

Memorandum

To: Files

From: Mindy Roberts

Cc: Andrew Kolosseus, Brandon Sackmann, Greg Pelletier (Ecology)
Tarang Khangaonkar, Zhaoqing Yang, Taeyun Kim, and Rochelle Labiosa (PNNL)
Ben Cope (EPA)

Date: February 26, 2009

Subject: Puget Sound Dissolved Oxygen Modeling Quarterly Progress Report #1 (October through December 2008)

The Puget Sound Dissolved Oxygen Modeling project began in October 2008 to evaluate factors contributing to low levels of dissolved oxygen in Puget Sound. The tools will address two questions:

1. Are human sources of nutrients in and around Puget Sound significantly impacting water quality?
2. How much do we need to reduce human sources of nutrients to protect water quality in Puget Sound?

The project includes developing model boundary conditions, applying circulation and water quality models for the entire Puget Sound, and evaluating potential management scenarios. The project team includes staff from Ecology, Pacific Northwest National Laboratories, and the Environmental Protection Agency Region 10. The team works with a Project Advisory Committee representing other organizations. This memorandum summarizes progress through December 2008.

Boundary Conditions

The project team discussed alternatives for meteorological boundary conditions and whether to use model output such as MM5 or WRF or actual data from primary stations (SeaTac, Bremerton, etc.). The decision was deferred to next quarter after PNNL has researched options.

Circulation Model

The project team discussed alternatives for circulation model software selection and developed summaries for the draft Quality Assurance Project Plan. The team also discussed a general approach to calibration and validation and the type of information needed for comparison. NOAA's guidelines would

be a good starting point for qualitative and quantitative comparisons and general error statistics. Water surface elevations, current velocities, and density profiles will be necessary to get both barotropic and baroclinic circulation.

Water Quality Model

The project team discussed alternatives for water quality model software selection and general capabilities. Ideas were compiled into the Intermediate-scale Model Quality Assurance Project Plan.

Advisory Committees

- October 16, 2008—Model Technical Advisory Committee Conference Call. Held conference call to discuss the overall project objectives and component, role of the MTAC (including input for first model selection and later model application), and the schedule.
- October 22, 2008—Bob Ambrose Conference Call. Project team held conference call to solicit the input of Bob Ambrose (EPA Athens, Environmental Research Laboratory), who was not available for the MTAC workshop. We discussed processes governing DO in Puget Sound and the state of modeling technology in general. Tarang introduced initial spatial and temporal scale ideas (30 layers, need for higher spatial definition in inlets). Bob considered that a fine-scale model (1-2 km is a typical length scale for some processes) and Ben felt it could be sufficient to set allocations if needed. Bob suggested using decoupled models, at least 3 to 4 phytoplankton groups, and maybe only one model layer within the euphotic zone. He did not recommend simulating zooplankton as a state variable but suggested considering it a first-order cropping process if seasonal scales are most important. If bloom scales are important, then the model needs at least three zooplankton groups to get the dynamics right. Bob said that sediment diagenesis is appropriate for shallow areas. (*No meeting summary was developed.*)
- November 4, 2008—Model Technical Advisory Committee Workshop. Held workshop to summarize lessons learned from recent and ongoing modeling, brainstorm the processes most important for describing dissolved oxygen dynamics, and rank what information is most uncertain. Participants were asked to weigh in by email (homework) on what other information is available that could help with model comparisons, model applications beyond regulatory, metrics to use for comparison between model output and data, and how to consider natural conditions. The presentation is available on the project web page (below).
- December 16, 2008—Project Advisory Committee kickoff meeting. Attendees covered an introduction, summary of the Model Technical Advisory Committee involvement to date, relationship to other projects, project schedule, and next steps. We tentatively identified June 2009 for the next meeting. The presentation is available on the project web page (below).

Reports, Presentations and Other Documentation

- Andrew created the project web page (www.ecy.wa.gov/programs/wq/PugetSound/DOModel.html).
- Intermediate-scale Quality Assurance Project Plan—Brandon drafted and the project team completed an internal review. Andrew circulated the external review draft to the PAC for comment. Comments were due January 2009.
- Box Model Quality Assurance Project Plan—Brandon drafted and the project team completed an internal review. No external review was planned because this will provide the project team with an internal tool for use in characterizing large-scale or long-time-period processes.
- Meeting summaries were distributed to participants via email:
 - 11/4/08 MTAC
 - 12/16/08 PAC

Other Communications

- Project team held monthly conference calls on November 13 and December 8, 2008.
- PNNL and Ecology coordinated on the technical requirements for the computer cluster to be purchased for the project.

Upcoming Tasks

- Finalize Intermediate-scale Model Quality Assurance Plan
- Finalize Box Model Quality Assurance Plan
- Begin developing boundary condition files
- Develop initial model grid
- Begin developing and calibrating circulation model
- Begin developing water quality model