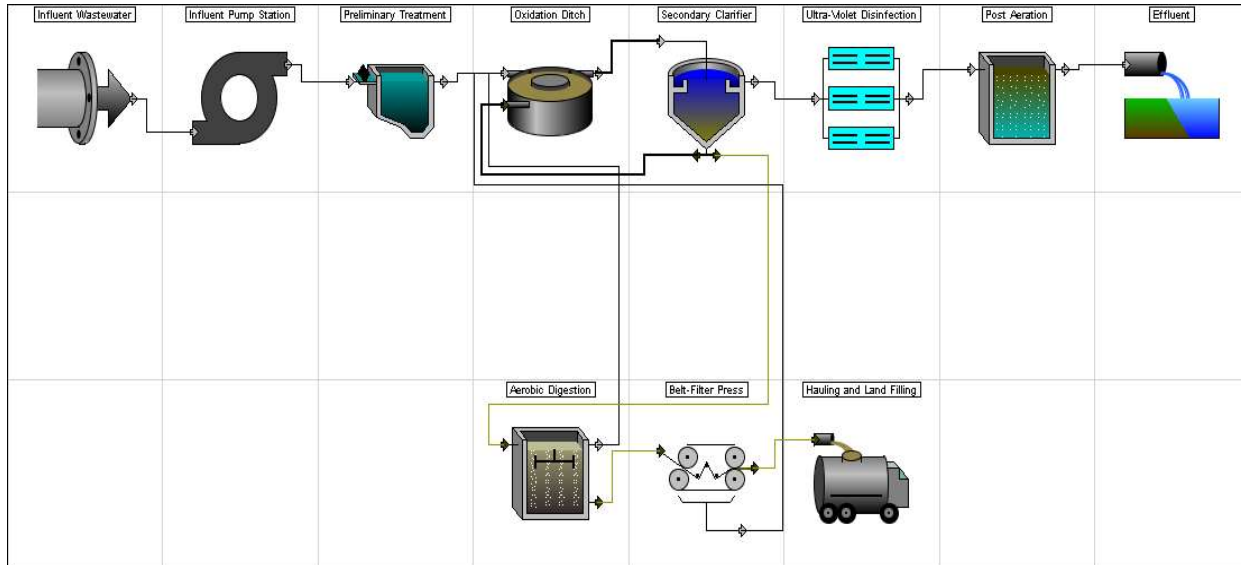


Layout - Brigham City



Summary

Equipment Database

Hydromantis 2014,(USA Avg)

Layout Summary

Description	Value	Units
CONSTRUCTION COSTS		
Unit process construction cost:	\$20,000,000	\$
Other direct construction costs	\$7,000,000	\$
Other indirect construction costs	\$20,200,000	\$
Total construction costs	\$47,100,000	\$

ANNUAL COSTS

LABOR COSTS

Administration labor cost	\$73,000	\$/yr
Laboratory labor cost	\$166,000	\$/yr
Unit process operation labor cost	\$566,000	\$/yr
Unit process maintenance labor cost	\$284,000	\$/yr
Total labor costs	\$1,090,000	\$/yr

MATERIAL COSTS

Total material cost	\$339,000	\$/yr
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CHEMICAL COSTS

Total chemical cost	\$85,200	\$/yr
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ENERGY COSTS

Total energy cost	\$884,000	\$/yr
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Total operation and maintenance	\$2,400,000	\$/yr
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CONSTRUCTION COST AMC

Amortization cost for total construction	\$4,090,000	\$/yr
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Total annual project cost	\$6,490,000	\$/yr
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PROJECT SUMMARY

Present worth	\$77,700,000	\$
Total project cost	\$47,100,000	\$
Total operation labor cost	\$805,000	\$/yr
Total maintenance labor cost	\$284,000	\$/yr
Total material cost	\$339,000	\$/yr
Total chemical cost	\$85,200	\$/yr
Total energy cost	\$884,000	\$/yr
Total amortization cost	\$4,090,000	\$/yr

Process Summary

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Influent Pump Station	1230000	41100	28300	8600	0	37400	111000
Preliminary Treatment	751000	66100	28500	18800	0	3670	63000
Oxidation Ditch	3640000	190000	0	20400	0	389000	338000
Aerobic Digestion	1950000	109000	48500	114000	0	153000	173000

Secondary Clarifier	885000	86000	42400	8700	0	1580	81100
Belt-Filter Press	918000	13700	2810	0	45400	7910	83700
Ultra-Violet Disinfection	9460000	0	122000	94600	39800	286000	863000
Hauling and Land Filling	398000	25400	0	72000	0	0	70900
Post Aeration	62000	35200	11600	1390	0	4980	5610
Effluent	0	0	0	0	0	0	0
Blower System	660000	0	0	0	0	0	55300
Other Costs	27100000	239000	0	0	0	0	2250000

Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	17	acre
Administration labor hours	1420	hr/yr
Laboratory labor hours	3210	hr/yr
Costs		
DIRECT COSTS		
Mobilization	632000	\$
Site preparation	893000	\$
Site electrical	1790000	\$
Yard piping	1190000	\$
Instrumentation and control	912000	\$
Lab and administration building	1580000	\$
Total direct construction costs	7000000	\$
INDIRECT COSTS		
Cost of land	340000	\$
Miscellaneous cost	1550000	\$
Legal cost	620000	\$
Engineering design fee	4650000	\$
Inspection cost	620000	\$
Contingency	3100000	\$
Technical	620000	\$
Interest during construction	4610000	\$
Profit	4040000	\$
Total indirect construction cost	20200000	\$
Total of other construction costs	27100000	\$
LABOR COSTS		
Administration labor cost	73000	\$/yr
Laboratory labor cost	166000	\$/yr

Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	5940	scfm
Safety factor	1.5	
Requested air flow capacity	8920	scfm
Total capacity of blowers	8920	scfm
Number of blowers in use	2	
Total number of blowers	3	
Capacity of individual blowers	4460	scfm
Estimated cost of an installed blower	150000	\$
Blower building area	1310	sqft
Costs		
Construction and equipment cost	660000	\$
Installed Blower Cost	450000	\$
Building Cost	144000	\$
Misc Costs	65400	\$
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	55300	\$/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	1810	cuft
Width of wet well	13.2	ft
Depth of the pumping station	29.4	ft
Length of the pumping station	22.8	ft
Width of the pumping station	45.7	ft

Minimum depth of water in wet	8.38 ft
Area of pump building	777 sqft
Peak capacity of pumps	19.6 MGD(US)
Firm pumping capacity	19.6 MGD(US)
Total dynamic head - average	44.3 ft
Quantities	
Operation labor required	798 pers-hrs/yr
Maintenance labor required	671 pers-hrs/yr
Electrical energy required	374000 kWh/yr
Volume of earthwork required	193000 cuft
Volume of slab concrete requir	8680 cuft
Volume of wall concrete requir	6330 cuft
Capacity per pump	13600 gpm(US)
Number of constant speed pur	0
Number of variable speed pur	2
Diameter of discharge header	26.4 in
Total dynamic head	57.3 ft
Size of selected pump	24 in
Specific speed of pump	3360
Pump rotating speed	714 rpm
Motor size required	205 HP
Size of selected motor	250 HP
Width of pump system	5.4 ft
Length of pump system	23.5 ft
Length of the dry well	22.8 ft
Width of the dry well	32.5 ft
Costs	
Construction and equipment cc	1230000 \$
Earthwork Cost	57100 \$
Wall Concrete Cost	152000 \$
Slab Concrete Cost	112000 \$
Building Cost	85500 \$
Installed Pump Equipment C	590000 \$
Installed Control Module Cos	44200 \$
Misc Costs	187000 \$
Operational labor cost	41100 \$/yr
Maintenance labor cost	28300 \$/yr
Material and supply cost	8600 \$/yr
Chemical cost	0 \$/yr
Energy cost	37400 \$/yr
Amortization cost	111000 \$/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	1.23	ft
Average channel depth	3	ft
Horizontal Flow Grit Chamber		
Maximum flow	18.5	cuft/s
Average flow	9.24	cuft/s
Minimum flow	3.85	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	9.24	cuft/s
Width of channel	1.54	ft
Depth of channel	4	ft
Length of channel	144	ft
Settling velocity of particle	0.0707	ft/s
Slope of channel bottom	0.00106	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.6	min
Volume of grit	24	cuft/d
Costs		
Construction and equipment cc	751000	\$
Operational labor cost	66100	\$/yr
Maintenance labor cost	28500	\$/yr
Material and supply cost	18800	\$/yr

Chemical cost	0 \$/yr
Energy cost	3670 \$/yr
Amortization cost	63000 \$/yr

Oxidation Ditch

Design Output Data

Description	Value	Units
Oxidation Ditch		
Design Information		
Carbon & Nitrification Design		
Design SRT for design at winter	25	d
Design SS	4000	mg/L
Calculated VSS	2790	mg/L
Calculated VSS:TSS ratio	0.697	mg VSS/mg SS
Total volume of reactors	36100	m ³
Ditch length	102	m
Ditch width	25.8	m
Sidewater depth	3.66	m
Number of batteries	2	
Number of parallel ditches per battery	2	
Number of rotors per ditch	3	
Rotor length for aeration	77	m
Rotor length for mixing	138	m
Installed rotor length per rotor	11.5	m
Rotor horsepower	20	HP
Total installed horsepower per battery	120	HP
Assumed surface velocity	0.46	m/s
Hydraulic retention time	37.3	hr
F/M ratio	0.0518	lb BOD/lb MLSS/d
Volumetric BOD loading	0.144	kg BOD/m ³ /d
Observed yield (VSS basis)	0.591	g VSS/g BOD
Observed yield (TSS basis)	0.848	g TSS/g BOD
Amount of alkalinity required	140	gCaCO ₃ /m ³
Amount of sludge generated	5780	kg/d
Sludge recycle rate	15500	m ³ /d
Nitrogen requirement for biomass	17.3	mg/L
Phosphorus requirement for biomass	3.46	mg/L
Oxygen requirement to meet aeration	10300	kg/d
Quantities		
Ditch bottom width	41.9	ft
Length of straight section	251	ft
Volume of excavation required	653000	cuft
Volume of backfill required per battery	8380	cuft
Volume of wall concrete required per battery	26600	cuft
Volume of slab concrete required per battery	40000	cuft
Length of adjustable weir	48.4	ft
Volume of concrete required per battery	214	cuft
Total handrail length	0	ft
Operation labor required	3680	pers-hrs/yr
Electrical energy required	3890000	kWh/yr
Costs		
Construction and equipment cost	3640000	\$
Earthwork Cost	194000	\$
Wall Concrete Cost	1300000	\$
Slab Concrete Cost	1040000	\$
Handrail Cost	0	\$
Installed Equipment Cost	928000	\$
Misc Costs	180000	\$
Operational labor cost	190000	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	20400	\$/yr
Chemical cost	0	\$/yr
Energy cost	389000	\$/yr
Amortization cost	338000	\$/yr

Notes

Minimum winter SRT not calculated, design SRT specified by user

Aerobic Digestion

Design Output Data

Description	Value	Units
Aerobic Digestion		
Design Information		
Solids retention time	26.6	d
Design SS	12000	mg/L
Calculated VSS	7770	mg/L
Calculated VSS:TSS ratio	0.648	mg VSS/mg SS
Total volume of reactors	8420	m ³
Length of parallel train	85	m
Width of parallel train	10	m
Sidewater depth	5	m
Number of batteries	1	
Number of parallel trains per battery	2	

Oxygen requirement to meet a	1560 kg/d
Air flow required to meet avera	10000 N m3/hr
Design air flow	19.8 N m3/min/1000 m3
Volatile solids loading	0.0304 lb/(cuft·d)
Solids accumulated	8380 lb/d
Digester capacity	223000 lb
Volume of wasted sludge	1020000 gal(US)
Quantities	
Operation labor required	2120 pers-hrs/yr
Maintenance labor required	1150 pers-hrs/yr
Electrical energy required	1530000 kWh/yr
Volume of earthwork required	166000 cuft
Volume of slab concrete requir	37300 cuft
Volume of wall concrete requir	23800 cuft
Handrail length	638 ft
Number of diffusers per train	248
Number of swing arm headers	12
Costs	
Construction and equipment co	1950000 \$
Earthwork Cost	49100 \$
Wall Concrete Cost	573000 \$
Slab Concrete Cost	484000 \$
Handrail Cost	47800 \$
Installed Aerator Equipment	497000 \$
Air Piping Cost	102000 \$
Misc Costs	193000 \$
Operational labor cost	109000 \$/yr
Maintenance labor cost	48500 \$/yr
Material and supply cost	114000 \$/yr
Chemical cost	0 \$/yr
Energy cost	153000 \$/yr
Amortization cost	173000 \$/yr
Notes	

Calculated effluent particulate COD is greater than user-specified effluent COD, consider changing user input.

Secondary Clarifier

Design Output Data

Description	Value	Units
Secondary Clarification		
Design Information		
Surface area	15400	sqft
Surface area per circular clarifi	7680	sqft
Diameter of each circular clarif	99	ft
Number of clarifiers per batter	2	
Number of batteries	1	
Solids loading rate	22.2	lb/(sqft·d)
Hydraulic retention time	4.04	hr
Designed surface overflow rate	400	gal(US)/(sqft·d)
Weir length	1520	ft
Volume of wasted sludge	148000	gpd(US)
Quantities		
Operation labor required	1320	pers-hrs/yr
Maintenance labor required	732	pers-hrs/yr
Electrical energy required	10800	kWh/yr
Volume of earthwork required	206000	cuft
Slab thickness	10.2	in
Volume of slab concrete requir	14800	cuft
Wall thickness	11.5	in
Volume of wall concrete requir	6470	cuft
Costs		
Construction and equipment co	833000	\$
Earthwork Cost	61200	\$
Wall Concrete Cost	156000	\$
Slab Concrete Cost	192000	\$
Installed Equipment Cost	297000	\$
Misc Costs	127000	\$
Operational labor cost	68200	\$/yr
Maintenance labor cost	30900	\$/yr
Material and supply cost	8330	\$/yr
Chemical cost	0	\$/yr
Energy cost	1080	\$/yr
Amortization cost	76200	\$/yr
Waste Sludge Pumping		
Design Information		
Average daily pumping rate	0.148	MGD(US)
Total pumping capacity	0.148	MGD(US)
Design capacity per pump	51.5	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.148	MGD(US)
Quantities		
Operation labor required	344	pers-hrs/yr

Maintenance labor required	272 pers-hrs/yr
Electrical energy required	4990 kWh/yr
Volume of earthwork required	1620 cuft
Area of pump building	203 sqft
Costs	
Construction and equipment cost	51900 \$
Earthwork Cost	481 \$
Pump Building Cost	22300 \$
Installed Pump Cost	21100 \$
Misc Costs	7910 \$
Operational labor cost	17700 \$/yr
Maintenance labor cost	11500 \$/yr
Material and supply cost	363 \$/yr
Chemical cost	0 \$/yr
Energy cost	499 \$/yr
Amortization cost	4900 \$/yr

Belt-Filter Press

Design Output Data

Description	Value	Units
Belt-Filter Press		
Design Information		
Belt filter width	2	m
Number of units	1	
Hydraulic loading per unit per r	70	gpm(US)
Hydraulic loading required per	112	gpm(US)
Final solids content	15	%
Solids capture fraction	0.996	
Quantities		
Operation labor required	266	pers-hrs/yr
Maintenance labor required	66.5	pers-hrs/yr
Power	79100	kWh/yr
Polymer required	34900	lb/yr
Dry solids produced	9560	lb/d
Belt filter(s)	301000	\$
Building	322000	\$
Installation	75300	\$
Polymer system	111000	\$
Feed pumps	33100	\$
Conveyor system	75300	\$
Costs		
Construction and equipment cost	918000	\$
Building Cost	322000	\$
Polymer System Cost	111000	\$
Feed Pumps Cost	33100	\$
Conveyor System Cost	75300	\$
Installed Belt Filter	376000	\$
Operational labor cost	13700	\$/yr
Maintenance labor cost	2810	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	45400	\$/yr
Energy cost	7910	\$/yr
Amortization cost	83700	\$/yr

Ultra-Violet Disinfection

Design Output Data

Description	Value	Units
Ultra-Violet Disinfection		
Design Information		
Design based on a model calcula	0.226	gal(US)/(min·W)
System is not headloss constr		
Total number of lamps needed	2820	
Number of spare channels	1	
Total number of lamps used in	3840	
Number of excess lamps	1020	
Number of lamps/modules	16	
Number of modules/bank	20	
Number of banks/channel	3	
Number of channels	4	
Calculated headloss	0.137	in
Costs		
Construction and equipment cost	9460000	\$
Cost of installation	5680000	\$
Total cost of UV lamps	3790000	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	122000	\$/yr
Material and supply cost	94600	\$/yr
Chemical cost	39800	\$/yr
Energy cost	286000	\$/yr
Amortization cost	863000	\$/yr

Hauling and Land Filling

Design Output Data

Description	Value	Units
Sludge Hauling and Land Filling		
Design Information		
Volume of sludge hauled	31.5	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	31.5	cuyd/d
Maximum anticipated landfill duration	30	d
Anticipated sludge storage height	8	ft
Sludge storage shed area	3190	sqft
Width of sludge storage shed	39.9	ft
Length of sludge storage shed	79.9	ft
Volume of earthwork required	8740	cuft
Volume of slab concrete required	3740	cuft
Surface area of canopy roof	3190	sqft
Round trip haul distance	20	miles
Round trips per day per truck	2	
Distance traveled per year per truck	10000	miles
Sludge hauled	27.9	ton(short)/d
Operation labor required	492	pers-hrs/yr
LandFilling cost	35200	\$/yr
Costs		
Construction and equipment cost	398000	\$
Earthwork Cost	2590	\$
Slab Concrete Cost	48400	\$
Canopy Roof Cost	63800	\$
Vehicle Cost	283000	\$
Operational labor cost	25400	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	72000	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	70900	\$/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	8.55	mg/L
Oxygen required	150	lb/d
Operating transfer efficiency	2.96	lbO ₂ /(HP·h)
Total volume of aerobic reactor	41600	gal(US)
Air flow rate required to meet oxygen demand	200	scfm
Quantities		
Basin depth	15	ft
Length of basin	12.4	ft
Width of basin	30	ft
Number of diffusers	17	
Number of swing arm diffuser lines	1	
Volume of wall concrete required	953	cuft
Volume of slab concrete required	278	cuft
Electrical energy required	49800	kWh/yr
Operation labor required	684	pers-hrs/yr
Maintenance labor required	274	pers-hrs/yr
Costs		
Construction and equipment cost	62000	\$
Wall Concrete Cost	22900	\$
Slab Concrete Cost	12400	\$
Installed Equipment Cost	20600	\$
Misc Costs	6150	\$
Operational labor cost	35200	\$/yr
Maintenance labor cost	11600	\$/yr
Material and supply cost	1390	\$/yr
Chemical cost	0	\$/yr
Energy cost	4980	\$/yr
Amortization cost	5610	\$/yr

Effluent

Design Output Data

Description	Value	Units
Costs		

Construction and equipment c	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