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BUREAU OF STATE AUDITS

California Department of Transportation:

Seismic Retrofit Costs of State-Owned Toll Bridges Have Significantly Exceeded the Department's Original Estimates and May Go Even Higher

August 2002
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CALIFORNIA STATE AUDITOR

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August 1, 2002 2001-122

The Governor of California
President pro Tempore of the Senate
Speaker of the Assembly
State Capitol
Sacramento, California 95814

Dear Governor and Legislative Leaders:

As requested by the Joint Legislative Audit Committee, the Bureau of State Audits presents its audit report concerning the California Department of Transportation (Caltrans) and the Metropolitan Transportation Commission (MTC) to examine the delays and higher cost estimates for the seismic upgrades of toll bridges in the Bay Area.

This report concludes that the seismic retrofit costs of state-owned toll bridges have significantly exceeded Caltrans' original estimates for many reasons; however, the largest contributor is the east span replacement of the San Francisco-Oakland Bay Bridge with an estimated cost increase of $1.3 billion. Overall, the program was likely to experience such increases because statute allows the Bay Area to purchase a more expensive east span replacement than Caltrans originally envisioned and estimated for. This statute also requires that bridge users fully fund the cost increase with the seismic retrofit surcharge imposed for passage on all Bay Area toll bridges. Caltrans also recognizes that the lack of including escalation rates in most of its estimates played a role in the understatement of estimated costs in the initial legislation. Additionally, external parties delayed project progress and subsequently increased costs. Although Caltrans maintains that its current funding is sufficient to cover estimated program costs, recent information suggests that Caltrans may need additional funding.

Respectfully submitted,

Elaine M. Howle

ELAINE M. HOWLE
State Auditor

CONTENTS

Summary 1

Introduction 5

Chapter 1

Various Factors Have Led to Significant Cost Increases and Time Delays in Retrofitting the Bay Area Toll Bridges 13

Chapter 2

Due to Remaining Uncertainties, the Potential Still Exists for Costs to Exceed Funding Levels 31

Appendix A

Detailed Cost Estimate Variances Between Senate Bill 60 and Assembly Bill 1171 for the Toll Bridge Seismic Retrofit Program 39

Appendix B

Timeline of Major Decisions Affecting the Toll Bridge Seismic Retrofit Program 43

Responses to the Audit

Business, Transportation and Housing Agency Department of Transportation 45

Metropolitan Transportation Commission 49

California State Auditor's Comments on the Response From the Metropolitan Transportation Commission 51

SUMMARY

Audit Highlights . . .

Our review of the California Department of Transportation (Caltrans) and the Metropolitan Transportation Commission (commission) to examine the delays and higher cost estimates for the seismic upgrades of Bay Area toll bridges revealed that:

- ☑ ***Efforts to seismically retrofit the toll bridges have resulted in significant cost increases and time delays.***
- ☑ ***The estimated $2 billion increase in cost occurred for several reasons; however, the east span replacement of the San Francisco-Oakland Bay Bridge is the largest contributor with an estimated cost increase of $1.3 billion.***
- ☑ ***The program was likely to exceed its initial estimates because legislation allowed the Bay Area to select a more expensive replacement for the east span than envisioned by Caltrans.***

continued . . .

RESULTS IN BRIEF

Rising costs and time delays plague the State's efforts to complete seismic retrofitting of selected toll bridges. To ensure maximum public safety and the continuous operation of the State's transportation network in the event of a major earthquake, the California Department of Transportation (Caltrans) determined that six state-owned toll bridges need seismic retrofitting, and one other needs a partial retrofit and a partial replacement. Initial estimates prepared by Caltrans set costs at $2.6 billion, with work to be completed by 2004; however, its current estimates increase these costs to $4.6 billion and delay project completion until 2009. The estimated $2 billion increase in cost and the 5-year time delay occurred for many reasons, but the replacement of the San Francisco-Oakland Bay Bridge (Bay Bridge) east span is the largest contributor with an estimated cost increase of $1.3 billion.

Overall, the program was likely to experience increases to its cost estimates because the initial legislation passed to aid in financing retrofit efforts allows the Bay Area to purchase a more expensive "signature" east span for the Bay Bridge than Caltrans originally envisioned and estimated for. Figure 4 on page 20 shows the chosen signature bridge for the east span and labels some of the significant features. The Metropolitan Transportation Commission (commission)—the regional transportation planning, coordinating, and financing agency for the Bay Area—has the authority to choose the bridge replacement for the east span, including the ability to select amenities not included by Caltrans.

Although legislation allows for the purchase of a different and more expensive bridge, it also requires that the commission fully fund any chosen amenities, such as a bicycle/pedestrian path, with the seismic retrofit surcharge equal to $1 per vehicle imposed for passage on all Bay Area toll bridges (seismic surcharge). Partially based on initial cost estimates, the commission extended the seismic surcharge, originally imposed for no longer than 10 years, for 2 years to pay for these additional amenities and to generate a pool of reserve funds for future eligible projects. Later, when Caltrans updated its cost estimates, it became clear that more funding would be needed.

- ☑ ***Caltrans did not include escalation rates in most of its estimates, a factor that contributed to the understatement of estimated costs in the initial legislation.***
- ☑ ***A recent review by a consulting firm reports the potential for an additional $250 million to $630 million in program costs.***
- ☑ ***Caltrans says that it will aggressively pursue cost saving measures to stay within its existing funding authority.***

Subsequent legislation, passed in 2001 to provide this additional funding, addressed the majority of the expected $2 billion funding shortfall by allowing for an overall 30-year extension of the original seismic surcharge, with the remaining funds coming from federal sources. Currently, the Bay Area toll surcharge overseen by Caltrans will pay for 49 percent of the entire toll bridge seismic retrofit program, an increase from its original 35 percent share.

Aside from the higher cost estimates resulting from the selection of a different and more expensive Bay Bridge east span replacement, Caltrans recognizes that the lack of including escalation rates in most of its estimates played a role in the understatement of cost estimates in the initial legislation. Also, the costs for the Bay Bridge east span replacement increased due to both efforts by the U.S. Navy to impede test drilling on Yerba Buena Island and a delay in the environmental review process. A few other bridges, such as the Richmond-San Rafael Bridge, experienced cost increases due to difficulties in estimating costs for underwater work, and like the Bay Bridge east span replacement, the Carquinez Bridge encountered problems with outside parties that resulted in cost increases and time delays.

A review by a commission-hired consulting firm concludes that program costs may go even higher than reported by Caltrans—as much as $250 million to $630 million more. The consulting firm based its conclusions on preliminary seismic retrofit designs provided by Caltrans, some of which are likely to experience additional changes. Furthermore, the consulting firm relied on a few assumptions, including that the program would not experience any more time delays. At this time, Caltrans says it will pursue cost-saving measures aggressively to stay within the funding levels established by the subsequent legislation. In addition, Caltrans explained that the consulting firm chose a different and more costly approach to demolishing the current east span of the Bay Bridge. However, we were able to confirm that the consultant was correct with regard to the significant underestimating of a time-related overhead cost. This seems to suggest that Caltrans may need additional funding to complete the Bay Bridge unless the contingency reserves it has planned for the other retrofit projects are overstated. However, past experience has shown that Caltrans' planned costs for retrofitting its toll bridges are generally understated rather than overstated.

If costs do go higher, the subsequent legislation requires Caltrans to acquire the additional funds of $448 million from the State Highway Operation and Protection Program (SHOPP), the Interregional Transportation Improvement Plan, or federal bridge funds. Caltrans has already committed to using $642 million from the federal bridge funds to cover earlier estimated cost increases. It considered recommending the use of SHOPP funds to cover overruns previously identified; however, it indicated that doing so would require using funds already earmarked for other projects. This particular solution would require approval by the California Transportation Commission.

AGENCY COMMENTS

The Business, Transportation and Housing Agency and the commission agree with the conclusions presented in our report. In addition, the commission offered a few clarifying points and proposed two suggestions directed toward the Legislature for funding and reporting on future large and complex transportation projects. ■

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INTRODUCTION

BACKGROUND

The California Department of Transportation (Caltrans) is responsible for the design, construction, maintenance, and operation of California's state highway system, and for assessing the seismic safety of all publicly owned bridges, with the exception of those not on the state highway system in the counties of Los Angeles and Santa Clara. The October 1989 Loma Prieta earthquake presented Caltrans with the task of repairing or replacing damaged highway facilities in the San Francisco Bay Area. In addition, the State's seismic retrofit program, created after the Loma Prieta earthquake, required the retrofit or replacement of all publicly owned bridges throughout the State, including highway overpasses and other structures, to meet the higher seismic safety standards established after the earthquake. The seismic retrofit program requires that Caltrans identify each bridge's seismic vulnerabilities and develop a retrofit project to address structural deficiencies, which may include reinforcing bridge columns, strengthening bridge footings, and adding redundant systems.

After reviewing all 12,000 state highway bridges, Caltrans identified 750 single- and multiple-column bridges in need of seismic retrofit that were either the most vulnerable to a seismic event or necessary for emergency response during a widespread civil disaster. In addition, Caltrans determined that 7 state-owned toll bridges needed seismic retrofitting. However, repairs on these toll bridges did not begin immediately because retrofit strategies for such complex structures did not exist at that time.

Seven State-Owned Toll Bridges in Need of Seismic Retrofitting

1. Benicia-Martinez Bridge
2. Carquinez Bridge
3. Richmond-San Rafael Bridge
4. San Diego-Coronado Bridge
5. San Francisco-Oakland Bay Bridge
6. San Mateo-Hayward Bridge
7. Vincent Thomas Bridge

Following the 1994 Northridge earthquake, Caltrans expanded and revised its seismic retrofit program for state highway bridges (except the toll bridges) by implementing a two-phase retrofitting approach. Phase 1 includes the retrofitting of the 1,039 bridges that Caltrans identified during its first screening process following the Loma Prieta earthquake. Phase 2 includes the retrofitting of an additional 1,155 bridges that Caltrans identified following the Northridge earthquake. Caltrans completed the retrofitting of the phase 1 bridges in May 2000, while work on the phase 2 bridges is an ongoing effort. As of June 2002,

FIGURE 1

The Seven State-Owned Toll Bridges in Need of Seismic Retrofitting

Caltrans had completed the retrofitting of 1,135 (or 98 percent) of its phase 2 bridges. Completion of the remaining 20 bridges is not expected until 2008 due to the more complex retrofit and replacement work needed on a number of these bridges. Caltrans is managing the retrofit and replacement strategies for the 7 state-owned toll bridges separately from these two phases. Figure 1 shows the location of each toll bridge in need of seismic retrofitting.

Following the Loma Prieta earthquake, Caltrans engaged two universities, numerous private consulting firms, and the Lawrence Livermore National Laboratory to conduct research to better understand the seismic vulnerabilities of the toll bridges. In the last half of the 1990s, Caltrans began preparing a retrofit strategy for each of the toll bridges, with the exception of the east span of the San Francisco-Oakland Bay Bridge (Bay Bridge). With the assistance of its seismic advisory board and toll bridge peer review panel (peer review panel), Caltrans recommended the replacement of the Bay Bridge east span to achieve what is known as "lifeline serviceability" after an earthquake. Lifeline structures are designed to meet a standard greater than the typical collapse or catastrophic failure standard, so that the structure will continue to function after an earthquake. However, to reduce the risk to Bay Area commuters from a moderate-level earthquake prior to the construction of the new east span, Caltrans completed an interim retrofit of the existing Bay Bridge east span in June 2000. The seismic advisory board and peer review panel that aided in Caltrans' replacement decision consisted of numerous experts from the earthquake engineering, seismology, major bridge design, and construction communities.

Lifeline Serviceability

- Allows emergency relief access to and through the affected region
- Connects major population centers within the affected region
- Serves as the most effective of several routes for emergency relief access
- Provides direct or nearby access to and from major emergency supply centers
- Links various modes of transportation
- Provides access to major traffic distribution centers

Funding the Seismic Retrofitting of State-Owned Toll Bridges Is an Ongoing Effort

To finance the $1.1 billion actual cost of retrofitting the phase 1 bridges, Caltrans indicated it drew mostly from four federal sources: highway bridge replacement and rehabilitation, interstate maintenance, national highway system, and surface transportation program funds. However, these same sources could not provide sufficient funds for retrofitting or replacing the phase 2 bridges or the toll bridges. Therefore, in March 1996

Funding Sources for the Toll Bridge Seismic Retrofit Program

Proposition 192 (1996)—sets initial costs at $650 million

SB 60 (1997)—raises program costs to $2.6 billion

AB 1171 (2001)—raises program costs again, to $4.6 billion

California voters approved the Seismic Retrofit Bond Act of 1996 (Bond Act) authorizing the sale of $2 billion in general obligation bonds. The breakout of the Bond Act funding was $1.4 billion for phase 2 bridges and $650 million for the toll bridges. However, the toll bridges required substantially more funding, so Chapter 327, Statutes of 1997 (SB 60), allocated an additional $2 billion, consisting mostly of state highway funds and proceeds from a newly created seismic surcharge equal to $1 per vehicle, imposed for passage on all Bay Area toll bridges (seismic surcharge). SB 60 also allocated tolls collected on the San Diego-Coronado and Vincent Thomas bridges to the seismic retrofit program for the toll bridges. The total cost estimate established in SB 60 for the seismic retrofit program was $2.6 billion. As allowed in SB 60, the Metropolitan Transportation Commission (commission) extended the seismic surcharge, originally set to expire no later than January 2008, to January 2010 to pay for some amenities chosen for the Bay Bridge east span and to generate a pool of reserve funds. This was a 2-year extension on the 10-year maximum duration of the original surcharge.

More recently, funding levels for the retrofitting of the toll bridges increased again with the passage of Chapter 907, Statutes of 2001 (AB 1171), which allocated an additional $2 billion in Bay Area seismic surcharge proceeds and federal bridge funds to the retrofitting effort, bringing the total funding for the toll bridges to $4.6 billion. AB 1171 allows the commission to request that the surcharge be extended to January 2038, subject to the approval of the director of Caltrans, to help raise the needed proceeds. The commission has requested and received approval for this extension. Additionally, AB 1171 includes a provision to make available to the toll bridges an additional $448 million in Interregional Transportation Improvement Plan, State Highway Operations and Protection Plan, or federal bridge funds if it becomes necessary.

State Law Allows for the Purchase of a More Expensive Bay Bridge East Span

In addition to providing funding for the toll bridges, SB 60 formalized the commission's role in selecting a design for the replacement of the Bay Bridge east span. As the regional transportation planning, coordinating, and financing agency for the Bay Area, the commission has the option to purchase

a few amenities for the Bay Bridge, such as a more expensive "signature" east span and a bicycle/pedestrian path. Figure 4 on page 20 depicts the commission's ultimate bridge selection and labels some of the significant features. Aiding in its decision was the Engineering and Design Advisory Panel, consisting of technical experts in structural and civil engineering, geology, seismology, and architectural bridge design. Although SB 60 gives the commission the authority to purchase a more expensive bridge, it also intended that the commission fund the cost increase with the Bay Area seismic surcharge. As we discussed previously, the commission extended the surcharge from January 2008 to January 2010, partially based on preliminary cost estimates, to fulfill its responsibilities under SB 60. Upon completion of the toll bridges, AB 1171 requires Caltrans to turn over any remaining surcharge proceeds to the commission for use in other projects that relieve congestion on the toll bridges.

Caltrans' April 2001 Annual Report to the Legislature Projects Significant Cost Increases

In April 2001, Caltrans issued an annual report to the Legislature and governor that detailed the rising cost estimates and project time delays for the toll bridges in the seismic retrofit program. The annual report contains revised cost estimates and project completion dates, along with explanations of the anticipated cost increases. The report shows that the Bay Bridge east span replacement is the largest contributor to the overall projected cost increase for the toll bridges, with an anticipated shortfall of $1.3 billion from SB 60's initial cost estimate. The Richmond-San Rafael Bridge is the next largest contributor to the projected cost increase, with a reported $336 million in expected additional costs. The additional funds provided by AB 1171 cover the project cost increases discussed by Caltrans in its annual report.

SCOPE AND METHODOLOGY

The Joint Legislative Audit Committee (audit committee) requested that the Bureau of State Audits review Caltrans and the commission to examine the delays and higher cost estimates for the seismic upgrades of toll bridges in the Bay Area. Specifically, the audit committee requested that we determine the roles that Caltrans and the commission hold in planning, implementing, and managing the costs of the retrofit and replacement projects. In addition, the audit

committee asked that we determine whether the procedures for modifying cost estimates and completion dates are adequate, evaluate the underlying reasons for the cost and time increases, and determine whether the current cost estimates are based on conditions rather than assumptions. Finally, the audit committee asked that we examine an independent cost review of Caltrans' current estimates, prepared by a commission-hired consulting firm, to identify bridge retrofit projects whose costs were likely to be significantly higher than those currently reported by Caltrans.

To comply with this request, we reviewed and evaluated the laws, rules, and regulations associated with the seismic retrofitting of toll bridges, including Chapter 327, Statutes of 1997, and Chapter 907, Statutes of 2001. Based on these statutes and various interviews with management and engineers, we determined the roles that Caltrans and the commission play in planning, implementing, and managing the costs of the toll bridge seismic retrofit program. Furthermore, we reviewed Caltrans' April 2001 annual report to the Legislature and governor to identify the reasons it cites for the cost increases and time delays in retrofitting seven state-owned toll bridges. We selected a sample of toll bridges—the San Francisco-Oakland Bay Bridge east span replacement, the Richmond-San Rafael Bridge, and the Carquinez Bridge—to evaluate the reasons cited in the annual report.

For each of the sampled bridges, with the exception of the Bay Bridge east span replacement, we reconciled the SB 60 and AB 1171 cost estimates to identify areas with significant increases. We did not perform this same comparison for the Bay Bridge because the SB 60 cost estimate was not based on the bridge currently under construction. Instead, we compared the earliest cost estimate for the selected replacement to the AB 1171 estimate to identify areas with significant increases. We selected these three bridges for our sample because the Richmond-San Rafael Bridge and the Bay Bridge are two of the largest and least complete retrofit projects, and therefore they have the greatest potential impact on the overall cost of the seismic retrofitting of the toll bridges. We selected the Carquinez Bridge because this project is nearly complete and therefore provides a contrasting cost perspective, given that few uncertainties remain.

In addition to reconciling the numerous cost estimates in the toll bridge seismic retrofit program, we reviewed Caltrans' policies and procedures for preparing cost estimates, including those that relate to contingency reserves and escalation. We also reviewed Caltrans' procedures governing contract change orders, since they have the potential to increase costs above original estimates. To understand the potential for additional cost increases above those Caltrans cites in its annual report, we reviewed the commission-hired consulting firm's cost review report and interviewed one of its representatives to determine whether it had relied on any assumptions rather than conditions in drawing its conclusions. ■

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CHAPTER 1

Various Factors Have Led to Significant Cost Increases and Time Delays in Retrofitting the Bay Area Toll Bridges

CHAPTER SUMMARY

Efforts to seismically retrofit selected California toll bridges have resulted in significant time delays and higher cost estimates. To ensure the safety of the traveling public, the California Department of Transportation (Caltrans) has determined that six state-owned toll bridges—Benicia-Martinez, Carquinez, Richmond-San Rafael, San Diego-Coronado, San Mateo-Hayward, and Vincent Thomas—need retrofitting, and one—the San Francisco-Oakland Bay Bridge (Bay Bridge)—needs a partial retrofit and a partial replacement. Chapter 327, Statutes of 1997 (SB 60), set original cost estimates for the seven toll bridges at $2.6 billion, with completion by 2004; however, revised estimates presented in Chapter 907, Statutes of 2001 (AB 1171), raise the costs to $4.6 billion, with completion by 2009.

Several factors contributed to the estimated $2 billion cost increase and 5-year time delay. From the beginning, the funding for toll bridges was likely to exceed the original estimates in SB 60, because this legislation allows the Metropolitan Transportation Commission (commission) to purchase a more expensive "signature" east span of the Bay Bridge than was originally envisioned, as long as Bay Area bridge users fund the increase in cost. Under AB 1171, Bay Area bridge users will also pay for other anticipated increases in cost not associated with the selection of a bridge design, with the remainder covered by federal highway bridge replacement and rehabilitation program funds (federal bridge funds).

Aside from the cost increases resulting from selecting a different and more expensive bridge, Caltrans recognizes the exclusion of escalation rates that typically apply to large construction projects for all of the toll bridges, except for the Bay Bridge east span replacement, also resulted in underestimated costs. In addition, for the Bay Bridge, efforts by the U.S. Navy to prevent test drilling on Yerba Buena Island, and a delay in

the environmental impact review process due to the selected alignment of the replacement for the Bay Bridge east span, resulted in time delays and rising costs. Retrofitting projects on other bridges, such as the Richmond-San Rafael Bridge, experienced higher than anticipated costs for underwater work. Like the Bay Bridge, the Carquinez Bridge encountered problems with outside parties that affected project costs.

RISING COSTS AND TIME DELAYS PLAGUE COMPLETION OF THE STATE'S LARGEST PUBLIC SAFETY PROJECT

Current cost estimates for the toll bridges in the seismic retrofit program are nearly double the initial estimates prepared only a few years earlier.

In its April 2001 annual report (annual report) to the Legislature and governor, Caltrans disclosed cost estimates for the toll bridges in the seismic retrofit program that are nearly double its initial estimates prepared only a few years earlier. This is not surprising, given that SB 60, which in 1997 set initial costs at $2.6 billion for the toll bridges, recognized the possibility that more funds may be needed and provided Caltrans with a mechanism to obtain the additional capital. Caltrans first became concerned about the sufficiency of the funding levels in SB 60 when the market prices escalated for projects awarded after its passage and when it became clear that the design and environmental process for the replacement of the Bay Bridge east span would delay completion by at least two years. Therefore, Caltrans reevaluated the estimates and raised the costs for the toll bridge seismic retrofit program to $4.6 billion, explaining the reasons for the projected cost increases in its annual report, along with recommendations on how to cover some of the funding shortfall. Shortly thereafter, AB 1171 adjusted the funding levels for the toll bridge seismic retrofit program to reflect these revised estimates by allocating additional Bay Area tolls and federal bridge funds.

Table 1 summarizes the substantial differences between the SB 60 and AB 1171 cost estimates for each of the seven state-owned toll bridges. As the table shows, the revised cost estimates for the toll bridges total $2 billion more than the initial cost estimates prepared for SB 60. Of this increase, Caltrans estimates that about $1.3 billion relates to many issues that affected the cost of a signature bridge for the east span replacement of the Bay Bridge.

TABLE 1

The Toll Bridge Seismic Retrofit Program Has Experienced Significant Increases in Projected Costs (In Millions of Dollars)

Toll Bridges	Original SB 60 Estimate	Revised AB 1171 Estimate	Cost Increases	Percentage Increase
San Francisco-Oakland Bay Bridge				
East span replacement	$1,285	$2,600	$1,315	102%
West span retrofit and approach replacement	553	700	147	27
Richmond-San Rafael Bridge	329	665	336	102
San Mateo-Hayward Bridge	127	190	63	50
Benicia-Martinez Bridge	101	190	89	88
Carquinez Bridge	83	125	42	51
San Diego-Coronado Bridge	95	105	10	11
Vincent Thomas Bridge	45	62	17	38
Totals	**$2,618***	**$4,637**	**$2,019**	**77%**

Sources: Chapter 327, Statutes of 1997 (SB 60) and Chapter 907, Statutes of 2001 (AB 1171).

* SB 60 provides the toll bridge seismic retrofit program with total funding of $2,620 million; however, the allocation of this funding to each individual toll bridge accounts for only $2,618 million.

As part of its planning and design phases, Caltrans prepared detailed cost estimates reflecting the materials and services needed to retrofit each toll bridge. To identify the areas where significant cost increases are anticipated, we obtained these detailed cost estimates, placed each type of cost into a descriptive category, and then compared the SB 60 estimates to the later AB 1171 estimates for the Richmond-San Rafael and Carquinez bridges. For the Bay Bridge east span, the SB 60 cost estimates are not based on the bridge design currently under construction; therefore, we acquired the first cost estimates for the bridge design currently being constructed and compared them to the AB 1171 estimates. Although SB 60 was passed in August 1997, the first cost estimates for the signature bridge were not available until May and June of 1998.

For two parts of the east span—the skyway and the signature span—we analyzed where the cost increases occurred. Figure 4 on page 20 illustrates these two parts of the bridge. When the design was 30 percent complete, the skyway and signature span were expected to cost $536 million and $312 million, respectively; however, the AB 1171 estimates are

for $723 million and $590 million, resulting in cost increases of $187 million and $278 million, respectively. The summary of the cost estimate increases for the selected toll bridges presented in Table 2 shows significant increases in concrete, micropiles, overhead, structural steel, and support. A more detailed presentation of the variances in the cost estimates for the bridges is presented in Appendix A.

Significant time delays in retrofitting the toll bridges raise economic and public safety concerns given the large volume of traffic that crosses these bridges and their importance to the Bay Area economy.

In addition to project cost increases, the toll bridge seismic retrofit program has also experienced significant time delays. Given the large volume of traffic that crosses these bridges on any given day and the importance of the bridges to the Bay Area economy, this delay raises economic and public safety concerns. The U.S. Geological Survey believes that a 70 percent probability exists that an earthquake with a magnitude 6.7 or greater will hit the Bay Area before 2030. Following the Loma Prieta earthquake, then-Governor George Deukmejian convened a Board of Inquiry and commissioned it to prepare a report. The report, titled *Competing Against Time*, emphasized the importance of the Bay Area crossings to the economical transportation of people and products.

The report stated that future earthquakes in California are inevitable, representing a clear and continuing danger to the State's population and economy. Caltrans believes that if a seismic event like the Loma Prieta earthquake hit closer to the Bay Bridge, the east span would be vulnerable to a collapse. A subsequent report published by Caltrans' Seismic Advisory Board titled *The Continuing Challenge,* urged that a greater emphasis be placed on the toll bridges to ensure their timely completion. Figure 2 on page 18 reflects the significant time delays affecting the toll bridge seismic retrofit program.

VARIOUS FACTORS CONTRIBUTED TO THE HIGHER COST ESTIMATES AND TIME DELAYS

No one factor alone caused the significant rising cost estimates that are affecting the seismic retrofitting of selected toll bridges. One factor is that SB 60 permitted the commission to select a more expensive Bay Bridge east span replacement than this legislation reflected in its cost estimates. Another is that Caltrans incorporated escalation rates into the SB 60 cost estimates only for the east span replacement of the Bay Bridge, but did not include escalation rates for the other toll bridges. In addition, actions by parties external to the toll bridge seismic retrofit

TABLE 2

Significant Increases Have Occurred in Concrete, Micropiles, Overhead, Structural Steel, Contingencies, and Support Cost Estimates*

	San Francisco-Oakland Bay Bridge					
	Skyway†	Signature Span†	Other Contracts	Total East Span	Richmond-San Rafael Bridge	Carquinez Bridge
Cast-in-place concrete	$(27,011,709)	$3,518,370			$ 7,070,372	$ (228,716)
Core concrete/drill and bond/ prestressing	(4,213,080)	(78,300)			(348,675)	1,137,145
Environmental preservation	—	242,100			1,001,812	1,026,877
Excavation and cleanup	5,850,000	(631,800)			2,225,519	4,043
Marine access	15,660,000	NA			18,250,000	200,000
Micropiles	NA	NA			44,748,308	NA
Other materials and services	8,031,960	4,535,126			985,309	1,154,878
Overhead	32,400,041	36,754,884			58,772,218	2,137,883
Pilings	(66,149,100)	6,175,260			(3,530,086)	360,486
Precast concrete	102,167,640	NA			14,685,899	NA
Removal and demolition	NA	NA			913,027	(753,066)
Seismic safety	1,954,800	(135,000)			(2,481,060)	247,000
Structural steel and miscellaneous metal	102,397,860	143,260,155			26,421,563	7,708,563
Temporary items	2,570,400	NA			6,011,384	NA
Traffic control and safety	(3,202,740)	(234,000)			8,316,786	(2,019,972)
Utility work and services	—	NA			2,494,900	237,550
Water pollution control measures	—	NA			876,000	4,900
Contingencies	**1,136,299**	**83,822,827**			**91,470,273**	**11,157,947**
Other minor items‡	**3,830,000**	—			**6,862,344**	**11,201,054**
Unreconciled difference§	**11,314,760**	**292,554**			**17,254,107**	**(5,576,572)**
Subtotals: Capital outlay cost differences	186,737,131	277,522,176	211,548,011	675,807,318	302,000,000	28,000,000
Support cost differences				224,543,000	34,000,000	14,000,000
Total Project Cost Differences				**$900,350,318**	**$336,000,000**	**$42,000,000**

Sources: Toll bridge seismic retrofit program's 30 percent design cost estimates; Chapter 327, Statutes of 1997 (SB 60) cost estimates; and Chapter 907, Statutes of 2001 (AB 1171) cost estimates.

* The line item variances are intended to be representative of where variances occurred. However, in some cases, bidders or subsequent estimators used line item categories that were not consistent with initial budget categories.

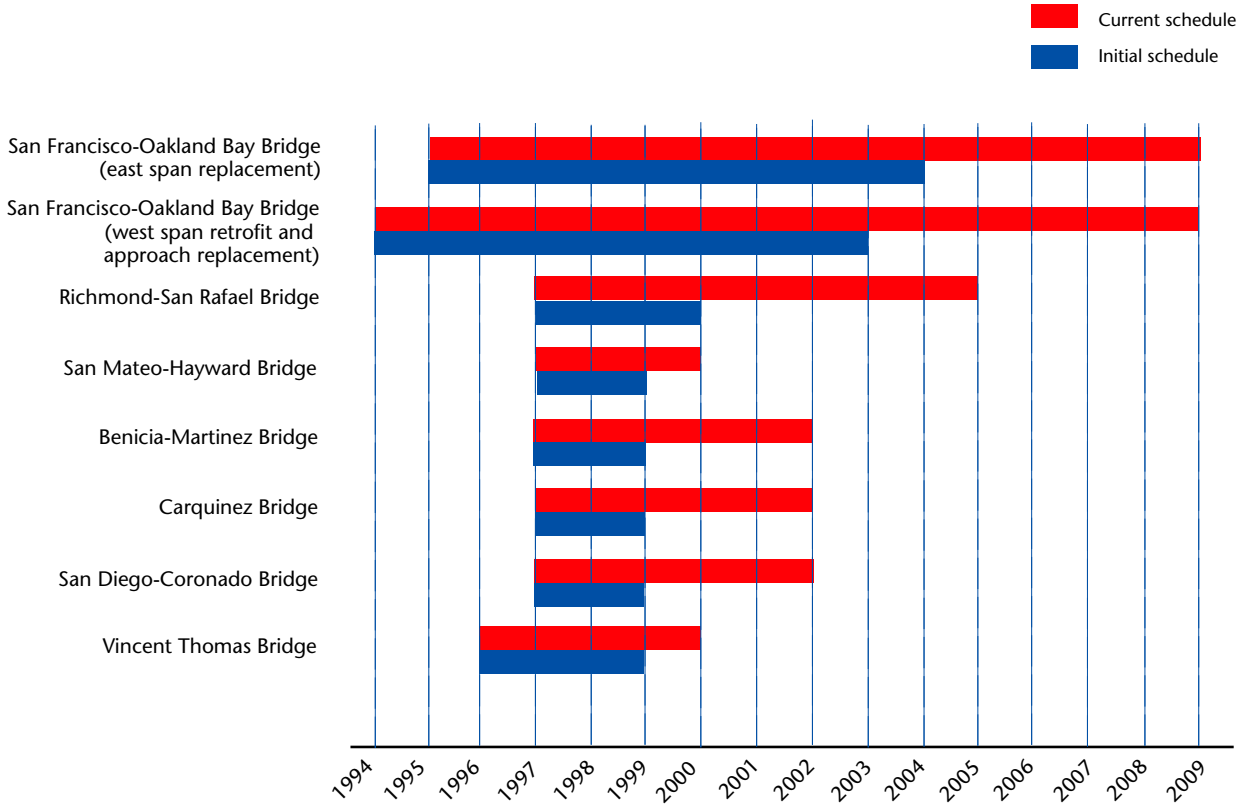
† The increases in cost estimates for the Bay Bridge skyway and signature span do not include roadway work, such as traffic control, landscaping, and lighting.

‡ Other minor items include supplemental work, state-furnished materials, right-of-way, and anticipated claims.

§ Unreconciled differences include rounding and timing of estimates versus SB 60 and AB 1171.

FIGURE 2

Retrofitting the Toll Bridges Is Taking Significantly Longer Than Planned



Source: Caltrans' project plans as of August 1997 and June 2002.

program delayed projects, thereby affecting program progress. For example, the U.S. Navy delayed test drilling on Yerba Buena Island and the Union Pacific Railroad did not promptly relocate railroad tracks interfering with bridge construction. Overall, difficulties in estimating the costs for the unique and complex retrofit strategies have created many uncertainties and challenges that affect program cost.

The Bay Area's Decision to Purchase a Signature Bridge Increased the Price Tag on the Bay Bridge East Span Replacement

In exercising its option under SB 60 to purchase a more expensive signature bridge, the commission set in motion some of the events that contributed to the projected cost increases for the new Bay Bridge east span replacement. However,

along with its authority to select a more expensive bridge, the commission was responsible for ensuring that bridge users pay for the increase in cost. In late 1996 Caltrans completed cost estimates for several different alternatives for the Bay Bridge east span replacement. Of these alternatives, it recommended the construction of a concrete skyway bridge spanning the entire width of the bay between the city of Oakland and Yerba Buena Island. Caltrans estimated the price tag for this replacement as being $1 billion, based on the preliminary bridge design and cost estimates. Figure 3 depicts Caltrans' recommendation.

FIGURE 3

Caltrans Recommended a Skyway Bridge Design for the Bay Bridge East Span Replacement

Under the guidelines of SB 60, the commission has the authority to select the new east span replacement, including the option to incorporate certain amenities, such as a more expensive bridge design than was originally envisioned and a bicycle/pedestrian path. In June 1998, the commission exercised its option and selected a bridge design that differed dramatically from Caltrans' recommendation. Therefore, the replacement alternative recommended by Caltrans was not commissioned for construction. The commission based its decision on a preliminary bridge design and cost estimates available in May and June of 1998 and prepared by a joint venture design team under contract to Caltrans. Figure 4 on the following page depicts the commission's selection.

FIGURE 4

The Commission Chose a Signature Bridge Design for the Bay Bridge East Span Replacement

The timing of these choices plays an important role in the higher cost estimates for the Bay Bridge. The original cost estimates for the east span replacement, outlined in SB 60 in August 1997, were based on Caltrans' initial design recommendation, not on the bridge design currently under construction. The Legislature did contribute an additional $80 million in SB 60 for the future inclusion of a signature span, but this amount is also not based on the cost of the commission-selected signature span replacement. As we mentioned previously, SB 60 permits the commission to select a more expensive bridge design than was originally estimated as long as bridge users pay for the increase in cost. In June 1998 the commission approved a 15-month extension of the seismic retrofit surcharge equal to $1 per vehicle, imposed for passage on all Bay Area toll bridges (seismic surcharge) to generate an additional $141 million to cover the preliminary estimates for its more expensive bridge design selection. In September 1999 and June 2000 the commission extended the seismic surcharge again, for 9 months, to generate additional funds related to its bridge design selection and to generate a pool of reserve funds for future eligible projects. Finally, in late 2001, due to cost increases above the SB 60 estimates, the commission requested and Caltrans approved, an overall 30-year extension of the original surcharge, as allowed by AB 1171.

Caltrans Excluded Escalation Rates From Most Estimates, Thus Understating Initial Cost Estimates

Caltrans factored escalation into its cost for the Bay Bridge east span replacement but not into the cost estimates for the other toll bridges.

When undertaking large construction projects that extend over a period of time, it is prudent to take into consideration the time value of money. In other words, estimates need to allow for escalating market prices (escalation rates). However, Caltrans incorporated escalation rates in the SB 60 cost estimates only for the east span replacement of the Bay Bridge, thereby contributing to the understatement of initial cost estimates on the other toll bridges. In discussing the subject of reliable cost estimates in recent testimony before a congressional committee, the inspector general of the U.S. Department of Transportation stated that early cost estimates are often inaccurate for a number of reasons. For example, projects may undergo considerable change during design, or the estimates may not have included all reasonably anticipated costs.

Caltrans clearly states in its guidelines for preparing cost estimates that reliable project estimates are necessary for responsible fiscal management. It further states that unreliable cost estimates result in severe problems in programming and budgeting and in local and regional planning, and that they may impair the effective use of resources. Additionally, Caltrans recognizes that to be able to accurately estimate costs on larger projects with longer time limits, it may be necessary to take into account escalation of costs. As we stated previously, Caltrans factored escalation into its cost estimate for the Bay Bridge east span replacement but not into the cost estimates for the other toll bridges. Although cost estimating can never be an exact science, Caltrans knew that completing the retrofit projects would take a number of years; therefore, one would reasonably expect the estimates to include a consideration for escalation. However, Caltrans stated that, consistent with past practice, it provided current dollar estimates to the Legislature for all projects except the new east span of the Bay Bridge.

Increases in Support Cost Estimates Contributed Significantly to the Overall Project Price

Support costs for the toll bridge seismic retrofit program increased significantly between the SB 60 and AB 1171 estimates, accounting for 26 percent of the overall reported cost increases. Support costs include such expenses as staff salaries, consultant fees, and other operating costs incurred in supporting the construction activities involved in retrofitting the toll bridges. Caltrans reports that for the bridges we sampled, the majority

of these costs—58 percent—are forecasted amounts rather than actual expenditures. For the SB 60 cost estimates, Caltrans says its project engineers estimated support costs based on their professional discretion. The actual percentage of support costs to estimated consultant staff and construction costs varied among the toll bridges, with the project engineer deciding the appropriate amount for the toll bridge under his or her supervision.

Increases in support costs, such as staff salaries and consultant fees, contributed significantly to the seismic retrofit program's overall estimated rise in cost.

When Caltrans became concerned about the sufficiency of the funding levels for the toll bridge seismic retrofit program and revised its cost estimates, it also updated the estimates for support costs. Of the AB 1171 support cost estimates, 42 percent are based on actual expenditures incurred from project inception through May 2000, with the remainder attributed to forecasted amounts for certain costs indirectly related to the program and for Caltrans direct staff and consultant services. To arrive at the forecasted amounts for staff, various Caltrans' managers within the toll bridge seismic retrofit program estimated the number of hours needed to complete assigned tasks for their projects. Caltrans then multiplied these hours by an hourly rate to derive a forecasted cost for staff. It calculated this hourly rate based on its historical billing rates, adjusted for overhead expenses and escalation. To forecast consultant services, Caltrans relies on the value of open and anticipated consultant contracts. The toll bridge seismic retrofit program must also absorb its share of costs not directly related to the program but for which it derives benefits. The AB 1171 estimates reflect $45 million in such costs.

Project Delays Raised Toll Bridge Seismic Retrofit Program Costs

Seismically retrofitting the toll bridges is an enormous project that requires the involvement and coordination of numerous organizations. A few of these organizations, including the U.S. Navy and the Union Pacific Railroad, have delayed the work on some of the toll bridges. These delays have not only lengthened the project but have also increased costs due to escalation rates and contractor delays. For the Bay Bridge east span replacement, the commission's selection of a path north of the existing bridge (northern alignment) caused some controversy. With the Carquinez Bridge, problems arose with adjacent landowners.

Disagreement Over the Selected Northern Alignment Delayed Progress and Raised Costs

Disagreement with the U.S. Navy over the selected northern alignment resulted in a one-year design delay for the east span replacement.

A general disagreement with the U.S. Navy over the proposed northern alignment of the Bay Bridge east span replacement resulted in almost one year of design delays, which eventually ended when the Federal Highway Administration (FHWA) executed a formal federal land transfer in October 2000 giving a portion of Yerba Buena Island to Caltrans. Important to the seismic safety of any erected structure is the geotechnical understanding of the proposed development site. According to Caltrans, a series of drillings into the underlying soil and rock on Yerba Buena Island was critical to the design of the replacement span.

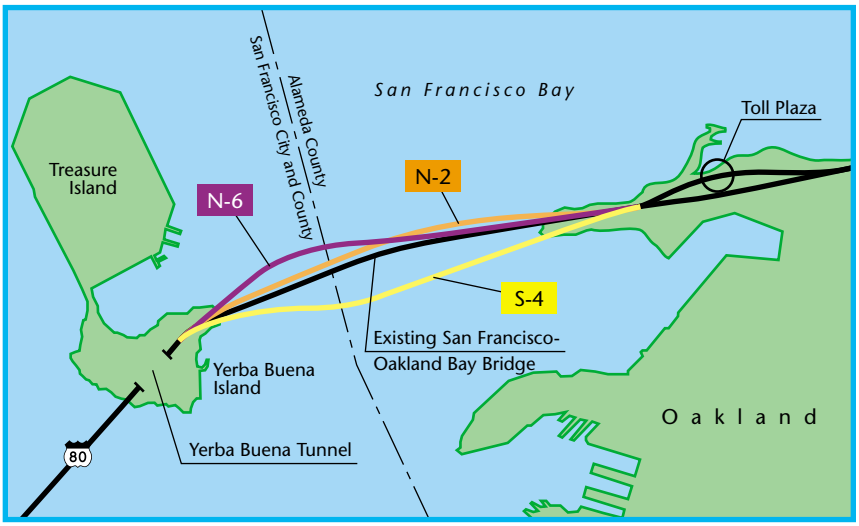
In September 1998 Caltrans requested an on-shore drilling license so that it could perform this seismic testing. Citing its opposition to the selected northern alignment because of the project's substantial adverse impact on Yerba Buena Island's historic and environmental resources and on the city of San Francisco's ability to redevelop the island under the Federal Base Closure Act, the U.S. Navy denied Caltrans' request. It finally granted Caltrans the license a year later, in September 1999. Ultimately, the U.S. Navy's ability to further delay the completion of the replacement span was eliminated when the FHWA executed a federal land transfer giving Caltrans title to a portion of Yerba Buena Island.

The U.S. Navy's position was that the path of the replacement span should be to the south of the existing span. During its federal environmental impact review, Caltrans considered the three alignment alternatives (N-2, N-6, and S-4) shown in Figure 5 on the following page. Caltrans and the FHWA identified replacement alternative N-6 as their preferred alternative since the geologic conditions would make construction of the main tower easier, because that alignment would bring greater aesthetic benefits and it was consistent with the regionally preferred alignment and design features as expressed by the commission.

The controversy over the proposed northern alignment also delayed the necessary environmental approval process for the replacement span by one year. Although this project is statutorily exempt from state environmental requirements because it qualifies as a seismic safety upgrade, Caltrans is still required under the National Environmental Policy Act (NEPA) to undergo a formal federal environmental review. Critical to

FIGURE 5

Caltrans Considered Three Alignment Alternatives for the Bay Bridge East Span Replacement



the NEPA process is the identification by the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers of the Least Environmentally Damaging Practicable Alternative (LEDPA) under the federal Clean Water Act.

As part of the LEDPA identification process, Caltrans was scheduled to meet with the FHWA, the U.S. Army Corps of Engineers, and the EPA in September 1999. However, this meeting was delayed until October 2000 so that the following six steps could be completed:

- The FHWA was to provide the U.S. Navy with information on the environmental impact of drilling on Yerba Buena Island.
- A meeting was to take place between the U.S. Navy, the FHWA, the U.S. Coast Guard, Caltrans, and the city of San Francisco to discuss the differing construction impacts for the northern and southern alignment alternatives.
- The U.S. Army Corps of Engineers was to serve as a neutral third party to review engineering analyses related to the southern alignment.
- The U.S. Navy agreed to evaluate the historic impact of alternative alignments, and the FHWA was to work with the U.S. Navy to reach an agreement regarding this issue.

- A discussion with Oakland Mayor Jerry Brown about the alignment alternative.

- The FHWA was to arrange a meeting with the city of San Francisco and the U.S. Navy to discuss the economic impact of the different alignments as they affected the development of Yerba Buena Island.

In February 2001 the U.S. Army Corps of Engineers identified alternative N-6 as its LEDPA selection, and in March 2001 the EPA identified alternative N-6 as its LEDPA selection. Although the issues with the U.S. Navy and the LEDPA were ultimately resolved, the effect was a nearly 2-year delay in the design and environmental process of the Bay Bridge east span replacement.

Construction Delays by Property Owners Slowed Caltrans' Project Timeline

Caltrans attributes significant delays in retrofitting the Carquinez Bridge to construction delays involving the Union Pacific Railroad and Pacific Gas & Electric Company (PG&E). These delays led the construction contractor to file contract change orders to recover costs it had incurred as a result of the delays, thereby increasing program costs.

A critical part of the retrofit strategy for this toll bridge requires the relocation of railroad tracks belonging to the Union Pacific Railroad that conflict with construction and the shifting of a high-pressure PG&E gas line from the west side of the bridge to the east side. During the project's early stages, Caltrans indicated that it began negotiations with Southern Pacific Railroad, which owned the tracks at that time, for the relocation. However, before an agreement was reached, the Union Pacific Railroad acquired Southern Pacific Railroad and subsequently took 143 days longer to perform the relocation than Caltrans originally anticipated. Regarding the gas line, PG&E originally estimated the scheduling of this work; however, due to delays in awarding the contract and additional design modifications, it took twice as long to shift the gas line as PG&E had initially estimated, resulting in 87 days of delay.

The construction for the Carquinez Bridge incurred certain reimbursable costs as a result of delays by external parties.

During these delays, Caltrans had a construction firm under contract to perform the retrofit work. This contractor incurred costs that would not have been necessary if Union Pacific Railroad had relocated the railroad tracks and PG&E had shifted the gas line by the dates Caltrans had anticipated. The

contractor submitted a number of contract change orders, of which the project manager attributes $9 million relating to these delays. These costs accounted for over 20 percent of the total projected increases on the Carquinez Bridge. Caltrans or the contractor can initiate contract change orders to recoup costs associated with design changes, actual conditions that vary from expectations, and delays such as those related to Union Pacific Railroad and PG&E. Caltrans has an established process for reviewing and approving contract change orders. In this instance, several of its bridge engineers concluded that the costs the construction contractor incurred were reasonable and unavoidable, and therefore reimbursable by Caltrans.

The Seismic Retrofit Work Has Proven Difficult to Estimate

According to Caltrans, not only are the toll bridges the largest and most complicated bridges in the State, but nowhere in the world have bridges as complex as these been seismically retrofitted. Furthermore, a consulting firm hired to perform an independent cost review of the toll bridge seismic retrofit program reported that the new Bay Bridge east span is sufficiently unique that traditional highway construction estimating metrics do not apply. In addition, the joint venture design firm for the Richmond-San Rafael Bridge claims that it is employing retrofit strategies at scales never used before. Such circumstances as these produce a greater degree of cost uncertainty and limit the ability to draw from past experiences and employ traditional estimating practices.

Circumstances unique to the seismic retrofitting of toll bridges result in a greater degree of cost uncertainty and limit the ability to use traditional estimating practices.

Recognizing these significant challenges, Caltrans used numerous outside experts and academic advisors when estimating project cost. In fact, private consulting firms, under Caltrans' supervision, prepared the cost estimates for all seven of the toll bridges, with the exception of the west span of the Bay Bridge, which Caltrans solely prepared. Even considering this additional expertise, each of the bridges is expected to experience cost increases above their original estimates. Additionally, Caltrans attributes much of the difficulty in retrofitting the structures to factors such as variable soils and foundations, seismic forces much stronger than the original design forces, aged structures, heavy traffic volumes, conflicts with utilities, and various environmental concerns. These factors present Caltrans with a unique and unprecedented task when estimating project cost.

For example, several of the Northern California toll bridges span geologic formations that place some portions of the respective bridges and their foundations in locations of rock and others portions in soft bay mud. Also, much of the foundation work is marine-based, which, as Table 2 on page 17 shows, is a condition that Caltrans has found difficult to accurately estimate. For instance, the construction bid for the micropile work on the Richmond-San Rafael Bridge came in significantly higher than estimated. This toll bridge was also faced with strict environmental restrictions that affected project costs by forcing the contractor into three cycles of marine mobilization and demobilization during construction.

The challenges faced in retrofitting the Northern California toll bridges also help explain why the cost increases for these bridges are far more dramatic than those for the two Southern California toll bridges. Specifically, Caltrans indicates that its retrofit strategies on the Southern California toll bridges have minimal foundation work in comparison, and since the geologic site conditions found in Northern California are more challenging, they are also more costly.

Contingency Reserves Provide Funding for Potential Cost Increases

Caltrans looks to its contingency reserves to cover the rising costs of the toll bridge seismic retrofit program.

To cover the rising costs related to the unique estimating challenges that the toll bridge seismic retrofit program presents, Caltrans looks to its contingency reserves. Contingency reserves do not represent costs but rather are budgetary amounts representing a portion of the cost estimate not allocated to cost categories. Therefore, a part of the anticipated $2 billion increase includes these budgetary amounts. The intent of contingencies is to compensate for the limited information available during the planning phase of a retrofit project. Early in a project's development, allocations for contingency reserves are high. They then decrease as funding is transferred from the contingency reserve to cost categories, either to a newly established cost category or to increase funding for cost categories where actual costs exceed the original estimate. At project completion, amounts remaining in the contingency reserve represent the extent to which the project was completed for less than the budget or cost estimate.

Although the procedures for estimating costs differ depending upon the type of project, Caltrans has established a cost estimating methodology in an effort to promote consistency in the

development of reliable cost estimates. Caltrans' policy dictates that in the early stages of a project, contingencies should range from 30 percent to 50 percent of the project cost. Once a project is approved and progresses into its planning and design phases, the contingency percentage is lowered. By the time a project is advertised for bid, contingency levels are normally reduced to about 5 percent of the project's cost. Any percentage higher than this needs to be justified based on the atypical nature of the project.

The contingency amounts that Caltrans reflects in its AB 1171 cost estimates for the Richmond-San Rafael and Carquinez bridges are higher than the levels included in the SB 60 cost estimates, and greatly exceed levels related to more typical projects under normal Caltrans guidelines. When AB 1171 was passed, both of these toll bridges had construction contracts already awarded; as discussed above, normal policy dictates contingency reserves of 5 percent. Regarding the Bay Bridge east span replacement, a comparison of contingency reserves would not be meaningful, given that the bridge budgeted for in SB 60 is not the same as the bridge currently under construction and budgeted for by AB 1171. Caltrans raised its contingency amounts for the Richmond-San Rafael and Carquinez bridges because it believed the levels included in SB 60 were not consistent with the lack of refinement in the planning level studies and with the number of uncertainties, given the unique nature of the toll bridge seismic retrofit program.

TABLE 3

AB 1171 Contingency Reserves Increased From Those Designated in SB 60

	Legislation	Percentage of Contingency Reserves (Includes Rounding)	Amount of Contingency Reserves (Includes Rounding)	Project Stage
Carquinez Bridge	SB 60 (1997)	10%	$5,974,385	Late stage of design
	AB 1171 (2001)	19	16,488,718	Construction
Richmond-San Rafael Bridge	SB 60 (1997)	6	15,057,198	Late stage of design
	AB 1171 (2001)	14%	$77,567,577	Construction

Sources: Consultant prepared cost estimates and Caltrans' project plans.

Table 3 shows the increase in contingency amounts between SB 60 and AB 1171. Both the percentage and amount of contingency reserves for the Carquinez and Richmond-San Rafael bridges increased between SB 60 and AB 1171. Additionally, Caltrans recently increased the Richmond-San Rafael Bridge's contingency levels by another $32.7 million, or 6 percent, for an overall total of about 20 percent. In the case of the Bay Bridge east span replacement, the contingency reserves represented in the SB 60 cost estimates were not based on the bridge design ultimately chosen. When the commission made its final design selection in 1998, the cost estimates for the skyway and signature span portions included contingency amounts of $93 million (21 percent) and $62 million (25 percent), respectively, of the contracted or to-be-contracted items. The contingency amounts included in the AB 1171 cost estimates are $94 million (15 percent) for the skyway, which was in a later stage of design, in comparison to the signature span, with contingency amounts of $146 million (33 percent).

BRIDGE USERS AND FEDERAL BRIDGE FUNDS WILL PAY FOR THE PROJECTED COST INCREASES OF THE RETROFIT PROGRAM

Legislation requires the commission to ensure that bridge users pay the additional cost of a more expensive bridge design.

Although SB 60 gives the commission the authority to select a more expensive bridge design than Caltrans originally estimated for, it also requires the commission to ensure that bridge users pay for the additional cost by extending the seismic surcharge imposed on all Bay Area toll bridges. Initially, the Legislature established the seismic surcharge in 1997 to cover the Bay Area's share of retrofit costs by generating an estimated $907 million and then expiring in 2008. The commission could extend the expiration date for the surcharge if it chose to purchase amenities for the Bay Bridge east span replacement. During the early design phase of the east span replacement, Caltrans estimated that the additional costs of the commission-selected bridge design and amenities would total $141 million more than the amount funded by SB 60. Therefore, the commission extended the seismic surcharge by 15 months to generate sufficient funds to cover the increase in cost. Later, the commission extended the seismic surcharge again, for 9 months, to pay for costs related to the amenities and to generate a pool of reserve funds for future eligible costs.

In late 2000, Caltrans became concerned that the funding levels outlined in SB 60 for the toll bridge seismic retrofit program would not be sufficient to cover program costs, so it undertook efforts to reevaluate its cost estimates for the seven toll bridges. The resulting updated estimates raised the cost for retrofitting the toll bridges to $4.6 billion. Caltrans addressed a portion of the $2 billion cost increase by recommending the use of federal bridge funds, but it provided no recommendation for how to cover the cost increase for the Bay Bridge. Ultimately, AB 1171 provided for the seismic surcharge to be extended for an overall 30 years, until 2038, to supply the projected funds needed. Thus, under Caltrans' current funding plan, Bay Area bridge users will pay for 49 percent of the entire toll bridge seismic retrofit program, an increase from their original 35 percent share. The remaining funding increase was addressed by drawing from federal bridge funds, as recommended by Caltrans. Table 4 shows the funding mix.

TABLE 4

Bridge Users Will Pay for the Majority of the Increase in Funding (In Millions of Dollars)

Funding Sources	Original Estimate SB 60	Revised Estimate AB 1171	Funding Increase
Bay Area Regional Toll Surcharge	$ 907	$2,282	$1,375
State Highway Account	795	795	—
Transportation Planning and Development Account	80	80	—
Seismic Retrofit Bond Act of 1996	650	650	—
Seismic Retrofit Bond Act of 1996 Surplus	140	140	—
San Diego-Coronado Toll Bridge Revenue Account	33	33	—
Vincent Thomas Toll Bridge Revenue Account	15	15	—
Federal Highway Bridge Replacement and Rehabilitation Program	—	642	642
Totals	**$2,620**	**$4,637**	**$2,017**
Percentage of total cost estimates paid by Bay Area bridge users	35%	49%	
Percentage of funding increases paid by Bay Area bridge users			68%

Sources: Chapter 327, Statutes of 1997 (SB 60) and Chapter 907, Statutes of 2001 (AB 1171).

CHAPTER 2

Due to Remaining Uncertainties, the Potential Still Exists for Costs to Exceed Funding Levels

CHAPTER SUMMARY

A consulting firm hired by the Metropolitan Transportation Commission (commission) reports that costs for the toll bridge seismic retrofit program may increase an additional $250 million to $630 million above what the California Department of Transportation (Caltrans) currently reports. The consulting firm concludes that the majority of these potential cost increases will result from capital construction, which includes contractor-charged overhead rates, as well as from higher support costs. If the consulting firm's estimates prove to be accurate, Caltrans will need to identify additional funding sources to cover the shortfall. Current law limits Caltrans' funding options to three programs: the State Highway Operation and Protection Program (SHOPP), the Interregional Transportation Improvement Plan (ITIP), and federal bridge funds, for a combined limit of $448 million in additional funding. Currently, Caltrans maintains that the toll bridge seismic retrofit program will be completed within the funding authority provided by AB 1171.

A CONSULTING FIRM HIRED TO REVIEW THE CURRENT ESTIMATES BELIEVES THAT COSTS MAY CONTINUE TO RISE

After Caltrans reported that costs for the toll bridge seismic retrofit program would nearly double from $2.6 billion to $4.6 billion, the California State Senate Select Committees on Bay Area Infrastructure and Transportation requested that the commission conduct an independent review of Caltrans' cost projections. In July 2001, a commission-hired consulting firm performed this review, focusing the majority of its efforts on the San Francisco-Oakland Bay Bridge (Bay Bridge) east span replacement and west approach projects, the retrofitting of the Richmond-San Rafael Bridge, and the program-wide issues of escalation, contingency, and support. The Bay Bridge east span and Richmond-San Rafael projects account for approximately

75 percent of the overall program costs. Based on this review, the consulting firm not only agreed that the costs for the toll bridges would double, but it also asserted the potential for additional costs ranging from $250 million to $630 million more than Caltrans estimated. The consulting firm concluded that increases may stem from higher capital construction costs, which include contractor-charged overhead rates, as well as from higher support, escalation, and demolition costs, and it stated that the allocated contingency reserves are insufficient to cover these and other costs.

A commission-hired consulting firm not only agrees that costs will double, but also reports the potential for costs to rise higher than estimated by Caltrans.

The limited time permitted for the review led the consulting firm to focus on the work with the greatest potential to affect the cost of the toll bridge seismic retrofit program. Its cost review was therefore influenced by a project's stage of design and construction and its relative construction value. For work awarded that was complete or nearly complete, like the Carquinez Bridge, the cost review consisted of a limited examination to ensure that the amounts Caltrans had reported were supportable. For work awarded that was largely incomplete—for example, the Richmond-San Rafael Bridge—the cost review focused on reserves set aside for potential contract change orders, as well as on projected support costs. Finally, for work not yet bid and awarded, such as the Bay Bridge east span replacement, the review focused on the scope, basis, and approach in estimating construction and support costs; on validating key quantities and prices; and on analyzing contingency reserves.

The consulting firm relied on a few assumptions and scope exclusions in arriving at its conclusions, a significant one being that the projects would be advertised and awarded at the times indicated in their current bidding schedules. The consulting firm reports that if additional delays occur, one could reasonably expect costs to exceed the potential $250 million to $630 million increase it estimates. The consulting firm was also careful to mention that its cost review was neither a value-engineering analysis nor a newly prepared comprehensive estimate of program costs. That is, the consulting firm did not question the effectiveness or efficiency of the retrofit or replacement designs that underlie Caltrans' cost estimates unless they appeared not to be feasible or conflicted with the design. A representative of the consulting firm further explained that any design changes taking place after the cost review would have the potential to affect the cost of retrofitting the toll bridges. At the time of the cost review, the design of the Bay Bridge east

span replacement was not fully completed. Table 5 summarizes where additional costs may occur and shows that the majority of the potential cost increases the consulting firm identified in its review relate to capital construction, which includes contractor-charged overhead rates, and support costs.

TABLE 5

An Independent Cost Review Identified Additional Cost Increases (In Millions of Dollars)

Toll Bridge	Low Range	High Range
Richmond-San Rafael Bridge		
Capital construction and contingency reserves due to higher construction costs and anticipated contract change orders	$ (10)	$ 25
Caltrans' support costs	0	25
Subtotals	**(10)**	**50**
San Francisco-Oakland Bay Bridge: West Approach Replacement		
Capital construction due to higher materials cost and general conditions*	50	60
Caltrans' support costs	5	25
Additional contingency reserves to cover potential increased costs	20	30
Demolition costs and escalation rates	(5)	25
Subtotals	**70**	**140**
San Francisco-Oakland Bay Bridge: East Span Replacement		
Capital construction due to higher construction costs and general conditions*	125	205
Demolition costs	40	40
Caltrans' and consultant support costs†	120	125
Escalation rates and additional contingency reserves to cover potential increased costs	(95)	70
Subtotals	**190**	**440**
Totals	**$250**	**$630**

Source: Bechtel Infrastructure Corporation's *Toll Bridge Seismic Retrofit Program Cost Review Report*, July 2001.

* General conditions include contractor-charged overhead rates and profit.

† Includes $90 million in additional support costs identified by Caltrans but not included in its April 2001 annual report.

A month following the issuance of this cost review, the Federal Highway Administration (FHWA) conducted its own review regarding the sufficiency of Caltrans' most recent cost estimate. The FHWA's review focused solely on the Bay Bridge east span replacement, not the entire toll bridge seismic retrofit program. Although at that time the FHWA concluded that the current

$2.6 billion cost estimate was reasonable, it went on to say that assurances can never be made that project costs will not change. Therefore, it recommended that Caltrans annually update its cost estimate until the project's full completion. The FHWA's review did not suggest an alternative method for demolishing the east span of the Bay Bridge suggested by the consulting firm and reflected in its estimate.

TABLE 6

Uncertainties Remain That Have the Potential to Increase Final Project Costs

Project Contract	Stage of Completion at Time of Consulting Firm's Cost Review (As of April 2001)		Current Status (As of June 2002)	
	Design	Construction	Design	Construction
Richmond-San Rafael				
Bridge retrofit	100%	4%	100%	30%
San Francisco-Oakland Bay Bridge: west approach				
West approach replacement	90	0	100	0
West approach archaeology and retrofit	100	0	100	44
San Francisco-Oakland Bay Bridge: east span replacement				
Pile installation demonstration	100	100	100	100
Skyway	100	0	100	2
Oakland touchdown geofill	90	0	100	28
Oakland touchdown structure	65	0	80	0
Signature span and Yerba Buena Island touchdown	65	0	90	0
Bridge demolition	10	0	45	0

Sources: Bechtel Infrastructure Corporation's *Toll Bridge Seismic Retrofit Program Cost Review Report*, July 2001, and Caltrans.

Table 6 shows the stage of design and construction for the toll bridges at the time of the consulting firm's cost review and currently as of June 2002. As the table shows, the retrofit program has progressed in many areas. For instance, Caltrans has begun construction on the skyway portion of the Bay Bridge east span replacement, a contract which was awarded to the lowest bidder at $321 million above the cost estimate included in AB 1171. The fact that this contract award far exceeded Caltrans' cost estimates validates the consulting firm's conclusion that the Bay Bridge east span replacement may

experience additional cost increases above those reported by Caltrans. Furthermore, our analysis shows that the east span replacement may experience even greater increases than those predicted by the consulting firm.

As shown in Table 5 on page 33, the consulting firm expects a possible increase in capital construction costs of between $125 million and $205 million for the east span replacement, due to higher construction costs and general conditions. Of this increase, the consulting firm attributes $52 million to $58 million to a skyway-related general conditions increase, which includes time-related overhead. However, based on the bid that has been accepted on the skyway contract, even the consultant's projected cost increases may prove to be too low. Just taking into account time-related overhead, the bid on the skyway contract exceeded the consultant's high estimate by $94 million. And, compared to Caltrans' estimate reported in 2001 for AB 1171, these costs, as bid, exceed that estimate by $152 million.

The program may need additional funding because the skyway used a disproportionate share of the contingency reserves for the east span of the Bay Bridge.

In its most recent annual report for the toll bridge seismic retrofit program, Caltrans states that it will cover these additional costs with existing contingency reserves; however, Caltrans will also need to use these reserves to cover any increased costs due to contract change orders that arise during and after construction. As shown in Table 7 on the following page, the skyway will use a disproportionate share of the overall contingency reserves for the east span of the Bay Bridge, due to the large amount by which the successful bid for the skyway exceeds Caltrans' current estimate. The skyway, which represents approximately one-third of the budgeted retrofit costs of the east span of the Bay Bridge, has already used two-thirds of the project's planned contingency reserves. This depletion of the reserves may result in a funding shortfall for the Bay Bridge east span replacement. Furthermore, contract change orders filed after the contract award to resolve disputes with the contractor could potentially use even more of the project's planned contingency reserves and drive the amount attributed to the skyway even higher. This seems to suggest that Caltrans may need additional funding to complete the east span unless the contingency reserves it has planned for the other retrofit projects are overstated. However, past experience has shown that Caltrans' planned costs for retrofitting its toll bridges are generally understated rather than overstated.

TABLE 7

The Bid for the Bay Bridge Skyway Used More Contingency Reserves Than Caltrans Expected (In Millions of Dollars)

East Span Replacement Contracts	AB 1171 Cost Estimate	Percentage of Total Estimate	Contingency Reserves	Bid Amount	Difference Between Bid and Cost Estimate	Percentage of Total Contingency
Skyway*	$ 769,680	30%	$ 99,133	$1,043,541	$273,861	67%
Pile installation demonstration project	9,560	0	536	7,299	(2,261)	
Oakland touchdown geofill	9,000	0	1,759	6,890	(2,110)	
Self-anchored suspension span	590,000	23	146,611	NA	NA	
Other contracts	1,221,820	47	161,501	NA	NA	
Totals	**$2,600,060**	**100%**	**$409,540**			

Sources: Chapter 907, Statutes of 2001 (AB 1171) cost estimates and awarded construction contracts as of June 2002.

* Skyway cost estimates include roadway items such as traffic control, landscaping, and lighting.

NA: Caltrans has not awarded a contract for these projects as of June 2002.

THE TOLL BRIDGE PROGRAM MUST DRAW FROM OTHER FUNDING SOURCES IF COSTS DO ACTUALLY INCREASE

If the commission-hired consulting firm's estimates prove to be accurate and costs for the toll bridges do exceed the currently reported estimates, Caltrans must report these differences to the Legislature and give the reasons for the increase in costs. Some of the funding solutions that may cover the cost increases could postpone the completion of other planned transportation projects in the State. AB 1171 currently limits Caltrans' funding options to three programs: SHOPP, ITIP, and federal bridge funds, for a combined total of $448 million. Although the consulting firm concluded that costs may increase more than previously reported, Caltrans maintains that its current estimates and funding levels are sufficient to cover program costs, and therefore it does not anticipate requesting any additional funds.

In its April 2001 annual report, Caltrans considered recommending the use of SHOPP funds to cover the cost overruns that it previously identified and that we discussed in Chapter 1. However, it indicated that doing so would require using funds previously earmarked for other projects. Projects funded under SHOPP address the safety and integrity of the

state highway system, not increased road capacity. Most projects covered relate to rehabilitation and traffic safety improvements and require the approval of the California Transportation Commission. ITIP addresses efforts to facilitate the interregional movement of people and goods on the state highway and transit systems, and receipt of its funds also requires the approval of the California Transportation Commission. Additionally, Caltrans has already committed to drawing from federal bridge funds to cover a portion of the previously reported cost overruns.

When questioned about the consulting firm's findings, Caltrans indicated that overall it could not form a detailed opinion about the additional costs because the consulting firm declined to share its back-up information supporting its findings. According to the chief deputy district director, the consulting firm asserted, and Caltrans agreed, that the information was proprietary. As a result, even though the commission contracted with the consulting firm in response to a legislative request, Caltrans was precluded from reviewing the specific information it would need to review in order to form a detailed opinion about the additional costs. Caltrans did state, with regard to the $90 million in additional support costs reported by the consulting firm, that the amount reflects an estimate of potential costs associated with using additional consultants, should Caltrans decide to use them. Since the mix of Caltrans and consultant staff is not fixed, Caltrans decided not to incorporate the $90 million into its estimates but rather to manage the resource mix within the AB 1171 funding limitations by using Caltrans' staff to complete the necessary work.

Caltrans maintains that it will complete the seismic retrofitting of the Bay Area toll bridges within the existing funding authority.

Further, Caltrans explains that in one instance the consulting firm's cost estimating methodology differed from its own. Specifically, Caltrans planned a different and less expensive method for demolishing the existing Bay Bridge east span than that used in the consultant's estimate. However, this example represents only $40 million of the $250 million to $630 million potential cost increases identified in the consulting firm's cost review. Currently, Caltrans maintains that the toll bridge seismic retrofit program will be completed within the funding authority provided by AB 1171.

We conducted this review under the authority vested in the California State Auditor by Section 8543 et seq. of the California Government Code and according to generally accepted government auditing standards. We limited our review to those areas specified in the audit scope section of this report.

Respectfully submitted,

ELAINE M. HOWLE
State Auditor

Date: August 1, 2002

Staff: Reed M. McDermott, CPA, Project Manager
Theresa Gartner, CPA
Mandi Gallardo
Ben Belnap

APPENDIX A

Detailed Cost Estimate Variances Between Senate Bill 60 and Assembly Bill 1171 for the Toll Bridge Seismic Retrofit Program*

	Bay Bridge Skyway	Bay Bridge Signature Span	Richmond-San Rafael	Carquinez
Cast-in-place concrete				
Bar reinforcing steel	$6,815,340	$(2,783,700)	$3,632,820	$692,275
Structural concrete	(39,674,700)	6,302,070	2,383,390	(1,032,806)
Other	5,847,651	—	1,054,162	111,815
Category totals	**(27,011,709)**	**3,518,370**	**7,070,372**	**(228,716)**
Core concrete/drill and bond prestressing				
Core and pressure grout	—	—	(42,674)	1,037,770
Core concrete	—	—	(2,835,332)	(722,155)
Drill and bond dowell	—	—	41,147	107,864
Prestressing	(4,213,080)	(78,300)	2,488,184	264,106
Other	—	—	—	449,560
Category totals	**(4,213,080)**	**(78,300)**	**(348,675)**	**1,137,145**
Environmental preservation				
Erosion control	—	—	—	(523)
Excavation	—	—	—	958,800
Rock slope protection	—	242,100	691,980	—
Remove and patch concrete	—	—	541,450	—
Other	—	—	(231,618)	68,600
Category totals	**—**	**242,100**	**1,001,812**	**1,026,877**
Excavation and cleanup				
Backfill	—	(55,800)	379,584	181,192
Structure excavation	5,850,000	(36,000)	852,573	(173,299)
Test borings	—	—	583,830	—
Other	—	(540,000)	409,532	(3,850)
Category totals	**5,850,000**	**(631,800)**	**2,225,519**	**4,043**
Marine access	15,660,000	—	18,250,000	200,000
Micropiles	—	—	44,748,308	—
Other materials and services				
Asphalt	—	—	121,671	346,620
Elevator	—	(380,700)	—	—

continued on the next page

	Bay Bridge Skyway	Bay Bridge Signature Span	Richmond-San Rafael	Carquinez
Jacking	180,000	—	—	645,000
Joint seal	2,597,850	(1,228,500)	72,434	—
Lumber	1,228,500	—	650,665	—
Minor concrete and grout	—	173,700	—	—
Overlay	1,547,370	1,383,156	—	—
Piping	—	—	—	89,900
Survey monument	—	—	(13,650)	—
Scaffolds	1,592,640	—	154,189	—
Other	885,600	4,587,470	—	73,358
Category totals	**8,031,960**	**4,535,126**	**985,309**	**1,154,878**
Overhead				
Mobilization	17,060,482	19,349,116	14,689,318	1,007,938
Time related overhead	15,339,559	17,405,768	43,852,500	905,345
Other	—	—	230,400	224,600
Category totals	**32,400,041**	**36,754,884**	**58,772,218**	**2,137,883**
Pilings				
Cast-in-drilled hole concrete pilings	—	6,115,860	14,955,788	360,486
Furnish cast-in-steel shell concrete pilings	(64,930,500)	(459,000)	(12,155,009)	—
Furnish steel pipe pilings	—	—	1,448,640	—
Drive cast-in-steel shell concrete pilings	1,805,400	518,400	(7,101,012)	—
Drive steel pipe pilings	—	—	(757,934)	—
Other	(3,024,000)	—	79,441	—
Category totals	**(66,149,100)**	**6,175,260**	**(3,530,086)**	**360,486**
Precast concrete				
Furnish precast concrete pile cap assemblies	—	—	(3,368,800)	—
Furnish precast concrete jacket assemblies	—	—	1,706,840	—
Furnish other precast concrete	80,967,330	—	6,051,644	—
Furnish and erect precast concrete wall	2,274,480	—	—	—
Erect precast concrete jacket assemblies	—	—	7,925,901	—

	Bay Bridge Skyway	Bay Bridge Signature Span	Richmond-San Rafael	Carquinez
Erect precast concrete pile cap assemblies	—	—	(1,010,080)	—
Erect other precast concrete	18,925,830	—	3,380,394	—
Category totals	**102,167,640**	**—**	**14,685,899**	**—**
Removal and demolition				
Bridge removal	—	—	(521,348)	(2,629)
Removal structural steel	—	—	—	(774,447)
Remove truss shoe pin	—	—	1,385,600	—
Other	—	—	48,775	24,010
Category totals	**—**	**—**	**913,027**	**(753,066)**
Seismic safety				
Bearings	1,954,800	(135,000)	—	—
Viscous damping device	—	—	(2,196,996)	—
Other	—	—	(284,064)	247,000
Category totals	**1,954,800**	**(135,000)**	**(2,481,060)**	**247,000**
Structural steel and miscellaneous metal				
Casings	—	—	6,940,990	(165,158)
Clean and paint	2,790,000	3,105,000	11,599,524	1,227,612
Column bracket	—	—	670,800	—
Furnish and erect assemblies	—	2,090,385	—	—
Furnish and erect structural steel	99,739,800	123,482,610	357,612	5,873,172
Install structural steel	—	71,100	—	—
Miscellaneous metal	(1,391,940)	968,760	1,681,861	714,181
Rivet removal and hole reaming	—	—	5,170,776	—
Other	1,260,000	13,542,300	—	58,756
Category totals	**102,397,860**	**143,260,155**	**26,421,563**	**7,708,563**
Temporary items	2,570,400	—	6,011,384	—
Traffic control and safety				
Area signs	—	—	977,840	97,000
Concrete barriers	19,170	—	163,467	1,141,900
Fenders	(3,510,000)	(234,000)	—	(1,260,000)
Traffic control system	—	—	2,154,000	(1,733,000)
Traffic railing	—	—	4,230,288	161,200

continued on the next page

	Bay Bridge Skyway	Bay Bridge Signature Span	Richmond-San Rafael	Carquinez
Traffic stripes	—	—	21,316	16,133
Other	288,090	—	769,875	(443,205)
Category totals	**(3,202,740)**	**(234,000)**	**8,316,786**	**(2,019,972)**
Utility work and services				
Clay sewer pipes	—	—	—	$24,950
Communication system	—	—	700,000	—
Lighting	—	—	(36,100)	—
Mechanical work	—	—	896,000	—
Modify electrical systems	—	—	1,121,100	—
Other	—	—	(186,100)	212,600
Category totals	**—**	**—**	**2,494,900**	**237,550**
Water pollution control measures	—	—	876,000	$4,900
Contingencies	1,136,299	83,822,827	91,470,273	11,157,947
Other minor items†	3,830,000	—	6,862,344	11,201,054
Unreconciled difference‡	11,314,760	292,554	17,254,107	(5,576,572)
Totals	**$186,737,131**	**$277,522,176**	**$302,000,000**	**$28,000,000**

Sources: Toll bridge seismic retrofit program's 30 percent design cost estimates; Chapter 327, Statutes of 1997 (SB 60) cost estimates; and Chapter 907, Statutes of 2001 (AB 1171) cost estimates.

* The line item variances are intended to be representative of where variances occured. However, in some cases, bidders or subsequent estimators used line item categories that were not consistent with initial budget categories.

† The increases in cost estimates for the Bay Bridge skyway and signature span do not include roadway work, such as traffic control, landscaping, and lighting.

‡ Other minor items include supplemental work, state-furnished materials, right-of-way, and anticipated claims.

APPENDIX B

Timeline of Major Decisions Affecting the Toll Bridge Seismic Retrofit Program

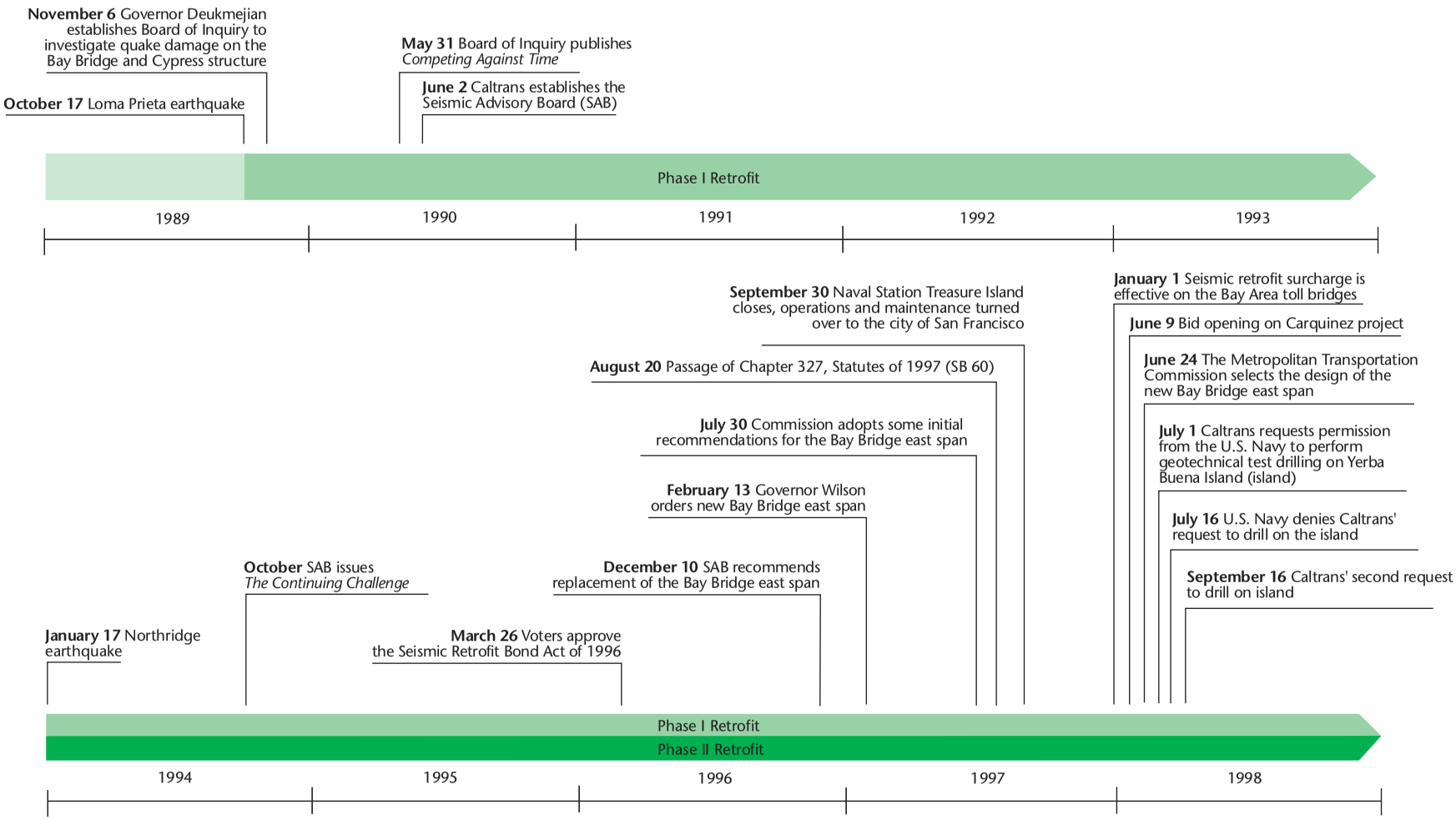


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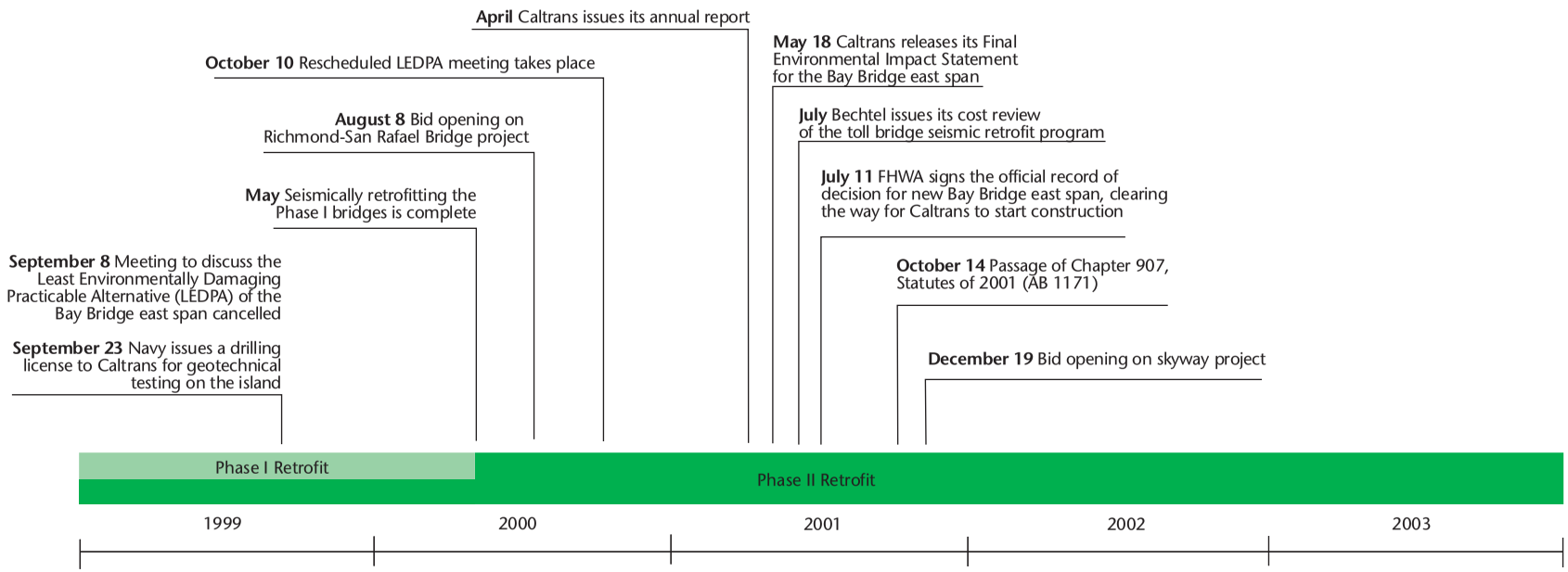
FIGURE B.1 CONTINUED



Agency's comments provided as text only.

Business, Transportation and Housing Agency
980 9th Street, Suite 2450
Sacramento, CA 95814-2719

July 22, 2002

Elaine M. Howle
State Auditor
Bureau of State Audits
555 Capitol Mall, Suite 300
Sacramento, CA 95814

Dear Ms. Howle:

Attached is the Department of Transportation's (Department) response to your draft report, *Department of Transportation: Seismic Retrofit Costs of State-Owned Toll Bridges Have Significantly Exceeded the Department's Original Estimates and May Go Even Higher* (#2001-122). I appreciate that your report points out that a variety of factors, most of which were beyond the Department's control, led to the cost increases and time delays in retrofitting the toll bridges in the San Francisco Bay Area. Additionally, although remaining uncertainties may result in a further increase in costs, I am confident that the Department will continue to contain those costs under its control.

I am proud of the job the Department has done to develop the extremely complex, unprecedented retrofit projects designed to meet the seismic safety standards for California's toll bridges. Through its efforts, the Department has overcome great challenges to develop a seismic retrofit strategy that will maximize public safety and ensure that the State's transportation network will continue to operate in the event of a major earthquake.

I appreciate the opportunity to respond to your audit report. If you need additional information, please do not hesitate to contact me, or Michael Tritz, Chief of the Office of Internal Audits within the Business, Transportation and Housing Agency, at (916) 324-7517.

Sincerely,

(Signed by: Catherine J.K. Sandoval for)

MARIA CONTRERAS-SWEET
Secretary

Attachment

Department of Transportation
Office of the Director
1120 N Street
P.O. Box 942873
Sacramento, CA 94273-0001

July 18, 2002

Maria Contreras-Sweet, Secretary
Business, Transportation and Housing Agency
980 - 9th Street, Suite 2450
Sacramento, CA 95814

Dear Secretary Contreras-Sweet:

I am pleased to provide our response to the Bureau of State Audits' (BSA) draft audit report titled "Department of Transportation: Seismic Retrofit Costs of State-Owned Toll Bridges Have Significantly Exceeded the Department's Original Estimates and May Go Even Higher." The audit report recognizes the various reasons for rising costs and time delays in completing the seismic retrofitting of selected toll bridges and does not offer recommendations for the California Department of Transportation (Department) to implement. However, the Department has the following general response to the draft report.

The Department has worked hard over the past 10 years to deliver what are perhaps the most challenging major bridge projects in the world. We are pleased that the audit of the Toll Bridge Seismic Retrofit Program (Program) recognizes the Department's effort on this unique program.

The Program consists of seven of the State's toll bridges. These projects are both complex and unique and require resourcefulness, technical expertise, and persistence to deliver. The State toll bridges are the largest and, from an engineering perspective, the most complicated bridges in the State. Nowhere in the world have bridges as complex as these been seismically retrofitted. Diverse soil conditions and foundations, seismic forces ten times the original design forces, aged structures, heavy traffic volumes, conflicts with utilities, air space lease concerns, handling of hazardous waste, and care to protect sensitive resources all contribute to the difficulty in retrofitting these structures. As this report is released, five of the seven bridges have been strengthened to resist the maximum credible earthquake. Seismic standards have been achieved on the Benicia-Martinez, Carquinez, San Mateo-Hayward, Vincent Thomas and San Diego-Coronado. Work to achieve seismic safety on the Richmond-San Rafael and San Francisco-Oakland Bay Bridges is underway. To date, approximately $1.2 billion has been spent to seismically upgrade the State's toll bridges.

The audit identifies a few challenges that caused the cost of the Program to increase to the level incorporated into Assembly Bill 1171, Dutra, 2001. Elements contributing to the cost increase are 1) the cost of engineering (capital outlay support) and 2) increases to various items of work.

With regard to the first issue, the initial costs for engineering were developed when the Department was using a statistical model to estimate such costs. That model did not logically extend to such unique and large projects, so another method was chosen. This method estimated the cost of engineering as a percentage of capital cost. As the Program has progressed, the engineering effort has been detailed in a resource planning set of tools and now captures the effort required to manage these projects. The Department continues to monitor and aggressively manage the planning for and utilization of staff to make sure the right work is done within the budget provided.

Secondly, estimating the cost to perform retrofit work on the toll bridges has proven quite challenging. While the Department has drawn upon world-renowned expertise in the development of the projects, much of the work has no historical precedence. Because of the unique requirements and strategies for each project and the challenge to deliver seismic safety quickly, the Department did not have cost histories needed to validate estimates of these types of projects prior to SB 60. The cost estimates used as a basis for AB 1171 contained contingencies to address uncertainties that still exist in this very unique and complex Program. As an example, in order to award the Skyway contract on the New East Span Project (Project), the Department did draw down contingencies for the Project that were incorporated in the AB 1171 estimate. Efforts are underway to identify cost saving measures in order to contain and reduce the costs of the future contracts on the San Francisco-Oakland Bay Bridge so that the remaining contingency is sufficient to address the needs of the Project.

While the Department has successfully overcome many challenges to complete the retrofit of five bridges and begin construction on the other two, there are still many challenges ahead. Continuous efforts are underway to review the costs, identify cost saving measures for all remaining construction contracts and identify ways to lower the costs while achieving seismic safety as quickly as possible.

The result of the Department's continued effort to review the Program's cost will be contained in future Annual Reports to the Legislature. Just as was the case in previous years, external factors beyond the Department's control can affect the cost and schedule of the Program. For example, the events of September 11, 2001, have created significant uncertainties in the construction market which could be reflected in future contracts. However, the Department is working aggressively to deliver the Program within the funding authority provided by AB 1171. We look forward to the day when seismic safety is achieved on all of the State's toll bridges.

If you have any questions, or require further information, please contact Gerald Long, External Audit Coordinator, at (916) 323-7122.

Sincerely,

(Signed by: Jeff Morales)

JEFF MORALES
Director

Agency's comments provided as text only.

Bay Area Toll Authority
Metropolitan Transportation Commission
101 8th Street
Oakland, CA 94607-4700

July 24, 2002

Ms. Elaine M. Howle*
State Auditor
Bureau of State Audits
555 Capital Mall, Suite 300
Sacramento, California 95814

Dear Ms. Howle:

Thank you for an opportunity to comment on the draft report prepared by the Bureau of State Audits titled *Seismic Retrofit of State-Owned Toll Bridges Have Significantly Exceeded the Department's Original Estimates and May Go Even Higher*. Based on our review of the report, it appears that your staff has completed a thorough review and assessment of a very complicated process and set of projects. I would like to offer a few additional comments and suggestions for your report.

The report appears to imply that MTC's process for and selection of a "signature" span of the San Francisco-Oakland Bay Bridge East Span Replacement project was the major cause of the project delay and cost increases. It should be noted that MTC selected the design for the new east span less than one year after Senate Bill 60 was signed and only six months after the bill became law on January 1, 1998. The delays on the project were caused by other parties (notably the U.S. Navy) after the design selection was made. Also, pursuant to Senate Bill 60, MTC provided the funding necessary to fully fund the selected design "amenities" based on the estimates that Caltrans provided at that time. I believe that these points need to be better clarified in your report.

I have also noticed that your report does not include any conclusions or recommendations. Based on the information presented in the report, I believe that two recommendations could be formulated, as follows:

1. Specific project cost estimates should not be incorporated into state statutes. As your report indicates, for projects as large and as complex as the toll bridge seismic retrofit program, project costs will fluctuate for a number of reasons. Inclusion of specific cost estimates in state law will almost always require later legislative action to revise them.

* California State Auditor's comments appear on page 51.

2. For projects of this magnitude, Caltrans or any other state agency should be required to provide more regular and on-going reports to the Legislature and the public. Current statutes require Caltrans to provide annual reports of the seismic program and to report to the Legislature if costs will exceed current estimates. I believe that Caltrans should be required to provide quarterly or semi-annual reports that update costs, schedule and progress of the toll bridge seismic program. As stated in your report, Caltrans did not report cost increases until it issued its annual report in April 2001, more than four years after the original cost estimates in SB 60.

If you have any questions regarding our response to you report or need any other information, please do not hesitate to call Peter Lee of my staff at (510) 817-3206.

Sincerely,

(Signed by: Steve Heminger)

Steve Heminger
Executive Director

COMMENTS

California State Auditor's Comments on the Response From the Metropolitan Transportation Commission

To provide clarity and perspective, we are commenting on the Metropolitan Transportation Commission's (commission) response to our audit report. The number corresponds to the number we have placed in the response.

- The commission says that our report appears to imply that its process for and selection of a "signature" span of the San Francisco-Oakland Bay Bridge east span replacement was the major cause to the project delay and cost increase. As a point of clarification, our report does not state, and is not intended to imply, that the commission's selection process for the signature span caused a project delay. However, its choice, within its authority, to have a signature span rather than a simple span did result in a more expensive bridge.

- The commission offers various reasons for cost increases and time delays and states that these points need to be better clarified in our report. In fact, we discuss each of the points raised by the commission. Specifically, we note on page 19 that the commission exercised its option and selected a bridge design for the east span replacement in June 1998. In addition, we discuss on page 23 the delays that resulted from the U.S. Navy's disagreement with the selected northern alignment.

cc: Members of the Legislature
Office of the Lieutenant Governor
Milton Marks Commission on California State Government Organization and Economy
Department of Finance
Attorney General
State Controller
State Treasurer
Legislative Analyst
Senate Office of Research
California Research Bureau
Capitol Press