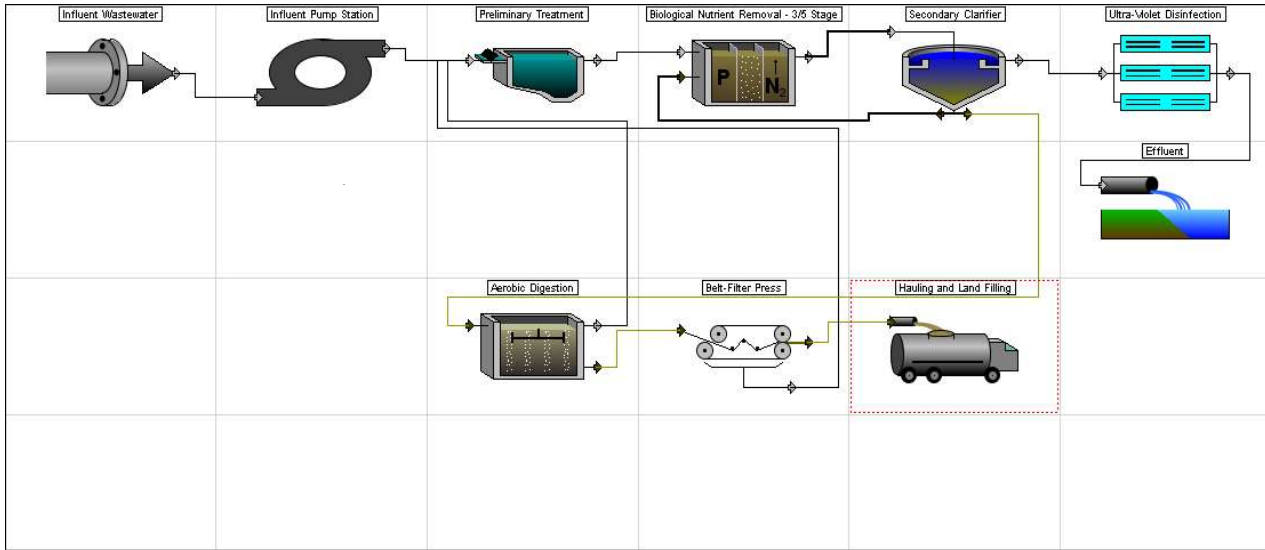


**Layout - Coalville City**



**Summary**

**Equipment Database**

Hydromantis 2014,(USA Avg)

**Layout Summary**

Description	Value	Units
<b>CONSTRUCTION COSTS</b>		
Unit process construction cost:	\$5,180,000	\$
Other direct construction costs	\$1,500,000	\$
Other indirect construction costs	\$5,130,000	\$
<b>Total construction costs</b>	<b>\$11,800,000</b>	<b>\$</b>

**ANNUAL COSTS**

**LABOR COSTS**

Administration labor cost	\$12,000	\$/yr
Laboratory labor cost	\$117,000	\$/yr
Unit process operation labor cost	\$289,000	\$/yr
Unit process maintenance labor cost	\$142,000	\$/yr
<b>Total labor costs</b>	<b>\$560,000</b>	<b>\$/yr</b>

**MATERIAL COSTS**

Total material cost	\$149,000	\$/yr
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**CHEMICAL COSTS**

Total chemical cost	\$5,590	\$/yr
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**ENERGY COSTS**

Total energy cost	\$92,100	\$/yr
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<b>Total operation and maintenance</b>	<b>\$808,000</b>	<b>\$/yr</b>
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**CONSTRUCTION COST AMC**

Amortization cost for total construction	\$1,040,000	\$/yr
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<b>Total annual project cost</b>	<b>\$1,840,000</b>	<b>\$/yr</b>
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**PROJECT SUMMARY**

Present worth	\$22,200,000	\$
Total project cost	\$11,800,000	\$
Total operation labor cost	\$418,000	\$/yr
Total maintenance labor cost	\$142,000	\$/yr
Total material cost	\$149,000	\$/yr
Total chemical cost	\$5,590	\$/yr
Total energy cost	\$92,100	\$/yr
Total amortization cost	\$1,040,000	\$/yr

**Process Summary**

Process	Construction (\$)	Operation (\$/yr)	Maintenance (\$/yr)	Material (\$/yr)	Chemical (\$/yr)	Energy (\$/yr)	Amortization (\$/yr)
Influent Pump Station	886000	27100	17700	6200	0	5100	76500
Preliminary Treatment	379000	26200	11800	9480	0	1280	31800
Aerobic Digestion	261000	48500	18200	27700	0	24000	22700
Biological Nutrient Removal - 3/5 Stage	1500000	150000	73400	45600	0	49400	138000

Belt-Filter Press	812000	1240	240	0	4100	856	74300
Secondary Clarifier	266000	33900	16800	2560	0	801	25100
Hauling and Land Filling	295000	2290	0	53600	0	0	62300
Ultra-Violet Disinfection	430000	0	4320	4300	1490	10700	36400
Effluent	0	0	0	0	0	0	0
Blower System	351000	0	0	0	0	0	29400
Other Costs	6630000	129000	0	0	0	0	539000

#### Summary of Other Costs for Layout

Description	Value	Units
Other Costs		
Quantities		
Required land	10 acre	
Administration labor hours	234 hr/yr	
Laboratory labor hours	2270 hr/yr	
Costs		
<b>DIRECT COSTS</b>		
Mobilization	129000 \$	
Site preparation	240000 \$	
Site electrical	333000 \$	
Yard piping	232000 \$	
Instrumentation and control	151000 \$	
Lab and administration building	416000 \$	
Total direct construction costs	1500000 \$	
<b>INDIRECT COSTS</b>		
Cost of land	200000 \$	
Miscellaneous cost	384000 \$	
Legal cost	154000 \$	
Engineering design fee	1150000 \$	
Inspection cost	154000 \$	
Contingency	768000 \$	
Technical	154000 \$	
Interest during construction	1160000 \$	
Profit	1000000 \$	
Total indirect construction cost	5130000 \$	
Total of other construction costs	6630000 \$	
<b>LABOR COSTS</b>		
Administration labor cost	12000 \$/yr	
Laboratory labor cost	117000 \$/yr	

#### Summary of Air Supply System

Description	Value	Units
Blower System for Entire Plant		
Design Information		
Minimum air flow capacity	1690 scfm	
Safety factor	1.5	
Requested air flow capacity	2530 scfm	
Total capacity of blowers	2530 scfm	
Number of blowers in use	1	
Total number of blowers	2	
Capacity of individual blowers	2530 scfm	
Estimated cost of an installed blower	106000 \$	
Blower building area	952 sqft	
Costs		
Construction and equipment cost	351000 \$	
Installed Blower Cost	212000 \$	
Building Cost	105000 \$	
Misc Costs	34800 \$	
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	29400 \$/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	9470 cuft	
Width of wet well	86.8 ft	
Depth of the pumping station	25.9 ft	
Length of the pumping station	18 ft	
Width of the pumping station	114 ft	
Minimum depth of water in wet well	4.9 ft	

Area of pump building	514 sqft
Peak capacity of pumps	4 MGD(US)
Firm pumping capacity	4 MGD(US)
Total dynamic head - average	43.9 ft
Quantities	
Operation labor required	526 pers-hrs/yr
Maintenance labor required	442 pers-hrs/yr
Electrical energy required	51000 kWh/yr
Volume of earthwork required	273000 cuft
Volume of slab concrete requir	16400 cuft
Volume of wall concrete requir	9440 cuft
Capacity per pump	2780 gpm(US)
Number of constant speed pur	2
Number of variable speed pur	0
Diameter of discharge header	11.9 in
Total dynamic head	74.5 ft
Size of selected pump	12 in
Specific speed of pump	3740
Pump rotating speed	1920 rpm
Motor size required	74.9 HP
Size of selected motor	75 HP
Width of pump system	3 ft
Length of pump system	18.2 ft
Length of the dry well	18 ft
Width of the dry well	27.2 ft
Costs	
Construction and equipment co	886000 \$
Earthwork Cost	80900 \$
Wall Concrete Cost	227000 \$
Slab Concrete Cost	212000 \$
Building Cost	56500 \$
Installed Pump Equipment C	174000 \$
Misc Costs	135000 \$
Operational labor cost	27100 \$/yr
Maintenance labor cost	17700 \$/yr
Material and supply cost	6200 \$/yr
Chemical cost	0 \$/yr
Energy cost	5100 \$/yr
Amortization cost	76500 \$/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	0.379	ft
Average channel depth	1	ft
Horizontal Flow Grit Chamber		
Maximum flow	6.18	cuft/s
Average flow	0.946	cuft/s
Minimum flow	0.484	cuft/s
Temperature	10.3	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	3.09	cuft/s
Width of channel	0.515	ft
Depth of channel	4	ft
Length of channel	143	ft
Settling velocity of particle	0.0711	ft/s
Slope of channel bottom	0.00469	
Allowance for currents	1.7	
Manning coefficient	0.035	
Hydraulic retention time	1.59	min
Volume of grit	2.46	cuft/d
Costs		
Construction and equipment co	379000	\$
Operational labor cost	26200	\$/yr
Maintenance labor cost	11800	\$/yr
Material and supply cost	9480	\$/yr
Chemical cost	0	\$/yr
Energy cost	1280	\$/yr

Amortization cost 31800 \$/yr

**Aerobic Digestion**

**Design Output Data**

Description	Value	Units
Aerobic Digestion		
Design Information		
Solids retention time	20	d
Design SS	12000	mg/L
Calculated VSS	5620	mg/L
Calculated VSS:TSS ratio	0.469	mg VSS/mg SS
Total volume of reactors	572	m <sup>3</sup>
Length of parallel train	6	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 average	272	kg/d
Air flow required to meet average	1510	N m <sup>3</sup> /hr
Design air flow	43.9	N m <sup>3</sup> /min/1000 m <sup>3</sup>
Volatile solids loading	0.039	lb/(cuft-d)
Solids accumulated	757	lb/d
Digester capacity	15100	lb
Volume of wasted sludge	69100	gal(US)
Quantities		
Operation labor required	942	pers-hrs/yr
Maintenance labor required	455	pers-hrs/yr
Electrical energy required	240000	kWh/yr
Volume of earthwork required	22600	cuft
Volume of slab concrete required	4630	cuft
Volume of wall concrete required	4280	cuft
Handrail length	119	ft
Number of diffusers per train	39	
Number of swing arm headers	1	
Costs		
Construction and equipment cost	261000	\$
Earthwork Cost	6680	\$
Wall Concrete Cost	103000	\$
Slab Concrete Cost	60000	\$
Handrail Cost	8960	\$
Installed Aerator Equipment	42900	\$
Air Piping Cost	13200	\$
Misc Costs	25800	\$
Operational labor cost	48500	\$/yr
Maintenance labor cost	18200	\$/yr
Material and supply cost	27700	\$/yr
Chemical cost	0	\$/yr
Energy cost	24000	\$/yr
Amortization cost	22700	\$/yr

**Biological Nutrient Removal - 3/5 Stage**

**Design Output Data**

Description	Value	Units
BNR System for BIO-P and N Removal		
Design Information		
3-Stage Biological Phosphorus		
Design aerobic SRT for nitrification	10	d
Total reactor SRT	20	d
Design SS	3000	mg/L
Calculated VSS	1790	mg/L
Calculated VSS:TSS ratio	0.595	mg VSS/mg SS
Total volume of anaerobic reactor	412	m <sup>3</sup>
Total volume of anoxic reactor	1550	m <sup>3</sup>
Total volume of aerobic reactor	1960	m <sup>3</sup>
Total volume of all reactors	3930	m <sup>3</sup>
Width of parallel train	10	m
Sidewater depth	5	m
Number of batteries	1	
Number of parallel trains per battery	2	
Number of anoxic cells within each battery	1	
Number of aerobic cells within each battery	1	
Anaerobic hydraulic retention time	4.25	hr
Anoxic hydraulic retention time	16	hr
Aerobic hydraulic retention time	20.3	hr
Amount of sludge generated	589	kg/d
Sludge recycle ratio	42.9	%
Sludge recycle rate	997	m <sup>3</sup> /d
Nitrogen required for biomass	22.4	mg/L
Phosphorus required for biomass	4.48	mg/L
Oxygen required to meet average	760	kg/d
Air flow required to meet average	1260	N m <sup>3</sup> /hr
Design air flow	10.7	N m <sup>3</sup> /min/1000 m <sup>3</sup>

Quantities	
Operation labor required	1610 pers-hrs/yr
Maintenance labor required	772 pers-hrs/yr
Electrical energy required	329000 kWh/yr
Volume of earthwork required	86000 cuft
Volume of slab concrete requir	19100 cuft
Volume of wall concrete requir	12900 cuft
Handrail length	349 ft
Number of diffusers per train	190
Fine bubble diffuser floor cover	3.9 %
Number of swing arm headers	6
Required mixing power	27.3 kW
Total number of mixers	4
Required mixing power per mi	6.83 kW
Design mixing power per mixer	3.73 kW
Mixing power for each unaerat	6.82 kW
Costs	
Construction and equipment cc	1070000 \$
Earthwork Cost	25500 \$
Wall Concrete Cost	311000 \$
Slab Concrete Cost	248000 \$
Handrail Cost	26200 \$
Installed Aerator Equipment	264000 \$
Air Piping Cost	20500 \$
Installed Mixer Equipment C	68600 \$
Misc Costs	106000 \$
Operational labor cost	82900 \$/yr
Maintenance labor cost	30900 \$/yr
Material and supply cost	42600 \$/yr
Chemical cost	0 \$/yr
Energy cost	32900 \$/yr
Amortization cost	97800 \$/yr
Internal Recycle Pumping	
Design Information	
Average daily pumping rate	0.922 MGD(US)
Total pumping capacity	0.922 MGD(US)
Design capacity per pump	320 gpm(US)
Number of pumps	6
Number of batteries	1
Firm pumping capacity	0.922 MGD(US)
Quantities	
Operation labor required	435 pers-hrs/yr
Maintenance labor required	356 pers-hrs/yr
Electrical energy required	61800 kWh/yr
Volume of earthwork required	1750 cuft
Area of pump building	218 sqft
Costs	
Construction and equipment cc	169000 \$
Earthwork Cost	1030 \$
Pump Building Cost	48000 \$
Installed Pump Cost	94600 \$
Misc Costs	25800 \$
Operational labor cost	22400 \$/yr
Maintenance labor cost	14200 \$/yr
Material and supply cost	1190 \$/yr
Chemical cost	0 \$/yr
Energy cost	6180 \$/yr
Amortization cost	16000 \$/yr
Internal Recycle Pumping	
Design Information	
Average daily pumping rate	1.23 MGD(US)
Total pumping capacity	1.23 MGD(US)
Design capacity per pump	427 gpm(US)
Number of pumps	6
Number of batteries	1
Firm pumping capacity	1.23 MGD(US)
Quantities	
Operation labor required	452 pers-hrs/yr
Maintenance labor required	371 pers-hrs/yr
Electrical energy required	82300 kWh/yr
Volume of earthwork required	1790 cuft
Area of pump building	224 sqft
Costs	
Construction and equipment cc	186000 \$
Earthwork Cost	1060 \$
Pump Building Cost	49300 \$
Installed Pump Cost	107000 \$
Misc Costs	28400 \$
Operational labor cost	23300 \$/yr
Maintenance labor cost	14900 \$/yr
Material and supply cost	1300 \$/yr
Chemical cost	0 \$/yr

Energy cost	8230 \$/yr
Amortization cost	17600 \$/yr
Sludge Recycle Pumping	
Design Information	
Average daily pumping rate	0.615 MGD(US)
Total pumping capacity	0.615 MGD(US)
Design capacity per pump	213 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.615 MGD(US)
Quantities	
Operation labor required	413 pers-hrs/yr
Maintenance labor required	335 pers-hrs/yr
Electrical energy required	20600 kWh/yr
Volume of earthwork required	1700 cuft
Area of pump building	212 sqft
Costs	
Construction and equipment cost	74800 \$
Earthwork Cost	503 \$
Pump Building Cost	23300 \$
Installed Pump Cost	39500 \$
Misc Costs	11400 \$
Operational labor cost	21300 \$/yr
Maintenance labor cost	13400 \$/yr
Material and supply cost	524 \$/yr
Chemical cost	0 \$/yr
Energy cost	2060 \$/yr
Amortization cost	7070 \$/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	10.1	gpm(US)
Final solids content	15	%
Solids capture fraction	0.996	
Quantities		
Operation labor required	24	pers-hrs/yr
Maintenance labor required	6.01	pers-hrs/yr
Power	8560	kWh/yr
Polymer required	3150	lb/yr
Dry solids produced	864	lb/d
Belt filter(s)	275000	\$
Building	279000	\$
Installation	68800	\$
Polymer system	82500	\$
Feed pumps	30300	\$
Conveyor system	77000	\$
Costs		
Construction and equipment cost	812000	\$
Building Cost	279000	\$
Polymer System Cost	82500	\$
Feed Pumps Cost	30300	\$
Conveyor System Cost	77000	\$
Installed Belt Filter	344000	\$
Operational labor cost	1240	\$/yr
Maintenance labor cost	240	\$/yr
Material and supply cost	0	\$/yr
Chemical cost	4100	\$/yr
Energy cost	856	\$/yr
Amortization cost	74300	\$/yr

### Secondary Clarifier

#### Design Output Data

Description	Value	Units
Secondary Clarification		
Design Information		
Surface area	1540	sqft
Surface area per circular clarifi	768	sqft
Diameter of each circular clarif	32	ft
Number of clarifiers per batter	2	
Number of batteries	1	
Solids loading rate	14.3	lb/(sqft·d)
Hydraulic retention time	4.04	hr
Designed surface overflow rate	400	gal(US)/(sqft·d)
Weir length	502	ft
Volume of wasted sludge	15100	gpd(US)
Quantities		

Operation labor required	402 pers-hrs/yr
Maintenance labor required	225 pers-hrs/yr
Electrical energy required	7500 kWh/yr
Volume of earthwork required	20600 cuft
Slab thickness	10.2 in
Volume of slab concrete requir	1810 cuft
Wall thickness	11.5 in
Volume of wall concrete requir	2240 cuft
Costs	
Construction and equipment cc	231000 \$
Earthwork Cost	6100 \$
Wall Concrete Cost	54000 \$
Slab Concrete Cost	23400 \$
Installed Equipment Cost	112000 \$
Misc Costs	35200 \$
Operational labor cost	20700 \$/yr
Maintenance labor cost	9010 \$/yr
Material and supply cost	2310 \$/yr
Chemical cost	0 \$/yr
Energy cost	750 \$/yr
Amortization cost	21700 \$/yr
Waste Sludge Pumping	
Design Information	
Average daily pumping rate	0.0151 MGD(US)
Total pumping capacity	0.0151 MGD(US)
Design capacity per pump	5.25 gpm(US)
Number of pumps	3
Number of batteries	1
Firm pumping capacity	0.0151 MGD(US)
Quantities	
Operation labor required	257 pers-hrs/yr
Maintenance labor required	194 pers-hrs/yr
Electrical energy required	512 kWh/yr
Volume of earthwork required	1600 cuft
Area of pump building	200 sqft
Costs	
Construction and equipment cc	35700 \$
Earthwork Cost	475 \$
Pump Building Cost	22000 \$
Installed Pump Cost	7740 \$
Misc Costs	5440 \$
Operational labor cost	13200 \$/yr
Maintenance labor cost	7760 \$/yr
Material and supply cost	250 \$/yr
Chemical cost	0 \$/yr
Energy cost	51 \$/yr
Amortization cost	3370 \$/yr

### Hauling and Land Filling

#### Design Output Data

Description	Value	Units
Sludge Hauling and Land Filling		
Design Information		
Volume of sludge hauled	2.84	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	2.84	cuyd/d
Maximum anticipated landfill d	30	d
Anticipated sludge storage hei	8	ft
Sludge storage shed area	288	sqft
Width of sludge storage shed	12	ft
Length of sludge storage shed	24	ft
Volume of earthwork required	964	cuft
Volume of slab concrete requir	453	cuft
Surface area of canopy roof	288	sqft
Round trip haul distance	20	miles
Round trips per day per truck	1	
Distance traveled per year per	5000	miles
Sludge hauled	2.51	ton(short)/d
Operation labor required	44.5	pers-hrs/yr
LandFilling cost	35200	\$/yr
Costs		
Construction and equipment cc	295000	\$
Earthwork Cost	286	\$
Slab Concrete Cost	5870	\$
Canopy Roof Cost	5760	\$
Vehicle Cost	283000	\$

Operational labor cost	2290 \$/yr
Maintenance labor cost	0 \$/yr
Material and supply cost	53600 \$/yr
Chemical cost	0 \$/yr
Energy cost	0 \$/yr
Amortization cost	62300 \$/yr

**Ultra-Violet Disinfection**

**Design Output Data**

Description	Value	Units
Ultra-Violet Disinfection		
Design Information		
Design based on a model calc	1.63	gal(US)/(min·W)
Total number of lamps needed	130	
Number of spare channels	1	
Total number of lamps used in	144	
Number of excess lamps	14	
Number of lamps/modules	2	
Number of modules/bank	3	
Number of banks/channel	2	
Number of channels	12	
Calculated headloss	2.14	in
Costs		
Construction and equipment cc	430000	\$
Cost of installation	258000	\$
Total cost of UV lamps	172000	\$
Operational labor cost	0	\$/yr
Maintenance labor cost	4320	\$/yr
Material and supply cost	4300	\$/yr
Chemical cost	1490	\$/yr
Energy cost	10700	\$/yr
Amortization cost	36400	\$/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