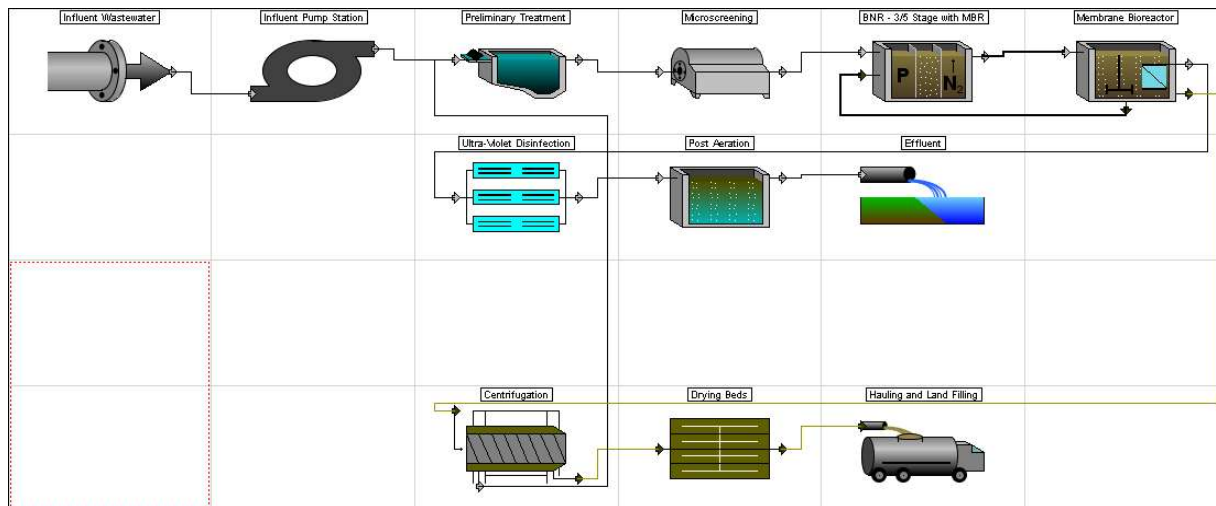


Layout - Snyderville Basin Silver Creek



Summary

Equipment Database

Hydromantis 2014, (USA Avg)

Layout Summary

Description	Value	Units
CONSTRUCTION COSTS		
Unit process construction cost	\$24,300,000	\$
Other direct construction costs	\$5,320,000	\$
Other indirect construction costs	\$22,000,000	\$
Total construction costs	\$51,600,000	\$

ANNUAL COSTS

LABOR COSTS

Administration labor cost	\$53,200	\$/yr
Laboratory labor cost	\$156,000	\$/yr
Unit process operation labor cost	\$1,060,000	\$/yr
Unit process maintenance labor cost	\$426,000	\$/yr
Total labor costs	\$1,690,000	\$/yr

MATERIAL COSTS

Total material cost	\$497,000	\$/yr
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CHEMICAL COSTS

Total chemical cost	\$71,400	\$/yr
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ENERGY COSTS

Total energy cost	\$550,000	\$/yr
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Total operation and maintenance	\$2,810,000	\$/yr
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CONSTRUCTION COST AMC

Amortization cost for total construction	\$4,880,000	\$/yr
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Total annual project cost	\$7,690,000	\$/yr
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PROJECT SUMMARY

Present worth	\$92,000,000	\$
Total project cost	\$51,600,000	\$
Total operation labor cost	\$1,260,000	\$/yr
Total maintenance labor cost	\$426,000	\$/yr
Total material cost	\$497,000	\$/yr
Total chemical cost	\$71,400	\$/yr
Total energy cost	\$550,000	\$/yr
Total amortization cost	\$4,880,000	\$/yr

Process Summary

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Influent Pump Station	3310000	36300	26000	23200	0	47000	283000
Preliminary Treatment	671000	52900	23900	16800	0	3050	56300
Ultra-Violet Disinfection	877000	0	9620	8770	3050	21900	74300
Centrifugation	4360000	264000	14800	109000	16800	5360	426000
Microscreening	1300000	33200	18100	129000	0	39500	142000
Post Aeration	58000	32900	10600	1440	0	3330	5270
Drying Beds	385000	83400	35300	3470	0	0	33500
BNR - 3/5 Stage with MBR	3990000	226000	120000	75800	0	258000	371000
Effluent	0	0	0	0	0	0	0
Hauling and Land Filling	298000	2910	0	53600	0	0	62500
Membrane Bioreactor	7800000	324000	167000	76700	51600	172000	1060000
Blower System	1200000	0	0	0	0	0	101000
Other Costs	27400000	209000	0	0	0	0	2270000

Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land		15 acre
Administration labor hours		1030 hr/yr
Laboratory labor hours		3020 hr/yr
Costs		
DIRECT COSTS		
Mobilization	478000	\$
Site preparation	709000	\$
Site electrical	1330000	\$
Yard piping	892000	\$
Instrumentation and control	665000	\$
Lab and administration building	1250000	\$
Total direct construction costs	5320000	\$
INDIRECT COSTS		
Cost of land	300000	\$
Miscellaneous cost	1700000	\$
Legal cost	680000	\$
Engineering design fee	5100000	\$
Inspection cost	680000	\$
Contingency	3400000	\$
Technical	680000	\$
Interest during construction	5060000	\$
Profit	4440000	\$
Total indirect construction cost	22000000	\$
Total of other construction costs	27400000	\$
LABOR COSTS		
Administration labor cost	53200	\$/yr
Laboratory labor cost	156000	\$/yr

Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	15900	scfm
Safety factor	1.5	
Requested air flow capacity	23800	scfm
Total capacity of blowers	23800	scfm
Number of blowers in use	4	
Total number of blowers	5	
Capacity of individual blowers	5950	scfm
Estimated cost of an installed blower	179000	\$
Blower building area	1690	sqft
Costs		
Construction and equipment cost	1200000	\$
Installed Blower Cost	896000	\$
Building Cost	186000	\$
Misc Costs	119000	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	101000	\$/yr

Notes

Energy costs are shown at the individual unit processes that require air

Influent Wastewater**Influent Pump Station****Design Output Data**

Description	Value	Units
Pump Station		
Design Information		
Volume of wet well	53200	cuft
Width of wet well	410	ft
Depth of the pumping station	28.3	ft
Length of the pumping station	21.2	ft
Width of the pumping station	441	ft
Minimum depth of water in wet well	7.31	ft
Area of pump building	682	sqft
Peak capacity of pumps	13.6	MGD(US)
Firm pumping capacity	13.6	MGD(US)
Total dynamic head - average	74.5	ft
Quantities		
Operation labor required	705	pers-hrs/yr
Maintenance labor required	595	pers-hrs/yr
Electrical energy required	470000	kWh/yr
Volume of earthwork required	1110000	cuft
Volume of slab concrete required	89400	cuft
Volume of wall concrete required	34800	cuft
Capacity per pump	9410	gpm(US)
Number of constant speed pumps	2	
Number of variable speed pumps	0	
Diameter of discharge header	21.9	in
Total dynamic head	90	ft
Size of selected pump	20	in
Specific speed of pump	3980	

Pump rotating speed	1200 rpm
Motor size required	249 HP
Size of selected motor	250 HP
Width of pump system	4.6 ft
Length of pump system	21.6 ft
Length of the dry well	21.2 ft
Width of the dry well	30.6 ft
Costs	
Construction and equipment cost	3310000 \$
Earthwork Cost	330000 \$
Wall Concrete Cost	839000 \$
Slab Concrete Cost	1160000 \$
Building Cost	75000 \$
Installed Pump Equipment Cost	407000 \$
Misc Costs	506000 \$
Operational labor cost	36300 \$/yr
Maintenance labor cost	26000 \$/yr
Material and supply cost	23200 \$/yr
Chemical cost	0 \$/yr
Energy cost	47000 \$/yr
Amortization cost	283000 \$/yr

Preliminary Treatment

Design Output Data

Description	Value	Units
Preliminary Treatment		
Design Information		
Mechanically Cleaned Bar Screen		
Bar size	0.25	in
Bar spacing	1.5	in
Slope of bars from horizontal	30	degrees
Head loss through screen	0.0206	ft
Approach velocity	2.5	ft/s
Average flow through velocity	2.5	ft/s
Maximum flow through velocity	3	ft/s
Screen channel width	2.48	ft
Average channel depth	1	ft
Horizontal Flow Grit Chamber		
Maximum flow	15.4	cuft/s
Average flow	6.21	cuft/s
Minimum flow	3.13	cuft/s
Temperature	10	deg C
Maximum flow through velocity	1.5	ft/s
Average flow through velocity	1	ft/s
Size of smallest particle 100%	0.2	mm
Specific gravity of particle	2.65	
Number of units	2	
Maximum flow/unit	7.72	cuft/s
Width of channel	1.29	ft
Depth of channel	4	ft
Length of channel	144	ft
Settling velocity of particle	0.0707	ft/s
Slope of channel bottom	0.00136	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.6	min
Volume of grit	16.1	cuft/d
Costs		
Construction and equipment cost	671000	\$
Operational labor cost	52900	\$/yr
Maintenance labor cost	23900	\$/yr
Material and supply cost	16800	\$/yr
Chemical cost	0	\$/yr
Energy cost	3050	\$/yr
Amortization cost	56300	\$/yr

Ultra-Violet Disinfection

Design Output Data

Description	Value	Units
Ultra-Violet Disinfection		
Design Information		
Design based on a model calculation	2.12	gal(US)/(min-W)
Total number of lamps needed	249	
Number of spare channels	1	
Total number of lamps used in	294	
Number of excess lamps	45	
Number of lamps/modules	2	
Number of modules/bank	3	
Number of banks/channel	7	
Number of channels	7	
Calculated headloss	158	in
Costs		
Construction and equipment cost	877000	\$
Cost of installation	526000	\$
Total cost of UV lamps	351000	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	9620	\$/yr
Material and supply cost	8770	\$/yr
Chemical cost	3050	\$/yr
Energy cost	21900	\$/yr
Amortization cost	74300	\$/yr

Centrifugation**Design Output Data**

Description	Value	Units
Centrifugation		
Design Information		
Total power required	123	HP
Power required per unit	61.5	HP
Excess capacity factor	1.25	
Number of units	2	
Chemical dose	1	% dry wt
Chemicals required	6.2	lb/hr
Sludge flow	98.4	gpm(US)
Initial solid conc	1.2	%
Operational hours per day	8	hr
Operational days per week	5	d
Quantities		
Number of centrifuges	2	
Power required per unit	61.5	HP
Area of building	422	sqft
Dry solids produced	1.69	ton(short)/d
Operation labor required	1970	pers-hrs/yr
Maintenance labor required	340	pers-hrs/yr
Electrical energy required	53600	kWh/yr
Costs		
Construction and equipment cost	4250000	\$
Operational labor cost	102000	\$/yr
Maintenance labor cost	14800	\$/yr
Material and supply cost	106000	\$/yr
Chemical cost	0	\$/yr
Energy cost	5360	\$/yr
Amortization cost	426000	\$/yr
Polymer Feed System		
Quantities		
Polymer dosage	49.6	lb/d
Liquid chemical solution fed	2380	gpd(US)
O&M labor required	2330	pers-hrs/yr
Dry material handling and mixing	833	pers-hrs/yr
Total operation labor required	3160	pers-hrs/yr
Costs		
Construction and equipment cost	115000	\$
Operational labor cost	163000	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	2300	\$/yr
Chemical cost	16800	\$/yr
Energy cost	0	\$/yr
Amortization cost	0	\$/yr

Microscreening**Design Output Data**

Description	Value	Units
Microscreening		
Design Information		
Microscreen loading rate	7	gal(US)/(sqft-min)
Quantity of wash water required	4	%
Area of microscreens required	995	sqft
Quantities		
Number of batteries	1	
Number of units/battery	4	
Drum diameter	10	ft
Drum width	10	ft
Area of selected unit	315	sqft
Area of building	660	sqft
Operation labor required	645	pers-hrs/yr
Maintenance labor required	415	pers-hrs/yr
Electrical energy required	395000	kWh/yr
Volume of wall concrete required	7900	cuft
Volume of earthwork required	26100	cuft
Costs		
Construction and equipment cost	1300000	\$
Earthwork Cost	7750	\$
Slab Concrete Cost	190000	\$
Building Cost	72600	\$
Installed Equipment Cost	857000	\$
Misc Costs	169000	\$
Operational labor cost	33200	\$/yr
Maintenance labor cost	18100	\$/yr
Material and supply cost	129000	\$/yr
Chemical cost	0	\$/yr
Energy cost	39500	\$/yr
Amortization cost	142000	\$/yr

Post Aeration**Design Output Data**

Description	Value	Units
Post Aeration by Diffused Aeration		
Design Information		
Dissolved oxygen in influent	2	mg/L
Desired dissolved oxygen in effluent	5	mg/L
Correction factor for pressure	1	
Minimum dissolved oxygen in influent	2	mg/L
Oxygen saturation at summer temperature	8.5	mg/L
Oxygen required	100	lb/d

Operating transfer efficiency	2.95 lbO2/(HP-h)
Total volume of aerobic reacto	27700 gal(US)
Air flow rate required to meet a	134 scfm
Quantities	
Basin depth	15 ft
Length of basin	8.24 ft
Width of basin	30 ft
Number of diffusers	12
Number of swing arm diffuser l	1
Volume of wall concrete requir	860 cuft
Volume of slab concrete requir	185 cuft
Electrical energy required	33300 kWh/yr
Operation labor required	640 pers-hrs/yr
Maintenance labor required	243 pers-hrs/yr
Costs	
Construction and equipment co	58000 \$
Wall Concrete Cost	20700 \$
Slab Concrete Cost	11200 \$
Installed Equipment Cost	20400 \$
Misc Costs	5750 \$
Operational labor cost	32900 \$/yr
Maintenance labor cost	10600 \$/yr
Material and supply cost	1440 \$/yr
Chemical cost	0 \$/yr
Energy cost	3330 \$/yr
Amortization cost	5270 \$/yr

Drying Beds

Design Output Data

Description	Value	Units
Sludge Drying Beds		
Design Information		
Total surface area required	26900	sqft
Initial depth of sludge	12	in
Final solids	50	%
Bed holding time	49.6	d
Quantities		
Total drying bed surface area	26900	sqft
Number beds	9	
Surface area of each individua	2990	sqft
Length of each bed	149	ft
Volume of earthwork required	132000	cuft
Volume concrete for dividing w	9370	cuft
Volume of R.C. in-place for tru	2010	cuft
Volume of sand	20100	cuft
Volume of gravel	26900	cuft
Clay pipe diameter	6	in
Total length clay pipe	2690	in
Sludge solids produced	1.52	ton(short)/d
Operational labor required	1620	pers-hrs/yr
Maintenance labor required	809	pers-hrs/yr
Costs		
Construction and equipment co	385000	\$
Earthwork Cost	39200	\$
Wall Concrete Cost	158000	\$
Slab Concrete Cost	15700	\$
Drying Bed Media Cost	75000	\$
Drain Pipe System Cost	59100	\$
Misc Costs	38200	\$
Operational labor cost	83400	\$/yr
Maintenance labor cost	35300	\$/yr
Material and supply cost	3470	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	33500	\$/yr

BNR - 3/5 Stage with MBR

Design Output Data

Description	Value	Units
BNR System for BIO-P and N Removal		
Design Information		
5-Stage Biological Phosphorus		
Design aerobic SRT for nitrific	15	d
Total reactor SRT	30	d
Design SS	9000	mg/L
Calculated VSS	6430	mg/L
Calculated VSS:TSS ratio	0.715	mg VSS/mg SS
Total volume of anaerobic reac	789	m3
Total volume of anoxic reactor	1840	m3
Total volume of aerobic reacto	2630	m3
Total volume of all reactors	5260	m3
Width of parallel train	10	m
Sidewater depth	5	m
Number of batteries	1	
Number of parallel trains per b	4	
Number of anoxic cells within c	2	
Number of aerobic cells within	2	
Anaerobic hydraulic retention t	1.24	hr
Anoxic hydraulic retention time	2.9	hr
Aerobic hydraulic retention tim	4.14	hr
Amount of sludge generated	1580	kg/d
Sludge recycle ratio	300	%

Sludge recycle rate	45800 m3/d
Nitrogen required for biomass	12.7 mg/L
Phosphorus required for biomass	2.54 mg/L
Oxygen required to meet average	3310 kg/d
Air flow required to meet average	5490 N m3/hr
Design air flow	34.8 N m3/min/1000 m3
Quantities	
Operation labor required	2800 pers-hrs/yr
Maintenance labor required	1420 pers-hrs/yr
Electrical energy required	1370000 kWh/yr
Volume of earthwork required	111000 cuft
Volume of slab concrete required	51100 cuft
Volume of wall concrete required	25200 cuft
Handrail length	928 ft
Number of diffusers per train	431
Fine bubble diffuser floor cover	12.6 %
Number of swing arm headers	4
Required mixing power	36.4 kW
Total number of mixers	24
Design mixing power per mixer	2.24 kW
Mixing power for each un-aerated	3.03 kW
Costs	
Construction and equipment cost	2700000 \$
Earthwork Cost	33000 \$
Wall Concrete Cost	606000 \$
Slab Concrete Cost	663000 \$
Handrail Cost	69600 \$
Installed Aerator Equipment	432000 \$
Air Piping Cost	257000 \$
Installed Mixer Equipment Cost	369000 \$
Misc Costs	267000 \$
Operational labor cost	144000 \$/yr
Maintenance labor cost	62000 \$/yr
Material and supply cost	66700 \$/yr
Chemical cost	0 \$/yr
Energy cost	137000 \$/yr
Amortization cost	249000 \$/yr
Internal Recycle Pumping	
Design Information	
Average daily pumping rate	4.03 MGD(US)
Total pumping capacity	4.03 MGD(US)
Design capacity per pump	1400 gpm(US)
Number of pumps	12
Number of batteries	1
Firm pumping capacity	4.03 MGD(US)
Quantities	
Operation labor required	526 pers-hrs/yr
Maintenance labor required	442 pers-hrs/yr
Electrical energy required	538000 kWh/yr
Volume of earthwork required	2240 cuft
Area of pump building	279 sqft
Costs	
Construction and equipment cost	576000 \$
Earthwork Cost	2650 \$
Pump Building Cost	123000 \$
Installed Pump Cost	362000 \$
Misc Costs	87800 \$
Operational labor cost	27100 \$/yr
Maintenance labor cost	19300 \$/yr
Material and supply cost	4030 \$/yr
Chemical cost	0 \$/yr
Energy cost	53800 \$/yr
Amortization cost	54400 \$/yr
Internal Recycle Pumping	
Design Information	
Average daily pumping rate	4.03 MGD(US)
Total pumping capacity	4.03 MGD(US)
Design capacity per pump	1400 gpm(US)
Number of pumps	12
Number of batteries	1
Firm pumping capacity	4.03 MGD(US)
Quantities	
Operation labor required	526 pers-hrs/yr
Maintenance labor required	442 pers-hrs/yr
Electrical energy required	538000 kWh/yr
Volume of earthwork required	2240 cuft
Area of pump building	279 sqft
Costs	
Construction and equipment cost	576000 \$
Earthwork Cost	2650 \$
Pump Building Cost	123000 \$
Installed Pump Cost	362000 \$
Misc Costs	87800 \$
Operational labor cost	27100 \$/yr
Maintenance labor cost	19300 \$/yr
Material and supply cost	4030 \$/yr
Chemical cost	0 \$/yr
Energy cost	53800 \$/yr
Amortization cost	54400 \$/yr
Sludge Recycle Pumping	
Design Information	
Average daily pumping rate	4.03 MGD(US)

Total pumping capacity	4.03 MGD(US)
Design capacity per pump	1400 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	4.03 MGD(US)
Quantities	
Operation labor required	526 pers-hrs/yr
Maintenance labor required	442 pers-hrs/yr
Electrical energy required	135000 kWh/yr
Volume of earthwork required	2240 cuft
Area of pump building	279 sqft
Costs	
Construction and equipment cost	144000 \$
Earthwork Cost	662 \$
Pump Building Cost	30700 \$
Installed Pump Cost	90500 \$
Misc Costs	21900 \$
Operational labor cost	27100 \$/yr
Maintenance labor cost	19300 \$/yr
Material and supply cost	1010 \$/yr
Chemical cost	0 \$/yr
Energy cost	13500 \$/yr
Amortization cost	13600 \$/yr

Effluent

Design Output Data

Description	Value	Units
Costs		
Construction and equipment cost	0 \$	
Operational labor cost	0 \$/yr	
Maintenance labor cost	0 \$/yr	
Material and supply cost	0 \$/yr	
Chemical cost	0 \$/yr	
Energy cost	0 \$/yr	
Amortization cost	0 \$/yr	

Hauling and Land Filling

Design Output Data

Description	Value	Units
Sludge Hauling and Land Filling Design Information		
Volume of sludge hauled	3.61	cuyd/d
Truck capacity	19	cuyd
Round trip time to disposal site	1	hr
Truck loading time	0.75	hr
Operational hours per day	8	hr
Number of trucks required	1	
Distance to disposal site	10	miles
Quantities		
Total sludge volume hauled	3.61	cuyd/d
Maximum anticipated landfill depth	30	d
Anticipated sludge storage height	8	ft
Sludge storage shed area	365	sqft
Width of sludge storage shed	13.5	ft
Length of sludge storage shed	27	ft
Volume of earthwork required	1190	cuft
Volume of slab concrete required	551	cuft
Surface area of canopy roof	365	sqft
Round trip haul distance	20	miles
Round trips per day per truck	1	
Distance traveled per year per truck	5000	miles
Sludge hauled	3.19	ton(short)/d
Operation labor required	56.4	pers-hrs/yr
LandFilling cost	35200	\$/yr
Costs		
Construction and equipment cost	298000	\$
Earthwork Cost	352	\$
Slab Concrete Cost	7140	\$
Canopy Roof Cost	7310	\$
Vehicle Cost	283000	\$
Operational labor cost	2910	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	53600	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	62500	\$/yr

Membrane Bioreactor

Design Output Data

Description	Value	Units
Membrane Bioreactor Design Information		
Total volume of reactors	55200	cuft
Length of parallel train	41	ft
Width of parallel train	20.5	ft
Sidewater depth	16.4	ft
Number of batteries	1	
Number of parallel trains per battery	4	
Total Membrane Area	70300	m2
Total Scour Air Requirement	15800	N m3/hr
Quantities		
Operation labor required	5350	pers-hrs/yr

Maintenance labor required	3060 pers-hrs/yr
Electrical energy required	1600000 kWh/yr
Volume of earthwork required	42100 cuft
Volume of slab concrete requir	27100 cuft
Volume of wall concrete requin	13000 cuft
Handrail length	738 ft
Number of diffusers per train	259
Number of swing arm headers	2
Costs	
Construction and equipment co	7350000 \$
Earthwork Cost	12500 \$
Wall Concrete Cost	313000 \$
Slab Concrete Cost	351000 \$
Handrail Cost	55300 \$
Membrane Cost	6070000 \$
Installed Aerator Equipment t	200000 \$
Air Piping Cost	218000 \$
Misc Cost	149000 \$
Operational labor cost	275000 \$/yr
Maintenance labor cost	134000 \$/yr
Material and supply cost	73500 \$/yr
Chemical cost	51600 \$/yr
Energy cost	160000 \$/yr
Amortization cost	1020000 \$/yr
Permeate Pumping	
Design Information	
Average daily pumping rate	1.34 MGD(US)
Total pumping capacity	3.34 MGD(US)
Design capacity per pump	1290 gpm(US)
Number of pumps	9
Number of batteries	1
Firm pumping capacity	11.1 MGD(US)
Quantities	
Operation labor required	660 pers-hrs/yr
Maintenance labor required	558 pers-hrs/yr
Electrical energy required	121000 kWh/yr
Volume of earthwork required	2190 cuft
Area of pump building	273 sqft
Costs	
Construction and equipment co	418000 \$
Earthwork Cost	1940 \$
Pump Building Cost	90200 \$
Installed Pump Cost	262000 \$
Misc Costs	63700 \$
Operational labor cost	34000 \$/yr
Maintenance labor cost	24400 \$/yr
Material and supply cost	2930 \$/yr
Chemical cost	0 \$/yr
Energy cost	12100 \$/yr
Amortization cost	39500 \$/yr
Waste Sludge Pumping	
Design Information	
Average daily pumping rate	0.0337 MGD(US)
Total pumping capacity	0.0337 MGD(US)
Design capacity per pump	11.7 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.0337 MGD(US)
Quantities	
Operation labor required	285 pers-hrs/yr
Maintenance labor required	218 pers-hrs/yr
Electrical energy required	1140 kWh/yr
Volume of earthwork required	1610 cuft
Area of pump building	201 sqft
Costs	
Construction and equipment co	39600 \$
Earthwork Cost	476 \$
Pump Building Cost	22100 \$
Installed Pump Cost	11000 \$
Misc Costs	6040 \$
Operational labor cost	14700 \$/yr
Maintenance labor cost	9520 \$/yr
Material and supply cost	277 \$/yr
Chemical cost	0 \$/yr
Energy cost	114 \$/yr
Amortization cost	3750 \$/yr