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Subject: Comments on the draft Environmental Impact Statement on the proposed changes to the Water Quality Standards for Surface Waters of the State of Washington – WAC 173-201A (Water Quality Standards)

Dear Ms. Braley,

The following Action Agency (AA) technical comments are in support of Washington’s proposed TDG standards change to 125% TDG in the tailrace in order to facilitate the implementation of the *2019-2021 Spill Operation Agreement* (Agreement) as described in the AAs formal comment letter. Based on the AAs review of both the Draft Environmental Impact Statement (DEIS) and Draft Rule Implementation Plan documents (DRIP), the AAs believe that a long term change is not advised at this time. The AAs support Alternative 4 because it most closely aligns with the principles of the Agreement. The AAs are submitting the following technical comments which are grouped into three areas of concern: Biological, Real-time Implementation, and Document Clarifications. These technical comments are intended to provide clarity to both DEIS and DRIP and will assist the AAs in operating the Columbia River System consistently with any resulting rule change.

**Biological:**

1. DRIP, pg 7: It is important to keep the statement in ‘Species Richness Requirement’ Section that ‘All gas bubble trauma observations must be reported regardless of meeting the minimum sample requirements to calculate the incidence of gas bubble trauma.’
2. DRIP, pg 7: See bottom, ‘Gas Bubble Trauma Monitoring’ section, Fish Passage Center is called out for establishing methods and protocols when FPC is a BPA contractor. Recommend that the language be updated to reflect that, for example: “Examination of fish for gas bubble trauma should follow the procedures similar to those detailed in the 2019 Gas Bubble Trauma Monitoring Protocol or as updated by the Action Agencies.”
3. DEIS, pg. 7: Such a significant change to the standard should be based on additional sources rather than just the CSS model. We recommend including additional information such as results from COMPASS modeling and in-river GBT data from a limited period operation as described in Alternative 4.
4. DRIP, pg 8: Currently, the physical monitoring is performed and results are documented at each dam individually. The DRIP allows for the samples to be collected as a combination from the dams to make up "the sample" that week. Historical records show higher GBT levels at some dams compared to others, along with varying levels of TDG levels at certain dams, so this approach may not capture impacts across all projects. The minimum sample size listed in this document is only 20% of what is currently done and spreading that sample size over four dams gives the opportunity to miss the problem location.
5. DEIS, pg 17: The referenced “technical analysis” needs a citation.

6. DEIS, pg 30: The Fish Passage Center data related to instances of GBT observed when gas levels exceed 125% is misleading. The statistic in the following statement should be clarified: "In a historical analysis of data collected by the Fish Passage Center from 1995-2018, the 15% GBT criterion has been exceeded in only 37 instances of 2,870 samples and 28 instances occurred when TDG was greater than 125%." The projects were not operated at 125% for the years analyzed (the historic juvenile fish passage spill regime was lower spill levels, significantly below 125% TDG). The statement should clarify how many samples occurred when TDG was greater than 125% and what portion of those samples met the 15% GBT criterion as it would be a better representation of the GBT impacts from the proposed change in WQS.
7. DEIS, pg. 27: In the "Early Development" section, the document states that Chinook salmon are not known to spawn in the area encompassing the lower eight dams. However, historically there have been Chinook redds below Bonneville Dam on the Washington shore during winter and spring. Their emergence is later than Chum, so they are more likely to be impacted by high TDG in spill season, especially if the river is held low, as it was in April 2019. Chum, conversely, tend to out-migrate before spring spill season.
8. DEIS, pg. 35: With the overwhelming amount of information documenting the adverse impacts associated with TDG more research is needed before to verify aquatic species are protected at 125 % TDG. It is not clear that the proposed biological monitoring under the DRIP will cover all the species explored in the DEIS (invertebrates, lamprey, salmonids and resident fish).
9. DEIS, pg 36: WDOE's conclusion regarding effects on lamprey of 125% TDG spill appears to be based on one article (Colotelo et al. 2012) that discusses impacts from barotrauma not TDG (in fact all testing during the study was done at a TDG level of 102%). This analysis on lamprey appears lacking and more analysis seems appropriate in order to avoid putting a disproportionate amount of risk on lamprey. Significant adverse impacts to lamprey could result from decision-making without appropriate analysis.
10. DEIS, pg 36: States "...Colotelo et al (2012) notes the lack of swim bladder may account for the reduced sensitivity to TDG." This sentence is contextually inaccurate regarding the Colotelo et al 2012, please see <https://www.sciencedirect.com/science/article/pii/S0165783612001737> Colotelo et al 2012 does not evaluate the effect of TDG on lamprey. In this research the only reference to TDG was in reference to TDG as a water quality parameter not in any relationship to effects on lamprey. Colotelo et al 2012 was about barotrauma associated with juveniles passing through turbines not effects of TDG on lamprey. The conclusions and statements made with respect to this citation should be examined.
11. DEIS, pg 36: This statement suggests high risk to daphnia magna by increasing TDG to 125%, is WDOE approving these types of impacts? "Daphnia magna were affected by supersaturated waters above 110%. The mean LC50 for Daphnia magna was 122.5% when fed and held in static water. When Daphnia were not fed in flowing water the 96 h LC50 was 114%. The 7-d LC50 was 120% and the 10-d LC50 was 117.5%." The potential negative impact on invertebrates, with several additional citations listed under "Aquatic Invertebrates" section of the DEIS, were not assessed for secondary impacts to the larger ecosystem if the invertebrate population is depleted due to high TDG exposure. Suggest this discussion be added to the DEIS.

12. DEIS, pg. 36: The DEIS should consider the effects of 125% TDG for the duration of the spring spill season (Apr 3 – Jun 20). The literature and studies cited to address effects in the DEIS generally contain observations obtained during shorter duration studies e.g., “2.7 days...” The significant duration of the proposed change in WQS to an unprecedented high saturation level has not been tested before. Consider if WDOE should conduct additional research, monitoring, and evaluation to evaluate the impacts on species with the proposed change in criteria.
13. DEIS, pg 37, Johnson et al (2005) cited on DEIS pg 37, states, “The authors concluded that there was minimal potential for GBT on adult spring and summer Chinook salmon under average river conditions, despite the fact that fish tissues were likely supersaturated with dissolved gases.” This citation is problematic because it omits the following key finding from the research, “However, additional research over a broader range of dissolved gas conditions is needed to confirm that short, but frequent, exposure to conditions conducive to gas bubble formation does not affect survival and reproductive potential.” Additionally the magnitude of the operation is not captured in this citation nor the vast majority of all the literature cited.
14. DEIS pg 43. The DEIS cites several documents that emphasize the uncertainty of repeated and chronic exposure to supersaturated water conditions. Reading the McGrath et al. (2006) citation directly emphasizes this point even more: “These areas of concern are 1) sensitive and vulnerable species or life stages, 2) long-term chronic or multiple exposure, 3) vulnerable habitats and reaches, 4) incubating fish in hyporheic habitats, and 5) community and ecosystem impacts.” An additional quote from McGrath et al. (2006) is also informative: “Long-term chronic exposure to levels as low as 110 to 115% TDG may produce serious sublethal effects and signs of GBD (Lutz 1995; Mesa et al. 2000; Beeman et al. 2003).” Implementing Alternative 4 for 2 years would provide WDOE time to evaluate and assess biological impacts under the proposed WQS.
15. DEIS, pg 45 and 46: Research has indicated that fish not exhibiting signs of GBT may still die from acute toxicity. Monitoring for non-GBT impacts related to TDG is not outlined in the implementation plan. Consider how WDOE will assess potential impacts to aquatic species that may not be detected through proposed GBT monitoring.
16. DEIS, pg. 46. The DEIS states, “Finally, several studies have suggested that GBT may not be an appropriate metric to measure TDG related effects. Some researchers found poor relationships between GBT observations and elevated TDG conditions that result in mortality (Meekin and Allen 1974; Weitkamp et al. 2003b). This further brings in question, the efficacy of biological monitoring programs at hydropower projects and whether observations of GBT accurately depicts the health of aquatic life passing through dams or the resident species residing above or below dams.” It is not clear with this statement how WDOE proposes to move forward with the given uncertainty. The DRIP proposes to use GBT monitoring solely as the mechanism for adjustment to the TDG levels in season.
17. DEIS pg 46 and 47. WDOE recognizes conflicting data regarding depth compensation. The DEIS (pg. 46) states “Several studies have demonstrated that depth compensation is a mechanism that protects aquatic life from TDG related effects. However, there is controversy whether fish can detect supersaturated waters and purposely depth compensate or if they move through the water column in a less intentional manner to a preferred foraging or migration depth. Moreover, some studies suggest that depth compensation is more efficient

for some fish than others. Significant differences in mortality for different fish at the same water depths and TDG levels, suggest that coping mechanisms for high TDG conditions may differ depending on the species.” Despite this uncertainty regarding the ability of all species to depth compensate, the DEIS cites Aquatic Life Depth Compensation as a mitigation measure (pg. 47) for high TDG impacts. It is not clear in the DEIS or the DIP how biological monitoring will be used to reduce this uncertainty and verify this key assumption.

18. DEIS, pg 55: In the summary of Alternative 3, it should be clarified that there is an increased risk of GBT occurrence in aquatic species as described throughout the DEIS.

### **Real-Time Implementation:**

1. General DRIP questions:
  - a. Who is responsible for consolidating and evaluating the GBT data against thresholds and determining that a change in criteria has been triggered? How is this decision communicated?
  - b. What are the reporting and data storage requirements for GBT data?
  - c. Are there examples where a water quality criteria can change instantly based on a biological data trigger? For example, if the TDG target changes it will take approximately 1-day to evaluate appropriate spill levels, communicate to BPA and the projects and then see a change in TDG.
  - d. How should monthly and annual reporting evaluate TDG data when a criteria changes? For example, it could take days for TDG to decrease to the appropriate level.
  - e. Could the criteria be different for each of the eight projects, or, if high GBT rates are observed at one project, do the criteria change for all projects?
2. DRIP, general comment. As captured in the proposed rule change, potential monitoring falls into the following three categories: TDG monitoring, salmonid biological monitoring GBT, and resident species biological monitoring for GBT. The Corps intends to continue the existing TDG monitoring practices consistent with previous years that includes a system wide array of TDG monitoring sites with gages placed below and above each of the eight fish passage dams to monitor TDG levels 24 hours per day. Current GBT monitoring consists of monitoring of juvenile salmonids conducted as part of the Smolt Monitoring Program. This Program will continue into the future to satisfy the salmonid biological monitoring criteria described in the DEIS. Though the AAs are supportive of enhanced GBT monitoring for resident species, the AAs are not aware of existing monitoring of either TDG effects on resident species or the incidence of GBT in these species and do not have funding for creating such a program. This point was clearly stated in Section VII.E of the Agreement in that the Corps would only continue existing monitoring that has been occurring in conjunction with the juvenile fish passage spill program and that Bonneville is limited by its existing Fish and Wildlife budget for any additional monitoring. Current TDG monitoring and salmonid GBT monitoring will continue. If the Ecology rule change is contingent on increased monitoring, the AAs are not the appropriate funding source for these activities.
3. DRIP, pg 6: Clarify monitoring plan submission frequency requirement. Neither the DEIS or DRIP specify the party responsible for submitting the annual biological monitoring report to Ecology for review and approval. Clarification should specify whether or not this must be the AAs or whether one of our partners (i.e. WDFW) can compile necessary information and submit to WDOE.

4. DRIP, pg 7: Clarify whether sample quantity listed is total quantity or per age group.
5. DRIP, pg 8: Clarify what kind of biological monitoring they are looking for? “A department approved biological monitoring plan is required from each hydropower project that intends to utilize the adjusted 125% tailrace only criteria.” Is the intent to have a plan for each project or can the AAs submit one plan for the entire Columbia River System?
6. DRIP, pg 8: The implementation of the approach suggested on pg 8 of the DRIP would be difficult in real time operations. Once additional monitoring demonstrates that the incidence of GBT is below biological thresholds, “Gas bubble trauma must be below biological thresholds over the next 7-day averaging period before the adjusted TDG criteria of 125% can be applied again.” Could this technically continue in perpetuity (if the permanent adjustment is implemented)? The criteria used to set spill caps could change each week and would be dependent upon receipt of the previous week’s biological monitoring results. The following are challenges in using a biological threshold as an operational trigger:
  - a. The frequency of sampling (weekly) does not allow for incremental change, i.e. small increases or decreases in spill to test impact.
  - b. The sampled species may differ week to week which may confuse a demonstration of “the incidence of gas bubble trauma is below biological thresholds”.
  - c. “If gas bubble trauma exceeds these biological thresholds for either salmonids or non-salmonids, additional monitoring must demonstrate the incidence of gas bubble trauma is below biological thresholds before the TDG criteria can be adjusted up to 125%.” We would expect biological thresholds to be exceeded again with a return to 125%. Consider how WDOE will develop criteria once biological thresholds are reached to minimize future biological impacts from TDG.
  - d. The sampling could occur at only some of the projects, so we would need to assume the sampling locations represent a reach.
7. DRIP, pg 14: “Ecology monitors surface waters across the state to determine whether water quality conditions meet the designated uses set in the standards.” This statement is not consistent with the draft rule change language assigning biological monitoring to other entities.
8. DEIS, pg 5 and pg 12: Regarding Recommendation 8 from the SRKW Task Force “Governor Jay Inslee includes a recommendation encouraging testing the potential of higher TDG standards and attendant spill to improve salmon survival and abundance, while also considering ways to minimize impacts on the BPA’s Fish and Wildlife Program.” If the recommendation is a test, then Alternative 4 for a two year period TDG standard change is appropriate. Because this is a Washington recommendation for testing, the state should ensure that its monitoring of surface waters (DRIP, pg 14) is appropriate to capture the results of operations to this level.
9. DEIS, pg 7 and 53: Alternative 4 is titled “removal of the 115% forebay criterion...” but the description describes returning “to the more stringent forebay and tailrace...”. This is inconsistent.
10. DEIS, pg 53: Alternative 4 states that the 125% criterion would be applied to approximately 16 hours per day and would return to the more stringent forebay and tailrace 12-hour average criteria for approximately 8 hours a day. It would be impossible to comply with a more stringent standard for 8 hours a day. A more stringent forebay criteria would be impossible to meet for only portions of each day as travel time between projects is variable and degassing rates are dependent upon environmental factors. Also, this does not align with the

flex spill agreement, which does not specify a lower TDG during performance standard hours. Instead, it is anticipated that the same criteria will apply during the gas cap and performance standard hours and we recommend removing language regarding the more stringent standard for those 8 hours.

11. DEIS pg 56: Remove the phrase “and would ease spill operations” at the top of pg 56 as this is not true.

**Document Clarifications:**

1. DRIP, general comment: In the DRIP, all instances of Army Corp of Engineers need to be corrected to Army **Corps** of Engineers.
2. DEIS, general comment: Replace “voluntary spill” to “juvenile fish passage spill”, which more accurately represents the purpose of the spill operations.
3. DEIS and DRIP, general comment: The DEIS and DRIP repeatedly refer to the dams as “hydropower projects” or the Columbia River System as “the hydrosystem.” It would be worth clarifying that the DEIS and DRIP are referring to the 14 dams that are operated in a coordinated manner for multiple congressionally authorized purposes, including hydropower generation, but also for flood risk management, irrigation, navigation, municipal and industrial water supply, fish and wildlife conservation, recreation, etc. in order to provide a better context for all of the authorized purposes for these projects.
4. DEIS, p. 4 and 16: states that the Spill Agreement also intends to provide a pause in “litigation over the impact of the federal dams on ESA-listed salmon and steelhead....” The ongoing litigation is regarding the impacts of the *operations and maintenance* of the federal dams on ESA-listed salmon and steelhead.
5. DEIS, pg 5 and 16: Describes Flex Spill as applying to “times of peak energy demand (early morning and late afternoon/evening)....” And pg 16 talks about “early morning and late afternoon/evening” and a lot of detail on the “Duck Curve.” Since the AAs are able to do 8 hour blocks at most projects during 2020 we would like this language to reflect that. *See* Attachment A to the Agreement.
6. DEIS, pg 7 and 53: States that July 1, 2021 is the end date for flex spill operations. Please revise the date to June 20.
7. DEIS pg 7 and 26: The DEIS states that “[t]he CSS model considers minimizing powerhouse encounters through measures such as spill or dam removal as critical to reducing ‘delayed mortality’ from hydro system passage and ultimately increasing adult salmon and steelhead returns.” Since dam removal is not within the scope of the DEIS, Washington should explain how CSS results are being used for its conclusions on the impacts of higher levels spill.
8. DEIS pages 7 and 53: Clarify why the language “return to more stringent forebay” criteria is included on Alternative 4, if the alternatives all state removal of the 115% forebay criteria, or remove this language.
9. DEIS, pg 8: Language should be added to link the 125% criterion during spring spill to juvenile ESA-listed anadromous fish.
10. DEIS, pg 18: “Standard modification and criteria adjustment” should be reversed.
11. DEIS, pg 23: Replace “negative market” with “lack of market”. Spilling due to lack of market does not necessarily present a negative market condition, consequently, we recommend revising the following sentence “Operational spills occur when the ability to pass water through the turbine is limited or in a negative market when power demand is low” to

read: “Operational spills occur when the ability to pass water through the turbines is limited or lack of market when power demand is low.”

12. DEIS, pg 20: 3rd paragraph under “Proposed Rule change for Increased Spill” section, the 120% should be 125% so it reads “Given the dam and salmon managers have not previously provided voluntary (fish passage) spill to 125%...”, not 120% because spill has occurred to 120% to date under the current TDG standard.
13. DEIS, pg 20: #2 identifies objectives of the EIS but focuses only on the Flex Spill agreement’s fish benefit objective rather than the three objectives, power and operational feasibility. Recommend including all three objectives.
14. DEIS, pg 22: It would be beneficial to have results/references from NOAA Fisheries Compass modeling in addition to CSS modeled results. Washington could utilize analysis in the 2019 NOAA Fisheries Columbia River System Biological Opinion.
15. DEIS, pg 22: Should clarify that the modeled results were only for spring spill. Also, the modeled scenario differs from the spill regime outlined in the Spill Agreement for 2020-2021. The scenario modeled in the CSS included 24 hours of spill to the 125% gas cap. Improvements to the powerhouse encounter rate, if provided, should be based on the spill regime in the spill agreement.
16. DEIS, pg 23: Suggest removing language about involuntary spill as it is not related to the 125% criteria.
17. DEIS, pg 48: Change “since 2018” to “in 2018”
18. DEIS, pg 49: Change “hydropower spill season” to “juvenile fish passage spill season”
19. DEIS, pg 49: Change “hydropower operations” to “spill operations”
20. DEIS, pg 49 and 54: Change “The removal of the forebay criteria of 115% may slightly increase the risk of TDG related impacts to aquatic life by increasing the duration of exposure at 120% TDG level.” to “The removal of the forebay criteria of 115% will slightly increase the risk of TDG related impacts to aquatic life by increasing the duration of exposure at 120% TDG level.”
21. DEIS, pg 50: Change “The Spill Agreement calls for ramping down spill at each dam well below the spill levels creating 120% TDG for eight hours a day every day during the spring spill season” to “The Spill Agreement allows for ramping down spill at each dam well below the spill levels reducing TDG below 125% for up to eight hours a day during the spring spill season.”
22. DEIS, pg 50: Define “prolonged” as it relates to exposure to higher TDG levels.
23. DEIS, pg 51: Clarify that Chum salmon spawn below Bonneville Dam prior to the early spill season, not during.
24. DEIS, pg 54: States “The removal of the forebay criteria may increase the duration of exposure to higher TDG levels but would not necessarily change the maximum allowable TDG level.” This language is unclear. Spill levels did impact the maximum TDG at 5 out of the 8 projects (for those projects that the downstream forebay had the more restrictive criteria).
25. DEIS, pg 55: In the summary of Alternative 4 on, the alternative is qualified as “less desirable than a rule that provides flexibility on implementation of different spill configurations that is offered by Alternative 3.” The subjective language “less desirable” should be removed from this statement.