Name of Toolbox Element—Pollutant Equivalency-Static Permit Limits

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 (Ecology, Revised February 2010). The TMDL established wasteload allocations (WLAs) for Washington dischargers, which are illustrated on Table 5 of the TMDL. The WLAs are for Ammonia (NH3-N), Phosphorus (TP), and Carbonaceous Biochemical Oxygen Demand (CBOD). These WLA's were established for each discharger based on TMDL CE-QUAL-W2 Model Scenario 1 (PSU, January 29, 2010).

The TMDL provides for "Delta Elimination" and "Target Pursuit Actions" in recognition that current treatment technologies may not be able to initially meet the WLA's established in the TMDL.

Modeling experts have determined that the predicted water quality in Lake Spokane reacts differently to increases or decreases in each of the three parameters. Various combinations of ammonia, phosphorus, and $CBOD_5$ discharged to the river may result in more or less impacts to water quality in Lake Spokane. Phosphorus has the most pronounced impact to water quality in the lake, while ammonia has the least impact. The modeling experts have also established that if one of these three parameters from a discharger is reduced sufficiently, then one of the other parameters may be increased, while still maintaining or improving the predicted water quality in Lake Spokane.

2. Toolbox Concept

Two toolbox concepts for Pollutant Equivalency are provided for in this manual: Static Permit Limits and Dynamic Permit Limits. A discharger's permit may use the WLA from the TMDL for limits in their National Pollutant Discharge Elimination System (NPDES) permit. The discharger may demonstrate an equivalent combination of ammonia, phosphorus, and $CBOD_5$ to the WLA that complies with the TMDL. The equivalents would then be used as effluent limits for an individual utility's NPDES permit. Fixed limits for each parameter throughout the TMDL season are referred to as Static Permit Limits. The Static Permit Limits concept is based on decreasing the permitted discharge of one parameter sufficiently to allow an increase in the permitted discharge of one or both of the other WLA parameters in the TMDL.

For Pollutant Equivalency using Static Permit Limits, once the modeling is completed, and the NPDES permit is written, the permit will stipulate seasonal limits for each of the parameters. These permit limits will apply for the duration of the NPDES permit, or until the equivalency analysis is revisited or the permit is modified.

For example, in the case of the new Spokane County Regional Water Reclamation Facility, it was determined that the facility could meet a more stringent CBOD limit of 2.0 mg/L, while the WLA was 4.2 mg/L. The WLA for TP was 0.042 mg/L, and based on the current technology was believed to be unachievable. The County requested a TP concentration of 0.050 mg/L. Lastly, the WLA for ammonia-nitrogen (NH_3N) varies seasonally, but because of challenges with nitrification during the early spring months when wastewater is colder, it was believed that the WLA was unachievable. Spokane County requested seasonally variable NH3-N limits of 16 mg/L in March, 1 mg/L in April, May, and October, and 0.25 mg/L in June, July, August, and September. When this Pollutant Equivalency scenario was analyzed using the adopted TMDL model, the result was an improvement in predicted water quality in Lake Spokane compared to the Scenario 1 model run in the approved TMDL (LimnoTech, May 18, 2011).

The above concept is differentiated from Pollutant Equivalency using Dynamic Permit Limits which may vary within the NPDES Permit. Under the alternative Pollutant Equivalency using Dynamic Permit Limits, the NPDES permit will provide for a mathematical relationship between each of the three parameters determined through modeling. Since these are flexible limits, they are referred to as Dynamic Permit Limits. This Toolbox Element is defined separately under "Pollutant Equivalency - Dynamic Permit Limits".

3. Data Collection, Sampling, and Research Needed

For Pollutant Equivalency using Static Permit Limits, no data collection, sampling, or research is needed. Modeling requirements to demonstrate equivalency are defined in the next section.

The pollutant equivalency analysis may or may not require supporting sampling and data collection, process testing, research investigations, etc. in the development of discharger equivalency scenarios. Pollutant equivalency scenarios may be proposed and modeled to guide treatment plant operational strategies in advance of available monitoring data on actual effluent quality. In this circumstance, post equivalency analysis monitoring may be used to assess adherence to the proposed scenario, or to refine the scenario based on actual treatment performance capabilities.

Alternatively, pollutant equivalency scenarios may be proposed and modeled based on actual treatment plant operational experience and monitoring data on actual effluent quality. In this circumstance, equivalency analysis will be based on monitoring data, or a range of data characterizing the expected future performance of the treatment process.

The discharger will be required to submit a detailed description of their plan for Pollutant Equivalency using Static Permit Limits. The plan should indicate the proposed parameters for inclusion in an equivalency analysis, what model input adjustments will be made, proposed adjustments to WLAs, and the resultant NPDES permit limits.

4. CE QUAL W2 Modeling Requirements for DO TMDL Equivalency

For Pollutant Equivalency using Static Permit Limits, a discharger will be required to obtain the latest approved version of CE-QUAL-W2 model files from Ecology. The discharger will be required to use the services of a qualified modeler to conduct the CE-QUAL-W2 analysis and the analysis will be subject to technical review by Ecology and/or their designated technical resource. The modeler will adjust the input variables and run the model to reflect the adjusted parameter loads as proposed for pollutant equivalency. At the completion of the modeling, the discharger will prepare a technical memorandum that summarizes the proposed equivalency scenario, characterizes the effluent parameters, documents adjustments to the CE-QUAL-W2 input files, and summarizes the results of the analysis.

To meet equivalency with the approved TMDL, pollutant equivalency must result in predicted water quality in Lake Spokane that is equal to or better than the result under Scenario 1 of the approved TMDL according to the guidelines defined by Ecology in a memorandum dated _____.

5. Permit Provisions

After the appropriate modeling is completed and a technical review is conducted by Ecology, the TMDL equivalency analysis will be posted for public review, if applicable. Ecology will then update NPDES permit limits and WLA's can be adjusted for the parameters included in the equivalency analysis. Once a Final NPDES permit is issued, the permit limits for these parameters will be applicable for the duration of the permit or until the equivalency analysis is revisited or the permit is modified.

Permit Compliance Considerations:
Since pollutant equivalency scenarios that are proposed may be based on either historical monitored effluent performance, or on proposed operational strategies to be implemented at full-scale, there is the potential for variability in effluent performance in the future that may depart from the exact definition used in the CE-QUAL-W2 water quality modeling for equivalency. Flexibility to account for minor variations should be provided.

Multiple Discharger Equivalency Considerations:
Multiple discharger equivalency scenarios may be developed and proposed to Ecology for evaluation for compliance with the TMDL. Multiple discharge scenarios could result from the independent development of equivalency scenarios by separate dischargers, or by the combination of dischargers altering the mix of parameters for a combined result. In either case, equivalency is to be demonstrated by CE-QUAL-W2 modeling of the combination of multiple discharger scenarios. Unification of the water quality modeling analysis may be proposed to be conducted by a single technical resource selected by the dischargers involved in developing the scenario, or alternatively, by Ecology providing a technical resource for conducting the analysis.