APPENDIX 2-D. Scott Valley GSP Groundwater Model Documentation

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Contents

Introduction

This document is Appendix 2-D, supplemental to Chapter 2 of the Scott Valley Groundwater Sustainability Plan (GSP). The purpose of this appendix is to document the Scott Valley Integrated Hydrologic Model (SVIHM), which was used to estimate water budget components and predict potential future water use and hydrologic conditions, as required under the Sustainable Groundwater Management Act. Specifically, objectives of this appendix are to:

1. Summarize key numerical model specifications and direct readers to published studies in which the model structure is documented in more detail.
2. Document the time extension of the model inputs:
    - Original (documented) model period: Oct. 1, 1991 - Sept. 30, 2011 (Tolley, Foglia, and Harter 2019)
    - Updated model period for GSP: Oct. 1, 1991- Sept. 30, 2018
3. Document validation of model outputs for the extension period of water years 2012-2018.
4. Publish the full tables and figures of annual water budget values, a subset of which have been included in Chapter 2 of the GSP.

An earlier version of the SVIHM, which covers the model period of water years 1991-2011, is documented in the report by Foglia et al. (2013) and the study by Tolley, Foglia, and Harter (2019). Applications of the model are published in Foglia, McNally, and Harter (2013) and Foglia et al. (2018). It is currently available as a GitHub repository at the url `https://github.com/UCDavisHydro/SVIHM`. The extended version (covering 1991-2018) remains in development until official adoption of the GSP and will be publicly available after submittal of the GSP to DWR.

Model Structure and Validation

SVIHM Model Structure Summary

The integrated model consists of three cascading sub-models, utilizing 3 software platforms:

1. Streamflow regression model (a statistical model using the R programming language)
2. Soil water budget model, or SWBM (FORTRAN)
3. Groundwater-surface water flow model (MODFLOW)

The **streamflow regression model** is a statistical tool used to estimate surface flow into the SVIHM domain, and is described in futher detail in Section 5 in Foglia et al. (2013) and Section 3 of Tolley, Foglia, and Harter (2019). Surface water inflow (i.e., runoff from the upper watershed) is explicitly simulated at the SVIHM domain boundary on 12 major tributaries, and though some flow monitoring exists for these locations, the stream gauge records do not cover the entire model period and are largely incomplete. Statistical analysis showed that existing daily flow records for tributary streams are best estimated using linear regression of the normalized, log-transformed daily flow data at the tributary stream gauge against the normalized, log-transformed daily flow data at the USGS Gauge

11519500 (Fort Jones Gauge). The Fort Jones gauge represents stream outflow from the Scott Valley. Two separate linear regressions were performed - one for the period period prior to water year 1973, prior to the occurrence of frequent summer flows below 30 cfs, and one for records falling into the period October 1, 1973 to September 30, 2011. Normalization with respect to mean and standard deviation of log-transformed daily flow data was performed separately for the time series records at each gauging station. The streamflow regression model is used to estimate a continuous daily flow record for the model period at each of the 12 inflow points from the upper watershed (Foglia et al. 2013).

The **soil water budget model (SWBM)** is a FORTRAN-based calculator used to simulate water fluxes into and out of the soil zone, on a field-by-field basis, for 2,119 fields in the Scott Valley. It is described in more detail in Section 6 of Foglia et al. (2013) and Section 3 of Tolley, Foglia, and Harter (2019). In the SWBM, agricultural irrigation is calculated based on daily crop demand. Perfect farmer foresight of daily irrigation demand is assumed and the water volume is attributed to either diverted surface water (i.e., Surface Water Irrigation in Figure 4) or pumped groundwater (i.e., Groundwater Irrigation and Wells in Figure 4) depending on which source(s) is (are) available for each field. Irrigation technologies associated with each field (i.e., flood irrigation, wheel line or center pivot) are used to calculate irrigation efficiencies. Each field is treated as a “tipping bucket” object: at the end of each day, any water remaining in the soil zone beyond its field capacity is assumed to recharge to groundwater. A small number of fields in the so-called “discharge zone” between Greenview and Etna, east of Highway 3, are sub-irrigated; ET in these fields is assumed to come not only from soil water storage but also directly from shallow groundwater (rather than applied irrigation), where the latter is simulated by the groundwater model. Additionally, all precipitation falling on cultivated fields or native vegetation is assumed to infiltrate into the soil column (i.e., runoff is neglected).

The finite difference **groundwater-surface-water model** simulates spatial and temporal groundwater and surface water conditions in the valley within the alluvial basin (also referred to as the **MODFLOW model**). It is described in more detail in Section 3.4 of Tolley, Foglia, and Harter (2019).

Specifically, the MODFLOW model is built using MODFLOW-NWT (Niswonger, Panday, and Ibaraki 2005), a version of MODFLOW-2005 (Harbaugh 2005) that solves for unconfined flow using the Newton-Raphson solver. The packages used in the MODFLOW-NWT model include:

- SFR, streamflow routing package (Prudic, Konikow, and Banta 2004)
- WEL, well package (Harbaugh 2005)
- RCH, recharge package (Harbaugh et al. 2000; Harbaugh 2005)
- ETS, evapotranspiration segments package (Banta 2000)
- DRN, drain package (Harbaugh et al. 2000)

The integrated SVIHM is weakly coupled in that calculated fluxes are passed from the first two submodels to the MODFLOW model, but there are no direct feedbacks from the MODFLOW model to the streamflow regression model or the SWBM (Tolley, Foglia, and Harter 2019). The exception is direct uptake of evapotranspiration from groundwater in the “discharge zone”. An explicit iterative process between MODFLOW and SWBM ensures appropriate allocation of the ET demand to the unsaturated (soil) zone and to groundwater.

MODFLOW Numerical Model Construction Summary

A description of the structure of the MODFLOW groundwater-surface water model can be found in section 3.4 of Tolley, Foglia, and Harter (2019). Key model construction information is summarized below. The model domain (i.e. the extent of active cells) is outlined in Figure 1.

- 440 rows
- 210 columns
- 100-m (328 ft) gridcell lateral resolution
- cell depths of 0-61 m (0-200ft) thick
- 46,618 total acres within model domain (Figure 1)
  - 17,232 acres alfalfa
  - 16,362 acres pasture
  - 11,246 acres natural vegetation (ET, no irrigation)
  - 1,626 acres of pavement or cobbles (no ET, no irrigation)
  - 152 acres of water surface
- 164 irrigation wells and 55 monitoring wells
- Nine hydrogeologic zones and three surface water channel zones (see Figure 1 in Tolley, Foglia, and Harter (2019))

Summary of Model Calibration and Sensitivity Analysis

Explanation of terms

Model calibration is a process for estimating parameter values that are unavailable or difficult to measure, such as the hydraulic conductivity of a geologic formation. The goal of calibration is to select parameter values that minimize the error in the model output (e.g., minimizing the difference between simulated and observed values for surface flow rates and groundwater elevations). Typically, this involves building the model using initial "best-guess" values for the difficult-to-measure parameters, then running the model many times using different parameter values, and recording the output to evaluate which parameter set generates the minimum error. "Gradient-based" methods use the information from past runs to select the next set of parameters.

More generally, **sensitivity analysis** is used to calculate an overall index of how sensitive a desired model output (such as a flowrate in a single location, or the aggregate error in simulated groundwater elevation) is to a change in the value of a given parameter, such as the infiltration rate of a soil type. Sensitivity analyses can be "global" (covering the full range of possible values for all parameters) or "local" (starting with an initial parameter and deviating from it by set "perturbation" values).

In the calibration analysis, the end point of the analysis is typically determined by: 1) the convergence of the error function on an assumed irreducible value or 2) limitations imposed by computational resources. For a model like the SVIHM, which takes 4-5 hours to complete one simulation, global sensitivity analysis methods are commonly too expensive.

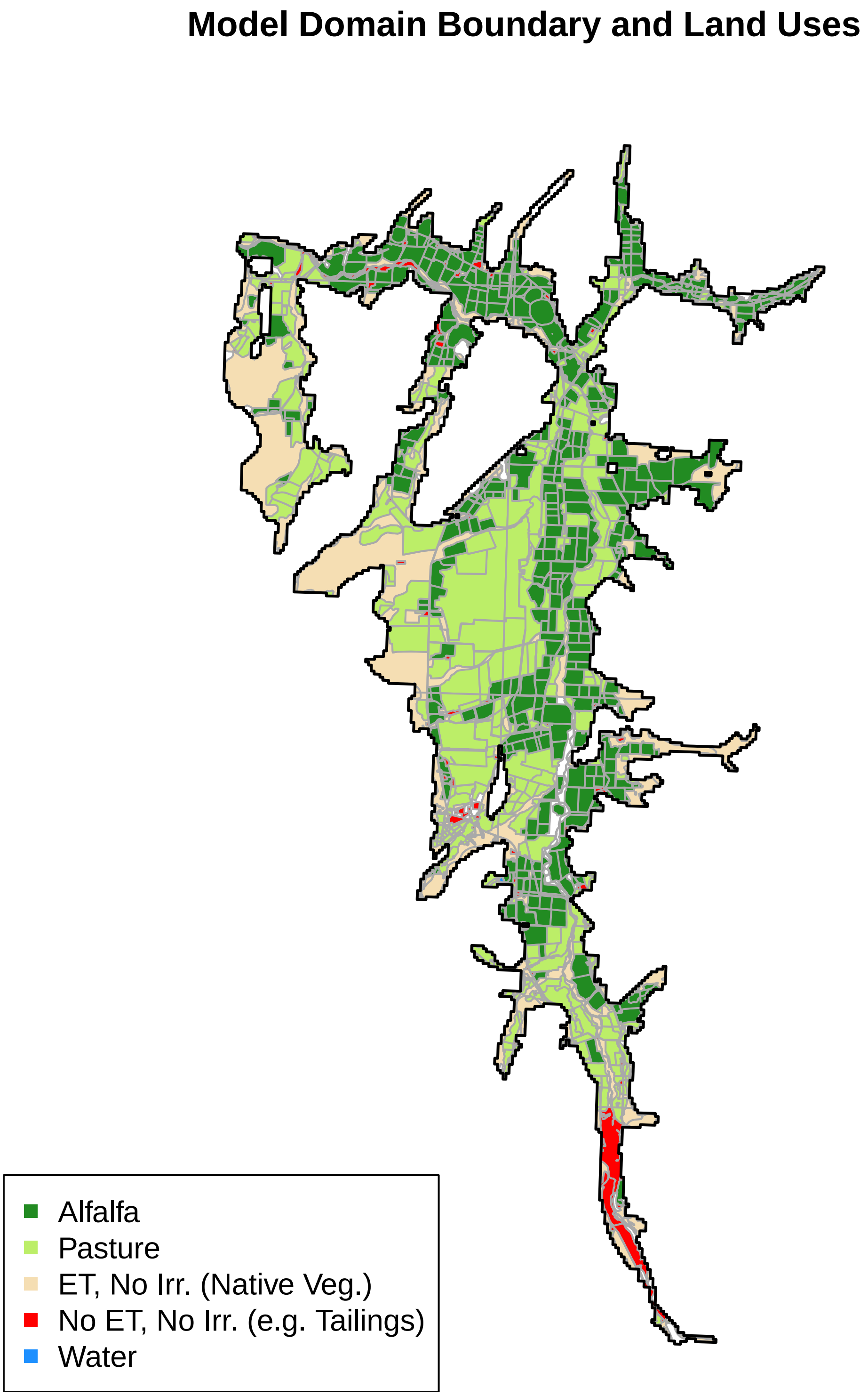

Figure 1: Land use categories used to represent irrigation behavior in the SVIHM.

SVIHM Calibration Results

Calibration and sensitivity analysis of the 1991-2011 version of SVIHM was performed using the inverse modeling software suite UCODE_2014 (Poeter and Hill 1998; Poeter et al. 2014) and is described in more detail Section 3.5 of Tolley, Foglia, and Harter (2019).

UCODE_2014 was used to automate the model calibration process, which included the following steps:

Sensitivity Analysis:

1. Select initial values for 61 parameters, including hydraulic properties of nine hydrogeologic zones, the amount of mountain front recharge, canal seepage, stream channel properties, and values in the SWBM related to deep soil moisture depletion, irrigation efficiency, and crop evapotranspiration.
2. Run the model forward to simulate groundwater heads and daily stream flowrates for the 1991-2011 model period.
3. Vary each of the 61 parameters by a small amount to determine sensitivity of simulated water levels and flow rates at monitored locations. Select the parameters for which model outcomes are significantly sensitive (14 parameters).

Calibration:

1. Run the model forward to simulate groundwater heads and daily stream flowrates for the 1991-2011 model period.
2. Compare the observed groundwater elevations and flowrates with corresponding simulated values. Record the difference; summarize the differences as the result of a weighted objective function. (Lower flow rates, for example, were weighted higher in the SVIHM calibration than higher flowrates to prioritize minimizing errors in low flows.)
3. Select a new set of 14 calibration parameters based on the results of past calibration runs and repeat steps 1-3 until parameters or the objective function no longer change significantly between calibration runs.

To account for the potential nonlinear effects of the initial parameter values, calibration of SVIHM was performed five times, using five sets of initial values for each of the 14 calibration variables (Table 2 in Tolley, Foglia, and Harter (2019)).

Sections 4 and 5 of Tolley, Foglia, and Harter (2019) describe the SVIHM calibration results in detail; key summary quotations are included below for convenience.

> The largest variations were observed in Kx1, Kx3, and Sy1, which ranged over an order of magnitude for hydraulic conductivity and varied up to 50% for specific yield. Parameters contained within SWBM showed similar variations across runs but with much less variability due to tighter imposed constraints. None of the parameters were calibrated to unreasonable values, with only a few limited by upper or lower calibration bounds.
>
> Values of DFBETAS and Cook's D (Figure 9) show that timing of the most influential observations occurs during or immediately following the lowest period of streamflow during the year.

The most sensitive parameters in SVIHM are crop coefficients for alfalfa and pasture, which control water demand (ET), and the SMDF for alfalfa/grain fields, which affects how much irrigation water is applied and therefore recharge rates for that land use type.

Model Extension and Validation

SVIHM development began nearly a decade ago in 2011, and the initial data summary and model input production was documented in Foglia et al. (2013). As a consequence, the version of SVIHM calibrated and documented in Tolley, Foglia, and Harter (2019) (or, the 2019 version) simulated conditions in the 21-year period between Oct. 1990 and Sept. 2011.

SGMA requires water budgets to include the 20 years prior to 2015, so an extension of SVIHM was necessary in order to use it for the Scott GSP. Work on this model extension began in 2019, so the extension period was 7 years, ending in Sept. 2018.

Model results for this extension period are an opportunity for a natural validation experiment, which analyzes how closely the parameter values, calibrated on observations in water years 1991-2011, can replicate observations from Oct. 2011 - Sept. 2018.

Methods for Extending Precipitation, Tributary Inflow, and ET

Extending the model period consists of extending key climate records that drive model behavior: valley floor precipitation, tributary inflow, and ET.

Precipitation

The precipitation record consists of a daily depth value, and is calculated as the average of the rainfall values for the Callahan and Fort Jones weather stations. On days with missing values in these two rain records, the value is calculated based on data at other stations. More details are included in Section 4 of Foglia et al. (2013) and below.

Though evidence exists of higher rainfall on the western side of the valley, the location of existing gauges did not allow estimation of a rainfall gradient at the time, so a single daily value was used. In a future version of the model, it may be possible to develop a spatially-explicit rainfall record that reflects this rainfall gradient, using the data from several new private rain gauges installed during monitoring efforts for the GSP in 2019-2021.

Based on methodology described in Foglia et al. (2013), the original rainfall record was generated in Excel. To extend the model, a researcher implemented the same methodology in R (R Core Team 2020), the statistical programming language. The steps in the method are:

1. Align all available precipitation data by date in one table. For this extension, the records used were from the following weather stations (with their NOAA identification code):
    - Callahan (USC00041316)
    - Fort Jones (USC00043182)
    - Etna (USC00042899)
    - Greenview (USC00043614)

- Yreka (USC00049866), long-term record
- Yreka (US1CASK0005), more recent record

The original precipitation record relied only on the first four stations in this list, but for this extension, it was necessary to add the two Yreka stations (which, notably, are outside the Scott River watershed) to fill in gaps with no records at the other stations in the 2012-2018 period.

2. Make a table of relevant values (slope and R^2) for the set of 0-intercept linear regressions in which the Callahan and Fort Jones stations' precipitation record is predicted using each other station's record, segregated by month. The total set of linear models calculated is [2 predicted values] * [6 predictors] * [12 months] - [24 combinations where x = y] = 120 total linear regressions.
3. For each missing value in the daily Callahan and Fort Jones records, estimate the precipitation on that day using the linear regression model for the relevant month with the highest R^2 value.
4. Once all gaps have been filled in this manner, average the values for each day for Callahan and Fort Jones.

Due possibly to corrections in the online databases from which records were obtained, this method was unable to exactly reproduce the original 1991-2011 precipitation record in the 2019 version of SVIHM. Therefore, the daily rainfall values produced using the R software were used only for water years 2012-2018 (and for five leap days, which were not included in the 2019 version).

Evapotranspiration

The evapotranspiration data that drives irrigation demand in SVIHM is denoted as ET_{ref}, or the ET measured over a reference short grass crop. Crop coefficients are used to convert this daily value into irrigation demand for different crops. The ET_{ref} model input for the 2019 version of SVIHM was calculated using the NWSETO program (Snyder, Orang, and Matyac 2002). Additional details are in Section 6 of Foglia et al. (2013). For this extension, two data sources were used. CIMIS Station 225 was installed in northeastern Scott Valley in 2015, and this ET_{ref} record is used for the days in which it is available (DWR 2021). The second source, used to bridge the gap between the end of the 2019 ET_{ref} record in Sept. 2011 and the start of the CIMIS Station 225 record in 2015, was interpolated Spatial CIMIS data products (DWR 2007). The location used to generate the Spatial CIMIS output was the location of the current CIMIS Station 225.

Tributary Inflow

The daily flow records for tributary inflow to the model domain were extended using the Fort Jones record, Oct. 2011 - Sept. 2018, and the existing Streamflow Regression Model script in R. Although at least one tributary flow gauge has recorded additional observations since 2011, the tributary flow records used to build regression models with the Fort Jones record were kept consistent between the 2019 SVIHM version and the extended version. In future work, expanding the tributary datasets may improve the Fort Jones Gauge-tributary flow predictions.

Flow Matching

Methods of validating the quality of flow-matching include:

- Visual comparison on time series plots (Figure 2, Panel A)
- Exceedance plots to compare overall abundance of high and low values (Figure2, Panel B)
- Calculations of flow-matching indices, such as the Nash-Sutcliffe Efficiency (NSE) (Nash and Sutcliffe 1970) and, to account for high variability in flow, a modified NSE (Tolley, Foglia, and Harter 2019) (Table 1)

These results indicate that SVIHM flow-matching performance in the 2012-2018 period is about the same, or slightly better, than in the 1991-2011 period (Table 1). This might simply be a consequence of the fact that SVIHM generally performs better at low flows, and that the 2012-2018 period (18.4 average annual inches of rainfall) was drier than 1991-2011 (21.8 inches).

A known limitation of the model is that it does not capture large storm flow peaks, because these happen in a matter of days, while the stress periods in SVIHM are monthly (Figure 2, Panel A). This is reflected in the seasonal difference in NSE values: SVIHM matches dry season flows better than wet season flows. The season in which flow-matching performance is highest is during the spring recession and early growing season. This probably reflects the fact that longer-term processes control streamflow during this time, such as snowmelt or the draining of the subsurface, rather than short-term storm events.

Due to the aforementioned limitation, SVIHM tends to underpredict flows >1,000 cfs (Figure 2, Panel B). Conversely, it tends to overpredict flows <10 cfs. This overprediction may be due to the high sensitivity of the low-flow hydrologic system to small deviations from simulated conditions or behaviors (e.g., irrigation behavior not captured by the logical statements in the SWBM). However, overpredictions during low-flow conditions tend to be small, on the order of 1-5 cfs. The middle area of discrepancy in the exceedance plots ranges from 10-70 cfs; SVIHM simulates fewer of these daily flowrates than are observed. This may reflect a lag in the fall, i.e., the model is slower to respond to fall rain events than the physical watershed (Figure 2).

Table 1: Nash-Sutcliffe Efficiencies (NSE) and modified NSE values for various time periods.

Time Period	NSE	MNSE
Water years 1991-2011	0.475	0.931
water years 2012-2018	0.533	0.939
All water years 1991-2018	0.488	0.934
Wet Season (Dec-Mar)	0.337	0.789
Spring Recession (Apr-Jul)	0.647	0.919
Dry Season (Aug-Nov)	0.451	0.847

Groundwater Head Matching

The model performance regarding groundwater head (elevation) matching can be evaluated using several methods or indices:

- Visual inspection of scatter plots

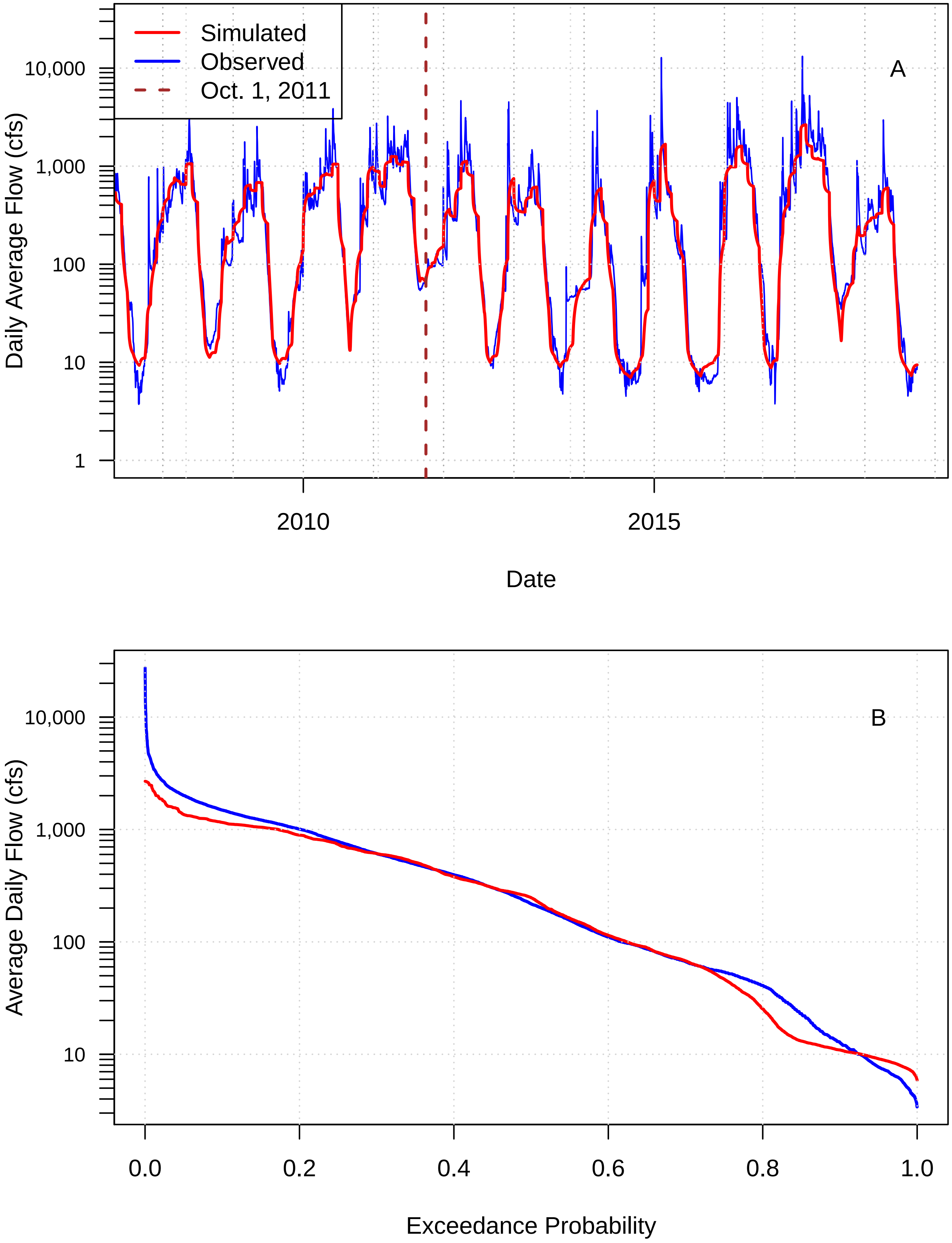

Figure 2: Daily flow at the Fort Jones Gauge, simulated vs. observed. Furthest extent of 2019 model version is indicated as a brown dashed line.

- The R^2 of the correlation between simulated and observed values
- The root mean squared error (RMSE) of simulated and observed values
- The percentage of groundwater elevation residuals less than a given number of feet or meters

Based on these results, the extended version of SVIHM performs about the same, and slightly worse, than the original 1991-2011 version at matching groundwater heads.

Observed and simulated groundwater head values show a strong correlation (Figure 3, Panel A; R^2 value of 0.98). The RMSE for the 1991-2018 period is 9.31 feet, compared with 7.48-9.12 feet in the 1991-2011 version (Tolley, Foglia, and Harter 2019).

Residuals range from -38 to 72 feet (Figure 3, Panel B). The proportion of residuals less than 3.3, 6.7, or 10 ft (1, 2, or 3 m) is 48%, 67%, and 78%, respectively, compared with 50%, 70%, and 80% in the 1991-2011 version.

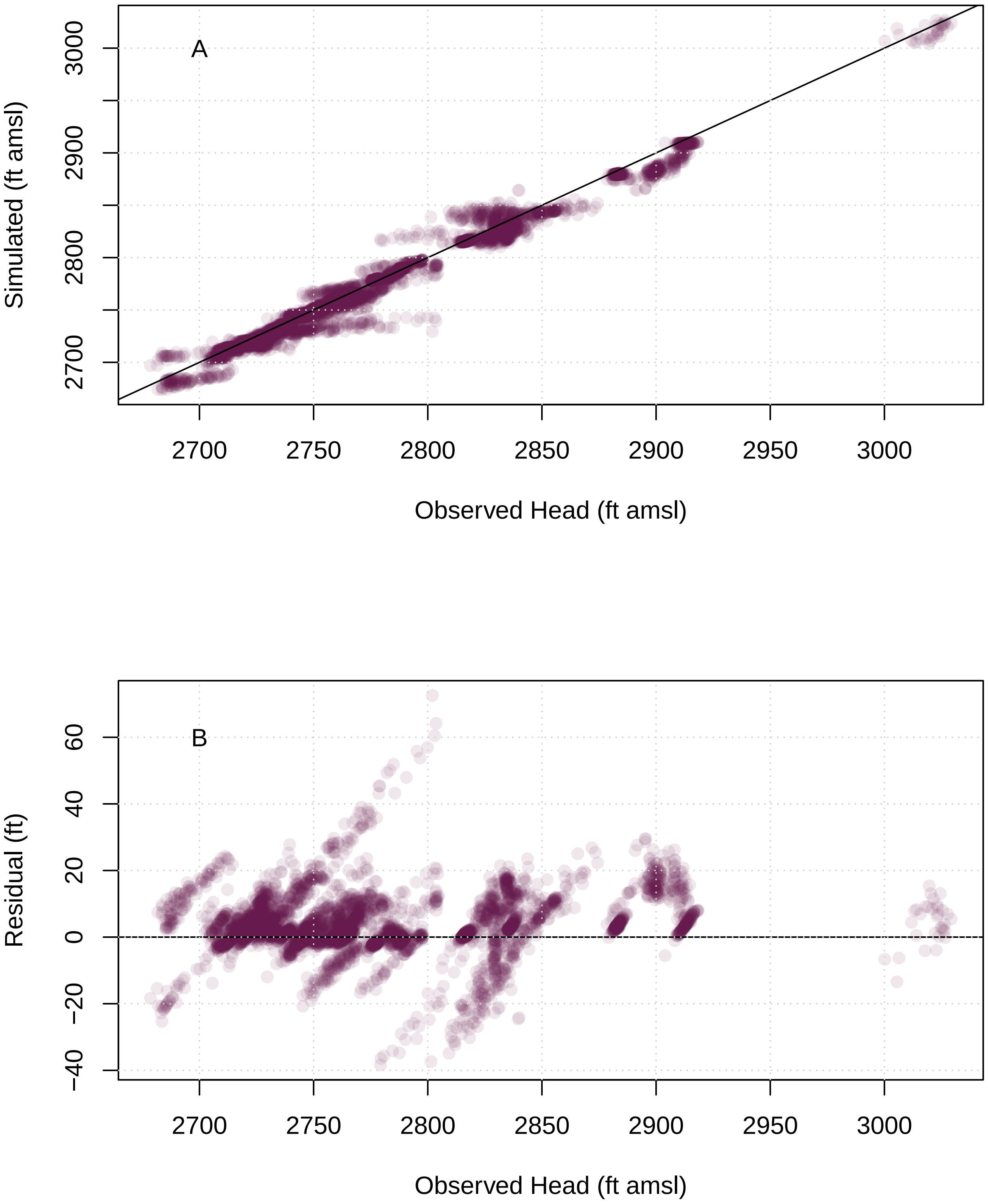

Figure 3: Groundwater elevations or heads, observed vs. simulated and observed vs. residuals (calculated as [simulated] - [observed]).

Water Budget

Water budget components are described in Chapter 2, Section 2.2.3, and in the reports referenced therein. For convenience they are listed below. Land cover used to calculate water useage in the SWBM is shown in Figure 1.

The water budget is visualized and tabulated for each of three subsystems: the Surface Water, the (Land/)Soil Zone, and the Aquifer subsystem. Thus, water budget components that flow from one subsystem to another appear in two tables or graph panels (i.e., Stream Leakage to groundwater is represented as negative in the Surface water and positive in the Aquifer subsystem). Tables shown here represent annual fluxes for each water year in the simulation period. Tables with monthly fluxes for each water budget component in each subsystem, for historic and future simulations, are available upon request.

1. Inflows
   - Precipitation
   - Surface inflow (tributaries)
   - Subsurface inflow (mountain front recharge or MFR)
2. Outflows
   - Surface water outflow
   - Subsurface water outflow (negligible)
   - Evapotranspiration
3. Flow between surface water and soil zone
   - Surface water irrigation
4. Flow between surface water and groundwater
   - Stream leakage
   - Drains/overland flow
   - Canal seepage from Farmes Ditch and SVID Ditch
5. Flow between soil zone and groundwater
   - Recharge to aquifer
   - Groundwater irrigation
6. Change in storage
   - Surface water storage
   - Soil zone storage
   - Aquifer storage

Historical Water Budget Figures and Tables

Historical Water Budget Barcharts

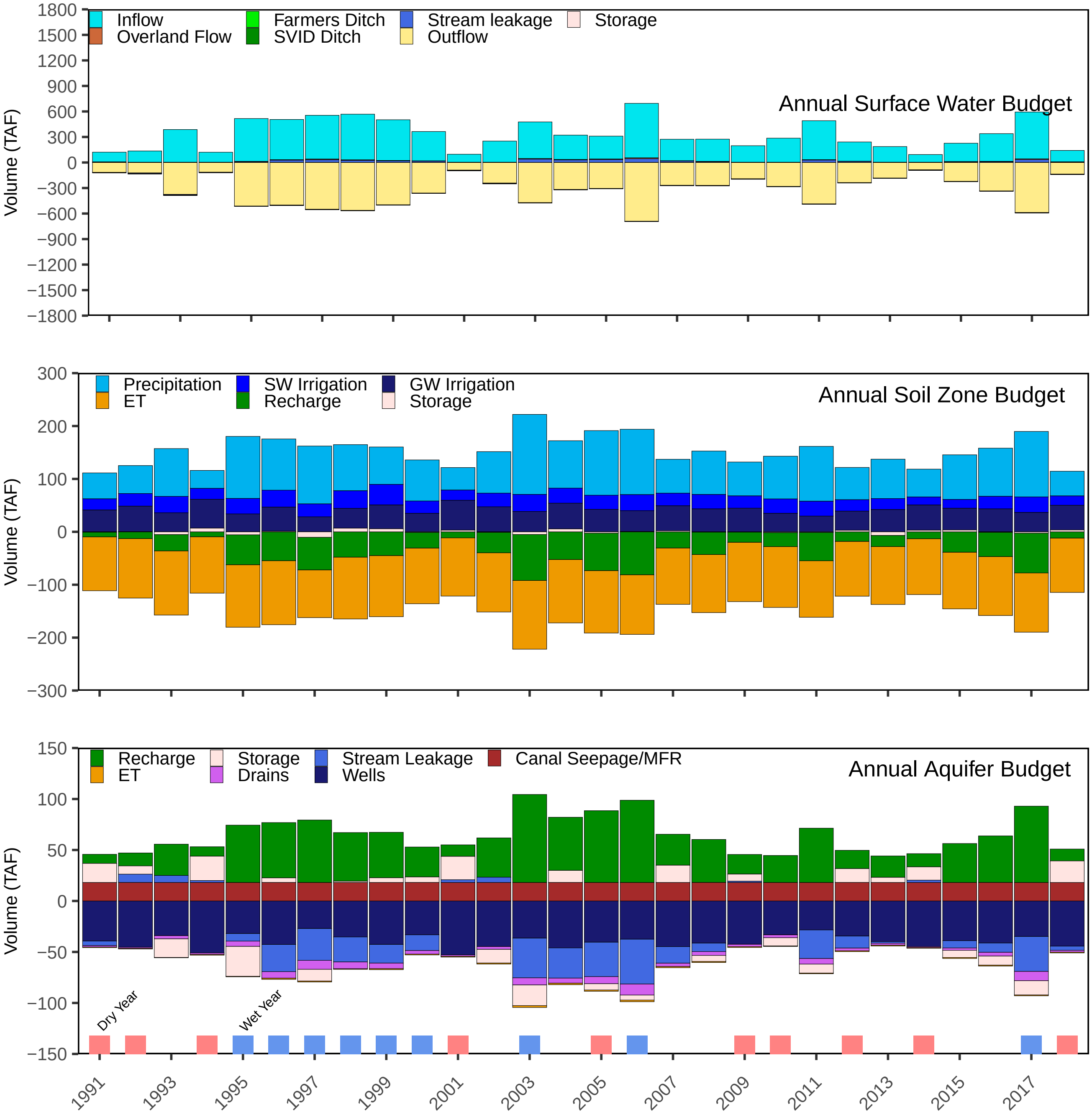

Figure 4: Annual water budgets for the three conceptual subsystems used to represent the hydrology of the Basin: the surface water system, the soil zone, and the aquifer.

Historical Water Budget - Annual and Summary Tables

Historical Water Budget - Streams Subsystem

Table 2: Annual and summarized annual values (TAF) for water budget components simulated in the Surface Water (SW) subsystem of the SVIHM. Positive values are water entering the stream network as inflows from tributary streams and overland flow entering streams; negative values are water leaving the stream network as diversions to the Farmers and SVID ditches and outflow from the valley through the Scott River. The net direction of stream leakage and the overall change in water stored in the stream system can be both negative and positive in different water years.

Water Year	Inflow	Overland	Farmers Div.	SVID Div.	Stream Leakage	Outflow	Storage
1991	115	2	-2	-4	4	-116	0
1992	133	1	-2	-4	-8	-121	1
1993	384	3	-2	-4	-7	-374	0
1994	118	1	-2	-4	-2	-113	1
1995	504	5	-2	-4	8	-511	0
1996	472	6	-2	-4	27	-500	0
1997	515	8	-2	-4	31	-549	0
1998	537	7	-2	-4	24	-562	0
1999	478	5	-2	-4	18	-496	0
2000	345	4	-2	-4	15	-358	0
2001	94	1	-2	-4	-3	-89	1
2002	249	3	-2	-4	-5	-241	0
2003	431	7	-2	-4	39	-471	0
2004	287	5	-2	-4	30	-316	0
2005	269	7	-2	-4	34	-304	0
2006	640	10	-2	-4	44	-689	0
2007	253	3	-2	-4	16	-267	1
2008	262	4	-2	-4	8	-269	0
2009	195	2	-2	-4	-1	-190	0
2010	283	3	-2	-4	0	-280	-0
2011	458	6	-2	-4	28	-485	0
2012	227	3	-2	-4	12	-236	0
2013	183	2	-2	-4	2	-182	1
2014	91	1	-2	-4	-2	-85	2
2015	216	2	-2	-4	7	-221	1
2016	326	4	-2	-4	9	-333	0
2017	550	9	-2	-4	34	-587	0
2018	135	2	-2	-4	4	-136	1
Minimum	91	1	-2	-4	-8	-689	-0
25th %ile	192	2	-2	-4	-0	-488	0
Median	276	3	-2	-4	9	-292	0
Mean	312	4	-2	-4	13	-324	0
75th %ile	461	6	-2	-4	27	-188	1
Maximum	640	10	-2	-4	44	-85	2

Historical Water Budget - Soil Zone Subsystem

Table 3: Annual and summarized annual values (TAF) for water budget components simulated in the Surface Water (SW) subsystem of the SVIHM. Positive values are water entering the stream network as inflows from tributary streams and overland flow entering streams; negative values are water leaving the stream network as diversions to the Farmers and SVID ditches and outflow from the valley through the Scott River. The net direction of stream leakage and the overall change in water stored in the stream system can be both negative and positive in different water years.

Water Year	Precip	SW Irrig.	GW Irrig.	ET	Recharge	Storage
1991	49	21	41	-102	-9	-1
1992	53	24	48	-112	-13	0
1993	90	31	36	-121	-31	-5
1994	34	21	54	-107	-9	7
1995	117	29	34	-118	-57	-6
1996	97	32	45	-121	-55	1
1997	109	25	28	-90	-62	-10
1998	87	33	37	-117	-48	7
1999	71	39	45	-116	-45	6
2000	78	23	35	-105	-30	-1
2001	42	19	56	-110	-11	3
2002	78	26	47	-112	-39	-1
2003	151	32	38	-130	-87	-5
2004	90	28	49	-120	-52	5
2005	122	27	42	-118	-71	-2
2006	124	30	39	-113	-81	1
2007	64	24	47	-107	-31	2
2008	82	27	43	-110	-42	-0
2009	64	23	45	-112	-19	-0
2010	81	27	35	-115	-27	-1
2011	104	28	30	-107	-54	-1
2012	61	22	36	-104	-18	3
2013	74	21	42	-109	-21	-7
2014	53	15	48	-106	-13	3
2015	84	17	41	-107	-39	3
2016	91	24	43	-111	-46	-1
2017	124	30	36	-112	-75	-2
2018	47	18	47	-103	-12	3
Minimum	34	15	28	-130	-87	-10
25th %ile	63	21	36	-116	-54	-2
Median	81	25	42	-112	-39	-0
Mean	83	26	42	-111	-39	0
75th %ile	99	29	47	-107	-19	3
Maximum	151	39	56	-90	-9	7

Historical Water Budget - Aquifer Subsystem

Table 4: Annual and summarized annual values (TAF) for water budget components simulated in the Surface Water (SW) subsystem of the SVIHM. Positive values are water entering the stream network as inflows from tributary streams and overland flow entering streams; negative values are water leaving the stream network as diversions to the Farmers and SVID ditches and outflow from the valley through the Scott River. The net direction of stream leakage and the overall change in water stored in the stream system can be both negative and positive in different water years.

Water Year	Recharge	ET	STorage	Drains	Stream Leakge	Wells	Canals, MFR
1991	9	-1	19	-1	-4	-39	18
1992	13	-1	8	-1	8	-45	18
1993	31	-0	-18	-3	7	-34	18
1994	9	-1	24	-1	2	-51	18
1995	56	-1	-29	-5	-8	-32	18
1996	54	-1	5	-6	-27	-43	18
1997	61	-1	-12	-9	-31	-27	18
1998	48	-1	1	-7	-24	-35	18
1999	45	-1	5	-5	-18	-43	18
2000	29	-1	5	-4	-15	-33	18
2001	11	-1	23	-1	3	-53	18
2002	39	-1	-13	-3	5	-45	18
2003	86	-2	-20	-7	-39	-36	18
2004	52	-2	12	-5	-30	-46	18
2005	70	-1	-6	-7	-34	-40	18
2006	81	-2	-5	-11	-44	-37	18
2007	30	-1	17	-3	-16	-45	18
2008	42	-1	-6	-4	-8	-41	18
2009	19	-1	7	-2	1	-42	18
2010	27	-1	-8	-3	-0	-33	18
2011	53	-1	-9	-6	-28	-28	18
2012	18	-1	14	-3	-12	-34	18
2013	21	-1	5	-2	-2	-40	18
2014	13	-1	13	-1	2	-45	18
2015	38	-1	-7	-2	-7	-39	18
2016	46	-1	-9	-4	-9	-41	18
2017	75	-1	-14	-9	-34	-35	18
2018	12	-1	21	-2	-4	-44	18
Minimum	9	-2	-29	-11	-44	-53	18
25th %ile	19	-1	-9	-6	-27	-44	18
Median	38	-1	3	-3	-9	-40	18
Mean	39	-1	1	-4	-13	-40	18
75th %ile	54	-1	12	-2	0	-35	18
Maximum	86	-0	24	-1	8	-27	18

Future Water Budget Figures and Tables (Basecase and 4 Climate Change Scenarios)

To inform long-term hydrologic planning, the Future Projected Water Budget was developed using the following method:

1. Observed weather and streamflow parameters from water years 1991-2011 were used multiple times to make a 50-year "Basecase" climate record (see Table 5 for details). The Basecase projection represents a hypothetical future period in which climate conditions are the same as conditions from 1991-2011.
2. The climate-influenced variables Precipitation (as rain), Reference Evapotranspiration (ET_{ref}), and tributary stream inflow were altered to represent four climate change scenarios:
   - Near-future climate, representing conditions in the year 2030
   - Far-future climate, Central Tendency, representing the central tendency of projected conditions in the year 2070
   - Far-future climate, Wet with Moderate Warming (WMW), representing the wetter extreme of projected conditions in the year 2070
   - Far-future climate, Dry with Extreme Warming (DEW), representing the drier extreme of projected conditions in the year 2070

For convenience, these scenarios will be referred to as Near, Far, Wet, and Dry, respectively.

Future Water Budget Barcharts

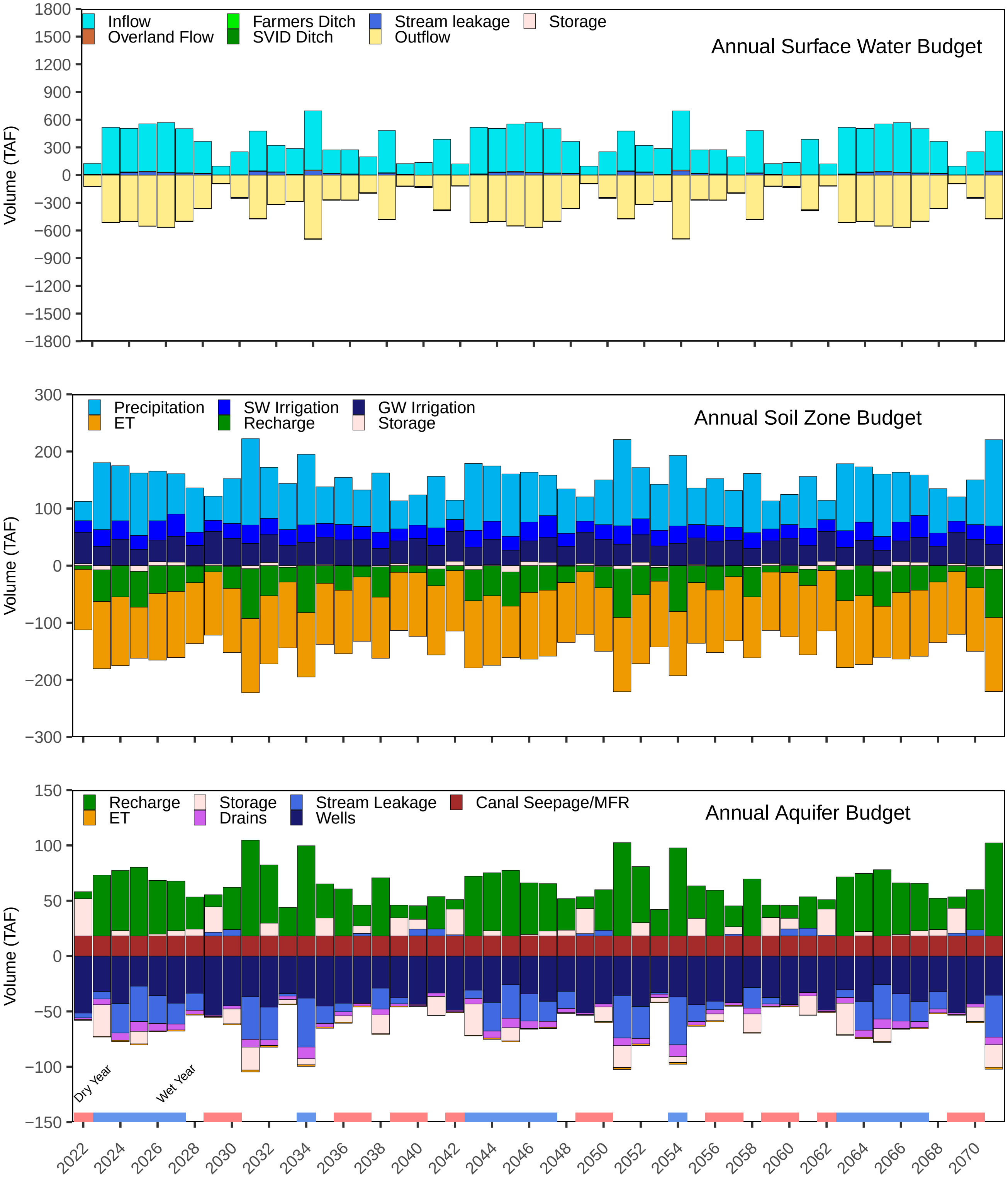

Figure 5: Scenario: Future Basecase. Annual water budgets for the three conceptual subsystems used to represent the hydrology of the Basin (the surface water system, the soil zone, and the aquifer) for 50 potential future years, with future climate data constructed from the past climate data of water years 1991-2011.

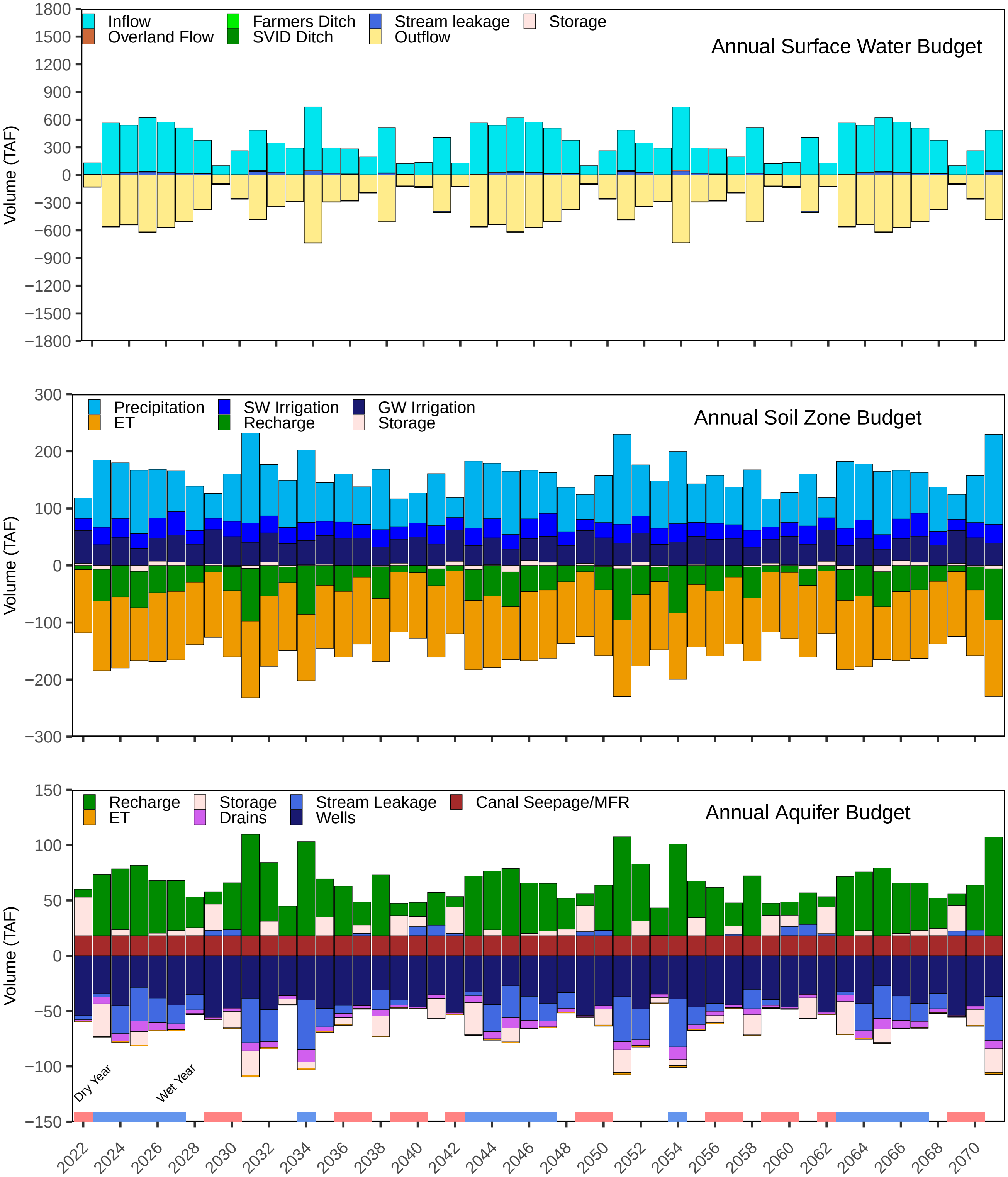

Figure 6: Scenario: Near Future (2030). Annual water budgets for the three conceptual subsystems used to represent the hydrology of the Basin (the surface water system, the soil zone, and the aquifer) for 50 potential future years, with basecsae future input data multiplied by change factors for the 2030 (Near) future climate scenario.

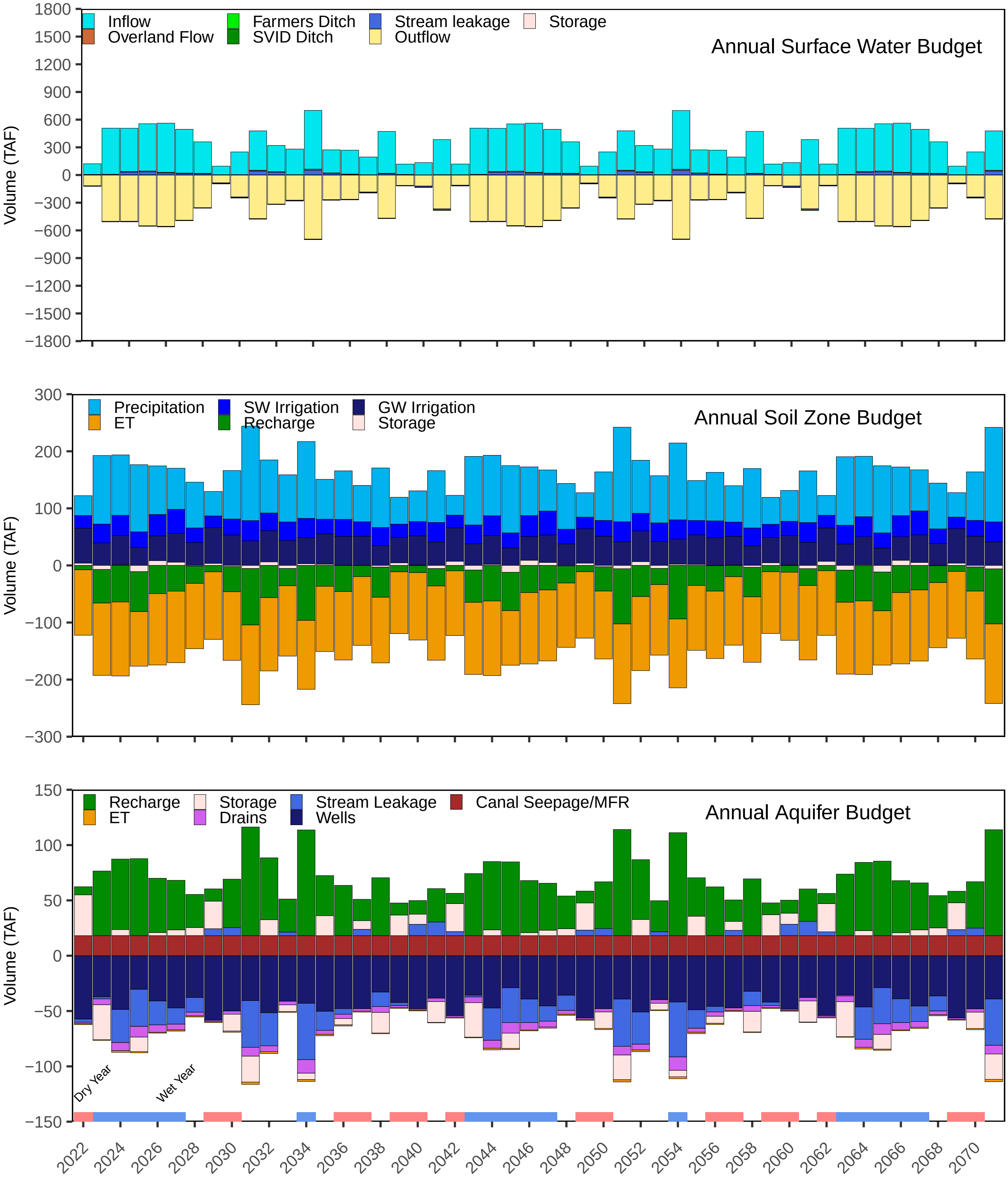

Figure 7: Scenario: Far Future (2070), Central Tendency.Annual water budgets for the three conceptual subsystems used to represent the hydrology of the Basin (the surface water system, the soil zone, and the aquifer) for 50 potential future years, with basecsae future input data multiplied by change factors for the 2070 Central Tendency (Far) future climate scenario.

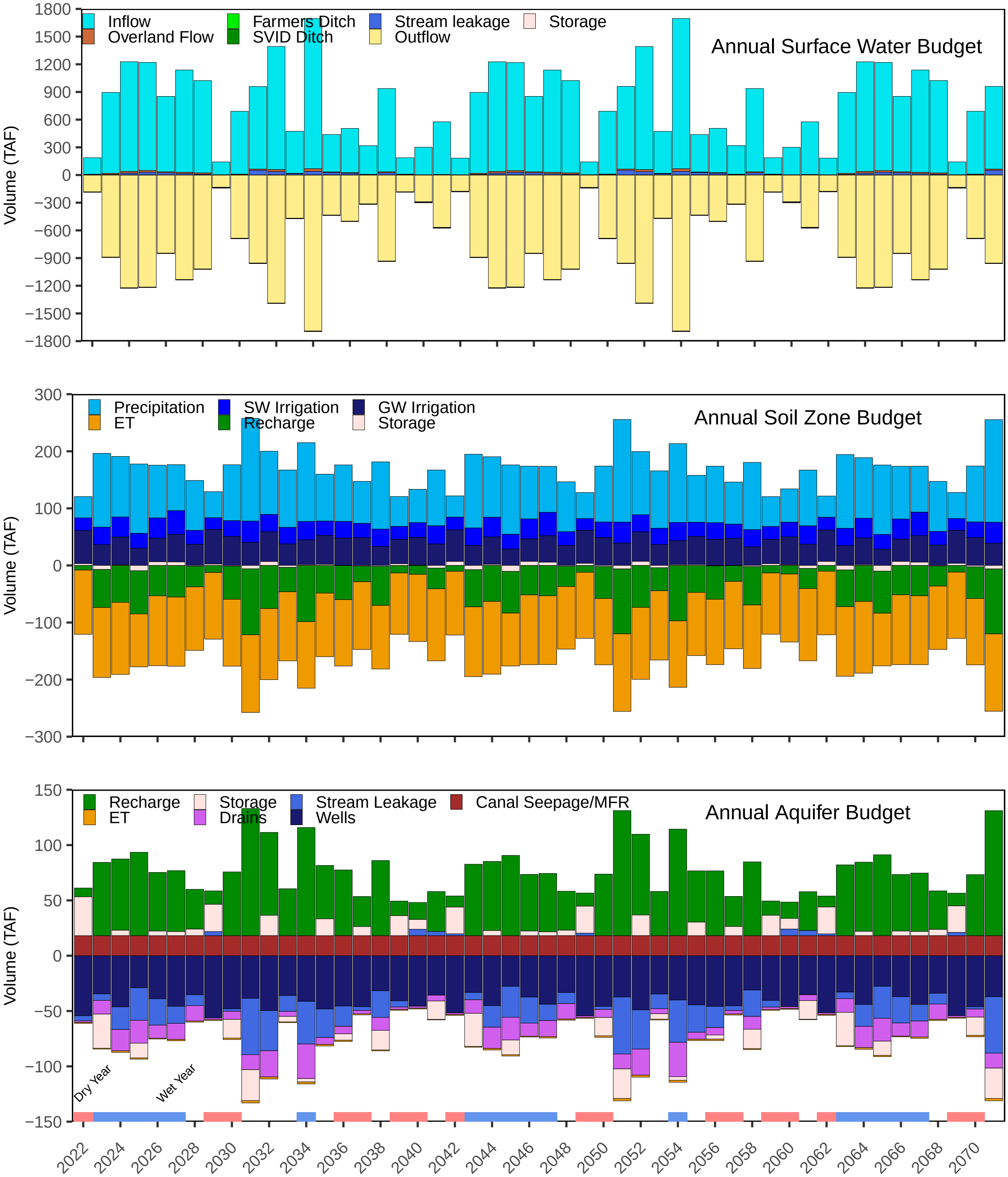

Figure 8: Scenario: Far Future (2070), Wet. Annual water budgets for the three conceptual subsystems used to represent the hydrology of the Basin (the surface water system, the soil zone, and the aquifer) for 50 potential future years, with basecsae future input data multiplied by change factors for the 2070 Wet with Moderate Warming (Wet) future climate scenario.

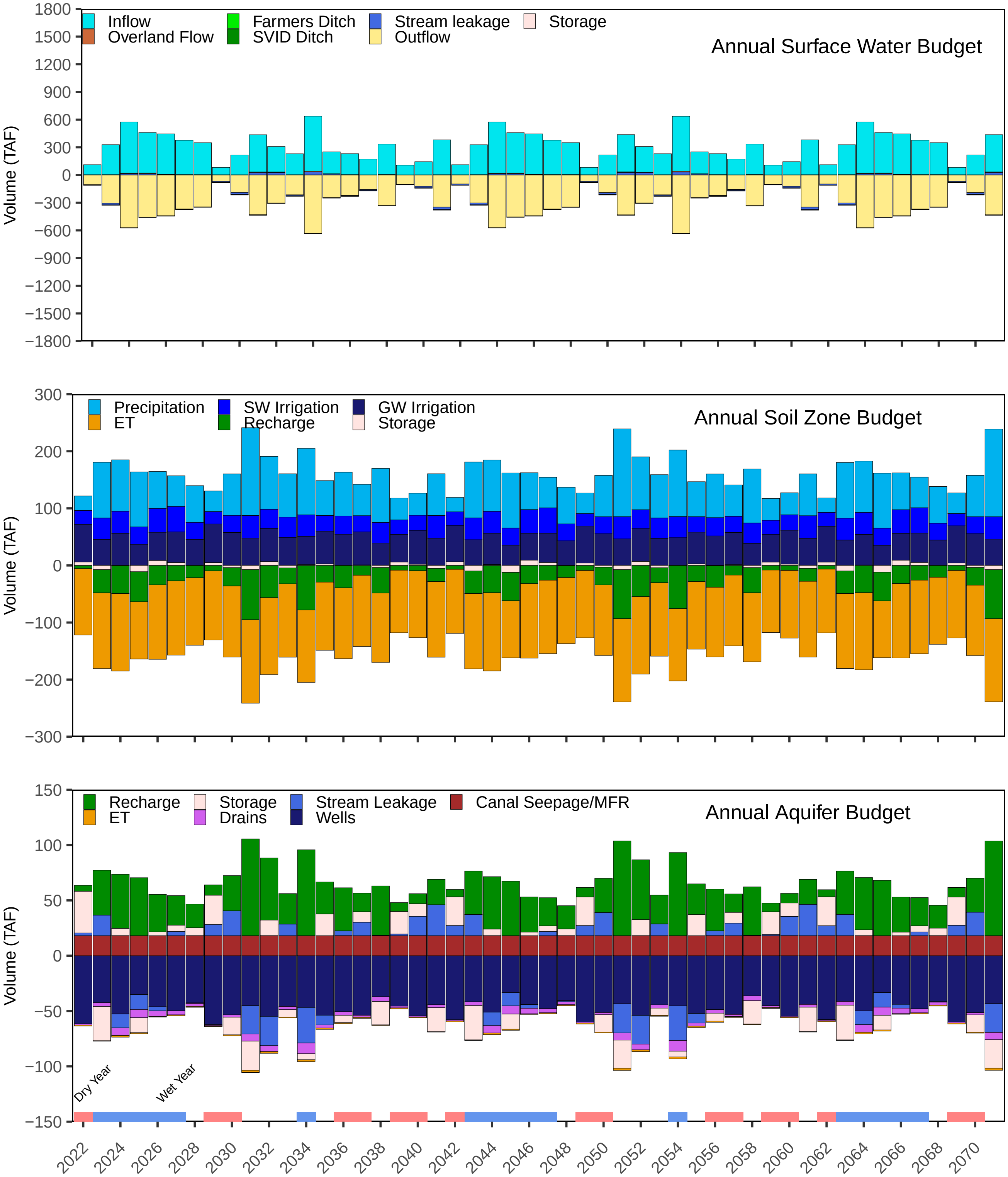

Figure 9: Scenario: Far Future (2070), Dry. Annual water budgets for the three conceptual subsystems used to represent the hydrology of the Basin (the surface water system, the soil zone, and the aquifer) for 50 potential future years, with basecsae future input data multiplied by change factors for the 2070 Dry with Extreme Warming (Dry) future climate scenario.

Table 5: The data used to build the 50-year future projected climate record is specified below, including the historical water year type. To account for leap days, some years were transposed.

Historical Year	Future Year	Water Year Type
1994	2022	Critical
1995	2023	Wet
1996	2024	Wet
1997	2025	Wet
1998	2026	Wet
1999	2027	Wet
2000	2028	Below Normal
2001	2029	Critical
2002	2030	Dry
2003	2031	Above Normal
2004	2032	Above Normal
2010	2033	Below Normal
2006	2034	Wet
2007	2035	Below Normal
2008	2036	Dry
2009	2037	Dry
2011	2038	Above Normal
1991	2039	Critical
1992	2040	Critical
1993	2041	Above Normal
1994	2042	Critical
1995	2043	Wet
1996	2044	Wet
1997	2045	Wet
1998	2046	Wet
1999	2047	Wet
2000	2048	Below Normal
2001	2049	Critical
2002	2050	Dry
2003	2051	Above Normal
2004	2052	Above Normal
2010	2053	Below Normal
2006	2054	Wet
2007	2055	Below Normal
2008	2056	Dry
2009	2057	Dry
2011	2058	Above Normal
1991	2059	Critical
1992	2060	Critical
1993	2061	Above Normal
1994	2062	Critical
1995	2063	Wet
1996	2064	Wet
1997	2065	Wet
1998	2066	Wet
1999	2067	Wet
2000	2068	Below Normal
2001	2069	Critical
2002	2070	Dry
2003	2071	Above Normal

Future Water Budget - Annual and Summary Tables

Future Basecase Stream Subsystem

Table 6: Annual flow volumes (TAF). Scenario: Future Basecase; Subsystem: Streams.

Water Year	Inflow	Overland	Farmers Div.	SVID Div.	Stream Leakage	Outflow	Storage
2022	118	2	-2	-4	4	-119	1
2023	504	5	-2	-4	7	-510	0
2024	472	6	-2	-4	27	-500	0
2025	515	9	-2	-4	32	-550	0
2026	537	7	-2	-4	25	-563	-0
2027	478	5	-2	-4	19	-497	0
2028	345	4	-2	-4	16	-358	0
2029	94	1	-2	-4	-3	-88	1
2030	249	3	-2	-4	-6	-240	0
2031	431	7	-2	-4	38	-470	-0
2032	287	5	-2	-4	30	-316	0
2033	283	3	-2	-4	2	-282	0
2034	640	10	-2	-4	44	-689	0
2035	253	3	-2	-4	16	-267	1
2036	262	4	-2	-4	8	-268	0
2037	195	2	-2	-4	-2	-189	0
2038	457	5	-2	-4	19	-476	-0
2039	115	2	-2	-4	5	-117	0
2040	133	1	-2	-4	-6	-123	1
2041	384	3	-2	-4	-6	-375	-0
2042	118	1	-2	-4	-1	-114	1
2043	504	5	-2	-4	8	-511	0
2044	472	6	-2	-4	26	-499	0
2045	515	8	-2	-4	30	-548	0
2046	537	7	-2	-4	24	-562	0
2047	479	5	-2	-4	18	-497	-0
2048	345	4	-2	-4	16	-358	0
2049	94	1	-2	-4	-2	-89	1
2050	249	3	-2	-4	-5	-241	0
2051	431	7	-2	-4	38	-471	-0
2052	287	5	-2	-4	29	-316	0
2053	283	3	-2	-4	2	-282	0
2054	640	10	-2	-4	43	-688	0
2055	253	3	-2	-4	15	-266	1
2056	262	4	-2	-4	8	-268	0
2057	195	2	-2	-4	-2	-190	0
2058	458	5	-2	-4	19	-476	0
2059	115	2	-2	-4	6	-118	0
2060	133	1	-2	-4	-6	-123	1
2061	384	3	-2	-4	-7	-374	0
2062	118	1	-2	-4	-1	-114	1
2063	504	5	-2	-4	7	-510	-0
2064	472	6	-2	-4	26	-499	0
2065	515	8	-2	-4	31	-549	0
2066	537	7	-2	-4	25	-563	-0
2067	479	5	-2	-4	18	-497	0
2068	345	4	-2	-4	16	-359	0
2069	94	1	-2	-4	-3	-89	1
2070	249	3	-2	-4	-6	-241	0
2071	431	7	-2	-4	38	-470	0
Minimum	94	1	-2	-4	-7	-689	-0
25th %ile	249	3	-2	-4	-1	-499	0
Median	345	4	-2	-4	15	-358	0
Mean	345	4	-2	-4	14	-358	0
75th %ile	479	6	-2	-4	26	-240	0
Maximum	640	10	-2	-4	44	-88	1

Future Basecase Soil Zone Subsystem

Table 7: Annual flow volumes (TAF). Scenario: Future Basecase; Subsystem: Soil Zone.

Water Year	Precip	SW Irrig.	GW Irrig.	ET	Recharge	Storage
2022	34	21	55	-106	-6	3
2023	117	29	34	-118	-55	-7
2024	97	32	45	-120	-55	1
2025	109	25	28	-90	-62	-10
2026	87	34	38	-117	-49	7
2027	71	39	45	-116	-45	6
2028	78	23	35	-106	-29	-1
2029	42	19	57	-111	-11	3
2030	78	26	48	-112	-38	-1
2031	151	32	39	-130	-87	-5
2032	90	28	49	-119	-53	6
2033	81	27	36	-115	-26	-3
2034	124	30	40	-113	-82	1
2035	64	24	48	-107	-31	2
2036	82	27	45	-111	-43	-0
2037	64	23	45	-113	-19	-1
2038	104	28	30	-107	-53	-2
2039	49	21	40	-102	-12	4
2040	53	24	46	-112	-12	1
2041	90	31	35	-121	-29	-6
2042	34	21	52	-106	-9	8
2043	117	29	33	-118	-54	-7
2044	97	32	44	-122	-53	2
2045	109	24	27	-90	-60	-11
2046	87	33	36	-117	-47	7
2047	71	39	43	-115	-43	6
2048	78	23	33	-105	-29	-1
2049	42	19	55	-110	-11	4
2050	78	26	46	-111	-37	-2
2051	151	32	37	-130	-85	-6
2052	90	28	48	-121	-51	6
2053	81	27	35	-115	-24	-3
2054	124	30	39	-113	-80	0
2055	64	24	46	-106	-30	2
2056	82	27	43	-110	-42	-1
2057	64	23	44	-112	-19	-0
2058	104	28	30	-107	-52	-3
2059	49	21	40	-102	-11	4
2060	53	24	47	-113	-12	1
2061	90	31	35	-121	-29	-6
2062	34	21	52	-106	-9	8
2063	117	29	32	-117	-54	-7
2064	97	32	43	-120	-53	1
2065	109	24	27	-89	-60	-11
2066	87	33	36	-117	-47	7
2067	71	39	43	-116	-43	6
2068	78	23	34	-106	-28	-0
2069	42	19	55	-110	-10	4
2070	78	26	46	-111	-37	-2
2071	151	32	37	-130	-85	-6
Minimum	34	19	27	-130	-87	-11
25th %ile	64	23	35	-117	-53	-3
Median	81	27	41	-113	-42	0
Mean	84	27	41	-112	-40	-0
75th %ile	102	31	46	-107	-25	4
Maximum	151	39	57	-89	-6	8

Future Basecase Aquifer Subsystem

Table 8: Annual flow volumes (TAF). Scenario: Future Basecase; Subsystem: Aquifer.

Water Year	Recharge	ET	STorage	Drains	Stream Leakge	Wells	Canals, MFR
2022	6	-1	34	-1	-4	-51	18
2023	55	-1	-29	-5	-7	-32	18
2024	54	-1	5	-6	-27	-43	18
2025	62	-1	-11	-9	-32	-27	18
2026	48	-1	2	-7	-25	-36	18
2027	45	-1	5	-5	-19	-42	18
2028	29	-1	6	-4	-16	-33	18
2029	11	-1	23	-1	3	-53	18
2030	38	-1	-13	-3	6	-45	18
2031	87	-2	-21	-7	-38	-37	18
2032	53	-2	12	-5	-30	-46	18
2033	26	-1	-4	-3	-2	-34	18
2034	82	-2	-5	-11	-44	-38	18
2035	31	-1	16	-3	-16	-45	18
2036	43	-1	-6	-4	-8	-42	18
2037	19	-1	7	-2	2	-43	18
2038	53	-1	-17	-5	-19	-29	18
2039	11	-1	16	-2	-5	-38	18
2040	12	-1	9	-1	6	-44	18
2041	29	-0	-17	-3	6	-33	18
2042	9	-1	23	-1	1	-49	18
2043	54	-1	-28	-5	-8	-31	18
2044	52	-1	5	-6	-26	-42	18
2045	59	-1	-12	-9	-30	-26	18
2046	47	-1	1	-7	-24	-34	18
2047	43	-1	4	-5	-18	-41	18
2048	28	-1	5	-4	-16	-32	18
2049	11	-1	23	-1	2	-51	18
2050	37	-1	-13	-3	5	-43	18
2051	84	-2	-20	-7	-38	-35	18
2052	51	-2	12	-5	-29	-45	18
2053	24	-1	-4	-3	-2	-33	18
2054	80	-2	-5	-11	-43	-37	18
2055	30	-1	16	-3	-15	-44	18
2056	41	-1	-6	-4	-8	-41	18
2057	19	-1	7	-2	2	-42	18
2058	52	-1	-17	-5	-19	-28	18
2059	11	-1	17	-2	-6	-37	18
2060	12	-1	10	-1	6	-44	18
2061	28	-0	-17	-3	7	-33	18
2062	9	-1	23	-1	1	-49	18
2063	53	-1	-28	-5	-7	-30	18
2064	52	-1	4	-6	-26	-41	18
2065	60	-1	-12	-9	-31	-26	18
2066	47	-1	1	-7	-25	-34	18
2067	43	-1	5	-5	-18	-41	18
2068	28	-1	6	-4	-16	-32	18
2069	10	-1	22	-1	3	-51	18
2070	36	-1	-13	-3	6	-43	18
2071	84	-2	-20	-7	-38	-35	18
Minimum	6	-2	-29	-11	-44	-53	18
25th %ile	25	-1	-13	-6	-26	-43	18
Median	42	-1	3	-4	-15	-39	18
Mean	40	-1	0	-4	-14	-39	18
75th %ile	53	-1	9	-3	1	-33	18
Maximum	87	-0	34	-1	7	-26	18

Near Future (2030) Stream Subsystem

Table 9: Annual flow volumes (TAF). Scenario: Near Future (2030); Subsystem: Streams.

Water Year	Inflow	Overland	Farmers Div.	SVID Div.	Stream Leakage	Outflow	Storage
2022	126	2	-2	-4	4	-127	1
2023	555	6	-2	-4	3	-558	0
2024	510	7	-2	-4	25	-536	0
2025	581	9	-2	-4	30	-615	0
2026	543	7	-2	-4	22	-566	0
2027	487	5	-2	-4	17	-503	0
2028	359	3	-2	-4	14	-371	0
2029	99	1	-2	-4	-5	-91	2
2030	260	3	-2	-4	-5	-252	0
2031	439	7	-2	-4	40	-481	-0
2032	313	5	-2	-4	29	-341	0
2033	288	3	-2	-4	0	-285	0
2034	683	11	-2	-4	45	-733	0
2035	274	4	-2	-4	17	-289	1
2036	272	4	-2	-4	7	-278	0
2037	193	2	-2	-4	-2	-188	0
2038	488	6	-2	-4	18	-505	-0
2039	116	2	-2	-4	5	-117	0
2040	135	1	-2	-4	-8	-123	1
2041	405	3	-2	-4	-10	-393	0
2042	126	1	-2	-4	-2	-121	1
2043	555	6	-2	-4	3	-559	-0
2044	510	6	-2	-4	24	-536	0
2045	581	9	-2	-4	29	-614	0
2046	544	7	-2	-4	22	-566	0
2047	487	5	-2	-4	16	-502	0
2048	359	3	-2	-4	14	-371	0
2049	99	1	-2	-4	-4	-92	1
2050	260	3	-2	-4	-5	-252	0
2051	440	7	-2	-4	41	-482	0
2052	313	5	-2	-4	28	-341	0
2053	288	3	-2	-4	-0	-285	-0
2054	683	11	-2	-4	44	-732	0
2055	274	4	-2	-4	16	-289	1
2056	272	4	-2	-4	7	-278	0
2057	193	2	-2	-4	-1	-189	0
2058	488	5	-2	-4	18	-505	-0
2059	116	2	-2	-4	5	-118	0
2060	135	1	-2	-4	-8	-123	1
2061	405	3	-2	-4	-10	-392	0
2062	126	1	-2	-4	-2	-121	1
2063	555	6	-2	-4	3	-558	-0
2064	510	7	-2	-4	24	-536	0
2065	582	9	-2	-4	30	-615	0
2066	544	7	-2	-4	22	-566	-0
2067	487	5	-2	-4	16	-503	0
2068	359	3	-2	-4	14	-371	0
2069	99	1	-2	-4	-4	-92	2
2070	260	3	-2	-4	-5	-252	0
2071	440	7	-2	-4	40	-481	0
Minimum	99	1	-2	-4	-10	-733	-0
25th %ile	260	3	-2	-4	-2	-536	0
Median	359	4	-2	-4	14	-371	0
Mean	364	5	-2	-4	12	-376	0
75th %ile	510	7	-2	-4	24	-252	0
Maximum	683	11	-2	-4	45	-91	2

Near Future (2030) Soil Zone Subsystem

Table 10: Annual flow volumes (TAF). Scenario: Near Future (2030); Subsystem: Soil Zone.

Water Year	Precip	SW Irrig.	GW Irrig.	ET	Recharge	Storage
2022	36	21	58	-111	-7	3
2023	117	31	36	-122	-56	-7
2024	98	34	48	-125	-55	0
2025	111	26	30	-93	-64	-10
2026	85	35	41	-121	-48	7
2027	71	41	48	-120	-45	6
2028	78	24	37	-110	-28	-1
2029	43	20	60	-115	-11	3
2030	83	27	50	-116	-43	-1
2031	158	34	40	-134	-92	-5
2032	90	30	51	-124	-53	6
2033	83	29	38	-119	-27	-3
2034	127	32	42	-117	-85	1
2035	68	25	50	-110	-35	2
2036	84	28	48	-115	-45	-0
2037	66	24	48	-117	-21	-0
2038	106	30	32	-111	-55	-2
2039	49	22	42	-105	-12	4
2040	53	24	49	-115	-13	1
2041	91	32	37	-125	-30	-6
2042	36	21	55	-110	-9	7
2043	117	31	35	-122	-54	-7
2044	98	33	47	-126	-53	1
2045	111	26	29	-93	-61	-11
2046	85	35	39	-121	-46	8
2047	71	40	45	-120	-43	6
2048	78	24	35	-108	-28	-1
2049	43	20	57	-113	-11	4
2050	83	27	48	-115	-41	-2
2051	158	33	39	-134	-90	-6
2052	90	29	51	-125	-51	6
2053	83	28	37	-120	-25	-3
2054	127	32	41	-116	-83	0
2055	68	24	49	-110	-33	2
2056	84	28	45	-113	-44	-1
2057	66	24	47	-116	-21	0
2058	106	30	32	-110	-54	-3
2059	49	22	42	-105	-11	4
2060	53	24	50	-116	-12	1
2061	91	32	37	-126	-29	-6
2062	36	21	55	-110	-9	7
2063	117	31	34	-121	-54	-7
2064	98	34	46	-124	-53	1
2065	111	25	28	-92	-62	-11
2066	85	35	39	-121	-46	8
2067	71	40	46	-120	-43	6
2068	78	24	36	-109	-28	-0
2069	43	20	57	-114	-11	4
2070	83	27	48	-115	-41	-2
2071	158	33	39	-134	-90	-6
Minimum	36	20	28	-134	-92	-11
25th %ile	68	24	37	-121	-54	-3
Median	84	28	44	-116	-43	0
Mean	85	28	43	-116	-41	-0
75th %ile	104	32	49	-111	-26	4
Maximum	158	41	60	-92	-7	8

Near Future (2030) Aquifer Subsystem

Table 11: Annual flow volumes (TAF). Scenario: Near Future (2030); Subsystem: Aquifer.

Water Year	Recharge	ET	STorage	Drains	Stream Leakge	Wells	Canals, MFR
2022	7	-1	35	-1	-4	-54	18
2023	56	-1	-30	-6	-3	-34	18
2024	55	-1	5	-7	-25	-45	18
2025	64	-1	-12	-10	-30	-29	18
2026	48	-1	2	-7	-22	-38	18
2027	45	-1	5	-5	-17	-45	18
2028	28	-1	7	-3	-14	-35	18
2029	11	-1	24	-1	5	-56	18
2030	42	-1	-15	-3	5	-47	18
2031	92	-2	-22	-7	-40	-38	18
2032	53	-2	13	-5	-29	-49	18
2033	27	-1	-5	-3	-0	-36	18
2034	85	-2	-5	-11	-45	-40	18
2035	34	-1	17	-4	-17	-48	18
2036	45	-1	-6	-4	-7	-45	18
2037	21	-1	8	-2	2	-45	18
2038	55	-1	-18	-6	-18	-31	18
2039	12	-1	18	-2	-5	-40	18
2040	13	-1	9	-1	8	-46	18
2041	29	-0	-18	-3	10	-35	18
2042	9	-1	24	-1	2	-51	18
2043	54	-1	-29	-6	-3	-33	18
2044	53	-1	5	-7	-24	-44	18
2045	61	-1	-13	-9	-29	-27	18
2046	46	-1	2	-7	-22	-37	18
2047	43	-1	4	-5	-16	-43	18
2048	28	-1	6	-3	-14	-33	18
2049	11	-1	23	-1	4	-54	18
2050	41	-1	-14	-3	5	-45	18
2051	89	-2	-21	-7	-41	-37	18
2052	51	-2	13	-5	-28	-48	18
2053	25	-1	-5	-3	0	-35	18
2054	83	-2	-5	-11	-44	-39	18
2055	33	-1	16	-4	-16	-46	18
2056	44	-1	-7	-4	-7	-43	18
2057	21	-1	8	-2	1	-44	18
2058	54	-1	-18	-5	-18	-30	18
2059	11	-1	18	-2	-5	-40	18
2060	12	-1	10	-1	8	-47	18
2061	29	-0	-18	-3	10	-35	18
2062	9	-1	24	-1	2	-51	18
2063	53	-1	-29	-6	-3	-33	18
2064	53	-1	5	-7	-24	-43	18
2065	61	-1	-12	-9	-30	-27	18
2066	46	-1	2	-7	-22	-36	18
2067	43	-1	5	-5	-16	-43	18
2068	27	-1	7	-3	-14	-34	18
2069	11	-1	23	-1	4	-54	18
2070	41	-1	-14	-3	5	-46	18
2071	89	-2	-21	-7	-40	-37	18
Minimum	7	-2	-30	-11	-45	-56	18
25th %ile	25	-1	-14	-7	-24	-46	18
Median	43	-1	3	-4	-14	-41	18
Mean	41	-1	-0	-5	-12	-41	18
75th %ile	54	-1	10	-3	2	-35	18
Maximum	92	-0	35	-1	10	-27	18

Far Future (2070), Central Tendency Stream Subsystem

Table 12: Annual flow volumes (TAF). Scenario: Far Future (2070), Central Tendency; Subsystem: Streams.

Water Year	Inflow	Overland	Farmers Div.	SVID Div.	Stream Leakage	Outflow	Storage
2022	116	1	-2	-4	3	-116	1
2023	500	5	-2	-4	2	-502	-0
2024	469	7	-2	-4	30	-501	0
2025	512	9	-2	-4	34	-550	0
2026	533	7	-2	-4	22	-555	0
2027	475	5	-2	-4	15	-489	0
2028	342	3	-2	-4	13	-354	0
2029	93	1	-2	-4	-6	-84	2
2030	247	3	-2	-4	-7	-237	0
2031	428	8	-2	-4	42	-472	-0
2032	284	5	-2	-4	30	-314	0
2033	278	3	-2	-4	-3	-272	0
2034	637	12	-2	-4	51	-694	0
2035	251	3	-2	-4	17	-267	1
2036	259	4	-2	-4	5	-263	0
2037	193	2	-2	-4	-6	-184	0
2038	454	5	-2	-4	13	-466	-0
2039	113	2	-2	-4	3	-112	0
2040	132	1	-2	-4	-10	-118	1
2041	380	3	-2	-4	-12	-366	0
2042	116	1	-2	-4	-4	-110	1
2043	501	5	-2	-4	2	-502	0
2044	470	7	-2	-4	29	-500	0
2045	512	9	-2	-4	32	-548	0
2046	533	7	-2	-4	21	-556	-0
2047	475	5	-2	-4	14	-489	0
2048	342	3	-2	-4	14	-354	0
2049	93	1	-2	-4	-5	-85	2
2050	247	3	-2	-4	-7	-238	0
2051	428	8	-2	-4	43	-473	-0
2052	285	5	-2	-4	29	-314	0
2053	278	3	-2	-4	-4	-272	0
2054	637	12	-2	-4	50	-693	0
2055	251	4	-2	-4	17	-267	1
2056	259	4	-2	-4	5	-263	0
2057	193	2	-2	-4	-5	-185	0
2058	454	5	-2	-4	13	-466	0
2059	113	2	-2	-4	3	-113	0
2060	132	1	-2	-4	-10	-118	1
2061	381	3	-2	-4	-13	-365	0
2062	116	1	-2	-4	-3	-110	1
2063	501	5	-2	-4	1	-501	0
2064	469	7	-2	-4	29	-500	0
2065	512	9	-2	-4	33	-549	0
2066	533	7	-2	-4	21	-556	0
2067	476	5	-2	-4	14	-489	0
2068	343	3	-2	-4	13	-354	0
2069	93	1	-2	-4	-5	-85	2
2070	247	3	-2	-4	-7	-238	0
2071	428	8	-2	-4	42	-472	-0
Minimum	93	1	-2	-4	-13	-694	-0
25th %ile	247	3	-2	-4	-4	-500	0
Median	342	4	-2	-4	13	-354	0
Mean	342	5	-2	-4	12	-354	0
75th %ile	475	7	-2	-4	27	-237	0
Maximum	637	12	-2	-4	51	-84	2

Far Future (2070), Central Tendency Soil Zone Subsystem

Table 13: Annual flow volumes (TAF). Scenario: Far Future (2070), Central Tendency; Subsystem: Soil Zone.

Water Year	Precip	SW Irrig.	GW Irrig.	ET	Recharge	Storage
2022	35	22	61	-115	-7	4
2023	120	33	39	-127	-59	-7
2024	106	35	51	-130	-64	1
2025	118	27	32	-96	-70	-11
2026	85	37	43	-125	-49	8
2027	72	42	50	-125	-45	6
2028	80	26	40	-115	-30	-1
2029	43	21	63	-118	-11	3
2030	85	28	53	-120	-44	-2
2031	166	35	43	-140	-99	-5
2032	93	31	54	-129	-56	6
2033	83	33	43	-123	-30	-5
2034	135	34	46	-121	-96	3
2035	70	26	53	-114	-36	2
2036	85	30	51	-120	-46	0
2037	64	25	51	-121	-19	0
2038	104	32	35	-115	-53	-3
2039	47	23	45	-108	-11	5
2040	54	25	51	-118	-12	1
2041	91	35	41	-130	-30	-5
2042	35	22	59	-113	-9	7
2043	120	33	38	-126	-57	-8
2044	106	35	50	-131	-62	2
2045	118	27	30	-96	-67	-12
2046	85	37	41	-125	-47	9
2047	72	42	48	-124	-43	5
2048	80	26	38	-113	-30	-1
2049	43	20	60	-117	-11	4
2050	85	28	51	-119	-42	-2
2051	166	35	41	-140	-97	-6
2052	93	31	54	-130	-54	7
2053	83	32	42	-124	-28	-5
2054	135	34	44	-121	-94	2
2055	70	25	52	-114	-35	2
2056	85	30	48	-118	-44	-0
2057	64	25	50	-120	-20	1
2058	104	31	34	-115	-52	-3
2059	47	23	44	-108	-11	5
2060	54	25	52	-119	-12	1
2061	91	34	40	-131	-29	-6
2062	35	22	58	-113	-9	7
2063	120	33	37	-126	-56	-8
2064	106	35	49	-129	-62	1
2065	118	27	30	-95	-68	-11
2066	85	37	41	-125	-47	9
2067	72	42	48	-125	-43	5
2068	80	25	38	-114	-29	-0
2069	43	20	60	-117	-11	4
2070	85	28	51	-119	-42	-3
2071	166	35	41	-140	-96	-6
Minimum	35	20	30	-140	-99	-12
25th %ile	70	25	41	-126	-56	-5
Median	85	30	47	-120	-43	1
Mean	88	30	46	-120	-44	-0
75th %ile	106	35	51	-115	-29	4
Maximum	166	42	63	-95	-7	9

Far Future (2070), Central Tendency Aquifer Subsystem

Table 14: Annual flow volumes (TAF). Scenario: Far Future (2070), Central Tendency; Subsystem: Aquifer.

Water Year	Recharge	ET	STorage	Drains	Stream Leakge	Wells	Canals, MFR
2022	7	-1	37	-1	-3	-57	18
2023	58	-1	-32	-5	-2	-37	18
2024	64	-2	5	-7	-30	-49	18
2025	70	-1	-13	-10	-34	-30	18
2026	49	-1	3	-7	-22	-41	18
2027	45	-1	5	-5	-15	-47	18
2028	30	-1	7	-3	-13	-38	18
2029	11	-1	25	-1	6	-58	18
2030	44	-1	-15	-3	7	-50	18
2031	98	-2	-23	-8	-42	-41	18
2032	56	-2	14	-5	-30	-52	18
2033	30	-1	-6	-3	3	-41	18
2034	96	-2	-6	-12	-51	-43	18
2035	36	-1	18	-4	-17	-50	18
2036	45	-1	-6	-4	-5	-48	18
2037	19	-1	8	-2	6	-48	18
2038	52	-1	-19	-5	-13	-33	18
2039	11	-1	19	-2	-3	-42	18
2040	12	-1	9	-1	10	-48	18
2041	30	-0	-19	-3	12	-38	18
2042	9	-1	25	-1	4	-54	18
2043	56	-1	-31	-5	-2	-36	18
2044	62	-2	5	-7	-29	-47	18
2045	67	-1	-14	-9	-32	-29	18
2046	47	-1	3	-7	-21	-39	18
2047	43	-1	5	-5	-14	-45	18
2048	30	-1	6	-3	-14	-36	18
2049	11	-1	25	-1	5	-56	18
2050	42	-1	-15	-3	7	-48	18
2051	96	-2	-22	-8	-43	-39	18
2052	54	-2	15	-5	-29	-51	18
2053	28	-1	-6	-3	4	-40	18
2054	93	-2	-6	-12	-50	-42	18
2055	35	-1	18	-4	-17	-49	18
2056	44	-1	-6	-4	-5	-46	18
2057	19	-1	8	-2	5	-47	18
2058	51	-1	-19	-5	-13	-32	18
2059	11	-1	19	-2	-3	-42	18
2060	12	-1	10	-1	10	-48	18
2061	29	-0	-19	-3	13	-38	18
2062	9	-1	25	-1	3	-54	18
2063	56	-1	-32	-5	-1	-35	18
2064	62	-2	5	-7	-29	-46	18
2065	67	-1	-13	-10	-33	-29	18
2066	47	-1	3	-7	-21	-39	18
2067	42	-1	5	-5	-14	-45	18
2068	29	-1	7	-3	-13	-36	18
2069	10	-1	24	-1	5	-56	18
2070	42	-1	-15	-3	7	-48	18
2071	96	-2	-23	-8	-42	-39	18
Minimum	7	-2	-32	-12	-51	-58	18
25th %ile	28	-1	-15	-7	-27	-48	18
Median	43	-1	4	-4	-13	-44	18
Mean	43	-1	-0	-5	-12	-44	18
75th %ile	56	-1	10	-3	4	-38	18
Maximum	98	-0	37	-1	13	-29	18

Far Future (2070), WMW Stream Subsystem

Table 15: Annual flow volumes (TAF). Scenario: Far Future (2070), Wet; Subsystem: Streams.

Water Year	Inflow	Overland	Farmers Div.	SVID Div.	Stream Leakage	Outflow	Storage
2022	180	2	-2	-4	5	-182	1
2023	877	12	-2	-4	6	-889	-0
2024	1188	18	-2	-4	20	-1221	0
2025	1171	19	-2	-4	29	-1214	0
2026	817	11	-2	-4	24	-846	-0
2027	1109	14	-2	-4	16	-1132	-0
2028	1000	13	-2	-4	10	-1017	0
2029	139	1	-2	-4	-4	-132	1
2030	681	7	-2	-4	2	-684	0
2031	895	13	-2	-4	51	-953	0
2032	1334	22	-2	-4	36	-1387	0
2033	455	5	-2	-4	14	-468	-0
2034	1628	29	-2	-4	39	-1690	0
2035	406	6	-2	-4	26	-433	1
2036	480	7	-2	-4	18	-499	0
2037	311	3	-2	-4	3	-312	0
2038	902	11	-2	-4	24	-931	0
2039	179	2	-2	-4	6	-181	0
2040	298	2	-2	-4	-6	-289	1
2041	571	5	-2	-4	-4	-567	0
2042	180	1	-2	-4	-2	-175	1
2043	877	12	-2	-4	7	-889	0
2044	1189	18	-2	-4	19	-1221	0
2045	1171	19	-2	-4	28	-1213	0
2046	817	11	-2	-4	24	-846	-0
2047	1109	14	-2	-4	15	-1132	0
2048	1000	13	-2	-4	10	-1017	0
2049	139	2	-2	-4	-2	-134	1
2050	681	7	-2	-4	3	-685	0
2051	896	13	-2	-4	52	-954	0
2052	1334	22	-2	-4	35	-1386	0
2053	455	4	-2	-4	13	-467	-0
2054	1628	29	-2	-4	38	-1690	0
2055	406	6	-2	-4	25	-433	1
2056	480	7	-2	-4	19	-499	-0
2057	311	3	-2	-4	4	-313	0
2058	902	11	-2	-4	24	-931	-0
2059	179	2	-2	-4	6	-182	0
2060	298	2	-2	-4	-6	-289	1
2061	571	5	-2	-4	-5	-566	0
2062	180	1	-2	-4	-2	-176	1
2063	877	12	-2	-4	6	-889	-0
2064	1189	18	-2	-4	20	-1221	0
2065	1171	19	-2	-4	29	-1214	0
2066	817	11	-2	-4	24	-846	0
2067	1109	14	-2	-4	15	-1132	-0
2068	1000	13	-2	-4	10	-1017	0
2069	139	1	-2	-4	-3	-133	1
2070	681	7	-2	-4	2	-685	0
2071	896	13	-2	-4	51	-954	-0
Minimum	139	1	-2	-4	-6	-1690	-0
25th %ile	406	4	-2	-4	4	-1103	0
Median	817	11	-2	-4	15	-846	0
Mean	746	10	-2	-4	15	-766	0
75th %ile	1082	13	-2	-4	24	-433	0
Maximum	1628	29	-2	-4	52	-132	1

Far Future (2070), WMW Soil Zone Subsystem

Table 16: Annual flow volumes (TAF). Scenario: Far Future (2070), Wet; Subsystem: Soil Zone.

Water Year	Precip	SW Irrig.	GW Irrig.	ET	Recharge	Storage
2022	37	22	58	-113	-8	3
2023	129	31	36	-123	-67	-7
2024	106	35	49	-126	-65	1
2025	122	26	30	-93	-76	-9
2026	92	35	41	-122	-53	6
2027	81	41	48	-121	-55	6
2028	87	24	37	-111	-36	-1
2029	46	21	60	-117	-12	2
2030	98	28	51	-117	-58	-1
2031	180	37	40	-136	-116	-6
2032	111	31	52	-125	-75	7
2033	101	29	38	-121	-43	-3
2034	138	32	43	-117	-98	1
2035	82	25	51	-111	-49	2
2036	99	29	48	-116	-60	-0
2037	74	25	49	-119	-27	-1
2038	118	31	33	-112	-68	-2
2039	52	23	43	-107	-13	3
2040	58	26	48	-118	-15	1
2041	98	32	38	-126	-36	-5
2042	37	22	55	-112	-10	7
2043	129	31	35	-122	-65	-7
2044	106	35	48	-128	-63	2
2045	122	26	29	-93	-73	-10
2046	92	35	39	-123	-51	7
2047	81	41	46	-121	-53	6
2048	87	24	35	-110	-35	-1
2049	46	21	58	-116	-12	4
2050	98	27	49	-116	-56	-2
2051	180	37	39	-136	-114	-6
2052	111	30	52	-126	-73	7
2053	101	29	36	-122	-40	-4
2054	138	32	42	-117	-97	1
2055	82	25	49	-111	-47	2
2056	99	29	46	-115	-58	-1
2057	74	25	48	-118	-27	-0
2058	118	30	32	-111	-67	-2
2059	52	22	43	-107	-13	3
2060	58	25	49	-119	-15	1
2061	98	32	37	-127	-35	-5
2062	37	22	55	-112	-10	7
2063	129	31	35	-122	-65	-8
2064	106	35	47	-126	-63	1
2065	122	26	29	-92	-74	-10
2066	92	35	39	-122	-51	7
2067	81	41	47	-121	-53	6
2068	87	24	36	-111	-35	-1
2069	46	21	58	-116	-12	4
2070	98	27	49	-116	-56	-2
2071	180	37	39	-136	-114	-6
Minimum	37	21	29	-136	-116	-10
25th %ile	81	25	37	-122	-66	-3
Median	98	29	45	-118	-53	0
Mean	96	29	44	-117	-51	-0
75th %ile	116	32	49	-112	-35	3
Maximum	180	41	60	-92	-8	7

Far Future (2070), WMW Aquifer Subsystem

Table 17: Annual flow volumes (TAF). Scenario: Far Future (2070), Wet; Subsystem: Aquifer.

Water Year	Recharge	ET	STorage	Drains	Stream Leakge	Wells	Canals, MFR
2022	8	-1	35	-1	-5	-54	18
2023	66	-1	-31	-12	-6	-34	18
2024	64	-2	5	-19	-20	-46	18
2025	75	-1	-13	-21	-29	-29	18
2026	53	-1	4	-12	-24	-39	18
2027	55	-1	4	-14	-16	-46	18
2028	36	-1	6	-14	-10	-35	18
2029	12	-1	25	-1	4	-56	18
2030	58	-1	-17	-7	-2	-48	18
2031	115	-2	-28	-13	-51	-38	18
2032	75	-2	18	-24	-36	-50	18
2033	42	-1	-5	-5	-14	-36	18
2034	98	-2	-3	-31	-39	-41	18
2035	48	-1	15	-6	-26	-48	18
2036	59	-1	-6	-7	-18	-45	18
2037	27	-1	8	-3	-3	-46	18
2038	68	-1	-18	-12	-24	-32	18
2039	13	-1	18	-2	-6	-41	18
2040	15	-1	9	-2	6	-46	18
2041	36	-0	-17	-5	4	-36	18
2042	10	-1	24	-1	2	-52	18
2043	65	-1	-30	-12	-7	-33	18
2044	63	-1	5	-19	-19	-45	18
2045	73	-1	-13	-21	-28	-28	18
2046	51	-1	4	-12	-24	-37	18
2047	53	-1	3	-15	-15	-44	18
2048	35	-1	5	-14	-10	-33	18
2049	12	-1	24	-2	2	-54	18
2050	56	-1	-17	-7	-3	-46	18
2051	113	-2	-27	-13	-52	-37	18
2052	73	-2	19	-24	-35	-49	18
2053	40	-1	-5	-4	-13	-35	18
2054	96	-2	-3	-31	-38	-40	18
2055	46	-1	12	-6	-25	-44	18
2056	59	-1	-4	-7	-19	-46	18
2057	27	-1	8	-3	-4	-45	18
2058	67	-1	-18	-12	-24	-31	18
2059	13	-1	18	-2	-6	-40	18
2060	15	-1	10	-2	6	-46	18
2061	35	-0	-17	-5	5	-35	18
2062	10	-1	24	-1	2	-52	18
2063	64	-1	-30	-12	-6	-33	18
2064	63	-2	4	-19	-20	-44	18
2065	73	-1	-13	-21	-29	-28	18
2066	51	-1	4	-12	-24	-37	18
2067	53	-1	4	-14	-15	-44	18
2068	35	-1	6	-14	-10	-34	18
2069	12	-1	24	-1	3	-54	18
2070	55	-1	-17	-7	-2	-46	18
2071	113	-2	-27	-13	-51	-37	18
Minimum	8	-2	-31	-31	-52	-56	18
25th %ile	35	-1	-16	-14	-24	-46	18
Median	53	-1	4	-12	-15	-42	18
Mean	51	-1	-0	-11	-15	-41	18
75th %ile	66	-1	9	-4	-4	-35	18
Maximum	115	-0	35	-1	6	-28	18

Far Future (2070), DEW Stream Subsystem

Table 18: Annual flow volumes (TAF). Scenario: Far Future (2070), Dry; Subsystem: Streams.

Water Year	Inflow	Overland	Farmers Div.	SVID Div.	Stream Leakage	Outflow	Storage
2022	109	1	-2	-4	-2	-104	2
2023	325	3	-2	-4	-19	-304	-0
2024	556	7	-2	-4	13	-570	0
2025	439	7	-2	-4	13	-455	1
2026	437	5	-2	-4	4	-440	0
2027	373	4	-2	-4	-4	-368	0
2028	347	3	-2	-4	1	-345	0
2029	80	1	-2	-4	-10	-67	2
2030	213	2	-2	-4	-22	-188	0
2031	403	6	-2	-4	26	-430	0
2032	276	5	-2	-4	27	-303	0
2033	227	3	-2	-4	-10	-214	-0
2034	596	9	-2	-4	32	-632	0
2035	238	3	-2	-4	9	-245	1
2036	227	3	-2	-4	-4	-220	0
2037	171	2	-2	-4	-12	-156	0
2038	332	4	-2	-4	-0	-330	0
2039	104	2	-2	-4	-2	-99	0
2040	142	1	-2	-4	-17	-120	1
2041	377	3	-2	-4	-28	-347	0
2042	109	1	-2	-4	-9	-97	2
2043	324	3	-2	-4	-19	-303	-0
2044	556	7	-2	-4	12	-569	0
2045	439	7	-2	-4	12	-453	1
2046	438	5	-2	-4	3	-440	0
2047	374	4	-2	-4	-4	-368	0
2048	347	3	-2	-4	1	-345	0
2049	80	1	-2	-4	-9	-68	2
2050	214	2	-2	-4	-21	-189	0
2051	404	6	-2	-4	26	-431	0
2052	277	5	-2	-4	26	-303	0
2053	227	3	-2	-4	-11	-214	-0
2054	596	9	-2	-4	31	-631	0
2055	238	3	-2	-4	9	-245	1
2056	227	3	-2	-4	-4	-220	0
2057	171	2	-2	-4	-11	-157	0
2058	332	4	-2	-4	-0	-330	-0
2059	105	2	-2	-4	-1	-100	0
2060	142	1	-2	-4	-17	-121	1
2061	378	3	-2	-4	-28	-346	0
2062	109	1	-2	-4	-9	-97	2
2063	324	3	-2	-4	-19	-303	-0
2064	556	7	-2	-4	12	-570	0
2065	439	7	-2	-4	13	-454	1
2066	438	5	-2	-4	3	-440	-0
2067	374	4	-2	-4	-3	-369	0
2068	347	3	-2	-4	1	-345	0
2069	80	1	-2	-4	-9	-68	2
2070	214	2	-2	-4	-21	-189	0
2071	404	6	-2	-4	26	-431	0
Minimum	80	1	-2	-4	-28	-632	-0
25th %ile	214	2	-2	-4	-11	-430	0
Median	325	3	-2	-4	-2	-303	0
Mean	305	4	-2	-4	-1	-303	1
75th %ile	404	5	-2	-4	11	-188	1
Maximum	596	9	-2	-4	32	-67	2

Far Future (2070), DEW Soil Zone Subsystem

Table 19: Annual flow volumes (TAF). Scenario: Far Future (2070), Dry; Subsystem: Soil Zone.

Water Year	Precip	SW Irrig.	GW Irrig.	ET	Recharge	Storage
2022	25	24	66	-116	-5	6
2023	98	38	45	-133	-41	-7
2024	90	39	56	-136	-49	0
2025	97	30	37	-100	-53	-11
2026	65	42	49	-130	-34	9
2027	54	45	54	-130	-27	5
2028	64	30	45	-118	-22	0
2029	36	22	68	-121	-9	5
2030	73	30	58	-125	-32	-4
2031	154	40	48	-146	-88	-7
2032	93	34	58	-135	-56	7
2033	76	36	49	-128	-28	-4
2034	117	37	50	-127	-78	1
2035	61	27	57	-119	-29	3
2036	77	32	54	-124	-39	1
2037	55	28	58	-125	-17	1
2038	95	36	39	-122	-45	-4
2039	38	25	48	-110	-8	6
2040	39	27	59	-117	-9	2
2041	73	40	48	-133	-23	-5
2042	25	24	63	-112	-7	6
2043	98	38	45	-132	-40	-10
2044	90	38	55	-137	-48	2
2045	97	30	35	-100	-50	-12
2046	65	41	47	-131	-32	9
2047	54	44	51	-129	-26	5
2048	64	30	43	-116	-21	0
2049	36	22	65	-118	-9	4
2050	73	30	55	-124	-31	-3
2051	154	39	46	-146	-86	-7
2052	93	33	57	-136	-54	7
2053	76	36	47	-129	-26	-4
2054	117	37	48	-127	-76	0
2055	61	27	55	-119	-28	3
2056	77	32	52	-122	-38	-0
2057	55	28	56	-124	-17	1
2058	95	36	39	-121	-44	-4
2059	38	25	48	-109	-8	6
2060	39	27	59	-118	-9	2
2061	73	39	48	-133	-23	-5
2062	25	24	63	-112	-7	6
2063	98	38	44	-131	-40	-10
2064	90	38	53	-135	-48	1
2065	97	30	35	-100	-50	-12
2066	65	41	47	-130	-32	9
2067	54	44	52	-129	-26	5
2068	64	30	44	-117	-21	0
2069	36	22	65	-118	-9	4
2070	73	30	55	-123	-31	-3
2071	154	39	46	-146	-86	-7
Minimum	25	22	35	-146	-88	-12
25th %ile	54	28	47	-131	-47	-4
Median	73	33	50	-124	-31	1
Mean	74	33	51	-124	-34	-0
75th %ile	94	38	57	-118	-21	5
Maximum	154	45	68	-100	-5	9

Far Future (2070), DEW Aquifer Subsystem

Table 20: Annual flow volumes (TAF). Scenario: Far Future (2070), Dry; Subsystem: Aquifer.

Water Year	Recharge	ET	STorage	Drains	Stream Leakge	Wells	Canals, MFR
2022	5	-1	38	-1	2	-62	18
2023	41	-1	-31	-3	19	-42	18
2024	49	-2	6	-7	-13	-53	18
2025	52	-1	-14	-7	-13	-35	18
2026	34	-1	3	-5	-4	-46	18
2027	27	-1	6	-4	4	-50	18
2028	21	-1	7	-3	-1	-43	18
2029	9	-1	26	-1	10	-62	18
2030	32	-1	-16	-2	22	-53	18
2031	87	-2	-26	-6	-26	-45	18
2032	56	-2	14	-5	-27	-55	18
2033	28	-1	-7	-3	10	-46	18
2034	78	-2	-5	-10	-32	-47	18
2035	29	-1	20	-3	-9	-54	18
2036	39	-1	-7	-3	4	-51	18
2037	17	-1	10	-2	12	-54	18
2038	45	-1	-21	-4	0	-37	18
2039	8	-1	20	-2	2	-46	18
2040	9	-1	11	-1	17	-54	18
2041	23	-0	-22	-3	28	-44	18
2042	7	-1	26	-1	9	-58	18
2043	39	-1	-31	-3	19	-42	18
2044	47	-2	6	-7	-12	-51	18
2045	49	-1	-14	-7	-12	-33	18
2046	32	-1	3	-5	-3	-44	18
2047	26	-1	5	-4	4	-48	18
2048	21	-1	6	-3	-1	-41	18
2049	9	-1	26	-1	9	-60	18
2050	31	-1	-16	-2	21	-51	18
2051	86	-2	-25	-6	-26	-43	18
2052	54	-2	14	-5	-26	-54	18
2053	26	-1	-7	-3	11	-44	18
2054	75	-2	-5	-10	-31	-45	18
2055	28	-1	19	-3	-9	-52	18
2056	38	-1	-7	-3	4	-49	18
2057	17	-1	10	-2	11	-53	18
2058	44	-1	-21	-4	0	-36	18
2059	8	-1	20	-2	1	-45	18
2060	9	-1	12	-1	17	-55	18
2061	23	-0	-22	-3	28	-44	18
2062	6	-1	26	-1	9	-58	18
2063	39	-1	-31	-3	19	-41	18
2064	47	-2	5	-7	-12	-50	18
2065	50	-1	-13	-7	-13	-33	18
2066	32	-1	3	-5	-3	-44	18
2067	26	-1	5	-4	3	-48	18
2068	21	-1	7	-3	-1	-41	18
2069	9	-1	26	-1	9	-60	18
2070	31	-1	-16	-2	21	-51	18
2071	86	-2	-26	-6	-26	-43	18
Minimum	5	-2	-31	-10	-32	-62	18
25th %ile	21	-1	-15	-5	-11	-53	18
Median	31	-1	4	-3	2	-47	18
Mean	34	-1	-0	-4	1	-48	18
75th %ile	47	-1	12	-2	11	-44	18
Maximum	87	-0	38	-1	28	-33	18

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