Pomona Valley
ITS Project

Project Deliverable 8.1.2
Recommendation Report

Prepared by:
Kimley-Horn
and Associates, Inc.

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PROJECT DESCRIPTION

The County of Los Angeles, in cooperation with the cities within the Pomona Valley, has determined that development of an Intelligent Transportation System (ITS) in the Pomona Valley would help to reduce congestion, enhance mobility, provide traveler information during non-recurring and event traffic congestion, and manage event traffic. The Pomona Valley Intelligent Transportation Systems (PVITS) project was conceived as a recommendation from the Pomona Valley ITS Feasibility Study completed by the LACMTA in 1995. The ultimate objectives of the Project are to:

- Improve mobility by optimizing traffic management on arterials and freeways;
- Enhance Route 60 capacity by better coordinating freeway traffic with parallel arterials;
- Improve agency efficiency by coordinating management of operations and maintenance efforts among and between agencies; and
- Increase agency staff productivity by providing low-maintenance, high-quality communications and computational tools to assist in daily management and coordination activities.

Phase 1 of the PVITS project is the development of a conceptual design that defines solutions to enhance capacity, reduce congestion, and improve traveler information in the Pomona Valley.

1.0 BACKGROUND

1.1 Purpose of Report

This report summarizes the recommendations for traffic signal and advanced technology solutions for deployment in the Pomona Valley subregion of LA County. Included in this report are summaries of recommendations for the following systems:

- Advanced Traffic Management System (ATMS)
- Communications
- Advanced Traveler Information System (ATIS)
- Subregional Traffic Management Center (TMC)
- Local Control Centers (LCC)
- Integration of the Various Systems

1.2 Report Organization

The information in this report is presented in the following sections:

Section 1 – Introduction

Section 2 – ATMS Recommendations

Section 3 – Communications Recommendations

Section 4 – ATIS Recommendations

Section 5 – Subregional TMC Recommendations

Section 6 – Local Control Center Recommendations

Section 7 – Integration Recommendations

2.0 ATMS RECOMMENDATIONS

2.1 Background

An ATMS is a system that can provide an agency with tools for managing traffic including the capability to operate traffic signals, collect and process data from vehicle detectors, operate and view closed-circuit television (CCTV) cameras (if desired), operate Dynamic Message Signs (DMS) and Trailblazers (if desired), and share data with other systems (such as a subregional Pomona Valley Advanced Traveler Information System [ATIS]) and other stakeholders. There are many options available for implementation of the ATMS, both in terms of which system to procure and in terms of which agencies will own and maintain their own systems and which will share.

Deliverable 7.1.1 ATMS Alternative Analysis reviewed these options and made recommendations for the following facets of the ATMS for the Pomona Valley Forum. The recommendations are summarized in this report.

- § ATMS Architecture – describes recommendations for which agencies should own and maintain their own systems, which should share ownership with other local agencies to reduce the maintenance burden, and which should contract with LA County to operate and maintain their traffic signals
- § ATMS Selection – summarizes the conclusions of the analysis of numerous off-the-shelf ATMS that are on the market for deployment in the Pomona Valley Forum; provides guidance for choosing systems for the Pomona Valley agencies
- § Vehicle Detection – as detection is a critical component of the solutions to improve traffic in the Pomona Valley Forum (in terms of improving traffic signal operation and collecting real-time traffic flow data) this section summarizes the results of the technology analysis that recommends which technologies would best serve the detection needs of the Pomona Valley

Additionally, locations of CCTV cameras and dynamic message signs and Trailblazer signs will be made in *Deliverable 13.1.2 Conceptual Design Report*. CCTV cameras are proposed to be located at critical intersections to assist local agencies in arterial management. A small number of arterial-based DMS are proposed to be deployed on key routes serving traffic traveling to the Fairplex. Trailblazers, which are smaller signs focused on route guidance, are proposed to be located at and around the Fairplex to improve congestion related to access and event parking. A network of Trailblazers are also proposed for arterials that comprise the SR 60 corridor in the west of the study area to improve mobility during both recurring and non-recurring congestion. Locations will be developed based on input from local agencies, the needs identified throughout the course of this project, engineering judgment, and concurrence on maintenance and use of the equipment by local agencies. The locations for these elements will be prioritized regionally for phased construction.

2.2 System Architecture (Deployment Options)

There are numerous ways of deploying ATMS for the various agencies in the Pomona Valley. A single system can serve all of the agencies, each agency can have its own system, or a hybrid option can be developed. The way in which the system(s) are procured and deployed is called the

system architecture. The architecture is the blueprint that describes the option that is chosen for system deployment. Given the technology, communication, and networking capabilities of the ATMS that are on the market, the way that the system(s) is deployed can be transparent to a city's operations. An operator would have the same user interface, go through the same actions, and interact with his or her field elements in the same way if a system is dedicated to that operator's city or if the system is shared among two or more cities. From an individual agency's perspective, operations will be identical regardless of which deployment option is chosen.

While the majority of the traffic signal controllers in the area are Type 170 controllers, a small number are NEMA controllers (less than four percent). The type of controller, whether it is Model 170 or NEMA, will affect the choice of the ATMS. **It is recommended that existing NEMA controllers be replaced with Model 170 or 2070 controllers for compatibility with the systems to be procured**. Normally, Model 2070N controllers can replace NEMA controllers with little change in functionality or ease of use (assuming staff training is provided); however, if a city would prefer to keep its NEMA controllers, alternatives to this recommendation can be explored on a case-by-case basis.

Three deployment options were identified:

Option 1, Single System Shared By All Agencies – a cost savings can be achieved by deploying one single ATMS for all Pomona Valley Forum cities. These cost savings would include the reduction in engineering and design effort, procurement discount, and savings in integration cost. As all PV Forum cities would get the same ATMS under this option, there is guaranteed scalability and interoperability. Within the Forum, only the City of Pomona currently owns a traffic control system, QuicNet IV, that is operational for a small number of signals on the Alameda Corridor East IR/RIS demonstration project. If this option is selected, Pomona's current system would be replaced with the proposed ATMS for the region. The disadvantage of this option is that the cities would not have the ability to choose their own system and would need to agree on one single ATMS.

Option 2, Separate System for Each Agency – the total deployment cost will be dependant on the ATMS selected by each agency. The deployment schedule will be dependant on the availability of each ATMS and the equipment lead time of the different ATMS components. This approach may have issues regarding scalability and interoperability because some ATMSs do not have an open architecture, which means that the system is designed to be able to connect with and communicate with other systems and that the vendor allows vendors of other systems to view the code necessary to create the connection. The open architecture challenge could be addressed by requiring development of an IEN interface as a prerequisite to funding each deployment. The deployment schedule would likely be extended when compared with the other options, since more different vendors might be involved, some of whom would need to implement software modifications (e.g. to deploy an IEN interface).

Option 3, Hybrid Procurement – the Forum cities will be divided into groups and the groups will be analyzed to determine whether each city within the group gets its own ATMS or whether the group will share a single ATMS procurement. This approach allows a city with fewer resources to join forces with a larger city or another smaller city. Also, the cities in each group can select the system that best suits their individual needs.

The agency groupings were based primarily on proximity to one another within the Forum, size of staff, current operating and maintenance arrangements and capabilities, and quantity of signals.

These options were evaluated against several criteria, including cost, system maintenance impacts, ease of procurement, scalability, interoperability, and compatibility. **It is recommended that Option 3 be the deployment option for the Pomona Valley ITS project.** The following hybrid deployment is recommended. This recommendation is also depicted in the following figure.

Group 1

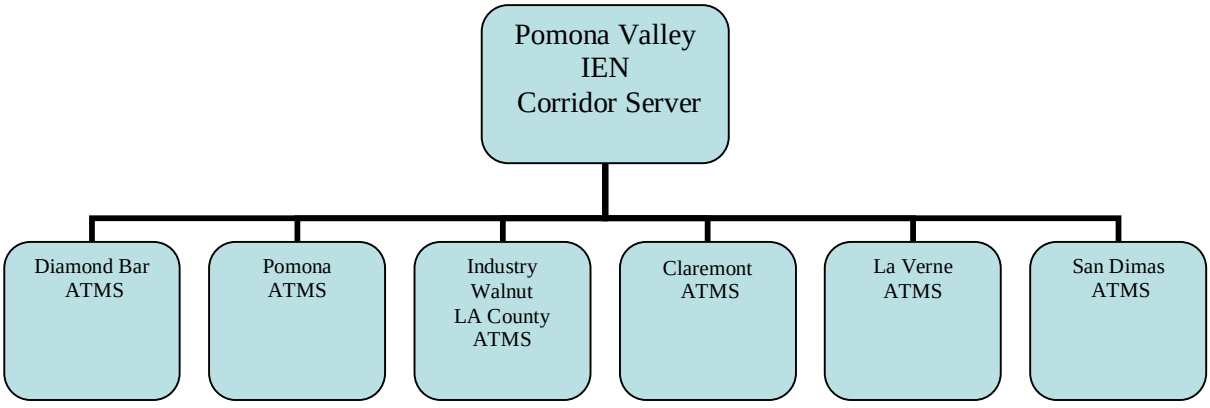
- Diamond Bar – select and procure its own system
- Pomona – expand QuicNet IV for deployment throughout the City OR select a new system

Group 2

- Industry – establish agreement for LA County to operate/ continue to maintain signals
- Walnut – establish agreement for LA County to operate/ continue to maintain signals
- LA County signals – currently in the process of installing a system at TMC in Alhambra; would operate/ maintain County-owned, Industry, and Walnut signals

Group 3 – select and procure a separate system for each of the three cities in Group 3

- Claremont
- La Verne
- San Dimas



2.3 ATMS Selection (Alternatives)

Deliverable 7.1.2 ATMS Alternative Analysis started with identifying a list of ATMS candidates' alternatives, which included existing systems that are currently on the market. A general review of these candidate systems was performed to identify systems that meet the basic requirements, such as the ability to operate with 170 controllers without modifications[1], vendor responsiveness, technical support and warranty, etc. By evaluating the ATMS candidates against these basic requirements, several ATMSs were eliminated during the general review. The following ATMS were analyzed in detail:

1. QuicNet/4 by BI Tran
2. ACTRA by Siemens/ Eagle
3. *icons* by Econolite Control Products/i2 TMS by Siemens-Gardner
4. Series 2000/Transuite by Transcore
5. KITS by Kimley-Horn
6. Pyramids by Econolite-AECOM

The detailed analysis consisted of a review of the system features and an evaluation against specific criteria such as conformance to user and functional requirements, technology maturity, ease of integration, cost, system features, etc. The following system features of each ATMS were reviewed and compared.

- Control Strategy - the method used by the ATMS to control the traffic signal controllers (sync pulse, closed-loop, time-based coordination, or centralized control)
- LAN/WAN Capabilities - the ability of the system to display data or be controlled over a local or wide area network
- Capacity - the theoretical limit (quantity) of controllers that can be handled by the system
- Local Controller Compatibility - identifies compatibility with NEMA, 170, and 2070 controllers
- Communication Requirements - describes the communication requirements of the system
- Coordination Plan Selection Methods - which methods are available (traffic-responsive, critical intersection control, override capability, others)
- Alarms - the means available to alert system users to issues that need attention
- GUI – provides graphical access to the software by users
- Evaluation – describes numerous evaluation features that are within the system and that require export to a spreadsheet program
- System Detection – capability of the system to provide volume counts [as collected locally in an intersection controller and aggregated into bins or groups for a user-selected time duration (usually five or 15 minutes)]. The ATMS gathers these "system" volume counts from the controller for bins that are completed.
- Video Detection - The ability for a system to utilize video detection technology to detect vehicles.

[1] There are a small number of NEMA controllers in the Pomona Valley on regionally significant arterials. It was recommended as a part of the analysis to replace the NEMA controllers for ease of compatibility with the new traffic signal systems.

- § ATMS / ATIS - enhanced features that provide the system user with additional tools and capabilities such as CCTV, DMS, traveler information, and coordination with a video display wall. The capability of a system to have these features integrated directly into the ATMS user interface (as opposed to being a separate, standalone application that could be running in the background concurrently) is indicated.
- § Advanced Functions - identifies which advanced ITS functions are available and integrated into the system. Examples include transit priority interface, emergency/ rail preemption, and incident management.

Information regarding these system features for each alternative was based on supporting data, information provided by the vendor, or from web-based research.

The six ATMS alternatives have many common features. For example, all systems have LAN, WAN, and GUI capabilities and support the most common communication media/technology, such as optical fiber, twisted pair, phone dial up, and microwave. However, each system has its own strengths and shortcomings.

Series 2000/Transuite is not recommended for deployment in the Pomona Valley due to its high cost relative to available features. Pyramids is not recommended for deployment in the Pomona Valley because it has a higher cost and offers less potential for integration with other Los Angeles County systems as compared with other systems that were analyzed.

Based on the analysis (see Deliverable 7.1.2 for full documentation of the analysis), QuicNet/4, KITS, and i2TMS were recommended as options for deployment in the Pomona Valley Region. Each of the agencies/ groups of agencies should make a selection for a system that they prefer, based on demonstrations by vendors, within this recommendation.

2.4 Vehicle Detection Selection (Technology Alternatives)

The primary purpose of a vehicle detection system is to provide real-time data about vehicle presence and other vehicular traffic features such as volume, density, and average speed. The signals that have been included in the County's Traffic Signal Synchronization Program (TSSP) for traffic signal timing and coordination have been (or will be) outfitted with advance and presence detection, which inform the controllers or ATMS of traffic demands for signal actuation.

System detectors collect speed, volume, and occupancy data and feed the data to a computerized traffic control system (ATMS) for traffic signal coordination adjustments, for use by the signal system operators for other traffic management strategies, or to be disseminated as traveler information. Ideally, system detectors are placed in a location that is unaffected by traffic signal queues. This means that, their ideal placement is further upstream than advance detection. Using one set of loops for both advance detection and system detection is a compromise between deployment cost and functionality; however, this compromise is often found to be acceptable.

It is recommended that system detection be implemented in the Pomona Valley Forum in order to establish the ability to collect real-time information for traveler and operator use. Mid-block system detection will not generally be included in the final Pomona Valley ITS program based on direction from the County, except potentially in key locations where traffic regularly queues over the advanced detection. Advanced detection may be used as system detection at a portion of the intersections (potentially approximately 25%) in the study area in order to collect an adequate quantity of real-time data for traffic management and traveler information.

The detector technologies were evaluated against the system detector requirements. **Table 2.1** presents the results of the evaluation.

Table 2.1 Comparison of System Detection Technologies

Detection Technology	Feature and Measuring Capability											
	Accurate Count	Presence	Speed	Occupancy	Vehicle Classification	Delay at Intersection	Incident Detection	Queue Length	Directional capability	Ease of Installation*	Number of Lanes a Single Unit Can Cover	10-Year Life Cycle Cost per Approach (three through lanes)
Inductive Loops	X	X	X	X	X	N/A	N/A	N/A	X	1	1	$19,600
Radar/Microwave Detectors	X	X	X	X	X	N/A	N/A	N/A	X	1	8	$6,600
Acoustic Detectors	-	X	X	X	N/A	N/A	N/A	N/A	X	2	5	$9,800
Video Image Detectors	X	X	X	X	X	X	X	X	X	1	4	$29,800
Infrared Detectors	-	X	X	X	X	N/A	N/A	N/A	X	3	4	$12,800

* 1- Easy, 2- Average, 3- Difficult

Based on the cost comparison only, the use of radar/microwave detectors for system detection is the most cost effective alternative over a 10-year life cycle. However, other factors must be considered to select the appropriate system detection technology, such as intersection conditions (geometry and sight distance), weather, and pavement type, and so forth. For example, inductive loop detectors require more effort to install in concrete pavement, while video detection systems require the camera unit to be installed at a certain height above the roadway to provide adequate line of sight.

The selection of a detection system should also consider the types of traffic information that need to be collected for a given application. Video detection is the only technology that provides all of the traffic flow measurements: vehicle counts, presence detection, vehicle speeds, lane occupancy, vehicle classification, intersection delay, incident detection, and queue length. It should be noted that video detection is unique in that it can actually be more cost effective in instances when it is installed to provide coverage at more than one of the detection zones (presence, advance, or system).

The following technologies are not recommended for use as system detectors:

- *Acoustic*—Not capable of providing sufficient count accuracy.
- *Infrared*— Not capable of providing sufficient count accuracy.

It is recommended that the following technologies be considered for use as system detectors:

- *Inductive loops*—Reasonable cost, proven technology, local agencies are comfortable maintaining them.
- *Video detection*—Greatest feature set; capable of returning live video from field
- *Radar/microwave*—Good performance at low cost.

3.0 COMMUNICATIONS RECOMMENDATIONS

3.1 Background

Communications are critical to the application of advanced technologies by serving as the link between field devices such as traffic signals, CCTV cameras, and Dynamic Message Signs (DMS) and an agency's central computer system – this is known as ***field-to-center*** communications. In addition, communications allow the transfer of data and information between different remote centers such as the subregional TMC, the Local Control Centers (LCC), and the LA County TMC – this is known as ***center-to-center communications***. There are many options for communications networks to meet these goals of providing center-to-field and center-to-center communications.

Field-to-Center

The communication system between the field equipment and the control center is influenced by the type of field equipment. Different equipment has different communication bandwidth requirements. The bandwidth is the "speed" or "size" of the communication channels for transmitting data and video.

Center-to-Center

To support the communication requirements for traffic control and video surveillance between a LCC and the Subregional TMC, and between the Subregional TMC and the LA County DPW TMC in Alhambra, it will likely require a high bandwidth transmission capacity.

This section provides a brief summary of the methodology used to select a communications solution in *Deliverable 7.2.2 Communication System Alternative Analysis*, briefly summarizes each alternative that was analyzed, and summarizes the recommendations.

3.2 Methodology

There are three alternatives that were analyzed as candidates to support the advanced traffic management system and advanced traveler information systems being recommended for deployment in the Pomona Valley:

- the leasing of facilities from public telecommunication companies;
- the development of a common agency-owned communication network, including all the conduit infrastructure, cables, and electronics; or
- a hybrid of both.

The key differences between these three alternatives are the capital and annual operations and maintenance costs, and the maintenance responsibilities.

Within the agency owned communication network alternatives, various technology options are available, such as:

- Analog Transmission

- Digital Transmission (copper or fiber using SONET or ATM technology)
- Wireless Transmission (microwave radio, spread spectrum radio, and Cellular Digital Packet Data [CDPD])
- Ethernet Transmission (twisted-pair copper, optical fiber and wireless using Ethernet technology)

3.3 Communications System Recommendation

Leased Network Conclusion

The center-to-field network will be a hybrid network based on the existing traffic signal interconnect and other existing agency-owned communications and will be supplemented with new leased services. A small segment of interconnect will be installed on Colima Road between Stoner Creek Road and Nogales Street where it is more cost effective to complete the hardwire interconnect than to lease connections to each of the signals. The center-to-center network will be comprised of leased services.

The MTA will allow program funding to be allocated to leasing communication lines under the following conditions (per MTA's leased line policy):

- There will be a 10 year cap on lease expenses.
- The County and local agencies participating in the lease of communication lines must sign an agreement with the MTA committing to fund lease costs after 10 years.
- Savings achieved from leasing communication lines shall be returned to the MTA.
- Agencies entering into leased line agreements will provide all documents to the MTA for review and approval prior to entering into any agreement.
- The payment of lease costs in no way implies that the MTA will pay on-going O&M costs associated with this ATMS/ITS program.

Summarized, each of the participating agencies must enter into an agreement, stating their intentions to fund the lease costs after the ten year cap has been reached. Additionally, relative to the third bullet listed above, discussions with MTA staff have confirmed that if there are ultimate grant cost savings that are achieved as a result of utilizing lease lines that these funds would be returned to the MTA at the end of the project.

From an economic perspective, the selection of a leased network is logical. Although there may be limitations on video transmission quality, the significant cost differences between the leased network alternative and others makes it the desirable alternative.

Agency-owned Network Conclusion

Analog and Wireless Options

Of the candidates evaluated, analog, microwave radio, spread spectrum radio and CDPD Radio are not considered viable candidates to be the principal transmission technology (though may be used in spot locations where applicable) for the PVITS communication network for various reasons such as inadequate bandwidth for center-to-center communications, insufficient video transmission capabilities, limited capacity expandability, low network service reliability, and error-prone data transmission.

Digital Option

For the agency owned network alternatives, although they have a higher life-cycle cost when calculated over a ten-year period, another aspect to be considered is the useful life of an optical fiber infrastructure. Although the average use life for communications electronic equipment is 10 years, the optical fiber infrastructure has a useful life of 35 to 40 years. Consequently, the amortization of these funds can be spread over a longer period of time.

Among the agency owned network alternatives, SONET and ATM technologies (using copper or fiber optic cable) are technically sound, but the implementation of these types of networks will necessitate the construction of an underground conduit infrastructure which will incur a substantial capital cost. Additionally, the only way to get the full benefit of these technologies is to build a "ring" or "mesh" physical topology for redundancy, which adds significantly to the capital cost. Additionally, the need for maintenance staff trained to maintain these technologies would likely be a continual challenge for the Pomona Valley stakeholder agencies. Therefore, this diminishes the desirability of these candidate alternatives.

Ethernet Option

The next most viable alternative when considering the ease of development and maintenance would be the Gigabit Ethernet technology. Although this technology has a high capital cost, it has the best potential to satisfy all requirements of PVITS stakeholders as well as the architecture and protocols of the transportation sector. Besides, maintenance staffing for this technology should be less demanding than SONET or ATM, since Ethernet is the prevailing technology for standard office local area networks (LANs), so existing office LAN maintenance staff (usually information technology division or information systems division staff) would be able to maintain the ITS network as well.

With regard to the development of an agency owned communication network, one key consideration for the PVITS stakeholders is maintenance. While existing information technology staff would be logical candidates to maintain an agency-owned communication network, building this network would add a significant amount of workload to those existing staff. The municipalities within the Pomona Valley Forum would likely need to hire additional maintenance staff or outsource to maintenance contractors for routine maintenance of the network infrastructure, including the conduits, fiber optic cables, and all electronics equipment. This is a long-term commitment. The decision to develop an agency owned network should be made only if each municipality commits to support the long-term maintenance of that agency's portion of the network.

Therefore, the recommendation of this study is as follows:

The center-to-field network will be a hybrid network based on the existing traffic signal interconnect and other existing agency-owned communications and will be supplemented with new leased services. Leased services will consist of 9600 baud data lines for all digital equipment (e.g., traffic signals, DMS, and Trailblazers) and T1 lines for CCTV. A small segment of interconnect will be installed on Colima Road between Stoner Creek Road and Nogales Street (approximately 1.4 miles) where it is more cost effective to complete the hardwire interconnect than to lease connections to each of the signals. The center-to-center network will be comprised of leased services with bandwidths necessary to support the services and systems being implemented (T1 lines would likely be appropriate).

4.0 ATIS RECOMMENDATIONS

It has been recommended that an Advanced Traveler Information System (ATIS) be developed to serve the Pomona Valley region. The goal of the Pomona Valley ATIS would be to provide accurate pre-trip and en-route information to motorists about current road conditions, closures, restrictions, incidents, and other factors that could affect their commute. The ATIS will use real-time data generated by the various ATMS in the region as well as event information from the various jurisdictions entered through the Information Exchange Network (IEN), and current travel conditions information to broadcast information to motorists.

Based on the ATIS component analysis in the *ATIS Analysis Report* (Deliverable 7.5.2), Table 4.1 below shows the technology recommendations and associated benefits for the Pomona Valley traveler information system. Table 4.2 provides a recommended ATIS strategy for the Forum and Fairplex for the short-term (3-year duration).

Table 4.1 Summary of ATIS Forum Technology Recommendations

Technology	Recommendation	Benefits
Highway Advisory Radio	While portable HAR was initially recommended for deployment in the Pomona Valley, a recent Caltrans project will deploy HAR in the vicinity of the project. Additional HAR would not be able to operate in such close proximity to the others. HAR is not recommended at this time for deployment by the Pomona Valley agencies.	§ HAR units can be moved to high impact locations (major events at Fairplex, construction zones, etc.) § Provide event-specific en-route information § Cost-effective, low-maintenance technology § Can use recorded messages or text-to-speech application § Potential to reach broad audience
CCTV Cameras	§ CCTV cameras are recommended for traffic management use in the Pomona Valley. § Dissemination of CCTV images to the public is recommended. § Digital CCTV is recommended for use in the Pomona Valley Forum for advantages over analog for comparable costs, including ease of video sharing.	§ Video can be used to reduce maintenance staff time in responding to complaints by providing a remote view of field conditions prior to going to the field. This view could eliminate some field visits and could prepare maintenance staff better prior to the other field visits, making the trips more efficient. § CCTV images can supplement real-time arterial maps generated by an ATMS by providing visual confirmation of roadway conditions. The images can lend credibility to the map data for the general public and traffic operations/ maintenance staff.
DMS	DMS is recommended for use on arterials in the Pomona Valley Forum. To reduce the aesthetic concerns of having large, dynamic signs in neighborhoods, a limited number of full dynamic signs will be recommended to be supplemented by CMS used for identifying routes (Trailblazers) and for specific spot information such as around and leading to the Fairplex. LED technology is recommended for use in the Pomona Valley due to the lower capital cost (compared with fiber optic technologies) and ease of maintenance (compared with shuttered or flip-disc options). The visibility of an LED will be acceptable for arterial use.	The primary function of DMS is to provide en-route information to drivers in spot locations regarding current traffic conditions. This information can assist drivers in choosing to take alternate routes or remain on current routes based on real-time information about adverse conditions.

Technology	Recommendation	Benefits
Community Access Television	CATV is not recommended at this time for deployment by Pomona Valley agencies. CATV has not demonstrated significant benefit for the cost and operations requirements, but could be re-evaluated over the next few years for potential future deployment. Pomona Valley agencies could serve as the data source (through the ATIS server located at the subregional TMC) if a private partner, such as ETAK/Metro Networks chose to deploy this type of ATIS solution.	§ If a private partner were to take the lead in transmitting regional data, formatting for broadcast on CATV, coordinating with the broadcast station and helping to promote the service, there would be no cost to agencies for this type of service § Public access stations are often looking for content, and might see a traffic report as a viable, important program to air § Has potential to reach a broad audience, particularly in AM peak period, since travelers generally have better access to television from home compared with from work

Technology	Recommendation	Benefits
Public Traveler Information Web Site	An ATIS web site for the Pomona Valley was recommended to be developed and hosted on LA County's current internet web site server, with an easily recognizable URL (such as PVTraffic.com). Initially, the site will include only static information from the Pomona Valley region, but eventually, it can be combined into a county-wide ATIS. This web site will include information from the IEN as well as manually entered data. As part of the initial web launch, primary information areas will include: § Map of arterials and freeways § Major incidents (manually entered as desired by local agencies) § Construction/closures/alternate routes § Events § Links to multimodal information § Links to Pomona Valley forum local agency web sites § Links to regional and state agency web sites The web site can be expanded as new information becomes available (e.g., CCTV snapshots). Web sites are the most widely used technology and the easy access to a Pomona Valley traffic web site will improve the opportunity for road users to plan their trips. The site could be maintained initially by the LA County IT staff, given that it will be hosted on the County's internet web site server. Eventually, the site can be combined with a county-wide ATIS web site, such as the LA/ Ventura ATIS, or, if such a site does not come to fruition, the Pomona Valley site can be moved to be hosted on a server at the subregional TMC.	§ Low-cost, accessible technology for pre-trip information § Makes extensive use of data gathered through IEN § Web can serve as foundation for ATIS data for other technologies (XML will allow for easy access by ISPs, Voice XML can translate to speech for telephone advisory system) § Easily expandable to accommodate new types of information § Used to co-promote other ATIS services, including phone line and HAR

Technology	Recommendation	Benefits
Travel Advisory Telephone	Travel Advisory Telephone is not recommended for a stand-alone deployment in the Pomona Valley. It has been recommended that PVITS coordinate with any potential upcoming Los Angeles area effort to implement 511, per national standards. Pomona Valley agencies would serve as data providers through the IEN and other information exchange systems, which would not involve a cost to the Pomona Valley agencies.	§ Provides pre-trip and en-route information via landline and wireless telephones. § Regional travel advisory telephone service eliminates need for PVITS to host service or phone lines.
Kiosks	Stand-alone kiosks not recommended for deployment. Kiosks have demonstrated success when they are for specialized applications (such as transit or rail), but not for traffic. Modified kiosks, such as a mounted flat screen showing regional maps, incidents, events and traffic 'hot spots', could be implemented at City Halls, for the Fairplex or for other high-traffic generators, once adequate information is available on the web portion of the ATIS to make this deployment media useful.	§ Large, mounted screen kiosk at major generators could provide highly-visible ATIS information to a broader audience than stand-alone kiosk § Maintenance requirements and potential for vandalism are reduced with overhead mounted screen.

Additionally, *Deliverable 3.7.2* summarizes recommendations for the Fairplex Event Management Plan. The ATIS portion includes minor web site updates, including posting of route information and driving directions.

Table 4.2 Recommended ATIS Cost Estimates

Technology	Capital Cost Estimate	Annual O&M Cost Estimate
ATIS Web Site – Basic (static content)	$ 50,000	$30,000 (includes staff hours, server upgrades, and server space charges from ISP)
Fairplex Web Site Upgrades	$ 5,000	Annual O&M costs related to this size and type of web site upgrade (adding maps that represent recommended routing for travelers in line with event management strategies) would be negligible

5.0 SUBREGIONAL TMC RECOMMENDATIONS

The subregional TMC is the location where the Forum's centralized traffic management components will be located. The subregional TMC will house the Information Exchange Network (IEN) server for the Forum that allows all of the individual agencies in the region to connect to the county-wide communication network for sharing of data within and outside of the Forum. The subregional ATIS server will also be located at the subregional TMC.

It has been recommended that the subregional TMC meet the following basic criteria:

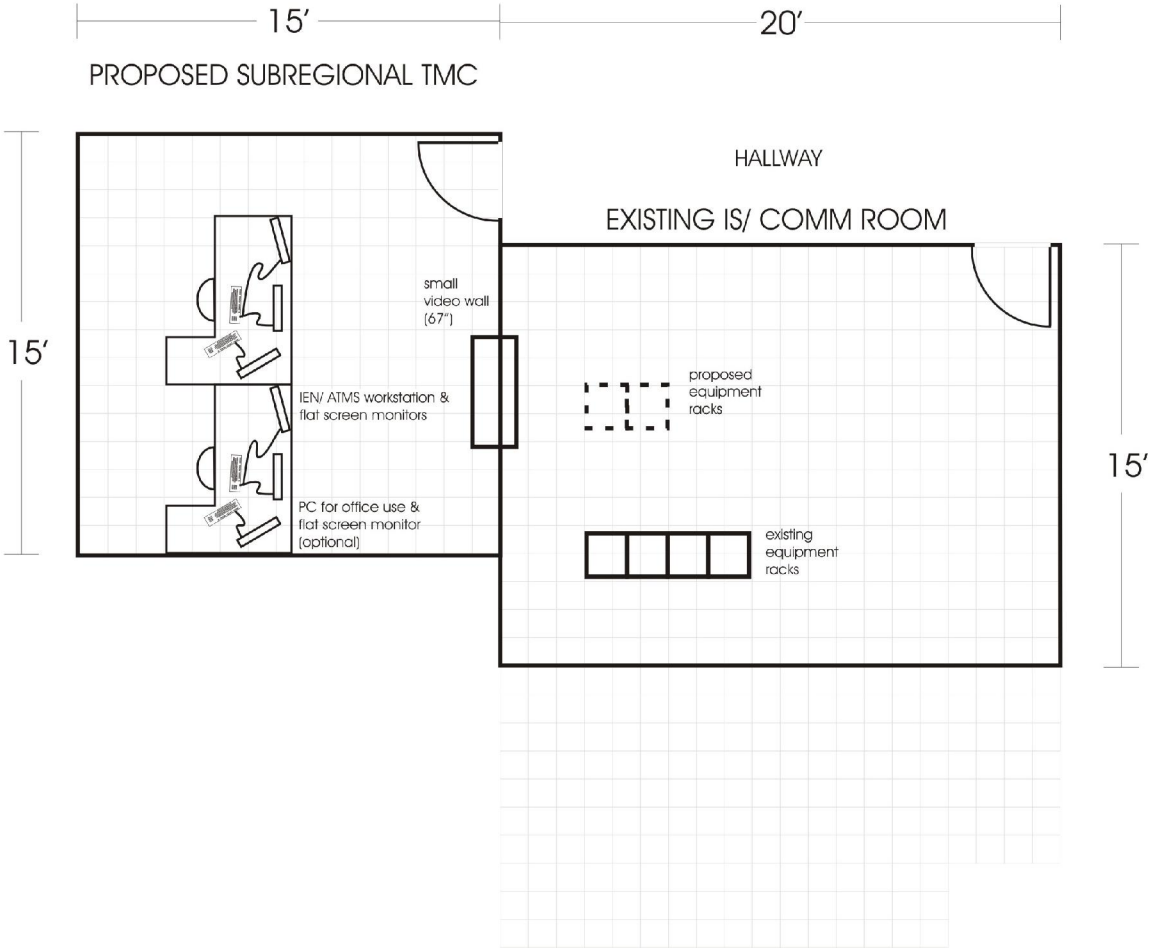
- The TMC should have adequate space for a minimum of four operator workstations and house two to four racks of traffic signal, communications, and computer server equipment; this spatial need has been identified as 700 – 1000 square feet
- Staffing would likely be built up as follows:
  - Initially, the TMC would not be staffed regularly, but used as necessary by local staff, similar to the LCCs
  - In the short-term, the TMC would be staffed during peak periods and potentially during major events
  - In the long-term, the TMC might additionally be staffed between the peak periods if deemed necessary by the local agencies.
- Based on the proposed level of staffing, the TMC would ideally be located in close proximity to traffic engineering staff that would benefit from having access to the TMC throughout the day. Those staff would also be acting as operators, as necessary.

Four potential locations for the subregional TMC were identified by stakeholders and analyzed in the *Subregional TMC Analysis Report* (Deliverable 7.3.2). The recommendation is for **the subregional TMC to be located in Diamond Bar**. The City of Diamond Bar City Hall is located at 21825 East Copley Drive in the Air Quality Management District (AQMD) building.

It is recommended that the subregional TMC be built in phases. Initially, a smaller TMC would be adequate to serve as the City of Diamond Bar's LCC and to act as the subregional TMC as needed. Two workstations and a small video wall would be sufficient to serve as the interim TMC until such time that the local agencies deem that a larger center is needed.

Figure 5.1 depicts a recommended layout for the space that has been identified for the interim TMC, including the equipment that would be placed in the existing information systems/ communication room (labeled as IS/COMM in the figure). *Deliverable 13.1.2 – Concept Design* will include the conceptual design for the ultimate TMC.

Figure 5.1 - Proposed Interim Subregional TMC Layout at the City of Diamond Bar



6.0 LOCAL CONTROL CENTER (LCC) RECOMMENDATIONS

The LCC at each local agency is the location where that agency's ATMS will be located. The sites are not proposed to be staffed on a regular basis, but will be accessible as needed by appropriate city engineering and maintenance staff to monitor and manage traffic in that city and to monitor the traffic in other areas of the Forum and/or County. The following sections summarize the LCC at each agency in the Pomona Valley Forum.

The LCC in the City of Claremont will include an ATMS workstation and an IEN workstation. The City does not desire a dedicated video wall for CCTV monitoring, but will use the ATMS workstation for video.

The City of Diamond Bar has been recommended for the subregional TMC location, which will act as their LCC as well. See **Section 5** for recommendations regarding the subregional TMC.

The City of Industry has an existing desk in the open area where staff is located that can be used for the LCC. The City wishes to have LA County control their signals (LA County currently maintains their traffic signals). They propose to use the IEN/ ATMS workstation for viewing only. The City does not desire a dedicated video wall for CCTV monitoring.

The City of La Verne LCC will be located in the existing Maintenance Operations Manager's Office. The LCC will consist of a combined ATMS and IEN workstation. The City does not desire a dedicated video wall for CCTV monitoring.

The City of Pomona LCC will include a combined ATMS and IEN workstation. The City desires a small dedicated video wall for CCTV monitoring. The City is planning to develop the LCC at the City Transit Center located at 1460 East Holt Avenue. Due to space constraints, a front projection system is proposed as a video wall at this location. The front projection system is suitable as a technology to serve the environment for this application.

The City of San Dimas LCC will include a combined ATMS and IEN workstation – this computer has already been procured and placed at the LCC location through the San Gabriel Valley Pilot Project. The City does not desire a dedicated video wall for CCTV monitoring.

There are plans to build a new City Hall for the City of Walnut. The LCC is proposed to be located at the new City Hall when it is built. The City wishes to have LA County control their signals (LA County currently maintains their traffic signals). The City does not desire a dedicated video wall for CCTV monitoring.

7.0 INTEGRATION RECOMMENDATIONS

7.1 Background

The Pomona Valley traffic management agencies' ATMS will connect to each other via the County's Information Exchange Network (IEN). The IEN corridor server for the Pomona Valley will allow the various agencies within the Pomona Valley to share information and potentially share control of devices within the subregion, as well as share information (monitoring) with agencies and stakeholders in other areas of LA County. This server is a part of a county-wide network that was defined and designed as a part of the San Gabriel Valley Forum Pilot Project. The purpose of the network is to provide a standard means of communicating among different agencies' signal systems within LA County. Each Forum, or subregion, of LA County will have its own IEN server that will enable the communication to occur within that Forum and from that Forum to other Forums/ agencies within the County. The IEN supports second-by-second data sharing for intersection data.

Currently, video transmission is not included in the IEN definition. The IEN may be designed to carry video. If the IEN is designed to carry video, it is recommended that the video be shared via that network. If not, a center-to-center network will be necessary to share video. This may be accomplished via the internet.

LIST OF ACRONYMS

ACE	Alameda Corridor East Construction Authority
ATIS	Advanced Traveler Information System
ATMS	Advanced Traffic Management System
Caltrans	California Department of Transportation
CAMS/IEN	Los Angeles County Countywide Arterial Management System/ Information Exchange Network
CCTV	Closed Circuit Television
CDPD	Cellular Digital Packet Data
DMS	Dynamic Message Sign
ITS	Intelligent Transportation System
LA	Los Angeles
LAN	Local Area Network
LACDPW	Los Angeles County Department of Public Works
LACMTA	Los Angeles County Metropolitan Transportation Authority
LCC	Local Control Center
MOU	Memorandum Of Understanding
NTCIP	National Transportation Communications for ITS Protocol
O&M	Operations and Maintenance
PC	Personal Computer
PTZ	Pan, Tilt and Zoom
PVITS	Pomona Valley Intelligent Transportation System
SONET	Synchronous Optical NETwork
TMC	Traffic Management Center
TOD	Time-of-Day
UFR	User Functional Requirements
UIR	User Interjurisdictional Requirements
UOR	User Operational Requirements
USR	User Supplementary Requirements
WWV	National Institute of Standards and Technology Time & Frequency shortwave radio station that broadcast accurate real time