

SAN DIEGO REGION

Intelligent Transportation Systems (ITS) Strategic Plan

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Prepared by:

ATKINS



Kimley-Horn
and Associates, Inc.

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EXECUTIVE SUMMARY

Intelligent Transportation Systems (ITS) offer the promise of more effective and efficient transportation operations and service delivery. Through the application of a range of advanced transportation technologies such as a combination of system and demand management applications it is possible to improve service delivery and optimize transportation infrastructure. The San Diego Region ITS Strategic Plan is a guidance document for regional transportation agency managers, staff, elected officials, and other regional decision makers involved with the planning, programming, and implementation of Transportation Systems Management strategies. These strategies address a regional need and serve to create the regional ITS vision.

PLAN FRAMEWORK

The ITS Strategic Plan outlines a unified vision for the regional ITS investment strategies and articulates a series of high-level guiding principles, goals, and strategies that regional transportation partners have prioritized for funding and implementation.

Figure 1: Plan Framework



The ITS Strategic Plan defines a ten-year vision for the effective use of technology to support intelligent transportation operations and management goals, and identifies key strategies that the region can implement to address critical technical and institutional needs that are inherent in a regional operations program. This Plan is not a tactical document—it does not identify projects and it is not meant to be a list of actions to be taken by regional transportation actors. Instead, the overarching purpose of this Plan is to provide policy guidance and articulate a common vision of what ITS applications should be employed in the region to improve mobility, safety, efficiency, and reliability.

VISION

The vision for ITS in San Diego was developed collaboratively with the ITS Working Group, a collection of agency staff from Caltrans, San Diego Association of Governments (SANDAG), the Metropolitan Transit System (MTS), North County Transit District (NCTD), local cities, and the County.

Figure 2: Vision Statement

Within the coming decade, the San Diego regional transportation system will connect people and goods, with a high degree of safety, reliability, and efficiency—both in terms of resources and energy consumed and in terms of the efficient flow of goods and people throughout the transportation network. Transportation system operators will be connected to one another across jurisdictional boundaries by a robust, integrated data environment that permits real-time decision-making, is transparent/accountable to all operators and the public, with performance managed against clear goals that are oriented toward providing a sustainable transportation network that maximizes value to the travelling public.

GUIDING PRINCIPLES

Guiding principles are those precepts that guide the region in working together to implement the ITS program. These guiding principles are core values that will continue to be applicable irrespective of changes in investment areas, goals, and strategies. The regional transportation agencies referred to in these principles include the freeway operator (Caltrans District 11), the transit operators (North County Transit District and Metropolitan Transit System, the County and 18 Cities, and the MPO (SANDAG).

Guiding principles describe underlying philosophies to the Plan’s development.

Figure 3: Guiding Principles







Cooperation	The regional transportation agencies seek to develop ITS projects and services that improve the region and are committed to cooperating across traditional modal silos and jurisdictional boundaries to see this occur.
Accountability	The regional transportation agencies believe that ITS projects and systems must be fiscally sound, where program revenues and costs are taken into account, and that agency actions will be transparent to the public.
Sustainability	The regional transportation agencies are committed to developing ITS programs that are sustainable—both economically and as it relates to the natural environment—and will prioritize funding for projects that help the region achieve greenhouse gas emission reduction targets and preserve our natural resources.
Pragmatism	The regional transportation agencies believe that the success of the ITS program hinges upon taking reasonable actions to implement achievable projects and services that do not jeopardize existing resource commitments and timelines.
Equity	The regional transportation agencies seek to advance a balanced ITS program that equally benefits highway, arterial, and transit users of the transportation system, and that minimizes adverse social, economic, or environmental impacts across geographic, income, race, age and, other protected classes.



GOALS

Goals were developed for each of the six investment areas from the Transportation Systems Management chapter of the 2050 Regional Transportation Plan. These goals align with the ITS vision and are based on the stated needs and priorities of the ITS plan stakeholders. Goals were developed collaboratively through the planning process (See Appendix A).

Figure 4: ITS Investment Areas/Goals

ITS Investment Area	San Diego Region Goal
Multimodal Integration and Performance-Based Management 	Achieve effective management of the San Diego region’s transportation network and maximize the efficiency of the transportation system through comprehensive integrated operations and management, which will result in reduced congestion and travel time during daily commutes, special events, and incidents.
Traveler Information 	Enhance and continue to deliver the region’s traveler information services that will increase awareness and information on travel choices and reliability, such that users of the system can play an active role in reducing congestion by being informed of network status and choices on when and how to travel.
Arterial Management 	Expand regional deployment and integration of arterial management systems, signal coordination and management, seamless arterial operations across jurisdictions, and support the related goal of improving the competitiveness of transit and reducing travel times on the region’s roadway network.
Freeway Management 	Continue to support and enhance existing investments in regional freeway operations and management with emphasis on the tools and systems that will enhance safety, improve system performance, respond to and address recurring and non-recurring congestion, and promote system efficiency and assets.
Transit Management 	Continue to support and enhance investments in the San Diego region’s transit operations with emphasis on the tools and systems that provide for connectivity and operations of the region’s transit system network, including critical safety and performance based management of bus services, more efficient transit operations, and the ability to direct service changes in real-time to improve system performance.
Electronic Payment Systems 	Support initiatives that expand use of automated payment systems for tolling, parking and transit to provide for integrated multimodal fare systems, seamless freeway tolling operations, and contribute to a regional demand management strategy.

STRATEGIES

Strategies were developed to correspond with ITS investment areas, and are overarching solutions to achieving the ITS vision and goals.

Figure 5: Strategies

Strategy	Multimodal Integration Performance-Based Management	Traveler Info	Arterial Management	Freeway Management	Transit Management	Electronic Payment Systems
MM1 – Deploy Advanced Technology and Connected Vehicle Systems						
MM2 – Review and Expand the Regional Communications Network						
MM3 – Manage Transportation Resources Through Performance Management						
MM4 – Integrate Regional Efforts to Manage Transportation System Assets						
T11 – Increase the Utility of Publicly-funded Transportation Portals						
T12 – Improve Interregional Coordination of Traveler Information with Neighboring Counties and Mexico						
T13 – Improve the Quality, Timeliness, and Consistency of Traveler Information Across all Dissemination Channels						
T14 – Develop Intelligent Parking Management Systems						
AM1 – Improve Corridor Signal Timing Across Jurisdictional Boundaries						
AM2 – Expand and Upgrade ITS Infrastructure for Arterial Routes						
AM3 – Utilize ITS to Create Intelligent “Complete Streets”						
FM1 – Enhance Ramp Metering to Use a Corridor-wide Approach						
FM2 – Implement Active Traffic Management and Variable Speed Limits						
FM3 – Diversify Freeway Detection to Reduce Maintenance and System Failures						
TM1 – Improve Transit Competitiveness Through Better Integration with the Traffic System						
TM2 – Increase Remote Monitoring Capabilities of Transit System Assets						
TM3 – Deliver Real-Time Transit Passenger Information						
EP1 – Integrate Existing Electronic Payment Systems Across Modes						
EP2 – Pursue Partnerships that Support and Expand Use of Payment Services						
EP3 – Improve the Efficiency and Reliability of Electronic Payment Systems						

Primary Strategy Secondary Strategy

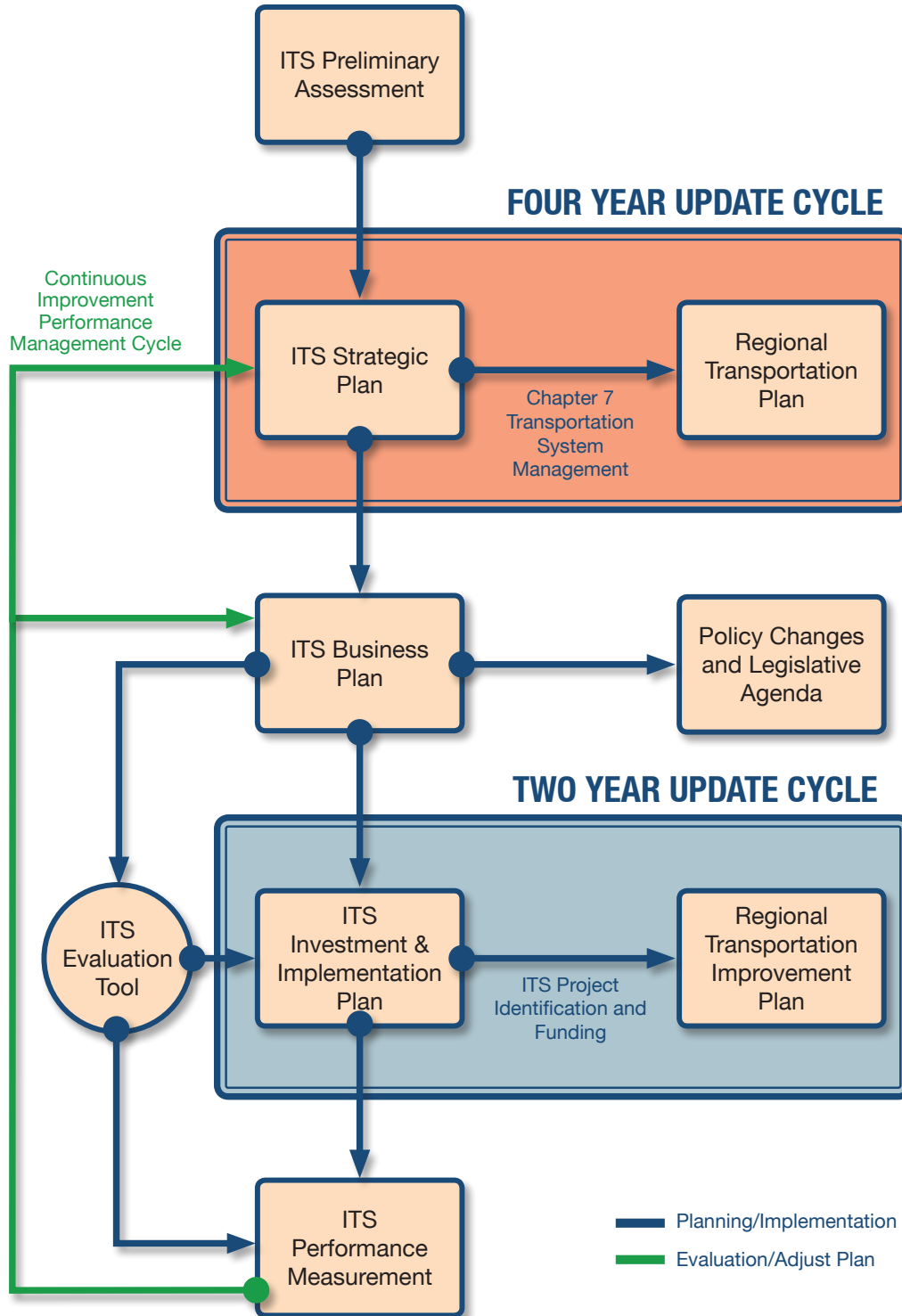
PLAN IMPLEMENTATION

The ITS Strategic Plan is not a stand-alone effort. The strategies identified within this Plan are intended to complement the longer-term strategic initiatives and vision contained in the 2050 Regional Transportation Plan (RTP). The RTP has a long-term focus and includes key transportation priorities for sustainability, modal choices and options, regional mobility, safety, and economic development. The ITS Strategic Plan will identify where technology, agency connectivity, and operational strategies can be implemented to support these important regional priorities. Further, the ITS Strategic Plan provides an important foundation for the subsequent development of an ITS Business Plan and an ITS Investment and Implementation Plan. Although the previous San Diego Region ITS Strategic Plan was adopted in 1996, going forward it is SANDAG's intention to adopt a revised ITS Strategic Plan with each successive RTP cycle (i.e., every four years).

An ITS Evaluation Tool is currently being developed. This tool is being designed to allow for quantification of the benefits of ITS programs and projects. The tool is being crafted with similar criteria as those used to assess other transportation improvements such as highways, transit, HOV lanes, and grade separation projects. This tool could be used in the future to compare similar projects and quantify the effectiveness of ITS improvements at reducing congestion and reducing emissions. The tool would be used in the ITS Investment and Implementation Plan in helping to set priorities, and will help in framing out the measures of effectiveness for an ITS Performance Measurement Plan that will also be developed. The projects that appear in the ITS Investment and Implementation Plan will also need to be programmed in the Regional Transportation Improvement Plan (RTIP)—funds must be identified before the projects can move forward to the point of implementation. The ITS Investment and Implementation Plan will be updated on a two year cycle concurrent with the RTIP preparation process.



Figure 6: ITS Planning Roadmap



1.0 INTRODUCTION

“Broadly speaking, the term Intelligent Transportation Systems (ITS) can be applied to any system or service that uses technology to enhance the movement of people and goods” (*source: Intelligent Transportation Society of America, 2010*). Intelligent Transportation Systems offer the promise of more effective and efficient transportation operations and service delivery. Through the application of a range of advanced transportation technologies, we can improve service delivery and optimize the current transportation infrastructure through a combination of system and demand management applications.

The San Diego Region Intelligent Transportation Systems (ITS) Strategic Plan (the “Plan”) is a guidance document for regional transportation agency managers, staff, elected officials, and other regional decision makers who are involved with the planning, programming, and implementation of Transportation Systems Management (TSM) strategies. These strategies address a regional need and serve to create the regional ITS vision. This Plan builds upon existing systems already in place and addresses several key questions about the future of ITS in San Diego County. The Plan defines a ten-year vision for the strategic use of technology to support regional mobility goals, and identifies key strategies that the region can implement to address critical technical and institutional needs that are inherent in the implementation of Intelligent Transportation Systems. The Plan is intended to be a living document that should be reviewed and modified over time. These reviews may be conducted periodically (every four years) or triggered by major events (e.g., economic recession, unanticipated technology breakthroughs, or new opportunities).

The San Diego Association of Governments (SANDAG) is leading this important initiative for the region. SANDAG is the regional planning agency for San Diego County, and has a regional responsibility for addressing mobility, connectivity, and planning for major regional transportation investments. This plan was prepared for SANDAG member agencies, Caltrans, and regional transit operators, who contributed to its contents.

The ITS Strategic Plan is not a stand-alone effort. The strategies identified within this Plan are intended to complement the longer-term strategic initiatives and vision contained in the 2050 Regional Transportation Plan (RTP). The RTP has a long-term focus, and includes key transportation priorities for sustainability, modal choices and options, regional mobility, safety, and economic development. The ITS Strategic Plan will identify where technology, agency connectivity, and operational and management strategies can be implemented to support these important regional priorities. Further, the ITS Strategic Plan provides an important foundation for the subsequent development of an ITS Business Plan and an ITS Investment and Implementation Plan, which are discussed in more detail in Section 4 of this document.

The ITS strategic planning effort is being developed in two phases:

- The first phase, encapsulated by this Plan, defines the strategic framework for ITS developments in the San Diego region. The framework outlines a unified vision for the regional ITS investment strategies and articulates a series of high-level guiding principles, goals, and strategies that regional transportation partners have prioritized for funding and implementation.
- The second phase of this planning effort will expand upon the strategic framework by developing specific ITS business cases, investment strategies, implementation and deployment plans, and performance management criteria for the delivery of the ITS strategies identified in the Plan. This latter phase will address a number of critical issues that will arise during the development and implementation of the regional ITS Strategic Plan, such that operational, management, monetary, and end-user benefits are optimized through improvements in resource utilization, safety, mobility, accessibility, and productivity of the system. It will also provide insight into the efficiency and sustainability of ITS applications to meet current and future challenges pertinent to service demands and economic constraints.

2.0 PLAN FRAMEWORK

An essential component of the Plan is an overarching vision for how technology can support important regional objectives and initiatives over the next five to ten years. Having a common vision will assist regional decision makers with the prioritization of technology investments. ITS project development at all participating agencies are expected to support the vision as project sponsors ask themselves the question: “Is this project helping us reach our vision?” This can help as functional requirements are defined, connectivity is designed, and new technologies are pursued.

Goals are an elaboration of the vision statement and address the environment, shortcomings, and needs to achieve the vision. The goals provide the framework for developing specific strategies to meet the region’s needs. Goals are broad measures that segment the vision into more manageable and tangible statements. The precision of the goal statements will provide a means of measuring and accomplishing each goal. The goals are then further segmented into different strategies that are needed to identify and develop specific projects. Specific ITS projects will be presented in the latter-phase Business and Investment/Implementation Plan documents. The structure, as presented below in **Figure 1**, shows how individual strategies build to the achievement of the overall vision. The guiding principles will support all levels of the structure, providing a basic, underlying philosophy for the Plan’s development.

Figure 1: Plan Framework



VISION FOR THE FUTURE OF ITS IN THE SAN DIEGO REGION

The vision for ITS in San Diego was developed collaboratively with the ITS Working Group, a collection of agency staff from Caltrans, SANDAG, the Metropolitan Transit System (MTS), North County Transit District (NCTD), and the 19 local agencies including 18 cities and the County of San Diego. The following vision statement reflects the groups’ collective direction for implementing ITS in the San Diego region.

Figure 2: Vision Statement

Within the coming decade, the San Diego regional transportation system will connect people and goods, with a high degree of safety, reliability, and efficiency—both in terms of resources and energy consumed and in terms of the efficient flow of goods and people throughout the transportation network. Transportation system operators will be connected to one another across jurisdictional boundaries by a robust, integrated data environment that permits real-time decision-making, is transparent/accountable to all operators and the public, with performance managed against clear goals that are oriented toward providing a sustainable transportation network that maximizes value to the traveling public.

This vision supports important regional initiatives for connectivity, energy efficiency, and overall mobility and reliability of the regional transportation network. It emphasizes a shift toward more proactive, real-time system management and information sharing among agencies in the region, which will result in a safer and more efficient regional transportation system. The vision emphasizes the impact of ITS strategies on the people—these are not just tools to aid agency transportation operators, but are intended to provide direct and tangible benefits to the traveling public who rely on the region’s transportation system every day.

GUIDING PRINCIPLES AND PLAN FRAMEWORK

Guiding principles and the framework from which the plan was developed describe boundaries and/or underlying philosophies to the Plan’s development. The San Diego region is at a mature juncture in its ITS investments, having deployed the first generation of traffic sensors, transit management systems, freeway management systems, and electronic payment systems over the past decade. While the region is committed to remaining at the forefront of using technologies for business applications, the project partners are also focused on delivering projects effectively, with a focus on the following guiding principles:

Figure 3: Guiding Principles

Cooperation	The regional transportation agencies seek to develop ITS projects and services that improve the region and are committed to cooperating across traditional modal silos and jurisdictional boundaries to see this occur.
Accountability	The regional transportation agencies believe that ITS projects and systems must be fiscally sound, where program revenues and costs are taken into account, and that agency actions will be transparent to the public.
Sustainability	The regional transportation agencies are committed to developing ITS programs that are sustainable—both economically and as it relates to the natural environment—and will prioritize funding for projects that help the region achieve greenhouse gas emission reduction targets and preserve our natural resources.
Pragmatism	The regional transportation agencies believe that the success of the ITS program hinges upon taking reasonable actions to implement achievable projects and services that do not jeopardize existing resource commitments and timelines.
Equity	The regional transportation agencies seek to advance a balanced ITS program that equally benefits highway, arterial, and transit users of the transportation system, and that minimizes adverse social, economic, or environmental impacts across geographic, income, race, age, and other protected classes.

In terms of the Plan context, the following boundaries constrained the development of this Plan:

- ITS as guided by this Plan, is defined as the efficient use of technology and advanced operating strategies for the purpose of improving transportation systems management in the San Diego region.
- The Plan is being defined in a true strategic sense to provide vision and opportunity for connectivity and advancement in transportation system operations and management.
- The Plan is neither prescriptive nor proscriptive, nor is it intended to limit the creativity or deployment of projects on the part of any stakeholders in the region.
- The Plan is not a list of recommended technology projects. It is intended to guide institutional needs as well as operational needs (such as agency agreements) that support the selection and deployment of ITS strategies.

GOALS

Goals were developed for each of the six investment areas from the TSM chapter of the 2050 Regional Transportation Plan. These goals align with the ITS vision and are based on the stated needs and priorities of the ITS plan stakeholders. It is important for the Plan to align with the RTP and present a unified and integrated investment approach for the region’s transportation system. The goals for each of the six regional ITS Investment Areas are shown in **Figure 4**, and on the summary pages for each Investment Area in Sections 3.0 through 8.0

Figure 4: ITS Investment Areas/Goals

ITS Investment Area	San Diego Region Goal
Multimodal Integration and Performance-Based Management 	Achieve effective management of the San Diego region’s transportation network and maximize the efficiency of the transportation system through comprehensive integrated operations and management, which will result in reduced congestion and travel time during daily commutes, special events, and incidents.
Traveler Information 	Enhance and continue to deliver the region’s traveler information services that will increase awareness and information on travel choices and reliability, such that users of the system can play an active role in reducing congestion by being informed of network status and choices on when and how to travel.
Arterial Management 	Expand regional deployment and integration of arterial management systems, signal coordination and management, seamless arterial operations across jurisdictions, and support the related goal of improving the competitiveness of transit and reducing travel times on the region’s roadway network.
Freeway Management 	Continue to support and enhance existing investments in regional freeway operations and management with emphasis on the tools and systems that will enhance safety, improve system performance, respond to and address recurring and non-recurring congestion, and promote system efficiency and assets.
Transit Management 	Continue to support and enhance investments in the San Diego region’s transit operations with emphasis on the tools and systems that provide for connectivity and operations of the region’s transit system network, including critical safety and performance based management of bus services, more efficient transit operations, and the ability to direct service changes in real-time to improve system performance.
Electronic Payment Systems 	Support initiatives that expand use of automated payment systems for tolling, parking and transit to provide for integrated multimodal fare systems, seamless freeway tolling operations, and contribute to a regional demand management strategy.

STRATEGIES

The strategies to guide the San Diego region to develop and deploy the next generation of ITS services in the region are outlined in **Figure 5** and explained in Sections 3.0 through 8.0. These strategies are overarching solutions to achieving the ITS vision and goals. The subsequent ITS Investment and Implementation Plans will define specific projects (tactics) and phasing. These strategies have been developed to correspond with ITS Investment Areas in the following categories.

Figure 5: Strategies

Strategy	Multimodal Integration Performance-Based Management	Traveler Info	Arterial Management	Freeway Management	Transit Management	Electronic Payment Systems
MM1 – Deploy Advanced Technology and Connected Vehicle Systems						
MM2 – Review and Expand the Regional Communications Network						
MM3 – Manage Transportation Resources Through Performance Management						
MM4 – Integrate Regional Efforts to Manage Transportation System Assets						
T11 – Increase the Utility of Publicly-funded Transportation Portals						
T12 – Improve Interregional Coordination of Traveler Information with Neighboring Counties and Mexico						
T13 – Improve the Quality, Timeliness, and Consistency of Traveler Information Across all Dissemination Channels						
T14 – Develop Intelligent Parking Management Systems						
AM1 – Improve Corridor Signal Timing Across Jurisdictional Boundaries						
AM2 – Expand and Upgrade ITS Infrastructure for Arterial Routes						
AM3 – Utilize ITS to Create Intelligent “Complete Streets”						
FM1 – Enhance Ramp Metering to Use a Corridor-wide Approach						
FM2 – Implement Active Traffic Management and Variable Speed Limits						
FM3 – Diversify Freeway Detection to Reduce Maintenance and System Failures						
TM1 – Improve Transit Competitiveness Through Better Integration with the Traffic System						
TM2 – Increase Remote Monitoring Capabilities of Transit System Assets						
TM3 – Deliver Real-Time Transit Passenger Information						
EP1 – Integrate Existing Electronic Payment Systems Across Modes						
EP2 – Pursue Partnerships that Support and Expand Use of Payment Services						
EP3 – Improve the Efficiency and Reliability of Electronic Payment Systems						

Primary Strategy Secondary Strategy



3.0 MULTIMODAL INTEGRATION AND PERFORMANCE-BASED MANAGEMENT

Allowing the traveling public to have choices in how they travel will improve mobility and allow for user based response to traffic congestion. These strategies rely on proactive performance-based management and multimodal, real-time data availability to improve travel conditions, assess travel options and provide feedback to the public.

Goal

Achieve effective management of the San Diego region's transportation network and maximize the efficiency of the transportation system through comprehensive integrated operations and management. This achievement will result in reduced congestion and travel time during daily commutes, special events, and incidents.

The following are key strategies to support achievement of the goal identified above:

Strategy	Multimodal Integration Performance-Based Management	Traveler Info	Arterial Management	Freeway Management	Transit Management	Electronic Payment Systems
MM1 – Deploy Advanced Technology and Connected Vehicle Systems						
MM2 – Review and Expand the Regional Communications Network						
MM3 – Manage Transportation Resources Through Performance Management						
MM4 – Integrate Regional Efforts to Manage Transportation System Assets						

Primary Strategy Secondary Strategy



**Strategy MM1 –
Deploy Advanced Technology and Connected Vehicle Systems**

This strategy applies advance technologies to improve safety and the efficiency of or transportation system. One such program that accomplishes this strategy is “Connected Vehicles,” formerly known as Vehicle Integration Initiative (VII) (and temporarily branded IntelliDriveSM). The U.S. DOT is actively sponsoring research to develop and deploy a fully connected transportation system that makes the most of multimodal, transformational applications that improve safety, mobility, and the environment. A number of San Diego transportation agencies and private industry partners have recently applied for funding under this program to develop an innovative testbed that extends from downtown San Diego and up the I-15 corridor. The Connected Vehicles program relies upon a robust platform of technologies, interfaces, and

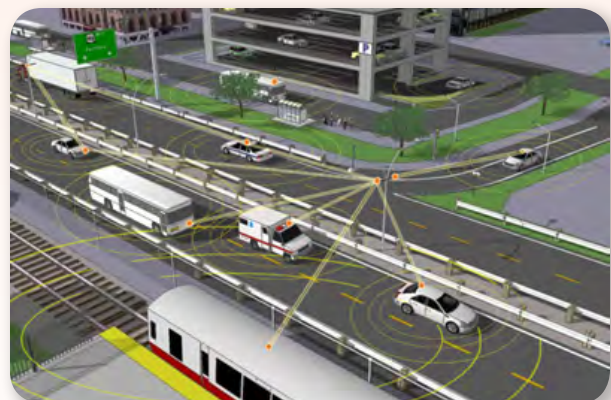
processes that, when combined, will ensure safe, stable, interoperable, reliable system operations that minimize risk and maximize opportunities for travelers. Connected vehicle safety applications are designed to increase situational awareness and reduce or eliminate crashes through vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) data transmission that support applications such as driver advisories, driver warnings, and vehicle and/or infrastructure controls. This strategy calls for the development of infrastructure and the know-how to determine the benefits to the region, and how Connected Vehicle applications might work, given various wireless network alternatives.

Related Strategies

- MM2 – Review and Expand the Regional Communications Network
- MM4 – Integrate Regional Efforts to Manage Transportation System Assets
- TI3 – Improve the Quality, Timeliness, and Consistency of Traveler Information Across all Dissemination Channels
- TI4 – Develop Real-time Parking Guidance and Management Systems
- FM2 - Implement Active Traffic Management and Variable Speed Limits
- AM2 - Expand and Upgrade ITS Infrastructure for Arterial Routes
- TM1 – Improve Transit Competitiveness Through Better Integration with the Traffic System
- TM2 – Increase Remote Monitoring Capabilities of Transit System Assets
- TM3 – Deliver Real-time Transit Passenger Information

Expected Benefits

- ✓ Reduced Energy Consumption
- ✓ Efficient Use of Resources
- ✓ Efficient Flow of Transportation Network
- ✓ Real-time Delivery of Traveler Information
- ✓ Real-time Operations and Maintenance
- ✓ Integrated Actions
- ✓ Benefits that Exceed Costs
- ✓ Increased Safety of Transportation Systems





Strategy MM2 – Review and Expand the Regional Communications Network

This strategy aims to improve the electronic communication network in order to support other ITS strategies. There are several key communications needs in San Diego: portions of the highway and arterial system lack connectivity to the traffic operations center(s); regional public safety communications during times of emergency; DSRC communications to support future Vehicle Infrastructure Integration (VII) deployments; and desire for Wireless Fidelity (WiFi) access on transit vehicles and stations serving key commute corridors. This strategy looks at providing regional communications coverage and backhaul for uninterrupted communications service and connectivity. The initiative will involve the planning, design, deployment, and operation of a region-wide high-speed data service capable of supporting the full range of technology initiatives defined for the region. The

regional network will support transportation applications such as smart vehicles, enhanced arterial data collection, public WiFi on transit vehicles, and a wide range of other advanced transportation technology initiatives. The strategy will involve the evaluation and consideration of regional or subregional business models for maintenance and operations, such as adopting a managed service approach to wireless service delivery. Also an evaluation of rail rights-of-way should be conducted in order to support the installation of the needed communications infrastructure to support many of the strategies identified in this Plan.

Related Strategies

- MM1 – Deploy Advanced Technology and Connected Vehicles Systems
- MM3 – Manage Transportation Resources Through Performance Management
- MM4 – Integrate Regional Efforts to Manage Transportation System Assets
- TI2 – Improve Inter-regional Coordination of Traveler Information With Neighboring Counties (Imperial, Orange, Riverside) and with Tijuana, Baja, Mexico
- TI4 – Develop Real-time Parking Guidance and Management Systems
- AM1 – Improve Corridor Signal Timing Across Jurisdictional Boundaries
- AM2 – Expand and Upgrade ITS Infrastructure for Arterial Routes
- FM3 – Diversify Freeway Detection to Reduce Maintenance and System Failures
- TM1 – Improve Transit Competitiveness Through Better Integration with the Traffic System
- TM2 – Increase Remote Monitoring Capabilities of Transit System Assets
- TM3 – Deliver Real-time Transit Passenger Information
- EP1 – Integrate Existing Electronic Payment Systems Across Modes

Expected Benefits

- ✓ Real-time Delivery of Traveler Information
- ✓ Real-time Operations and Maintenance
- ✓ Integrated Actions
- ✓ Benefits that Exceed Costs





Strategy MM3 – Manage Transportation Resources Based on System Performance

To effectively manage the region’s transportation infrastructure requires a performance-driven approach to corridor operations and systems management. Performance monitoring allows data from various sources to be collected and assessed, and to provide input to specific operational improvements or achievements. This strategy supports the development of key performance indicators to be used in transportation performance measurement and to determine congestion problem locations and to report return on investment for ITS deployments. This strategy is reliant on the deployment and maintenance of a rich network of multimodal traffic sensors. The California Freeway Performance Measurement System (PeMS)¹ is being used throughout the state and is currently being enhanced to support both transit and

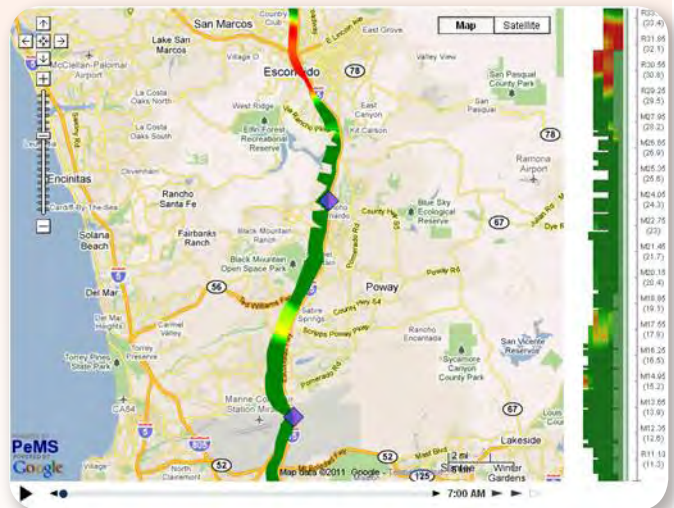
arterial performance monitoring. Transit and arterial versions of PeMS and a shift towards using PeMS data for real-time operations support, integrated performance management, and traveler information are now nearly complete. This strategy would expand the coverage of transit and arterial monitoring stations and include the development, evaluation, and refinement of additional performance measures such that transportation operators can better manage the system and the traveling public will have real-time information about travel options. The expansion of PeMS to include arterial and transit performance monitoring will allow SANDAG and its partners to perform comprehensive monitoring across the region and across modes.²

Related Strategies

- 📡 MM2 – Review and Expand the Regional Communications Network
- 📡 MM4 – Integrate Regional Efforts to Manage Transportation System Assets
- 📡 TI3 – Improve the Quality, Timeliness, and Consistency of Traveler Information Across all Dissemination Channels
- 📡 TM2 – Increase Remote Monitoring Capabilities of Transit System Assets

Expected Benefits

- ✓ Real-time Delivery of Traveler Information
- ✓ Integrated Actions
- ✓ Benefits that Exceed Costs



¹ <http://pems.dot.ca.gov>

² ITS Preliminary Assessment, Appendix A. Prepared for SANDAG, by PBS&J. December 2007.



Strategy MM4 – Integrate Regional Efforts to Manage Transportation System Assets

A key means to improve mobility is better cooperation among transportation system managers in operating the region's transportation system in a coordinated fashion. Among the ways this strategy could be implemented is through the use of Integrated Corridor Management (ICM) and the development of a Joint Transportation Operations Center (JTOC). ICM is a performance-based, corridorwide approach that aims to improve mobility and reduce congestion by using advanced technologies and coordinated multimodal management strategies. Recent advances in transportation analysis, modeling, and simulation (AMS) have established the foundation for significantly improved levels of analysis on transportation corridor operations and enable transportation managers to improve awareness of corridor operations as conditions change in real-time. For the Interstate 15 corridor, an online Decision Support System (DSS) composed of macroscopic and mesoscopic tools, is being developed as part of the Intermodal Transportation Management System (IMTMS), to permit real-time travel forecasting and decision support as a

component of the U.S. DOT-funded I-15 ICM demonstration. ICM enables transportation system managers to actively manage traffic and transit resources within the transportation network by managing the flow of traffic as it moves across arterials and highways. San Diego is currently one of two regions nationwide that is implementing ICM using federal funds in a test corridor on Interstate-15 that will serve as the foundation for the region's proposal to build and implement an ICM network region-wide. The JTOC would link transit, Caltrans, the County, and Cities traffic/transit management centers via one or more integrated transportation systems management networks. Ideally, through operational agreements, the JTOC could be operated after normal workday hours with appropriate agency protocols in place. The JTOC would provide for data sharing and delegated controls occurring via the internet or dedicated communications lines. JTOC operations could operate from one single building and/or could be linked in a more virtual manner.

Related Strategies

- MM1 – Deploy Advanced Technology and Connected Vehicles Systems
- MM2 – Review and Expand the Regional Communications Network
- MM3 – Manage Transportation Resources Through Performance Management
- FM3 – Diversify Freeway Detection to Reduce Maintenance and System Failures
- AM1 – Improve Corridor Signal Timing Across Jurisdictional Boundaries

Expected Benefits

- ✓ Reduced Energy Consumption
- ✓ Efficient Use of Resources
- ✓ Efficient Flow of Transportation Network
- ✓ Real-time Delivery of Traveler Information
- ✓ Real-time Operations and Maintenance
- ✓ Integrated Actions
- ✓ Benefits that Exceed Costs
- ✓ Increased Safety of Transportation Systems





4.0 TRAVELER INFORMATION

The San Diego region currently provides the traveling public with information about freeway travel times, transit trip planning, travel incentives, road closures, and ridesharing services through a regional 511 Traveler Information Service. This information, when conveyed to travelers, is an important means to reduce traffic congestion and improve safety. Today's commuters expect continued expansion of delivery channels, along with improvements in the quality and type of information that is available, as well as the immediacy of the information, so that they can make informed travel choices in real-time.

Goal

Enhance and continue to deliver the region's traveler information services that will increase awareness and information on travel choices and reliability, such that users of the system can play an active role in reducing congestion by being informed of network status and choices on when and how to travel.

The following are potential strategies to support achievement of the goals identified above:

Strategy	Multimodal Integration Performance-Based Management	Traveler Info	Arterial Management	Freeway Management	Transit Management	Electronic Payment Systems
T1 – Increase the Utility of Publicly-funded Transportation Portals						
T2 – Improve Interregional Coordination of Traveler Information with Neighboring Counties and Mexico						
T13 – Improve the Quality, Timeliness, and Consistency of Traveler Information Across all Dissemination Channels						
T14 – Develop Intelligent Parking Management Systems						

Primary Strategy Secondary Strategy





Strategy T11 – Increase the Utility of Publicly-funded Transportation Portals

This strategy looks at ways to harness innovations in the private sector to get traveler information to the public more cheaply and effectively. SANDAG implemented the 511 traveler information system for the San Diego region in March of 2007. The 511 service currently provides information on traffic, transit, and roadway conditions to system users via telephone/interactive voice response (IVR) and the Web. The publically-funded 511 system has begun to share its XML data feed to support third-party developers who create applications that access traveler information and provide value-added services. Private industry has emerged over the past decade as an important provider of information to the public for a variety of services and applications including transportation and security/public safety. Enhancements should be made to the current 511 system to provide customized trip planning services and information on competitive mode choice options delivered via smart vehicles, mobile and personal

devices, as well as in vehicle information devices as part of the U.S. DOT's Connected Vehicles initiative. While government-sponsored 511 services are an essential component of a regional communication strategy, better reliance and partnerships with private-sector data providers is both cost effective and desirable for the end user. This may include the provision of concierge style services to travelers enabling them to make the best mode, route and timing choices for their trips. Partnerships should be pursued with commercial data providers to increase the number of sources and depth of real-time traffic data. The possibility for commercialization of traveler information and related services to provide revenue for transportation will also be explored.

Related Strategies

- TI3 – Improve the Quality, Timeliness, and Consistency of Traveler Information Across all Dissemination Channels
- TI4 – Develop Real-time Parking Guidance and Management Systems
- TM3 – Deliver Real-Time Transit Passenger Information

Expected Benefits

- ✓ Efficient Use of Resources
- ✓ Real-time Delivery of Traveler Information
- ✓ Benefits that Exceed Costs





**Strategy TI2 –
Improve Inter-regional Coordination of Traveler Information
with Neighboring Counties (Imperial, Orange, Riverside)
and with Tijuana, Baja, Mexico**

San Diego sits at the crossroads of one of the world’s busiest land border crossings, and in a growing mega-region that includes Tijuana, Baja Mexico, Los Angeles, Orange County, and the “Inland Empire” (Riverside and San Bernardino Counties). It has major inter-regional travel routes on Interstates 5, 8, and 15, that connect to the cities of Los Angeles, Las Vegas, and Phoenix (via neighboring Imperial County). These three routes routinely carry several hundred thousand cars a day, and the number of foot crossings at San Diego’s major border crossing (San Ysidro), and cars and trucks at San Ysidro and a second (and soon a third adjoining) crossing(s) at Otay Mesa, are unrivaled elsewhere in the United States. In 2010, SANDAG completed a Border Wait Times Study and market assessment to identify commercially available ITS technologies capable of automatically measuring, monitoring, and reporting cross border wait times of commercial vehicles waiting to enter the U.S. at the existing

Otay Mesa West Truck Crossing. FHWA is exploring the use of satellite and other technology through its Freight Performance Measurement (FPM) initiative to automatically monitor, measure, and report travel times and border wait times. SANDAG began an ITS Study in 2011 for the new Port of Entry at the junction of State Route 11 and the U.S./Mexico border, that is expected to result in specific ITS strategies and pricing for the new border crossing when implemented. This Strategy is to expand on the previous exploratory research and lead to the deployment of ITS technologies that can be used to monitor, measure and report border wait times at U.S./Mexico border crossings in San Diego County, and to support other traveler information initiatives that benefit inter-regional travel on routes 5, 8, and 15.

Related Strategies

- MM2 – Review and Expand the Regional Communications Network
- TI3 – Improve the Quality, Timeliness, and Consistency of Traveler Information Across all Dissemination Channels
- TI4 – Develop Real-time Parking Guidance and Management Systems
- FM2 – Implement Active Traffic Management and Variable Speed Limits
- TM3 – Deliver Real-Time Transit Passenger Information

Expected Benefits

- ✓ Reduced Energy Consumption
- ✓ Efficient Flow of Transportation Network
- ✓ Real-time Delivery of Traveler Information
- ✓ Integrated Actions











Strategy T13 – Improve the Quality, Timeliness, and Consistency of Traveler Information Across all Dissemination Channels

The San Diego Regional ITS Architecture is configured to centralize transit, traffic, and incident information almost exclusively from a single regional system called the Intermodal Transportation Management System (IMTMS). IMTMS collects data from numerous sources, and generates an XML feed that is consumed by the regional 511 service and articulated through the various dissemination channels. This means the regional information integration work is done using one system rather than integrating multiple systems. However, all publicly-available traveler information in the San Diego region does not flow through 511/IMTMS today. During the 2003 and 2007 wildfires, it became apparent that better coordination between regional actors was needed, to ensure a consistent message was being sent out through all channels. Misinformation or poorly timed releases of information can lead to public confusion and complicate responses to regional incidents. This Strategy applies to routine traffic incidents as well as major regional events such as wildfires or earthquake evacuations, and seeks to leverage current (and future) data sources and types, and provide standardized information feeds to support a variety of traveler information applications. Examples of external data sources that

are not currently integrated with 511 include Highway Advisory Radio (HAR), an older service, used by Caltrans to broadcast information on traffic and delays to motorists. Today, the use of HAR is limited in San Diego, with most broadcast transmitters no longer in service. A more recent concept that functions similar to HAR is the Radio Data System, Traffic Message Channel (RDS-TMC), which also uses radio broadcast frequencies to disseminate traveler information. However, instead of listening to a prerecorded message, the motorist receives and views digital messages that are encoded over FM radio broadcast signals. FM radio tuners, satellite radio receivers, and in-vehicle navigation devices are capable of decoding and displaying the RDS-TMC data stream, or announcing them using text-to-speech converters. These strategies add another traveler information option using broadcast information and can provide traveler information coverage for areas that lack changeable message signs (CMS). In addition, broadcast radio has the advantage of not contributing to driver distraction from using mobile devices to access traveler information.

Related Strategies

-  MM1 – Deploy Advanced Technology and Connected Vehicles Systems
-  MM3 – Manage Transportation Resources Through Performance Management
-  MM4 – Integrate Regional Efforts to Manage Transportation System Assets
-  T11 – Increase the Utility of Publically-funded Transportation Portals
-  T12 – Improve Inter-regional Coordination of Traveler Information With Neighboring Counties (Imperial, Orange, Riverside) and with Tijuana, Baja, Mexico
-  TM2 – Increase Remote Monitoring Capabilities of Transit System Assets
-  TM3 – Deliver Real-Time Transit Passenger Information

Expected Benefits

- ✓ Reduced Energy Consumption
- ✓ Efficient Flow of Transportation Network
- ✓ Real-time Delivery of Traveler Information
- ✓ Real-time Operations and Maintenance
- ✓ Integrated Actions
- ✓ Increased Safety of Transportation Systems





Strategy T14 –
Develop Intelligent Parking Guidance and Management Systems

Major advances in parking guidance and parking management systems have been made in the past few years. Using sensors, new meters, and real-time parking data, intelligent parking systems work together to make parking easier to find and reduce time and wasted fuel spent idling or circling city blocks to find a space. Demonstrations of the latest parking guidance and parking pricing and fee collection technologies are under way in Seattle and San Francisco, and have tremendous promise for future applicability in the San Diego region. This Strategy supports the development of new parking information and management systems that make use of the Web (cloud computing), wireless telecommunications, and parking sensors, and builds upon an

existing federally-funded pilot project in North County that is investigating the use of smart parking technologies and techniques at three COASTER commuter rail stations. One tactic of this strategy will be to leverage the findings attained from the COASTER smart parking pilot initiative to determine how advanced parking systems can be scaled to other parts of the region.

Related Strategies

- MM1 – Deploy Advanced Technology and Connected Vehicles Systems
- MM2 – Review and Expand the Regional Communications Network
- T11 – Increase the Utility of Publically-funded Transportation Portals
- T12 – Improve Inter-regional Coordination of Traveler Information With Neighboring Counties (Imperial, Orange, Riverside) and with Tijuana, Baja, Mexico
- TM1 – Improve Transit Competitiveness Through Better Integration with the Traffic System
- TM3 – Deliver Real-Time Transit Passenger Information
- EP1 – Integrate Existing Electronic Payment Systems Across Modes
- EP2 – Pursue Partnerships that Support and Expand Use of Payment Services

Expected Benefits

- ✓ Reduced Energy Consumption
- ✓ Efficient Use of Resources
- ✓ Efficient Flow of Transportation Network
- ✓ Real-time Delivery of Traveler Information
- ✓ Real-time Operations and Maintenance
- ✓ Benefits that Exceed Costs
- ✓ Increased Safety of Transportation Systems





5.0 ARTERIAL MANAGEMENT

ITS has been used for decades to improve the flow of traffic on arterials. Arterial management is one of the most cost-effective means of reducing congestion and travel times, reducing vehicle emissions, and lowering fuel consumption.

Goal

Expand regional deployment and integration of arterial management systems, signal coordination and management, seamless arterial operations across jurisdictions, and support the related goal of improving the competitiveness of transit and reducing travel times on the region's roadway network.

The following are potential strategies to support achievement of the goals identified above:

Strategy	Multimodal Integration Performance-Based Management	Traveler Info	Arterial Management	Freeway Management	Transit Management	Electronic Payment Systems
AM1 – Improve Corridor Signal Timing Across Jurisdictional Boundaries						
AM2 – Expand and Upgrade ITS Infrastructure for Arterial Routes						
AM3 – Utilize ITS to Create Intelligent “Complete Streets”						



Primary Strategy



Secondary Strategy



**Strategy AM1 –
Improve Corridor Signal Timing Across Jurisdictional Boundaries**

The use of coordinated signal timing has been demonstrated as an effective means to improve traffic flow and reduce energy consumption. This strategy would continue to develop and refine coordinating timing plans, with a particular emphasis on corridors that traverse across agencies, including Caltrans, cities, and the County. In corridors where traffic conditions are expected to dramatically change, using signal control strategies that can react to these changes should be considered. Two means of accomplishing this are through the use of adaptive and responsive control. An adaptive system is one that dynamically adjusts traffic signal timing to accommodate changing traffic patterns and demand. The dynamic changes to traffic signal timing are predictive in nature where the adjustments are implemented when the anticipated traffic demand occurs. In other words,

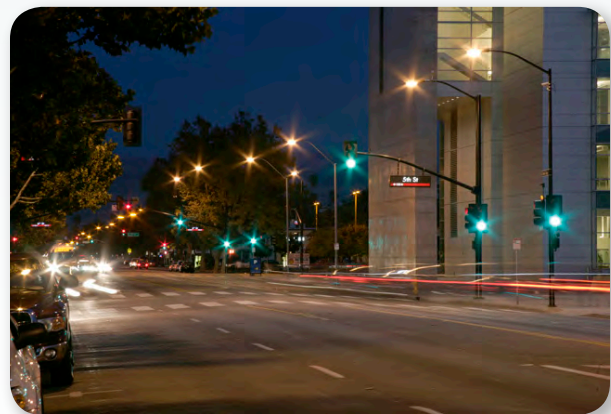
the traffic signal timing is proactive versus reactive. The adaptive algorithms continuously determine where the traffic patterns and demand will be at some point in the future and implements traffic signal timing to accommodate that future traffic demand. This technology supports the implementation of corridor management strategies at the local, arterial level. Responsive control uses monitoring of traffic volumes and other available data to instruct the signal system when to switch from a series of predefined signal timing plans. Responsive control reacts to information, but this reaction typically occurs shortly after travel patterns change.

Related Strategies

- MM2 – Review and Expand the Regional Communications Network
- MM4 – Integrate Regional Efforts to Manage Transportation System Assets
- AM2 - Expand and Upgrade ITS Infrastructure for Arterial Routes
- AM3 - Utilize ITS to Create Intelligent “Complete Streets”
- FM1 – Enhance Ramp Metering to Use a Corridor-wide Approach
- TM1 – Improve Transit Competitiveness Through Better Integration with the Traffic System

Expected Benefits

- ✓ Reduced Energy Consumption
- ✓ Efficient Flow of Transportation Network
- ✓ Integrated Actions
- ✓ Benefits that Exceed Costs
- ✓ Increased Safety of Transportation Systems





Strategy AM2 –
Expand and Upgrade ITS Infrastructure for Arterial Routes

Many agencies have deployed various advanced operational strategies within their respective existing traffic signal systems. The utilization of these advanced strategies has at times been limited due to the existing traffic signal infrastructure’s inability to support these proposed deployments. Improvements that could be implemented as part of this strategy include, but are not limited to, deployment of Advanced Traffic Control (ATC) signal controllers, or deployment of central control software for operations and management of the video detection system and monitoring system. The use of Closed Circuit Television (CCTV) cameras for verifying the results of traffic management strategies, such as

signal timing changes, work zone diversions, and for detection and verification of traffic incidents. CCTV images facilitate rapid response to incidents that affect traffic flow. As a whole, the region has a relatively small percentage of the principal arterial network covered by real-time video surveillance. Changeable Message Signs (CMS) are currently providing traveler information on incidents and travel times across the freeway network in San Diego. This Strategy will expand the region’s use of CMS to support dynamic traveler information during peak as well as non-peak travel hours on the selected arterial streets.

Related Strategies

- 📡 MM1 – Deploy Advanced Technology and Connected Vehicles Systems
- 📡 MM2 – Review and Expand the Regional Communications Network
- 📡 TI3 – Improve the Quality, Timeliness, and Consistency of Traveler Information Across all Dissemination Channels
- 📡 AM1 – Improve Corridor Signal Timing Across Jurisdictional Boundaries
- 📡 AM3 – Utilize ITS to Create Intelligent “Complete Streets”
- 📡 TM1 – Improve Transit Competitiveness Through Better Integration with the Traffic System

Expected Benefits

- ✓ Efficient Use of Resources
- ✓ Efficient Flow of Transportation Network
- ✓ Real-time Delivery of Traveler Information
- ✓ Real-time Operations and Maintenance
- ✓ Benefits that Exceed Costs
- ✓ Increased Safety of Transportation Systems





Strategy AM3 –
Utilize ITS to Create Intelligent “Complete Streets”

Legislation such as AB1358 (Complete Streets Act) that requires cities undergoing major revisions to their general plans to consider multimodal use of the circulation system. The creation of Complete Streets can be partially facilitated by using ITS technologies to better detect bicycles, pedestrians, and transit vehicles, and then applying strategies for management across modes of travel. Many arterial traffic signal systems in San Diego focus only on vehicle detection and signal actuation. Detection of all users—not just automobiles—will be important as Complete Street concepts are integrated into the design and operation of the roadways. To support multimodal users, the system will need sensors that can detect transit vehicles, bicycles, and

pedestrians. This Strategy calls for integrating technologies to enhance detection systems with bicycle loop detectors, passive pedestrian detectors, and other technologies to manage the network and to alert drivers of other users on the road. Signal coordination strategies now need to consider strategies to benefit all modes of travel. Allowing pedestrians to begin crossing a street a few seconds prior to vehicles can improve safety and incentivize walking. Providing sufficient time for bicycles to cross wide streets and providing coordination that allows for bicycle progression will help to encourage bicycle use.

Related Strategies

- AM1 – Improve Corridor Signal Timing Across Jurisdictional Boundaries
- AM2 – Expand and Upgrade ITS Infrastructure for Arterial Routes
- TM1 – Improve Transit Competitiveness Through Better Integration with the Traffic System

Expected Benefits

- ✓ Reduced Energy Consumption
- ✓ Efficient Flow of Transportation Network
- ✓ Real-time Operations and Maintenance
- ✓ Increased Safety of Transportation Systems





6.0 FREEWAY MANAGEMENT

San Diego offers an extensive and relatively modern freeway system that provides a backbone for travel through and within the region, as well as serving goods movement on primary routes. In the future, most freeways in San Diego County will offer managed lanes used exclusively by carpool, transit vehicles, and single-occupant vehicles for a fee, increasing the throughput of people. ITS is an effective tool used to increase the efficiency of travel on the freeways.

Goal

Continue to support and enhance existing investments in regional freeway operations and management with emphasis on the tools and systems that will enhance safety, improve system performance, respond to and address recurring and non-recurring congestion, and promote system operations and management strategies that maximize system efficiency and assets.

The following are potential strategies to support achievement of the goals identified above:

Strategy	Multimodal Integration Performance-Based Management	Traveler Info	Arterial Management	Freeway Management	Transit Management	Electronic Payment Systems
FM1 – Enhance Ramp Metering to Use a Corridor-wide Approach						
FM2 – Implement Active Traffic Management and Variable Speed Limits						
FM3 – Diversify Freeway Detection to Reduce Maintenance and System Failures						



Primary Strategy



Secondary Strategy





Strategy FM1 – Enhance Ramp Metering to Use a Corridorwide Approach

While ramp metering is in place throughout most of the region, this Strategy is intended to focus on improvements to the way ramp metering is operated and consideration of the interrelationship of ramp metering with arterial traffic flow. This Strategy is a shift towards state-of-the-art approaches to freeway corridor management, using traffic detection throughout the corridor to adjust the number of vehicles entering the freeway, so that upstream and downstream traffic flow is maintained at an optimized level. Future application of this Strategy will analyze

traffic conditions in real-time to anticipate when and where freeway bottlenecks will likely occur so that vehicles entering the freeway are prevented from forming platoons. Connectivity to the traffic management center will allow operators to adjust ramp metering rates to manage traffic conditions proactively on the freeway and to improve the progression of vehicles at on and off ramp locations to mitigate spillover onto arterials.

Related Strategies

- MM4 – Integrate Regional Efforts to Manage Transportation System Assets
- AM1 – Improve Corridor Signal Timing Across Jurisdictional Boundaries

Expected Benefits

- ✓ Efficient Use of Resources
- ✓ Efficient Flow of Transportation Network
- ✓ Real-time Operations and Maintenance
- ✓ Integrated Actions





Strategy FM2 – Implement Active Traffic Management and Variable Speed Limits

Active Traffic Management (ATM) is the ability to dynamically manage recurrent and non-recurrent congestion based on prevailing traffic conditions. Focusing on trip reliability, ATM strategies, including the deployment of variable speed limits, have been shown to maximize the effectiveness and efficiency of transportation facilities and increase throughput and safety. The San Diego region has experience with the application of advanced ITS technology such as congestion pricing, an automated highways demonstration project, the use of buses on shoulders in freeway transit operations, as well as variable speed limits to advise motorists of and/or to enforce the posted speed limits on freeways and arterials. There have been requests for the study of potential applications for advisory variable speed limits in conjunction with other advanced technologies to actively manage traffic congestion such as hard shoulder running, junction

control, lane control signals, and adaptive ramp metering. ATM would be “turned on” not only during recurring congestion, but also to smooth flows and optimize speeds during incidents, events, or major disasters which will help manage demand. Specific projects stemming from this Strategy will include studying the applicability for various challenged corridors in the region and subsequent deployment of ATM and coordinated use of Transportation Demand Management (TDM) on priority corridors. The implementation of this Strategy is expected to improve traveler safety on these roadways and to promote changes in driver behavior to observe posted speed limits.

Related Strategies

- T12 – Improve Inter-regional Coordination of Traveler Information With Neighboring Counties (Imperial, Orange, Riverside) and with Tijuana, Baja, Mexico

Expected Benefits

- ✓ Reduced Energy Consumption
- ✓ Efficient Flow of Transportation Network
- ✓ Real-time Delivery of Traveler Information
- ✓ Real-time Operations and Maintenance
- ✓ Integrated Actions
- ✓ Increased Safety of Transportation Systems



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Strategy FM3 –
Diversify Freeway Detection to Reduce Maintenance and System Failures

Loop detectors are widely deployed in the Southern California region but they become unreliable when lanes are shifted and the loop detector fields cover more than one lane leading to erroneous data. Further, loop detectors are prone to breakage and require a high level of maintenance to remain reliably in service. Loop detectors are also labor intensive to install or replace and require portions of the roadway to be closed for one or more days creating congestion and posing danger to the crews in the work zones. This Strategy evaluates the cost effectiveness of replacing loop detectors with other non invasive technologies such as side fire radar devices, video based devices, and others. All of these devices are mounted to the side of or above the roadway surface making installation easier and also greatly reduces the

traffic congestion during installation and maintenance. Most radar devices need to be aligned and calibrated correctly to provide accurate data on a lane by lane basis. The video image systems usually need only to be aligned properly. The life-cycle costs of the different technologies available today need to be reviewed and compared against the ongoing costs of the loop detector systems that are in wide use today. A field test of the new technologies along a stretch of I-15 may be useful in collecting real world data for the evaluation and it may be possible to involve the vendors of the devices in a competitive evaluation which may reduce the cost of pursuing this Strategy.

Related Strategies

- MM2 – Review and Expand the Regional Communications Network

Expected Benefits

- ✓ Reduced energy consumption
- ✓ Efficient Use of Resources
- ✓ Efficient Flow of Transportation Network
- ✓ Real-time Delivery of Traveler Information
- ✓ Real-time Operations and Maintenance
- ✓ Benefits that Exceed Costs
- ✓ Increased Safety of Transportation Systems





7.0 TRANSIT MANAGEMENT

Intelligent Transportation System technologies that support public transportation service enhance fleet management and service performance, support the goal of increasing ridership, and build a truly multimodal transportation system. Transit management technologies can be applied to bus, rail, and trolley services to move the region toward achieving a more public transportation friendly environment, create a more effective and efficient public transportation system through enhanced passenger experiences, reduce operations costs, and improved customer satisfaction through options such as transit incentives. Public transportation service in the San Diego region is provided by the Metropolitan Transit System (MTS), North County Transit District (NCTD) and includes scheduled bus service, demand-responsive shuttle service, commuter rail, and light rail services.

Goal

Continue to support and enhance investments in the San Diego region's transit operations with emphasis on the tools and systems that provide for connectivity and operations of the region's transit system network, including critical safety and performance based management of bus services, more efficient transit operations and the ability to direct service changes in real-time to improve system performance.

The following are key strategies to support achievement of the goals identified above:

Strategy	Multimodal Integration Performance-Based Management	Traveler Info	Arterial Management	Freeway Management	Transit Management	Electronic Payment Systems
TM1 – Improve Transit Competitiveness Through Better Integration with the Traffic System						
TM2 – Increase Remote Monitoring Capabilities of Transit System Assets						
TM3 – Deliver Real-Time Transit Passenger Information						



Primary Strategy



Secondary Strategy





**Strategy TM1 –
Improve Transit Competitiveness Through Better Integration
with the Traffic System**

While transit and traffic management have been somewhat coordinated in the San Diego region in recent years, further integration has the potential to improve transit service, and thus improve ridership and overall person throughput on public facilities. Different priority treatments for transit can attract more choice riders into the system helping to improve overall cost effectiveness and lead to added service. BRT and Rapid Bus routes will benefit from transit signal priority (TSP) treatments on major arterial and freeway routes, and from other supporting approaches including queue jump lanes, dedicated guideways, hard shoulder running bus lanes, and improved communications between traffic signal controllers and trolleys/trains where train and car interactions can delay service and block intersections during stops or where on-time service can be improved by providing progression for trains/trolleys leaving the station. A newer

concept that can leverage the dynamics of ITS is the creation of “virtual Bus Lanes, with Intermittent Priority”. Sometimes called “BLIMP” lanes, this application utilizes dynamic lane assignment to designate an exclusive bus lane on a temporary, bus-actuated basis. The temporary lane is designated via overhead variable message signs and in-ground dynamic lane markings, similar to active traffic management on freeways. This concept has been considered by many agencies but has been implemented in only two locations worldwide, in Lisbon, Portugal and Melbourne, Australia. BLIMP lanes may be practical for constrained urban corridors that lack sufficient right-of-way to dedicate a lane to transit on a full-time basis.

Related Strategies

- MM2 – Review and Expand the Regional Communications Network
- TI4 – Develop Real-time Parking Guidance and Management Systems
- AM1 – Improve Corridor Signal Timing Across Jurisdictional Boundaries
- AM2 – Expand and Upgrade ITS Infrastructure for Arterial Routes
- AM3 – Utilize ITS to Create Intelligent “Complete Streets”
- TM2 – Increase Remote Monitoring Capabilities of Transit System Assets

Expected Benefits

- ✓ Reduced Energy Consumption
- ✓ Efficient Use of Resources
- ✓ Efficient Flow of Transportation Network
- ✓ Real-time Operations and Maintenance
- ✓ Integrated Actions
- ✓ Increased Safety of Transportation Systems





Strategy TM2 – Increase Remote Monitoring Capabilities of Transit System Assets

Now fully deployed on the region’s transit fleet, computer-aided dispatch and automatic vehicle location (CAD/AVL) technologies provide vehicle operators, dispatchers, and agency managers with accurate and timely position data, schedule and route adherence data, and performance tracking capabilities, while minimizing the use of radio communications for the transmission of vehicle location data. CAD/AVL technology relies on commercial cellular data communications to transmit location, status and messages between vehicles and dispatch. The implementation of CAD/AVL (i.e., the Regional Transit Management System or RTMS) addressed a critical deficiency in the region’s transit communications infrastructure, improved the efficiency of transit scheduling and dispatch functions, and brought about a major advancement in the level of operational capabilities available to the transit operators to respond more quickly and efficiently to changes in the operating environment. As a result, transit dispatchers are now able to view and respond based on actual traffic conditions, emergency situations, special event conditions, and traffic incidents.

Being able to monitor traffic conditions in real-time, and receiving automated real-time traffic advisory information, greatly help to improve transit operations. RTMS also provides a basis from which to deploy future transit signal priority (Strategy TM1) and real-time passenger information systems (Strategy TM3). The implementation of automatic passenger counting (APC) technology will add valuable data on trip demand that can help service planners adjust transit capacity to match demand. Deploying vehicle diagnostic and emissions monitoring technologies on buses, trolleys and trains can provide real-time predictive vehicle health monitoring to avoid major maintenance failures and reduce operating costs while improving the environment. Additionally, CCTV security cameras at stations and on vehicles improve passenger safety and comfort, supplement transit enforcement, and provide evidence when incidents occur. Overall, the RTMS greatly enhances the customer experience and helps to improve transit service delivery in the region.

Related Strategies

- MM1 – Deploy Advanced Technology and Connected Vehicles Systems
- MM2 – Review and Expand the Regional Communications Network
- AM2 – Expand and Upgrade ITS Infrastructure for Arterial Routes
- TM1 – Improve Transit Competitiveness Through Better Integration with the Traffic System
- TM3 – Deliver Real-time Transit Passenger Information

Expected Benefits

- ✓ Reduced Energy Consumption
- ✓ Efficient Use of Resources
- ✓ Real-time Operations and Maintenance
- ✓ Benefits that Exceed Costs
- ✓ Increased Safety of Transportation Systems





**Strategy TM3 –
Deliver Real-time Transit Passenger Information**

Real-time transit passenger information systems for transit are key technology applications within the transit industry designed to provide better customer service by disseminating timely and accurate information. Riders use this information to make various decisions about modes of travel, travel routes, and travel times. In 2010, both of the region’s transit operators (MTS and NCTD) issued requests for proposals to develop advanced passenger information systems at bus stops and rail stations throughout the regional transit network. MTS is focusing initially on a hosted next time of arrival system in which all messages are relayed via Short Message Service (SMS or text messages). Customers will be able to send a text message to an SMS short code with a five-digit stop identifier and receive arrival information for MTS Bus or Trolley routes arriving at the requested stop; upon receiving the message, the system will return the next scheduled or actual arrivals to the stop. NCTD is deploying a full suite of real-time passenger information systems for its bus and rail services that will allow passenger information to be available via the internet, personal communication devices (cell phones), custom kiosks, and electronic display signs at various stops and transit centers. Both of these projects will build upon the existing

Regional Transit Management System (RTMS) platform which provides ITS vehicle tracking and reporting capabilities that permit the real-time information to be displayed on available distribution channels. Passenger information systems are expected to be integrated with the RTMS as well as the Regional 511 service to provide riders with increased information about their trips. In order to ensure compatibility with the regional ITS Architecture, the transit operators should work with SANDAG to establish regional standards for real-time transit data display, including data formats and how best to deliver the information on the phone, on the Web or on electronic signs at transit stops. Another enhancement to the RTMS is the utilization of automated station/stop announcements on buses and trains. This initiative would deploy technology on buses and trains to announce the name of each stop prior to arrival at the next stop. The audible announcements would automate on-board passenger information primarily to allow for accessibility by the visually impaired and also to improve the overall transit experience with an eye toward increasing ridership.

Related Strategies

- MM2 – Review and Expand the Regional Communications Network
- MM4 – Integrate Regional Efforts to Manage Transportation System Assets
- TI1 – Increase the Utility of Publically-funded Transportation Portals
- TI3 – Improve the Quality, Timeliness, and Consistency of Traveler Information Across all Dissemination Channels
- TI4 – Develop Real-time Parking Guidance and Management Systems
- AM3 – Utilize ITS to Create Intelligent “Complete Streets”
- TM2 – Increase Remote Monitoring Capabilities of Transit System Assets

Expected Benefits

- ✓ Efficient Use of Resources
- ✓ Real-time Delivery of Traveler Information
- ✓ Integrated Actions





8.0 ELECTRONIC PAYMENT SYSTEMS

Travelers use a variety of modes to reach their destinations. Electronic payment systems are looked to in order to support a convenient and efficient payment for services. Electronic payment methods for road-use, transit, and parking are becoming increasingly popular due to the convenience and the elimination of wait times associated with traditional cash payment. Electronic payment systems employ various communication and electronic technologies to facilitate commerce between travelers and transportation agencies. Electronic payment systems support congestion pricing strategies such as what is in use on the I-15 Managed Lanes and planned for other managed lane corridors in the San Diego region. Congestion pricing enables the use of price “signals” and user incentives/cross subsidies that support the regional transportation goals of enhanced mobility, a prosperous economy, and improved reliability of the transportation system.

Goal

Support initiatives that expand use of automated payment systems for tolling, parking, and transit to provide for integrated multimodal fare systems, seamless freeway tolling operations, and contribute to a regional demand management strategy.

The following are key strategies to support achievement of the goals identified above:

Strategy	Multimodal Integration Performance-Based Management	Traveler Info	Arterial Management	Freeway Management	Transit Management	Electronic Payment Systems
EP1 – Integrate Existing Electronic Payment Systems Across Modes						
EP2 – Pursue Partnerships that Support and Expand Use of Payment Services						
EP3 – Improve the Efficiency and Reliability of Electronic Payment Systems						



Primary Strategy



Secondary Strategy



**Strategy EP1 –
Integrate Existing Electronic Payment Systems Across Modes**

This Strategy describes the “virtual” integration of account management of the FasTrak® tolling, Compass transit and local/ regional parking systems including but not limited to: vehicle payment through both automatic license plate recognition (ALPR) and radio-frequency identification (RFID)-based electronic toll collection; smart cards and electronic ticketing for transit fare payment; and cell phone, GPS, and card-based payment for parking fees, among others. The result will be a single, convenient view of transportation accounts for travelers, and a complete view of customers for SANDAG. This Strategy will deliver increased value and convenience of payment for transportation services by

providing users with simpler and more flexible choices for the payment of transportation-related user fees such as tolls, parking fees, and transit tickets. Development of an integrated account network that interconnects all of the region’s local transportation management centers will also help to increase coordination among agencies within the region. By integrating account networks, San Diego can take advantage of synergies created when multiple agencies share data and resources. This provides a mechanism to reduce costs and provide additional funding for projects.

Related Strategies

- MM2 – Review and Expand the Regional Communications Network
- TI4 – Develop Real-time Parking Guidance and Management Systems
- EP3 – Improve the Efficiency and Reliability of Electronic Payment Systems

Expected Benefits

- ✓ Reduced Energy Consumption
- ✓ Efficient Use of Resources
- ✓ Efficient Flow of Transportation Network



Note: FasTrak® is a registered trademark of the Transportation Corridor Agencies



Strategy EP2 –
Pursue Partnerships that Support and Expand Use of Payment Services

This Strategy consists of forming new partnerships and business arrangements that broaden the use of existing electronic payment systems (FasTrak® and Compass) to provide a convenient and quick payment method for customers when they use regional facilities other than Express Lanes and toll roads, and potentially parking facilities. Specifically, near term opportunities include the use of FasTrak® for payment of parking fees at the San Diego International Airport and/or at regional park-and-ride facilities, as well as the development of pre-payment options for FasTrak® in car rentals and for commercial vehicle operators. This Strategy will examine the potential for expanding the use of the FasTrak® brand to cover a variety of electronic payment in the region, thus providing a streamlined business model across multiple modes and transportation options. In addition to inter-agency

coordination, partnering with the private sector and use of privately financed projects can provide the San Diego region with an opportunity to deliver projects more rapidly while freeing up funds to invest in other initiatives. A private partner is able to bring equity to provide operations under a long-term concession. This could provide additional capital and support greater efficiency of operations and reduced overall cost in exchange for less control over the payment services operations. Partnering provides access to public and private sector solutions already in place, avoiding the time and expense to redevelop a solution. Additionally, partnering provides the opportunity to obtain services more cost-effectively.

Related Strategies

- TI4 – Develop Real-time Parking Guidance and Management Systems

Expected Benefits

- ✓ Efficient Use of Resources
- ✓ Integrated Actions





Strategy EP3 –
Improve the Efficiency and Reliability of Electronic Payment Systems

This Strategy calls for SANDAG to continue its involvement in working with Caltrans and the other California Toll Operators Committee (CTOC) agencies as well as national organizations such as the Alliance for Toll Interoperability and the U.S. DOT to define and develop standards that support enhanced payment services and user convenience in using electronic payment services. SANDAG uses FasTrak® Electronic Toll Collection (ETC) technology to automate toll payments and to eliminate the need to collect payments at toll booths or toll collection plazas. This enables SANDAG to track patron usage and process toll transactions seamlessly and without the need for manual cash collection lanes or conventional toll collector staff. In California, toll transponders are required to meet the statewide communication standard, known as Title 21. Efforts are underway by Caltrans and CTOC to reexamine Title 21 for possible changes to support new types of ETC technologies and new ways to handle ETC transactions. Maintaining technical interoperability allows the use of one transponder and user account versus obtaining separate transponders and accounts with each operator.

This Strategy also focuses on effectively minimizing revenue loss from toll and vehicle occupancy violations and to reduce the violation rate of the Express Lanes. SANDAG has already invested in a camera-based violation enforcement system (VES), and is currently working on the design of a mobile application that will allow for determination of whether single occupant vehicles (SOV) traveling in the Express Lanes are customers with valid accounts. SANDAG will also continue to investigate and test occupancy detection systems that have the potential to automate the carpool lane enforcement process. As SANDAG moves toward the use of violation enforcement systems, its back-office processing operations and staffing will need to be realigned and expanded to accommodate these changes, and current policies related to the use of HOV and Express Lanes may also need to be modified to support the system’s operational needs. This Strategy will look at new and emerging technologies and approaches to support increased automation and accuracy of toll and vehicle occupancy violations.

Related Strategies

- EP1 – Integrate Existing Electronic Payment Systems Across Modes

Expected Benefits

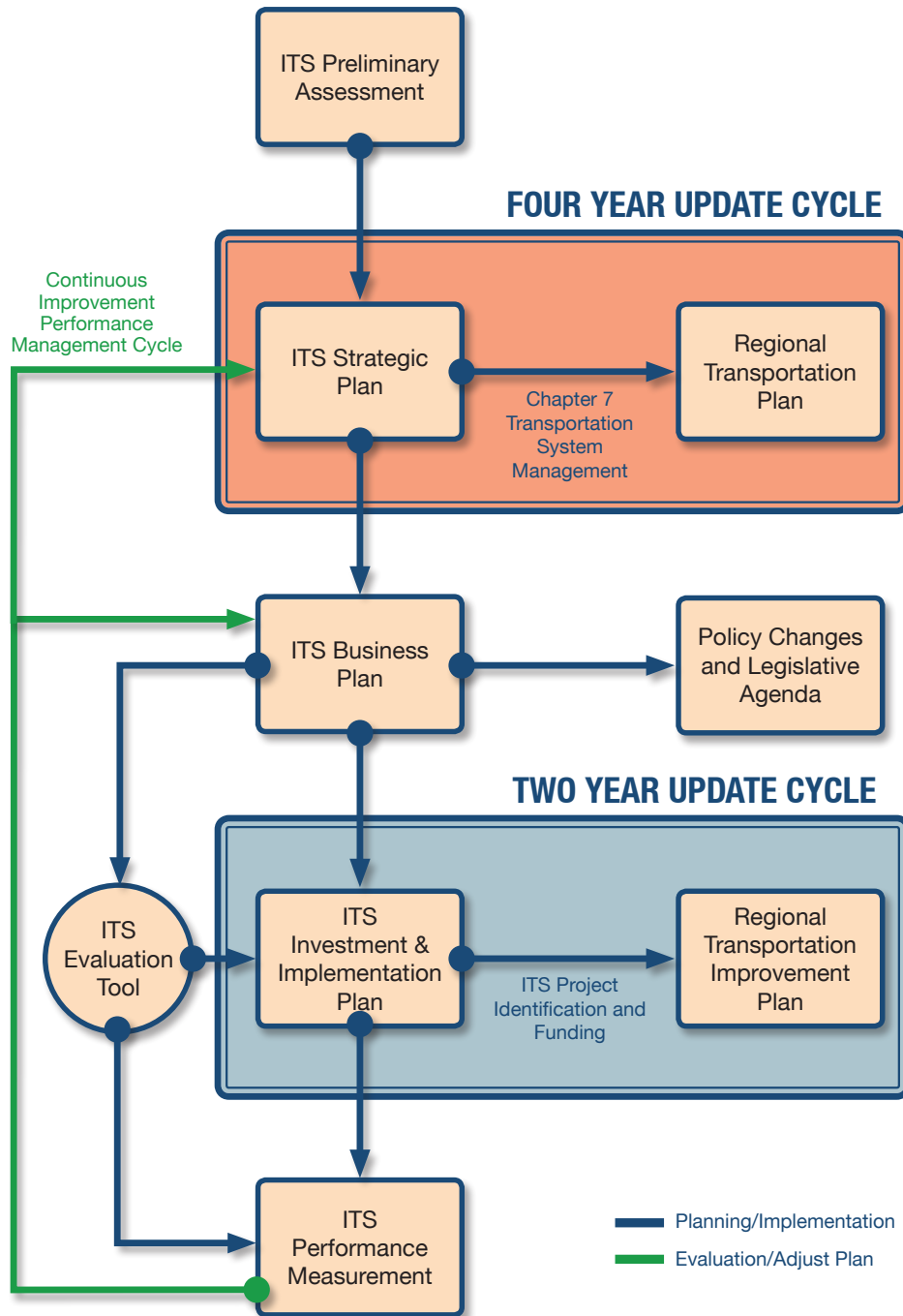
- ✓ Reduced Energy Consumption
- ✓ Efficient Use of Resources
- ✓ Efficient Flow of Transportation Network
- ✓ Real-time Operations and Maintenance
- ✓ Integrated Actions



9.0 ROADMAP

The ITS Strategic Plan is an integral piece of the overall ITS planning and implementation for the San Diego Region. **Figure 6** displays the interrelationship between this Plan and other past, present, and pending/future efforts. This current cycle of ITS planning includes an ITS Preliminary Assessment (which was completed in 2009), this Strategic Plan, development of an ITS project evaluation tool, and an ITS Business Plan and Investment/Implementation Plan(s).

Figure 6: ITS Planning Roadmap



ITS Strategic Plan

This ITS Strategic Plan sets the vision and direction for implementing ITS in this region over a 10-year horizon. The ITS Strategic Plan is not a tactical document—it does not identify projects and it is not meant to be a list of actions to be taken by regional transportation actors. Instead, the overarching purpose of this Plan is to provide policy guidance and to articulate a common vision of what ITS applications should be employed in the region to improve mobility, safety, efficiency, and reliability.

The 2050 Regional Transportation Plan (RTP) is the blueprint for a regional transportation system, and the ITS Strategic Plan sets the vision and strategic direction for deploying intelligent transportation strategies that implement the RTP. The ITS Strategic Plan is one of several technical appendices to the 2050 RTP and is intended to outline strategies for the next 10-year period. The Plan also closely meshes with Chapter 7 of the RTP on Transportation System Management. Although the previous San Diego Region ITS Strategic Plan was adopted in 1996, going forward it is SANDAG's intention to adopt a revised ITS Strategic Plan with each successive RTP cycle (i.e., every four years).

ITS Business Plan

Following the adoption of this ITS Strategic Plan, SANDAG will prepare an ITS Business Plan. The purpose of the Business Plan is as follows:

- Respond to and recommend strategic initiatives,
- Identify a funding strategy for the SANDAG ITS program management, system operations and regional technology, and identified ownership and maintenance costs, and
- Identify the potential for private partnerships, revenue generating activities, and cost recovery mechanisms.

ITS Evaluation Tool

An ITS Evaluation Tool is currently being developed. This tool is being designed to allow for quantification of the benefits of ITS programs and projects. The tool is being crafted with similar criteria being used to assess other transportation improvements such as highways, transit, HOV lanes, and grade separation projects. This tool could be used in the future to compare similar projects and quantify effectiveness of ITS improvements at reducing congestion and reducing emissions. The tool would be used in the ITS Investment and Implementation Plan in helping to identify and establish project benefits for consideration during selection.

ITS Investment & Implementation Plan

An ITS Investment Plan and Implementation Plan will also be prepared. This document will outline the specific projects and corridors for ITS investments. Those secondary project plans shall serve to carry out the vision and goals of this Strategic Framework Plan. The projects that appear in the ITS Investment and Implementation Plan will also need to be programmed in the Regional Transportation Improvement Plan (RTIP), and funds must be identified before the projects can move forward to the point of implementation. Funding strategies for projects will also be identified during the Investment and Implementation Plan phase.

Federal and state regulations dictate that SANDAG adopt a Regional Transportation Improvement Program (RTIP) every two years, and that the RTIP include all major projects receiving certain categories of federal or state transportation funding which need federal approval, capacity increasing projects, and projects identified as regionally significant, as well as projects funded by TransNet (the local transportation sales tax program administered by SANDAG). The ITS Investment and Implementation Plan will be updated on a two-year cycle concurrent with the RTIP preparation process.

ITS Performance Measurement

The collection and analysis of transportation data continues to play a critical role in assessing the performance of transportation investments and estimating the benefits of future investments. Limited funding and obstacles to obtaining right-of-way make building new transportation infrastructure difficult. As a result, a greater focus has been placed on using tools that manage traffic flows in real-time, in an effort to better manage transportation networks and improve road conditions. Improving the performance of our region's transportation system requires the continued development of an automated and consistent program to collect, analyze, and utilize data. High-level measures of effectiveness/performance evaluation criteria are provided in **Figure 7**.

Figure 7: High-Level Measures of Effectiveness / Performance Evaluation Criteria by Investment Area

						
Measure of Effectiveness	Multimodal Integration Performance-Based Management	Traveler Info	Arterial Management	Freeway Management	Transit Management	Electronic Payment Systems
Energy Consumption	GHG Emissions	GHG Emissions	GHG Emissions	GHG Emissions	GHG Emissions	N/A
Resource Consumption	Operations and Maintenance resources	Operations and Maintenance resources	Operations and Maintenance resources	Operations and Maintenance resources	Operations and Maintenance resources	Operations and Maintenance resources
Efficient Flow	Travel Time Reliability	Travel Time Reliability	Travel Time Reliability	Travel Time Reliability	Time Competitiveness/Reliability of Transit Services	N/A
Real-Time Public Information	Travelers reached	Travelers reached	N/A	N/A	N/A	N/A
Real-Time Operations and Management	Integration of O&M Activities	N/A	Operational awareness of System Performance	Operational awareness of System Performance	Operational awareness of System Performance	Available Payment Channels
Integrated Actions	# of Regional or Private Partners involved	# of Regional or Private Partners involved	# of Regional or Private Partners involved	# of Regional or Private Partners involved	# of Regional or Private Partners involved	# of Regional or Private Partners involved
Maximized Value	Lifecycle Benefit/Cost	Lifecycle Benefit/Cost	Lifecycle Benefit/Cost	Lifecycle Benefit/Cost	Lifecycle Benefit/Cost	Lifecycle Benefit/Cost

10.0 RECOMMENDATIONS

The ITS Strategic Plan is developed as a guidance document but also serves as a communications piece for the ITS programs in the San Diego region. SANDAG and its partners should actively promote the benefits of ITS and this plan is one tool for doing that. Dissemination of the plan should be a priority and will help the region's elected officials, transportation planners, and program managers effectively steer attention toward the numerous benefits of ITS. In turn, this is expected to result in additional focus and funding being granted for implementing the ITS strategies described by the plan.

It is important to note that the ITS Strategic Plan is not a policy document. The Plan does not advance any specific policies, nor does it specify exactly how the strategies and goals will be obtained. Rather, the Plan leaves this area of detail open to be defined during the subsequent Business Planning, Investment and Implementation Planning Phase. With that said, this section of the Plan does include some examples of the types of policies that would support successful implementation of the ITS Strategies that are articulated by the Plan. Here is a list of suggested policy and program actions that the regional transportation partners may want to pursue during the ITS Plan Implementation phase:

- In order to obtain the maximum value from the ITS investments in the region, SANDAG, transit operators, Caltrans, and local agencies should implement training and capacity building efforts that provide ITS program staff, traffic engineers, planners, and others with the required ITS operations, maintenance, and management skill sets necessary to effectively carry out the ITS programs.
- Similar to the federal requirements, SANDAG, transit operators, Caltrans, and local agencies should consider the life-cycle replacement costs of ITS equipment when planning for the implementation and/or upgrade of ITS projects, and should ensure that funding is secured for a minimum number of years for the successful on-going operation and maintenance of the ITS program.
- The 18 cities and the County of San Diego should adopt local procedures that require city/county traffic engineers to perform regular reviews of traffic conditions and to make appropriate adjustments to signal timing plans to ensure that traffic flows remain optimal for the affected areas. The cities/County should coordinate arterial signal timing plans with freeway ramp meter plans and shall partner with Caltrans and SANDAG to determine the appropriate actions for the overall corridor.
- As the regional agency responsible for Electronic Payment Services that include FasTrak[®], Compass, and QuickPark, SANDAG should continue to be an active member of Payment Card Industry (PCI) organizations, submit to periodic audits consistent with PCI requirements, and complete regular training in the areas of Identity Theft Prevention, Information Systems Security, Data Protection, Customer Privacy Law, and Data Retention/Destruction of Private Data, to ensure the threat of data breach and to protect the privacy of SANDAG's customers.
- Develop regional procurement mechanisms to help support local agencies as they deploy, integrate, or upgrade their ITS systems. SANDAG has begun use of a Job Order Contractor (JOC) to streamline procurements and installations. In addition, SANDAG uses on-call design services to streamline consultant procurements. Making these standard contracts available to be used by local agencies could streamline the process for local agencies, take advantage of economies of scale, and promote consistent/standardized equipment.
- The regional/local transportation agencies should increase ITS-related public outreach initiatives to help educate the public about the benefits of ITS programs. There will be new systems and new ways of operating systems that the public should know about. Many of these tools will have a direct benefit on users and provide cost-effective solutions that should be publicized.
- SANDAG should work with the transit operators to establish regional standards for real-time transit data, including how to best deliver the information on the phone, on the web, or on electronic signs at the transit stops.
- The regional/local transportation agencies should consider how the private sectors may be able to provide ITS support as a means to provide cost effective programs.

APPENDIX A

BACKGROUND - PLAN DEVELOPMENT

SAN DIEGO REGION ITS STRATEGIC PLAN OVERVIEW

The current San Diego ITS Strategic Plan was completed in 1996 and was the first such document for the San Diego region. Having served its purpose in laying out the initial vision for ITS in the region and in setting forth the initial San Diego Regional ITS Architecture, it is now being updated to reflect changes in deployment, goals, and future direction for the region. In the 15 years since the adoption of the prior plan, the region has experienced significant growth and numerous advancements in ITS have been leveraged in the region that were not identified in the prior plan.

ITS Preliminary Assessment

In 2007, SANDAG undertook a process of documenting the physical inventory, operational structure, and maintenance approach to ITS that is currently in place in the region. Additionally, experienced gaps and quantifiable deficiencies in the system were documented. Using the established baseline and assessed system needs, the focus has now shifted toward developing an ITS Strategic Plan that includes tools to effectively expand, operate, and maintain the system for the next five to ten years.

The ITS Preliminary Assessment, which was completed in 2008, identified a path forward, through the adoption of a coherent, integrated strategy, focused on service and results, and based on lessons learned and experience gained to date locally and based on national and international best practices.

STAKEHOLDER INVOLVEMENT

The needs based process used to develop the projects within the Plan aligns with the project level guidance of the Systems Engineering process required by the U.S. DOT for federally funded ITS projects. From the needs identified, deficiencies can be derived, and projects established and validated against the needs. The end result will be a customized Plan for the San Diego Region that provides a comprehensive system addressing the prioritized needs of the stakeholders. As the projects are further developed, the needs assessment from the Plan development will serve as the foundation for the systems engineering analysis for each project.

Stakeholder input was critical in developing the Plan. A stakeholder outreach approach was devised to collect input, validate derived vision, goals and strategies, and to provide reviews of the draft Plan. **Figure A-1** illustrates this outreach approach, which is described in more detail in the following bullet points:

- SANDAG's initial input was gathered using an internal project kick-off meeting and a two topic specific meetings on the 2050 Regional Transportation Plan and the FasTrak® program. Weekly project management meeting were also held to gain input and plan outreach efforts.
- ITS Executive meetings were held at various stages in the process with executives from Caltrans, MTS and NCTD. These meetings used standing appointments between SANDAG and these executives.
- An ITS Working Group was formed with staff from the cities and the County, Caltrans, MTS, NCTD, and SANDAG. This group was the core group used to identify the project vision and recommended ITS strategies. The group met in April 2011 to develop the ITS strategic plan vision for the region. The group met in June 2011 to identify ITS strategies in six investment areas. The group's final meeting in July 2011 was designed to provide feedback on the draft ITS plan, including a ranking of potential strategies. The meetings were held in workshop formats to provide ample opportunity for brainstorming of ideas and feedback on interim work products.
- Two committees, San Diego Traffic Engineers Council (SANTEC) and Cities/County Transportation Advisory Committee (CTAC), were used to provide input and feedback on the plan.

Figure A-1: Stakeholder Involvement Process

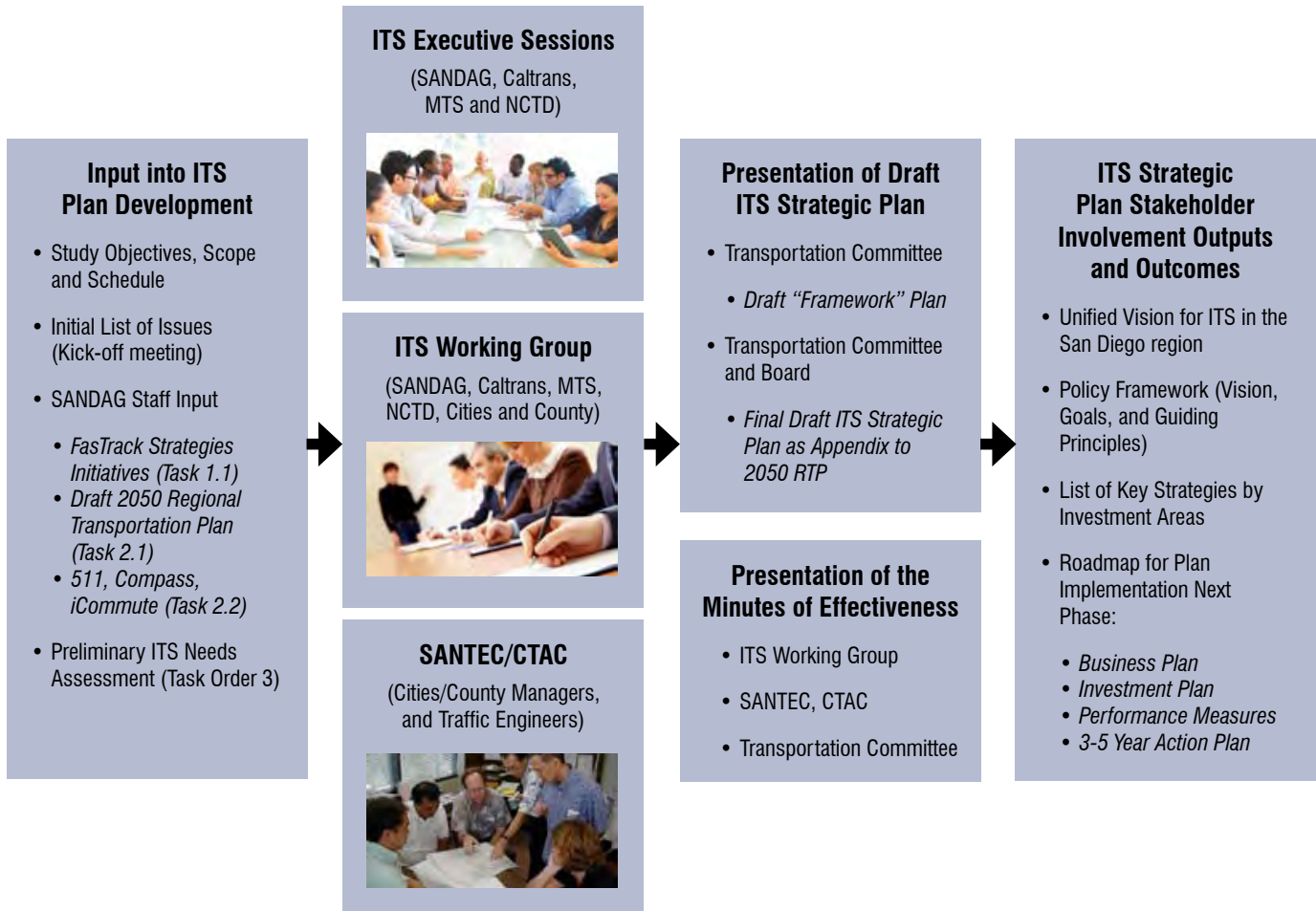


Figure A-2: Local Agency Participation

Participating Agency	Workshops			SANTEC Meetings			Cities/County TAC				CEO Meetings	
	#1	#2	#3	April	May	June	May	June	July	Aug.	April	Aug.
Caltrans	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	
City of Carlsbad							<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		
City of Chula Vista	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
City of Coronado						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
City of Del Mar							<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			
City of El Cajon			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
City of Encinitas							<input checked="" type="checkbox"/>					
City of Escondido	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
City of Imperial Beach				<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
City of La Mesa					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
City of Lemon Grove							<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				
City of National City				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
City of Oceanside	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
City of Poway	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		
City of San Diego	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>
City of San Marcos				<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>
City of Santee				<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
City of Solana Beach		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			
City of Vista	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
County of San Diego	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
Metropolitan Transit System (MTS)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
North County Transit District (NCTD)		<input checked="" type="checkbox"/>									<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
SANDAG	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>



The following agencies contributed to the development of this plan:



