Center Sanitation District
EH2LS Engineering
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Heath Anderson
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Outline of Presentation
- Background
- Current and Future Conditions
- Decision Matrix Description
- Regulations and Permits
- Alternatives and Preliminary Design
  - Sequenced Batch Reactors
  - Dewatering
  - Composting
- Final Costs and Construction Staging
- Questions

Project Scope and Objectives
- The Sanitation District distributed a Request for Proposal to analyze their agricultural wastewater treatment plant.
- EH2LS responded to this RFP on Sept 16th.
- Goals of the RFP:
  - Discharge to meet permit levels
  - Biosolids management plan
  - Dewatering
  - Composting
- EH2LS was awarded the contract
  - Deliver a Preliminary Design (30% Design)

Background
- Mainly an agricultural city
  - 18.1% of the total industry
- Influent from 4 potato processing plants
  - 75% Coming from Idaho Pacific Plant
- Average flow of 200,000 gal/day
  - BOD of 2,500 lbs/day

Current Conditions
- Plant Overview
- Influent
- Wastewater
- Effluent
- Sludge
- Gravity Thickener
- Shed
- Dewatering
- Composting
- Final Costs and Construction Staging
Current Conditions

Current Conditions-Sludge
- During our plant visit on Sept. 24th: 4-6 truck loads of Biosolids per day, and SBR 2 acting as a sludge holding tank.
- During normal operation 20 loads per month are expected.

Future Conditions
- Idaho Pacific to double plant capacity by 2006.
- Idaho Pacific installed 60 micron filter in replace of a 1/8" filter.
  - Estimated 40% reduction in solids.

Decision Matrix Description
- A constraint is anything that would completely eliminate an option from being a feasible solution.
  - Meeting the current effluent standards in the current permit.
  - The ability to handle the plant’s current flow rate.
  - Must not exceed the Sanitation Districts budget.
  - The flow regime of the plant must be free of sludge back up.
- Criteria: Important factors to the project that are weighted according to importance.
  - A low score of 1 indicates that the option did not meet any of the qualifications.
  - A high score of 10 means it met every qualification.

SBR Matrix

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Raw Score</th>
<th>Option Score</th>
<th>Weighted Score</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social Benefits</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Odor</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>1</td>
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<tr>
<td>Aesthetics and Noise</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>1</td>
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<tr>
<td>Public Approval</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Sustainability of design choice</td>
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<td>2</td>
<td>6</td>
<td>1</td>
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<tr>
<td>Public Effects</td>
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<td>1</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Total</td>
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</table>

Biosolids Matrix

<table>
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<tr>
<th>Criteria</th>
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<td>6</td>
<td>1</td>
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<tr>
<td>Public Approval</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>1</td>
</tr>
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<td>Sustainability</td>
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<td>2</td>
<td>6</td>
<td>1</td>
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<tr>
<td>Public Effects</td>
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<td>1</td>
<td>2</td>
<td>1</td>
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<tr>
<td>Total</td>
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Current Regulations

<table>
<thead>
<tr>
<th>Effluent Parameters</th>
<th>30 Day Average</th>
<th>7 Day Average</th>
<th>Daily Maximum</th>
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<tbody>
<tr>
<td>5-Day BOD (mg/l)</td>
<td>30</td>
<td>45</td>
<td>N/A</td>
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<tr>
<td>Total Suspended Solids (mg/l)</td>
<td>30</td>
<td>45</td>
<td>N/A</td>
</tr>
<tr>
<td>Oil and Grease (mg/l)</td>
<td>N/A</td>
<td>N/A</td>
<td>10</td>
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<tr>
<td>pH (min-max)</td>
<td>N/A</td>
<td>N/A</td>
<td>6.0-9.0</td>
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</tbody>
</table>

- Plant has had trouble meeting these when solids are too high in the SBR’s.
- High BOD and TSS has been sealing the irrigation ditch, preventing groundwater recharge.

Permits

Current Effluent Stream Requirements
State Colorado Upgrade Requirements Policy 96-1
Licensee Operator Class B Policy 100
Land Application 503

Alternatives Assessment:
SBR Operation

- Seasonal startup and new filter
- Reseeding
- Time to new steady state condition

Alternatives Assessment:
SBR Operation

- Eliminated Alternatives
  - Decant process
  - Influent solids concentrations
  - Temperature sensitivity
  - Biological clogging of aerators
  - Equipment maintenance
  - Insufficient mixing
  - Influent nutrient characteristics
  - Anaerobic pretreatment
  - Membranes

Alternatives Assessment:
SBR Operation

Alt. 1: Baffle and Cycle Time Adjustment
- Current flow vs. Design Flow
- Current cycle times vs. SBR Manual
  - FILL: 12 hours vs. 4 hours
  - SETTLE/DECANT: 8 hours vs. 2 hours
  - TOTAL: 22+ hours vs. 8 hours
- Filamentous growth, F/M
- Baffle
- Costs - a big savings!

Alternatives Assessment:
SBR Operation

Alt. 2: Decanter Cleaning
- Calculations show sufficient capacity
- Cheap!
- Permit
- Effluent changes
Alternatives Assessment: SBR Operation

Alt. 3: Adjust Solids Content in SBRs
- Settling
- Consuming BOD
- Influent BOD data, Q
- Cheap!

Alt. 4: Cease Operation July - September
- Current operations
- Fewer operator hours
- Reduction in energy costs
- Reseed from nearby domestic plant
- Complex startup
- Permit issues

Alt. 5: Domestic WW July - Sept
- Ensure summer bacterial survival
- Expensive

Preliminary Design: SBR Operation
- Baffle addition in SBR3 only
  - Regular operation, ample V
  - Lowest head losses
- No new Q measurement equipment
- No permit changes (Q, # cells)
- Automatic controls and operation
- Sludge startup
Preliminary Design: SBR Operation

- Recommended initial cycle times:
  - Fill: 12 hours (12) to 8.33 (1.67) hours
  - Full React: 2 hours to 0.25 hours
  - Settle: 4 hours to 2 hours
  - Decant: 4 hours to 0.5 hours
- Based on F/M, aeration for BOD uptake, 2000 mg/L MLSS
- Startup - current times in one SBR
- Flow rate increase

Alternatives for dewatering

- **Rejected options**
  - Centrifuges
  - Recessed Plate and Belt Press Filters

- **Accepted Options**
  - Drum Thickeners
  - Sludge Dewatering Lagoons
  - Sludge Drying Beds

Decision Matrix-Dewatering Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Weighted Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drum thickener</td>
<td>9.0</td>
</tr>
<tr>
<td>Sludge drying Lagoon</td>
<td>7.9</td>
</tr>
<tr>
<td>Sludge drying beds</td>
<td>8.2</td>
</tr>
</tbody>
</table>

Final option: Drum Thickener

- **Benefits**
  - Unit can be placed in the existing building
  - Can handle the low flow volumes
  - Low Capital Cost
  - Low O&M Cost
  - Low odor
  - High removal rate: 10 to 12% H₂O removed
Biosolids Management Problem
Over production of biosolids which is causing back up in operations
During the design of the Plant no management program was put in place
Currently producing 6000 gal/day sludge
Outsourcing their waste to a transport company which cost $.03/gal
Total cost outsourcing $62,000/yr

Considered Alternatives
Option | Project Cost
--- | ---
20 year |  
Subsurface Injection | $1,010,000
Outsourcing | $845,000
On-site composting | $830,000
Purchasing Truck | $290,000

Weighted Matrix Alternatives

<table>
<thead>
<tr>
<th></th>
<th>Total Score:</th>
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</thead>
<tbody>
<tr>
<td>Buying a Truck</td>
<td>750</td>
</tr>
<tr>
<td>Onsite Composting</td>
<td>630</td>
</tr>
<tr>
<td>Outsourcing</td>
<td>525</td>
</tr>
<tr>
<td>Subsurface Injection</td>
<td>470</td>
</tr>
</tbody>
</table>

Buying a truck to take sludge to composting received the highest score in both present value and non-cost options

Final Design Biosolids Management
- Biosolids vs. Dewatered Biosolids
- Dewatered Biosolids reduces volume by 50% but still contain enough liquid to use the existing pump for loading
- Cost associated operation and maintenance of Dewater Machinery

Projected Costs Water vs. Dewater

<table>
<thead>
<tr>
<th>Sludge Volume (GPD)</th>
<th>Current Flow Rates</th>
<th>Future Flow Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>5567</td>
<td>2834</td>
<td>9918 4949</td>
</tr>
<tr>
<td>Total Operation Costs ($/yr)</td>
<td>22500</td>
<td>12227 37265 20083</td>
</tr>
<tr>
<td>Present Value 20 Years ($)</td>
<td>512500</td>
<td>327040 807800 484160</td>
</tr>
<tr>
<td># Years DW = W</td>
<td>2 years</td>
<td>1.1 years</td>
</tr>
</tbody>
</table>

Dewatering will pay for itself with in 2 years

Decision Matrix Biosolids Water vs. Dewater

<table>
<thead>
<tr>
<th></th>
<th>Unweighted</th>
<th>Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Water Sludge</td>
<td>81</td>
<td></td>
</tr>
<tr>
<td>Current Dewatered Sludge</td>
<td>78</td>
<td></td>
</tr>
<tr>
<td>Weighted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Water Sludge</td>
<td>660</td>
<td></td>
</tr>
<tr>
<td>Current Dewatered Sludge</td>
<td>800</td>
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</tbody>
</table>

Dewater option scored significantly higher because of the present value
Recommend dewatering and buying a truck
Preliminary Design: COSTS

- SBR
  - Baffle addition: $35,000
  - Cycle Time Adjustment: $28,000 saved annually
- Dewatering
  - Capital costs: Unit approximate cost $20,000
  - O&M costs: Total energy cost ≈ $63 per year
- Biosolids
  - $62,500 truck
  - $22,500 O&M
- TOTAL CAPITAL: $120,000
- TOTAL O&M: up to $5500 saved

QUESTIONS?