Moving Beyond Minimal Treatment: King County’s Brightwater Treatment Project

Water Center Seminars, May 11, 2010
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Presentation overview

- Project overview
- Treatment Plant, North Mitigation Area, and Environmental Education & Community Center
- Membrane Bioreactors (MBR)
- Reclaimed Water
- Conveyance system construction
FUTURE KING COUNTY WASTEWATER TREATMENT SYSTEM WITH BRIGHTWATER
Brightwater Treatment Plant and Conveyance System
Brightwater Project elements:

- 36 mgd (expandable to 54 mgd) treatment plant with enhanced secondary treatment
- 13-mile long conveyance system from plant site to outfall at Point Wells
- Influent Pump Station in Bothell
- Reclaimed water distribution system
- Environmental Education and Community Center
Original condition of Plant site
Brightwater Mitigation

- 114 acre site
- Extensive stormwater retention and treatment for habitat improvements
- Retaining excavated soils onsite to create landforms which will be used to visually screen wastewater processing areas
- Over 22,000 native plantings
- Restoring approximately 1,350 feet and adding 350 feet of new stream corridor
- Gold level LEED certification for Environmental Education and Community Center
- Extensive odor control to achieve “no odor” commitments
Site Layout
Future view of Brightwater from Route 9

Conceptual Rendering by Stephanie Bower
Brightwater on-site mitigation
North Mitigation Area
North Mitigation Area
Brightwater Environmental Education & Community Center
Education and Community Center

- 15,000 square-foot facility opening Fall 2011
- Access to 70 acres of open space, trails and habitat area
- Two college-level labs and prep room for educational use
- Exhibit hall and three meeting rooms for up to 250 people, which can be rented for public or private events
- The county is exploring partnerships for funding and operation of the facility
- LEED design features include use of reclaimed water, solar panels and hot water from plant used to heat building, passive solar and natural ventilation systems.
Membrane Bioreactors (MBR)

- Strands of hollow, tubular membranes are placed in biologically active water
- Membranes separate water from very fine solids
- Treated water meets Class A standards for water reuse
MBR Benefits compared to conventional secondary treatment

- Reduces BOD & TSS discharge by 70-80% over conventional activated sludge
- TSS & BOD reduction to Puget Sound by 1,000,000 lbs each year
- Effluent quality comparison:

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<tr>
<th></th>
<th>MBR</th>
<th>CAS</th>
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<tr>
<td><strong>TSS</strong></td>
<td>2 mg/L</td>
<td>15 – 20 mg/L</td>
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<tr>
<td><strong>BOD</strong></td>
<td>2 mg/L</td>
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MBR Benefits

- More effective removal of heavy metals and endocrine disrupting compounds (EDCs)
- More effective removal of parasites and bacteria
- Reduced chemicals for disinfection
- Produces a nitrified and denitrified effluent – reduces oxygen demand on Puget Sound
- Produces Class A reclaimed water for industrial uses and landscape irrigation
Water Quality Concerns – Puget Sound

- Nutrient discharge contribute to dissolved oxygen problems in Hood Canal, South Sound and Port Susan
- Puget Sound Partnership identifies nutrients and toxics as priority focus areas
- Potential for future nutrient limits?
- Increased focus on fate and effect of toxic pollutants in marine waters
Comparison of the Annual Discharge of BOD and TSS for Conventional Activated Sludge and MBR Split Stream Treatment Alternatives for Brightwater Treatment Plant at 36 MGD
Comparison of Ammonia Discharge to Puget Sound for 36 mgd Conventional Activated Sludge Process to MBR Treatment at Brightwater
MBR basin and piping
Opportunities – Reclaimed Water

- MBR technology produces Class A reclaimed water suitable for landscape irrigation
- Brightwater conveyance tunnel construction provides opportunity to construct reclaimed water distribution system
- Transmission piping to deliver 21 mgd Class A reclaimed water
Treatment plant construction

Head works
Treatment plant construction

Outside wall of membrane building
Treatment plant construction
Conveyance System piping configuration
Treatment Plant: 70% completed
Influent Pumping Station: 30% completed
East Tunnel (BT-1)
- Tunnel mining completed November 2008
- All pipes installed, fiber optics being pulled, 50% of backfill completed
Central Tunnel (BT-2)
- Tunneling resumed February 15th. As of May 9, 10,095 feet complete, 1,495 feet to go
Central Tunnel (BT-3)
- Tunnel excavated 9,965 feet with 10,000 feet remaining; tunneling stopped
West Tunnel (BT-4)
- Tunnel excavated 20,767 feet (99%) with 285 feet remaining
- Machine will be reconditioned to complete remaining BT-3 tunnel, fall 2010 until fall 2011
Marine Outfall: completed October 2008
East Tunnel Contract

A look inside the machine
Central Tunnel Contract

BT-2 tunneling machine
West Tunnel Contract

TBM delivery to Point Wells

Tunnel segments.
Marine Outfall

- The marine includes 4700 feet of pipe and a 500 foot diffuser, 600 feet deep in Puget Sound
- Design/build team lead by Triton Marine
  Construction completed outfall pull and submergence in late 2008
Marine Outfall
Overall system completion

- Treatment plant scheduled for completion February 2011
- Begin sewage treatment August 2011
- System completion scheduled for 2012
Questions?