Big Valley Basin Groundwater Sustainability Plan

Annual Report for Water Year 2023

No. 5-004 Big Valley Groundwater Basin

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Abbreviations

AEM	Airborne Electromagnetic Surveys
AF	Acre-feet
AgMAR	Agricultural Managed Recharge
BVAC	Big Valley Advisory Committee
BVGB	Big Valley Groundwater Basin
BVGSP	Big Valley Groundwater Sustainability Plan
BVMW	Big Valley Monitoring Well
CASGEM	California Statewide Groundwater Elevation Monitoring Program
CCR	California Code of Regulations
CIMIS	California Irrigation Management Information System
DWR	California Department of Water Resources
ET	Evapotranspiration
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
IM	Interim Milestone
MOU	Memorandum of Understanding
MO	Measurable Objective
MT	Minimum Threshold
NOAA	National Oceanic and Atmospheric Administration
RMW	Representative Monitoring Well
RVB	Round Valley Basin
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
USGS	United States Geological Survey
UCCE	University of California Cooperative Extension
WY	Water year

Executive Summary

The Big Valley Groundwater Basin (referred to herein as "the basin," or "BVGB" interchangeably), California Department of Water Resources (DWR) Basin No. 5-004 is classified as a "medium" priority basin (DWR, 2019). The basin, shown in **Figure 1.1,** spans a land area of about 144 square miles in Modoc and Lassen counties (28 and 72 percent respectively). To comply with the requirements set forth by the 2014 Sustainable Groundwater Management Act (SGMA) (California Water Code, Section 10720 et seq.), both counties have taken on the role of Groundwater Sustainability Agency (GSA) for the portion of the basin within their jurisdictional boundaries.

The Groundwater Sustainability Plan (BVGSP or GSP) was adopted by both County Boards of Supervisors on December 15, 2021 and submitted to DWR on January 27, 2022. DWR determined that the BVGSP was "incomplete" and notified the GSAs of their findings on October 26, 2023. The GSAs must respond to DWR's comments by submitting a revised GSP by April 23, 2024. This annual report references the language and pages of the original BVGSP, as the updated version will not be adopted by the GSAs before the annual report deadline. Future annual reports starting in water year (WY) 2024 will reference the updated BVGSP.

Per California Code of Regulations (CCR) 23 § 356.2, an Annual Report must be submitted to DWR by April 1 of each year following the adoption of the GSP, providing updates to basin conditions for the preceding water year (October 1 through September 30). Data covered in the basin GSP concludes in WY 2018. The first annual report provided an update on basin conditions for the subsequent water years, 2019 through 2021 and a second annual report was prepared for WY 2022. This annual report covers WY 2023, October 1, 2022 through September 30, 2023.

The GSA technical team has worked diligently to provide the best available data for this annual report but are constrained by data availability and limited funding. We were left with a flawed water budget from our GSP development that we have updated for WY 2023; however, the water budget still lacks basin specifics that limit its utility for basin management. The first annual report used the water budget at face value, the second annual report and this current annual report use actual measured water levels instead of relying as heavily on the flawed water budget. This is explained in further detail in the water levels and water storage sections. We hope to address discrepancies further in the five-year update and GSP edits due April 23, 2024. A majority of the wells used for the annual report are measured by DWR.

Conditions in the Basin during the 2023 WY have remained consistent with those discussed in the GSP with relation to sustainability criteria. There was significant recharge measured in WY 2023 and average groundwater levels are virtually identical to WY 2013 levels showing ten years of stable conditions. Water elevations at all representative monitoring wells with significant historical data to analyze remained above their measurable objectives.

The 2023 WY is considered very slightly above normal with Pit River stream flows at 212.2 average cfs/day. The flow this year was similar in volume to 2016 and much higher than 2021 and 2022. The months with the highest flow were March, April, and May. The Pit River and Ash Creek, major tributaries in the basin, typically experience high flows occurring during the winter/spring and low flows during the summer/fall, correlating with trends in precipitation and snowpack melt. Summer flows of the Pit River and all tributaries are fully allocated under existing water rights.

Prior to GSP implementation, 22 wells were enrolled in the California Statewide Groundwater Elevation Monitoring Program (CASGEM) within the basin. During GSP implementation, five deep wells were constructed to support additional monitoring and were added to the CASGEM program. These deep wells, along with 7 other CASGEM wells, were selected to be Representative Monitoring Wells (RMWs) for basin conditions and assigned Sustainable Management Criteria (SMC). Hydrographs for each RMW are provided in **Appendix A** and summarized in **Table 2.1.2** relative to their SMCs**.**

Depth-to-groundwater data taken from the RMWs was used to generate groundwater elevation contours for fall and spring for WY 2023. These wells are also used to determine change in groundwater storage. The hydraulic gradients illustrated by the contour maps generally indicate north-south directional flow on the west side of the basin, and east-west directional flow on the east side of the basin. Seasonal variations are apparent as the groundwater gradient increases in the fall and decreases in the spring across the basin, corresponding with times of groundwater extraction and recharge, respectively. Estimates of groundwater storage for WY 2023 are reported in **Figure 2.2.4,** which shows water year type (as indicated by precipitation and the cumulative departure from mean precipitation [CDFM]), the annual change in groundwater storage, and the cumulative change in groundwater storage from WY 1983 to WY 2023.

Although the water budget model developed for the GSP is limited by its reliance on assumptions about aquifer structure and the quality of data available, it is the best tool available as of the writing of this report. As implementation progresses and more data is made available, refining this and other models will improve the accuracy of estimates of water budget components and storage changes. A map showing annual changes in groundwater storage between the fall season of WY 2022 to 2023 can be found in **Appendix E.**

As described in the GSP, land use sectors in Big Valley “differ from DWR’s water use sectors identified in Article 2 of the GSP regulations because DWR’s sectors don’t adequately describe the uses in Big Valley.” (BVGSP 3-8). At the time of this report, the best data available to estimate land use by water use sector remains that which was reported in the development of the GSP. However, this dataset was identified as inaccurate, and as such, remains a data gap in this report. **Table 2.2.1** (Table 3-2 in the GSP**)** continues to provide the best summary of water use sectors for WY 2023.

Overall, basin conditions during the 2023 water year have remained consistent with the trends anticipated in the GSP. **Table 2.1.2** provides a summary of water levels and SMCs in the RMWs. For wells where there is sufficient data to analyze, groundwater levels have remained above the measurable objectives and as such, remain well above Minimum Thresholds.

Implementation of the GSP has been ongoing concurrently with its development, as outlined in Chapter 9: Project and Management Actions. Due to limited data availability, as within the GSP, the water budget and other models used in this report draw heavily on assumptions about environmental factors such as evapotranspiration (ET), crop water use efficiency, and land use data. Improving data quality for basin management is a major goal of the GSAs. Therefore, the primary focus of work at this time has been to address the data gaps identified in the GSP, many of which carry over into this report. Research continued to understand the relationship between ET and applied water in the basin, which will now be aided by the installation of a California Irrigation Management Information System (CIMIS) sensor in the basin. A water availability analysis was completed to provide a foundation for an application for winter recharge water and organized data that can be used for future revisions of the GSP. The GSAs also applied for and were successful in getting a new grant from DWR for projects and management actions as well as GSP revisions.

1. General Information

1.1 Background

The local community in the Big Valley Groundwater Basin and surrounding areas is extremely rural, economically disadvantaged, and resource capacity limited. As with much of the surrounding region, the economy is largely agricultural, but unlike many other groundwater basins in California, the growing season in Big Valley is constrained to about 101 days per year by hard freezes and snow. Considering these limitations, the majority of farmed land employs low impact farming techniques to produce low-input crops such as hay and pasture crops. The ensuing cropping systems support an abundance of wildlife habitat and help maintain pristine quality in both surface and groundwater systems.

1.1.1 Big Valley Basin GSAs and Big Valley Advisory Committee

With no other existing agency to take up this task, Modoc and Lassen Counties were established as GSAs for their respective portions of the basin in 2017 in an attempt to retain local control of groundwater management.

When DWR finalized the basin's medium priority designation in 2019, the GSAs elected to collaborate on a single GSP and developed a Memorandum of Understanding (MOU) which details the coordination between the two GSAs. The MOU provided for the establishment of a local advisory committee to oversee the development of the GSP. Applications for this committee, known as the Big Valley Advisory Committee (BVAC) were solicited from local landowners and residents following public noticing protocols. Appointments were made by the County Boards of Supervisors. The BVAC was comprised of a board member from each county, one alternate board member from each county, and two public applicants from each county.

1.1.2 Big Valley Basin Groundwater Sustainability Plan

From chapter one of the Big Valley GSP, "the sustainability goal for the Big Valley Groundwater Basin is to maintain a locally governed, economically feasible, sustainable groundwater basin and surrounding watershed for existing and future legal beneficial uses with a concentration on agriculture. Sustainable management will be conducted in context with the unique culture of the basin, character of the community, quality of life of the Big Valley residents, and the vested right of agricultural pursuits through the continued use of groundwater and surface water." (BVGSP p. 1-5).

Management of the basin prioritizes the interests of the basin's legal beneficial users in all decisions, as defined under the sustainability goal. To this effect, projects and management actions were identified in Chapter 9 of the GSP and are being implemented to refine and address existing data gaps. Consistent with this objective and to avoid undesirable results, monitoring networks to evaluate quantifiable management criteria (minimum thresholds, measurable objectives, and interim milestones[1]) were established for the six sustainability indicators[2].

In compliance with 23 CCR §352.6[3], monitoring data is stored on a SharePoint site, accessible by Modoc and Lassen GSAs, and technical support staff.

1.2 Plan Area

With ground elevations averaging around 4,500 feet, the basin is located in the volcanic high desert region of California's far northeastern corner. It is one of many similar basins spread throughout the region classified by their relative isolation and small size. The total land area covered by the basin is about 144 square miles, with Modoc County representing around 40 square miles in the north and Lassen County comprising roughly 104 square miles in the south. A map showing the basin boundary and county jurisdictions is provided in **Figure 1.1**.

Geologically, "The BVGB is bounded to the north and south by Pleistocene and Pliocene basalt and Tertiary pyroclastic rocks of the Turner Creek Formation, to the west by Tertiary rocks of the Big Valley Mountain volcanic series and to the east by the Turner Creek Formation. The Pit River enters the Basin from the north and exits at the southernmost tip of the valley through a narrow canyon gorge. Ash Creek flows into the valley from Round Valley and disperses into Big Swamp. Near its confluence with the Pit River, Ash Creek reforms as a tributary at the western edge of Big Swamp. Annual precipitation ranges from 13 to 17 inches." (DWR 2003). Since 2003, the Ash Creek Wildlife Refuge was established and now occupies most of the area formerly known as Big Swamp. A series of restoration projects and farming practices have been implemented within its boundaries, resulting in changes to the stream channel where it flows through the refuge.

The definable bottom of the aquifer sits at about 1,200 feet (BVGSP, ES-4), at which depth all production wells are represented. Models used in basin management assume a single principal aquifer because no distinct, widespread confining beds have been identified in the subsurface.

Although the BVGB is isolated and does not share a boundary with another basin, the Round Valley Basin (RVB), which received a very low prioritization, is located directly to the north from where Ash Creek flows into the BVGB at the town of Adin. Hydraulic connection between the two basins where they are separated by a half-mile gap of alluvium is suspected by the GSAs but has not been confirmed. Surrounding upland areas are also thought to contribute to basin

[1] Interim Milestones are optional criteria not subject to enforcement and none have been set for the BVGB.
[2] The six sustainability indicators defined under SGMA are: chronic lowering of groundwater levels, reduction of groundwater storage, seawater intrusion, degraded water quality, land subsidence, and depletions of interconnected surface water. The BVGB was not found to experience direct impacts from seawater intrusion, subsidence, depletion of interconnected surface water, or degraded water quality.
[3] 23 CCR §352.6. Data Management System, "Each Agency shall develop and maintain a data management system that is capable of storing and reporting information relevant to the development or implementation of the Plan and monitoring of the basin."

recharge and were mapped as such by DWR in 1963. An upland assessment completed by GEI also supports this relationship.

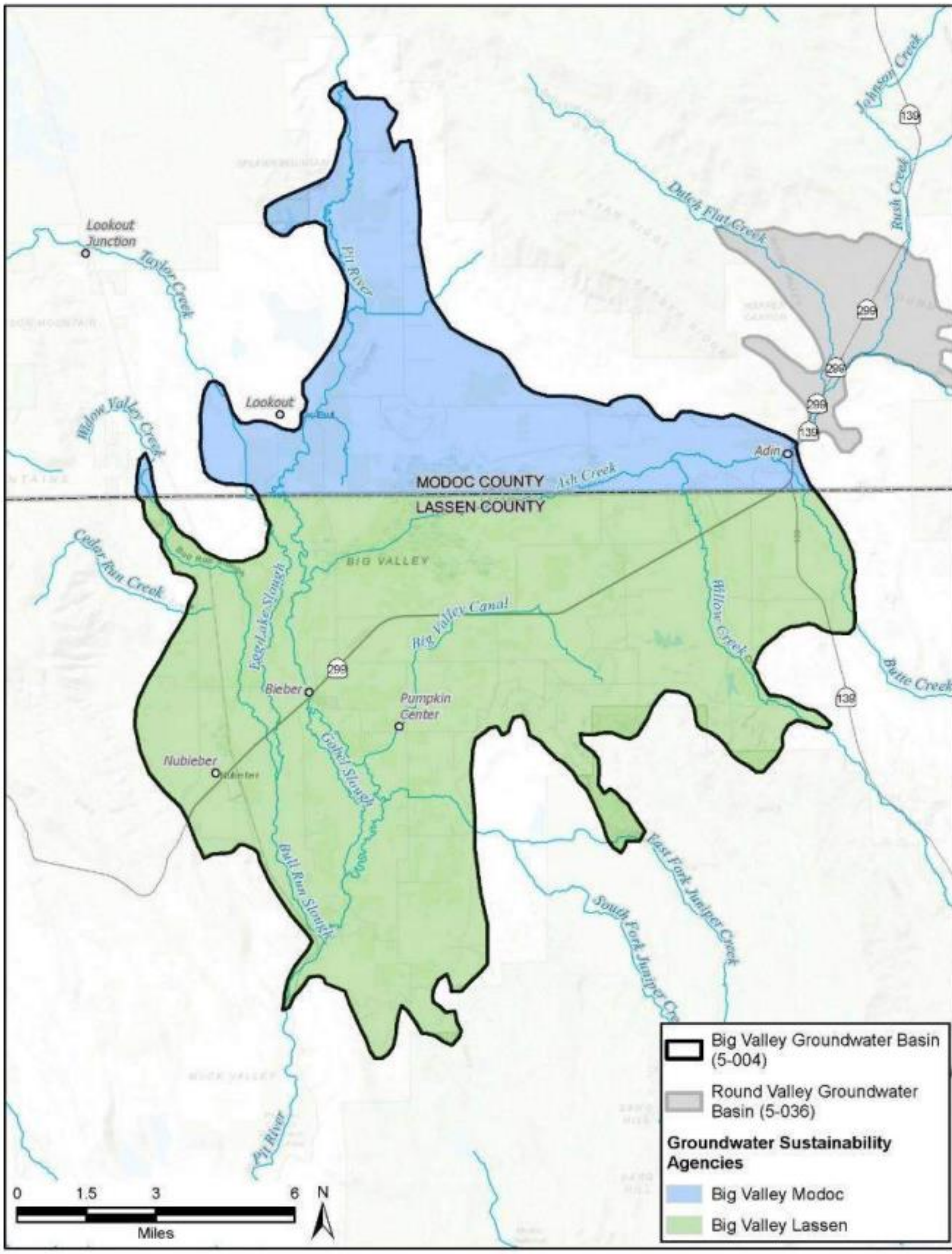

Figure 1.1 Big Valley Groundwater Basin Map (BVGSP ES-2*)*

1.2.1 Climate

The climate of the BVGB is highly variable depending on season and year. On average, temperatures range between 32 and 69 degrees Fahrenheit (°F). However, the summer months regularly see temperatures exceeding 90°F, and temperatures in winter months can fall as low as -10°F. These hard freezes limit agricultural production for much of the year.

Historical climate data was recorded in the basin at two stations, Bieber 4 NW and Adin RS, which were administered by the National Oceanic and Atmospheric Administration (NOAA). Both stations are no longer active. Current Evapotranspiration (ET) data used in the water budget estimations is drawn from the nearest CIMIS station in McArthur CA, #43, which is separated from the BVGB by the Big Valley Mountains to the west. Current precipitation data is from estimated precipitation data using PRISM provided by Oregon State University (https://prism.oregonstate.edu/explorer/).

1.2.2 Surface Water and Drainage Features

The two major sources of surface water in the BVGB are the Pit River and Ash Creek, which enter the basin near the towns of Lookout and Adin respectively. There are several other small creeks which connect into the two larger systems throughout the basin. Water is diverted through a series of unlined drainage ditches and canals, which have been identified along with agricultural land for their potential to contribute to recharge. Historically, several stream gages have monitored water levels on the Pit River, Ash Creek, and Willow Creek, shown in **Figure 1.2**. For this reporting period, the water budget is estimating inflow from streams using the USGS Canby Gage. Future data inputs could include the new gage on the Pit River just below where it enters the basin, a new gage at Robert's Reservoir, the Muck Valley output on the Pit River, and the Willow Creek gage.

Annual average daily streamflow at the Canby gage is reported for water years 2010 through 2023 in **Table 1.2.1.** Flows are shown to correlate with water year type, with highest daily averages occurring concurrently with the wet years in 2011, 2017 and 2019, and the lowest daily flows occurring during the less than normal years of 2014, 2021 and 2022. This data demonstrates the extreme variability in surface water availability in the Pit River. The wettest year (WY 2017) reported an approximately 20 times larger average daily surface water flow than the driest (WY 2014).

Table 1.2.1 Annual Average Daily Streamflow at the Canby USGS Gage and SRI Water Year Type

Water Year	Average Daily Flow (cfs) at Canby Gage	SRI Water Year[1]
2010	56.4	BN
2011	380.8	W
2012	66	BN
2013	73.6	D
2014	20.9	C
2015	41.7	C
2016	208.2	BN
2017	456.1	W
2018	138.5	BN
2019	387.2	W
2020	69.3	D
2021	30.6	C
2022	38.5	C
2023	212.2	AN*

Notes:
[1]Sacramento Valley Water Year Indices Water year type. C = Critical, D = Dry, BN = Below Normal, AN = Above Normal, W = Wet
*preliminary analysis
Source(s): USGS Surface Water Data; DWR Data Exchange Center Historic Water Year Hydrologic Classification Indices.

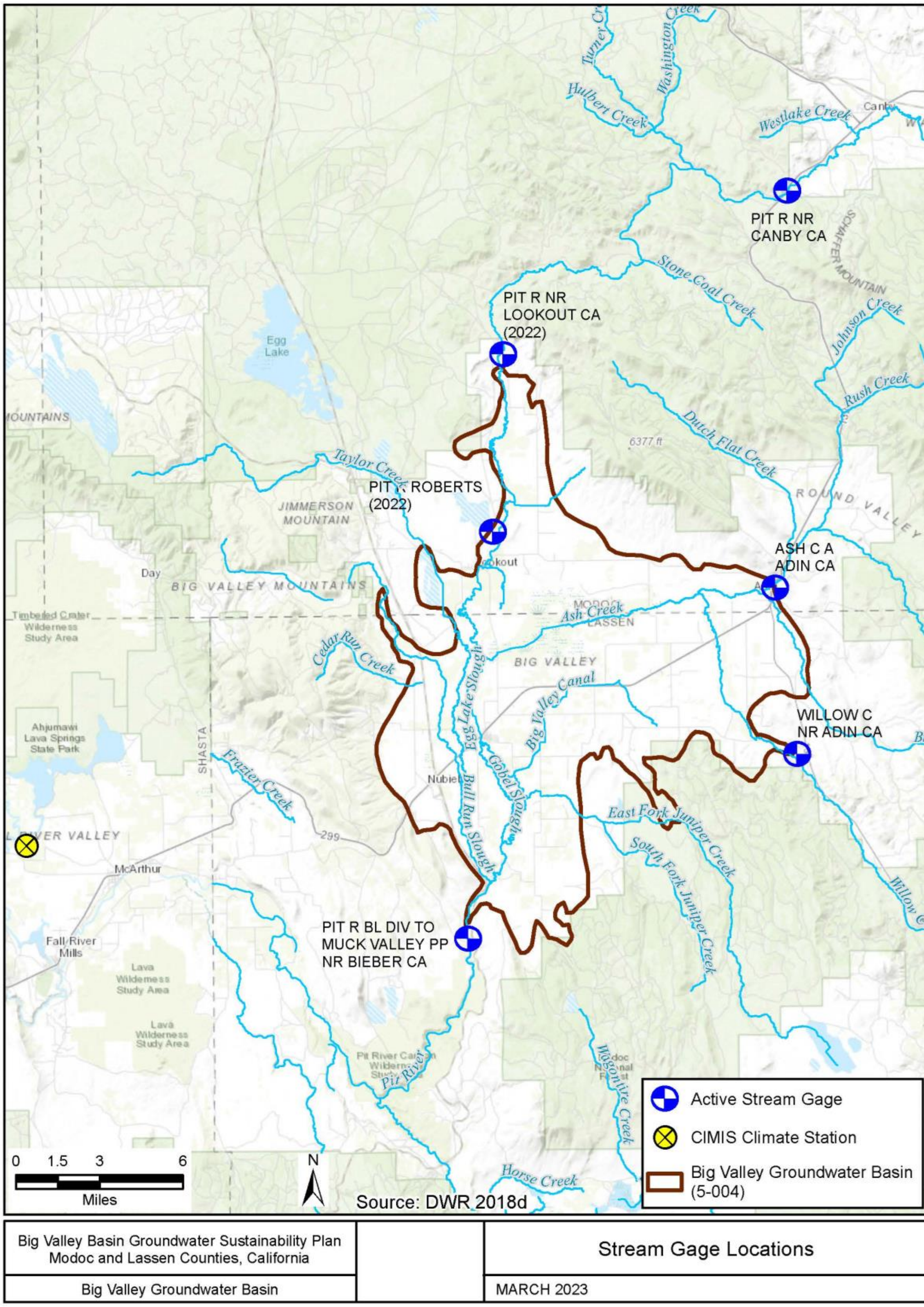

Figure 1.2 Map of Stream Gage and CIMIS Locations

2 Groundwater Conditions

This section provides an update on changes in groundwater conditions in the BVGB for the 2023 water year.

2.1 Groundwater Elevations

2.1.1 Groundwater Elevation Contour Maps

Spring and fall groundwater elevation contours included in the GSP are current through WY 2019. Groundwater contours for WYs 2019 to 2022 were presented in the 2021and 2022 Annual Reports. Spring and fall groundwater elevation contour maps for WY 2023 are presented in **Appendix B** of this report.

The WY 2023 saw slightly above normal precipitation with most of the rainfall coming in January, March, April, and May. Much of the precipitation came as rain in the late spring contributing to increased stream flows through June. Groundwater elevation contour maps reflect significant recharge occurring in the basin.

These trends suggest that the basin's storage is resilient, provided that sufficient water is available for recharge. In years where precipitation is limited, a combination of surface water storage options and off-season recharge projects may help enhance recharge and mitigate groundwater level declines during dry periods.

The contour maps are reliant on well monitoring data. Each monitoring well reflects a significant area. Thus, missing data from even a few wells, can have a substantial effect on the contour maps. As more data is obtained from the new monitoring wells added as part of the GSP process, overall accuracy of the contour data will improve. This year, a single data point that is an apparent outlier appears to be skewing groundwater elevations lower in the middle of the basin and contributing significantly to change in groundwater storage measurements. This may be due to the measurement being taken after the production well had started pumping for the season and may not be representative of static levels.

DWR has measured water levels for many decades in the basin, and DWR staff has indicated that it will continue to measure water levels for the foreseeable future. The period preceded by this report coincides with an extended period of limited data availability, particularly in the southern portion of the basin for the 2019-2021 water years. COVID-19 is suspected to have contributed to this data gap by constraining the ability of DWR staff to conduct necessary field work, which has required technical staff to estimate water levels for some parts of the basin.

2.1.2 Groundwater Elevation Hydrographs

Twelve Representative Monitoring Wells were selected and assigned measurable objectives[4] (MOs) and minimum thresholds (MTs) to assess groundwater elevation and depth to water conditions. **Figure 2.1.2** shows the relative distribution of these RMWs within the BVGB and **Appendix A** shows the hydrographs for each RMW. Of these, the five Big Valley Monitoring Wells (BVMWs) are each located at one of the clusters of monitoring wells that the GSAs received funding from DWR to drill in 2019 and 2020. Data from the BVMW clusters can be used to determine the directional flow of groundwater within the basin. MOs were set at the 2015[5] fall water elevation levels wherever possible. The newer wells included in the monitoring network were assigned MOs at the earliest fall water elevation reported. For the five new BVMWs, 2020 was the first year when fall monitoring data was collected. The ACWA-3 well was assigned an MO at its 2017 fall level. Given the differences in conditions that occurred in the basin between the 2015, 2017 and 2019 water years, the MOs set for the newer wells may be adjusted in the future to better reflect basin conditions for the five-year update.

During the time period covered by this report, conditions in the basin have remained sustainable. Substantively, the wells with sufficient historical data to predict future trends are all projected to remain above their respective MOs through 2040 except one, 20B6. 20B6 remained at its MO in 2023 but may need to be adjusted for the five-year update. There was a long period where 20B6 was unmonitored and recent monitoring suggests that the water levels at this well are now stable. Wells installed or added to the representative monitoring network after 2015, which include the five new BVMWs and ACWA-3, do not have significant historical data to analyze at this point. However, preliminary data suggests low seasonal variance across these sites.

Water level trends for all wells appear to correlate with water year type, although the degree of change differs from site to site. Three wells, 08F1, 26E1, and ACWA-3, have fluctuated minimally. Preliminary data from BVMW wells 2-1 and 3-1 appear to reflect similar trends. BVMW 1-1, 4-1, and 5-1 fluctuate more than BVMW 2-1 and 3-1 but preliminarily show stable trends and demonstrate recharge in WY 2023. Again, however, empirical data from the five new monitoring wells cannot be meaningfully interpreted at this time due to the limited period for which it has been collected. By the time of the five-year report, however, that is expected to change as six years of monitoring will have been completed.

Sporadic monitoring of two wells, 13K2 and 20B6 make trends difficult to determine but their slight declining trends in water levels in the last couple dry years saw signs of stabilization in 2023. Given the uncertainty produced by this lack of data, it is imperative that either efforts to

[4] "Measurable objective (MO): Numeric Values that reflect the desired groundwater conditions at a particular monitoring site. MOs must be set for the same monitoring sites as the MTs and are not subject to enforcement." (BVGSP 7-1)

[5] Measurable objectives were set at the fall 2015 levels, which were generally the lowest, most recent groundwater level measurements prior to the adoption of the BVGSP. These levels provide a reasonable proxy for desired conditions because agricultural uses remain feasible at them. (BVGSP 7-3).

consistently collect and report data for these sites are improved, or new sites are selected to reflect basin conditions in future reports. The first of these options is the most desirable outcome to maintain reporting consistency through future years, keeping in mind that these wells are also used for contour mapping.

Although trends reflected in 01A1 and 16D1 indicate moderate levels of decline, of the twelve RMWs, the data represented in the hydrographs for these sites are the most variable, particularly during the dry period from 2011 to 2016. Fall 2022 and 2023 measurements at 16D1 are considerably lower than other measurements taken in the basin. In the coming year, the technical team will work with the landowner and DWR to try to pinpoint the reason this well is seeing differences compared to other wells in the basin and validate measurements. Potential reasons for the differences include changes and/or differences in pumping patterns, changes in pumping amounts, and other external impacts like nearby pumping.

Overall, water levels increased in response to significant recharge in WY 2023. This relationship highlights the correlation between recharge and seasonality which suggests that much of the water pumped in the basin from one year to another was likely recharged during the preceding year. The GSAs suspect that much of the recharge observed in the basin is contributed by upland areas within the watershed, but which fall outside the basin’s current boundaries. For this reason, the GSAs are interested in expanding basin boundaries. Additionally, increases in demand on groundwater supplies correlate with dry periods such as seen in the hydrograph for well 01A1, which implies that groundwater is used most often when surface water is not available. This can also be seen in the groundwater pumping numbers produced by the water budget. Economically, this makes sense because groundwater extraction is much more energy intensive than surface water diversions and thus more expensive. The trends observed in the hydrographs support the need for enhancements to surface water storage capacity in and around the basin. An additional 5,000 AF of storage would greatly help to offset the slight overdraft estimated in the water budget.

A summary of spring and fall elevations for the 2023 water year and corresponding sustainable management criteria is provided in **Table 2.1.2** to highlight current conditions in the basin. Minimum thresholds were set to reflect the water level at which pumping costs would render agricultural pursuits unviable. For this reporting period, water levels have remained well above minimum thresholds. Conditions in the basin will continue to be monitored at these locations with respect to their sustainable management criteria, and updates will be provided in future reports.

Table 2.1.2 Water Year 2023 RMW Hydrograph Summary Table[1]				
Well Name	Spring Groundwater Elevation (ft)	Fall Groundwater Elevation (ft)	Minimum Threshold (ft)	Measurable Objective (ft)
01A1	4118	4099.5	3895	4035
08F1	4226.5	4227	4082	4222
13K2	N/A	N/A	3922	4062
16D1	4083.8	4032.9	3939	4079
20B6	4082.8	4081.1	3945	4085
26E1	4129.1	4123.4	3974	4114
ACWA-3	4149.3	4135.4	3996	4136
BVMW 1-1	4183.2	4176.7	4022	4162
BVMW 2-1	4193.3	4194.6	4054	4194
BVMW 3-1	4155.4	4152.4	4006	4146
BVMW 4-1	4119.1	4105.7	3948	4088
BVMW 5-1	4082.2	4067.0	3942	4082

Notes:
[1] Data reported in this table was downloaded from the online SGMA Data Viewer (https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer)

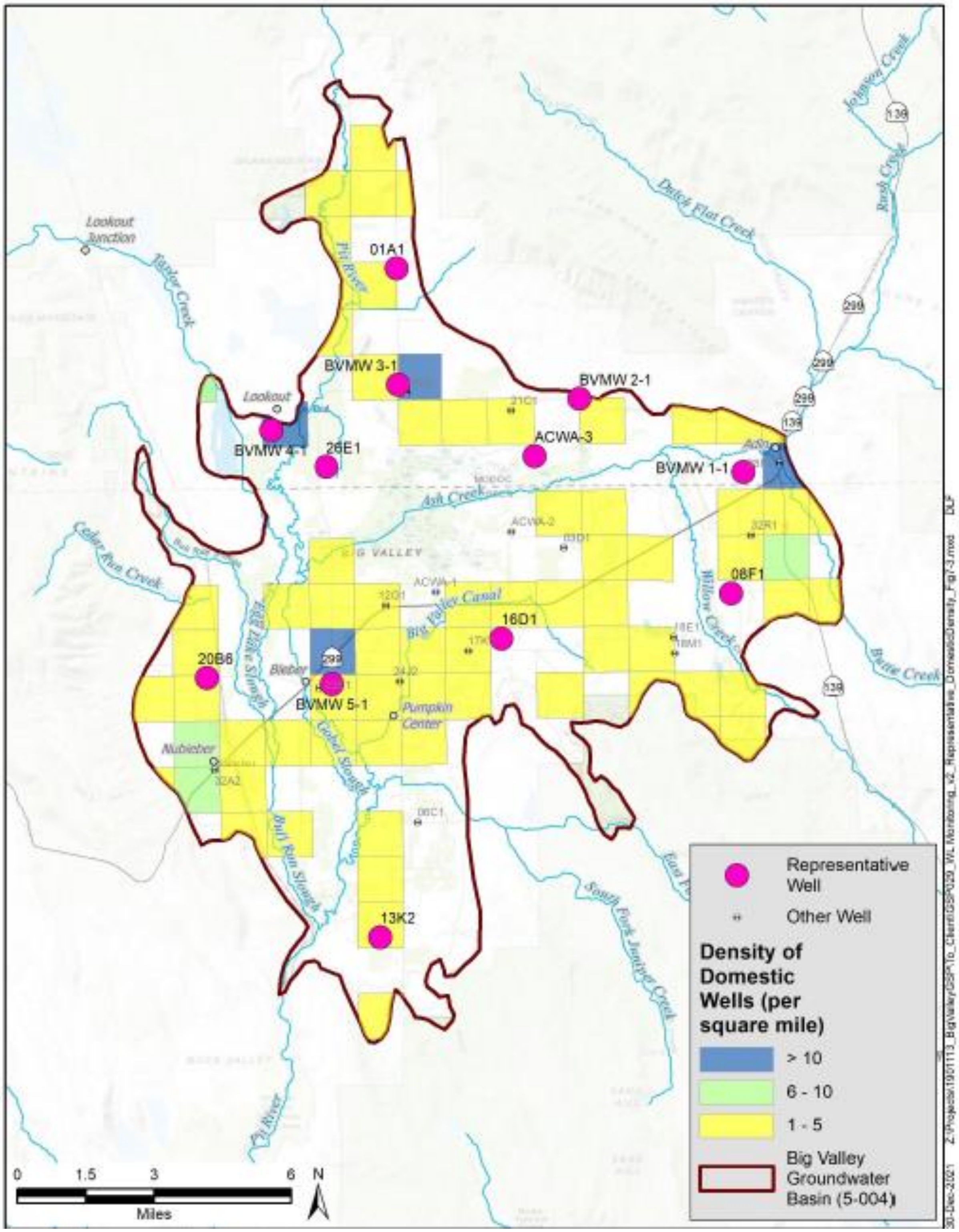

Figure 2.1.2 Map of Domestic Well Densities and Representative Groundwater Wells (BVGSP 7-6)

2.2 Water Budget

GEI, the engineering firm contracted to be the technical lead for the current Big Valley GSP, recommended the development of the water budget (**Appendix D**) using an excel spreadsheet tool. This method was selected as both an economically and technologically feasible way for the GSAs to create the water budget for the GSP, and to estimate future water budget conditions. The University of California Cooperative Extension technical team is using the provided water budget at face value until an alternative tool can be prepared. As discussed in depth in the GSP, the many assumptions and data gaps that were present when completing the water budget carry over into this report. The water budget included in this report continues to rely upon the assumptions determined by GEI. The GSA's are currently working with a consultant to have an updated water budget by March of 2026. (See more details in project and management actions page 26.)

2.2.1 Groundwater Extraction

Groundwater extraction within Big Valley is estimated in the water budget using a combination of pumping, land use, ET, and extraction data. Groundwater extraction by land use sector has not been quantified due to the data gaps from the GSP that carry over into this report. The exact amount of extraction occurring within the basin is not easily quantified. There are strong positive relationships between groundwater pumping, surface water availability, and annual precipitation. WY 2023 was a slightly above normal year and saw a reduced estimate of groundwater extraction by pumping of 43,700 acre-feet, which is about 7,000 acre-feet less than in WY 2022.

Future reports will include estimates of groundwater extraction by sector, once the data and methodology used to make these estimates is available to the GSAs. For now, the general understanding of extractions within the basin is sufficient to manage the basin until more data becomes available. **Table 2.2.1**, carried over from the GSP, summarizes land use by water use sector. A map illustrating the distribution of land use sectors throughout the basin is available in **Appendix C**. Evaluated together, these figures indicate the areas where groundwater extraction is most likely to occur, although they do not provide good estimates of extraction. For this reason, it is necessary to refer to the contour maps to infer where most extraction occurs which can be accomplished by analyzing the hydrologic gradients. In doing so, the agricultural sector generally represents the greatest amount of groundwater extraction within the basin, most notably in years when there is not sufficient surface water to maintain crop yield and survival.

Table 2.2.1 2016 Land Use Summary by Water Use Sector

Water use sector	Acres	Percent of Total
Community[a]	250	<1%
Industrial	196	<1%
Agricultural	22,246	24%
State Wildlife Area[b]	14,583	16%
Managed Recharge	-	0%
Native Vegetation and Rural Domestic[c]	54,782	60%
Total	92,057	100%

Notes:
[a] Includes the use in the communities of Bieber, Nubieber and Adin
[b] Made up of a combination of wetlands and non-irrigated upland areas
[c] Includes the large areas of land in the Valley which have domestic wells interspersed
(Source: Modified from DWR 2020b by GEI)

BVGSP (3-9)

2.2.2 Surface Water Supply

The Pit River and Ash Creek are the primary sources of surface water into the BVGB. Stream inflow and outflow volume is not well understood in the basin, but recent efforts to increase data sharing between entities and new stream gages on the Pit River and Roberts Reservoir should improve estimates in the future. Surface water supply in WY 2023 was up significantly from prior years. From the water budget tables provided in **Appendix D,** in WY 2023, stream flow was 376,300 AF.

Drastic variation in stream flow is reflected in the water budget between wet and dry years. The water budget highlights the importance of surface water availability for meeting the needs of agriculture production and habitat in the basin. Cumulatively, the relationships between water supply and demand both from surface and groundwater sources indicate that increased surface water storage options are required to support the continued sustainability of the basin. DWR climate model forecasts, which predict increased precipitation in the form of rain instead of snow in the Big Valley region, provide another reason for more surface water storage to create a sustainable water resource for water users.

2.2.3 Total Water Available

As discussed in preceding sections, there is currently not sufficient data available to quantify water use by sector for the basin. For the period covered by this report, a definite relationship is apparent between surface water availability and groundwater extraction in Big Valley. In years when surface water availability is high, considerably less groundwater is used to support all water users. **Table 2.2.3** provides a summary of water budget estimates of water available for use by all sectors since publication of the GSP. Because users tend to use less water overall in dry and critically dry years and a higher proportion of groundwater to surface water in these dry years, developing more surface storage and off-season recharge opportunities for plentiful years could significantly abate groundwater dependence. In wet and above-normal years (e.g., 2019 and 2023), the volume of surface water inflow to the basin can exceed 300,000 AF; most of this flow, while physically divertible and beyond volumes allocated under existing water rights, is not captured, resulting in a lost opportunity for storage or recharge. Expanding surface water storage or recharge opportunities is important to the basin, and the GSAs have prioritized multiple projects and management actions in the BVGSP to capture excess surface water.

Table 2.2.3 Total Water Use By All Sectors[1]

Water Year	Groundwater (AF)	Surface Water (AF)	Total Water (AF)
2019 (W)	38,400	70,000	108,400
2020 (D)	53,700	84,900	138,600
2021 (C)	54,000	86,400	140,400
2022 (C)	50,400	82,000	132,400
2023 (AN*)	43,700	75,700	119,400

Notes:
[1] Numbers reported in this table are derived from the water budget provided by GEI (**Appendix D**). Data available for use in future reports is anticipated to improve in quality, at which point water use by sector can be estimated with greater accuracy. Estimates of combined water sources are not available at this time.
*preliminary analysis

2.2.4 Change in Groundwater Storage

As explained in section 5.2 of the BVGSP, change in groundwater elevation is directly correlated with change in groundwater storage. (BVGSP 5-9). The contour maps included in **Appendix B** provide a static representation of groundwater storage for the spring and fall seasons of WY 2023. Therefore, the annual change in groundwater storage for the WY 2022 to WY 2023 was estimated in ArcGIS by calculating the difference in groundwater surface elevation between spring 2022 and spring 2023. Spring values were used for this estimate as they provide a more stable short-term reference to measure storage than fall values, given the amount of recharge that occurs between the two seasons. The resulting map is provided in **Appendix E.**

Simply put, the change in storage is calculated by the following equation: (1200ft definable bottom- average depth to water) x (92,057 Acre Basin Area) x (5% specific yield). The annual reports for WY 2022 and WY 2023 derive basin storage using this equation, whereas annual reports for WY 2020 and WY 2021 were derived directly from the water budget. The water budget storage calculations were shown to drastically differ from the actual water levels measured in the basin. The water budget will be revisited and revised for the five-year update of the GSP.

Groundwater level differences, delineated by the contours, show that groundwater levels fluctuated depending on location. Some areas saw an increase in groundwater level by over 10 feet. One particular area saw a decrease in water-level elevations by 20 feet. This change in water levels created a “bullseye” effect due to the anomalous reading in well 03D1. This well has not shown significant drawdown in the past and effort will be taken to determine the cause of this measurement and its validity. **Figure 2.2.4** shows the groundwater pumping and cumulative change in storage vs. precipitation for water years 1983-2023. Basin storage has tracked precipitation patterns over that period. Above normal conditions in WY 2023 showed recharge to cumulative groundwater storage levels similar to WY 2013. Since WY 2013, overall basin storage has remained relatively flat with dry years in 2013, 2014 and 2020 through 2022 counterbalanced by wet years of 2017, 2019, 2023.

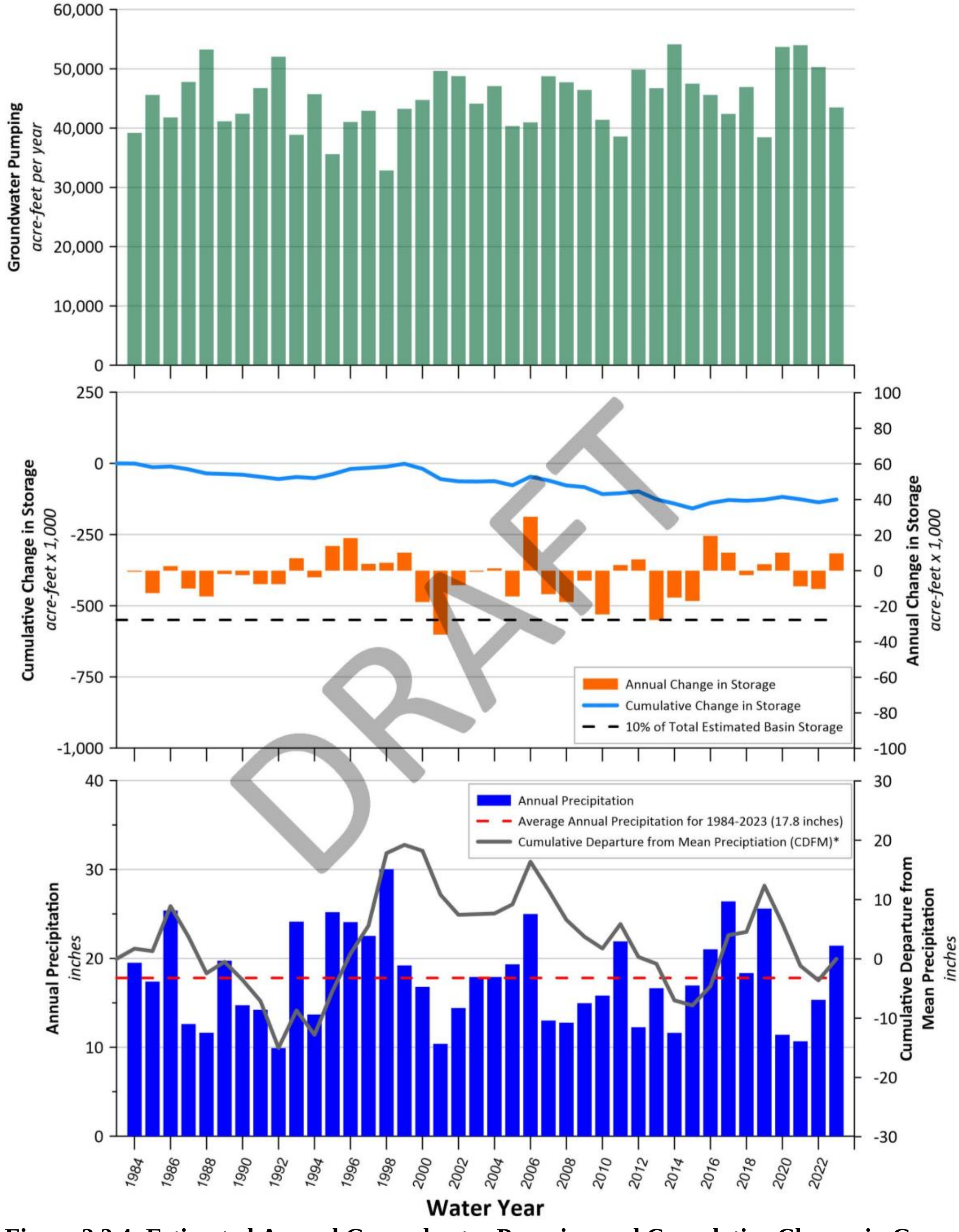

Figure 2.2.4: Estimated Annual Groundwater Pumping and Cumulative Change in Groundwater Storage Vs. Precipitation

*The CDFM precipitation curve illustrates the accumulated deviation from the long-term average precipitation for Water Year 1984 through 2023. Positive values indicate periods of above-average precipitation, while negative values signify below-average conditions.

Cumulatively, the storage of the basin has remained stable since 2013. Intuitively this figure suggests that the basin will remain sustainable well into the future, as the decrease in storage capacity has not approached 10% of the total basin storage. A similar figure is also in the GSP as Figure 5-7 with data from 1983-2019.

3 GSP Implementation Progress

The objectives of the projects laid out in Ch. 9 of the GSP, Projects and Management Actions, target the data gaps which have driven the current assumptions about basin conditions. For this reason, adaptive management is a strategy identified in the GSP to inform its implementation as better data becomes available. In support of this, many of the projects identified in the GSP have been running concurrently with its development.

Throughout the development of the GSP, strong efforts were made to engage stakeholders at monthly BVAC meetings, University of California Cooperative Extension (UCCE) workshops and mailings, and via social media. The GSAs also maintain a list of interested parties to whom announcements are and have been released. These interactions have helped inform the type and scope of projects important to Big Valley groundwater users and other represented groups. Communication through mailings, social media, and email has also been used to keep interested parties up to date and informed about opportunities to participate.

As part of a wider research effort led by UCCE in cooperation with local landowners, a study evaluating the relationship between evapotranspiration and applied water is continuing to help refine future water budget estimates. The installation of a California Irrigation Management Information System (CIMIS) sensor in the basin was completed in fall 2023 and will aid in data development, support future research, and improve irrigation management. A winter water availability study was completed by West Yost to support AgMAR and support a future application for an off-season diversion.

Following the installation of five representative monitoring well clusters in 2019 and 2020, water levels and electrical conductivity have been continuously downloaded from the transducers, which are set to record at 15-minute intervals. Calibration of stream gages is also being completed by GSA staff. Data collected is being stored in the Lassen County SharePoint data management system and required data is submitted into the SGMA portal.

The GSAs applied for the SGMA Implementation – Round 2 funding in early 2023 and were successful in their application. The grant includes funding for support of GSP updates including the water budget, annual reports and five-year update. The grant also has funding for continued work on winter water availability and a temporary groundwater recharge application. To support domestic water supplies, the grant includes a water storage and community water supply feasibility assessment. Continued improvement on upland recharge areas and a potential basin boundary modification along with improved irrigated efficiency and water use are all included in the grant. Finally, the grant includes funding to support engagement and outreach to all beneficial uses and users of groundwater in Big Valley.

4. References

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5. Appendices

Appendix A: Hydrographs

Groundwater Level Report

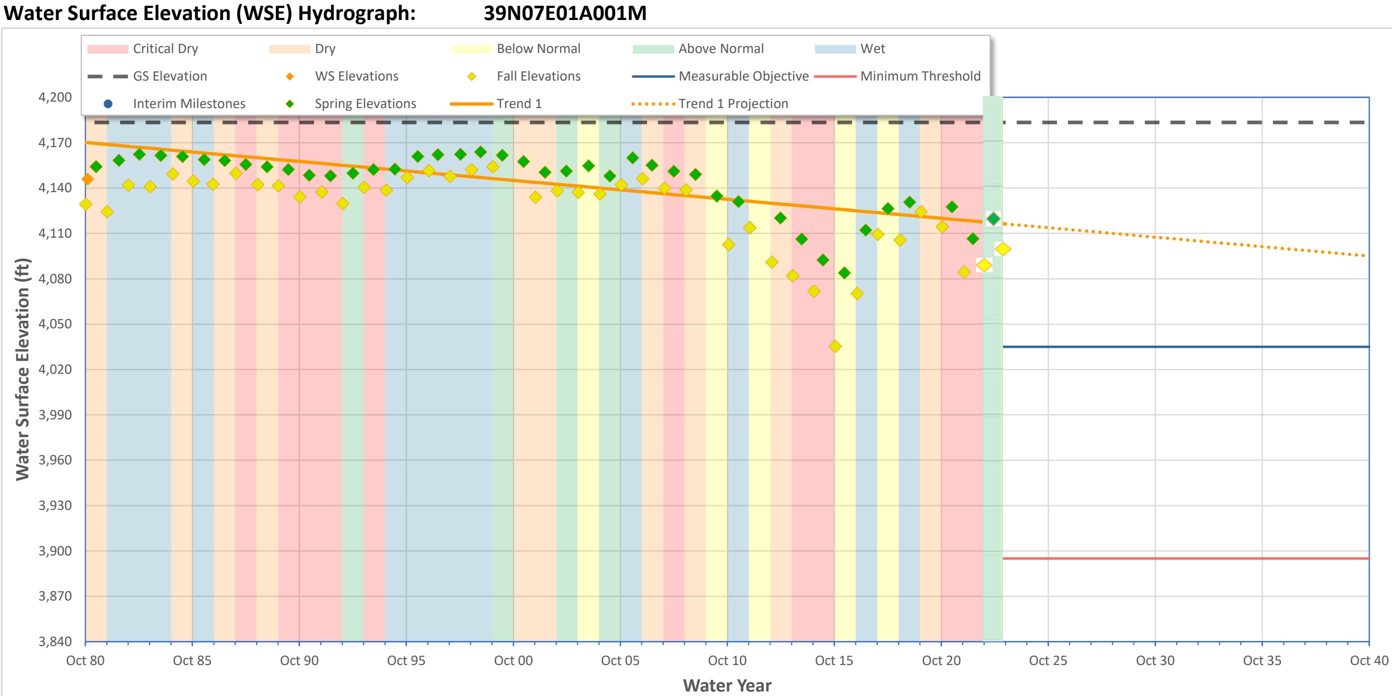
Date: 3/7/2024

Well Information	
Well ID	036673_39N07E01A001M
Well Name	39N07E01A001M
State Number	39N07E01A001M
WCR Number	14565
Site Code	412539N1211050W001
Well Location	
County	Modoc
Basin	Big Valley
Hydrologic Region	Sacramento River
Station Organization	Modoc County Planning Department
Well Type Information	
Well Use	Stockwatering
Completion Type	Single Well

Well Coordinates/Geometry		
Location	Lat:	41.2539
	Long:	-121.1050
Well Depth		300 ft
Ground Surface Elevation		4183.4 ft
Ref. Point Elevation		4184.40 ft
Screen Depth Range		-
Screen Elevation Range		-
Well Period of Record		
Period-of-Record		1979..2023
WS Elev-Range	Min:	4035.4 ft
	Max	4163.9 ft

Trend Analysis		
Seasonal Data Method		Apr1/Oct1
Show Trend 1		Spring Data
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		Yes
Trend Results	Slope	(1.252 ft/yr)
Show Trend 2		None
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		No
Trend Results	Slope	-

Water Surface Elevation (WSE) Hydrograph: 39N07E01A001M



Sustainability Indicator Considerations

Observed WS Elevations		
Parameter		**Value**
WS Elevation Range	Min:	4035.4 ft
	Max	4163.9 ft
2015 WS Elevations	Spring:	4092.5 ft
	Fall:	4035.4 ft
Current WS Elevations	Spring:	4106.5 ft
	Fall:	4088.0 ft

Trend Projections		
Year	**Trend 1**	**Trend 2**
2025	4113.8 ft	-
2030	4107.5 ft	-
2035	4101.3 ft	-
2040	4095.0 ft	-
	-	-
	-	-

Sustainability Indicator Settings

Key	Threshold Type	Effect. Yr.	Value	Description
MT	Minimum Threshold	2022	3895.0 ft	
MO	Measureable Objective	2022	4035.0 ft	

Groundwater Level Report

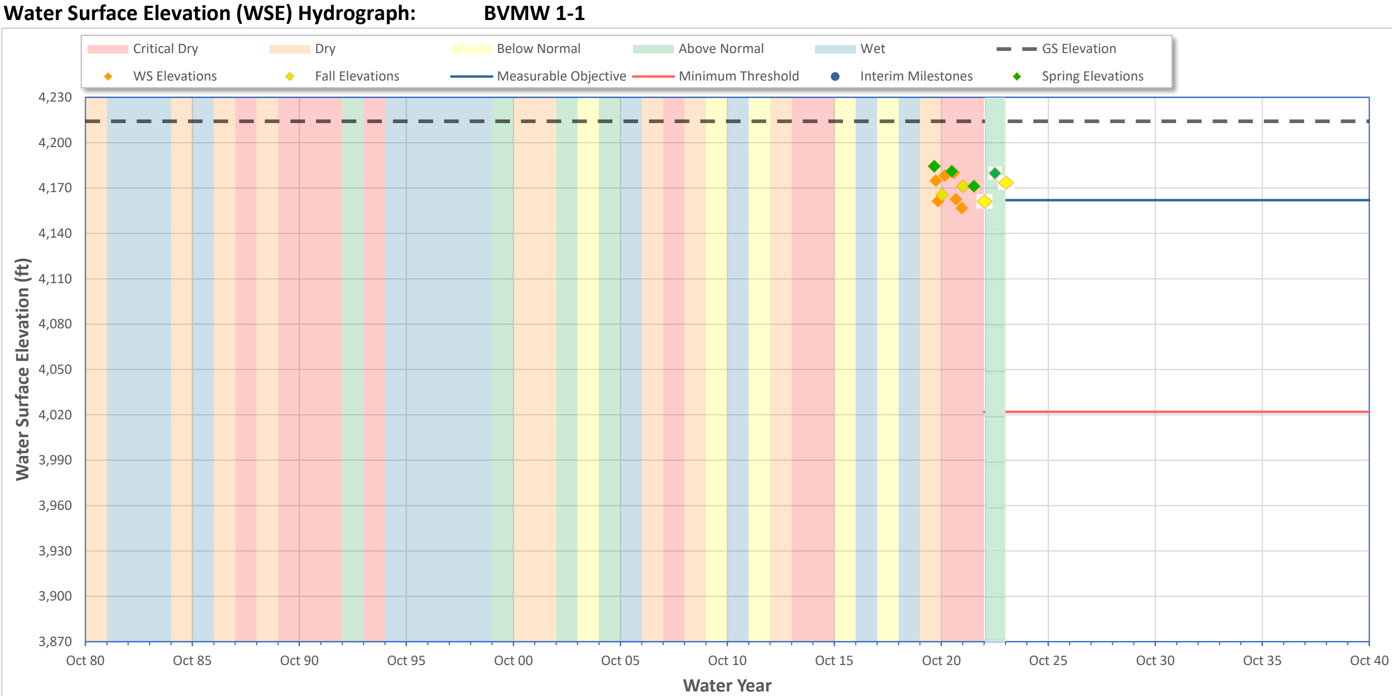
Date: 3/7/2024

Well Information	
Well ID	055615_BVMW 1-1
Well Name	BVMW 1-1
State Number	-
WCR Number	WCR2020-006214
Site Code	411880N1209599W001
Well Location	
County	Lassen
Basin	Big Valley
Hydrologic Region	Sacramento River
Station Organization	Modoc County Planning Department
Well Type Information	
Well Use	Observation
Completion Type	Single Well

Well Coordinates/Geometry	
Location Lat:	41.1880
Long:	-120.9599
Well Depth	265 ft
Ground Surface Elevation	4214.2 ft
Ref. Point Elevation	4213.84 ft
Screen Depth Range	175 to 265 ft
Screen Elevation Range	3985 to 3895 ft
Well Period of Record	
Period-of-Record	2020..2023
WS Elev-Range Min:	4156.8 ft
Max	4184.5 ft

Trend Analysis	
Seasonal Data Method	Apr1/Oct1
Show Trend 1	Spring Data
Date Range (Optional) Start WY:	
End WY:	
Extend Trend Line	Yes
Trend Results Slope	(7.190 ft/yr)
Show Trend 2	None
Date Range (Optional) Start WY:	
End WY:	
Extend Trend Line	No
Trend Results Slope	-

Water Surface Elevation (WSE) Hydrograph: **BVMW 1-1**



Groundwater Level Report

Date: 3/7/2024

Well Information

Well ID	055619_BVMW 2-1
Well Name	BVMW 2-1
State Number	-
WCR Number	WCR2020-006667
Site Code	412119N1210286W001

Well Location

County	Lassen
Basin	Big Valley
Hydrologic Region	Sacramento River
Station Organization	Modoc County Planning Department

Well Type Information

Well Use	Observation
Completion Type	Single Well

Well Coordinates/Geometry

Location	Lat:	41.2119
	Long:	-121.0286
Well Depth		250 ft
Ground Surface Elevation		4216.5 ft
Ref. Point Elevation		4216.18 ft
Screen Depth Range		210 to 250 ft
Screen Elevation Range		4004 to 3964 ft

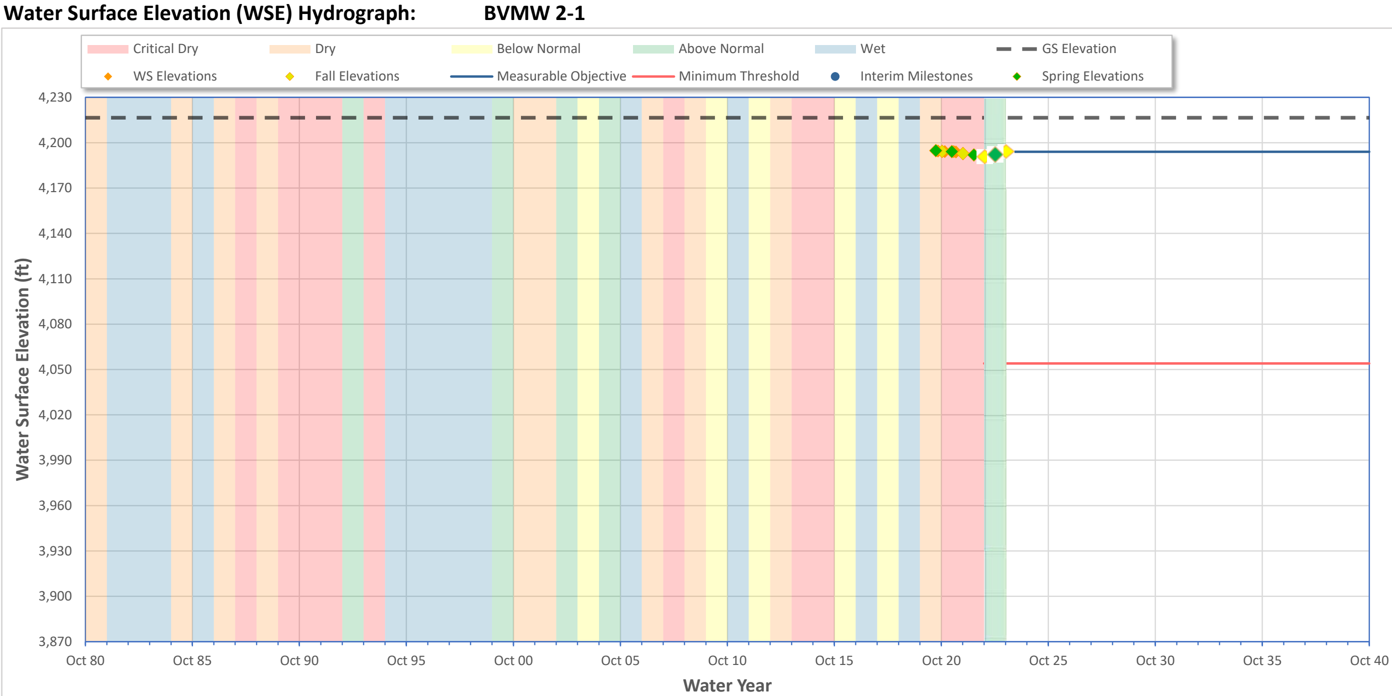
Well Period of Record

Period-of-Record		2020..2023
WS Elev-Range	Min:	4192.0 ft
	Max	4194.9 ft

Trend Analysis

Seasonal Data Method		Apr1/Oct1
Show Trend 1		Spring Data
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		Yes
Trend Results	Slope	(1.601 ft/yr)
Show Trend 2		None
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		No
Trend Results	Slope	-

Water Surface Elevation (WSE) Hydrograph: **BVMW 2-1**



Groundwater Level Report

Date: 3/7/2024

Well Information

Well ID	055623_BVMW 3-1
Well Name	BVMW 3-1
State Number	-
WCR Number	WCR2020-006592
Site Code	412169N1211050W001

Well Location

County	Lassen
Basin	Big Valley
Hydrologic Region	Sacramento River
Station Organization	Modoc County Planning Department

Well Type Information

Well Use	Observation
Completion Type	Single Well

Well Coordinates/Geometry

Location	Lat:	41.2169
	Long:	-121.1050
Well Depth		185 ft
Ground Surface Elevation		4164.8 ft
Ref. Point Elevation		4167.41 ft
Screen Depth Range		135 to 185 ft
Screen Elevation Range		4081 to 4031 ft

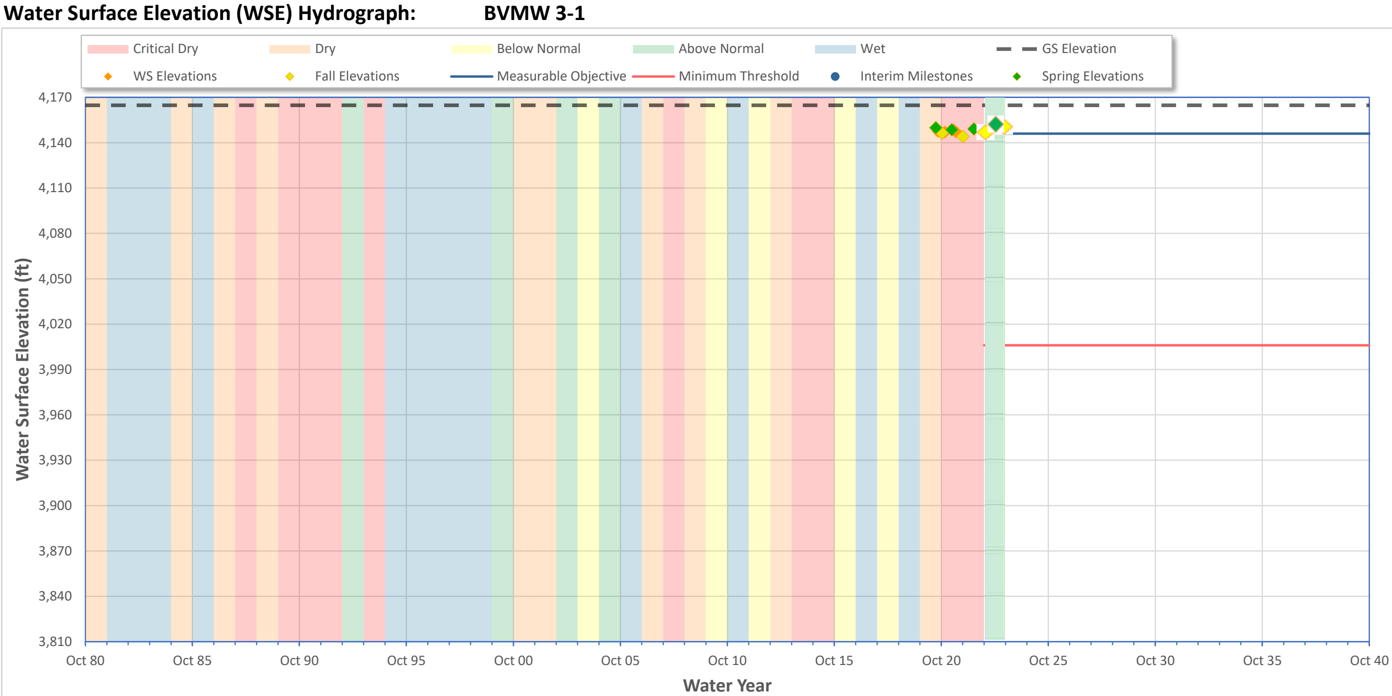
Well Period of Record

Period-of-Record		2020..2023
WS Elev-Range	Min:	4144.2 ft
	Max	4149.9 ft

Trend Analysis

Seasonal Data Method		Apr1/Oct1
Show Trend 1		Spring Data
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		Yes
Trend Results	Slope	(0.316 ft/yr)
Show Trend 2		None
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		No
Trend Results	Slope	-

Water Surface Elevation (WSE) Hydrograph: **BVMW 3-1**



Groundwater Level Report

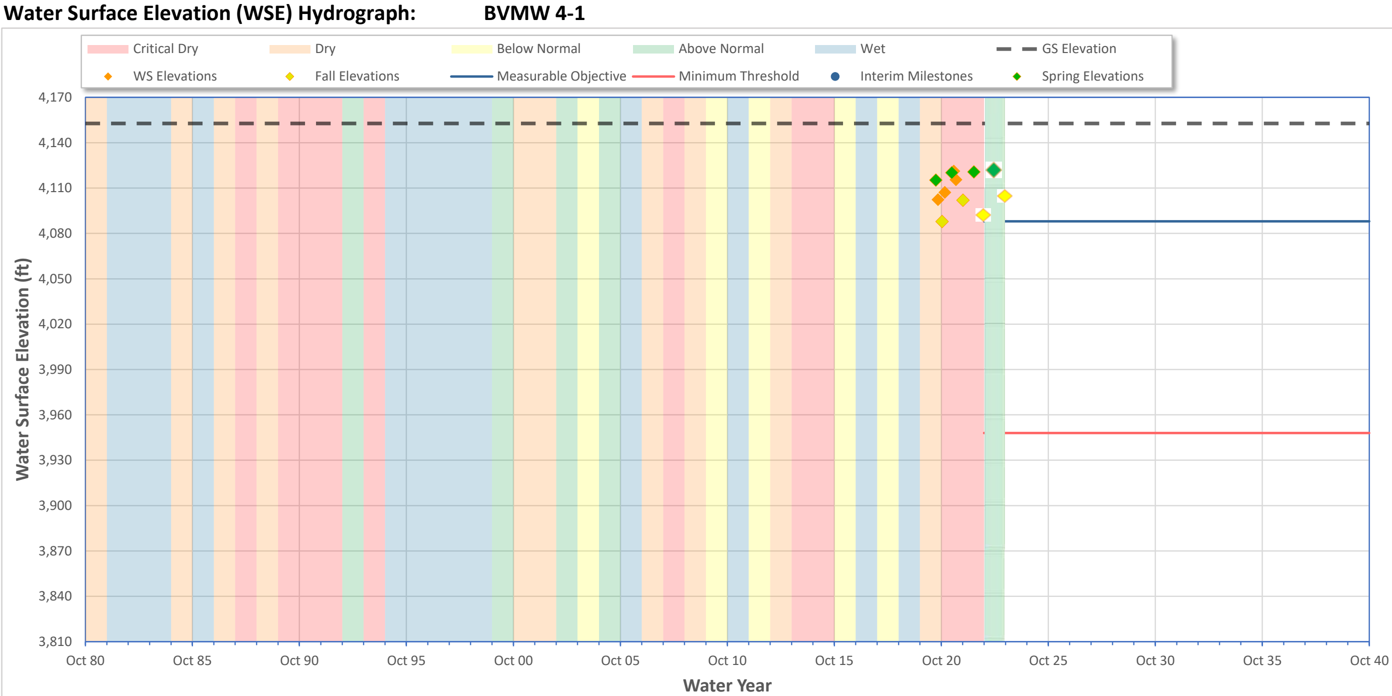
Date: 3/7/2024

Well Information	
Well ID	055627_BVMW 4-1
Well Name	BVMW 4-1
State Number	-
WCR Number	WCR2019-017359
Site Code	412029N1211587W001
Well Location	
County	Lassen
Basin	Big Valley
Hydrologic Region	Sacramento River
Station Organization	Modoc County Planning Department
Well Type Information	
Well Use	Observation
Completion Type	Single Well

Well Coordinates/Geometry		
Location	Lat:	41.2029
	Long:	-121.1587
Well Depth		425 ft
Ground Surface Elevation		4152.7 ft
Ref. Point Elevation		4152.40 ft
Screen Depth Range		385 to 415 ft
Screen Elevation Range		3782 to 3752 ft
Well Period of Record		
Period-of-Record		2020..2023
WS Elev-Range	Min:	4088.0 ft
	Max	4121.3 ft

Trend Analysis		
Seasonal Data Method		Apr1/Oct1
Show Trend 1		Spring Data
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		Yes
Trend Results	Slope	2.868 ft/yr
Show Trend 2		None
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		No
Trend Results	Slope	-

Water Surface Elevation (WSE) Hydrograph: BVMW 4-1



Sustainability Indicator Considerations

Observed WS Elevations		
Parameter		**Value**
WS Elevation Range	Min:	4088.0 ft
	Max	4121.3 ft
2015 WS Elevations	Spring:	-
	Fall:	-
Current WS Elevations	Spring:	4120.7 ft
	Fall:	4092.3 ft

Trend Projections		
Year	**Trend 1**	**Trend 2**
2025	4131.4 ft	-
2030	4145.8 ft	-
2035	4160.1 ft	-
2040	4174.4 ft	-
	-	-
	-	-

Sustainability Indicator Settings

Key	Threshold Type	Effect. Yr.	Value	Description
MT	Minimum Threshold	2022	3948.0 ft	
MO	Measureable Objective	2022	4088.0 ft	

Groundwater Level Report

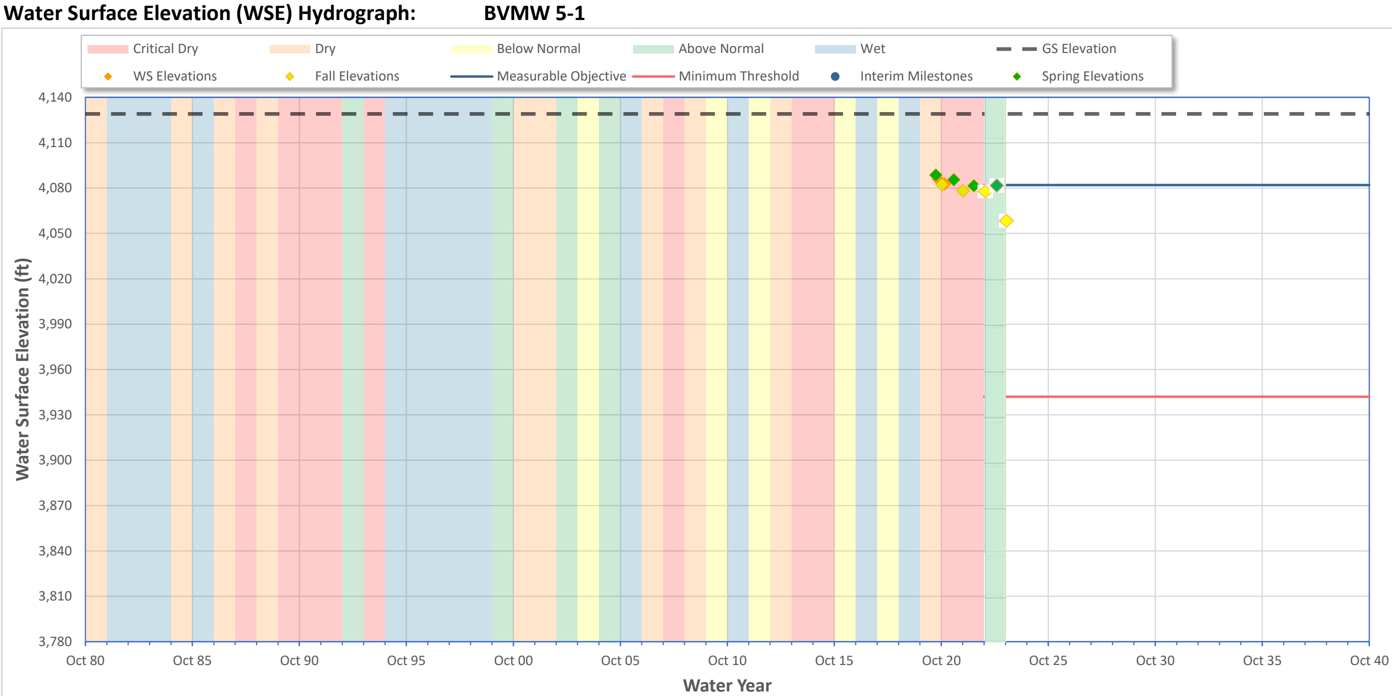
Date: 3/7/2024

Well Information	
Well ID	055525_BVMW 5-1
Well Name	BVMW 5-1
State Number	-
WCR Number	WCR2020-006658
Site Code	411219N1211339W001
Well Location	
County	Lassen
Basin	Big Valley
Hydrologic Region	Sacramento River
Station Organization	Lassen County Department of Planning and Building Services
Well Type Information	
Well Use	Observation
Completion Type	Single Well

Well Coordinates/Geometry		
Location	Lat:	41.1219
	Long:	-121.1339
Well Depth		540 ft
Ground Surface Elevation		4129.1 ft
Ref. Point Elevation		4128.72 ft
Screen Depth Range		485 to 535 ft
Screen Elevation Range		3667 to 3617 ft
Well Period of Record		
Period-of-Record		2020..2023
WS Elev-Range	Min:	4078.2 ft
	Max	4088.7 ft

Trend Analysis		
Seasonal Data Method		Apr1/Oct1
Show Trend 1		Spring Data
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		Yes
Trend Results	Slope	(4.011 ft/yr)
Show Trend 2		None
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		No
Trend Results	Slope	-

Water Surface Elevation (WSE) Hydrograph: BVMW 5-1



Sustainability Indicator Considerations

Observed WS Elevations		
Parameter		**Value**
WS Elevation Range	Min:	4078.2 ft
	Max	4088.7 ft
2015 WS Elevations	Spring:	-
	Fall:	-
Current WS Elevations	Spring:	4081.6 ft
	Fall:	4078.2 ft

Trend Projections		
Year	**Trend 1**	**Trend 2**
2025	4067.7 ft	-
2030	4047.7 ft	-
2035	4027.6 ft	-
2040	4007.5 ft	-
	-	-
	-	-

Sustainability Indicator Settings

Key	Threshold Type	Effect. Yr.	Value	Description
MT	Minimum Threshold	2022	3942.0 ft	
MO	Measureable Objective	2022	4082.0 ft	

Groundwater Level Report

Date: 3/7/2024

Well Information

Well ID	036672_38N09E08F001M
Well Name	38N09E08F001M
State Number	38N09E08F001M
WCR Number	49934
Site Code	411493N1209656W001

Well Location

County	Lassen
Basin	Big Valley
Hydrologic Region	Sacramento River
Station Organization	Lassen County Department of Planning and Building Services

Well Type Information

Well Use	Other
Completion Type	Single Well

Well Coordinates/Geometry

Location	Lat:	41.1493
	Long:	-120.9656
Well Depth		217 ft
Ground Surface Elevation		4253.4 ft
Ref. Point Elevation		4255.40 ft
Screen Depth Range		-
Screen Elevation Range		-

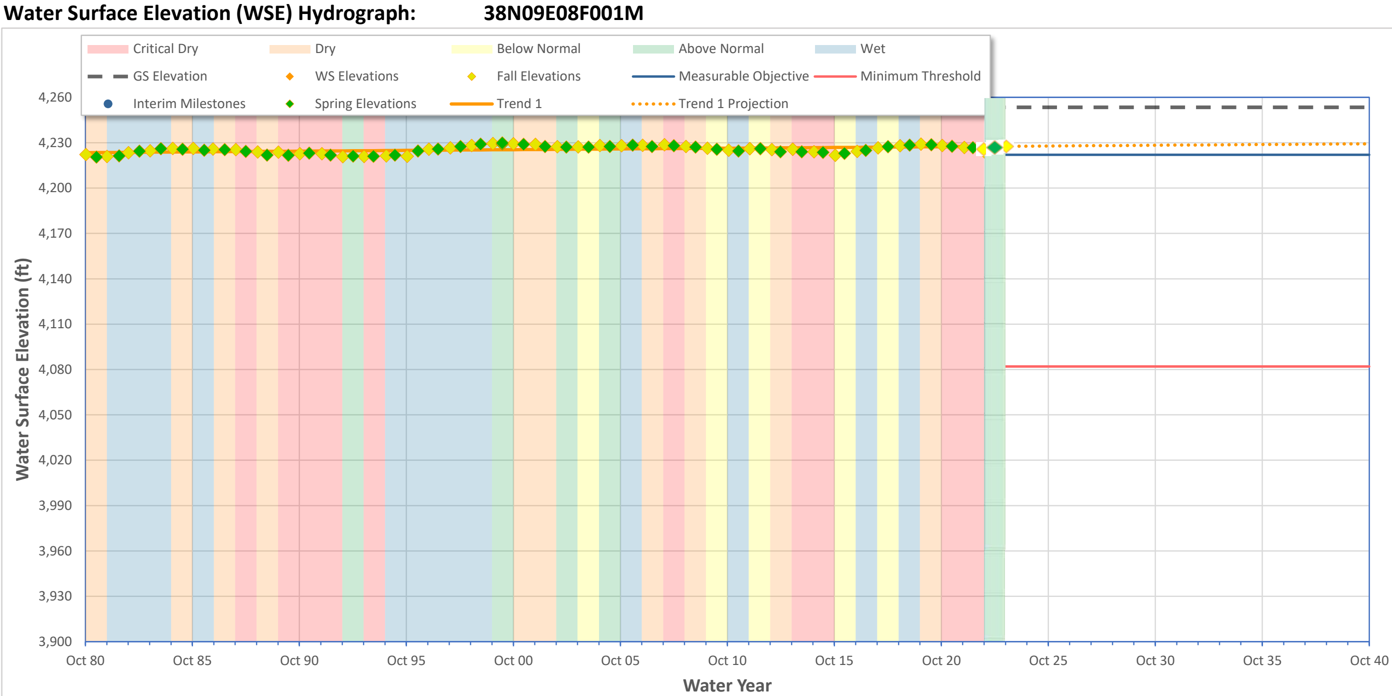
Well Period of Record

Period-of-Record		1979..2023
WS Elev-Range	Min:	4220.5 ft
	Max	4229.8 ft

Trend Analysis

Seasonal Data Method		Apr1/Oct1
Show Trend 1		Spring Data
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		Yes
Trend Results	Slope	0.097 ft/yr
Show Trend 2		None
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		No
Trend Results	Slope	-

Water Surface Elevation (WSE) Hydrograph: 38N09E08F001M



Groundwater Level Report

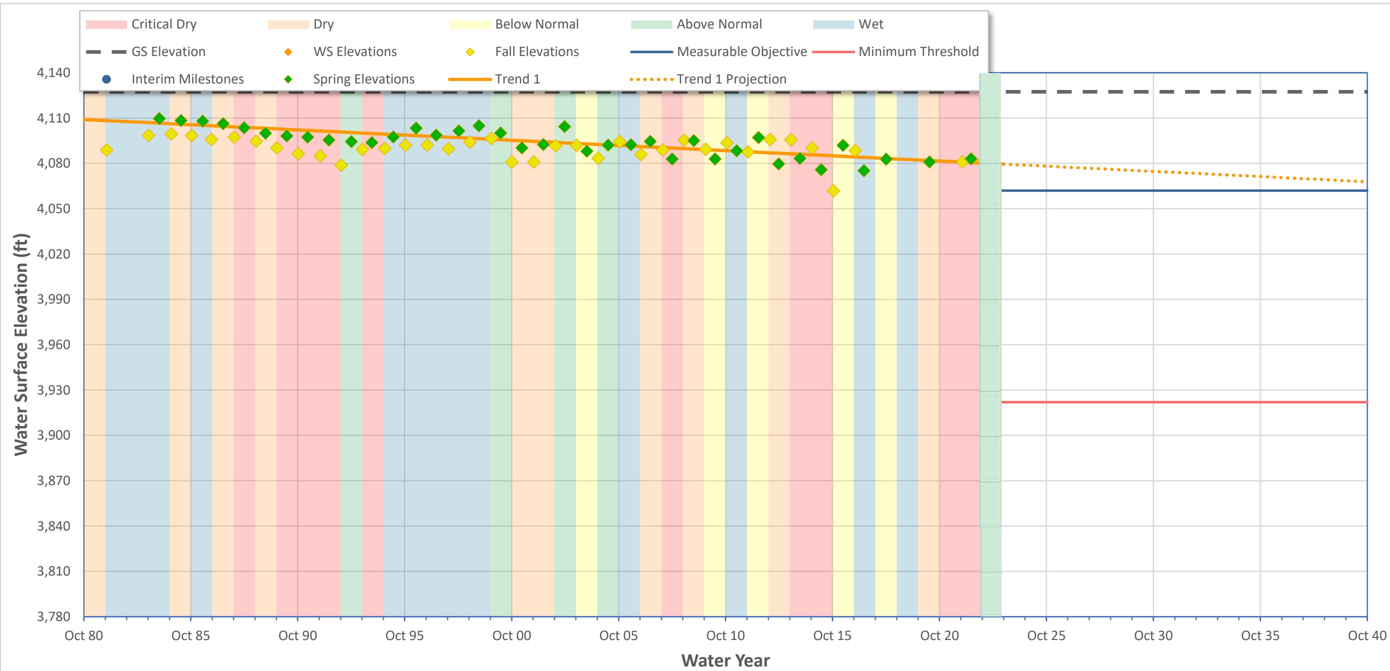
Date: 3/7/2024

Well Information	
Well ID	036667_37N07E13K002M
Well Name	37N07E13K002M
State Number	37N07E13K002M
WCR Number	90029
Site Code	410413N1211147W001
Well Location	
County	Lassen
Basin	Big Valley
Hydrologic Region	Sacramento River
Station Organization	Lassen County Department of Planning and Building Services
Well Type Information	
Well Use	Irrigation
Completion Type	Single Well

Well Coordinates/Geometry		
Location	Lat:	41.0413
	Long:	-121.1147
Well Depth		260 ft
Ground Surface Elevation		4127.4 ft
Ref. Point Elevation		4127.90 ft
Screen Depth Range		-
Screen Elevation Range		-
Well Period of Record		
Period-of-Record		1982..2023
WS Elev-Range	Min:	4061.9 ft
	Max	4109.7 ft

Trend Analysis		
Seasonal Data Method		Apr1/Oct1
Show Trend 1		Spring Data
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		Yes
Trend Results	Slope	(0.686 ft/yr)
Show Trend 2		None
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		No
Trend Results	Slope	-

Water Surface Elevation (WSE) Hydrograph: 37N07E13K002M



No measurement fall 23

Groundwater Level Report

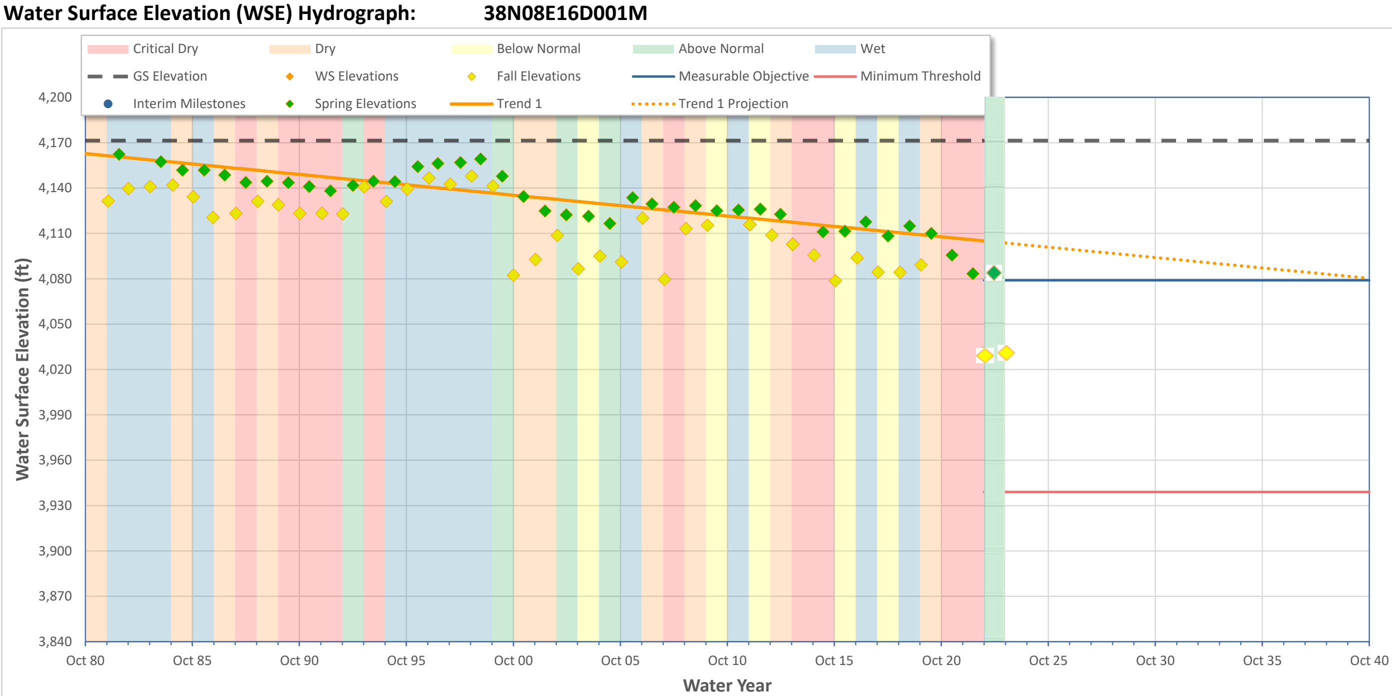
Date: 3/7/2024

Well Information	
Well ID	022097_38N08E16D001M
Well Name	38N08E16D001M
State Number	38N08E16D001M
WCR Number	90143
Site Code	411359N1210625W001
Well Location	
County	Lassen
Basin	Big Valley
Hydrologic Region	Sacramento River
Station Organization	Lassen County Department of Planning and Building Services
Well Type Information	
Well Use	Irrigation
Completion Type	Single Well

Well Coordinates/Geometry		
Location	Lat:	41.1358
	Long:	-121.0625
Well Depth		491 ft
Ground Surface Elevation		4171.4 ft
Ref. Point Elevation		4171.60 ft
Screen Depth Range		-
Screen Elevation Range		-
Well Period of Record		
Period-of-Record		1982..2023
WS Elev-Range	Min:	4032.0 ft
	Max	4162.4 ft

Trend Analysis		
Seasonal Data Method		Apr1/Oct1
Show Trend 1		Spring Data
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		Yes
Trend Results	Slope	(1.375 ft/yr)
Show Trend 2		None
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		No
Trend Results	Slope	-

Water Surface Elevation (WSE) Hydrograph: 38N08E16D001M



Sustainability Indicator Considerations

Observed WS Elevations		
Parameter		**Value**
WS Elevation Range	Min:	4032.0 ft
	Max	4162.4 ft
2015 WS Elevations	Spring:	4111.1 ft
	Fall:	4078.7 ft
Current WS Elevations	Spring:	4083.5 ft
	Fall:	4032.0 ft

Trend Projections		
Year	**Trend 1**	**Trend 2**
2025	4100.9 ft	-
2030	4094.1 ft	-
2035	4087.2 ft	-
2040	4080.3 ft	-
	-	-
	-	-

Sustainability Indicator Settings

Key	Threshold Type	Effect. Yr.	Value	Description
MT	Minimum Threshold	2022	3939.0 ft	
MO	Measureable Objective	2022	4079.0 ft	

Groundwater Level Report

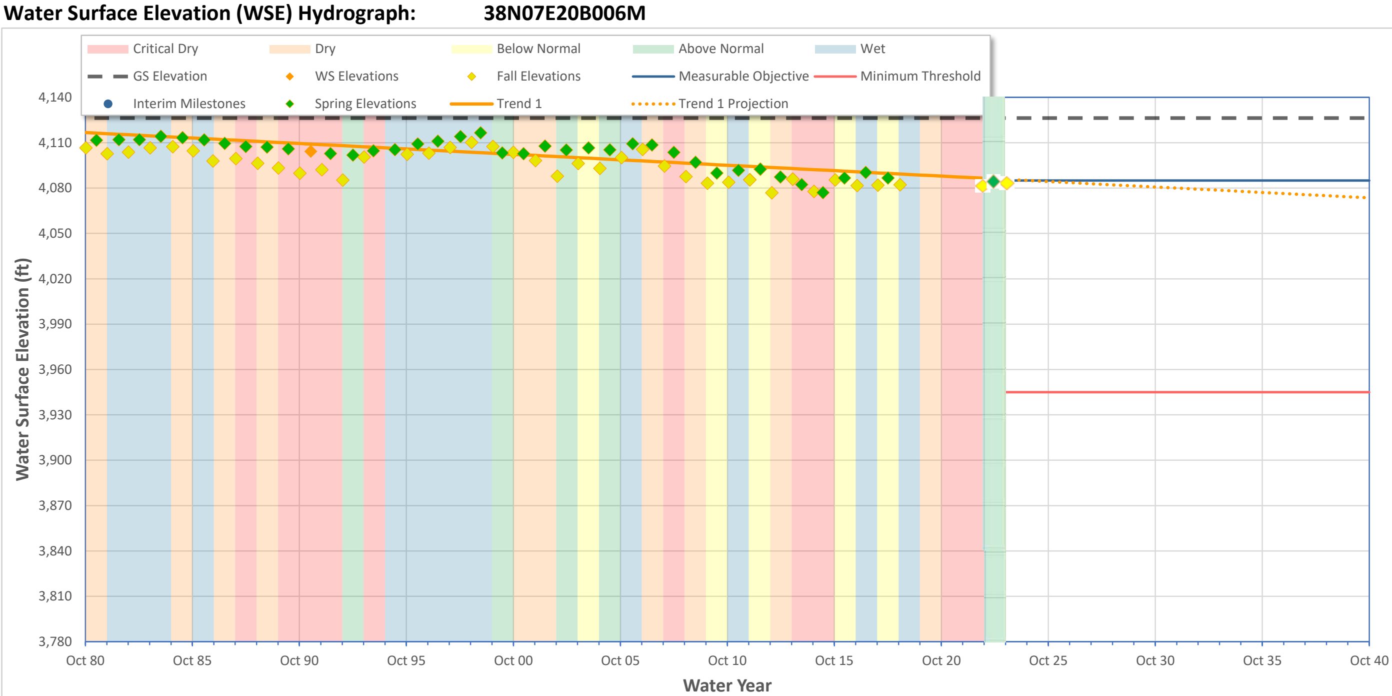
Date: 3/7/2024

Well Information	
Well ID	022094_38N07E20B006M
Well Name	38N07E20B006M
State Number	38N07E20B006M
WCR Number	128135
Site Code	411242N1211866W001
Well Location	
County	Lassen
Basin	Big Valley
Hydrologic Region	Sacramento River
Station Organization	Lassen County Department of Planning and Building Services
Well Type Information	
Well Use	Residential
Completion Type	Single Well

Well Coordinates/Geometry		
Location	Lat:	41.1242
	Long:	-121.1866
Well Depth		183 ft
Ground Surface Elevation		4126.3 ft
Ref. Point Elevation		4127.30 ft
Screen Depth Range		-
Screen Elevation Range		-
Well Period of Record		
Period-of-Record		1979..2023
WS Elev-Range	Min:	4076.9 ft
	Max	4116.6 ft

Trend Analysis		
Seasonal Data Method		Apr1/Oct1
Show Trend 1		Spring Data
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		Yes
Trend Results	Slope	(0.720 ft/yr)
Show Trend 2		None
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		No
Trend Results	Slope	-

Water Surface Elevation (WSE) Hydrograph: 38N07E20B006M



Sustainability Indicator Considerations

Observed WS Elevations		
Parameter		**Value**
WS Elevation Range	Min:	4076.9 ft
	Max	4116.6 ft
2015 WS Elevations	Spring:	4077.1 ft
	Fall:	4085.4 ft
Current WS Elevations	Spring:	4086.7 ft
	Fall:	4081.4 ft

Trend Projections		
Year	**Trend 1**	**Trend 2**
2025	4084.3 ft	-
2030	4080.7 ft	-
2035	4077.1 ft	-
2040	4073.5 ft	-
	-	-
	-	-

Sustainability Indicator Settings

Key	Threshold Type	Effect. Yr.	Value	Description
MT	Minimum Threshold	2022	3945.0 ft	
MO	Measureable Objective	2022	4085.0 ft	

Groundwater Level Report

Date: 3/7/2024

Well Information	
Well ID	022102_39N07E26E001M
Well Name	39N07E26E001M
State Number	39N07E26E001M
WCR Number	127484
Site Code	411911N1211354W001
Well Location	
County	Modoc
Basin	Big Valley
Hydrologic Region	Sacramento River
Station Organization	Modoc County Planning Department
Well Type Information	
Well Use	Irrigation
Completion Type	Single Well

Well Coordinates/Geometry		
Location	Lat:	41.1911
	Long:	-121.1354
Well Depth		400 ft
Ground Surface Elevation		4133.4 ft
Ref. Point Elevation		4135.00 ft
Screen Depth Range		20 to 400 ft
Screen Elevation Range		4107 to 3727 ft
Well Period of Record		
Period-of-Record		1979..2023
WS Elev-Range	Min:	4088.9 ft
	Max	4131.3 ft

Trend Analysis		
Seasonal Data Method		Apr1/Oct1
Show Trend 1		Spring Data
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		Yes
Trend Results	Slope	(0.078 ft/yr)
Show Trend 2		None
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		No
Trend Results	Slope	-

Water Surface Elevation (WSE) Hydrograph: 39N07E26E001M

Sustainability Indicator Considerations

Observed WS Elevations		
Parameter		**Value**
WS Elevation Range	Min:	4088.9 ft
	Max	4131.3 ft
2015 WS Elevations	Spring:	4121.0 ft
	Fall:	4113.6 ft
Current WS Elevations	Spring:	4116.6 ft
	Fall:	4114.9 ft

Trend Projections		
Year	**Trend 1**	**Trend 2**
2025	4125.2 ft	-
2030	4124.8 ft	-
2035	4124.4 ft	-
2040	4124.0 ft	-
	-	-
	-	-

Sustainability Indicator Settings

Key	Threshold Type	Effect. Yr.	Value	Description
MT	Minimum Threshold	2022	3974.0 ft	
MO	Measureable Objective	2022	4114.0 ft	

Groundwater Level Report

Date: 3/7/2024

Well Information

Well ID	051537_ACWA-3
Well Name	ACWA-3
State Number	39N08E28A001M
WCR Number	951365
Site Code	411938N1210478W001

Well Location

County	Modoc
Basin	Big Valley
Hydrologic Region	Sacramento River
Station Organization	Lassen County Department of Planning and Building Services

Well Type Information

Well Use	Irrigation
Completion Type	Single Well

Well Coordinates/Geometry

Location	Lat:	41.1938
	Long:	-121.0478
Well Depth		720 ft
Ground Surface Elevation		4159.0 ft
Ref. Point Elevation		4159.83 ft
Screen Depth Range		60 to 720 ft
Screen Elevation Range		4075 to 3415 ft

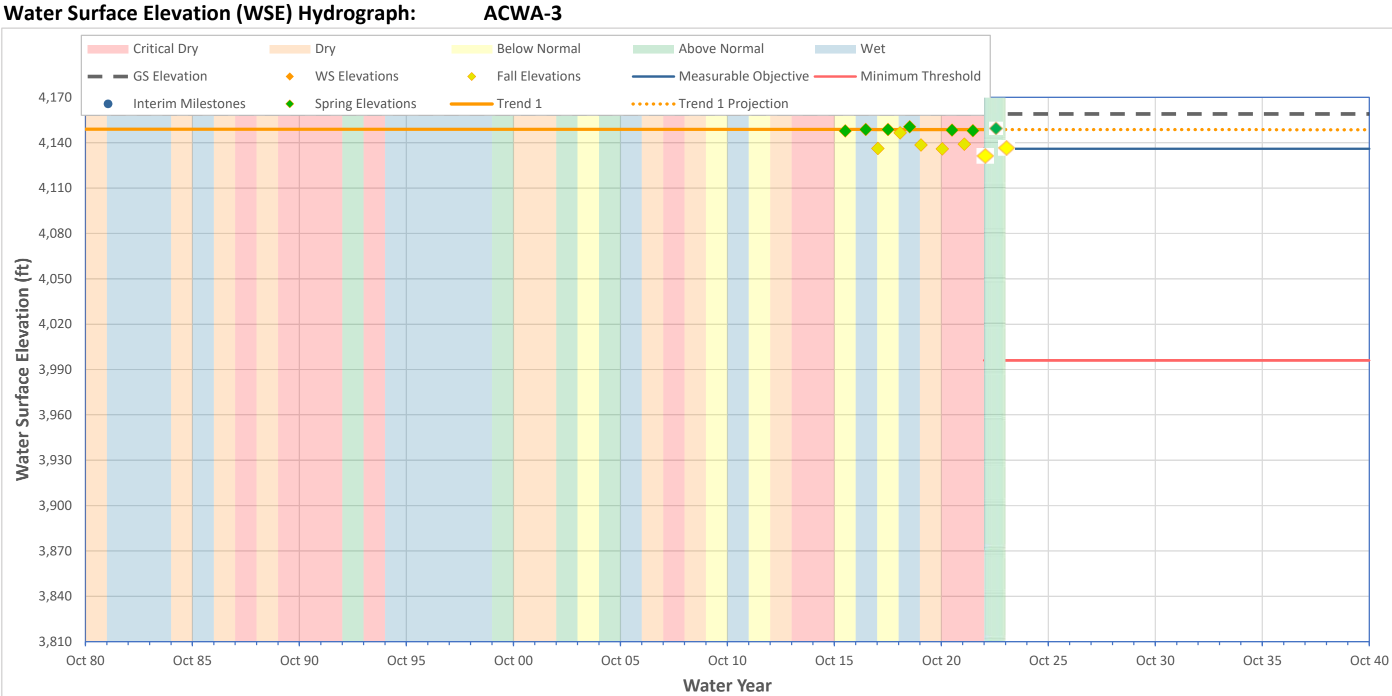
Well Period of Record

Period-of-Record		2016..2023
WS Elev-Range	Min:	4131.6 ft
	Max	4150.6 ft

Trend Analysis

Seasonal Data Method		Apr1/Oct1
Show Trend 1		Spring Data
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		Yes
Trend Results	Slope	(0.007 ft/yr)
Show Trend 2		None
Date Range (Optional)	Start WY:	
	End WY:	
Extend Trend Line		No
Trend Results	Slope	-

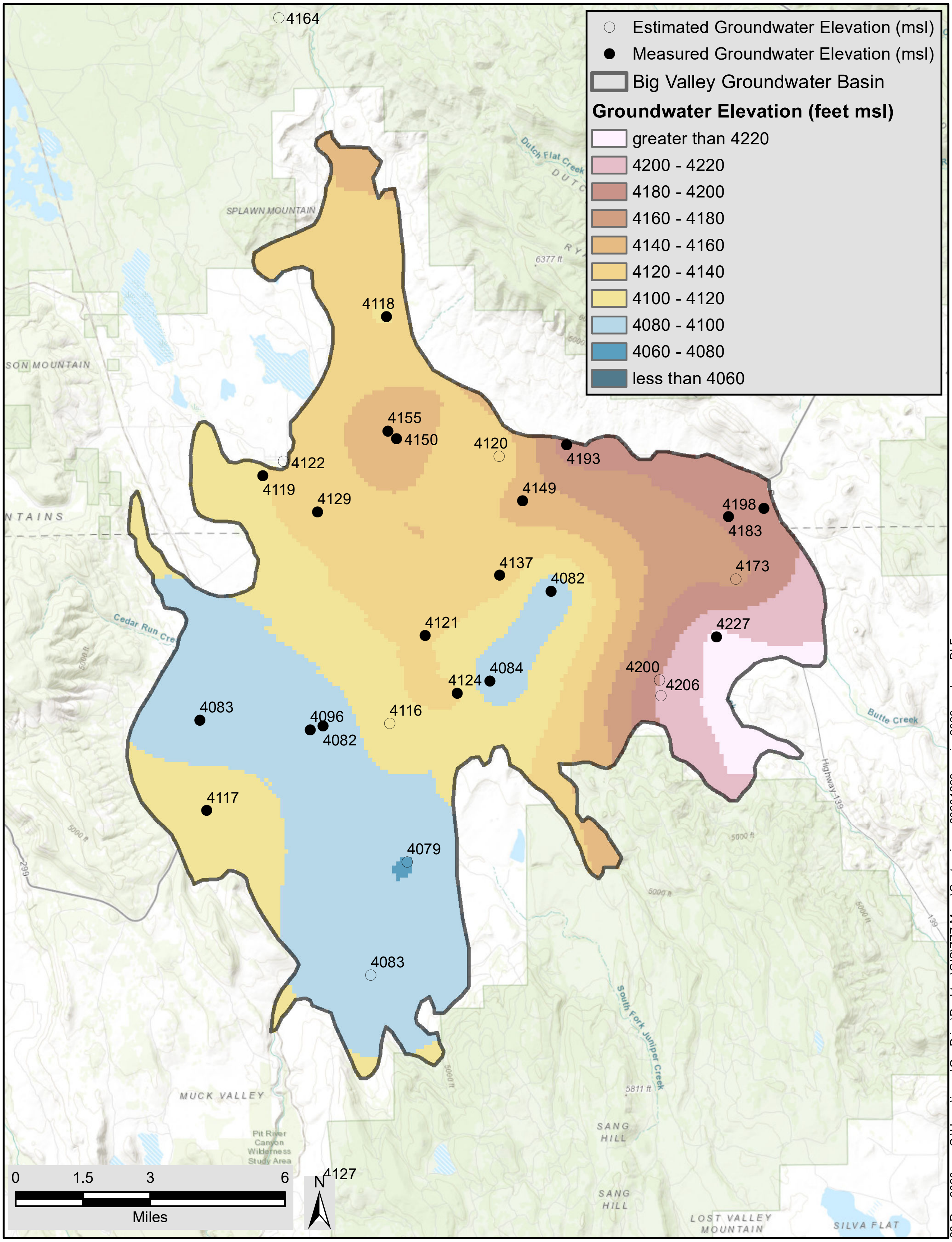
Water Surface Elevation (WSE) Hydrograph: ACWA-3



Sustainability Indicator Settings

Key	Threshold Type	Effect. Yr.	Value	Description
MT	Minimum Threshold	2022	3996.0 ft	
MO	Measureable Objective	2022	4136.0 ft	

Appendix B: Groundwater Elevation Contours

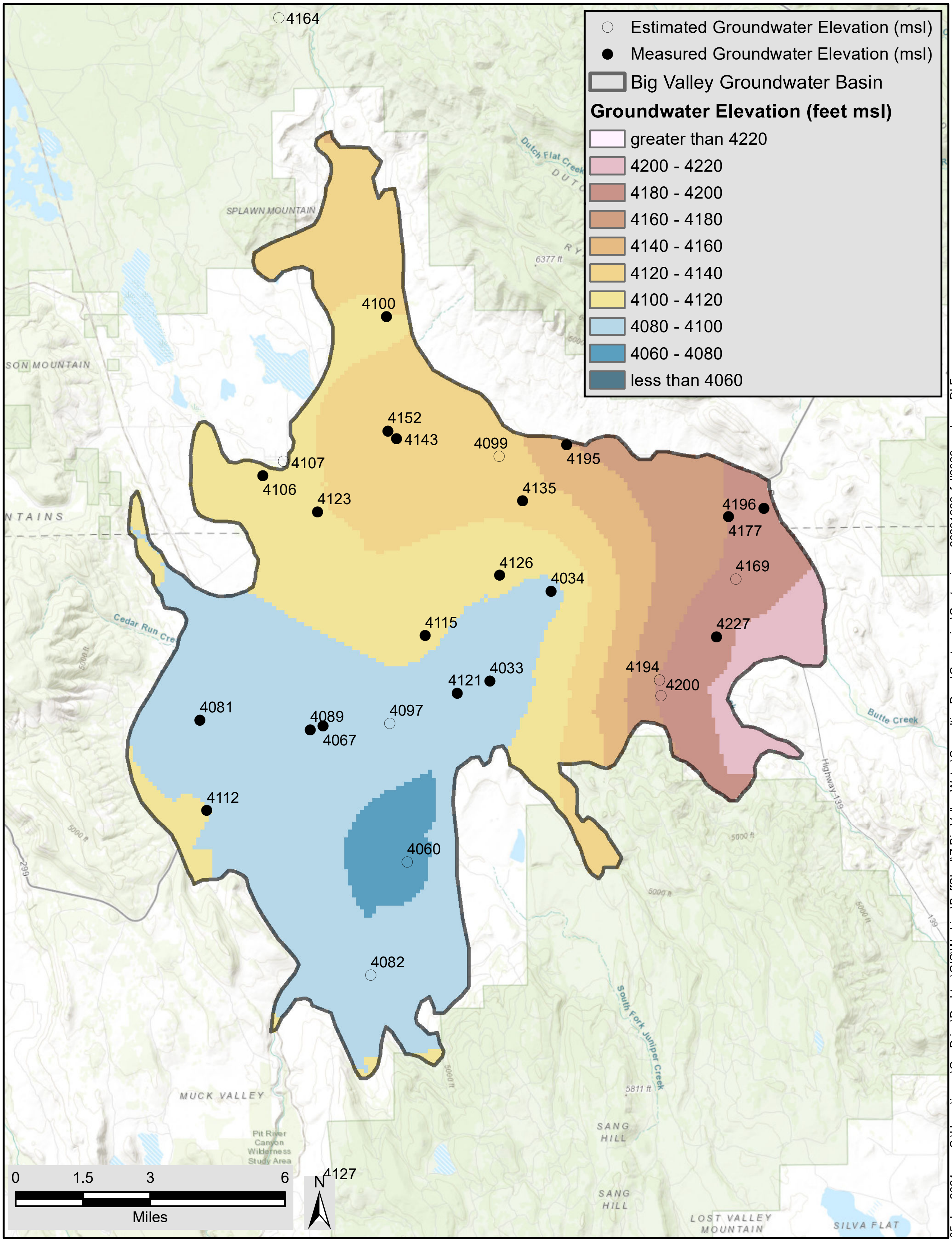


Big Valley Basin Groundwater Sustainability Plan
Modoc and Lassen Counties, California

Big Valley Groundwater Basin GSAs

Groundwater Elevations
Spring 2023

DECEMBER 2023 **DRAFT** FIGURE



DLF

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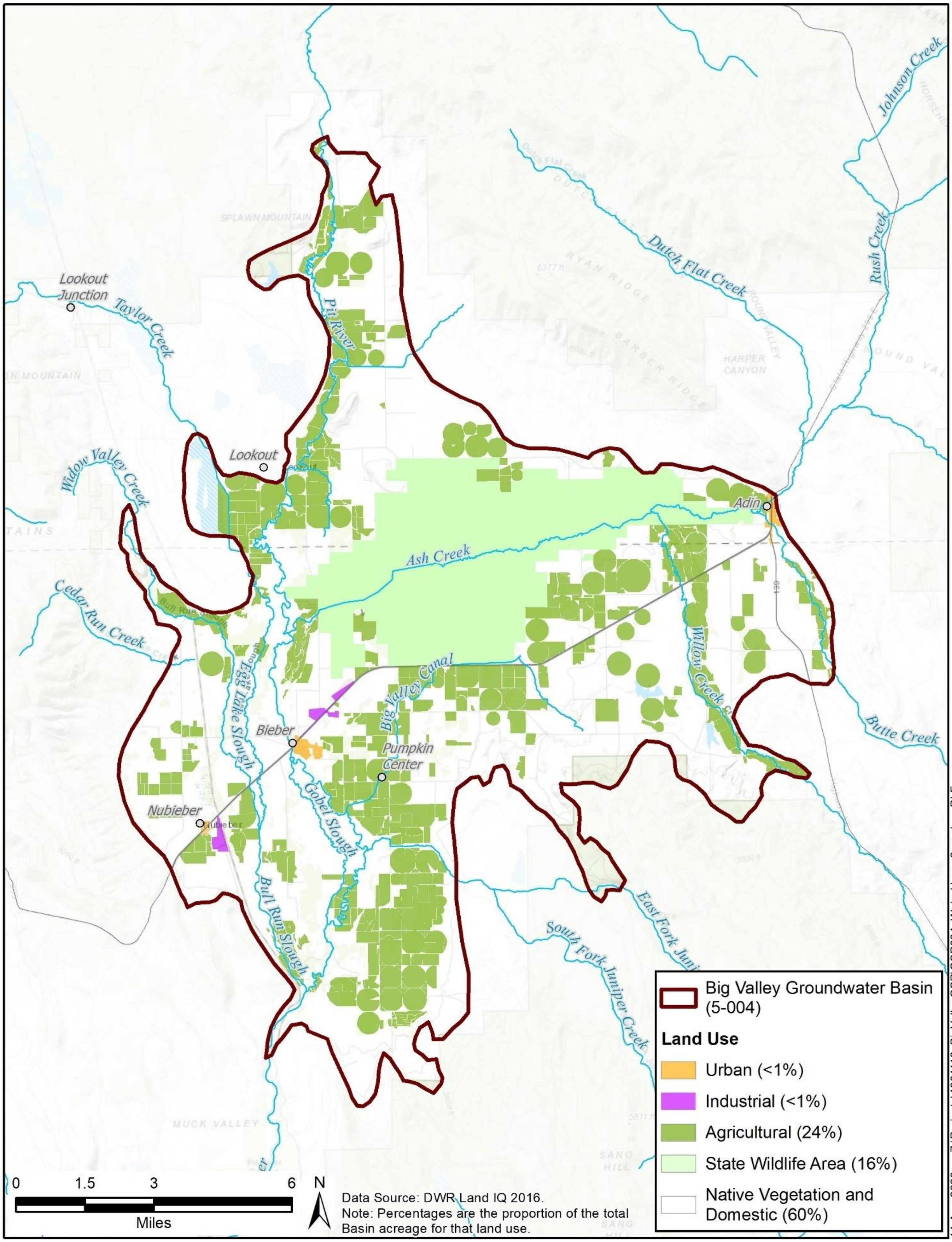
05-Jan-2024

Big Valley Basin Groundwater Sustainability Plan Modoc and Lassen Counties, California		Groundwater Elevations Fall 2023
Big Valley Groundwater Basin GSAs		JANUARY 2024 **DRAFT** FIGURE

Appendix C: Land Use by Water Use Sector Map



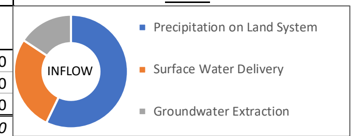
Land Use by Water Use Sector

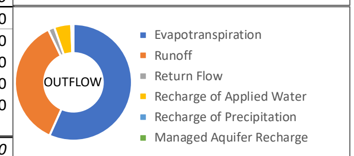
Appendix D: Water Budget

Big Valley Groundwater Basin Water Budget

	item	Flow Type	Origin/ Destination	Component	2019 Estimated Acre-Feet	2020 Estimated Acre-Feet	2021 Estimated Acre-Feet	2022 Estimated Acre-Feet	2023 Estimated Acre-Feet
		LAND SYSTEM							
1	(1)	Inflow	Into Basin	Precipitation on Land System	195,300	87,100	81,500	115,900	159,100
2	(2)	Inflow	Between Systems	Surface Water Delivery	70,000	84,900	86,400	82,000	75,700
3	(3)	Inflow	Between Systems	Groundwater Extraction	38,400	53,700	54,000	50,400	43,700
4	(4)	Inflow	*(1)+(2)+(3)*	*Total Inflow*	*304,000*	*226,000*	*222,000*	*248,000*	*278,000*
5	(5)	Outflow	Out of Basin	Evapotranspiration	154,400	155,000	158,900	157,100	157,900
6	(6)	Outflow	Between Systems	Runoff	131,100	48,700	40,700	69,900	100,800
7	(7)	Outflow	Between Systems	Return Flow	4,300	6,000	6,100	5,700	4,900
8	(8)	Outflow	Between Systems	Recharge of Applied Water	12,000	14,800	15,100	14,300	13,100
9	(9)	Outflow	Between Systems	Recharge of Precipitation	1,900	1,200	1,200	1,400	1,700
10	(10)	Outflow	Between Systems	Managed Aquifer Recharge	-	-	-	-	-
11	(11)	Outflow	*(5)+(6)+(7)+(8)+(9)+(10)*	*Total Outflow*	*304,000*	*226,000*	*222,000*	*248,000*	*278,000*
12	(12)	Storage Change	(4)-(11)	Change in Land System Storage	-	-	-	-	-

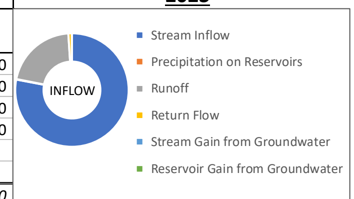
2023

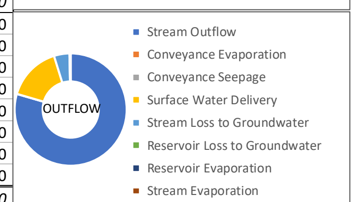




	item	Flow Type	Origin/ Destination	Component	2019 Estimated Acre-Feet	2020 Estimated Acre-Feet	2021 Estimated Acre-Feet	2022 Estimated Acre-Feet	2023 Estimated Acre-Feet
		SURFACE WATER SYSTEM							
13	(13)	Inflow	Into Basin	Stream Inflow	683,300	130,700	67,900	78,200	376,300
14	(14)	Inflow	Into Basin	Precipitation on Reservoirs	700	300	300	400	600
6	(6)	Inflow	Between Systems	Runoff	131,100	48,700	40,700	69,900	100,800
7	(7)	Inflow	Between Systems	Return Flow	4,300	6,000	6,100	5,700	4,900
15	(15)	Inflow	Between Systems	Stream Gain from Groundwater	-	-	-	-	-
16	(16)	Inflow	Between Systems	Reservoir Gain from Groundwater	-	-	-	-	-
17	(17)	Inflow	*(13)+(14)+(6)+(7)+(15)+(16)*	*Total Inflow*	*819,000*	*186,000*	*115,000*	*154,000*	*483,000*
18	(18)	Outflow	Out of Basin	Stream Outflow	712,000	88,800	19,500	62,600	383,700
19	(19)	Outflow	Out of Basin	Conveyance Evaporation	40	50	50	50	50
20	(20)	Outflow	Between Systems	Conveyance Seepage	30	30	30	30	30
2	(2)	Outflow	Between Systems	Surface Water Delivery	70,000	84,900	86,400	82,000	75,700
21	(21)	Outflow	Between Systems	Stream Loss to Groundwater	35,800	10,100	7,200	7,600	21,500
22	(22)	Outflow	Between Systems	Reservoir Loss to Groundwater	600	600	600	600	600
23	(23)	Outflow	Out of Basin	Reservoir Evaporation	700	800	800	800	700
24	(24)	Outflow	Out of Basin	Stream Evaporation	400	400	400	400	400
25	(25)	Outflow	*(18)+(19)+(20)+(2)+(21)+(22)+(23)+(24)*	*Total Outflow*	*819,000*	*186,000*	*115,000*	*154,000*	*483,000*
26	(26)	Storage Change	(17)-(25)	Change in Surface Water Storage	-	-	-	-	-

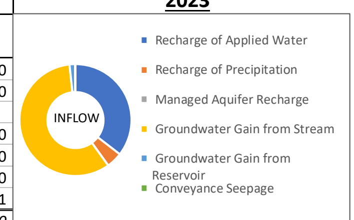
2023

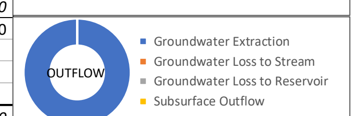




	item	Flow Type	Origin/ Destination	Component	2019 Estimated Acre-Feet	2020 Estimated Acre-Feet	2021 Estimated Acre-Feet	2022 Estimated Acre-Feet	2023 Estimated Acre-Feet
		GROUNDWATER SYSTEM							
8	(8)	Inflow	Between Systems	Recharge of Applied Water	12,000	14,800	15,100	14,300	13,100
9	(9)	Inflow	Between Systems	Recharge of Precipitation	1,900	1,200	1,200	1,400	1,700
10	(10)	Inflow	Between Systems	Managed Aquifer Recharge	-	-	-	-	-
21	(21)	Inflow	Between Systems	Groundwater Gain from Stream	35,800	10,100	7,200	7,600	21,500
22	(22)	Inflow	Between Systems	Groundwater Gain from Reservoir	600	600	600	600	600
20	(20)	Inflow	Between Systems	Conveyance Seepage	30	30	30	30	30
27	(27)	Inflow	Into Basin	Subsurface Inflow	1	1	1	1	1
28	(28)	Inflow	*(8)+(9)+(10)+(21)+(22)+(20)+(27)*	*Total Inflow*	*50,400*	*26,700*	*24,100*	*23,900*	*37,000*
3	(3)	Outflow	Between Systems	Groundwater Extraction	38,400	53,700	54,000	50,400	43,700
15	(15)	Outflow	Between Systems	Groundwater Loss to Stream	-	-	-	-	-
16	(16)	Outflow	Between Systems	Groundwater Loss to Reservoir	-	-	-	-	-
29	(29)	Outflow	Out of Basin	Subsurface Outflow	-	-	-	-	-
30	(30)	Outflow	*(3)+(15)+(16)+(29)*	*Total Outflow*	*38,400*	*53,700*	*54,000*	*50,400*	*43,700*
31	(31)	Storage Change	(28)-(30)	Change in Groundwater Storage	12,000	(27,000)	(30,000)	(27,000)	(7,000)

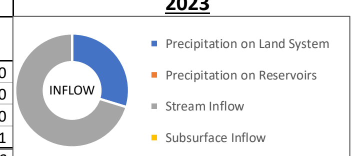
2023

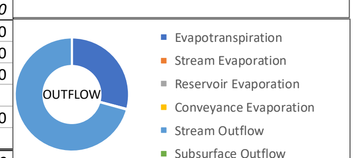




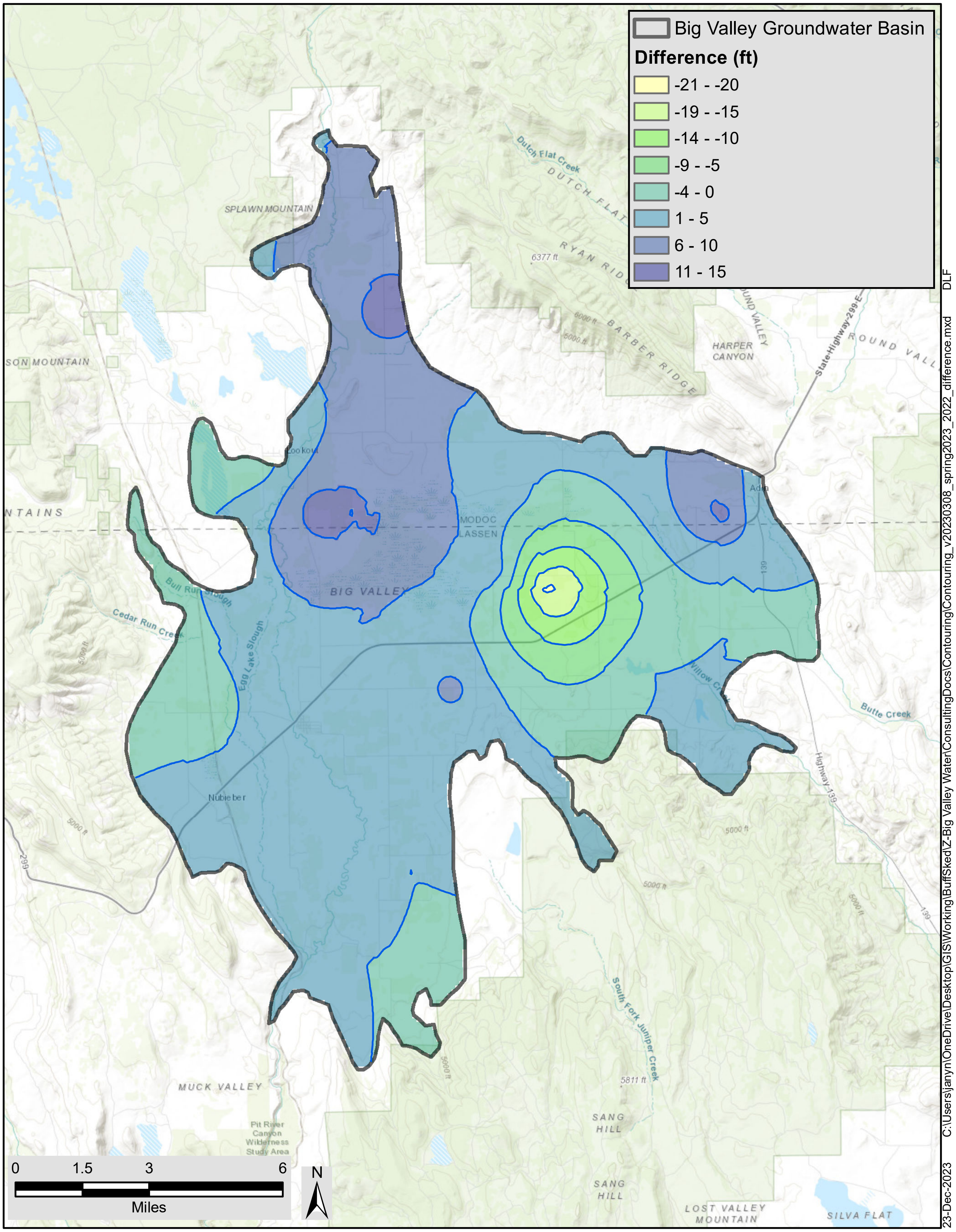
	item	Flow Type	Origin/ Destination	Component	2019 Estimated Acre-Feet	2020 Estimated Acre-Feet	2021 Estimated Acre-Feet	2022 Estimated Acre-Feet	2023 Estimated Acre-Feet
		TOTAL BASIN WATER BUDGET							
1	(1)	Inflow	Into Basin	Precipitation on Land System	195,300	87,100	81,500	115,900	159,100
14	(14)	Inflow	Into Basin	Precipitation on Reservoirs	700	300	300	400	600
13	(13)	Inflow	Into Basin	Stream Inflow	683,300	130,700	67,900	78,200	376,300
27	(27)	Inflow	Into Basin	Subsurface Inflow	1	1	1	1	1
32	(32)	Inflow	*(1)+(14)+(13)+(27)*	*Total Inflow*	*879,300*	*218,100*	*149,700*	*194,500*	*536,000*
5	(5)	Outflow	Out of Basin	Evapotranspiration	154,400	155,000	158,900	157,100	157,900
24	(24)	Outflow	Out of Basin	Stream Evaporation	400	400	400	400	400
23	(23)	Outflow	Out of Basin	Reservoir Evaporation	700	800	800	800	700
19	(19)	Outflow	Out of Basin	Conveyance Evaporation	-	-	-	-	-
18	(18)	Outflow	Out of Basin	Stream Outflow	712,000	88,800	19,500	62,600	383,700
29	(29)	Outflow	Out of Basin	Subsurface Outflow	-	-	-	-	-
33	(33)	Outflow	*(5)+(24)+(23)+(19)+(18)+(29)*	*Total Outflow*	*867,500*	*245,000*	*179,600*	*220,900*	*542,700*
34	(34)	Storage Change	(32)-(33)	Change in Total System Storage	12,000	(27,000)	(30,000)	(26,000)	(7,000)

2023





Appendix E: Map of Storage Change



Big Valley Basin Groundwater Sustainability Plan Modoc and Lassen Counties, California		Groundwater Elevations Spring 2022 and 2023 Difference
Big Valley Groundwater Basin GSAs		DECEMBER 2023 **DRAFT** FIGURE