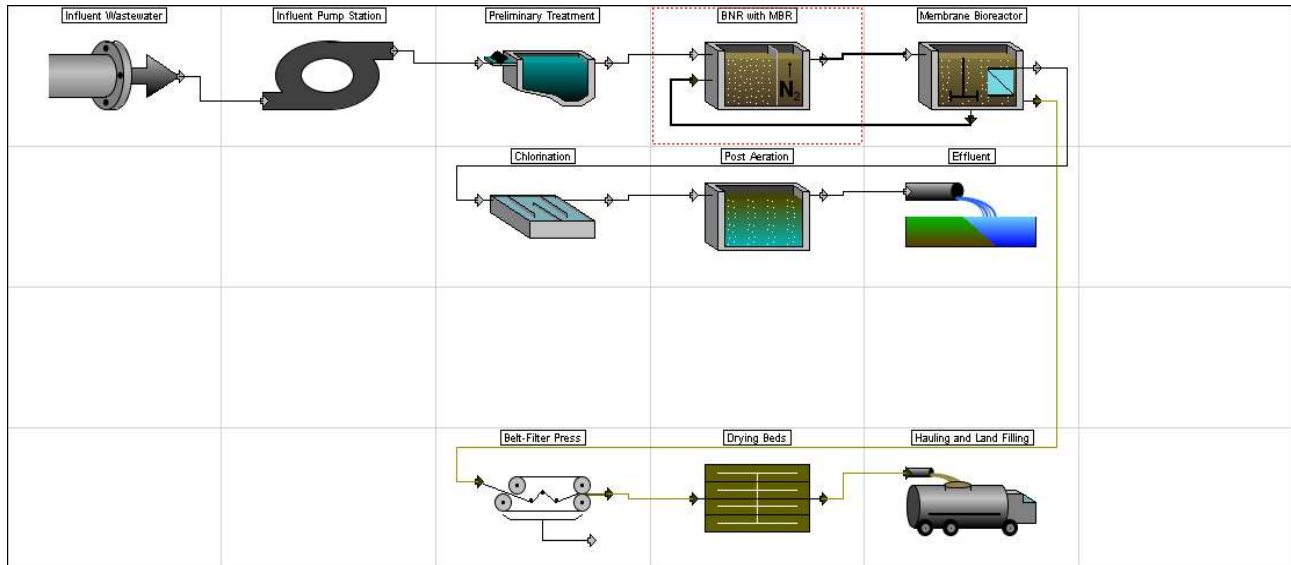


Layout - Fairview



Summary

Equipment Database

Hydromantis 2014, (USA Avg)

Layout Summary

Description	Value	Units
CONSTRUCTION COSTS		
Unit process construction cost:	\$4,080,000	\$
Other direct construction costs	\$1,100,000	\$
Other indirect construction costs	\$4,000,000	\$
Total construction costs	\$9,190,000	\$

ANNUAL COSTS

LABOR COSTS

Administration labor cost	\$8,330	\$/yr
Laboratory labor cost	\$109,000	\$/yr
Unit process operation labor cost	\$329,000	\$/yr
Unit process maintenance labor cost	\$140,000	\$/yr
Total labor costs	\$586,000	\$/yr

MATERIAL COSTS

Total material cost	\$105,000	\$/yr
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CHEMICAL COSTS

Total chemical cost	\$16,300	\$/yr
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ENERGY COSTS

Total energy cost	\$64,800	\$/yr
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Total operation and maintenance	\$772,000	\$/yr
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CONSTRUCTION COST AMC

Amortization cost for total construction	\$861,000	\$/yr
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Total annual project cost	\$1,630,000	\$/yr
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PROJECT SUMMARY

Present worth	\$19,600,000	\$
Total project cost	\$9,190,000	\$
Total operation labor cost	\$446,000	\$/yr
Total maintenance labor cost	\$140,000	\$/yr
Total material cost	\$105,000	\$/yr
Total chemical cost	\$16,300	\$/yr
Total energy cost	\$64,800	\$/yr
Total amortization cost	\$861,000	\$/yr

Process Summary

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Influent Pump Station	419000	24000	15400	2930	0	3590	36500
Preliminary Treatment	160000	22200	10200	3990	0	1020	13400
Chlorination	329000	12900	1850	15600	7280	11800	35400
Belt-Filter Press	812000	1180	229	0	3900	820	74300

BNR with MBR	444000	90600	39500	15700	0	28200	42000
Post Aeration	50600	22200	4730	2340	0	306	4640
Drying Beds	90200	32000	11100	812	0	0	7740
Membrane Bioreactor	1090000	123000	56600	10300	5140	19100	139000
Effluent	0	0	0	0	0	0	0
Hauling and Land Filling	287000	653	0	53600	0	0	61600
Blower System	404000	0	0	0	0	0	33900
Other Costs	5100000	117000	0	0	0	0	413000

Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	9 acre	
Administration labor hours	162 hr/yr	
Laboratory labor hours	2110 hr/yr	
Costs		
DIRECT COSTS		
Mobilization	93400 \$	
Site preparation	184000 \$	
Site electrical	236000 \$	
Yard piping	166000 \$	
Instrumentation and control	105000 \$	
Lab and administration building	317000 \$	
Total direct construction costs	1100000 \$	
INDIRECT COSTS		
Cost of land	180000 \$	
Miscellaneous cost	298000 \$	
Legal cost	119000 \$	
Engineering design fee	894000 \$	
Inspection cost	119000 \$	
Contingency	596000 \$	
Technical	119000 \$	
Interest during construction	901000 \$	
Profit	777000 \$	
Total indirect construction cost	4000000 \$	
Total of other construction costs	5100000 \$	
LABOR COSTS		
Administration labor cost	8330 \$/yr	
Laboratory labor cost	109000 \$/yr	

Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	2240 scfm	
Safety factor	1.5	
Requested air flow capacity	3360 scfm	
Total capacity of blowers	3360 scfm	
Number of blowers in use	1	
Total number of blowers	2	
Capacity of individual blowers	3360 scfm	
Estimated cost of an installed blower	126000 \$	
Blower building area	1020 sqft	
Costs		
Construction and equipment cost	404000 \$	
Installed Blower Cost	252000 \$	
Building Cost	113000 \$	
Misc Costs	40100 \$	
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	33900 \$/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	1670 cuft	
Width of wet well	16.8 ft	
Depth of the pumping station	24.8 ft	
Length of the pumping station	16.4 ft	
Width of the pumping station	42.4 ft	

Minimum depth of water in wet	3.83 ft
Area of pump building	440 sqft
Peak capacity of pumps	1.57 MGD(US)
Firm pumping capacity	1.57 MGD(US)
Total dynamic head - average	46.5 ft
Quantities	
Operation labor required	466 pers-hrs/yr
Maintenance labor required	385 pers-hrs/yr
Electrical energy required	35900 kWh/yr
Volume of earthwork required	120000 cuft
Volume of slab concrete requir	4430 cuft
Volume of wall concrete requir	4340 cuft
Capacity per pump	1090 gpm(US)
Number of constant speed pur	2
Number of variable speed pur	0
Diameter of discharge header	7.47 in
Total dynamic head	95.1 ft
Size of selected pump	8 in
Specific speed of pump	1950
Pump rotating speed	3680 rpm
Motor size required	40 HP
Size of selected motor	40 HP
Width of pump system	2.2 ft
Length of pump system	16.6 ft
Length of the dry well	16.4 ft
Width of the dry well	25.6 ft
Costs	
Construction and equipment cc	419000 \$
Earthwork Cost	35500 \$
Wall Concrete Cost	105000 \$
Slab Concrete Cost	57400 \$
Building Cost	48400 \$
Installed Pump Equipment C	109000 \$
Misc Costs	63900 \$
Operational labor cost	24000 \$/yr
Maintenance labor cost	15400 \$/yr
Material and supply cost	2930 \$/yr
Chemical cost	0 \$/yr
Energy cost	3590 \$/yr
Amortization cost	36500 \$/yr

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	0.231 ft	
Average channel depth	1 ft	
Horizontal Flow Grit Chamber		
Maximum flow	1.54 cuft/s	
Average flow	0.578 cuft/s	
Minimum flow	0.154 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	0.77 cuft/s	
Width of channel	0.128 ft	
Depth of channel	4 ft	
Length of channel	144 ft	
Settling velocity of particle	0.0707 ft/s	
Slope of channel bottom	0.0223	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.6 min	
Volume of grit	1.5 cuft/d	
Costs		
Construction and equipment cc	160000 \$	
Operational labor cost	22200 \$/yr	
Maintenance labor cost	10200 \$/yr	
Material and supply cost	3990 \$/yr	
Chemical cost	0 \$/yr	

Energy cost	1020 \$/yr
Amortization cost	13400 \$/yr

Chlorination

Design Output Data

Description	Value	Units
Chlorination		
Design Information		
Volume of tank	20700	gal(US)
Average chlorine required	30.7	lb/d
Peak chlorine required	82.8	lb/d
Influent coliform count	10000000	/100ml
Effluent coliform count	29.2	/100ml
Quantities		
Operational labor required	250	pers-hrs/yr
Maintenance labor required	46.4	pers-hrs/yr
Electrical energy required	118000	kWh/yr
Volume of earthwork required	1180	cuft
Volume of slab concrete requir	277	cuft
Volume of wall concrete requir	2110	cuft
Number of chlorinators and ev.	1	
Chlorination building area	220	sqft
Number of chlorine cylinders	7	
Area of chlorine storage buildir	112	sqft
Costs		
Construction and equipment cc	329000	\$
Earthwork Cost	351	\$
Wall Concrete Cost	50800	\$
Slab Concrete Cost	3590	\$
Installed Equipment Cost	234000	\$
Building Cost	24200	\$
Storage Building Cost	6160	\$
Misc Costs	9860	\$
Operational labor cost	12900	\$/yr
Maintenance labor cost	1850	\$/yr
Material and supply cost	15600	\$/yr
Chemical cost	7280	\$/yr
Energy cost	11800	\$/yr
Amortization cost	35400	\$/yr

Belt-Filter Press

Design Output Data

Description	Value	Units
Belt-Filter Press		
Design Information		
Belt filter width	1	m
Number of units	1	
Hydraulic loading per unit per r	70	gpm(US)
Hydraulic loading required per	20.1	gpm(US)
Final solids content	19	%
Solids capture fraction	0.992	
Quantities		
Operation labor required	22.9	pers-hrs/yr
Maintenance labor required	5.74	pers-hrs/yr
Power	8200	kWh/yr
Polymer required	3000	lb/yr
Dry solids produced	821	lb/d
Belt filter(s)	275000	\$
Building	279000	\$
Installation	68800	\$
Polymer system	82500	\$
Feed pumps	30300	\$
Conveyor system	77000	\$
Costs		
Construction and equipment cc	812000	\$
Building Cost	279000	\$
Polymer System Cost	82500	\$
Feed Pumps Cost	30300	\$
Conveyor System Cost	77000	\$
Installed Belt Filter	344000	\$
Operational labor cost	1180	\$/yr
Maintenance labor cost	229	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	3900	\$/yr
Energy cost	820	\$/yr
Amortization cost	74300	\$/yr

BNR with MBR

Design Output Data

Description	Value	Units
Biological Nitrogen Removal		
Design Information		

Biological Nitrogen Removal D	
Max. specific growth of nitrifier:	0.2 1/d
Death rate of nitrifiers at winter	0.0301 1/d
Minimum aerobic SRT for nitrif	5.89 d
Design aerobic SRT for nitrific	8.83 d
Total reactor SRT	12.6 d
Design SS	9000 mg/L
Calculated VSS	6810 mg/L
Calculated VSS:TSS ratio	0.757 mg VSS/mg SS
Total volume of anoxic reactor:	135 m3
Total volume of aerobic reacto	315 m3
Total volume of all reactors	451 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
Aerobic hydraulic retention tim	5.33 hr
Anoxic hydraulic retention time	2.29 hr
Amount of sludge generated	322 kg/d
Sludge recycle ratio	300 %
Sludge recycle rate	4260 m3/d
Nitrogen required for biomass	19.9 mg/L
Phosphorus required for biom	3.99 mg/L
Oxygen required to meet aver	487 kg/d
Air flow required to meet aver	1130 N m3/hr
Design air flow	59.8 N m3/min/1000 m3
Quantities	
Operation labor required	1310 pers-hrs/yr
Maintenance labor required	622 pers-hrs/yr
Electrical energy required	244000 kWh/yr
Volume of earthwork required	22600 cuft
Volume of slab concrete requir	4630 cuft
Volume of wall concrete requir	4280 cuft
Handrail length	119 ft
Number of diffusers per train	212
Fine bubble diffuser floor cover	21.8 %
Number of swing arm headers	1
Required mixing power	2.6 kW
Total number of mixers	2
Design mixing power per mixer	1.49 kW
Mixing power for each unaerat	1.3 kW
Costs	
Construction and equipment cc	329000 \$
Earthwork Cost	6680 \$
Wall Concrete Cost	103000 \$
Slab Concrete Cost	60000 \$
Handrail Cost	8960 \$
Installed Aerator Equipment	67800 \$
Air Piping Cost	21100 \$
Installed Mixer Equipment C	29000 \$
Misc Costs	32600 \$
Operational labor cost	67600 \$/yr
Maintenance labor cost	24900 \$/yr
Material and supply cost	14900 \$/yr
Chemical cost	0 \$/yr
Energy cost	24400 \$/yr
Amortization cost	31100 \$/yr
Sludge Recycle Pumping	
Design Information	
Average daily pumping rate	1.13 MGD(US)
Total pumping capacity	2.25 MGD(US)
Design capacity per pump	781 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	1.13 MGD(US)
Quantities	
Operation labor required	447 pers-hrs/yr
Maintenance labor required	366 pers-hrs/yr
Electrical energy required	37700 kWh/yr
Volume of earthwork required	1960 cuft
Area of pump building	244 sqft
Costs	
Construction and equipment cc	115000 \$
Earthwork Cost	579 \$
Pump Building Cost	26900 \$
Installed Pump Cost	70000 \$
Misc Costs	17500 \$
Operational labor cost	23000 \$/yr
Maintenance labor cost	14600 \$/yr
Material and supply cost	805 \$/yr

Chemical cost	0 \$/yr
Energy cost	3770 \$/yr
Amortization cost	10900 \$/yr
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

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 tank	2	mg/L
Oxygen saturation at summer temperature	8.5	mg/L
Oxygen required	9.21	lb/d
Operating transfer efficiency	2.95	lbO ₂ /(HP·h)
Total volume of aerobic reactor	2560	gal(US)
Air flow rate required to meet aeration demand	12.3	scfm
Quantities		
Basin depth	15	ft
Length of basin	0.759	ft
Width of basin	30	ft
Number of diffusers	1	
Number of swing arm diffuser lines	1	
Volume of wall concrete required	692	cuft
Volume of slab concrete required	17.1	cuft
Electrical energy required	3060	kWh/yr
Operation labor required	432	pers-hrs/yr
Maintenance labor required	118	pers-hrs/yr
Costs		
Construction and equipment cost	50600	\$
Wall Concrete Cost	16700	\$
Slab Concrete Cost	8970	\$
Installed Equipment Cost	19900	\$
Misc Costs	5010	\$
Operational labor cost	22200	\$/yr
Maintenance labor cost	4730	\$/yr
Material and supply cost	2340	\$/yr
Chemical cost	0	\$/yr
Energy cost	306	\$/yr
Amortization cost	4640	\$/yr

Drying Beds

Design Output Data

Description	Value	Units
Sludge Drying Beds		
Design Information		
Total surface area required	5910	sqft
Initial depth of sludge	12	in
Final solids	50	%
Bed holding time	103	d
Quantities		
Total drying bed surface area	5910	sqft
Number beds	3	
Surface area of each individual bed	1970	sqft
Length of each bed	98.5	ft
Volume of earthwork required	29500	cuft
Volume concrete for dividing walls	2600	cuft
Volume of R.C. in-place for troughs	443	cuft
Volume of sand	4430	cuft
Volume of gravel	5910	cuft
Clay pipe diameter	4	in
Total length clay pipe	591	in
Sludge solids produced	0.341	ton(short)/d
Operational labor required	621	pers-hrs/yr
Maintenance labor required	279	pers-hrs/yr
Costs		
Construction and equipment cost	90200	\$
Earthwork Cost	8740	\$
Wall Concrete Cost	43800	\$
Slab Concrete Cost	3450	\$
Drying Bed Media Cost	16500	\$
Drain Pipe System Cost	8750	\$
Misc Costs	8940	\$

Operational labor cost	32000 \$/yr
Maintenance labor cost	11100 \$/yr
Material and supply cost	812 \$/yr
Chemical cost	0 \$/yr
Energy cost	0 \$/yr
Amortization cost	7740 \$/yr

Membrane Bioreactor

Design Output Data

Description	Value	Units
Membrane Bioreactor		
Design Information		
Total volume of reactors	6190	cuft
Length of parallel train	15.9	ft
Width of parallel train	7.93	ft
Sidewater depth	16.4	ft
Number of batteries	1	
Number of parallel trains per b	3	
Total Membrane Area	7890	m2
Total Scour Air Requirement	1580	N m3/hr
Quantities		
Operation labor required	1720	pers-hrs/yr
Maintenance labor required	877	pers-hrs/yr
Electrical energy required	179000	kWh/yr
Volume of earthwork required	11100	cuft
Volume of slab concrete requir	2160	cuft
Volume of wall concrete requir	3120	cuft
Handrail length	180	ft
Number of diffusers per train	39	
Number of swing arm headers	1	
Costs		
Construction and equipment c	907000	\$
Earthwork Cost	3300	\$
Wall Concrete Cost	75000	\$
Slab Concrete Cost	28000	\$
Handrail Cost	13500	\$
Membrane Cost	681000	\$
Installed Aerator Equipment	64300	\$
Air Piping Cost	19600	\$
Misc Cost	29500	\$
Operational labor cost	88400	\$/yr
Maintenance labor cost	35100	\$/yr
Material and supply cost	9070	\$/yr
Chemical cost	5140	\$/yr
Energy cost	17900	\$/yr
Amortization cost	122000	\$/yr
Permeate Pumping		
Design Information		
Average daily pumping rate	0.188	MGD(US)
Total pumping capacity	0.5	MGD(US)
Design capacity per pump	193	gpm(US)
Number of pumps	6	
Number of batteries	1	
Firm pumping capacity	1.11	MGD(US)
Quantities		
Operation labor required	446	pers-hrs/yr
Maintenance labor required	366	pers-hrs/yr
Electrical energy required	11400	kWh/yr
Volume of earthwork required	1690	cuft
Area of pump building	211	sqft
Costs		
Construction and equipment c	145000	\$
Earthwork Cost	1000	\$
Pump Building Cost	46400	\$
Installed Pump Cost	75700	\$
Misc Costs	22200	\$
Operational labor cost	23000	\$/yr
Maintenance labor cost	14600	\$/yr
Material and supply cost	1020	\$/yr
Chemical cost	0	\$/yr
Energy cost	1140	\$/yr
Amortization cost	13700	\$/yr
Waste Sludge Pumping		
Design Information		
Average daily pumping rate	0.00688	MGD(US)
Total pumping capacity	0.00688	MGD(US)
Design capacity per pump	2.39	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.00688	MGD(US)
Quantities		
Operation labor required	232	pers-hrs/yr

Maintenance labor required	172 pers-hrs/yr
Electrical energy required	233 kWh/yr
Volume of earthwork required	1600 cuft
Area of pump building	200 sqft
Costs	
Construction and equipment cost	33000 \$
Earthwork Cost	474 \$
Pump Building Cost	22000 \$
Installed Pump Cost	5470 \$
Misc Costs	5030 \$
Operational labor cost	11900 \$/yr
Maintenance labor cost	6890 \$/yr
Material and supply cost	231 \$/yr
Chemical cost	0 \$/yr
Energy cost	23 \$/yr
Amortization cost	3120 \$/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	0.811	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	0.811	cuyd/d
Maximum anticipated landfill depth	30	d
Anticipated sludge storage height	8	ft
Sludge storage shed area	82.1	sqft
Width of sludge storage shed	6.41	ft
Length of sludge storage shed	12.8	ft
Volume of earthwork required	345	cuft
Volume of slab concrete required	170	cuft
Surface area of canopy roof	82.1	sqft
Round trip haul distance	20	miles
Round trips per day per truck	1	
Distance traveled per year per truck	5000	miles
Sludge hauled	0.717	ton(short)/d
Operation labor required	12.7	pers-hrs/yr
LandFilling cost	35200	\$/yr
Costs		
Construction and equipment cost	287000	\$
Earthwork Cost	102	\$
Slab Concrete Cost	2210	\$
Canopy Roof Cost	1640	\$
Vehicle Cost	283000	\$
Operational labor cost	653	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	53600	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	61600	\$/yr