**To:** Chambers-Clover (WRIA 12) Watershed Restoration and Enhancement Committee

**From:** Rebecca Brown, Committee Chair

**Date:** March 11, 2020

**Re:** Workgroup Recommendation on Permit Exempt Well Projections and Consumptive Use Estimates

**The WRIA 12 workgroup recommends the following consumptive use estimates for the plan:**

* Moderate Growth Scenario Consumptive Use Estimate: 0.08 cfs/57.4 acre-feet per year, based on an anticipated 145 new PE wells and an outdoor irrigated area of 0.21 acres.
* High Growth Scenario Consumptive Use Estimate: 0.12 cfs/89.8 acre-feet per year, based on a high growth scenario of 227 new PE wells and an outdoor irrigated area of 0.21 acres. The high growth scenario will account for uncertainties in the methodology.

**Background**

The WRIA 12 Watershed Restoration and Enhancement Committee and workgroup have discussed PE well projections and consumptive use estimates with its related methodologies and assumptions for the past several months. The workgroup met on February 24, 2020 to review the preliminary consumptive use estimate and safety factors with the intent to make a recommendation for the 20-year consumptive water use estimate to be included in the plan.

**PE Well Projections**

HDR developed high, medium, and low PE well projections using well data from Tacoma-Pierce County Health Department (TPCHD).

At the November 13, 2019 committee meeting, committee members requested that the high, medium, and low PE well projections be included in the plan regardless of which projection(s) the committee opts to focus on.

Committee members requested that HDR provide the number of developable parcels outside of water service areas to use as a check against the projections, with the understanding that some new homes within service areas will still use wells.

* There are **28** developable parcels outside of the water service areas in WRIA 12.

Committee agreed to move forward with the moderate PE well projection (145) for the “working” consumptive use estimate and high PE well projection (227) as a factor for the offset target.

**Consumptive Use Estimate**

The committee focused on using the outdoor irrigated method for CU estimates due to considerations that water systems often have incentives (pricing or otherwise) that encourage water conservation. PE wells do not have those incentives.

On October 22, 2019, the workgroup discussed the consumptive use estimate, focusing on the outdoor irrigation analysis conducted by HDR. HDR provided their methodology and answered questions. HDR provided additional information on their methodology and statistics on a webinar on October 28, 2019.

HDR’s initial analysis yielded an average outdoor irrigation area of 0.15 acres. The analysis returned a large number of parcels without detectable outdoor irrigation. HDR used a conservative value of 0.05 acres to account for the outdoor water use that may occur but was not detected. Including the 0.05 value instead of zero yielded an average outdoor irrigation area of 0.17 acres. From there, HDR calculated the 95% Upper Confidence Level (UCL)as 0.21 acres.[[1]](#footnote-1)

Concerns remained from WDFW and other entities regarding the sample size used to conduct the outdoor irrigation analysis, and the use of 0.05 as the non-detect value. Additional questions revolved around the different values returned from GeoEngineers’ work in WRIAs 7, 8, and 9. HDR and GeoEngineers conducted a comparison study to check each other’s work. GeoEngineers analyzed 10 parcels from WRIA 10, and HDR analyzed 10 parcels from WRIA 9.

At the November 13, 2019 full committee meeting, the committee agreed to a preliminary consumptive use estimate using an outdoor irrigation area of 0.21 acres. The reason behind using the 95% UCL was that the outdoor irrigation area will likely to be smaller than the 95% UCL.

The committee used the following inputs to estimate the consumptive use in WRIA 10:

* Outdoor irrigation area based on 95% UCL (0.21 acres).
* Average irrigation requirement based on Washington Irrigation Guide (20.3 inches/year).
* Irrigation efficiency (75%).
* Outdoor consumptive use (80%).
* Indoor use (60 gal/day/person).
* Indoor consumptive use (10%).
* Average persons per household (2.5 people).
* Anticipated Growth Rate. PE well projection (moderate projection: 145).

The preliminary consumptive use estimate the committee agreed to use is 0.08 cfs and 57.4 afy. The committee agreed to return to the consumptive use discussion after results from the GeoEngineers/HDR cross-check were available, and after we had more information on the other questions and concerns.

**Outstanding Questions:** The committee had several outstanding questions about the consumptive use estimate. The responses to these questions are listed below:

* What are the results from the HDR and GeoEngineers comparison study?
  + Both GeoEngineers and HDR stand by their work and each other’s work.
  + The outdoor irrigation method is conservative because it uses the Washington Irrigation Guide rate for commercial pasture/turf grass.
  + People do not water their lawns at the rate required for turf grass, so differences between irrigated and not irrigated lawns are difficult to discern, which led to some differences in interpretation by individual analysts.
  + The comparison study showed HDR values being somewhat lower than GeoEngineers values. An “adjustment factor” could be applied to account for this bias, but it results in an outdoor irrigated acres value lower than 0.21.
  + Their [full report](https://app.box.com/s/oljdp1eztlei4khfhigykby3fibuptp7) is available on Box.
* How has HDR responded to WDFW’s concerns on sample size?
  + HDR sent WDFW a number of statistical analyses on the outdoor irrigation analysis as requested by WDFW.
  + Remaining issue is the power analysis for estimating number of samples.
  + Sample pool was 137 parcels in WRIA 12; sample selection may be less of a concern in WRIA 12.
* Is there a more scientific approach to addressing the non-detect values, rather than using 0.05 acres?
  + From Chad (HDR): I calculated the minimum and 5th percentile values of the delineated parcels where they actually “detected” an irrigated area. See below. You can see that imputing 0.05 acres for the zero’s may be a bit conservative (as I’ve noted). I proposed a conservative number to help alleviate concerns over methodology. If I were to base a non-detect value to impute the zero values from these results, I’d go with 0.03 acres.

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| **Statistic** | **WRIA 10** | **WRIA 12** | **WRIA 13** | **WRIA 14** | **WRIA 15** | **All** |
| Number of Detected Acreages | 37 | 48 | 31 | 31 | 36 | 183 |
| Minimum (acres) | 0.04 | 0.02 | 0.01 | 0.03 | 0.02 | 0.01 |
| 5th Percentile (acres) | 0.06 | 0.03 | 0.03 | 0.03 | 0.02 | 0.03 |

**Workgroup Recommendation:**  Continue to use the moderate permit-exempt well projection and the 95% upper confidence limit for the outdoor irrigated area for the anticipated consumptive use estimate. The workgroup recommends using the consumptive use estimate of 0.08 cfs and 57.4 acre-feet per year.

**High Growth Scenario Consumptive Use**

In addition to the consumptive use estimate, the committee may choose to pursue an “offset target”—a value higher than the consumptive use estimate that provides a safety factor to account for uncertainty inherent in the analysis.

At the November 13, 2019 meeting, committee members discussed developing an offset target based on changing specific factors in the consumptive use calculations. Ideas included:

* Use the high PE well projection (227 new wells).
* Use a higher irrigation requirement to account for climate change (22 in/year).
* Conduct a sensitivity analysis to identify which assumptions are the most sensitive to change.
  + Paul Pickett developed a [sensitivity analysis](https://app.box.com/s/w7rcoqrsdp8zlc9iiekwgwpk1aff4fqk) for WRIA 12, which is available on Box.
  + HDR developed a sensitivity analysis using WRIA 10 numbers. [Their analysis](https://app.box.com/s/yw7zjbvjikjgmm0zri03l0tub4s9iknn) is available on Box for comparison.

At the February 24, 2020 WRIA 12 workgroup meeting, the workgroup members proposed using the term “high growth scenario consumptive use” to reflect a consumptive use estimate that accounts for uncertainty in the consumptive use calculations. The workgroup opted to use on the high growth scenario and not the climate change scenario for three reasons. The consumptive use methodology is already conservative, especially in regards to the Washington Irrigation Guide rate. The estimated higher rate of watering needed to account for climate change changed the consumptive use estimate by only a very small amount. Focusing on climate change is unlikely to be supported by Pierce County.

**Workgroup Recommendations:** Use the high growth permit-exempt well projection (227 wells) and the 95% upper confidence limit for the outdoor irrigated area (0.21 acres) as inputs for the high growth scenario consumptive use estimate. This estimate is 0.12 cfs and 89.8 acre-feet per year.

**Next Steps:** Bring both recommendations to the March committee meeting for their review and input.

1. The 95% Upper Confidence Level assuming 0's are non-detects, replaced with 0.05 acres; Parameteric (Gamma or Lognormal). [↑](#footnote-ref-1)