State of California
DEPARTMENT OF TRANSPORTATION

Business, Transportation and Housing Agency

M e m o r a n d u m

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Information Item

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Subject: **REPORT ON THE IMPLEMENTATION AND PERFORMANCE OF SHORT-TERM MOBILITY PROJECTS**

SUMMARY:

In support of the Administration's Strategic Growth Plan, the Department of Transportation (Department) identified congestion relief projects that could be implemented rapidly and "open to the public" by July 2007. These projects included signal coordination, auxiliary lanes, high occupancy vehicle (HOV) lane operational improvements, and intelligent transportation systems (ITS). A final report (attached) has been prepared to assess the benefits and lessons learned.

BACKGROUND:

Traditional measures to reduce congestion require a long lead-time and take many years to deliver. As part of the Short-Term Congestion Relief Action Plan, the Department initiated an internal review of short-term congestion relief projects that would be consistent with the Strategic Growth Plan and would be open to the public in the short term. The Department identified projects consistent with all of the following criteria:

- Could be completed and open to traffic in 18 months (by July 2007).
- Supported by regional transportation partners.
- Amended into the State Highway Operation and Protection Program (SHOPP) by June 2006 or funded in first year of the 2006 State Transportation Improvement Program.
- Could overcome engineering, environmental, or legal obstacles by June 2006.

All of the strategies were designed to reduce traffic congestion in the short-term and continue to improve mobility over the long-term. By accelerating the delivery of short-term improvements to the existing transportation system, the Department aimed to provide congestion relief as quickly as possible, as well as to address the Transportation Management Systems Master Plan recommended strategies for long-term system management. The 2006 SHOPP was amended to include these projects, and the Department presented updates at the December 2006 and November 2007 Commission meetings.

Attachment

SHORT-TERM CONGESTION MOBILITY SHOPP PROJECTS FINAL REPORT

California Department of Transportation
Division of Traffic Operations
December 2008

INTRODUCTION

When California decided a significant public investment in roads was a good idea the initial leaders of what was ultimately to become the Department of Transportation did not speak of the enterprise they were undertaking as a "mobility company". Nonetheless, they were embarking on the same voyage that we share today, i.e. improving mobility across California. Of course, at that time there was a greater need to build facilities to actually connect the various parts of the state to help grow the state. While our destination remains unchanged--the state of improved mobility, where Californians have access to goods, services and places--the journey has taken on new dimensions. The vehicle is no longer a Division of Highways within a Department of Public Works with a sole driver, and the route or ride is not a one dimensional build it and we will get there. A regional effort has arisen to share the driving and the route itself has more dimensions, not just in terms of multiple modes, but the emerging management strategies that call for more agile planning, operations, and maintenance efforts. The original building emphasis still plays a critical role, particularly in terms of renewal, and is part of the overall system management effort. This effort is predicated on knowing how our system is performing and why; understanding what types of improvements are available to improve performance across all critical performance metrics including return on investment; and managing not just the transportation systems, but the institutions and processes providing the functions that plan, develop, operate and maintain the system.

As much as our journey has changed, so too must it continue to change if we are to keep up with the challenging mission of improving mobility throughout California. Population growth and economic prosperity alone would justify this. Energy and environmental issues demand it. The Governor's Strategic Growth Plan certainly recognizes this and that is why we undertook the effort known as short-term congestion relief, to push ourselves and our processes to produce results by striving to get every ounce of mobility out of our existing system. Think of it as "squeezing the system". Facing fiscal constraints and demanding environmental objectives, we cannot afford to leave a drop of mobility untapped, and we must re-tool business processes continuously to reduce our costs of production. The Short-Term Congestion Relief Program was a small step in that direction.

This report is not a definitive scientific study. The conclusions are not fully supported by irrefutable data, but there is ample evidence that we can squeeze more out and need to repeat this process whenever possible.

If a similar effort is undertaken it should be supported with more rigorous documentation of what transpires in terms of the steps involved in identifying and developing projects with high payoff and short turn-around.

BACKGROUND

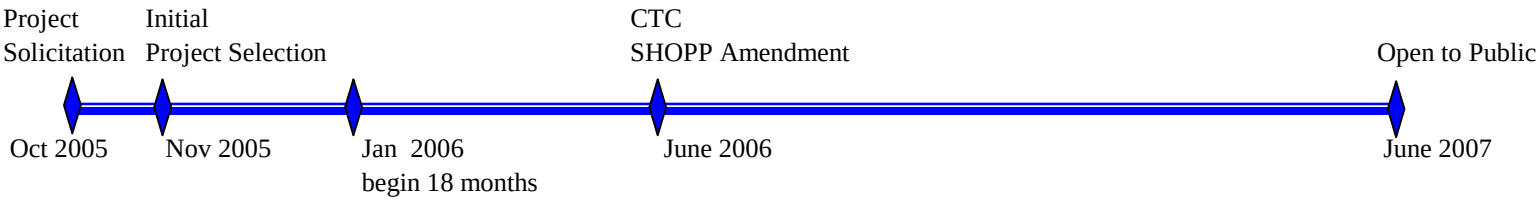
The Governor's Strategic Growth Plan proposed a comprehensive transportation investment package designed to decrease congestion, improve travel times and increase safety, while accommodating for future growth in the population and the economy. In November 2005, the Business, Transportation, and Housing Agency and the Department of Transportation (Department) developed the *Immediate, Short-Term Congestion Relief Action Plan* to bring forward key strategies consistent with the Strategic Growth Plan. In developing this plan, Director Will Kempton instructed the Department to propose strategies to jump-start congestion relief in the short term. Traditional measures to reduce congestion require a long

lead-time and take many years to deliver. By accelerating the delivery of short-term improvements to the existing transportation system, the Department aimed to provide congestion relief immediately. The Department identified projects based on the following criteria:

- Projects that could be completed and open to traffic in 18 months—by the end of June 2007.
- Projects that would be supported by regional transportation partners and federal agencies.
- Projects that could be amended into the State Highway Operation and Protection Program (SHOPP) by June 2006 or could be funded in the first year of 2006 State Transportation Improvement Program (STIP) by regional transportation partners.
- Projects that could overcome engineering, environmental or legal obstacles by June 2006, including achieving air quality conformity.

The Department's district operations deputies, in conjunction with district directors, initially proposed 38 projects for consideration at a cost of $136.9 million. All of the strategies were designed to reduce traffic congestion in the short-term and continue to improve mobility over the long-term. After submission of initial projects, districts made a more thorough review of projects based on timeline and constraints. Some projects were dropped and others added. The final list of 28 projects included auxiliary lanes, signal coordination, operational improvements, intelligent transportation systems (ITS) and corridor management strategies worth over $100 million. The 2006 SHOPP was amended to include these projects.

Timeline Summary



PROJECTS UNDERTAKEN

The following chart lists the projects undertaken and the cost for each project.

COUNTY	PROJECT DESCRIPTION	CAPITAL $$	SUPPORT $$
Sacramento	Construct auxiliary lanes on State Route 99 from Mack Road to Florin Road	$5,895,000	$1,256,000
Sacramento	Construct auxiliary lanes on U.S. 50 from Mather Field Road to Zinfandel Drive	$7,000,000	$1,144,000
Sacramento	Extend the existing westbound auxiliary lane on U.S 50 from Folsom Boulevard to Hazel Avenue	$3,100,000	$919,000
Sacramento	Extend truck climbing lane on U.S. 50 from Scott Road to Latrobe Road	$2,200,000	$730,000
San Mateo	Expand signal coordination on State Route 82	$6,545,000	$951000
Solano	Install detection and motorist information systems on Interstate 80	$1,100,000	$773,060
San Mateo	Establish Commuter Travel Time Information System on the U.S. 101 Corridor in San Mateo County	$1,030,000	$1,011,100
Kern	Construct eastbound State Route 58 auxiliary lane by adding lane on existing median; widen connector ramp from merge point to State Route 99 and restripe existing eastbound lanes to provide two-lane connector ramp at the merge.	$3,798,000	$491,500
Madera	Convert northbound right shoulder on State Route 41 to a right turn lane; re-stripe existing two northbound lanes to 11-foot lanes	$100,000	$37,400
Los Angeles	Provide adaptive signal system development on State Route 1	$9,004,000	$3,360,000
Los Angeles	Provide adaptive signal system development on State Route 66	$1,496,000	$1,061,300
Los Angeles	Provide adaptive signal system development on State Route 72	$1,666,000	$1,645,700
Los Angeles	Provide adaptive signal system development on State Route 107	$1,255,000	$1,077,500
Los Angeles	Provide adaptive signal system development on State Route 213	$834,000	$844,600
Los Angeles	Develop and implement corridor management on Interstate 210	$20,970,000	$8,382,000
San Bernardino	Coordinate traffic signals on various arterials and state routes in San Bernardino County	$3,677,000	$144,800
Riverside	Convert full time High Occupancy Vehicle Lane (HOV) lane on State Route 60 to part time	FHWA denied	
San Diego	Auxiliary Lane from end of truck lane to Santo Road on westbound State Route 52	$5,000,000	$1,425,300
San Diego	Convert HOV to mixed flow on State Route 54	$100,000	$101,300

COUNTY	PROJECT DESCRIPTION	CAPITAL $$	SUPPORT $$
San Diego	Add port of entry egress lane and improvements to Secure Electronic Network For Travelers Rapid Inspection (SENTRI) system	$1,400,000	$822,000
San Diego	Add a Free and Secure Trade (FAST) lane at Otay Mesa on Interstate 905	$1,000,000	$736,900
San Diego	Modify interchange on Interstate 5 at 28th Street	$2,900,000	$1,190,800
San Diego	Detection system for the major metro area of the county. Install radar scanners	$2,750,000	$2,279,000
San Diego	Add auxiliary lanes at Lomas Santa Fe on Interstate 5	$9,500,000	$1,881,000
San Diego	Modify the eastbound Via de la Valle onramp to northbound Interstate 5 and connect to auxiliary lane	$1,400,000	$692,300
San Diego	Widen single lane exit ramp at southbound Interstate 805 to Telegraph Canyon Road to two lanes	$1,800,000	$908,000
San Diego	Relocate Ramp Meter and HOV Bypass Storage Lane on State Route 94	$1,100,000	$681,300
Orange	Install 13 additional Changeable Message Signs (CMS) within Orange County	$3,978,000	$1,355,600
		$100,598,000	$35,902,400

DELIVERY

All of the above projects were open for business within the 18 months stipulated in the plan except for one project, the Route 210 congestion relief project.

PROJECT BENEFITS

The projects and their delay savings are arranged by project type.

- Operational Improvements
- Signal Coordination
- High Occupancy Vehicle (HOV) Lane and Border Improvements
- Intelligent Transportation Systems

Before and after studies were conducted to assess the benefits of these projects. The signal projects benefits are expressed in travel time and trip delay saving. The rest of the projects use daily vehicle hours of delay (DVHD) savings as used in the Highway Congestion Monitoring Program (HICOMP).

Operational Improvement Projects (10)

Ten projects were for operational improvements to reduce bottlenecks by adding space for vehicles entering and exiting the freeway. Auxiliary lanes and ramp modifications were constructed to accommodate speed changes and the lack of

Eastbound SR 58 after SR 99 merge

adequate weaving distances. They balanced the traffic load to maintain a more uniform level of service on the freeway.

EA	County	Description	Before DVHD	After DVHD	Delay Savings
2E120	Sacramento	Construct auxiliary lanes on State Route 99 from Mack Road to Florin Road	1347	1113	234
2E130	Sacramento	Construct auxiliary lanes on U.S. 50 from Mather Field Road to Zinfandel Drive	2510	0	2510
2E140	Sacramento	Extend the existing westbound auxiliary lane on U.S 50 from Folsom Boulevard to Hazel Avenue	833	0	833
2E150	Sacramento	Extend truck climbing lane on U.S. 50 from Scott Road to Latrobe Road	88	0	88
0F380	Kern	Construct eastbound State Route 58 auxiliary lane by adding lane on existing median; widen connector ramp from merge point to State Route 99	430	0	430
0F530	Madera	Convert northbound right shoulder on State Route 41 to a right turn	42	24	18
2T0201	San Diego	Auxiliary Lane from end of truck lane to Santo Road on westbound State Route 52	1773	556	1217
27960	San Diego	Modify the eastbound Via de la Valle onramp to northbound Interstate 5 and connect to auxiliary lane	2361	2044	317
22431	San Diego	Add auxiliary lanes at Lomas Santa Fe on Interstate 5	474	410	64
28010	San Diego	Widen single lane exit ramp at southbound Interstate 805 to Telegraph Canyon Road to two lanes	130	27	103

Signal Projects (8)

Los Angeles Signal Project Locations

Eight projects involved signal coordination. Coordination and synchronization of traffic signals based on real-time demand reduces congestion and increases throughput on major arterials. It reduces trip travel times, encourages transit use, and can encourage short distance trips to remain on arterials instead of saturating freeways.

The five projects in the Los Angeles area installed adaptive traffic-signal control systems (ATSCS), which includes over 120 intersections. ATSCS belongs to the latest generation of signalized intersection control. This new system allows the Department to optimize signal coordination at the project routes in coordination with local agencies. ATSCS continuously detects vehicular traffic volume and computes "optimal" signal timings based on real-time demand. A project in San Mateo County expanded signal coordination on State Route 82, and signalization and ramp

modifications made to a ramp on Interstate 5 used extensively by trucks, improved access to the Port of San Diego.

The Department also contributed to a signal coordination project managed by San Bernardino Association of Governments (SANBAG). The project covered 150 miles of major arterials parallel to and connecting to interstate and state routes. The project consisted of a total of 650 traffic signals, including 143 Department signals on two state highways and 48 freeway interchanges, and involved 15 separate agencies.

EA	County	Description	Travel Time Savings	Vehicle hours/day saved
24991	San Mateo	Expand signal coordination on State Route 82	5.8 minutes	498 (11%)
25730	Los Angeles	Provide adaptive signal system development on State Route 1	5.1 minutes	650 (5%)
25760	Los Angeles	Provide adaptive signal system development on State Route 66	8.5 minutes	550 (13%)
25770	Los Angeles	Provide adaptive signal system development on State Route 72	8.1 minutes	480 (10%)
25780	Los Angeles	Provide adaptive signal system development on State Route 107	3.0 minutes	780 (21%)
25790	Los Angeles	Provide adaptive signal system development on State Route 213	8 minutes	450 (18%)
0H780	San Bernardino	Coordinate traffic signals on various arterials and state routes	78 minutes*	9,360 (20%) *
27980	San Diego	Modify interchange on Interstate 5 at 28th Street and add signal	2.6 minutes **	

* Travel time savings for peak direction for 150 miles of the arterial system based on field surveys on Foothill Boulevard.
**Although benefits are based on signal savings, main benefit was derived from large trucks being able to use this ramp instead of using a longer alternate route to get to the port.

High-Occupancy Vehicle (HOV) Lane and Border Improvements (5)

Five projects involved HOV lanes or border crossing improvements. One project reduced congestion by converting a 3-mile HOV lane with a high violation rate back to mixed flow on State Route 54. Later, when the State Route 54/125 corridor is complete, an HOV system corridor-wide will be proposed. Another project extended the HOV lane for storing more vehicles and better operation to reduce delay on the Route 94/125 connector. However, a project to convert an HOV lane from full time to part time on Interstate 60, to reduce congestion during off-peak periods, was denied. The Federal Highway Administration (FHWA) denied the request fearing it could deter motorists from forming carpools.

Secure Electronic Network For Travelers Rapid Inspection (SENTRI) lanes at the San Ysidro Border crossing allow frequent travelers with prior security clearance to bypass the standard lanes. SENTRI technology was implemented as an alternative to reduce the long queue at the border crossing. Standard lane wait times are about 45-60 minutes and can be as high as 120 minutes. SENTRI lanes have wait times generally less than 10 minutes.

Similarly, an additional Free and Secure Trade (FAST) lane was installed at the Otay Mesa border crossing for trucks. Approved trucks are fitted with transponders that automatically give border inspectors detailed information about the cargo and company. Drivers carry a FAST pass card that indicates whether either or both countries have cleared them.

EA	County	Description	Before DVHD	After DVHD	Delay Savings
OH3901	Riverside	Convert full time High Occupancy Vehicle Lane (HOV) lane on State Route 60 to part time			FHWA denied
28190	San Diego	Convert HOV to mixed flow on State Route 54	155	30	125
280401	San Diego	Relocate Ramp Meter and HOV Bypass Storage Lane on State Route 94	500	311	189
28030	San Diego	Add a Free and Secure Trade (FAST) lane at Otay Mesa on Interstate 905	BEFORE: 19 MINUTES PER TRUCK AFTER: 13 MINUTES, PER TRUCK SAVINGS: 6 MINUTES+ 33% Average Savings on U.S.A. side of border for 6,000 trucks daily and 1.4 million trucks annually		
279901	San Diego	Add port of entry egress lane and improvements to Secure Electronic Network For Travelers Rapid Inspection (SENTRI) system	With the addition of a 7th lane, the traffic volume on each existing lane was reduced BEFORE : Average ADT 8,980 Average PHV 593 AFTER: Average ADT 7,265 and Average PHV 442 20% reduction in average peak hour volume per lane		

Intelligent Transportation Systems (4)

Four projects incorporated ITS to increase traveler information. Three of these projects expanded detection, changeable message sign, or closed circuit television coverage as recommended in the Transportation Management System Master Plan.

Message Sign with comparative times

The Commuter Travel Time Information System project allows the public to make an informed decision to use public transit. It gives real-time comparisons in travel-

time between the freeway and Caltrain, and indicates parking availability. Showcasing leadership, partnership and innovation, this project won the 2008 TRANNY award for the best traffic operations project of the year

EA	County	Description	Delay Savings
3A360	San Mateo	Establish Commuter Travel Time Information System on the U.S. 101 Corridor in San Mateo County	10% increase in ridership++
15290	Solano	Install detection and motorist information systems on Interstate 80	Transportation management system investments yield a benefit-cost ratio of 7.5:1 through improved traveler information and incident management (Based on analysis from the TMS Master Plan –Financial Report)
08080	San Diego	Detection system for the major metro area of the county. Install radar scanners	
0E160	Orange	Install 13 additional Changeable Message Signs (CMS) within Orange County	

++Based on Caltrain data 9months after implementation. A report evaluating the benefits will be completed by the end of 2008.

Congestion Relief Project - Interstate 210

The I-210 corridor management project included the expansion of existing traffic management strategies to new locations and implemented new and innovative ramp metering strategies. The initial results are promising. The project includes two major metering strategies.

Connector Metering on I-210

This first phase focused on the implementation of new ramp metering strategies in the corridor. This included the introduction of freeway-to-freeway connector metering at several key interchanges, the conversion of previously unmetered HOV (High Occupancy Vehicle) by-pass lanes to metered lanes. It also included deployment of on-ramp metering at previously unmetered locations. This essentially created a "closed" system in which all points of entry are controlled by a ramp or freeway connector meter. This is a key concept necessary for successful implementation of the adaptive metering concept, which is the next major strategy.

The adaptive metering concept focuses on further enhancing the deployed metering strategies through the introduction of system-wide adaptive ramp metering (SWARM). This advanced metering strategy works by automatically evaluating realtime traffic situations at selected and dynamic bottlenecks throughout the corridor. When ultimately refined, it will predict future congestion and automatically adjust metering rates accordingly to help to reduce congestion. This methodology improves the ability to maximize and maintain efficiency of traffic flow throughout the corridor. It represents an innovation over current metering capabilities, by implementing ramp metering on a system wide basis, and can respond to both recurring and non-recurring traffic congestion.


Metering onramp to westbound I-210

Initial evaluation results include:

- Corridor speeds were observed to increase as a result of the Phase 1 metering improvements. Overall corridor speed changes in the westbound direction were modest. Average speed changes in the eastbound direction, however, were significantly positive, increasing by up to 33 percent.

- As a result of the increase in speeds, corridor travel times decreased. Peak period travel times in the westbound direction decreased by an average of 2 minutes, while travel times in the eastbound direction decreased by an average of 10 minutes.

The SWARM metering algorithm was deployed initially in the fall of 2008; the data collection took place in November 2008. The analysis of this data, as well as the analysis of the data collected after the metering changes were implemented, will be documented in a comprehensive evaluation report anticipated to be completed by March 2009.

LESSONS LEARNED

A variety of hurdles had to be overcome to implement these proposals in the shorter than normal time frame. For the most part, these projects were given priority and special handling. The project managers worked closely with staff every step of the way to ensure timely delivery. Below are some of the successful processes used to achieve the accelerated timeline and some of the problems and issues encountered.

Successes

- Full support was given from the district director down to every functional unit to get the projects done and open to traffic by June 2007. It was the cooperation from all parties involved and the funding commitment that enabled projects to be completed in such a short time, much shorter than a typical project schedule of this type.

- Design for many projects took place concurrently with the programming documents in order to meet the schedule. One District is using the STCRP projects as an example for a shorten project report process.

- The environmental and right of way process for most of the projects were non-issues as projects were chosen that could clear quickly in these two functional areas.

- Districts worked with the Department's Construction office early and often on these projects. Construction was able to discuss with the project manager which projects were possible to construct in a short time line.

- Innovative ideas were used. District 4 (Bay Area) investigated the possibility of utilizing existing conduits that were placed along the San Mateo Route 82 corridor in 2000 by a

telecommunications consortium. Instead of digging up an active roadway with a lot of existing utilities, tree roots, traffic, etc, it was determined more cost effective to purchase the existing conduit. Utilizing the existing conduit saved the inconvenience to the traveling public, business owners and residents, saved time and minimized risks due to the abundance of existing utility lines along the corridor. An added benefit is that the conduit would be large enough and extends far enough to be utilized for a future planned fiber optic cable installation.

PROBLEMS/ISSUES

- Without a complete project study phase, there was not enough time to consider multiple options so all the report did was substantiate what was already chosen instead of investigate other alternatives. This was not a big deal for the simplistic projects where the solution was obvious, but for the more complicated projects, the best solution or the most cost effective solution may not have been considered.

- Short schedules for complex projects result in schedules that cannot be realistically met and get squeezed at the end in the construction schedule. The SENTRI lane project at the San Diego border was one of these complicated projects. It required a design exception, a sole source to be compatible with the existing system, and a "risk vote". Response strategies were developed to manage the risk, including shortening review times.

- Several auxiliary lane projects were initially planned as interim re-striping jobs to reduce lane widths to add a lane. Instead, a paved lane was added and exceptions to standard lane and shoulder widths were not needed. This saved money in the long run since a future permanent project was no longer needed.

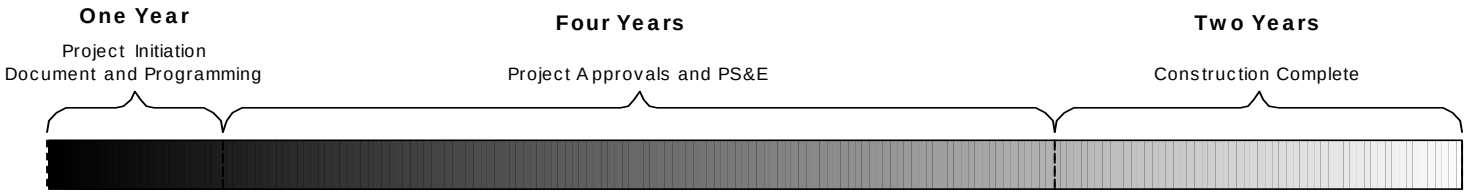
- No matter how smoothly a project progresses through the PS&E (Plans, Specifications, and Estimates) process, once in Construction unforeseen events can occur. The auxiliary project on State Route 99 between Mack Road and Florin Road was delayed due to unsuitable material found on the project. The contractor was to re-use excavated material for backfill, but when the material was excavated it was found to be unsuitable for use. Time was spent testing the material and negotiating imported material with the contractor. On another project, delays occurred due to a difficult contractor who did not commit the number of people to the project necessary to get the work done. The District had to threaten to bill for liquidated damages, providing the motivation to get the work done

- The District 8 (San Bernardino/Riverside) signal project faced many institutional challenges. The Department contributed funds to the San Bernardino Valley Coordinated Traffic Signal System Program project. It coordinated approximately 650 signals parallel to and connecting to state routes and interstates. The Department provided oversight during project development and control over state-maintained signals. However, the lead agency was San Bernardino Association of Governments (SANBAG) in cooperation with 15 other agencies. Since the project involved multiple agencies and many new ITS technologies, direct vendor support was required to help assist contractors in successful implementation of the project. The newly coordinated traffic signals will be monitored/fine-tuned for three years to help ensure the project benefits are sustained on a long-term basis.

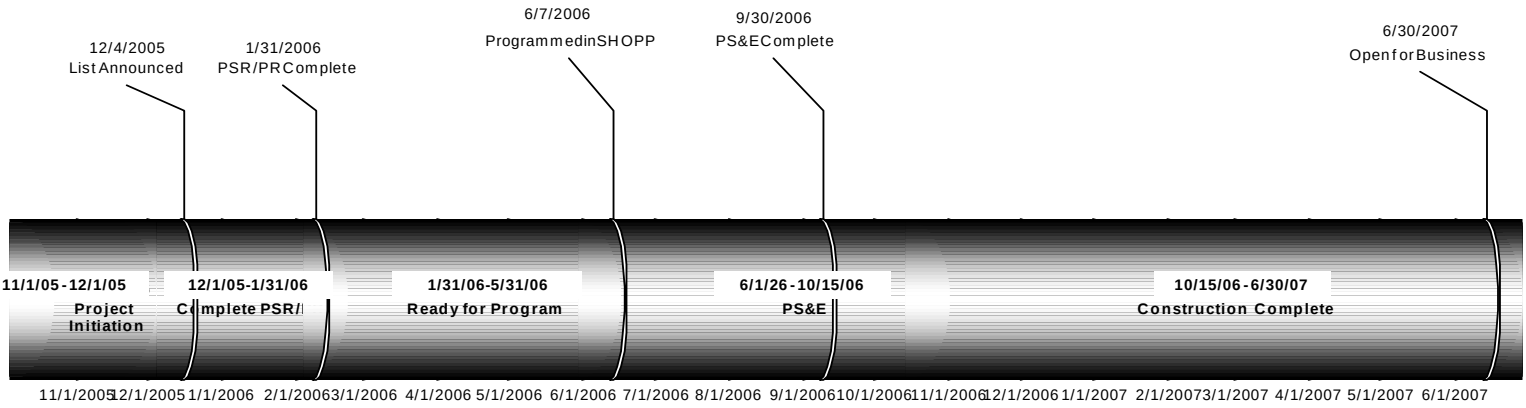
CONCLUSIONS

- It is clear that projects were developed and executed in less time than normally would have elapsed for such projects (see diagram). Instead of up to five years, it was accomplished in less than two. However calendar time alone does not tell the complete story. More importantly the work effort was reduced. Aggressive scheduling kept all activities fresh and reduced the multiple reviews that can occur on a more normal schedule. This translates into higher risk--the exact magnitude was unable to be determined. At this time, there is no indication that the higher risk was of serious magnitude.

Normal Mobility Project Life Cycle



STCR Project Life Cycle



- The SHOPP Mobility Program needs to consider using a similar process for future investments. Given the uncertainty of SHOPP Mobility funding, we should not be continuously developing needs list which most likely will be shelved. Rather, we should be prepared to move at the same pace experienced in this effort when funding is available, emphasizing new ideas and high payoff.

- There is a need to push the envelope for ways to better utilize the physical plant available to us to move people and goods with reasonable travel times, safely and reliably. While we had limited success with re-striping in these projects, it has opened our eyes to such opportunities as evidenced by the improvement embedded in the I-5 “Boatsection” project (restriped during the project to eliminate a lane-drop caused bottleneck) and proposed for the HOT lane on I-10 in Los Angeles.