UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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OFFICE OF
WATER AND WATERSHEDS

May 20, 2010

Mr. Kelly Susewind
Water Quality Program Manager
Department of Ecology
P.O. Box 47600
Olympia, Washington 98504-7600

Re: Approval of the Spokane River Dissolved Oxygen TMDLs

Dear Mr. Susewind:

Following our review of the Spokane River Total Maximum Daily Loads for dissolved oxygen (" Spokane TMDL") developed by the Washington Department of Ecology, the U.S. Environmental Protection Agency (EPA) is pleased to approve 18 TMDLs for the water quality limited segments in Lake Spokane and the Spokane River, as identified in Table 1 of the enclosed decision document. The enclosed decision document describes the applicable Clean Water Act and regulatory requirements, and the TMDL's compliance with these requirements. This TMDL effectively replaces the Lake Spokane TMDL for phosphorous, which was approved by EPA in October, 1992.

The Spokane TMDL was submitted to EPA by Ecology on February 12, 2010, with a correction to Table 7 of the TMDL provided to EPA on March 18, 2010. This approval includes all load and wasteload allocations established in the TMDL. By statute and regulation, these allocations, taken cumulatively, are required to be established at a level necessary to attain applicable water quality criteria in the impaired segments in the Lake Spokane watershed. Our review of this TMDL and its supporting record, including Ecology's response to public comments on the draft TMDL, indicates that this TMDL is approvable under section 303(d) and that these allocations have been established at a level that, when fully implemented, will lead to the attainment of the applicable water quality criteria. Therefore, Ecology does not need to include the waterbodies identified in Table 1 of the enclosed decision document on the next §303(d) list of impaired waters for the pollutants covered by this TMDL.

The Spokane TMDL submittal also included Ecology's implementation strategy. EPA is not required by section 303(d) or its implementing regulations to approve or disapprove implementation strategies submitted with TMDLs. EPA has reviewed the strategy, and that review has informed EPA's review and approval of the submitted TMDL. However, EPA is taking no action to approve or disapprove the implementation strategy.

Because implementation is a critical next-step to realize improvements in water quality in Lake Spokane and the watershed, EPA encourages Ecology to continue its work with stakeholders to implement these strategies. EPA will continue to stay involved in the implementation of the TMDL both in its role as the NPDES permitting authority in Idaho, and in its NPDES oversight role in Washington. EPA recognizes that this TMDL requires very low permit limits for dischargers in Washington, and because EPA is required to develop permits that ensure compliance with Washington's water quality standards, the Idaho permit limits will also be very low. EPA recognizes that compliance schedules will be needed to provide time for permittees to build and bring on-line the advanced treatment that is necessary to achieve these low levels. In addition, EPA supports Ecology and Idaho DEQ in their efforts to develop a credible and transparent water quality trading framework for the watershed that is consistent with the assumptions of the TMDL.

By EPA's approval, these TMDLs may now be incorporated into the State's Water Quality Management Plan under §303(e) of the CWA. EPA appreciates the opportunity to have worked with Ecology on these TMDLs. The Spokane TMDL is exceptional both in terms of difficulty and achievement. I commend you and your staff for the dedication, hard-work, and skill you have shown by successfully complete this TMDL project. If you have any comments or questions, please feel free to call me at (206) 553-4198, or you may call Laurie Mann of my staff at (206) 553-1583.

Sincerely

/s/

Michael A. Bussell, Director
Office of Water & Watersheds

Enclosure

cc: Dave Moore, Ecology Eastern Regional Office
Helen Bresler, Ecology HQ Office

U.S. EPA Review of the Spokane River
Dissolved Oxygen (DO) TMDL
May 20, 2010

Introduction

On February 12, 2010, Washington Department of Ecology (Ecology) submitted the Spokane River Dissolved Oxygen (DO) Total Maximum Daily Load (TMDL) to the U.S. Environmental Protection Agency (EPA) for review under Section 303(d)(2) of the Clean Water Act. A correction to Table 7 of the TMDL was submitted to EPA by Ecology on March 18, 2010.

After a full and complete review of the Spokane River DO TMDL and supporting documents, EPA finds that pursuant to Section 303(d) of the Clean Water Act, 33 U.S.C. Section 1313(d), and EPA's implementing regulations at 40 CFR Part 130, the TMDL satisfies the elements of approvable TMDLs. This decision document presents the rationale supporting EPA Region 10's decision to approve the Spokane River TMDL.

Ecology's submittal document also contains a Managed Implementation Plan (MIP) which was developed by Ecology and the Spokane River TMDL Collaboration group and which EPA understands Ecology will use to guide implementation of the TMDL. EPA has reviewed the MIP, but – as stated in our approval letter – neither the Clean Water Act ("CWA") nor its implementing regulations requires EPA to specifically "approve" the MIP, and EPA has not done so.

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1. History and Scope of TMDL

The Spokane River Dissolved Oxygen (DO) TMDL applies to a 63-mile stretch of the Spokane River that extends from the Idaho-Washington border (RM 96.5), through Lake Spokane, to Long Lake Dam (RM 33.9). Lake Spokane is a 24 mile long reservoir created by the construction and operation of the Long Lake Dam in 1915. Lake Spokane is also known as Long Lake, but in this document is referred to as “Lake Spokane,” “the lake,” or “the reservoir.” The lake is downstream of Washington’s second largest city, Spokane, and several smaller communities.

Lake Spokane has a long history of water quality problems and nutrient enrichment, which has caused algae blooms and low dissolved oxygen levels in the reservoir for decades. Homeowners living near the reservoir filed a lawsuit against the Liberty Lake Sewer District and Ecology because of large blue green algae blooms in the reservoir during the summers of 1976-78. A July 24, 1979 Spokane Superior Court decision charged Ecology and the EPA to complete a TMDL for the Spokane River. Ecology subsequently developed a phosphorus TMDL for Lake Spokane designed to meet the phosphorus standard for Lake Spokane (25 μg/L); the phosphorus TMDL was approved by EPA in October, 1992.

The 1992 TMDL proved insufficient to reduce algae blooms in the lake. Subsequently, Ecology expanded its water quality study to include the entire watershed, and began to develop a TMDL to meet the reservoir’s dissolved oxygen standard, using ammonia, phosphorus and carbonaceous biochemical oxygen demand (CBOD) as surrogate pollutants. Ecology’s work with the Spokane community to address the algae blooms in Lake Spokane began in the late 1990s. Ecology developed a draft TMDL in 2004. That draft TMDL prompted the point source dischargers in Washington and Idaho to develop a Use Attainability Analysis (UAA), and to petition the State to change the reservoir’s DO water quality standard. In 2005 the dischargers withdrew the UAA petition and a larger group of stakeholders, the Spokane River TMDL Collaboration, began to work together on the Spokane water quality issues. Ecology released draft TMDLs in 2007 and 2008.

Because the 2008 draft TMDL did not adequately consider the cumulative impact of pollution from both Idaho and Washington, EPA requested that Ecology postpone finalization of the 2008 TMDL (TMDL, Appendix H). An interagency workgroup comprised of Idaho Department of Environmental Quality (IDEQ), Ecology, and EPA then collaborated through the latter part of 2008 into 2009 to develop a revised TMDL assessment. The goals of this workgroup were to

- Determine an objective basis to distinguish between the dissolved oxygen impacts caused by Long Lake Dam versus impacts caused by excess nutrients from upstream sources (point source dischargers, tributaries, etc.), and
- Determine the cumulative impact on dissolved oxygen in Lake Spokane by all the dischargers in both states based on an equitable distribution of nutrient wasteload allocations.

At the request of the Washington Department of Ecology, EPA assumed the lead role for the water quality modeling. EPA provided funding to Portland State University (PSU) for CEQUAL-W2 modeling; and sponsored six stakeholder meetings between December, 2008 and June 25, 2009, including a modeling workshop, and a meeting focused on a discussion of legal issues. EPA also sponsored two modeling conference calls after the workshop. The TMDL history is presented in more detail on pages xii and 13-15 of the final TMDL; public involvement is summarized on pages 82-83 of the TMDL.

Recurring impairments of the beneficial uses and excursions of water quality criteria have resulted in the inclusion of numerous Spokane River waterbody segments on one or more of Ecology's 1996, 1998, 2004 and 2008 CWA Section 303(d) lists of impaired waterbodies. In this action EPA is approving TMDLs for 18 segments of the Spokane River and Lake Spokane that are impaired for dissolved oxygen (DO) due to excess loadings of CBOD, ammonia and total phosphorus. Six waterbody segments in this watershed are listed on the 2008 303(d) list, and are identified in the first two columns of Table 1 (i.e. waterbody name and township/range/section location). For the purposes of counting TMDLs, EPA considers each of the three targets (i.e. CBOD, ammonia, total phosphorus) developed for each of the six waterbodies listed on Washington's 303(d) list to be distinct TMDLs. EPA is therefore approving three TMDLs for each of the six listed waterbodies, or 18 TMDLs, for the Spokane River and Lake Spokane.

Table 1: Spokane River and Lake Spokane dissolved oxygen listings on the 1996 and 2008 303(d) lists

Waterbody Segment	Township, Range, Section	Impairment	TMDL Pollutants	1996 List	1996 Listing ID	1996 Count	2008 Count	2008 303(d) Listing ID
Lake Spokane (Long Lake)	27N, 40E, 15	Dissolved Oxygen	CBOD, Ammonia, Total Phosphorus (TP)	No	WA-54-9040	3	3	40939
Spokane River	26N, 42E, 17	Dissolved Oxygen	CBOD, Ammonia, TP	No	WA-54-1020	3	3	15188
Spokane River	25N, 43E, 02	Dissolved Oxygen	CBOD, Ammonia, TP	Yes	WA-57-1010	3	3	17523
Spokane River	25N, 43E, 18	Dissolved Oxygen	CBOD, Ammonia, TP	Yes	WA-57-1010	---	3	15187
Spokane River	25N, 46E, 06	Dissolved Oxygen	CBOD, Ammonia, TP	Yes	WA-57-1010	---	3	11400
Spokane River	26N, 42E, 07	Total Phosphorus[1]	CBOD, Ammonia, TP	Yes	WA-54-1020	---	3	6373
Totals	---	---		---		9	18	---

[1] The Spokane River at 26N, 42E, 07 is currently listed in Category 4A on the Washington Water Quality Assessment because a TMDL was completed in 1992.

On January 6, 1998, EPA entered into a Settlement Agreement with the Northwest Environmental Advocates (NWEA) and the Northwest Environmental Defense Center (NEDC). A provision of the settlement agreement provides that EPA will submit progress reports to NEDC and NWEA on meeting the fifteen year TMDL development schedule. For the purposes of tracking EPA's compliance with the 1998 settlement agreement, EPA counts TMDLs based on the waterbody identification system used by Ecology to develop the 1996 303(d) list (see Table 1, column "1996 Listing ID").

There are three waterbodies from the 1996 waterbody identification system covered by the Spokane River TMDL (i.e. WA-54-1010, WA-54-1020, WA-54-9040). Because three targets (i.e. CBOD, ammonia and total phosphorus) have been established for each of these three waterbodies, this approval covers TMDLs for 9 segments for the purposes of tracking approved TMDLs pursuant to EPA's 1998 settlement agreement. Two of these waterbody / pollutant combinations were identified as being impaired on the 1996 303(d) list: WA-57-1010 was listed for DO; and WA-54-1020 was listed for Ammonia-N and total phosphorus. The other seven waterbody / pollutant combinations were not considered impaired when the 1996 303(d) was developed, but are impaired now.

2. Applicable Water Quality Standards & Numeric Targets

In the Washington State water quality standards, freshwater aquatic-life use categories are described using key species (salmonid versus warm-water species) and life-stage conditions (spawning versus rearing). For each of these aquatic-life use categories, minimum concentrations of dissolved oxygen are established to protect those aquatic communities (WAC 173-201A-200). For the Spokane River and Lake Spokane, there are two applicable dissolved oxygen standards; one applies to the riverine portion of the Spokane River, from the state-line to Nine Mile Dam; and the second applies to Lake Spokane, from Nine Mile Dam to Long Lake Dam. These two standards are summarized in Table 2, below.

Table 2. Designated aquatic life uses and criteria as defined in the Washington State standards (173-201A-200 WAC).

Portion of Study Area	Aquatic Life Uses	Dissolved Oxygen Criterion
Spokane River (from Nine Mile Bridge to the Idaho border)	Salmonid Spawning, Rearing and Migration	Human actions considered cumulatively may not cause the DO to decrease more than 0.2 mg/L below natural conditions when DO levels are lower than aquatic life criteria for salmonids spawning, rearing and migration (8.0 mg/L).
Lake Spokane (from Long Lake Dam to Nine Mile Bridge)	Core Summer Habitat	Human actions considered cumulatively may not cause the DO to decrease more than 0.2 mg/L below natural conditions when DO levels are lower than aquatic life criteria for core summer salmonids habitat (9.5 mg/L).

Lake Spokane also has a phosphorus water quality criterion expressed as an average euphotic zone concentration that does not exceed 25 µg/L from June 1 to October 31 (WAC 173-201A-130). While this phosphorus criterion was used by Ecology to develop the 1992 TMDL, it was not used to develop this TMDL because Ecology has determined that the Lake Spokane phosphorus criterion is not, by itself, sufficient to meet the dissolved oxygen criteria or protect the designated uses in Lake Spokane. For example, significant blue-green algae blooms occurred in the lake during the summers of 1990 and 1991 at a time when the phosphorus criterion was not exceeded (Cusimano, 2004). EPA agrees that the Lake Spokane phosphorus criterion is not sufficient to meet the dissolved oxygen criteria or protect the designated uses in Lake Spokane, because algae blooms and DO impairments continue to occur in the lake despite implementation of the 1992 TMDL phosphorus TMDL.

Ecology used the following natural condition water quality standard provision for dissolved oxygen in lakes as the basis for the TMDL:

> *For lakes, human actions considered cumulatively may not cause the DO to decrease more than 0.2 mg/L below natural conditions when DO levels are lower than aquatic life criteria for core summer salmonids habitat (9.5 mg/L). (WAC 173-201A-200(1)(d)(i)*

The ways in which Ecology has interpreted and considered the appropriateness of using a "lake" standard; the "cumulative" effect of pollutants; the designated uses in Lake Spokane; and the "natural condition" of the lake are summarized in Sections 2.1 through 2.4. As explained below, EPA believes that Ecology has made reasonable interpretations of its water quality standards in each of the decisions made by Ecology on each of these issues.

2.1 Is Lake Spokane a Lake?

Washington's water quality standards define "lakes" as waterbodies, including reservoirs, with a mean detention time greater than fifteen days (WAC 173-201A-020). Ecology explains in the TMDL, and EPA agrees, that Lake Spokane is a "lake" for purposes of applying Ecology's water quality standards. For the 2001 modeling year used to develop this TMDL, Ecology determined, using the CE-QUAL-W2 model, that the mean retention time in Lake Spokane ranges from approximately 20 days to greater than 100 days during the critical summer period, with retention times increasing with depth (Cusimano 2004).

2.2 Cumulative Impact

Ecology considers the way in which human actions cumulatively impact the DO in Lake Spokane by including all known anthropogenic loading to the Spokane River from both Idaho and Washington (WAC 173-201A-200(1)(d)(ii)). Ecology has accounted for loading from Idaho, and EPA believes that Ecology's interpretation of cumulative impact

is reasonable, for reasons discussed in detail in Section 3.4 of this document (*Loading Capacity – Loading from Sources in Idaho*).

2.3 Designated Uses in Lake Spokane

The natural condition provision for DO in lakes used to develop this TMDL protects "core summer salmonid" habitat (Table 2). The key characteristic of this designated use includes summer (June 15-September 15) salmonid spawning or emergence, or adult holding; use as important summer rearing habitat by one or more salmonids; or foraging by adult and subadult native char (WAC 173-201A-200(1)(d)).

Commenters have expressed concern about the absence of data supporting this beneficial use (e.g., do salmonids live in Lake Spokane? how many are there?), arguing that the water quality standards should be changed through a use attainability analysis (UAA). EPA agrees with Ecology's responses to these comments (TMDL, p. C143-144). Ecology has determined that, while Lake Spokane fisheries have not been specifically studied by the Washington Department of Fish and Wildlife (WDFW), salmonids species do exist in Lake Spokane and, according to WDFW, salmonid habitat in Lake Spokane would be improved with better dissolved oxygen (EPA 2010a).

Cold water habitat is available in Lake Spokane, but its availability is limited due to anoxic conditions in the hypolimnion in a large area of the lake. The limited habitat allows predators, principally warm water species (e.g., small mouth bass, northern pike minnow) to easily prey on the limited cold water species (e.g., redband trout, mountain whitefish and hatchery rainbow trout) due to the narrow physical living space (habitat) that is caused by anoxic conditions in the hypolimnion. WDFW has also stated that a key element for a more productive cold water fishery is the expansion of available habitat (EPA 2010a).

2.4 Natural Condition

Ecology estimated the natural condition of DO in Lake Spokane using the CE-QUAL-W2 water quality model. The CE-QUAL-W2 model is a dynamic model that is specifically designed to assess seasonal changes in pollutant loading and many other variables; it continuously simulates changes in various parameters of concern at any given time or place for the simulation period, including changes in dissolved oxygen due to human activities. The model was used to simulate the DO conditions that would occur in Lake Spokane if all anthropogenic sources of pollution were removed from the Spokane River and Lake Spokane (i.e. the natural condition).

In interpreting the "natural condition" provision of the DO criterion, EPA believes that Ecology has appropriately considered how to apply a "natural condition" provision to a lake that has been created by a dam. In a letter to EPA dated October 24, 2008 (TMDL, Appendix I), Ecology acknowledged that, while Long Lake dam itself is not a natural feature of the river's hydrology, Ecology determined that the reservoir created by the dam

should be treated as a lake for the purpose of determining the applicable water quality criterion and thus subject to the "natural condition" provision. As stated in the letter:

> *It is appropriate to model [the TMDL] with the dam in place because the impacts of pollutants must be evaluated under critical conditions in the TMDL process. This does not mean, however, that the effect of the dam on the reservoir cannot be assessed as part of the TMDL. In fact, since the dam is not natural, its affect should be assessed and addressed as part of the TMDL. Impacts of pollutants must be evaluated under critical conditions in a TMDL wasteload allocation process. The reservoirs and the reservoir basins greatly contribute to the critical hydraulic conditions for dissolved oxygen. If we run the model without the reservoirs, then the critical condition would be greatly altered and the problems with dissolved oxygen would appear to be non-existent.*

EPA believes Ecology has made a reasonable decision to simulate the "natural" DO condition of the river with the dam in place, rather than estimating the "natural" DO condition with the dam removed. As discussed in Section 3.3 of this document, Ecology has determined that the dam changes the character and hydrodynamic characteristics of the river system in a way that causes DO impairments in the lake. By modeling the "natural" DO condition with the dam in place, Ecology has developed a TMDL that will improve water quality (e.g., reduce upstream anthropogenic pollution) under the current critical conditions (i.e., the dam is there, and there are no plans to remove it). If Ecology were to simulate the "natural" DO condition of the river as it existed prior to construction of the dam, the capacity of the river would not be representative of the existing lake. EPA believes a TMDL not based on existing conditions would reduce the likelihood of achieving water quality standards in the future.

Ecology made numerous assumptions during development of the natural condition model simulation (the "no source" model run), including assumptions about the natural groundwater and tributary phosphorus levels; critical season flows; and storm-related discharges. Each of these assumptions, and the reasoning behind each assumption, is discussed in Section 3.2 of this document (*Loading Capacity – Natural Conditions*).

3. Loading Capacity

The loading capacity of a TMDL is the greatest amount of loading that a waterbody can receive without violating water quality standards (40 CFR 130.2(f)). In this TMDL the loading capacity is based on Washington natural condition provision of the DO standards which states:

> *For lakes, human actions considered cumulatively may not cause the DO to decrease more than 0.2 mg/L below natural conditions when DO levels are lower than aquatic life criteria for core summer salmonids habitat (9.5 mg/L). (WAC 173-201A-200(1)(d)(i).*

EPA's review of the loading capacity includes an examination of the assumptions and calculations comprising the loading capacity calculation, including seasonal variation, natural conditions estimation, determination of Avista's contribution, and the sources of

anthropogenic loading that may cumulatively decrease the DO by 0.2 mg/L below natural conditions. Each of these issues is discussed in detail in Sections 3.1 - 3.4 of this document. As explained below, EPA believes each of the decisions made by Ecology on each of these issues is reasonable; and EPA believes that the loading capacities in Table 4 of the TMDL, which incorporate the increased loading capacity provided by Avista in Table 7 of the TMDL, are established at a level which, if fully attained, will lead to attainment of the water quality standards.

In Table 4 of the TMDL, Ecology presents the Lake Spokane loading capacity as the load (lb/day) of oxygen demanding pollutants (i.e. phosphorus, CBOD and ammonia) that can enter Lake Spokane from March through October without violating the water quality standard. Because Lake Spokane has the capacity to absorb both natural and anthropogenic loads, Ecology has identified that portion of the load capacity that is "natural;" and that portion of the load capacity utilized by anthropogenic sources (i.e., the anthropogenic loads that are estimated to decrease the DO by 0.2 mg/L when the TMDL is implemented).

The loading capacity varies from month-to-month because Ecology has determined that the capacity of the lake to absorb oxygen-demanding pollutants varies seasonally. For example, the lake can absorb only 105 lb/day of phosphorus during the low-flow month of August, but can absorb 600 lbs/day of phosphorus during the high-flows of March. Ecology has expressed the loading capacity in Table 4 as a combination of three different pollutants, and EPA agrees with this assessment, because previous modeling efforts have shown that anthropogenic increases in phosphorus, BOD and ammonia contribute to DO impairments in the Spokane River and Lake Spokane (Cusimano 2004).

Ecology's calculation of the loading capacity includes the additional loading capacity created by actions to be undertaken by Avista, the operator of Long Lake dam, under the requirements of its FERC license and CWA 401 Certification. Ecology assumes that Avista's actions, required in its 401 Certification, will address dissolved oxygen impairments attributed to the existence and operation of Long Lake Dam and will provide improved DO levels in Lake Spokane. EPA believes this assumption is reasonable for the following reasons. Long Lake dam was relicensed by the Federal Energy Regulatory Commission (FERC) on June 18, 2009. Relicensing required the issuance of an Ecology certification (May 8, 2009) under Section 401 of the Clean Water Act ("401 Certification"), which states the following:

- After EPA approval of the DO TMDL, Ecology will amend the 401 Certification by Administrative Order to include new conditions that will require the Licensee (i.e. Avista) to develop a Water Quality Attainment Plan (WQAP) for DO.
- The WQAP will provide a detailed strategy to address Avista's "proportional level of responsibility," based on its contribution to the DO oxygen problem in Lake Spokane as determined in the DO TMDL.

The requirements of the 401 Certification will become conditions of any license issued by FERC (33 U.S.C. § 1341(d)). These anticipated actions by Avista are expected to

create additional loading capacity in the Lake for phosphorus, BOD and ammonia, and therefore have informed the calculation of the reservoir's loading capacity included in this TMDL.

Ecology has calculated Avista's anticipated contribution to the reservoir's loading capacity in terms of mg/L DO improvement in each segment of the reservoir; these anticipated contributions to the loading capacity are presented in Table 7 of the TMDL. For example, the TMDL assumes that Avista's actions will improve DO in segments 177 – 188 from July 1-15 by the amounts listed in Table 7 for each segment (ranging from 0.1 – 0.2 mg/L DO).

EPA believes it is appropriate and reasonable to include the DO improvements due to Avista's anticipated actions in the loading capacity calculations for Lake Spokane because these actions are required by the FERC license and 401 Certification for Long Lake Dam. As discussed in Section 3.3 below, Ecology has determined that Long Lake dam changes the character and hydrodynamic characteristics of the river system in a way that causes DO impairments in the lake. Therefore, Ecology has required Avista to improve the DO levels as requirements of the 401 Certification, which are enforceable by the Department of Ecology, as discussed in more detail in the *Reasonable Assurance* portion of this document (Section 8.1).

3.1 Seasonal Loading Capacity

Ecology has established a March-October loading capacity. Some commenters consider an eight month TMDL to be unnecessarily stringent, while others expressed concern about the impacts of discharges in the winter and early spring. Ecology's 2007 draft TMDL proposed to limit pollutant-loading for seven months (i.e. April-October). Ecology subsequently directed PSU to run a "March Test" with the water quality model to determine whether or not the anthropogenic loading that originates from the far-upstream ends of the modeled area (i.e. Idaho) impacts water quality in Lake Spokane in March. The results of this test indicate that discharges from Idaho in March impact DO in the reservoir from June through November 15 (Tables 11 and 12, PSU 2010). EPA therefore agrees with Ecology's decision to develop the TMDL for the March through October time period.

EPA believes it is reasonable to establish a seasonal (i.e. March – October) TMDL for Lake Spokane and the Spokane River, as opposed to a year-round TMDL, because algae growth is greatly reduced or negligible during the winter months; and impairments occur only during the summer months. The TMDL will decrease the year-round loading of pollutants because nonpoint source reductions will occur year-round; and because all NPDES permits in Washington and Idaho will contain conditions which prohibit bypassing the treatment facilities, as required by 40 CFR 122.41(e), (m). Therefore, when there are no effluent limits for oxygen-demanding pollutants from November through February, the continued operation of treatment facilities will serve to limit pollutant loading during those winter and spring months.

In order to better assess the effect of the bypass provision on winter discharges, EPA plans to propose to include year-round phosphorus monitoring in the NPDES permits for Idaho, and EPA believes that Ecology will include similar requirements for Washington dischargers. When this data is collected, Ecology can determine whether or not further limitations on winter discharges are necessary. A thorough discussion of the seasonality of DO and algae is included in Section 7 of this document, *Seasonal Variation*.

3.2 Natural Conditions

Ecology interpreted the DO "natural condition" criterion for Lake Spokane using a water quality model. As explained in the TMDL (p. 21), Ecology used the water quality model to estimate the baseline conditions for that portion of the Spokane River extending from the outlet of Lake Coeur d'Alene in Idaho, to Long Lake Dam in Washington. This water quality model simulation is referred to as the "No Source" model scenario in the TMDL. The model was developed and operated by Portland State University (PSU), under joint direction from Ecology and EPA. EPA administered the funding and general technical direction, while Ecology directed all TMDL-related model inputs (e.g. natural condition values, point and nonpoint allocations).

The upper boundary of the model is the outlet of Lake Coeur d'Alene (RM 111), where current nutrient concentrations in the lake are very low, and are minimally impacted by anthropogenic sources of nutrients. Ecology estimated the baseline natural condition at the mouths of the 3 tributaries to the Spokane River using measured water quality at California Creek for Hangman and Coulee Creeks, and at the Scotia monitoring station on the Little Spokane River. EPA agrees with Ecology's assessment that these locations are upstream of most human activities in the watershed, and that they therefore provide a reasonable estimate of the natural condition at the tributary mouths.

Ecology estimated the baseline natural condition for groundwater inflows using well data from the watershed. The well information was analyzed to determine the characteristics of the highest quality, least impacted groundwater. Ecology set the baseline total phosphorus condition for groundwater at 4 µg/L. EPA agrees with Ecology's approach for identifying the natural background levels of tributaries and groundwater, which is explained in the TMDL (p. 20-22, and Appendix J).

Ecology has identified the 2001 water year as the most appropriate critical flow year to use in the CE-QUAL-W2 modeling simulations. EPA agrees with Ecology's determination that the low river flow period is the most critical period for pollutant loading effects because there is less dilution available for anthropogenic nutrient inputs and there is a longer retention time in the reservoir. Both of these conditions can exacerbate dissolved oxygen shortages. The inputs for the baseline (or "no source") conditions are listed in Table 3 of the TMDL.

Commenters requested that, rather than using the 2001 water year in the model, Ecology use higher flow rates that reflect the in-stream minimum flow of 600 cfs that is required by the 401 Certification for Avista's Post Falls Dam in Idaho (June 5, 2008) beginning

June 7 of each year. In response to these concerns, the effect on the TMDL of using the flow requirement in the Post Falls Dam 401 Certification was modeled by PSU. PSU's model simulation indicates that the increased summer flows have a relatively small and variable effect on DO in the reservoir. Increased flows result in improved DO levels in the hypolimnion in August (0.01 – 0.10 mg/L DO), but also result in decreased DO levels in July (0.01 – 0.04 mg/L DO). Because the water quality model indicates that these increased flows do not always result in improved water quality, EPA agrees with Ecology's decision to retain the 2001 low flow conditions for the TMDL.

Ecology's decisions on the baseline model were augmented by extensive review and input from water quality modelers representing various stakeholder interests. A stakeholder modeling workshop, as well as two subsequent conference calls, was devoted to discussing the baseline model.

3.3 Determining the Water Quality Improvements Assigned to Avista's Long Lake Dam

Ecology has characterized the Spokane River system from the Idaho border (RM 96) to Long Lake Dam as containing both a riverine and a reservoir reach. The riverine reach extends from the Idaho-Washington border, downstream through the Cities of Spokane Valley and Spokane, to the portion of the river just below Nine-Mile dam (see discussion in TMDL, page 44). There are four small dams (including Nine-Mile) in this 72-mile reach, but the river is predominantly free-flowing. The reservoir reach is identified as the 24-mile reservoir created by Long Lake dam, extending from just below Nine-Mile dam to Long Lake Dam.

Ecology determined that Long Lake dam creates conditions that decrease dissolved oxygen. Long Lake dam changes the character and hydrodynamic characteristics of the river system by slowing water movement and increasing the residence time of pollutants. Phosphorus that flows into the lake promotes algae growth in the slack water of the reservoir; and dead algae and other particulate organic matter decay and settle on the bottom. This decay process uses oxygen, resulting in significant oxygen depletion in deeper areas of the water column. Also, the depth of the impoundment promotes unfavorable mixing conditions vertically, which contributes to the low levels of oxygen in deep areas of the lake, and a greater probability of algae blooms in the stable top layers of the lake. EPA agrees with Ecology's assessment that these hydrologic changes, when combined with even relatively small anthropogenic nutrients from upstream sources, will cause dissolved oxygen impairments in the lake.

Ecology considers the 401 Certification and the DO TMDL to be parallel processes which will result in improvements to water quality in Lake Spokane. In the 401 Certification for Long Lake dam, Ecology states that the Certification will be amended by Administrative Order after the TMDL is approved to require Avista to develop a Water Quality Attainment Plan (WQAP) that improves DO based on the proportional responsibility assigned to Avista in this TMDL (Ecology, May 2009). In the TMDL, Ecology has quantified the dam's contribution to the impairments in Lake Spokane by

separately analyzing the upstream source contributions and the dam's contributions to the impairments in Lake Spokane. Ecology's approach for quantifying the dam's contributions, referred to as the "Riverine Assessment Approach," is described here:

1. **Riverine Assessment Point**
   A location in the river is selected which is upstream of the reservoir, and downstream of all point sources and virtually all nonpoint sources of pollution. Ecology considered two alternative locations for the assessment point, and a location just downstream of Nine Mile dam was selected. Ecology chose this location for reasons discussed at length in the TMDL (p. 44-45).

2. **Phosphorus Concentration at the Riverine Assessment Point**
   Ecology identified the concentration of phosphorus at the riverine assessment point that is typical of phosphorus levels in similar rivers, and that represents "minimal human impact." This concentration, identified as 10µg/L total phosphorus, is based on EPA's Clean Water Act Section 304(a) recommended criterion for total phosphorus in Ecoregion II because this criterion is intended to characterize nutrient concentrations that represent "minimal human impact" (p. 4, EPA 2000). Ecoregion II is the western forested mountain region which includes all or parts of the States of Washington, Oregon, and other states in the Western U.S.; and is one of fourteen nutrient ecoregions identified by EPA.

3. **Upstream WLA and LA Scenarios**
   Ecology then used the water quality model to determine the impact of two different WLA /LA scenarios on the riverine assessment point. Ecology's goal was to identify upstream reductions (i.e. WLA and LA) that result in a phosphorus concentration of 10 µg/L at the riverine assessment point. The two scenarios considered by Ecology are outlined in Table 3 of the TMDL.

4. **TMDL Scenario #1 Selection**
   Ecology chose WLAs and LAs associated with TMDL scenario #1 to develop the TMDL because, when implemented, scenario #1 will reduce the upstream anthropogenic sources such that the average concentration of phosphorus entering Lake Spokane is approximately 10 µg/L during the critical season (March to October). Ecology's use of this scenario (i.e., a combination of LA and WLA) approximates minimum human impact at the riverine assessment point and results in a fair assessment of the contribution of the dam to DO impairment in the Lake.

5. **Estimating Avista's "Proportional Responsibility"**
   Using the upstream pollution reductions associated with TMDL scenario #1, Ecology used the water quality model to estimate the resulting reservoir impairments that occur under this scenario. These are the impairments occurring in Lake Spokane when phosphorus concentrations entering the lake are at levels representing "minimal human impact." Avista's "proportional responsibility" is the DO improvement required in order to eliminate the

reservoir impairments associated with TMDL scenario #1, and achieve water quality standards in the reservoir.

Under direction from Ecology, PSU set up the water quality model to divide the 24-mile long reservoir into 31 segments (segment #157-188). Each segment consists of a stack of vertical model cells that are 1 meter in depth. The model estimates DO levels in each cell at short time intervals. Ecology directed PSU to vertically average the DO values in each segment; and exclude the top 8 meters from the calculation.

EPA agrees with Ecology's decision to exclude the top 8 meters of the reservoir from these vertical averages, because amplified algae activity near the surface increases the DO levels; and because Ecology determined that these elevated DO levels are not representative of the impairments that occur deeper in the reservoir. Ecology calculated Avista's anticipated contributions to DO improvement (i.e. proportional level of responsibility) by using the difference between the natural condition ("no source") and the reservoir impairments estimated by TMDL scenario #1 to determine the resulting reservoir impairment for each vertically averaged segment, over two-week periods. The DO improvements required in order to eliminate these anticipated impairments are listed in Table 7 of the TMDL.

EPA believes Ecology's methodology for separating the impact of upstream sources from the impact of the dam (the "riverine assessment approach") is reasonable for the following reasons. First, EPA believes the location of the riverine assessment point is appropriate because it is immediately upstream of the riverine – lake transition area where water quality modeling indicates that algae growth increases; and is therefore impacted by upstream pollution sources, but is not impacted by the reservoir. Secondly, EPA believes Ecology's use of the ecoregional phosphorus criteria for the Spokane River (10 µg/L) is a reasonable way of quantifying the impairments for which Avista is responsible.

During the public comment period, commenters pointed out that 10 µg/L is not an adopted water quality standard, and that Ecology should not be using the ecoregional criteria to guide TMDL development. The ecoregional criterion is not, however, used as a water quality standard on which the TMDL's loading capacity is determined. Rather, Ecology used the ecoregional criterion to assess the proportional responsibility of the dam and upstream sources for impairments in the Lake. The ecoregional criterion identifies the baseline conditions of surface waters that are minimally impacted by human activities (EPA 2000) and therefore EPA believes it is a reasonable basis for assessing the remaining impairments to the Lake attributable to Long Lake dam.

This approach for quantifying Avista's anticipated contributions to DO improvement does not assume the elimination of all upstream anthropogenic sources of pollution and lake-side non-point sources; rather, it assumes reduction of phosphorus loading to a level that is typical of other rivers in the same ecoregion that are minimally impacted by anthropogenic phosphorus loading. Logically, when upstream anthropogenic pollutants are reduced to a level that represents minimal human impact, the impairments that occur in the downstream reservoir can fairly be attributed to the hydrologic changes caused by the dam. This is why

EPA believes this approach is a reasonable way to assess the impairments caused by the dam.

EPA review of the comments submitted to Ecology during the public review shows broad agreement among the Spokane River stakeholders that Lake Spokane impairments are caused by both the loading of oxygen-demanding pollutants from sources upstream of the Lake, and by the dam's hydrologic changes. Water quality standards in Lake Spokane can be achieved through a combination of upstream reductions, combined with Avista loading capacity enhancements. While there is no unique solution, Ecology has chosen a combination of upstream reductions and reservoir enhancements that it believes is equitable and most likely to result in water quality standards being met. EPA believes that Ecology's approach is reasonable and equitable because Avista is responsible only for those impairments that occur when the phosphorus concentrations entering the lake are at minimal levels of human impact from upstream sources as represented by EPA's ecoregional criterion.

EPA believes that Ecology's choice of TMDL scenario #1 model run is a reasonable basis for the reductions in anthropogenic loading from point and nonpoint sources (WLAs and LAs) because it will achieve the water quality standard for DO while equitably distributing the responsibilities for impairment in the Lake among point sources, nonpoint sources, and the contributions of the dam. In addition, it achieves an average riverine assessment concentration of 10 µg/L from June through September (TMDL, p. 27). Some commenters expressed preference for TMDL scenario #2 over scenario #1 because scenario #2 combined slightly higher upstream pollutant loading with higher reservoir enhancements, when compared to scenario #1. EPA supports Ecology's choice of scenario #1, however, because it reduces the overall loading of phosphorus entering the lake (compared to scenario #2).

Commenters expressed concern about the expression of Avista's anticipated contribution as mg/L DO improvement, rather than as pound/day pollutants. EPA supports Ecology's decision to express Avista's anticipated contribution as a direct calculation of the DO improvements necessary to meet the water quality standard in Lake Spokane for the following reasons. The DO improvements outlined in Table 7 of the TMDL are a direct expression of the improvements needed to achieve the water quality standard for DO and therefore protect the designated uses. In addition, Ecology explains in the TMDL (p. 56) that Avista may employ several methods of pollutant reduction to meet the terms and conditions of the 401 Certification, including BMPs or hyoplimnetic oxygenation. In the Response to Comments (TMDL, p. C-46), Ecology explains that Avista's responsibility can be converted into pollutants (lbs/day) during implementation, but that such a conversion must consider the oxygen demand from all three pollutants, the location of the pollutant reductions, and in-stream processes governing the effect of those pollutants on Long Lake oxygen levels. In other words, Avista's responsibility can be converted into lbs/day pollution only after the location of planned non-point source reductions are known, and must be done using a water quality model.

3.4 Loading from sources in Idaho

The Clean Water Act's primary mechanism for assessing and addressing cumulative pollutant loadings from a variety of sources that cause water quality impairments is the total maximum daily load (TMDL) process. When a State establishes a TMDL to address an in-state impairment, EPA interprets the CWA and its regulations to preclude that State from establishing, within the TMDL, load and wasteload allocations for pollutant sources located outside the boundaries of that State. However, when a State establishes such a TMDL, the State may make assumptions about anticipated cross-boundary loadings and may reasonably assume that NPDES permits for point sources in upstream States, which have an effect on water quality in the downstream State preparing the TMDL, will include effluent limits sufficiently stringent to ensure compliance with the downstream State's water quality requirements, including water quality standards, because this is required by the federal regulation at 40 CFR 122.4(d).

The Spokane River originates at Lake Coeur d'Alene (RM 111), and flows through Idaho for 15 miles, crossing into Washington at RM 96. Point sources of pollution in Idaho include the Post Falls Wastewater Treatment Plant, Hayden Area Regional Sewer Board, the City of Coeur d'Alene Advanced Wastewater Treatment Plant; and stormwater discharge (Coeur d'Alene MS4 permit). Each discharger has a National Pollutant Discharge Elimination System (NPDES) permit which sets limits on the amount of pollutants that can be discharged to the river. Because EPA will develop and issue NPDES permits for Idaho point sources, Ecology worked closely with EPA to develop the specific assumptions about the anticipated permit-driven reductions of anthropogenic loading of phosphorus, CBOD, and ammonia from wastewater treatment plants and stormwater in Idaho.

Washington's water quality criterion for dissolved oxygen in lakes and reservoirs requires that *human actions considered cumulatively* may not decrease the dissolved oxygen concentration more than 0.2 mg/L below natural conditions" (emphasis added). When Ecology calculated the loading capacity for the TMDL, EPA believes that Ecology made reasonable assumptions about the future pollutant loading from Idaho that will enter Washington.

Through water quality modeling performed by PSU, Ecology has determined that when Idaho point source loadings are reduced to the levels assumed by the TMDL, those loadings cause a 0.12 mg/L decrease in Lake Spokane DO levels in certain reservoir segments during the most critical months (Tables 15 and 16, PSU 2010). Many commenters considered this impact to be insignificant, and argued that the TMDL should not assume reductions of pollutant loading from Idaho. EPA, however, believes that Ecology's water quality standard requires Ecology to consider the capacity of the Spokane River and Lake Spokane to absorb the *cumulative* anthropogenic effect of pollutants from both Idaho and Washington. Assumptions about the loading from Idaho impact the available loading capacity for Washington point and non-point sources. EPA also considers the 0.12 mg/L decrease in Lake Spokane DO levels to be a significant

impact on DO levels in Lake Spokane considering the total cumulative decrease allowed by the Washington DO standard is .2 mg/L below the natural condition DO level in Lake Spokane.

EPA will propose effluent limits in the NPDES permits for Idaho point source dischargers that ensure that the total dissolved oxygen depletion resulting from those dischargers is not greater than that shown in Tables 15 and 16 of PSU (2010). The total assumed anthropogenic loading of phosphorus, $CBOD_5$ and ammonia from Idaho point sources are 7.2 lb/day, 497 lb/day, and 94.4 lb/day, respectively. These figures include 2.4 lb/day, 23 lb/day, and 0.4 lb/day of phosphorus, $CBOD_5$, and ammonia, respectively, from stormwater (TMDL, p. 35). The assumptions for individual sources can be found in Table 2 of PSU 2010. In the TMDL, Ecology states that the assumed Idaho point source loads (including stormwater) account for 18 percent of the phosphorus, 15 percent of the $CBOD_5$, and 24 percent of the ammonia discharged by all of the point sources in both States (including stormwater and CSOs), under the wasteload allocations (see Table 5) and assumptions in this TMDL. EPA agrees that these calculations are correct.

Some commenters also argued that there is a "difference in assimilative capacity that occurs throughout the riverine portion of this waterbody" which should allow for higher loading from Idaho. EPA supports Ecology's assertion that all anthropogenic sources of phosphorus to the Spokane River upstream of Lake Spokane contribute to dissolved oxygen depletion in Lake Spokane, regardless of whether those sources are located in Idaho or Washington. This assertion is clearly supported by the CE-QUAL-W2 modeling performed by PSU.

Developing a TMDL with equitable allocations for Washington dischargers and equitable loading assumptions for Idaho point sources were core goals for both Ecology and EPA. EPA believes that Ecology's Idaho loading assumptions are equitable when considered in light of treatment levels (discharge concentrations), population growth projections, achievability and source identification, as discussed below.

3.4.1 Equity in effluent concentration for municipal sources

In developing this TMDL, Ecology has calculated Idaho's loading by assuming that Idaho wastewater dischargers will be required by their NPDES permits to achieve the same effluent phosphorus concentration as similar Washington wastewater dischargers. "Wastewater" is used in this document to refer to both treated sewage and industrial wastewater. As explained in the TMDL (p. 33) and in greater detail in Ecology's response to comments (p. C30-C31), Ecology developed the phosphorus wasteload allocations (WLAs) for all Washington wastewater dischargers (except Kaiser Aluminum, as discussed in Section 4.1) and the phosphorus loading assumptions for all Idaho wastewater dischargers, based on the assumption that the phosphorus effluent limits for all of those sources will be a monthly average limit of 50 µg/L total phosphorus. In general, NPDES regulations require that effluent limits for continuous discharges be stated as average monthly discharge limitations (40 CFR 122.45(d)).

EPA believes Ecology's "equal effluent concentration" approach is reasonable because it assumes an equal level of treatment for all wastewater dischargers. The "equal effluent concentration" approach is one of several suggested methods for equitably distributing loading capacity among point sources discussed in EPA's *Protocol for Developing Nutrient TMDLs* (EPA 1999). There are other approaches suggested for consideration by EPA's 1999 *Protocol* document, but given Ecology's goal of balancing upstream allocations and Avista responsibilities in a TMDL for a river with a very limited loading capacity, EPA agrees that the "equal effluent concentration" approach is a logical choice; other approaches might result in unachievable effluent limits for some dischargers and/or a significantly higher responsibility for Avista.

Commenters have pointed out that when the maximum monthly average concentration of 50 µg/L of phosphorus was converted into a long-term average concentration for modeling purposes, that the resulting model inputs, which range from 36 – 42 µg/L are no longer equitable. As Ecology explained in detail in the Response to Comments (TMDL p. C30-31), the differences between the model inputs for the City of Spokane and Spokane County (42 µg/L) and the loading assumptions for Idaho are due to differences in the sampling frequency expected to be required in the NPDES permits for these sources. Because the water quality model required the use of a long-term average phosphorus input, Ecology calculated seasonal average values for each discharger based, in part, on assumed monitoring frequencies. EPA agrees with Ecology's explanation, and supports Ecology's efforts to develop WLAs that appropriately consider the relationship between long-term averages, monthly averages and monitoring frequencies; and that consider the way in which the WLAs can be used to develop NPDES permit requirements.

In supporting Ecology's approach, EPA also notes that Ecology involved all stakeholders in the TMDL development process through a series of meetings from late 2008 through 2009. All dischargers in Washington and Idaho were invited by Ecology to work together to develop an alternative approach for equitably distributing the limited loading capacity, but no approach was proposed that was supported by all the dischargers.

Numerous dischargers requested, during the public comment period, that the loading assumptions be adjusted (i.e. increased). Some of the dischargers have also separately run the model to demonstrate that a higher wasteload allocation is appropriate for a single discharger. EPA agrees with Ecology's decision that increasing a wasteload allocation for one discharger (or increasing the loading assumptions from Idaho) at the expense of the other dischargers or Avista is less equitable than Ecology's current TMDL allocations.

EPA notes that without the anticipated loading capacity contributions provided by Avista, the point sources would, out of necessity, be receiving WLAs lower than those developed for this TMDL. EPA believes that Ecology's thorough discussion of the stakeholder comments on this issue contained in Ecology's Response to Comments document (TMDL, Appendix C) reflects both the complexity of the issue, and the thoughtfulness with which Ecology made their TMDL decisions.

3.4.2 Equity in population growth and effluent flow allowance

Ecology calculated each facility's load based on projected effluent flow rates for the year 2027. In the case of the Idaho dischargers, these flow rates were provided by the utilities themselves. Idaho commenters later requested that the projected flow assumptions be changed because the methodologies used by municipalities to calculate their future loads varied.

EPA supports Ecology's decision to use the projected effluent flow rates provided by the municipalities during development of the TMDL, and strongly supports a TMDL that considers and incorporates population growth that may occur twenty years in the future. In their response to comments, Ecology recognized that each of these projections are based on assumptions about population growth that can be reevaluated in the future; Ecology states that if the actual increase in effluent flow rates for POTWs is different than projected, the wasteload allocations and loading assumptions may be re-evaluated as part of the ten-year assessment described in the Managed Implementation Plan section of the TMDL (p. C41-42).

3.4.3 Achievability

As discussed above, the Idaho loading assumptions in the TMDL are calculated assuming a maximum monthly average total phosphorus concentration of 50 μg/L total phosphorus. While achievability is not a requirement of the TMDL, EPA believes that advancements in treatment technologies demonstrate that the permit limitations based on the WLAs can be met at wastewater treatment facilities (TMDL, Appendix J).

Many comments criticize the memorandum from EPA in Appendix J of the TMDL, which is perceived as providing the sole basis for determining wasteload allocations. Appendix J is neither a "technology-based target" nor is it a water quality-based analysis of phosphorus loading capacity in the Spokane River. It simply provides information about the phosphorus removal capabilities of eleven existing high-performing wastewater treatment plants. Appendix J is "a summary of previous reports and effluent data regarding existing wastewater treatment plants achieving low (≤ 50 μg/L) effluent phosphorus concentrations." Appendix J states that "existing (wastewater treatment plants) are consistently achieving monthly average phosphorus concentrations in the range of 21 to 60 ppb" (see Page 14 of Appendix J) and that eight of the eleven wastewater treatment plants described in the memorandum consistently produce effluents with monthly average phosphorus concentrations of 50 μg/L or lower.

3.4.4 Source Identification

Some commenters requested that non-point sources be included in the Idaho loading assumptions. EPA worked closely with Ecology to identify all sources that contribute loading of oxygen-demanding pollutants to the 15-mile stretch of the Spokane River in Idaho, and believes that Ecology has reasonably assessed the nonpoint source loading from Idaho for the following reasons. In developing the water quality model, PSU concluded that groundwater is not a source of pollutant loading in Idaho, because there is a net-loss of water from the Spokane River to groundwater (PSU 2005). Point source loading from stormwater in Coeur d'Alene has been included in the Idaho loading

assumptions. Finally, there are several small intermittent tributaries, including Skalan Creek, flowing into the Spokane River in Idaho. There are no flow data available for Skalan Creek. Since it is intermittent, EPA expects the flow to be negligible, particularly during the critical summer months. Over several years of model development, PSU has set the flow in the creek to zero in the model inputs. Based on this information, EPA has not identified any nonpoint source contributors to phosphorus loading in the 15 mile stretch of the Spokane River in Idaho. Therefore EPA agrees that Ecology has reasonable assessed the loading of oxygen-demanding pollutants from Idaho.

4. Wasteload Allocations

Ecology assigned seasonal (March – October) wasteload allocations (WLA) for NH3-N (ammonia), total phosphorus and CBOD to the point sources identified below. The WLAs are presented in Table 5 of the TMDL (p. 34) in units of pounds/day.

- Liberty Lake Sewer and Water District (WA-004514-4)
- Kaiser Aluminum (WA-000089-2)
- Inland Empire Paper Co. (WA-000082-5)
- City of Spokane WWTP (WA-002447-3)
- Spokane County (new source)
- Stormwater from the City of Spokane, City of Spokane Valley, and Spokane County (Eastern Washington Phase II Municipal Stormwater permit)
- CSOs (City of Spokane WWTP WA-002447-3)

Using the results of the water quality model, Ecology has determined that the impact of these WLAs, when combined with the loading assumptions from Idaho, the reduced loading from non-point sources in Washington, and Avista's anticipated contributions to loading capacity, will result in water quality standards being met in the Spokane River and Lake Spokane.

EPA agrees with Ecology's determination that the WLAs in Table 5 will result in water quality standards being met, for the reasons outlined in the discussions of wastewater WLAs and stormwater WLAs below. Although TMDL regulations do not require the State to develop TMDL allocations based on any specific formula or approach, EPA has also found that Ecology considered equitability, achievability and management options during development of the wasteload allocations.

4.1 Wastewater WLAs

Wastewater discharges (i.e. treated sewage and industrial wastewater) are a significant contributor to the pollutant loading in the Spokane River. The pie charts in Figure 4 of the TMDL (p. 32) illustrate the magnitude of wastewater point source loading compared to the loadings from the tributaries, groundwater and stormwater. Ecology has determined that the WLAs, when implemented, will reduce wastewater point source loadings by 94 percent from March through May, and by 90 percent from July through

August (TMDL, Figure 4). For each of the wastewater point sources, Ecology has worked with the dischargers to project loadings through 2027.

Ecology has calculated the phosphorus wasteload allocations (WLAs) for all Washington wastewater point sources, except Kaiser Aluminum, based on an "equal effluent concentration" approach, which assumes a monthly average effluent concentration of 50 µg/L, and also takes into account projected future flow estimates provided by the dischargers. Kaiser has a lower total phosphorus wasteload allocation (25 µg/L) because its use of non-contact groundwater results in relatively low levels of total phosphorus in its effluent, and Ecology has determined that Kaiser can achieve this WLA. EPA believes the "equal effluent concentration" approach is reasonable because the WLAs will reduce anthropogenic loads significantly, and when combined with the LAs and Avista's assumed improvements in loading capacity, will ensure that water quality standards are met in Lake Spokane. In addition, EPA and Ecology believe this approach is equitable for all wastewater dischargers, as discussed in Section 3.4.1 of this document, and briefly below.

EPA believes Ecology's "equal effluent concentration" approach is reasonable and equitable because it assumes an equal level of treatment for all point source dischargers (except Kaiser and stormwater). Some commenters have pointed out that when the maximum monthly average concentration of 50 µg/L of phosphorus was converted into a long-term average concentration for modeling purposes, the resulting model inputs, which range from 36 – 42 µg/L, are no longer equitable. EPA believes that Ecology's detailed response to these concerns (TMDL p. C30-31) clearly explains that the differences between the model inputs for the City of Spokane and Spokane County (42 µg/L) and the model inputs for other wastewater point sources (except Kaiser) are due to differences in the sampling frequency expected to be required in the NPDES permits for these sources. Because the water quality model required the use of a long-term average phosphorus input, Ecology calculated seasonal average values for each discharger based, in part, on assumed monitoring frequencies. EPA believes it is appropriate and reasonable for Ecology to develop loading assumptions that consider the relationship between long-term averages, monthly averages and monitoring frequencies, because EPA NPDES permitting guidance (EPA 1991b) recommends that each of these factors be considered during the development of NPDES permits.

Dischargers have expressed concerns about the achievability of these WLAs. For example, Inland Empire Paper Company (IEP) has expressed concern about the achievability of its phosphorus allocation, which is based on a long-term average effluent concentration of 36 µg/L. In the response to comments, Ecology committed to continue working with the IEP and all other dischargers to identify opportunities to meet permit limits. Ecology believes there are numerous alternative ways to meet the TMDL limits, including trading, water conservation, and wastewater reuse. EPA believes this is a reasonable response to dischargers' concerns about achievability, but notes that the CWA requirements for TMDLs are based on achieving the water quality standards, and are not based on technical achievability. EPA believes that these effluent limitations are achievable for municipal wastewater treatment plants, as discussed in Appendix J of the

TMDL. In addition, EPA notes that the WLAs are based on anticipated higher discharge flows in 2027 (not current discharge flows), thus providing additional flexibility for dischargers whose flows are less than those expected in 2027.

Some commenters requested that WLAs consider the amount of bioavailable phosphorus being discharged by point sources. Ecology has stated, however, that there is currently no standard method or protocol for quantifying the non-biodegradable fraction of phosphorus in an effluent sample. After reviewing the studies submitted by commenters, Ecology has concluded that the studies fail to satisfactorily determine the bioavailable fraction of phosphorus. EPA believes it is reasonable to establish WLAs for the total phosphorus in the effluent discharges because of the lack of data or methodology to identify the bioavailable fraction of phosphorus. This assumption is also part of the margin of safety for the TMDL.

EPA believes that Ecology's thorough discussion of the stakeholder comments contained in Ecology's Response to Comments document (TMDL, Appendix C) on the issues of WLA equitability and achievability reflect both the complexity of the issues, and the rigor with which Ecology made their TMDL decisions.

4.2 Stormwater Wasteload Allocations

Ecology's stormwater wasteload allocations in Table 5 of the TMDL are set at the estimated *current* loadings for ammonia, total phosphorus and CBOD. Ecology regulates stormwater from the City of Spokane, City of Spokane Valley, and Spokane County through the Eastern Washington Phase II Municipal Stormwater permit (MS4s). The Washington State Department of Transportation (WSDOT) operates under a similar but separate stormwater discharge permit. The majority of the stormwater entering the Spokane River is discharged by the City of Spokane; but the other three dischargers are geographically contiguous to the City of Spokane. Ecology determined that the information needed to separate out the specific contributions for each of the dischargers is not available, so aggregate wasteload allocations have been established for the total stormwater loading of ammonia, total phosphorus and CBOD.

EPA believes it is reasonable for Ecology to assign one WLA for all of the stormwater being discharged to the Spokane River from the City of Spokane, City of Spokane Valley, Spokane County, and Washington state highways for the following reasons. Ecology has found that information is not available to clearly identify the land area and outfalls associated with individual dischargers; and sampling data is limited. So it is difficult to quantify pollutant loading for individual dischargers. The dischargers are geographically contiguous, however, so it is possible to calculate the stormwater loading for all stormwater discharges based on land area and land use – and this is what Ecology has done.

Although no stormwater discharges were measured during the low flow year (2001) used to develop the TMDL, Ecology included estimated average-year stormwater flows and concentrations in the TMDL model. EPA believes it is reasonable for Ecology to allocate

loadings for average-year stormwater flows - even though no stormwater discharges were measured - as a way of ensuring that the potential impacts of storm events are considered, even during low flow years. EPA also believes Ecology has used a reasonable approach for calculating the stormwater loads: a standard analytical method (called the "Simple Method") has been used to estimate average stormwater flow using precipitation and land cover data; and this flow estimate has been combined with available stormwater sampling data for phosphorus in order to estimate the loadings. Ecology includes a thorough explanation of the stormwater loading analysis in the TMDL (pages 35-36 and Appendix K).

Although the stormwater WLA is numeric, Ecology anticipates expressing the effluent limits in the stormwater permits as BMPs, consistent with EPA policy (EPA 2002). EPA believes that the load allocations are reasonable because they have been set at the estimated current loadings. Ecology is requiring stormwater permit holders to take additional actions to monitor, quantify and reduce the loading of pollutants in stormwater. In other words, Ecology has conservatively estimated the loading of stormwater, as discussed above, by assuming that loading will not decrease, even though Ecology plans to modify the MS4 stormwater permits to include additional actions to help identify and reduce nutrient pollution (e.g., outfall inventories; phosphorus, ammonia and CBOD monitoring; targeted education programs), as discussed in more detail on page 65 of the TMDL.

5. Load Allocations

The TMDL assigns load allocations for total phosphorus, ammonia and CBOD at the mouths of the main Spokane River tributaries (Hangman Creek, Coulee Creek and the Little Spokane River). EPA believes it is reasonable for Ecology to assign load allocations at the mouth of tributaries (rather than assigning LA to individual sources, or categories of sources) because, as discussed below, TMDLs are currently under development on two of the three tributaries (i.e. Hangman and Little Spokane). Detailed assessments of sources and implementation strategies will be developed for all three of the tributaries, and will be implemented by 2025 (TMDL, p. 55).

The TMDL also accounts for other non-point sources of pollution entering the river by assigning load allocations for groundwater inflow to the main stem of the Spokane River; and by assigning load allocations for groundwater and runoff in the watershed immediately adjacent to Lake Spokane ("Lake Watershed"), as discussed in Section 5.2 below.

EPA believes the assumptions used to develop the load allocations of this TMDL are both reasonable and achievable, and are established at a level which, if combined with the loading capacity improvements created by Avista's actions, will lead to attainment of the water quality standards, as discussed in Sections 5.1 and 5.2 below.

5.1 Tributary Load Allocations

Ecology's load allocations (lbs/day) for Hangman Creek, Coulee Creek, and Little Spokane River are presented on page 36 and in Table 6a of the TMDL. Ecology has calculated these load allocations by determining the percent reductions that are likely to occur when non-point source contributions are reduced through use of Best Management Practices (BMPs); these percent reductions are shown in the last column of Table 6b, and range from 20 to 50 percent reduction of the *human* load, which is equivalent to 12 to 27 percent reduction of the *total* load.

EPA believes that Ecology's load allocations for the Hangman, Coulee and Little Spokane tributaries are reasonable estimates of future reductions because they are based on watershed restoration planning efforts that are currently underway in Hangman Creek and WARMF modeling developed for Hangman Creek. The Hangman Creek TMDL for total suspended sediment (TSS) was completed by Ecology, and approved by EPA, in 2009. The WARMF model used by Ecology in the development of the Hangman TSS TMDL relies on soil, land-use, climate and land-cover data to simulate processes in a watershed that affect suspended sediment generation and transport; and as such, the WARMF model estimates the suspended sediment reductions that will occur when BMPS are installed in Hangman Creek. Ecology's analysis also indicates that when sediment is reduced, total phosphorus is reduced by a similar amount (TMDL, C-48).

Ecology used the WARMF model developed for Hangman Creek for comparison purposes to estimate whether the load reductions for the Spokane TMDL could be achieved. The Hangman Creek TSS load reductions couldn't be incorporated directly into the Spokane TMDL for two reasons. First, the Hangman Creek TSS TMDL has aggregated the percent reduction goals over multiple years; and has *annual*, not *seasonal*, reductions. In addition, the Hangman Creek TMDL calculated percent reduction of *total* loads; whereas the Spokane TMDL was set-up to model percent reduction of *anthropogenic* loads.

Nevertheless, during development of the Spokane TMDL, Ecology used the WARMF model to estimate reductions that could be compared directly to the reductions used in the Spokane water quality model. Ecology used the WARMF model to estimate the *seasonal* reductions for Hangman Creek that would occur during a *2001 critical low-flow year* after BMPs have been installed. The results of this comparison showed that the reductions at the mouth of the tributaries would more than meet the LAs identified in the Spokane TMDL. The WARMF model estimated that installation of BMPs would reduce *total* TSS by 20% (March – May), 46% (June) and 60% (July – October) during 2001 low-flow conditions in Hangman Creek In comparison, the phosphorus reductions proposed by the Spokane TMDL at the mouth of Hangman Creek and Coulee Creek are smaller, and thus more readily attained than those estimated by the WARMF model: 12% (March-May), 24% (June) and 22% (July – October). The load reductions for Little Spokane are similar: a 36% reduction in the anthropogenic load, which translates to a 22 – 27% reduction of the total load. Lastly, EPA notes that recent monitoring of the

tributaries has shown nutrient concentrations close to the allocation concentrations over the past several years, indicating that loading reductions are already occurring (TMDL, C-109).

5.2 Groundwater (at Mainstem)

Ecology's load allocations (lbs/day) for groundwater are presented in Table 6a of the TMDL. During development of the TMDL, groundwater flowing into the mainstem of the Spokane River was considered separately from groundwater flowing into the lake. EPA believes it's reasonable to consider groundwater in the two geographic areas separately because of the way that the Lake watershed flow regime was set-up in the model, as discussed in Section 5.3 below.

The Spokane River has areas of inflows (ground water flowing into the river) and outflows (river water loss to the ground water) that complicate the river flow hydrology; both types of groundwater flow are considered by Ecology in the water quality model. As noted in the *Loading Capacity* discussion above, the baseline natural condition for groundwater inflows was estimated using well data from the watershed. Ecology selected 13 wells from Spokane County's network, far from the river channel, to minimize surface water impacts, and set the "natural condition" total phosphorus condition for groundwater at 4 µg/L. EPA believes this is reasonable because the well data used to establish this concentration represents the highest quality, least impacted groundwater.

Groundwater has received a phosphorus load allocation that is equivalent to current conditions, which range from 7.6 µg/L to 8.1 µg/L on average (TMDL Table 6a and Appendix M); in other words, the TMDL assumes that no reductions in elevated groundwater loading will occur in the future. EPA believes Ecology has made reasonable assumptions about the current conditions of groundwater because Ecology's assumptions are based on data from groundwater wells near the river; and because Ecology has conservatively assumed that groundwater loading will remain unchanged although implementation plans may lead to reductions in groundwater loading in the future.

5.3 Lake Spokane Groundwater and Runoff

Ecology's load allocations (lbs/day) for groundwater adjacent to Lake Spokane are presented in Table 6a of the TMDL. Ecology has set the total phosphorus, ammonia and CBOD load allocations for groundwater and surface water adjacent to the Lake at current conditions; in other words, Ecology assumes that phosphorus concentrations in groundwater and surface water will remain at current conditions. EPA believes this assumption is reasonable for the reasons explained below.

Ecology has identified the following nonpoint sources adjacent to Lake Spokane that could affect the pollutant loading in groundwater and surface water runoff: a relatively new housing development, minor agriculture and low traffic volume roadways. Because the majority of the area around the lake is undeveloped, non-point source contributions

from the land area adjacent to Lake Spokane are variable, and relatively minor compared to other sources identified in this TMDL; they are also difficult to quantify accurately because there is no existing flow data for surface or groundwater flow.

As described in the TMDL response to comments (TMDL, p. C53-56), Ecology considered the impact of pollutant loadings from groundwater and surface runoff in the water quality model through the input of flows containing elevated phosphorus concentrations. Because there are no known data on inflow rates in the area around the Lake, Ecology has relied on existing elements of the core water quality model (i.e., the "correction flows") to represent these potential loadings. As explained in the TMDL, the model includes a water balance for Lake Spokane based on measured inflows to the reservoir (mainstem Spokane River and mouth of Little Spokane River), outflows from Long Lake Dam, and the water elevation of the reservoir. EPA considers "correction flows" to be a normal component of water quality models for the following reason: flow and elevation data are typically imperfect, and errors in the balance are added/subtracted from the reservoir by the water quality model to maintain the flow balance and the correct reservoir depth. The correction flows are highly variable and can be positive or negative (similar to random "noise" in a data stream), and are illustrated on page C-54 of the TMDL.

EPA believes Ecology's allocation for groundwater is reasonable because Ecology used the average phosphorus concentration in wells around the lake (25 µg/L) and the correction flows to calculate the phosphorus load that is allocated to Lake Spokane groundwater and surface. EPA also believes that Ecology has conservatively estimated the existing and future loading of phosphorus from the lake watershed, and has therefore contributed to the margin of safety, for the following reasons:

- The average phosphorus levels in groundwater are probably lower than 25 µg/l, given that the average levels in more developed areas upstream of the lake range from 7 to 8 µg/L.
- The TMDL assumes that groundwater and runoff flows will continue to enter the lake at phosphorus concentrations of 25 µg/L even after the TMDL is implemented and concentrations of phosphorus in the lake itself are reduced to approximately 10 µg/L.
- The model is set-up to assume that all inflows have a high concentration of phosphorus (25 µg/l), while all outflows are assumed to be at the fully-mixed concentration in the lake (approximately 10 µg/l). A detailed discussion of the way in which correction flows "pump" phosphorus into the lake is included in the response to comments (TMDL, p. C54-C56).

Groundwater typically has low or zero ammonia and CBOD, and Ecology has therefore not allocated loads for these pollutants. To the extent that surface water contains CBOD and ammonia, EPA believes it is reasonable for Ecology to consider the phosphorus load allocation to be a surrogate for impacts from surface water CBOD and ammonia, as well as phosphorus (TMDL, p. C-56).

6. Margin of Safety

Federal regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between loads and water quality. The following conservative assumptions comprise the implicit margin of safety for this TMDL (TMDL, p. 51).

- For each tributary, the headwater phosphorus concentration has been used as the "natural background" concentration at the mouth of the tributary, even though natural phosphorus concentrations may increase between the headwaters and the mouth, and result in a higher natural condition for phosphorus. This effectively adds a margin of safety to the tributary load reductions.
- Stormwater flows from an "average" rainfall year have been assumed to occur during the 2001 low-flow year, thereby simulating more loading that would occur during a critical low-flow year.
- All phosphorus is assumed to be bioavailable, when in fact there may be a fraction of the total phosphorus that is not bioavailable and does not contribute to the growth of algae or periphyton, and therefore does not impact DO levels.
- The top eight meters of the reservoir are not included in the vertical averaging because of increased algae activity that increases daytime dissolved oxygen levels.
- Conservative assumptions were used in the load allocation for groundwater and runoff that is directly entering Lake Spokane, described in Section 5.3 above, thereby simulating future loads that are greater than those that will likely occur.

EPA believes that the TMDL adequately incorporates a margin of safety because, as outlined above and discussed in detail in other portions of this document, Ecology has overestimated the loading that is likely to occur during critical conditions (i.e. stormwater, groundwater, tributaries, lake watershed loadings, bioavailability).

7. Seasonal Variation

Ecology discusses seasonal variation, or the changes in loading rates due to changing conditions associated with the annual change in seasons, on pages 40-41 of the TMDL. EPA's believes that the TMDL appropriately considers seasonal variability and critical conditions, for each of the reasons described below.

The CE-QUAL-W2 model is a dynamic model that is specifically designed to assess seasonal changes in pollutant loading and many other variables, as it continuously predicts changes in various parameters of concern, including dissolved oxygen, at any given time or place for the simulation period.

There is broad agreement in the scientific and regulatory community that dissolved oxygen in lakes and rivers is typically of greatest concern in the summer when stream flows are lowest, mean detention times are longest, the water is the warmest, gas-holding capacity is reduced, growing conditions for algae are optimal, and thermal stratification of lakes becomes well established. Because of the residence time of the reservoir, Ecology has established TMDL allocations beginning in March, which is earlier in the year than the critical period for dissolved oxygen. The water quality modeling indicates that elevated discharges during March will contribute to impairments from June 1 through early October; therefore the allocations in the TMDL apply from March through October (PSU 2010).

Ecology has determined that algae blooms in the upper end of the lake and depressed dissolved oxygen in the metalimnion (middle interflow stratum) of the lower end of the lake are directly impacted by pollutant loading that occurs during the growing season, typically June to October. The impact of nutrient loading is more pronounced during low flow conditions because the nutrients become more concentrated and the travel time through the shallow, warm upstream end of the lake becomes longer, allowing optimal conditions for algae growth.

This seasonality is exhibited by Ecology in a graphical representation of data collected from the Spokane River at the state line and dissolved oxygen in Lake Spokane, as shown in Figures 5 and 6 of the TMDL, respectively. The oxygen profiles in Figure 2 also illustrate the seasonal fluctuations of dissolved oxygen. As shown in these figures, all parameters exhibit variations with the changing seasons in Lake Spokane.

The TMDL does not establish numeric limits for point or non-point sources during the winter (November through February). However, point source discharges will remain well controlled year-round because federal NPDES regulations at 40CFR 122.41(e), (m) prohibit bypass of treatment facilities and require proper operation and maintenance of treatment facilities. Therefore, facilities must continue discharging their effluent through the same treatment facilities during the winter as they do during the March-October time period. These regulatory requirements will be incorporated into the Washington and Idaho wastewater permits (as required by 40 CFR 122.41(e), (m)), and when coupled with specific Best Management Practices for phosphorus control, will ensure that discharges are well-controlled year-round. In order to better assess the effect of the bypass provision on winter discharges, EPA plans to propose to include year-round phosphorus monitoring in the NPDES permits for Idaho, and EPA believes that Ecology will act similarly for Washington dischargers.

8. Reasonable Assurance

Section 303(d)(1)(C) of the Clean Water Act states that TMDLs must be established at a level necessary to implement the applicable water quality standards. The 1991 EPA document, "Guidance for Water Quality-based Decisions: The TMDL Process," indicates that, where a TMDL allocates both load and wasteload allocations, there must be

reasonable assurance that nonpoint source reductions necessary to meet load allocations will in fact occur as a basis for allocating wasteload allocations to point sources. If there is no reasonable assurance that nonpoint source reductions will be achieved, the entire load reduction must be assigned to point sources (EPA 1991a, p. 15).

In order to assign WLAs to point sources at a level above natural background level for the Spokane River, there must be reasonable assurance that point and nonpoint source reductions will be implemented, and that Avista's actions will create additional loading capacity in the Lake for phosphorus, BOD and ammonia. If it's not reasonable to assume that point and nonpoint source reductions and the loading capacity improvements in Lake Spokane can be achieved, then the allocations for the point sources must be reduced in order to ensure that water quality standards will be met in Lake Spokane.

EPA is satisfied that adequate reasonable assurance has been provided in the TMDL, for all of the reasons discussed below. In the absence of national EPA reasonable assurance guidance, EPA Region 10 has evaluated the reasonable assurances for Avista and nonpoint source reductions by examining the following five aspects of implementation.

- Who will implement the control measures (e.g. Federal, State or local authorities)?
- Is there an implementation plan that identifies the measures needed to achieve the required reductions?
- What is the timeframe for implementation?
- Are the proposed reductions technically feasible; what incentives exist for implementation?
- How will Ecology know if substantial progress is being made to implement the TMDL?

EPA's evaluation of reasonable assurance for Avista and nonpoint sources is explained in Sections 8.1 and 8.2 below. Implementation of the wasteload allocations established for point source dischargers is discussed in Section 8.3.

8.1 Avista's Long Lake Dam

EPA believes that it is reasonable for Ecology to expect that Avista will implement control measures that achieve the DO improvements specified in Table 7 of the TMDL because such control measures are required, are enforceable, and are thought to be technologically achievable, as explained below.

Long Lake dam was relicensed by the Federal Energy Regulatory Commission (FERC) on June 18, 2009. Relicensing required the issuance of an Ecology certification under Section 401 of the Clean Water Act ("401 Certification"). The 401 Certification, finalized by Ecology on May 8, 2009, includes a General Condition requiring that the Project comply with water quality standards. The 401 Certification also states the following:

- Ecology will determine Avista's contribution for the DO problem in the Spokane River and Avista's proportional level of responsibility for control measures (401 Certification, Part 5.6A).
- After EPA approval of the DO TMDL, Ecology will amend the 401 Certification by Administrative Order to require the Licensee (i.e. Avista) to develop a Water Quality Attainment Plan (WQAP) for DO.
- The WQAP will provide a detailed strategy to address Avista's proportional level of responsibility, based on its contribution to the DO oxygen problem in Lake Spokane as determined in the DO TMDL.
- The WQAP will contain a compliance schedule for implementation that, to the degree it is reasonable and feasible, is synchronized with the milestones and assessments of the DO TMDL for the Spokane River, and that does not exceed ten years.
- If at the end of the ten year compliance period Avista is unable to address its proportional level of responsibility as determined by the TMDL, then Avista will propose an alternative action to achieve compliance with the DO TMDL (401 Certification, p. 47).

The requirements of the 401 Certification are enforceable by the Department of Ecology, and the conditions of the certification also become conditions of any license issued by FERC (33 U.S.C. § 1341(d)).

The 401 Certification requires that the most feasible methods for improving DO in Lake Spokane be identified during the development of the WQAP. Ecology indicates in the TMDL that Avista can consider all necessary methods of pollutant reduction to meet the terms and conditions of the 401 Certification (TMDL, p. 56). Ecology's preferred method of pollutant reduction is to reduce nonpoint source contributions to the reservoir by implementing BMPs and pollutant controls on lands that would otherwise directly contribute pollutants to the reservoir. But language in the TMDL does not preclude the possibility of "other methods" or "technologies," which can include hypolimnetic oxygenation (TMDL, p. C9).

Some commenters expressed concerns that the DO improvement required of Avista are "too large." EPA believes, however, that the DO improvements specified in Table 7 of the TMDL are both reasonable and feasible, and can be achieved either through oxygenation and/or non-point source reduction, or a combination of the two, for the following reasons.

The DO improvements needed for Lake Spokane are wide-spread throughout the lake, but relatively small in magnitude (i.e. 1 mg/L DO improvement). EPA has identified examples of other DO enhancement projects that have achieved DO improvement significantly greater (e.g., 3-5 mg/L DO improvement) than that required of Avista in the TMDL. EPA has not determined whether or not these projects are similar in scale or

complexity to a comparable project on Lake Spokane, but in the absence of a site specific feasibility study, one can reasonably conclude from these examples that the DO improvement of 1 mg/L specified in this TMDL is not in itself "too large."

> *Twin Lakes, Washington*. A pilot oxygenation system was installed in North Twin Lake in 2008. The pilot data show that the hypolimnion of North Twin Lake maintained DO levels above 6 mg/L and supported the native cold water fishery. Nearby South Twin Lake served as a reference lake, with DO levels below 1 mg/L (EPA, D. Martin, 2010).
>
> *Amisk Lake, Alberta*. Oxygenation of the hyponlimnion increased DO from 1.0 to 4.6 mg/L (Prepas 1997).
>
> *Gulf Island Pond, Maine*. The 1995 Gulf Island Pond TMDL includes requirements for reservoir aeration. Prior to aeration, 5% of Gulf Island Pond met the minimum DO criterion; in the first 4 years after the oxygenation project was initiated approximately 85% of the Pond met the criterion (personal communication with B. Mower, Maine DEQ, 2009).

In summary, EPA believes it is reasonable to assume that Avista will achieve the water quality improvements required by this TMDL because the requirements of the 401 Certification are enforceable by the Department of Ecology; because significant improvement in DO levels have been obtained in other reservoirs; and because Avista has the flexibility of looking at a combination of oxygenation and non-point source reductions. Ecology states that all assumptions in the TMDL, including WLAs, LAs and Avista's anticipated contribution to the reservoir's increased loading capacity, will be re-evaluated and possibly changed based on new information and research (adaptive management), as described in the Managed Implementation Plan section of the TMDL, during biennial assessments, between NPDES permit cycles, and during the ten year assessment.

8.2 Nonpoint Source Reductions

EPA believes that it is reasonable for Ecology to expect that nonpoint sources controls will be implemented, as required by the TMDL, because such control measures are thought to be technologically achievable, are enforceable, and because numerous incentives for implementation exist, as discussed below.

TMDL Implementation Plans are routinely developed by Ecology for all TMDL projects in Washington, in accordance with the "Memorandum of Agreement Between the EPA and Ecology Regarding the Implementation of Section 303(d) of the Federal Clean Water Act" (October 1997). This MOA specifies that Ecology's TMDLs contain a Summary Implementation Strategy, and that one year later a more detailed implementation plan be completed. The Spokane River TMDL contains a Managed Implementation Plan (MIP), which was developed by Ecology and the Spokane River TMDL Collaboration group, and which will be utilized to guide implementation of the TMDL (p. 59-84).

As described in the MIP, the Nonpoint Source Advisory Committee oversees the development of a nonpoint source study. Funding for the study ($246,000) was initially provided by the US Congress, and administered by EPA. Funding for later stages of the project ($650,000) was recently provided by the Washington State Legislature. The study's purpose is to:

- Identify and quantify nonpoint sources into the mainstem Spokane River and Lake Spokane and major tributaries, including Hangman, Little Spokane River, and Coulee Cree.
- Identify BMPs to address nonpoint sources.
- Evaluate the cost-effectiveness and longevity of the BMPs
- Prepare a BMP plan for reduction of phosphorus from nonpoint sources based on selected BMPs

Findings from this study will support the work of TMDL advisory committee members in the development of TMDL implementation plans, delta management plans and Avista's WQAP (TMDL, p. 54-55). The following state, local and nonprofit agencies are participating in the Spokane River Nonpoint Source Advisory Committee:

- Washington Department of Ecology
- Spokane County
- Spokane County Conservation District
- City of Spokane
- City of Spokane Valley
- Liberty Lake Water & Sewer District
- Spokane Tribe
- Idaho Dept. of Environmental Quality
- Kootenai County
- Panhandle Health District
- City of Coeur d'Alene
- City of Post Falls
- Coeur d'Alene Tribe
- Spokane River DO TMDL Oversight Committee
- Sierra Club - Center for Justice
- Lands Council

TMDL implementation planning is well underway on Hangman Creek. Ecology completed the Hangman Creek TMDL for fecal coliform, temperature and turbidity in 2009. This TMDL contains an implementation strategy for TSS that will also be effective in reducing phosphorus in Hangman Creek. The Hangman Creek dissolved oxygen and pH TMDLs remain under development and are expected to be complete in 2011. These TMDLs may further differentiate the amount of nutrient loading in these tributaries that is naturally-occurring from that which is human-caused. The detailed implementation plans expected from these TMDL will also outline the BMPs needed to

meet load reductions specified for Coulee Creek. Recommended BMPs for Coulee Creek are expected to be very similar to the BMPs specified in the Hangman Creek TMDL TSS section. The Little Spokane River DO and pH TMDL (and summary implementation plan) is scheduled to be completed in 2010.

Ecology indicates that it will take 10-15 years (i.e. 2025) to achieve 75 to 100 percent of the implementation activities necessary to meet water quality standards for total suspended solids (11 to 26 percent reduction in total load) in Hangman Creek. Since reductions in phosphorus are expected to occur along with reductions in sediment, the schedule for meeting the load allocations in Table 6 should be on roughly the same time frame as the wasteload allocations (TMDL, p. 55). Given that implementation will be occurring in all 3 of the tributaries concurrently, EPA believes this is a realistic assessment of the implementation timeframe.

Ecology states in the TMDL that recent tributary monitoring indicates that, during the past several years, nutrient concentrations have decreased and are close to the allocation concentrations specified in Table 6a. Ecology has therefore concluded that the allocation concentrations should be achievable in typical flow years, especially upon implementation of the tributary TMDLs, but may still be difficult to obtain during high flow years. In addition, the proposed tributary reductions are based on WARMF modeling that predicts the reductions that will occur when BMPs are installed, as discussed in more detail in the LA section above.

Implementation of some nonpoint source reduction activities is well underway. For example, a ban on dishwashing detergents containing more than 0.5% phosphorus went into effect in July 2008 in Spokane County. Preliminary results show that there is less phosphorus entering treatment plants since the ban went into effect (TMDL, p. 56).

EPA believes it is likely that non-point source reductions will take place, in part because Avista and point source dischargers may participate in actions to reduce phosphorus from any nonpoint sources, provided those actions meet the requirements of the state water quality standards offset rule (WAC 173-201A-450) and are approved by Ecology, or directly reduce the pollutant load of the permittees' influent. These potential offsets are discussed on pages 66-67 of the TMDL. In addition, Ecology has the authority to enforce water quality regulations under Chapter 90.48 RCW; and may use formal enforcement authority, including fines, if voluntary compliance with BMPs is unsuccessful.

Ecology states that Shoreline Management Plans (SMPs) have recently been developed by the City of Spokane and Spokane County (TMDL, p. 56). These SMPs define BMPs within their jurisdictions for water quality improvements, including most of Hangman Creek and the Little Spokane River. For example, both the city and county SMPs contain provisions to protect vegetative buffers, which help prevent water pollution by limiting entry of sediments, nutrients and other pollutants into surface waters. Upon approval by Ecology, these plans provide a potential means of city and county enforcement of water quality BMPs for nonpoint source pollution to meet the tributary load allocations (TMDL p. 56).

The TMDL states that all assumptions in the TMDL, including WLAs, LAs and Avista's anticipated contribution to the reservoir's increased loading capacity, will be re-evaluated and possibly changed based on new information and research (adaptive management) as described in the Managed Implementation Plan section of the TMDL, during biennial assessments, between NPDES permit cycles, and during the ten year assessment.

The monitoring associated with these assessments is discussed on pages 76-77 of the TMDL. Ecology is conducting ambient monitoring at ten sites, from Lake Coeur d'Alene to the Long Lake Dam. Monitoring began in May 2007 and, pending available resources, will continue into the future. Samples are collected monthly for temperature, nutrients (nitrogen and phosphorus), total suspended solids, pH, conductivity, DO, TOC and DOC. Data from this monitoring effort will be used to refine the model and evaluate the effectiveness of the TMDL (TMDL, p. 55).

8.3 Point Source permits

For the reasons discussed below, EPA believes that the WLAs for point sources will be incorporated into NPDES permits, and therefore will be fully implemented.

All point sources of pollution in Washington and Idaho that discharge to the Spokane River and contribute to impairments in the Spokane River have received WLAs in this TMDL, and are covered by NPDES permits (see Table 5 in the TMDL). One of the facilities receiving a WLA in the TMDL, Spokane County, is currently under construction and has not yet received an NPDES permit.

The way in which the stormwater WLAs will be implemented is discussed in Section 4B of this document. The Washington Department of Ecology plans to request public comment on NDPES permits for Liberty Lake, Kaiser, Inland Empire Paper Company and the City of Spokane WWTP in 2010, shortly after completion of the TMDL (TMDL, p. C-12). Ecology expects those NPDES permits will contain effluent limits consistent with the final WLAs specified by this TMDL (122.44(d)(1)(vii)(B). State regulations currently allow up to a ten year compliance schedule for NPDES permits. The TMDL contains an extensive discussion of point source implementation issues as part of the Managed Implementation Plan (pages 61-66).

EPA is currently developing draft NPDES permits for the 3 municipal dischargers in Idaho, which are scheduled to be available for public review in 2010.

Dischargers in the Spokane basin are currently piloting WWTP technologies that achieve phosphorus removal down to a monthly average of 50 µg/L or lower. Ecology has also agreed to consider allowing dischargers to meet their WLA through a combination of advanced treatment and "delta management" strategies - - other actions that reduce an equivalent amount of pollution. Potential delta management strategies are discussed on pages 62-64 of the TMDL.

9. Spokane Tribe of Indians

The Spokane Tribe of Indians has jurisdiction over a portion of the Spokane River that begins approximately 2 miles downstream of Long Lake Dam, and which includes the Spokane Arm. The Spokane Arm of Lake Roosevelt is the lower portion of the Spokane River, under the jurisdiction of the Spokane Tribe, that lies upstream of Grand Coulee Dam and which is hydrologically influenced by Grand Coulee dam (e.g., increased residence time). Dissolved oxygen levels in the Spokane Arm are, at times, below aquatic life criteria, and the Spokane Tribe requested EPA's support in evaluating the impact of the upstream TMDL on Tribal waters.

A preliminary Spokane Arm modeling report was available during the public comment period, and was finalized, under the direction of EPA and in consultation with the Spokane Tribe, in December 2009. The final modeling report for the Spokane Arm (Cadmus 2009) contains extensive information about the impact of upstream sources.

The goal of the Spokane River TMDL is to solve the DO water quality problems in the Spokane River between the Idaho border and Lake Spokane. While the TMDL was not designed to eliminate impairments on the Spokane Arm, it will improve water quality in the Spokane Arm even as population increases in the watershed. The final modeling report for the Spokane Arm indicates that the upstream TMDL, which is established for projected 2027 population levels, will improve the phosphorus levels in Tribal waters from an average of 0.025 mg/L (current conditions) to 0.016 mg/L and will result in minor DO improvements in the Arm (Table 30, Cadmus 2009). The modeling report also indicates that reducing sediment oxygen demand (SOD) in the Arm is the single most important factor in improving water quality in the Spokane Arm; and is, in fact, more important than the reductions required by the upstream TMDL.

Without an official interpretation of Tribal Standards, it is unclear whether or not the TMDL meets the EPA-approved Water Quality Standards for the Spokane Tribe. Specifically, there is ambiguity regarding the appropriate classification of the Spokane Arm. The EPA-approved Water Quality Standards for the Spokane Tribe of Indians (2003) classifies the Spokane Arm as a "Class A" river, even though the lower portion of the Arm may fall within the Tribe's definition of a "lake" (e.g. parts of the Spokane Arm become stratified in the summer). Additionally, it is unclear how the presence of the impoundment will be considered under the "natural condition" provision of the Tribal Standards; the way in which the "natural condition" is interpreted (e.g. hydrologic impact of Grand Coulee dam; SOD) significantly impacts the interpretation of the Tribe's water quality standards.

If the Spokane Arm is considered to be riverine, there are two standards that could apply; a numeric standard and a natural condition standard:

- "Dissolved oxygen shall not be less than 8.0 mg/L (9.2.c.ii);

- “Whenever the natural conditions of any specific surface waters of the reservation are of a lower quality than the criteria assigned to waters typical of that class, the Department may determine that the natural conditions shall constitute the water quality criteria.”(3.2)

The standards define “all reservoirs with a mean detention time of greater than 15 days” as Lake Class. If the Spokane Arm is considered to be a lake, the following standard applies:

- “Dissolved oxygen shall exhibit no measurable decrease from natural conditions,”

Despite uncertainty about the way in which the Tribal standards will be interpreted, many conclusions can be drawn from the water quality modeling of the Spokane Arm performed by Cadmus Group and Scott Wells (December 2009). Four different modeling scenarios, described below, were developed in order to better understand the existing and potential future water quality in the Spokane Arm after the TMDL is implemented.

1. TMDL Scenario.
   This scenario illustrates the way in which the upstream Spokane TMDL, when fully implemented, will impact water quality in the Spokane Arm. Oxygen-demanding pollutants are reduced to the levels required by the TMDL, and DO levels at the Long Lake Dam tailrace are increased to 8.0 mg/L (in recognition of Avista’s requirement to increase DO in the tailrace). The impacts of Avista’s anticipated contribution to the reservoir’s increased loading capacity (i.e. oxygenation or non-point source reductions) are not included in this scenario, which means that the results of this scenario under-predict future water quality improvements.

2. TMDL Scenario with increased Tributary Sources.
   This scenario is identical to scenario #1, except that tributary loadings are increased to the 2001 levels. This scenario looks at the impact on Tribal water quality if non-point sources aren’t reduced during TMDL implementation.

3. No Source.
   This is similar to the Spokane TMDLs “no source” model run; all upstream anthropogenic sources are removed. Sediment oxygen demand levels in the Arm (ranging from 0.1 to 1.1) reflect estimated current conditions, and they are higher than the levels in Lake Spokane in the “no source” TMDL run. The impacts of Avista’s anticipated contribution to the reservoir’s increased loading capacity (i.e. oxygenation or non-point source reductions) are not included in this scenario.

4. No Source with 50% reduced SOD.
   This scenario is identical to scenario #3 except that sediment oxygen demand is reduced 50%, and ranges from 0.05 to 0.55.

As noted above, Scenario #1 indicates that implementation of the upstream TMDL will improve the quality of Tribal waters even as population grows (the TMDL scenarios consider growth through 2027).

Scenario #2 predicts that the upstream TMDL will improve water quality even if upstream non-point sources are not reduced as much as the TMDL requires. The impact of these increased non-point source loads on water quality is relatively small (Cadmus, Tables 30 and 31).

Scenario #3 ("no source") predicts that, even if all upstream anthropogenic sources are removed, the DO will decrease rapidly in the bottom portions of the river, reaching concentrations as low as 1 mg/L (Cadmus, Figure 77). In other words, the 8 mg/L riverine standard will not be achieved in portions of the Spokane Arm even if all upstream sources of pollution are eliminated; indicating that application of the natural condition provision may be the best way to assess the quality of the lower Arm.

Scenario #4 predicts that SOD is the most important factor affecting DO in the Spokane Arm (Figure 78). When SOD is reduced by 50%, DO levels in the deeper portions of the Arm increase to above 3 mg/L, and anoxic conditions are eliminated. While conditions are improved, they still do not achieve the 8 mg/l riverine standard. The elevated SOD in the Spokane Arm is a legacy of the accumulation of oxygen-demanding pollutants in sediment. Sediment accumulation is, in turn, caused by the hydrologic regime created by Grand Coulee dam. These results indicates that improving SOD is critical to improving water quality, and that assumptions about SOD will have a significant impact on the estimation of "natural conditions" within the Arm.

Finally, although EPA's regulations expressly require that NPDES permit limits ensure compliance with downstream state water quality standards, it is less clear that TMDLs must be set at a level necessary to implement all downstream jurisdiction's water quality standards. However, even if it is assumed that there is such a requirement, it is not possible at this time, and for purposes of developing this TMDL (which addresses impairments in the Spokane River and Lake Spokane, upstream of Long Lake Dam), to determine whether the tribe's water quality standard is being met based on the ambiguities discussed above.

10. Public Participation

The extensive public participation process used to develop the Spokane River DO TMDL is documented on pages 82-84 of the TMDL. EPA believes that the process provided all stakeholders a fair and adequate opportunity to comment on the proposed TMDL. EPA has considered all stakeholder comments (and responses provided by Ecology) in the course of its review and approval of this TMDL.

11. Dispute Resolution

Washington state law at RCW 23.21A.130 specifies that for any Ecology studies conducted as part of TMDL development, those technical or procedural disputes or disagreements that arise during the participation and comment process may be presented to the Director for review. The Director shall then conduct a review of the disputed items and issue written findings and conclusions to all interested participants. The process developed by Ecology to implement this "dispute resolution" law is described in a May, 2008 Policy ("Dispute Resolution Related to Total Maximum Daily Loads").

After the Spokane TMDL was submitted to EPA on February 12, 2010, numerous parties filed formal written disputes with Ecology, and requested that Ecology provide an opportunity for the disputing parties to make oral presentations. Ecology accepted the dispute resolution requests, and held an oral presentation meeting on Monday April 5, 2010, from 1:00pm to 5:00pm in Spokane. The dispute was heard by a panel assembled by the Director of Ecology consisting of Ecology officials (and one external expert) not involved in the development of the TMDL.

On April 14, Ecology requested EPA's assistance in following-up on a water quality model "flow stability" issue identified by one of the disputing parties. EPA's evaluation of that issue is summarized in an April 16, 2010 memorandum. In early March, EPA received two written requests to delay its decision on whether or not to approve the final Spokane River TMDL pending the outcome of the dispute resolution process. On March 26th, EPA decided to temporarily postpone EPA's final action on the TMDL until Ecology completed its dispute resolution process.

On May 5, 2010, Ted Sturdevant, the Director of Ecology, notified the disputing parties that Ecology will not change the TMDL as a result of the dispute resolution process. Ted Sturdevant's May 5 letters to the disputing parties affirm each of the dispute panel's recommendations as described in the panel's *Summary of Recommendations* memorandum and *Summary Matrixes* (five matrices developed for each of the five disputing parties). The panel recommends that Ecology's Water Quality Program work with stakeholders during TMDL implementation to clarify several issues. Ecology's decision was sent to each of the disputing parties by Ecology's Director and includes the dispute panel recommendations ("Summary of Recommendations," May 5), the Summary Matrixes (5 different matrices developed for each of the five disputing parties), and EPA's April 16th memorandum. On May 6, 2010, Ecology informed EPA that the dispute resolution process had concluded, and requested that EPA move forward with its decision process.

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