

Name of Toolbox Element—Ortho Phosphorus (Ortho-P)

1. Introduction / Overview

U.S. EPA and Washington Department of Ecology (Ecology) developed a Total Maximum Daily Load (TMDL) for nutrients and oxygen demanding materials designed to minimize the anthropogenic affects on dissolved oxygen in Lake Spokane. The TMDL established wasteload allocations (WLA's) for Washington dischargers, which are illustrated on Table 5 of the TMDL. The WLA's are for Ammonia (NH₃-N), Total Phosphorus (P), and Carbonaceous Biological Oxygen Demand (CBOD). These WLA's were established for each discharger based on TMDL CE-QUAL-W2 Model Scenario 1.

The TMDL also provides for "Delta Elimination" and "Target Pursuit Actions" in recognition that currently available advanced treatment technologies may not be able to meet the WLA's established in the TMDL. One of the Target Pursuit Actions provided for in the TMDL is to adjust final water quality based effluent limitations by using the actual Ortho-phosphorus (Ortho-P) to total phosphorus (Total P) ratio of final effluents resulting from the installation of advanced treatment systems.

Specific language regarding this provision is provided in Section S5 of the final NPDES Permit for Inland Empire Paper Company (Permit Number WA-000082-5, dated September 29, 2011): "The Department may adjust the final water quality based effluent limitations on the basis of new information on the ratio of ortho phosphorus to total phosphorus in the effluent. An adjustment to the effluent limitations based on a new ratio of ortho phosphorus to total phosphorus will be consistent with the assumptions and wasteload allocations in the Spokane River DO TMDL and, as such, does not require a modification to the DO TMDL."

The CE-QUAL-W2 model used to develop the approved TMDL includes assumptions related to the types of phosphorus in wastewater effluents. As currently modeled, the assumed phosphorus fractions are made up of two components:

- **Ortho-Phosphorus (Ortho-P)** or soluble reactive phosphorus (SRP) which is immediately available for algal growth
- **Carbonaceous Biochemical Oxygen Demand (CBOD) phosphorus** which is initially unavailable for algal growth, but is assumed to mineralize into SRP at a rate set equal to the CBOD decay rate.

These assumptions were based on existing municipal treatment plant performance and limited pilot testing data from various advanced phosphorus removal wastewater treatment processes.

The TMDL model assumed that 25% of Total P is in the form of Ortho-P. Recently available data from larger scale advanced treatment systems, additional pilot studies and the University of Washington Bioavailable Phosphorus study have demonstrated that the advanced treatment systems are very efficient at removing the Ortho-P fraction and that this percentage may be significantly lower than previously assumed.

2. Toolbox Concept

Each discharger may determine the actual Ortho-P percentage of the Total P in its final effluent from the advanced treatment technology installed to achieve the waste load allocations in the TMDL. The final water quality based effluent limitations in the NPDES permits may then be adjusted on the basis of the actual ratio of Ortho-P to Total P. The adjusted water quality based effluent limitations will be determined by meeting the guidelines established for modeling in accordance with Scenario 1 of the Spokane River CE-QUAL-W2 model.

3. Data Collection, Sampling, and Research Needed

Each facility will be required to collect both Ortho-P and Total P data from the final effluent of the advanced treatment systems installed to achieve the waste load allocations in the TMDL. This data will be used to support a revised Ortho-P to Total P ratio for use in Scenario 1 of the Spokane River CE-QUAL-W2 model to determine adjusted water quality based effluent limitations in the NPDES permit. A mutually agreed upon test plan for assuring quality assurance shall be developed by the Department of Ecology and the NPDES Permit holder(s).

4. CE QUAL W2 Modeling Requirements for Ortho-P

After collection and validation of the data in Step #3 above, the CE-QUAL-W2 model for the Spokane River will be modified with the adjusted Ortho-P to Total P ratio. Waste load allocations may then be adjusted without exceeding any of the guidelines established for modeling in accordance with Scenario 1 of the Spokane River CE-QUAL-W2 model. Outputs from the revised modeling scenario can then be used to adjust the final water quality based effluent limitations in the NPDES permit.

5. Permit Provisions

After completion of the data collection and modeling phases outlined in Step Numbers 3 and 4 above, the Spokane River NPDES permits may be revised to adjust the final water quality based effluent limitations. The permit(s) will be

revised as provided for in Section S5 of the final NPDES Permit for Inland Empire Paper Company (Permit Number WA-000082-5, dated September 29, 2011): “The Department may adjust the final water quality based effluent limitations on the basis of new information on the ratio of ortho phosphorus to total phosphorus in the effluent. An adjustment to the effluent limitations based on a new ratio of ortho phosphorus to total phosphorus will be consistent with the assumptions and wasteload allocations in the Spokane River DO TMDL and, as such, does not require a modification to the DO TMDL.”