Idaho Department of Water Resources

Watermaster's Report Water District 63-S (Stewart Gulch)

October 1, 2023 – September 30, 2024

McVay, Michael
February 22, 2025

Withdrawals

The combined total withdrawal in Stewart Gulch Ground Water District 63-S (WD 63-S) in Water Year 2024 (WY24) was 165.9 million gallons (mgal), which is an increase of 5.2 (+3%) mgal from WY23 (Figure 1; Table 1).

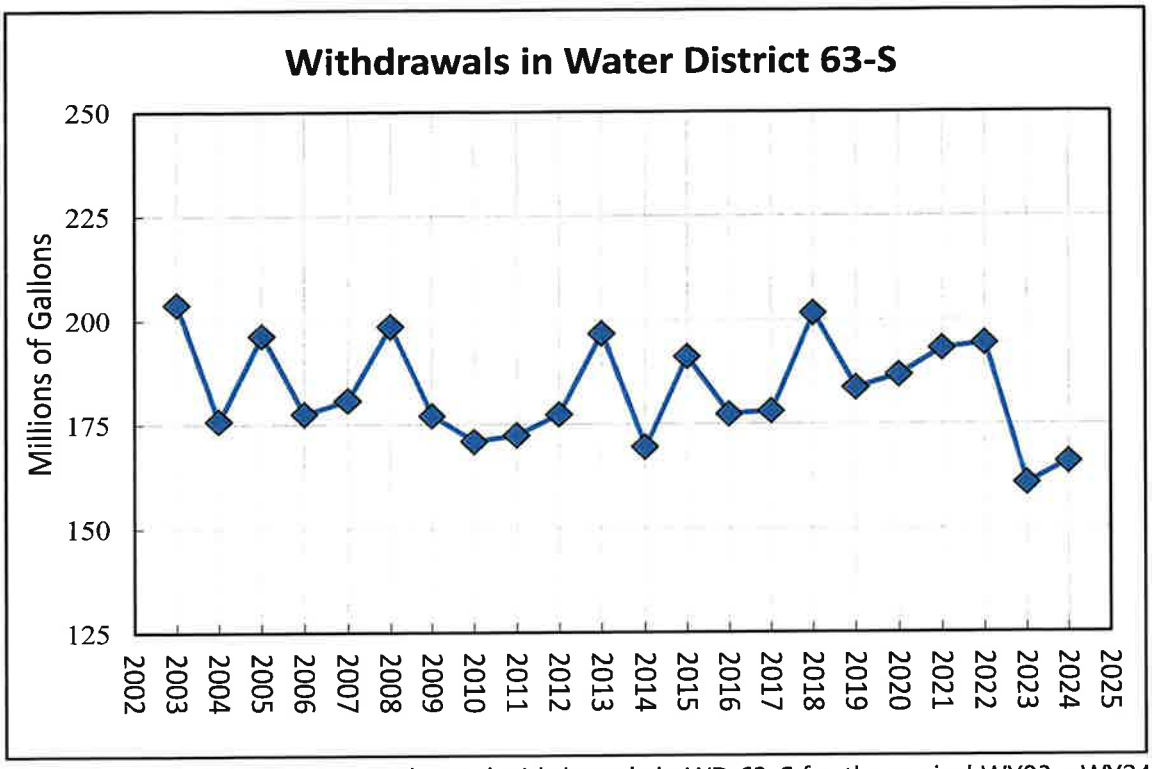

Figure 1. Low-temperature geothermal withdrawals in WD 63-S for the period WY03 – WY24.

Production Wells

TLP Production

All Terteling Company, Inc. (TLP) production wells increased usage from WY23 to WY24, and the combined withdrawal increased by 4.63 mgal (+5%).

The TLP Garden wells both increased withdrawals from WY23 to WY24. The Silkey well increased withdrawals by 0.5 mgal (+4%), and the House well increased withdrawals by 0.2 mgal (+10%) (Table 1; Figure A-1).

The Terteling Ranch wells both increased withdrawals from WY23 to WY24. The Pool well increased withdrawals by 3.2 mgal (+22%), and the Windsock well increased withdrawals by 0.7 mgal (+1%) (Table 1; Figure A-1).

Quail Hollow Production

The meter on the Upper well failed in July or August of 2024; therefore, the reported production volume is an estimate. Quail Hollow turned the pump off as soon as the failure was discovered, so the estimate has been assumed to be a reasonable approximation of actual production. Based on the reported production volumes, the total withdrawal from the Upper well decreased by 1.6 mgal (-94%), and the total WY24 withdrawal from the Lower well increased by 0.13 mgal (+379%) from WY23 to WY24. The total withdrawal by Quail Hollow decreased by an estimated 1.5 mgal from WY23 to WY24 (Table 1).

Edwards and Niznik Production

The total withdrawal from the Edwards Greenhouse (Edwards) well increased by 2.6 mgal (+4%) from WY23 to WY24.

The total withdrawal from the Niznik well decreased by 0.6 mgal (-11%) from WY23 to WY24.

Table 1. Withdrawals from WD 63-S well for Water Year 2024.

Well	Withdrawals (mgal)	Change from WY23 (mgal)	Percent Change from WY23
Terteling Ranch Pool	17.8	+3.2	+22%
Terteling Ranch Windsock	62.9	+0.7	+1%
TLP Silkey	12.7	+0.5	+4%
TLP House	2.1	+0.2	+10%
Edwards	65.2	+2.6	+4%
Niznik	5.0	-0.6	-11%
Quail Hollow #1 (Upper)	0.1	-1.6	-94%
Quail Hollow #2 (Lower)	0.2	+0.1	379%
Total	**165.9**	**+5.2**	**+3%**

Withdrawal Centers

The locations of the wells allow them to be grouped into five withdrawal centers: 1) Terteling Ranch, 2) TLP Garden, 3) Edwards, 4) Niznik, and 5) Quail Hollow (Appendix A). This is a useful approach for summarizing the withdrawals in localized areas within WD 63-S (Table 2) and allows for the visual assessment of the relative magnitude of withdrawals in the sub-district areas (Figure 2).

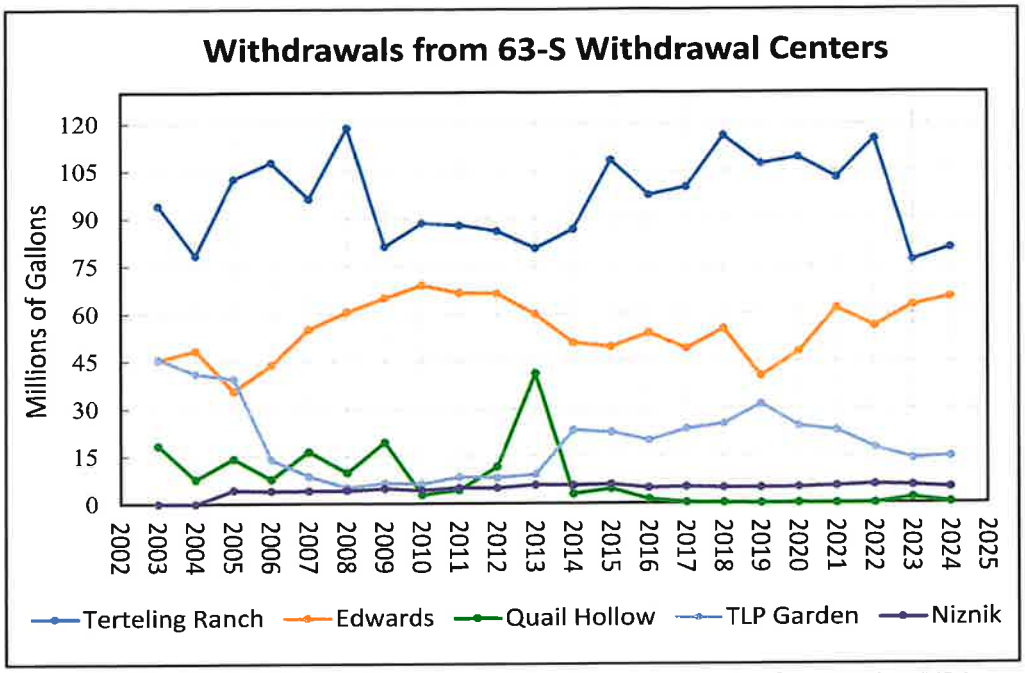

Figure 2. WD 63-S withdrawals grouped by withdrawal center for WY03-WY24.

Table 2. Five withdrawal centers in WD 63-S and changes from WY23 to WY24.

Withdrawal Center	Withdrawals (mgal)	Percent of WY24 District Withdrawals	Change from WY23 (mgal)
Terteling Ranch	80.7	49%	+4.0
Edwards	65.2	39%	+2.6
TLP Garden	14.8	9%	+0.7
Niznik	5.0	3%	-0.6
Quail Hollow	0.3	0%	-1.5

Terteling Ranch and Edwards were the two largest water users in WY24 and accounted for 49% and 39% of WD 63-S withdrawals, respectively. Combined withdrawals from TLP Garden, Niznik, and Quail Hollow accounted for the remaining 12% of total District withdrawals (Table 2).

Withdrawals Trend

Statistically significant trends provide a technically defensible assessment of changes over time. Statistical significance indicates that there is a non-zero trend in the data at the chosen confidence interval, and the calculated trend is assumed to be the best linear representation of changes over time. Lack of statistical significance indicates that the trend cannot be considered different than zero (at the chosen confidence interval), and the calculated trend does not represent changes over time. A confidence interval of 95% has been used to determine statistical significance for the trend in combined WD 63-S withdrawals.

The WY03 – WY24 trend in combined withdrawals for WD 63-S is -0.3 mgal/year; however, the trend is not statistically significant. Furthermore, the magnitude of the trend may be smaller

than the uncertainty of the flow measurements. In other words, the calculated trend is not statistically different than zero and does not accurately represent changes in withdrawals over time.

Water Levels

The shallowest (peak) water levels in a well are the best indication of the aquifer water levels because they are the least affected by local water use. Peak water levels in the Tiegs, Edwards, and Quail Hollow Lower wells declined from WY23 to WY24 (Table 3); The peak water level rose in the Quail Hollow Upper well.

Table 3. Peak water level changes in WD 63-S wells for WY23 – WY24.

Well	Water Level Change (ft)
Tiegs	-2.5
Edwards	-2.3
Quail Hollow Upper	+2.8
Quail Hollow Lower	-0.1

Tiegs Well

The Tiegs well is used as an indicator of WD 63-S aquifer conditions because it is unused and somewhat centrally located. The peak water level in the Tiegs well declined 2.5 feet (ft) from WY23 to WY24 (Figure 3; Table 3).

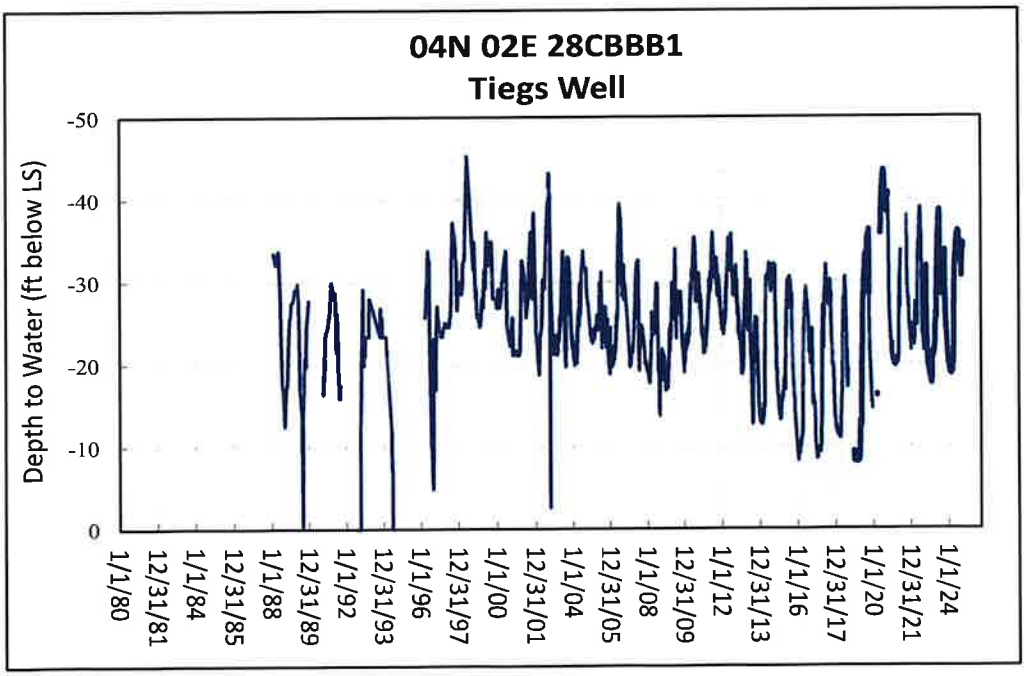

Figure 3. Water-levels in the Tiegs well.

Edwards Greenhouse Well

The peak water level in the Edwards well declined 2.3 ft from WY23 to WY24 (Figure 4; Table 3).

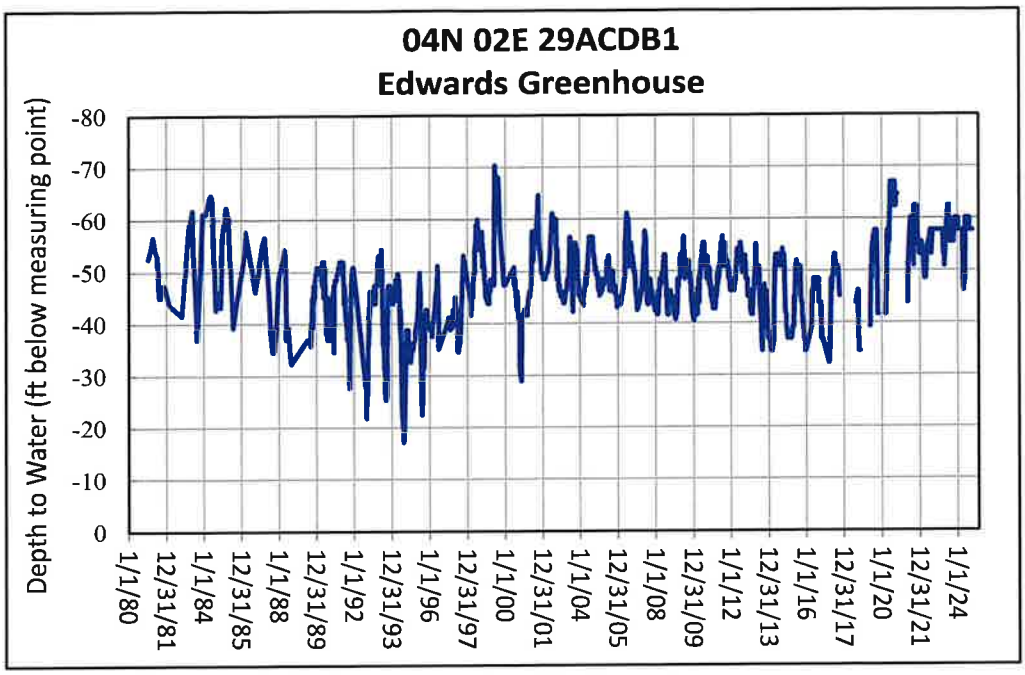

Figure 4. Water levels in the Edwards Greenhouse well.

Quail Hollow Wells

The peak water level in the Upper well rose 2.8 ft from WY23 to WY24 (Figure 5; Table 3).

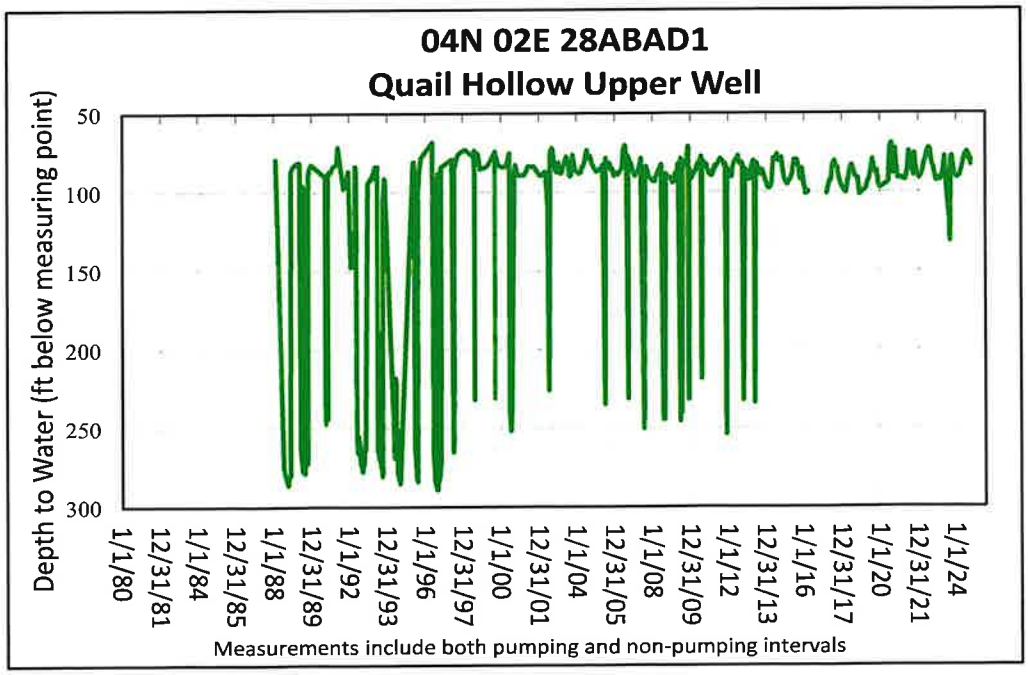

Figure 5. Water levels in the Quail Hollow Upper well.

The peak water level in the Lower well declined 0.1 ft from WY23 to WY24 (Figure 6; Table 3).

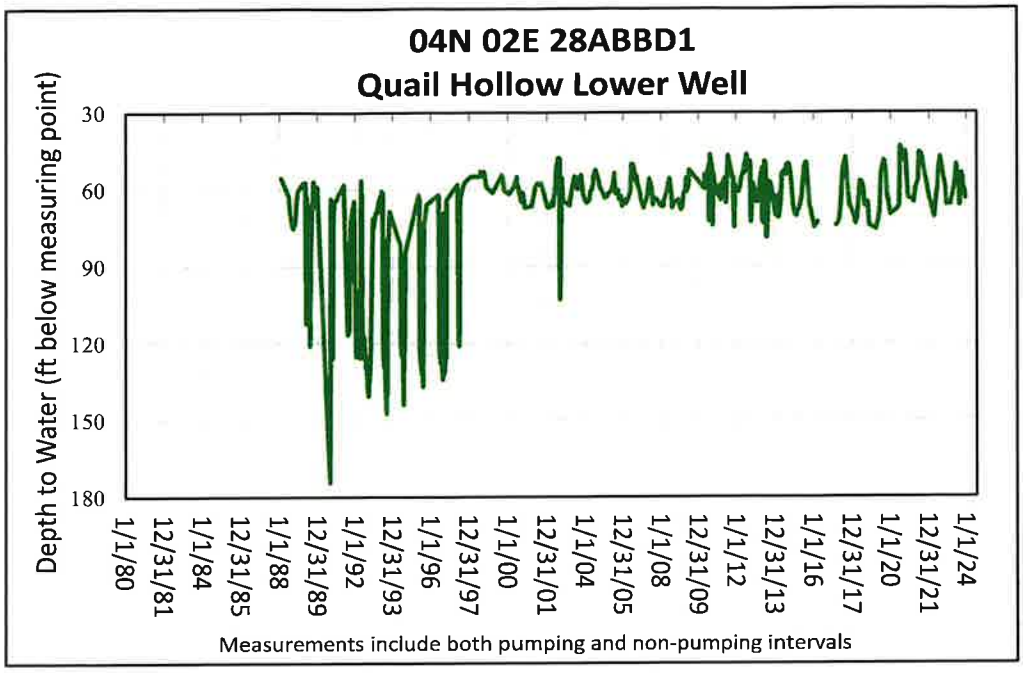

Figure 6. Water levels in the Quail Hollow Lower well.

Water-Level Trends

Calculating a linear trend for a set of water-level data is a simple way to describe the long-term water-level changes. However, a calculated trend is not always representative of the behavior if there are frequent and/or large water-level fluctuations, and/or if the calculated trend is small. Therefore, a statistical assessment of the calculated trend is an important step in determining the general water-level behavior over time. A statistically significant trend indicates that there is a non-zero trend in the data (at the chosen confidence interval), and the calculated trend is assumed to be the best linear representation of changes over time. Lack of statistical significance indicates that the trend cannot be considered different than zero, and the calculated trend does not adequately represent changes over time. A confidence interval of 95% has been used to determine statistical significance for all water-level trends.

Calculating a linear trend facilitates assessment of long-term changes independent of short-term water level fluctuations. However, it is difficult to calculate a trend that describes the state of the aquifer using all the data because some of the variability is due to local and/or short-term water use. As stated in the above section, peak water levels are the best indication of the aquifer water levels because they are the least affected by local water use; therefore, water-level trends have been calculated for the peak annual water levels in the wells. Minimum water levels

may provide insight into how water use impacts the aquifer, and the trend for the minimum water levels in the Tiegs well has been calculated for reference.

Tiegs Well Water-Level Trends

The Tiegs well is used an indicator well for WD 63-S because it is an unused well that is somewhat centrally located. The WY03 to WY24 peak water-level trend in the Tiegs well is 0.2 ft/year; however, it is not statistically significant (Figure 7 and Table 4). This does not mean that peak water levels aren't changing, it means that the calculated trend does not accurately represent water-level changes over time.

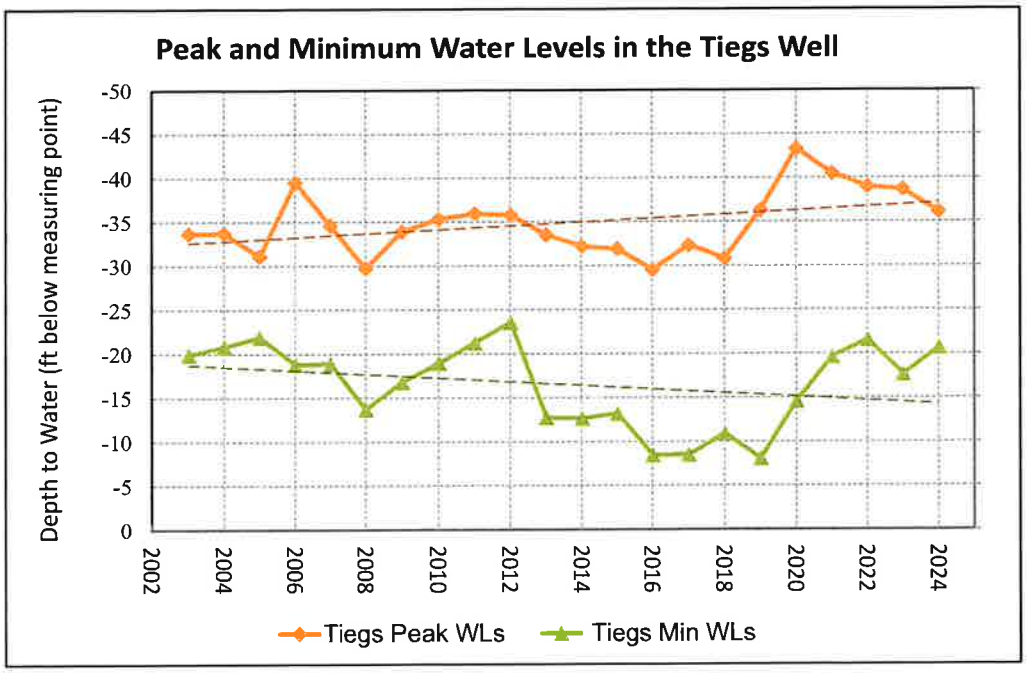

Figure 7. Water-year peak and minimum water levels in the Tiegs well.

Edwards Greenhouse Well Water-Level Trend

The WY03 to WY24 peak water-level trend in the Edwards Greenhouse well is 0.1 ft/yr, but the trend is not statistically significant (Figure 8 and Table 4). This does not mean that water levels aren't changing, it means that the calculated trend does not accurately represent water-level changes over time.

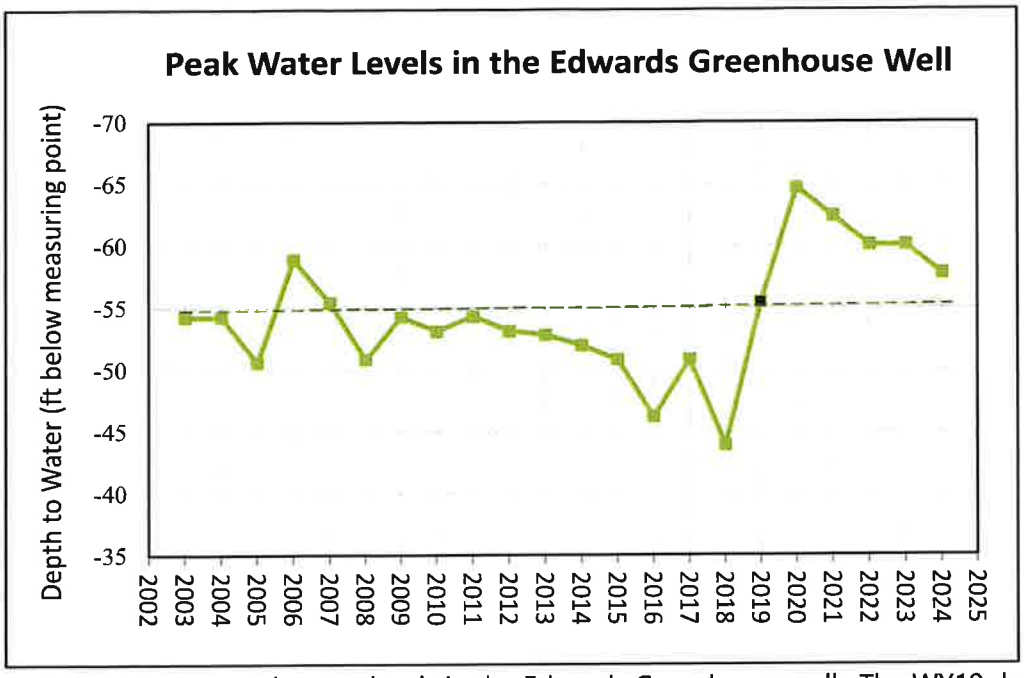

Figure 8. Water-year peak water levels in the Edwards Greenhouse well. The WY19 data point (black dot) may not represent the true peak water level because of missing data.

Quail Hollow Upper and Lower Wells Water-Level Trends

The WY03 to WY24 peak water-level trends in the Quail Hollow Upper and Lower wells are 0.0 and 0.4 ft/year, respectively; however, the trends are not statistically significant (Figure 9 and Table 4). The lack of statistical significance means that the calculated trend does not accurately represent water-level changes over time.

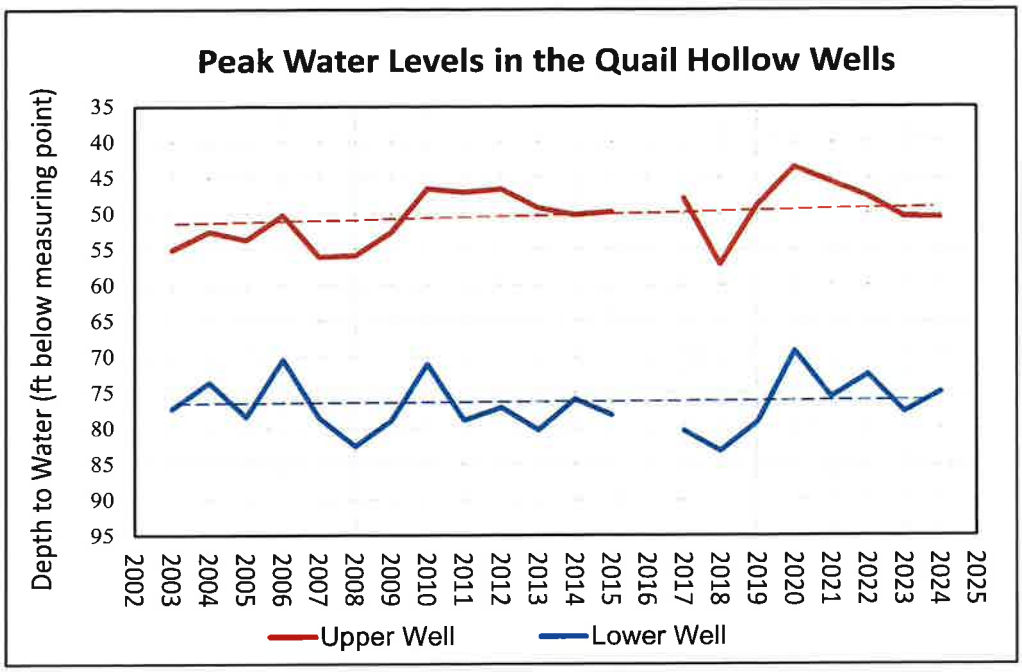

Figure 9. Water-year peak water levels in the Quail Hollow wells.

Peak water-levels in WD 63-S exhibit flat to slightly rising trends (Figures 3 – 9, Table 4); however, none of the wells exhibit a statistically significant peak water-level trend for the WY03 – WY24 period. The lack of statistical significance means that none of the water-level trends can be considered different than no trend, and the calculated trends do not accurately represent water-level changes over time.

Table 4. Water-level trends in district 63-S wells for the period WY03 – WY24.

Water Level	Trend (ft/year) [1]	p-value[2]	Statistically Significant
Tiegs Peak Water Levels	+0.2	0.18	NO
Tiegs Minimum Water Levels	-0.2	0.24	NO
Edwards Peak Water Levels	+0.1	0.48	NO
Quail Hollow Upper Peak Water Levels	0.0	0.88	NO
Quail Hollow Lower Peak Water Levels	+0.3	0.09	NO

[1]Trends and significance have been calculated using the Mann-Kendall statistical test (Hirsch and Slack, 1984).

[2]P-values less than 0.05 indicate the trend is significant at the 95% confidence interval.

Analysis of Withdrawals and Water Levels

Water levels have cycled up and down over the past 22 years, with higher withdrawal rates generally coinciding with deeper peak water levels in the Tiegs well. Figure 10 illustrates the relationship between water-year withdrawals and peak water-year water levels.

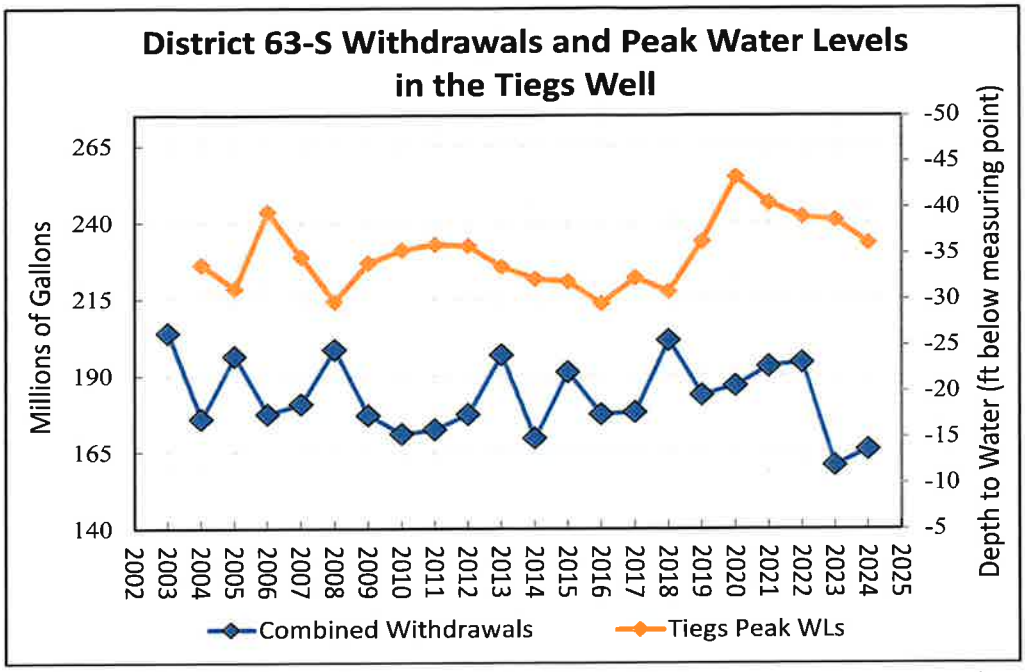

Figure 10. WY03 – WY24 water-year combined 63-S withdrawals compared to peak water levels in the Tiegs well.

The inverse relationship between withdrawals and Tiegs water levels is plainly visible from WY03 to WY13, and WY22. The relationship is less direct from WY13 to WY20, WY23, and WY24. The change in this relationship may be due to:

- Timing of local or regional withdrawals that result in peak water levels which are not reflective of regional water-year production,
- Spatial changes in the relative magnitudes of withdrawals between the withdrawal centers (e.g., an increase in withdrawals at one or more of the withdrawal centers in combination with a decrease in withdrawals at one or more withdrawal centers),
- Monitoring equipment issues,
- Changes in withdrawals from hydraulically connected wells that are unidentified or located outside of the district, or
- A combination of the above-listed factors.

The WY03 – WY24 trend in the combined withdrawal volume is -0.3 mgal/year; however, the trend is not statistically significant, and the magnitude of the trend may be smaller than the uncertainty in flow measurements. Peak water level trends in the Tiegs, Edwards, and Quail

Hollow wells range from -0.2 to 0.4 ft/year, but none of the trends are statistically significant (Figures 7- 9 and Table 4).

Peak-water level trends do not exhibit a consistent, inverse relationship with the trend in combined WD 63-S withdrawals over the WY03-WY24 period; however, none of the trends are statistically significant, which means they are not statistically different than no trend. Due to the lack of statistically significant trends in withdrawals or water levels, no real conclusions can be made by comparing the trends.

Summary

Combined district withdrawals were 165.9 mgal in WY24, which is an increase of 3%; however, the WY03 – WY24 trend in combined withdrawals is very small and not statistically significant, indicating the calculated trends do not accurately represent changes over this period.

All peak water levels in WD 63-S, except for the Quail Hollow Upper well, declined from WY23 to WY24. However none of the wells exhibit a statistically significant peak water-level trend for the WY03 – WY24 period, indicating the calculated trends do not accurately represent changes over this period.

References

Hirsch, R.M., and Slack, J.R., 1984. A nonparametric trend test for seasonal data with serial dependence: Water Resources Research v. 20, p. 727–732.

IDWR, 2017a. Stipulated Agreement In the Matter of the City of Boise Application for Water Right Permit 63-34326, Exhibit C.

Respectfully submitted,

Michael McVay, Water District 63-S Watermaster

APPENDIX A

WD 63-S LOCATION MAP

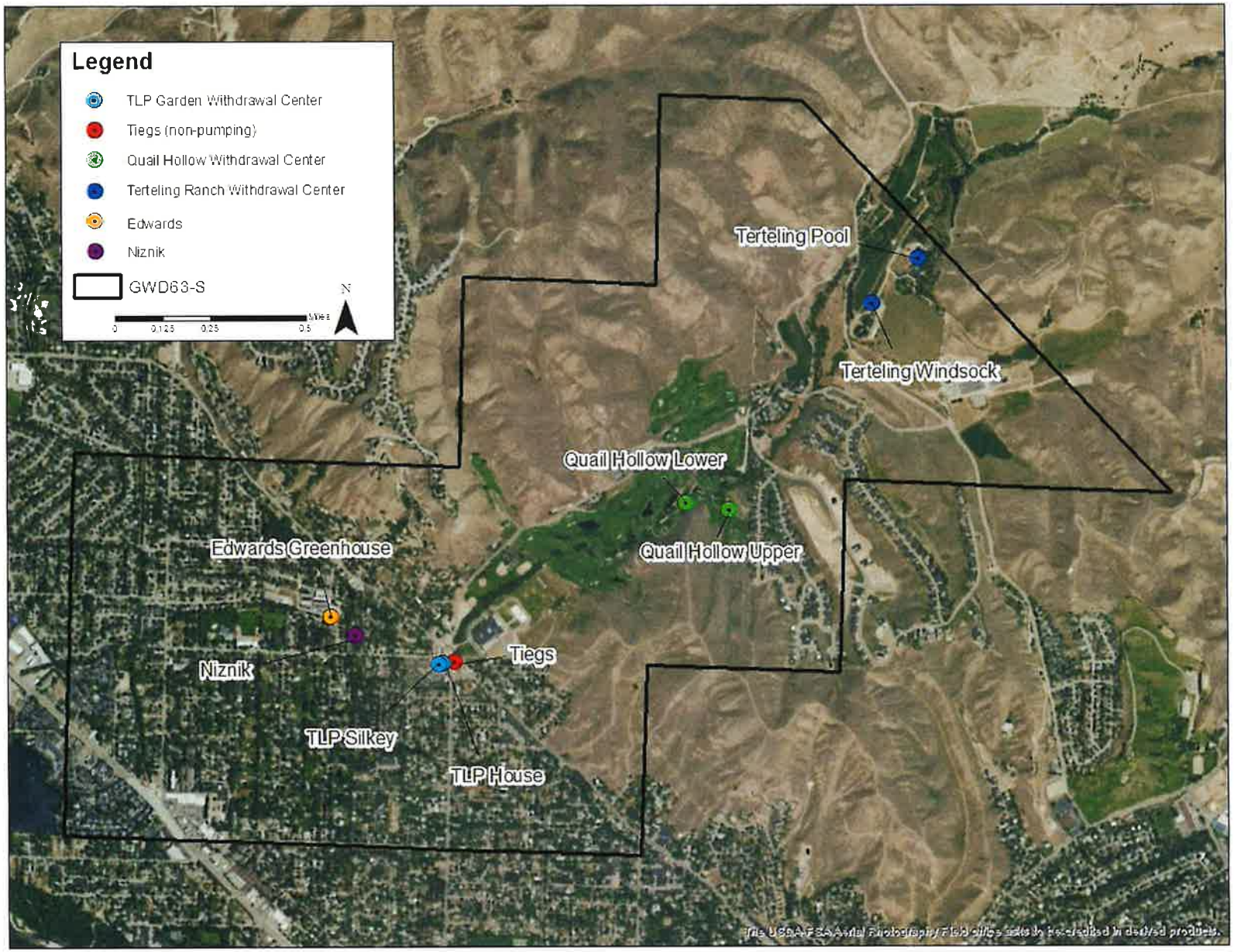

Figure A-1. Well locations within WD 63-S