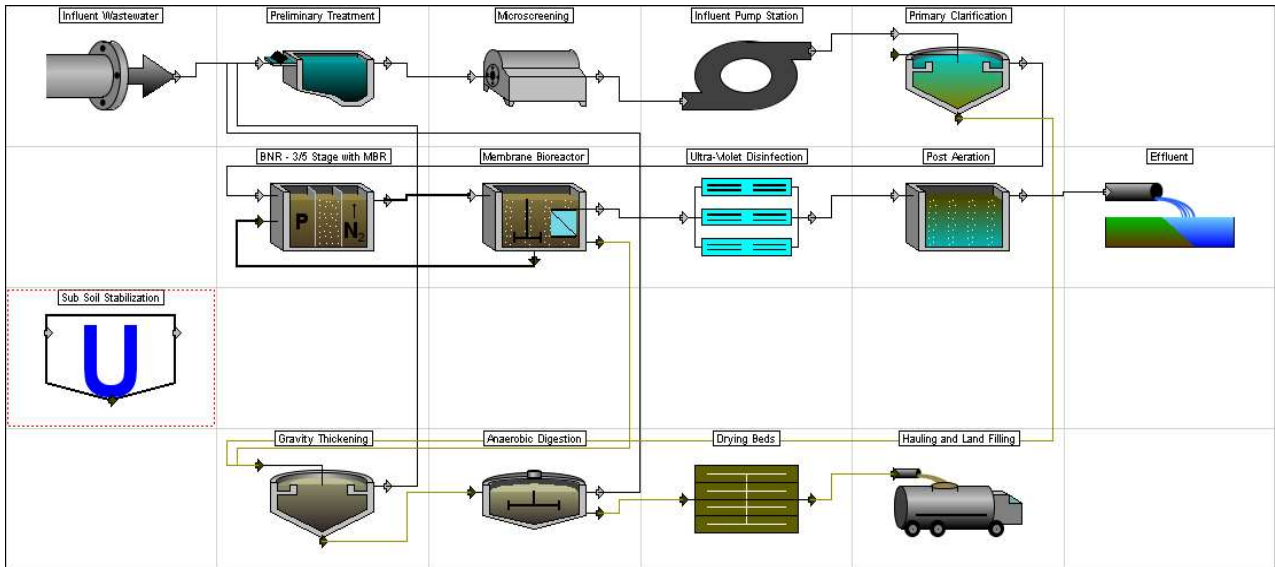


**Layout - Logan City**



**Summary**

**Equipment Database**

Hydromantis 2014,(USA Avg)

**Layout Summary**

Description	Value	Units
<b>CONSTRUCTION COSTS</b>		
Unit process construction cost:	\$71,100,000	\$
Other direct construction costs	\$14,700,000	\$
Other indirect construction costs	\$63,600,000	\$
<b>Total construction costs</b>	<b>\$150,000,000</b>	<b>\$</b>

**ANNUAL COSTS**

**LABOR COSTS**

Administration labor cost	\$173,000	\$/yr
Laboratory labor cost	\$196,000	\$/yr
Unit process operation labor cost	\$1,870,000	\$/yr
Unit process maintenance labor cost	\$1,060,000	\$/yr
<b>Total labor costs</b>	<b>\$3,300,000</b>	<b>\$/yr</b>

**MATERIAL COSTS**

Total material cost	\$1,100,000	\$/yr
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**CHEMICAL COSTS**

Total chemical cost	\$218,000	\$/yr
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**ENERGY COSTS**

Total energy cost	\$1,790,000	\$/yr
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Total operation and maintenance	\$6,410,000	\$/yr
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**CONSTRUCTION COST AMC**

Amortization cost for total construction	\$13,700,000	\$/yr
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<b>Total annual project cost</b>	<b>\$20,100,000</b>	<b>\$/yr</b>
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**PROJECT SUMMARY**

Present worth	\$240,000,000	\$
Total project cost	\$150,000,000	\$
Total operation labor cost	\$2,240,000	\$/yr
Total maintenance labor cost	\$1,060,000	\$/yr
Total material cost	\$1,100,000	\$/yr
Total chemical cost	\$218,000	\$/yr
Total energy cost	\$1,790,000	\$/yr
Total amortization cost	\$13,700,000	\$/yr

**Process Summary**

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Sub Soil Stabilization	7000000	0	0	0	0	0	0
Preliminary Treatment	1590000	165000	69900	39800	0	6120	134000
BNR - 3/5 Stage with MBR	7710000	327000	193000	103000	0	835000	724000
Gravity Thickening	297000	27800	18500	2970	0	854	28400

Microscreening	4650000	149000	87300	482000	0	131000	514000
Membrane Bioreactor	25900000	627000	370000	256000	206000	629000	3610000
Anaerobic Digestion	3810000	91000	54300	31200	0	15600	361000
Influent Pump Station	11600000	65500	52400	81300	0	70200	990000
Ultra-Violet Disinfection	2280000	0	25800	22800	11400	81900	224000
Drying Beds	1150000	248000	113000	10400	0	0	100000
Primary Clarification	1680000	117000	61600	16700	0	1630	154000
Post Aeration	131000	42200	17900	2200	0	15000	12200
Hauling and Land Filling	324000	8620	0	53600	0	0	64700
Effluent	0	0	0	0	0	0	0
Blower System	3010000	0	0	0	0	0	253000
Other Costs	78400000	368000	0	0	0	0	6530000

#### Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land		27 acre
Administration labor hours	3350	hr/yr
Laboratory labor hours	3800	hr/yr
Costs		
<b>DIRECT COSTS</b>		
Mobilization	1350000	\$
Site preparation	1670000	\$
Site electrical	3990000	\$
Yard piping	2590000	\$
Instrumentation and control	2150000	\$
Lab and administration building	2990000	\$
Total direct construction costs	14700000	\$
<b>INDIRECT COSTS</b>		
Cost of land	540000	\$
Miscellaneous cost	4940000	\$
Legal cost	1980000	\$
Engineering design fee	14800000	\$
Inspection cost	1980000	\$
Contingency	9880000	\$
Technical	1980000	\$
Interest during construction	14600000	\$
Profit	12900000	\$
Total indirect construction cost	63600000	\$
Total of other construction costs	78400000	\$
<b>LABOR COSTS</b>		
Administration labor cost	173000	\$/yr
Laboratory labor cost	196000	\$/yr

#### Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	55300	scfm
Safety factor	1.5	
Requested air flow capacity	82900	scfm
Total capacity of blowers	82900	scfm
Number of blowers in use	1	
Total number of blowers	2	
Capacity of individual blowers	82900	scfm
Estimated cost of an installed blower	1230000	\$
Blower building area	2320	sqft
Costs		
Construction and equipment cost	3010000	\$
Installed Blower Cost	2460000	\$
Building Cost	256000	\$
Misc Costs	298000	\$
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	253000	\$/yr

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

#### Influent Wastewater

#### Sub Soil Stabilization

#### Design Output Data

Description	Value	Units
Costs		
Construction and equipment cost	Overridden	
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

### Preliminary Treatment

#### Design Output Data

Description	Value	Units
Preliminary Treatment		
Design Information		
Mechanically Cleaned Bar Screen		
Bar size	0.25	in
Bar spacing	0.5	in
Slope of bars from horizontal	30	degrees
Head loss through screen	0.176	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	11.1	ft
Average channel depth	1	ft
Horizontal Flow Grit Chamber		
Maximum flow	61.7	cuft/s
Average flow	27.9	cuft/s
Minimum flow	18.6	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	30.9	cuft/s
Width of channel	5.14	ft
Depth of channel	4	ft
Length of channel	144	ft
Settling velocity of particle	0.0707	ft/s
Slope of channel bottom	0.000381	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.6	min
Volume of grit	72.4	cuft/d
Costs		
Construction and equipment co	1590000	\$
Operational labor cost	165000	\$/yr
Maintenance labor cost	69900	\$/yr
Material and supply cost	39800	\$/yr
Chemical cost	0	\$/yr
Energy cost	6120	\$/yr
Amortization cost	134000	\$/yr

### BNR - 3/5 Stage with MBR

#### Design Output Data

Description	Value	Units
BNR System for BIO-P and N Removal		
Design Information		
Influent BOD/TP ratio too smal		
3-Stage Biological Phosphorus		
Design aerobic SRT for nitrific:	12.5	d
Total reactor SRT	25	d
Design SS	9000	mg/L
Calculated VSS	6710	mg/L
Calculated VSS:TSS ratio	0.746	mg VSS/mg SS
Total volume of anaerobic reac	0	m3
Total volume of anoxic reactor:	5470	m3
Total volume of aerobic reactor	5470	m3
Total volume of all reactors	10900	m3
Width of parallel train	10	m
Sidewater depth	5	m
Number of batteries	1	
Number of parallel trains per b	6	
Number of anoxic cells within c	1	
Number of aerobic cells within	1	
Anaerobic hydraulic retention ti	0	hr
Anoxic hydraulic retention time	1.92	hr
Aerobic hydraulic retention tim	1.92	hr
Amount of sludge generated	3930	kg/d
Sludge recycle ratio	300	%
Sludge recycle rate	205000	m3/d
Nitrogen required for biomass	7.95	mg/L
Phosphorus required for biome	1.59	mg/L
Oxygen required to meet aver:	10400	kg/d
Air flow required to meet aver:	17300	N m3/hr

Design air flow	52.8 N m3/min/1000 m3
Quantities	
Operation labor required	4280 pers-hrs/yr
Maintenance labor required	2370 pers-hrs/yr
Electrical energy required	3540000 kWh/yr
Volume of earthwork required	211000 cuft
Volume of slab concrete requir	84700 cuft
Volume of wall concrete requir	44400 cuft
Handrail length	1530 ft
Number of diffusers per train	886
Fine bubble diffuser floor cover	19.1 %
Number of swing arm headers	5
Required mixing power	74.1 kW
Total number of mixers	24
Design mixing power per mixer	3.73 kW
Mixing power for each unaerated	6.18 kW
Costs	
Construction and equipment cost	4790000 \$
Earthwork Cost	62400 \$
Wall Concrete Cost	1070000 \$
Slab Concrete Cost	1100000 \$
Handrail Cost	114000 \$
Installed Aerator Equipment	948000 \$
Air Piping Cost	612000 \$
Installed Mixer Equipment Cost	412000 \$
Misc Costs	475000 \$
Operational labor cost	221000 \$/yr
Maintenance labor cost	111000 \$/yr
Material and supply cost	82600 \$/yr
Chemical cost	0 \$/yr
Energy cost	354000 \$/yr
Amortization cost	448000 \$/yr
Internal Recycle Pumping	
Design Information	
Average daily pumping rate	9.03 MGD(US)
Total pumping capacity	9.03 MGD(US)
Design capacity per pump	3140 gpm(US)
Number of pumps	18
Number of batteries	1
Firm pumping capacity	9.03 MGD(US)
Quantities	
Operation labor required	615 pers-hrs/yr
Maintenance labor required	521 pers-hrs/yr
Electrical energy required	1810000 kWh/yr
Volume of earthwork required	3020 cuft
Area of pump building	378 sqft
Costs	
Construction and equipment cost	1220000 \$
Earthwork Cost	5380 \$
Pump Building Cost	250000 \$
Installed Pump Cost	775000 \$
Misc Costs	185000 \$
Operational labor cost	31700 \$/yr
Maintenance labor cost	24400 \$/yr
Material and supply cost	8510 \$/yr
Chemical cost	0 \$/yr
Energy cost	181000 \$/yr
Amortization cost	115000 \$/yr
Internal Recycle Pumping	
Design Information	
Average daily pumping rate	12 MGD(US)
Total pumping capacity	12 MGD(US)
Design capacity per pump	4180 gpm(US)
Number of pumps	18
Number of batteries	1
Firm pumping capacity	12 MGD(US)
Quantities	
Operation labor required	678 pers-hrs/yr
Maintenance labor required	573 pers-hrs/yr
Electrical energy required	2410000 kWh/yr
Volume of earthwork required	3500 cuft
Area of pump building	437 sqft
Costs	
Construction and equipment cost	1390000 \$
Earthwork Cost	6220 \$
Pump Building Cost	289000 \$
Installed Pump Cost	880000 \$
Misc Costs	211000 \$
Operational labor cost	34900 \$/yr
Maintenance labor cost	26800 \$/yr
Material and supply cost	9700 \$/yr
Chemical cost	0 \$/yr

Energy cost	241000 \$/yr
Amortization cost	131000 \$/yr
Sludge Recycle Pumping	
Design Information	
Average daily pumping rate	18.1 MGD(US)
Total pumping capacity	18.1 MGD(US)
Design capacity per pump	6270 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	18.1 MGD(US)
Quantities	
Operation labor required	776 pers-hrs/yr
Maintenance labor required	653 pers-hrs/yr
Electrical energy required	601000 kWh/yr
Volume of earthwork required	4450 cuft
Area of pump building	556 sqft
Costs	
Construction and equipment cost	318000 \$
Earthwork Cost	1320 \$
Pump Building Cost	61200 \$
Installed Pump Cost	207000 \$
Misc Costs	48500 \$
Operational labor cost	40000 \$/yr
Maintenance labor cost	30600 \$/yr
Material and supply cost	2220 \$/yr
Chemical cost	0 \$/yr
Energy cost	60100 \$/yr
Amortization cost	30100 \$/yr

### Gravity Thickening

#### Design Output Data

Description	Value	Units
Gravity Thickening		
Design Information		
Initial concentration	1.84	%
Thickened concentration	5	%
Mass loading	10	lb/(sqft-d)
Hydraulic loading	65	gal(US)/(sqft-d)
Hydraulic retention time	24.8	hr
Number of tanks	2	
Tank volume	15100	cuft
Depth	9	ft
Surface area per tank	840	sqft
Tank diameter	33	ft
Quantities		
Amount of sludge generated	8.4	ton(short)/d
Volume of thickened sludge	34500	gpd(US)
Operation labor required	539	pers-hrs/yr
Maintenance labor required	394	pers-hrs/yr
Electrical energy required	8540	kWh/yr
Volume of earthwork required	21800	cuft
Slab thickness	10.2	in
Volume of slab concrete required	1910	cuft
Wall thickness	11.5	in
Volume of wall concrete required	2300	cuft
Costs		
Construction and equipment cost	297000	\$
Earthwork Cost	6450	\$
Wall Concrete Cost	55500	\$
Slab Concrete Cost	24800	\$
Installed Equipment Cost	165000	\$
Misc Costs	45300	\$
Operational labor cost	27800	\$/yr
Maintenance labor cost	18500	\$/yr
Material and supply cost	2970	\$/yr
Chemical cost	0	\$/yr
Energy cost	854	\$/yr
Amortization cost	28400	\$/yr

### Microscreening

#### Design Output Data

Description	Value	Units
Microscreening		
Design Information		
Microscreen loading rate	7	gal(US)/(sqft-min)
Quantity of wash water required	4	%
Area of microscreens required	3980	sqft
Quantities		
Number of batteries	1	
Number of units/battery	15	
Drum diameter	10	ft
Drum width	10	ft

Area of selected unit	315 sqft
Area of building	2300 sqft
Operation labor required	2890 pers-hrs/yr
Maintenance labor required	1860 pers-hrs/yr
Electrical energy required	1310000 kWh/yr
Volume of wall concrete requir	22900 cuft
Volume of earthwork required	94700 cuft
Costs	
Construction and equipment co	4650000 \$
Earthwork Cost	28100 \$
Slab Concrete Cost	551000 \$
Building Cost	252000 \$
Installed Equipment Cost	3220000 \$
Misc Costs	607000 \$
Operational labor cost	149000 \$/yr
Maintenance labor cost	87300 \$/yr
Material and supply cost	482000 \$/yr
Chemical cost	0 \$/yr
Energy cost	131000 \$/yr
Amortization cost	514000 \$/yr

### Membrane Bioreactor

#### Design Output Data

Description	Value	Units
Membrane Bioreactor		
Design Information		
Total volume of reactors	198000	cuft
Length of parallel train	63.5	ft
Width of parallel train	31.7	ft
Sidewater depth	16.4	ft
Number of batteries	1	
Number of parallel trains per b	6	
Total Membrane Area	253000	m2
Total Scour Air Requirement	63200	N m3/hr
Quantities		
Operation labor required	10800	pers-hrs/yr
Maintenance labor required	6650	pers-hrs/yr
Electrical energy required	5750000	kWh/yr
Volume of earthwork required	120000	cuft
Volume of slab concrete requir	60900	cuft
Volume of wall concrete requir	27000	cuft
Handrail length	1500	ft
Number of diffusers per train	620	
Number of swing arm headers	3	
Costs		
Construction and equipment co	24800000	\$
Earthwork Cost	35600	\$
Wall Concrete Cost	651000	\$
Slab Concrete Cost	790000	\$
Handrail Cost	112000	\$
Membrane Cost	21800000	\$
Installed Aerator Equipment	506000	\$
Air Piping Cost	615000	\$
Misc Cost	354000	\$
Operational labor cost	555000	\$/yr
Maintenance labor cost	312000	\$/yr
Material and supply cost	248000	\$/yr
Chemical cost	206000	\$/yr
Energy cost	575000	\$/yr
Amortization cost	3510000	\$/yr
Permeate Pumping		
Design Information		
Average daily pumping rate	3.61	MGD(US)
Total pumping capacity	8.01	MGD(US)
Design capacity per pump	3090	gpm(US)
Number of pumps	15	
Number of batteries	1	
Firm pumping capacity	44.5	MGD(US)
Quantities		
Operation labor required	1080	pers-hrs/yr
Maintenance labor required	994	pers-hrs/yr
Electrical energy required	543000	kWh/yr
Volume of earthwork required	3000	cuft
Area of pump building	376	sqft
Costs		
Construction and equipment co	1010000	\$
Earthwork Cost	4450	\$
Pump Building Cost	207000	\$
Installed Pump Cost	642000	\$
Misc Costs	154000	\$
Operational labor cost	55900	\$/yr
Maintenance labor cost	46600	\$/yr

Material and supply cost	7040 \$/yr
Chemical cost	0 \$/yr
Energy cost	54300 \$/yr
Amortization cost	95200 \$/yr
Waste Sludge Pumping	
Design Information	
Average daily pumping rate	0.0842 MGD(US)
Total pumping capacity	0.0842 MGD(US)
Design capacity per pump	29.2 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.0842 MGD(US)
Quantities	
Operation labor required	320 pers-hrs/yr
Maintenance labor required	250 pers-hrs/yr
Electrical energy required	2840 kWh/yr
Volume of earthwork required	1610 cuft
Area of pump building	202 sqft
Costs	
Construction and equipment cost	46200 \$
Earthwork Cost	478 \$
Pump Building Cost	22200 \$
Installed Pump Cost	16500 \$
Misc Costs	7040 \$
Operational labor cost	16500 \$/yr
Maintenance labor cost	11700 \$/yr
Material and supply cost	323 \$/yr
Chemical cost	0 \$/yr
Energy cost	284 \$/yr
Amortization cost	4370 \$/yr

### Anaerobic Digestion

#### Design Output Data

Description	Value	Units
Anaerobic Digestion		
Design Information		
Percent VSS destroyed	50	%
Solids concentration in digester	5	%
Detention time	25	d
Digester depth	28	ft
Digester diameter	70	ft
Effective digester volume	238000	cuft
Number of digesters per battery	2	
Number of primary digesters per battery	1	
Number of secondary digesters per battery	1	
Number of batteries	1	
Gas produced	58.9	cuft/min
Heat required	894000	BTU/hr
Digester gas required	34.5	cuft/min
Total natural gas required	0	cuft/yr
Quantities		
Operation labor required	1770	pers-hrs/yr
Maintenance labor required	1160	pers-hrs/yr
Electrical energy required	156000	kWh/yr
Volume of earthwork required	237000	cuft
Slab thickness	11	in
Volume of slab concrete required	7710	cuft
Wall thickness	21.5	in
Volume of wall concrete required	26800	cuft
Sidewater depth	28	ft
Surface area/floor of 2-story concrete building	1440	sqft
Piping size	8	in
Length of total piping system	659	ft
Number of 90 degree elbows	26	
Number of tees	51	
Number of plug valves	37	
Total dry solids treated	7.56	ton(short)/d
Costs		
Construction and equipment cost	3810000	\$
Earthwork Cost	70200	\$
Wall Concrete Cost	646000	\$
Slab Concrete Cost	99900	\$
Building Cost	158000	\$
Piping System Cost	384000	\$
Floating Cover Cost	1400000	\$
Gas Recirculation Units Cost	280000	\$
Heating Units Cost	198000	\$
Gas Safety Equipment Cost	120000	\$
Installed Pumps Cost	74800	\$
Operational labor cost	91000	\$/yr
Maintenance labor cost	54300	\$/yr
Material and supply cost	31200	\$/yr

Chemical cost	0 \$/yr
Energy cost	15600 \$/yr
Amortization cost	361000 \$/yr

### Influent Pump Station

#### Design Output Data

Description	Value	Units
Pump Station		
Design Information		
Volume of wet well	197000	cuft
Width of wet well	1010	ft
Depth of the pumping station	33.5	ft
Length of the pumping station	30	ft
Width of the pumping station	1050	ft
Minimum depth of water in wet	12.5	ft
Area of pump building	1310	sqft
Peak capacity of pumps	53.5	MGD(US)
Firm pumping capacity	53.5	MGD(US)
Total dynamic head - average	43.8	ft
Quantities		
Operation labor required	1270	pers-hrs/yr
Maintenance labor required	1120	pers-hrs/yr
Electrical energy required	702000	kWh/yr
Volume of earthwork required	3860000	cuft
Volume of slab concrete requir	380000	cuft
Volume of wall concrete requir	99000	cuft
Capacity per pump	37100	gpm(US)
Number of constant speed purr	2	
Number of variable speed purr	0	
Diameter of discharge header	43.6	in
Total dynamic head	52.3	ft
Size of selected pump	42	in
Specific speed of pump	5950	
Pump rotating speed	404	rpm
Motor size required	321	HP
Size of selected motor	350	HP
Width of pump system	9	ft
Length of pump system	32.7	ft
Length of the dry well	30	ft
Width of the dry well	41.7	ft
Costs		
Construction and equipment co	11600000	\$
Earthwork Cost	1140000	\$
Wall Concrete Cost	2380000	\$
Slab Concrete Cost	4920000	\$
Building Cost	144000	\$
Installed Pump Equipment C	1250000	\$
Misc Costs	1770000	\$
Operational labor cost	65500	\$/yr
Maintenance labor cost	52400	\$/yr
Material and supply cost	81300	\$/yr
Chemical cost	0	\$/yr
Energy cost	70200	\$/yr
Amortization cost	990000	\$/yr

### Ultra-Violet Disinfection

#### Design Output Data

Description	Value	Units
Ultra-Violet Disinfection		
Design Information		
Design based on a model calcul	2.12	gal(US)/(min·W)
Total number of lamps needed	999	
Number of spare channels	1	
Total number of lamps used in	1100	
Number of excess lamps	101	
Number of lamps/modules	4	
Number of modules/bank	5	
Number of banks/channel	5	
Number of channels	11	
Calculated headloss	58.3	in
Costs		
Construction and equipment co	2280000	\$
Cost of installation	1370000	\$
Total cost of UV lamps	913000	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	25800	\$/yr
Material and supply cost	22800	\$/yr
Chemical cost	11400	\$/yr
Energy cost	81900	\$/yr
Amortization cost	224000	\$/yr

### Drying Beds



**Design Output Data**

Description	Value	Units
<b>Sludge Drying Beds</b>		
Design Information		
Total surface area required	82300	sqft
Initial depth of sludge	12	in
Final solids	50	%
Bed holding time	28.5	d
Quantities		
Total drying bed surface area	82300	sqft
Number beds	28	
Surface area of each individual	2940	sqft
Length of each bed	147	ft
Volume of earthwork required	405000	cuft
Volume concrete for dividing w	27200	cuft
Volume of R.C. in-place for tru	6170	cuft
Volume of sand	61700	cuft
Volume of gravel	82300	cuft
Clay pipe diameter	6	in
Total length clay pipe	8230	in
Sludge solids produced	4.51	ton(short)/d
Operational labor required	4810	pers-hrs/yr
Maintenance labor required	2400	pers-hrs/yr
Costs		
Construction and equipment co	1150000	\$
Earthwork Cost	120000	\$
Wall Concrete Cost	459000	\$
Slab Concrete Cost	48000	\$
Drying Bed Media Cost	230000	\$
Drain Pipe System Cost	181000	\$
Misc Costs	114000	\$
Operational labor cost	248000	\$/yr
Maintenance labor cost	113000	\$/yr
Material and supply cost	10400	\$/yr
Chemical cost	0	\$/yr
Energy cost	0	\$/yr
Amortization cost	100000	\$/yr

**Primary Clarification****Design Output Data**

Description	Value	Units
<b>Primary Clarification</b>		
Design Information		
Surface area	30100	sqft
Surface area per circular clarifi	7540	sqft
Diameter of each circular clarif	98	ft
Number of clarifiers per batter	4	
Number of batteries	1	
Solids loading rate	0.479	lb/(sqft·d)
Hydraulic retention time	2.69	hr
Weir length	4010	ft
Volume of sludge generated	25100	gpd(US)
Quantities		
Operation labor required	1990	pers-hrs/yr
Maintenance labor required	1100	pers-hrs/yr
Electrical energy required	15500	kWh/yr
Volume of earthwork required	403000	cuft
Slab thickness	10.2	in
Volume of slab concrete requir	29000	cuft
Wall thickness	11.5	in
Volume of wall concrete requir	12900	cuft
Costs		
Construction and equipment co	1650000	\$
Earthwork Cost	120000	\$
Wall Concrete Cost	310000	\$
Slab Concrete Cost	376000	\$
Installed Equipment Cost	589000	\$
Misc Costs	251000	\$
Operational labor cost	102000	\$/yr
Maintenance labor cost	51800	\$/yr
Material and supply cost	16500	\$/yr
Chemical cost	0	\$/yr
Energy cost	1550	\$/yr
Amortization cost	151000	\$/yr
<b>Waste Sludge Pumping</b>		
Design Information		
Average daily pumping rate	0.0251	MGD(US)
Total pumping capacity	0.0251	MGD(US)
Design capacity per pump	8.73	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.0251	MGD(US)

Quantities	
Operation labor required	274 pers-hrs/yr
Maintenance labor required	209 pers-hrs/yr
Electrical energy required	849 kWh/yr
Volume of earthwork required	1600 cuft
Area of pump building	200 sqft
Costs	
Construction and equipment cost	38000 \$
Earthwork Cost	475 \$
Pump Building Cost	22100 \$
Installed Pump Cost	9680 \$
Misc Costs	5800 \$
Operational labor cost	14100 \$/yr
Maintenance labor cost	9790 \$/yr
Material and supply cost	266 \$/yr
Chemical cost	0 \$/yr
Energy cost	85 \$/yr
Amortization cost	3590 \$/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	8.5	mg/L
Oxygen required	450	lb/d
Operating transfer efficiency	2.95	lbO <sub>2</sub> /(HP·h)
Total volume of aerobic reactor	125000	gal(US)
Air flow rate required to meet oxygen demand	601	scfm
Quantities		
Basin depth	15	ft
Length of basin	37.1	ft
Width of basin	30	ft
Number of diffusers	51	
Number of swing arm diffuser lines	3	
Volume of wall concrete required	1510	cuft
Volume of slab concrete required	835	cuft
Electrical energy required	150000	kWh/yr
Operation labor required	820	pers-hrs/yr
Maintenance labor required	382	pers-hrs/yr
Costs		
Construction and equipment cost	131000	\$
Wall Concrete Cost	36300	\$
Slab Concrete Cost	19600	\$
Installed Equipment Cost	61700	\$
Misc Costs	12900	\$
Operational labor cost	42200	\$/yr
Maintenance labor cost	17900	\$/yr
Material and supply cost	2200	\$/yr
Chemical cost	0	\$/yr
Energy cost	15000	\$/yr
Amortization cost	12200	\$/yr

### Hauling and Land Filling

#### Design Output Data

Description	Value	Units
Sludge Hauling and Land Filling		
Design Information		
Volume of sludge hauled	10.7	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	10.7	cuyd/d
Maximum anticipated landfill duration	30	d
Anticipated sludge storage height	8	ft
Sludge storage shed area	1080	sqft
Width of sludge storage shed	23.3	ft
Length of sludge storage shed	46.6	ft
Volume of earthwork required	3170	cuft
Volume of slab concrete required	1400	cuft
Surface area of canopy roof	1080	sqft
Round trip haul distance	20	miles
Round trips per day per truck	1	
Distance traveled per year per truck	5000	miles

Sludge hauled	9.47 ton(short)/d
Operation labor required	167 pers-hrs/yr
LandFilling cost	35200 \$/yr
Costs	
Construction and equipment cc	324000 \$
Earthwork Cost	938 \$
Slab Concrete Cost	18200 \$
Canopy Roof Cost	21700 \$
Vehicle Cost	283000 \$
Operational labor cost	8620 \$/yr
Maintenance labor cost	0 \$/yr
Material and supply cost	53600 \$/yr
Chemical cost	0 \$/yr
Energy cost	0 \$/yr
Amortization cost	64700 \$/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