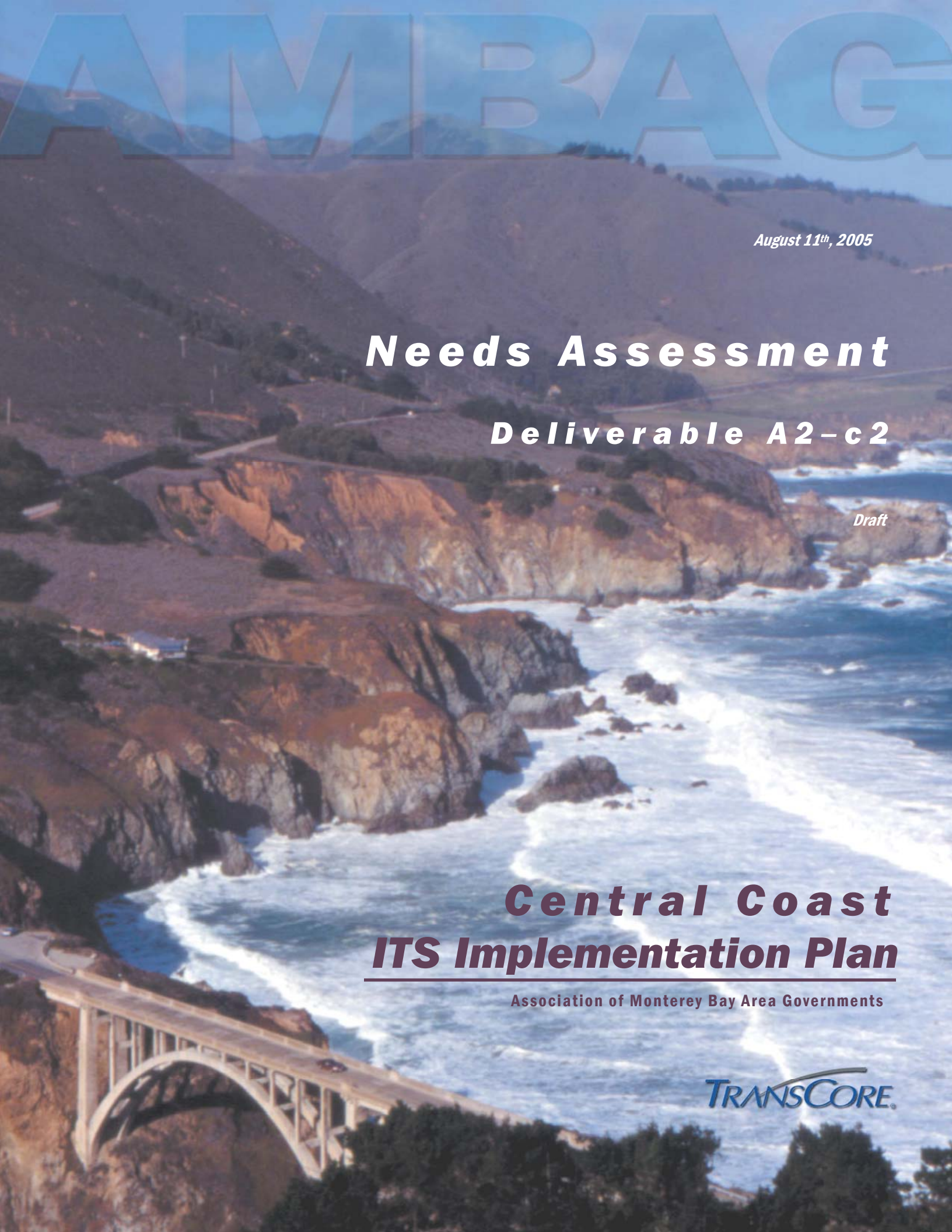

August 11th, 2005

Needs Assessment

Deliverable A2–c2

Draft

Central Coast ITS Implementation Plan

Association of Monterey Bay Area Governments

TRANSCORE

CENTRAL COAST ITS IMPLEMENTATION PLAN

Needs Assessment

Deliverable A2-c2

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1. INTRODUCTION

1.1 Overview

As part of the original *2000 Central Coast ITS Strategic Deployment Plan (SDP)*, the TransCore Team identified the Region's transportation-related needs and deficiencies. At the request of the Central Coast ITS Coordinating Group, the TransCore Team has updated the Region's needs and deficiencies as part of the 2005 Central Coast ITS Implementation Plan.

The structure of the in Section 2 provides the reader with a clearer understanding of the transportation system-related problems facing the Central Coast Region. Definitions of the problems and needs are provided in Section 2, along with the locations or samples of locations where the problem currently occurs within the Region.

2. NEEDS & PROBLEMS

Based upon information provided in the original *2000 CCITS SDP*, fifteen (15) transportation system-related problems were identified along with initial solutions for the appropriate needs and problems. 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.

2.1 Recurring Congestion

A. COMMUTER

- **Definition:**

  Commuter-related congestion is defined as the regular occurrence of heavy or significant vehicular travel along specific streets and highways during weekdays, usually occurring during the AM, Mid-day, and PM peak periods. ITS applications focusing on incident detection, weather detection, traveler information, and system management can provide some relief.

- **Location:**

  The problems associated with commuter congestion primarily occur within the urbanized areas of the region during the peak commuter periods. The major highways impacted by commuter congestion problems include US 101 around Santa Barbara, Santa Maria, Salinas, and San Luis Obispo, Hwy 1 near Santa Cruz, and SR 17 in Santa Cruz County. Commuter or recurring congestion problems also occur on host of highways and local arterials.

B. RECREATIONAL

- **Definition:**

  Recurring recreational congestion is defined as the regular occurrence of heavy or significant recreation-related vehicular travel along specific streets and highways, usually occurring over weekends. The region generally receives an influx of additional traffic associated with recreational travel, not only on weekends, but also during holidays, and over the summer vacation period. ITS applications focusing on incident detection, weather detection, traveler information, and system management may used to address this issue.

- **Location:**

  While congestion due to recreational travel occurs through the region, major highways identified as experiencing significant recreational congestion on a regular basis include US 101, Hwy 1, SR 17, SR 68, and SR 156. Urban arterials near the recreational destinations may also be impacted by recurring recreational congestion.

C. ACTIVITY CENTERS

- **Definition:**

  Activity centers, including airports, major universities, recreation areas, and other major attractions within the Central Coast region contribute to congestion and related problems during certain time periods. Because many of these activity centers operate year-round and attract both resident and visitor trips, their impact on the

transportation system is a regular occurrence. ITS-related applications focusing on advanced signal control, incident detection, weather detection, traveler information, and parking management can be used to address this need.

- **Location:**

  Recurring congestion due to a specific activity center is usually focused on the arterials and highways that provide direct access to that facility. Examples include the arterials near the Monterey Aquarium/Cannery Row, and those serving the Santa Cruz Boardwalk.

2.2 Non-Recurring Congestion and Incidents

- **Definition:**

  Non-recurring congestion refers to congestion that does not occur on a regular basis and is often the result of unplanned incidents, and maintenance and construction activities. Sources of non-recurring congestion can include accidents, major disasters such as landslides that close roadways, construction activities, and special events. Often these events result in significant localized congestion, but may, in some instances, have system-wide impacts. Transportation agencies need to quickly and accurately identify the cause of the non-recurring, and to implement responses that minimize the effects on the motoring public.

  Incident management may be supported through the detection and surveillance of conditions, and through the use of advanced communication systems. The application of incident detection and traveler alert or information systems can often reduce the severity of congestion. Applying incident management techniques can also reduce safety problems associated with incidents.

- **Location:**

  Incidents can occur throughout the region. In the urbanized or more populous parts of the region, severe localized congestion can occur very quickly when an incident occurs. Landslides along the Cuesta Grade (US 101) as well as along Highways 1, 9, 17, and 46 can cause this congestion seasonally. Often alternative routes of travel can be identified. In rural areas where there may not be a nearby alternative route of travel, incident detection coupled with adequate traveler information at locations where alternative decisions regarding a new route of travel can be made is essential

2.3 Special Event/Activity Center Traffic

- **Definition:**

  Special events and activity centers often create unique and irregular travel patterns and traffic conditions. This is a result of the high concentration of trips generated, usually in a focused geographic area and for short periods of time, and the high number of visitors who may be unfamiliar with the transportation system. The need to adequately respond to the traffic impacts caused by special events and activity centers is of concern throughout the Central Coast region. Issues related to special events and activity centers include access guidance, congestion, and parking. Severe

congestion on facilities adjacent to a special event/activity center can result from insufficient or poor parking management.

Generally, these events/centers are not equipped to completely handle transportation-related impacts, and rely on various transportation agencies to assist in these efforts. Strategies to aid in these efforts include traveler information services, adaptive signal control systems, and parking management strategies.

- **Location:**

  Traffic-related problems associated with special events and activity centers are an issue throughout the Central Coast region. Locations with major special events include Laguna Seca Raceway (various events), Pebble Beach (AT&T National Pro-Am Golf Tournament), Paso Robles (Mid State Fair), Castroville (Artichoke Festival), and numerous other arts & crafts and music festivals throughout the Region. Activity centers oriented toward visitors include local beaches, missions, airports, Santa Cruz Boardwalk, Hearst Castle, Big Sur, the Monterey Bay Aquarium, and Stearn's Warf in Santa Barbara. Other special events and activity centers are listed in Appendix B of Working Paper 1. The highways and local roadways in the immediate vicinity of these locations are most directly impacted.

2.4 Transit Efficiency And Effectiveness

- **Definition:**

  Transit efficiency and effectiveness is defined as the need to provide mobility, reduce demand, and improve air quality through the provision of adequate transit services and programs. Although public transit does not carry a large percentage of trips in the communities of the region, it is viewed to be an important part of the overall transportation system. Since there is a region-wide funding shortfall for transit services, ways to improve the efficiency and effectiveness of the existing transit systems are important. AVL systems, electronic fare payment systems (e.g. SMART Cards), transit information systems, advanced vehicle maintenance systems, and automated passenger counting systems are viewed to be desirable, where cost-effective. Increased use of the Internet is envisioned to reduce printed materials costs and optimize staff resources. Each of these applications will also improve the ability of transit providers to effectively manage their transit systems by providing better planning data such as the ability to track transit system trends and ridership, on-time performance and schedule tracking, transit users, performance of mechanical equipment, etc.

- **Location:**

  Some form of public transit service is provided within and between most communities and activity centers and special event locations in the Central Coast region. Each of the public transportation agencies throughout the region faces the problem of increasing efficiency while at the same time trying to balance the funding shortfall.

2.5 Mobility And Accessibility

- **Definition:**

  Mobility and accessibility is defined as the need to provide improved or additional access and increased mobility through the provision of adequate transit services. One goal of the region's transit systems is to offer the public mobility. This effort is hampered by service shortfalls throughout the region, especially outside of the more urbanized areas. Increased service coverage, increased frequency, improved Dial-A-Ride services, increased coordination with social service agencies, through automated/electronic billing and record keeping systems, are all areas of potential pursuit.

- **Location:**

  Each of the public transportation agencies throughout the region faces increasing demands for greater transit service coverage, frequency and flexibility.

2.6 Emergency Response

- **Definition:**

  The effectiveness of emergency response is predicated in the amount of time it takes to identify and respond to an emergency or incident. The cause of the emergency can range from homeland security issues to traffic collisions. Population dispersion throughout the region makes timely large-scale emergency response difficult. General transportation problems and inadequate communications systems further exacerbate the problem. ITS components that can help improve response time include advanced communications systems, targeted expansion of the call box system, freeway service patrols, and promotion of "mayday" systems.

- **Location:**

  This is a region-wide problem; however, the problem (and potential solutions) may be subdivided into two separate classifications – urban areas and rural areas. In addition, areas and roadways around military installations and the Diablo Canyon Nuclear Power Plant are also potential locations.

2.7 System Monitoring

- **Definition:**

  Effective management of the transportation system requires accurate and timely information regarding the status and operation of transportation system components. The types of information collected to provide for effective system monitoring include incident detection (including road closures), roadway operating conditions (including congestion), transit operating conditions (vehicle location, schedule adherence), and weather detection (including the presence of fog). This information can help transportation system managers operate the system more effectively and efficiently. Caltrans and the California Highway Patrol view traffic management centers to be at the heart of the California strategy for monitoring and managing traffic, both within and outside major metropolitan areas. The TMC Master Plan identifies current

concepts for establishing TMCs throughout the State. A TMC for Caltrans District 5 has recently been deployed for monitoring and managing the State-operated roads in the Region.

- **Location:**

  System monitoring is a need throughout the region. Traffic and transit operations monitoring is most appropriate in the urbanized areas of Santa Cruz, Monterey, San Luis Obispo, and Santa Barbara Counties. Many transit Agencies in the Region are implementing AVL systems to help monitor their transit system operations. In rural areas, incident, road closure, and weather monitoring may be more important. Weather problems occur along Hwy 1 and SR 46 in Monterey and San Luis Obispo Counties, and on US 101 and Hwy 154 in Santa Barbara County.

2.8 Travel Information Needs Including Visitors

- **Definition:**

  Maximizing the efficient use of the transportation system requires that travelers be informed about travel options and current operating conditions. This is especially important in the Central Coast region because it attracts a significant number of visitors who may not be fully aware of the transportation system along the Central Coast. Tourism is a very important component of the region's economic base. Inefficient use can not only lead to transportation-related impacts such as congestion, unsafe conditions and additional vehicle miles traveled, but may also have economic impacts resulting from inefficient goods movement and unfavorable experiences of visitors. As a result, ITS can help address the needs of the region's tourists through traveler information systems, incident detection, adverse weather detection, and other applications. Travel information includes the provision of Internet services and kiosks at activity centers and major transportation hubs.

- **Location:**

  Travel information is a general need throughout the region. It may be particularly important at key route-decision points, such as the U.S. 101 and Hwy 156 junction, and within the major tourist destination spots such as the Monterey Peninsula. Major routes used by visitors include US 101, Hwy 1, SR 17, SR 41, SR 46, SR 68, and SR 156. Operating condition information is also a need in urbanized areas and along congested corridors. Also, several transit Agencies are implementing next bus arrival messaging systems at transit stops and centers.

2.9 Efficient Network For Commercial Vehicles

- **Definition:**

  A major industry in each of the Counties is agriculture. Major crops grown along the Central Coast include apricots, artichokes, asparagus, avocados, broccoli, brussel sprouts, cauliflower, cherries, flowers, garlic, grapes, lettuce, lemons, onions, strawberries, and tomatoes. Getting these products to market is naturally critical to the industry and the region's economy. In addition, the efficient transport of retail goods within and through the Central Coast is vital. Thus, it is important that the transportation network be accessible and efficient for commercial operators. The

problems of commercial operators include the inefficiency of the truck and load permitting processes, delay associated with weigh stations, delays due to congestion and inefficient routing, and traveler information needs.

- **Location:**

  The efficient movement of goods is a regional transportation issue in the Central Coast region. Specific locations where improvements should occur include existing weigh stations, rest stops or areas, and major commercial truck centers located along major routes in the region.

2.10 Impacts of Commercial Vehicles on Highways

- **Definition:**

  A corollary to the above, is the impact that commercial vehicles have on the region's roadway network. Because they are generally slower moving and less maneuverable, and simply because of their size, commercial vehicles can contribute to congestion and safety problems. In urban areas, particularly near major loading facilities, commercial vehicles can create unique parking problems. ITS strategies such as travel information, hazard warning, and incident detection systems can not only improve truck operations, but may also provide safety and congestion relief benefits.

  Another important issue is the transport of hazardous materials. Petroleum products, fertilizers, and insecticides are examples of hazardous materials that must be transported within and through the Central Coast region.

- **Location:**

  The movement of goods via commercial vehicles is a regional characteristic. Large volumes of truck traffic impact the major routes throughout the region, including US 101, SR 17, and SR 46. Of special concern is heavy duty and agricultural truck travel along streets and highways within the cities of Castroville and Salinas (distribution centers). Streets and roads within these cities are severely impacted by agricultural and other heavy-duty trucks loading agricultural products for delivery within and outside the region.

2.11 Safety

- **Definition:**

  Throughout the region there are transportation safety problems that have proven difficult and costly to address with basic engineering tools. Highway safety along a number of facilities in the region is a significant concern of state, regional, and local agencies. Many safety concerns in the region are related to the design constraints or specific roadways, however other types of safety issues that are of general concern are pedestrian accidents and vehicular accidents at railroad crossings. ITS strategies that may address safety concerns include improved traveler information, safety and hazard warning, incident management and emergency response systems, and systems management.

- **Location:**

  Specifically, agencies are concerned with street and highway facilities that traverse the Diablo and Coast Ranges such as SR 17, SR 25, SR 46, SR 41, SR 58, SR 166, and SR 198. Most of these facilities are rural two-lane highways with limited passing opportunities and a significant number of curves with treacherous and steep passages. Other routes along the coastal plain and in the valleys where limited passing is provided such as along Hwy 1, SR 41, SR 46, and SR 154 are also of concern.

  Other locations of concern include high volume pedestrian areas, such as downtowns, universities, and tourist/activity centers, and at-grade railroad crossings, both vehicular and pedestrian (e.g., San Miguel).

2.12 Better Planning Data

- **Definition:**

  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 on system condition and use. However, collecting this data can be a time-consuming and costly endeavor. Several ITS applications can provide the data needed by planning agencies as an input into the transportation planning process. As an example, Smart Call Boxes can be used to collect traffic volume data. Such data forms the basis for most transportation planning or traffic engineering related work that is undertaken within the region. Another example includes the use of video detection that provides count data such as vehicle occupancy, traffic volume, queue analysis, and speed.

- **Location:**

  Better planning data can be used by all agencies within the Central Coast region.

2.13 Maintenance Activities

- **Definition:**

  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. The potential payoff in technological applications of highway maintenance could be significant, given that regional budgets for roadway maintenance and rehabilitation in the Central Coast are typically between 30 and 40 percent of projected transportation expenses. Investments in technology to enhance maintenance efficiency could yield substantial cost savings. These investments may also provide safety benefits. One element of Caltrans technology research is directed toward technological developments such as robotics and automation that improve the efficiency and safety of highway maintenance and construction activities. In addition to the technological advancement of maintenance equipment, possible ITS applications in this area include the management of maintenance fleets through AVL systems, and infrastructure inventory and monitoring systems.

- **Location:**

  Maintenance will be a continuing problem for all agencies within the Central Coast region.

2.14 Inter-Agency Communication

- **Definition:**

  Because transportation-related responsibilities are distributed between several entities, interagency communication and cooperation is critical to the effective management of the transportation system. An effective communications system allows all interested jurisdictions to share important data in a timely manner thereby allowing the personnel to coordinate operations safely and efficiently. To address this issue, the need for the regional standardization of communications protocol that will enhance the ability of agencies communicate and share data is vital. The proposed TMC can facilitate interagency communication by serving central processing point for transportation information.

- **Location:**

  Inter-agency communication problems are a concern throughout the region.

2.15 Environmental Impacts

- **Definition:**

  Sensitivity to the environment is an important factor that shapes all transportation programs within the Central Coast region. There is a general reluctance to move forward with major highway widening projects unless absolutely necessary. This increases the importance of managing the existing infrastructure, with ITS being a potential tool to consider in that management effort. ITS applications that can help reduce prolonged congestion and enhance the use of alternative modes of transportation would, in-turn, help reduce environmental impacts. For example, the continued implementation of signal system optimization using advanced computer and communication technologies can help minimize vehicle delay thereby reducing emissions and noise pollution, and the expanded use of demand-responsive shuttle services by the elderly, handicapped and business/education commuters can help eliminate vehicle trips thus reducing congestion.

- **Location:**

  Environmental impacts are a concern throughout the region, but are potentially more significant in urban areas.

Exhibit 2.1
SUMMARY OF NEEDS AND DEFICIENCIES IN THE CENTRAL COAST

Problem Area/Need	Location
♦ Recurring Congestion *A. Commute* *B. Recreational* *C. Activity Centers*	• Major regional routes include US 101, Hwy 1, Hwy 17 and SR 68, plus major urban arterials throughout the region. • Major routes include US 101, Hwy 1, SR 17, SR 68, SR 156, as well as the urban arterials near recreational destinations. • 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 Hwys 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, etc. Activity Centers include beaches, missions, airports, Hearst Castle, Big Sur, Monterey Bay Aquarium, Stearns Wharf, etc.
♦ Transit Efficiency and Effectiveness ▪ Service Quality and Reliability ▪ Transit Service Management	Regional. All public transportation services.
♦ Mobility and Accessibility ▪ Transit Service Coverage	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 Hwy 1 and SR 46 in Monterey and San Luis Obispo Counties and US 101 and Hwy 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, Hwy 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 Batista, 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, and SR 46, and local streets and roads in the cities of Castroville and Salinas.
♦ Safety ▪ Design Issues ▪ Railroad Crossings ▪ Pedestrian Safety	Regional, including Hwy 1, SR 17, SR 41, SR 46, SR 58, SR 166, and SR 198. Other routes where limited passing occurs is along Hwy 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.

3. SUMMARY OF PROBLEMS

The *2000 CCITS SDP* 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 the applicability of market packages to the solution of 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, based on the prioritized market packages and 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 presented a generic description of each problem type.

Exhibit 2.2
TRANSPORTATION-RELATED PROBLEMS AND NEEDS IN THE CENTRAL COAST

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:

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

B. Highway/Arterial:

- Hwy 129 & Hwy 152 near Hwy 1
- Hwy 25 & Hwy 156-near Hollister
- Hwy 68 – York Road to Torero
- Hwy 68 – Hwy 1 to CHOMP
- Hwy 156 – Castroville Blvd to US 101
- Hwy 183 – Castroville Separation to Hwy 1
- Hwy 46 – Paso Robles urbanized area
- Hwy 1 – Castroville to Salinas Road through Moss Landing
- Hwy 1 – Salinas Road Intersection near Moss Landing
- Hwy 1 – Monterey to Marina (near Fort Ord) (AM/PM peaks)
- Hwy 1 – Santa Rosa St. in SLO
- US 101 – Tefft St. in Nipomo
- Hwy 135 – near Santa Maria
- Hwy 246 – near Lompoc and Santa Ynez
- Interchanges in Arroyo Grande
- Bridge capacity in Paso Robles
- Hollister Av (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 Hwy 1 (Santa Cruz, Monterey, SLO)
- Landslides along Hwy 17 (Santa Cruz)
- Landslides along Hwy 9 (Santa Cruz)
- Landslides along Hwy 46 (SLO)
- Hwy 46 (San Luis Obispo)
- Hwy 1, 154, and 156 (Santa Barbara)
- Cuesta Grade (US 101)

B. Construction/Maintenance:

Regional

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)
- Hollister Motorbike Festival
- 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 Piaso, Pismo, & Cayucos (SLO County)

A. Congestion:	
• Santa Cruz Boardwalk (Hwy 1, Hwy 17 & local roads) • Hollister Municipal Airport (Hwy 156) • Monterey (US 101 & Hwy 156 near Salinas & Prunedale, Hwy 1 & Hwy 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 (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):	
• Hwy 17 (Santa Cruz) • Hwy 154 (Santa Barbara) • Hwy 166 (Santa Barbara)	• Hwy 1 (Monterey, SLO, SB) • US 101 in Shell Beach (SLO)
B. Operating Conditions:	
• Congested routes as identified above	
C. Weather:	
• Hwy 1 (Monterey, SLO) • Hwy 154 (Santa Barbara) • US 101 near Goleta/Buellton (Santa Barbara)	• Hwy 41 (SLO) • Hwy 46 (SLO)
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/Hwy 156 (Monterey) • Hwy 1/Hwy 68 (Monterey)	• US 101/Hwy 154 (Santa Barbara) • Hwy 1/US 101 (San Luis Obispo) • Hwy 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:

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

B. Congestion:

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

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):

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

B. Railroad Crossings

C. Pedestrian Safety:

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

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 highways (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.

4. ITS USER SERVICES DEFINITIONS

"User Services" represent types or categories of potential ITS applications as defined by their purpose, rather than by the specific technology. The term "user services" was intended to convey the idea that ITS should help the transportation system user: someone who is traveling, shipping goods, or carrying goods from place to place. A "User Service Bundle" is a logical grouping of user services that provides a convenient way to discuss the range of requirements in a broad stakeholder area. Within the bundles, the underlying user services are the same.

The U.S. DOT and ITS America have identified a list of 33 user services grouped into eight logical bundles: Travel and Traffic Management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle Safety Systems, Information Management, and Maintenance and Construction Management. These definitions are from Version 5 of the National ITS Architecture. Major changes from the prior version include the merging of two previously separate bundles, "Travel and Transportation Management" and "Travel Demand Management", and the addition of two (2) new bundles: "Information Management" and "Maintenance and Construction Management".

A description of each user service bundle and its constituent user services is provided below.

4.1 Travel and Traffic Management

The ten (10) Travel and Traffic Management user services in this bundle deal with information collection, dissemination, and processing for the surface transportation system. These services collect and process information about the surface transportation system, and provide commands to various traffic control devices. Travel management services disseminate this information to travelers. These services also provide information to support the Public Transportation Management and Information Management bundles. Thus, the Travel and Traffic Management bundle will be of interest to transportation policy makers, public and private sector operators of transportation management centers, those involved in accident response or travel demand management, and private sector vendors supplying travel information products and services.

Pre-trip Travel Information

The Pre-Trip Travel Information user service allows travelers to access a complete range of real-time multimodal transportation information at home, work, and other major sites where trips originate. Information on road network conditions, incidents, weather, and transit services, are conveyed through these systems to provide travelers with the latest conditions and opportunities in order to plan their travel. Based on this information, the traveler can select the best departure time, route and modes of travel, or perhaps decide not to make the trip at all.

En-route Driver Information

The En-Route Driver Information user service provides driver advisories to convey information about traffic conditions, incidents, construction, transit schedules, and other mode choice options to drivers of personal, commercial, and public transit vehicles. This service also includes in-vehicle signing, which provides the same types of information found on highway signs today, but displays it directly in the vehicle. Full deployment of in-vehicle signing would also include customized information, such as warnings of hazardous road conditions (e.g., fog, ice) or the safe speed for a specific type of vehicle (e.g., autos, buses, large trucks).

Route Guidance

The Route Guidance user service provides travelers with a suggested route to reach a specified destination, along with simple instructions on upcoming turns and other maneuvers. When fully deployed, route guidance systems will provide travelers of all modes with directions to their destinations based on real-time information about the transportation system, including traffic conditions, road closures, and the status and schedule of transit systems.

Ride Matching and Reservation

The Ride Matching and Reservation service provides real-time ride matching information and reservations to users in their homes, offices or other locations, and assist transportation providers, as well as van/carpoolers, with vehicle assignments and scheduling. Its goal is to make ride sharing easier and more convenient. This will expand the market for ridesharing as an alternative to single occupant vehicle travel and will provide for enhanced alternatives for special population groups, such as the elderly or the handicapped.

Travel Services Information

The Traveler Services Information user service provides a business directory, or "yellow pages," of information on travel-related services and facilities, for example the location, operating hours, and availability of food, lodging, parking, auto repair, hospitals, and police facilities. Traveler services information would be accessible in the home, office or other public locations to help plan trips, and it would also be available en-route. The service includes not only the traveler services information, but the capability to make reservations for many of the traveler services.

Traffic Control

The Traffic Control user service provides for the integration and adaptive control of the freeway and surface street systems to improve the flow of traffic, give preference to transit and other high occupancy vehicles, and minimize congestion while maximizing the movement of people and goods. This service gathers data from the transportation system, fuses it into usable information, and uses it to determine the optimum assignment of right-of-way to vehicles and pedestrians. The real-time traffic information collected by the Traffic Control service is also disseminated for use by many other user services.

Incident Management

The Incident Management user service utilizes sensors, data processing, and communications to improve the incident management and response capabilities of transportation and public safety officials, the towing and recovery industry, and others involved in incident response. This service will help these groups to quickly and accurately identify incidents and implement a response which minimizes traffic congestion and the effects of these incidents on the environment and the movement of people and goods.

Travel Demand Management

The Travel Demand Management user service uses advanced technologies to support policies and regulations designed to mitigate the environmental and social impacts of traffic congestion. This service generates and communicates management and control strategies that support the implementation of programs to reduce the number of individuals who choose to drive alone; increase the use of high occupancy vehicles and transit; and provide a variety of mobility options for those who wish to travel in a more efficient manner, for example in non-peak periods.

Emissions Testing and Mitigation

The Emissions Testing and Mitigation user service uses advanced sensors to monitor and implement strategies to reroute traffic around sensitive air quality areas, or control access to such areas. Other technologies provide identification of vehicles that are emitting levels of pollutants that exceed state, local or regional standards, and provide 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 implementation and evaluation of various pollution control strategies.

Highway Rail Intersection

The Highway Rail Intersection (HRI) user service uses ITS technologies to provide improved control of highway and train traffic to avoid or decrease the severity of collisions that occur between trains and vehicles at HRIs.

4.2 Public Transportation Management

The Public Transportation Management user services bundle describes those services provided by public transit organizations throughout the country. They address both fixed route and demand response systems, as well as those passenger rail systems operated by transit agencies. Aspects of the transit system ranging from operations, to maintenance and security are covered. This bundle includes a transit traveler information aspect that also supports services in the Travel and Traffic Management bundle.

Public Transportation Management

The Public Transportation Management user service automates the operations, planning and management functions of public transit systems. It provides real-time computer analysis of vehicles and facilities to improve transit operations and maintenance. It monitors the location of transit vehicles, identifies deviations from the schedule, and offers potential solutions to dispatchers and operators. This service will help maintain transportation schedules and assure transfer connections from vehicle to vehicle and between modes and can be coupled with traffic control services to facilitate quick response to service delays. Information regarding passenger loading, vehicle running times, accumulated miles and hours and vehicle maintenance will help improve service and provide managers with a wealth of information on which to base decisions. Service schedulers will have timely data to adjust trips. Personnel management will be enhanced with the automatic recording and verification of operating and maintenance task performance. Security of transit personnel will be enhanced through providing access management of transit. vehicles.

En-route Transit Information

The En-Route Transit Information user service provides information to travelers using public transportation after they begin their trips. Real-time, accurate transit service information will be available on-board the vehicle, at transit stations and bus stops to assist travelers in making informed decisions and itinerary modifications while a trip is underway.

Personalized Public Transportation

The Personalized Public Transit user service supports flexibly routed transit vehicles. Small, publicly or privately operated vehicles provide on-demand routing to pick up passengers who have requested service and deliver them to their destinations. Route deviation schemes, where vehicles would leave a fixed route for a short distance to pick up or discharge passengers, is

another approach employed to improve service. Vehicles providing this service can include small buses, taxicabs, or other small, shared-ride vehicles.

Public Travel Security

The Public Travel Security user service creates a secure environment for public transportation patrons, operators, and support staff. It provides systems that monitor the environment in transit facilities, transit stations, parking lots, bus stops and on-board transit vehicles and generates alarms (either automatically or manually) when necessary. The service also provides systems that monitor key infrastructure of transit (rail track, bridges, tunnels, bus guideways, etc.).

4.3 Electronic Payment

While this bundle contains only one user service, Electronic Payment Services for tolls, fares, and parking; it supports deployment of many other services, both within and outside the transportation arena. This service will be developed, deployed, and operated by both public and private organizations.

Electronic Payment Services

The Electronic Payment Services user service allows travelers to pay for transportation services with a common electronic payment medium for all transportation modes and functions. Electronic toll collection, transit fare payment, and parking payment would be linked through a multimodal multi-use electronic system. A common transportation service fee payment structure could be used with all modes, possibly tying into roadway pricing options.

4.4 Commercial Vehicle Operations

These six (6) user services support the goals of improving the efficiency and safety of commercial fleet operations, and will benefit both the states and the motor carrier industry. The bundle is organized around the use of advanced computer and communication technologies to improve the safety and productivity of the motor carrier industry throughout North America. From a technical perspective, the foundation for all the commercial vehicle operations user services is the exchange of information on the motor carrier, the vehicle, the driver, and, in some cases, the cargo. The services are interrelated in terms of the specific types and functionality of information and data required. This network of information will be accessible by states and motor carriers nationwide.

Commercial Vehicle Electronic Clearance

The Commercial Vehicle Electronic Clearance user service allows enforcement personnel to electronically check safety, credential, and size and weight data for transponder-equipped vehicles before they reach an inspection site, selecting only illegal or potentially unsafe vehicles for an inspection. Safe and legal carriers will be able to travel without stopping for compliance checks at weigh stations, ports-of-entry, and other inspection sites. This service also supports the North American Free Trade Agreement (NAFTA) by expediting international carriers at the Mexican and Canadian borders.

Automated Roadside Safety Inspection

The Automated Roadside Safety Inspection service uses safety data provided by the Electronic Clearance service combined with state-of-the-art technology to allow for more selective and rapid inspections. Through the use of sensors and diagnostics, inspectors will eventually be able to

check vehicle systems and driver requirements and ultimately driver alertness and fitness for duty.

On-board Safety and Security Monitoring

The On-board Safety and Security Monitoring user service non-intrusively monitors the driver, vehicle, and cargo and notifies the driver, carrier, and, possibly, enforcement personnel if an unsafe situation arises during operation of the vehicle. Such an unsafe situation might involve the status of driver fatigue, vehicle systems, or cargo shift. This user service also assures freight container, trailer, and commercial vehicle integrity by monitoring on-board sensors for a breach or tamper event and monitoring assignment integrity between the vehicle, the driver or custodian, and the freight container.

Commercial Vehicle Administrative Processes

The Commercial Vehicle Administrative Processes user service allows carriers to purchase credentials and to collect and report fuel and mileage tax information electronically. Through automation, this service should provide to carriers and States a significant reduction in the paperwork burden and has the potential for simplifying compliance operations.

Hazardous Materials Security and Incident Response

The Hazardous Materials Security and Incident Response user service provides emergency personnel at the scene of a hazardous materials incident immediate information on the types and quantities of hazardous materials present in order to facilitate a quick and appropriate response. The service includes tracking of security sensitive hazardous materials shipments, notification of security sensitive HAZMAT unauthorized activity, notification of unauthorized security sensitive HAZMAT driver, and roadside security sensitive HAZMAT monitoring.

Freight Mobility

The Freight Mobility user service provides information links between drivers, dispatchers, and intermodal transportation providers, enabling carriers to take advantage of real-time traffic information, as well as vehicle and load location information, to increase productivity.

4.5 Emergency Management

Emergency management and public safety (police, fire, and emergency medical services) agencies (will/can) use the three (3) services in this bundle to improve their management of and response to emergency situations. In addition this bundle covers the coordination between public safety organizations and the other transportation organizations (e.g. traffic, transit, and maintenance) to address situations ranging from traffic incidents to disasters to evacuations.

Emergency Notification and Personal Security

The Emergency Notification and Personal Security user service provides the ability for travelers to notify appropriate emergency response personnel regarding the need for assistance due to emergency or non-emergency situations. The notification can be initiated manually by the traveler, or it could be provided from a vehicle automatically on the occurrence of a crash. The service also provides for monitoring, threat alerts, and automated security system support in secure areas. Secure areas encompass physical areas related to travel including remote areas and critical transportation infrastructure. In addition, the service provides wide area alert to notify the traveling public in emergency situations such as child abductions, severe weather watches and warnings, natural and human-caused disasters, military operations, and civil emergencies where

lives and/or property are at stake. Finally, the service prevents public distribution of traveler information that may impact individual privacy or public safety.

Emergency Vehicle Management

The Emergency Vehicle Management user service is oriented towards reducing the time from receipt of notification of an incident by a Public Safety Answering Point operator to arrival of the emergency vehicles on the scene. This service includes improved communications between response vehicles and the dispatch center to provide improved display of emergency vehicle location and automation support to dispatchers to help them dispatch the vehicle that can most quickly reach the incident site. The service also provides specialized route guidance for emergency vehicles to assist the dispatcher and emergency vehicle driver in determining the minimum time route to reach the incident scene, and, if required, from the incident scene to a suitable hospital. It will also provide in-vehicle route guidance for directing the emergency vehicle driver to the destination. Finally, the service provides preemption of traffic signals on an emergency vehicle's route so that the emergency vehicle is nearly always presented with a green signal. It includes the capability to warn drivers of affected vehicles that an emergency vehicle is approaching.

Disaster Response and Evacuation

The Disaster Response and Evacuation user service uses ITS to enhance the ability of the surface transportation system to respond to disasters. The user service provides enhanced access to the scene for response personnel and resources, provides better information about the transportation system in the vicinity of the disaster, and provides more efficient, safer evacuation for the general public if needed. In addition, the transportation system includes a wealth of trained professionals and resources that constitute a portion of the disaster response. Use of ITS to prioritize, allocate, and track these personnel and resources also provides a more effective response to disasters.

4.6 Advanced Vehicle Safety Systems

Although each of these seven (7) user services addresses a separate function, they all contribute to the common goal of improving vehicle safety. With the exception of Automated Vehicle Operations, all these user services are characterized by reliance on self-contained systems within the vehicle. Supplementing the on-board capabilities with additional sensors deployed in the infrastructure, however, can enhance the functionality of these user services. Within the vehicle, common functional elements, such as data storage, processing units, sensors, or actuators, could be shared among the user services in this bundle, including Automated Vehicle Operations.

Longitudinal Collision Avoidance

The Longitudinal Collision Avoidance user service is specifically aimed at providing vehicle operators with assistance in avoiding longitudinal collisions to the front and/or rear of the vehicle. The service provides rear-end collision warning and control, Adaptive Cruise Control (ACC), head-on collision warning and control, and backing collision warning. Longitudinal collision avoidance systems assist the driver by: (1) sensing potential and/or impending collisions or dangers to the front or rear of the vehicle; (2) eliciting proper collision avoidance actions from the driver; and/or (3) providing temporary automatic control of the vehicle to assist the driver in avoiding the potential collision situation.

Lateral Collision Avoidance

The Lateral Collision Avoidance user service is specifically aimed at augmenting the vehicle operator's ability to avoid collisions by first providing information, and second, if a crash

situation is imminent, providing warnings and/or assuming temporary control of the vehicle. The service includes lane change/blind spot situation display collision warning and control, as well as lane/road departure warning and control.

Intersection Collision Avoidance

The Intersection Collision Avoidance user service is specifically aimed at providing vehicle operators with assistance in avoiding collisions at intersections. The situations addressed include those that arise when vehicles improperly violate the right-of-way of another vehicle, or when the right-of-way is not clear. The service will provide warnings of imminent collisions with crossing traffic, as well as warnings of stop control -- either a stop sign or a traffic signal -- in the intersection ahead.

Vision Enhancement for Crash Avoidance

The Vision Enhancement for Crash Avoidance user service can reduce the number of vehicle crashes that occur during periods of poor visibility. The focus of this effort is on systems that can improve the ability of the driver to perceive the roadway itself and objects on and along the roadway. This improved visibility would allow the driver to avoid potential collisions with other vehicles, fences and railings, pedestrians, wildlife and livestock, or obstacles in the line of travel; and would assist the driver in complying with traffic signals and signs.

Safety Readiness

The Safety Readiness user service implements systems that provide drivers with warnings regarding their own driving performance, the condition of the vehicle, and the condition of the roadway as sensed from the vehicle. At the more complex level, Safety Readiness systems will also include the ability to assume temporary, partial control of the vehicle in situations deemed to be highly hazardous. The service includes Impaired Driver Warning and Control Override systems that monitor driver performance features and either warn of impaired driver condition or take temporary control of the vehicle to prevent or discourage continued driving under such circumstances. The service also includes Vehicle Condition Warning systems that monitor the performance of components, such as tires and brakes, whose degradation could have a significant impact on the safe operation of the vehicle, and warn of their imminent failure. The service includes In-Vehicle Infrastructure Condition Warning systems that detect and warn the driver of unsafe conditions on the roadway or bridge infrastructure, such as the presence of ice or water

Pre-crash Restraint Deployment

The Pre-Crash Restraint Deployment user service reduces the number and severity of injuries caused by vehicle collisions. This is accomplished by developing means both to anticipate an imminent collision and to activate passenger safety systems prior to the actual impact, or earlier after crash onset than is currently feasible. These safety systems would be more effective if their deployment were based on information such as details of an imminent collision situation (velocity, mass and direction of the vehicle being hit and the vehicle or object it is hitting); and the number, location and major physical characteristics of the vehicle occupants.

Automated Highway Systems (AHS)

The Automated Vehicle Operations (AVO) user service provides a fully automated vehicle-highway system in which instrumented vehicles operate on instrumented roadways without operator intervention. Drivers will enter an AVO lane through a check-in area where the AVO system will check the worthiness of the vehicle and driver. The AVO system assumes control of an approved vehicle and moves it onto an AVO lane, merging it with the other automated vehicle traffic. Vehicles are moved as part of the traffic flow; and when the destination exit is reached,

the system moves the vehicle to an off-ramp where control is returned to the driver after the driver's ability to resume control has been demonstrated.

4.7 Information Management

This bundle is the logical offshoot of both the Travel and Traffic Management and Public Transportation Management user service bundles. Both of the two original bundles focus on measuring transportation data for real-time use and disseminating it to the traveling public. However, the copious amount of data gathered in the process is also useful to planners, safety personnel, and other organizations. The single user service in the Information Management bundle addresses how to process and store the data acquired by ITS monitoring systems in a manner that is efficient, thorough, and user-friendly.

Archived Data

The Archived Data user service provides an ITS historical data archive for all relevant ITS data and will incorporate the planning, safety, operations, and research communities into ITS. It will provide the data collection, manipulation, and dissemination functions of these groups, as they relate to data generated by ITS.

4.8 Maintenance and Construction Management

This single user service bundle addresses the monitoring, maintaining, improving, and managing of the physical condition of the roadway, associated infrastructure equipment on the roadway, and the available resources necessary to conduct these activities.

Maintenance and Construction Operations

The Maintenance and Construction Operations (MCO) user service integrates key activities to ensure that roadways, associated infrastructure, and available resources are coordinated in the best possible manner. Key MCO activities include monitoring, operating, maintaining, improving, and managing the physical condition of the roadway. The areas covered by the MCO user service are maintenance vehicle fleet management, roadway management, work zone management and safety, and roadway maintenance conditions and work plan dissemination

5. ITS MARKET PACKAGE PLAN

This section presents the Market Package Plan for Intelligent Transportation Systems (ITS) for the Central Coast. The plan updates the *2000 CCITS Market Package Plan* to reflect enhancements made in Version 5 of the National ITS Architecture and input from the CCITS Coordinating Group. The Central Coast ITS Implementation Plan is a multi-County effort to provide direction in the application of advanced transportation technology in the five-county Central Coast Region. The study covers the counties of Santa Cruz, San Benito, Monterey, San Luis Obispo, and Santa Barbara. It will define the technological applications that make sense for the Central Coast Region and develop an action plan for implementing those strategies. It is particularly important to conduct the effort jointly, because ITS applications will be more effective if they are coordinated across jurisdictional boundaries. The Implementation Plan will comprise a road map to implement a system of technology-based strategies over a period of time. It also coordinates with a variety of other planning activities, both Locally and Regionally. The Implementation Plan will be an important tool in integrating a variety of possible actions that will move the area forward in the application of advanced transportation technology. The Market Package Plan details the types of ITS concepts and strategies believed to have the greatest potential for future implementation in the Central Coast Region. It is an important step in the development of the overall Implementation Plan.

5.1 Market Packages – The Building Blocks of ITS

The term "market package" is a way of defining an ITS application that can be implemented. It implies a group of technologies that work together to perform a useful function. Vehicle navigation systems, traffic signal systems, motorist aid call boxes, or traveler information systems are examples of ITS market packages. Almost 90 market packages have been identified at the national level. These have been defined by the U.S. Department of Transportation (USDOT) as part of the development of the National ITS Architecture. Some of these market packages represent products or services that the private sector may develop. Others will likely be the responsibility of the public sector. Many market packages are already in place in California. Others may not be available for a number of years to come. The USDOT list of market packages is not necessarily a complete list. There are other good ideas that may emerge based on matching possible technology solutions to the specific problems and needs of the Central Coast.

The “package” part of the term refers to the fact that market packages consist of multiple elements of technology that work together to perform a particular function. The “market” part of the term implies that a consumer market exists for these devices. Market packages are bundles of technology that the public will buy to improve their travel, either directly in the open market or indirectly through government entities that implement these systems. In the Central Coast, Caltrans, the CHP, Local governments and Regional governments may all be involved in developing and operating elements of an overall ITS system that is built on selected market packages. Identifying appropriate market packages will bring these Agencies one step closer to identifying specific “projects” that can be implemented through their Agency’s programming, project development, construction, and operation activities.

5.2 Listing of ITS Market Packages

Exhibit 5.1 lists the market packages as identified in the National ITS Architecture. A brief description of each market package is provided in Appendix A. The CD-ROM that contains all the National ITS Architecture documentation provides additional descriptive material on each of the market packages, including flow diagrams that illustrate the functions included in each. This information is also available via the FHWA National ITS Architecture website at: http://www.iteris.com/itsarch/.

In some cases, the USDOT market packages are not defined at a sufficient level of detail to distinguish specific ITS strategies. Several ITS strategies are sometimes included under a single market package definition. For example, the market package "freeway management" includes both ramp metering and lane control, two different ITS strategies. Likewise, the market package "network surveillance" includes different types of surveillance, ranging from visual surveillance using video imagery to vehicle detection.

To promote better understanding of the market packages, additional definition below the market package level is provided in the form of market package subcategories. The market package subcategories proposed for the Central Coast are also presented in Exhibit 5.1. The intent is to distinguish strategies functionally, not in terms of specific technologies that can provide that function. Thinking through the subcategories provides a more detailed understanding of the market packages and functions that may be appropriate for addressing the identified problems and issues in the Central Coast. It also allows Agencies to distinguish possible applications by specific location. For example, the possibilities for video surveillance can be associated with specific sections of freeway that may be more prone to congestion or traffic incidents.

It is important to note that the listing of market packages contained in the National Architecture is neither comprehensive nor prescriptive. This listing has been used as a starting point. Other ITS market packages may be defined in response to specific problems as part of the 2005 CCITS Implementation Plan effort, or may be generated as part of the development of the ITS industry in the coming years.

5.3 Why is a Market Package Plan Important?

The idea behind developing a market package plan is to have Agencies work together to identify the best way of organizing the Central Coast's approach to ITS. There are a variety of decisions to be made, such as:

- What market packages best correspond to the goals and objectives the Central Coast has for transportation, economic development, and other areas?
- What market packages will work best with some of the other major transportation investments expected in the future?
- What market packages can the Central Coast best afford?
- What types of communications and technology infrastructure will be needed to support the long-term development of ITS?

The best way to define the Central Coast's approach to the implementation of ITS market packages is to bring the planning, implementing and operating Agencies together. This is important, because ITS applications will work better and may cost less if they are planned in a coordinated way. Many of the market packages share information and need to have

communications links that cross-jurisdictional and Agency boundaries. This interconnection of market packages and communications links is often called an "architecture." If the architecture is not properly planned, some of the market packages may not work together the way they were intended.

Exhibit 5.1
ITS MARKET PACKAGES

Market Package	Sub-category
Traffic Management	
Network Surveillance	• Roadway sensors • Closed-circuit television (CCTV) • Smart call-boxes • Height detectors
Probe Surveillance	
Surface Street Control	• Basic synchronization/coordination • Central control • Advanced crosswalks • Curve/grade warning systems
Freeway Control	• Ramp metering • Lane control
High-occupancy Vehicle (HOV) Lane Management	
Traffic Information Dissemination	• Changeable message signs • Highway advisory radio (HAR) • In-vehicle displays/pagers
Regional Traffic Control	• Integrated freeway/arterial control • Regional Transportation Management Center (TMC)
Traffic Incident Management System	• Computer-aided dispatch (CAD) system enhancements • Motorist aid systems (i.e. call boxes) • Incident detection algorithms • Response strategy support
Traffic Forecast and Demand Management	• Traffic volume estimation • Travel time estimation
Electronic Toll Collection	• FasTrak
Emissions Monitoring and Management	• Pollution level monitoring • Vehicle emissions monitor/spot locations
Virtual TMC and Smart Probe	• Virtual TMC • Smart Probe
Enforcement	• Red light enforcement • Stop sign enforcement • Neighborhood speed monitoring
Standard Railroad Grade Crossing	
Advanced Railroad Grade Crossing	
Railroad Operations Coordination	
Parking Facility Management	• Parking usage monitoring • Electronic parking fees
Regional Parking Management	• Coordinated parking systems
Reversible Lane Management	
Speed Monitoring	
Drawbridge Management	
Roadway Closure Management	• Gate closure systems
Public Transportation	
Transit Vehicle Tracking	• Advanced Vehicle Location (AVL)
Transit Fixed-Route Operations	• Real-time operations management • Off-line route/schedule management
Demand Response Transit Operations	• Automated dispatching/information • Automated route optimization
Transit Passenger and Fare Management	• Automated passenger counting • Electronic fare collection
Transit Security	• Video surveillance • Voice/data communications
Transit Maintenance	• Maintenance scheduling • On-board diagnostics
Multi-modal Coordination	• Signal pre-emption/priority • Transit management center

Market Package	Sub-category
Transit Traveler Information	• Itinerary information services • Static transit route/schedule information • Real-time transit schedule information
Traveler Information	
Broadcast Traveler Information	• Pager-based systems • Radio-based systems
Interactive Traveler Information	• Telephone-based • Kiosk-based • Internet-based
Autonomous Route Guidance	• Mapping systems
Dynamic Route Guidance	
Internet Service Provider (ISP) Based Route Guidance	• Real-time GPS routing
Integrated Transportation Management/Route Guidance	
Yellow Pages and Reservation	
Dynamic Ridesharing	
In-Vehicle Signing	
Vehicle Safety	
Vehicle Safety Monitoring	• On-board diagnostic/warning systems
Driver Safety Monitoring	
Longitudinal Safety Warning	
Lateral Safety Warning	
Intersection Safety Warning	
Pre-Crash Restraint Deployment	
Driver Visibility Improvement	
Advanced Vehicle Longitudinal Control	
Advanced Vehicle Lateral Control	
Intersection Collision Avoidance	
Automated Highway System	
Commercial Vehicle Operations (CVO)	
Fleet Administration	• Radio Frequency Identification (RFID) Transponders • Advanced Vehicle Location (AVL)
Freight Administration	
Electronic Clearance	• Automated Vehicle Identification (AVI)
CV Administrative Processes	
International Border Electronic Clearance	
Weigh-In-Motion	
Roadside CVO Safety	
On-board CVO Safety	
CVO Fleet Maintenance	
Hazardous Materials (HAZMAT) Management	
Roadside HAZMAT Security Detection and Mitigation	
CV Driver Security Authentication	
Freight Assignment Tracking	
Emergency Management	
Emergency Call-Taking and Dispatch	• Emergency vehicle tracking • Enhanced CAD systems
Emergency Routing	• Signal pre-emption for emergency vehicle • Route guidance
Mayday Support	• Mayday notification system • Mayday response center • On-Star
Roadway Service Patrols	• Freeway Service Patrol (FSP)
Transportation Infrastructure Protection	
Wide-Area Alert	
Early Warning System	
Disaster Response and Recovery	
Evacuation and Reentry Management	
Disaster Traveler Information	

Market Package	Sub-category
Archived Data Management	
ITS Data Mart	• Agency-specific traffic & transportation data
ITS Data Warehouse	• Multi-Agency traffic & transportation data
ITS Virtual Data Warehouse	
Maintenance and Construction Management	
Maintenance and Construction Vehicle and Equipment Tracking	• Automatic Vehicle Location (AVL)
Maintenance and Construction Vehicle Maintenance	
Road Weather Data Collection	• Environmental sensors
Weather Information Processing and Distribution	
Roadway Automated Treatment	• Automated de-icing • Fog dispersion
Winter Maintenance	
Roadway Maintenance and Construction	
Work Zone Management	
Work Zone Safety Monitoring	
Maintenance and Construction Activity Coordination	

Source: The National ITS Architecture – Implementation Strategy, U.S. Department of Transportation (CD-ROM)

One of the end results of the ITS Implementation Plan will be an ITS Architecture that the participating Agencies can agree to work toward. It is similar to planning and designing a building so that the various systems work together. The design of an architecture does not mean that everything will be done right away. It means that as pieces of the system are put in place, they will build on one another and be able to communicate with one another.

The market package plan is not the architecture. It represents the ITS applications that should be included in the architecture. The market packages are the building blocks; the architecture is the "glue" that holds them together. The market packages cut across travel modes as well as jurisdictional boundaries. The intermodal and inter-jurisdictional nature of ITS is a compelling reason for all the responsible Agencies to be at the same table for the development of the plan.

5.4 Market Package Evaluation Process

Exhibit 5.2 illustrates the general flow of the process that has been used leading up to the identification and prioritization of ITS market packages. The exhibit also indicates that the next step will involve moving into the definition of projects through the activities of functional requirements and architecture development.

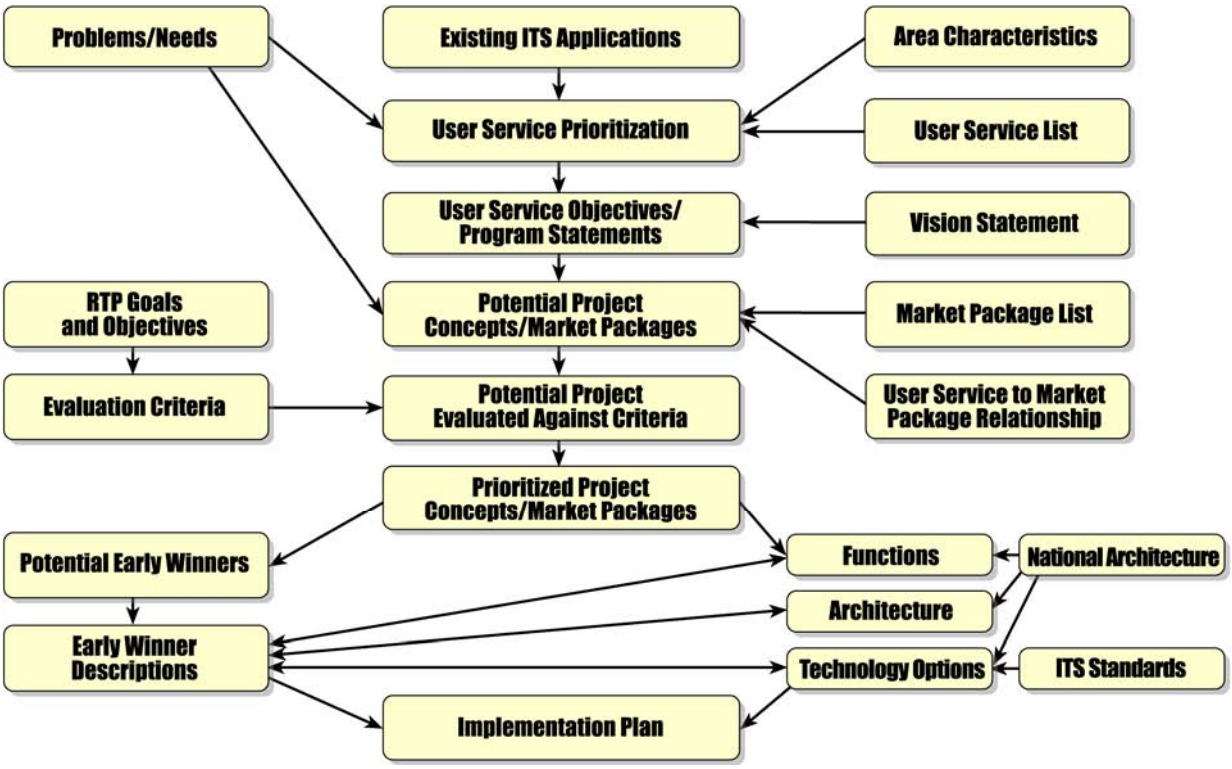
One of the key inputs was an understanding of the problems and issues that exist in the Central Coast that ITS may have some possibility of addressing. The ITS vision and user service objectives (*2000 CCITS Working Paper No. 2*) provided some basic direction and insight into the areas of ITS that stakeholders believe should be emphasized. One of the most important activities, however, involved an assessment by both the TransCore Team and by CCITS Coordinating Group members of the applicability of ITS in the short, medium, and long-term time frames to specific types of problems and their locations, based on all the groundwork conducted up to this point.

Several specific steps were involved in developing the Market Package Plan:

- Existing conditions and problems related to potential ITS applications were documented in *CCITS 2000 Working Paper No. 1, "Issues and Opportunities"*
- Input was obtained from the CCITS Coordinating Group on their view of various market packages both at a Regional level and for individual Counties
- A correlation was developed between candidate market packages and the problems identified earlier in the project
- The TransCore Team convened to develop a draft set of market package recommendations

This is a draft version of the Market Package Plan. It needs to be reviewed by the CCITS Coordinating Group and other study participants before being finalized. Even then, it will be reviewed once more later in the project following the development of the architecture, to ensure that all the recommendations are feasible and in the interest of the Central Coast. The Market Package Plan does not imply any financial obligation on the part of any Agency. However, it reflects substantial outreach to and input from a variety of stakeholders. The intent is to identify market packages that make sense in the short-term (less than 5 years), mid-term (5-10 years), and long-term time frames (longer than 10 years), recognizing that financial and political support will be needed from those Agencies with responsibility for implementation.

Exhibit 5.2
STUDY PROCESS



5.5 Market Packages Related to Identified Problems

An exercise was undertaken by the TransCore Team to relate potential ITS market packages, as described in the National ITS Architecture, to the set of transportation-related problems identified in the Central Coast Region. Exhibit 5.3 shows this relationship based on the list of market packages in the rows and the listing of problem types in the columns. For each combination of market package and problem, an assessment was made as to whether the market package could potentially address the problem and whether that relationship was direct (in which case a "D" was placed in the cell) or whether the relationship was indirect (in which case an "I" was placed in the cell). If the cell has neither a D nor an I, the market package is not viewed to potentially address the problem at all. It is important to recognize that this evaluation was conducted for the general application of market packages in the Region as a whole, not for specific Counties or specific problem locations.

A second element of Exhibit 5.3 is an initial rating of the possible timeframe for implementation of each market package or subcategory within the Central Coast Region. This rating is based on whether it may applicable in the short-term, mid-term, or long-term time frames, or not at all. This assessment takes into consideration both the availability of technology and existing needs. It also implies a priority, to some extent. For example, short-term applicability would generally mean that projects developed based on that market package would likely receive higher priority than projects based on market packages designated for mid-term or long-term applicability. These judgments will become more refined and may be modified during the development of the architecture and definition of specific projects. It is important to note that this initial assessment is for the Region in general, but is not intended to imply that a particular market package would apply to all areas of the Region within the same timeframe. Individual County assessments may not be exactly the same, because the type and magnitude of the problems may vary.

Exhibit 5.3

ITS MARKET PACKAGES VERSUS IDENTIFIED PROBLEMS/NEEDS

Legend: **Implementation Timeframe:** S – short (1 to 5 years), M – mid-term (5 to 10 years), L – long-term (10 to 20 years), N – not applicable in this region

Applicability: D – market package may directly address the problem, I – market package may indirectly address the problem

	Market Package	Implementation Timeframe	Applicability to Problem/Need																										
			Manage Recurring Cong.		Manage Non-recurring		Manage Special Events		Improve Transit Operation		Improve Mobility	Improve Emergency Response		Improve Real-time Monitoring			Provide Traveler Information		Facilitate Goods Movement	Minimize Truck Impacts		Improve Safety			Enhance Planning Data	Improve Maintenance Proc.	Improve Agency Comm.	Minimize Environ. Impacts
			Freeway	Arterial	Incidents	Const./ Events	Congestion	Parking	Quality of Service	Management		Detection	Response	Infrastructure Fail.	Operations	Weather	Operating Conditions	Travel Services		Safety/HAZ MAT	Congestion	Curves/ grades	Railroad Crossing	Pedestrian/ Bike				
Traffic Management	Network Surveillance																												
	• Roadway sensors (include ped and bike)	S	D	D	D	D	D	I				D			D		I		D		I			D	D			
	• CCTV	S	D	D	D	D	D	I				D	I	D	D	I	I		D		I				D			
	• Smart call boxes	S	D	D	D	D	D	I				D	D		D	D	I		D	I	I				D			
	• Height detectors	M												I						D		D						
	Probe Surveillance	L	D	D	I	I	I					D	I	D	D	D	I				I				D		D	
	Surface Street Control																												
	• Basic synchronization/coordination	S		D	I	I	D		D				I				D		D		D			D	I		D	D
	• Central control	S-L		D	D	D	D	I	D				D		D		D		D		D			D		D		I
	• Advanced crosswalk	M																				D			D			
	• Curve/grade warning systems	M																		D		D			D			
	Freeway Control																												
	• Ramp metering	S	D		D	D	D						I		D		I		D						D			I
	• Lane control	N	D		D	D	D						I				I		D							I		I
	HOV Lane Management	M-L	D	D	I	I	I		D	I	D		I		D		I												I
	Traffic Information Dissemination																												
	• Changeable message signs	S	D	D	D	D	D	D									D		I		I	D	D	D		I	D	
	• Highway advisory radio	S	D	D	D	D	D	D									D		I		I					I	D	
	• In-vehicle displays/pagers	M-L	D	D	D	D	D	D									D	D	I		I					I	D	
	Regional Traffic Control																												
	• Integrated freeway/arterial control	M-L	D	D	D	D	D		I		I		I		I		I		D	I	I				I		I	D
	• Regional Transportation Mgmt. Center	M	D	D	D	D	D	I	I	I	I	D	I	I	D		D	I	I	I	I				D		D	I
	Incident Management System																												
	• CAD system enhancements	M			D	I	I			I		I	D						I	D							D	
	• Motorist aid systems (i.e. call boxes)	S			I							D	I	I					I	I								
	• Incident detection algorithms	N			D	I	I					D	I	I	D				I	I	I							I
	• Response strategy support	S			D					I		I	D				I		I	D	D						D	I
	Traffic Forecast and Demand Management																												
	• Traffic volume estimation	L	I	I		I	I	I		I	I						I		I						D	I		I
	• Travel time estimation	L	I	I		I	I			D	I		I				I								D			I
	Electronic Toll Collection	M-L	D	I							D				I		I		D		D				D			I

	Market Package	Implementation Timeframe	Applicability to Problem/Need: Manage Recurring Cong. – Freeway	Manage Recurring Cong. – Arterial	Manage Non-recurring – Incidents	Manage Non-recurring – Const./ Events	Manage Special Events – Congestion	Manage Special Events – Parking	Improve Transit Operation – Quality of Service	Improve Transit Operation – Management	Improve Mobility	Improve Emergency Response – Detection	Improve Emergency Response – Response	Improve Real-time Monitoring – Infrastructure Fail.	Improve Real-time Monitoring – Operations	Improve Real-time Monitoring – Weather	Provide Traveler Information – Operating Conditions	Provide Traveler Information – Travel Services	Facilitate Goods Movement	Minimize Truck Impacts – Safety/HAZ MAT	Minimize Truck Impacts – Congestion	Improve Safety – Curves/ grades	Improve Safety – Railroad Crossing	Improve Safety – Pedestrian/ Bike	Enhance Planning Data	Improve Maintenance Proc.	Improve Agency Comm.	Minimize Environ. Impacts
Traffic Management	Emissions Monitoring and Management																											
	• Pollution level monitoring	S-M													I	I									I			D
	• Vehicle emissions monitor/spot locations	M								I										I					I			D
	Virtual TMC and Smart Probe																											
	• Virtual TMC	M-L	D	D	D	D	I		I	I	I	D	D	I	D	I	D	D	I	I			I		D	I	D	I
	• Smart Probe	L	D	D	D	D	I		I	I	I	D	I	I	D	D	D	I	I						D	I	D	I
	Enforcement																											
	• Red light enforcement	M																		D		D	D	D	D			
	• Stop sign enforcement	M																		D		D	D	D	D			
	• Neighborhood speed monitoring	S																		D		D	D	D	D			
	Standard Railroad Grade Crossing	S																	I	I			D					
	Advanced Railroad Grade Crossing	M		D		D													I	I			D					
	Railroad Operations Coordination	L		D		D											I		I	I	I		D		I		I	
	Parking Facility Management																											
	• Parking usage monitoring	M-L					I	D							D		I	I							D		I	
	• Electronic parking fees	S-L					I	D							I			I							D			I
	Reversible Lane Management	L	D	D	D	D	D	I	I		D		I						D									I
Public Transportation	Transit Vehicle Tracking	S-M							D	D	I	I			D		I	I							D			
	Transit Fixed-Route Operations																											
	• Real-time operations management	M-L			D		D	I	D	D	I	I			D		D	I							D		D	I
	• Off-line route/schedule management	S-M							D	D	I							I							I			I
	Demand Response Transit Operations																											
	• Automated dispatching/information	S				D	D		D	D	D				I		I	I							I		D	I
	• Automated route optimization	M		I	I	D	D		D	D	I														I			I
	Transit Passenger and Fare Management																											
	• Automated passenger counting	S-M								D					D		I								D			
	• Electronic fare collection	S-M							D	D	D				D		I	I							D			
	Transit Security																											
	• Video surveillance	M							D	D					D	I	I								I		I	
	• Voice/data communications	S							D	D					D	I	I								I		I	
	Transit Maintenance																											
	• Maintenance scheduling	S-M							I	D	I				I										D	D		I
	• On-board diagnostics	S-M							D	D	I				D		I								D	D		I
	Multi-modal Coordination																											
	• Signal pre-emption	M		I		I	I		D	I	I		D														I	
	• Transit management center	M-L			I	I	I		I	D	D				D		I	D									D	
	Transit Traveler Information																		D									
	• Itinerary information services	S	I	I		I	I		D		D							D										I
	• Static transit route/schedule info	S	I	I		I	I		D		D							D										I
	• Real-time transit schedule info	M	I	I	I	I	I		D	D	D				D		D	D							I			I

	Market Package	Implementation Timeframe	Applicability to Problem/Need: Manage Recurring Cong. – Freeway	Manage Recurring Cong. – Arterial	Manage Non-recurring – Incidents	Manage Non-recurring – Const./ Events	Manage Special Events – Congestion	Manage Special Events – Parking	Improve Transit Operation – Quality of Service	Improve Transit Operation – Management	Improve Mobility	Improve Emergency Response – Detection	Improve Emergency Response – Response	Improve Real-time Monitoring – Infrastructure Fail.	Improve Real-time Monitoring – Operations	Improve Real-time Monitoring – Weather	Provide Traveler Information – Operating Conditions	Provide Traveler Information – Travel Services	Facilitate Goods Movement	Minimize Truck Impacts – Safety/HAZ MAT	Minimize Truck Impacts – Congestion	Improve Safety – Curves/ grades	Improve Safety – Railroad Crossing	Improve Safety – Pedestrian/ Bike	Enhance Planning Data	Improve Maintenance Proc.	Improve Agency Comm.	Minimize Environ. Impacts
Traveler Information	Broadcast Traveler Information																											
	• Pager-based systems	M	D	D	D	D	D	D									D	D	I		I							
	• Radio-based systems	S	D	D	D	D	D	D									D	D	I		I							
	Interactive Traveler Information																											
	• Telephone-based	S	D	D	D	D	D	D	D		D						D	D	I							I		
	• Kiosk-based	M	D	D	D	D	D	D	D		D						D	D	I							I		
	• Internet-based	S	D	D	D	D	D	D	D		D						D	D	I							I		
	Autonomous Route Guidance	N	I	I	I	I	I		I		I		D					D	I		I							
	Dynamic Route Guidance	L	I	I	I	I	I		I		I		D				D	D	I		I						I	
	ISP Based Route Guidance	M	I	I	I	I	I		I		I		D				D	D	I		I						I	
	Integrated Trans. Management/Route Guidance	N	D	D	D	D	D	D	I		I		D				D	D	D		D						D	I
	Yellow Pages and Reservation	S									D							D									I	
	Dynamic Ridesharing	L	I	I		I	I		I		D							D							D			I
	In Vehicle Signing	L	D	D	D	D	D				I						D		D		D	D	D					
Vehicle Safety	Vehicle Safety Monitoring	N			D															I		I	I	I				
	Driver Safety Monitoring	N			D															I								
	Longitudinal Safety Warning	N			D															D		I						
	Lateral Safety Warning	N			D															D		I						
	Intersection Safety Warning	N			D												I			D		I	D	I				
	Pre-Crash Restraint Deployment	N			D															I		I						
	Driver Visibility Improvement	N			D															D		I	I	D				
	Advanced Vehicle Longitudinal Control	N	I	I	D															D		I						
	Advanced Vehicle Lateral Control	N			D															D		I						
	Intersection Collision Avoidance	N			D												I		I	D		I	D	I				
	Automated Highway System	N	D	D	D				I			D			D		I		D	D	I	D	D	I			I	I
Commercial Vehicle Operations	Fleet Administration	N													I				D	I	D							
	Freight Administration	N																	D	D								I
	Electronic Clearance	S	D												D				D	D	D				D		I	I
	CV Administrative Processes	S																	D						D			
	International Border Electronic Clearance	N	D	D							I				D				D	D					D			I
	Weigh-In-Motion	S	D												D				D	D	D				D			I
	Roadside CVO Safety	M			I														D	I		I						
	On-board CVO Safety	N			I														D	I		I						
	CVO Fleet Maintenance	N			I														D	I		I						
	HAZMAT Management	S-M			I								D							D								D
	Roadside HAZMAT Security Detection and Mitigation	L			I							D	I		I				I	D					I			I
	CV Driver Security Authentication	L																	I		D							
	Freight Assignment Tracking	L																	I		D							
	Automated Dispatch/Information (CVO ATIS)	M									I								D		D							

	Market Package	Implementation Timeframe	Applicability to Problem/Need: Manage Recurring Cong. – Freeway	Manage Recurring Cong. – Arterial	Manage Non-recurring – Incidents	Manage Non-recurring – Const./ Events	Manage Special Events – Congestion	Manage Special Events – Parking	Improve Transit Operation – Quality of Service	Improve Transit Operation – Management	Improve Mobility	Improve Emergency Response – Detection	Improve Emergency Response – Response	Improve Real-time Monitoring – Infrastructure Fail.	Improve Real-time Monitoring – Operations	Improve Real-time Monitoring – Weather	Provide Traveler Information – Operating Conditions	Provide Traveler Information – Travel Services	Facilitate Goods Movement	Minimize Truck Impacts – Safety/HAZ MAT	Minimize Truck Impacts – Congestion	Improve Safety – Curves/ grades	Improve Safety – Railroad Crossing	Improve Safety – Pedestrian/ Bike	Enhance Planning Data	Improve Maintenance Proc.	Improve Agency Comm.	Minimize Environ. Impacts
Emergency Management	Emergency Call-Taking and Dispatch																											
	• Emergency vehicle tracking	S			I							I	D							I					D		D	
	• Enhanced CAD systems	S-M			I								D							I							D	
	Emergency Routing																											
	• Signal pre-emption for emergency veh.	S			I								D							D								
	• Route guidance	M			I								D							D								
	Mayday Support																											
	• Mayday notification system	M			I							D	D					I		D								
	• Mayday response center	M			I							D	D					I		D						D		
	Roadway Service Patrol																											
	• Freeway service patrols	M	I		D		I		I		I	I	I						I									
	Transportation Infrastructure Protection	L			D							D	I	D	I										I			I
	Wide-Area Alert	M-L			D					I	I		D				D	D									I	
	Early Warning System	M-L			D					I	I		I				D	D									I	
	Disaster Recovery and Response	M-L			D					I	I		I				D	D									I	
	Evacuation and Reentry Management	M-L			D					I	I		I				D	D									I	
	Disaster Traveler Information	S-M			D					I	I		I				D	D									I	
Archive Data Mgmt.	ITS Data Management																											
	• Speed/delay	M	I	I	I	I	I										I		I						D			
	• Volume	S	I	I	I	I	I										I		I						D			
	• Environmental data	S															I			I					D			D
	ITS Data Warehouse	L	I	I	I	I	I	I	I	I	I	I	I	I					I		I					D	I	I	
Maintenance and Construction Management	Maintenance and Construction Vehicle Equipment Tracking	L				I								I													D		
	Maintenance and Construction Vehicle Maintenance	L				I								I													D		
	Road Weather data collection																											
	• Environmental sensors	S			I	I							I	D		D	I		I	I		I			D			D
	Weather Information Processing and Distribution																											
	• Weather info dissemination	S-M			I								I				D	I	D		I	I			I		D	
	Roadway Automated Treatment																											
	• Fog dispersion	M-L							I		D					D			I	I		D	I	I		I		
	• Automated de-icing	M-L							I		D					D			I	I		D	I			I		
	Winter Maintenance	M							I		D					D			I	I		D	I	I		I		
	Roadway Maintenance and Construction	S				D					D						I				I					D		
	Work Zone Management	M				D																				D		
	Work Zone Safety Monitoring	L				D																				D		
	Maintenance and Construction Activity Coordination	M				D					I						I		I							D	D	

5.6 Summary Of Recommended Market Package Priorities

As indicated, Exhibit 5.3 expresses the market package applicability for the identified problem types at the level of the entire 5-County Region. The TransCore Team also worked with the individual Counties and with Caltrans to identify variations that may be appropriate in the short/mid/long term assessments at the County level. These variations may be appropriate based on the degree to which the problems either exist or do not exist in each County and the level of severity of the problems or needs.

Exhibit 5.4 provides an assessment of market package applicability (in terms of short/medium/long term) for the individual Counties, as well as the Region as a whole. It is based on the same market package list and Regional assessment presented in Exhibit 5.3, but adds to it assessments that are specific to the individual Counties. It also shows which market packages are specifically not recommended. These assessments will be used as take-off points for the development of the architecture and associated projects.

Exhibit 5.4 provides the following specific information:

- Listing of the ITS market package and the subcategories within the package, if applicable
- As assessment of overall implementation timeframe for the Region in general and by County
- Expected benefits – a short statement of how the market package could be expected to benefit travel in the Region
- Comment – Any ideas that should be conveyed as part of carrying the market package forward

The implementation timeframe assessment takes into consideration the availability of technology, as well as existing needs and priorities. This rating is based on whether individual market packages may applicable in the short-term (within the next 5 years), mid-term (5 to 10 years), or long-term (more than 10 years) time frames, or not at all. A NR in Exhibit 5.4 means "not recommended for further consideration for public sector implementation." The private sector (auto manufacturers, communications firms, etc.) will move forward with their own initiatives based on the receptivity of the marketplace. These areas are not viewed to be initiatives that the public Agencies in the Central Coast can influence. It is not that the potential for these market packages is minimal, but they do not generally involve public sector decisions. However, public Agencies should be aware of developments in these areas as they occur, so that their own decisions can take advantage of any developments that can enhance government services or make them more cost-effective.

It is important to note that the timeframe assessment presented in this exhibit is not intended to imply that a particular market package would apply to all areas of the Region, or even a County, within the same timeframe. This assessment generally reflects the earliest time that a particular market package may be implemented within the Region or individual County. Furthermore, the market package may only be applicable to certain locations within the Region or County.

Exhibit 5.4 can be viewed as a summary of the market packages recommended to carry forward for further evaluation in the Central Coast. Much of the focus of subsequent work in the development of the Implementation Plan will focus on the market packages recommended for

the short and mid-term. The architecture and project development activities will consider long-term applications as well, but the emphasis will be on the short and mid-term. The rapid pace of change in technology makes planning for the long term more difficult and uncertain. The recommendations should be considered draft, as they represent the assessment of the TransCore Team without review by the CCITS Coordinating Group nor other study participants. In addition, there may be modifications to these priorities associated with the development of the architecture and specific projects

Exhibit 5.4
ITS MARKET PACKAGE APPLICABILITY BY COUNTY

Legend:
County: SBE – San Benito; SCR – Santa Cruz; M – Monterey; SLO – San Luis Obispo; SBA – Santa Barbara
Implementation Timeframe: S – short (1 to 5 years), M – mid-term (5 to 10 years), L – long-term (10 to 20 years), NR – not recommended for Public Agency implementation

Market Package	Overall Regional Timeframe	TIMEFRAME by COUNTY					Potential Benefits	Comments
		SBE	SCR	M	SLO	SBA		
TRAFFIC MANAGEMENT								
Network Surveillance								
• Roadway sensors	S	M	S	S	S-M	S	Enables control and info functions	Freeway and arterial
• CCTV	S	S-M	S	S-M	M	S	Cong. mon. and inc. response	Freeway and arterial
• Smart call boxes	S	S-M	S	S	S-M	S	Better data in selected locations	Extends use of existing call boxes
• Height detectors	M	M	M	M	M	M	Better info for truckers	Strategic locations and/or overpasses
Probe Surveillance	L	NR	L	L	L	L		
Surface Street Control								
• Basic synchronization/coordination	S	S	S	S	S	S	Improved speeds, fewer stops	Highly effective use of $
• Central control	S-L	L	S	M	M	S	Same as above plus better mgmt. of system overall	For larger Cities in Central Coast CBD areas
• Advanced crosswalks	M	NR	M	M	S-M	M	Improved pedestrian/bicycle safety	Freeways
• Curve/grade warning systems	M	M	M	M	M	M	Increases level of awareness & safety	
Freeway Control								
• Ramp metering	S	L	S	L	M-L	S	Better use of freeway, safer merging	Need to plan with Cities
• Lane control	NR	NR	NR	NR	NR	NR		Technique not used in area
HOV Lane Management	M-L	NR	L	NR	NR	L	More automated control of lanes	Only as HOV implemented
Traffic Information Dissemination								
• Changeable message signs	S	M	S	S	S	S	Quick, effective display of info to public	Quality of info is key
• Highway advisory radio	S	M	S	S	M	S	Good for construction areas/events	
• In-vehicle displays/pagers	M-L	NR	M-L	M-L	M-L	L	Emerging as way to target info to customer	
Regional Traffic Control								
• Integrated freeway/arterial control	M-L	L	M-L	M-L	L	M	Reduced congestion at interchanges	Need state/local agmt
• Regional Transportation Mgmt. Center	M	NR	M	M	M	M	Better inter-jurisdictional coord/ response	

Market Package	Overall Regional Timeframe	TIMEFRAME by COUNTY					Potential Benefits	Comments
		SBE	SCR	M	SLO	SBA		
Traffic Incident Management System								
• CAD system enhancements	M	M	M	M	M	M	Better inter-Agency coord/response	Funding is local option
• Motorist aid systems (i.e. call boxes)	S	S	S	S	S	S	Assistance to stranded motorists	Most inc. reported thru mobile phones
• Incident detection algorithms	NR	NR	NR	NR	NR	NR		
• Response strategy support	S	S	S	S	M	S	Rapid clearance, reduced delay	
Traffic Forecast and Demand Management								
• Traffic volume estimation	L	NR	L	NR	NR	L		These strategies more advanced than needed
• Travel time estimation	L	NR	L	NR	NR	L		
Electronic Toll Collection	M-L	NR	L	M-L	NR	L	Operational efficiency, reduced delay	If toll facilities built
Emissions Monitoring and Management								
• Pollution level monitoring	S-M	NR	M	S-M	M	S	Automation of smog alerts	Need to tie to policy
• Vehicle emissions monitor/spot locations	M	NR	M	M	M	M	Enforcement of emission reqts	
Virtual TMC and Smart Probe								
• Virtual TMC	M-L	NR	L	M-L	M	L	Could be local or low-cost TMC	
• Smart Probe	L	NR	L	L	L	L	Unlikely in Central Coast for some time	
Enforcement								
• Red light enforcement	M	M	M	M	L	M	Better traffic discipline/safety	Should be implemented selectively to address known problems
• Stop sign enforcement	M	M	M	M	L	M	Better traffic discipline/safety	
• Neighborhood speed monitoring	S	M	S	S	M	S	Safer neighborhood streets	
Standard Railroad Grade Crossing	S	S	S	S	S	S	Standard safety warning systems	
Advanced Railroad Grade Crossing	M	M	M	M	M	M	Improved warning/protection	
Railroad Operations Coordination	L	L	L	L	L	L	Unlikely in Central Coast for some time	
Parking Facility Management								Only use in garages with frequent overflow
• Parking usage monitoring	M-L	NR	L	M-L	M-L	S-M	Reduced delay	
• Electronic parking fees	S-L	NR	L	M-L	S-M	M	Improved efficiency	In govt. run lots/garages
Reversible Lane Management	L	NR	L	NR	NR	L	Unlikely to have much application	
PUBLIC TRANSPORTATION								
Transit Vehicle Tracking	S-M	NR	S-M	S-M	M	M	Improves operation, schedule adherence	
Transit Fixed-Route Operations								
• Real-time operations management	M-L	NR	M-L	M-L	M	M	Provides real-time bus info to passngrs	
• Off-line route/schedule management	S-M	NR	S-M	S-M	S-M	S-M	Improves internal operations	
Demand Response Transit Operations								
• Automated dispatching/information	S	M	S	S	M	S	Reduces demands on dispatchers	
• Automated route optimization	M	L	M	M	M	M	Better use of existing vehicles	

Market Package	Overall Regional Timeframe	TIMEFRAME by COUNTY					Potential Benefits	Comments
		SBE	SCR	M	SLO	SBA		
Transit Passenger and Fare Management								
• Automated passenger counting	S-M	NR	S	S	M	S	Better info for route planning	
• Electronic fare collection	S-M	NR	S	S	M	S	Faster boarding, less cash mgmt	
Transit Security								
• Video surveillance	M	NR	M	M	S-M	L	Improved passenger/driver security	Only where security is a problem
• Voice/data communications	S	S	S	S	M	L	Improved pass/driver security	
Transit Maintenance								
• Maintenance scheduling	S-M	NR	S	S	M-L	S	Improved in-service percentage	
• On-board diagnostics	S-M	NR	S	S	M-L	S	Improved in-service percentage	Bus purchase option
Multi-modal Coordination								
• Signal pre-emption/priority	M	NR	M	M	M	M	Improved schedule adherence	On heavier routes and must not degrade flow
• Transit management center	M-L	NR	M-L	M-L	M-L	L	Improved overall operations	
Transit Traveler Information								
• Itinerary information services	S	M	S	S	S	S	Personalized route planning	Can add features incrementally
• Static transit route/schedule info	S	M	S	S	M	S	Basic info automated	
• Real-time transit schedule info	M	NR	M	M	M-L	M	Improved passenger info	
TRAVELER INFORMATION								
Broadcast Traveler Information								
• Pager-based systems	M	L	M	M	M	M	Targeted info to subscribers	All info systems must maintain info quality
• Radio-based systems	S	L	S	S	M	S	Traffic info to wide audience	
Interactive Traveler Information								
• Telephone-based	S	L	S	S	S	S	Provides easy immediate info access	
• Kiosk-based	M	L	M	M	M	M	Provides info at spot locations	Need to be selective
• Internet-based	S	S	S	S	S	S	Info to users with PCs	
Autonomous Route Guidance	NR	NR	NR	NR	NR	NR	A private sector initiative	
Dynamic Route Guidance	L	NR	NR	L	L	L	Will require some public sector action	
ISP Based Route Guidance	L	NR	NR	L	L	L	Long term strategy	
Integrated Transportation Management/Route Guidance	NR	NR	NR	NR	NR	NR	Most advanced level not likely in Central Coast	
Yellow Pages and Reservation	S	M	S	S	S	S	Basic info to travelers on services	
Dynamic Ridesharing	L	NR	L	L	L	L	Possibly more use of transit	Feasibility questionable
In Vehicle Signing	L	NR	L	L	L	L	Mainly a private sector initiative	
VEHICLE SAFETY								
Vehicle Safety Monitoring	NR	NR	NR	NR	NR	NR	Private sector initiative	Public agency support
Driver Safety Monitoring	NR	NR	NR	NR	NR	NR	Private sector initiative	Public agency support
Longitudinal Safety Warning	NR	NR	NR	NR	NR	NR	Private sector initiative	Public agency support

Market Package	Overall Regional Timeframe	TIMEFRAME by COUNTY					Potential Benefits	Comments
		SBE	SCR	M	SLO	SBA		
Lateral Safety Warning	NR	NR	NR	NR	NR	NR	Private sector initiative	Public agency support
Intersection Safety Warning	NR	NR	NR	NR	NR	NR	Private sector initiative	Public agency support
Pre-Crash Restraint Deployment	NR	NR	NR	NR	NR	NR	Private sector initiative	Public agency support
Driver Visibility Improvement	NR	NR	NR	NR	NR	NR	Private sector initiative	Public agency support
Advanced Vehicle Longitudinal Control	NR	NR	NR	NR	NR	NR	Private sector initiative	Public agency support
Advanced Vehicle Lateral Control	NR	NR	NR	NR	NR	NR	Private sector initiative	Public agency support
Intersection Collision Avoidance	NR	NR	NR	NR	NR	NR	Private sector initiative	Public agency support
Automated Highway System	NR	NR	NR	NR	NR	NR	Private sector initiative	Public agency support
COMMERCIAL VEHICLE OPERATIONS								
Fleet Administration	NR	NR	NR	NR	NR	NR	Private sector initiative	
Freight Administration	NR	NR	NR	NR	NR	NR	Private sector initiative	
Electronic Clearance	S	NR	S	S	S	S	Less delay, more efficient	Respons. of State
CV Administrative Processes	S	NR	S	S	S	S	Less delay, more efficient	Respons. of State
International Border Electronic Clearance	NR	NR	NR	NR	NR	NR	Not applicable in Central Coast	
Weigh-In-Motion	S	NR	S	S	NR	S	Less delay	Respons. of State
Roadside CVO Safety	M	M	M	M	M	M	Reduced accidents	
On-board CVO Safety	NR	NR	NR	NR	NR	NR	Private sector initiative	
CVO Fleet Maintenance	NR	NR	NR	NR	NR	NR	Private sector initiative	
HAZMAT Management	S-M	M	S-M	S-M	M	S-M	Improved safety	Respons. of State
Roadside HAZMAT Security Detection and Mitigation	L	L	L	L	L	L	Improved safety	Respons. of State
CV Driver Security Authentication	L	L	L	L	L	L	Improved safety	Respons. of State
Freight Assignment Tracking	L	L	L	L	L	L	Improved safety	Respons. of State
Automated dispatch/information or CVO ATIS	M			S-M			Assist with truck staging areas, congestion	
EMERGENCY MANAGEMENT								
Emergency Call-Taking and Dispatch • Emergency vehicle tracking • Enhanced CAD systems	 S S-M	 M M	 S S-M	 S S-M	 M L	 S S	 Improved service, response times Improved emergency response	
Emergency Routing • Signal pre-emption for emergency vehicles • Route guidance	 S M	 M L	 S M	 S M	 S-M L	 S M	 Improved response times Improved response times	
Mayday Support • Mayday notification system • Mayday response center	 M M	 M M	 M M	 M M	 M L	 M M	 Improved response times Improved response times	For remote areas. Mainly private sector.

Market Package	Overall Regional Timeframe	TIMEFRAME by COUNTY					Potential Benefits	Comments
		SBE	SCR	M	SLO	SBA		
Roadway Service Patrol • Freeway Service Patrols	M	L	S	S	M	M	Improved incident management	
Transportation Infrastructure Protection	L	L	L	L	L	L	Improved safety	
Wide-Area Alert	M-L	L	L	L	M	L	Improved safety	Diablo Canyon
Early Warning System	M-L	L	L	L	M	L	Improved safety	Diablo Canyon, Fires, Earthquakes, etc.
Disaster Response and Recovery	M-L	L	L	L	M	L	Improved incident and traffic management	Regional coordination rqd.
Evacuation and Re-entry Management	M-L	L	L	L	M	L	Improved incident and traffic management	Regional coordination rqd.
Disaster Traveler Information	S-M	M	S	S	S	S	Improved incident and emergency management	Regional coordination rqd.
ARCHIVED DATA MANAGEMENT								
ITS Data Mart • Speed/delay • Volume • Environmental data	 M S S	 L S S	 M S S	 M S S	 S-M S-M M	 M S S	 Better data on congestion locations Better data for traffic planning Better data for environmental planning	Design ability to capture and store data into ITS projects
ITS Data Warehouse	L	L	L	L	L	L	Improved Regional collaboration	AMBAG respons.
MAINTENANCE AND CONSTRUCTION MANAGEMENT								
Maintenance and Construction Vehicle Equipment Tracking	L	L	L	L	L	L	Improved MCO efficiency	
Maintenance and Construction Vehicle Maintenance	L	L	L	L	L	L	Improved MCO vehicle availability	
Road Weather Data Collection • Environmental sensors	M	M	M	M	M	M	Faster response to weather conditions	Caltrans D5 RWIS planned
Weather Information Processing and Distribution • Weather info dissemination	S-M	M	S-M	S-M	M	M	More effective info to public	
Roadway Automated Treatment • Fog dispersion • Automated de-icing	 M-L M-L	M-L	M-L	M-L	M-L	M-L	Faster response to weather conditions and improved traveler safety	
Winter Maintenance	M					M		
Roadway Maintenance and Construction	S	S	S	S	S	S	Improved road and equipment condition	
Work Zone Management	M	M	M	M	M	M	Improved worker and traveler safety	With Caltrans
Work Zone Safety Monitoring	L	L	L	L	L	L	Improved worker and traveler safety	With Caltrans
Maintenance and Construction Activity Coordination	M	M	M	M	M	M	Better Regional collaboration and improved traveler information	Regional coordination rqd. With Caltrans

6. ITS PERFORMANCE MEASURES/EVALUATION CRITERIA

Task II.A, Sub-Task #2 of the CCITS Implementation Plan calls for the development of performance criteria that can be applied to the development of the plan. This technical memorandum briefly highlights a recommended set of performance criteria to be used as the CCITS Implementation Plan is developed.

There are several potential uses of performance criteria. In some cases, they can be used in an analytical evaluation of potential ITS applications (e.g. estimating changes in vehicle miles of travel, vehicle or person hours of travel, emissions, number of trips, etc.), similar to the way in which highway or transit improvements would be evaluated in a transportation planning study. Performance criteria can also be used to determine how well an implemented system is operating: whether the system has actually improved traffic flow; how many passengers are using the information, etc.

However, one of the most important uses of performance criteria is as a set of "evaluation criteria" that can be used in the evaluation and prioritization of projects and programs for implementation. These criteria can be used to guide Agencies through their decisions on areas of ITS and specific types of projects move forward through their own planning and funding processes. Ideally, these criteria should be quantitative in nature, but must also take into consideration factors that are more difficult to quantify. This memorandum primarily addresses the criteria to be used in evaluating and prioritizing potential ITS projects and programs for the Central Coast. For the most part, performance criteria developed for the other applications will flow from these evaluation criteria and will consist of more detailed subsets of the criteria.

It is also important to note that many RTPAs already have sets of evaluation criteria that they apply to the evaluation and prioritization of projects and programs (e.g. for prioritization for the TIP and for local funding). For applications in any individual County, it may be most appropriate to use the County-level criteria for project and program evaluation, 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. The criteria presented in this memorandum are suggested for applicability across the Central Coast Region for the specific purpose of addressing ITS. Later in the project, the TransCore Team will assist the CCITS Coordinating Group with identifying and compiling data that can support the evaluation of projects and programs, to the extent that such information is available.

The remainder of this memorandum provides a suggested set of evaluation criteria for discussion. The intent is not to create an exhaustive list of criteria, but a list that can be used as a reasonable guide for the CCITS Coordinating Group and other Stakeholders in the examination of possible ITS projects and programs. The criteria are intended for discussion at the August 2005 meeting of the CCITS Coordinating Group and will be incorporated into later study documentation. The criteria may also be modified later in the study, if necessary. The draft recommended evaluation criteria include:

- **Consistency with local goals and objectives** – Does the ITS project or program support the goals and objectives already in place in the Regional Transportation Plans and other planning documents?

- **Benefits to congestion and mobility** – To what extent does the project or program improve traffic flow, reduce trip time, or make travel more convenient for auto travelers, transit passengers, truck drivers, etc.? Measures used in county Congestion Management Programs may be good descriptors.
- **Benefits to safety (protection of life and property)** – To what extent does the project or program reduce the frequency and/or severity of accidents or improve security?
- **Benefits to environmental quality** – To what extent does the project or program reduce emissions or limit impacts on the environment and communities?
- **Benefits to tourism/economic development** – To what extent is the project or program likely to benefit tourism, agriculture/industry, or otherwise help the economy?
- **Benefits to emergency preparedness** – Does the project or program assist in helping Agencies be more prepared to deal with natural disasters and emergencies?
- **Improvement to Agency operational efficiency** – To what extent does the project or program help Agencies improve or provide additional services without increased cost or to do more with less?
- **Implementation cost** – What are the costs of construction and implementation?
- **Operating and maintenance cost** – What are the costs of keeping the system running, both technologically and in terms of personnel?
- **Cost-effectiveness** – Does the project or program return a good level of benefit for the investment?
- **Institutional feasibility** – Can Agencies determine who will be responsible for various aspects of the project or program, coordinate the effort, and make sure that it can be managed effectively?
- **Public acceptance and satisfaction** – Will the public be able to see that the project or program was a good investment of public dollars and be willing to use it in the way that it was intended? Does the project give them more accurate and timely information?
- **Level of risk (i.e. extent to which technology is proven)** – Is the development of the technology advanced enough so that there is relatively little risk of failure?

APPENDIX A- ITS MARKET PACKAGES

APPENDIX A – ITS MARKET PACKAGES

(Source: National ITS Architecture Version 5 – CD-ROM)

The National ITS Architecture uses the term "market packages" to represent an ITS improvement strategy or set of strategies that can be deployed as a unit to address a transportation or air quality objective or problem. The market package terminology is considered to be synonymous with improvement strategies. A set of market package descriptions is provided below. The complete set of market packages, as identified in the National ITS Architecture, are listed in Exhibit A-1. As stated in the Integrating ITS in the Planning Process handbook, "it is important to note that the listing of market packages is neither comprehensive nor prescriptive." This listing should be used as a starting point. Other ITS market packages may be defined in response to specific problems, or may be generated as part of the development of the ITS industry in the coming years.

The market packages address the specific service requirements of traffic managers, transit operators, travelers, and other ITS stakeholders. The market packages have been organized into eight (8) major application areas.

1. Archived Data Management (AD)
2. Public Transportation (APTS)
3. Traveler Information (ATIS)
4. Traffic Management (ATMS)
5. Vehicle Safety (AVS)
6. Commercial Vehicle Operations (CVO)
7. Emergency Management (EM)
8. Maintenance & Construction Management (MCO)

Market packages are also structured to segregate services that are likely to encounter technical or non-technical challenges from lower risk services. This approach identifies a subset of the market packages that are likely early deployments. At the other end of the spectrum, several of the market packages represent advanced products or services that will not be available for some time. Many of the market packages are also incremental so that more advanced packages can be efficiently implemented by building on common elements that were deployed earlier with more basic packages. The market packages were defined with enough granularity to support specific benefits analysis and clear ties to transportation problems. Some of the user services are too broadly defined to allow this sort of evaluation.

It is important to note that the market packages are illustrative rather than prescriptive. The actual implementation variations that are possible across the Country are myriad and cannot be enumerated through a finite set of packages. The market packages are tools that allow the CCITS Implementation Strategy to discuss incremental deployment of ITS services in a manner that is relevant to the underlying architecture definition.

The remainder of this memo provides a description of the service offered by each market package. Where several major implementation options are supported by the market package, these are also identified and differentiated in the descriptions. In order to more accurately specify market packages in tables, each is given an abbreviation indicating the general class of stakeholder and an index (e.g., ATMS01 is a market package primarily of interest to transportation managers).

Exhibit A-1: Market Packages Summary

Market Package	Market Package Name
Archived Data Management	
AD1	ITS Data Mart
AD2	ITS Data Warehouse
AD3	ITS virtual Data Warehouse
Public Transportation	
APTS1	Transit Vehicle Tracking
APTS2	Transit Fixed-Route Operations
APTS3	Demand Response Transit Operations
APTS4	Transit Passenger and Fare Management
APTS5	Transit Security
APTS6	Transit Maintenance
APTS7	Multi-modal Coordination
APTS8	Transit Traveler Information
Traveler Information	
ATIS1	Broadcast Traveler Information
ATIS2	Interactive Traveler Information
ATIS3	Autonomous Route Guidance
ATIS4	Dynamic Route Guidance
ATIS5	ISP Based Trip Planning and Route Guidance
ATIS6	Integrated Transportation Management/Route Guidance
ATIS7	Yellow Pages and Reservation
ATIS8	Dynamic Ridesharing
ATIS9	In Vehicle Signing
Traffic Management	
ATMS01	Network Surveillance
ATMS02	Probe Surveillance
ATMS03	Surface Street Control
ATMS04	Freeway Control
ATMS05	HOV Lane Management
ATMS06	Traffic Information Dissemination
ATMS07	Regional Traffic Control
ATMS08	Traffic Incident Management System
ATMS09	Traffic Forecast and Demand Management
ATMS10	Electronic Toll Collection
ATMS11	Emissions Monitoring and Management
ATMS12	Virtual TMC and Smart Probe Data
ATMS13	Standard Railroad Grade Crossing
ATMS14	Advanced Railroad Grade Crossing
ATMS15	Railroad Operations Coordination
ATMS16	Parking Facility Management
ATMS17	Regional Parking Management
ATMS18	Reversible Lane Management
ATMS19	Speed Monitoring
ATMS20	Drawbridge Management
ATMS21	Roadway Closure Mangement
Vehicle Safety	
AVSS01	Vehicle Safety Monitoring
AVSS02	Driver Safety Monitoring
AVSS03	Longitudinal Safety Warning
AVSS04	Lateral Safety Warning
AVSS05	Intersection Safety Warning
AVSS06	Pre-Crash Restraint Deployment

Market Package	Market Package Name
AVSS07	Driver Visibility Improvement
AVSS08	Advanced Vehicle Longitudinal Control
AVSS09	Advanced Vehicle Lateral Control
AVSS10	Intersection Collision Avoidance
AVSS11	Automated Highway System
Commercial Vehicle Operations	
CVO01	Fleet Administration
CVO02	Freight Administration
CVO03	Electronic Clearance
CVO04	CV Administrative Processes
CVO05	International Border Electronic Clearance
CVO06	Weigh-In-Motion
CVO07	Roadside CVO Safety
CVO08	On-board CVO and Freight Safety & Security
CVO09	CVO Fleet Maintenance
CVO10	HAZMAT Management
CVO11	Roadside HAZMAT Security Detection and Mitigation
CVO12	CV Driver Security Authentication
CVO13	Freight Assignment Tracking
Emergency Management	
EM1	Emergency Call-Taking and Dispatch
EM2	Emergency Routing
EM3	Mayday and Alarms Support
EM4	Roadway Service Patrols
EM5	Transportation Infrastructure Protection
EM6	Wide-Area Alert
EM7	Early Warning System
EM8	Disaster Response and Recovery
EM9	Evacuation and Reentry Management
EM10	Disaster Traveler Information
Maintenance and Construction Management	
MCO01	Maintenance and Construction Vehicle and Equipment Tracking
MCO02	Maintenance and Construction Vehicle Maintenance
MCO03	Road Weather Data Collection
MCO04	Weather Information Processing and Distribution
MCO05	Roadway Automated Treatment
MCO06	Winter Maintenance
MCO07	Roadway Maintenance and Construction
MCO08	Work Zone Management
MCO09	Work Zone Safety Monitoring
MCO010	Maintenance and Construction Activity Coordination

A.1 Archived Data Management Market Packages

ITS Data Mart (AD1)

This market package provides a focused archive that houses data collected and owned by a single agency, district, private sector provider, research institution, or other organization. This focused archive typically includes data covering a single transportation mode and one jurisdiction that is collected from an operational data store and archived for future use. It provides the basic data quality, data privacy, and meta data management common to all ITS archives and provides general query and report access to archive data users.

ITS Data Warehouse (AD2)

This market package includes all the data collection and management capabilities provided by the ITS Data Mart, and adds the functionality and interface definitions that allow collection of data from multiple agencies and data sources spanning across modal and jurisdictional boundaries. It performs the additional transformations and provides the additional meta data management features that are necessary so that all this data can be managed in a single repository with consistent formats. The potential for large volumes of varied data suggests additional on-line analysis and data mining features that are also included in this market package in addition to the basic query and reporting user access features offered by the ITS Data Mart.

ITS Virtual Data Warehouse (AD3)

This market package provides the same broad access to multimodal, multidimensional data from varied data sources as in the ITS Data Warehouse Market Package, but provides this access using enhanced interoperability between physically distributed ITS archives that are each locally managed. Requests for data that are satisfied by access to a single repository in the ITS Data Warehouse Market Package are parsed by the local archive and dynamically translated to requests to remote archives which relay the data necessary to satisfy the request.

A.2 Transit Management Market Packages

Transit Vehicle Tracking (APTS1)

This market package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle (e.g., through GPS) and relayed to the infrastructure or may be determined directly by the communications infrastructure. A two-way wireless communication link with the Transit Management Subsystem is 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 Subsystem processes this information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider.

Transit Fixed-Route Operations (APTS2)

This market package performs vehicle routing and scheduling, as well as automatic operator assignment and system monitoring for fixed-route and flexible-route transit services. This service determines current schedule performance using AVL data and provides information displays at the Transit Management Subsystem. Static and real time transit data is exchanged with

Information Service Providers where it is integrated with that from other transportation modes (e.g. rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.

Demand Response Transit Operations (APTS3)

This market package performs vehicle routing and scheduling as well as automatic operator assignment and monitoring for demand responsive transit services. In addition, this market package performs similar functions to support dynamic features of flexible-route transit services. This package monitors the current status of the transit fleet and supports allocation of these fleet resources to service incoming requests for transit service while also considering traffic conditions. The Transit Management Subsystem provides the necessary data processing and information display to assist the transit operator in making optimal use of the transit fleet. This service includes the capability for a traveler request for personalized transit services to be made through the Information Service Provider (ISP) Subsystem. The ISP may either be operated by a transit management center or be independently owned and operated by a separate service provider. In the first scenario, the traveler makes a direct request to a specific paratransit service. In the second scenario, a third party service provider determines that the paratransit service is a viable means of satisfying a traveler request and makes a reservation for the traveler.

Transit Passenger and Fare Management (APTS4)

This market package manages passenger loading and fare payments on-board transit vehicles using electronic means. It allows transit users to use a traveler card or other electronic payment device. Sensors mounted on the vehicle permit the operator and central operations to determine vehicle loads, and readers located either in the infrastructure or on-board the transit vehicle allow electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem. Two other market packages, ATMS10: Electronic Toll Collection and ATMS16: Parking Facility Management also provide electronic payment services. These three market packages in combination provide an integrated electronic payment system for transportation services.

Transit Security (APTS5)

This market package provides for the physical security of transit passengers and transit vehicle operators. On-board equipment is deployed to perform surveillance and sensor monitoring in order to warn of potentially hazardous situations. The surveillance equipment includes video (e.g., CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g., chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g., metal detectors). Transit user or transit vehicle operator activated alarms are provided on-board. Public areas (e.g., transit stops, park and ride lots, stations) are also monitored with similar surveillance and sensor equipment and provided with transit user activated alarms. In addition this market package provides surveillance and sensor monitoring of non-public areas of transit facilities (e.g., transit yards) and transit infrastructure such as bridges, tunnels, and transit railways or bus rapid transit (BRT) guideways. The surveillance equipment includes video and/or audio systems. The sensor equipment includes threat sensors and object detection sensors as described above as well as, intrusion or motion detection sensors and infrastructure integrity monitoring (e.g., rail track continuity checking or bridge structural integrity monitoring).

The surveillance and sensor information is transmitted to the Emergency Management Subsystem, as are transit user activated alarms in public secure areas. On-board alarms, activated by transit users or transit vehicle operators are transmitted to both the Emergency Management Subsystem and the Transit Management Subsystem, indicating two possible approaches to implementing this market package.

In addition the market package supports remote transit vehicle disabling by the Transit Management Subsystem and transit vehicle operator authentication.

Transit Maintenance (APTS6)

This market package supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Subsystem. Hardware and software in the Transit Management Subsystem processes this data and schedules preventative and corrective maintenance.

Multi-modal Coordination (APTS7)

This market package establishes two-way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transit transfer points and clusters (a collection of stops, stations, or terminals where transfers can be made conveniently) and also improve operating efficiency. Transit transfer information is shared between Multimodal Transportation Service Providers, Transit Agencies, and ISPs. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network. More limited local coordination between the transit vehicle and the individual intersection for signal priority is also supported by this package.

Transit Traveler Information (APTS8)

This market package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that provide custom transit trip itineraries and other tailored transit information services are also represented by this market package.

A.3 Traveler Information Market Packages

Broadcast Traveler Information (ATIS1)

This market package collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadly disseminates this information through existing infrastructures and low cost user equipment (e.g., FM subcarrier, cellular data broadcast). The information may be provided directly to travelers or provided to merchants and other traveler service providers so that they can better inform their customers of travel conditions. Different from the market package ATMS6 - Traffic Information Dissemination, which provides localized HAR and DMS information capabilities, ATIS1 provides a wide area digital broadcast service. Successful deployment of this market package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.

Interactive Traveler Information (ATIS2)

This market package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours and pricing information. A range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications between the traveler and Information Service Provider. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal, kiosk, Personal Digital Assistant, personal computer, and a variety of in-vehicle devices. This market package also allows value-added resellers to collect transportation information that can be aggregated and be available to their personal devices or remote traveler systems to better inform their customers of transportation conditions. Successful deployment of this market package relies on availability of real-time transportation data from roadway instrumentation, transit, probe vehicles or other means. A traveler may also input personal preferences and identification information via a “traveler card” that can convey information to the system about the traveler as well as receive updates from the system so the card can be updated over time.

Autonomous Route Guidance (ATIS3)

This market package relies on in-vehicle sensory, location determination, computational, map database, and interactive driver interface equipment to enable route planning and detailed route guidance based on static, stored information. No communication with the infrastructure is assumed or required. Identical capabilities are available to the traveler outside the vehicle by integrating a similar suite of equipment into portable devices.

Dynamic Route Guidance (ATIS4)

This market package offers advanced route planning and guidance that is responsive to current conditions. The package combines the autonomous route guidance user equipment with a digital receiver capable of receiving real-time traffic, transit, and road condition information, which is considered by the user equipment in provision of route guidance.

ISP-Based Trip Planning and Route Guidance (ATIS5)

This market package offers the user trip planning and en-route guidance services. It generates a trip plan, including a multimodal route and associated service information (e.g., parking information), based on traveler preferences and constraints. Routes may be based on static information or reflect real time network conditions. Unlike ATIS3 and ATIS4, where the user equipment determines the route, the route determination functions are performed in the Information Service Provider Subsystem in this market package. The trip plan may be confirmed by the traveler and advanced payment and reservations for transit and alternate mode (e.g., airline, rail, and ferry) trip segments, and ancillary services (e.g., parking reservations) are accepted and processed. The confirmed trip plan may include specific routing information that can be supplied to the traveler as general directions or as turn-by-turn route guidance depending on the level of user equipment.

Integrated Transportation Management/Route Guidance (ATIS6)

This market package provides advanced route planning and guidance which is responsive to current conditions, and supports collection of near-real time information on intended routes for a proportion of the vehicles in the network. This comprehensive road network probe information can be used by the Traffic Management Subsystem to optimize the traffic control strategy based on anticipated vehicle routes. The Traffic Management Subsystem would utilize the individual and ISP route planning information to optimize signal timing while at the same time providing updated signal timing information to allow optimized route plans. The predictive link times used by this market package are provided by the market package ATMS9--Traffic Forecast and Demand Management--at the traffic management center.

Yellow Pages and Reservation (ATIS7)

This market package provides yellow pages and reservation services to the user. These additional traveler services may be provided using the same basic user equipment used for Interactive Traveler Information. This market package provides multiple ways for accessing information either while en route in a vehicle using wide-area wireless communications or pre-trip via fixed-point to fixed-point connections.

Dynamic Ridesharing (ATIS8)

This market package provides dynamic ridesharing/ride matching services to travelers. This service could allow near real time ridesharing reservations to be made through the same basic user equipment used for Interactive Traveler Information. This ridesharing/ride matching capability also includes arranging connections to transit or other multimodal services.

In Vehicle Signing (ATIS9)

This market package supports distribution of traffic and travel advisory information to drivers through in-vehicle devices. It includes short-range communications between roadside equipment and the vehicle and wireline connections to the Traffic Management Subsystem for coordination and control. This market package also informs the driver of both highway-highway and highway-rail intersection status.

A.4 Traffic Management Market Packages

Network Surveillance (ATMS01)

This market package includes traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Subsystem). The data generated by this market package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.

Probe Surveillance (ATMS02)

This market package provides an alternative approach for surveillance of the roadway network. Two general implementation paths are supported by this market package: 1) wide-area wireless

communications between the vehicle and Information Service Provider is used to communicate current vehicle location and status, and 2) dedicated short range communications between the vehicle and roadside is used to provide equivalent information directly to the Traffic Management Subsystem. The first approach leverages wide area communications equipment that may already be in the vehicle to support personal safety and advanced traveler information services. The second approach utilizes vehicle equipment that supports toll collection, in-vehicle signing, and other short range communications applications identified within the architecture. The market package enables traffic managers to monitor road conditions, identify incidents, analyze and reduce the collected data, and make it available to users and private information providers. It requires one of the communications options identified above, roadside beacons and fixed-point to fixed-point communications for the short range communications option, data reduction software, and utilizes fixed-point to fixed-point links between the Traffic Management Subsystem and Information Service Provider Subsystem to share the collected information. Both "Opt out" and "Opt in" strategies are available to ensure the user has the ability to turn off the probe functions to ensure individual privacy. Due to the large volume of data collected by probes, data reduction techniques are required, such as the ability to identify and filter out-of-bounds or extreme data reports.

Surface Street Control (ATMS03)

This market package provides the central control and monitoring equipment, communication links, and the signal control equipment that support local surface street control and/or arterial traffic management. A range of traffic signal control systems are represented by this market package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This market package is generally an intra-jurisdictional package that does not rely on real-time communications between separate control systems to achieve area-wide traffic signal coordination. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would be represented by this package. This market package is consistent with typical urban traffic signal control systems.

Freeway Control (ATMS04)

This market package provides central monitoring and control, communications, and field equipment that support freeway management. It supports a range of freeway management control strategies including ramp metering, interchange metering, mainline lane controls, mainline metering, and other strategies including variable speed controls. This package incorporates the instrumentation included in the Network Surveillance Market Package to support freeway monitoring and adaptive strategies as an option.

This market package also includes the capability to utilize surveillance information for detection of incidents. Typically, the processing would be performed at a traffic management center; however, developments might allow for point detection with roadway equipment. For example, a CCTV might include the capability to detect an incident based upon image changes. Additionally, this market package allows general advisory and traffic control information to be provided to the driver while en route.

HOV Lane Management (ATMS05)

This market package manages HOV lanes by coordinating freeway ramp meters and connector signals with HOV lane usage signals. Preferential treatment is given to HOV lanes using special bypasses, reserved lanes, and exclusive rights-of-way that may vary by time of day. Vehicle occupancy detectors may be installed to verify HOV compliance and to notify enforcement agencies of violations.

Traffic Information Dissemination (ATMS06)

This market package provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Information Service Providers. A link to the Maintenance and Construction Management subsystem allows real time information on road/bridge closures due to maintenance and construction activities to be disseminated.

Regional Traffic Control (ATMS07)

This market package provides for the sharing of traffic information and control among traffic management centers to support a regional control strategy. This market package advances the Surface Street Control and Freeway Control Market Packages by adding the communications links and integrated control strategies that enable integrated interjurisdictional traffic control. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Surface Street Control and Freeway Control Market Packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.

Traffic Incident Management System (ATMS08)

This market package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The market package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters. Information from these diverse sources is collected and correlated by this market package to detect and verify incidents and implement an appropriate response. This market package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications or resource coordination between center subsystems. Incident response also includes presentation of

information to affected travelers using the Traffic Information Dissemination market package and dissemination of incident information to travelers through the Broadcast Traveler Information or Interactive Traveler Information market packages. The roadside equipment used to detect and verify incidents also allows the operator to monitor incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency field personnel. The coordination can also extend to tow trucks and other allied response agencies and field service personnel.

Traffic Forecast and Demand Management (ATMS09)

This market package includes advanced algorithms, processing, and mass storage capabilities that support historical evaluation, real-time assessment, and forecast of the roadway network performance. This includes the prediction of travel demand patterns to support better link travel time forecasts. The source data would come from the Traffic Management Subsystem itself as well as other traffic management centers and forecasted traffic loads derived from route plans supplied by the Information Service Provider Subsystem. This market package provides data that supports the implementation of TDM programs, and policies managing both traffic and the environment. The package collects information on vehicle pollution levels, parking availability, usage levels, and vehicle occupancy to support these functions. Demand management requests can also be made to Toll Administration, Transit Management, and Parking Management Subsystems.

Electronic Toll Collection (ATMS10)

This market package provides toll operators with the ability to collect tolls electronically and detect and process violations. The fees that are collected may be adjusted to implement demand management strategies. Dedicated short range communication between the roadway equipment and the vehicle is required as well as fixed-point to fixed-point interfaces between the toll collection equipment and transportation authorities and the financial infrastructure that supports fee collection. Vehicle tags of toll violators are read and electronically posted to vehicle owners. Standards, inter-agency coordination, and financial clearinghouse capabilities enable regional, and ultimately national interoperability for these services. Two other market packages, APTS4: Transit Passenger and Fare Management and ATMS16: Parking Facility Management also provide electronic payment services. These three market packages in combination provide an integrated electronic payment system for transportation services.

The toll tags and roadside readers that these systems utilize can also be used to collect road use statistics for highway authorities. This data can be collected as a natural by-product of the toll collection process or collected by separate readers that are dedicated to probe data collection.

Emissions Monitoring and Management (ATMS11)

This market package monitors individual vehicle emissions and provides general air quality monitoring using distributed sensors to collect the data. The collected information is transmitted to the emissions management subsystem for processing. Both area wide air quality monitoring and point emissions monitoring are supported by this market package. For area wide monitoring, this market package measures air quality, identifies sectors that are non-compliant with air quality standards, and collects, stores and reports supporting statistical data. For point emissions monitoring, this market package measures tail pipe emissions and identifies vehicles that exceed emissions standards. Summary emissions information or warnings can also be displayed to

drivers. The gathered information can be used to implement environmentally sensitive TDM programs, policies, and regulations.

Virtual TMC and Smart Probe Data (ATMS12)

This market package provides for special requirements of rural road systems. Instead of a central TMC, the traffic management is distributed over a very wide area (e.g., a whole state or collection of states). Each locality has the capability of accessing available information for assessment of road conditions. The package uses vehicles as smart probes that are capable of measuring road conditions and providing this information to the roadway for relay to the Traffic Management Subsystem and potentially direct relay to following vehicles (i.e., the automated road signing equipment is capable of autonomous operation). In-vehicle signing is used to inform drivers of detected road conditions.

Standard Railroad Grade Crossing (ATMS13)

This market package 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. Health 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.

Advanced Railroad Grade Crossing (ATMS14)

This market package 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 market package includes all capabilities from the Standard Railroad Grade Crossing Market Package and augments these with additional safety features to mitigate the risks associated with higher rail speeds. The active warning systems supported by this market package include positive barrier systems that 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. In this market package, the wayside equipment provides additional information about the arriving train so that the train's direction of travel, estimated time of arrival, and 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 market package 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.

Railroad Operations Coordination (ATMS15)

This market package provides an additional level of strategic coordination between freight rail operations and traffic management centers. Rail operations provides train schedules, maintenance schedules, and any other forecast events that will result in highway-rail intersection (HRI) closures. This information is used to develop forecast HRI closure times and durations that may be used in advanced traffic control strategies or to enhance the quality of traveler information.

Parking Facility Management (ATMS16)

This market package provides enhanced monitoring and management of parking facilities. It assists in the management of parking operations, coordinates with transportation authorities, and supports electronic collection of parking fees. This market package collects current parking status, shares this data with Information Service Providers and Traffic Management, and collects parking fees using the same in-vehicle equipment utilized for electronic toll collection or contact or proximity traveler cards used for electronic payment. Two other market packages, APTS4: Transit Passenger and Fare Management and ATMS10: Electronic Toll Collection also provide electronic payment services. These three market packages in combination provide an integrated electronic payment system for transportation services.

Regional Parking Management (ATMS17)

This market package supports coordination between parking facilities to enable regional parking management strategies.

Reversible Lane Management (ATMS18)

This market package provides for the management of reversible lane facilities. In addition to standard surveillance capabilities, this market package includes sensory functions that detect wrong-way vehicles and other special surveillance capabilities that mitigate safety hazards associated with reversible lanes. The package includes the field equipment, physical lane access controls, and associated control electronics that manage and control these special lanes. This market package also includes the equipment used to electronically reconfigure intersections and manage right-of-way to address dynamic demand changes and special events.

Speed Monitoring (ATMS19)

This market package monitors the speeds of vehicles traveling through a roadway system. If the speed is determine to be excessive, roadside equipment can suggest a safe driving speed. Environmental conditions may be monitored and factored into the safe speed advisories that are provided to the motorist. This service can also support notifications to an enforcement agency to enforce the speed limit on a roadway system.

Drawbridge Management (ATMS20)

This market package supports systems that manage drawbridges at rivers and canals and other multimodal crossings (other than railroad grade crossings which are specifically covered by other market packages). The equipment managed by this market package includes control devices (e.g., gates, warning lights, dynamic message signs) at the drawbridge as well as the information systems that are used to keep travelers appraised of current and forecasted drawbridge status.

Roadway Closure Management (ATMS21)

This market package closes roadways to vehicular traffic when driving conditions are unsafe, maintenance must be performed, and other scenarios where access to the roadway must be prohibited. The market package includes automatic or remotely controlled gates or barriers that control access to roadway segments including ramps and traffic lanes. Remote control systems allow the gates to be controlled from a central location or from a vehicle at the gate/barrier location, improving system efficiency and reducing personnel exposure to unsafe conditions during severe weather and other situations where roads must be closed. Surveillance systems allow operating personnel to visually verify the safe activation of the closure system and driver information systems (e.g., DMS) provide closure information to motorists in the vicinity of the closure. The equipment managed by this market package includes the control and monitoring systems, the field devices (e.g., gates, warning lights, DMS, CCTV cameras) at the closure location(s), and the information systems that notify other systems of a closure. This market package covers general road closure applications; specific closure systems that are used at railroad grade crossings, drawbridges, reversible lanes, etc. are covered by other ATMS market packages.

A.5 Vehicle Safety Market Packages

Vehicle Safety Monitoring (AVSS01)

This market package will diagnose critical components of the vehicle and warn the driver of potential dangers. On-board sensors will determine the vehicle's condition, performance, on-board safety data, and display information.

Driver Safety Monitoring (AVSS02)

This market package will determine the driver's condition, and warn the driver of potential dangers. On-board sensors will determine the driver's condition, performance, on-board safety data, and display information.

Longitudinal Safety Warning (AVSS03)

This market package allows for longitudinal warning. It utilizes safety sensors and collision sensors. It requires on-board sensors to monitor the areas in front of and behind the vehicle and present warnings to the driver about potential hazards.

Lateral Safety Warning (AVSS04)

This market package allows for lateral warning. It utilizes safety sensors and collision sensors. It requires on-board sensors to monitor the areas to the sides of the vehicle and present warnings to the driver about potential hazards.

Intersection Safety Warning (AVSS05)

This market package will determine the probability of a collision in an equipped intersection (either highway-highway or highway-rail) and provide timely warnings to drivers in response to hazardous conditions. Monitors in the roadway infrastructure assess vehicle locations and speeds near an intersection. Using this information, a warning is determined and communicated to the approaching vehicle using a short-range communications system. Information can be provided to the driver through the market package ATIS9--In-Vehicle Signing.

Pre-Crash Restraint Deployment (AVSS06)

This market package provides in-vehicle sensors to monitor the vehicle's local environment, determine collision probability and deploy a pre-crash safety system. It will include on-board sensors to measure lateral and longitudinal gaps and together with weather and roadway conditions will determine lateral and longitudinal collision probability. It will have the mechanism to deploy a pre-crash safety system.

Driver Visibility Improvement (AVSS07)

This market package will enhance driver visibility using an enhanced vision system. On-board display hardware is needed

Advanced Vehicle Longitudinal Control (AVSS08)

This market package automates the speed and headway control functions on board the vehicle. It utilizes safety sensors and collision sensors combined with vehicle dynamics processing to control the throttle and brakes. It requires on-board sensors to measure longitudinal gaps and a processor for controlling the vehicle speed.

Advanced Vehicle Lateral Control (AVSS09)

This market package automates the steering control on board the vehicle. It utilizes safety sensors and collision sensors combined with vehicle dynamics processing to control the steering. It requires on-board sensors to measure lane position and lateral deviations and a processor for controlling the vehicle steering.

Intersection Collision Avoidance (AVSS10)

This market package will determine the probability of an intersection collision and provide timely warnings to approaching vehicles so that avoidance actions can be taken. This market package builds on the Intersection Collision Warning infrastructure and in-vehicle equipment and adds equipment in the vehicle that can take control of the vehicle in emergency situations. The same monitors in the roadway infrastructure are needed to assess vehicle locations and speeds near an intersection. This information is determined and communicated to the approaching vehicle using a short range communications system. The vehicle uses this information to develop control actions which alter the vehicle’s speed and steering control and potentially activate its pre-crash safety system.

Automated Highway System (AVSS11)

This market package enables “hands-off” operation of the vehicle on the automated portion of the highway system. Implementation requires lateral lane holding, vehicle speed and steering control, and Automated Highway System check-in and checkout. This market package currently supports a balance in intelligence allocation between infrastructure and the vehicle pending selection of a single operational concept by the AHS consortium.

A.6 Commercial Vehicle Operations Market Packages

Fleet Administration (CVO01)

This market package provides the capabilities to manage a fleet of commercial vehicles. The Fleet and Freight Management subsystem provides the route for a commercial vehicle by either utilizing an in-house routing software package or an Information Service Provider. Routes generated by either approach are constrained by hazardous materials and other restrictions (such

as height or weight). Any such restricted areas are determined by the Commercial Vehicle Administration. A route would be electronically sent to the Commercial Vehicle with any appropriate dispatch instructions. The location of the Commercial Vehicle can be monitored by the Fleet and Freight Management subsystem and routing changes can be made depending on current road network conditions. Once a route has been assigned, changes must be coordinated between the Fleet and Freight Management subsystem and the Commercial Vehicle. Commercial Vehicle Drivers would be alerted to any changes in route from the planned route and given an opportunity to justify a rerouting. Any unauthorized or unexpected route changes by the Commercial Vehicle will register a route deviation alert with the Fleet and Freight Management subsystem. The Fleet and Freight Management subsystem can also notify local public safety agencies of the route deviation when appropriate (e.g., if there is safety sensitive HAZMAT being carried), by sending an alarm to the Emergency Management subsystem.

Freight Administration (CVO02)

This market package tracks the movement of cargo and monitors the cargo condition. Interconnections are provided to intermodal freight shippers and intermodal freight depots for tracking of cargo from source to destination. In addition to the usual cargo monitoring required to insure that cargo gets from origin to destination, the Fleet and Freight Management subsystem monitors shipments to make sure that no tampering or breach of security occurs to the cargo on commercial vehicles. Any such tampering will be reported to the Fleet and Freight Management subsystem. In addition to exceptions (e.g., alerts) that are reported, on-going indications of the state of the various freight equipment are reported to the Fleet and Freight Management subsystem. The commercial vehicle driver is also alerted of any tampering or breach of cargo security. Freight managers may decide to take further action on the alerts and/or provide responses that explain that the alerts are false alarms. If no explanation is received, the Fleet and Freight Management subsystem may notify the Emergency Management subsystem.

Electronic Clearance (CVO03)

This market package provides for automated clearance at roadside check facilities. The roadside check facility communicates with the Commercial Vehicle Administration subsystem to retrieve infrastructure snapshots of critical carrier, vehicle, and driver data to be used to sort passing vehicles. This allows a good driver/vehicle/carrier to pass roadside facilities at highway speeds using transponders and dedicated short range communications to the roadside. Results of roadside clearance activities will be passed on to the Commercial Vehicle Administration. The roadside check facility may be equipped with Automated Vehicle Identification (AVI), weighing sensors, transponder read/write devices and computer workstations.

CV Administrative Processes (CVO04)

This market package provides for electronic application, processing, fee collection, issuance, and distribution of CVO credential and tax filing. Through this process, carriers, drivers, and vehicles may be enrolled in the electronic clearance program provided by a separate market package which allows commercial vehicles to be screened at mainline speeds at roadside check facilities. Through this enrollment process, current profile databases are maintained in the Commercial Vehicle Administration subsystem and snapshots of this database are made available to the roadside check facilities at the roadside to support the electronic clearance process.

Commercial Vehicle Administration subsystems can share credential information with other Commercial Vehicle Administration subsystems, so that it is possible for any Commercial Vehicle Administration subsystem to have access to all credentials, credential fees, credentials status and safety status information. In addition, it is possible for one Commercial Vehicle Administration subsystem to collect HAZMAT route restrictions information from other Commercial Vehicle Administration subsystems and then act as a clearinghouse for this route restrictions information for Information Service Providers, Map Update Providers, and Fleet and Freight Management subsystems.

International Border Electronic Clearance (CVO05)

This market package provides for automated clearance at international border crossings. This package augments the electronic clearance package by allowing interface with customs related functions.

Weigh-In-Motion (CVO06)

This market package provides for high speed weigh-in-motion with or without Automated Vehicle Identification (AVI) capabilities. This market package provides the roadside equipment that could be used as a stand-alone system or to augment the Electronic Clearance (CVO03) market package.

Roadside CVO Safety (CVO07)

This market package provides for automated roadside safety monitoring and reporting. It automates commercial vehicle safety inspections at the roadside check facilities. The capabilities for performing the safety inspection are shared between this market package and the On-board CVO and Freight Safety & Security (CVO08) Market Package which enables a variety of implementation options. The basic option, directly supported by this market package, facilitates safety inspection of vehicles that have been pulled in, perhaps as a result of the automated screening process provided by the Electronic Clearance (CVO03) Market Package. In this scenario, only basic identification data and status information is read from the electronic tag on the commercial vehicle. The identification data from the tag enables access to additional safety data maintained in the infrastructure which is used to support the safety inspection, and may also inform the pull-in decision if system timing requirements can be met. More advanced implementations, supported by the On-board CVO and Freight Safety & Security (CVO08) market package, utilize additional on-board vehicle safety monitoring and reporting capabilities in the commercial vehicle to augment the roadside safety check.

On-board CVO and Freight Safety & Security (CVO08)

This market package provides for on-board commercial vehicle safety monitoring and reporting. It is an enhancement of the Roadside CVO Safety Market Package and includes roadside support for reading on-board safety data via tags. Safety warnings are provided to the driver as a priority with secondary requirements to notify the Commercial Vehicle Check roadside elements. This market package allows for the Fleet and Freight Management subsystem to have access to the on-board safety data. In addition to safety data, this market package provides a means for monitoring the security of the Commercial Vehicle along with the cargo, containers, trailers, and other equipment that are being hauled. Commercial Vehicle on-board tamper and breach sensors provide an indication of any security irregularities and the sensor data is provided to the Fleet

and Freight Management subsystem along with particular notification of any breach alerts. Commercial Vehicle Drivers may be aware of the sensor readings and can provide an explanation back to the Fleet and Freight Management subsystem via the Commercial Vehicle. Commercial vehicle and freight security breaches are also sent to the commercial vehicle check.

CVO Fleet Maintenance (CVO09)

This market package supports maintenance of CVO fleet vehicles with on-board monitoring equipment and Automated Vehicle Location (AVL) capabilities within the Fleet and Freight Management Subsystem. Records of vehicle mileage, repairs, and safety violations are maintained to assure safe vehicles on the highway.

HAZMAT Management (CVO10)

This market package integrates incident management capabilities with commercial vehicle tracking to assure effective treatment of HAZMAT material and incidents. HAZMAT tracking is performed by the Fleet and Freight Management Subsystem. The Emergency Management subsystem is notified by the Commercial Vehicle if an incident occurs and coordinates the response. The response is tailored based on information that is provided as part of the original incident notification or derived from supplemental information provided by the Fleet and Freight Management Subsystem. The latter information can be provided prior to the beginning of the trip or gathered following the incident depending on the selected policy and implementation.

Roadside HAZMAT Security Detection and Mitigation (CVO11)

This market package provides the capability to detect and classify security sensitive HAZMAT on commercial vehicles using roadside sensing and imaging technology. Credentials information can be accessed to verify if the commercial driver, vehicle and carrier are permitted to transport the identified HAZMAT. If the credentials analysis and sensed HAZMAT information do not agree, the vehicle can be signaled to pull in, and if required, an alarm can be sent to Emergency Management to request they monitor, traffic stop or disable the vehicle.

CV Driver Security Authentication (CVO12)

This market package provides the ability for Fleet and Freight Management to detect when an unauthorized commercial vehicle driver attempts to drive their vehicle based on stored driver identity information. If an unauthorized driver has been detected, Fleet and Freight Management can activate commands to safely disable the commercial vehicle. Alarms can also be sent to emergency management to inform them of a potential commercial vehicle hijacking or theft and potential hazardous situation. In addition, Emergency Management can request Fleet and Freight Management to disable a specific vehicle in their fleet.

Freight Assignment Tracking (CVO13)

This market package provides for the planning and tracking of three aspects of commercial vehicle shipments. For each shipment, the commercial vehicle, the freight equipment, and the commercial vehicle driver are monitored for consistency with the planned assignment. Any unauthorized changes are determined by the Fleet and Freight Management subsystem and then the appropriate people and subsystems are notified. Data collected by the On-board CV and Freight Safety & Security and the On-board Driver Authentication equipment packages used in other market packages are also used to monitor the three aspects of assignment for this market

package. In addition to this market package, Fleet and Freight Managers may also monitor routes and itineraries and this capability is included in Fleet Administration.

A.7 Emergency Management Market Packages

Emergency Call-Taking and Response (EM01)

This market package provides basic public safety call-taking and dispatch services. It includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Subsystems supports emergency notification between agencies. Wide area wireless communications between the Emergency Management Subsystem and an Emergency Vehicle supports dispatch and provision of information to responding personnel.

Emergency Routing (EM02)

This market package supports automated vehicle location and dynamic routing of emergency vehicles. Traffic information, road conditions, and suggested routing information are provided to enhance emergency vehicle routing. Special priority or other specific emergency traffic control strategies can be coordinated to improve the safety and time-efficiency of responding vehicle travel on the selected route(s). The Emergency Management Subsystem provides the routing for the emergency fleet based on real-time conditions and has the option of requesting a route from the Traffic Management subsystem. The Emergency Vehicle may also be equipped with dedicated short range communications for local signal preemption. The service provides for information exchange between care facilities and both the Emergency Management Subsystem and emergency vehicles.

Mayday and Alarms Support (EM03)

This market package allows the user (driver or non-driver) to initiate a request for emergency assistance and enables the Emergency Management Subsystem to locate the user, gather information about the incident, and determine the appropriate response. The request for assistance may be manually initiated or automated and linked to vehicle sensors. This market package also includes general surveillance capabilities that enable the Emergency Management Subsystem to remotely monitor public areas (e.g., rest stops, parking lots) to improve security in these areas. The Emergency Management Subsystem may be operated by the public sector or by a private sector telematics service provider.

Roadway Service Patrols (EM04)

This market package supports roadway service patrol vehicles that monitor roads that aid motorists, offering rapid response to minor incidents (flat tire, accidents, out of gas) to minimize disruption to the traffic stream. If problems are detected, the roadway service patrol vehicles will provide assistance to the motorist (e.g., push a vehicle to the shoulder or median). The market package monitors service patrol vehicle locations and supports vehicle dispatch to identified incident locations. Incident information collected by the service patrol is shared with traffic, maintenance and construction, and traveler information systems.

Transportation Infrastructure Protection (EM05)

This market package includes the monitoring of transportation infrastructure (e.g., bridges, tunnels and management centers) for potential threats using sensors and surveillance equipment and barrier and safeguard systems to preclude an incident, control access during and after an incident or mitigate impact of an incident. Threats can result from acts of nature (e.g., hurricanes, earthquakes), terrorist attacks or other incidents causing damage to the infrastructure (e.g., stray barge hitting a bridge support). Infrastructure may be monitored with acoustic, environmental threat (such as nuclear, biological, chemical, and explosives), infrastructure condition and integrity, motion and object sensors and video and audio surveillance equipment. Data from such sensors and surveillance equipment may be processed in the field or sent to a center for processing. The data enables operators at the center to detect and verify threats. When a threat is detected, agencies are notified. Detected threats or advisories received from other agencies result in an increased level of system preparedness. In response to threats, barrier and safeguard systems may be activated by Traffic Management Subsystems to deter an incident, control access to an area or mitigate the impact of an incident. Barrier systems include gates, barriers and other automated and remotely controlled systems that manage entry to transportation infrastructure. Safeguard systems include blast shields, exhaust systems and other automated and remotely controlled systems that mitigate impact of an incident.

Wide-Area Alert (EM06)

This market package uses ITS driver and traveler information systems to alert the public in emergency situations such as child abductions, severe weather events, civil emergencies, and other situations that pose a threat to life and property. The alert includes information and instructions for transportation system operators and the traveling public, improving public safety and enlisting the public's help in some scenarios. The ITS technologies will supplement and support other emergency and homeland security alert systems such as the Emergency Alert System (EAS). When an emergency situation is reported and verified and the terms and conditions for system activation are satisfied, a designated agency broadcasts emergency information to traffic agencies, transit agencies, information service providers, toll operators, and others that operate ITS systems. The ITS systems, in turn, provide the alert information to transportation system operators and the traveling public using ITS technologies such as dynamic message signs, highway advisory radios, in-vehicle displays, transit displays, 511 traveler information systems, and traveler information web sites.

Early Warning System (EM07)

This market package monitors and detects potential, looming, and actual disasters including natural disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and acts of terrorism including nuclear, chemical, biological, and radiological weapons attacks). The market package monitors alerting and advisory systems, ITS sensors and surveillance systems, field reports, and emergency call-taking systems to identify emergencies and notifies all responding agencies of detected emergencies.

Disaster Response and Recovery (EM08)

This market package enhances the ability of the surface transportation system to respond to and recover from disasters. It addresses the most severe incidents that require an extraordinary response from outside the local community. All types of disasters are addressed including natural

disasters (hurricanes, earthquakes, floods, winter storms, tsunamis, etc.) and technological and man-made disasters (hazardous materials incidents, nuclear power plant accidents, and national security emergencies such as nuclear, chemical, biological, and radiological weapons attacks).

The market package supports coordination of emergency response plans, including general plans developed before a disaster as well as specific tactical plans with short time horizon that are developed as part of a disaster response. The market package provides enhanced access to the scene for response personnel and resources, provides better information about the transportation system in the vicinity of the disaster, and maintains situation awareness regarding the disaster itself. In addition, this market package tracks and coordinates the transportation resources - the transportation professionals, equipment, and materials - that constitute a portion of the disaster response.

The market package identifies the key points of integration between transportation systems and the public safety, emergency management, and other allied organizations that form the overall disaster response. In this market package, the Emergency Management subsystem represents the federal, regional, state, and local Emergency Operations Centers and the Incident Commands that are established to respond to the disaster. The interface between the Emergency Management Subsystem and the other center subsystems provides situation awareness and resource coordination among transportation and other allied response agencies. In its role, traffic management implements special traffic control strategies and detours and restrictions to effectively manage traffic in and around the disaster. Maintenance and construction provides damage assessment of road network facilities and manages service restoration. Transit management provides a similar assessment of status for transit facilities and modifies transit operations to meet the special demands of the disaster. As immediate public safety concerns are addressed and disaster response transitions into recovery, this market package supports transition back to normal transportation system operation, recovering resources, managing on-going transportation facility repair, supporting data collection and revised plan coordination, and other recovery activities.

This market package builds on the basic traffic incident response service that is provided by ATMS08, the Traffic Incident Management market package. This market package addresses the additional complexities and coordination requirements that are associated with the most severe incidents that warrant an extraordinary response from outside the local jurisdictions and require special measures such as the activation of one or more emergency operations centers. Many users of the National ITS Architecture will want to consider both ATMS08 and this market package since every region is concerned with both day-to-day management of traffic-related incidents and occasional management of disasters that require extraordinary response.

Disaster Response and Recovery is also supported by EM10, the "Disaster Traveler Information" market package that keeps the public informed during a disaster response. See that market package for more information.

Evacuation and Reentry Management (EM09)

This market package supports evacuation of the general public from a disaster area and manages subsequent reentry to the disaster area. The market package addresses evacuations for all types of disasters, including disasters like hurricanes that are anticipated and occur slowly, allowing a

well-planned orderly evacuation, as well as disasters like terrorist acts that occur rapidly, without warning, and allow little or no time for preparation or public warning.

This market package supports coordination of evacuation plans among the federal, state, and local transportation, emergency, and law enforcement agencies that may be involved in a large-scale evacuation. All affected jurisdictions (e.g., states and counties) at the evacuation origin, evacuation destination, and along the evacuation route are informed of the plan. Information is shared with traffic management agencies to implement special traffic control strategies and to control evacuation traffic, including traffic on local streets and arterials as well as the major evacuation routes. Reversible lanes, shoulder use, closures, special signal control strategies, and other special strategies may be implemented to maximize capacity along the evacuation routes. Transit resources play an important role in an evacuation, removing many people from an evacuated area while making efficient use of limited capacity. Additional shared transit resources may be added and managed in evacuation scenarios. Resource requirements are forecast based on the evacuation plans, and the necessary resources are located, shared between agencies if necessary, and deployed at the right locations at the appropriate times.

Evacuations are also supported by EM10, the "Disaster Traveler Information" market package, which keeps the public informed during evacuations. See that market package for more information.

Disaster Traveler Information (EM10)

This market package uses ITS to provide disaster-related traveler information to the general public, including evacuation and reentry information and other information concerning the operation of the transportation system during a disaster. This market package collects information from multiple sources including traffic, transit, public safety, emergency management, shelter provider, and travel service provider organizations. The collected information is processed and the public is provided with real-time disaster and evacuation information using ITS traveler information systems.

A disaster will stress the surface transportation system since it may damage transportation facilities at the same time that it places unique demands on these facilities to support public evacuation and provide access for emergency responders. Similarly, a disaster may interrupt or degrade the operation of many traveler information systems at the same time that safety-critical information must be provided to the traveling public. This market package keeps the public informed in these scenarios, using all available means to provide information about the disaster area including damage to the transportation system, detours and closures in effect, special traffic restrictions and allowances, special transit schedules, and real-time information on traffic conditions and transit system performance in and around the disaster.

This market package also provides emergency information to assist the public with evacuations when necessary. Information on mandatory and voluntary evacuation zones, evacuation times, and instructions are provided. Available evacuation routes and destinations and current and anticipated travel conditions along those routes are provided so evacuees are prepared and know their destination and preferred evacuation route. Information on available transit services and traveler services (shelters, medical services, hotels, restaurants, gas stations, etc.) is also provided. In addition to general evacuation information, this market package provides specific

evacuation trip planning information that is tailored for the evacuee based on origin, selected destination, and evacuee-specified evacuation requirements and route parameters.

This market package augments the ATIS market packages that provide traveler information on a day-to-day basis for the surface transportation system. This market package provides focus on the special requirements for traveler information dissemination in disaster situations.

A.8 Maintenance & Construction Management Market Packages

Maintenance and Construction Vehicle and Equipment Tracking (MC01)

This market package will track the location of maintenance and construction vehicles and other equipment to ascertain the progress of their activities. These activities can include ensuring the correct roads are being plowed and work activity is being performed at the correct locations.

Maintenance and Construction Vehicle Maintenance (MC02)

This market package performs vehicle maintenance scheduling and manages both routine and corrective maintenance activities on vehicles and other maintenance and construction equipment. It includes on-board sensors capable of automatically performing diagnostics for maintenance and construction vehicles, and the systems that collect this diagnostic information and use it to schedule and manage vehicle maintenance.

Road Weather Data Collection (MC03)

This market package collects current road and weather conditions using data collected from environmental sensors deployed on and about the roadway (or guideway in the case of transit related rail systems). In addition to fixed sensor stations at the roadside, sensing of the roadway environment can also occur from sensor systems located on Maintenance and Construction Vehicles and on-board sensors provided by auto manufacturers. The collected environmental data is used by the Weather Information Processing and Distribution Market Package to process the information and make decisions on operations.

Weather Information Processing and Distribution (MC04)

This market package processes and distributes the environmental information collected from the Road Weather Data Collection market package. This market package uses the environmental data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc. so system operators and decision support systems can make decision on corrective actions to take. The continuing updates of road condition information and current temperatures can be used by system operators to more effectively deploy road maintenance resources, issue general traveler advisories, issue location specific warnings to drivers using the Traffic Information Dissemination market package, and aid operators in scheduling work activity.

Roadway Automated Treatment (MC05)

This market package automatically treats a roadway section based on environmental or atmospheric conditions. Treatments include fog dispersion, anti-icing chemicals, etc. The market package includes the environmental sensors that detect adverse conditions, the automated treatment system itself, and driver information systems (e.g., dynamic message signs) that warn drivers when the treatment system is activated.

Winter Maintenance (MC06)

This market package supports winter road maintenance including snow plow operations, roadway treatments (e.g., salt spraying and other anti-icing material applications), and other snow and ice control activities. This package monitors environmental conditions and weather forecasts and uses the information to schedule winter maintenance activities, determine the appropriate snow and ice control response, and track and manage response operations.

Roadway Maintenance and Construction (MC07)

This market package supports numerous services for scheduled and unscheduled maintenance and construction on a roadway system or right-of-way. Maintenance services would include landscape maintenance, hazard removal (roadway debris, dead animals), routine maintenance activities (roadway cleaning, grass cutting), and repair and maintenance of both ITS and non-ITS equipment on the roadway (e.g., signs, traffic controllers, traffic detectors, dynamic message signs, traffic signals, CCTV, etc.). Environmental conditions information is also received from various weather sources to aid in scheduling maintenance and construction activities.

Work Zone Management (MC08)

This market package manages work zones, controlling traffic in areas of the roadway where maintenance, construction, and utility work activities are underway. Traffic conditions are monitored using CCTV cameras and controlled using dynamic message signs (DMS), Highway Advisory Radio (HAR), gates and barriers. Work zone information is coordinated with other groups (e.g., ISP, traffic management, other maintenance and construction centers). Work zone speeds and delays are provided to the motorist prior to the work zones. This market package provides control of field equipment in all maintenance and construction areas, including fixed, portable, and truck-mounted devices supporting both stationary and mobile work zones.

Work zone Safety Monitoring (MC09)

This market package includes systems that improve work crew safety and reduce collisions between the motoring public and maintenance and construction vehicles. This market package detects vehicle intrusions in work zones and warns crew workers and drivers of imminent encroachment or other potential safety hazards. Crew movements are also monitored so that the crew can be warned of movement beyond the designated safe zone. The market package supports both stationary and mobile work zones. The intrusion detection and alarm systems may be collocated or distributed, allowing systems that detect safety issues far upstream from a work zone (e.g., detection of over dimension vehicles before they enter the work zone).

Maintenance and Construction Activity Coordination (MC10)

This market package supports the dissemination of maintenance and construction activity to centers that can utilize it as part of their operations, or to the Information Service Providers who can provide the information to travelers.

APPENDIX B- CCITS MARKET PACKAGES

APPENDIX B – CCITS MARKET PACKAGES

AD1: ITS Data Mart - Existing

This market package provides a focused archive that houses data collected and owned by a single agency, district, private sector provider, research institution, or other organization. This focused archive typically includes data covering a single transportation mode and one jurisdiction that is collected from an operational data store and archived for future use. It provides the basic data quality, data privacy, and meta data management common to all ITS archives and provides general query and report access to archive data users.

Inventory Element
AMBAG Planning (
SBCAG Planning
SBtCOG Planning
SCCRTC Planning
SLOCOG Planning
TAMC Planning

APTS1: Transit Vehicle Tracking - Existing

This market package monitors current transit vehicle location using an Automated Vehicle Location System. The location data may be used to determine real time schedule adherence and update the transit system's schedule in real-time. Vehicle position may be determined either by the vehicle (e.g., through GPS) and relayed to the infrastructure or may be determined directly by the communications infrastructure. A two-way wireless communication link with the Transit Management Subsystem is 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 Subsystem processes this information, updates the transit schedule and makes real-time schedule information available to the Information Service Provider.

Inventory Element
Lompoc Transit
Lompoc Transit Vehicle Locator (AVL)
SCAT (South County Area Transit)
SCAT AVL
SLO Transit
SLO Transit AVL
SLORTA AVL
SLORTA Transit (RTA)
SMAT (Santa Maria Area Transit)
SMAT AVL

APTS2: Transit Fixed-Route Operations - Existing

This market package performs vehicle routing and scheduling, as well as automatic operator assignment and system monitoring for fixed-route and flexible-route transit services. This service determines current schedule performance using AVL data and provides information displays at the Transit Management Subsystem. Static and real time transit data is exchanged with Information Service Providers where it is integrated with that from other transportation modes (e.g. rail, ferry, air) to provide the public with integrated and personalized dynamic schedules.

Inventory Element
Atascadero Transit
Lompoc Transit
MST (Monterey-Salinas Transit)
PRCATS (Paso Robles City Area Transit Service)
San Benito County Express (SBCE)
Santa Barbara Metropolitan Transit District (SBMTD)
SC Metro (Santa Cruz Metropolitan Transit District)
SCAT (South County Area Transit)
SLO Transit
SLORTA Transit (RTA)
SMAT (Santa Maria Area Transit)

APTS3: Demand Response Transit Operations - Existing

This market package performs vehicle routing and scheduling as well as automatic operator assignment and monitoring for demand responsive transit services. In addition, this market package performs similar functions to support dynamic features of flexible-route transit services. This package monitors the current status of the transit fleet and supports allocation of these fleet resources to service incoming requests for transit service while also considering traffic conditions. The Transit Management Subsystem provides the necessary data processing and information display to assist the transit operator in making optimal use of the transit fleet. This service includes the capability for a traveler request for personalized transit services to be made through the Information Service Provider (ISP) Subsystem. The ISP may either be operated by a transit management center or be independently owned and operated by a separate service provider. In the first scenario, the traveler makes a direct request to a specific paratransit service. In the second scenario, a third party service provider determines that the paratransit service is a viable means of satisfying a traveler request and makes a reservation for the traveler.

Inventory Element
Dial-A-Ride Operators (Central Coast)

APTS4: Transit Passenger and Fare Management - Existing

This market package manages passenger loading and fare payments on-board transit vehicles using electronic means. It allows transit users to use a traveler card or other electronic payment device. Sensors mounted on the vehicle permit the operator and central operations to determine vehicle loads, and readers located either in the infrastructure or on-board the transit vehicle allow electronic fare payment. Data is processed, stored, and displayed on the transit vehicle and communicated as needed to the Transit Management Subsystem. Two other market packages, ATMS10: Electronic Toll Collection and ATMS16: Parking Facility Management also provide electronic payment services. These three market packages in combination provide an integrated electronic payment system for transportation services.

Inventory Element

Amtrak/MetroLink Automated Ticketing
Atascadero Transit
Atascadero Transit Smart Card
PRCATS (Paso Robles City Area Transit Service)
PRCATS Smart Cards
Santa Barbara Metropolitan Transit District (SBMTD)
SBCAG Smart Card
SC Metro (Santa Cruz Metropolitan Transit District)
SC Metro Fare Management System
SCAT (South County Area Transit)
SCAT Smart Card
SLO Transit
SLO Transit Smart Card
SLORTA Smart Card
SLORTA Transit (RTA)
SMAT (Santa Maria Area Transit)
SMAT Smart Card

APTS5: Transit Security - Existing

This market package provides for the physical security of transit passengers and transit vehicle operators. On-board equipment is deployed to perform surveillance and sensor monitoring in order to warn of potentially hazardous situations. The surveillance equipment includes video (e.g., CCTV cameras), audio systems and/or event recorder systems. The sensor equipment includes threat sensors (e.g., chemical agent, toxic industrial chemical, biological, explosives, and radiological sensors) and object detection sensors (e.g., metal detectors). Transit user or transit vehicle operator activated alarms are provided on-board. Public areas (e.g., transit stops, park and ride lots, stations) are also monitored with similar surveillance and sensor equipment and provided with transit user activated alarms. In addition this market package provides surveillance and sensor monitoring of non-public areas of transit facilities (e.g., transit yards) and transit infrastructure such as bridges, tunnels, and transit railways or bus rapid transit (BRT) guideways. The surveillance equipment includes video and/or audio systems. The sensor equipment includes threat sensors and object detection sensors as described above as well as, intrusion or motion detection sensors and infrastructure integrity monitoring (e.g., rail track continuity checking or bridge structural integrity monitoring).

The surveillance and sensor information is transmitted to the Emergency Management Subsystem, as are transit user activated alarms in public secure areas. On-board alarms, activated by transit users or transit vehicle operators are transmitted to both the Emergency Management Subsystem and the Transit Management Subsystem, indicating two possible approaches to implementing this market package.
In addition the market package supports remote transit vehicle disabling by the Transit Management Subsystem and transit vehicle operator authentication.

Inventory Element
Atascadero Transit
Lompoc Transit
MST (Monterey-Salinas Transit)
PRCATS (Paso Robles City Area Transit Service)
San Benito County Express (SBCE)
Santa Barbara Metropolitan Transit District (SBMTD)
SC Metro (Santa Cruz Metropolitan Transit District)
SCAT (South County Area Transit)
SLO Transit
SLO Transit Automatic Safety Buttons
SLORTA Automatic Safety Buttons
SLORTA Transit (RTA)
SMAT (Santa Maria Area Transit)

APTS6: Transit Maintenance - Existing

This market package supports automatic transit maintenance scheduling and monitoring. On-board condition sensors monitor system status and transmit critical status information to the Transit Management Subsystem. Hardware and software in the Transit Management Subsystem processes this data and schedules preventative and corrective maintenance.

Inventory Element
Atascadero Transit
Dial-A-Ride Operators (Central Coast)
Lompoc Transit
MST (Monterey-Salinas Transit)
MST Integrated Maintenance Management Information System
PRCATS (Paso Robles City Area Transit Service)
San Benito County Express (SBCE)
Santa Barbara Metropolitan Transit District (SBMTD)
SC Metro (Santa Cruz Metropolitan Transit District)
SCAT (South County Area Transit)
SLO Transit
SLORTA Transit (RTA)
SMAT (Santa Maria Area Transit)

APTS7: Multi-modal Coordination - Existing

This market package establishes two-way communications between multiple transit and traffic agencies to improve service coordination. Multimodal coordination between transit agencies can increase traveler convenience at transit transfer points and clusters (a collection of stops, stations, or terminals where transfers can be made conveniently) and also improve operating efficiency. Transit transfer information is shared between Multimodal Transportation Service Providers, Transit Agencies, and ISPs. Coordination between traffic and transit management is intended to improve on-time performance of the transit system to the extent that this can be accommodated without degrading overall performance of the traffic network. More limited local coordination between the transit vehicle and the individual intersection for signal priority is also supported by this package.

Inventory Element
Arroyo Grande Signal System
Grover Beach Signal System
Monterey (City) Signal System
Monterey (City) TMC
MST (Monterey-Salinas Transit)
San Luis Obispo (City) Signal System
San Luis Obispo (City) TMC
Santa Barbara (City) Signal System
Santa Barbara Metropolitan Transit District (SBMTD)
Santa Cruz (City) Signal System
Santa Cruz (City) TMC
SLO Transit
SLORTA Transit (RTA)

APTS8: Transit Traveler Information - Existing

This market package provides transit users at transit stops and on-board transit vehicles with ready access to transit information. The information services include transit stop annunciation, imminent arrival signs, and real-time transit schedule displays that are of general interest to transit users. Systems that

provide custom transit trip itineraries and other tailored transit information services are also represented by this market package.

Inventory Element
Atascadero Transit
Atascadero Transit Next Bus CMS
Lompoc Transit
MST (Monterey-Salinas Transit)
PRCATS (Paso Robles City Area Transit Service)
San Benito County Express (SBCE)
Santa Barbara Metropolitan Transit District (SBMTD)
Santa Barbara MTD Kiosks
Santa Barbara MTD Next Bus
Santa Barbara MTD Website
SC Metro Traveler Information System
SCAT (South County Area Transit)
SCAT Kiosks
SCAT Next Bus CMS
SLO Transit
SLO Transit EDAPTS (TIS)
SLO Transit Kiosks
SLORTA Next Bus CMS
SLORTA Transit (RTA)
SMAT (Santa Maria Area Transit)

ATIS1: Broadcast Traveler Information - Existing

This market package collects traffic conditions, advisories, general public transportation, toll and parking information, incident information, roadway maintenance and construction information, air quality and weather information, and broadly disseminates this information through existing infrastructures and low cost user equipment (e.g., FM subcarrier, cellular data broadcast). The information may be provided directly to travelers or provided to merchants and other traveler service providers so that they can better inform their customers of travel conditions. Different from the market package ATMS6 - Traffic Information Dissemination, which provides localized HAR and DMS information capabilities, ATIS1 provides a wide area digital broadcast service. Successful deployment of this market package relies on availability of real-time traveler information from roadway instrumentation, probe vehicles or other sources.

Inventory Element
Caltrans D4 HAR

ATIS2: Interactive Traveler Information - Existing

This market package provides tailored information in response to a traveler request. Both real-time interactive request/response systems and information systems that "push" a tailored stream of information to the traveler based on a submitted profile are supported. The traveler can obtain current information regarding traffic conditions, roadway maintenance and construction, transit services, ride share/ride match, parking management, detours and pricing information. A range of two-way wide-area wireless and fixed-point to fixed-point communications systems may be used to support the required data communications between the traveler and Information Service Provider. A variety of interactive devices may be used by the traveler to access information prior to a trip or en route including phone via a 511-like portal, kiosk, Personal Digital Assistant, personal computer, and a variety of in-vehicle devices. This market package also allows value-added resellers to collect transportation information that can be aggregated and be available to their personal devices or remote traveler systems to better inform their customers of transportation conditions. Successful deployment of this market package relies on availability of real-time transportation data from roadway instrumentation, transit, probe vehicles or other means. A traveler may also input personal preferences and identification information via a “traveler card” that can convey information to the system about the traveler as well as receive updates from the system so the card can be updated over time.

Inventory Element

Atascadero Transit Smart Kiosk
Caltrans 1-800 ROAD Call-In System
Caltrans Website
CHP Website
Santa Barbara MTD Kiosks
Santa Barbara MTD Website
Santa Cruz County Website
SCAT Kiosks
SLO Transit Kiosks
SLORTA Kiosks

ATMS01: Network Surveillance - Existing

This market package includes traffic detectors, other surveillance equipment, the supporting field equipment, and fixed-point to fixed-point communications to transmit the collected data back to the Traffic Management Subsystem. The derived data can be used locally such as when traffic detectors are connected directly to a signal control system or remotely (e.g., when a CCTV system sends data back to the Traffic Management Subsystem). The data generated by this market package enables traffic managers to monitor traffic and road conditions, identify and verify incidents, detect faults in indicator operations, and collect census data for traffic strategy development and long range planning. The collected data can also be analyzed and made available to users and the Information Service Provider Subsystem.

Inventory Element
Caltrans D4 CCTV
Caltrans D4 Traffic Monitoring Stations
Caltrans D5 CCTV
Caltrans D5 Smart Call Boxes
Caltrans D5 Traffic Monitoring Stations
Monterey County Traffic Counters
Santa Barbara County CCTV
Santa Cruz (City) CCTV
SBCAG Smart Call Boxes
SBtCOG Smart Call Boxes
SCCRTC Smart Call Boxes
SLOCOG Smart Call Boxes

ATMS03: Surface Street Control - Existing

This market package provides the central control and monitoring equipment, communication links, and the signal control equipment that support local surface street control and/or arterial traffic management. A range of traffic signal control systems are represented by this market package ranging from fixed-schedule control systems to fully traffic responsive systems that dynamically adjust control plans and strategies based on current traffic conditions and priority requests. This market package is generally an intra-jurisdictional package that does not rely on real-time communications between separate control systems to achieve area-wide traffic signal coordination. Systems that achieve coordination across jurisdictions by using a common time base or other strategies that do not require real time coordination would be represented by this package. This market package is consistent with typical urban traffic signal control systems.

Inventory Element

Arroyo Grande Advanced Crosswalks
Arroyo Grande Signal Pre-Emption
Arroyo Grande Signal System
Atascadero Advanced Crosswalk
Atascadero Signal Pre-Emption
Atascadero Signal System
Buelton Advanced Crosswalks
Buelton Signal System
Caltrans D5 Signal System
Capitola Signal System
Goleta Advanced Crosswalks
Goleta Signal System
Greenfield Signal System
Grover Beach Advanced Crosswalks
Grover Beach Signal Pre-Emption
Grover Beach Signal System
Hollister Advanced Crosswalks
Hollister Signal System
King City Signal System
Lompoc Signal System
Marina Signal System
Monterey (City) Advanced Crosswalks
Monterey (City) Signal System
Monterey (City) TMC
Monterey County Signal Pre-Emption
MST Signal Priority
Pacific Grove Signal System
Paso Robles Advanced Crosswalks
Paso Robles Signal Pre-Emption
Paso Robles Signal System
Pismo Beach Advanced Crosswalks
Pismo Beach Signal Pre-emption
Pismo Beach Signal System
Salinas Advanced Crosswalks
Salinas Signal System
Salinas TMC

San Luis Obispo (City) Advanced Crosswalks
San Luis Obispo (City) Signal Pre-Emption
San Luis Obispo (City) Signal System
San Luis Obispo (City) TMC
San Luis Obispo County Advanced Crosswalks
San Luis Obispo County Signal Pre-Emption
San Luis Obispo County Signal System
Santa Barbara (City) Advanced Crosswalks
Santa Barbara (City) Signal System
Santa Barbara County Signal System
Santa Cruz (City) Advanced Crosswalks
Santa Cruz (City) Signal System
Santa Cruz (City) TMC
Santa Cruz County Signal System
Santa Maria Signal System
Santa Maria TMC
Seaside Signal System
Soledad Signal System
Solvang Signal System

ATMS04: Freeway Control - Existing

This market package provides central monitoring and control, communications, and field equipment that support freeway management. It supports a range of freeway management control strategies including ramp metering, interchange metering, mainline lane controls, mainline metering, and other strategies including variable speed controls. This package incorporates the instrumentation included in the Network Surveillance Market Package to support freeway monitoring and adaptive strategies as an option.

This market package also includes the capability to utilize surveillance information for detection of incidents. Typically, the processing would be performed at a traffic management center; however, developments might allow for point detection with roadway equipment. For example, a CCTV might include the capability to detect an incident based upon image changes. Additionally, this market package allows general advisory and traffic control information to be provided to the driver while en route.

Inventory Element
Caltrans D5 Ramp Meters
SLOCOG Ramp Meters

ATMS06: Traffic Information Dissemination - Existing

This market package provides driver information using roadway equipment such as dynamic message signs or highway advisory radio. A wide range of information can be disseminated including traffic and road conditions, closure and detour information, incident information, and emergency alerts and driver advisories. This package provides information to drivers at specific equipped locations on the road network. Careful placement of the roadway equipment provides the information at points in the network where the drivers have recourse and can tailor their routes to account for the new information. This package also covers the equipment and interfaces that provide traffic information from a traffic management center to the media (for instance via a direct tie-in between a traffic management center and radio or television station computer systems), Transit Management, Emergency Management, and Information Service Providers. A link to the Maintenance and Construction Management subsystem allows real time information on road/bridge closures due to maintenance and construction activities to be disseminated.

Inventory Element
Caltrans D4 CMS
Caltrans D4 HAR
Caltrans D5 (Portable) HAR
Caltrans D5 CMS
Monterey (City) CMS
Monterey (City) HAR
Santa Cruz County CMS
Santa Cruz County HAR

ATMS07: Regional Traffic Control - Existing

This market package provides for the sharing of traffic information and control among traffic management centers to support a regional control strategy. This market package advances the Surface Street Control and Freeway Control Market Packages by adding the communications links and integrated control strategies that enable integrated interjurisdictional traffic control. The nature of optimization and extent of information and control sharing is determined through working arrangements between jurisdictions. This package relies principally on roadside instrumentation supported by the Surface Street Control and Freeway Control Market Packages and adds hardware, software, and fixed-point to fixed-point communications capabilities to implement traffic management strategies that are coordinated between allied traffic management centers. Several levels of coordination are supported from sharing of information through sharing of control between traffic management centers.

Inventory Element
Caltrans D4 TMC
Caltrans D5 Ramp Meters
Caltrans D5 TMC
Monterey (City) TMC
Salinas TMC
San Luis Obispo (City) TMC
Santa Barbara County TMC
Santa Cruz (City) TMC
Santa Maria TMC

ATMS08: Traffic Incident Management System - Existing

This market package manages both unexpected incidents and planned events so that the impact to the transportation network and traveler safety is minimized. The market package includes incident detection capabilities through roadside surveillance devices (e.g. CCTV) and through regional coordination with other traffic management, maintenance and construction management and emergency management centers as well as rail operations and event promoters. Information from these diverse sources is collected and correlated by this market package to detect and verify incidents and implement an appropriate response. This market package supports traffic operations personnel in developing an appropriate response in coordination with emergency management, maintenance and construction management, and other incident response personnel to confirmed incidents. The response may include traffic control strategy modifications or resource coordination between center subsystems. Incident response also includes presentation of information to affected travelers using the Traffic Information Dissemination market package and dissemination of incident information to travelers through the Broadcast Traveler Information or Interactive Traveler Information market packages. The roadside equipment used to detect and verify incidents also allows the operator to monitor incident status as the response unfolds. The coordination with emergency management might be through a CAD system or through other communication with emergency field personnel. The coordination can also extend to tow trucks and other allied response agencies and field service personnel.

Inventory Element
Caltrans D4 TMC
Caltrans D5 Smart Call Boxes
Caltrans D5 TMC
Monterey County Freeway Service Patrol
Santa Cruz County Freeway Service Patrol
SBCAG Freeway Service Patrol
SBCAG Smart Call Boxes
SBtCOG Smart Call Boxes
SCCRTC Freeway Service Patrol
SCCRTC Smart Call Boxes
SLOCOG Smart Call Boxes
TAMC Freeway Service Patrol
TAMC Smart Call Boxes

ATMS13: Standard Railroad Grade Crossing - Planned

This market package 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. Health 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.

Inventory Element
Caltrans D5 HRI
Monterey County HRI
San Luis Obispo County HRI
Santa Cruz County HRI

ATMS14: Advanced Railroad Grade Crossing - Planned

This market package 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 market package includes all capabilities from the Standard Railroad Grade Crossing Market Package and augments these with additional safety features to mitigate the risks associated with higher rail speeds. The active warning systems supported by this market package include positive barrier systems that 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. In this market package, the wayside equipment provides additional information about the arriving train so that the train's direction of travel, estimated time of arrival, and 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 market package 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.

Inventory Element

Caltrans D5 HRI

Grover Beach Advanced Rail Crossings

Paso Robles Advanced Rail Crossing

San Luis Obispo (City) Advanced Rail Crossing

San Luis Obispo County Advanced Rail Crossings

ATMS16: Parking Facility Management - Existing

This market package provides enhanced monitoring and management of parking facilities. It assists in the management of parking operations, coordinates with transportation authorities, and supports electronic collection of parking fees. This market package collects current parking status, shares this data with Information Service Providers and Traffic Management, and collects parking fees using the same in-vehicle equipment utilized for electronic toll collection or contact or proximity traveler cards used for electronic payment. Two other market packages, APTS4: Transit Passenger and Fare Management and ATMS10: Electronic Toll Collection also provide electronic payment services. These three market packages in combination provide an integrated electronic payment system for transportation services.

Inventory Element

Atascadero Parking Management System

Monterey Parking (Monterey, Carmel, and Private)

Paso Robles Parking Management System

Pismo Beach Parking Management System

San Benito Parking (Local Agencies and Private)

San Luis Obispo (City) Parking Management System

San Luis Obispo Parking (City and Private)

Santa Barbara (City) Parking Management System

Santa Barbara Parking (City and Private)

Santa Cruz Parking (City and Private)

UCSB Smart Card

EM01: Emergency Call-Taking and Dispatch - Existing

This market package provides basic public safety call-taking and dispatch services. It includes emergency vehicle equipment, equipment used to receive and route emergency calls, and wireless communications that enable safe and rapid deployment of appropriate resources to an emergency. Coordination between Emergency Management Subsystems supports emergency notification between agencies. Wide area wireless communications between the Emergency Management Subsystem and an Emergency Vehicle supports dispatch and provision of information to responding personnel.

Inventory Element
Caltrans D4 TMC
Caltrans D5 TMC
CHP CAD
Monterey County Emergency Medical Services
Monterey County Freeway Service Patrol
San Benito County Emergency Medical Services
San Luis Obispo (City) TMC
San Luis Obispo County Emergency Medical Services
Santa Barbara County Emergency Medical Services
Santa Barbara County TMC
Santa Cruz (City) TMC
Santa Cruz County Emergency Medical Services
Santa Cruz County Freeway Service Patrol
Santa Maria TMC
SBCAG Call Boxes
SBCAG Freeway Service Patrol
SBCAG Smart Call Boxes
SBCAG Smart Card
SBtCOG Call Boxes
SBtCOG Smart Call Boxes
SCCRTC Call Boxes
SCCRTC Freeway Service Patrol
SCCRTC Smart Call Boxes
SLOCOG Call Boxes
SLOCOG Smart Call Boxes
TAMC Call Boxes
TAMC Freeway Service Patrol
TAMC Smart Call Boxes

EM04: Roadway Service Patrols - Existing

This market package supports roadway service patrol vehicles that monitor roads that aid motorists, offering rapid response to minor incidents (flat tire, accidents, out of gas) to minimize disruption to the traffic stream. If problems are detected, the roadway service patrol vehicles will provide assistance to the motorist (e.g., push a vehicle to the shoulder or median). The market package monitors service patrol vehicle locations and supports vehicle dispatch to identified incident locations. Incident information collected by the service patrol is shared with traffic, maintenance and construction, and traveler information systems.

Inventory Element

Monterey County Freeway Service Patrol

Santa Cruz County Freeway Service Patrol

SBCAG Freeway Service Patrol

SCCRTC Freeway Service Patrol

TAMC Freeway Service Patrol

MC04: Weather Information Processing and Distribution - Planned

This market package processes and distributes the environmental information collected from the Road Weather Data Collection market package. This market package uses the environmental data to detect environmental hazards such as icy road conditions, high winds, dense fog, etc. so system operators and decision support systems can make decision on corrective actions to take. The continuing updates of road condition information and current temperatures can be used by system operators to more effectively deploy road maintenance resources, issue general traveler advisories, issue location specific warnings to drivers using the Traffic Information Dissemination market package, and aid operators in scheduling work activity.

Inventory Element

Caltrans D5 RWIS