Technical Review Report

WATERSHED PLAN ADDENDUM
Okanogan River Basin (WRIA 49)

Water Resources Program
Washington State Department of Ecology

Olympia, WA

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I. Verification of Compliance with Submittal Requirements of RCW 90.94.020

The Washington Department of Ecology (Ecology) has reviewed the WRIA 49 Watershed Plan Addendum (Addendum) in light of the requirements of RCW 90.94.020, and affirms that the document was submitted by the WRIA 49 Planning Unit prior to the February 1, 2021 deadline, and that the planning process followed the statutory process outlined in the law.

II. RCW 90.94.020 Technical Review

1. Overview

The WRIA 49 Planning Unit locally approved an Addendum to the Okanogan Watershed Basin Watershed Management Plan, dated October 1, 2020, to address the requirements of chapter 90.94 RCW. This document provides the Ecology Water Resources Program Streamflow Restoration Section technical staff's review of this Addendum to the WRIA 49 Watershed Management Plan.

In addition to the coordination and technical assistance provided by Ecology to the Planning Unit, Ecology provided guidance (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.

Sections 2 through 5 of this Ecology technical review document summarize the elements discussed in the Addendum. A figure, tables, and much of the information and text presented in these sections are taken directly from the Addendum. Section 6 discusses the State Environmental Policy Act (SEPA) review for this project, and Sections 7 and 8 provide Ecology technical staff's NEB determination and conclusions.

2.0 Assessment of potential impacts

Note: This section presents information and conclusions provided in the Addendum.

2.1 Population projections

To address the requirements of chapter 90.94 RCW, the Planning Unit divided WRIA 49 into five subbasins. The Planning Unit considered several factors when selecting subbasins, including previous subbasins defined in the original watershed plan, suitability of using topographic divides for subbasin delineation, and habitat potential and Ecosystem Diagnosis and Treatment modeling considerations. The subbasins identified include:

- Loup – Swamp (Lower Okanogan)
- Salmon Creek
- Bonaparte-Johnson (Middle Okanogan)
- Antoine-Whitestone (Upper Okanogan)
- Similkameen

By proximity, the mainstem Okanogan River is included in each of the adjacent subbasins as noted above (i.e., lower, middle, upper), from the confluence with the Columbia River to the Canadian Border. The WRIA 49 subbasins are indicated in Figure 1 on page 9 below.

Once the subbasins were delineated, the number of permit-exempt domestic wells expected through 2038 were estimated. These estimates generally exclude two areas of WRIA 49: the reservation lands of the Confederated Tribes of the Colville Reservation, which are outside the jurisdiction of chapter 90.94 RCW, and the Duck Lake Aquifer Groundwater Area, which has been adjudicated and where mitigation is available through the Okanogan Irrigation District.

The forecast of new permit-exempt domestic wells involved two parts:

1. An estimate of which parcels are currently served by permit-exempt domestic wells.
2. Review, comparison, and selection of growth rate forecasts to extrapolate the current estimate of permit-exempt domestic wells to 2038.

Based primarily on the Okanogan parcel data and the Okanogan County's Building Permit Database, a Geographic Information System (GIS) analysis was conducted to evaluate current permit-exempt well use.

To forecast the 20-year increase from the present-day estimate, a range of potential growth rates were considered by the Planning Unit. The primary sources for this analysis were estimates/data from the Washington State Office of Financial Management, including data from the Small Area Estimates Program, and an analysis of Okanogan County building permit trends by the County's Office of Planning and Development. Analysis and review of the various datasets, yielded low-growth, medium-growth, and high-growth scenarios (Table 1).

Table 1. Estimated Number of New Permit-Exempt Well Connections (Table 2 in Addendum)

Subbasin	**Estimated Current Number of Permit-Exempt Well Connections**	**6% Growth Scenario:** New Permit-Exempt Well Connections by 2038	**10% Growth Scenario:** New Permit-Exempt Well Connections by 2038	**30% Growth Scenario:** New Permit-Exempt Well Connections by 2038
Loup Loup-Swamp (Lower Okanogan)*	1,058	63	106	317
Salmon Creek	324	19	32	97
Bonaparte-Johnson (Middle Okanogan)*	2,559	154	256	768
Antoine-Whitestone (Upper Okanogan)	1,730	104	173	519
Similkameen	286	17	29	86
Total*	**5,957**	**357**	**596**	**1,787**

Notes: *excluding areas in Confederated Tribes of the Colville Reservation lands

2.2 Consumptive use estimates

Methods and assumptions recommended in Ecology's Final Guidance for Determining Net Ecological Benefit (Publication 19-11-079, 2019) were employed by the Planning Unit when estimating consumptive water use from new permit-exempt domestic wells. Two aspects of consumptive use were evaluated:

- **Outdoor water use:** 299 gpd/0.34 acre-feet per year (afy) consumptive use (373 gpd/0.42 afy total use), based on an estimated average outdoor irrigated area of 0.14 acres for WRIA 49, and a pasture/turf net irrigation water requirement of 26.89 inches per year (Washington Irrigation Guide, Appendix A, Omak station).

  The 0.14 acre estimate was generated based on a GIS-based, multi-year aerial photo analysis of 508 parcels, evenly distributed across the WRIA 49 subbasins.

- **Indoor water use:** 15 gpd/0.017 afy consumptive use (153 gpd/0.17 afy total use), from the Guidance of 60 gpd total use per person and a 10 percent consumptive water use assumption. Using the U.S. Census Bureau's estimate of 2.55 persons per household (2014-2018) for Washington State, this equates to 153 gallons per day of total indoor water use (0.17 afy). The 2.55 assumption is conservative, since 2.31 persons per household are estimated to reside in Okanogan County.

The Addendum contains consumptive use impact estimates for each WRIA 49 subbasin for the three growth scenarios, over the 20-year planning horizon. The total estimated consumptive water use from new permit-exempt domestic wells for all subbasins combined ranges from 122 afy (0.168 cubic feet per second (cfs)) to 607 afy (0.837 cfs) (excluding the Duck Lake Aquifer Groundwater Subarea and tribal reservation lands). For the purposes of forecasting impacts on instream flows associated with permit-exempt well growth and identifying water-related projects for chapter 90.94 RCW offsets, the medium-growth scenario was adopted by the

Planning Unit as the primary planning number (Table 2). A medium scenario growth rate of 10 percent through 2038 is consistent with the overall average of all growth rates.

Table 2. Water Use Impact Detail – Medium Growth Scenario (Table 4 in Addendum)

	10% Growth (Medium Scenario)						
		Total Water Use (afy)[2]			***Consumptive Water Use (afy)[3]***		
Subbasin	New Permit-Exempt Well Connections	Indoor *(0.17 afy per dwelling)*	Outdoor *(0.42 afy per dwelling)*	**Total**	Indoor *(0.017 afy per dwelling)*	Outdoor *(0.335 afy per dwelling)*	**Total**
Loup Loup-Swamp (Lower Okanogan)	106	18.0	44.5	**62.5**	1.8	35.5	**37.3**
Salmon Creek	32	5.4	13.4	**18.8**	0.5	10.7	**11.2**
Bonaparte-Johnson (Middle Okanogan)[1]	238	40.5	100.0	**140.5**	4.0	79.7	**83.7**
Antoine-Whitestone (Upper Okanogan)	173	29.4	72.7	**102.1**	2.9	58.0	**60.9**
Similkameen	29	4.9	12.2	**17.1**	0.5	9.7	**10.2**
TOTAL	**578**	**98.2**	**242.8**	**341**	**9.7**	**193.6**	**203**

[1] Excludes Colville Tribe Reservation lands and the Duck Lake aquifer Area.
[2] Total Water Use (i.e., quantity withdrawn from a permit-exempt well) equals consumptive use + return flow.
[3]Consumptive Water Use is the quantity of water lost to indoor evaporation and outdoor evapotranspiration and water evaporated during irrigation applications.

Domestic wells associated with permit-exempt development will withdraw water from many different hydrogeologic units and at various depths in WRIA 49. As explained in Appendix B in Ecology's Final Guidance for Determine Net Ecological Benefit (Publication 19-11-079), while water use and pumping associated with residential development will produce a seasonal increase, particularly during the summer months, this impact will be attenuated by the distance from surface water, both laterally and vertically. Therefore, consistent with Guidance provided by Ecology, the Addendum concludes that the distribution of wells and attenuation of well pumping based on numerous factors will create impacts that are essentially "steady state" or spread evenly throughout the year.

While consumptive use impacts will essentually be steady state, they represent the greatest percentage of surface flow during the low flow periods of late summer and early fall. Consequently, several water offset projects are included in the Addendum that focus on providing the greatest benefit during low flow periods.

3. Addendum offset projects

Note: This section presents information and conclusions provided in the Addendum.

RCW 90.94 requires planning units to develop actions "necessary to offset potential impacts to instream flows associated with permit-exempt domestic water use." The Planning Unit used a two-tier scheme to distinguish projects presenting the highest potential for providing measurable streamflow restoration benefits. Tier 1 projects included both water-for-water offset and non-water offset that are sufficiently well defined to:

1. Quantify a consumptive use offset;
2. Estimate a net effect on instream flow and/or;
3. Estimate an effect on aquatic habitat conditions (e.g. habitat area, fish passage, water temperature conditions, etc.).

Additionally Tier 1 projects were deemed to have known costs and be feasible. Tier 2 projects included those likely to provide future water-for-water and non-water offset benefits, but are currently not well defined enough to estimate their benefits.

The Addendum relies exclusively on Tier 1 projects to demonstrate that it offers sufficient resources to fully offset future permit-exempt domestic well consumptive water use and achieve NEB at the WRIA level. The Tier 2 projects were considered additional resources by the Planning Unit that can be adaptively managed to achieve Addendum objectives and chapter 90.94 RCW requirements as they are more fully defined during Addendum implementation.

Prior to passage of chapter 90.94 RCW, the Confederated Tribes of the Coleville Reservation's Okanogan Basin Monitoring and Evaluation Program (OBMEP) developed an Ecosystem Diagnosis and Treatment (EDT) model to evaluate habitat protection and restoration actions within the watershed. The Planning Unit relied upon this Okanogan EDT model to evaluate all but one of the Tier 1 projects (the Pine Creek Water Right Acquisition), with results influencing the presentation of projects throughout the Addendum.

Table 5, provided at the end of this Ecology report (Table 5 in the Addendum), describes the projects included in the plan, including the estimated project costs and their tier designations. Figure 1, below, indicates approximate locations for all projects.

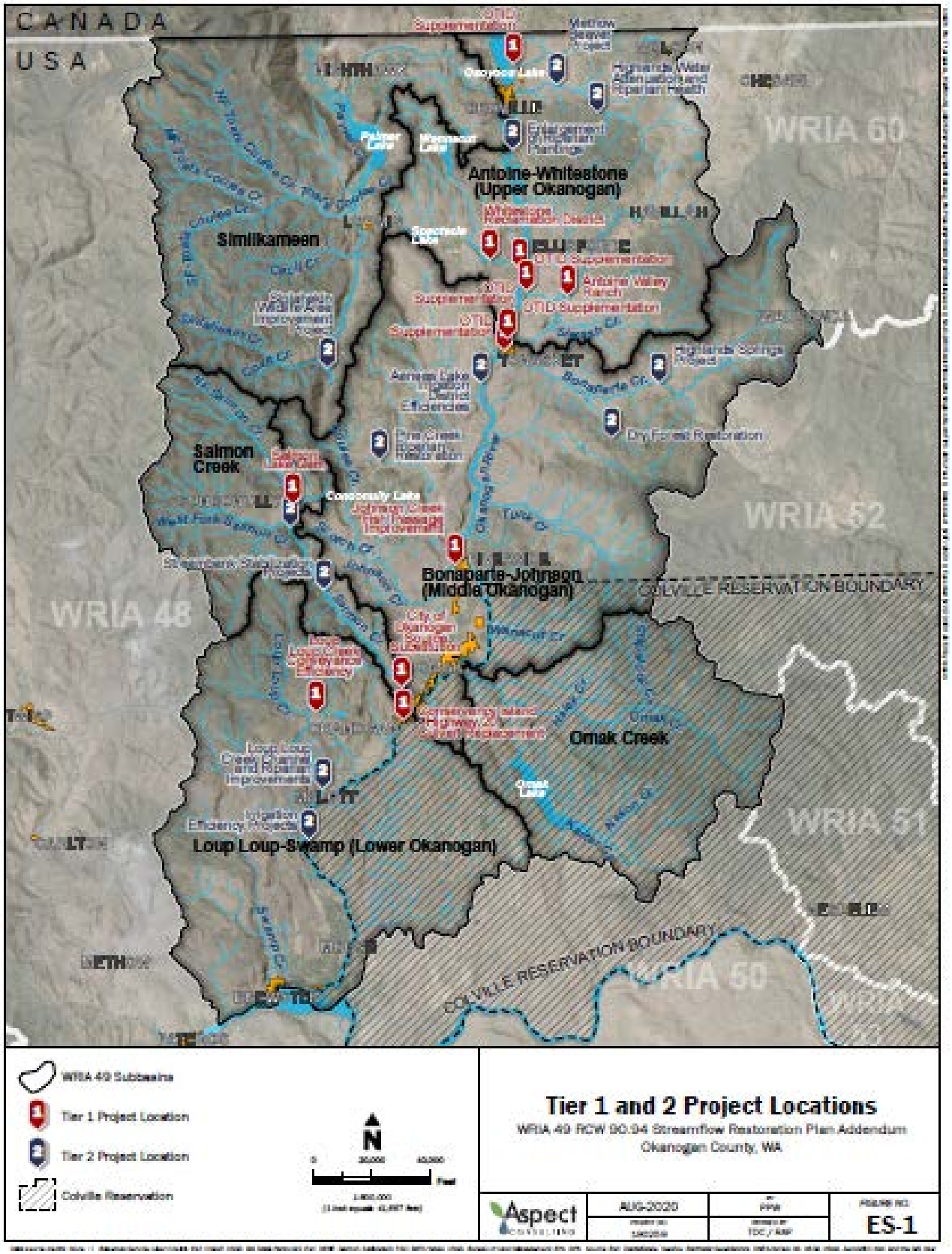

Figure 1. WRIA 49 subbasins, and Tier 1 and 2 project locations (Figure ES-1 in Addendum)

A total of 21 restoration projects (including nine Tier 1, and twelve Tier 2) were included in the WRIA 49 Addendum. All of the Tier 1 projects are briefly described below using information derived from Appendix B in the Addendum.

Antoine Valley Ranch (AVR) – Proposal is a land and water acquisition to purchase approximately 2,500 acres of land, including water rights totaling approximately 1,160 afy of consumptive use offset benefiting flows and temperature in Antoine Creek. Project also includes the purchase of Fanchers Dam and an associated ~500af of reservoir rights allowing controlled release of stored water when most essential for steelhead. Project would provide a consumptive use offset in the Antoine-Whitestone subbasin and contribute to NEB in Antoine Creek and the Okanogan River.

Project Cost: Purchase price for the ranch is pending private negotiations, but is estimated to be $7 to $7.5 million. Post-acquisition restoration and land and vegetation management is estimated to be about $150,000 to $200,000 per year for the first few years.

Conservancy Island Side Channel Reactivation – Highway and roadway construction in this area has resulted in disconnection of a historic side channel and/or split flow channel. This project would restore flows through the simultaneous replacement of the Highway 20 and the city-owned Island Avenue SW culverts.

Project Cost: Plan development, design, permitting, and public engagement is estimated at $150,000; and project construction at $700,000.

Johnson Creek Fish Passage – Four fish passage improvement projects have been proposed to build upon an ongoing effort to replace barriers blocking fish passage in the lower mile of Johnson Creek. Three of the four projects are eligible restoration actions under chapter 90.94 RCW, while the fourth is required mitigation per other legal requirements.

Project Cost: These projects are currently fully-funded at a combined cost of $2.7 million.

Loup Loup Creek Diversion Improvements – This project would provide improvements to a water right diversion, including operational changes, distribution system improvements, and increased water delivery efficiency. A major upstream diverter has a storage reservoir that could play a part in adjusting re-timing of flows. A preliminary estimate suggests potential water savings of approximately 5 to 10 cfs, providing offset benefits at the subbasin scale. It is expected by the Planning Unit that irrigation efficiency water (leakage) would be placed into the State Trust Water Right Program. Future consumptive use savings associated with evapotranspiration loss along the current ditch alignment was not quantified under this evaluation, and could produce further benefits. Regarding the project as a whole, there are unanswered questions regarding in-basin return flows under current conditions and potential impairment of senior water rights.

Project Cost: Feasibility and design are estimated at $175,000 and construction at $1.5 million.

Okanogan-Tonasket Irrigation District (OTID) Flow Supplementation – This project would develop a long-term flow supplementation program to increase streamflows and decrease

temperatures in fish-bearing tributaries in the Okanogan Basin. Using existing infrastructure with minor modifications, OTID would supplement flows in select tributaries as follows:

- Bonaparte Creek - 75 gallons per minute (gpm), located 2,095 feet from the creek mouth.
- Siwash Creek - 75 gpm, located 500 feet from the creek mouth.
- White Stone Creek - 75 gpm, located 650 feet and 3,100 feet from the creek mouth for a total of 150 gpm.
- Nine Mile Creek - 75 gpm, located 1,740 feet from the creek mouth.
- Antoine Creek - 100 gpm, at 2,324 feet and 50 gpm at 940 feet from the creek mouth.

Project Cost: Cost for an Antoine Creek pilot spring supplementation study, a system-wide infrastructure modification assessment, and a MAR feasibility study are estimated at $404,079.

Pine Creek Water Right Acquisition – This project involves potential purchase of a Pine Creek water right currently held in the State Trust Water Right Program (TWRP). An Office of Columbia River analysis suggests the right has 625.7 afy of consumptive use available for mitigation downstream of Janis Rapids on the mainstem Okanogan River, of which 225.7 afy is available for mainstem Okanogan River mitigation within Okanogan County. The remaining 400 afy may be used further downstream out of the WRIA. This project would not affect tributary flows and would not significantly contribute to NEB, and thus was the only Tier 1 project not evaluated using the Okanogan EDT model.

Project Cost: Cost for the water right purchase is $1,300 per afy. Because the water is currently in the TWRP, no additional permitting or O&M cost would be incurred.

Salmon Creek Source Substitution –This project would entail transferring a City of Okanogan, 1908, municipal water right claim for 300 gpm (about 484 afy) from Salmon Creek to a well in continuity with the Okanogan River. The project would provide funding to mitigate any existing facilities on Salmon Creek, and would improve an existing well or provide for a new well to meet state requirements.

Project Cost: Project development and design is estimated at approximately $50,000, project construction of a new municipal water supply well is estimated at $200,000, and annual O&M is estimated at approximately $10,000.

Salmon Lake Storage – This project would increase storage for retiming of up to 1,000 afy of water benefitting instream flows in Salmon Creek. The project was considered previously, but not pursued due to, among other things, potential effects on cabins by the lake. Project elements would include replacement of eight cabins and their associated septic systems.

Project Cost: Estimated construction cost is $652,000, with no ongoing O&M costs anticipated.

Whitestone Creek Flow and Temperature Augmentation – A phased project is proposed to construct additional storage and/or conveyance to improve irrigation efficiency, both increasing flow and benefiting water quality in lower Whitestone Creek.

Project Cost: A Cost estimate is pending additional refinement of project alternatives.

4.0 Plan implementation and adaptive management

Note: This section presents information and conclusions provided in the Addendum.

The Addendum indicates that implementation of the Watershed Plan Update will be achieved through the efforts of multiple Planning Unit member organizations and will require ongoing management by a lead entity (Okanogan County).

4.1 Roles and responsibilities

As stated on page 24 of the Addendum, implementation, operation and maintenance, monitoring, tracking and reporting of the Watershed Plan Update will require proactive involvement and management from the WRIA 49 initiating governments and other members of the Planning Unit. The 21 restoration projects included in the Addendum were identified by sponsors that will be responsible for implementation. Okanogan County will take the lead role in plan implementation with primary support from City of Omak and Oroville-Tonasket Irrigation District. All three initiating governments will participate, and work together as necessary to assist with the watershed pan implementation and monitoring.

As also stated on page 24 of the Addendum, several other Planning Unit entities will serve as the lead for implementation of both water offset and Tier 1 projects contributing to NEB. Based on the projects included, these entities currently include the Okanogan Conservation District, the Whitestone Irrigation District, the Confederated Tribes of the Colville Reservation, the City of Okanogan, and Washington Department of Fish and Wildlife. Various entities may also contract with outside parties to facilitate project implementation.

4.2 Funding

The Addendum indicates that implementation of the WRIA 49 Addendum will require funding for capital projects, project operation and maintenance, and ongoing program management. The Addendum provides an overview of funding mechanisms authorized through chapter 90.94 RCW Streamflow Restoration Grant Program and other potential state and federal grant funding options, including:

- Bureau of Reclamation WaterSmart Programs (e.g. Drought Resiliency, Water Efficiency, and Water Market programs)
- Ecology Office of Columbia River grant program
- Ecology Water Quality Program grants
- Various habitat restoration grant programs

The Addendum notes that current funding mechanisms established through chapter 90.94 RCW do not address ongoing implementation and/or project operations and maintenance. The Addendum goes on to state that in the absence of state funding for this purpose, each project proponent will need to develop a funding source to offset these aspects of projects.

4.3 Adaptive management

The Addendum states that adaptive management was included to clearly indicate the Planning Unit's goal of successful plan implementation, to the extent possible based on available future

funding from Ecology and from other sources. The Addendum goes on to indicate that adaptive management will add flexibility during implementation, and allow adjustments based on actual exempt well demand, offset project status, and new, opportunistic projects that are identified following Addendum adoption.

The Addendum outlines specific tasks envisioned over the 20-year implementation period, some of which include:

Review of Actual Exempt Well Demand

The Plan Addendum indicates that, on an every five-year basis, Okanogan County will develop a summary report of plan implementation and adaptive management tasks. This report will tally and summarize exempt well demand by subbasin, with a comparison to the estimates presented in the plan. Okanagan County has secured a grant from Ecology and is currently developing software to track exempt well demand by subbasin.

Review of Water and Non-Water Offset Project Status

As part of this approach, Okanagan County also intends to review the status of water offset projects throughout WRIA 49. Projects that have been implemented will be tallied and compared to actual exempt well demand on a subbasin and watershed basis, and surpluses and deficits compared to actual demand will be noted. Potential changes to the overall water and non-water offset project list will be considered based on any new, opportunistic projects that have been identified. Offset projects that no longer appear to be feasible for implementation (e.g. due to lack of landowner interest or inability to obtain funding) may be removed from the Planning Unit's target project list. In addition, consistent with the Planning Unit's values and desire to protect local agriculture, Okanagan County, in consultation with the Planning Unit, will manage water offset projects to meet the 20-year exempt well impacts, while retaining excess water for future uses, when appropriate.

The Addendum also includes specific recommendations by the Planning Unit for three Tier 1 water offset projects, including the Antoine Valley Ranch, the Pine Creek Water Right Acquisition, and Salmon Lake Storage.

5-Year Review and Reporting

The proposed 5-year report will incorporate a summary of plan implementation and adaptive management tasks, including:

- Status of actual permit-exempt domestic well demand by subbasin, with a comparison to the estimates presented in this plan.
- Status of water offset projects implemented or in-progress, combined with a tally of instream flow benefits by subbasin and for the whole watershed relative to actual permit-exempt domestic well demand.
- Status of non-water offset projects implemented or in progress.
- Comparison of completed projects with the water budget offset requirements and EDT modeling results supporting the NEB determination. Updated EDT modeling results may be used to support an updated suite of projects to demonstrate NEB continues to be achieved at the WRIA scale.

- Modifications, if any, to the offset project list based on inclusion of new, opportunistic projects and removal of projects, with a description of the rationale for the changes.
- Operation and maintenance status active projects, including identification of any concerns and/or corrective actions required.
- Status of offset project capital and O&M funding.

The 5-year report will be submitted to Ecology and posted online to the County's webpage and associated online reporting tool. The Planning Unit provides no direction to Ecology in their Addendum in respect to what wants done with these reports.

5.0 Planning unit evaluation of Net Ecological Benefit

Note: This section presents information and conclusions provided in the Addendum.

Prior to passage of chapter 90.94 RCW, the Confederated Tribes of the Coleville Reservation's Okanogan Basin Monitoring and Evaluation Program (OBMEP) developed an Ecosystem Diagnosis and Treatment (EDT) model to evaluate habitat protection and restoration actions within the watershed. Although not required in Ecology's Guidance, the WRIA 49 Planning Unit took advantage of this existing Okanogan EDT model to conduct its' NEB analysis. EDT is a life-cycle-based habitat model that synthesizes data and information about fish habitat conditions into quantitative metrics that describe habitat potential.

The Addendum states that the Okanogan EDT model is a useful tool for supporting the WRIA 49 NEB analysis because:

- It is a life-cycle-based model with a spatial and temporal dispersal component that emulates the full range of life history expression for the target species;
- It covers over 180 miles of mainstem and tributary stream reaches in WRIA 49, including all currently accessible anadromous habitat and nearly all tributaries likely to be affected by future consumptive use demand;
- It characterizes the environment using over 40 attributes with unique values assigned to each reach in the model network by month, and;
- It is based on over 15 years of habitat data collected by OBMEP as part of long-term habitat status and trends monitoring.

5.1 EDT model analysis approach

As explained in the Addendum, Okanogan EDT includes model populations for summer steelhead and summer-fall Chinook salmon. The Planning Unit selected Okanogan steelhead as the primary indicator species for the NEB analysis, because this population is listed under the ESA and its distribution includes most of tributary streams likely to be affected by future water demand. Okanogan Chinook salmon are currently found only in mainstem habitats, and are unlikely to be measurably affected by consumptive use impacts on tributaries. However, Okanogan Chinook salmon were modeled to evaluate the effects of one non-water offset project that would specifically improve habitat conditions on the mainstem. While not ESA-listed, Okanogan Chinook salmon are an important anadromous species relied upon by the Confederated Tribes of the Colville Reservation and others for subsistence, commercial, and recreational harvest.

The Okanogan EDT model generates an array of results that are useful for describing habitat potential for salmon and steelhead and identifying protection and restoration priorities. The Addendum's EDT-supported NEB analysis relied upon a single reporting metric, equilibrium abundance, also referred to as Neq. Neq is the theoretical population size that a given quantity and quality of habitat can support over time. The effects of projected permit-exempt domestic well water demand combined with proposed water and non-water offset projects, were measured using the net effect on juvenile and adult Neq. Specifically this included the numbers

of juvenile steelhead or Chinook salmon leaving WRIA 49 as smolts, and adults returning to the watershed to spawn.

In addition to projected benefits for salmon and steelhead, the projects presented in the Addendum are likely to benefit resident fish species. While these species were not modeled in EDT, it is reasonable to conclude that projects that increase habitat potential for salmon and steelhead will also benefit native fish species. Rationale for this conclusion provided by the Planning Unit in the Addendum is that native species that coevolved and share habitat with steelhead and Chinook salmon are similarly adapted to cold water environments, and are similarly sensitive, to the negative effects of habitat degradation. These species are also likely to benefit, on balance, from actions that improve habitat conditions for keystone species. Therefore, the Addendum concludes that resident fish are likely to benefit in every subbasin where EDT predicts that proposed projects would increase salmon and steelhead habitat.

The baseline condition (BASE scenario) used for the Okanogan EDT model analysis was the OBMEP 2017 Habitat Status and Trends monitoring scenario. This scenario is based on habitat monitoring data collected by OMBEP from 2014 through 2017, and provides a useful representation of average habitat conditions over this recent four-year period. Where appropriate, BASE scenario conditions were modified by the Planning Unit in specific tributaries to reflect habitat restoration actions that occurred after 2017, but are chapter 90.94 RCW ineligible.

The Planning Unit used a sensitivity analysis approach to evaluate the impacts of future consumptive use on aquatic habitat performance in WRIA 49. As described in Section 5.2 below, this approach provided a conservative overestimate of demand effects on wetted channel width under low flow conditions to provide a factor of safety for demonstrating NEB.

In tributaries where flow restoration of some type is proposed in the Addendum, either water-for-water or tributary instream flow offset (e.g. the Salmon Creek source substitution, where a tributary offset is provided, but water is withdrawn later downstream on the mainstem), the NEB analysis scenario considers the net effect of the projected change on baseflow channel width, as well as other potentially beneficial effects, such as improved habitat composition, reduced low flow variability, improved fish passage, and reduced water temperatures. The intent of this approach by the Planning Unit is to conservatively overestimate the potential effects of future water demand to provide a factor of safety for the NEB evaluation.

5.2 Future consumptive use impact analysis

As discussed in the Addendum, consumptive water use in WRIA 49 is projected to increase by 203 afy by 2038. The distribution of the effects of this water use will depend on the number of tributary streams in each subbasin, and where future development occurs. In the Salmon Creek subbasin there is only one major tributary, so the projected 0.016 cfs streamflow loss was assumed to occur within that tributary. In contrast, the Bonaparte-Johnson subbasin includes four steelhead-bearing tributaries (Johnson Creek, Tunk Creek, Aeneas Creek, and Bonaparte Creek) as well as 32.7 miles of Okanogan mainstem habitat. The projected loss of 0.116 cfs in instream flows was assumed by the Planning Unit to be distributed across these streams and the river based upon where future development occurs. A portion of this 0.116 cfs is

attributable to development likely to occur on the valley floor adjacent to the Okanogan River, where domestic wells are completed in the valley aquifer and would likely be in continuity with the Okanogan River.

As stated in the Addendum, there is no direct way to use the Okanogan EDT model to evaluate the effects of future consumptive water use on habitat performance for steelhead, so the Planning Unit used an approach that combined a threshold assumption with a sensitivity analysis. The analysis assumed that future consumptive use would reduce baseflow channel width in all Okanogan tributary streams used by steelhead by 0.5 percent during low flow months. Tributary channel dimensions in the EDT sensitivity analysis scenario were reduced by 0.5% relative to BASE conditions from July-September and December-March. Peak tributary flows in WRIA 49 typically occur during the snowmelt period from April through early June, and any water demand effects on surface flows during this period are likely to be unmeasurable and insignificant. When distributed across subbasins, the flow effect was a fraction of intra-seasonal and inter-annual mainstem flow variability and the associated effect on wetted channel width was effectively unmeasurable. The sensitivity analysis was not applied by the Planning Unit to the Okanogan River. The results of the consumptive use impact sensitivity analysis are presented in Table 3.

The Addendum states that because the distribution of future instream flow effects cannot be predicted with certainty, the sensitivity analysis scenario intentionally overestimated likely effects on tributary habitat conditions. This is demonstrated by case studies of sensitivity analysis assumptions in four steelhead-bearing tributary drainages: Antoine Creek, Bonaparte Creek, Loup Loup Creek, and Ninemile Creek. The decrease in instream flows required to reduce wetted channel width in each of these systems by 0.5 percent ranges from four to over 1,000 times greater than the predicted consumptive use effect on streamflow, varying by month. Given these findings, the Addendum found that the actual effect on adult and juvenile steelhead Neq would be smaller than predicted. This demonstrates that the Addendum impact analysis provides a conservative overestimate of future consumptive use effects on aquatic habitat conditions in WRIA 49.

Table 3. EDT sensitivity analysis of estimated increased consumptive use (Table 6 in Addendum)

NEB Subbasin	Estimated Self-Supplied Parcels	New Well Dwellings	Consumptive Use		Sensitivity Analysis Effect on Steelhead *Neq* (change from BASE conditions)	
			afy[2]	*cfs*	Adult	Juvenile
Loup Loup-Swamp (Lower Okanogan)	1,058	106	37.3	0.052	19 (0)	1,069 (-3)
Salmon Creek	324	32	11.3	0.016	120 (-1)	8,944 (-36)
Bonaparte-Johnson (Middle Okanogan)[4]	2,379	238	83.8	0.116	32 (0)	1,908 (-5)
Antoine-Whitestone (Upper Okanogan)	1730	173	60.9	0.084	62 (0)	3,756 (-8)
Similkameen	286	29	10.2	0.014	51 (0)	2,056 (0)
TOTAL	5,777	578	203	0.281	304 (-1)	18,875 (-52)

[1] Based on a per-residence total water use estimate of 0.59 afy
[2] Based on a per-residence consumptive water use estimate of 0.35 afy
[3] Subbasin is located entirely on CTCR lands, no parcels under chapter 90.94 RCW jurisdiction.
[4] Excludes the Duck Lake Aquifer Area

5.3 Planning Unit conclusions on achievement of NEB in WRIA 49

Table 4 below presents a summary of results of the Planning Unit's NEB analyses, including water offset balance, total tributary offset balance, and the estimated beneficial effect of Tier 1 streamflow and habitat restoration projects on salmon and steelhead resources in WRIA 49.

The Addendum states that as demonstrated by the water-for-water offset analysis, EDT model results, and supporting qualitative assessment of beneficial habitat effects, the Tier 1 projects proposed achieve NEB at the WRIA-level with a wide factor of safety. The only subbasin where positive benefits for ESA-listed steelhead were not convincingly demonstrated by the Addendum analysis, is in the Similkameen, which currently has no Tier 1 NEB projects proposed. However, this subbasin has the smallest projected increase in consumptive use and a proposed Tier 2 non-water offset project that would provide significant benefits for resident fish species. The additional Tier 2 projects included in the Addendum would also contribute to NEB, providing an additional factor of safety at the WRIA-scale when added to Tier 1 actions. These Planning Unit findings demonstrate that the Addendum provides sufficient resources to adaptively manage future water demand and achieve NEB consistent with chapter 90.94 RCW requirements.

Some specific conclusions by the Planning Unit in the Addendum regarding their WRIA 49 NEB evaluation are as follows:

- The effects of future consumptive use impacts of permit-exempt wells of 203 afy are likely to be small; the EDT model predicts that future consumptive use would result in a

net reduction in steelhead abundance of less than one adult and 52 juveniles at the WRIA scale (see TOTAL Adult and Juvenile columns in Table 3 above).

- Tier 1 projects proposed in the Addendum achieve a significant net positive streamflow benefit (up to a 2,666 afy surplus) at the WRIA level (see Table 4).
- Water offset and non-water offset projects are distributed throughout WRIA 49, including in the upper portions and/or targeted tributary reaches in the basin, providing instream flow and habitat benefits to over 100 river miles on the mainstem Okanogan River and its tributaries.
- Proposed Tier 1 projects are capable of maintaining or increasing instream flows in all analysis subbasins except the Similkameen, where no Tier 1 projects are currently proposed (see Table 4).
- The EDT model analysis estimates that the Tier 1 projects in the Addendum would produce a net increase of 119 adult and 5,850 juvenile steelhead, and 18 adult and 4,826 juvenile summer/fall Chinook salmon at the WRIA level (see Table 4).
- EDT model results indicate that habitat potential would increase for steelhead in all analysis subbasins except the Similkameen where projected consumptive use effects are will be negligible. EDT results also indicate that habitat potential for summer/fall Chinook salmon would increase at the WRIA level and in all subbasins except Salmon Creek where this species does not and did not historically occur.
- Resident fish species are likely to benefit from improved habitat conditions at the WRIA level, and in every analyzed subbasin, with specific benefits likely to occur where the EDT model predicted improved habitat performance for steelhead and Chinook salmon.
- Consumptive use effects on steelhead in the Similkameen subbasin were not modeled because the sensitivity analysis assumptions were not applied to mainstem reaches, however any incremental effect on steelhead or other aquatic species would be fully offset by the instream flow benefits of a proposed Tier 2 non-water offset project in Sinlahekin Creek.
- The Tier 2 Sinlahekin Creek project would provide habitat benefits for resident fish species, such as rainbow trout, cutthroat trout, mountain whitefish, native suckers, and sculpins.
- Based on the quantitative benefits to steelhead and Chinook salmon from Tier 1 projects demonstrated by EDT at the subbasin and WRIA level, the qualitative benefits to resident fish provided by these projects, and the additional benefits and factor of safety provided by Tier 2 projects, the Addendum can achieve NEB at the subbasin and WRIA level.
- The water offset and non-water offset projects in this Addendum would provide a net surplus of water offset, tributary offset, and ecological benefit sufficient to adaptively manage for future water demand and meet chapter 90.94 RCW requirements with a factor of safety.

- The proposed projects are realistic, are in project categories that are supported by state and federal funding programs, have viable sponsors and defensible conceptual designs, and include some projects that have already been implemented.
- The WRIA 49 Planning Unit has reached concurrence that this Addendum demonstrates that the combined components of the plan achieve NEB consistent with chapter 90.94 RCW requirements.

Table 4. WRIA 49 Planning Unit NEB analysis results (Table 8 in Addendum)

NEB Subbasin	Water-for-Water Offset		Tributary Offset[1]		Net Ecological Benefit			
	Net change (afy)	Net change (cfs)	Net change (afy)	Net change (cfs)[2]	Adult Steelhead Neq	Juvenile Steelhead Neq	Adult Chinook Neq[3]	Juvenile Chinook Neq[3]
Loup Loup-Swamp (Lower Okanogan)	-37	-0.51	275 (approx)	0.38	2	118	2	2,537
Salmon Creek	1,000 (+988)	1.36	1,499	2.07	111	5,539	--	--
Bonaparte-Johnson (Middle Okanogan)	626 (+626)[4]	0.864	123	0.17	4	83	14	1,999
Antoine-Whitestone (Upper Okanogan)[5]	1,160 (+1,099)	1.52	2,371	3.28	2	110	1	305
Similkameen[6]	-10	-0.01	-	-	0	0	1	166
WRIA 49 Total	**2,786 (+2,666)**	**3.22**	**6,753**	**5.9**	**119**	**5,850**	**18**	**4,826**

[1] Tributary Offset is the total instream flow increase in Okanogan River tributaries that support summer steelhead, combining water-for-water offset projects and Tier 1 non-water offset projects.

[2] Net change (cfs) values are average over 1 year. All non-water offset projects provide flow augmentation during specific periods (e.g. April through October) to optimize habitat benefits for steelhead.

[3] Chinook NEB effect from Highway 20/Conservancy Island side channel project

[4] Pine Creek water-for-water offset applies in mainstem Okanogan only (no tributary offset or measurable NEB effect)

[5] Tributary offset and NEB estimate include AVR project with full instream flow benefit of 1,294 afy, including additional non-water offset of 134 afy.

[6] The Tier 2 Sinlahekin Wildlife Area Impoundments Improvement project provides sufficient potential tributary offset in the Similkameen subbasin to avoid consumptive use effects and produce additional NEB benefit for resident fish species. A net tributary offset of zero is assumed for the purpose of the NEB determination.

6. State Environmental Policy Act

The State Environmental Policy Act (SEPA) (chapter 43.21C RCW) requires state and local governments to consider potential environmental consequences of proposed actions, including project and non-project actions, during the decision-making stage. Under SEPA rules, non-project actions are defined as governmental actions involving changes to policies, plans, and programs (WAC 197-11-774). Any non-project action must be reviewed under SEPA unless specifically exempted. The SEPA review consists of identification and evaluation of probable impacts of a proposed action, reasonable alternatives to the proposed action, and mitigation measures, before committing to a particular action.

Okanogan County is the SEPA lead agency and Stephanie Palmer, the Director of Planning, was identified as the SEPA Responsible Official. On September 1, 2020, the SEPA Responsible Official submitted a SEPA checklist for the adoption of an addendum to the Okanogan Basin Watershed Plan and issued a Threshold Determination of Non Significance (DNS) in accordance with WAC 197-11-340, identifying the proposal would not have a probable, significant, and adverse environmental impact. The date of the publication in Okanogan County's legal periodical of record was September 9, 2020, and public comments were received through September 23, 2020. The DNS was upheld after all received comments were reviewed and were determined not to provide probable, significant, and adverse impacts from the proposal.

7.0 Ecology technical staff Net Ecological Benefit determination

7.1 Adequacy of plan analysis

RCW 90.94.020(4)(c) states that,

> Prior to adoption of the updated watershed plan, the department must determine 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.

The law requires Ecology to determine that a NEB will result prior to adopting watershed plan updates. NEB is not a technical term that has been defined in the natural sciences, and instead is a creation of the Washington State Legislature. Therefore Ecology prepared the document Final Guidance for Determining Net Ecological Benefit (Publication 19-11-079).

Although it is not a requirement under the RCW, Ecology's Guidance encourages planning groups to clearly and systematically articulate NEB evaluations in their watershed plans. The Guidance states that plans that include NEB evaluations significantly contribute to reasonable assurances that offsets within and the NEB of plans will occur. The Guidance goes on to say that Ecology will review any such plans with considerable deference to the knowledge, insights, and expertise of the partners and stakeholders who prepared the plans. The WRIA 49 Planning Unit chose to evaluate NEB in their Addendum, which the discussion in Section 5.0 above summarizes.

As articulated in Ecology's NEB Guidance document, at a minimum plan updates occurring under chapter 90.94 RCW should provide 5 elements. These items were addressed in the by the Planning Unit in the Addendum as follows:

1. **Clear and Systematic Logic** - The Addendum describes comprehensive planning undertaken by the initiating governments, and logical steps taken and analyses conducted during the planning process to produce the document.
2. **Subbasin delineations** - The Addendum describes an appropriate process that was conducted during the subbasin delineation process that considered a number of factors, including subbasins defined in the original watershed plan, suitability of using topographic divides, and habitat potential and EDT modeling considerations.
3. **New consumptive water use estimates** - Methods recommended by Ecology Guidance were used during this portion of the analysis. The forecast of new permit-exempt domestic wells involved an estimate of which parcels are currently served by permit-exempt domestic wells, and selection of growth rate forecasts to extrapolate the current estimate through 2038. When forecasting impacts on instream flows associated with permit-exempt well growth and identifying chapter 90.94 RCW offset projects, a medium-growth scenario (10% growth) was adopted as the primary planning number. The results of the analyses suggest that the total consumptive use anticipated from all new permit-exempt domestic wells within WRIA 49 from 2018 through 2038 will be approximately 203 afy.

4. **Evaluation of impacts from new consumptive water use** - New permit-exempt domestic well development will be spread throughout the WRIA and will occur in hydrogeologic units at various depths. While water use associated with the development will vary during the year, seasonal impacts will be attenuated by distance from surface water both laterally and vertically. Therefore the Addendum concludes that new permit-exempt domestic well-pumping impacts will essentially be steady state. The Addendum goes on to explain that while consumptive use impacts will be spread somewhat evenly throughout the year, they likely represent the greatest percentage of surface flow during low flow periods of late summer and early fall. Consequently, several water offset projects were included that focus on providing greatest benefit during low flow periods in certain areas.

   Ecology's Guidance indicates that to the degree plan evaluations should consider:

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

   Due to the Addendum's reliance on the Okanogan EDT model to evaluate the effects of proposed projects relative the anticipated impacts from new permit-exempt domestic wells, the Addendum's evaluations do take these factors into consideration.
5. **Descriptions and evaluations of projects and actions for their offset potential** – The Addendum presents thorough descriptions of the projects and a thoughtful and logical process that was followed to evaluate the offset potential of projects. The Addendum also describes the Planning Unit's use of the Okanogan EDT model to conduct an NEB analysis. It is an effective tool for this purpose, since it is a life cycle-based habitat model that synthesizes data and information about fish habitat conditions into quantitative metrics that describe habitat potential.

Ecology's Technical Staff concludes that the Addendum easily meets the minimum requirements described in Ecology's NEB Guidance and likewise meets the requirements of chapter 90.94 RCW.

The foregoing staff conclusion notwithstanding, there are several errors that were discovered during the Addendum review, none of which are significant enough to affect any of Ecology's conclusions. One can be found on page 8 of Appendix B, which states there are 20 offset projects, including eight Tier 1 and twelve Tier 2 projects. The Addendum actually presents 21 offset projects, including nine Tier 1 and twelve Tier 2 projects. Ecology also discovered some small discrepancies between the offset amounts noted on page 9 in Appendix B compared to numbers in Table 1 in Appendix B. This was true for both the Antoine Valley Ranch project and the OTID Flow Supplementation project, however, those differences amounted to less than one percent of claimed benefits for each of those projects. Finally, although not necessarily an error, it is unclear what is represented in Table 4 in the second column. That column, labeled Water-for- Water Offsets - Net change (afy), includes negative numbers for subbasins that include water offset projects. However, based on Ecology's evaluation the totals at the bottom of this table are correct, and questionable aspects did not adversely affect Ecology's analysis.

7.2 NEB evaluations

One method of evaluating the NEB of a watershed plan is to conduct a general ledger-type comparison of the magnitude and spatial distribution of detriments caused by the consumptive water use associated with new permit-exempt domestic wells versus the benefits of the proposed offset projects. Another method is to rely on models like the Okanogan EDT model in order to evaluate potential tradeoffs between these two. Below are evaluations using both of these methods.

7.2.1 Ledger-type comparison

Consumptive water use from permit-exempt domestic wells in WRIA 49 is projected to increase by about 203 afy in WRIA 49 by 2038. This increased demand will not be distributed evenly over the planning subbasins, and is predicted to range from a low of 10.2 afy in the Similkameen subbasin to a high of 83.8 afy in the Bonaparte-Johnson (Middle Okanogan) subbasin. This translates to a steady-state equivalent reduction in streamflow ranging from -0.014 to -0.116 cfs, respectively.

The distribution of streamflow effects will depend on the number and location of tributary streams in each subbasin and where future development takes place. In the Salmon Creek subbasin there is just one major tributary, while in the Bonaparte-Johnson subbasin four steelhead-bearing tributaries exist and 32.7 miles of Okanogan mainstem. The projected loss of 0.116 cfs in the Bonaparte-Johnson subbasin will be distributed across these waterbodies. The portion of new domestic wells growth that occurs on the valley floor adjacent to the Okanogan River will likely be in continuity with the river and have a negligible effect on tributary flows.

The Planning Unit developed a geographically widely-distributed portfolio of 21 offset projects, as presented in Figure 1. As described previously, a two-tier scheme was used to distinguish all of these projects. Tier 1 projects include both water offset and non-water offset projects that are sufficiently well defined to have their consumptive use offset potential quantified with a high degree of certainty. There are a total of nine Tier 1 projects and twelve Tier 2 projects.

A comparison of the magnitude and spatial distribution of the effects of consumptive water use associated with new wells versus the benefits of proposed offset projects indicates that the latter significantly outweighs the former. Support for this conclusion provided in the Addendum includes:

- Effects of water use from permit-exempt domestic wells anticipated through 2038 are likely to be small – cumulatively 203 afy.
- Considering the Tier 1 projects alone, the benefits of proposed water offset projects are likely to achieve a significant streamflow surplus benefit (up to 2,666 afy assuming all projects implemented) at the WRIA level.
- Proposed Tier 1 projects would increase stream flows and increase habitat potential for steelhead in all of the WRIA subbasins except the Similkameen, where projected new consumptive water use will be negligible (10 afy, with no modeled impact on fish).
- The proposed Tier 1 projects would increase habitat potential for summer/fall Chinook salmon at the WRIA scale, and in all subbasins except Salmon Creek where this species does not and did not historically occur.

- Consumptive use effects in the Similkameen subbasin could be fully offset by the streamflow benefits of a proposed Tier 2 non-water offset project in Sinlahekin Creek.
- The Tier 2 Sinlahekin Creek project would provide a benefit for resident fish species such as rainbow trout, cutthroat trout, mountain whitefish, native suckers, and sculpins.

Results of NEB analysis conducted by the Planning Unit are summarized in Table 4 above. As shown, the water and tributary offset projects presented in the Addendum fully offset future consumptive use in four of five analysis subbasins and at the WRIA scale.

7.2.2 Analysis using Okanogan EDT model

Previously, the OBMEP developed an Ecosystem Diagnosis and Treatment (EDT) model to evaluate habitat protection and restoration actions within the watershed. The Planning Unit took advantage of this existing model to evaluate all but one (the Pine Creek Water Right Acquisition) proposed Tier 1 offset projects. The Addendum relies exclusively on Tier 1 projects to demonstrate that it offers sufficient resources to fully offset future consumptive use and achieve NEB at the WRIA level.

The effects of projected permit-exempt domestic well water demand, combined with proposed water and non-water offset projects were measured using the net effect on juvenile and adult Neq, specifically the number of juvenile steelhead or Chinook salmon leaving WRIA 49 as smolts and the number of adults returning to the watershed to spawn. Results of the NEB analysis relying on the Okanogan EDT model are summarized in Table 4 above.

The Okanogan EDT model was designed for summer steelhead and summer-fall Chinook salmon. The Planning Unit selected Okanogan steelhead as the primary indicator species for the WRIA 49 NEB analysis, because this population is listed under the ESA and its distribution includes most of tributary streams likely to be affected by future water demand.

Increased habitat potential for salmon and steelhead as a result of the proposed projects will also benefit native resident species at the WRIA-wide and subbasin scales. Although resident fish species were not explicitly modeled, it is reasonable to conclude this since resident species coevolved and share habitat with steelhead and Chinook salmon, and are similarly adapted to their cold water environments.

Based on the EDT modeling conducted, benefits from the proposed offset projects will far outweigh the detriments caused by the consumptive water use associated with new permit-exempt domestic wells. Support for this conclusion includes:

- EDT modeling predicts that future consumptive use will likely result in a net reduction in steelhead abundance of less than 1 adult and 52 juveniles at the WRIA level.
- EDT modeling predicts that future consumptive use likely will have no significant effect on summer/fall Chinook salmon abundance at the WRIA level (less than 1 fewer juvenile and adult).
- Estimates based on EDT modeling suggests that the Tier 1 projects will produce a net increase of 119 adult and 5,850 juvenile steelhead, and 18 adult and 4,826 juvenile summer/fall Chinook salmon at the WRIA level.

EDT model results predict that the combined effects of Tier 1 water and non-water offset projects will generate a net increase in adult and juvenile steelhead abundance in all subbasins except the Similkameen, which has no Tier 1 projects, but has only 10 afy of projected consumptive use and a modeled impact of less than one adult and juvenile fish. The EDT model results also indicate that non-water offset projects will increase adult and juvenile summer/fall Chinook abundance in 4 of 5 subbasins and at the WRIA scale.

Ecology staff reviewed the EDT model, its inputs, and the assumptions made both during the planning process and after Addendum submittal, and found the approach to be reasonable in its application and quite conservative in its extrapolation. When modeling for the impacts of new permit exempt domestic wells, the model assumed a 0.5 percent reduction in a stream's wetted width, which is four to over ten times greater than the measured impact at four of the modeled stream locations. The model also identified factors that cause the greatest impairment to fish habitat and targeted several habitat projects to produce the greatest improvements. In the end, the model provided Ecology a reasonable quantification of the effects of new wells and the benefits of water offset and habitat projects. Although the model only evaluated impacts on and benefits to Steelhead and Chinook salmon, it is logical to assume positive effects for resident fish in the improved subbasins as well.

7.3 Relationship to existing plans and current watershed protection efforts

This Addendum recognizes relevant past and on-going planning processes, and describes how this document is linked and coordinated with existing plans and efforts. The document describes previous watershed planning that occurred under the Watershed Planning Act (RCW 90.82), as well as subsequent plans, actions and projects that are relevant. Since the watershed planning process in 2009, the Confederated Tribes of the Colville Reservation and the State's Upper Columbia Salmon Recovery Board have identified many projects benefitting instream flow resources. That work, as well as proposals identified in the original watershed plan, were incorporated during development of the WRIA 49 Addendum.

Following the 2009 watershed planning process, the Confederated Tribes of the Colville Reservation's OBMEP has been a key contributor to WRIA 49 protection and recovery efforts. OBMEP has developed and maintained an extensive monitoring network to support long-term habitat status and trends monitoring and restoration planning under the Columbia Basin Fish Accords, which provide federal funding to promote the conservation and recovery of salmon and steelhead populations listed under the ESA. The OBMEP developed an EDT model for the Okanogan River and its tributaries, and this model played a central role in the NEB evaluation presented in the Addendum.

7.4 Uncertainty and adaptive management

There is uncertainty associated with all Planning Unit analyses provided in Addendum – ranging from the amount of consumptive use anticipated from future permit-exempt domestic wells, to the benefits that will actually occur from the proposed projects. The future consumptive use estimates, for example, derive from an assumption that new homes will water their landscaping at rates equivalent to irrigation requirements for commercial pasture/turf grass presented in

the Washington Irrigation Guide, Appendix A. That particular assumption builds a de facto safety factor into the planning effort.

Based on all of the potential uncertainty, the Addendum includes robust adaptive management that indicates the Planning Unit's goal of successful plan implementation, to the extent possible based on available future offset project funding from Ecology and from other sources. The Addendum states that adaptive management will add flexibility to the implementation process, allow adjustments based on actual exempt well demand, offset project status, and new, opportunistic projects that are identified following adoption of the Addendum.

Recent decisions by Ecology regarding two WRIA 49 grant applications also reinforce expectations that actions described in the Addendum will result in stream restoration within the watershed. Those projects, selected for funding under the 2020 Ecology Streamflow Restoration competitive grant round, include the Antoine Valley Ranch (AVR) acquisition and the Methow Beaver Project. For the AVR acquisition, Ecology awarded funds to Western Rivers Conservancy, in partnership with the Confederated Tribes of the Colville Reservation, to assist with the purchase of the 2,524 acre ranch with approximately 1,200 acre feet of water rights, and 500 acre feet of reservoir rights. The AVR acquisition alone far exceeds the 203 afy in future projected permit-exempt domestic well consumptive use. This project is described on page 10 above. The Methow Beaver Project is habitat focused, and helps achieve a NEB by restoring degraded stream channels impacted by wildfire, using restoration strategies such as beaver dam analogs and engineered log jam installations, riparian plantings, and beaver relocation.

In order to achieve plan goals, Okanagan County plans to track the number of permit-exempt wells permitted during the planning period and progress towards implementation of the identified offset projects. To maintain a high level of landowner engagement, Okanagan County will also develop a forum that will help insure that there is community buy in to implementation of the plan. The Addendum calls for periodic updates to each of the Implementing Governments and a requirement to reconvene the entire planning unit at least every five years. Some key adaptive management provisions of the Addendum include:

- Review of Actual Exempt Well Demand.
- Review of Water and Non-Water Offset Project Status.
- 5-Year Review and Reporting.

The 5-year report will be submitted to Ecology and posted online to the County's webpage and associated online reporting tool.

All of these elements identified in the Addendum demonstrate a strong commitment by the Planning Unit to ensure that this plan will be implemented and lead to significant streamflow restoration actions within the WRIA.

8.0 Ecology technical staff conclusions

The Planning Unit developed the WRIA 49 Watershed Plan Addendum in compliance with chapter 90.94 RCW. This law requires watershed plans to identify projects and actions necessary to offset the potential consumptive use of new permit-exempt domestic well withdrawals from 2018 through 2038, and achieve a Net Ecological Benefit (NEB) for the WRIA. The RCW requires that prior to plan adoption, Ecology determine that the plans will result in a NEB to instream resources. To aid planning groups, Ecology prepared Guidance for determining NEB (Publication 19-11-079). The Addendum submitted by the Okanogan Planning Unit follows Ecology's recommendations and provides ample information for Ecology to make its determination.

The WRIA 49 Addendum anticipates growth in the number of permit-exempt-domestic wells from 2018 through 2038, and estimates the associated consumptive water use. The Addendum also presents a portfolio of water and non-water projects designed to offset the effects of these withdrawals. Although not required under chapter 90.94 RCW, the Planning Unit chose to conduct its own NEB evaluation, and in so doing relied on an existing Okanogan EDT model. The Okanogan EDT model is a life cycle-based habitat model, that synthesizes data and information about fish habitat conditions into quantitative metrics, and is well suited for this purpose. Based on that modeling and other information presented in the Addendum, the Planning Unit concluded that the actions and projects proposed will produce a NEB.

Ecology conducted its NEB evaluation relying upon two methods.

The ledger-type evaluation, compared the magnitude and spatial distribution of anticipated detriments caused by consumptive water use associated with new permit-exempt domestic wells, with the likely benefits of proposed offset projects. On a WRIA-wide basis, anticipated new consumptive water use will be small (about 203 afy) compared to anticipated benefits from the proposed water offset projects (up to a 2,786 afy). And the proposed Tier 1 water offset projects (those most likely to occur) would increase stream flows and increase habitat potential for steelhead, summer/fall Chinook salmon, and resident fish in most subbasins.

Ecology's evaluation of the Okanogan EDT modeling results found the Planning Unit's approach reasonable in its application and quite conservative in its extrapolation. Those results predict significant net increases in adult and juvenile steelhead abundance in every subbasin, except the Similkameen where the effects from new permit-exempt domestic wells are anticipated to be small (10 afy) with a modeled effect of less than one adult and juvenile fish. Modeling results also predict that adult and juvenile summer/fall Chinook salmon will increase at the WRIA scale.

Ecology technical staff conclude that the WRIA 49 Addendum is thorough and well-executed, and uses reasonable and scientifically-sound methods when conducting the analyses presented. This strategy is well-integrated with existing and current watershed protection and restoration efforts, and includes a robust implementation and adaptive management strategy that clearly indicates the Planning Unit's goal to successfully implement the plan. For these reasons, we conclude there is a reasonable assurance that the Addendum will provide significant improvements to stream resources within WRIA 49 and achieves a NEB in the context of chapter 90.94 RCW.

Table 5. Summary of proposed WRIA 49 offset projects (also designated Table 5 in Addendum)

Project	WRIA 49 Subbasin/Stream	Tier Ranking	Sponsor	Project Type[1]	Description	Consumptive Use Offset	Instream Flow Benefit	Affected Stream Length (mi)[2]	Estimated Cost	Requires O&M?
Antoine Valley Ranch (AVR)[3]	Antoine-Whitestone/ Antoine Creek	Tier 1	Washington Water Trust, CTCR, Trout Unlimited	O&NEB	Conservation acquisition of 2,524-acre Antoine Valley Ranch (AVR) and senior water rights totaling 1,294 af. Includes ownership of Fanchers Dam with its related storage 500 AF capacity. Project will provide flow augmentation and retiming for summer baseflow and thermal benefits, and support future habitat restoration in a valuable spawning tributary.	Up to 1,294 afy	1.8 cfs (average)	5.4 (flow restoration may support restoring access to additional ~12 miles of habitat between AVR and Fanchers Dam)	$7.9-$8.5 million	Yes
Conservancy Island Side Channel Reactivation	Bonaparte-Johnson/ Okanogan River	Tier 1	City of Okanogan	NEB	Restore Conservancy Island side channel connectivity with Okanogan River, providing access to historical Chinook salmon and steelhead spawning and rearing habitat.	--	--	0.9	$850,000	Yes
Johnson Creek Fish Passage	Bonaparte-Johnson/ Johnson Creek	Tier 1	Trout Unlimited	NEB	Package of 3 90.94-eligible fish passage restoration projects funded by the Brian Abbot (Washington State) Fish Barrier Removal Board. Provides access from mouth upstream to Duck Lake diversion.	--	--	4	$2.7 million	No
Loup Loup Creek Diversion Improvements[3]	Swamp-Loup Loup/ Loup Loup Creek	Tier 1	CTCR, Washington Water Trust	NEB&LO (O pending additional study)	Replace unlined diversion ditch with pipe to eliminate leakage and evaporation losses. Water savings will be dedicated to instream flows.	TBD	0.38 cfs (average), ~275 afy	2.17	$1.7 million	Yes
OTID Tributary Supplementation[3]	Johnson-Bonaparte/ Bonaparte Creek Antoine-Whitestone/ Siwash Creek, Antoine Creek, Whitestone Creek, Ninemile Creek	Tier 1	Oroville-Tonasket Irrigation District	NEB&LO	Use existing diversion infrastructure to provide flow augmentation in lower reaches of select Okanogan tributary streams from April 1 to October 15.	460-525 afy	1.2-1.3 cfs (Apr-Oct)	5.7	$10,500	Yes
Pine Creek Water Right Acquisition[3]	Bonaparte-Johnson (Middle Okanogan)	Tier 1	Okanogan County / OCD	O	Purchase the Pine Creek Trust Water Right (CG4-23992(A)C) from Ecology for consumptive use offset.	625.7 afy	0.86 cfs	51	$1,300 per af	No
Salmon Creek Source Substitution	Salmon Creek	Tier 1	City of Okanogan	NEB&LO	Transfer 300 gpm municipal surface water diversion right from Salmon Creek to an existing or new groundwater well in continuity with Okanogan River.	485 afy	0.67 cfs	3.7	$250,000, +$10,000 annual O&M	Yes
Salmon Lake Storage	Salmon Creek	Tier 1	Bureau of Reclamation, CTCR, Okanogan Irrigation District	O&NEB	Residential infrastructure purchase or improvements to allow for full use of Salmon Lake reservoir pool. Provides increased storage for flow retiming.	~1,000 afy	2.1 cfs (average)	18.8	$175,000 to $652,000 depending on management option	Yes
Whitestone Creek Flow and Temperature Augmentation	Antoine-Whitestone/ Whitestone Creek	Tier 1	Whitestone Irrigation District	NEB	Improve conveyance system to increase irrigation system efficiency and reduce maintenance. Provide 1 to 1.5 cfs additional instream flow in Whitestone Creek from Apr-Oct to for flow and temperature augmentation.	425-485 afy	1-1.5 cfs inflow (Apr-Oct) at 5-7 degrees C below ambient surface water temperature	3.3	In development	Yes
Aeneas Lake Irrigation District Efficiencies	Bonaparte-Johnson (Middle Okanogan)	Tier 2	OCD	NEB	Reduce the amount of excess water pumped from the mainstem Okanogan River. This would reduce the over-pumping and return flow to the river, which is expected to reduce turbidity in that location.	--	--	TBD	$30,000	Yes
Conconully Dam Replacement	Salmon Creek	Tier 2	Bureau of Reclamation, Okanogan Irrigation District	O&NEB	Proposed dam replacement, with potential to increase available storage and provide fish passage to historically accessible headwaters of Salmon Creek.	Unspecified	Unspecified	TBD	Unspecified	Yes

Project	WRIA 49 Subbasin/Stream	Tier Ranking	Sponsor	Project Type[1]	Description	Consumptive Use Offset	Instream Flow Benefit	Affected Stream Length (mi)[2]	Estimated Cost	Requires O&M?
Highlands Springs Protection and Enhancement	Bonaparte-Johnson (Middle Okanogan)	Tier 2	Okanogan Highlands Alliance	NEB	Partner with range lessees, landowners, and the U.S. Forest Service (USFS) to assess the condition of water resources, repair spring protection infrastructure, and install fencing and troughs to protect undeveloped springs.	--	--	TBD	$20,000 + $5,000-$10,000 annual O&M	Yes
Irrigation Efficiency Projects	Multiple	Tier 2	OCD	O&NEB	Opportunistic irrigation efficiency projects throughout WRIA 49 reducing overall water demand. Water savings will be dedicated to instream flows.	TBD	Unspecified	TBD	Unspecified	Yes
Loup Loup Creek Channel and Riparian Improvements	Swamp-Loup Loup/ Loup Loup Creek	Tier 2	OCD	NEB	Improve instream habitat and riparian conditions along 600 feet of Loup Loup Creek, improving spawning habitat for ESA-listed steelhead. Riparian buffers will be increased from 10 feet to 30-100 feet.	--	--	0.11	Unspecified	No
Methow Beaver Project[3]	Antoine-Whitestone/ Whitestone Creek, Swamp-Loup Loup, Bonaparte-Johnson	Tier 2	Methow Beaver Project	NEB	Increase late season streamflow by adding and improving channel structure and floodplain connection to restore natural watershed functions.	--	--	TBD	$550,000	No
Okanogan Highlands Water Riparian Restoration	Antoine-Whitestone/ Whitestone Creek	Tier 2	Okanogan Highlands Alliance	NEB	Restoration techniques will vary by site, depending on geomorphology, land use, streamflow, instream structure and roughness, etc., but will include structural adjustments to improve flow and storage, plant native species, and	--	--	TBD	$10,000-$65,000 + $1,000-$15,000 annual O&M	Yes
Okanogan River Riparian Enhancement	Antoine-Whitestone/ Whitestone Creek	Tier 2	OCD	NEB	Maintain four previously planted acres on the 2-mile long stretch of property. This will include replacement of dead plants, adaptive management for weed control, and irrigation.	--	--	2	$55,000 + $1,500 annual O&M	Yes
Pine Creek Riparian Restoration	Bonaparte-Johnson (Middle Okanogan)	Tier 2	OCD	NEB	Protect riparian and wetland areas from water quality impacts from livestock using downed 'jackstraw' logs. These scattered logs mimic natural barriers to browsing and protect natural regeneration of riparian plants and new plantings.	--	--	0.13	12,000 + $2,000 annual O&M	Yes
Salmon Creek Streambank Stabilization Projects	Salmon Creek	Tier 2	OCD	NEB	Restore and enhance riparian vegetation by planting woody shrub and tree species for the purpose of providing woody debris recruitment into Salmon Creek as a means of creating habitat for invertebrates, which will enhance food sources for	--	--	TBD	$16,000 + $900 annual O&M (5 years)	Yes
Sinlahekin Wildlife Area Improvement Project	Similkameen	Tier 2	Oroville-Tonasket Irrigation District, Washington Department of Fish and Wildlife	O&NEB	Impoundment and diversion system improvements to support instream flows in Sinlahekin Creek. A portion of water savings will be dedicated to instream flows.	Unspecified	Unspecified	42	$750,000	Yes
Tunk Valley Dry Forest Restoration	Bonaparte-Johnson (Middle Okanogan)	Tier 2	OCD, DNR	NEB	1,100-acre project to create long-term habitat quality and ecological integrity by moving stands back towards more dispersed, larger diameter trees at a much-reduced density.	--	--	--	Unspecified	Yes

1 O&NEB = consumptive use offset project with or without additional habitat restoration that contributes to NEB; NEB = streamflow and/or habitat restoration project that contributes to NEB; LO = Local Tributary Offset

2 The approximate length of tributary or mainstem reach measurably affected by the proposed non-water offset project. For the Highway 20 culvert replacement project the affected length covers the Conservancy Island side channel from its historical upstream and downstream connection points with the mainstem Okanogan River.

3 Indicates project applied for 2020 Streamflow Restoration Grant funding.