

**Operations and Maintenance Cost, VVWRA Apple Valley Subregional
Reclamation Facility**

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**OPERATION & MAINTENANCE COSTS
OVERALL PROJECT SUMMARY**

Project: Apple Valley Water Reclamation Plant
1 mgd (Phase 1)
Job #: 8229A.10
Location: Apple Valley, CA

Updated: August 3, 2010
Estimator: CL/AG
Project Status: Detailed Design
ENR CCI at Time of Estimate: 8865

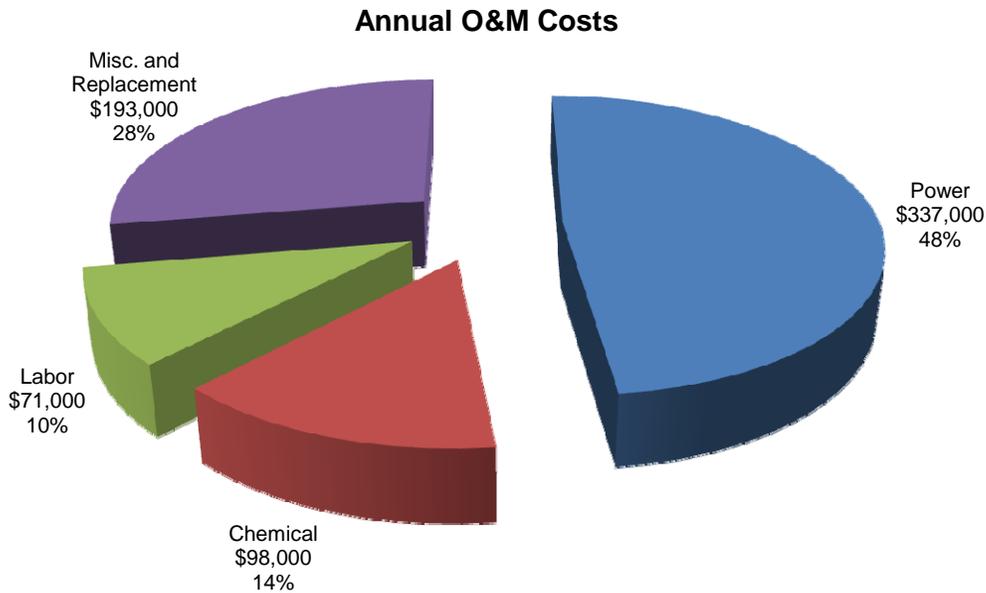
Item No.	DESCRIPTION	Total Cost
1	ANNUAL POWER COSTS ^(a, b)	\$337,000
2	ANNUAL CHEMICAL COSTS	\$98,000
3	ANNUAL LABOR COSTS	\$71,000
4	ANNUAL MISCELLANEOUS AND REPLACEMENT COSTS	\$193,000
ESTIMATED ANNUAL O&M TOTAL		\$699,000

Notes:

a) Costs do not include existing Otoe Rd lift station **NUMBER OF YEARS** **10**

b) Costs do not include reclaimed water pumping

ESTIMATED 10-YEAR O&M TOTAL **\$6,990,000**





**OPERATION AND MAINTENANCE COSTS
DETAILED PROJECT SUMMARY**

Project: Apple Valley Water Reclamation Plant
1 mgd (Phase 1)
Job #: 8229A.10
Location: Apple Valley, CA

Updated: August 3, 2010
Estimator: CL/JAG
Project Status: Detailed Design
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Item No.	Description	Unit Qty.	Std. Unit	Unit Price	Total Cost
A. ANNUAL POWER COSTS					
1	Fine Screening	16,331	kW-hr	0.1036	\$1,692
2	Secondary Treatment	1,268,926	kW-hr	0.1036	\$131,448
3	Membrane Filtration	1,241,163	kW-hr	0.1036	\$128,572
4	UV Disinfection	123,117	kW-hr	0.1036	\$12,754
5	Reclaimed Water Pumping System	130,649	kW-hr	0.1036	\$13,534
6	Miscellaneous Pumping	7,204	kW-hr	0.1036	\$746
7	Chemical Feed	3,459	kW-hr	0.1036	\$358
8	Odor Control	65,324	kW-hr	0.1036	\$6,767
9	HVAC Systems	395,344	kW-hr	0.1036	\$40,954
ANNUAL POWER COST SUBTOTAL					\$336,825
B. ANNUAL CHEMICAL COSTS					
1	Sodium Hypochlorite	51,600	gal	1.80	\$92,979
2	Citric Acid	341	gal	4.77	\$1,627
3	Citric Acid (UV Cleaning)	520	lb	1.00	\$520
4	Oils and Lubricants	1	LS	2,000	\$2,000
ANNUAL CHEMICAL COST SUBTOTAL					\$97,127
C. ANNUAL LABOR COSTS					
1	Supervisor	0.07	staff	94,299	\$6,717
2	Operators	0.50	staff	82,255	\$41,127
3	Mechanical	0.14	staff	65,773	\$9,370
4	Electrical/Instrumentation	0.14	staff	63,367	\$9,028
5	Administration	0.10	staff	43,114	\$4,252
ANNUAL LABOR SUBTOTAL					\$70,495
D. ANNUAL MISCELLANEOUS AND REPLACEMENT COSTS					
1	Fine Screening	1	LS	2,147	\$2,147
2	Secondary Treatment	1	LS	22,008	\$22,008
3	Membrane Filtration	1	LS	47,570	\$47,570
4	UV Disinfection	1	LS	36,886	\$36,886
5	Reclaimed Water Pumping	1	LS	12,533	\$12,533
6	Miscellaneous Pumping	1	LS	3,133	\$3,133
7	Chemical Feed	1	LS	11,400	\$11,400
8	Odor Control	1	LS	183	\$183
9	HVAC Systems and Odor Control Fans	1	LS	18,400	\$18,400
10	Potable Water, Gas, Communication	12	months	1,000	\$12,000
11	Miscellaneous	1	LS	26,000	\$26,000
ANNUAL MISCELLANEOUS COST SUBTOTAL					\$192,261



**A. POWER CONSUMPTION ESTIMATES
APPLE VALLEY WRP, PHASE 1 (1 MGD)**

Item No.	Description	Total # units	# running	HP, each	HP running	kW running	Hours per day	Hours per year	kW-hr /yr
1	Fine Screening								
	Rotary drum screens	2	1	1.0	1.0	0.7	24	8,760	6,532
	Washer-compactor	2	1	3.0	3.0	2.2	12	4,380	9,799
								SUBTOTAL	16,331
2	Secondary Treatment								
	Mixers	6	6	4.0	24.0	17.9	24	8,760	156,779
	Process air blowers	2	1	120.0	120.0	89.5	24	8,760	783,893
	Feed forward pumping	3	2	25.0	50.0	37.3	24	8,760	326,622
	Waste activated sludge pumping	2	1	3.0	3.0	2.2	2	730	1,633
								SUBTOTAL	1,268,926
3	Membrane Filtration								
	Membrane scouring blowers	3	2	60.0	120.0	89.5	24	8,760	783,893
	Permeate pumping	2	2	30.0	60.0	44.7	24	8,760	391,946
	Air compressor	2	1	10.0	10.0	7.5	24	8,760	65,324
								SUBTOTAL	1,241,163
4	UV Disinfection								
	UV reactors	3	3	-	-	14.1	24	8,760	123,117
								SUBTOTAL	123,117
5	Reclaimed Water Pumping System								
	Plant water pumping	2	1	20.0	20.0	14.9	24	8,760	130,649
								SUBTOTAL	130,649
6	Miscellaneous Pumping								
	Process drain sump pumps	2	1	1.0	1.0	0.7	12	4,380	3,266
	Reclaimed water sample pumps	2	1	0.5	0.5	0.4	24	8,760	3,266
	Storm water pumps	2	1	5.0	5.0	3.7	6	180	671
								SUBTOTAL	7,204
7	Chemical Feed								
	Primary chlorination pumping	2	1	0.5	0.5	0.4	24	8,760	3,266
	Reuse line shock hypochlorite pumping	1	1	0.5	0.5	0.4	4	48	18
	Filament control chlorination pumping	2	1	0.3	0.3	0.2	8	96	18
	Membrane sodium hypochlorite pumping	2	1	1.0	1.0	0.7	1	208	155
	Membrane citric acid feed pumping	2	1	1.0	1.0	0.7	1	2	1
								SUBTOTAL	3,459
8	Odor Control								
	Biofilter fans	2	1	10.0	10.0	7.5	24	8,760	65,324
								SUBTOTAL	65,324
9	HVAC Systems								
	Headworks Bldg MAU Supply fan 460 V	1	1	5.0	5.0	3.7	24	8,760	32,662
	Chemical Storage/Pumping Room A/C	1	1	26.8	26.8	20.0	14.4	1,728	34,557
	Chemical Storage Exhaust fan 115V	1	1	9.0	9.0	6.7	24	8,760	58,792
	UV and Permeate Pumping Room A/C	1	1	16.6	16.6	12.3	14.4	1,728	21,340
	Membrane Blowers Building A/C	1	1	31.5	31.5	23.5	14.4	1,728	40,615
	Operations Room Supply fan 115V	1	1	0.2	0.2	0.1	24	8,760	1,089
	Operations Room A/C unit	1	1	19.1	19.1	14.3	14.4	1,728	24,644
	Operation Room MAU Exhaust fan 460V	1	1	1.0	1.0	0.7	24	8,760	6,532
	Operation Room Exhaust fan 115V	1	1	0.2	0.2	0.1	24	8,760	1,089
	Electrical Room (Main Building) A/C	1	1	13.9	13.9	10.4	14.4	1,728	17,898
	Electrical Room (Secondary Bldg) A/C	1	1	31.5	31.5	23.5	14.4	1,728	40,615
	Process Blower Building A/C outdoor	1	1	71.7	71.7	53.5	14.4	1,728	92,381
	Process Blower Building A/C indoor	1	1	17.9	17.9	13.4	14.4	1,728	23,130
								SUBTOTAL	395,344



**B. CHEMICAL CONSUMPTION ESTIMATES
APPLE VALLEY WRP, PHASE 1 (1 MGD)**

Item No.	Description	Unit	Quantity per event	Events per year	Quantity per year
1	Sodium Hypochlorite				
	Primary chlorination	gal	3,654	12	43,848
	Reuse line shock chlorination	gal	83	12	996
	Filament control chlorination	gal	14	12	168
	Membrane sodium hypochlorite maintenance clean	gal	106	52	5,522
	Membrane sodium hypochlorite recovery clean	gal	533	2	1,066
				SUBTOTAL	51,600
2	Citric Acid				
	Citric acid recovery clean	gal	171	2	341
				SUBTOTAL	341
3	Citric Acid (UV Cleaning)				
	UV reactor cleaning	lb	260	2	520
				SUBTOTAL	520



**D. MISCELLANEOUS AND REPLACEMENT COSTS
APPLE VALLEY WRP, PHASE 1 (1 MGD)**

Item No.	Description	# of Units	Unit Cost	Lifespan (yr)	Annual Cost
1	Fine Screening				
	Rotary Drum Screens				
	Stabilizer pads	2	\$115	1	\$230
	Carbon steel chain	1	\$680	2	\$340
	Trunions	1	\$550	3.5	\$157
	Motor and gear reducer	1	\$2,000	10	\$200
	Drive sprocket	1	\$800	5	\$160
	Driven sprocket	1	\$4,600	10	\$460
	Spray nozzle replacement	1	\$200	2	\$100
	Washer-compactor				
	Miscellaneous	1	\$500	1	\$500
				SUBTOTAL	\$2,147
2	Secondary Treatment				
	Equipment replacement				
	Mixers replacement	6	\$10,000	15	\$4,000
	Process air blowers replacement	2	\$77,000	15	\$10,267
	Feed forward pumps replacement	3	\$26,500	12	\$6,625
	Waste activated sludge pumps replacement	2	\$6,700	12	\$1,117
				SUBTOTAL	\$22,008
	Diffuser system parts replacement				
	Membrane diffusers replacement	1,584	\$5	6	\$1,320
	Retainer rings	1,584	\$3	6	\$792
	Miscellaneous	1	\$1,000	1	\$1,000
				SUBTOTAL	\$3,112
3	Membrane Filtration				
	Membrane module replacement	240	\$1,200	10	\$28,800
	Membrane scouring blowers replacement	3	\$61,600	15	\$12,320
	Permeate pumping replacement	2	\$34,700	12	\$5,783
	Reuse line shock hypochlorite pumping	2	\$5,000	15	\$667
				SUBTOTAL	\$47,570
4	UV Disinfection				
	Lamp Replacement	96	\$260	1.1	\$21,865
	Ballast Replacement	48	\$534	5	\$5,126
	Wiper Replacement	96	\$21	3	\$672
	Sleeve Replacement	96	\$74	10	\$710
	Miscellaneous Replacement	1	\$8,512	1	\$8,512
				SUBTOTAL	\$36,886



**D. MISCELLANEOUS AND REPLACEMENT COSTS
APPLE VALLEY WRP, PHASE 1 (1 MGD)**

Item No.	Description	# of Units	Unit Cost	Lifespan (yr)	Annual Cost
5	Reclaimed Water Pumping				
	Plant water pumps replacement	2	\$38,000	15	\$5,067
	Reclaimed water pumps replacement	2	\$56,000	15	\$7,467
				SUBTOTAL	\$12,533
6	Miscellaneous Pumping				
	Process drain sump pumps replacement	2	\$12,000	15	\$1,600
	Reclaimed water sample pumps replacement	2	\$4,000	15	\$533
	Storm water pumps replacement	2	\$10,000	20	\$1,000
				SUBTOTAL	\$3,133
7	Chemical Feed				
	Chemical feed pumps replacement	1	\$171,000	15	\$11,400
				SUBTOTAL	\$11,400
8	Odor Control				
	Biofilter lava rock replacement	200	\$71	8	\$1,774
	Biofilter organic media replacement	200	\$44	8	\$1,107
	Biofilter media cover replacement	33	\$44	8	\$183
				SUBTOTAL	\$183
9	HVAC Systems and Odor Control Fans				
	HVAC Systems replacement	1	\$460,000	25	\$18,400
				SUBTOTAL	\$18,400