SMART REGION SACRAMENTO

SMART REGION

CITY OF RANCHO CORDOVA

TECHNOLOGY IMPLEMENTATION PLAN

FINAL

February 2019

RANCHO CORDOVA
CALIFORNIA

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List of Abbreviations

ATMS – Advanced Transportation Management System
ATP – Active Transportation Program
ATSPM – Automated Traffic Signal Performance Measures
CCTV – Closed Circuit Television
CIP – Capital Improvement Program
CMAQ – Congested Mitigation and Air Quality Improvement
CMS – Changeable Message Signs
CV/AV – Connected Vehicle/Automated Vehicle
GIS – Geographical Information System
IoT – Internet of Things
ITIP – Interregional Transportation Improvement Plan
ITS – Intelligent Transportation Systems
MPO – Metropolitan Planning Organization
MTP – Metropolitan Transportation Plan O&M – Operations and Maintenance
PTZ – Pan-tilt-zoom
RSTP – Regional Surface Transportation Program
RTIP – Regional Transportation Improvement Plan
SACOG – Sacramento Area Council of Government
SCS – Sustainable Communities Strategy
SHA – State Highway Account
SOV – Single Occupancy Vehicle
STARNET – Sacramento Transportation Area Network
STIP – State Transportation Improvement Plan
TMC – Traffic Management Center
TOC – Traffic Operations Center
VMT – Vehicle Miles Travelled

SMART REGION SACRAMENTO

City of Rancho Cordova TECHNOLOGY IMPLEMENTATION PLAN EXECUTIVE SUMMARY

February 2019

Transportation management is growing in terms of technology, software, and applications. The future of transportation includes connected vehicles, autonomous vehicles, decision-making based on performance metrics, and a committed focus on more effective operations and management of systems rather than just capital improvements. There is no way to build the way out of congestion, the only way to effectively improve mobility is to manage it better.

The City of Rancho Cordova is one of eight agencies that is contributing to the Sacramento Area Council of Governments' (SACOG's) Smart Region Sacramento: Intelligent Transportation System (ITS) Architecture and Future Technology Project (referred to as Smart Region Sacramento). This Technology Implementation Plan provides the City of Rancho Cordova with the framework necessary to proactively and positively affect how residents and all travelers move within and access the City transportation network. This framework and its resulting tools, if prioritized and managed well by the City, will assist with every aspect of City public service: mobility, incident response, efficient maintenance, and cost savings across the City's bottom line. Because technology investments are low-cost compared to capacity-related projects and offer potentially significant benefits to the broad transportation system and its users, prioritizing technology investments supports the vision of an integrated and reliable transportation system.

Goals and Objectives

The City of Rancho Cordova participated in the development of this Technology Implementation Plan that follows the Smart Region mission statement intended to clearly define the path toward technology investments and resources moving forward from 2019.

SMART REGION MISSION STATEMENT: To improve system performance, safety, sustainability, and reliability by ensuring efficient investments in regional smart transportation projects.

During the development of the 2010 ITS Master Plan, the City of Rancho Cordova identified goals for the build out of the transportation management network for efficient flow, facilitating enhanced travel speeds for public transit, incident response, traveler information, traffic infrastructure management, and traffic system management. The City has made great strides to address these goals. As part of this implementation plan development, the City defined the goals of regional cooperation and emerging technologies to add. The City recognizes the Smart Region Objectives which include:

- Accommodate Different Communities Throughout the Region (Urban, Suburban, Rural, and Underserved)
- Adapt the Region to New Technology
- Achieve Consistency and Reliability for all Modes
- Increase Safety
- Improve Traveler Information Dissemination
- Improve Emergency/Disaster Preparedness

The Mobility Master Plan , JPA connector SMART Corridor Plan, ICM and Regional SMART plan, RT Master Plan were all considered in the development of recommendations as part of this plan and will all be important tools moving forward for the City of Ranch Cordova to integrate all necessary elements into future investments.

System Needs

The City is challenged with significant gaps that are inhibiting the system from addressing operational and management goals. System needs are identified by Infrastructure/Data (D), Operational (O), and Institutional (I) categories:

- D1: Baseline communications infrastructure
- D2: Support active transportation operations
- D3: High-resolution traffic data for real-time operational decision making
- D4: Real-time travel time data for operations
- D5: Sharing of camera images to support pre-trip, en-route, and incident management purposes
- D6: Reduce impact of light rail preemption on traffic mobility
- D7: Share data between agencies that share a corridor
- D8: Encourage travel mode shift
- D9: Real-time traveler information
- D10: CV/AV technology readiness
- O1: Trained staff to support operations
- I1: CV/AV policy readiness
- I2: Funding strategy

SMART REGION SACRAMENTO

City of Rancho Cordova
TECHNOLOGY IMPLEMENTATION PLAN
EXECUTIVE SUMMARY

February 2019

Determining the Path Forward

Traffic operations and management technology is constantly advancing and evolving, which makes it an important consideration during the formulation of implementation strategies. It is crucial that the implementation process takes full advantage of the existing ITS technologies available while also formulating strategies that align with where technological advancements may be heading. The following are current technology trends that were evaluated for applicability in addressing needs and gaps:

- *Big data* – more data collected from roads, vehicles, and other sources
- *Transportation network carriers* – rideshare services
- *Connected vehicles* – field infrastructure and policies for data sharing
- *Autonomous vehicles* – vehicle fleets, availability, additional data
- *Smart wayfinding and citizen engagement platforms* – smart kiosks
- *Adaptive traffic signal control* – signals that can retime themselves
- *Traffic signal performance metrics* – software that finetunes how traffic signal timing serves the traveling public
- *Vehicle-to-everything communications* – data exchange
- *Internet of things* – connected devices that communicate in new ways
- *Electrification* – electric vehicles and charging stations
- *Multi-modal considerations* – on-board and fleet transit technologies

Determining the priority of which strategies are applicable to the City of Rancho Cordova requires a careful evaluation of not only the existing conditions of the region (the infrastructure available, the data available, and the propensity for agencies to adopt certain technologies over others) but also the available technology trends that lend themselves toward potentially being solutions to the needs of the City of Rancho Cordova.

Operations & Maintenance

The major elements of the future network include:

- 38.5 miles of fiber optic communications
- 75 traffic monitoring cameras
- 11 traffic information signs
- 28 transit signal priority devices
- 13 upgraded traffic signal controllers
- 134 traffic detection devices

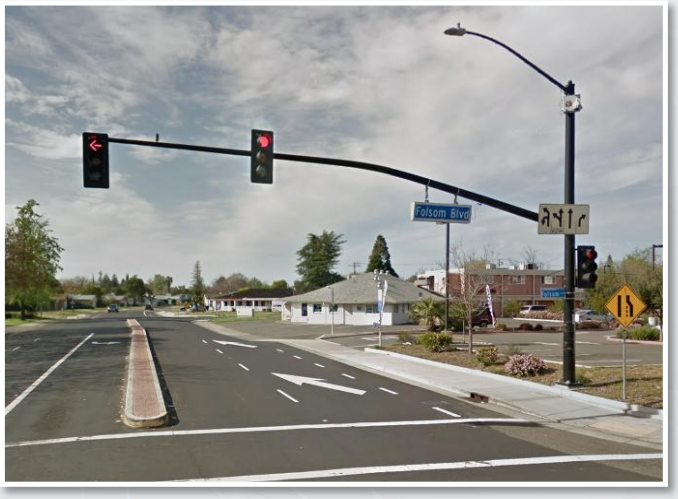
To effectively operate and maintain the various project elements and projects identified in this Implementation Plan, the City of Rancho Cordova must be adequately staffed and prepared to sustain the system after it is deployed. Operations and maintenance procedures are essential to define the appropriate staffing levels, training, operational processes, and maintenance plans necessary to sustain an effective system. This Plan includes guidance for staffing resources necessary to support operations and maintenance activities recommended to maximize investment in assets.

Deployment Strategies

Strategies were developed and prioritized based on the City's conveyed needs and will aid in the phasing of future technology deployments and investments in the future of a Smart Region. Project corridors recommended to be outfitted with technology generally include enhanced communication infrastructure, deployment of vehicle video detection, installation of traffic monitoring cameras, installation of changeable message signs, installation of connected vehicle radio units, deployment of advanced traffic signal performance metrics, deployment of transit signal priority, and traffic signal controller upgrades. Other strategies were developed to improve processes, outline standard operating procedures, or prepare for a future of connected and autonomous vehicles. A series of 14 project corridors have been specifically identified for recommended deployments that include:

- Old Placerville Upgrade—Bradshaw Road to Schriever Avenue
- Routier Road - Old Placerville Road to Vanguard Drive, Vanguard Drive - Routier Road to Pegasus Way
- Folsom Boulevard - Bradshaw Road to Hazel Avenue
- Sunrise Boulevard - Jackson Road to Bridge Street
- Coloma Road - Folsom Boulevard to Sunrise Boulevard
- International Drive / Mather Field Road - to Folsom Boulevard to Sunrise Boulevard
- Bradshaw Road - Old Placerville Road to Folsom Boulevard
- Zinfandel Drive - Sunrise Boulevard to Douglas Road
- White Rock Road - Zinfandel Drive to Sunrise Boulevard
- Douglas Road - Sunrise Boulevard to Grant Line Road
- Kiefer Road - Sunrise Boulevard to Grant Line Road
- Grant Line Road - Jackson Road to Douglas Boulevard
- Hazel Avenue Upgrades
- Rancho Cordova Parkway - Douglas Road to Kiefer Road

The vision for this Plan is to be able to expand to future corridors such as Chrysanthy Boulevard, Jackson Road, Rancho Cordova Parkway, and others that will all be major roadways serving developments in coming years.



INTRODUCTION

Why Pursue Strategic Investments in Smart Mobility

This Technology Implementation Plan provides the City of Rancho Cordova with the framework necessary to proactively and positively affect how residents and all travelers move within and access the City transportation network. This framework and its resulting tools, if prioritized and managed well by the City, will assist with every aspect of City public service: mobility, incident response, efficient maintenance, and cost savings across the City bottom line. Because Intelligent Transportation System (ITS) investments are low-cost compared to capacity-related projects and offer potentially significant benefits to the broad transportation system and its users, prioritizing ITS investments supports the vision of an integrated and reliable transportation system.

Transportation management is growing in terms of technology, software, and applications. The future of transportation includes connected vehicles, autonomous vehicles, decision-making based on performance metrics, and a committed focus on more effective operations and management of systems rather than just capital improvements. There is no way to build the way out of congestion, the only way to effectively improve mobility is to manage it better. Continuing to build lanes and add capacity will become more and more restricted and ITS Programs will continue to mature in their capability to actively manage traffic (both reactive and proactive management), incidents, events, and work zones.

It is acknowledged that there is an expectation from travelers that a City's transportation system is equipped with the tools to move people as efficiently and safety as possible, yet the public rarely understands what is involved in implementing these tools. This Technology Implementation Plan provides the City of Rancho Cordova with the opportunity to enhance their existing ITS Program with a solid foundation of strategic and necessary infrastructure enhancements, in combination with collaborative growth across the SACOG region, in operations and management capabilities.

This Plan is intended to be a strategic direction for the City to plan for capital and operational investments. External stakeholders will see benefit in this Plan as providing a direction of where development, design standardization, and anticipated technologies and piloting innovation will be part of the City's investments.

City of Rancho Cordova Technology Implementation Plan

The City of Rancho Cordova is one of eight agencies that is contributing to the Sacramento Area Council of Governments' (SACOG's) Smart Region Sacramento: ITS Architecture and Future Technology Project (referred to as Smart Region Sacramento). The eight partner agencies participating in this regional program are:

- City of Sacramento
- City of Citrus Heights
- City of Elk Grove
- City of Folsom
- **City of Rancho Cordova**
- Sacramento County
- El Dorado County
- Caltrans District 3

MISSION STATEMENT

To improve system performance, safety, sustainability, and reliability by ensuring efficient investments in regional smart transportation projects.

Development of the Smart Region plan follows a methodical Systems Engineering approach illustrated in **Figure 1**.

The initial discovery phase included a comprehensive review of adopted regional and local plans, existing transportation infrastructure, existing assets, and a definition of program needs. Gaps were identified for the region within individual agencies based on the existing conditions and input received from agency stakeholders at one-on-one meetings and the Concept of Operations group workshop. These initial phases established a benchmark for what the City currently has and defined the needs and deficiencies for the transportation system. This document culminates with a roadmap in the form of a list of implementable projects that close the gaps and fulfill the needs of the City.

On a separate and related path, the Concept of Operations was developed to document the parameters in which the system will function, define stakeholder roles and responsibilities, and outline data usage expectations.

The City of Rancho Cordova participated in developing this plan and provided input to all stages of the Smart Region Sacramento program development. The City of Rancho Cordova is unique in its role within the greater region because of an extensive existing infrastructure which will support the deployment of smart transportation technologies.an existing ITS Master Plan. Information and details presented in this Technology Implementation Plan incorporate and build on the current infrastructure deployment projects and objectives to update the City's overall strategy going forward.

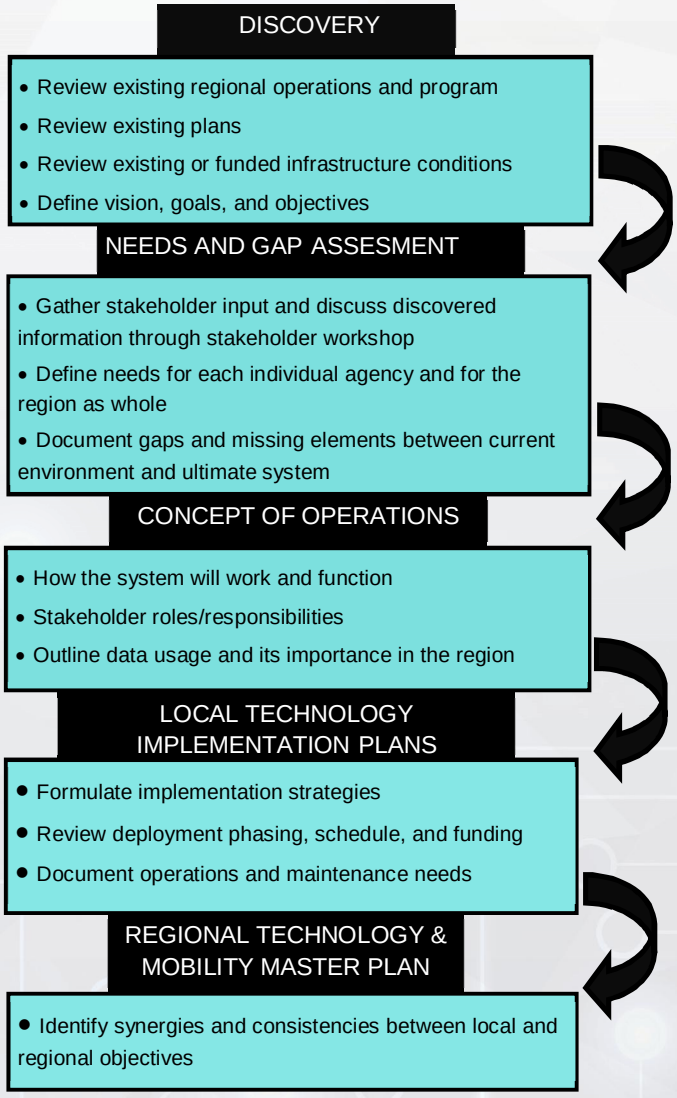


Figure 1 – Smart Region Sacramento Development Process

Additional background information was gathered from the City to enhance the previous work. This included the following:

- **One-on-one and group meetings** – At the one-on-one stakeholder meeting held in March 2018, the City's existing transportation system and ITS infrastructure was discussed. The City expressed its primary vision of the project to ***leverage the City's robust signal and communication network and emerging transportation technologies to proactively manage traffic***. While the City currently contracts with the County of Sacramento for maintenance and operations, the City desires to implement tools that will allow City staff to monitoring system performance through collecting real-time traffic data and performance metrics. The City's priority concerns of the City include monitoring traffic conditions on Sunrise

Boulevard and Folsom Boulevard, and addressing congestion related to the significant number of commuters into the City.

- **Documents/Plans** – A variety of documents and plans were gathered to support the background understanding of the City's current infrastructure, programs and capabilities. The City's previous Intelligent Transportation Systems Master Plan (2010), and Citywide Intelligent Transportation System Concept of Operations and construction documentation were reviewed in addition to City provided documentation on CCTV camera locations, GIS maps, network communications diagram, and traffic signal locations. Regional documents that represent multiple jurisdictions were also collected, an example of which is the Caltrans US 50 ICM Regional Concept of Transportation Operations (RCTO).

Document Organization

This document includes the following primary sections:

- **Program Goals, and Objectives** – Summarizes the guiding principles for developing the Plan.
- **Existing Conditions** – Summarizes existing field devices, system performance, and operations and maintenance performance.
- **Needs and Gaps Assessment** – Discusses and tabulates the City of Rancho Cordova's Needs and Gaps Assessment.
- **Determining the Path Forward** – Provides a link between needs and gaps assessment and how implementation projects were developed.
- **Implementation Project Development** – Describes the methodology for grouping strategy elements into implementable projects for delivery.
- **Deployment Prioritization** – Provides information on how projects are prioritized based on 10 criteria.
- **Funding** – Describes regional, state, and federal funding opportunities for ITS Projects.
- **Operations and Maintenance** – Describes strategies for staffing and ongoing maintenance.
- **Performance Metrics** – Describes evaluation and performance standards that will be used to evaluate transportation system performance, traffic signal operations, safety, and maintenance.
- **Next Steps** – Describes how to use the results of the Technology Implementation Plan to develop and deliver projects.

PROGRAM GOALS AND OBJECTIVES

During the development of the 2010 ITS Master Plan, the City of Rancho Cordova identified the following goals for the build out of the transportation management network:

- Efficient Flow – Move all modes of transportation along the City's primary corridors without unnecessary delays caused by the transportation system.
- Facilitate Enhance Travel Speeds for Public Transit – Use available technologies to enhance corridor operations to encourage mode split.
- Incident Response –Implement tools to provide incident and special event operations and management.
- Traveler Information – Provide advanced information about traffic congestion and incidents.
- Traffic Infrastructure Management – Build, manage, and maintain traffic infrastructure on primary corridors to proactively and effectively manage traffic.
- Traffic System Management – Actively monitor and manage the corridor roadway network through adequate staffing and data collection.

The City of Rancho Cordova has made great strides to address these goals with the system wide communications upgrades and traffic signal system implementation completed in early 2018. Based on input on current transportation needs and goals, provided by City stakeholders as a part of the one-on-one and group meetings as a part of this Smart Region Sacramento project, these goals are still applicable and relevant. As a part of this implementation plan development, the City of Rancho Cordova defined the following goals and objectives to add to the ones listed above:

- Regional Cooperation - Expand interagency collaboration and coordination with regional partners like Caltrans and SACOG.
- Emerging Technologies – Identify opportunities to utilize emerging technologies to improve traffic operations and be flexible in updating the plan to utilize new technology to create an efficient transportation system within the City.

The Smart Region Plan has six key regional objectives that emerged as most critical throughout the project process, particularly during the strategy implementation phase. These six key objectives were crucial in guiding the strategy development process. The Smart Region objectives are:

- Accommodate Different Communities Throughout the Region (Urban, Suburban, Rural, Underserved)
- Adapt the Region to New Technology
- Achieve Consistency and Reliability for all modes
- Increase Safety
- Improve Traveler Information Dissemination
- Improve Emergency/Disaster Preparedness

These primary objectives are important considerations throughout Smart Region development and implementation because they provide guidelines for identifying projects and creating performance measures to evaluate program efficacy. In addition, these objectives were helpful in determining strategy prioritization and deployment phasing priorities, which will be discussed in more detail later in this document.

EXISTING CONDITIONS

Traffic Signals

The City owns, operates, and maintains 80 traffic signals, jointly owns 17 signals with Sacramento County, and jointly owns four (4) signals with Caltrans. Five (5) of the City-owned traffic signals are located at pedestrian crossings and one (1) is located at the driveway of Fire Station 61. Traffic signals are interconnected on major arterials in the City, including Folsom Boulevard, Coloma Road, Sunrise Boulevard, Zinfandel Drive, and International Drive. The remaining non-interconnected signals are mainly isolated in the southwest corner of the City. Interconnected signals are operated and managed through the City's Econolite Centracs traffic signal central management system software and through a center-to-center (C2C) connection with Sacramento County Department of Transportation's (DOT) Centracs central system.

The City utilizes traffic signal controllers from multiple vendors and central systems. Fifty-nine of the City's traffic signals were recently upgraded to Econolite Cobalt controllers. The remaining 34 signals operate on Econolite 2070, Mulitsonic 820, and Naztec 2070 controllers. The traffic signal controller cabinets are a combination of Type 332, Type P, Type R, and Type M cabinets. The City's existing traffic signal inventory and the locations of the existing traffic signals within the City are shown in **Exhibit 1** of **Appendix A**.

The City currently uses loop detection but plans to convert to stop bar video detection in conjunction with advance radar detection in the future. GTT Opticom optical detection is currently used for emergency vehicle pre-emption (EVP).

Communications Network

The City's existing Ethernet-based communications network consists of two (2) miles of copper interconnect communications and over 35 miles of single-mode fiber optic communications. Most of the City's backbone fiber consists of 96-strand cables, except there are several minor segments of 12-strand and 48-strand backbones on Coloma Road and the southern portion of Sunrise Boulevard. The extensive fiber network provides up to one (1) gigabit/second communications to the traffic signals and a ten (10) gigabit/second connection for C2C communication between the City and County. Most traffic signals and ITS elements have two paths of connection to the City's central server to prevent loss of communications to network devices in the event of a single-point failure.

See **Exhibit 1** of **Appendix A** for the location and extents of existing communications network deployments.

Closed Circuit Television (CCTV) Cameras

The City has 72 pan-tilt-zoom (PTZ) closed circuit television (CCTV) cameras, located at key intersections along Folsom Boulevard, Coloma Road, Sunrise Boulevard, Zinfandel Drive, and International Drive. Most of the cameras are high-definition cameras though some of the older legacy cameras are standard-definition. The viewing and control of the CCTV cameras is through the City and County Centracs systems. The existing camera locations are shown in **Exhibit 2** of **Appendix A**.

Traffic Management/Operations Center

The City's current Traffic Management Center (TMC) consists of a single workstation located at the Public Works Department offices at City Hall. The City does not have any staff that actively operates and monitors the TMC, though the workstation is located at the desk of an Associate Engineer that periodically checks system alerts. In addition to the TMC, the City has a 70" LCD monitor with a remote desktop connection in a conference room which the City can use as an emergency and traffic operations center.

As mentioned above, the City's TMC communicates with the County DOT TMC through a direct fiber connection. County DOT staff is contracted by the City to operate and manage the City's traffic signals and ITS network. The long-term plan is to establish a separate, fully operational TMC at a future Corporation Yard. This future TMC is expected to consist of two (2) operator workstations, a video display wall, a server room, and a conference room.

System Performance

Based on City estimates, of the approximately 50,000 employees that work within the City, nearly 80% commute to the City. As such, the City experiences significant congestions during peak commute hours. Folsom Boulevard, Zinfandel Drive, and Sunrise Boulevard are the arterials which experience the highest levels of congestion and are the City's biggest concerns. Many of the intersections operate at or above capacity, and signal coordination is already optimized to the greatest extent possible. The City's recent system upgrade project has developed a base system capable of collecting traffic volumes and monitoring traffic signal performance, but the system still requires additional modules to provide automated traffic signal performance measures.

Another system performance concern is the interaction of Sacramento Regional Transit's Gold Line which runs parallel to Folsom Boulevard. Due to the light rail operations and railroad preemption, Folsom Boulevard is unable to run signal coordination, so the signals currently are under free operations. Advanced transit signal preemption is needed to provide more effective operations of Folsom Boulevard and the crossing corridors.

NEEDS AND GAPS ASSESSMENT

The City of Rancho Cordova's Needs and Gaps Assessment process was conducted using a combination of methods. Existing documents and plans related to transportation and technology relevant to the City and the region were thoroughly reviewed. In addition to document review, subject

matter experts conducted agency stakeholder interviews and distributed surveys to obtain a sense of specific needs and gaps at each agency.

The needs and gaps were identified and categorized by the following distinctions:

- **Infrastructure/Data (D)** – field infrastructure, communications equipment, data, systems/software
- **Operations (O)** – operational enhancement projects and processes, staffing
- **Institutional (I)** – policies, agreements, funding/programming, reporting/documenting, training

Table 1 summarizes the City of Rancho Cordova's Needs and Gaps Assessment.

Table 1 – City of Rancho Cordova Needs and Gaps Summary

ID #	Need	Gap
	Infrastructure/Data (D)	
D1	Baseline communications infrastructure	While the City of Rancho Cordova has connected the majority of the signals and field devices, there are still intersections that must be integrated into the network.
D2	Support active transportation operations	Legacy bicycle detection and pedestrian signals limits ability to optimize signal timing.
D3	High-resolution traffic data for real-time operational decision making	Lack of performance measurement and analysis capabilities. Lack of ATSPM software for data analytics.
D4	Real-time travel time data for operations	Lack of real-time travel time data and of analytics software for real-time operations decision making.
D5	Sharing of camera images to support pre-trip, en-route, and incident management purposes	While Sacramento County DOT and Rancho Cordova Police Department have access to City traffic camera video, the City does not have connections in place to share with public or other regional agencies.
D6	Reduce impact of light rail preemption on traffic mobility	Light rail preemption throws signal system out of coordination and reduces traffic throughput. Lack of optimized traffic signal timing and transit signal priority along transit service corridors.
D7	Share data between agencies that share a corridor	Lack of real-time or planned knowledge of corridor restrictions to operate efficiently across jurisdictions. Lack of regional data sharing policies and guidelines to establish data sharing protocol.
D8	Encourage travel mode shift	Limited information is available or disseminated to support mode shift
D9	Real-time traveler information	Limited real-time traveler information available to public and limited methods to disseminate information. Limited CMS equipment for communication of traveler information.
D10	CV/AV technology readiness	The City's traffic signal network is equipped for future CV/AV deployments, but the necessary CV/AV communications are not in place.
	Operations (O)	
O1	Trained staff to support operations	City contracts operations and maintenance activities to Sacramento County, but lacks sufficient number of staff members to provide engineering and planning staff to proactively support operations of the network.

ID #	Need	Gap
		Institutional (I)
I1	CV/AV policy readiness	Policies and codes currently do not support CV/AV
I2	Funding strategy	Lack of reliable funding mechanism to support Smart City or Smart Region initiatives on a regional or agency-by-agency basis. Lack of regional technology procurement contract and regional technology and systems funding program.

DETERMINING THE PATH FORWARD

There are many directions that SACOG and the region could move toward in implementing solutions to address the needs and gaps. While some gaps point to specific types of strategies that will directly and completely address that gap, other gaps are more difficult to solve and will require a combination of infrastructure, operations, and institutional processes to be implemented to completely address the gap.

Traffic operations and management technology is constantly advancing and evolving, which makes it an important consideration during the formulation of implementation strategies. It is crucial that the implementation process takes full advantage of the existing ITS technologies available while also formulating strategies that align with where technological advancements may be heading. The following are current technology trends that were evaluated for applicability in addressing needs and gaps as defined for the Smart Region Program:

- **Big Data** is becoming readily available as more data is acquired from connected field infrastructure on a near-real-time-basis as well as additional data-rich information from new sources such as probe vehicles, fleet vehicles, and connected vehicles becomes more mainstream. Big Data is about predictive analytics; or more simply, improving our ability to predict and anticipate outcomes. Historically, transportation data has been difficult and costly to obtain, but as it becomes increasingly available through global positioning location tracking, phone apps, and many other sources this is quickly changing. Big Data is already changing the way we plan, analyze, and operate our transportation, and big data will play a large role in affecting the evolution of the Sacramento Transportation Area Network (STARNET).
- **Transportation Network Carriers (TNCs)** – TNCs pair passengers with drivers who provide on-demand service, most often via websites or mobile apps. Services such as Uber and Lyft are examples of the sharing economy. Increasingly, transit providers, including Sacramento Regional Transit (RT), are beginning to provide on-demand transportation services to augment their systems. These services have the potential to address the long-standing challenge of first-mile, last-mile service to expand the reach of existing bus and light rail service.
- **Connected Vehicle (CV)** readiness, both in terms of infrastructure and institutions, was identified as a need and yet full connected vehicle CV deployment is gradually becoming a reality in the industry. As a result, it is important that the partner agencies are equipped with the infrastructure and projects needed to adapt to those changes and needs. It is important to recognize the changing landscape of technology options with connected vehicles because the federal guidelines have not been finalized. Agency adoption of providing data to or collecting data from a connected

vehicle will need to have benefits outlined and likely deployed on a scalable basis until more formal guidelines for adoption and expectations are defined.

- **Autonomous Vehicle (AV)** readiness, in terms of institutions and policies, was identified as a need as AVs are being tested on more and more roadways throughout the Country. Although functioning autonomously, there may be a variety of useful data that could be provided to the vehicle, collected by the vehicle, or shared between AVs that could require an agency role and responsibility.
- **Smart Wayfinding and Citizen Engagement Platforms –** Smart kiosks offer new, interactive ways for municipalities, business improvement districts, and marketing organizations to communicate with the public. Citizens and visitors use touchscreen displays to access a wide variety of information ranging from smart wayfinding and transit planning to locating nearby businesses and entertainment. Cities have the ability to broadcast important service announcements and relay emergency alerts enhancing public safety.
- **Adaptive Traffic Signal Control** enables traffic signals to proactively adjust signal timing parameters to accommodate unplanned variances in traffic demand. There are several adaptive systems in the market, each of which tends to accommodate specific corridor needs (e.g., maximize throughput, minimize side-street delay).
- **Automated Traffic Signal Performance Measures (ATSPM)** is a software module add-on to many traffic signal software applications that processes and analyzes traffic signal data to display and report performance metrics of an individual traffic signal, corridor, and/or across the traffic signal network. This feature enables agencies to proactively identify trouble areas, report on corridor performance, and facilitate efficient traffic management.
- **Vehicle-to-Everything (V2X) Communications** is becoming a highly-desirable system feature that establishes an exchange of data between vehicles and field infrastructure. One example includes Signal Phase and Timing data that enables subscribed vehicles to display when a downstream traffic signal will change. Another example is collecting vehicle location information for collision avoidance or for origin-destination analysis.
- **Internet of Things (IoT)** – Often referred to as “connected devices”, items are embedded with technology such that objects can exchange and collect data. From a streetlight bulb that notifies that it needs changing to roadway sensors that monitor traffic speeds, the opportunities to collect and use data to improve the maintenance and operations of the transportation system are rapidly expanding.
- **Electrification** – The transportation sector is responsible for approximately 36 percent of California’s Green House Gas (GHG) emissions (50 percent when you include refineries) and more than 80 percent of NOx and particulate emissions. In conjunction with the continued addition of renewable energy sources as the basis for electrification, the positive impact of air quality will be significant. As the location of charging stations continues to expand, electric vehicles will also become increasingly easy to own and operate.
- **Multi-Modal Considerations –** Municipalities and transit providers are also faced with the challenge of embracing technological advancements. These technologies are aimed at improving bicycle and pedestrian safety and mobility, as well as maximizing the efficiency and convenience

of transit service. Technological advancements that provide more meaningful real-time and situational awareness information for multi-modal users include detection techniques, minimizing conflicts at traffic signals, fleet management, mobile traveler information, and Automatic Vehicle Location (AVL), among other methods. Multi-modal transportation users are diverse in their ability to provide information as well as receive it, and service providers are already applying technology in equipment as well as systems to provide a greater experience for the user.

The City of Rancho Cordova is a participant in SACOG's Civic Lab program, a regional effort which started in SACOG launched their Civic Lab program in August 2017. Civic Lab aims to improve effectiveness and efficiency of the region's transportation systems by finding creative solutions to smart mobility issues. The City of Rancho Cordova is involved in the program through its autonomous vehicle deployment of a Level 5 autonomous shuttle. Additionally, the City is exploring opportunities to encourage mode shift through programs like a pilot project with Lyft to provide first/last mile connections, microtransit service using Cordovavan, and Zipcar.

Determining the priority of which strategies are applicable to the SACOG region requires a careful evaluation of not only the existing conditions of the region (the infrastructure available, the data available, and the propensity for agencies to adopt certain technologies over others) but also the available technology trends that lend themselves toward potentially being solutions to the needs of the SACOG region.

IMPLEMENTATION PROJECT DEVELOPMENT

The previous information gathering efforts and the needs and gap assessment influence the development of the City of Rancho Cordova's implementation projects. The needs and gaps illustrate the foundation for project opportunities to enhance the overall transportation system. The foundation of knowledge and understanding of previously built projects ensures that the implementation projects developed are realistic and relevant to the City's conditions.

Several deployment parameters were considered in conjunction with previously discovered information to formulate overarching implementation projects. These include:

- Key Emerging Technologies – Provisions for CV/AV technology, multi-modal considerations (including transit), as well as other important initiatives in the region that are advancing innovative technology deployment.
- Emergency/Disaster Preparedness – Strategies facilitate the ability to improve the effectiveness of emergency and disaster response.
- Data Availability – The type and quality of available data, how that data set can be improved and/or expanded, and how that data can be effectively leveraged once it has been analyzed.
- Project Dependencies – Certain project elements must be constructed before other elements can be advanced.
- Overlap with Other projects – Other projects within the same project area offer efficiencies for construction.

- Safety – Strategy contributes to improved safety.
- Context of Individual Agency – Specifically customized for applicability to each agency.

An ITS Master Plan for the City of Rancho Cordova was established in 2010 and was involved in determining implementation strategies for this Smart Region document. The strategies outlined in this document were developed from remaining projects of the original Master Plan, as well as from gaps the City staff identified.

Strategy Development

Overarching project strategies have been developed to identify a broad set of technology solutions that will address infrastructure/data, operations, and institutional needs and system gaps, and to satisfy these deployment criteria. The strategy summary format is provided below and is detailed for each strategy in **Appendix B – Detailed Project Sheets**:

- **ID #** – This is the identification number of the strategy.
- **Title** – This is the title of the strategy.
- **Description** – This is a succinct description of the Strategy for context.
- **Relation to Needs** – This is a mapping of projects to the original needs, recognizing that one strategy may serve multiple needs.
- **Scope/Limits** – This is a succinct summary of what is included in the strategy and/or locations (if applicable) of where the strategy would be deployed.
- **Considerations** – This is a bullet listing of other strategy ID #'s and Titles that are relevant for the City to reference during implementation or that could be packaged together to be implemented as part of a larger project in a particular timeframe.
- **Prerequisite Dependencies** – This is a bullet list summary of the high-level steps required to implement the strategy.

When all of these strategies are constructed, the City will have established an overall transportation network that provides the tools and functionality to effectively monitor and manage traffic congestion. Infrastructure strategies, inclusive of communications media, CMS, CCTV cameras, detection, and traffic signal controllers, are visually presented in **Figures 2** and **3**, which shows the ultimate communication and ITS device deployment in the City, respectively.

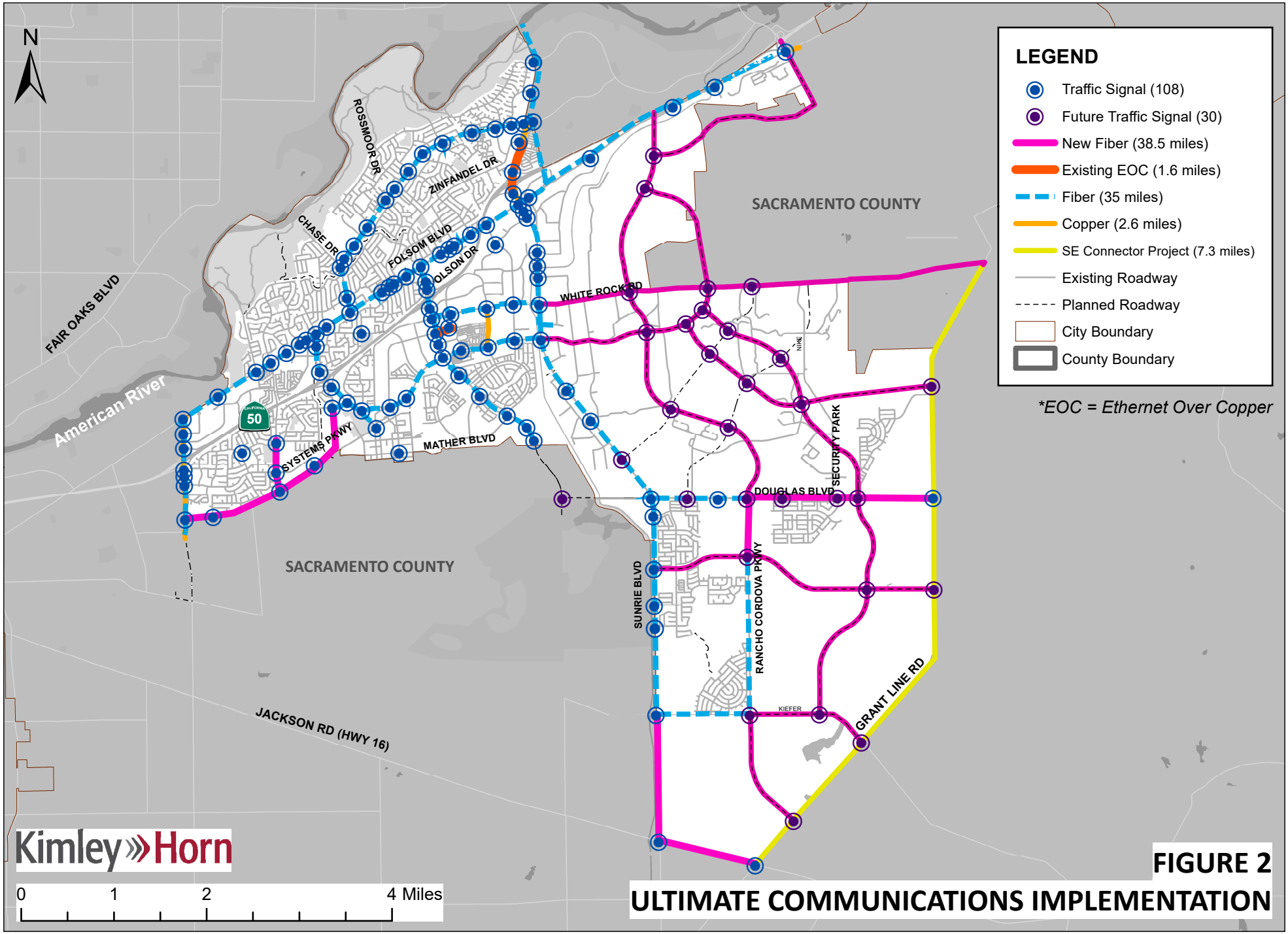


FIGURE 2

ULTIMATE COMMUNICATIONS IMPLEMENTATION

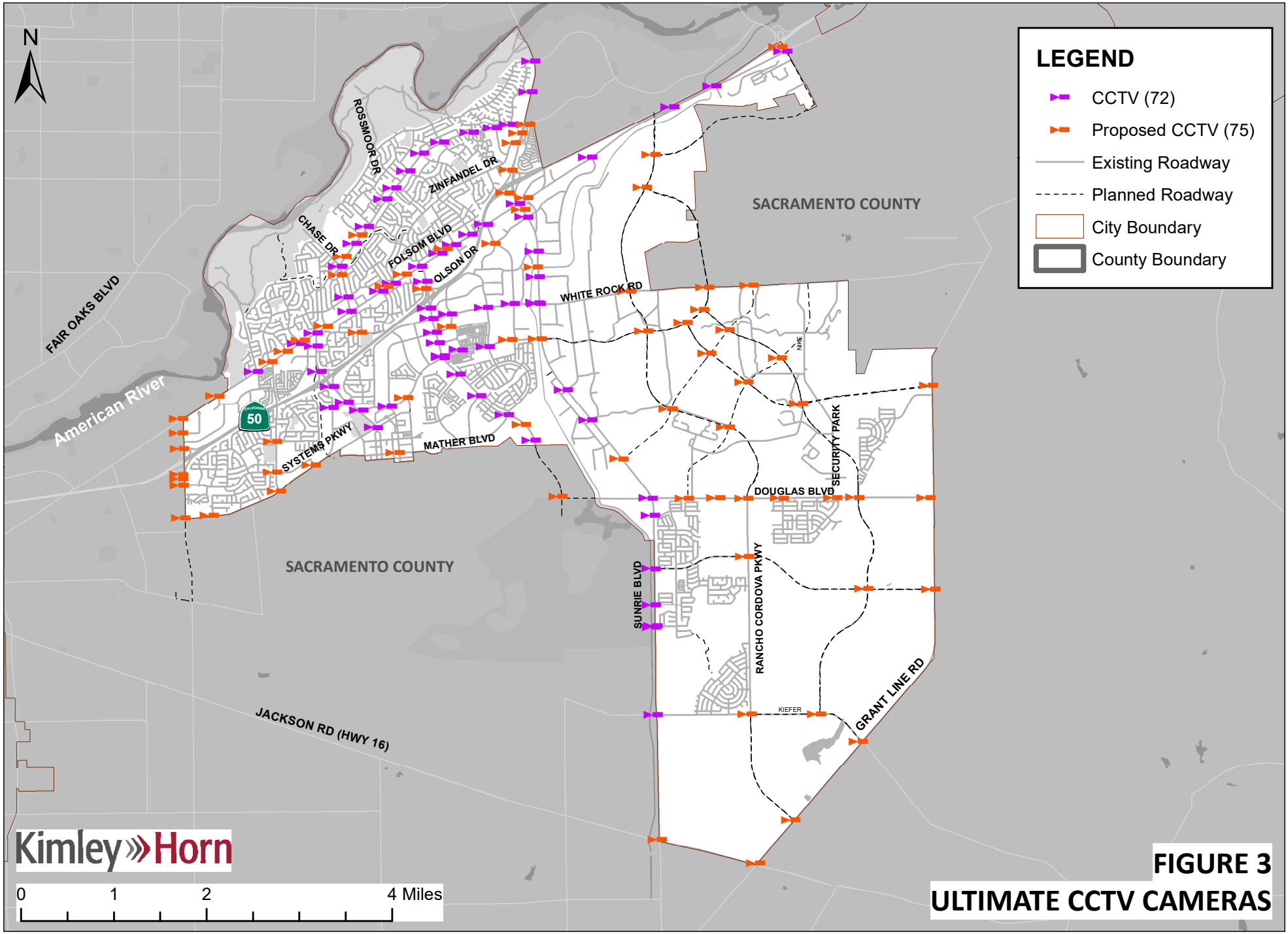


FIGURE 3
ULTIMATE CCTV CAMERAS

DEPLOYMENT PRIORITIZATION

Projects are prioritized based on a set of 10 local and regional criteria and emphasize providing an infrastructure foundation, systems and data integration to enhance functionality, and innovative advanced technology solutions when other critical elements are in place. Each criterion was weighted to represent some criteria being more important than others. The 10 local objectives and their weighting value are shown below:

1. **Extent that project achieves local objectives (14)** – project emphasizes addressing local needs
2. **Adaptable to new technology (13)** – can handle new technology without needing to be replaced
3. **Safety (13)**
4. **Addresses multijurisdictional networking (10)** – contributes to a multijurisdictional solution
5. **Improves reliability and consistency of driver trips (10)** – traveler information to drivers helps them make informed and real-time decisions
6. **Improves traveler information and dissemination (10)** – provides more and better information about roadway conditions and multimodal options
7. **Contributes to operational and institutional efficiency (10)** – enables staff to more efficiently manage the transportation network
8. **Enhances major corridors (10)** – corridors that serve more people than other corridors
9. **Emergency/disaster preparedness (5)** – better information to public and more robust system
10. **Other projects rely on this project (5)** – this project must be done before other projects can begin

Each project was given a subjective score of zero (0) to four (4) for each criterion based on its relevancy to the criteria. Project scores were totaled and ranked to identify the highest priority projects.

This Plan is intentionally structured to be agile and flexible in its implementation to enable the City to quickly identify a candidate project with a concise set of actions and next steps as funding becomes available and opportunities arise or to reprioritize projects based on specific areas of emphasis.

Prioritization Summary

The master summary of strategy prioritization for the City of Rancho Cordova projects is provided in **Appendix D**. The details provided in each of the master summaries are outlined below:

- **Project Title** – This is the title of the project.
- **Project Description** – This is a succinct summary of what is included in the strategy and/or locations (if applicable) of where the project would be deployed.
- **Project Type** – This relates to the needs/gaps assessment and determines how the projects fit into the three categories used for needs/gaps (infrastructure/data, operations, institutional).
- **Relation to Needs** – This is a mapping of projects to the original needs, recognizing that one strategy may serve multiple needs.

- **Relation to Objectives** – This is a section that consists of ten headings for each local objective and is related to the scoring system of the prioritization process.

Cost Estimations

Planning level cost estimations were developed to reflect order-of-magnitude costs. A summary of specific costs or considerations related to implementing Smart Region elements is provided for each strategy where a cost can be reasonably estimated. **Appendix C – Cost Assumptions** summarizes the cost assumptions that were used to provide planning level cost estimations for each project, if applicable.

These assumptions include a detailed breakdown of capital component costs and acknowledges the project development, design, construction, integration, and operations and maintenance costs associated with each project. The cost information is a planning-level estimate to deploy each project, based on available current (2018) pricing information for similar technology projects in the region.

Throughout development of projects, a distinction was made between projects that carry a cost and those that carry little to no cost. Projects that have costs may require initial capital investments and subsequent ongoing operations and maintenance (O&M) costs. Examples of these costed projects would be the deployment of new field infrastructure or upgrades to existing Traffic Operations systems. No cost projects tend to fall more into the institutional category and can be deployed with little to no cost and no future O&M costs. Examples of these projects would be the creation of a set of security guidelines, an interjurisdictional agreement, changes to a policy, or completing performance measurement analysis.

Planning level cost estimates include a budget (50% of capital costs) for the design and spec development associated with proposed equipment. Based on the ITS Improvements Project, signal equipment retrofits (pole upgrades, etc.) were not necessary. As such, this plan assumed infrastructure upgrades will not be required. However, necessary controller upgrades were included to replace old Multisonics equipment.

List of Prioritized Projects

A summary of prioritized projects is presented in **Table 2**.

Table 2 – Project Summary

Priority No.	Project Corridor	Project Description	Planning Level Cost Estimate
1	Old Placerville Road – Bradshaw Road to Schriever Avenue	Project includes enhanced communication infrastructure through installation of new interconnect; deployment of vehicle video detection; installation of CCTV cameras; installation of fiber equipment; and controller upgrades.	$ 2,100,300
2	Routier Road – Old Placerville Road to Vanguard Drive Vanguard Drive – Routier Road to Pegasus Way	Project includes enhanced communication infrastructure through installation of new interconnect; deployment of vehicle video detection; installation of CCTV cameras; installation of fiber equipment; and controller upgrades.	$ 1,115,600
3	Folsom Boulevard - Bradshaw Road to Hazel Avenue	Project includes deployment of vehicle video detection; deployment of transit signal priority; installation of CCTV cameras; installation of ethernet over copper devices; installation of DSRC radio units; and deployment of ATSPM.	$ 2,464,200
4	Sunrise Boulevard - Jackson Road to Bridge Street	Project includes enhanced communication infrastructure through installation of new interconnect; deployment of vehicle video detection; installation of CCTV cameras; installation of CMS; installation of DSRC radio units; and deployment of ATSPM.	$ 3,484,600
5	Coloma Road - Folsom Boulevard to Sunrise Boulevard	Project includes deployment of vehicle video detection; installation of CCTV cameras; installation of CMS; installation of DSRC radio units; and deployment of ATSPM.	$ 894,600
6	International Drive / Mather Field Road - to Folsom Boulevard to Sunrise Boulevard	Project includes deployment of vehicle video detection; installation of CCTV cameras; installation of CMS; installation of DSRC radio units; and deployment of ATSPM.	$ 720,000
7	Bradshaw Road - Old Placerville Road to Folsom Boulevard	Project includes deployment of vehicle video detection; controller upgrades; installation of CCTV cameras; installation of CMS; installation of DSRC radio units; and deployment of ATSPM.	$ 621,000
8	Zinfandel Drive - Sunrise Boulevard to Douglas Road	Project includes deployment of vehicle video detection; installation of CCTV cameras; installation of CMS; installation of DSRC radio units; installation of ethernet over copper devices; and deployment of ATSPM.	$ 812,700
9	White Rock Road - Zinfandel Drive to Sunrise Boulevard	Project includes deployment of vehicle video detection; installation of CCTV cameras; installation of CMS; installation of DSRC radio units; and installation of communication hub.	$ 325,600
10	Douglas Road - Sunrise Boulevard to Grant Line Road	Project includes enhanced communication infrastructure through installation of new interconnect; installation of DSRC radio units; installation	$ 2,265,700

Priority No.	Project Corridor	Project Description	Planning Level Cost Estimate
		of vehicle video detection; installation of CCTV cameras; installation of fiber equipment; and installation of a communication hub.	
11	Grant Line Road - Jackson Road to Douglas Boulevard	Project includes installation of vehicle video detection; and installation of DSRC radio units.	$ 45,000
12	Hazel Avenue Video Detection	Project includes installation of CMS; and installation of CCTV cameras.	$ 63,000
13	Rancho Cordova Parkway - Douglas Road to Kiefer Road	Project includes enhanced communication infrastructure through installation of new interconnect.	$ 525,300
		New Development Area Projects	
14	White Rock Road - Sunrise Boulevard to Grant Line Road	Project includes enhanced communication infrastructure through installation of new interconnect; installation of fiber equipment; deployment of vehicle video detection; installation of DSRC radio units; and installation of CCTV cameras.	$ 4,546,700
15	Rancho Cordova Parkway - Douglas Road to Kiefer Road	Project includes enhanced communication infrastructure through installation of new interconnect; installation of fiber equipment; deployment of vehicle video detection; installation of DSRC radio units; and installation of CCTV cameras.	$ 6,460,600
16	Americanos Boulevard - Kiefer Boulevard to Rancho Cordova Parkway	Project includes enhanced communication infrastructure through installation of new interconnect; installation of fiber equipment; deployment of vehicle video detection; installation of DSRC radio units; and installation of CCTV cameras.	$ 5,501,600
17	Centennial Drive - Americanos Boulevard to International Drive	Project includes enhanced communication infrastructure through installation of new interconnect; installation of fiber equipment; deployment of vehicle video detection; installation of DSRC radio units; and installation of CCTV cameras.	$ 2,968,700
18	International Drive - Sunrise Boulevard to Future Americanos Road	Project includes enhanced communication infrastructure through installation of new interconnect.	$ 3,064,400
19	Chrysanthy Boulevard - Sunrise Boulevard to Grant Line Road	Project includes enhanced communication infrastructure through installation of new interconnect.	$ 2,819,800
20	Kiefer Road - Rancho Cordova Parkway to Grant Line Road	Project includes enhanced communication infrastructure through installation of new interconnect and installation of ethernet over copper devices.	$ 1,326,400
21	Easton Valley Parkway - Rancho Cordova Parkway to Nimbus Road & Nimbus Road	Project includes enhanced communication infrastructure through installation of new interconnect.	$ 2,364,000

Priority No.	Project Corridor	Project Description	Planning Level Cost Estimate
	- Easton Valley Parkway to I-50		
22	Sunrise Boulevard - Jackson Road to Douglas Boulevard	Project includes installation of CCTV cameras.	$ 18,000
23	Douglas Boulevard - Sunrise Boulevard to Grant Line Road	Project includes installation of CCTV cameras.	$ 90,000
Unprioritized Projects			
N/A	Develop Center-to-Center Network for Sharing CCTV Imagery with Regional Partners	Regional network for sharing CCTV imagery	See Regional Document
	CV/AV Roadside Technology Evaluation	Staffing to evaluate CV/AV technology needs	$ 38,880
	O-D and Travel Time Technology Deployment Evaluation	Analyze technology to complete Origin-Destination and Travel Time Studies	$ 36,720
	Install TMC at Future Maintenance Corporation Yard	Install Traffic Management Center at the future maintenance corporation yard.	$ 54,000
	Increase Staffing Levels to Improve Real-Time Operations	Establish new staffing levels for operation and maintenance of transportation network	Salary Dependent
	Support of Regional Technology Procurement Contract Development	Provide support for establishment of regional technology procurement contract	See Regional Document

Funding

Implementation of many of the projects identified by this Plan are contingent upon acquiring additional funding. The following are potential funding opportunities for ITS infrastructure and systems that are described in additional detail below.

- Local Funding Programs
- SACOG Funding Programs
- State Funding Programs
- Federal Funding Programs
- Grants/Pilot Programs
- Other Funding Types

Local Funding Programs

The City of Rancho Cordova has a five-year Capital Improvement Program (CIP) that outlines the City's priorities with regards to improvements, including transportation-related projects. This document also contains information about funding and budgeting.

The City of Rancho Cordova has an ITS Master Plan, established in 2010, as well as a five-year CIP that provides a range of information including regional, federal, and state funding opportunities. This plan serves as a reference for basic funding information. In general, this document is updated or reproduced in five-year intervals. Local projects typically need to be included in this regional document to receive funding.

SACOG Funding Programs

SACOG offers a variety of different annual funding programs for public agencies within the region. The funding programs relevant to ITS projects are shown in **Table 3**

Table 3 – SACOG Funding Programs

Program	Funding Amount	Criteria	Performance Outcomes Measured for Selection
Regional Program	$92,586,000 Amount given and to how many projects will vary depending on applicants	• Eligible for CMAQ, RSTP or STIP funds • Listed in recent MTP/SCS or fit within a lump-sum project category • Must match 11.47% of award with non-federal funds • Begin construction or operation before April 2025	• Reduce regional VMT per capita • Reduce regional congest VMT per capita • Increase multi-modal or alternative travel choices • Provide long term benefits, sustaining both rural and urban economies • Improve movement of goods, in and through the region • Improve safety and security • Maintain and improve upon the existing transportation system

Program	Funding Amount	Criteria	Performance Outcomes Measured for Selection
Green Region	$11,760,000 Amount given and to how many projects will vary depending on applicants	• Eligible for CMAQ, RSTP or STIP funds • Must match 11.47% of award with non-federal funds • Begin construction or operation before April 2021 • Request for construction funding demonstrates that environmental, engineering and right-of-way will be ready by the time funds are requested • Agency is capable of on-going O&M costs	• Reduce regional VMT per capita • Increase multi-modal or alternative travel choices • Advances the use of electric and other zero-emission vehicles • Project exists within at least one of the Green Region Plan program areas
TDM Innovations Grant	$750,000 Awards of $25,000-$150,000 per project	• El Dorado, Placer, Sacramento, Yuba, Yolo and Sutter Counties • Must match 11.47% of award with non-federal funds • Program must be active within 2 years of an agreement being signed • Include a detailed project budget and how funding will be used • Must demonstrate link between project and grant program's goal to reduce SOV trip and miles • Demonstrate how the project will serve underserved or insecure communities • Demonstrate creativity and appeal to a broad audience	• Innovative and Uniqueness of Project (40pts) • Potential of project to reduce motor vehicle trips and miles (15pts) • Target/Market Audience Development (15pts) • Description of plan to measure VMT reductions, data collection/analysis and project modification/adaptability (25pts) • Budget & project cost/participant (5pts)
Regional Active Transportation Program	$11,664,000 ($439,560 Statewide) Amount given and to how many projects will vary depending on applicants	• Projects must first complete in Statewide ATP program before being eligible for smaller MPO programs • Must match 11.47% of award with non-federal funds	• Disadvantaged communities • Potential to increase users (biking/walking) • Public participation and planning • Potential to reduce crashes (fatalities and injuries)

Program	Funding Amount	Criteria	Performance Outcomes Measured for Selection
Metropolitan Transportation Improvement Program	Varies based on federal and state funds available	• Projects must be included in the Metropolitan Transportation Plan (MTP)	• Projects must be included in the Metropolitan Transportation Plan (MTP) then prioritized alongside other submitted projects. Funds are allocated based off prioritization.

State Funding Programs

The State Highway Account is essentially a bank account that funds a variety of California programs for transportation and traveler mobility purposes. The SHA receives its funds from the State Base Excise Tax and the Federal Highway Trust Fund. The programs that are relevant to the Smart Regions project are described in **Table 4**.

Table 4 – State Transportation Funding Opportunities

Program	Important Dates	Funding Information	Criteria
State/ Regional/ Interregional Transportation Improvement Program (STIP/RTIP/ ITIP)	• Multi-year CIP • Cycle begins in odd-numbered years with the release of fund estimate in July. • December 15th of odd-numbered years the ITIP/RTIP/STIP is submitted • Next opportunity for this funding will be July, 2019	• Local agencies work with their MPO to get their projects included in the RTIP for nomination	• Must include a Project Study Report (PSR) or an equivalent for non-State Highway projects • Caltrans/Regional consultations for projects are to be included in the STIP/RTIP/ITIP • Evaluated on how the project aligns with furthering regional objectives, particularly for Sustainable Communities Strategies • STIP Guidelines
California Transportation Commission Active Transportation Program (CTC ATP)	• Distributed annually	• 40% of funds goes to MPO's in urban areas • 10% of funds goes to small urban or rural communities and awarded by the Commission on a competitive basis • The remaining 50% is competitively distributed on a statewide basis	• Selected through a competitive process and meet one or more ATP program goals. • Minimum funding request is $250,000 • ATP Guidelines

Federal Grant/Pilot Funding Programs

Many federal programs funnel their money directly to the state, which then distributes the funds based on local policies or award programs. One example of this type of funding is described above in the State Highway Account which receives a portion of its funding from federal programs. Other programs are described below.

Surface Transportation Block Grant Program (STBG): The STBG is an approved funding program through at least 2020. Infrastructure-based ITS capital improvements, including the installation of vehicle-to-infrastructure communication equipment, are eligible for the grant. In addition, operational improvements (including capital and operations costs) for traffic operations facilities, environmental measures, and some parking strategies are eligible. The project must be identified in a Statewide Transportation Improvement Program (STIP) and be aligned by long range Metropolitan Transportation Plans. Federal share is generally 80% although there are stipulations that allow for a full 100% share or as low as 50% federal share and is determined by project type per 23 U.S.C. 120.

Better Utilizing Investments to Leverage Development (BUILD) Grants: The BUILD program has replaced the Transportation Investment Generating Economic Recovery (TIGER) grant program and grants are awarded on a competitive basis for projects with significant regional or local impacts. These grants are designed to benefit surface transportation systems while providing further support to rural communities. A greater share of BUILD grants will be awarded to projects located in rural areas. $1.5 billion dollars has been made available for BUILD grants through September 2020. BUILD funds may cover up to 80% of project costs in urban areas and 100% of project costs in rural areas. During the 2018 cycle, the maximum project award is $25 million and a single state cannot receive more than $150 million. The application deadline for BUILD grants is late July of each year.

The Nationally Significant Freight and Highway Projects (INFRA) Program: The INFRA Grants program provides dedicated, discretionary funding for projects that address critical issues facing our nation's highways and bridges. In 2018 approximately $1.5 billion in INFRA Grants will be awarded to projects across the country.

Advanced Transportation and Congestion Management Technologies Deployment (ATCMTD): ATCMTD is a competitive grant program that funds projects related to many ITS objectives. The grant serves to fund installation of transportation technologies that can improve efficiency, safety, and system performance. A state, local, transit, or Municipal Planning Area (MPA) agency is eligible to apply. In addition, a multijurisdictional group can apply with a signed agreement. A maximum of $60 million is available each fiscal year through 2020. A 50% minimum local match is required. Single project awards will not exceed $12 million and there will be between 5 and 10 grants awarded. Applications are invited during the Spring of each year.

Other Funding Types

Other funding opportunities that the City could utilize to help support their ITS Program include:

Safety/Emergency Projects/Initiatives

Partnering with other departments or emergency/safety agencies to include ITS components or to identify additional data that can be obtained from emergency/safety service systems could be mechanisms used to expand the ITS program or data that is available. An example might be a project to upgrade the radio network of the Police Department.

Establishing Open Funding Streams

Some states and localities MPOs have developed alternative methods for financing congestion reduction efforts, including ITS projects. Supplemental traditional funding sources could include: tolling; local/regional sales tax measures, or other fees; and developing partnerships with private industry.

Public/Private Partnerships (P3s):

P3s can provide alternative funding sources for transportation projects when a public agency enters into a partnership/agreement with a third party private company. Essentially, the public agency brings in a private-sector firm who provides development, operation, and financing mechanisms for the transportation project. P3s have become more popular as public resources become more limited and the demand for improved transportation systems continues to increase. There are benefits and limitations to engaging in a public/private partnership, so it is important to weigh those factors prior to P3 implementation.

OPERATIONS AND MAINTENANCE

To effectively operate and maintain the various project elements and projects identified in this Implementation Plan, the City of Rancho Cordova must be adequately staffed and prepared to sustain the system after it is deployed. Operations and maintenance procedures are essential to define the appropriate staffing levels, training, operational processes, and maintenance plans necessary to sustain an effective system.

Staffing

Staffing serves as the operations side of the Implementation Plan. The successful implementation of operations strategies is largely dependent on providing appropriate staffing as related to the increase in operational capabilities.

Since its incorporation in July 2003, the City of Rancho Cordova has assumed responsibility for operation and maintenance of the transportation network. However, the City has contracted out day-to-day operations and maintenance activities to the Sacramento County DOT. The County's operational staff, which manages the City's traffic signals and over 500 County-owned traffic signals, consists of a Senior Civil Engineer, two Associate Civil Engineers, two Assistant Civil Engineers, and one Engineering Technician. For field maintenance of the City of Rancho Cordova's transportation network, the County has one electrical technician.

In addition to the County staff described above, a City has a Senior Civil Engineer, and an Associate Civil Engineer (Associate Engineer position is currently vacant) whom provide some traffic engineering support as part of their overall duties. Management and maintenance of the central server and hub equipment located at City Hall is provided by the City IT department.

Staffing the Smart Region Program

The City of Rancho Cordova should follow a well-crafted staffing plan that addresses five key objectives:

1. Ensure appropriate staffing levels based on increasing and aging assets;
2. Ensure the organization employs staff with the requisite knowledge, skills, ability, and other characteristics in the appropriate positions when needed;
3. Ensure that the organization adapts to changes internally and externally;
4. Provide a systematic approach for human resource management; and
5. Provide a shared vision of human resource functions.

Table 5 provides recommended ratios for the number of devices or signals to warrant one staff person for small, medium, and large jurisdictions based on the total number of devices or signals the jurisdiction is expected to operate and maintain. Operations staff are responsible for daily monitoring and use of transportation management assets. Engineers are responsible for conducting analysis of system performance and developing solutions. Maintenance staff are responsible for preventative and routine servicing of field assets.

Table 5 – Staffing Ratios for Operations and Maintenance

City Size Classifications	Number Of:	Small	Medium	Large
Total	Signals	< 50	50 – 200	> 200
Total	Devices	< 100	100 – 300	> 300
Recommended Staffing Ratios	**Number Of:**	**Small**	**Medium**	**Large**
Operations	Devices	25 : 1	50 : 1	75 : 1
Engineer	Devices	100 : 1	100 : 1	100 : 1
Maintenance/Technicians	Signals	40 : 1	40 : 1	40 : 1
Maintenance/Technicians	Devices	100 : 1	100 : 1	100 : 1

** Using ITE recommendations for staffing ratios per device from Traffic Control Systems Operations – Installation, Management and Maintenance which recognizes the difference between large, medium, and small agency size ratios. Values were verified to be consistent with other more recent sources such as Traffic Signal Operations and Maintenance Staffing Guidelines (FHWA-HOP-09-006) and other agency publications around the country.*

With 107 traffic signals and 108 devices, The City of Rancho Cordova is considered a medium-sized agency. **Table 6** provides a summary of the existing and future number of devices and staff recommendations to support the desired infrastructure and functionality called out in this Plan. As shown, recommended staff under full build out conditions includes

Table 6 – Staffing Recommendations for SACOG Agency Stakeholders

Rancho Cordova	Devices*	Operations Staff – Devices (50:1)	Engineering Staff – Devices (100:1)	Traffic Signals	Maintenance Staff - Signals (40:1)	Maintenance Staff - Devices (100:1)
Existing Conditions	108	2	1	107	3	5
Full buildout needs	244	3	2	139	3	2

**ITS equipment includes: vehicle detection devices, emergency vehicle preemption devices, CCTV cameras, CMS, ARID devices, miles of fiber and wireless radios.*

Staffing Considerations

Understanding there is an existing staffing shortage, adding additional ITS infrastructure and functionalities that are desired by the City and recommended within this Plan to accommodate future mobility and technology will only exacerbate these staffing challenges unless a process is put in place to identify and account for staffing needs for the Smart Region program. To address this challenge, it is recommended that a process be put in place as part of the capital project programming process for traffic signals and other ITS communications projects that requires consideration of the staffing resources needed to operate and maintain the new infrastructure in addition to existing infrastructure.

There are regional staffing structures for operations and maintenance that are being recommended to SACOG to help support individual local agencies and their ability to support Smart Region initiatives. These regional structures may alleviate some of the need for additional staffing at the City level.

When planning for additional or adjusted staffing to account for Smart Region improvements, the City should consider the following:

- **Heightened Skill Set** – Central management systems are undergoing fundamental changes, including the introduction of more sophisticated technologies, a shift to integrated operations (multiagency, multimodal), and improvements to customer service capabilities. The increased demand for services and changes to central management system operations affects staffing skill sets. Increasing demand requires more employees and the necessary knowledge, skills, and abilities to handle the demand. In many cases, personnel required to manage multijurisdictional systems should have an Information Technology background and skill set that includes network management, software development, database administration, and application troubleshooting. Although engineering skill sets, or a professional license may be warranted for specific activities such as signal timing plan development, an engineer may not always be necessary to fulfill other agency functions. Each agency should consider a combination of personnel skill sets as they relate to the individual agency requirements to fulfill operational functions. This section is intended to emphasize that skill sets outside of the standard "traffic operations" or "traffic engineering" must be considered to satisfy the needs of a technology-based system. As such, it may not be

recommended or preferable to have IT dominant functions be part of an Operations or Engineering person's direct responsibilities.

- **Redundant Support Structure** – It will be important to foster and maintain staff skills and redundancy through greater training and cross-training so that there is more than one person with the knowledge and skill set required to operate and maintain ITS equipment and systems.
- **Central System Management Architecture** – Another major factor that has a significant impact on staff planning is whether the central management system operations function out of a traditional TMC with workstations and a video wall, or if the central management system is operated on a virtual basis with a few City offices having permissions-level access to certain parts of the system.

Maintenance Plan

Planning for ITS operations and maintenance costs is a critical component when developing an implementation project. Operation and maintenance of ITS technologies and systems extends beyond simply keeping the equipment working. The City will need to maintain ITS devices and systems and will require appropriate training to serve in that role. Reacting to emergency failure conditions, maintaining accurate maintenance logs, and conducting preventative maintenance programs all require fully-trained staff. Maintenance of ITS devices will require an allocation of funds within the City budget. A maintenance management system can also be used to track failures and decrease the time needed to repair the failures.

The maintenance plan identifies the criteria for replacement and preventative maintenance and the need for ongoing support for ITS Program devices and systems. The number of devices and systems that need to be maintained throughout the City will increase in the near-term based on the programmed ITS infrastructure projects. These devices and systems need to be appropriately maintained and effectively operated to provide accurate, reliable, and timely information.

The following three maintenance types are included in this section to recommend maintenance activities based on general guidelines for each type of device, rather than required activities, to allow the City to identify areas where maintenance activities could be introduced based on resource availability:

- **Preventative Maintenance** – What to do to prevent failure – This encompasses a set of checks and procedures performed at scheduled intervals including inspection, record keeping, cleaning, and replacement.
- **Responsive Maintenance** – What to do when something fails – This is the initial reply by field maintenance staff to an ITS subsystem or malfunctioning device. Response maintenance includes minor maintenance activities, major maintenance activities, and major rehabilitation/upgrade activities.
- **End-of-Life Replacements and Upgrades** – What to do when something cannot be fixed – This can be required if the device has experienced frequent malfunctions, failures, or has reached end-of-life and it is more cost-effective to replace the technology rather than continue to maintain it.

Roles and responsibilities, maintenance guidelines, and requirements of the Engineering Department staff should be updated to include preventative maintenance, responsive maintenance, and replacement of ITS devices and systems

Preventative Maintenance

Preventative maintenance is performed to ensure the reliability and longevity of the mechanical and electrical operations of the system and will reduce equipment failures, response maintenance, road user costs, and liability exposure. Preventative maintenance involves repetitive upkeep to allow devices and systems to operate efficiently and effectively to maximize the operating lifespan of ITS devices. Preventative maintenance includes minor and major maintenance needs, making the frequency of maintenance an important consideration.

The preventative maintenance activities and frequency varies by device, device components, and system, which are outlined in **Table 7**. The City can refer to this table when incorporating new signals, new ITS infrastructure, or new staff. The City should review and revise the preventative maintenance procedures on an annual basis to ensure new issues are being addressed and equipment is being properly maintained.

Table 7– Preventative Maintenance Recommendations

Intersection PM Checklist	Recommended Interval
Interior Cabinet Check	
Clean Cabinet Interior Check controller lamp and door switch Check filter Check door fit and gasket Check locks and hinges Check/verify for cabinet timing and log sheet Check field block terminal connections Signal controller battery backup check	Annual
Check conflict monitor indications Check all detectors	Quarterly
Exterior Cabinet Field Check	
Check condition of cabinet exterior Check all signal indications Check all pedestrian indications Check pole conditions and hand hole covers	Annual
Check all signal head back plates and visors Check alignment of signals and pedestrian heads Check condition of pull boxes and lids	Quarterly
Intersection Field Check	
Visual check of all traffic signs at intersection Visual check of intersection luminaries	Monthly
Visual check of all traffic loops	Quarterly
Visual check of other traffic system related cabinets	Annual

Intersection PM Checklist	Recommended Interval
Typical CCTV Checklist Items	
Visual check of assembly CCTV receiver Video transmitter Fiber distribution unit Cabinet equipment Pole or exterior condition	Annual
Typical Message Sign Check List Items	
Field intersection Sign panel Pull boxes Cabinet exterior Cabinet interior Re-lamping	Every six-months

Responsive Maintenance

ITS devices and systems have specific maintenance requirements per the manufacturer's maintenance manual of each device. There are three types of maintenance that ITS devices require to fulfill their intended design for operations and lifecycle:

- **Minor Maintenance** – Minor maintenance includes tasks which can be carried out without large scale testing or the use of heavy equipment. It includes visual inspections and checking of many items, elementary testing, cleaning, lubricating, rebooting/resetting, and minor repairs that can be carried out with hand tools or portable instruments.
- **Major Maintenance** – As well as all items normally done under minor maintenance, major maintenance also includes extensive testing, overhauling and replacement of components, which may require a scheduled power outage and the use of bucket trucks or other heavy equipment.
- **Major Rehabilitation** – Major rehabilitation or complete replacement is contemplated for devices that experience frequent or recurring malfunctions or failures.

Table 8 identifies a rule-of-thumb frequency of minor and major maintenance and major rehabilitation for a range of ITS devices that the City will be implementing. These guidelines should be reviewed and updated annually to reflect actual needs in the City of Rancho Cordova.

Table 8 – ITS Device and Network Communications Maintenance Guidelines

Equipment	Minor Maintenance	Major Maintenance	Major Rehabilitation
Traffic Signal Systems			
Cabinets	26 weeks	2-5 years	10 years
Signal Heads	26 weeks	2-5 years	10 years
Electronics	13 weeks	N/A	N/A
Traffic Signal Controller	26 weeks	2-5 years	10-15 years
Poles	26 weeks	5 years	15 years
CCTV Camera Systems			
PTZ Units	26 weeks	1 years	3 years
Changeable Message Signs			

Equipment	Minor Maintenance	Major Maintenance	Major Rehabilitation
Sign Case	-	26 weeks	1.5 years
Protective Devices	26 weeks	1 year	2 years
Pixels, Modules and Drivers	-	26 weeks	3 years
Controllers	-	26 weeks	3 years
Vehicle Detection Systems			
Cabinets	-	26 weeks	10 years
Power Supply	26 weeks	5 years	10 years
Emergency Vehicle Preemption (EVP) / Transit Signal Priority (TSP)	26 weeks	2-5 years	10 years
Loop Detection (per approach)	26 weeks	1 year	5 years
Video Detection (per intersection)	26 weeks	1 year	5 years
Travel Time Readers (per location)	26 weeks	1 year	5 years
Pedestrian Detection (per intersection)	26 weeks	1 year	5 years
Grounding	-	2-5 years	10 years
Controllers	-	26 weeks	3 years
Telecommunication Systems			
Fiber Optic Cable Plant	1 year	5 years	25 years
Communication Switches (field)	26 weeks	1 year	3 years
Wireless Radio Spread Spectrum	26 weeks	4 years	10 years
TMC Equipment			
Servers	26 weeks	1 year	2 years
Communication Switches (TMC/Hub)	26 weeks	1 year	3 years
Rack Equipment	-	1 year	2 years
Workstations	26 weeks	2 years	2 years
Workstation Displays	26 weeks	1 year	3 years
Uninterruptable Power Supply	1 year	5 years	10 years

Data source: Recommended Practice for Operations and Management of ITS (ITE Publication); and International Municipal Signal Association (IMSA) Preventative Maintenance of Traffic Signal Equipment Program.

Development or integration of a maintenance tracking system would be beneficial to keep an inventory of maintenance activities that have occurred on each device. The City's responsive maintenance tracking should consist of the following maintenance activities:

- Failure detection;
- Work order creation;
- Dispatched resources;
- Response activities;
- Diagnosis;
- Interim repairs; and
- Work order close out.

This tracking will allow the City's to identify devices that are not reliable or accurate or have had frequent malfunctions. The tracking will also allow the City to identify appropriate cases for technology replacements where maintenance of an existing technology may be costlier than upgrading to a newer

technology. Developing periodic reports and then reviewing those reports are critical to being able to identify frequently failing devices for replacement.

End-of-Life Replacements and Upgrades

End-of-life replacement strategies and upgrades are an important aspect of technology projects because equipment and infrastructure need to be maintained and/or replaced in a routine manner. Equipment replacement is required if a device has exceeded its life expectancy, either through a sunsetting of manufacturer servicing or a failure in legacy equipment. Equipment upgrades are required when additional functionality is needed that cannot be provided by legacy equipment. This section provides information about what the City of Rancho Cordova's replacement needs are, recommended equipment lifecycle timeframes, and mechanisms available for procurement and maintenance.

Agency Replacement Needs

It is recommended that the City of Rancho Cordova establish an inventory of modernized, supplemental traffic and ITS equipment for replacement of devices in the field as they reach end-of-life or become broken. A typical method for establishing an inventory is to keep 10% of existing field devices for each type. A proper inventory of devices and spare parts that can be accessed to conduct routine and emergency maintenance also needs to be built into the City's budget cycle. This means that for every 100 cameras deployed across the transportation network, the City should have at a minimum ten (10) cameras in inventory to be able to be responsive and make repairs/replacements when needed.

Lifecycle Replacement

To adequately prepare for necessary infrastructure updates in the future, the City should consider the estimated lifespan of its infrastructure. Lifecycle replacement mechanisms will need to be developed to stay up-to-date on equipment replacement needs and emerging technology availability. **Table 9** should be used as a reference tool for the City of Rancho Cordova so that equipment remains current and performs at an optimal level.

Table 9 – Anticipated Technology Lifecycle Timeframes

Equipment	Anticipated Lifecycle Timeframe (Years)
Traffic Signal Systems	
Cabinets	20
Signal Heads	20
Electronics	10
Traffic Signal Controller	15
Poles	50
CCTV Camera Systems	
PTZ Units	10
Changeable Message Signs	
Sign Case	10
Protective Devices	10
Pixels, Modules and Drivers	6
Controllers	6

Equipment	Anticipated Lifecycle Timeframe (Years)
Vehicle Detection Systems	
Cabinets	20
Power Supply	20
Emergency Vehicle Preemption (EVP) / Transit Signal Priority (TSP)	10-15
Loop Detection (per approach)	5-15
Video Detection (per intersection)	10
Pedestrian Detection (per intersection)	10
Grounding	25
Controllers	7
Telecommunication Systems	
Fiber Optic Cable Plant	25
Communication Switches (field)	5-8
Wireless Radio Spread Spectrum	20
TMC Equipment	
Servers	5
Communication Switches (TMC/Hub)	5-8
Rack Equipment	5
Workstations	5
Workstation Displays	5
Uninterruptable Power Supply	20

Agency Replacement Strategy

Since the City has recently completed a systemwide upgrade of traffic signal controllers and communication equipment, the lifecycles on this equipment has just begun. The same is true for the 40 CCTV cameras that were installed as part of the Citywide ITS project. However, there are 32 CCTV cameras that are 5-years or older that will reach their expected lifecycle in the next several years. In anticipation, it is recommended that the City initiate a replacement strategy which establishes a yearly replacement program. The program would allocate the appropriate funds to replace end-of-life, legacy devices over five years. For the legacy CCTV cameras, this would translate to replacing 6 cameras every year until the conversion is complete.

PERFORMANCE METRICS

Performance metrics are used to evaluate and demonstrate the effectiveness of the City of Rancho Cordova's implementation projects in addressing local and regional objectives. Recommended data types, data sources, and calculations to evaluate performance of projects are provided in **Table 10**. As projects are delivered, the City of Rancho Cordova can use these metrics as a guideline to evaluate projects.

Table 10 – Performance Metrics to Perform Project Evaluations

Objective	Performance Metric	Data Type	Source	Calculation
Efficient traffic	Reduced Travel Time	Travel Time	Agency TMC	Travel time in minutes between Point A and Point B prior to and

Objective	Performance Metric	Data Type	Source	Calculation
operations for all modes				after project implementation
	Intersection Operations: Reduced Delays, Queues, Stops, % Arrivals on Greens, Emissions, and Saturation Levels	Turning Movement Counts, and ADT Volumes	Agency TMC	Compare traffic signal operations before and after project implementation, calculate percentage change.
	Reduced vehicle-to-vehicle crashes	Crash Records	Crash Record System	Calculate percentage change of crashes before and after implementation
	Reduced vehicle-to-bicycle crashes	Crash Records	Crash Record System	Calculate percentage change of crashes before and after implementation
	Reduced vehicle-to-pedestrian crashes	Crash Records	Crash Record System	Calculate percentage change of crashes before and after implementation
	Reduced Safety Incidents Involving Transit Operations	Transit Incident Records	Transit TMC and Transit Provider Records	Count amount of safety incidents involving transit operations after project implementation and compare to before implementation
Encourage Transit Usage through enhanced corridor operations	Increased Transit and Microtransit Ridership	Sales/Revenue Microtransit Ridership	Transit TMC, and Transit and Microtransit Provider Records	Count ridership levels before and after project implementation, calculate percentage change
	Reduced Travel Time	Travel Time	Agency TMC	Travel time in minutes between Point A and Point B prior to and after project implementation
Improve Incident Response	See performance measures for regional Emergency/Disaster Preparedness objective below			
Provide Traveler Information	See performance measures for regional Traveler Information objective below			

Objective	Performance Metric	Data Type	Source	Calculation
Build Infrastructure to effectively manage traffic	See performance measures for regional Smart Region Infrastructure objective below.			
Efficiently operate and manage transportation system	Reduced Travel Time	Travel Time	Agency TMC	Travel time in minutes between Point A and Point B prior to and after project implementation
	Incident detection by CCTV cameras	CCTV Images	Agency TMC	Count incidents that are detected via CCTV camera before being identified by public
	Number of hours (in 6-month intervals) of continued education or training completed by staff	Training Hours	CE courses, Vendor Training Seminars, etc.	Count hours staff spent attending new technology trainings or pursuing certifications
Expand interagency collaboration	Reduced Travel Time	Travel Time	Agency TMC	Travel time in minutes between Point A and Point B prior to and after project implementation along cross-jurisdictional corridors
	Improved Incident Clearing Times	Incident Response and Clearing Times	Agency TMC	Compare time it takes to respond to and clear an incident before and after project implementation
Utilize emerging technologies to improve traffic operations	See performance measures for regional Smart Region Infrastructure objective below.			
Address **smart** transportation **strategies** for urban, suburban, and rural communities	Reduced Travel Time	Travel Time	Agency TMC	Travel time in minutes between Point A and Point B prior to and after project implementation
	Increased Transit Ridership	Sales/Revenue	Transit TMC and Transit Provider Records	Count ridership levels before and after project implementation,

Objective	Performance Metric	Data Type	Source	Calculation
				calculate percentage change
	Incident detection by CCTV cameras	CCTV Images	Agency TMC	Count incidents that are detected via CCTV camera before being identified by public
	Accurate Travel Time Estimates (particularly focused on rural and suburban communities w/ commuting needs)	Travel Times	Agency TMC	Compare travel times estimated and actual travel times to verify accuracy for those commuting into urban centers from rural or suburban communities
Prepare for **smart** region **infrastructure** adapting to new technology	Number of hours (in 6-month intervals) of continued education or training completed by staff	Training Hours	CE courses, Vendor Training Seminars, etc.	Count hours staff spent attending new technology trainings or pursuing certifications
	System Readiness for CV/AV Technology Integration	CV/AV Technology (Device and Data)	TMC System	When applicable, monitor CV/AV technology integration and compare qualitatively or quantitively with other region's technology integration experiences
	Increase Capacity of Communications Network	Fiber/Wireless/Bandwidth Usage	TMC System	Measure communications network capacity before and after ITS device deployment
Reduce user frustration by providing **consistency and reliability**	Reduced Downtime	System Errors/Failure	System Operations	Compare Downtime Incident Occurrences before and after project implementation
	Reduced Public Complaints	Public Complaints	TMC, TOC and other Operator Records	Compare the amount of public complaints related to inconsistency/unreliability from before and after implementation project
	Reduce Response Time to Device Failures	Response Time	TOC and Dispatch Records	Measure reduction in response times before and after project implementation

Objective	Performance Metric	Data Type	Source	Calculation
	Increase percent of field device that are operational	Operational Devices	Asset Management System	Calculate percent of devices that are operational based on total devices in the inventory. Compare that figure to the same percentage ratio prior to implementation project
Proactively improve transportation system **safety**	Reduced vehicle-to-vehicle crashes	Crash Records	Crash Record System	Calculate percentage change of crashes before and after implementation
	Reduced vehicle-to-bicycle crashes	Crash Records	Crash Record System	Calculate percentage change of crashes before and after implementation
	Reduced vehicle-to-pedestrian crashes	Crash Records	Crash Record System	Calculate percentage change of crashes before and after implementation
	Reduced Safety Incidents Involving Transit Operations	Transit Incident Records	Transit TMC and Transit Provider Records	Count amount of safety incidents involving transit operations after project implementation and compare to before implementation
Improve **traveler information** and dissemination to public and within region	Reduced vehicle traffic (congestion) due to DMS Message	Traffic Volume	Agency TMC	Difference between Pre/Post DMS Traffic Volumes on Corridor and Alternate Corridor
	Increased Social Media Presence via Agency Managed Apps/Websites	Social Media Posts and Push Notifications (Facebook, twitter)	PR/PIO Records	Track social media outputs, compare to posts prior to implementation strategies
	Increased Partnerships between Third Party Data Companies and Public Agencies	Partnerships	Institutional Policies/Documents	Count the number of private party /public agency data sharing agreements that have occurred since implementing strategies
	Increased 511 Inputs (on all	Website Updates, Radio Updates, and Push Notifications	511 System/Records	Count traveler information inputs that are sent out through

Objective	Performance Metric	Data Type	Source	Calculation
	available platforms)			511 systems and compare it to counts prior to implementation
	Increased 511 Usage/Subscriptions	App Download/Website Usage	App/Website Management	Count of 511 website views
Emergency / Disaster preparedness	Improved Emergency Response Time	Travel Time	Agency TMC	Time between initial notification to first responder arrival
	Improved Incident Clearing Times	Incident Response and Clearing Times	Agency TMC	Compare time it takes to respond to and clear an incident before and after project implementation

NEXT STEPS

The outcome of this Implementation Plan is a roadmap of prioritized projects that the City of Rancho Cordova can follow to systematically implement technology projects that achieve local and regional objectives through expansion of infrastructure, integration of systems and subsystems, and deployment and readiness for emerging technologies. The rest of this Plan contains supporting information on project priority development, costs, project details, and other information that are essential to moving projects into development and deployment.

The City of Rancho Cordova's Technology Implementation Plan is a dynamic and flexible set of projects that contribute to SACOG's broader Smart Region Plan. The projects set forth are a mix of infrastructure, operations and institutional projects that are adaptable to changing needs and evolving technologies. This plan and the associated tools should remain a living set of resources that staff can update as projects are implemented or expanded, agency priorities change, or other changes occur that impact the region or the City of Rancho Cordova. The projects identified in this plan can and should be modified, or priorities adjusted, to accommodate changing priorities, emerging technology opportunities, other construction and development projects, or other initiatives that influence the guidance and recommendations provided in this Plan. In addition, it is particularly important to maintain a process to update the Plan because of the deployment phasing methodology used.

Plan Components to Update

- **Deployment Phasing** – It will be particularly important to update the Plan to reflect projects have been completed. Priorities across projects may also change and should be reflected in the document. As time goes by and projects change in priority, updating the project list will provide an opportunity to evaluate if new projects are available based on emerging technology, increased staffing levels, and so on.
- **Funding Opportunities** – Funding opportunities are always changing. Existing programs or grants may expire, while new ones may emerge. It is imperative that funding opportunities are kept

current to maximize the opportunity to utilize new funding sources. In addition, it will continue to be important to leverage emerging opportunities for third party or private sector support.

- **Equipment Replacement Strategies** – The success of this Plan is largely based on ensuring that all equipment continues to work effectively and efficiently. Legacy equipment should be continuously updated or replaced to accommodate emerging technology and enhanced system functionality.
- **Operations and Maintenance** – Adequate staffing levels allow for optimal functionality. As the plan grows and progresses, staffing levels must continue to reflect the need for sustaining a functioning system.

APPENDIX A – EXISTING CONDITIONS

Table 1: City of Rancho Cordova Traffic Signal Inventory

ID	Intersection	Cabinet	Controller	Owner
28	Bradshaw Rd & Folsom Blvd	Multisonics Extended M	Multisonics 820a	Rancho owned, County maintained
36	Coloma Rd & Mills Jr. H.S.	Type P Cab, TS2-1	Econolite 2070	City of Rancho Cordova
104	Coloma Rd & Sunrise Blvd	Multisonics Extended M	Econolite Cobalt	County owned, Rancho maintained
156	Chase Dr & Coloma Rd	Type-R Cab, TS2-1	Econolite 2070	City of Rancho Cordova
182	Chardonay Dr & Coloma Rd	Type-R Cab, TS2-1	Econolite 2070	City of Rancho Cordova
208	Coloma Rd & Mcgregor Dr	Type-R Cab, TS2-1	Econolite 2070	City of Rancho Cordova
229	Mather Field Rd & Rockingham	Type M Cab, TS2-1	Econolite Cobalt	City of Rancho Cordova
242	Coloma Rd & Elmanto Dr	Type-R Cab, TS2-1	Econolite 2070	City of Rancho Cordova
251	Bradshaw Rd & Old Placerville	Multisonics Extended M	Multisonics 820a	Rancho owned, County maintained
264	Macready/Systm Pk & Old Placer	Multisonics Extended M	Multisonics 820a	Rancho owned, County maintained
282	Bradshaw Rd & U.S. 50/E/B/R	State Spec 332 Cabinet	M/S 870 (State Spec)	Caltrans/Rancho/County
283	Bradshaw Rd & U.S. 50/W/B/R	State Spec 332 Cabinet	M/S 870 (State Spec)	Caltrans/Rancho/County
284	Mather Field & U.S. 50 W/B/R	State Spec 332 Cabinet	Econolite Cobalt	City of Rancho Cordova
285	Mather Field & U.S. 50 E/B/R	State Spec 332 Cabinet	Econolite Cobalt	City of Rancho Cordova
305	Cordova/Olson & Folsom Blvd	Type P Cab, TS2-1	Econolite Cobalt	City of Rancho Cordova
306	Folsom Blvd & Zinfandel Dr	Type M Cab, TS2-1	Econolite Cobalt	City of Rancho Cordova
307	Folsom Blvd & Mills Park Dr	Type M Cab, TS2-1	Econolite Cobalt	City of Rancho Cordova
308	Coloma Rd & Folsom Blvd	Type P Cab, TS2-1	Econolite 2070	City of Rancho Cordova
309	Folsom Bl & Mather Field/Paseo	Type M Cab, TS2-1	Econolite Cobalt	City of Rancho Cordova
310	Folsom Bl & Routier/W. La Loma	Type M Cab, TS2-1	Econolite Cobalt	City of Rancho Cordova
318	Mather Field & Mills Station	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
319	Sunrise & Zinfandel/Club House	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
326	Folsom Blvd & Sunrise Blvd	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
327	Jackson/Sr16 & Sunrise Blvd	State Spec 332 Cabinet	Econolite 2070	Caltrans/Rancho/County
353	Gold Exp/Trinity Riv & Sunrise	Multisonics Extended M	Econolite Cobalt	County owned, Rancho maintained
357	Folsom Blvd & La Loma Dr	Type M Cab, TS2-1	Naztec 2070	City of Rancho Cordova
362	Ellenwood Ave & Routier Rd	Pedestrian Type Cabinet	Electro-Mechnical Dial Unit	City of Rancho Cordova
366	Bridlewood/Trucke Riv & Coloma	Type M Cab, TS2-1	Econolite 2070	City of Rancho Cordova
386	Bradshaw Rd & Lincoln Village	Multisonics Extended M	Multisonics 820a	Rancho owned, County maintained
400	Gold Country Blvd & Sunrise Bl	Multisonics Extended M	Econolite Cobalt	County owned, Rancho maintained
413	Sunrise Blvd & White Rock Rd	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
416	Olson Dr & Zinfandel Dr	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
427	Zinfandel & Us 50 E/B/R/G.Cntr	State Spec 332 Cabinet	Econolite Cobalt	City of Rancho Cordova
432	Folsom Blvd & Hazel Ave/Nimbus	Multisonics Extended M	Econolite Cobalt	Rancho owned, County maintained
479	Sun Cntr/Sunrise Gld & Sunrise	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
483	Grant Line & Jackson Rd/Sr-16	State Spec 332 Cabinet	Econolite 2070	Caltrans/Rancho/County
486	Folsom Blvd W/O Aramon Dr	Fire Station Cabinet	Electro-Mechnical Dial Unit	City of Rancho Cordova
491	Prospect Park E. & White Rock	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
492	Data/Prospect Pk & White Rock	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
493	Sunrise Blvd & Sunrise Park Dr	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
494	Sunrise Blvd & Trade Center Dr	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
495	Folsom Blvd & Kilgore Rd	Type M Cab, TS2-1	Econolite Cobalt	City of Rancho Cordova
496	Granby Dr & Old Placerville Rd	Multisonics Extended M	Multisonics 820a	Rancho owned, County maintained

ID	Intersection	Cabinet	Controller	Owner
499	Lincoln Vil/Systm Pk & Routier	Multisonics Extended M	Multisonics 820a	City of Rancho Cordova
500	Old Placerville Rd & Routier	Multisonics Extended M	Multisonics 820a	Rancho owned, County maintained
501	Folsom Blvd & Horn/Paseo Rio	Multisonics Extended M	Econolite Cobalt	Rancho owned, County maintained
513	Douglas Rd & Sunrise Blvd	Type P Cab, TS2-2	Econolite Cobalt	City of Rancho Cordova
517	Folsom Blvd & Mcgregor Dr	Type M Cab, TS2-1	Econolite Cobalt	City of Rancho Cordova
525	Kilgore Rd & White Rock Rd	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
526	White Rock Rd & Zinfandel Dr	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
527	Zinfandel Dr & U.S. 50/W/B/R	State Spec 332 Cabinet	Econolite Cobalt	City of Rancho Cordova
548	International & Mather Field	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
551	Fitzgerald Rd & Sunrise Blvd	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
560	Sunrise Blvd & Us 50 E/B/R	State Spec 332 Cabinet	Econolite Cobalt	City of Rancho Cordova
573	Old Placerv/Ramos & Rockingham	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
574	Mechanical Dr & Sunrise Blvd	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
593	Folsom Blvd & Rod Beaudry Dr	Type M Cab, TS2-1	Naztec 2070	City of Rancho Cordova
619	Bradshaw Rd & Micron Ave	Multisonics Extended M	Multisonics 820a	Rancho owned, County maintained
621	Bradshaw Rd & Gore/Oates	Multisonics Extended M	Multisonics 820a	Rancho owned, County maintained
661	P A Mccuen & Mather/Von Karmen	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
664	Bleckley St & Mather Blvd	Type M Cab, TS2-1	Multisonics 820a	City of Rancho Cordova
665	Folsom Bl Ped W/O Mather Field	Type M Cab, TS2-1	Naztec 2070	City of Rancho Cordova
669	Coloma Rd & Trinity River Dr	Type M Cab, TS2-1	Econolite 2070	City of Rancho Cordova
676	Coloma Rd/500' N/O Chase Dr	Pedestrian Type Cabinet	Flasher	City of Rancho Cordova
680	Folsom Blvd E/O Point East Dr	Pedestrian Type Cabinet	Multisonics 820	City of Rancho Cordova
699	Folsom Blvd & Marketplace Ln	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
700	Folsom Bl & Mercantile Dr	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
716	Folsom Blvd & Village Ln	Type M Cab, TS2-1	Econolite Cobalt	City of Rancho Cordova
727	Sunrise Blvd & Us 50 W/B/R	State Spec 332 Cabinet	Econolite Cobalt	City of Rancho Cordova
743	Dawes St & Folsom Blvd	Type M Cab, TS2-1	Econolite Cobalt	City of Rancho Cordova
756	International Dr & Zinfandel	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
757	Folsom Blvd & Mine Shaft Ln	Multisonics Extended M	Econolite Cobalt	City of Rancho Cordova
780	Chrysanthy Blvd & Sunrise Blvd	Type P Cab, TS2-2	Econolite Cobalt	County owned, Rancho maintained
781	Herodian Dr & Sunrise Blvd	Type P Cab, TS2-2	Econolite Cobalt	City of Rancho Cordova
783	Sunrise 60' N/O Folsom So Canl	Type P Cab, TS2-2	Multisonics 820a	City of Rancho Cordova
784	Coloma Rd & Cordova Ln	Type P Cab, TS2-1	Econolite 2070	City of Rancho Cordova
785	Bosphorus Dr & Sunrise Blvd	Type P Cab, TS2-2	Econolite Cobalt	County owned, Rancho maintained
786	Kilgore Rd & Trade Center Dr	Type P Cab, TS2-1	Siemens/Eagle 2070	City of Rancho Cordova
787	Don Juan Dr & Folsom Blvd	Type P Cab, TS2-2	Econolite Cobalt	City of Rancho Cordova
788	Aramon Dr & Folsom Blvd	Type P Cab, TS2-2	Econolite Cobalt	City of Rancho Cordova
794	Bridgeway Dr & International	Type P Cab, TS2-2	Econolite Cobalt	City of Rancho Cordova
795	International & Prospect Park	Type P Cab, TS2-2	Econolite Cobalt	City of Rancho Cordova
796	Data Dr & Disk Dr	Type P Cab, TS2-2	Multisonics 820a	City of Rancho Cordova
797	Data Dr & Zinfandel Dr	Type P Cab, TS2-2	Econolite Cobalt	City of Rancho Cordova
798	Capital Village & Zinfandel Dr	Type P Cab, TS2-2	Econolite Cobalt	City of Rancho Cordova
800	Kiefer Blvd & Sunrise Blvd	Type P Cab, TS2-2	Econolite Cobalt	County owned, Rancho maintained
806	Bear Hollow/Frogs Leap & Zinfa	Type P Cab, TS2-2	Econolite Cobalt	City of Rancho Cordova
808	Data Dr & International Dr	Type P Cab, TS2-2	Econolite Cobalt	City of Rancho Cordova
810	Douglas Rd & Montelena Dr	Type P Cab, TS2-2	Multisonics 820a	City of Rancho Cordova
822	Evadna Dr & E/Leg White Rock R	Pedestrian Type Cabinet	Spot Devices	City of Rancho Cordova
829	Benita Dr & Coloma Rd	Type P Cab, TS2-1	Econolite 2070	City of Rancho Cordova
830	Coloma Rd & Vehicle Dr	Type P Cab, TS2-1	Econolite 2070	City of Rancho Cordova
831	Pegasus Way & Vanguard Dr	Pedestrian Type Cabinet	Spot Devices	City of Rancho Cordova
839	International Dr & Kilgore Rd	Type P Cab, TS2-1	Econolite 2070	City of Rancho Cordova

ID	Intersection	Cabinet	Controller	Owner
845	Aramon Dr/Studarus & Coloma Rd	Type P Cab, TS2-1	Econolite 2070	City of Rancho Cordova
854	Zinfandel & Smfd Entry	Type P Cab, TS2-1	Econolite 2070	City of Rancho Cordova
857	Routier Rd S/O Vanguard Dr Ped	Type P Cab, TS2-1	Econolite 2070	City of Rancho Cordova
862	Femoyer St & International Dr	Type P Cab, TS2-2	Econolite 2070	City of Rancho Cordova
869	Folsom Bl W/O Crdova/Olson Ped	Type P Cab, TS2-1	Econolite 2070	City of Rancho Cordova
870	Bravado Dr & Folsom Blvd	Type P Cab, TS2-1	Econolite Cobalt	City of Rancho Cordova
875	Spoto Dr & Zinfandel Dr	Type P Cab, TS2-1	Econolite Cobalt	City of Rancho Cordova
876	Baroque/N.Mather & Zinfandel	Type P Cab, TS2-1	Naztec 2070	City of Rancho Cordova
877	Zinfandel Bike Xing N/O Canal	Type P Cab, TS2-1	Econolite Cobalt	City of Rancho Cordova
889	Douglas Rd & Grant Line Rd	Type P Cab, TS2-1	Econolite Cobalt	County owned, Rancho maintained

APPENDIX B – DETAILED PROJECT SHEETS

Strategy ID # – This is the identification number by strategy.

Title – This is the title of strategy.

Description – This is a succinct description of the strategy for context.

Relation to Needs – This is a mapping of strategies to the original needs, recognizing that one strategy may serve a variety of needs.

Scope/Limits – This is a succinct summary of what is included in the strategy and/or locations (if applicable) of where the strategy would apply.

Considerations – This is a bullet listing of other strategy #'s and titles that are relevant for the City to reference during implementation or could be packaged together to be implemented in a larger strategy in a particular timeframe.

Prerequisite Dependencies – This is a summary bullet list of high-level steps to implement the strategy.

Strategy ID #1

Improve Existing Communications Capabilities on Secondary Corridors

Strategy Description – Eliminate communications gaps that exist along secondary traffic movement corridors. Utilize copper/fiber or wireless technologies to achieve more robust communications coverage. Connect communications to devices and traffic signals along the secondary corridors.

Relation to Needs – Improving existing communications capabilities addresses the following needs.

- Baseline communications infrastructure (Need D1)

Scope/Limits – Below is a list of secondary corridors in the City of Rancho Cordova that are involved with this strategy.

- Rancho Cordova Parkway (Existing and New Development Area Roadway Segments
- International Drive (Existing and New Development Area Roadway Segments)
- Douglas Road (Existing and New Development Area Roadway Segments
- Chrysanthy Boulevard (Existing and New Development Area Roadway Segments
- Kiefer Boulevard
- Jackson Boulevard
- White Rock Road (East of Sunrise Boulevard)
- Americanos Boulevard (New Development Area Roadway)
- Easton Valley Parkway (New Development Area Roadway)
- Nimbus Road (New Development Area Roadway)
- Centennial Drive (New Development Area Roadway)

Considerations – The following is a list of other strategies within this agency's Implementation Plan that should be considered along with this strategy.

- ID #2
- ID #3

Prerequisite Dependencies – The following is a high-level list of prerequisite actions that will need to be taken prior to implementing this strategy.

- Deploy projects that connect to the central system
- Existing infrastructure supporting subsequent projects should be functional

Strategy ID #2

Deploy New Vehicle Detection Devices: Video and CCTV

Strategy Description – Deploy new video detection equipment at signalized intersection locations that do not have current detection available. Video detection equipment will require devices to be mounted on all mast arms or overhanging on one pole location to be able to view all legs of the intersection, depending on the type of technology procured. Video detection will be able to detect vehicles, bicycles, and pedestrians in zones set up by the traffic operations center to support signal timing plan implementation. Also, depending on the type of technology procured, video detection may be able to collect real-time turning movement counts to support more real-time signal timing adjustments required.

Deploy new CCTV equipment at signalized intersection locations that do not have current video capabilities available. CCTV equipment will require devices to be mounted on one pole location to be able to view all legs of the intersection and, as feasible as possible, to view to the next intersection location. CCTV video will provide real-time streaming video to allow traffic operations centers to view road network conditions and to share information about real-time conditions with partner departments, such as public safety, that may need to respond to an incident or event. The new CCTV will need to be integrated into the agency's central management system for viewing and control.

Relation to Needs – The installation of a range of vehicle detection devices addresses the following needs.

- Support active transportation operations (Need D2)
- High-resolution traffic data for real-time operational decision making (Need D3)
- Sharing of camera images to support pre-trip, en-route, and incident management purposes (Need D5)

Scope/Limits – The 2010 ITS Master Plan for the City of Rancho Cordova identified proposed CCTV locations to install as part of an implementation plan. All 24 proposed CCTV's have been installed since 2010. The remainder of the signalized intersections in Rancho Cordova will receive new CCTV equipment. In addition, all signalized intersections with loop detectors will receive Video Detection Cameras. New signalized intersections in the future eastern development area will include new CCTV cameras and video detection.

Considerations – The following is a list of other strategies within this agency's Implementation Plan that should be considered along with this strategy.

- ID #1
- ID #4

Prerequisite Dependencies – None

Strategy ID #3

Deploy New CMS Equipment

Strategy Description – Deploy new CMS equipment at key locations within the City. CMS equipment will require devices to be a mounted cantilever, on a pole, or over the travel lane. CMS provides the traveling public with an en-route message that is pertinent to their travel. The CMS will need to be integrated into the City's central management system to post messages.

Relation to Needs – The installation of a new CMS equipment addresses the need to provide real-time traveler information (Need D9)

Scope/Limits – As outlined in the 2010 Rancho Cordova ITS Master Plan, the following list includes the CMS's that will be installed at key strategic decision locations to relay traveler information, which may include incident and special event information. There are also additional locations identified beyond the locations detailed in the Master Plan.

- Coloma Road at Folsom Boulevard
- Zinfandel Drive at International Drive
- Sunrise Boulevard at Coloma Road
- Sunrise Boulevard at White Rock Road
- Bradshaw Road at Lincoln Village Drive
- Zinfandel Drive at Mather Boulevard
- Mather Field Road at Mills Station Road
- Hazel Road at Lincoln Highway
- Sunrise Boulevard at American River
- International Drive at Zinfandel Drive
- White Rock Road at Grant Line Road
- Sunrise Boulevard at Jackson Road

Considerations – The following is a list of other strategies within this agency's Implementation Plan that should be considered along with this strategy.

- ID #1
- ID #2

Prerequisite Dependencies - None

Strategy ID #4

Analytics Software for Real-Time Operations Decision Making

Strategy Description – Integrate back end software linked to the agency ATMS to analyze data for real-time operations decision making. This will include software, server, and identified staff responsible for verifying system outputs. System should be set up to provide reports and alerts to TOC operators or other personnel regarding real-time decision making that needs to be made based on data analysis completed by the software. Data used as inputs to the software may include speeds, volumes, travel times, or other types of traffic condition data. Comparative travel times should be an output of the analytics software to be able to post to the public via multiple traveler information methods such as CMS, website, or push notification via mobile application.

Relation to Needs – The installation of analytics software for real-time operations decision-making addresses the following needs.

- High-resolution traffic data for real-time operational decision making (Need D3)
- Real-time travel time data for operations (Need D4)

Scope/Limits – Install and integrate software to the City's ATMS.

Considerations – The following is a list of other strategies within this agency's Implementation Plan that should be considered along with this strategy.

- ID #2

Prerequisite Dependencies – The following is a high-level list of prerequisite actions that will need to be taken prior to implementing this strategy.

- Deploy modernized vehicle detection equipment to collect real-time data

Strategy ID #5

Share CCTV Camera Video with Individual Agencies

Strategy Description – Utilizing a robust communications center-to-center (C2C) network between agencies, CCTV streaming video images should be shared between agencies. Shared control of CCTV may not be desirable nor feasible but could be allowed through this viewing capability.

Relation to Needs – The development of a center-to-center sharing network addresses the following needs.

- Sharing of camera images to support pre-trip, en-route, and incident management (Need D5)
- Share data between agencies that share a corridor (Need D7)

Scope/Limits – A network will be set up on a regional basis to share CCTV imagery between agencies.

Considerations – See regional document for further details.

Prerequisite Dependencies – The following is a high-level list of prerequisite actions that will need to be taken prior to implementing this strategy.

- Establish communication connection with partner agency

Strategy ID #6

Implement Transit Signal Priority

Strategy Description – Implement transit signal priority along key transit routes where signal timing has made mobility and efficiency for the transit service challenging. This involves infrastructure installed at the signalized intersection as well as integration into the existing signal controller for priority requests of the signal timing plan.

Relation to Needs – Implementing transit signal priority addresses the need of reducing the impact of light rail preemption on traffic mobility (Need D6) and encourages travel mode shift (Need D8).

Scope/Limits – The Gold Line, part of the Sacramento Regional Transit light rail system, passes adjacent to 28 signalized intersections along Folsom Boulevard. Traffic signal priority equipment will be implemented at each of these 28 locations.

Considerations – The following is a list of other strategies within this agency's Implementation Plan that should be considered along with this strategy.

- ID #2

Prerequisite Dependencies – The following is a high-level list of prerequisite actions that will need to be taken prior to implementing this strategy.

- Coordinate signals along light rail
- Coordination with Sacramento Regional Transit to install TSP equipment on light rail system

Strategy ID #7

CV/AV Technology Readiness

Strategy Description – Deploy CV equipment (DSRC radios or equivalent) at signalized locations or other key locations through the use of agency-owned infrastructure. This strategy would initiate a pilot program (with option to extend) of key corridors that supports agency-owned CV technology and would require procuring CV equipment that would need to be installed at signalized intersections along priority corridors by the agency. Expansions to this pilot program would be assumed after the pilot project completion. This strategy does not include the push of specific CV data to vehicles using the system, but rather making the CV infrastructure available for agencies or the region to utilize when CV software and data are more robust and available. Deploy AV pilot for fleet of vehicles to be managed and operated by the agency. This could include transit vehicles or maintenance vehicles, depending on the agency priority. Vehicles would be procured by the agency or a contract with a private provider would be established to provide the vehicles for the AV fleet. The AV fleet program would be closely monitored and managed by the agency and performance evaluations completed to determine its viability for expansion. Capital, operations, and maintenance costs will need to be factored in and identification of the fleet type, number of vehicles, and scope for the pilot program would need to be established.

Relation to Needs – Deploying CV/AV technology addresses the need for the City to be CV/AV ready (Needs D10 and I1).

Scope/Limits – To prepare for CV/AV technology, Rancho Cordova will evaluate its CV roadside technology and ultimately will deploy CV roadside technology at signalized intersections. This technology will be implemented at all 104 signals in the City.

Considerations – The following is a list of other strategies within this agency's Implementation Plan that should be considered along with this strategy.

- ID #1
- ID #2
- ID #3
- ID #6

Prerequisite Dependencies – The following is a high-level list of prerequisite actions that will need to be taken prior to implementing this strategy.

- Deploy modernized traffic signal and ITS device equipment at all signalized intersections

Strategy ID #8

Title – Increase Staffing Levels to Improve Real-Time Operations

Strategy Description – Establish new staffing levels to support the operations and maintenance of the transportation network and Smart Region initiatives. Offered in the plan are ratios of devices to the number of staff required to operate or maintain those devices. The agency should consider potential IT or Traffic Engineering staff that would need to be involved in the implementation of Smart Region initiatives such as data access/sharing and project management of infrastructure implementations. Additional staff may be required such a data analysis staff. The agency will need to identify reallocated staff or hire new staff to support operations and maintenance to implement Smart Region strategies.

Relation to Needs – Increasing staffing levels to improve real-time operations addresses the need for trained staff to support operations (Need O1).

Scope/Limits – Review staffing recommendations in Implementation Plan to determine suggested levels of staffing per transportation network devices.

Considerations – None

Prerequisite Dependencies – The following is a high-level list of prerequisite actions that will need to be taken prior to implementing this strategy.

- Identify point person to recruit and hire staff to support ITS operations and maintenance

Strategy ID #9

Establish Regional Technology Procurement Contract

Strategy Description – Establish a regional technology procurement contract that will be managed by a single agency and can be utilized by local agencies to procure technology for transportation use such as detection, CCTV, CMS, software, or other technologies. This strategy will alleviate the requirement for all agencies to individually establish procurement specifications for this equipment. This contract is envisioned as a qualified vendor list that offers the agencies multiple vendor options for each type of device, not that a single vendor would be chosen for each type of device. This will expedite the procurement and acquisition of technologies in the region. No dedicated budgeting is anticipated for this contract as it is focused on contractual use by individual agencies.

Relation to Needs – Establishing a regional technology procurement contract will address the need of a funding strategy for the Smart Region implementation plans (Need I2).

Scope/Limits – Rancho Cordova should support the development of a regional technology procurement contract.

Considerations – See regional planning document for further details.

Prerequisite Dependencies – The following is a high-level list of prerequisite actions that will need to be taken prior to implementing this strategy.

- Identify a staff member to coordinate with regional staff and other agency staff to develop the technology procurement contract

Strategy ID #10

Establish and Staff Agency TOC

Strategy Description – Establish permanent TOC at the City of Rancho Cordova's future Corporation Yard. Improvements would include including such components as a video wall, extra screens for view only, network equipment, workstation layouts, and workstation equipment. New staff may need to be accommodated and access to systems warrants a specific design and allocation of space within an existing facility or office space. This strategy includes design, procurement, installation, and integration of new TOC components to modern standards and functionality to be able to support Smart Region initiatives. Establish staffing levels to support the operations and maintenance of the transportation network and Smart Region initiatives. Offered in the plan are ratios of devices to the number of staff required to operate or maintain those devices. The agency should consider potential IT or Traffic Engineering staff that would need to be involved in the implementation of Smart Region initiatives such as data access/sharing and project management of infrastructure implementations. Additional staff may be required such a data analysis staff. The agency will need to identify reallocated staff or hire new staff to support operations and maintenance in order to implement Smart Region strategies.

Relation to Needs – Establishing and staffing a TOC for the agency will address the following needs:

- Trained staff to support operations (Need O1).

Scope/Limits – The TOC developed for the City will have at least two workstation locations, a large LCD screen, and a conference room, which is the standard setup for a local TOC. Sites will be evaluated by senior level and production staff to determine a location for the TOC. This implementation will also include developing standard operating procedures and functional requirements.

Considerations – Since the City already has established an ATMS, and a temporary TMC at City Hall, the only considerations required to establish the TMC at the future Corporation Yard would be whether the City desires to relocate the ATMS service equipment away from City Hall. Alternatively, the City could establish a backup server at the Corporation Yard to increase network resilience.

Prerequisite Dependencies – The following is a high-level list of prerequisite actions that will need to be taken prior to implementing this strategy.

- Employ staff to work at the local TOC

Strategy ID #11

Back Up TOC Capabilities

Description – Establish VPN or other remote access to be able to control field infrastructure through ATMS system from a minimum of two physically separate locations. It is recommended that one of the locations is not a laptop or tablet, as there may be instances where that device is physically located in the TOC and thus creates a single-failure-point for the ATMS system. Redundant servers in a separate facility is an ideal condition.

Relation to Needs –

- N4: Reliable communications and systems to prevent downtime

Scope/Limits – At a location that has communications connectivity, locate a server and firewall that can remotely access the main TMC servers to provide live backup and act as a secondary TMC location in case access to the main facility is compromised

Considerations –

- Establish Agency Network Security Policies and Standards
- Communications Sharing to Support Local Agencies
- Improve Existing Communications Capabilities on Key-Corridors

Prerequisite Dependencies –

- Identify a location that has existing communications and can serve traffic management functions
- Consider opportunities to partner with another agency, such as City of Sacramento, to identify the location - there may be opportunities to share fiber to provide the necessary connectivity
- Engage Caltrans IT to procure a server and firewall equipment to be installed at the back up location
- Coordinate with IT to have the server perform live back ups of the main TMC system and provide VPN access to the main server from the backup facility
- If necessary, develop an IGA with partner agency for the facility sharing and establish an agreement for roles and responsibilities related to performing back up operations and define thresholds for activation
- Include new equipment into asset management system and maintenance budget/procedures

Strategy ID #12

Deploy Bluetooth Devices

Description – Deploy Bluetooth devices to collect anonymous speed and travel time data for use in real-time operations, real-time traveler information notifications, or for planning purposes. Devices will require mounting at signalized intersections and connection to the agency's communication network for management and data collection from an agency traffic operations center or via third-party vendor service.

Relation to Needs –

- Robust coverage to acquire real-time conditions (Need #2)
- Real-time travel time data for operations (Need #8)
- Use data to support planning purposes (Need #14)

Scope/Limits – Deploy Bluetooth readers at the following 21 intersections:

- Laguna Boulevard/Harbour Point Drive
- Elk Grove Boulevard/Harbour Point Drive
- Franklin Boulevard/Big Horn Boulevard
- Franklin Boulevard/Laguna Boulevard
- Franklin Boulevard/Elk Grove Boulevard
- Franklin Boulevard/Whitelock Parkway
- Bruceville Road/Big Horn Boulevard
- Bruceville Road/Laguna Boulevard
- Bruceville Road/Elk Grove Boulevard
- Bruceville Road/Whitelock Parkway
- Laguna Boulevard/Laguna Springs Drive
- Laguna Boulevard/E Stockton Boulevard
- Elk Grove Boulevard/Laguna Springs Drive
- Elk Grove Boulevard/E Stockton Boulevard
- Kammerer Road/Promenade Parkway
- Kammerer Road/E Stockton Boulevard
- Elk Grove Florin Road/Calvine Road
- Elk Grove Florin Road/Bond Road
- Elk Grove Boulevard/Elk Grove Florin Road
- Bradshaw Road/Calvine Road
- Grant Line Road/Sheldon Road

Considerations – This strategy is not codependent on any other strategy identified for the City and can stand alone in implementation.

Prerequisite Dependencies – The following is a high-level list of prerequisite actions that will need to be taken prior to implementing this strategy.

- Establish a baseline communications network
- Establish power at traffic signal

Strategy ID #13

Establish CAD System and TOC Connections for Automated Alerts/Notifications

Description – Establish filtered CAD system access from agency TOCs to be able to see when incidents are restricting lanes and warrant traffic management measures. This strategy will involve communications between the public safety network and the agency TOC. The CAD system will need to be filtered to anonymous data for lane restriction and location information only, and separate monitors and server will be required at the agency TOC because CAD will not be integrated into the agency's ATMS system for viewing. If filtered CAD system access is already in place, this strategy will then integrate public safety CAD system with agency ATMS system and TOC. This would involve a significant software integration process to update the public safety CAD system to allow data push in a specific format for agency ATMS to be able to view via the ATMS interface. Software and servers will need to be installed at the agency TOC to support.

Relation to Needs – Better incident coordination across jurisdictions and with public safety (Need #24)

Scope/Limits – Integrate Sacramento County Sheriff CAD system with City's ATMS system and TOC. This scope of work includes software integration to update Sacramento County Sheriff CAD system and City's ATMS system to allow data push from sheriff CAD system to ATMS system and view the data in ATMS interface. The scope includes purchase, installation, configuration and integration of servers and software required at City's TOC.

Considerations – This strategy is not codependent on any other strategy identified for the City and can stand alone in implementation.

Prerequisite Dependencies – The following is a high-level list of prerequisite actions that will need to be taken prior to implementing this strategy.

- Server located at TOC

Strategy ID #14

Establish Agency Network Security Policies and Standards

Description – Network security training will be a requirement for personnel involved in using, accessing, or securing the agency's ATMS system or technologies. This will involve an agency requirement for IT to update security training on a regular basis. This will also involve in procurement specifications that the vendor/firm providing new technology provide training on the new functionality and security standards involved in that new technology. The agency's IT department will need to stay involved in keeping these policies and procedures up to date with current security requirements on the agency enterprise system.

Relation to Needs – Implementing network security policies and standards will address the following need.

- Reliable network security (Need I1)

Scope – The Traffic Department will work with City IT staff to procure a new firewall system and establish standard network security policies for operations and maintenance of traffic assets and the collection, storage, and dissemination of data.

Considerations – This strategy is not codependent on any other strategy identified for the City and can stand alone in implementation.

Strategy ID #15

Improve Traffic Signal Timing Along Key Transit Corridors

Description – Complete signal optimization plans along key transit routes that need updating to consider transit mobility needs as well as transit signal priority, if existing. Signal timing plans need to be developed based on current traffic turning movement counts, developed modeling outputs, and uploaded into the signal controllers. Before and after evaluation of the corridor is recommended as many times tweaks are required of signal timing plans prior to completion of a signal timing plan effort. Use performance metrics to analyze throughput and coordinate light rail and heavy rail preemption where necessary with traffic signal operations.

Relation to Needs – Optimizing traffic signal timing along transit corridors will address the following needs.

- Reduce impact of light rail preemption on traffic mobility (Need D12)

Scope/Limits – The City of Sacramento will develop signal optimization plans for corridors that run adjacent to or intersect Sacramento RT light rail transit corridors. Once signals optimization plans are developed at these locations, the City will prioritize bus transit corridors for retiming based on recommendations from Sacramento RT. Complete signal optimization will be implemented on these corridors based on signal infrastructure capabilities such as detection and communications.

Considerations – The following are other strategies that should also be considered in conjunction with this strategy.

- ID #2 – Modernize Signal Controllers and Cabinets
- ID #16 – Implement Transit Signal Priority

- **Prerequisite Dependencies** – The following is a high-level list of prerequisite actions that will need to be taken prior to implementing this strategy.

  - Establish a functional baseline communications network

Strategy ID #16

Real-Time Data Connection between Transit and Transportation Agencies

Description – Establish connection between transit and transportation agencies for sharing data related to transit services. The purpose is for transportation agencies to organize traffic operations to accommodate transit services through collected data, such as vehicle location and on-time schedule performance that can better support the coordination of transit mobility and traffic mobility. This strategy specifically addresses transit signal priority needs and light rail transit needs for better mobility.

Relation to Needs – This is a mapping of strategies to the original needs, recognizing that one strategy may serve multiple needs.

- Share data between agencies that share a corridor (Need 10)
- Encourage travel mode shift (Need D11)
- Real-time traveler information (Need D12)
- Improve traffic operations (Need O3)
- Improve notification and alerts to travelers (Need O9)

Scope/Limits – Develop inter-agency agreements to share real-time data collected through video detection and CCTV cameras.

Considerations – The following are other strategies that should also be considered in conjunction with this strategy.

- ID #2 – Deploy New Video Detection and CCTV Equipment
- ID #4 – Third Party Real-Time Data
- ID #5 – Perform ATMS Data Back Up
- ID #7 – Establish Central Regional Video Management System
- ID #10 – Share CCTV with Individual Agencies
- ID #11 – Share CCTV with Agency Public Traveler Information Platforms

Prerequisite Dependencies – This is a bullet list summary of the high-level steps required to implement the strategy.

- Establish CCTV Sharing Agreements between the individual agencies.
- Deploy modernized CCTV cameras at identified locations
- Establish an inventory of supplemental CCTV cameras

Strategy ID #17

Train Staff on Network Security

Description – Network security training will be a requirement for personnel involved in using, accessing, or securing the agency's ATMS system or technologies. This will involve an agency requirement for IT to update security training on a regular basis. This will also involve in procurement specifications that the vendor/firm providing new technology provide training on the new functionality and security standards involved in that new technology. The agency's IT department will need to stay involved in keeping these policies and procedures up to date with current security requirements on the agency enterprise system.

Relation to Needs – This is a mapping of strategies to the original needs, recognizing that one strategy may serve multiple needs.

- Reliable network security (Need I1)

Scope/Limits – Sacramento County will need to consider placing staff through technology training tracks and/or encourage staff to pursue certifications.

Considerations – The following are other strategies that should also be considered in conjunction with this strategy.

- ID #5– Perform ATMS Data Back Up
- ID #23 – Establish Agency Network Security Procedures and Standards

Prerequisite Dependencies – This is a bullet list summary of the high-level steps required to implement the strategy.

- Agency must have a defined set of security procedures and standards in order to train staff

APPENDIX C - COST ASSUMPTIONS

Table 1: Cost Summary

Project No.	Project Description	VID	Transit Signal Priority	Controller Upgrade	Intersection Fiber Equipment	CCTV	CMS	Communication (Miles)			Communication Hub	Install Ethernet Over Copper Device	Connected Vehicle Technology	ATSPM	Planning Level Cost
								New	In empty	Replace					
Infrastructure Projects - Improve Existing Communications Capabilities															
Communication Gap Closures, Communications Equipment Upgrade, Upgrade to Fiber															
1	Old Placerville Upgrade - Bradshaw Road to Schriever Avenue	4		4	4	4		2.0							$ 2,100,300.00
2	Routier Road - Old Placerville Road to Vanguard Drive, Vanguard Drive - Routier Road to Pegasus Way	3		3	3	3		1.0							$ 1,115,600.00
3	Folsom Boulevard - Bradshaw Road to Hazel Avenue	29	28			11						2	28	28	$ 2,464,200.00
4	Sunrise Boulevard - Jackson Road to Bridge Street	19				8	4	2.4					21	21	$ 3,484,600.00
5	Coloma Road - Folsom Boulevard to Sunrise Boulevard	14				3	1						18	18	$ 894,600.00
6	International Drive / Mather Field Road - to Folsom Boulevard to Sunrise Boulevard	12				2	2						10	10	$ 720,000.00
7	Bradshaw Road - Old Placerville Road to Folsom Boulevard	6		6	6	6							6	6	$ 621,000.00
8	Zinfandel Drive - Sunrise Boulevard to Douglas Road	13				3	2					1	12	12	$ 812,700.00
9	White Rock Road - Zinfandel Drive to Sunrise Boulevard	4				1	1				1		4		$ 325,600.00
10	Douglas Boulevard - Sunrise Boulevard to Grant Line Road	6			4	4		2.0			1		6		$ 2,265,700.00
11	Grant Line Road - Jackson Road to Douglas Boulevard	1											1		$ 45,000.00
12	Hazel Avenue Upgrades					1	1								$ 63,000.00
13	Rancho Cordova Parkway - Douglas Road to Kiefer Road							0.6							$ 525,300.00
New Development Area Projects															
14	White Rock Road - Sunrise Boulevard to Grant Line Road	3			3	3		4.9					3		$ 4,546,700.00
15	Rancho Cordova Parkway - Douglas Road to Kiefer Road	9			9	9		6.5					9		$ 6,460,600.00
16	Americanos Boulevard - Kiefer Boulevard to Rancho Cordova Parkway	7			7	7		5.6					7		$ 5,501,600.00
17	Centennial Drive - Americanos Boulevard to International Drive	4			4	4		3.0					4		$ 2,968,700.00
18	International Drive - Sunrise Boulevard to Future Americanos Road							3.5							$ 3,064,400.00
19	Chrysanthy Boulevard - Sunrise Boulevard to Grant Line Road					1		3.2					1		$ 2,828,800.00
20	Kiefer Road - Rancho Cordova Parkway to Grant Line Road					1		1.4			1		1		$ 1,335,400.00
21	Easton Valley Parkway - Rancho Cordova Parkway to Nimbus Road & Nimbus Road - Easton Valley Parkway to I-50							2.7							$ 2,364,000.00
22	Sunrise Boulevard - Jackson Road to Douglas Boulevard					1									$ 18,000.00
23	Douglas Boulevard - Sunrise Boulevard to Grant Line Road					5									$ 90,000.00
Non-Infrastructure Projects															
24	Develop Center-to-Center Network for Sharing CCTV Imagery with Regional Partners														See Regional Document
25	CV/AV Roadside Technology Evaluation														$ 38,880.00
26	O-D and Travel Time Technology Deployment Evaluation														$ 36,720.00
27	Install TMC at Future Maintenance and Corporation Yard														$ 54,000.00
28	Increase Staffing Levels to Improve Real-Time Operations														*Salary-dependent*
29	Support of Regional Technology Procurement Contract Development														See Regional Document

APPENDIX D - PRIORITIZATION SUMMARY

Table 1: Prioritization Summary

Project	Project Corridor	Address multijurisdictional networking	Adapt to new technology	Improve reliability and consistency of driver trips	Safety	Improve traveler information and dissemination	Emergency / disaster preparedness	Contribute to operational and institutional efficiency	Enhances major corridors	Extent that project achieves local objectives	Other projects rely on this project	Total Strategy Score Compared to Objectives
		10	13	10	13	10	5	10	10	14	5	100
1	Old Placerville Upgrade - Bradshaw Road to Schriever Avenue	4	3	3	1	0	1	3	4	4	4	68
2	Routier Technology Upgrade - Old Placerville Road to Vanguard Drive, Vanguard Drive - Routier Road to Pegasus Way	4	3	3	1	0	1	3	4	4	4	68
3	Folsom Technology Upgrade	4	3	3	1	0	1	3	4	4	4	68
4	Sunrise Technology Upgrade	3	3	3	1	4	1	3	3	3	3	69
5	Coloma Technology Upgrade	3	3	3	1	3	1	2	2	3	2	60
6	International / Mather Field Technology Upgrade	3	3	3	1	3	1	2	2	3	2	60
7	Bradshaw Technology Upgrade	3	3	2	1	0	1	3	2	2	0	46
8	Zinfandel Technology Upgrade	3	3	2	1	3	1	3	2	2	0	54
9	White Rock Technology Upgrade	2	3	3	1	4	1	3	2	2	0	56
10	Douglas Technology Upgrade	1	2	2	1	0	1	3	1	1	0	32
11	Grant Line Upgrade	1	2	2	1	3	1	3	1	1	0	40
12	Hazel Upgrade	1	2	2	1	0	1	3	1	1	0	32
13	Rancho Cordova Parkway Upgrade	1	2	2	1	0	1	3	1	1	0	32
14	White Rock Road (New Development Area) Technology Upgrade	2	2	1	1	0	1	3	1	1	0	32
15	Rancho Cordova Parkway (New Development Area) Technology Upgrade	1	2	1	1	0	1	3	1	1	0	30
16	Americanos Boulevard (New Development Area) Technology Upgrade	1	2	1	1	0	1	3	1	1	0	30
17	Centennial Drive (New Development Area) Technology Upgrade	1	2	1	1	0	1	3	1	1	0	30
18	International Drive (New Development Area) Technology Upgrade	1	2	1	1	0	1	2	1	1	0	27
19	Chrysanthy Boulevard (New Development Area) Technology Upgrade	1	2	1	1	0	1	2	1	1	0	27
20	Kiefer Road (New Development Area) Technology Upgrade	1	2	1	1	0	1	2	1	1	0	27
21	Easton Valley Parkway and Nimbus Road (New Development Area) Technology Upgrade	1	2	1	1	0	1	2	1	1	0	27
22	Sunrise Boulevard (New Development Area) Technology Upgrade	1	2	1	1	0	1	2	1	1	0	27
23	Douglas Boulevard (New Development Area) Technology Upgrade	1	2	1	1	0	1	2	1	1	0	27