Technical Staff

Net Ecological Benefit Determination

RCW 90.94.030 Watershed Restoration and Enhancement Plan

Chambers-Clover Creeks Basin (WRIA 12)

Water Resources Program

Washington State Department of Ecology

Olympia, WA

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Related Information

- Link to Final WRIA 12 Watershed Restoration and Enhancement Plan[1]
- Streamflow Restoration Planning[2]

[1] https://apps.ecology.wa.gov/publications/SummaryPages/2111012.html
[2] https://ecology.wa.gov/Water-Shorelines/Water-supply/Streamflow-restoration/Streamflow-restoration-planning

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1.0 Overview

The Water Resources Inventory Area (WRIA) 12 Watershed Restoration and Enhancement Committee (Committee) has produced and approved a Watershed Restoration and Enhancement Plan (Plan), dated April 26, 2021, which addresses the requirements of chapter 90.94 RCW (RCW 90.94) relative to WRIA 12, the Chambers-Clover Creeks Watershed. This document provides the Streamflow Restoration Section technical staff's evaluation and determination of Net Ecological Benefit (NEB) as required in RCW 90.94.030(3)(c).

In addition to the coordination and technical assistance provided by the Program to the Committee, Ecology provided Net Ecological Benefit guidance (NEB Guidance) to help them address the requirements of chapter 90.94 RCW:

> Final Guidance for Determining Net Ecological Benefit, GUID-2094 Water Resource Program Guidance, July 31, 2019, Publication 19-11-079, 131 p.

Ecology staff chaired the Committee, were the lead authors of the Plan, and voted to approve the Plan. HDR, Inc., a technical consulting firm, was hired by Ecology and worked on behalf of the Committee to conduct much of the technical work that went into development of the Plan. Although not required by the statute, Ecology's NEB Guidance encourages committees to include NEB evaluations in their plans. The Plan includes an NEB evaluation and concludes:

"Based on the information and analyses summarized in this plan and the intention that projects in the plan will be implemented, the WRIA 12 Committee finds that this plan, when implemented, will enhance streamflows in several important salmon streams and, for the WRIA as a whole, offset new consumptive use from PE wells anticipated during the planning horizon."

RCW 90.94.030(3)(c) indicates that Ecology "must determine that actions identified in the plan, after accounting for new projected uses of water over the subsequent twenty years, will result in a NEB to instream resources within the water resource inventory area". Ecology's NEB Guidance indicates that Ecology intends to provide deference to the NEB recommendations in a well-developed Plan. However, Ecology must ultimately make the NEB determination.

All figures and tables provided in this document are taken from the Plan.

2.0 Assessment of potential impacts

The Plan provides estimates of how many new permit-exempt domestic (PE wells) are likely to be constructed within WRIA 12 over the 2018-2038 planning horizon; how much new consumptive water use will likely result; and what streamflow impacts are likely to occur. To facilitate planning, the Committee divided the watershed into three subbasins, then broke out the estimates of future wells and anticipated consumptive uses by subbasin.

2.1 Evaluation of new PE domestic wells

WRIA 12 is completely contained within Pierce County (County). City boundaries and urban growth areas (UGA) cover approximately 67% of the watershed and 88% of the watershed is served by Group A water systems. The remainder of the watershed uses permit-exempt wells and surface water sources.

The Committee used the Tacoma-Pierce County Health Department (TPCHD) PE well data for years the 1999-2018 as the basis of their projections. The Committee produced low, moderate, and high PE well growth projections for each subbasin. The moderate growth scenario used the using PE well data from 1999-2018, while the high growth scenario used the data from 1999-2008, and the low growth scenario used the data from 2009-2018 (Table 1).

Table 1. Number of PE wells projected between 2018 and 2038 (Table 5 in Plan)

Subbasin	Moderate Growth Scenario	High Growth Scenario	Low Growth Scenario
Chambers	4	7	2
Clover Creek	141	220	76
Sequalitchew	0	0	0
Total	**145**	**227**	**78**

Analysis of the breakdown of projected growth in the three subbasins indicates that growth will most likely occur in the far eastern portion of the watershed in the Clover Creek subbasin (Figure 1).

2.2 Evaluation of impacts from new consumptive use

The Committee used methods and assumptions recommended in Ecology's NEB Guidance to estimate consumptive indoor and outdoor water use from new domestic PE wells. The outdoor irrigation estimation methodology has several conservative assumptions built in, with the largest being the use of commercial turf grass irrigation requirements for an analog to domestic lawns. The Plan identifies the moderate growth projection as the most likely scenario to occur but uses the high growth projection of 227 new permit-exempt PE wells as an offset target. The higher offset target addresses uncertainty in the estimate methodologies. Using the high growth projection of 227 new PE wells yields a consumptive use estimate of 89.9 acre-feet per year (AFY) or 0.12 cubic feet per second (cfs) (Table 2). Figure 2 displays the distribution of projected new PE wells and associated estimated consumptive use over the planning horizon broken out by subbasin.

Figure 1. Projected growth map (Figure 4 in Plan)

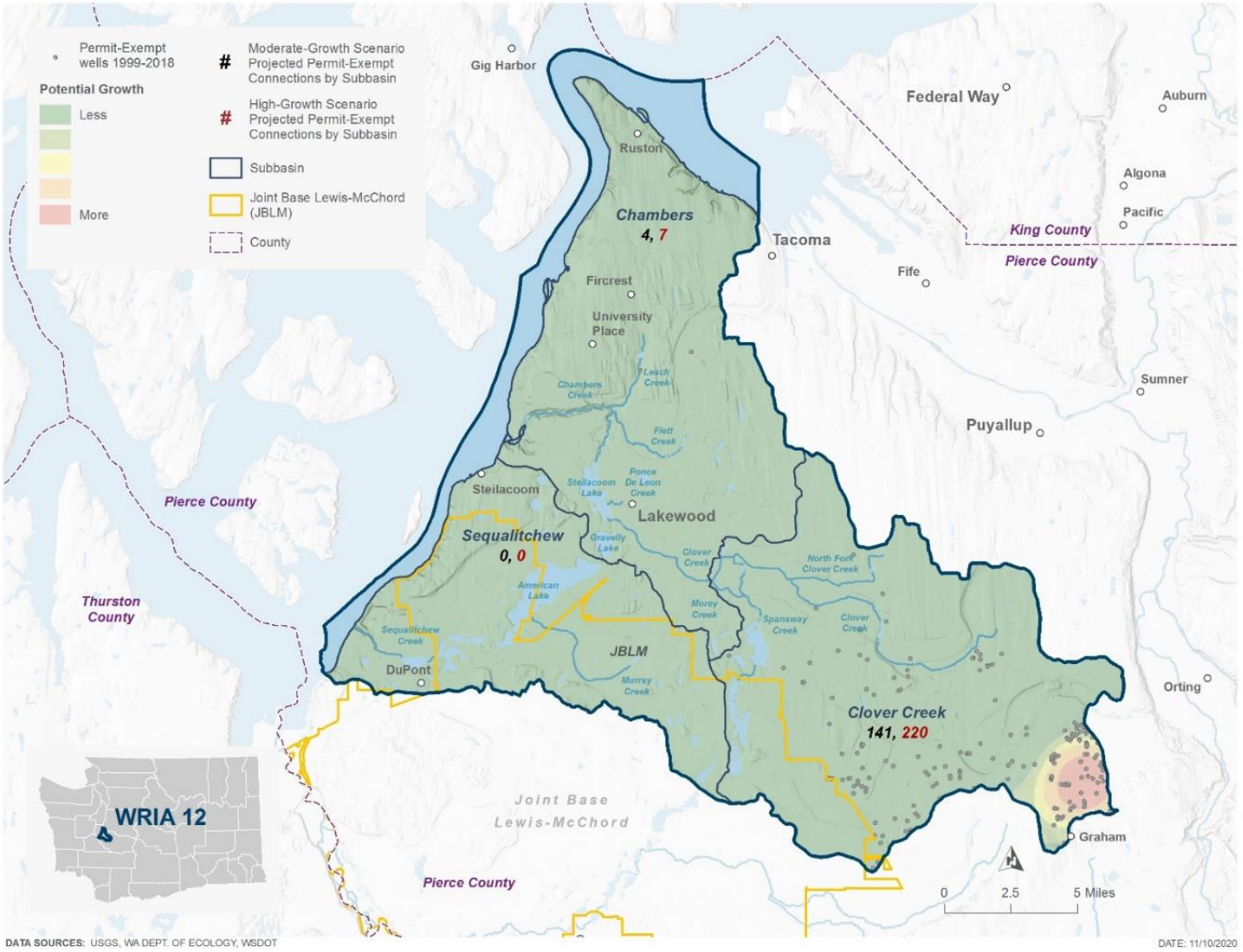


Figure 2. WRIA 12 estimated consumptive use by subbasin 2018-2038 (Figure 5 in Plan)

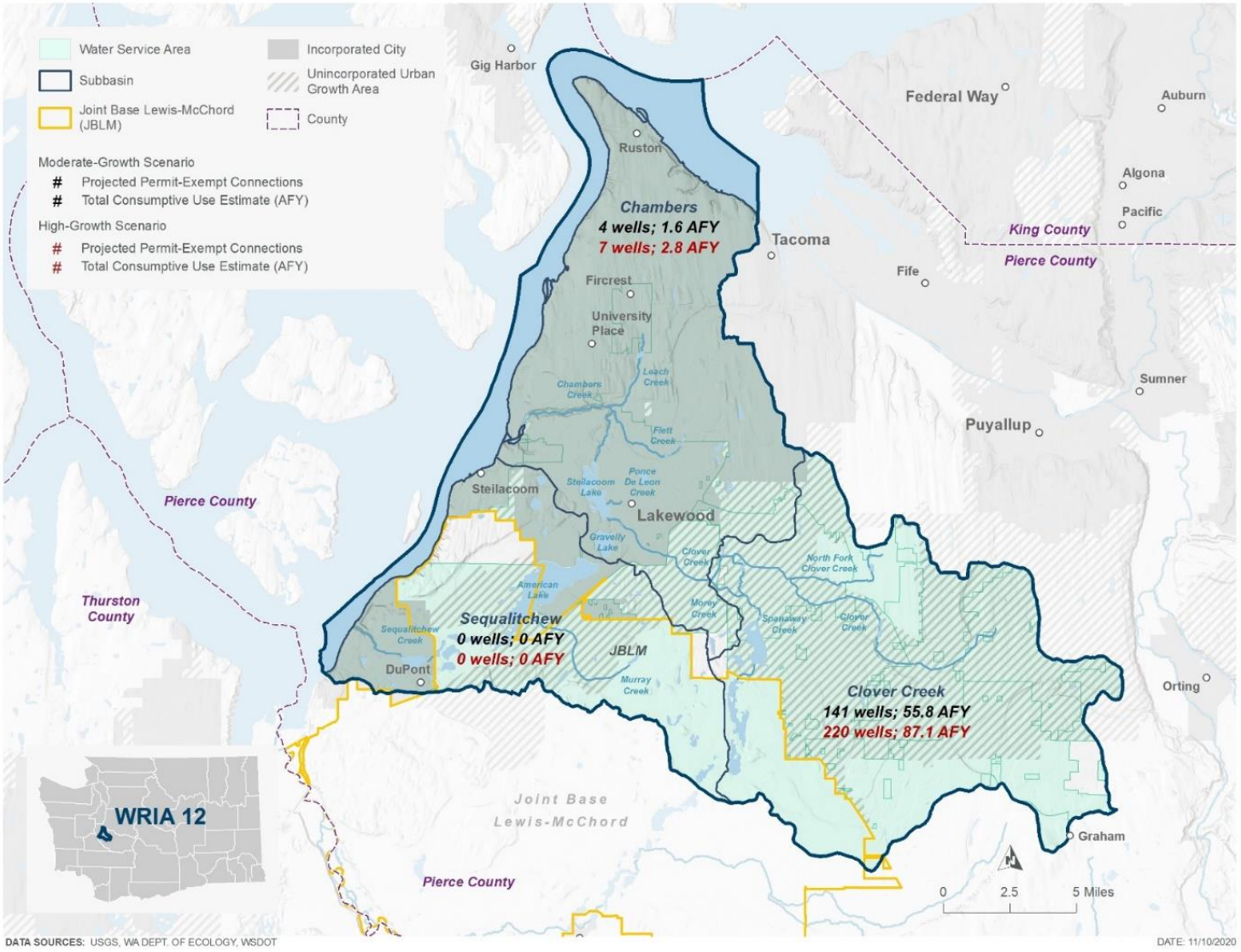


Table 2. Indoor and outdoor consumptive use estimates by subbasin (High Growth) (Table 7 in Plan)

Subbasin	Projected PE wells	Indoor CU		Outdoor CU		Total CU/year in 2038	
		AFY	GPD	AFY	GPD	AFY	GPD
Chambers	7	0.1	89	2.7	2,410	2.8	2,500
Clover Creek	220	3.7	3,303	83.4	74,455	87.1	77,758
Sequalitchew	0	0	0	0	0	0	0
TOTAL	**227**	**3.9**	**3,482**	**86.1**	**76,865**	**89.9**	**80,258**

It is the opinion of Ecology technical staff that 89.9 AFY is a conservative offset target, because it is unlikely that homeowners will water their lawns using a commercial turf grass irrigation schedule and that construction of all 227 projected PE wells will occur during the planning horizon. Meeting or exceeding the conservative offset target will help provide a reasonable assurance that offset projects will exceed actual consumptive use in the watershed during the planning horizon. Ecology technical staff concurs with the Plan's estimates of both the number of new PE wells anticipated in the WRIA over the 20-year timeline, and their projected new consumptive uses.

2.3 Evaluation of streamflow impacts

PE wells withdraw water from many different hydrogeologic units and at various depths in WRIA 12. As explained in Appendix B in Ecology's NEB Guidance, while water use and pumping associated with residential development will produce seasonal increases, particularly during the summer months, these impacts will be attenuated by the distance from surface water, both laterally and vertically. Therefore, most impacts from new PE wells in WRIA 12 will essentially be "steady-state" (spread evenly) throughout the year. While consumptive use impacts from PE wells will essentially be steady-state, they represent the greatest percentage of surface flow during the low flow periods of late summer and early fall.

3.0 Plan water and non-water offset projects

The plan includes a suite of projects designed to offset the anticipated impacts from new PE wells.

Projects in the plan are classified into three categories:

- Water offsets projects.
- Habitat projects.
- Programmatic actions.

Water offset projects provide a quantifiable streamflow benefit, and thus their contribution to offsetting consumptive use from PE wells is quantifiable.

Habitat projects 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. Habitat projects may also result in an increase in streamflow, but the water offset benefits for these projects is difficult to quantify with a high degree of certainty. Therefore, the Plan does not rely on habitat projects to contribute toward offsetting consumptive use, however it recognizes they provide ecological benefits and therefore should be included in the plan to contribute towards achieving NEB.

Programmatic actions are non-capital projects that are implemented at a subbasin or larger scale, increase knowledge of water use in the WRIA, and contribute to water conservation. While programmatic actions may contribute to a lower overall PE well consumptive use in the watershed, the benefits of these actions are widely dispersed and difficult to quantify.

3.1 Water offset projects

The Plan identifies two water offset projects that will exceed the PE well consumptive use offset target with high certainty (Table 3). One project is located in the Sequalitchew subbasin and the other is in the Chambers subbasin. Both of these subbasins provide the best potential for habitat benefits relative to the upland Clover subbasin. Brief project descriptions from the plan are found in sections 3.1.1 and 3.1.2 of this document. Full descriptions of the projects can be found in Appendix I of the Plan.

Three other water offset projects were identified that provide water offsets across the WRIA. Due to time and resource constraints, these three water offset projects were not developed enough to count towards the PE well consumptive use offset target. All projects are displayed on Figure 3.

Table 3. WRIA 12 Offset Projects

Project Number	Project Type	Subbasin	Water Offset (Annual AF)	Project Sponsor
12-S-W1	Stream reconnection	Sequalitchew	724	U.S. Department of Defense and South Puget Sound Salmon Enhancement Group
12-Ch-W2	Stormwater Infiltration	Chambers	701	City of Tacoma
WRIA 12 Total Water Offset (Cumulative from above)			**1,425**	
WRIA 12 Consumptive Use Estimate			**89.9**	
Net Water Gain			**+1,335.9**	

3.1.1 Repair Diversion Structure at Lake Sequalitchew

Joint Base Lewis McChord (JBLM) is proposing to modify an existing weir and diversion structure at the outlet of Sequalitchew Lake to protect their drinking water source and repair a failed storm system. As part of these modifications, surface flow exiting Sequalitchew Lake and surface flow from adjacent wetland drainages will be re-directed from the drainage canal back to the Sequalitchew Creek channel. A flow control structure would still divert flood flows (100-year flood flows and greater).

Average flow discharging from Sequalitchew Lake is expected to be 6 – 7 cfs (4,300 – 5,000 AFY). This estimate was based on hydrologic modeling of Sequalitchew Lake. This flow would be re-directed to the natural channel of Sequalitchew Creek.

Restored flows will directly benefit Sequalitchew Creek downstream of Sequalitchew Lake. This is approximately 3.2 miles of stream habitat. Sequalitchew Creek primarily supports cutthroat trout, Coho, and chum salmon. These species currently use the most downstream portion of the creek, where base flows are supported by groundwater inflow.

Restoring flow to the entire channel length downstream of Sequalitchew Lake may provide new aquatic habitat suitable for spawning, if adequate water velocity, depth, temperature, and sediment composition results from the restored flows. Suitable spawning habitat may be limited in the creek, as it winds through the marshes, because of the low slope of the area. The habitat may be suitable for chum, given their affinity for groundwater influence. The lower portion of the creek likely has suitable spawning habitat for Coho salmon, cutthroat trout, and chum salmon, and will likely be improved with increasing flows.

3.1.2 South Tacoma Channel

The City of Tacoma (City) is proposing a multi-site project to enhance streamflow in the Flett Creek Watershed. The project will direct stormwater flows to large-scale infiltration facilities within the South Tacoma Channel (Sites 1 and 2) to enhance instream flows and the function of lower Flett Creek and Flett Wetland (Site 3).

The project would enhance instream flows that have been negatively impacted over time by the progressive increase in urbanization, the City's historical stormwater management practices, and out-of-basin pumping of surface water to marine outfalls.

Source stormwater would originate from throughout the Flett Creek Watershed and also from a redirection of current cross-basin flows from the Leach Creek Regional Stormwater Holding Basin to the Thea Foss Waterway (Commencement Bay outfall).

Based on the results of the groundwater model completed by Landau Associates, it is estimated that the streamflow enhancement to Flett Creek due to infiltration at Sites 1 and 2 may be on the order of 0.8 to 1.1 CFS, with the highest magnitude benefits occurring in the dry-season (summer) months.

Modeling indicates that Flett Creek streamflows may be enhanced both in terms of overall magnitude and timing of groundwater baseflow to provide targeted benefit during the dry-season months. The water offset quantity for the WRIA 12 Watershed Plan is estimated to be 701 acre-feet per year.

3.2 Habitat projects

Habitat and conservation projects are those that contribute toward achieving NEB by:

- Improving ecosystem function and resilience of aquatic systems.
- Supporting the recovery of threatened or endangered salmonids.
- Protecting instream resources including native aquatic species.

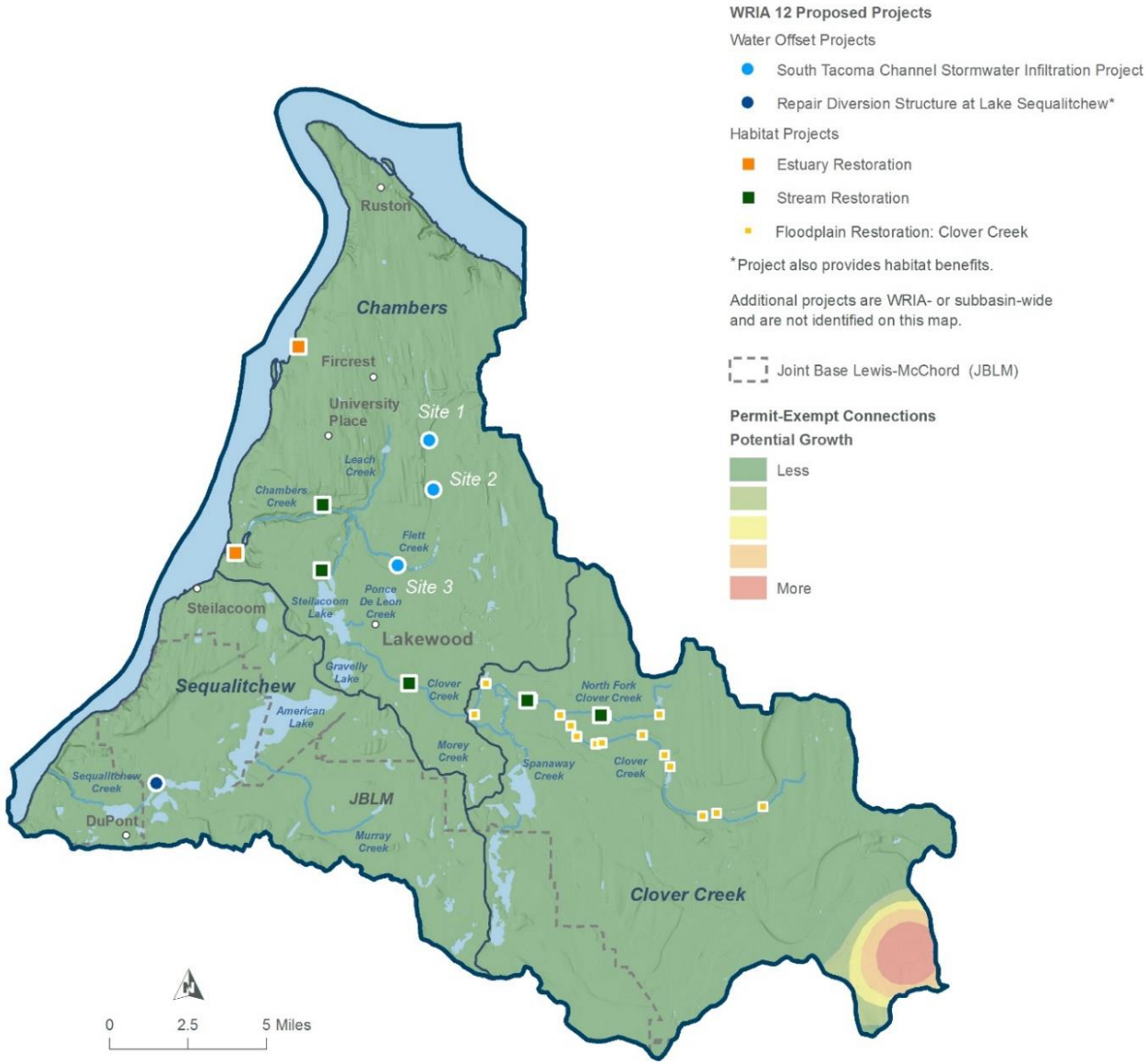
In general, these projects would increase stream complexity, reconnect floodplains, promote fish passage, and enhance natural processes that had been lost to the benefit of salmonids and other aquatic species. Habitat projects defined in Table 4 and displayed in Figure 3 were developed to the design or concept level and highlighted in the Plan.

Table 4. WRIA 12 Habitat Projects (Table 9 in Plan)

Project Number	Project Name	Project Type and Brief Description	Subbasin	Additional Benefits	Project Sponsor	Project Stage
12-Cl-H1	Clover Creek Floodplain Restoration	Floodplain restoration in a number of potential locations as identified by the Committee. Projects would include: Floodplain reconnection, pavement removal, log jams.	Clover	Off-channel rearing, high flow refugia, instream cover, instream habitat complexity.	Potential: Puyallup Tribe, Pierce County	Conceptual
12-Cl-H2	Habitat Assessment	Conduct habitat assessment for riparian buffers, floodplain reconnections, and stream channel improvements.	Clover	Identify needs and opportunities for habitat projects, identifying appropriate treatments for each reach.	Potential: Puyallup Tribe	Conceptual
12-Ch-H3	Clover Creek Springbrook Restoration Project	Restore up to 1,600 lineal feet of Clover Creek in the Springbrook neighborhood of the City of Lakewood.	Chambers	Improve/restore habitat.	City of Lakewood	Feasibility
12-Ch-H4	Protect and Restore mainstem Chambers Creek habitat	Implement a variety of stream treatments as identified through an assessment conducted by the Puyallup Tribe.	Chambers	Restoration of floodplains, placement of large woody debris, off-channel refugia. Potential to quantify storage opportunities.	Puyallup Tribe	Design
12-Ch-H5	Peach Creek	Roughening and hyporheic exchange. Addressing stream incision, erosion.	Chambers	Habitat improvements	Potential: Pierce County	Conceptual
12-Ch-H6	Chambers Bay Estuarine and Riparian Enhancement	Restore and enhance the estuarine habitat structure within Chambers Bay, including removal of the Chambers Dam, removal of shoreline armoring, addition of large woody debris, enhancement of riparian vegetation.	Chambers		South Puget Sound Salmon Enhancement Group	Planning/ Design
12-Ch-H7	Titlow Estuary Restoration	Restore Titlow Lagoon to a connected and productive estuary.	Chambers	Increase habitat, remove fish barriers, expand lagoon, and install woody habitat structure.	South Puget Sound Salmon Enhancement Group	Planning/ Design

Project Number	Project Name	Project Type and Brief Description	Subbasin	Additional Benefits	Project Sponsor	Project Stage
12-Cl-H8	Streambed pavement removal	Restore Clover Creek by removing the asphalt.	Clover	Removing asphalt enhances the habitat, but may also create space for infiltration.	Pierce County	Conceptual

Figure 3. Proposed Offset and Habitat Projects (Figure 6 in Plan)



3.3 Programmatic Action

In addition to the projects described above, the Plan identifies a programmatic action aimed at PE well users throughout the WRIA by using conservation education and an incentive program. This programmatic action does not have specific locations, but would improve PE well water management through voluntary actions and improved data collection.

This program would raise awareness of the impacts PE well water usage has on groundwater levels and the connection to streams and rivers. This program could supplement water offset and restoration projects, especially in subbasins important for fish and where water offsets were difficult to find. Long term funding is needed for the program to be established and effective in benefiting streamflows.

It is the opinion of Ecology technical staff that implementation of this programmatic action will help improve ecological functions primarily in the Clover subbasin through water conservation and reduced water use in water short years.

4.0 Ecology Technical Staff Net Ecological Benefit analysis

RCW 90.94.030(3)(c)) requires that,

> "Prior to adoption of the watershed restoration and enhancement plan, the department must determine 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."

4.1 New PE domestic wells and consumptive use estimates

The Plan applies high population growth estimates for Pierce County to project a total of 227 new PE well connections in WRIA 12 over the 2018 to 2038 planning horizon. Based on this projection, the Plan presents a conservative new consumptive water use estimate of 1,425 acre-feet per year across the WRIA. Ecology technical staff concurs with this analysis, and believes that the conservative new consumptive water-use estimate best addresses the inherent uncertainties in the methodologies used.

4.2 Quantity and spatial distribution of water offset projects

The Plan includes five water offset projects, with only two having a defined offset quantity in two of the three subbasins in WRIA 12. These two projects will bring an estimated total of 1,425 AFY, a net gain of 1335.1 AFY, to the Sequalitchew and Chambers subbasins. This additional water will enhance the natural conditions of the surrounding habitat and contribute wide ranging ecological benefits that will be considered in Ecology's NEB determination. In addition, the anticipated offset quantity is nearly spilt 50/50 between both water offset projects and provides a figurative safety net should one fail to materialize or encounter significant setbacks during the planning horizon.

The three remaining projects with no offset quantities are mostly conceptual but are considered important enough for inclusion by the Committee provided the project's offset potentials if developed to completion.

As noted in Figure 2, there are an anticipated zero and seven new PE wells in Sequalitchew and Chambers subbasins, respectively, using the high growth estimate. This leaves the bulk of the projected PE wells (220) in the far east upland side of the Clover subbasin.

While Clover Creek will have a high percentage of potential impacts from new PE wells, the creek has some significant issues regarding flow. The creek currently runs completely dry in the summer due to the local geology. In addition, the creek is highly channelized with sections paved with concrete, and it travels under McChord airfield through a large culvert. These conditions surrounding Clover Creek led to concerns from the Committee about whether or not a water offset project would provide any meaningful flow benefits or contribute toward improving ecological functions.

Based on the projects presented in Figure 3, projected water benefits are located within the basin to provide maximum flow benefits with the highest certainty of success. The 1335.1 AFY surplus (water volume in excess of that needed to offset future PE well use) provides ecological benefits that will be considered in Ecology's NEB analysis.

4.3 Quantity and spatial distribution of habitat projects

The Committee has identified eight habitat and conservation projects to include in the Plan (Table 4). Ecological benefits which address many of the limiting factors affecting fish habitat associated with these projects include:

- Floodplain restoration.
- Wetland reconnection.
- Availability of off-channel habitat for juvenile salmonids.
- Increase in groundwater levels and baseflow.
- Increase in channel complexity.

While many of these projects have potential streamflow benefits, this plan does not account for the water offset from habitat projects. The ecological and streamflow benefits from habitat projects are supplemental to the quantified water offsets.

Four of the eight listed habitat projects are conceptual and do not provide Ecology's technical staff with a reasonable assurance of implementation or habitat benefits. As such they will not be directly considered in our NEB evaluation, but can be considered as potential projects that could replace the benefits of the other habitat projects that unexpectedly fail to be implemented or do not produce the expected benefits.

Three of the projects are in a design phase but lack details and we were unable to quantify the benefits. These projects will be considered for the general habitat improvements they produce.

The Clover Creek Springbrook Restoration project plans to restore 1,600 feet of a currently channelized and asphalted stream channel. Implementation of the three habitat improvement projects and the Clover Creek restoration, provide benefits that are spread throughout the watershed. They address several factors limiting fish habitat and will contribute many ecological benefits to the WRIA.

4.4 Uncertainty, implementation and adaptive management

There is uncertainty associated with all analyses presented in the Plan – ranging from the amount of consumptive use anticipated from future PE domestic wells, to the benefits likely to occur from the proposed projects.

Ecology technical staff have reasonable assurance that the selected water offset projects will be implemented, and will provide more than 15 times the estimated consumptive use quantity over the planning horizon. Specifically, the City of Tacoma project was awarded an Ecology Streamflow Restoration Competitive Grant to begin the preliminary investigations and design.

Since the offset quantity of 1,425 AFY is split evenly between the two water offset projects, successful implementation of one project could easily cover the estimated PE well consumptive use.

This much offset water available with the two projects significantly reduces the uncertainties inherent in the growth estimate and consumptive use methodologies. Both offset projects have project sponsors and are part of needed upgrades to existing infrastructure and/or improve operational functions.

The Plan includes three additional water offset projects with no associated offset quantities. The Plan also includes three habitat improvement projects that are in the design/feasibility stages with the South Puget Sound Salmon Enhancement Group and Puyallup Tribe as individual project sponsors. The inclusion of these six projects helps raise the reasonable assurance of achieving NEB.

The Plan describes an implementation and adaptive management approach, and recommends that Ecology:

- Update the tracking and reporting system for new PE wells.
- Document the completion of offset projects and estimate the “as-built” benefits of the project.
- Track and assess completed offset projects to determine their on-going viability and effectiveness.
- Develop and implement a monitoring and research strategy.

5.0 Ecology Technical staff NEB determination

RCW 90.94.030 requires that prior to plan adoption, Ecology must determine that the Watershed Restoration and Enhancement Plans will result in a NEB to instream resources.

This Plan puts forward five water offset projects that are complemented by eight habitat improvement projects. Four of the habitat improvement projects are detailed enough to provide a reasonable assurance of habitat benefits. While some of these habitat improvement projects have potential streamflow benefits, the Committee excluded any associated water offset from the Plan’s water offset accounting. Ecology technical staff has maintained this exclusion.

The WRIA 12 Plan anticipates 227 new PE wells and a consumptive water use of 89.9 acre-feet per year using a conservative "high-growth" estimate, WRIA-wide, over the planning horizon.

Offset projects described in the Plan focus on stream reconnection, stormwater infiltration, infiltration of reclaimed water, water right acquisition, and green stormwater infrastructure. The Plan proposes to offset new projected water use through five projects, for a total estimated offset quantity of 1,425 AFY. Two of the offset projects have quantities assigned to them. The remaining three projects are in the conceptual stage. Comparing the offset value of the most developed projects to the "high growth" PE well consumptive water use provides a water-offset surplus of 1,335 AFY.

The benefits associated with the water-offset projects in the Sequalitchew and Chambers subbains far exceed the conservative consumptive use estimate in those subbasins and contributes greatly toward our NEB determination.

The Clover subbasin does not have any water offset projects located in it, resulting in a defecit of (-87.1 AFY). However, the floodplain reconnection habitat projects identified in the plan will provide some margin of streamflow benefit. The habitat projects proposed in the Clover subbasin address the limiting factors affecting fish habitat and would add meaningful ecological benefits to the subbasin. The Program staff considered whether the projects in the Plan provide enough positive impacts at the WRIA-scale to offset the estimated water deficit in the Clover subbasin. This consideration was the primary factor in this NEB determination.

There are several project types that could potentially yield additional amounts of offset water not accounted for in the Plan. An important aspect of these offset projects is that they would be located in the Clover subbasin where the majority of the water deficits are projected in the Plan. These offset projects rely on water right acquisitions, infiltration of reclaimed water, and storm runoff across the basin. These types of projects will distribute water into the subsurface for retiming instead of discharge into Puget Sound or infiltrating water near the coastline where it does not benefit stream flow.

Based on the projects included in the Plan, Program staff conclude the WRIA 12 Plan uses reasonable and scientifically-sound methods during the analyses presented. This Plan includes an implementation and adaptive management strategy that clearly indicates the Committee's goal to successfully implement the plan. Even though the projects presented in the Plan do not provide water offsets in the Clover subbasin, Ecology staff have determined there are sufficient improvements across the watershed to ensure NEB will be reached.

Therefore, Ecology staff conclude there is a reasonable assurance that the Plan will provide significant improvements to stream resources within WRIA 12 and achieve a NEB in the context of chapter 90.94 RCW.

6.0 References

Ecology 2019a. Washington State Department of Ecology (July 2019). Final Guidance for Determining Net Ecological Benefit GUID-2094. Publication 19-11-079 131p. https://fortress.wa.gov/ecy/publications/documents/1911079.pdf.