



APPENDIX I

Full-Scale Cost Estimates

Bay Area Regional Desalination Project
Alternative No. 1

Capital Costs						\$168,500,000
1. Sitework						\$4,200,000
2. Intake and Raw Water Pump Station						\$3,100,000
3. Brine Disposal						\$1,100,000
4. MF/UF Facilities						\$18,300,000
5. Filtrate Tanks						\$1,100,000
6. RO Facilities						\$44,100,000
7. Permeate Tank						\$500,000
8. Clearwells						\$1,900,000
9. High Service Pumping Station						\$4,400,000
10. Neutralization Tanks						\$400,000
11. Chemical Building A						\$1,900,000
12. Chemical Building B						\$2,300,000
13. Solids Handling Facilities						\$9,900,000
14. Pile Foundations						\$3,100,000
15. Transmission Main						\$7,800,000
16. Site Electrical Systems						\$5,200,000
Subtotal						\$109,300,000
Contingencies			20%			\$21,900,000
Planning, Permitting, Engineering & Administrative Costs			25%			\$32,800,000
Land Acquisition						\$3,500,000
Concentrate Discharge Permit & Connection Fee						\$1,000,000
Annual Costs						\$10,450,000
1. Power Requirements						\$5,400,000
a. Raw Water Pumping	6,300,000	kWh/yr	\$0.10	\$/kWh		\$630,000
c. RO High Pressure Pumps	28,100,000	kWh/yr		\$/kWh		\$2,810,000
d. Finished Water Pumping	19,100,000	kWh/yr		\$/kWh		\$1,910,000
e. Centrifuge	79,000	kWh/yr		\$/kWh		\$7,900
2. Chemical Costs						\$1,400,000
a. Sodium Hypochlorite (12.5% soln)	450,000	gallons/yr	\$1.00	\$/gal		\$450,000
b. Aqueous Ammonia (19%)	699,500	lbs/year	\$300.00	\$/liquid ton		\$104,925
c. Citric Acid (dry)	17,200	lbs/year	\$1.00	\$/lbs		\$17,200
d. Caustic Soda (30% soln)	33,600	lbs/year	\$700.00	\$/liquid ton		\$11,760
e. Ferric Chloride (dry)	380,500	lbs/year	\$0.40	\$/lbs		\$152,200
f. Antiscalant (100% soln)	10,500	gallons/yr	\$10.00	\$/gal		\$105,000
g. Sodium Bisulfite (38%)	67,000	lbs/year	\$0.58	\$/lbs		\$38,592
h. Fluorosilicic Acid (24% soln)	197,500	lbs/year	\$760.00	\$/liquid ton		\$75,050
i. Polymer (dry)	13,700	lbs/year	\$1.50	\$/lbs		\$20,550
j. Lime	1,500	tons/yr	\$170.00	\$/ton		\$255,000
k. Carbon Dioxide	800	tons/yr	\$100.00	\$/ton		\$80,000
3. Equipment Replacement Cost						\$1,400,000
a. Feed Water Screens	10	years	\$138,000	\$/replacement		\$13,800
b. Feed Water Microscreens	10	years	\$26,000	\$/replacement		\$31,200
c. UF Modules	7	years	\$3,600	\$/replacement		\$617,143
d. Cartridge Filters	0.25	years	\$30	\$/replacement		\$169,920
e. RO BW Modules	5	years	\$600	\$/replacement		\$302,400
f. RO SW Modules	5	years	\$1,050	\$/replacement		\$264,600
4. Staffing Costs						\$900,000
a. Operators	1.5	people	112.5	\$/hr/person		\$351,000
b. Technicians	1.5	people	87.5	\$/hr/person		\$273,000
c. Maintenance	1.5	people	75	\$/hr/person		\$234,000
d. Administrative	0.5	people	50	\$/hr/person		\$52,000
5. Outside Services						\$1,350,000
a. Hauling costs	9,900	tons (wet)	45	\$/ton		\$445,500
b. Landfill costs	9,900	tons (wet)	40	\$/ton		\$396,000
c. Concentrate disposal costs		LS				\$500,000
Present Worth of Annual Costs						\$204,900,000
Annual Worth of Capital Costs						\$8,600,000
Period	30	years				
Discount Rate	3	%				
Net Present Worth Factor	19.60		\$10,450,000			\$204,900,000
Net Annual Worth Factor	0.0510		\$168,500,000			\$8,600,000
TOTAL PRESENT WORTH VALUE (Annual + Capital Costs)						\$373,400,000
TOTAL ANNUAL WORTH VALUE (Annual + Capital Costs)						\$19,050,000
Net Present Worth per acre-foot						\$550
Unit Cost of Water, based on Annual Worth (Year 1), per acre-foot						\$840
Water produced (acre-feet)						680,000

**BAY AREA REGIONAL DESALINATION PLANT
(BARDP)**

PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COSTS

**BASED ON
CONCEPTUAL DESIGN STUDY
FOR
ALTERNATIVE NO. 1**

owner:
EBMUD, CCWD, SCVWD, SFPUC

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**BAY AREA REGIONAL DESALINATION PLANT
(BARDP)**

PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COSTS

**BASED ON
CONCEPTUAL DESIGN STUDY
FOR
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**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1
BASIS OF ESTIMATE**

1.0 Outline

1.1 The preliminary construction cost estimate, which represents our opinion of probable construction cost, is comprised of the following integral parts:

- a) Preamble
- b) Estimate Summary
- c) Estimate Details

Please see "Table of Contents" for further details.

1.2 The preparation of this estimate is based on the following:

- a) Draft Alternative 1 Design Criteria dated 9-17-2009 by MWH
- b) Revised Conceptual Site Plan prepared by MWH received on 10-13-2009
- c) Various supplemental preliminary information via emails from MWH's project manager/designer
- d) Clarifications with designers.

Based on a total site area of 8.2 acres, 300 ft long 54" in-take pipe and 3 miles long 30" dia transmission pipeline off site.

Note: The following buildings are no longer part of the program for the scope of this estimate: Operations Building, Maintenance Building and Microscreen Building.

2.0 Assumptions & Qualifications

2.1 The estimate specifically excludes the following items:

- a) Land acquisition or ROW costs
- b) Hazmat abatement, if any
- c) Legal fees and finance costs
- d) Permit & plan check fees
- e) Utility connection fees
- f) Owner's administration costs
- g) Design services
- h) Survey services, materials lab
- i) Project/Construction management
- j) Change orders during construction
- k) Cost escalation beyond the date of this estimate.
- l) Design & Estimate Contingency (to be carried separately)
- m) Construction Contingency

**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
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CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1
BASIS OF ESTIMATE**

It is assumed that the above items, if needed, are included elsewhere in the owner's overall project budget.

2.2 The estimate is based on the following assumptions:

All work will be done during regular working hours. Assumed no overtime work is required.

Unit costs are based on prevailing rates.

The estimate is based on estimated prices, current as of September 2009, with a minimum of four responsible and responsive bids under a competitive bidding environment for a fixed price lump sum contract.

Note: Experience indicates that fewer than four bidders may result in higher bids, and conversely more than four bidders may result in more competitive bids. Therefore it is important to obtain as many bids as possible.

Allowances have been used for items which are required but are currently undefined.

Assume all buildings and tanks are on pile foundations based on experience with subsurface conditions in this region.

The unit prices used in the direct cost estimate section are composite unit prices which include : costs for material, sales tax, labor, equipment and subcontractor's/supplier's mark-ups.

Cost Escalation

No cost escalation factor is included in the estimate. For the next two years, we recommend that an 4% escalation per year to mid-point of construction be included as a separate line item in the total project cost.

2.3 The following is a list of some items that may affect the cost estimate:

- a) Modifications to the scope of work or assumptions included in this estimate
- b) Unforeseen sub-surface conditions such rock and hazardous material
- c) Special phasing requirements
- d) Restrictive technical specifications or excessive contract conditions
- e) Any specified item of equipment, material, or product that cannot be obtained from at least three different sources
- f) Any other non-competitive bid situations

**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
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BASIS OF ESTIMATE**

2.4 The estimate has been prepared using generally accepted practices and it represents our opinion of probable construction costs. It is intended to be a determination of fair market value for the project construction. It is not a prediction of low bid. Since we have no control over market conditions (such as surges in steel and cement prices) and other factors which may affect the bid prices, we cannot and do not warrant nor guarantee that bids or ultimate construction costs will not vary from the cost estimate.

2.5 Please note that the estimate has been prepared based on preliminary information and design assumptions which are subject to verifications and changes as the design progresses. An updated estimate should be prepared when more specific and detailed design information is available.

3.0 Abbreviations used in the estimate:

cy = cubic yard

ea = each

gsf = gross square foot

hr = hour

lb = pound

lf = linear foot

loc=location

ls = lump sum

sf = square foot

4.0 This is a Class 5 Conceptual Design Level Estimate according to AACE International Cost Estimate Classification.

**CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1
BASIS OF ESTIMATE
GRAND SUMMARY OF CONSTRUCTION**

ALL IN 2009 DOLLARS

Code	Item	Total Construction (Hardcost) Estimate \$
1	Sitework	4,200,000
2	Intake and Raw Water Pump Station	3,100,000
3	Brine Disposal	1,100,000
4	MF/UF Facilities	18,300,000
5	Filtrate Tanks	1,100,000
6	RO Facilities	44,100,000
7	Permeate Tank	500,000
8	Clearwells	1,900,000
9	High Service Pumping Station	4,400,000
10	Neutralization Tanks	400,000
11	Chemical Building A	1,900,000
12	Chemical Building B	2,300,000
13	Solids Handling Facilities	9,900,000
14	Pile Foundation	3,100,000
15	30" Transmission Mains	7,800,000
16	Site Electrical Systems	5,200,000
TOTAL		109,300,000

Please read the attached "Preamble" and 'Estimate Details' for assumptions, exclusions, qualifications and scope of work

**CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1
BASIS OF ESTIMATE
ESTIMATE SUMMARY**

ALL IN 2009 DOLLARS

Code	Direct Cost Estimate per Attached Detail	(Gen Condition)	Bonds & Insurance	G.C.'s OH&P	Total Construction (Hardcost) Estimate	
		5% A*10%	2% (A+B)*2%	5% (A+B+C)*	Total A to D	Rounded-off
	A	B	C	D	F	
1 Sitework	3,730,348	186,517	78,337	199,760	4,194,962	4,200,000
2 Intake and Raw Water Pump Station	2,760,782	138,039	57,976	147,840	3,104,637	3,100,000
3 Brine Disposal	1,000,000	50,000	21,000	53,550	1,124,550	1,100,000
4 MF/UF Facilities	16,282,000	814,100	341,922	871,901	18,309,923	18,300,000
5 Filtrate Tanks	960,000	48,000	20,160	51,408	1,079,568	1,100,000
6 RO Facilities	39,250,110	1,962,506	824,252	2,101,843	44,138,711	44,100,000
7 Permeate Tank	450,000	22,500	9,450	24,098	506,048	500,000
8 Clearwells	1,690,000	84,500	35,490	90,500	1,900,490	1,900,000
9 High Service Pumping Station	3,945,000	197,250	82,845	211,255	4,436,350	4,400,000
10 Neutralization Tanks	320,000	16,000	6,720	17,136	359,856	400,000
11 Chemical Building A	1,712,000	85,600	35,952	91,678	1,925,230	1,900,000
12 Chemical Building B	2,064,000	103,200	43,344	110,527	2,321,071	2,300,000
13 Solids Handling Facilities	8,833,000	441,650	185,493	473,007	9,933,150	9,900,000
14 Pile Foundation	2,729,000	136,450	57,309	146,138	3,068,897	3,100,000
15 30" Transmission Mains	6,969,600	348,480	146,362	373,222	7,837,664	7,800,000
16 Site Electrical Systems	4,643,565	232,178	97,515	248,663	5,221,921	5,200,000
TOTAL	97,339,405	4,866,970	2,044,127	5,212,526	109,463,028	\$109,300,000

Please read the attached "Preamble" and "Estimate Details" for assumptions, exclusions, qualifications and scope of work.

**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1
ESTIMATE DETAILS ALL IN 2009 DOLLARS**

Line #	Code	Item	Description of Work	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
1		A - SITEWORK		7.0	Acre			assume site is 750'x405' = 330,750 SF = 7.0 acres
2	1		Site clearance/misc. demo	304,920	SF	0.20	60,984	
3	1		Rough grading/fine grading	304,920	SF	0.25	76,230	
4	1		Building pad formation	84,975	SF	1.50	127,463	
5	1		Tank pad formation	59,912	SF	1.50	89,868	
6	1		Circulation paved roadway	65,893	SF	5.50	362,412	4" AC on 8" AB on 6" subbase
7	1		Other paved area/gravel area	146,220	SF	3.00	438,660	
8	1		Site fencing	2,540	LF	20.00	50,800	
9	1		Entry control	1	LS	100,000.00	100,000	
10	1		Site security allowance	1	LS	250,000.00	250,000	
11	1		Landscaping allowance	1	LS	150,000.00	150,000	
12	1		Site parking allowance	1	LS	100,000.00	100,000	
13								
14			Site utilities allowances:					
15	1		Storm drainage	212,113	SF	1.60	339,381	area outside buildings & tanks
16	1		Sanitary sewer	1	LS	200,000.00	200,000	
17	1		Site Electrical					
18	16		Substation	1	LS	800,000.00	800,000	
19	16		Electrical/telecom	1	LS	3,475,000.00	3,475,000	
20	16		Site lighting	212,113	SF	1.25	265,141	
21	16		Concrete pad for substation	6,912	SF	12.00	82,944	
22	16		Fencing/enclosure for substation	256	LF	80.00	20,480	
23	1		Pad for CO2	2,400	SF	18.00	43,200	
24								
25								
26			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				7,032,563	
27								
28								
29			B1 - BUILDINGS (EXCLUDING PILES)					CMU bldgs
30			Costs for foundation, structure, architecture, building M&E only.					All building to be on pile
31			Piles for Buildings and equipment inside buildings with a separate section.					

**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1
ESTIMATE DETAILS ALL IN 2009 DOLLARS**

Line #	Code	Item	Description of Work	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
32								
33	2		Raw Water Pump Station	4,500	GSF	200.00	900,000	
34	13		Solids Building	2,400	GSF	200.00	480,000	
35			Microscreen Building		None			
36			Maintenance Shop		None			
37	13		not used		GSF	200.00		
38	4		MF/UF Building	12,000	GSF	180.00	2,160,000	
39	11		Chemical Building A	4,900	GSF	200.00	980,000	
40	12		Chemical Building B	4,800	GSF	200.00	960,000	
41	6		RO Building	30,625	GSF	180.00	5,512,500	
42			Operation Building, 2-story		None			
43	9		High Service Pump Station	9,000	GSF	200.00	1,800,000	
44								
45								
46			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				12,792,500	
47								
48								
29			B2 - BUILDINGS - PILES ONLY					CMU bldgs
32								
33	14		Raw Water Pump Station	4,500	GSF	40.00	180,000	
34	14		Solids Building	2,400	GSF	40.00	96,000	
35	14		Microscreen Building		None			
36			None	None	None			
37	14		not used		GSF	40.00		
38	14		MF/UF Building	12,000	GSF	40.00	480,000	
39	14		Chemical Building A	4,900	GSF	40.00	196,000	
40	14		Chemical Building B	4,800	GSF	40.00	192,000	
41	14		RO Building	30,625	GSF	40.00	1,225,000	
42			Operation Building, 2-story		None			
43	14		High Service Pump Station	9,000	GSF	40.00	360,000	
44								
45								
46			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				2,729,000	
47								

**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1
ESTIMATE DETAILS ALL IN 2009 DOLLARS**

Line #	Code	Item	Description of Work	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
48								
49		C: TANKS						All tanks to be on piles
50	13		Thickener, 80' dia, RC construction	2	EA	2,000,000.00	4,000,000	
51	10		Neutralization tank	2	EA	160,000.00	320,000	
52	5		Filtration Tank	2	EA	480,000.00	960,000	
53	8		Clearwell	1	EA	1,440,000.00	1,440,000	
54	7		Permeate Tank	1	EA	450,000.00	450,000	
55	8		Concrete vaults	1	EA	250,000.00	250,000	
56	12		CO2 plant/storage	1	EA	400,000.00	400,000	
57								
58								
59			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				7,820,000	
60								
61								
62		D-EQUIPMENT						Unit cost include 10% for electrical & instrumentation
63								
64			Material cost, FOB jobsite					Includes 9.25% sales tax
65	4		UF Membrane System	1	EA	8,805,600.00	8,805,600	per Layne Christensen Company
66	6		RO equipment	1	EA	24,300,000.00	24,300,000	per Biwater AEW
67	2		Wedge wire screen intake	1	EA	100,292.00	100,292	per Johnson Screens
68	4		Miscroscreen equipment	4	EA	305,900.00	1,223,600	per Amiad Filtration System
69	6		Cartridge filters	10	EA	29,716.00	297,160	per Parker Process Advanced Filtration
70			Sales tax @ 9.25%					with above
71			Installation cost for the above equipment					
72	4		UF Membrane System	1	EA	2,640,000.00	2,640,000	
73	6		RO equipment	1	EA	7,290,000.00	7,290,000	
74	2		Wedge wire screen intake	1	EA	50,490.00	50,490	
75	4		Miscroscreen equipment	4	EA	123,200.00	492,800	
76	6		Cartridge filters	26	EA	10,450.00	271,700	
77								
78			Other system					
79			Solid handling system					
80	13		Thickening	2	EA	990,000.00	1,980,000	
81	13		Sludge pump system	2	EA	550,000.00	1,100,000	

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CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
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ESTIMATE DETAILS ALL IN 2009 DOLLARS**

Line #	Code	Item	Description of Work	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
82	13		Centrifuge dewatering system	2	EA	485,000.00	970,000	per Andritz
83			Chemical system					
84	11		Sodium bisulfite	1	LS	85,000.00	85,000	
85	11		Ferric Chloride system	1	LS	85,000.00	85,000	
86	11		Antiscalant system	1	LS	85,000.00	85,000	
87	11		Polymer	1	LS	85,000.00	85,000	
88	12		Aqua Ammonia	1	LS	85,000.00	85,000	
89	12		Sodium Hypochlorite	1	LS	85,000.00	85,000	
90	12		Fluorosilicic Acid	1	LS	85,000.00	85,000	
91	12		Lime	1	LS	55,000.00	55,000	
92	12		Carbon Dioxide	1	LS	10,000.00	10,000	
93								
94			Pumps					
95	2		Raw water pumps	3	EA	330,000.00	990,000	
96	6		Booster pump	3	EA	220,000.00	660,000	located in RO Bldg
97	9		Finish water pump	3	EA	165,000.00	495,000	
98	13		Sludge pump	3	EA	55,000.00	165,000	
99	2		VFD for raw water pumps	3	EA	165,000.00	495,000	
100	13		VFD for sludge pump	3	EA	6,000.00	18,000	
101	9		VFD for high service pump	3	EA	250,000.00	750,000	
102								
103			Electrical & instrumentation for equipment			Included above		
104								
105								
106			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				53,754,642	
107								
108								
109			E-INSIDE BUILDING PIPING					
110			Piping, fitting & valves for equipment inside buildings (not building mechanical or plumbing)					
111	2		Raw Water Pump Station	4,500	GSF	50.00	225,000	
112	13		Solids Building	2,400	GSF	50.00	120,000	
113			Microscreen Building		None			
114			Maintenance Shop		None			
115	13		not used		GSF	60.00		

**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1
ESTIMATE DETAILS ALL IN 2009 DOLLARS**

Line #	Code	Item	Description of Work	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
116	4		MF/UF Building	12,000	GSF	80.00	960,000	
117	11		Chemical Building A	4,900	GSF	80.00	392,000	
118	12		Chemical Building B	4,800	GSF	80.00	384,000	
119	6		RO Building	30,625	GSF	30.00	918,750	
120			Operation Building, 2-story		None			
121	9		High Service Pump Station	9,000	GSF	100.00	900,000	
122								
123								
124			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				3,899,750	
125								
126								
127			F-YARD PIPING					
128			Piping, fitting & valves for equipment at Yard					Welded steel, motored lined & coated
129	1		12"	570	LF	290.00	165,300	
130	1		36"	920	LF	560.00	515,200	
131	1		42"	310	LF	660.00	204,600	
132	1		54"	260	LF	1,410.00	366,600	
133								
134			Add trenching					
135	1		12"	570	LF	17.00	9,690	
136	1		36"	920	LF	46.00	42,320	
137	1		42"	310	LF	56.00	17,360	
138	1		54"	260	LF	78.00	20,280	
139								
140								
141			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				1,341,350	
142								
143								
144			G: Off-Site Transmission Pipeline (3 miles)					Extend 3 miles = 15840 LF
145			Piping, fitting & valves for equipment at Yard					
146	15		30" pipe	15,840	LF	350.00	5,544,000	
147	15		Trenching	15,840	LF	40.00	633,600	
148	15		Restore disturbed paving/Crossing/Misc	15,840	LF	50.00	792,000	
149								

**BAY AREA REGIONAL DESALINATION PLANT
 CONTRA COSTA SITE
 PRELIMINARY CONSTRUCTION COST OPINION BASED ON
 CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 1
 ESTIMATE DETAILS ALL IN 2009 DOLLARS**

Line #	Code	Item	Description of Work	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
150								
151			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				6,969,600	
152								
153								
154	3		Brine Disposal	1	LS	1,000,000.00	1,000,000	

Alternative No. 1 Power Calculations

Non-RO Power Costs

Annual		365		Raw Water Pumps			Finished Water Pumps			Centrifuge ¹	
Efficiency	Pressure	Flow	Power	Pressure	Flow	Power	motor	Power	HP	kWh/yr	
%	psi	gpm	kWh/yr	psi	MG/yr	kWh/yr					
68%	57	19,646	6,300,000	240	7,421	19,100,000	100	79,000			

¹Centrifuge runs 4 hrs per day, 22 days per month, 12 months per year

Conversion factors
 2.31 head (ft) / psi
 3956 gpm*ft / hp
 0.7457 kW / hp

0.84 energy factor for future recovery system

RO Power Costs

January		31		RO Feed Pumps			
Specific	RO Feed	Pressure	Permeate	High			
Energy ¹	Flow	Pump	Flow	Power			
kWh/kgal	gpm	kWh/mo	MG /mo				
3.54	17,288	2,800,000	617				

May		31		RO Feed Pumps			
Specific	RO Feed	Pressure	Permeate	High			
Energy ¹	Flow	Pump	Flow	Power			
kWh/kgal	gpm	kWh/mo	MG /mo				
2.34	17,288	1,900,000	641				

September		30		RO Feed Pumps			
Specific	RO Feed	Pressure	Permeate	High			
Energy ¹	Flow	Pump	Flow	Power			
kWh/kgal	gpm	kWh/mo	MG /mo				
3.276	17,288	2,500,000	605				

February		28		RO Feed Pumps			
Specific	RO Feed	Pressure	Permeate	High			
Energy ¹	Flow	Pump	Flow	Power			
kWh/kgal	gpm	kWh/mo	MG /mo				
3.024	17,288	2,200,000	572				

June		30		RO Feed Pumps			
Specific	RO Feed	Pressure	Permeate	High			
Energy ¹	Flow	Pump	Flow	Power			
kWh/kgal	gpm	kWh/mo	MG /mo				
2.44	17,288	1,900,000	620				

October		31		RO Feed Pumps			
Specific	RO Feed	Pressure	Permeate	High			
Energy ¹	Flow	Pump	Flow	Power			
kWh/kgal	gpm	kWh/mo	MG /mo				
3.2592	17,288	2,600,000	633				

March		31		RO Feed Pumps			
Specific	RO Feed	Pressure	Permeate	High			
Energy ¹	Flow	Pump	Flow	Power			
kWh/kgal	gpm	kWh/mo	MG /mo				
2.5872	17,288	2,000,000	633				

July		31		RO Feed Pumps			
Specific	RO Feed	Pressure	Permeate	High			
Energy ¹	Flow	Pump	Flow	Power			
kWh/kgal	gpm	kWh/mo	MG /mo				
2.478	17,288	2,000,000	641				

November		30		RO Feed Pumps			
Specific	RO Feed	Pressure	Permeate	High			
Energy ¹	Flow	Pump	Flow	Power			
kWh/kgal	gpm	kWh/mo	MG /mo				
3.696	17,288	2,800,000	605				

April		30		RO Feed Pumps			
Specific	RO Feed	Pressure	Permeate	High			
Energy ¹	Flow	Pump	Flow	Power			
kWh/kgal	gpm	kWh/mo	MG /mo				
2.5284	17,288	1,900,000	612				

August		31		RO Feed Pumps			
Specific	RO Feed	Pressure	Permeate	High			
Energy ¹	Flow	Pump	Flow	Power			
kWh/kgal	gpm	kWh/mo	MG /mo				
3.024	17,288	2,400,000	625				

December		31		RO Feed Pumps			
Specific	RO Feed	Pressure	Permeate	High			
Energy ¹	Flow	Pump	Flow	Power			
kWh/kgal	gpm	kWh/mo	MG /mo				
3.9144	17,288	3,100,000	617				

28,100,000 kWh/year
 7,421 MG/year (permeate)
 20.330171 MG/day (permeate)

Bay Area Regional Desalination Project
Alternative No. 2

Capital Costs						\$181,000,000
1. Sitework						\$4,200,000
2. Intake and Raw Water Pump Station						\$3,100,000
3. Brine Disposal						\$1,100,000
4. MF/UF Facilities						\$18,300,000
5. Filtrate Tanks						\$1,100,000
6. RO Facilities						\$51,300,000
7. Permeate Tank						\$500,000
8. Clearwells						\$1,800,000
9. High Service Pumping Station						\$4,400,000
10. Neutralization Tanks						\$400,000
11. Chemical Building A						\$1,900,000
12. Chemical Building B						\$2,300,000
13. Solids Handling Facilities						\$10,600,000
14. Pile Foundations						\$3,300,000
15. Transmission Main						\$7,800,000
16. Site Electrical Systems						\$5,600,000
Subtotal						\$117,700,000
Contingencies				20%		\$23,500,000
Planning, Permitting, Engineering & Administrative Costs				25%		\$35,300,000
Land Acquisition						\$3,500,000
Concentrate Discharge Permit & Connection Fee						\$1,000,000
Annual Costs						\$13,150,000
1. Power Requirements						\$7,900,000
a. Raw Water Pumps	6,300,000	kWh/yr	\$0.10	\$/kWh	\$630,000	
b. RO High Pressure Pumps	53,400,000	kWh/yr		\$/kWh	\$5,340,000	
c. Finished Water Pumps	18,500,000	kWh/yr		\$/kWh	\$1,850,000	
d. Centrifuge	79,000	kWh/yr		\$/kWh	\$7,900	
2. Chemical Costs						\$1,300,000
a. Sodium Hypochlorite (12.5% soln)	424,000	gallons/yr	\$1.00	\$/gal	\$424,000	
b. Aqueous Ammonia (19%)	720,000	lbs/year	\$300.00	\$/liquid ton	\$108,000	
c. Citric Acid (dry)	25,800	lbs/year	\$1.00	\$/lbs	\$25,800	
d. Caustic Soda (30% soln)	33,600	lbs/year	\$700.00	\$/liquid ton	\$11,760	
e. Ferric Chloride (dry)	420,000	lbs/year	\$0.40	\$/lbs	\$168,000	
f. Antiscalant (100% soln)	10,000	gallons/yr	\$10.00	\$/gal	\$100,000	
g. Sodium Bisulfite (38%)	67,000	lbs/year	\$0.58	\$/lbs	\$38,592	
h. Fluorosilicic Acid (24% soln)	189,300	lbs/year	\$760.00	\$/liquid ton	\$71,934	
i. Polymer (dry)	13,700	lbs/year	\$1.50	\$/lbs	\$20,550	
j. Lime	1,400	tons/yr	\$170.00	\$/ton	\$238,000	
k. Carbon Dioxide	800	tons/yr	\$100.00	\$/ton	\$80,000	
3. Equipment Replacement Cost						\$1,700,000
a. Feed Water Screens	10	years	\$138,000	\$/replacement	\$13,800	
b. Feed Water Microscreens	10	years	\$26,303	\$/replacement	\$31,563	
c. UF Modules	7	years	\$3,600	\$/replacement	\$617,143	
d. Cartridge Filters	0.25	years	\$27	\$/replacement	\$272,160	
e. NF Modules	5	years	\$600	\$/replacement	\$288,120	
f. SW Modules	5	years	\$1,050	\$/replacement	\$432,180	
4. Staffing Costs						\$900,000
a. Operators	1.5	people	112.5	\$/hr/person	\$351,000	
b. Technicians	1.5	people	87.5	\$/hr/person	\$273,000	
c. Maintenance	1.5	people	75	\$/hr/person	\$234,000	
d. Administrative	0.5	people	50	\$/hr/person	\$52,000	
5. Outside Services						\$1,350,000
a. Hauling costs	9,900	tons (wet)	45	\$/ton	\$445,500	
b. Landfill costs	9,900	tons (wet)	40	\$/ton	\$396,000	
c. Concentrate disposal costs		LS			\$500,000	
Present Worth of Annual Costs						\$257,800,000
Annual Worth of Capital Costs						\$9,300,000
Period	30	years				
Discount Rate	3	%				
Net Present Worth Factor	19.60		\$13,150,000		\$257,800,000	
Net Annual Worth Factor	0.0510		\$181,000,000		\$9,300,000	
TOTAL PRESENT WORTH VALUE (Annual + Capital Costs)						\$438,800,000
TOTAL ANNUAL WORTH VALUE (Annual + Capital Costs)						\$22,450,000
Net Present Worth, per acre-foot						\$660
Unit Cost of Water, based on Annual Worth (Year 1), per acre-foot						\$1,010
Water produced (acre-feet)						664,000

**BAY AREA REGIONAL DESALINATION PLANT
(BARDP)**

PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COSTS

**BASED ON
CONCEPTUAL DESIGN STUDY
FOR
ALTERNATIVE NO. 2**

owner:
EBMUD, CCWD, SCVWD, SFPUC

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**BAY AREA REGIONAL DESALINATION PLANT
(BARDP)**

PRELIMINARY OPINION OF PROBABLE CONSTRUCTION COSTS

**BASED ON
CONCEPTUAL DESIGN STUDY
FOR
ALTERNATIVE NO. 2**

Table of Contents

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Estimate Summary by Components/Buildings	7
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**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2
BASIS OF ESTIMATE**

1.0 Outline

1.1 The preliminary construction cost estimate, which represents our opinion of probable construction cost, is comprised of the following integral parts:

- a) Preamble
- b) Estimate Summary
- c) Estimate Details

Please see "Table of Contents" for further details.

1.2 The preparation of this estimate is based on the following:

- a) Draft Alternative 1 Design Criteria dated 9-17-2009 by MWH
- b) Revised Conceptual Site Plan prepared by MWH received on 10-13-2009
- c) Various supplemental preliminary information via emails from MWH's project manager/designer
- d) Clarifications with designers.

Based on a total site area of 8.2 acres, 300 ft long 54" in-take pipe and 3 miles long 30" dia transmission pipeline off site.

Note: The following buildings are no longer part of the program for the scope of this estimate: Operations Building, Maintenance Building and Microscreen Building.

2.0 Assumptions & Qualifications

2.1 The estimate specifically excludes the following items:

- a) Land acquisition or ROW costs
- b) Hazmat abatement, if any
- c) Legal fees and finance costs
- d) Permit & plan check fees
- e) Utility connection fees
- f) Owner's administration costs
- g) Design services
- h) Survey services, materials lab
- i) Project/Construction management
- j) Change orders during construction
- k) Cost escalation beyond the date of this estimate.
- l) Design & Estimate Contingency (to be carried separately)
- m) Construction Contingency

**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2
BASIS OF ESTIMATE**

It is assumed that the above items, if needed, are included elsewhere in the owner's overall project budget.

2.2 The estimate is based on the following assumptions:

All work will be done during regular working hours. Assumed no overtime work is required.

Unit costs are based on prevailing rates.

The estimate is based on estimated prices, current as of September 2009, with a minimum of four responsible and responsive bids under a competitive bidding environment for a fixed price lump sum contract.

Note: Experience indicates that fewer than four bidders may result in higher bids, and conversely more than four bidders may result in more competitive bids. Therefore it is important to obtain as many bids as possible.

Allowances have been used for items which are required but are currently undefined.

Assume all buildings and tanks are on pile foundations based on experience with subsurface conditions in this region.

The unit prices used in the direct cost estimate section are composite unit prices which include : costs for material, sales tax, labor, equipment and subcontractor's/supplier's mark-ups.

Cost Escalation

No cost escalation factor is included in the estimate. For the next two years, we recommend that an 4% escalation per year to mid-point of construction be included as a separate line item in the total project cost.

2.3 The following is a list of some items that may affect the cost estimate:

- a) Modifications to the scope of work or assumptions included in this estimate
- b) Unforeseen sub-surface conditions such rock and hazardous material
- c) Special phasing requirements
- d) Restrictive technical specifications or excessive contract conditions
- e) Any specified item of equipment, material, or product that cannot be obtained from at least three different sources
- f) Any other non-competitive bid situations

**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2
BASIS OF ESTIMATE**

2.4 The estimate has been prepared using generally accepted practices and it represents our opinion of probable construction costs. It is intended to be a determination of fair market value for the project construction. It is not a prediction of low bid. Since we have no control over market conditions (such as surges in steel and cement prices) and other factors which may affect the bid prices, we cannot and do not warrant nor guarantee that bids or ultimate construction costs will not vary from the cost estimate.

2.5 Please note that the estimate has been prepared based on preliminary information and design assumptions which are subject to verifications and changes as the design progresses. An updated estimate should be prepared when more specific and detailed design information is available.

3.0 Abbreviations used in the estimate:

cy = cubic yard

ea = each

gsf = gross square foot

hr = hour

lb = pound

lf = linear foot

loc=location

ls = lump sum

sf = square foot

4.0 This is a Class 5 Conceptual Design Level Estimate according to AACE International Cost Estimate Classification.

**CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2
BASIS OF ESTIMATE
GRAND SUMMARY OF CONSTRUCTION**

ALL IN 2009 DOLLARS

Code	Item	Total Construction (Hardcost) Estimate \$
1	Sitework	4,200,000
2	Intake and Raw Water Pump Station	3,100,000
3	Brine Disposal	1,100,000
4	MF/UF Facilities	18,300,000
5	Filtrate Tanks	1,100,000
6	RO Facilities	51,300,000
7	Permeate Tank	500,000
8	Clearwells	1,800,000
9	High Service Pumping Station	4,400,000
10	Neutralization Tanks	400,000
11	Chemical Building A	1,900,000
12	Chemical Building B	2,300,000
13	Solids Handling Facilities	10,600,000
14	Pile Foundation	3,300,000
15	30" Transmission Mains	7,800,000
16	Site Electrical Systems	5,600,000
TOTAL		117,700,000

Please read the attached "Preamble" and 'Estimate Details" for assumptions, exclusions, qualifications and scope of work

**CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2
BASIS OF ESTIMATE
ESTIMATE SUMMARY**

ALL IN 2009 DOLLARS

Code	Direct Cost Estimate per Attached Detail	(Gen Condition)	Bonds & Insurance	G.C.'s OH&P	Total Construction (Hardcost) Estimate	
		5% A*10%	2% (A+B)*2%	5% (A+B+C)*	Total A to D	Rounded-off
	A	B	C	D	F	
1 Sitework	3,695,085	184,754	77,597	197,872	4,155,308	4,200,000
2 Intake and Raw Water Pump Station	2,760,782	138,039	57,976	147,840	3,104,637	3,100,000
3 Brine Disposal	1,000,000	50,000	21,000	53,550	1,124,550	1,100,000
4 MF/UF Facilities	16,282,000	814,100	341,922	871,901	18,309,923	18,300,000
5 Filtrate Tanks	960,000	48,000	20,160	51,408	1,079,568	1,100,000
6 RO Facilities	45,627,610	2,281,381	958,180	2,443,359	51,310,530	51,300,000
7 Permeate Tank	450,000	22,500	9,450	24,098	506,048	500,000
8 Clearwells	1,600,000	80,000	33,600	85,680	1,799,280	1,800,000
9 High Service Pumping Station	3,945,000	197,250	82,845	211,255	4,436,350	4,400,000
10 Neutralization Tanks	320,000	16,000	6,720	17,136	359,856	400,000
11 Chemical Building A	1,712,000	85,600	35,952	91,678	1,925,230	1,900,000
12 Chemical Building B	2,064,000	103,200	43,344	110,527	2,321,071	2,300,000
13 Solids Handling Facilities	9,457,000	472,850	198,597	506,422	10,634,869	10,600,000
14 Pile Foundation	2,975,000	148,750	62,475	159,311	3,345,536	3,300,000
15 30" Transmission Mains	6,969,600	348,480	146,362	373,222	7,837,664	7,800,000
16 Site Electrical Systems	4,965,347	248,267	104,272	265,894	5,583,780	5,600,000
TOTAL	104,783,424	5,239,171	2,200,452	5,611,153	117,834,200	\$117,700,000

Please read the attached "Preamble" and "Estimate Details" for assumptions, exclusions, qualifications and scope of work.

**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2
ESTIMATE DETAILS ALL IN 2009 DOLLARS**

Line #	Code	Item	Description of Work	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
1		A - SITEWORK		7.0	Acre			assume site is 750'x405' = 357,000 SF = 7.0 acres
2	1		Site clearance/misc. demo	304,920	SF	0.20	60,984	
3	1		Rough grading/fine grading	304,920	SF	0.25	76,230	
4	1		Building pad formation	96,350	SF	1.50	144,525	
5	1		Tank pad formation	59,912	SF	1.50	89,868	
6	1		Circulation paved roadway	65,893	SF	5.50	362,412	4" AC on 8" AB on 6" subbase
7	1		Other paved area/gravel area	134,845	SF	3.00	404,535	
8	1		Site fencing	2,540	LF	20.00	50,800	
9	1		Entry control	1	LS	100,000.00	100,000	
10	1		Site security allowance	1	LS	250,000.00	250,000	
11	1		Landscaping allowance	1	LS	150,000.00	150,000	
12	1		Site parking allowance	1	LS	100,000.00	100,000	
13								
14			Site utilities allowances:					
15	1		Storm drainage	200,738	SF	1.60	321,181	area outside buildings & tanks
16	1		Sanitary sewer	1	LS	200,000.00	200,000	
17	1		Site Electrical					
18	16		Substation	1	LS	800,000.00	800,000	
19	16		Electrical/telecom	1	LS	3,811,000.00	3,811,000	
20	16		Site lighting	200,738	SF	1.25	250,923	
21	16		Concrete pad for substation	6,912	SF	12.00	82,944	
22	16		Fencing/enclosure for substation	256	LF	80.00	20,480	
23	1		Pad for CO2	2,400	SF	18.00	43,200	
24								
25								
26			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				7,319,082	
27								
28								
29		B1 - BUILDINGS (EXCLUDING PILES)						CMU bldgs
30			Costs for foundation, structure, architecture, building M&E only.					All building to be on pile
31			Piles for Buildings and equipment inside buildings with a separate section.					

**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2
ESTIMATE DETAILS ALL IN 2009 DOLLARS**

Line #	Code	Item	Description of Work	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
32								
33	2		Raw Water Pump Station	4,500	GSF	200.00	900,000	
34	13		Solids Building	2,400	GSF	200.00	480,000	
35			Microscreen Building		None			
36			Maintenance Shop		None			
37	13		not used	2,400	GSF	200.00	480,000	
38	4		MF/UF Building	12,000	GSF	180.00	2,160,000	
39	11		Chemical Building A	4,900	GSF	200.00	980,000	
40	12		Chemical Building B	4,800	GSF	200.00	960,000	
41	6		RO Building	34,375	GSF	180.00	6,187,500	
42			Operation Building, 2-story		None			
43	9		High Service Pump Station	9,000	GSF	200.00	1,800,000	
44								
45								
46			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				13,947,500	
47								
48								
29			B2 - BUILDINGS - PILES ONLY					CMU bldgs
32								
33	14		Raw Water Pump Station	4,500	GSF	40.00	180,000	
34	14		Solids Building	2,400	GSF	40.00	96,000	
35	14		Microscreen Building		None			
36			Maintenance Shop	None	None			
37	14		not used	2,400	GSF	40.00	96,000	
38	14		MF/UF Building	12,000	GSF	40.00	480,000	
39	14		Chemical Building A	4,900	GSF	40.00	196,000	
40	14		Chemical Building B	4,800	GSF	40.00	192,000	
41	14		RO Building	34,375	GSF	40.00	1,375,000	
42			Operation Building, 2-story		None			
43	14		High Service Pump Station	9,000	GSF	40.00	360,000	
44								
45								
46			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				2,975,000	
47								

**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2
ESTIMATE DETAILS ALL IN 2009 DOLLARS**

Line #	Code	Item	Description of Work	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
48								
49		C: TANKS						All tanks to be on piles
50	13		Thickener, 80' dia, RC construction	2	EA	2,000,000.00	4,000,000	
51	10		Neutralization tank	2	EA	160,000.00	320,000	
52	5		Filtration Tank	2	EA	480,000.00	960,000	
53	8		Clearwell	1	EA	1,350,000.00	1,350,000	
54	7		Permeate Tank	1	EA	450,000.00	450,000	
55	8		Concrete vaults	1	EA	250,000.00	250,000	
56	12		CO2 plant/storage	1	EA	400,000.00	400,000	
57								
58								
59			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				7,730,000	
60								
61								
62		D-EQUIPMENT						Unit cost include 10% for electrical & instrumentation
63								
64			Material cost, FOB jobsite					Includes 9.25% sales tax
65	4		UF Membrane System	1	EA	8,805,600.00	8,805,600	per Layne Christensen Company
66	6		RO equipment	1	EA	28,600,000.00	28,600,000	per Biwater AEWI
67	2		Wedge wire screen intake	1	EA	100,292.00	100,292	per Johnson Screens
68	4		Miscroscreen equipment	4	EA	305,900.00	1,223,600	per Amiad Filtration System
69	6		Cartridge filters	10	EA	29,716.00	297,160	per Parker Process Advanced Filtration
70			Sales tax @ 9.25%		with above			
71			Installation cost for the above equipment					
72	4		UF Membrane System	1	EA	2,640,000.00	2,640,000	
73	6		RO equipment	1	EA	8,580,000.00	8,580,000	
74	2		Wedge wire screen intake	1	EA	50,490.00	50,490	
75	4		Miscroscreen equipment	4	EA	123,200.00	492,800	
76	6		Cartridge filters	26	EA	10,450.00	271,700	
77								
78			Other system					
79			Solid handling system					
80	13		Thickening	2	EA	990,000.00	1,980,000	
81	13		Sludge pump system	2	EA	550,000.00	1,100,000	

**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2
ESTIMATE DETAILS ALL IN 2009 DOLLARS**

Line #	Code	Item	Description of Work	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
82	13		Centrifuge dewatering system	2	EA	485,000.00	970,000	per Andritz
83			Chemical system					
84	11		Sodium bisulfite	1	LS	85,000.00	85,000	
85	11		Ferric Chloride system	1	LS	85,000.00	85,000	
86	11		Antiscalant system	1	LS	85,000.00	85,000	
87	11		Polymer	1	LS	85,000.00	85,000	
88	12		Aqua Ammonia	1	LS	85,000.00	85,000	
89	12		Sodium Hypochlorite	1	LS	85,000.00	85,000	
90	12		Fluorosilicic Acid	1	LS	85,000.00	85,000	
91	12		Lime	1	LS	55,000.00	55,000	
92	12		Carbon Dioxide	1	LS	10,000.00	10,000	
93								
94			Pumps					
95	2		Raw water pumps	3	EA	330,000.00	990,000	
96	6		Booster pump	3	EA	220,000.00	660,000	located in RO Bldg
97	9		Finish water pump	3	EA	165,000.00	495,000	
98	13		Sludge pump	3	EA	55,000.00	165,000	
99	2		VFD for raw water pumps	3	EA	165,000.00	495,000	
100	13		VFD for sludge pump	3	EA	6,000.00	18,000	
101	9		VFD for high service pump	3	EA	250,000.00	750,000	
102								
103			Electrical & instrumentation for equipment			Included above		
104								
105								
106			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				59,344,642	
107								
108								
109			E-INSIDE BUILDING PIPING					
110			Piping, fitting & valves for equipment inside buildings (not building mechanical or plumbing)					
111	2		Raw Water Pump Station	4,500	GSF	50.00	225,000	
112	13		Solids Building	2,400	GSF	50.00	120,000	
113			Microscreen Building		None			
114			Maintenance Shop		None			
115	13		not used	2,400	GSF	60.00	144,000	

**BAY AREA REGIONAL DESALINATION PLANT
CONTRA COSTA SITE
PRELIMINARY CONSTRUCTION COST OPINION BASED ON
CONCEPTUAL DESIGN STUDY - ALTERNATIVE NO. 2
ESTIMATE DETAILS ALL IN 2009 DOLLARS**

Line #	Code	Item	Description of Work	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
116	4		MF/UF Building	12,000	GSF	80.00	960,000	
117	11		Chemical Building A	4,900	GSF	80.00	392,000	
118	12		Chemical Building B	4,800	GSF	80.00	384,000	
119	6		RO Building	34,375	GSF	30.00	1,031,250	
120			Operation Building, 2-story		None			
121	9		High Service Pump Station	9,000	GSF	100.00	900,000	
122								
123								
124			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				4,156,250	
125								
126								
127			F-YARD PIPING					
128			Piping, fitting & valves for equipment at Yard					Welded steel, motored lined & coated
129	1		12"	570	LF	290.00	165,300	
130	1		36"	920	LF	560.00	515,200	
131	1		42"	310	LF	660.00	204,600	
132	1		54"	260	LF	1,410.00	366,600	
133								
134			Add trenching					
135	1		12"	570	LF	17.00	9,690	
136	1		36"	920	LF	46.00	42,320	
137	1		42"	310	LF	56.00	17,360	
138	1		54"	260	LF	78.00	20,280	
139								
140								
141			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				1,341,350	
142								
143								
144			G: Off-Site Transmission Pipeline (3 miles)					Extend 3 miles = 15840 LF
145			Piping, fitting & valves for equipment at Yard					
146	15		30" pipe	15,840	LF	350.00	5,544,000	
147	15		Trenching	15,840	LF	40.00	633,600	
148	15		Restore disturbed paving/Crossing/Misc	15,840	LF	50.00	792,000	
149								

**BAY AREA REGIONAL DESALINATION PLANT
 CONTRA COSTA SITE
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 ESTIMATE DETAILS ALL IN 2009 DOLLARS**

Line #	Code	Item	Description of Work	Quantity	Unit	Unit Cost \$ Total	Direct Cost Total \$	Remarks/Assumptions
150								
151			Total before Mobilization, Bonds, Insurance, OH&P, Contingencies				6,969,600	
152								
153								
154	3		Brine Disposal	1	LS	1,000,000.00	1,000,000	
153								

BARDP Alternative No. 2 Power Calculations

Non-RO Power Costs

Annual	365							
Efficiency %	Raw Water Pumps			Finished Water Pumps			Centrifuge ¹	
	Pressure psi	Flow gpm	Power kWh/yr	Pressure psi	Flow MG/yr	Power kWh/yr	motor HP	Power kWh/yr
68%	57	19,646	6,300,000	240	7,217	18,500,000	100	79,000

Conversion factors

2.31	head (ft) / psi
3956	gpm*ft / hp
0.7457	kW / hp

¹Centrifuge runs 4 hrs per day, 22 days per month, 12 months per year

0.8 energy factor for future recovery system

RO Power Costs

January		31						
NF Feed Pumps			SW Feed Pumps				Permeate Flow	
Specific Energy	NF Feed Flow	High Pressure Pump Power	Specific Energy	Specific w/energy recovery	SW Feed Flow	High Pressure Pump Power		
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month	
2.6	17,292	2,100,000	9.16	7.328	7,778	3,200,000	632.71	

July		31						
NF Feed Pumps			SW Feed Pumps				Permeate Flow	
Specific Energy	NF Feed Flow	High Pressure Pump Power	Specific Energy	Specific w/energy recovery	SW Feed Flow	High Pressure Pump Power		
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month	
2.04	13,833	1,300,000	5.62	4.496	10,507	2,700,000	602.95	

February		28						
NF Feed Pumps			SW Feed Pumps				Permeate Flow	
Specific Energy	NF Feed Flow	High Pressure Pump Power	Specific Energy	Specific w/energy recovery	SW Feed Flow	High Pressure Pump Power		
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month	
2.06	17,292	1,500,000	7.71	6.168	7,264	2,300,000	579.88	

August		31						
NF Feed Pumps			SW Feed Pumps				Permeate Flow	
Specific Energy	NF Feed Flow	High Pressure Pump Power	Specific Energy	Specific w/energy recovery	SW Feed Flow	High Pressure Pump Power		
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month	
2.67	7,778	1,000,000	5.96	4.768	13,708	3,700,000	557.69	

March		31						
NF Feed Pumps			SW Feed Pumps				Permeate Flow	
Specific Energy	NF Feed Flow	High Pressure Pump Power	Specific Energy	Specific w/energy recovery	SW Feed Flow	High Pressure Pump Power		
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month	
1.61	17,292	1,300,000	6.39	5.112	6,569	1,900,000	654.41	

September		30						
NF Feed Pumps			SW Feed Pumps				Permeate Flow	
Specific Energy	NF Feed Flow	High Pressure Pump Power	Specific Energy	Specific w/energy recovery	SW Feed Flow	High Pressure Pump Power		
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month	
2.89	8,299	1,100,000	6.56	5.248	13,708	3,900,000	539.7	

April		30						
NF Feed Pumps			SW Feed Pumps				Permeate Flow	
Specific Energy	NF Feed Flow	High Pressure Pump Power	Specific Energy	Specific w/energy recovery	SW Feed Flow	High Pressure Pump Power		
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month	
1.73	17,292	1,300,000	6.2	4.96	7,431	2,000,000	621.3	

October		31						
NF Feed Pumps			SW Feed Pumps				Permeate Flow	
Specific Energy	NF Feed Flow	High Pressure Pump Power	Specific Energy	Specific w/energy recovery	SW Feed Flow	High Pressure Pump Power		
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month	
2.79	10,375	1,300,000	6.85	5.48	12,410	3,800,000	572.26	

May		31						
NF Feed Pumps			SW Feed Pumps				Permeate Flow	
Specific Energy	NF Feed Flow	High Pressure Pump Power	Specific Energy	Specific w/energy recovery	SW Feed Flow	High Pressure Pump Power		
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month	
1.68	17,292	1,300,000	5.67	4.536	7,785	2,000,000	636.43	

November		30						
NF Feed Pumps			SW Feed Pumps				Permeate Flow	
Specific Energy	NF Feed Flow	High Pressure Pump Power	Specific Energy	Specific w/energy recovery	SW Feed Flow	High Pressure Pump Power		
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month	
3.1	12,104	1,700,000	8.23	6.584	11,361	4,100,000	570.3	

June		30						
NF Feed Pumps			SW Feed Pumps				Permeate Flow	
Specific Energy	NF Feed Flow	High Pressure Pump Power	Specific Energy	Specific w/energy recovery	SW Feed Flow	High Pressure Pump Power		
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month	
1.9	17,292	1,500,000	5.81	4.648	8,472	2,200,000	611.4	

December		31						
NF Feed Pumps			SW Feed Pumps				Permeate Flow	
Specific Energy	NF Feed Flow	High Pressure Pump Power	Specific Energy	Specific w/energy recovery	SW Feed Flow	High Pressure Pump Power		
kWh/kgal	gpm	kWh/mo	kWh/kgal	kWh/kgal	gpm	kWh/mo	mg/month	
3.1	17,292	2,400,000	10.2	8.16	8,299	3,800,000	638.29	