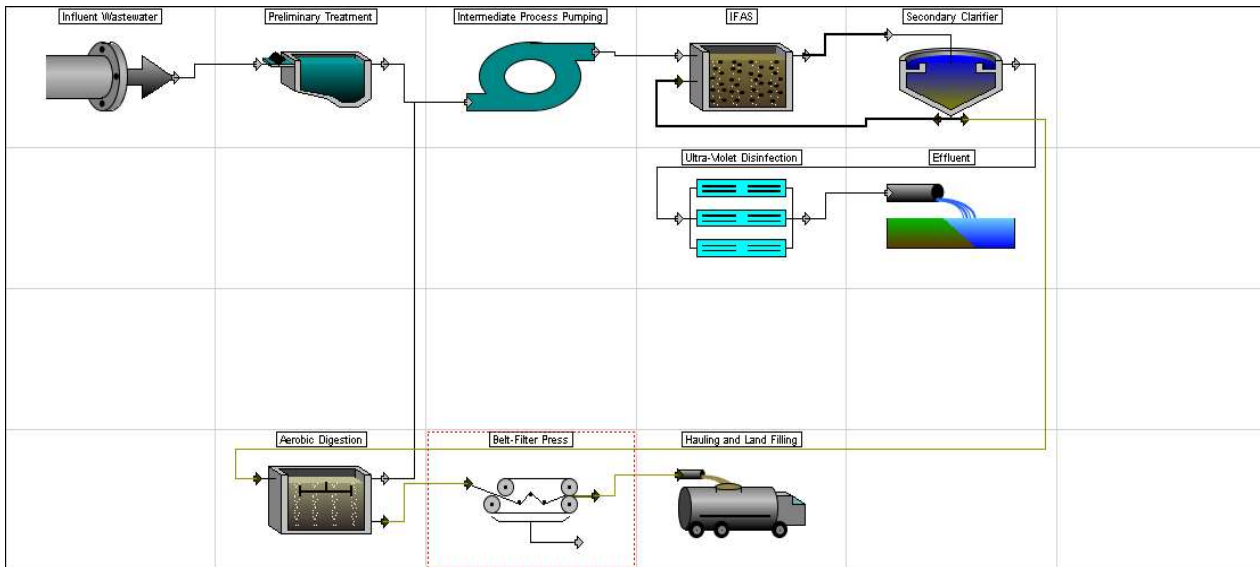


Layout - Perry Willard



Summary

Equipment Database

Hydromantis 2014,(USA Avg)

Layout Summary

Description	Value	Units
CONSTRUCTION COSTS		
Unit process construction cost	\$5,920,000	\$
Other direct construction costs	\$3,340,000	\$
Other indirect construction costs	\$7,060,000	\$
Total construction costs	\$16,300,000	\$

ANNUAL COSTS

LABOR COSTS

Administration labor cost	\$30,900	\$/yr
Laboratory labor cost	\$140,000	\$/yr
Unit process operation labor cost	\$372,000	\$/yr
Unit process maintenance labor cost	\$171,000	\$/yr
Total labor costs	\$713,000	\$/yr

MATERIAL COSTS

Total material cost	\$180,000	\$/yr
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CHEMICAL COSTS

Total chemical cost	\$15,800	\$/yr
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ENERGY COSTS

Total energy cost	\$333,000	\$/yr
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Total operation and maintenance \$1,240,000 \$/yr

CONSTRUCTION COST AMC

Amortization cost for total construction \$1,450,000 \$/yr

Total annual project cost \$2,690,000 \$/yr

PROJECT SUMMARY

Present worth	\$32,300,000	\$
Total project cost	\$16,300,000	\$
Total operation labor cost	\$543,000	\$/yr
Total maintenance labor cost	\$171,000	\$/yr
Total material cost	\$180,000	\$/yr
Total chemical cost	\$15,800	\$/yr
Total energy cost	\$333,000	\$/yr
Total amortization cost	\$1,450,000	\$/yr

Process Summary

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Preliminary Treatment	128000	39100	16900	3190	0	2210	10700
Aerobic Digestion	1000000	83900	34100	75400	0	91200	89300
Intermediate Process Pumping	79200	24800	16200	555	0	6820	7490
Belt-Filter Press	812000	4670	920	0	15500	2920	74300

IFAS	1810000	155000	73500	39600	0	226000	196000
Ultra-Violet Disinfection	107000	0	1100	1070	374	2680	9100
Hauling and Land Filling	316000	6820	0	53600	0	0	64000
Secondary Clarifier	656000	57500	27700	6430	0	1140	59900
Effluent	0	0	0	0	0	0	0
Blower System	998000	0	0	0	0	0	83700
Other Costs	10400000	171000	0	0	0	0	853000

Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land		12 acre
Administration labor hours		600 hr/yr
Laboratory labor hours		2720 hr/yr
Costs		
DIRECT COSTS		
Mobilization	296000 \$	
Site preparation	477000 \$	
Site electrical	802000 \$	
Yard piping	545000 \$	
Instrumentation and control	387000 \$	
Lab and administration building	836000 \$	
Total direct construction costs	3340000 \$	
INDIRECT COSTS		
Cost of land	240000 \$	
Miscellaneous cost	532000 \$	
Legal cost	213000 \$	
Engineering design fee	1600000 \$	
Inspection cost	213000 \$	
Contingency	1060000 \$	
Technical	213000 \$	
Interest during construction	1600000 \$	
Profit	1390000 \$	
Total indirect construction cost	7060000 \$	
Total of other construction costs	10400000 \$	
LABOR COSTS		
Administration labor cost	30900 \$/yr	
Laboratory labor cost	140000 \$/yr	

Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity		12100 scfm
Safety factor		1.5
Requested air flow capacity		18200 scfm
Total capacity of blowers		18200 scfm
Number of blowers in use		3
Total number of blowers		4
Capacity of individual blowers		6060 scfm
Estimated cost of an installed blower	181000 \$	
Blower building area		1580 sqft
Costs		
Construction and equipment cost	998000 \$	
Installed Blower Cost	725000 \$	
Building Cost	173000 \$	
Misc Costs	98900 \$	
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	83700 \$/yr	

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

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	1.23 ft
Average channel depth	1 ft
Horizontal Flow Grit Chamber	
Maximum flow	1.08 cuft/s
Average flow	3.08 cuft/s
Minimum flow	7.7 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	0.539 cuft/s
Width of channel	0.0898 ft
Depth of channel	4 ft
Length of channel	144 ft
Settling velocity of particle	0.0707 ft/s
Slope of channel bottom	0.0348
Allowance for currents	1.7
Manning coefficient	0.035
Hydraulic retention time	1.6 min
Volume of grit	8 cuft/d
Costs	
Construction and equipment co	128000 \$
Operational labor cost	39100 \$/yr
Maintenance labor cost	16900 \$/yr
Material and supply cost	3190 \$/yr
Chemical cost	0 \$/yr
Energy cost	2210 \$/yr
Amortization cost	10700 \$/yr

Aerobic Digestion

Design Output Data

Description	Value	Units
Aerobic Digestion		
Design Information		
Solids retention time	36.3 d	
Design SS	12000 mg/L	
Calculated VSS	5820 mg/L	
Calculated VSS:TSS ratio	0.485 mg VSS/mg SS	
Total volume of reactors	3920 m ³	
Length of parallel train	40 m	
Width of parallel train	10 m	
Sidewater depth	5 m	
Number of batteries	1	
Number of parallel trains per b	2	
Oxygen requirement to meet a	1060 kg/d	
Air flow required to meet avera	5890 N m ³ /hr	
Design air flow	25.1 N m ³ /min/1000 m ³	
Volatile solids loading	0.0222 lb/(cuft-d)	
Solids accumulated	2850 lb/d	
Digester capacity	104000 lb	
Volume of wasted sludge	473000 gal(US)	
Quantities		
Operation labor required	1630 pers-hrs/yr	
Maintenance labor required	840 pers-hrs/yr	
Electrical energy required	912000 kWh/yr	
Volume of earthwork required	84100 cuft	
Volume of slab concrete requir	18700 cuft	
Volume of wall concrete requir	12700 cuft	
Handrail length	343 ft	
Number of diffusers per train	148	
Number of swing arm headers	6	
Costs		
Construction and equipment co	1000000 \$	
Earthwork Cost	24900 \$	
Wall Concrete Cost	305000 \$	
Slab Concrete Cost	242000 \$	
Handrail Cost	25700 \$	
Installed Aerator Equipment	250000 \$	
Air Piping Cost	56500 \$	
Misc Costs	99600 \$	
Operational labor cost	83900 \$/yr	
Maintenance labor cost	34100 \$/yr	
Material and supply cost	75400 \$/yr	
Chemical cost	0 \$/yr	
Energy cost	91200 \$/yr	
Amortization cost	89300 \$/yr	

Intermediate Process Pumping

Design Output Data

Description	Value	Units
Intermediate Pumping Design Information		
Average daily pumping rate	2.04	MGD(US)
Total pumping capacity	0.744	MGD(US)
Design capacity per pump	258	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	2.04	MGD(US)
Quantities		
Operation labor required	482	pers-hrs/yr
Maintenance labor required	400	pers-hrs/yr
Electrical energy required	68200	kWh/yr
Volume of earthwork required	1720	cuft
Area of pump building	215	sqft
Costs		
Construction and equipment cost	79200	\$
Earthwork Cost	509	\$
Pump Building Cost	23600	\$
Installed Pump Cost	43000	\$
Misc Costs	12100	\$
Operational labor cost	24800	\$/yr
Maintenance labor cost	16200	\$/yr
Material and supply cost	555	\$/yr
Chemical cost	0	\$/yr
Energy cost	6820	\$/yr
Amortization cost	7490	\$/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	50.7	gpm(US)
Final solids content	19	%
Solids capture fraction	0.996	
Quantities		
Operation labor required	90.6	pers-hrs/yr
Maintenance labor required	22.7	pers-hrs/yr
Power	29200	kWh/yr
Polymer required	11900	lb/yr
Dry solids produced	3260	lb/d
Belt filter(s)	275000	\$
Building	279000	\$
Installation	68800	\$
Polymer system	82500	\$
Feed pumps	30300	\$
Conveyor system	77000	\$
Costs		
Construction and equipment cost	812000	\$
Building Cost	279000	\$
Polymer System Cost	82500	\$
Feed Pumps Cost	30300	\$
Conveyor System Cost	77000	\$
Installed Belt Filter	344000	\$
Operational labor cost	4670	\$/yr
Maintenance labor cost	920	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	15500	\$/yr
Energy cost	2920	\$/yr
Amortization cost	74300	\$/yr

IFAS**Design Output Data**

Description	Value	Units
IFAS Design Information		
Carbon & Nitrification Design		
Max. specific growth of nitrifier	0.205	1/d
Death rate of nitrifiers at winter	0.0303	1/d
Minimum SRT for design at winter	5.72	d
Design SRT for design at winter	8.58	d
Design SS	4000	mg/L
Calculated VSS	2440	mg/L
Calculated VSS:TSS ratio	0.611	mg VSS/mg SS
Total volume of reactors	3490	m ³
Length of parallel train	24	m
Width of parallel train	10	m

Sidewater depth	5 m
Number of batteries	1
Number of parallel trains per b	3
Number of cells within one train	2
Total number of dividing walls	3
Hydraulic retention time	10.8 hr
F/M ratio	0.149 kg BOD/kg MLSS/d
Volumetric BOD loading	0.502 kg BOD/m ³ /d
Observed yield (VSS basis)	0.875 g VSS/g BOD
Observed yield (TSS basis)	0.954 g TSS/g BOD
Amount of alkalinity required	172 gCaCO ₃ /m ³
Amount of sludge generated	2240 kg/d
Sludge recycle rate	5160 m ³ /d
Nitrogen requirement for biomass	11.8 mg/L
Phosphorus requirement for biomass	2.36 mg/L
Oxygen requirement to meet average	3040 kg/d
Air flow required to meet average	14100 N m ³ /hr
Design air flow	67.5 N m ³ /min/1000 m ³
Quantities	
Operation labor required	2550 pers-hrs/yr
Maintenance labor required	1430 pers-hrs/yr
Electrical energy required	2210000 kWh/yr
Volume of earthwork required	76600 cuft
Volume of slab concrete required	17000 cuft
Volume of wall concrete required	12700 cuft
Handrail length	439 ft
Number of diffusers per train	239
Number of swing arm headers	4
Volume of Media required	1740 m ³
Sieve Area required	2.82 m ²
Costs	
Construction and equipment cost	1690000 \$
Earthwork Cost	22700 \$
Wall Concrete Cost	305000 \$
Slab Concrete Cost	220000 \$
Handrail Cost	33000 \$
Installed Aerator Equipment	267000 \$
Air Piping Cost	154000 \$
Misc Costs	110000 \$
Media Cost	575000 \$
Screen Cost	3100 \$
Operational labor cost	131000 \$/yr
Maintenance labor cost	58200 \$/yr
Material and supply cost	38700 \$/yr
Chemical cost	0 \$/yr
Energy cost	221000 \$/yr
Amortization cost	185000 \$/yr
Sludge Recycle Pumping	
Design Information	
Average daily pumping rate	1.36 MGD(US)
Total pumping capacity	2.73 MGD(US)
Design capacity per pump	947 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	1.36 MGD(US)
Quantities	
Operation labor required	458 pers-hrs/yr
Maintenance labor required	377 pers-hrs/yr
Electrical energy required	45600 kWh/yr
Volume of earthwork required	2030 cuft
Area of pump building	254 sqft
Costs	
Construction and equipment cost	124000 \$
Earthwork Cost	602 \$
Pump Building Cost	27900 \$
Installed Pump Cost	76200 \$
Misc Costs	18900 \$
Operational labor cost	23600 \$/yr
Maintenance labor cost	15300 \$/yr
Material and supply cost	865 \$/yr
Chemical cost	0 \$/yr
Energy cost	4560 \$/yr
Amortization cost	11700 \$/yr

Ultra-Violet Disinfection

Design Output Data

Description	Value	Units
Ultra-Violet Disinfection		
Design Information		
Design based on a model calculation	1.63	gal(US)/(min-W)
System is not headloss constrained		
Total number of lamps needed	22	

Number of spare channels	1
Total number of lamps used in	36
Number of excess lamps	14
Number of lamps/modules	2
Number of modules/bank	3
Number of banks/channel	2
Number of channels	3
Calculated headloss	1.91 in
Costs	
Construction and equipment co	107000 \$
Cost of installation	64400 \$
Total cost of UV lamps	43000 \$
Operational labor cost	0 \$/yr
Maintenance labor cost	1100 \$/yr
Material and supply cost	1070 \$/yr
Chemical cost	374 \$/yr
Energy cost	2680 \$/yr
Amortization cost	9100 \$/yr

Hauling and Land Filling

Design Output Data

Description	Value	Units
Sludge Hauling and Land Filling		
Design Information		
Volume of sludge hauled	8.46	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	8.46	cuyd/d
Maximum anticipated landfill d	30	d
Anticipated sludge storage hei	8	ft
Sludge storage shed area	857	sqft
Width of sludge storage shed	20.7	ft
Length of sludge storage shed	41.4	ft
Volume of earthwork required	2550	cuft
Volume of slab concrete requir	1140	cuft
Surface area of canopy roof	857	sqft
Round trip haul distance	20	miles
Round trips per day per truck	1	
Distance traveled per year per	5000	miles
Sludge hauled	7.49	ton(short)/d
Operation labor required	132	pers-hrs/yr
LandFilling cost	35200	\$/yr
Costs		
Construction and equipment co	316000	\$
Earthwork Cost	756	\$
Slab Concrete Cost	14800	\$
Canopy Roof Cost	17100	\$
Vehicle Cost	283000	\$
Operational labor cost	6820	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	53600	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	64000	\$/yr

Secondary Clarifier

Design Output Data

Description	Value	Units
Secondary Clarification		
Design Information		
Surface area	6810	sqft
Surface area per circular clarifi	3410	sqft
Diameter of each circular clarif	66	ft
Number of clarifiers per batter	2	
Number of batteries	1	
Solids loading rate	16.7	lb/(sqft-d)
Hydraulic retention time	8.38	hr
Designed surface overflow rate	300	gal(US)/(sqft-d)
Weir length	74.4	ft
Volume of wasted sludge	57500	gpd(US)
Quantities		
Operation labor required	812	pers-hrs/yr
Maintenance labor required	446	pers-hrs/yr
Electrical energy required	9480	kWh/yr
Volume of earthwork required	84500	cuft
Slab thickness	11.4	in
Volume of slab concrete requir	7680	cuft

Wall thickness	14 in
Volume of wall concrete requir	7710 cuft
Costs	
Construction and equipment cc	613000 \$
Earthwork Cost	25000 \$
Wall Concrete Cost	186000 \$
Slab Concrete Cost	99600 \$
Installed Equipment Cost	209000 \$
Misc Costs	93500 \$
Operational labor cost	41800 \$/yr
Maintenance labor cost	18100 \$/yr
Material and supply cost	6130 \$/yr
Chemical cost	0 \$/yr
Energy cost	948 \$/yr
Amortization cost	55900 \$/yr
Waste Sludge Pumping	
Design Information	
Average daily pumping rate	0.0575 MGD(US)
Total pumping capacity	0.0575 MGD(US)
Design capacity per pump	20 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.0575 MGD(US)
Quantities	
Operation labor required	305 pers-hrs/yr
Maintenance labor required	236 pers-hrs/yr
Electrical energy required	1940 kWh/yr
Volume of earthwork required	1610 cuft
Area of pump building	201 sqft
Costs	
Construction and equipment cc	43100 \$
Earthwork Cost	477 \$
Pump Building Cost	22100 \$
Installed Pump Cost	13900 \$
Misc Costs	6580 \$
Operational labor cost	15700 \$/yr
Maintenance labor cost	9590 \$/yr
Material and supply cost	302 \$/yr
Chemical cost	0 \$/yr
Energy cost	194 \$/yr
Amortization cost	4080 \$/yr

Effluent

Design Output Data

Description	Value	Units
Costs		
Construction and equipment cc	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	