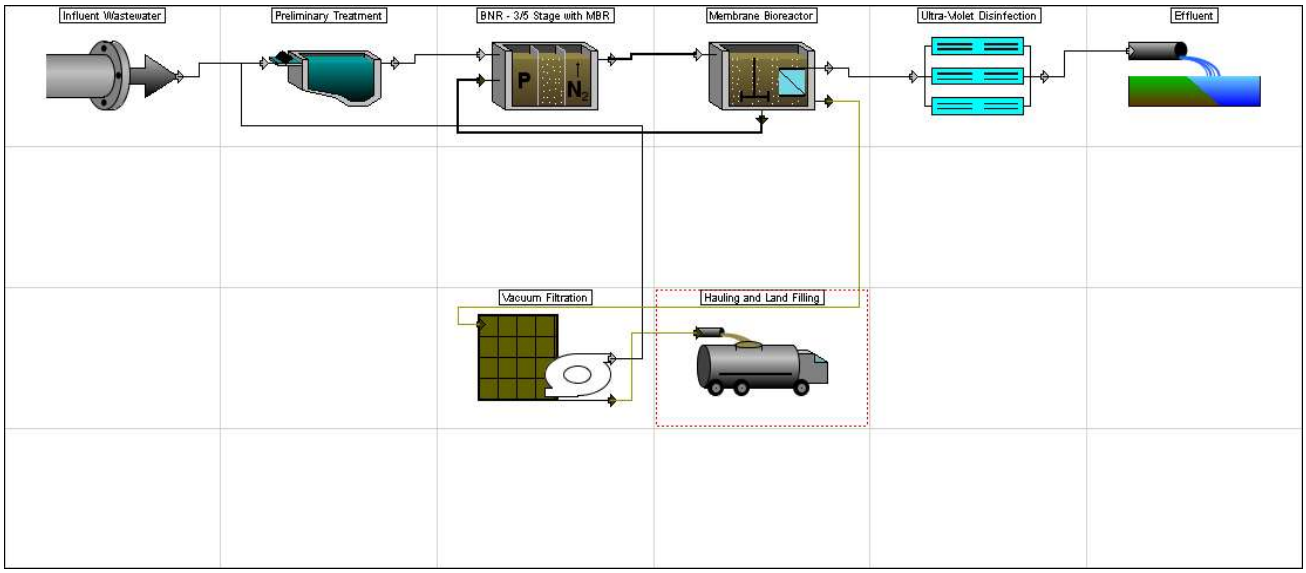
Layout 1 Oakley City



Summary

Equipment Database

Hydromantis 2014,(USA Avg)

Layout Summary

Description	Value	Units
CONSTRUCTION COSTS		
Unit process construction cost	$3,340,000	$
Other direct construction costs	$844,000	$
Other indirect construction cos	$3,270,000	$
Total construction costs	$7,450,000	$
ANNUAL COSTS		
LABOR COSTS		
Administration labor cost	$6,070	$/yr
Laboratory labor cost	$102,000	$/yr
Unit process operation labor c	$358,000	$/yr
Unit process maintenance labc	$126,000	$/yr
Total labor costs	$593,000	$/yr
MATERIAL COSTS		
Total material cost	$161,000	$/yr
CHEMICAL COSTS		
Total chemical cost	$9,360	$/yr
ENERGY COSTS		
Total energy cost	$41,500	$/yr
Total operation and maintanen	$804,000	$/yr
CONSTRUCTION COST AMC		
Amortization cost for total cons	$706,000	$/yr
Total annual project cost	$1,510,000	$/yr
PROJECT SUMMARY		
Present worth	$18,200,000	$
Total project cost	$7,450,000	$
Total operation labor cost	$466,000	$/yr
Total maintenance labor cost	$126,000	$/yr
Total material cost	$161,000	$/yr
Total chemical cost	$9,360	$/yr
Total energy cost	$41,500	$/yr
Total amortization cost	$706,000	$/yr

Process Summary

Process	Construction ($)	Operation ($/yr)	Maintenance ($/yr)	Material ($/yr)	Chemical ($/yr)	Energy ($/yr)	Amortization ($/yr)
Preliminary Treatment	160000	19500	9020	4000	0	850	13400
BNR - 3/5 Stage with MBR	635000	111000	55200	17000	0	17000	59400
Vacuum Filtration	547000	46000	4560	25900	3630	799	51400
Membrane Bioreactor	1090000	123000	56000	10400	5170	18800	139000

Hauling and Land Filling	288000	2820	0	99600	0	0	61600
Ultra-Violet Disinfection	161000	0	1610	1610	560	4020	13600
Effluent	0	0	0	0	0	0	0
Lime Feed System	104000	55300	0	2080	0	0	8730
Blower System	351000	0	0	0	0	0	29400
Other Costs	4110000	108000	0	0	0	0	330000

Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	9	acre
Administration labor hours	118	hr/yr
Laboratory labor hours	1990	hr/yr
Costs		
DIRECT COSTS		
Mobilization	70600	$
Site preparation	146000	$
Site electrical	176000	$
Yard piping	125000	$
Instrumentation and control	76400	$
Lab and administration building	250000	$
Total direct construction costs	844000	$
INDIRECT COSTS		
Cost of land	180000	$
Miscellaneous cost	240000	$
Legal cost	96100	$
Engineering design fee	721000	$
Inspection cost	96100	$
Contingency	481000	$
Technical	96100	$
Interest during construction	731000	$
Profit	627000	$
Total indirect construction cost	3270000	$
Total of other construction cos	4110000	$
LABOR COSTS		
Administration labor cost	6070	$/yr
Laboratory labor cost	102000	$/yr

Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	1690	scfm
Safety factor	1.5	
Requested air flow capacity	2530	scfm
Total capacity of blowers	2530	scfm
Number of blowers in use	1	
Total number of blowers	2	
Capacity of individual blowers	2530	scfm
Estimated cost of an installed l	106000	$
Blower building area	952	sqft
Costs		
Construction and equipment co	351000	$
Installed Blower Cost	212000	$
Building Cost	105000	$
Misc Costs	34800	$
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	29400	$/yr
Notes		
Energy costs are shown at the individual unit processes that require air		

Summary of Chemical Feed System for Lime

Description	Value	Units
Lime Solution Feed System		
Quantities		
Lime feed rate of Ca(OH)2	77.5	lb/d
Liquid chemical solution fed	155	gpd(US)
O&M labor required	690	pers-hrs/yr
Dry material handling and mixi	385	pers-hrs/yr
Total operation labor required	1070	pers-hrs/yr
Costs		
Construction and equipment co	104000	$
Operational labor cost	55300	$/yr
Maintenance labor cost	0	$/yr

Material and supply cost	2080	$/yr
Chemical cost	0	$/yr
Energy cost	0	$/yr
Amortization cost	8730	$/yr

Influent Wastewater
Preliminary Treatment
Design Output Data

Description	Value	Units
Preliminary Treatment		
Design Information		
Mechanically Cleaned Bar Screen		
Bar size	0.25	in
Bar spacing	0.375	in
Slope of bars from horizontal	30	degrees
Head loss through screen	0.444	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	0.157	ft
Average channel depth	1	ft
Horizontal Flow Grit Chamber		
Maximum flow	1.55	cuft/s
Average flow	0.393	cuft/s
Minimum flow	0.162	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	0.774	cuft/s
Width of channel	0.129	ft
Depth of channel	4	ft
Length of channel	144	ft
Settling velocity of particle	0.0707	ft/s
Slope of channel bottom	0.0226	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.6	min
Volume of grit	1.02	cuft/d
Costs		
Construction and equipment cc	160000	$
Operational labor cost	19500	$/yr
Maintenance labor cost	9020	$/yr
Material and supply cost	4000	$/yr
Chemical cost	0	$/yr
Energy cost	850	$/yr
Amortization cost	13400	$/yr

BNR - 3/5 Stage with MBR
Design Output Data

Description	Value	Units
BNR System for BIO-P and N Removal		
Design Information		
Influent BOD/TP ratio too smal		
3-Stage Biological Phosphorus		
Max. specific growth of nitrifier	0.374	1/d
Death rate of nitrifiers at winter	0.0601	1/d
Minimum aerobic SRT for nitrif	4.67	d
Design aerobic SRT for nitrifica	6.54	d
Total reactor SRT	10.5	d
Design SS	9000	mg/L
Calculated VSS	6210	mg/L
Calculated VSS:TSS ratio	0.69	mg VSS/mg SS
Total volume of anaerobic reac	0	m3
Total volume of anoxic reactor	108	m3
Total volume of aerobic reacto	179	m3
Total volume of all reactors	287	m3
Width of parallel train	10	m
Sidewater depth	5	m
Number of batteries	1	
Number of parallel trains per b	2	
Number of anoxic cells within c	1	
Number of aerobic cells within	1	
Anaerobic hydraulic retention ti	0	hr
Anoxic hydraulic retention time	2.69	hr
Aerobic hydraulic retention time	4.45	hr
Amount of sludge generated	246	kg/d
Sludge recycle ratio	300	%
Sludge recycle rate	2900	m3/d
Nitrogen required for biomass	20.1	mg/L

Phosphorus required for biom	4.02	mg/L
Oxygen required to meet aver	264	kg/d
Air flow required to meet aver	439	N m3/hr
Design air flow	40.9	N m3/min/1000 m3
Quantities		
Operation labor required	998	pers-hrs/yr
Maintenance labor required	459	pers-hrs/yr
Electrical energy required	101000	kWh/yr
Volume of earthwork required	18900	cuft
Volume of slab concrete requir	3800	cuft
Volume of wall concrete requir	3790	cuft
Handrail length	106	ft
Number of diffusers per train	73	
Fine bubble diffuser floor cove	15	%
Number of swing arm headers	1	
Required mixing power	2.6	kW
Total number of mixers	4	
Design mixing power per mixe	0.745	kW
Mixing power for each unaerat	0.65	kW
Costs		
Construction and equipment co	304000	$
Earthwork Cost	5610	$
Wall Concrete Cost	91200	$
Slab Concrete Cost	49300	$
Handrail Cost	7980	$
Installed Aerator Equipment	49400	$
Air Piping Cost	16000	$
Installed Mixer Equipment C	54400	$
Misc Costs	30100	$
Operational labor cost	51400	$/yr
Maintenance labor cost	18200	$/yr
Material and supply cost	14700	$/yr
Chemical cost	0	$/yr
Energy cost	10100	$/yr
Amortization cost	28100	$/yr
Internal Recycle Pumping		
Design Information		
Average daily pumping rate	0.383	MGD(US)
Total pumping capacity	0.383	MGD(US)
Design capacity per pump	133	gpm(US)
Number of pumps	6	
Number of batteries	1	
Firm pumping capacity	0.383	MGD(US)
Quantities		
Operation labor required	389	pers-hrs/yr
Maintenance labor required	312	pers-hrs/yr
Electrical energy required	25700	kWh/yr
Volume of earthwork required	1660	cuft
Area of pump building	208	sqft
Costs		
Construction and equipment co	131000	$
Earthwork Cost	984	$
Pump Building Cost	45700	$
Installed Pump Cost	64200	$
Misc Costs	20000	$
Operational labor cost	20000	$/yr
Maintenance labor cost	12400	$/yr
Material and supply cost	916	$/yr
Chemical cost	0	$/yr
Energy cost	2570	$/yr
Amortization cost	12400	$/yr
Internal Recycle Pumping		
Design Information		
Average daily pumping rate	0.51	MGD(US)
Total pumping capacity	0.51	MGD(US)
Design capacity per pump	177	gpm(US)
Number of pumps	6	
Number of batteries	1	
Firm pumping capacity	0.51	MGD(US)
Quantities		
Operation labor required	404	pers-hrs/yr
Maintenance labor required	326	pers-hrs/yr
Electrical energy required	34200	kWh/yr
Volume of earthwork required	1680	cuft
Area of pump building	210	sqft
Costs		
Construction and equipment co	142000	$
Earthwork Cost	996	$
Pump Building Cost	46200	$
Installed Pump Cost	72900	$
Misc Costs	21600	$
Operational labor cost	20800	$/yr

Maintenance labor cost	12900	$/yr
Material and supply cost	992	$/yr
Chemical cost	0	$/yr
Energy cost	3420	$/yr
Amortization cost	13400	$/yr
Sludge Recycle Pumping		
Design Information		
Average daily pumping rate	0.255	MGD(US)
Total pumping capacity	0.255	MGD(US)
Design capacity per pump	88.6	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.255	MGD(US)
Quantities		
Operation labor required	369	pers-hrs/yr
Maintenance labor required	294	pers-hrs/yr
Electrical energy required	8570	kWh/yr
Volume of earthwork required	1640	cuft
Area of pump building	205	sqft
Costs		
Construction and equipment cc	58900	$
Earthwork Cost	486	$
Pump Building Cost	22600	$
Installed Pump Cost	26800	$
Misc Costs	8980	$
Operational labor cost	19000	$/yr
Maintenance labor cost	11700	$/yr
Material and supply cost	412	$/yr
Chemical cost	0	$/yr
Energy cost	857	$/yr
Amortization cost	5570	$/yr

Vacuum Filtration

Design Output Data

Description	Value	Units
Vacuum Filtration		
Design Information		
Total filter area required	29	sqft
Number of filters	1	
Area of single filter unit	60	sqft
Area of building	262	sqft
Hydrated lime [Ca(OH)2] requi	9.68	lb/hr
Quantities		
Volume of sludge	5270	gpd(US)
Initial moisture content of sludg	98.8	%
Dry solids produced	0.261	ton(short)/d
Operation labor required	894	pers-hrs/yr
Maintenance labor required	115	pers-hrs/yr
Electrical energy required	7990	kWh/yr
Costs		
Construction and equipment cc	547000	$
Installed Equipment Cost	518000	$
Building Cost	28800	$
Operational labor cost	46000	$/yr
Maintenance labor cost	4560	$/yr
Material and supply cost	25900	$/yr
Chemical cost	3630	$/yr
Energy cost	799	$/yr
Amortization cost	51400	$/yr

Membrane Bioreactor

Design Output Data

Description	Value	Units
Membrane Bioreactor		
Design Information		
Total volume of reactors	6220	cuft
Length of parallel train	15.9	ft
Width of parallel train	7.95	ft
Sidewater depth	16.4	ft
Number of batteries	1	
Number of parallel trains per b	3	
Total Membrane Area	7930	m2
Total Scour Air Requirement	1590	N m3/hr
Quantities		
Operation labor required	1720	pers-hrs/yr
Maintenance labor required	880	pers-hrs/yr
Electrical energy required	180000	kWh/yr
Volume of earthwork required	11200	cuft
Volume of slab concrete requir	2160	cuft
Volume of wall concrete requir	3120	cuft
Handrail length	181	ft
Number of diffusers per train	39	

Number of swing arm headers	1	
Costs		
Construction and equipment cc	911000	$
Earthwork Cost	3310	$
Wall Concrete Cost	75200	$
Slab Concrete Cost	28100	$
Handrail Cost	13600	$
Membrane Cost	684000	$
Installed Aerator Equipment	64300	$
Air Piping Cost	19700	$
Misc Cost	29500	$
Operational labor cost	88600	$/yr
Maintenance labor cost	34900	$/yr
Material and supply cost	9110	$/yr
Chemical cost	5170	$/yr
Energy cost	18000	$/yr
Amortization cost	122000	$/yr
Permeate Pumping		
Design Information		
Average daily pumping rate	0.128	MGD(US)
Total pumping capacity	0.503	MGD(US)
Design capacity per pump	194	gpm(US)
Number of pumps	6	
Number of batteries	1	
Firm pumping capacity	1.12	MGD(US)
Quantities		
Operation labor required	446	pers-hrs/yr
Maintenance labor required	366	pers-hrs/yr
Electrical energy required	7730	kWh/yr
Volume of earthwork required	1690	cuft
Area of pump building	211	sqft
Costs		
Construction and equipment cc	145000	$
Earthwork Cost	1000	$
Pump Building Cost	46400	$
Installed Pump Cost	75800	$
Misc Costs	22200	$
Operational labor cost	23000	$/yr
Maintenance labor cost	14500	$/yr
Material and supply cost	1020	$/yr
Chemical cost	0	$/yr
Energy cost	773	$/yr
Amortization cost	13800	$/yr
Waste Sludge Pumping		
Design Information		
Average daily pumping rate	0.00527	MGD(US)
Total pumping capacity	0.00527	MGD(US)
Design capacity per pump	1.83	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.00527	MGD(US)
Quantities		
Operation labor required	224	pers-hrs/yr
Maintenance labor required	166	pers-hrs/yr
Electrical energy required	179	kWh/yr
Volume of earthwork required	1600	cuft
Area of pump building	200	sqft
Costs		
Construction and equipment cc	32300	$
Earthwork Cost	474	$
Pump Building Cost	22000	$
Installed Pump Cost	4860	$
Misc Costs	4920	$
Operational labor cost	11500	$/yr
Maintenance labor cost	6580	$/yr
Material and supply cost	226	$/yr
Chemical cost	0	$/yr
Energy cost	18	$/yr
Amortization cost	3050	$/yr

Hauling and Land Filling

Design Output Data

Description	Value	Units
Sludge Hauling and Land Filling		
Design Information		
Volume of sludge hauled	0.999	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	35	miles

Quantities		
Total sludge volume hauled	0.999	cuyd/d
Maximum anticipated landfill d	30	d
Anticipated sludge storage hei	8	ft
Sludge storage shed area	101	sqft
Width of sludge storage shed s	7.11	ft
Length of sludge storage shed	14.2	ft
Volume of earthwork required	406	cuft
Volume of slab concrete requir	199	cuft
Surface area of canopy roof	101	sqft
Round trip haul distance	70	miles
Round trips per day per truck	1	
Distance traveled per year per	17500	miles
Sludge hauled	0.884	ton(short)/d
Operation labor required	54.7	pers-hrs/yr
LandFilling cost	35200	$/yr
Costs		
Construction and equipment co	288000	$
Earthwork Cost	120	$
Slab Concrete Cost	2580	$
Canopy Roof Cost	2020	$
Vehicle Cost	283000	$
Operational labor cost	2820	$/yr
Maintenance labor cost	0	$/yr
Material and supply cost	99600	$/yr
Chemical cost	0	$/yr
Energy cost	0	$/yr
Amortization cost	61600	$/yr

Ultra-Violet Disinfection

Design Output Data

Description	Value	Units
Ultra-Violet Disinfection		
Design Information		
Design based on a model calcu	2.12	gal(US)/(min·W)
Total number of lamps needed	25	
Number of spare channels	1	
Total number of lamps used in	54	
Number of excess lamps	29	
Number of lamps/modules	2	
Number of modules/bank	3	
Number of banks/channel	3	
Number of channels	3	
Calculated headloss	6.08	in
Costs		
Construction and equipment co	161000	$
Cost of installation	96700	$
Total cost of UV lamps	64400	$
Operational labor cost	0	$/yr
Maintenance labor cost	1610	$/yr
Material and supply cost	1610	$/yr
Chemical cost	560	$/yr
Energy cost	4020	$/yr
Amortization cost	13600	$/yr

Effluent

Design Output Data

Description	Value	Units
Costs		
Construction and equipment co	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