

California State Auditor

B U R E A U O F S T A T E A U D I T S

Department of Transportation:

*Disregarding Early Warnings Has Caused
Millions of Dollars to Be Spent Correcting
Century Freeway Design Flaws*



August 1999
99113

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August 25, 1999

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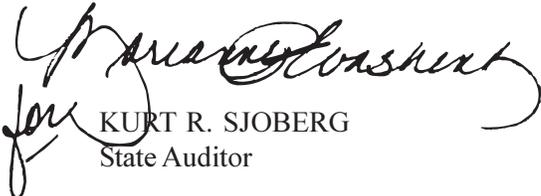
The Governor of California
President pro Tempore of the Senate
Speaker of the Assembly
State Capitol
Sacramento, California 95814

Dear Governor and Legislative Leaders:

As requested by the Joint Legislative Audit Committee, the Bureau of State Audits presents its audit report concerning the Department of Transportation's (CalTrans) management of the circumstances surrounding the damage to the Century Freeway. This report concludes that CalTrans disregarded warning signs of potential groundwater problems during the original design, planning, and construction of the Century Freeway.

In its efforts to resolve the resulting problems of cracked pavement and a damaged storm drain system, CalTrans made emergency repairs and is continuing permanent repairs. As of May 1999, total repair costs are estimated at \$67 million, which does not include the cost to dispose of the groundwater pumped out from under the freeway. CalTrans is currently reviewing options for the beneficial reuse of this groundwater and these options could add millions of dollars more to the total cost of solving the freeway's problems. Further, CalTrans has taken appropriate steps to review and revise its own procedures to avoid similar problems in future highway projects.

Respectfully submitted,


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SUMMARY

RESULTS IN BRIEF

After nearly 30 years of controversy, court injunctions, and delays, the California Department of Transportation (CalTrans) opened the Century Freeway in Los Angeles County in October 1993. In March 1995, problems again arose for the freeway when, less than two years after the opening, CalTrans discovered cracking and sunken sections in the shoulder areas of the freeway that it had constructed below ground level. Although it originally thought the problems involved maintenance issues, by January 1996 CalTrans became aware that matters were far worse: it had not designed the lowered section of the freeway to compensate sufficiently for the effects of rising groundwater beneath the pavement.

During the planning, design, and construction phases for the Century Freeway, CalTrans disregarded warning signs that could have prevented design flaws in the freeway's 3.5-mile lowered section. Most significantly, CalTrans disregarded the 1968 recommendation of its staff to test extensively the soils and the groundwater levels in the area planned for the lowered section, even when it designed the modified storm-drain system for the freeway in 1973. Further, in late 1981, CalTrans agreed to extend the length of the lowered section of the freeway west toward the Los Angeles River, and the department apparently designed this extension without adequate research and consideration, such as additional testing of the soil and groundwater conditions in the area. If CalTrans had performed these tests, it could have realized the rising groundwater would threaten the freeway as designed, and it could have taken appropriate steps early in the project.

CalTrans has documents from 1987 showing that groundwater levels had risen substantially between 1985 and 1987 in the area planned for the below ground level section of the freeway. However, because this analysis was for determining bridge foundations, it was not sent to the district unit designing the lowered section. During construction of the drain system for the lowered section in July 1990, CalTrans installed four dewatering wells because it was encountering a lot of water. The ground was

Audit Highlights . . .

Our review of the damaged Century Freeway and the Department of Transportation's (CalTrans) response found that:

- CalTrans did not adequately test for groundwater conditions and the design lacked needed elements to counteract the effects of rising groundwater.*
 - Emergency and permanent repairs will cost \$67 million, not including the cost to dispose of the water.*
 - Options under consideration for reuse of the water could add another \$50 million in one-time costs and up to \$5 million in annual expenses.*
-

so wet that CalTrans halted construction for more than six weeks. Another six years passed before CalTrans realized it had a serious groundwater problem.

While CalTrans was struggling to move forward with the Century Freeway project, another agency was taking action that was to have important consequences for the freeway. The freeway crosses over two groundwater basins. By the 1950s, the groundwater of these basins had been overpumped, reducing available groundwater supplies while demand for groundwater was increasing. As part of the effort to restore the health of the groundwater basins, a water replenishment district was established in 1959 to return water to the basins. By early 1997, the groundwater levels had increased over 30 feet. Although the groundwater replenishment involves all the geological layers, those layers closest to the surface, which are about 25 feet below grade, are the ones affecting the lowered section of the Century Freeway.

CalTrans may have pushed ahead without further analyzing groundwater conditions because it was under some pressure to begin construction of the freeway after the 1981 lifting of a court injunction that had halted progress for many years. To qualify for federal highway funding for this project, CalTrans had to meet certain construction deadlines.

In January 1996, once CalTrans acknowledged that the cracking and sinking were more than ongoing maintenance problems, it spent \$22 million in emergency repairs and planned to use another \$45 million for permanent repairs to the drainage system. CalTrans engaged both in-house engineers and outside consultants from academia and private practice to evaluate the underlying causes of the problems and develop options to resolve them.

Although it is working to remedy the situation, CalTrans must still determine what it will do with the groundwater it pumps from beneath the freeway. As of May 1999, CalTrans had paid, under protest, more than \$370,000 in taxes to pump out the groundwater. The department is currently diverting the water into the Los Angeles and San Gabriel rivers: thus the water is not available for other uses. CalTrans is, on the other hand, reviewing proposals with two local cities to find beneficial uses for the extracted water so that it does not waste the water or undermine the efforts of the local water replenishment district. Because CalTrans has not determined the best resolution to the

groundwater disposal problem, it has no firm estimates of the costs related to the reuse of the extracted water. However, preliminary estimates suggest that the additional costs could be more than \$50 million for initial costs and from \$370,000 to \$5 million in annual costs.

In responding to concerns that CalTrans withheld information about the problems it was experiencing on the Century Freeway, CalTrans acknowledged it could have done more to inform the Legislature. However, CalTrans did include some information related to the Century Freeway problems in its normal communications with local legislators, the public, and the California Transportation Commission.

Since the groundwater problems became apparent, CalTrans has reassessed some of its policies and procedures and convened an in-house review of the circumstances leading to the problems at the lowered section of the Century Freeway. The review panel made numerous recommendations for new or revised procedures and most units have responded appropriately. However, CalTrans has not monitored some units, which were slow to implement changes.

RECOMMENDATIONS

CalTrans should inform the Legislature, through its Senate and Assembly Transportation committees, as well as the California Transportation Commission about the department's progress in determining an environmentally sound and cost-effective method for reusing the groundwater pumped from under the Century Freeway.

CalTrans should continue working with the Water Replenishment District of Southern California to coordinate actions so that neither agency jeopardizes the other's efforts to fulfill its organizational mission.

To ensure that it properly puts into practice the recommendations from special in-house staff reports, CalTrans should ensure that the unit designated to implement these recommendations periodically reports its progress to department management.

AGENCY COMMENTS

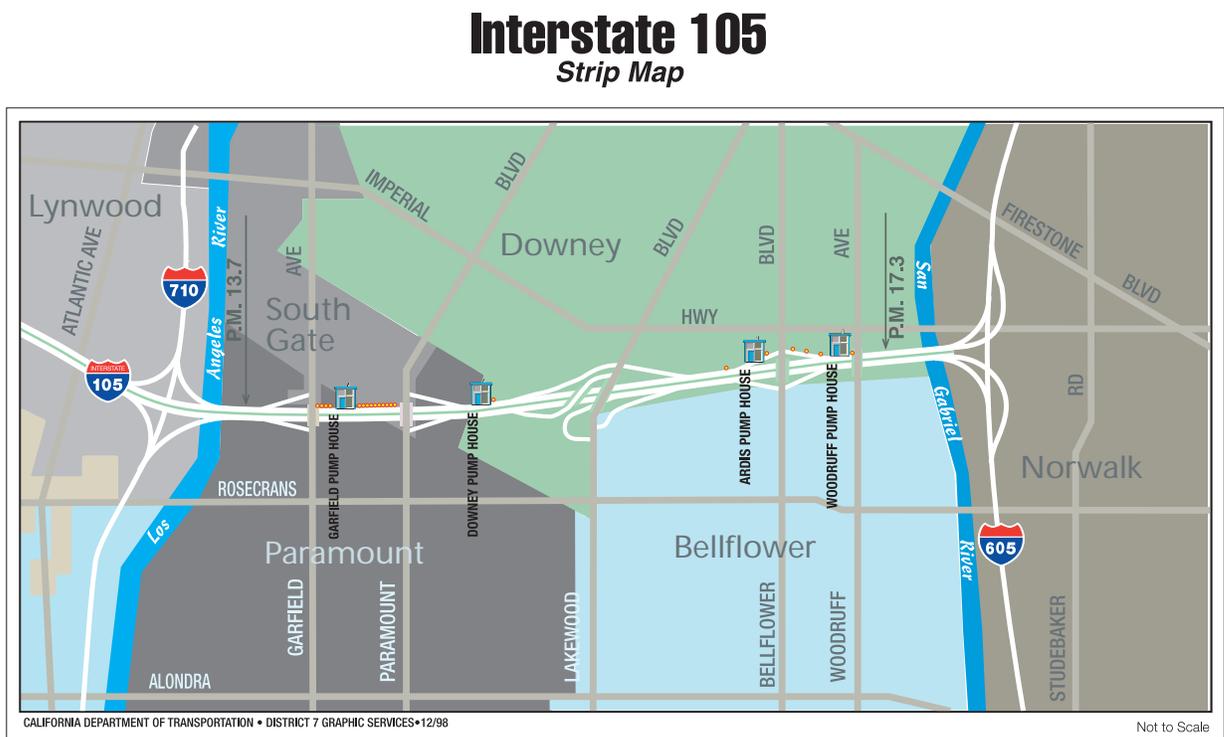
The Business, Transportation and Housing Agency and CalTrans agreed with our recommendations. In addition, the department suggested several wording changes to the draft report. We have accepted some of the department's suggestions in developing our final report. ■

INTRODUCTION

BACKGROUND

In October 1993, the California Department of Transportation (CalTrans) opened the Century Freeway (Interstate 105) to the public after nearly 30 years of controversy, court injunctions, and numerous delays. The Century Freeway extends 17 miles across Los Angeles County from the Los Angeles International Airport in the west to the city of Norwalk in the east. As it crosses the county, the freeway changes elevation. Some sections are at ground level, others are elevated, and some are below ground level. A 3.5-mile portion of the Century Freeway built below ground level is the subject of this report. Figure 1 shows that the freeway lies roughly in the area between the Los Angeles and San Gabriel rivers and runs through the cities of South Gate, Downey, Paramount, and Bellflower.

FIGURE 1



CalTrans recommended a route for the Century Freeway in 1968. Also during this year, the federal government added the Century Freeway to the interstate highway system, a decision that meant federal highway money would pay for a portion of the freeway's construction. CalTrans' Los Angeles district office, known as District 7, was responsible for the planning, design, and construction of the freeway. Designing the freeway took from 1968 to 1972. Then, in 1972, a class action lawsuit was filed against CalTrans to block the freeway's construction. Under the preliminary injunction, CalTrans had to satisfy a number of requirements, which included preparing a formal environmental impact statement and conducting public hearings and further studies examining the effects of the proposed freeway on air pollution and housing availability.

The timeline in the Appendix shows the lawsuit froze all work on the freeway project until 1979, when a settlement, called a consent decree, was reached. Because of the delays, the revised estimates of construction costs were substantially higher than the costs CalTrans originally estimated. To salvage the project, CalTrans, the federal government, and the parties to the lawsuit agreed to reduce the scope of the freeway project, eliminating 2 traffic lanes, 11 local freeway interchanges, and 500 units of replacement housing. The court approved this agreement by issuing an amended consent decree in 1981. Before CalTrans could begin construction, it had to revise the freeway's design to reflect the reduced size and other changes. CalTrans also needed to negotiate new freeway agreements with the local governments, obtain any remaining right-of-way properties, and begin advertising the contracts for construction. By this time, however, CalTrans was facing additional pressure from critical deadlines imposed by federal law that required states to have new interstate routes substantially under construction by September 1986. The law also stated that the federal government would give the last funding authorizations for the final contracts no later than September 1990. Further, the amended consent decree required that before freeway construction could begin, CalTrans had to meet certain objectives related to replacing the residences lost to the freeway.

While CalTrans was struggling to move forward with the Century Freeway project, another agency, the Water Replenishment District of Southern California, was taking action that was to have important consequences for the freeway. The freeway crosses over two groundwater basins. By the 1950s, the groundwater in these basins had been overpumped, reducing

available groundwater supplies while demand for water was increasing. The entities that pumped water from the basins went to court to have the rights to the groundwater apportioned and, thus, limit the withdrawal of water from the basins. As part of the effort to restore the health of the groundwater basins, a water replenishment district was established in 1959 to return water to the basins. By early 1997, the groundwater levels had increased over 30 feet. The groundwater basins consist of several layers of aquifers¹ and aquicludes² that extend to a depth of at least 1,000 feet. Although the groundwater replenishment involves all the geological layers, those layers closest to the surface, which are about 25 feet below grade, are the ones affecting the lowered section of the Century Freeway.

Actual construction on the Century Freeway began in 1982, but construction of the drainage system began in 1990 for the lowered section of the freeway. A drainage system is necessary for all freeways, but is even more important when a freeway lies below ground level in an area of high groundwater because the system removes groundwater from the surrounding area so the water does not erode or weaken the roadbed. In 1973, CalTrans modified the design of its standard drain system for this project to add an underdrain to control groundwater. This underdrain consisted of a six-inch perforated pipe wrapped in filter fabric, placed at least six feet below the freeway pavement, and located directly above the storm-drain pipes. The underdrain and storm-drain pipes then channeled the water to one of four pump houses, where the water was pumped up to ground level and discharged into the county storm-drain system.

By March 1995, areas of the lowered 3.5 miles of freeway began to crack, and sunken sections of pavement developed. CalTrans originally attributed the road degradation to the major storms of 1995, but by January 1996, CalTrans realized that the problems only began with storm damage—the drainage system under the freeway shoulders had also been damaged. The pressure associated with the significant rise in the groundwater level under the freeway forced the surrounding soil to flow into the damaged system, which eroded the soil under and around the freeway and caused portions of the freeway shoulder pavement to sink.

¹ An aquifer is an underground layer of sand and gravel through which water can easily flow.

² An aquiclude is an underground layer of clay or silt that can hold water but through which water cannot easily flow.

As it became evident that a major problem had occurred with the Century Freeway, CalTrans assembled a team of its staff to investigate why the freeway failed. This independent analysis team focused on the department's processes and procedures and made several recommendations for improvements.

SCOPE AND METHODOLOGY

The Joint Legislative Audit Committee asked the Bureau of State Audits to perform an audit of the circumstances surrounding the damage to the Century Freeway. Specifically, the Legislature was concerned that design errors, and the construction projects intended to correct the structural defects, could lead to even more costly repairs and long-term safety problems.

To understand the construction and rehabilitation work that CalTrans performed on the Century Freeway, we reviewed and assessed the available analyses and reports prepared to identify both the causes of the freeway failure and the options available to rehabilitate the freeway. This review, in conjunction with interviews of CalTrans staff, allowed us to assess the methodology CalTrans used to develop and implement corrective action.

We reviewed records at CalTrans and at the California Transportation Commission to determine the total cost of the original construction of the freeway and the cost of emergency and permanent repairs. We also reviewed press releases, newspaper articles, briefing documents, and other records to assess the information that CalTrans had communicated to other agencies and to legislators concerning the extent of the problems it was experiencing on the Century Freeway.

Finally, we reviewed the steps CalTrans is taking to determine what to do with the groundwater it is pumping from under the freeway. As part of this work, we reviewed the tests CalTrans is performing on the water to ensure it is clean enough to discharge to the Los Angeles and San Gabriel rivers. ■

AUDIT RESULTS

CalTrans Has Worked to Correct Design Flaws on the Century Freeway But Has Not Yet Solved Its Groundwater Disposal Problem

SUMMARY

Despite recommendations from its professional staff to perform extensive testing of the area where it was planning to build a section of the Century Freeway below ground level, the California Department of Transportation (CalTrans) did not perform this testing. As a result, the design of this freeway did not have sufficient engineering elements to counteract the effects of rising groundwater in the area. CalTrans had dealt with the water it encountered during the construction of the freeway, but at that time did not believe the water was an indicator of a serious problem. CalTrans estimates it will spend \$67 million to repair and rehabilitate the 3.5-mile lowered section of the Century Freeway caused by groundwater problems. Although still exploring the available options, CalTrans estimates it will need another \$50 million in capital costs to pipe groundwater away from the site and treat it so the water can be used for a beneficial purpose.

In pumping out the water, CalTrans must also be sure it does not reverse the efforts of the local water replenishment district to restore groundwater to an acceptable level. The demands of the area's rapidly growing population had seriously depleted groundwater stores in the past. An effect of the district's water replenishment project is the rise in groundwater at the Century Freeway site; therefore, these agencies must work together on a permanent plan to avoid undermining each other's efforts.

To keep the State and the public informed of the problems it was experiencing with the Century Freeway, CalTrans briefed the California Transportation Commission (commission) and conducted annual briefings with the legislators whose districts the damaged section of the freeway crosses. It also sent out press releases and responded to requests for information from the general public. In addition to providing updates to the State and the public, CalTrans has taken appropriate steps to review its

own procedures to determine how it could improve them. CalTrans commissioned an in-house independent analysis team to recommend improvements. Although the department evaluated how it can avoid similar problems in the future, it should have ensured all of its units promptly complied with the team's proposals.

CALTRANS OVERLOOKED WARNING SIGNS THAT MAY HAVE AFFECTED THE DESIGN OF THE CENTURY FREEWAY

Although preliminary analyses in 1968 showed groundwater would affect construction, CalTrans disregarded its own professional staff's recommendations to test the soil and groundwater extensively where it planned to build the section below ground level. In 1981, 13 years later, CalTrans agreed to extend the lowered section, but it did not perform any soil or groundwater tests to see if any of the conditions had changed. Beyond incorporating a modified drainage system into the design that it believed would address the groundwater conditions, CalTrans did not sufficiently take into account the changing groundwater levels under that freeway section.

Although preliminary analyses showed groundwater would affect construction, CalTrans disregarded staff recommendations for testing.

Another decade passed when, during construction of the drainage system and the pump houses in 1990, CalTrans encountered groundwater that halted construction until crews installed dewatering wells to pump out the groundwater. In one instance, CalTrans encountered saturated ground in July and August, which are typically very dry months in Southern California and during which groundwater levels are usually at their lowest. However, at the time, CalTrans staff thought the wet ground indicated that the drain system was working as intended even though the saturated ground held up construction for over six weeks.

CalTrans Did Not Update Its Analyses of Groundwater Conditions

Memos sent in 1968 from the materials and drainage units of CalTrans' District 7 informed the District 7 design unit that groundwater could be a problem in the eastern portion of the freeway route, which lies in the groundwater basin known as the Central Basin. At this time, groundwater levels were estimated to be 30 feet or more below the expected pavement level of the freeway. However, the drainage unit noted in August 1968

In August 1968, the drainage unit noted that groundwater levels in the freeway area had been rising for the prior seven years.

that the groundwater in the area had been rising since 1961 due to three factors. First, a court order assigned water rights to water users in the groundwater basin. Additionally, Los Angeles County was replenishing groundwater near Whittier Narrows Dam and the area had also experienced a few wet years.

The drainage unit's memo also recognized that the groundwater could rise to levels near the historic high, so construction of a freeway below ground level would need to rely heavily on dewatering facilities. In September 1968, a memo from the materials unit detailed the results of the preliminary soil and water investigation. The unit concluded that, because of the possibility of rising groundwater in the area, construction of a section below ground level was not feasible along a specific portion of the right of way. The memo further stated that the soil conditions would allow groundwater to penetrate the aquiclude and seep into any section constructed below ground level if the groundwater levels approached their historic highs.

An internal CalTrans memo to the design file in October 1968 summarized the conclusions of a meeting of District 7 staff from the materials, drainage, and design units. The group concluded that, even though it did not anticipate any insurmountable problems, CalTrans would need to construct major facilities to control the groundwater. The group also recommended extensive testing to determine the extent of groundwater present throughout the area. In response to the group's conclusions, in 1973 CalTrans modified its standard design for freeway drain systems to incorporate for this project an underdrain system to capture water welling up from below the roadway. A June 1973 memo from the materials unit to the project design unit warned that this system would not be completely effective if very high groundwater levels occurred. Nevertheless, in June 1996, the independent analysis team, which CalTrans formed to review the problems it was experiencing with the Century Freeway, concluded that this underdrain system is the only component to control groundwater conditions that CalTrans included in its original freeway design.

When it negotiated a new freeway agreement with the City of Paramount in December 1981, CalTrans agreed to extend the lowered section of the freeway westward through the city. Because the final materials report for that section, dated February 1983, does not mention additional groundwater testing but only references the 1968 and 1973 work, we assume that CalTrans did no further testing before designing the extension.

This section, which includes the Garfield Avenue pump house, is where CalTrans is currently operating the greatest number of dewatering wells.

Efforts to replenish groundwater in the area produced a substantial rise in the groundwater level since the initial design of the freeway.

Groundwater levels in the Central Basin began rising in the early 1960s as area users reduced their pumping of groundwater and as artificial replenishment activity continued. This artificial replenishment adds imported water to man-made ponds, where it gradually percolates into the aquifers lying beneath. Although groundwater levels will fluctuate because of factors such as the amount of pumping from the area or drought conditions, as a result of the artificial replenishment, groundwater levels around the Century Freeway site rose about 12 feet between 1968 and 1981. If CalTrans had performed the testing its staff recommended in 1968 and then retested when it designed the extension, CalTrans could have adjusted the final freeway design accordingly.

Before constructing the lowered section of the Century Freeway, CalTrans did in fact have some information about the higher groundwater levels from a number of test borings a headquarters unit made to determine foundation levels for bridges and pump houses. The independent analysis team found that the project design staff at District 7 received most, but not all, of the test results. However, one memo, a May 1987 report chronicling a 5.2-foot rise in groundwater over the preceding two years, apparently was not sent to the district unit. Evidently, since the district project design unit was unaware of the most recent information, it made no proposals to counteract the changing groundwater conditions.

CalTrans Felt a Sense of Urgency to Begin Construction So the Project Would Not Lose Federal Funding

In 1979, when the court issued a consent decree, discussed in this report's introduction, that allowed CalTrans to resume design and construction of the Century Freeway, several factors had changed. Because the estimated cost for the freeway had risen from \$250 million to between \$1.6 billion and \$2.2 billion, the viability of the project was now in question. Consequently, the federal government and the parties to the lawsuit agreed to a much smaller project, which the court approved in the amended consent decree issued in 1981. The agreement eliminated from the original design 2 traffic lanes, 11 local freeway interchanges, and 500 units of replacement housing.

Because the lawsuit delayed freeway construction for so many years, CalTrans now found itself rushing to meet a federal requirement that new interstate routes be substantially under construction by September 1986. The federal government would also give no funding authorizations after September 1990 for the final contracts. However, before CalTrans could begin actual construction, it needed to revise the design of the freeway to comply with the amended consent decree, negotiate new freeway agreements with Los Angeles County and the nine corridor cities, obtain any remaining right-of-way properties, and begin advertising bidding for contracts. Further, the amended consent decree also mandated that CalTrans establish a replacement housing program in conjunction with the Department of Housing and Community Development, a project requiring additional time and resources.

Several memos and letters indicate that CalTrans had established a project timeline of tasks it needed to complete to meet the federal participation requirements. According to these documents, December 1981 was a critical time, and the documents also convey the sense of urgency staff felt to reach these goals. Further, since many of the local governments had felt the effects of the long-stalled project in their jurisdictions, they were anxious for CalTrans to begin construction.

CalTrans Encountered Groundwater During Freeway Construction

In 1990 when CalTrans began constructing the drainage system for the Century Freeway's lowered section, crews encountered groundwater. When, in 1996, the independent analysis team reviewed the construction diaries, it had two primary concerns: CalTrans relied heavily on dewatering wells to remove the water during construction, and it probably penetrated the aquiclude when building the pump houses, thus providing a conduit for the rapid upward flow of groundwater.

To illustrate how much groundwater that construction crews encountered, the June 1996 report by the independent analysis team used the example of the Ardis pump house site. When digging at the site, CalTrans had to install four dewatering wells to remove large amounts of groundwater. Although it is not unusual for construction crews to encounter groundwater when excavating, in this case, work was halted between July 6, 1990, and August 21, 1990—more than six weeks—because the ground was too saturated to continue work. This amount of

In one instance, construction crews halted freeway work for six weeks because the ground was too saturated—an unusual event during the dry summer months.

groundwater was an unusual event during what is historically a very dry period in Southern California and a time when groundwater levels are generally at their lowest.

The independent analysis report also states that CalTrans' construction diaries recorded that large amounts of sediment and water were flowing into the pump houses. At the time, staff assumed that the large amount of water was evidence that the drainage system was working as designed and that the sediment was soil washed from the bare slopes graded during construction. Maintenance staff also found sediment and water in the pump houses after the freeway was opened to the public in October 1993. They, too, believed the sediment was soil eroding from the freeway slopes and would diminish over time as the slopes stabilized. It was not until the 1996 independent analysis team investigation that the water and sediment were seen as indicators of a larger problem with the underground drainage system.

Although staff thought sediment and water found in pumphouses would diminish, these later were found to be indicators of larger problems.

Both State and Federal Oversight Were Present During Original Construction

During the original construction of the Century Freeway, both CalTrans and a federal agency performed inspections to ensure that the project complied with contract and construction standards. Because it provided funding for the freeway, the Federal Highway Administration (FHWA) conducted inspections of work at the construction site. In addition, CalTrans used its normal process for managing and inspecting projects; the department subdivided the large job into smaller projects with specific geographical boundaries. For example, the 3.5-mile lowered section of the Century Freeway between Interstate 710 and Interstate 605 became three projects. CalTrans then assigned each smaller project to an engineer, designated the resident engineer, who was responsible for coordinating and approving all work performed on the project.

Some of the resident engineers on these projects were CalTrans employees, while others were contract employees, who were responsible for following all CalTrans policies and procedures in performing resident engineer duties. As part of their duties, resident engineers were on the construction site full-time coordinating the work performed by the various contractors, making decisions about how to proceed when unexpected situations arose, and ensuring that the project was proceeding

appropriately. Resident engineers prepared daily construction diaries that recorded events occurring on the project, decisions reached, change orders approved, and other noteworthy items.

CalTrans inspections included tests of the materials used on the project, interim inspections of work done by contractors, and final inspections of the work in order to develop a list of items that the contractor needed to correct before CalTrans formally accepted the work. When specified in the contract, either CalTrans or the contractor performed testing of materials used on the project. However, final acceptance of the project's materials remained the responsibility of the resident engineer, who monitored the acceptance testing of these materials. The designated resident engineer was responsible for the interim and final inspections. CalTrans formally accepted the three projects located in the lowered section of the freeway.

In addition, the FHWA inspectors routinely visited the Century Freeway construction site to inspect the work that had been completed. The FHWA prepared inspection reports covering each visit, which covered the project status, construction details, processes that the inspectors had examined, deficiencies, and follow-up inspections of deficiencies noted in previous reports. Generally, FHWA performed these inspections at the start of the project, at different phases during the construction of the project, and at the end of the project. For two of the three projects that became the freeway's lowered section, we were able to obtain FHWA's final inspection reports in which it deemed acceptable the work performed by the contractor. However, as of August 1999, FHWA has been unable to provide the final inspection for the third project.

EVEN THOUGH CALTRANS FOLLOWED A LEGITIMATE PROCESS TO DECIDE HOW TO CORRECT THE PROBLEMS, SIGNIFICANT ISSUES REMAIN

At first, CalTrans believed that pavement failures were isolated occurrences due to heavy rains.

In March 1995, CalTrans' maintenance unit discovered an open depression on the Bellflower Boulevard on-ramp in the lowered section of the freeway. At that time, the pavement failure along the freeway shoulder and subsidence of the drainage inlets was attributed to recent heavy rains. CalTrans investigated to determine the extent of the damage and to develop an appropriate method of repair by contracting for ground-penetrating radar tests and subsurface video inspections. In addition, five pits were excavated to allow crews to inspect the damage.

Soon after the first depression appeared, maintenance crews noticed similar depressions at three other locations on the westbound side of the freeway. However, not until January 1996 did CalTrans realize that its drainage problems and the pavement's cracking were more than isolated occurrences; in addition to the failure of the storm-drain system, high levels of groundwater were present. Because the pipe joints were not designed to withstand the amount of pressure associated with the rising groundwater, the combination of these conditions allowed sandy, silty soil to flow into the system, eroding the soil and developing voids in the ground beneath the pavement. CalTrans began several emergency repairs intended to prevent further damage to the freeway, while District 7 and headquarters units also began designing changes to the freeway drainage system to counteract the effects of the high groundwater present throughout this 3.5-mile section of freeway.

CalTrans Investigated Problems and Sought Expert Advice for Possible Solutions

In its efforts to identify and address the problems it had encountered on the Century Freeway, CalTrans used the expertise of both in-house staff and outside consultants. In 1996, CalTrans initiated an in-house independent analysis team, which was charged with determining the reasons behind the roadway failure and recommending procedural changes to prevent a recurrence of this type of failure. In addition, it contracted with outside consultants to perform a value analysis study and to identify possible solutions for the freeway problems. This team, consisting of professional engineers from academia and industry, issued three value analysis reports. CalTrans also had its Engineering Service Center in Sacramento prepare a geotechnical design report to evaluate the most viable options to remedy the groundwater problems.

CalTrans assembled the independent analysis team to evaluate the freeway's design and construction. Its report, issued in June 1996, identified the reasons behind the roadway's failure, and was critical in its acknowledgment of failures in the original design, planning, and construction of the freeway. The team, which consisted of members from a variety of CalTrans units, including project development, maintenance, construction, and roadway geotechnical engineering services, recommended improved procedures to prevent a recurrence of this type of failure. After its review of project documents and its discussions with personnel from headquarters, District 7, and industry, the

CalTrans used a combination of in-house staff and outside consultants to decide on the best way to repair and rehabilitate the freeway.

team identified the presence of groundwater as the main cause of the roadway's failure. In addition, the team recommended that CalTrans obtain external experts to help identify and analyze the possible solutions.

Following the team's recommendations, CalTrans contracted with outside consultants to explore the alternatives for repairing the freeway. This consultant team issued three separate value analysis reports from September 1996 through September 1997. The studies evaluated the short-term corrective measures and discussed the alternatives for a long-term solution. The first report focused on determining the problems in the lowered section of the freeway, and the repairs needed to the storm-drain system. Building on this information, the second value analysis report provided a strategy for controlling the rising groundwater levels and the final report reviewed the recommendations in CalTrans' geotechnical design report on controlling groundwater and devising a long-term strategy to the storm-drain problem. Caltrans' Engineering Service Center prepared the geotechnical design report in September 1997 to represent its approach to assessing and correcting groundwater problems. Once it received comments from the value analysis team, CalTrans began the permanent repairs in April 1998.

CalTrans Audits and Investigations Division Conducted a Limited Review

In late 1998, CalTrans directed its Audits and Investigations Division to survey the drainage system repair and replacement project. During the initial work, which took place while CalTrans was excavating and replacing the drainage system, the auditor found two instances in which improper construction methods may have been used in the original construction of the freeway. In one of the instances, workers had applied concrete over sandbags during construction of a drain inlet. The other instance was the possible use of improper joint fasteners on the pipes in the drainage system.

According to District 7 staff's research of the sandbag issue, the concrete poured over sandbags was not an acceptable construction technique, and, presumably, the concrete was not visible to inspectors during original construction because of the depth of the trench in which the sandbags lay. The sandbags should only have supported the form into which the workers were to pour the concrete. District 7 staff also noted that when repair workers fixed this portion of the drainage system and excavated this

Although not contributing to the failure of the freeway's original drainage system, a CalTrans auditor found one instance of an improper construction technique.

portion of the freeway, the burlap or containers showed signs of deterioration. However, the chunks of sand under the concrete wall did not exhibit the erosion, dislocation, or displacement that they would have shown if the structure had failed. Therefore, District 7 staff concluded that, although this work did not meet CalTrans construction standards, it did not contribute materially to the failure of the drainage system.

In investigating the possible use of improper joint fasteners, District 7 staff found that the contractor had used, with the approval of the resident engineer, an accepted alternative technique to connect the pipes. According to evidence provided by District 7, CalTrans staff had inspected the material at the manufacturer and the resident engineer had approved its use on the project. Since the material was inspected and approved in accordance with established procedures, CalTrans concluded that it needed to take no further action.

CalTrans Is Spending \$67 Million to Correct Design Flaws on the Century Freeway But Will Need Millions More to Solve Its Groundwater Disposal Problem

Between March 1995 and December 1997, CalTrans spent \$22 million on emergency repairs to keep the Century Freeway open. Although the emergency repairs are now complete, the last of the three phases of the permanent repairs awaits implementation. The first phase involved the installation of 17 pump wells on the north side of the freeway. Each pumping well has a corresponding control well used to monitor groundwater levels near the pavement surface, along the shoulders. If the groundwater comes within three feet of the pavement surface, the pump wells automatically pump water until it drops below the three-foot threshold. To date, CalTrans has only had to use five of the pump wells.

The second phase encompassed compaction grouting in the freeway median. Compaction grouting uses a stiff mixture of cement mortar pumped through small holes in the freeway, and this mixture fills the voids in the soil and establishes a stable base below the surface of the freeway and the median. Workers completed additional grouting around the drainpipes to seal the drainage system from further soil and water infiltration. CalTrans completed this phase in December 1998.

Emergency repairs to keep the Century Freeway open cost \$22 million.

In the final phase of the permanent repairs, CalTrans will use high-density polyethylene pipe in constructing a new storm-drain system at a higher elevation than the old system. According to CalTrans, this pipe is highly flexible and can be welded, characteristics that eliminate the need for joint seals. The department believes this pipe has an advantage over the old system of corrugated steel and reinforced concrete pipes because water or soil cannot permeate the joints. The storm drains will be replaced in three phases. Workers will replace the storm drains around the Ardis pump plant first. At the end of May 1999, this work was near completion. The next replacement of the storm drains is around the Downey pump plant. Construction was scheduled to begin June 1999. The drains at the last two pump plants, Woodruff and Garfield, will be replaced last. CalTrans has scheduled construction at these plants to begin April 2000. See Figure 1 on page 5 for the locations of the pump plants.

Emergency and permanent repairs will total \$67 million—13 percent of the original cost to construct the 3.5-mile section.

We determined that CalTrans has spent \$10 million for the permanent repairs completed thus far, with another \$1.4 million available to spend. In addition, CalTrans recently requested that the California Transportation Commission (commission) approve an allocation of \$7.6 million for the second of the storm-drain replacement projects. CalTrans estimates it will need another \$26 million for the final phase of the storm-drain replacement. The cost of repairs has added about \$67 million to the \$2.4 billion cost to construct the entire freeway. We estimate that CalTrans spent, on average, \$137 million per mile to construct the Century Freeway; therefore, the 3.5-mile lowered section could have cost roughly \$480 million. The costs to repair this lowered section of the Century Freeway are approximately 13 percent of the original cost of its construction.

Since September 1996, CalTrans has requested Emergency Relief funds from the FHWA for repairs on the freeway. In a letter dated June 30, 1999, FHWA denied the request from CalTrans for Emergency Relief funds for the permanent repairs. The agency approved the eligibility of the emergency repairs for funding through Emergency Relief funds. FHWA informed CalTrans that the new storm-drain system could be constructed using conventional federal highway funding. As of July 21, 1999, CalTrans had not received funding from FHWA for the emergency repairs.

The Problem of Groundwater Disposal Remains Unresolved and Will Add to CalTrans' Costs

CalTrans has yet to determine what it will do with the groundwater it pumps from beneath the lowered section of the Century Freeway. CalTrans is currently identifying the specific options available, their feasibility, and the costs associated with each. In order to maintain the integrity of the roadway, CalTrans must keep groundwater levels three feet below the pavement.

CalTrans is using 5 of its 20 dewatering wells to keep the levels down. The wells pump the water into the Los Angeles County storm-drain system, which flows into the San Gabriel and Los Angeles rivers. In developing a permanent diversion system for the water, CalTrans must acquire its own or partner with an entity that has water rights, assure the quality of the water, and arrange for proper disposal.

In the early 1960s, water rights in the Central Basin were legally assigned to specific entities to halt excessive pumping. Each pumper received the rights to a certain number of acre-feet of water per year. Currently, the State has rights to 50 acre-feet of water per year but it has assigned none of these rights to CalTrans. Although CalTrans lacks water rights in the Central Basin, it continues to pump the water to stabilize the roadway and ensure public safety. As of May 1, 1999, CalTrans had paid, under protest, more than \$370,000 in pump taxes to the Water Replenishment District of Southern California on the 2,428 acre-feet of groundwater it has pumped out from under the freeway.

Because CalTrans is pumping water, which eventually discharges into a public waterway, it must have a National Pollutant Discharge Elimination System permit. In September 1996, the Los Angeles Regional Water Quality Control Board issued this permit to CalTrans for the four initial pump test wells. To draw down the groundwater levels, CalTrans turned on 2 of the 4 original wells in October 1997. The board extended the discharge permit in December 1997 to include the construction of 17 new wells. Since installation of the wells, CalTrans has used only five wells when water levels exceeded the three-foot buffer zone.

According to our review of water quality data and discussion notes provided by CalTrans' Audits and Investigations Division, Trichloroethylene and other pollutants contaminate the water being discharged from some wells. In order to comply with the requirements of its discharge permit, CalTrans began treating

CalTrans is currently identifying specific options available, their feasibility, and associated costs of each.

The significant amount of water pumped from beneath the freeway is currently discharged into the county storm-drain system and lost.

this water with temporary filters in February 1999. However, in February and March 1999, CalTrans performed no testing of the treated water to determine if the contaminant levels were within acceptable levels for disposal. In May, the department installed two permanent filters, one on either side of the freeway at the Garfield pump house. During the filter installation, CalTrans analyzed the water it pumped before and after it was treated. However, water analysis from one of the five wells indicated that the Trichloroethylene levels were still not within acceptable standards even after treatment. Effective May 1999, the treated water is tested at the point of discharge. Even though the water from one of the wells is contaminated, by the time CalTrans discharges it to the county storm-water system, the water has blended with water from uncontaminated wells. It is at this point that CalTrans now tests the water for contaminants. Testing the water quality in this way meets the requirements of the long-term discharge permit issued by the Regional Water Quality Control Board in July 1999.

A more difficult problem for CalTrans to resolve is what to do with the groundwater that was part of the basin recharge activity. CalTrans is currently evaluating three options for disposal of this water. One option is to acquire water rights to pump the water. Using figures for the most recent amount of groundwater CalTrans has pumped, we estimate that CalTrans will extract nearly 2,700 acre-feet of water annually. Thus the projected cost to purchase water rights would be \$7.2 million, and the annual pump tax would be more than \$370,000. This option presumes CalTrans would propose discharging groundwater into the river systems as a long-term solution. However, CalTrans has always proposed the reuse of this water as a long-term solution and has no plans to pursue this option.

Another option is for CalTrans to construct a water treatment facility in partnership with the City of Downey. CalTrans is currently working with the City of Downey to prepare a feasibility study for this facility. According to CalTrans, capital costs for building a water treatment facility could be \$40 million to \$50 million, with operating costs of \$5 million annually. Under this option, the City of Downey would use its water rights to extract the groundwater and then pay the pump tax.

The third option is for CalTrans to construct a pipeline to carry water from the Century Freeway to Long Beach. Like the City of Downey in the second option, Long Beach would use its water rights and pay the pump tax. CalTrans is in the process of

reviewing this proposal, which could require that the quality of the water CalTrans delivers be of the same quality as the water the city currently extracts with its own wells. In addition, Long Beach might require CalTrans to deliver the same amount of water in the summer as in the winter, regardless of the amount needed to keep the groundwater three feet below the freeway pavement.

CALTRANS EXERTED SOME EFFORTS TO INFORM THE COMMISSION, LEGISLATORS, AND THE PUBLIC ABOUT CENTURY FREEWAY PROBLEMS

To investigate concerns that it had withheld information about its problems with the Century Freeway, we assessed CalTrans' communications with legislators, the public, and the California Transportation Commission (commission) and found that the agency covered some information about these problems. CalTrans, however, has acknowledged that it could have done more over the past three years to inform the Legislature of problems on the Century Freeway.

CalTrans informed Los Angeles area legislators about the freeway problems during District 7's annual legislative briefings. According to the acting district director, each year District 7 management meets with area legislators or their staff to discuss projects affecting their districts. Consequently, only those legislators whose districts the freeway runs through would have received a briefing. CalTrans' records show that between May 1995 and May 1999, it held meetings with area legislators; however, these records do not consistently describe what participants specifically discussed at these meetings. In February 1998, CalTrans held at least three meetings with legislators at which the Century Freeway repair project was one of several projects listed on the agenda.

In addition, we found that over the past three years, CalTrans briefed local governments; issued press releases to local news stations, radio stations, and local and major newspapers on traffic lane closures; and responded to written requests for information from the general public. Since the discovery of the first cracking and sunken sections of the freeway, CalTrans has issued 24 press releases notifying the public of the road closures and problems.

CalTrans acknowledges that it could have done more over the past three years to inform the Legislature of what was happening.

CalTrans was not always prompt in notifying the commission of emergency allocations to repair the freeway.

On the other hand, CalTrans was not always prompt when notifying the commission about emergency allocations of funding to repair the freeway. CalTrans did follow proper protocol when it presented to the commission its requests for funding allocations for repairs. The department used three methods for requesting funds. For the emergency repairs, CalTrans used authority delegated to its director by the commission. This authority allows allocations of funds for emergency projects with the understanding that CalTrans will report these allocations to the commission at its next meeting. However, CalTrans did not always notify the commission at its next scheduled meeting. Although the commission reprimanded the agency in May 1996, CalTrans continued to be late in notifying the commission about emergency projects. According to CalTrans and the commission, the department's internal process for requesting funds created the time lags. Most recently, the commission instituted a new reporting process to improve the timing of these notifications.

In addition, CalTrans must report to the commission's executive secretary any emergency project estimated to cost over \$400,000 at the time the director approves the project. In all but one instance, CalTrans properly notified the commission's executive secretary of these emergency projects.

The two other methods CalTrans used were the State Highway Operations and Protection Program (SHOPP) and the SHOPP amendment process. The SHOPP is a four-year program of projects related to traffic safety, roadway rehabilitation, roadside rehabilitation, or operations of the State highway system. CalTrans prepared the SHOPP and presented it to the commission for approval. At any time after the commission approves the four-year SHOPP, CalTrans may make necessary amendments. CalTrans used the SHOPP and SHOPP amendment processes to request allocations for the permanent repairs of the Century Freeway, and the department presented all amendments to the commission for approval.

CalTrans' director appropriately informed the commission of his requests, which included any amendments necessary for requests for emergency repairs. In addition to notifying the commission of the funding requests, CalTrans briefed the commission at least twice about the problems with the Century Freeway. The first briefing took place at the commission's meeting on March 28, 1996. CalTrans explained that it did not know the extent of the problem but that it was encountering a

substantial amount of groundwater. Further, CalTrans reported initiating the emergency repairs needed to keep the freeway open until it could find out what was causing the underlying problem.

In the second briefing, which took place on May 5, 1999, CalTrans gave the commission a presentation on the Century Freeway groundwater issue, the department's response, and the additional work necessary to correct the problems. CalTrans informed the commission that it was working on the permanent repairs, with two more phases of the storm-drain replacement to complete. CalTrans also briefed the commission about the groundwater disposal dilemma. At the meeting, the commission requested that CalTrans give updates at each of the commission's monthly meetings. Our review of the next meeting on June 6, 1999, indicated that CalTrans complied with the commission's request.

THE INDEPENDENT ANALYSIS TEAM PROMPTED CALTRANS TO CHANGE SOME PROCESSES

In June 1996, the in-house independent analysis team assembled by CalTrans concluded that inadequate procedures compounded the problems with the lowered section of the Century Freeway. Most importantly, CalTrans had not done extensive groundwater testing. In addition, CalTrans' Highway Design Manual contained inadequate procedures for the use of watertight joints, and its Construction Manual lacked appropriate procedures to follow when workers encounter groundwater during excavation. Based on the investigation, the team made a series of recommendations to avoid a recurrence of similar problems on future projects.

Although implementing all recommendations of the independent analysis team, changes needed in the construction and maintenance manuals were delayed.

In August 1996, the independent analysis team developed a plan to implement its recommendations, which identified the planned action, the unit responsible for implementing the corrective action, and a target date for completion. As one of the first steps in responding to the recommendations, CalTrans revised its Highway Design Manual to include the use of watertight joints for submersible pipes. In addition, in May 1998, to improve communication among CalTrans' various units, the Project Development Unit in Sacramento began holding training and information seminars on the responsibilities of various units within CalTrans.

As of July 1999, CalTrans had implemented all the recommendations made by the independent analysis team. However, either due to low priority or a lack of monitoring, CalTrans construction and maintenance units were neither prompt nor timely in implementing their changes. Specifically, the construction unit did not circulate revisions to the Construction Manual regarding groundwater until July 1999, 2.5 years after the targeted completion date for the manual revision. Also, until May 1999, the maintenance unit had not completed a revised policy related to obtaining support from other units even though CalTrans targeted this item for completion two years earlier. A lack of regular status reports by the CalTrans units responsible for implementing new procedures compounded the delays in the department's putting the recommendations into practice. By not closely monitoring its progress in completing the recommended changes, CalTrans risks the potential of making similar mistakes on other projects.

RECOMMENDATIONS

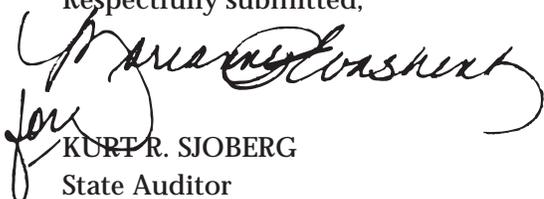
CalTrans should inform the Legislature, through its Senate and Assembly Transportation committees, as well as the California Transportation Commission about the department's progress in determining an environmentally sound and cost-effective method for reusing the groundwater pumped from under the Century Freeway.

CalTrans should continue working with the Water Replenishment District of Southern California to coordinate actions so that neither agency jeopardizes the other's efforts to fulfill its organizational mission.

To ensure that it properly puts into practice the recommendations from special in-house staff reports, CalTrans should ensure that the unit designated to implement these recommendations periodically reports its progress to agency management.

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,



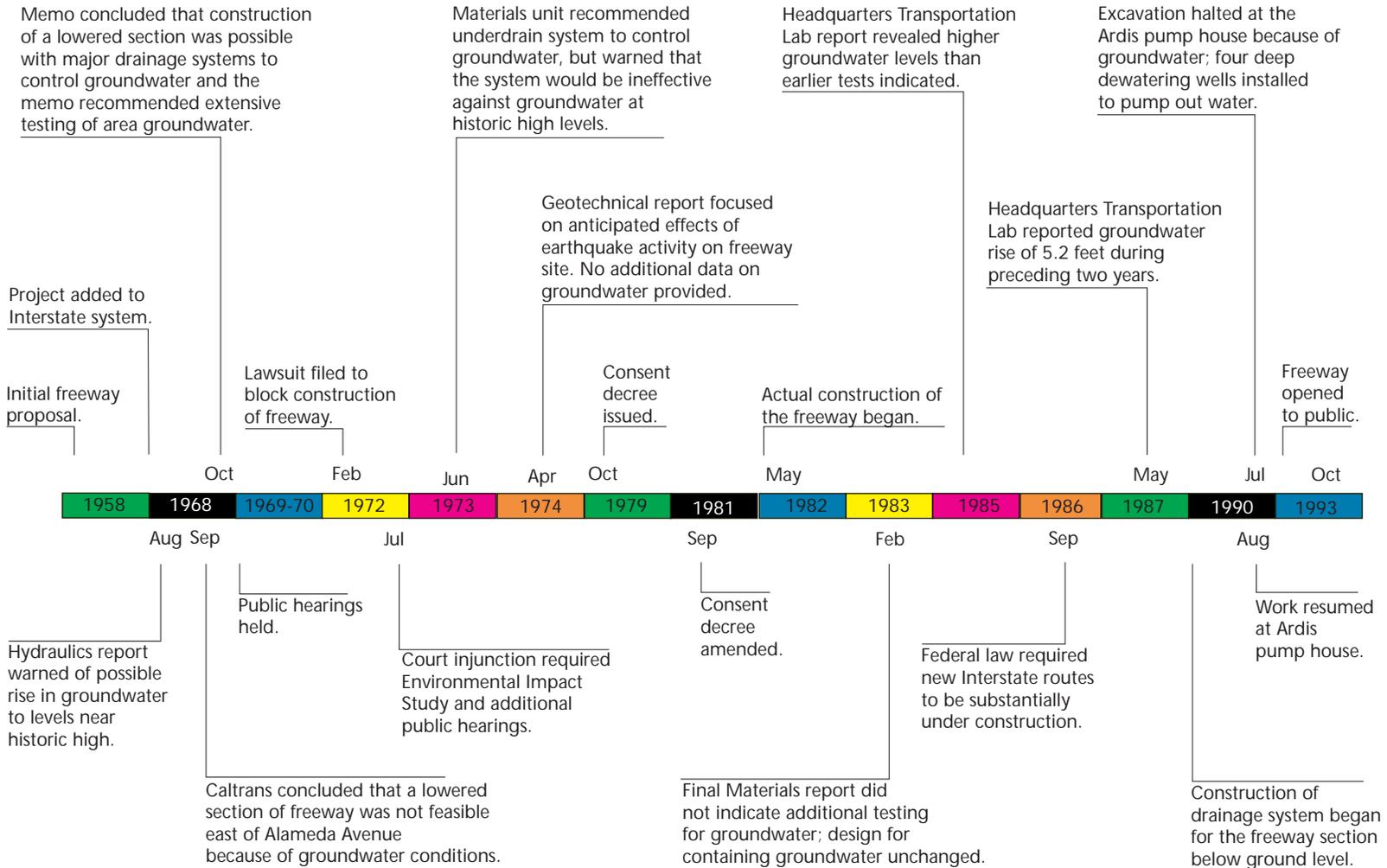
KURT R. SJOBERG
State Auditor

Date: August 25, 1999

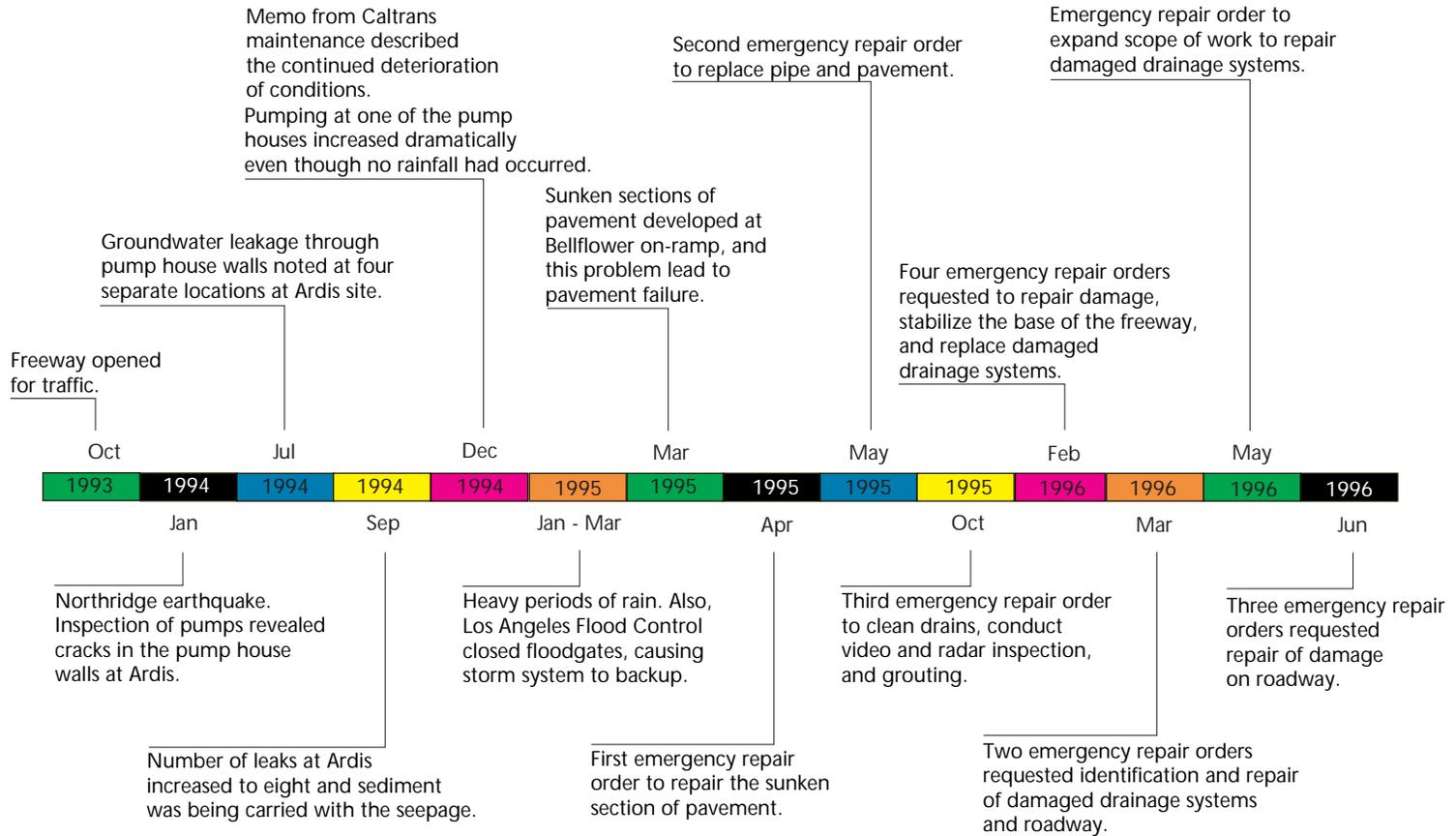
Staff: Steven M. Hendrickson, Audit Principal
Nancy C. Woodward, CPA
Dawn Tomita
Vikram Mandla

Events Related to Construction and Repair of the Century Freeway

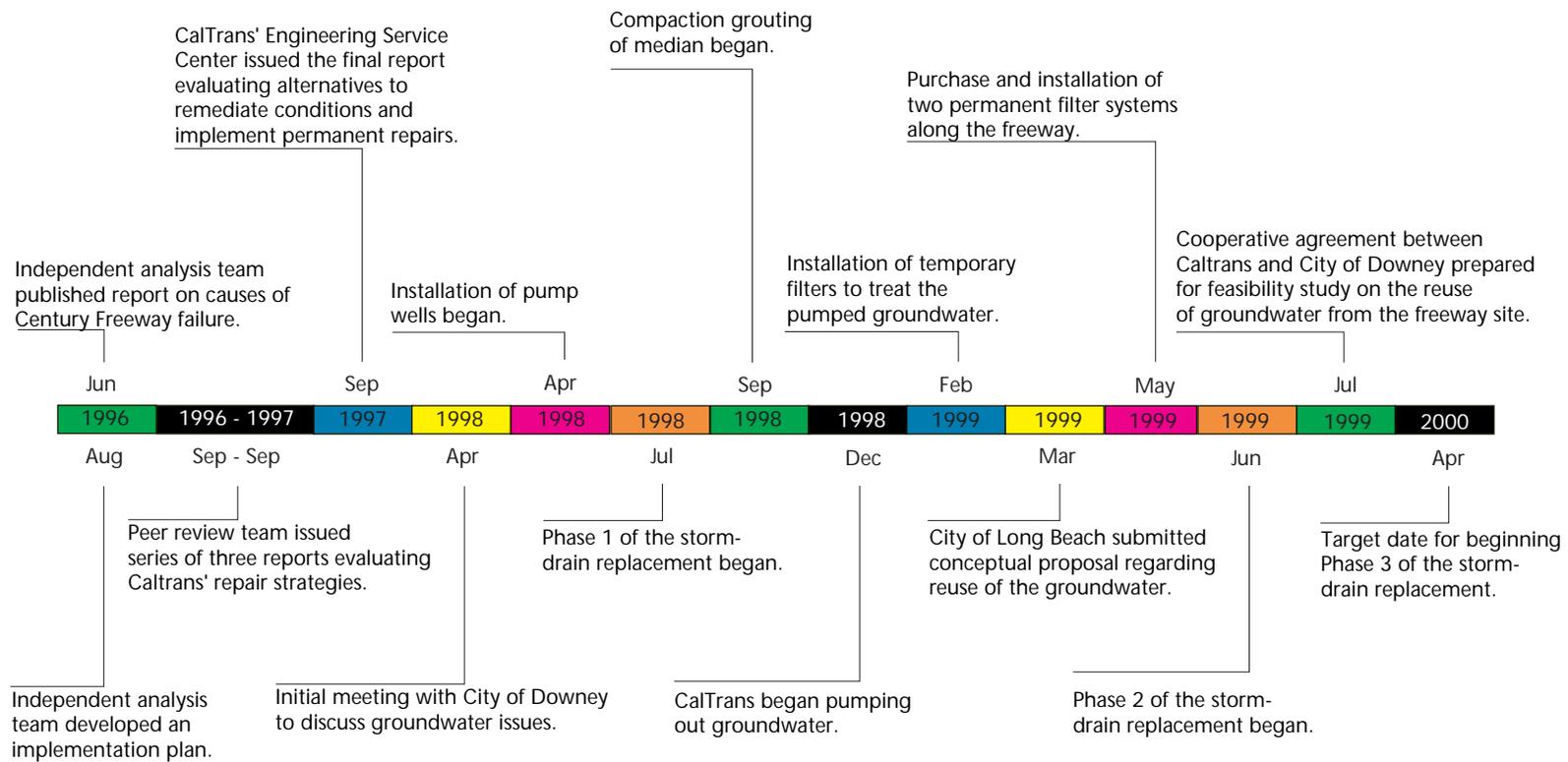
Initial Freeway Proposal Through Freeway Completion



Opening of Freeway Through Completion of Repairs



Permanent Repairs



Agency's response provided as text only.

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

August 18, 1999

Kurt R. Sjoberg, State Auditor
Bureau of State Audits
555 Capitol Mall, Suite 300
Sacramento, CA 95814

Dear Mr. Sjoberg:

As the Secretary of the Business, Transportation and Housing Agency, I am pleased to receive and respond to your draft audit report entitled *"Department of Transportation: Disregarding Early Warnings Has Caused Millions of Dollars to Be Spent Correcting Century Freeway Design Flaws."* While the origin of the Century Freeway issues date back three decades, responsive and prudent action must be taken to address this issue.

Attached, please find the Department of Transportation's (Caltrans) response to your draft report. The Caltrans response indicates that they have reviewed the issues raised in the audit report and concur with the report's recommendations.

As you have pointed out in the report, Caltrans has not yet solved the groundwater disposal problem. Because of the differing organizational missions of the local water replenishment agency and Caltrans, options are being considered which meet their needs while ensuring the safety of users of the Century Freeway. The options being considered must also include a comprehensive cost analysis of each approach. The Business, Transportation and Housing Agency will facilitate discussions among the key stakeholders including the Water Replenishment District of Southern California, the California Resources Agency, the State Water Resources Department, and other affected agencies to discuss the issue of beneficial groundwater reuse and disposal and make recommendations to the Governor.

I want to thank your audit staff for their professionalism and quality of their work. If you have any questions, please let me know.

Sincerely,

(Signed by: Maria Contreras-Sweet)

MARIA CONTRERAS-SWEET
Secretary

Attachment

Agency's response provided as text only.

DEPARTMENT OF TRANSPORTATION
OFFICE OF THE DIRECTOR 1120 N STREET
P. O. BOX 942873
SACRAMENTO, CA 94273-0001
PHONE (916) 654-5267 FAX (916) 654-6608

August 17, 1999

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 California State Auditor's report and adopt the following three recommendations:

1. To keep the Legislature and the California Transportation Commission informed of CalTrans' progress in determining an environmentally sound and cost-effective reuse of the groundwater pumped from under the Century Freeway.
2. To continue working with the Water Replenishment District of Southern California to coordinate actions to avoid undermining each other's efforts to fulfill their organizational mission
3. To ensure in-house staff report recommendations are assigned to a responsible unit for implementation and periodically reports the progress to departmental management.

To add clarification to the report I suggest the following changes:

1. The title of the audit report should be changed to read: "Unexpected Occurrences Caused Millions of Dollars to be Spent on Corrective Measures to the Century Freeway". I believe this much more accurately characterizes the facts detailed in the report.
2. In the Summary section, page 1, first paragraph, and second sentence change from, "CalTrans discovered pavement cracking and sinkholes" to read, "Caltrans discovered pavement cracking and depressions".

*California State Auditor's comments on this response appear on page 39.

3. In the Summary section, page 1, first paragraph, last sentence change from, "...it had not designed the lowered section of the freeway to" to read, "...it had not incorporated enough design features in the lower section of the freeway to".
4. In the Summary section, page 1, second paragraph, first sentence change from, "prevented design flaws in the 3.5-mile lowered section" to read, "the problems in the 3.5-mile lowered section".
5. In the Summary section, page 1, second paragraph, second sentence change from, "CalTrans disregarded the 1968 recommendations of its staff " to read, "A CalTrans team evaluated recommendations from one member of its staff and implemented those that were deemed reasonable at the time".
6. In the Summary section, page 1, last paragraph, the last sentence should be deleted. This sentence as worded makes an assumption of the results of testing. The testing would have identified that the groundwater had risen, but it's not reasonable to assume that the rising ground water would have threatened the freeway. Identification of rising groundwater would have triggered more tests. Based on the results of these tests, other steps would have been taken.
7. In the Summary section, page 2, first paragraph, and third sentence change from, "encountering a lot of water" to read "encountering groundwater".
8. In the Summary section, page 2, last paragraph, the third sentence should be changed to read, "While CalTrans continues to adhere to the existing National Pollution Discharge Elimination System Permits (NPDES), by treating groundwater discharged to the Los Angeles and San Gabriel Rivers, it is currently not beneficially being re-used".
9. In the Summary section, page 2, last paragraph, the fourth sentence should be deleted due to the suggested changes in the third sentence (See suggestion 8 above).
10. In the Summary section, page 3, second paragraph, second sentence change from, "However, some information..." to read "However, information...".
11. In regards to the Introductory - Background section, page 2 and last paragraph, discussing WRD's efforts. I believe WRD's water restoration efforts should also be discussed in the Summary section in the beginning of the report so that all issues are addressed at the start. This would be of great benefit to the reader of the report.

12. In the Introductory - Background section, page 3, second paragraph, and second sentence change from, "...a freeway is constructed below ground level since it also removes groundwater from the surrounding area so it does not erode or weaken the roadbed" to read, "...a freeway is constructed in an area of high groundwater, since it also will be required to remove groundwater from the surrounding area so it does not erode or weaken the roadbed".
13. In the Introductory - Background section, page 3, second paragraph I recommend adding the following statement, "To mitigate the effects of a natural groundwater rise, Caltrans installed a 6" perforated pipe subdrain, located above the storm drain pipes to collect and discharge the groundwater."
14. In the Introductory - Background section, page 3, third paragraph, and first sentence change from, "and sinkholes developed" to read "and depressions developed". Sinkholes never developed. At the Paramount on-ramp area, a depression on the pavement developed, not a sinkhole.
15. In the Introductory - Background section, page 3, second paragraph, and third sentence change from, "...to a depth of 30 feet." to read "...to a depth of 30 feet below the freeway surface".
16. In the Summary section, page 1, change from, "CalTrans Has Worked to Correct Design Flaws on the Century Freeway, But Has Not yet Solved its Groundwater Disposal Problem" to read, "Caltrans Has Worked on Implementing Corrective Measures on the Century Freeway, and is Working to Solve the Groundwater Disposal Problem".
17. In the Summary section, page 1, and end of first paragraph, add the following, "Much of this cost can be eliminated if an agreement can be reached with WRD to maintain the water table elevation at a minimum of three feet below the pavement surface. Maintaining this water level would eliminate the need to pump groundwater".
18. In the Summary section, page 1, second paragraph regarding WRD's water restoration efforts, it should be noted in this paragraph that at the Senate Transportation Agency, WRD testified that the current water table elevation is adequate, and they do not have any plans to continue to cause the groundwater to rise.
19. In the Summary section, page 2, second paragraph, last sentence change from, "Beyond incorporating a modified drainage system into the design, CalTrans did not ..." to read, "Beyond incorporating a modified drainage system, to address the natural groundwater rises, Caltrans did not ... "

20. In the Summary section, third paragraph, the third and fourth sentences should be change from “groundwater levels rose substantially between 1968 and 1990. If CalTrans had performed the testing its staff recommended in 1968, and retested when the extension was designed, CalTrans could have adjusted the final freeway design accordingly” to read, “groundwater levels rose substantially between 1968 and 1990; but, there were periods of decline as well. Specifically between the mid-1980’s to 1990, there was a significant decline in the level of groundwater. Additional testing may not have provided information indicating a need for design adjustment.” It should be noted that WRD indicated that it takes approximately seven years, after water replenishment efforts, before the water reaches the Century Freeway corridor. Therefore, as stated earlier, it is not reasonable to assume that the additional testing would have identified and accounted for the unexpected occurrences encountered.
21. In the Summary section, page 6, third paragraph, second sentence change from, “When digging at the site, Caltrans had to install four dewatering wells” to read “While it is not uncommon to encounter groundwater during construction when digging at the site, Caltrans had to install four dewatering wells”.
22. In the Summary section, page 10, first paragraph, second sentence, it should be stated “September 1997” in lieu of “August 1997”.
23. In the Summary section, page 11, third paragraph, introductory heading change from, “CalTrans is Spending \$67 Million to Correct Design Flaws...” to read “CalTrans is Spending \$67 Million to Implement Corrective Measures”.
24. In the Summary section, page 13, second paragraph, second sentence change from, “but approved the eligibility of the emergency repairs for funding” to read “but approved the eligibility of the emergency Relief Funds”.
25. In the Summary section, page 13, third paragraph, fourth sentence change from, “17 dewatering wells” to read “20 dewatering wells”.
26. In the Summary section, page 14, third paragraph, second sentence, “However, from January through March 1999, CalTrans performed no testing of the treated water to determine if the contaminate levels were within acceptable levels of disposal” should be deleted since during that time period, Caltrans did not have all five pumps operating. Only one pump was essentially operating on an emergency basis to protect the

pavement at the specific location. Within that time period, Caltrans was working closely with the Regional Water Quality Control Board (RWQCB) to implement a temporary water treatment system in order to turn on five pump wells. Caltrans was able to place a temporary treatment system by March 1999. Caltrans began to monitor the water quality data of the treated water on a monthly basis.

27. In the Summary section, page 15, second paragraph, the fifth and sixth sentences should be deleted and replaced with the following: "This option would presume Caltrans would propose discharging groundwater into the river systems as a long-term solution. Caltrans has always proposed the reuse of this water as a long-term solution and has no plans to pursue this option".
28. In the Summary section, page 15, third paragraph, first sentence change from, "Another option is that CalTrans could construct a water treatment facility in the City of Downey." to read, "Another option is that Caltrans could partner with the City of Downey to construct a water treatment facility."
29. In the Summary section, page 15, last paragraph, I recommend that the following statement be added: "CalTrans is actively working to reach an agreement with WRD to manage the water basin in a manner to maintain the groundwater level at three feet below the pavement. Assuming such an agreement can be reached, the need to pump and dispose of groundwater would be eliminated."
30. In the Summary section, page 16, third paragraph I recommend that this statement be included: "Specific letters about the groundwater issue were received and CalTrans routinely answered those at the time."

If we can provide any further information, or if you have any questions, please do not hesitate to contact me.

Sincerely,

(Signed by: Jose Medina)

JOSE MEDINA

Director

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COMMENTS

California State Auditor's Comments on the Response From the Department of Transportation

To provide clarity and perspective, we are commenting on the Department of Transportation's (CalTrans) response to our audit report. The number corresponds to the number we placed in CalTrans' response.

- We disagree with CalTrans suggestions to change the title. We believe that the title accurately reflects the findings in our report.
- After considering CalTrans' suggestion, we agreed to reword these sentences.
- As was previously discussed with CalTrans, we made some modifications in the text, which is reflective in the report.
- After considering CalTrans' suggestion, we believe that clarification is not necessary. Therefore, no modification was made to the report.
- During our editing of this report, we deleted the reference "depth of 30 feet."
- We disagree with CalTrans' suggestion to change the subheading. We believe that the subheading accurately reflects the contents in the report.
- As stated in our recommendations, CalTrans should continue working with the Water Replenishment District to coordinate actions so that neither agency jeopardizes the others' efforts to fulfill its organizational mission.

cc: Members of the Legislature
Office of the Lieutenant Governor
Attorney General
State Controller
Legislative Analyst
Assembly Office of Research
Senate Office of Research
Assembly Majority/Minority Consultants
Senate Majority/Minority Consultants
Capitol Press Corps