

May 5, 2025

Mr. Ivan Gall, Director
Oregon Water Resources Department
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Salem, Oregon 97301
Via email only: ivan.k.gall@water.oregon.gov

Re: Annual Report Regarding OWRD Groundwater Monitoring for the U.S. Bureau of Reclamation Project Area in the Upper Klamath Basin, Calendar Year 2024

Director Gall,

Thank you for your virtual attendance at the meeting on April 30th whereby several of your staff, locally and beyond, met in person at KWUA's office and conference room to deliver a presentation of the above-referenced report. The report was/is sanctioned by the U.S. Bureau of Reclamation (USBR) Klamath Basin Area Office (KBAO), and we appreciate representatives on their behalf being in attendance and in person as well.

KWUA is keenly aware of the importance of this work and of the interrelated hydraulic and hydrologic nature of the surface and groundwater resources common to the Klamath Basin. We are also keenly aware of KBAO policies regarding surface water management that have led to substantially reduced delivery of otherwise available surface water to the Klamath Project for irrigation for decades, and the subsequent induced and increased dependence on groundwater for irrigation as a surrogate. While the 2025 water year continues to be promising, we understand very well that next year and future years could continue to exacerbate aquifer stresses and that a more comprehensive, genuine and expanded groundwater monitoring program and management plan with attention to targeted aquifer recharge is needed.

We applaud the efforts of Mr. Grayson Fish, P.G., to lead this groundwater monitoring study, and we look forward to working closely with him and others of your staff and our associates with the KBAO to produce a more complete and honest understanding of how groundwater resources and our use of them fit within the Klamath Project. In this vein, we also anticipate working more closely with local U.S. Geological Survey (USGS) scientists to further these efforts.

While the efforts of OWRD in this matter are appreciated, KWUA does have, as was voiced during the April 30th meeting, some concerns. This letter/white paper is a good faith attempt to further articulate those concerns from a technical perspective.

The 2024 OWRD report points to a conclusion that naturally occurring area precipitation, or lack thereof in the context of drought, is what drives the agricultural shift to groundwater pumping as a supplement or surrogate to less available surface water, leading to aquifer declines and shallow

domestic wells going dry. It is concerning that the report does not consider how available surface water of the Klamath Project is managed by the KBAO, seasonally or annually or otherwise.

Figure 5 of the 2024 OWRD report, appended below, is a plot of water-year precipitation and recorded groundwater pumping from 150 wells taken to be a representative subset of groundwater pumping in recent years (2010 – 2024) within the Klamath Project area.

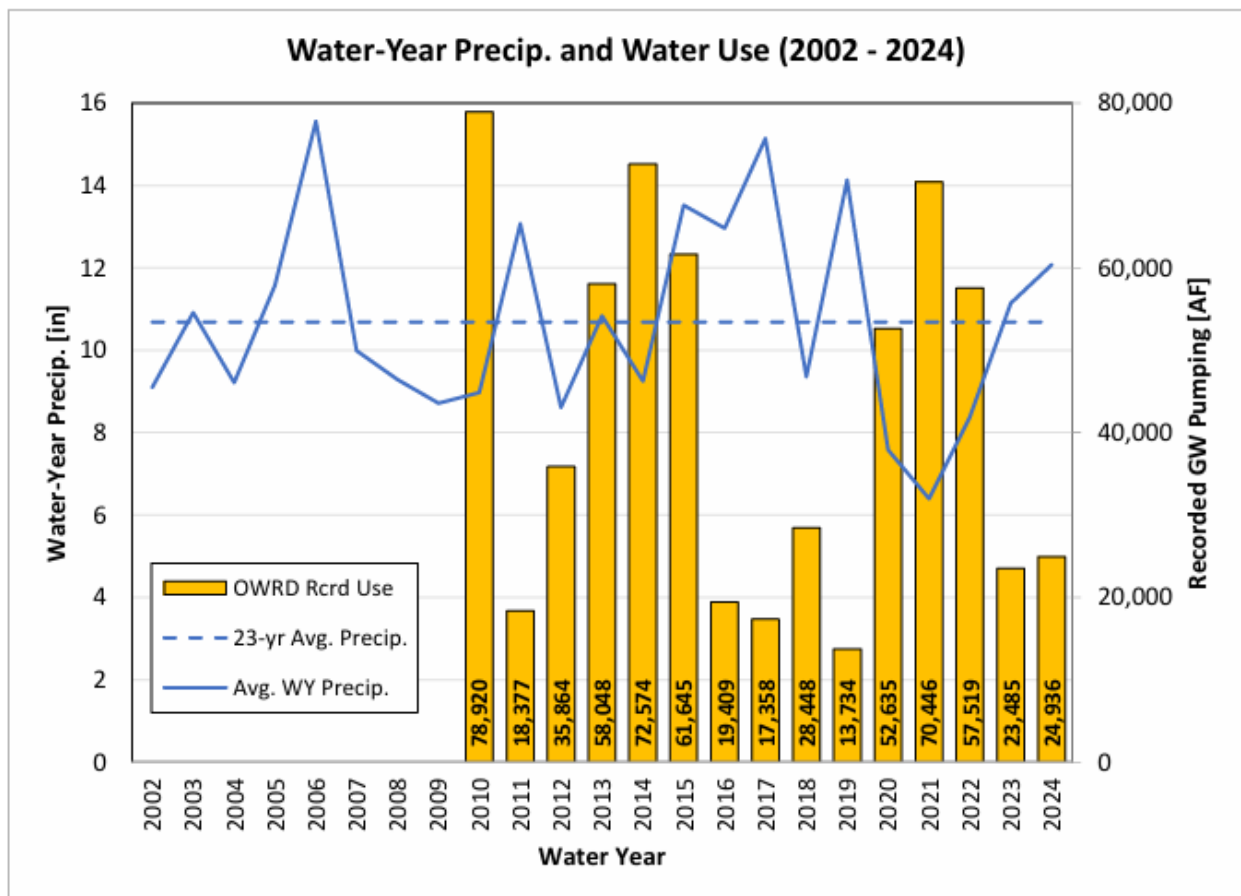


Figure 5: Annual and 23-year average water-year precipitation (from three AgriMet sites) and recorded groundwater pumping by OWRD.

The 2024 OWRD report asserts, on page 11, that “*As expected, there is a general correlation between water-year precipitation and groundwater pumping, as less surface water is available for irrigation during dryer years.*”

A closer analysis of the data used to construct Figure 5 of the 2024 OWRD report reveals that there is actually very little correlation between water-year precipitation and groundwater pumping.

Figure 1 of this letter/white paper, appended below, is a plot of the data used in OWRD’s Figure 5. This plot is a linear regression analysis of the same Klamath Project area groundwater pumping and water-year precipitation data used by OWRD, for 2010 through 2024. In

regression analysis, a key metric is the coefficient of determination (R^2) produced by the regression equation, which is a statistical, quantitative measure of correlation. It can also be thought of in terms of a percentage, for example, a coefficient of determination of 1.0 would indicate that the datasets being compared are 100% correlated. In quantitative hydrology and all the earth sciences, a coefficient of determination of at least .80 is considered the minimum to establish a correlation, and even that would be considered weak for applied management purposes.

As shown in Figure 1, a coefficient of determination (R^2) of 0.42 indicates that something other than or in addition to water-year precipitation is driving or influencing groundwater pumping, or perhaps the groundwater pumping dataset upon which OWRD is relying in this instance is for some reason not reliable or not representative as a subset of Klamath Project area groundwater pumping.

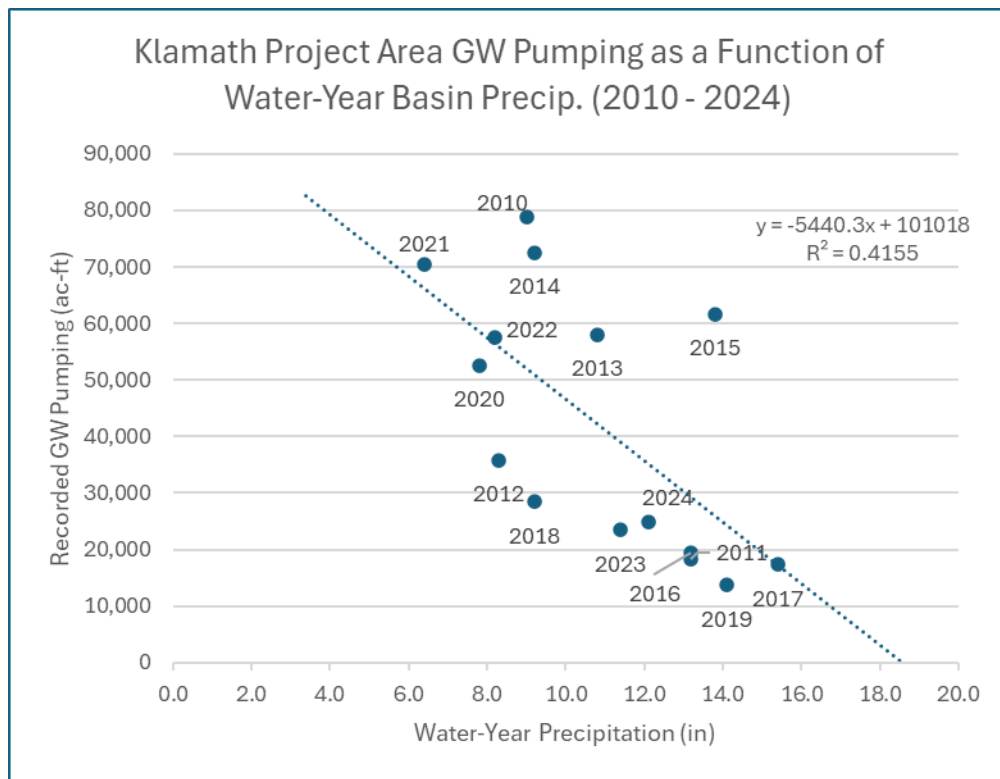


Figure 1. Klamath Project area annual groundwater pumping (ac-ft) as a function of annual water-year precipitation (in), 2010 - 2024.

Regardless, if the dataset and results of the weak correlation presented in Figure 1 were taken to be reliable, a water-year precipitation of 18.57 inches would be necessary to bring about a situation where zero groundwater pumping would be expected. Such a situation and related water-year precipitation of such magnitude are highly improbable.

An obvious limitation of the 2024 OWRD report is that it does not consider how available surface water to the Klamath Project is managed by USBR KBAO, seasonally or annually or

otherwise. The total annual supply of surface water available to irrigate each year often is not made available by USBR KBAO to contracted Klamath Project beneficiaries and therefore not delivered. This point was raised several times during the April 30, 2025, meeting with OWRD. OWRD has committed to creating a graphic of BOR deliveries relative to groundwater use similar to what it provided in the past, but the technical discussion of this issue could be more robust. While water-year basin precipitation surely influences the total annual supply of surface water available to irrigate each year, this is not well correlated if these two variables are evaluated in isolation. It would be appropriate for experts to discuss the best sources and ranges of data to analyze any given question regarding groundwater use and its relationship to other variables, and I would be very interested in participating in such a process. To illustrate this, total surface water irrigation delivery data¹ were gleaned from the numeric model that the KBAO uses to make Klamath Project operational decisions, and these data were compared to the same water-year precipitation data discussed above. This regression analysis is shown in Figure 2 of this white paper, below.

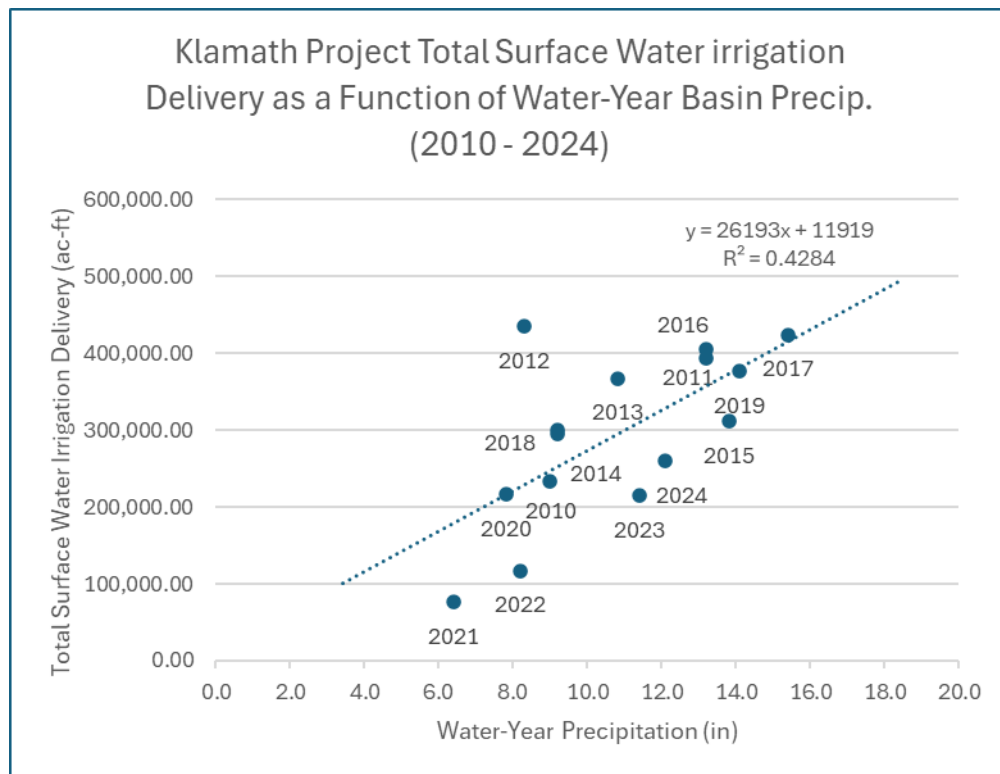


Figure 2. Klamath Project total annual surface water irrigation delivery (ac-ft) as a function of annual water-year precipitation (in), 2010 - 2024.

Here again, it is seen that a very weak coefficient of determination of 0.43 does not support much of a correlation. Something other than, or in addition to, water-year precipitation is influencing total surface water irrigation delivery. Multi-variate regression analysis might help with this, including a close review of the KBAO’s management actions and directives

¹ Personal communication with G. Moss Driscoll, 4-14-2025.

concerning available surface water and Upper Klamath Lake over the last couple of decades or longer. I am eager to explore this issue further with your team.

The 2024 OWRD report also presents historical groundwater levels at six well sites scattered throughout the Klamath Project area. The locations of these sites are labeled as Hydrograph Wells as shown on page 9 of the report, and indeed hydrographs revealing the historical water levels at these sites are included in the report. Mr. Gene Souza, Executive Director of the Klamath Irrigation District, as part of his review of the subject OWRD report has performed a spatiotemporal analysis of several of these sites to show that lands in proximity to Hydrograph Wells that have been denied surface water in a given year and upon which no groundwater was applied in that same year corresponds directly with troughs (i.e., steep water level declines) apparent in the hydrograph associated with the site. The obvious implication from Mr. Souza's analysis is, among other things, that not only does restricted access to otherwise available surface water tend to promote more supplemental groundwater pumping, but it also clearly and substantially, and perhaps most importantly reduces groundwater recharge in the shallow aquifer in the year(s) in which the available surface water was/is denied. Combined with the likelihood of increased proximal groundwater pumping under these circumstances, it is easy to see where and why aquifer declines might be expected. Recharge of the shallow aquifer in many instances will also result in recharge of the deeper aquifer, albeit taking much longer.

I know that OWRD has received and given attention to Mr. Souza's report. I have written on the subject of surface water application and groundwater recharge (i.e., see Robertson et. al, 2022) extensively and look forward to further dialogue on this topic as well.

KWUA understands that OWRD has limited control, by choice or otherwise, over USBR's KBAO and the operational decisions that are made there regarding the Klamath Project. However, to the extent that OWRD anticipates continuing a groundwater monitoring program in the Klamath Basin, whether it is funded by USBR or not, KWUA strongly urges OWRD, at least from a technical perspective, not to overlook the physical reality of Klamath Project operations significantly impacting the area hydrology.

Please feel free to get in touch by email at erek@kwua.org or call at either (541) 883-6100 or (575) 639-4464 if you have any questions or would like to further this discussion.

Sincerely,



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References

Robertson, A.J., Kennedy, J.R., Wildermith, L.M., Bell, M.T., Fuchs, E.H., Rinehart, A., and Fernald, I. (2022). “Determining seasonal recharge, storage changes, and specific yield using repeat microgravity and water-level measurements in the Mesilla Basin alluvial aquifer, New Mexico, 2016–2018”. *Journal of Applied Geophysics*, 209 (2023) 104916.
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