Evaluation of Alternative Effluent Limits for Consistency with the Spokane River TMDL and Compliance with Washington Water Quality Standards

Overview

Ecology and EPA have evaluated modeling performed by LimnoTech on behalf of the Spokane River Stewardship Partners (SRSP) to determine whether it is equivalent with dissolved oxygen impacts contemplated by the Spokane River DO TMDL, specifically Table 7. As described in the May 18, 2011 report by LimnoTech, Inland Empire Paper (IEP) was modeled with a seasonal average wasteload allocation (WLA) of 70 ug/L total phosphorus from February through October. All other dischargers were kept at the wasteload allocations (or assumptions for Idaho dischargers) as described in the May 4, 2011 LimnoTech report, which includes lower $CBOD_5$ WLAs and higher TP WLAs for Spokane County relative to table the *Spokane River and Lake Spokane Dissolved Oxygen Total Maximum Daily Load* (TMDL) and several changes relative to the TMDL's modeling assumptions for Idaho dischargers. All other model inputs, including those for the City of Spokane, Liberty Lake Sewer and Water District, and Kaiser Aluminum were identical to those in the TMDL #1 modeling scenario, upon which the Spokane River DO TMDL is based.

Summary of Results

As described in the May 18th report, the new scenario is equivalent to the scenario used to develop the Spokane TMDL because:

- The effluent limits, considered cumulatively with the load allocations in Table 6 of the TMDL and Avista's DO responsibility as reported in Table 7 of the TMDL, meet Washington's DO criteria (WAC 173-201A-200(1)(d)) when the precision of the water quality model is considered (as discussed in detail below), and
- The effluent limits do not further decrease the cumulative average dissolved oxygen in the shaded cells in Table 7 of the final TMDL (i.e., when and where Avista has a DO responsibility). In fact, the effluent limits improve the dissolved oxygen by 0.006 mg/l (relative to the TMDL) when averaged over all segments and times of Avista responsibility.

With three exceptions, each individual model output result ensures compliance with Washington's DO criteria (WAC 173-201A-200(1)(d)), when considered cumulatively with the load allocations in Table 6 of the TMDL and Avista's DO responsibility as reported in Table 7 of the TMDL, after results are rounded to 0.1 mg/l.

Portland State University (PSU) under contract to EPA, has repeated LimnoTech's modeling as described in their May 18th memo. PSU has verified that the modeling performed by LimnoTech included no technical errors in the input files or model setup. PSU repeated the model run and

obtained identical results to LimnoTech. These findings by PSU will be presented in a forthcoming technical memo (estimated completion by June 3, 2011).

Equivalency Determination

Ecology has determined that the effluent limits modeled in the May 18th LimnoTech report are consistent with the assumptions and requirements of the wasteload allocations in the TMDL (for Washington dischargers) and will ensure compliance with Washington's water quality standards (WQS) for DO, for the following reasons.

The Exceptions are within Model Precision

Each of the three exceptions is characterized by a markedly low arithmetic tolerance for any downward deviation from the TMDL. That is to say, in each of these instances, the DO sag under the TMDL scenario, after considering Avista's responsibility, was just slightly less than 0.25 mg/L. Thus, a very small additional DO sag (e.g. 0.002 mg/L) would cause the rounded difference between the "no source" DO and the DO resulting from point and non-point controls and Avista's responsibility to change from 0.2 mg/L to 0.3 mg/L. The actual DO decreases in the three exceptions, relative to the TMDL, were 0.002 – 0.003 mg/L (see Table 1, below).

Table 1.
Increases in Rounded DO Sag to 0.3 mg/L

Segment	Time Period	Tolerance (mg/L)	Modeled DO Change Relative to TMDL (mg/L)
188	July 1-15	0.0008	-0.003
188	September 1-15	0.0001	-0.002
186	September 16-30	0.0014	-0.003

Ecology believes these deviations are within the precision of the CE-QUAL-W2 model. In a memo dated December 28, 2010, LimnoTech described some issues encountered when performing a sensitivity analysis for the Idaho point sources. As stated on Page 2 of the memo, a *reduction* in Post Falls' CBOD discharge (with all other model inputs held constant) actually effected a 0.002 mg/L *decrease* in the average DO in the reservoir, in times and locations where Avista has a DO responsibility. The DO should have *increased* in response to decreased BOD discharges. Even if the change in CBOD loading was too small to have any discernible impact, the DO should have, at a minimum, been unchanged. Thus, it is reasonable to consider the difference between these two results, for the average DO in times and locations where Avista has a DO responsibility (0.002 mg/L) to be within the precision of the model.

Because this average DO is computed from 106 individual results, the model is less precise than 0.002 mg/L for any *individual* result. Therefore, Ecology believes that the 0.002 – 0.003 mg/L deviations from the TMDL scenario, which resulted in the increased rounded DO sag in three instances, are within the precision of the CE-QUAL-W2 model. Two results that vary by less than the precision limits of the model are functionally the same result.

The Exceptions Are Balanced by Improvements in DO Relative to the TMDL

Under this alternative, the cumulative DO sag, rounded to the nearest tenth of a milligram per liter, would actually decrease to 0.1 mg/L from 0.2 mg/L in five instances, as shown in Table 2, below. Also, as stated above, the alternative improves the dissolved oxygen by 0.006 mg/l

(relative to the TMDL) when averaged over all segments and times of Avista responsibility. This means that any decreases in DO concentrations, relative to the TDML scenario, are balanced by DO improvements at other times and in other locations.

Table 2.
Decreases in Rounded DO Sag to 0.1 mg/L

Segment	Time Period	Modeled Change Relative to TMDL (mg/L)
172	August 1-15	0.007
177	September 1-15	0.018
185	September 1-15	0.001
175	September 16-30	0.025
180	September 16-30	0.018

The Exceptions are Very Infrequent

The three instances where the cumulative DO sag increased to 0.3 mg/L, when rounded to the tenths place, comprise 0.7% of all of the times and locations that were evaluated in Table 7 of the TMDL (448 total) and less than 3% of the times and locations where Avista has a DO responsibility (106 total). Since Table 7 only provides DO results for June 1st - December 31st, and modeling indicates no violations of DO WQS prior to June 1st, this percentage would be even smaller than 0.7% on a year-round basis.

The TMDL's Margin of Safety

The TMDL has an implicit margin of safety comprised of several conservative assumptions (see the TMDL at Page 51). Some of these will tend to exaggerate the impact of nutrients and oxygen demand discharged by point sources. Specifically:

- Low flows (2001) were used as the baseline hydrologic condition.
- All phosphorus is assumed to be bioavailable.[1]
- The top eight meters of the reservoir are not included in the vertical averaging because of amplified algal activity which increases daytime dissolved oxygen levels.

Therefore, the DO impact of the point source discharges will tend to be somewhat less than that predicted by the model.

Conclusion

Because the alternative effluent limits proposed by the SRSP are equivalent to the scenario used to develop the Spokane River TMDL for the reasons described above, Ecology and EPA believe that these effluent limits are, in fact, consistent with the assumptions and requirements of the wasteload allocations for the Washington point sources (specifically IEP and Spokane County), and will ensure compliance with Washington's water quality standards for DO, when considered cumulatively with other actions taking place under the TMDL.

[1] The model partitions point source phosphorus into two fractions: One which is immediately bioavailable and another that is not immediately bioavailable but becomes less bioavailable over time according to first-order kinetics.