Annie Sawabini June 7, 2019
Department of Ecology
Water Resources Program
PO Box 47600
Olympia WA 98504-7600

RE: Draft Final Guidance for Determining Net Ecological Benefit (May 6, 2019)

Dear Ms. Sawabini,

We've reviewed the above and have the following comments with respect to our watershed, Chambers-Clover, or Water Resource Inventory Area (WRIA) 12.

First a comment on terminology. We see this effort as essentially a <u>mitigation</u> program in our watershed to offset future groundwater withdrawal impacts to surface waters. The time horizon is only twenty years: January 19, 2018 and ending on January 18, 2038. We do not see it as a true restoration program, and the term restoration is misleading. The ecological integrity of the WRIA 12 watershed's surface waters, especially streams, has already been greatly destroyed through structural changes to the original surface water network along with water quality impairment. A number of key instream ponds and wetlands have been obliterated[1]. Groundwater withdrawals have probably already taken a substantial, albeit unquantified, toll on surface water flows based on anecdotal evidence. Clover Creek in the Parkland area, for example, was noted as an intermittent stream[2] in summer based on the earliest maps made before American settlement[3]. It exhibited intermittent flows up into the 20th century based on testimony and photographs of local residents[4]. Pierce County, however, re-routed the creek in the 1960's into an asphalt-lined channel, breaking any connections with hyporheic flow. Water in the stream channel during summertime is now a distant memory.

Salmonids were fairly abundant up until the 1930's despite changes to the watershed in the 19th century[5]. Chum, coho, steelhead, cutthroat, Chinook, sockeye, and probably pink salmon all used Chambers Creek. Bull trout probably used the estuary. Now the early chum, sockeye, native Chinook, and pink have probably been extirpated. Steelhead are thought to be extinct by NOAA Fisheries[6] although there's

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[1] Two examples: the wetland complex termed Smith Lake marking the confluence of 3 streams (Clover, Spanaway, & Morey Creeks) was filled in during the construction of McChord Field in the 1930's and a small unnamed lake east of Steilacoom Lake in the original Clover Creek channel was filled in during the 1950's to build a shopping center in what is now Lakewood. A number of other instream wetlands have been destroyed as well.

[2] For insight into the ecological benefits of intermittent streams see: Wigington Jr,P.J., J.L. Ebersole, M.E. Colvin, S.G. Leibowitz, B. Miller, B. Hansen, H.R. Lavigne, D. White, J.P. Baker, M.R. Church, J.R. Brooks, M.A. Cairns, and J.E. Compton. 2006. Coho salmon dependence on intermittent streams. Front. Ecol. Environ. 4(10): 513–518. Available at https://www.fs.usda.gov/treesearch/pubs/29645

[3] See Sastuk map at Manitoba Archives: http://pam.minisisinc.com/pam/search.htm

[4] Tobiason, F.L. 2003. Historic Flows, Flow Problems and Fish Presence in Clover Creek---1924-1942: Interviews with Early Residents. Unpublished manuscript to Clover Creek Council and WRIA 12 Watershed Planning Committee. Available from Chambers-Clover Watershed Council (https://www.piercecountywa.org/1860/Chambers---Clover-Watershed-Council).

[5] Internal memos, Washington State Archives.

[6] For example, see p. B2 in the Designation of Critical Habitat for Lower Columbia River Coho Salmon and Puget Sound Steelhead - FINAL Biological Report at: https://www.westcoast.fisheries.noaa.gov/publications/protected_species/salmon_steelhead/critical_habitat/chart_report/fch_chartreport.pdf.

evidence small numbers may persist. Small numbers of coho and winter chum are still counted and a hatchery run of Chinook is artificially maintained for fishing opportunities.

It could take substantial sums to achieve any semblance of restoration under these circumstances. In fact, it may be quite challenging to demonstrate any Net Ecological Benefit (NEB) in WRIA 12 as a result of water mitigation efforts under this program, particularly with respect to the salmonid fishes the document seems to focus on. We suspect it will be an uphill struggle just to maintain what still exists.

Estimating New Consumption and Withdrawal Impacts

The USGS carried out a fairly comprehensive study of groundwater in WRIA 12 (the Chambers-Clover watershed), published in 2010[7] and found it is comprised of several vertical aquifer layers separated by more or less impermeable confining units[8]. The topmost aquifer (designated 'A1') probably has the most intimate connection with surface water. Groundwater was generally found to flow in a northwesterly direction towards Puget Sound. In some cases, surface waters may be influenced by the deeper aquifers where they approach ground surface (e.g., exposure at ravines). Drilled wells were used to identify these aquifers indicating most are exploited for water use, even the deepest unit (designated 'G'). The groundwater-surface water system is also complicated because there are "gaining" and "losing" stream reaches in the basin.

Your overall evaluation is at the WRIA scale. But your document focuses on a much smaller subbasin scale. Under section 3.2.4.2, Specific Elements of an NEB Evaluation, you write: "*First, NEB evaluations should compare the total projected impact from new consumptive water use in all the subbasins in the WRIA with the total amount of water offset benefits generated by all of the planned projects in the WRIA. <u>The evaluation should then compare the impacts and offsets in each subbasin</u>* (underline added)."

The implication is that a fairly detailed assessment must be carried out to get a subbasin by subbasin accounting. Moreover, section 3.2.3.2 Delineate Subbasins, states: "*Watershed plans must include a partitioning of the WRIA into suitably-sized subbasins to allow meaningful analysis*". <u>We do not, however, see any guidance on what might constitute a subbasin, let alone a clear definition of subbasin</u>. Is a subbasin the watershed basin of a named stream? Is it the watershed basin of a tributary to that stream? Is it some minimum fraction of the total WRIA? The numerical simulation study by Johnson et. al. (2011, Table 5)[9] for the Chambers-Clover Basin used eight (8) fairly large subbasins (e.g., entirety of the Chambers-Clover drainage which includes several creeks and lakes, American Lake-Murray Creek drainage, etc.). Subbasin size has implications for matching mitigation/restoration actions as freshwater ecological resources are very patchy – compensating flows may be of little use if they don't get to the

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[7] Savoca, M.E., W.B. Welch, K.H. Johnson, R.C. Lane, B.G. Clothier, and E.T. Fasser, 2010. Hydrogeologic Framework, Groundwater Movement, and Water Budget in the Chambers-Clover Creek Watershed and Vicinity, Pierce County, Washington. U.S. Geological Survey Scientific Investigations Report 2010–5055, 46 p. (https://pubs.usgs.gov/sir/2010/5055/)

[8] Barlow, P.M and S.A. Leake. 2012.Streamflow Depletion by Wells—Understanding and Managing the Effects of Groundwater Pumping on Streamflow. U.S. Geological Survey Circular 1376, 84 p. (https://pubs.usgs.gov/circ/1376/)

[9] Johnson, K.H., Savoca, M.E., and Clothier, B. 2011. Numerical simulation of the groundwater-flow system in the Chambers-Clover Creek Watershed and Vicinity, Pierce County, Washington. U.S. Geological Survey Scientific Investigations Report 2011–5086, 108 p.

right area (covered under "Ecological Context, Scale and Critical flow periods" on p. 19 of the WSU document).

For example, the simulations carried out by Johnson et. al. (2011) showed gains and losses for the <u>entire</u> ‘WRIA 12 Streams and Lakes’ category and under their ‘Model Limitations’ (p. 33), they note:

> “… In general, because of model scale and level of detail, the model is most applicable to analysis of groundwater issues <u>at the subbasin scale</u> (see fig. 9). Local-scale heterogeneity in hydrologic properties, recharge, and discharge that occur at a scale of one model cell or less (1,000 ft or less) are not adequately represented by the regional-scale groundwater-flow model constructed for this study” (underline added).

We see the potential for a mis-match between groundwater measures, predicted or actual, and target ecological measures given the latter are often assessed at a finer level of detail, sometimes the reaches within individual streams. If a mitigative water action is expected to produce some flow and/or ecological response, will you be able to detect it at the location chosen for monitoring? We think you need to work more on this by giving the planning groups clearer guidance on the issue of spatial resolution.

Estimating impacts from future withdrawals thus not only requires forecasting the proximity of new wells to surface water within the subbasins but the aquifer source, too. The latter will have a bearing on how surface waters are affected. Your guidance document (e.g., Appendices A & B) does mention in passing the existence of different aquifers and their properties but doesn’t really give any guidance on how one might estimate and, more importantly, forecast groundwater withdrawals in a 3-dimensional context with respect to surface waters in each subbasin. The same can be said for predicting the effects of offset projects. For example, it doesn’t seem adequate to simply state “*...planning groups should consider how the benefits of water offset projects will be distributed in time and space.*” (p. 24, Appendix B). <u>It seems to us it would be more informative to include an actual case study to show what methodology and statistics are involved, and what the Department of Ecology expects</u>. If the Department doesn’t have a case study, then the Department should develop explanatory methodology that can be used at the subbasin level.

Perhaps just as important, your guidance seems to downplay actual monitoring because individual projects are assumed to have small effects that are difficult to detect (*Limitations of Monitoring*, p. 25). This seems risky, not only because some individual projects may have measurable effects, but it also ignores the larger <u>cumulative effects</u> that could be very significant in individual subbasins. We see a significant risk here that work done under this law might become disconnected from reality and give misleading results.

Even though considerable work has been done to characterize groundwater in WRIA 12, there appears to be information uncertainty. For example, the Savoca et. al. (2010:22) report gives a table of hydraulic conductivities in feet/day for the top-level ‘A1’ aquifer. Hydraulic conductivity, a component of aquifer hydraulic diffusivity, is a key factor in understanding well depletion of streamflow. Unfortunately, their measures are based on only 4 wells from the entire aquifer and the range is from 62 to 5,065, with a median of 933. Any predictions that use values like these are going to be questionable, i.e., it would seem monitoring of some sort will be mandatory to verify that expected withdrawal impacts and replacement water projects in a given subbasin are valid.

We suggest one of the initial tasks faced by planners will be to assess what is known and what is not known (or at least very uncertain) about the groundwater resources in each basin. Then they'll be in a better position to decide what is feasible in predicting groundwater changes to the surface waters that are the ultimate focus of the law.

Estimating Net Ecological Benefit

The appendix contributed by the WSU's Water Resource Center (Technical Supplement: Determining Net Ecological Benefit), is interesting and of broad scope. But it's too wide-ranging and speculative to be included as 'guidance' in itself. It does cover what's possible over the range of conditions this program is likely to encounter, and we see it as a resource from which Ecology can draw in developing its own document. It might be offered to planners as a reference document.

The emphasis on salmonids seems laudable, as the necessary conditions for their existence in a freshwater ecosystem are the same for many other non-salmonid animal species. But measuring/monitoring and forecasting salmonid population abundance as a function of freshwater availability is probably not practical, particularly for species that are rare or exhibit low abundance.

There are also too many other confounding factors that affect these animals. For example, ocean conditions may be an overwhelmingly dominant driver for anadromous species. Discerning whether a water supplementation program is providing ecological benefits in such a case will likely be difficult, perhaps impossible. Even strictly freshwater resident salmonids will be affected by a wide range of influences other than water quantity per se. Given that some species (steelhead and cutthroat trout) have both resident and anadromous forms in the same stream also complicates the picture.

Experiences from the Intensively Monitored Watersheds program illustrate the complexities of carrying out this type of monitoring[10]. We quote from p. 10 of the 2004-2014 Monitoring Program: Washington Salmon Recovery Funding Board[11]:

> "Validation (Intensive) Monitoring–<u>This type of monitoring is the only type of monitoring that can establish cause and effect relationships between fish, habitat, water quality, water quantity, and management actions.</u> It is the evaluation of projects and programs that conduct, promote, or regulate activities meant to protect or enhance habitat, water quality, or fish production. One example of intensive monitoring might be a case study of a watershed that examines the cumulative impacts of total maximum daily loading requirements for various water users on the overall water quality of the basin. Another example might study the impacts of categories of riparian habitat projects on salmon in a specific stream. The common theme of these studies is to develop an understanding of the link between management actions and the numbers of fish produced. <u>These studies are the most complex and technically rigorous, and often require measuring many parameters to detect the variable affecting change</u>. Once determined, the relationship between restoration actions and the numbers of fish produced may or may not be directly extrapolated to other watersheds and is dependent on the strength of the information obtained. However, intensively monitored watersheds can be assumed to represent the overall responses of other nearby watersheds to the same restoration treatments." (*underline added*).

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[10] Documents at https://ecology.wa.gov/Research-Data/Monitoring-assessment/River-stream-monitoring/Intensively-monitored-watersheds and https://www.rco.wa.gov/doc_pages/other_pubs.shtml#intensive.
[11] Available at https://www.rco.wa.gov/documents/monitoring/WSRFB-MonitoringProgram_2004-2014_Dec%202015.pdf.

Use of predictive habitat models (e.g., PHABSIM) that focus on fish will require data collection and the expertise to use them. Planning groups may have to hire outside help to carry out this work if Ecology and/or other agencies can't provide it.

But instead of focusing on salmonids directly, a more practical approach to NEB might be to use proxy measures to infer ecological benefits. For example, if diminished flows result in impaired water quality (e.g., higher summer water temperatures), then predicting as well as measuring flow and temperature could be used along with supplemental macroinvertebrate sampling to assess any ecological benefit. Advances in instrumentation now allow continuous remote measurement of parameters like flow, temperature, and dissolved oxygen, making this type of monitoring cost-effective.

We believe monitoring will be crucial in detecting anomalies and will provide the basis for adaptive changes, if required. The WSU authors emphasized this as well. Ecology can look to its own EIM system to find useful examples of monitoring studies that can be used to infer ecological benefit. For example, in WRIA 12, Ecology carried out a year-long program (March 2013 – February 2014) in some of the streams (Clover and Spanaway Creeks) within the basin as part of TMDL development. Multiple parameters were collected (flow, DO, temperature, stream width, depth, etc.). We suggest a similar program using some combination of predictive modeling in combination with actual field monitoring of selected measures, especially flows, might be the most appropriate approach for the creeks in this basin.

Thank you for the opportunity to comment.

Sincerely,

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