American Rivers · Trout Unlimited

November 14, 2016

Gordon White
Program Manager, Shorelines and Environmental Assistance
Department of Ecology
PO Box 47600
Olympia, WA 98504-7600

RE: Comments on Chehalis Basin Strategy Draft Programmatic Environmental Impact Statement

Dear Mr. White,

Please accept these joint comments for the record on the Chehalis Basin Strategy Draft Programmatic Environmental Impact Statement (PEIS) on behalf of American Rivers and Trout Unlimited. The comments below include general comments followed by more detailed technical comments on each of the alternatives proposed in the PEIS.

- American Rivers' mission is to protect wild rivers, restore damaged rivers, and conserve clean water for people and nature. American Rivers' Northwest Office seeks to preserve the region's most valuable rivers, to protect remaining wild, free-flowing waterways, to conserve fish and wildlife, and to improve and enhance recreation opportunities.

- Trout Unlimited's mission is to conserve, protect, and restore North America's coldwater fisheries and their watersheds. TU's organizational goal is that by the next generation, we will ensure that robust populations of native and wild coldwater fish once again thrive within their North American range.

GENERAL COMMENTS

1) No action is not an alternative for the fish and wildlife of the Chehalis basin, which are declining under current conditions and will decline faster as climate changes. No action is also not acceptable for the people of the Chehalis basin or for the nation, given how important I-5 is. Action is needed. However, given how long the flood proposals will take to implement, especially the dams which will be mired in controversy for years, early action on habitat and local flood damage reduction is needed now and should continue regardless of the status of the flood projects.

2) The Restorative Flood Protection actions (RFP), Aquatic Species Restoration actions (ASR), and Local Flood Damage Reduction actions are strongly supported. The Chehalis Basin is the second largest watershed in the state and it supports what is likely the largest floodplain matrix in the state. The watershed supports the highest diversity of amphibians in the state, including species protected under the Endangered Species Act (ESA) such as Oregon Spotted Frog, as well as salmon and steelhead populations that have been on a downward trend toward ESA listings, and serves as a key upland habitat connection between the Cascades and Olympics. The RFP and ASR actions will have significant positive impacts on salmon, amphibians, and other species by restoring habitat, the natural river channel and floodplain processes, and landscape habitat connectivity. Restoring these

natural processes will also reduce flood damage by buffering high flow events and work in concert with Local Flood Damage Reductions actions. These actions should be selected to move forward.

3) Appendix C: Draft economic study update – Executive Summary
Under Alternative 1 and Alternative 2 sections, it states:
"*For the purposes of the economic study, the benefits and costs of Alternative 1* (and 2) *do not include the Aberdeen/Hoquiam North Shore Levee, Local Projects, Land Use Management, and Flood Warning System Improvements. Information on the costs and impacts for these action elements were not available at the time of this study as these action elements are in the early stage of the planning process." (similar language for Alternatives 3 and 4)*

The benefits and costs from these action items should be included in the economic study before any decisions are made, particularly on Alternatives 1 and 2. This is because the ecological and economic impacts resulting from any of the actions in Alternative 1 or 2 will be significant ("long-term significant adverse impacts of the Flood Retention Facility would be greater than the rest of the action elements" section 4.1.4), and a better understanding of what implications are at hand with each action are critical to making informed decisions at this stage in the process, rather than down the line when a project level EIS is proposed and other alternatives are off the table.

4) The economic analysis for the PEIS actions items should include accounting for Ecosystem Services before any decisions are made on alternatives that could negatively impact these highly valuable and all too often overlooked services. Ecosystem services include a multitude of benefits, including nutrient cycling, air and water purification, carbon sequestration, and climate regulation.

"Ecosystem services" are not mentioned anywhere in the draft PEIS, and this is cause for concern. Thankfully, from what we understand, the state is funding an ecosystem services analysis of the Chehalis Watershed. The study is currently underway, and results are expected to be out in late spring/early summer of 2017. These results should be applied to the cost/benefit analysis of the PEIS alternatives before any decisions are made, particularly on the FRFA and FRO alternatives because the "long-term significant adverse impacts of the Flood Retention Facility would be greater than the rest of the action elements", as stated in section 4.1.4.

5) The combined approach of integrating restoration into each alternative seems disingenuous by obscuring the detrimental effects of the dam alternatives on wildlife. Overall, there are no examples where dams have shown a long-term benefit to native wildlife. It would make more sense to address restoration actions and their benefits separately from the flood-control alternatives.

6) Recommend dividing some of the packaged alternatives into smaller individual alternatives. For example, the airport levee improvements and Aberdeen/Hoquiam north shore levee actions are packaged with Alternatives 1 and 2, and I-5 projects only in Alternative 2, but not an option with Alternatives 3 and 4.

7) There is little discussion or evaluation on effects of the alternatives on non-salmonid wildlife species. All of the modeled changes to population numbers and habitat suitability focus on salmon, but they do not live in isolation; salmon require healthy and resilient ecosystems. In particular, one major unresolved question is how reduced flooding events will alter the extent of ephemeral wetlands, connectivity of floodplain wetlands to the mainstem, and wetland hydroperiod. While the PEIS acknowledges that wetlands and periodically inundated areas will be reduced under Alternative

1, the quantitative data is missing. Summary tables, maps, and models are needed to assess the impact to species, such as amphibians, that use these wetlands to overwinter or breed.

8) It is not clear if all wetland types are included in the "Modeled Wetlands Inventory" (page 127). For instance, many temporary wetlands cannot be identified from aerial photographs, especially if photos were taken in the late summer or early fall under dryer conditions. Temporary and isolated or semi-connected wetlands provide critical overwintering habitat for fish and waterfowl, while also providing habitat for amphibian breeding and development in late winter. These wetlands are likely very sensitive to reduced flooding events.

9) Alternatives 1 and 2 mention that wetlands will be lost or damaged during various construction projects, but that this will be mitigated. Yet, consensus from scientific literature is that created and restored wetlands often do not functionally match natural wetlands. The PEIS appears to boldly assume that any wetland damage can be mitigated.

FRFA – FLOOD RETENTION AND FLOW AUGMENTATION DAM

A flood-retention flow-augmentation (FRFA) dam will not meet the needs for both flood-damage reduction and enhanced aquatic ecosystems in the Chehalis Basin. The environmental and socioeconomic costs of an FRFA structure far outweigh the perceived benefits.

1) *An FRFA dam facility will have enormous environmental impacts and devastating impacts on native salmonid and amphibian species*. Conversion of the Chehalis River to a permanent reservoir impoundment will remove hundreds of acres of forest and wetland, impair water quality, reduce fish-passage, reduce aquatic habitat quality, reduce salmonid survival across the basin, impair migration corridors for terrestrial species, inhibit sediment and debris transport, and induce negative geomorphic changes up and downstream for decades to come. These impacts blatantly conflict with one of the two primary objectives of the Chehalis Strategy; to protect and restore aquatic species habitat.

2) *There are major information gaps in the analysis of the two dam alternatives.* If they go forward, a project level EIS needs to closely analyze critical uncertainties or loose assumptions regarding the technical feasibility, environmental impacts and cost-benefit ratios of the dam alternatives. Specifically: the costs of the dams appear to be understated; the analysis of sediment transport in the dams and downstream of them is weak; and the feasibility of fish passage, including for non-salmonids such as lamprey, needs to be examined more closely. In addition, building these dams will almost certainly encourage development of downstream floodplains, further degrading habitat and putting more people at risk during large flood events. We should not set up the conditions like those on the Puyallup or Green River floodplains that have put communities at risk and degraded salmon runs.

3) *Both of the dam alternatives considered would disrupt and degrade geomorphic, hydrologic, and ecological functions of the Chehalis River Basin*. Human activities have altered the watershed over the past century, which has significantly impaired natural functions and resulted in increasing flood damage, degraded habitat, and fish population declines. In order to effectively address flooding issues, habitat degradation, and threats from climate change, we must build natural processes and climate resiliency, not build dams

4) *Millions of dollars are spent each year to reverse the impacts of dams on aquatic species in Washington State*. An FRFA dam will lead to a hydrologically altered system even with careful planning for flow maintenance. Flow management is not typically successful at recreating natural flow regimes and altered flow can negatively impact habitat, macroinvertebrate communities, and hyporheic exchange, among many other factors. Even with the potential benefits of augmented summer flows the PEIS demonstrates that Chehalis aquatic species will decline if an FRFA facility is constructed. We strongly question the proposition of a new dam where alternatives, such as mixed non-structural and restorative approaches exist that have been shown to dramatically benefit aquatic species and reduce flood damage. For instance, restorative flood measures accompanied by local-scale flood mitigation practices can meet both clearly stated objectives of the Chehalis Strategy. Washington's communities and ecosystems don't need another dam and the economic and ecological burdens that come with it.

5) *Dams have contributed to the listing of dozens of Washington's native aquatic species on the Endangered Species List.* While none of the Chehalis populations of salmonids or lamprey are currently listed as threatened or endangered, some may soon be candidates for listing without the right intervention. A dam is will further reduce aquatic species in the Chehalis Basin. Of particular concern is the susceptibility of lamprey, a species of significant value to the Quinault and Chehalis Tribes, to extirpation from the basin as a result of blocked passage. Proposed fish-passage mechanisms for both FRFA and FRO dams are likely to have low success rates at passing lamprey, since there are no proven examples to draw upon.

6) *Fisheries impacts from the FRFA and FRO dams would go far beyond the local area*. When one population of salmon is degraded or threatened, it can close fisheries on other species due to bycatch concerns and "take" limitations on ESA listed species, which share ocean habitats with Chehalis origin salmon. Therefore, negative impacts to Chehalis origin salmon can have influence on commercial fisheries taking place elsewhere in Washington as well as in Canada, Alaska, etc.

7) *The proposed impact of the dam's cold-water releases on spring chinook behavior is qualitative, with no certainty that positive impacts will occur*. Section 4.2.4.2.1: "The behavioral response of adult spring chinook salmon in the Chehalis River to modulating temperature and flow from the FRFA facility is unknown and represents a key uncertainty…" (Appendix K). Additionally, cool-water releases may be phosphorus rich and could contain toxic algae. This is not fully addressed in the EIS, and seems like a large oversight. Overall, the FRFA dam cannot be justified based on its assumed benefits to stream temperature and aquatic species.

8) *Salmon population projections do not include mortality due to fish passage*. While passage rates are included (page 286), these numbers are not included into any sort of population model to see how long we will have sustainable runs of salmon, steelhead, and lamprey. This seems like a major oversight when considering the long-term impacts of a dam and the goal to avoid future ESA listings.

9) *Impacts of the dam proposals on fish passage are a major concern*. Once fish navigate the relatively long fish ladder, exhausted fish must then navigate the reservoir with unnatural environmental conditions. Furthermore, the environmental conditions caused by the FRFA reservoir are conducive to invasive fish species and not conducive to salmonids, as can be seen in the Columbia River, where resources used for controlling predatory invasive fish (e.g. pikeminnow) could be utilized on more effective salmon recovery efforts.

10) *We are skeptical of the "change in abundance" figures for salmon as it relates to impacts from the FRFA and FRO dams.* A decrease of only 1-4% for all salmon species seems unlikely, when looking at historical abundance of salmon in other watersheds before dams were installed and the current abundance after a dam has been in place for some time. In short, time and again, dams have been proven to contribute to major declines in salmon abundance all across the Northwest.

11) *Extirpation of Lamprey in the Upper Chehalis above the proposed dam locations is unacceptable* – Section 4.2.4.2.1 states: "*FRFA dam (adult passage estimates range from 40% to 60%; juvenile downstream passage estimates range from 0.3% to 0.6%)"; "The fish passage facilities associated with the FRFA dam could nearly eliminate downstream passage for lamprey. Over the long term, the challenge of passing lamprey downstream around the FRFA dam could prevent lamprey form migrating to the ocean, leading to local reductions in the population, and possibly the elimination of lamprey upstream of the dam."*

    This is an unacceptable outcome in our opinion, and we strongly recommend that the FRFA dam not move forward for this fact alone.

12) *Projected population impacts do not address impacts on native species of amphibians, invertebrates, or waterfowl.* Why do the projected population numbers only focus on salmon? What about other native fish and amphibians (Page 471-472: The loss of wetlands would likely have significant adverse effects to amphibian populations as well as possibly invertebrate and waterfowl populations as well)? This is largely overlooked in the PEIS.

13) *Further analysis on the impacts to terrestrial species and wildlife corridors is needed.* Section 4.2.4.2.2 and figure 4.2-10 on Page 300, identifies the FRFA impacts on wildlife, and figure 4.2-10 shows that the dam would impact a major elk migration corridor. Further analysis of impacts to these corridors needs to be completed, and how these impacts will affect terrestrial species over the long term needs to be analyzed, quantified, and included in the cost/benefit analysis of Alternative 1.

14) *There is no assurance that wetland mitigation and restoration efforts will be adequate.* Pages 367, 382, 396, 423: "Temporarily disturbed areas would be restored to pre-construction status and/or function following construction." This appears to be a blanket statement, but all too often created and mitigated wetlands do not functionally match undisturbed conditions.

15) *An FRFA dam facility will have wide-reaching socioeconomic costs, while producing benefits to only a few*. Constructing an FRFA dam will be very expensive to build, and then maintain for the decades to come. All of Washington's citizens will foot this bill, while only some may feel the benefits of reduced flood-damage costs. An FRFA facility may arguably be most costly to members of the Chehalis and Quinault Nations, whom face significant cultural loss as salmon and lamprey populations dwindle. In return, an FRFA facility could reduce 100-year flood stage at Grand Mount by a mere .9 ft (17%), and lessen the time transportation corridors are inundated by 1-3 days.

16) *There are uncertain implications of a dam facility on legal water rights.* Additional analysis is needed on the water rights in the Chehalis Basin so instream and out of stream use is better understood. In addition, the potential impacts to water supply and water rights resulting from each of the alternatives needs to be analyzed more closely before any decisions are made. For example,

expectations need to be clarified should any "new" water become available as a result of any of the proposed actions. Water quantity is a major concern in the Chehalis Basin, and the basin is already over appropriated. For example, the basin is "closed" to new water rights, water claims regularly exceed water availability, and junior water rights have experienced curtailments over the past two summers. These issues are present on the tributaries and on the main stem, and appropriately, any solutions to water quantity and low flows need to be distributed throughout the basin and specifically designed to meet water needs for basin residents and instream use. The use of an FRFA dam as a "water storage" facility is not the right approach for meeting low instream flows and other water quantity needs in the basin. The summer flow augmentation concept proposed in the PEIS would not be natural and it would diminish the watershed's natural ability to buffer low flows and high flows, working directly against building climate change resiliency and avoiding ESA listings. Details on what is needed to address low flows and water quantity in the basin are included in the *Chehalis Basin Watershed Management Plan* and accompanying technical reports.

17) *Groundwater modeling, quantifying the impacts on wells, and a theoretical revised water budget should all be completed before the FRFA option can proceed any further*. Regarding groundwater, the PEIS, section 4.2.1.2.3 states that there could be "changes to groundwater flow regime in downstream floodplain area" but "this has not be quantified." The section concludes that there will not be adverse impacts on groundwater as a result of these actions. The fact that the studies have not been done on the connection between surface water and groundwater recharge and therefore the impacts are not known, appears to negate the validity of the "no impact" conclusion.

18) *Neither an FRFA nor FRO dam facility will control flooding on the South Fork Chehalis or Newaukum Rivers*. Proposed dams will only regulate high flows on the mainstem Chehalis above Pe Ell, WA. Communities will still be at risk of flood from tributary systems. This would be an enormously costly and impactful approach to solving only part of a problem.

19) *Neither an FRFA nor an FRO dam facility will eliminate flood risk in the Chehalis Basin. Residual flood risk will always remain.* Recent dam failures across the Southeastern United States during intense rain events demonstrate the reality of flood control infrastructure; they still hold risk. Failure of these structures can result in catastrophic losses, especially where those structures have encouraged floodplain development downstream.

20) *Washington State has an unprecedented opportunity to set an example for wiser, multi-benefit flood reduction strategies with permanent flood-risk reduction and enhanced ecosystem health.* Another dam will maintain the status quo in flood risk management and continue to degrade aquatic ecosystems, an especially disheartening outcome at a time when a new paradigm is needed most.

21) *Alternative 1 will dramatically alter water quality both in the reservoir and downstream*. While the PEIS discusses and models dissolved Oxygen and temperature, it glosses over or omits other serious concerns such as summertime phosphorus releases, harmful algal blooms, methylmercury bioaccumulation, and carbon emissions. Since reservoirs are proven to be large emitters of greenhouse gases, implementing a flood reduction strategy that further contributes to unnatural climate change is in conflict with the objectives of the Chehalis Strategy.

    Cool-water summertime releases will come from the reservoir's benthic waters (hypolimnion), which will be largely anoxic. Under anoxic conditions, phosphorus is released from sediments into the water column, which means that summertime cool-water releases could flush phosphorus

downstream and cause algal blooms and possible oxygen depletion. This needs to be modeled and evaluated.

Reservoirs can foster harmful algal blooms such as toxic cyanobacteria due to prime temperature, light, and nutrient conditions. These toxic blooms can travel hundreds of kilometers downstream.

Reservoirs promote methylmercury production due to fluctuating water levels and buildup in anoxic waters. Methylmercury bioaccumulates in the food web, with consequences for wildlife and human health. Mercury naturally occurs in soils and can also be atmospherically deposited. Current mercury concentrations in the proposed dam footprint and drainage area should be evaluated.

Reservoirs are known to be net sources of three greenhouse gases: carbon dioxide, methane, and nitrous oxide. While forest carbon storage was evaluated in the EIS, carbon release from a reservoir was not mentioned. Methane is a particularly potent greenhouse gas that is released from reservoirs, particularly in young reservoirs (< 10 years old) and in warm, eutrophic systems.

FRO - FLOOD RETETION ONLY DAM

The FRO dam concept is largely unprecedented, and the design for such a facility doesn't seem to exist anywhere else. We acknowledge that the FRO design alternative was created to reconcile the water and fish passage impacts of typical dams, with the need for predictable structural flood control. While we are pleased to see this effort, we have serious concerns about the realistic capacity of a FRO dam to maintain hydrologic and geomorphic processes, and the effectiveness of such a structure overtime. We expect that much more analysis would be needed if the FRO alternative were to move forward for consideration. Below are some specific concerns:

1) *The FRO dam concept is an unproven design and there is enormous uncertainty as to what it would entail.* We expect that many more detailed studies are needed to understand how an FRO facility would actually work, and what impacts such a structure would have. The "devil is in the details", and we have few details to evaluate at this point.

2) *Detailed analysis of the sediment transport capacity of a FRO dam facility is needed*. An FRO design dam is described as having multiple 150 foot long culverts to support natural flows, with adequate capacity to maintain bedload sediment transport. However the PEIS states that "25-50% of the bedload would be retained by the FRO facility". This would likely result in a sediment starved channel downstream over time, affecting salmonid spawning productivity. Sediment will not be moved downstream during high-flow retention/impoundment periods when most bedload material would be naturally transported, and it seems unlikely that natural flushing will be adequate to remove the accumulated sediment from the FRO reservoir following impoundment. Based on our experiences with dam management, we strongly suspect that sediment would need manual removal over time. The PEIS fails to account for potential pollutants that could be trapped in this material and how it could be disposed of. Further investigation is needed.

3) *There is no assurance that the capacity of an FRO facility to maintain natural flow regimes will not be impaired by accumulation of sediment and wood debris*. These impacts will compound, especially following the small and more frequent flood events that don't trigger retention. Additionally, the FRO facility will act as a wood filter, and channel habitat impacts as a result of lack of large wood material conveyance through and below dam site are of major concern.

4) *The impacts from the permanent loss of vegetation from the FRO facility needs to be analyzed in more detail*. In section 4.1.4, the PEIS indicates that there would be a "permanent of loss of vegetation: 6 acres for the FRO facility (in the dam footprint)…". However, the vegetation impacts would likely be much more widespread as a result of the altered surface water and ground water flow regime. This unpredictable inundation would lead to changes in soil hydrology, bacterial and fungal assemblages, and the overall soil ecosystem within the inundation zone, and this should be addressed in the PEIS.

LEVEES – AIRPORT LEVEE IMPROVEMENTS; ABERDEE/HOQUIAM NORTH SHORE LEVEE; I-5 PROJECTS

We have serious concerns about the effectiveness of levees to provide sustained flood-protection, and their implications on river-floodplain functions. Levees and bank-hardening practices simply move flood and erosion hazards downstream; we do not support this as wise-use of public funds to reduce flood damage and enhance aquatic ecosystems.

1) *Levees come with high economic and environmental costs in return for uncertain levels of effectiveness.* Proposed directly along the river channel and accompanied by bank hardening of tributary streams, the North Shore levees would be especially degrading to the Chehalis Basin. Levees would come at the cost of permanent loss of 27,000 acres of wetland habitat, impaired channel-migration capacity, exacerbated flood and erosion hazards up and downstream, and years of continual maintenance costs. In return, the proposed North Shore levee could potentially protect 2,715 structures from large flood events. Even with the levee however, many homes and businesses will still be prone to flooding and require local flood-proofing investment. The cost-benefit ratio for the North Shore levees seems far from acceptable.

2) *Levees resist natural riverine processes, disconnect and degrade habitat, and move hazards elsewhere in a watershed.* Levees have been a reactive approach to flood-control for centuries in the United States, and have channelized and homogenized river systems across the country. While providing protection from small and medium floods to the lands directly behind them, levees exacerbate flood risk and erosion hazards elsewhere in a watershed. Levee and bank hardening practices disconnect rivers from floodplains and impede natural processes, such as channel migration and groundwater exchange, leading to degraded water quality and habitat for fish and wildlife.

3) *Levees incentivize new and continued development within flood hazard areas.* Levees create an inflated sense of flood protection within communities behind them, especially where those areas are deemed to be no longer within the flood hazard zone regulated by the National Flood Insurance Program. Even behind a levee, residual flood risk remains; all levees degrade overtime and many eventually fail. These structures create the potential for catastrophic flood loss, and such events have occurred time and again nationally. We strongly recommend stringent development restrictions be implemented with any levee construction to minimize flood damage impacts that would otherwise take place behind protective structures.

4) *Levees will be less effective as climate impacts intensify*. The effectiveness of levees to protect communities from flood will be reduced as flood magnitudes increase and sea-level rises overtime. Structures built now are unlikely to be as effective 25 or 50 years from now, especially in Cities of

Aberdeen and Hoquiam which face impacts from sea level rise. With such changes, capacity of a levee to protect communities from flood will degrade, and the pace at which structures require expensive maintenance will hasten.

5) *Instead of building a wall, focus on reducing flood risk through smart floodplain management and guiding development away from floodplain.* We suggest flood damage reductions be sought through investment in local-scale efforts and improved floodplain management.

LOCAL SCALE FLOOD DAMAGE REDUCTIONS ACTIONS

We strongly support efforts to implement local-scale flood damage reduction projects, and floodplain management strategies that reduce flood risk while still supporting floodplain functions. These components should be included in a Chehalis Strategy, and we offer some recommendations for advancing them.

1) *Local-scale flood damage reduction measures are effective, but guidance for property-owners is needed to ensure adequate implementation.* We understand the need for greater flood protection for communities in the Chehalis Basin. Floods pose risk to human safety and well-being, and impose enormous economic costs on impacted communities. Investment in local-scale flood damage reduction projects such as elevating structures, flood-proofing, farm pads, alarm systems, and smart floodplain management have shown success in reducing damage to structures and improving safety. We encourage inclusion of financial support and technical resources for implementing local-scale flood damage reduction projects and incentivizing property-owners to pursue these lot-scale approaches.

2) *Local strategies are needed that avoid flood damage, not just mitigate it.* The City of Centralia has invested in acquisition and relocation of high-risk floodplain structures, removing flood risk outright in those areas. In addition to relocating repetitively damaged and high-risk structures, preventing further development within floodplains will be critical to meeting flood-damage reduction objectives in Chehalis communities. Land management practices that minimize development in flood hazard zones and loss of floodplain areas can avoid future flood damage costs, while preserving open space and natural floodplain functions that further reduce flooding potential. Zoning ordinances that can achieve these outcomes may include; floodplain fill restrictions and low-density lots.

3) *Plan for future flood risks and support natural floodplain functions.* Where connected to waterways and allowed to flood, floodplains provide space to convey and store floodwaters, enhance groundwater flows, and reduce the speed and stage of floods downstream. Floodplains also support unique spawning and rearing habitat for fish and connect critical wildlife habitat areas. With effective planning, natural floodplain functions can protect well-sited structures from damage. We strongly support local-scale efforts that utilize floodplain functions as a means to reduce and avoid flood damage. Communities may use a number of floodplain management strategies to achieve this. Floodplains should be maintained as open-space where possible through use of conservation easements, public greenway corridors, and subdivision set-asides. Where historically filled, floodplains functions can be returned through use of buyout programs that target high risk or repetitively flood- damaged structures for relocation, and subsequent conversion of floodplains to open space.

4) *Existing programs within the National Flood Insurance Program can help guide improved floodplain management practices.* We suggest that Chehalis communities receive guidance on how to participate in the Community Rating System (CRS) offered through the National Flood Insurance Program (NFIP). The CRS works to reward communities that implement floodplain management standards that go beyond minimum standards required by the NFIP. Through the CRS, communities can earn discounts on insurance premium costs for properties enrolled in the NFIP. As more creditable activities are implemented, such as preserving floodplain open space, communities earn greater discounts, up to 40%, on the cost flood insurance. Communities in Pierce and King Counties have set national examples as highly rated CRS communities, and could help guide similar successes in the Chehalis Basin.

   Communities should keep in mind that the cost of flood insurance for some properties in NFIP regulated flood hazard zones will increase nationally in the coming years, some up to 25% annually until they reflect actual risk-based rates. Cost increases are a result of NFIP reform enacted by the U.S. Congress in 2015, and are intended to phase-out subsidizing of risky development with taxpayer money. As such, many high-risk insurance policies will be restructured to reflect risk-based rates, and increase in cost in the coming years. These changes will create disincentive for further development in the flood hazard areas, and strengthen justification for community buyouts and open-space floodplain management practices.

5) *Develop better-informed river corridor management using models from other states*. Communities in the Chehalis Basin have an opportunity to develop better informed methods of floodplain management and provide an example to the rest of Washington. There is a critical need for river management schemes that apply fluvial and floodplain processes, such as channel migration and erosion dynamics, to land planning and development standards. A lack of consideration for these processes is largely to blame for the current trend of worsening flood risk, sky-rocketing flood damage costs, and degrading river functions across the United States. Some states, such as Vermont, have realized this and begun to develop new ways of thinking to manage community flood and erosion hazards. An example of this effort is the concept of River Corridor Zoning developed by Vermont's Agency of Natural Resources. A river corridor zone is developed based on a river channel's meander belt width, fluvial processes, and habitat features (Kline and Cahoon 2010). This offers a river management unit more fully informed by fluvial processes and not just the NFIP regulated floodplain area, resulting in safer development and restored dynamic equilibrium to river channels. Application of this thinking to develop Washington specific practices is desperately needed, and this is a prime opportunity to do so.

RESTORATIVE FLOOD PROTECTION

We strongly support alternatives that enhance resiliency of the Chehalis Basin to the impacts of climate change and help communities and ecosystems adapt to expected impacts of those changes. The restorative flood protection measures proposed in Alternative 4 can be a major benefit to this end; alternatives dependent on structural flood control are not.

1) *The Restorative Flood Approach is an environmentally preferable alternative that was added very late in the PEIS development process*. The technical and economic details of Alternative 4 need to be further developed before a decision as to feasibility is possible. Further, the cost-benefit analysis lacks detail and seems to undervalue ecosystem service benefits of the restorative approach. We look forward to seeing further analysis.

2) *Flooding will continue, and likely intensify, in the Chehalis Basin*. The best available climate science indicates that flood hazards are expected to grow significantly in the Chehalis River Basin. Intensifying precipitation patterns will increase the magnitude of flood events throughout the Chehalis Basin. Models suggest that the 100-year flood may be up to 66% larger on the mainstem Chehalis River and potentially even greater in headwater streams. All of this indicates that floods will continue to occur in the Chehalis Basin, and adapting to these trends vs reacting to them with manmade, engineered structures should be a priority. Quantifiable actions that address climate change and promote climate resiliency are much needed in the PEIS, and these actions and their socio-economic, biological, and ecological impacts need to be clearly defined and supported with the best available science.

3) *Structured means to control floods are not climate resilient, and offer short-term relief to the intensifying symptoms of climate change*. Dams and levees resist the impacts of climate change and attempt to mitigate future flood damages. We see these alternatives as poor means to provide long-term flood risk reduction to people and structures, with disastrous implications for Chehalis Basin ecosystems, cultural values, and fish and wildlife. Additionally, these actions put enormous financial burdens on local communities and tax-payers. Instead, we encourage consideration of alternatives like the Restorative Flood Protection alternative that leverage natural processes and floodplain functions to advance objectives for flood reduction, habitat enhancement, and climate resiliency in the Basin.

4) *Nonstructural and restorative approaches can produce permanent reductions in flood risk and prepare the Basin for future climate conditions.* Non-structural approaches that improve floodplain management, relocate high-risk structures, and restore river-floodplain natural capacity to store, slow, and withstand floods may reduce flood stage and avoid damages altogether. These measures acknowledge and anticipate future climate conditions in the Basin, and offer an informed approach to meeting multiple needs for flood damage reduction and ecosystem restoration.

5) *Combined nonstructural and restorative flood protection alternatives can meet Chehalis Basin flood damage reduction and habitat enhancement needs, and bestow climate resiliency to the region*. The restorative flood protection treatments considered in Alternative 4 are truly multi-benefit projects. Use of large wood debris to reconnect floodplains and increase channel complexity is a proven successful method for increasing floodwater storage capacity in floodplain-river systems. Applied in the mainstem Chehalis and its tributaries, RFP treatments will return natural functions necessary to adapt to impacts of climate change, and set the Basin on a trajectory towards safer communities and restored ecosystems.

6) There is uncertainty as to who will host floodplain property acquisitions. Local entities need to be the ones developing the land acquisition strategy, and this strategy needs to be a transparent locally led process. Cost estimates for acquiring these properties seems surficial, and could use a more informed assessment to better understand the cost-benefits of Alternative 4.

AQUATIC SPECIES HABITAT ACTIONS

ASH restoration actions should be included as part of the Chehalis Strategy regardless of the other alternatives selected. These plans should move forward as soon as feasible, and on a rolling basis as lands and resources become available.

1) *RFP and Aquatic Species Habitat actions offer an excellent return on investment for salmon and steelhead recovery*. It is much more cost-effective to protect and restore habitat before it is degraded than it is to recover endangered or threatened populations. Chehalis salmon and steelhead populations are not yet ESA-listed and still productive enough to utilize restored habitat, proliferate, and support self-sustaining populations. Therefore, investments in habitat restoration, while addressing flood damage reduction goals through the RFP alternative, will go a long way towards securing strongholds for wild salmon and steelhead and ensuring the persistence of fishable populations well into the future.

2) *ASH action projects should be prioritized in the onset and then reevaluated at regular intervals as landowner willingness develops and changes*. As noted in section 2.3.3.3, ASH actions will likely be implemented in only a percentage of opportunity areas due to landowner willingness. Landowner willingness is difficult to predict when planning restoration efforts on such a large scale. Prioritizing ASH actions will minimize newly restored reaches form being segregated, and aim to increase connected, functioning quality habitats that will have the greatest benefits to the aquatic ecosystem.

3) *The economic analysis of the ASH actions is very simplistic and needs more analysis*. As noted in section 4.8, the long term impacts of ASH actions have significant benefits to the aquatic ecosystem, water quality and water quantity. Some of these benefits include: improvements to water quality, improved riparian conditions, restored stream habitat and geomorphic processes, removal of fish barriers, and significant increases in salmonid abundance. The perceived benefits outlined at this point are surely enough to warrant more funding to study and further identify what it will take to attain these very desirable and much needed environmental benefits.

4) *ASH actions must be focused on lands under public ownership or conservation easement to guarantee the permanence of restoration efforts*. The RFP action suggests land buyouts whereas the ASH actions would largely be under 10 year leases with the USDA's Conservation Reserve Program (CRP). This is a cause for concern since significant investment would be put toward aquatic species restoration projects and a relatively short-term 10 year lease would not necessarily protect the investment over the long term. ASH actions should be as permanent as the FRFA and FRO dams being proposed in Alternative 1.

In conclusion, we feel that there is still a large degree of uncertainty to the cost-benefit analysis of alternatives put forward in the Chehalis Strategy PEIS. This makes a fair comparison of those alternatives difficult, and perhaps unrealistic.

We strongly support the concept behind the Aquatic Species Habitat Actions and support further development of these actions. We oppose the FRO dam based on the limited information presented in the PEIS. We strongly oppose construction of the FRFA facility due to it having the most significant adverse impacts of all of the alternatives. Both dam alternatives would significantly impair geomorphic and ecosystem processes, and salmon populations in the Chehalis Basin. We support the concepts developed in the Restorative Flood Approach alternative, and encourage further technical and feasibility analysis of this approach in the Chehalis Basin. Local-scale Flood Damage Reduction Actions need to be more completely developed and analyzed. The relationship between forest practices in the uplands and the hydrology of the Chehalis River system needs to be characterized and understood as part of this process.

We hope that these technical comments can help guide consideration of Chehalis Strategy alternatives moving forward, and we look forward to considering the outcomes of that effort.

Thank you for your attention to these comments.

Sincerely,

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References

Kline, Michael and Barry Cahoon, 2010. Protecting River Corridors in Vermont. Journal of the American Water Resources Association (JAWRA) 1-10. DOI: 10.1111／j.1752-1688.2010.00417.x