Reducing Phosphorus Loading to the Spokane River & Long Lake...

An Overview

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Pilot photographs courtesy of Esvelt Environmental Engineering, Spokane
Spokane’s WWTP in 1958
Spokane’s Water Quality Improvement Program

**RPWRF Upgrades**

**CSO Reduction**

**Next Level of Treatment**

**NPDES Permits & TMDLs**

**Stormwater Management**

**Water Reuse & Delta**

**Regulations**
- Federal Clean Water Act
- Revised Code of WA
- WA Administrative Code
- Shoreline Master Plan

**Process**
- Facility Plans
- Preliminary Designs
- Real Estate
- Final Designs
- Construction

**Funding**
- Rates & Reserves
- Spokane County
- PWTF & SRF Loans
- Bonding

NPDES = National Pollutant Discharge Elimination System (Federal EPA)
TMDL = Total Maximum Daily Load (WA State Dept of Ecology)
RPWRF = Riverside Park Water Reclamation Facility (treatment plant)
CSO = Combined Sewer Overflow (sewage mixed with rain or snowmelt)
Delta = any "gap" between plant performance and the Permit Requirements
Spokane’s WWTP in 2011

RPWRF is an activated sludge plant with anaerobic digestion and alum addition for advanced secondary treatment.

Average flow ~40 MGD
Wet peak flow ~135 MGD

Undergoing continuous upgrades since 1999

Next Level of Treatment is the addition of tertiary treatment to achieve new and future more stringent effluent limits.
Next Level of Treatment

NLT Pilot
Next Level Of Treatment

New NPDES Permit implements TMDL for Dissolved Oxygen:

- Total Phosphorus (WLA 17.8 lbs/day)
- Ammonia Nitrogen
- Carbonaceous BOD

Compliance deadline is March, 2018

PCBs, PBDEs, metals, etc. are also of concern
Next Level of Treatment

- Pilot a variety of technologies
- Identify which best serves City’s needs
  - Focus on P, evaluate re: PCBs, metals, etc.
  - This step does not select a Vendor
- Update the Facility Plan
- RFP for Design or Alternative Delivery
- Vendor selected during design
- Proceed to construction
- Operate to determine performance
Next Level of Treatment

Technology Selection Protocol is underway

Esvelt Environmental Engineering is coordinating the City’s full-scale, peer-reviewed Pilot to determine most suitable technology(ies) for NLT.

• Treatment performance – new and future
• Life cycle cost – capital and O&M
• Compact installation – limited space
• Operational considerations
• Design considerations
Next Level of Treatment

1\textsuperscript{st} stage – sedimentation

- Corix (S)
- Kruger Actiflo (K)
- Cambridge Water Technology (C)

2\textsuperscript{nd} stage – filtration

- Corix multimedia granular (F)
- Bluewater continuous upwash sand (B)
- Zenon membrane (Z)
Next Level of Treatment
Next Level of Treatment

Installation of one “S” unit ~ 0.5 MGD
RPWRF Upgrades & NLT

**Phosphorus**

- Influent: 5000
- Effluent: 500
- NLT: 50
- Reduction: 42 ppb

**PCBs**

- Influent: 20,000
- Effluent: 2000
- NLT: 200
- Reduction: 170 ppq
Next Level of Treatment

Spokane P-Pilots - Diurnal Flow Model

- Avg
- Synthetic15
- Synthetic30

Relative Flow to Design Average Flow

Time of Day
Next Level of Treatment

Spokane P-Pilots Transient Flow Model - Based on 10/4/2007

Ratio of program flow to average design flow for unit

Time of day
Next Level of Treatment

Implementation of Selected Technology

• Pilot testing completed 1st Quarter 2011

• Data analysis is underway

• Pilot Report expected 2nd Quarter 2012

• Facility Plan Amendment

• Engineering Report
Next level of Treatment

Implementation of Selected Technology

Three Delivery Methods to choose from

• Traditional Design-Bid-Build

• Design-Build

• General Contractor as Construction Manager (a.k.a. Construction Manager at Risk)

DB and GC/CM are authorized in the RCW
Next Level of Treatment

Alternative Delivery Considerations

Influence curves

Optimize timing of input

Owner
Designer
Constructor
Next Level of Treatment

Alternative Delivery Considerations

Risk-Control continuum
• innovation and responsibility
• regulatory compliance
• City’s comfort level

General Considerations regarding NLT

Plant Operations
• flow variations and process impacts
• accuracy of lab methods
• financing and sustainability
Combined Sewer Overflows

- **Sewage**
- **Storm Runoff**
- **CSO Regulator**
- **Treatment Plant**
CSO Regulator = Overflow Threshold

Pipe sized for sewage and storm flow

Hole intercepts sewage on dry days

Old style “Leaping Weir”
Improved Regulator

Float-actuated control valve
CSO Tank Construction
Completed CSO Tank
## CSO Reduction Program

<table>
<thead>
<tr>
<th>Year</th>
<th>Outfalls</th>
<th>Avg Gallons</th>
<th>Avg Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>~42</td>
<td>600 M</td>
<td>1000</td>
</tr>
<tr>
<td>1994</td>
<td>24</td>
<td>80 M</td>
<td>450</td>
</tr>
<tr>
<td>2011</td>
<td>22</td>
<td>75 M</td>
<td>350</td>
</tr>
<tr>
<td>2017</td>
<td>&lt;20</td>
<td>~8 M</td>
<td>&lt;20</td>
</tr>
</tbody>
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One overflow per outfall per year, on average
Separated Stormwater

1" of rain over the whole City is a Billion Gallons!
   (about 25% falls on right-of-way)

Discharges to River
   • OR –

Discharges to Ground
   • Bio-infiltration Swales
   • Regional Facilities
   • Catch Basins and Drywells (UIC)
Stormwater Management

- 1980s – separated for CSO Reduction
- 1980s – grass swales for treatment (LID)
- 2000s – public education/involvement (BMPs)
- 2010s – rain gardens, permeable pavement
- 2010s – monitoring and enhanced LID
- 2010s – low-phosphorus fertilizer?
Low Impact Development...
... and Best Management Practices
Questions?

Wastewater Management

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