Fall 2007

ITS Implementation Plan

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Final

Central Coast ITS Implementation Plan

Association of Monterey Bay Area Governments

TRANSCORE

CENTRAL COAST ITS
IMPLEMENTATION PLAN

FINAL

Prepared for:

Association of Monterey Bay Area Governments
&
CCITS Coordinating Group

Prepared by:

626 Wilshire Blvd.
Suite 818
Los Angeles, California 90017

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1. INTRODUCTION

1.1 PROJECT OVERVIEW

The Central Coast region has a long history of planning and designing Intelligent Transportation Systems (ITS). Beginning in 1998, stakeholder agencies from the 5-County region (Santa Cruz, San Benito, Monterey, San Luis Obispo, Santa Barbara) came together to collaboratively begin the process to determine the region's viability to apply ITS to the area's transportation issues. From 1998 through 2000, the stakeholder agencies, later identified as the Central Coast ITS Coordinating Group, worked in partnership to develop the 2000 Central Coast ITS Strategic Deployment Plan (2000 CCITS SDP) the Central Coast Regional ITS Architecture, and several ITS promotional publications (e.g., brochure, video tape, presentation materials, etc.).

Within the 2000 CCITS SDP, the CCITS Coordinating Group concluded that ITS technology had tremendous potential for improving regional mobility, safety, and economic competitiveness. Solidifying their commitment to ITS in the Central Coast, the CCITS Coordinating Group continued to meet on a quarterly basis to guide ITS planning and deployment activities, advise other stakeholder agencies on adherence/updates to the Regional ITS Architecture; advise/assist them in seeking discretionary funding for ITS projects, and to coordinate/share information on planned or proposed ITS projects in the region.

As the Central Coast agencies continued their deployment, operation, and management of ITS devices, the CCITS Coordinating Group foresaw the benefits of reaching out to multiple groups throughout the region. The concept of formulating a more cohesive ITS education piece could assist with informing more agencies and policy makers about the "state of ITS" within the region. The ITS promotional publications prepared for the 2000 SDP (e.g., brochure, video tape, presentation materials, etc.) have been used extensively to educate and inform both agency staff as well as the general public about the value of ITS deployment, and its ability to improve not only the safety of the transportation network but also its efficiency and effectiveness of moving people and goods.

Building upon this momentum, the California Department of Transportation (Caltrans) awarded a grant to the region under the Federal Highway Administration (FHWA) Partnership Planning Program on the promotion and deployment of ITS in the Central Coast. Funded by this grant, the Central Coast ITS Implementation Plan project provided a more expeditious, unified, and consistent integration of ITS into the State and regional transportation planning and programming processes within the Central Coast. Further, the Central Coast ITS Implementation Plan project performed the following activities for the region:

- Utilized the work undertaken over the last several years to maintain the momentum gained
- Updated the Central Coast Regional ITS Architecture to the National ITS Architecture (Version 5) and Turbo Architecture (Version 3)
- Ensured compliance of the region with the current United States Department of Transportation (USDOT) FHWA Rule and Federal Transit Administration (FTA) Policy for National ITS Architecture
- Provided a strategy for moving forward with ITS
- Established/implemented a CCITS Regional Architecture Implementation Plan

- Established/implemented a CCITS Regional Architecture Maintenance Plan
- Provided cooperative agency agreement templates
- Reviewed/updated promotional/informational ITS publications
- Provided assistance promoting ITS technology and knowledge in the Central Coast
- Provided an authoritative resource of ITS information to Caltrans, regional, and local agencies
- Provided training in the use of the Turbo Architecture software

1.2 WHAT IS ITS?

Intelligent Transportation Systems (ITS) involve the use of a broad range of advanced computer, wireless and wireline communications-based information, and electronics technologies. When integrated into the transportation system's infrastructure and in vehicles themselves, these technologies relieve congestion, improve safety, enhance productivity, and increase the efficiency of the entire surface transportation network.

For illustrative purposes, some typical ITS applications include the following:

<u>Traffic Signal Control on Surface Streets</u>

- Provides the ability to modify signal timings at surface street intersections in response to changing roadway conditions
- Advanced applications include interconnected or synchronized signals along a roadway
- Central traffic control systems (TCS) include upgraded signal controllers and advanced system monitoring capabilities
- Other applications include signal priority (for transit and emergency vehicles) and advanced crosswalks

<u>Network Surveillance (CCTV & Roadway Sensors)</u>

- System of detection and/or surveillance devices that monitor roadway conditions to assist in operational and management decisions
- Closed Circuit Television (CCTV) cameras can provide real-time video images of the roadway
- Roadway sensors can measure traffic volumes, occupancy, speed, etc.

<u>En-Route Traveler Information Systems (DS & HAR)</u>

- Roadside devices that provide en-route traveler information to passing motorists at key decision points
- Dynamic Message Signs (DMS) are electronic message boards at strategic locations that display dynamic information in an illuminated manner
- Highway Advisory Radio (HAR) involves the broadcast of location-specific information via the car radio (typically on AM with a 1-mile range)

<u>Transit Management Systems (AVL, Smart Cards, & Maintenance Systems)</u>

- Applications to increase transit safety, efficiency, ridership, and performance
- Automated Vehicle Location (AVL) systems can track a transit vehicle's/bus' location in real-time and compare against its schedule/route

- Smart Cards are a form of electronic fare payment (credit, debit, etc.)
- System maintenance applications use on-board sensors to monitor vehicle diagnostics to better troubleshoot problems and/or optimize repairs

As transportation funds become more limited and travel demands increase, the Central Coast is trying to find ways to maximize the use of its existing transportation system. Wise use of ITS technologies will help stakeholder agencies to more efficiently use its initial transportation investment and lead to significant benefits such as the following:

- Travel time savings and reduced delays, vehicle emissions, and fuel consumption at traffic signals through improved signal coordination
- Reduced secondary accidents at freeway incident scenes through faster incident identification, site clean-up, and traveler advisories
- Improved on-time performance, better customer service, and reduced travel times through transit vehicle tracking, schedule adherence monitoring, and traffic signal priority treatment
- Reduced traveler frustration and increased convenience and security through more accurate, timely, and reliable information on traffic conditions, alternate routes, transit routes and schedules, parking, and attractions
- Increased freeway capacity through ramp metering
- Improved motorist and transit rider safety and security through video monitoring, emergency call devices, and faster response
- Reduced delays and reduced administrative costs for commercial vehicle operators through streamlining of credential and other administrative processes and through weight and safety inspection pre-clearance
- Reduced traffic accidents and reduced accident injury severity through advanced warning of hazardous traffic conditions; enhanced speed, traffic signal, railroad crossing and stop sign enforcement; enhanced railroad crossing sensing and warning systems; and faster and more effective identification and response to traffic incidents

The actual benefits achieved by the Central Coast will depend on a number of factors, such as congestion levels, the extent of ITS system deployment, and system operations. For further information and to obtain additional/specific details regarding ITS benefits, please visit the following USDOT websites:

- ITS Benefits (http://www.itsbenefits.its.dot.gov/)
- ITS Lessons Learned (http://www.itslessons.its.dot.gov/)

1.3 WHAT IS THE CENTRAL COAST ITS IMPLEMENTATION PLAN?

In 2000, the initial CCITS SDP provided an ITS Project deployment "road map", a phased implementation schedule, and an integrated framework to "connect" the ITS projects together (i.e., the CCITS Regional Architecture). Building upon this foundation, the region is further deploying and promoting ITS through this Central Coast ITS Implementation Plan (the Plan). The Plan updates the 2000 CCITS SDP as well as provides materials/products to help each stakeholder agency to better implement, operate, and maintain their ITS projects.

The Plan serves as a blueprint for how technology may be used to enhance the transportation system in both the short-and long-term. This Plan and related Regional ITS Architecture also fulfill planning requirements related to the use of Federal funding for the deployment of ITS projects in the Central Coast. Finally, the implementation planning exercise itself has served as a valuable activity in bringing together the diverse set of stakeholders in the region. The Plan coordinates with a variety of other planning activities, both locally and regionally. It is important for the Plan to tie together a variety of possible actions that would move the Central Coast forward in the application of advanced transportation technologies.

The overall goal of the Plan is to identify and prioritize potential ITS projects in the region based on existing and projected future travel and transportation needs and deficiencies. It is expected that ITS technologies will be increasingly incorporated into the transportation infrastructure over a period of time. Therefore, the Plan's importance grows as it becomes the framework to assure that all the pieces will ultimately fit together, not only with each other, but with other types of transportation improvements. The Plan is a road map on how to implement a system of technology-based strategies over a period of time. It is important to recognize that the Plan includes both highway-oriented strategies plus ways to reduce the demand for travel, through enhancements to transit, ridesharing programs, and telecommuting opportunities.

The Plan takes an inclusive approach to ITS projects, to ensure the range of possible applications can be accommodated in the Regional ITS Architecture, even though in some cases, a particular application may be many years away. Project implementation priorities then define which ITS projects are likely to be implemented earlier than others. These priorities have been indicated in general short- (less than 5 years), medium- (5-10 years), and long-term (greater than 10-years) timeframes, providing flexibility for the stakeholder agencies to make adjustments in priorities in response to funding availability and overall needs of the transportation program.

Because of the dynamic, evolving nature of ITS, it is important to understand the role of the Plan – what it is intended to do and what it does not do. The Plan should be viewed as a tool to guide the CCITS Coordinating Group, not as a mandate re: what agencies must do, nor limit what they can do. But properly understood, the Plan can help agencies make the best use of transportation technology, providing the overall framework for purposeful, integrated, and coordinated ITS implementation. In this respect, the following principles pertain to the Plan.

- The Plan exists to improve the delivery of transportation service and provide new and better ways of running the transportation system
- The Plan shows a connection to the transportation-related problems, issues, and challenges being faced by the State, region, counties, and localities
- The Plan reinforces the integration of ITS into the mainstream planning process

- The Plan envisions no significant shifts in institutional arrangements, but rather implementation of the plan will require increasing institutional coordination between the stakeholder agencies (through the CCITS Coordinating Group)
- The Plan recognizes that basic infrastructure deployment is fundamental to the development of some future ITS services
- The Plan should be viewed as a living document, one that stakeholder agencies should be ready to change as the direction of technology, transportation, and public policy unfolds

The challenge now is to implement ITS project in a series of achievable and sustainable steps, with each step building the political and financial bridge to the Central Coast's long range goals.

1.4 CCITS IMPLEMENTATION PLAN "ROADMAP"

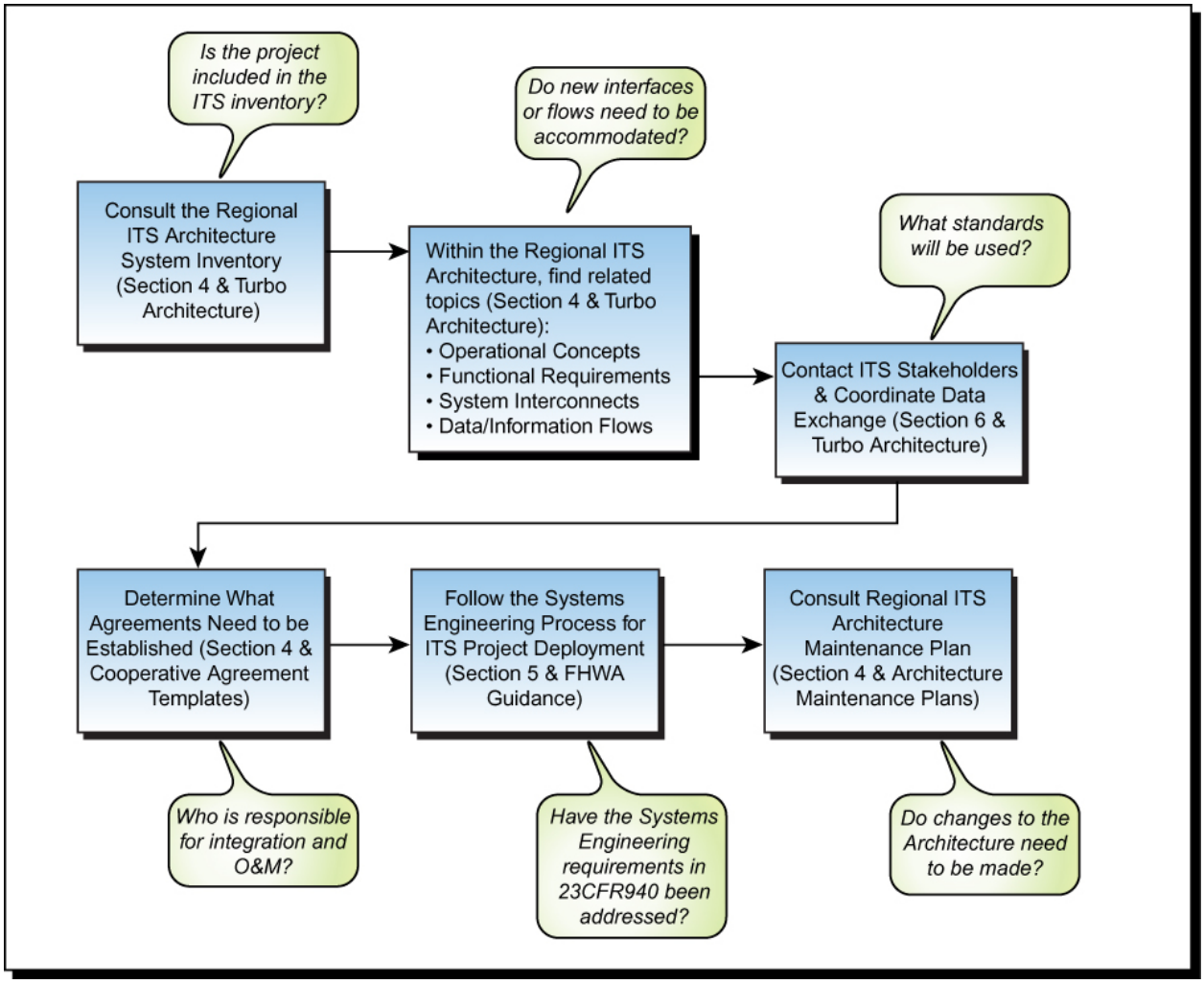
A primary purpose of the Central Coast ITS Implementation Plan is to serve as an overall framework for integration between the many ITS Projects that have been or will be deployed in the region. The Plan includes an inventory of Regional ITS elements/systems/projects, cooperative agreements between agencies, and technical integration necessary for an ITS project to interface with other ITS projects and systems.

Agencies in the Central Coast believe that ITS needs should be considered in both the transportation planning and project development processes. As an ITS project is conceptualized, the sponsoring agency must consult the Plan as well as the Central Coast Regional ITS Architecture. The sponsoring agency should have a basic understanding re: existing ITS in the region (Section 2), how to use ITS to improve the region's transportation systems (Section 3), what are the existing ITS priorities for the Central Coast (Section 3), be familiar with how to integrate ITS into the project development process (Section 4), consider ITS conformance requirements, potential agency agreements, funding and procurement opportunities (Section 5), and consider future operations and maintenance (O&M) activities (Section 5).

For example, if an agency wanted to establish a Transportation Management Center (TMC) to better support O&M activities re: their traffic control system (TCS) and other associated ITS devices (e.g., CCTV cameras, electronic changeable message signs, etc.), the technical process would follow the flow of activities presented in Exhibit 1.1. A similar process would be used when considering implementation of other ITS projects such as a transit system or traveler information system.

If the ITS project has not been previously identified within the Plan or in the Regional ITS Architecture, then a systems engineering process should be executed by the sponsoring agency. The systems engineering process undertaken would mimic the Regional ITS Architecture development process and modify corresponding ITS project and/or Architecture needs, services, operational concepts, functional requirements, system interconnects, agency agreements, and data/information flows as appropriate so that the new ITS project being considered for deployment includes all of the necessary requirements.

Exhibit 1.1 – Central Coast ITS Implementation Plan "Roadmap"



1.5 PROJECT PARTICIPANTS

The following agencies comprise the CCITS Coordinating Group and continue to provide oversight for ITS implementation in the Central Coast:

- Association of Monterey Bay Area Governments (AMBAG)
- Caltrans (District 5)
- Caltrans Division of Transportation Planning, Office of Policy & Research
- California Highway Patrol (CHP)
- Council of San Benito County Governments (SBtCOG)
- Federal Highway Administration (FHWA)
- Monterey-Salinas Transit (MST)
- San Benito County Local Transportation Authority (SBCLTA)
- San Luis Obispo Council of Governments (SLOCOG)
- Santa Barbara County Association of Governments (SBCAG)
- Santa Cruz County Regional Transportation Commission (SCCRTC)
- Santa Cruz Metropolitan Transit District (SCMTD)
- Transportation Agency for Monterey County (TAMC)

The CCITS Coordinating Group will continue to periodically meet to guide ITS planning and deployment activities; advise other stakeholder agencies on adherence/updates to the Regional ITS Architecture; advise/assist them in seeking discretionary funding for ITS projects; and to coordinate/share information on planned or proposed ITS projects in the region.

2. CENTRAL COAST REGION

2.1 CHALLENGES & OPPORTUNITIES

ITS offers the potential to address many of the region's existing and future transportation challenges. Some of the challenges that were initially identified by representatives of the various affected agencies include the following:

- Further enhancing roadway and motorist safety
- Providing real-time information to travelers
- Better managing traffic safety along congested roadways
- Better coordinating incident/emergency response activities
- Increasing transit system efficiency and accessibility
- Enhancing and upgrading the communications network

As part of the original 2000 CCITS SDP, the region's transportation-related needs and deficiencies were identified. As part of the Central Coast ITS Implementation Plan project, the CCITS Coordinating Group wanted to update the region's needs and deficiencies. This update was documented within the Central Coast Needs Assessment deliverable. Based upon feedback received from the CCITS Coordinating Group, the following transportation system-related problems were identified:

- Recurring Congestion (Commuter, Recreational, and Activity Centers)
- Non-Recurring Congestion and Incidents
- Special Event/Activity Center Traffic
- Transit Efficiency and Effectiveness
- Mobility and Accessibility
- Emergency Response
- System Monitoring
- Travel Information Needs Including Visitors
- Efficient Network for Commercial Vehicles
- Impacts of Commercial Vehicles on Highways
- Safety
- Better Planning Data
- Maintenance Activities
- Inter-Agency Communication
- Environmental Impacts

Exhibit 2.1 provides a brief listing of each problem or need and the associated locations where the problem or need currently exists within the Central Coast region. For additional details re: definitions of the Central Coast's problems and needs, as well as the locations or samples of locations where the problem currently occurs within the region, please refer to the Needs Assessment document (Section 2).

Exhibit 2.1 – Summary of Needs & Deficiencies in the Central Coast

Problem Area/Need	Location
♦ Recurring Congestion *A. Commute* *B. Recreational* *C. Activity Centers*	• Major regional routes include US 101, SR 1, SR 17 and SR 68, plus major urban arterials throughout the region. • Major routes include US 101, SR 1, SR 17, SR 68, SR 156, as well as the urban arterials near recreational destinations. • SR 46 and urban and rural areas near activity centers in the region.
♦ Non-Recurring Congestion ▪ Incidents & Construction ▪ Major Disasters	Urban and rural areas region-wide, particularly landslides along the Cuesta Grade (US 101) and along SRs 1, 9, 17, and 46, and MCO activities regionally.
♦ Special Event/Activity Center Traffic ▪ Congestion ▪ Parking Management	Special Events include the Laguna Seca Raceway, AT&T National Pro-Am Golf Tournament, Mid State Fair, Artichoke Festival, Mardi Gras, Hollister Motorcycle Rally, Hollister Hills Off-Road Cycling, etc. Activity Centers include beaches, missions, airports, Hearst Castle, Big Sur, Monterey Bay Aquarium, Stearns Wharf, Santa Cruz Beach Boardwalk, etc.
♦ Transit Efficiency and Effectiveness ▪ Service Quality and Reliability ▪ Transit Service Management	Regional & Inter-Regional. All public transportation services.
♦ Mobility and Accessibility ▪ Transit Service Coverage	Regional & Inter-Regional. All public transportation services.
♦ Emergency Response	Regional. Can be subdivided into urban areas and rural areas. Also includes potential Homeland Security incidents at Diablo Canyon Nuclear Power Plant, military installations, etc.
♦ System Monitoring ▪ Roadway Closures ▪ Operating Conditions ▪ Weather	Regional. Operating condition problems occur in urbanized areas in Santa Cruz, Monterey, San Luis Obispo, and Santa Barbara Counties. Weather problems occur most often along SR 9, SR 17, and SR 152 in Santa Cruz County, SR 1 and SR 46 in Monterey and San Luis Obispo Counties, and US 101 and SR 154 in Santa Barbara County. Transit Agency AVL systems to monitor operations.
♦ Travel Information Needs Including Visitors ▪ Operating Conditions ▪ Travel Services	Regional. Major routes include US 101, SR 1, SR 17, SR 41, SR 46, SR 68, and SR 156. Major tourist destinations including Monterey Peninsula, Big Sur, beaches and waterfronts, downtown areas of San Luis Obispo, Santa Cruz, and San Juan Bautista, etc. Transit Agency next bus arrival messaging at transit stops.
♦ Efficient Network for Commercial Vehicles ▪ Weigh Stations and Permitting ▪ Information	Weight stations, rest stops or areas, and major commercial truck centers located along major routes in the region.
♦ Impacts of Commercial Vehicles on Highways ▪ Safety ▪ Congestion ▪ Hazardous Materials	Regional. Major routes include US 101, SR 17, SR 25, SR 46, SR 156, and local streets and roads in the Cities of Castroville and Salinas.
♦ Safety ▪ Design Issues ▪ Railroad Crossings ▪ Pedestrian Safety	Regional, including SR 1, SR 17, SR 41, SR 46, SR 58, SR 166, and SR 198. Other routes where limited passing occurs is along SR 1, SR 41, SR 46, and SR 154. Also at-grade railroad crossings and locations with significant pedestrian safety issues at schools/universities and tourist areas.
♦ Better Planning Data	Regional. Types of data include volume, speed, vehicle classification, etc.
♦ Maintenance Activities	Regional.
♦ Inter-Agency Communication	Regional.
♦ Environmental Impacts	Regional.

The Needs Assessment provided a discussion of many of the transportation problems and issues that exist in the Central Coast, both at a regional level and at a county-by-county level. This work was further developed by categorizing and summarizing the problems in a way that an applicable ITS project that could potentially address those problems could be readily seen. In addition, specific locations of those problems were identified, where appropriate, to set the stage for the development of location-specific ITS projects in subsequent work, in coordination with the Regional ITS Architecture.

Exhibit 2.2 presents the summary of problems and the locations in the Central Coast to which they were deemed to apply. This list was developed in consultation with Caltrans and with each of the counties participating in the study. Exhibit 2.2 also presents a generic description of each problem type.

Exhibit 2.2 – Transportation

1. Recurring Congestion

Refers to need for managing and minimizing the impacts of recurring commuter, recreational, and activity center-related congestion. This congestion is defined as the regular occurrence of heavy or significant vehicular travel along specific streets and highways. Subdivided according to roadway classification.

A. Freeway:

- SR 1 – Santa Cruz urban area (Santa Cruz)
- SR 9 (Santa Cruz)
- SR 17 – Santa Cruz to Santa Clara (Santa Cruz)
- SR 1 – Monterey Peninsula (Monterey)
- US 101 – Prunedale to SR 156 Hollister Off-ramp (Monterey and San Benito)
- US 101 – South of Salinas to Prunedale (Monterey)
- US 101 – SLO urban area (SLO)
- SR 1 – near Lompoc (Santa Barbara)
- US 101 – Santa Barbara and Santa Maria urban areas (Santa Barbara)
- US 101 Salinas interchanges (Monterey)
- US 101 – 5 Cities area (SLO)

B. Highway/Arterial:

- SR 129 & SR 152 near SR 1
- SR 25 & SR 156-near Hollister
- SR 68 – SR 1 to Torero
- SR 68 – SR 1 to CHOMP
- SR 156 – Castroville Blvd to US 101
- SR 183 – Castroville Separation to SR 1
- SR 46 – Paso Robles urbanized area
- SR 1 – Castroville to Salinas Rd. through Moss Landing
- SR 1 – Salinas Rd. Intersection near Moss Landing
- SR 1 – Monterey to Marina (near Fort Ord) (AM/PM peaks)
- SR 1 – Santa Rosa St. in SLO
- US 101 – Tefft St. in Nipomo
- SR 135 – near Santa Maria
- SR 246 – near Lompoc, Solvang, and Santa Ynez
- Interchanges in Arroyo Grande
- Bridge capacity in Paso Robles
- Hollister Ave. (Goleta)
- State St. (Santa Barbara)
- Lighthouse Ave. (Monterey)
- Del Monte Ave. (Monterey)
- Blanco Rd. – Reservation to Davis
- Davis Rd. (Salinas)
- Boranda Rd. (Salinas)
- North Main St. (Salinas)

2. Non-Recurring Congestion

Refers to managing congestion that does not occur on a regular basis and is often the result of unplanned incidents. The unpredictability of this congestion suggests variation in location, and potentially different ITS applications from those used for recurring congestion.

A. Incidents/Major Disasters:

Regional – key locations include:

- Landslides along SR 1 (Santa Cruz, Monterey, SLO)
- Landslides along SR 17 (Santa Cruz)
- Landslides along SR 9 (Santa Cruz)
- Landslides along SR 46 (SLO)
- SR 46 (San Luis Obispo)
- SR 1, 154, and 156 (Santa Barbara)
- Cuesta Grade (US 101)

B. Construction/Maintenance:

Regional

Exhibit 2.2 – Transportation

3. Special Event/Activity Center Traffic

This problem involves responding to the unique and irregular travel patterns and traffic conditions created by special events and activity centers. While not always recurring, this problem differs from non-recurring congestion in that the impacts are foreseeable and advance planning can occur.

Major events include:

- Races at Laguna Seca
- AT&T National Pro-Am Golf Tournaments
- Mid State Fair in Paso Robles
- Castroville Artichoke Festival
- Moss Landing Street Faire
- San Juan Bautista Antique & Collectable Flea Market
- San Juan Bautista Arts & Crafts Show/Wine Festival
- AIDS Bike Ride (101 Corridor)
- Santa Barbara Fiesta
- Hollister Hills Off-Road Cycling
- Hollister Motorcycle Rally
- Vandenberg Air Show activities
- Solvang Danish Festival
- Monterey Car events (Concours, Antique Race Cars)
- Monterey Jazz Festival
- Monterey County Fair
- Big Sur Marathon (Monterey County)
- 4th of July events in Paso Robles, Pismo, & Cayucos (SLO County)
- 4th of July events in Monterey
- Amgen Tour (Santa Barbara & San Luis Obispo)

A. Congestion:

- Santa Cruz Boardwalk (SR 1, SR 17 & local roads)
- Hollister Municipal Airport (SR 156)
- Monterey (US 101 & SR 156 near Salinas & Prunedale, SR 1 & SR 68 in Monterey)
- Pismo State Beach, SLO Mission & Cal Poly (US 101 within San Luis Obispo urbanized area)
- Santa Barbara, Univ. of CA Santa Barbara & Stearn's Wharf (within Santa Barbara urbanized area)

B. Parking Management:

- Santa Cruz Boardwalk area
- Pebble Beach area (during AT&T)
- Former Fort Ord
- Laguna Seca Raceway
- Fisherman's Wharf/Cannery Row (Monterey)
- Casino (Santa Ynez)

4. Transit Efficiency and Effectiveness

Transit efficiency and effectiveness is defined as the need to provide mobility, reduce vehicular travel demand, and improve air quality through the provision of adequate transit services and programs.

A. Service Quality and Reliability (e.g., On-time performance, traveler information, etc.)	Regional. All public transportation services.
B. Transit Service Management (e.g., AVL, automated fleet management, etc.)	Regional. All public transportation services.

5. Mobility and Accessibility

Mobility and accessibility is defined as the need to provide improved or additional access and increased mobility through the provision of adequate transit services.

Regional. All public transportation services.

6. Emergency Response

This need refers to the ability to identify and react to emergencies or incidents.

A. Detection/Verification	Regional. Can be subdivided into urban areas and rural areas.
B. Response	Regional. Can be subdivided into urban areas and rural areas.
C. Homeland Security	Military installations and Diablo Canyon Nuclear Power Plant

7. Real-Time System Monitoring

This need covers the ability of transportation Agencies to obtain accurate and timely information regarding the status and operation of transportation system components. It has been subdivided into three categories based on the type of information.

A. Infrastructure (Roadway Closures):

- SR 17 (Santa Cruz)
- SR 154 (Santa Barbara)
- SR 166 (Santa Barbara)
- SR 156 (Monterey)
- SR 1 (Monterey, SLO, SB)
- US 101 in Shell Beach (SLO)
- US 101 (Monterey)
- SR 68 (Monterey)

B. Operating Conditions:

- Congested routes as identified above

Exhibit 2.2 – Transportation

C. Weather:

- SR 1 (Monterey, SLO)
- SR 154 (Santa Barbara)
- US 101 near Goleta/Buellton (Santa Barbara)
- SR 41 (SLO)
- SR 46 (SLO)
- SR 17 (Santa Cruz)

8. Travel Information Needs

Maximizing the efficient use of the transportation system requires that travelers be informed about travel options and current operating conditions.

A. Operating Conditions:

Along major, congested routes as identified above.
At key junctions/decision points:

- US 101/SR 156 (Monterey)
- SR 1/SR 68 (Monterey)
- SR 1/SR 156 (Monterey)
- US 101/SR 154 (Santa Barbara)
- SR 1/US 101 (San Luis Obispo)
- SR 46/US 101 (San Luis Obispo)

B. Travel Services (hotels, motels, etc.):

Major tourist destinations including:

- Monterey Peninsula
- Big Sur
- Santa Barbara waterfront
- Solvang
- Hearst Castle/Cambria
- Downtown San Luis Obispo
- Downtown Santa Cruz
- Downtown San Juan Bautista
- Santa Cruz beaches & boardwalk
- Pismo & Shell Beach

9. Efficient Network for Commercial Vehicles

This need recognizes the importance of goods movement to the region's economy, particularly as it relates to the agricultural industry. Thus, it is important that the transportation network be accessible and efficient for commercial operators

- Reduce delays at weigh stations
- Traffic flow around major commercial truck centers located along major routes in the region.
- Permitting procedures
- Transportation Service Center (multi-modal hub/logistics center)

10. Impacts of Commercial Vehicles on Highways

A corollary to the above, is the impact that commercial vehicles have on the region's roadway network.

A. Safety:

- SR 17 (Santa Cruz)
- SR 25 and 156 – near Hollister (San Benito)
- SR 68, 156, and 183 (Monterey)
- US 101 (South Monterey County)
- SR 152 (Santa Cruz)
- SR 46/41 (SLO)
- US 101 – near Prunedale

B. Congestion:

- SR 17 (Santa Cruz)
- SR 166 (Santa Barbara)
- Around distribution centers – Salinas (Monterey)
- SR 156E (San Benito)
- SR 183 – Castroville (Monterey)
- SR 46E – Paso Robles' urban area
- US 101 – near Prunedale (southbound)
- US 101 (South Monterey County)

C. Hazardous Materials:

Regional.

11. Safety

Improving the safety of all travelers is an issue throughout the region.

A. Roadway geometry (curves, grades, limited passing):

- SR 1 (Monterey, SLO)
- SRs 9, 17, 129, and 152 (Santa Cruz)
- SRs 25 and 198 (Monterey)
- SRs 41, 46, 58, and 166 (SLO)
- SRs 154 and 166 (Santa Barbara)
- SR 146 to Hwys 25 & 198 (Monterey)

B. Railroad Crossings

Exhibit 2.2 – Transportation

C. Pedestrian Safety:

- Boardwalk Area
- UC Santa Cruz
- Local streets adjacent to Monterey Bay Aquarium
- Downtown SLO
- Cal Poly SLO
- Downtown Santa Barbara
- Mission District
- UC Santa Barbara in Isla Vista
- San Miguel school kids crossing RR tracks
- Goleta
- Santa Maria

12. Better Planning Data

Short- and long-range planning is an important function for most of the Region's transportation Agencies. To be done effectively, this function requires accurate and comprehensive data.

Regional.

- State routes (all Counties)
- Major urban arterials (all Counties)

13. Maintenance Activities

Funding constraints have reduced the ability of the state and local governments to adequately repair heavily traveled roadways, let alone rural facilities that attract low traffic volumes, thereby creating a need for enhancing maintenance activity efficiency.

Regional.

14. Inter-agency Communication

Because responsibilities are distributed, interagency communication and cooperation is critical to the effective management of the transportation system. An effective communications system allows all interested Agencies to share important data in a timely manner thereby allowing the personnel to coordinate operations safely and efficiently.

Regional.

15. Environmental Impacts

Sensitivity to the environment is an important factor that shapes all transportation programs within the Central Coast Region. Minimizing impacts may be accomplished by reducing vehicle emissions, reducing the likelihood of incidents such as hazardous material spills, and responding more quickly when environmental problems arise.

Regional.

2.2 EXISTING ITS INITIATIVES

"Building blocks" for regionally-integrated ITS in the Central Coast are already in place. Existing ITS applications and those ITS systems that have been implemented since their inclusion within the 2000 CCITS SDP continue to provide critical functionality to the regional transportation system. Highlights of some of the more significant current and/or in-progress ITS implementations within the Central Coast are found in the following sections.

2.3 CENTRAL COAST – REGIONALLY-SIGNIFICANT ITS SYSTEMS

Caltrans D5 Transportation Management Center (TMC)

- Operational since October 2001
- Located in San Luis Obispo
- Jointly managed/operated by Caltrans and CHP staff
- "Open" Monday thru Friday (6:00 AM to 6:00 PM)
- Uses computer-aided dispatching (CAD) system to more efficiently manage CHP and Caltrans vehicles/resources
- Serves as the central clearinghouse facility to manage/coordinate/support incidents and/or special events

- Monitors freeway conditions using CCTV
- Issues SigAlerts via e-mail, posts messages on CMS signs and initiates HAR messages based on information provided by Caltrans and CHP

Roadway Sensors (Detector Stations)

- Description
  - General – System of detection and/or surveillance devices that monitor roadway conditions to assist in operational and management decisions
  - Roadway Sensors – Measure traffic volumes, speed, occupancy, etc.
- Programmed Installations
  - Along US 101 (San Luis Obispo County)
  - Along US 101 (Santa Barbara County)

Ramp Meters

- Description
  - Traffic signals located upstream from the merge point of an on-ramp with a freeway, which control the flow of vehicles onto the freeway
  - Typically involves the use of roadway sensors and software programs to balance the number of vehicles allowed onto the freeway versus the number of vehicle already on the freeway
- Existing Installations
  - Monterey County (US 101 at SR 156)
  - Santa Barbara County (US 101 at Garden Street)

Changeable Message Signs (CMS)

- Description
  - Overall – Roadside device that provides en-route traveler information to passing motorists at key decision points
  - CMS – Electronic message boards at strategic locations that display dynamic information in an illuminated manner
- Existing Installations (Fixed Locations)
  - Santa Cruz County
    - SR 1 (PM 13.9)
    - SR 17 (PM 4.3)
    - SR 17 (PM 11.3) (as part of Dynamic Speed/Curve Warning System)
    - SR 17 (PM 12.55)

- San Luis Obispo County
    - US 101 and Prado Road (NB on US 101 just south of Prado)
    - US 101 and Paso Robles Street (SB on US 101 just north of Paso Robles)
    - US 101 and SR 46 West (WB on SR 46 just west of US 101)
    - SR 1 and SR 46 (NB on SR 1 just south of SR 46)
    - SR 46 and SR 41
- Santa Barbara County
    - US 101 and SR 154 interchange's north and south junctures
- Portable CMS (14 devices/units)

<u>Closed Circuit Television (CCTV) Cameras</u>

- Description
    - General – System of detection and/or surveillance devices that monitor roadway conditions to assist in operational and management decisions
    - CCTV – Cameras that provide video images of the roadway
- Existing Installations
    - Santa Cruz County
        - SR 1 (PM 13.9) (north of 41st Street in Santa Cruz)
        - SR 1 (PM 16.7) (at Emeline in Santa Cruz)
        - SR 1 (PM 17.2) (north of Woodwardia Highway)
        - SR1 and SR 17 interchange
        - SR 17 (PM 4.3) (south of Granite Creek)
        - SR 17 (PM 11.3) (as part of Dynamic Speed/Curve Warning System)
        - SR 17 (PM 12.5) (south of Santa Clara County Line)
    - Monterey County
        - US 101 and SR 156 interchange
    - San Luis Obispo County
        - US 101 and 4th Street (PM 15.6) (in Pismo Beach)
        - US 101 and Bello (PM 17.2) (in Pismo Beach)
        - US 101 and Mattie Road (PM 17.9) (in Shell Beach)
        - US 101 and SR 58 (near Santa Margarita)
        - US 101 and Curbaril (in Atascadero)
        - US 101 and SR 46 East (in Paso Robles)
    - Santa Barbara County
        - US 101 and Patterson Avenue (in Goleta)

Highway Advisory Radio (HAR)

- Description
  - Overall – Roadside device that provides en-route traveler information to passing motorists at key decision points
  - HAR – Involves the broadcast of location-specific information via the car radio (typically on AM with a 1-mile range)
- Existing Installations (Fixed Locations)
  - Santa Cruz County
    - SR 1 and SR 17 interchange
    - SR 17 (PM 5.5)
- Portable HAR (1 device/unit)

Interactive Traveler Information Systems

- Description
  - Interactive devices providing access to traveler information (typically used before a trip is taken) (e.g., internet websites, kiosks, telephone call-in systems, etc.)
  - Typically provide freeway congestion maps, travel times, road closures, etc.
- Existing Installations
  - Caltrans telephone call-in system (1-800-427-ROAD)
  - Caltrans internet website (coordinated postings by Caltrans D4 and D5)
    - http://www.dot.ca.gov/hq/roadinfo/
    - http://www.dot.ca.gov/roadsandtraffic.htm

Radio Communications Network

- Description
  - Radio interoperability with direct radio communications between CHP and non-CHP emergency service providers
- Existing Installations (Fixed Locations)
  - CHP and emergency providers in San Luis Obispo County
  - CHP and emergency service providers in San Luis Obispo County

2.3.1 Santa Cruz County

Roadway Sensors (Detector Stations)

- SR 17 (as part of Dynamic Speed/Curve Warning System)
- SR 1 and SR 17

CMS (Regionally-Significant)

- SR 1 (PM 13.9)
- SR 17 (PM 4.3)
- SR 17 (PM 11.3) (as part of Dynamic Speed/Curve Warning System)
- SR 17 (PM 12.55) (2 CMS signs operated by Caltrans D4)

CCTV (Regionally-Significant)

- SR 1 (PM 13.9) (north of 41st Street in Santa Cruz)
- SR 1 (PM 16.7) (at Emeline in Santa Cruz)
- SR 1 (PM 17.2) (north of Woodwardia Highway)
- SR1 and SR 17 interchange
- SR 17 (PM 4.3) (south of Granite Creek)
- SR 17 (PM 11.3) (as part of Dynamic Speed/Curve Warning System)
- SR 17 (PM 12.5) (south of Santa Clara County Line)

Traffic Signal Control (Surface Streets)

- Description
    - "Stand-alone" traffic signal timings/operations along arterial roadways
- Existing Installations
    - SR 152 (near SR 1/Watsonville)
    - SR129 (near SR 1)
    - City of Santa Cruz
    - City of Capitola
    - City of Scotts Valley

Dynamic Speed/Curve Warning System

- Description
    - Situation –Vehicles traveling too fast for conditions, particularly on curves or downslopes, increase their risk of being involved in an accident
    - Application – Using roadway sensors, CCTV, and CMS, information regarding unsafe traveling speeds (particularly in relation to an upcoming curve) are provided to the motorist
- Existing Installations
    - Along SR 17

Motorist Aid Call Boxes

- Description
  - Call boxes help motorists in-distress by providing a direct connection to a CHP communications center or other private call answering center (PCAC)
  - The California Call Box Program is a motorist-aid system operating along major roadways throughout the State and administered at the County level by local Service Authorities for Freeways and Emergencies (SAFEs)
- Existing Installations
  - Along SR 1, SR 9, SR 17, SR 129, and SR 152

HAR (Regionally-Significant)

- SR 1 and SR 17 interchange
- SR 17 (PM 5.5)

2.3.2 San Benito County

Traffic Signal Control (Surface Streets)

- SR 25 (near Hollister)
- SR 156 (near Hollister)

Motorist Aid Call Boxes

- Along US 101, SR 25, SR 146, and SR 156

2.3.3 Monterey County

Ramp Meters (Regionally-Significant)

- US 101 and SR 156 interchange

CMS (Regionally-Significant)

- City of Monterey (Washington St. and Del Monte Ave.)

CCTV (Regionally-Significant)

- US 101 and SR 156 interchange

Traffic Signal Control (Surface Streets)

- SR 183 (near Salinas)
- City of Salinas

- City of Monterey
- City of Marina
- City of Pacific Grove
- City of Seaside
- City of Gonzales

Dynamic Speed/Curve Warning System

- Along SR 1
- West Blanco Rd. (between South Davis Rd. and Reservation Rd.)

Motorist Aid Call Boxes

- Along US 101, SR 1, SR 68, and SR 156

HAR

- City of Monterey

Transit Automated Vehicle Location (AVL) System

- Description
  - System that tracks a vehicle's location in real-time and compares it against schedule/route in order to increase transit system performance/efficiency
- Existing Installations
  - Monterey-Salinas Transit (MST)

Transit Traveler Information System

- Description
  - System that includes CMS, AVL status, internet websites, and TV displays of route status
- Existing Installations
  - MST "OnStreet" System (Salinas, Monterey, and Marina)

Transit Signal Priority

- Description
  - System that uses sensors to detect approaching transit vehicles and alter signal timings to improve transit performance
- Existing Installations
  - City of Salinas and MST
  - City of Monterey and MST

Transit Security (Video Surveillance)

- Description
  - Use of CCTV cameras installed on-board transit vehicles/buses and at transit stations to monitor activities in order to improve transit passenger security
- Existing Installations
  - MST (entire transit vehicle/bus fleet)
  - MST (Salinas Transit Center and Marina Transit Exchange)

2.3.4 San Luis Obispo County

Roadway Sensors (Detector Stations) (Regionally-Significant)

- Along US 101 (various locations)

CMS (Regionally-Significant)

- US 101 and Prado Road (NB on US 101 just south of Prado)
- US 101 and Paso Robles Street (SB on US 101 just north of Paso Robles)
- US 101 and SR 46 West (WB on SR 46 just west of US 101)
- SR 1 and SR 46 (NB on SR 1 just south of SR 46)
- SR 46 and SR 41

CCTV (Regionally-Significant)

- US 101 and 4th Street (PM 15.6) (in Pismo Beach)
- US 101 and Bello (PM 17.2) (in Pismo Beach)
- US 101 and Mattie Road (PM 17.9) (in Shell Beach)
- US 101 and SR 58 (near Santa Margarita)
- US 101 and Curbaril (in Atascadero)
- US 101 and SR 46 East (in Paso Robles)

Highway Advisory Radio (HAR)

- Description
  - Overall – Roadside device that provides en-route traveler information to passing motorists at key decision points
  - HAR – Involves the broadcast of location-specific information via the car radio (typically on AM with a 1-mile range)
- Existing Installations (Fixed Locations)
  - Cal Poly Parking and Events

Traffic Signal Control (Surface Streets)

- SR 227
- SR 1
- City of Arroyo Grande
- City of Atascadero
- City of Grover Beach
- City of Morro Bay
- City of Paso Robles
- City of Pismo Beach
- City of San Luis Obispo

Dynamic Speed/Curve Warning System

- Description
    - Situation –Vehicles traveling too fast for conditions, particularly on curves or downslopes, increase their risk of being involved in an accident
    - Application – Using roadway sensors, CCTV, and CMS, information regarding unsafe traveling speeds (particularly in relation to an upcoming curve) are provided to the motorist
- Existing Installations
    - City of Atascadero
    - City of Grover Beach
    - City of San Luis Obispo
    - County of San Luis Obispo
    - US 101 (Cuesta Grade)

Advanced Crosswalks

- Description
    - Use of indicators/"flashing" beacons installed in the roadway along crosswalk borders in order to increase awareness of potential pedestrian conflict and improve safety
- Existing Installations
    - Downtown San Luis Obispo
    - Downtown Atascadero
    - Downtown Pismo Beach
    - Paso Robles

Motorist Aid Call Boxes

- Along US 101, SR 1, SR 41, SR 46, and SR 166

Rideshare System/Website

- Description
  - Provides a rideshare match based on travelers' origin/destination, routing constraints/preferences, date/time of travel, eligibility, etc.
- Existing Installations
  - San Luis Obispo Regional Rideshare (www.rideshare.org/)

Transit Automated Vehicle Location (AVL) System

- Description
  - System that tracks a vehicle's location in real-time and compares it against schedule/route in order to increase transit system performance/efficiency
- Existing Installations
  - San Luis Obispo Transit (SLO Transit)
  - South County Area Transit (SCAT)

Transit Traveler Information System

- Description
  - Bus arrival notification system (developed by Cal Poly)
- Existing Installations
  - San Luis Obispo Transit EDAPTS (SLO Transit)

Transit Safety Systems (Driver Safety Buttons)

- Description
  - Button/switch located in transit driver seating area that provides a silent alarm/indication to the transit dispatching center that a situation is in-effect and the driver needs assistance
  - In some applications, the button/switch also activates a microphone so that the transit dispatching center can hear what is going on inside the transit vehicle/bus
- Existing Installations
  - SCAT
  - San Luis Obispo Regional Transit Authority (RTA)

Emergency Vehicle Pre-Emption

- Description
  - System that uses sensors to detect approaching emergency vehicles and alter signal timings to allow emergency vehicles a "green-light" for safer passage through the intersection
- Existing Installations
  - All jurisdictions

2.3.5 Santa Barbara County

Roadway Sensors (Detector Stations) (Regionally-Significant)

- Along US 101 (various locations)

Ramp Meters (Regionally-Significant)

- US 101 and Garden Street interchange

CMS (Regionally-Significant)

- US 101 and SR 154 interchange's north and south junctures

CCTV (Regionally-Significant)

- US 101 and Patterson Avenue (in Goleta)

Traffic Signal Control (Surface Streets)

- Along State Street and Hollister Avenue
- SR 246 (in the Cities of Solvang & Buellton)
- City of Santa Barbara
- City of Goleta
- City of Lompoc
- City of Santa Maria
- City of Carpinteria

Motorist Aid Call Boxes

- Along US 101, SR 1, SR 154, SR 166, and SR 246

Rideshare System/Website

- Santa Barbara Association of Governments (SBCAG) (www.sbcag.org/)

Transit Traveler Information System

- Description
  - Internet website and kiosks located at transit terminals that allow passengers to obtain bus information (e.g., schedules, routes, fares, etc.)
- Existing Installations
  - Santa Barbara Metropolitan Transit District (SBMTD) (www.sbmtd.gov/)

Transit AVL System

- Lompoc Transit
- SBMTD
- Santa Maria Area Transit (SMAT)

"Smart" Cards

- Description
  - Description – A form of electronic fare payment (debit, credit, etc.) to help better mange fare collection and financial accounting systems
  - Applications – Transit vehicles/buses, toll facilities, parking lots, etc.
- Existing Installations
  - SBCAG/Vista Coastal Express
  - University of California – Santa Barbara (UCSB) Parking Program

2.4 ITS ACTIVITIES OUTSIDE THE CENTRAL COAST

It is important to recognize that the Central Coast ITS Implementation Plan is not an isolated effort. There are numerous activities being conducted at the Federal, State, and regional levels that may affect the Central Coast region. These other activities may help influence or guide the Central Coast Implementation Plan, or they may provide the opportunity or need for integration and coordination, for example the San Joaquin Valley ITS Plan.

2.4.1 Federal Activities

AS part of the U.S. Department of Transportation (DOT), the Federal Highway Administration (FHWA – http://www.fhwa.dot.gov) has engaged in several major initiatives for ITS. These initiatives include preparation of the ITS National Program Plan that outlines National goals and objectives for ITS, the development of National Standards for ITS in areas where such standards are appropriate, and the development of a "National ITS Architecture" that establishes an overall framework for the integration of ITS systems and subsystems.

Within the Transportation Equity Act for the 21st Century (TEA-21), the FHWA has placed a continued emphasis on the operation and management of the transportation infrastructure through ITS and other strategies. In particular, 23 CFR 940.9 and 940.11 require that ITS Projects carried out using funds made available by the Highway Trust Fund conform to the National ITS Architecture, applicable provisional National ITS Standards, and protocols. In addition, such projects must comply with system engineering requirements and applicable Federal standards that have been adopted for the implementation of ITS.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU – http://www.fhwa.dot.gov/safetealu/index.htm) was enacted August 10th, 2005, as Public Law 109-59. SAFETEA-LU authorizes the Federal surface transportation programs

for highways, highway safety, and transit for the 5-year period 2005-2009. SAFETEA-LU continues the TEA-21 concept of guaranteed funding, keyed to Highway Trust Fund (Highway Account) receipts. In essence, the guaranteed amount is a floor – it defines the least amount of the authorizations that may be spent. Within total authorizations, the amount guaranteed for the Federal-aid Highway program (FAHP) in SAFETEA-LU total $193.2 billion.

The U.S. DOT supports State and local governments with training, research, and technical assistance. There are many avenues for obtaining this assistance. Information can be obtained through FHWA's ITS staff in California at (916) 498-5005 or through the U.S. DOT's ITS Joint Program Office (JPO – http://www.its.dot.gov).

2.4.2 Statewide Activities

Caltrans has taken an active role in the planning and deployment of ITS. Recognizing the importance of ITS, Caltrans established the "California Statewide ITS Architecture and System Plan (SWITSA)" in 2004 in order to provide leadership in the development of statewide consensus on ITS. Caltrans continues to provide information, advice, assistance, and liaison activities (as appropriate) to elected and appointed officials about the costs and benefits of implementing ITS technologies. Further, a Caltrans transportation programming component – State Highway Operation and Protection Program (SHOPP – http://www.dot.ca.gov/hq/transprog/shopp.htm) – serves as a potential source of funding for ITS.

2.4.3 Activities in Other Regions

A number of ITS projects and plans have been implemented or are in progress throughout the state of California. Of primary importance is to improve coordination between agencies within and outside the Central Coast region in terms of establishing connections/communications between systems and/or facilities, use of equipment/technologies that are compatible with one another, and the use of ITS standards to ensure inter-operability between systems/components.

The inter-relationships with other neighboring regions and Caltrans Districts are important because the Central Coast provides numerous recreational outlets and access to popular scenic/tourist destinations for the rest of the State. In addition, some residents who live in its northern (Santa Cruz) and southern (Santa Barbara) counties work in the greater San Francisco Bay or Los Angeles/Ventura metropolitan areas respectively. The following efforts, as described below, are of importance to the Central Coast ITS Implementation Plan:

- Caltrans D4 – San Francisco Bay Area
    - Current activities in Santa Cruz County
        - Jointly managed by Caltrans and CHP Staff
        - "Open" 24-hours-a-day, 7-days-a-week (24/7)
        - Operates CMS, HAR, CCTV ,and roadway sensors/detector stations along SR 1 and SR 17
    - Establish connections/communications between the Caltrans D5 TMC and the Caltrans D4 TMC for information sharing purposes

- Allow for access between the Caltrans D5 TMC and the BAVU CCTV Program for CCTV video images

- Caltrans D6 – San Joaquin Valley
  - Establish connections/communications between the Caltrans D5 TMC and the Caltrans D6 TMC for information sharing purposes
  - Ensure coordination of CMS messages along SR 41, SR 46, and SR 58

- Caltrans D7 – Los Angeles Metropolitan Area
  - Establish connections/communications between the Caltrans D5 TMC and the Caltrans D7 TMC for information sharing purposes
  - Ensure coordinated "smart" Card usage between Santa Barbara and Ventura Counties for transit applications
  - Ensure coordination between multi-modal trip planning systems between Santa Barbara and the Southern California Association of Governments (SCAG

3. CENTRAL COAST ITS PROJECTS

3.1 IMPORTANCE OF PLANNING FOR IMPLEMENTATION

Section 3 identifies the overall strategy for implementing ITS in the Central Coast. It presents this strategy as a progression from the strategic direction originally developed in the 2000 CCITS SDP, to existing and/or programmed ITS initiatives, to specific recommended ITS projects, to project implementation priorities. The section discusses the strategy at a regional level as well as at the county level.

As discussed in Section 2, ITS implementation should address the needs and challenges within the Central Coast region. It makes sense then that ITS implementation should also build upon the basic infrastructure that is already deployed (or programmed) in order to offer more cost-effective solutions in some cases. Making this happen takes planning. Making this happen takes coordination, even though in some cases the ITS applications may be many years away from actual implementation.

At this time, the CCITS Implementation Plan does not envision any significant shifts in existing institutional arrangements. However, the Implementation Plan will require increasing institutional coordination between Caltrans, CHP, county agencies, local agencies, and the private sector in order to actually implement the identified ITS projects. For instance, consensus needs to be reached between all stakeholders when a regionally significant ITS project is embarked upon. Within the planning stage, the "sponsoring" agency needs to inform those agencies that are impacted by the ITS project (e.g., geographically, functionally, financially, etc.) of their intent to implement. All parties need to agree that the ITS project addresses an existing transportation challenge/issue, will benefit the region and motorists traveling within/thru, and is a cost-effective, financially-achievable solution. Once consensus is reached at the planning stage, all parties need to agree upon each agency's roles and responsibilities to actually implement the ITS project (e.g., requirements, design, procurement, construction/installation, funding, etc.).

The Implementation Plan reinforces the integration of ITS into the mainstream planning process. Since ITS technologies are just another set of tools available for the solution of recognized transportation problems, mainstreaming ITS allows all parties (and their respective decision-makers) to make informed decisions re: the most effective manner in which to spend available resources. That means, even though this is not a financially-constrained plan, the ITS initiatives proposed must be within reason in terms of affordability.

The Implementation Plan should be viewed as a living document, one that the agencies should be ready to change as the direction of technology, transportation, and public policy unfolds. The challenge now is to implement ITS technologies in a series of achievable and sustainable steps, with each step building the political and financial bridge to the Implementation Plan's long-range goals.

3.2 ITS STRATEGIC DIRECTION

The ITS strategic direction for the Central Coast region is based upon how ITS technologies (and their inherent functionality and/or features) address identified transportation challenges and Agency needs. Input on the Central Coast region's transportation challenges was obtained from the CCITS Coordinating Group and documented within "Deliverable A2-c2 – Needs Assessment" as well as summarized in Section 2. Then, based on the selected User Services from the original 2000 SDP, the CCITS Coordinating Group developed program statements that link the type of ITS application to the need(s) they specifically address. In the descriptions that follow, the program statements listed characterize the Central Coast's overall ITS strategic direction. Please note that for each ITS strategic direction, most of the key existing ITS systems have already been described in Section 2 and some of the key planned ITS projects will be identified in Sections 3.3 thru 3.8.

3.2.1 Traffic Management and Safety

Transportation Management Centers (TMCs)

- Staff/operate a facility that serves as the central clearinghouse to manage/coordinate/support incidents and/or special events
- Focus traffic management and traveler information for distribution via multiple outlets supporting tourism, goods movement, agriculture, emergency services, and other users within the region
- Exchange information with other TMCs within the region (and throughout the State)
- Better coordinate dispatching activities to use resources more effectively (e.g., Freeway Service Patrols, Caltrans, CHP, and local emergency service vehicles, etc.)
- Establish ITS control/management systems and connections to strategically-placed field devices to allow truck drivers, tourists, and other travelers to make route choices with the knowledge of road and traffic conditions
- Ensure cooperative, multi-county efforts with the media for information dissemination

Roadway Network Surveillance

- Coordinated use of detection and/or surveillance devices that monitor traffic flow and roadway conditions to assist in operational and management decisions
- Use roadway sensors/detector stations to better monitor/collect more accurate, reliable, and timely data/information (e.g., traffic volume, occupancy, speed, etc.)
- Use CCTV cameras to provide video images of the roadway and improve the ability to identify and/or verify incidents

Ramp Metering

- Use ramp meters to control the flow of vehicles onto the freeway in order to improve traffic flow and proactively manage/decrease congestion
- Use metering strategies to balance traffic flow on both the freeway and adjacent arterial networks

Traffic Signal Control (Surface Streets)

- Interconnected signal systems along surface streets that better coordinate arterial traffic signals, improve traffic flow, and modify signal timings in response to changing roadway conditions
- Interconnect signals across jurisdictional boundaries of adjacent cities/counties and Caltrans to better facilitate traffic flow on major arterials
- Install centralized Traffic Control Systems at agency TMCs to allow operators more advanced system monitoring and control capabilities

Communications Networks

- Work with the private sector to expand cell phone coverage (aka install new cell phone towers) into more rural areas to more broadly support a range of information delivery options and possible "mayday" applications
- Coordinate interactive efforts between transportation planning staff, emergency services, and planning agency staff to work with their planning commissions, supervisors, and councils on applications for new cell phone towers
- Enhance/coordinate CHP, local law enforcement, and emergency response radio systems to facilitate interagency management of traffic accidents, incidents, and other emergency events
- Take advantage of innovations and advances in communications technologies to promote public safety

Safety Applications

- Establish a management approach that allows Caltrans, CHP, local law enforcement, and other emergency service agencies to monitor, share, and dispatch vehicles/resources in a coordinated manner to improve incident response activities
- Use Dynamic Speed/Curve Warning Systems along the roadside to post safe speed advisories that warn motorists of impending adverse travel conditions (e.g., low visibility, sharp curve, steep grades, etc.)

Internet Websites

- Use internet websites to distribute multi-modal traveler information to the public
- Use "interactive" internet websites that support rideshare matches/programs

Advanced Crosswalks

- Deploy methods to visibly indicate pedestrian presence in the crosswalks to oncoming vehicles, especially at night, in order to improve intersection safety for both motorists and pedestrians

3.2.2 Travel Demand Management

Trip Planning

- Use transportation information and trip planning systems, including automated rideshare matching, to encourage travelers to use transit, ridesharing, and non-motorized modes of travel
- Provide travelers with information about travel time in an effort to better manage the timing of travel demand

Intermodal Coordination

- Use ITS applications, where appropriate, to facilitate coordination among modes and provide for efficient modal transfer

3.2.3 Transit Management and Electronic Payment

Smart Cards

- Providing for a consistent "smart card" approach to provide for seamless operation among transit systems, parking systems, toll operations, and other transaction-based systems
- Strive to implement smart cards and other electronic payment systems that allow for payment for multiple services using a single card or device
- Use smart cards to better manage fare collection and financial accounting systems

Transit Operations and Management

- Use ITS applications to improve transit system efficiency, public information, timeliness of service, and internal record-keeping and management systems
- Where individual transit systems interface, use ITS to enhance the timeliness of modal transfer
- Use AVL systems to track a transit vehicle’s location in real-time and compare against schedule/route in order to improve transit system efficiency through schedule adherence
- Provide riders with real-time transit information via kiosks, internet website, and monitors/signs located at terminal stations
- Provide signal priority for transit buses through coordination with traffic signal systems to improve schedule adherence

- Use system maintenance applications that use on-board sensors to monitor vehicle diagnostics in order to improve transit system reliability and maintenance efficiencies

3.2.4 Emergency Management

Call Boxes

- Use call boxes to help motorists in-distress and improve emergency/incident response activities by providing a direct connection to a CHP communications center or other Private Call Answering Centers (PCACs)
- Upgrade to "smart call boxes" in selected areas to support data collection and planning functions (i.e., call boxes equipped with roadway and/or weather detection devices)

Signal Pre-Emption and Mayday Systems

- Provide signal priority for emergency vehicles through coordination with traffic signal systems to improve emergency response
- Use "mayday" systems in rural areas to dramatically reduce response times to accidents, incidents, collisions, etc.

3.2.5 Commercial Vehicle Operations

Goods Movement

- Work in partnership with trucking and agriculture industries to pursue ITS applications that facilitate goods movement and vehicle safety

3.2.6 Railroad/Highway Intersections

Improved Warning at Grade Crossings

- Work with the railroad industry to provide improved motorist warning through ITS

3.2.7 Traveler Information

En-Route Traveler Information Systems

- Use roadside devices to provide more accurate, reliable, and timely traveler information to passing motorists at key decision points
- Use CMS and/or HAR to improve the ability to notify and "re-route" travelers around upcoming roadway incidents (e.g., congestion, accidents, roadway closures, etc.)

Interactive Traveler Information Systems

- Increase the availability and quality of multi-modal traveler information (e.g. roadway conditions, transit schedules, rail/train arrival times, tourism activities, etc.) generally by making regional and local information available via internet websites and telephone call-in systems
- Use kiosks located at rest areas, truck stops, transit terminals, etc. to allow long-distance traffic to avoid major incidents/road closures and improve the ability to better plan trips (i.e., route, mode, and time choices)
- Coordinate implementation of a 511 telephone call-in system

Tourism

- Work with the tourism industry and business groups to facilitate the provision of information to all travelers, with emphasis on tourists and visitors to the region

Weather and Closure Information

- Employ ITS applications to identify and provide warning for roadway closures, flooded areas, weather problems, and other unexpected events to reduce inconveniences to the public

Train Arrival Information

- Provide information on train arrival times, connections to other modes, and other information at AMTRAK rail stations, especially unmanned stations

3.2.8 Other ITS Application Areas

Maintenance

- Promote the development and acquisition of ITS technologies to improve maintenance efficiency

Planning Data

- Use ITS applications to provide data for planning and system operations

3.3 ITS PROJECT PRIORITIES IN THE CENTRAL COAST

The entire Central Coast ITS Implementation Plan cannot be implemented at one time. There must be a sense of priority among potential ITS projects so that staging and phasing can occur in a systematic manner. These priorities may vary within each individual county, based on the needs and characteristics of each area. In addition, some ITS projects should be viewed as "core projects" or foundational to the ability to implement other projects.

ITS project priorities define which projects are likely to be implemented earlier than others. These priorities have been indicated in general short-, medium-, and long-term timeframes (S/M/L), providing flexibility for Caltrans and local agencies to make adjustments in priorities in response to funding availability and overall needs of the transportation program in some cases. Through discussions with the CCITS Coordinating Group, the ITS project planning horizon and implementation phasing strategy for the Central Coast region is as follows:

- S/Short-term (less than 5-years) (2008 – 2012)
- M/Medium-term (5 to 10 years) (2013 – 2017)
- L/Long-term (greater than 10-years) (after 2018)

These are generalized timeframes, and the actual implementation period will depend on when funding becomes available. Other modifications may also be made to the projects as technology advances and other ideas emerge. The Central Coast ITS Implementation Plan uses an inclusive approach, incorporating ITS projects that may have application in the long-term, as well as those that have higher potential for more immediate application. This allows for the development of a complete Regional ITS Architecture and maximizes investment in both the short- and long-term, even though some ITS projects may not be implemented for years to come.

It is also important to note that some of the Central Coast Regional Transportation Planning Agencies (RTPAs) already have sets of criteria that they apply to the prioritization of projects and programs [e.g. for prioritization for the Transportation Improvement Program (TIP) and for local funding]. For ITS applications in any individual county, it may be most appropriate to use the county-level criteria for project and program prioritization, if such criteria exist. However, some of these sets of criteria do not take into consideration the non-traditional nature of ITS, and many need to be amplified to accommodate aspects of ITS.

Within Appendix A, Exhibit A-1 lists all of the Implementation Plan's recommended ITS projects, including their potential implementation timeframe (S/M/L). Implementation of Central Coast's ITS projects will depend upon the availability of funding and initiative taken by the project sponsors.

3.4 ITS PROJECT DESCRIPTIONS

A series of ITS projects for implementation was developed based on the identified transportation problems/needs, the existing ITS infrastructure, recommendations from the 2000 CCITS SDP, and discussions with the CCITS Coordinating Group. To the extent possible, these ITS projects are tied to a specific location and/or agency. There are however, some ITS projects that can only be provided with general locations (since their implementation timeframe is identified as long-term).

Appendix A provides a full listing of the ITS projects developed in the Central Coast ITS Implementation Plan process. Within Exhibit A-1, a table is presented that indicates the following

- Detailed description of the various ITS projects
- Specific project locations/areas
- Problems/needs addressed
- Implementation timeframe
- Possible responsible agencies (for implementation)

Section 4 describes how these ITS projects are accommodated within the Central Coast Regional ITS Architecture. It is expected that this list of ITS projects will be expanded or modified over time as new ideas are generated and as technology changes, offering opportunities that had not been anticipated. These additional ITS projects or modifications need to be tied to the overall Regional ITS Architecture through the guidelines provided by the respective Architecture Maintenance Plan. The Implementation Plan should be modified periodically to reflect these updates, but there is no requirement for the ITS project to be in the Central Coast ITS Implementation Plan before it can be programmed. However, in order to receive Federal funds, the ITS project shall be based on a systems engineering analysis. A part of this analysis will identify portions of the Regional ITS Architecture being implemented.

Exhibit 3.1 indicates general location information for the various ITS projects. The location specification is tailored to the type of ITS project. In some cases, the location is associated with various streets. In others, it is associated with cities or systems (e.g. transit or emergency service agencies). The ITS projects and their locations can be defined in greater detail as funding is identified and as they are included in State and local programs. These locations are spelled out in greater detail in the following sections as well as Appendix A.

Exhibit 3.1 – Recommended Central Coast ITS Project Locations

Central Coast ITS Project	General Project Locations
Traffic Management and Safety	
Network Surveillance • CCTV • Roadway Sensors • Smart Call Boxes	• At ramp meter locations and selected mainline freeway sections (as congestion warrants) • On freeway ramps and selected mainline sections (as congestion warrants) • Selected locations where planning data or monitoring data are desired
Surface Street Control • Basic Synchronization • Traffic Control System (TCS)	• Selected arterial locations identified by Local Agencies • Cities of Santa Barbara, Santa Maria, San Luis Obispo, Monterey, Salinas, and Santa Cruz
Freeway Control • Ramp Metering	• At on-ramps in congested sections (as warranted)
HOV Lane Management • High Occupancy Vehicle (HOV) Lanes	• SR 1 in Santa Cruz County • From junction with SR 17, HOV lanes will run south for approx. 6-miles
Traffic Information Dissemination • CMS • HAR • Portable Traffic Mgt. System	• At major route decision points (as identified in Appendix A) • At points where additional information is needed (such as adverse weather-prone areas) • One or two units per County for use at special events or construction zones
Regional Traffic Control • Regional Freeway/Arterial Coordination/Control • Caltrans D5 TMC Enhancements	• Freeways in Santa Barbara, Santa Maria, Monterey Peninsula Cities, and Santa Cruz • San Luis Obispo
Incident Management System • CAD System Enhancements • Integrated Comm. System • Call Boxes • Response Strategy Support	• Emergency response Agencies (as they can afford upgrades) • Support enhancements and upgrades to CHP and emergency response Agency radio systems • Along all State highways • Upgrades implemented by individual Agencies over time
Emission Monitoring and Mgmt.	• MPOs in consultation with Air Pollution Control Districts and State
Standard RR Grade Crossing	• Rural locations without current protection
Advanced RR Grade Crossing	• Rural and urban locations with highest vehicle-train accident rates
Parking Facility Management • Parking Usage Monitoring • Electronic Parking Fees	• Santa Barbara (downtown, waterfront, and mission area), San Luis Obispo (downtown), Monterey (downtown and Aquarium), Carmel (downtown), Santa Cruz (downtown), and selected special event centers • Same as above plus Monterey (Fisherman's Wharf)and Santa Cruz (Boardwalk)
Road Weather Info System	• US 101 (Ventura to Buellton), SR 154, SR 1 (Big Sur area), US 101 (through Prunedale), SR 1, and SR 17

Exhibit 3.1 – Recommended Central Coast ITS Project Locations

Central Coast ITS Project	General Project Locations
Advanced Safety Systems	
• Advanced Crosswalks	• Around universities, central business districts, and other selected locations with identified pedestrian safety issues
• Curve/Grade Warning System	• At locations with severe/sharp curves and steep downslopes (additional locations to be determined through the Caltrans Safety Improvement Program)
• Height Detectors	• No specific projects proposed
Transit Management	
Transit Vehicle Tracking	• All transit Agencies (phased-in over time)
Transit Fixed Route Operations	
• Off-Line Route/Schedule Mgt.	• All transit agencies (phased-in over time)
Demand/Response Transit Ops	
• Automated Dispatching/Info	• Transit Agencies providing dial-a-ride service
Transit Passenger and Fare Mgmt	
• Automated Passenger Counting	• All fixed route operators
• Electronic Fare Collection	• All fixed route operators
Transit Security	
• Video Surveillance	• Possibly all operators (Medium- to Long-term)
• Voice/Data Communications	• Possibly all operators (Medium- to Long-term)
Transit Maintenance	• All operators as technology becomes affordable
Multi-Modal Coordination	
• Signal Priority	• Santa Barbara (State Street), San Luis Obispo (selected arterials), Monterey (Abrego Street), and Santa Cruz (Ocean Avenue)
Transit Traveler Information	
• Static Route/Schedule Info	• All fixed route operators
• Real-Time Schedule Info	• SBMTD, CCAT, SLO Transit, MST, and SCMTD • Arrival information at AMTRAK stations, especially unmanned stations
Traveler Information	
Broadcast Traveler Information	• Information service providers (ISPs) implement systems (as market dictates) • For this and "Interactive Traveler Information," CHP, Caltrans, and other Agencies can facilitate the collection and distribution of information
Interactive Traveler Information	• Traffic information made available through Internet, kiosks tied to Internet, ISPs, telephone call-in systems, and private sector implementations
Yellow Pages and Reservation	• Region-wide by tourism Agencies and private sector
Commercial Vehicle Operations	
Electronic Clearance	• At weigh station/inspection locations
CV Administrative Processes	• State issue, not implemented locally
Weigh-in-Motion	• At weigh station/inspection locations
Roadside CVO Safety	• At weigh station/inspection locations
HazMat Management	• Tie into State or National system (when available)
Automated Dispatch Info System	• Salinas
Emergency Management and Enforcement	
Emergency Response	• Individual law enforcement Agencies and emergency service providers • In addition, government Agencies could encourage improved cellular coverage to allow faster incident reporting and greater coverage for Mayday systems

Exhibit 3.1 – Recommended Central Coast ITS Project Locations

Central Coast ITS Project	General Project Locations
Emergency Routing • Signal Pre-Emption • Route Guidance	• Santa Barbara (State Street), San Luis Obispo (Higuera Avenue, SR 1, & SR 227), Arroyo Grande (Grand Avenue), Atascadero (El Camino Real), Monterey (Abrego Street), and Santa Cruz (Ocean Avenue) • Individual law enforcement and other emergency service Agencies
Mayday Support	• Implemented through private call centers with information forwarded to CHP and other public safety answering points (PSAPs) • For the transfer of information by voice, training and procedures are necessary for PSAPs • For data transfer, additional PSAP equipment may be necessary
Enforcement Systems	• Designated safety corridors and other areas of high accident potential
Planning	
Planning Data Collection	• Data archiving system at MPOs/RTPAs and Caltrans

3.5 REGIONALLY SIGNIFICANT ITS PROJECTS – RECOMMENDATIONS

In the Central Coast, the goal is to ensure that all of these ITS program statements are taken into account when programming particular transportation plans (e.g. RTP, MTP, CTP, etc.) and the Caltrans SHOPP and STIP. Although there are elements of all of the above ITS strategies that are part of the Implementation Plan, several could be considered as part of the core of the strategic direction at a regional level. These are regionally significant ITS projects. The high-priority regionally significant ITS projects that should be considered for short-term implementation are identified below. A listing of the other remaining regionally significant ITS projects and the ITS project descriptions can be found in Appendix A (as applicable).

<u>Caltrans D5 TMC</u>

1. Establish connections to other neighboring Regional TMCs for information sharing purposes (Caltrans D5)
   - Caltrans D4 TMC (San Francisco Bay Area)
   - Caltrans D6 TMC (Fresno)
   - Caltrans D7 TMC (Los Angeles)
2. Install/"in-fill" ITS devices in the field and establish connections/"hook-up" to the Caltrans D5 TMC (Caltrans D5)
   - Roadway Sensors/Detector Stations
   - Ramp Meters
   - CMS
   - CCTV
   - HAR

Roadway Sensors (Detector Stations)

1. Santa Cruz County (Caltrans D5)
   - SR 1 - Freedom Blvd. O.C. to SR 1/SR 17 Junction
   - SR 17 - SR 1/SR 17 Junction to Santa Clara County Line
2. San Benito County (Caltrans D5)
   - SR 25 - Hollister City limits to Santa Clara County Line
   - SR 156 - US 101 to SR 152/Santa Clara County Line
3. Monterey County (Caltrans D5)
   - US 101 - Airport Blvd. to Crazy Horse Rd
   - SR 1- Start freeway (Carmel) to end freeway/SR 156 (Castroville)
4. San Luis Obispo County (Caltrans D5)
   - US 101 - Santa Barbara County Line to northern San Luis Obispo City limits
   - US 101 - SR 58 to SR 46 east
5. Santa Barbara County (Caltrans D5)
   - US 101 - SR 150 Junction (Ventura County Line) to Hollister Ave.
   - US 101 - Clark Ave. south of Santa Maria to San Luis Obispo County Line

Ramp Meters

1. Santa Cruz County (Caltrans D5/CHP)
   - SR 1 - Freedom Blvd. to SR 1/SR 17 Junction (Emeline)
   - SR 17 - SR 1/SR 17 Junction to Santa Clara County Line
2. Monterey County (Caltrans D5/CHP)
   - SR 1 - SR 68 (south) to Reservation Rd. (Monterey Peninsula)
   - US 101 - Airport Blvd. to Boronda (Salinas Area)
3. San Luis Obispo County (Caltrans D5/CHP)
   - US 101 - SR 166/Santa Barbara County Line to Los Berros (Nipomo Area)
   - US 101 - El Campo to Lower Higuera (Five Cities Area)
4. Santa Barbara County (Caltrans D5/CHP)
   - US 101 - SR 150/Ventura County Line to Hollister Ave. (Santa Barbara Area)
   - US 101 - Clark Ave. to San Luis Obispo County Line (Santa Maria Area)

CMS

1. Santa Cruz County (Caltrans D5)
   - SR 1
   - SR 17
2. San Benito County (Caltrans D5)
   - US 101

3. Monterey County (Caltrans D5)
   - Junction of US 101 & SR 156 south (near Prunedale)
   - Junction of State Routes 1 & 68 south
   - Junction of State Routes 1 & 156
4. San Luis Obispo County (Caltrans D5)
   - Junction of US 101 & SR 1 (north in SLO)
5. Santa Barbara County (Caltrans D5)
   - Junction of US 101 & SR 166
   - Junction of US 101 & SR 1 (south in Gaviota Pass)
   - Junction of US 101 & Las Positas Rd.
   - SR 154 at the San Marcos Pass

CCTV

1. Regional (as part of all future Ramp Meter installations) (Caltrans D5)
2. Santa Cruz County (Caltrans D5)
   - SR 17 (Laurel Rd., Pasatiempo, La Madrona, Mt. Herman Rd., Granite Creek, north of Crescent Dr., north of Vine Hill Rd., Sugar Loaf, Glenwood Cut-Off, Glenwood Curves, Glenwood Dr., Summit, north of Summit, and Santa Cruz County Line)
   - SR 1 (Soquel Ave., north of Morrissey, Emeline, Porter St., Park Ave., State Park Dr., Rio Del Mar, and Freedom Blvd.)
3. San Benito County (Caltrans D5)
   - US 101 - Monterey County Line to 7.5 miles north
4. Monterey County (Caltrans D5)
   - SR 1 - SR 68 (south) to Reservation Rd. (Monterey Peninsula)
   - US 101 - Airport Blvd. to Boronda (Salinas Area)
5. San Luis Obispo County (Caltrans D5)
   - US 101 - Cuesta Grade (San Luis Obispo to SR 58)
   - US 101 - SR 166/Santa Barbara County Line to Los Berros (Nipomo Area)
6. Santa Barbara County (Caltrans D5)
   - US 101 - SR 150/Ventura County Line to Hollister Ave. (Santa Barbara Area)
   - US 101 - Clark Ave. to San Luis Obispo County Line (Santa Maria Area)

HAR

1. Santa Cruz County (Caltrans D5)
   - SR 1
   - SR 9
   - SR 17
   - SR 129

2. San Benito County (Caltrans D5)
   - US 101
3. Monterey County (Caltrans D5)
   - US 101/SR 156 Junction
4. San Luis Obispo County (Caltrans D5)
   - US 101/SR 1 in San Luis Obispo
5. Santa Barbara County (Caltrans D5)
   - US 101/SR 154 in Santa Barbara

3.6 SANTA CRUZ ITS PROJECTS – RECOMMENDATIONS

In addition to the regionally significant ITS projects, the activities listed below represent the high-priority ITS projects that should be considered for short-term implementation in Santa Cruz County. A listing of the other remaining Santa Cruz County ITS projects and the ITS project descriptions can be found in Appendix A (as applicable).

<u>CMS</u>

1. SR 1 (and nearby local roads)
   - Local Agencies/Caltrans D5
2. SR 17 (and nearby local roads)
   - (Local Agencies/Caltrans D5)

<u>TCS</u>

1. City of Santa Cruz
   - Deploy/install centralized traffic control system (TCS)

<u>511 Telephone Call-In System</u>

1. SCCRTC

<u>Internet Traveler Information System</u>

1. SCCRTC

<u>Parking Management/Information System</u>

1. City of Santa Cruz
   - Santa Cruz Boardwalk area

Transit AVL System

1. SCMTD (all transit vehicles/buses)

Transit Vehicle Signal Priority

1. City of Santa Cruz and SCMTD

Transit Electronic Fare Collection System

1. SCMTD (all transit vehicles/buses)

Transit Traveler Information System

1. SCMTD
   - Deploy/install system that includes CMS, AVL status, kiosks, and TV displays of route status
   - Deploy/install Transit Trip Planning system

3.7 SAN BENITO ITS PROJECTS – RECOMMENDATIONS

In addition to the regionally significant ITS projects, the activities listed below represent the high-priority ITS projects that should be considered for short-term implementation in San Benito County. A listing of the other remaining San Benito County ITS projects and the ITS project descriptions can be found in Appendix A (as applicable).

Traffic Signal Control (Surface Streets)

1. SR 25 (near Hollister)
   - Install interconnect/synchronize signals along roadways
   - Caltrans D5
2. SR 156 (near Hollister)
   - Install interconnect/synchronize signals along roadways
   - Caltrans D5

CMS

1. Along SR 156

Advanced Crosswalks

1. Nash Rd. (Hollister – near San Benito High School)
2. SR 25 (near Hollister)
3. Hawkins Hospital (Hollister)

Transit AVL System

1. San Benito County LTA (all transit vehicles/buses)

Transit Electronic Fare Collection System

1. San Benito County LTA (all transit vehicles/buses)

3.8 MONTEREY ITS PROJECTS – RECOMMENDATIONS

In addition to the regionally significant ITS projects, the activities listed below represent the high-priority ITS projects that should be considered for short-term implementation in Monterey County. A listing of the other remaining Monterey County ITS projects and the ITS project descriptions can be found in Appendix A (as applicable).

Traffic Signal Control (Surface Streets)

1. SR 183 - Castroville Sep. to SR 1 (near Salinas)
   - Install interconnect/synchronize signals along roadways
   - Caltrans D5
2. SR 68 - York Road to Torero
   - Install interconnect/synchronize signals along roadways
   - Caltrans D5
3. SR 156 - Castroville Blvd. to US 101
   - Install interconnect/synchronize signals along roadways
   - Caltrans D5

TCS

1. City of Monterey
   - Deploy/install centralized traffic control system (TCS)

511 Telephone Call-In System

1. MST, AMBAG, and TAMC

Parking Management/Information System

1. City of Monterey
   - Downtown Monterey
   - Monterey Bay Aquarium Area

Transit Electronic Fare Collection System

1. MST (all transit vehicles/buses)

Commercial Vehicle Traveler Information System

1. City of Salinas
   - A truck information service in the Salinas area to optimize freight routing and management

3.9 SAN LUIS OBISPO ITS PROJECTS – RECOMMENDATIONS

In addition to the regionally significant ITS projects, the activities listed below represent the high-priority ITS projects that should be considered for short-term implementation in San Luis Obispo County. A listing of the other remaining San Luis Obispo County ITS projects and the ITS project descriptions can be found in Appendix A (as applicable).

Traffic Signal Control (Surface Streets)

1. Grand Avenue
   - Install interconnect/synchronize signals along roadways
   - Cities of Arroyo Grande and Grover Beach
2. El Camino - Atascadero
   - Install interconnect/synchronize signals along roadways
   - City of Atascadero

TCS

1. City of San Luis Obispo
   - Deploy/install centralized traffic control system (TCS)

511 Telephone Call-In System

1. SLOCOG

Motorist Aid Call Boxes

1. Rural SR 227 (SLOCOG, Caltrans D5, and CHP)

Advanced Crosswalks

1. Grand Avenue (Cities of Arroyo Grande and Grover Beach

Emergency Vehicle Signal Priority*

1. Higuera Street (City of San Luis Obispo)
2. SR 1 (City of San Luis Obispo and Caltrans D5)
3. SR 227 (City of San Luis Obispo and Caltrans D5)

* Compatibility issues currently exist between various deployed systems

Transit AVL System

1. SLORTA

Transit Vehicle Signal Priority

1. Throughout SLO urban area (City of San Luis Obispo and SLORTA)
2. Grand Avenue (Cities of Arroyo Grande and Grover Beach and SLORTA)

Transit Electronic Fare Collection System

1. SLORTA (all transit vehicles/buses)

Transit Safety Systems (Driver Safety Buttons)

1. SLO Transit

3.10 SANTA BARBARA ITS PROJECTS – RECOMMENDATIONS

In addition to the regionally significant ITS projects, the activities listed below represent the high-priority ITS projects that should be considered for short-term implementation in Santa Barbara County. A listing of the other remaining Santa Barbara County ITS projects and the ITS project descriptions can be found in Appendix A (as applicable).

Traffic Signal Control (Surface Streets)

1. Upper State Street
   - Install interconnect/synchronize signals along roadways
   - City of Santa Barbara
2. Hollister Avenue
   - Install interconnect/synchronize signals along roadways
   - City of Goleta

TCS

1. City of Santa Barbara
   - Deploy/install centralized traffic control system (TCS)

Integrated Freeway/Arterial Coordination/Control

1. City of Santa Barbara
   - Dynamic traffic and incident management strategies (ramp meters, traffic signals, and freeway/arterial coordination) on US 101 in Santa Barbara
   - City of Santa Barbara and Caltrans D5

HAR

1. SBCAG (US 101 in the Montecito and Downtown Santa Barbara area)

Traveler Information System

1. SBCAG (Web-based traveler information service to provide real-time traffic conditions and transit information)

Roadway Weather Information System (RWIS) ("Smart" Call Boxes)

1. SBCAG (Install weather detection and telecommunications devices on existing call boxes along SR 154 so that information can be displayed via CMS)

Transit AVL System

1. SBMTD (buses along Hollister, State, and US 101 corridors)

Transit Vehicle Signal Priority

1. Along Upper State Street, install hardware at intersections and transponders on transit vehicles to allow for extended green times for buses in close proximity (City of Santa Barbara and SBMTD)

Transit Maintenance System

1. SBMTD
   - All transit vehicles/buses
   - Includes maintenance scheduling systems and on-board diagnostics

Transit Electronic Fare Collection System

1. SBMTD (all transit vehicles/buses)

3.11 ITS PROJECT COST ANALYSIS

The Central Coast ITS Implementation Plan sees technology as an enabler, as a means to deliver transportation services more effectively. But ITS technology must be applied in the right locations, at the right time, and in the right way. It must be targeted to specific, identified needs. Transportation dollars are scarce, and investments in ITS must leverage those dollars to achieve the transportation objectives of the Central Coast. The investments must be thought through in the context of the entire life cycle of the expenditure, not committing to more than it is possible to operate and maintain.

Determining ITS project costs at this stage of the implementation process is difficult for a number of reasons. In some instances, the ITS project will be several years away, and the technologies and associated costs may change radically. In others, the associated approaches to the communications systems may change, depending on developments in the communications industry. In addition, similar ITS projects in different jurisdictions will be of varying size and complexity, so a "one-cost-fits-all" approach will not work.

Despite these challenges, the region's Federal, State, and local agencies are looking to the Central Coast ITS Implementation Plan to assist them in planning and estimating the deployment costs associated with identified ITS projects. With these financial guidelines in-hand, each agency is better poised to gather more specifics about the ITS project and prepare better cost estimates for inclusion into State and county-level project programming documents. Exhibit 3.2 provides an estimate of costs by ITS project. As seen from Exhibit 3.2, the project deployment process is broken-down into distinct phases to provide each agency with an understanding of the level of funding required to implement an ITS project. Please note the following items when reviewing the costs presented in Exhibit 3.2:

- All costs presented are intended as planning-level estimates, not engineering estimates
- Better estimates can be provided as each ITS project moves into design and procurement
- All cost estimates are provided at the component level approach (i.e., per vehicle, per location, etc.)
    - Provides more detail to the interested agency due to its "bottoms-up" approach
    - Normalizes the effect of different spacing of the components along the roadway or a different number of vehicle in a fleet
- Capital costs provided are based on real-world experience and notably accurate
- Other project phase costs are estimates (i.e., rule-of-thumb) based on a percentage of the capital cost:
    - Project Administration → 10%
    - Requirements and Design → 15%
    - Installation and Integration → 15%
    - Testing and Evaluation → 10%
    - Operations and Maintenance → 10% per year
- Costs for communications and construction activities are not included within this cost analysis

- These costs can vary widely depending upon the project's deployment location, the amount of existing infrastructure already in-place, and the specific design details associated with the ITS project
- These costs are substantial components of the ITS project's entire deployment cost, often 40-50% of the total cost

For those ITS projects where capital costs are not provided, the desired level-of-accuracy could not be maintained. Therefore, the reader is referred to the individual ITS project description in Appendix A for further information concerning applicable cost range(s) based on real-world experiences.

Please note that the costs in Exhibit 3.2 and Appendix A are Year 2007 dollars and provide a starting point and possible baseline for future ITS implementation costs applicable to the Central Coast region. The reader is cautioned about using the costs directly without first examining the assumptions, local conditions, and other factors associated with the particular ITS project.

Exhibit 3.2 – Central Coast ITS Project Cost Analysis

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Traffic Management and Safety								
Network Surveillance • CCTV • Roadway Sensors/Detector Stations • Smart Call Boxes	 $46,000 $34,500 $6,900	 $4,600 $3,450 $690	 $6,900 $5,175 $1,035	 $6,900 $5,175 $1,035	 $4,600 $3,450 $690	 $69,000 $51,750 $10,350	 $4,600 $3,450 $690	 Per camera Per location Per location
Surface Street Control • Basic Synchronization • Traffic Control System (TCS)	 $287,500	 $28,750	 $43,125	 $43,125	 $28,750	 $431,250	 $28,750	 See Appendix A System costs only
Freeway Control • Ramp Meters	 $63,250	 $6,325	 $9,487	 $9,488	 $6,325	 $94,875	 $6,325	 Per location
HOV Lane Management • High Occupancy Toll (HOT) Lanes								 See Appendix A
Traffic Information Dissemination • CMS • HAR • Portable Traffic Mgmt. Sys. (CMS, HAR, & CCTV)	 $230,000 $57,500 $149,500	 $23,000 $5,750 $14,950	 $34,500 $8,625 $22,425	 $34,500 $8,625 $22,425	 $23,000 $5,750 $14,950	 $345,000 $86,250 $224,250	 $23,000 $5,750 $14,950	 Freeway-type CMS Per location Per PTMS
Regional Traffic Control • Caltrans D5 TMC								 See Appendix A
Incident Management System • Response Strategy Support • Call Boxes	 $4,600	 $460	 $690	 $690	 $460	 $6,900	 $34,500*	 See Appendix A Per location Denotes cost to manage Call Box program for a typical County (*)
Standard RR Grade Crossing	$63,250	$6,325	$9,487	$9,488	$6,325	$94,875	$6,325	Per location
Advanced RR Grade Crossing	$86,250	$8,625	$12,937	$12,938	$8,625	$140,875	$8,625	Per location
Parking Facility Management • Parking Usage Monitoring	 $143,750	 $14,375	 $21,562	 $21,563	 $14,375	 $215,625	 $14,375	 Per location
Road Weather Info System (RWIS)	$51,750	$5,175	$7,762	$7,763	$5,175	$77,625	$5,175	Per location

Exhibit 3.2 – Central Coast ITS Project Cost Analysis

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Advanced Safety Systems • Speed/Curve Warning System • Advanced Crosswalks	$80,500 $34,500	**$8,050** **$3,450**	$12,075 $5,175	$12,075 $46,000*	$8,050 $3,450	$120,750 $92,575	$8,050 $3,450	Per location Per crosswalk Denotes actual installation costs (*)
Transit Management								
Transit Vehicle Tracking • AVL (vehicle) • AVL (system)	$17,250 $575,000	$1,725 $57,500	$2,587 $86,250	$2,588 $86,250	$1,725 $57,500	$25,875 $862,500	$1,725 $57,500	Per transit vehicle Includes training
Demand/Response Transit Ops • Automated Dispatching/Info								See Appendix A
Transit Passenger and Fare Mgmt • Automated Pass. Counting • Electronic Fare Collection	$5,750 $11,500	$575 $1,150	$862 $1,725	$863 $1,725	$575 $1,150	$8,625 $17,250	$575 $1,150	Per transit vehicle Per transit vehicle
Transit Security • Video Surveillance • Voice/Data Communications	$11,500	$1,150	$1,725	$1,725	$1,150	$17,250	$1,150	See Appendix A Per transit vehicle
Multi-Modal Coordination • Signal Priority (vehicle) • Signal Priority (intersection)	$2,300 $2,875	$230 $288	$345 $431	$345 $431	$230 $288	$3,450 $4,313	$230 $288	Per transit vehicle Per intersection
Transit Traveler Information • Static Route/Schedule Info • Real-Time Schedule Info								See Appendix A See Appendix A
Traveler Information								
Broadcast Traveler Information								See Appendix A
Interactive Traveler Information								See Appendix A
Commercial Vehicle Operations								
Electronic Clearance								See Appendix A
CV Administrative Processes								See Appendix A
Weigh-in-Motion								See Appendix A
Roadside CVO Safety								See Appendix A
HazMat Management								See Appendix A

Exhibit 3.2 – Central Coast ITS Project Cost Analysis

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Emergency Management and Enforcement								
Emergency Response								See Appendix A
Emergency Routing • Signal Pre-Emption (vehicle) • Signal Pre-Emption (int.)	 $2,300 $5,750	 $230 $575	 $345 $862	 $345 $863	 $230 $575	 $3,450 $8,625	 $230 $575	 Per transit vehicle Per intersection
Mayday Support								See Appendix A

4. CENTRAL COAST REGIONAL ITS ARCHITECTURE

4.1 NATIONAL ITS ARCHITECTURE RULE/POLICY

On April 8, 2001, the FHWA issued Rule 940 entitled ITS Architecture and Standards and concurrently, FTA issued a policy entitled National ITS Architecture Policy on Transit Projects. The intent of the Federal Rule/Policy is to require procedures for implementing sections of the Transportation Equity Act for the 21st Century (TEA-21) requiring ITS projects to conform to the National ITS Architecture and standards.

The Rule requires that agencies develop a Regional ITS Architecture based on the National ITS Architecture that reflects the local needs, issues, problems, and objectives for implementation and is consistent with the transportation planning process for Statewide and Metropolitan planning practice. Each region had 4-years to adopt a Regional ITS Architecture that included:

1. Description of the region
2. Identification of participating agencies and other stakeholders
3. Operational concept
4. Any agreements required for implementation
5. System functional requirements
6. Interface requirements
7. Identification of ITS standards
8. Sequence of ITS projects required for implementation

In addition, any ITS project that moves into design is required to follow a systems engineering analysis that is commensurate with the project scope. A project is defined as an ITS project or program that will receive Federal-aid. If the project moves into design prior to the completion of a Regional ITS Architecture, a project architecture is required to support the system engineering analysis. The system engineering approach shall include at a minimum:

1. Identification of portions of the Regional ITS Architecture being implemented
2. Identification of participating agencies roles and responsibilities
3. Requirements definition
4. Analysis of alternate system configurations and technology options to meet requirements
5. Procurement options
6. Identification of applicable standards and testing procedures
7. Procedures and resources necessary for operations and management of the system

In its most basic form, an ITS Architecture is a set of rules that facilitates the building of systems and that allows these systems to communicate and inter-operate after being built. The National ITS Architecture provides the common framework or "blueprint" from which to plan and/or design ITS projects so that systems are compatible and operations are coordinated.

4.2 INTERRELATIONSHIP OF ITS PLANNING AND THE CCITS REGIONAL ARCHITECTURE

The Central Coast Regional ITS Architecture was developed based on the transportation planning process used by the CCITS Coordinating Group to develop the Implementation Plan and identify prioritized ITS projects. Using the National ITS Architecture (Version 5) as the baseline, the CCITS Regional ITS Architecture was developed by translating its components into practical applications tailored to the Central Coast. The Regional ITS Architecture is a description of "what" we want to do in the Central Coast. It describes the planned ITS services and functions, incorporates the relevant subsystems and organizations, and describes the information exchanges planned between them. Therefore, the CCITS Regional Architecture supports the definition of ITS projects that fully consider the integration opportunities defined in the National ITS Architecture.

The CCITS Regional ITS Architecture can/should be used within the planning, programming, and implementation of ITS projects. Integrating the Architecture with other planning tools improves the continuity between the transportation planning process and ITS projects. The challenge is to create the CCITS Regional Architecture, supporting processes, and documentation that is high-level enough to support long-range planning but detailed enough to provide direction to those agencies responsible for implementation.

The Federal Rule/Policy requires identification of the portion of the Regional ITS Architecture that is implemented by each ITS project. The CCITS Regional ITS Architecture should be used then as the basis for ITS project implementation since it provides the regional context. That is, it provides the ITS project sponsor (aka agency responsible for implementation) the opportunity to view their project in the context of surrounding systems. It prompts the sponsor to think about how its ITS project fits within the overall transportation vision for the Central Coast region. It identifies the integration opportunities that should be considered and provides a head start for the systems engineering analysis that is required for ITS project implementation.

4.3 TURBO ARCHITECTURE

The Turbo Architecture Software (Turbo) is a computer database program developed by the FHWA to assist practitioners in developing their Regional ITS Architecture. Turbo includes all of the elements, components, and details of the National ITS Architecture as well as provides a number of data input screens to translate its components into practical applications tailored to the Central Coast.

The 2000 CCITS Strategic Deployment Plans (SDP's) Regional ITS Architecture Turbo files were used as the baseline/template for developing the current CCITS Regional Architecture. The first step was to convert the original Turbo files into the current version of Turbo (Version 3). Originally, the 2000 CCITS SDP's Regional ITS Architecture segregated the Central Coast region into seven (7) project areas (Project Architectures in Turbo nomenclature): one for each of the five (5) Counties, one for AMBAG (made up mostly of inventory elements from the constituent county project architectures), and one for ITS elements of regional significance (e.g., supporting/facilitating regional collaboration, affecting multiple counties, etc.).

As stated previously, the Federal Rule/Policy requires agencies develop a Regional ITS Architecture based on the National ITS Architecture that reflects the local needs, issues, problems, and objectives for implementation and is consistent with the transportation planning process for Statewide and Metropolitan planning practice. That being said, the CCITS Coordinating Group determined that the best way now for the Central Coast to meet this requirement was to develop three (3) distinct Turbo database files, one for each of the three (3) Metropolitan Planning Organizations (MPOs) in the region:

- AMBAG (including Santa Cruz, San Benito, and Monterey Counties)
- SLOCOG (San Luis Obispo County)
- SBCAG (Santa Barbara County)

Therefore, the seven (7) project architectures from the 2000 CCITS SDP's Regional ITS Architecture were re-structured into the three (3) MPO Turbo database files in order to comprise/make-up the overall CCITS Regional ITS Architecture. Then, additional and/or updated data based on discussions/interactions with the CCITS Coordinating Group was input into Turbo to better reflect the Central Coast's existing conditions and planned direction (as described in the following sections).

4.4 SYSTEM INVENTORY (UPDATE)

An ITS System Inventory is the foundation for all subsequent ITS Architecture development activities. It is a listing of each ITS-related element, deployed/existing or planned, for all of the stakeholders in the region. Using the 2000 CCITS SDP as a guideline, the CCITS Coordinating Group has made great strides in preparing ITS projects for implementation. As seen in Section 2, there are many existing ITS systems already deployed in the Central Coast. In Section 3, the region's planned ITS projects and their implementation priorities were discussed. But as several CCITS Coordinating Group members noted, Turbo's use of "Existing" or "Planned" to categorize ITS projects/systems just did not accurately reflect those ITS initiatives that were in-between. That is, how best to distinguish those ITS projects that were progressing through the transportation planning process and for which funding was just being granted, but implementation had not yet gotten underway. To meet this need, the CCITS Coordinating Group decided to add "Programmed" as a new ITS project/system status designation for such situations.

The Turbo Architecture software tool was utilized to input and manage the CCITS System Inventory (and Architecture as a whole). Turbo was also flexible enough to handle the new "Programmed" designation. The 2000 CCITS SDP Architecture was used as the starting point. Turbo "System Inventory" reports were generated and submitted to the CCITS Coordinating Group for review, comments, and updates. Then, the three (3) MPO Turbo databases were updated to reflect this information (e.g., changes in status, new inventory elements, etc.). Stakeholder input at CCITS meetings and other communications were then used to finalize the CCITS System Inventory as documented in Deliverable A2–c1 – ITS System Inventory.

Due to the structure of the CCITS Regional Architecture, it is quite possible that an inventory element is in multiple MPO Turbo databases. This occurs when the element is of "regional significance". For example, "smart cards" are ITS projects that could/should span multiple agencies and are therefore of interest beyond just one particular county and/or agency.

A sample page from the CCITS System Inventory (Turbo-generated report) can be found in Appendix B. Typically, Turbo provides the following information for each ITS element:

- Element name
- Stakeholder/owner
- A brief description
- Deployment status (Existing, Programmed, or Planned)
- National ITS Architecture subsystem(s) (pre-defined representations of real-world transportation system functionality) to which it is mapped

4.5 OPERATIONAL CONCEPTS

After the System Inventory, the next step in developing (and maintaining) an ITS Architecture is the definition of stakeholder roles and responsibilities (R&R) – the Operational Concepts (OCs). In general, these are high-level tasks/activities (aka responsibilities) that are, or will be, performed by stakeholders (aka roles) with respect to the operation of their ITS project/system.

OCs are based upon the National ITS Architecture's Market Package (MP) associations with the stakeholders' ITS elements (that were made in Turbo via the System Inventory update), thereby creating the linkage between the stakeholders' ITS System Inventory and what they are (or will be) using it to do. OCs are grouped into role and responsibility areas. There is not a one-to-one correspondence between MPs and R&R areas, as an R&R area may be linked to multiple MPs. For example, an Emergency Management R&R area could be linked with the EM01 (Emergency Call-Taking and Dispatch) and EM04 (Roadway Service Patrols) MPs. Nor is there a one-to-one correspondence between ITS System Inventory and R&R areas, as multiple ITS elements may be required to carry out the actual responsibility/task/activity.

Each responsibility has a status attribute associated with it. By default, the status can be set to: Existing (the task is currently being performed by the stakeholder) or Planned (it is to be done at some point in the future). As discussed, the CCITS Regional Architecture also has an additional value available: Programmed. This value may be used if the ITS element to be used to support this role also has the status of Programmed [the element is in the applicable planning cycle(s)]. A task can have a value that is different than the supporting ITS element, but it should be an "earlier" status (Planned before Programmed before Existing).

With the new CCITS Regional Architecture structure (aka separate Turbo databases for each MPO with local and regionally significant ITS Project Architectures), there are separate R&R areas for each project architecture. This is by design to try and segregate tasks performed by a local agency to support local ITS-related duties from those done in support of its regional responsibilities (if any).

The Turbo Architecture software tool was utilized to input and manage the CCITS Operational Concepts/R&Rs. Turbo "Operational Concept" reports were generated and submitted to the CCITS Coordinating Group for review, comments, and updates. Then, the three (3) MPO Turbo databases were updated to reflect this information. Stakeholder input at CCITS meetings and other communications were then used to finalize the CCITS OCs/R&Rs as documented in Deliverable A2–c3 – ITS Operational Concepts (Working Paper).

Overall, the R&Rs are sorted by stakeholder and then by R&R area and include the R&Rs for the local and regionally significant ITS Project Architectures in each MPO Turbo database. For each MPO Turbo database, one or more high-level tasks are presented for each stakeholder/R&R area pairing. A sample page from the CCITS Operational Concepts (Turbo-generated report) can be found in Appendix B. Please note that it will require coordination and cooperation between the CCITS agencies to maintain the consistency of the OCs/R&Rs within/between the MPO Turbo databases during their next Architecture Maintenance cycle.

4.6 FUNCTIONAL REQUIREMENTS

After the Operational Concepts, the next step in developing (and maintaining) an ITS Architecture is the description of what the various ITS elements in the System Inventory (will) do – their Functional Requirements (FRs). FRs describe what functions each ITS element is to perform. Each requirement should be described in enough detail to understand what the system will do, but not so detailed as to be used to build or include in a procurement package (e.g., an RFP, etc.) – each project sponsor for an ITS project to be implemented will need to expand the FRs for that.

The National ITS Architecture (and Turbo Architecture software) includes a large set of pre-defined FRs based upon the functionality of the Equipment Packages that are part of Market Packages (MPs). These FRs are organized into logical groups, called Functional Areas. Earlier in the ITS Architecture development process, each of the CCITS System Inventory elements were mapped to MPs, thereby creating the linkage between these pre-defined FRs and the ITS elements. During the FR definition process, some of the FRs were tailored to describe the elements' actual functionality more accurately. In some cases, the pre-defined FRs did not include descriptions of some specific functionality (to be) performed, so additional FRs were created for those elements. For example, in Santa Barbara County, additional FRs were developed for ITS data warehousing/repository purposes that more accurately reflected SBCAG's intended system operations re: planning and Architecture maintenance [i.e., the center shall participate in the maintenance of the local (County) ITS architecture, the center shall participate in the maintenance of the MPO ITS Architecture with Regional (CCITS) coordination].

Each FR in the MPO Turbo databases has an associated status attribute. The default values are: Existing (the requirement is currently being performed by the element) or Planned (to be done at some point in the future).

With the new CCITS Regional Architecture structure (aka separate Turbo databases for each MPO with local and regionally significant ITS Project Architectures), there are separate FRs for each element in each Project Architecture. This is by design to try and segregate the requirements included to support local ITS-related operations from those included in support of its regional operations (if any). As applicable, an ITS element can have FRs in multiple MPO Turbo databases. For example, a TMC may have FRs to support operating the local signal system as well as those for coordinating with other TMCs.

The Turbo Architecture software tool was utilized to input and manage the CCITS Functional Requirements. Turbo "Functional Requirement" reports were generated and submitted to the CCITS Coordinating Group for review, comments, and updates. Then, the three (3) MPO Turbo

databases were updated to reflect this information. Stakeholder input at CCITS meetings and other communications were then used to finalize the CCITS FRs as documented in Deliverable A2–c4 – ITS Functional Requirements (Working Paper).

Overall, the FRs are sorted by ITS element and then by functional area and include the local and regionally significant ITS Architectures in each MPO Turbo database. (The number in parentheses following the FR status is the actual requirement number from the applicable ITS Architecture and is for reference purposes only.). A sample page from the CCITS Functional Requirements (Turbo-generated report) can be found in Appendix B. Please note that it will require coordination and cooperation between the CCITS agencies to maintain the consistency of the FRs within/between the MPO Turbo databases during their next Architecture Maintenance cycle.

4.7 SYSTEM INTERCONNECTS AND ARCHITECTURE FLOWS (UPDATE)

After the Functional Requirements, the next step in developing (and maintaining) an ITS Architecture is the definition of the system interconnections and associated data flows. The system interconnects describe which systems (from the CCITS System Inventory) will be linked with each other (who's talking with whom), while the data flows describe what information is actually being passed between them (what's being said) – the (planned and existing) integration of ITS systems.

Please note that "System Interconnects" and "Architecture Data Flows" are so related that they are managed on the same form in Turbo. When Turbo is used to "build" the interconnections for tailoring, it is in fact generating the data flows at the same time. Further, a user can create (or delete) interconnections by creating one or more (or deleting all) data flows between systems.

There is also an implementation status defined for both interconnects and data flows. The status options are the same as elsewhere in the CCITS Regional Architecture (Existing, Planned, or Programmed). A user cannot directly change the status of the interconnects since they are based upon the status of their underlying (and included) data flows. It is possible that there are multiple types of data flow statuses for the same interconnection (depending upon the implementation stages of each data flow). If there are any existing data flows, the status of the interconnect should be existing.

Also, interconnections are "directionless" – two (2) systems may be interconnected, but as far as the interconnection is concerned, it is irrelevant in what direction(s) the communications are occurring. However, direction and content are very important for the data flows. For example, for a CCTV system feeding video images to an internet website, these systems would be included as an interconnection even though the data flow would probably just be a video feed from the CCTV to the website (and nothing in the return direction).

The National ITS Architecture (and Turbo Architecture software) includes a large set of pre-defined data flows based upon the ITS element's subsystem assignments and Market Package associations. In addition to these, new data flows can be defined if needed.

The actual tailoring process involves identifying all potential and existing ITS system interconnections and including them in the applicable MPO Turbo database. Once these are identified, the applicable data flows are included and the status for each flow is defined.

Generally, interconnections (and data flows) are within the same MPO Turbo database. That is, most ITS elements that are going to be integrated have the same scope – an agency TMC will manage its signal system or a Next Bus arrival system is linked to the local transit service. These types of interconnects (and data flows) are included under the local county project architecture. However, not all interconnections (and data flows) are this localized. For example, that same transit bus may accept a smart card from another transit agency in another county. These types of interconnects (and data flows) are described in the regionally significant ITS Architecture.

The Turbo Architecture software tool was utilized to input and manage the CCITS System Interconnects and Architecture Data Flows. Since Turbo only supports diagrams reflecting the "System Interconnects" and "Architecture Data Flows", customized Access database reports were developed. These customized reports were generated and submitted to the CCITS Coordinating Group for review, comments, and updates. Then, the three (3) MPO Turbo databases were updated to reflect this information. Stakeholder input at CCITS meetings and other communications were then used to finalize the system interconnects and data flows as reflected in the CCITS Interconnects and Data Flows (Technical Memorandum).

Overall, each customized report is sorted by ITS element. The System Interconnect report presents, for each ITS element in the MPO Turbo database, a list of each system that that element is or will be connected to. The Data Flow report also presents what data is being passed and its associated implementation status. A sample page from the CCITS Interconnects and Data Flows (customized report) can be found in Appendix B. Please note that it will require coordination and cooperation between the CCITS agencies to maintain the consistency of the system interconnects and data flows within/between the MPO Turbo databases during their next Architecture Maintenance cycle.

4.8 ITS STANDARDS

After the System Interconnects and Architecture Data Flows, the next step in developing (and maintaining) an ITS Architecture is the identification of the applicable ITS Standards to support the system interconnections and associated data flows in order to provide a common set of standards to better coordinate operations, integrate systems, and share data/information in the Central Coast. The Central Coast's tailored data flows begin to identify the requirements for the ITS standards needed to support national, regional, and local system interoperability. Although the National ITS Architecture (and Turbo Architecture software) is not developing the specific standards, they do identify where and how they are to be used, once fully developed:

- Physical entities or subsystems that are to be interconnected
- Communication requirements for the information/data flows between subsystems

The Turbo Architecture software tool was used to generate the list of ITS Standards that the CCITS Coordinating Group and regional stakeholder agencies need to incorporate within their ITS projects/systems. This in turn enables the Central Coast to plan for ITS projects/systems in the region from the "get-go" that will be deployed with an eye towards both regional integration and national interoperability. A sample page from the CCITS ITS Standards (Turbo-generated report) can be found in Appendix B.

4.9 AGENCY AGREEMENTS

In order to facilitate ITS project implementation in the Central Coast and complement the CCITS Regional Architecture, agency cooperative agreement templates were developed for the following ITS project areas:

- Ramp Metering (Metering Rates and Freeway/Arterial Coordination)
- Traffic Signal Priority and/or Pre-Emption
    - Transit Vehicles
    - Emergency Service Vehicles
- CCTV Video (Sharing Images and/or Control)
    - Letter-of-Understanding (LOU)
    - Memorandum-of-Understanding (MOU)
- Inter-Agency Traffic Signal Synchronization/Coordination
- Center-to-Center (C2C) Connections and Data Sharing (Regional and Local TMCs)

The CCITS Coordinating Group determined that the development of these five (5) templates will satisfy the majority of needs of the Central Coast Stakeholder agencies and meet the requirements of the Federal Rule/Policy. For each agreement type, the following were developed:

- Complete "filled-in" template (sample tailored to the Central Coast)
- "Blank" template to that still needs to be "filled-in" with the necessary/specific details (e.g., functionality, operations, roles and responsibilities, etc.) for the affected agencies

The CCITS Coordinating Group recognizes that each cooperative agreement template has the potential for multiple uses within the Central Coast. The intent was to create templates that are basically re-usable with only the details of the services to be provided required to be filled-in/completed. Drafts of each agency cooperative agreement template were developed and submitted to the CCITS Coordinating Group for review, comments, and updates. Stakeholder input at CCITS meetings and other communications were then used to finalize the templates as reflected in Deliverable 2B-b2 – Cooperative Agency Agreement Templates.

4.10 ITS ARCHITECTURE CONFORMANCE

As discussed, the National ITS Architecture is a common framework for the design and implementation of ITS projects/systems. Because of its strategic role, the Federal Rule/Policy requires the U.S. DOT to ensure that Federally-funded ITS projects conform to the National ITS Architecture and approved standards. In short, the Federal Rule/Policy requires that agencies develop a Regional ITS Architecture based on the National ITS Architecture that reflects the local needs, issues, problems, and objectives for implementation and is consistent with the transportation planning process for Statewide and Metropolitan planning practice.

As described previously, the ITS Implementation Plan for the Central Coast contains a Regional ITS Architecture that is in conformance with the National ITS Architecture because the Central Coast took into account those same elements that the Architecture is looking for to determine planning conformance as shown in Exhibit 4.1.

Exhibit 4.1 – Architecture Conformance in the Central Coast

Conformance Requirement	Central Coast Approach
1. Description of the Region	• Central Coast ITS Strategic Deployment Plan (Volume I – ITS Strategic Plan, Sections 1 & 2) • Central Coast ITS Implementation Plan (Section 2) • CCITS Coordinator Study (Deliverable A2–c1 – ITS System Inventory) • MPO Turbo Databases (AMBAG, SLOCOG, & SBCAG)
2. Identification of participating agencies and other stakeholders	• Central Coast ITS Strategic Deployment Plan (Volume I – ITS Strategic Plan, Section 1) • Central Coast ITS Implementation Plan (Section 1) • MPO Turbo Databases (AMBAG, SLOCOG, & SBCAG) • Use of existing Agency channels to put ITS on TTAC, County Board, etc. agendas in order to promote ITS, educate interested parties, and actively involve potential Stakeholders
3. Operational concept that identifies the roles and responsibilities of participating agencies and stakeholders in the operation and implementation of the systems included in the Regional ITS Architecture	• Central Coast ITS Implementation Plan (Sections 4 & 5) • CCITS Coordinator Study [Deliverable A2–c3 – ITS Operational Concepts (Working Paper)] • MPO Turbo Databases (AMBAG, SLOCOG, & SBCAG)
4. Any agreements (existing or new) required for operations, including at a minimum those affecting ITS project interoperability, utilization of ITS related standards, and the operation of the ITS projects identified in the Regional ITS Architecture	• Central Coast ITS Implementation Plan (Sections 4 & 5) • CCITS Coordinator Study (Deliverable 2B-b2 – Cooperative Agency Agreement Templates) • MPO Turbo Databases (AMBAG, SLOCOG, & SBCAG)
5. System functional requirements	• Central Coast ITS Implementation Plan (Section 4) • CCITS Coordinator Study [Deliverable A2–c4 – ITS Functional Requirements (Working Paper)] • MPO Turbo Databases (AMBAG, SLOCOG, & SBCAG)

Conformance Requirement	Central Coast Approach
6. Interface requirements and information exchanges with planned and existing systems and subsystems (for example, subsystems and architecture flows as defined in the National ITS Architecture)	• Central Coast ITS Implementation Plan (Section 4) • CCITS Coordinator Study [Interconnects and Data Flows (Technical Memorandum)] • MPO Turbo Databases (AMBAG, SLOCOG, & SBCAG)
7. Identification of ITS Standards supporting regional and national interoperability	• Central Coast ITS Implementation Plan (Section 4) • MPO Turbo Databases (AMBAG, SLOCOG, & SBCAG)
8. The sequence of ITS projects required for implementation	• Central Coast ITS Implementation Plan (Section 3 & Appendix A)

In addition, the CCITS Regional ITS Architecture also provides a starting point for the systems engineering analyses that are required by the Federal Rule/Policy and performed during ITS project development. An "abbreviated" ITS project lifecycle contains the following phases:

- Phase 1 – Project Initiation
- Phase 2 – Preliminary Engineering
- Phase 3 – Plans, Specifications, & Estimates (PS&E)
- Phase 4 – Construction
- Phase 5 – Project Closeout

Between Phases 1 and 2, the CCITS Regional Architecture should be used to define the ITS project scope. Typically this is done by comparing the ITS project against the Architecture's regional context. In later steps, when the project scope is firmly established and the ITS project is defined in increasing detail, there is less opportunity to use the high-level definitions included in the Regional ITS Architecture. More detailed guidance for using the Regional ITS Architecture as each step in the project development process is defined later in Section 5.

4.11 CCITS ARCHITECTURE MAINTENANCE PLANS

An ITS Architecture Maintenance Plan was developed for each of the three (3) MPO Regional ITS Architectures that were developed for the Central Coast (AMBAG, SLOCOG, and SBCAG). These ITS Architecture Maintenance Plans were developed using the "Build-A-Plan" tool developed for Caltrans as part of the California Statewide ITS Architecture and Systems Engineering Plan (SWITSA) project. The tool was developed using input from several stakeholders, research of existing regional ITS architectures and regional plans, the Regional ITS Architecture Maintenance White Paper, and the FHWA Final Rule/FTA Final Policy.

Documentation of the Maintenance Plan to keep the regional architecture up-to-date is a requirement of the Federal Rule 940/Policy 655 for ITS, which states that, "Regional ITS architectures be developed to guide the development of ITS projects and programs" and requires each MPO and jurisdiction with an ITS architecture (and ITS projects) to have a plan in place to maintain and update those regional ITS architectures. More specifically, Rule 940.9f states:

"…The agencies and other stakeholders participating in the development of the regional ITS architecture shall develop and implement procedures and responsibilities for maintaining it, as needs evolve within the region…"

The CCITS Implementation Plan is a blueprint for the orderly planning and deployment of ITS in the Central Coast region. It is also intended to be a living document that may require frequent review and periodic updating. As ITS projects are implemented or expanded, as agency priorities change, or as other changes occur that impact ITS in the Central Coast region, they will be documented through an update to the respective MPO Regional ITS Architectures. The ITS Architecture Maintenance Plans document the procedures for updating the respective MPO Regional ITS Architectures. These ITS Architecture Maintenance Plans are a very important part of the overall Central Coast Regional ITS Architecture as they act as a control mechanism for maintaining order in the process of keeping ITS architectures up to date over time. They also act as the instructions for keeping a set of complex, interrelated actions and documents on course over time.

The CCITS Architecture Maintenance Plans outline the strategies for AMBAG, SLOCOG, and SBCAG to use/update their respective Regional ITS Architecture in coordination with the other MPO Regional ITS Architectures and the CCITS Implementation Plan. They discuss the proposed "Who, What, When and How" of ITS architecture maintenance. As such, these ITS Architecture Maintenance Plans discuss the roles and responsibilities of the MPO regions' ITS stakeholders and a high-level process for those stakeholders to maintain and update their respective MPO Regional ITS Architecture. They also discuss what portions of the MPO Regional ITS Architecture will be maintained and updated and when the architecture will be maintained and updated.

The ITS Architecture Maintenance Plans are laid out in two (2) parts, both of which act as an instruction manual for changes to the respective MPO Regional ITS Architecture. The first portion of the Maintenance Plan provides some background information along with recommended procedures for how a change should be initiated by the user. The second portion of the Maintenance Plan identifies how the change is handled after it is submitted by the user.

5. ITS DEPLOYMENT CONSIDERATIONS

5.1 ITS PROJECT INTEROPERABILITY

Within the Central Coast, one of the primary motives for ITS is the need for more effective management of the existing transportation infrastructure. One of the primary purposes of the CCITS Regional Architecture is to define how an integrated transportation system of ITS elements can evolve in the region.

To take full advantage of their potential, most individual ITS applications will need to accommodate linkages to other systems and coordination between different agencies. This ability for the different ITS projects and systems to communicate and work with one another is referred to as "interoperability". Related to this, a goal of the Federal ITS Program is to ensure that mobile users can travel across the region and the nation and retain the same level of ITS services. There are three (3) types/levels of ITS interoperability that the Central Coast needs to be concerned with:

- Technical – The capability for equipment (hardware and software) to communicate effectively (i.e., send and receive information)
- Procedural – Common procedures to exchange meaningful information
- Institutional – Administrative and or/contractual agreements between operators and users of the information

The CCITS Regional Architecture and National ITS Standards provide a framework for achieving technical interoperability. Close coordination and cooperation between various agencies will be required to ensure procedural and institutional interoperability. This may be achieved, in part, through the on-going activity of the CCITS Coordinating Group and the previously developed Agency Cooperative Agreement Templates.

5.2 ITS PROJECT CONFORMANCE

5.2.1 "MainstreamING" ITS into Planning Process

Under SAFETEA-LU legislation, ITS projects, like other transportation-related projects, will have to wend their way through the mainstream Federal, State, regional, and local planning processes before obtaining funds and moving into the implementation phase. The ITS projects discussed in this Implementation Plan will need to be considered in subsequent versions of the various regional transportation plans (RTPs) produced for areas within the Central Coast. Projects requiring Federal funds must be represented in the applicable RTP and in the appropriate Transportation Improvement Program (TIP): Regional (RTIP), Federal (FTIP), and Statewide (STIP). The specific project requirements and funding sources are needed for the RTIP, FTIP, and STIP, not necessarily for the RTP.

The Project Sponsor must determine what funding mechanism will be used, determine the rules of the particular funding program, and then take the actions required to connect the program to the funding source. Particular attention must be paid to meeting the milestone dates required in project calls. Early and continuing liaison with the respective agency's financial staff is important, as always.

The typical agency planning process is organized around the State of California budget cycle as represented in the State fiscal year (July through June). Future ITS project implementations are going to have to be a part of the transportation planning process, and the ITS projects must compete for the same transportation dollars as the traditional transportation infrastructure projects.

For more detailed information, please refer to the "Regional ITS Architecture Guidance Document", specifically Section 7 – Using a Regional ITS Architecture. Within this guidance document, informative materials and discussion which can be understood by a lay person are presented which help to better describe the use of the regional ITS architecture within both the transportation planning process as well as ITS project deployment.

Furthermore, please refer to the "CCITS – Architecture Usage Guide". Within this Usage Guide, the basics of the National ITS Architecture are presented and an overview of the Turbo Architecture software provided. In addition, two (2) sample scenarios regarding how the regional ITS architecture can be used are described:

- Scenario 1 – Add New ITS Project to the Architectures
- Scenario 2 – Using the Architecture to Help Prepare a Systems Engineering Analysis

5.2.2 FEDERAL FUNDING AND ITS PROJECTS

An early ITS Project definition checkpoint should include information about the project that allows project type and complexity to be determined so that appropriate Architecture use and systems engineering analysis processes can be defined. The purpose of the CCITS Regional Architecture use and systems engineering analysis requirements for ITS projects is to reduce technical risk and increase the likelihood of project success. Since the inherent risk within an ITS project varies significantly depending upon the nature of the project, the Federal Rule/Policy allows the systems engineering analysis to be commensurate with the ITS project scope. ITS projects (types) that will benefit most from using the CCITS Regional Architecture include:

- Multi-modal or multi-jurisdictional projects that connect systems from different agencies
- New system developments that must consider future integration requirements

Federal regulation 23 CFR 940 provides policies and procedures pertaining to conformance with the National ITS Architecture and Standards. Section 940.11 (Project Implementation) states that "all ITS projects be based on a systems engineering analysis." Section 940.13 (Project Administration) states that "Prior to authorization of highway trust funds for construction or implementation of ITS projects, compliance with Paragraph 940.11 shall be demonstrated."

Caltrans Local Assistance implemented new procedures to address the ITS program by local agencies in California in 2004. Local Assistance manuals and guidance were updated to include new procedures for identification, review, funding, and implementation of ITS projects by local agencies. Highlights of changes within the new procedures are the following:

- **ITS Projects are defined as two types – minor and major.** Minor ITS projects involve the design and installation of ITS field devices expanding and/or upgrading existing systems, which add no new capabilities or interfaces. Minor ITS projects are more often referred to as "ITS Infrastructure" projects. Major ITS projects include multi-jurisdictional or multi-modal system implementations. These projects involve software development and/or software/hardware integration. Major ITS projects are more often referred to as "ITS System Developments".
- **Planning TIP Listing of ITS Projects –** Delineates operational improvements from the rest of the capital program. This gives FHWA ITS engineers opportunity to make pre-authorization outreach visits to project sponsors to assess degree of education, technical assistance, and oversight that will be needed before the project reaches its funding year. This can reduce risk of project failure.
- **Preliminary Engineering (PE) Approval Steps –** An additional Preliminary Engineering funding step has been added for ITS System Developments. In addition to the traditional PE step to allow initial project development, FHWA gives funding authority to perform design and deployment of hardware/software systems at completion of system definition phase.
- **Systems Engineering Review Form (SERF*)*** – This fill-in form provides responses to the seven (7) requirements for systems engineering analysis within 23 CFR 940(11). It documents conformance with 23 CFR 940 for ITS Infrastructure expansion/upgrade of existing systems. For those new ITS System Developments, the SERF does not document conformance - it simply highlights expectations in application of the systems engineering process by the Project Sponsor and/or their contractor in later phases of the project development.
- **Systems Engineering Management Plan (SEMP) –** Completed in early phases of ITS System Development to serve as part of the Project Management Plan, the SEMP identifies the "best professional practices" to manage and undertake the technical tasks. For new systems (new functionality), conformance to 23 CFR 940 is supported within the completed SEMP, submitted to FHWA for approval at completion of system definition and before actual design and implementation begins. This approval releases remaining PE funds to complete the system implementation. Any infrastructure within the field (on the street) needed to complement the hardware/software system development will undergo the traditional PE and Construction approval processes.

5.2.3 ITS PROJECTS – SERF

Either before or soon after initial Preliminary Engineering funding is authorized, the project sponsor submits the completed Field Review Form package to the Caltrans District Local Assistance Engineer. The completed Field Review package includes an ITS Systems Engineering Review Form (SERF). The SERF checklist is a streamlined form (2-pages long), but it is enough to ensure that each project sponsor determines the mapping between the ITS project and the Regional ITS Architecture and that the project plan will address the other systems engineering requirements of the Rule. Please refer to Appendix C for a copy of the SERF checklist form as well as several completed SERF samples.

In the SERF, the project sponsor must provide as much information as possible for each of the seven (7) following ITS requirements:

1. Identification of portions of the Regional ITS Architecture being implemented
   - Identify which market packages, physical subsystems, and information flows are being completed as part of the ITS project and how these pieces are part of the Regional ITS Architecture.
2. Identification of participating agencies roles and responsibilities
   - For the market packages to be implemented, define the high-level operations of the system, including where the system will be used, functions of the system capabilities, performance parameters, the life cycle of the system, and who will operate and maintain the system. Establish requirements or agreements on information sharing and traffic device control responsibilities. The Regional ITS Architecture Operational Concept is a good starting point for discussion.
3. Requirements definition
   - Based on the concept of operations in Item #2, define the "what" and not "how" of the system. During early stages of the systems engineering process, these will be broken down into detailed requirements for eventual detailed design. The applicable high-level functional requirements from the regional ITS architecture are a good starting point for discussion. A review of the requirements by the ITS project stakeholders is recommended.
4. Analysis of alternate system configurations and technology options to meet requirements
   - The analysis of system alternatives should outline the strengths and weaknesses, technical feasibility, institutional compatibility, and life cycle costs of each alternative. The ITS project stakeholders should have input in choosing the preferred solution.
5. Procurement options
   - Some procurement (contracting) options to consider include: consultant design/low bid contractor, systems manager, systems integrator, task order, and design/build. Deciding on the best procurement option should consider the level of agency participation, compatibility with existing procurement methods, role of system integrator, and life cycle costs.
6. Identification of applicable standards and testing procedures
   - Include documentation on which standards will be incorporated into the system design and justification for any applicable standards not incorporated. The standards report from the regional ITS architecture is a good starting point for discussion.

7. Procedures and resources necessary for operations and management of the system
   - In addition to the concept of operations in Item #2, document any internal policies or procedures necessary to recognize and incorporate the new system into their current operations and decision processes. Resources necessary to support continued operations, including staffing and training must also be recognized early and be provided. Such resources must also be provided to support necessary maintenance and upkeep to ensure continued system viability.

5.2.4 ITS PROJECTS – SEMP

The following information defines the FHWA oversight of the systems engineering process while the ITS project is being executed, as is required by Caltrans Local Assistance Procedures. Please note that this systems engineering oversight is limited to the ITS portions of the project only. General oversight for all other aspects of the Federal-aid process will continue to be handled by the provisions of the Stewardship Oversight Agreement between Caltrans and FHWA.

In general, this section describes how the ITS oversight process works. Although it is not a "requirement", FHWA strongly encourage the use of the Caltrans/FHWA "Systems Engineering Guidebook for ITS" as a reference for organizing the ITS project tasks and defining work products. The terminology used in this discussion is defined fully in that Guidebook.

The FHWA oversight process is built upon the common systems engineering practice of using "control gates" as a project-management tool. It assumes that implementation of the ITS project (or the ITS elements of a larger construction project) will follow a pre-determined sequence of steps, with each step (or "milestone") being judged by the project manager to be satisfactorily completed before substantive work begins on the next step.

FHWA will exercise its oversight responsibilities primarily via review of the document(s) produced at each of the milestones in the systems engineering process (e.g., Concept-of-Operations, Acceptance Tests, etc.). They will do this in a manner that avoids unnecessary delays to the ITS project. The action at each step will take just one of the following forms: a.) Review and approval, b.) Review and comment, or c.) Information only. These terms are explained below. This determination of level of oversight will be made at time of SERF review, which occurs before systems engineering process tasks have begun.

- **Review and Approval –** FHWA shall receive the final version of the milestone document for review and approval. They will respond within 1-week – whenever given at least 2-weeks advanced notice of the document's arrival. Otherwise, turnaround time will be 2-to-3-weeks. If they do not respond within the applicable time period, the document is automatically deemed approved.
- **Review and Comment –** FHWA shall participate in the normal review process that the Agency uses at the "final draft" stage of developing the milestone document. They will abide by the same schedule that is given to all other reviewers. If they do not provide comments within the given schedule, ITS project work may proceed without them. Their comments will be treated as suggestions that will be given the same consideration as comments from other stakeholders.

- **Information Only –** Upon completion of the milestone, the project manager shall e-mail the associated document to FHWA. No "approval" by FHWA will be needed. Upon e-mailing the document, the ITS project may begin the next task immediately.

Regardless of the level of oversight determined for each systems engineering process milestone deliverable, the completed Systems Engineering Management Plan (SEMP) must always be submitted to FHWA for review and approval at completion of the system definition tasks. This approval will authorize Caltrans Local Assistance to obligate preliminary engineering funding for system design and implementation. Specific SEMP development and documentation guidance can be found in the Caltrans/FHWA "Systems Engineering Guidebook for ITS".

To expedite FHWA review process, they recommend that these documents be sent via e-mail to FHWA simultaneously with distribution to Caltrans and/or other stakeholders involved in the ITS project development. Paper copies are *not* required, unless the materials cannot be sent electronically.

5.3 INTER-AGENCY AGREEMENTS

In Section 4.9, the Agency Cooperative Agreement Templates for the Central Coast were identified. Most of the ITS projects in this Implementation Plan may call for cooperative deployment and operations efforts between multiple jurisdictions and/or agencies. These types of implementation most often require some sort of inter-agency agreement such as a bi-lateral letter of agreement or a Memorandum-of-Understanding (MOU). Regardless of the specific institutional tool decided upon by agencies, there should be a purpose and protocol for inter-agency agreements to establish some type of general guidelines to assist when addressing relationships outside the sample cooperative agreements identified in Section 4.9. It is felt that any inter-agency agreement should attempt to achieve the following purposes:

- Establish roles and responsibilities for the smooth operation and maintenance of system components that affect management of regional traffic and traveler information on a day-to-day basis
- Provide agencies with enough degree of freedom (as per agreement) so that motorist needs are met irrespective of the agency that has jurisdiction over the system components
- Develop operational guidelines to regional agencies such that they follow consistent and common methods of operations, which benefit both motorists and the system operators
- Set forth and mutually agree upon standard operating procedures and strategies for various components of the system
- Serve as a standard reference document for partnering agencies for day to day operation and during staff turnovers
- Establish contact personnel during and after hours of business to manage emergency situations

- As part of the standard operating procedure, identify:
  - Type of information to be shared (type and content) between agencies
  - Resources to be shared between agencies and how, where, and to whom the information from the system can be distributed
  - How operating costs for the system will be distributed

5.4 POSSIBLE FUNDING SOURCES

Accurately forecasting and securing stable funding is essential to the long-term success of any ITS program. As these activities are expanded, the need for implementation and operations funding becomes even more critical. Long-term funding of operations and maintenance activities are of particular concern. In fact, the requirements for many Federal funding opportunities require that ITS projects be consistent with the guidelines provided in the National ITS Architecture, which includes having funding for operations and maintenance. Available and applicable general funding programs are described in more detail in the following sections.

5.4.1 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)

Every 5-7 years Congress passes a spending authorization to support operation of the U.S. Department of Transportation. Integral parts of this spending authorization are regulations on how this money will be spent to improve the nation's transportation system. Improvements include expanding capacities, maintenance, restoration, rehabilitation and safety projects. The current spending bill is called SAFETEA-LU and is in effect through 2009. Simply put, SAFETEA-LU is the legislation which funds the other Federal programs described below.

5.4.2 National Highway System (NHS)

The purpose of the NHS is to provide an interconnected system of principal arterial routes which serve major population centers, international border crossings, ports, airports, public transportation facilities, and other intermodal transportation facilities and other major travel destinations; meet national defense requirements; and serve interstate and interregional travel.

NHS program funds are allocated to each State by the Federal government on a formula basis. At a minimum, each State will receive 0.5% of the available funds Caltrans distributes the money through the STIP program. Funds are provided on an 80/20 percent Federal/Local match basis within the initial project scope. Eligible projects include:[1]

- Highway safety improvements for segments of the NHS
- Highway related technology transfer activities
- Capital and operating costs for traffic monitoring, management, and control facilities and programs
- Infrastructure-based ITS capital improvements

[1] "A Guide to Federal-Aid Programs and Projects", FHWA, May 1999, page 42.

5.4.3 Surface Transportation program (STP)

STP provides for capital and operating cost for traffic monitoring, management and control facilities and programs. Funds are provided on an 80/20 percent Federal/Local match basis within the initial project scope. Projects are considered eligible if on Federally functional roads classified above minor rural collectors.

STP funds are allocated to each State on a formula basis. The State then distributes the money to the MPOs and RTPAs. All modes of transportation are eligible; however the final criteria used in the application process are established by the MPO and RTPA. Eligible projects include:[2]

- Highway and transit safety infrastructure improvements and programs, hazard eliminations, projects to mitigate hazards caused by wildlife, and railway-highway grade crossings
- Highway and transit research and development and technology transfer programs
- Capital and operating costs for traffic monitoring, management, and control facilities and programs
- Infrastructure based ITS capital improvements

5.4.4 Congestion Mitigation and Air Quality Improvement Program (CMAQ)

CMAQ provides funds for the establishment or operation of traffic monitoring, management, and control facility or program in non-attainment areas. This program funds transportation projects that will contribute to attainment of National Ambient Air Quality Standards (NAAQS). The projects mush be included in a conforming transportation plan and also conform to the requirements of the Clean Air Act. Funds are provided for operations and maintenance on an 80/20 percent Federal/local match basis for 3-years, or longer if the project demonstrates air quality benefits on a continuing basis. After the State receives their portion of the grant money from the Federal government, it is distributed to the MPOs. The MPOs are then responsible for soliciting applications to receive CMAQ funds.

Within CMAQ's "Congestion Reduction & Traffic Flow Improvements" eligible projects category, traffic flow improvements may include ITS Projects (such as traffic signal synchronization projects, traffic management projects, and traveler information systems) that can be effective in relieving traffic congestion, enhancing transit bus performance, and improving air quality. The following ITS Projects have the greatest potential for improving air quality:[3]

- Regional multi-modal traveler information systems
- Traffic signal control systems
- Freeway management systems
- Electronic toll collection systems

[2] "A Guide to Federal-Aid Programs and Projects", FHWA, May 1999, page 52.

[3] "The CMAQ Improvement Program Under SAFETEA-LU", FHWA, October 2006, page 15.

- Transit management systems
- Incident management programs

Please note that with the implementation of the new Federal 8-hour ozone averaging standards, the Central Coast is in attainment for the 8-hour ozone standard. Although Federal law allows for the use of CMAQ funds in former 1-hour ozone non-attainment and maintenance areas responsible for the preparation of a Section 105 Maintenance Plan, Federal implementing regulations do not include areas like the Monterey Bay region and Santa Barbara in the distribution of funds. Therefore, after a 3-year graduated phase-out of CMAQ to the Monterey Bay region and SBCAG, no CCITS partner counties will receive future CMAQ funding.

5.4.5 ITS Integration

This component of the ITS Deployment Program provides funding for activities necessary to integrate ITS infrastructure components that are either deployed (existing) or will be deployed with other sources of funds. This may include the integration of different ITS systems or sub-systems (e.g. freeway management, arterial management, etc.) or the integration of like ITS components across jurisdictions. Eligible activities include the system design and integration, creation of data sharing/archiving capabilities, deployment of components that support integration with systems outside of metropolitan areas and the development of regional or statewide ITS architectures. In metropolitan areas, funding shall be used primarily for integration; for projects outside metropolitan areas, funding may also be used for installation costs.[4]

5.4.6 Federal Lands Highway Program

This program was initially established by the Amendment Relative to Construction of Roads through Public Lands and Federal Reservations of 1930. The Federal-Aid Highway Act of 1970 changed the funding source for the program from the General Fund to the Highway Trust Fund, effective FY 1972. The program has been continued with each highway or transportation act since then. Applications for funding are solicited annually from the States. By statute, these funds are available for any kind of transportation project eligible for assistance under Title 23, United States Code that is within, adjacent to, or provides access to the areas served by the public lands highway. A "public lands highway" as defined in 23 U.S.C. 101 is a forest road or any highway through un-appropriated or unreserved public lands, nontaxable Indian lands, or other Federal reservations that is under the jurisdiction of and maintained by a public authority and open to public travel.[5] Eligible projects include:

- Planning, research, engineering, highway construction and highway reconstruction
- Transportation planning for programs to enhance tourism and recreational development
- Adjacent vehicular parking areas
- Interpretive signs

[4] "A Guide to Federal-Aid Programs and Projects", FHWA, May 1999, page 103.

[5] "A Guide to Federal-Aid Programs and Projects", FHWA, May 1999, page 82.

- Acquisition of necessary scenic easements and scenic or historic sites
- Pedestrian/bicycles off-road or on-road facilities including modification of existing public walkways to comply with the Americans with Disabilities Act
- Construction and reconstruction of roadside rest areas, including sanitary and water facilities
- Other appropriate facilities such as visitor centers

5.4.7 National Scenic Byways

This program provides funding for improvement, maintenance, and operation of roadways designated as National and State Scenic Byways. Projects can include improvements to safety or aesthetic quality of designated highways or that would make a highway eligible for designation. Funds are distributed on a discretionary basis from FHWA.

5.4.8 National Environmental Policy Act (NEPA)

FHWA and FTA have published a notice of proposed rulemaking on changes to the joint FHWA/FTA procedures that implement the National Environmental Policy Act (NEPA). Basically, it proposes adding stand-alone ITS projects to the categorical exclusion list, exempting them from environmental impact studies and environmental assessment requirements. Revisions are being prompted by SAFETEA-LU, which calls for additional requirements for environmental review and project decision-making that are not appropriately reflected in the existing joint NEPA procedures. Specifically, the proposed rule will add new categorical exclusions from the NEPA process and make minor changes to the joint procedures to provide clarification with respect to the interpretation of provisions.

5.4.9 Environmental Justice Grants

Environmental Justice Grants promote more public involvement by diverse and under-served communities in the planning for transportation projects to prevent or mitigate disproportionate, negative impacts while improving their mobility, access to services, equity, affordable housing, and economic opportunities. Proposed projects should have a clear focus on transportation and community development issues that address the interests of low-income, minority, Native American, and other under-represented communities. Further information can be found at http://www.dot.ca.gov/hq/tpp/grants.html. Eligible projects include:

- Promoting transportation technology, traveler information, and energy efficiency in under-served communities
- Improving access to telecommunications and internet where a transportation benefit is clearly demonstrated

MPOs, RTPAs, cities, counties, Native American tribal governments, and transit districts may apply for a grant independently as an applicant. Universities and community colleges, private non-profit organizations, community-based organizations, local transportation commissions, port authorities, and airport commissions are considered sub-recipients and must have an MPO, RTPA, city, or county as the main or lead applicant. Every application should have letters of support from all its partners, including city and county resolutions, as well as identifying the

specific work and funding each partner will contribute. City and county resolutions will not be needed until a grant is actually awarded.

An estimated $1,500,000 will be available each fiscal year pending State budget approval. Funding for each approved project requires a maximum of 90% State grant funds (maximum $250,000) and a local match equal to at least 10% of the grant request (one-half may be in-kind and one-half must be local funding). Local match funds cannot be State or Federal, or money that has already been used for other programs or projects.

5.4.10 State Transportation Improvement Program (STIP)

The STIP is a multi-year capital improvement program of transportation projects on and off the State Highway System, funded with revenues from the State Highway Account and other funding sources. STIP programming generally occurs every 2-years. The programming cycle begins with the release of a proposed fund estimate in July of odd-numbered years, followed by California Transportation Commission (CTC) adoption of the fund estimate in August (odd years). The fund estimate serves to identify the amount of new funds available for the programming of transportation projects. Once the fund estimate is adopted, Caltrans and the regional planning agencies prepare transportation improvement plans for submittal by December 15th (odd years). Caltrans prepares the Interregional Transportation Improvement Plan (ITIP) and regional agencies prepare Regional Transportation Improvement Plans (RTIPs). Public hearings are held in January (even years) in both northern and southern California. The STIP is adopted by the CTC by April (even years).[6]

5.4.11 State of California Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006

Passed in the November 2006 election as Proposition 1B, the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006 provides for a bond issue not to exceed $19.925 billion to implement projects that address the following areas:

- Safety improvements and repairs to State highways; congestion mitigation measures on freeways; local street and road repairs; upgrades to highways along major transportation corridors
- Infrastructure based ITS capital improvements (to be channeled through Caltrans SHOPP)
- Seismic safety improvements to local bridges
- Public transit expansion
- Car pool lanes on freeways
- Air pollution reduction
- Anti-terrorism improvements at port facilities

[6] The description of the STIP program was obtained Caltrans Division of Local Assistance web site (http://www.dot.ca.gov/hq/LocalPrograms/STIP.htm).

The CTC is responsible for approving all projects funded through this bond issuance. On February 28, 2007, the first phase of projects was announced totaling $4.5 billion.

Please note that the $100 million in funding for ITS improvements through the Caltrans SHOPP has already been allocated. In addition, $250 million in funding is still available to local agencies for traffic light synchronization projects. Program guidelines for allocating these funds will be developed in December 2007.

5.4.12 Regional TransportAtion Planning Agency (RTPA)

As the RTPAs/MPOs for the Central Coast Counties, AMBAG and the Monterey Bay Region RTPAs (Santa Cruz, San Benito, and Monterey), SLOCOG (San Luis Obispo), and SBCAG (Santa Barbara) serve as the planning and programming authority for transportation projects within their respective jurisdictions.

5.4.13 Developer Fees

Local agencies can impose reasonable developer fees to implement ITS and other traffic elements to manage impacts resulting from a land development project.

5.4.14 General Funds

The General Fund is an account used for financing the general administration of a county. Typically, State appropriation funds and tax revenues are the primary sources of funds flowing into this account. Funds are distributed at the discretion of the local political jurisdiction (i.e. County Board of Supervisors, City Council, etc.).

5.4.15 Public/Private Partnerships

Typically, ITS deployments that incorporate public/private partnerships are focused on the sharing of telecommunications infrastructure such as fiber optic communications lines or communications tower access. There are two (2) models for sharing telecommunications resources between the public and private sector.

- **Market Driven –** All parties pay full market value for telecommunications resources. Public entities requiring bandwidth purchase the materials (i.e. real estate, electronics equipment, frequency spectrum, fiber optic cable, etc.) required to construct a network or lease communications lines from private telecommunications providers.
- **Quid Pro Quo –** In lieu of exchanging currency, each party exchanges goods and services of equal value.

5.4.16 Public Sector Resource Sharing

Resource sharing agreements between two (2) pubic sector agencies are also typically focused on telecommunications infrastructure and follow the Quid Pro Quo model described above. For example, agencies will provide access to each other's telecommunications infrastructure without any currency changing hands and each agency retaining responsibility for maintaining their own facilities.

5.5 PROCUREMENT

5.5.1 Procurement Methods

ITS applications are, by their very nature, multi-agency and multi-jurisdiction projects. Frequently, the individual agencies involved do not have the resources to design and install them. Most often one of the agencies, acting for the multiple agencies, contracts with private industry for design, installation, or both. The lead agency for contracting is usually the one whose contracting rules are the easiest or quickest to navigate. Delays in purchasing equipment or services for the ITS project because of slow or complex procedures and approvals may well cause ITS projects to miss deadlines for project implementation imposed by the funding source.

5.5.2 Sole Source

Because of past abuses and legislative reaction, public agencies do not favor sole source contracts. This form of procurement is most often used when there is a documented existence of one technical solution to the project requirements, or when compatibility with an existing base of equipment or systems is required. Prior approval to use the sole source is normally required from the Agency's Board.

Because ITS projects require compatibility across a region, which may be much larger than a single agency's area of operation, sole source contracts or de facto sole source contracting may be required and justified.

5.5.3 Competitive Procurements

Competitive procurements allow the public agency to select from an array of technical approaches, schedules and costs, and to promote fairness in public contracting. The most common competitive procurement methods used for ITS projects are described below. Ongoing changes to these procedures should be expected, given the differences in procedure amongst agencies involved in ITS projects, and those likely to come from the reauthorization of the ITS program in moving from TEA-21 to SAFETEA-LU.

5.5.4 State of California Competitive Bidding Procedures

The State of California has evolved a set of competitive bidding procedures that are also available for local agency use.

Exhibit 5.1 – State of California Competitive Bidding Process

Background	The State of California primarily procures goods and services through competitive bidding.
Definition	Competitive bidding means the process of obtaining bids in such a manner as not to limit bidding directly or indirectly to any one bidder, and to award the contract to a responsive and responsible entity offering the lowest price, or the most cost effective solution.

Exhibit 5.1 – State of California Competitive Bidding Process

Bid/Proposal Review and Evaluation	Bid/proposal review and evaluation involves applying the three (3) R's: Is the bidder responsive, responsible, and reasonable? A bidder must meet all three (3) R's to be successful. The following definitions explain the distinctive meaning of each. **Responsive:** Meeting deadlines, specifications and compliance, signing and returning all necessary forms, including required licenses and documents **Responsible:** Availability of parts and services, past record with the State **Reasonable:** Lowest price, the optimum solution at the optimum cost to the State, feasibility
Solicitation Methods	Exhibit 5.2 offers comparison of the types of methods in competitive bidding.

Exhibit 5.2 – Types of Competitive Bidding Methods

Method	Definition	Review Method	Award Method
Invitation for Bid (IFB)	"Here is exactly what we want, how much will you charge us?"	After bid opening, review low bid to ensure that it is responsive, responsible, and reasonable.	Award to the lowest responsive and responsible bidder.
Request for Proposal (RFP)	"Here is what we wish to accomplish, how would you accomplish it for us and for how much?"	**Primary** Technical proposals reviewed and points are assigned. Those who meet qualifications are placed in a pool from which the lowest cost bid is selected. **Secondary** Evaluation committee assigns points to proposals that are responsive, responsible, and reasonable.	Award to the lowest responsive and responsible bidder. Award to the highest scored proposal.
Request for Qualifications (RFQ) (Architectural and Engineering)	"Here are our selection criteria for providing the service, how does your experience fulfill the criteria requirements?"	Responses are evaluated to determine most qualified, then negotiate to reach the best qualified at optimum cost to the State.	Award to the best qualified with the optimum cost to the State.

Source: California State Contracts Register February 10, 1995

5.5.5 Two-step Process for Engineer/Contractor or Turn-key Engineer/Contractor

This procurement approach has traditionally been used by transportation agencies for civil engineering contracts. Typically, an engineer prepares a single set of contract documents (Plans, Specifications and Estimates PS&E) for a specific phase of the proposed system. For an ITS project such as those found in this Implementation Plan, a specialty design consultant is often used when public agencies lack the ability to do so.

The completed contract documents are then advertised, bids are received from contractors, and the project is awarded to the lowest or best value responsible bidder. The winning contractor is responsible for providing a complete and full operational system, including furnishing and

installing all hardware and software, system integration efforts, training and documentation, and the development of operational concepts and plans.

If the process forces a break for further competition between the phases, it is called two-step, otherwise, it is called turn-key in recognition that the public agency will receive a system ready to "turn the key" and go operational.

The consulting engineer often continues activities during system installation by monitoring the contractor's progress, reviewing contractor submissions, participating in the system testing, providing interpretations of plans and specifications, and developing data bases and operational plans if not done by the contractor. The consultant may also provide training.

Generally there will be one contract to prepare and administer for each construction phase; however, no single prime may possess the necessary experience and qualifications to perform all of the work included. Therefore, the prime contractor can be expected to use subcontractors and perhaps tiers of subcontractors, depending upon the breadth and complexity of the work.

The prime contractor is the contractually responsible entity for the prime's staff, the subcontractors and equipment suppliers. The prime contractor must coordinate and manage the subcontractors, a critical issue for project success. Administering multiple layers of subcontractors and suppliers is difficult even under the best conditions. It requires good human relations, technical expertise in the subject mater, and familiarity with the type of work being performed by the subcontractors.

In the engineer/contractor approach, the administering agency generally retains the responsibility for ensuring conformance with bid documents and for testing and accepting system elements. The agency is also generally responsible for coordination between contractors working on the various phases of the overall program.

5.5.6 Design/Build

In the design/build approach, a single responsible entity is selected to perform all work associated with deployment of the system. The public agency's sole role is monitoring the activity of the designer/builder. The designer/builder performs all design work, contracts for or constructs system elements, commissions the system and turns it over to the operating agency.

In the United States, the design/build approach has most often been used for buildings and for Department of Defense procurements. Design/build is used extensively for transportation projects outside the United States. The design/build process is the least well known in transportation projects, and procedures are not well established. In the US, one or more firms develop a conceptual plan for the project, and the "best" concept is selected. The firm then carries the design through preliminary engineering and design, sometimes called the "30% design level". Negotiations are then held for the final cost of implementation.

After the agreement is negotiated, the designer/builder completes all aspects of the project in conformance with the preliminary design. A key attribute of the design/build approach is the complete transfer of responsibility for completion to the designer/builder. This generally allows the project to be completed more quickly, as procurement procedures can be streamlined and problems can be resolved quickly. The designer/builder is under significant incentive to reduce

its costs and risks. This leads the design/builder to complete all work quickly and turn the system over to the agency.

The agency role is to supervise the designer/builder to ensure that quality is maintained, and that the designer/builder meets the schedule. The design/build approach can present some difficulty in coordinating technology changes. The public agency also may have to make decisions more quickly than their traditional decision loop can easily handle.

5.5.7 System Manager

The system manager approach uses a single entity in charge, known as the system manager. The system manager may be a specially staffed and equipped office of the public agency. More likely, it is a private sector consultant. The system manager is typically responsible for preliminary design and program definition, preparation of standard bid documents, preparation of final bid documents or supervision of others performing these services, development of any required software, procurement of software or hardware, system integration, preparation of concept-of-operations and operation plans, training, and documentation. Overall system management and quality control of other consultants or contractors is also typically provided. The contract between the agency and the system manager is expected to be a negotiated agreement for engineering services similar to design contracts. Both parties jointly determine the scope-of-work, define their respective duties and responsibilities, develop a realistic estimate of the corresponding costs, and fully define what is required from the system before the work actually commences.

Instead of a single construction contract, several contracts for the various subsystems are prepared. The agency's normal procurement processes are generally used to procure the individual subsystems and services; however, the system manager may administer these contracts and is responsible for integrating the various subsystems into an operating system. The system manager also controls technical specifications and standards throughout the construction phase, even where others do design work.

An inherent feature of the system management approach is the overall system design, and required hardware and software development, and system integration and testing activities are all controlled by a single entity – the system manager. The approach provides continuity through the process as well as a single focus of responsibility and accountability.

5.6 OPERATIONS & MAINTENANCE (O&M)

Successful ITS applications depend to a great extent on the approach taken to provide day-to-day operation of the systems. Operations can consist of activities ranging from deployment of portable devices to supervision of a TMC. These activities are often labor intensive raising staffing issues that will need to be addressed during implementation. Maintenance of ITS infrastructure typically entails systems calibration, software and hardware updates, re-establishing lost communications, and repair of damaged equipment.

Costs associated with these tasks can be as varied as the operations themselves and the technologies in question. In some cases, operations and maintenance costs associated with ITS can be high in comparison with more traditional transportation infrastructure, however, when

viewed in light of the benefit provided, they can actually represent on-going savings in other areas.

Project sponsors must have a plan for and devote resources to operations and maintenance. They cannot take a "set it and forget it" approach. They must think through not only how they will get a system running, but how they will keep it running, and how they will maximize its potential benefit. Key issues include the availability of staff, the need for special training, the development of operating procedures, and the budgeting of annual funding. However these issues are ultimately addressed, it is important to consider the impact of these requirements during both the planning and implementation phases.

5.7 MOVING FROM PROJECT CONCEPT TO AN OPERATING SYSTEM

One of the main outcomes of the Central Coast ITS Implementation Plan is to successfully deploy ITS projects. In fact, the Implementation Plan identified a number of ITS projects for the Central Coast as indicated in Section 3 and Appendix A. However, it is expected that this original list of ITS projects will be expanded or modified over time as new ideas are generated and as technology changes, offering opportunities that had not been anticipated. These additional ITS projects or modifications need to be first defined then tied to the CCITS Regional Architecture.

To ease inclusion into future updates of the Implementation Plan, future ITS projects should provide the same level-of-detail as originally presented in Appendix A. Therefore, to assist in this process, the following instructions have been prepared to help complete the project description template:

Exhibit 5.3 – Instructions for "Filling-Out" a Project Description Form

Category	Instruction/Explanation
Project Name	A brief, descriptive name that reflects the nature of the ITS project and its general location.
Project Description	An explanation of the elements to be included in the ITS project and essential operational aspects, such as: the general types of technologies to be employed (categories of technology, not vendor-specific), communications systems needed for the technologies to function, information that will be gathered, how the information will be used, how various agencies will be involved in operation, etc. The description need only go so far as to describe those ITS project elements that can be defined at this time. In some cases, further conceptual design and planning will be needed prior to implementation. In other cases, the description may be a sufficient basis for preparation of design and bid documents. The description may be supplemented with diagrams, where appropriate. The description should indicate the issues that remain to be resolved, both technological and institutional.
Relationship to Other Projects	Describes how the ITS project may be related to other projects in the ITS Implementation Plan. In some cases, the ITS project could represent an expansion of another project that will be implemented earlier. In other cases, the ITS project could be one component of a larger, multi-faceted strategy, requiring a description of how the project fits into the bigger picture.

Exhibit 5.3 – Instructions for "Filling-Out" a Project Description Form

Category	Instruction/Explanation
Specific Problems or Needs Addressed	Describes how the ITS project addresses problems and needs that have been defined earlier in the process of developing the Implementation Plan.
Traveler and Agency Benefits	Lists specific benefits that will result from the implementation of the ITS project.
Relationship to ITS Market Packages	Provides the linkage back to the ITS Market Packages defined in the Market Package Plan. This helps to identify the relationship to the National ITS Architecture.
Relationship to the Regional ITS Architecture	Describes where the ITS project fits within the overall framework of the Regional ITS Architecture for the Central Coast. The ITS project should be shown, if possible, on architecture diagrams prepared as part of the Implementation Plan.
Time Frame	Identifies when the ITS project would be targeted for implementation. If the ITS project is anticipated to be implemented within the first 5-years of the Implementation Plan, the year will be specified. Otherwise, the timeframe will be specified as 2013 to 2018 or after 2018. Specific implementation years will be resolved at a later date.
Implementing Agency	Identifies the lead agency and supporting agencies. The lead agency will be identified as the one to move the ITS project forward into implementation.
Potential Costs	Develop ITS project-specific cost estimates using the most recent real-world value available. Breakdown the project cost into various components of the project lifecycle. That is, capital investment, project administration, requirements and design, installation and integration, testing and evaluation, and operations and maintenance.
Possible Funding Sources	Funding for most Implementation Plan ITS projects will not have been specifically appropriated. Rather, one or more possible funding sources will be identified. Lead agencies will be responsible for pursuing the funds needed to implement and operate/maintain the ITS project.
Follow-up Actions	Describes the subsequent steps that need to be taken to move the ITS project toward implementation. This could include resolution of specific issues ranging from technology to institutional responsibility.

6. ITS PROGRAM MANAGEMENT

6.1 PROGRAM LEADERSHIP

Through the Central Coast ITS Implementation Plan, individual agencies or entities will need to step forward to lead or "champion" individual ITS projects based on their level of interest and need. However, the successful implementation of ITS also requires top-level leadership that focuses on the overall program.

The Implementation Plan resulted from a joint effort by the CCITS Coordinating Group and other involved stakeholders in the region. The participant agencies will need to be committed to a cooperative method of program management in order to realize the full benefits of systems integration inherent in ITS deployment. This approach will need to provide oversight and guidance to ITS implementation throughout the region using this plan as a starting point to move ITS projects forward and into the mainstream of transportation planning, development, and operations.

The CCITS Coordinating Group should continue to meet on a quarterly basis to help guide further planning, design, and implementation of ITS projects. This forum should assess the status of ITS project implementation, facilitate coordination among the various agencies within the region as well as with the adjacent regions, and for working out inter-agency agreements. It is essential that this guiding body takes an active role in ITS project implementation in order to ensure the coordination among these agencies and that an integrated approach to deployment of field elements is taken. It is imperative that guidance come from a committee that represents the full spectrum of agencies in the region and also has the background regarding the ITS planning process as well as the technology options available through ITS deployment.

In order for ITS project implementation to be successful within the Central Coast, the agencies that comprise the CCITS Coordinating Group should continue to "stay at the table", but more than likely, the individuals that attend/participate will change. The development of the CCITS Implementation Plan and Regional Architecture was driven primarily by planners representing their own Operations/Transportation Technical Advisory Committee (TAC). However, the implementation team that evolves from the CCITS Coordinating Group should likely include the actual ITS project sponsor agency, subject matter ITS experts (as necessary), as well as individuals from each agency that currently participate as members of the CCITS Coordinating Group.

Therefore, this new "CCITS Implementation Group" would be responsible for identifying potential funding for ITS projects, monitor progress on ITS project implementation, provide information to those within and outside the agency on ITS applications, and serve as a primary point of contact for inter-regional coordination on ITS issues. The key areas of program leadership and responsibility include:

- Tracking ITS project implementation and conformance
- Updating the Implementation Plan
- Maintaining the Regional ITS Architecture
- Maintaining intra- and inter-regional coordination

- Providing technical support and assistance
- Identifying funding opportunities
- Evaluating the overall ITS program and individual ITS projects
- Ensuring Federal compliance
- Mainstreaming and promoting ITS

These areas are discussed in more detail in the following sections. In general, the CCITS Coordinating Group will provide oversight and overall guidance, while the CCITS Implementation Group will be responsible for the completion of specific activities. At this time, AMBAG will continue to lead the CCITS Implementation Group. It is envisioned that CCITS Implementation Group meetings will occur on a bi-annual basis (2x per year) unless more frequently needed.

A significant component of the program leadership will consist of coordination among agencies as specific ITS projects are implemented. The coordination of ITS activities by various agencies provides the key to maximizing the value of integration of systems. Intra-regional coordination is necessary on an ITS project level basis. This may involve issues of compatible communication technologies, data formats, and physical connectivity, as well as the need for additional inter-agency agreements.

Beyond the boundaries of the Central Coast, coordination may be necessary at both program and project levels. At the program level, contact with other regions can facilitate congruent implementation approaches. A focal point for inter-regional coordination is the sharing of traveler information. A significant portion of travel in the Central Coast involves a trip ending outside the boundaries of the region itself. For the traveler, therefore, it is valuable to have access to information not only for the Central Coast but also for the adjacent regions. The integration of information dissemination will allow travelers to make their trips and, consequently, the transportation facilities more efficient. Information sharing on this scale requires coordination at both the planning and implementation stages. Neighboring regions with which agreements regarding data sharing are appropriate include the San Francisco Bay area, the Fresno area, and the Los Angeles area.

The CCITS Coordinating Group will need to stay involved in coordination of system linkages, integration, and interoperability issues at both the intra- and inter-regional levels. The CCITS Implementation Group can help facilitate these activities by working with the program managers from these regions and participating in their committee discussions as appropriate.

6.2 IMPLEMENTATION PRINCIPLES FOR THE CENTRAL COAST

The implementation of ITS projects will be carried out by a broad cross-section of agencies: Caltrans D5, the CHP, and regional or local Agencies across the 5-County Central Coast region. The private sector will likely implement yet another portion of the eventual ITS system (e.g. devices in vehicles, information systems, etc.). All of these systems must work together. For this to occur, the various agencies must understand their responsibilities in implementing certain parts of the system. This is particularly important for those portions of the system that are dependent on one another. This requires a game plan for implementation, or an implementation framework. This framework is founded on a set of guiding principles, as outlined below:

1. In general, implementation will occur to the extent that lead agencies take the initiative in project development and funding. Caltrans D5 will take the lead for ITS projects on State highways. Local and regional agencies will take the lead for ITS projects on county and city roadways. Transit agencies will take the lead for ITS projects related to transit systems. Lead agencies for other ITS projects, such as information-oriented projects that cross jurisdictional boundaries, will depend on the specific application.
2. Technical resources should be identified to whom agencies can refer for assistance in ITS project design, procurement, maintenance, and operations. These could be individuals within FHWA, FTA, Caltrans, or other agencies within California that are available to provide technical guidance on various facets of ITS implementation.
3. A library of sample RFPs, design guidance, and procurement information should be developed that can provide guidance for development of bid documents for ITS procurement. Caltrans D5 should serve as the coordinator of this activity initially, but drawing on information and experience available from other Caltrans districts.
4. Implementing agencies should develop management procedures for operation of ITS applications before they are procured. This should be done along with preparation of design documents. This will ensure that agencies have thought through how they will use what they are about to acquire, reducing the chance of misapplication, misunderstanding, or procurement of inappropriate equipment. Training budgets should be included with many ITS procurements. For information-oriented projects, agencies must ensure that there is a commitment to delivery of accurate and timely information.
5. Agencies in the Central Coast should participate in Statewide efforts that could benefit ITS applications in the Central Coast. Letters of support should be provided for those Statewide initiatives that will allow the Central Coast to deliver more cost-effective projects. The Central Coast ITS Coordinating Group should continue to serve as a deliberating body on the proper course of action.
6. Agencies in the Central Coast should coordinate with other Caltrans districts to ensure effective and consistent operations across jurisdictional boundaries and optimum use of available resources for staffing and management. Caltrans D5 should serve as the coordinating entity with other districts.
7. Agencies should be encouraged to implement additional or ancillary ITS projects that are not necessarily included in the Implementation Plan but that will benefit traffic management, emergency services, transit management, etc. This could include, for example, ITS Projects by the CHP, local law enforcement and emergency service agencies, and/or private entities to enhance regional communications systems.
8. A wide range of funding opportunities should be examined to build the regional ITS system over time. This could include consideration of opportunities in non-ITS construction projects to build portions of the ITS infrastructure. Agencies need to take a long-term view and anticipate opportunities for cost savings. Each implementing agency should examine potential ITS projects in their capital programs to determine if ITS applications are appropriate.

9. Implementing agencies should ensure that a continuing source of operations and maintenance funding is available prior to procuring ITS Projects.
10. Implementing agencies should provide adequate public education for ITS initiatives that require public understanding for their effectiveness. This could include such items as providing information on ramp metering, allaying privacy concerns, and explaining procedures for using "Smart Cards".
11. The staging of ITS projects and programs in the Implementation Plan must be viewed as flexible enough to make adjustments to respond to funding opportunities and changing circumstances. This suggests that the Implementation Plan will need periodic updating, as described later in this section.

The Implementation Plan needs to be visionary, but with a realistic expectation of what can and should be achieved. Part of the vision is to creatively and effectively use the resources expected to be available. The Implementation Plan describes the mechanisms by which the potential ITS projects referenced in Section 3 and Appendix A can move forward. It also includes an assessment of the funding possibilities, schedule, and institutional arrangements.

6.3 UPDATE ITS IMPLEMENTATION PLAN

The Central Coast ITS Implementation Plan should be a living document. This is particularly important in light of the rapid pace of change in technology. The technology options and ITS projects in this plan are aimed at meeting specific transportation needs while building upon the ITS systems deployed previously. While it is imperative for a guiding document such as this to be in place, as changes in direction within the agencies or for the region as a whole are realized, the planning goals and therefore, specific ITS projects may need to be revisited and revised. The Implementation Plan presents an overall framework, but decisions regarding the best timing and technical approaches for ITS projects must be responsive to conditions that exist at the time when the decisions are being made.

While the Implementation Plan cannot be constantly updated to keep pace with these changes, a process should be established to conduct a periodic review and update of information in the Implementation Plan. The CCITS Coordinating Group should be responsible for overseeing updates to the Implementation Plan. This could include revisions of top-level issues such as program goals, or it could focus on specific issues such as ITS project scoping and scheduling and detailed Regional ITS Architecture refinements. The following strategy will allow agencies to make the necessary adjustments to foster continued coordination and maintenance of the essential elements of the Implementation Plan.

- Maintain a centralized log of ITS projects that appear in individual agency transportation programs (e.g., RTP, STIP, STP, etc.). This will foster coordination among projects and provide a type of "status report" on progress. Exhibit 6.1 is a recommended sample format. The log should include projects in adjacent regions (e.g. the San Francisco Bay or Los Angeles/Ventura areas) that are relevant to the Central Coast.
- Update the ITS project descriptions contained in Appendix A. This could include revisions to existing ITS projects or new project descriptions. An agency needs to be

designated as the clearinghouse for ITS Project descriptions. This responsibility can be rotated periodically.

- Conduct a periodic review and update of information in the Implementation Plan. It is suggested that this be done on a cycle similar to updates of Regional/Metropolitan Transportation Improvement Programs (i.e., every 2 years). Particular attention needs to be given to the inclusion of new/revised ITS projects and updates of the Regional ITS Architecture. In this respect, the updates will be similar to those conducted for other types of transportation strategies, such as short-range transit plans, highway plans, and bicycle plans, but the update cycle may be more frequent because of the pace of change.
- Update the Action Plan, reflected in Exhibit 6.2, on an annual basis. As progress occurs, the Action Plan can become more specific.

Responsibility for these updates needs to be identified, but may be passed from one agency to another on an agreed-upon cycle. The CCITS Coordinating Group should determine who/which agency(ies) will be responsible for initiating this activity and producing the updated documents.

Exhibit 6.1 – Sample Format for Maintaining Regional Project Status List

Project Title	Lead Agency	Project Description	Project Location	Planned Construct.	Funding Sources	Arch. Conf. Status.
Ramp Meters	Caltrans D5	Install ramp meters on US 101 at SR 154	SR 154 on-ramps to US 101 (north & south)	2008	SHOPP	OK
Transit AVL	SCMTD	Install AVL vehicle tracking system on all buses/transit vehicles	Santa Cruz metro area	2009	CMAQ	In-progress
Others…						

6.4 ACTION PLAN

There are a variety of actions that should be taken to move ITS implementation forward in the Central Coast. These are in support of the general program leadership requirements described earlier. Exhibit 6.2 lists a series of actions that should be taken following the approval of the Implementation Plan and the agencies responsible for initiation of those actions.

One of the keys to a successful, ongoing ITS program is having individuals who understand and can promote its objectives. The deployment of the Central Coast ITS Implementation Plan will require several individuals in key agencies who have this vision. They will need to possess or be supported by technical and management expertise that can deal with the specific challenges of ITS technologies and on-going operations. Communications with technical staff at Caltrans, and

with technical staff in larger urban areas with ongoing ITS applications will be helpful in developing the expertise in the Central Coast Agencies

Exhibit 6.2 – List of Actions and Agencies Responsible for Those Actions

Action	Responsible Agencies				
	CCITS Coord. Group	Caltrans D5	RTPAs/ MPOs	Local Agencies	FHWA/ FTA
Designate an ongoing oversight group to ensure that ITS funding and implementation is moving forward in a coordinated fashion. This group would meet on a periodic, as-needed basis.	X				
Identify/form the CCITS Implementation Group. Membership would include those agencies on the CCITS Coordinating Group as well as other stakeholders forwarding ITS projects for implementation. Responsible for identifying potential funding, monitoring progress on ITS project implementation and conformance, providing information to others on ITS applications, and serving as a primary technical point of contact for inter-county (and inter-regional) coordination.	X	X	X	X	X
Maintain a log of ITS projects in the transportation programs of State, regional, and local agencies, and distribute that information at least on a biannual basis.	X		X		
Review and update the ITS Implementation Plan on a periodic basis (perhaps on a cycle similar to the RTIP), including: • Update the ITS Project Descriptions (contained in Appendix A) • Update this Action Plan on an annual basis • Maintain the Regional ITS Architecture	X		X		
Begin to identify specific funding opportunities for short-term ITS projects.	X	X	X	X	X
Collect information on ITS-related contracting to make available to agencies responsible for ITS project implementation.		X	X		X
Provide updates of information on ITS project conformance with the National ITS Architecture.					X
Prepare/submit ITS project conformance with the National ITS Architecture (SERF & SEMP).		X	X	X	
Proceed with ITS project design and implementation, as funding becomes available.		X	X	X	
Develop evaluation criteria and performance measures to assess the impacts, benefits, and costs of ITS projects.	X				
Incorporate CCITS Implementation Plan elements into the Regional Transportation Plan (RTP), Caltrans SHOPP, agency planning documents, Project Study Reports, Short-Range Transit Plans, etc.		X	X	X	

Exhibit 6.2 – List of Actions and Agencies Responsible for Those Actions

Action	Responsible Agencies				
	CCITS Coord. Group	Caltrans D5	RTPAs/ MPOs	Local Agencies	FHWA/ FTA
Incorporate ITS considerations into program and project prioritization criteria, where applicable. This may include additional information on how ITS projects will be considered in the applicable transportation program.			X		
As funding becomes available, incorporate projects into the Regional and Federal Transportation Improvement Programs.			X		
Include information about ITS in agency outreach efforts to help promote ITS.	X	X	X		
Support Statewide ITS projects, legislative changes, or other public/private ITS initiatives, as appropriate, to foster ITS implementation in the Central Coast.	X	X	X	X	X

7. ITS RESOURCES – WHO'S THERE TO HELP?

7.1 CCITS COORDINATING GROUP

Although the ITS Implementation Plan and CCITS Regional Architecture are complete, the ITS planning process is just getting under way in the Central Coast. Involved stakeholders have already recognized this situation, as reflected by the formation of the CCITS Coordinating Group to further successful ITS deployments and foster coordination across jurisdictional and agency boundaries. The following agencies are key members of the CCITS Coordinating Group and continue to provide oversight for ITS implementation in the Central Coast.

- Association of Monterey Bay Area Governments (AMBAG)
  (831) 883-3750
  http://www.ambag.org
- Caltrans District 5
  (805) 549-3130
  http://www.dot.ca.gov/dist05
- Federal Highway Administration (FHWA)
  (916) 498-5005
  http://www.fhwa.dot.gov
- San Luis Obispo Council of Governments (SLOCOG)
  (805 781-4219
  http://www.slocog.org
- Santa Cruz County Regional Transportation Commission (SCCRTC)
  (831) 460-3200
  http://www.sccrtc.org
- Transportation Agency for Monterey County (TAMC)
  (831) 775-0903
  http://www.tamcmonterey.org
- California Highway Patrol (CHP)
  (805) 549-3261
- http://www.chp.ca.gov
- Council of San Benito County Governments (SBtCOG)
  (831) 637-7665
- http://www.sanbenitocog.org
- Monterey-Salinas Transit (MST)
  (888) 678-2871
  http://www.mst.org
- Santa Barbara County Association of Governments (SBCAG)
  (805) 961-8900
  http://www.sbcag.org
- Santa Cruz Metropolitan Transit District (SCMTD)
  (831) 426-6080
  http://www.scmtd.com
- Central Coast ITS Project Website
  http://www.iteris.com/ccits-admin/

Typical roles/responsibilities of the CCITS Coordinating Group include the following:

- Provide input on issues related to an ITS project identified in the CCITS Implementation Plan
    - Planning/programming
    - Design
    - Implementation
    - Architecture conformance
    - Funding
    - Operations and maintenance
    - Assess the status of Implementation Plan deployment
    - Work out inter-agency agreements/MOUs
- Coordinate Central Coast ITS initiatives with neighboring regions and statewide
- Track ITS standards-setting activities
- Update the ITS Implementation Plan

7.2 CCITS IMPLEMENTATION GROUP

In order for ITS project implementation to be successful within the Central Coast, the agencies that comprise the CCITS Coordinating Group should continue to "stay at the table". Further, the CCITS Implementation Group that evolves from this existing group should also include the actual ITS project sponsor agency as well as subject matter ITS experts (as necessary). Therefore, this new CCITS Implementation Group would continue to perform the general roles and responsibilities of the CCITS Coordinating Group (as described above), conduct more specific or in-depth activities per particular ITS Projects, as well as carry-out the following measures:

- Consult the Regional ITS Architecture to verify if a particular ITS project is included within the System Inventory
- Determine if new agency operations, system functionality/requirements, interfaces, and/or data flows need to be accommodated for an ITS project
- Contact ITS stakeholders and coordinate data exchange
- Establish agency responsibilities regarding integration and O&M
- Follow the systems engineering process for ITS project deployment to ensure Federal compliance
- Determine if changes to the Regional ITS Architecture need to be made and then make the modifications (in accordance with the Architecture Maintenance Plan)
- Identify potential funding source(s) for particular ITS projects
- Monitor/track progress on ITS project implementation and conformance
- Provide information to those within and outside the agency on ITS applications
- Serve as a primary point of contact for inter-regional coordination on ITS issues
- Provide technical support and assistance
- Mainstream/promote ITS and educate stakeholders

7.3 OTHER RESOURCES

The Central Coast is not alone in its efforts to deploy ITS. Many other agencies are planning and/or deploying ITS. The Central Coast should seek out all of these parties and use them as a resource when contemplating current and future ITS decisions. Some agencies to consider as ITS references and other ITS-related websites to visit to find out more information about ITS are identified below.

- U.S. DOT (ITS Joint Program Office) http://www.its.dot.gov
- Institute of Transportation Engineers (ITE) http://www.ite.org
- ITS/Operations Resource Guide http://www.resourceguide.its.dot.gov/
- ITS Lessons Learned http://www.itslessons.its.dot.gov/
- ITS in my State http://itsdeployment.ornl.gov/technology_overview/ITSInMyState.asp
- ITS America http://www.itsa.org
- ITS Benefits http://www.itsbenefits.its.dot.gov/
- ITS Costs http://www.itscosts.its.dot.gov/
- ITS Standards http://www.standards.its.dot.gov/
- FHWA – Professional Capacity Building Program http://www.pcb.its.dot.gov/res_t3.asp

APPENDIX A

CENTRAL COAST

ITS PROJECT DESCRIPTIONS

Recommended Central Coast ITS Projects A-2

Traffic Management & Safety A-13

Transit Management A-51

Traveler Information Systems..... A-68

Commercial Vehicle Operations (CVO)..... A-74

Recommended Central Coast ITS Projects

A series of candidate ITS Projects was developed for the Central Coast ITS Implementation Plan based on the identified problems, the existing ITS infrastructure, and discussions with the CCITS Coordinating Group. By "ITS Project", we mean specific ITS systems, technologies, or components that will be deployed at specific locations (e.g., US 101, SR 1, etc.) or for a specific Agency (e.g., MST, City of Santa Barbara, etc.), existing systems (e.g., traffic management, transit operations, emergency services, etc.), implementation timeframe (i.e., Short-, Medium-, or Long-term), and responsible Agencies (e.g., Caltrans, City of Santa Cruz,, etc.).

Appendix A provides a full listing of ITS Projects developed within the Implementation Plan process. It presents Exhibit A.1, which indicates project name and locations, plus a more detailed description of the various ITS Projects. In many cases, multiple locations and responsible Agencies are listed under the same project description to provide an indication of the anticipated extent of deployment in the Central Coast. It is expected that this list of ITS Projects will be expanded or modified over time as new ideas are generated and as technology changes, offering opportunities that had not been anticipated. In any case, all of these ITS Projects are already included within the Central Coast Regional ITS Architecture [aka three (3) MPO Turbo databases]. Future ITS Project additions/modifications will also need to be accommodated within the MPO Turbo databases through the process outlined within their respective Architecture Maintenance Plan.

The Implementation Plan should be modified periodically to reflect these updates, but there is no requirement for the ITS Project to be in the Implementation Plan before it can be programmed. However, the ITS Project will require a determination of conformance with the National ITS Architecture and follow a Systems Engineering analysis in order to receive Federal funds. There is no financial commitment associated with the listing of an ITS Project in the Implementation Plan.

Potential ITS Costs

Within each project description, cost information will be presented (as available) in the form of applicable cost range(s) based on real-world experiences. Please note that these costs provide a starting point and possible baseline for future ITS implementation costs applicable to the Central Coast Region. The reader is cautioned about using the costs directly without first examining the assumptions, local conditions, and other factors associated with the particular ITS Project.

Central Coast ITS Project Descriptions

Most of the project descriptions were developed by TransCore (aka the Consultant selected by the CCITS Coordinating Group to develop the Implementation Plan). In some cases, individual project descriptions were submitted by Regional and Local Agencies. Therefore, some may overlap slightly with certain project descriptions that cover a project type that is common among multiple geographic areas. Each project description starts at the top of a new page and contains the following information:

- Project Name
- Project Description
- Relationship to Other Projects
- Specific Problems or Needs Addressed
- Traveler and Agency Benefits
- Relationship to ITS Market Packages
- Relationship to the Regional ITS Architecture
- Time Frame (Short → within 5 years, Medium → 5-10 years, and Long → over 10 years)
- Implementing Lead Agency(s)
- Potential Costs (as available)
- Possible Funding Sources (where appropriate)
- Follow-up Actions (where appropriate)

EXHIBIT A-1
RECOMMENDED CENTRAL COAST ITS PROJECTS
POSSIBLE LOCATIONS AND RESPONSIBLE AGENCIES

ITS Project	Specific Locations/Areas	Problems Addressed	Time Frame (S/M/L)	Possible Responsible Agencies
TRAFFIC MANAGEMENT AND SAFETY				
Network Surveillance □ ***CCTV*** - The use of closed circuit television (CCTV) cameras to monitor roadway conditions - CCTV at approx. 1-mile spacing - Generally near ramp meters when available	***Region:*** As part of all future ramp meter installations ***Santa Barbara County:*** US 101 - SR 150/Ventura County Line to Hollister Ave. (Santa Barbara Area) US 101 - Clark Ave. to San Luis Obispo County Line (Santa Maria Area) ***San Luis Obispo County:*** US 101 - Cuesta Grade (San Luis Obispo to SR 58) US 101 - SR 166/Santa Barbara County Line to Los Berros (Nipomo Area) US 101 - El Campo to Lower Higuera (Five Cities Area) US 101 - Los Osos Valley Rd. to Monterey St. (San Luis Obispo Area) US 101 - SR 58 to Santa Cruz Rd. (Santa Margarita/Atascadero Area) US 101 - Vineyard to SR 46 east (Templeton/Paso Robles Area) ***San Benito County:*** US 101 - Monterey County Line to 7.5 miles north ***Monterey County:*** US 101 - Airport Blvd. to Boronda (Salinas Area) US 101 - Russel Rd./Espinosa Rd. to Crazy Horse Rd. (Prunedale Area) SR 68 - SR 1 to Salinas SR 156 - SR 1 to US 101 SR 1 - SR 68 (south) to Reservation Rd. (Monterey Peninsula) ***Santa Cruz County:*** SR 1 - Freedom Blvd. O.C. to SR 1/SR 17 Junction SR 17 - SR 1/SR 17 Junction to Santa Clara County Line SR 17 - Glenwood Curve Area	(Recurring Congestion, Non-Recurring Congestion, Spec. Event/ Act. Cntr Traffic, Emergency Response, Real-Time System Monit., Better Plng Data)	S/M/L S S/M M M M M M M M M M M M S/M M M M	 Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans
Network Surveillance (cont.) □ ***Roadway Sensors*** - Detector stations/devices at specific locations to monitor roadway conditions - Has the ability to capture planning data - Detector stations/devices at approx. 1/2-mile spacing (infilling coverage between ramp meter mainline detectors) - The combination of detector stations and ramp meter mainline detectors will provide surveillance at approx. 1/2-mile intervals	***Santa Barbara County:*** US 101 - SR 150 Junction (Ventura County Line) to Hollister Ave. US 101 - Clark Ave. south of Santa Maria to San Luis Obispo County Line SR 1 - Start of expressway (Lompoc) to SR 135 north (Orcutt) SR 135 - Santa Antonio Rd. to SR 1 S ***San Luis Obispo County:*** US 101 - Santa Barbara County Line to northern San Luis Obispo City limits US 101 - Cuesta Grade US 101 - SR 58 to SR 46 east SR 1 - US 101 to end of freeway section (Cayucos) SR 46 - US 101 to east ***San Benito County:*** SR 25 - Hollister City limits to Santa Clara County Line SR 156 - US 101 to SR 152/Santa Clara County Line ***Monterey County:*** US 101 - Airport Blvd. to Crazy Horse Rd. SR 1- Start freeway (Carmel) to end freeway/SR 156 (Castroville) SR 68 - Monterey to Salinas ***Santa Cruz County:*** SR 1 - Freedom Blvd. O.C. to SR 1/SR 17 Junction SR 17 - SR 1/SR 17 Junction to Santa Clara County Line UC Santa Cruz City of Scotts Valley	(Recurring Congestion, Non-Recurring Congestion, Spec. Event/ Act. Cntr Traffic, Emergency Response, Real-Time System Monit., Better Plng Data)	S S/M M M M M M M M M M S/M S/M M S S M S/M	 Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans UCSC Scotts Valley
Network Surveillance (cont.) □ ***Smart Call Boxes*** - Includes traffic and environmental detection capabilities - Smart Call Boxes provided along highway sections where other network surveillance does not exist as the routes become equipped with Call Boxes	***Santa Barbara County:*** US 101 - Ventura County Line to San Luis Obispo County Line SR 1 - US 101 to San Luis Obispo County Line SR 154 (4 locations) SR 166 (4 locations) SR 246 (4 locations) ***San Luis Obispo County:*** US 101 - Santa Barbara County Line to north Paso Robles SR 1 - San Luis Obispo to Monterey County Line SR 41 - Kings County Line to SR 46 SR 41 - US 101 to SR 1 SR 46 - Kern County Line to SR 1 ***San Benito County:*** SR 156 - Santa Clara County Line to US 101 ***Monterey County:*** US 101 - San Luis Obispo County Line to San Benito County Line SR 1 - San Luis Obispo County Line to Santa Cruz County Line ***Santa Cruz County:*** SR 17 - SR 1 to Santa Clara County Line SR 1 - Monterey County Line to San Mateo County Line	(Recurring Congestion, Non-Recurring Congestion, Spec. Event/ Act. Cntr Traffic, Emergency Response, Real-Time System Monit., Better Plng Data)	M M S M M M/L L M/L M/L L M M M M M	SBCAG, Caltrans SBCAG, Caltrans SBCAG, Caltrans SBCAG, Caltrans SBCAG, Caltrans SLOCOG, Caltrans SLOCOG, Caltrans SLOCOG, Caltrans SLOCOG, Caltrans SLOCOG, Caltrans SBtCOG, Caltrans TAMC, Caltrans TAMC, Caltrans SCCRTC, Caltrans SCCRTC, Caltrans

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Surface Street Control □ ***Basic Synchronization/ Coordination*** - Interconnected traffic signal systems coordinated to allow for smooth traffic flow - Allows inter-jurisdictional traffic control	***Santa Barbara County:*** Carrillo Blvd. Main St. Broadway Central North H St. Hollister Ave. Upper State St. SR 246 - Solvang City limits ***San Luis Obispo County:*** Grand Ave. - Arroyo Grande/Grover Beach El Camino - Atascadero ***San Benito County:*** SR 25 (near Hollister) SR 156 (near Hollister) ***Monterey County:*** SR 68 - York Rd. to Torero SR 156 - Castroville Blvd. to US 101 SR 183 - Castroville Sep. to SR 1 ***Santa Cruz County:*** UC Santa Cruz City of Watsonville Inter-Agency signal management/coordination	(Recurring Congestion, Non-Recurring Congestion, Transit Efficiency & Effectiveness, Efficient Network Vehicles, Better Plng Data)	S S S S S S S S S S S S S S S S S S/M	Santa Barbara City Santa Maria Santa Maria/Caltrans Lompoc Lompoc/Caltrans Goleta Santa Barbara City Solvang/Caltrans Local Agencies Atascadero Caltrans Caltrans Caltrans Caltrans Caltrans UCSC Watsonville SCCRTC
Surface Street Control (cont.) □ ***Traffic Control System (TCS)*** - Centralized system that connects to signal systems in the field - Allows dynamic traffic-responsive operations	***Santa Barbara County:*** City of Santa Barbara City of Santa Maria ***San Luis Obispo County:*** City of San Luis Obispo ***San Benito County:*** None ***Monterey County:*** City of Monterey City of Salinas ***Santa Cruz County:*** City of Santa Cruz City of Scotts Valley	(Recurring Congestion, Non-Recurring Congestion, Transit Efficiency & Effectiveness, Efficient Network for Commercial Vehicles, Better Plng Data)	S M S S M S M	Santa Barbara Santa Maria San Luis Obispo Monterey Salinas Santa Cruz Scotts Valley
Freeway Control □ ***Ramp Metering*** - Typical urban freeway traffic control systems - The combination of detector stations and ramp meter mainline detectors will provide surveillance at approximate 1/2-mile intervals	***Santa Barbara County:*** US 101 - SR 150/Ventura County Line to Hollister Ave. (Santa Barbara Area) US 101 - Clark Ave. to San Luis Obispo County Line (Santa Maria Area) ***San Luis Obispo County:*** US 101 - SR 166/Santa Barbara County Line to Los Berros (Nipomo Area) US 101 - El Campo to Lower Higuera (Five Cities Area) US 101 - Los Osos Valley Rd. to Monterey St. (San Luis Obispo Area) US 101 - SR 58 to Santa Cruz Rd. (Santa Margarita/Atascadero Area) US 101 - Vineyard to SR 46 east (Templeton/Paso Robles Area) ***San Benito County:*** None ***Monterey County:*** US 101 - Airport Blvd. to Boronda (Salinas Area) US 101 - Russel Rd./Espinosa Rd. to Crazy Horse Rd. (Prunedale Area) SR 1 - SR 68 (south) to Reservation Rd. (Monterey Peninsula) ***Santa Cruz County:*** SR 1 - Freedom Blvd. to SR 1/SR 17 Junction (Emeline) SR 17 - SR 1/SR 17 Junction to Santa Clara County Line	(Recurring Congestion, Non-Recurring Congestion, Safety)	M/L M/L M M M M M M M S/M S M	Caltrans/CHP Caltrans/CHP Caltrans/CHP Caltrans/CHP Caltrans/CHP Caltrans/CHP Caltrans/CHP Caltrans/CHP Caltrans/CHP Caltrans/CHP Caltrans/CHP Caltrans/CHP
HOV Lane Management ***High Occupancy Vehicle (HOV) Lanes***	***Santa Cruz County:*** SR 1 - From junction of SR 17 approx. 6 miles south (both directions)		M/L	Caltrans/CHP/SCCRTC

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Traffic Information Dissemination □ ***CMS (Permanent)*** - Provides motorists with traffic information via electronic message boards	***Santa Barbara County:*** Junction of US 101 & SR 1 (south in Gaviota Pass) Junction of US 101 & SR 166 Junction of US 101 & Las Positas Rd. Junction of SR 1 & SR 150 Junction of SR 1 & SR 246 Junction of SR 246 & US 101 Junction of SR 246 & SR 154 Junction of SR 154 & SR 192 SR 154 at the San Marcos Pass ***San Luis Obispo County:*** Junction of US 101 & SR 1 (north in SLO) US 101 - At juncture ends of Cuesta Grade SR 41 (in Central Valley) SR 46 (in Central Valley) SR 166 (in Central Valley) ***San Benito County:*** US 101 SR 25 SR 156 Hollister Municipal Airport (SR 156) ***Monterey County:*** Junction of US 101 & SR 156 south (near Prunedale) Junction of US 101 & SR 156 north Junction of SR 1 & SR 68 south Junction of SR 1 & SR 156 ***Santa Cruz County:*** SR 1 (and nearby local roads) SR 17 (and nearby local roads)	(Recurring Congestion, Non-Recurring Congestion, Travel Info. Needs, Maintenance Activities)	S S/M S M M M S S/M S/M S M/L M/L M/L M/L M M M M S M S S S S	Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans, Local Agencies Caltrans, Local Agencies
Traffic Information Dissemination (cont.) □ ***HAR (Permanent)*** - Provides motorists with traffic information via radio	***Santa Barbara County:*** US 101/SR 154 in Santa Barbara US 101 (Montecito & Downtown Santa Barbara area) US 101/SR 154 San Marcos Pass ***San Luis Obispo County:*** US 101/SR 1 in San Luis Obispo US 101/SR 58 in Santa Margarita US 101/SR 46 in Paso Robles ***San Benito County:*** US 101 SR 25 SR 156 ***Monterey County:*** SR 1/SR 68 Junction US 101/SR 156 Junction ***Santa Cruz County:*** SR 1 SR 9 SR 17 SR 129	(Non-Recurring Congestion, Special Event/ Activity Center Traffic, Travel Travel Info. Needs, & Activities)	S S M M M M M M M M S M M M M	CHP, Caltrans SBCAG, Caltrans CHP, Caltrans CHP, Caltrans CHP, Caltrans CHP, Caltrans Caltrans Caltrans Caltrans CHP, Caltrans CHP, Caltrans Caltrans, Local Agencies Caltrans, Local Agencies Caltrans, Local Agencies Caltrans, Local Agencies
Traffic Information Dissemination (cont.) □ ***Portable Traffic Management System*** - Refers to portable system that may include CMS, HAR and/or CCTV - May be used for special events, activity centers, & & facility construction activities	***Santa Barbara County:*** Concept to be defined. Agencies coord. use of port. equip. where approp. ***San Luis Obispo County:*** Concept to be defined. Agencies coord. use of port. equip. where approp. ***San Benito County:*** Concept to be defined. Agencies coord. use of port. equip. where approp. ***Monterey County:*** Concept to be defined. Agencies coord. use of port. equip. where approp. ***Santa Cruz County:*** Concept to be defined. Agencies coord. use of port. equip. where approp.	(Non-Recurring Congestion, Special Event/ Activity Center Traffic, Travel Information Needs)	S S S S S	RTPAs/CTCs RTPAs/CTCs RTPAs/CTCs RTPAs/CTCs RTPAs/CTCs
Regional Traffic Control □ ***Integrated Freeway/ Arterial Control*** - Allows inter-jurisdictional traffic control	***Santa Barbara County:*** City of Santa Barbara City of Santa Maria ***San Luis Obispo County:*** None ***San Benito County:*** None ***Monterey County:*** Monterey Peninsula Cities City of Salinas ***Santa Cruz County:*** City of Santa Cruz & Adjacent Cities	(Recurring Congestion, Non-Recurring Congestion, Spec. Event/ Act. Cntr Traffic, Emergency Response, Efficient Network for Commercial Vehicles)	S M/L M/L M/L S	Caltrans/Santa Barbara Caltrans/Santa Maria Caltrans/Local Agencies Caltrans/Salinas Caltrans/Local Agencies

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Regional Traffic Control (cont.) □ ***Caltrans D5 TMC*** - Clearinghouse for traffic information - Overall system management	***Region:*** ITS Field Devices/Components Infill Throughout Region or Subregion (Roadway Sensors, Ramp Meters, CCTV, CMS, & HAR) Communications to ITS Field Devices TMC System Enhancements	(Recurring Congestion, Non-Recurring Congestion, Spec. Event/ Act. Cntr Traffic, Emergency Response, Real-Time System Monit., Efficient Network for Commercial Vehicles, Inter-Agency Communication)	S/M S/M S/M	Caltrans/CHP Caltrans/CHP Caltrans/CHP
Incident Management System □ ***CAD System Enhancements*** - Optimizes response to reduce the impact of incidents	***Region:*** Emergency Response Agencies	(Non-Recurring Congestion, Spec. Event/ Act. Cntr Traffic, Emergency Response)	S/M	Law Enforcement, Emergency Service Providers
Incident Management System (cont.) ***Integrated Communication System***	***Region:*** May be Implemented by Individual Agencies	(Non-Recurring Congestion, Spec. Event/ Act. Cntr Traffic, Emergency Response)	S/M	Caltrans, Law Enforcement, Emergency Service
Incident Management System (cont.) □ ***Motorist Aid Call Boxes*** - Quicker incident identification to reduce the impact of incidents	***Santa Barbara County:*** DONE -- US 101, SR 1, SR 154, SR 166, and SR 246 Remaining State Routes (as necessary) ***San Luis Obispo County:*** DONE -- US 101, SR 1, SR 41, SR 46, and SR 166 Rural SR 227 Remaining State Routes (as necessary) ***San Benito County:*** DONE -- US 101, SR 25, and SR 156 Remaining State Routes (as necessary) ***Monterey County:*** DONE -- US 101, SR 1, SR 68, and SR 156 Remaining State Routes (as necessary) ***Santa Cruz County:*** DONE -- SR 1 SR 9, SR 17, SR 129, and SR 152 Remaining State Routes (as necessary)	(Non-Recurring Congestion, Emergency Response)	S/M S/M S/M S/M S/M S/M	SBCAG/Caltrans/CHP SLOCOG/Caltrans/CHP SLOCOG/Caltrans/CHP SBtCOG/Caltrans/CHP TAMC/Caltrans/CHP SCCRTC/Caltrans/CHP
Incident Management System (cont.) □ ***Response Strategy Support*** - Optimize inter-jurisdictional cooperation to reduce the impact of incidents	***Region:*** May be Implemented by Individual Agencies Over Time	(Non-Recurring Congestion, Emergency Response)	S/M	Caltrans, CHP Law Enforcement, Emergency Service Providers
Emissions Monitoring and Management - Includes pollution level monitoring & vehicle emissions monitor spot locations	***Region:*** No projects proposed	(Better Planning Data, Inter-Agency Commun., Environmental Impacts)	L	AQMD/APCD

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Standard Railroad Grade Crossings - Includes passive and active warning systems and diagnostics	***Region:*** Appropriate Rural Locations ***San Luis Obispo County:*** Orcutt Rd. in San Luis Obispo Grand Ave. in Grover Beach Foothill Blvd. in San Luis Obispo SR 58 in Santa Margarita 13th St. in Paso Robles	(Safety)	S/M M S/M M M/L M	Caltrans, Local Agencies San Luis Obispo Grover Beach San Luis Obispo SLO County Paso Robles
Advanced Railroad Grade Crossings - Includes positive barrier systems and advanced detection capabilities	***Region:*** Appropriate Urban Locations Appropriate Rural Locations ***Santa Barbara County:*** US 101 in Gavitola US 101 - RR Bridge Adjacent to Carrillo St. Off-Ramp ***San Luis Obispo County:*** Orcutt Rd. in San Luis Obispo Grand Ave. in Grover Beach Foothill Blvd. in San Luis Obispo SR 58 in Santa Margarita 13th St. in Paso Robles	(Efficient Net-work for Commercial Vehicles, Safety)	S/M S/M S S M S/M M M/L M	Caltrans, Local Agencies Caltrans, Local Agencies Caltrans Caltrans San Luis Obispo Grover Beach San Luis Obispo SLO County Paso Robles
Parking Facility Management □ ***Parking Usage Monitoring*** - Collects current parking facility status and shares information with traffic management personnel - May include limited signage as to lot status, but would be an input to other information dissemination systems/projects	***Santa Barbara County:*** Activity and Special Event Centers Downtown Santa Barbara and Waterfront Mission Area ***San Luis Obispo County:*** Activity and Special Event Centers Downtown San Luis Obispo ***San Benito County:*** Activity and Special Event Centers ***Monterey County:*** Activity and Special Event Centers Downtown Monterey Monterey Bay Aquarium Area Downtown Carmel ***Santa Cruz County:*** Activity and Special Event Centers Downtown Santa Cruz UC Santa Cruz Parking System City of Santa Cruz Parking System	(Recurring Congestion, Special Event/ Activity Center Traffic, Real-Time System Monitoring, Better Planning Data)	S/M S/M S/M S/M M S/M S/M S/M S/M S/M S/M S/M S S	Local & Private Agencies Santa Barbara Santa Barbara Local & Private Agencies San Luis Obispo Local & Private Agencies Local & Private Agencies Monterey Monterey Carmel Local & Private Agencies Santa Cruz UCSC Santa Cruz
Parking Facility Management □ ***Electronic Parking Fees*** - Automated fee collection with in-vehicle communications equipment	***Santa Barbara County:*** Activity and Special Event Centers Downtown Santa Barbara Santa Barbara Mission Area ***San Luis Obispo County:*** Activity and Special Event Centers Downtown San Luis Obispo ***San Benito County:*** Activity and Special Event Centers ***Monterey County:*** Activity and Special Event Centers Downtown Monterey Fisherman's Wharf Area Monterey Bay Aquarium Area Downtown Carmel ***Santa Cruz County:*** Activity and Special Event Centers Downtown Santa Cruz Santa Cruz Boardwalk Area	(Recurring Congestion, Real-Time System Monitoring, Better Planning Data)	L S/M S/M L M L L S/M S/M S/M S/M L S/M S/M	Local & Private Agencies Santa Barbara/Priv. Ag. Santa Barbara/Priv. Ag. Local & Private Agencies San Luis Obispo/Priv. Ag. Local & Private Agencies Local & Private Agencies Monterey/Priv. Ag. Monterey/Priv. Ag. Monterey/Priv. Ag. Carmel/Priv. Ag. Local & Private Agencies Santa Cruz/Priv. Ag. Santa Cruz/Priv. Ag.

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Road Weather Information System - Includes environmental sensors and information dissemination - Information may be disseminated through other information dissemination systems/projects - Use depends upon severity of impact or problem	***Santa Barbara County:*** US 101 - Ventura County Line to San Luis Obispo County Line SR 1 - US 101 to San Luis Obispo County Line SR 154 ***San Luis Obispo County:*** US 101 - Santa Barbara County Line to Monterey County Line SR 1 - Santa Barbara County Line to Monterey County Line SR 41 - Kings County Line to SR 46 SR 41 - US 101 to SR 1 SR 46 - Kern County Line to SR 1 ***San Benito County:*** SR 156 - Santa Clara County Line to US 101 ***Monterey County:*** SR 1 - San Luis Obispo County Line to Santa Cruz County Line US 101 - San Luis Obispo County Line to San Benito County Line ***Santa Cruz County:*** SR 1 - Monterey County Line to San Mateo County Line SR 17 - SR 1 to Santa Clara County Line	(Non-Recurring Congestion, Emergency Response, Real-Time System Monit., Travel Info. Needs, Efficient Network for Commercial Vehicles, Safety, Environmental Impacts)	S/M S/M S M M M M M M S/M S/M S/M S/M	Caltrans Caltrans SBCAG, Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans Caltrans
Advanced Safety Systems □ ***Advanced Crosswalks*** - Increases awareness of potential pedestrian conflicts	***Santa Barbara County:*** Downtown Santa Barbara Mission District UC Santa Barbara in Isla Vista SR 246 in Solvang SR 246 in Buellton ***San Luis Obispo County:*** CalPoly Area Arroyo Grande Village Area El Camino Real in Atascadero Spring St. in Paso Robles Grand Ave. - Arroyo Grande/Grover Beach ***San Benito County:*** Nash Rd. (Hollister -- near San Benito High School) SR 25 (near Hollister) Hawkins Hospital (Hollister) ***Monterey County:*** Local Streets Adjacent to Monterey Bay Aquarium ***Santa Cruz County:*** Boardwalk Area UC Santa Cruz Area SR 1 & Mission St. (Santa Cruz) SR 152 & Main St. (Watsonville) City of Scotts Valley	(Emergency Response, Safety)	M/L M/L M/L M/L M/L L M M M S M/L M/L M/L M/L M/L M/L M/L M/L M/L	Santa Barbara Santa Barbara Santa Barbara County Solvang/Caltrans Buellton/Caltrans Local Agencies Arroyo Grande Atascadero Paso Robles Local Agencies Hollister Hollister Hollister Monterey Santa Cruz Santa Cruz Caltrans Caltrans Scotts Valley
Advanced Safety Systems (cont.) □ ***Curve/Grade Warning Systems*** - Increases awareness of approaching curves and grade changes	***Region:*** At locations with severe/sharp curves and steep downslopes (Additional locations to be determined through the Caltrans Safety Improvement Program)	(Emergency Response, Effic. Network for Commer. Vehicles, Safety)	L	Caltrans
Advanced Safety Systems □ ***Height Detectors*** - Increases awareness of approaching overhead hazards	***Region:*** No Projects Proposed			
TRANSIT MANAGEMENT				
Transit Vehicle Tracking - Includes vehicle tracking and real-time schedule updating - Use of Automated Vehicle Location (AVL) Systems	***Region:*** All transit systems ***Santa Barbara County:*** SBMTD SMAT COLT ***San Luis Obispo County:*** CCAT SLO Transit PRCATS SCAT Ride-On ***San Benito County:*** San Benito County LTA ***Santa Cruz County:*** SCMTD	(Transit Efficiency & Effectiveness, Better Planning Data, Inter-Agency Communication)	S/M S M/L M/L S/M S/M L S/M S/M S/M S/M	Transit Agencies SBMTD SMAT COLT CCAT SLO Transit PRCATS SCAT Ride-On SBCLTA SCMTD

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Transit Fixed-Route Operations □ ***Off-Line Route/ Schedule Management*** - Vehicle routing and scheduling for fixed-route services	***Santa Barbara County:*** SBMTD SMAT ***San Luis Obispo County:*** CCAT SLO Transit PRCATS SCAT ***San Benito County:*** San Benito County LTA ***Monterey County:*** MST ***Santa Cruz County:*** SCMTD	(Transit Efficiency & Effectiveness, Travel Information Needs)	S/M S/M M S/M M M L S/M S/M	SBMTD SMAT CCAT SLO Transit PRCATS SCAT SBCLTA MST SCMTD
Demand Response Transit Operations □ ***Automated Dispatching/Information*** - Allows automated demand responsive transit services	***All Counties:*** Dial-A-Ride Operators	(Transit Efficiency & Effectiveness)	M	Dial-A-Ride Operators
Transit Passenger & Fare Management □ ***Automated Passenger Counting*** - Counts passengers through the use of automated devices	***Santa Barbara County:*** SBMTD SMAT ***San Luis Obispo County:*** CCAT SLO Transit SCAT ***San Benito County:*** San Benito County LTA ***Monterey County:*** MST ***Santa Cruz County:*** SCMTD	(Transit Efficiency & Effectiveness, Better Planning Data)	S/M S/M S/M S/M L L S/M S/M	SBMTD SMAT CCAT SLO Transit SCAT SBCLTA MST SCMTD
Transit Passenger & Fare Management □ ***Electronic Fare Collection*** - Collects fares through automated devices, usually through electronic transit pass readers	***Santa Barbara County:*** SBMTD ***San Luis Obispo County:*** CCAT SLO Transit PRCATS SCAT Atascadero ***San Benito County:*** San Benito County LTA ***Monterey County:*** MST ***Santa Cruz County:*** SCMTD	(Transit Efficiency & Effectiveness, Better Planning Data)	S/M M S M M M L S/M S/M	SBMTD CCAT SLO Transit PRCATS SCAT Atascadero SBCLTA MST SCMTD
Transit Security □ ***Video Surveillance*** - Transit vehicles and public areas associated with transit are monitored for the security of transit passengers	***Santa Barbara County:*** SBMTD SMAT ***San Luis Obispo County:*** CCAT SLO Transit SCAT ***San Benito County:*** San Benito County LTA ***Monterey County:*** MST ***Santa Cruz County:*** SCMTD	(Transit Efficiency & Effectiveness)	M M L M/L L M S/M M	SBMTD SMAT CCAT SLO Transit SCAT SBCLTA MST SCMTD

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Transit Security □ ***Voice/Data Communications*** - Infrastructure that allows the on-board transit security system to communicate with transit management	***Santa Barbara County:*** SBMTD SMAT ***San Luis Obispo County:*** CCAT SLO Transit ***San Benito County:*** San Benito County LTA ***Monterey County:*** MST ***Santa Cruz County:*** SCMTD	(Transit Efficiency & Effectiveness)	M M L M M M M	SBMTD SMAT CCAT SLO Transit SBCLTA MST SCMTD
Transit Maintenance - Includes maintenance scheduling systems and on-board diagnostics	***Santa Barbara County:*** SBMTD SMAT ***San Luis Obispo County:*** CCAT SLO Transit SCAT ***San Benito County:*** San Benito County LTA ***Monterey County:*** MST ***Santa Cruz County:*** SCMTD	(Transit Efficiency & Effectiveness, Maintenance Activities)	S/M S/M M/L M/L M/L M/L S/M S/M	SBMTD SMAT CCAT SLO Transit SCAT SBCLTA MST SCMTD
Multi-Modal Coordination □ ***Signal Priority*** - Gives traffic signal priority to the transit vehicle	***Santa Barbara County:*** Upper State St. ***San Luis Obispo County:*** Grand Ave. (Arroyo Grande & Grover Beach) Throughout SLO urban area ***San Benito County:*** None ***Monterey County:*** Lighthouse Ave. Del Monte Ave. Fremont St./Blvd. East Alisal St. North Main St. Market St. SR 68 Reservation Rd. Abrego St. ***Santa Cruz County:*** Throughout Santa Cruz urban area (especially Ocean Ave.)	(Transit Efficiency & Effectiveness, Mobility & Accessibility, Inter-Agency Communication)	S M M S/M S/M S/M S/M S/M S/M S/M S/M M M	Santa Barbara, SBMTD Cities City of SLO, RTA, SLO MST/Local Agency MST/Local Agency MST/Local Agency MST/Local Agency MST/Local Agency MST/Local Agency MST/Local Agency MST/Local Agency MST/Local Agency Santa Cruz, SCMTD
Transit Traveler Information □ ***Static Transit Route/ Schedule Information*** - Provides transit users access to static transit & itinerary planning information	***Santa Barbara County:*** SBMTD SMAT ***San Luis Obispo County:*** CCAT SLO Transit SCAT ***San Benito County:*** San Benito County LTA ***Monterey County:*** MST ***Santa Cruz County:*** SCMTD	(Transit Efficiency & Effectiveness, Mobility & Accessibility, Travel Information Needs)	S S M M M S S S	SBMTD SMAT CCAT SLO Transit SCAT SBCLTA MST SCMTD
Transit Traveler Information (cont.) □ ***Real-Time Transit Schedule Information*** - Provides transit users access to dynamic transit information	***Santa Barbara County:*** SBMTD ***San Luis Obispo County:*** CCAT SLO Transit ***San Benito County:*** No Projects Proposed ***Monterey County:*** MST ***Santa Cruz County:*** SCMTD	(Transit Efficiency & Effectiveness, Mobility & Accessibility, Travel Information Needs)	S M/L M/L S S	SBMTD CCAT SLO Transit MST SCMTD

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Transit Traveler Information (cont.) □ ***Station and Bus Stop Information System*** - Provides real-time "NextBus" route and schedule information to passengers at bus stops and transit stations	***Santa Barbara County:*** SMAT ***San Luis Obispo County:*** CCAT SCAT ***San Benito County:*** San Benito County LTA ***Monterey County:*** MST ***Santa Cruz County:*** SCMTD	(Transit Efficiency & Effectiveness, Mobility & Accessibility, Travel Information Needs)	S M M M S/M S	SMAT CCAT SCAT SBCLTA MST SCMTD
TRAVELER INFORMATION				
Broadcast Traveler Information - Includes pager and radio based systems	***Region:*** Information Service Providers (ISP) implement systems as market dictates	(Trav. Info. Needs, Inter-Agency Communication)	M/L	Infor. Service Providers
Interactive Traveler Information	***Santa Barbara County:*** Real-time traffic information made available through the Internet ***San Luis Obispo County:*** 511 Telephone Call-In System ***Monterey County:*** 511 Telephone Call-In Systems ***Santa Cruz County:*** 511 Telephone Call-In System Real-time traffic information made available through the Internet ***Region:*** Information Service Providers (ISP) implement systems as market dictates Kiosks located at Activity Centers and Special Events	(Transit Effic. & Mobility & Accessibility, Travel Information Needs, Inter-Agency Comm.)	S S S/M S/M S/M M/L	SBCAG SLOCOG MST, AMBAG SCCRTC, AMBAG SCCRTC ISPs Local Agencies
Yellow Pages and Reservation - Adds interactive yellow pages and reservation capabilities	***Region:*** Regionwide or in Subregions	(Travel Information Needs)	M/L	Chambers of Commerce, Visitors Bureau, Etc.
COMMERCIAL VEHICLE OPERATIONS				
Electronic Clearance - Provides automated clearance at roadside check facilities	***Region:*** At Weigh Station/Inspection Locations	(Effic. Netwrk for Commer. Vehs, Impacts of Commer. Vehs on Hwys, Safety)	S/M	CHP/Caltrans
CV Administrative Processes - Electronically stream-lines CVO filings	***Region:*** State issue; not handled at the County level		S/M	Various State Agencies CHP/Caltrans
Weigh-In-Motion - Provides for high speed weigh-in-motion	***Region:*** At Weigh Station/Inspection Locations	(Effic. Netwrk for Commer. Vehs, Inter-Agency Communication)	S/M	CHP/Caltrans
Roadside CVO Safety - Automates inspections at the roadside element	***Region:*** At Weigh Station/Inspection Locations	(Impacts of Commer. Vehs on Hwys)	S/M	CHP/Caltrans
HazMat Management - Integrates incident management capabilities with commercial vehicle tracking	***Region:*** Tie into State and/or National system when available	(Emergency Re-sponse, Effic. Netwrk for Commer. Vehs, Impacts of Commer. Vehs on Hwys, Envir. Impacts)	S/M	CHP/Caltrans/ Emergency Service Providers
Automated Dispatch/ Information System *(CVO ATIS)*	***Monterey County:*** Salinas	(Effic. Netwrk for Commer. Vehs, Impacts of Commer. Vehs on Hwys)	S/M	Salinas

EXHIBIT A-1
RECOMMENDED CENTRAL COAST ITS PROJECTS
POSSIBLE LOCATIONS AND RESPONSIBLE AGENCIES

EMERGENCY MANAGEMENT AND ENFORCEMENT				
Emergency Response - Includes emergency vehicle tracking and enhanced computer-aided dispatch (CAD) systems	***Region:*** Individual law enforcement and emergency service providers	(Non-Recurring Congestion, Emergency Response, Safety, Inter-Agency Communication, Environmental Impacts)	M/L	CHP/Law Enforcement/ Emergency Service Providers
Emergency Routing □ ***Signal Pre-emption for Emergency Vehicles*** - Gives traffic signal priority to the emergency vehicle	***Santa Barbara County:*** State St. ***San Luis Obispo County:*** Higuera Ave. (SLO) SR 1 & SR 227 (SLO) Grand Ave. (Arroyo Grande/Grover Beach) El Camino Real (Atascadero) ***San Benito County:*** None ***Monterey County:*** Abrego St. ***Santa Cruz County:*** Ocean Ave.	(Non-Recurring Congestion, Emergency Response, Safety, Inter-Agency Communication)	M M M M M M M	Santa Barbara San Luis Obispo San Luis Obispo/Caltrans AG/GB Atascadero Monterey Santa Cruz
Emergency Routing (cont.) □ ***Route Guidance*** - Supports dynamic routing of emergency vehicles	***Region:*** Individual law enforcement and emergency service providers	(Non-Recurring Congestion, Emergency Response, Inter-Agency Communication)	M	Law Enforcement/ Emergency Service Providers
Mayday Support - Includes Mayday notification system and Mayday response center	***Region:*** Implemented through private call centers and forwarded to the CHP	(Emergency Response, Safety, Inter-Agency Communication)	M	Private Call Centers/CHP
Enforcement - Includes red light enforcement, stop sign enforcement, and neighborhood speed monitoring	***Region:*** Areas of high accident potential ***Monterey County:*** US 101 - Prunedale area - radar speed enforcement	(Safety)	S/M S/M	Law Enforcement CHP
PLANNING				
Planning Data Collection - Includes archive function and additional data collection devices	***Region:*** Archive system located at RTPAs/CTCs and at Caltrans	(Better Plng. Data, Inter-Agen. Commun., Env.	S/M	RTPAs/CTCs/

TRAFFIC MANAGEMENT & SAFETY

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Project Name:
Caltrans D5 TMC Connections/Enhancements

Caltrans D5 TMC Purpose:

- Provide a central clearinghouse facility to focus data collection, information dissemination, and operational decision-making activities in order to aggressively manage the transportation system to reduce congestion and provide for the safe and efficient movement of people, goods, services, and information in order to promote economic vitality and enhance the quality of life throughout the Central Coast
- Provide access to other Agencies for selected elements or functions
- Minimize impacts on the local street system by proactively discussing/coordinating State/Local operational issues

Caltrans D5 TMC "Core" Functionality:

- Control of ramp meters
- Control of changeable message signs (CMS) and highway advisory radio (HAR)
- Control of closed circuit television (CCTV)
- Monitors freeway conditions using roadway sensors and CCTV
- Disseminates incident and traveler information through CMS, HAR, and SigAlerts
- Monitoring of environmental sensors on State highways (control functions, if any, tied to project sponsor, unless other arrangements are made)
- Recommendation of diversion timing plans (not control – control still exercised by local Agencies except under pre-specified plans developed jointly by Caltrans D5 and local Agencies)
- Coordinate maintenance and construction real-time traffic management activities (including lane closures)
- Coordinate special event activities
- Pursue and maintain multi-modal Agency and private sector partnerships
- Provide a focal point to the media/ISPs for traveler information dissemination
- Coordinate CHP and Caltrans communications center activities (including dispatching)
- Inform other Regional TMCs (e.g., San Francisco Bay Area, Southern California, Fresno, etc.) and Headquarters TMCs of major events and occurrences

Caltrans D5 TMC "Other" Functionality:

- CHP will have access to CCTV (including secondary level control)
- Caltrans D5 has exclusive responsibility for ramp metering operations and CHP for enforcement
- CHP can recommend CMS sign messages to Caltrans D5, who is responsible for implementation
- Caltrans D4 will have primary responsibility for State highways in Santa Cruz County (primarily SR 17 and portions of SR 1) that have commuting patterns associated with the San Francisco Bay Area
- The Bay Area Regional TMC will have the ability to perform Central Coast TMC operations during times when CHP/Caltrans D5 staff are unavailable
- The Southern California Regional TMC will be interfaced with the Caltrans D5 TMC and will have second-tier responsibility for Santa Barbara County, should CHP/Caltrans D5 staff be unavailable
- Local Agencies have access to camera viewing, not control
- Traffic congestion map will be available on Internet websites
- CCTV camera images will be available on Internet websites

- Portable traffic management systems (PTMS) will be controlled by the owning Agency → PTMS units will have the potential for operation from remote locations by the unit owner or from the Caltrans D5 TMC
- Other types of information dissemination (e.g. for special events) will be the responsibility of the event sponsor
    - The TMC will have the capability to receive input from information providers and to make the information available to Agencies with connections to the TMC
    - Maximum use will be made of the Internet as the communications linkage
- Access to the Caltrans D5 TMC will be provided either through dial-up computer terminals at individual Agencies or through the Internet → these interfaces need to be designed to maximize security and operational integrity of all systems
- The Caltrans D5 TMC will integrate systems and coordinate activities with local transit, law enforcement, and other emergency service Agencies

Project Description: This project involves the on-going enhancement of the Caltrans D5 TMC.

- Establish connections to other neighboring Regional TMCs for information sharing purposes
    - Caltrans D4 TMC (San Francisco)
    - Caltrans D6 TMC (Fresno)
    - Caltrans D7 TMC (Los Angeles)
- Install/"in-fill" ITS devices in the field and establish connections/"hook-up" to the Caltrans D5 TMC
    - Roadway Sensors/Detector Stations
    - Ramp Meters
    - CMS
    - CCTV
    - HAR

Relationship to Other Projects:

The Caltrans D5 TMC is/will be the focal point of Region-wide traffic operations. It is/will be responsible for monitoring and controlling network surveillance, CCTV, ramp meters, CMS, and HAR, all of which are described in other project descriptions. It will provide for connections to CHP divisions, other local control centers (law enforcement and emergency service), transit management centers, and transportation management centers, when desired by local Agencies. These connections will be made through dial-up network connection or through the Internet.

Specific Problems or Needs Addressed:

- Recurring congestion on freeways and major roadways in the Central Coast
- Congestion caused by traffic incidents, construction, special events, natural disasters, and other causes
- Excess emissions and fuel consumption due to congestion
- Need for improved routing and traffic management information for public Agencies, emergency vehicles, and the public
- Safety

Traveler and Agency Benefits:
- Improved speeds on freeways
- Improved public information in response to major incidents, weather problems, and natural disasters
- Reduced delay made possible through better routing decisions
- Improved emergency vehicle response times

Relationship to ITS Market Packages:
- Primary component of Regional Traffic Control, Freeway Control, Traffic Information Dissemination, and Incident Management market packages

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Connections to other TMCs → Proposed for implementation by 2010
- ITS device "in-fill/hook-up": → On-going per funding availability

Implementing Agency:
- Caltrans D5 and CHP will be the lead Agencies
- An Operations Committee (e.g., Caltrans, CHP, local Agencies, etc.) will provide advice and support

Potential Costs:
The cost to deploy a TMC varies widely due to the desired level of capabilities/operations included at the center. Since the Caltrans D5 TMC has been operational since October 2001, a specific "TMC Operations/Facility Study" would need to be undertaken as a separate contract to provide a more in-depth analysis of the exact capabilities/functionality to add to its current level of operations. As its functionality expands, the TMC's roles/responsibilities, functionality, operations, staffing requirements, facility layout, time of operations, data exchange/sharing agreements, inherent systems/technologies, etc., would need to be worked out in more detail within and between all involved Stakeholders.

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
TMC Roadside Location • Per signalized int. • Per ramp meter	$115,000 $115,000	$6,900 - $9,200 $6,900 - $9,200	• Capital Costs → Equipment & systems integration for surveillance & control • O&M Costs → Staffing & communications w/ roadside devices
TMC Incident Management • TMC Enhancements • Roadside Monitor • Center-to-Center Link	$575,000 $92,000 $172,500	$575,000 - $1.15 mil. $4,600 $172,500	• Capital Costs → Additional software, hardware, video & graphic displays, communications, dispatching, etc. • O&M Costs → Communications & staffing for real-time response
TMC Multi-modal Functions (e.g., signal priority, HOV, reversible lanes, etc.) • TMC Enhancements (e.g., signal priority, HOV, reversible lanes) • Surveillance & Monitoring	$460,000 $460,000 - $690,000	$345,000 $57,500 - $86,250	• Capital Costs → Additional software, hardware, communications, systems integration, etc. • O&M Costs → Communications & staffing

Possible Funding Sources:

- Within its "10-Year Plan", Caltrans D5 had budgeted approx. $500,000 per year for four (4) years to provide hardware and software to download video images, surveillance station data, and control ramp meter operations
- For the most part, this approx. $2 mil. in funding has already been spent to establish the existing Caltrans D5 TMC (located in San Luis Obispo) and connections to existing ITS field devices

Follow-up Actions:

- Caltrans D5 to explore funding options and secure funding
- Local Agencies to specify their mechanism for connection to the TMC (if any)

Project Name:
Roadway Sensors/Detector Stations on highways in the Central Coast

Project Description:
The purpose of the project is to install roadway sensors/detection devices at specific locations to monitor roadway conditions (e.g., volume, speed, occupancy, headway, etc.). Surveillance roadway sensors/detector stations will be installed in the following manner:

- Where ramp meters are installed, will infill between ramp meter mainline detectors at approx. 1/2 mile spacing
- Where ramp meters are not installed, will be located at 1/2 mile intervals

This combination of surveillance roadway sensors/detector stations and ramp meter mainline detectors will provide continuous, 1/2 mile surveillance on Central Coast highways. When highways identified as candidates for surveillance sensors/detectors are widened or rehabilitated, installation of surveillance sensors/detectors should be included in the project, and Caltrans D5 Traffic Operations consulted for spacing and location specifications. In addition, the surveillance station controllers' should have the ability to capture and store the data for monitoring, control, and planning applications. It is anticipated that surveillance roadway sensor/detector stations will be located along the freeways in the following areas:

Santa Barbara County:

US 101 - SR 150 Junction (Ventura County line) to Hollister Ave.
US 101 - Clark Ave. south of Santa Maria to San Luis Obispo County Line
SR 1 - Start of expressway (Lompoc) to SR 135 N (Orcutt)
SR 135 - Santa Antonio Rd. to SR 1 south

San Luis Obispo County:

US 101 - Santa Barbara County Line to northern San Luis Obispo City limits
US 101 - Cuesta Grade
US 101 - SR 58 to SR 46 east
SR 1 - US 101 to end of freeway section (Cayucos)
SR 46 - US 101 to east

San Benito County:

SR 25 - Hollister City limits to Santa Clara County Line
SR 156 - US 101 to SR 152/Santa Clara County Line

Monterey County:

US 101 - Airport Blvd. to Crazy Horse Rd.
SR 1- Start freeway (Carmel) to end freeway/SR 156 (Castroville)
SR 68 – Monterey to Salinas

Santa Cruz County:

SR 1 - Freedom Blvd. O.C. to SR 1/SR 17 Junction
SR 17 - SR 1/SR 17 Junction to Santa Clara County Line
City of Scotts Valley

Relationship to Other Projects:
- The surveillance stations will be strategically located to complement the ramp metering system
- The surveillance stations will be a primary provider of data/information for the Caltrans D5 TMC to monitor, control, and manage the roadway network (e.g., incident management, CCTV surveillance, traveler information dissemination, coordinated dispatching activities, etc.)

Specific Problems or Needs Addressed:
- Improve ability to manage the roadway network by monitoring traffic characteristics (e.g., volume, speed, occupancy, headways, etc.)
- Improve ability to detect and respond to highway incidents
- Improve ability to provide traveler information

Traveler and Agency Benefits:
- Provides information that can be used by traffic engineers to improve traffic flow, reduce congestion, and delay caused by recurring or non-recurring incidents
- Provides information that can be used by emergency response providers on incidence response
- Provides more accurate information to the public

Relationship to ITS Market Packages:
- Part of Network Surveillance market package

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway Sensor (Roadside) subsystems

Time Frame:
- Varies → see the Caltrans D5 "10-Year Plan"

Implementing Agency:
- Caltrans D5 will be the lead Agency
- Local Agencies support as necessary

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Network Surveillance • Roadway Sensors/Detector Stations	$34,500	$3,450	$5,175	$5,175	$3,450	$51,750	$3,450	Per location

- Other cost estimates include the following:
  - Inductive Loops → $5,750 – $17,250 per location
  - Video Imaging Detection → $46,000 – $57,500 per location
  - Radar Detection $23,000 – $34,500 per location

Possible Funding Sources:
- Within its "10-Year Plan", Caltrans D5 has budgeted approx. $20,000 per roadway sensor/detector station for both directions of the highway

Project Name:
Automated Real-Time Traffic Counts for the University of California at Santa Cruz (UCSC)

Project Description:
Automated real-time traffic counters using inductive loop detectors in the roadbed at the two campus entrances would provide accurate data for traffic systems management on- and off-campus.

Relationship to Other Projects:
- Potential inclusion of traffic data at City of Santa Cruz TMC for special event management

Specific Problems or Needs Addressed:
- The campus semi-annually conducts traffic counts at the two entrances to campus as well as other roadways on campus
- Having accurate and consistent counts conducted at the entrances would provide the campus and City with information on the traffic volumes, types of vehicles, and times of travel
- This information can be made consistent with City monitoring as well as other campus traffic monitoring programs

Traveler and Agency Benefits:
- Data gathered will assist the campus (and City) in providing additional TDM programs to serve the times and travel patterns of campus commuters
- In addition, having consistent data throughout the years will be beneficial in campus traffic monitoring

Relationship to ITS Market Packages:
- Part of Network Surveillance market package

Relationship to Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Medium-term

Implementing Agency:
- UCSC will be the lead Agency

Potential Costs:
- Inductive Loops → $5,750 – $17,250 per location

Project Name:
Ramp meters at strategic locations on selected Central Coast highways

Project Description:
Ramp meters are traffic signals located upstream from the merge point of on-ramps with the freeway mainline. Operating on short cycles, the ramp meters allow vehicles onto the freeway one or two at a time. The purpose is to obtain maximum utilization from the available freeway lanes and to improve the merging of traffic onto the freeway. The project will locate ramp meters, in appropriate phases (per Caltrans D5 "10-Year Plan"), at on-ramps on the following sections of freeway:

Santa Barbara County:
US 101 - SR 150/Ventura County Line to Hollister Ave. (Santa Barbara Area)
US 101 - Clark Ave. to San Luis Obispo County Line (Santa Maria Area)

San Luis Obispo County:
US 101 - SR 166/Santa Barbara County Line to Los Berros (Nipomo Area)
US 101 - El Campo to Lower Higuera (Five Cities Area)
US 101 - Los Osos Valley Rd. to Monterey St. (San Luis Obispo Area)
US 101 - SR 58 to Santa Cruz Rd. (Santa Margarita/Atascadero Area)
US 101 - Vineyard to SR 46 east (Templeton/Paso Robles Area)

San Benito County:
None

Monterey County:
US 101 - Airport Blvd. to Boronda (Salinas Area)
US 101 - Russel Rd./Espinosa Rd. to Crazy Horse Rd. (Prunedale Area)
SR 1 - SR 68 (south) to Reservation Rd. (Monterey Peninsula)

Santa Cruz County:
SR 1 - Freedom Blvd. to SR 1/SR 17 Junction (Emeline)
SR 17 - SR 1/SR 17 Junction to Santa Clara County Line

Ramp meters will be installed based on the general phasing indicated in the Caltrans D5 Ramp Meter Development Plan. In addition, metering decisions will be made in coordination with local government and will be based on criteria that indicate when metering may be appropriate, such as the following factors:

- Level of mainline congestion (i.e., need dependent on amount of traffic growth in the future)
- Availability of parallel surface streets
- Storage capacity of the ramps
- Safety considerations

The ramp metering system will be designed according to Caltrans' Ramp Meter Design Guidelines, existing standards, and use software developed for other Districts. A communications analysis will be conducted for each area where ramp metering and surveillance is being planned to determine the most cost-effective communications solution available at the time. Individual ramps will be evaluated for demand and potential diversion from adjacent ramps during the PSSR stage before installing meters. If meters are not indicated when the system segment is installed, ramps are re-constructed or modified, or a new interchange is added,

underground conduit, and ramp and freeway loops will be installed for surveillance purposes. In addition, HOV lanes and CHP enforcement pads will be provided on existing ramps where warranted, and where excessive cost and R/W will not be involved.

In areas where ramp metering is implemented, a limited public information campaign will be undertaken prior to initiation to ensure that local motorists understand the reasons for the system and are aware of their obligations under the law.

Relationship to Other Projects:
The successful operation of ramp meters is dependent on a surveillance system that provides information for ramp metering decisions. A communications system will be needed to link the ramp meter controllers with the network surveillance system and to link the ramp meter controllers with the Caltrans D5 TMC to monitor the metering operation. These three projects need to be implemented together. However, ramp meters could be under local control during an early phase (i.e. not linked to the TMC).

Specific Problems or Needs Addressed:
- Recurring and non-recurring congestion on freeways
- Platoons of vehicles released from arterial traffic signals at on-ramps, degrading merging operation
- Tendency for local traffic to use freeways

Traveler and Agency Benefits:
- Helps to optimize flow on freeways
- Provides smoother merging operation
- Reduces accidents on freeway
- Reduces congestion on freeway caused by local traffic

Relationship to ITS Market Packages:
- Part of Freeway Control market package

Relationship to the Regional ITS Architecture:
- Part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Varies → see the Caltrans D5 "10-Year Plan"

Implementing Agency:
- Caltrans D5 will be the lead Agency (in consultation with CHP)
- CHP and the affected local governments will support as necessary

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Freeway Control • Ramp Meters	$63,250	$6,325	$9,487	$9,488	$6,325	$94,875	$6,325	Per location

Possible Funding Sources:
- Within its "10-Year Plan", Caltrans D5 has budgeted approx. $200,000 per ramp meter (including CCTV, mainline detectors, ramp meter, and telephone service for data and video image)
- Mitigating measures for traffic relief on local streets is not included in the budgeted cost estimates

Project Name:
Closed Circuit Television (CCTV) surveillance on highways in the Central Coast

Project Description:
The purpose of the CCTV cameras will be to provide visual surveillance for more heavily traveled roadways in the Central Coast. A "slow-scan" video technology approach is proposed to minimize communications costs. Cameras will have full pan, tilt, and zoom capability. Two approaches are possible, to be determined through further project development and investigation of technologies and costs:

- Provide 24-hour surveillance using dedicated telephone lines.
- Activate surveillance only when triggered by speeds below a user-specified threshold as determined by radar detectors mounted on the same pole or other nearby strategic locations. The cameras should also be capable of being activated on-demand.

The video will be communicated to the Caltrans D5 TMC. The video will be made available to the CHP and to participating local police departments to assist in traffic management and incident management, as necessary. Discussions will occur concerning making the video available to other potential users. It is anticipated that CCTV cameras will be located along the freeways in the following areas:

Central Coast Region:
As part of all future ramp meter installations

Santa Barbara County:
US 101 – SR 150/Ventura County Line to Hollister Ave. (Santa Barbara Area)
US 101 – Clark Ave. to San Luis Obispo County Line (Santa Maria Area)

San Luis Obispo County:
US 101 – Cuesta Grade (San Luis Obispo to SR 58)
US 101 – SR 166/Santa Barbara County Line to Los Berros (Nipomo Area)
US 101 – El Campo to Lower Higuera (Five Cities Area)
US 101 – Los Osos Valley Rd. to Monterey St. (San Luis Obispo Area)
US 101 – SR 58 to Santa Cruz Rd. (Santa Margarita/Atascadero Area)
US 101 – Vineyard to SR 46 east (Templeton/Paso Robles Area)

San Benito County:
US 101 – Monterey County Line to 7.5 miles north

Monterey County:
US 101 – Airport Blvd. to Boronda (Salinas Area)
US 101 – Russell Rd./Espinosa Rd. to Crazy Horse Rd. (Prunedale Area)
SR 68 – SR 1 to Salinas
SR 156 – SR 1 to US 101
SR 1 – SR 68 (south) to Reservation Rd. (Monterey Peninsula)

Santa Cruz County:
SR 17 – Laurel Rd., Pasatiempo, La Madrona, Mt. Herman Rd., Granite Creek, north of Crescent Dr., north of Vine Hill Rd., Sugar Loaf, Glenwood Cut-Off, Glenwood Curves, Glenwood Dr., Summit, north of Summit, and Santa Cruz County Line
SR 1 – Soquel Ave., north of Morrissey, Emeline, Porter St., Park Ave., State Park Dr., Rio Del Mar, and Freedom Blvd.

Relationship to Other Projects:
- The CCTV is viewed to be an early implementation component of the Caltrans D5 TMC

Specific Problems Addressed:
- Recurring congestion at each of the above locations
- Incident-related congestion and construction activity that occurs in these sections

Traveler and Agency Benefits:
- Provides mechanism for verifying the occurrence and location of incidents
- Allows more accurate and timely decisions on incident response, including necessary on-scene equipment and traffic management decisions
- Provides information that can be used in traffic reports to the public
- Reduces congestion through more rapid and timely response to incidents

Relationship to ITS Market Packages:
- Part of the Network Surveillance market package
- Supports the Broadcast Traveler Information and Interactive Traveler Information market packages

Relationship to the Regional ITS Architecture:
- Part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Varies → see the Caltrans D5 "10-Year Plan"

Implementing Agency:
- Caltrans D5 will be the lead Agency
- CHP, local police departments, and Regional Transportation Planning Agencies will serve as supporting Agencies

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Network Surveillance • CCTV	$46,000	$4,600	$6,900	$6,900	$4,600	$69,000	$4,600	Per camera

Possible Funding Sources:
- Within its "10-Year Plan", Caltrans D5 has budgeted approx. $150,000 per stand-alone CCTV site, including video camera, mounting, utilities, poles, and codec for the TMC (if necessary)

Project Name:
Changeable Message Signs (CMS) at strategic locations on Central Coast highways

Project Description:
The primary purpose of CMS signs is to provide motorists with information as to closures, major delays, or incidents at points where they have options for avoiding the delay. CMS signs will primarily be installed along state roadways and the messages controlled by Caltrans D5 (in conjunction with the CHP). CHP and Caltrans D's 4 and 7 would have access to sign control functions for use when D5 staff is unavailable. CMS messages will be drawn from a standard library, but with special messages authorized at management staff levels, or as required by Caltrans protocol. Caltrans will work with individual jurisdictions to determine priorities, timing, and operational protocols. Because some of these facilities are not high-volume, a high-cost sign (such as might be used on a freeway) may not likely be warranted at every location. In addition, other situations must be sensitive to scenic views and the environment. Caltrans D5 will work with the jurisdictions to determine the most cost-effective technology for each application. In some cases, it may be more cost-effective to rely on the use of portable CMS signs [see Portable Traffic Management Systems (PTMS)] at locations only when the need occurs (e.g. long-term roadway closure). Recommended CMS locations include the following:

Santa Barbara County:

Junction of US 101 & SR 1 (south in Gaviota Pass)
Junction of US 101 & SR 166
Junction of US 101 & Las Positas Rd.
Junction of SR 1 & SR 150
Junction of SR 246 & US 101
Junction of SR 1 & SR 246
Junction of SR 246 & SR 154
Junction of SR 154 & SR 192
SR 154 at the San Marcos Pass

San Luis Obispo County:

Junction of US 101 & SR 1 (north in SLO)
US 101 - At juncture ends of Cuesta Grade
Central Valley (SR 41, SR 46, & SR 166)

San Benito County:

US 101
SR 25
SR 156
Hollister Municipal Airport (SR 156)

Monterey County:

Junction of US 101 & SR 156 (south near Prunedale)
Junction of US 101 & SR 156 (north)
Junction of SR 1 & SR 68 (south)
Junction of SR 1 & SR 156

Santa Cruz County:

SR 1 (and nearby local roads)
SR 17 (and nearby local roads)

Relationship to Other Projects:
The reason for CMS is to provide a way to communicate directly and quickly with the traveling public when the need arises. This may include hazard warnings (e.g. fog), emergencies (e.g. a road washed out or earthquake damage), or major traffic problems (e.g. an extended roadway blockage). Information on these events will come from various sources, both automated and manual. Therefore, the project will require inputs from weather detection systems, applicable roadway surveillance systems, and law enforcement and emergency service Agencies.

Specific Problems or Needs Addressed:
- Non-recurring congestion
- Need to improve emergency response
- Safety
- Need to provide traveler information (particularly in the case of emergencies and special events)

Traveler and Agency Benefits:
- Reduced delay
- More reliable trip times for moving people and goods
- Fewer "surprises" from roadway closures
- Improved public relations

Relationship to ITS Market Packages:
- Part of Traffic Information Dissemination market package
- Related to Network Surveillance, Regional Traffic Control, Incident Management, and Emergency Response market packages

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Varies → see Caltrans D5 "10-Year Plan"
- Some locations may be appropriate for portable CMS in the near future (deployed on an as-needed basis)

Implementing Agency:
- Caltrans D5 will be the lead Agency
- CHP and affected local governments will provide support (as necessary)

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Traffic Information Dissemination • CMS	$230,000	$23,000	$34,500	$34,500	$23,000	$345,000	$23,000	Freeway CMS

Possible Funding Sources:
- Within its "10-Year Plan", Caltrans D5 has budgeted approx. $150,000 per CMS, including CMS structure, hardware, software, power source, and phone service

Project Name:
Highway Advisory Radio (HAR) at selected locations on Central Coast highways

Project Description:
HAR allows for the dissemination of information directly to the traveler through the AM radio. Most HAR transmitters have operated on the 530 and 1610 frequencies, but other frequencies have been used as well. Information could be disseminated for a variety of traffic-related reasons, such as construction, congestion, incidents, other highway emergencies, etc. Proposed locations for HAR in the Central Coast include:

Santa Barbara County:
US 101/SR 154 in Santa Barbara
US 101/SR 154 San Marcos Pass
US 101 (Montecito & Downtown Santa Barbara area)

San Luis Obispo County:
US 101/SR 1 in San Luis Obispo
US 101/SR 58 in Santa Margarita
US 101/SR 46 in Paso Robles

San Benito County:
US 101
SR 25
SR 156

Monterey County:
SR 1/SR 68 Junction
US 101/SR 156 Junction

Santa Cruz County:
SR 1
SR 9
SR 17
SR 129

Relationship to Other Projects:
A pre-packaged set of messages would be composed, based on typical events that may occur in areas where the signs were installed. Special messages could also be composed by TMC staff. Communications would likely be by hardwire or wireless phone service.

Specific Problems or Needs Addressed:
- Non-recurring congestion
- Need to improve emergency response
- Safety
- Need to provide traveler information (particularly in the case of emergencies and special events)

Traveler and Agency Benefits:
- Reduced delay
- More reliable trip times for moving people and goods
- Fewer "surprises" from roadway closures
- Improved public relations

Relationship to ITS Market Packages:
- Part of Traffic Information Dissemination market package
- Related to Network Surveillance, Regional Traffic Control, Incident Management, and Emergency Response market packages

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Varies → see the Caltrans D5 "10-Year Plan"

Implementing Agency: a
- Caltrans D5 will be the lead agency
- CHP and affected local governments will provide support (as necessary)

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Traffic Information Dissemination • HAR	$57,500	$5,750	$8,625	$8,625	$5,750	$86,250	$5,750	Per location

Possible Funding Sources:
- Within its "10-Year Plan", Caltrans D5 has budgeted approx. $100,000 per HAR site, including HAR transmitter, antenna, utility services, software, and message recorders

Project Name:
Response Strategy Support

Project Description:
This technology is designed to increase roadway safety, reduce motorist delays, and improve the overall efficiency of freeway operations. Agencies use a computer-aided dispatch (CAD) system to alert local resources to incidents. TMC personnel develop an appropriate response in coordination with emergency management and other incident response personnel to confirmed incidents. Also the same equipment assists the operator by monitoring incident status as the response unfolds. Necessary resources include officers, firemen, paramedics, freeway service patrols, patrol cars, Emergency Medical Technicians (EMT) vans, and helicopters. Included in the resources are Freeway Service Patrols (FSP) offering a wide range of services to stranded motorists at no cost. Services include changing flat tires, providing jump-starts, providing a gallon of fuel, or towing disabled vehicles off the freeway. The coordination can also extend to tow trucks and other field service personnel.

Relationship to Other Projects:
- This project is inter-related with the development of the Caltrans D5 TMC and its associated activities

Specific Problems or Needs Addressed:
- Optimize inter-jurisdictional cooperation to reduce the impacts of incidents

Traveler and Agency Benefits:
- Collection of real-time data from roadway instrumentation
- Enhanced roadway service responsiveness
- Reduce time delay associated with incident-induced congestion
- Improve the ability to handle Hazardous Materials (HazMat) incidents

Relationship to ITS Market Packages:
- Related to the Network Surveillance, Planning Data Collection, and Emergency Management and Enforcement market packages

Relationship to the Regional ITS Architecture:
- Part of the Emergency Management (Center) and Traffic Management (Center) subsystems

Time Frame:
- 2008 to 2013

Implementing Agency:
- Caltrans, CHP, local law enforcement Agencies, and emergency service providers will coordinate the implementation of this project

Potential Costs:
Response Strategy Support is an integral component of the Caltrans D5 TMC's operations. Therefore, specific TMC capabilities concerning this project will need to be incorporated into the TMC's planning and design activities. For incident management, integrating traffic and emergency personnel at the Caltrans D5 TMC may reduce these costs, through coordinated staffing and joint use of similar technologies. Some potential cost estimates are provided below for portions of this project:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
TMC Incident Management • TMC Enhancements • Roadside Monitor • Center-to-Center Link	$575,000 $92,000 $172,500	$575,000 - $1.15 mil. $4,600 $172,500	• Capital Costs → Additional software, hardware, video & graphic displays, communications, dispatching, etc. • O&M Costs → Communications & staffing for real-time response
Emergency Vehicle Management • Vehicle • Emergency Center	$3,450 $57,500 - $86,250	$460,000 $115,000	• Capital Costs → Additional software, hardware, communications, systems integration, etc. • O&M Costs → Communications & staffing

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
TMC Incident Dispatch Coordination & Communications • Hardware (Workstation) • Software • Integration • TMC to EMS Communications • IM Coordinator • Maintenance (5% of Capital Cost) • Roadside-to-TMC Comms.	$3,450 $17,250 $207,000 $1,150	$115,000 $11,500 $3,450	• Capital Costs → Additional software, hardware, video & graphic displays, communications, dispatching, etc. • O&M Costs → Communications & staffing for real-time response
Emergency Response Management • Comms. to/from TMC • Emergency Response Plan Database • I/F with Vehicle & Other Agencies • Vehicle Tracking Software • Real-time Traffic Coordination • Hardware (Workstations) • Maintenance (5% of Capital Costs)	$1,150 $28,750 $1,150 $46,000 $11,500 $23,000	$5,750	• Capital Costs → Additional software, hardware, communications, systems integration, etc. • O&M Costs → Communications & staffing

Project Name:
Basic Signal Synchronization/Coordination

Project Description:
Traffic flow on arterial streets is largely controlled by traffic signals at intersections. Synchronization of traffic signals has been a long-standing traffic management strategy for small Cities as well as large ones. This set of projects seeks to improve traffic flow on arterial streets through signal coordination. The following projects are anticipated, by each County:

Santa Barbara County:
Carrillo Blvd.
Main St.
Broadway
Central
North H St.
Hollister Ave.
Upper State St.
SR 246 - Solvang City limits

San Luis Obispo County:
Grand Ave. - Arroyo Grande/Grover Beach
El Camino – Atascadero

San Benito County:
SR 25 (near Hollister)
SR 156 (near Hollister)

Monterey County:
SR 68 - York Rd. to Torero
SR 156 - Castroville Blvd. to US 101
SR 183 - Castroville Sep. to SR 1

Santa Cruz County:
City of Watsonville
SCCRTC Inter-Agency Signal Management & Coordination

Relationship to Other Projects:
- Signal coordination is often a stand-alone activity, but there are reasons to connect it with other projects
- Agencies implementing signal coordination need to consider other enhancements such as emergency vehicle signal pre-emption/priority, and transit vehicle pre-emption/priority

Specific Problems or Needs Addressed:
- Recurring congestion on arterial streets
- Slow speeds
- Excess emissions and fuel consumption from idling, acceleration, deceleration

Traveler and Agency Benefits:
- Improved speeds (typically 10 to 20 percent increase from uncoordinated conditions)
- Lower emissions
- Improved emergency vehicle response times

Relationship to ITS Market Packages:
- Part of Surface Street Control market package

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Projects vary in terms of timeframe (depending on funding and prioritization of local jurisdictions)
- Most will be implemented in the first 5-years

Implementing Agency:
- Lead Agency → TBD in each area, but generally the owner of the arterial street

Potential Costs:
- Intersection construction costs will vary depending upon status of existing conditions and field equipment
- Communications interconnect → $65/meter (includes both conduit & cable)
- Inductive loops → $1,150 per loop
- Intersection controllers → $6,900 per controller
- Intersection timing plans → $5,750 per int. (inc. traffic counts, geometrics, etc)
- System coordination → $28,750 per system

Possible Funding Sources:
- CMAQ, STP, PVEA, and local funds

Project Name:
Improved Signal Synchronization for University of California at Santa Cruz (UCSC) Travelers

Project Description:
Improved signal synchronization along Bay and High Streets (approaches to UCSC), as well as at new planned signals around or near the campus: Camfac/Coolidge, Hagar/Coolidge, Heller/Empire Grade, and Western/Empire Grade.

Relationship to Other Projects:
- Better traffic flows to areas off-campus to improve commute times and minimize congestion

Specific Problems or Needs Addressed:
- Better signal synchronization will improve traffic flows in the area and will reduce traffic congestion in the neighborhoods surrounding UCSC

Traveler and Agency Benefits:
- Improved traffic flows and reduced congestion, especially at peak travel times
- Shorter transit delays with improved traffic flows

Relationship to ITS Market Packages:
- Part of Surface Street Control market package

Relationship to Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Short-term

Implementing Agency:
- UCSC

Potential Costs:
- Intersection construction costs will vary depending upon status of existing conditions and field equipment
- Communications interconnect → $65/meter (includes both conduit & cable)
- Inductive loops → $1,150 per loop
- Intersection controllers → $6,900 per controller
- Intersection timing plans → $5,750 per int. (inc. traffic counts, geometrics, etc)
- System coordination → $28,750 per system

Project Name:
Traffic Control System (TCS)

Project Description:
Basic signal coordination provides signal control for a series of signals on an independent basis, without bringing surveillance or monitoring information to a central location. A TCS provides communications to a central point where monitoring and control functions can occur on a computer platform.. The capabilities of the centralized TCS can vary widely, from simple monitoring of signal controller functions to full graphic display of intersection traffic movement. One of the strengths of central TCS is the ability to design and implement multiple signal timing plans that deal with particular times, or days of traffic that vary from the norm (special events, etc.). Enhanced maintenance monitoring functions can also be provided (immediate identification of failed loops, burned out lamps, etc.). System features will vary by City. New or expanded central TCSs are anticipated in the following areas:

Santa Barbara County:
City of Santa Barbara
City of Santa Maria

San Luis Obispo County:
City of San Luis Obispo

San Benito County:
None

Monterey County:
City of Monterey
City of Salinas

Santa Cruz County:
City of Santa Cruz
City of Scotts Valley

Relationship to Other Projects:
City-wide TCSs will likely be a vehicle for connecting to the Caltrans D5 TMC, where warranted. This could include the ability to view freeway CCTV cameras and traffic conditions on the freeway, in addition to controlling arterial street signals. This may be done through the Internet, or through direct connections to the TMC. In addition, provisions need to be made for coordinating with Caltrans traffic signals, where coordination is important. Provision should be made for collecting traffic data for planning purposes (see project related to Planning Market Package). If transit or emergency vehicle pre-emption/priority is anticipated, this needs to be accommodated as well.

Specific Problems or Needs Addressed:
- Recurring congestion on arterial streets
- Slow speeds
- Excess emissions and fuel consumption from idling, acceleration, deceleration

Traveler and Agency Benefits:
- Improved speeds (typically 25% increase from uncoordinated conditions)
- Lower emissions
- Improved emergency vehicle response times

Relationship to ITS Market Packages:
- Part of Surface Street Control market package

Relationship to the Regional ITS Architecture:
- Part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Projects vary in terms of timeframe (depending on funding and prioritization of local jurisdictions)
- Most will be implemented in first 5-years

Implementing Agency:
- Lead Agency to be determined in each area
- Generally considered to be the "owner" of the arterial roadway network

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Surface Street Control • Traffic Control System (TCS)	$287,500	$28,750	$43,125	$43,125	$28,750	$431,250	$28,750	System costs only

Possible Funding Sources:
- CMAQ, STP, PVEA, and local funds

Follow-up Actions:
- Each City to provide more definitive plan for new/expanded central TCS control at the appropriate time

Project Name:
Motorist-Aid Call Boxes

Project Description:
The California Call Box Program is a motorist-aid system operating on freeways, expressways, and highways throughout the State. It is administered at the County level by local Service Authorities for Freeways and Expressways (SAFEs). The call boxes provide motorists with a direct connection to a CHP communications center or other private call answering center (PCAC). Using this link, motorists can report a road hazard, flat tire, mechanical breakdown, traffic accident, or other incident. Upon receiving a call from a call box, CHP (or PCAC) personnel dispatch appropriate assistance, including tow service, law enforcement, fire departments, or emergency medical service (EMS) personnel . Use of the call box is free, but motorists are responsible for paying the resultant roadside assistance charges. Since the program's inception in 1986, a total of 17 SAFEs have been formed, covering 29 of California's 58 Counties, for a total of over 15,000 operational call boxes throughout the State.

At this time, call box installation is basically complete within the Central Coast Region as indicated below on a per County and State Route basis. An additional focus of this project is to complement the existing program investment in these Counties by adding call boxes at strategic locations to "fill-in-the-gaps" along their roadway network. Call boxes are being considered for installation at the following locations:

Santa Barbara County:
DONE – US 101, SR 1, SR 154, SR 166, and SR 246
Remaining State Routes (as necessary)

San Luis Obispo County:
DONE – US 101, SR 1, SR 41, SR 46, and SR 166
Rural SR 227
Remaining State Routes (as necessary)

San Benito County:
DONE – US 101, SR 25, and SR 156
Remaining State Routes (as necessary)

Monterey County:
DONE – US 101, SR 1, SR 68, and SR 156
Remaining State Routes (as necessary)

Santa Cruz County:
DONE – SR 1 SR 9, SR 17, SR 129, and SR 152
Remaining State Routes (as necessary)

Relationship to Other Projects:
- Potential to modify/enhance existing and/or planned call boxes to become "smart" call boxes
- Provide input to Caltrans D5 TMC concerning roadway incidents
- Allows EMS and incident management response strategies to get underway

Specific Problems or Needs Addressed:
- Travelers do not have the ability to readily contact CHP, law enforcement, EMS, etc when they are experiencing problems
- The ability to further enhance roadway network safety in a cost-efficient manner

Traveler and Agency Benefits:
- Improve incident identification (e.g., location, type, severity, etc.)
- Reduce incident response times
- Enhance traveler safety and "peace-of-mind"

Relationship to ITS Market Packages:
- Part of the Incident Management System market package

Relationship to the Regional ITS Architecture:
- Included as part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Short-term

Implementing Agency:
- Within each County, the individual RTPA/COG will be the lead Agency → SCCRTC, SBCOG, TAMC, SLOCOG, and SBCAG
- Caltrans D5 and CHP will provide support in key areas to ensure the program's success

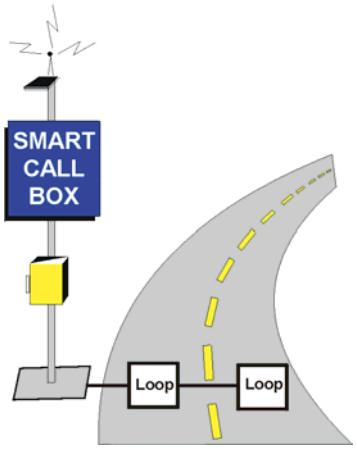
Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Inc. Mgt. System • Call Boxes	$4,600	$460	$690	$690	$460	$6,900	$34,500[1]	Per location

1. Denotes cost to manage Call Box program for a typical County.

Project Name:
"Smart" Call Box Traffic Monitoring Program

- For each of the five (5) Counties in the Central Coast
- Systems would use existing or planned Motorist Aid Call Boxes for traffic monitoring purposes



Project Description:
Traffic counts and classification data form the basis for transportation planning, engineering, and financial analysis. Counts are required when developing, designing, and updating traffic models, conducting corridor studies, developing traffic impact assessments, air quality impact assessments, level of service (LOS) monitoring, etc. Historically, Regional count information has been available from Caltrans D5; however, the process through which Caltrans D5 conducts traffic counts has been adversely impacted by Agency funding shortages. Caltrans D5 currently conducts traffic counts at designated control stations in each County (other than at permanent count stations) once every 3-years. For the other 2- years, the actual control station count is increased considering application of an average growth rate (typically 2%). As a result, the accuracy of the count data is diminished in years when actual counts are not conducted. In addition, the counts are taken during one representative week in each quarter of the year. This count schedule may or may not account for average and/or peak seasonal or average annual traffic conditions along specific routes in the Central Coast Region.

A "Smart" Call Traffic Monitoring Program can use the existing or planned call box system with integrated counter devices, existing Caltrans D5 or other Agency inductive loops, and various classification equipment to provide accurate, reliable, and timely traffic census and classification data throughout the Central Coast. The count/classification data collected through "Smart" Call Boxes is needed to calibrate and validate regional and local transportation models. The count/classification data will also enable Agencies in the Central Coast, especially Caltrans D5; to monitor heavily traveled corridors to determine the appropriate application of improvements and funding priority. In addition, the "Smart" Call Box can remotely sense an incident considering average speed data compared to actual speeds of vehicles along a State Route or local highway.

The "Smart"' Call Box is very similar to permanent traffic counter equipment except that downloading the data occurs through a modem call via the cellular network to the "Smart" Call Box. Caltrans D5 and other Agencies currently retrieve or download the data manually in the field at traffic control stations or sites to a laptop computer. Remote collection of traffic data allows the Agency to reduce staff collection costs and collect year-round data. The Traffic Count Program in each County will be designed in cooperation with Caltrans D5 personnel to maximize siting benefits.

Specific locations for installation of the "Smart" Call Boxes will be determined on a County-by-County basis. At this time, several locations have already been identified as follows:

Santa Barbara County:

US 101 - Ventura County Line to San Luis Obispo County Line
SR 1 - US 101 to San Luis Obispo County Line
SR 154
SR 166
SR 246

San Luis Obispo County:

US 101 - Santa Barbara County Line to Monterey County Line
SR 1 - Santa Barbara County Line to Monterey County Line
SR 41 - Kings County Line to SR 46
SR 41 - US 101 to SR 1
SR 46 - Kern County Line to SR 1

San Benito County:

SR 156 - Santa Clara County Line to US 101

Monterey County:

US 101 - San Luis Obispo County Line to San Benito County Line
SR 1 - San Luis Obispo County Line to Santa Cruz County Line

Santa Cruz County:

SR 17 - SR 1 to Santa Clara County Line
SR 1 - Monterey County Line to San Mateo County Line

Relationship to Other Projects:

As mentioned above, the "Smart" Call Box Program will rely on availability of the Motorist Aid Call Box Program. In some cases however, the placement of "Smart" Call Boxes may be independent of the Motorist Aid System. Factors that determine the location of a "Smart" Call Box include: an existing or planned call box, the availability of inductive loop detectors, and the need to monitor traffic at specific locations consistent with monitoring program requirements. In addition to Call Boxes, the "Smart" Call Box can remotely sense traffic conditions or incidents along a specific segment. Other projects in the ITS Implementation Plan that would provide similar capabilities include CCTV to monitor road conditions, network surveillance stations (also used to monitor road conditions and capture/store planning data), and planning data collection (including an archive function and additional data collection devices).

Specific Problems or Needs Addressed:

It has been shown that utilizing "Smart" Call Boxes as an ITS technology can provide for significant improvements in the amount and quality of traffic count data for transportation planning, engineering, modeling, and funding allocation purposes. Moreover, traffic count data management and results, as well as Level of Service (LOS) analyses can be directly linked to "Smart" Call Box monitoring efforts and transportation modeling programs to significantly reduce staff operations costs. In addition, use of "Smart" Call Boxes can aid agencies in monitoring the street and highway system to determine remaining capacity and determining how well an individual facility or the entire system is operating.

Traveler and Agency Benefits:

- Improved traffic data available on an as-needed basis through a simple dial-up system
- Reduced travel and greater efficiency for Agency personnel

Relationship to ITS Market Packages:

- Related to Network Surveillance, Regional Traffic Control, Incident Management System, and Planning Data Collection market packages

Relationship to the Regional ITS Architecture:

- Part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:

- Short- to long-term (depending upon each County's priorities)

Implementing Agency:

- Regional Agencies (CTCs, RTPAs, COGs) and Caltrans D5

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Network Surveillance • Smart Call Boxes	$6,900	$690	$1,035	$1,035	$690	$10,350	$690	Per location[1]

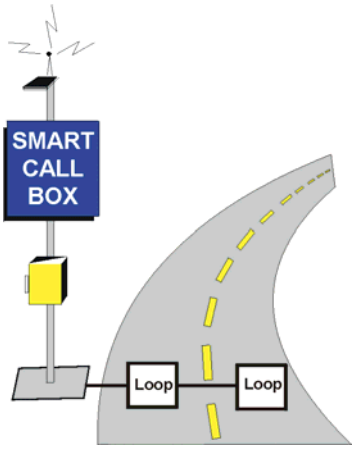
1. Costs do not include loop detectors, traffic control, or communications.

Possible Funding Sources:

- SAFE Program funds, CMAQ funds, STP funds, and other Federal, State, and Local funding sources

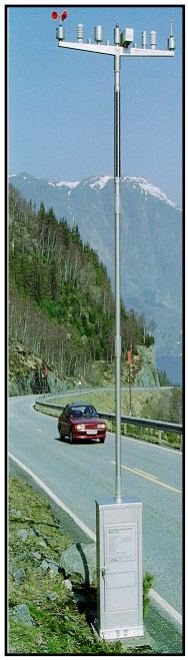
Project Name:
Environmental Detection System

- Use of Roadway Weather Information Systems (RWIS)
- Use of "Smart" Call Boxes



Project Description:
An Environmental Detection System is proposed at selected locations throughout the Central Coast Region. The system would utilize existing or planned "Smart" Call Boxes in conjunction with RWIS to remotely sense environmental conditions, weather hazards or low visibility conditions (e.g., high winds, fog, blowing dust, wet pavement, etc.). Existing or planned "Smart" Call Box sites can host different types of RWIS sensors to these environmental conditions and send alerts to the CHP's Computer Aid Dispatch (CAD) System. An Environmental Detection System can provide high wind and fog detection, as well as monitor air quality along streets and highways where visibility and high levels of pollutant emissions are known to occur. Pre-designated levels of high wind and visibility are programmed into the system and triggered to activate the "Smart" Call Box to transmit alerts to directly to the CHP's CAD system. The dispatcher at the CHP responds to the alert according to CHP policy. Possible locations include the following:

Santa Barbara County:
US 101 - Ventura County Line to San Luis Obispo County Line
SR 1 - US 101 to San Luis Obispo County Line
SR 154
SR 166
SR 246



San Luis Obispo County:
US 101 - Santa Barbara County Line to Monterey County Line
SR 1 - Santa Barbara County Line to Monterey County Line
SR 41 - Kings County Line to SR 46
SR 41 - US 101 to SR 1
SR 46 - Kern County Line to SR 1

San Benito County:
SR 156 - Santa Clara County Line to US 101

Monterey County:
US 101 - San Luis Obispo County Line to San Benito County Line
SR 1 - San Luis Obispo County Line to Santa Cruz County Line

Santa Cruz County:
SR 17 - SR 1 to Santa Clara County Line
SR 1 - Monterey County Line to San Mateo County Line

Relationship to Other Projects:
As mentioned above, the "Smart" Call Box Environmental Detection System will rely on the availability of the Motorist Aid Call Box Program. In some cases however, the placement of such "Smart" Call Boxes may be independent of the Motorist Aid System. Factors that determine the location of a "Smart" Call Box for environmental detection may include: an existing or planned call box site and/or where the need to monitor high wind and/or fog conditions at specific locations where travel hazards and incidents are known to occur.

Specific Problems or Needs Addressed:
- Need for motorists to know about weather-related hazards

Traveler and Agency Benefits:
- Earlier detection of weather conditions about which the public should be notified
- Remote detection, minimizing labor costs

Relationship to ITS Market Packages:
- Related to Network Surveillance, Regional Traffic Control, Incident Management System, and Planning Data Collection market packages

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) and Roadway Sensors (Roadside) subsystems

Time Frame:
- By 2013 for initial sensors (continuing expansion in future years)

Implementing Agency:
- Regional Agencies (CTCs, RTPAs, COGs), CHP, and Caltrans D5

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Network Surveillance • Smart Call Boxes	$6,900	$690	$1,035	$1,035	$690	$10,350	$690	Per location[1]
Road Weather Info System RWIS)	$51,750	$5,175	$7,762	$7,763	$5,175	$77,625	$5,175	Per location

1. Costs do not include loop detectors, traffic control, or communications.

Possible Funding Sources:
- SAFE Program funds, CMAQ funds, STP funds, and other Federal, State, and Local funding sources

Project Name:
Portable Traffic Management System (PTMS)

Project Description:
Traffic management needs in rural and small urban areas are more sporadic and require smaller scale approaches. The need for traffic and traveler information is often driven by seasonal demands and/or special events. This project involves the procurement of portable traffic management and information systems (PTMS) that can be used in addressing these periodic needs. A PTMS would consist of the following ITS components, mounted on either a trailer or vehicle:

- Changeable message sign (CMS)
- Highway advisory radio (HAR) (with an area license)
- Optional digital cellular telephone for transmitting/receiving data (or an Agency's own radio system could be used, if appropriate and available)
- Optional slow-scan CCTV on extendable pole

These units would be owned by a lead Agency in each participating County and made available for a variety of purposes, mainly construction traffic management needs and special events. The lead Agency would determine whether or not a rental fee would be charged for usage. The Agency using the unit would be responsible for its proper deployment. A standard set of messages would be provided for the CMS, or unique messages could be composed. A set of guidelines would govern proper usage, to limit the potential for confusion and misuse.

Relationship to Other Projects:
- If configured with the capability to send and receive data, the PTMS units could be operated remotely, including from the Caltrans D5 TMC or other Agency TMCs
- Compatibility of communications with these TMCs needs to be considered within the PTMS design

Specific Problems or Needs Addressed:
- Traffic problems associated with special events
- Construction and maintenance traffic management needs
- Traveler information needs associated with special events

Traveler and Agency Benefits:
- Improved roadway surveillance at traffic hot spots
- Improved public information at special events

Relationship to ITS Market Packages:
- Part of Traffic Information Dissemination market package
- Will have capability of interface with Regional TMC (Regional Traffic Control market package)

Relationship to the Regional ITS Architecture:
- Part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Design and pilot test of one (1) PTMS unit by 2012
- Procurement of PTMS units for individual counties by 2013 (if pilot successful)

Implementing Agency:
- Lead Agency(s) will be determined on a County-by-County basis
- Caltrans D5 will lead the PTMS pilot test

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Traffic Information Dissemination • Portable Traffic Mgmt. Sys. (CMS, HAR, & CCTV)	$149,500	$14,950	$22,425	$22,425	$14,950	$224,250	$14,950	Per PTMS

Possible Funding Sources:
- CMAQ, STP, and local general funds
- Rental revenue by event managers (but operation by qualified Agency staff)

Follow-up Actions:
- Define specific functions and parameters for PTMS pilot test
- Based on results of PTMS pilot, procure systems for Counties (as required)

Project Name:
Dynamic Speed/Curve Warning System

Project Description:
This project provides real-time traveler information to motorists regarding safe travel speeds, particularly in relation to upcoming curves/bends and downgrades. When a speeding vehicle is detected (using radar detectors), a changeable message sign (CMS) is activated which displays a warning message "YOU ARE SPEEDING -- 72 MPH" or "60 MPH CURVES AHEAD". The CMS will have a telephone connection to the Caltrans D5 TMC to display messages other than vehicle speeds. CCTV can also be installed to monitor traffic conditions and allow the Caltrans D5 TMC to see if there has been an accident.

Relationship to Other Projects:
- Can be used in conjunction with CCTV, CMS, Surveillance Stations, and "Smart" Call Boxes
- Provides input to and dissemination outlet for the Caltrans D5 TMC

Specific Problems or Needs Addressed:
- Motorists traveling too fast for roadway conditions
- Higher accident rates at sharp curve/bend and steep downgrade roadway segments
- Roadway network safety improvements in a cost-effective manner

Traveler and Agency Benefits:
- Improve roadway network safety, especially in high accident areas (e.g., sharp curves, bends, steep downgrades, etc.)
- Decrease the number of accidents
- Reduce travel speeds when motorists are traveling too fast for roadway conditions

Relationship to ITS Market Packages:
- Part of the Advanced Safety Systems market package

Relationship to the Regional ITS Architecture:
- Included as part of the Traffic Management (Center) and Roadway (Roadside) subsystem

Time Frame:
- Long-term

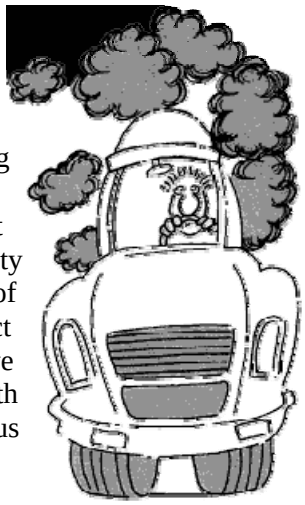
Implementing Agency:
- Caltrans D5 will be the lead Agency
- Rural areas within each of the Central Coast Counties are considering curve/grade speed warning systems

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Advanced Safety Systems • Speed/Curve Warning System	$80,500	$8,050	$12,075	$12,075	$8,050	$120,750	$8,050	Per location

- Within the COATS program, Caltrans D2 reported that the construction costs for each advance curve warning system was approx. $100,000 per location

Project Name:
Emissions Monitoring and Management



Project Description:
Provides information for monitoring vehicle emissions and air quality and developing emissions/air quality improvements strategies. This project uses advanced vehicle emissions testing systems to provide information to identify environmental "hot spots" and implement strategies to reroute traffic away and around sensitive air quality areas, or control access to such areas. Other technologies provide identification of vehicles that are exceeding Local, State, and Federal levels of pollutants. This project provides information to drivers or fleet operators to enable them to take corrective action. The service also provides transportation planning and operating Agencies with information that can be used to facilitate the implementation and evaluation of various pollution control strategies.

Relationship to Other Projects:
- Monitoring emissions plays a very important role in obtaining Local, State, and Federal funding for regional projects
- Additional funding sources may become available (or not) based upon the results of emissions monitoring

Specific Problems or Needs Addressed:
- Gathered information can be used to implement Travel Demand Management (TDM) programs, policies and regulations
- Environmental "hot spots" can be determined
- Management of emissions will, ultimately, lead to improved air quality
- Additional funding for projects may become available, based upon the need for monitoring data

Traveler and Agency Benefits:
- Improved vehicle emissions monitoring at traffic/transit hot spots
- Provides information to assist in the development of emissions improvement strategies

Relationship to ITS Market Packages:
- Related to Regional Traffic Control, Network Surveillance, Planning Data Collection, and Commercial Vehicle Operations market packages

Relationship to the Regional ITS Architecture:
- Part of Emissions Management (Center) subsystem

Time Frame:
- After 2017

Implementing Agency:
- Regional Air Quality Management District (AQMD)
- Local Air Pollution Control District (APCD)

Project Name:
Standard Railroad Grade Crossings

Project Description:
Manages highway traffic at highway-rail intersections (HRIs) where operational requirements do not dictate more advanced features (e.g., where rail operational speeds are less than 80 miles per hour). Both passive (e.g., the crossbuck sign) and active warning systems (e.g., flashing lights and gates) are supported. (Note that passive systems exercise only the single interface between the roadway subsystem and the driver in the Architecture definition). These traditional HRI warning systems may also be augmented with other standard traffic management devices. The warning systems are activated on notification by interfaced wayside equipment of an approaching train. The equipment at the HRI may also be interconnected with adjacent signalized intersections so that local control can be adapted to highway-rail intersection activities. Monitoring of the HRI equipment and interfaces is performed; detected abnormalities are reported to both highway and railroad officials through wayside interfaces and interfaces to the traffic management subsystem.

Relationship to Other Projects:
- Coordination with traffic signal synchronization/coordination systems (where appropriate)

Specific Problems or Needs Addressed:
- Increased safety at key railroad crossings

Traveler and Agency Benefits:
- Develops user information systems that display accurate, timely, and useful information on expected train crossings and anticipated delays

Relationship to ITS Market Packages:
- Part of Network Surveillance and Incident Management market packages

Relationship to the Regional ITS Architecture:
- Included as part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Short- to Long-term

Implementing Agency:
- Caltrans, local Agencies, San Luis Obispo, Grover Beach, SLO County, and Paso Robles

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Std. RR Grade Crossing	$63,250	$6,325	$9,487	$9,488	$6,325	$94,875	$6,325	Per location

Project Name:
Advanced Railroad Grade Crossings

Project Description:
Manages highway traffic at highway-rail intersections (HRIs) where operational requirements demand advanced features (e.g., where rail operational speeds are greater than 80 miles per hour). This includes all capabilities from the Standard Railroad Grade Crossing and augments these with additional safety features to mitigate the risks associated with higher rail speeds. The active warning systems include positive barrier systems, which preclude entrance into the intersection when the barriers are activated. Like the Standard Package, the HRI equipment is activated on notification by wayside interface equipment, which detects, or communicates with, the approaching train. Additional information about the arriving train is also provided by the wayside interface equipment so that the train's direction of travel, its estimated time of arrival, and the estimated duration of closure may be derived. This enhanced information may be conveyed to the driver prior to, or in context with, warning system activation. This also includes additional detection capabilities that enable it to detect an entrapped or otherwise immobilized vehicle within the HRI and provide an immediate notification to highway and railroad officials.

Relationship to Other Projects:
- Coordination with traffic signal synchronization/coordination systems (where appropriate)

Specific Problems or Needs Addressed:
- Increased safety at key railroad crossings

Traveler and Agency Benefits:
- Develops information systems that display accurate, timely, and useful information on expected train crossings and anticipated delays

Relationship to ITS Market Packages:
- Related to the Network Surveillance and Incident Management System market packages

Relationship to the Regional ITS Architecture:
- Included as part of the Traffic Management (Center) and Roadway (Roadside) subsystems

Time Frame:
- Short- to Long-term

Implementing Agency:
- Caltrans D5, local Agencies, San Luis Obispo, Grover Beach, SLO County, and Paseo Robles

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Adv. RR Grade Crossing	$86,250	$8,625	$12,937	$12,938	$8,625	$140,875	$8,625	Per location

Project Name:
Advanced Crosswalks

Project Description:
Provides surveillance/detection equipment for critical pedestrian crosswalk locations. Depending on the individual crosswalk, this could include audible signal change indications, security monitoring, and/or visible warnings to drivers of pedestrians in the crosswalk. Locations would be determined by local Agencies by prioritizing the most hazardous locations for pedestrian-vehicle conflicts.

Relationship to Other Projects:
- Coordination required with traffic signal coordination and pre emption/priority systems

Specific Problems or Needs Addressed:
- Pedestrian safety and security at critical crosswalk locations

Traveler and Agency Benefits:
- Improved safety
- Improved traffic operations

Relationship to ITS Market Packages:
- Part of Network Surveillance and Incident Management System market packages

Relationship to the Regional ITS Architecture:
- Part of Traffic Management (Center) subsystem

Time Frame:
- Short- to Long-term

Implementing Agency:
- Cities of Santa Barbara, Arroyo Grande, Buellton, Solvang, San Luis Obispo, Atascadero, Paso Robles, Hollister, Monterey, Watsonville, Scotts Valley, and Santa Cruz
- Santa Barbara County, City of San Luis Obispo, Caltrans D5, and other local Agencies

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Advanced Safety Systems • Advanced Crosswalks	$34,500	$3,450	$5,175	$46,000[1]	$3,450	$92,575	$3,450	Per crosswalk

1. Denotes actual installation costs.

TRANSIT MANAGEMENT

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Project Name:
Transit Vehicle Tracking using Automated Vehicle Location (AVL) Systems

Project Description:
Transit Vehicle Tracking provides for an Automated Vehicle Location (AVL) System to track the transit vehicle's real-time schedule adherence and updates the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle [e.g., global positioning satellites (GPS), dead-reckoning systems, etc.] and relayed to the infrastructure or may be determined directly by the communications infrastructure [e.g., automatic vehicle identification (AVI), beacon systems, etc.]. A 2-way wireless communication link with a transit management center will be used for relaying vehicle position and control measures. Fixed-route transit systems may also employ beacons along the route to enable position determination and facilitate communications with each vehicle at fixed intervals. The transit management center will process this information, update the transit schedule and make real-time schedule information available via the Internet, transit center(s), and selected bus stops. The application and time frame will vary by transit property within the Central Coast. Each transit agency will need to define the extent of deployment expected.

Relationship to Other Projects:
- Provides data for transit information, schedule management, dispatching, and transit priority systems
- Can be connected to the Caltrans D5 TMC to provide for multi-modal functionality

Specific Problems or Needs Addressed:
- Transit efficiency and effectiveness
- Better planning data
- Inter-Agency communication

Traveler and Agency Benefits:
- Improved transit scheduling
- More efficient timed transfers
- Improved travel time performance for transit travelers

Relationship to ITS Market Packages:
- Functions as the Transit Vehicle Tracking market package
- Can be inter-related to the Broadcast Traveler Information and Traffic Control market packages

Relationship to the Regional ITS Architecture:
- Part of Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to Long-term (at the discretion of individual transit Agencies)

Implementing Agencies:
- SBMTD, CCAT, SLO Transit, PRCATS, SCAT, Ride-On, SBCLTA, and SCMTD

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Transit Vehicle Tracking • AVL (vehicle) • AVL (system)	$17,250 $575,000	$1,725 $57,500	$2,587 $86,250	$2,588 $86,250	$1,725 $57,500	$25,875 $862,500	$1,725 $57,500	Per transit vehicle Includes training

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Public Transportation Mgt. • Vehicle • Transit Mgt. Center	$4,600 $690,000 - $1.15 mil.	$2,875 $230,000 - $345,000	• Capital Costs → System software, hardware, on-board devices, communications, computers, etc. • O&M Costs → Staffing & communications

Project Name:
Automated Passenger Counting (APC) Systems

Project Description:
This project allows for the management of passenger loading and counting on-board vehicles using electronic means. This package is implemented with sensors mounted on the vehicle to permit the driver and central operations to determine vehicle loads, and readers located either in the infrastructure or on-board the transit vehicle. Data will be processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem using existing wireless infrastructure. Ultimately, it would be anticipated that all fixed-route transit properties in the Central Coast would be equipped with APC systems.

Relationship to Other Projects:
- Coordinated and integrated with the Electronic Fare Collection project

Specific Problems or Needs Addressed:
- Efficiency of transit operations
- Quality of service for transit riders

Traveler and Agency Benefits:
- Improved data availability
- Improved efficiency

Relationship to ITS Market Packages:
- Part of the Traveler Information and Transit Maintenance market packages

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to Mid-term → Santa Barbara and San Luis Obispo
- Long-term → SBCLTA and other transit Agencies (as desired)

Implementing Agency:
- Individual transit Agencies (when need is determined to exist and funding becomes available)

Potentials Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Transit Passenger and Fare Mgmt • Automated Pass. Counting	$5,750	$575	$862	$862	$575	$8,625	$575	Per transit vehicle

Project Name:
Electronic Fare Collection using "Smart" Cards

Project Description:
Allows for the collection of fare payments on-board vehicles using "Smart" Card technology. Several payment approaches can be used, but it is important that the approaches be coordinated with other "Smart" Card applications in the Central Coast and elsewhere in the State of California in order to promote seamless operation. The electronic fare collection system is implemented with readers mounted on the vehicle to permit fare payment or authorization to ride through an electronic pass. Data is processed, stored, and communicated as needed to the Transit Management Subsystem using wireless infrastructure. The system is tied into social services billing mechanisms to serve as the accounting system for inter-agency transfers of funds, based on ridership.

Relationship to Other Projects:
- Needs to be integrated with the Automated Passenger Counting project

Specific Problems or Needs Addressed:
- Transit efficiency and effectiveness
- Better planning data

Traveler and Agency Benefits:
- Reduced cash-handling
- More automated accounting systems
- Faster boarding, reduced dwell times
- Improved data availability
- Improved efficiency overall

Relationship to ITS Market Packages:
- Part of Transit Passenger and Fare Management market package
- Must be coordinated with Demand Response Transit Operations and Transit Maintenance market packages

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to Long-term (depending on the transit property)

Implementing Agency:
- SBMTD, CCAT, SLO Transit, PRCATS, SCAT, Atascadero SBCLTA, MST, and SCMTD

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Transit Passenger and Fare Mgmt • Electronic Fare Collection	$11,500	$1,150	$1,725	$1,725	$1,150	$17,250	$1,150	Per transit vehicle

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Electronic Payment Services • Vehicle Tag/Card • Tag/Card Reader • Management Center	$28,750 - $57,500 $34,500 - $46,000 $46,000 - $92,000	N/A $9,200 -$11,500 $86,250 - $115,000	• Capital Costs → System software, hardware, vehicle tags, tag readers, communications, system integration, etc. • O&M Costs → Power, communications, staffing, etc.

Project Name:
Transit Video Surveillance

Project Description:
This project involves deployment of security systems to perform surveillance and warn of potentially hazardous situations both on-board vehicles and at transit centers (e.g., unmanned train stations, park-and-ride lots, etc.). Each geographic area will have its own criteria for the implementation of such devices but, in general, implementation will be triggered by a known security issue at each location. The method of surveillance will be determined based on the specific needs at each site, either monitoring with an observer at the transit management center or monitoring that is triggered by an event, such as detected movement in a parking lot. The system will be similar to other security systems that have been implemented throughout the U.S. The communications approach will depend on location and type of monitoring contemplated. Security problems for transit in the Central Coast are limited, and widespread implementation is not anticipated.

Relationship to Other Projects:
- Feeds information to a transit management center

Specific Problems or Needs Addressed:
- Safety/security in areas with known security problems

Traveler and Agency Benefits:
- Improved safety/security
- Reduced on-site labor to address patron security, with possible reduced costs

Relationship to ITS Market Packages:
- Part of the Transit Security market package

Relationship to the Regional ITS Architecture:
- Part of Transit Management (Center) subsystem

Time Frame:
- Medium- to Long-term

Implementing Agency:
- SBMTD, SMAT, CCAT, SLO Transit, SCAT, SBCLTA, MST, and SCMTD

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Public Travel Security • In-Vehicle Device • Fixed Location • Emergency Center	$4,600 - $5,750 $6,900 - $9,200 $575,000	$575 $6,900 - $9,200 $86,250 - $115,000	• Capital Costs → System software, hardware, on-board devices, communications, video surveillance, computers, etc. • O&M Costs → Staffing & communications

Project Name:
Voice/Data Communications

Project Description:
This project addresses the needs for communications enhancements to support a variety of transit management ITS applications. Radio systems will generally need upgrading to allow for the communication of transit vehicle location back to the Transit Management Center. In addition, improved voice communications will be a benefit to system operation as well. Each transit operator will need to evaluate their current communications system in light of the Transit Management functions they would intend to include. Multiple transit systems in the same geographic area should have their AVL and communications implemented under a single system to allow for economies of scale.

Relationship to Other Projects:
The communications systems will need to work together with the Transit Vehicle Tracking project, and may need to provide support for Transit Security and Electronic Fare Collection, depending on how the systems are ultimately configured.

Specific Problems or Needs Addressed:
- Need for voice and data communications between the vehicles and the transit management center
- Need for reporting maintenance problems
- Transit security

Traveler and Agency Benefits:
- Improved passenger safety and security
- Improved efficiency of transit operations
- Mechanism for real-time monitoring and traveler information

Relationship to ITS Market Packages:
- Part of Transit Security market package, but supports Transit Tracking market package as well

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to Long-term (each system to make their own assessment)

Implementing Agency:
- Individual transit operators → SBMTD, SMAT, CCAT, SCAT, SBCLTA, MST, and SCMTD

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Transit Security • Voice/Data Communications	$11,500	$1,150	$1,725	$1,725	$1,150	$17,250	$1,150	Per transit vehicle

Project Name:
Transit Signal Priority System

Project Description:
Traffic signals disrupt the progress of transit vehicles by causing them to slowdown or stop. This can be a serious problem when a transit vehicle is behind schedule. Since other vehicles in cross-traffic appear to have the right-of-way, hazardous situations occur at intersections. The purpose of this project is to give specially equipped transit vehicles priority (or right-of-way preferential treatment) at traffic signalized intersections. Basically, the transit vehicle activates (via radio signals, beacon system, loop detectors, etc.) a signal priority phase (within an equipped intersection traffic controller), adding green time to the signal phase for the on-coming transit vehicle. The green phase can be brought-on early or extended for a pre-set time between 5-45 seconds. A visual verification system (either in-vehicle or installed in the field) is used to confirm to the transit driver that it has been given the right-of-way.

Relationship to Other Projects:
- Inter-related to traffic signal control, signal coordination strategies, and central TCS
- Inter-related to transit vehicle tracking/AVL systems
- Could be coordinated with emergency vehicle pre-emption systems
- Could be coordinated with the Caltrans D5 TMC

Specific Problems and Needs Addressed
- Potentially hazardous situations at signalized intersections
- Transit vehicles behind schedule
- Disruption to traffic flow at intersections

Traveler and Agency Benefits:
- Improved intersection safety (vehicle and pedestrian)
- Improved ability of the transit vehicle to get back on schedule
- Overall smoother flow of traffic when a transit vehicle passes through an intersection

Relationship to ITS Market Packages:
- Part of the Multi-Modal Coordination market package
- Related to the Surface Street Control market package

Relationship to the Regional ITS Architecture
- Part of the Transit Management (Center), Traffic Management (Center), Roadway (Roadside), and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to Long-term (depending upon the local community)

Implementing Agency:
- Individual transit operators → SBMTD, SMAT, CCAT, SCAT, SBCLTA, MST, and SCMTD
- Local Agency traffic departments

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Multi-modal Coordination								
• Signal Priority (vehicle)	$2,300	$230	$345	$345	$230	$3,450	$230	Per transit vehicle
• Signal Priority (intersection)	$2,875	$288	$431	$431	$288	$4,313	$288	Per intersection

Project Name:
Transit Maintenance

Project Description:
This project supports automatic maintenance scheduling and monitoring. On-board condition sensors monitor critical system status and transmit critical status information to the transit management center. Hardware and software in the transit maintenance center processes this data and schedules appropriate maintenance activities. Information regarding passenger loading, bus running times, and mileage accumulated will help improve service and facilitate administrative reporting. Automatically recording and verifying performed tasks will also enhance transit personnel management. These functions may also be implemented in a way that does not require communications with the transit management center, but focus on improved vehicle diagnostics, which are evaluated when the vehicle returns to its garaging location. Each transit property will need to evaluate its own needs and determine what functions should be included. The most likely scenario is that these functions will be gradually introduced as new vehicles are purchased, based on options offered by the manufacturer.

Relationship to Other Projects:
- The transit management center may need to accommodate communications of maintenance information to and from the transit vehicles, depending on configuration

Specific Problems or Needs Addressed:
- Need to minimize transit vehicle down time and prevent breakdowns

Traveler and Agency Benefits:
- Provides information that can be used to maintain transit system
- Promotes increased transit system reliability
- Allows systematic response to maintenance problems by transit Agencies

Relationship to ITS Market Packages:
- Part of the Transit Maintenance market packages

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to Long-term (depending on system)

Implementing Agency:
- SBMTD, SMAT, CCAT, SLO Transit, SCAT, SBCLTA, MST, and SCMTD

Project Name:
Santa Barbara MTD Vehicle Maintenance System

Project Description:
SBMTD's operations could benefit greatly from the use of new and innovative technology that assists maintenance personnel to maintain the SBMTD's fleet of transit vehicles. Historically, maintenance is an area that has been overlooked by companies interested in deploying technology in the transit industry. The SBMTD believes that in order to produce a reliable and efficient transit system, great care must be taken in maintaining transit vehicles.

SBMTD intends to create a more efficient method of communication between mechanics and supply personnel as well as provide mechanics with all of the information they require directly to their work area. By deploying networked computers and touch screens to the mechanics, vehicle information can be passed between SBMTD personnel quickly. Mechanics can easily determine the location of parts and place orders that can be quickly filled by supply personnel and delivered to the mechanic. If the necessary parts are not in stock a mechanic can defer the work order and move on to another job with no loss of time. Also, the SBMTD can store vehicle diagrams and instructions about each vehicle on a network server and the images and text can be accessed by the mechanic directly from his assigned work area. Naturally, the complete history of each vehicle including parts and labor performed can be accessed by the mechanic. This provides the mechanic with all of the information required to complete their task.

Commercial packages that perform the majority of tasks envisioned by the SBMTD currently exist. This project would require the need for modifications and integration to the SBMTD's existing internal systems.

Relationship to Other Projects:
- The SBMTD transit management center may need to accommodate communications of maintenance information to and from the transit vehicles, depending on configuration

Specific Problems or Needs Addressed:
- Need to keep buses operational
- Need to minimize in-service breakdowns

Traveler and Agency Benefits:
- Increases efficiency of maintenance personnel
- Increases diagnostic abilities and reduces chance of bus breakdown

Relationship to ITS Market Packages:
- Part of the Transit Maintenance market package

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short-term

Implementing Agency:
- SBMTD

Project Name:
Static Transit Route/Schedule Information

Project Description:
This project provides information in response to a traveler request. The approach for transit Agencies in the Central Coast is to provide as much information on schedules, routing, and fares on their Internet websites. Some Agencies have already implemented such systems, and these will be maintained and upgraded. Other Agencies will be implementing such systems over the next several years. It is anticipated that the development of wireless internet technologies will allow this information to be obtained from mobile locations as well as from fixed personal computers, within the next several years. Kiosks may be established in key locations (e.g., hotels, transit centers, office parks, etc.) that provide access to this information through the internet. However, telephone/voice based information on routes still needs to be maintained.

Relationship to Other Projects:
- Stepping-stone towards more sophisticated applications under "Real-Time Route/Schedule Information"

Specific Problems or Needs Addressed:
- Need for basic transit route and schedule information

Traveler and Agency Benefits:
- Provides easy, immediate access to information on transit routes, schedules, and fares
- Interactive kiosks provides remote access to information
- Availability of information on the internet reduces agency staff resource requirements

Relationship to ITS Market Packages:
- Part of Transit Traveler Information market package

Relationship to the Regional ITS Architecture:
- Part of Transit Management (Center) subsystem

Time Frame:
- Short-term

Implementing Agency:
- SBMTD, SMAT, CCAT, SLO Transit, SCAT, SBCLTA, MST, and SCMTD

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
En-Route Transit Information • Personal Device • In-Vehicle Device • Interactive Kiosk • Info Service Providers (ISPs)	 $805,000 $575 $23,000 - $46,000 $1.15 mil. - $2.3 mil.	 $345,000 - $575,000 $230 $11,500 – $57,500 $345,000	• Capital Costs → System software, hardware, communications, sensors, position determination, kiosk, systems integration, etc. • O&M Costs → Staffing & communications

Project Name:
Real-time Transit Route/Schedule Information

Project Description:
Some transit Agencies will take the next step in sophistication of transit traveler information, providing real-time information on schedules and arrival times. The system would allow the user to request and obtain current information regarding real-time transit vehicle location and arrival time at given points. This information could be delivered in multiple ways, and each transit Agency may decide to implement different levels of sophistication. One level would be to provide information on bus location on the Agency's Internet website. This is a relatively simple and cost-effective application, once the AVL system and communication of that information to the transit management center are in place. The website would show current vehicle location, so that travelers at home, office, or other location could see how close the bus is to its expected schedule. Kiosks or other displays can be provided at key locations (e.g. office lobbies, hotels, transit center, etc.) that display the website, either on a continuing basis or as a user-selected feature.

Relationship to Other Projects:
- Will rely on data from the Automated Vehicle Location (AVL) system

Specific Problems or Needs Addressed:
- Need for information on bus location and schedule adherence

Traveler and Agency Benefits:
- Real-time information of transit routes, schedules, and fares
- Multimedia access to information
- Easy access to connecting service information

Relationship to ITS Market Packages:
- Part of Transit Traveler Information market package

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) subsystem

Time Frame:
- Medium- to Long-term

Implementing Agency:
- SBMTD, CCAT, SLO Transit, MST, and SCMTD

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
En-Route Transit Information • Personal Device • In-Vehicle Device • Interactive Kiosk • Info Service Providers (ISPs)	 $805,000 $575 $23,000 - $46,000 $1.15 mil. - $2.3 mil.	 $345,000 - $575,000 $230 $11,500 – $57,500 $345,000	• Capital Costs → System software, hardware, communications, sensors, position determination, kiosk, systems integration, etc. • O&M Costs → Staffing & communications

Project Name:
Passenger Train Arrival Status Message System

Project Description:
This project would locate signs at remote train stations in Santa Barbara County:

- Surf
- Goleta
- Guadalupe
- Carpinteria

The purpose of the message sign network is to systematically apprise the traveling public of train arrival status. The signs will be controlled by AMTRAK. Communication to the signs could be through dial-up communications, given that passenger trains arrive only several times per day. AMTRAK already maintains a train schedule information system, and the messaging system would simply tap into that information. Hardware has been installed at all stations and software is currently being tested. Problems have delayed implementation.

Relationship to Other Projects:

- Should be integrated with the Santa Barbara transit management center to allow bus drivers to better coordinate with train arrival and departures, where bus service is provided

Specific Problems Addressed:

- Need to know about delays in train arrival
- Traveler Information

Traveler and Agency Benefits:

- Provides traveler information
- Promote use of train travel.

Relationship to ITS Market Packages:

- Supports the Broadcast Traveler Information and Interactive Traveler Information market packages

Relationship to the Regional ITS Architecture:

- Part of the Transit Management (Center) subsystem

Time Frame:

- By 2005

Implementing Agency

- AMTRAK, Caltrans (Rail Programs Division), and Regional Transportation Planning Agencies

Possible Funding Sources:

- SHOPP, ITIP, RTIP, and RSTP

Follow-up Actions:

- In SBCAG 2004 MTP
- PSR development by Caltrans
- At least one station programmed within the 1998 STIP

Project Name:
Station and Bus Stop Information System

Project Description:
Many transit Agencies recognize that providing route and schedule information to passengers at bus stops and transit stations is a necessity. Currently, several transit Agencies already provide route and schedule information in paper form at a number of their bus stops and/or transit centers. However, what most people want to know is the time at which the next bus is actually going to arrive. Therefore, many transit Agencies are interested in providing "NextBus" information to bus stops, transit stations, and the home via the use of existing technologies.

This requires the purchase of software and hardware that when integrated with a Global Positioning System (GPS), can relay information directly to equipment installed at bus stops and stations that display the estimated time of arrival of the nearest transit vehicle. Then, this information would be available via the Internet. By providing actual arrival times to the public in their home or place of business, transit may become a more attractive alternative.

Currently, there are existing commercial packages that when integrated with a GPS system can provide the desired information to bus stops and transit stations. In Monterey County, MST has already implemented such a "NextBus" system in the Cities of Salinas, Monterey, and Marina. The Internet aspect of this project would require the development of a new application.

Relationship to Other Projects:
- This project requires the deployment of the On-Board Passenger Information System

Specific Problems or Needs Addressed:
- Need for bus arrival time information

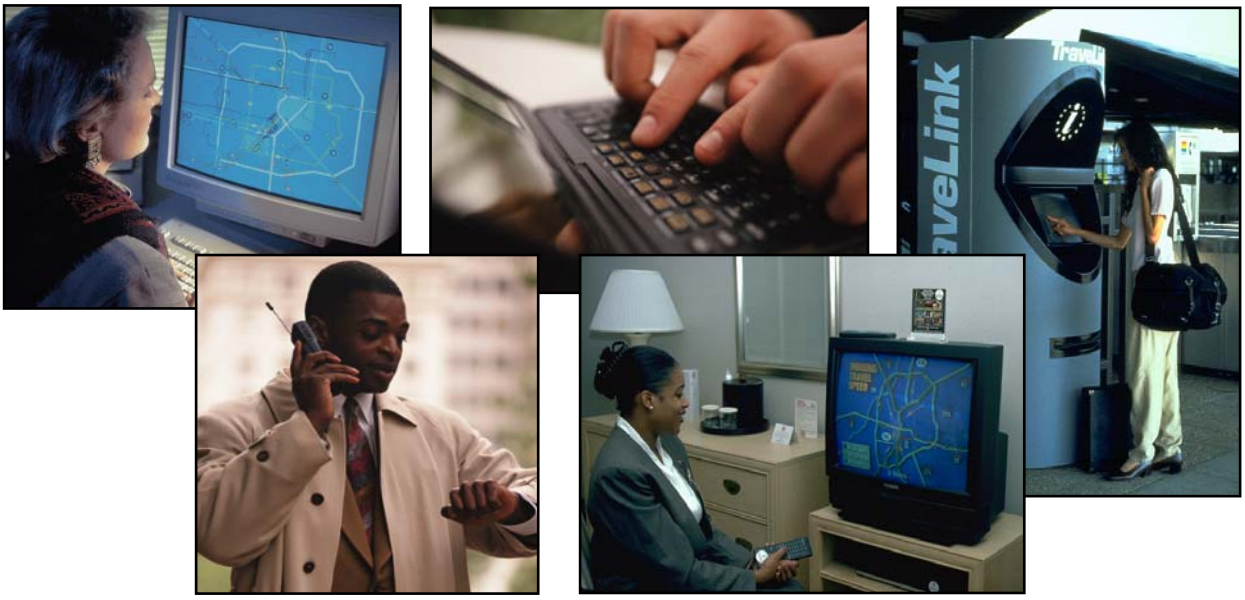
Traveler and Agency Benefits:
- Provides expected bus arrival time at specific locations, allowing passengers to optimize their use of time

Relationship to ITS Market Packages:
- Part of the Transit Traveler Information market package
- Works together with the Transit Vehicle Tracking market package

Relationship to the Regional ITS Architecture:
- Part of the Transit Management (Center) and Transit Vehicle (Vehicle) subsystems

Time Frame:
- Short- to Medium-term

Implementing Agency:
- SBMTD, SMAT, CCAT, SCAT, MST, SBCLTA, and SCMTD



TRAVELER INFORMATION SYSTEMS

Broadcast Traveler Information A-69
Interactive Traveler Information A-71
Yellow-Pages and Reservations A-73

Project Name:
Broadcast Traveler Information

Project Description:
This project anticipates the availability of multiple possible outlets for traveler information. Commercial radio provides an existing outlet for broadcast traveler information, but is subject to the limitations of commercial radio airtime. Devices are becoming available for obtaining information through pagers, palm computers, personal digital assistants, and other devices. The Internet can now be accessed through wireless devices as well. The purpose of this project is to design information "packets" that can be given to information service providers (ISPs) and distributed via these multiple channels. This information could include traffic congestion information, reports on delays on specific bus routes, train arrival information, parking information, event information, etc. Such a system would be ideal for disseminating information on the status of public emergencies, such as earthquakes and floods. Devices on which this information would be broadcast could be purchased by travelers through the commercial marketplace. Agencies may wish to purchase such devices and install them at appropriate locations (e.g., office lobbies, transit centers, hotels, etc.). Ideally, the consolidation of this information would be taken on by the private sector. The public sector would organize the information under its control and make it available. In some cases, public Agencies may be a distributor of this information, as in the case of transit information projects, discussed earlier.

Relationship to Other Projects:
- This information brings information from multiple projects together → transit, traffic, incident management, emergency management, and parking

Specific Problems or Needs Addressed:
- Need for traveler information integrated across a spectrum of types
- Need to coordinate and consolidate traveler information across Agencies
- Need for information on status of public emergencies

Traveler and Agency Benefits:
- Improved information for route choice
- Reduced travel time because of better knowledge of congestion and incident locations
- Immediate knowledge of weather conditions, enabling better decisions and information to the public

Relationship to ITS Market Packages:
- Part of the Broadcast Traveler Information market package
- Related to multiple other market packages → Network Surveillance, Incident Management System, Transit Vehicle Tracking, and Traffic Information Dissemination

Relationship to the Regional ITS Architecture:
- Part of the Remote Traveler Support (Traveler) and Information Service Provided (Center) subsystems
- Related to the Personal Information Access (Traveler), Traffic Management (Center), and Transit Management (Center) subsystems

Time Frame:
- Short- to Medium-term
- Will be implemented in stages (as technologies become available and as the information becomes increasingly available)

Implementing Agency:
- Information Service Providers (ISPs), Caltrans D5, and CHP with the support from other public Agencies

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Smart Traveler Services • Personal Device • In-Vehicle Device • Interactive Kiosk • Info Service Providers (ISPs)	$805,000 $575 $23,000 - $46,000 $1.15 mil. - $2.3 mil.	$345,000 - $575,000 $230 $11,500 – $57,500 $345,000	• Capital Costs → System software, hardware, communications, sensors, position determination, kiosk, systems integration, etc. • O&M Costs → Staffing & communications

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Broadcast Traveler Information • Basic Information Broadcast • Personal Basic Information Reception	$862,500 $172,500	$632,500 $57,500	• Capital Costs → System software, hardware, communications, sensors, position determination, kiosk, systems integration, etc. • O&M Costs → Staffing & communications • Assumes → 100 PDAs & Route Guidance

Project Name:
Interactive Traveler Information

Project Description:
This project is an extension of the Broadcast Traveler Information project. It takes the same consolidated information database and makes it available in interactive form. This will allow for travelers to obtain more targeted information that will assist them in travel decisions. Possible applications in the Central Coast include 511 telephone-based systems (both wireline and wireless), and interactive kiosks. In all likelihood, this will be an Internet-based/website application. It is expected that, once the information from multiple sources is consolidated, that Agencies and private entities may choose to install kiosks at appropriate locations. The kiosk would be ideally situated to help alleviate the problem of information distribution. These locations cannot be pre-determined, but are likely to include airports, hotels, offices, event centers, etc. Any computer and hand-held devices that can access the Internet will also be able to tap into this information.

Relationship to Other Projects:
- This information brings information from multiple projects together → transit, traffic, incident management, emergency management, and parking

Specific Problems or Needs Addressed:
- Travel information needs for transit, congestion, emergencies
- Users would have access to up-to-date, across-the-board information form all transportation providers

Traveler and Agency Benefits:
- Improved information for route choice
- Reduce travel time and delays
- Immediate knowledge of traffic/transit conditions, enabling better decisions and information to the public
- Improved mobility and service responsiveness
- Access to real-time information on transit network
- Service efficiency and resource management

Relationship to ITS Market Packages:
- Part of the Interactive Traveler Information market package
- Part of the Traveler Information Dissemination market package
- Supports and is supported by a variety of other market packages → Network Surveillance, Regional Traffic Control, Planning Data Collection, Incident Management System, and Transit Management

Relationship to the Regional ITS Architecture:
- Part of the Personal Information Access (Traveler) and Information Service Provided (Center) subsystems
- Related to the Remote Traveler Support (Traveler), Traffic Management (Center), Transit Management (Center), and Emergency Management (Center) subsystems

Time Frame:
- Medium-term

Implementing Agency:
- Caltrans D5, local Agencies, SCCRTC, AMBAG, MST, SLOCOG, SBCAG, and Information Service Providers (ISPs)

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Smart Traveler Services • Personal Device • In-Vehicle Device • Interactive Kiosk • Info Service Providers (ISPs)	 $805,000 $575 $23,000 - $46,000 $1.15 mil. - $2.3 mil.	 $345,000 - $575,000 $230 $11,500 – $57,500 $345,000	• Capital Costs → System software, hardware, communications, sensors, position determination, kiosk, systems integration, etc. • O&M Costs → Staffing & communications

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Interactive Traveler Information • Interactive Infrastructure Information • Remote Interactive Reception	 $747,500 $1.15 mil.	 $230,000 $115,000	• Capital Costs → System software, hardware, communications, sensors, position determination, kiosk, systems integration, etc. • O&M Costs → Staffing & communications • Assumes → 40 Kiosks & Pre-Trip Planning

Project Name:
Yellow Pages and Reservation

Project Description:
This project enhances the Interactive Traveler Information package by providing an interactive yellow pages directory with reservation capabilities. In the Central Coast, it is envisioned that this capability will be implemented by the private sector through access to the Internet. Public Agencies can be involved by providing information and capabilities on the Internet that can be accessed from either fixed or mobile media. Examples would involve the ability to make a dial-a-ride reservation through an Internet site or to update one's smart card account. From the private side, a host of information and reservation applications are possible → hotel, rental car, dinner, theater, etc. Focusing these applications through the Internet will ensure the broadest possible access.

Relationship to Other Projects:
- This project could be an add-on service to Interactive Traveler Information

Specific Problems or Needs Addressed:
- Travel information needs

Traveler and Agency Benefits:
- More convenient means of obtaining targeted information and making reservations

Relationship to ITS Market Packages:
- Part of the Yellow Pages and Reservation market package
- Linked to a wide range of other applications → Demand Response Transit Operations, Transit Traveler Information, and Real-Time Transit Schedule Information

Relationship to the Regional ITS Architecture:
- Part of the Remote Traveler Support (Traveler) and Information Service Provider (Center) subsystems
- Related to Traffic Management (Center), Transit Management (Center), and Information Service Provider (Center) subsystems

Time Frame:
- Short-term

D5

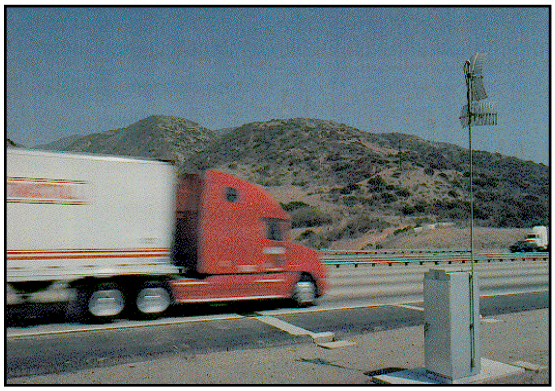
Implementing Agency:
- Caltrans, CHP, local Agencies, ISPs, and the private sector in general

COMMERCIAL VEHICLE OPERATIONS (CVO)

Electronic Clearance A-75
Commercial Vehicle Administrative Processes..... A-75
Weigh-in-Motion (WIM) A-75
Roadside CVO Safety A-75
HazMat Management..... A-75
Monterey Bay Regional Freight Logistics Center A-77

Project Name:
Commercial Vehicle Operations (CVO) Projects

- Electronic Clearance
- Commercial Vehicle Administrative Processes
- Weigh-in-Motion
- Roadside CVO Safety
- HazMat Management



Project Description:
These projects are grouped together because they represent a class of projects that fall into the domain of a combination of the State of California and the private sector. Strategies association with these projects are generally determined and budgeted in Sacramento. However, these projects can benefit the Central Coast through the facilitation of goods movement into, out of, and through the Region. The most pertinent to Central Coast strategies is HazMat Management. The CHP, fire departments, and emergency medical services are charged with managing hazardous materials incidents, and Caltrans D5 may supply cleanup and traffic management support. The principal local initiatives to be considered include public notification (through a variety of information outlets discussed in other projects), resource deployment (HazMat cleanup teams), and traffic management. Law enforcement and emergency service Agencies generally keep logs of resources that may be required for dealing with HazMat incidents. The availability of this information electronically through enhanced CAD systems or other similar systems can improve response.

Relationship to Other Projects:

- Communications would be tied into the Caltrans D5 TMC
- Various traveler information systems/technologies would be available for CVO use

Specific Problems or Needs Addressed:

- Goods movement into, out of, and through the Region
- Knowledge of the whereabouts of CVOs hauling HazMat loads
- Improve ability to plan roadway maintenance and rehabilitation due to excess heavy freight movements
- Traveler information for CVO use

Traveler and Agency Benefits:

- Improve goods movement into, out of, and through the Region
- Provide timely information to truckers road network status
- Reduces recurring congestion and to some extent incident-related congestion by reducing the quantity of freight truck movement on the road network

Relationship to ITS Market Packages:

- Electronic Clearance, Commercial Vehicle Administrative Processes, Weigh-in-Motion, Roadside CVO Safety, and HazMat Management are each a market package

Relationship to Regional ITS Architecture:

- Part of the Freight and Fleet Management (Center), Commercial Vehicle Administration (Center), Commercial Vehicle Check (Roadside), and Commercial Vehicle (Vehicle) subsystems

Time Frame:
- Long-term

Implementing Agency:
- California Department of Motor Carriers, Caltrans D5, CHP, and California Trucking Association

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Automated Roadside Safety Inspection • Vehicle • Inspection Site	$2,300 $57,500 - $86,250	$57,500 - $115,000 $5,750	• Capital Costs → On-board electronic sensors & monitors, roadside beacons, hand-held devices, software, hardware, communications, systems integration, etc. • O&M Costs → Staffing & communications
CVO Fleet Management • Vehicle • Fleet Mgt. Center	$2,300 $575,000 - $1.15 mil.	$230-288 $172,500 - $230,000	• Capital Costs → Vehicle location system, condition & cargo monitoring, vehicle manifest data, data radio communications system, software, hardware, systems integration, etc • O&M Costs → Staffing & communications
CVO Electronic Clearance • Vehicle • Border Checkpoint	$920 - $1,150 $345,000 - $460,000	$230 $34,500 - $57,500	• Capital Costs → ID tags, roadside readers, software, hardware, communications, systems integration, etc. • O&M Costs → Staffing & communications
CVO Administrative Processes • Fleet Mgt. Center • Administrative Center	$575,000 $690,000	$460,000 $460,000	• Capital Costs → System software, hardware, communications, systems integration, etc. • O&M Costs → Staffing & communications
On-Board Safety Monitoring • Vehicle • Commercial vehicle	$345 $1,725	$23 - $57 $575 - $1,150	• Capital Costs → System software, hardware, data communications, position determination, systems integration, etc. • O&M Costs → Staffing & communications

Project Name:
Monterey Bay Regional Freight Logistics Center

Project Description:
This project involves the conduct of a detailed feasibility assessment of the development of a regional freight logistics center for the Salinas Valley of the Monterey Bay area, a combination of urban and rural areas. Current shipping practices and communications in the fresh fruit and vegetable industry contribute to congested arterials and highways as truck drivers, unable to receive information on load availability, must make multiple trips to a site to check on load status. A truck driver typically stays 1.5 to 3 days in Salinas to fulfill their load obligations. A freight logistics center would provide centralized communication among the coolers, the trucking company dispatch centers and/or drivers, and a central dispatch facility. The central dispatch facility would receive real-time information from the coolers about load availability, parking availability, and traffic conditions (via the Caltrans D5 TMC). A large central staging area or, alternatively, several distributed staging areas and a large truck stop would also be included in the analysis. The assessment will incorporate the following aspects

- Project definition
- Site(s)-specific evaluation(s) and selection
- Site(s) master plan development
- Engineering cost estimates
- Estimates of potential truck revenues
- Financing recommendations
- Truck count and survey study to model expected community traffic benefits
- An extensive National ITS Architecture compliant communications system is expected to be the backbone of this study

A Regional Freight Logistics Center may be found feasible and recommended from this proposed assessment. Thus, this ITS sample project information sheet includes both the feasibility assessment as well as the development of the logistics center itself.

Relationship to Other Projects:

- If found feasible, a Regional Freight Logistics Center would reduce congestion on local roads and highways in and around Salinas due to agricultural freight movement
- As such, it could be considered potentially preemptive to some infrastructure enhancements and maintenance
- Additionally, if implemented, communications would be tied into the Caltrans D5 TMC

Specific Problems or Needs Addressed:

- Recurring congestion in Salinas and the surrounding highway network
- Incident-related congestion due to more frequent roadway maintenance and rehabilitation due to excess heavy freight movement
- Provision of facilities (lodging, food, recreation, etc.) for truck drivers waiting on their loads
- Integrated communications for truck drivers checking on the availability of their loads and the condition of the road network

Traveler and Agency Benefits:
- Provide timely information to truckers on load availability and road network status
- Reduces recurring congestion and to some extent incident-related congestion by reducing the quantity of freight truck movement on the road network
- Provides facility whereby truckers are able spend downtime

Relationship to ITS Market Packages:
- Part of the Automated Dispatch/Information System market package

Relationship to Regional ITS Architecture:
- Part of the Freight and Fleet Management (Center) subsystem

Time Frame:
- 2001 for Feasibility Assessment
- By 2006 for Logistics Center (if warranted)

Implementing Agency:
- Feasibility Assessment
    - AMBAG would be the lead Agency
    - Supporting partners include Caltrans, California Trucking Association, Grower-Shipper Vegetable Association of Central California, Monterey County Agricultural Commissioner's Office, Monterey County Farm Bureau, City of Salinas, and Transportation Agency for Monterey County
- Logistics Center
    - Project lead TBD

Possible Funding Sources:
- Feasibility Assessment → TEA-21 (ITS and TCSP)
- Logistics Center → TBD

Follow-up Actions:
- Work with potential funding Agencies, legislative representatives, and project partners to achieve funding for detailed feasibility assessment
- Project sponsor and partners to develop action plan for Logistics Center based on feasibility assessment recommendations

EMERGENCY MANAGEMENT & ENFORCEMENT

Emergency Response A-80
Emergency Vehicle Signal Priority Systems A-82
Mayday Support A-84
Enforcement Projects A-86

Project Name:
Emergency Response

Project Description:
This project involves a series of strategies that may be employed to enhance the response of law enforcement and emergency services and use their resources more efficiently. These strategies may include:

- Improvements to intra- and inter-Agency communications systems
- Emergency vehicle tracking/AVL systems
- Enhanced Computer-Aided Dispatch (CAD) systems
- Working with the private sector to extend cellular phone coverage to more rural areas

The State of California is considering a major upgrade to the communications systems for the CHP and associated Agencies. Other Agencies in the Central Coast should support and coordinate with this initiative so that the resulting communications system allows for seamless communications with local Agencies, for more efficient handling of incidents. Currently, Agencies must go through their dispatchers to convey messages from one Agency to another. Cellular phones are sometimes used to supplement Agency radio systems, but during major events, the public cell phone system may be clogged.

Tracking of emergency vehicles through GPS/AVL systems is an important consideration that goes along with the communications upgrade. This would allow for rapid identification of the location of response units and reduced response times. State and Local Agencies will be making decisions on these systems in the coming years based on cost and perceived benefit.

Decisions on enhanced CAD systems are generally tied together with these other two systems. Over time, it is expected that more emergency service vehicles will be equipped with on-board terminals from which a variety of functions can occur, from checking criminal records to being able to display traffic information. Other public Agencies, such as Caltrans D5, can enhance the usefulness of these systems by designing information so that it can be readily integrated into the enhanced CAD systems.

Finally, the upgrading of the cellular phone network can have a variety of benefits, in terms of improved incident detection in rural areas to improved communications among emergency service Agencies during incident response. Caltrans and the CHP should work with the private sector to encourage further development of the cellular network throughout the Central Coast.

Relationship to Other Projects:

- These four activities are highly inter-related among themselves and with incident management initiatives of Caltrans and CHP

Specific Problems and Needs Addressed:

- Need for faster emergency response
- Need for better field communications among emergency service Agencies
- Need for optimum resource allocation to enable coverage of all emergencies

Traveler and Agency Benefits:
- Faster response for citizens in accident/emergency situations
- Better use of CHP and other emergency service personnel and resources
- Reduced delays from faster incident response

Relationship to ITS Market Packages:
- All of these can be considered elements of the Emergency Management market package

Relationship to the Regional ITS Architecture
- Part of the Emergency Management (Center) and Emergency Vehicle (Vehicle) subsystems

Time Frame:
- Short-term (but up to State of California and local emergency service Agency budgeting decisions)

Implementing Agency:
- CHP, local police and sheriff's departments, fire departments, and emergency medical services

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Emergency Vehicle Management • Vehicle • Emergency center	$3,450 $57,500 - $86,250	$460 $115,000	• Capital Costs → On-board electronic sensors, software, hardware, communications, systems integration, etc. • O&M Costs → Staffing & communications

Project Name:
Emergency Vehicle Signal Priority System

Project Description:
Traffic signals disrupt the progress of emergency vehicles by causing them to slowdown or stop. Since other vehicles in cross-traffic appear to have the right-of-way, hazardous situations occur at intersections. The purpose of this project is to pre-empt traffic signals to give specially equipped emergency vehicles the right-of-way. Basically, the emergency vehicle activates (via radio signals, audial/sirens, etc.) a signal pre-emption phase (within an equipped intersection traffic controller), giving a green light to the on-coming emergency vehicle and switching all pedestrian crossings to the "DON'T WALK" message. The green light can be held for a pre-set time between 5-45 seconds. A visual verification system, usually consisting of a white light and a blue light, is installed next to the regular traffic signal. When the white light is activated, this confirms to the emergency vehicle driver that it has been given the right-of-way. The blue light indicates that the intersection is being controlled by an emergency vehicle approaching from another direction. An in-vehicle verification system could also be used.

Relationship to Other Projects:
- Inter-related to traffic signal control, signal coordination strategies, and central traffic control
- Inter-related to emergency vehicle tracking/AVL systems
- Could be coordinated with transit signal priority systems
- Could be coordinated with the Caltrans D5 TMC

Specific Problems and Needs Addressed
- Potentially hazardous situations at signalized intersections
- Emergency vehicle delays passing through an intersection
- Disruption to traffic flow at intersections

Traveler and Agency Benefits:
- Improved intersection safety (vehicle and pedestrian)
- Reduction in emergency vehicle response times
- Overall smoother flow of traffic when an emergency vehicle passes through an intersection

Relationship to ITS Market Packages:
- Part of the Emergency Routing market package
- Related to the Surface Street Control market package

Relationship to the Regional ITS Architecture
- Part of the Emergency Management (Center), Traffic Management (Center, Roadway (Roadside), and Emergency Vehicle (Vehicle) subsystems

Time Frame:
- Short- to long-term (depending upon the local community)

Implementing Agency:
- Emergency medical services and local Agency traffic departments

Potential Costs:

Central Coast ITS Project	Capital Cost (per unit)	Project Admin. (10%)	Reqs. & Design (15%)	Installation & Integration (15%)	Testing & Evaluation (10%)	Total Cost	O&M (per year) (10%)	Comments
Emergency Routing								
• Signal Pre-Emption (vehicle)	$2,300	$2300	$345	$345	$230	$3,450	$230	Per transit vehicle
• Signal Pre-Emption (int.)	$5,750	$575	$862	$863	$575	$8,625	$575	Per intersection

Project Name:
Mayday Support

Project Description:
Mayday systems have the potential in rural areas to dramatically reduce response times to collisions, and as the number of deployed systems grows, emergency service providers must be in a position to fully respond to mayday calls. It is expected that mayday systems themselves will be a private initiative, similar to the General Motors "OnStar" system, in which motorists in trouble can directly access their mayday provider, who can then take an action (e.g., send a tow truck), or notify public authorities. It is hoped that the private providers will screen the emergencies so that only those true emergencies will be reported to the authorities for response. This is particularly important in rural areas, given the commitment of resources to respond to incidents in remote areas.

This project involves CHP and other emergency service coordination with private providers to make this system as efficient an error-free as possible. Extension of cellular phone coverage into more rural areas will also assist in providing a more efficient emergency response, and the CHP and local police/sheriffs offices should coordinate with the communications companies in this regard.

Relationship to Other Projects:
- Information from the Caltrans D5 TMC may be useful in facilitating emergency response
- Likewise, information on incidents that comes through the mayday system may be appropriate for inclusion in TMC incident logs for notification of other parties

Specific Problems and Needs Addressed:
- Typically long emergency response times in rural areas
- False calls in rural areas, resulting in waste of resources

Traveler and Agency Benefits:
- Faster response times
- Better utilization of agency resources

Relationship to ITS Market Packages:
- Part of Mayday Support market package.
- Related to Emergency Management market package.

Relationship to the Regional ITS Architecture:
- Part of the Emergency Management (Center) and Emergency Vehicle (Vehicle) subsystems

Time Frame:
- Coordination should be initiated immediately with the private sector to explore expansion in cellular coverage and coordination of mayday and Public Safety Answering Points

Implementing Agency:
- CHP and local police and sheriffs' departments

Potential Costs:

System Topic	Capital Cost (per unit)	O&M Cost (per year)	Comments
Emergency Notification & Personal Security • Personal or In-Vehicle Device • Fixed Location (on kiosks) • Emergency Center (incremental)	$575 - $1,150 $115 - $173 $172,500	$115 - $230 $1,150 $5,750 - $11,500	• Capital Costs → On-board electronic sensors, software, hardware, communications, systems integration, etc. • O&M Costs → Staffing & communications

Project Name:
Enforcement Projects
- Red Light Enforcement
- Stop Sign Enforcement
- Neighborhood Speed Monitoring

Project Description:
Technologies have become available that can automate certain enforcement functions. One of those which is rapidly increasing in popularity is red light enforcement. This is intended to reinforce safer driver behavior by monitoring movement through signalized intersections, taking a picture of the license plate of violating vehicles, and sending either a warning or a ticket to the offending party by mail. Cities implementing such systems have noted a reduction in red light violations. The technology is implemented through cameras mounted at intersections, having the ability to detect when vehicles have passed through on red and to photograph the license plate.

Similar technology can detect the failure to stop at "STOP" signs or to detect speeding vehicles in neighborhoods. All of these types of projects, because they are controversial, need to come through local initiatives. Local Agencies can support the decision-making process by clearly explaining the intent and to ensure that systems are properly working. Improperly working equipment can easily cause ill feelings and credibility problems in the community. These strategies are best applied by targeting them to known problem areas.

Relationship to Other Projects:
- In general, these are stand-alone projects, but require coordination with the Departments of Motor Vehicles to trace license numbers.

Specific Problems and Needs Addressed:
- Unsafe driving behavior such as speeding and failure to stop

Traveler and Agency Benefits:
- Low-cost method of enforcing good driver behavior

Relationship to ITS Market Packages:
- Part of the Enforcement market package

Relationship to the Regional ITS Architecture:
- Part of the Emergency Management (Center) subsystem

Time Frame:
- Systems exist for immediate implementation (but decisions will come through local initiatives)

Implementing Agency:
- CHP and local police and sheriffs' departments

Possible Funding Sources:
- Some companies install systems for free (if given permission to collect fines and share portion of fine with local jurisdictions)

Appendix B

CCITS Regional Architecture

MPO Turbo Database Samples

System Inventory

Operational Concept

Functional Requirements

System Interconnects

Architecture Data Flows

ITS Standards

SYSTEM INVENTORY

Central Coast TMC Agencies

Element: Other Central Coast TMCs *Status:* Planned
Description: Traffic Management Centers operated by other Central Coast Agencies outside of AMBAG tri-County area

Central Coast Transit Agencies

Element: Other Central Coast Smart Cards *Status:* Planned
Description: Transit (and parking) Smart Card issued by other Central Coast Transit Agencies

Element: Other Central Coast Transit Agencies *Status:* Existing
Description: Other Central Coast Transit Agencies

City of Monterey

Element: Monterey (City) Parking Management System *Status:* Existing
Description: System to maintain counts of parked vehicles

Element: Monterey (City) TMC *Status:* Programmed
Description: Traffic Management Center for the City of Monterey (field equipment to be installed (winter/spring 2006)

City of Salinas

Element: Salinas TMC *Status:* Planned
Description: Traffic Management Center for the City of Salinas

City of Santa Cruz

Element: Santa Cruz (City) TMC *Status:* Planned
Description: Traffic Management Center for the City of Santa Cruz

Council of San Benito County Governments (SBtCOG)

Element: SBtCOG Planning *Status:* Existing
Description: Transportation planning and data services for SBtCOG

Element: SBtCOG San Benito Rideshare *Status:* Existing
Description: Ride matching system for San Benito County area (http://www.sanbenitorideshare.org/) The architecture joins demand-responsive transit operators and rideshare providers in one dial-a-ride operators category that should be carefully considered and re-evaluated for applicability in future architecture updates

Monterey County Local Agencies

Stakeholders in this group:

City of Salinas
City of Marina
City of Monterey
City of Seaside
City of Greenfield
City of Soledad
City of King City
City of Pacific Grove
City of Gonzales

Element: Monterey County Emergency Medical Services *Status:* Existing
Description: Monterey County EMT/ambulance system

Monterey Parking (City and Private)

Element: Monterey County Parking (Monterey, Carmel, and Private) *Status:* Planned
Description: Various parking lots/systems in Monterey County

Monterey-Salinas Transit (MST)

Element: MST (Monterey-Salinas Transit) *Status:* Existing

OPERATIONAL CONCEPTS

Stakeholder: City of Monterey

Role/Area: Incident Management in Monterey County

Incident management activities in Monterey County

Responsibilities:

1) Notify/coordinate with emergency service providers (CHP, local Agency) about detected incidents on local roads, as appropriate (Planned)
2) Monitor transportation network and roadside equipment status from TMC (Planned)
3) Modify signal system and other roadway equipment settings, as needed to mitigate the impact of the incident (Planned)
4) Issue advisories to the media, as needed (Planned)

Role/Area: Parking Management in Monterey County

Operation and maintenance of parking facilities in Monterey County

Responsibilities:

1) Monitor status (available spaces) of City-operated parking facilities (Existing)
2) Route traveler vehicles to nearby parking facilities that have parking available (Planned)

Role/Area: Surface Street Management for AMBAG Regionally Significant ITS

Responsibilities:

1) Coordinate traffic signal operations with other TMCs in the Region as appropriate (Planned)

Role/Area: Surface Street Management in Monterey County

Management of the traffic signal system in Monterey County

Responsibilities:

1) Operate and maintain (surface street) traffic signal system (Existing)
2) Manage (surface street) traffic signal system from TMC (Planned)

Role/Area: Traveler Information in Monterey County

Local/County-wide transportation information dissemination

Responsibilities:

1) Update traveler information systems, as needed (Planned)

FUNCTIONAL REQUIREMENTS

Architecture	Status
AMBAG Regionally Significant ITS	Existing
Element: **SC Metro (Santa Cruz Metropolitan Transit District)**	
Entity: **Transit Management**	
Functional Area: **Transit Center Fare and Load Management** Management of fare collection at the center - includes setting and distributing fare information, central processing of fares for transit as well as other ITS services, links to financial institutions and enforcement agencies.	
Requirement: 11 The center shall exchange fare and load information with other transit management centers, including potential Centralized Payments facilities.	Planned
Requirement: 12 The center shall provide transit fare information to other centers, including traveler information providers upon request.	Planned
Functional Area: **Transit Center Information Services** Provide interactive traveler information to travelers (on-board transit vehicles, at stops/stations, using personal devices), traveler information service providers, media, and other transit organizations. Includes routes, schedules, transfer options, fares, real-time schedule adherence, current incidents, weather conditions, yellow pages, and special events.	
Requirement: 3 The center shall exchange transit schedules, real-time arrival information, fare schedules, and general transit service information with other transit organizations to support transit traveler information systems.	Planned
Element: **SCCRTC 511**	
Entity: **Information Service Provider**	
Functional Area: **ISP Traveler Data Collection** Collects traveler information from other centers, consolidates and refines the collected data, and makes this data available to traveler information applications.	
Requirement: 10 [User Defined] The center shall collect, process, and store Regional traffic and highway condition information, including incident information, detours and road closures, event information, recommended routes, and current speeds on specific routes.	Planned
Requirement: 11 [User Defined] The center shall collect, process, and store Regional transit routes and schedules, transit transfer options, transit fares, and real-time schedule adherence information.	Planned
Requirement: 12 [User Defined] The center shall collect, process, and store Regional parking information, including location, availability, and fees.	Planned
Functional Area: **Interactive Infrastructure Information** Collection, processing, storage, and personalized dissemination of traffic, transit, maintenance and construction, multimodal, event, and weather information to traveler interface systems and vehicles, upon request.	
Requirement: 18 [User Defined] The center shall collect, process, store, and disseminate customized Regional traffic and highway condition information to travelers, including incident information, detours and road closures, recommended routes, and current speeds on specific routes within the Region upon request.	Planned

SYSTEM INTERCONNECTS

Santa Barbara Metropolitan Transit District (SBMTD) (Existing)

Santa Barbara County Local ITS

Is or will be connected to: Central Coast Dial-A-Ride Operators (Existing)

Is or will be connected to: Santa Barbara MTD AVL (Planned)

Is or will be connected to: Santa Barbara MTD Kiosks (Existing)

Is or will be connected to: Santa Barbara MTD Website (Existing)

Santa Barbara Regionally Significant ITS

Is or will be connected to: Caltrans D4 TMC (Existing)

Is or will be connected to: Caltrans D5 TMC (Existing)

Is or will be connected to: City of Lompoc Transit (COLT) (Existing)

Is or will be connected to: Other Central Coast Transit Agencies (Existing)

Is or will be connected to: Santa Barbara County TMC (Programmed)

Is or will be connected to: Santa Ynez Valley Transit (SYVT) (Existing)

Is or will be connected to: SBCAG Planning (Existing)

Santa Barbara MTD AVL (Planned)

Santa Barbara County Local ITS

Is or will be connected to: Santa Barbara Metropolitan Transit District (SBMTD) (Existing)

Santa Barbara MTD Kiosks (Existing)

Santa Barbara County Local ITS

Is or will be connected to: Santa Barbara Metropolitan Transit District (SBMTD) (Existing)

Santa Barbara MTD Website (Existing)

Santa Barbara County Local ITS

Is or will be connected to: Santa Barbara Metropolitan Transit District (SBMTD) (Existing)

Santa Ynez Valley Transit (SYVT) (Existing)

Santa Barbara County Local ITS

Is or will be connected to: Central Coast Dial-A-Ride Operators (Existing)

Santa Barbara Regionally Significant ITS

Is or will be connected to: Caltrans D4 TMC (Existing)

Is or will be connected to: Caltrans D5 TMC (Existing)

Is or will be connected to: City of Lompoc Transit (COLT) (Existing)

Is or will be connected to: Other Central Coast Transit Agencies (Existing)

Is or will be connected to: Santa Barbara Metropolitan Transit District (SBMTD) (Existing)

ARCHITECTURE DATA FLOWS

To: San Luis Obispo County Signal Pre-Emption (Existing)
- Planned flow: roadway equipment coordination
- Planned flow: signal control data
- Planned flow: traffic sensor control
- Planned flow: video surveillance control

Data flows from: SCAT (South County Area Transit) (Existing)

San Luis Obispo County Local ITS

To: SCAT AVL (Planned)
- Planned flow: bad tag list
- Planned flow: fare management information
- Planned flow: vehicle location

To: SCAT Kiosks (Planned)
- Planned flow: transit and fare schedules
- Planned flow: transit request confirmation
- Planned flow: transit traveler information

To: SCAT Next Bus CMS (Planned)
- Planned flow: transit traveler information

To: SCAT Smart Card (Planned)
- Planned flow: bad tag list
- Planned flow: fare and payment status
- Planned flow: fare management information
- Planned flow: request for bad tag list
- Planned flow: transit fare coordination
- Planned flow: transit vehicle passenger and use data

Data flows from: SCAT AVL (Planned)

San Luis Obispo County Local ITS

To: SCAT (South County Area Transit) (Existing)
- Planned flow: fare and payment status
- Planned flow: request for bad tag list
- Planned flow: transit vehicle location data
- Planned flow: transit vehicle passenger and use data
- Planned flow: transit vehicle schedule performance
- Planned flow: vehicle location

Data flows from: SCAT Kiosks (Planned)

San Luis Obispo County Local ITS

To: SCAT (South County Area Transit) (Existing)
- Planned flow: transit information request
- Planned flow: transit information user request

Data flows from: SCAT Next Bus CMS (Planned)

San Luis Obispo County Local ITS

To: SCAT (South County Area Transit) (Existing)
- Planned flow: transit information user request

Data flows from: SCAT Smart Card (Planned)

ITS STANDARDS

Regional Standards

9/28/2007 11:35:23AM

Standards for San Benito County Local ITS *status:* Existing

⚠NOTE: The ITS standards presented in this report may represent a superset of options, and in some cases, provide redundant capabilities. In addition, these ITS standards are at different maturity levels. Care should be taken to select the standards that best meet the needs of the region or project.

Lead SDO	Standard Name	Version	Document ID
AASHTO/ITE/NEMA	NTCIP Center-to-Center Standards Group		(See Footnote)
AASHTO/ITE/NEMA	NTCIP Center-to-Field Standards Group		(See Footnote)
AASHTO/ITE/NEMA	Global Object Definitions		NTCIP 1201
AASHTO/ITE/NEMA	Object Definitions for Actuated Traffic Signal Controller Units		NTCIP 1202
AASHTO/ITE/NEMA	Object Definitions for Dynamic Message Signs (DMS)		NTCIP 1203
AASHTO/ITE/NEMA	Environmental Sensor Station (ESS) Interface Standard		NTCIP 1204
AASHTO/ITE/NEMA	Object Definitions for Closed Circuit Television (CCTV) Camera Control		NTCIP 1205
AASHTO/ITE/NEMA	Object Definitions for Data Collection and Monitoring (DCM) Devices		NTCIP 1206
AASHTO/ITE/NEMA	Object Definitions for Ramp Meter Control (RMC) Units		NTCIP 1207
AASHTO/ITE/NEMA	Object Definitions for Closed Circuit Television (CCTV) Switching		NTCIP 1208
AASHTO/ITE/NEMA	Data Element Definitions for Transportation Sensor Systems (TSS)		NTCIP 1209
AASHTO/ITE/NEMA	Field Management Stations - Part 1: Object Definitions for Signal System Masters		NTCIP 1210
AASHTO/ITE/NEMA	Object Definitions for Signal Control and Prioritization		NTCIP 1211
AASHTO/ITE/NEMA	TCIP Common Public Transportation (CPT) Objects		NTCIP 1401
AASHTO/ITE/NEMA	TCIP Incident Management (IM) Objects		NTCIP 1402
AASHTO/ITE/NEMA	TCIP Passenger Information (PI) Objects		NTCIP 1403
AASHTO/ITE/NEMA	TCIP Scheduling/Runcutting (SCH) Objects		NTCIP 1404
AASHTO/ITE/NEMA	TCIP Spatial Representation (SP) Objects		NTCIP 1405

Appendix C

Systems Engineering Review Form (SERF)

SERF Form (Template/Instructions)

City of Calameda Signal Upgrade SERF (Sample)

City of Los Diablos Transit SERF (Sample)

METRO Electronic Toll Collection SERF (Sample)

SERF Form
(Template/Instructions)

SYSTEMS ENGINEERING REVIEW FORM (SERF)

This form needs to be filled out for all ITS projects. For all major ITS projects, this completed form needs to be submitted to FHWA for review and approval prior to PE authorization (Phase 1 PE authorization).

For all major ITS projects, a Systems Engineering Management Plan (SEMP), which includes the seven items below, must be submitted to FHWA for review and approval, prior to PE authorization for component detailed design (Phase 2 PE authorization). Required FHWA approvals are limited to major ITS projects.

For guidance in filling out the seven items below, see last part of this exhibit.

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

_____
_____
_____
_____

2. Identification of participating agencies roles and responsibilities:

_____
_____
_____
_____
_____

3. Requirements definitions:

_____
_____
_____
_____
_____

4. Analysis of alternative system configurations and technology options to meet requirements:

_____
_____
_____
_____
_____

5. Procurement options:

_____
_____
_____
_____
_____

6. Identification of applicable ITS standards and testing procedures:

_____
_____
_____
_____
_____

7. Procedures and resources necessary for operations and management of the system:

_____
_____
_____
_____
_____

Address the above items to the degree possible at Field Review stage AND acknowledge commitment to address during system design in the early stages of the SE process.

1. Identification of portions of the RA being implemented:

   [Identify which market packages, physical subsystems, information flows, and market packages are being completed as part of the project and how these pieces are part of the RA.]

2. Identification of participating agencies roles and responsibilities (concept of operations):

   [For the market packages to be implemented, define the high-level operations of the system, including where the system will be used, functions of the system capabilities, performance parameters, the life cycle of the system, and who will operate and maintain the system. Establish requirements or agreements on information sharing and traffic device control responsibilities. The RA Operational Concept is a good starting point for discussion.]

3. Requirements definitions:

   [Based on the concept of operations in 2. above, define the "what" and not "how" of the system. During early stages of the SE process these will be broken down into detailed requirements for eventual detailed design. The applicable high-level functional requirements from the RA are a good starting point for discussion. A review of the requirements by the project stakeholders is recommended]

4. Analysis of alternative system configurations and technology options to meet requirements:

   [The analysis of system alternatives should outline the strengths and weaknesses, technical feasibility, institutional compatibility, and life cycle costs of each alternative. The project stakeholders should have input in choosing the preferred solution.]

5. Procurement options:

   [Some procurement (contracting) options to consider include: consultant design/low bid contractor, systems manager, systems integrator, task order, and design/build. Deciding on the best procurement option should consider the level of agency participation, compatibility with existing procurement methods, role of system integrator, and life cycle costs.]

6. Identification of applicable ITS standards and testing procedures:

   [Include documentation on which standards will be incorporated into the system design and justification for any applicable standards not incorporated. The standards report from the RA is a good starting point for discussion.]

7. Procedures and resources necessary for operations and management of the system:

   [In addition to the concept of operations in 2. above, document any internal policies or procedures necessary to recognize and incorporate the new system into their current operations and decision processes. Resources necessary to support continued operations, including staffing and training must also be recognized early and be provided. Such resources must also be provided to support necessary maintenance and upkeep to ensure continued system viability.]

City of Calameda

Signal Upgrade SERF

(Sample)

SYSTEMS ENGINEERING REVIEW FORM
Re: City of Calameda Signal Upgrade
Federal Aid No. CML 5000 (001)

1. Identification of portions of the Regional ITS Architecture being implemented:
   City of Calameda Public Works is represented generically in the Bay Area Regional Intelligent Transportation System Plan as Surface Street Control (ATMS3) market package. This package is described in the Appendix E of the Bay Area ITS Plan.

2. Identification of participating agencies roles and responsibilities:
   None.
   City of Calameda will utilize the master system capabilities such as intersection displays, counts etc., and bring data back to the Central Computer System.

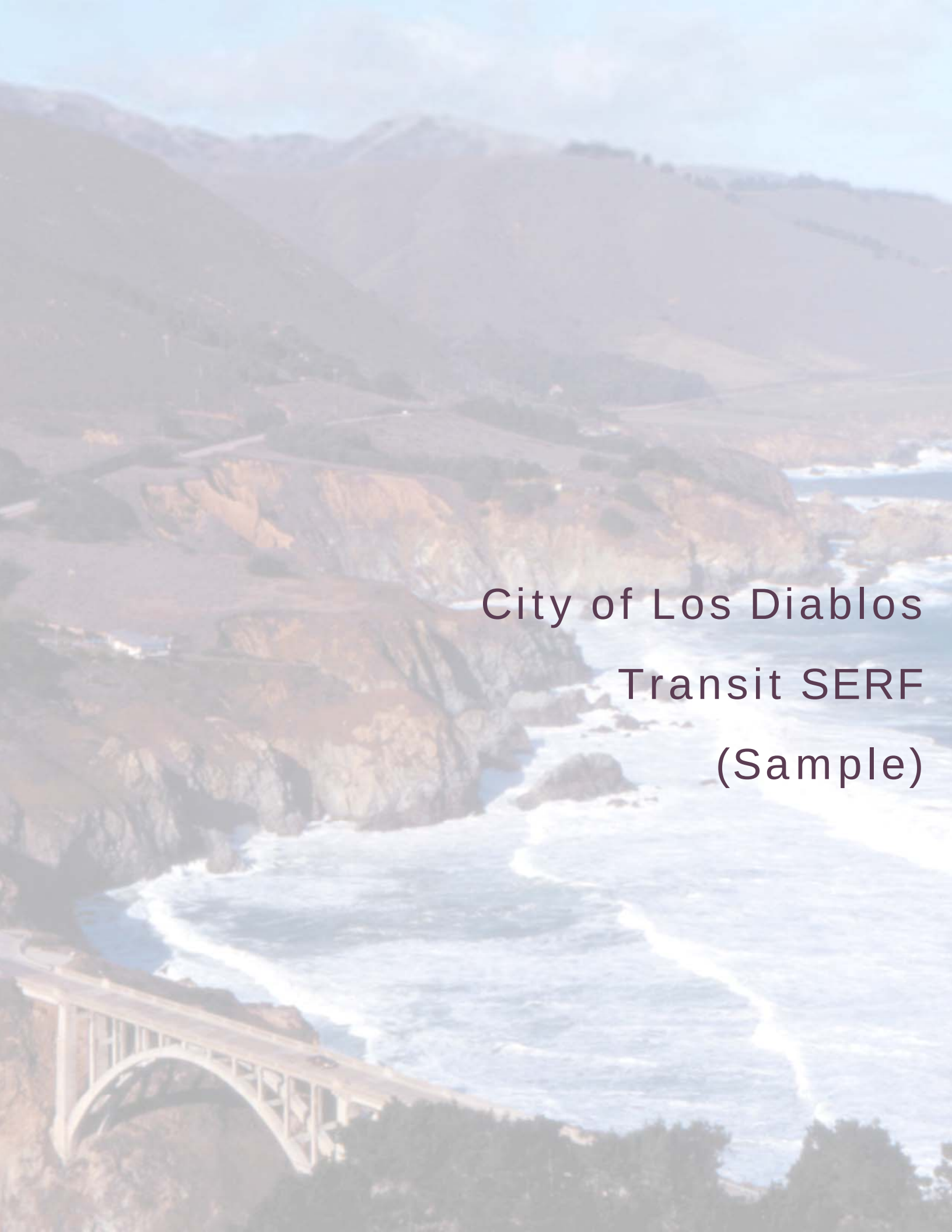
3. Requirements definition:
   N/A

4. Analysis of alternative system configurations and technology options to meet requirements:
   N/A

5. Procurement options:
   City will be purchasing this equipment from the vendor who has supplied compatible equipment for other locations to maintain compatibility of the coordinated system.

6. Identification of applicable ITS standards and testing procedures:
   The only architecture flow involved in this project is surface street control (ATMS3) market package (see Appendix E of Bay Area ITS Plan). This is addressed in NTCIP 1202. However, the new equipment must be compatible with existing system. The project will be NTCIP compliant using existing controllers by adding translator cards for NTCIP communication.

7. Procedures and resources necessary for operations and management of the system:
   Maintain existing 332 cabinet and C1 Connectors at Doomore/Lake Drive. The replacement of existing 170 controllers with TYPE 90 Controllers is required to provide coordination along Lake Drive, Doomore Drive, and Scott Drive.



City of Los Diablos

Transit SERF

(Sample)

Example Project for Systems Engineering Process – Los Diablos *Fast Bus* Project

BACKGROUND INFORMATION

Project Objectives:
Increase transit ridership by substantially reducing travel time for existing express buses on the heavily traveled Hades Street corridor in the City of Los Diablos, California (in Riverside County).

Background:
Local and Express SCAMP buses run every five minutes along this major arterial roadway. Studies show that these buses encounter 20 minutes of delay at the 40 traffic signals on the route. To support the Mayor's new "Go Transit" initiative, Los Diablos DOT (LoDDOT) and Southern California Associated Mobility Providers (SCAMP) aim to reduce this delay to 10 minutes or less for express buses.

Preliminary Planning:
During their monthly golf game, the CEO's of LoDDOT and SCAMP agreed to their first application of preferential treatment for transit vehicles. Technical staff at each agency then conducted a Feasibility Study, including research and site visits, to learn about the current technologies and alternative project designs that have been used elsewhere, plus typical costs.

Description in TIP:
"Preferential Treatment for SCAMP buses on Hades Street in Los Diablos, from Atlantic Road to Pacific Avenue (10 miles) – $500,000."

Description in the Regional ITS Architecture:
This project appears in a generic form in the Inland Empire Regional ITS Architecture –
"IE-13: Transit Vehicle Signal Priority" [See page G-3]

Systems Engineering Review Form (SERF):

See next page.

Systems Engineering Review Form (SERF) for Los Diablos *Fast Bus* Project

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

Project IE-13: "Transit Vehicle Traffic Signal Priority (local agencies)" [see I.E. Reg. Arch., page G-3]

Subsystems: roadway and transit vehicle; Arch. Flows: Local Signal Priority Request.

2. Identification of Participating Agencies roles and responsibilities:

SCAMP will install/operate equipment on buses to issue requests for traffic signal priority [RA, 4-21]

LoDDOT will upgrade signal controllers to receive requests and provide appropriate priority [RA, 4-21]

We will define detailed roles and responsibilities in the Concept of Operations step.

3. Requirements Definitions:

The high-level requirements, as defined in the Regional Architecture, are:

SCAMP Transit Vehicles [RA, 5-19]

- Request signal priority from equipment on the roadside, as appropriate

LoDDOT Roadside Equipment [RA, 5-11]

- Receive vehicle signal priority requests and send to traffic signal controllers
- Provide signal priority at signalized intersections when activated (as appropriate)

We will identify detailed requirements during the project definition phase.

4. Analysis of alternative system configurations and technology options to meet requirements:

Our Feasibility Study indicated that the project budget will constrain our options to "local control" at each intersection, because SCAMP buses will not have AVL until 2010 and LoDDOT will not have a centralized traffic control system until 2009. We will analyze: (1) alternative approaches and technologies for local signal control, (2) alternative schedule-adherence policies for the SCAMP buses, and (3) options for communications between bus and traffic signals.

5. Procurement options:

If this requires two separate contracts, we will hire a Systems Manager to coordinate both projects and perform acceptance tests. We will also consider having one agency lead the project and hire a System Integrator for implementation, plus a System Manager for project definition and acceptance testing. We believe that all components will be "off the shelf" with no software development, so we plan to use fixed-price contract(s) for system installation, and probably T&M for the Systems Manager.

6. Identification of applicable ITS standards and testing procedures:

No information yet. The System Manager will assess and recommend ITS standards during the project definition phase, and will later develop and oversee the system acceptance/validation tests.

7. <u>Procedures and resources necessary for operations and management of the system</u>:
LoDDOT will train their equipment maintenance staff to repair the upgraded signal controllers. SCAMP will repair bad transmitters by swapping out a bad unit and sending it to the factory. In both shops, the existing staff can handle the small additional workload. LoDDOT will have final authority to decide on when and how much extra green time is allowed at each intersection. Full details regarding procedures and resources needed for O&M will be developed during the project definition

.

METRO

Electronic Toll Collection SERF

(Sample)

Systems Engineering Review Form (SERF) for METRO 1-55 Value Pricing Electronic Toll Collection (ETC) and Violation Enforcement (VES) Project

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

The Value Pricing Electronic Toll Collection (ETC) and Violation Enforcement System (VES) are not specifically referenced in the current regional architecture. The regional architecture will be updated in conjunction with the completion of designs for the electronic tolling and violation enforcement systems. METRO has established a schedule to complete the regional ITS architecture update by December,
2006.

2. **Identification of Participating Agencies roles and responsibilities:**

METRO will manage the project with the support of Caltrans, FHWA and CHP. METRO will also seek the support and participation of the I-55 Corridor cities and other public agencies and community groups through a structured outreach process. Detailed roles and responsibilities will be defined during the development of the Concept of Operations.

3. ***Requirements Definitions:***

The high level requirements as defined in the Regional Architecture are:

- Support High Occupancy Toll (HOT) lane management, enforcement and coordination RA, 6-63]
- Develop road pricing and other demand management policies that can alleviate congestion and influence mode selection [RA, 6-63]
- Develop toll/HOV enforcement policies and supporting systems that will enable METRO to accurately, reliably and equitably enforce toll and HOV provisions, while moving a large volume of traffic at freeway speeds.
- Provide an ETC/VES system that incorporates the latest available, proven technologies and equipment to ensure chosen road pricing and enforcement strategies are successfully implemented.
- Improve the violation rates on existing I-55 HOT lanes and ensure toll evasion vs. enforcement of toll violations is revenue positive.
- Export/Integrate data to the comprehensive regional management system as necessary to support multi-modal corridor management and traveler information system.

We will identify detailed requirements during the project definition, systems requirements phase.

4. ***Analysis of alternative system configurations and technology options to meet requirements:***

There are two elements to the overall Value Pricing Project for the I-55 facility. These are: the electronic toll collection system (ETC) and the violations enforcement system (VES). The project will be structured to allow for the maximum technological flexibility to meet the identified system requirements. An RFP for the ETC system will be developed and proposals will be solicited that will also allow for alternative configurations and technologies that meet the identified requirements.

There will be a VES pilot project analysis phase that will include a review of alternative configuration and technology options for violation enforcement systems for high occupancy vehicle/toll enforcement. The goal of this analysis is to determine which technology or combinations of technology and strategies best meet requirements. A strategy analysis will be conducted that evaluates the impacts of various violation enforcement strategies and systems on the I-55 facility. This analysis will (1) examine various enforcement policies and available technologies; (2) evaluate a series of alternative strategies and systems, and (3) recommend a preferred alternative, with supporting policies and systems, including integration of the VES into the planned ETC system for the 1-55 Managed Lanes.

5. ***Procurement options:***

A consultant will be hired to perform the pre-implementation study portions of the VES project and define the system requirements. The consultant will also develop the Request for Proposal (RFP) for the ETC system which will also include the VES. A contractor will be selected to design, integrate, construct, install and test the selected system on the I-55 Managed Lanes. The consultant will oversee the work of the contractor including system design, development, testing and implementation.

6. ***Identification of applicable ITS standards and testing procedures:***

The consultant will assess, identify and recommend ITS standards during the project definition phase. The selected strategy (system) must integrate into portions of the existing ETC system. The project includes a VES prototype field test, as well as a program of factory testing, system integration tests and acceptance tests to verify that the installed project will meet requirements and project objectives.

7. ***Procedures and resources necessary for operations and management of the system:***

The project analysis will identify all requirements for operation and management of the selected and implemented ETC/VES technology. This will include any new administrative or legal procedures necessary for violation enforcement, changes in policy and procedures with the CHP, and new equipment maintenance procedures that must be incorporated into METRO's I-55 standard operations. Full details regarding procedures and resources needed for operations and management of the system will be developed during the project definition. The HOT lane users (Paying SOV and HOV) will be educated on the use of the new technology through public outreach programs.