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Addendum to Wenatchee River Watershed Dissolved Oxygen and pH Total Maximum Daily Load, WRIA 45

The Wenatchee River and its tributaries are located in Water Resources Inventory Area 45. In April 2006, the Washington Department of Ecology (Ecology) published the Wenatchee River Watershed Dissolved Oxygen, pH and Phosphorus TMDL Study, publication number 06-03-018. This study was based on intensive water quality monitoring from 2002 to 2004. The observed data showed DO and pH impairments in the Wenatchee River below Leavenworth.

The study concluded the dissolved oxygen (DO) and pH impairments in the Wenatchee River were caused by excessive periphyton growth. Phosphorus (P) is the most limiting nutrient that controls periphyton growth and biomass in the Wenatchee basin. A mass balance of phosphorus loading sources was determined for the Wenatchee River by using the QUAL2K water quality model, which was calibrated to the observed conditions seen in the summer/fall of 2002.

The Wenatchee River Watershed Dissolved Oxygen and pH TMDL Water Quality Improvement Report, publication number 08-10-062 was published in September 2008, then revised and approved by EPA in August 2009. This report employed the calibrated QUAL2K model to evaluate natural conditions in the Wenatchee basin and set waste load allocations (WLA) and load allocations (LA) to meet the TMDL capacity.

Water quality simulations of natural conditions show there is no capacity for additional P in the lower Wenatchee River (below the Peshastin Creek confluence). In addition, there is very limited capacity for additional P in the impaired areas above Peshastin Creek confluence; however, the limited capacity is much smaller than the current combined point and non-point loads.

Accordingly, Ecology determined that existing point sources would only be allowed to continue to discharge if they had a “de minimus” or “no measurable” affect on the pH levels throughout the impaired portions of the Wenatchee River basin. Based on the water quality standards and the simulated measurable effects, pH is more restrictive than DO for permitting point source discharges to the Wenatchee River and Icicle Creek (i.e., by meeting the pH standard requirements, the dischargers would more than meet the DO standard requirements).

Ecology determined that existing point source discharge levels of P should be held to a level that does not cause a cumulative, measurable change in pH, established as less than a 0.1 pH change from the natural condition pH range in any part of the river. Based on simulations, “de minimus

WLAs" for phosphorus were subsequently set for the existing permitted dischargers in the lower Wenatchee River and Icicle Creek, based on having no measurable effect on pH.

All facilities that were given WLAs operate year-round discharges into the Wenatchee River watershed and were given WLAs based on their impact during critical summer and fall conditions. The most critical time period in the Wenatchee River watershed occurs during July through October (after snowmelt run-off). During this period, flow is the lowest, and there is enough sunlight and warm water temperatures for algal (or biological) productivity.

The application of the annual 7Q10 flow in the development of the Wenatchee River TMDL assured the annual failure frequency of 0.1 would not be exceeded. The annual 7Q10 flow in the Wenatchee basin is governed by the low flow period in the fall. The new WLAs will result in a nearly 99% reduction in P load from the existing year-round dischargers.

Early in 2011, as a result of discussions with Chelan County public utility district (PUD), Ecology discovered that an existing fish acclimation facility operated by the PUD at Dryden on the Wenatchee River had not been identified as a discharger during the original TMDL study. The Dryden acclimation facility holds and rears hatchery Chinook salmon fry during winter and early spring as part of the required fish mitigation measures associated with the PUD's Columbia River dams.

The salmon fry are acclimated to Wenatchee River water and are released by the end of May. At that point, the facility ceases operations and does not operate or discharge during the late summer and fall critical period. As a result of the seasonal timing of the discharge for this facility, it was missed during the TMDL study. Data collection for the TMDL focused primarily on the July through October portion of the critical period.

The Dryden facility was not assigned a waste load allocation, however; this was an existing facility prior to the initiation of the TMDL and the PUD plans on continuing to operate it on a seasonal basis. Therefore, Ecology considered a seasonal WLA for the late winter and early spring period. The late winter and early spring period (February through May - prior to snow melt run-off) can also be productive and have impairments, but not as much as in the fall.

For a solution to this problem, Ecology's Central Region staff involved Ecology's Environmental Assessment Program (EAP), who modeled and authored the original TMDL study. To analyze the seasonal discharge from the acclimation facility, EAP re-ran the QUAL2K model to determine what level of P discharge from the Dryden acclimation facility would have no measurable impact on pH in the river during a springtime critical period.

Due to the uncertainty of using a model calibrated under fall conditions for springtime conditions, several additional margins of safety were utilized:

- The annual 7Q10 critical flow was used in the spring model. This flow has a very low probability of occurring in the springtime.
- An equivalent allocation scheme was used where the seasonal WLA could not change or exceed the "de minimus" load allowances of the other dischargers that operate year-round.

The existing year-round dischargers will be allowed to cumulatively discharge up to 743g/day and still have a de minimus effect in the fall critical season. They have the same WLA for the springtime, even though there is even less of a measurable effect during that time. Model simulations showed that an additional discharge of P, equal to the year-round dischargers, could occur from the Dryden facility without having a measurable change in the pH range during critical springtime conditions.

A seasonal "de minimus" WLA of 743g/day, based on an equal mass discharge per day at the other existing year-round facilities, is granted to the Dryden acclimation facility for a discharge of 33 cfs. The WLA decreases at lower facility flow due to changes in dispersion of a more concentrated effluent. The table below shows the WLA at different facility flows.

Dryden Q	Conc	Load
cfs	ug/L	g/d
33	9.2	743
17	16.1	670
8	32.0	626
4	62.3	610
2	122.8	601
1	243.6	596

The following tables show the WLA for the Dryden fish acclimation facility in addition to the WLAs for the other facilities set by the TMDL.

Wasteload allocation for the Dryden fish acclimation facility that discharge to the lower Wenatchee River in spring.

Facility name	Wasteload allocation (micrograms/liter of total phosphorus)
Dryden fish acclimation facility	9.2

Wasteload allocations for wastewater treatment plants that discharge to the lower Wenatchee River.

WWTPs	Wasteload allocation (micrograms/liter of total phosphorus)
Leavenworth	90
Peshastin	90
Cashmere	90

Wasteload allocation for the Leavenworth National Fish Hatchery on Icicle Creek

Facility name	Wasteload allocation (micrograms/liter of total phosphorus)
Leavenworth National Fish Hatchery	5.7