MEMORANDUM

To: TJ Budge, Bob Turner
From: Sophia Sigstedt, Lynker
Subject: Review of IDWR GWMA Modeling (Sukow, July 17 2024)
Date: July 31, 2024

This memorandum describes my review of an analysis by the Idaho Department of Water Resources (IDWR or Department) presented July 17, 2024 to the Ground Water Management Area (GWMA) Management Plan Advisory Committee (Advisory Committee) titled "Estimated Management Action Volumes for a Range of Eastern Snake Plains Aquifer Storage Volume Goals".

1.0 Background

IDWR's Director designated the Eastern Snake Plain Aquifer (ESPA) a GWMA in November 2016. The Advisory Committee is comprised of water users who have been tasked to prepare a draft management plan for the ESPA GWMA. A major aspect of the management plan will be the amount of groundwater conservation that will be required.

1.1 Overview of IDWR Analysis

Jennifer Sukow, a groundwater modeler with the Department, presented a suite of model scenarios showing the management actions required to achieve five different levels of ESPA storage:

1. Stabilize the ESPA at the 2016 level with no increase in aquifer storage.
2. Increase aquifer storage content by 2 million AF in 36 years
3. Increase aquifer storage content by 4 million AF in 36 years
4. Increase aquifer storage content by 6 million AF in 36 years
5. Increase average aquifer storage content by 6 million AF in 100 years

In performing this review, I am not commenting on the validity of the modeling performed to estimate the management actions (groundwater conservation actions) required to increase aquifer storage, as I have not reviewed the model files directly. For the purpose of my review, I am simply taking the presentation at face value and have performed my own modeling consistent with my understanding of the Department's approach.

2.0 Summary of IDWR Conclusions

1. Stabilizing the ESPA at the 2016 level requires a continuation of the management actions that occurred from spring 2016- spring 2023 which averaged 720,000 acre-feet per year (af/yr).
2. Increasing ESPA storage by 2 million af in 36 years requires an additional 230,000 af/yr of management actions.
3. Increasing ESPA storage by 4 million af in 36 years requires an additional 460 af/yr of management actions.

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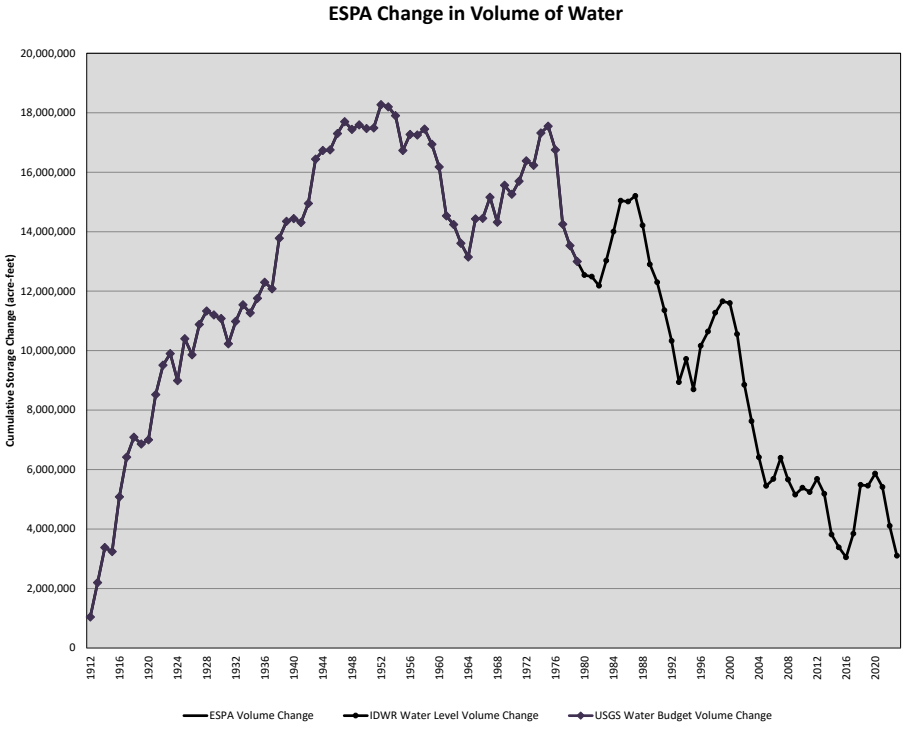
4. Increasing ESPA storage by 6 million af in 36 years requires an additional 680,000 af/yr of management actions.
5. Increasing ESPA storage by 6 million af in 100 years requires an additional 580,000 af/yr of management actions.

2.2 Comments on Aquifer Stabilization (IDWR Conclusion #1)

Sukow concluded that continuing the management actions implemented from 2016-2023, which she calculated at 720,000 af/yr on average, is sufficient to stabilize the aquifer at the 2016 level. Notably, this conclusion is not based on an ESPAM analysis but by a comparison of the ESPA storage change values calculated by the Department for 2023 (3.05 MAF) and 2016 (3.10 MAF). The conclusion that 720,000 AF of management actions is required to stabilize the ESPA is inconsistent with two of the Department's scientific datasets.

The first such dataset is the Department's time-series of cumulative ESPA storage change (Figure 1). Department hydrologist Mike McVay calculated the average annual change in aquifer storage through several decadal cycles, finding the highest annual declines to be 250,000 and 260,000 af/yr during the periods 1975-2020 and 1982-2016, respectively. The timeseries shows the aquifer lost 35,500 af/yr on average from 2016-2023. This dataset indicates that 720,000 af/yr is more than double the volume needed to stabilize the aquifer based on the Department's analysis of long-term trends in ESPA storage volume.



Period	Volume Change (AF)	Average Annual Change (AF/yr)	Comment
1952-2020	-12,400,000	-180,000	Maximum storage to most recent cyle peak
1964-2016	-10,100,000	-190,000	Trough near maximum storage to most recent cycle trough
1975-2020	-11,700,000	-250,000	Post maximum storage peak to peak
1982-2016	-9,100,000	-260,000	Post maximum storage trough to trough

Figure 1: ESPA Calculated Cumulative Storage Change (af) and historical average annual aquifer storage declines prepared by Mike McVay IDWR (July 4, 2024)

The second such dataset is the Eastern Snake Plain Aquifer Model (ESPAM) water budget based on 1980-2018 model calibrated values. Based on these values for water that enters the aquifer (precipitation, tributaries, surface water irrigation losses) and water that exits the aquifer (groundwater withdrawls, wetland evapotranspiration, river and spring discharge) the annual average volume removed from aquifer storage is about 300,000 af/year. Thus, 720,000 af/yr is more than twice the volume needed to stabilize long-term trends in calculated ESPA storage declines.

Both of the foregoing datasets— the calculation of cumulative ESPA storage change and ESPAM—indicate that 720,000 af/yr substantially exceeds the management volume necessary to stabilize the aquifer long-term.

2.3 Comments on Aquifer Storage Increases (IDWR Conclusions #2-#5)

Sukow's presentation to the Advisory Committee states that 950,000 af/yr, 1,180,000 af/yr, and 1,400,000 af/yr in management actions are needed to increase ESPA storage by 2 million af, 4 million af, and 6 million af, respectively, over 36 years. Notably, that analysis is not based on the modeled effects of 950,000 af/yr, 1,180,000 af/yr, or 1,400,000 af/yr of management actions. Rather, Sukow assumed 720,000 af/yr is needed to achieve stabilization, then modeled the incremental increase in management actions (230,000 af/yr, 460,000 af/yr, and 680,000 af/yr) needed to increase aquifer storage by 2 million af, 4 million af, and 6 million af, respectively.

IGWA has previously contemplated a groundwater management plan designed to achieve a water budget change of 600,000 af/yr. ESPAM modeling indicates that both 600,000 af/yr and 720,000 af/yr of management actions will increase aquifer storage over time. I modeled both actions using the transient superpostion ESPAM2.2 version. The results are shown in the Figure 2:

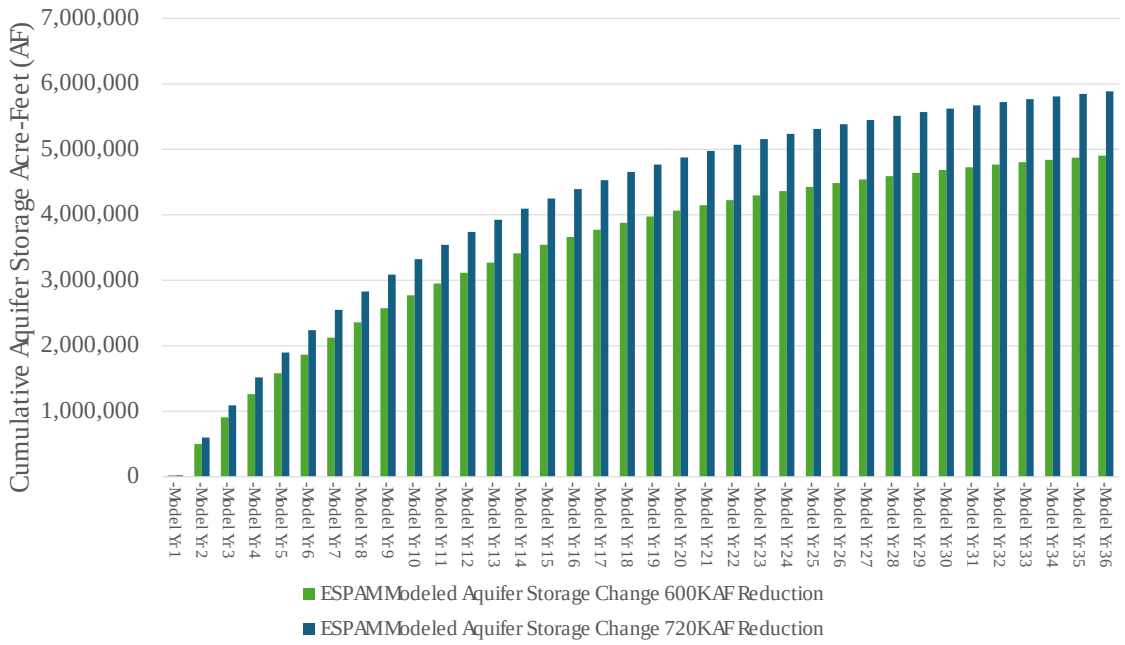


Figure 2: ESPAM simulated recovery to increase average aquifer storage content (af) from 600,00 af/yr (*green bars)* and 720,000 af/yr (*blue bars)* in ESPA management activities over 36 years