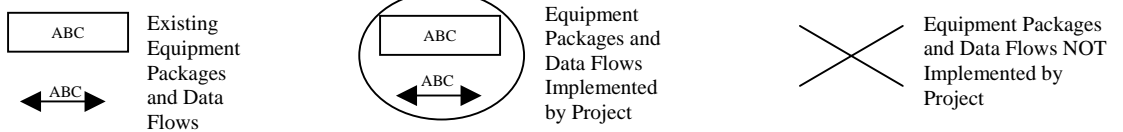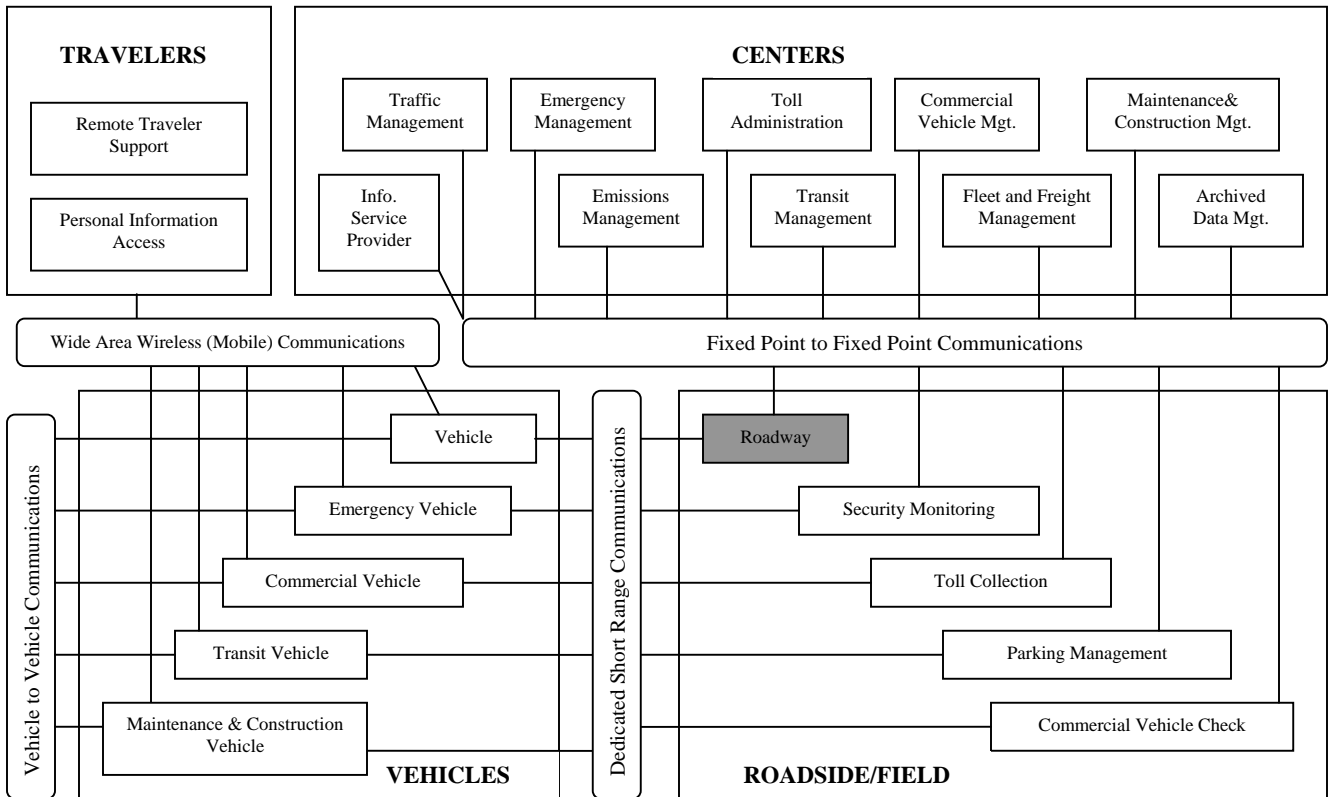*(Source: Fig. A-40, Regional Architecture Document)*

LEGEND

Existing Equipment Packages and Data Flows

Equipment Packages and Data Flows Implemented by Project

Equipment Packages and Data Flows NOT Implemented by Project

Market Package: Weather Information Processing and Distribution
(Source: Fig. A-41, Regional Architecture Document)

LEGEND

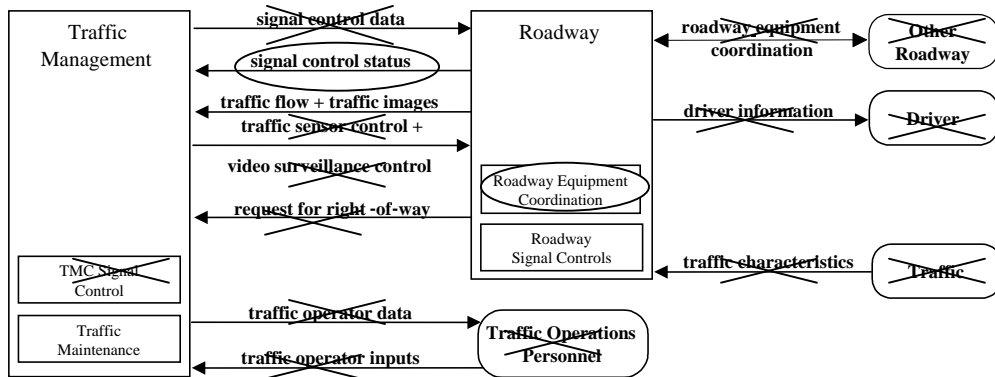|	
ABC (box) / ABC (arrow)	Existing Equipment Packages and Data Flows
ABC (ellipse with box) / ABC (arrow)	Equipment Packages and Data Flows Implemented by Project
X	Equipment Packages and Data Flows NOT Implemented by Project

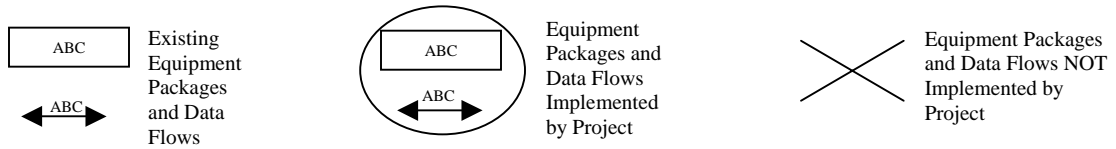| Contact Information	Mr. John Smith, Town of Spring, 281-000-0000
Date	February 4, 2004
Project Owner	Town of Spring, Texas
Project Name	Isolated Traffic Signal Field Hardware Modernization and Interconnection
Project Scope & Geographic Location	The town of Spring, a predominantly rural area, is planning to interconnect two adjacent, but isolated, traffic signals, and also planning to upgrade the hardware for these signals to improve efficiency and better coordination. These signals and this intersection will not be integrating with any other regional traffic control system and will operate as a stand-alone system. The upgrades will include newer controllers (e.g. from electro-mechanical to microprocessor controlled), newer cabinets, improved signal timing plans, and the hardware necessary to connect with the adjacent traffic signal. Other signal upgrades could include implementing automated maintenance and malfunction monitoring, so that the town can eliminate the need for performing manual checks and/or obtaining malfunction information from the public.
Applicability of Federal Rule/Policy	**Is it an ITS Project?** Given the definition of ITS projects identified in the FHWA Policy and FTA Rule, this project is an ITS project. **Is it Federally Funded?** No. **Is it identified in the Strategic Plan/Architecture Report?** No. **Does FHWA Rule 940/FTA Policy Requirements Apply?** No. The scope of the project indicates that it is an isolated system and does not plan to integrate or share information with any other regional or local agency. Even though the requirements of the policy on using a regional architecture (see market package figure below) and a systems engineering process are not applicable for this project, the local agency is encouraged to consider using the documented regional architecture and the strategic plan as a guide in implementing this project.
Systems Engineering Analyses	Not Applicable. But, when implementing any new project, it is good practice to use a general systems engineering process based on needs.
Systems to be integrated with	Not applicable.

Sausage Diagram *(Source: Fig. 4-1, Regional Architecture Document)*

� **Deployed Subsystem**   ▬▬▬ **Deployed Communications**

Market Package: Surface Street Control
(Source: Fig. A-3, Regional Architecture Document)

LEGEND

4.3   Integrating ITS Projects into the TIP Process

As previously stated, H-GAC shall review ITS projects to ensure they meet the federal and regional ITS requirements. All ITS projects must be submitted to H-GAC for review. Once projects are approved they will become eligible for inclusion in the TIP process. An ITS project's compliance with the ITS Architecture should be independent of the overall prioritization of project selection/consideration process.

The process illustrated in the figure below shows the steps to be followed in this review process. Each agency shall develop and submit documentation similar to that provided in the previous examples. This documentation shall be provided to Mr. Tung-Lung Cheng at H-GAC. The following are Mr. Cheng's contact information.

Tung-Lung Cheng
Transportation Engineer
Houston-Galveston Area Council
3555 Timmons Lane, Suite 120, Houston, TX 77027
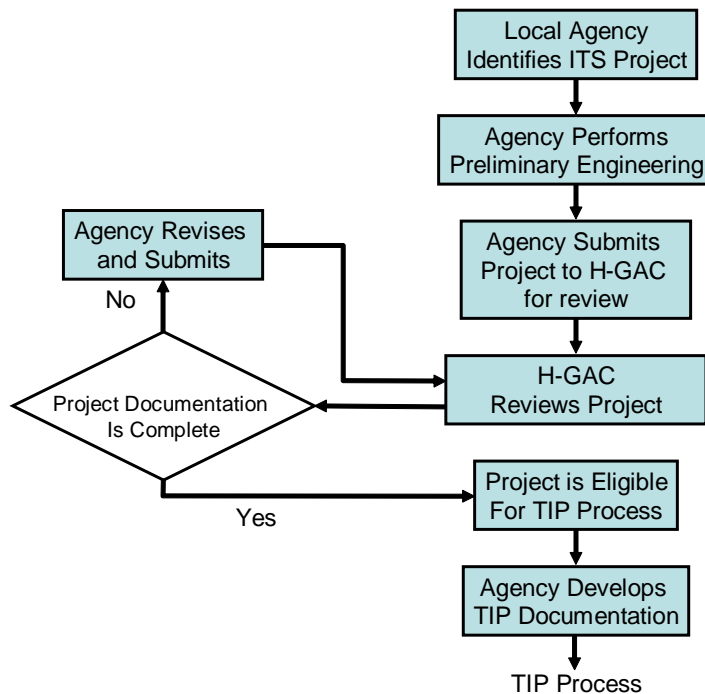phone: (713) 993-2443
fax: (713) 993-4508

Figure 4-2: Process for Integrating ITS Projects into TIP

5.0   WHERE TO FIND MORE INFORMATION

5.1   Houston Region ITS Strategic Plan and Architecture

Information on the Region ITS Strategic Plan and Architecture can be obtained from Mr. Tung-Lung Cheng, Transportation Engineer at the Houston-Galveston Area Council (tung-lung.cheng@h-gac.com); (713) 993-2443).

5.2   National ITS Architecture and Conformity

Extensive information on the National ITS Architecture and conformity with the FHWA and FTA Rule and Policy is available via the USDOT ITS web site (http://www.its.dot.gov/). The "architecture" menu item at the top leads to an on-line version of the latest (version 5.0) National ITS Architecture, includes information on architecture training opportunities, and provides architecture guidance documents (http://www.its.dot.gov/arch/arch.htm).

The "architecture conformity" menu item leads to copies of the FHWA Rule and FTA Policy, guidance documents, sample architecture excerpts, training information, and an extensive and comprehensive list of frequently asked questions relating to many aspects of the architecture, standards and conformity (http://www.its.dot.gov/aconform/aconform.htm).

The USDOT ITS web site also includes much additional information on ITS and the federal ITS program, as well as links to related web sites, including *ITS America*, the leading national ITS industry organization.

FINAL NOTE

An Intelligent Transportation System (ITS) Deployment Requirements Workshop was held in January 13, 2004, in H-GAC Conference Room A, to present important information and tools designed to help ITS stakeholders develop and deploy ITS projects that are consistent with the regional ITS architecture.

The followings are the topics that were discussed in the workshop:

- What is the Regional ITS Architecture?
- What is the Regional ITS Strategic Plan?
- How can I use the ITS Strategic Plan/Architecture in the development of potential ITS projects?
- What documentation is needed with my proposed project to ensure consistency with ITS Strategic Plan/Architecture?

There were more than 70 people attended the workshop, including consultants, ITS stakeholders, and local and federal officials. It was a very successful workshop. This document incorporates comments from the workshop.