Evaluation

of a funded FY00 ITS Integration Component of the
ITS Deployment Program

"Traveler Information Integration Project"

within the East Bay SMART Corridors Project

Submitted to

Alameda County Congestion Management Agency

Submitted by

ITERIS™

December 7, 2004

Evaluation of Earmark-Funded Project Component

Project Name: ***Traveler Information for East Bay SMART Corridors Project***

Project Location: Alameda and Contra Costa counties, California

Funded Agency: Alameda County CMA, in association with East Bay SMART Corridors Partnership

Background:

The project originally was granted funding from the earmark in an application dated June 1, 2000. A revised application received approval on May 19, 2003 to reflect a different proposed implementation of the project, while still achieving the project goal (disseminating real-time traveler information to the public via the SMART Corridors project ATMS website).

The original earmarked project was to develop a 'smart' system component of the ATMS that would track Opticom™-equipped AC transit buses traveling along the smart corridors and produce forecasted arrival times at upcoming bus stops along the route. This component was named the BAIS, standing for "Bus Arrival Information System". Subsequent to the commencement of the SMART Corridors project, AC Transit elected to contract directly with a private provider (NextBus Information Systems, Inc.) to achieve the BAIS functionality.

The amended earmark application expanded on the original project goal (just transit-related useful traveler info) by adding general traffic congestion information on the freeway facilities that run parallel to the SMART Corridors project's managed arterials. It did so by adding the real-time information that was already being gathered and distilled by the regional traveler information system (originally TravInfo®, now Bay Area 511®) to the SMART Corridors ATMS, so that it could also be displayed on that project's website. The TravInfo® Project is an Advanced Traveler Information System (ATIS) program sponsored by the Metropolitan Transportation Commission (MTC) to provide real-time traveler information to San Francisco Bay area travelers.

[Note: the project also originally envisioned reciprocally providing the SMART Corridors system's real-time traffic congestion data to Bay Area 511®; that offer of traffic performance data on the SMART Corridors' arterial streets was made to 511®, but MTC and its Contractor responsible for building and operating the 511® system elected not to take advantage of the SMART Corridors ATMS data.]

Following the section below, the remainder of this document contains the excerpt of the SMART Corridors Evaluation Report that pertains to this earmark-funded element. Two appendices are also included. The first is the complete results of the Public Opinion survey that was conducted at the conclusion of the project. That survey contained an inquiry about the usefulness of the project's website for trip planning purposes. The second appendix contains the amended Earmark Application in which this TravInfo® project data integration was scoped.

System-to-System Integration Technical Aspects:

The discussion in this section describes some of the more technical details of this integration, and provides the evaluation as to how, how extensively, and how successfully the integration was achieved, and to what extent the integration complies with the regional and national ITS standards. This information was not contained in the SMART Corridors Evaluation Report, because it is too detailed for the general nature of that report, and it pertains to specific requirements of the grant funding application. This additional information is presented in the form of queries posed and answers.

Q: Describe the specific data being obtained from the 511® system by the SMART Corridors ATMS.
A: All of the speed data from several dozen traffic flow monitoring stations along the I-80 and I-880 freeways that are within the mapped area of the SMART Corridors ATIS page are scraped from the 511® system. Also, any CHP-originated traffic incident reports along those two freeways that have been added to the 511® system are scraped.

Q: Describe the format in which the 511® system data is made available for capture or sending to the SMART Corridors ATMS. What work was required of the 511® system developer in order to provide for that data format preparation?
A: The project's System Engineering Report proposed a recommended interface of DATEX-ASN.1, an approved Center-to-Center NTCIP standard, as defined in NTCIP 2304 and 2501. The applicable data dictionaries were also recommended in that Report. In the subsequent design and deployment of this ATMS-to-511® connection, the use of DATEX-ASN was pursued with the TravInfo® developer, but without success. The data exchange process is dependent upon the cooperation of the 'sending data' system developer, and for whatever reason, that developer elected not to provide the data exchange interface as DATEX. Rather, an XML interface was promulgated by that developer, and the SMART Corridors project's inquiry 'engine' was constructed to match that interface. XML was an easy interface to develop by both parties.

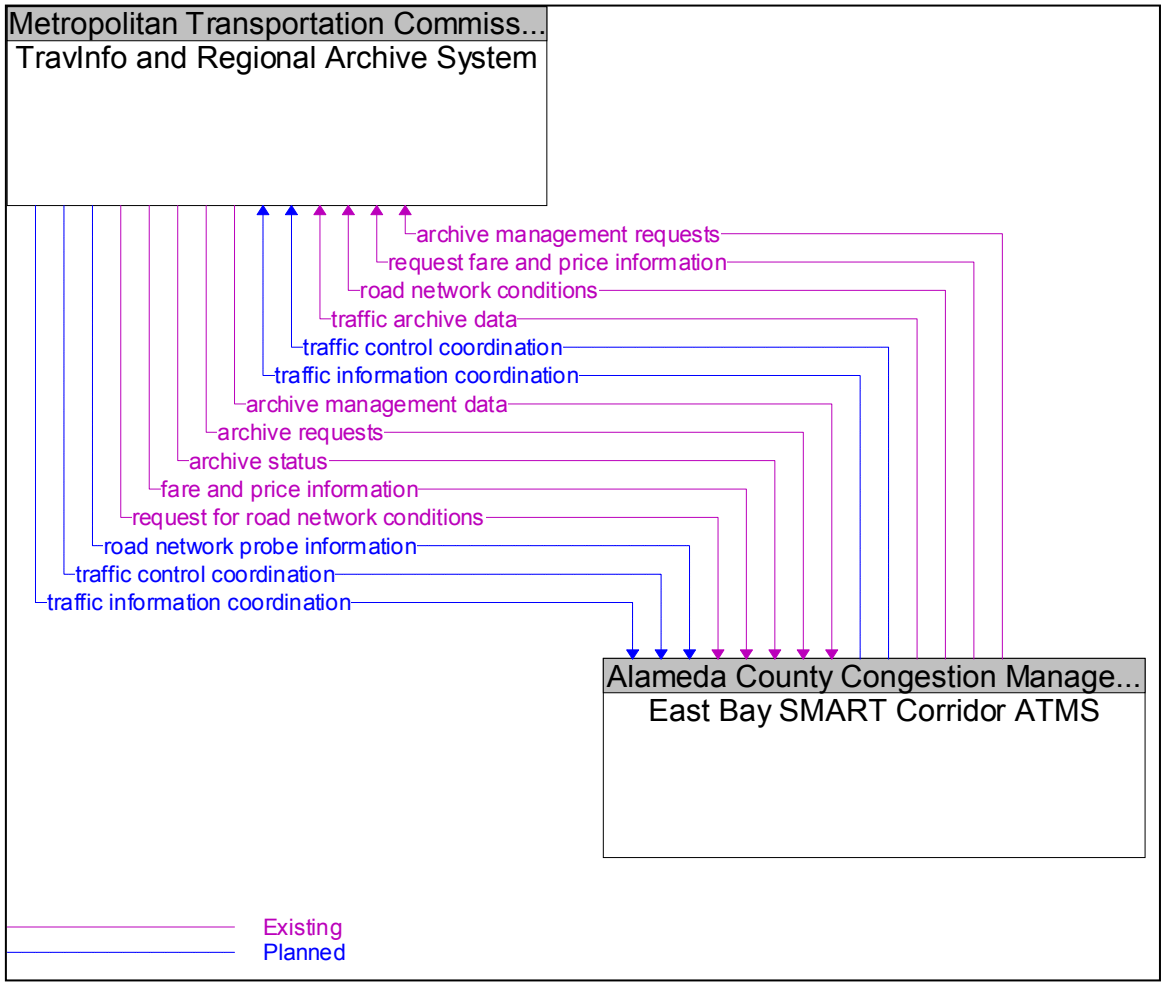
Q: Describe the nature of the system-to-system interface that was implemented to achieve the data mining.
A: The process for the data exchange is best described as a 'polling for data' setup. The 511® system posts these data reports to an accessible server location within its own computer system. The SMART Corridors ATMS is allowed access or permission to visit that server (via a no-cost Internet connection) and retrieve all or whatever portion desired of data is residing there. The 511® system updates the data fields of that database whenever the information changes. The SMART Corridors ATMS retrieves the select set of data records on a continual and frequent basis.

Q: Identify which National ITS Architecture standards are being complied with in this system-to-system data exchange.
A: The C2C data exchange standards currently include DATEX and CORBA. Neither of those was used in this system-to-system interface. Rather, the data exchange was established using the XML interface; XML is an emerging standard for C2C, and is likely to become an approved standard in the near future. XML, in contrast to DATEX or CORBA, is much simpler to program and modify, and it requires much less 'overhead', in terms of the percentage of the total data stream that is the actual message in question.

Should the eventual adoption of the XML interface as an NTCIP standard differ slightly from this deployment, developers at the 511® system and the SMART Corridors ATMS would jointly be able to easily modify this C2C implementation to be compliant with NTCIP. The Systems Engineering Report also envisioned that this C2C data exchange would need to be carried over dedicated leased telecommunications lines. The actual deployment instead uses the Internet as the medium or carrier, at no incremental cost to the SMART Corridors project.

Q: Identify whether the center-to-center data exchange is consistent with the Bay area's Regional ITS Architecture, and if not, why not.

A: The Regional ITS Architecture was also in development during the time that this center-to-center application was being constructed. The final Bay Area Intelligent Transportation Systems (ITS) Plan dated June 2004 contains the following diagram depicting the information flows envisioned between these two ITS systems.



The 511® system is a significant component of the overall Regional Architecture, and the interface it developed to share these ATIS data is, by definition, a part of the Regional ITS Architecture. The interface was made generic, in that all of its ATIS data are placed in its database repository. As other regional systems and users have the need to access

these data, the 511® system can grant access permission, and provide those new users with the XML-based data subscription interface definition. No significant additional work will be required on the part of the 511® system to disseminate its ATIS data to new subscribers.

Q: Identify the nature and extent of "breakdowns" in the final accepted data transfer process, such that the desired data was not captured by the SMART Corridors ATMS for any significant periods of time.

A: There have been few, if any, breakdowns or interruptions in the data. The C2C data extraction works 24 hours a day, is fully automated, and requires little or no ongoing manual intervention.

Q: Describe any data element anomalies that were detected by the SMART Corridors ATMS developer during the integration effort, such that the veracities of the data received were suspect. Identify what remedies were applied, with what result.

A: Some of the raw speed data posted on the 511® system's data repository occasionally have an obvious error, such as a mean speed at a monitoring station of 136 mph. Those data are discarded by the SMART Corridors ATMS. A set of reasonable minimum and maximum threshold values determine if the data will be used by the ATMS. In most cases, the data anomalies are fleeting, or can be traced to a maintenance problem at a Caltrans flow monitoring station. For the duration of the suspect data, those station's values are reported as N/A, for "not available". Also, the raw speed data values extracted from 511®'s database are not reported on the SMART Corridors webpage. Rather, each freeway segment's flow rate is characterized as being one of several color-coded speed ranges.

3.3 Integration of Regional 511 System Data

The live traffic flow data that are reported in the Bay Area's 511 traveler information system (previously called TravInfo) are captured by the Project's ATMS for incorporation into the Project's ATIS website. This section describes the Project's implementation of this functionality, and the review process for assessing the results of this implementation.

3.3.1 Approach

The Project developed a linkage to the 511 system, allowing a select set of real time data artifacts to be automatically and continuously sent from 511 to the Project's ATMS server. The 511 system's data that is used by the ATMS is to be displayed as a "freeway" layer on the Project's public website. That public website is a map of the Project area showing live updated useful traffic information in a graphical and/or colored format. The incorporation of the 511 data is intended to make the public website more useful to the public, as it will contain both freeway and arterial travel information within the Project area. This evaluation reviews the nature and extent of that select data set, and determines the extent to which the goal of integrating that regional 511 system's information was achieved. This evaluation also reviews the public information website that this Integration task created, as to the completeness and understandability of the traffic information presented.

3.3.2 Analysis and Findings

A site visit was made to ACCMA's offices in February 2004 to review the progress in this Integration task. At that time, each of the technical issues had been resolved and successfully implemented, the Project's public website had been completed in a beta test state (not yet open to the public), and the 511 data was successfully being received by the Project's ATMS. At that time, the planned URL for this public information website was www.smartcorridors.com/atms. However, the display of the 511 information on the ATMS GUI was still being adjusted as to the formatting of the data as icons or numerical values (or both). Additionally, the overall "look and feel" of the public webpage was still evolving to one that would be satisfactory to the ACCMA staff. The subsequently revised final public version (the address was shortened to www.smartcorridors.com) unveiled in May 2004 is shown below.

The public website **Traffic Map** tab consists of four pages, each similar, but with a different zoom aspect on the Project area. The initial view, **Figure 3.1**, is of the complete area, showing the full extent of both corridors. The remaining three pages are of zoomed-in views of the northern, middle, and southern thirds of the Project area. The map panes from each of these successive zoomed-in views are shown in **Figure 3.2**.

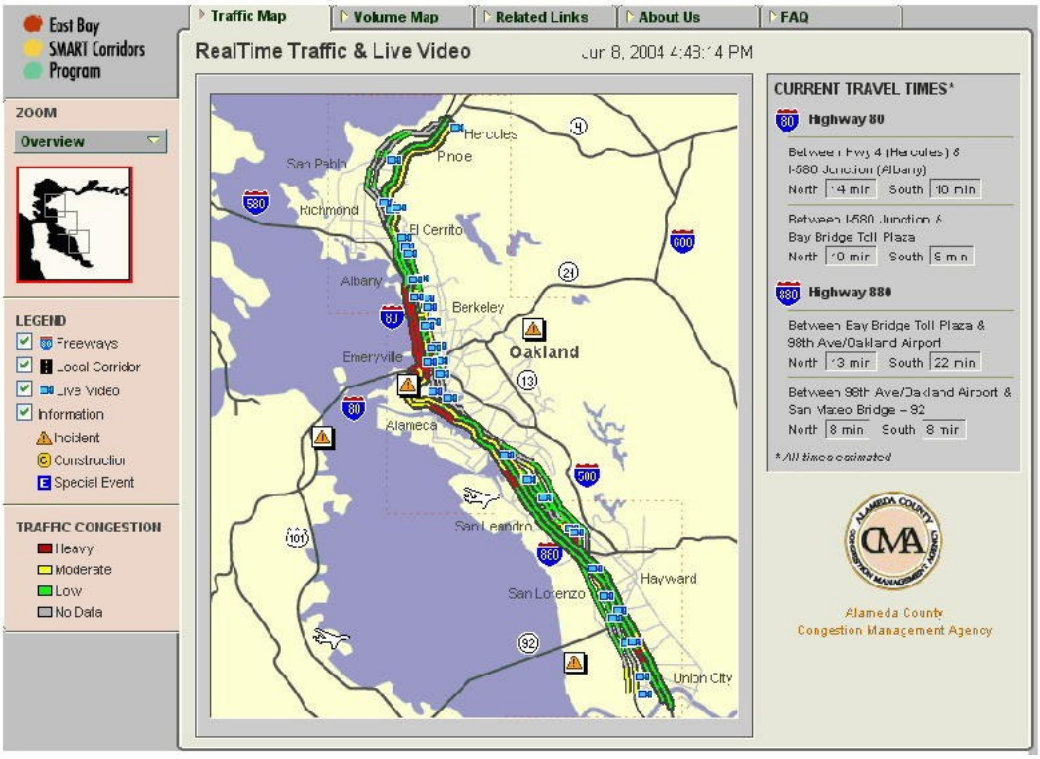


Figure 3.1: Overview map of the East Bay SMART Corridors ATIS

The Project consultant's decision to present the corridors in these three pre-defined zoom levels was a result of a conscious decision to not allow the user to pan or zoom the view to what might be considered the "perfect" view for that person. The map background graphic on this webpage is "fetched" from the ATMS system server each time this page is first requested, and because of the nature of the computer software system driving this map (Bentley's ATMS, which uses the Bentley Microstation graphics "engine"), the screen refresh rate was not fast. If the users were allowed to pan and/or zoom, each movement of the background map image would require a complete new background map

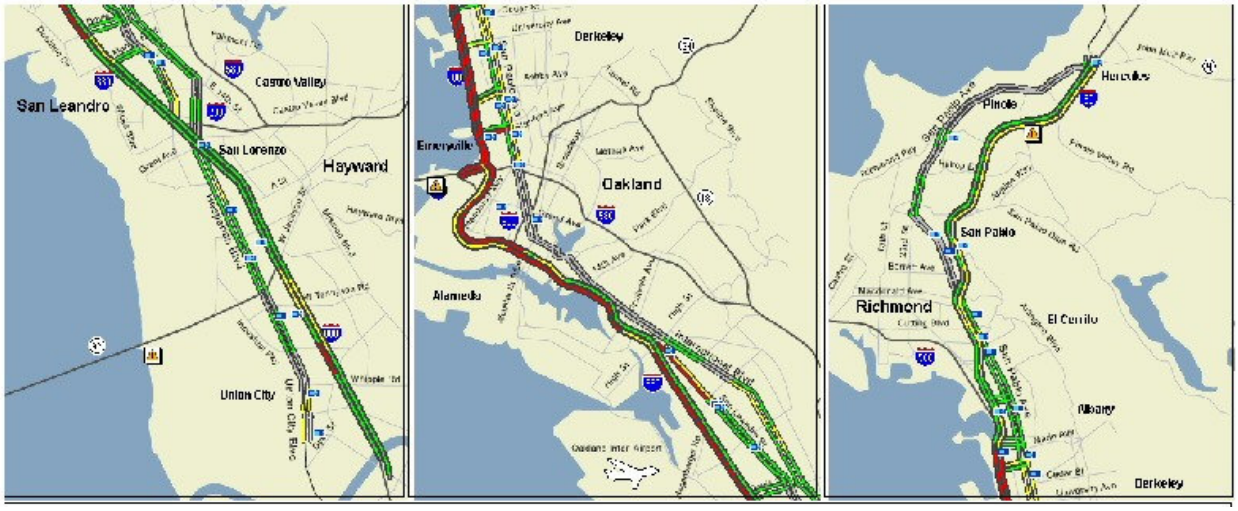


Figure 3.2: Zoomed map panes of the East Bay SMART Corridors ATIS webpage

retrieval request from the ATMS server. The result would be a sluggish map response, not deemed acceptable for this new public ATIS website.

Onto these maps, the information gleaned from the live feed from Bay Area 511® is also displayed. These freeway flow characteristics are displayed similarly to the arterial results, and have been enabled as yet one more user-selectable layer that can be toggled off or on.

The Bay Area 511® system is an Advanced Traveler Information System (ATIS) program sponsored by the Metropolitan Transportation Commission (MTC) to provide real-time traveler information to the Bay Area travelers. It contains a wide variety of static and dynamic information, some of which is based on real-time traffic flow monitoring stations and incident management databases. The SMART Corridors project sought to add a subset of the Bay Area 511® system's database to its own ATIS website, namely the speed measurements along the freeways adjacent to the two SMART corridors, and any tracked traffic incidents within the East Bay area that could be spotted on the Overview map.

To achieve this real-time data retrieval from 511®, a system-to-system connection was created using the Internet. Working with the cooperation of the 511® database system creator, the technical process for providing the real-time data was developed, and it uses the popular standard for such data sharing, the XML[1] (Extended Markup Language) protocol. The desired shared information is stored in an accessible database by the 511® system, and is subsequently "mined" by the SMART Corridors system.

The 511® system does not particularly tailor its published data for the SMART Corridors ATMS. Rather, a generalized database of all freeway speed data and all tracked incidents was created, so that other future system needs anywhere in the Bay area could be accommodated without any special re-writing of the data transfer processes. The SMART Corridors ATMS polling of this database, then, was written to filter this continuous information feed, and utilize only the pertinent data elements.

The SMART Corridors Consultant noted that not all data elements were valid, particularly in some of the reported freeway speed stations. There was an internal project team discussion as to appropriate handling of suspect and/or clearly erroneous data values. Smoothing was considered, and then rejected. The Project Consultant recommended, and ACCMA agreed, that the 511® data elements will be reported exactly as they are received, without any attempt to verify or calculate their veracity. The exception to this would be the discarding of obviously faulty data (such as a freeway speed station reporting a mean speed of 145 mph).

[1] XML is the acronym for eXtensible Markup Language, the universal format for structured documents and data on the Web. XML is an industry-standard protocol administered by the World Wide Web Consortium (W3C). XML is a programming language that enables designers to create their own tags to indicate specific information. Information in the XML document is described entirely in text thus enabling ease of transmission and sharing across computer platforms via the Internet. A Center-to-Center standard is currently in development using the XML interface, and this project's implementation sought to be consistent with that emerging standard.

The XML interface to the 511® system was successfully implemented, and the resulting data results have been consistently and continuously displayed on the SMART Corridors website. The result is an approximate doubling of the visually-presented information to the website visitor, and should result in a more useful ATIS experience. The data extraction and integration is totally automated; no regular manual operator intervention is needed to sustain this data mining functionality.

On the SMART Corridors ATIS web page, when the user clicks on any of the discrete data points, more detailed information is presented about that particular device and its current data content. Of particular interest is the ability to bring up a "live" camera scene of a selected intersection approach. A screen snapshot of two such camera views is shown below for one of the about 36 intersections equipped with surveillance cameras. The streaming video presented to the user is, for all intents and purposes, "live" even though it may lag a few seconds behind real-time. The video is shown in 320x200 pixel images, and are updated at 10 to 15 frames per second. Medium-speed broadband (or faster) Internet connections are able to sustain the streaming video. However, public users viewing the video over a dial-up Internet connection will have frequent image freezes and then jumps, because the retrieved video stream is buffered more often with low bandwidth Internet connections.

One other category of traveler information is displayed on the website, that being the freeway travel times on 4 segments of the I-80 and I-880 freeways that parallel the SMART corridors. These travel times are calculated using the freeway speeds on each short segment, as gathered from the 511® system, and adding each segment's derived travel time. This traveler information is similar to what is available on the 511® site, except that it is for the four fixed freeway segments on the SMART Corridors ATIS, but is a fully-interactive tool (user picks starting and ending freeway points anywhere in the Bay area) on www.511.org .

Appendix 1: Public Opinion Survey Findings

1. Which of these corridors do you typically use? (click all that apply)			
		%	#
San Pablo Avenue		76.2%	16
Hesperian Blvd.		4.8%	1
San Leandro Blvd.		4.8%	1
Union City Blvd.		4.8%	1
none of these		19%	4
	Total Respondents		21
	(skipped this question)		0

2. Between what cross-streets?			
		%	#
San Pablo Avenue		94.1%	16
Hesperian Blvd.		5.9%	1
San Leandro Blvd.		5.9%	1
Union City Blvd.		5.9%	1
	Total Respondents		17
	(skipped this question)		4

3. How Many Times A Week Do You Take The Same Route To Work - - BY CAR?			
		%	#
Daily		70.6%	12
Once a Week		5.9%	1
Two Days each week		0%	0
Three Days each week		0%	0
Four Days each week		0%	0
Every Day		23.5%	4
	Total Respondents		17
	(skipped this question)		4

Appendix 1: Public Opinion Survey Findings

4. How Often Do You Make This Trip Taking A Different Route?			
		%	#
Never / Not Often		64.7%	11
at least once a week		23.5%	4
2 or more times a week		11.8%	2
	Total Respondents		17
	(skipped this question)		4

5. Why Do You Sometime Choose a Different Route For Your Regular Commute? (click all that apply)			
		%	#
Traffic Accident on Regular Route		61.5%	8
My Route is bad on a particular day (e.g. Monday or Friday)		7.7%	1
Construction Detours		46.2%	6
Bad Weather		7.7%	1
Other (please specify)		23.1%	3
	Total Respondents		13
	(skipped this question)		8

6. How Many Times A Week Do You Make This Commute - - BY TRANSIT?			
		%	#
Never, or very infrequently		87.5%	14
Daily		0%	0
Once a Week		0%	0
Two Days each week		0%	0
Three Days each week		0%	0
Four Days each week		6.2%	1
Other (please specify)		6.2%	1
	Total Respondents		16

(skipped this question)	5

7. Have you noticed anything different on your regular commute route lately (compared to, say, 12 months ago) that has made your getting to / from work better (or worse)? Please provide details:

Total Respondents	16
(skipped this question)	5

8. Have You Noticed Any Reduction In Your Regular Commute Time Compared To A Year Ago?

		%	#
Yes -- it has decreased		25%	4
No -- it has stayed about the same		62.5%	10
My Commute Time Has Actually Increased		12.5%	2
Total Respondents			16
(skipped this question)			5

9. I have noticed that I ALWAYS save _____ per trip (compared to last year).

		%	#
5 minutes		0%	0
5-10 minutes		50%	2
10-15 minutes		0%	0
I don't ALWAYS save time		50%	2
Total Respondents			4
(skipped this question)			17

10. I have noticed that I OFTEN save _____ per trip (compared to last year).

		%	#
5 minutes		0%	0
5-10 minutes		25%	1

Appendix 1: Public Opinion Survey Findings

10-15 minutes	25%	1
I don't OFTEN save time	50%	2
Total Respondents		4
(skipped this question)		17

11. Have you ever visited this website?		
	%	#
Yes	43.8%	7
No	56.2%	9
Total Respondents		16
(skipped this question)		5

12. Do you think you might use this website in the future to make travel decisions about your commute?		
	%	#
Yes, I will probably check it frequently	25%	4
Maybe, once in a while.	43.8%	7
No, probably not.	31.2%	5
Total Respondents		16
(skipped this question)		5

13. Have you noticed any improvements in your travel time ALONG SAN PABLO AVENUE?		
	%	#
No, it seems the same	31.2%	5
I don’t use San Pablo Avenue on my commute	25%	4
Yes, this many minutes each way, on average:	43.8%	7
Total Respondents		16
(skipped this question)		5

Appendix 1: Public Opinion Survey Findings

14. A new "bus rapid transit" service, the San Pablo Rapid, has begun on one of the corridors. Have you ever used this new transit service?			
		%	#
Yes		0%	0
No		93.8%	15
Never Heard of It		6.2%	1
		Total Respondents	16
		(skipped this question)	5

15. You indicated that you have used the San Pablo Rapid bus service. How would you rate the service?			
		%	**#**
Good		0%	0
Bad		0%	0
So-So		0%	0
About the same as the 72-Limited		0%	0
		Total Respondents	**0**
		(skipped this question)	**21**

16. Do you have any additional comments about these two Corridors that you would like to share with us?		
	Total Respondents	**12**
	(skipped this question)	**9**

17. When we review your answers, may we contact you if necessary for clarification and/or any additional questions?			
		%	**#**
No		33.3%	6
Yes (Thanks; please provide your name and a phone number where you can be reached:)		**66.7%**	**12**
		Total Respondents	**18**
		(skipped this question)	**3**

Appendix 2: Earmark Application (page breaks removed)

APPLICATION FOR PARTICIPATION IN THE FY00 ITS INTEGRATION COMPONENT Of the ITS DEPLOYMENT PROGRAM

PROJECT DESCRIPTION

U.S. Department of Transportation Federal Highway Administration Federal Transit Administration

Project Name: ***Traveler Information for East Bay SMART Corridors Project***

Project Location: Alameda and Contra Costa counties, California

FY00 Congressionally Designated Funding Amount: $ 393,000

Submitted by: (Agency) Alameda County CMA, in association with East Bay SMART Corridors Partnership

(Date) June 1, 2000 (Revised 05/19/03)

Contact: (Name) Cyrus Minoofar, P.E.
Senior Transportation Engineer

(Address) 1333 Broadway, Suite 220
Oakland, CA 94612

(Phone) (510) 836-2560 X14
(Fax) (510) 836-2185

(E-mail) cminoofar@accma.ca.gov

Appendix 2: Earmark Application (page breaks removed)

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Executive Summary

The Alameda County Congestion Management Agency (CMA) in cooperation with the Contra Costa County Transportation Authority (CCTA) and participating agencies in Alameda and Contra Costa Counties is in the process of deploying an Intelligent Transportation System (ITS) for San Pablo Avenue/I-80 and Union City Blvd/Hesperian/East 14th/International Blvd/I-880 corridors for 22 agencies, known as the East Bay SMART Corridors project.

The San Pablo Avenue, Union City Blvd/Hesperian Blvd/East 14th Street/International Blvd corridors are Metropolitan Transportation System (MTS) arterial routes in Alameda County and western portion of Contra Costa County. The San Pablo Avenue corridor parallel Highway 80 and is a major regional arterial, traversing along portions of Cities of Oakland, Emeryville, Berkeley and Albany in Alameda County; and Cities of El Cerrito, Richmond, San Pablo, unincorporated parts of Contra Costa County, and Hercules in Contra Costa County. The Union City Blvd/Hesperian Blvd/East 14th Street/International Blvd parallels the I-880 corridor, traversing along portions of Cities of Union City, Hayward, San Leandro, Oakland and unincorporated parts of Alameda County. There are approximately 220 traffic signals in these corridors.

The goal of the East Bay SMART Corridors is to allow the participating agencies to electronically monitor video and exchange traffic data for the purpose of transportation management applications. This project will implement an Advanced Transportation Management System to better manage congestion and incidents in the corridor and provide useful, multi-modal transportation information to the public and transportation managers.

The East Bay SMART Corridor project will help to effectively manage traffic on local streets and nearby freeways. The goal of this project is to increase transit usage and provide traveler information to help with route and mode choices.

The Traveler Information Integration project (this application) will build upon the East Bay SMART corridors project and integrate the traffic signal system with a Traveler Information component. The project will integrate with the TravInfo® program, which is a regional Advanced Traveler Information System and will disseminate traveler information to the public via Internet. The total cost of the integration for this portion of the project is approximately $790,000. A limited number of necessary speed and volume sensor units being deployed in support of this project is being funded from other contracts and are not funded from the $790,000 budget. The proposed project will include:

- Integration of TravInfo® with the East Bay SMART Corridors project. Traffic volumes, arterial speeds and level of congestion will be made available to TravInfo® for dissemination to the public.
- Development of a speed and volume model by processing real-time traffic information and providing the information to the public.
- Development of a web site to disseminate traffic information to the public.
- Installation of traffic sensor units to measure speed and volumes on selected arterials (**funded under a different contract)**.

FY 2000 Federal ITS Appropriation will provide 50 percent funding while the remaining 50 percent will be in local match (20% non-federal and 30% federal funds). The project will begin immediately after the funds are obligated, and will be completed by December 2003.

The project will allow the participating agencies (15 agencies) to manage traffic effectively and develop a multi-modal solution to the congestion in the Region.

Alameda County Congestion Management Agency is committed to successful implementation of this project, bringing substantial benefits to commuters in the area.

PROJECT PROPOSAL

TECHNICAL APPROACH

1. Background

The East Bay SMART Corridors "*Traveler Information Integration Project"* will integrate the transportation management capabilities of the East Bay SMART Corridors project with the Metropolitan Transportation Commission TravInfo® program. The project will process data to provide a variety of useful information to the public. The project will disseminate the information to the public via a web site.

This project will build upon the East Bay SMART Corridors Project which is a multi-agency Intelligent Transportation Systems management project involving 22 agencies, including cities of Albany, Berkeley, El Cerrito, Emeryville, Hayward, Hercules, Oakland, Pinole, Richmond, San Pablo, San Leandro and Union City; Alameda County, Contra Costa County, West Contra Costa Transportation Advisory Committee, Contra Costa Transportation Authority, AC Transit, WestCAT, Union City Transit, California Department of Transportation, Metropolitan Transportation Commission, and Alameda County Congestion Management Agency.

The East Bay SMART Corridors project include implementation of an Advanced Transportation Management System for the participating agencies, to better manage the traffic congestion along the San Pablo Avenue/Highway 80 and Union City Blvd/Hesperian Blvd/East 14th Street/International Blvd/I-880 corridors. These corridors have received Federal, State, and Regional funding for deployment of field devices for traffic monitoring, implementation of new signal systems, and data and video exchange among the participating agencies.

Phase I of the project, which has been recently completed, includes installation of communication system as well as signal system and equipment upgrades. The implementation of Phase II will begin soon which includes deployment of field sensors for traffic monitoring, installation of field devices for real-time traveler information, implementation of a data and video exchange system, and implementation of an emergency vehicles/transit priority system with the transportation management plan.

The TravInfo® Project is an Advanced Traveler Information System (ATIS) program sponsored by Metropolitan Transportation Commission (MTC) to provide real-time traveler information to the Bay Area travelers. MTC has recently selected a Contractor for design and implementation of a regional ATIS system.

The proposed *"Traveler Information Integration Project"* will integrate the East Bay SMART Corridors project with the TravInfo® project for information dissemination to the public.

2. Project Description

The following elements/field devices are already in place, or will be completed as part of the East Bay SMART Corridors Project.

- Central signal control systems

- Communication links between the partner agencies
- Deployment of field sensors, including count stations, and CCTV
- Deployment of transit priority system
- Deployment of emergency vehicle activation system (to be used for transit vehicle identification purposes)

The are five major elements for the proposed *"Traveler Information Integration Project":*

- ***Systems Engineering -*** A Systems Engineering Study will be conducted to develop requirements for traveler information and systems integration. The Systems Engineering Study will also review the requirements for data exchange, and consistency with National Transportation Communication for ITS Protocol (NTCIP) requirements and standards.

- ***Integration of TravInfo® with the SMART Corridor -*** This element will include software development to integrate the traffic management data in a standardized NTCIP format.

- ***Development of Processed information -*** This element of the project will process arterial traffic volumes and provide information on the arterial level of congestion to assist the public with route and mode choices.

- ***Development of a Web Site for dissemination of Transit Information to the public -*** This element will include development of a web site to provide real-time information to the public.

- ***Testing and Evaluation of Project Benefit -*** Testing and evaluation of project benefits will be conducted during and upon the completion of the project to address project effectiveness.

3. Rural Projects

This project is located within an urban area and rural components do not apply.

4. Infrastructure Components to be Integrated

A. Traffic Signal Control
   1. Signal Control Systems
      (Responsible Agency – Local Agencies)
B. Freeway Management
C. Transit Management
   1. AC Transit
D. Incident Management
E. Electronic Fare Payment
F. Electronic Toll Collection
G. Highway-Rail Intersection Control
H. Emergency Services Management
I. Paratransit and Demand-Responsive Transit

J. Regional Multi-Modal Traveler Information Services
Metropolitan Transportation Commission TravInfo® System
K. Other ITS Systems
1. Cities of Berkeley, San Pablo, Richmond, Union City, Hayward, San Leandro, Contra Costa County, Alameda County, AC Transit and Caltrans for Data and Video Exchange systems.

Using the identifying letters and numbers above; indicate those infrastructure components that will be integrated.

A, B and K with J .

5. Integration Approach

The following are the five elements of the project and the integration approach for each task:

Task 1 – Systems Engineering - A Systems Engineering Study will be conducted to develop requirements for traveler information integration. The Systems Engineering Study will also review the requirements for data exchange, and consistency with National Transportation Communication for ITS Protocol (NTCIP) requirements and standards. This study will augment the Strategic Plan Study for the Smart Corridor project and prepare a Systems Engineering Study, consistent with the Federal process. Estimated cost - $200,000 (for additional services related to Systems Engineering Study).

Task 2 - Integration of TravInfo® with the Smart Corridor Project - This element will include software development to integrate the traffic management data with the regional Advanced Traveler Information (ATIS), TravInfo® system. Estimated cost - $140,000

Task 3 - Development of Processed information - This element of the project will process traffic volumes and provide information on the arterial level of congestion. Estimated cost - $150,000

Task 4 - Development of a Web Site for dissemination of Transit and Traffic Information to the public - This element will include development of a web site to provide real-time information to the public. Estimated cost - $100,000

Task 5 – Testing and Evaluation of Project Benefit - An evaluation of project benefits will be conducted during and upon the completion of the project to address project benefits. This evaluation will be both qualitative and quantitative. The evaluation is a part of a larger ITS evaluation project that will review ITS benefits and in particular the SMART Corridor benefits. The evaluation project will be funded using both local funds and the ITS Integration funds. The total estimated cost is $200,000.

The matching local funds are actual cash from TFCA funds.

6. National ITS Architecture

The Metropolitan Transportation Commission (MTC) is in the process of adoption of a Regional Architecture for the Bay area. A Statewide ITS Initiative is also underway.

The proposed project will directly support the National ITS Architecture by providing interoperability standards and by developing data exchange to comply with NTCIP, protocol requirements. Once the regional architecture has been developed and adopted, this project will ensure that the project meets both the regional as well as the national architecture.

The project will include systems engineering process for the development of project specific architecture in compliance with the statewide and national architecture.

7. ITS Standards

The project will include testing/evaluation of data exchange between the signal systems and transit buses. The project will include specific systems engineering process to assure compliance with all federally adopted policies and directives. The Systems Engineering Study will identify all applicable standards for the project.

8. Evaluation of Benefits

Alameda County Congestion Management Agency and the partnering agencies look forward to participate and fully cooperate in an independent evaluation process to measure the performance and the benefits of this integration project. CMA anticipates focusing on at least two of the following evaluation activities:

- Summarize various institutional issues associated with the project and how consensus was achieved
- Testing of the effectiveness of the system will be performed.
- An evaluation report on alternative financing and procurement efforts undertaken to maximize the benefits
- Provide a brief lessons learned report on the technical and institutional issues encountered in integrating ITS components.
- Provide appropriate metropolitan planning process with data generated by ITS technologies and services, and provide a report on plans or intentions for archiving the data and using it.

An Evaluation Report, documenting the lessons learned in meeting project goals and objectives will be developed. The Evaluation Report will include collection and documentation of cost accounting data, which will be collected as a part of the implementation of the program.

The evaluation is a part of a larger project that will evaluate the benefits of ITS programs.

SCHEDULE

9. Start Date: [Within nine months of the final obligation date, that is, September 30, 2000]

September 29, 2000

10. Expected Completion Date: December 2003

11. Milestones and Expected Completion Date:

Consultant Selection:	October 2000
Prepare Systems Engineering Study:	May 2001
Complete System Integration:	September 2003
Testing and Project Acceptance:	December 2003
Evaluation and Final Report:	February 2004

FINANCIAL PLAN

The proposed project shall identify the matching funds as identified in Section 3.1 of the Guidance.

12. Non-Federally Derived Funding Sources:
Local Money (such as TFCA Funds): $160,000 (20%)

13. All Non-ITS Integration Program Funding Sources:
CMAQ Funds for Smart Corridor Projects: $237,000 (30%)

Description of Source of Funds Non-Federally Derived Matching Funds (20% minimum)	**Amount of Funds**	**Period of Expenditure**
Local money (TFCA Funds)	$160,000	NA
Total Non-Federally Derived Funds	$160,000	
Description of Source of Funds Other Matching Funds		
TEA -21 Funds – Alameda-Contra Costa Smart Corridor	$237,000	
Total Other Matching Funds	$237,000	
Total Matching Funds	$397,000	

COST BREAKDOWN (subject to change)

Task/Item	ITS Earmark	Local Match	Total
Systems Engineering	$83,000	$117,000	$200,000
Integration & Software Development	230,000	160,000	390,000

Testing and Evaluation	80,000	120,000	200,000
Construction	0	0	0
TOTAL	393,000	397,000	790,000

PROJECT FUNDING SUMMARY:

Integration Funds: $393,000
Matching Funds: $397,000 (50.3%)
Total Project Costs: $790,000

14. Memorandum of Understanding

Lead Agency	Alameda County Congestion Management Agency (CMA)
Roles and Responsibilities	< Managing the delivery of capital project elements for the East Bay SMART Corridors < Project delivery, program administration and management for the East Bay SMART Corridors < Coordinating the Policy Advisory Committee and TAC meetings
Contact	Mr. Cyrus Minoofar, P.E., Principal Transportation Engineer Alameda County CMA 1333 Broadway, Suite 220, Oakland, CA 94612 Phone: (510) 836-2560 x14 Fax: (510) 836-2185 email: cminoofar@accma.ca.gov

Participating Agency	Cities of Albany, Berkeley, El Cerrito, Emeryville, Hayward, Hercules, Oakland, Pinole, Richmond, San Pablo, San Leandro and Union City; Alameda County, Contra Costa County, West Contra Costa Transportation Advisory, Contra Costa Transportation Authority, California Department of Transportation, AC Transit, WestCAT, Union City Transit and Metropolitan Transportation Commission
Roles and Responsibilities	Participating Agencies in the East Bay SMART Corridors
Contact	See the Attached MOU for San Pablo Avenue and I-880 Corridors

15. SMART Corridors Implementation Plan

The SMART Corridors Implementation Plan is a building block for the implementation of various elements of the SMART Corridors in Alameda and Contra Costa Counties along the defined corridors including San Pablo Avenue (I-80) and Hesperian/E 14th/International Blvd (I-880).