INTELLIGENT TRANSPORTATION SYSTEMS (ITS) PLAN FOR THE KERN REGION

DELIVERABLE NO. 11

REGIONAL ITS ARCHITECTURE MAINTENANCE PLAN

MARCH 2018

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1.0 INTRODUCTION

The Intelligent Transportation Systems (ITS) Plan for the Kern Region is a critical component in addressing the transportation needs of the region. As travel demand on the freeway and arterial system increases, there is an increasing need to improve the system through better management of existing capacity. In recognition of this, the Kern Council of Governments (Kern COG) and the local communities in the region continue to invest in ITS. The ITS Plan will ensure that these investments address the important needs in the region and bring the maximum benefit to travelers. The ITS Plan will include a specific implementation plan that reflects the changes in technology since the 1997 ITS Early Deployment Plan (EDP) was completed.

1.1 PROJECT BACKGROUND

The EDP was developed for the Kern region in 1997, led by Kern COG. The EDP was developed in consultation with local Kern County agencies, and reflected the input and priorities of the local agencies. Subsequently, the San Joaquin Valley ITS Strategic Deployment Plan (SDP) was developed for the eight counties of the San Joaquin Valley: Fresno, Kern, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare. The 1997 EDP and the 2001 SDP documents are consistent with one another with regards to the Kern regions' inputs, needs, and plans.

A comprehensive update of the countywide EDP has not been completed since 1997. In the interim, Kern metropolitan area agencies have made significant investments in the planning, design, and implementation of ITS for the surface transportation and transit networks. There is an expectation, documented in the 1997 EDP and Architecture, that investment in ITS strategies will continue with a focus at the local level. At the same time, it's important that investments be made in reliable technologies that deliver proven benefit in a cost effective manner. Toward this end, Kern COG is leading this countywide ITS Plan to direct ITS investments throughout the county over the next twenty years and beyond.

Concurrently, Kern COG is in the process of updating the Regional Transportation Plan (RTP) for 2018, including the development of an updated project list for implementation using local, state, and federal funding. ITS strategies, particularly those related to operational improvements to the arterial street system, and to enhancing transit service are important elements of the RTP and can provide improvements that lend to the Sustainable Community Strategies (SCS). Updating the ITS Plan will provide timely input to the RTP and the SCS, and will improve consistency among the three planning documents.

1.2 ITS PLANNING PROCESS

The ITS planning process is much like any other transportation planning activity, with the primary difference being the focus on technological solutions. One of the primary areas of emphasis of ITS planning is the extensive involvement and participation by the stakeholders of the region. This is especially important to ensure interagency systems integration, address potential institutional issues early, and to provide the necessary education and awareness of advanced technology transportation solutions.

Using the federal ITS planning process as a guideline, the overall approach to achieving the stated project goals will be performance of the following tasks (the **bolded text** indicates the current task and/or deliverable):

Task 1: Project Initiation

Deliverable 1: Project Plan

- The Project Plan incorporates the Stakeholder Engagement Plan, the stakeholder governance structure, and the detailed master project schedule.

Task 2: Data Gathering

Deliverable 2: Existing Data Report

- The report identifies the ITS elements within the Kern region, existing and planned policies/projects combined with an understanding of the region's users to fully recognize the various opportunities and constraints.

Task 3: Assessment of the 1997 ITS Early Deployment Plan (EDP) and the Kern portion of the 2001 San Joaquin Valley ITS Strategic Deployment Plan (SDP)

Deliverable 3: Assessment of 1997 Early Deployment Plan (EDP) Report

- The report documents the findings of the assessment of the 1997 EDP and the 2001 SDP with the lessons learned from those efforts.

Task 4: Update Regional ITS Inventories

Deliverable 4: System Inventory Summary Report

- The report presents a summary of the findings from the Inventory Survey forms from various Stakeholders identifying existing and planned ITS elements within each jurisdiction.

Task 5: Stakeholder Consultation/Identification of ITS Needs, Vision, Goals, and Objectives

Deliverable 5: Vision, Goals, Objectives and Needs Technical Report

- The report identifies an ITS vision for the Kern region, set of goals and objectives, and identifies ITS needs after various exercises with Stakeholders.

Task 6: Develop Key Regional ITS Strategies

Deliverable 6: Regional ITS Strategies Report

- The report refines and presents a range of Intelligent Transportation Systems (ITS) components for inclusion in the ITS Plan.

Task 7: Determine Specific Needs, ITS Service Packages and Elements Based on Strategies

Deliverable 7: Regional Consolidated Needs Assessment Summary Report

- The report will translate generic ITS needs into the National ITS Architecture framework. ITS Elements will also be identified as part of the process of identifying and selecting Service Packages for the region.

Task 8: Define Operational Roles and Responsibilities Consistent with Regional Vision, Goals, Objectives, and Strategies

Deliverable 8: Regional ITS Operational Roles and Responsibilities Report

- The report identifies Operational Roles and Responsibilities that are consistent with the Vision Statement and the Goals and Objectives identified and developed in Task 5 and are based on Strategies development in Task 6.

Task 9: Determine the Functional Requirements

Deliverable 9: Functional Requirements Report

- The report will identify Functional Requirements for ITS Architecture for the Kern region based on Federal Highway Administration's (FHWA) guidance

Task 10: Prepare Regional ITS Architecture

Deliverable 10: Draft and Final Electronic Copy of the RAD-IT Architecture Database

- The electronic RAD-IT Architecture database will be developed consistent with latest available version of the National ITS Architecture, FHWA Rule 940.9, and Part V of the Federal Transit Administration (FTA) National ITS Architecture Policy for Transit Projects and provided to Kern COG.

Task 11: Develop an Architecture Maintenance Plan

Deliverable 11: Architecture Maintenance Plan

- **The report will develop an Architecture Maintenance Plan that will describe how to use the Architecture. The Report will provide project planning, project programming, project design, and maintenance procedures.**

Task 12: Develop Kern Region ITS Plan

Deliverable 12: Kern Region ITS Plan

- The Plan will take all of the inputs from Tasks 2 through 11 and meld them together into a cohesive and comprehensive ITS Plan Report and Phasing Plan for Kern County.

Task 13: ITS Website for Regional Stakeholders

Deliverable 13: Draft and Final Website

- The Kern COG website ITS webpage will provide background on the project, the deliverables, and links to meeting agendas and material during Draft ITS Plan development. The Final webpage will include the Final ITS Plan.

1.3 STAKEHOLDER PARTICIPANTS

The success of a regional ITS architecture depends on participation by a diverse set of regional Stakeholders. **Table 1-1** lists the agencies/organizations of approximately 28 key stakeholders that will be engaged to provide input for the ITS Plan. Input from the Stakeholders as well as others, will be instrumental in the development of the information presented in the final ITS Plan. These Stakeholders, and any others that join the project along the way, will be instrumental to the

development of the regional ITS architecture. The stakeholder list will be updated periodically throughout the life of the project.

Table 1-1. ITS Plan for the Kern Region Stakeholder List

Amtrak	City of Taft
Bureau of Land Management	City of Tehachapi
Burlington Northern Santa Fe Railroad	City of Wasco
Caltrans District 6	CommuteKern (Kern COG)
Caltrans District 9	County of Kern
Caltrans Headquarters	Delano Area Rapid Transit
City of Arvin	Federal Highway Administration California Division
City of Bakersfield	Federal Transit Administration Region 9
City of California City	Golden Empire Transit District (GET)
City of Delano	Kern Council of Governments (Kern COG)
City of Maricopa	Kern Motorist Aid Authority (Kern COG)
City of McFarland	Kern Transit
City of Ridgecrest	Tejon Indian Tribe
City of Shafter	Union Pacific Railroad

1.4 RELATIONSHIP TO 1997 EDP

As noted in Section 1.1, the ITS Early Deployment Plan (EDP) was completed for Kern County in 1997. That plan was comprehensive, in terms of both needs assessment and the development of recommendations. For this ITS Plan update, the 1997 EDP will be reviewed and assessed. This assessment will provide some insight and guidance in the project process when considering project and program prioritization, which will also be influenced to varying degrees by the changes in technology since 1997. The assessment will provide a look back at prior ITS planning and implementation efforts and lessons learned from those efforts while moving forward with this most current ITS planning and implementation effort.

1.5 PURPOSE OF ITS ARCHITECTURE USE AND MAINTENANCE PLAN

The purpose of the Draft ITS Architecture Use and Maintenance Plan is to provide guidance to the Kern Region ITS stakeholders on how to use the newly updated regional ITS architecture for project planning and development, as well as how to maintain the newly updated architecture once this development process is completed. The Federal Highway Administration (FHWA) ITS Architecture and Standards Rule, and its companion Federal Transit Administration Policy, requires the development and documentation of a regional ITS architecture in metropolitan areas that are deploying ITS. Among the required elements of a regional ITS Architecture is the development and implementation of procedures and responsibilities for maintaining the architecture as needs evolve within the region on highways and transit systems. This document serves the purpose of documenting the procedures and responsibilities for maintaining the Kern Regional ITS Architecture.

2.0 METHODOLOGY TO DEVELOP THE KERN REGIONAL ITS ARCHITECTURE

The process of developing a regional ITS architecture includes many inputs and review sessions with regional stakeholders to establish a consensus-based regional architecture. Given that, it is no surprise that stakeholder involvement and information sharing was foundational during the development of the Kern Regional ITS Architecture. Inputs included needs and focus areas identified by stakeholders. These needs and focus areas were combined with local knowledge of existing systems to develop a comprehensive inventory of ITS infrastructure that is existing, under-construction, programmed and desired in the region. This inventory is captured in the architecture database.

The Kern Regional ITS Architecture development process involved the development of the 'physical view' of the ITS architecture. The physical architecture defines how ITS systems and devices are currently being operated and provides a comprehensive picture of current ITS functions in the Kern Region. The physical view considers stakeholders, subsystems, information and data flows, connectivity among subsystems, and infrastructure, and these inputs are used to develop a well-documented and graphically diagrammed ITS architecture. Components of each relevant agency's ITS, such as devices, centers, and systems that help to efficiently manage the area's surface transportation network were identified and used during the development of the Kern Regional ITS Architecture.

In 2017, the U.S. Department of Transportation released the latest version of the National ITS Architecture framework, now known as Architecture References for Cooperative and Intelligent Transportation (ARC-IT) as well as supporting software Regional Architecture Development for Intelligent Transportation (RAD-IT) to guide the planning and deployment of ITS. ARC-IT version 8.0 was used as the basis for developing the physical architecture for the Kern Region. Some ITS elements within the Kern Region were customized to reflect actual agency and system names, as well as to clearly define the status of various elements and the connectivity between them.

RAD-IT™ is the software application that was used to develop the Kern Regional ITS Architecture. RAD-IT Architecture focuses on the physical view of the architecture and requires input such as regional stakeholders, the regional ITS inventory, relevant services packages, and requirements. After these inputs are added to the RAD-IT Architecture database, RAD-IT then facilitates the processes of assigning information/data flows to the various inventory entities and devices.

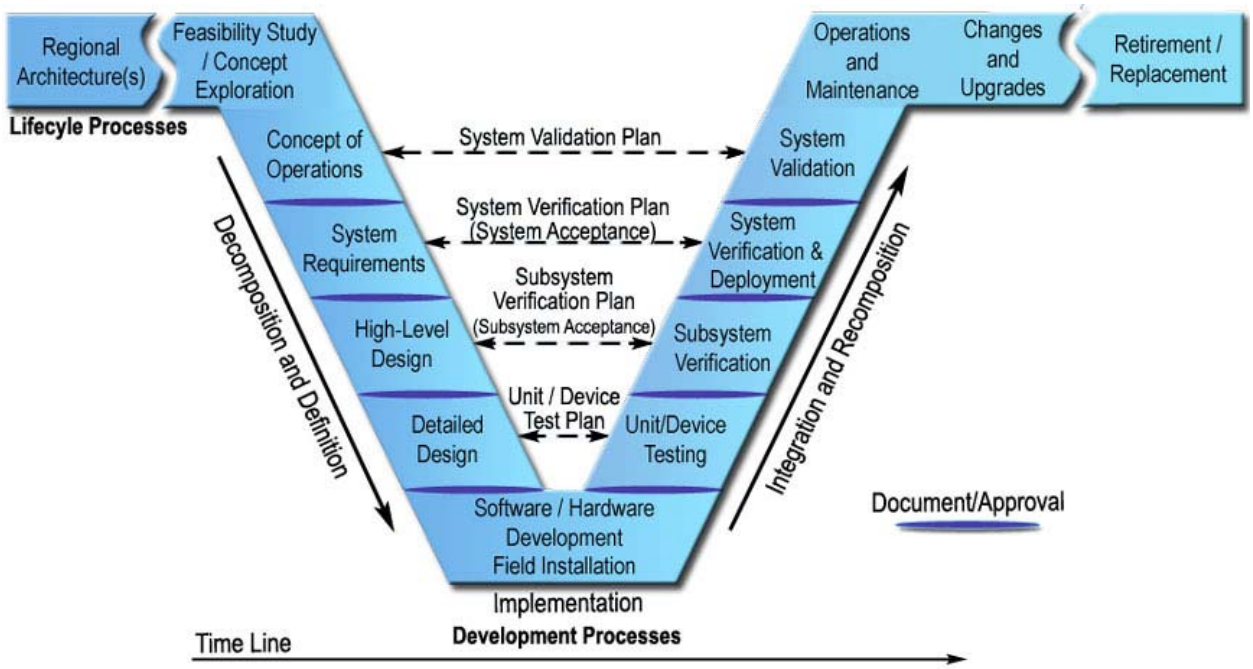
The software draws from the updated ARC-IT version 8.0 to provide standards and guidance when developing user-defined information flows and communications for a specific region. Additionally, RAD-IT Architecture can customize service packages to accurately display ITS infrastructure and communications. Stakeholders were able to view the customized service packages specific to their agency to confirm that they were accurate and correct.

This was the first time that the Kern Regional ITS Architecture was developed using RAD-IT Architecture, and it is anticipated that the use of the software will facilitate the process for future reviews and updates.

2.1 SYSTEMS ENGINEERING

Systems Engineering uses an ITS architecture as a cornerstone for the process of developing ITS related projects within a region or state. Systems Engineering is a multi-step and iterative process that requires agencies to ask critical questions about the technical processes of the project that may have been overlooked. **Figure 2-1** illustrates the "Vee" diagram, which starts with the development of the regional ITS architecture, shows how each step of the systems engineering process builds on the previous one and is reliant on a system of back checking to ensure that the project is being designed and constructed based on its originally intended purpose. Systems Engineering is a risk management tool – by taking critical measures of key metrics to identify project issues, benefits, risks and impacts, as well as going through a series of validation and approval points, there is less uncertainty about project objectives or expectations.

Figure 2-1 – Systems Engineering "Vee" Process – Regional ITS Architecture is First Step



More information, such as training and publications, is available at: https://ops.fhwa.dot.gov/int_its_deployment/sys_eng.htm

System Engineering Guidebook for ITS is available at: https://www.fhwa.dot.gov/cadiv/segb/

3.0 USE OF THE ARCHITECTURE

3.1 PROJECT PLANNING

Kern Council of Governments (Kern COG) will be responsible for housing and maintaining the Kern Regional ITS Architecture. Being responsible for the architecture requires Kern COG to be able to identify stakeholders, inventory, and service packages that are related to specific systems or projects when agencies request pertinent information.

In order to do this, the first step is to identify the type of service package(s) (e.g. transit, traveler information, emergency management, etc.) that are related to the project. Depending on the scope of the project, multiple types of service packages could be relevant and they should all be identified. For example, for a project involving the installation of dynamic message signs, the relevant service package types would be traveler information, public safety, and traffic management. After service package types are identified, the specific service package(s) that describe the project must be identified. In continuing the example, the specific service packages that relate to dynamic message sign installation would be TM06 Traffic Information Dissemination, TM07 Regional Traffic Management, MC06 Work Zone Management, and PS10 Wide Area Alert.

Once specific service packages have been identified, the service package diagrams must be reviewed to make sure they are correct and not duplicating functionality with another service package. For each project, the following items should be considered and inputted into RAD-IT:

- Make sure all specific service packages that relate to the project are identified (i.e. TM06, PS10, etc.);
- A specific service package may be associated with multiple agencies; therefore, multiple instances of that service package will need to be created – once for each of the stakeholder agencies for which that specific service package is associated (i.e. a TM03 for City of Bakersfield, and TM03 for County of Kern, etc.);
- Select the appropriate inventory items that are related to each specific service package;
- Select the appropriate stakeholder that owns the inventory item; and
- Check whether the data flow is planned or existing.

Following review of the service package diagrams, the updated diagrams should be passed along to the agencies who are implementing the project to ensure all stakeholders are involved and they have the proper information to determine if it will impact other projects. This is documented through the communications trail between the project sponsor and Kern COG. It would be further documented in the change request form (discussed later in this document) and “before and after” versions of the service package diagrams.

3.2 PROJECT PROGRAMMING

The availability of an up-to-date regional ITS architecture allows jurisdictions to request federal project funding or programming as projects must be consistent with the area’s regional ITS architecture to receive federal funds. This section discusses how stakeholders can determine if a project is consistent with the architecture.

In order to use the Kern Regional ITS Architecture to support project development, the agency must identify how the project contributes to or aligns with a portion of the architecture. This is a key step when using the architecture because it requires the agency to view the ITS project in the broader context of the entire architecture. Having an agency consider the wider architecture while the project's scope is being defined, forces them to consider the services, functionality, and integration opportunities that are envisioned by the Region as a whole. As mentioned previously, this step is also required to meet the FHWA Architecture Rule/FTA Architecture Policy.

The architecture should be used as early in the project development lifecycle as possible so that integration opportunities are considered. The architecture should be reviewed before firm project cost estimates are established so that there is still opportunity to adjust the scope in order to accommodate the regional functionality and interfaces identified in the Kern Regional ITS Architecture. This opportunity may occur before or after programming/budgeting, depending on how specifically the ITS project is defined in the programming/budget documents.

3.2.1 Federal and State Funding for ITS Projects

Any agency applying for and/or using, federal and/or state funds for ITS planning, design, and deployment will need to be familiar with, and utilize, administrative, programming, and project development procedures from Chapter 13 of the Caltrans Local Assistance Program Guidelines (LAPG). Chapter 13 of the LAPG provides guidance on the following key topic areas:

- The definition of ITS
- Required ITS project risk assessment procedures
- General ITS roles and responsibilities for the various funding, implementing, and oversight agencies in the region
- Step-by-step procedures of the funding process

As of March 2018, the most current version of the Caltrans Local Assistance Program Guidelines (LAPG) could be found on the Internet, at:
http://www.dot.ca.gov/hq/LocalPrograms/lam/lapg.htm

As of March 2018, Chapter 13 of the LAPG could be found at:
http://dot.ca.gov/hq/LocalPrograms/ITS/ITS.htm

3.3 PROJECT DESIGN

When designing a project, functionality and ITS standards provide guidance and criteria to identify how the project will serve and connect the region's overall operations. As projects grow in size, the function and standards can become complicated and could require agreements between agencies. It is beneficial to be able to identify the agencies involved and the type(s) of agreement(s) needed early on in the project design.

This section will describe how functional requirements were developed and where they can be found. There will be discussion of standards that are in the Kern Regional ITS Architecture currently, standards that are envisioned to be needed or utilized in the future, and the applicability of the standards. Additionally, this section includes a discussion of agreements between

stakeholders in the Kern Region that are currently in place, as well as those that may need to be developed to facilitate operations, coordination, information sharing, and integration.

3.3.1 How ITS infrastructure is shown in the architecture

All stakeholders will find the Physical viewpoint informative. The Physical provides the basis for Service Packages, which communicate notions of service delivery, functionality, information exchange and concerns related to those concepts. The Physical Viewpoint enables the engineer to answer questions such as:

- What physical entities are involved in the delivery of a given service?
- What interfaces are required between different physical elements?
- What functionality is allocated to physical entities?
- What are the security considerations for information exchanged between physical elements?
- What are the security considerations for physical devices?

The Physical Viewpoint defines the **Physical Object (P-Object)** as person, place, or thing that participates in ITS. Physical Objects are defined in terms of the applications they support, the processing they include, and their interfaces with other physical objects. They are grouped into five classes: Center, Field, Support, Traveler and Vehicle. **Table 3-1** provides class descriptions from ARC-IT and examples in the Kern Region.

Table 3-1 – Class Definitions

Class	Definition	Examples in Kern County
Center	An element that provides application, management, administrative, and support functions from a fixed location not in proximity to the road network. The terms "back office" and "center" are used interchangeably. Center is traditionally a transportation-focused term, evoking management centers to support transportation needs, while back office generally refers to commercial applications.	Traffic Operations Centers Emergency Operations Centers Police/Fire Dispatch Centers
Field	Infrastructure proximate to the transportation network which performs surveillance (e.g. traffic detectors, cameras), traffic control (e.g. signal controllers), information provision (e.g. Dynamic Message Signs (DMS)) and local transaction (e.g., tolling, parking) functions. Typically governed by transportation management functions running in centers. Field also includes connected vehicle roadside equipment and other non-DSRC wireless communications infrastructure that provides communications between mobile elements and fixed infrastructure.	Traffic Signals CCTV Cameras Dynamic Message Signs Vehicle Detection
Support	A center that provides a non-transportation specific service. Typically these are enabling functions, such as communications facilitation, security or management.	Archived Data Administrator
Vehicle	Vehicles, including driver information and safety systems applicable to all vehicle types.	Maintenance and Construction Vehicles Public Safety Vehicles Incident Response Vehicles

Class	Definition	Examples in Kern County
Traveler	Equipment used by travelers to access transportation services pre-trip and en-route. This includes equipment owned and operated by the traveler as well as equipment owned by transportation and information providers.	Internet Web Sites Kern 511

3.3.2 How to find general functional requirements related to a proposed project

The functional requirements are high-level requirements that can support system requirements development. The functional requirements can be found on the ARC-IT website (http://arc-it.net). The ARC-IT website is comprised of four views. The Physical View defines the physical objects (the systems and devices) that provide ITS functionality. Information flows define the flow of information between physical objects. Functional Objects organize the functionality that is required to support ITS within each physical object.

The following process is one method to access requirements for specific service packages items on the ARC-IT website:

- Select "Architecture" drop-down in the top left corner of the Home Page of the ARC-IT website
- Then select "Service Packages"
- Then select a "Service Package" link
- Then select the "Needs and Requirements" tab
- A list of requirements will be identified

3.3.3 How to obtain specific functional requirements from the Kern Regional ITS Architecture

The need to obtain specific functional requirements from the Kern Regional ITS Architecture related to a specific project can be accommodated by requesting the information directly from the Kern COG contact listed below. The Kern COG contact will utilize the method described in Section 3.1 Project Planning to collect the requirements specific to the request. This is documented through the communications trail between the project sponsor and Kern COG. It would be further documented in the change request form. One of the final products would be a comparison of the "before" functional requirements to the "after" functional requirements.

The specific request will need to include:

- Identifying which specific service packages where the project is represented;
- Provide scope/description of the project;
- List the infrastructure involved;
- List the stakeholders involved; and
- List the purpose of the project (if not already captured in the scope/description of the project).

Contact information for the Kern Regional ITS Architecture is:
Name: Raquel Pacheco
Email: rpacheco@kerncog.org

A complete listing of functional requirements for the Kern Regional ITS Architecture is provided in Deliverable 9 – Functional Requirements. Those functional requirements are an output from the Kern Regional ITS Architecture RAD-IT Architecture database. The functional requirements identified for this architecture are organized by inventory item in alphabetic order. When an inventory item is selected in the architecture, four types of information are displayed. 1. Physical Object Name – this provide context of what type of equipment or center or interface that inventory item has within the ITS Architecture.; 2. Functional Object – This summarizes the type of service that is associated with the inventory item.; 3. Requirement – This is a functional requirement that can be used to inform a Request for Proposals or in the development of Project Specifications for a project that would be accounted for in the ITS Architecture.; and 4. Status – This provides the currently operating or planned status of the inventory item as it is represented in the ITS Architecture.

Table 3-2 provides examples of various potential ITS project proposals in the Kern Region, to help agencies find the location of information within the architecture that might be needed during the project development process, such as pertinent subsystems, service packages, and functional requirements for a given project. This will be useful as an agency applies for funding for various types of ITS projects. This sample information may be used to identify a project within the Regional ITS Architecture to illustrate Kern Regional ITS Architecture compliance. The table is not intended to be the ITS Plan for the Kern Region listing of projects. The table is merely intended to provide project examples and guidance for the architecture maintainer to find various types of information on future project proposals based on the type of project proposal that is brought forward.

Table 3-2 – Example Project Type Mapping to Kern COG ITS Architecture Components

Project Type	ITS Inventory	Subsystems	Associated Service Packages	Functional Requirements Example
Installation of new CCTV cameras/expansion of existing camera system and integrating the cameras to be operational from a control center.	CCTV, TMC	Roadway Subsystem, Traffic Management	TM01 – Infrastructure-Based Traffic Surveillance	The field element shall collect, process, and send traffic images to the center for further analysis and distribution.
Installation of new DMS and integrating DMS to be operational from a control center.	DMS, TMC	Roadway Subsystem, Traffic Management	TM06 - Traffic Information Dissemination	The field element shall include dynamic messages signs for dissemination of traffic and other information to drivers, under center control; the DMS may be either those that display variable text messages, or those that have fixed format display(s) (e.g. vehicle restrictions, or lane open/close).
Synchronization of traffic signals along key corridor and integrating system to be operational from a control center.	Traffic Signals, TMC	Roadway Subsystem, Traffic Management	TM03 – Traffic Signal Control	The field element shall control traffic signals at intersections and on main highways for urban and rural areas, under center control.
Deployment of traffic detection for use at mid-block locations and intersections.	Vehicle Detectors, TMC	Roadway Subsystem, Traffic Management	TM01 – Infrastructure-Based Traffic Surveillance	The field element shall collect, process, digitize, and send traffic sensor data (speed, volume, and occupancy) to the center for further analysis and storage, under center control.
TMC to TMC communications installation to facilitate interagency coordination	TMC	Traffic Management	TM07 - Regional Traffic Management	The center shall exchange traffic information with other traffic management centers including incident information, congestion data, traffic data, signal timing plans, and real-time signal control information.
Implement a project to archive data and send applicable information to a regional server for dissemination via 511 or another traveler information service.	TMC, County of Kern, Kern COG	Archived Data Management Subsystem	DM01 - ITS Data Warehouse	The center shall collect data catalogs from one or more data sources. A catalog describes the data contained in the collection of archived data and may include descriptions of the schema or structure of the data, a description of the contents of the data.
Installation of tracking devices on transit vehicles to facilitate schedule adherence	Transit Detectors, Transit Operations Center	Transit Vehicle Subsystem	PT01 – Transit Vehicle Tracking	The transit vehicle shall track the current location of the transit vehicle.
Installation of environmental sensors along roadways that monitor weather and roadway conditions	Environmental Sensors, Maintenance and Construction Center	Roadway, Maintenance and Construction Management	WX01 – Weather Data Collection	The center shall remotely control environmental sensors that measure weather conditions including temperature, wind, humidity, precipitation, and visibility.

Project Type	ITS Inventory	Subsystems	Associated Service Packages	Functional Requirements Example
Implementing a connection with ITS devices and information service providers to disseminate pertinent information to the public.	Local Changeable Message Sign, Highway Advisory Radio, Kern 511	Information Service Provider, vehicle, personal information access, remote traveler support	PS10 – Wide Area Alert	The center shall track the availability of resources and coordinate resource sharing with allied agency centers including traffic, maintenance, or other emergency centers.
Installation of automated vehicle identification capabilities at port of entries to allow for higher speed weigh-in-motion process.	Caltrans Department of Motor Vehicles, Caltrans Weigh-In-Motion, Commercial Vehicles	Commercial Vehicle Check, Commercial Vehicle	CVO08 – Smart Roadside and Virtual WIM	The commercial vehicle shall respond to requests to provide the identity, status and other information from the electronic cargo lock tag, if so equipped, to roadside check facilities, including border crossings.
Implement a project to disseminate applicable information via 511 or another traveler information service to the public.	Kern 511, travelers, Kern Website, Other Information Service Providers	Information Service Provider, vehicle, personal information access, remote traveler support	TI02 – Personalized Traveler Information	The center shall collect, process, and store traffic and highway condition information, including incident information, detours and road closures, event information, recommended routes, and current speeds on specific routes.

3.3.4 How to select communication standards that apply to the project

ITS standards define how system components interact within the overall framework of the National ITS Architecture. The use of standards ensures interoperability amongst various functions of an ITS project so that components or technologies from various vendors and at different scales (local, regional, and national) are still compatible. Standards also facilitate innovation in technology development without necessitating replacement of hardware or software systems that are needed to operate the new technology. Other purposes for ITS standards include:

- ITS standards used in a deployment can greatly reduce component development costs;
- ITS standards are open and non-proprietary, helping state and local transportation managers avoid costly single-source procurements and locked-in maintenance relationships with vendors;
- ITS standards support the deployment of interoperable ITS systems, helping agencies link together different types of ITS technologies and making system expansions easier to plan and implement; and
- ITS standards are being developed for many different types of ITS technologies and their use in project deployment is a key aspect of conformity with the Final Rule.

New standards that are developed go through an approval process before they are included in documents as formalized standards. Existing standards are amended and modified as needed based on new standards development or new technology development. Several national and international standards organizations are working toward developing ITS standards for communications, field infrastructure, messages and data dictionaries, and other areas. The organizations participating in ITS standards activities include:

- AASHTO (American Association of State Highway and Transportation Officials)
- ANSI (American National Standards Institute)
- APTA (American Public Transportation Association)
- ASTM (American Society for Testing and Materials)
- IEEE (Institute of Electrical and Electronics Engineers)
- ITE (Institute of Transportation Engineers)
- NEMA (National Electrical Manufacturers Association)
- SAE (Society of Automotive Engineers)

A listing of ITS standards that are pertinent to the Kern Regional ITS Architecture is contained in the ITS Plan for the Kern Region. That listing is taken from the Kern Regional ITS Architecture RAD-IT Architecture database, and represents ITS Standards that need to be considered in the Kern Region.

3.3.5 What agreements may be needed to support a proposed project?

Intuitional agreements can support ITS functionality and project development in the region. Agreements allow agencies to document the roles and responsibilities of the particular service or

function that is being agreed to, as well as any obligations each agency has for maintenance, operations, or financial support.

Table 3-3 provides a list of potential agreements based on the types of interfaces identified in the Kern Regional ITS Architecture. It is important to note that as ITS services and systems are implemented or expanded in the region, part of the planning and review process for those projects should include a review of potential agreements that would be needed for implementation or operations. These agreements are not specified for specific projects because the possibility of coordination/sharing/joint operations should be evaluated on every project. The table also identifies the agency/agencies for which each agreement would be beneficial.

Table 3-3 – Potential Agreements that Support Existing/Future Coordination Shown in Architecture

Agreement and Agencies	Agreement Description
Data Sharing and Usage (Internal Public Divisions)	
TMC/EOC TMC/Police TMC/Fire TMC/Public Works	This agreement would define the parameters, guidelines, and policies for intra-agency ITS data, road restriction, maintenance activity and work zone activity information sharing. This data sharing would support regional activities related to traffic management, incident management, work zone notifications, traveler information, and other functions. The terms of this agreement should generally address such items as: ▪ Types of data and information to be shared – camera feeds, roadway restrictions, detector information, incident and special event information, maintenance activity ▪ How the information will be used (traffic incident management, displayed on web site for travel information, distributed to private media, etc.) ▪ Parameters for data format, quality, security ▪ Frequency of sharing data
Data Sharing and Usage (Public Agency-Public Agency)	
TMC/TMC TMC/Transit TMC/Police TMC/Fire TMC/EOC TMC/Airport	This agreement would define the parameters, guidelines, and policies for data sharing and usage of ITS-related information from public agency to public agency. Because this agreement is with external entities, it will likely be in the form of a Memorandum of Understanding or Inter-Governmental Agreement. This type of agreement is recommended to define terms of use for distributing public-agency information regarding: ▪ Traffic conditions ▪ Traffic signal timing plans ▪ Road closures and restrictions ▪ CCTV camera images ▪ Data sent to data warehouses or data archive servers ▪ Work zone information ▪ Public safety coordination with traffic management ▪ Transit coordination with traffic management In specific, coordination among jurisdictions for traffic signal timing to improve overall flow and progression along multi-jurisdictional corridors is a priority for this region.

Agreement and Agencies	Agreement Description
Shared Video Monitoring (Public Agency-Public Agency)	
TMC/Police TMC/Fire TMC/EOC	This agreement would enable shared video monitoring of CCTV by public safety and neighboring jurisdictions for incident and traffic management purposes. This agreement would define the parameters and policies for public safety and other transportation agencies to access video images. It is recommended that the agreement include any established or newly developed policies relating to video images (including archiving, privacy, disclaimers, use of video and redistribution) as well as processes for agency requests for specific views. Shared video monitoring does not address shared use or shared control of video equipment functions. There might be some cost incurred for infrastructure, systems or fiber to enable communications between agencies, particularly with the high bandwidth required for transmitting live video images. Lower bandwidth video images such as screen-shots could also be considered for sharing.
Joint Operations/Shared Control Agreements (Public Agency-Public Agency)	
TMC/TMC TMC/Police	This agreement is a formal arrangement to allow joint operations or control of certain systems and equipment. This agreement will allow the other TMCs or public safety to control certain devices such as permanent DMS and CCTV cameras in incident or emergency situations and in after-hours operations. The agreement would need to define the terms of this arrangement, such as hours of operation and time of day/day of week where shared control would take effect, circumstances or incidents where shared control would take effect, system requirements for each agency to be able to share device control, definition of permissions with device control, etc. Traffic signals are typically not included as part of a joint operations strategy. Agencies have typically determined that sharing access to traffic signal timing plans will enable enhanced corridor management and operations among multiple partners, but that actual control of signals or changing timing plans on traffic signals by another jurisdiction is not permitted.
Emergency Coordination Agreements (Public Agency-Public Agency)	
TMC/Local EOC, Fire, Police, County or State EOC	This agreement would establish the roles and responsibilities of a TMC in supporting emergency coordination for disasters or threats requiring evacuation or other mass coordination efforts. May include sharing requirements of CCTV video images by emergency management agencies.
Fiber Sharing Agreements (Public Agency-Public Agency)	
TMC/TMC	This agreement would establish the requirements and security needs of each agency in sharing fiber cable to connect to their respective devices. Cost sharing should be delineated in the agreement as well as network maintenance / management on the fiber infrastructure. These agreements are developed to define the roles and responsibilities of the agencies for the actual sharing of fiber and should outline cost sharing that established the fiber sharing path.

4.0 KERN REGIONAL ITS ARCHITECTURE MAINTENANCE PLAN

The Kern Regional ITS Architecture is a dynamic plan that documents current and future ITS infrastructure and plans throughout Kern County, as well as the systems' relationships with other agencies and systems. To stay consistent with changing needs and evolving technologies, the architecture and database will require periodic updates as the ITS program evolves. In order to maintain and upkeep the architecture, regular maintenance should occur, especially as projects are implemented or expanded, agency priorities change, or other changes occur that impact ITS in the various jurisdictions. The architecture maintenance plan outlined in the following subsections acts as a control mechanism for maintaining order, while updating the architecture. It also outlines a process for keeping the architecture up-to-date over time.

This maintenance plan is laid out in two parts, both of which provide instructions for making changes to the architecture. The first section is built for stakeholders to use in order to identify when updates are needed in the architecture. The second section of the maintenance plan was built for the person in charge of maintaining the architecture and database; a Regional ITS Architecture Maintenance committee at Kern COG will assume this responsibility. The Transportation Technical Advisory Committee will serve as the Regional ITS Architecture Committee. This section of the plan proposes a process to be used when reviewing updates that are submitted by stakeholders.

4.1 PURPOSE FOR MAINTENANCE

The Kern Regional ITS Architecture and database are dynamic planning tools that are subject to change as ITS needs and infrastructure evolve in the County. New projects that are planned or constructed each year may change the status or existence of inventory elements and information flows that are currently represented in the architecture. As changes occur, portions of the architecture documents and database will need to be updated accordingly. These changes should be initiated by the stakeholders as the need arises and should be submitted to Kern COG via e-mail for inclusion in the next ITS architecture update. The Kern Regional ITS Architecture would need to be updated for any of the following reasons:

- **New Stakeholders** – New stakeholders become active in ITS. If this occurs, the architecture documents and database should be updated to reflect the new stakeholder's place in the local network of ITS elements, interfaces, information flows, and participation in regional activities. For example, new transportation modes and new transportation services might arise that touch the systems of additional stakeholders.
- **Changes in Scope of Services Considered** – The range of services that are provided in the region expands to new functionalities and new uses of technologies not already covered by the current architecture.
- **Changes in Other Architectures** – The Kern Regional ITS Architecture should be coordinated with the Caltrans Statewide ITS Architecture. Changes in the statewide ITS architecture may necessitate changes in the architecture for the Kern Region to maintain consistency between them. Changes to the Caltrans Statewide ITS Architecture should be communicated to Kern COG (and other affected stakeholders) by the maintainer of that

architecture so that there can be coordination between the Caltrans Statewide ITS Architecture and the Kern Regional ITS Architecture. Similarly, changes to the San Joaquin Valley ITS Architecture should be communicated to Kern COG (and other affected stakeholders) by the maintainer of that architecture so that there can be coordination between the San Joaquin Valley ITS Architecture and the Kern Regional ITS Architecture. Kern COG should also be cognizant of the need to notify the maintainers of neighboring and overlapping ITS architectures when changes are made to the Kern Regional ITS Architecture, so that those architectures can be assessed and updated as appropriate.

- **Changes due to Project Definition or Implementation** – A project may add, subtract, or modify elements, interfaces, or information flows when actually defined or implemented, and these changes need to be reflected in the architecture. The architecture is meant to describe the current, as well as future implementation of ITS, thus it must be updated to accurately reflect how any newly deployed projects integrate into the region's systems.
- **Changes due to Project Addition/Deletion** – Occasionally a project will be added or deleted from the architecture due to funding, planning processes, or through project delivery. This could change the status or existence of inventory items, information flows, and service packages in the architecture and database.

4.2 FREQUENCY AND PROCESS OF REVIEW/UPDATES

There is no fixed time period or exact event dictating when the regional ITS Architecture **should** be updated. Even when a change occurs, it does not necessarily require that the architecture be updated immediately. For example, it is not necessary to update the architecture just because a new version of the U.S. National ITS Architecture is released. Similarly, if there are no significant changes in policies or in the status of the deployment of ITS in the region, it may not be necessary to update the architecture for several years. Kern COG, in association with the ITS stakeholders in the Kern Region, would determine what constitutes "significant changes" on a case by case basis. However, it is important to ensure that the architecture continues to accurately represent ITS in the region, and that the architecture remains compliant with federal requirements.

It will be important to periodically review the architecture, even though a major update might not necessarily be warranted. A recommended review and update cycle is presented below:

- **Annual Review** – The Kern Regional ITS Architecture will be checked annually, and updated if necessary, to make minor corrections and modifications to reflect any changes to existing or future ITS projects that might have occurred. These modifications may be a result of changes in project status, emergence of new stakeholders, or updates to agency agreements. Modifications may also result from projects being implemented (changing status of data flows from "planned" to "existing"). This review will be led by Kern COG. It is recommended that Kern COG compile and distribute any architecture Change Request Forms that have been received over the past year to stakeholders for review prior to the annual review meeting. This will provide stakeholders with the opportunity to discuss any changes needed to the architecture. Kern COG will consider changes stemming from the annual reviews in conjunction with more comprehensive updates to the Kern Regional ITS Architecture that are coordinated with updates to the Regional Transportation Plan (RTP).

- **Comprehensive Update** – Kern COG will coordinate a more thorough update of the Kern Region ITS Architecture in coordination with the update of the RTP, as needed. With minor updates and modifications occurring in the interim, this Comprehensive Update would address new or adjusted projects outlined in the funding programs being included in the Kern Regional ITS Architecture, as well as identify significant changes or additions that could affect multiple stakeholders. It is recommended that this Comprehensive Update include input from the stakeholders, either through a workshop format, individual phone calls, or smaller focus groups. Proposed updates and revisions to the Kern Regional ITS Architecture should be reviewed by the affected stakeholders for consensus.

As mentioned in the first bullet, stakeholders should complete and submit a Change Request Form when they anticipate or identify a possible change to the architecture. This request should be submitted to Kern COG, and should include the following information:

- Contact information of the individual proposing the change: name, title, agency, email, fax number, and phone number;
- Date;
- Short description of proposed change (a title up to 25 characters);
- Detailed description of proposed change. (What is to be added, deleted, or modified?);
- Type of change proposed (e.g. new project, new stakeholder, etc.);
- Name of system(s) or project(s) being implemented or modified (if applicable);
- Status:
    - Proposed (want to implement but has not yet secured funding for the project);
    - Planned (secured funding for the project);
    - Under Construction (currently deploying the system); or
    - Existing (deployed the system and it is currently operational).

The Change Request Form is included in **Table 4-1**. A copy of the form can be sent via e-mail or fax to:
Name: Raquel Pacheco
Email: rpacheco@kerncog.org
Fax: 661-324-8215

Kern COG will designate a Regional ITS Architecture Maintenance Committee that will be responsible for reviewing information contained in the submitted Change Request Forms and approving and/or recommending the corresponding updates within the Kern Regional ITS Architecture. By default, the Regional ITS Architecture Maintenance Committee will be made up of a representative from the Transportation Technical Advisory Committee from each of the following agencies:

- Kern COG
- Caltrans
- City of Arvin

- City of Bakersfield
- City of California City
- City of Delano
- City of Maricopa
- City of McFarland
- City of Ridgecrest
- City of Shafter
- City of Taft
- City of Tehachapi
- City of Wasco
- County of Kern
- Golden Empire Transit District

The Regional ITS Architecture Maintenance Committee will operate in a transparent manner. Any parties that are impacted directly, or indirectly, by any matters that come before the Committee will be engaged in open discussion to ensure full understanding of all matters that come before the Committee, by all affected parties. All ITS stakeholders in the Kern Region will be notified about change requests that come before the Committee via the posting of the Transportation Technical Advisory Committee agenda to the Kern COG website (www.kerncog.org), and will be given an opportunity to provide input into the process. All ITS stakeholders in the Kern Region affected by changes will be notified of the final disposition of matters deliberated by the Committee. In addition, Kern COG will notify the maintainers of neighboring and overlapping ITS architectures when changes are made to the Kern Regional ITS Architecture, so that those architectures can be assessed and updated as appropriate.

A flow chart outlining the thought processes that the Committee should go through when reviewing a Change Request Form has been developed to assist the Kern COG Regional ITS Architecture Maintenance Committee in determining whether an architecture update is necessary. The flow chart has two questions to help identify if stakeholders agree on the change that is being requested, what impact the change will have to the physical architecture, and what discussions should occur in specific situations. For each change request form, both questions should be reviewed in their entirety.

The committee should use the following processes responding to two specific questions as described in **Figure 4-1** and **Figure 4-2** when reviewing each Change Request Form for approval.

Table 4-1 –Change Request Form

Stakeholder Proposing Change	Name		Job Title	
	Agency			
	Email			
	Phone No.		Fax No.	
Date				
Description of Change	Title	*Short Description (up to 25 characters)*		
	Detailed Description	*(What is to be added, deleted, or modified? Attach additional documentation if necessary)*		
	Type of Change	☐ New Service Package ☐ Deleted Service Package ☐ Modified Service Package or Data Flow (attach mark up or sketch)	☐ New/Changed Stakeholder ☐ Change in Project Status (planned now existing) ☐ Other	
	Systems or Projects	*Name of System(s) or Project(s) being implemented or modified (if applicable)*		
Project Status	☐ PROPOSED (funding not yet secured) ☐ PLANNED (funding secured) ☐ UNDER CONSTRUCTION (stakeholder is currently deploying system/project) ☐ EXISTING			

Figure 4-1 – Kern COG Architecture Update Review Process – Agreement Question

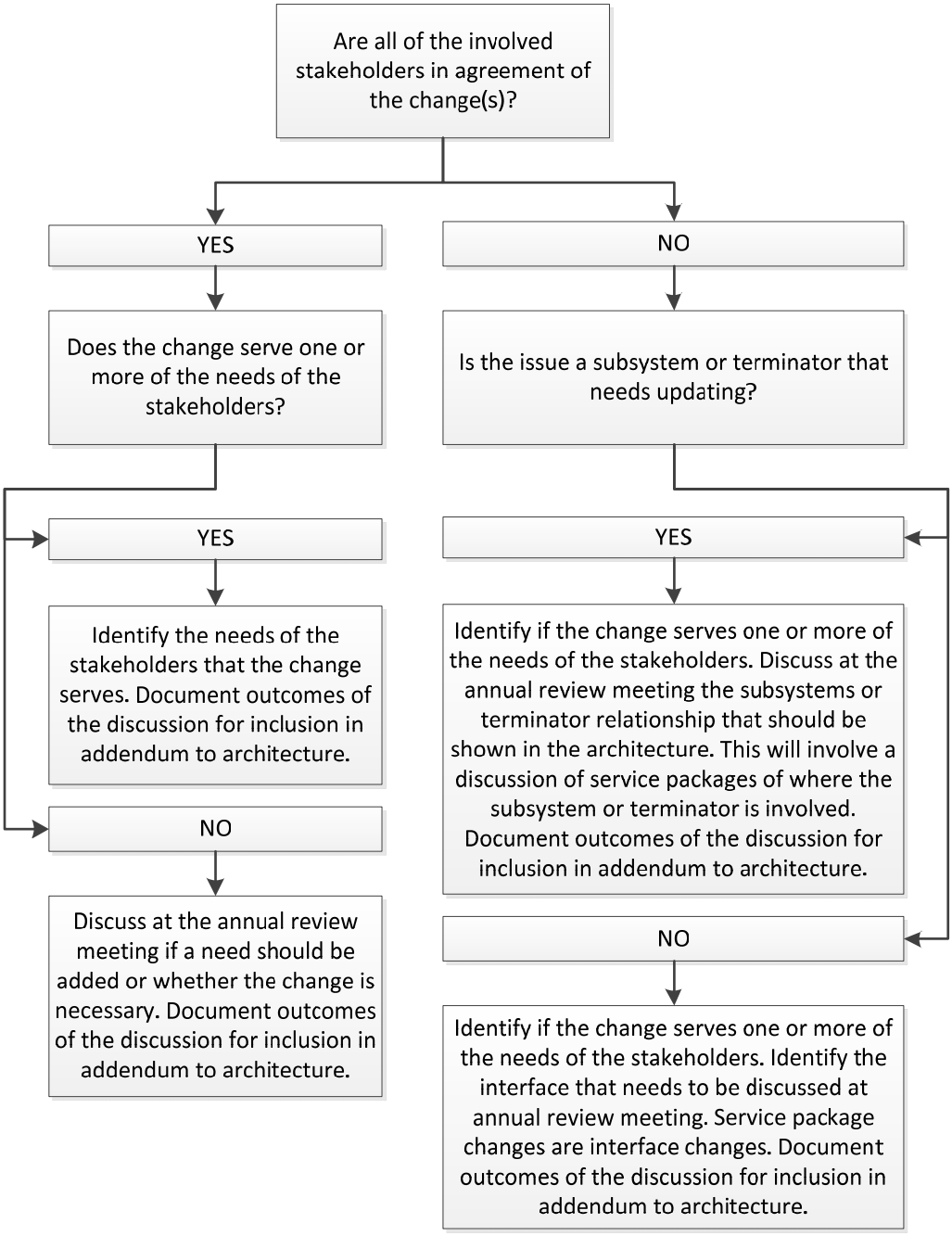
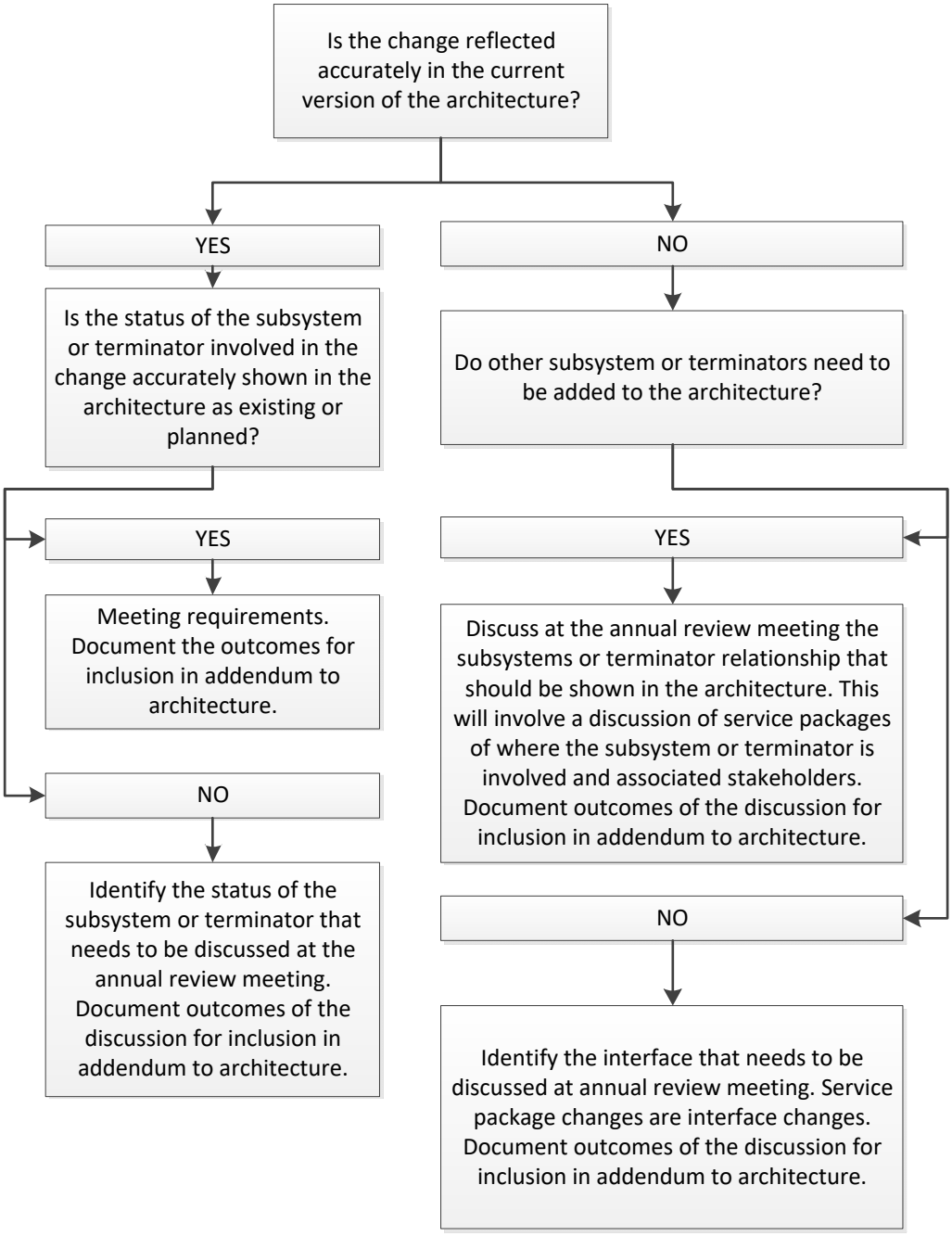


Figure 4-2 – Kern COG Architecture Update Review Process – Architecture Question



4.3 ROLES AND RESPONSIBILITIES

Kern COG will update the architecture (addition, deletion, or modification) as specified in the approved Change Request Form, which includes performing the following tasks:

- Evaluate how the changes affect the architecture documents, RAD-IT database, and website.
- Evaluate whether or not the change impacts multiple stakeholders or other elements within the regional ITS architecture. This step will also include coordinating with those stakeholders to obtain consensus on the proposed change.
- Ensure that changes are carried out in the most recent versions of the documents, databases, and graphics.
- Verify that all dependencies and updated and related documents are synchronized with each other.
- After changes are made, make sure that the revised documents are posted, stored online, or otherwise disseminated in "read-only" format to prevent any unauthorized changes from being made.
- Ensure that the most current RAD-IT Architecture file version and date/time are updated on the Start tab of the RAD-IT Architecture database file.
- Ensure file names, document titles, and website are consistent with the architecture name, version, and dates.
- Kern COG staff will periodically update the Transportation Technical Advisory Committee and Kern COG Board on matters concerning the ITS Architecture and ITS Plan for the Kern Region.

5.0 NEXT STEPS

The next step in the overall project is to incorporate the results of this deliverable into the Final ITS Plan. The consultant team will continue the more intensive activities in the development of the Regional ITS Architecture, which is being developed and documented. The results of this Regional ITS Architecture development and this ITS Architecture Use and Maintenance Plan are presented to the stakeholder group for review and input. Upon review of the proposed ITS documents the draft ITS Plan will be circulated for comments culminating in the Final ITS Plan.