## Topics Covered

1. Background
2. Preliminary Studies
3. Permit Compliance Schedule
4. Optimization
5. Summary
Background

Washington County
Pop. 14,258
Large Industrial Base
Dairy Tannery
Metal Finishing
Background

Water Pollution Control Facility

- Activated Sludge
- Extended Aeration
- Advanced Treatment
  - Nitrification/Denit.
  - Tertiary Filters
- Design ADF: 3.4 MGD
- New Permit July 2012
  - Interim P Limit: 0.6 mg/L
  - Final P Limit: 0.075 mg/L
- Discharge to Rubicon River → Rock River
Preliminary Studies

Combine with the Village of Slinger?
Preliminary Studies

Watershed
Solution
Feasibility

Site Specific Criteria
Preliminary Studies

Watershed Solution Feasibility

Filter Strips
Preliminary Studies
Watershed Solution Feasibility

Watershed

No New Building
Reuse deep bed filter
concrete superstructure

Capital Cost
= $2.7 million

20-year 4% i-rate
annualized cost
= $175,370

Incremental cost (0.45 mg/L to 0.06 mg/L =
$109/lb P

Plant Upgrade

Filter strips
= $39/lb P
Permit Compliance Schedule

Operation and Needs Review/Optimization

Due June 30, 2013

“…report shall evaluate collected effluent data, possible source reduction measures, operational improvements or other minor facility modifications that would enable compliance with the final phosphorus WQBEL or some improved level of effluent quality…”
Facilities Planning Status Report

Due June 30, 2014

This report shall provide an update on the permittee’s progress in evaluating feasible alternatives which may include: facility upgrading, consolidation with other sewerage systems, alternative effluent discharge locations, an Adaptive Management Plan, Water Quality Trading plan or a water quality standards variance.
Permit Compliance Schedule

Preliminary Facilities Planning

Due June 30, 2015

- Ultrafiltration
- Disk Filtration (cloth)
- Disk Filtration (membrane)
- Ballasted Sedimentation
- Continuous Backwash Filter
- Rare Earth Product/Biological P Removal
Permit Compliance Schedule

Preliminary Facilities Planning

<table>
<thead>
<tr>
<th>Process</th>
<th>Equipment Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ultrafiltration</td>
<td>$4,567,000</td>
</tr>
<tr>
<td>Disk Filtration (cloth)</td>
<td>$974,000</td>
</tr>
<tr>
<td>Disk Filtration (membrane)</td>
<td>$1,026,000</td>
</tr>
<tr>
<td>Ballasted Sedimentation</td>
<td>$1,153,000</td>
</tr>
<tr>
<td>Continuous Backwash Filter</td>
<td>$1,950,000</td>
</tr>
<tr>
<td>Rare Earth Product/Biological</td>
<td>$0</td>
</tr>
</tbody>
</table>

Use Anthracite Filters Concrete Superstructure, No new Bldg.
Permit Compliance Schedule

Final Facilities Planning

Due June 30, 2016

- Bio P / Rare Earth Product Alternative
  - No Further Updates Needed
- Backup Plan – Bio P with Disk Filtration (cloth or membrane)
- Backup Plan – Bio P Coupled with WQT
  - 0.15 mg/L TP ➔ 0.075 mg/L TP
Optimization

On-line Ortho P Analyzer

- Secondary clarifier effluent
- Heavy industrial loading
- In place July of 2014
Optimization

Constant Chemical Feed

- Replaced pump with smaller unit
- Continuous operation instead of intermittent
- In place July of 2014
Optimization

Industrial Coordination

- Grande Cheese
- Hartford Finishing

Went to P-Free Products
Effluent 100 mg/L ➔ 40 mg/L
Optimization

Rare Earth Product

SorbX-100 rare earth technology forms strong, crystalline bonds with phosphorus.

Traditional coagulants form amorphous “clouds” in solution. Phosphorus is easily released back into solution.

SorbX-100 has a unique mode of action resulting in rapid and stable precipitation of phosphorus. SorbX-100 generates less chemical sludge than other coagulants due to its high reactivity with phosphate based compounds.
## Optimization

### Rare Earth Product

**Advantages**
- Less sludge produced
- Thicker MLSS conc.
- More efficient than ferrous chloride
- Lower SVI
- NP water, no smell

**Disadvantages**
- Higher unit cost
- Unknown market stability and distribution network
- Unknown future pricing
- Few competitors
Optimization

- Bio P in Ditch
  - Relative DO deficit
  - ORP
  - Remove discs in outer
  - Mixing OK
  - Save energy
Optimization-Pilot Data
Optimization-Pilot Data
Optimization-Pilot Data
Optimization-Pilot Data

The graph shows the ortho phosphorus concentration (mg/L) over time from 8/21/2014 to 4/21/2015. The data points are color-coded to represent different channels: Influent (blue), Outer Channel (red), and Middle Channel (green).
Plant demonstrated it can meet 0.075 mg/L consistently
- Rare earth, Bio P
- ORP variable

Optimization takes time
- Seasonal fluctuations
Summary

- Bio P and Rare Earth
  - No Add’l Upgrades
- Backup Bio P and Disc Filter
  - Membrane
  - Cloth
- Backup Bio P with WQT
  - 0.15 mg/L TP ➞ 0.075 mg/L TP
- Expect New Permit 2017
  - 0.075 mg/L TP
QUESTIONS?

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