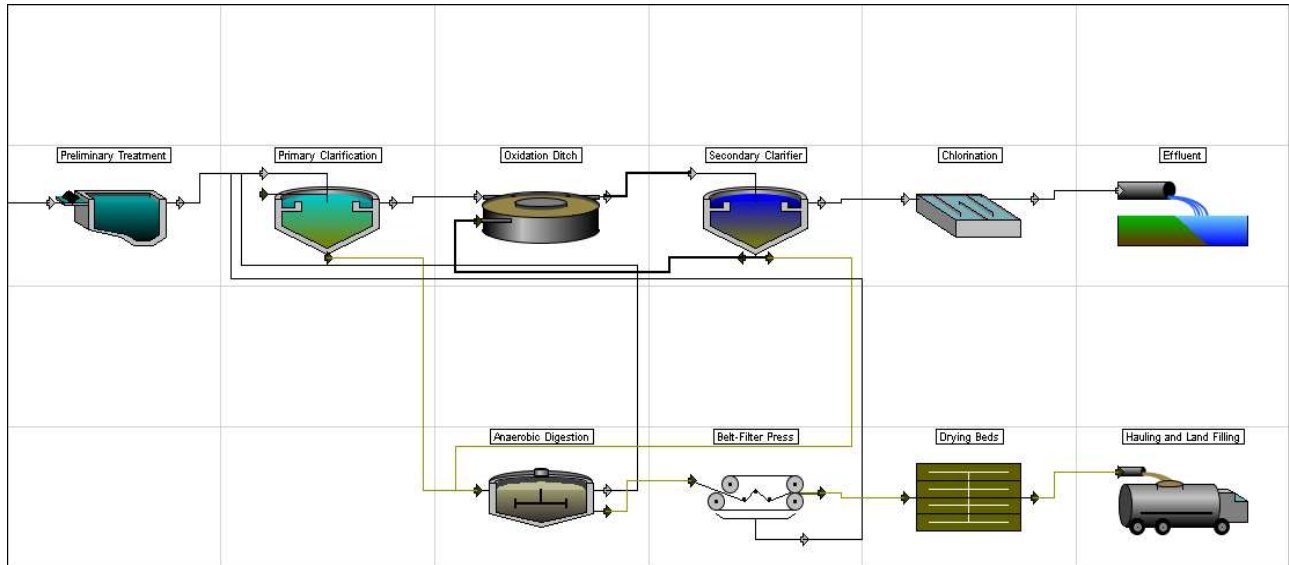


Layout - Cedar City



Summary

Equipment Database

Hydromantis 2014,(USA Avg)

Layout Summary

Description	Value	Units
CONSTRUCTION COSTS		
Unit process construction cost:	\$18,200,000	\$
Other direct construction costs	\$6,020,000	\$
Other indirect construction costs	\$18,100,000	\$
Total construction costs	\$42,300,000	\$

ANNUAL COSTS

LABOR COSTS

Administration labor cost	\$61,300	\$/yr
Laboratory labor cost	\$160,000	\$/yr
Unit process operation labor cost	\$695,000	\$/yr
Unit process maintenance labor cost	\$247,000	\$/yr
Total labor costs	\$1,160,000	\$/yr

MATERIAL COSTS

Total material cost	\$242,000	\$/yr
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CHEMICAL COSTS

Total chemical cost	\$136,000	\$/yr
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ENERGY COSTS

Total energy cost	\$316,000	\$/yr
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Total operation and maintenance	\$1,860,000	\$/yr
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CONSTRUCTION COST AMC

Amortization cost for total construction	\$3,720,000	\$/yr
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Total annual project cost	\$5,580,000	\$/yr
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PROJECT SUMMARY

Present worth	\$66,800,000	\$
Total project cost	\$42,300,000	\$
Total operation labor cost	\$916,000	\$/yr
Total maintenance labor cost	\$247,000	\$/yr
Total material cost	\$242,000	\$/yr
Total chemical cost	\$136,000	\$/yr
Total energy cost	\$316,000	\$/yr
Total amortization cost	\$3,720,000	\$/yr

Process Summary

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Influent Pump Station	2430000	38400	26200	17000	0	32000	210000
Preliminary Treatment	670000	58300	25100	16800	0	3310	56200
Primary Clarification	516000	52900	25900	5050	0	1000	48000
Oxidation Ditch	2420000	122000	0	19500	0	229000	234000

Anaerobic Digestion	8580000	82100	43500	87400	0	30500	812000
Secondary Clarifier	845000	74800	36300	8320	0	1230	77000
Belt-Filter Press	812000	12300	2500	0	41000	7180	74300
Chlorination	716000	50400	7450	26600	94900	11800	70700
Drying Beds	877000	197000	79900	7890	0	0	76300
Effluent	0	0	0	0	0	0	0
Hauling and Land Filling	316000	6870	0	53600	0	0	64000
Other Costs	24100000	221000	0	0	0	0	2000000

Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	16	acre
Administration labor hours	1190	hr/yr
Laboratory labor hours	3110	hr/yr
Costs		
DIRECT COSTS		
Mobilization	542000	\$
Site preparation	786000	\$
Site electrical	1520000	\$
Yard piping	1010000	\$
Instrumentation and control	766000	\$
Lab and administration building	1390000	\$
Total direct construction costs	6020000	\$
INDIRECT COSTS		
Cost of land	320000	\$
Miscellaneous cost	1390000	\$
Legal cost	557000	\$
Engineering design fee	4170000	\$
Inspection cost	557000	\$
Contingency	2780000	\$
Technical	557000	\$
Interest during construction	4140000	\$
Profit	3630000	\$
Total indirect construction cost	18100000	\$
Total of other construction costs	24100000	\$
LABOR COSTS		
Administration labor cost	61300	\$/yr
Laboratory labor cost	160000	\$/yr

Influent Wastewater Influent Pump Station Design Output Data

Description	Value	Units
Pump Station		
Design Information		
Volume of wet well	31200	cuft
Width of wet well	221	ft
Depth of the pumping station	28.8	ft
Length of the pumping station	22.8	ft
Width of the pumping station	254	ft
Minimum depth of water in wet	7.77	ft
Area of pump building	777	sqft
Peak capacity of pumps	16	MGD(US)
Firm pumping capacity	16	MGD(US)
Total dynamic head - average	44.4	ft
Quantities		
Operation labor required	745	pers-hrs/yr
Maintenance labor required	628	pers-hrs/yr
Electrical energy required	320000	kWh/yr
Volume of earthwork required	710000	cuft
Volume of slab concrete required	56200	cuft
Volume of wall concrete required	21700	cuft
Capacity per pump	11100	gpm(US)
Number of constant speed pumps	2	
Number of variable speed pumps	0	
Diameter of discharge header	23.8	in
Total dynamic head	58.7	ft
Size of selected pump	24	in
Specific speed of pump	4470	
Pump rotating speed	805	rpm
Motor size required	183	HP
Size of selected motor	200	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 cost	2430000 \$
Earthwork Cost	210000 \$
Wall Concrete Cost	523000 \$
Slab Concrete Cost	729000 \$
Building Cost	85500 \$
Installed Pump Equipment Cost	512000 \$
Misc Costs	371000 \$
Operational labor cost	38400 \$/yr
Maintenance labor cost	26200 \$/yr
Material and supply cost	17000 \$/yr
Chemical cost	0 \$/yr
Energy cost	32000 \$/yr
Amortization cost	210000 \$/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 (ft/s)	2.5 ft/s	
Maximum flow through velocity (ft/s)	3 ft/s	
Screen channel width	2.96 ft	
Average channel depth	1 ft	
Horizontal Flow Grit Chamber		
Maximum flow	15.4 cuft/s	
Average flow	7.39 cuft/s	
Minimum flow	2.31 cuft/s	
Temperature	10 deg C	
Maximum flow through velocity (ft/s)	1.5 ft/s	
Average flow through velocity (ft/s)	1 ft/s	
Size of smallest particle 100%	0.2 mm	
Specific gravity of particle	2.65	
Number of units	2	
Maximum flow/unit	7.7 cuft/s	
Width of channel	1.28 ft	
Depth of channel	4 ft	
Length of channel	144 ft	
Settling velocity of particle	0.0707 ft/s	
Slope of channel bottom	0.0013	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.6 min	
Volume of grit	19.2 cuft/d	
Costs		
Construction and equipment cost	670000 \$	
Operational labor cost	58300 \$/yr	
Maintenance labor cost	25100 \$/yr	
Material and supply cost	16800 \$/yr	
Chemical cost	0 \$/yr	
Energy cost	3310 \$/yr	
Amortization cost	56200 \$/yr	

Primary Clarification

Design Output Data

Description	Value	Units
Primary Clarification		
Design Information		
Surface area	6090 sqft	
Surface area per circular clarifier	3040 sqft	
Diameter of each circular clarifier	63 ft	
Number of clarifiers per battery	2	
Number of batteries	1	
Solids loading rate	1.94 lb/(sqft-d)	
Hydraulic retention time	2.02 hr	
Weir length	1010 ft	
Volume of sludge generated	20600 gpd(US)	
Quantities		
Operation labor required	759 pers-hrs/yr	
Maintenance labor required	416 pers-hrs/yr	
Electrical energy required	9300 kWh/yr	
Volume of earthwork required	76600 cuft	
Slab thickness	10.2 in	
Volume of slab concrete required	6260 cuft	
Wall thickness	11.5 in	
Volume of wall concrete required	4200 cuft	
Costs		

Construction and equipment cost	479000 \$
Earthwork Cost	22700 \$
Wall Concrete Cost	101000 \$
Slab Concrete Cost	81200 \$
Installed Equipment Cost	201000 \$
Misc Costs	73100 \$
Operational labor cost	39100 \$/yr
Maintenance labor cost	17400 \$/yr
Material and supply cost	4790 \$/yr
Chemical cost	0 \$/yr
Energy cost	930 \$/yr
Amortization cost	44500 \$/yr
Waste Sludge Pumping	
Design Information	
Average daily pumping rate	0.0206 MGD(US)
Total pumping capacity	0.0206 MGD(US)
Design capacity per pump	7.17 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.0206 MGD(US)
Quantities	
Operation labor required	267 pers-hrs/yr
Maintenance labor required	203 pers-hrs/yr
Electrical energy required	698 kWh/yr
Volume of earthwork required	1600 cuft
Area of pump building	200 sqft
Costs	
Construction and equipment cost	37000 \$
Earthwork Cost	475 \$
Pump Building Cost	22000 \$
Installed Pump Cost	8870 \$
Misc Costs	5650 \$
Operational labor cost	13800 \$/yr
Maintenance labor cost	8480 \$/yr
Material and supply cost	259 \$/yr
Chemical cost	0 \$/yr
Energy cost	70 \$/yr
Amortization cost	3500 \$/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	2500	mg/L
Calculated VSS	1830	mg/L
Calculated VSS:TSS ratio	0.733	mg VSS/mg SS
Total volume of reactors	21200	m ³
Ditch length	104	m
Ditch width	29.9	m
Sidewater depth	3.66	m
Number of batteries	1	
Number of parallel ditches per	2	
Number of rotors per ditch	3	
Rotor length for aeration	51.8	m
Rotor length for mixing	81.4	m
Installed rotor length per rotor	13.6	m
Rotor horsepower	20	HP
Total installed horsepower per	120	HP
Assumed surface velocity	0.46	m/s
Hydraulic retention time	27.8	hr
F/M ratio	0.0735	lb BOD/lb MLSS/d
Volumetric BOD loading	0.135	kg BOD/m ³ /d
Observed yield (VSS basis)	0.509	g VSS/g BOD
Observed yield (TSS basis)	0.694	g TSS/g BOD
Amount of alkalinity required	253	gCaCO ₃ /m ³
Amount of sludge generated	2120	kg/d
Sludge recycle rate	6120	m ³ /d
Nitrogen requirement for biomass	8.48	mg/L
Phosphorus requirement for biomass	1.7	mg/L
Oxygen requirement to meet a	6920	kg/d
Quantities		
Ditch bottom width	48.5	ft
Length of straight section	245	ft
Volume of excavation required	381000	cuft
Volume of backfill required per	8930	cuft
Volume of wall concrete required	27900	cuft
Volume of slab concrete required	46900	cuft
Length of adjustable weir	76.4	ft
Volume of concrete required per	326	cuft

Total handrail length	0 ft
Operation labor required	2360 pers-hrs/yr
Electrical energy required	2290000 kWh/yr
Costs	
Construction and equipment cc	2420000 \$
Earthwork Cost	113000 \$
Wall Concrete Cost	687000 \$
Slab Concrete Cost	608000 \$
Handrail Cost	0 \$
Installed Equipment Cost	888000 \$
Misc Costs	119000 \$
Operational labor cost	122000 \$/yr
Maintenance labor cost	0 \$/yr
Material and supply cost	19500 \$/yr
Chemical cost	0 \$/yr
Energy cost	229000 \$/yr
Amortization cost	234000 \$/yr

Anaerobic Digestion

Design Output Data

Description	Value	Units
Anaerobic Digestion		
Design Information		
Percent VSS destroyed	50	%
Solids concentration in digeste	5	%
Detention time	30	d
Digester depth	35	ft
Digester diameter	110	ft
Effective digester volume	753000	cuft
Number of digesters per batter	2	
Number of primary digesters p	1	
Number of secondary digester:	1	
Number of batteries	1	
Gas produced	46.4	cuft/min
Heat required	2200000	BTU/hr
Digester gas required	84.8	cuft/min
Total natural gas required	995000	cuft/yr
Quantities		
Operation labor required	1590	pers-hrs/yr
Maintenance labor required	1040	pers-hrs/yr
Electrical energy required	136000	kWh/yr
Volume of earthwork required	751000	cuft
Slab thickness	12.7	in
Volume of slab concrete requir	21400	cuft
Wall thickness	25	in
Volume of wall concrete requir	59800	cuft
Sidewater depth	35	ft
Surface area/floor of 2-story cc	3560	sqft
Piping size	12	in
Length of total piping system	937	ft
Number of 90 degree elbows	26	
Number of tees	51	
Number of plug valves	37	
Total dry solids treated	6	ton(short)/d
Costs		
Construction and equipment cc	8580000	\$
Earthwork Cost	222000	\$
Wall Concrete Cost	1440000	\$
Slab Concrete Cost	278000	\$
Building Cost	391000	\$
Piping System Cost	704000	\$
Floating Cover Cost	3590000	\$
Gas Recirculation Units Cost	387000	\$
Heating Units Cost	425000	\$
Gas Safety Equipment Cost	150000	\$
Installed Pumps Cost	150000	\$
Operational labor cost	82100	\$/yr
Maintenance labor cost	43500	\$/yr
Material and supply cost	87400	\$/yr
Chemical cost	0	\$/yr
Energy cost	30500	\$/yr
Amortization cost	812000	\$/yr

Secondary Clarifier

Design Output Data

Description	Value	Units
Secondary Clarification		
Design Information		
Surface area	12100	sqft
Surface area per circular clarifi	6060	sqft
Diameter of each circular clarif	88	ft
Number of clarifiers per batter	2	

Number of batteries	1
Solids loading rate	11.1 lb/(sqft-d)
Hydraulic retention time	5.39 hr
Designed surface overflow rate	400 gal(US)/(sqft-d)
Weir length	1260 ft
Volume of wasted sludge	54500 gpd(US)
Quantities	
Operation labor required	1150 pers-hrs/yr
Maintenance labor required	634 pers-hrs/yr
Electrical energy required	10400 kWh/yr
Volume of earthwork required	158000 cuft
Slab thickness	10.9 in
Volume of slab concrete requir	12700 cuft
Wall thickness	13 in
Volume of wall concrete requir	8300 cuft
Costs	
Construction and equipment cc	802000 \$
Earthwork Cost	46900 \$
Wall Concrete Cost	200000 \$
Slab Concrete Cost	164000 \$
Installed Equipment Cost	268000 \$
Misc Costs	122000 \$
Operational labor cost	59200 \$/yr
Maintenance labor cost	26500 \$/yr
Material and supply cost	8020 \$/yr
Chemical cost	0 \$/yr
Energy cost	1040 \$/yr
Amortization cost	72900 \$/yr
Waste Sludge Pumping	
Design Information	
Average daily pumping rate	0.0545 MGD(US)
Total pumping capacity	0.0545 MGD(US)
Design capacity per pump	18.9 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.0545 MGD(US)
Quantities	
Operation labor required	303 pers-hrs/yr
Maintenance labor required	234 pers-hrs/yr
Electrical energy required	1840 kWh/yr
Volume of earthwork required	1610 cuft
Area of pump building	201 sqft
Costs	
Construction and equipment cc	42700 \$
Earthwork Cost	477 \$
Pump Building Cost	22100 \$
Installed Pump Cost	13600 \$
Misc Costs	6520 \$
Operational labor cost	15600 \$/yr
Maintenance labor cost	9790 \$/yr
Material and supply cost	299 \$/yr
Chemical cost	0 \$/yr
Energy cost	184 \$/yr
Amortization cost	4040 \$/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	50.3	gpm(US)
Final solids content	15	%
Solids capture fraction	0.998	
Quantities		
Operation labor required	240	pers-hrs/yr
Maintenance labor required	59.9	pers-hrs/yr
Power	71800	kWh/yr
Polymer required	31500	lb/yr
Dry solids produced	8630	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	12300 \$/yr
Maintenance labor cost	2500 \$/yr
Material and supply cost	0 \$/yr
Chemical cost	41000 \$/yr
Energy cost	7180 \$/yr
Amortization cost	74300 \$/yr

Chlorination

Design Output Data

Description	Value	Units
Chlorination		
Design Information		
Volume of tank	416000	gal(US)
Average chlorine required	400	lb/d
Peak chlorine required	834	lb/d
Influent coliform count	10000000	/100ml
Effluent coliform count	3.72	/100ml
Quantities		
Operational labor required	978	pers-hrs/yr
Maintenance labor required	178	pers-hrs/yr
Electrical energy required	118000	kWh/yr
Volume of earthwork required	23700	cuft
Volume of slab concrete requir	5580	cuft
Volume of wall concrete requir	8150	cuft
Number of chlorinators and ev.	1	
Chlorination building area	220	sqft
Number of chlorine cylinders	6	
Area of chlorine storage buildir	840	sqft
Costs		
Construction and equipment cc	716000	\$
Earthwork Cost	7030	\$
Wall Concrete Cost	196000	\$
Slab Concrete Cost	72300	\$
Installed Equipment Cost	320000	\$
Building Cost	24200	\$
Storage Building Cost	46200	\$
Misc Costs	49600	\$
Operational labor cost	50400	\$/yr
Maintenance labor cost	7450	\$/yr
Material and supply cost	26600	\$/yr
Chemical cost	94900	\$/yr
Energy cost	11800	\$/yr
Amortization cost	70700	\$/yr

Drying Beds

Design Output Data

Description	Value	Units
Sludge Drying Beds		
Design Information		
Total surface area required	62500	sqft
Initial depth of sludge	12	in
Final solids	50	%
Bed holding time	81.4	d
Quantities		
Total drying bed surface area	62500	sqft
Number beds	21	
Surface area of each individua	2970	sqft
Length of each bed	149	ft
Volume of earthwork required	307000	cuft
Volume concrete for dividing w	20800	cuft
Volume of R.C. in-place for tru	4680	cuft
Volume of sand	46800	cuft
Volume of gravel	62500	cuft
Clay pipe diameter	6	in
Total length clay pipe	6250	in
Sludge solids produced	3.59	ton(short)/d
Operational labor required	3830	pers-hrs/yr
Maintenance labor required	1910	pers-hrs/yr
Costs		
Construction and equipment cc	877000	\$
Earthwork Cost	91000	\$
Wall Concrete Cost	351000	\$
Slab Concrete Cost	36400	\$
Drying Bed Media Cost	174000	\$
Drain Pipe System Cost	137000	\$
Misc Costs	86900	\$
Operational labor cost	197000	\$/yr
Maintenance labor cost	79900	\$/yr
Material and supply cost	7890	\$/yr

Chemical cost	0 \$/yr
Energy cost	0 \$/yr
Amortization cost	76300 \$/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	8.52	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	8.52	cuyd/d
Maximum anticipated landfill duration	30	d
Anticipated sludge storage height	8	ft
Sludge storage shed area	863	sqft
Width of sludge storage shed	20.8	ft
Length of sludge storage shed	41.5	ft
Volume of earthwork required	2570	cuft
Volume of slab concrete required	1150	cuft
Surface area of canopy roof	863	sqft
Round trip haul distance	20	miles
Round trips per day per truck	1	
Distance traveled per year per truck	5000	miles
Sludge hauled	7.54	ton(short)/d
Operation labor required	133	pers-hrs/yr
LandFilling cost	35200	\$/yr
Costs		
Construction and equipment cost	316000	\$
Earthwork Cost	761	\$
Slab Concrete Cost	14900	\$
Canopy Roof Cost	17300	\$
Vehicle Cost	283000	\$
Operational labor cost	6870	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	53600	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	64000	\$/yr