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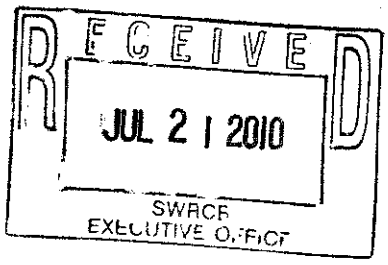
July 21, 2010



Jeanine Townsend
Clerk to the Board
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814

RE: Comment Letter – Klamath River – TMDLs.

Dear Ms. Townsend:

This letter provides PacifiCorp's response to the State Water Resources Control Board (State Water Board) June 22, 2010 *Notice of Opportunity to Comment on Proposed Approval of an Amendment to the Water Quality Control Plan for the North Coast Region (Basin Plan) to Establish: (1) Site Specific Water Quality Objectives for Dissolved Oxygen in the Klamath River; (2) an Action Plan for the Klamath River Total Maximum Daily Loads Addressing Temperature, Dissolved Oxygen, Nutrient, and Microcystin Impairments in the Klamath River; and (3) an Implementation Plan for the Klamath and Lost River Basins* (hereafter referred to as "the Notice").

Thank you for the opportunity to comment on the proposed approval of the amendment by the State Water Board. As indicated in the attachment, and already discussed in detail in our previous comment letters to the North Coast Regional Water Quality Control Board (Regional Water Board) which are enclosed, PacifiCorp remains concerned about the technical integrity of the TMDL modeling, analysis, and the defensibility and achievability of the TMDL's proposed load allocations. Among other things, the TMDL is deficient in the following ways:

- The TMDL assigns water quality targets and load allocations that are inappropriate and unachievable.

- Several errors in the TMDL model stand uncorrected.

- The Regional Water Board did not perform an adequate environmental review and unlawfully postpone environmental analysis, even at the programmatic level, to after TMDL adoption and approval.

PacifiCorp submitted voluminous comments to the Regional Water Board on the Draft Klamath River (California) TMDL on August 27, 2009, and numerous additional comments on the Revised Draft Klamath River (California) TMDL on February 9, 2010. In addition, PacifiCorp made oral comments at the March 2010 hearing and the Regional Water Board made oral responses at that time. Appendix 10 of the Final Klamath River TMDL Staff Report issued by the Regional Water Board in March 2010 provided responses to comments on the TMDL documents by various sources, including responses to over 700 comments made by PacifiCorp in the letters cited above. The Final Klamath River TMDL Staff Report is the key technical document supporting the version of the amendment that is currently being considered for approval by the State Water Board.

In nearly all cases, the responses in Appendix 10 of the Final Klamath River TMDL Staff Report did not adequately address PacifiCorp's concerns. Despite the numerous and substantive comments provided by PacifiCorp as part of its detailed review of the California TMDL, the Final Klamath River TMDL largely sidestepped PacifiCorp's comments and retains many serious technical errors and flaws that render the TMDL modeling and underlying technical analysis unsuitable for setting TMDL load allocations.

For example, both the TMDL model reviews conducted by the U.S. Geological Survey on behalf of the U.S. Bureau of Reclamation and by PacifiCorp identified an improper modification to the TMDL modeling source code which reduced the solar radiation in certain river reaches contained within the Klamath Hydroelectric Project area by 20 percent. This model revision, which was described as an "error" by the USGS, was corrected in the Keno reservoir reach – the portion of the model reviewed by USGS – but retained in the river reaches below Keno dam included within the Klamath Hydroelectric Project area, and downstream to the estuary. Retaining this modeling assumption in river reaches without model recalibration introduces error that significantly biases the TMDL temperature modeling results and increases the magnitude of the temperature load allocations assigned to the Klamath Hydroelectric Project. This condition, coupled with unrealistic and incorrect representation of the critical water quality boundary condition at Link River dam, raise concerns about the modeling completed to determine and assign load allocations. Many other significant technical comments remain inadequately addressed.

As requested by the Notice, PacifiCorp provides further explanations[1] in the following attachment of why the responses in Appendix 10 of the Final Klamath River TMDL Staff Report were inadequate, incorrect, or unresponsive. For efficiency purposes, PacifiCorp's explanations in the attachment are presented according to the relevant comment categories and comment/response reference numbers used in Appendix 10 of the Final Klamath River TMDL Staff Report. Rather than repeat each of the numerous comments made by PacifiCorp and explain the inadequacies of each of the Appendix 10 responses, PacifiCorp summarizes the inadequacies in bulleted form under the relevant comment categories and according to the specific comment reference numbers used in Appendix 10. To the extent the Regional Water Board did not respond to any or portions of the comments made, the State Water Board should consider them reiterated here.

Should you have any questions in regard to these comments please feel free to contact me at (916) 447-2166.

ELLISON, SCHNEIDER & HARRIS L.L.P.

By: _____
Robert E. Donlan

Attorneys for PacifiCorp

[1] While PacifiCorp provides explanations herein for how the Regional Water Board's responses did not adequately address the concerns raised in PacifiCorp's comments, this should not be construed as a concession that these explanations are necessary or a waiver of the right to raise these concerns in later proceedings.

Attachment

Klamath River (California) TMDL: PacifiCorp Comments Not Adequately Addressed by Appendix 10 Responses

Introduction

PacifiCorp submitted numerous comments to the North Coast Regional Water Quality Control Board on the Draft Klamath River (California) TMDL on August 27, 2009 and also submitted numerous additional comments on the Revised Draft Klamath River (California) TMDL on February 9, 2010. In addition, PacifiCorp made oral comments at the March 24 hearing and the Regional Water Board provided oral responses at that time. Appendix 10 of the Final Klamath River TMDL Staff Report issued by the Regional Water Board in March 2010 provided responses to comments on the TMDL documents by various sources, including comments made by PacifiCorp in the letters cited above. The Final Klamath River TMDL Staff Report is the key technical document supporting the version of the amendment that is currently being considered for approval by the State Water Resources Control Board.

In nearly all cases, the responses in Appendix 10 of the Final Klamath River TMDL Staff Report did not adequately address PacifiCorp's concerns. In this attachment, PacifiCorp explains why. Rather than repeat each of the numerous comments made by PacifiCorp and explain the inadequacies of each of the Appendix 10 responses, PacifiCorp summarizes the inadequacies in bulleted form under the relevant comment categories and according to the specific comment reference numbers used in Appendix 10.

Responses to PacifiCorp's Key Comments

The Regional Water Board's responses do not adequately address PacifiCorp's comments that the very large nutrient load reductions required by the Klamath River TMDL are not achievable or practicable.

Applicable Comment Response Reference Numbers: Responses to PacifiCorp August 2009 comments referenced in Appendix 10 as A6, A30, B10, B12, C47, D1, D4, D9, and E3. Responses to PacifiCorp February 2010 comments referenced in Appendix 10 as Hemstreet-1, 2, 4, 21, 22, 23, 25, 75, 77, 107, 109, 119, 125, 170, 172, 204, 205, 206, 207, 209, and 238, 248, 296, 299, and 301.

- The Regional Water Board's responses do not adequately address a key concern of PacifiCorp's comments, namely that the very large nutrient load reductions required by the Klamath River TMDL are not achievable or practicable. For example, the TMDL's nutrient allocations call for reductions in total phosphorus (TP) of up to 98 percent and total nitrogen (TN) of up to 75 percent at Stateline (and other downstream locations by extension). The Regional Water Board's responses

(including Responses 1, 2, 4, 21, 22, 77, 107, 109, 170, 172, 204, 205, 209, and 238 in Appendix 10) offer no substantive technical rationale supporting the achievability and practicality of these very large nutrient load reductions. Rather, the responses only provide simple unsubstantiated opinion statements, such as Regional Water Board staff "disagrees with this comment" (e.g., Response 2) or "believe that the targets and allocations are achievable" (e.g., Response 172).

- The Regional Water Board's responses do not adequately address PacifiCorp's request for actual documented cases in which nutrient load reductions on such a large scale have been achieved elsewhere, or even determined to be feasible and achievable for planning and implementation purposes, particularly where nutrient sources are overwhelmingly nonpoint source-dominated as in the Klamath Basin (e.g., Responses D1 and 205). The Regional Water Board briefly mentions (in Response D1) four "nutrient management programs", namely Lake Washington, Moses Lake, Gulf of Mexico hypoxia, and the Chesapeake Bay. The Lake Washington and Moses Lake programs are at a much smaller scale than the Klamath Basin. In the case of Lake Washington, nutrient sources are principally related to specific point-source discharges (e.g., sewage treatment plants). The Gulf of Mexico and Chesapeake Bay programs involve nutrient load reduction goals that are at much lower percentages than required in the Klamath River TMDL. If the above programs are the only cases that the Regional Water Board can cite, this simply reinforces PacifiCorp's conclusion that the magnitude of nutrient load reductions required in the Klamath River TMDL are unprecedented and unlikely to be attained.

- PacifiCorp's previous comments demonstrated that the TMDL's water quality targets and load allocations are inappropriate and unrealistic because they do not reflect the reality of the Klamath River Basin's natural or background nutrient-enriched characteristics. The TMDL acknowledges that Upper Klamath Lake's hypereutrophic status "has had profound water quality implications and has resulted in impairment of beneficial uses ... in downstream waters" of the Klamath River. The Regional Water Board's response (Response 1) also acknowledges that the 'TMDL nutrient limits for reservoirs do require nutrient reduction below background" (emphasis added). Despite these acknowledgements, the Regional Water Board's response (Response 1) states that the "targets and allocations are achievable and the implementation plan provides a strong framework to develop the necessary management actions required to achieve the proposed nutrient reductions". Also, it is unclear why the Regional Water Board considers the implementation plan to be "strong" (Response 1), given that it is only a generalized framework for the process for developing an implementation plan. Beyond these general statements and information, the TMDL and the Regional Water Board's responses to various PacifiCorp's comments on this issue (including Responses A6, A30, B10, B12, C47, D4, D9, E3, 23, 25, 75, 77, 119, 125, 205, 206, 207, 238, 248, 296, 299, and 301 in Appendix 10) provide no details on the specific actions, technologies, or methods the Regional Water Board assumes could achieve these large nutrient reductions, nor the likely timeframe in which the reductions could be attained. Absent these details, the TMDL lacks credibility, particularly given the Klamath River's natural nutrient-enriched characteristics.

- The Regional Water Board's responses are also inadequate because EPA's TMDL regulations require that load allocations be "attributed" to nonpoint and natural background sources based on best estimates of the actual pollutant loadings from those sources and of the load reductions that can practicably be achieved from them. See 40 C.F.R. § 130.2. There is no basis in the record for reasonably concluding that the TMDL load allocations can practicably be achieved; to the contrary, the record shows that they cannot practicably be achieved.

The Regional Water Board's responses do not adequately address PacifiCorp's comments related to problems with the water quality modeling used to support the Klamath River TMDL.

Applicable Comment Response Reference Numbers: Responses to PacifiCorp August 2009 comments referenced in Appendix 10 as C3 and D1. Responses to PacifiCorp February 2010 comments referenced in Appendix 10 as Hemstreet-9, 68, 76, 116, 151, 187, 189, 190, 257, 258, 259, 261, 262, 264, 283 to 321, 323, 324, and 325.

- PacifiCorp provided extensive comments detailing our concern with the 20 percent reduction in solar radiation in the river models, including detailed performance metrics based on model simulations denoting clear bias under the Regional Water Board's assumptions. The Regional Water Board's responses (including Responses 9, 68, and 261) do not address the fundamental issue: although the river models and reservoir models utilized different solar radiation values (calculated and measured, respectively), the river model (as supplied by PacifiCorp) was calibrated to the calculated solar values, and these temperature calibration parameters were not changed when solar radiation was reduced by 20 percent. Regional Water Board comments do not address this critical, yet fundamental issue: simply lowering the calculated solar radiation by 20 percent in the river models without recalibration introduces systematic bias towards lower simulated temperatures compared to field observations. Another element of the comment that is not adequately addressed is why the 20 percent reduction was applied to all river reaches from Link Dam to the Klamath River estuary, even though the stated concern was a single site – Klamath River near Shovel Creek. USGS (Risley and Rounds, 2006) had provided a detailed peer review of the river calibration period – five years from 2000-04 – citing it as the best available model for regulatory processes. However, this peer review finding does not justify a solar radiation reduction without recalibration of the model. Further, this reduction in solar radiation, which was described as an "error" and an "oversight" in the recently released USGS review of the TMDL model (Rounds and Sullivan 2010), was corrected in the Lake Ewauna to Keno reservoir reach portion of the model upon which the USGS commented, but remains uncorrected in downstream river reaches. Thus, this comment remains unaddressed.

- The Regional Water Board's responses do not adequately address PacifiCorp's comments regarding our concerns with the inappropriate boundary conditions at Link Dam assumed as the input to the model. PacifiCorp's key concerns include: (1) biased selection of phosphorus loads and concentrations from the Upper Klamath Lake TMDL to form boundary conditions; (2) incorrect extrapolation of the Upper

Klamath Lake TMDL for phosphorus to other nutrients based on fixed species ratios; and (3) incorrect partitioning of organic matter between labile and refractory fractions. The Regional Water Board's responses (including Responses 76, 151, 257, 258, 259, 291, 295-305, and 314) do not adequately address these key concerns for the following reasons:

- The Regional Water Board's responses continue to defend the biased selection of phosphorus loads and concentrations from the Upper Klamath Lake TMDL to form boundary conditions. Regional Water Board staff selected the single year 1995 as the representative year from the Upper Klamath Lake TMDL. Using either load or concentration, 1995 is not the median year, but rather has lower loads and concentrations than the median year (which was 1998: 1995 was approximately 14 percent lower by concentration and nearly 30 percent lower by load than 1998). Also, using the median values to set regulatory criteria in the TMDL ensures that for half of the years the river will not be in compliance, leading to unrealistic expectations from regulated entities and unrealized water quality benefits. Selecting the appropriate year coupled with sensitivity analysis would have readily quantified the potential effect of the selected boundary condition and led to a more appropriate TMDL analysis.
- The Regional Water Board's responses continue to defend the incorrect extrapolation of the Upper Klamath Lake TMDL for phosphorus to other nutrients based on fixed species ratios (stoichiometry). This incorrect extrapolation leads to unrealistic negative organic matter concentrations. To ameliorate negative concentrations, a minimum value was applied, leading to an overall loss of mass in the system boundary condition. The fixed annual ratios relating one nutrient species to another resulted in a seasonal distribution of organic matter that is counter to the scientific literature, with minimum values (near zero) occurring in summer and maximum values occurring in winter.
- The Regional Water Board's responses do not adequately address the incorrect partitioning of organic matter. Regional Water Board staff concluded that data from 2007-2008 were not applicable because "the data are 5 to 8 years more recent than the modeled period" (Response 259). However, Regional Water Board staff relied heavily on draft data and draft reports for their assessment of conditions in Copco and Iron Gate reservoirs from later data sets (Asarian et al. 2010). Further, the critical issue of partitioning was first broached in 2006 between Watercourse Engineering, Inc, and the Regional Board Staff and their consultant Tetra Tech. USGS reports with data from 2007 and 2008 clearly documented the more representative partitioning of organic matter, including seasonal variation. The data from 2007 and 2008 has clearly been one of the most insightful and useful data sets collected in the upper Klamath River to date. This is the best available data (even though collected in a time period later than 2000), and would have dramatically improved the model's accuracy in representing the system, yet was ignored in the TMDL analysis.
- Downstream implications of these boundary conditions at Link Dam for the 2000 year simulation are also important. In PacifiCorp's comments associated with

Response 300, it was pointed out that the model results from the TMDL output indicate severe nutrient limitation on benthic algae, creating an unrealistic condition, which would have dramatic effects on food webs in the Klamath River between Keno Dam and the springs below J.C. Boyle Dam. However, the Regional Water Board's response dismisses the concern that these conditions upstream of the Oregon-California stateline are unattainable yet provides no sufficient explanation as to why.

- The Regional Water Board's responses do not adequately address PacifiCorp's comments regarding the need for formal model calibration and quantification of uncertainty, both of which are pivotal for setting regulatory criteria (Responses 116, 187, 189, 190, 261, 262, 264, 283- 300, 302 -321, 323-325). PacifiCorp's comments provided detailed critiques of: (1) the use of only a single year for model calibration, with no validation; (2) stated conservative assumptions that are insufficient to characterize uncertainty; and (3) lack of formal recalibration (including sensitivity analysis) of the TMDL model in the Revised Draft TMDL. The Regional Water Board's responses do not adequately address these three issues for the following reasons:
    - The Regional Water Board's responses continue to defend the insufficient single year calibration: The model was only calibrated in California for 2000. Although the TMDL states that the model was validated in Oregon for 2002, calibration parameters differed between the 2000 and 2002 simulations, casting doubt on the validation. Five modeled years were provided by PacifiCorp and data were available to develop additional modeled years. These additional modeled years would have allowed assessment of interannual variability that is critical to setting regulatory criteria. At a minimum, these other modeled years should have been analyzed to determine if the 2000 year applied in the TMDL analysis represented median (or low or high) conditions with respect to water quality. Furthermore, the Regional Water Board's responses are contradictory, indicating on the one hand that the one year is sufficient for model calibration and to set TMDL requirements, but on the other hand indicating that one year is insufficient for other studies (e.g., Response 45, 259). The Regional Water Board needs to consider all data and information consistently.
    - The Regional Water Board's responses continue to defend conservative assumptions that are insufficient to allow for sensitivity analysis and quantification of uncertainty: The conservative assumptions approach identified in the TMDL (Response 190) includes only a handful of mostly small magnitude effects, and is not quantified in any manner. Without sensitivity analysis and quantification of uncertainty, the predictive tools (models) used in the TMDL are not adequate to form explicit regulatory requirements, let alone provide guidance to the regulated community regarding prescriptions to improve water quality.
    - It appears as though the Regional Water Board made some changes to model parameters between the Draft TMDL in June 2009 and the Revised Draft TMDL in December 2009. However, the TMDL does not discuss formal recalibration of

the model. Rather the figures and results were simply updated, i.e., formal reassessment of sensitivity and model calibration were not addressed (and uncertainty is not quantified or sufficiently accommodated in the draft or final TMDL). A non-unique calibration data set is problematic in the Klamath River TMDL model application (Response D1, page 20 Appendix 10).

- An important note in the application of both RMA and CE-QUAL-W2 models is that they are "off the shelf" models. (Response C3, page 14 Appendix 10) and that for specific applications it is the calibration parameter set that defines the model version for a particular river system, i.e., an RMA or CE-QUAL-W2 application to a river or reservoir in another system is not the "same" model application as the one used in the Klamath Basin. Thus when the model parameters changed notably between June and December, PacifiCorp commented that the latter model was notably "different," while the Regional Water Board identified the models as "the same." The use of "the same" is vague and misleading; they are not the same models, particularly because formal recalibration did not occur. Nor are they the same model that was submitted for peer review, which the Regional Water Board relies upon heavily in its comment responses.

- The Regional Water Board's responses do not adequately address PacifiCorp's comments regarding the incorrect specification of nutrient inflows that were used for the TMDL compliance scenarios. The Regional Water Board's responses also do not adequately address the implications of this incorrect speciation on modeled reservoir algal production (Responses 306 through 313). The Regional Water Board needs to more directly address and implement corrections related to the following model problems arising from this incorrect specification:

  - Incomplete representation of nutrient dynamics in response to reservoir presence (e.g., the modeling does not accurately reflect that the reservoirs reduce loads during maximum biostimulatory periods, or retain and moderate event-driven nutrient peaks from upstream);

  - Reductions in phosphorus and organic matter (by 30 percent), but not algae in incoming waters;

  - Unrealistic algal concentrations in inflow (constant throughout year);

  - Inconsistent definition for "summer" regarding attainment of 10 µg/l chlorophyll a criteria in Copco reservoir;

  - Lack of uncertainty and sensitivity quantification regarding model results, and the 10 µg/l chlorophyll a criteria in Copco Reservoir.

  - The incorrect assumption that all incoming algae is toxin-producing cyanobacteria;

  - The inherent bias in the modeling of Copco and Iron Gate reservoirs from assuming the presence of only a single algal group (which is assumed to consist of 100 percent toxin-producing cyanobacteria).

The Regional Water Board's responses do not adequately address PacifiCorp's comments related to the inappropriate or unrealistic target and allocations required by the Klamath River TMDL.

Applicable Comment Response Reference Numbers: Responses to PacifiCorp August 2009 comments referenced in Appendix 10 as A4, A25, A40, A163, B13, C8, D1, D2, D4, D6, D8, D10, D12, D11, D22, D23, K1, K54, L26, U6, and U7. Responses to PacifiCorp February 2010 comments referenced in Appendix 10 as Hemstreet-4, 5, 21, 24, 52, 53, 57, 106, 107, 109, 111, 139, 144, 145, 146, 147, 148, 149, 150, 152, 155, 170, 171, 172, 178, 180, 182, 185, 205, 208, 211, 238, 248, and 301.

- PacifiCorp's previous comments showed that the TMDL's "temperature and dissolved oxygen compliance lens" approach for assigning allocations to Copco and Iron Gate reservoirs would be unrealistic to actually apply in the reservoirs. The Regional Water Board's responses (including Responses A163, C8, D6, D8, D11, D22, D23, U6, U7, 5, 178, and 211 in Appendix 10) do not provide any information on if and how such a "compliance lens" approach has been used elsewhere, and provide no technical details on how such an approach could be realistically implemented. The Regional Water Board needs to either provide actual examples of use of such a "compliance lens" approach elsewhere, or clearly acknowledge that the "compliance lens" approach required in this TMDL is new and unprecedented. The Regional Water Board needs to do more than simply require a "compliance lens" in concept; the Board needs to provide specific details on how the "compliance lens" approach would be applied in practice. It is inappropriate to leave such details to be developed in "the initial PacifiCorp compliance plan and as part of the TMDL adaptive management framework" (e.g., Responses D6 and U6), particularly since the "compliance lens" concept is unrealistic for actual application to a dynamic and advection-dominated reservoir setting.

- PacifiCorp's previous comments showed that the TMDL's negative nutrient "load allocations" upstream of Copco Reservoir are unprecedented, and are not appropriately addressed to pollutant loadings to the Klamath River from PacifiCorp or that PacifiCorp can control. The Regional Water Board's responses (including Responses 5, 180, 182, 185, and 208 in Appendix 10) neither adequately nor correctly address PacifiCorp's comments on this matter. EPA's TMDL regulations define a TMDL load allocation as "[t]he portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources" (40 CFR § 130.2(g)). Because PacifiCorp is not the cause or source of the nutrient loading upstream of Copco Reservoir, the TMDL cannot attribute that loading to PacifiCorp. As such, it is inappropriate and incorrect to assign any nutrient load allocation—positive, zero, or negative—to PacifiCorp upstream of Copco Reservoir.

- PacifiCorp's previous comments showed that retention of nutrients by PacifiCorp's reservoirs plays an important role in decreasing nutrient loads to the Klamath River downstream of Iron Gate dam. The Regional Water Board's responses (including Responses A40, K1, 52, 53, 57, 139, 144, 145, 146, 147, 148, 149, 150, 152, and 155 in

Appendix 10) do not adequately address PacifiCorp's comments on this matter. In response to PacifiCorp's comments, the Regional Water Board claims the TMDL provides a "balanced presentation of the issues" (i.e., Responses 146, 148, 150, and 155). But rather than balance, the Regional Water Board's responses are parsed in a manner that only confounds the matter. For example, in Response 155, the Regional Water Board first acknowledges that "The mass amounts retained are large on an absolute basis", but then goes on to state "When Regional Water Board staff state that the retention is "small" and "limited" we are referring to the percent retained, which is a small fraction of the total and is limited relative to other reservoirs of similar size". As another example, the Regional Water Board acknowledges that reservoir retention lessens event-driven spikes of nutrients loads from upstream (notably from Upper Klamath Lake), but then states "however, this is not necessarily a good thing in regard to algal response in the lower river" (page 4-26 of TMDL Staff Report). Rather than confound and discount the matter of reservoir nutrient retention, the TMDL needs to state the simple facts that the reservoirs retain inflowing nutrient loads equivalent to an ***annual reduction*** to the Klamath River of about 40,000 pounds of TP, about 500,000 pounds of TN, and about 8,000,000 pounds of CBOD (using the TMDL's own annual load estimates in Table 4.2 on page 4-11 of TMDL Staff Report).

- The Regional Water Board's responses do not address PacifiCorp's comment that the implications of increased nutrient loads under the "without dams" condition on river reaches and the estuary needs to be more comprehensively and accurately assessed to determine the implications for implementation of TMDL actions (i.e., comment related to Response 155). The TMDL only provides the vague statement that "Given the recent developments regarding dam removal (see Klamath Hydroelectric Settlement Agreement) it is unclear whether it will be necessary for the Regional Water Board to balance any potential benefits of the nutrient retention provided by the reservoirs versus the negative water quality impacts created by the reservoirs" (page 4-26 of TMDL Staff Report). The recent report by Asarian (2010) confirms PacifiCorp's findings (PacifiCorp 2006, 2008) that nutrients will be substantially higher in the Klamath River when Project dams are removed.

- PacifiCorp's previous comments showed that the TMDL's use of natural, "predisturbance" conditions as the "starting point" for the Klamath River TMDL is unrealistic. For example, regarding the Upper Klamath Lake TMDL, the National Research Council (2004) concluded that "[c]urrent proposals for improvement of water quality in Upper Klamath Lake, even if implemented fully, cannot be counted on to achieve the desired improvements in water quality". The Regional Water Board responded that "The NRC comment is on proposals that were current in 2004 and is not relevant to a very different set of options that are potentially available today" (Response 106). Yet, no further mention is made as to what the Board considers to be the "very different set of options that are potentially available today" that were not available in 2004. PacifiCorp is unaware of significant changes in potentially available water quality control options since 2004.

- The Regional Water Board's responses do not adequately address a key concern of PacifiCorp's comments that the TMDL allocations are based on desired water quality outcomes rather than on an assessment of what load allocations are appropriately attributed to sources and what load reductions are reasonably achievable and enforceable. A TMDL must be based on reasonable estimates of technically and economically achievable pollutant load reductions. The Regional Water Board's responses (including Responses A4, A25, B13, D1, D2, D4, D10, D12, K54, L26, 4, 21, 24, 107, 109, 111, 170, 171, 172, 205, 238, 248, and 301 in Appendix 10) provide only general and vague responses, and include no details supporting the technical and economic achievability of the load reductions required by the TMDL. Instead, the Regional Water Board responds that "Comments regarding achievability are speculative and premature" (Response A4). Regarding potential technical approaches to achieving load reductions, the Regional Water Board responses offer only generalized descriptions, such as "a wide range of innovative landscape engineering approaches" (Response A4), "centralized treatment options"(e.g., Response K54), "alternative treatment options" (e.g., Response I8), "a combination of traditional BMPs, wetlands restoration, and innovative treatment technologies" (Response D2), and "a water quality tracking and accounting system that will facilitate the purchase of nutrient reduction credits to fund the innovative treatments" (Response 4). Without a more detailed and rigorous assessment of the technical and economic means of achieving the load reductions, the TMDL lacks credibility and is based only on desired outcome and aspiration, rather than realistic and attainable load reductions.

The Regional Water Board's responses do not adequately address PacifiCorp's comments that the temperature TMDL should have been established by determining the thermal loads that are protective of a BIP.

Applicable Comment Response Reference Numbers: Responses to PacifiCorp August 2009 comments referenced in Appendix 10 as K40, K41, K42, and K43. Responses to PacifiCorp February 2010 comments referenced in Appendix 10 as Hemstreet-7, 27, 62, 170, 176, 194.

- The Regional Water Board's responses do not adequately address a key concern of PacifiCorp's comments, namely that temperature TMDL was not established consistent with the Clean Water Act which requires the Board to determine and establish the thermal load limits required to ensure a balanced indigenous population of aquatic life (BIP).

- The Regional Water Board summarized the comments made by PacifiCorp regarding BIP in Appendix 10 rather than repeat them (Response to K40). The Board mischaracterized the concern raised by the comment and misinterpreted PacifiCorp's comments on this topic on both drafts.

- The Board disagrees with PacifiCorp's stated position that the CWA requires the thermal load to be established by determining the thermal loads required to support a BIP. Regardless, the Regional Water Board's responses acknowledge that the Board did not perform a BIP analysis. PacifiCorp's comments were asserting that

the only appropriate way to establish thermal loads is to determine which are protective of BIP. In addition, PacifiCorp submitted comments that the temperature effects of the Project are consistent with the protection and propagation of a BIP in the Klamath River. The Board did not adequately address this in its response.

Other Appendix 10 Responses to PacifiCorp February 2010 Comments (Pages Hemstreet-1 to Hemstreet-146)

Applicable Comment Response Reference Numbers: Responses to PacifiCorp February 2010 comments referenced in Appendix 10 as Hemstreet-17, 26, 27, 28, 31 to 45, 47, 48, 49, 52, 53, 58, 58, 63, 69, 70, 76 to 85, 88, 89, 90, 93, 95, 97, 98, 99, 101, 102, 114, 116, 117, 118, 119, 123, 124, 127 to 132, 136, 137, 139, 140, 142, 153, 157 to 163, 165, 166, 168, 170, 171, 175, 178, 179, 181, 186, 188, 190, 193, 195, 197 to 215, 219, 221 to 228, 230 to 255, 257, 262, 265, 266, 269, 270, 271, 273 to 279, 281, 282, 284, 286, 288, 292, 293, 294, 303, 315, 322, and 325.

Chapter 2. Problem Statement

- The Regional Water Board's Response 26 inadequately addresses PacifiCorp's comment. The Regional Water Board's response states that "the goal is not to establish a particular trophic status". The Regional Water Board's response also indicates that PacifiCorp's comment reference to the TMDL's reference to "pre-disturbance" conditions was "a characterization not provided by the Regional Water Board". However, on page 2-17, the Revised Draft TMDL states that "Reducing pollutant loading in the upper basin is critical to restoring conditions in the upper Klamath River, currently eutrophic and hypereutrophic, to a range more consistent with pre-disturbance conditions, that is mesotrophic to eutrophic". On one hand, the Regional Water Board argues that a shift to a "pre-disturbance" trophic state is not the TMDL's goal. However, the targets and allocations required by the TMDL, and the rationale given in the TMDL for these targets and allocations (such as in the quote above) certainly ends up requiring a shift in trophic status to "pre-disturbance" conditions (that is, conditions without and before human development and disturbance activities over at least the last century).

- The Regional Water Board's Response 28 inadequately addresses PacifiCorp's comment. PacifiCorp requested citations and documentation of the TMDL's boundary target as it pertains specifically to the Klamath River. The Tetra Tech (2006) reference cited in Response 28 is generic to California and has no information or analysis specific to the Klamath River.

- PacifiCorp's previous comments questioning the appropriateness of the TMDL's benthic chlorophyll a target of 150 mg/m2 are not fully addressed by the Regional Water Board's responses (Responses 31, 32, 33, 34). The references to additional sampling and sampling protocols partially address PacifiCorp's comments. However, the responses do not address the issues of aquatic macrophytes, the determination of the relationship of chlorophyll a to plant biomass, the highly variable nature of benthic algal distribution, the lack of sensitivity analysis, and the

inappropriate application of a eutrophic target to a hypereutrophic river. The Regional Water Board's responses do not directly address the comment that the target of 150 mg/m^2 is not practical because it would be exceeded even under "natural" (pre-disturbance) conditions (i.e., Response 31). Recently published estimates that nitrogen and phosphorus concentrations would rise substantially in the Klamath River under a dam removal scenario (Asarian et al. 2010) make it even more unlikely that the TMDL target could ever be achieved.

- PacifiCorp's previous comments questioning the appropriateness of the TMDL's suspended algae chlorophyll a target of 10 µg/L are not adequately addressed by the Regional Water Board's responses (Responses 35, 38, 39). The responses provide no additional information to explain why the chlorophyll a standard for Klamath reservoirs in California should be only two-thirds of the chlorophyll a standard in Oregon. Nor do they address the substantial number of authorities (some cited in PacifiCorp's comments) who disagree with the Regional Board's contention that a chlorophyll a concentration greater than 10 µg/L constitutes a hypereutrophic condition. The Regional Board did respond to PacifiCorp's comment regarding the lack of protocols for target measurement, but the protocols they cite are inappropriate to measure compliance with a reservoir-wide chlorophyll a concentration, on which the CA NNE framework is based.

- PacifiCorp's previous comments questioning the relationship between the chlorophyll a target and the corresponding abundance of *Microcystis aeruginosa* and questioning the validity of the chlorophyll a target of 10 µg/L, the microcystin target of 4 ppb, and the 20,000 cells/mL *Microcystis aeruginosa* abundance target are not adequately addressed by the Regional Water Board's responses (Responses 36, 40, 41, and 42). Rather than address PacifiCorp's comments that the World Health Organization (WHO) guidelines are misrepresented, that the target values are unnecessarily restrictive and that the WHO guidelines do not support the target values of 4 µg/L microcystin and 20,000 cells/mL of *Microcystis* to protect public health from microcystin toxin, the Regional Board merely asserts that their choice is correct.

- PacifiCorp's previous comments that the proposed chlorophyll a target of 10 µg/L cannot be achieved are not adequately addressed by the Regional Water Board's responses (Response 43). Rather than address the evidence presented in PacifiCorp's comment that the natural nutrient concentration in the Klamath River precludes the possibility of meeting the target value, the Regional Board merely asserts that the target is achievable.

- PacifiCorp's previous comments that the Staff Report continues to make inappropriate comparisons between the chlorophyll a target in the reservoirs to the chlorophyll a measured in the flowing river sections are not adequately addressed (Responses 39, 79). The Staff Report repeatedly compares the 10 µg/mL target for suspended algae in the reservoirs to the values for suspended algae in the river (for example, see Figure 2.23). This is an inappropriate comparison, as the Staff Report clearly recognizes, because it presents a completely different chlorophyll a target for the river reaches based on benthic (attached) chlorophyll a. Contrary to the incorrect

assertion in the responses that the comparison "demonstrates" that the impoundments promote nuisance algal blooms, the correct comparison of the trophic state (hypereutrophic) indicated by the suspended algae in the reservoirs and the attached algae in the river would demonstrate that the trophic state of the Klamath River system is determined by the abundant nutrients transported from upstream sources.

- The Regional Water Board's Responses 44 and 48 inadequately addresses PacifiCorp's comments that the TMDL does not describe or consider important uncertainties in the hypothesized causal connections between nutrient loads and fish disease. The Regional Water Board's response simply defends the "conceptual model" as "peer reviewed" and "the state of the science understanding of these processes". PacifiCorp's point is missed and not addressed - that is, the "conceptual model" on this important issue is hypothesized with important uncertainties and unknowns that the TMDL does not describe or take into account.

- The Regional Water Board's Response 45 does not adequately address PacifiCorp's comment. There is little or no quantitative information on fine particulate organic matter (FPOM). The model does not represent FPOM, nor is the relationship between organic matter and FPOM known.

- The Regional Water Board's Responses 49, 52, and 58 inadequately address PacifiCorp's comments. The Regional Water Board continues to fundamentally misunderstand or inaccurately speculate on the effects of the reservoirs on flows. The Regional Water Board does not seem to understand and does not accurately explain the factors controlling flows in the Klamath River. Flow conditions in the Klamath River in the vicinity of PacifiCorp's facilities are dictated by releases from Link River dam (the outflow from Upper Klamath Lake) and from Iron Gate dam. These flow releases are provided as required by Biological Opinions (issued by NMFS and USFWS) on Bureau of Reclamation's Klamath Project. The Regional Water Board's various assumptions regarding "attenuation", "scouring flows", and "important effects at lower flows" are incorrect.

- The Regional Water Board's Response 69 does not adequately address PacifiCorp's comment. Tributary temperatures are still not appropriately discussed. Many of the tributaries form valuable thermal refugia at their confluences with the Klamath River. These refugia provide much existing cool water habitat. Thus, upstream temperatures cannot be as adverse as the TMDL concludes.

- The Regional Water Board's Response 76 does not adequately address PacifiCorp's comment. The model does not account for "all boundary inputs sources, and instream processes affecting fate and transport of phosphorus in the river." Not all tributaries are presented, non-point source inputs are neglected, hyporheic function is omitted, food web impacts are not modeled, and benthic plant growth is grossly simplified with many processes absent. No mention of historical conditions is presented in Response 76. Phosphorus as a limiting nutrient is not addressed (under natural conditions simulations).

- PacifiCorp's previous comments concerning the Staff Report's assertions about the effect of the Klamath reservoirs on the presence and abundance of algae and particulate matter in the Klamath River below Iron Gate dam have not been adequately addressed (Reponses 80-85). The Staff Report has been appropriately modified to recognize that assertions about the contribution of particulate matter to the lower river caused by the reservoirs cannot be supported. Similar assertions regarding the effect of the reservoirs on algal biomass remain in the staff report, however. The Staff Report reinterprets data from selected years to show that algal biomass at a site below Iron Gate dam is greater than at a site above Iron Gate dam, but does not demonstrate that the increase is caused by the reservoirs, or that it would not have occurred in the absence of the reservoirs.

- PacifiCorp (Hemstreet) comments 17, 27, 32, 37, 41, 42, 47, 52, 53, 58, 63, 70, 77, and 78 regarding the Revised Draft TMDL Chapter 2 (Problem Statement) were not directly addressed. The responses to these comments (Responses 17, 27, 32, 37, 41, 42, 47, 52, 53, 58, 63, 70, 77, and 78) were either "Comment Noted" or only references to other comment numbers.

Chapter 3. Analytical Approach

- PacifiCorp (Hemstreet) comments 88, 89, 90, 93, 95, 97, 98, and 99 regarding the Revised Draft TMDL Chapter 3 (Analytical Approach) were not directly addressed. The responses to these comments (Responses 88, 89, 90, 93, 95, 97, 98, and 99) were either "Comment Noted" or only references to other comment numbers.

Chapter 4. Pollutant Source Analysis

- PacifiCorp's previous comments concerning the unaccounted gains and losses of nitrogen, phosphorus, and CBOD in Figures 4.1, 4.2, and 4.3 have not been adequately addressed (Responses 116, 117, 118, and 153-Chapter 5). PacifiCorp noted that it was not possible to evaluate the source analysis because of numerous instances where substantial gains and losses were missing from the tables and diagrams, and pointed out that the inputs and outputs depicted in load diagrams did not balance. Rather than address these comments, the response asserted that figures were not intended to add up and the TMDL was adequate as presented. PacifiCorp reiterates that the unaccounted-for gains and losses must be provided to permit an adequate assessment of the TMDL source analysis.

- The Regional Water Board's Response 119 does not adequately address PacifiCorp's comment. The response does not address the Shasta, Scott or Salmon Rivers.

- PacifiCorp's previous comment regarding the export of organic matter from the reservoirs has not been adequately addressed (Response 139). The Staff Report has been amended to suggest that no data exist to support statements concerning export of organic matter from the reservoirs. The Staff Report presents a figure of selected data (Figure 2.25) in support of the contention that the reservoirs are a source of algae to the lower river, but presents no evidence to demonstrate that the algal biomass is not generated by algae growing between the dam and the sample point or

that the algal biomass at the sampling point would be different in the absence of the reservoirs.

- PacifiCorp's previous comment (comment 142) regarding the lack of evidence for an effect on periphyton from the presumed export of nutrients from the reservoirs has been addressed. The Staff Report now recognizes that the reservoirs provide a significant net retention of nutrients (pg 4-25 and following).

- PacifiCorp (Hemstreet) comments 101, 102, 114, 123, 124, 127, 128, 129, 130, 131, 132, 136, 137, 140, 153, 157, 158, 159, 160, 161, 162, 163, 165, 166, and 168 regarding the Revised Draft TMDL Chapter 4 (Pollutant Source Analysis) were not directly addressed. The responses to these comments (Responses 101, 102, 114, 123, 124, 127, 128, 129, 130, 131, 132, 136, 137, 140, 153, 157, 158, 159, 160, 161, 162, 163, 165, 166, and 168) were either "Comment Noted" or only references to other comment numbers.

Chapter 5. Allocation and Targets

- PacifiCorp's previous comment concerning the validity of the Microcystis target has not been addressed (Response 179). The Staff Report proposes target values for chlorophyll a and Microcystis abundance that are five times lower than the WHO guidelines. PacifiCorp has repeatedly requested that some justification for this choice be provided. No such justification has been provided other than the assertion that the chosen target is protective of beneficial uses. What is needed is some evidence that the WHO guideline value of 50 µg/L is not protective of beneficial uses.

- The Regional Water Board's Response 190 does not adequately address PacifiCorp's comment. Conservative assumptions are insufficient to arrive at a conservative estimate. Quantification of these assumptions should be determined so that meaningless assumptions (those which have little or no measurable impacts) are not included. Median conditions at Upper Klamath Lake are still misrepresented (either by concentration or load). Nutrient levels assumed in the TMDL modeling are unrealistically low.

- Response 203 addresses PacifiCorp's comment. However, it does not appear that the Staff Report text was changed to reflect the content of the response.

- PacifiCorp (Hemstreet) comments 170, 171, 175, 178, 181, 186, 188, 193, 195, 197, 198, 199, 200, 201, 202, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, and 214 regarding the Revised Draft TMDL Chapter 5 (Allocation and Targets) were not directly addressed. The responses to these comments (Responses 170, 171, 175, 178, 181, 186, 188, 193, 195, 197, 198, 199, 200, 201, 202, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, and 214) were either "Comment Noted" or only references to other comment numbers.

Chapter 6. Implementation Plan

- PacifiCorp (Hemstreet) comments 215, 219, and 221 regarding the Revised Draft TMDL Chapter 6 (Implementation Plan) were not directly addressed. The responses

to these comments (Responses 215, 219, and 221) were either "Comment Noted" or only references to other comment numbers.

Chapter 7. Monitoring Program

- Response 224 says that comment 224 has been addressed, but the Final Staff Report shows that the units for chlorophyll a are still wrong - mg/L not µg/L.
- Response 225 addresses PacifiCorp's comment, but there was no corresponding change in the text of the Staff Report.
- PacifiCorp's previous comment regarding the proposed compliance monitoring program (Response 231) has been inadequately addressed. PacifiCorp noted that the plan suffers from a lack of objectives, lack of rationale for the constituents chosen, lack of clear decision criteria, lack of congruence between the targets and the sampling sites, dates, and frequency, and lack of any apparent consideration of cost. The response suggests that all these attributes are in fact present in the Staff Report, but further inspection reveals little in the way of sufficient detail that would provide confidence that the results of the monitoring program would in fact allow decisions to be made with regard to compliance with the targets or to guide adaptive management decisions.
- Response 234 clarifies the intent of the study of temperature in the Scott River, but it does not address the relevance of that study to the Klamath River TMDL.
- PacifiCorp's previous comment regarding the necessity for additional monitoring to develop a nutrient mass balance has been partially addressed (Response 235). PacifiCorp remains skeptical concerning the value of additional sampling, or of the value of continued fixation on developing a detailed mass balance. No explanation of the value of such an effort is provided in the Staff Report. PacifiCorp, however, remains hopeful that through coordination with the Klamath Basin Water Quality Monitoring Coordination Group an understanding of these issues can be developed.
- PacifiCorp (Hemstreet) comments 222, 223, 226, 227, 228, 230, 232, 233, and 236 regarding the Revised Draft TMDL Chapter 7 (Monitoring Plan) were not directly addressed. The responses to these comments (Responses 222, 223, 226, 227, 228, 230, 232, 233, and 236) were only references to other comment numbers.

Chapter 9-CEQA Analysis (Responses 237-243)

- Response to 237. The Regional Water Board inadequately responded to PacifiCorp's concern that the status of review on the CEQA document and the ability to comment on the revision was made uncertain and difficult by circulating the entire document but requesting comments on only the revised portions, while simultaneously failing to provide a redline version of the revised environmental analysis. The Board's response simply agrees that it was intended to be a recirculated environmental analysis and notes that a summary of changes was provided. However, the summary document only noted that the Board added a discussion of impacts of dam removal, but provided minimal detail and did not mention any other changes in the

environmental analysis chapter, so it did not resolve the difficulty of commenting on the revisions without a redline, as noted in the comment.

- Response to 238. The Regional Water Board's response refuses to add a discussion of the feasibility of meeting the load allocations. However, CEQA requires that alternatives be feasible and requires discussion of alternatives in a manner to foster meaningful public participation. The Board puts feasibility considerations off to a later date, after adoption of the TMDL. But CEQA requires an analysis of feasible alternatives prior to approval of the project.

- Response to 239. The comment requested discussion of the interaction of reduced nutrients and salmonid rearing. The Regional Water Board's response again postpones discussion required by CEQA of potential adverse impacts to post-approval of the project.

- Response to 240. The comment requested discussion of additional reasonably foreseeable potentially adverse environmental effects of dam removal and an identification of potential mitigation or avoidance measures; again the Regional Water Board's response delays an adequate discussion of environmental impacts to post-approval of the project.

- Response to 241. The comment requests a discussion of alternative means of compliance, which CEQA requires for an adequate programmatic environmental analysis. See Pub. Res. Code § 21159. The Regional Water Board's response addresses the selection of individual compliance measures rather than a discussion of reasonably foreseeable alternative means of compliance that is required by CEQA.

- Response to 242. The Regional Water Board's response does not clarify what is required by this prohibition. The prohibition against unauthorized discharges was added to the revised draft, yet the environmental analysis did not change substantively at all. The Board's response claims that the compliance measures for the prohibition were already discussed in the previous draft.

- Response to 243. The Regional Board declined to recirculate the CEQA document, claiming the public had sufficient opportunity to provide comments on previous drafts. However, the need for recirculation arises not from inadequate opportunity to participate in scoping and commenting on previous drafts, but from inadequate analysis in the document itself. Recirculation is also needed as a result of last minute changes in the TMDL that were not adequately described or analyzed in this or previous drafts.

Chapter 11-Public Participation (Responses 244-246)

- Response to 244a. The comment requested copies of all referenced reports that are not publicly available. The Regional Water Board's response is that some of these references are "only one line of evidence" or that the staff's conclusions were drawn "long before the draft final" report was released. These responses raise more concerns about the evidence that the Board is relying upon and do not change the fact that not all of these referenced documents are available for public review.

- Response to 244b. The Regional Water Board's response does not address PacifiCorp's stated concern that the tables frustrate public review. The fact that PacifiCorp was provided all of the model-related files does not address the fact that the Staff Report contains a misleading presentation of data to the public.
- Response to 245. The Regional Water Board is required by its own regulations to respond to written comments submitted up to 15 days before the hearing and to oral and written comments thereafter in writing, if feasible, or otherwise orally at the hearing. The Board's response invents alternative legal requirements that are not codified.
- Response to 246. While PacifiCorp did not need to test this point, the Regional Water Board's response is inadequate because it describes the opportunities PacifiCorp has had to review previous model applications. The comment addressed the time available to review and comment on revised model applications, not previous ones.

Appendix 1. Proposed DO Objective

- PacifiCorp's previous comments regarding the proposed site-specific dissolved oxygen objective (SSO)(Responses 247 through 255) have not been adequately addressed. PacifiCorp outlined several deficiencies in the Staff Report Appendix:
    - The SSO did not adequately address annual variability because it was based on only one year of data (247, 255),
    - The SSO levels are not related to the protection of beneficial uses, and are unlikely to be achieved because they are based on "natural conditions" that are unrealistic given the geology, hydrology, meteorology, and land use in the basin (248, 253),
    - The contention that DO concentration in the river is reduced simply because of the presence of the dams ignores many of the physical processes that contribute to DO concentration; insufficient evidence is presented to support the assertion that impoundments perpetuate exacerbated DO fluctuations downstream (250, 252), and
    - The use of the CADDIS model has little relevance to the Klamath SSO for DO (249, 251).
- Responses 247 and 255 concerning the lack of consideration of inter-annual variability are inadequate in that they do not demonstrate that inter-annual variability was considered, but merely assert that the TMDL model accounts for variability "in a number of ways" with no description of what those ways might be. It appears that the authors confuse "data" (i.e. measurements) with "calculations" when they assert that the model output of "every hour of every day" for 2000 provides a more comprehensive data set than data "covering many months and years" during numerous climatic conditions for the existing SSOs.

- PacifiCorp's observation that the "natural conditions" on which the SSOs are based are unlikely to ever be met because of existing conditions of geology and other factors was dealt with by simply asserting that the model says they will be met. Given the many deficiencies in the model and its assumptions described throughout the comments, this is an inadequate response. Finally, in response to PacifiCorp's suggestion that some quantitative evidence is required to support the statements that simply by existing the impoundments reduce DO concentration and exacerbate fluctuations in DO in the river, the staff simply disagrees and provides no support for the statements in the Staff Report Appendix.

Appendix 6. Modeling Configuration and Results

- The Regional Water Board's Response 257 does not adequately address PacifiCorp's comment. Link River dam boundary conditions were not correctly represented, although data were available to provide a markedly better representation of portioning among species and seasonal concerns. Differences in partitioning in the natural baselines case is still unrealistic (i.e., less than what would occur under a trophic shift at Upper Klamath Lake).

- The Regional Water Board's Response 262 does not adequately address PacifiCorp's comment. The Regional Water Board identifies how little data there are to represent buoyant blue-green algae settling rates, yet they readily adopted a completely untested, and unknown two box model representation for algal mortality in Keno reservoir. Sufficient literature information is known to complete a more appropriate representation of algal settling, particularly given the extensive species data in the system.

- PacifiCorp (Hemstreet) comments 265, 266, 269, 270, 271, 273, 274, 275, 276, 277, 278, 279, 281, 282, 284, 286, 288, 292, 293, and 294 regarding the Revised Draft TMDL Appendix 6 (Modeling Configuration and Results) were not directly addressed. The responses to these comments (Responses 265, 266, 269, 270, 271, 273, 274, 275, 276, 277, 278, 279, 281, 282, 284, 286, 288, 292, 293, and 294) were only references to other comment numbers.

Appendix 7. Modeling Scenarios

- PacifiCorp (Hemstreet) comments 303, 315, 322, and 325 regarding the Revised Draft TMDL Appendix 7 (Modeling Scenarios) were not directly addressed. The responses to these comments (Responses 303, 315, 322, and 325) were either "Comment Noted" or only references to other comment numbers.

Other Appendix 10 Responses to PacifiCorp August 2009 Comments (Comment Categories A-Z)

Applicable Comment Response Reference Numbers: Responses to PacifiCorp August 2009 comments referenced in Appendix 10 as A10e, A108, A118 to A122, A129 to A133, A138, A141, A142, A144, A147 to A151, A154, A155, A158, B2 to B19, C3, D1 to D4, D9, D12, S23, S24, T8a, T8b, T8c, T16, U4, U6, U9, U17, U18, U20, and V11.

Comment Category A-TMDL Model Comments

- The Regional Water Board's Response A10e (page A-18, Appendix 10) is incorrect. The discussions were limited to general conditions of reaeration below Iron Gate dam. Watercourse Engineering, Inc. did not suggest introducing the computer code logic associated with the FTURB parameter.
- The Regional Water Board's Response A108 (page A-80, Appendix 10) is incorrect. Watercourse Engineering, Inc. completed some modest exploration of the concept of algal mortality associated with low dissolved oxygen by modifying the code of CE-QUAL-W2. While it is true there is a Lagrangian element to assessing such a hypothesized problem, the real issue is there was absolutely no proof to support such a representation in a numerical model. When M. Deas of Watercourse Engineering, Inc. inquired about the parameterization of this logic (e.g., the mortality rates, respiration rates, rate of shifting from the healthy box to the unhealthy box) with the Tetra Tech modeler, the modeler stated that he simply made them up because there was no literature on the topic (Rui Zou, pers. comm.). As a result this logic is simply a black box used for calibration that has no supporting basis in scientific or gray literature. This clarification is also pertinent to Response D1 (page 20, Appendix 10).
- The Regional Water Board's Responses A118, A119, A120, A121, and A122 do not adequately address PacifiCorp's comments. PacifiCorp reiterates that calibrating with modified boundary conditions is an inappropriate approach, which masks model uncertainty, particularly when the natural conditions baseline is far from the calibration condition (that is, dramatically different water quality is assumed).
- The Regional Water Board's Response A129 does not adequately address PacifiCorp's comment. Formal recalibration was not undertaken.
- The Regional Water Board's Response A130 does not adequately address PacifiCorp's comment. Organic matter partitioning is still not properly addressed.
- The Regional Water Board's Response A131 does not adequately address PacifiCorp's comment. SOD can change reach to reach, but such information is lacking in the Klamath River. Identified values are speculative.
- The Regional Water Board's Response A132 does not adequately address PacifiCorp's comment. The Regional Water Board's rationale for changing these values without sufficient data is not explained.

- The Regional Water Board's Response A133 does not adequately address PacifiCorp's comment. Judging model performance without sensitivity analysis and quantified uncertainty is speculative.
- The Regional Water Board's Response A138 does not adequately address PacifiCorp's comment. Nitrate and ammonium values at Keno reservoir are not realistically represented in the model. These upstream model locations are pivotal in the results generated from the model for downstream reaches.
- The Regional Water Board's Response A141 does not adequately address PacifiCorp's comment. The type of data discussed in the response was available for 2000 data in Keno reservoir and at selected other locations in the Klamath Basin to represent error bars.
- The Regional Water Board's Responses A142, A147, A150, A151, and A154 do not adequately address PacifiCorp's comments. There is no formal uncertainty analysis identifying the TMDL model accuracy.
- The Regional Water Board's Responses A144, A149, and A158 do not adequately address PacifiCorp's comments. PacifiCorp has continued concerns about calibrating the model based on only a single year. Including the estuary calculation of 2004 (a different year than used to calibrate the model) is misleading to the reader that multiple years were used in calibration.
- The Regional Water Board's Response A148 does not adequately address PacifiCorp's comment. Adjusting boundary conditions as done in the TMDL modeling is not typical modeling practice.
- The Regional Water Board's Response A155 does not adequately address PacifiCorp's comment. Solar reduction by 20% in river models without recalibrating the model leads to systematic underprediction of simulated temperatures.

Comment Category A-TMDL Model Comments: Attachment 1 - USGS Model Review

- With regard to Responses A4 and E3 in Attachment 1, the data used in the TMDL calibration are not representative of actual conditions. Bureau of Reclamation collected this data in 2000 and in 2001 found different conditions. Working with Watercourse Engineering, this issue was explored. After comparing several years of data, the 2000 data for NO3 and NH4 at Miller Island and Keno has been identified as being incorrect.
- With regard to Responses A5 and F4 in Attachment 1, Regional Water Board staff response is inadequate. Extensive work on this topic over the past several years has provided key insight into organic matter (OM) partitioning and seasonal variations. Proposed OM concentrations under natural conditions are untenable. Modification to partitioning does not address the comment.
- With regard to Response C3 in Attachment 1, version control has been a serious concern in this TMDL. PacifiCorp experienced considerable setback in review of the

TMDL due to version control issues. Such issues lead to lack of confidence in models, when Regional Water Board staff cannot produce the version of the model used in the simulations for the TMDL. In the end, it appears that most of the version control issues were worked out, but there are still model files and simulations that were not checked due to time constraints – leaving a lingering doubt about reproducibility of TMDL modeling results.

- With regard to Response C4 in Attachment 1, although the SC10 error has been remedied in the reservoir models (CE-QUAL-W2), this error remains in the river models. The undocumented (both in the code and in the model documentation) nature and potential implications of this coding change are unsettling.
- With regard to Responses C6 and F2 in Attachment 1, the reef spillway issue, although resolved in regards to the USGS comment, was also identified as problematic in the Oregon TMDL. The weir representation and outlet representation in CE-QUAL-W2 produce notably different results. This affects temperature and dissolved oxygen concentrations below the dam, and thus appears to be an error in the CE-QUAL-W2 logic. The "natural conditions baseline" and "with dam" model scenarios are not comparable until this logic error is remedied.
- With regard to Response D1 in Attachment 1, USGS identifies in great detail issues associated with algal representation, including the two-compartment representation. Regional Water Board response identifies that "in the absence of additional data or research, the team used best professional judgment to proceed with code modifications related to algae representation" (page 24). There are no scientific studies on this approach and no literature on this approach, and thus little basis. This logic is simply a black box that may make calibration look better, but may have no physical basis in reality (and no way to refute or confirm model performance with regards to this particular process).
- With regard to Response D2 in Attachment 1, representation of SOD is an important element in Keno reservoir. Regional Water Board staff did not adequately address the points made by USGS regarding the rate multiplier function values.
- With regard to Response E1 in Attachment 1, USGS identifies the importance of independent periods for calibration and validation, but that the validation period had different parameter values. This casts doubt on independent check of model performance.
- With regard to Response E2 in Attachment 1, USGS identifies, and PacifiCorp concurs, that error statistics are an integral element of assessing model performance and quantifying uncertainty. Regional Water Board staff suggest that the Klamath Basin is "different" and thus these approaches are less appropriate than visual (graphical) assessment. Both measures are useful, but for quantification, model performance statistics are required.
- With regard to Response F5 in Attachment 1, the USGS comment noted that N and P values are too low in the natural conditions baseline, providing extensive supporting

documentation and references. Regional Water Board response does not adequately address this point.

Comment Category B- Impairment Assessment

- In previous comments, PacifiCorp has raised a number of questions concerning the validity of the 10 µg/L chlorophyll a target, the analysis used to support that target, and the likelihood that the target could ever be achieved. PacifiCorp has pointed out that statements used to support concepts such as chlorophyll a is a response variable to impoundment or that high chlorophyll a concentration is harmful to aquatic life are presented without supporting data or relevant citation. PacifiCorp submits that the chlorophyll a target was not chosen to protect any particular beneficial use, but was selected to conform to a hypothetical "natural" condition that there is no reasonable expectation will ever be achieved. The chlorophyll a target is arbitrarily low with respect to protecting the REC1 beneficial use, resulting in a target for cyanobacteria toxin that is five times lower than widely recognized targets that are protective of human health (WHO 2003). The Regional Water Board's responses to these concerns are inadequate, consisting largely of brief, unsupported statements that Staff disagrees with the comment and that the TMDL model results support the target value (Responses B2 through B19). There responses are not reassuring given the serious concerns raised elsewhere in these comments about the validity of the TMDL model.

Comment Category C- Source Analysis

- With regard to Response C3, an important note in the application of both RMA and CE-QUAL-W2 models is that they are "off the shelf models" (response to comment C3, page 14 Appendix 10). They are generic models that can be "fit" or "applied" to a basin based on river specific information such as system geometry, elevation, tributaries inflows, particular water quantity and quality inflows, or withdrawals, among other factors. For a specific application, it is the calibration parameter set that defines the model "version" for a particular river system, i.e., an RMA or CE-QUAL-W2 application to a river or reservoir in another system is not the "same" model application as the one used in the Klamath Basin. Thus, when the model parameters changed notably between the Draft TMDL (June 2009) and Revised Draft TMDL (December 2009), PacifiCorp commented that the latter model was notably "different," while the Regional Water Board identified the models as "the same." PacifiCorp believes the models are sufficiently different – producing notably different results – that the newer version needs to be recalibrated and model performance (e.g., sensitivity and uncertainty) reassessed. Similarly, given the significant differences in the models, the models should again be submitted for peer review.

Comment Category D- Targets and Allocations

- In a number of previous comments (D1, D2, D3, D4, D9, D12) PacifiCorp has pointed out that the proposed chlorophyll a target of 10 µg/L is inappropriate and cannot be achieved without such drastic reductions in nutrient loads as are not possible to accomplish. PacifiCorp repeatedly requested the Regional Board to provide

suggestions describing any legal or practicable means of achieving the necessary reductions. The response to these requests was wholly inadequate, consisting mainly of assertions that the targets were appropriate and that the board "believes" that the reductions will be met with "full implementation of the Upper Klamath Lake TMDL, the Lost River TMDL and the Klamath River TMDL. No suggestions addressing practicable means of achieving the reductions have been supplied.

- PacifiCorp's previous comment (D20) requesting the Regional Board to provide any evidence that nutrient releases from the reservoir sediments has any effect at all on algal growth in the reservoirs or in the river downstream has not been adequately addressed. Rather than produce evidence of an effect the response referred to "simple logic", situations that "may occur", and "fundamental concepts". While logic, hypothetical situations, and fundamental concepts may provide a framework for speculation, they do not provide evidence that particular process is occurring.

Comment S- Economics and Environmental Analysis

- The Regional Water Board's responses do not adequately respond to PacifiCorp's comments regarding an appropriate analysis of potential compliance methods and their environmental impacts as required to be performed at the programmatic level by CEQA. See Pub. Res. Code § 21159.

- Response to S23. PacifiCorp's comments on the June Draft regarding a discussion of the impacts of dam removal as a reasonably foreseeable method of compliance with the TMDL's load allocations were only partially and inadequately addressed by the Regional Water Board. Although the Regional Water Board added a discussion of some environmental and economic impacts of dam removal, that analysis was inadequate, as discussed in PacifiCorp's comments on the December Draft (see comments 238-246).

- Response to S24. The Regional Water Board's response to PacifiCorp's comments regarding its insufficient analysis of alternative means of compliance is inadequate because it is not on point. Stating that the Board is prohibited from requiring specific means of compliance is not an answer to CEQA's requirement of an analysis of reasonably foreseeable alternative methods of compliance, at the programmatic level, whenever an agency adopts a performance standard. The Board does not need to require specific means of compliance in order to comply with CEQA. Further, claiming that more CEQA review will occur in the future is not appropriate where CEQA requires an analysis here, at the programmatic level. Pub. Res. Code § 21159.

Comment T- Stakeholder Participation

- Responses to T8a, T8b, and T8c. The Regional Water Board's responses to PacifiCorp's comments regarding the basis for their decision and the length of the public comment period is inadequate because it noted that the Regional Water Board met all public noticing requirements. Distributing a public notice or agenda is not the same as providing sufficient time for the public to understand and participate in agency rule making through a public comment period. The Regional Water Board's response that the public comment period on the December Draft was 47 days did not

respond to PacifiCorp's concern with the adequacy of the public comment period on the June Draft.

- Response to T16. The Regional Water Board's response to PacifiCorp's comment that public participation was hindered by lack of information and delayed release of documents was a reference to the response to PacifiCorp's comments regarding the length of the public comment period. The availability of information on which to comment is a different concern than the length of the public comment period (the subject of PacifiCorp's comments T8a-c) and also a different concern than the notice (addressed by the Board's referenced response).

Comment U- Peer Review

- Response to U4. The Regional Water Board's response to PacifiCorp's comments that it did not adequately respond to peer reviewers who noted the need for an analysis of model uncertainty is to point to its responses to A2, A 51, A142, and A147. The Board's response is inadequate for the same reasons those responses are inadequate to address PacifiCorp's concerns with the accuracy of the model.

- Response to U6. The Regional Water Board's response to PacifiCorp's comments on its responses to peer reviewers concerns with the efficacy of the compliance lens is inadequate. It simply refers to an adaptive management approach without providing a discussion of the efficacy of the compliance lens concept.

- Response to U9. The Regional Water Board's response does not address PacifiCorp's concern that the Board ignored the questions raised by a peer reviewer regarding achievability of temperature reductions in Copco and Iron Gate.

- Responses to U17 and U18. In response to PacifiCorp's comments regarding the availability of extensive research on thermal refugia in the Klamath River, the Regional Water Board staff state that they did in fact consider this literature although it is not cited in their list of references. This response is not adequate. The public would not know what sources provide the data and support for the Regional Water Board's conclusions if they are not listed in the Board's reference list. Furthermore, this literature is relevant to the issue and informative on the topic and should be discussed.

- Response to U20. The Regional Water board's response is inadequate to address why Chapters 6 and 7 do not contain provisions premised upon or derived from scientific findings and conclusions.

Comment V- Data and QA/QC

- Response to V11. The Regional Water Board's response was inadequate to PacifiCorp's comment regarding the unavailability of the data or criteria used for the Board's conclusion that TMDL allocations and targets, and thereby water quality objectives and beneficial uses, will be achieved upon dam removal. Neither the Regional Water Board's response to V11 nor the response to K56 (referenced within the response to V11) reveal the data or criteria used to decide that allocations and targets will be achieved upon dam removal.

Oral Comments Made at March 24 Hearing

- In response to PacifiCorp's oral comments regarding achievability of the load allocations, the Regional Water Board's response was a conclusory statement that Staff believes they are achievable.
- In response to PacifiCorp's concerns regarding achievability and fairness of the load allocations when the upstream water quality issues are the cause, the Regional Water Board's response was another conclusory statement that the allocations are only for PacifiCorp's contributions.
- On CEQA issues, the Board's oral responses were inadequate for the same reasons its written responses to comments 238-241 were inadequate. CEQA requires an analysis of reasonably foreseeable means of compliance and alternative means of compliance now, at the programmatic level, taking into consideration all applicable factors. See Pub. Res. Code § 21159.

References

Risley, J.C., and Rounds, S.A. 2006. Evaluation and review of recent Klamath River water-temperature modeling studies: U.S. Geological Survey Administrative Letter, 27 p.

Asarian, E., J. Kann, and W. Walker. 2010. Klamath River Nutrient Loading and Retention Dynamics in Free-Flowing Reaches, 2005-2008. Final Technical Report to the Yurok Tribe Environmental Program, Klamath, CA. 59pp + appendices.

Rounds, S.A., and Sullivan, A.B., 2010, Review of revised Klamath River Total Maximum Daily Load models from Link River Dam to Keno Dam, Oregon: U.S. Geological Survey Administrative Report, 32 p.