Port Gamble S'Klallam Tribe (Benjamin Harrison)

Attachments to Port Gamble S'Klallam Tribe's comments on WRIA 15 Rulemaking

Final Guidance for Determining Net Ecological Benefit

GUID-2094 Water Resources Program Guidance

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1. Purpose

The 2018 Streamflow Restoration law (Engrossed Substitute Senate Bill (ESSB) 6091), now codified primarily in chapter 90.94 RCW, requires the Department of Ecology (Ecology) to determine that a Net Ecological Benefit (NEB) will result prior to adopting:

- Watershed plan updates, as required under ESSB 6091 Section 202, now RCW 90.94.020.
- Watershed restoration and enhancement plans under ESSB 6091 Section 203, now RCW 90.94.030.
- Water resource mitigation pilot projects under ESSB 6091 Section 301, now RCW 90.94.090.

After conducting a thorough scientific literature review, Ecology has determined that NEB is not a technical term that has been defined in the natural sciences. Instead, it is a creation of the Washington State Legislature. Therefore, Ecology has prepared this guidance for interpretation and application of this term. This guidance provides supplemental information, beyond that provided expressly in the law, for those groups engaged in the watershed planning work required by RCW 90.94.020 and RCW 90.94.030. Detailed information on the use of the term in these three sections of the law is described below (see "Authorities").

Because NEB is not a scientific term, Ecology does not have a technical basis to establish a metric or amount of appropriate benefit that the plans must identify beyond the offsetting of projected impacts from new permit-exempt domestic consumptive water use. Instead, local planning groups are best situated, and will therefore determine the appropriate amount of benefits beyond the offsetting of projected impacts for their specific Water Resource Inventory Area (WRIA).

This document establishes Ecology's interpretation of NEB for the purposes described below, given the context in which the law introduces and uses this phrase. This document does not apply to any of Ecology's decisions relating to competitive grants applications or any regulatory matter.

a) Watershed Planning:[1] This guidance is to be used by planning groups preparing updated watershed plans or watershed restoration and enhancement plans required by RCW 90.94.020 or RCW 90.94.030, respectively. This guidance supersedes Ecology's June 2018 Interim Guidance, except for the planning groups that faced 2019 deadlines, or which planned in accordance with the 2018 Interim NEB Guidance due to those planning

[1] In this Guidance the term "Watershed Planning" does not refer to the Watershed Planning process described in chapter 90.82 RCW.

groups' accelerated schedules with Ecology's prior agreement.[2] This guidance also supersedes Ecology's past publication on recommendations for water use estimates. This guidance controls when there are apparent inconsistencies in similar language usage between the guidance and the appendices. This guidance also notifies planning groups of the standards Ecology will apply when reviewing any watershed plan appropriately submitted to Ecology under RCW 90.94.020 and RCW 90.94.030.

b) Pilot Projects under RCW 90.94.090: This guidance contains minor clarifications, and changes to address omissions in the information provided in the Interim Guidance for projects designed to address the Washington State Supreme Court Foster decision.

This final guidance for determining NEB was developed based on the Interim Guidance (June 2018), input received during six public meetings in October 2018, and public comments submitted on draft final guidance from May 6 to June 7, 2019.

[2] Ecology's June 2018 Interim Guidance for Determining Net Ecological Benefit (NEB) provided: "This interim guidance will be used to evaluate plans that are completed within the next twelve months, or later if there is prior agreement with Ecology…"

2. Authorities: Specific Provisions of RCW 90.94.020, RCW 90.94.030, and RCW 90.94.090

Chapter 90.94 RCW introduces and uses the phrase "Net Ecological Benefit" four times. This phrase is used three times in the context of watershed planning requirements under RCW 90.94.020 and RCW 90.94.030, and once in the context of pilot projects in RCW 90.94.090.

In the context of watershed planning, the law requires Ecology to determine, "prior to adoption of the… plan… that actions identified in the watershed plan, after accounting for new projected uses of water over the subsequent twenty years, will result in a net ecological benefit to instream resources within the water resource inventory area."[3] In the event a locally approved watershed plan update[4] is not submitted to Ecology for review and adoption by February 1, 2021, Ecology is required to initiate rulemaking. In the event a watershed restoration and enhancement committee is unable to submit a locally approved plan[5] to Ecology for review and adoption by June 30, 2021, the law requires Ecology to finalize the plan, with technical review and recommendations from the salmon recovery funding board, and then initiate rulemaking. In both of these circumstances the law applies the identical net ecological benefit requirement to Ecology's action as it does to locally prepared plans.[6]

Proposals for each of the five pilot projects need to meet or exceed a NEB threshold, as described in RCW 90.94.090(8)(c):

> "Where avoidance and minimization are not reasonably attainable, compensating for impacts by providing net ecological benefits to fish and related aquatic resources in the water resource inventory area through in-kind or out-of-kind mitigation or a combination thereof, that improves the function and productivity of affected fish populations and related aquatic habitat. Out-of-kind mitigation may include instream or out-of-stream measures that improve or enhance existing water quality, riparian habitat, or other instream functions and values for which minimum instream flows or closures were established in that watershed."

[3] RCW 90.94.020(4) (c) and RCW 90.94.030(3) (c).
[4] RCW 90.94.020(4) (a) directs "In collaboration with the planning unit, the initiating governments must update the watershed plan".
[5] RCW 90.94.030 (3) (c) directs "the department shall prepare and adopt a watershed restoration and enhancement plan for each watershed listed under subsection (2)(a) of this section, in collaboration with the watershed restoration and enhancement committee."
[6] RCW 90.94.020(7) and RCW 90.94.030(3)(h)

3. NEB for Watershed Planning Under RCW 90.94.020 and RCW 90.94.030

3.1 Definitions

The following definitions guide the watershed planning required by RCW 90.94.020 and RCW 90.94.030:

- **Adaptive Management:** An iterative and systematic decision-making process that aims to reduce uncertainty over time and help meet project, action, and plan performance goals by learning from the implementation and outcomes of projects and actions.
- **Critical Flow Period:** The time period of low streamflow (generally described in bi-monthly or monthly time steps) that has the greatest likelihood to negatively impact the survival and recovery of threatened or endangered salmonids or other fish species targeted by the planning group. The planning group should discuss with Ecology, local tribal and WDFW biologists to determine the critical flow period in those reaches under the planning group's evaluation.
- **Domestic Use:** In the context of chapter 90.94 RCW, "domestic use" and the withdrawal limits from permit-exempt domestic wells include both indoor and outdoor household uses, and watering of a lawn and noncommercial garden.
- **Impact:** For the purpose of this guidance impact is the same as new consumptive water use (see definition below). As provided in Ecology WR POL 2094 "Though the statute requires the offset of 'consumptive impacts to instream flows associated with permit-exempt domestic water use' (RCW 90.94.020(4)(b)) and 90.94.030(3)(b)), watershed plans should address the consumptive use of new permit-exempt domestic well withdrawals. Ecology recommends consumptive use as a surrogate for consumptive impact to eliminate the need for detailed hydrogeologic modeling, which is costly and unlikely feasible to complete within the limited planning timeframes provided in chapter 90.94 RCW. "
- **Instream Resources:** Fish and related aquatic resources.
- **Net Ecological Benefit (NEB):** The outcome that is anticipated to occur through implementation of projects and actions in a plan to yield offsets that exceed impacts within: a) the planning horizon; and, b) the relevant WRIA boundary.

- **Net Ecological Benefit Determination:** Occurs solely upon Ecology's conclusion after its review of a watershed plan submitted to Ecology by appropriate procedures,[7] that the plan does or does not achieves a NEB as defined in this guidance. The Director of Ecology will issue the results of that review and the NEB determination in the form of an order.[8]

- **Net Ecological Benefit Evaluation:** A planning group's demonstration, using NEB Guidance and as reflected in their watershed plan, that their plan has or has not achieved a NEB.

- **New Consumptive Water Use:** The consumptive water use from the permit-exempt domestic groundwater withdrawals estimated to be initiated within the planning horizon. Water Resources Program Policy 1020 (1991) states, "Consumptive water use causes diminishment of the source at the point of appropriation," and that, "Diminishment is defined as to make smaller or less in quantity, quality, rate of flow, or availability." For the purposes described here, consumptive water use is considered water that is evaporated, transpired, consumed by humans, or otherwise removed from an immediate water environment due to the use of new permit-exempt domestic wells.[9]

- **Offset:** The anticipated ability of a project or action to counterbalance some amount of the new consumptive water use over the next 20 years (2018-2038). Offsets need to continue beyond the 20-year period for as long as new well pumping continues.[10]

- **Planning Groups:** A general term that refers to either initiating governments, in consultation with the planning unit, preparing a watershed plan update required by RCW 90.94.020, or a watershed restoration and enhancement committee preparing a plan required by RCW 90.94.030.[11]

- **Planning Horizon:** The 20-year period beginning on January 19, 2018 and ending on January 18, 2038, over which new consumptive water use by permit-exempt domestic withdrawals within a WRIA must be addressed.

- **Projects and Actions:** General terms describing any activities in watershed plans to offset impacts from new consumptive water use and/or contribute to NEB.

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[7] For more information on appropriate procedures see Ecology WR POL 2094 and information provided by Ecology staff to the planning group.

[8] An order issued by the Director of Ecology is an appealable action as provided by chapter 43.21 RCW and chapter 371-08 WAC.

[9] New consumptive water use in this document addresses new homes connected to permit-exempt domestic wells. Generally such new homes will be associated with wells that are yet to be drilled during the planning horizon. However, new uses could also occur where new homes are added to existing wells on group systems relying on permit-exempt wells. In this document the well use discussed refers to both these types of new well use.

[10] In this Guidance "offset" is used as both a noun and a verb following the common practice of the planning participants.

[11] Planning group roles are described in RCW 90.94.020(4)(a) and RCW 90.94.030(3)(c).

- **Reasonable Assurance:** Explicit statement(s) in a watershed plan that the plan's content is realistic regarding the outcomes anticipated by the plan, and that the plan content is supported with scientifically rigorous documentation of the methods, assumptions, data, and implementation considerations used by the planning group.
- **Subbasins:** A geographic subarea within a WRIA, equivalent to the words "same basin or tributary" as used in RCW 90.94.020(4)(b) and RCW 90.94.030 (3)(b). In some instances, subbasins may not correspond with hydrologic or geologic basin delineations (e.g. watershed divides).
- **Watershed Plan:** A general term that refers to either: a watershed plan update prepared by a WRIA's initiating governments, in collaboration with the WRIA's planning unit, per RCW 90.94.020; or a watershed restoration and enhancement plan prepared by a watershed restoration and enhancement committee, per RCW 90.94.030. This term does not refer to RCW 90.82.020(6).

3.2 Watershed Planning

3.2.1 Roles and Responsibilities

Planning groups will prepare a watershed plan for their WRIA. These plans will include projects and actions intended by the planning group to both offset all new consumptive water use and achieve a NEB. Planning groups will submit locally approved watershed plans within a reasonable time for Ecology review prior to the relevant statutory deadlines.[12] Planning groups are expected to include a clearly and systematically articulated NEB evaluation in the watershed plan. Section 3.2.4 below provides guidance as to how planning groups will undertake this evaluation. A watershed plan that includes a NEB evaluation based on this guidance significantly contributes to the reasonable assurances that the offsets and NEB within the plan will occur.

Ecology will review any such plan with considerable deference in light of the knowledge, insights, and expertise of the partners and stakeholders who influenced the preparation of their plan. Ecology will make the NEB determination as part of this review.

Planning groups may choose not to include a NEB evaluation. Ecology will review plans that do not include a NEB evaluation, as well as any plans that include a NEB evaluation that do not meet the standards described in this guidance. However, without this information and technical foundation, Ecology will not have benefit of the knowledge, insights, and expertise of partners and stakeholders. Consequently, Ecology will review any such plan with considerably less deference than plans that include NEB evaluations that meet the standards described in this guidance.

[12] Ecology's lead planners assigned to each planning group will coordinate with their respective planning group to establish this "reasonable time."

3.2.2 Minimum Geographic and Temporal Requirements

Ecology will conduct NEB determinations at the WRIA scale. In order for Ecology to evaluate NEB, each plan will need to include evaluations of different plan elements at a more refined scale. Planning groups may opt to prepare a plan that seeks to address ecological benefits at a more refined scale.

The planning horizon for planning to achieve a NEB is the 20 year period beginning with January 19, 2018 and ending on January 18, 2038. The planning horizon only applies to determining which new consumptive water uses the plan must address under the law. The projects and actions required to offset the new uses must continue beyond the 20-year period and for as long as new well pumping continues. Planning groups may opt to look at a longer planning timeline, but must include a 20-year analysis of new consumptive water use to allow for the NEB determination.

3.2.3 Minimum Planning Requirements

3.2.3.1 Clear and Systematic Logic

Watershed plans must be prepared with implementation in mind. The plans must thoroughly document the planning group's understanding of any complex mechanisms and assumptions used in the plan. The plan should also describe the planning group's methods for reaching its conclusions. Sound watershed planning also properly recognizes past related and relevant planning processes and conclusions. Therefore, planning groups will describe how their watershed plan, including the projects and actions, is linked or coordinated with other existing plans such as local salmon recovery plans, ecosystem recovery plans, or other recovery plans being developed or implemented in the WRIA.

3.2.3.2 Delineate Subbasins

Planning groups must divide the WRIA into suitably-sized subbasins to allow meaningful analysis of the relationship between new consumptive use and offsets. Subbasins will help the planning groups understand and describe location and timing of projected new consumptive water use, location and timing of impacts to instream resources, and the necessary scope, scale, and anticipated benefits of projects. Planning at the subbasin scale will also allow planning groups to consider specific reaches in terms of documented presence (e.g., spawning and rearing) of salmonid species listed under the federal Endangered Species Act.

3.2.3.3 Estimate New Consumptive Water Uses

Watershed plans must include a new consumptive water use estimate for each subbasin, and the technical basis for such estimate. The recommended methods for estimating new consumptive water use are described in Appendix A - ESSB 6091 - Recommendations for Water Use Estimates. If planning groups choose not to carry out the level of analysis recommended in Appendix A, they will introduce uncertainty and ambiguity in the estimates of the new consumptive water use expected over the planning horizon. Approaches that increase uncertainty

will reasonably require additional quantities of offset water in watershed plans to account for the unknowns.

3.2.3.4 Evaluate Impacts from New Consumptive Water Use

Watershed plans must consider both the estimated quantity of new consumptive water use from new domestic permit-exempt wells initiated within the planning horizon (as described in Appendix A), and how those impacts will be distributed. As described in the definitions section above, for the purpose of this guidance impact is the same as new consumptive water use (see more in Appendix B - Considerations for Evaluating Hydrologic Impacts by and Offsets for Permit-Exempt Domestic Wells). As discussed in Appendix B, while planning groups should consider where, when, and how those effects will impact surface water, in most instances it is justifiable to make assumptions that will produce a simplified analysis. Specifically, in most cases, Ecology deems it reasonable to assume that the pumping effects of permit-exempt domestic withdrawals on streamflow will be steady-state, meaning impacts to the stream from pumping do not change over time. This assumption is based on the wide distribution of future well locations and depths across varying hydrogeological conditions. Therefore, planning groups may make steady-state assumptions for all or most of their watersheds. To the degree planning groups choose not to make the steady-state assumption they still may choose for their plans to include special considerations for selected areas (e.g. high concentrations of wells near critical salmon habitat).

The planning group's evaluation of impacts to instream resources due to the new consumptive water use will also consider, to the degree possible:

1) Habitat, including but not limited to location and length of affected stream reaches.
2) Fish and related aquatic species and their presence, distribution, and life stages.
3) Ecosystem function, structure and composition.

This evaluation will include, at a minimum, whether streamflow, or streamflow-affected traits (i.e. temperature), are a limiting factor[13] to salmon recovery.

Information on local conditions will be crucial to understanding how to assess potential impacts. Plans should make use of information about the watershed to understand local conditions and best describe the impacts to streamflow and instream resources. Plans should also consider links to other ongoing planning work as identified in 3.2.3.1, and existing projects and actions to understand local conditions in the watershed where the new consumptive water use is projected to occur.

3.2.3.5 Describe and Evaluate Projects and Actions for their Offset Potential

Watershed plans must, at a minimum, identify projects and actions intended to offset impacts associated with new consumptive water use. Planning groups may, at their discretion, decide to

[13] See local salmon recovery plans for this information.

address new water use beyond these minimum requirements. Such an optional approach may include, but is not limited to, new water use beyond the 20-year planning horizon, or beyond new consumptive water use, or other goals of the planning group. However, watershed plans are not required to include such projects and actions. Any work undertaken beyond the specific planning minimum requirements increases the likelihood that time and funds are spent on matters that will not necessarily yield a locally approvable or adoptable plan within the very tight timeframes of the law.

There is no minimum requirement for the number or distribution of offset projects or actions within each WRIA. Chapter 90.94 RCW allows offsets for permit-exempt domestic wells to occur anywhere within a WRIA, provided the watershed plan achieves a NEB within the given WRIA. This means planning groups have significant latitude to place offset projects at desired locations (e.g. most beneficial to fish, meet local feasibility considerations, etc.) regardless of whether these provide offsets within each of a WRIA's subbasins. For the purposes of clarification, Ecology notes here that it is crucial to keep in mind that the purpose, meaning, and operation of "offsets" for planning under chapter 90.94 RCW are fundamentally different than "mitigation" for water right permits (or other regulatory purposes) authorized by other water law statutes such as Chapter 90.03 RCW, where "mitigation" is typically required to be in-time and in-place.

Watershed plans can include specific recommended actions intended to contribute towards offsetting new consumptive water use or achieving NEB. It is presumed that such actions would include, but not be limited to, new, or amended, state regulations, or local ordinances in effect after January 19, 2018, that are enacted to contribute to the restoration or enhancement of streamflows.

A. Project and Action Description

Many projects and actions will have multiple types of potential benefits. Ecology recommends planning groups evaluate project or action benefits both in terms of how it will offset new consumptive use, and how it will translate into effects on other instream resources. Each project or action should include the following information, to the degree possible:

1) A narrative description.
2) A quantitative or qualitative assessment of how the project will function, including offset benefits, if applicable.
3) A map and drawings of the project location.
4) Description of the spatial distribution of likely benefits.
5) Performance goals and measures.
6) Descriptions of the species, life stages and specific ecosystem structure, composition, or function addressed.
7) Identification of support and barriers to completion.

8) Documentation of sources, methods, and assumptions.

For regulatory actions: Describe state rule or local ordinance that would be changed to provide benefits as part of plan. Ecology will only consider recommended state rule or local ordinance changes that were approved after January 19, 2018 and established to contribute to the local watershed plan, not another regulatory requirement. For other actions: description and information requirements should be discussed on a case by case basis with Ecology.

B. Examples of Projects

There are many different types of projects that could address the new consumptive water use and achievement of a NEB. Below are some examples of some projects, as well as some relevant considerations, for planning groups to consider, if they choose. The category headers provided here are suggestive and not prescriptive.

- **Water Right Acquisition Offset Projects.** Ecology acquires water rights and holds the rights in the Trust Water Rights Program (chapter 90.42 RCW) to protect them from relinquishment. These trust water rights are managed by Ecology for the benefit of instream and out-of-stream uses.
    - Water rights that Ecology acquires on behalf of planning groups must be permanently and legally held by Ecology in the Trust Water Rights Program to ensure that the benefits to instream resources are permanent. Water right acquisitions intended to offset new consumptive use will be contingent upon a water right change under RCW 90.03.380. Any acquisition project must identify the volume and instantaneous rate being acquired and the stream reaches or aquifers that would benefit from the water right acquisition.
    - Developing and assessing potential water right acquisitions is highly uncertain. Ecology will assist planning groups considering these projects in their plan.
- **Non-Acquisition Water Offset Projects.** These types of water offset projects will typically involve retiming high flow season surface waters. The streamflow benefits of some types of these water projects might be straightforward to analyze because of the specific attributes of the project and because benefits would be immediate. However, the benefits from other types of these projects will be more difficult to analyze. For NEB evaluations, plans should include the assumptions and methods used to estimate streamflow benefits for all these projects. Below are some examples of projects that improve streamflow that planning groups can consider:
    - Managed aquifer recharge projects involving the addition of water to an aquifer through infiltration basins, injection wells, or other methods. The stored water can then be used to benefit stream flows, especially during critical flow periods.
    - Projects that switch the source of withdrawal from surface to groundwater, or other beneficial source exchanges. The estimation of benefits of a source exchange project may depend on the connection between the sources and should

take into consideration the possible consequences of unsustainable withdrawals from the affected aquifer.

- Streamflow augmentation projects that involve pumping groundwater and discharging it into a stream. As with source switching, estimates of benefits may depend on the connection between groundwater and the stream and should take into consideration the possible consequences of unsustainable withdrawals from the affected aquifer.
- Off-channel storage projects that capture and store water for release back into the stream channel at other times, such as during critical flow periods.

- **Habitat and Other Related Projects.** Many people think of projects that are not water right acquisition or non-acquisition water offset projects as habitat projects, but there are a wide range of potential projects that might be included in this category in a watershed plan. These projects will contribute toward achieving NEB by focusing on actions that improve the ecosystem function and resilience of aquatic systems, support the recovery of threatened or endangered salmonids, and protect instream resources including important native aquatic species. These projects may also result in an increase in streamflow, but (by design) they prioritize the habitat benefits. It may also be difficult to quantify the offset benefits for these projects, potentially increasing uncertainty in calculating water offset quantities for the plan, and therefore potentially increasing uncertainty in the plan's conclusions and assurances. Examples of habitat projects include:
  - Projects that focus on returning stream habitat to a more natural state such as through river-floodplain restoration, instream habitat restoration, beaver reintroduction, and beaver dam analogs.
  - Projects that protect current habitats through riparian or upland conservation and management, forest management, or water conservation.
  - Projects that increase connectivity and fish passage between habitats such as fish barrier removal, or reconnection of off-channel habitat.

C. Individual Project and Action Evaluation for Offset Projects

Projects and actions included by planning groups in a watershed plan designed to offset new consumptive water use must do so by:

1) Replacing new consumptive water use during the same time and in the same subbasin as the impacts occur (i.e. high priority projects); or

2) Replacing new consumptive water use elsewhere within the WRIA, or only during critical flow periods (i.e. lower priority projects).[14]

While the law describes "high and lower priority projects," use of these terms is not the sole critical factor in determining whether a plan achieves a NEB. For example, a project involving acquisition of surface water irrigation right may be very beneficial to salmon and very important toward achieving a NEB even though it technically is a "lower priority" project since it might only provide water during part of the year. Therefore, plan development should be focused on developing projects that provide the most benefits to salmon regardless of how they align with priority labels.

In the event a planning group wishes to use priority labels project descriptions need to:

- Include information about the location in the WRIA where the offset will occur relative to impacts, and
- Identify critical flow periods relative to fish presence and distribution (as applicable). This should describe anticipated effects on ecosystem composition, structure, and function in the context of the historic hydrograph.

D. Individual Project and Action Evaluation for Habitat and Other Projects

As discussed above in section 3.2.3.5 B, habitat and other projects and actions included by planning groups in a watershed plan are assumed to primarily contribute toward achieving a NEB. Because it will be difficult to quantify the water offsets for these projects Ecology will apply a conservative approach in assessing the estimated water offset quantity relying on the substantial technical analysis provided by planning group.

E. Project and Action Benefit Summary to Support Implementation

Watershed plans must include an accounting of the offsets from the projects and actions described in the watershed plan.[15] The accounting of offsets must include a well-organized and transparent evaluation of benefits from projects.

As discussed above in section 3.2.3.5 A.7, Planning groups must also include an assessment of the likelihood that project and action benefits will occur, including local support, and any possible barriers to implementation. Planning groups may want to consider addressing some of the common factors that could either facilitate or hinder plan implementation, such as:

- Cost of implementation.
- Technical feasibility of implementation.

[14] Chapter 90.94 RCW authorizes plans to include lower priority projects—those that do not occur in the same subbasin or that only replace water during critical flow periods. See Ecology Water Resources Program POL 2094 for additional information.
[15] See RCW 90.94.020(4)(b) and 90.94.030(3)(b)

- Operations and maintenance needs and costs.
- Parties identified to undertake specified project or action.
- Political support.
- The role of uncertainty, including projected trends, in the offset estimates and project or action benefits.
- The duration of project or action compared to the duration of the new consumptive water use.
- Connections to existing projects and actions, such as land use regulations.
- The role of adaptive management in plan implementation.

For the purposes of competitive funding under Chapter 173-566 WAC (the streamflow restoration grant funding rule) watershed plans are recommend to include the planning group's "sequencing" of projects in order of most to least estimated project benefit contributing to achieving NEB. This sequencing is anticipated to be one of a series of factors that inform competitive grant funding decisions. This sequencing, if the planning groups so choose, may also take into account the categories of high and lower priority as defined in the law, however this is not required.

F. Adaptive Management

Planning groups may want to consider adaptive management. An adaptive management component of the plan helps demonstrate the watershed planning group's intent that the plan will be implemented, thereby bolstering the plan's reasonable assurances. Ecology will not interpret adaptive management provisions in a plan as an obligation of the planning group to continue its work or for Ecology to continue to fund the planning group.

3.2.4 NEB Evaluation

As noted in section 3.2.1. Roles and Responsibilities, Ecology expects that watershed plans clearly and systematically describe the planning group's NEB evaluation. The following details will help the planning groups prepare their NEB evaluation.

As noted above, in order for Ecology to make a NEB determination on a locally approved watershed plan, the planning group must submit it with adequate time for Ecology review. Ecology's review and adoption must occur prior to the relevant statutory deadlines.

3.2.4.1 Additional NEB Methods and Considerations

The State of Washington Water Research Center at Washington State University (WSU), under contract to Ecology, produced a document discussing potential methods and considerations for determining NEB. A key finding was that there are many potential ways to evaluate whether or not any individual watershed plan will produce a NEB. Each approach has strengths and

weaknesses, especially regarding data availability, complexity of the analysis, and technical resources required to complete the NEB analysis. For the purposes of watershed planning under chapter 90.94 RCW, the WSU document is provided in Appendix C for reference purposes only. This document looks beyond the statutory requirements and constraints of chapter 90.94 RCW, and therefore many of the conclusions are not directly relevant or analogous to this planning process. Ecology has also provided a preface with more information in that appendix.

In the event a watershed plan's number and/or types of projects make the NEB evaluation challenging, planning groups may, at their discretion, opt to engage in a "tiering" exercise. Projects could be organized into groups or "tiers" that reflect the likelihood that individual projects will be implemented and/or the certainty that the benefits will occur. In instances where plans only require a subset of projects to achieve a NEB, planning groups may find this approach helpful as this will enable the bulk of their analyses to focus on just those projects that are needed to provide reasonable assurance that their plan will achieve a NEB. Ecology may incorporate this type of analysis in our NEB determination.

3.2.4.2 Specific Elements of a NEB Evaluation

Ecology recommends that planning groups consider the following steps in completing a NEB evaluation.

1) NEB evaluations should begin by comparing the total projected impact from new consumptive water use in all the subbasins in the WRIA with the total amount of water offset benefits generated by all of the planned projects and actions in the WRIA.

2) Next the evaluation should describe the projected impacts and any offsets within each of the subbasins. Because all impacts at a minimum must be offset at the WRIA level, the evaluation should determine if the plan has succeeded in offsetting the impacts at the WRIA level. This means there may be instances where the amount of offsets provided in certain subbasins will be more or less than the projected new consumptive water use there. This is acceptable because the offsets are provided within the WRIA and in sufficient quantities.

3) The planning group then needs to identify the projects and actions that provide the additional benefits to instream resources beyond those necessary to offset the impacts from new consumptive water use within the WRIA boundary. The degree to which the plan must exceed this minimum offset is a matter for the planning group to decide, along with any margin of error they choose to include in the plan. Inclusion of the planning group's reasoning that supports the amount of exceedance and any associated margins of error included will be useful during Ecology's review of the plan.

4) Adaptive management conditions can also be included to address uncertainty.

5) The evaluation should include a clear statement of the planning group's finding that the combined components of the plan do or do not achieve a NEB.

4. NEB for Projects Under RCW 90.94.090

RCW 90.94.090 establishes a joint legislative task force to (1) review the treatment of surface water and groundwater appropriations as they relate to instream flows and fish habitat, (2) develop and recommend a mitigation sequencing process and scoring system to address such appropriations, and (3) review the Washington Supreme Court decision in Foster v. Department of Ecology. This section also authorizes Ecology to approve up to five pilot projects, and authorizes Ecology to issue permit decisions and water right changes in reliance upon water resource mitigation projects under a prescribed mitigation sequence. Proposals for each of the five pilot projects need to follow the mitigation sequence in RCW 90.94.090(8). It is the intent of the legislature to use the pilot projects to inform the legislative task force process while also enabling the processing of water right applications that address water supply needs. The department is authorized to issue permits and approve changes in reliance upon water resource mitigation of impacts to instream flows and closed surface water bodies under the following mitigation sequence:

> (a) Avoiding impacts by: (i) Complying with mitigation required by adopted rules that set forth minimum flows, levels, or closures; or (ii) making the water diversion or withdrawal subject to the applicable minimum flows or levels; or
>
> (b) Where avoidance of impacts is not reasonably attainable, minimizing impacts by providing permanent new or existing trust water rights or through other types of replacement water supply resulting in no net annual increase in the quantity of water diverted or withdrawn from the stream or surface water body and no net detrimental impacts to fish and related aquatic resources; or
>
> (c) Where avoidance and minimization are not reasonably attainable, compensating for impacts by providing net ecological benefits to fish and related aquatic resources in the water resource inventory area through in-kind or out-of-kind mitigation or a combination thereof, that improves the function and productivity of affected fish populations and related aquatic habitat. Out-of-kind mitigation may include instream or out-of-stream measures that improve or enhance existing water quality, riparian habitat, or other instream functions and values for which minimum instream flows or closures were established in that watershed.

4.1 Elements of NEB Analyses in Section 301 Pilot Project Proposals

RCW 90.94.090 NEB evaluations first need to demonstrate that water offset projects were not reasonably attainable. Then, pilot projects must provide a structured and transparent analysis for Ecology to use as the basis for making a NEB determination. This analysis should quantitatively compare any negative habitat and instream resource impacts of the proposed withdrawal project(s) or water resource management actions to the proposed mitigation's benefits to the habitat and resources. All consumptive use impacts to instream resources must be quantified.

Proposals must describe the amount, location, and timing of all of the water being provided through water offset projects. Benefits from proposed mitigation projects must be described in detail and quantified to the maximum extent practicable.

The water permit application and NEB analysis should contain the following elements:

- Structure the analysis in the form of a ledger or matrix that describes all the impacts to water and in-kind water offsets in detail and sums up the benefits in a quantitative or semi-quantitative manner.
- Describe any ecological impacts that are not offset through in-place and in-kind replacement of consumptive water use.
- Include an evaluation of impacts and offsets based on a detailed hydrological analysis, conceptual model, or numerical model.
- Document financial, institutional controls, and other assurances that the mitigation will be fully implemented and remain in place for the full duration of the new water use (likely in perpetuity).
- Include monitoring and evaluation plans that describe or detail maintenance needed to ensure lasting benefits.
- Include contingency plans or corrective actions to be taken if goals and measures are not achieved.
- Include information that describes the level of support for the proposed mitigation pilot from tribal, state and local resource managers (which may be in the form of letters of support or agreement).
- Identify and document scientific sources and methods of analysis.

Appendices

Appendix A. Chapter 90.94 RCW – Streamflow Restoration Recommendations for Water Use Estimates

This document provides the Department of Ecology's recommendations for estimating water use by permit-exempt domestic wells to meet the intent of chapter 90.94 RCW. The methods described are not requirements, and planning units and watershed restoration and enhancement committees can modify these methods based on credible, location- specific information, with Ecology concurrence.

The purpose of estimating the consumptive use portion of new permit-exempt domestic withdrawals is to establish the amount of new projected water that watershed plans must address. Plans must include estimates of the cumulative consumptive water use over the twenty years beginning January 19, 2018 to determine which water use must be addressed under chapter 90.94 RCW.

Ecology Water Resources Program POL 2094 and the Guidance for Determining Net Ecology Benefit (NEB) contains information on how Ecology interprets the requirements of chapter 90.94 RCW, and for definitions of terms including new consumptive water use and subbasins.

New consumptive water use in this document addresses new homes connected to permit-exempt domestic wells associated with building permits issued during the planning horizon. Generally, new homes will be associated with wells drilled during the planning horizon. However, new uses could occur where new homes are added to existing wells on group systems or shared wells operating under RCW 90.44.050. In this document the well use discussed refers to both these types of new well use.[16] Permit-exempt domestic wells may be used to supply houses, and in some cases other Equivalent Residential Units (ERUs) such as small apartments. For the purposes of this document, the terms "house" or "home" refer to any permit-exempt domestic groundwater use, including other ERUs.

Estimating the Number of Future Permit-Exempt Domestic Wells

There are many ways to predict consumptive use of new permit-exempt domestic wells for WRIAs or subbasins. The best methods rely on building permit data, population data, and county comprehensive plans. Ideally more than one method will be used and the results compared.

One method for predicting future permit-exempt domestic wells involves conducting a Geographic Information System (GIS) analysis of county building permits, zoning, and parcel information. Once these data have been segregated into WRIAs or subbasins, single-family building permit data can be evaluated to determine the number of building permits issued over some previous time period (e.g. the past 10 years). Those results can then be used to project

[16] This does not affect withdrawals authorized under RCW 19.27.097(5).

permit-exempt domestic wells over the subsequent 20 year period, based on zoning restrictions, information on undeveloped parcels, assumptions regarding how many of those building permits translate into permit- exempt domestic wells, etc.

Another method of predicting future permit-exempt domestic wells relies on population data. The Washington State Office of Financial Management (OFM) website provides estimates of past and current populations by WRIA, and projected future household populations on a county basis. One way to predict future populations is to look at populations for two different years (e.g. 2007 and 2017), then use that rate of increase to predict future populations. Upon request, OFM can also prepare 2000-2017 small area estimates. Planning groups can provide OFM GIS shapefiles for their subbasins, then a similar method can be used to predict future populations for individual subbasins. An alternate method of using the OFM data is to use current populations for a given subbasin or WRIA as a base, then increase that number based on county population projections. This latter method requires some subjectivity, however, since all of the WRIAs span two or more counties, and this method requires looking at projections for multiple counties, then inferring reasonable assumptions for each subbasin or WRIA.

- OFM population by WRIA 2000 through 2017 is available at: https://www.ofm.wa.gov/washington-data-research/population-demographics/population-estimates/small-area-estimates-program
- OFM projected growth rate by county 2010–2050 by one-year intervals is available at: https://ofm.wa.gov/sites/default/files/public/dataresearch/pop/GMA/projections17/gma_2017_1yr_2050.xlsx

County comprehensive plans also provide population projection information, which often is based on OFM data.

Once future WRIA populations have been estimated, those populations that will be served by community water systems and municipalities must be removed. This can be done relying on available information on the distribution/growth rate patterns of populations served by water systems. Other methodologies may be used, so long as clear technical documentation is provided by the planning group. Finally, future populations that will be served by permit-exempt domestic wells can be divided by the average number of people per household currently (U.S. Census Bureau Quick Facts or other County-derived sources) to estimate the number of future permit-exempt domestic wells.

An additional potential method relies on spatial data for well reports (logs) available from Ecology (https://ecology.wa.gov/Research-Data/Data-resources/Geographic-Information-Systems-GIS/GIS-data). However, estimates of future wells relying on well log data tends to not be as reliable as the methods described above due to such things as: failure to submit logs; only partially complete submitted forms; new wells replacing existing wells and not representing new uses; poor location accuracy (generally just to quarter-quarter), etc.

Total Water Use versus Consumptive Water Use

Estimates of water use by future permit-exempt domestic wells must account for the portion of water that is consumptively used. To do this, water use estimates can be divided into indoor and outdoor water use, then those estimates adjusted to identify the portion of water that will return to the hydrologic system.

In general, most houses on permit-exempt domestic wells are connected to individual septic systems. For those houses, indoor water that is discharged via septic system mostly returns to the groundwater system, and the water used outdoors is mainly lost to evapotranspiration. The percentage of water consumed (lost to the atmosphere) during these processes is a function of climate, soil type, aspect, etc., and varies across the state.

A reasonable assumption for much of Washington is that about 10 percent of indoor domestic water use from homes on septic systems is consumed, and about 80 percent of outdoor domestic water use is consumed (Culhane and Nazy, 2015). A consumptive use rate of 10 percent for indoor domestic use is in keeping with recent groundwater models constructed by the U.S. Geological Survey (USGS) for the Kitsap peninsula (Frans and Olsen, 2016) and the Chamokane Creek basin (Ely and Kahle, 2012), the Chimacum Basin (Jones, et al, 2013), and the Yakima River Basin (Vaccaro and Olsen, 2007). The USGS used a 13 percent indoor domestic consumptive use rate assumption in their Chambers-Clover watershed modeling report (Johnson et al., 2011). For outdoor consumptive use the USGS has used various percentages. For their Kitsap peninsula model, the consumptive use rate for outdoor use was estimated at 90 percent, and for their Colville model (Ely and Kahle, 2004), irrigation consumptive use was estimated at 88%. The USGS assumed landscape irrigation efficiency of 60 percent during their modeling of the Chambers-Clover watershed (Johnson et al., 2011) and the Spokane Valley-Rathdrum Prairie Aquifer (Hsieh et al., 2007). However, the Spokane Valley-Rathdrum Prairie Aquifer is associated with Missoula glacial outburst flood deposits that are unusually highly transmissive.

If houses are connected to sewer systems that discharge water outside of or near the mouth of a watershed, it can be assumed that 100 percent of the indoor water use consumptive.

Watershed planning groups can use assumptions other than 10 percent and 80 percent for indoor and outdoor water consumption, respectively, if technical justification is provided. However, ultimately, Ecology will need to use these results to determine the total quantity of water consumed by new permit-exempt domestic wells, so substitutions of different percentages need to have Ecology concurrence.

Consumptive Water Use Analyses

Estimates of the consumptive use by future permit-exempt domestic wells can be made by looking at the anticipated increases in population and/or permit-exempt domestic wells, then making a series of assumptions regarding indoor and outdoor consumptive water use.

When developing or updating watershed plans, planning groups may decide to review and potentially recommend limits on the numbers of wells and/or the amounts of water those wells

can pump within a specific subbasin or entire WRIA, in order to reduce the amount of water use impacts that must be offset. As such, it may be helpful for planning groups to generate more than one estimate of consumptive water use, using different sets of assumptions for outdoor water use, so this information will be available when developing watershed plan alternatives.

The following describes steps to produce estimates for entire WRIAs or individual subbasins.

A. Consumption due to Indoor Water Use

To estimate the impacts of indoor water use, the population to be served by future permit-exempt domestic wells can be multiplied by assumed water use. A 2016 study by the Water Research Foundation (DeOreo, et al., 2016) determined an average per capita water use of 59 gallons per day (gpd) in homes provided municipal water in 23 areas across the U.S. and Canada. This result is based on actual flow monitoring and survey responses from 737 homes. The 59 gpd average is down 15.4 percent from results found during a 1999 American Water Works Association Research Foundation study (Mayer and DeOreo, 1999). Some homes supplied by Tacoma Water were monitored for the 2016 report, producing an average 51 gpd per capita indoor water use. Bearing in mind that homes supplied by municipal water are more likely to be fitted with water saving appliances[17], an assumption of 60 gpd per capita seems reasonable when estimating water use for permit exempt wells.

To produce a result in acre-feet per year (AF/YR), estimated daily water use can be multiplied by 365 days per year, then converted to units of AF/YR, then multiplied by an assumed amount of water use that is consumptive. Different assumptions apply to homes connected to sewer systems versus those on septic systems. If homes are connected to sewer systems that discharge water outside of or near the mouth of a watershed, the assumption is that indoor water use is 100 percent consumptive. If homes are connected to septic systems, the estimated total annual water use for permit-exempt domestic wells can be multiplied by an assumed consumptive use factor, such as 10 percent, since most of this water will return to the ground via septic systems.

B. Consumption due to Outdoor Water Use

Under RCW 90.44.050, there is a maximum limit of one-half acre of outdoor watering for non-commercial lawn or garden associated with the state's permit-exemption law. However, the average outdoor water use area in any given area will likely be less. The preferred method of estimating future outdoor water use is based on an estimate of the average outdoor watering area for existing homes on permit-exempt domestic wells based on analyses using GIS and satellite imagery. Such analyses involve scanning images to get a sense of the outdoor lawn/garden areas associated with existing homes, to provide a basis to estimate the irrigated footprint of outdoor lawn/garden areas during the irrigation season for a representative samples of recently built homes.

[17] WAC 246-290-800 fulfills a legislative mandate that all municipal water suppliers create a water use efficiency program (https://apps.leg.wa.gov/WAC/default.aspx?cite=246-290-800). These efficiency programs are not a requirement for individual, domestic, permit-exempt well owners.

If planning groups choose not to perform this level of analysis and, for example, simply assume one-half acre of outdoor watering area associated with every future permit-exempt domestic well, this will introduce uncertainty and ambiguity in the estimates of the new consumptive water use expected over the planning horizon. Approaches like this that increases uncertainty will reasonably require additional quantities of offset water in watershed plans to account of the unknowns.

Once an outdoor water use area has been selected, future permit-exempt domestic outdoor water use can be estimated using an assumed crop type (e.g. pasture/turf grass) and relying on crop use estimates for nearby station(s), such as those available in Appendix A in the Washington Irrigation Guide (WAIG) (U.S. Department of Agriculture, 1997). This number can then be multiplied by an assumed outdoor watering area, as well as factors to account for both irrigation inefficiency and the amount of water that is unused and returns to the ground.

C. Use of Other Data

In some instances, additional location-specific information may exist to supplement or replace portions of the method. One example would be actual water use data for small- to medium-sized water systems within a county. Depending on the nature and distribution of such data, extrapolations might be used to either verify or modify the above estimates. However, one caution is that water system estimates may be low if users pay fees that include built-in incentives to conserve water.

In all instances, any significant variances from the above methods need to be well documented with reasons why the changes are justified.

D. Method Example

Assuming the methods described above are used, an estimate of the consumptive water use for permit-exempt domestic withdrawals during the planning horizon might look like the following:

Household Consumptive Indoor Water Use (HCIWU):

Depending on the methods used to predict the number of future permit-exempt domestic wells (see above), the population using wells may already have been determined. If an estimate of the number of future permit-exempt domestic wells relied on county building permit data or Ecology's water-well report spatial data, that number of wells can be multiplied by an average number of people per household to estimate increased population. Estimates of average household numbers are available from the U.S. Census Bureau, County data, or OFM, however, some inference will be required to convert these from a county to a WRIA basis.

For the example here, it will be assumed that there are 2.5 people per household. Given that assumption, and assuming per capita water use of 60 gpd and that only 10 percent of indoor water use is consumptive, an example of a consumptive indoor water use per house calculation in acre-feet per year (AF/YR) would be:

HCIWU = 60 gpd X 2.5 people per house X 365 days X 0.00000307 AF/gal. X 10% cons. use = 0.017 AF/YR

Household Consumptive Outdoor Water Use (HCOWU):

To estimate consumptive outdoor water use per household, domestic lawn/garden irrigation requirements can be estimated using information for a nearby station found in Appendix A of the Washington Irrigation Guide (WAIG) (U.S. Department of Agriculture, 1997). For a hypothetical pasture/turf grass example, the WAIG irrigation requirements (inches) might look something like:

Table A1. Irrigation requirement example

	May	June	July	August	September	Total
Irrigation requirements (inches)	0.63	2.72	4.11	2.75	0.9	11.11

The irrigation requirement can then be divided by 12 to convert from inches to feet, and then multiplied by an assumed outdoor watering area, which for this example is 0.4 acre:

Irrigation Requirements (in.) = 11.11 inches/12 inches per feet X 0.4 acres = 0.37 AF/YR

When consumptive water use for irrigation is calculated in accordance with Water Resources Program Guidance 1210, it includes a step to account for water lost during the water application process (e.g. water sprayed on a sidewalk instead of a lawn). Therefore, if the efficiency for a residential pop-up sprinkler system is assumed at 75 percent, the required water amount would be:

0.37 acre-feet ÷ 75% application efficiency = 0.49 acre-feet

The method in Guidance 1210 then subtracts out the amount of water that is not consumed and returns to groundwater or the surface water system. Therefore, for this example assuming the consumptive loss associated with outdoor water use is 80 percent, the estimated total consumptive outdoor water use per house during the irrigation season would be:

0.49 acre-feet x 80% consumed (20% return flow) = 0.39 acre-feet

Therefore, under this scenario Household Consumptive Outdoor Water Use (HCOWU) equals 0.39 acre-feet.

Basin-wide Household Consumptive Water Use (BHCWU):

Consumptive water use by future permit-exempt domestic wells for a WRIA or subbasin can then be estimated by:

BHCWU = number of houses served by permit-exempt domestic wells X (HCIWU + HCOWU)

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Appendix B. Chapter 90.94 RCW – Considerations for Evaluating Hydrologic Impacts by and Offsets for Permit-Exempt Domestic Wells

This appendix provides considerations for planning groups when evaluating consumptive water use by new permit-exempt domestic wells, and projects aimed at offsetting impacts from those wells. The conclusion of this appendix is that in most instances pumping impacts associated with new permit-exempt domestic withdrawals will be quite small, well dispersed, and nearly steady-state with respect to streams. Also, in general it will not be possible and is unnecessary to evaluate the impacts of pumping at individual locations. Planning groups can assume the impacts from new permit-exempt domestic withdrawals over the planning horizon will be steady-state. In the NEB Guidance, Ecology makes the assumption that impact is the same as new consumptive water use, therefore these terms of used interchangeably. This should free up planning groups to focus their efforts on identifying water offset and habitat projects that are most beneficial for fish. In rare instances, some planning groups may opt to include special considerations for selected areas where high concentrations of wells are anticipated in close proximity to critical salmon habitat, however, such exceptions, if any, are expected to be rare.

This appendix does not provide requirements, and planning groups have latitude regarding their analyses. However, any methods used and assumptions made need to be credible and well vetted, since the analyses provided will affect Ecology's determination of whether or not implementation of watershed restoration plans and plan updates (referred to as "plans" in this appendix) will achieve a Net Ecological Benefit (NEB).

Appendix A, titled, "Chapter 90.94 RCW – Streamflow Restoration, Recommendations for Water Use Estimates", recommends methods for estimating the consumptive water use anticipated from permit-exempt domestic wells over the specified 20-year period. This Appendix discusses how to take those consumptive water use estimates and combine them with an understanding of an area's hydrogeology in order to understand the distribution and timing of the impacts of permit-exempt domestic wells on surface water.

Ecology Water Resources Program POL 2094 and the Guidance for Determining Net Ecology Benefit (NEB) contains information on how Ecology interprets the requirements of chapter 90.94 RCW, and for definitions of terms including new consumptive water use and subbasins.

Background

Chapter 90.94 RCW defines that the highest priority offset projects in plans replace the quantity of new consumptive water use initiated over the planning horizon in-time and in the same subbasin. The law also defines lower priority projects as those projects not in the same subbasin and projects that replace new consumptive water use impacts only during critical flow periods. In reality the distinction between higher priority projects and lower priority projects may not be critical in determining whether or not a plan achieves a NEB. For example, a project that involves acquisition of a surface water irrigation right in a subbasin that is significant to salmon

may be critical to a plan achieving NEB even though that project provides water only during critical times (i.e. it is not in-time). However, in order to determine the significance of water offset projects it will be necessary to consider the distribution and timing of new consumptive water use as well as projects aimed at offsetting those impacts.

The requirements to offset new consumptive water use from permit-exempt domestic withdrawals under chapter 90.94 RCW are fundamentally different from mitigation requirements for permitted water rights in Washington under chapter 90.03 RCW. In the case of water right permits where new water uses will affect surface waters with legal use restrictions, mitigation is typically required and usually that mitigation must be in-time and in-place. However, under the requirements of chapter 90.94 RCW offset projects for the new consumptive water use from permit-exempt domestic wells can occur anywhere within a WRIA provided the watershed plan achieves a NEB.

Most water consumptively used for domestic use is pumped at higher volumes during the summer months due to outdoor watering. So, theoretically, in order for projects to provide benefits that are in-time, these must provide year-round replacement of water at variable rates equal to the variable, year-round, consumptive use rates of houses. Offset projects involving such things as retiring seasonal surface water irrigation rights improve flows only during the months when the water was historically used, and thus do not provide year-round benefits. Moreover, many offset projects that involve groundwater sources, such as retiring seasonal groundwater irrigation rights or developing managed aquifer recharge projects using high flow diversions, may provide year-round flow benefits to surface water sources, but may include seasonal variations depending on site-specific aquifer properties and distances from streams.

Analysis of Consumptive Water Use Impacts

Estimating the timing of groundwater impacts from permit-exempt domestic wells on streams can be complicated due to potential lags between when wells are pumped and when pumping impacts propagate to rivers or streams. If a shallow well pumps an unconfined aquifer directly adjacent to a stream, impacts created by that pumping can be almost instantaneous. However, if a well pumps a confined aquifer some distance from a stream, smaller impacts can occur down gradient and over much longer periods.

To fully analyze timing of the impacts of groundwater pumping requires taking into account an area's hydrogeology, as well as the location, timing and magnitude of new well pumping. However, in some instances simplifications can be made that have little effect on the outcome of analyses. For example, unless a well is completed in bank storage right next to a stream, pumping groundwater at 50 gallons per minute (gpm) for one hour per day (say, for lawn watering) may have almost the same impact as pumping a well at 5 gpm for 10 hours per day.

For all analyses the place to start will be to construct a conceptual groundwater model that factors in hydrogeology, geographic distribution, and depths of the wells. In water resources terms conceptual groundwater models generally include spatial delineations of recharge and discharge areas, identification of pathways from unsaturated zones through saturated zones to

groundwater receptors (e.g. streams and rivers), and estimates of time scales of flow and impacts of groundwater pumping.

As stated above, in most instances, it is reasonable to assume that the impacts of pumping on streamflow depletion will essentially be steady-state. This is because the magnitude of a pumping pulse within an aquifer decays over distance and time as the effects spread out. This is illustrated in U.S. Geological Survey (USGS) Circular 1376 - Streamflow Depletion by Wells—Understanding and Managing the Effects of Groundwater Pumping on Streamflow (Barlow and Leake, 2012), which relied on analytical modeling results to demonstrate the effects of a pumping withdrawal during a 3-month irrigation season on nearby streams of varying distances to that well. A figure in that report (Figure B1 below) depicts how pumping pulses change at distance and over time. These changes range from distinct pump-on – pump-off patterns, to a relatively constant impact that approaches the annualized, steady-state rate that produces an equivalent water volume.

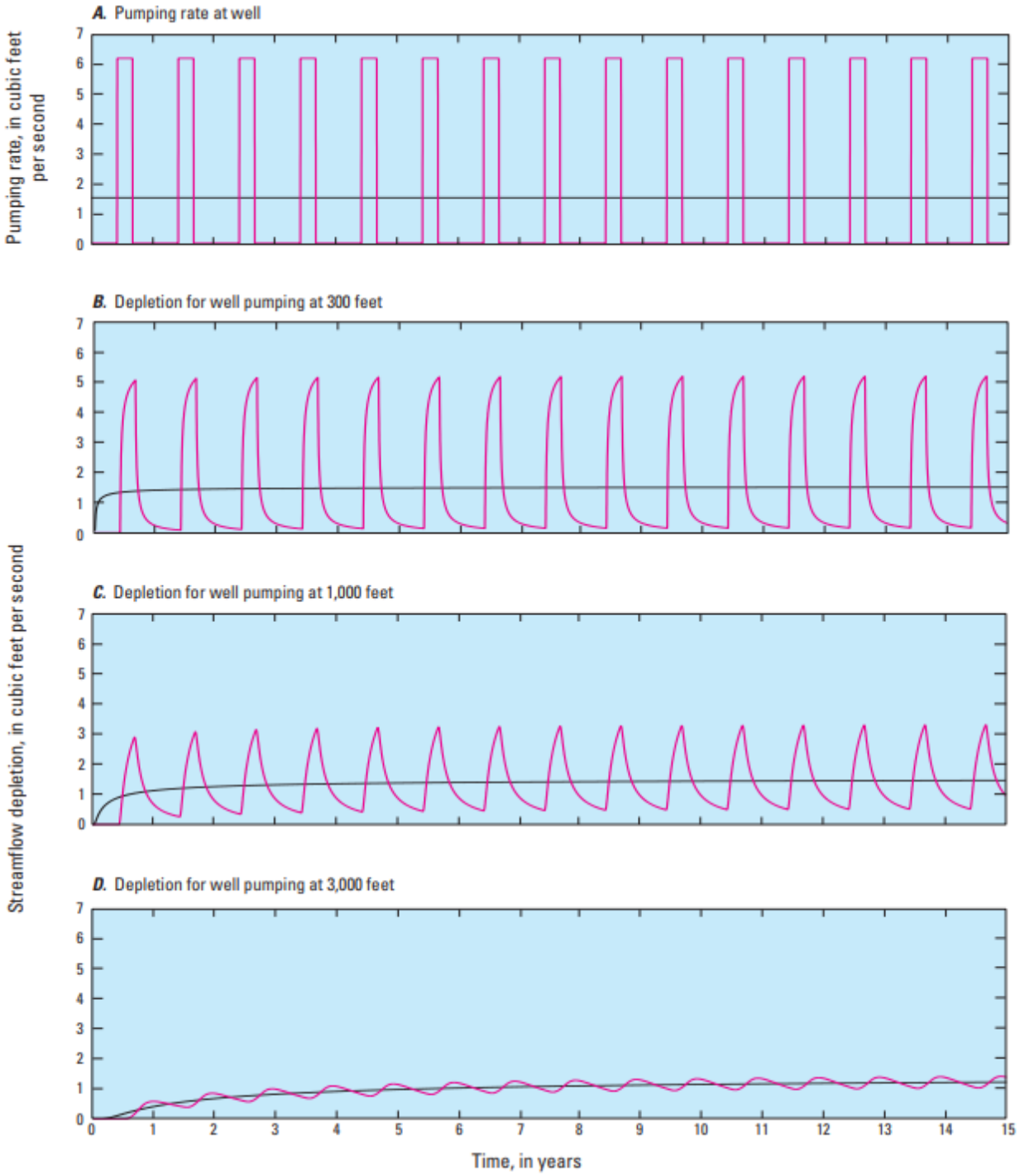

Figure B1. Patterns of streamflow depletion at varying distances from USGS Circular 1376. Patterns of streamflow depletion for both seasonal and constant pumping rates. A, The constant pumping rate, shown by the black line, is 1 million gallons per day (1.55 cubic feet per second); the seasonal pumping rate, shown by the magenta line, is approximately 4 million gallons per day (6.14 cubic feet per second) during June, July, and August. Depletion rates are shown for a well pumping at, B, 300 feet; C, 1,000 feet; and D, 3,000 feet from the river. Streamflow-depletion rates for the constant pumping rate are shown by the solid black lines and for the seasonal pumping rate by the magenta lines. The hydraulic diffusivity of the aquifer is 10,000 feet squared per day.

The graphs in Figure B1 were generated using an analytical model based on equations that rely on a number of assumptions. As with all groundwater models the assumptions simplify the mathematics involved and those assumptions are never fully met in the real world. Some of the assumptions lead to an overestimation of the impacts of pumping on nearby surface water, while other assumptions lead to an underestimation of impacts. Despite these challenges the results help us understand the interconnections between groundwater pumping and surface water depletion.

The model input parameters used by the USGS in developing Figure 1B were not chosen to represent Washington state aquifers. However, a comparison suggests these values are fairly similar to those for the Puget Sound region. For example, these results in Figure 1B are based on calculations using an assumed diffusivity of 10,000 feet squared per day (ft2/d). Since diffusivity equals transmissivity divided by storativity, a diffusivity of 10,000 ft2/d and a storativity of 0.1 suggests a transmissivity of 1,000 ft2/d. By comparison, USGS professional Paper 1424-D Hydrogeologic Framework of the Puget Sound Aquifer System, Washington and British Columbia (Vaccaro, et al., 1998) reports that regional transmissivity values generally range from about 50 to 2,000 ft2/d, and average about 500 ft2/d. Such values suggest that the modeled results displayed in Figure B1 are generally applicable for wells completed in unconsolidated glacial materials around Puget Sound. Furthermore, lower aquifer diffusivity values would increase the attenuation, thus increasing the tendency of pumping effects at distance to approach steady-state.

Although most of the 15 WRIAs specified in chapter 90.94 RCW fall within or are located nearby Puget Sound, three are not. Those three watersheds, Okanogan, Colville, and Little Spokane, are all located in eastern Washington. Domestic wells in these watersheds will be completed in unconsolidated materials, basalts, or other bedrock aquifers and will be a mixture of both unconfined and confined aquifers. While aquifer parameters will vary for different wells, groundwater use tends to flatten out the streamflow depletion impacts of peak seasonal pumping in most aquifers.

Due to hydrogeologic variability, uncertainty regarding where new well uses will occur during the next 20 years, available money, and available time, it is unrealistic for planning groups to model the impacts of anticipated pumping from the new wells. However, what the above figure suggests is that wells located 1000 feet from adjacent streams show peak depletion effects that are reduced by half of the instantaneous pumping rate (compare C to A in Figure B1) and that effects are more spread out over the entire water year. Furthermore, depletion effects from wells located 3,000 feet from adjacent streams (just over one-half mile) approach an attenuated, steady-state impact (see D in Figure B1).

Analysis of Water Offsets

Evaluations of individual water offset projects should include a determination of the magnitude and timing of hydrologic changes resulting from those projects. Projects such as permanent transfers of surface-water irrigation rights to instream flows should have fairly well-defined benefit periods. However, other projects, such as retiming of flows through managed aquifer

recharge or floodplain restoration, will require various assumptions and analyses to estimate when stream flows may increase and/or decrease. Whenever project analyses require making a significant numbers of assumptions and the results carry a significant degree of uncertainty, the plan should document and describe those limitations.

As with the estimation and distribution of new consumptive water use impacts, planning groups should consider how the benefits of water offset projects will be distributed in time and space. Additionally, some projects such as managed aquifer recharge projects will not just retime flows, but also to some extent redistribute water within given streams. In those cases, both annual and seasonal impacts of water offset projects should be considered.

Significance of Scale

When evaluating the hydrologic impacts of well uses or water offset projects on surface water, two important considerations are: (1) which surface water bodies will be affected and where, and (2) what will the magnitude of those impacts or benefits be relative to the size of the water bodies. For example, the significance of a 0.4 cfs impact created by new, permit-exempt domestic well pumping will depend in part on the size of the affected surface water body. If new houses are dispersed such that any one tributary will experience the impacts of pumping from a small fraction of the homes anticipated, the full impact will only occur on larger, downstream river segments where the significance of that impact will be much smaller. By contrast, if a 0.4 cfs impact is anticipated to specifically occur on a stream with a low flow of 4 cfs and that stream is critical to fish, it would be advantageous to locate a water offset project such that it will improve flows on that effected reach if at all possible.

Limitations of Monitoring

Planning groups should not expect to physically monitor the impacts of pumping or the benefits of water offset projects to assure compliance, and instead it will be more productive to focus their efforts on accounting for impacts and offsets in conceptual ways. In most instances, the consumptive use impacts from new well uses and/or the benefits produced from water offset projects will comprise a small fraction of flows in mainstem rivers - even during summer low-flow periods. As such, it will not be possible to physically measure changes in streamflow with conventional monitoring equipment. Even the best streamflow measurements are only accurate to within +/- 5%, which is generally much larger than anticipated effects. In small tributaries where the summer low flows may be in the single digits, it is unrealistic to expect to conventionally monitor new permit-exempt domestic withdrawal impacts or flow benefits from most water offset projects. In addition, lag times resulting from either will often manifest themselves in ways that cannot be separated from other changing flow conditions.

Putting It All Together

In most cases it is anticipated that the wide distribution of future well locations and depths, and the hydrogeological conditions, will make it reasonable to assume that the pumping impacts associated with new well use on streamflow will essentially be steady-state. However, even if

planning groups make steady-state assumptions, they will need to consider the distribution of pumping impacts throughout the watershed.

Due to a myriad of conditions involving such things as well distributions and well depths, confined versus unconfined conditions, gaining versus losing stream reaches, etc., it is unrealistic to expect planning groups to develop and use detailed information on how permit-exempt domestic withdrawals will affect streams. Therefore other approaches are appropriate. One option is for planning groups to make a simplifying assumption throughout most of their watersheds, but allow for exceptions. For most of their watershed that assumption could be that all pumping impacts will remain within the subbasin where they occur and that they will be distributed fairly evenly to the surface water bodies found within. However, in rare instances, such as where a high concentration of wells is anticipated near a particular stream, a different assumption could be made that depletion impacts are attributed to the stream located closest to the nearby pumping wells.

Conceptually it would be optimum to have sufficient water offset projects located in each subbasin to compensate for groundwater pumping impacts within those subbasins. However, in most cases that will not be possible. Instead, the approach allowed under chapter 90.94 RCW focuses on (1) making sure there are sufficient offset projects to replace the volume of consumptively used water of new permit-exempt domestic withdrawals in the planning horizon at the WRIA scale, and (2) that the portfolio of water offset and habitat improvement projects, as a whole, produce a NEB within the WRIA. The main purpose of the hydrologic effects analyses is to reasonably understand how groundwater pumping effects will manifest in the watershed in order to make a NEB determination. Since most pumping effects will be quite small, very dispersed, and steady-state with respect to streams, in most cases it is unnecessary to evaluate with precision the effects of pumping at single locations. Therefore, in general, watershed planning groups should be freed up to focus their efforts on identifying water offset and habitat projects that are most beneficial for fish – which should ultimately should help in producing watershed plans that achieve a NEB.

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Appendix C. WSU, Technical Supplement: Determining Net Ecological Benefit

Ecology Preface on WSU Technical Supplement

Planning groups are charged with the task of developing a set of projects and actions "necessary to offset potential impacts to instream flows associated with permit-exempt domestic water use" (RCW 90.94.020(4)(b) and RCW 90.94.030(3)(b)). Ecology believes that the WSU Technical Supplement's introduction provides a good introduction for NEB discussions, and some of the methods discussed may be of value to planning groups.

Section 1-D explains the benefits of coordinating with other plans and actions and provides a valuable list of natural resource management groups that conduct and coordinate planning efforts. This section outlines some of the technical issues planning units will face when developing a narrative description and evaluating their plans. The issue of uncertainty is particularly important. If there is not a multiplier of project benefits to the projected impacts to account for offset uncertainty or a divisor to account for the uncertainty in the timescale response, the technical review team will be looking for a similarly defensible rationale to account for uncertainty.

Chapter 2 looks at issues common to all NEB approaches. All are important to consider, but the comparison of out-of-kind offsets in Section 2-4 is of particular importance and highlights the most difficult issue concerning NEB. That issue involves the relative value, or weight, of habitat type or species losses relative to gains that may be "sufficient" to compensate for the losses. The approach that WSU took involves data that the planning groups likely won't have time to develop in the timeframe allowed under chapter 90.94 RCW.

Chapter 3 details five general approaches to determine NEB, but based on the amount of data and analysis required, some may not be available. Therefore watershed groups should to take inventory of all the available information on watershed-specific factors including: hydrogeology, stream flow conditions, fish populations and life histories, fish habitat studies, and current habitat conditions. In general, only two of these approaches (A and C) appear to be compatible with the constraints of the chapter 90.94 RCW planning process. The five approaches include:

A. IN-KIND/IN-PLACE HABITAT REPLACEMENT (AREA/TYPE): This approach relies on hydrogeological analysis to estimate flow offset amounts in-time and in-subbasin or even in-place or better. Such analyses could potentially be used to evaluate MAR projects and groundwater right purchases for specific projects. However, for overall plan evaluations this method probably will not be viable.

B. REPLACING HABITAT FUNCTION: This approach looks at how impacts to certain habitat features could be replaced with some combination of features at different locations that would on balance provide the same ecological function. An example of habitat function replacement would be Habitat Equivalency Analysis (HEA). However, this type of analysis requires pre-impact monitoring to develop testable metrics of the

baseline habitat services and that need, along with the data necessary for a secondary production analysis, are not compatible with the constraints of the chapter 90.94 RCW planning process.

C. REPLACING HABITAT CAPACITY FOR SPECIFIC SPECIES: This approach involves producing quantitative estimates of habitat loss that could be compared to anticipated amounts of habitat gained from offsets projects. The amount of habitat area would then become a comparable currency for impact and offset to provide a NEB determination. An example of habitat replacement could come from the suite of PHABSIM types of analyses. This approach is flexible in that the WUA can accommodate changes in general habitat amount (area) as well as specific habitat quality for targeted species and life stages. This flexibility is particularly useful in the case where offsets are not located at the impact area or if the offset's ecological result is different from the impact. Due to this flexibility this approach may be useful to some planning units.

D. REPLACING FISH ABUNDANCE: This approach is similar to habitat capacity replacement in that it requires similar information on habitat in order to forecast offsets, but it also requires more detailed information on fish abundance. Since the WRIAs are unlikely to have previous EDT assessments that included habitat qualities and fish survival, this option is probably not compatible with our timescale.

E. REPLACING FISH PRODUCTION: This approach relies on population production metrics to evaluate NEB. Reliance on productivity has a number positive attributes, including direct measures of the productive capacity of a given habitat unit, but data needs are often more intensive and population-level assessments must rely on models and methods that are often complicated and technically challenging. Therefore once again in most instances this option likely would not be useful.

Technical Supplement: Determining Net Ecological Benefit

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1. INTRODUCTION

A. CONTEXT

The 2018 law (Engrossed Substitute Senate Bill (ESSB) 6091, codified as RCW 90.94, required the Department of Ecology (Ecology) to determine that a **Net Ecological Benefit (NEB)** will result when adopting and approving:

- Watershed plan updates, as required under RCW 90.94.020.
- Watershed restoration and enhancement plans under RCW 90.94.030.
- Water resource mitigation pilot projects under RCW 90.94.090.

Interim guidance (Ecology, June 2018) was developed to inform and evaluate plans that are completed within the following twelve months, or later if there is prior agreement with Ecology, and for pilot projects being conducted under RCW 90.94.090. To assist the agency in their development of a final guidance, Ecology developed a consultation with an academic research team affiliated with the Washington Water Research Center at Washington State University to support the technical aspects of the interim guidance. This report is the product of the academic team. The final NEB guidance will be used to evaluate the remaining plans submitted to Ecology later in 2019 through 2021.

Under RCW 90.94.020 and RCW 90.94.030, the completed plans must, at a minimum, recommend actions to offset the potential consumptive impacts of new permit-exempt domestic water uses to instream flows. Before plans are adopted, Ecology must determine that actions identified in a plan, after accounting for new projected domestic uses of water within a water resource inventory area (WRIA) over the next twenty years, will result in a NEB to instream resources within that WRIA.

RCW 90.94.090 authorizes Ecology to issue permit decisions for a series of water resource mitigation pilot projects. Those pilot project proposal evaluations involve issuance of municipal water right permits rather than permit exempt wells. Therefore, the content of this report will focus on planning and evaluations conducted under RCW 90.94.020 and RCW 90.94.030 only.

B. THE NEB DETERMINATION

In essence, the NEB process under RCW 90.94 is a ***transaction***; plans will be evaluated to see if, given a forecast environmental impact from consumptive water withdrawals, there are sufficient forecast offsets from management actions, to meet or exceed those water withdrawals. Specifically in the Interim Guidance Ecology defines NEB as:

> "*A **Net Ecological Benefit** determination means anticipated benefits to instream resources from actions designed to restore streamflow will offset and exceed the projected impacts to instream resources from new water use.*"

Thus, the transaction will amount to a comparison in the quantity and quality of anticipated instream resources prior to water withdrawals and following the deployment and maturation of offset projects. To evaluate this transaction we need to be clear regarding what instream resources are relevant, and how to structure the assessment of the transaction.

Ecology defines instream resources as:

> *"Ecology interprets "**instream resources**" in the context of this provision of ESSB 6091 to include the instream resources and values protected under RCW 90.22.010 and RCW 90.54.020(3)(a), with an emphasis on measures to support the recovery of threatened and endangered salmonids."*

The references to existing rules add the following:

> From RCW 90.22.010: *The department of ecology may establish minimum water flows or levels for streams, lakes or other public waters for the purposes of protecting fish, game, birds or other wildlife resources, or recreational or aesthetic values of said public waters whenever it appears to be in the public interest to establish the same*.
>
> From RCW 90.54.020(3)(a): *Perennial rivers and streams of the state shall be retained with base flows necessary to provide for preservation of wildlife, fish, scenic, aesthetic and other environmental values, and navigational values. Lakes and ponds shall be retained substantially in their natural condition. Withdrawals of water which would conflict therewith shall be authorized only in those situations where it is clear that overriding considerations of the public interest will be served*.

While the available language potentially encompasses a diversity of ecosystem goods and services (e.g. "recreational or aesthetic values"), the evaluation of instream resources will focus on endangered salmonids.

This is emphasized in the proposed rule for Chapter 173-566 WAC – Streamflow Restoration Funding, which will establish process and criteria for funding projects under Chapter 90.94 RCW which includes the following definition:

> *"Instream resources" for the purposes of this chapter means fish and related aquatic resources.*

In Washington State, consideration of instream flow generally focuses on salmon and trout to a significant extent, as well as on other instream values. Salmon and trout are the most evident native fish in most Washington freshwaters and have high cultural, economic, and recreational importance, as well as being important ecologically (food for other wildlife, transporters inland of marine-derived nutrients that fertilize riparian vegetation (Ben-David et al. 1998; Helfield and Naiman 2001; Naiman et al. 2002; Shaff 2005), and as geomorphic modifiers (Kondolf and Wolman 1993; Macdonald et al. 2010). Based on this focus, this technical supplement will likewise focus on fish and fish habitat aspects of evaluating instream resources.

C. PURPOSE OF THIS DOCUMENT

This document primarily serves as **technical supplement** to the Department of Ecology's final NEB guidance, and does not supersede information provided in Ecology's final guidance. Ecology intends to distribute final NEB guidance that will inform diverse issues related to the development of proposals, and may include objectives for and descriptions of the planning process, requirements for proposals and process for proposal evaluation. This document in contrast, will not address requirements, and is only intended to provide technical support for the ecological assessments that are part of the NEB process. In particular, while this document describes what information content ***may*** be included in the proposals, it does not require specific information be present in all proposals, and indeed, does not define adequacy nor standards for what will be deemed sufficient by and for the Department of Ecology.

It is also a critical distinction that this document is intended to inform and support proposals and planning in response to RCW 90.94, rather than the implementation process for those plans. This distinction has a number of implications. Clearly each subbasin presents unique sets of opportunities and constraints in terms of managing instream resources that need to be examined by each planning group. Each planning group will know its basin best and it is impossible for this planning document to anticipate all of those opportunities and constraints ahead of time. Most importantly however, the role of monitoring and adaptive management will differ between planning and implementation. In the planning process scientific information, presumably collected with effective monitoring, can inform the models, forecasts and assessments in an NEB determination. However, once plans are implemented, additional monitoring may be required to evaluate project effectiveness, validate that performance targets are met, and inform the decision to deploy contingencies in the event that performance targets are not met (Crawford 2007). The incorporation of monitoring into a management loop consisting of: performance target identification, project implementation, monitoring, and management course correction based on monitoring, is termed adaptive management (Walters 1986, 1997) and is likely to be an important component of implementation. Although planning is distinct from implementation, there are both roles for the information produced with monitoring and opportunities for efficiencies in planning that come from consideration of monitoring in the planning process. Therefore, this report includes a brief discussion of monitoring and adaptive management below.

The framework for this document is derived from work produced for the Canadian Science Advisory Secretariat (CSAS) that sought to provide guidance on evaluating offsets from fisheries-related management in relation to any harm development projects may cause to fish and fisheries (Bradford et al. 2014). That report describes an approach to assessing "equivalency" from impacts and offsets, and applied several approaches to evaluating equivalency. The notion of equivalency is similar to NEB, but it derives from statutes which are themselves different in Washington and Canada. Therefore, we do not coopt the technical definition of equivalency in this document. However, Bradford et al (2014) do provide a number

of useful insights. Specifically, they recognize the general distinction of In-kind/In-place/In-time offsets on the one hand, to a diversity of approaches to out-of-kind/place offsets on the other[1].

Across the regulatory and research literature on environmental impact mitigation the terms “in-time” and “in-place” are commonly used. However, each regulatory situation may impose unique definitions based on jurisdictional and planning constraints. In Washington State relative to water right permits, the term “in-place” refers to mitigation that is located in the same place as the pumping impacts. However, RCW 90.94 applies to permit-exempt wells and not permitted wells, and relative to offsets for permit-exempt wells in this law does not have in-time or in-place requirements. RCW 90.94 does describe highest priority offset actions as being capable of “replacing the quantity of consumptive water use during the same time as the impact and in the same basin or tributary”, and Ecology has referred to this latter locational constraint as meaning within the same sub-basin. Thus, within the law “Lower priority projects include projects not in the same basin or tributary and projects that replace consumptive water supply impacts only during critical flow periods”. However, beyond this, RCW 90.94 allows great latitude in where offset projects can be located and what the timing of the benefits will be - provided that collectively the plan will achieve a Net Ecological Benefit.

Therefore the spatial domain used in RCW 90.94 is larger than other uses of the term “in-place” -particularly in the research literature broadly, and Bradford et al. (2014) specifically. For the purposes of this document, there are places where the terminology “In-place” is used equivalent to “same basin or tributary” consistent with RCW 90.94, and there are other places where the term “in-place” is used in same sense as the research literature more broadly – with the text noting areas where one or the other situation applies.

Bradford et al. (2014) recognize the diversity of out-of-kind/place/time approaches based on offset goals and modeling frameworks. We have leveraged these insights here and adopted their organization of offset approaches in this document. We use this definition and the conceptual foundations provided by Bradford et al. 2014 within the context of the decades of salmonid research done in the U.S. Pacific Northwest. As such, this discussion outlines pathways forward for developing scientifically defensible plans to estimate 1) the harm new development may inflict on fish, and 2) the efficacy of proposed offset projects towards preventing, reducing or offsetting harm in Washington State.

Given the unique challenges and opportunities present in each watershed in Washington State, and the diversity of approaches to NEB determination described below, this document does not dictate specific actions to be taken. Rather, this document is meant to provide a scientific framework from which planners and regulators can understand the current state of knowledge. We attempt to identify the most scientifically rigorous method in a given area for estimating the

[1] Separate from defining the spatial boundary of “In-Place”, the meaning of In-Kind/In-place is meaningful only if mitigation is contemporaneous or performed over relevant time scales. The ecological responses of habitat to mitigation may operate on different time scales than the impacts of water withdrawals and if those scales are very different, it may be difficult to associate responses with impacts in the same place and of the same response type. Therefore, while In-Kind/In-Place is used here to be consistent with other nomenclature, it should be understood to be In-Kind/In-Place/In-Time unless otherwise noted.

potential harm and potential benefits to endangered salmonids, other fishes and other instream resources despite continued watershed development.

The following sections outline the steps needed to estimate NEB and discuss anticipated issues associated with monitoring and diverse spatial scales, as well as the rationale for making out-of-kind NEB comparisons. These are followed by a review of five approaches for establishing NEB and the merits and limitations of each. These five approaches include: 1) In-kind/In-place Habitat Replacement, 2) Habitat Function Replacement, 3) Habitat Capacity for Single Species Replacement, 4) Fish Abundance Replacement and 5) Fish Production Replacement[2].

The authors of this report do not have detailed knowledge concerning the level of resources, expertise and research sophistication available to each planning unit. Our professional experience suggests that the resources and expertise available to the planning units will vary widely. For example, the Pacific Northwest is one of the most sophisticated natural resource management domains on this planet, with research, monitoring and evaluation expertise built on Endangered Species Act, Northwest Power Planning Act, Northwest Forest Plan and other regulatory framework legacy experiences. Therefore, in some cases the capacity to perform sophisticated NEB determinations may be quite high. At the same time RCW 90.94 addresses a new framework, with new expectations, and some planning units may find they do not currently possess the tools to perform a detailed, demanding NEB determination as described below. In these cases, planners may perceive the information that follows in this report to be somewhat demanding. We feel however, that it is important to describe the approaches to NEB determination that would represent a contemporary and comprehensive approach, with the understanding that some groups may not exploit that comprehensiveness, rather than compose a report that was narrow in approach, based on lower expectations for regional expertise, and fail to provide guidance to planning groups that did possess more capacity.

In the past, when subbasin planning or recovery planning groups and agencies have lacked expertise or access to appropriate monitoring data, detailed research products have been substituted with subjective assessments, often labelled “best professional judgement” or similar. It is likely that in the case of NEB determinations performed under the RCW 90.94 process this will also be the case for some planning groups. Planning units and the Department of Ecology will need to resolve what expectations are appropriate for each planning group, and where the recruitment of additional expertise is justified and available.

D. STEPS IN A NET ECOLOGICAL BENEFITS DETERMINATION

NEB determination is composed of four key parts as defined by the Interim Guidance:

1. **Characterize and quantify potential impacts to instream resources from the projected 20-year new domestic permit-exempt water use at a scale that allows meaningful determinations of whether the proposed offset is in-time and/or in the same subbasin.**
2. **Describe and evaluate individual offset projects.**

[2] Fish Production Replacement refers to the productivity of fish in the habitat. It does not refer to hatchery supplementation of fish.

3. **Explain how the planned projects are linked or coordinated with other existing plans and actions underway to address existing factors impacting instream resources.**
4. **Provide a narrative description and quantitative evaluation (to the extent practical) of the net ecological effect of the plan.**

1) Characterize and quantify potential impacts to instream resources from the projected 20-year new domestic permit-exempt water use at a scale that allows meaningful determinations of whether the proposed offset is in-time and/or in the same subbasin

Planning groups must evaluate "potential impacts to instream resources" as the losses that must be counterbalanced by the proposed offsetting measures. Of particular interest are those spatially- and temporally-dependent changes in stream flow resulting from consumptive use withdrawals that may have impacts on fish and fish habitat. Impacts on fish may not be uniform across space, time or fish life-stage (e.g. decreases in flow can have a positive impact on some life-stages of fish but negative impacts on others, or mitigation actions may take multiple years to take effect—see below). Thus, estimates of ***net*** impacts should be determined and quantified for each impact type in each phase of a proposed activity across the forecasted 20-year time horizon. This may include determining the extent, duration, and magnitude of the impacts on fish and fish habitat in terms of the reduced fish numbers, area of habitat lost, area of habitat permanently altered and degree of alteration. There are several approaches to making these forecasts (see below); this document outlines the benefits and limitations of these available methods.

2) Describe and evaluate individual offset projects.

All proposed offsetting measures should include details about the design, implementation, and desired outcomes for the NEB determination. The desired outcomes should be determined by the forecasted potential impacts to instream resources in Part 1 of this section. The NEB determination should include clearly defined measures of success that are linked to the desired outcomes of the offset projects, and be expressed as metrics that can be monitored to evaluate effectiveness.

Potential designs for offset project metadata are provided in an accessory appendix (Appendix 1). The metadata dictionary provides examples of metrics for describing the magnitude, location, and extent of each offset project and a rationale for the key information needs listed.

The steps involved in describing and evaluating projects are discussed in Ecology's Interim Guidance. Once all of the projects have thus been characterized, it is useful to distinguish between those that are "in-time" and "in-same-subbasin" versus those that are "out-of-time and out of-same-subbasin".RCW 90.94 establishes a hierarchy of priority for actions (projects) aimed at offsetting the impacts of consumptive domestic permit-exempt well use:

- Highest priority are projects that replace consumptive domestic water use impacts during the same time and in the same subbasin as the impacts occur.
- Lower priority are projects that replace consumptive domestic water use impacts elsewhere within the WRIA or only during critical flow periods.

"In-time and In-same subbasin" offsetting refers to situations in which the water used for permit exempt domestic well consumptive use is replaced by the same quantity and quality of water in the same place—where place is defined as the same subbasin. Additional habitat offsetting may potentially be required to account for uncertainty and time lags. The benefits of in-kind offsetting are assumed to accrue to the fish populations affected by the project. In these situations, balancing the losses to fish and fish habitat caused by a project with the benefits that result from offsetting measures can be a straight-forward calculation. The calculation is based on the impacts, water use, and the comparability of offsets both in terms of the metrics used to describe them and the affected fish populations.

With "out-of-same-subbasin" or "out-of-time" offsets, offset projects address factors limiting fish productivity in a given area, but not by replacing what has been lost. Rather, offsets meet or exceed those losses with increased production elsewhere. Out-of-same subbasin/time offsetting measures may include the restoration or creation of habitat types that are different from the habitat type that was lost, or other types of measures. This is sometimes referred to as off-site mitigation. Measuring and comparing losses with offsetting gains can be more complicated in out-of-same subbasin/time offsets, as the transaction relies on a correct understanding of the relationship between habitat alterations in a given location and a fish productivity response. This has been challenging to demonstrate and it is an important limiting assumption (see Locke et al. 2008 and Monitoring and Evaluation section below).

3) Explain how the planned projects are linked or coordinated with other existing plans and actions underway to address existing factors impacting instream resources.

This step is principally an administrative activity, and the Interim Guidance provides additional details and rationale for coordination within other management plans as well as with other ongoing habitat and fish management within their WRIA's and sub- WRIA planning units. Planned offset projects may indeed benefit in terms of greater environmental benefit if they are planned, designed and implemented in coordination with partners. Effective coordination is likely to leverage a larger set of resources and reduce overall cost per unit ecological benefit.

Notwithstanding the desired outcome that more coordination will produce greater environmental benefit, it is also likely that in some cases there will be a state of diminishing returns. For example, if water temperature is a critical concern for salmon in a given WRIA, and 100 out of 130 miles of the riparian corridor have been addressed previously with restoration, then the next 10 miles may not be as effective in increasing fish populations as the first 10 miles of riparian revegetation, nor as effective as 10 miles of riparian revegetation in a different corridor that has been untreated.

In any case, siting offset projects in the context of historical habitat management and coordinating with on-going management will be critical for supporting the forecasts of potential impact and offsets described in each NEB Determination.

Each WRIA-based planning group is likely aware of much of the habitat management actions occurring within their WRIA. However, additional sources of information on planned and implemented projects can be obtained from known data holders on the following list:

Data Holder	Location	Phone	Web url
Columbia Basin Fish and Wildlife Authority - CBFWA	851 SW 6th Ave # 250, Portland, OR 97204	(503) 229-0191	https://www.cbfish.org/
Nisqually Indian Tribe	Nisqually Tribe 4820 She-Nah-Num Drive S.E. Olympia, WA 98513	(360) 456-5221	http://www.nisqually-nsn.gov/index.php/administration/tribal-services/natural-resources/habitat-restoration/
NOAA – Pacific Coast Salmon Recovery Fund	7600 Sand Point Way, Seattle, WA 98115	(503) 230-5419	https://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/pacific_coastal_salmon_recovery_fund.html
NOAA Fisheries Community Based Restoration Center	7600 Sand Point Way, Seattle, WA 98115	(360) 902-2603	https://www.fpir.noaa.gov/HCD/hcd_restoration.html
NOAA Restoration Center	7600 Sand Point Way, Seattle, WA 98115	(360) 902-2603	https://www.westcoast.fisheries.noaa.gov/habitat/restoration_on_the_wc.html
NOAA Pacific Northwest Salmon Habitat Project Database	Northwest Fisheries Science Center 2725 Montlake Blvd. East Seattle, WA 98112	(206) 860-3362	https://www.webapps.nwfsc.noaa.gov/apex/f?p=409:13::::::
Nooksack Salmon Enhancement Association	3057 E. Bakerview Road Bellingham, WA 98226	(360) 715-0283	http://www.n-sea.org/contact (also see: https://wdfw.wa.gov/about/volunteer/rfeg/)
Ocean Trust	1000 Padre Blvd. Suite 528 South Padre Island, TX 78597	(703) 434-1444	https://www.oceantrust.org/contact/
South Puget Sound Salmon Enhancement Group	6700 Martin Way East, Suite 112 Olympia, WA 98516	(360) 412-0808	http://spsseg.org/contact-us/
Stillaguamish-Snohomish Fisheries Enhancement Task Force	425.252.6686 PO Box 5006, 2723 Hoyt Ave Everett, WA 98206	(425) 252-6686	http://www.stillysnofish.org/
United States Army Corps of Engineers	PO Box 3755 Seattle, WA 98124-3755	(206) 764-3742	https://www.nws.usace.army.mil/
United States Bureau of Land Management	Bureau of Land Management 333 S.W. 1st. Avenue Portland, OR 97204	(503) 808-6002	https://www.blm.gov/or/programs/fisheries/salmon_habitat_mgmt.htm
United States Fish and Wildlife Service	911 NE 11th Avenue Portland, OR 97232	(509) 548-2985	https://www.fws.gov/pacific/fisheries/HabitatRestorationMain.cfm

United State Forest Service – Regional Ecosystem Office	1220 SW 3rd Avenue Portland, Oregon 97204	(503) 808-2851	https://www.fs.fed.us/r6/reo/nwfp/
Washington State Department of Fish and Wildlife – Habitat Program		(360) 902-2534	https://wdfw.wa.gov/conservation/habitat/
Washington State Salmon Recovery Funding Board (SRFBD)	1111 Washington Street S.E. Olympia, Washington 98501	(360) 902-3000	https://www.rco.wa.gov/boards/srfb.shtml

4) Provide a narrative description and quantitative evaluation (to the extent practical) of the net ecological effect of the plan.

Similar to the forecasts of potential impacts to instream resources identified in Step 1 of this section, planning groups will also need to forecast anticipated net ecological effect of their planned offset projects. Also similar to Step 1, these forecasts can be performed with a variety of approaches, some of which are identified below. Importantly, each approach must address the following technical issues:

a) The forecasted benefits from offset projects need to meet or exceed the potential environmental impacts to stream resources;

b) Recognition that uncertainties exist on several scales

   a. *Uncertainty in offset magnitude*: Given that the magnitude of offset effects are uncertain, the magnitude of total planned offsets may need to be increased in the plans in order to increase likelihood that net offsets exceed impacts of withdrawals;

   b. *Uncertainty in timescale of response*: Recognizing that although not explicitly considered under the streamflow law, there may be time lags between the implementation of a project and when the potential benefits to instream resources may manifest, but the negative impacts of consumptive water withdrawals may occur in the near-term, the magnitude of the offset projects may need to be increased. For example, if the impacts of a set of withdrawals occur over years 1-20, but the benefits from offsets are only manifest in years 10-20, then the magnitudes of the offsets would need to be larger than the impacts at any moment in time for the NEB to net out positive at the end of the planning horizon;

c) Contingency measures for the event that offsets are not reaching performance targets, timelines for evaluating triggers for those contingencies, and management decision process for employing those contingencies should also be identified if the offsetting measures do not meet expectations.

2. ISSUES COMMON TO ALL NEB DETERMINATION APPROACHES

1) Monitoring

As mentioned above, this guidance is intended to address planning rather than implementation needs. However, we can anticipate opportunities and constraints presented by implementation feeding back into the planning process. One of those issues is monitoring and adaptive management. It is appreciated that that monitoring is a key component of management action implementation, but it may be less clear how monitoring fits into planning exercises prior to management action deployment.

Plans that anticipate the realities of implementation, such as uncertainty, risk and management decision making, are most likely to be successful. Monitoring is a critical tool in addressing these realities, and is most effective when incorporated into an adaptive management framework. As mentioned above, there are several scales of uncertainty in forecasting NEB both in terms of impacts of water withdrawals and the impacts of offset projects. The potential that planned projects will not generate a positive NEB is an important risk associated with these uncertainties. Monitoring of offset impacts informs evaluation of progress in meeting plan objectives, and when invested in a framework for making management decisions can determine if plans need to be modified to reach targets. Importantly, monitoring of offsets can determine if performance targets are not being reached and triggers for contingencies are required prior to an unsuccessful project completion. Incorporating monitoring into this loop of performance target identification, project implementation, monitoring, and management course correction based on monitoring, is termed adaptive management (Walters 1986, 1997; Katz et al. 2007). By allowing informed course corrections over the 20 year time horizon of the NEB process, monitoring is a critical to reducing the risk that NEB will be negative.

For these reasons, projects that include an explicit effectiveness monitoring plan[3] should garner greater deference in determining project benefits. In addition, the State of Washington and the region more broadly have recognized the critical role of monitoring in validating fish-habitat response models as well as validating the effort and significant investments in habitat management across the Pacific Northwest. The precepts behind monitoring across the region are summarized in the ***Coordinated Habitat Action Effectiveness Monitoring*** guidance from the Pacific Northwest Aquatic Monitoring Partnership (PNAMP), to which Ecology is a partner agency. The following is an excerpt that underscores the role of, and commitment to, effectiveness monitoring:

> *"Habitat action effectiveness monitoring is a critical component of performance tracking and adaptive management needs of the Pacific Coastal Salmon Recovery Fund (PCSRF), the Columbia Basin Fish and Wildlife Program, the 2008 NOAA Federal*

[3] Action effectiveness studies [=effectiveness monitoring] look at "cause and effect" relationships between management actions and improvements to fish survival and/or environmental conditions. In other words, these studies help evaluate whether actions for fish are achieving their biological objectives. https://www.salmonrecovery.gov/Evaluation/ActionEffectiveness.aspx

Columbia River Power System (FCRPS) Biological Opinion, several other regional Biological Opinions, and several federal, state and tribal mitigation programs. The current habitat action effectiveness monitoring and assessment strategies being implemented under these Programs requires a combination of project implementation monitoring, project level and watershed scale effectiveness monitoring, along with habitat/fish status and trend monitoring. This information will support a tool box of various habitat and fish population relationships and models that can be used to make assessments and inferences about the effectiveness of various actions. For these strategies to succeed, the components need to be coordinated with compatible and well documented metrics, methods, and designs and balanced across different categories of action types within limited budgeting available for this type of information." PNAMP 2010[4]

Effectiveness monitoring plans should include:

- Clearly articulated models of the managed system, where 'model' refers to a description of the environmental system that includes hydrologic and ecological process and allows a specific forecast for the effect of the implemented management action in terms that can be monitored with current methods.
- Clearly defined and reportable benchmarks of success and time lines that can be used to determine success in reaching NEB, as well as recognizing when NEB is not being achieved and contingencies must be triggered.
- Methods and designs consistent with effectiveness monitoring guidelines or plans in place across the region (e.g. PNAMP).
- The same level of transparency present in other aspects of the NEB determination.
- Coordination with other status and trends and effectiveness monitoring programs within their planning domain and in adjacent planning domains to ensure interoperability and maximal efficiency with respect to multiple NEB determinations.

Although monitoring has been described here in the context of validating the performance of offsets, it is also likely that monitoring will inform some of the estimates of impacts. However, the degree to which monitoring influences the estimates of impacts from water withdrawals will be highly variable among the approaches to NEB determination described below. This variability makes it difficult to specify the characteristics of monitoring for this objective. However, if monitoring is a component of impact assessment as well as offset forecasts, that monitoring should be designed to generate data that is interoperable between those activities.

2) Accuracy, Precision & Transparency

[4] Crawford, B., J. O'Neal, M. Newsom and J. Geiselman. (2010). Coordinated Habitat Action Effectiveness Monitoring. PNAMP Available at https://www.pnamp.org/document/3039 (accessed Nov. 5, 2018)

The RCW 90.94 interim guidance indicates that plans should characterize relevant uncertainties in their estimates of impacts and offsets in each NEB determination. This direction is specific:

"*Uncertainty of benefits should be identified and quantified to the extent possible*."

How then to characterize uncertainty? Every model is a simplification of a true and complicated process. As such, it is important to understand both the sources and magnitudes of uncertainties that are part of any model prediction. Uncertainty in this context can actually arise from several aspects of the analyses used to forecast impacts and offsets.

In general, there are two primary elements to uncertainty that one needs to consider: accuracy and precision (fig 1). ***Precision is how close predictions or observations are to each other***. Models that make predictions that are tightly clustered together are said to have high precision, and this is expressed statistically as low "variance". ***Accuracy on the other hand, is how close a prediction is to the truth***. Models that make predictions that are consistently close to the true values are said to have high accuracy, and this is expressed statistically as low "bias". It is important to keep these sources of uncertainty distinct for several reasons. They are statistically different, they affect interpretations differently, and they have different origins such that minimizing one or the other requires different alterations to our methods. For example, there are times when increasing the amount of data can increase precision, but it usually has no effect on accuracy. As a consequence, there are times when no amount of more data will get an answer with more accuracy. In addition, it must be recognized that they are independent in that either one or both can be high or low at the same time. This is illustrated in figure 1 below.

An ideal model has both high accuracy and high precision, but in practice this rarely happens. Especially with models, there are good reasons for the presence of trade-offs among the two. Relatively simple models may have fairly high precision, but low accuracy, especially when applied to novel data. Increasing the complexity of models can increase accuracy, but at the cost of decreased precision.

Several features of the interaction between precision and accuracy can be illustrated with the following simple example of fitting a curve to estimate an underlying process. Consider a simple relationship, or process, in the environment (gray line in each panel of fig 2a-c), that we observe at a sample of X values (indicated by black dots). The values of the dots are determined by the process and a little bit of uncertainty, or error in the data. So the black dots are the data in hand, and the process is what we are trying to model, and in each panel of the figure they are the same. Now if we fit the data with a simple linear model with 2 parameters (the slope and intercept) we get the straight red line in figure 2a. The points deviate from the red line quite a lot (low precision), but the line represents the underlying process fairly accurately; the overall trend is going down with increasing X over this range of X values. In the far right panel the process is estimated with a much more complex model that has 7 parameters (6 polynomial exponents and an intercept). Here the red line goes through all the points, and so is very precise (indicated by the high value of r^2), but the red line is not a very accurate description of the process given all the diversions and "waviness". In the middle, we fit the data with a polynomial with 4 parameters.

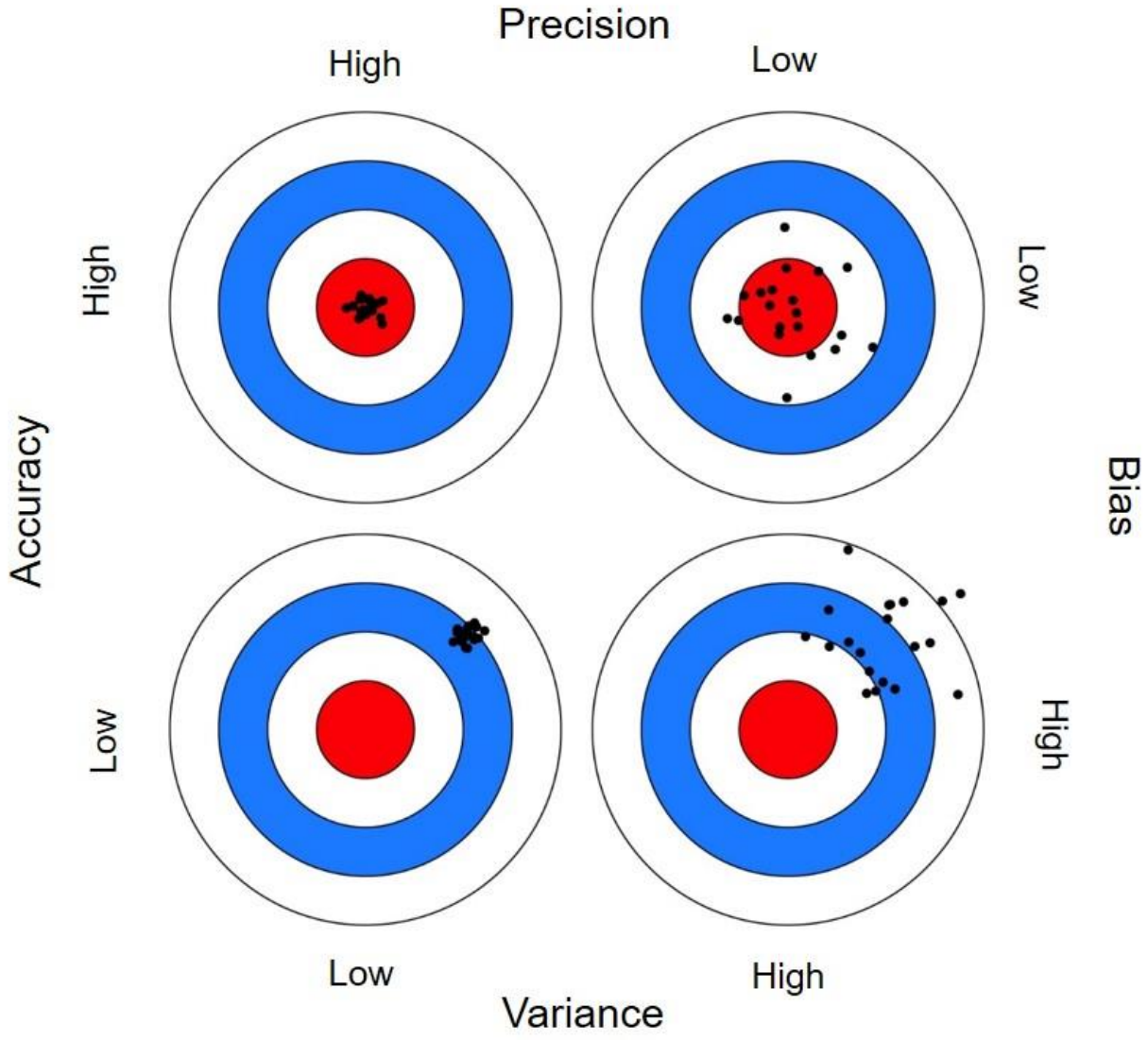

Figure 1 Diagrammatic representation of accuracy and precision. The distribution of holes in the targets is an expression of the statistical properties of accuracy and precision in order to convey 1) that they are independent properties in that either may be high or low regardless of the other, and 2) that they have different impacts on how model forecasts are viewed. In this framework, the bull's eye on the targets represent what is happening in reality, and the bullet holes represent the model descriptions of that reality. In the best of all outcomes, models would be accurate and precise and the bullet holes would all be clustered closely at the center of the target (model=reality). The fact that precision and accuracy are separate and independent means that models can be poor reflections of reality in multiple ways.

This example of a trade-off illustrates a general principle. As model complexity increases, precision generally increases, but accuracy may decrease. The interpretation is that the more complex models are better at approximating all the data, but they perform more poorly at estimating the underlying process. In between is an optimum where the Total Error arising from both imprecision and inaccuracy are at a minimum. This trade-off is graphically summarized in figure 2d. A second implication of the trade-off in figure 2d is that while there is a minimum Total Error, it never goes to zero. So our models will never be free from uncertainty; the

question is can we develop useful models and can we make choices among models that get us as close to the minimum as

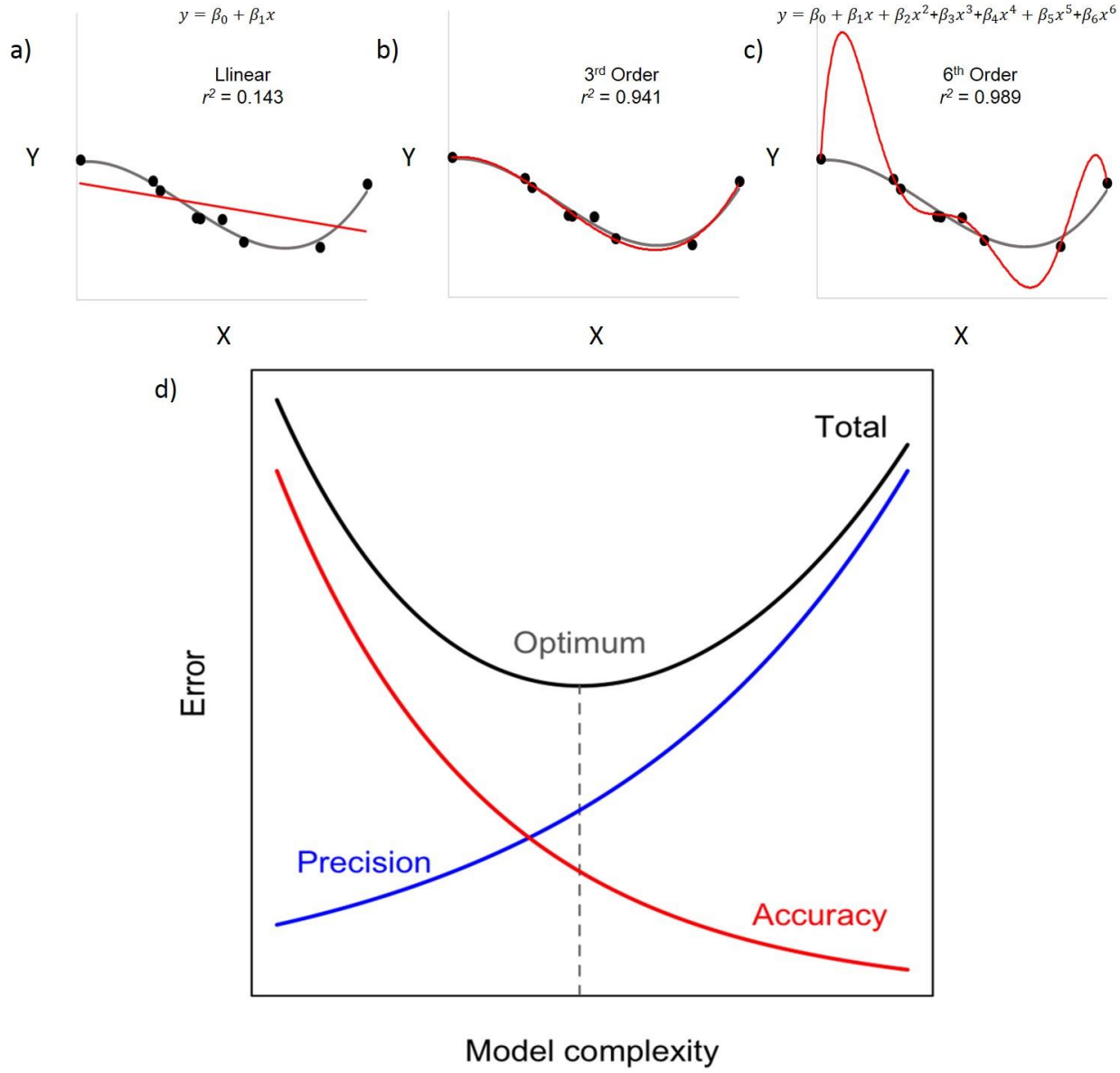

Figure 2 Illustrations of relationship between model complexity and total uncertainty or error. A) A simple process (gray line) observed at various values of X (black dots), and fit with a linear regression model (red line). The form of this most simple model is above the curve. B) The same process and observations as in A, but fit with a 3rd order polynomial as a model of intermediate complexity. C) The same process and observations as in A and B, but fit with a 6rd order polynomial as a model of high complexity. The form of this most complex model is above the curve. D) The generic trade-off between errors due to loss of accuracy and increased precision as model complexity increases (total error is the sum of the other two components). The dashed vertical line indicates the optimum level of model complexity.

possible. In practice, the optimum is often wide—a range of complexity will give similar total error—and spending large efforts to acutely optimize model complexity is not a useful expense of effort. However, especially in the context of fish-habitat association modeling and salmon

recovery very complex models are in use with potentially profound inaccuracies. Therefore, planners and reviewers need to be conscious of the choices they make with respect to approaches to NEB determination, and then be clear on how they report those choices.

In the context of NEB determination, this trade-off has an additional important implication. As stated above, ideally we would like both precision and accuracy. In many research contexts however, one is likely interested in describing the data in hand and so precision is very important. In this case, one may tolerate a more complex model to achieve a better "fit" to the data. In contrast, in the present context NEB determinations need to project impacts and offsets out into the future and so one must prioritize a better understanding of the underlying process. The most complex models in use can make very precise forecasts (i.e. 165,500 Coho salmon from a given sub basin), and this is often seductive in a management context where future ecological status is at stake. But those same models can make wildly inaccurate forecasts because of that same complexity. In fig. 2c for example, the model fits the data well, but the 6th order polynomial deviates wildly from the process; would it be prudent to use the red line to make a forecast of where the gray line is going to be at some far outlying value of X? Likely not.

This discussion of precision and accuracy has focused on the implications of model complexity at the level of making choices among NEB determination approaches (see below). Once one has decided on a specific approach to NEB determination, it is possible to then continue to evaluate the complexity of models and tactics to increase precision and accuracy that are related to data quality, sampling design and statistical estimation techniques. All of which are potentially important, but which are also likely to vary quite widely from WRIA to WRIA. That level of model selection and optimization will involve location-specific detail that exceeds the scope of this guidance. However, it is likely that at small scales the benefits of an intensive optimization process will be marginal, and the decisions regarding specific choice of impact and offset forecast will be made based on the data, expertise and other resources at hand to make the determination.

These uncertainties are important, and the design choices that are made have interacting implications for total uncertainty in the impact and offset forecasts, but at the same time planners will need to make judgments about what they need and what they can do to develop their NEB determinations. This reality makes it important to be transparent with respect to what choices are made and how. The interim guidance states:

> *"… plans will provide a **transparent**, structured evaluation to be used in Ecology's NEB analysis to determine whether the requirement in ESSB 6091 has been met. If the planning group concludes that the planned projects recommended in the plan will achieve NEB, the plan should include a clear explanation and justification for that conclusion."* (emphasis added)

In this context, transparent means that all methods and assumptions are reported. This would include descriptions, sources and magnitude of bias and uncertainties that affect the impact and offset forecasts. At a minimum, this would include the uncertainties that arise from data, model choice and estimation methods. As noted above and various places in this guidance however,

some of the choices made on adopting one approach or another involve complex trade-offs between technical issues, but also practical constraints. Therefore, a transparent description of the methods and approaches taken should also identify where choices were made and what constraints may have been in place to guide those decisions. As demonstrated in figure 2d, it may not be possible to reduce uncertainty to zero, therefore it is critical to document what efforts were taken to address uncertainty throughout the NEB determination process.

3) Ecological Context, Scale and Critical flow periods

The interim guidance defines high and low priority projects, and instructs planners that viability of proposed projects will be evaluated in an ecological context. Ecological context in this case refers to the scales, environmental conditions and scope of biodiversity relevant to the fish affected by consumptive water withdrawals. Specifically, the guidance includes:

> *"Where highest priority projects are not feasible, ESSB 6091 authorizes plans to include lower priority projects—those that do not occur in the same subbasin or tributary (but are within the same WRIA) or only replace water during critical flow periods. To determine the viability of a lower priority water offset project, planning groups will need to determine critical flow periods. The critical flow period determinations should consider fish presence and distribution, and the historic hydrograph (synthesized hydrograph if necessary)."*

Ecological context matters to NEB determinations in a number of ways. Location and setting will be important for both high and low priority projects. Location and scale are important both to correctly account for the ecological system being managed, but also because the approaches to NEB determination described below all have dependencies on data and data aggregation that are affected by location, timing and scale. For high priority projects (i.e. In-the same subbasin and In-time), a clear description of the extent of water use and offset is needed to evaluate the offset equivalence, and determine NEB. The guidance also refers to different opportunities for offsets at scales from the tributary to the subbasin and WRIA scales. Therefore, planners need to be clear about the spatial extent of their projects and impacts if their plans are to be evaluated appropriately. For low priority projects, location and scale will be similarly important as environmental conditions subject to proposed offsets are heterogeneously distributed across the landscape. Accounting for habitat capacity or fish production equivalence and substitution will require habitat descriptions of similarly high detail to capture that heterogeneity.

In addition to the scale dependencies of ecological data, ecological context can also affect the scale of ecological process that impacts instream flow. For example, a specific reduction in stream flow (e.g. 0.75 cubic feet per second, cfs) is likely to have a larger impact on a smaller tributary than a larger river. Alternatively, a given withdrawal may have a larger impact on habitat (i.e. the environmental correlates of stream flow) if taken higher in the watershed than closer to the confluence of the tributary to a large stream. Yet the effect of a withdrawal can also be diminished as other tributaries or groundwater are added downstream.

In addressing ecological process, planners may need to aggregate withdrawals along tributaries, weighted by the tributary stream flow, catchment size, geomorphology and adjacent withdrawals. It is hard to predict how complex such schemes are likely to get across the diversity of stream networks within the geographic range of Washington WRIA's, but planners will need to incorporate at least the basic watershed characteristics listed above in their plans.

Figure 3 is a map of the state of Washington that identifies the watersheds covered under this planning process. These watersheds cover a wide swath of the state and the ecological conditions are distinct among them. These ecological differences will affect the impacts of consumptive water withdrawals from permit exempt wells.

As mentioned above, the magnitude of stream flow changes are anticipated to vary widely from WRIA to WRIA, with some obvious and others almost imperceptible. If one is evaluating withdrawal impacts on a large tributary the effect of a fraction of a cfs change is likely to be very small and perhaps technically challenging to demonstrate. WRIA's dominated by rain inputs in the western portion of the state (e.g. WRIAs 12,14, 22 & 23), may commonly experience localized areas of low flow in the late summer and fall. Here a small cfs reduction could have large impacts seasonally. On the other hand, the Little Spokane and Colville subbasins (WRIAs 55 & 59), while having regulated flows do not support listed salmonids, and so the determination of NEB will likely be made on a basis other than anadromous fish impacts (see RCW 90.22.010 and 90.54.020). This is an additional component to ecological context, and it will create both challenges and opportunities for NEB determinations.

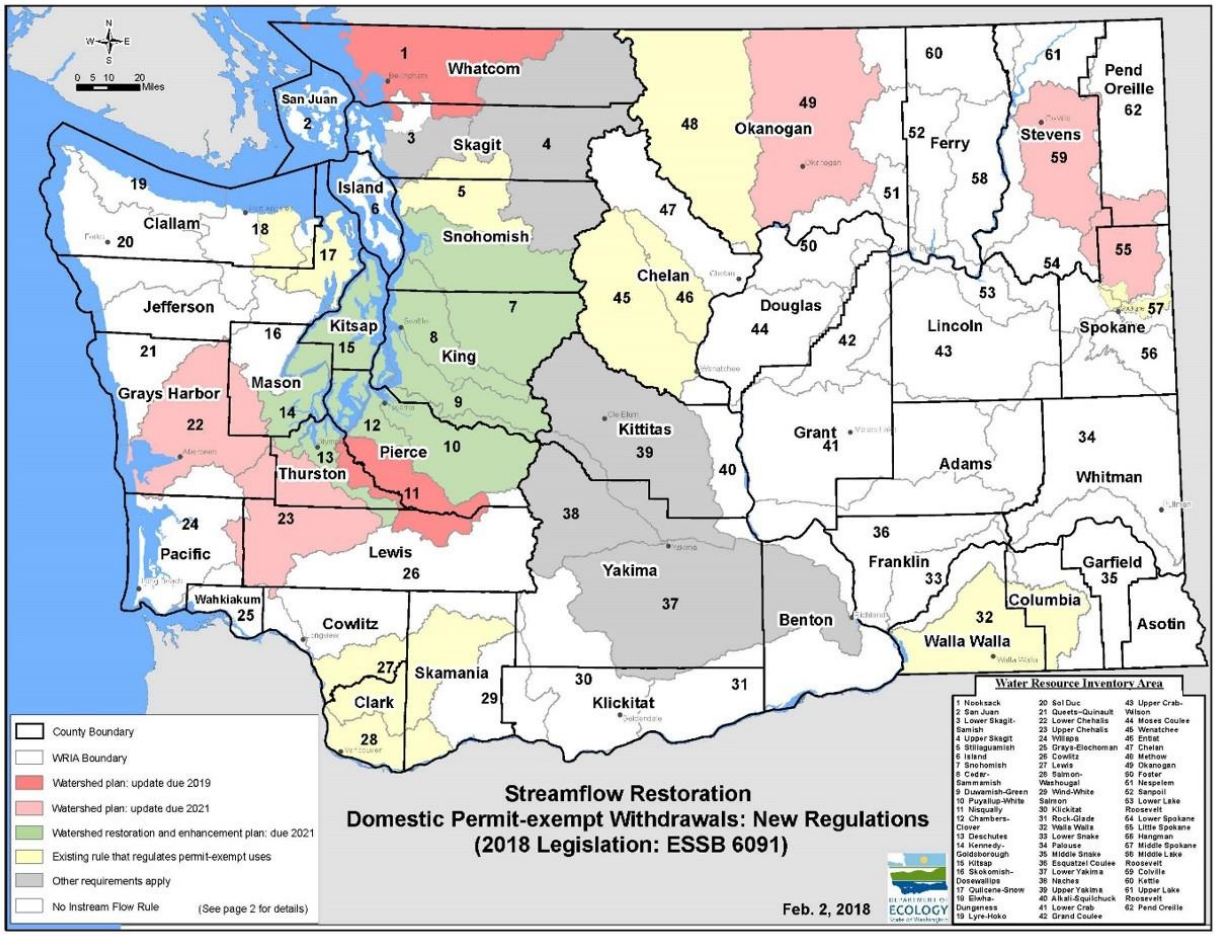

Figure 3 Planning Watersheds under RCW 90.94. The WRIAs submitting plans under section 202 are in red and pink based on timing. WRIAs submitting plans under section 203 are in green.

In several places, the interim guidance refers to critical flows as an acknowledgement that the magnitude of stream flows can change significantly during different seasons. In general, stream flows are highest in the winter when precipitation is highest and are lowest in the late summer when precipitation is low or zero and flows are supplied by snow melt, groundwater, or reservoir release. These seasonal patterns are often expressed in the characteristic hydrograph for the stream under study. Periods of low flow are likely to be critical periods for fish. However, it is an oversimplification to suggest that critical flows are times of low stream flow. Anadromous fish life histories are diverse, and involve complex patterns where different species use different habitat at different life stages for different ecological objectives. This makes it difficult to identify a single time and circumstance that is uniquely "critical".

While the literature on differential habitat use by different species is voluminous and summarized in detail elsewhere (Groot and Margolis 1991), highlighting some specific patterns of fish-habitat relationships can help give context to how withdrawal decisions and fish production may be linked.

Salmon and trout spawn in gravel, burying their eggs below the surface of the gravel, where the eggs stay for a number of weeks or months (depending on temperature) as they develop. Flow generally changes during this incubation period while they develop. If adults spawn in a deeper, mid-channel area because they spawned while flow was unusually low and a flood occurs during incubation, many eggs could be lost to flood scour, resulting in lower production (Tripp and Poulin 1985; Thorne and Ames 1987; DeVries 1997, 2000; Lapointe et al. 2000; Ames and Beecher 2001). Conversely, flow reduction during incubation could result in no water going through the egg pocket in the gravel, a risk that is greatest if incubation occurs during declining flows or if spawning occurred when flows were particularly high (Hawke 1978; Becker et al. 1982, 1983; Reiser and White 1983; Reiser 1990; Connor and Pflug 2004). Given that the volume of groundwater withdrawal by new permit-exempt domestic wells are anticipated to be relatively small, impacts to fish spawning in small streams (e.g. cutthroat trout, coho salmon, some chum salmon) are the most likely to be negatively impacted.

Riffles, the shallowest areas along the length of streams, can be sufficiently shallow to hinder or even halt migration when stream flow is at its lowest (Locke et al. 2008; Grantham 2013). When flow reduction at riffles coincides with upstream spawning migration of salmon and trout, adults can be blocked from reaching spawning areas (Thompson 1972; Smith 1973; Locke et al. 2008; Warren et al. 2015; Holmes et al. 2016), and mortality can be increased through exposure to predation, energy depletion, and injury and infection. Pink salmon, summer chum salmon, fall Chinook salmon, and bull trout may all migrate upstream during late summer and early fall when flows can be lowest.

Lowering stream flow can also impact young fish prior to out migration. Stream flow reduction can impact rearing fish by (1) reducing suitable habitat area and volume, (2) reducing overall system productivity and food transport, and (3) reducing water quality. Coho salmon and cutthroat trout that rear in small streams through summer low flows can be adversely impacted by flow reductions (Brown and Hartman 1988; Beecher et al. 2010; Vadas Jr et al. 2016). Steelhead and Chinook salmon rear in somewhat larger streams, but they are also sensitive to flow reduction. As habitat area and volume are reduced, fish crowding may result in density-dependent reduction in growth and condition, leading to lower survival (Harvey and Nakamoto 1996; Bailey et al. 2010). When flow reduction coincides with higher temperature, water quality (including dissolved oxygen) can also be adversely affected by flow reduction (Elliott 2000). This is particularly true in riparian wetlands, with large surface areas and shallow depths, but

which provide important rearing habitat for coho salmon (Brown and Hartman 1988; Swales and Levings 1989; Henning et al. 2006; Jeffres et al. 2008; Rosenfeld et al. 2008; Katz et al. 2017).

Here the major associations between species, life history stage, stream order and usage are summarized in the following table (sources listed above, summarized in Groot and Margolis, 1991):

Species & lifestage	**Small streams**	**Medium streams**	**Large streams**	**Very large streams**	**Largest streams**
Pink salmon adult migration		Early fall	Early fall	Early fall	
Pink salmon spawning & onset of incubation		Early fall	Early fall	Early fall	
Pink salmon incubation		Fall & winter	Fall & winter	Fall & winter	
Pink salmon fry emergence & seaward migration		Early spring	Early spring	Early spring	
Chum salmon adult migration	Late fall (fall chum salmon)	Early (summer chum salmon – Hood Canal, eastern Straits) & late fall(fall chum salmon)	Early (summer chum)& late fall (fall chum)	Late fall (fall chum)	Late fall (fall chum)
Chum salmon spawning & onset of incubation	Late fall (fall chum)	Early (summer chum) & late fall (fall chum)	Early (summer chum) & late fall (fall chum)	Late fall (fall chum)	Late fall (fall chum)
Chum salmon incubation	Winter	Fall (summer chum) & winter (both)	Fall (summer chum) & winter (both)	Winter (fall chum)	Winter (fall chum)
Chum salmon fry emergence & seaward migration	Spring	Spring	Spring	Spring	Spring
Sockeye salmon adult migration	Fall	Fall	Fall	Fall	Fall
Sockeye salmon spawning & onset of incubation	Fall	Fall	Fall	Fall	

Sockeye salmon incubation	Winter	Winter	Winter	Winter	
Sockeye salmon fry emergence & lakeward migration	Spring	Spring	Spring	Spring	
Sockeye salmon rearing in lake	Year-round	Year-round	Year-round	Year-round	
Sockeye salmon smolt migration from lake to sea	Spring	Spring	Spring	Spring	Spring
Coho salmon adult migration	Late fall	Late fall	Late fall	Late fall	Fall
Coho salmon spawning & onset of incubation	Late fall	Late fall			
Coho salmon incubation	Winter	Winter			
Coho salmon fry emergence	Spring	Spring			
Coho salmon rearing	Year-round	Year-round	Year-round	Year-round	Year-round
Chinook salmon adult migration		Spring, summer, early fall	Spring, summer, early fall	Spring, summer, early fall	Spring, summer, early fall
Chinook salmon spawning & onset of incubation		Summer, early fall	Summer, early fall	Summer, early fall	Summer, early fall
Chinook salmon rearing		Year-round	Year-round	Year-round	Year-round
Steelhead adult migration		Spring, summer, fall, winter; spring	Spring, summer, fall, winter; spring	Spring, summer, fall, winter; spring	Spring, summer
Steelhead spawning & incubation		Spring	Spring	Spring	
Steelhead rearing		Year-round	Year-round	Year-round	Year-round
Cutthroat trout adult migration	Winter; spring	Winter; spring	Winter; spring	Winter; spring	Winter; spring

Cutthroat trout spawning & incubation	Spring				
Cutthroat trout rearing	Year-round	Year-round	Year-round	Year-round	Year-round
Bull trout adult migration		Summer, fall	Summer, fall	Summer, fall	Summer, fall
Bull trout spawning & onset of incubation		Fall	Fall		
Bull trout incubation		Winter	Winter		
Bull trout rearing	Year-round	Year-round	Year-round	Year-round	Year-round
Bull trout downstream migration for migratory fish		Spring	Spring	Spring	Spring

4) Basis for comparison for out-of-kind offsets for NEB determination

Offset projects that can be demonstrated to provide benefits in the same subbasin and time with available stream flow (i.e. “in-same subbasin/in-time”) make NEB determination conceptually simple.

When out-of-kind/time/place offsets are proposed, a comparison of impact and offset will necessarily entail implicit or explicit use of relative values, or weights, to complete the NEB determination. Here we illustrate concepts for evaluating these more complex comparisons of impact on instream resources drawn from the field of resource economics. Examples of questions that might arise when perfect water-for-water replacement is not possible include:

1. Does a (set of) project(s) that provides 0.5 cfs in May in one sub-basin compensate for 0.5 cfs loss in May in an adjoining sub-basin; or in August in another sub-basin?[5]
2. Does a set of projects that augments one species’ habitat (such as an ESA-listed steelhead trout) in one basin offset losses of habitat for another species’ habitat (such as a non-listed coho salmon)? How is this tradeoff considered as a part of calculating NEB?

The answer to question 1 likely depends, in part, on the relative importance in each particular watershed of stream flow across time and space, and how instream resources are affected by changes in stream flow. In this case it is likely that the functional effect of stream flow changes on instream resources (including fish) will be treated as similar in character. Question 2

[5] The magnitudes here are only for comparison purposes, and may not necessarily reflect values seen in each planning domain.

however, necessarily requires assessing the *relative value* of changes in the target populations. The basic elements of such a comparison are described next.

Imagine the following simple scenario from question 2 (Fig 4). Projected increases in permit-exempt wells around the Yellow River are expected to lead to lower summer flows, measurable at point A, reducing spawning habitat for Coho salmon, a non-listed and harvested population

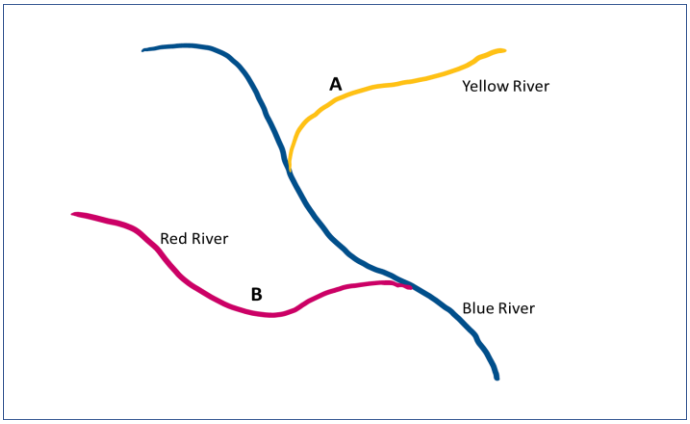

Figure 4: Hypothetical river basin

(suppose this is the only environmental impact). Suppose also that there is no feasible way to replace "water for water" during the critical summer flows in the Yellow River basin. The proposal instead is to provide mitigation along the Red River that increases habitat capacity for the population of ESA-listed steelhead trout in that tributary (again suppose no additional ecological benefits). Do the projected gains in steelhead at point B "outweigh" the lost coho at point A, and provide a "net ecological benefit"?

A little mathematical structure will be used to clarify concepts. Define a generic ecological endpoint condition modeled at location x as $Q_x(S_x, T_x, P_x)$. The endpoint condition Q could be the abundance of steelhead or coho, and is a function of the species affected (S_x, where S_A=coho and S_B=steelhead), the timing of habitat changes (T_x, where T_A could be critical summer flows and T_B could be year-round), and the place (P_x, where P_A is point A in Yellow River and P_B is point B in Red River). One could also think of the time dimension on a longer time-scale: the decline in coho will happen in the next 3 years, but the steelhead populations may not reach full capacity for 30 years.

An NEB determination will assess *changes* in these endpoint conditions, or ΔQ_x. In our example, what is the (positive) gain in steelhead (ΔQ_B), and what is the loss in coho (ΔQ_A, a negative amount) from a watershed perspective, given both losses in streamflow from groundwater use and the offsetting effect of mitigation projects? Because ΔQ_B and ΔQ_A vary in the three dimensions (timing, place, and species) even in this simplistic example, the answer to these questions is complicated and generally uncertain, and is the focus of the majority of this technical document.

Comparing net impacts to steelhead with net impacts to Coho is like comparing apples and oranges. Is the gain in one species due to plan implementation sufficient to offset the loss due to exempt-well-induced streamflow reductions in another species? To answer this question, we need more information. In addition to changes in resources, (ΔQ_B and ΔQ_A), we also need to place a relative value, or weight, on each species to decide whether the gains are "sufficient" to compensate for the losses.

To make this determination we add one more level of mathematical structure. Define $V(\Delta Q_B)$ as the value that affected households in the region place on the gain in steelhead. What is the minimum acceptable increase in steelhead abundance ("willingness to accept") due to the proposed plan necessary to mitigate for the failure to mitigate losses to coho yield in the Yellow river $V(\Delta Q_A)$? A simple economic decision rule might be that if $V(\Delta Q_B) > -(V(\Delta Q_A))$, the combined growth in exempt wells and mitigation projects should be acceptable if this metric is deemed appropriate for NEB determination. The simplest possible representation of such a comparison is provided in Textbox 1. It is not unreasonable to think of placing a "price" or value on each unit (each fish), and multiply the change in each by that price. These "prices" need not reflect market prices, but instead reflect what people are willing to give up (or accept) for an increase or decrease in Q_A and Q_B (even in the absence of a relevant market). Therefore, this is not inherently or necessarily a process of "monetizing" the fish, rather it is a way of formally representing tradeoffs. Below we provide some more context and guidance for how to estimate and compare environmental impacts in an economic framework.

In general, environmental economists have well-developed tools to answer questions of relative value such as these, though the information required to answer them is often difficult and costly to acquire. The most relevant for this application is a "stated preference" approach to surveying the relevant constituent members of the public. A prominent recent example was a survey to assess the damages (at $17.2B) caused by the 2010 Deepwater Horizon oil spill[6]. The Deepwater study team spent over 3 years at great expense developing, testing and refining their survey.

Less costly approaches to valuation include "benefits transfer" approaches in which researchers attempt to find studies already undertaken in a different place with *a similar environmental context and a package of changes* as similar as possible to ΔQ_B and

Text box 1: A course workflow for value comparisons.

1) Estimate the physical changes due to streamflow changes and mitigation projects (ΔQ_A and ΔQ_B).
2) Estimate the value of individual units of Q_A and Q_B. Call these P_A and P_B.
3) The value of changes in Q_A and Q_B could be estimated as

$$V(\Delta Q_A)=P_A \text{ X } \Delta Q_A$$

and

$$V(\Delta Q_B)=P_B \text{ X } \Delta Q_B$$

[6] Bishop, B.R.C., K.J. Boyle, R.T. Carson, D. Chapman, W. Michael, B. Kanninen, R.J. Kopp, J.A. Krosnick, J. List, R. Paterson, S. Presser, V.K. Smith, R. Tourangeau, M. Welsh, J.M. Wooldridge, M. Debell, C. Donovan, M. Konopka, and N. Scherer. 2017. "Putting a value on injuries to natural assets: The BP oil spill." *Science* 356(6335).

ΔQ_A. The benefits transfer would also include an adjustment for factors that we expect would shift overall willingness-to-pay, like differences in income or general environmental attitudes between the study site and our Blue River Basin site. There are a number of environmental consulting firms that can provide input for such benefit transfer studies; Earth Economics in Tacoma specializes in part on this type of analysis. ECONorthwest is another regional consulting firm with expertise in this area. The Natural Capital project at Stanford University is another useful source for relevant primary studies[7]. Table A1 in Appendix 1 provides a complete (to our knowledge) list of studies estimating the value the public places on changes in anadromous fish populations.

However, the valuation task at hand in our example is not as simple as laid out above. The comparison $V(\Delta Q_B) > -(V(\Delta Q_A))$ was simplified for illustration, but each ΔQ_A depends on *timing (T), place (P) and species (S)*. For example, Mansfield et al (2012) asked survey respondents whether they would be willing to make hypothetical, annual payments over 20 years through federal taxes to increase wild salmon populations in the Klamath River Basin from 30 – 150% based on change in extinction risks (low, moderate, high, very high). In this example, timing (20 years), place (Klamath) and species (wild salmon) are all held constant; the only varying attribute is the change in quantity/abundance. In our example, this would be like answering the question of changing coho returns only at point A, at the same point in time. This complexity manifests in several ways; in each case the trade-offs can be identified, but we are unaware of any existing studies examining willingness to pay or consistency in perception and weighting for such complex tradeoff, or explicit trade-offs of different species. One response to this complexity would be to incorporate a stated preference study into the proposals submitted under RCW 90.94, and tailor the scenarios given to respondents to precisely target the package of changes in our decision problem. Done correctly, this would provide a defensible information set to guide an economic decision rule.

To supplement this conceptual summary, we have included an annotated bibliography in Appendix 1 of selected relevant journal articles that may be of use as context for NEB determination.

3. APPROACHES TO NEB DETERMINATION

There are a variety of approaches to NEB determination, with different strengths and weaknesses, demands for data, assumptions and key uncertainties (Table 1). In addition, different constraints on how impacts of consumptive water withdrawals and offset benefits are forecasted will also vary based on the approach taken. For instance, in some cases it may be possible for impacts to be assessed empirically, but forecasting benefits from offset actions over the 20 year planning horizon will most likely rely on calculated projections. Therefore, planners should choose their approach to NEB determination based on data availability and planning goals. The following is a suite of approaches to NEB determination that planners may pursue. Each approach includes a discussion describing the data needs and methods, the assumptions

[7] https://naturalcapitalproject.stanford.edu/

required/used, and the sources of uncertainty. These approaches to determining NEB resulting from planned offset to consumptive water use from permit exempt wells were derived from Bradford et al. (2014), and include:

- In-kind/In-place Habitat Replacement
- Habitat Function Replacement
- Habitat Capacity for Single Species Replacement
- Fish Abundance Replacement
- Fish Production Replacement

The most appropriate approach for any planning unit will depend on the different needs, opportunities, and constraints in each situation. Deciding the right approach requires evaluating what technical or ecological data and expertise are available, but also practical in terms of the size of ecological impacts, and the benefits and the values attributed to those impacts and benefits in each case. Given the uniqueness of each planning unit, it is impossible to set out a single technical NEB determination "recipe" that will work in all cases, nor is it the role of a technical team to decide for planners what approach they must, or even should take given the constraints confronting each planning group.

At the same time, the technical team is conscious of the need for some guidance in this regard, at least to the extent of considerations of how such a decision may be made. In responding to this, this technical report has developed the following decision tree to help planners identify the most appropriate approach to NEB determinations. This decision tree is based on commonly encountered constraints, such as the types and richness of available data, presence of monitoring programs, and the complexity of analysis demanded in each approach. In the decision tree below (fig. 5), the end points are in rectangles; one starts with the need to perform an NEB determination, and arrives at one of the approaches outlined here.

Using the decision tree, planners would evaluate decisions within each diamond. For example, in the first diamond at the top, if the answer is "YES" that water-for-water replacement is possible, then there is no need to perform more complicated modeling exercises to estimate the impacts on instream resources in the execution of the NEB determination. Planners would implement the In-the-same –subbasin/In-kind habitat replacement approach to NEB determination. However, if In-the-same –subbasin/In-kind habitat replacement is not possible (i.e., the answer is "NO"), and one lacks specific information about the fish species of interest in the relevant ecological context (e.g. species and life stage of fish, see above), then one is limited to making the NEB determinations in terms of the habitat as the instream resources being offset for consumptive water use, and extending this to fish contingent on the availability of reliable habitat-fish associations (habitat function or habitat capacity for single species replacement). This can be in the form of modelled or experimentally derived relationships (e.g., Habitat Function Replacement or Habitat Capacity for Single Species Replacement). On the other hand, if fish population data are available, then one can perform the NEB determination on the basis of either fish abundance or productivity replacement depending on the degree to which correlated habitat data are available to inform these approaches. As pointed out in more

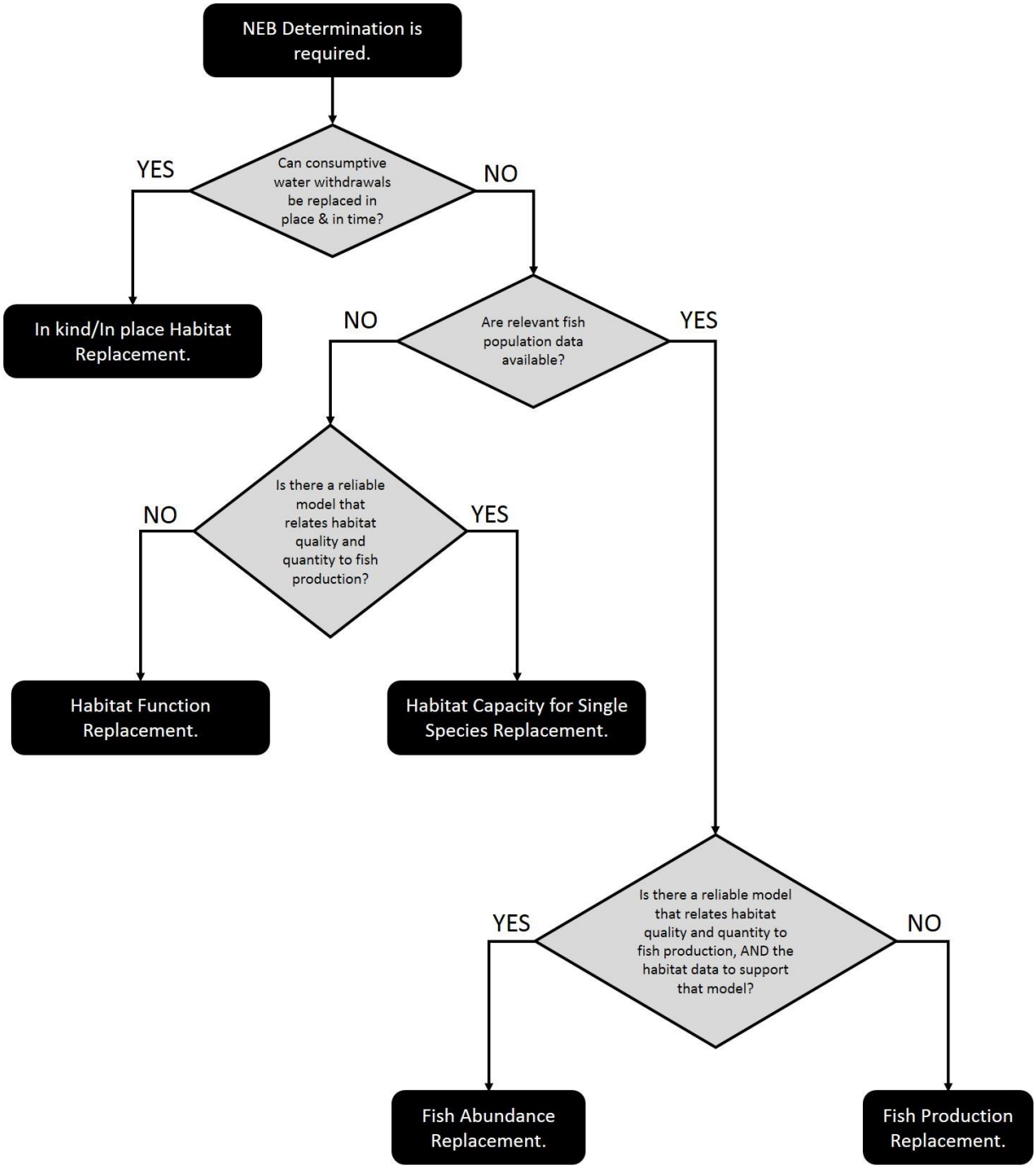

Figure 5 Decision Tree for approaches to NEB determination. Starting and ending points are black rectangles with white text, and decisions are made in diamonds on the basis of answers to the contained questions. Users should keep in mind these are sufficient, but not necessary criteria for making the decision of NEB determination approach. Other considerations may include available funding, time and expertise (see text).

detail for each approach below, if one has long-term time series data (i.e. multiple generations of fish) on fish and habitat at a population scale, then one might be inclined to adopt the fish production replacement approach, such as modeling spawner-recruit relationships, or run reconstructions with habitat metrics as cofactors influencing the production process. However,

if fish and habitat data were more limited in time, but at high spatial resolution, then one might be inclined to adopt a fish abundance replacement approach, such as the Ecosystem Diagnosis and Treatment model (EDT).

To use this decision tree effectively, the user should follow the tree to choose an appropriate approach to NEB determination, and then find the description below for that approach. For each tier, there is a secondary work flow chart that indicates the conceptual steps to performing each respective approach. Conceptual steps include where data of different types enter the assessment process, what estimation is performed in each assessment, and where various kinds of outputs exit the assessment process.

This decision tree is offered in an effort to be helpful and promote transparency in decision making, but all users must be conscious that the answers to the questions are ***sufficient***, but ***not necessary*** conditions for selecting an NEB determination approach. For example, if one doesn't have any data on fish at the scale of the affected unit of fish (population, Evolutionary Significant Unit = ESU, etc,), then one is not likely to generate a credible fish production replacement-based NEB determination. However, even if one has high quality fish population monitoring data, there may be reasons why a planning group would opt for a habitat function replacement assessment. For example, if the costs of the requisite modeling is perceived as excessive, the analytical expertise is not readily accessible, or the available data inventory of habitat units and their net ecological services is seen as superior in quality to available fish data (see HEA description below), then planners might opt for habitat function replacement in spite of this decision tree.

A. IN-KIND/IN-SAME-SUBBASIN HABITAT REPLACEMENT (AREA/TYPE)

Under RCW 90.94, a disruption or detraction of fish habitat, resulting from reductions in stream flow consequent to consumptive use withdrawals must be balanced by some form of mitigation or redesign to achieve the goal of a positive Net Ecological Benefit. The highest priority (i.e. "most preferred") mechanism, within a range of offset mechanisms, are projects that replace consumptive domestic water use impacts during the same time and in the same subbasin as where the impacts occur. This option is supported by the assumption that keeping impacts and benefits comparable in type, extent and location is most likely to maintain the existing productivity and integrity of the ecosystem; this assumption is broadly relied upon, but is an assumption none the less (Moilanen et al. 2009; McKenney and Kiesecker 2010).

In-kind/In-place offsets are the simplest offset mechanism since the equivalence of habitat for habitat is the most straight-forward. However, establishing that the offsets are indeed In-kind/In-place offsets may become difficult as the area becomes larger and increased habitat diversity makes it difficult to validate that offsets are truly "In-kind". Therefore In-kind/In-place offsets are best suited for smaller habitat units and do not include habitat conversion (e.g., river to reservoir or confined (bank-hardened) to unconfined channels). The biggest advantage of In-kind/In-place offsets is the ease of establishing equivalency as the determination is based on water for water in the same units. This is the most direct comparison and the easiest NEB determination. However, the largest risk in assessing this form of offset is the assumption that the replacement

habitat and the associated fisheries productivity will be equivalent to that lost. For example, if the area considered has multiple and diverse habitat types, the benefits to each fish species/life-stage may be different for a given change in stream flow.

a. Data and Methods

The primary metric for in-kind habitat replacement is stream flow (e.g., cfs). Since the units are the same for in-kind/in-place offsets, it is not necessary to determine NEB by assessing fish productivity. Calculation of environmental impact is made by measuring consumptive water use, and establishing offsets. In some cases, particularly in low flow locations where a very small change in stream flow at a critical time can be the difference between passage and no passage for out-migrating juvenile fish, continued stream flow monitoring may be warranted.

b. Assumptions and Implications

In-kind/In-place offsets assumes that habitat and environmental variables (e.g., macrophytes, depth, substrate, nutrients, temperature etc.) will respond to quantities of stream flow equivalently among different locations within a planning unit, and further that responses in habitat variables can be considered surrogates of fish productivity. It also assumes that new habitat generated by the offset will have the same ecological characteristics and associated production values (e.g. primary and secondary production). This assumption may not be supported (Bull et al. 2013), and therefore should be validated with appropriate monitoring.

Because replacing habitat in-kind/in-place is not expected to alter the total habitat available to fish (given that the new location will be in proximity to the lost habitat) it is not anticipated to change fish population dynamics. However, the result of where stream flows are offset may have an impact on that new location's potential productivity. Specifically, in making an NEB determination it is the marginal increase in productivity at the offset location that must meet or exceed the production lost at the impact locations. The offset locations may have had some prior intrinsic productivity under baseline conditions that would be expected to continue in the absence of the offset, and this should not contribute to the estimate of NEB in the planning scenario.

c. Sources of Uncertainties

Replacing stream flow in-kind and in-place relies on relatively common and well understood measurement methods and consequently have relatively little uncertainty in the measurements themselves. Assuming the nature of in-kind and in-place can be validated, the associated benefits to habitat and productivity are also relatively low uncertainty. However, the validity of these assumptions are more certain for well-studied habitat types (e.g. spawning gravels Fitzsimons 2014). Uncertainty increases for less-well studied habitat types, or especially highly unstable or typically mobile or dynamic habitat types (e.g., gravel bars or pools created and maintained by log-jams that migrate under typical conditions, Abbe et al. 2003; Pess et al. 2012).

B. REPLACING HABITAT FUNCTION

When in-kind/in-time/in-place offsets are not possible, plans will need to determine NEB based upon more complex assessments of equivalence between locations of impact and offset. The

first among these offset mechanisms are cases where offsets are based upon replacing the ecological function of certain habitat features with some different combination of features at different locations that would on balance provide the same ecological function. These are called service-to-service equivalency analysis (e.g. NOAA 2000; Lipton et al. 2008). Ideally, these functions relate to fish production, and would include some multivariate description of the habitat, such as habitat structure, cover, or substrate type. Alternatively a description of the habitat might be integrated by measures such as secondary production. Because the NEB determination is made based on the ecological function, the specific habitat provided as offset could be different from the habitat that is impacted, as long as the NEB nets out positive.

Habitats are multifaceted and complex, and a clear mapping of habitat features to fish production can be complex, if it is possible at all (McMillan et al. 2013). Therefore, it is often important to rely on metrics that express some level of integration of habitat features, rather than the features themselves. One example of such integration that expresses ecosystem function is secondary production (i.e., the rate of incorporation of organic matter into body tissue of invertebrate mass per unit time and area (e.g.,Cusson and Bourget 2005). Production, manifesting a rate of energy exchange across trophic levels, is a better indicator of ecological function than standing stock of macroinvertebrate biomass (Benke et al. 1984; Benke 1993). Secondary production can integrate across life stages and generations of invertebrate fauna, and will do so over temporally variable environmental conditions. Thus, secondary production has been suggested as a valid proxy for ecological function. Relationships between secondary production and commercial, recreational, Aboriginal (CRA) fisheries can be determined using productivity-state response curves (Koops et al. 2013).

NEB determination via ecological function replacement can also be complicated by the ecological context. For example, where ecological function that impacts one life stage of fish is replaced with ecological function that impacts a different life stage of fish, those different life stages may not be equally limiting to total population growth. In the case of steelhead, Hall et al. (2016) showed a considerable diversity of life history trajectories that might better accommodate out-of-kind mitigation than a species with a more rigid life history. Given the RCW 90.94's focus on fish, some accounting of fish life history should be part of the assessment of ecological function replacement.

Making an NEB determination based on ecological function is suitable for not only situations with designed offsets to balance the functions lost to impacts, but also situations where alternative functions are preferred in the context of other available habitat in the planning unit. When the intent of offsets is to replace the same ecological function, determining the offset may be as straightforward as the in-kind/in-place. However, if the impacted habitat provides a non-critical ecological function, it may be preferable to design offsets that provide a rate-limiting or rare ecological function.

A specific example of habitat function replacement is Habitat Equivalency Analysis (HEA). HEA is a method developed to determine the compensation for damages to natural resources such as oil discharges, hazardous waste release or physical damage to resources from ship groundings (NOAA 2000). Consequent to statutory requirements, when damage to natural

resources occurs, responsible parties are asked to pay damages to cover “compensatory restoration”, where the offsets provided by habitat function at least balance those lost due to the original damage. Thus, the context for its development was principally as a regulatory tool rather than a scientific research tool. Similar to RCW 90.94, restoration plans must determine and quantify injury, develop restoration alternatives that consist of actions that at least match the injury. HEA is a not-In-kind/place approach to evaluate the services provided by the lost habitat, offset habitat and the balance between them. The steps in an HEA determination are:

1. Document and estimate the duration and extent of injury, from the time of injury until the resource recovers to baseline, or possibly to a maximum level below baseline;
2. Document and estimate the services provided by the compensatory project, over the full life of the habitat;
3. Calculate the size of the replacement project for which the total increase in services provided by the replacement project equals the total interim loss of services due to the injury; and
4. Calculate the costs of the replacement project, or specify the performance standards where implementing the compensatory habitat project.

In steps 1 and 2 numerical values for the ecological goods and services provided by each impacted and offset habitat unit must be generated. When aggregated across all the relevant habitat units, injury and offset can be evaluated for net ecological benefit (See fig. 6).

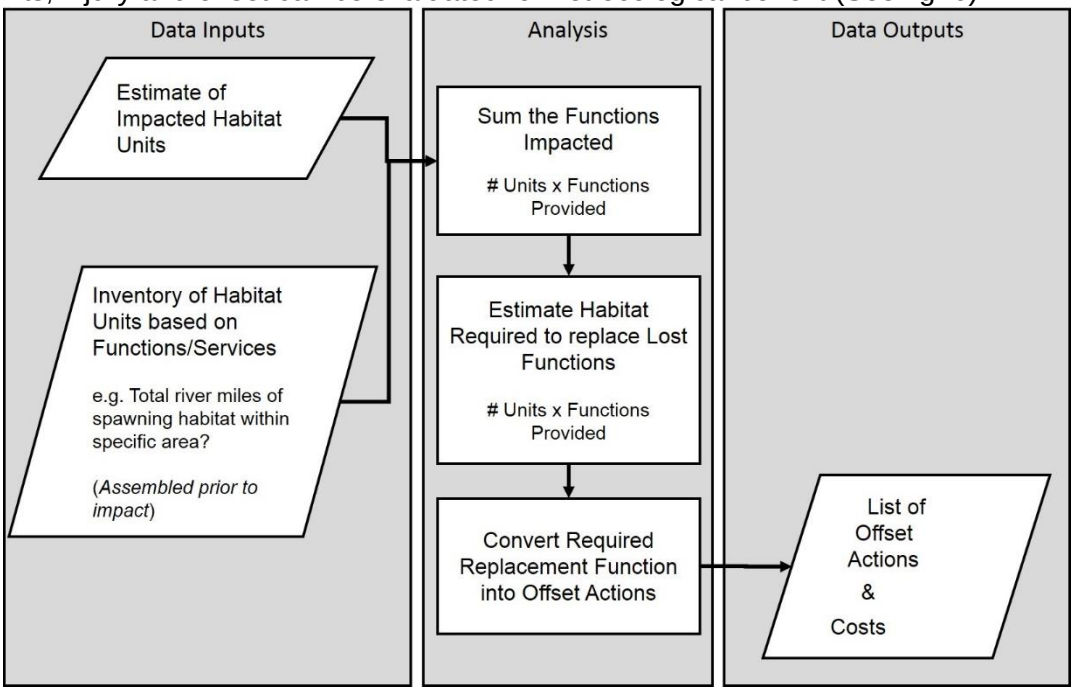

Figure 6 Workflow for Habitat Equivalency Analysis. User data enters the analysis in the form of 1) an inventory of the habitat with the ecological functions or services provided by each habitat unit (e.g. “river miles of Chinook spawning habitat for unit X.”) and 2) an estimate of which habitat units will be impacted by changes in stream flow. The impacts are then added up as number of units times the functions supplied. This number then has to be balanced by the ecological functions or services generated by the habitat offset projects. The inventory of habitat services is prepared ahead of time and can be informed by monitoring data, but is often based on best professional judgement.

HEA has been used in a variety of ecological damage determinations and many lessons have been learned with respect to its strengths and weaknesses (e.g. Dunford et al. 2004; Desvousges et al. 2018). In particular, HEA has a number of critical assumptions that may be difficult to justify: e.g. a design that imposes a preference for offsets to provide the same services that were injured, as well as a constant ratio of habitat services to habitat value, and a constant real value of services and injuries over time (Desvousges et al. 2018). HEA has also been criticized for reducing complex ecological services to a single metric, and for failing to properly account for ecological injuries that continue having incremental or marginal effects over time (Desvousges et al. 2018). In practice, natural resource agencies assemble inventories of their management habitat units and attribute a numerical score for the net services supported by those units. In the absence of targeted monitoring, these scores are assigned based on professional judgement, which can be problematic. Professional judgement by itself is prone to high variability, low and untestable accuracy and hidden bias (e.g. Burgman et al. 2011). Therefore, where habitat function replacement is deployed for NEB determination, significant resources should be applied if possible to pre-impact monitoring to develop testable metrics of the baseline habitat services being replaced (Kennedy and Cheong 2013).

a. Data and Methods

Examples of common indicators associated with habitat function include measures of substrate type and characteristics, densities of riparian or aquatic macrophytes or quantity of large wood. Regionally there are numerous standardized protocols for monitoring and reporting these metrics including:

- CHaMP (http://www.monitoringresources.org/Document/Protocol/Details/2235)
- Washington Dept. of Ecology: (https://ecology.wa.gov/Research-Data/Monitoring-assessment/River-stream-monitoring/Habitat-monitoring/Habitat-monitoring-methods)
- AREMP (https://www.fs.fed.us/pnw/pubs/pnw_gtr625.pdf)
- EPA-EMAP (http://www.epa.gov/emap/html/pubs/docs/groupdocs/surfwatr/field/ewwsm01.html)
- USGS NWQA (http://water.usgs.gov/nawqa/protocols/OFR02-150/OFR02-150.pdf)

Indicators for characterizing secondary production in stream macroinvertebrates include the density and biomass of the entire community of secondary producers (Plotnikoff 1994). The taxonomic level required for this approach can be quite coarse. Methods for sampling secondary consumers are available for many of the same sources of information on metrics for habitat features above.

If the approach is to characterize secondary production it is critically important that methods distinguish between production and biomass. As mentioned, most archived data are reported as biomass, but there are reasons why there would not be a one-to-one mapping of biomass onto productivity (Jenkins 2015). Therefore, NEB determinations should clearly indicate if they are adopting biomass as a proxy for productivity, and if not what model they rely on to convert. Examples include models that relate production to biomass via metabolic energetics, regressions of observed data or reliance on literature benchmarks (Schwinghamer et al. 1986; Tumbiolo and Downing 1994; Wong et al. 2011).

b. Assumptions and Implications

Making a NEB determination on the basis of service-to-service equivalency makes a number of important assumptions. First, it assumes that substitution of equivalent ecological function will result in equivalent fish production. Even if this assumption may work conceptually, salmonid fishes in particular are highly locally adapted (Taylor 1991; Waples 1991, 2006) and the same services provided in a different ecological context may influence fish production differently. In addition, if the substituted ecological functions are different than those impacted, a significant amount of pre-treatment baseline data, benchmarks and models will be required to justify a favorable NEB. In the case of habitat-feature for habitat-feature substitution (equivalent amount and type of structure/cover/substrate) the assumptions and implications are similar for in-kind/in-place above. However, for non-in-kind/in-place mechanisms, there are additional considerations including:

a) Source Data Quality—raw field data are presumed to be accurate, but it is also very site specific, and collecting it over a large domain results in high data density. Therefore, field habitat data are often compiled or aggregated into indexes. Compiled data may do a better job describing a large assessment domain, but may mask the detailed relationships among multivariate data that actually determine fish production. The choice of data type (raw, aggregated, derived, etc.) may be subject to constraints that limit flexibility one way or the other, but planners need to be aware of the character and limitations of source data in this context.
b) Data Interpretation—aggregation can occur in space and time, but also in terms of what ecological feature is being represented. For example, were one to perform a NEB determination on the basis of secondary production, the taxonomic resolution of the consumers can change the interpretation of net biomass. Biomass changes can reflect net energy flow through foodwebs, but animals have food preferences and the details may or may not matter in different ecological contexts.
c) Model structure—relating biomass to productivity will be affected by the structure of the model used and roles that the empirical data, standardized benchmarks and professional knowledge play in the process. Model design choice should reflect a model most similar to the ecological context in the planning unit.

These implications are important, and if NEB determination is to be performed via habitat function substitution, plans should provide details for each of these implications and how they will be addressed to be consistent with the expectation of transparency in the interim guidance.

c. Sources of Uncertainties

There are several sources of critical uncertainty here. As mentioned above, if the offset is designed as ecological function for ecological function, then the uncertainty is dependent on how the service is expressed with a metric or metrics, where the different metrics have different data-related uncertainties. This metric uncertainty is likely to be greater for habitat variables than for stream flow, and will increase rapidly as metrics are built from multivariate habitat features. In addition, the assumption that one will see a given benefit for a given level of service provided generates a model-based uncertainty. When offsets are achieved with services different than those impacted, there are additional uncertainties related to correctly forecasting

the effectiveness of projects for those different services. Some locations will be relatively information-rich with respect to the well-researched relationship between habitat features and fish productivity (e.g. Intensively Monitored Watersheds, IMW's). However, many planning units will be information-poor in this regard and NEB determinations will increasingly rely on the scientific literature, expert knowledge, productivity-state curves, and pathways of indicators models. Each of these alternatives can significantly increase uncertainty in the final NEB determination.

C. REPLACING HABITAT CAPACITY FOR SPECIFIC SPECIES

The second NEB approach among the non In-kind/In-place offset mechanisms are cases where offsets are based on applying models of habitat-fish relationships to the amount of available, suitable habitat for selected species. All things being equal, we have good evidence from empirical studies in specific locations that some combinations of habitat features including water depth, water velocity, substrate type and vegetation cover are suitable, and in some cases preferred by specific life-stages and species of fish (Orth and Maughan 1982; Beecher et al. 1993; Thomas and Bovee 1993). If we were to add up all the habitat of the preferred type (including stream flow), we could quantify potential capacity of a given habitat unit within an assessment area. In the present application, quantitative estimates of habitat loss from consumptive use withdrawals could be measured against anticipated amounts of habitat gained from offsets to provide an NEB determination.

Habitat capacity models have been applied to both lake and stream systems. In particular, there is a rich diversity of models that have related stream habitat to fish capacity that include: PHABSIM (Stalnaker et al. 1995), River2D (Katopodis 2003), and MesoHABSIM (Parasiewicz 2001; Parasiewicz and Walker 2007). Many sockeye salmon are lake spawning, and "spawners per hectare" of lake-bottom has also been used as a method to evaluate the environmental benefits of reservoir enhancements (Goodlad et al. 1974; U.S. Department of the Interior Bureau of Reclamation and State of Washington Department of Ecology 2012; ECONorthwest et al. 2012). In either habitat type, the amount of habitat area becomes a comparable currency for impact and offset, but in both cases as well, it is based on the critical assumption that capacity of habitat will be realized by the target species.

PHABSIM and some of its extensions have been used in a diversity of situations to evaluate associations between fish and hydrology (Gallagher and Gard 1999; Parasiewicz and Walker 2007; Beecher et al. 2010; Reiser and Hilgert 2018). PHABSIM (Physical HABitat SIMulation) is part of a family of approaches called the Instream Flow Incremental Methodology (IFIM; Bovee et al. 1998). IFIM is a broad conceptual toolbox that considers a variety of aspects of stream ecology. PHABSIM relates hydraulics to hydrology and to specific components of fish habitat. Other tools in IFIM can integrate PHABSIM results with hydrology over time.

PHABSIM consists of a hydraulic model which is linked with habitat suitability criteria (HSC) to map habitat quality for specified life-stages of target species at different discharges. Several options for hydraulic models are available within PHABSIM. The most common options are step-backwater modeling, depth and velocity regression on transects, and two-dimensional hydraulic modeling based on channel roughness and flow routing. With a hydraulic framework

in hand, the amounts of habitat weighted by habitat quality (as indicated by habitat suitability criteria [HSC]) can be integrated across a stream reach at discharges of interest to produce a metric called weighted usable area (WUA). This is accomplished by applying HSCs for each species life-stage of interest to each location within a specific stream network across a range of discharges. This applied weighting is then summed for each discharge and species life-stage to generate a WUA value (e.g., for juvenile Chinook salmon at 300 cfs). The workflow for PHABSIM is illustrated in Fig. 7. Traditional use of PHABSIM incorporates microhabitat (depth, velocity, substrate and/or cover), using HSC for each species life-stage for each microhabitat variable, but consideration of mesohabitat or macrohabitat can be included with appropriate study design. The output allows comparison of the relative habitat value of different discharges for a particular species life-stage.

Experience with PHABSIM has revealed a number of important lessons and constraints to its use. The weightings applied to the area of habitat rely on a representative stream reach (or a critical reach if one is identified) for assessment of impacts of hydrologic changes to fish or other aquatic organisms. Where multiple reaches are expected to be affected by water withdrawal, it may be necessary to model multiple reaches. In either case, there is a critical need to validate that each representative reach where the fish/habitat relationships are developed is truly representative of the locations where the WUA estimates are going to be made. Validation of the HSC's and WUA can be accomplished with field measurements at one or more known discharges. Resources for such validation should be included in plans that perform NEB determinations via habitat capacity replacement.

This approach to NEB determination is flexible in that the WUA can accommodate changes in habitat amount as well as quality. This flexibility is particularly useful in the case where offsets are not located at the impact area or if the offset's ecological result is different from the impact. Of particular importance in this context, there may not be any available water to offset loss of stream flow from consumptive use in the same time and place, and the ecological mechanism of offset has to be of a different kind, such as habitat improvement (McKenney and Kiesecker 2010). The fact that there is a quantitative basis for determining NEB also makes it attractive, but it must be kept in mind that there are good reasons that model predictions may not always be realized in terms of fish numbers. For example, in order for fish-habitat capacity models to be applied generally, the underlying relationship between observed fish preference must reflect a global, or population-wide preference rather than fish making the best of what habitat variability is available (McMillan et al. 2013). Indeed, uncertainty over HSCs has received considerable critique and is discussed elsewhere. Critiques have also challenged if the variables used to construct HSCs are the variables most relevant in the case of changes in stream discharge (Railsback 2016).

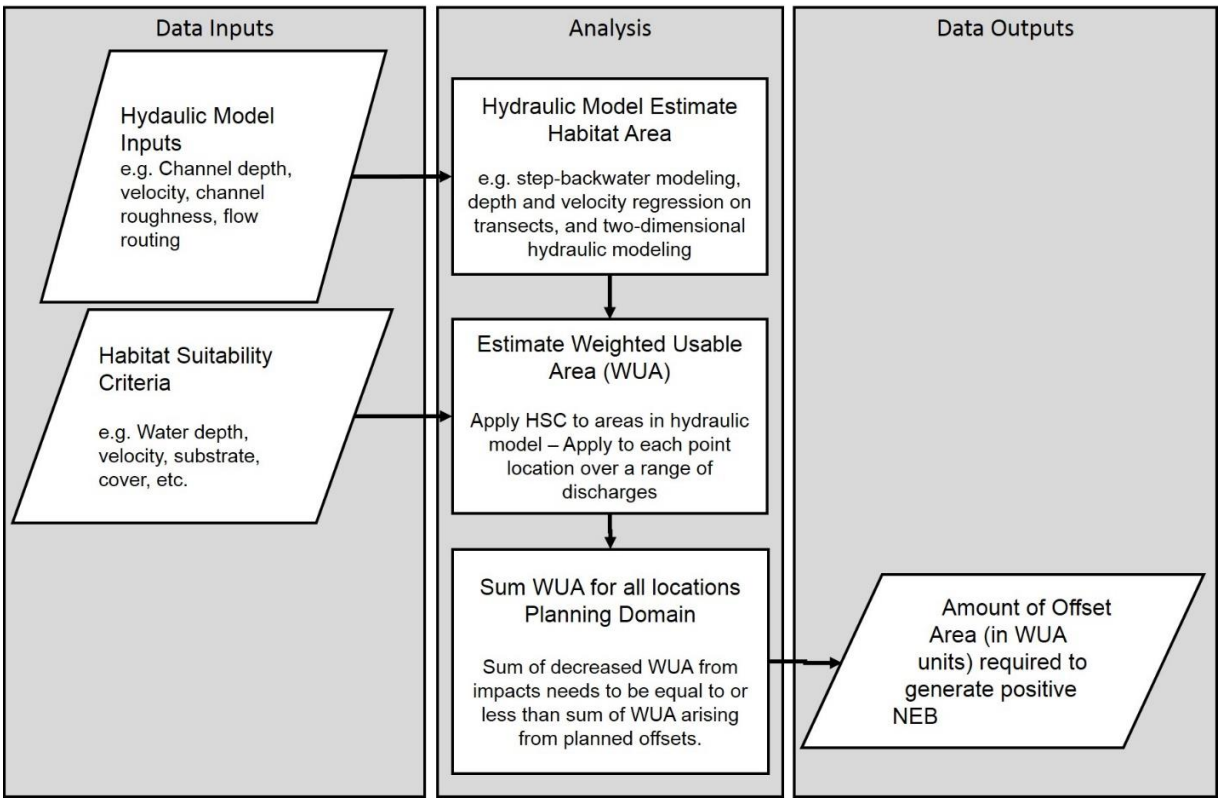

Figure 7 PHABSIM workflow. User data enters the analysis in the form of output from an hydraulic model that provides a framework of a map of stream habitat amount (= area), to which habitat data is applied. User data also enters in the form of Habitat Suitability Criteria (HSC), which are based on a relationship between habitat characteristics and fish preference. HSCs can be derived from other modeling or field monitoring, but should be validated for the planning domain in either case. Modelled areas are weighted by the HSCs and produce an estimate of WUA for each unit across a range of river discharges. This is then summed to get a measure of impact or offset. NEB can be estimated by subtraction.

a. Data and Methods

Habitat capacity has two parts: the suitability or preference of habitat units by fish, and the amount of those units. Measures of suitability or preference are weights that are multiplied by the area of the units producing the WUA metric that is species and life stage specific. Characterizing stream units to characterize their suitability often relies on the lower level, unit-specific data described for the habitat substitution approach above. Examples of these data types include combinations of water depth, water velocity, substrate type and vegetation cover. As described above there are numerous standardized protocols for monitoring and reporting these metrics across the region. Collecting these data is often expensive and labor intensive, but these same regional sources offer data collection protocols that provide the greatest degree of reliability, interoperability and transferability to other locations.

The data needs of the NEB determination based on habitat capacity depends on the choice to estimate both parts of the WUA metric. In many cases, the characterization of habitat suitability (e.g. HSC) is taken from the literature or other studies and the quantification of habitat capacity in a specific case amounts to measuring the amount of that habitat type. Indeed, the Departments of Ecology and Fish and Wildlife have collaborated in compiling composite HSC

for most WA salmonids. While these data may vary substantially, the range of values may put some bounds on the variability one may encounter in actual implementations.

These methods have been forcefully criticized. In particular, the transportability of HSC's from one location to another is an assumption that has been challenged (Railsback 2016). As a result, the NEB determination may include developing the fish-habitat relationships directly for each stream. In one example where HSC were critically evaluated, a mismatch between HSC and coho salmon response was recognized (Beecher et al. 2010). This led to an updated method of estimating HSC that included estimates of food intake HSC and habitat scale bioenergetics, and resulted in an improved match between fish response & model (Rosenfeld et al. 2016). The performance of the HSC was improved at the cost of additional data, modeling and validation effort. In this event, data needs will include fish density data over a large number of habitat units within the NEB determination area, and the development of quantitative associations between habitat metrics and fish density (e.g. regression, canonical correspondence, etc.). Importantly, HSC will be species and life stage specific, and so fish density data required to evaluate HSC will likewise need to be for the appropriate species and life stages.

b. Assumptions and Implications

Habitat capacity approaches have been criticized for having a number of unrealistic assumptions and for being overly data intensive for the level of precision achieved. In the case of developing study-specific HSC, the demand for both habitat and fish data is intensive and is often viewed as expensive. Among the assumptions that are viewed as problematic are those related to the habitat being oversimplified over a given assessment unit, static in time, independent of species or life stage and equivalent across assessment units (Parasiewicz 2007; Railsback 2016).

These approaches have also been critiqued for issues related to scale of analysis. The hydraulic flow models that are commonly combined with environmental habitat data to evaluate changes in capacity are often developed over different and potentially incompatible scales (Wu and Li 2006). In addition, since one is accumulating habitat units to estimate WUA, the WUA metric may apply over many habitat units, that could each vary greatly. This variance among habitat units may be differentially important to different species and their life-stages, but is missed in most habitat capacity approaches, arguing perhaps for smaller scale assessments. Parasiewicz (2007) however, argues that larger assessment units (10^3-10^5 m^2) are more appropriate for this type of assessment because it is the relevant unit from the management point of view and more fairly represent the concept of "Functional Habitat".

There is also an important assumption that the fish-habitat association represented by HSC reflects a global preference for habitat characteristics, rather than the best of whatever is available. Across a watershed with numerous tributaries and diverse habitat conditions one could sample all the habitat units and correlate the density of fish with the local habitat conditions to develop an HSC rule set. However, in order for fish density in that process to be a true signal of habitat preference, the fish sampled would need to know that the habitat

conditions where they are located is more preferable than the possible range of conditions elsewhere across the watershed where the rules were being developed. In reality this is never the case; salmon emerge from gravel and sample a very small subset of habitat conditions in their local surroundings and likely choose the most preferred from the available options. Indeed, when this assumption was tested, the fish made choices within the limits of their local environment and no global rules emerged (McMillan et al. 2013). Over evolutionary time intervals, it is likely globally preferred habitat will have higher net fish productivities, but over that same time the habitat is evolving (e.g. log jam washouts, sediment transport, etc., DeVries et al. 2001; Pess et al. 2012; Fremier et al. 2018). Thus, the pattern of fish density observed at any moment in time is a snap shot of interactions between hydraulic, habitat and biological processes that may or may not permit use of the assumption that HSC are transportable across time and space.

c. Sources of Uncertainties

Habitat capacity models carry large amounts of uncertainty from several sources. Most of the sources of uncertainty are related to the assumptions discussed above, and in particular fish-habitat associations. Uncertainty can be significant with respect to the portability of the fish-habitat relationships to new locations (Freeman et al. 1997; Williams et al. 1999; Railsback 2016), and inappropriate inferences drawn from fish-habitat data (Rose 2000; Minns and Moore 2003; McMillan et al. 2013). There are also potentially large uncertainties from mismatch of scale in the data used to develop WUA measures as hydraulic modeling on one scale married to finer scale habitat data can misrepresent fish preference (Bovee 1986; Railsback 2016). The uncertainties related to habitat preferences being species and life-stage dependent can also be large, especially when preference differences among life stages of fish interacts with seasonal variability in in-stream habitat conditions (Heggenes et al. 1996).

Responding to these uncertainties lies along two lines. On a technical basis, the implementation of NEB determinations should include validations (e.g. Studley et al. 1996; Gallagher and Gard 1999; Beecher et al. 2010), where relationships between flow and fish production are validated in the location where the offsets are implemented. On a policy basis however, the magnitudes of these uncertainties and species dependence may be large, but not addressable. For example, in a watershed with both listed and unlisted salmonids, failure of the assumptions related to the non-listed fish may impact instream resources in the context of fisheries yield, but failure related to the listed fish is a regulatory issue and the Endangered Species Act may impose constraints that one cannot address with a trade-off of habitat functions. It is also possible that the listed fish is in smaller numbers and uncertainties in estimating fish abundance could include zero fish, where the unlisted fish may occur in larger abundance, making mistakes in estimating abundance less costly. Resolving what “large uncertainty” means and how it is handled may represent a policy choice rather than a technical or scientific choice reflecting case-specific, and potentially competing, values.

D. REPLACING FISH ABUNDANCE

In fish abundance replacement, NEB determinations are based on fish abundance in offset areas equaling or exceeding the abundance of fish lost from impact areas. This is one version

of a general set of resource-to-resource equivalency analyses (REA, Kim et al. 2017; Holmes and Lipton 2018). This approach expresses NEB in terms of abundance of fish of the same type. For salmonid fishes, this would be fish of the same population group within their Evolutionary Significant Unit (DSP & ESU, Waples 1991, 2006).

Fish abundance replacement approaches to NEB determination are similar to habitat capacity replacement to the extent that it requires similar information on habitat in order to justify the forecast offsets, but more complicated in that it also requires more detailed information on fish abundance. In addition, this more detailed information will be required for both the impacted and offset locations. While it may be possible to acquire some of this more detailed information in pre-treatment monitoring at the impact site, the offsets will usually require forecasts. The challenge is that the forecasts usually must rely on analogs, expert opinion or models that can become quite complex; the dividend is that the detailed information inform the design of a relevant effectiveness monitoring program.

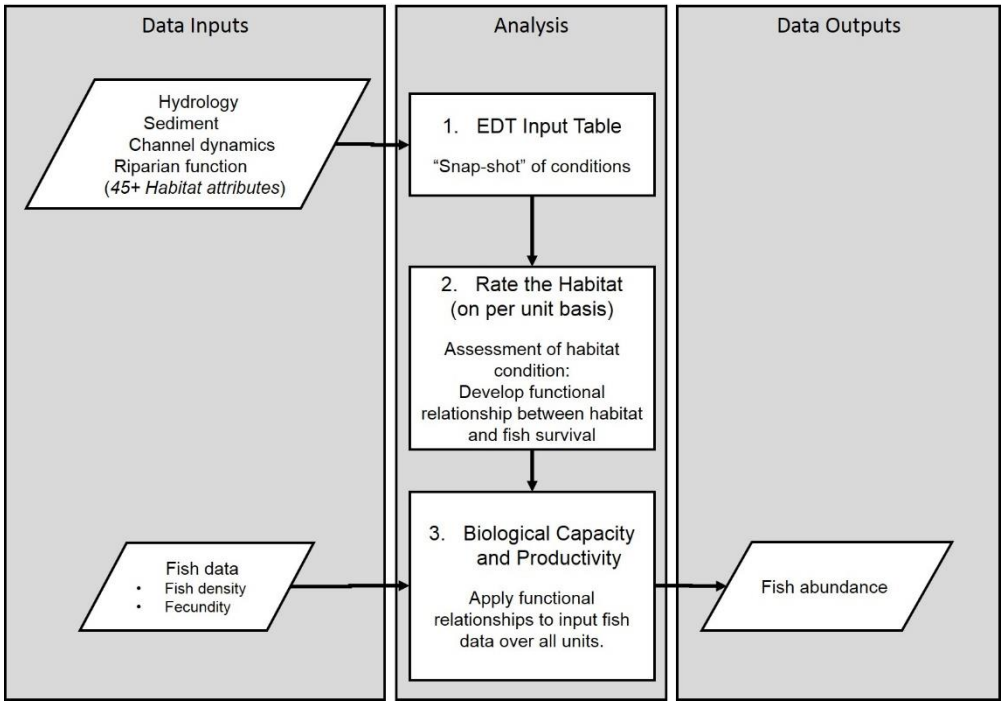

Figure 8 EDT Workflow. User data enters the analysis in the form of habitat data on a per habitat unit basis (e.g. pool) to establish a snap shot of the habitat. In step 2, those data are applied to functional relationships between habitat condition and fish responses. These relationships can be based on empirical monitoring, but are more often based on best professional judgement. In step 3, these functional relationships are applied to additional input data on current or historical fish production and used to generate forecasts of fish abundance. Given the functional relationships and habitat current condition "snap-shot", one can estimate where habitat improvements are likely to generate the greatest fish population response. However, these estimates may not be sufficiently certain to support NEB determination. In addition, much of step 3 is proprietary and requires contracting with the EDT copyright holders.

Quantifying fish abundance becomes increasingly hard as the assessment area gets larger. This is in part due to ecological issues including movement of individuals, but more so due to

the logistical aspects of sampling including the expense of sampling a large number of times and the time it takes to conduct monitoring. Therefore, fish numbers-for-fish numbers substitution is better suited to smaller assessment units.

As fish abundance replacement approaches to NEB determination rely on outcomes (numbers of fish) rather than mechanism of achieving those outcomes, they can be quite flexible. Offsets can be achieved through a diversity of habitat alterations, and in quite different ways than at impact locations. Fish abundance replacement is similar to habitat capacity replacement in this flexibility, however it is distinct in that the response metrics are direct measures of fish, rather than relying simply on habitat.

A specific example of habitat function replacement is Ecosystem Diagnosis and Treatment (EDT) model. In principle, EDT works on the premise that each habitat unit has intrinsic qualities that affect the survivorship of the fish that encounter it. These qualities can vary across units, and their functional responses can vary across the life history stages and species of fish; a specific feature of a given pool (e.g. temperature, depth) might positively affect the parr of one species, but negatively affect smolts of a different species. In principle, one could start with a number of eggs in a salmon redd or redds, and then serially apply the survivorships for all units across all life stages of each species and forecast the abundance of fish at the time of the next spawning. This framework is dependent on having detailed, quantitative associations between habitat qualities and fish survival (see fig. 8). This is a strength in that with this information in hand it allows one to evaluate alternative habitat improvement scenarios and prioritize projects; it is a weakness to the extent that all of these relationships are rarely available a priori and EDT often requires significant subjective human input as a substitute. Conceptually however, the idea of net survivorship as a product of many small survivorship steps is a rational approach.

EDT has been used widely across the Pacific Northwest and we have learned a lot about how it works and about a number of limitations. Many of these limitations have been summarized elsewhere (Paine et al. 2001; McElhany et al. 2010) and so here will not be repeated in detail but discussed only as a list of relevant highlights. From a statistical point of view, this approach is a multi-regression with many (many hundreds to thousands, McElhany et al. 2010) parameters used to estimate survival at each point, with the results for all habitat units in the life history applied to the result from the prior habitat unit. This is widely recognized as over-parameterization, and it results in the generation and propagation of errors and generating untestable predictions (Freedman and Freedman 1983; Freedman et al. 1988; Burnham and Anderson 2003; Leinweber 2007). In addition, this approach makes demands on the habitat quality data far in excess of available monitoring data. For those many EDT parameters for which fish and habitat data are lacking, experts are polled for their opinions on what the actual values are likely to be. Thus, much of EDT products result from an “expert-panel” process rather than a data-based, scientific process. As such, many of the uncertainties that exist within the process that might otherwise influence our characterization uncertainty in the ultimate forecasts are subjective, based on opinion rather than data, and ultimately unknowable. Due to its high spatial resolution, EDT does provide very specific forecasts, although its uncertainties mean its accuracy cannot be evaluated. This is an important distinction, that EDT is an expert-

panel process does not make its predictions wrong, but it does limit the ability for a scientific review to test its predictions, and is therefore not transparent. That said, the limited literature that attempts to characterize the reliability of EDT forecasts has indicated that it has relatively poor performance and is not useful for forecasting population sizes based on habitat assessment (McElhany et al. 2010).

a. Data and Methods

Fish abundance is expressed and monitored in a variety of ways. The choice of measure has technical implications for how the information is collected and interpreted, and for methods and uncertainties. Common ways that abundance is expressed include total abundance, density, biomass and catch per unit effort (CPUE). Some of these measures are more common in fisheries assessments than in conservation assessments and the choice of method may depend on the motivation for the assessment as well as available technical resources and data. Total abundance is the result of a census or probabilistic sample (Courbois et al. 2008). Total abundance is desirable as a metric as it is a direct answer to the question of abundance; however, it is often expensive or otherwise difficult to obtain in practice.

Density of fish is a measure of abundance within a specific area of habitat and at a specific time. The area is commonly the habitat unit being sampled (e.g. pool area or reach length), and expressed unit of measure is number of individuals per area. Samples that are part of large scale sampling designs often consist of individual density measures, and so density measures are among the most common indexes of fish abundance. It must be kept in mind however, that density of fish, particularly juvenile salmonids can vary greatly habitat unit to habitat unit (e.g. McMillan et al. 2013). Therefore, density measures are often highly location and time dependent and extrapolating from density measures at a limited set of locations can impart large biases to an estimate of abundance (e.g. Courbois et al. 2008).

Fish enumeration is a common activity within fisheries and there are standard methods for enumerating fish. Across the region there are numerous references on methods for enumerating or estimating fish abundance (e.g. Bonar et al. 2000, 2009; Crawford 2007). Additional information on abundance measures is available from Ecology at:

https://ecology.wa.gov/Research-Data/Monitoring-assessment/River-stream-monitoring/Intensively-monitored-watersheds

In addition to estimating some measure of fish abundance, NEB determinations via abundance substitution will require some method to relate or forecast management actions in the watershed plans to future abundances. Therefore, the habitat impacts or baselines, and offset forecasts will need to be characterized, and a method or model that relates offset scenarios with future fish abundance is required. Given the history of habitat management across the Pacific Northwest and the long-term investments in habitat restoration, there is a broad expectation that specific forecasts of fish responses from habitat manipulation are at hand (Roni et al. 2008). However, in practice such expectations for specific habitat types and actions come with large uncertainties (see below).

b. Assumptions and Implications

Given that fish abundance replacement relies on outcomes (numbers of fish) rather than mechanism of achieving those outcomes, the number of assumptions may be less. Nevertheless, there are specific assumptions associated with fish abundance that are similar to assumptions related to habitat capacity replacement. Fish abundance also relies on the assumption that the future ecosystem is similar to the current ecosystem. For example, as water temperatures rise over the next 20 years and centrarchid fishes replace salmonid fishes (Isaak et al. 2015; Rubenson and Olden 2016), the habitat management one would put in place may not be beneficial for centrarchids as they may have been for salmon.

It is also important to remember that the fish are wild, rather than domestic. The relevance to fish-for-fish, or habitat-for-habitat replacement is that human activity can reduce the numbers of fish deterministically (harvest, habitat loss, etc.), but cannot force the production of new wild fish. The foundational assumption of a restoration-based substitution is that by reducing the contribution to mortality from specific sources, such as lost or degraded habitat quality, we will see a consequent increase in the number of wild fish. This may not be unreasonable, but we have to keep in mind that the mechanisms are passive and even if the habitat alteration is successful, there are reasons why that may not correlate with increasing numbers of fish. If current abundances of fish are below the current carrying capacity of the habitat for example, then it suggests something else is limiting population size and increasing habitat capacity further via restoration is unlikely to increase population size. An ecological illustration is the middle fork of the Salmon River; the Frank Church River of No Return wilderness has near-pristine habitat quality and suggesting the need for actions to increase the quality and quantity of habitat is not reasonable. However, Chinook salmon in that area are below carrying capacity and listed as endangered under the ESA.

c. ***Sources of Uncertainties***

Management planning that alters habitat to achieve natural resource responses will have uncertainties. Recent approaches to using the fish abundance metrics to evaluate habitat management and planning (e.g. EDT) have demonstrated a number of critical uncertainties. McElhany et al. (2010) performed an extensive simulation analysis of EDT to evaluate the significance of these issues. That analysis indicated that EDT estimates of fish productivity and habitat capacity were not reliable due to internal parameter uncertainty. However, prioritization of reaches for preservation or restoration based on EDT forecasts were somewhat more robust to given input uncertainties. The interpretation was that EDT may be better as a relative index of where important habitat is, rather than in making specific estimates of fish produced from a given habitat improvement scenario. Like all complex models, EDT outputs are subject to large uncertainties, and therefore it is important to explicitly incorporate the uncertainty and sensitivity analyses into any analyses. Sensitivity analyses should be performed to evaluate the precision of any forecast made with complex models such as EDT (McElhany et al. 2010). As mentioned, much of EDT's products are heavily influenced by subjective, "expert-panel" inputs, rather than data-based, scientific process. Uncertainties introduced with this approach generally have been shown to be highly imprecise, untestable, non-transparent and unreliable (e.g. Burgman et al.

2011). Given the magnitude of these uncertainties, a transparent use of EDT for NEB determination will require an evaluation of the sensitivity of the forecasts to subjective opinion.

E. REPLACING FISH PRODUCTION

Rather than relying on fish abundance, a fish production replacement approach to NEB determination uses population production metrics to evaluate NEB. This amounts to replacing lost fish production in impact areas with equivalent or greater production in offset areas through management actions that are believed to change population growth rate or mortality. As such, this can be viewed as another example of resource-for-resource replacement (Lipton et al. 2008; Clarke and Bradford 2014). Reliance on productivity has a number positive attributes, including direct measures of the productive capacity of a given habitat unit, feeding directly into fisheries-related yield estimates, and in some cases estimation from smaller, less extensive sampling than abundance. However, data needs are often more intensive (one needs more detailed information, albeit from perhaps fewer samples), and population-level assessments must rely on models and methods that are often complicated and technically challenging. Therefore, this approach is likely to be most appropriate when the assessment units are large and heterogeneous.

Estimating fish productivity requires developing a relationship between current abundance of "parent" fish (spawners) and the numbers of "offspring" fish that will return in the future (recruits). In salmon and steelhead trout management, a common approach to estimating productivity are spawner-recruit models. There are a number of familiar formulations of these models that include Ricker, Beverton-Holt, Schaefer or Fox models. Once a particular model is chosen, the parameters must be estimated from the data.

In particular, a Ricker model has been a popular choice due to the ease with which it can be formulated as a linear regression model, such that

$$\log_e(R_t / S_t) = a - b \times S_t + e_t,$$

where R_t is the total number of surviving recruits from brood year t, S_t is the number of spawners in brood year t, a is the intrinsic productivity (i.e., the number of recruits per spawner in the absence of density dependence), b is the per capita strength of density dependence, and e_t is the observation error in brood year t. From a set of R_t and S_t values the log of R_t / S_t is regressed on S_t; the intercept is a and the slope is b in the equation above. The Ricker model is particularly convenient in that the carrying capacity and intrinsic productivity of the population are estimated directly from this regression.

Before beginning with the model fitting, however, R_t must be estimated. For organisms that breed once and all at the same age, the number of recruits is the number of breeding organisms surviving from a prior brood year. In most cases, and in salmonid fishes certainly, the animals that join breeding populations can be from several different years' production, each with a different survivorship. In these cases we need to evaluate the regression above for recruits that

may accumulate over several subsequent years. This is often done with a brood table or run reconstruction, which in turn is derived from combining observed age composition and total spawner counts.

Productivity varies year to year, and so this approach requires multiple years of data to provide reasonable estimates. Indeed, the intrinsic variability in production can, in many cases, require many years of data. It is fortunate that salmon monitoring in the Pacific Northwest has been intensive and ongoing for many years. This is in contrast to many of the fish abundance replacement approaches which rely on a snap shot in time, but extensive data in space. However, if time series data are available it is also possible to evaluate the degree to which co-varying habitat conditions affect the estimates of *a* and *b*, and in so doing develop an estimate of how engineered changes in habitat may alter fish production. This is one approach to forecasting the anticipated positive effects of offset projects for NEB. The workflow for a fish production estimate is illustrated in Fig. 9.

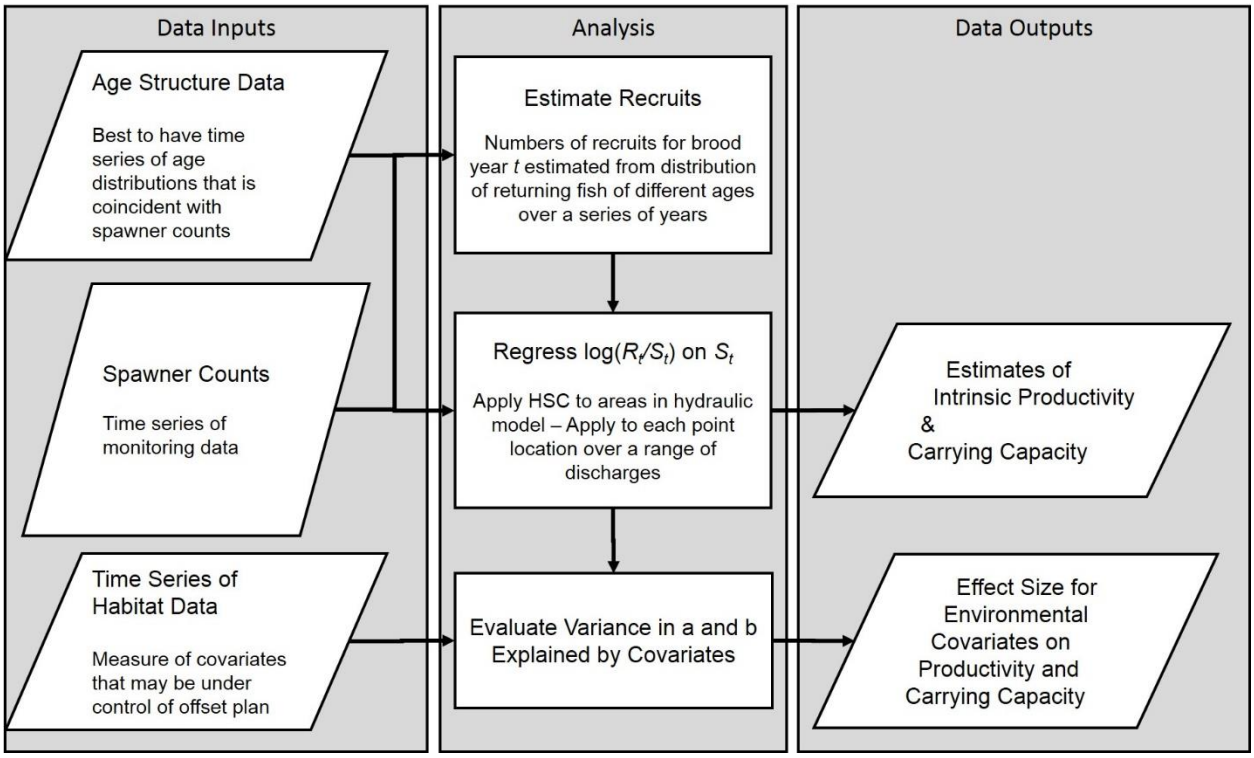

Figure 9 Fish Production replacement workflow. User data enters the analysis in the form time series of spawner counts, age distributions and environmental covariates. Spawner counts from prior years are combined with age structure data to estimate a time series of returning recruits. Production and Carrying capacity estimates for the planned habitat unit are estimated with a linear regression model in the case of a Ricker approach. Slightly different mathematical formulations are used in alternatives to the Ricker model. The outputs from the regression are the principal Data Outputs. If time series data of habitat covariates are available these can be used to explain variation in the productivity and carrying capacity estimates in order to forecast the changes in future production from habitat management actions performed now.

Although convenient, there are a number of inherent challenges when estimating the model parameters in this manner. First, the available raw data are used inefficiently, in that information

is lost when summarized into brood tables to calculate demographic rates. Second, the spawner and age data are rarely, if ever, comprehensive or error free due to imperfect detection, misidentification, and non-exhaustive sampling in collecting field data. When not appropriately addressed, these errors in population census may underestimate recruitment (Sanz-Aguilar et al. 2016) or overestimate the strength of density dependence (Knape and de Valpine 2012). Third, failure to acknowledge trade-offs among parameters and the fact that any given type of data (e.g., age structure) may contain information on multiple aspects of population dynamics (e.g., recruitment and survival) can lead to biased parameter estimates.

a. Data and Methods

Fish production rate is the net generation of new biomass in a stock per unit time, whether or not it survives to the end of that time (Ricker 1975). The time unit used to represent the rate can be a variety of units, but in salmon and other fish that have a strong seasonality to their presence in fresh water, the most common time unit is annual. Therefore, the unit of measure for expressing fish production is most often either fish in numbers/year or biomass in kg/year. Consequently, there is an immediate need for data on fish numbers and size. Data on fish abundance and size (i.e. annual estimates of adults and/or biomass) can be collected directly in impacted areas using the methods described above, but estimates of fish abundance for the offset areas will have to be obtained from modeling or other forecasts. The models used in this approach to forecast population responses to habitat management are increasing in use, but remain somewhat rare, and are often complicated. Regardless of the modeling approach, it should include explicit metrics that can be deployed in effectiveness monitoring to allow forecast validation as well as inform the triggering of contingencies for failure to meet forecast goals.

Approaches in use to characterize population productivity in fish include metrics based on and derived from:

- Population structure (e.g. distributions of body size, Productivity: Biomass Ratios),
- Size structure,
- Habitat Productivity Index (HPI) is the product of P:B ratio and seasonal biomass (Randall and Minns 2000, 2002).
- Individual vital rates including growth, survival, fecundity

Methods for implementing these approaches to assessing population productivity are presented in numerous fisheries texts including:

- Hilborn, Ray, and Carl J. Walters, eds. Quantitative fisheries stock assessment: choice, dynamics and uncertainty. Springer Science & Business Media, 2013.
- Gulland, John Alan. Fish stock assessment: a manual of basic methods. Vol. 425. New York: Wiley, 1983.
- Pauly, Daniel, and G. R. Morgan, eds. Length-based methods in fisheries research. Vol. 13. WorldFish, 1987.
- Haddon, Malcolm. Modeling and quantitative methods in fisheries. CRC press, 2010.

There are a number of modeling approaches that can be used to investigate the mechanistic relationships between habitat and production. Two of the more common are stock-recruitment models and stage structured habitat supply models.

Stock-recruitment models were originally developed for harvest management and extractive fisheries (e.g. Ricker 1954). Although the techniques have evolved and developed into more general population modeling schemes, the data needs, assumptions and challenges to use remain, as do debates regarding the choice of model form in any given application (e.g. how density dependence is represented in Beverton-Holt vs. Ricker formulations). Stock-recruitment models have high utility in that they incorporate estimates of recruitment, intrinsic growth rates, survival, fecundity and environmental carrying capacity, and they produce estimates of surplus production and sustainability targets for harvest. All of these population properties have wide utility in fisheries management (e.g. Gibson 2006; Parken et al. 2006), although it is less clear that they have similar utility in conservation and habitat-population management scenarios. Most estimation approaches rely on linearizing the stock-recruitment relationship with a log transform of the data, estimation of the parameters and then transform back to linear space where the parameters are reported. While this provides conceptual simplicity and useful outputs (Clark et al. 2009), it results in very large uncertainties in the estimates of recruitment (Ludwig and Walters 1981; Hilborn and Walters 2013), and many of the assumptions are problematic (Walters and Ludwig 1981; Walters 1985, 1987; Kehler et al. 2002; Kope 2006).

Stage-structured models are an alternative that recognizes that fish will encounter different sources of mortality at different times in their life histories. The modeling approach is to take the entire life history of the fish and divide it into a number of stages; the net survivorship is the resulting cumulative probability of survival at each of the steps or life-stage transitions over the lifetime of the fish (Nickelson 1998; Nickelson and Lawson 1998). In salmon, where there is a protracted fresh water period with several recognized developmental stages, it has been possible to construct life cycle models with many survivorship steps. The net survival of fish is calculated as a long series of multiplications of numbers between zero and one (survival probabilities range from 0 to 1), and for the whole life history it can be a very long series. As a consequence, even if survivorship for a specific step is high, or made high by a specific management action, the net survivorship works out close to zero. This is not a surprise when we remember that female fish may lay 3,000 to 7,000 eggs in a salmon redd (Groot and Margolis 1991), but only two fish survive to reproduce if the population is just replacing itself. The other consequence however, is that our sensitivity to detect small changes at specific life history steps is relatively low when we are looking at a population level outcome, such as numbers of returning adult fish

Much of the current paradigm for endangered fish recovery is based on a life-cycle concept. In principle, if we change the mortality at a specific step with a habitat restoration project for example, we could increase the net overall production of fish and put the population on a trajectory to recovery. Unfortunately, this paradigm has an important limitation in that the effect of any change in survival itself is probabilistic. We can't specify how many fish will survive passing a given dam, or other threat, we can only say what the probability of survival is and if

sufficient monitoring data exists, what change in the probability is likely for a given management action. The good news is that while we cannot predict the fate of an actual fish, the probabilistic nature of survival provides a mechanism to estimate our uncertainty in any estimate.

b. Assumptions and Implications

Both life cycle and stock recruitment modeling approaches rely on many of the same data types as the other NEB determination approaches. Therefore, this approach has similar assumptions and constraints as the other methods with respect to data. In addition, the modeling approaches currently in use can become quite complicated. For example, life cycle models in particular can have many steps with different values of survival for each. This is problematic both because the model complexity/bias uncertainty rises and also because there is less monitoring data and empirical studies to support the estimate of survival in a specific habitat and fish life history context. In many of these cases of low empirical data availability, planners have resorted to expert opinion and this introduces additional problems of transparency and model validations (McElhany et al. 2010).

Because production approaches are built on our understanding of a population process, its relevance is greater on the scale over which the survivorship or stock recruitment processes operate. This is usually a large scale, and in the case of endangered anadromous salmon, the scale is the whole population (Bradford et al. 2014). For example, the premise of a habitat restoration project is that by improving habitat-related survivorship we will see an increase in the number of wild fish. This may be a reasonable hypothesis, but we have to keep in mind that the mechanisms are passive—we are not making new fish--and even if the habitat alteration is successful, there are reasons why improved habitat may not correlate with increased fish production. Indeed, in the Columbia River there are a large number of potential sources of mortality occurring outside the basin, with as little as 34 to 64% of mortality occurring in the freshwater life history of anadromous salmonids (Bradford et al. 2014). Thus, improvements in early life survivorship due to actions in the NEB determination may be entirely successful, but out of basin mortality may prevent any of that success from being measurable into the future.

c. Sources of Uncertainties

Uncertainties from this approach to NEB determination arise both from the data and metrics, as well as the modeling approaches chosen to forecast offsets. With respect to data and metrics, the uncertainties are similar to the other approaches to NEB determination that rely on fish abundance and habitat condition measures. Life cycle models have the additional complication that these same data are required for possibly many life stages and habitat conditions.

When any of these approaches to fish production replacement are linked to habitat there are important uncertainties related to ecological context. Empirical measures of habitat affecting life stage survival may be just as site-specific as habitat preference described above. In cases where fish population responses are inferred from localized studies, the lack of transferability of the estimated relationships between habitat and survival may be just as uncertain as habitat capacity modeling.

Perhaps the largest uncertainty is the complex nature of productivity models as forecast tools for the NEB determination. As mentioned above, these models are generally some of the more complex models in fisheries and conservation use, and this complexity exists in models that do not make explicit linkages to habitat metrics as covariates or drivers of population processes. This model complexity imparts large uncertainties to any forecast made that bases fish production from habitat changes. Also important is that the uncertainties in the data that goes into the models and the uncertainties arising from the models themselves may interact in more than a simple additive manner and produce unexpectedly large uncertainties in the forecast results (Caputi 1988). Therefore, if NEB determination is to be made with a fish production replacement approach, large increases in proposed offsets may be needed to increase the likelihood that NEB will be net positive by the end of the planning period. Certainly, monitoring, validation metrics, timelines and triggers for contingencies in the event of failure to reach validation targets will be prudent components for watershed plans developed under RCW 90.94.

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Table 1.

NEB Determination Approach Comparison Summary					
Type of Environmental Offset	In-Kind, In-Place	Out of-Kind, Out of-Place			
	In-Kind Replacement Water for Water	Habitat Function Substitution	Habitat Substitution for Specific Species	Fish Abundance	Fish Production
Example	Water for Water	HEA	PHABSIM	EDT Fish-Flow curves	Life-Cycle Modeling
Basic Information Outputs					
Produces Quantitative Measures of flow? (Will it connect consumptive withdrawals to quantitative changes in instream flow?)	Yes	No	No	No	No
Produces Quantitative Estimates of Habitat Response?	No	Yes	Limited, does estimate hydraulic condition at different flows. However, some professional judgment or input from other model or framework is required to relate hydraulic condition to quantitative habitat responses (e.g. step-backwater modeling, depth and velocity regression on transects, or two-dimensional hydraulic modeling based on channel roughness and flow routing for hydraulic component)	Yes, depending on scale and dimensions and input of habitat variables (cover, mesohabitat, other options)	No
Produces Quantitative Estimates of Fish Population Response?	No	No (associated estimates are from external judgment or model)	Yes, but based upon flow-habitat input	No – requires interpretation of habitat response via model or judgement.	Yes
Estimates responses in other Ecosystem	No	Yes	No	No	No

Goods and Services? (e.g. Recreational, Aesthetic, etc.)					
Qualities of Information Produced					
Data and Methods					
What data are required to perform the assessment?	Streamflow	Impacted habitat estimate; multivariate description of the habitat, such as habitat structure, cover, or substrate type;	Suitability or preference metrics at microhabitat (or meso/marcro habitat) level incl. depth, velocity, substrate, roughness and/or cover) for each species life-stage	Hydrology, sediment, channel dynamics, riparian/habitat function, total fish abundance as count, density, fecundity, biomass, catch per unit effort	Fish age structure (e.g., growth, survival, fecundity), spawner information (e.g. number or biomass per time), habitat productivity, Productivity: Biomass ratios.
Spatial Issues					
Transferability If we have data for one location, can you extend developed inferences to other locations?	No	No	No	No	No
		In all cases, there have been implementations where fish:habitat relationships have been developed in one place and deployed elsewhere. This is done, but it is difficult to support technically, and if done, should be accompanied by extensive validation monitoring.			
Spatial Extent	Stream reach	Arbitrary	Typically a representative reach scale (Can be expand to larger segment-scales if habitat weighting is used. Modeled results have been used to inform watershed-scale decisions for planning and policy purposes.)	Can be made up of very small scale – how close do you want to space measurement points, and at the cost of time and effort	Limited to domain over which the supporting data are relevant. Commonly the distinct population segment (DSP).
Spatial Resolution		Arbitrary (Commonly determined by the spatial resolution of the inventory of habitat units)	Commonly 100 meter reaches	Reach (Although, the resolution is the reach, supporting data at that scale are often unavailable, and supplemented with expert opinion.)	Limited to domain over which the supporting data are relevant. Commonly the distinct population segment (DSP).
Assumptions and Statistical properties of Ecological Benefits Forecast					

Assumptions	That water quantity is a surrogates for habitat metrics and population response	Assumes ecological function is equivalent to fish production	Assumes stationarity in a number of aspects: • that all space are equivalent • static in time, independent of species/life stage, fish have a global knowledge of site suitability	Assumes future ecosystem is similar to the current ecosystem; restoration efforts are directly correlated with wild fish recovery	Ability to accurately model multiple fish life stages; relies on heavily on empirical data or expert opinion
Implications	Any Net benefit from new habitat will have to meet or exceed the lost function in excess of the existing production in the offset location.	Aggregated data may mask detail among data that actually determine fish production; results will depend on structure of the model used and data used.	The pattern of fish density observed at any moment in time is a snap shot of interactions between hydraulic, habitat and biological processes that may or may not permit use of the assumption that HSC are transportable across time and space	Difficult to account for environmental changes associated with a changing climate; restoration activities may not be sufficient to increase wild fish population (other factors may play a role)	Models provide a better understanding for larger scale/process-level estimation, while specific habitat alterations may exact a more local scale response
Uncertainties					
Where do critical uncertainties lie?	Habitat for habitat on a quantity basis is low uncertainty; establishing habitat for habitat on a quality basis is less certain.	Degree of uncertainty is metric-dependent-greater uncertainty for metrics representing complex features (e.g. habitat) and information-poor metrics; reduces complex ecological services to a single metric; does not account for injuries that	Assumptions of fish-habitat associations; portability of fish-habitat relationships; mismatches of scale and/or data;	Estimates of fish productivity and habitat capacity are estimated using other parameters with varying uncertainty; depend heavily on “expert-panel” inputs	Assumptions of fish-habitat associations; portability of fish-habitat relationships; Empirical measures of habitat affecting life stage survival may be just as site-specific as habitat preference; complex models do not make explicit linkages to habitat metrics as covariates or drivers of population processes.

		accumulate over time			
Does it produce a measure of precision of forecast? (What is the uncertainty?)	Lower for well-studied systems when using common/well-understood measurement methods	Can require data aggregation which can mask more detailed/ nuanced relationships	No- hydraulic modeling on one scale married to finer scale habitat data can misrepresent fish preference	Not as currently done, although it could be built in, particularly where hydraulic models are based on regression. Suitability criteria input could also be developed with estimates of precision, but would require extensive work	Estimates may be more robust at the larger/process-based scale
Does it produce a measure of accuracy in the forecast? (How far from the forecast is the truth?)	Higher when modeled as described above	Dependent on data quality	If quantitative habitat:fish models are used, estimates of forecast accuracy are possible. However, as commonly deployed, these approaches rely extensively on expert judgement which does not allow a quantitative assessment of accuracy (see above). As such, resolving what constitutes an estimate of accuracy and how it is handled may represent a policy choice rather than a technical or scientific choice reflecting case-specific, and potentially competing, values.	No, but see above- while EDT does provide specific forecasts, its uncertainties mean its accuracy cannot be evaluated.	Yes, However, uncertainties arising from models being sensitive to data variance can be large. In addition, uncertainties arising from the models themselves may interact in more than a simple additive manner and produce unexpectedly large uncertainties in the forecast results
Is it transparent? (Are all data sources, assumptions and methods documentable and inform estimates of accuracy and precision?)	Yes in principle.	Aggregation and expert opinion can reduce transparency	Yes in principle.	No. As currently implemented, relies extensively on expert opinion, which may be subjective or imprecise.	Yes in principle.

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5. APPENDICIES

Appendix 1: Economic valuation

1) Table A1

Table II: Comparison of Willingness-to-Pay Estimates for Anadromous Salmon in the United States, Post- 1990

Year	Type	Authors	Study location	Sample size	Payment Period	Payment Frequency	Baseline (in 1000s fish	Change (in 1000s fish)	Amount	Payment vehicle	Survey method	Income elasticity
1990	CVM - DC	Hanemann, Loomis, Kanninen	CA, OR, WA	1003	NS	annual	0.1	15	$324	taxes	mult	NR
1991	CVM - OE	Olson, Richards, Scott	WA, OR, ID, MT	1400	one-time	month	2500	2500	$49 - $137	electric bill	phone	NR
1991	CVM - DC	Stevens et al	MA	1000	5 years	annual	NA	complete loss	$13 (Atlantic salmon only)	trust fund	mail	NR
1992	CVM - OE	Duffield and Patterson	MT	796	one-time	lump sum	NS Status Quo	NS	$31	trust fund	mail	NR
1996	MA	Loomis & White	NA	NA	NA	NA	NA	NA	$100	NA	NA	NR
1996	CVM - DC	Loomis	WA & USA	1174	10 years	annual	50	350	$91 - $113	taxes	mail	NR
2001	CVM – R	Layton, Brown, Plummer	WA & OR	1611	20 years	month	2000	3000	$167	utility bill	mail	NR
2003	CVM - DC	Bell, Huppert, Johnson	WA & OR	2209	5 years	annual	64 - 69	64 - 146	$101 - $162 (WA)	taxes	mult	NR
2006	WTP - MC	Montgomery and Helvoigt	OR	5300	NS	month	SQ	NS	$15 - $46 (mode)	utility bill	mail	NR
2007	BT (LBP 1999)	Goodstein and Matson	OR & WA	NA	NA	NA	NA	33 - 66% decrease	$33-$144	NA	NA	0.3
2008	MA	Martin-Lopez et al	NA	NA	NA	NA	NA	NA	$76 - $149	NA	NA	NR
2009	MA	Richardson, L. and Loomis, J.	NA	NA	NA	NA	NA	NA	$92	NA	NA	NR
2009	BT (Loomis 1999)	Helvoigt and Charlton	OR	NA	NA	NA	NA	NA	$33	NA	NA	NR
2009	CVM - CE	Rudd, M.	Canada	2761	20 years	annual	SQ	50 - 200% increase	$86	taxes	online	NR
2012	CVM - CE	Johnston et al	RI	522	NS	annual	SQ	NS	NA	taxes	mail	NR
2012	CVM - CE	Wallmo, K. and Lew, D. K.	US	8476	10 years	annual	SQ	De-list as threatened	$40	taxes	online	NR
2012	CVM - CE	Mansfield et al	OR & CA	3,372	20 years	Annual	SQ	30 – 150% increase	$121 - $213	Taxes	mail	Constant real income

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Willingness to Pay

Hanemann, M., Loomis, J., & Kanninen, B. (1991). Statistical efficiency of double-bounded dichotomous choice contingent valuation. *American journal of agricultural economics*, *73*(4), 1255-1263.

The authors conduct a survey of 1,003 residents in Colorado, Oregon, Washington and California to compare willingness-to-pay for various environmental improvement programs in California's San Joaquin Valley. One of those programs is a salmon improvement program. Bid amounts range from $45 - $225 with hypothetical payments made through annual taxes. On average, respondents are willing-to-pay $324 each year to increase fish populations from 100 to 14,900. The authors compare results obtained through both one round and two rounds of "yes/no" questions posed to respondents. The authors concluded that the sequential survey question format provides more efficient estimates of willingness to pay than those obtained through a single question.

Olsen, D., Richards, J., & Scott, R. D. (1991). Existence and sport values for doubling the size of Columbia River basin salmon and steelhead runs. *Rivers*, *2*(1), 44-56

The authors estimate the existence value of doubling Columbia basin salmon runs from 2,500,000 to 5,000,000 fish. A mail survey is used to solicit responses from 1,400 residents of Idaho, Montana, Oregon and Washington, exactly half of which are participants in the commercial fishing industry. Hypothetical payments are made through annual increases in electric bills, and the authors use an open-ended question format. Total economic value is reported as approximately double the non-use values. Non-users of the Columbia basin fishery express an annual willingness-to-pay of $49 per household; for people who may fish at some point in the future, $108; for those who currently participate in the sport or commercial fishing industry, $137.

Stevens, T. H., Echeverria, J., Glass, R. J., Hager, T., & More, T. A. (1991). Measuring the existence value of wildlife: what do CVM estimates really show?. *Land Economics*, *67*(4), 390-400.

The authors conduct a survey of 1000 New England residents soliciting willingness-to-pay to avoid funding cuts for species preservation programs. A sequence of two "yes/no" questions was posed to respondents asking if they would be willing to pay specific amounts between $5 and $150 to a trust fund for the purpose of protecting specific species, including Atlantic salmon. Individuals were told that species would not survive unless the fund was created. Average values for Atlantic salmon were reported as $13 per person. Only 12% of respondents had reported seeing Atlantic salmon. 52%

of respondents did not think their opinion would matter for policy decisions. 64% of respondents expressed a willingness-to-pay of $0.

Duffield, J. W., & Patterson, D. A. (1992). Field testing existence values: comparison of hypothetical and cash transaction values. *Benefits and Costs in Natural Resource Planning, Oregon State University*.

Authors examine the importance of "hypothetical bias" when it comes to valuing instream flows. Hypothetical bias is the tendency of respondents to overstate willingness-to-pay when payments are not actually made. The authors conduct a mail survey of 796 individuals with registered fishing licenses in Montana, approximately half of which are state residents and half non-residents. One version of the survey solicited one-time, actual cash donations to finance a fund for instream flows that would be established through the Montana Nature Conservancy. A second version was identical except that trust fund donations were hypothetical. A final version was similar to the hypothetical version, except that it was delivered through a separate mailing from the University of Montana. Respondents were asked to express Willingness to Pay (WTP) through payment cards in amounts from $10 - $250. Response rates to the actual payment program were only 10%, though the authors did not conduct re-contact respondents for any mailing sent through the Nature Conservancy. Of TNC mailings, the average contributions made by residents to the actual trust program was $31.34 (adjusted to reflect $2012). To the hypothetical program, WTP was reported as $26.25. For non-residents, WTP was reported as $50.04 (actual) and $56.06 (hypothetical).

Loomis, John B. "Measuring the economic benefits of removing dams and restoring the Elwha River: results of a contingent valuation survey." Water Resources Research 32.2 (1996): 441-447.

The author conducts a survey of 1,174 residents in Washington State and other US residents. Respondents are asked to express willingness-to-pay to remove two dams on the Elwha River in order to restore river runs to a natural, pre-dam state. Hypothetical payments were made through annual federal taxes over a period of 10 years and reflect non-use values associated with wild salmon, as opposed to generic salmon populations that include both wild and hatchery fish. Available bid amounts range from $3 to $190 and are solicited through a dichotomous choice, voter referendum format. It is assumed that dam removal would increase salmon populations from 50,000 to 350,000. On a per household basis, the mean annual WTP in Clallam County, WA is $91 mean annual WTP; for rest of Washington State, $113; for the rest of the United States, $105.

Bell, K. P., Huppert, D., & Johnson, R. L. 2003. Willingness to pay for local coho salmon enhancement in coastal communities. *Marine Resource Economics*, *18*(1), 15-32.

The authors examine the willingness-to-pay of coastal residents in Oregon and Washington for various coho salmon enhancement programs. The estimates presented are more variable than those of other studies. In total 2,209 respondents were recruited from Grays Harbor, WA; Willapa Bay, WA; Coos Bay, OR; Tillamook Bay, OR; and Yaquina Bay, OR. Questions were posed through a voter referendum format conducted through a combined mail and telephone survey approach. Costs of the programs ranged from $5 to $500 in annual tax payments over a period of 5 years. Fish population increases in Washington ranged from 200% to 400%. In Oregon, residents were asked to value fish population increases of sufficient size to de-list Coho as a threatened species under the Endangered Species Act. The authors find wider variation in willingness-to-pay between the Oregon locations than for Washington, and they report a *lower* willingness-to-pay for conservation programs that would result in *higher* increases in coho populations. They also find that participation in the local sport fishing industry is significantly associated with willingness-to-pay, and affiliation with environmental groups is affiliated with greater willingness-to-pay for some, but not all survey locations. For the Washington survey locations, average annual household WTP ranges from $101 - $162.

Montgomery, C. A., & Helvoigt, T. L. (2006). Changes in attitudes about importance of and willingness to pay for salmon recovery in Oregon. *Journal of Environmental Management*, *78*(4), 330-340.

Since 1996, the biennial Oregon Population Survey has two questions regarding salmon restoration efforts. First, “as you may know, salmon runs are declining in Oregon. How important do you feel it is to improve salmon runs in Oregon?” Second, “How much per month would you be willing to pay to for water quality and habitat improvement efforts to help improve salmon runs in Oregon?” Oregon residents have become less supportive of salmon recovery efforts from 1996- 2002, and the authors attempt to explain those changes. More than 30% of respondents were willing to pay $1-$3 per month in 2002 (the largest category for each survey year). Greater willingness to pay is reported for younger and unmarried respondents, males, American Indians, those with higher levels of education, people living in urban areas or areas that are less economically depressed. Long-term trends are not clear, as “an important portion of the decline in expressed support for salmon recovery and salmon recovery efforts is not explained by [socioeconomic information]” (p.2006, p.338).

Wallmo, K., & Lew, D. K. (2012). Public Willingness to Pay for Recovering and Downlisting Threatened and Endangered Marine Species. *Conservation Biology*, *26*(5), 830-839.

The authors conduct an online survey of 8,476 randomly selected U.S. households to estimate willingness to pay to downlist eight threatened and endangered species. Hypothetical payments would be made annually so that species could be de-listed 50 years in the future. Respondents expressed a willingness to pay of $40.65 ($37.94, $43.19) for Chinook salmon in the Willamette River and $40.49 ($37.91, $42.87) for those in Puget Sound. The survey took the form of a choice experiment. Responses were dropped for individuals who either unsure about their feeling regarding threatened and endangered species or not confident in their answers. The authors caution against using the estimates in benefit transfer applications to value more than three species at once.

Johnston, R. J., Schultz, E. T., Segerson, K., Besedin, E. Y., & Ramachandran, M. (2012). Enhancing the content validity of stated preference valuation: the structure and function of ecological indicators. *Land Economics*, *88*(1), 102-120.

While the public has expressed a willingness to pay to protect fish populations, the authors test whether values are sensitive to alternative ecological indicators of fish population changes. Indicators include the amount of river acres that are made accessible (1), the probability that a restored fish run will still exist in 50 years (2), changes in harvest (3), the amount of wildlife (4), and the overall ecological condition of a watershed as measured through a biological index (5). Public access to enhanced streams is associated with an additional $20 per household per year compared with streams with no public access. One percentage point increases in both biological quality index scores and the number of new acres made accessible to migratory fish is associated with an $0.80 increase in annual, per household values. This is approximately twice the effect of a one percent increases in harvest and one percent increase in the probability of fish survival 50 years later. Results were obtained from a 2008 mail survey of Rhode Island residents and a review of the existing scholarly literature. See also Johnston et al (2005) and Zhau et al (2013).

Mansfield, Carol, Van Houtven, George, Amy Hendershott, Patrick Chen, Jeremy Porter, Vesall Nourani, and Vikram Kilambi. Klamath River Basin Restoration Nonuse Value Survey. RTI International, 2012.

Mansfield and colleagues estimate the total economic value of salmon restoration in the Klamath River Basin of southern Oregon and northern California. The study was commissioned by USBR and asks respondents to express preferences between the status quo and the proposed alternative Klamath River Basin Agreement, a river restoration project that would remove four dams. Respondents are asked to make hypothetical, annual payments over 20 years through federal taxes. The survey asks

respondents to value increases in wild salmon populations from 30 – 150% and changes in extinction risks (low, moderate, high, very high). The survey was administered through the mail in June 2011, but respondents had the option to complete the survey online. The sample was stratified into three geographic zones, oversampling residents in the 12-county area closest to the Basin. The overall response rate was 32.8%. The survey included cheap talk and followed up the valuation question by asking respondents how sure they were about their response. The authors estimate annual household WTP for the project in the amount of $121 for Klamath area households; $213 for all other U.S. households. A reduction in extinction risk for coho salmon from “very high” to “high” is associated with an annual WTP of $70 for Klamath-area households, $54 for households in the rest of Oregon and California; and $78 for households in the rest of the U.S.

Meta-Analyses

Loomis, J. B., & White, D. S. (1996). Economic benefits of rare and endangered species: summary and meta-analysis. *Ecological Economics*, *18*(3), 197-206.

The authors conduct a meta-analysis similar to Richardson and Loomis (2009). They use the same variables to explain willingness-to-pay estimates, though they do not control for survey mode. The authors review 20 studies from both the published and non- published literature and report “best” estimates where multiple estimates are reported from a single study. They report an annual household willingness-to-pay (in $1993) for Pacific salmon/ steelhead of $49 - $140 (average $100); for Atlantic salmon $11 - $13 (average $13). Neither survey response rate nor study date was found to have a significant influence on willingness-to-pay estimates in any model estimated. Over 50% of the variation in willingness-to-pay estimates is explained by payment frequency, change in population size, species type, and whether respondents are visitors or residents. They argue that economic values are insensitive to the format of questions posed to respondents.

Johnston, R. J., Besedin, E. Y., Iovanna, R., Miller, C. J., Wardwell, R. F., & Ranson, M. H. (2005). Systematic Variation in Willingness to Pay for Aquatic Resource Improvements and Implications for Benefit Transfer: A Meta-Analysis. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie*, *53*(2-3), 221-248.

Meta-analysis is used to determine the importance of contextual variables on estimates of total economic value of water quality and habitat improvements that benefit aquatic species. In total the authors use 81 observations from 34 studies conducted

from 1973 – 2001, two of which include salmon and steelhead (Olsen et al, 1991; Loomis, 1996). The preferred specification assumes a semi-log form, where all right hand side variables are additive. Multilevel models are used reject random effects that might explain willingness-to-pay estimates through unobservable, study specific characteristics. Willingness-to-pay increases with the number of waterbodies affected and water quality enhancements.
The authors distinguish between valuations for large and small fish population increases (greater or less than 50%). Estimates vary by region and methodological approach, with lower estimates reported in the Pacific Northwest and higher values associated with both mandatory payments and higher response rates. The authors find that most studies express WTP in terms of annual payments of an indefinite duration. Where the duration is reported, a short time horizon is most common (i.e. 3-5 years).

MARTÍN-LÓPEZ, Berta., Montes, C., & Benayas, J. 2008. Economic valuation of biodiversity conservation: the meaning of numbers. *Conservation Biology*, *22*(3), 624-635.

The authors conduct a systematic review of 60 articles valuing different indicators of biodiversity in an attempt to explain variation in the reported estimates. Two studies relate to values for Atlantic salmon (Stevens et al, 1991; Bulte and Kooten, 1999) and two studies relate to values for Pacific salmon/ steelhead (Hanemann et al, 1991; Olsen et al, 1991). In per household terms, the authors report an average annual willingness to pay for Chinook salmon of $76 and for steelhead, $149. Results largely confirm the findings of previous meta-analyses (Loomis and White, 1996; Richardson and Loomis, 1999) that explain variation in willingness to pay estimates from multiple studies.

Richardson, L., & Loomis, J. (2009). The total economic value of threatened, endangered and rare species: an updated meta-analysis. *Ecological Economics*, *68*(5), 1535-1548.

The authors conduct a meta-analysis of 31 estimates of public willingness-to-pay for threatened and endangered species from academic studies published from 1984-2001. Updated from Loomis and White (1996), the study reviews four previous estimates for Pacific Salmon (Olsen et al, 1991; Loomis, 1996; Layton et al, 2001; Bell et al, 2003) and one for Atlantic salmon (Stevens et al, 1991). Average error of the willingness-to-pay model compared with individual study estimates ranges from 34-45%. Willingness-to-pay increases with changes in population size (1), payment frequency (2), dichotomous choice survey formats (3), respondents who are visitors rather than residents (4), more recent study years (5), mammals compared to other species types (6), “charismatic” species (7), phone and in person surveys compared to mail survey

modes (8), and lower response rates (9). An indicator of survey quality, higher response rates tend to be associated with lower WTP estimates. LBP is the only study to use a variation of traditional contingent valuation methods, which the authors refer to as conjoint technique. The authors point out that this technique tends to generate higher WTP estimates (Stevens et al, 2001) and "drives a lot of the difference between new and old studies" (2009, p.1542). The annual economic value of salmon/ steelhead ranges from $11 to $158 (average $92) per household in $2012. The authors prefer a double log specification that includes a variable for study year (model 3, p.1545). Using this model, a 1 year increase is associated with an 8% increase in economic value.

Other Benefit-Transfer Studies

Goodstein, Eban, and Laura Matson. "Climate change in the Pacific Northwest: Valuing snowpack loss for agriculture and salmon." *Frontiers in Ecological Economic Theory and Application*. Northampton, MA: Edward Elgar (2007).

The authors review previous estimates of the non-use values associated with anadromous salmon and report a range in annual, per household willingness-to-pay from $33 - $144. They then estimate the total willingness-to-pay for Oregon and Washington residents to avoid a one-third decrease in the size future salmon populations as $398 million. They interpret this amount as the required compensation for the public to be "made whole." As a basis for the estimate, the authors use a modified version of the valuation model presented in Layton, Brown and Plummer (1999).

Helvoight T. and Charlton, D. 2009. The Economic Value of Rogue River Salmon. ECONorthwest. Accessed online 6 December 2013 from http://www.americanrivers.org/assets/pdfs/wild-and-scenic-rivers/RogueSalmonFinalReport0130090e8f.pdf

In a report commissioned by the Save the Wild Rogue Campaign, ECONorthwest analyzed the economic value of salmon and steelhead in Oregon's Wild & Scenic Rogue River. Citing Goodstein and Matson (2007), the authors argue that Washington and Oregon residents are typically willing to pay $30 - $130 per year for salmon recovery programs. Using fish count data from the Oregon Department of Fish and Wildlife and estimates from academic studies, the authors then estimate a range of values associated with salmon use. The per fish economic value of commercial caught salmon ranges from $13 - $68 with sport – caught values ranging up to $900 per fish (Meyer Resources, 1986). To estimate non-use values associated with Rogue River salmon, the authors apply a marginal willingness-to-pay function from Loomis (1999). They

calculate the total annual non – use willingness to pay for the Rogue River salmon fishery at $1.5 billion, or $32.67 per person per year. The authors assume a salmon population size of 830,000 based on escapement numbers.

Niemi, C.L., E. G., Buckley, M., Neculae, C., & Reich, S. (2009). An Overview of Potential Economic Costs to Washington of a Business-As-Usual Approach to Climate Change.

The authors provide an overview of potential costs that climate change may impose on Washington State residents under a status quo management scenario. With a total projected cost to Washington State residents of $530 million per year in 2020 and growing to $3 billion per year in 2080, decreases in future salmon populations are one of the three largest climate-related costs out of 18 cost categories considered (the other two, estimated for 2020, are $1.3 billion in annual health-related costs and $220 million in energy costs). The authors use the model presented by Layton, Brown and Plummer (1999) as the basis for salmon-related costs, though they assume that the status quo would result in a 22% reduction in the size of salmon runs by 2090.

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Appendix 2: Restoration Metadata Needs for Assessing impacts of Water Plans under RCW 90.94

A. Implementation tracking information

The Streamflow Restoration Act, RCW 90.94, calls for plans to be developed to evaluate the impacts and responses to consumptive water use, and in particular the in-stream impacts of ground water withdrawals. Those plans will include four key functionalities that follow directly from the Act and the interim guidance. When assembled, these four functions form a workflow that addresses the following questions:

1. What are the specific plans for consumptive withdrawals of water (projected new wells in context of existing withdrawals)?
2. What are the forecasted environmental outcomes of the water use described in part 1?
3. What are the planned mitigation/restoration actions anticipated to produce environmental benefits in response to the environmental outcomes identified in part 2?
4. Do the net environmental benefits in part 3 outweigh the outcomes in part 2, or result in a positive NEB?

As a consequence, RCW 90.94 requests planners to draw ***inferences*** regarding the environmental impacts (in the form of forecasts in parts 2 & 4 above) of water withdrawals and management actions in response (parts 1 & 3). Here we describe the types of ***information*** concerning the actions taken that are needed to draw those inferences (see below for rationale). Those information needs, and their technical specification, are relevant to both the forecasting of impacts and the possible monitoring of action effectiveness. Critically, ***information*** in this context is distinct from ***data***; in any given case, different kinds of data (e.g. latitude/ longitude) could convey the same information need (*where is it?*). This distinction also highlights that the need for information follows from the inferences defined in RCW 90.94, but they are not specified by RCW 90.94 itself.

Regardless of the origin of the information need, this document describes the kinds of relevant metadata for actions proposed or undertaken as part of RCW 90.94 planning or assessment, but it does not provide a specific prescription for minimum requirements regarding planning and monitoring data systems. Recognizing that new calls for data and reporting are often perceived as onerous and demanding, where they exist we

provide pointers to existing data systems across the region that can deliver those informational needs, and we provide an example data dictionary in the Appendix below that could be used to address these information needs. However, this document avoids specifying a single data system that constitutes a minimum requirement under RCW 90.94.

B. Common information needs consistent with RCW 90.94

There are common information needs for management actions regardless of whether one is planning future actions, or assessing existing actions. The needs derive from the questions being asked and the assessment techniques deployed, and amount to specific information on the ***who***, ***what kind***, ***how much***, ***where*** and ***when*** of the restoration or mitigation that has occurred or is planned for the near term. The specific technical questions raised in any water management plan will be implementation and location specific. However, there are several overarching classes of questions that are likely to be encountered (Katz et al., 2007):

Q1. How does a single restoration action alter environmental resources?
Q2. How does a diverse set of restoration actions implemented within some spatial domain, such as a watershed or subbasin alter environmental resources?
Q3. How does a given class of similar restoration projects alter environmental resources?

In each case, “alter environmental resources” is contextual and must be defined in a manner relevant to the project and the study (and for the purposes of RCW 90.94 is considered elsewhere). In one case, it might refer to alterations in habitat quantity, while in another it could refer to responses seen in a population of salmon that are impacted by a change in some habitat character. For example, to address question Q2, we would need to know about all restoration projects in a particular basin, including their type, extent and abundance. We also appreciate that actions take time to implement, and their immediate impacts on things like salmon may take several years to be realized due to the complex life cycle of those fish. Thus, we would also need to know projects’ planning and implementation dates. In addition, we would also need to connect this information to a functional model that links the impacts of actions to changes in habitat, and perhaps in turn to changes in the net productivity of fish. Information about the distribution of restoration projects and productivity in adjacent basins would provide contrast and thereby separate the impact of those restoration actions from some other large-scale driver of the system such as climate variability. More explicitly, the *who*, *what when*, *where* and *how much* information should include:

- Spatially explicit data on project location (i.e. the work-site), not the location of the project contract (which has been common for project metadata in the past—see Katz et al., 2007). If the planned actions are to be connected to a model of environmental response and ultimately fish response, project data will need to be linked to spatially explicit environmental data. To identify the relevant habitat data to analyze these projects in a particular reach or stream unit, such as stream gradient, vegetation cover type and so on, the geographic coordinates for the restoration project are needed. There are a number of potential data types to express this information including latitude and longitude or LLID (latitude-longitude identification; https://www.oregon.gov/deq/Data-and-Reports/Pages/default.aspx) and stream mile. However, while larger scale spatial data, such as HUC or County, can be easily generated given a latitude and longitude, the converse is not true – given only a County, one cannot translate that into specific locations for the purposes of supporting these assessments. Fortunately, any spatially explicit coordinate system (e.g. latitude and longitude in decimal degrees or LLID and Stream km), the others can be generated in an automated data system. This recommendation is consistent with the Best Practices for Reporting Location and Time Related Data developed by the Northwest Environmental Data-network (NED 2006).

- Project level data on all implementations—not just projects undertaken as part of RCW 90.94. Characterizing the net impact of diverse restoration actions, and clearly identifying areas that are unimpacted by adjacent restoration actions, require knowledge of all restoration actions in the watershed or relevant spatial domain. In the former case one needs to accurately model or forecast the net magnitude of the treatments, while in the latter, one needs to identify the presence of potentially confounding treatments. Therefore, both the design and analysis of net restoration or mitigation require information about RCW 90.94-specific as well as all the other existing projects, regardless of funding source (e.g., SRFB, CBFWA, TNC). Fortunately, there are publicly-available data systems that provide information on pre-existing and non-RCW 90.94 projects (e.g. the Pacific Coast Salmon Recovery Fund (PCSRF), the Pacific Northwest Salmon Habitat Project Tracking Database (PNSHPTD)), so planners have resources to address this need at hand.

- Measures of magnitude or extent of treatment for each action proposed or implemented. These measures of treatment magnitude are useful in several contexts.
    - To identify the net management effect from a diversity of individual project effects, the level of treatment is critical. One would not compare the effect of 10 fencing projects that excluded cattle from 5 miles of stream

length each, with 10 projects that excluded cattle from ¼ mile of stream length each.

- Many forecasts of environmental effects for the purposes of satisfying RCW 90.94 will amount to comparisons of levels of treatment with levels of environmental response. This is illustrated in the figure below (Fig. A2-1), although the actual statistical comparison may be more sophisticated and complicated (e.g. multivariate and/or non-linear or saturating responses), on a conceptual level the comparison is straight forward. If projects are to be forecast as having a net ecological benefit, one expects to see more recovery (e.g. # of fish) with more treatment (e.g. # of culverts), although there may be reasons this relationship would have an upper or lower limit. Therefore, some measure of treatment extent needs to be incorporated into a water plans in response to RCW 90.94.

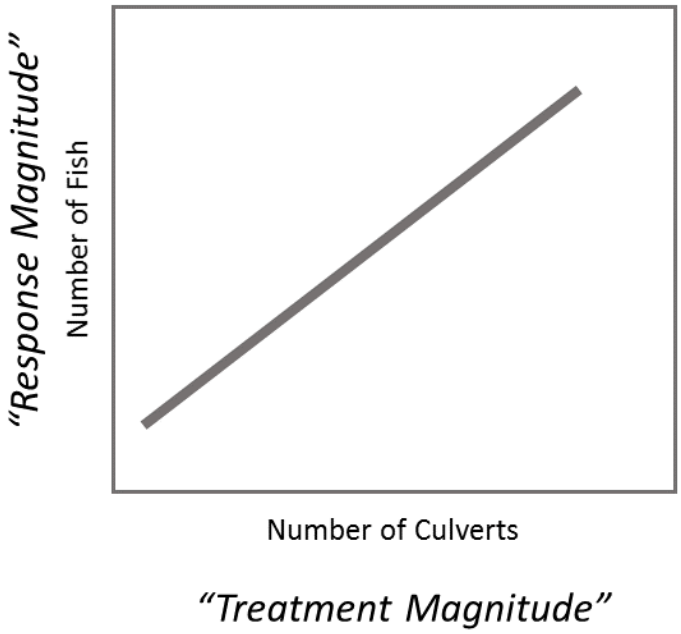

Figure A2-1 Conceptual application of project inventory to assessment of project impact. Conceptually forecasts will amount to estimates of response for a given amount of treatment. Given the lack of simple systems with single restoration types, the actual statistical analysis will require more sophistication.

- Prioritizing project placement – Planning and prioritizing restoration has often occurred at local levels (Beechie et al., 2008). If prior effectiveness monitoring and evaluation efforts are to inform the prioritization of new action implementation at any scale, then some measure of implemented treatments must be available to planners. Historically, project tracking and planning systems in the Pacific Northwest have not included explicit measures of project extent and this has been a significant impediment to regional coordination (Katz et al., 2007; Barnas and Katz, 2010), .

There is a diversity of specific metrics one could employ to express project extent. Indeed, different project types will have different metrics that are relevant to only those projects. For example, change in instream flow is unlikely to be useful to express the extent of a riparian fencing project. Thus, the relevance of a given metric may be case-specific. However, there are existing data management systems that capture and organize information in a manner that is portable across regional planning, funding and monitoring programs (e.g. the Pacific Coast Salmon Recovery Fund (PCSRF), the Pacific Northwest Habitat Restoration Project Tracking Database (PNSHPTD)), and would represent cost-effective data management to satisfy data needs for NEB planning and assessment under RCW 90.94. Appendix A & B are example data definitions from the PNSHPTD data system that is widely deployed across the states of Washington, Oregon and Idaho that provides an example of how these information needs have been interpreted in data structures and metrics. It is intended to be an example of how these data may be defined, but not presented as a requirement.

C. Specific information needs associated with RCW 90.94

There are different sets of management actions that could be undertaken in different parts of the above workflow. Part 1 of the workflow addresses a limited variety of water withdrawals, but the restoration/mitigation actions that are possible in response, and referenced in part 3, include a much larger diversity of mitigation possibilities in terms of type, location and coincidence in time with the consumptive use withdrawal. The actions specific to the context of RCW 90.94 are not covered under other regional guidance, and so are described here. In the interim guidance, these additional actions include:

1. Water right acquisitions (including period of use, instantaneous and annual volume as ac-ft/yr, and source location); and

2. Other projects that provide flow benefits such as:
   - Shallow aquifer recharge;
   - Floodplain restoration/levee removal;

- Floodplain reconnection;
- Switching the source of withdrawal from surface to ground, or other beneficial source of withdrawal change;
- Streamflow augmentation;
- Off-channel storage.

3. In addition, plans may recommend other actions that may or may not be eligible for funding under 90.94 to protect instream resources or offset potential impacts to instream flows such as:
   - Specific conservation requirements for new water users to be adopted by local or state permitting authorities;
   - Requesting rule-making to establish standards for water use quantities that are less than authorized RCW 90.44.050, or more or less than authorized under RCW 90.94;
   - Requesting rule-making to modify fees established under RCW 90.94;
   - Subbasin scale stormwater management strategies to protect or restore hydrologic processes.

This last set of new actions includes in part regulatory decisions (e.g. “conservation requirements”, “rule-making”, etc.) and are therefore outside the scope of this guidance. As such, they will not be covered here.

Current information tracking systems for habitat management actions do not cover all of these project types (e.g. PCSRF or PNSHPTD). Therefore, in meeting the information needs for these actions, some new information will be required. In Table 2 of the appendix below, there are definitions for project types and examples of metrics for water and non-water control projects identified in RCW 90.94 that could satisfy the information needs identified above for projects generally. These are offered as examples of data that, if collected, would be consistent with the conceptual information needs identified in RCW 90.94 and the interim guidance. Indeed, this is true for all of the metrics provided in the appendix; they do not represent a minimum requirement.

D. References

Barnas, Katie, and Stephen L. Katz. 2010. The challenges of tracking habitat restoration at various spatial scales. Fisheries 35(5): 232-241.

Beechie, T., Pess, G., Roni, P. and Giannico, G., 2008. Setting river restoration priorities: a review of approaches and a general protocol for identifying and prioritizing actions. North American Journal of Fisheries Management, 28(3), pp.891-905.

Katz, S.L., Barnas, K.A., Hicks, R., Cowen, J. and Jenkinson, R.. 2007. Freshwater habitat restoration actions in the Pacific Northwest: a decade's investment in habitat improvement. Restoration Ecology 15(3), pp.494-505.

Northwest Environmental Data-Network (NED) 2006. Best Practices for Data Dictionary Definitions and Usage. Ver. 1.1 2006-11-14. https://www.pnamp.org/document/3411.

E. Reportable Metrics

Part 1: Project-Level information Common to All Projects.

Information on the location, timing and contact is needed for all restoration/mitigation actions. Table A2.1 provides examples of project metadata and data definitions that would provide that information. This is one example mechanism to acquire that information in a manner that would be consistent with ESSB 6091 and the interim guidance.

Table	Definition	format (units) for proposed actions and field length	format (units) for completed actions
Project identification number	This is the number given to the project by the State or Tribe	text field	not applicable
Project Grantee	This the official Grantee (State or Tribal group)	Lookup Value	
Primary Subgrantee	The Tribe or State Agency that will assign the project work to be completed (i.e. NWIFC member tribe, CRITFC member tribe, KRITFWC member tribe, OR state agencies, WA state agencies)	Lookup Value	
Project name	This is the name given to the project by the State or Tribe	text field	not applicable
Project start date	The date that the project lead/subgrantee proposes to start the project.	mm/dd/yyyy	not applicable
Project end date	The date that the project's lead/subgrantee contract is completed	mm/dd/yyyy	mm/dd/yyyy
Project description	Short description of the project. The fish stock(s) and or ESUs targeted by the project should be identified as a part of this description.	Narrative, limited to 1000 char. Additional documentation can be attached (e.g. project plans).	Narrative, limited to 1000 char. Additional documentation can be attached (e.g. project plans).
Project Contact(s)	Contact person/people for the project.	Lookup List	
Everything below can be populated automatically once spatial location of worksite is provided.			
State	State that worksite is located in.	Lookup Value	
County	County that worksite is located in.	Lookup Value	
Latitude	The Latitude coordinate value for the worksite. Value should be reported as a positive number from	Number (0-180 Degrees and up to 8 Decimal Places)	
Longitude	The Longitude coordinate value for the worksite. Value should be reported as a negative number from 0 to -180 degrees with up to 8 decimal places.	Number (0-180 Degrees and up to 8 Decimal Places)	
Streamname	The name of the stream where the worksite is located. This name should be taken from the stream data layer provided by StreamNet, so that this name is consistent.	Varchar Text (60 Char.)	
LLID	The LLID of the stream where the worksite is located. An LLID is a stream number method used only in the Northwest region that is based on Latitude/Longitude coordinates of the stream confluences.	Number (25 Char.)	
Begin Ft.	This marks where on a stream network a worksite begins. Begin Ft is a distance measure on a stream network from the confluence.	Number	
End Ft.	This marks where on a stream network a worksite ends. End Ft is a distance measure on a stream network from the confluence.	Number	

Township	A public land surveying unit of 36 sections or 36 square miles. This displays the Township where the worksite is located.	Varchar Text (20 Char.)	
Range	A north-south strip of townships, each six miles square, numbered east and west from a specified meridian in a U.S. public land survey. This displays the Range within a Township that the worksite is located in.	Varchar Text (20 Char.)	
Section	A land unit equal to one square mile (2.59 square kilometers), 640 acres, or 1/36 of a Township. This displays the Section that the worksite is located in.	Varchar Text (20 Char.)	
3rd Field HUC	H.U.C. is an acronym for Hydrologic Unit Codes. Hydrologic unit codes are a way of identifying all of the drainage basins in the United States in a nested arrangement from largest (Regions) to smallest (Cataloging Units). A drainage basin is an area or region.	Lookup Value	
4th Field HUC	H.U.C. is an acronym for Hydrologic Unit Codes. Hydrologic unit codes are a way of identifying all of the drainage basins in the United States in a nested arrangement from largest (Regions) to smallest (Cataloging Units). A drainage basin is an area or region.	Number (25 Char.)	
5th Field HUC	H.U.C. is an acronym for Hydrologic Unit Codes. Hydrologic unit codes are a way of identifying all of the drainage basins in the United States in a nested arrangement from largest (Regions) to smallest (Cataloging Units). A drainage basin is an area or region.	Number (25 Char.)	
Targeted ESU (Evolutionary		Lookup Value	
Geographic area name	On land the Geographic Area Name is defined as the name of the 5th field Hydrologic Unit (HUC). For ocean/estuarine areas not covered by 5th field HUC's the Geographic Area is the name of the water body as shown on NOAA charts or the name of the statistical area. The NWFSC will provide web access to a set of NOAA nautical charts.	text field	not applicable
Geospatial reference/location	This is locational data for each treatment site where the project work is done. Report as a point, line or polygon for all treatment locations. Latitude and longitude from GPS is preferred.	Point, line or polygon. Latitude/ longitude from GPS is preferred. Beginning and end points of stream segment can also be provided if available.	Point, line or polygon. Latitude/ longitude from GPS is preferred. Beginning and end points of stream segment can also be provided if available.

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PART 2: Project-Level information Common to All Projects

In addition to information on the location, timing and contact for each action, information is needed on what kind of action is taken and how extensive it is. Table A2.2 provides example action metadata and data definitions for project type and extent metrics. In practice, those reporting the data would not report all of these metrics, but rather only those metrics that are specific to the project type undertaken – everything from the top of part 1 and one element from part 2. These metadata definitions are not provided to indicate a minimum standard, but rather to provide examples of what would be consistent with ESSB 6091 not only in terms of information needs as described above, but also in terms of the expectation in ESSB 6091 that where possible, actions undertaken as part of ESSB 6091 will be coordinated and consistent with other state and regional programs.

Table A2.2

Type	Type Definition	Subtype	Subtype Definition	Metric	Metric Definition
Water Projects (*Highest Priority from Funding Guidance*)					
Instream Flow	Projects that maintain and/or increase the flow of water to provide needed habitat conditions. These can include releases of water from dams or impoundments or water conservation projects to reduce stream diversions or extractions.	Water leased or purchased	Purchase of water rights. These water allocations are not withdrawn from the stream.	Annual volume as ac-ft/yr, cfs_a, cfs_i	Water volume proposed for lease or purchase and actually leased or purchased should be reported in (CFS to nearest 0.01 CFS), on both an annual and instantaneous basis.
		Irrigation practice improvement	Installation of a headgate with water gauge that controls water flow into irrigation canals and ditches. Regulates flow on previously unregulated diversions. Also the addition of other water sources (wells etc.) so that water from diversion is less needed or improvement in irrigation systems eg. Replacing open canals with pipes to reduce water loss to evaporation.	cfs_a, cfs_i	The flow of water returned to the stream (not including water that is maintained in the stream) (CFS to nearest 0.01 CFS), on both an annual and instantaneous basis
		Shallow aquifer recharge	Reclaimed water, stormwater collection projects directing water to shallow water aquifer via rock gallery, beaver relocation, beaver dam analogs or direct pumping located near a body of surface water in need of flow and temperature improvements.	cfs_a, cfs_i	The flow of water returned to the stream (not including water that is maintained in the stream). (CFS to nearest 0.01 CFS), on both an annual and instantaneous basis
		Switch to ground water withdrawal	Switching the source of withdrawal from surface to ground, or other beneficial source of withdrawal change	cfs_a, cfs_i	The flow of water returned to the stream (not including water that is maintained in the stream). (CFS to nearest 0.01 CFS), on both an annual and instantaneous basis
		Streamflow augmentation	Reclaimed water, stored water, reduction of surface diversions, or other means that are redirected with an ecologically relevant water quality (temperature & chemistry for affected species), back to a natural channel directly or via an infiltration gallery or shallow aquifer recharge.	cfs_a, cfs_i	The flow of water returned to the stream (not including water that is maintained in the stream). (CFS to nearest 0.01 CFS), on both an annual and instantaneous basis

		Off-channel storage	Off channel storage that diversts high flows from surface waters, either through gravity or pumping into off channel holdings. This project category also includes stormwater projects designed to slow and treat residential or urban runoff stored for later realease to surface waters.	cfsa, cfsi	The flow of water returned to the stream (not including water that is maintained in the stream). (CFS to nearest 0.01 CFS), on both an annual and instantaneous basis
Non-Water Projects (*Lower Priority from Funding Guidance*)					
Fish Screening	Projects that result in the installation or improvement of screening systems that prevent Salmonids from passing into areas that do not support salmonid survival, for example into irrigation diversion channels.	Fish Screen Installed	to an unscreened diversion to keep juveniles from being diverted.	#, cfs_a, cfs_i	A total count of screens proposed for installation and actually installed, recognizing that a project may install more than one screen, The flow rate at the screened diversion(s) from the water right. (CFS to nearest 0.01 CFS), on both an annual and instantaneous basis
		Fish Screen Replaced	Replacement, repair or improvement of an existing fish screen	#, cfs_a, cfs_i	A total count of screens proposed for installation and actually installed, recognizing that a project may install more than one screen, The flow rate at the screened diversion(s) from the water right. (CFS to nearest 0.01 CFS), on both an annual and instantaneous basis
Fish Passage	Projects that affect or provide fish migration up and down stream including road crossings (bridges or culverts), barriers (dams or log jams), fishways (ladders, chutes or pools), and weirs (log or rock). Barriers may be complete or partial.	Fish Ladder Improved	Improvement or upgrade of an existing fish ladder	#, target species	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Fish Ladder Installed	Installation of a fish ladder where there was not one previously	#, target species	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Fishways (chutes or pools) Installed	Placement of an engineered way around a barrier (usually a side channel/ or pool) or any by-pass that isn't specified as a fish ladder that is used by salmon migrating upstream; or a chute, used to ease salmon migrating downstream over a dam.	#, target species	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Barriers (dams or log jams)	Removal of a dam other than a push-up or diversion dam; or removal of a naturally formed log or debris jam that created a passage barrier	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Diversion Dam/ push up dam removal	Removal of a push-up dam (earthen dam), or removal of a diversion dam (permanent structure)	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Road Crossings in stream bed	Establishment of engineered passage associated with road placement that may include placement of a bridge.	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Culvert Improvements or	Improve, upgrade or replace an existing culvert	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.

		Culvert Installation	Add a passable culvert where none previously existed.	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Culvert Removal	Removal of culvert (often replaced by a non-blocking structure, bridge etc. or removed because the structure it was associated with was removed, a road etc.)	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
		Weirs (Incomplete dams)	Placement, modification or removal of an incomplete dam that is a passage barrier to fish	#	There may be more than one fish passage installation per project. Report a count of all blockages that are proposed for removal or improvement and those that are actually removed or improved as part of this project. Latin name of target species.
Instream Habitat	Projects that increase or improve the physical conditions within the stream environment (below the ordinary high water mark of the stream) to support an increased salmonid population.	Streambank Stabilization	The use of rock barbs, log barbs, revetments, gabions etc. to stabilize stream banks	length treated in miles	The number of miles of treatment. Add length treated on both sides when both sides are stabilized. Add one side when one side is treated. (miles to .01 miles)
		Channel Connectivity	Increasing channel connectivity between stream channels, wetlands, and/ or off-channel habitat and floodplain channels. May include increase of historic or new	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Channel reconfiguration	Changes in channel morphology, e.g. pools added/created, meanders added, former channel bed	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Deflectors/ barbs	Placement of triangular structures of rock or logs that extend into the stream to narrow and deepen the channel	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Log weirs	Placement of logs to collect and retain gravel for spawning habitat, to deepen existing resting/jumping pools, to create new pools above and/or below the structure, to trap sediment, aerate the water, or promote deposition of organic debris.	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Off channel habitat	Creation of off-channel habitat consisting of side-channels, backwater areas, alcoves or side-pools, off-channel pools, off- channel ponds, and oxbows.	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Plant Removal/ Control	The removal or control of aquatic non-native plants and noxious weeds growing in the stream channel.	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Rock Weirs	The placement of rocks to collect and retain gravel for spawning habitat, to deepen existing resting/jumping pools; and/or to create new pools, to trap sediment, aerate the water, and to promote deposition of organic debris.	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Spawning Gravel Placement	Addition of spawning gravel to the channel	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Large Woody Debris	Placement of individual logs in the stream that are not part of engineered structures or log jams or other large woody debris not specified as rootwads	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.

		Boulders	Addition of large rocks or boulders to a stream channel	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Rootwads	Placement of a stump with roots attached extending into the stream. Root wads are a type of large woody debris.	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Wood Structure/ Log Jam	Placement of Wood Structure/Log Jam with multiple logs fastened together to form increasing instream habitat	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.
		Beaver Introduction	The introduction or management of beavers to add natural stream complexity (beaver dams, ponds,	# of beavers introduced	# of beavers introduced to increase instream structure/ complexity
Instream-Wetland	Projects designed to protect, create or improve connected wetland areas (that meet the standard for federal delineation) that are known to support salmonid production. For example salmonid populations, especially juveniles, can benefit from access to connected wetland areas where conditions provide food supply, protection from high flows and protection from predators.	Wetland Creation	Creation of wetland area where it did not previously exist	area treated (acres)	Acres of artificial wetland proposed to be created and actually created from an area not formerly a wetland. (Acres to nearest whole acre)
		Wetland Improvement/ Enhancement	Improvements or enhancements to an existing wetland	area treated (acres)	Acres of wetland proposed for treatment and actually treated. (Acre to nearest whole acre)
		Wetland Restoration	Restoration of existing or historic wetland	area treated	Acres of wetland proposed for treatment and actually treated. (Acre to nearest whole acre)
		Wetland Vegetation Planting	Planting of native wetland species in wetland areas.	area treated	Acres of wetland proposed for treatment and actually treated. (Acre to nearest whole acre)
		Wetland Invasive/Noxious Weed Species Removal	Remove or control Non-native species and/or noxious weeds in wetland area	area treated (acres)	The acreage of invasive species proposed for treatment and actuall treated in the wetland project. The proposed project area may only be a portion of an existing wetland such as removing an area of purple loosestrife. (Acres)
Riparian	Projects that change areas (above the ordinary high water mark of the stream and within the flood plain of streams) in order to improve the environmental conditions necessary to sustain Salmonids throughout their life cycle.	Livestock Water Development	Provision of water supply for livestock that is out of the riparian zone. Also called livestock water development or livestock water supply.	# of installations	# of installations, may be more than 1 per project
		Water Gap Development	Provision of a fenced livestock stream crossing	# of installations	# of installations, may be more than 1 per project
		Fencing	Creation of livestock exclusion or other riparian fencing	length of fencing	This refers to meander miles of stream bank proposed for treatment and treated. Report the actual length of proposed treatment, adding lengths of treatment on both sides if treatment was on both sides. (miles to .01 miles)
		Forestry Practices/ Stand Management	Prescribed burnings, stand thinnings, stand conversions, silviculture, vegetation management	area treated (acres)	Total acres proposed and actually treated to nearest whole acre. Examples of treatment include riparian plantings, or protection of riparian zone with a fence.
		Planting	Riparian planting, native plant establishment	Species; area treated (acres	Species Planted (Latin name); Total riparian acres proposed and actually treated to nearest whole acre. Examples of treatment include riparian plantings, or protection of riparian zone with a fence
		Livestock Exclusion	Remove livestock from riparian areas	area treated (acres)	Total riparian acres proposed and actually treated to nearest whole acre. Examples of treatment include riparian plantings, or protection of riparian zone with a fence.
		Conservation Grazing Management	Alteration of agricultural land use practices to reducing grazing pressure for conservation. E.g. Rotate livestock grazing to minimize impact on riparian areas	area treated (acres)	Total riparian acres proposed and actually treated to nearest whole acre. Examples of treatment include riparian plantings, or protection of riparian zone with a fence.

		Weed Control	Removal and/or control of non-native species and noxious weed	Species; area treated (acres)	Invasive species (latin name); the total riparian acres proposed and actually treated to nearest whole acre. Examples of treatment include riparian plantings, or protection of riparian zone with a fence
Sediment Reduction	Projects the diminish sediment transport into streams	Road Reconstruction	Reconstruction and restoration of road in place (not a road relocation) and for a restoration purpose (e.g. road is crumbling into stream and needs to be reinforced). Road reconstruction does not include drainage improvement	miles	Proposed and actual treatments include road(s) decommissioned (closed, obliterated), upgraded, relocated or restored. (miles to .01 miles)
		Road Relocation	Abandonment of existing road in riparian or streambed area with or without rehabilitation and with a new road constructed in a less sensitive area.	Miles	Proposed and actual treatments include road(s) decommissioned (closed, obliterated), upgraded, relocated or restored. (miles to .01 miles)
		Road Stream Crossing Improvements (same as Rocked Ford)	Creation or improvement of a reinforced rock roadbed that crosses the stream without restricting the stream flow. Does not include stream crossing improvements that have a fish passage goal.	miles	Proposed and actual treatments include road(s) decommissioned (closed, obliterated), upgraded, relocated or restored. (miles to .01 miles)
		Road Drainage System Improvements	Placement of structures to contain/ control run-off from roads. Includes surface drainage, peak flow drainage improvements and roadside vegetation	miles	Proposed and actual treatments include road(s) decommissioned (closed, obliterated), upgraded, relocated or restored. (miles to .01 miles)
		Road Obliteration	Road closed with or without rehabilitation. Not a road relocation	miles	Proposed and actual treatments include road(s) decommissioned (closed, obliterated), upgraded, relocated or restored. (miles to .01 miles)
		Erosion Control Structures	Hillside stabilization, grassed waterways wind breaks, planting, conservation land management, and waterbars.	# of erosion structures	# of sediment control installations
		Sediment Control	Sediment basins, sediment ponds and sediment traps.	# of erosion structures	# of sediment control installations
Upland-Agriculture	Upland restoration activities relating to agricultural	Livestock Management	Any upland livestock management including livestock watering schedules and grazing management plans	acres	Total acres proposed for each treatment to nearest whole acre.
		Agriculture Management Best Management Practices	Implementation of best management practices eg low/ no till agriculture	acres	Total acres proposed for each treatment to nearest whole acre.
		Fencing	Placement of exclusion and non-exclusion fencing	miles	Total miles of fencing to nearest 0.01 mile
		Water Development	Irrigation and livestock water development including ditches, wells, ponds, springs etc.	type and #	Type of water development project (ditch, well, pond, etc.) and number of treatments.
Upland- Vegetation	Upland restoration activities relating to vegetation, includes forestry	Planting	Upland plant installation, seeding, and revegetation	area treated	Total acres for each treatment to nearest whole acre.
		Invasive Plant Control	Removal and control of non-native plants and noxious weeds	area treated	Total acres for each treatment to nearest whole acre.
		Vegetation/ Stand Management	Prescribed burns, stand thinning, stand conversion, silviculture, vegetation management, selective thinning, hazard reduction	area treated (acres)	Total acres for each treatment to nearest whole acre.
		Slope Stabilization	Implementation of slope stabilization methods including landslide reparation and terracing.	area treated	Total acres for each treatment to nearest whole acre.
Upland Wetland	Projects designed to protect, create or improve connected wetland areas (that meet the standard for federal delineation)	Wetland Creation	Wetland area created where it did not previously exist	area treated	Acres of artificial wetland created from an area not formerly a wetland. (Acres to nearest whole acre)
		Wetland Improvement/ Enhancement	Changes to an existing wetland	area treated	Acres of wetland actually treated. (Acres to nearest whole acre)

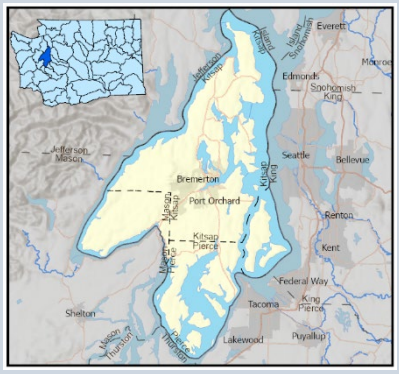
		Wetland Restoration	Restoration of existing or historic wetland	area treated	Acres of wetland actually treated. (Acres to nearest whole acre)
		Wetland Vegetation Planting	The planting of native wetland species in wetland areas.	area treated	Acres of wetland actually treated. (Acres to nearest whole acre)
		Wetland Invasive Species Removal	Removal and/or control of non-native species and/or noxious weeds in a wetland area.	area treated (acres)	The acreage of invasive species actually treated in the wetland project. The proposed project area may only be a portion of an existing wetland such as removing an area of purple loosestrife. (Acres to nearest whole acre)
Water Quality Improvement	Projects that result in an improvement of water quality conditions for example through improved water quality treatment, capture toxic highway runoff, reduction in the use of herbicides, pesticides and fertilizers, and other point sources.	Return Flow Cooling	All projects with a goal of directly reducing or directly limiting increase in water temperature. Most are return flow cooling projects which generally consist of replacing old open return ditches with underground PVC pipe. The primary benefits are eliminate nutrient and thermal loading, by filtering flows underground where they cool before returning to the river.	water temp	Water temp before and after project completion (if at a point source then avg water temp before at after of point source emission) in degrees Celsius to nearest whole degree.
		Refuse Removal	Removal of garbage in the waterway	lbs of trash collected	Pounds of trash collected from stream and wetland areas to nearest 100 pounds.
		Sewage Clean-up	Clean up of sewage outfall, etc.	Toxin, area treated (acres)	Name of Toxic species, element or material Total acres, wet and/or dry for each cleaned up to nearest whole acre.
		Toxic Clean-up	Clean up/prevention of mine tailings, hebicide, pesticide, toxic sediments, etc.	Toxin, area treated (acres)	Name of Toxic species, element or material Total acres, wet and/or dry for each cleaned up to nearest whole acre.
Outmigrant Survival Improvement (Estuary)	Projects that result in improvement of or increase in the availability of estuarine habitat such as tidal channel restoration, floodplain connectivity, floodgate fish passage or diked land conversion. This habitat is important for salmonid out migration where juvenile Salmonids begin the transition from fresh to salt water environments and where predatory pressures are known to be high. Estuarine habitat is distinct from other wetland habitat in being tidally influenced.	Invasive Species Treated	Control or removal of invasive or exotic estuarine species e.g. Spartina alterniflora	Invasive species, area treated (acres)	Invasive species (latin name); Acres of estuary proposed for treatment and actually treated to nearest whole acre.
		Creation of new estuarine habitat	Creation of an estuarine area where one did not exist previously	area created (acres)	Acres of estuary proposed for treatment and actually treated to nearest whole acre.
		Restoration/Rehabilitation of estuarine habitat	Restoration of existing or historic estuarine habitat	area created (acres)	Acres of estuary proposed for treatment and actually treated to nearest whole acre.
		Removal of existing fill material	Removal of fill that isn't associated with a dike e.g. removal of tideflat fill.	area treated	Acres of estuary proposed for treatment and actually created to nearest whole acre.
		Channel Modification	Deepening or widening existing tidal channel	Type of modification length treate in miles	Type of channel modification and Length of channel modified in miles to nearest 0.01 miles)
		Dike Breaching/ Removal	Removal or breaching of a barrier constructed to contain tidal flooding. Breaching/ removal allows for natural flow/flood regime and potential for off-channel habitat usage.	#; length of treatment (miles)	Number of Dikes breached or removed, total aggregate length of dike reconfigured in miles to .01 miles.
		Tidegate Alteration/ Removal	Removal or changes to tidegate that allows water to flow freely when the tide goes out, but which prevents the water from flowing in the other direction. Changes are generally made to allow fish passage at low and high tide.	#	Number of tide gaits removed or altered
		Dike Reconfiguration	Modification of location or design of an embankment to confine or control water flow.	#, length of treatment (miles)	Number of reconfigurings, total aggregate length of dike reconfigured in miles to .01 miles.
Land Protected, Acquired, or	Projects that involve the acquisition or lease of land or riparian areas.	Streambank Protection	Protection of section of streambank from further degradation or development through purchase, lease, negotiated agreement, statute or other mechanism.	meander miles	This refers to meander miles (to nearest 0.01 mile) of stream bank proposed for protection and actually protected by acquisition, easement or lease. Count miles on both sides of stream if both sides are acquired. Count on one side if only one side is acquired.

Leased		Wetland or Estuarine Area Protection	Protection of wetland or estuarine area from further degradation or development through purchase, lease, negotiated agreement statute or other mechanism.	acres	The acreage reported should be the total acreage proposed for protection and actually protected regardless of whether all of the habitat is applicable to the desired goals for acquisition. (Acres to nearest whole acre)
Nutrient Enrichment	Projects to add marine derived nutrients back into the system	Fertilizer	Nutrients placed in stream to increase nutrient availability	Weight of fertilizer, area treated (acres)	Total of fertilizer delivered (pounds to nearest 100 pounds); Total acres of each treatment to nearest whole acre
		Carcass Analog	Fish meal bricks placed in the stream to increase nutrient availability	Weight of fertilizer, area treated (acres)	Total of fertilizer delivered (pounds to nearest 100 pounds); Total acres of each treatment to nearest whole acre.
		Carcass Placement	Dead salmon added to stream	area treated (acres), weight of carcasses	Total acres of each treatment to nearest whole acre, total weight of salmon carcasses placed in the stream
Project Maintenance	Projects that maintain the functionality of Salmonid Restoration Projects	Site Maintenance	Maintenance of the restoration project site eg.replanting trees that failed to survive	length treated in miles	This refers to meander miles of instream habitat treatments. Count actual stream length treated to nearest 0.01 miles.

WRIA 15 Kitsap Watershed Water Availability

Port Orchard; Photo by David Seibold, https://flic.kr/p/2hMtiXe

Overview



What is a watershed?

Washington is divided into 62 major watersheds or Water Resource Inventory Areas (WRIAs), which are areas that each capture precipitation and funnel rain and snowmelt through smaller subbasins into streams, tributaries, and rivers and typically drain to marine waters or the Columbia River.

Introduction to WRIA 15

The Kitsap Watershed or Water Resource Inventory Area (WRIA) 15 is situated in south central Puget Sound and comprises all of Kitsap County plus parts of Mason, Pierce, and King counties. It is bounded to the east by Puget Sound and to the west by Hood Canal.

The watershed includes the Union and Tahuya rivers, and numerous creek systems of various sizes that discharge directly to Puget Sound and Hood Canal.

How can I get water?

Depending on your proposal, you may have more than one option to acquire a reliable water supply:

- Connecting to an existing water system is usually the fastest and easiest option if your project is within the system's service area.
- Using a permit-exempt well if you meet the limits under state law.
- Purchasing an existing water right and transferring it to the new use.
- Applying for a new water right, which may need mitigation.

See the *Options for Acquiring Water* section for more information about water right permit options and when to meet with Ecology staff.

Washington Water Law

Waters of the state belong to the public and can't be owned by any one individual or group. Water right holders have the right to use water, from a set source, for a particular purpose, in a specific location.

The Department of Ecology is responsible for managing the water resources of the state, including issuing the right to use water as well as protecting the instream resources for the benefit of the public.

Washington water law is based on the "prior appropriation" system, often called "first in time, first in right." New water rights may not harm older water rights. Applications for water from the same source must be processed in the order they are received, although there are certain exceptions.

Applicable Laws and Regulations

- RCW 90.03: Washington Water Code
- RCW 90.44: Regulation of Public Groundwaters
- RCW 90.54: Water Resources Act of 1971
- RCW 90.94: Streamflow Restoration
- WAC 173-515: The Instream Flow Rule for WRIA 15

Water Availability Factors

Due to Washington's varied land uses, hydrology, and precipitation levels, water availability for new water right permits varies dramatically across the state. In the Kitsap Watershed, key factors affecting water availability include:

- Instream flow rule
- Existing water rights, including unquantified Tribal rights
- Seawater intrusion
- Precipitation

Refer to a map at the end of the document.

Instream flow rule

Instream flow rules are an element of water and river management that help maintain healthy ecosystems that support fish, communities, and economies. WRIA 15 has an instream flow rule, adopted to preserve the uses and values of individual rivers and streams.

The instream flow rule:

- Protects the rivers and a number of creeks from new permitted water rights by setting minimum flow levels, which are like water rights for the stream. Instream flows do not put water in the streams and do not affect existing (senior) water rights.
- Creates year-round or seasonal closures for some streams, protecting existing flows from new appropriations.

Note that groundwater wells nearly always impact nearby streams. RCW 90.94 allows new homes using permit-exempt groundwater to potentially impact instream flows and closures in this watershed.

Existing water rights

Water rights have been issued in the Kitsap Watershed for over 100 years, and as a result, most water in the watershed is already legally spoken for or "appropriated."

Tribal interests

The Port Madison Indian Reservation, home of the Suquamish People, and the Port Gamble S'klallam Reservation are located within WRIA 15. These tribes, and others, also hold federally reserved treaty rights to fish, hunt, and gather in the watershed. While unquantified, the tribes may claim the most senior water rights in the WRIA. Tribes are concerned about maintaining necessary flows and fish habitat. Water right applications and mitigation plans are routinely sent to the Tribes for review and comment.

Seawater intrusion

The movement of salt water into freshwater aquifers, known as seawater intrusion, is a concern for coastal areas of Puget Sound. Any applications for groundwater withdrawals (wells) located in the coastal areas are evaluated for the risk of seawater intrusion into existing fresh groundwater supplies.

Precipitation

Average precipitation ranges from about 20 inches per year at the northern tip of the peninsula to about 70 inches per year in the southernmost areas. Most of this precipitation arrives during the winter months when water demands are the lowest, and only a fraction becomes available for human and economic uses. During the summer, there is little rain, so low stream flows are dependent on groundwater inflow. This means that groundwater and surface water are least available when water demands are the highest.

Summary

Increasing demands for water over time, from ongoing population growth, agriculture, and other consumptive uses as well as associated land use practices, have resulted in lower streamflows and declining groundwater levels in some areas. These decreases have impacted important resources for fisheries and general stream health. The impacts of climate change in WRIA 15 are also yet to be fully realized. However, it is apparent that water availability is limited throughout the Kitsap Watershed.

Options for Acquiring Water

Permit-exempt options

State law, RCW 90.44.050, exempts the following groundwater uses from the water right permitting process:

- Single or group domestic uses, not exceeding 5,000 gallons per day (gpd), although in some areas, including WRIA 15, there are other restrictions (see *Domestic uses*, later in this section).
- Irrigation of up to a half-acre of non-commercial lawn or garden.
- Industrial purposes (such as water for a store, restaurant, or small industrial facility, or irrigation of a small commercial farm), not exceeding 5,000 gpd.
- Stockwater to provide drinking water for stock animals. Other stock-related purposes (such as washdown of a milking parlor or irrigation for growing hay for stock animals) may require a water right permit.

A project proposal is also limited to the use of one exemption for each type of use. For example, a housing subdivision cannot use a series of wells to exceed the 5,000 gpd limit or the half-acre of non-commercial lawn and garden. The entire subdivision, collectively, cannot exceed either limitation. There is no exemption from permitting for surface water diversions.

Domestic uses

If your project will rely on a well drilled before January 19, 2018, you are regulated solely under RCW 90.44.050, and the requirements under RCW 90.94 do not apply.

The following describes additional requirements set forth by RCW 90.94.030 for single and group domestic uses that will rely on a well drilled on or after January 19, 2018.

If you are building a new home that will rely on a new[1] permit-exempt well:

- Your *combined* indoor and outdoor domestic water use is limited to 950 gpd as a maximum annual average, not to exceed 5,000 gpd on any given day. For example, you could withdraw 3,000 gallons on one summer day, so long as you do not do so enough that your average exceeds 950 gpd in a year.
- Your outdoor personal lawn and garden remain limited to an area no greater than one-half acre. (Note that your outdoor water use for your lawn and garden is included in the 950 gpd annual average limit.)
- If there is a drought emergency declaration, water use can be restricted to 350 gpd for indoor uses only, with the exception of any water needed to maintain a fire control buffer.

If you are building more than one home reliant on a new permit-exempt well:

The withdrawal limit for each home is "per connection", meaning that for subdivisions, each home is limited to the 950 gpd maximum annual average limit and the 350 gpd indoor use only during a declared drought emergency. However, the entire subdivision is limited to the 5,000 gpd limit and ½-acre personal lawn and garden in total across all the homes in the subdivision.[2]

Table 1. Permit-exempt domestic use for an individual home or group use.

Criteria	Well drilled on or after Jan. 19, 2018	Well drilled before Jan. 19, 2018
Water limitation per day	5,000 gpd	5,000 gpd
Annual average daily use limit per home	950 gpd	-
Irrigation allowed per single or group use exemption	½ acre	½ acre
Read the fine print	RCW 90.94.030 RCW 90.44.050	RCW 90.44.050

*During a state drought declaration for the area, water use may be limited to 350 gpd.

[1] Drilled on or after January 19, 2018.

[2] Established under RCW 90.44.050.

Permit options

If your project cannot access water from an existing water purveyor and doesn't qualify for use of a permit-exempt well, you will need to:

- Apply for **and receive** a new water right, or
- Acquire an existing water right and apply for **and receive** a change or transfer for the new use, new point of withdrawal/diversion, and/or new place of use.

Ecology asks anyone who needs a water right (new, change, or transfer) to submit the pre-application consultation form and meet with us to review your water supply needs and project proposal. See the *Resources* section for links to forms and other information.

New water right

Attempting to acquire new water rights within areas regulated with either instream flows or closures will be a very difficult and expensive process. It requires hiring qualified professionals and submitting a comprehensive mitigation and monitoring plan. This does not guarantee approval of a water right. Mitigation can be any action or group of actions that address the impact of the water withdrawal or diversion on instream flows, closures, or other senior water rights.

Projects proposing non-consumptive uses of water may be approvable in both closed areas and areas with instream flow regulations.

Mitigation refers to measures taken to prevent any impact on streamflow during the period that water is not available, by either:

- Halting the diversion or withdrawal, or
- Replacing the water taken—in time and in-place.

A common form of mitigation is to retire an existing water right upstream from the new use.

Change or transfer an existing water right

It can be easier to buy an existing water right and change the place of use, the point of diversion or withdrawal, or the purpose or manner of use. Changing aspects of a water right can be challenging if the change creates a new or different impact on a stream. It is important that the water right be in good standing by regular use over its lifetime.

Processing options

The wait for your water right application to be processed can be years. To speed up the process, you can submit your new or change water right application through the Cost Reimbursement Program. For more information on this and other options, refer to Alternatives for Water Right Application Processing.

You can discuss all of your options for supplying water to your project at a pre-application consultation with Ecology. To schedule, submit the pre-application consultation form.

Resources

Contact Information

Ecology Northwest Regional Office
Mailing address: PO Box 330316, Shoreline, WA 98133-9716

Physical address: 15700 Dayton Ave N, Shoreline, WA

Phone: 206-594-0000

More Information

Visit our website for the most current information.

ecology.wa.gov/Water-Shorelines/Water-supply

Publications and forms are searchable in the online database.

ecology.wa.gov/publications

Forms

- Water Right Pre-Application Consultation form, Form ECY 070-440
  https://apps.ecology.wa.gov/publications/summarypages/ecy070440.html
- Application for a New Water Right, Form ECY 040-114
  https://apps.ecology.wa.gov/publications/summarypages/ecy040114.html
- Application to Change or Transfer a Water Right or Claim, Form ECY 040-197
  https://apps.ecology.wa.gov/publications/summarypages/ecy040197.html

Publications

- Cost Reimbursement Program, Publication 05-11-016
  https://apps.ecology.wa.gov/publications/SummaryPages/2211022.html
- Alternatives for Water Right Application Processing, Publication 11-11-067
  https://apps.ecology.wa.gov/publications/summarypages/1111067.html
- Focus on: The Groundwater Permit Exemption, Publication 19-11-090
  https://apps.ecology.wa.gov/publications/SummaryPages/1911090.html

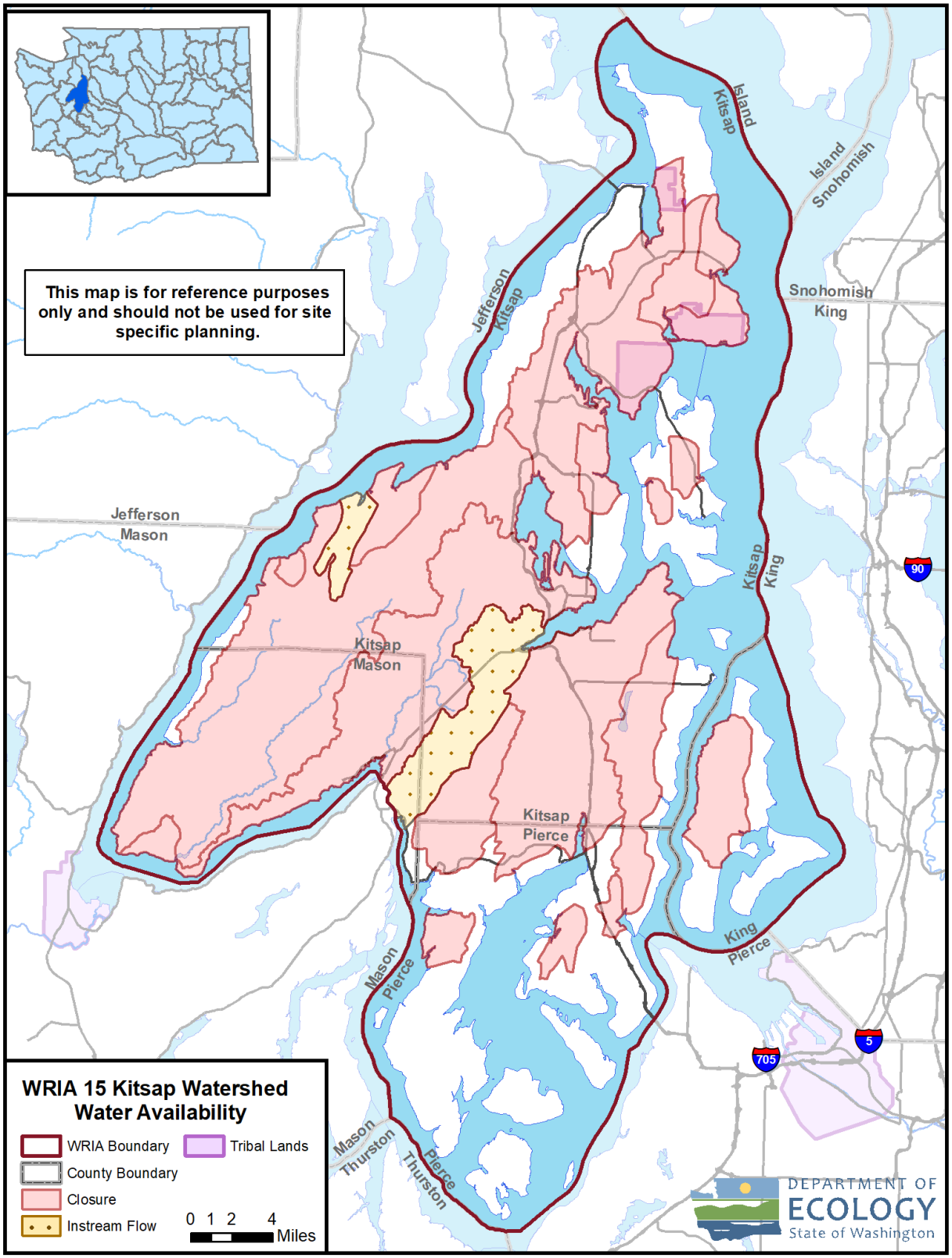
Website – ecology.wa.gov

- Visit the water rights permits page for more information and helpful links.
  https://ecology.wa.gov/WaterRightPermits
- Use the Water Rights Search to locate and research water rights on land parcels anywhere in the state.
  https://ecology.wa.gov/WaterRightsSearch

The Department of Ecology is committed to providing people with disabilities access to information and services by meeting or exceeding the requirements of the Americans with Disabilities Act (ADA), Section 504 and 508 of the Rehabilitation Act, and Washington State Policy #188.

To request an ADA accommodation, contact Ecology by phone at 360-407-6872, or visit https://ecology.wa.gov/accessibility. For Relay Service or TTY call 711 or 877-833-6341.

Map


This map is for reference purposes only and should not be used for site specific planning.
Island
Kitsap
Island
Snohomish
Jefferson
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Snohomish
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Jefferson
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Kitsap
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Mason
Pierce
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705
Mason
Thurston
Pierce
Thurston
WRIA 15 Kitsap Watershed Water Availability
WRIA Boundary
Tribal Lands
County Boundary
Closure
Instream Flow
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Miles
DEPARTMENT OF ECOLOGY
State of Washington

POL-2094

DEPARTMENT OF ECOLOGY WATER RESOURCES PROGRAM
POLICY AND INTERPRETIVE STATEMENT

STREAMFLOW RESTORATION POLICY AND INTERPRETIVE STATEMENT

Effective Date: 12/1/2022

Contact: Program Development and Operations Support

References: *Statute:* Chapters 18.104, 34.05, 90.03, 90.82, and 90.94 RCW; RCW 19.27.097, 43.83B.405, 89.08.460, and 90.44.050
Administrative Rule: Chapters 173-500, 173-531A, 173-563, and 173-566 WAC.

Purpose: To ensure consistency, conformity with state law, and transparency in the implementation of chapters 19.27 and 90.94 RCW.

Application: This policy applies to the evaluation of building permit applications under RCW 19.27.097 and the implementation of activities authorized under chapter 90.94 RCW.

This policy supersedes any previous policy statement with which it conflicts.

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1. Background

In January 2018, the Washington State Legislature passed Engrossed Substitute Senate Bill (ESSB) 6091 (session law 2018 c 1). This law was enacted in response to the State Supreme Court's 2016 decision in *Whatcom County vs. Hirst, Futurewise, et al*. (commonly referred to as the "Hirst decision")[1]. The law, now primarily codified in chapter 90.94 RCW, clarifies how local governments can issue building permits for homes intending to use a permit-exempt well for their domestic water supply. The law also requires that local watershed planning efforts take place in 15 WRIAs. Plans must be developed that identify projects to offset the potential consumptive impacts of new permit-exempt domestic groundwater withdrawals on instream flows over the next 20 years (2018-2038), and provide a net ecological benefit to the WRIA. Additionally, the law provides opportunities for Ecology to issue water right permits to authorize pilot projects related to the State Supreme Court's 2015 decision in *Foster vs. Ecology, City of Yelm, et al*. (commonly referred to as the "Foster decision")[2]. Such permits may be issued if impacts on streamflows can be mitigated based on criteria provided in the new law. This document provides policy statements as it relates to Ecology's interpretation and implementation of the law. This policy applies to the interpretation and implementation of RCW 19.27.097 and chapter 90.94 RCW.

[1] *Whatcom Cty. v. Hirst,* 186 Wn.2d 648, 381 P.3d 1 (2016).

[2] *Foster v. Dep't of Ecology*, 142 Wn.2d 465, 362 P.3d 959 (2015).

2. Acronyms

GPD – Gallons Per Day
LID – Low Impact Development
NEB – Net Ecological Benefit
RCW – Revised Code of Washington
SEPA – State Environmental Policy Act
WAC – Washington Administrative Code
WRIA – Water Resource Inventory Area[3]

3. Definitions

The following definitions apply in the context of this policy and the interpretation of chapter 90.94 RCW. Unless otherwise noted, Ecology does not apply these definitions to the interpretation of other statutes.

Home: A general term referring to any house, household, or other Equivalent Residential Unit.

Instream resources: Fish and related aquatic resources.

Net ecological benefit (NEB): The outcome that is anticipated to occur through implementation of projects and actions in a plan to yield offsets that exceed impacts within: a) the planning horizon; and, b) the relevant WRIA boundary.

Planning group: A general term that refers to either initiating governments, in consultation with the planning unit, preparing a watershed plan update required by RCW 90.94.020, or a watershed restoration and enhancement committee preparing a plan required by RCW 90.94.030[4].

Planning horizon: The 20-year period beginning on January 19, 2018 and ending on January 18, 2038, over which new consumptive water use by permit-exempt domestic withdrawals within a WRIA must be addressed.

Watershed plan: A general term that refers to either: a watershed plan update prepared by a WRIA's initiating governments, in collaboration with the WRIA's planning unit, per RCW 90.94.020; or a watershed restoration and enhancement plan prepared by a watershed restoration and enhancement committee, per RCW 90.94.030. This term does not refer to RCW 90.82.020(6).

[3] For the purposes of this policy, "water resource inventory area" refers to those areas described in chapter 173-500 WAC as of January 19, 2018.
[4] Planning group roles are described in RCW 90.94.020(4)(a) and RCW 90.94.030(3)(c).

4. Applicability

RCW 19.27.097 establishes requirements as to what constitutes evidence of an adequate water supply for an applicant to receive a building permit from a local government for a building necessitating potable water.

Per RCW 19.27.097(5), water wells constructed *before* the effective date of the law (January 19, 2018) can serve as proof of adequate water supply for a building permit except for the Skagit Basin and the Yakima Basin, as specified below.[5] These building permits are, therefore, not subject to requirements of chapter 90.94 RCW, regardless of whether water was put to beneficial use by operation of the well prior to January 19, 2018.

Geographic applicability is as follows:

- **In basins with instream flow rules that *do not* regulate permit-exempt groundwater withdrawals** (permit-exempt withdrawals), evidence must be consistent with the statutory requirements established in RCW 90.94.020 and 90.94.030, including requirements about a fee and water use restriction (RCW 19.27.097(1)(c)-(d)).
- **In basins with instream flow rules that *explicitly* regulate permit-exempt withdrawals**, evidence must be consistent with requirements set forth in the rule (RCW 19.27.097(1)(b)).
- **In the Yakima basin**, additional requirements may be required to satisfy adjudicated water rights (RCW 19.27.097(1)(e)).
- **In the Skagit basin**, additional requirements apply due to the *Swinomish* Supreme Court decision[6] (RCW 19.27.097(1)(f)).
- **In the rest of the state**, a well report showing physical availability, proof of potability, and demonstration of meeting other requirements imposed by local governments of water is sufficient proof of an adequate water supply (RCW 19.27.097(1)(g)).
    - **In WRIAs tributary to the Columbia River**, a building permit application is subject to the requirements in the law relating to the respective WRIA in which the proposed well is located. If the proposed well is in an area governed by the Columbia River Rules (chapters 173-531A and/or 173-563 WAC), then RCW 19.27.097(1)(g) is applicable.
    - **In WRIAs where existing instream flow rules only cover portions of the WRIA**, requirements under chapter 90.94 RCW only apply to the geographical areas directly covered by the existing rule.
- Local governments may impose additional requirements (RCW 19.27.097(2)).

[5] Local governments may impose additional requirements. Requirements, such as those to purchase mitigation, limit quantities, meter, and report water use may still exist if those provisions are included in an instream flow rule or if required by the local permitting jurisdiction.

[6] *Swinomish Indian Tribal Community v. Dept of Ecology,* 178 Wn.2d 571, 311 P.3d 6 (2013).

The requirements in RCW 90.94.020 and 90.94.030 only pertain to permit-exempt domestic withdrawals associated with a new building permit, and do not affect other uses exempt from permitting under RCW 90.44.050[7].

If an applicant for a building permit or subdivision provides technical evidence that demonstrates a new permit-exempt domestic withdrawal will not cause impairment to an adopted instream flow or closure, then the applicant is relieved of having to comply with the requirements in chapter 90.94 RCW.

5. Local Government Obligations

Under RCW 90.94.020 & 90.94.030, Ecology interprets local governments in the 15 affected WRIAs[8] to have the following obligations as of January 19, 2018[9]:

- Collect a $500 fee for each development permit authorizing a new permit-exempt domestic withdrawal regulated by chapter 90.94 RCW. The law does not specify whether local governments must collect the fee at the time of a subdivision or building permit application. Local governments are expected to annually remit $350 from each fee collected to Ecology. The $500 fee is in addition to existing well drilling fees required under chapter 18.104 RCW.

- Record withdrawal restrictions on the title of affected properties. Ecology recommends local governments use the following language: "Domestic water use at this property is subject to a water use limitation of a maximum annual average withdrawal of [three thousand *or* nine hundred and fifty *or* other amount specified by rule[10]] gallons per day, per connection, subject to the five thousand gallons per day limit in RCW 90.44.050."

For WRIAs listed in RCW 90.94.030:

- Where applicable, record withdrawal curtailment during drought emergencies on affected properties. Ecology recommends local governments use the following language: "If a Drought Emergency Order is issued pursuant to RCW 43.83B.405, domestic water use at this property may be curtailed to no more than three hundred and fifty gallons per day per connection [or other amount specified by rule], for indoor use only. Notwithstanding the drought restriction to indoor use, a fire control buffer may be maintained."

- Require applicants to manage stormwater runoff on-site to the extent practicable by maximizing infiltration, including using LID techniques, or pursuant to stormwater management requirements adopted by the local permitting authority, if locally adopted requirements are more stringent.

[7] See Section 6 for further details.
[8] WRIAs 1, 7-15, 22-23, 49, 55, and 59.
[9] These are the initial directions provided in RCW 90.94.20 and 90.94.030. RCW 90.94.20 and 90.94.030 further direct that these obligations may be changed thru rulemaking. Where rulemaking modifies these obligations, they should be appropriately interpreted with the respective modifications.
[10] Local governments should include the relevant volume, *i.e.* one of the amounts in the brackets.

6. Withdrawal Limits under RCW 90.94.020 and 90.94.030

RCW 90.44.050 establishes the following permit-exempt withdrawal limits:

- **Domestic** - 5,000 GPD limit
- **Non-commercial lawn or garden** – ½ acre limit (no GPD limit)
- Stockwater - no GPD limit
- Industrial - 5,000 GPD limit

The withdrawal limits under chapter 90.94 RCW further restrict the limits identified in RCW 90.44.050 for:

- **Domestic**
- **Non-commercial lawn or garden**

Collectively, the amounts for both of these are a maximum annual average of 950 or 3,000 GPD per connection[11]

Chapter 90.94 RCW includes restrictions for new permit-exempt domestic withdrawals for "domestic use" to a maximum annual average of up to 950 GPD per connection in basins planning under RCW 90.94.030, and a maximum annual average of up to 3,000 GPD per connection in basins planning under RCW 90.94.020[11].

- In the context of chapter 90.94 RCW, "domestic use" and the GPD withdrawal limits include both indoor and outdoor home uses, and watering of a lawn and noncommercial garden up to ½ acre in size.

- Water restrictions are based on a maximum annual average withdrawal. Ecology interprets this to mean that a home's withdrawals cannot exceed 950 or 3,000 GPD as the daily average over the entire year.

- Homes are still limited to a 5,000 GPD maximum limit for domestic use and ½ acre non-commercial lawn or garden, as set forth in RCW 90.44.050. As an example, under RCW 90.94.020 and RCW 90.94.030, a home could withdraw 4,000 gallons on a summer day, so long as the home did not do so often enough that their annual average exceeds the 950 or 3,000 GPD limit.

In RCW 90.94.030 during drought emergencies issued pursuant to RCW 43.83B.405, domestic withdrawals may be curtailed to no more than 350 GPD per connection, for indoor use only. Notwithstanding the drought restriction to indoor use, a fire control buffer may be maintained.

A rule adopted pursuant to chapter 90.94 RCW for a specific WRIA may change the withdrawal limit(s) in that WRIA, but those limits cannot exceed limits in RCW 90.44.050.

Ecology v. Campbell & Gwinn, LLC, et al (2002)[12] specifies that a development project, such as a residential subdivision, is considered to be supplied with water by a single withdrawal of groundwater. Well(s) supplying water for all the homes in the project are subject to the

[11] These are the initial volumetric limits provided in RCW 90.94.20 and 90.94.030. RCW 90.94.20 and 90.94.030 further direct that these limits may be changed thru rulemaking. Where rulemaking modifies these limits, they should be appropriately interpreted with the respective modifications.
[12] *Department of* ***Ecology v. Campbell & Gwinn****, LLC*, 146 Wash.2d 1, 9-10, 43 P.3d 4 (2002).

withdrawal limits under RCW 90.44.050 in aggregate. Though the withdrawal restrictions in chapter 90.94 RCW are specified as "per connection," the limits under *Campbell & Gwinn* also apply. Thus, while an individual home within a subdivision may withdraw a maximum annual average of 950 GPD or 3,000 GPD under chapter 90.94 RCW, the entire project is still restricted to no more than 5,000 GPD for all domestic use for all the homes in the project, and irrigation of no more than ½ acre of lawn or non-commercial garden, collectively, in the subdivision.

7. Planning under RCW 90.94.020 and 90.94.030

WRIAs planning under RCW 90.94.020

For WRIAs planning under RCW 90.94.020, Ecology will work with existing planning units and initiating governments formed under chapter 90.82 RCW, where those groups are still active. In a WRIA where a planning unit created under chapter 90.82 RCW is no longer active, Ecology will work with the respective WRIA's initiating governments to reestablish a planning unit that includes the range of representation identified under chapter 90.82 RCW, to the extent practicable. RCW 90.94.020 does not specify that Ecology is required to follow the process in RCW 90.82.060(6) to reestablish a planning unit for the purpose of implementing RCW 90.94.020. Per RCW 90.94.020(3), the lead agency shall invite a representative from each federally recognized Indian tribe that has a usual and accustomed harvest area within the WRIA to participate as a part of the planning unit.

Minimum watershed plan requirements

RCW 90.94.020 and 90.94.030 establish requirements for updating a watershed management plan or completing a watershed restoration and enhancement plan ("watershed plans"). Watershed plans must identify projects and actions necessary that *at a minimum*, offset the consumptive use of new groundwater permit-exempt domestic withdrawals over the planning horizon[13] and achieve NEB. Ecology has developed guidance for determining whether a watershed plan meets the NEB requirement[14].

A complete update of all the elements of the original watershed management plan is not required for WRIAs planning under RCW 90.94.020. The requirement to update an existing watershed management plan applies specifically to the objectives of the Streamflow Restoration legislation.

Projects and actions identified in watershed plans are not limited to those that can provide strict in-time, in-place offsets, though projects in the same sub-basin or tributary (within the same

[13] New consumptive water use in this document addresses new homes connected to permit-exempt domestic wells associated with building permits issued during the planning horizon. Generally, new homes will be associated with wells drilled during the planning horizon. However, new uses could occur where new homes are added to existing wells on group systems or shared wells operating under RCW 90.44.050. In this document the well use discussed refers to both these types of new well use. This does not affect withdrawals authorized under RCW 19.27.097(5).

[14] *Interim Guidance for Determining Net Ecological Benefit* (Draft Publication 18-11-009; June 2018) applies to planning groups with 2019 deadlines, or planning groups which planned in accordance with the Interim NEB Guidance due to the group's accelerated schedules with Ecology's prior agreement; *Final Guidance for Determining Net Ecological Benefit* (GUID 2094; Publication 19-11-079; July 2019) pertains to all other WRIAs identified in chapter 90.94 RCW. Where there is any apparent conflict between this Policy and the *Final Guidance for Determining Net Ecology Benefit*, this Policy shall be considered the controlling document.

WRIA), and during the same time that the use occurs are prioritized. Projects and actions in other sub-basins or tributaries, or projects that replace water only during critical times for fish, may also be recommended.

- Though the statute requires the offset of "consumptive impacts to instream flows associated with permit-exempt domestic water use" (RCW 90.94.020(4)(b)) and 90.94.030(3)(b)), watershed plans should address the *consumptive use* of new permit-exempt domestic withdrawals. Ecology recommends *consumptive use* as a surrogate for *consumptive impact* to eliminate the need for detailed hydrogeologic modeling, which is costly and unlikely feasible to complete within the limited planning timeframes provided in chapter 90.94 RCW.
- RCW 90.94.020 and 90.94.030 have various references to how watershed plans are to project, offset, or account for "water use." Ecology interprets these subsections of the law (RCW 90.94.020(4)(b), 90.94.020(4)(c), 90.94.030(3)(b), 90.94.030(3)(c), 90.94.030(3)(d), and 90.94.030(3)(e)) to relate to the consumptive water use of new permit-exempt domestic withdrawals that come online during the planning horizon.

SEPA review, in the form of a non-project SEPA analysis, is necessary prior to Ecology adopting a watershed plan. SEPA may be completed by Ecology or by a local government. In general, this allows for projects identified in adopted watershed plans to be implemented without further SEPA analysis. However, some individual projects or actions implemented under chapter 90.94 RCW may also need SEPA review, depending on how the project or action conforms under the criteria provided in RCW 89.08.460.

Acceptable projects and actions

Projects and actions identified in watershed plans should meet the intent of chapter 90.94 RCW for development of *new* projects and actions that benefit instream resources, offset the consumptive use of new permit-exempt domestic withdrawals projected during the planning horizon, and achieve NEB in the WRIA. In Ecology's evaluation of watershed plans, the agency considers:

- Projects or phases of a project with a signed funding contract or agreement *after* January 19, 2018 may count towards the required consumptive use offset and/or providing NEB.
- New regulations or amendments to existing regulations adopted *after* January 19, 2018, enacted to contribute to the restoration or enhancement of streamflows may count towards the required consumptive use offset and/or providing NEB.
- Projects and actions funded by Streamflow Restoration (chapter 90.94 RCW) funding may count towards the required consumptive use offset and/or providing NEB.
- Projects and actions funded by means other than Streamflow Restoration (chapter 90.94 RCW) funding may count towards the required consumptive use offset and/or providing NEB.

- Projects or actions completed *before* January 19, 2018 will *not* count towards the required consumptive use offset and/or providing NEB.

- Ecology will *not* consider mitigation required by existing environmental regulations such as critical area buffers, shoreline setbacks, stormwater/LID, floodplain management, forest practices, NPDES requirements, etc., as contributing towards the required consumptive use offset and/or NEB. Ecology understands that regulations required by other laws or programs would apply regardless of the passage of chapter 90.94 RCW. This is irrespective of whether or not a building or project had yet been constructed under the regulation.

All funding decisions for projects and actions applied for using Streamflow Restoration (chapter 90.94 RCW) funding will be made pursuant to chapter 173-566 WAC – Streamflow Restoration Funding Program.

Watershed plan approval, review, and adoption

For the purposes of chapter 90.94 RCW, Ecology defines watershed plan *approval* as an action taken on the local level (*i.e.* by the planning group) to document support for the WRIA's respective watershed plan. Watershed plan *review* is an action taken by Ecology to examine and evaluate an approved watershed plan. Watershed plan *adoption* is a formal action taken by Ecology after review, if the agency determines the watershed plan meets the requirements of RCW 90.94.020 or 90.94.030. These steps must occur sequentially, meaning that Ecology will not begin its review until the watershed plan is formally approved by the local planning group.

For watershed plan ***approval*:**

- In WRIAs planning under RCW 90.94.020, the planning group (the planning unit and initiating governments) must determine the watershed plan approval procedure. The approval procedure identified under RCW 90.82.130 is not specifically required under RCW 90.94.020, so planning groups can elect to follow different approval procedures, if preferred.

  RCW 90.94.020(4)(a) states, "In collaboration with the planning unit, the initiating governments must update the watershed plan…." This means that both the planning unit and initiating governments support the approval procedures for a watershed plan.

- In WRIAs planning under RCW 90.94.030, the planning group must follow the specific approval procedures outlined in that section of the law.

For watershed plan ***review***:

- Ecology will not edit or provide feedback on draft watershed plans in advance of approval by the planning group and submittal to Ecology. Ecology will base its review on what has been approved and submitted to Ecology.
- Ecology will not consider a draft watershed plan, or portions thereof, which were not approved by the planning group.
- For the WRIAs identified in RCW 90.94.020, Ecology will not review a watershed plan that has not been approved by the planning group.

For watershed plan ***adoption***:

- Ecology will not adopt a watershed plan contingent upon specific revisions to the watershed plan.
- Planning groups may include components which they believe help ensure that projects/actions will be completed successfully (*e.g.* conditions to allow for adjustment of the watershed plan in the future) as an "adaptive management" element. However, Ecology cannot adaptively change statutory-defined requirements, such as water quantities or the connection fee, at some future date if certain projects or actions are not completed. Such a change requires rulemaking. Ecology could not include such a "potential conditional rulemaking" for adaptive management as part of a watershed plan adoption.
- Ecology will review approved watershed plans submitted by planning groups that provide reasonable time for Ecology review prior to the relevant statutory deadline.[15]
- RCW 90.94.020 and 90.94.030 require that, prior to the adoption of a watershed plan, Ecology must determine that the projects and actions identified in the plan will result in a NEB within the WRIA.
- The NEB Guidance[16] notifies planning groups of the standards Ecology applies when reviewing an approved watershed plan.
- Watershed plans must, at a minimum, identify projects and actions intended to offset impacts. Planning groups may, at their discretion, opt to identify projects and actions in their plans that offset water use and anticipated effects beyond those associated with new consumptive permit-exempt domestic withdrawals initiated over the planning horizon. However, watershed plans are not required to include such projects and actions. Any work undertaken beyond the specific planning minimums increases the likelihood that

[15] Ecology's lead planner assigned to each planning group will coordinate with their respective planning group to establish this "reasonable time."

[16] *Interim Guidance for Determining Net Ecological Benefit* (Draft Publication 18-11-009; June 2018) applies to planning groups with 2019 deadlines, or planning groups which planned in accordance with the Interim NEB Guidance due to the group's accelerated schedules with Ecology's prior agreement; *Final Guidance for Determining Net Ecological Benefit* (GUID 2094; Publication 19-11-079; July 2019) pertains to all other WRIAs identified in chapter 90.94 RCW. Where there is any apparent conflict between this Policy and the *Final Guidance for Determining Net Ecology Benefit*, this Policy shall be considered the controlling document.

time and funds are spent on matters that will not necessarily yield a locally approvable or adoptable plan within the very tight timeframes of the law.

If Ecology does not adopt a watershed plan on or before the statutory deadline set forth in RCW 90.94.020 or 90.94.030, the agency must initiate rulemaking consistent with the provisions in the law (see Section 8).

As articulated in the *Final Guidance for Determining Net Ecological Benefit*[17], watershed plans are to be prepared with implementation in mind. However, RCW 90.94.020 and 90.94.030 do not create an obligation on any party to ensure that plans, or projects and actions in those plans or associated with rulemaking, are implemented. Further, the law does not predicate the issuance of building permits on the implementation of watershed plans or any projects and actions in those plans.

8. Rulemaking under RCW 90.94.020 and 90.94.030

RCW 90.94.020 and 90.94.030 establish that Ecology *must* adopt rules to incorporate watershed plan provisions under the following circumstances:

(a) If the adopted watershed plan recommends a change to the fee or the water use restriction prescribed in the law; or

(b) If the watershed plan is not adopted by Ecology by the statutory timeline.

Ecology *may* amend or adopt rules if it believes it necessary for another reason.

If Ecology adopts a watershed plan by the prescribed deadline, Ecology may commence a rulemaking process, depending on the contents of the adopted watershed plan.

- Ecology will generally avoid rulemaking if an adopted watershed plan does not include recommendations that require it.
- Ecology will begin rulemaking if an adopted watershed plan recommends changing the statutory withdrawal limits or fees. The rulemaking may be limited to the scope of what is recommended in the watershed plan. In general, Ecology will rely on adopted watershed plan recommendations supported by legal and scientific information when proposing the rule amendments. If additional information or analysis is developed during the public rulemaking process, Ecology will use that information, and may modify rule amendments, as appropriate.
- If planning groups include measures in the adopted plan that are outside the scope of chapter 90.94 RCW. Ecology will evaluate these recommendations during rulemaking. Ecology is not obligated to include such changes in a rule.

If a watershed plan has not been adopted by the prescribed deadline, Ecology is required to commence a rulemaking process under RCW 90.94.020 or 90.94.030.

[17] *Final Guidance for Determining Net Ecology Benefit* (GUID 2094; Publication 19-11-079; July 2019).

- Ecology will not write a watershed plan update for WRIAs identified in RCW 90.94.020. As required under the law, Ecology will initiate rulemaking and develop rule supporting documents that meet the intent and requirements of RCW 90.94.020. At a minimum, the rule supporting documents will include: a WRIA-wide estimate of consumptive use from new permit-exempt domestic withdrawals over the planning horizon; a list of projects and actions that Ecology is reasonably assured could be completed to offset the consumptive use; and a NEB determination.

- For the WRIAs identified in RCW 90.94.030, Ecology will follow the procedures specified in RCW 90.94.030(3)(h). Ecology will submit the final draft plan to the Salmon Recovery Funding Board for a technical review, and provide recommendations to amend the final draft plan, if necessary. Ecology shall consider the recommendations and may amend the final draft plan without committee approval prior to adoption.

9. Foster Pilot Projects

RCW 90.94.090(8) authorizes Ecology to issue permit decisions for up to five water resource mitigation pilot projects. Ecology expects the pilot projects to consist of applications for new water right permits and/or applications to change existing water rights. Ecology retains the authority and obligation to review each pilot project water right decision and approve or deny the application based on sufficiency of technical information and compliance with the law. Decisions on applications for Foster pilot project permits are appealable following the same procedure as for other water right permit decisions under the Administrative Procedures Act, chapter 34.05 RCW.

Under RCW 90.94.090, Ecology is not authorized to issue permits that will impair senior consumptive rights. Additionally, under chapter 90.03 RCW, Ecology is only authorized to issue permits for water rights that will be put to beneficial use.

Pursuant to RCW 90.94.090(8), Ecology must determine whether proposed withdrawals and diversions of water from pilot projects would impair adopted instream flows, or would otherwise impact closed surface waters. To do this, Ecology will assess whether the applicants have addressed impacts through the established mitigation sequence as described in RCW 90.94.090(8)(a)-(c) in assessing permit applications for the pilot projects. This process will be followed instead of applying the traditional test for impairment and availability of water subject to adopted instream flow water rights and closures.

The mitigation sequencing of RCW 90.94.090(8) should be followed in order. Applicants may only proceed along the sequence when the previous step was not "reasonably attainable."

Avoiding impacts, under RCW 90.94.090(8)(a), refers only to compliance with minimum flows adopted by rule or making the water use interruptible in favor of the rule. To show that avoidance is not "reasonably attainable," an applicant must explain why the water use cannot be subject to otherwise-applicable minimum flows.

Minimizing impacts, under RCW 90.94.090(8)(b), refers to mitigating the impacts to instream flows or closures by replacing the water supply.

- This can include acquiring existing trust water rights that are not already committed to mitigation, placing water rights into trust; or other types of replacement water supply.

- Mitigation rights that are not placed into trust should be secured with adequate legal provisions, such as permit conditions, to ensure that the water use is fully contingent on the supply of mitigation water.
- These measures must ensure both (1) no net annual increase in quantity of water diverted or withdrawn and (2) no net detrimental impacts to fish and related aquatic resources.

To show that minimizing impacts is not reasonably attainable, applicants should:

- Explain what efforts have been taken to identify replacement water rights; and
- Whether it would be technically feasible to mitigate with those rights.

If applicants attest that "water for water" mitigation is not reasonable because of cost, they should explain how the cost of potentially obtainable water was determined.

Compensation, under RCW 90.94.090(8)(c), should provide a NEB through replacement of water, habitat improvements, and/or other measures that improve instream functions and values. Under RCW 90.94.090(8)(c), Ecology will evaluate projects consistent with the published Final NEB Guidance (Final Guidance for Determining Net Ecological Benefit (GUID 2094; Publication 19-11-079; July 2019).

Ecology has sole discretion, and will use its best professional judgement, in assessing the technical merits of projected impacts of the proposed project and whether the mitigation sequence was properly followed. Ecology will document its findings in the draft Report of Examination, which must be posted for public review and comment, under RCW 90.03.290.

Ria Berns
Program Manager
Water Resources Program

Note: These policies and procedures are used to guide and ensure consistency among water resources program staff in the administration of laws and regulations. These policies and procedures are not formal administrative regulations that have been adopted through a rule-making process. In some cases, the policies may not reflect subsequent changes in statutory law or judicial findings, but they are indicative of the department's practices and interpretations of laws and regulations at the time they are adopted. If you have any questions regarding a policy or procedure, please contact the department.

WASHINGTON STATE RECREATION AND CONSERVATION OFFICE
Salmon Recovery Funding Board

Salmon Recovery Funding Board Decision Memo

Item 5

APPROVED BY RCO DIRECTOR MEGAN DUFFY

Meeting Date: December 13, 2023

Title: Watershed Plan Recommendation Report

Prepared By: Kat Moore, Senior Outdoor Grants Manager; Lauren Burnes, Special Assistant to the Director

Summary

This memo summarizes the technical review of the Watershed Restoration and Enhancement Plans for five watersheds.

Board Action Requested

This item will be a:

- ☒ Request for Decision
- ☐ Request for Direction
- ☐ Briefing

Introduction/Background

In January 2018, the Washington State Legislature passed the Streamflow Restoration law (Revised Code of Washington 90.94) to help support robust, healthy, and sustainable salmon populations while ensuring rural communities have access to water. Pursuant to that law, the Department of Ecology established watershed restoration and enhancement committees to develop and adopt plans in fifteen watersheds, or Water Resource Inventory Areas (WRIAs). The committees in WRIAs 7 (Snohomish), 8 (Cedar-Sammamish), 13 (Deschutes), 14 (Kennedy-Goldsborough), and 15 (Kitsap) developed watershed restoration and enhancement plans but did not unanimously approve the plans.

Under the law, if a committee fails to approve its plan unanimously, the Salmon Recovery Funding Board (board) is required to provide a technical review of the plan. The technical review should consider whether the actions in the plan, after accounting for new projected uses of water in the subsequent twenty years (2018–2038), will result in a net ecological benefit to instream resources in the WRIA. The board is to provide recommendations to the director of the Department of Ecology to consider. Ecology may amend the plan without committee approval before adoption. After plan adoption, the director of Ecology will initiate rulemaking for the plans.

To meet this requirement, in 2022 the Recreation and Conservation Office (RCO) convened a science panel of six regional experts to review the five unapproved plans. Panel members Hans Berge, Annika Fain, and Adam Hill reviewed plans for WRIA 7 (Snohomish) and WRIA 8 (Cedar-Sammamish). Panel members Bob Montgomery, Bill Norris, and Phil Roni reviewed plans for WRIA 13 (Deschutes), 14 (Kennedy-Goldsborough), and 15 (Kitsap). The panel was supported by RCO staff members Kat Moore, senior outdoor grants manager, and Lauren Burnes, special assistant to the director.

At the May 2023 board meeting, Hans Berge and Kat Moore presented the draft Watershed Restoration and Enhancement Plan Review Report. After the board meeting, staff and the review panel packaged the draft report and the panel's detailed comment matrix for comment. RCO posted the report and comments for stakeholder and Tribal review between July 27 and October 13, 2023. RCO received eleven comments, which are provided in Attachment B: Watershed Restoration and Enhancement Plan Tribal and Public Comments. After reviewing the comments, the panel revised the draft report in response to some of the comments received. The changes to the draft plan are summarized in Attachment B. RCO notified the commenting parties of the revised report, comment table, and of the December 2023 board meeting where the final report will be presented.

The full panel is providing this final report to the board summarizing its review and recommendations, including updates in response to comments received. The updated report is found in Attachment A: Watershed Restoration and Enhancement Plan Review Report. This report includes specific technical information that the board may recommend Ecology add to the final draft plans.

The review panel recommends revisions for each plan. The report identifies general recommendations for each WRIA and contains an appendix with detailed comments for each WRIA's plan. Overall, the panel concluded that across all five plans, the consumptive use estimates are technically sound and the methodology applied consistently. For water offsets, all plans identify projects that offset projected consumptive use impacts, though in particular WRIAs 13, 14, and 15 include offset projects that are too optimistic, and some projects should be removed or offset estimates revised. Given the surplus of estimated offsets, it still is likely there would be adequate offsets. However, the panel recommends that the quantities of the offsets for the remaining projects be summed up to ensure that they will offset projected consumptive use. Similarly, all plans identified actions that would provide a net ecological benefit. However, for WRIA 13, 14, and 15, the panel recommended that some projects be removed or revised, and that the benefit of the remaining projects be re-evaluated to ensure that net ecological benefit can still be achieved. The panel also

recommended that the plans include mechanisms for monitoring, assessment, accountability, and adaptation to ensure successful implementation of the plan.

Motions

Move to accept the Watershed Restoration and Enhancement Plan Review Report, Recreation and Conservation Office: Attachment A and submit the report to the director of the Department of Ecology.

Attachments

A. Watershed Restoration and Enhancement Plan Review Report
   Includes Appendix of Detailed Review Comment Tables for WRIA 7, 8, 13, 14 and 15
B. Watershed Restoration and Enhancement Plan Tribal and Public Comments
C. Tribal and Public Comment Letters

Watershed Restoration and Enhancement Plan Review Report

Executive Summary

The 2018 streamflow restoration law required planning groups in fifteen watersheds, or Water Resource Inventory Areas (WRIAs), to develop watershed plans that offset impacts from new domestic permit-exempt wells and identify actions that will provide a net ecological benefit. Only plans that were approved by all members of the local committees could be adopted. The Department of Ecology adopted plans in nine WRIAs and completed rulemaking in a tenth. Five plans were not approved including WRIA 7 (Snohomish), WRIA 8 (Cedar-Sammamish), WRIA 13 (Deschutes), WRIA 14 (Kennedy-Goldsborough), and WRIA 15 (Kitsap). Pursuant to the law, if a committee failed to approve its plan, the Salmon Recovery Funding Board must provide a technical review of the plan. To meet this requirement, the Recreation and Conservation Office convened a science panel to review the five plans and provide recommendations.

Consumptive Use

Watershed plans must include a new consumptive water use estimate for each subbasin and the technical basis for each estimate. Consumptive use is the estimated water consumption from permit-exempt domestic groundwater withdrawals during the next twenty years. The methods used to estimate consumptive use across the five watersheds reviewed varied. For WRIAs 7, 8, 13, and 15, data from their respective counties were used based upon patterns in development in basins with permit-exempt wells, although each county's method was different. In contrast, WRIA 14 relied upon data provided from the state Office of Financial Management. These estimates then were multiplied by an estimate provided by the Department of Ecology of the average consumption (acre-feet/well) of indoor and outdoor permit-exempt wells in the WRIAs. This resulted in an estimate of the total number of acre-feet of water consumed by permit-exempt wells in each WRIA from 2018-2038 (Table 1). In each of the five watersheds, the methods used to estimate consumptive use were technically sound.

Water Offsets

Once consumptive use was calculated, the five WRIAs identified projects to offset the impacts of permit-exempt wells on aquifers and streams. Each identified a large number of projects and asserted they would offset the consumptive use. Generally, the projects

selected appeared to be overly optimistic about the offset value. Particularly, some project types, such as water right purchases, roof runoff, and low-impact development, used assumptions that likely were overestimated. A more conservative estimate for these project types is warranted, particularly in WRIAs 13, 14, and 15. For WRIAs 7 and 8, it appeared that many of the projects had relatively low feasibility and the water offsets would occur outside the basins with high or moderate water consumption, resulting in negligible offset in the basins that will need it most.

Net Ecological Benefit

Once consumptive use was calculated and offsets accounted for, the plans needed to identify additional actions to benefit instream resources beyond those necessary to offset the consumptive water use. Each WRIA identified a large number of projects intended to provide ecological benefits. While the projects in general appear to be beneficial for aquatic resources, the certainty that the projects will be completed was lacking, and in many cases the ecological value is overstated. Without providing information on project status/stage, feasibility, funding source(s), technical reviews, previous prioritization decisions, landowner acknowledgment (private or public land), and identified project sponsors, it is difficult to assume that the project will be successfully implemented and ecological benefits will be occur as planned.

Conclusions

A great deal of work went into these plans. Each plan has important information that seeks to document consumption from exempt wells, offsets to mitigate consumption, and additional ecological benefits. While important progress has been made and many details provided, there are still key areas for improvement, which have been identified in the report below.

Introduction and Purpose

In January 2018, the Washington State Legislature passed the streamflow restoration law (Revised Code of Washington 90.94) to help support robust, healthy, and sustainable salmon populations while ensuring rural communities have access to water. The law directs the Department of Ecology to develop watershed restoration and enhancement plans for fifteen WRIAs that identify projects to offset potential consumptive impacts of new permit-exempt domestic groundwater withdrawals on instream flows over twenty years (2018–2038) and which provide a net ecological benefit to the watershed. Following the provisions of the law, Ecology collaborated with a committee composed of cities, counties, special interest groups, state agencies, and tribes in each WRIA to prepare a draft plan. The law requires all committee members to approve the plan

before Ecology considers plan adoption. Ecology adopted nine plans and completed rulemaking for a tenth.

Five watershed plans were not approved unanimously by their committees including watershed plans for WRIA 7 (Snohomish), WRIA 8 (Cedar-Sammamish), WRIA 13 (Deschutes), WRIA 14 (Kennedy-Goldsborough), and WRIA 15 (Kitsap). For these unapproved plans, the streamflow restoration law requires Ecology to submit the draft plan for each WRIA to the Salmon Recovery Funding Board (SRFB) in the Recreation and Conservation Office for technical review. The SRFB review is designed to provide recommendations to Ecology about whether to amend the draft plan to ensure that actions identified in the plan, after accounting for new projected uses of water during the subsequent twenty years, will result in a net ecological benefit to in-stream resources in the WRIA. The law further states that the director of Ecology must consider the recommendations, may amend the plan before adoption, and must initiate rulemaking for the plan after adoption.

To meet this requirement, a science panel of six regional experts reviewed the five final draft plans provided by Ecology. Panel members Hans Berge, Annika Fain, and Adam Hill reviewed plans for WRIA 7 (Snohomish) and WRIA 8 (Cedar-Sammamish); panel members Bob Montgomery, Bill Norris, and Phil Roni reviewed plans for WRIA 13 (Deschutes), WRIA 14 (Kennedy-Goldsborough), and WRIA 15 (Kitsap). The panel was supported by RCO staff members Kat Moore, senior outdoor grants manager, and Lauren Burnes, special assistant to the director. The full panel is providing this report to the SRFB to summarize its review and recommendations. In addition to the summary report, the panel has provided detailed comments on the plans in Appendix A: Detailed Review Comment Tables for WRIA 7, 8, 13, 14, and 15. The panel's review is limited to the technical aspects of the watershed plans, including:

- **Consumptive Use**: *Estimated water consumption from permit-exempt domestic groundwater withdrawals in the next twenty years.* Are the projections technically sound? Was the methodology applied consistently?

- **Water Offsets:** *Actions that put water back into aquifers and streams that offset new consumptive water use*. Will the planned projects and actions (if implemented), at a minimum, offset the total projected impacts to in-stream flows from new consumptive water use in all the subbasins in the WRIA?

- **Net Ecological Benefit**: *Actions in the plan provide additional benefits to aquifers and streams beyond the minimum to offset projected consumptive use*. Does the plan identify projects and actions that provide additional benefits to in-stream resources beyond

those necessary to minimally offset the impacts from new consumptive water use in the WRIA?

- **Table 1. Summary Information from Plans**

	Snohomish WRIA 7	Cedar-Sammamish WRIA 8	Deschutes WRIA 13	Kennedy-Goldsborough WRIA 14	Kitsap WRIA 15
Area (square miles)	1,856	692	270	381	676
County	King, Snohomish	King, Snohomish	Lewis, Thurston	Mason, Thurston	King, Kitsap, Pierce, Mason
Major Streams	Skykomish, Snohomish, Snoqualmie Rivers	Cedar and Sammamish Rivers; Bear, Coal, Evans, Issaquah, Little Bear, May, North, and Swamp Creeks	Deschutes River and Percival, Woodard, and Woodland, Creeks	Alderbrook, Cranberry, Deer, Goldsborough, Kennedy, Johns, Mill, Perry, Sherwood, Shumocher, and Skookum Creeks	Dewatto, Tahuya, and Union Rivers, and numerous smaller streams
Subbasins	16	12	13	8	7
Permit-Exempt Wells	3,389	967	2,616	4,294	5,215
Acre-Feet Per Year (use)	797	425	434	760	718
Offset Acre-Feet Per Year	1,444	1,805	1,801	1,725	2,873
Net Acre-Feet Per Year (surplus)	647	1,380	1,367	965	2,155
Water Offset Projects	11	10	9	8	15
Habitat Projects	26	23	19	25	31
Consumptive Water Use Method	Appendix A of *Final Guidance for Determining Net Ecological Benefit* (Ecology, 2019)				
Indoor Consumptive Uses	Appendix A (Ecology, 2019)				
Outdoor Consumptive Uses	393 randomly selected parcels from recent building permits	153 randomly selected parcels from recent building permits	80 randomly selected parcels	80 randomly selected parcels	80 randomly selected parcels
Members voting to approve/not support	21/1 (Snoqualmie Indian Tribe)	15/1 (Snoqualmie Indian Tribe)	11/1 (Building Industry Association of Washington)	7/4 (BIAW, Department of Fish and Wildlife, Skokomish Indian Tribe, Squaxin Island Tribe)	12/6 (City of Gig Harbor Department of Fish and Wildlife, Port Gamble S'Klallam Tribe, Skokomish Indian Tribe, Squaxin Island

	Snohomish WRIA 7	Cedar-Sammamish WRIA 8	Deschutes WRIA 13	Kennedy-Goldsborough WRIA 14	Kitsap WRIA 15
					Tribe, Suquamish Tribe)

WRIA 7

Introduction to the Watershed Plan

The Snohomish watershed, WRIA 7, is about 1,856 square miles and includes all the lands drained by the Skykomish, Snohomish, and Snoqualmie Rivers. It is divided into sixteen subbasins. The watershed is split about equally between King and Snohomish Counties. The WRIA includes the Snohomish River and its two main tributaries, the Skykomish and Snoqualmie Rivers. The watershed also contains the Tolt Reservoir and Spada Lake, which supply water to Seattle and Everett, respectively.

The WRIA watershed plan projects 3,389 new permit-exempt domestic well connections in the next twenty years, using 797 acre-feet per year or 1.1 cubic-feet per second. The watershed plan identifies eleven water offset projects that would provide an anticipated 1,444 acre-feet per year to benefit streamflows and enhance the watershed. The total offset yields a surplus offset of 647 acre-feet per year above the 797 acre-feet per year consumptive use estimate. The watershed plan identifies twenty-six habitat projects that could provide benefits to fish and other wildlife habitat through floodplain restoration, wetland reconnection, increased channel complexity, reduction of peak flow during storms, and increased groundwater levels and baseflow.

Technical Summary and Review Comments

Consumptive Use

Total offset is determined on an annual basis. King County consumptive use was based on 2000 to 2017 and Snohomish County was based on 2008 to 2018. The total consumptive use for the predicted 3,389 new wells is 797 acre-feet per year. Estimated consumptive use is shown in Table 2.

Table 2. Estimated Consumptive Use for WRIA 7

Wells and Consumptive Use	Quantity
Projected number of permit-exempt wells in twenty-year planning horizon	3,389
Indoor consumptive use, acre-feet per year/per well (average)	0.0184
Outdoor consumptive use, acre-feet per year/per well (average)	0.22
Total estimated consumptive use from 2018-2038, acre-feet per year	797

Note: average indoor consumptive use in the plan is listed as 0.00184 (page 48), rather than 0.0184

The method used to project the number of new permit-exempt wells and consumptive use estimates in WRIA 7 is based on recommendations from Appendix A of Ecology's *Final Guidance for Determining Net Ecological Benefit*. The method to calculate consumptive use assumes 90 percent of the indoor water use returns to groundwater via septic tanks and is not counted as consumptive use. About 20 percent of the outdoor water use returns to groundwater or surface water and also is not counted as consumptive use.

A Geographic Information System analysis was used on 393 randomly selected parcels with recent building permits throughout the watershed to estimate outdoor irrigated area. The average irrigated area was estimated to be 0.20 acre.

Consumptive use is much higher in the summer than winter, but the calculations used are based upon an annual average. If the summer consumptive use was broken out separately it would help guide the implementation of future water offset projects at the time when resources are most limiting. Additionally, the methods used to calculate the number of permit-exempt wells in King and Snohomish Counties were different, which may result in minor differences in consumptive use estimates across basins. Despite these limitations, WRIA 7 followed the methodology prescribed by Ecology, used the most accurate data available for each basin, and applied the methods consistently.

Water Offsets

The WRIA 7 committee identified eleven water offset projects across seven subbasins, which if implemented, would provide a total water offset of 1,444 acre-feet per year (Table 3). The total offset yields a surplus offset of 647 acre-feet per year above the 797 acre-feet per year consumptive use estimate. There will be a water deficit in ten of the sixteen subbasins but habitat projects are proposed in all subbasins.

Table 3. Estimated Water Offsets for WRIA 7

Project	Short Description	Subbasins Benefiting	Estimated Offset Benefits (acre-feet per year)
Lake Shoecraft Outlet Modification	Water storage and retiming	Tulalip	62.5
Coho Creek Relocation and Streamflow Enhancement	Streamflow augmentation and floodplain restoration	Quilceda-Allen	362
Lake Stevens Outlet Structure and Lake Level Management	Water storage and retiming	Little Pilchuck	500
Lochaven Source Switch	Water right acquisition	Pilchuck	12.7
Lower Pilchuck Number 1	Water right acquisition	Pilchuck	2.8
Lower Pilchuck Number 11	Water right acquisition	Pilchuck	2.1
Raging River Number 1	Water right acquisition	Snoqualmie South	126
Patterson Number 1	Water right acquisition	Patterson	29.7
Patterson Number 4	Water right acquisition	Patterson	71.6
Managed aquifer recharge in Snoqualmie	Water storage and retiming	Snoqualmie North, Snoqualmie South, Upper Snoqualmie	198
Snoqualmie River Watershed Surface Water Storage	Water storage and retiming	Cherry-Harris, Snoqualmie South, Upper Snoqualmie	77
		Total	1,444.4

The estimated cost for proposed water storage projects varies from $175,000 to $3.5 million. The water rights projects range from $5,000 to $324,000. The total cost for implementing all the water offset projects described in the plan is about $7 million. As of March 2022, three of the

eleven planned water offset projects have secured initial feasibility funding. Project sponsors will further refine these cost estimates during their project scoping and development processes.

The certainty of implementation of projects depends on many factors, such as identification and support of project sponsors, readiness to implement the project, and identification of potential barriers. Each of the water offset projects identified in the plan has a project sponsor ready to proceed with project development. One of the largest barriers to implementation is funding. Additionally, landowner's willingness to sell existing water rights is one very uncertain component of this plan. Other potential barriers include the willingness of landowners to sell or allow development of projects. Many of the water offset projects included in the plan have not yet secured landowner approval.

If implemented, the planned water offset projects and actions identified in the WRIA 7 plan will offset the total projected impacts to in-stream flows from the total new consumptive water use.

Net Ecological Benefit

The plan identifies twenty-six proposed habitat projects that provide additional benefits to in-stream resources beyond those necessary to minimally offset the impacts from new consumption water use in the WRIA. Ecological benefits associated with these projects include floodplain restoration, wetland reconnection, availability of off-channel habitat, reduction of peak flow during storms, increased groundwater levels and baseflow, and increased channel complexity. These habitat projects will contribute to addressing limiting factors for salmonids in WRIA 7.

The estimated cost for implementing individual habitat projects ranges from $20,000 (per lined storage pond) for the Snohomish Conservation District Small Farm Storage Initiative project to $15.5 million for the Raging River Bridge to Bridge Acquisitions and Floodplain Restoration project. As of March 2022, five of the twenty-six planned habitat projects have secured funding. Project sponsors will further refine these cost estimates during their project scoping and development processes.

Recommendations

The panel has identified specific recommendations and revisions for each plan, found in Appendix A: Detailed Review Comment Tables for WRIA 7, 8, 13, 14, and 15. The detailed comments include minor edits, inconsistencies, suggestions for clarity, identifies projects to remove or re-evaluate, and other technical recommendations.

Overall, the WRIA 7 watershed plan would be improved by a better distribution of projects to match the needs of individual subbasins. Additionally, we recommend improvements to reduce the uncertainty of how consumptive use was measured, and the uncertainty of implementing projects to provide net ecological benefit.

The years used to calculate the King County consumptive use could be based on 2008 to 2018, the same as Snohomish County consumptive use.

For projects focused on consumptive use or net ecological benefit, it would be helpful to identify project feasibility, certainty of implementation, and corresponding streamflow benefits. A matrix may be a helpful tool to use.

The number of projects in Pilchuck and Patterson seem light, considering the needs. Additionally, we would have expected to see more projects in Cherry-Harris given consumptive use projections, even if estimates are low. We also suggest projects focused on irrigation and agriculture along the Skykomish and Snoqualmie Rivers, even if only modest offsets to projected consumption.

Finally, include mechanisms for monitoring, assessment, accountability, and adaptation to ensure successful implementation of the plan. Plan adaptation should address:

- Identification of additional consumptive use offset or habitat projects.
- Changes in the feasibility and / or priority of habitat or consumptive use offset projects.
- Consumptive use changes due to better data, including changes from a changing climate.

WRIA 8

Introduction to the Watershed Plan

The Cedar-Sammamish watershed (WRIA 8) encompasses about 692 square miles and includes the lands that drain through the Ballard Locks as well as nearshore streams north of the Duwamish River to Mukilteo. The watershed has two major river basins, the Cedar and Sammamish, both of which empty into Lake Washington. The Cedar River has a mean annual flow of 679 cubic feet per second, over two times the discharge of the Sammamish River's 304 cubic feet per second. The upper Cedar River watershed provides water to Seattle. Other major tributaries include Bear Creek, Coal Creek, Evans Creek, Issaquah Creek, Little Bear Creek, May Creek, North Creek, and Swamp Creek. Fifty percent of the watershed is in a city or designated urban growth area. It is the most populated WRIA in Washington. About 85 percent of the watershed is in King County and the remaining 15 percent is in Snohomish County.

Technical Summary and Review Comments

Consumptive Use

A total of 967 new permit-exempt domestic wells are expected in WRIA 8 by 2038, with an estimated use of 425 acre-feet per year, with an estimated error of plus or minus six percent (Table 4). King County is projected to experience the most, with 740 wells, while Snohomish County expects about 210. The remaining 17 are expected in cities and urban growth areas.

Table 4. Reported Estimated Consumptive Use for WRIA 8 and Assumptions used for Wells.

Wells and Consumptive Use	Quantity
Projected number of permit-exempt wells in twenty-year planning horizon	967
Indoor consumptive use, acre-feet per year/per well (average)	0.0184

Wells and Consumptive Use	Quantity
Outdoor consumptive use, acre-feet per year/per well (average)	0.42
Total estimated consumptive use from 2018-2038, acre-feet per year	425

The method used to project the number of new permit-exempt wells and consumptive use estimates in WRIA 8 are based on recommendations from Appendix A of Ecology's *Final Guidance for Determining Net Ecological Benefit*. The method to calculate consumptive use assumes 90 percent of the indoor water use returns to groundwater via septic tanks and is not counted as consumptive use. About 20 percent of the outdoor water use is assumed to return to groundwater or surface water and is not counted as consumptive use. A Geographic Information System analysis was used on 153 randomly selected parcels throughout the watershed to estimate outdoor irrigated area. The average irrigated area was estimated to be 0.32 acres.

Consumptive use is much higher in the summer than winter, but the calculations are based on an annual average. If the summer consumptive use was separated, it would help guide the implementation of future water offset projects during the most water-limited time of the year. As noted previously, King and Snohomish Counties' methods of calculating the number of permit-exempt wells differ slightly and may result in subtle differences in consumptive use in basins in different counties. However, the slightly different projections would have little overall effect because they both use the same methods prescribed by Ecology in a consistent manner.

Water Offsets

The WRIA 8 committee identified ten water offset projects, across five subbasins, which if implemented would provide a total water offset of 1,805 acre-feet per year (Table 5). The total offset yields a surplus offset of 1,380 acre-feet per year above the 425 acre-feet per year consumptive use estimate, making any subtle differences in projections negligible. There will be a water deficit in six of the twelve subbasins, but planned habitat restoration projects are identified in each subbasin intended to mitigate deficits.

Table 5. Estimated Water Offsets for WRIA 8 for Each Project Identified in the Plan by Project Type.

Project	Short Description	Subbasins Benefiting	Estimated Offset Benefits (acre-feet per year)
Snohomish County Recycled Water Managed Aquifer Recharge	Water storage and retiming	Little Bear	181
Wayne Golf Course Water Right Acquisition	Water right acquisition	Sammamish River Valley	3.54
Sixty Acres Park Water Right Acquisition	Water right acquisition	Sammamish River Valley	126
Water Right Acquisition Number 8	Water right acquisition	Sammamish River Valley	23.43
Sammamish River Valley Irrigation Water Rights	Water right acquisition	Sammamish River Valley	551.83
Sammamish River Valley Recycled Water Managed Aquifer Recharge	Water storage and retiming	Sammamish River Valley	181
Number 1 Water Right Acquisition	Water right acquisition	Bear / Evans	346.8

Project	Short Description	Subbasins Benefiting	Estimated Offset Benefits (acre-feet per year)
Number 4 Water Right Acquisition	Water right acquisition	Issaquah	286
Riverbend Mobile Home Park Water Right Acquisition	Water right acquisition	Lower Cedar	20.1
Number 5 Water Right Acquisition	Water right acquisition	Lower Cedar	85.4
		Total	1,805.1

Water offset projects include two water storage and retiming projects (or projects that change the timing of water withdrawal or addition from the river), and eight water right acquisitions. The total estimated cost for these projects is $4.4 million, with individual projects ranging from about $9,100 to $1.4 million. The certainty of implementation depends on support from landowners, funding, certainty of success, and feasibility. Each of these projects has project sponsors, but many do not have agreements in place with landowners or funding. It is difficult to imagine how budgets can be specific without concurrence on the project or the plan. If these impediments can be removed and the estimates provided by the committee are correct, the implementation of these projects would offset the total projected impacts to in-stream flows from the total new consumptive water use.

Net Ecological Benefit

Twenty-three habitat projects are proposed in the plan to provide ecological benefits, including improvements to stormwater management and infiltration. There is a great deal of uncertainty as to how these habitat projects may offset consumptive use because stormwater projects are in built-out basins, and in these instances are largely retrofits of out-of-date infrastructure. The projects that include floodplain restoration, wetland reconnection, increased off-channel habitat, increased groundwater levels and baseflow, and improved channel complexity in salmon-bearing streams, will provide ecological benefits; few of them offer any offset benefits. The projects that do, are in the Sammamish River (primary flow originating from Lake Sammamish) and will not address the most limiting factor of warm water temperature. Estimates of project costs where available are between $94,000 for beaver dam analogs to $7 million for a floodplain reconnection project on the Cedar River. While not prioritized, each of these project concepts are consistent with creating potentially measurable and meaningful ecological benefits for salmonids within WRIA 8.

Recommendations

The panel has identified specific recommendations and revisions for each plan, found in Appendix A: Detailed Review Comment Summary Tables for WRIA 7, 8, 13, 14, and 15. The detailed comments include minor edits, inconsistencies, suggestions for clarity, identifies projects to remove or re-evaluate, and other technical recommendations.

For consistency across basins, King County and Snohomish County should use the same assumptions for new permit-exempt wells, possibly using numbers from the state Office of Financial Management.

For projects focused on consumptive use or net ecological benefit, it would be helpful to identify feasibility, certainty of implementation, and associated streamflow benefits. A matrix may be a helpful tool to use.

Ecological projects should be prioritized, and effort should be made to include design elements that would increase cold water refugia in the Sammamish River and specifically address water offset directly as design elements in planned restoration projects.

The Sammamish Basin, North Lake Washington Tributaries (Little Bear, North, and Swamp), and the Bear/Evans basins seem to have the most mitigating effects on water withdrawals and have a lot of pressure for new consumptive use. There should be more emphasis on ecological projects in those streams that are cooler, rather than relying upon relatively small improvements in the much larger Sammamish River.

Finally, include mechanisms for monitoring, assessment, accountability, and adaptation to ensure successful implementation of the plan. Plan adaptation should address:

- Identification of additional consumptive use offset or habitat projects.
- Changes in the feasibility and / or priority of habitat or consumptive use offset projects.
- Consumptive use or offset changes due to better data, including changes from a changing climate.

WRIA 13

Introduction to the Watershed Plan

WRIA13, the Deschutes watershed, in Thurston and Lewis Counties, covers 270 square miles. The Deschutes River is the major hydrologic basin in WRIA 13, with a number of smaller independent tributaries that drain into four saltwater inlets: Budd, Eld, Henderson, and Nisqually Reach. Other principal streams include Woodard and Woodland Creeks, which drain into Henderson. WRIA 13 is divided into nine subbasins for the purposes of the watershed plan.

The WRIA 13 Watershed Restoration and Enhancement Plan projects 2,616 new permit-exempt domestic wells in the next twenty years with an estimated consumptive use of 434 acre-feet per year. A total of four water offset projects would provide an expected offset of 1,801 acre-feet per year to benefit streamflow. This is estimated to provide a total net surplus offset of 1,367 acre-feet per year. The WRIA 13 watershed plan identifies nineteen habitat projects designed to increase stream complexity, reconnect floodplains, promote fish passage, enhance natural processes, and ultimately benefit salmonids and other aquatic species.

Technical Summary and Review Comments

Consumptive Use

A total of 2,616 new permit-exempt wells are expected in WRIA 13 by 2038, with an estimated 434 acre-feet per year (Table 6). Although WRIA 13 includes both Thurston and Lewis County, no new permit-exempt wells are expected to occur in Lewis County in the twenty-year planning horizon. The largest number of wells are in the Middle and Lower Deschutes subbasins and the three peninsulas.

Table 6. Estimated Consumptive Use for WRIA 13

Wells and Consumptive Use	Quantity
Projected number of permit-exempt wells in the twenty-year planning horizon	2,616
Indoor consumptive use, acre-feet per year/per well (average)	0.017
Outdoor consumptive use, acre-feet per year/per well (average)	0.15
Total estimated consumptive use from 2018-2038, acre-feet per year	434

The method used to project the number of new permit-exempt wells in WRIA 13 is based on recommendations from Appendix A of Ecology's *Final Guidance for Determining Net Ecological Benefit*. Ecology used growth estimates and growth allocations that were prepared by individual counties to forecast the number of permit-exempt wells in the twenty-year planning horizon by subbasin.

The method assumed an average indoor use per person per day and used estimates of the average irrigated area (outdoor lawn and garden areas), amount of irrigation, and irrigation efficiency to derive the total water use per household with a permit-exempt well. A large portion (90 percent) of the indoor water use returns to groundwater via septic tanks and is not counted as a consumptive use. A small portion (20 percent) of the outdoor water use returns to groundwater or surface water and also is not counted as a consumptive use.

To estimate the average irrigated area for a new residence using a permit-exempt well, the lawn and garden areas of eighty parcels distributed throughout the WRIA and representative of a range of property values were analyzed. The average irrigated area was estimated to be 0.1 acre.

The methodology used to project the number of permit-exempt wells and consumptive use was consistent with WRIAs 14 and 15, the other watershed plans reviewed by our team. The indoor consumptive use per permit-exempt well estimated for WRIA 13 was the same as for WRIAs 14 and 15. The outdoor consumptive use estimated for WRIA 13 was the same as for WRIA 14 and slightly more than for WRIA 15. The difference is caused by a larger average irrigated area in WRIAs 13 and 14 (0.1 acre) compared to WRIA 15 (0.08 acre).

The estimated outdoor consumptive use is much greater than the indoor consumptive use and comprises 90 percent of the total consumptive use. Ecology expects the outdoor water use will occur mainly in summer, but the consumptive use calculations present an average annual use, not the summer use. Showing the summer consumptive use would help guide implementation of future water offset projects as the largest streamflow deficits occur in summer. However, the consumptive use

projections were developed using the methods found in Appendix A of Ecology's *Final Guidance for Determining Net Ecological Benefit,* and they are consistent with those methods.

Water Offsets

The WRIA 13 committee identified four water offset projects, across six subbasins, which if implemented would provide a total water offset of 1,801 acre-feet per year (Table 7). The total offset yields a surplus offset of 1,367 acre-feet per year above the 434 acre-feet per year consumptive use estimate.

Subbasins were delineated by Ecology and the Watershed Restoration Committee to describe the location of projected new consumptive water use and as a guide to developing projects that offset that use in the same general locations and that addressed habitat needs to provide net ecological benefit.

Table 7. Estimated Water Offsets for WRIA 13

Project	Short Description	Subbasins Benefiting	Estimated Offset Benefits (acre-feet per year)
Schneider's Prairie Off-Channel Connection	Off-channel reconnection and infiltration	Lower Deschutes	681
Hicks Lake Stormwater Retrofit	Stormwater infiltration in series with existing stormwater treatment	Woodland	296
Donnelly Drive Infiltration	Improve neighborhood stormwater infiltration, avoiding surcharge and runoff to Chambers ditch	Lower Deschutes	14
Deschutes/ Chambers Managed Aquifer Recharge	Several candidate locations for managed aquifer recharge of diverted Deschutes River water from high flow periods, exceeding in-stream minimum flows or ecological flows	Boston Harbor, Cooper Point, Lower Deschutes, Middle Deschutes, Upper Deschutes, Woodland	810
		Total	1,801

Managed aquifer recharge projects account for 45 percent of the total water offsets for permit-exempt wells. The projected offsets rely heavily on managed aquifer recharge facilities with benefits that appear overestimated. While managed aquifer recharge facilities that accept stormwater or treated wastewater appear appropriate, managed aquifer recharge facilities that withdraw flow from streams rely on hydrologic manipulations of natural resources and natural processes that have questionable feasibility and benefits.

The plan segregates habitat projects from quantitative water offsets and fails to integrate natural stream processes into quantitative offset solutions. The plan provides the following quote, "Restoring floodplain connectivity and streamflow regimes, and re-aggrading incised channels are most likely to ameliorate streamflow and temperature changes and increase habitat diversity and population resilience" (Beechie et al. 2013) yet the plan fails to discuss degradation of streambed elevations as a root cause of reduced base flow volumes. Channel and streambed degradation is listed as a Habitat

Limiting Factor Addressed for sixteen of the nineteen habitat projects listed in the plan. indicating root causes of reduced summer base flow. Channel degradation reduces water table elevations. Furthermore, the plan fails to sufficiently promote projects that specifically raise streambed and water table elevations.

Alteration of natural stream hydrology is a high-priority limiting factor in WRIA 13. Streamflow is important for supporting riparian vegetation and wetlands that provide shading, wildfire breaks, food web support, and flood and sediment attenuation functions. Yet the plan's water offsets seem to rely on further alterations of natural stream hydrology instead of seeking solutions that reverse such alterations to offset permit-exempt well withdrawals.

The narrative description for managed aquifer recharge projects mentions stormwater as a source for these projects. Yet, it is the only occurrence of the word "stormwater" in the entire description for managed aquifer recharge projects in WRIA 13. The plan should contain more details about how stormwater could be considered a source of water for managed aquifer recharge projects.

There appears to be no consideration of turbidity associated with high flows and its effect on operations and maintenance of managed aquifer recharge facilities. Consideration of turbidity with high flows likely will reduce the number of delivery days to offset operations and maintenance costs of managed aquifer recharge facilities.

The plan assumes that the groundwater recharge rate will be maintained through a program of periodic rehabilitation of the infiltration structure(s). However, rehabilitation could mean a number of things including excavating managed aquifer recharge facilities and screening out fines, which are not compatible with some of the natural areas identified as managed aquifer recharge locations.

There seems to be quite a bit of uncertainty around many offset projects. The offsets for this plan with high uncertainty should be revisited and removed as potential offsets. The quantifies of offsets for the remaining projects should be summed up to ensure that they will still offset projected consumptive use.

Net Ecological Benefit

The plan estimates a surplus and net ecological benefit of 1,367 acre-feet per year. This includes a number of projects that we feel are uncertain or don't have project sponsors and thus should not be included. In other cases, there are projects that we felt overestimated the potential benefit. Given the surplus, if the authors of the plan were to provide more conservative estimates or remove projects, it still is likely there would be a net ecological benefit. The location and quantity of net ecological benefit shows a deficit in five subbasins and a surplus in four subbasins. Additional offset projects should be considered to improve spatial distribution of offset projects to correspond to permit-exempt well locations and their impacts on specific subbasins.

The plan also includes nineteen habitat projects. The plan states that the ecological and streamflow benefits from these projects are supplemental to the quantified water offset projects but will contribute to achieving net ecological benefit. There are a few habitat projects that appear to benefit

marine or estuarine habitat and, while beneficial for salmon and other species, should not be considered contributing to net ecological benefit. In addition, most of the habitat projects do not have a project sponsor, which suggests that they are unlikely to be implemented. These should be flagged as conceptual only and not likely to provide a benefit.

Recommendations

The panel has identified specific recommendations and revisions for each plan, found in Appendix A: Detailed Review Comment Tables for WRIA 7, 8, 13, 14, and 15. The detailed comments include minor edits, inconsistencies, suggestions for clarity, identifies projects to remove or re-evaluate, and other technical recommendations.

Many of the offset projects are highly conceptual and feasibility analyses may find that the potential estimated offset in acre-feet per year is too high. More conservative estimates are needed for most of the managed aquifer recharge and water right acquisition projects.

The estuarine and nearshore projects are good habitat projects for salmon and other fish but would not provide an offset to projected consumptive use and should be removed from the list of projects used to determine net ecological benefit.

Because the location and quantity of net ecological benefit shows a deficit in five subbasins and a surplus in four subbasins, additional offset projects should be considered to improve spatial distribution of offset projects to correspond to permit-exempt well locations and their impacts on specific subbasins.

We recommend the plan be revised to remove the less likely projects and include other recommendations above. The quantities of offsets for the remaining projects should be summed up to ensure that they will still offset projected consumptive use and provide a net ecological benefit.

Consider solutions that address and enhance natural processes. Wood additions have the potential to accrete sediments and increase water table elevations. We recommend including projects that raise water table elevations through raising streambed elevations. Aggradation of gravel in streams acts as filter media and helps to improve water quality. Wood additions coupled with riparian plantings can raise streambed elevations while limiting lateral stream migration. Riparian plantings improve water quality by shading streamflow and promoting deposition of fine sediments on floodplains. Floodplain connectivity offsets can be evaluated with analyses similar to those identified in the WRIA 13 plan's Appendix I: Detailed Project Descriptions, pages I-26 and I-27.

We recommend developing strategies that recognize and reverse the root causes of reduced summer base flows. The plan should recognize impacts of increased stormwater flow and display a preference for intercepting stormwater to source managed aquifer recharge facilities. The plan should evaluate existing stormwater conveyance systems for managed aquifer recharge source water, including an evaluation of water quality. The plan should make estimates of turbidity during high flows to consider turbid waters' plugging effect on recharge facilities and evaluate if turbid flows can be allowed or if

they will increase operations and maintenance costs to such a level that the number of diversion days must be reduced.

The plan should use caution when replicating natural annual hydrographs through further manipulation of natural stream hydrography (i.e., stream withdrawals to source managed aquifer recharge projects). Instead, the plan should develop and evaluate projects that reduce alterations of natural stream hydrology and avoid further manipulation of natural stream processes.

Finally, include mechanisms for monitoring, assessment, accountability, and adaptation to ensure successful implementation of the plan. Plan adaptation should address:

- Identification of additional consumptive use offset or habitat projects.
- Changes in the feasibility and / or priority of habitat or consumptive use offset projects.
- Consumptive use or offset changes due to better data, including changes from a changing climate.

WRIA 14

Introduction to the Watershed Plan

WRIA 14, the Kennedy Goldsborough watershed, is in Mason and Thurston Counties and covers 381 square miles and includes an extensive network of independent streams. Principal drainages include Alderbrook, Cranberry, Deer, Goldsborough, Johns, Kennedy, Mill, Perry, Sherwood, Shumocher, and Skookum Creeks. WRIA 14 is divided into eight subbasins.

The WRIA 14 Watershed Restoration and Enhancement Plan projects 4,294 new permit-exempt domestic wells in the next twenty years and an estimated consumptive use of 760 acre-feet per year. A total of eight water offset projects would provide an expected offset of 1,725 acre-feet per year to benefit streamflow. This is estimated to provide a total net surplus offset of 965 acre-feet per year. The WRIA 14 watershed plan identifies twenty-five habitat projects designed to increase stream complexity, reconnect floodplains, promote fish passage, enhance natural processes, and ultimately benefit salmonids and other aquatic species.

Technical Summary and Review Comments

Consumptive Use

A total of 4,294 permit-exempt wells are expected in WRIA 14 by 2038, with an estimated use of 760 acre-feet per year (Table 8). WRIA 14 includes both Mason and Thurston Counties, but the largest number of the wells are expected to be in Mason County in the Oakland Bay subbasin.

Table 8. Estimated Consumptive Use for WRIA 14

Wells and Consumptive Use	Quantity
Projected number of permit exempt wells in twenty-year planning horizon	4,294
Indoor consumptive use, acre-feet per year/per well (average)	0.017

Outdoor consumptive use, acre-feet per year/per well (average)	0.16
Total estimated consumptive use from 2018-2038, acre-feet per year	760

The method used to project the number of new permit-exempt wells in WRIA 14 is based on recommendations from Appendix A of Ecology's *Final Guidance for Determining Net Ecological Benefit*. Ecology used growth estimates and growth allocations that were prepared by individual counties to forecast the number of permit-exempt wells in the twenty-year planning horizon. Ecology also forecasts the number of permit-exempt wells in the planning horizon by subbasin.

The method assumed an average indoor use per person per day and used estimates of the average irrigated area (outdoor lawn and garden areas), the amount of irrigation, and irrigation efficiency to derive the total water use per household with a permit-exempt well. A large portion (90 percent) of the indoor water use returns to groundwater via septic tanks and is not counted as a consumptive use. A small portion (20 percent) of the outdoor water use returns to groundwater or surface water and also is not counted as a consumptive use.

To estimate the average irrigated area for a new residence using a permit-exempt well, the lawn and garden areas of eighty parcels distributed throughout the WRIA and representative of a range of property values were analyzed. The average irrigated area was estimated to be 0.1 acre.

The methodology used to project the number of permit-exempt wells and estimate consumptive use in WRIA 14 was consistent with WRIAs 13 and 15, the other watershed plans reviewed by our team. The indoor consumptive use per permit-exempt well estimated for WRIA 14 was the same as WRIAs 13 and 15. The outdoor use consumptive use estimated for WRIA 14 was the same as WRIA 13 and slightly more than WRIA 15. The difference is caused by a larger average irrigated area in WRIAs 13 and 14 (0.1 acre) compared to WRIA 15 (0.08 acre).

The estimated outdoor consumptive use is much greater than the indoor consumptive use and comprises 90 percent of the total consumptive use. Ecology expects outdoor water use will occur mainly in summer but the consumptive use calculations present an average annual use, not the summer use. Showing the summer consumptive use would help guide implementation of future water offset projects as the largest streamflow deficits occur in summer. However, the consumptive use projections were developed using the methods found in Appendix A of Ecology's *Final Guidance for Determining Net Ecological Benefit*, and they are consistent with those methods.

Water Offsets

The WRIA 14 committee identified six water offset projects across seven subbasins, which if implemented would provide a total water offset of 1,725 acre-feet per year (Table 9). The total offset yields a surplus offset of 965 acre-feet per year above the
760 acre-feet per year consumptive use estimate.

Subbasins were delineated by Ecology and the Watershed Restoration Committee to describe the location of projected new consumptive water use and as a guide to developing projects that offset

that use in the same general location and that addressed habitat needs to provide net ecological benefit.

Table 9. Estimated Water Offsets for WRIA 14

Project	Short Description	Subbasins Benefiting	Estimated Offset Benefits (acre-feet per year)
Mason County Rooftop Runoff	New county requirement for new rural residential building to install low-impact development best management practices that infiltrate more than 95 percent of rooftop runoff	WRIA-wide	224
City of Shelton Reclaimed Water / Washington Correction Center Source Switch	Redirect north Shelton wastewater to the Water Reclamation Plan and infiltrate Class A reclaimed water at existing spray field near the Washington Corrections Center.	Goldsborough	459
Evergreen Mobile Estates	Water system consolidation and water right acquisition	Oakland	7
Managed Aquifer Recharge	Install managed aquifer recharge facilities	Case, Goldsborough, Kennedy, Mill, Oakland, Skookum	910
Water Right Opportunities	A focused WRIA-wide analysis on potential water right efficiencies and acquisition for future studies and implementation	Goldsborough, Hood, Mill, Oakland	111
Steamboat Middle	Surface water retention and infiltration	Kennedy	14
		Total	1,725

Note that the Schneider's Prairie Off-Channel Connection was included in Table 10 of the plan, but Schneider's Prairie is in WRIA 13. Schneider's Prairie Off-Channel Connection was not included in water offsets for WRIA 14.

Managed aquifer recharge projects account for 53 percent of the total water offsets for permit-exempt wells. The projected offsets rely heavily on managed aquifer recharge facilities with benefits that appear overestimated. While managed aquifer recharge facilities that accept stormwater or treated wastewater appear appropriate, managed aquifer recharge facilities that withdraw flow from streams rely on hydrologic manipulations of natural resources and natural processes that have questionable feasibility and benefits.

The plan cites the National Oceanic and Atmospheric Administration's Puget Sound Watershed Characterization Project, which is a tool used in Puget Sound by planners and resource managers to identify priorities for habitat protection and restoration. The characterization project directs planners to identify the root causes of watershed issues and develop appropriate solutions. The plan fails to identify stream degradation as a root cause of reduced base flows even though it is well understood that reduced streambed elevations directly impact water table elevations and base flow volumes. Channel and streambed degradation is listed as a habitat limiting factor addressed for nineteen of the

twenty-three habitat projects listed in the plan's Table 12, indicating them as root causes of reduced summer base flow. Channel degradation reduces water table elevations. Furthermore, the plan fails to sufficiently promote projects that specifically raise streambed and water table elevations.

Alteration of natural stream hydrology is a high priority limiting factor in WRIA 14. Streamflow is important for supporting riparian vegetation and wetlands that provide shade, wildfire breaks, food web support, and flood and sediment attenuation functions. Yet the plan seems to rely on further alterations of natural stream hydrology such as diverting streamflow to managed aquifer recharge facilities instead of seeking solutions that reverse those alterations, such as reversing channel degradation.

The Narrative Description for managed aquifer recharge projects identifies stormwater as a water source. Yet, it is the only occurrence of the word "stormwater" in the entire description for managed aquifer recharge projects. The plan should contain more details about how stormwater could be considered a source of water for managed aquifer recharge projects.

There appears to be no consideration of turbidity associated with high flows and turbidity's effect on operations and maintenance of managed aquifer recharge facilities. Consideration of turbidity with high flows likely will reduce the number of delivery days to offset operations and maintenance costs of managed aquifer recharge facilities.

The plan assumes that the groundwater recharge rate will be maintained through a program of periodic rehabilitation of the infiltration structure(s). However, rehabilitation could mean a number of things including excavating managed aquifer recharge facilities and screening out fines, which are not compatible with some of the natural areas identified as managed aquifer recharge locations.

Net Ecological Benefit

The WRIA 14 watershed plan estimates a surplus and net ecological benefit of 965 acre-feet per year. This includes a number of projects that we feel either are uncertain or highly conceptual and thus should not be included. In addition, there are projects that we felt overestimated the potential benefit. Given the surplus, if the authors of the plan were to reduce or remove projects, it still is likely there would be a net ecological benefit. The offsets and benefits for the remaining projects should be summed up to ensure that they will still offset projected consumptive use and provide a net ecological benefit. The location and quantity of net ecological benefit shows a deficit in three subbasins and a surplus in five subbasins. Additional offset projects should be considered to improve spatial distribution of offset projects to correspond to permit-exempt well locations and their impacts on specific subbasins.

The plan also identifies twenty-five habitat projects. The plan states that the ecological and streamflow benefits from these projects are supplemental to the quantified water offset projects but will contribute to achieving net ecological benefit. There are at least three habitat projects that appear to benefit marine or estuarine habitats and, while beneficial for salmon and other species, they should not be considered contributing to net ecological benefit. In addition, habitat projects without a

project sponsor suggest a high likelihood that they will not be implemented. These should be flagged as conceptual only and not included.

Recommendations

The panel has identified specific recommendations and revisions for each plan, found in Appendix A: Detailed Review Comment Tables for WRIA 7, 8, 13, 14, and 15. The detailed comments include minor edits, inconsistencies, suggestions for clarity, identifies projects to remove or re-evaluate, and other technical recommendations.

The offset projects generally include many that are highly conceptual, and feasibility analyses may find that potential offsets in acre-feet per year are too high. More conservative estimates should be used for most of the managed aquifer recharge, rooftop runoff/low-impact development, and water right acquisition projects while keeping the estimates for wastewater infiltration. Remove Schneider's Prairie Off-Channel Connection project from the plan as it is in WRIA 13.

The estuarine and nearshore projects are good habitat projects for salmon and other fish but would not provide an offset to projected consumptive use and should be removed from the list of projects. If habitat projects don't have a sponsor or landowners have not indicated some interest, then the project really is only conceptual and should not be included.

Because the location and quantity of net ecological benefit shows a deficit in three subbasins and a surplus in five subbasins, additional offset projects should be considered to improve spatial distribution of offset projects to correspond to permit-exempt well locations and their impacts on specific subbasins.

Consider solutions that address root causes of reduced summer base flows and use natural stream processes to reverse root causes. Wood additions can be used to accrete sediments to raise streambed and water table elevations. Include a discussion that recognizes that raised streambed elevations also raise water table elevations to address root causes of reduced summer base flows. Accreted sediments in streams also act as filter media to improve water quality. Wood placements that effectively raise streambed elevations can be coupled with riparian plantings to minimize lateral stream migration. Riparian plantings also improve water quality by shading streams and promoting fine sediment deposition on floodplains.

We recommend using stormwater for managed aquifer recharge source water rather than surface water. Many managed aquifer recharge projects use surface water for their sources, which does not appear to consider that stormwater discharges to streams increases turbidity. Intercepting stormwater before it enters natural streams avoids increases in erosion and turbidity. The plan should evaluate existing stormwater conveyance systems for managed aquifer recharge source water and consider if turbidity during high flows can be allowed or if increased turbidity effects operations and maintenance costs to such a level that the number of diversion days must be reduced.

The plan should use caution when replicating natural annual hydrographs through further manipulation of natural stream hydrography (i.e., stream withdrawals to source managed aquifer recharge projects). Instead, the plan should develop and evaluate projects that reduce alterations of natural stream hydrology and avoid further manipulation of natural stream processes.

We recommend the plans be revised to remove some of the less likely projects and consider other recommendations above, and the quantifies of offsets for the remaining projects should be summed up to ensure that they will offset consumptive use will provide a net ecological benefit.

Finally, include mechanisms for monitoring, assessment, accountability, and adaptation to ensure successful implementation of the plan. Plan adaptation should address:

- Identification of additional consumptive use offset or habitat projects.
- Changes in the feasibility and / or priority of habitat or consumptive use offset projects.
- Consumptive use or offset changes due to better data, including changes from a changing climate.

WRIA 15

Introduction to the Watershed Plan

WRIA 15, the Kitsap watershed, encompasses the entire Kitsap Peninsula and surrounding islands. It covers 676 square miles including Kitsap County and portions of King, Mason, and Pierce Counties. Major drainages include Dewatto, Tahuya, and Union Rivers and dozens of independent streams. WRIA 15 is divided into seven subbasins.

The WRIA 15 watershed plan projects 5,215 new permit-exempt domestic wells in the twenty-year planning horizon with an estimated consumptive use of 718 acre-feet per year. A total of fifteen water offset projects would provide an expected offset of 2,873 acre-feet per year to benefit streamflow. This is estimated to provide a total net surplus offset of 2,155 acre-feet per year. The plan identifies thirty-one habitat projects designed to provide a variety of ecological benefits.

Technical Summary and Review Comments

Consumptive Use

A total of 5,215 new permit-exempt wells are expected in WRIA 15 by 2038, with an estimated use of 718 acre-feet per year (Table 10). Kitsap County is projects to experience the most, with 2,568 new wells, followed by Mason County with 1,301 new wells, Pierce County with 978 new wells, and King County with 368 new wells.

Table 10. Estimated Consumptive Use for WRIA 15

Wells and Consumptive Use	Quantity
Projected number of permit-exempt wells in the twenty-year planning horizon	5,215
Indoor consumptive use, acre-feet per year/per well (average)	0.0168
Outdoor consumptive use, acre-feet per year/per well (average)	0.121
Total estimated consumptive use from 2018-2038, acre-feet per year	718

The method used to project the number of new permit-exempt wells in WRIA 15 is based on recommendations from Appendix A of Ecology's *Final Guidance for Determining Net Ecological Benefit*. Ecology used growth estimates and growth allocations that were prepared by individual counties to forecast the number of permit-exempt wells in the twenty-year planning horizon. Ecology also forecasted the number of permit-exempt wells by subbasin.

The method assumed an average indoor use per person per day and used estimates of average irrigated area (outdoor lawn and garden areas), the amount of irrigation, and irrigation efficiency to derive the total water use per household with a permit-exempt well. A large portion (90 percent) of the indoor water use returns to groundwater via septic tanks and is not counted as a consumptive use. A small portion (20 percent) of the outdoor water use returns to groundwater or surface water and is not counted as a consumptive use.

To estimate the average irrigated area for a new residence using a permit-exempt well, the lawn and garden areas of eighty parcels distributed throughout the WRIA and representative of a range of property values were analyzed. The average irrigated area was estimated to be 0.8 acre.

The methodology used to project the number of permit-exempt wells and estimate consumptive use in WRIA 15 was consistent with WRIAs 13 and 14, the other watershed plans reviewed by our team. The indoor consumptive use per permit-exempt well estimated for WRIA 15 was the same as for WRIAs 13 and 14. The outdoor consumptive use estimated for WRIA 15 was slightly lower than for WRIAs 13 and 14. The difference is caused by a larger average irrigated area used in WRIAs 13 and 14 (0.1 acre) compared to WRIA 15 (0.08 acre).

The estimated outdoor consumptive use is much greater than the indoor consumptive use and comprises 90 percent of the total consumptive use. Ecology expects the outdoor water use will occur mainly in summer, but the consumptive use calculations present an average annual use, not the summer use. Showing the summer consumptive use would help guide implementation of future water offset projects as the largest streamflow deficits occur in summer. However, the consumptive use projections were developed using the methods found in Appendix A of *Ecology's Final Guidance for Determining Net Ecological Benefit* and are consistent with those methods.

Water Offsets

The WRIA 15 committee identified fifteen water offset projects, across seven subbasins, which if implemented would provide a total water offset of 2,873 acre-feet per year (Table 11). The total offset

yields a surplus offset of 2,155 acre-feet per year above the 718 acre-feet per year consumptive use estimate.

Subbasins were delineated by Ecology and the Watershed Restoration Committee to describe the location of projected new consumptive water use and as a guide to developing projects that offset that use in the same general location and that addressed habitat needs to provide net ecological benefits.

Table 11. Estimated Water Offsets for WRIA 15

Project	Short Description	Subbasins Benefiting	Estimated Offset Benefits (acre-feet per year)
Kingston Wastewater Treatment Plan	Reclaimed water to recharge groundwater	North Hood Canal, West Sound	328
Central Kitsap Water Treatment Plan	Reclaimed water for stream augmentation	North Hood Canal, West Sound	560
Tahuya Managed Aquifer Recharge	Managed aquifer recharge	South Hood Canal	200
South Hood Canal Lakes Managed Aquifer Recharge	Surface water storage and aquifer recharge	South Hood Canal	62
Bainbridge Island Managed Aquifer Recharge Opportunities	Managed aquifer recharge through diversion of flow and infiltration	Bainbridge Island	64.2
Belfair Wastewater Treatment Plant	Reclaimed water for infiltration to recharge groundwater	South Sound	70
Rocky Creek Managed Aquifer Recharge	Managed aquifer recharge through diversion of flow and infiltration	South Sound	150
M&E Farm Stormwater Infiltration	Stormwater collection and infiltration to recharge groundwater	Bainbridge Island	8
Ridgetop Boulevard Stormwater	Stormwater collection and infiltration to recharge groundwater	West Sound	126.7
Mason County Rooftop Runoff	Recharge groundwater through infiltration at homes	South Hood Canal, South Sound	71
Beall Creek	Flow improvements	Vashon Maury	26
Stream Augmentation	Discharge water indirectly into streams to augment streamflow	Bainbridge Island (future), North Kitsap, South Sound, West Sound	632
Forests for Streamflow	Acquire forestland to preserve stands or emphasize longer harvest interval	Bainbridge Island, North Hood Canal, South Hood Canal, South Sound, South Sound Islands, Vashon Maury, West Sound	241.2
Raingardens and Low Impact Development	Improve infiltration on impervious surfaces that generate stormwater	Bainbridge Island, North Hood Canal, South Hood Canal, South Sound, Vashon Maury, West Sound	188

Project	Short Description	Subbasins Benefiting	Estimated Offset Benefits (acre-feet per year)
Water Right Acquisitions	Permanently protect water rights, habitat improvements	Bainbridge Island, Vashon Maury	146
		Total	2,873

The plan lists primary limiting factors of channel and streambed degradation, increased peak flows, low streamflow, loss of upland forest cover, loss of riparian forest, and loss of floodplain connectivity and habitats. The limiting factors listed all speak to past land-use practices of removing wood from streams and draining wetlands that resulted in reduced streambed and water table elevations. These practices coincided with increases in stormwater and associated water quality and quantity impacts. This does not appear to be appropriately identified and many solutions rely on further manipulation of natural systems instead of restoration of natural processes.

The plan cites the National Oceanic and Atmospheric Administration's Puget Sound Watershed Characterization Project, which is a tool used in Puget Sound by planners and resource managers to identify priorities for habitat protection and restoration. The characterization project directs planners to identify the root causes of watershed issues and develop appropriate solutions. The plan fails to identify stream degradation as a root cause of reduced base flows even though it is well understood that reduced streambed elevations directly impact water table elevations and base flow volumes. The plan's Table 14 lists channel and streambed degradation, degradation of wetland and shoreline habitats, or loss of floodplain connectivity and habitats, as a habitat limiting factor addressed for twenty-three of the thirty-one habitat projects. This is an indication of root causes of reduced summer base flow. Channel degradation reduces water table elevations. Furthermore, the plan fails to sufficiently promote projects that specifically raise streambed and water table elevations.

Forest protection projects seem like a good idea, but there is uncertainty about the age of the stands. These also are largely protection projects and while protection is always cheaper than restoration or mitigation, the benefits seem theoretical, and the forestry offset should be considered.

It is unclear if forest protection projects–are considered an offset project by the Department of Ecology. It is clear from literature that mature forests provide better in-stream flows, but not clear if the parcels would become mature forest anyway. Moreover, one could argue that these that forest protection projects are meant to prevent future groundwater depletion rather than address water extraction.

Net Ecological Benefit

The watershed plan estimates a surplus and net ecological benefit of 2,155 acre-feet per year just by accounting for the offset projects. However, this includes a number of projects that we felt were uncertain and thus should not be included. In addition, there are projects that we felt overestimated the potential benefit. Given the surplus, if the authors of the plan were to reduce or remove unlikely projects, it still is likely there would be a net ecological benefit. The location and quantity of net

ecological benefit shows that all subbasins have a surplus, though this may change when the offset is revisited to adjust for our suggestions.

The plan also identifies thirty-one habitat projects. The plan states that the ecological and streamflow benefits from these projects are supplemental to the quantified water offset projects but will contribute to achieving net ecological benefit. However, there are a few habitat projects that appear to benefit marine or estuarine habitats and, while beneficial for salmon and other species, should not be considered contributing to net ecological benefit. In contrast to other WRIAs, all the habitat projects have sponsors and thus may be more likely to be implemented.

Recommendations

The panel has identified specific recommendations and revisions for each plan, found in Appendix A: Detailed Review Comment Tables for WRIA 7, 8, 13, 14, and 15. The detailed comments include minor edits, inconsistencies, suggestions for clarity, identifies projects to remove or re-evaluate, and other technical recommendations.

The offset projects generally include many that are highly conceptual, which suggests that the potential offset in acre-feet per year is too high. More conservative estimates should be used for most of the managed aquifer recharge, rooftop runoff/low-impact development, and water right acquisition projects while keeping the estimates for wastewater infiltration. Projects that pump groundwater to augment surface water should not be considered as offset projects.

Estuarine and nearshore projects are good habitat projects for salmon and other fish but would not provide an offset to projected consumptive use and should be removed from the list of projects.

Consider solutions that address and enhance natural processes. Wood additions can accrete sediments and increase water table elevations. Include discussion of projects that raise streambed elevations to raise water table elevations. Accreted gravels in streams act as filter media and improve water quality. If wood additions are coupled with riparian plantings, lateral stream migration can be arrested. Water quality is improved by shading streamflow and fine sediments tend to deposit on floodplains with intact riparian corridors.

Recognize root causes of reduced summer base flows and develop strategies for reversing root causes. Display a preference for intercepting stormwater before it enters natural streams and increases in erosion and turbidity. Develop and evaluate projects that reduce alterations of natural stream hydrology and avoid further manipulation of natural stream processes.

Evaluate existing stormwater conveyance systems for managed aquifer recharge source water, including an evaluation of water quality. Consider the turbid waters' plugging effect on managed aquifer recharge facilities. Make estimates of turbidity during high flows. Evaluate if turbid flows can be allowed or if they will increase operations and maintenance costs to such a level that the number of diversion days must be reduced.

The plan should be revised to remove the less likely projects and consider other recommendations above. The quantities of offsets for the remaining projects should be summed up to ensure that they will still offset projected consumptive use and provide a net ecological benefit.

Finally, include mechanisms for monitoring, assessment, accountability, and adaptation to ensure successful implementation of the plan. Plan adaptation should address:

- Identification of additional consumptive use offset or habitat projects.
- Changes in the feasibility and / or priority of habitat or consumptive use offset projects.
- Consumptive use or offset changes due to better data, including changes from a changing climate.

Specifically, RCO received public comments from the City of Bainbridge and Kitsap County regarding the status of projects included in the WRIA 15 plan. The plan should be updated to reflect projects which have already been completed and update the projects which have changed in scope or are no longer feasible.

Conclusions

We reviewed the watershed plans for WRIAs 7, 8, 13, 14, and 15 to answer specific questions about consumptive use, water offsets and net ecological benefits.

Consumptive Use: *Estimated water consumption from permit-exempt domestic groundwater withdrawals in the next twenty years.* Are the projections technically sound? Was the methodology applied consistently?

- Across all five plans, the consumptive use estimates were technically sound and the methodology was applied consistently. Note that there are recommendations for improving consumptive use estimates in WRIA 7.

Water Offsets: *Actions that put water back into aquifers and streams that offset new consumptive water use.* Will the planned projects and actions (if implemented), at a minimum, offset the total projected impacts to in-stream flows from new consumptive water use in all the subbasins in the WRIA?

- Yes, all plans identify projects that offset projected consumptive use impacts, though in particular for WRIAs 13, 14, and 15, we feel that those offsets are too optimistic, and some projects should be removed or offset estimates revised. All plans should be updated to remove projects which have already been implemented, and update project status or costs for projects yet to be implemented. Given the surplus of estimated offsets, we believe that even after removal of more uncertain projects, or revision of benefit, there still will be adequate offsets. However, we recommend that the quantities of offsets for the remaining projects be summed up to ensure that they will offset projected consumptive use.

Net Ecological Benefit: *Actions in the plans provide additional benefits to aquifers and streams beyond the minimum to offset projected consumptive use.* Do the plans identify projects and actions that provide additional benefits to in-stream resources beyond those necessary to minimally offset the impacts from new consumptive water use in the WRIA?

- Yes, though, as noted above, there are a number of water offset projects in WRIAs 13, 14, and 15 and some habitat projects that should not be included.

While we recommend some minor revisions for WRIAs 7 and 8, we felt that they meet the stated intent for watershed restoration and enhancement plans. For WRIAs 13, 14, and 15, we recommend revising or removing some habitat projects and addressing other minor comments. Given the surplus of habitat projects, if the authors of the plan were to remove the more uncertain projects, it still is likely there would be a net ecological benefit. However, we recommend that the remaining habitat benefit of the projects be re-evaluated to ensure that the net ecological benefit can still be achieved. It would be helpful to include information showing the stage of the project, its certainty and feasibility, funding source, technical reviews, prioritization, private or public land, and identified project sponsors. We believe this would help evaluate the certainty that these projects will occur.

References

Washington Department of Ecology (Ecology). 2019. Final Guidance for Determining Net Ecological Benefit. GUID-2094 Water Resource Program Guidance. Publication 19-11-079. Olympia, Washington. Published on July 31, 2019.

Appendices

Appendix A: Detailed Review Comment Tables for WRIA 7, 8, 13, 14, and 15

Detailed Review Comment Tables for WRIA 7, 8, 13, 14, and 15

Summary

The following technical comment tables were created by the review panel during their review of the watershed plans. Where relevant to the report, their findings were incorporated into the Watershed Restoration and Enhancement Plan Review Report. These comment tables are provided below to share the WRIA-specific comments the panelists found during their assessment.

Contents

WRIA 7

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
7	all	**all**	**Overall Summary: The plan identifies a total of 11 water offset and 26 habitat projects that would provide an anticipated offset of 1,444 AFY to benefit streamflows and enhance the watershed. Ignores water quality concerns. Needs error bars around assumptions to show uncertainty.**	All
7	all	**all**	**The plan projects 3,389 new permit-exempt domestic well connections (PE wells) over the planning horizon. Associated consumptive use with the new wells is 797 AFY**	All
7	Throughout		Consider rounding Overall CU to the nearest AFY integer (not tenths). There is a lot of uncertainty in these numbers.	CU
7	4.3	46	Reasonable assumptions: 60 gpd per person - indoor, 2.73 to 2.75 people per household, 0.10 CUF	CU
7	Fig 4.2	49	Consider rounding Overall CU to the nearest AFY integer (not tenths). This figure shows AFY to the nearest integer, but the project is listed to the tenth AFY.	CU
7	4.2.2	40	Potential Flaw: assumptions about building. King Co. based on 2000 to 2017 and Snohomish Co based on 2008-2018. Consider updating years and assumptions to provide consistency across counties.	CU

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
7	4.2.2	40	Maybe use Snohomish Co method based on 2008-2018 (or use OFM). Account for new building rates. Consider updating years and assumptions to provide consistency across counties.	CU
7	Appendix B		Some of the King Co subbasins could be refined for CU.	CU
7	Throughout		Review project list for feasibility & certainty. Consider including the likelihood of projects being implemented	NEB
7	Throughout		Estimates may be high for water offsets - state assumptions clearly. Consider stating assumptions of water offset clearly.	NEB/WO
7	Throughout		Significant figures are inconsistent. Consider updating for consistency.	WO
7	Table 4.2	47	Total offset on an annual basis - note that summer consumptive use is much higher than winter consumptive use (see comment on Appendix B, B-48). Consider stating this limitation clearly.	CU
7	Ap B	B-7	Projections: Inconsistent methodology between PE well projections between counties, both in past trends and in potential locations. Note that both methodologies appear valid, but using a single methodology for a watershed would improve consistency. King County's methods result in a higher estimate of PE Wells as building rate from 2000-2009 was much higher than 2010-2017. Consider using the same methodology for both counties.	CU
7	Ap B	B-48	Appendix notes that average water use is one value, but average summer use (due to lawn irrigation) is higher and may need to be considered for offset purposes. Consider stating this limitation clearly.	CU

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
7	Table 4.2	47	Note that CU assumed average irrigated area which is lowest of 3 options given in Appendix D - reasonable assumption but check for consistency with other plans. Consider verifying assumptions with other plans.	CU
7	Appendices		Minor comment - overarching page numbers on appendices (most are in WRIA 7) would be useful for referencing. Consider format update for clarity.	other
7	Appendices		Minor comment - would be useful to have consistent Appendices throughout all watershed plans to the extent possible; example: WRIA 7 has meeting summary in Appendix A, WRIA 8's meeting summary is Appendix C. Consider format update for clarity.	other
7	Table 5.1	53	The number of projects in Pilchuck and Patterson seem light, considering the needs. We would have expected to see more projects in Cherry/Harris given projection---even if estimates are low. We would have expected some projects to focus on irrigation and agriculture along the Skykomish and Snoqualmie Rivers, even if only modest offsets to projected consumption. Consider including additional projects in these areas. 10 of 16 subbasins will still have a deficit of water.	NEB/WO
7	Throughout		Technical feasibility - not enough information provided; We would like to see additional information to assess this aspect in projects (landowner issues; funding issues, etc.). Consider updating project list based on likelihood of projects being implemented.	NEB/WO

WRIA 8

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
8	Fig ES.1	9	Format update to identify number of WO & Habitat Projects, similar to WRIA 7 figure.	WO & NEB
8	Throughout		Round Overall CU to the nearest AFY integer (not tenths). There is a lot of uncertainty in these numbers	CU
8	4.3	40	Reasonable assumptions: 60 gpd per person - indoor, 2.73 to 2.75 people per household, 0.10 CUF	CU
8	Overall		Expectations of 967 new permit-exempt wells may be low. Offset assumption of 10 projects providing a surplus for the watershed is great, but there would be a deficit in 6 of 12 subbasins. Water quality concerns are ignored (e.g., nutrients, endocrine disruptors).	CU/WO/NEB
8	Throughout		Known ecological problems are not addressed by Sammamish River projects. Salmon recovery projects have been on list since Basin Planning in the late 1990s, but little progress has been made.	NEB
8	Throughout		Review project list for feasibility, and certainty, maybe a matrix.	NEB
8			Assumptions need to be stated for estimates for WO - state assumptions clearly. Present error bars where appropriate.	NEB/WO
8	Throughout		Update significant figures	WO

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
8	Appendix E		Projects in the Sammamish Basin (Sammamish River, Bear Creek, Little Bear, North Creek, and Swamp Creek) seem to have the most mitigating effects on water withdrawals. Instream flows and water withdrawals were ignored for the municipal water supplies. The diversity of projects planned in these basins seem to provide more ecological value. The key will be to implement them. Cedar and Issaquah Basins have little value to instream flow, although Riverbend would have strong ecological value for fish.	NEB
8	Table 4.2	43	Total offset on an annual basis - note that summer consumptive use is much higher than winter consumptive use (see comment on B-48)	CU
8	Appendix D		Projections: Inconsistent methodology between PE well projections between counties, both in past trends and in potential locations - Note that both methodologies appear valid, but using a single methodology for a watershed would improve consistency. King County's methods result in a higher estimate of PE Wells as building rate from 2000-2009 was much higher than 2010-2017	CU
8	Appendix D		Appendix notes that average water use is one value, but average summer use (due to lawn irrigation) is higher and may need to be considered for offset purposes.	CU
8	Table 4.2	43	Note that CU assumed average irrigated area which is lowest of 3 options given in Appendix D - reasonable assumption but check for consistency with other plans	CU
8	Appendices		Minor comment - overarching page numbers on appendices (only some pages are labeled in WRIA 8) would be useful for referencing	other

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
8	Appendices		Minor comment - would be useful to have consistent Appendices throughout all watershed plans to the extent possible; example: WRIA 7 has meeting summary in Appendix A, WRIA 8's meeting summary is Appendix C	other
8	General Comment		Technical feasibility - not enough information provided; is there additional information to assess this aspect in projects (landowner issues; funding issues, etc.)? Develop a matrix to show where projects are in development stage.	NEB/WO

WRIA 13

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
13	all	all	**Overall Summary: The plan identifies a total of 9 water offset and 19 habitat projects that would provide an anticipated offset of 1,801 AFY to benefit streamflows and enhance the watershed.**	All
13	all	all	**The plan projects 2,616 new permit-exempt domestic well connections (PE wells) over the planning horizon. Associated consumptive use with the new wells is 434 AFY**	All
13	2.1.3	11	Limiting factors are identified but not necessarily addressed. There are opportunities to work with natural stream processes for multi-objective solutions that address habitat, hydrology and water quality. Consider solutions that address and enhance natural processes such as wood additions to accrete sediments and increase water table elevations. Include discussion	NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
			of projects that raise streambed elevations to raise water table elevations. Accreted gravels in streams act as filter media and improve water quality. If wood additions are coupled with riparian plantings, lateral stream migration can be arrested. Water quality is improved by shading stream flows and fine sediments tend to deposit on floodplains with intact riparian corridors NEB should be evaluated based on how offsets address salmonid population limiting factors.	
13	2.3.2	16	"...Summer base flows in the watershed are sustained by groundwater." It is important to note that past land use practices of removing wood from streams and excavating drainage ditches through wetlands were performed to lower the water table, remove water from the landscape, and influence local groundwater trends to make water flow out of our streams. Recognize root causes of reduced summer base flows and develop strategies for reversing root causes to improve NEB.	NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
13	2.3.3	18	The text recognizes alterations of the natural hydrologic regime, including: • alteration of the frequency and magnitude of high flow events (usually associated with increased stormwater runoff from impervious surfaces), and; • reduction of summer base flows that affect the salmonid rearing capacity of streams (usually associated with reduced infiltration of groundwater, water withdrawals, or excess coarse sediment that can cause the flow to go subsurface)." Recognize root causes of reduced summer base flows and develop strategies for reversing root causes to improve NEB. Display a preference for intercepting stormwater before it enters natural streams and subsequent increases in erosion and turbidity.	NEB
13	5.1	34	"Restoring floodplain connectivity and streamflow regimes, and re-aggrading incised channels are most likely to ameliorate streamflow and temperature changes and increase habitat diversity and population resilience (Beechie et al. 2013)." Include discussion of projects that raise streambed elevations to raise water table elevations. Floodplain connectivity offsets can be evaluated with analyses similar to those identified in the paragraph that spans Pages I-26 and I-27 in Appendix I and the following paragraph on page I-27.	NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
13	5.2.1.1	34	"MAR potential was estimated in terms of 1) potential locations suitable for MAR projects, 2) flow available for diversion during high flows, and 3) the number of days when diversion is feasible." However, suitability of potential MAR project locations appears skewed toward streamflow withdrawal ($^1/_4$-$^1/_2$ mile from streams). Review of appendices does not reveal that existing stormwater conveyance systems were evaluated as source water for MAR candidate sites. Flow available during high flow appears to ignore the influence that turbid flows will have on operations and maintenance of MAR facilities. Feasibility analyses will likely reduce the number of days when diversion occurs due to the plugging effect of turbid flows. Discharging stormwater to streams, which increases turbidity, then removing flow from streams as source water for a MAR facility ignores the potential for turbid water to reduce the effectiveness of a MAR facility and it ignores increased operations and maintenance costs. Evaluate existing stormwater conveyance systems for MAR source water. Consider the turbid waters' plugging effect on MAR facilities. Make estimates of turbidity during high flows. Evaluate if turbid flows can be allowed, or if they will increase operations and maintenance costs to such a level that the number of diversion days must be reduced.	CU Offset Development and Evaluation
13	5.2.1.1	35	MAR offsets could be overestimated since there appears to be no consideration of turbidly effects on operations and maintenance costs. Consider turbid waters' plugging effect on MAR facilities. Make estimates of turbidity during high flows. Evaluate if turbid flows can be allowed or if they will increase operations and maintenance costs to such a level that the number of diversion days must be reduced.	CU Offset Evaluation

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
13	5.2.4.1	37	Reconnection of the Schneider's Prairie off channel site represents an opportunity to raise Deschutes River streambed elevation and water table elevation. The off-channel connection will increase conveyance in the reach and the increased conveyance can be offset by reducing conveyance in the Deschutes River mainstem by raising the channel bed. Raising the channel bed will raise the water table and address reduced summer base flow root causes. Develop more solutions to address reduced summer base flow root causes. Include discussion of raised streambed elevations to raise water table elevations. Consider direct stormwater discharge to Schneider's Prairie off channel wetland.	CU Offset Development and NEB
13	5.2.7.1	39	Stormwater source addresses root causes of reduced summer base flow. Consider more projects with similar stormwater sources.	CU Offset Development and NEB
13	Table 12	57-64	Past land use practices often included management aimed at reducing streambed and water table elevations. Channel and streambed degradation is listed as a Habitat Limiting Factor Addressed for 16 of the 19 habitat projects listed in Table 12. This is an indication of root causes of reduced summer base flow. Channel degradation reduces water table elevations. This is a legacy of past land use practices. Consider solutions that address and raise streambed and water table elevations. Projects that seek to raise water table elevations address root causes of reduced summer base flow. Such projects should rank highly for NEB.	CU Offset Development and NEB
13	Appendix I	I-6	Reduction of stromwater flows from 3.5 cfs to 3 cfs appears arbitrary. Provide justification for reduction.	other

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
13	Appendix I	I-7	NOAA Puget Sound Salmon Recovery Plan identifies alterations of natural stream hydrology as a high priority limiting factor in WRIA 13 and streamflow is important for supporting riparian vegetation and wetlands that provide shading, wildfire breaks, food web support, and flood and sediment attenuation functions. Develop more solutions that consider natural processes to improve NEB.	CU Offset Development and NEB
13	Appendix I	I-11	The Narrative Description for MAR projects mentions stormwater as a source for MAR projects. Yet, it is the only occurrence of the word "stormwater" in the entire description for Managed Aquifer Recharge Projects in WRIA 13, pages I-11 through I-34. Provide consideration of stormwater as a source for MAR projects.	CU Offset Development and NEB
13	Appendix I	I-12	"Favorable MAR locations were defined as those within 0.25 and 0.5 miles from a potential source stream or river" is the only bullet listed under "Distance to potential water source" This can be interpreted as a bias toward surface water extraction from natural stream flows to source water to MAR facilities. Provide consideration of stormwater as a source for MAR projects.	CU Offset Development and NEB
13	Appendix I	I-13 - 16	Many MAR facility locations are natural areas and there is no indication of natural resource impacts associated with the MAR. MAR sites could be an ecological benefit or impact depending on the MAR design. The MAR design could have passive controls that raise streambed elevations and increase floodplain inundation, or it could include forest clearing, berms for water retention and engineered diversions. Without a description of the design concept, NEB associated with MAR is difficult to determine. Improve description of MAR facilities to assist in determining NEB.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
13	Table 2	I-16	There appears to be no consideration of turbidity associated with high flows and turbidity's effect on operations and maintenance of MAR facilities. Consideration of turbidity with high flows will likely reduce the number of delivery days to offset operations and maintenance costs of MAR facilities. Consider turbid waters' plugging effect on MAR facilities and operations and maintenance costs.	CU Offset Development and Evaluation
13	Table 5	I-20	There appears to be no consideration of turbidity associated with high flows and turbidity's effect on operations and maintenance of MAR facilities. Consideration of turbidity with high flows will likely reduce the number of delivery days to offset operations and maintenance costs of MAR facilities. Consider turbid waters' plugging effect on MAR facilities and operations and maintenance costs.	CU Offset Development and Evaluation
13	Appendix I	I-22	"In the Puget Sound Salmon Recovery Plan, NOAA identifies the alteration of natural stream hydrology as a high priority limiting factor in WRIA 13 (NOAA 2007), and streamflow is important for supporting riparian vegetation and wetlands that provide shading, wildfire breaks, food web support, and flood and sediment attenuation functions." Solutions presented rely on further alteration of natural stream hydrology by removing surface water from natural streams during high flows. The Plan does not provide a convincing evaluation of using stormwater sources which would reduce alterations of natural stream hydrology. Develop and evaluate projects that reduce alterations of natural stream hydrology and avoid further manipulation of natural stream processes. The Plan should use caution when citing the quote from the Puget Sound Salmon Recovery Plan and claiming in the following paragraph that further manipulation of natural stream hydrology will provide a benefit to juvenile salmonids.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
13	Appendix I	I-23	"The rates of diversion will be precisely maintained through engineering controls" does not consider the effects of sediment transport dynamics in natural alluvial systems.	CU Offset Development and NEB
13	Appendix I	I-33	"Groundwater recharge rate will be maintained through a program of periodic rehabilitation of the infiltration structure(s)." Rehabilitation could mean a number of things including excavating MAR facilities and screening out fines, which is not compatible with some of the natural areas identified as MAR locations. Description of operations and maintenance actions associated with MAR facilities is inadequate for assessing NEB.	CU Offset Development and NEB
13	Appendix I	I-43 - I-47	The straight alignment of Chambers Creek represents excavated wetland drainage ditches. It is commendable to increase sinuosity, but the apparent historical impact also includes reducing streambed elevations. The description does not address streambed elevations. Increasing streambed elevations would increase water table elevations and address root causes of reduced summer base flows. It is unclear if raising streambed elevations in Chambers Creek is considered. Please identify if streambed elevations will be raised to raise water table elevations.	NEB
13		35	The Water Rights Opportunities are the ones that seem to most directly off-set consumptive use estimates. MAR next, then LID and stormwater projects. My concern with the LID and stormwater is they are infiltrating stormwater into groundwater, and I would think there would be some WQ or contaminant issues. None of the MAR projects appear to use recycled Class A water from water treatment plants.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
13		36	Good to see not considering the LID projects and Woodard Creek projects due to uncertainties. No action required.	CU Offset Development and NEB
13		37-38	There seems to be quite a bit of uncertainties with Schneider's Prairie project. Revisit whether offset is warranted given uncertainties.	CU Offset Development and NEB
13		38	Donnelly Drive Infiltration Galleries – I would be concerned about WQ and pollutants with this project. Address concerns about pollutants in stormwater.	CU Offset Development and NEB
13		45-46	Zangle Cove and Evergreen State College appear to be marine armor removal. This would not seem to meet the guidelines for habitat project offsets as they don't mention marine or nearshore projects. I would suggest removing these two projects or providing justification so it offsets freshwater habitats.	CU Offset Development and NEB
13		50	The 1,801 AFY far exceeds estimate of 434 AFY of consumptive use, but I think the 1,801 is still a liberal estimate. I would ramp that back based on the number of off-set projects that are purely conceptual or seem to have some issues. Authors should reconsider estimates of offset for more uncertain projects.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
13		52	I understand that the term Net Ecological Benefit is undefined, but it appears it is being defined as the offset projects exceeding the estimated consumptive use. Figuring out what a reduction in stream flow would mean for fish would require detailed hydraulic mapping and isn't really feasible at the watershed scale. For habitat projects one could come up with an increase in amount of habitat or juvenile salmon capacity based on area or length of stream habitat created or improved. However, I'm not sure it would add much because the habitat projects aren't being used for the offset. (Comment – no specific action required)	CU Offset Development and NEB
13		53	It is concerning that 4 subbasins are projected to have surpluses and 5 deficits. This coupled with uncertainties around implementation of projects and somewhat liberal estimates of total offset are a concern. Consider revising estimates of volume of offsets. The lack of projects in so many sub-basins is a concern, but not sure how it can be addressed.	CU Offset Development and NEB
13	Table 12		Again, I'm not sure the nearshore projects should be included. Not saying they aren't good projects, but given they are in marine environment, they aren't doing anything for instream flows. Consider removing these projects or provide justification how offset freshwater habitats.	CU Offset Development and NEB
13	Appendix 12	I-2 – I-5	Donnely Drive Infiltration Gallery - no project sponsor. Has a sponsor been identified? Adds to uncertainty related to benefits.	CU Offset Development and NEB
13	Appendix 12	I-11 to I-14	MAR projects are all very conceptual. Reconsider or justify estimate of offset.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
13	Appendix 12	I-25 to I-34	Schnieder's Prairie projects has several uncertainties. Reconsider estimates of offset.	CU Offset Development and NEB
13	Appendix 12	I 58- I 59	WRIA 13 General Floodplain Rest. Projects – all conceptual, no sponsors for any of the projects to date. Seems low likelihood any will be implemented given lack of sponsors, and this was an analysis done by consultant independent of any of salmon recovery groups doing restoration work. The authors should clarify if any of groups doing salmon recovery are considering using this analysis and any of projects identified.	CU Offset Development and NEB
13	General Comments		• Population and PE forecasts are consistent among 13, 14, 15 • CU estimates are consistent and conservative • Projects supply the required water offsets • Habitat projects are numerous and are based upon projects supplied by committee members, lead entities • An inconsistency is for MAR quantities – different method used in WRAI 13 and 14 compared to 15 for water availability/MAR offset	CU Offsets
13	2.1.3	8	First paragraph "changing weather patterns" - do you mean climate change? Also says "summer flows are expected to change" - should say summer flows are expected to reduce or similar wording. Sentence should be more direct	General
13	2.3.3	*16*	Footnote 24 - is that correct?	General

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
13	2.3.3	18	Third paragraph. Sentence starting "Comparison of August…" should have a reference. The 7.2 deg F also seems high, I don't think its correct. Take a look at USFS NorWeST site https://www.fs.usda.gov/rmrs/tools/stream-temperatures-monitoring-and-modeling for a better estimate. A quick check indicates a 2.4 deg C rise - < 5 deg F	General
13			general comment - found font sizes that weren't consistent in document.	General
13	4.3.1	28	second to last bullet - was that truly a "weighted average"? How was weighting done?	CU Offsets
13	5.2.1.1	35	The "flow rate estimated as less than 2% of minimum flows" seems arbitrary. How was that selected and does that affect the potential size of the MAR project compared to projects in other WRIAs?	CU Offsets
13	5.2.7.1	39	The Hicks Lake infiltration volume equals a flow of 3 cfs for only 49 days. Is that too conservative?	CU Offsets
13	5.3	45	"marginal offset benefit by increasing seasonal storage" - isn't that what the Schneiders Prairie project is?	CU Offsets
13	5.5.3	50	second paragraph. "water storage and stream augmentation". Should be rewritten to say MAR and infiltration projects?	CU Offsets
13	Appendix J		Appears to be redundancies in project descriptions in the appendix.	CU Offsets
13	Appendix H	6	last sentence - spelling error, should be "acres"	CU Offsets
13	App H, Section 5.2	9	2nd paragraph - is that the method used in the plan?	CU Offsets

WRIA 14

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
14	all	all	**Overall Summary: The plan identifies a total of 8 water offset and 23 habitat projects that would provide an anticipated offset of 1,725 AFY to benefit streamflows and enhance the watershed.**	All
14	all	all	**The plan projects 4,294 new permit-exempt domestic well connections (PE wells) over the planning horizon. Associated consumptive use with the new wells is 760 AFY**	All
14		all	General comment - Many projects are still very conceptual thus the likelihood of these being implemented is low. I would recommend they dial back their offset of 1,725 to include on the highly likely projects.	CU Offset Development and NEB
14		34	Indicated that highly conceptual projects were removed though it seems like there are many that are still highly conceptual that could be removed.	CU Offset Development and NEB
14		36	Based on details in Appendix I, these projects seem highly conceptual.	CU Offset Development and NEB
14		37	Based on details in Appendix, this is just an analysis of available water rights with some assumption that 10% would be willing to sell.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
14		37	Mason County Rooftop Runoff – Based on assumption of full build-out.	CU Offset Development and NEB
14		38	City of Shelton Reclaimed Water – This seems like most likely of proposed offsets for this WRIA.	CU Offset Development and NEB
14		40	Summit Lake Water System – This seems highly conceptual and based on Appendix I doesn't have homeowner support at this time. Good to see that this wasn't included as an offset.	CU Offset Development and NEB
14	Table 9	49	Chapman Cove project sounds like a marine shoreline or nearshore project and not sure how would off-set consumptive use of well or stream water.	CU Offset Development and NEB
14	Table 9	50	How do acquisition projects off-set consumptive use?	CU Offset Development and NEB
14	Table 9	50	Oyster Bay CE – this is estuarine and marine shoreline. Not clear how would off-set consumptive use.	CU Offset Development and NEB
14	Table 9	51	Case Inlet Bulkhead removal and Little Skookum CE Acquisition are estuarine and marine shoreline projects, not clear how would off-set consumptive use.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
14		56	See comments for WRIA 13 about NEB definition and calculation.	CU Offset Development and NEB
14		57	Surpluses in 5 subbasins and deficits in 3 subbasins though deficits are small with 2 of 3 less than 10 AFY.	CU Offset Development and NEB
14	Table 10	58	With exception of City of Shelton RW/WCC Source Switch (459 AFY) Most of these are highly conceptual. However, if you reduce all the others by half there is still an offset of 1,092 AFY which results in NEB of 332 (1092-760 AFY).	CU Offset Development and NEB
14		60-61	Again, I would remove those that are marine nearshore/estuarine projects. As I note in my comments for appendix, many of these are highly conceptual.	CU Offset Development and NEB
14		74	There is a large surplus, but if you remove many of the highly conceptual projects or reduce the benefit of these highly conceptual projects by half, you are left with a NEB of 332.	CU Offset Development and NEB
14	Appendix I	I-2	Shelton Water Reclaim – in design phase – seems high likelihood	CU Offset Development and NEB
14	Appendix I	I-8	Evergreen Mobile Home Estates Water System Consolidation -decommission wells and go on city water. Direct benefit.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
14	Appendix I	I-12	MAR Projects – These seem very conceptual with only potential locations identified and feasibility seems unknown. Thus, there is high uncertainty of these being implemented. MAR offset of 910 seems high given uncertainty.	CU Offset Development and NEB
14	Appendix I	I-24	Mason County Rooftop Runoff for new rural residential developments of 5 acres or more – requires that proposed requirement is adopted. No indication of how likely this is.	CU Offset Development and NEB
14	Appendix I	I-33	Steamboat Middle Storage Enhancement and Habitat Improvement -expand water storage in an existing forested/non-forested wetland. – because still conceptual only claiming 14 AF/Y	CU Offset Development and NEB
14	Appendix I	I-36	Summit Lake Alternative Water Supply (235 homes) – currently use surface water from Summit Lake…not an offset if pump groundwater or take surface water. Also, would restrict irrigation if on new source which would be a benefit. This seems like an unlikely project with no funding source or homeowner cooperation to date.	CU Offset Development and NEB
14	Appendix I	I-42	Water Right Acquisition – took 90% of available rights. Unclear if anyone interested in selling.	CU Offset Development and NEB
14	Appendix I	I-45	WRIA 14 General Floodplain Restoration Project – Like WRIA 13, this was just based on GIS analysis no idea if feasible or interest in funding these.	CU Offset Development and NEB
14	Appendix I	I-51	Goldsborough Hilburn Restoration Project – Sponsored by SPS Salmon Enhancement Group – seems to be high likelihood of implementation.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
14	Appendix I	I-54	Skookum Valley Ag Project – Sponsored by Squaxin Tribe. – high likelihood.	CU Offset Development and NEB
14	Appendix I	I-58	Skookum Valley Railroad Culvert Blockages – Squaxin Island Tribe – Still need approval of railroad owners.	CU Offset Development and NEB
14	2.3.3	19	Climate impacts discussion isn't consistent with WRIA 13. This description is better and perhaps should be used in WRAI 13 plan.	General
14	4.3.1	28	at end of page starting with "60 gallons per day….". Formatting is off, perhaps this was a sub-bullet?	CU Offsets
14	4.3.1	29	Same comment as in WRIA 13 plan - how was IR weighted average calculated?	CU Offsets
14	5.2.1	*36*	Same comment as for WRA 13 - 2% of minimum flows, how was that arrived at?	CU Offsets
14	5.2.1.2	37	10% assumption for water rights - based on recent personal experience that seems high	CU Offsets
14	5.2.8.1	42	1st paragraph - "… no longer being unused." Do you mean "used" instead? Also, our experience with water system consolidations are the larger system wants to acquire the water rights of the smaller system	CU Offsets
14	5.2.8.1	42	2nd paragraph - seems like other projects that had a high degree of uncertainty weren't counted against the offset. Consider not counting this one, even though its small	CU Offsets

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
14	5.2.9.2, table 7	45	Table 7 - MAR costs of $3.1 million seem very low. Note that only 685 AFY have high readiness to proceed and 760 AFY offset is required	CU Offsets
14	5.3	48	I didn't follow this section easily as Table 9 contains different types of projects, but floodplain restoration is the only type of project described in the text. Also, there are type of projects seemingly unrelated to streamflow restoration such as shoreline projects, barrier removals (is it someone else's responsibility to remove the barriers already?)	CU Offsets
14	5.5.2	54	Costs for MAR projects are very low	CU Offsets
14	5.5.3	54	2nd paragraph - "water storage, stream augmentation, and water right acquisitions". Not the correct list of types of projects	CU Offsets
14	6.2.2	58	1st row is a WRA 13, not a WRA 14 project. Delete.	
14	5.3	48	It's not clear how these projects tie into NEB, referring to later NEB section and stating these projects were used to meet NEB. Or in NEB section refer back to this section so there is a connection. Right now, it just says 25 projects are listed, didn't say it is the 25 from section 5.3	NEB
14	2.2.1	13-14	The Puget Sound Watershed Characterization Project identifies the following goals including recommending identification of root causes of watershed issues and development of appropriate solutions is deficient. A predominant root cause of reduced summer base flow is past land use practices and stormwater impacts. Past land use practices of removing wood from streams and draining wetlands resulted in reduced streambed and water table elevations. These land use practices coincided with increases in stormwater and associated water quality and quantity impacts. This does not appear to be appropriately identified and many solutions rely on further manipulation of	NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
			natural systems instead of restoration of natural processes. Consider more solutions that address and enhance natural processes. Wood additions can accrete sediments and increase water table elevations. Include discussion of projects that raise streambed elevations to raise water table elevations. Accreted gravels in streams act as filter media and improve water quality. If wood additions are coupled with riparian plantings, lateral stream migration can be arrested. Water quality is improved by shading stream flows and fine sediments tend to deposit on floodplains with intact riparian corridors.	
14	2.3.2	16	The text identifies that local groundwater flows toward streams. It is important to note that past land use practices of removing wood from streams and excavating drainage ditches through wetlands were performed to lower the water table, remove water from the landscape, and influence local groundwater trends to expedite water flow out of our streams to salt water. Recognize root causes of reduced summer base flows and develop strategies for reversing root causes to improve NEB.	NEB
14	2.3.3	17	The text recognizes the importance of water tables' ability to sustain flows during extreme conditions. If we acknowledge reductions in streambed and water table elevations due to past land use practices and we acknowledge that our shallow aquifers as reservoirs to sustain flows during extreme conditions, we must recognize the capacity of these reservoirs have been reduced through past land use practices and storm water impacts and identify these conditions as root causes of reduced summer base flows. Recognize root causes of reduced summer base flows and develop strategies for reversing root causes to improve NEB.	NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
14	3	20-22	Subbasin delineation appears appropriate	All
14	4.3	28-33	Consumptive use estimates appear reasonable	CU
14	5.1	35	The Beechie et al. 2013 citation appears misplaced, and it is not included in the References section. Check citations.	NEB
14	5.2.1.1	36	Many MAR facilitates source water from streamflows at high flow. Flow availability during such conditions appears to ignore the influence that turbid flows will have on operations and maintenance of MAR facilities. Feasibility analyses will likely reduce the number of days when diversion occurs due to the plugging effect of turbid flows. Consider the turbid waters' plugging effect on MAR facilities. Make estimates of turbidity during high flows. Evaluate if turbid flows can be allowed, or if they will increase operations and maintenance costs to such a level that the number of diversion days must be reduced.	CU Offset Development and Evaluation
14	5.2.1.3	37-38	LID projects directly address stormwater impacts to water quantity and quality. They also help address spatial disparities in CU impact and offset locations.	NEB
14	5.2.1.1	35	MAR offsets could be overestimated since there appears to be no consideration of turbidly effects on operations and maintenance costs. See comments on Appendices for further MAR comments. Consider turbid waters' plugging effect on MAR facilities. Make estimates of turbidity during high flows. Evaluate if turbid flows can be allowed or if they will increase operations and maintenance costs to such a level that the number of diversion days must be reduced.	CU Offset Evaluation

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
14	5.2.1.3	37 - 38	Mason County rooftop runoff infiltration delivers relatively clean stormwater to aquifers where future PE wells impact hydrology. There is likely no better source or location for aquifer recharge. Evaluate more opportunities for infiltration of stormwater.	CU Offset Development and NEB
14	6.2.2	59-60	Additional benefits to instream water resources bullet points are accurate, however, MAR benefits may be offset by impacts to natural resources. MAR projects appear to have a preference to use surface water withdrawals as a source of water. MAR project site descriptions do not identify if they will include land clearing and placement of berms to retain water. MAR project rehabilitation activities lack detail of operations and maintenance activities that could impact natural resources. Provide more detailed descriptions of MAR project concepts and anticipated operations and maintenance activities.	CU Offset Development and NEB
14	Appendix I	I-12	The Narrative Description for MAR projects mentions stormwater as a source for MAR projects. Yet, it is the only occurrence of the word "stormwater" in the entire description for Managed Aquifer Recharge Projects in WRIA 14, pages I-11 through I-24. Provide consideration of stormwater as a source for MAR projects.	CU Offset Development and NEB
14	Appendix I	I-14	"Proximity to potential source" only lists natural streams as water sources and that MAR facilities should be located. No stormwater sources are identified or appear to have been considered. Provide consideration of stormwater as a source for MAR projects.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
14	Appendix I	I-14	The number of diversion days available to divert streams flows appears to be no consideration of turbidity associated with high flows and turbidity's effect on operations and maintenance of MAR facilities. Consideration of turbidity with high flows will likely reduce the number of delivery days to offset operations and maintenance costs of MAR facilities. Consider turbid waters' plugging effect on MAR facilities and operations and maintenance costs.	CU Offset Development and Evaluation
14	Appendix I	I-14 - 16	Many MAR facility locations are natural areas and there is no indication of natural resource impacts associated with the MAR. MAR sites could be an ecological benefit or impact depending on the MAR design. The MAR design could have passive controls that raise streambed elevations and increase floodplain inundation, or it could include forest clearing, berms for water retention and engineered diversions. Without a description of the design concept, NEB associated with MAR is difficult to determine. Improve description of MAR facilities to assist in determining NEB.	CU Offset Development and NEB
14	Table 2	I-18	There appears to be no consideration of turbidity associated with high flows and turbidity's effect on operations and maintenance of MAR facilities. Consideration of turbidity with high flows will likely reduce the number of delivery days to offset operations and maintenance costs of MAR facilities. Consider turbid waters' plugging effect on MAR facilities and operations and maintenance costs.	CU Offset Development and Evaluation
14	Figure 1	I-20	There appears to be favorable geology for MAR facilities in the area around Shelton, WA, WRIA 14's most densely populated area, which likely produces the most stormwater in WRIA 14. Although the Plan says it considers stormwater as a source for MAR facilities, it is not evident. Only stream	CU Offset Development and Evaluation

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
			withdrawals are considered. Provide consideration of stormwater as a source for MAR projects.	
14	Appendix I	I-22	The Puget Sound Salmon Recovery Plan identifies the alteration of natural stream hydrology as a high priority limiting factor in WRIA 13 (NOAA 2007), and streamflow is important for supporting riparian vegetation and wetlands that provide shading, wildfire breaks, food web support, and flood and sediment attenuation functions." Solutions presented rely on further alteration of natural stream hydrology by removing surface water from natural streams during high flows. The Plan does not provide a convincing evaluation of using stormwater sources which would reduce alterations of natural stream hydrology. Develop and evaluate projects that reduce alterations of natural stream hydrology and avoid further manipulation of natural stream processes.	CU Offset Development and NEB
14	Appendix I	I-23	"The rates of diversion will be precisely maintained through engineering controls" does not consider the effects of sediment transport dynamics in natural alluvial systems.	CU Offset Development and NEB
14	Appendix I	I-23	"Groundwater recharge rate will be maintained through a program of periodic rehabilitation of the infiltration structure(s)." Rehabilitation could mean a number of things including excavating MAR facilities and screening out fines, which is not compatible with some of the natural areas identified as MAR locations. Description of operations and maintenance actions associated with MAR facilities is inadequate for assessing NEB.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
14	Appendix I	I-25 - 32	Mason County rooftop runoff infiltration delivers relatively clean stormwater to aquifers where future PE wells impact hydrology. There is likely no better source or location for aquifer recharge. Evaluate more opportunities for infiltration of stormwater.	CU Offset Development and NEB

WRIA 15

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
15	all	all	**Overall Summary: The plan identifies a total of 15 water offset and 31 habitat projects that would provide an anticipated offset of 2,873 AFY to benefit streamflows and enhance the watershed.**	All
15	all	all	**The plan projects 5,215 new permit-exempt domestic well connections (PE wells) over the planning horizon. Associated consumptive use with the new wells is 718 AFY**	All
15		35	Kingston Treatment Plant Recycled Water – uses recycled water. This affects one small stream (Grovers Creek) on North Kitsap Peninsula.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
15		35	Central Kitsap Treatment Plant recycle – Various uses Central Kitsap	CU Offset Development and NEB
15		36	Tahuya MAR OK, see appendix for feasibility.	CU Offset Development and NEB
15		36	South Hood Canal Lake Storage and MAR (Oak and Shoe Lakes) – This is a water storage project. Is raising elevation lakes and regulating them a good idea? I don't think it will change the ecology of the lakes. MAR seems theoretical.	CU Offset Development and NEB
15		36	Bainbridge Island MAR facilities –Bainbridge Island has low number of PE wells projected. Appendix, indicates It is sponsored and identified by city of Bainbridge Island thus it seems feasible.	CU Offset Development and NEB
15		37	Belfair Wastewater Treatment Plant – Currently operational and irrigates 70 AFY	CU Offset Development and NEB
15		37	Rocky Creek MAR – Seems to have detailed estimates in description, However, appendix indicates that project is conceptual and technical studies needed to determine feasibility.	CU Offset Development and NEB
15		38	M&E Stormwater Infiltration – conceptual? This is part of the City of Bainbridge MAR project. Seems feasible given proposed and outlined by City of Bainbridge.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
15		39	Ridgetop Boulevard Stormwater – two of three phases completed	CU Offset Development and NEB
15		39	Mason County Rooftop Runoff Program – See WRIA 14 comments.	CU Offset Development and NEB
15		40	Beall Creek Flow Improvement –Based on appendix diversion that is a barrier to fish passage. Seems very feasible.	CU Offset Development and NEB
15		40	Stream Augmentation – Pumping groundwater to augment streams seems to defeat purpose. I would remove this one and the 632 AFY.	CU Offset Development and NEB
15		40-42	I agree acquiring forest land would be good, but is this really an offset? Does have 2100 acres identified by project sponsors. I think some additional justification for this approach would be helpful or ecology could clarify if they have this in other areas.	CU Offset Development and NEB
15		42	Rain Garden and LID Package – Perhaps an overestimate of how many and how much. I would be more conservative about estimate as it seems dependent upon homeowner acceptance which may wain with time unless the homeowners see some benefit.	CU Offset Development and NEB
15		43	Water Rights on Vashon-Maury and Bainbridge – are there more details on likelihood of this. Bainbridge and Vashon don't have a very high number of PE wells and offset needed, do they?	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
15	Table 11	45-60	Little Manzanita has more than 2000 feet of shoreline and 2.5 acres of tidelands. Good to protect, but I don't think that offsets consumptive use projects. Big Beef Creek has some estuarine. That being said, all these habitat projects have sponsors so they seem likely they will eventually be implemented. There appear to be many good habitat projects in this list and level of detail is much higher than other two plans (WRIA13 an14). I think the difference between WRIA 15 and 13 and 14 is the salmon recovery dollars being spent in area and entities involved in salmon habitat restoration. The last project "WRIA-wide Beaver Project is mainly an assessment.	CU Offset Development and NEB
15		63	Yes 1.4 million is likely a better average estimate of cost of projects.	CU Offset Development and NEB
15		64	Indicates that all projects in Table 6 have project sponsors and experience implementing these type of projects. However, Table 6 is just the summary of off-sets by basin, so I don't think the statement could really apply to all the types of water offset projects could it?	CU Offset Development and NEB
15		65	While I think there are number of projects in the offset list that have high probability of being implemented, there are others that I think the estimates should be more conservative (e.g., LIDs, forest acquisition) and I think the estimate of 2,873 is too optimistic. I would remove South Hood Canal Lakes MAR (62), Mason County Rooftop Runnoff (71), Raingardens and LID (188), Forests for streamflow (241), and stream augmentation (632).	CU Offset Development and NEB
15	Table 13	68	Would be good to see this with the above projects removed.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
15		69	Again I'm impressed that all the habitat projects have sponsors and thus have a high likelihood of being implemented.	CU Offset Development and NEB
15		80	While I think there are some projects that should not be counted for the offset of consumptive use (see comment on page 65), there still appears to be a net ecological benefit if that is being purely defined as difference between potential consumptive use of 718 AFY and offset projects.	CU Offset Development and NEB
15	Appendix E	137	Tahuya River Managed Aquifer Recharge Project – States that is currently at the conceptual level and additional studies needed to determine feasibility. Thus, it should not be considered as part of offset.	CU Offset Development and NEB
15	Appendix E	144	South Hood Canal Lake Storage – Increasing surface area/storage and regulating flow may increase fish barriers. I would remove this one from plan/consideration for offset.	CU Offset Development and NEB
15	Appendix E	161	Rocky Creek MAR – Indicates it is conceptual and studies needed to determine feasibility.	CU Offset Development and NEB
15	Appendix E	166	Mason County Rooftop Runoff for new rural residential developments of 5 acres or more – requires that proposed requirement is adopted. No indication of how likely this is.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
15	Appendix E	192	Pumping groundwater to augment surface water and offset PE wells should be removed from consideration for offset.	CU Offset Development and NEB
15	Appendix E	198	Provides justification showing that young rapidly growing forests can transpire three times more than mature forests. So there is justification for this. The question is would these forests remain mature without protection?	CU Offset Development and NEB
15	Appendix E	211	Rain Garden and LID program. "Barriers to implementation of the WRIA 15 Rain Garden and LID Program include the availability of funding for new project construction and the willingness of private landowners to participate in the program." I think this means that this program is not a guarantee. I would reduce the expected offset as I suspect as time goes on it may be harder to find landowners willing to participate.	CU Offset Development and NEB
15	Appendix E	218	Water rights acquisitions Bainbridge and Vashon. "Barriers to project implementation could be the availability of project funding and the willingness of existing water right holders/property owners to sell their water rights and/or property." Thus, I think it is highly unlikely they will get an offset of 146 AFY.	CU Offset Development and NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
15	2.1.3	11	Primary limiting factors of: channel and streambed degradation, increased peak flows, low streamflow loss of upland forest cover, loss of riparian forest, and loss of floodplain connectivity and habitats all speak to past land use practices. Past land use practices of removing wood from streams and draining wetlands resulted in reduced streambed and water table elevations. These land use practices coincided with increases in stormwater and associated water quality and quantity impacts. This does not appear to be appropriately identified and many solutions rely on further manipulation of natural systems instead of restoration of natural processes. Consider more solutions that address and enhance natural processes. Wood additions can accrete sediments and increase water table elevations. Include discussion of projects that raise streambed elevations to raise water table elevations. Accreted gravels in streams act as filter media and improve water quality. If wood additions are coupled with riparian plantings, lateral stream migration can be arrested. Water quality is improved by shading stream flows and fine sediments tend to deposit on floodplains with intact riparian corridors. NEB should be evaluated based on how offsets address root causes of watershed issues through restoration of natural processes.	NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
15	2.2.1	13-14	The Puget Sound Watershed Characterization Project recommends Identifying root causes of watershed issues and develop appropriate solutions. A predominant root cause of reduced summer base flow is past land use practices and stormwater impacts. Past land use practices of removing wood from streams and draining wetlands resulted in reduced streambed and water table elevations. These land use practices coincided with increases in stormwater and associated water quality and quantity impacts. This does not appear to be appropriately identified and many solutions rely on further manipulation of natural systems instead of restoration of natural processes. Consider more solutions that address and enhance natural processes. Wood additions can accrete sediments and increase water table elevations. Include discussion of projects that raise streambed elevations to raise water table elevations. Accreted gravels in streams act as filter media and improve water quality. If wood additions are coupled with riparian plantings, lateral stream migration can be arrested. Water quality is improved by shading stream flows and fine sediments tend to deposit on floodplains with intact riparian corridors. NEB should be evaluated based on how offsets address root causes of watershed issues through restoration of natural processes.	NEB
15	2.3.3	17	"Practically all streams in WRIA 15 are augmented by groundwater discharge and many would go dry if groundwater recharge during precipitation became insufficient to maintain streamflow during dry periods (Ecology 1981)." This statement recognizes the importance of water tables' ability to sustain flows during extreme conditions. If we acknowledge reductions in streambed and water table elevations due to past land use practices and we acknowledge that our shallow aquifers as reservoirs to sustain flows during extreme conditions, we must recognize the capacity of these reservoirs have been reduced through past land use practices and storm water impacts and identify these conditions as root causes of reduced summer base flows. Recognize root causes	NEB

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
			of reduced summer base flows and develop strategies for reversing root causes to improve NEB.	
15	5.2.2	40	Stream augmentation from pumping groundwater will rely on electricity to pump water for streamflow augmentation. Electric supplies will become more at risk during fire season as climate change worsens. Utilities may preemptively shut off power to avoid causing wildfires, or electricity may be cut off due to wildfires.	CU Offset Development and NEB
15	5.2.2	40-42	Forests for Streamflow Package addresses root causes of reduced base flow, but actual project implementation appears highly speculative with regard to project locations and sponsors.	
15	Appendix E	137 - 143	Tahuya River Managed Aquifer Recharge Project uses streamflow during the wet season as source water to feed infiltration galleries. Flows during the wet season will have a high incidence of turbidity and infiltration galleries will be prone to plugging effects of turbid flows. Maintenance of MAR facilities has not been adequately described and could be extensive. A viable alternative would be extensive large wood placements with the intent to raise streambed elevations in the main stem Tahuya River and tributaries to raise the water table and enhance habitat. This will also make valley bottoms more resilient to fire risk.	CU Offset and NEB
15	Appendix E	143 - 148	South Hood Canal Lake Storage and Managed Aquifer Recharge South Hood Canal Lake Storage and Managed Aquifer Recharge relies on water control structures to be "precisely maintained through engineering controls." Engineered controls can fail, they typically require upgrading, operations and maintenance costs are undervalued, and fish and wildlife habitat value is diminished.	CU Offset Development and Evaluation

WRIA	Section/ Fig/ Table	Page	Review Panel Comment	Tech Aspect
15	Appendix E	150	The Manzanita Creek Miller Road Parcel Infiltration Project should establish clarity of whether the tributary is a natural stream or constructed drainage feature.	CU Offset and NEB
15	Appendix E	161 - 165	Rocky Creek Managed Aquifer Recharge Project diverts surface flows, which can be considered an impact to natural resources. Its benefits are highly uncertain.	CU Offset and NEB
15	4.3.1	26	CU calculation is fine, WRIA 13/14 say they use a weighted average but not explained in those documents. Nothing to change here, pointing out inconsistency	CU Offset
15	5.1	30	Use of "reasonable" - reasonable assurance used in document. "Reasonable benefit" not used and the use of reasonable in 2 places close to each other is confusing. Would replace 2nd use of reasonable with adequate or something similar - section 5.2 has another filter - "greatest potential for implementation"	CU Offset
15	5.1	31	1st paragraph. Other WRIA plans used 10% of identified water rights as possible acquisitions. This plan didn't appear to use same approach	CU Offset
15	5.2	32	note cost of MAR - more reasonable than WRIA 14 plan	CU Offset
15	5.2.1	36	note different approach from WRA 13/14 on MAR quantities in Tahuya River project	CU Offset
15	5.2.1	37	Belfair project - list MAR offset of 70 AFY to be consistent with other project descriptions. Just lists plant capacity now	CU Offset
15	5.2.1	37	Rocky Creek MAR - MAR quantities not consistent with WRIA 13/14 approach	CU Offset
15	5.2.2	43	Water Rights - consistency with other WRIAs? 10% used in WRIA 14	CU Offset

Watershed Restoration and Enhancement Plan Tribal and Public Comments

Summary

At the May 24, 2023 board meeting staff and panel members presented the draft Watershed Restoration and Enhancement Plan Review Report. After the board meeting, staff and the panel packaged the draft report as well as the panel's detailed comment matrix for public comment. The Recreation and Conservation Office offered an opportunity to review and provide comments on the Watershed Restoration and Enhancement Plan Review Report and table of technical comments from the review panel. Documents were made available online on RCO's website. The review period was between July 27 and October 13, 2023. RCO received eleven comments which are provided as Attachment B. After reviewing the public comments the panel revised the draft report in response to some of the comments received. The changes to the draft report are shown in track changes and also summarized in the table below. RCO notified the commenting parties of the revised report, comment table, and of the December 2023 board meeting where the final report will be presented.

Commenting Party	WRIA	Changes made to report
Center for Environmental Law and Policy	7, 8, 13, 14, 15	Added mention of uncertainty of streamflow benefits to WRIA 7 and 8. Added recommendation that after project offsets are revised or removed, that the remaining projects be re-evaluated to ensure consumptive use can be offset and net ecological benefit can be achieved.
City of Bainbridge Island	15	Added recommendation to update list of projects based on current information.
Deschutes Estuary Restoration Team	13	Refer to the plans reviewed as the final draft plans provided by Ecology, not the plans unapproved by the watershed committees. Added recommendation for monitoring and adaptive management.
Kitsap County	15	Added recommendation to update list of projects based on current information.
Kitsap PUD	15	Deleted comment regarding loss of electricity because of potential wildfires
Port Gamble S'Klallam Tribe	15	Added a sentence to indicate that forestry projects are meant to prevent future groundwater depletion.
Snoqualmie Tribe	7, 8	Added recommendation for monitoring and adaptive management for all plans. Added recommendation that after project offsets are revised or removed, that the remaining projects be re-evaluated to ensure consumptive use can be offset and net ecological benefit can be achieved.
Squaxin Island Tribe	13, 14, 15	Added recommendation for monitoring and adaptive management for all plans. Added recommendation that after project offsets are revised or removed, that the remaining projects be re-evaluated to ensure consumptive use can be offset and net ecological benefit can be achieved. Added recommendations that additional offset projects be considered to improve spatial distribution across the WRIA.
Commenting Party	**WRIA**	**Changes made to report**

Table 1. Public Comment Summary

Suquamish Tribe	15	Added recommendation for monitoring and adaptive management. Added recommendation that after project offsets are revised or removed, that the remaining projects be re-evaluated to ensure net ecological benefit can be achieved.
Thurston County	13, 14	The report recommends evaluating stormwater as a source. It now recommends evaluating stormwater as a source, including water quality.
Washington Department of Fish and Wildlife	14, 15	Added recommendation that after project offsets are revised or removed, that the remaining projects be re-evaluated to ensure net ecological benefit can be achieved.

CLEAN, FLOWING WATERS FOR WASHINGTON
The Center for Environmental Law & Policy

August 10, 2023

Recreation and Conservation Office
Attn: Director and Board

RE: Watershed Restoration and Enhancement Plan Review Comments

The Center for Environmental Law and Policy (CELP) appreciates the opportunity to comment on the Watershed Restoration and Enhancement Plan Review for WRIA's 7,8,13, 14 and 15 completed by the Salmon Recovery Funding Board. CELP participated in the watershed planning committees for WRIA's 7, 8 and 13. And followed the planning process for 14 & 15 closely, and we have several key concerns.

Our primary concerns are summarized below:

1. Consumptive use estimates for WRIA's 13, 14 & 15. Estimating outdoor water use is a highly uncertain aspect of projecting future consumptive use impacts, and the fact that different methods were used in different WRIA's based on the consultant that was hired has resulted in grossly underestimating the consumptive water use that needs to be mitigated in WRIA's 13, 14 and 15. These areas are predominantly rural areas where lots are larger, and more likely to use outdoor irrigation at an increased level over more urban areas like WRIA's 8. The consumptive use in WRIA 8 is .42 acre-feet per year per well compared to WRIA 13's .15 af, WRIA 14's .16 af and WRIA 15's .121 af. The planning process required a reliable estimate of future consumptive use to develop an adequate offset portfolio of projects capable of replacing water. These lower consumptive use numbers result in a lower number of projects to offset and replace the water lost. We are concerned that this will result in lower flows and devastating impacts to salmon and other aquatic species in WRIA's 13, 14 & 15. We think these consumptive use numbers should be re-evaluated, and new water offset projects be added to the plans.

2. Uncertainty related to the streamflow benefits. The determination of a given project's contribution to increased streamflows is complex. Ensuring that many of the claimed streamflow benefits described in these plans would require significant analysis beyond the extent conducted during the planning process. We agree with your determination that flow benefits from highly conceptual managed aquifer recharge projects and water right acquisitions that lack identified locations and specificity related to the timing of their anticipated benefits. The disproportionate reliance on these conceptual water replacement projects makes it challenging to evaluate the plan's ability to successfully offset estimated impacts. WRIA 9 discounted the amount of water replacement from manage aquifer recharge projects and added a safety factor to the amount of water that needed to be replaced by 1.5%. This might be an option to address the issue.

3. Uncertainty related to implementation of the plan's components. Various aspects of project implementation carry additional uncertainty. Many projects appear to lack clear sponsors willing to pursue the necessary funding, permits, landowner agreements, or other crucial project development tasks necessary to ensure their implementation. Ecology is not required by the legislation to fund these projects, and funding could be gone by the time they find a sponsor for these projects.

4. Tribal Concerns. We believe that these plans did not incorporate the concerns of the tribes that participated. Some of the concerns they raised were about certain projects that were included for water offset, and with the methodology used to determine outdoor consumptive use. More needs to be done to make sure these concerns are addressed before these plans are adopted.

We agree with your comments regarding project location respective to the water use impacts, relying on year-round use without acknowledging that summer use is greater. We also agree that the highly conceptual projects be removed and replaced with projects that can improve flows. These plans do not do anything to account for climate change, or any process for revaluations of water offsets if most of the water projects are not feasible in the coming years. More work needs to be done on these plans to adequately mitigate the impacts of new domestic wells.

We appreciate the opportunity to comment on the review of your plan, and I hope you will reconsider our comments.

Sincerely,

Trish Rolfe
Executive Director

CITY OF BAINBRIDGE ISLAND

Department of Public Works – Engineering

August 10, 2023

Megan Duffy, Director
Recreation and Conservation Office
1111 Washington Street S.E.
Olympia, Washington 98501
VIA Email: rco-director@rco.wa.gov

RE: Water Resource Inventory Area (WRIA) 15 Streamflow Restoration Plan Comments

Dear Director Duffy,

Thank you for the opportunity to comment on the Water Resource Inventory Area (WRIA) 15 Streamflow Restoration Plan before it proceeds to the rulemaking process. The City of Bainbridge Island is interested in being an active partner in the future of sustainable streamflows in the Kitsap region. Please consider including these changes in your next draft of the plan.

City of Bainbridge Island Comments

- The M&E Farm Stormwater Infiltration (15-BI-OP2) is now called the Bainbridge Island Native Food Forest Stormwater Park. Design is complete and the engineer's estimated cost for construction is about $900,000. (increase likelihood multiplier to 0.9)
- The Forest for Streamflow project on Bainbridge (Springbrook Preserve) is complete and should be removed from the list (subtract 3.2 AF/Y).
- The Winslow WWTP Reclaimed Water project should be added back into the plan. Recent conversations with the Wing Point Country Club indicated that they may be interested in using the reclaimed water. The water offset quantity for the WRIA 15 Watershed Plan is preliminarily estimated to be up to 45 AFY from the golf course based on current water usage and existing water rights. (add 45 AFY). See attached project description from a previous draft of the WRIA 15 plan.

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CITY OF BAINBRIDGE ISLAND

Department of Public Works – Engineering

- Replace Miller Rd managed aquifer recharge (MAR) project with Fieldstone Lane Bioretention. The Miller Rd project diverts a disconnected natural stream channel and may be infeasible. Fieldstone Lane bioretention is a nearby project with a slightly smaller contributing basin (subtract 19 AFY, add 4.5 AFY based on the ratio of contributing area basin size to Miller Rd MAR). See attached conceptual project description from a recent watershed assessment project.

We look forward to reviewing the final plan and following the rulemaking process. Please reach out to us with any follow up questions. Thank you for your work on this important body of work.

Sincerely,

Christopher Wierzbicki
Public Works Director

Attachments:
Fieldstone Lane Bioretention Project PDF
Winslow WWTP Reclaimed Water Project PDF

Cc:
Kathryn Moore, RCO

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Bainbridge Island, WA 98110-1812
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October 13, 2023

Megan Duffy, Director
Washington State Recreation and Conservation Office
PO Box 40917
Olympia, WA 98504-0917

[Sent via electronic mail to rco-director@rco.wa.gov]

Re: WRIA 13 Watershed Restoration and Enhancement Plan Review

Dear Director Duffy:

Thank you for the continuing opportunity to provide comments on the report on the technical review by the RCO of the draft final plan for WRIA 13 (Deschutes) ("Plan") written by the Watershed Restoration and Enhancement Committee (WREC) created for the watershed under the Streamflow Restoration Act (RCW chapter 90.94)(the Act). The below comments are in addition to the comments already provided by DERT to the Recreation and Conservation Office (RCO) and the Salmon Recovery Funding Board (SRF Board) earlier this year. We appreciate the extension of time until October 13 to provide more complete comments, and express our concerns about both the process and the content of the plan delivered by the Department of Ecology (Ecology) to RCO for its review.

We would like to thank you once again for promptly providing us with a copy of the Memorandum of Understanding (MOU) between RCO and the Ecology with regard to review of the final draft plan, after months of our unsuccessful attempts to get a copy from Ecology.

The Deschutes Estuary Restoration Team (DERT) was the environmental representative to the WREC from its inception in 2018 until its last meeting in April 2021. As we believe you are aware, between 2018 and April 2021, the WRIA 13 WREC developed a detailed and comprehensive plan to meet the requirements under the Act. Per the provisions of the Act (RCW 90.94.030(3)), all members of the WREC were required to "approve the plan" prior to adoption by the Ecology. At its April 2021 meeting, every member but one (including Ecology) voted to approve the final draft plan. The member representing the building industry objected to one provision in the final draft plan. That provision recommended the adoption by Ecology of new and updated instream flows. Other members pointed out that by objecting to that provision, and not voting to approve the Plan, the representative was in fact triggering the mandatory rulemaking process under RCW 90.94.030(3)(h). Nonetheless, the building industry representative maintained its position until the June 30, 2021 deadline for approving a plan.

After June 30, 2021, Ecology unilaterally, and without consulting WREC members, made major modifications to the draft Plan developed by the WREC, and submitted it to the RCO in 2022. Ecology did not have the authority to make those changes, which substantially altered both the plan and the evaluation of whether it will achieve net ecological benefit in the watershed.

Since 2009, DERT has been an advocate for the removal of the Fifth Avenue Dam (which created Capitol Lake in 1951), and restoration of the free-flowing Deschutes River, its watershed, and the estuary where the river meets Budd Bay. In this role it has actively been supported by the Squaxin Tribe, local organizations, and many citizens of the area.

As you are no doubt aware, in October 2022 the Washington Department of Enterprise Services (DES) completed a final Environmental Impact Statement (EIS) evaluating the alternatives for the Deschutes River/Capitol Lake, given its multiple environmental, ecological, cultural, and aesthetic problems. The final EIS concluded that the preferred alternative is in fact removal of the dam, and restoration of the river and estuary, for multiple reasons—including reversing the destruction to cultural and historic sites of significant value to the Squaxin Tribe. In 2023 the Legislature appropriated an initial $7 million to DES to begin the planning and permitting process for dam removal and estuary restoration, which DES anticipates taking three to five years before actual construction begins.

This is an exciting development, and will significantly affect the entire watershed, including full watershed restoration and enhancement that the 2021 WREC Plan is intended to provide. It is in this context that we offer the following comments.

Comments

We want to note at the outset that the Squaxin Tribe has provided us with a copy of their October 9 comments on the RCO draft technical analysis, along with other documents provided to Ecology as part of the WREC process since 2018. We fully support the comments of the Squaxin Tribe, and defer to their technical expertise and knowledge of the full watershed. We will avoid, in our comments, simply duplicating what the Tribe has said.

The Streamflow Restoration Act, and the plans developed under them, have two fundamental problems:

- There is very little actual data regarding water use from exempt wells, because those withdrawals are not metered. For that reason, the Plan could make some educated guesses as to the 20-year impact on the watershed from those withdrawals, but those guesses could be wildly off. The WREC recognized that, and supported adding buffers and adaptive management where possible to ensure that potential impacts were not minimized. In addition, the WREC unanimously agreed to create a Deschutes Watershed Council that, over time, would monitor uses and impacts and tweak the plan as needed. The need for this is quite evident. For instance, as of April 2021, Ecology had not received any of the annual reports accounting for building permits and new subdivisions using new exempt wells, as required under RCW 90.94.030(4)(v). We believe that those reports would be provided if the Deschutes Watershed Council were monitoring data collection.

- There is no provision for implementation of the plan, or accountability for mitigation projects. Ecology repeatedly stated to the WREC that, once a plan were adopted, it would not commit to taking any implementation actions. For that reason as well, the WREC agreed (unanimously) that the Deschutes Watershed Council would provide oversight for implementation of the mitigation measures, and coordinate with other activities in the watershed addressing related goals (e.g., TMDL plans; salmon recovery plans). This would be important for routine communication, and avoiding duplicative actions.

Key points (see below for statutory references)

1. The “final draft plan” submitted by Ecology to the RCO is not, as your review states, a plan that was prepared by the WREC. The “final draft plan,” as developed over 2 ½ years by the WREC and completed in April 2021, was substantially modified by Ecology after it was completed by

the WREC. Notably Ecology deleted an entire chapter with policy recommendations that included development of new instream flow rules, and creation of the Deschutes Watershed Council to monitor and coordinate implementation of the Plan. As a result, the plan submitted by Ecology to the RCO is considerably weaker than the plan drafted by the WREC. The Legislature provided Ecology with authority to unilaterally modify a plan, without consulting the WREC, only **after** receiving the analysis and recommendations from the RCO, not before. We request to the RCO that in its analysis it (1) not refer to the plan as the one that was developed by the WREC, and (2) review the changes made by Ecology, and include recommendations for restoration of the deleted and modified provisions that, if included, would make the plan more likely to achieve the objectives of the Streamflow Restoration Act, and also more likely to achieve a net ecological benefit for the watershed.

2. The Ecology plan completely ignores the direction in the Streamflow Restoration Act to address all projected consumptive uses of water over the 20-year planning horizon, and not just those forecast by the predicted increase in new exempt well uses. Ecology took the position at the beginning of the process that the plan would only address exempt well impacts, without any real explanation. In reality, the major existing water uses directly affecting the Deschutes River and its tributaries are well-known. For municipal water suppliers, their existing water system plans would provide information on their forecasted need for additional supplies, and withdrawals, to accommodate growth. Yet there was no effort to acquire and compile this information. For that reason, both the final draft plan and the Ecology plan do not meet the statutory requirements.

3. The initial review by the RCO states that the assumptions regarding exempt well use, and water withdrawals, over the 20 year period, appear to be valid and defensible. We would take issue with that, for the following reasons:

    - The number of exempt wells likely to be drilled over the next 20 years is highly speculative, based on well-intentioned forecasts of population growth, but only for medium growth scenarios. In the view of DERT, the best protection of the watershed required use of a higher-growth estimate.

    - The projected net impact on water resources from the exempt wells assumes a very high return flow to the underlying aquifers from septic system drainfield discharges. There is very little data from studies in Washington to support this assumption.

    - The absence of any metering of water withdrawn from exempt wells means that that water use is speculative, particularly with regard to outdoor water use—which is the highest use during the summer and fall months, which are also the times of year when instream flows are most critical. While there is/was general agreement on in-house water use (stable year-round), the figures for outdoor water use were derived from a statistical model that sampled rural parcels, estimated outdoor water use based on aerial photos, and provided no site visits to those parcels or other ground-truthing of the assumed irrigation. Most disturbing, when the consultants for the WRIA 13 WREC provided their estimates, using this approach, for review to colleagues in their office doing similar work in other watersheds, the conclusions were significantly different, indicating the highly subjective nature of the conclusions. Having accurate projections is critical to the forecast of potential withdrawals, and impacts to streamflows, over the 20-year planning horizon.

4. There is little to no analysis of the impact of climate change on the watershed, instream flows, or withdrawals within the watershed.

5. There is little to no analysis of the impact of other planning and regulatory requirements (e.g., the TMDLs for the Deschutes River, developed by Ecology and adopted by the Environmental Protection Agency and Ecology, respectively; both of which were pending and were adopted in final form after April 2021, and should be identified and included in the scope of the final Plan).

The RCO draft technical analysis of actions and projects

We agree with the evaluation done by the Squaxin Tribe, and the responses by the Tribe to specific statements in the RCO draft analysis. In particular, we fully agree that projects identified in the plan with little likelihood of implementation, or beneficial impact, should not be included.

Statutory Provisions

The following are specific statutory provisions that guide the process, including the review by RCO. It is important to understand and acknowledge the precise language used by the Legislature, which governs development of the plan as well as the RCO review, as follows:

- The plan developed by the WRIA 13 WREC, "***should*** include recommendations for projects and actions that will measure, protect, and enhance instream resources and improve watershed functions that support the recovery of threatened and endangered salmonids…." RCW 90.94.030(3) (a) [emphasis added]

- "***At a minimum***, the plan ***must*** include those actions ***that the committee determines*** to be necessary to offset potential impacts to instream flows associated with permit-exempt domestic water use…. " RCW 90.94.030(3)(b) [emphasis added]

- The plan "***must*** include an evaluation or estimation" of the cost of offsetting "new domestic water uses over the subsequent twenty years, ***including*** withdrawals exempt from permitting under RCW 90.44.050" RCW 90.94.030(3)(d) [emphasis added]

- The plan "***must*** include estimates of the ***cumulative consumptive water use impacts*** over the subsequent twenty years, ***including*** withdrawals exempt from permitting under RCW 90.44.050" RCW 90.94.030(3)(e) [emphasis added]

- In the event that the WREC is not able to unanimously agree to a Plan, the Director of Ecology "shall submit the ***final draft plan***" to the SRF Board to "provide a technical review ***and*** provide recommendations to the Director to amend the final draft plan, if necessary, so that actions identified in the plan, after accounting for ***new projected uses of water*** over the subsequent twenty years, will result in a net ecological benefit to instream resources….The Director [of Ecology] ***shall*** consider the recommendations and ***may*** amend the plan without committee approval prior to adoption….After plan adoption, the Director of Ecology "***shall*** initiate rulemaking within six months to incorporate recommendations into rules…." RCW 90.94.030(3)(h) [emphasis added]

- Prior to adoption of the plan, Ecology "***must*** determine that the actions identified in the plan, after accounting for ***new projected uses of water*** over the subsequent twenty years, will result in a net ecological benefit to instream resources within [WRIA 13] RCW 90.94.030(3)(c).

We believe that within the RCO review, and set of recommendations, there should be identification of whether the Plan, as provided to RCO by Ecology, meets the statutory requirements. We believe it does not.

Below is a table of the changes made by Ecology (provided by Ecology) that in summary form describes them. Note that Ecology deleted the offset "targets" agreed to by the Committee (making its own determination that they were not needed), and added salmon/habitat projects that were not included in the draft final plan developed by the WREC.

Plan Content	Change from Committee Draft Plan	Justification
Overall	Language changed from committee to Ecology in regards to authorship and recommendations of the plans.	Since these five plans were not completed by the statutory deadline, Ecology took on the role of completing them so they could be recommended to the SRFB. Nevertheless, Ecology retained significant committee input throughout the plan.
Executive Summary and Chapter 1	Removed committee specific language.	Used a template for consistency across all of the plans.
Figures and Tables	Updated to account for changes made to the plan (e.g. consumptive use, offset benefits, projects)	To reflect changes Ecology deeded necessary as the author of the plans.
Chapter 4: Offset Target	Removed the committee's inclusion of "offset targets."	The law requires the plan to offset the consumptive use and result in a net ecological benefit. In the WRIA. Neither the law nor POL-2094 not the NEB guidance requires an offset target. Nevertheless, some committees sought to include yet an additional safety factor. Ecology considers the consumptive use estimates an adequately conservative estimate and the plans all provide additional project offsets and habitat benefits beyond

		what is needed to offset consumptive use.
Chapter 5: Removed Prospective Projects	Removed section on prospective projects, but included language on Managed Aquifer Recharge (MAR) and Water Right (WR) acquisition projects.	Ecology recognizes that projects may be developed in the future that are not currently anticipated, but as written, a majority of the committee's conception of prospective projects was too conceptual to provide reasonable assurances that the plan offsets impacts and results in a NEB for the WRIA.
Chapter 5: Water Offset Projects	Removed offset discount on MAR projects.	Ecology determined the MAR projects were heavily discounted by the committee.
Chapter 5: Habitat Projects	Added new habitat projects that provide benefit to NEB based on information from project sponsors. Some new projects from the salmon recovery plans were added as well.	With additional time and resources to support project development, Ecology has completed additional work on a set of projects to increase the available information and likelihood of implementation.
Removed Committee Policy and Adaptive Management Recommendations	This section was removed from the body of the plans and included in the Appendix.	Ecology does not endorse the recommendations, but retains the recommendations out of respect for amount of effort and importance of these recommendations to some of the committee members.
Policy Rulemaking Recommendations	Added footnote in Appendix F	A footnote was added to the committee's rulemaking recommendation in order to clarify that it would not be possible to complete this type of rulemaking within the two year requirement for rule adoption stated in RCW 90.94.030(3)(h); and that Ecology will discuss with partner governments and stakeholders to explore options.

Revised Net Ecological Benefit Chapter	Revised to include Ecology's analysis and determination of whether the plans meet NEB.	The committee draft plans included the committee's NEB evaluation, prepared based on section 3.2.4 of the Final NEB guidance. The chapters were revised to summarize Ecology's analysis and determination that the plans achieve a NEB.

As mentioned above, one of the policy recommendations made in the final draft was to update the current instream flows, which were adopted more than 30 years ago, and are outdated. Ecology voted for this provision as a member of the WREC (only the building industry representative objected to it). Yet, even after moving the entire set of policy recommendations to an appendix, Ecology added a footnote saying that it could not do this within the two-year rulemaking period of RCW 90.94.030(3)(h)--an objection (and footnote) that it did not provide to the Committee before the vote on plan adoption. There is no explanation for the footnote, nor did Ecology discuss this concern with the WREC.

We are aware that some may consider the RCO's addressing some of the above issues as beyond the scope of the review directed by the Legislature for the final draft plan. We would argue that that is not the case, since all the points we make above can and should be included within a set of recommendations directed toward assuring that the Plan is implemented and will achieve net ecological benefit to the watershed's instream resources. As one example, the RCO and SRF Board could recommend creation of the Deschutes Watershed Council as an action, approved by the WREC, that would make it much more likely to achieve the full restoration and enhancement objectives as prescribed by the Legislature.

This is particularly true given Ecology's open ambivalence towards implementation, and actual completion, of not only the work envisioned in the Plan, but also other provisions of the Streamflow Restoration Act. For instance, under RCW 90.94.030(4)(b), the Legislature authorized Ecology to restrict withdrawals from new exempt wells to no more than 350 gallons per day in the event of drought emergency order being issued by Ecology. During the work of the WREC, there was such an emergency order issued for WRIA 13. When asked if they intended to limit exempt well withdrawals per this provision, it was not clear if Ecology had even considered it; Ecology's response was essentially that it would be too much work and too little gain.

We urge the RCO and the SRF Board to respect the work done by the members of the WREC, and the unanimity of its members on nearly every provision in the final draft Plan.

We want to note that we are now five years into the 20-year period to be covered by the Plan, and five years after the Legislature directed that the planning process be initiated. During that time, and under the terms of the legislation, new exempt wells, with unmitigated impacts to instream resources, have continued to be authorized under new building permits and subdivision approvals. And we anticipate this will continue until 2027, in all likelihood, assuming that Ecology will take a year to evaluate the RCO/SRF Board recommendations and modify and approve a final Plan (the same amount of time it took Ecology to transmit its version of the plan to the RCO), another six months to initiate rulemaking,

and another two years to complete rulemaking (the periods prescribed by the Legislature). In short, the Deschutes watershed will likely only begin to see restoration, enhancement, and offset measures begun nearly 10 years into the 20-year planning process. That is all the more reason for the RCO and SRF Board to ensure that the final Plan is robust and will actually accomplish what the Legislature laid out, and what the WREC attempted to ensure would be achieved.

Thank you for the opportunity to comment.

Sincerely,

David Monthie
President, Board of Directors
Deschutes Estuary Restoration Team (DERT)

Note: Also enclosed is a copy of the DERT "signing letter," provided to Ecology and the WREC at the time that DERT voted to approve the final draft Plan.

Joel Purdy, Water Resources Manager, Kitsap PUD

From: Joel Purdy <jpurdy@kpud.org>
Sent: Thursday, August 3, 2023 3:32 PM
To: RCO-Director (RCO) <rco-director@rco.wa.gov>
Cc: Angela Bennink <angela@kpud.org>
Subject: Salmon Recovery Funding Board's Watershed Restorations and Enhancement Plan Review Report

External Email

RCO Director,
The SRFB's review report is generally spot on in pointing out the positives and shortcomings of the WRIA 15 plan. However, there is one particular paragraph that I wanted to comment on. On p. 30 (p. 35 of 37 in the PDF), the second paragraph on the page within the Water Offset section of WRIA 15 review:

> *Stream augmentation from pumping groundwater twists a root cause problem into a solution. It will rely on electricity to pump water for streamflow augmentation. Electric supplies will become more at-risk during fire season as climate change worsens. Utilities may shut off power preemptively to avoid causing wildfires or electricity may be cut off due to wildfires. Providing generators as a solution to this concern does not address root causes of the problem.*

While I agree that an engineered solution (or "further manipulation of natural solutions") is not ideal, this project is one of the few, other than the reclaimed water projects, that actually puts a quantifiable amount of "wet" water into streams. The SRFB is asking to remove from the WRIA 15 plan "highly conceptual" projects from the offset project list. Yet, the scenario that a wildfire or a utility shutting off electricity for wildfire prevention could put this project at risk is a highly conceptual, speculative, and unlikely idea. This statement could be applied to every project that relies on electricity, yet it is not presented anywhere else in the report. You could also speculate "what if a fire happened?" for every project, but I could not find it elsewhere in the report. The scenario is also untrue. Even if the scenario happened, electrical outages are on the order of hours or days. That amount of time would have negligible impact on the project's overall offsets. **The presented scenario of a loss of electricity because of potential wildfires, a reach at best, should be removed.**

I did notice a few typos but felt it wasn't worth commenting on.

Thank you for the opportunity to comment on the report.

Joel

Joel W. Purdy, LHG
Water Resources Manager
Kitsap PUD
1431 Finn Hill Rd.
Poulsbo, WA 98370
Office (360) 626-7722

KITSAP COUNTY DEPARTMENT OF COMMUNITY DEVELOPMENT
Your partner in building, safe, resilient, and sustainable Kitsap County communities!

Jeff Rimack
Director

David Kinley
Assistant Director, CBO

Watershed Restoration and Enhancement Plan: WRIA 15 Kitsap Watershed

August 14, 2023

Recreation & Conservation Office
Olympia, WA

RE: Watershed Restoration and Enhancement Plan: WRIA 15 Kitsap Watershed

Dear Director Duffy,

I am writing to submit comments on behalf of Kitsap County on the *Watershed Restoration and Enhancement Plan: WRIA 15 Kitsap Watershed.* Protecting our water supply and streamflow and enhancing ecological functions in WRIA 15 are a high priority for Kitsap County. As a local jurisdiction, we represent all citizens of Kitsap County and manage both built infrastructure and natural assets that provide ecosystem services to our citizens and the environment.

Our comments are primarily limited to updates and corrections to County-sponsored projects or projects that involve Kitsap County in some way. Thank you for considering these comments in your review of this plan.

Project	Comment
15-WS-OP3. Ridgetop Blvd Stormwater	Cost estimate for this project in 2023 is at least $4 Million.
15-WS-OP1. Kingston Treatment Plant Recycled Water.	Cost estimate for this project in 2023 is $10.3 Million.
15-NHC-H2. Finn Creek Restoration.	This project subbasin should be West Sound, not North Hood Canal. Also, please add Kitsap County as a co-sponsor with Wild Fish Conservancy. Add to project description: *The project also includes replacement of a County-owned fish passage barrier culvert at the intersection of Buck Lake Rd NE and Hansville Rd NE. Kitsap County does not have a cost estimate for this culvert replacement at this time.* Current project cost estimate is approximately $2 Million according to Wild Fish Conservancy, but this estimate does not include the County culvert replacement.
15-NHC-H3. Seabeck Creek Watershed Restoration	Very little detail is provided on this project. It is unclear whether this project includes replacement of any County-owned water crossings. We suggest including additional information about this project.
15-WS-H1. Chico Bridge- Golf Club Hill NW	This project is complete and should be removed. If a replacement project is

	needed, we recommend consulting the 2014 Chico Creek Watershed Assessment (GEI_FormalRpt (westsoundpartners.org)). For example, the identified near term priority action to restore stream, floodplain, and riparian functions on County property at Erlands Point Park (Project C3 in the watershed assessment) may be a fit.

We also found a lot of ambiguity in the plan. We request that Ecology clarify the County's role and responsibilities regarding plan implementation.

Thank you for considering these comments in your review of the WRIA 15 plan. Please contact me with any questions.

Sincerely,

Brittany Gordon
Natural Resources Coordinator
Kitsap County Department of Community Development
bgordon@kitsap.gov
(360) 801-6240

PORT GAMBLE S'KLALLAM TRIBE
NATURAL RESOURCES DEPARTMENT
31912 Little Boston Rd. NE – Kingston, WA 98346

Dear Director Duffy,

The Port Gamble S'Klallam Tribe possesses reserved water rights recognized by the U.S. Supreme Court (*U.S. v. Winters*, 1908) for consumptive use on the Reservation with a priority date tied to the 1855 Treaty of Point no Point. Aboriginal water rights are further interpreted to guarantee treaty fishing, gathering, and hunting practices. In Washington State, the *Hirst* decision restricts new development that would impact protected streamflow or impair a senior water right. PGST previously took part in the streamflow restoration planning process mandated under the Streamflow Restoration Act (RCW 90.94.030), in response to *Hirst*, ultimately voting against approval of the WRIA 15 Watershed Restoration and Enhancement Plan. The draft of the plan submitted to the Recreation and Conservation Office for review by the Salmon Recovery Funding Board is largely unchanged from the version disapproved by Port Gable S'Klallam Tribal Council Resolution 21-A-056. The Tribe is disappointed that the present draft and SRFB review panel comments do not directly address many of the Tribe's concerns, and we sustain the objections and comments made previously. Below, we offer further observations reflecting on the content of the review panel's comments.

- We agree that assumptions in the Watershed Restoration and Enhancement Plan concerning permit-exempt well development rate and consumptive use are consistent and technically sound. However, the plan does not adequately consider potential changes to typical behavior of permit-exempt well-users from levels established in the analysis. The Puget Sound Lowland is expected to experience an increase in overall annual precipitation over the coming decades, characterized by higher-intensity rainfall during wet winters and longer, drier summers[1]. High-intensity rainfall events may diminish rain infiltration into groundwater systems in Kitsap, limiting the impact of increased annual rainfall on groundwater recharge[2]. As the review notes, water offsets are assessed for continuous implementation and not designed to mitigate increased summer demand and outdoor consumptive use, when low flows have significant impacts on fish, water quality, and – later in the fall – may dramatically limit spawning. The RCO review accurately notes this seasonal variability must be considered in further detail.

- The WRIA report includes mitigation strategies intended to prevent future groundwater depletion rather than compensating directly for anticipated growth, including the acquisition and conservation of existing water rights and the

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[1] Pitz, C.F., 2016, *Predicted Impacts of Climate Change on Groundwater Resources of Washington State*, Washington State Department of Ecology, Publication No. 16-03-006.

[2] Ibid.

preservation of mature forestland. These are important habitat projects needed for the purpose of attaining net ecological benefit in WRIA 15 riparian systems but do not directly replace water extracted by exempt wells. In the case of forest conservation, too much uncertainty remains in the impact to streamflow. For the purchase of water rights, it is not clear that this would entail discontinued groundwater appropriation rather than exclusion of unutilized pumping capacity. In both cases, the projects do not directly replace or mitigate anticipated water appropriation from future permit-exempt wells.

- The RCO review accurately questions the quantification of water offsets gained through forest conservation, as noted above. However, the review also calls attention to the importance of restoring natural processes and repairing stream degradation as important goals for streamflow restoration. Forest protection plays an important role in sustaining water table elevations, tree cover, and natural debris within vulnerable riparian systems.

- WRIA15 aquifers are fragmentary and offset projects in one part of the watershed may have little practical impact upon streamflow in areas where permit-exempt wells are concentrated. This issue is exacerbated by the Restoration and Enhancement Plan's use of elongated, heterogenous subbasins in accounting for finer-scale offsets between development and mitigation.

For the above reasons, the Tribe sustains its concerns regarding the WRIA15 plan, which appears insufficient to protect the Tribe's treaty reserved fishing and water rights. We welcome the opportunity to provide comments at this stage of review and look forward to engaging with the revision and rulemaking processes in the future. We continue to believe an adaptive management process, incorporating enhanced monitoring of Kitsap stream flows and seasonal water consumption, is necessary to avoid impairment. Within the watersheds of protected streams, restrictions should be in place on concentrated development of exempt wells until robust, quantified mitigation projects are planned and fully supported for implementation.

Sincerely,

Roma Call

Natural Resources Director
Port Gamble S'Klallam Tribe

10/12/2023

Megan Duffy
Director, Washington State Recreation and Conservation Office
PO Box 40917
Olympia, WA 98504-0917

Sent via electronic mail to rco-director@rco.wa.gov

RE: Snoqualmie Tribe's comments on the Watershed Restoration and Enhancement Plan Review Report (WREPRR)

Dear Director Duffy,

Thank you for the opportunity to review and provide comments on the Watershed Restoration and Enhancement Plan Review Report.

The Snoqualmie Indian Tribe ["Tribe"] is a federally-recognized sovereign Indian Tribe and a signatory to the Treaty of Point Elliott of 1855 in which it reserved to itself certain rights and privileges, and ceded certain lands to the United States. As a signatory to the Treaty of Point Elliot, the Tribe specifically reserved to itself, among other things, the right to fish at usual and accustomed areas and the "privilege of hunting and gathering roots and berries on open and unclaimed lands" off-reservation throughout the modern-day state of Washington. Treaty of Point Elliot, art. V, 12 Stat. 928." The Snoqualmie Tribe was a member of the WRIA 7 (Snohomish) and WRIA 8 (Cedar-Sammamish) Watershed Restoration and Enhancement Planning Committees.

As RCO is aware, the Snohomish and Cedar-Sammamish basins are home to ESA-protected salmon and steelhead and resident coldwater fish populations, which contribute to important regional and international fisheries as well as the physical, cultural and mental health, vitality, and well-being of the Snoqualmie People. These watersheds have been degraded over the years due to development, channelization, and reduction in summer flows due to agricultural, residential, and commercial use of the basin's water. Fish runs have been severely reduced, and some species are on the verge of disappearance from the watersheds.

Climate forecasts indicate that the Snoqualmie River basin and the Cedar-Sammamish basin will transition from transient-snow-basins to rain-dominated basins before the end of the century, resulting in higher winter flows, lower summer flows, and higher water

temperatures during the summer. These impacts, coupled with increasing demand for domestic, agricultural, and industrial water supply, are expected to further degrade the productivity of cold-water fish habitat. Focused planning and adaptation work is needed to address future climate forecasts, ensure a reliable water supply for the Tribe, the environment, and other water users, to reverse diminishing trends in native fish populations, and to manage the river basins' water to support both instream and out of stream uses. Unfortunately, the WRIA 7 (Snohomish) and WRIA 8 (Cedar-Sammamish) WRE plans do not provide the necessary level of assurance that the impacts of Permit Exempt Wells (PEWs) will be mitigated (or in the parlance of the plans, "offset") over the course of the planning period, which will end in 2038. We urge RCO to modify the plans as the Snoqualmie Tribe worked tirelessly to do while the Committees worked to meet the deadline imposed upon them, so that at a minimum, there are mechanisms in place for monitoring, assessment, accountability, and critically, ***adaptation***, if the offset projects considered in the plans are not being implemented effectively, as the plans project.

Monitoring and assessment, and adaptive management, were originally included in the Draft WRIA 7 and WRIA 8 Plans, but, disappointingly, Ecology removed those sections, likely because Ecology views such elements as an additional burden upon the agency. As the state agency responsible for managing water resources, however, it is incumbent upon Ecology to ensure that WAC mandated minimum instream flows are met and that new development is not illegally and unfairly further impacting water and aquatic resources, and it is unclear how they can meet this responsibility given the high uncertainty around many of the WRIA 7 and 8 WRE offset projects, including lack of project sponsors, lack of adequate funding for projects within basins and across the state, and lack of confidence in offset project effectiveness, even if they are constructed. Furthermore, without this component, nobody is tracking the rate, location, and on-the-ground actual impacts to streamflow from new and future PEWs. Consider the current legislative push to enable quicker development, streamline permitting, etc., to meet housing demand at a vastly increased pace. None of that was considered in the WRE planning processes.

Both the WRIA 7 and 8 committees spent considerable time and effort discussing how to monitor and assess WRE Plan status and effectiveness up until 2038, even without funding or other support from Ecology or the legislature (which we asked for and did not receive). We urge RCO to look to the draft plans from which Ecology stripped those parts. Therein lie clever proposed solutions that the Committee considered for this clearly desperately needed, but curiously and discouragingly absent component. For example, RCO's comment summary table notes broad concerns for both WRIAs 7 and 8 that the plans do not fully offset subbasin-by-subbasin impacts. At a minimum, this must be monitored; ideally, it would be adaptively managed. Unfortunately, neither plan contains these components.

Snoqualmie Tribe is concerned that the Watershed Restoration and Enhancement Plan Review Report glosses over a critical flaw in the WRE Plans: namely, that some of the offset projects identified as needed to offset the expected impacts of PEWs, are ultimately unproven in their feasibility, and untested and unevaluated in their ability to provide any actual mitigation/offset water or net ecological benefit. RCO's comment summary table for WRIA 7 notes that "[e]stimates may be high for water offsets - state assumptions clearly.

Consider stating assumptions of water offset clearly." This statement downplays a major flaw; without the Managed Aquifer Recharge projects included in the WRIA 7 plan, it cannot meet its needed offset quantity, but confidence is very low in the ability of MAR to provide meaningful offset, let alone the large offset quantities that Ecology proposes. These offset deficiencies persist, in spite of clear concerns with the technical merits and feasibility of MAR projects in Western Washington post-glacial transient-snow basins such as the Snohomish and Cedar-Sammamish, which are also already moving toward a precipitation-driven hydrographs as a result of climate change. The result of all this is far too much uncertainty.

During the WREC process, the WRIA 7 Committee had strong concerns about the technical merits of the Snoqualmie MAR projects. The offset quantities proposed for each MAR project was agreed upon by the committee to be included at a much lower number than what is in the plan that ECY puts forth. The WRIA 7 Snoqualmie MAR sites were picked by an ECY staff person by looking for public land near the river. This sole criteria was used because it is more feasible to implement projects on public land. However, this lone criterion fails to account for any other critical technical aspects, such as: soils, hydrology, saturation, phenology, biota, life histories and ecology, climate change, etc. Furthermore, the offset quantities that ECY are simply the predicted maximum possible annual diversions at those locations, equating all diversion at all times of year as all the same "offset" water. This is clearly an overly crude concept that is ecologically deficient—the concept that all water diverted at all the considered sites, at all times of year, will re-enter the stream at a beneficial time of year, and in an appropriate sub-basin. All of this is absolute conjecture, completely unknown, and most likely untrue, which is why the members of the WRIA 7 technical subcommittee were vocal with their discomfort with it, and why they modified it from the overly optimistic numbers that ECY proposed.

RCO should not be comfortable using ECY's offset quantities for Snoqualmie MAR projects, which are not founded in scientific findings and methodology. We suggest RCO apply further scrutiny and modification to this component of the plan, and consult with local experts such as Tribes and other WREC members as to how to plausibly strive to meet offset targets. MARs using natural streamflow as the source water in the Snoqualmie/Snohomish are completely unproven as to their efficacy for providing offset water or ecological benefit—not at the subject sites nor at any site, since none have been sufficiently considered. Snoqualmie Tribe is more comfortable with the MAR proposed in the WRIA 8 plan, since it proposes to use reclaimed water (and has a project sponsor), not to divert streamflow directly for MAR, which is a critical difference.

As to project sponsors—only a small subset of projects in either plan have identified sponsors, and these sponsors must compete with others (and themselves) across the state for funding to implement projects. Projects in King and Snohomish Counties are more expensive than anywhere else in the state, as well. All of this adds more than considerable uncertainty to the plan, which is why monitoring and adaptive management were originally included by the Committees. As is, the WRE Plans include zero assessment and zero accountability. Without them, Snoqualmie Tribe is not optimistic that the basins will meet

their offset requirements. Rather, we anticipate that streamflows will continue to diminish in part because of the impacts of PEWs, and watershed conditions will continue to degrade.

We respectfully request that RCO look to the draft plans that the WRIAs 7 and 8 WRE Committees produced. Look for the innovative sections about code changes, collaboration across agencies and groups to fill in water resource planning gaps (like including WA Department of Health), where we encouraged thoughtful solutions to obvious problems with Washington State's failed water management policies. For example, the Committee included specific, well-thought out recommendations to fund and implement science-based adaptive management monitoring programs for water offset and habitat projects in the WRE program. The Committee recommended an increase in available funding for projects and policy implementation. We recognized the need for and encouraged statewide policies that protect streamflow throughout the state, by upgrading the tracking database for permit-exempt wells, encouraging connections to public water sources, initiating permit-exempt well metering, delivering water conservation education in non-urban areas, and implementing mandatory water conservation measure for permit-exempt well users during statewide drought events. If additional enforcement capacity is determined to be needed to effectively implement those actions, we also recommended funding staff pertinent to those programs. Additionally, we urged the inclusion of salmon recovery experts in the Streamflow Restoration Competitive Grant review process. We stand by all these recommendations today as critical to Plan success.

Please look to the above listed areas of the Draft Plans prepared by the Committees to help give the WREPs a chance of success between now and 2038, and please give more scrutiny to the offset projections of the offset projects in the plans, especially MAR projects in the glacially created watersheds that are pervasive across Western Washington. Streamflow-sourced MAR projects in these systems have not been widely accepted as a universally beneficial approach and requires a great deal more investigation before being included so specifically in such an important water resource management plan.

Thank you for the opportunity to comment.

Sincerely,

Matthew J Baerwalde
Environmental Policy Analyst
Environmental and Natural Resources Department
Snoqualmie Tribe

SQUAXIN ISLAND TRIBE

October 9, 2023

Megan Duffy
Director, Washington State Recreation and Conservation Office
PO Box 40917
Olympia, WA 98504-0917

Sent via electronic mail to rco-director@rco.wa.gov

RE: Watershed Restoration and Enhancement Plan Review Report

Dear Director Duffy:

Thank you for the opportunity to review and provide comments on the Watershed Restoration and Enhancement Plan Review Report.

The Squaxin Island Tribe ("Squaxin" or the "Tribe") is a federally recognized Indian tribe located in Southern Puget Sound in Mason County, Washington with treaty rights to harvest fish and shellfish, "at their usual and accustomed fishing places in the shallow bays, estuaries, inlets and open Sound of Southern Puget Sound and in the freshwater streams and creeks draining into those inlets."[1] The Tribe's cultural and economic well-being depend upon sufficient water to support abundant and sustainable fisheries. Watershed planning is of the utmost importance to the Squaxin Island Tribe, as the goal of restoring and protecting ever-diminishing instream flows and salmon populations is critical to maintaining the Tribe's traditional lifeways and the exercise of its federal treaty rights.

The Tribe has been a full participant in the watershed planning processes for WRIAs 12, 13, 14, and 15. During these processes, the Tribe submitted many documents into the agency record that support the need for effective watershed plans and WRIA rules. These documents, many of which are provided as attachments to this letter, should be taken into consideration during any decision-making related to developing a watershed Plan and/or rulemaking. At issue in these comments to

[1] See generally United States v. Washington, 384 F.Supp. 312, 378 (W.D. Wash. 1974); United States v. Washington, 459 F.Supp. 1020 (W.D. Wash. 1978).

the Washington State Recreation and Conservation Office ("RCO") are watershed plans for WRIAs 13, 14, and 15, which were not approved locally and thus could not be adopted.

WRIA 13 Watershed Plan

Squaxin, along with ten other committee members, approved this Watershed Plan. The Tribe urges RCO and the Salmon Recovery Funding Board (the "Board") to recommend that the Washington State Department of Ecology ("Ecology") adopt the WRIA 13 Plan after correcting the following weaknesses that were noted in the Tribe's April 16, 2021 approval letter:

- The poor geographical distribution of projects. The Plan provides insufficient projects to restore stream flows in locations where impacts are likely to occur and harm salmon streams.
- A focus on the "moderate" permit-exempt well growth estimate and a weaker commitment to offset the higher estimate. Permit-exempt well growth may be faster than expected, and we can expect a hotter, dryer future with climate change. Providing offset projects to meet the moderate estimate may be insufficient to prevent future impacts to stream flows and protect Tribal rights.
- Committee members' commitments to plan implementation could be stronger. In particular, Ecology was unwilling to make firm commitments to Plan implementation, including establishing clear consequences if implementation fails to develop sufficient projects to offset higher permit-exempt well growth estimates across the WRIA.
- Of particular importance to the Tribe is Policy and Regulatory Recommendation item 7, "Instream Flow Rules," located in the Plan's Appendix F, Section 6.1. Item 7's stated purpose is "Greater protection of aquatic resources, streamflows, Tribal Treaty water rights, and senior water rights from future water demands." Revisions to the WRIA 13 Instream Flow Rule (WAC 173-513) should be made after an investigation into the health of WRIA 13 salmon streams. Per Item 7, these revisions should make the rule effective, legally consistent, and enforceable.

While a number of the Science Panel's (the "Panel") comments demonstrate some insight into the deficiencies identified in the plan, the subsequent conclusions reached are not consistent with the comments and recommendations.

Science Panel Technical Summary and Review Comments with Squaxin Response:

- *The benefits of MAR facilities are overestimated.*

- Squaxin Response: The Panel challenges the evaluation of MAR's contributions to offsets yet offers no guidance as to how these projects should be evaluated. This shortcoming goes directly to the issue of whether offset projects are adequate in the Plan. If these benefits are overestimated it is unclear how a conclusion can be reached that offsets are adequate. They have provided no empirical evidence to support this claim.

- *The plan fails to identify stream degradation as a root cause of reduced summer base flows. Streamflow is important for riparian vegetation and wetlands, yet the plan relies on further alterations of natural stream hydrology instead of seeking solutions that reverse those alterations to offset well withdrawals.*
  - Squaxin Response: This is a critically important point for evaluating the ongoing impacts on stream systems and we appreciate the Panel raising it. We encourage a more specific directive to reevaluate this concern in the context of revising a deficient plan.
- *The WRIA 13 Watershed Plan should contain more details about how stormwater could be considered a source of water for MAR projects.*
  - Squaxin Response: Again, this points to a lack of any empirical analysis of the extent to which stormwater may be an appropriate source of offsets to impacts. In a naturally functioning stream system, a significant portion of stormwater already recharges local aquifers. Stormwater is not a new source of external mitigation. It is not an independent variable. In a developed watershed there is a short circuiting of the hydrological system which diverts precipitation into unnatural peak flow conditions within streams. This needs to be ameliorated for watershed restoration, not credited as an offset for further development.
- *A number of projects are uncertain and should not be included. Other projects have overestimated benefits.*
  - Squaxin Response: The Plan is rife with uncertainty for project implementation, even among the projects that may be considered appropriate. Again, we request some empirical evaluation of whether projects that are uncertain and/or unlikely can still contribute to a conclusion of sufficient offsets.
- *There is a deficit in five subbasins and a surplus in four subbasins. It may not be possible to identify additional projects to create a balance across subbasins.*
  - Squaxin Response: In these watersheds many of the smaller stream systems are independent drainages that support their own diversity of biological resources.

Accordingly, it is not acceptable to concentrate offsets in some basins while ignoring others. This problem must be addressed in any Plan revision.

- *Habitat projects that benefit marine or estuarine habitat should not be considered contributing to net ecological benefit.*
    - Squaxin Response: In addition to other deficiencies identified in this review, like projects lacking sponsors and overestimation of benefits, it is unclear how the authors can conclude that net ecological benefit can be achieved based merely on the supposition that the proposed benefits are larger than the required offset. Such an analysis requires some empirical reasoning, not guesswork.
- *Projects without sponsors should not be included.*
    - Squaxin Response: Agree that projects without sponsors should not be used in calculations for offsets or net ecological benefit. Perhaps they could be listed as potential project ideas so they are not lost to future consideration.

WRIA 14 Watershed Plan

Squaxin disapproved the WRIA 14 Watershed Plan. The principal issues affecting the Tribe's decision to disapprove are:

- The Plan focuses on the "moderate" permit-exempt well growth estimate and includes a weak commitment to offset the higher estimate. Permit-exempt well growth, however, may be faster than expected, and we can expect a hotter, dryer future with climate change. Providing offset projects to meet the moderate estimate will likely be insufficient to prevent future impacts to stream flows. Therefore, the Tribe needs a plan that firmly commits to the higher estimate in order to ensure that stream flows are restored and Tribal rights are protected.
- The plan provides insufficient projects to restore streamflows in locations where impacts are likely to occur and harm salmon streams. The Plan acknowledges that the estimated offset benefits are poorly distributed and fall short of even the moderate targets in many subbasins.
- The Tribe proposed a variety of policy and regulatory proposals, most of which were blocked by a few Committee members. These proposals, if adopted, would have added a margin of safety by supporting activities that increase the likelihood of meeting the goal of stream flow restoration.

- Committee members, in particular Ecology and Mason County, have a weak commitment to Plan implementation. The necessary commitment includes both a process to further develop projects, and clear consequences if implementation fails.
- There is no recommendation for rule-making. Ecology's goals of offsetting development and restoring stream flows cannot be met unless it fixes outdated, defective rules.

While a number of the Panel's comments demonstrate some insight into the deficiencies identified in the plan, the subsequent conclusions reached are not consistent with the comments and recommendations.

Science Panel Technical Summary and Review Comments with Squaxin Response:

- *The benefits of MAR facilities are overestimated.*
    - Squaxin Response: The Panel challenges the evaluation of MAR's contributions to offsets yet offers no guidance as to how these projects should be evaluated. This shortcoming goes directly to the issue of whether offset projects are adequate in the Plan. If these benefits are overestimated it is unclear how a conclusion can be reached that offsets are adequate. They have provided no empirical evidence to support this claim.
- *The plan fails to identify stream degradation as a root cause of reduced summer base flows. Streamflow is important for riparian vegetation and wetlands, yet the plan relies on further alterations of natural stream hydrology instead of seeking solutions that reverse those alterations to offset well withdrawals.*
    - Squaxin Response: This is a critically important point for evaluating the ongoing impacts on stream systems and we appreciate the Panel raising it. We encourage a more specific directive to reevaluate this concern in the context of revising a deficient plan.
- *The WRIA 14 Watershed Plan should contain more details about how stormwater could be considered a source of water for MAR projects.*
    - Squaxin Response: Again, this points to a lack of any empirical analysis of the extent to which stormwater may be an appropriate source of offsets to impacts. In a naturally functioning stream system, a significant portion of stormwater already recharges local aquifers. Stormwater is not a new source of external mitigation. It is not an independent variable. In a developed watershed there is a short circuiting of the hydrological system which diverts precipitation into unnatural peak flow

conditions within streams. This needs to be ameliorated for watershed restoration, not credited as an offset for further development.

- *A number of projects are uncertain and should not be included. Other projects have overestimated benefits.*
    - Squaxin Response: The Plan is rife with uncertainty for project implementation, even among the projects that may be considered appropriate. Again, we request some empirical evaluation of whether projects that are uncertain and/or unlikely can still contribute to a conclusion of sufficient offsets.
- *There is a deficit in three subbasins and a surplus in five subbasins. It may not be possible to identify additional projects to create a balance across subbasins.*
    - Squaxin Response: In these watersheds many of the smaller stream systems are independent drainages that support their own diversity of biological resources. Accordingly, it is not acceptable to concentrate offsets in some basins while ignoring others. This problem must be addressed in any Plan revision.
- *Habitat projects that benefit marine or estuarine habitat should not be considered contributing to net ecological benefit.*
    - Squaxin Response: In addition to other deficiencies identified in this review, like projects lacking sponsors and overestimation of benefits, it is unclear how the authors can conclude that net ecological benefit can be achieved based merely on the supposition that the proposed benefits are larger than the required offset. Such an analysis requires some empirical reasoning, not guesswork.
- *Projects without sponsors should not be included.*
    - Squaxin Response: Agree that projects without sponsors should not be used in calculations for offsets or net ecological benefit. Perhaps they could be listed as potential project ideas so they are not lost to future consideration.

WRIA 15 Watershed Plan

Squaxin disapproved the WRIA 15 Watershed Plan. The principal issues affecting the Tribe's decision to disapprove are:

- The Plan focuses on the "moderate" permit-exempt well growth estimate and includes a weak commitment to offset the higher estimate. Permit-exempt well growth, however, may be faster than expected, and we can expect a hotter, dryer future with climate change. Providing offset projects to meet the moderate estimate will likely be insufficient to prevent future impacts to streamflows. Therefore, the Tribe needs a plan that firmly commits to

the higher estimate to ensure that stream flows are restored and Tribal rights to water are protected.

- The Plan provides insufficient commitment to offset permit-exempt well growth by subbasin. The subbasins in the South Sound (as compared to the Hood Canal and Mid-Sound drainages) closely align with a portion of the Tribe's usual and accustomed fishing areas. Offset projects outside of South Sound will do little or nothing to protect the Tribe's Treaty rights to stream flow.
- The Plan provides few projects in the South Sound, and the projects listed are highly uncertain to occur. The Plan acknowledges that the estimated offset benefits fall short of even the moderate targets. Overall, the lack of projects, the vagueness of the proposals, and the lack of commitment by potential project sponsors (in particular, the counties) are major plan weaknesses.
- The Tribe proposed a variety of policy and regulatory proposals, most of which were blocked by a few Committee members. These proposals, if adopted, would have provided a margin of safety by supporting activities that increase the likelihood of meeting the goal of stream flow restoration.
- Committee members, in particular Ecology and the counties, have a weak commitment to plan implementation. This includes both a process to further develop projects, and clear consequences if implementation fails - including development and implementation of sufficient projects to offset higher permit-exempt well growth estimates in every subbasin.

While a number of the Panel's comments demonstrate some insight into the deficiencies identified in the plan, the subsequent conclusions reached are not consistent with the comments and recommendations.

Science Panel Technical Summary and Review Comments with Squaxin Response:

- *Primary limiting factors in the plan are channel and streambed degradation, increased peak flows, loss of upland forest cover, loss of riparian forest, and loss of floodplain connectivity habitats. These are all factors that speak to past land-use practices that reduce streambed and water table elevations, coinciding with increases in stormwater and associated water quality and quantity impacts. However, this issue is not appropriately identified in the plan and many of the proposed solutions rely on further manipulation of natural systems instead of restoration of natural processes.*

- Squaxin Response: This deficiency should be addressed in the recommended Ecology revisions to the plan.

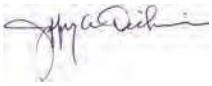
- *The plan fails to identify stream degradation as a root cause of reduced base flows and fails to sufficiently promote projects that specifically raise streambed and water table elevations.*
  - Squaxin Response: This is a critically important point for evaluating the ongoing impacts on stream systems and we appreciate the Panel raising it. We encourage a more specific directive to reevaluate this concern in the context of revising a deficient plan.
- *Stream augmentation from pumping groundwater twists a root cause problem into a solution.*
  - Squaxin Response: This type of project should not be allowed as an offset for further development. It constitutes further mining of groundwater.
- *The forestry offset should be revisited because there is uncertainty about the age of stands and the benefits of a protection project are theoretical.*
  - Squaxin Response: The forestry offset should not be used in calculations for offsets or net ecological gain because there is uncertainty about the age of stands and the benefits of a protection project are theoretical.
- *A number of projects are uncertain and should not be included. Other projects have overestimated benefits.*
  - Squaxin Response: The plan is rife with uncertainty for project implementation, even among the projects that may be considered appropriate. Again, we request some empirical evaluation of whether projects that are uncertain and/or unlikely can still contribute to a conclusion of sufficient offsets.
- *Habitat projects that benefit marine or estuarine habitat should not be considered contributing to net ecological benefit.*
  - Squaxin Response: In addition to other deficiencies identified in this review, like projects lacking sponsors and overestimation of benefits, it is unclear how the authors can conclude that net ecological benefit can be achieved based merely on the supposition that the proposed benefits are larger than the required offset. Such an analysis requires some empirical reasoning, not guesswork.

Healthy streamflows and fisheries are a matter of existential importance to the Squaxin Island Tribe. Thus, the Tribe urges the Recreation and Conservation Office and the Salmon Recovery

Funding Board to adopt the changes requested in this letter and endeavor to approve watershed plans that truly protect and restore the imperiled salmonid fisheries.

Thank you for the opportunity to comment.

Sincerely,



Jeff Dickison
Assistant Director of Natural Resources
Squaxin Island Tribe

Enclosures

2021-08-12 Ltr Ecology & SRFB – WRIA 13
2021-04-16 Squaxin ltr. disapproving WRIA 14
2021-04-16 Squaxin ltr re WRIA 15

SQUAXIN ISLAND TRIBE

August 12, 2021

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Jeff Breckel, Chair
Salmon Recovery Funding Board
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Re: WRIA 13 Watershed Restoration & Enhancement Plan

Dear Mary and Jeff:

As you know, all members of the WRIA 13 committee, including the Squaxin Island Tribe ("Tribe"), voted to approve the WRIA 13 Final Draft Watershed Restoration and Enhancement Plan (Jan. 28, 2021) ("Plan"). The lone disapproving member was the Building Industry Association of Washington ("BIAW"). Since the Plan was not unanimously approved, the Streamflow Restoration Act, RCW Ch. 90.94 ("Act"), requires Board involvement before Ecology adopts a final plan. RCW 90.94.030(h).

While imperfect, the Final Draft Plan approaches the letter and spirit of the Act because its elements will likely lead to streamflow restoration and enhancement. For reasons described below, this letter urges that: (1) Ecology submit the Plan to the Salmon Recovery Funding Board ("Board") either intact or with provisions that improve upon efforts to restore and enhance streamflows; (2) the Board, after conducting a technical review, recommend that Ecology adopt the Plan in either its current state or, with additional recommendations that increase the plan's effectiveness; (3) Ecology adopt the Board-recommended plan and limit any amendments to those that strengthen the Plan's effectiveness; and (4) Ecology initiate rule-making as currently recommended by the Plan.

This is the correct path to a watershed plan that actually protects, restores and enhances fish-bearing waters in WRIA 13. State and federal laws, including the Treaty of Medicine Creek, require no less. Ecology and the Board should also understand the consequences if Ecology ultimately adopts a plan that fails to comply with the Act and engages in rule-making with an overly narrow scope. Local government(s) cannot legally approve streamflow-impactful buildings and subdivisions pending compliance with the Act and other water laws. Until compliance is achieved, applicants would have to provide evidence of legal and physical water availability.

Natural Resources Department / 200 S.E. Billy Frank Jr. Way / Shelton, WA 98584
Phone (360) 426-9781 / Fax (360) 426-3971

Interagency Memorandum of Understanding

Squaxin understands that Ecology and the Recreation & Conservation Office ("RCO") will be entering into an MOU that will guide the process. Squaxin respectfully requests a consultation during the drafting of the MOU and an opportunity to review drafts. We believe that MOU provisions will likely have some bearing on the process and outcome of a final plan and rule-making, and would greatly appreciate a chance to share comments. Squaxin also requests notice of the final MOU.

Background

Streams in WRIA 13 fall short of instream flows established by rule (WAC Ch. 173-514) and the rule's stream closures are ignored. The WRIA 13 instream rule is nearly 40 years old, is woefully outdated and ineffective, and contains numerous provisions that conflict with state water statutes.

Accordingly, the Tribe during the Plan development process submitted many documents into the agency record that support the need for an effective WRIA 13 plan and rule-making with a broad scope[1]. We urge Ecology and the Board to carefully consider these documents during the remaining steps of the process. We have attached two letters that in particular provide a helpful overview of the Tribe's position. The Tribe's December 7, 2020 letter to Ecology comments on four watershed plans (including the WRIA 13 plan) that overlap with Squaxin usual and accustomed fishing area ("U&A"). (Attachment 1) The Tribe described the impaired status of the WRIA 12-15 watersheds, the legal framework governing the plans, Ecology's mandate to amend the outdated and ineffective WRIA rules, and criteria for successful plans. Also attached is an April 16, 2021, letter in which the Tribe approved the WRIA 13 Plan and described the positive aspects of the Plan as well as its shortcomings. (Attachment 2).

As mentioned, all WRIA 13 committee members, including Ecology, approved the Plan except for the BIAW.

The WRIA 13 Plan's Rule-Making Recommendation

Item 7 under the Plan's "Policy and Regulatory Recommendations" is entitled "Instream Flow Rules." It recommends the following, with the stated purpose of "Greater protection of aquatic resources, streamflows, Tribal Treaty water rights, and senior water rights from future water demands":

> • Investigate the WRIA 13 salmon streams and determine needed revisions to the WRIA 13 Instream Flow (ISF) Rule (WAC 173-513). Streams under review for instream flow revisions will be clearly represented to the public through maps in an accessible manner. Consider need to close streams in WRIA 13 with summer salmonid habitat (which could include: Upper Deschutes River, Middle Deschutes River, Lower Deschutes River, McLane Creek, Green Cove, Woodland Creek, Woodard Creek, Percival Creek, Adams Creek, and other associated tributaries and small coastal streams with salmonid habitat) annually in the low flow season (typically from June through October) and what effect it would have on growth in the watershed. This would apply to water rights that have a priority date after any changes made to the instream flow rule.

[1]Ecology has indicated that it will maintain these documents intact. We urge the Board to consult these documents during its process. Squaxin is available to answer any questions that the Board may have.

• Review other salmon streams without existing ISF between November and May and consider setting ISF levels using current methodology.

• Use the latest ISF assessment methodology to reassess ISF values for the Deschutes River below Deschutes Falls.

• Revise and add any other conditions consistent with the final watershed plan to the ISF rule.

• Ecology to initiate rulemaking to update the 40-year old WRIA 13 rule to reflect changed conditions and new information, and make the rule effective, legally consistent, and enforceable.

Plan at pp. 66-67. Rule-making of this nature is a particularly important part of the process for reasons described in the attached letters. We seek rule-making with a broader scope and that Ecology consult with Squaxin well in advance of initiating formal rule-making.

Process required by the Streamflow Restoration Act

The Act sets out five next steps in the watershed plan process:

> If the watershed restoration and enhancement committee fails to approve a plan by June 30, 2021, [Ecology] shall submit the final draft plan to the [Board] and request that the [Board] provide a technical review and provide recommendations to [Ecology] to amend the final draft plan, if necessary, so that actions identified in the plan, after accounting for new projected uses of water over the subsequent twenty years, will result in a net ecological benefit to instream resources within the water resource inventory area. [Ecology] shall consider the recommendations and may amend the plan without committee approval prior to adoption. After plan adoption, [Ecology] shall initiate rule making within six months to incorporate recommendations into rules adopted under this chapter or under chapter 90.22 or 90.54 RCW, and shall adopt amended rules within two years of initiation of rule making. RCW 90.94.030(3)(h)

To summarize, Ecology first "submit[s] the final draft plan" to the Board. In so doing, the Tribe urges Ecology not to weaken any part of the Final Draft Plan. Any changes to the Plan should be to ensure that streamflow restoration and enhancement actually occur. Next, the Board conducts (1) a technical review of the Final Draft Plan and (2) prepares recommendations for amendments "if necessary, so that actions identified in the plan, after accounting for new projected uses of water over the subsequent twenty years, will result in a net ecological benefit ["NEB"] to instream resources within the water resource inventory area." Importantly, the Legislature did not limit this provision to require offsetting 20 years of only domestic permit-exempt wells; rather, the statute's plain language requires offsetting 20 years of <u>all</u> projected water uses. *Compare* RCW 90.94.030(3)(h) with .030(1) ("new domestic groundwater withdrawals exempt from permitting").

Third, Ecology "shall" consider the Board's recommendations and may amend the final draft plan without Committee approval prior to adoption. At minimum, Ecology cannot amend a plan in a manner that fails to meet the Act's requirement – i.e., that the plan, after accounting for <u>all</u> new projected uses of water over the subsequent twenty years, will result in a net ecological benefit to instream resources. *See id.* Fourth, Ecology adopts the plan. Finally, Ecology "shall" initiate rule-making within six months "to incorporate recommendations into rules adopted under this chapter or under chapter 90.22 or 90.54 RCW."

The Board's Mission and Authority

The Tribe respectfully urges that Board, after completing its technical review, recommend that Ecology adopt the WRIA 13 Plan either in its current form or, better yet, after correcting weaknesses as noted in the Tribe's April 16 approval letter. This action will be consistent with the Board's governing mission, authority, the Act and the 1971 Water Resources Act.

The Board's mission is to protect and restore imperiled salmonid fisheries. The Legislature when establishing the Board found that "repeated attempts to improve salmonid fish runs throughout the state of Washington have failed to avert [ESA] listings of salmon and steelhead runs". RCW 77.85.005. It further recognized:

> These listings threaten the sport, commercial, and tribal fishing industries as well as the economic well-being and vitality of vast areas of the state. It is the intent of the legislature to begin activities required for the recovery of salmon stocks as soon as possible, . . .

Id. The Legislature also found that "A strong watershed-based locally implemented plan is essential for local, regional, and statewide salmon recovery", and that "credible scientific review and oversight is essential for any salmon recovery effort to be successful." *Id.*

When reviewing the WRIA 13 Plan, the Tribe urges the Board to apply the same "outcome-focused performance measures" that the Board applies towards grant applications. *See* RCW 77.85.110(3)(j), .135. The Board's goal should be a "strong" watershed plan that will be implemented to protect, restore and enhance salmonid fisheries. *See* RCW 77.85.005. The Board should also consider the 1971 Water Resources Act's mandate that "[a]ll agencies of state and local government, including counties" carry out their vested powers "in manners which are consistent with" the 1971 Act. RCW 90.54.090. Among other things, the Act includes in its declaration of "fundamentals" that "[p]erennial rivers and streams of the state shall be retained with base flows necessary to provide for preservation of wildlife, fish, scenic, aesthetic and other environmental values, and navigational values." RCW 90.54.020(3)(a).

Thank you for your consideration. Please don't hesitate to contact us if you have any questions.

Sincerely,

s/ Jeff Dickison

Jeff Dickison, Assistant Director
Squaxin Island Natural Resources Department

Enclosures

cc: Megan Duffy, Director, RCO
Bennett Weinstein, Streamflow Section Manager, Department of Ecology
Angela Johnson, Watershed Lead, WRIAs 13 and 14, Department of Ecology
Alan Reichman, Assistant Attorney General
Andy Whitener, Director, Squaxin Island Tribe Natural Resources Department
Paul Pickett, consultant for Squaxin Island Tribe
Sharon Haensly, counsel for Squaxin Island Tribe

ATTACHMENT 1

SENT BY ELECTRONIC MAIL

December 7, 2020

Mary Verner, Program Manager
Water Resources Program
Washington Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600
mary.verner@ecy.wa.gov

Re: Squaxin Island Tribe's comments on draft WRIA 12-14 Streamflow Restoration Plans

Dear Mary:

The comments in this letter apply to four draft watershed plans in WRIAs 12-15 being developed as part of the process created by ESSB 6091 and the Streamflow Restoration Act (the "Act", codified as RCW 90.94). (These plans are sometimes referred to as "Streamflow Restoration" or "Watershed Restoration and Enhancement" Plans.) These comments address the Squaxin Island Tribe's ("Tribe" or "Squaxin") expectations for the plans in context of the appropriate legal framework. The Tribe has invested, and will continue to invest, significant effort in the ESSB 6091 watershed planning process. WRIAs 12-15, which are covered by Section 203 of the Streamflow Restoration Act ("Act"), overlap with most of the Tribe's usual and accustomed fishing areas ("U&As") in South Puget Sound. Accordingly, the Tribe is focusing its efforts on developing plans that actually protect, restore and enhance fish-bearing waters. This is what the Act mandates.

We are quite concerned, however, that the four emerging draft plans fall far short of the mandates of the Act and other state laws, and violate the Tribe's federally-reserved water rights. The plain language of the Act requires more than noncommittal statements about offsetting twenty years of domestic permit-exempt wells. These plans must actually restore and enhance streamflows. In some basins, creeks are currently dewatered by existing permit-exempt wells, especially during low flow times (summer, fall) that are critical for fish spawning and rearing. In other places, water systems growing into inchoate state water rights will dewater fish-bearing streams. These harms are compounded by the predicted water scarcity that accompanies climate change in Western Washington. These plans, if properly devised, can help avoid delaying important water management decisions, avoid curtailments, and bring longer certainty to South Puget Sound.

This letter provides comments that apply to all four plans, covering the legal issues and our expectations for the Plans:

- Section A: Status of WRIA 12-15 Watersheds

- Section B: Correct Legal Framework for Plans
- Section C: Ecology's mandate to amend the rules for WRIAs 12-15.
- Section D: Criteria for Successful Plans

We want to be clear that the Tribe has engaged in the planning process in the spirit of cooperation and compromise. Our positions in the Committee meetings were motivated by that spirit, but do not necessarily reflect our legal views in the event that we are in future litigation.

For example, in meetings our representative Paul Pickett has made comments or declined to place blocks on plan actions and projects that contain non-binding, discretionary language (like "should" and "could)". Even when we accept non-binding plan language as part of a collaborative process, we still expect binding commitments from Committee members and from Ecology, including commitments enshrined in rule amendments. Interim decisions or agreements where we "stand aside" or agree to one element of the plan, out of a willingness to compromise and keep the process moving, do not necessarily mean approval of the plan as a whole, or even approval of the item we agreed to.

We reserve our rights to address the legal shortcomings of the planning process, despite Squaxin plan comments that allow the inclusion of plan elements that we believe do not meet the language and intent of the Act. Should we find the plan otherwise acceptable to approve, we expect to articulate this view in a signing statement to be included in the plan.

A. Status of WRIA 12-15 Watersheds

Most precipitation in these WRIAs arrives during the winter months when water demands are the lowest. During the summer there is little rain, and naturally low stream flows are dependent on groundwater inflow. This means that groundwater and surface water are least available when water demands are the highest. This is especially true in hot, dry years, and increasingly true with climate trends.

Much of the water supply in these watersheds is now compromised or controlled by the owners of claims, permits, rights, and permit-exempt wells. Increased demands from population growth, low summer and early fall streamflow levels, and impacts from climate change add to the challenge of finding new water supplies in these WRIAs. There is limited water available for new uses in parts of these WRIAs, especially given that river levels need to be maintained to ensure adequate water quality and fish migration. This reality is explicitly acknowledged by RCW 90.45.005(2)(a) ("The legislature finds that: . . . The state of Washington is faced with a shortage of water with which to meet existing and future needs, particularly during the summer and fall months and in dry years when the demand is greatest; . . .").

In the 1980's, Ecology adopted instream flow rules for many streams in these four WRIAs. These rules close, partially close, or set instream flow levels in numerous streams. For

those streams with gages, records indicate the streams are frequently not meeting instream flows during the late summer and early fall periods that are critical for salmon. *See, e.g.,* Ecology, Focus on Water Availability for WRIAs 13, 14.

For years, Ecology has shirked its duty in these WRIAs to ensure that senior water rights, including instream flows, closures, and the Tribe's rights, are protected by enforcement of the laws and rules. Ecology in recent years has taken the incorrect position that these WRIA rules do not limit the use of permit-exempt wells, inviting a free-for-all that contravenes the governing statutes.

B. Correct Legal Framework for Plans

1. The draft plans exclude elements mandated by the Act, and/or make it impossible for Ecology to adopt without violating the Act.

Ecology's position is that it can adopt plans that only offset 20 years of "new" domestic permit-exempt wells and achieve net ecological benefit ("NEB"). This interpretation is incorrect. It ignores mandatory language in RCW 90.94.030. First, the statute, both implicitly and explicitly, mandates that offsets must at minimum include both permit-exempt domestic uses dating back to the date of WRIA rule adoption and new domestic permit-exempt wells. RCW 90.94.030(3)(b). Second, the law mandates that Ecology, before adopting the plan, "must" determine that actions identified in the plan, after accounting for all new projected uses of water over the subsequent twenty years – i.e., not just new, domestic permit-exempt wells – will result in a net ecological benefit ("NEB") to instream resources within the WRIA. RCW 90.94.030(c). Third, the plan "must" include an evaluation or estimation of the cost of offsetting all new domestic water uses over 20 years, not just new, domestic permit-exempt wells. RCW 90.94.030(d). Finally, the plan "must" estimate 20 years of all cumulative consumptive water use impacts – not just new domestic permit-exempt withdrawals. RCW 90.94.030(e).

2. Guaranteed plan implementation is mandatory, not optional.

As envisioned by the Act, Ecology-adopted watershed plans (with or without unanimous committee votes) can meet the Act's mandates by:

(1) ensuring the offsetting of (a) existing domestic permit-exempt wells that are junior to instream flow rules, and (b) future domestic permit-exempt wells through 2038 (RCW 90.94.030(3)(b));
(2) beginning to restore flows where instream flows are unmet;
(3) assuring implementation; and
(4) being enforceable.

See RCW 90.04.030(3)(b). That outcome, however, appears highly unlikely given the current nature of the draft plans.

ESSB 6091 allows streamflow impacts from new domestic permit-exempt wells – impacts that are highly likely to occur – provided adequate offsets are realized and NEB is achieved. ESSB 6091 accomplished this through the Act itself, as well as amending the Building and Subdivision codes and the Growth Management Act ("GMA")[1]. The Act authorizes new domestic permit-exempt wells to impair instream flows and impact closures "through compliance with the requirements [of RCW 90.94.030], unless instream flow rules specify otherwise. RCW 90.94.030(1). Among other things, RCW 90.94.030 requires plans that offset impacts and achieve NEB.

Ecology's position effectively means that impacts can occur even if the projects and actions intended to offset permit-exempt wells and achieve NEB are not implemented. Ecology's guidance states that the Act "does not predicate the issuance of building permits on the implementation of watershed plans or any projects and actions in those plans." Ecology, *Streamflow Restoration Policy and Interpretive Statement*, POL-2094 at p. 10 (July 31, 2019) (Ecology POL-2094). We expect local governments to take the position that they can approve streamflow-impactful buildings and subdivisions because these approvals are consistent with the watershed plans, permit-exempt well law, and/or instream flow rules, even if implementation is not at all certain to occur or never occurs.

Compliance with RCW 90.94.030, however, requires implementation of offsets and NEB that is comprehensive, timely, and effective. Nowhere does the Act absolve Ecology or any other entity of the duty to ensure implementation of the projects and actions. Rather, it is clear that the Legislature directed Ecology to implement a program that restores and enhances streamflows. For all plans, regardless of whether the committees unanimously adopt them, Ecology must make a specific determination that requires guaranteed implementation. RCW 90.94.030(3)(c), (_). Ecology can therefore not legally adopt a plan that fails to ensure that the impacts from new domestic permit-exempt wells and domestic permit-exempt wells constructed after the date of the ISF rule will be offset and that NEB will occur. There is no indication that the Legislature intended to sanction streamflow-impacting development while allowing Ecology to adopt plans that may never be implemented and thus fail to actually offset the impacts and achieve NEB.

Moreover, ESSB 6091 did not amend a host of water laws that recognize instream flows as water rights and prohibit junior withdrawals from impairing instream flows. Those laws, combined with recent Washington Supreme Court decisions that confirm instream flows as senior rights and prohibit impairment by junior uses, provide an important backdrop for analyzing the Act. *See Swinomish Indian Tribal Community v. Department of Ecology*, 178

[1] ESSB 6091 amended RCW 19.27.097, 58.17.110, 90.03.247, and 90.03.290; added a new section to chapter 36.70A RCW; added a new section to chapter 36.70 RCW; and created the new chapter 90.94 RCW.

Wash.2d 571, 311 P.3d 6 (2013); *Foster v. Washington State Dept. of Ecology*, 184 Wash.2d 465, 362 P.3d 959 (2015).

Ecology has proposed that watershed plans should contain "reasonable assurances" as to implementation. *See* Ecology, *Final Guidance for Determining Net Ecology Benefit*, GUID 2094 at p. 6 (July 31, 2019). It is unclear where this term came from and exactly what it means. It is clear, however, that reasonable assurance does not equate to certain implementation given Ecology's repeated statements elsewhere that no one has a duty to implement. Accordingly, the plans' predicted success must actually occur. In addition, the criteria for making this determination should include the incorporation of a monitoring plan to gauge effectiveness and a corrective action strategy if the benefits fail to accrue.

Finally, SEPA requires that Ecology interpret its laws in accordance with SEPA's environmentally-protective policies and requires a heightened level of certainty for implementation. *See, e.g.,* RCW 43.21C.030 (mitigation measures must be "reasonable and capable of being accomplished"). Since it appears that the watershed plans will result in significant impacts, Ecology will have to prepare EIS's and mitigate the impacts. *See, generally,* RCW Ch. 43.21C.060.

3. <u>The Plans, if adopted without the mandatory offsets, NEB and implementation, will interfere with the Tribe's federally reserved water rights</u>.

Tribes' federally-reserved water rights have been litigated and found to exist under the longstanding *Winans* and *Winters* doctrines. *See, e.g., Aquavella II*, 121 Wash.2d 257, 850 P.2d 1306 (Wash. 1993). *Winans* rights are based on the doctrine that the treaties were "not a grant of rights to the Indians, but a grant of rights from them – a reservation of those [rights] not granted." *United States v. Winans*, 198 U.S. 371, 381 (1905). *Winans* rights preserve pre-existing uses, and impress a servitude that runs against the state of Washington. The priority date for these rights is "time immemorial." A water right for fishing "consists of the right to prevent other appropriators from depleting the streams waters below a protected level in any area where the non-consumptive rights applies." *United States v. Adair*, 723 F.2d 1394, 1411 (9th Cir. 1983).

Winters rights are federally created and arise when the federal government reserves land for a particular purpose. *Winters v. United States*, 143 F. 740, 742 (9th Cir. 1906); *Arizona v. California*, 373 U.S. 546 (1963). Creation of an Indian reservation carries an implied right to unappropriated water to the extent needed to accomplish the purposes of the reservation. The priority date is when the reservation was established.

Both types of rights exist and predate all rights created by state law. These rights include the right to prevent appropriators from using water so as to deplete water sources below levels that damage the habitat of fish that the Tribes have a right to take. Finally, the rights cannot be given away or diminished by state law.

There is no question that Squaxin has reserved water rights to instream flows. The historical record and case law confirm that the Squaxin people have been a fishing people since time immemorial; and that the purposes of the Squaxin Island Reservation were: (1) to create a sustainable, permanent homeland for the Squaxin people; and (2) to ensure the Squaxin people's access to and harvest of healthy fish populations to continue their fishing way of life.

This is consistent with the Ninth Circuit's ruling in the culverts case:

> "Thus, even if Governor Stevens had made no explicit promise, we would infer, as in *Winters* and *Adair*, a promise to "support the purpose" of the Treaties. That is, even in the absence of an explicit promise, we would infer a promise that the number of fish would always be sufficient to provide a "moderate living" to the Tribes. *Fishing Vessel*, 443 U.S. at 686, 99 S.Ct. 3055. Just as the land on the Belknap Reservation would have been worthless without water to irrigate the arid land, and just as the right to hunt and fish on the Klamath Marsh would have been worthless without water to provide habitat for game and fish, the Tribes' right of access to their usual and accustomed fishing places would be worthless without harvestable fish."
>
> *9th Cir. Culverts decision,* 853 F.3d 946, 965 (9th Cir. 2017)*; see also id.* at 964 ("[The Stevens Treaties'] principal purpose was to secure a means of supporting themselves once the Treaties took effect"; "[The Indians] reasonably understood that they would have, in Stevens' words, "food and drink ... forever.").

When these rights are adjudicated, it is highly likely that the quantities of reserved rights will exceed many of the instream flows established in Ecology's rules. Accordingly, it defies common sense and the law to adopt watershed plans that sanction streamflow diminishment by permit-exempt wells or unsupported or non-guaranteed projects, when the Tribe (and public) have a legal right to those waters.

Finally, nothing in RCW Ch. 90.94 allows Ecology to violate federal law or exclude it from consideration when adopting these plans. Nor could it. *See, e.g.*, RCW 90.82.120(1) ("Plan parameters. (1) Watershed planning developed and approved under this chapter shall not contain provisions that: (a) Are in conflict with . . . federal laws, or tribal treaty rights . . . .").

4. <u>Successful South Sound plans and outcomes require significant Ecology engagement</u>.

Successful WRIA 12-15 plans require Ecology to significantly engage in water management in the South Sound. The Tribe has proposed for the WRIA plans the appointment of a "water steward" with water master and groundwater supervisor responsibilities. This position could:

(1) Help track plan activities vis-à-vis the salmon recovery database, measure plan outcomes, and determine if plan goals are being achieved;
(2) support technical analyses of watershed conditions, including monitoring flows;
(3) help to resolve disputes;

(4) enforce use limits and senior rights;
(5) take steps to avoid impairment of senior instream flow rights by junior users;
(6) provide education/outreach;
(7) participate and supporting committee meetings; and
(8) coordinate drought responses.

See RCW 90.03.060(1); RCW 90.44.200. An additional reason to appoint a South Sound Water Steward is to improve Ecology's implementation and enforcement of the WRIA 12-15 rules. Ecology should actively seek resources and assign staff to serve in this position or its equivalent. This could include reassignment of existing resources and advocacy in the legislature for additional funding.

5. Potential consequences if plans fail to ensure offsets and NEB

If Ecology adopts a plan that fails to comply with RCW 90.94.030 (e.g., the plan lacks ensured implementation of offsets and NEB), and either refuses to rule-make or rule-makes with an overly narrow scope, then Ecology should understand the potential consequences. Local government(s) would be prohibited from approving streamflow-impactful buildings and subdivisions pending compliance. Until compliance is achieved, applicants would have to provide evidence of legal and physical water availability.

C. Ecology's mandate to amend the rules for WRIAs 12-15.

1. Why rules are defective and should be amended

Instream flow rules for WRIAs 12-15 are outdated, contain illegal provisions that are inconsistent with the governing statutes, don't explicitly regulate permit-exempt wells, and are rarely if ever enforced by Ecology. Among other things, these rules are illegal because Ecology lacks statutory authority to, by rule, exempt domestic and stock watering uses from instream flows. Instream flows are water rights with priority dates (the date of rule adoption); and apply to all junior groundwater withdrawals (permitted and permit-exempt) and surface water diversions.

Table 1 summarizes key problems with the exemptions in WRIA 12-15 rules.

For the following reasons, Ecology has a duty to amend these defective rules. First, leaving them in place will result in more impairment of instream flows. This is because the Act allows authorizes new domestic permit-exempt wells to impair instream flows and to impact closures "through compliance with the requirements [of RCW 90.94.030], unless instream flow rules specify otherwise. RCW 90.94.030(1). It does not appear that "instream flow rules" for WRIAs 12-15 "specify otherwise" – i.e., expressly provide an alternative path for offsetting new domestic permit-exempt wells and achieving NEB. In fact, Ecology's recent position (*see Hirst*) is that permit-exempt wells are exempt from instream flows when WRIA rules don't expressly address permit-exempt wells.

Table 1. Key problems with exemptions in the WRIA 12-15 rules

WRIA	Does the rule expressly regulate permit-exempt wells?	Does the rule implicitly regulate permit-exempt wells?	Does rule expressly state that water is unavailable for permit-exempt wells in specific area(s)?	Does rule contain illegal exemptions for permit-exempt wells?
WRIA 12 (WAC Ch. 173-512)	No.	Yes.	No.	Yes. Exempts from closures stock watering use, except as related to feed lots. (-060(2))
WRIA 13 (WAC Ch. 173-513)	No.	Yes.	No.	Yes. Exempts from the chapter (i.e., ISFs & closures) domestic use for a single residence and stock watering, except as related to feedlots, if no alternative source is available. If the cumulative effects of numerous single domestic diversions would seriously affect the quantity of water available for instream uses, then only domestic in-house use is exempt. (-070(2))
WRIA 14 (WAC Ch. 173-514)	No.	Yes.	No.	Yes. Exempts from the chapter (i.e., ISFs & closures) single domestic and stockwatering use, except as related to feedlots. If the cumulative impacts of numerous single domestic diversions would significantly affect the quantity of water available for instream uses, then only single domestic in-house use is exempt if no alternative source is available. (-060(2))
WRIA 15 (WAC Ch. 173-515)	No.	Yes.	No.	Yes. Exempts from the chapter (i.e., ISFs & closures) domestic use for a single residence, and stockwatering use except that related to feedlots. If the cumulative effects of numerous single domestic diversions would seriously affect the quantity of water available for instream uses, then domestic in-house use is exempt if no alternative source is available. (-070(3), (4))

Accordingly, to the extent that Ecology adopts watershed plans that fail to guarantee mandatory offsets and NEB (which in itself would violate the Act), Ecology must amend the WRIA 12-15 rules to achieve these outcomes. Put another way, Ecology lacks authority to both (1) adopt plans that do not guarantee offsets and NEB, and (2) fail to amend instream flow rules.

Second, Ecology cannot allow defective instream flow rules to remain in place because the Act allows local governments to rely on WRIA rules when planning and approving development that will interfere with instream flows. Again, leaving these defective rules in place will result in impaired flows and impacted closures. That is because ESSB 6091 amended the GMA, Building and Subdivision Codes to allow local governments, for purposes of complying with the GMA's provisions relating to surface and groundwater resources, to rely on ISF rules. RCW 90.36A.590; RCW 19.27.097, RCW 58.17.110.

Third, other statutory and regulatory provisions mandate that Ecology fix the WRIA 12-15 rules. For example, the 1971 Water Resources Act mandates that Ecology is "directed to modify existing regulations and adopt new regulations, when needed and possible, to insure that existing regulatory programs are in accord with the water resource policy of this chapter and the program established in subsection (1) of this section. RCW 90.54.040(2) (emphasis added). For the above reasons, rule-making is "needed" and "possible".

See also Ecology's implementing regulations in WAC 173-500-010(4) ("The [1971 Water Resources Act] further directed [E]cology to modify existing regulations and adopt new regulations to insure that existing regulatory programs are in accord with the water resource policies of the act."); WAC 173-500-070 ("[E]cology shall initiate a review of the rules established in this chapter whenever new information, changing conditions, or statutory modifications make it necessary to consider revisions."). (Emphases added.) *See also* Ecology's regulations governing reservations of water for future water supply; WAC 173-590-010(5) ("The [1971 Act] further directs the [E]cology to modify existing regulations and adopt new regulations to insure that existing regulatory programs are in accord with the water resource policies of the act.") (emphasis added).

Additionally, provisions in the rules for WRIAs 12-15 mandate that Ecology "shall initiate a review" of rules "whenever new information, changing conditions, or statutory modifications make it necessary to consider revisions." WAC 173-512-080, WAC 173-513-100, WAC 173-514-090, WAC 173-515-100 (emphases added).

Ecology takes a constricted position as to rulemaking that is inconsistent with its statutory and regulatory mandates, including its obligations as a steward of public water

resources. RCW 90.03.010 ("Subject to existing rights all waters within the state belong to the public, and any right thereto, or to the use thereof, shall be hereafter acquired only by appropriation for a beneficial use and in the manner provided and not otherwise; and, as between appropriations, the first in time shall be the first in right."). Ecology's position is that it must adopt rules to incorporate plan provisions only if: (1) the adopted plan recommends a change to the fee or the water use restriction prescribed in RCW 90.94.030(_); or (2) Ecology fails to adopt a plan by the statutory timeline. Ecology POL 2094, *Streamflow Restoration Policy and Interpretive Statement* at pp. 10-11 (July 31, 2019). Ecology's position is to avoid rulemaking unless a plan contains recommendations that "require it" to rulemake. Even if Ecology decides to engage in rulemaking, its stated policy is to avoid addressing anything outside the scope of the Act.

2. Areas where rule-making is needed.

The Tribe has found, from experience in past water resources issues and the current WRIA planning process, that specific areas of the current rules need revision. Table 2 lists some of the revisions that we believe are necessary.

Table 2. List of proposed rule changes for WRIAs 12-15

Section/topic	Changes needed
Purpose	Update to current standards and goals
Establishment of Instream flows	Review all streams in WRIA and identify streams with salmon habitat depending on flow
Establishment of Instream flows	Conduct ISF studies for all salmon streams and either update ISF levels for streams in the rule or add ISF flows for streams lacking them.
Establishment of Instream flows	Remove exemption for ground water withdrawals that "would not interfere significantly with stream flow" in streams listed in the rule.
Establishment of Instream flows	Acknowledge seniority of Tribal water rights and update language for consultation with Tribes
Surface water source limitations to further consumptive appropriation	Close all streams with salmon habitat during the low flow season
Surface water source limitations to further consumptive appropriation	Add language to protect tributaries to closed streams
Surface water source limitations to further consumptive appropriation	Add language to expressly prohibit loss of flow during stream closures
Groundwater	Add section prohibiting impacts on ISF flows and closures from ground water withdrawals

Section/topic	Changes needed
Permit-exempt groundwater for future domestic uses.	Add a section similar to WAC 173-501 with fee requirements, including increased fees to support implementation.
Permit-exempt groundwater for future domestic uses.	Add a section similar to WAC 173-501 with water use limits and metering that apply to all PE wells.
Future surface and groundwater appropriations, including PEWs	Provide all Group A systems a "right of first refusal" for new connections. Require all new water connections within Group A service areas to hook up if connections is "timely and reasonable". Prohibit PE wells where timely and reasonable connection is available. Set a statewide standard for "timely and reasonable".
Future surface and groundwater appropriations, including PEWs	Add limitations to new surface and ground water appropriation similar to Quilcene Rule.
Future surface and groundwater appropriations, including PEWs	Establish setback requirements (depth and horizontal distance) for any new well from a stream listed in the rule
Future surface and groundwater appropriations, including PEWs	Require access to wells and meters for authorized Ecology, Dept. of Health, or county staff.
Mitigation	Set standards for mitigation
Mitigation	Mitigation for interties that affect instream flows and do not have existing mitigation.
Drought response	Counties must establish and ecology approve mandatory water conservation and drought response programs for all PE wells.
Drought response	Establish drought water use limits which go into effect during a drought declaration. Exemptions for food production, fire protection (approved by fire marshal), and approved environmental projects.
Exemptions	Remove any exemptions for single domestic wells and stock watering. Revise and update. Allow limited use of peak flows for environmental and low flow augmentation projects.
Enforcement	Ecology shall establish enforcement guidelines, which include halting building permits for development with PE wells if offset projects are insufficient to exceed PE well growth within a limited amount of time, such as 5 years.

Section/topic	Changes needed
Enforcement	Ecology will develop enforcement guidelines for complaint response and water users not following rules
Rule harmonization	Provide requirements that align water resources rules with GMA requirements such as comp plans and critical areas, with the goal of increasing recharge and reducing water withdrawals.
Reopener	Include standards for reviewing and revising the rule on a regular schedule (for example, every 5 years), or if new information or trends indicate loss of effectiveness.

D. Criteria for Successful Plans

After two years at the table in four WRIA Planning committees, our criteria for a successful plan are becoming clear. Ecology should support the Tribe to ensure these elements are included in each Plan:

1. **PE CU: A conservative (high) estimate of permit-exempt well consumptive use (PE CU) set as a target for offsets.**

   - Estimates for the future consumptive use of permit-exempt wells that provide the target for offsets and define the success of the plan must be based on conservative assumptions that ensure that water produced by successful offset projects will address potential consumptive use levels under all reasonable future scenarios of high growth and use. This "precautionary principle" approach is needed because once wells are installed they will not be removed, and there needs to be a high level of confidence that offset projects will exceed future PE CU under reasonable scenarios of higher use that are foreseeable.
   - To protect senior water rights, the CU estimate must be high enough to ensure certainty that PE well use will be offset under all reasonable potential future situations. This will also ensure that streamflow restoration is likely to be an additional benefit.

2. **Projects: Strong list of projects with good water quantities, reasonable certainty, identified sponsors, willing landowners, and covering areas of high PE well impacts and important salmon areas.**

- Projects are going to be uncertain, whether in an approved plan or in Ecology's plan and rule. Most are undeveloped concepts that will need sponsors, willing landowners, feasibility studies, funding, permits, and when completed may not perform as expected. Projects with a reasonable likelihood of success are those that are well defined and have an identified sponsor. In addition, plans need to identify projects in areas where PE wells are most likely to have an impact and where increased flows in streams are most likely to benefit salmon habitat. And overall, strong implementation is necessary to increase the likelihood of effective projects getting done and the mandates of the Act being met.

3. Policies: Policy and regulatory recommendations that show good faith effort to meet legal requirements and provide additional streamflow benefits.

- The Tribe has proposed a variety of policy and regulatory recommendations that contribute to protecting and restoring streamflow (see Table 3). The Plan should propose the adoption and enhancement of a significant number of these policies. These are key elements of the Plan that both help reduce PE well impacts and increase water recharging ground water and supporting summer baseflows.
- Ecology and local governments, through the plan, should commit to policies that are certain to supplement the offset of past and future PEWs and achieve NEB, in addition to the offset projects. Implementation of innovative policies included in the plan will add benefits that increase the likelihood of streamflow restoration. In addition, some project proposals can address disputes over the legal requirements for plan content and make legal disagreements moot.

4. ISF Rule: Identification in the Plan of rule-making necessary to implement the Plan and for other reasons.

- As discussed above, there are many reasons for Ecology to initiate rule-making, both as a consequence of Plan adoption, to help ensure implementation, and because the existing South Sound WRIA rules are defective and failing to protect the water resource and fisheries. Ecology should identify the elements of each plan and other relevant needs that require rule-making and call these out in the Plan.

Table 3. List of Squaxin Island Tribe policy and regulatory proposals

Proposal Titles	Purpose
Assurance of Implementation	Document Ecology's and Counties' commitment to implementation

Proposal Titles	Purpose
	and adaptive management
Lead Organization for Implementation	Support long-term sustainable adaptive management
Monitoring and Research	Continue collecting data and information to support adaptive management and water management in general
Adaptive Management responses	Specify adaptive management responses if Plan implementation is falling behind
Funding for Plan Implementation	Support long-term Plan implementation and adaptive management through the lead organization
South Sound Water Steward	Provide improved and enhanced Ecology interface in the South Sound for Plan implementation and better management of instream flow rules
Water Supply Data for Comprehensive Water Planning	Provide critical data for water management and show good faith effort to comply with legal requirements
Upgrade Well Reporting	Bring Ecology's data collection on wells up to date with current technology and improve the information collected.
Water Conservation Policy - Education And Incentives Program	Provide an overarching conservation program for all permit exempt wells, in parallel with conservation plan requirements for Group A systems.
Drought limits	Address extreme hydrological events and climate change with water use limits when Ecology issues a drought declaration (like WRIA 1 rule)
ISF updates	Bring 1980s ISF rules up to date with current scientific methodology and increased protection for salmon stream.
Permit-exempt Well Withdrawal Limits	Set realistic permit-exempt well water use limits (like WRIA 1 rule).
Study of County Planning Streamflow Restoration Effectiveness	Compare how planning and permitting by local governments in the South Sound supports protecting groundwater recharge and stream flows, in order to identify successful strategies and areas for potential improvement.
Revolving Loan and Grant Fund for Small Public Water Systems	Counties can explore setting up a fund to offset the costs of connecting to a Group A system instead of a permit exempt well
County Policies to Promote Connections to Group A systems	Review "right of first refusal" in coordinated water system plans and county ordinances to find ways to discourage permit exempt wells inside water system areas.

5. <u>Implementation and Adaptive Management: Implementation and Adaptive Management proposals that show commitment to implementation</u>.

- Implementation of the Plan, as discussed above, is required under the law. And if a Plan is inadequately implemented and offset water is not created for existing and future PE wells that are junior to instream flows, and/or NEB is not guaranteed, both Ecology and the Counties may be at increased risk for litigation.
- But beyond that, the Tribe believes an approved Plan could provide much more vigorous, long-term implementation than if Ecology writes a plan and a rule. This could set the table for more cooperative water management, and provide future opportunities for collaboration to improve water management into the future.

6. <u>NEB: Include an analysis of Net Ecological Benefit that actually demonstrates with high certainty that restores streamflow and enhances salmon habitat will result when projects and actions are implemented</u>.

- As the Tribe commented during Ecology's comment period for the NEB guidance, the definition of NEB should be much broader than simply providing more offset water than expected PE well use. To fulfill the objectives of the Act, NEB must demonstrate that the plan will protect and increase streamflows, and implementation of the Plan will produce both significant benefits to salmon and no harm from effects such as geographic gaps or implementation time lags.

Conclusion

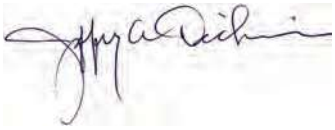
In conclusion, we ask that Ecology review the issues raised in this letter and take action to address the Tribe's concerns. We hope for the process to be a successful step forward for effective water management in the Tribe's South Sound U&A watersheds, and the beginning of adequate protections of Tribal water rights.

To reach those goals, however, Ecology needs to:

- Make immediate course corrections to improve how it is guiding the planning process and communicating with the Committees.
- Make a strong commitment to review and revise the rules for WRIAs 12-15 to ensure implementation of the plan and bring the rules up to date for protection of salmon and Tribal water rights.

This will make the difference between a future of collaborative water management or one of ongoing conflict and dispute. We hope you choose collaboration.

Sincerely,



Jeff Dickison, Assistant Director
Squaxin Island Natural Resources Department

cc: Bennett Weinstein, Streamflow Section Manager, Department of Ecology
Rebecca Brown, Watershed Lead, WRIA 12, Department of Ecology
Angela Johnson, Watershed Lead, WRIAs 13 and 14, Department of Ecology
Stacy Vynn-McKinstry, Watershed Lead, WRIA 15, Department of Ecology
Alan Reichman, Assistant Attorney General
Andy Whitener, Director, Squaxin Island Tribe Natural Resources Department
Paul Pickett, consultant for Squaxin Island Tribe
Sharon Haensley, counsel for Squaxin Island Tribe

SQUAXIN ISLAND TRIBE

ATTACHMENT 2

SENT BY ELECTRONIC MAIL

April 16, 2021

Mary Verner, Program Manager
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300 Desmond Drive SE
Lacey, WA 98503
mary.verner@ecy.wa.gov

Re: Squaxin Island Tribe's approval of Watershed Restoration and Enhancement Plan WRIA 13 – Deschutes Watershed (Final Draft Plan, March 18, 2021)

Dear Mary:

By this letter, the Squaxin Island Tribe ("Tribe") informs you that the Tribal Council has approved the above WRIA 13 Watershed Restoration and Enhancement Plan ("Plan"). The Tribe now looks to Ecology to adopt the Plan and fully commit to its implementation. This letter discusses our reasons for supporting the Plan as well as our concerns. In light of the uncertainties going forward, we also feel it necessary to reserve and not waive certain rights.

The Tribe acknowledges and greatly appreciates the hard work that went into this Plan by Committee members and Ecology staff and consultants. The Committee's engagement in the consensus process resulted in specific elements of the Plan that the Tribe fully supports:

- Using a "higher" permit exempt well growth estimate that accounts for future uncertainty;
- Inclusion of policy recommendations that, when implemented, should support streamflow restoration.
- Scientifically supported projects that may benefit flows and fisheries, with identified sponsors;
- Thurston County's commitments to projects and implementation;
- Thurston County's support for updating the WRIA 13 instream flow rules;

- Committee members' broad commitment for a Deschutes Watershed Council to guide implementation; and
- The Plan's acknowledgement of the importance of restoring streamflows.

The Tribe believes these positive aspects of the Plan outweigh some remaining flaws that include:

- The poor geographical distribution of projects. The Plan provides insufficient projects to restore streamflows in locations where impacts are likely to occur and harm salmon streams;
- A focus on the "moderate" permit-exempt well growth estimate and a weaker commitment to offset the higher estimate. Permit-exempt well growth may be faster than expected, and we can expect a hotter, dryer future with climate change. Providing offset projects to meet the moderate estimate may be insufficient to prevent future impacts to streamflows and protect Tribal rights; and
- Committee members' commitments to plan Implementation could be stronger. In particular, Ecology was unwilling to make firm commitments to Plan implementation, including establishing clear consequences if implementation fails to develop sufficient projects to offset higher permit-exempt well growth estimates across the WRIA.

Please understand that while the Tribe has approved the WRIA 13 Plan, it continues to have reservations about the state's process, which include a lack of assurance that streamflow restoration will actually occur and that protection of the Tribe's federally-reserved water rights. We expressed these and other concerns in our letter to you dated December 7, 2020.[1] Moreover, even if the Committee unanimously approves the Plan, we face significant uncertainty going forward, including Ecology action or inaction with regard to rulemaking, local government efforts, funding and implementation of projects and actions, and the accuracy of underlying Plan assumptions.

With that in mind, the Tribe feels it necessary to reserve and expressly not waive any rights including its right:

(1) To assert an interpretation of state laws, including ESSB 6091, that differs from that presented in the Plan or elsewhere;
(2) To take any legal action against any party if new evidence indicates that assumptions underlying the Plan are erroneous to the detriment of instream flows and fisheries;
(3) To take any legal action to protect its interests against any party if, after a reasonable amount of time has passed, projects and actions identified in the Plan to offset impacts are not implemented; and/or
(4) To bring any legal action against any party to seek any and all amendments of administrative rules or to oppose proposed amendments, including the WRIA 13 rule;

[1] This letter and the Tribe's other correspondence with Ecology is incorporated by reference.

In the event that the WRIA 13 Plan is not unanimously approved by the committee, the Tribe reserves all rights and does not waive any rights.

Additionally, the Tribe takes the position that neither the Plan, nor its approval of the Plan, nor its participation in the planning process:

(5) Has any legal effect on its approval or disapproval of other watershed plans in the RCW Ch. 90.94 process;
(6) Affects the existence, amount or enforceability of the Tribe's federally-reserved water rights, or its right to have them adjudicated; and/or
(7) Has any effect on its right to take any legal action against any party to protect its interests.

During this process, the Tribe submitted many documents into the agency record that support the need for an effective Plan and WRIA rule. Ecology should take these documents into consideration during any decision-making relating to developing a watershed Plan and/or rule-making; and should maintain them in the agency record for the long term, particularly in light of the operative statutes' forward-looking elements.

To conclude, the Tribe looks forward to participating in constructive partnerships that implement the Plan and restore and enhance streamflows. We encourage Committee members to continue to improve water management in the South Sound through collaborative dialogue and relationships, and demonstration of a firm commitment through actions and investments.

Sincerely,

Andy Whitener, Director
Squaxin Island Natural Resources Department

SQUAXIN ISLAND TRIBE

SENT BY ELECTRONIC MAIL

April 16, 2021

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Re: Squaxin Island Tribe's disapproval of Watershed Restoration and Enhancement Plan WRIA 14 – Kennedy-Goldsborough Watershed (Final Draft Plan, February 3, 2021)

Dear Mary:

By this letter, the Squaxin Island Tribe ("Tribe") informs you that the Tribal Council has disapproved the above WRIA 14 Watershed Restoration and Enhancement Plan ("Plan"). This letter discusses some positive outcomes of the process as well as some of the Tribe's reasons for disapproving the Plan.

We first want to acknowledge and convey our appreciation for the hard work that went into this Plan by Committee members and Ecology staff and consultants. The engagement of the Committee in the consensus process resulted in several positive aspects of the Plan:

- Several scientifically supported projects that may benefit flows and fisheries, with identified sponsors;
- Inclusion of several policy recommendations that would support streamflow restoration;
- Mason County's expression of support for implementation;
- Thurston County's commitments to projects and implementation; and
- The Plan's acknowledgement of the importance of restoring streamflows.

Unfortunately, the Plan's inadequacies outweigh these positive aspects. We expressed many of our concerns in our letter to you dated December 7, 2020.[1] The principal issues affecting the Tribe's decision to disapprove are:

- The Plan focuses on the "moderate" permit-exempt well growth estimate and includes a weak commitment to offset the higher estimate. Permit-exempt well growth, however, may be faster than expected, and we can expect a hotter, dryer future with climate change. Providing offset projects to meet the moderate estimate will likely be insufficient to prevent future impacts to streamflows. Therefore, the Tribe needs a Plan that firmly commits to the higher estimate in order to ensure that streamflows are restored and Tribal rights are protected.
- The Plan provides insufficient projects to restore streamflows in locations where impacts are likely to occur and harm salmon streams. The Plan acknowledges that the estimated offset benefits are poorly distributed and fall short of even the moderate targets in many subbasins. The Tribe was also disappointed that Mason County proposed the rooftop runoff project, then withdrew it.
- The Tribe proposed a variety of policy and regulatory proposals, most of which were blocked by a few Committee members. These proposals, if adopted, would have added a margin of safety by supporting activities that increase the likelihood of meeting the goal of streamflow restoration.
- Committee members, in particular Ecology and Mason County, have a weak commitment to Plan implementation. The necessary commitment includes both a process to further develop projects, and clear consequences if implementation fails.
- There is no recommendation for rule-making. Ecology's goals of offsetting development and restoring streamflows cannot be met unless it fixes outdated, defective rules.

We understand that this process now heads to the Salmon Recovery Funding Board. The Tribe will continue to advocate for a plan that it can ultimately support, which must be accompanied by meaningful rule-making. We hope that Mason County will reconsider many of its positions and join in this effort, particularly in light of the commitments made in the February 22, 2019 Memorandum of Agreement with the Tribe. Ecology and other committee members must understand that a plan that falls short of state law, in combination with no or inadequate rule-making, means that local governments could be prohibited from approving streamflow-impactful development pending compliance. Until compliance is achieved, applicants would have to provide evidence of legal and physical water availability.

At this critical point in the process with much uncertainty remaining, the Tribe finds it necessary to clarify that its continued participation in the ESSB 6091 process does not:

(1) Have any legal effect on its approval or disapproval of other watershed plans in the RCW Ch. 90.94 process;

[1] This letter and the Tribe's other correspondence with Ecology is incorporated by reference.

(2) Affect the existence, amount or enforceability of the Tribe's federally-reserved water rights, or its right to have them adjudicated;
(3) Have any effect on its right to take any legal action against any party to protect its interests; and/or
(4) Have any effect on its right to bring any legal action against any party to seek any and all amendments of administrative rules or to oppose proposed amendments.

During this process, the Tribe submitted many documents into the agency record that support the need for an effective Plan and WRIA rule. Ecology should take these documents into consideration during any decision-making relating to developing a watershed Plan and/or rule-making; and should maintain them in the agency record for the long term, particularly in light of the operative statutes' forward-looking elements.

In conclusion, we wish that our decision was otherwise. The Tribe simply cannot, however, sacrifice streamflows and fisheries by approving a plan that is virtually devoid of certainty and commitment to actual streamflow restoration.

Sincerely,

Andy Whitener, Director
Squaxin Island Natural Resources Department

SQUAXIN ISLAND TRIBE

SENT BY ELECTRONIC MAIL

April 16, 2021

Mary Verner, Program Manager
Water Resources Program
Washington Department of Ecology
300 Desmond Drive SE
Lacey, WA 98503
mary.verner@ecy.wa.gov

Re: Squaxin Island Tribe's disapproval of Watershed Restoration and Enhancement Draft Plan – WRIA 15 – Kitsap Watershed (revised March 1, 2021)

Dear Mary:

By this letter, the Squaxin Island Tribe ("Tribe") informs you that the Tribal Council has disapproved the above WRIA 15 Watershed Restoration and Enhancement Plan ("Plan"). This letter discusses some positive outcomes of the process as well as some of the Tribe's reasons for disapproving the Plan.

We first want to acknowledge and convey our appreciation for the hard work that went into this Plan by Committee members and Ecology staff and consultants. The engagement of the Committee in the consensus process resulted in several positive aspects of the Plan:

- Inclusion of several policy recommendations that would support streamflow restoration;
- Expressions of support for implementation, and in particular Kitsap PUD's offer to coordinate implementation planning; and
- The Plan's acknowledgement of the importance of restoring streamflows.

Unfortunately, the Plan's inadequacies outweigh these positive aspects. We expressed many of our concerns in our letter to you dated December 7, 2020.[1] The principal issues affecting the

[1] This letter and the Tribe's other correspondence with Ecology is incorporated by reference.

Tribe's decision to disapprove are:

- The Plan focuses on the "moderate" PE well growth estimate and includes a weak commitment to offset the higher estimate. Permit-exempt well growth, however, may be faster than expected, and we can expect a hotter, dryer future with climate change. Providing offset projects to meet the moderate estimate will likely be insufficient to prevent future impacts to streamflows. Therefore, the Tribe needs a Plan that firmly commits to the higher estimate to ensure that streamflows are restored and Tribal rights to water are protected.
- The Plan provides insufficient commitment to offset permit-exempt well growth by subbasin. The subbasins in the South Sound closely align with a portion of the Tribe's usual and accustomed fishing areas. Offset projects outside of South Sound will do little or nothing to protect the Tribe's Treaty rights to streamflow.
- The Plan provides few projects in the South Sound, and the projects listed are highly uncertain to occur. The Plan acknowledges that the estimated offset benefits fall short of the even the moderate targets. Overall, the lack of projects, the vagueness of the proposals, and the lack of commitment by potential project sponsors (in particular, the Counties) are major Plan weaknesses.
- The Tribe proposed a variety of policy and regulatory proposals, most of which were blocked by a few Committee members. These proposals, if adopted, would have provided a margin of safety by supporting activities that increase the likelihood of meeting the goal of streamflow restoration.
- Committee members, in particular Ecology and the counties, have a weak commitment to Plan implementation. This includes both a process to further develop projects, and clear consequences if implementation fails – including development and implementation of sufficient projects to offset higher permit-exempt well growth estimates in every subbasin.

We understand that this process now heads to the Salmon Recovery Funding Board. The Tribe will continue to advocate for a plan that it can ultimately support, which must be accompanied by meaningful rule-making. Ecology and other committee members must understand that a plan that falls short of state law, in combination with no or inadequate rule-making, means that local governments could be prohibited from approving streamflow-impactful development pending compliance. Until compliance is achieved, applicants would have to provide evidence of legal and physical water availability.

At this critical point in the process with much uncertainty remaining, the Tribe finds it necessary to clarify that its continued participation in the ESSB 6091 process does not:

(1) Have any legal effect on its approval or disapproval of other watershed plans in the RCW Ch. 90.94 process;
(2) Affect the existence, amount or enforceability of the Tribe's federally-reserved water rights, or its right to have them adjudicated;

(3) Have any effect on its right to take any legal action against any party to protect its interests; and/or

(4) Have any effect on its right to bring any legal action against any party to seek any and all amendments of administrative rules or to oppose proposed amendments.

During this process, the Tribe submitted many documents into the agency record that support the need for an effective Plan and WRIA rule. Ecology should take these documents into consideration during any decision-making relating to developing a watershed Plan and/or rule-making; and should maintain them in the agency record for the long term, particularly in light of the operative statutes' forward-looking elements.

In conclusion, we wish that our decision was otherwise. The Tribe simply cannot, however, sacrifice streamflows and fisheries by approving a plan that is virtually devoid of certainty and commitment to actual streamflow restoration.

Sincerely,

Andy Whitener, Director
Squaxin Island Natural Resources Department

Squaxin RCO Watershed Comment Letter Oct 13 2023

Final Audit Report 2023-10-09

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SUQUAMISH INDIAN TRIBE
PO Box 498 Suquamish, WA 98392-0498

October 13, 2023

Megan Duffy, Director
Recreation and Conservation Office
P.O. Box 40917
Olympia, WA 98504

RE: WRIA 15 Watershed Restoration and Enhancement Plan

Dear Director Duffy:

The Suquamish Indian Tribe of the Port Madison Reservation ("Tribe" or "Suquamish Tribe") is a federally recognized tribe and signatory to the 1855 Treaty of Point Elliott. In negotiating the Treaty of Point Elliott, the Tribe's U& A extends well beyond the Port Madison Indian Reservation boundaries and includes marine waters of Puget Sound from the northern tip of Vashon Island to the Fraser River in Canada, including Haro and Rosario Straits, the streams draining into the western side of Puget Sound and Hood Canal. The U& A of the Suquamish Tribe encompasses all of Kitsap County while also extending west into Jefferson County, south into Mason County, and east to King County.

The Tribe protects all its treaty-reserved resources throughout its aboriginal homeland and U&A. Water quality and quantity is critical for healthy fish populations. In the Kitsap Watershed, Water Resource Inventory Area (WRIA) 15, there are no large rivers. Streams and springs in WRIA 15 tend to be smaller and seasonal and are often dependent on ground water recharge. Over appropriation of water in WRIA 15 is resulting in depleted stream flows which do not support fish populations and jeopardizes the Tribe's treaty-reserved fishery.

Under the Treaty of Point Elliott, the Port Madison Reservation was reserved and subsequently expanded by Secretarial Order on October 21, 1864, to accommodate the Suquamish Tribe at the request of Chief Seattle. The Tribe's on-reservation *Winters* water rights are among the most senior water rights in the WRIA.

I. WRIA 15 Planning

The Streamflow Restoration Act (RCW 90.94) passed in 2018, clarifies that local governments can issue building permits for homes that intend to use permit exempt wells for their water supply. The law directs local planning groups in 15 watersheds to develop or update plans that, if implemented, are intended to offset, or "mitigate," impacts to instream flows associated with permit-exempt domestic groundwater withdrawals and provide a Net Ecological Benefit (NEB) to the WRIA. Offsets are projects or actions intended to compensate for permit-exempt consumptive water use over the next 20-year planning period (2018-2038). NEB is the outcome that is anticipated to occur through implementation of projects and actions identified in the plan that result in a water benefit greater than the impact within the planning period.

The Tribe has participated in good faith in the WRIA 15 Watershed Restoration and Enhancement Planning Committee and has collaborated with other federally recognized tribes and regulatory agencies engaged in the WRIA planning effort under this law. Comments were provided to Ecology on Chapters 1-7 of the draft plan

via email on October 2, 2020 and on the complete draft plan (all chapters) also via email on January 14, 2021. After participating in the WRIA 15 committee meetings, providing comments to Ecology on the draft WRIA 15 plan, and further deliberating on the potential impacts to streamflow and water resources in WRIA 15, the Tribe voted to oppose the plan.

Unfortunately, there have not been substantial changes to the plan and many of the Tribe's concerns remain outstanding. In addition to concurrence with many of the WRIA 15 Watershed Plan comments outlined in the Squaxin Tribal letter dated October 9, 2023, a summary of the Suquamish Tribe's key concerns are provided below.

II. Uncertainty regarding streamflow benefits

In the WRIA 15 draft plan, there are projects that have some offset benefit but there is simply not enough detailed analysis to accurately estimate the offset benefit amount. The law requires that plans include projects that have reasonable assurance of success and provide sufficient documentation of those methods, assumptions, data, and implementation considerations.

None of the projects identified in the draft plan include estimates of the timing on when the benefit would be realized. Ecology Guidance (Final Guidance for Determining Net Ecological Benefit, GUID-2094 Water Resources Program Guidance, July 31, 2019) requires both annual and seasonal impacts of water offset projects be considered and this information is not provided. The Tribe cannot support this lack of certainty.

III. Over Reliance on Habitat Projects

The draft plan does identify some projects that would be beneficial to streamflow, the draft plan relies too heavily on the habitat projects to offset exempt wells. Habitat projects do not mitigate for water withdrawal. Water must be mitigated with water.

Another issue with the draft plan is the inclusion of culvert projects. Culvert projects should be removed from the list and not be included as mitigation because the State is subject to a federal injunction requiring the replacement of fishing blocking culverts and under Washington State law fish blocking culverts and dams are illegal.

No project in the draft plan should impact or alter naturally occurring wetland habitat, resulting in rerouting of streams or include instream structures (including but not limited to flow controls, storm water facilities etc.). Alteration of flows or hydroperiod can impact water quality and other wetland components (pH, temperature, system functions, etc.). In addition, hydrologic changes can impact mammal populations in wetlands by diminishing vegetative habitat.

The habitat projects included in the draft are problematic. Many do not have accurate project cost estimates and lack detail that would assure a measurable benefit to streamflow, and some have already been completed. For example, for West Sound there are only three water offset projects (Koch Creek regional storm water facility, Kitsap Creek outlet structure removal and KPUD stream augmentation); six habitat projects with some offset; nine habitat projects with no offset component; and three managed aquifer recharge projects. The only offset projects that may provide assurance of "in time" and "in kind" instream flow benefit are the Kitsap Creek outlet structure removal and the KPUD stream augmentation. Even then, while augmentation has its assurances it is essentially taking water from deeper aquifers to augment shallow aquifers, in other words robbing Peter to pay Paul. Due to augmentation being one of the only projects providing assurances we request that it remain as an option if needed even if not ideal.

IV. Adaptive Management and Assurance of Plan Implementation

According to the law and Ecology Guidance, once a WRIA plan is finalized Ecology will cease participation and involvement with the stakeholder group. There are no assurances or requirements that the projects will be implemented. Commitments to plan implementation made by local jurisdictions are laden with funding contingencies. This is simply unacceptable. Future permit exempt wells will impact stream flows, habitat, and fish populations and must be mitigated for within in-kind and in-time projects that are implemented. If Ecology ceases to hold local jurisdictions accountable for the projects, then the state threatens to undermine all the work that has been spent to develop the WRIA plans and to continue allowing residential permit-exempt wells.

Further, in the WRIA 15 draft plan many of the projects are conceptual and lack an assigned 'sponsor' with responsibility for project implementation and monitoring. This is not consistent with Ecology Guidance. Finally, there is no enforcement mechanism, monitoring program or robust adaptive management plan including performance standards to ensure project success or to address failures to comply with the identified offsets required in the plan.

We hope that you will strongly consider the comments that the Tribe, other tribes and WDFW have provided throughout the process to bring forward a revised plan that will more effectively and more assuredly mitigate the impacts of permit-exempt wells on stream flows and ensure that there is water to support salmon for future generations.

Sincerely,

Alison O'Sullivan

Ecosystem Recovery Program Manager

THURSTON COUNTY
WASHINGTON
SINCE 1852

COUNTY COMMISSIONERS

Carolina Mejia-Barahona
District One
Gary Edwards
District Two
Tye Menser
District Three

**COMMUNITY PLANNING &
ECONOMIC DEVELOPMENT DEPARTMENT**

Creating Solutions for Our Future

Joshua Cummings, Director

Megan Duffy
Director, Washington State Recreation and Conservation Office
PO Box 40917
Olympia, WA 98504-0917

Sent via electronic mail to rco-director@rco.wa.gov

Dear Director Duffy,

Thank you for the opportunity to review and provide comments on the Watershed Restoration and Enhancement Plan Review Report. Thurston County Community Planning participated in the watershed planning process for two plans reviewed in the report, WRIA 13 and WRIA 14, and wishes to respond to the Science Panel's (the "Panel") comments on both plans. Due to similarities in the Panel's comments between the two plans the County's responses apply to both WRIA 13 and WRIA 14 plans.

Science Panel Technical Summary and Review Comments with Thurston County Response:

- The benefits of Managed Aquifer Recharge (MAR) facilities are overstated.
    - County Response: The Panel's comment challenges the approach used in the plans to evaluate MAR contributions to offsets but does not offer an actionable alternative approach to make those evaluations.
- The plans fail to identify stream degradation as a root cause of reduced summer base flows and relies on further alterations of natural stream hydrology instead of seeking solutions that reverse alterations.
    - County Response: The County agrees that identification and exploration of root causes of streamflow reduction, including stream degradation, should be represented in the plans. The Panel's comment offers no specific approach to identify the extent streambed degradation plays in streamflow reduction in WRIAs 13 and 14. The Panel should work with watershed planning units to develop an accepted approach to quantify impacts of stream degradation on flows. The Panel should further work with watershed planning units to develop an approach to calculate potential benefits from stream restoration to offset future permit exempt well installations.

THURSTON COUNTY
WASHINGTON
SINCE 1852

COUNTY COMMISSIONERS

Carolina Mejia-Barahona
District One
Gary Edwards
District Two
Tye Menser
District Three

**COMMUNITY PLANNING &
ECONOMIC DEVELOPMENT DEPARTMENT**

Creating Solutions for Our Future

Joshua Cummings, Director

- The watershed plans should contain more details about how stormwater could be considered a source of water for MAR projects.
    - County Response: Stormwater may not be an appropriate source to consider for external mitigation. Water quality is a concern for introducing runoff into groundwater and further clarification on the Panel's recommendations for balancing water quality concerns with offset quantity is desirable, including identification of specific MAR approaches suitable for both watersheds. Additionally, in developed areas precipitation is diverted into streams in unnatural peak flow conditions and considering impervious surface runoff as an external source of mitigation may not be appropriate without further empirical analysis.

In addition to the above, the County wants to note that the policy recommendations developed for both WRIA 13 and WRIA 14—placed into Appendix F of the respective plans during Department of Ecology's rulemaking process—should be represented as contents of the respective plans. Many of these policies outline approaches that encourage implementing jurisdictions to continue participation in integrated, collaboartive watershed planning. These policies promote implementation strategy development that will help ensure offset needs are met and provide an empirical basis to pursue new project types and monitor project outcomes.

We appreciate the opportunity to respond with comments to the Watershed Restoration and Enhancement Plan Review Report. We encourage RCO, the Salmon Recovery Funding Board, the Department of Ecology, and the Panel to engage with watershed planning units to share literature and review local examples that would clarify how to make the Panel's recommendations actionable.

Best Regards,

Bryan Benjamin
Associate Planner, Community Planning
Thurston County

To: Recreation and Conservation Office

From: Tristan Weiss, Streamflow Restoration Ecologist, WDFW
Nate White, Streamflow Restoration Coordinator, WDFW

Date: October 3, 2023

Re: WRIA 14 and 15 technical comments on SRFB's *Watershed Restoration and Enhancement Plan Review Report*

Washington Department of Fish and Wildlife's (WDFW) comments primarily address the Salmon Recovery Funding Board's (SRFB) review panel's analysis of the WRIA 14 and 15 Watershed Restoration and Enhancement Committees (WREC) plans. WDFW voted not to approve these plans during the original WREC planning process. We stand by our voting decisions and maintain our comments made about these plans at that time. We offer our comments here to provide further context for our perspective and to aid the SRFB in providing recommendations to Ecology that encourage the adoption of plans that support robust, healthy, and sustainable salmon populations.

Consumptive use

- We agree with the panel's findings that consumptive use estimates were consistently applied across WRIAs. We also support the finding that summer consumptive uses should be provided in more detail.

- In addition, we believe that the use of one sample size across all WRIAs to estimate outdoor irrigated acreage, regardless of the projected number of new wells in the WRIA, increases uncertainty of the outdoor irrigated acreage estimate and undermines confidence in the final projected consumptive use value and sufficiency of offset actions.

Water Offsets

- We agree with the review panel's findings regarding the uncertainties surrounding stream augmentation supplied by groundwater and managed aquifer recharge (MAR) facilities supplied by surface water withdrawals. The panel's analysis aligns with our broader reluctance to rely on overly engineered, complex projects that are proposed as mitigation for new permit exempt well impacts in perpetuity.

- We also agree that the plans should seek to implement actions that address the root causes of stream degradation and avoid further hydrological manipulation of surface-groundwater systems.

Net Ecological Benefits

- We share the panel's observation that highly conceptual, impracticable, and unsponsored projects are less likely to be implemented and should be revised or removed from the plan as offset/habitat projects. However, in lieu of replacing projects that are more likely to achieve tangible offsets, we believe that remaining projects should be re-evaluated to determine if NEB can be achieved.

- The ecological impacts of new water withdrawals will be greater where aquifers are stressed by climate change. In consideration of climate change, the long-term viability of both water and habitat offset projects should be evaluated individually and cumulatively in the analysis of NEB.

- We agree with the panel's recognition that there is a lack of clarity around the use of forest protection projects in WRIA 15. We strongly support the use of forest protection as a strategy for improving watershed resilience and protecting aquifer health. We encourage the inclusion of forest protection in the plan; however, we believe that streamflow benefits should not be quantified given the short- and long-term uncertainty in the benefits.

We hope these comments help to inform the SRFB's technical recommendations to Ecology. The adoption of robust WRIA 14 and 15 WREC plans that support streamflows and salmon populations are necessary to meet the intent of RCW 90.94. We welcome future opportunities to discuss our comments in more detail or answer any questions you may have.

CC: Jeremy Cram, Salmon Recovery Policy Lead, WDFW
Megan Kernan, Water Policy Section Manager, WDFW
Kiza Gates, Water Science Team Section Manager, WDFW

RESOLUTION NO. 21-A-056

THE	
PORT GAMBLE	)
S'KLALLAM	)
TRIBAL COUNCIL	)
OF THE	)
PORT GAMBLE	)
S'KLALLAM TRIBE	)

I.

WHEREAS, the Port Gamble S'Klallam Tribe entered into the Treaty of Point No Point with the United States of America on January 26, 1855, reserving sovereign and aboriginal rights in perpetuity;

II.

WHEREAS, the Port Gamble S'Klallam Reservation was proclaimed on June 16, 1938 to be an Indian reservation, held in trust by the federal government "for the benefit and use of the Port Gamble Band of Clallam Indians" under the provisions of Section 5 of the Indian Reorganization Act, and the purchase of which was paid in full by the Tribe;

III.

WHEREAS, the Port Gamble S'Klallam Tribe's General Council delegated the Tribe's authority to negotiate and enter into agreements with other governments, their agencies, and with private persons and entities; regulate land use; and to protect the Tribe's natural and cultural resources to the Tribal Council under Article IV, Section 3, (H, P & T) of the Constitution of the Port Gamble S'Klallam Tribe, approved by the Secretary of Interior on July 7, 2007, **AMENDED BY CERTIFIED ELECTION JULY 8, 2013**;

IV.

WHEREAS, S'Klallam people rely on fisheries for food, income and ceremony, both subsistence and commercial harvest pre-date the Treaty, and the Treaty of Point No Point reserved to the S'Klallam the right to take fish at "usual and accustomed grounds and stations" (U&A), which include waters draining to Port Gamble Bay and Hood Canal;

V.

WHEREAS, 164 years after the signing of the Treaty of Point No Point, the Tribe retains the right to conduct fisheries in its U&A including the right of access to places, the right to a share of harvest to meet tribal moderate living needs, and the right to protection of fish habitat in all areas of the Tribe's U&A;

VI.

WHEREAS, the Tribe holds treaty-reserved senior water rights and fishing rights as a sovereign nation with rights over natural resources, including enough water to fulfill the purposes of the reservation and in quantities that are necessary to support healthy salmon populations, and such rights are property rights held in trust by the United States for the benefit of the Tribe;

VII.

WHEREAS, Water Resource Inventory Areas (WRIAs) are large watershed areas formalized under Washington Administrative Code for the purpose of administrative management and planning; and WRIA 15, also known as the Kitsap Watershed, is one of the 62 designated WRIAs in Washington State;

VIII.

WHEREAS, the 676-square mile Kitsap Watershed (WRIA 15) is within Kitsap, Mason, Pierce, and King counties and is primarily drained by hundreds of relatively small lowland stream and river systems directly into the surrounding marine waters and Hood Canal; and the Port Gamble S'Klallam Tribe Reservation occupies over 1,700 acres within the Kitsap Watershed;

IX.

WHEREAS, the Kitsap Watershed supports anadromous salmon, as well as other fish species, and aquatic life and minimum streamflow regulations were established in Kitsap County by the State Department of Ecology in 1981;

X.

WHEREAS, on January 18, 2018, the Washington State Legislature passed Engrossed Substitute Senate Bill (ESSB 6091), codified as the Streamflow Restoration Act (RCW 90.94); and the Streamflow Restoration Act directed the Washington State Department of Ecology (Ecology) to establish a committee to draft a Watershed Restoration and Enhancement Plan ("Plan") for the Kitsap Watershed with a deadline of June 30, 2021;

XI.

WHEREAS, the WRIA 15 Watershed Restoration and Enhancement Committee met on a regular basis between October 2018 and January 2021 to develop a plan intended to meet the requirements of State law, and the Port Gamble S'Klallam Tribe sat on the Committee, participated in good faith to ensure that the final WRIA 15 Plan would protect the Tribe's treaty-reserved water and fishing rights, and acknowledges and appreciates the hard work that each of the Committee members and their staff put into the WRIA 15 Plan process;

XII.

WHEREAS, the Committee members worked together to develop estimates of the number, distribution and consumptive use of new permit exempt wells over the

20 year plan horizon and identified projects for inclusion in the plan to meet the consumptive use offset quantity required by law; and

XIII

WHEREAS, the Tribe's Natural Resources staff and attorneys reviewed the Plan and determined that the plan did not achieve the higher offset goal, did not achieve offsets by subbasin, and did not identify projects with a high degree of success certainty.

XIV.

NOW THEREFORE BE IT RESOLVED, the Tribal Council finds that the Plan provides little certainty that impacts to streamflows by permit exempt well withdrawals will be adequately mitigated and streamflows will not be impaired by said groundwater withdrawals;

XV.

BE IT FURTHER RESOLVED, the Tribal Council finds that the Plan, as drafted, does not sufficiently protect the Tribe's treaty-reserved water and fishing rights and therefore is not in the long-term best interests of the Port Gamble S'Klallam Tribe; and

XVI.

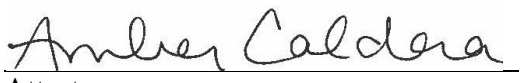
BE IT FINALLY RESOLVED, that the Tribal Council hereby disapproves of the final adoption of the WRIA 15 Watershed Restoration and Enhancement Plan and grants authority to the Tribe's representative on the Watershed Restoration and Enhancement Committee to convey this disapproval to all interested parties.

C E R T I F I C A T I O N

WE HEREBY CERTIFY that on this date there was a __**X**__**regular** _____**special** meeting held of the Port Gamble S'Klallam Tribal Council on the Port Gamble S'Klallam Indian Reservation, at which time a quorum was present;

WE FURTHER CERTIFY, that the above numbered resolution, was at said meeting, introduced, evaluated, and was passed by a vote of__5__FOR, __0__AGAINST, 0 ABSTAIN dated this __12__day of __April____, 2021.

Jeromy Sullivan
Chairperson



Attest:
Council Member