

Memorandum

To: CHAIR AND COMMISSIONERS

CTC Meeting: March 12-13, 2008

Reference No.: 3.7
Information Item

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Subject: **DRAFT 2007 FOURTH QUARTER SEISMIC SAFETY RETROFIT REPORT**

Per Section 188.5(g) of the Streets and Highways Code, attached is the Department of Transportation's Draft 2007 Fourth Quarter Seismic Retrofit Report.

Attachment

CALIFORNIA DEPARTMENT OF TRANSPORTATION

FOURTH QUARTER 2007 NON-TOLL SEISMIC RETROFIT PROGRAM QUARTERLY REPORT

Seismic Retrofitting of Freeway Structures

Previous California earthquakes that devastated highway bridges have prompted a massive renovation program. Older overpasses are vulnerable at their joints and columns and are being retrofitted to help them stand up to a quake.

Original concrete column
Grout
Steel casing
Footing

Cable supports
Keep road beds from separating at joints.

Hinge restrainers
Cables hold bridge decks to columns.

Support columns

- Older concrete columns lack the tight spiral steel wrapping that better holds the columns together during a quake. These columns are fitted with a steel casing.
- A thin layer of concrete grout fills in gaps between steel casing and concrete column.
- Footings are enlarged and pilings driven deep into ground for structures built in soft soil.

Old columns
Vertical rods and 1/2" steel hoops on 12" centers.

New columns
Continuous 3/4" steel spirals on 3" centers support vertical rods.

During quake
Columns collapse under lateral motion.

Floodbed cross section at joint
Cable supports
Underside
Hinge extension

Source: Caltrans rev. 1/95

AP/Karl Gude, Dawn Desilets

Executive Summary

The purpose of this report is to provide information on the status and progress in delivering the California Department of Transportation's (Department) non-toll seismic retrofit programs. The Phase 1 Seismic Retrofit Program is complete and is no longer being reported on. The Toll Bridge Seismic Retrofit Program Report is prepared and submitted separately by the Toll Bridge Program Oversight Committee as outlined in Section 30952.2 (b) (1) of the Streets and Highways Code.

This report fulfills the Department's statutory reporting requirement outlined in Assembly Bill (AB) 144 (Chapter 71, Statutes of 2005), which amended Section 188.5 (g) of the Streets and Highways Code as follows:

"(1) Commencing on January 1, 2004, and quarterly thereafter until completion of all applicable projects, the Department shall provide quarterly seismic reports to the transportation committees of both houses of the Legislature and to the commission for other seismic retrofit programs.

(2) The reports shall include all of the following:

- (A) A progress report for each program.*
- (B) The program baseline budget for support and capital outlay construction costs.*
- (C) The current or projected program budget for support and capital outlay construction costs.*
- (D) Expenditures to date for support and capital outlay construction costs.*
- (E) A comparison of the current or projected schedule and the baseline schedule.*

(F) A summary of milestones achieved during the quarterly period and any issues identified and actions taken to address those issues."

The Department currently has two active non-toll seismic retrofit programs as outlined below.

Phase 2 Seismic Retrofit Program:

The program consists of additional (beyond Phase 1) State-owned bridges that were determined to need seismic retrofit based on additional screening.

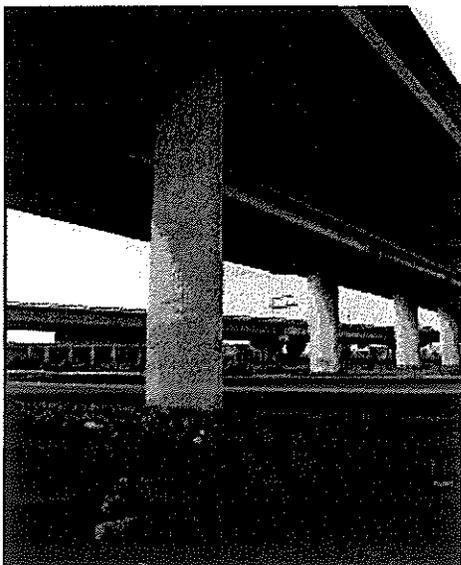
Local Bridge Seismic Retrofit Program:

The program consists of seismic retrofit of locally-owned and Department of Water Resources (DWR) bridges. This program is funded and implemented by the agencies having jurisdiction over the bridges.

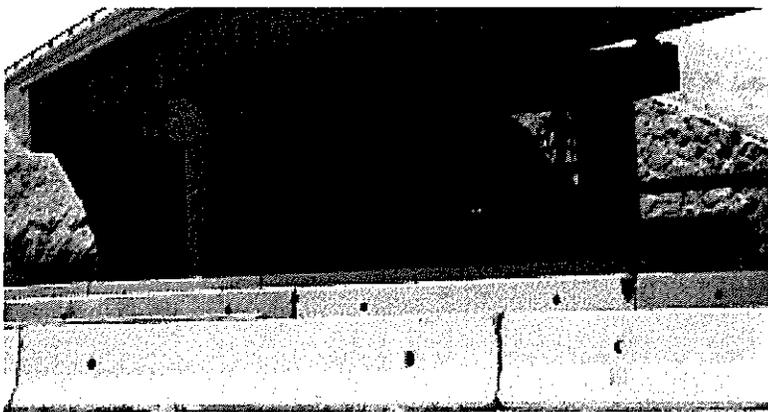
Seismic Retrofit Program Overview

In California, there are more than 12,000 State-owned bridges on the State Highway System, plus an additional 11,500 city and county-owned bridges not on the State Highway System. Each bridge is inspected at least once every two years. Since the 1971 Sylmar earthquake struck the Los Angeles area, the Department has been engaged in an ongoing bridge Seismic Retrofit Program. Following the 1989 Loma Prieta earthquake, the Department's current Seismic Retrofit Program was established to identify and strengthen bridges that needed to be brought up to seismic safety standards.

Using research developed following the 1971 Sylmar earthquake, the Department initially identified 1,039 State-owned bridges in need of being retrofitted to meet seismic safety standards, called Phase 1. The Phase 1 program consisted of mostly single-column bridges that were considered the most vulnerable during an earthquake. The work was funded by State gas taxes.



After the 1994 Northridge earthquake, the Department identified another 1,155 State-owned bridges that became the Phase 2 program consisting of mostly multi-column bridges. Funding for this \$1.35 billion program came from a \$2 billion bond (Proposition 192), which was passed in 1996.



When the Seismic Retrofit Program was established, there were also seven State-owned toll bridges that required retrofit work. The status and progress of the Toll Bridge Seismic Retrofit Program is reported separately in the quarterly Toll Bridge Seismic Retrofit Program Report.

There are a total of 1,235 locally-owned and DWR bridges statewide in the Local Bridge Program. Lead agencies are responsible for assessing the need for seismic retrofit work on locally-owned bridges. The majority of funding comes from gas tax revenues utilizing subvention funds through the Department's Local Assistance Program, \$125 million is available from Proposition 1B Bond program funds, and additional local funds may be used.

Seismic Evaluation

Based on the 1971 Sylmar earthquake research, the Department implemented new bridge design criteria. From 1986 to 1989, a retrofit program developed by the Department identified single-column bridges as being potentially the most vulnerable to earthquake damage. Research sponsored by the Department at the University of California, San Diego, led to a retrofit procedure that uses steel jackets to increase the strength of columns. Following the 1989 Loma Prieta earthquake, the Department sponsored accelerated retrofit research primarily conducted at the University of California, Berkeley, and the University of California, San Diego.

The Seismic Retrofit Program now involves strengthening the columns of existing bridges by encircling certain columns with a steel casing or, in a few instances, an advanced woven fiber casing. In addition to the column casing, some of the bridge footings are made bigger and given more support by placing additional pilings in the ground, or by using steel tie-down rods to better anchor the footings to the ground. In a few projects, bridge abutments are made larger and the existing restrainer units are made stronger because encasing the columns makes them stiffer and can change the way forces are transmitted within the bridge. Many seismic retrofits involve "hinge seat extensions" which enlarge the size of the hinges that connect sections of bridge decks and help prevent them from separating during severe ground movement. The design of each bridge to be retrofitted is "site specific" based on the

maximum credible earth movement expected at that location. The design details depend on many factors, including the nearest active earthquake fault, type of geology beneath the bridge and the original bridge design.

Phase 2 Seismic Retrofit Program

Progress Report

The Phase 2 Seismic Retrofit Program is currently 99 percent complete. To date 1,149 State-owned bridges, out of a total of 1,155 planned bridges, have been retrofitted under the Phase 2 program. Of the remaining six bridges, two are under construction, one is advertised and three bridges are in design.

Milestones Achieved This Quarter

Seismic retrofit work was completed on the Mojave River Bridge on State Route 18 in San Bernardino County on October 5, 2007.

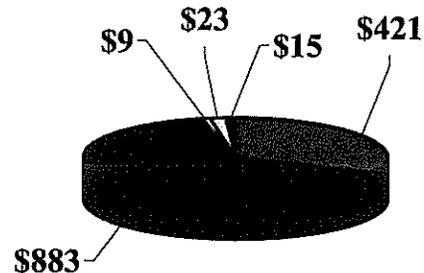
Program Budget and Expenditures

The total budget for Phase 2 is \$1.35 billion. A total of \$883 million has been allocated for construction and right-of-way, and an additional \$421 million has been expended for support. The total of \$1,304 million committed to date utilizes approximately 97 percent of the available program funds.

Of the remaining balance of \$46 million, \$23 million is to be allocated for construction and right-of-way, and \$9 million is planned for support, leaving a reserve of \$14 million. This reserve is intended to cover cost changes, higher than anticipated bid results, any potential supplemental funds that may be needed, and arbitration settlements.

No program cost overruns are anticipated. All remaining funds will be utilized to complete the Phase 2 program.

Program Costs (millions)



- Support Expenditures
- Construction and Right of Way
- Planned Support
- Planned Construction and Right of Way
- Reserve

Program Funds

The funding for the Phase 2 program for seismic retrofit comes from three sources. Proposition 192, which the voters approved in March of 1996, provides bonds for \$1.21 billion. As shown in the table below, an additional \$140 million was expended from a combination of State (\$99.8 million) and Federal (\$40.2 million) funds prior to the passage of Proposition 192. The total budget for Phase 2 is \$1.35 billion.

Seismic Retrofit Funds

Funds (millions)	Budgeted	Allocated
State	\$99.8	\$99.8
Federal	\$40.2	\$40.2
Bond	\$1,210.0	\$1,164.0
Total	\$1,350.0	\$1,304.0
Available		\$46.0

As bridges were evaluated for seismic retrofit design strategies, it was determined that for some bridges it would be more cost effective to replace the bridge than to retrofit. This is particularly true when the existing bridge needed non-seismic improvements for bridge repair or rehabilitation.

The additional cost for replacement is beyond the scope of funds available for the retrofit program. Consequently, bridge replacement costs were programmed in the State Highway Operations and Protection Program (SHOPP).

**Additional Bridge Replacement Funds
Funded from SHOPP**

Replacement Bridges	Program Year	Const \$	R/W \$
Ten Mile	2005-06	\$ 22.3	\$ 0.2
5 th Avenue Overhead	2006-07	\$ 153.8	19.8
Projects Allocated from SHOPP - \$195.9 million			
High Street Separation	2005-06	\$ 73.2	\$ 20.1
Schuyler Heim	2005-06	\$ 250.0	\$ 5.0
Projects Programmed in SHOPP - \$348.3 million			

Program Delivery by Region / District

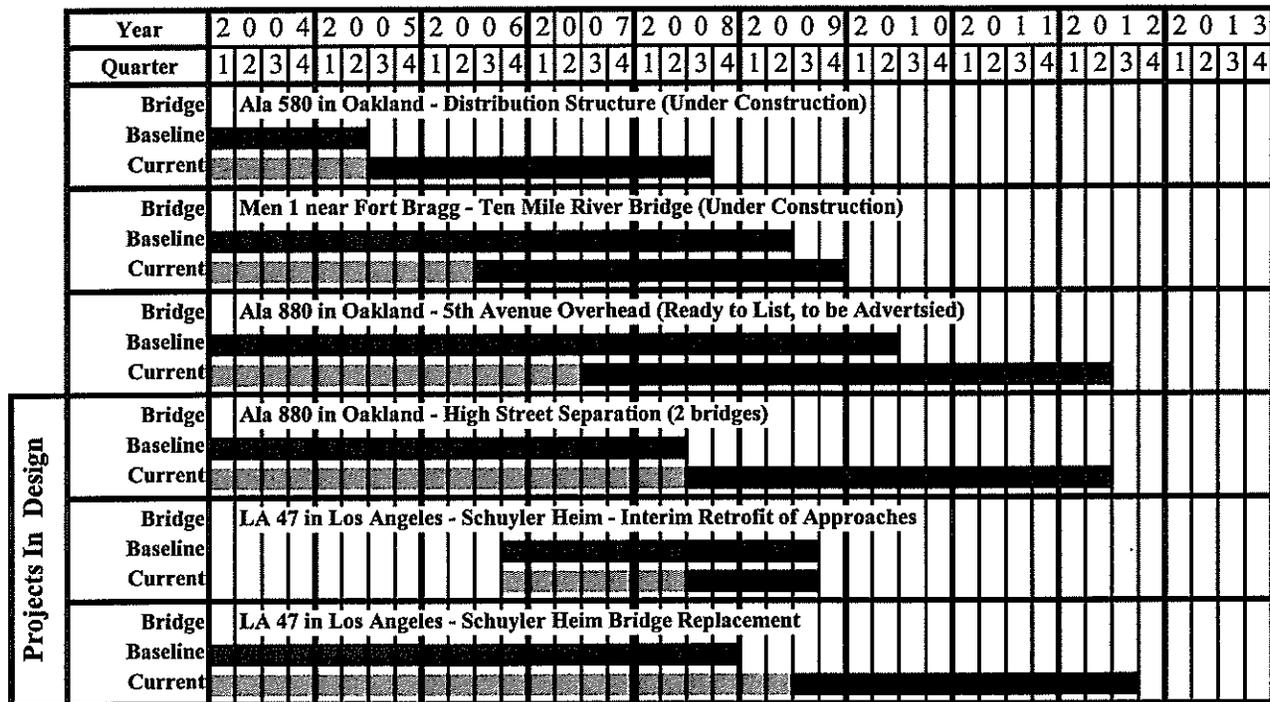
Bridges By Region	#	Percent of Total	\$ million	Percent of Total
North Coast	81	7	\$ 154	11
Bay Area	151	13	\$ 527	39
Central Valley	267	23	\$ 184	14
Southern California	656	57	\$ 485	36
Total	1,155	100	\$ 1,350	100

Bridges By District Office	#	Percent of Total	\$ million	Percent of Total
1 (Redding)	69	6	\$ 139	11
2 (Eureka)	12	1	\$ 15	1
3 (Marysville)	36	3	\$ 40	3
4 (Oakland)	151	13	\$ 527	39
5 (San Luis Obispo)	107	9	\$ 82	6
6 (Fresno)	77	7	\$ 18	1
7 (Los Angeles)	292	25	\$ 301	22
8 (San Bernardino)	131	11	\$ 86	6
9 (Bishop)	7	<1	\$ 2	<1
10 (Stockton)	40	4	\$ 42	3
11 (San Diego)	172	15	\$ 82	6
12 (Irvine)	61	6	\$ 16	1
Total	1,155	100	\$ 1,350	100

Comparison of Current and Baseline Schedule

While the program is 99 percent complete, the few remaining bridges (1 percent) are taking substantially longer than originally planned because they are either total bridge replacement projects, or are follow-up contracts to earlier

contracts. The bridge replacement contracts face delivery challenges, including environmental protection, construction under heavy traffic conditions, and securing public and external agency input and acceptance for project approval.



Indicates Current Reporting Quarter

Baseline date is planned schedule as of November 2001 (AB1171 approved)

Projects Under Construction

Distribution Structure – Project #3 / 3

In Alameda County at the junction of Interstates 80 and 580 in Oakland.

This project is the third project to retrofit a portion of the bridges at this location. There have been multiple projects due to right-of-way utility relocation and constructability issues.

Retrofit Strategy: Reinforce columns and expand footings.

	Construction		Budget (millions)
	Begins	Ends	
Baseline Schedule	Mid 04	Early 05	
Current Schedule	Mid 05	Late 08	

Funding:	Total		
Construction			\$13.9
Right-of-Way			\$ 0.0
Support			\$ 5.3
Total			\$19.2

Number of Bridges to be Retrofitted – 1
33 0061L EB 80 / EB 580



The construction contract is currently 94 percent complete.

Ten Mile River Bridge

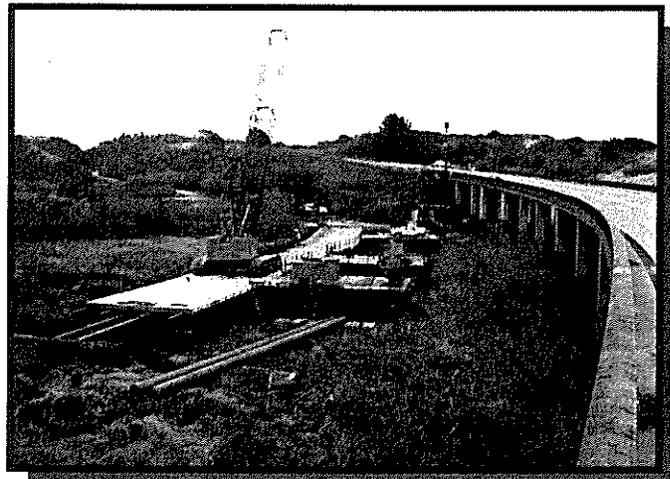
In Mendocino County on Route 1 North of Fort Bragg and South of Westport.

Retrofit Strategy: Replace Bridge.

	Construction		Budget (millions)
	Begins	Ends	
Baseline Schedule	Late 05	Early 09	
Current Schedule	Late 06	Early 10	

Funding:	SHOPP	Seismic	Total
Construction	\$22.3	\$29.9	\$52.2
Right-of-Way	\$ 0.2	\$ 0.0	\$ 0.2
Support	\$10.0	\$10.0	\$20.0
Total	\$32.5	\$39.9	\$72.4

Number of Bridges to be Retrofitted – 1
10-0161 Ten Mile



The construction contract is currently 52 percent complete.

Projects in Design

High Street Separation

In Alameda County on Interstate 880 in Oakland.

Retrofit Strategy: Replace Bridges.

	Construction		Budget (millions)
	Begins	Ends	
Baseline Schedule	Mid 04	Mid 08	
Current Schedule	Mid 08	Mid 12	
Funding:	SHOPP	Seismic	Total
Construction	\$73.2	\$ 0.0	\$73.2
Right-of-Way	\$20.1	\$22.0	\$42.1
Support	\$32.4	\$15.5	\$47.9
Total	\$125.7	\$37.5	\$163.2

Number of Bridges to be Retrofitted – 2

33 0040L High Street Separation Overhead

33 0040R High Street Separation Overhead

The current schedule to deliver this project is the ready to list milestone in June 2008.



Final contract plans are scheduled for late this year.

The major issue delaying the implementation of this project has been the project's right-of-way requirements.

One parcel presents a difficult challenge to keeping a local business in operation while the building is cut and refaced. Another risk is securing one other parcel along with potential street modifications and approvals from the City.

Fifth Avenue Overhead

In Alameda County on Interstate 880 in Oakland.

Retrofit Strategy: Replace Bridge.

	Construction		Budget (millions)
	Begins	Ends	
Baseline Schedule	Mid 04	Early 10	
Current Schedule	Mid 07	Mid 12	
Funding:	SHOPP	Seismic	Total
Construction	\$122.1	\$ 0.0	\$122.1
Right-of-Way	\$ 19.8	\$17.2	\$ 37.0
Mitigation	\$ 0.0	\$17.0	\$ 17.0
Support	\$ 15.3	\$ 7.0	\$ 22.3
Total	\$157.2	\$41.2	\$198.4

Number of Bridges to be Retrofitted – 1
33 0027 Fifth Avenue Overhead



This project was advertised on November 26, 2007 and is scheduled for bid opening February 5, 2008.

Schuyler Heim Bridge Interim Retrofit

In Los Angeles County on Route 47 in Long Beach.

Retrofit Strategy: Reinforce bridge approaches.

	Construction		Budget (millions)
	Begins	Ends	
Baseline Schedule	Late 08	Late 09	
Current Schedule	Mid 08	Early 09	
Funding:			Total
Construction			\$6.0
Right-of-Way			\$0.3
Support			\$2.0
Total			\$8.3

Number of Bridges to be Retrofitted – 0 – Interim Measure
53 2618 Schuyler Heim Bridge

The Department is initiating an interim retrofit project to enhance safety of the approach slabs to the bridge. This will provide an increased level of safety on an interim basis while the bridge replacement project is implemented.

Schuyler Heim Bridge Replacement
In Los Angeles County on Route 47 in Long Beach.
Retrofit Strategy: Replace Bridge.

	Construction		Budget (millions)
	Begins	Ends	
Baseline Schedule	Late 05	Late 08	
Current Schedule	Mid 09	Late 12	
Funding:	SHOPP	Seismic	Total
Construction	\$250.0	\$0.0	\$250.0
Right-of-Way	\$ 5.0	\$0.0	\$ 5.0
Support	\$ 25.1	\$4.0	\$ 29.1
Total	\$280.1	\$4.0	\$284.1

Number of Bridges to be Retrofitted – 1
53 2618 Schuyler Heim Bridge

Note: Current schedule tied to local improvements schedule.

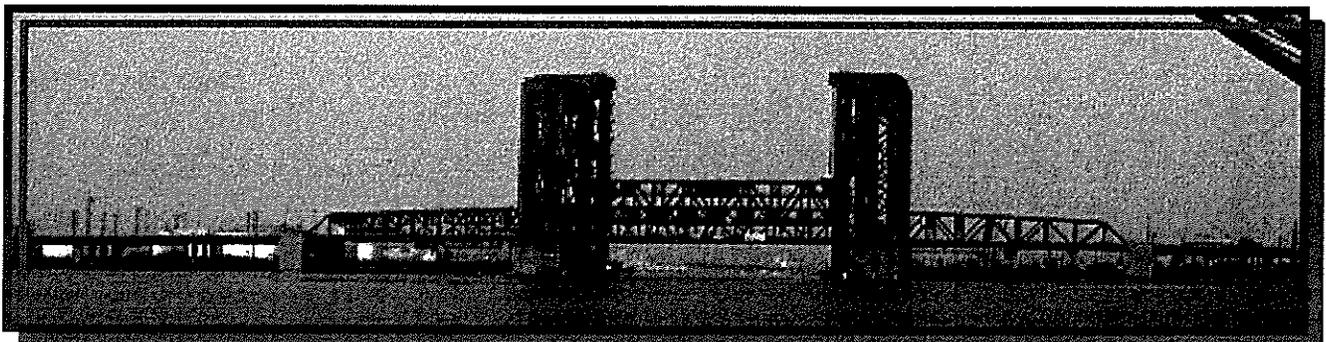
The Alameda Corridor Transportation Authority (ACTA) is the lead agency in preparation of the environmental document and has been evaluating an elevated Truck Corridor Expressway to tie into a replacement bridge.

The draft environmental document for the combined project was recently completed by ACTA. The public hearing was held on September 25, 2007.

The environmental document is being finalized for project approval.

Because of the scope and magnitude of the combined project, there is a substantial amount of risk in delivering this project on the proposed schedule. Project risks are outlined below:

- Environmental issues (noise, air quality and traffic impacts).
- Property impacts to pier operations.
- Residents may oppose the project.
- Time to address construction issues and complications due to maintaining and reconstructing, as needed, numerous utilities, railroad operations and pier and port operations.
- Hazardous waste studies and remedial action.



**Seismic Retrofit Program Budget, Expenditures and Current Estimates
(Phase 2 Funds Only)**

Bridges	Projects	Baseline Budget*	Current Budget*	Expenditures To Date*
1,149	Completed Projects			
	Capital Outlay Support		\$ 391.9	\$ 388.0
	Capital Outlay	\$ 825.0	\$ 795.0	\$ 781.2
	Total		\$ 1,186.9	\$ 1,169.2
	Projects Being Advertised or In Construction			
1	580 Distribution Structure			
	Capital Outlay Support		\$ 5.3	\$ 3.2
	Capital Outlay	\$ 15.0	\$ 13.9	\$ 9.4
	Total		\$ 19.2	\$ 12.6
1	Ten Mile River Bridge			
	Capital Outlay Support		\$ 10.0	\$ 5.5
	Capital Outlay	\$ 25.0	\$ 29.9	\$ 14.2
	Total		\$ 39.9	\$ 19.7
	Projects in Design			
1	5th Avenue Overhead			
	Capital Outlay Support		\$ 7.0	\$ 6.0
	Capital Outlay (R/W Only)	\$ 0.0	\$ 34.2	\$ 16.9
	Total		\$ 41.2	\$ 22.9
2	High Street Separations			
	Capital Outlay Support		\$ 15.5	\$ 14.5
	Capital Outlay (R/W Only)	\$ 0.0	\$ 22.0	\$ 9.6
	Total		\$ 37.5	\$ 24.1
Interim	Schuyler Heim Interim Retrofit Approaches			
	Capital Outlay Support		\$ 2.0	\$ 0.1
	Capital Outlay	\$ 0.0	\$ 6.3	\$ 0.0
	Total		\$ 8.3	\$ 0.1
1	Schuyler Heim Bridge replacement			
	Capital Outlay Support		\$ 4.0	\$ 4.0
	Capital Outlay	\$ 66.0	\$ 0.0	\$ 0.0
	Total		\$ 4.0	\$ 4.0
1,155	Program Totals			
	Capital Outlay Support	\$ 419.0	\$ 434.7	\$ 421.3
	Capital Outlay	\$ 931.0	\$ 901.3	\$ 831.3
	Total	\$1,350.0	\$1,336.0	\$1,252.6

* Note: All costs shown are in millions and include only the seismic retrofit program's portions of costs and expenditures.

Local Bridge Seismic Retrofit Program

Progress Report

The Local Bridge Seismic Retrofit Program (LBSRP) is currently 57 percent complete. To date, 709 local bridges, out of a total of 1,235 planned bridges, have been retrofitted under the LBSRP. Currently, there are 66 bridges under construction, 333 bridges under design, and 127 bridges in a pre-strategy phase.

This program was initially mandated by emergency legislation (SB 36X) after the October 17, 1989 Loma Prieta earthquake.

Milestones Achieved This Quarter

The status as of December 31, 2007 of local bridges by phase is as follows:

	2003	2004	2005*	2006	2007
Complete	559	589	692	699	709
Construction	121	128	46	45	66
Design	266	248	291	295	333
Pre-Strategy	288	269	206	196	127
Total	1,234	1,234	1,235	1,235	1,235

*One bridge was added to the retrofit list in 2005.

The funding for the LBSRP comes from Federal, State, and local sources. Federal funds are provided through the Department's Local Assistance Program. State funds were provided through the annual budget process as a match for Federal funds until 2002. The recent passage of the Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006 will provide \$125 million of State matching funds to complete the LBSRP with bond funds. The funds

in this account will be available upon appropriation by the legislature, to provide 11.47 percent required match for the Federal Highway Bridge Program (HBP) funds, for eligible bridges listed in the LBSRP.

Program Budget and Expenditures

The estimated budget for the LBSRP is \$1.630 billion. A total of \$675.9 million has been encumbered (spent) to date.

Funds (millions)	Spent	Plan	Total
State	\$72.2	\$0.0	\$72.2
Local	n/a	\$7.7	\$7.7
Bond	\$3.8	\$104.3	\$108.1
Federal	\$599.9	\$842.1	\$1,442.0
Total	\$675.9	\$954.1	\$1,630.0

The Department's Division of Local Assistance completed a one-on-one workshop with all of the local agencies that have bridges identified to receive bond funds. The workshops covered availability of the bond match, programming seismic retrofit projects in the Federal Transportation Improvement Program, and the Governor's Executive Order establishing guidelines for spending bond funds and SB 88 requirements on reporting activities and progress toward implementation of projects. Information collected from local agencies will be used to establish baseline schedules and costs for all phases as required by SB 88 which will be posted on the Department's Bond Accountability website. Project cost and schedule will be updated by local agencies on a semi-annual basis.

Program Delivery by Agency Group

Bridges By Agency Group	Number Of Agencies	Pre Strategy	In Design	In Construction	Complete or No Retrofit	Total # Bridges	Percent Program
All Other Agencies	193	11	143	40	603	797	65%
Los Angeles Region (City and County)	2	1	54	26	105	186	15%
Department of Water Resources	1	0	24	0	1	25	2%
BART	1	115	112	0	0	227	18%
Total	197	127	333	66	709	1,235	100%

Based on the information presented above, the following points are noted:

- One agency, Bay Area Rapid Transit (BART) is responsible for 91 percent of projects in the pre-strategy phase. They are also responsible for 227 bridges (18 percent of the entire program) that are not completed. BART recently completed the strategy phase on 49 projects and has completed strategy reports for 72 of the 115 bridges remaining in the strategy phase.
- BART's Seismic Retrofit Program consists of: Segment 1 - from the Montgomery Station in San Francisco to the Berkeley Hills tunnels, and Outside Segment 1. Right-of-way phase has begun for segment 1. Construction is anticipated later this year. The environmental document for bridges outside Segment 1 was completed on August 3, 2007. First construction contract is anticipated in Fall 2008 for bridges outside Segment 1.
- Construction of nine DWR bridges is planned in 2008. The United States Bureau of Reclamation (USBR) owns the remaining 15 DWR bridges and recently completed the strategy phase on all 15 bridges.
- Excluding BART, DWR and Los Angeles region bridges, the other local agencies have completed 603 bridges out of a total of 797 bridges, which represents a 76 percent completion rate.
- Los Angeles area bridges are lagging slightly behind other agencies (excluding BART and DWR) for completion. A significant number are in design and should be in construction soon.