

June 2005

Technical Memorandum: UCPRC-TM-2005-06

---

# Evaluation of I-710 Long Beach (07-1384U4) Long-Life Pavement Rehabilitation Costs

**Authors:**

John Harvey, Nicholas Santero, Hojung Lee,  
Willem du Toit, and Mary Grace Fermo

Partnered Pavement Research Program Contract

Strategic Plan Element 4.15:

Development of Integrated Pavement Strategy Decision Support System

Including Life Cycle Cost Analysis

---

**PREPARED FOR:**

California Department of Transportation

(Caltrans)

**PREPARED BY:**

University of California

Pavement Research Center

Berkeley and Davis

---



## **DISCLAIMER**

The contents of this report reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the State of California or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

## **1.0 INTRODUCTION**

This technical memorandum summarizes the analysis performed in evaluating Long-Life Pavement Rehabilitation Strategies (LLPRS) cost. This study is part of the effort to ultimately develop an Integrated Pavement Strategy Decision Support System to allow engineers to analyze efficient allocation of financial resources when planning pavement projects at both project and network levels. To develop a decision support system, which will include life cycle cost analysis to compare different rehabilitation alternatives, actual cost data are needed from many rehabilitation projects, such as the Interstate 710 project. This memorandum is based on data collected as of May 2005. As of the date of writing of this memorandum, costs for the I-710 Project presented herein are still being accumulated, and data and analysis may not be complete.

For this study, cost performances were analyzed for a long-life pavement project on Interstate 710 in Long Beach (EA 07-1384U4) from Route 1 to the Route 405 and 710 separation. Data for this analysis was gathered through the kind cooperation of Caltrans in District 7.

### **1.1 Project Description**

A 4.4-km stretch (total of 26.3 lane-km) of the Interstate 710 was rehabilitated by resurfacing of the existing PCC pavement structure with long-life AC over eight 55-hour weekend closures. The contract was awarded to Excel Paving Company at about \$16,743,676.50. Construction began at the end of February 2001 and was completed at the end of 2004.

### **1.2 Definitions**

For this analysis, the original contract amount and the actual cost of the project are compared. Included in this comparison are the original bid cost, actual bid cost, and the total

costs, which include contract change orders. The 'original bid cost' consists of the costs of the bid items as proposed by the contractor before construction. The 'actual bid cost' is the actual amount expended for these bid items at the end of the project. The engineer's estimate, which includes the bid estimate, supplemental work, state furnished materials, and contingencies anticipated by Caltrans, is also included for comparison.

To analyze the expenditures for these projects, costs were divided into several categories:

- The total cost is divided into direct, indirect, and administrative costs.
- Direct costs consist of cost of the pavement or work performed that directly relates to building the pavement.
- Indirect costs include non-pavement construction items such as traffic handling, drainage, roadside, and operational costs.
- Administrative costs are non-construction related items and include administration-related costs, state-furnished materials, and supplemental work.

See the Appendix for a complete list and description of each subcategory.

For each cost category, the percentage of the total cost and a cost multiplier is calculated.

Each multiplier represents a ratio of each amount to the direct cost:

$$\text{Multiplier} = (\text{Line Item Cost Category}) / (\text{Direct Cost})$$

The multiplier illustrates the correlation between direct costs and other costs categories.

Developed by Caltrans, the multiplier is meant to be used as a tool for roughly estimating other costs when the direct costs are known.

Also determined is the percentage difference between the original bid amount and the actual bid amount.

## 2.0 RESULTS

Table 1 presents the results of the cost analysis. As shown in the table, the original bid amount plus the cost of state-furnished materials for the I-710 rehabilitation project was \$17,391,527. Figure 1 illustrates the cost breakdown of the original bid plus the cost of state-furnished materials.

For this project, the original bid accounts for a large portion of the total cost due to indirect costs. Traffic control is a major contributor to the indirect costs and makes up about 23 percent of the total cost. When the original bid cost is compared to the actual bid cost (see Figure 2), the cost allocations are identical. However, as shown in Table 1, the total dollar amount for the actual bid cost is slightly greater than the original bid by 1.40 percent. This slight difference of is to due to underestimation of quantities such as sign structures and drainage to be modified and repaired.

Although the difference between the actual bid cost and the contract amount is only 1.4 percent, the total cost of the project is about 18 percent greater than the original bid cost. This cost difference can be explained by the cost expended for contract change orders (CCOs). Figure 3 illustrates the cost allocations for these CCOs along with the bid items costs.

Figure 4 shows that indirect costs make up 72 percent of the CCO costs. The major causes for these indirect costs include extra work for traffic control (9 percent), barrier installations (16 percent), and removal of asbestos discovered in the center median (22 percent).

The total cost breakdown of the project is illustrated in Figure 5. Total cost is comprised of the actual bid cost and the CCOs combined. The CCOs for this project accounted for 17 percent of the total cost. In comparison with the engineer's estimate and the total cost of the project (shown in Table 1), the cost difference is about \$3 million (approximately 13 percent).

However, this difference is not mainly due to the CCOs. As shown in Table 1, the engineer's estimate anticipates CCO charges by including costs for "supplemental work." Since the cost difference between the supplemental work and the CCOs is only about \$130,000, the reason for difference between the engineer's estimate and the total cost is underestimation of the bid items. As shown in Table 1, the multipliers from the engineer's estimate are often less than that of the actual total cost — this is especially true for the multipliers for the indirect costs.

### **3.0 CONCLUSIONS**

The major reason for the difference between the engineer's estimate and the actual cost of the project is underestimation of the cost of the bid items that are indirectly related to the construction of the pavement. To achieve a better prediction of the cost allocations for similar projects, the given multipliers for each category in relation to the total cost can be used as a guide. These findings are based on circumstances limited specifically to I-710 project costs.

**Table 1 Project Cost Breakdown**

**Direct Costs**

Category	Engineer's Estimate			Original Bid			Actual Bid Cost			% Dif-ference <sup>1</sup>	CCO			Total Cost			Cost/ lane mile <sup>3</sup> 16.40 lane-mi.
	Amount	%	Multi-plier <sup>2</sup>	Amount	%	Multi-plier <sup>2</sup>	Amount	%	Multi-plier <sup>2</sup>		Amount	%	Multi-plier <sup>2</sup>	Amount	%	Multi-plier <sup>2</sup>	
Repair Exist. Pavement	\$5,758,699	31.36	0.81	\$4,748,930	27.31	0.77	\$4,790,643	27.16	0.77	0.88	\$468,459	13.02	0.56	\$5,259,101	24.77	0.75	\$320,677
Earthwork	\$639,500	3.48	0.09	\$707,600	4.07	0.11	\$676,208	3.83	0.11	-4.44	\$357,538	9.94	0.42	\$1,033,746	4.87	0.15	\$63,033
Pavement Striping	\$180,137	0.98	0.03	\$113,335	0.65	0.02	\$126,133	0.72	0.02	11.29	\$15,625	0.43	0.02	\$141,758	0.67	0.02	\$8,644
Open Graded Surface	\$545,350	2.97	0.08	\$594,300	3.42	0.10	\$596,728	3.38	0.10	0.41	\$0	0.00	0.00	\$596,728	2.81	0.08	\$36,386
<b>Subtotal (Direct Costs)</b>	<b>\$7,123,686</b>	<b>38.79</b>	<b>1.00</b>	<b>\$6,164,165</b>	<b>35.44</b>	<b>1.00</b>	<b>\$6,189,712</b>	<b>35.10</b>	<b>1.00</b>	<b>0.41</b>	<b>\$841,622</b>	<b>23.40</b>	<b>1.00</b>	<b>\$7,031,334</b>	<b>33.12</b>	<b>1.00</b>	<b>\$428,740</b>

<sup>1</sup> % Difference = (Actual - Original) / Original

<sup>2</sup> Multiplier = (Cost Category)/(Direct Pavement Cost)

<sup>3</sup> Lane Mile Cost = (Total Cost)/(Lane Miles)

**Indirect Costs**

Category	Engineer's Estimate			Original Bid			Actual Bid Cost			% Dif-ference <sup>1</sup>	CCO			Total Cost			Cost/ lane mile <sup>3</sup> 16.40 lane-mi.
	Amount	%	Multi-plier <sup>2</sup>	Amount	%	Multi-plier <sup>2</sup>	Amount	%	Multi-plier <sup>2</sup>		Amount	%	Multi-plier <sup>2</sup>	Amount	%	Multi-plier <sup>2</sup>	
Traffic Control	\$2,781,190	15.14	0.39	\$4,042,609	23.24	0.66	\$4,132,915	23.44	0.67	2.23	\$317,616	8.83	0.38	\$4,450,531	20.96	0.63	\$271,374
Other Traffic Handling	\$0	0.00	0.00	\$0	0.00	0.00	\$0	0.00	0.00	0.00	\$57,860	1.61	0.07	\$57,860	0.27	0.01	\$3,528
Dikes/Curbs	\$213,206	1.16	0.03	\$238,630	1.37	0.04	\$244,690	1.39	0.04	2.54	\$0	0.00	0.00	\$244,690	1.15	0.03	\$14,920
Modify Drainage within Pavement	\$48,410	0.26	0.01	\$118,500	0.68	0.02	\$132,000	0.75	0.02	11.39	\$5,400	0.15	0.01	\$137,400	0.65	0.02	\$8,378
Repair Existing Drainage	\$104,040	0.57	0.01	\$178,200	1.02	0.03	\$203,016	1.15	0.03	13.93	\$148,661	4.13	0.18	\$351,677	1.66	0.05	\$21,444
Upgrade/New Drainage	\$101,818	0.55	0.01	\$221,013	1.27	0.04	\$250,125	1.42	0.04	13.17	\$129,571	3.60	0.15	\$379,696	1.79	0.05	\$23,152
Storm Water Upgrades	\$9,000	0.05	0.00	\$30,000	0.17	0.00	\$30,000	0.17	0.00	0.00	\$23,045	0.64	0.03	\$53,045	0.25	0.01	\$3,234
Identified in Safety Analysis	\$0	0.00	0.00	\$0	0.00	0.00	\$0	0.00	0.00	0.00	\$797,858	22.18	0.95	\$797,858	3.76	0.11	\$48,650
Guardrail/Barriers	\$1,322,600	7.20	0.19	\$2,886,850	16.60	0.47	\$3,000,416	17.01	0.48	3.93	\$588,390	16.36	0.70	\$3,588,806	16.90	0.51	\$218,830
Other Safety Upgrades	\$0	0.00	0.00	\$0	0.00	0.00	\$0	0.00	0.00	0.00	\$0	0.00	0.00	\$0	0.00	0.00	\$0
Embankment Upgrades	\$0	0.00	0.00	\$0	0.00	0.00	\$0	0.00	0.00	0.00	\$80,000	2.22	0.10	\$80,000	0.38	0.01	\$4,878
Erosion Control	\$0	0.00	0.00	\$0	0.00	0.00	\$0	0.00	0.00	0.00	\$30,000	0.83	0.04	\$30,000	0.14	0.00	\$1,829
Roadside/Ditch Paving	\$228,800	1.25	0.03	\$343,200	1.97	0.06	\$265,620	1.51	0.04	-22.60	\$0	0.00	0.00	\$265,620	1.25	0.04	\$16,196
Landscaping	\$9,300	0.05	0.00	\$8,900	0.05	0.00	\$8,900	0.05	0.00	0.00	\$0	0.00	0.00	\$8,900	0.04	0.00	\$543
Environmental Mitigation	\$364,700	1.99	0.05	\$222,770	1.28	0.04	\$154,878	0.88	0.03	-30.48	\$10,000	0.28	0.01	\$164,878	0.78	0.02	\$10,054
New Right of Way	\$0	0.00	0.00	\$0	0.00	0.00	\$0	0.00	0.00	0.00	\$103,855	2.89	0.12	\$103,855	0.49	0.01	\$6,333
Electrical Code Upgrades	\$0	0.00	0.00	\$0	0.00	0.00	\$0	0.00	0.00	0.00	\$90,302	2.51	0.11	\$90,302	0.43	0.01	\$5,506
New Electrical	\$228,500	1.24	0.03	\$310,000	1.78	0.05	\$310,000	1.76	0.05	0.00	\$0	0.00	0.00	\$310,000	1.46	0.04	\$18,902
Sign Structures	\$120,540	0.66	0.02	\$160,140	0.92	0.03	\$246,980	1.40	0.04	54.23	\$176,531	4.91	0.21	\$423,511	1.99	0.06	\$25,824
Roadside Signs	\$2,800	0.02	0.00	\$3,700	0.02	0.00	\$3,410	0.02	0.00	-7.84	\$0	0.00	0.00	\$3,410	0.02	0.00	\$208
<b>Subtotal (Indirect Costs)</b>	<b>\$5,534,904</b>	<b>30.14</b>	<b>0.78</b>	<b>\$8,764,512</b>	<b>50.40</b>	<b>1.42</b>	<b>\$8,982,950</b>	<b>50.94</b>	<b>1.45</b>	<b>2.49</b>	<b>\$2,559,090</b>	<b>71.15</b>	<b>3.04</b>	<b>\$11,542,039</b>	<b>54.36</b>	<b>1.64</b>	<b>\$703,783</b>

<sup>1</sup> % Difference = (Actual - Original) / Original

<sup>2</sup> Multiplier = (Cost Category)/(Direct Pavement Cost)

<sup>3</sup> Lane Mile Cost = (Total Cost)/(Lane Miles)

### Administrative Costs

Category	Engineer's Estimate			Original Bid			Actual Bid Cost			% Dif-ference <sup>1</sup>	CCO			Total Cost			Cost/ lane mile <sup>3</sup>
	Amount	%	Multi-plier <sup>2</sup>	Amount	%	Multi-plier <sup>2</sup>	Amount	%	Multi-plier <sup>2</sup>		Amount	%	Multi-plier <sup>2</sup>	Amount	%	Multi-plier <sup>2</sup>	16.40 lane-mi.
Administrative Related	\$1,425,000	7.76	0.20	\$1,815,000	10.44	0.29	\$1,815,000	10.29	0.29	0.00	\$196,075	5.45	0.23	\$2,011,075	9.47	0.29	\$122,626
State Furnished Materials	\$647,850	3.53	0.09	\$647,850	3.73	0.11	\$647,850	3.67	0.10	0.00	\$0	0.00	0.00	\$647,850	3.05	0.09	\$39,503
Supplemental Work	\$3,632,560	19.78	0.51	\$0	0.00	0.00	\$0	0.00	0.00	0.00	\$0	0.00	0.00	\$0	0.00	0.00	\$0
<b>Subtotal (Administrative Costs)</b>	<b>\$5,705,410</b>	<b>31.07</b>	<b>0.80</b>	<b>\$2,462,850</b>	<b>14.16</b>	<b>0.40</b>	<b>\$2,462,850</b>	<b>13.97</b>	<b>0.40</b>	<b>0.00</b>	<b>\$196,075</b>	<b>5.45</b>	<b>0.23</b>	<b>\$2,658,925</b>	<b>12.52</b>	<b>0.38</b>	<b>\$162,130</b>

<sup>1</sup> % Difference = (Actual - Original) / Original

<sup>2</sup> Multiplier = (Cost Category)/(Direct Pavement Cost)

<sup>3</sup> Lane Mile Cost = (Total Cost)/(Lane Miles)

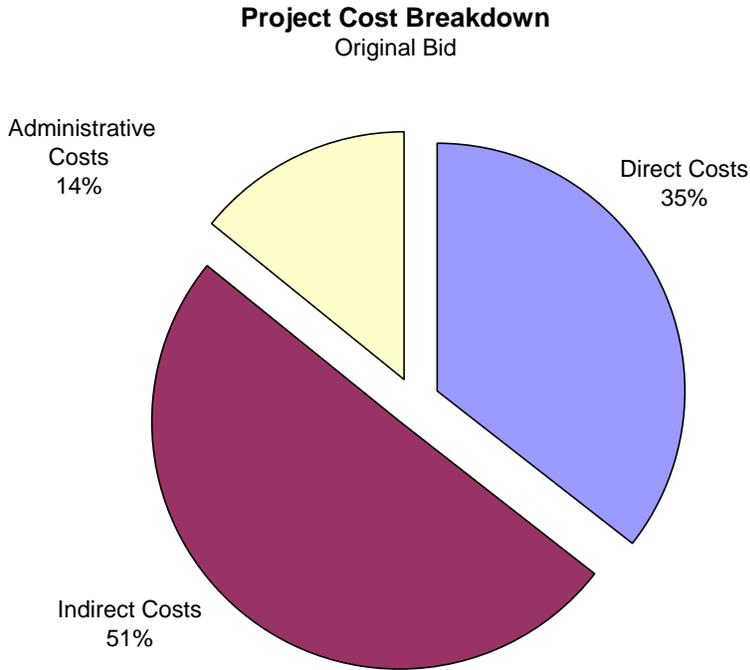
### Total (All Costs)

Category	Engineer's Estimate			Original Bid			Actual Bid Cost			% Dif-ference <sup>1</sup>	CCO			Total Cost			Cost/ lane mile <sup>3</sup>
	Amount	%	Multi-plier <sup>2</sup>	Amount	%	Multi-plier <sup>2</sup>	Amount	%	Multi-plier <sup>2</sup>		Amount	%	Multi-plier <sup>2</sup>	Amount	%	Multi-plier <sup>2</sup>	16.40 lane-mi.
Total (All Costs)	\$18,364,000	100	2.58	\$17,391,527	100	2.82	\$17,635,512	100	2.85	1.40	\$3,596,786	100	4.27	\$21,232,297	100	3.02	\$1,294,652

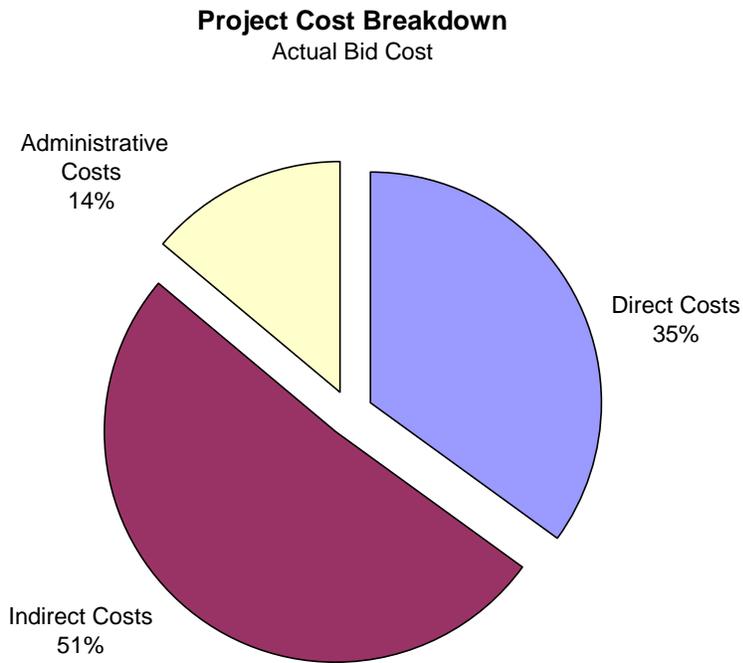
<sup>1</sup> % Difference = (Actual - Original) / Original

<sup>2</sup> Multiplier = (Cost Category)/(Direct Pavement Cost)

<sup>3</sup> Lane Mile Cost = (Total Cost)/(Lane Miles)

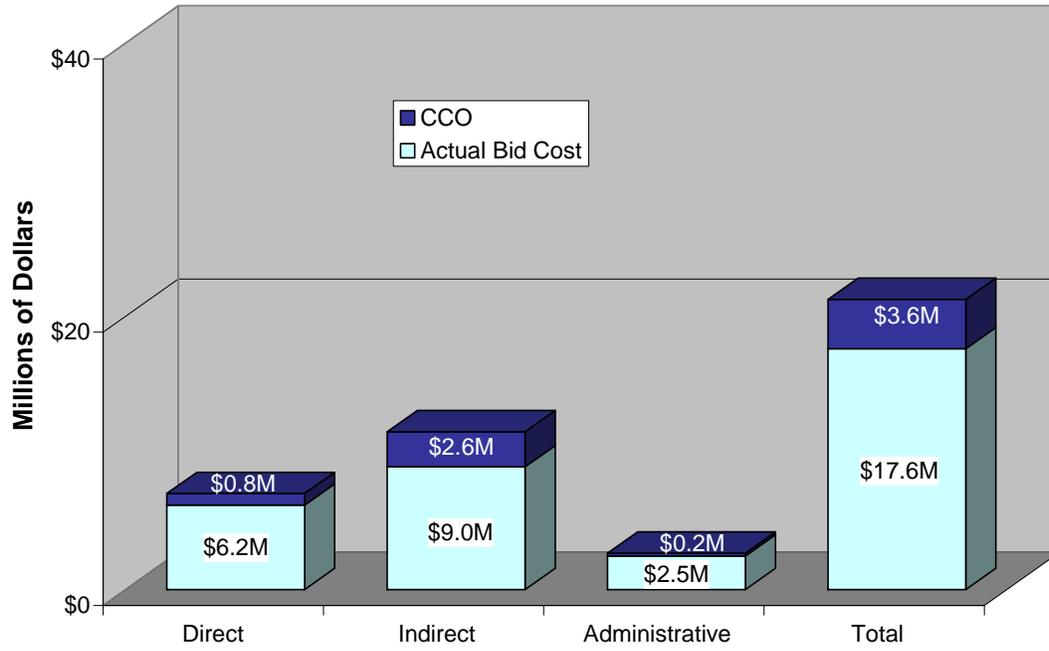


**Figure 1. Project cost breakdown based on original bid for I-710 Long Beach rehabilitation project.**

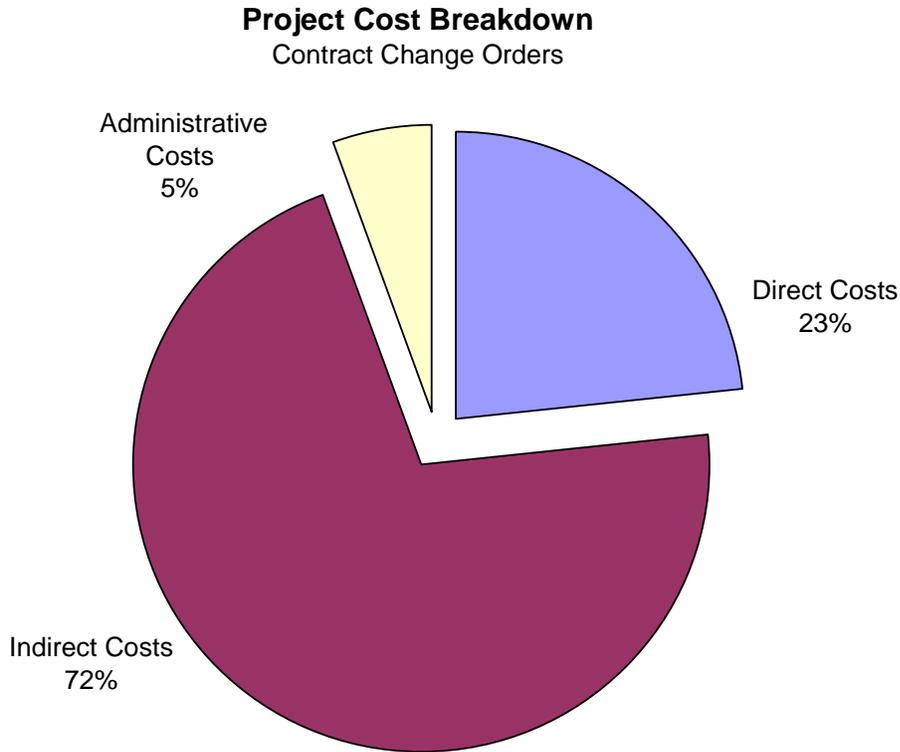


**Figure 2. Project cost breakdown of actual bid costs for I-710 Long Beach rehabilitation project.**

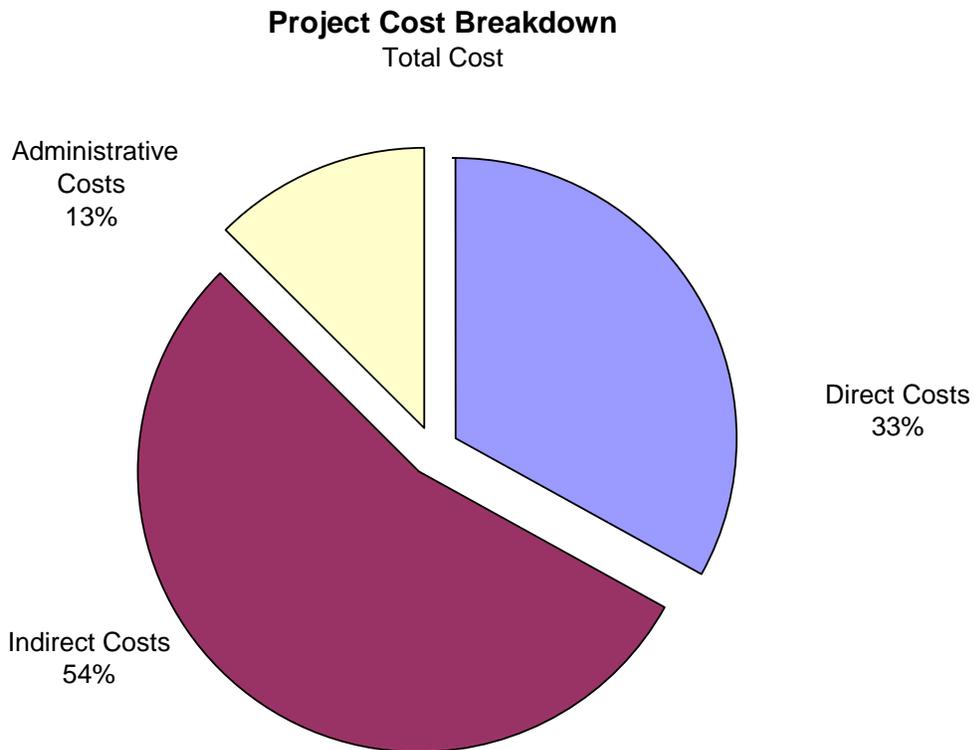
### Total Cost Distributions



**Figure 3. Actual bid cost and CCO distributions of the total cost of the I-710 Long Beach rehabilitation project.**



**Figure 4. Project cost breakdown of the contract change orders (CCOs) for I-710 Long Beach rehabilitation project.**



**Figure 5. Cost breakdown of the total cost of the I-710 Long Beach rehabilitation project.**

## 4.0 APPENDIX

**Table A1 Cost Categories and Descriptions**

Category	Code	Item	Description	Sample Items (Partial List)
Direct	D-010	Repair Exist Pavement	Work done to existing pavement to repair deficiencies and extend life	Overlays, Reconstruct Existing, Replace AC, PCC Slab Replacement, Cold Planing, Grinding
	D-020	Earthwork	Work done to embankments to construct pavement repairs and eliminate drop-offs	Shoulder Backing, Embankment reconstruction next to pavement
	D-030	Pavement Striping	Work done to restripe new pavement	Permanent traffic stripes and markers
	I-034	Open Graded Surface	Placement of open graded surfaces on top of pavement	OGAC, RAC-O
Traffic Handling	I-011	Traffic Control	Costs incurred to manage traffic during construction	Traffic Control, Construction Area Signs, Temporary Signing and Striping, Temporary Barriers, Portable Message Signs
	I-012	Temporary Detours	Temporary pavement, bridges, and drainage built to handle traffic during construction	Asphalt Concrete, Aggregate Base and Subbase, Earthwork related to detours
	I-013	Permanent Widening for Construction Traffic Handling	Permanent pavement placed to be used for traffic handling during construction	Asphalt Concrete, Aggregate Base and Subbase, Earthwork related widening work
	I-014	Others	Work not covered under above items	
Drainage	I-021	Dikes/Curbs	Replace existing dikes and curbs	Place Dike (Type ___), Minor Concrete Curb. Includes costs to replace existing dikes and curbs
	I-022	Modify within Pavement	Work done to adjust drainage systems to match new pavement profile	Adjust or replace inlets, manholes
	I-023	Repair Existing	Work done to repair existing deficiencies	Replaced damaged pipes, inlets. Fix ponding or other drainage deficiencies
	I-024	Upgrade/New	Improvements to overall drainage system	New systems placed due to widenings, realignments
	I-025	Storm Water Upgrades	Work done to address storm water issues	Detention Basins, Catch Basins, Litter Catchers
Safety	I-031	Identified in Safety Analysis	Work done to address site specific issues raised in the project safety analysis	Associated paving and earthwork for realignments, left or right turns lanes
	I-032	Guardrail/Barriers	Replacement and upgrade of guardrails and barriers	Metal Beam Guardrail, Concrete Barriers, End Anchors, Crash Cushions
	I-033	Meet 3R Design Standards	Work done to upgrade facility to meet 3R Design Standards	Shoulder Widening, Lane Widening, Vertical Clearance
	I-035	Other Safety Upgrades	Safety work not identified in above items	

Category	Code	Item	Description	Sample Items (Partial List)
Roadside	I-041	Embankment Upgrades	Work done to pavement not impacted by paving operations	Flattening Slopes
	I-042	Erosion Control	All erosion control work done to new or existing pavements	
	I-043	Roadside/Ditch Paving	Paving work done to the roadside	
	I-044	Landscaping	Upgrade or addition of landscaping	
	I-045	Environmental Mitigation	Work done to meet environmental commitments	
Right of Way	I-051	New Right of Way	New Right of Way	Costs are incurred prior to construction and are found separately in the Right of Way costs
	I-052	Temp. Construction Easements	Temporary Construction Easements	
	I-053	Utility Relocations	Utility Relocations	
Bridges	I-061	All Works Done on Bridges	All work done to bridges	Replacement, Widening, Bridge Rail Upgrade
Operational	I-071	Lane Additions	Work done to add lanes not required for traffic handling during construction	Auxiliary, Truck, Passing, and Turn Lanes not constructed for traffic handling or safety reasons
	I-072	Other Widening (beyond 3R Stds)	Other widening work performed that is not required for traffic handling during construction	Additional shoulder widening beyond 3R Design Standards
	I-073	ITS/Fiber Optic	All work to upgrade or install new Intelligent Transportation elements	Cameras, Radios, Changeable Message Signs, Fiber Optics
	I-074	Electrical Code Upgrades	Upgrades to existing electrical systems to meet current code	Usually part of a lump sum item. Need cost breakdown from electrical
	I-075	New Electrical	New non-ITS electrical systems	New Lighting, Traffic Signals, Ramp Meters
	I-076	Sign Structures	Replacement or construction of new sign structures	Furnish and Place Sign Structure
	I-077	Roadside Signs	Replacement or construction of new roadside signs	Roadside Signs
Administrative	I-080	Administrative Related	Administrative Related Costs	Mobilization, Time Related Overhead
	I-090	State Furnished Materials	State Furnished Materials	Found Separately. Includes COZEEP, additional traffic control, etc.
		Supplemental Work	Supplemental Work	Found Separately

**Table A2 Engineer's Estimate, Original Bid Costs, Actual Bid Costs**

Bid No.	Item Code	Item Descriptions	Engineer's Estimate		Original Contract		Actual Contract		Cost Code
			Qty.	Amount	Qty.	Amount	Qty.	Amount	
1	70010	Progress Schedule (Critical Path)	1	\$17,000.00	1	\$15,000.00	1	\$15,000.00	I-080
2	70020	Warranty	1	\$15,700.00	1	\$10,000.00	1	\$10,000.00	I-034
3	74019	Prepare Storm Water Pollution Prevention Plan	1	\$9,000.00	1	\$30,000.00	1	\$30,000.00	I-025
4	74020	Water Pollution Control	1	\$70,000.00	1	\$30,000.00	1	\$30,000.00	I-045
5	120090	Construction Area Signs	1	\$70,000.00	1	\$200,000.00	1	\$200,000.00	I-011
6	120100	Traffic Control System	1	\$550,000.00	1	\$1,997,909.00	1	\$1,997,909.00	I-011
7	120151	Temporary Traffic Stripe (Tape)	102000	\$663,000.00	102000	\$306,000.00	91704.64	\$275,113.92	I-011
8	120159	Temporary Traffic Stripe (Paint)	79000	\$55,300.00	79000	\$31,600.00	252864	\$101,145.60	I-011
9	120165	Channelizer (Surface Mounted)	370	\$12,210.00	370	\$18,500.00	228	\$11,400.00	I-011
10	120300	Temporary Pavement Marker	19900	\$63,680.00	19900	\$79,600.00	26064	\$104,256.00	I-011
11	129000	Temporary Railing (Type K)	22300	\$669,000.00	22300	\$669,000.00	20463	\$613,890.00	I-011
12	20030	Moveable Concrete Barrier	1	\$650,000.00	1	\$700,000.00	1	\$700,000.00	I-011
13	129100	Temporary Crash Cushion Module	200	\$48,000.00	200	\$40,000.00	646	\$129,200.00	I-011
14	150662	Remove Metal Beam Guard Railing	210	\$4,620.00	210	\$5,250.00	899.98	\$22,499.50	I-032
15	150667	Remove Double Metal Beam Barrier	4660	\$111,840.00	4660	\$372,800.00	4833	\$386,640.00	I-032
16	20031	Remove Traffic Stripe (Yellow)	11500	\$74,750.00	11500	\$20,125.00	11394.4	\$19,940.20	D-030
17	150711	Remove Painted Traffic Stripe	24600	\$49,200.00	24600	\$24,600.00	25151	\$25,151.00	D-030
18	150714	Remove Thermoplastic Traffic Stripe	3080	\$6,160.00	3080	\$3,080.00	4898	\$4,898.00	D-030
19	150722	Remove Pavement Marker	8500	\$8,500.00	8500	\$8,500.00	6827	\$6,827.00	D-030
20	150744	Remove Roadside Sign (Wood Post)	4	\$480.00	4	\$600.00	3	\$450.00	I-077
21	150760	Remove Sign Structure	2	\$5,600.00	2	\$20,000.00	3	\$30,000.00	I-076
22	150806	Remove Pipe	270	\$21,600.00	270	\$54,000.00	252.5	\$50,500.00	I-022
23	150820	Remove Inlet	27	\$17,010.00	27	\$54,000.00	37	\$74,000.00	I-022
24	150846	Remove Concrete Pavement	39400	\$472,800.00	39400	\$157,600.00	34656.69	\$138,626.76	D-010
25	152386	Relocate Roadside Sign – One Post	4	\$740.00	4	\$2,400.00	2	\$1,200.00	I-076
26	152430	Adjust Inlet	7	\$9,800.00	7	\$10,500.00	5	\$7,500.00	I-022
27	153103	Cold Plane Asphalt Concrete Pavement	3830	\$10,724.00	3830	\$19,150.00	3570.54	\$17,852.70	D-010
28	153214	Remove Concrete Curb	13700	\$178,100.00	13700	\$205,500.00	13786.5	\$206,797.50	I-021
29	155003	Cap Inlet	15	\$10,500.00	15	\$30,000.00	18	\$36,000.00	I-023
30	160101	Clearing and Grubbing	1	\$9,300.00	1	\$8,900.00	1	\$8,900.00	I-044
31	190101	Roadway Excavation	32700	\$425,100.00	32700	\$654,000.00	30692.42	\$613,848.40	D-020
32	20032	Roadway Excavation (Material with Aerially Deposited Lead (Type Y))	1460	\$29,200.00	1460	\$54,020.00	651	\$24,087.00	I-045

Bid No.	Item Code	Item Descriptions	Engineer's Estimate		Original Contract		Actual Contract		Cost Code
			Qty.	Amount	Qty.	Amount	Qty.	Amount	
33	20040	Roadway Excavation (Material with Aerially Deposited Lead (Type Z-2))	870	\$261,000.00	870	\$108,750.00	566.33	\$70,791.25	I-045
34	20033	Lead Compliance Plan	1	\$4,500.00	1	\$30,000.00	1	\$30,000.00	I-045
35	198007	Imported Material (Shoulder Backing)	2680	\$214,400.00	2680	\$53,600.00	3118	\$62,360.00	D-020
36	260301	Class 3 Aggregate Base	550	\$16,500.00	550	\$22,000.00	473.67	\$18,946.80	D-010
37	20034	Asphalt Concrete Textured Paving – Pattern “A”	3420	\$136,800.00	3420	\$205,200.00	2508	\$150,480.00	I-043
38	20035	Asphalt Concrete Textured Paving – Pattern “B”	2300	\$92,000.00	2300	\$138,000.00	1919	\$115,140.00	I-043
39	390127	Rubberized Asphalt Concrete (Type O)	9500	\$522,500.00	9500	\$570,000.00	9561.87	\$573,712.20	I-034
40	20036	Asphalt Concrete (Type A) (PBA-6A (Modified))	27700	\$1,274,200.00	27700	\$1,108,000.00	28396.5	\$1,135,860.00	D-010
41	20037	Asphalt Concrete (Type A) (AR 8000) (Rich Bottom)	9600	\$451,200.00	9600	\$336,000.00	11966.35	\$418,822.25	D-010
42	20038	Asphalt Concrete (Type A) (AR 8000) (Working Platform)	2280	\$104,880.00	2280	\$84,360.00	87.75	\$3,246.75	D-010
43	20039	Asphalt Concrete (Type A) (AR 8000)	72000	\$3,312,000.00	72000	\$2,880,000.00	73247.86	\$2,929,914.40	D-010
44	390206	Rubberized Asphalt Concrete (Type G)	110	\$7,150.00	110	\$14,300.00	119.35	\$15,515.50	I-034
45	391031	Paving Asphalt (Binder Pavement Reinforcing Fabric)	150	\$14,250.00	150	\$15,000.00	79.71	\$7,971.00	D-010
46	393001	Pavement Reinforcing Fabric	97700	\$73,275.00	97700	\$58,620.00	95462	\$57,277.20	D-010
47	394040	Place Asphalt Concrete Dike (Type A)	2700	\$31,050.00	2700	\$27,000.00	3213	\$32,130.00	I-021
48	394044	Place Asphalt Concrete Dike (Type C)	150	\$1,410.00	150	\$1,500.00	114.1	\$1,141.00	I-021
49	394046	Place Asphalt Concrete Dike (Type D)	100	\$940.00	100	\$1,000.00	103.6	\$1,036.00	I-021
50	394048	Place Asphalt Concrete Dike (Type E)	310	\$1,457.00	310	\$3,100.00	307.53	\$3,075.30	I-021
51	394049	Place Asphalt Concrete Dike (Type F)	53	\$249.10	53	\$530.00	51.04	\$510.40	I-021
52	415101	Crack Existing Concrete Pavement	67300	\$26,920.00	67300	\$67,300.00	61202.5	\$61,202.50	D-010
53	420201	Grind Existing Concrete Pavement	30	\$1,950.00	30	\$900.00	30.75	\$922.50	D-010
54	510502	Minor Concrete (Minor Structure)	88	\$89,760.00	88	\$132,000.00	91.44	\$137,160.00	I-023
55	510526	Minor Concrete (Backfill)	27	\$3,780.00	27	\$16,200.00	49.76	\$29,856.00	I-023
56	560218	Furnish Sign Structure (Truss)	18790	\$75,160.00	18790	\$93,950.00	37390	\$186,950.00	I-076
57	560219	Install Sign Structure (Truss)	18790	\$18,790.00	18790	\$18,790.00	37390	\$37,390.00	I-076
58	561009	920-mm Cast-In-Drilled-Hole Concrete Pile (Sign Foundation)	25	\$20,250.00	25	\$25,000.00	47	\$47,000.00	I-076
59	566011	Roadside Sign – One Post	2	\$370.00	2	\$1,000.00	2	\$1,000.00	I-077
60	650069	450-mm Reinforced Concrete Pipe	110	\$21,450.00	110	\$77,000.00	165.14	\$115,598.00	I-024
61	650075	600-mm Reinforced Concrete Pipe	22	\$5,280.00	22	\$15,400.00	21.4	\$14,980.00	I-024

Bid No.	Item Code	Item Descriptions	Engineer's Estimate		Original Contract		Actual Contract		Cost Code
			Qty.	Amount	Qty.	Amount	Qty.	Amount	
62	664006	250-mm Corrugated Steel Pipe (1.63 mm thick)	160	\$44,480.00	160	\$96,000.00	143.04	\$85,824.00	I-024
63	705224	600-mm Concrete Flared End Section	1	\$740.00	1	\$1,500.00	1	\$1,500.00	I-024
64	750001	Miscellaneous Iron and Steel	12445	\$29,868.00	12445	\$31,112.50	12889	\$32,222.50	I-024
65	820180	Install Median Mileage Panel	30	\$1,950.00	30	\$2,100.00	28	\$1,960.00	I-077
66	832003	Metal Beam Guard Railing (Wood Post)	170	\$20,400.00	170	\$25,500.00	232.37	\$34,855.50	I-032
67	833080	Concrete Barrier (Type K)	210	\$11,760.00	210	\$14,700.00	520	\$36,400.00	I-032
68	833162	Concrete Barrier (Type 27B)	340	\$66,300.00	340	\$102,000.00	312	\$93,600.00	I-032
69	839311	Double Thrie Beam Barrier (Wood Post)	160	\$26,400.00	160	\$27,200.00	173.36	\$29,471.20	I-032
70	839559	Terminal System (Type ET)	3	\$8,400.00	3	\$9,000.00	3	\$9,000.00	I-032
71	839565	Terminal System (Type SRT)	12	\$23,400.00	12	\$26,400.00	15	\$33,000.00	I-032
72	839568	Terminal Anchor Assembly (Type SFT)	9	\$6,660.00	9	\$9,000.00	11	\$11,000.00	I-032
73	20041	Crash Cushion (Type ADIEM II 350)	1	\$18,500.00	1	\$18,000.00	2	\$36,000.00	I-032
74	20042	Concrete Barrier (Type 60W)	1990	\$427,850.00	1990	\$1,194,000.00	1992	\$1,195,200.00	I-032
75	20043	Concrete Barrier (Type 60C Mod)	2360	\$405,920.00	2360	\$708,000.00	2351.1	\$705,330.00	I-032
76	20044	Concrete Barrier (Type 60C Mod Trans)	30	\$5,550.00	30	\$27,000.00	42.2	\$37,980.00	I-032
77	20045	Concrete Barrier (Type 60D Mod)	360	\$63,000.00	360	\$108,000.00	0	\$0.00	I-032
78	20046	Concrete Barrier (Type 60GE Mod)	200	\$80,000.00	200	\$160,000.00	183.5	\$146,800.00	I-032
79	20047	Concrete Barrier (Type 60SE Mod)	100	\$42,000.00	100	\$80,000.00	278.3	\$222,640.00	I-032
80	840515	Thermoplastic Pavement Marking	22	\$1,012.00	22	\$2,640.00	29.32	\$3,518.40	D-030
81	840561	100-mm Thermoplastic Traffic Stripe	23300	\$15,145.00	23300	\$23,300.00	24863	\$24,863.00	D-030
82	840563	200-mm Thermoplastic Traffic Stripe	1270	\$4,191.00	1270	\$6,350.00	1962	\$9,810.00	D-030
83	840564	200-mm Thermoplastic Traffic Stripe (Broken 3.66 m - 0.92 m)	910	\$2,548.00	910	\$3,640.00	2104	\$8,416.00	D-030
84	840571	100-mm Thermoplastic Traffic Stripe (Broken 5.18 m - 2.14 m)	130	\$130.00	130	\$130.00	249	\$249.00	D-030
85	850101	Pavement Marker (Non-Reflective)	5340	\$7,476.00	5340	\$10,680.00	5352	\$10,704.00	D-030
86	850111	Pavement Marker (Retroreflective)	2940	\$11,025.00	2940	\$10,290.00	3359	\$11,756.50	D-030
87	860460	Lighting and Sign Illumination	1	\$210,000.00	1	\$300,000.00	1	\$300,000.00	I-075
88	20048	Modify Automatic Vehicle Classification (AVC) Station	1	\$18,500.00	1	\$10,000.00	1	\$10,000.00	I-075
89	999990	Mobilization	1	\$1,408,000.00	1	\$1,800,000.00	1	\$1,800,000.00	I-080
		<b>Totals</b>		<b>\$14,083,590.10</b>		<b>\$16,743,676.50</b>		<b>\$17,045,721.73</b>	

**Table A3 Contract Change Orders (CCOs)**

<b>CCO No.</b>	<b>Item Description</b>	<b>Amount</b>	<b>Cost Code</b>
1	Maintain Roadway and Traffic Control	50,000.00	I-011
1-1	Additional Funds	30,000.00	I-011
2	Federal Aid Training Program	3,200.00	I-080
3	Maintain Highway and Street Lighting	20,000.00	I-074
3-1	Additional Funds	20,000.00	I-074
3-2	Additional Funds	40,000.00	I-074
4	Maintain, Repair, or Modify Existing Irrigations	5,000.00	I-023
4-1	Additional Funds	40,000.00	I-023
4-2	Additional Funds	60,000.00	I-023
5	SWPP Changes to Winter Season Period	-	I-025
6	Maintain, Repair, and Modify Drainage Facilities	50,000.00	I-024
7	Remove Portion of Drainage Pipe	5,400.00	I-022
8	Disputes Review Board	5,000.00	I-080
9	Partnering	15,000.00	I-080
10	Change Sampling Quality	-	I-080
11	Change Lift Thickness	-	D-010
12	Change S.P. for Materials on Hand	-	
13	Allow Placement of Non-Contract Compliance AR 8000 in the Center Median	-	D-010
14	Treatment of Asbestos Substances	200,000.00	I-031
14-1	Additional Funds	500,000.00	I-031
14-2	Delay Contract Time	-	I-031
14-3	Right of Way Delay	67,361.28	I-031
15	Delete Drainage Inlet and Change Barrier Rail	(5,472.54)	I-023
16	AC Price Index Fluctuation	120,000.00	D-010
		(20,000.00)	D-010
17	S.P. Changes for Curing Compound	-	D-010
18	Remove and Replace Deteriorated Slabs	200,000.00	D-010
19	Replacing Overhead Signs	25,356.25	I-076
		125,615.00	I-076
		(4,440.00)	I-076
		30,000.00	I-076
19-1	Contract Time Adjustment	-	I-080
19-2	Right of Way Delay	107,228.16	I-032
19-3	Install Walkways for Signs "E," "G," & "H"	15,000.00	I-014
		42,860.00	I-014
20	Quality Control / Quality Assurance	-	I-080
21	Request Modifications to Drainage Inlet	-	I-024
22	Protect Existing Drainage System	49,134.00	I-023
23	Revise and Resubmit SWPPP	3,045.00	I-025
24	Compensation for Testing Sedimentation/Siltation	30,000.00	I-042
25	Barrier Rail Visual Enhancement	48,000.00	I-032
		112,684.00	I-032
26	Changes to Traffic Handling and Final Pavement Delineation Plans due to Obstruction at Station 153+49	(17,338.00)	I-011
27	Change Center Median Barrier Rail T.	10,000.00	I-032
28	Quality Control / Quality Assurance	-	D-040
29	Revising the Height and Base Plant Elevation for Right Post F Sign C at Station 147+00	-	I-076
	Removal of Asbestos PPR / Receiving Record Paid on 06/13/02	1,110.00	I-031

<b>CCO No.</b>	<b>Item Description</b>	<b>Amount</b>	<b>Cost Code</b>
	Removal of Asbestos PPR / Receiving Record Paid on 06/25/02	6,807.10	I-031
	Removal of Asbestos PPR / Receiving Record Paid on 07/11/02	6,651.00	I-031
30	Revise Detail for the Concrete Barrier	-	I-032
31	Revise the Stage 2 Traffic Handling Plans	10,490.00	I-011
32	Right of Way Delay	103,855.01	I-051
33	Structural Section Changes	-	D-010
34	Install Concrete Barrier Rail (Type 60SE) in lieu of Type "D" Concrete Barrier Rail	162,000.00	I-032
		(123,368.00)	I-032
		20,000.00	I-032
35	Revise Profile Grades	20,000.00	I-041
35-1	Additional Funds	15,000.00	I-041
35-2	Additional Funds	45,000.00	I-041
36	Construct Additional Drainage System	10,325.00	I-024
37	Revise the Height of Type 27B Barrier Rail S/B from 146+50 to 147+20	10,000.00	I-032
38	Winter SWPP Monitoring and Maintenance	10,000.00	I-025
38-1	Additional Funds	10,000.00	I-025
39	Additional Electrical Work	10,301.80	I-074
40	SEA Container for Storage of Asphalt Concrete Samples	7,390.58	D-010
41	Provide Labor Equipment	50,000.00	D-010
42	Construct French Drain behind C.B.	10,000.00	I-024
43	Concrete Barrier Type 736 Mod	44,762.41	I-032
44	Concrete Encasement of Pipe	59,246.40	I-024
45	Revising Traffic Handling Plan	15,000.00	I-011
46	Renting Temporary Trailer	7,360.00	I-080
47	AC Specification Revision	-	D-010
48	Remove and Replace Ramp Shoulder	15,000.00	D-010
49	Settlement for Claim #5	25,181.92	I-080
50	Disposing to Class II Dump	10,000.00	I-045
51	Repair PCC Slabs with AC Before Overlaid	15,000.00	D-010
52	Additional Work for Excavation	357,538.00	D-020
	Removal of Asbestos PPE / Receiving Record Paid on 06/09/03	4,182.50	I-031
	Removal of Asbestos PPE / Receiving Record Paid on 06/09/03	7,047.81	I-031
	Removal of Asbestos PPE / Receiving Record Paid on 06/09/03	4,698.00	I-031
53	Perform Additional Work by Cutting, Removing, and Disposing Excess Asphalt Concrete	15,000.00	D-010
54	Traffic Closure	-	I-011
55	5-Hour Closure Weekend Incentive	200,000.00	I-011
56	State Budget is Not Approved	-	
58	Construct Concrete Barrier and Metal Beam Guard Rail	142,225.88	I-032
59	Incurred Cost due to Work Shutdown by CHP	22,463.98	I-011
60	Additional Traffic Control for Testing	7,000.00	I-011
61	Additional Work on AC Median	15,000.00	D-010
		33,948.00	D-010
		(26,880.00)	D-010
61-1	Additional Funds	44,000.00	D-010
62	Install Additional Concrete Barrier	23,500.00	I-032
63	Install Additional ADIEM II Crash Cushion	18,000.00	I-032
		(3,343.00)	I-032
		2,000.00	I-032
64	Install Additional Thermoplastic Striping	15,624.96	D-030

<b>CCO No.</b>	<b>Item Description</b>	<b>Amount</b>	<b>Cost Code</b>
65	Install Additional Metal Beam Guard Rail	14,700.50	I-032
66	Pay Factor Determination and Compensation Adjustment	78,289.63	I-080
67	Resolution of NOPC Dated 08/12/03	62,043.00	I-080
	<b>Total</b>	<b>3,596,785.63</b>	

**Table A4 State Furnished Materials**

<b>Item Description</b>	<b>Quantity</b>	<b>Amount</b>
Automatic Vehicle Classifier	LS	\$4,000
Piezo-Electric Axle Sensors	12	\$48,000
Epoxy Grout for Piezo-Electric Axle Sensors	12	\$1,200
Target Plates for Median Mileage Panel	LS	\$2,800
COZEEP Contract	LS	\$180,000
Maintain Traffic (Traffic Signal Resetting)	LS	\$15,000
Tow Truck Service Patrol	LS	\$300,000
Resident Engineer's Office	LS	\$130,000
Sign Panel and Hardware	LS	\$10,000
Sign Overlay	LS	\$50
<b>Total</b>		<b>\$691,050</b>

**Table A5 Supplemental Work**

<b>Item Description</b>	<b>Quantity</b>	<b>Amount</b>
Incentive Payment	LS	\$500,000
Federal Trainee Program	LS	\$3,200
Haul Material	LS	\$649,000
Traffic Management Plan – Public Information	LS	\$50,000
Maintain Traffic	LS	\$315,000
Repair Existing Irrigation System	LS	\$10,000
Additional SWPP Requirements	LS	\$800,000
Compensation Adjustment for Paving Asphalt Price Index Fluctuation	LS	\$150,000
Partnering	LS	\$7,000
Incentive for Asphalt Concrete QC/QA	LS	\$225,000
Maintain Existing and Temporary Electrical System	LS	\$40,000
Disputes Review Board	LS	\$9,000
Contingencies		\$874,359.90
<b>Total</b>		<b>\$3,632,559.90</b>