

**Cost to the Taxpayers of Obtaining  
Architectural and Engineering Services:  
State Employees vs. Private Consulting Firms**

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## I. Executive Summary

To complete highway and other transportation projects, California's Department of Transportation (Caltrans) requires extensive architectural and engineering (A/E) support services. Caltrans refers to these services as "Capital Outlay Support." To obtain the needed A/E services, Caltrans can either use engineers employed and paid by the State, or contract with private-sector engineering firms.

LECG, LLC was asked to analyze the relative cost to the taxpayers of utilizing these two methods.

To be meaningful, the cost comparison must take into account all direct and indirect costs associated with each alternative. It should also consider such factors as productivity, capacity utilization, and risk, since these factors help determine the relative cost to the taxpayers of improving the State's transportation network.

We begin our analysis with the cost for a State (in-house) engineer, as reported by Caltrans, including the cost of salary, benefits, and "functional" overhead. We then adjust Caltrans' reported cost to account for non-payroll benefits and "administration" overhead.<sup>1</sup> We also adjust the amount to account for differences in the mix of engineers between Caltrans and private firms, so that the results are not biased against, or in favor of, using in-house personnel.

We find that in fiscal year 2006-2007, the amount that the State must pay to utilize an in-house engineer ranges from \$173,434 to \$209,212, while the amount paid for an outside engineer averages \$193,000. (See Table 1.)

This comparison understates the cost to the taxpayers of using State, rather than private, engineers. It makes no allowance for four important factors that tend to increase the cost of in-house engineers, relative to their counterparts in the private sector. Specifically, it makes no allowance for:

- Less than 100% utilization of Caltrans staff;
- The cost of idle capacity when demand is below capacity;
- Costs incurred by the State as the result of uninsured A/E errors and omissions; and
- Costs resulting from project delay.

Unfortunately, the data needed to quantify these additional factors are not maintained by the State or private organizations.

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<sup>1</sup> "Functional" and "administration" are terms used by Caltrans to categorize overhead cost components. We discuss the distinction in greater detail below.

This report was prepared by Dr. William G. Hamm, a Managing Director of LECG, and Mark Rodini, a Senior Economist. The authors' qualifications are summarized on Attachment 1.

## II. Background

In January 2007, the Professional Engineers in California Government (“PECG”) – a union representing the State’s engineers and architects – issued a press release asserting that “the state pays \$105,000 per year for a state engineer and \$178,000 for a private consultant to do the same work.”<sup>2</sup> The press release cited as its source a statement made by an unidentified witness to the 2004 Budget Conference Committee.

On March 8, 2007, *Capitol Weekly* reported that PECG’s Bruce Blanning claimed “a Caltrans engineer costs taxpayers \$105,000, while an outsourced engineer costs \$193,000.” According to the same publication, Mark DeSio, a spokesperson for Caltrans, said the cost to Caltrans for a senior transportation engineer “ranges from \$138,664 to \$168,475.”<sup>3</sup>

No analytical data was offered to support any of the claimed dollar figures.

The Consulting Engineers and Land Surveyors of California (“CELSOC”) hired LECG to objectively analyze available data regarding the relative cost of using state and private engineers for State highway projects.

Caltrans has been interested in the relative cost of in-house versus contracted A/E support at least since the early 1990s. For example, in 1991, Caltrans commissioned engineers at the University of California at Berkeley to perform an analysis which was published in a 1992 report entitled “A Cost Comparison of Contracting Out for Engineering Services by Caltrans Versus Inhouse Engineering.”<sup>4</sup> Subsequently, in 1998, Caltrans and CELSOC formed a Cost Accounting Task Force whose primary objective was to “increase the understanding of the differences in the cost accounting methods used by [the

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<sup>2</sup> “Outsourcing Engineering Work, Design-Build and Public-Private Partnerships – Proven Failures in California,” PECG Press Release, January 10, 2007.

<sup>3</sup> “Private firms gear up for larger transportation role,” *Capitol Weekly*, March 8, 2007 ([http://www.capitolweekly.net/news/article.html?article\\_id=1319](http://www.capitolweekly.net/news/article.html?article_id=1319)).

<sup>4</sup> Institute of Transportation Studies, University of California, Berkeley, UCB-ITS-RR-92-8. The report compared the ratio of capital outlay support to total construction cost for contracted versus in-house projects, and found no statistically significant difference. This ratio is a common metric for assessing A/E costs, and was evidently a proposed performance measure in Caltrans’ Project Management 1995 Performance Report. ([http://www.dot.ca.gov/hq/projmgmt/perf\\_report95a.htm](http://www.dot.ca.gov/hq/projmgmt/perf_report95a.htm)). The advantage of this measure is that it aggregates over projects and utilized engineers in order to determine overall program efficiency.

private sector and Caltrans] and the composition of the total costs included in the determination of their respective overhead rates.”<sup>5</sup>

### III. Components of Caltrans’ Reported Costs

The cost to Caltrans for an in-house engineer is the sum of three cost components: the engineer’s salary, the engineer’s fringe benefits, and overhead (both labor and non-labor). *Salary* (“direct labor cost”) is the most straightforward component of cost. Salaries differ by type and class of engineer, as well as by where the engineer is employed. As used in this context, “salary” reflects all components of the engineer’s total annual income including bonuses and profit sharing arrangements. *Fringe benefits* include the total package of benefits provided to engineers by their employers, and are frequently expressed as a percentage of direct labor cost. This component varies by employee, both within Caltrans and across the private sector.

For State agencies, including Caltrans, the third cost component – *overhead* – consists of two parts. “Functional” overhead refers to indirect support costs that are attributable to a specific transportation program, but which cannot be practically assigned to a particular project. This category includes program management and supervisory costs, training costs, and costs for non-project-specific equipment. “Administration” overhead refers to Caltrans’ general administration costs and those costs incurred by other agencies or departments of State government which provide support services to Caltrans. General administration includes Caltrans’ executive management, human resources, accounting and procurement costs. Administration overhead also includes costs of support provided by agencies such as the Department of Personnel Administration, the State Controller, the Treasury, and so forth.

Overhead is accounted for by applying an *overhead rate*, which is the ratio of indirect costs to direct labor cost. Caltrans is required to submit an “Indirect Cost Rate Proposal” to the Federal Government for each functional and administration overhead rate it proposes to apply.<sup>6</sup> The proposal, which we understand must conform with Federal Acquisition Regulations (FAR), is based on actual costs incurred for projects undertaken during the previous fiscal year. Caltrans applies the approved functional rate to each of its in-house projects, regardless of location or project type. In addition, Caltrans is required to add to its cost the administration overhead, using the approved administration rate, when Caltrans provides work for others.<sup>7</sup> Caltrans,

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<sup>5</sup> Final Report of CELSOC/Caltrans Cost Accounting Task Force, November 1998. The task force concluded that a true “apples-to-apples” comparison was not possible, due to substantial differences in cost accounting.

<sup>6</sup> This understanding is based on conversations with Caltrans personnel. See also the discussion of computing “fully-burdened” personnel costs in Cost Accounting Policies and Procedures Manual of the California Uniform Public Construction Cost Accounting Commission, pp. 58-62 and Appendix B.

<sup>7</sup> We understand that projects Caltrans undertakes for others frequently comprise co-operative projects with local governments. For example, if a county wishes to build an interchange, and has its own funds that it is

however, does not add administration overhead to the cost of projects it funds itself, and the administration rate is not a component of Caltrans' calculated cost for an in-house engineer.

In order to remain in business, a private engineering firm must be able to cover the same three cost components – the engineer's salary, fringe benefits, and labor and non-labor overhead. Therefore, when it submits a proposal on a Caltrans project, such a firm typically applies an overhead rate to Caltrans work that factors in all allowable cost components. This rate must cover the equivalent of Caltrans' administration costs, such as payroll, human resource staff, and so forth. In other words, the overhead rate for a consultant engineer accounts for total allowable overhead – not simply the consultants' equivalent of Caltrans' functional overhead.

A private consultant contracting with Caltrans also must follow the FAR when applying an overhead rate to its billing, but it lumps functional and administration together into a single overhead rate. Under the FAR, however, certain costs are deemed “non-allowable,” and cannot be passed on to government agencies.<sup>8</sup> Like Caltrans rates, overhead rates for private firms are derived annually, and are generally applied to each project, regardless of location or project type.<sup>9</sup>

Overhead is the most difficult cost component to compare when analyzing the relative cost of using State-employed and private engineers, due to the different methods of accounting.

Caltrans has advised us that, for fiscal year 2006-2007, it has calculated the cost per personnel-year for an in-house engineer to range from \$138,664 to \$168,475. These amounts reflect the minimum and maximum salary range for a licensed class “D” civil engineer, based on the civil service pay scale, payroll fringe benefits, and the functional overhead.<sup>10</sup>

We have also obtained from the Legislative Analyst's Office Caltrans' calculated cost for a consultant engineer in fiscal year 2006-2007, which is \$193,000.<sup>11</sup>

These cost calculations, however, tell only part of the story.

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willing to spend, the county may “hire” Caltrans to undertake the A/E work. In such case, payment to Caltrans would include coverage of administration overhead.

<sup>8</sup> Because Caltrans must also follow the FAR for its indirect cost rate proposal, it also may incur “non-allowable” costs, which would not be incorporated into their calculated cost.

<sup>9</sup> For multiple-year projects, Caltrans may negotiate escalation clauses on overhead rates.

<sup>10</sup> The Legislative Analyst's Office confirmed for us that these were the figures they received from Caltrans. This corresponds with the figures cited in the *Capitol Weekly* article referenced above.

<sup>11</sup> For the FY 2003-2004, the figure was \$178,000; for FY 2004-2005 it was \$182,000, and for FY 2005-2006 it was \$194,000.

Whereas Caltrans' calculated cost for an in-house engineer refers to a specific type and grade of engineer, the calculated cost for a consultant engineer is a true average for all grades providing engineering services to the State. The average is computed by dividing actual and planned contract dollars requested by the actual and planned "personnel-year-equivalents."<sup>12</sup> In other words, the calculated cost for a consultant is not tied to a specific type or grade of engineer. Moreover, as discussed above, the calculated cost for a consultant engineer includes *total* allowable overhead, while the calculated cost of a State engineer reflects functional overhead, but not administration overhead.

#### IV. Analysis of Caltrans' Calculated Cost for an Engineer

Our analysis compares Caltrans' calculated personnel-year cost of a Caltrans engineer with Caltrans' calculated personnel-year-equivalent cost of a contracted engineer. The first two columns in Table 1 present Caltrans' most recent calculated cost range for an in-house engineer (shown in bold), and decomposes it into salary, benefits and functional overhead. We discuss each of these components below.

Table 1					
Annual Cost to Caltrans for an In-House Engineer <sup>[1]</sup>					
		Caltrans In-House Class D Licensed Civil		Caltrans In-House Weighted Average <sup>[2]</sup>	
		Minimum	Maximum	Minimum	Maximum
(1)	Direct salary range	\$67,596	\$82,128	\$71,798	\$86,609
(2)	Payroll benefits rate	37.87%	37.87%	37.87%	37.87%
(3)	Salary + payroll Benefits	\$93,194	\$113,230	\$98,988	\$119,408
<b>General overhead:</b>					
(4)	Functional rate	48.79%	48.79%	48.79%	48.79%
(5)	Functional cost ((3) x (4))	\$45,470	\$55,245	\$48,296	\$58,259
(6)	<b>Total including payroll benefits and functional overhead</b>	<b>\$138,664</b>	<b>\$168,475</b>	\$147,284	\$177,667
(7)	Non-payroll benefits rate	2.92%	2.92%	2.92%	2.92%
(8)	Non-payroll benefits ((1) x (7))	\$1,974	\$2,398	\$2,097	\$2,529
(9)	Administration rate	24.30%	24.30%	24.30%	24.30%
(10)	Total administration cost ((3) x (9))	\$22,646	\$27,515	\$24,054	\$29,016
(11)	<b>Total Cost ((6) + (8) + (10))</b>	<b>\$163,284</b>	<b>\$198,388</b>	\$173,434	\$209,212

[1] Caltrans' current reported cost for a consultant engineer is \$193,000.

[2] Weighted by number of authorized positions for 2003-2004 reported in Department of Finance 2004-2005 Salaries and Wages Supplement. Transportation engineering positions only. Counts include Program Management and Planning positions at district level and Program Management, Office of Engineering, and Structure Design at Headquarters.

- i. Base salary. As noted above, the calculated cost reflects the salary for a class "D" civil engineer. According to the State of California Civil

<sup>12</sup> A "personnel-year-equivalent" (PYE) is 1758 hours, which is the same as a "personnel-year" (PY) used for an in-house staffing. Costs are calculated based on estimates of the number of hours expected to perform specific activities. Total hours divided by 1758 equals the number of PYs or PYEs.

Service Pay Scale, updated on 1/11/2007,<sup>13</sup> the minimum and maximum monthly salary for this type and grade of engineer is \$5,633 - \$6,844, or \$67,596 - \$82,128 on an annual basis. These amounts are shown in the table on row (1). Senior engineers' salaries can reach \$94,284 per year, and supervisory engineers' salaries are even higher.

- ii. Fringe benefits. Caltrans has informed us that the August 2006 payroll fringe benefit percentage is 37.87%. This is shown in row (2) of the table. Caltrans defines payroll benefits to include health and retirement, social security, life insurance and disability leave.
- iii. Functional overhead. Caltrans has informed us that its indirect cost rates effective for fiscal year 2006-2007 are 48.79% and 24.30% for functional and administration overhead, respectively. These rates use labor hours and fringe benefits as the base, so in order to calculate overhead dollars, one multiplies the sum of labor plus benefits by these percentages. The addition of functional overhead is shown in the table on rows (4) and (5).

#### **A. Adjustments to Caltrans' in-house calculated cost range**

To ensure an accurate “apples-to-apples” comparison, we have made three adjustments to the cost range indicated by Caltrans for an in-house engineer. These adjustments account for (1) non-payroll benefits, (2) administration overhead, and (3) the potential bias if the benchmark engineering grade (class “D” civil engineer) is not representative of Caltrans' mix of engineers.

PECG has argued that the fixed costs associated with Caltrans' capital outlay support should not be included in a comparison of in-house and consulting engineer costs. As a matter of both economics and public finance, excluding these costs would not result in a meaningful comparison. So-called “fixed costs” are only fixed in the short run; they are variable over longer periods of time. An increase in Caltrans' engineering staff levels ultimately will require additional space, additional equipment, and additional support staff. The cost of the additional overhead will be borne by California taxpayers. Accordingly, there is no basis for excluding so-called fixed costs if the purpose of the comparison is to assist policy makers in determining the most cost-effective way of improving the State's transportation system.

Rows (7) and (8) of Table 1 show the adjustment needed to account for non-payroll benefits. Caltrans informs us that non-payroll benefits were about 2.92% of salary in August 2006. These benefits include unemployment compensation, bonuses, survivor benefits and transit passes. As the cost decomposition on rows (1) through (6) makes clear, the cost that Caltrans calculates for a class “D” civil engineer does not include non-payroll benefits.

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<sup>13</sup> <http://www.dpa.ca.gov/jobinfo/payscale/toc.shtml>

Moreover, we understand that these benefits are not loaded into either functional or administration overhead.<sup>14</sup> Table 1 shows that inclusion of these benefits adds between \$1,974 and \$2,398 to the cost of a class “D” civil engineer.

Rows (9) and (10) of the table show the adjustments to Caltrans’ calculated cost that are necessary to reflect administration overhead. This adjustment is based on Caltrans’ current administration overhead rate. With these adjustments, we calculate that the true cost of hiring and supporting an in-house class “D” civil engineer is between \$163,284 and \$198,388. Caltrans’ computed rate for a consultant engineer – \$193,000 – is within this range.

The third adjustment is needed to account for the engineer mix. Recall that the in-house cost used in the table is for a class “D” civil engineer, whereas the consultant cost is a straight average for all engineering positions assigned to Caltrans work. In order to make this adjustment, we relied upon the 2004-2005 Salaries and Wages Supplement produced by the Department of Finance. This document provides a breakdown of authorized positions by job title. From this information, we calculated a weighted average of salaries.<sup>15</sup> The second two columns of Table 1 show the Caltrans in-house cost of an engineer after adjusting for engineer mix. This adjustment adds about 5%-6% to the calculated cost of a Caltrans engineer.

After making these three adjustments, we calculate that the full cost to Caltrans for utilizing an in-house engineer is between \$173,434 and \$209,212. Caltrans’ average cost of a consulting engineer – \$193,000 – remains within this range.

## **B. Additional discussion**

In 2003, State-employed engineers negotiated a salary increase that provides for increases over four years until salaries are “no less than salaries received by their counterparts in California’s larger local agencies and the University

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<sup>14</sup> We understand from Caltrans that some State agencies may include non-payroll benefits in their overhead rates, but that Caltrans does not. Another category of benefits Caltrans tracks is “leave benefits,” which include vacation and sick leave. These benefits are captured in an employee’s salary, and are thus already accounted for in row (1) of Table 1.

<sup>15</sup> We assume that the current distribution of types of engineers is roughly equivalent to what was authorized in 2003-2004, and that this distribution is a reasonable reflection of the mix of consultant engineers on Caltrans projects. We also only counted the staff positions specifically identified as transportation engineers (non-electrical), limited to Project Management and Planning, at the district level, and limited to Program Management, Office of Engineering, and Structure Design at Headquarters. Based on these restrictions, Associate-level civil engineers comprise almost 70% of the total.

of California.”<sup>16</sup> Under the Memorandum of Understanding, salaries are to be increased again in July 2007 and July 2008.<sup>17</sup>

These salary increases have had an important impact on Caltrans’ in-house engineering costs. We obtained from Caltrans figures for some prior years’ benefits and overhead rates. The rates we received from Caltrans for February 2004 are 45.87% for functional overhead, and 33.74% for payroll fringe benefits. Applying these rates to the \$105,000 figure cited in the PECG press release implies a base salary of \$4,485 per month, or \$53,822 per year. This corresponds roughly to the straight average of the minimum salaries across class A through D licensed civil engineers, at salary levels prior to the July 2006 salary increase.<sup>18</sup>

In order to further understand the importance of salary, benefits and overhead costs, we reviewed available information from the private sector on these cost components and compared the data with Caltrans’ in-house figures.

Table 2 below compares base salaries for Caltrans and private sector engineers. For private engineers, we relied on the 2007 ZweigWhite *Salary Survey of Pacific Engineers*.<sup>19</sup> As the table indicates, the private sector pays somewhat lower salaries for entry level and lower-level engineers, but at the managerial level, private sector salaries exceed State salaries. This highlights further that the cost for an engineer depends on the type and mix of engineer experience levels utilized.<sup>20</sup>

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<sup>16</sup> “2003-2008 Unit 9 Memorandum of Understanding (MOU) between the Professional Engineers in California Government (PECG) and the State of California” (<http://www.pecg.org/2004MOU.htm>).

<sup>17</sup> Per the Memorandum of Understanding, after 2008, salaries will continue to be adjusted annually to eliminate any salary lag based on a survey of “Professional Engineer Benchmarks” carried out by the Department of Personnel Administration.

<sup>18</sup> The February 2004 administration rate we are told was 25.95%: adding administration overhead to the \$105,000 figure results in a total cost of \$123,679.

<sup>19</sup> We also referred to ASCE’s *The Engineering Income and Salary Survey* of 2005, which provided larger sample sizes, but did not break out the data in sufficient detail.

<sup>20</sup> The data also show that engineers in California earn approximately ten percent more than engineers nationwide, and that medium sized firms pay less than large or small firms.

Table 2 Salary Ranges for Transportation Engineers						
	Caltrans <sup>[1]</sup>			Private, California <sup>[2]</sup>		
	Minimum	Maximum	Midpoint	Quartile 1	Quartile 4	Median
Associate/Entry Level <sup>[3]</sup>	\$67,776	\$82,356	\$75,066	\$56,100	\$64,254	\$62,150
Senior/Project	\$77,580	\$94,284	\$85,932	\$70,002	\$78,780	\$77,740
Supervising/Project Manager	\$94,176	\$103,884	\$99,030	\$101,300	\$109,051	\$106,343
Department Manager	n.a.	n.a.	n.a.	\$100,100	\$132,000	\$112,038
Principal	\$103,512	\$114,144	\$108,828	\$132,704	\$154,000	\$149,864

[1] Source: Civil Service Pay Scale, 2007. Salaries reported on monthly basis and converted to annual.

[2] Source: ZweigWhite 2007 Salary Survey of Pacific Engineering Firms

[3] Job levels titles do not precisely correspond, and were "matched" based on observed salary ranges.

Entry Level, Department Manager and Principal salaries in private sector were calculated from the nationwide figures plus ten percent. Reported California salaries are between 2%-15% higher than nationwide salaries.

An “apples-to-apples” comparison of benefits is difficult because of the wide range of benefits paid by private employers, and the different methods used to account for them. Caltrans informs us that the payroll benefits rate was about 29.48% in 1992, and has risen to the current 37.87%, while their non-payroll benefits have fallen somewhat, from 3.89% in 1992 to the current 2.92%.<sup>21</sup>

With respect to overhead rates, we understand that Caltrans’ method for computing its overhead rates differs from the method applied by private firms. Specifically, Caltrans includes benefits as part of direct labor costs, and thus benefits are part of the *denominator* in the overhead rate ratio. In contrast, private engineering firms consider benefit costs as part of indirect overhead, and add them to the *numerator* in calculating their overhead rates.<sup>22</sup> If no adjustment is made for this difference, Caltrans’ reported overhead rates will appear low compared to private sector rates. For example the functional and administration overhead of 48.79% and 24.3% provided by Caltrans are equivalent to 67.27% and 33.5% when payroll benefits are moved to the numerator (assuming a payroll benefit rate of 37.87%). Combined with benefits, this implies a total overhead rate of 138.64%.

It appears that private sector overhead rates are somewhat higher. According to the publicly available Executive Summary of the *PSMJ A/E Financial Performance Survey* for 2006, the median overhead rate for engineering and design firms was 156.57% in 2005 and 156.25% in 2006.<sup>23</sup> We also obtained a breakout of costs for a “typical” engineering firm in California from an

<sup>21</sup> We have been informed by representatives from two different private engineering firms that their benefits packages are about 31% and 45% of salary respectively. However, we do not have sufficient information to evaluate the basis for these percentages, or to draw a comparison with Caltrans’ rates.

<sup>22</sup> See the UCB-ITS Study and the PECG response. This was confirmed by a Caltrans representative who indicated that the labor cost base includes an addition to account for direct labor fringe benefits. Table 1 applies Caltrans’ methodology.

<sup>23</sup> One of PECG’s criticisms of the UCB-ITS study was its reliance on PSMJ figures for private overhead rates.

industry source. This cost breakout implied an overhead rate of about 155% for projects where work was done using the consultants' facilities.<sup>24</sup>

Though not considered part of overhead, private A/E consultants negotiate with Caltrans for what it calls a "fixed fee," which is an addition that is intended to compensate for risk and non-allowable costs, as well as to provide an allowance for profit. Industry sources have informed us that this fee for Caltrans projects is at best eight percent.<sup>25</sup> The profit allowance is added on as a percentage of the sum of salaries, benefits and overhead, and is included in the amount that Caltrans' reports as the average cost of a consulting engineer.

## V. Other Factors Affecting Overall Cost

The analysis above focuses on the calculated price to Caltrans for contracting versus using in-house engineering staff. This analysis, however, does not quantify other factors that contribute to Caltrans' *total* cost for highway engineering and design. Table 3 identifies other significant elements of total cost which are not readily quantifiable.

Table 3 Summary of the Total Cost to Taxpayer from Caltrans Use of an In-House Versus a Consultant Engineer		
	In-House Engineer	Private Consultant Engineer
Caltrans Calculated Cost, After Adjustments <sup>[1]</sup>	\$173,434 - \$209,212	\$193,000
Additions to Caltrans' Cost	Utilization adjustments	Contract administration
	Idle capacity costs	
	Self-insured A/E errors and omissions	
	Facilities cost of capital	
Deductions from Caltrans' Cost		Mitigation of in-house training
		Gains from more rapid project delivery
		Tax revenues on contractor profits

[1] Adjustments include addition of administration overhead, non-payroll benefits, and accounting for engineer mix; (See Table 1).

Factors that tend to *increase* Caltrans' relative cost of contracting-out:

- Contract administration and oversight. An important cost of contracting to Caltrans is the cost of administering and supervising

<sup>24</sup> We understand that the overhead rate will be substantially lower if the consultants use client facilities. Another industry source suggested that overhead rates are approximately 190% for small firms and about 160% for larger firms in California. A third industry source indicated an overhead rate closer to the 190% figure (about 45% benefits and 155% general overhead).

<sup>25</sup> In its response to the UCB-ITS study, PECG assumed a 10% profit margin.

the contracting process –a cost that would be avoided if all capital outlay support were performed in-house. A Caltrans representative informed us that these costs are not factored into Caltrans’ calculated cost for an engineer, although they are accounted for in Caltrans’ overall budget. The representative told us that these costs have amounted to about 15% of personnel-year cost for capital outlay support in recent years.<sup>26</sup> We were not able to validate this estimate.

Factors that tend to *reduce* Caltrans’ relative cost of contracting-out:

- Utilization adjustments. By factoring in the full annual salary of an engineer in the cost calculation for an in-house engineer, Caltrans is assuming 100% utilization of the engineer’s time on project work. In reality, some of an engineer’s time will be spent on organizational tasks not directly related to A/E projects.<sup>27</sup> In contrast, Caltrans’ calculated cost for a consultant engineer is based only on actual and planned time and dollars consultants spend working on Caltrans projects. Therefore, the calculated cost of in-house staff must be increased to account for less-than-100% utilization rates.

To illustrate the importance of this factor, if a Caltrans engineer spends four hours per week on non-project-related tasks, the total cost of using an in-house engineer would increase to between \$192,512 and \$232,225.<sup>28</sup>

- Idle or insufficient capacity. An analysis by the Legislative Analyst’s Office in February 2004 highlighted costs and inefficiencies incurred by Caltrans as a result of how staff requirements are determined.<sup>29</sup> The analysis pointed to increased cost owing to large staff fluctuations, which include the cost of idle capacity – paying non-producing staff, and the cost of hiring and training. These costs can be substantial. According to the LAO, Caltrans employs more than 10,000 staff persons to perform capital

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<sup>26</sup> In its response to the UCB-ITS study, PEGC claimed that these costs exceeded 20% of Caltrans A/E costs. UCB-ITS study, p. 270; PEGC’s March 18, 1992 response.

<sup>27</sup> For example, the engineer will attend meetings, spend time on performance reviews, and so forth.

<sup>28</sup> Assuming a personnel-year of 1758, and that an in-house engineer works 48 weeks (after vacation and State holidays), four hours per week amounts to 192 hours of non-project related tasks, or about eleven percent. Thus, the amounts in row (11) of Table 1 must be increased by about eleven percent. For example, \$173,434 increases to \$173,434 times 1.11, or \$192,512.

<sup>29</sup> Analysis of the 2004-2005 Budget Bill, Legislative Analyst’s Office, February 2004 ([http://www.lao.ca.gov/analysis\\_2004/transportation/trans\\_04\\_2660\\_anl04.htm](http://www.lao.ca.gov/analysis_2004/transportation/trans_04_2660_anl04.htm)). Briefly, staffing requirements are based on a review of each year’s project needs.

outlay support.<sup>30</sup> Thus, even fairly small fluctuations in program outlays from year to year could have significant impacts on costs resulting from idle or insufficient capacity.<sup>31</sup>

- Reduced training expenses. Utilizing consultants reduces Caltrans' cost of hiring and training, and therefore, the true cost of contracting should be reduced to account for these savings.<sup>32</sup>

This is especially pertinent now. With the recent expansion of funds provided by Proposition 1B for transportation projects, Caltrans has the option of hiring additional A/E staff, or of contracting. By hiring more staff, Caltrans bears the cost of training as well as the potential future cost of idle staff should project funding be reduced.

- Accelerated project delivery. The LAO's analysis pointed to the problem of project delays as a result of insufficient staffing in a particular year. Consider the case in which Caltrans' staff is employed at full capacity and there are funds available for an additional project. Under these circumstances, attempting to hire additional Caltrans engineers is likely to delay projects – and the benefits derived from them by Californians. The cost of delay may become a cost to the State, to the extent that State employees experience greater congestion as a result of project delays.<sup>33</sup> These costs could be reduced or eliminated by instead hiring a private consultant.
- Errors and omissions (E&O). In the event that a consultant makes an error, it is responsible for correcting its mistake, and must absorb the cost. Private consultants insure themselves against this risk, and the cost of this insurance is reflected in their proposal for State projects.<sup>34</sup> The private consultant, however, will generally be held liable for its errors which result in additional costs to Caltrans (such as costs associated with reconstruction or delay).

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<sup>30</sup> Analysis of the 2007-08 Budget Bill: Transportation  
([http://www.lao.ca.gov/analysis\\_2007/transportation/tran\\_07\\_2660\\_anl07.aspx#Department%20of%20Transportation%20\(2660\)](http://www.lao.ca.gov/analysis_2007/transportation/tran_07_2660_anl07.aspx#Department%20of%20Transportation%20(2660))).

<sup>31</sup> Private consultants also may experience idle time, but the cost of such unproductive staff time (to the extent allowed by the FAR) is fully reflected in the calculated cost of using consultant engineers.

<sup>32</sup> Under the FAR, most training costs are allowable. Therefore it is likely that Caltrans' overhead rates already account for this to some extent. We therefore assume that training costs do not add to Caltrans' in-house calculated figure.

<sup>33</sup> In addition, to the extent that delays reduce productivity in the private sector, the State could also lose additional tax revenues.

<sup>34</sup> According to one industry representative, E&O insurance contributes nearly five percentage points of his company's approximate 120% general overhead rate (calculated excluding benefits).

Because Caltrans, in effect, self insures against errors and omissions, the taxpayer bears the costs resulting from in-house A/E errors. These costs are not reflected in the calculated cost for a Caltrans engineer. Accordingly, Caltrans' cost for in-house staff should be adjusted upward to account for an appropriate risk premium.

We also understand from Caltrans that so-called "tort liability costs" are excluded from Caltrans' overhead rate calculations. These are liability costs incurred as a result of suits against Caltrans alleging design negligence.

- Facilities cost of capital. Caltrans does not depreciate its facilities and building costs as private sector engineering firms must do. Rather, the department charges the entire cost of a facility when incurred. These costs, thus, are not a component of the in-house cost.<sup>35</sup>
- Lost profits tax revenues. As discussed above, Caltrans' cost of contracting includes an allowance for profit. Because the State levies an 8.84% tax on corporate taxable profits,<sup>36</sup> a portion of the profit allowance is returned to the State as revenue, thereby reducing the taxpayers' net cost of contracting engineering services.<sup>37</sup>
- Productivity and quality of service. Ultimately, the total cost for capital outlay support depends on the ability of the engineers to deliver high-quality designs in an efficient and timely manner. Quality can be measured for example, by the amount of required maintenance, the life of the construction, the cost of construction, and the number of errors or omissions.

We are not aware of any definitive evidence indicating whether State or private engineers produce higher-quality outlay support. Some private engineering firms surely offer specialized skills not readily found at Caltrans, whereas Caltrans engineers are likely more familiar with existing Caltrans design standards. In any case, for a given project, any reliance on a comparison of cost would need to account for this factor.

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<sup>35</sup> One private engineering source informed us that this cost was approximately 0.4 percent of his company's total labor costs for the previous year.

<sup>36</sup> Analysis of the 2007-08 Budget Bill: Perspectives and Issues, Legislative Analyst's Office ([http://www.lao.ca.gov/analysis\\_2007/2007\\_pandi/pi\\_03\\_anl07.aspx](http://www.lao.ca.gov/analysis_2007/2007_pandi/pi_03_anl07.aspx)).

<sup>37</sup> Assuming an 8% profit and an 8.84% profit tax, the State would recoup more than \$1000 on the \$193,000 cost for hiring a contract engineer. Under the FAR, Federal and State income and profits taxes are non-allowable expenses.

## **Attachment 1**

**Dr. William G. Hamm** is a successful economics consultant with high-level experience in both business and government. An expert in banking and financial institutions, he has been the executive vice-president/chief operating officer of an AAA-rated \$50 billion bank. He has also run a \$1.5 billion payment processing and customer service operation for an S&P 500 company. Prior to entering the private sector, Dr. Hamm headed the non-partisan Legislative Analyst's Office in California, where he earned a nationwide reputation for objectivity, expertise and credibility on public policy issues ranging from taxation to healthcare. In addition, he spent eight years in the Executive Office of the President in Washington, DC, where he headed a division of OMB responsible for analyzing the programs and budgets of the Department of Labor, HUD, the Veterans Administration, and numerous other federal agencies.

As a consultant, Dr. Hamm specializes in helping courts, legislative bodies, and the public develop a better understanding of complex economic and public policy issues. He assists businesses and public agencies analyze existing and proposed government policies, develop sound policy alternatives, and communicate the results to decision-makers. He is also recognized as an effective expert witness who can clarify complex litigation issues.

Dr. Hamm has a BA from Dartmouth College and a PhD in economics from the University of Michigan. His doctoral dissertation is titled, "Wage Determination in Public Utilities." He is a member of the American Economics Association and the American Law and Economics Association, a Fellow of the National Academy for Public Administration, a founding principal of the Council for Excellence in Government, and a member of the California Earthquake Authority's Advisory Panel.

**Mark Rodini** is a Senior Economist at LECG, LLC. Before coming to LECG, Mr. Rodini was a graduate student in the Ph.D. program of the Department of Economics at the University of California at Berkeley, where he specialized in regulatory and industrial economics, microeconomics and applied econometrics. At UC-Berkeley, Mr. Rodini earned a Master of Arts degree in Economics, and was advanced to candidacy. During his three years at LECG, Mr. Rodini has provided consulting and litigation support in areas related to merger analysis, price fixing, attempted monopolization, and intellectual property. His industry experience includes telecommunications, pharmaceuticals, health care equipment, semi-conductors, consumer durables, and mutual funds. In addition to his consulting work, Mr. Rodini is currently working towards completing his doctoral thesis on the demand for wireless telephone service.