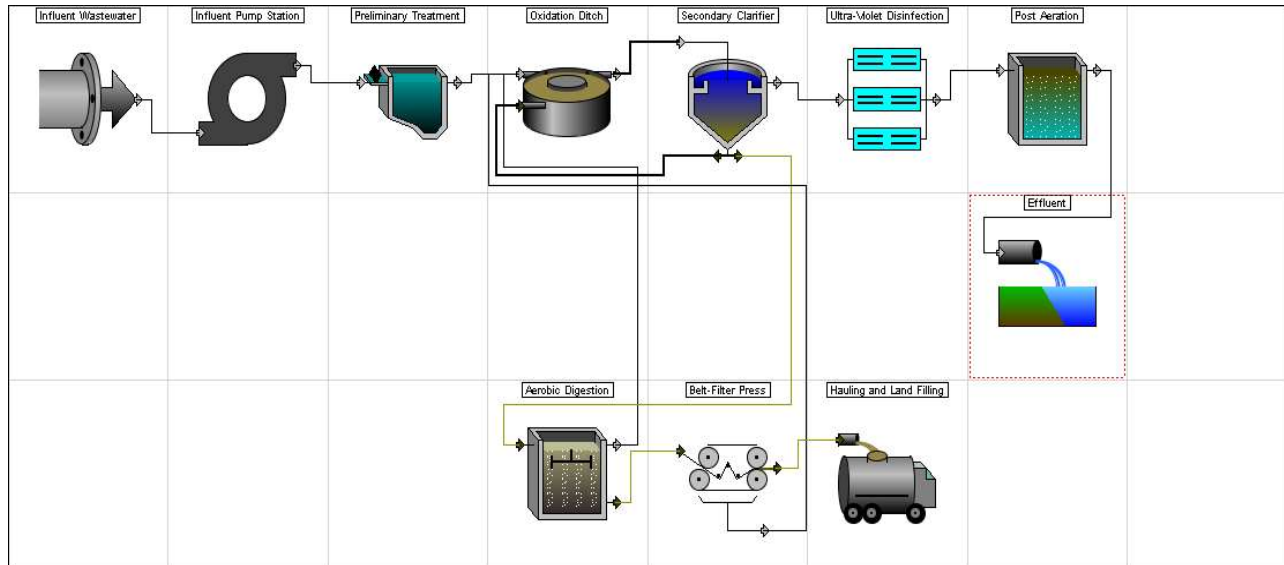


### Layout 1 Ashley Valley



### Summary

#### Equipment Database

Hydromantis 2014,(USA Avg)

#### Layout Summary

Description	Value	Units
<b>CONSTRUCTION COSTS</b>		
Unit process construction cost:	\$14,900,000	\$
Other direct construction costs	\$5,930,000	\$
Other indirect construction costs	\$15,700,000	\$
<b>Total construction costs</b>	<b>\$36,600,000</b>	<b>\$</b>

#### ANNUAL COSTS

##### LABOR COSTS

Administration labor cost	\$60,300	\$/yr
Laboratory labor cost	\$160,000	\$/yr
Unit process operation labor cost	\$454,000	\$/yr
Unit process maintenance labor cost	\$199,000	\$/yr
<b>Total labor costs</b>	<b>\$873,000</b>	<b>\$/yr</b>

##### MATERIAL COSTS

Total material cost	\$283,000	\$/yr
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##### CHEMICAL COSTS

Total chemical cost	\$55,900	\$/yr
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##### ENERGY COSTS

Total energy cost	\$616,000	\$/yr
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Total operation and maintenance	\$1,830,000	\$/yr
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##### CONSTRUCTION COST AMC

Amortization cost for total construction	\$3,150,000	\$/yr
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<b>Total annual project cost</b>	<b>\$4,980,000</b>	<b>\$/yr</b>
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#### PROJECT SUMMARY

Present worth	\$59,600,000	\$
Total project cost	\$36,600,000	\$
Total operation labor cost	\$674,000	\$/yr
Total maintenance labor cost	\$199,000	\$/yr
Total material cost	\$283,000	\$/yr
Total chemical cost	\$55,900	\$/yr
Total energy cost	\$616,000	\$/yr
Total amortization cost	\$3,150,000	\$/yr

#### Process Summary

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Influent Pump Station	1110000	38100	25600	7790	0	31600	100000
Preliminary Treatment	670000	57700	24400	16800	0	3280	56200
Oxidation Ditch	3110000	121000	0	24600	0	305000	302000
Aerobic Digestion	1520000	96000	40500	95000	0	119000	135000

Secondary Clarifier	736000	73500	35500	7210	0	1420	67800
Belt-Filter Press	918000	10700	2140	0	35600	6310	83700
Ultra-Violet Disinfection	5850000	0	60400	58500	20300	146000	495000
Hauling and Land Filling	387000	22900	0	72000	0	0	70000
Post Aeration	59400	33800	10500	1420	0	3900	5390
Effluent	0	0	0	0	0	0	0
Blower System	587000	0	0	0	0	0	49200
Other Costs	21600000	220000	0	0	0	0	1790000

#### Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	16	acre
Administration labor hours	1170	hr/yr
Laboratory labor hours	3100	hr/yr
Costs		
DIRECT COSTS		
Mobilization	534000	\$
Site preparation	777000	\$
Site electrical	1500000	\$
Yard piping	1000000	\$
Instrumentation and control	754000	\$
Lab and administration building	1370000	\$
Total direct construction costs	5930000	\$
INDIRECT COSTS		
Cost of land	320000	\$
Miscellaneous cost	1200000	\$
Legal cost	480000	\$
Engineering design fee	3600000	\$
Inspection cost	480000	\$
Contingency	2400000	\$
Technical	480000	\$
Interest during construction	3580000	\$
Profit	3130000	\$
Total indirect construction cost	15700000	\$
Total of other construction costs	21600000	\$
LABOR COSTS		
Administration labor cost	60300	\$/yr
Laboratory labor cost	160000	\$/yr

#### Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	4620	scfm
Safety factor	1.5	
Requested air flow capacity	6920	scfm
Total capacity of blowers	6920	scfm
Number of blowers in use	1	
Total number of blowers	2	
Capacity of individual blowers	6920	scfm
Estimated cost of an installed blower	197000	\$
Blower building area	1230	sqft
Costs		
Construction and equipment cost	587000	\$
Installed Blower Cost	394000	\$
Building Cost	135000	\$
Misc Costs	58200	\$
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	49200	\$/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	1720	cuft
Width of wet well	12.6	ft
Depth of the pumping station	28.7	ft
Length of the pumping station	22.8	ft
Width of the pumping station	45.1	ft

Minimum depth of water in wet	7.71 ft
Area of pump building	777 sqft
Peak capacity of pumps	15.7 MGD(US)
Firm pumping capacity	15.7 MGD(US)
Total dynamic head - average	44.4 ft
Quantities	
Operation labor required	741 pers-hrs/yr
Maintenance labor required	624 pers-hrs/yr
Electrical energy required	316000 kWh/yr
Volume of earthwork required	184000 cuft
Volume of slab concrete requir	8350 cuft
Volume of wall concrete requir	6110 cuft
Capacity per pump	10900 gpm(US)
Number of constant speed pur	0
Number of variable speed pur	2
Diameter of discharge header	23.6 in
Total dynamic head	58.8 ft
Size of selected pump	24 in
Specific speed of pump	4420
Pump rotating speed	814 rpm
Motor size required	181 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 cc	1110000 \$
Earthwork Cost	54400 \$
Wall Concrete Cost	147000 \$
Slab Concrete Cost	108000 \$
Building Cost	85500 \$
Installed Pump Equipment C	512000 \$
Installed Control Module Cos	35600 \$
Misc Costs	170000 \$
Operational labor cost	38100 \$/yr
Maintenance labor cost	25600 \$/yr
Material and supply cost	7790 \$/yr
Chemical cost	0 \$/yr
Energy cost	31600 \$/yr
Amortization cost	100000 \$/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	0.965 ft	
Average channel depth	3 ft	
Horizontal Flow Grit Chamber		
Maximum flow	15.4 cuft/s	
Average flow	7.24 cuft/s	
Minimum flow	4.16 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	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	0.00131	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.6 min	
Volume of grit	18.8 cuft/d	
Costs		
Construction and equipment cc	670000 \$	
Operational labor cost	57700 \$/yr	
Maintenance labor cost	24400 \$/yr	
Material and supply cost	16800 \$/yr	

Chemical cost	0 \$/yr
Energy cost	3280 \$/yr
Amortization cost	56200 \$/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	28300	m <sup>3</sup>
Ditch length	137	m
Ditch width	29.9	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	60.3	m
Rotor length for mixing	108	m
Installed rotor length per rotor	13.6	m
Rotor horsepower	20	HP
Total installed horsepower per battery	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 <sup>3</sup> /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 <sub>3</sub> /m <sup>3</sup>
Amount of sludge generated	4530	kg/d
Sludge recycle rate	12100	m <sup>3</sup> /d
Nitrogen requirement for biomass	17.3	mg/L
Phosphorus requirement for biomass	3.46	mg/L
Oxygen requirement to meet aeration	8060	kg/d
Quantities		
Ditch bottom width	48.5	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	34900	cuft
Volume of slab concrete required per battery	59500	cuft
Length of adjustable weir	75.8	ft
Volume of concrete required per battery	323	cuft
Total handrail length	0	ft
Operation labor required	2350	pers-hrs/yr
Electrical energy required	3050000	kWh/yr
Costs		
Construction and equipment cost	3110000	\$
Earthwork Cost	147000	\$
Wall Concrete Cost	855000	\$
Slab Concrete Cost	772000	\$
Handrail Cost	0	\$
Installed Equipment Cost	1180000	\$
Misc Costs	154000	\$
Operational labor cost	121000	\$/yr
Maintenance labor cost	0	\$/yr
Material and supply cost	24600	\$/yr
Chemical cost	0	\$/yr
Energy cost	305000	\$/yr
Amortization cost	302000	\$/yr

### 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	6600	m <sup>3</sup>
Length of parallel train	66	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	1230	kg/d
Air flow required to meet aeration	7840	N m <sup>3</sup> /hr

Design air flow	19.8 N m3/min/1000 m3
Volatile solids loading	0.0304 lb/(cuft-d)
Solids accumulated	6570 lb/d
Digester capacity	174000 lb
Volume of wasted sludge	796000 gal(US)
Quantities	
Operation labor required	1860 pers-hrs/yr
Maintenance labor required	986 pers-hrs/yr
Electrical energy required	1190000 kWh/yr
Volume of earthwork required	131000 cuft
Volume of slab concrete requir	29500 cuft
Volume of wall concrete requir	19100 cuft
Handrail length	513 ft
Number of diffusers per train	193
Number of swing arm headers	9
Costs	
Construction and equipment cc	1520000 \$
Earthwork Cost	38900 \$
Wall Concrete Cost	460000 \$
Slab Concrete Cost	382000 \$
Handrail Cost	38500 \$
Installed Aerator Equipment	373000 \$
Air Piping Cost	76300 \$
Misc Costs	151000 \$
Operational labor cost	96000 \$/yr
Maintenance labor cost	40500 \$/yr
Material and supply cost	95000 \$/yr
Chemical cost	0 \$/yr
Energy cost	119000 \$/yr
Amortization cost	135000 \$/yr

### Secondary Clarifier

#### Design Output Data

Description	Value	Units
Secondary Clarification		
Design Information		
Surface area	11200	sqft
Surface area per circular clarifi	5580	sqft
Diameter of each circular clarif	85	ft
Number of clarifiers per batter	2	
Number of batteries	1	
Solids loading rate	24	lb/(sqft-d)
Hydraulic retention time	3.75	hr
Designed surface overflow rate	431	gal(US)/(sqft-d)
Weir length	674	ft
Volume of wasted sludge	116000	gpd(US)
Quantities		
Operation labor required	1090	pers-hrs/yr
Maintenance labor required	602	pers-hrs/yr
Electrical energy required	10300	kWh/yr
Volume of earthwork required	146000	cuft
Slab thickness	10.2	in
Volume of slab concrete requir	11100	cuft
Wall thickness	11.5	in
Volume of wall concrete requir	5590	cuft
Costs		
Construction and equipment cc	686000	\$
Earthwork Cost	43400	\$
Wall Concrete Cost	135000	\$
Slab Concrete Cost	143000	\$
Installed Equipment Cost	261000	\$
Misc Costs	105000	\$
Operational labor cost	56300	\$/yr
Maintenance labor cost	24800	\$/yr
Material and supply cost	6860	\$/yr
Chemical cost	0	\$/yr
Energy cost	1030	\$/yr
Amortization cost	63100	\$/yr
Waste Sludge Pumping		
Design Information		
Average daily pumping rate	0.116	MGD(US)
Total pumping capacity	0.116	MGD(US)
Design capacity per pump	40.3	gpm(US)
Number of pumps	3	
Number of batteries	1	
Firm pumping capacity	0.116	MGD(US)
Quantities		
Operation labor required	334	pers-hrs/yr
Maintenance labor required	262	pers-hrs/yr
Electrical energy required	3910	kWh/yr
Volume of earthwork required	1620	cuft
Area of pump building	202	sqft

Costs	
Construction and equipment cost	49200 \$
Earthwork Cost	480 \$
Pump Building Cost	22300 \$
Installed Pump Cost	19000 \$
Misc Costs	7510 \$
Operational labor cost	17200 \$/yr
Maintenance labor cost	10800 \$/yr
Material and supply cost	345 \$/yr
Chemical cost	0 \$/yr
Energy cost	391 \$/yr
Amortization cost	4660 \$/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	87.5	gpm(US)
Final solids content	13	%
Solids capture fraction	0.996	
Quantities		
Operation labor required	208	pers-hrs/yr
Maintenance labor required	52.1	pers-hrs/yr
Power	63100	kWh/yr
Polymer required	27300	lb/yr
Dry solids produced	7490	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	10700	\$/yr
Maintenance labor cost	2140	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	35600	\$/yr
Energy cost	6310	\$/yr
Amortization cost	83700	\$/yr

### Ultra-Violet Disinfection

#### Design Output Data

Description	Value	Units
Ultra-Violet Disinfection		
Design Information		
Design based on a model calc	0.294	gal(US)/(min-W)
Total number of lamps needed	1810	
Number of spare channels	1	
Total number of lamps used in	1960	
Number of excess lamps	155	
Number of lamps/modules	4	
Number of modules/bank	5	
Number of banks/channel	7	
Number of channels	14	
Calculated headloss	3.02	in
Costs		
Construction and equipment cost	5850000	\$
Cost of installation	3510000	\$
Total cost of UV lamps	2340000	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	60400	\$/yr
Material and supply cost	58500	\$/yr
Chemical cost	20300	\$/yr
Energy cost	146000	\$/yr
Amortization cost	495000	\$/yr

### Hauling and Land Filling

#### Design Output Data

Description	Value	Units
Sludge Hauling and Land Filling		
Design Information		
Volume of sludge hauled	28.5	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	28.5 cuyd/d
Maximum anticipated landfill duration	30 d
Anticipated sludge storage height	8 ft
Sludge storage shed area	2880 sqft
Width of sludge storage shed	38 ft
Length of sludge storage shed	75.9 ft
Volume of earthwork required	7940 cuft
Volume of slab concrete required	3400 cuft
Surface area of canopy roof	2880 sqft
Round trip haul distance	20 miles
Round trips per day per truck	2
Distance traveled per year per truck	10000 miles
Sludge hauled	25.2 ton(short)/d
Operation labor required	445 pers-hrs/yr
LandFilling cost	35200 \$/yr
Costs	
Construction and equipment cost	387000 \$
Earthwork Cost	2350 \$
Slab Concrete Cost	44100 \$
Canopy Roof Cost	57600 \$
Vehicle Cost	283000 \$
Operational labor cost	22900 \$/yr
Maintenance labor cost	0 \$/yr
Material and supply cost	72000 \$/yr
Chemical cost	0 \$/yr
Energy cost	0 \$/yr
Amortization cost	70000 \$/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	117	lb/d
Operating transfer efficiency	2.96	lbO <sub>2</sub> /(HP·h)
Total volume of aerobic reactor	32600	gal(US)
Air flow rate required to meet aeration demand	157	scfm
Quantities		
Basin depth	15	ft
Length of basin	9.68	ft
Width of basin	30	ft
Number of diffusers	14	
Number of swing arm diffuser in each row	1	
Volume of wall concrete required	893	cuft
Volume of slab concrete required	218	cuft
Electrical energy required	39000	kWh/yr
Operation labor required	657	pers-hrs/yr
Maintenance labor required	255	pers-hrs/yr
Costs		
Construction and equipment cost	59400	\$
Wall Concrete Cost	21500	\$
Slab Concrete Cost	11600	\$
Installed Equipment Cost	20400	\$
Misc Costs	5890	\$
Operational labor cost	33800	\$/yr
Maintenance labor cost	10500	\$/yr
Material and supply cost	1420	\$/yr
Chemical cost	0	\$/yr
Energy cost	3900	\$/yr
Amortization cost	5390	\$/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  
Amortization cost

0 \$/yr  
0 \$/yr