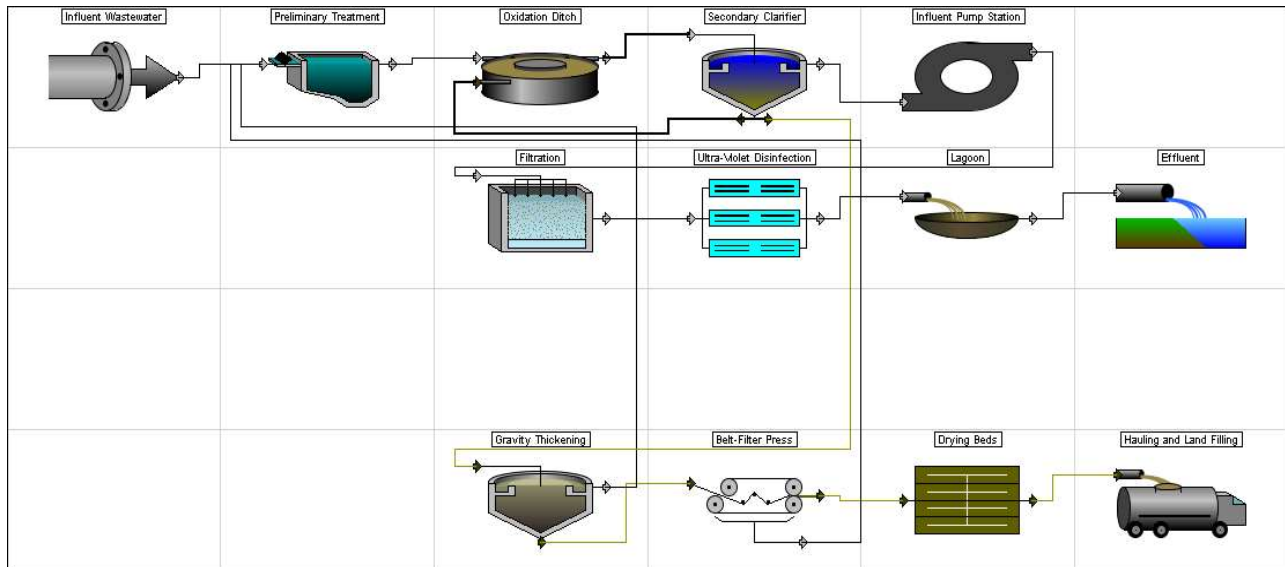


Layout - Tooele City.



Summary

Equipment Database

Hydromantis 2014,(USA Avg)

Layout Summary

Description	Value	Units
CONSTRUCTION COSTS		
Unit process construction cost:	\$11,300,000	\$
Other direct construction costs	\$4,770,000	\$
Other indirect construction costs	\$12,100,000	\$
Total construction costs	\$28,100,000	\$

ANNUAL COSTS

LABOR COSTS

Administration labor cost	\$46,800	\$/yr
Laboratory labor cost	\$152,000	\$/yr
Unit process operation labor cost	\$453,000	\$/yr
Unit process maintenance labor cost	\$161,000	\$/yr
Total labor costs	\$813,000	\$/yr

MATERIAL COSTS

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

Total chemical cost	\$34,500	\$/yr
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ENERGY COSTS

Total energy cost	\$377,000	\$/yr
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Total operation and maintenance	\$1,400,000	\$/yr
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CONSTRUCTION COST AMC

Amortization cost for total construction	\$2,460,000	\$/yr
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Total annual project cost	\$3,860,000	\$/yr
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PROJECT SUMMARY

Present worth	\$46,300,000	\$
Total project cost	\$28,100,000	\$
Total operation labor cost	\$652,000	\$/yr
Total maintenance labor cost	\$161,000	\$/yr
Total material cost	\$180,000	\$/yr
Total chemical cost	\$34,500	\$/yr
Total energy cost	\$377,000	\$/yr
Total amortization cost	\$2,460,000	\$/yr

Process Summary

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Preliminary Treatment	586000	48600	20500	14700	0	2850	49200
Oxidation Ditch	3100000	101000	0	24500	0	304000	302000
Filtration	1650000	8330	4460	47000	0	2700	160000
Gravity Thickening	126000	16600	10500	1260	0	628	12100

Secondary Clarifier	634000	64600	30800	6200	0	1230	58600
Ultra-Violet Disinfection	1430000	0	14600	14300	4980	35700	121000
Belt-Filter Press	812000	8900	1750	0	29500	5310	74300
Influent Pump Station	1830000	34500	22900	12800	0	24800	158000
Lagoon	140000	23100	0	0	0	0	14900
Drying Beds	632000	142000	55700	5690	0	0	55000
Effluent	0	0	0	0	0	0	0
Hauling and Land Filling	307000	4950	0	53600	0	0	63300
Other Costs	16800000	199000	0	0	0	0	1390000

Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	14	acre
Administration labor hours	909	hr/yr
Laboratory labor hours	2950	hr/yr
Costs		
DIRECT COSTS		
Mobilization	427000	\$
Site preparation	646000	\$
Site electrical	1180000	\$
Yard piping	794000	\$
Instrumentation and control	585000	\$
Lab and administration building	1140000	\$
Total direct construction costs	4770000	\$
INDIRECT COSTS		
Cost of land	280000	\$
Miscellaneous cost	922000	\$
Legal cost	369000	\$
Engineering design fee	2770000	\$
Inspection cost	369000	\$
Contingency	1840000	\$
Technical	369000	\$
Interest during construction	2750000	\$
Profit	2400000	\$
Total indirect construction cost	12100000	\$
Total of other construction costs	16800000	\$
LABOR COSTS		
Administration labor cost	46800	\$/yr
Laboratory labor cost	152000	\$/yr

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	2.14	ft
Average channel depth	1	ft
Horizontal Flow Grit Chamber		
Maximum flow	12.4	cuft/s
Average flow	5.34	cuft/s
Minimum flow	3.49	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	6.21	cuft/s
Width of channel	1.04	ft
Depth of channel	4	ft
Length of channel	144	ft
Settling velocity of particle	0.0707	ft/s
Slope of channel bottom	0.00169	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.6	min
Volume of grit	13.9	cuft/d
Costs		

Construction and equipment cost	586000 \$
Operational labor cost	48600 \$/yr
Maintenance labor cost	20500 \$/yr
Material and supply cost	14700 \$/yr
Chemical cost	0 \$/yr
Energy cost	2850 \$/yr
Amortization cost	49200 \$/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	1770	mg/L
Calculated VSS:TSS ratio	0.709	mg VSS/mg SS
Total volume of reactors	28200	m ³
Ditch length	137	m
Ditch width	29.8	m
Sidewater depth	3.66	m
Number of batteries	1	
Number of parallel ditches per battery	2	
Number of rotors per ditch	4	
Rotor length for aeration	41.8	m
Rotor length for mixing	108	m
Installed rotor length per rotor	13.5	m
Rotor horsepower	20	HP
Total installed horsepower per battery	160	HP
Assumed surface velocity	0.46	m/s
Hydraulic retention time	51.6	hr
F/M ratio	0.0571	lb BOD/lb MLSS/d
Volumetric BOD loading	0.101	kg BOD/m ³ /d
Observed yield (VSS basis)	0.572	g VSS/g BOD
Observed yield (TSS basis)	0.808	g TSS/g BOD
Amount of alkalinity required	128	gCaCO ₃ /m ³
Amount of sludge generated	2820	kg/d
Sludge recycle rate	4380	m ³ /d
Nitrogen requirement for biomass	15.2	mg/L
Phosphorus requirement for biomass	3.05	mg/L
Oxygen requirement to meet aeration	5580	kg/d
Quantities		
Ditch bottom width	48.4	ft
Length of straight section	352	ft
Volume of excavation required	495000	cuft
Volume of backfill required per battery	10600	cuft
Volume of wall concrete required per battery	34800	cuft
Volume of slab concrete required per battery	59400	cuft
Length of adjustable weir	54.7	ft
Volume of concrete required per battery	239	cuft
Total handrail length	0	ft
Operation labor required	1970	pers-hrs/yr
Electrical energy required	3040000	kWh/yr
Costs		
Construction and equipment cost	3100000	\$
Earthwork Cost	147000	\$
Wall Concrete Cost	850000	\$
Slab Concrete Cost	771000	\$
Handrail Cost	0	\$
Installed Equipment Cost	1180000	\$
Misc Costs	153000	\$
Operational labor cost	101000	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	24500	\$/yr
Chemical cost	0	\$/yr
Energy cost	304000	\$/yr
Amortization cost	302000	\$/yr

Filtration

Design Output Data

Description	Value	Units
Filtration		
Design Information		
Surface area	1480	sqft
Depth	9	ft
Terminal headloss through bed	192000	ft
Maximum head for backwash	19.6	ft
Backwash rate	20	gal(US)/(sqft·min)
Washwater gutter depth	0.609	ft
Washwater needed	148000	gal(US)
Quantities		

Operation labor required	162 pers-hrs/yr
Maintenance labor required	110 pers-hrs/yr
Electrical energy required	27000 kWh
Surface area per filter unit	1480 sqft
Number of cells per filter unit	4
Number of filter units per batte	1
Number of batteries	1
Volume of earthwork for filter	18400 cuft
Volume of concrete for filter	9370 cuft
Volume of surge tank	19800 cuft
Width of surge tank	37.6 ft
Length of surge tank	75.2 ft
Volume of earthwork for surge	42900 cuft
Volume of concrete for surge t	5800 cuft
Costs	
Construction and equipment cc	1650000 \$
Earthwork Cost for Filter	5460 \$
Earthwork Cost for Surge Ta	12700 \$
Concrete Cost for Filter	225000 \$
Concrete Cost for Surge Tar	140000 \$
Installed Equipment Cost	940000 \$
Misc Costs	331000 \$
Operational labor cost	8330 \$/yr
Maintenance labor cost	4460 \$/yr
Material and supply cost	47000 \$/yr
Chemical cost	0 \$/yr
Energy cost	2700 \$/yr
Amortization cost	160000 \$/yr

Gravity Thickening

Design Output Data

Description	Value	Units
Gravity Thickening		
Design Information		
Initial concentration	1	%
Thickened concentration	5	%
Mass loading	10	lb/(sqft-d)
Hydraulic loading	120	gal(US)/(sqft-d)
Hydraulic retention time	13.5	hr
Number of tanks	1	
Tank volume	5440	cuft
Depth	9	ft
Surface area per tank	605	sqft
Tank diameter	28	ft
Quantities		
Amount of sludge generated	3.02	ton(short)/d
Volume of thickened sludge	12400	gpd(US)
Operation labor required	322	pers-hrs/yr
Maintenance labor required	259	pers-hrs/yr
Electrical energy required	6280	kWh/yr
Volume of earthwork required	8170	cuft
Slab thickness	10.2	in
Volume of slab concrete requir	715	cuft
Wall thickness	11.5	in
Volume of wall concrete requir	985	cuft
Costs		
Construction and equipment cc	126000	\$
Earthwork Cost	2420	\$
Wall Concrete Cost	23700	\$
Slab Concrete Cost	9260	\$
Installed Equipment Cost	71600	\$
Misc Costs	19300	\$
Operational labor cost	16600	\$/yr
Maintenance labor cost	10500	\$/yr
Material and supply cost	1260	\$/yr
Chemical cost	0	\$/yr
Energy cost	628	\$/yr
Amortization cost	12100	\$/yr

Secondary Clarifier

Design Output Data

Description	Value	Units
Secondary Clarification		
Design Information		
Surface area	8670	sqft
Surface area per circular clarifi	4340	sqft
Diameter of each circular clarif	75	ft
Number of clarifiers per batter	2	
Number of batteries	1	
Solids loading rate	11.1	lb/(sqft-d)
Hydraulic retention time	4.04	hr
Designed surface overflow rat	400	gal(US)/(sqft-d)

Weir length	807 ft
Volume of wasted sludge	72500 gpd(US)
Quantities	
Operation labor required	939 pers-hrs/yr
Maintenance labor required	517 pers-hrs/yr
Electrical energy required	9860 kWh/yr
Volume of earthwork required	111000 cuft
Slab thickness	10.2 in
Volume of slab concrete requir	8710 cuft
Wall thickness	11.5 in
Volume of wall concrete requir	4960 cuft
Costs	
Construction and equipment cc	589000 \$
Earthwork Cost	32900 \$
Wall Concrete Cost	119000 \$
Slab Concrete Cost	113000 \$
Installed Equipment Cost	234000 \$
Misc Costs	89800 \$
Operational labor cost	48400 \$/yr
Maintenance labor cost	20900 \$/yr
Material and supply cost	5890 \$/yr
Chemical cost	0 \$/yr
Energy cost	986 \$/yr
Amortization cost	54300 \$/yr
Waste Sludge Pumping	
Design Information	
Average daily pumping rate	0.0725 MGD(US)
Total pumping capacity	0.0725 MGD(US)
Design capacity per pump	25.2 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.0725 MGD(US)
Quantities	
Operation labor required	314 pers-hrs/yr
Maintenance labor required	244 pers-hrs/yr
Electrical energy required	2440 kWh/yr
Volume of earthwork required	1610 cuft
Area of pump building	201 sqft
Costs	
Construction and equipment cc	44900 \$
Earthwork Cost	477 \$
Pump Building Cost	22200 \$
Installed Pump Cost	15400 \$
Misc Costs	6850 \$
Operational labor cost	16200 \$/yr
Maintenance labor cost	9870 \$/yr
Material and supply cost	314 \$/yr
Chemical cost	0 \$/yr
Energy cost	244 \$/yr
Amortization cost	4250 \$/yr

Ultra-Violet Disinfection

Design Output Data

Description	Value	Units
Ultra-Violet Disinfection		
Design Information		
Design based on a model calcula	1.34	gal(US)/(min·W)
System is not headloss constr		
Total number of lamps needed	316	
Number of spare channels	1	
Total number of lamps used in	480	
Number of excess lamps	164	
Number of lamps/modules	8	
Number of modules/bank	10	
Number of banks/channel	2	
Number of channels	3	
Calculated headloss	1.46	in
Costs		
Construction and equipment cc	1430000	\$
Cost of installation	859000	\$
Total cost of UV lamps	573000	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	14600	\$/yr
Material and supply cost	14300	\$/yr
Chemical cost	4980	\$/yr
Energy cost	35700	\$/yr
Amortization cost	121000	\$/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	36.2 gpm(US)
Final solids content	19 %
Solids capture fraction	0.998
Quantities	
Operation labor required	173 pers-hrs/yr
Maintenance labor required	43.2 pers-hrs/yr
Power	53100 kWh/yr
Polymer required	22700 lb/yr
Dry solids produced	6220 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	8900 \$/yr
Maintenance labor cost	1750 \$/yr
Material and supply cost	0 \$/yr
Chemical cost	29500 \$/yr
Energy cost	5310 \$/yr
Amortization cost	74300 \$/yr

Influent Pump Station

Design Output Data

Description	Value	Units
Pump Station		
Design Information		
Volume of wet well	23100	cuft
Width of wet well	185	ft
Depth of the pumping station	27.9	ft
Length of the pumping station	20.4	ft
Width of the pumping station	215	ft
Minimum depth of water in wet	6.93	ft
Area of pump building	637	sqft
Peak capacity of pumps	11.7	MGD(US)
Firm pumping capacity	11.7	MGD(US)
Total dynamic head - average	44.6	ft
Quantities		
Operation labor required	671	pers-hrs/yr
Maintenance labor required	567	pers-hrs/yr
Electrical energy required	248000	kWh/yr
Volume of earthwork required	556000	cuft
Volume of slab concrete requir	40200	cuft
Volume of wall concrete requir	17900	cuft
Capacity per pump	8110	gpm(US)
Number of constant speed purr	2	
Number of variable speed purr	0	
Diameter of discharge header	20.4	in
Total dynamic head	61.3	ft
Size of selected pump	18	in
Specific speed of pump	3700	
Pump rotating speed	972	rpm
Motor size required	152	HP
Size of selected motor	200	HP
Width of pump system	4.2	ft
Length of pump system	20.7	ft
Length of the dry well	20.4	ft
Width of the dry well	29.7	ft
Costs		
Construction and equipment cc	1830000	\$
Earthwork Cost	165000	\$
Wall Concrete Cost	431000	\$
Slab Concrete Cost	522000	\$
Building Cost	70100	\$
Installed Pump Equipment C	364000	\$
Misc Costs	279000	\$
Operational labor cost	34500	\$/yr
Maintenance labor cost	22900	\$/yr
Material and supply cost	12800	\$/yr
Chemical cost	0	\$/yr
Energy cost	24800	\$/yr

Amortization cost 158000 \$/yr

Lagoon

Design Output Data

Description	Value	Units
Aerobic Lagoon		
Design Information		
Hydraulic retention time	0.131	d
BOD loading rate	90	lb/(acre-d)
Number of units	2	
Sidewater depth	3	ft
Depth of cut	2.4	ft
Length of unit at water level	112	ft
Surface area per unit	0.228	acre
Total surface area	0.456	acre
Volume of one unit	0.223	Mgal(US)
Total volume	0.446	Mgal(US)
Freeboard	2	ft
Quantities		
Area of lagoon liner	20300	sqft
Operation and maintenance lat	449	pers-hrs/yr
Pipe diameter	28	in
Length of pipe	56	ft
Number of butterfly valves	3	
Diameter of butterfly valves	28	in
Volume of earthwork required	35000	cuft
Volume of slab concrete requir	8	cuft
Volume of wall concrete requir	40	cuft
Costs		
Construction and equipment cc	140000	\$
Earthwork Cost	10400	\$
Wall Concrete Cost	963	\$
Slab Concrete Cost	104	\$
Installed Valves Cost	29700	\$
Installed Pipe Cost	32500	\$
Liner Cost	52500	\$
Misc Costs	13900	\$
Operational labor cost	23100	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	14900	\$/yr

Drying Beds

Design Output Data

Description	Value	Units
Sludge Drying Beds		
Design Information		
Total surface area required	44800	sqft
Initial depth of sludge	12	in
Final solids	50	%
Bed holding time	103	d
Quantities		
Total drying bed surface area	44800	sqft
Number beds	15	
Surface area of each individual	2990	sqft
Length of each bed	149	ft
Volume of earthwork required	220000	cuft
Volume concrete for dividing w	15100	cuft
Volume of R.C. in-place for tru	3360	cuft
Volume of sand	33600	cuft
Volume of gravel	44800	cuft
Clay pipe diameter	6	in
Total length clay pipe	4480	in
Sludge solids produced	2.59	ton(short)/d
Operational labor required	2760	pers-hrs/yr
Maintenance labor required	1380	pers-hrs/yr
Costs		
Construction and equipment cc	632000	\$
Earthwork Cost	65300	\$
Wall Concrete Cost	255000	\$
Slab Concrete Cost	26100	\$
Drying Bed Media Cost	125000	\$
Drain Pipe System Cost	98500	\$
Misc Costs	62700	\$
Operational labor cost	142000	\$/yr
Maintenance labor cost	55700	\$/yr
Material and supply cost	5690	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	55000	\$/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	6.14	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	6.14	cuyd/d
Maximum anticipated landfill depth	30	d
Anticipated sludge storage height	8	ft
Sludge storage shed area	622	sqft
Width of sludge storage shed	17.6	ft
Length of sludge storage shed	35.3	ft
Volume of earthwork required	1910	cuft
Volume of slab concrete required	864	cuft
Surface area of canopy roof	622	sqft
Round trip haul distance	20	miles
Round trips per day per truck	1	
Distance traveled per year per truck	5000	miles
Sludge hauled	5.43	ton(short)/d
Operation labor required	96.1	pers-hrs/yr
LandFilling cost	35200	\$/yr
Costs		
Construction and equipment cost	307000	\$
Earthwork Cost	565	\$
Slab Concrete Cost	11200	\$
Canopy Roof Cost	12400	\$
Vehicle Cost	283000	\$
Operational labor cost	4950	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	53600	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	63300	\$/yr