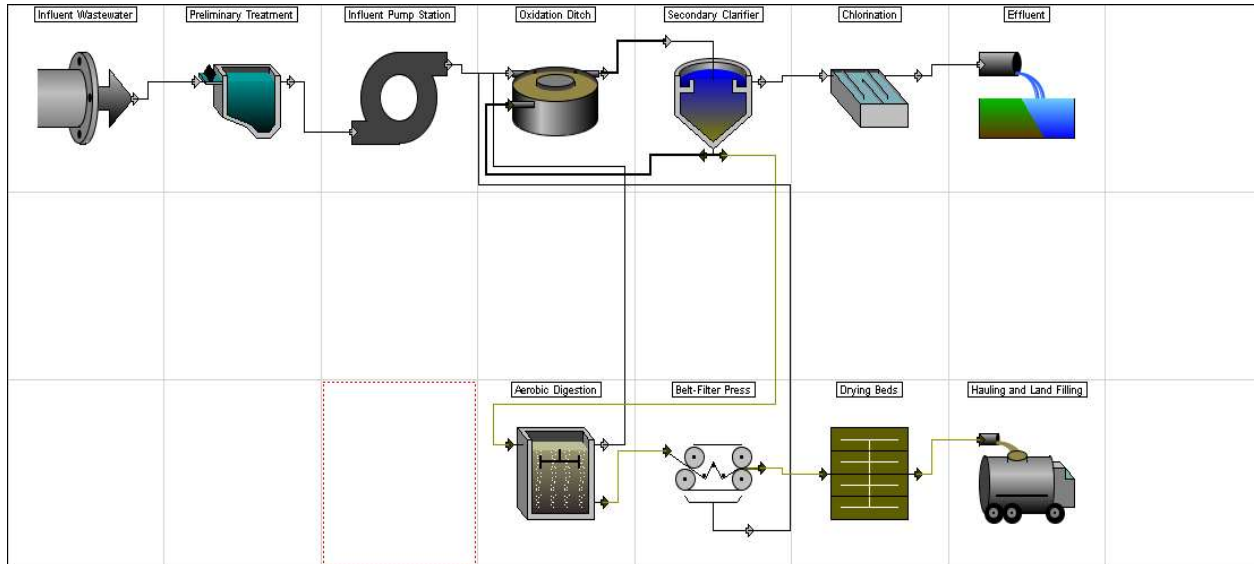


Layout 1 - Magna



Summary

Equipment Database

Hydromantis 2014,(USA Avg)

Layout Summary

Description	Value	Units
CONSTRUCTION COSTS		
Unit process construction cost:	\$19,100,000	\$
Other direct construction costs	\$8,500,000	\$
Other indirect construction costs	\$20,700,000	\$
Total construction costs	\$48,300,000	\$

ANNUAL COSTS

LABOR COSTS

Administration labor cost	\$91,500	\$/yr
Laboratory labor cost	\$173,000	\$/yr
Unit process operation labor cost	\$967,000	\$/yr
Unit process maintenance labor cost	\$302,000	\$/yr
Total labor costs	\$1,530,000	\$/yr

MATERIAL COSTS

Total material cost	\$329,000	\$/yr
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CHEMICAL COSTS

Total chemical cost	\$219,000	\$/yr
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ENERGY COSTS

Total energy cost	\$759,000	\$/yr
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Total operation and maintenance	\$2,840,000	\$/yr
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CONSTRUCTION COST AMC

Amortization cost for total construction	\$4,160,000	\$/yr
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Total annual project cost	\$7,000,000	\$/yr
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PROJECT SUMMARY

Present worth	\$83,800,000	\$
Total project cost	\$48,300,000	\$
Total operation labor cost	\$1,230,000	\$/yr
Total maintenance labor cost	\$302,000	\$/yr
Total material cost	\$329,000	\$/yr
Total chemical cost	\$219,000	\$/yr
Total energy cost	\$759,000	\$/yr
Total amortization cost	\$4,160,000	\$/yr

Process Summary

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Preliminary Treatment	898000	81000	34300	22500	0	4190	75300
Influent Pump Station	5920000	44800	31000	41400	0	45100	506000
Oxidation Ditch	4680000	222000	0	25700	0	519000	436000
Aerobic Digestion	1730000	114000	51300	94300	0	167000	154000

Secondary Clarifier	1070000	99500	49100	10600	0	1900	97600
Belt-Filter Press	1550000	18300	3770	0	60500	10300	143000
Chlorination	975000	66100	12400	32100	158000	12600	94700
Drying Beds	1290000	291000	120000	11600	0	0	112000
Effluent	0	0	0	0	0	0	0
Hauling and Land Filling	331000	30400	0	90400	0	0	65200
Blower System	690000	0	0	0	0	0	57900
Other Costs	29200000	264000	0	0	0	0	2420000

Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	19	acre
Administration labor hours	1780	hr/yr
Laboratory labor hours	3360	hr/yr
Costs		
DIRECT COSTS		
Mobilization	771000	\$
Site preparation	1050000	\$
Site electrical	2210000	\$
Yard piping	1460000	\$
Instrumentation and control	1140000	\$
Lab and administration building	1870000	\$
Total direct construction costs	8500000	\$
INDIRECT COSTS		
Cost of land	380000	\$
Miscellaneous cost	1590000	\$
Legal cost	636000	\$
Engineering design fee	4770000	\$
Inspection cost	636000	\$
Contingency	3180000	\$
Technical	636000	\$
Interest during construction	4740000	\$
Profit	4150000	\$
Total indirect construction cost	20700000	\$
Total of other construction costs	29200000	\$
LABOR COSTS		
Administration labor cost	91500	\$/yr
Laboratory labor cost	173000	\$/yr

Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	6470	scfm
Safety factor	1.5	
Requested air flow capacity	9700	scfm
Total capacity of blowers	9700	scfm
Number of blowers in use	2	
Total number of blowers	3	
Capacity of individual blowers	4850	scfm
Estimated cost of an installed blower	158000	\$
Blower building area	1340	sqft
Costs		
Construction and equipment cost	690000	\$
Installed Blower Cost	474000	\$
Building Cost	148000	\$
Misc Costs	68400	\$
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	57900	\$/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	1.64 ft
Average channel depth	3 ft
Horizontal Flow Grit Chamber	
Maximum flow	24.6 cuft/s
Average flow	12.3 cuft/s
Minimum flow	5.39 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	12.3 cuft/s
Width of channel	2.05 ft
Depth of channel	4 ft
Length of channel	144 ft
Settling velocity of particle	0.0707 ft/s
Slope of channel bottom	0.000789
Allowance for currents	1.7
Manning coefficient	0.035
Hydraulic retention time	1.6 min
Volume of grit	32 cuft/d
Costs	
Construction and equipment co	898000 \$
Operational labor cost	81000 \$/yr
Maintenance labor cost	34300 \$/yr
Material and supply cost	22500 \$/yr
Chemical cost	0 \$/yr
Energy cost	4190 \$/yr
Amortization cost	75300 \$/yr

Influent Pump Station

Design Output Data

Description	Value	Units
Pump Station		
Design Information		
Volume of wet well	97300	cuft
Width of wet well	615	ft
Depth of the pumping station	30.3	ft
Length of the pumping station	25.2	ft
Width of the pumping station	650	ft
Minimum depth of water in wet	9.27	ft
Area of pump building	936	sqft
Peak capacity of pumps	25.5	MGD(US)
Firm pumping capacity	25.5	MGD(US)
Total dynamic head - average	44.1	ft
Quantities		
Operation labor required	871	pers-hrs/yr
Maintenance labor required	730	pers-hrs/yr
Electrical energy required	451000	kWh/yr
Volume of earthwork required	1930000	cuft
Volume of slab concrete requir	174000	cuft
Volume of wall concrete requir	55000	cuft
Capacity per pump	17700	gpm(US)
Number of constant speed pur	2	
Number of variable speed purr	0	
Diameter of discharge header	30.1	in
Total dynamic head	55.7	ft
Size of selected pump	30	in
Specific speed of pump	3910	
Pump rotating speed	613	rpm
Motor size required	235	HP
Size of selected motor	250	HP
Width of pump system	6.6	ft
Length of pump system	26.4	ft
Length of the dry well	25.2	ft
Width of the dry well	35.4	ft
Costs		
Construction and equipment co	5920000	\$
Earthwork Cost	572000	\$
Wall Concrete Cost	1320000	\$
Slab Concrete Cost	2250000	\$
Building Cost	103000	\$
Installed Pump Equipment C	765000	\$
Misc Costs	903000	\$
Operational labor cost	44800	\$/yr
Maintenance labor cost	31000	\$/yr
Material and supply cost	41400	\$/yr
Chemical cost	0	\$/yr

Energy cost	45100 \$/yr
Amortization cost	506000 \$/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	48100	m ³
Ditch length	134	m
Ditch width	25.8	m
Sidewater depth	3.66	m
Number of batteries	2	
Number of parallel ditches per ditch	2	
Number of rotors per ditch	4	
Rotor length for aeration	103	m
Rotor length for mixing	185	m
Installed rotor length per rotor	11.5	m
Rotor horsepower	20	HP
Total installed horsepower per ditch	160	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	7700	kg/d
Sludge recycle rate	20700	m ³ /d
Nitrogen requirement for biomass	17.3	mg/L
Phosphorus requirement for biomass	3.46	mg/L
Oxygen requirement to meet aeration	13700	kg/d
Quantities		
Ditch bottom width	41.9	ft
Length of straight section	357	ft
Volume of excavation required	850000	cuft
Volume of backfill required per ditch	10100	cuft
Volume of wall concrete required per ditch	33500	cuft
Volume of slab concrete required per ditch	51000	cuft
Length of adjustable weir	64.5	ft
Volume of concrete required per ditch	278	cuft
Total handrail length	0	ft
Operation labor required	4310	pers-hrs/yr
Electrical energy required	5190000	kWh/yr
Costs		
Construction and equipment cost	4680000	\$
Earthwork Cost	252000	\$
Wall Concrete Cost	1640000	\$
Slab Concrete Cost	1320000	\$
Handrail Cost	0	\$
Installed Equipment Cost	1240000	\$
Misc Costs	232000	\$
Operational labor cost	222000	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	25700	\$/yr
Chemical cost	0	\$/yr
Energy cost	519000	\$/yr
Amortization cost	436000	\$/yr

Aerobic Digestion

Design Output Data

Description	Value	Units
Aerobic Digestion		
Design Information		
Solids retention time	17.7	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	7480	m ³
Length of parallel train	75	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 aeration	2090	kg/d
Air flow required to meet aeration	11000	N m ³ /hr
Design air flow	24.4	N m ³ /min/1000 m ³

Volatile solids loading	0.0456 lb/(cuft-d)
Solids accumulated	11200 lb/d
Digester capacity	198000 lb
Volume of wasted sludge	904000 gal(US)
Quantities	
Operation labor required	2210 pers-hrs/yr
Maintenance labor required	1210 pers-hrs/yr
Electrical energy required	1670000 kWh/yr
Volume of earthwork required	148000 cuft
Volume of slab concrete requir	33200 cuft
Volume of wall concrete requir	21300 cuft
Handrail length	572 ft
Number of diffusers per train	270
Number of swing arm headers	10
Costs	
Construction and equipment co	1730000 \$
Earthwork Cost	43700 \$
Wall Concrete Cost	513000 \$
Slab Concrete Cost	430000 \$
Handrail Cost	42900 \$
Installed Aerator Equipment	419000 \$
Air Piping Cost	112000 \$
Misc Costs	172000 \$
Operational labor cost	114000 \$/yr
Maintenance labor cost	51300 \$/yr
Material and supply cost	94300 \$/yr
Chemical cost	0 \$/yr
Energy cost	167000 \$/yr
Amortization cost	154000 \$/yr

Secondary Clarifier

Design Output Data

Description	Value	Units
Secondary Clarification		
Design Information		
Surface area	20500	sqft
Surface area per circular clarifi	10200	sqft
Diameter of each circular clarif	115	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	2020	ft
Volume of wasted sludge	198000	gpd(US)
Quantities		
Operation labor required	1580	pers-hrs/yr
Maintenance labor required	872	pers-hrs/yr
Electrical energy required	12400	kWh/yr
Volume of earthwork required	292000	cuft
Slab thickness	10.2	in
Volume of slab concrete requir	19800	cuft
Wall thickness	11.5	in
Volume of wall concrete requir	7490	cuft
Costs		
Construction and equipment co	1020000	\$
Earthwork Cost	86500	\$
Wall Concrete Cost	180000	\$
Slab Concrete Cost	256000	\$
Installed Equipment Cost	338000	\$
Misc Costs	155000	\$
Operational labor cost	81100	\$/yr
Maintenance labor cost	37000	\$/yr
Material and supply cost	10200	\$/yr
Chemical cost	0	\$/yr
Energy cost	1240	\$/yr
Amortization cost	92400	\$/yr
Waste Sludge Pumping		
Design Information		
Average daily pumping rate	0.198	MGD(US)
Total pumping capacity	0.198	MGD(US)
Design capacity per pump	68.6	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.198	MGD(US)
Quantities		
Operation labor required	357	pers-hrs/yr
Maintenance labor required	283	pers-hrs/yr
Electrical energy required	6650	kWh/yr
Volume of earthwork required	1630	cuft
Area of pump building	204	sqft
Costs		

Construction and equipment cost	55400 \$
Earthwork Cost	483 \$
Pump Building Cost	22400 \$
Installed Pump Cost	24000 \$
Misc Costs	8440 \$
Operational labor cost	18400 \$/yr
Maintenance labor cost	12000 \$/yr
Material and supply cost	387 \$/yr
Chemical cost	0 \$/yr
Energy cost	665 \$/yr
Amortization cost	5230 \$/yr

Belt-Filter Press

Design Output Data

Description	Value	Units
Belt-Filter Press		
Design Information		
Belt filter width	2	m
Number of units	2	
Hydraulic loading per unit per r	70	gpm(US)
Hydraulic loading required per	149	gpm(US)
Final solids content	15	%
Solids capture fraction	0.996	
Quantities		
Operation labor required	355	pers-hrs/yr
Maintenance labor required	88.7	pers-hrs/yr
Power	103000	kWh/yr
Polymer required	46500	lb/yr
Dry solids produced	12800	lb/d
Belt filter(s)	602000	\$
Building	358000	\$
Installation	151000	\$
Polymer system	223000	\$
Feed pumps	66200	\$
Conveyor system	151000	\$
Costs		
Construction and equipment cost	1550000	\$
Building Cost	358000	\$
Polymer System Cost	223000	\$
Feed Pumps Cost	66200	\$
Conveyor System Cost	151000	\$
Installed Belt Filter	753000	\$
Operational labor cost	18300	\$/yr
Maintenance labor cost	3770	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	60500	\$/yr
Energy cost	10300	\$/yr
Amortization cost	143000	\$/yr

Chlorination

Design Output Data

Description	Value	Units
Chlorination		
Design Information		
Volume of tank	666000	gal(US)
Average chlorine required	666	lb/d
Peak chlorine required	1330	lb/d
Influent coliform count	10000000	/100ml
Effluent coliform count	3.72	/100ml
Quantities		
Operational labor required	1280	pers-hrs/yr
Maintenance labor required	292	pers-hrs/yr
Electrical energy required	126000	kWh/yr
Volume of earthwork required	37800	cuft
Volume of slab concrete requir	8930	cuft
Volume of wall concrete requir	11900	cuft
Number of chlorinators and ev.	1	
Chlorination building area	220	sqft
Number of chlorine cylinders	10	
Area of chlorine storage buildir	1400	sqft
Costs		
Construction and equipment cost	975000	\$
Earthwork Cost	11200	\$
Wall Concrete Cost	287000	\$
Slab Concrete Cost	116000	\$
Installed Equipment Cost	386000	\$
Building Cost	24200	\$
Storage Building Cost	77000	\$
Misc Costs	74500	\$
Operational labor cost	66100	\$/yr
Maintenance labor cost	12400	\$/yr
Material and supply cost	32100	\$/yr

Chemical cost	158000 \$/yr
Energy cost	12600 \$/yr
Amortization cost	94700 \$/yr

Drying Beds

Design Output Data

Description	Value	Units
Sludge Drying Beds		
Design Information		
Total surface area required	92300	sqft
Initial depth of sludge	12	in
Final solids	50	%
Bed holding time	81.4	d
Quantities		
Total drying bed surface area	92300	sqft
Number beds	31	
Surface area of each individual	2980	sqft
Length of each bed	149	ft
Volume of earthwork required	454000	cuft
Volume concrete for dividing w	30400	cuft
Volume of R.C. in-place for tru	6920	cuft
Volume of sand	69200	cuft
Volume of gravel	92300	cuft
Clay pipe diameter	6	in
Total length clay pipe	9230	in
Sludge solids produced	5.3	ton(short)/d
Operational labor required	5660	pers-hrs/yr
Maintenance labor required	2830	pers-hrs/yr
Costs		
Construction and equipment co	1290000	\$
Earthwork Cost	135000	\$
Wall Concrete Cost	512000	\$
Slab Concrete Cost	53800	\$
Drying Bed Media Cost	258000	\$
Drain Pipe System Cost	203000	\$
Misc Costs	128000	\$
Operational labor cost	291000	\$/yr
Maintenance labor cost	120000	\$/yr
Material and supply cost	11600	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	112000	\$/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

Hauling and Land Filling

Design Output Data

Description	Value	Units
Sludge Hauling and Land Filling		
Design Information		
Volume of sludge hauled	12.6	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	30	miles
Quantities		
Total sludge volume hauled	12.6	cuyd/d
Maximum anticipated landfill d	30	d
Anticipated sludge storage hei	8	ft
Sludge storage shed area	1280	sqft
Width of sludge storage shed	25.3	ft
Length of sludge storage shed	50.5	ft
Volume of earthwork required	3680	cuft
Volume of slab concrete requir	1620	cuft
Surface area of canopy roof	1280	sqft
Round trip haul distance	60	miles
Round trips per day per truck	1	
Distance traveled per year per	15000	miles
Sludge hauled	11.1	ton(short)/d
Operation labor required	591	pers-hrs/yr

LandFilling cost	35200 \$/yr
Costs	
Construction and equipment c	331000 \$
Earthwork Cost	1090 \$
Slab Concrete Cost	21000 \$
Canopy Roof Cost	25500 \$
Vehicle Cost	283000 \$
Operational labor cost	30400 \$/yr
Maintenance labor cost	0 \$/yr
Material and supply cost	90400 \$/yr
Chemical cost	0 \$/yr
Energy cost	0 \$/yr
Amortization cost	65200 \$/yr