King County

Brightwater

TREATMENT SYSTEM

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

Water Center Seminars, May 11, 2010

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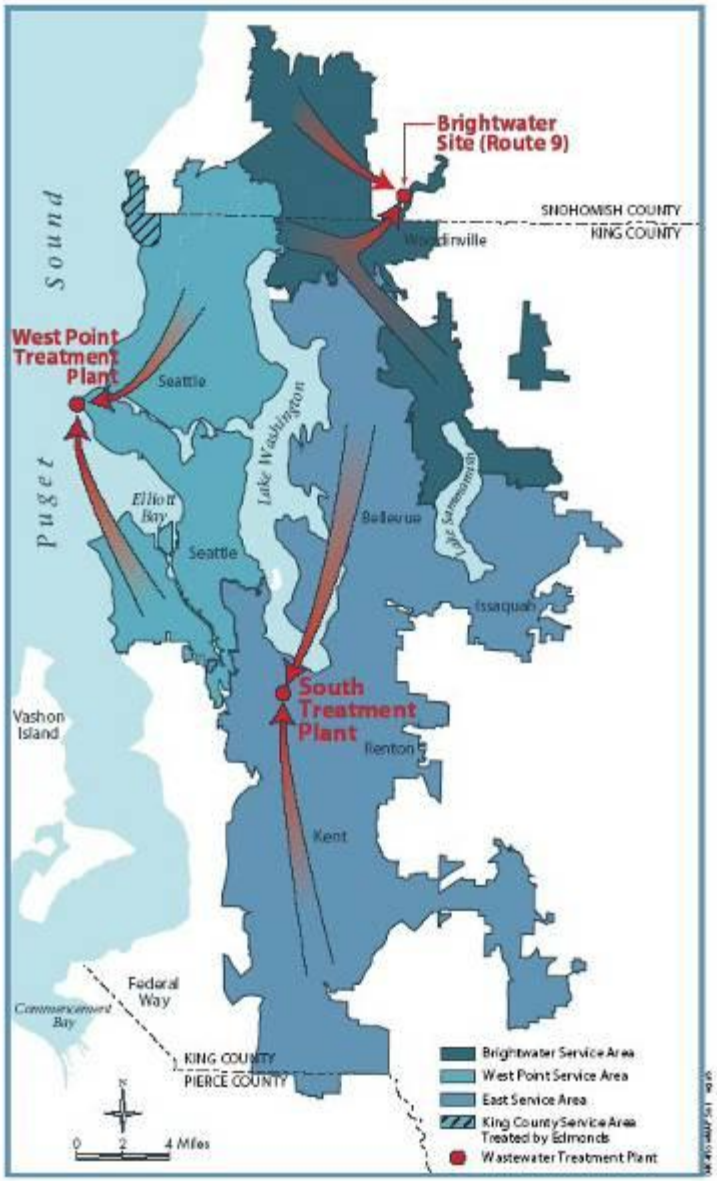
TREATMENT SYSTEM

Presentation overview

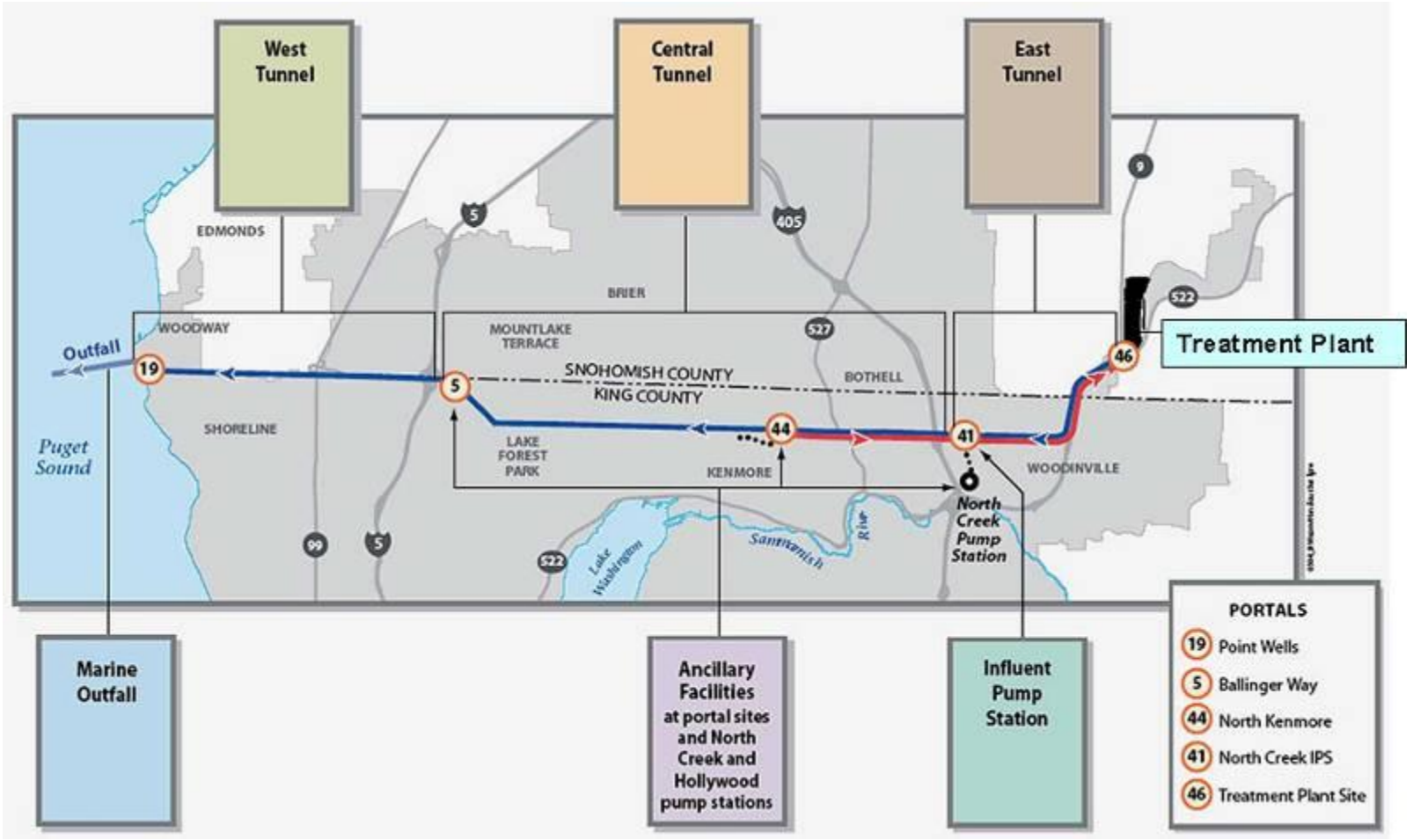
- Project overview
- Treatment Plant, North Mitigation Area, and Environmental Education & Community Center
- Membrane Bioreactors (MBR)
- Reclaimed Water
- Conveyance system construction

FUTURE KING COUNTY WASTEWATER TREATMENT SYSTEM WITH BRIGHTWATER



King County
Department of
Natural Resources and Parks
Wastewater Treatment Division

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


UNNAMED CREEK OVERLOOK
FIELD HOUSE & GARDEN
MEADOW HILLS
MITIGATION FORESTED WETLAND
ROUTE 522
UPLAND FOREST
UPPER UNNAMED CREEK
UPPER POND
BOARDWALK OVERLOOK
LOWER UNNAMED CREEK
MITIGATION WETLAND
BOARDWALK
LOWER POND
NORTH WETSCAPE
POND OVERLOOK
SOUTH WETSCAPE
BOARDWALK
MITIGATION WETLAND
HOWELL CREEK

Future view of Brightwater from Route 9

Conceptual Rendering by Stephanie Bower

Brightwater on-site mitigation

Close-up of North Habitat Area

North Mitigation Area

North Mitigation Area

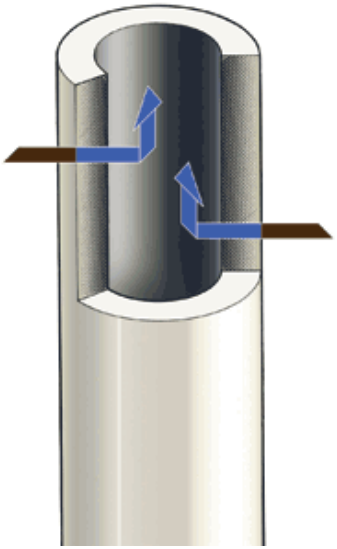
Brightwater Environmental Education & Community Center

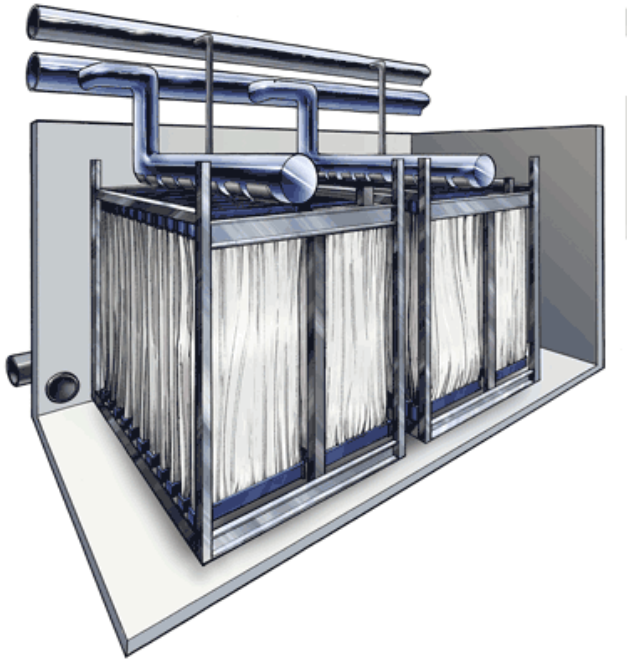
Education and Community Center

- 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:

	TSS	BOD
MBR	2 mg/L	2 mg/L
CAS	15 – 20 mg/L	15-20 mg/L

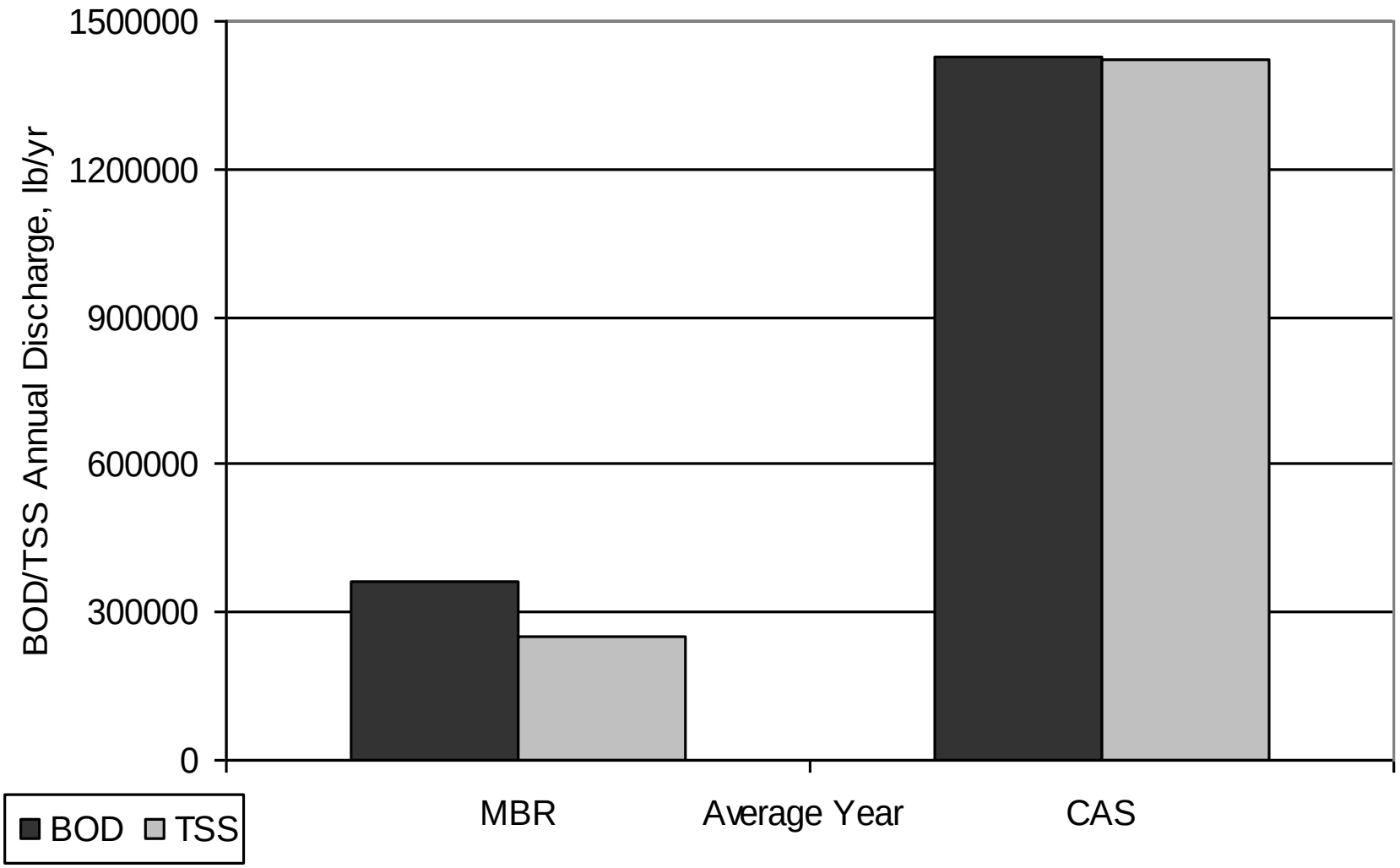
MBR Benefits

- 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

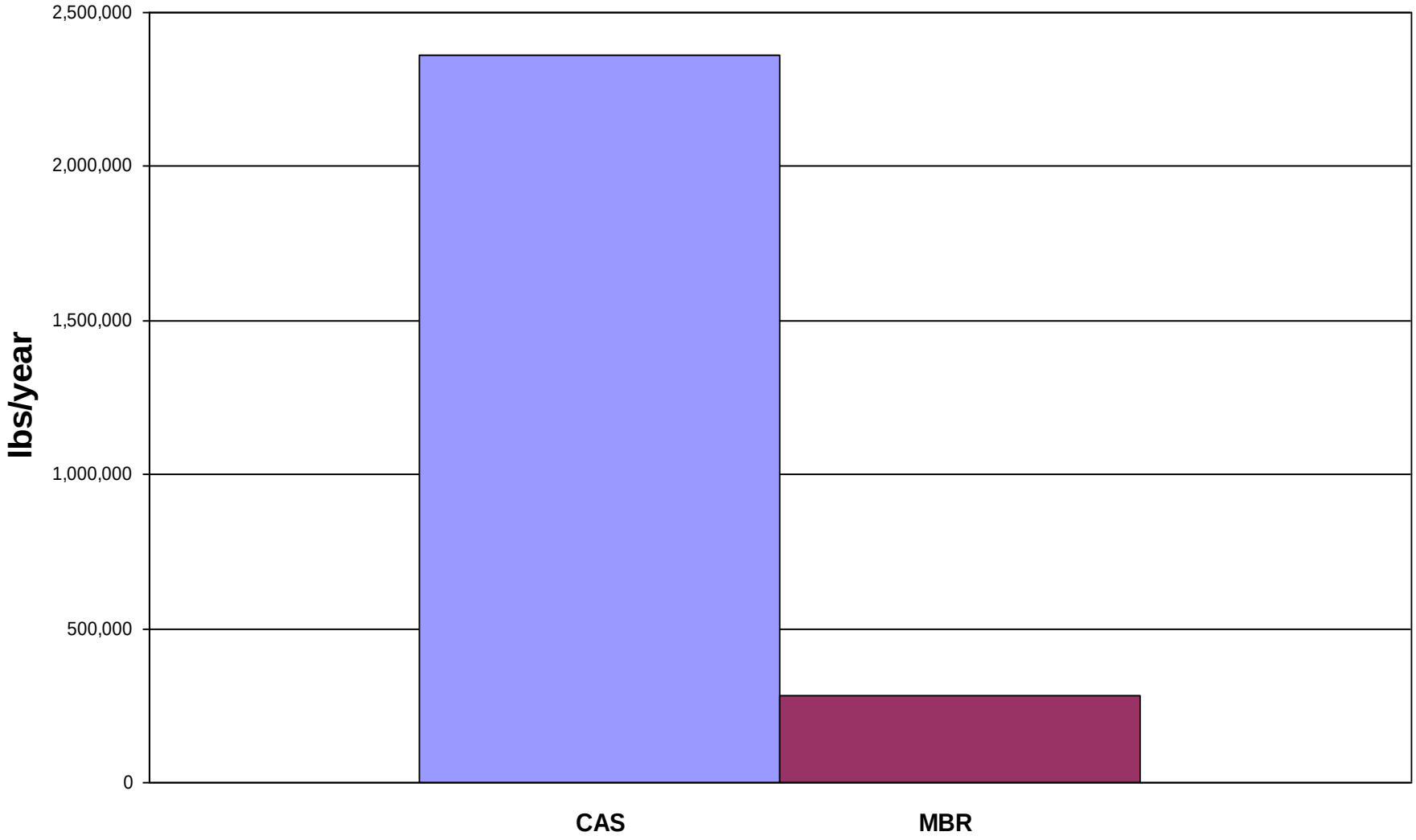
Water Quality Concerns – Puget Sound

- 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

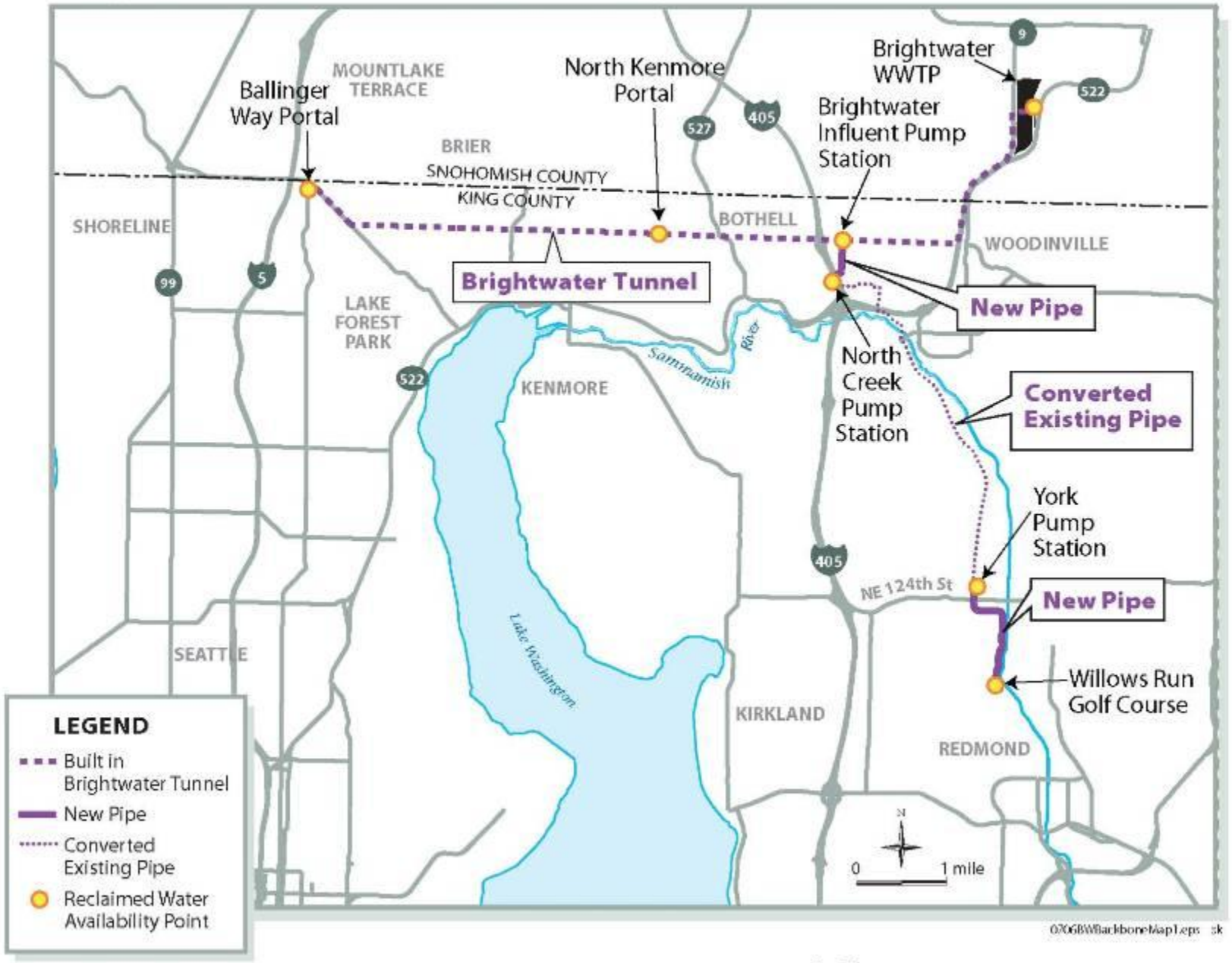


MBR basin and piping

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

Brightwater Reclaimed Water System



Treatment plant construction

Head works

Treatment plant construction

Outside wall of membrane building

Treatment plant construction

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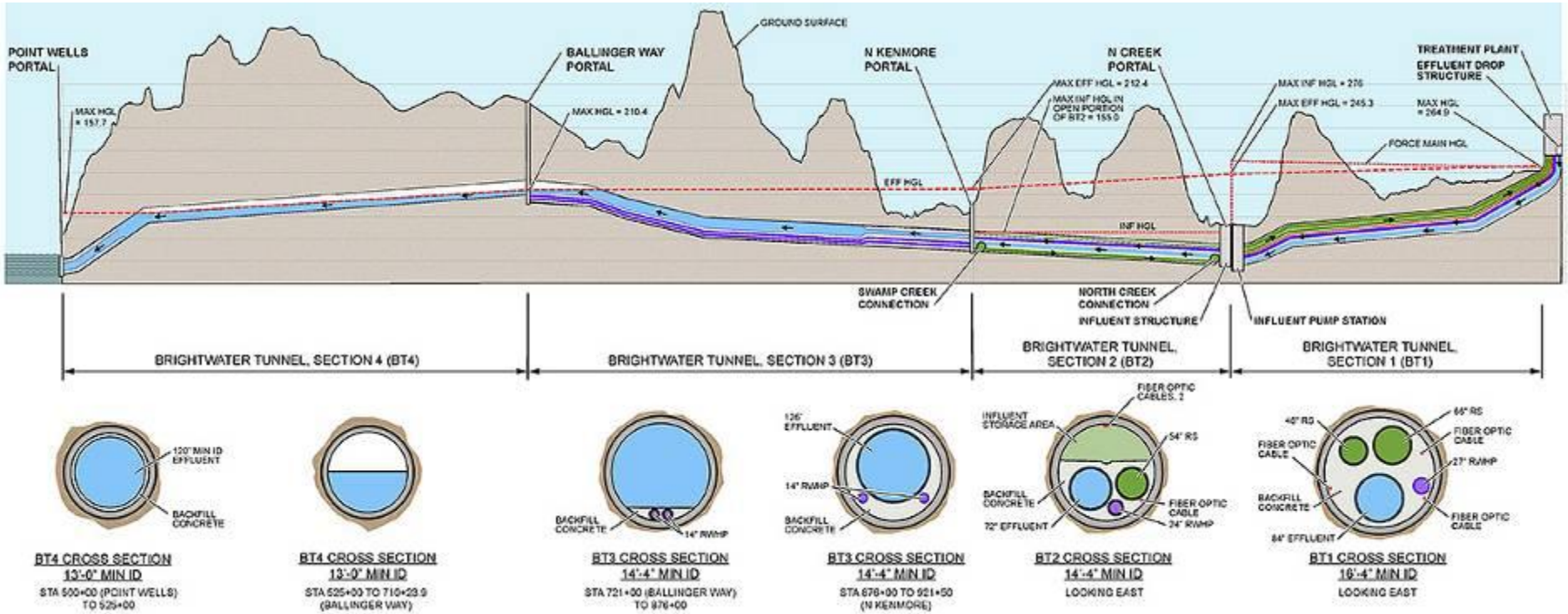
Conveyance System piping configuration



BT4 CROSS SECTION
13'-0" MIN ID
STA 500+00 (POINT WELLS) TO 525+00

BT4 CROSS SECTION
13'-0" MIN ID
STA 525+00 TO 710+23.9 (BALLINGER WAY)

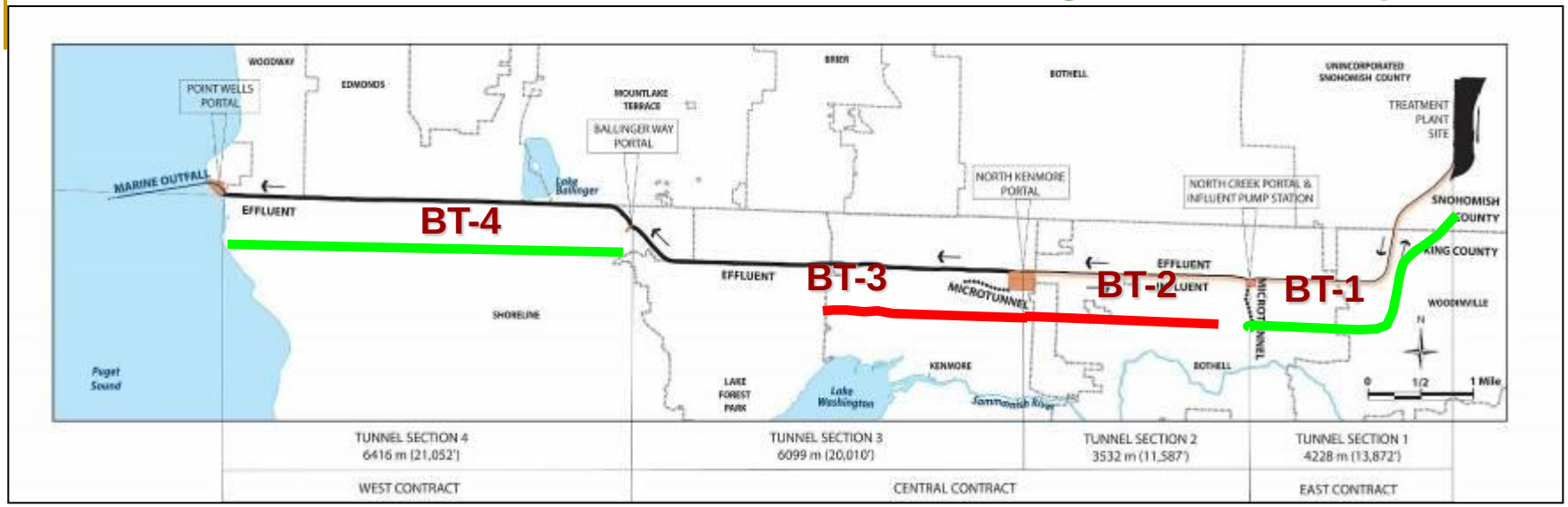
BT3 CROSS SECTION
14'-4" MIN ID
STA 721+30 (BALLINGER WAY) TO 876+00

BT3 CROSS SECTION
14'-4" MIN ID
STA 876+00 TO 921+50 (N KENMORE)

BT2 CROSS SECTION
14'-4" MIN ID
LOOKING EAST

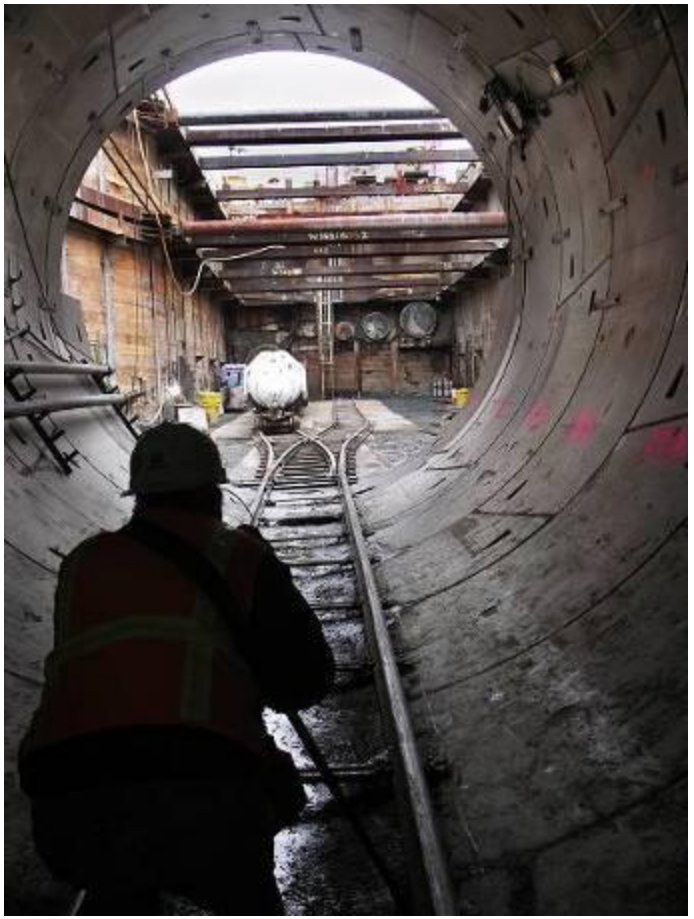
BT1 CROSS SECTION
16'-4" MIN ID
LOOKING EAST

Construction Progress as May 2010



- **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

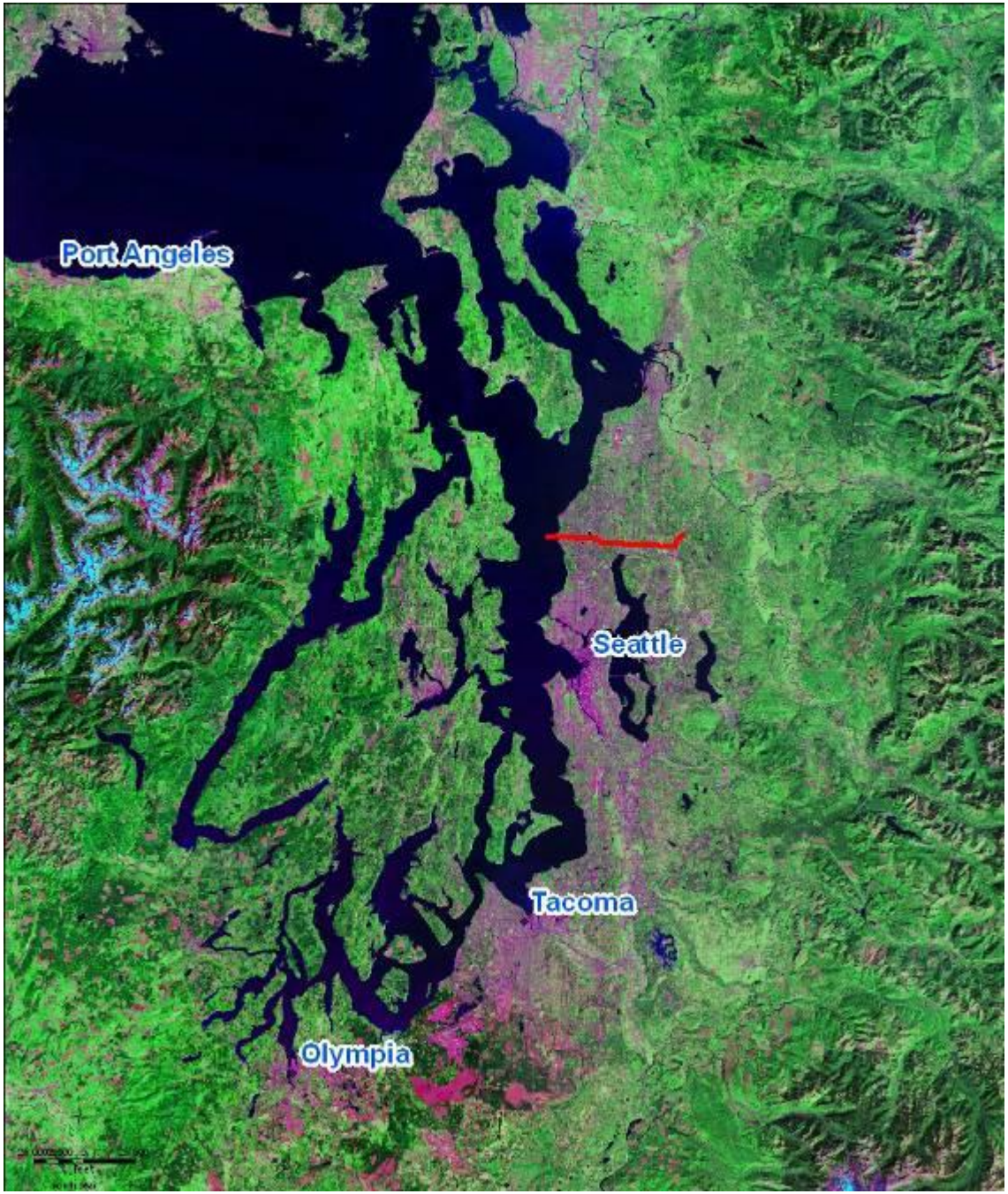
TBM delivery to Point Wells

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?