Agenda

• Introduction
• Changes to Study Plan
• WWTP and tributary data
• Other issues
• Marine data
• Schedule and budget
South Puget Sound
Dissolved Oxygen Study

WQ Partnership Meeting
March 15, 2007
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The Problem

Oxygen in Puget Sound

- Impaired Waters
- Waters of Concern
Goal of the Study

Determine how human activities (along with natural factors) affect low dissolved oxygen levels in South Puget Sound.

This study is part of Governor Gregoire’s long-term effort to protect Puget Sound.
Primary Issues

• Fish need oxygen
• Solve the problem before it gets worse
• Nitrogen is the main pollutant that causes low dissolved oxygen levels
Long Term

If the study shows that something needs be done to protect dissolved oxygen levels in South Puget Sound, a plan of action that will result in clean water will be necessary.
Involvement

1. Webpage
www.ecy.wa.gov/puget_sound
then click on “South Puget Sound Dissolved Oxygen Study”

2. ListServ
<table>
<thead>
<tr>
<th>Year</th>
<th>Data</th>
<th>Analyses</th>
<th>Model</th>
<th>Reporting</th>
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<tbody>
<tr>
<td>Jul - Sep</td>
<td>2006</td>
<td>Data Collection</td>
<td>Model Setup</td>
<td>Draft Report</td>
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<td>QA, Compilation</td>
<td>Report Review/ Final Report</td>
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<td>Supplemental Data Collection as needed</td>
<td>Hydrodynamic Model Calibration</td>
<td>Proposed end June 2010</td>
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<td>WQ Model Calibration</td>
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<td>Scenarios</td>
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Budget

Total Cost of Study: $1,530,000

Costs covered through June 2007: $530,000

Costs for July 2007 – June 2009: $982,000

Funding Gap: $100,000-400,000
Presentation overview

- QAPP changes
- Monitoring results
  - WWTPs
  - Tributaries
- Circulation patterns (*boundary selection*)
- Other study components
  - ADCP deployments
  - Sediment flux study
QAPP

• Revised QAPP
  – PDF distributed by e-mail
  – Response to comments

• Anything else?
Results to date

- http://www.ecy.wa.gov/eim/
  - User Study ID
    - MROB0004 (fresh)
    - SPSMEM_M (marine)
  - “get results”
  - Provisional only (until QA/QC complete)
  - Station names inconsistent
WWTP monitoring plan

• Supplement DMRs
• Monthly 24-hour composites
  – Sludge dewatering complication
  – BOD, N, P, C, alkalinity, *in situ*
• 17 plants (up to 30 plants for fall 2007)

• *South Sound Phase 1 DIN loads:*
  – 4,200 kg/d (1,700 tons/yr)
WWTPs currently monitored

- Boston Harbor
- Bremerton
- Central Kitsap
- Chambers Creek
- Gig Harbor
- King County South
- King County West Pt
- Lakota
- LOTT
- Manchester
- Midway
- Port Orchard
- Redondo
- Shelton
- Tacoma Central
- Tacoma North
- Tamoshan
WWTP results

- Presented to WWTP subcommittee 3/1/07
- (Review memo summarizing results across all 17 plants)
- Splits with individual labs
  - South King: good inter-laboratory replicates
Sludge dewatering issue

May refine fall 2007 sampling plan depending on initial results.
Tributary monitoring

• Ambient monitoring for large rivers
  – Puyallup, Nisqually, Deschutes

• Supplemental monitoring for streams
  – 15 sites (up to 30 stations for fall 2007)
  – monthly grabs (N, P, C, alkalinity, in situ)

• South Sound Phase 1 DIN loads:
  – 10,000 kg/d (4,000 tons/yr)
Current tributary monitoring

- Burley
- Chambers
- Coulter
- **Deschutes**
- Goldsborough
- Kennedy
- McAllister
- McLane
- Minter
- **Nisqually**
- Perry
- **Puyallup**
- Rocky
- Sequalitchew
- Sherwood
- Skookum
- Woodard
- Woodland
Tributary results

- August through January
- Concentrations
  - Source intensity
  - Priorities for cleanup?
- Loads
  - Relative area of influence of sources
Total nitrogen
Nitrate + nitrite
Total phosphorus
Orthophosphate

![Box plot showing orthophosphate levels for various locations.](image-url)
Tributary results to date

• Hot spots?
  – Burley, Chambers, McAllister, Woodard, Woodland
  – Deschutes, Puyallup

• Loads will be estimated from flow and concentration
Open boundary circulation

- Tide Prints
- (go to open boundary file)
- Surface currents…
South Sound circulation

• (go to open South Sound file)

• Surface currents…
Circulation and boundary selection
Currents (ADCP)

• Short-term deployments
• Profiles to get water column structure
• Key locations
Spatial variability in currents

Option 1: Detailed
(16 hours)
Spatial variability in currents

Option 2: Simplified
(8 hours)
When?

July 10-13
Strong ebb
Strong flood
Temporal variability in currents

• Use data from July survey to select bottom-mounted deployment locations
  – Two separate inlets?
  – Two locations cross-channel in one inlet?
• Rotate two ADCPs for 30-day periods
  – August-September
  – September-October
Sediment flux study

- $100k from EPA (good!)
- Consultant to be selected
  - contract in April with EPA
  - QAPP development
  - Field work and lab analyses
  - Data summary report and database
- Al Devol reviewing plan
Initial sediment study design

- Budd, Carr, Case, and Totten/Eld
- 3 stations per inlet (focus on shallows)
- Deployments
  - August, September, October 2007
  - 2 rounds per month
  - 4 nutrient grabs per round
  - Continuous DO, temperature, pH
  - 2 days per deployment
Miscellaneous follow up

• Simpson plant? \(\rightarrow\) WA-000085-0
• Shelton plant (stormwater? sand&gravel?)
• Fort Lewis WWTP (Solo Pt)
• \(~1990\) nitrogen monitoring for WWTPs?
  – Still looking
• Met data
  – contacted Pierce County, UW Tacoma
• Dougal Pt. Hartstene/DOH?
  – (not sure)
• Seabird/King County?
## Historical WWTP nutrient data

<table>
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<tr>
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<th>TN (NO$_2$3N, NH$_4$N, OrgN)</th>
<th>TKN (NH$_4$N, OrgN)</th>
<th>NO$_2$3N</th>
<th>NH$_4$N</th>
</tr>
</thead>
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Questions?

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September Barnes Cruise Stations
Dissolved Oxygen in 2003 (near bottom levels)
Dissolved Oxygen Levels

Dissolved Oxygen in 2004 (near bottom levels)

Budd Inlet
Carr Inlet
Case Inlet
Olympia
Shelton
Tacoma
Dissolved Oxygen Levels

Dissolved Oxygen in 2005 (near bottom levels)

- Budd Inlet
- Carr Inlet
- Case Inlet
- Shelton
- Tacoma
- Olympia
Dissolved Oxygen Levels

Dissolved Oxygen in 2006 (near bottom levels)
Ceratium fusus, a solitary dinoflagellate