

# ***CALFED STORAGE AND CONVEYANCE FACILITY COSTS***

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## ✓ PURPOSE

- ⇒ To disclose the developed costs used to support the CALFED Alternatives as described in the *CALFED Programmatic EIR/EIS Technical Appendix - Project Alternatives* dated March 1998

# ***COST CATEGORIES***

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- ✓ Base Construction Estimates
- ✓ Total Capital and Total Annual Costs (Economic Analysis)
- ✓ Alternative Costs

# ***BASE CONSTRUCTION ESTIMATES***

## ***APPENDICES A - D***

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- ✓ Surface storage facilities
- ✓ Major reservoir conveyance facilities
- ✓ Delta conveyance facilities
- ✓ Groundwater storage facilities

CALFED Bay Delta Program  
Technical Services Branch

Construction Estimate: \$ 934,737,267  
Revision Date: October-96

## SACRAMENTO RIVER TRIBUTARY SURFACE STORAGE

Description: **THOMES-NEUVILLE RESERVOIR PROJECT - 1.34 MAF ALTERNATIVE**

FACILITY GROUPING: STORAGE  
CODE: BRTN18

ITEM No.	ITEM	UNIT	UNIT COST	QUANTITY	ITEM COST
<b>I. LANDS</b>					
	Newville Reservoir Right of Way	AC	\$ 1,500	18,350	\$ 27,525,000
	Thomes Creek Diversion Right of Way	AC	\$ 1,500	125	\$ 187,500
	Tehenn Reservoir right of Way	AC	\$ 1,500	1,250	\$ 1,875,000
	Tehenn Canal Right of Way	AC	\$ 1,500	212	\$ 318,000
	Black Butte Canal Right of Way	AC	\$ 1,500	191	\$ 286,500
	Sour Grass Canal Right of Way	AC	\$ 1,500	191	\$ 286,500
	<b>Subtotal</b>				<b>\$ 30,478,500</b>
<b>II. DAM</b>					
	Mobilization	LS	\$ 2,770,455	JOB	\$ 2,770,455
	Care of Water	LS	\$ 180,682	JOB	\$ 180,682
	Foundation Excavation and Stripping	CY	\$ 3.23	1,946,670	\$ 6,287,744
	Imported Borrow - Impervious	CY	\$ 3.22	4,301,200	\$ 13,849,864
	Place and Compact Impervious Material	CY	\$ 0.95	3,910,200	\$ 3,714,690
	Furnish and Compact Filter and Drain	CY	\$ 8.54	1,595,300	\$ 13,623,862
	Furnish and Compact Random Material	CY	\$ 3.11	1,677,800	\$ 5,217,958
	Furnish and Compact Sand and Gravel	CY	\$ 5.90	8,816,930	\$ 52,019,887
	Drill Grout Holes	LF	\$ 18.70	35,300	\$ 660,110
	Grout Connections	EA	\$ 60.00	380	\$ 22,800
	Grouting	CY	\$ 229	870	\$ 199,230
	Grout Pipe	LF	\$ 10.00	1,140	\$ 11,400
	Instrumentation	LS	\$ 421,591	JOB	\$ 421,591
	<b>Subtotal</b>				<b>\$ 98,980,273</b>
<b>III. OUTLET WORKS</b>					
	Dewatering	LS	\$ 146,099	JOB	\$ 146,099
	Excavations for:				
	Gate Chamber	CY	\$ 146	1,500	\$ 219,000
	Intake and Gate Chamber	CY	\$ 6.76	12,000	\$ 81,120
	Penstocks and Tunnel	CY	\$ 128.27	37,000	\$ 4,745,990
	Portal	CY	\$ 9.00	127,000	\$ 1,143,000
	By-pass and Trifuration	CY	\$ 6.00	9,000	\$ 54,000
	Shaft	CY	\$ 147	1,000	\$ 146,590
	Diversion Channel	CY	\$ 6.00	71,000	\$ 426,000
	Compaction Backfill	CY	\$ 29.00	7,000	\$ 203,000
	Granular Structural Backfill	CY	\$ 18.99	2,000	\$ 37,980
	Concrete				
	Penstock-Tunnel	CY	\$ 321	10,500	\$ 3,367,140
	Intake and Gate Chamber Access Tunnel	CY	\$ 321	3,600	\$ 1,154,448
	Gate Chambers	CY	\$ 340	700	\$ 237,650
	Low Intake	CY	\$ 340	500	\$ 169,750
	Low Intake Foundation	CY	\$ 270	400	\$ 108,180
	Control Valve House	CY	\$ 340	700	\$ 237,650
	Vertical Shaft	CY	\$ 340	300	\$ 101,850
	Grouting Cement	BBL	\$ 26.00	21,000	\$ 546,000
	Mass Concrete	CY	\$ 293	4,000	\$ 1,172,360
	Ring Girder	LBS	\$ 3.00	72,000	\$ 216,000
	Overhead Hoist Rails	LBS	\$ 3.63	150,000	\$ 544,500

APPENDIX A 5.1

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# ***TOTAL CAPITAL COST DEVELOPMENT***

## ***APPENDIX E***

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- ✓ **Base Construction Estimate**
- ✓ **Construction Cost** (Base Construction Estimate + 20% for contingencies)
- ✓ **Engineering Cost** (35% of Construction Cost)
- ✓ **Regulatory Cost\*** (20% of Construction Cost)
- ✓ **Forgone Investment Value (a.k.a. Interest During Construction)** -- Discount rate of 6%

\* Regulatory cost includes environmental documentation, permitting, and mitigation.

# ***FORGONE INVESTMENT VALUE***

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- ✓ Definition -- The lost investment opportunity due to commitment of funds prior to return on the project.
- ✓ Cost allocation (or construction period) for storage is assumed be 5 years
- ✓ Cost allocation for major reservoir conveyance and groundwater storage facilities is 2 years
- ✓ Discount rate = 6 percent

# ***TOTAL ANNUAL COST DEVELOPMENT***

## ***APPENDIX E***

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- ✓ **Capital Recovery** -- Total Capital Cost amortized over 50 years with a discount rate of 6%
- ✓ **Operation and Maintenance** -- 1.5% of Construction Cost
- ✓ **Annual Energy Cost\*** -- 0.5% of the Construction Cost

\* Not applicable to on-stream storage

CALFED Facility Components

(Million of 1996 Dollars)

Facility Component	Base Construction Estimate	Contingency Cost	Construction Cost	Engineering Cost	Regulatory Cost	Subtotal Cost	Forgone Investment Adjustment	TOTAL CAPITAL COST	Annual Capital Cost	Annual O&M Cost	Annual Energy Cost	TOTAL ANNUAL COST
A	B	C	D	E	F	G	H	I	J	K	L	M
		0.2 x B	B + C	0.35 x D	0.2 x D	D + E + F		G + H	0.0634 x I	0.015 x D	0.005 x D	J + K + L
<b>SURFACE STORAGE</b>												
<b>SACRAMENTO RIVER TRIBUTARY STORAGE</b>												
Colusa Reservoir (3,300 taf)	916.6	183.3	1,099.9	385.0	220.0	1,704.9	232.9	1,937.8	122.9	16.5	5.5	144.9
Red Bank Project (359 taf)	132.6	26.5	159.1	55.7	31.8	246.7	33.7	280.4	17.8	2.4	0.8	21.0
Sites (1,200 taf)	309.5	61.9	371.5	130.0	74.3	575.8	78.6	654.4	41.5	5.6	1.9	48.9
Sites (1,900 taf)	445.3	89.1	534.4	187.0	106.9	828.3	113.2	941.5	59.7	8.0	2.7	70.4
Thomes-Newville Reservoir (1,840 taf)	934.7	186.9	1,121.7	392.6	224.3	1,738.6	237.5	1,976.1	125.4	16.8	5.6	147.8
<b>SAN JOAQUIN RIVER TRIBUTARY STORAGE</b>												
Montgomery Reservoir (240 taf)	155.9	31.2	187.1	65.5	37.4	290.0	39.6	329.6	20.9	2.8	0.9	24.7
<b>OFF-AQUEDUCT STORAGE</b>												
Los Banos Grandes (2,030 taf)	816.7	163.3	980.0	343.0	196.0	1,519.1	207.5	1,726.6	109.5	14.7	4.9	129.1
Los Vaqueros Enlargement (1,065)	1,124.1	224.8	1,348.9	472.1	269.8	2,090.8	285.6	2,376.4	150.8	20.2	6.7	177.7
<b>MAJOR RESERVOIR CONVEYANCE</b>												
(2a2) Enlarge existing T-C Canal from Red Bluff Diversion to Funks Reservoir (Reaches 1 through 5) -- Screened Pump Alternative	236.9	47.4	284.3	99.5	56.9	440.6	13.2	453.8	28.8	4.3	1.4	34.5
(2a2) Enlarge existing T-C Canal structure from the Red Bluff Diversion to the Sour Grass Canal (Reaches 1 through 2) -- Screened Pump Alternative	166.3	33.3	199.5	69.8	39.9	309.3	9.3	318.6	20.2	3.0	1.0	24.2
Chico Landing Intertie	252.7	50.5	303.2	106.1	60.6	470.0	14.1	484.1	30.7	4.5	1.5	36.8
<b>DELTA CONVEYANCE</b>												
<b>CVP-SWP IMPROVEMENTS</b>												
New Fish Screen @ Skinner; New Fish Screen @ Tracy; and Tracy/CCFB Intertie	174.5	34.9	209.4	73.3	41.9	324.6	44.3	368.9	23.4	3.1	1.0	27.6
New Fish Screen @ Skinner; New Fish Screen @ Tracy; New Intake at CCFB, and Tracy/CCFB Intertie	227.5	45.5	273.0	95.6	54.6	423.2	57.8	481.0	30.5	4.1	1.4	36.0
<b>NORTH DELTA IMPROVEMENTS</b>												
10,000 cfs Hood Diversion; Flooded McCormick Williamson; Setback Levees @ New Hope, Stater/Tyler, and Boulden	440.4	88.1	528.5	185.0	105.7	819.1	111.9	931.0	59.1	7.9	2.6	69.6
Setback Levees @ New Hope, Stater/Tyler, and Boulden	150.6	30.1	180.7	63.3	36.1	280.1	38.3	318.4	20.2	2.7	0.9	23.8
East Floodway; 10,000 cfs Hood Diversion; Flooded McCormick Williamson, Canal Ranch, Brack, and Boulden; Setback Levees @ New Hope, Terminus, and Stater	569.6	113.9	683.5	239.2	136.7	1,059.5	144.7	1,204.2	76.4	10.3	3.4	90.1
West Floodway; Wier Intake; Flooded McCormick Williamson, Tyler, and Boulden Islands; East Delta Habitat on Canal Ranch and Brack	272.5	54.5	327.0	114.5	65.4	506.9	69.2	576.1	36.5	4.9	1.6	43.1
<b>SOUTH DELTA IMPROVEMENTS</b>												
Dredging on Old River; one Operable Fish Barrier and three Flow Barriers	41.5	8.3	49.8	17.4	10.0	77.2	10.5	87.7	5.6	0.7	0.2	6.6
NO Dredging; one Operable Fish Barrier and three Flow Barriers	28.8	5.8	34.6	12.1	6.9	53.6	7.3	60.9	3.9	0.5	0.2	4.6
Setback Levees; one Operable Fish Barrier and South Delta habitat with setback levees from Franks Track to CCFB	142.1	28.4	170.5	59.7	34.1	264.3	36.1	300.4	19.1	2.6	0.9	22.5
One Operable Fish Barrier ONLY	8.9	1.8	10.7	3.7	2.1	16.6	2.3	18.8	1.2	0.2	0.1	1.4
<b>MULTIPLE INTAKES</b>												
Expanded version -- Four intakes; Northern (15,000 cfs), Western (15,000 cfs) and Eastern (5,000 cfs) - the Northern Intake is extended to Hood with a new supplementary intake structure at Hood	1,961.0	392.2	2,353.2	823.6	470.6	3,647.5	498.2	4,145.7	263.0	35.3	11.8	310.1
<b>ISOLATED FACILITY</b>												
5,000 cfs Isolated open channel with a diversion at Hood	522.4	104.5	626.9	219.4	125.4	971.7	132.7	1,104.4	70.1	9.4	3.1	82.6
15,000 cfs Isolated open channel with a diversion at Hood	789.7	157.9	947.6	331.7	189.5	1,468.8	200.6	1,669.5	105.9	14.2	4.7	124.9

TABLE E

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# ***CALFED ALTERNATIVE COSTS***

## ***APPENDIX G***

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- ✓ Includes cost information for Alternatives 1A, 1B, 1C, 2A, 2B, 2D, 2E, 3B, 3E, 3H, and 3I
  - ⇒ **Total Capital Costs** range from \$4.0 billion to \$14.8 billion for Alternatives 1A and 3I, respectively.
  - ⇒ **Total Annual Costs** range from \$133 million to \$944 million for same alternatives

**ALTERNATIVE 3I****COMPONENTS:**

	<b>TOTAL CAPITAL COST</b>	<b>TOTAL ANNUAL COST</b> <small>(Includes Capital Repayment, Energy Cost, and O&amp;M)</small>
	(\$ Million)	(\$ Million)
<b><u>STORAGE</u></b>		
<b>NORTH OF DELTA GROUND WATER STORAGE</b>		
* 250 TAF Sacramento Valley Projects	57	4
<b>SACRAMENTO RIVER TRIBUTARY SURFACE STORAGE</b>		
3.0 MAF Surface Storage in Sacramento Valley		
Cost Basis -- Average Cost of the following 4 projects -- 1) 3.3 MAF Colusa; 2) 1.9 MAF Sites + .350 MAF Red Bank; 3) 1.8 MAF Thomes-Newville + 1.2 MAF Sites; 4) 1.8 MAF Thomes- Newville + .350 MAF Red Bank	2,863	215
<b>SAN JOAQUIN RIVER TRIBUTARY SURFACE STORAGE</b>		
# 240 TAF Surface Storage in San Joaquin Valley -- Cost Basis: Cost of 240 TAF Montgomery Reservoir	330	25
<b>IN-DELTA STORAGE</b>		
100 TAF Holland Tract	268	20
<b>SOUTH OF DELTA GROUND WATER STORAGE</b>		
* 500 TAF San Joaquin Valley Projects	139	11
<b>SOUTH OF DELTA OFF-AQUEDUCT SURFACE STORAGE</b>		
2.0 MAF Off-Aqueduct Surface Storage -- Cost Basis -- Average Cost of Following 2 Projects: 1.) 2.0 MAF Los Grandes; 2.) 1.1 MAF Los Vaqueros Enlargement	2,647	198
<b><u>SUBTOTAL STORAGE</u></b>	<b>6,304</b>	<b>473</b>
<b><u>DELTA CONVEYANCE</u></b>		
<b>MULTIPLE INTAKE</b>		
Multiple Intakes - Extended version, Four intakes, Northern (15,000 cfs), Western (15,000 cfs) * and Eastern (5,000 cfs) - the Northern intake is extended to Hood with a new supplementary intake structure at Hood	4,146	310
<b>CVP - SWP IMPROVEMENTS</b>		
* CVP-SWP Improvements including new fish screens at Skinner, new fish screens at Tracy, new intake at CCFB, and an intertie for Tracy and CCFB	394	30
<b><u>SUBTOTAL DELTA CONVEYANCE</u></b>	<b>4,540</b>	<b>340</b>
<b><u>COMMON PROGRAMS</u></b>		
WATER QUALITY AND UPPER WATERSHED MANAGEMENT	750	25
ECOSYSTEM RESTORATION	1,500	50
WATER USE EFFICIENCY AND WATER TRANSFERS	750	25
LEVEE SYSTEM INTEGRITY	1,000	33
<b><u>SUBTOTAL COMMON PROGRAMS</u></b>	<b>4,000</b>	<b>133</b>
<b>TOTAL PROGRAM COST -- ALTERNATIVE 3I</b>	<b>14,844</b>	<b>945</b>
<b>RANGE</b>		
LOW (-10%)	13,359	851
HIGH (+15%)	17,070	1,087

## ALTERNATIVE COST SUMMARY

<u>CALFED</u> <u>ALTERNATIVE</u>	<u>STORAGE</u>		<u>DELTA CONVEYANCE</u>		<u>COMMON PROGRAMS</u>		<u>TOTAL</u> <u>CAPITAL COST</u>	<u>TOTAL</u> <u>ANNUAL COST</u> (Includes Capital Repayment, Energy Cost, and O&M)
	CAPITAL COST	ANNUAL COST	CAPITAL COST	ANNUAL COST	CAPITAL COST	ANNUAL COST		
	(\$ Million)	(\$ Million)	(\$ Million)	(\$ Million)	(\$ Million)	(\$ Million)		
<b>1A</b>					\$4,000	\$133	<b>\$4,000</b>	<b>\$133</b>
<b>1B</b>			\$430	\$32	\$4,000	\$133	<b>\$4,430</b>	<b>\$165</b>
<b>1C</b>	\$4,383	\$329	\$482	\$36	\$4,000	\$133	<b>\$8,865</b>	<b>\$498</b>
<b>2A</b>			\$1,413	\$106	\$4,000	\$133	<b>\$5,413</b>	<b>\$239</b>
<b>2B</b>	\$6,036	\$452	\$1,413	\$106	\$4,000	\$133	<b>\$11,449</b>	<b>\$691</b>
<b>2D</b>	\$2,647	\$198	\$1,899	\$142	\$4,000	\$133	<b>\$8,546</b>	<b>\$473</b>
<b>2E</b>	\$6,036	\$452	\$1,271	\$95	\$4,000	\$133	<b>\$11,307</b>	<b>\$681</b>
<b>3A</b>			\$1,905	\$143	\$4,000	\$133	<b>\$5,905</b>	<b>\$276</b>
<b>3B</b>	\$7,179	\$538	\$1,905	\$143	\$4,000	\$133	<b>\$13,084</b>	<b>\$814</b>
<b>3E</b>	\$7,179	\$538	\$2,401	\$180	\$4,000	\$133	<b>\$13,580</b>	<b>\$851</b>
<b>3H</b>	\$6,036	\$452	\$2,375	\$178	\$4,000	\$133	<b>\$12,411</b>	<b>\$763</b>
<b>3I</b>	\$6,304	\$473	\$4,540	\$340	\$4,000	\$133	<b>\$14,844</b>	<b>\$945</b>

TABLE G