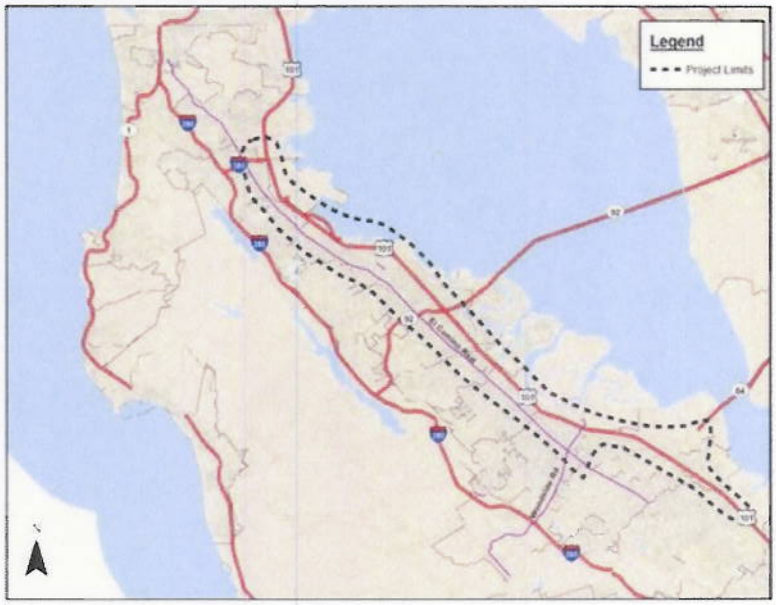
A truly thinking highway

Al B Lee, **David Man** and **Sean Nozzari** introduced the "who, what and where" of California's San Mateo Smart Corridor

The San Mateo Smart Corridor project is a joint effort between the California Department of Transportation (Caltrans) District 4 and the City/County Association of Governments (C/CAG) of San Mateo to proactively manage traffic on local streets and El Camino Real (State Route 82) along the US-101 freeway corridor in San Mateo County, California. The impetus for implementing Intelligent Transportation System (ITS) tools on major arterials in this corridor was a jack-knifed tanker truck gasoline spill and fire that created a traffic nightmare for more than two days.

A Traffic Incident Management Committee comprised of C/CAG, Caltrans, California Highway Patrol, emergency workers and public works engineers confirmed that local street traffic is frequently impacted with congestion whenever there are incidents on US-101, as motorists voluntarily exit the freeway to find alternative routes around incidents or continue to their destination via local streets. Without clear directional signs or information, motorists unfamiliar with the area often find themselves lost on busy commercial or residential streets looking for an alternative route, or at a standstill due to the absence of a concerted traffic management effort among the various jurisdictions. The San Mateo Smart Corridor project was conceived to address these issues and more.

San Mateo County is located in between San Francisco to the north and San Jose to the south. This county benefits from a freeway grid network that includes two major freeways, US-101 and I-280, that run north- south, and two freeways in the east-west direction, I-380 and SR-92, together providing regional access to the San Francisco Bay Area economic and population centers in San Francisco Peninsula, and the Silicon Valley. The US-101 is a heavily traveled freeway, carrying 250,000 vehicles per day. El Camino Real is a parallel north-south multi-lane arterial that also connects business districts through the cities' downtowns, carrying 30,000 vehicles per day and is within Caltrans jurisdiction. The Smart Corridor local arterials are within the jurisdictions of the following agencies: San Bruno, Millbrae, Burlingame, San Mateo, Belmont, San Carlos, Redwood City, Menlo Park, East Palo Alto, Atherton, and County of San Mateo.



The San Mateo Smart Corridor in San Mateo County, California. San Francisco lies to the north, San Jose to the south

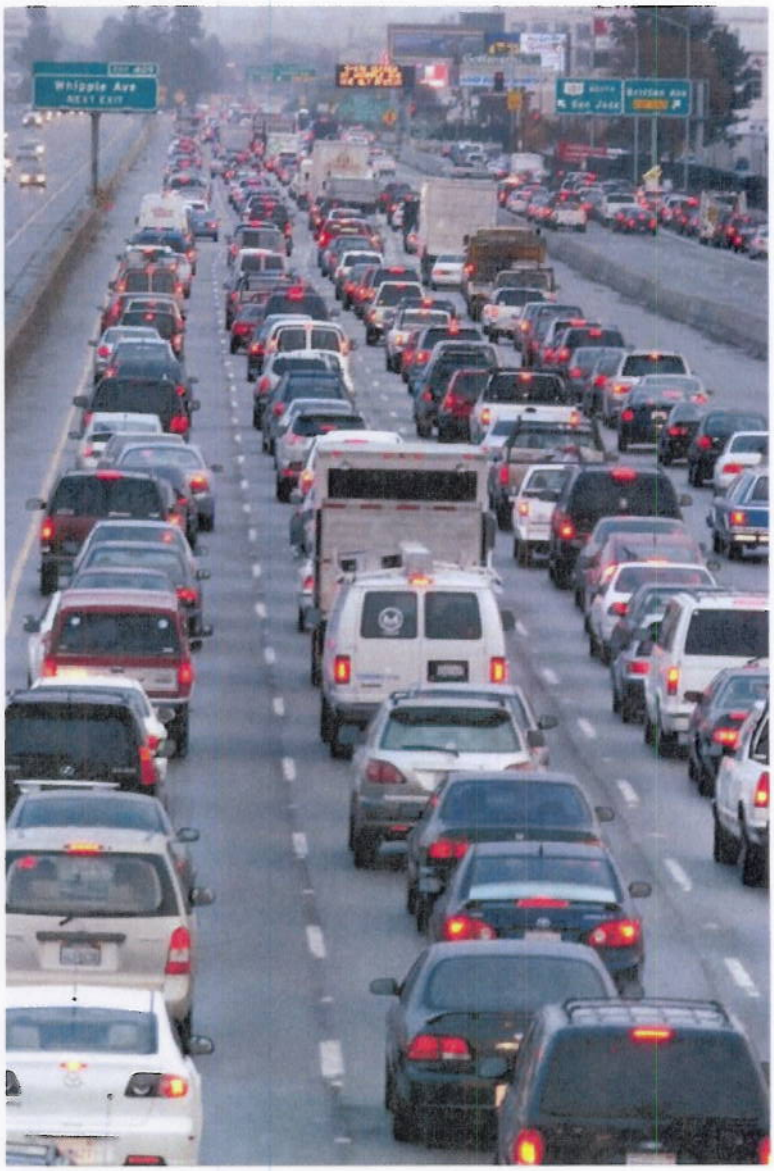
THE GOODS AND HOW THEY WERE DELIVERED

The San Mateo Smart Corridor project runs for approximately 20 miles and is comprised of US-101, El Camino Real and more than 25 local arterial roads (mostly in east/west travel direction) that connect US-101 and El Camino Real. The total lineal mileage of Smart Corridor streets including El Camino Real and local arterials is approximately 65 miles. Smart Corridor ITS elements include: fixed cameras (on each approach) at 80 intersections, 11 Pan-Tilt-Zoom (PTZ) cameras varying from 18' to 60' in mounting height, 115 Trailblazer (TB) signs, eight Arterial Dynamic Message Signs (ADMS), 43 microwave vehicle detection system (MVDS) detectors. The project includes 250 Caltrans and local traffic signals that will be interconnected with fiber optic communication infrastructure and predominately upgraded with Model 2070 signal controllers.

TB signs will provide direction to the

"The Smart Corridor project used an integrated team approach for delivery, using both agency staff and industry consultant expertise"

The US-101 carries over a quarter of a million vehicles per day



freeway with an electronic indicator arrow above the freeway signage. Under normal operations, electronic signage on El Camino Real will typically indicate a left or right turn to the freeway but under "Smart Corridor" or incident conditions, the TB may direct the motorist to return to US-101 via downstream east-west arterials.

ADMS are changeable message signs that provide advisory or detour information to motorists. The dimensions are approximately 4' x 8' and mounted on pole structures. ADMS are located on El Camino Real at I-380 and SR-92 where drivers can decide to take these connector freeways to I-280 to continue to their destination.

The Smart Corridor project used an integrated team approach for delivery, using both agency staff and industry consultant expertise. The design process included implementing the Federal Highway Administration (FHWA) Systems Engineering Management Process (SEMP) and Caltrans' Project Approval/Environmental Document process. The SEMP process was vital to the communication design and developed functional requirements for the cornerstone problem statement of addressing overflow incident traffic from US-101. The goal was established to proactively manage traffic already diverted from the freeway to minimize impacts on local arterials and redirect corridor traffic back to the freeway as soon as possible. This could be achieved by implementing preset signal timing plans or traffic responsive systems on Smart Corridor routes and providing real-time motorist information. Potential diversion routes on local streets with physical impediments such as those with reduced overhead clearance, speed bumps and other constraints were dismissed early-on. Routes close to and parallel to US-101 on frontage roads were found desirable. Although some east-west arterial streets did not posses all desired characteristics, they were included as Smart Corridor routes because of lack of other options and operational benefits they would provide.

ALL POINTS COVERED

The Project approval process documented the day-to-day benefits of the Smart Corridor and its applications for major special events beyond incident management. Environmental >>>

"Coordination goals included the sharing of resources and traffic information between agencies towards a unified transportation management approach across jurisdictions"

clearance was obtained for both local and state facilities within the project limits, including evaluation and mitigation of cultural affects, visual, utilities, air and noise, hazardous material, endangered species and other biological related risk. A value analysis study confirmed scope of work and provided recommendations such as adding more TB and ADMS signs and ensuring that traffic detectors were installed at expected end of queue at mid-blocks. The value analysis team included design professionals from industry, Caltrans and FHWA.

Interagency coordination goals were also established in the SEMP process. Coordination goals included the sharing of resources and traffic information between agencies towards a unified transportation management approach across jurisdictions and to enhance operations during normal conditions, incidents, or special events. Caltrans was identified as the lead agency during incident management conditions where proactive 24/7 operations can be initiated from the Bay Area Transportation Management Center (TMC). Based on these goals, the San Mateo TMC hub was also developed to provide an independent facility as a backup to the Bay Area TMC.

The Smart Corridor system is designed with a center-to-center architecture between the hub and the Bay Area TMC. Field elements connect point to point to the hub for reliability and simplicity. Communication line capacity and expandability were functional requirements for the real time video images and polling of system detectors. An evaluation of communication technologies included network systems and comparison of wireless cellular (leased line), Wi-Fi lines, microwave and fiber lines. The Smart Corridor uses Synchronous Optical Network (SONET) fiber optics standards and installs up to a 96 single mode fiber optics (SMFO) line for expandability with few wireless applications in areas where it's impractical to install fiber infrastructure. Reliability, capacity, maintenance and minimal operating cost were criteria for using fiber optic technology. Another valuable feature resulting from the project was connecting the various jurisdictions' city halls along the Smart Corridor routes with the fiber optic infrastructure.

The impetus for implementing ITSon the San Mateo corridor was a jack-knifed tanker truck gasoline spill and fire that created a traffic nightmare for more than two days

WHERE ARE WE NOW, WHERE ARE WE GOING AND THE FUTURE OF THE SAN MATEO SMART CORRIDOR?

The project was funded in various stages as funding became available. This US$35m project includes over US$25m for capital projects split into four infrastructure projects and three vendor contracts to build the signal software and supplement Caltrans resources with developing traffic signal timing flush plans, and providing systems integration. Currently, the infrastructure projects are in the construction phase, where the last project is expected to be completed in the Fall of 2013. The design team is now focusing on customizing the commercial-off-the-shelf traffic signal software, traffic signal timing and operations planning and providing system integration in anticipation of start-up in 2014.

The vision for the San Mateo Smart Corridor is to quickly verify incidents and the resulting traffic congestion on local streets, and if applicable, activate the Smart Corridor TB or ADMS signs and signal timing on affected Smart Corridor streets. The operator would have pre-set signal timing templates and map or list of devices that could be activated with a few clicks of a mouse depending on the scenario. During the incident, all stakeholders are informed and have view access to the software and camera images and are informed when the incident is over and traffic is back to normal conditions. The Smart Corridor does not change the emergency responders' standard field

incident management procedures.

The Smart Corridor is also applicable to evaluation of day to day recurrent traffic congestion where city traffic engineers can assess typical performance and initiate improvements. During special events, ability to utilize electronic signs and remote signal timing will benefit motorists and would be more cost effective as opposed to providing additional work force to provide field management.

Monitoring of incidents with Smart Corridor tools will be invaluable where experience and lessons learned can be applied to the next incident. The implementation of these tools in itself will satisfy interagency partnership goals. Future development of this expandable system may include supplemental bus transit priority and/or emergency preemption at intersections, additional TB signs, safety enhancements through advance warning signs at railroad crossings, additional changeable message signs for arterial travel times or road conditions, and consideration of other ITS or communication technologies. This project brings motorists in San Mateo County one step closer to a seamless travel within multiple jurisdictional boundaries.

fyi

Al B. Lee, P.E. is Project Manager; David Man, P.E, Smart Corridor Strategist and Sean Nozzari , P.E. is Deputy District Director/ Traffic Operations for the San Mateo Smart Corridor

sean.nozzari@dot.ca.gov al.b.lee@
david.man@dot.ca.gov al.lee@dot.ca.gov

Read more in our Archives at thinkinghighways.com
http://www.menlopark.org/departments/trn/Smartcorridors.html
http://www.cityofsanmateo.org/index.aspx?NID=2186

A strange name with an interesting business model.

Our maxim is simple.

We pledge to deliver the ØCash position. When we deliver service to you, the value realized will be at least equal to and probably much greater than our fee. In total, it will cost you nothing to use our services. As part of our service delivery to you we will quantify the value and agree it with you so you won't pay more than that value.

We specialize in helping public and private sector organizations to understand the effects of advanced transportation technologies then harness the value.

We have a unique combination of expertise and innovation; have worked with some of the biggest names in the business and many of the leading public agencies.

Talk with us and discover how we can help your organization define and unlock the safety, efficiency and customer service effects of ITS.

When it comes to ITS, ØCash is the watchword.

Bob McQueen
CEO, The ØCash Company
bob@0cash.com : 407 491 2842

....doing more with less