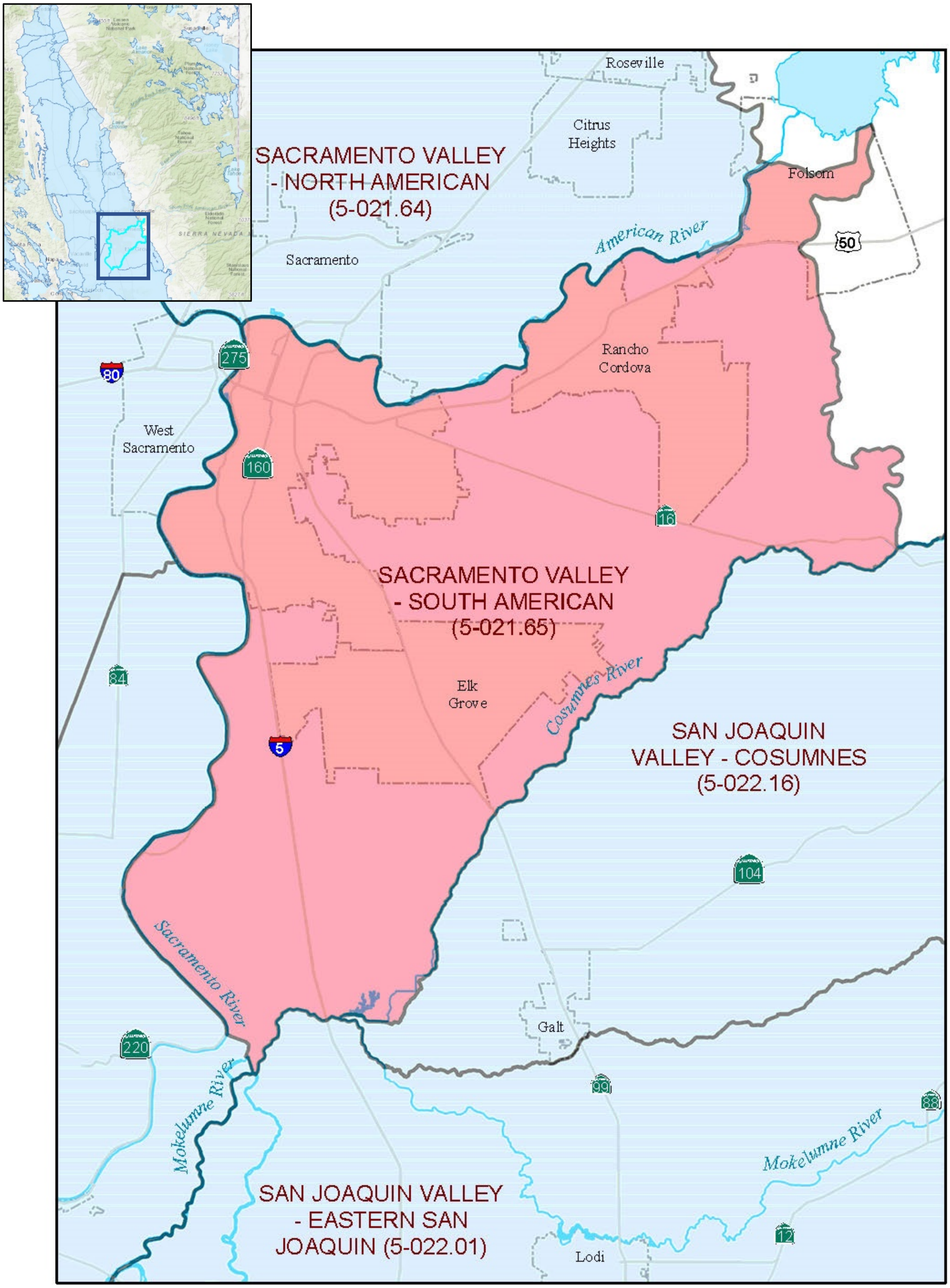
2018 SGMA Annual Report
South American Subbasin (5-021.65)
Sacramento Central Groundwater Authority

March 2019

Prepared by the Sacramento Central Groundwater Authority,
and GEI Consultants, Inc.



Subbasin Location Map

Chapter 1. Executive Summary (§356.2(a))

The 2018 Annual Report for the South American Subbasin has been prepared for submittal to the California State Department of Water Resources (State DWR) per Appendix B. State DWR Notice of Annual Report Requirement, and in compliance with the Groundwater Sustainability Plan Emergency Regulations provided in Appendix A. GSP Regulations for Annual Reports, and included as attached reference table, **Alternative Annual Report Elements Guide**.

E.1 Introduction

The Sacramento Central Groundwater Authority (SCGA) has prepared an Annual Report describing groundwater conditions in the South American Subbasin (see **Figure 1**) for the 2018 Water Year (i.e., inclusive of months October 2017 to September 2018) in support of their pending Alternative Submittal.

The Annual Report is intended for conveying monitoring and water use data to the State DWR on an annual basis to gauge performance of the groundwater subbasin relative to the sustainability goal set forth in a Groundwater Sustainability Plan (GSP) or, for SCGA, the Alternative Submittal. As such, SCGA is including information to provide interested parties with sufficient background and supporting details to serve as a public communications document for subbasin management. Historic annual and biennial reports are available on the SCGA website www.scgah2o.org.

Sections of the Annual Report include:

Executive Summary: summary of Annual Report contents including a copy of the **Alternative Annual Report Elements Guide**

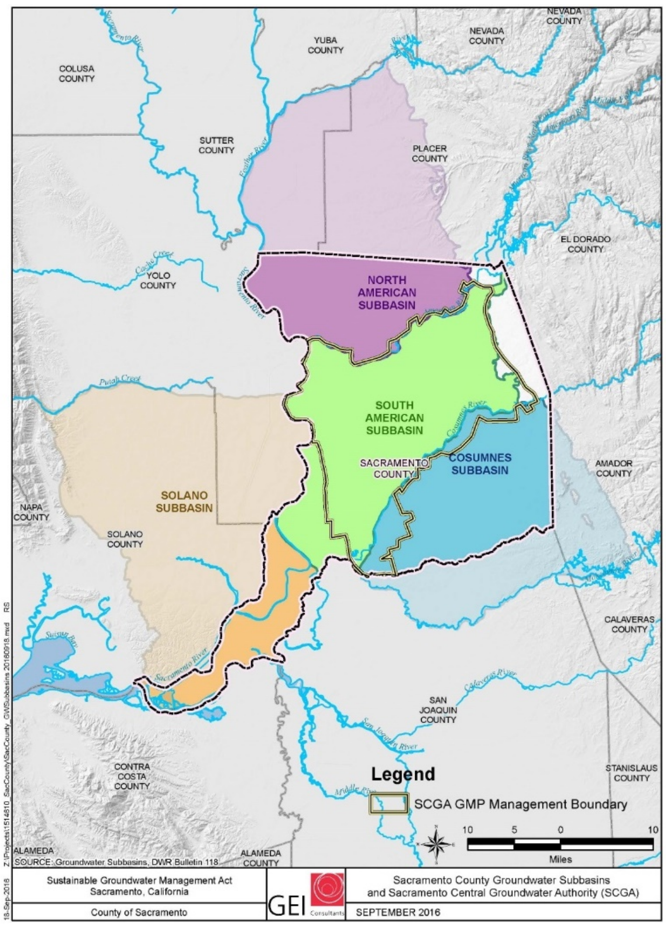


Figure 1. South American Subbasin Location Map

Chapter 2. 2018 Annual Report Introduction: a brief background of SCGA and report purpose in context with Alternative Submittal requirements, and changes from past reporting.

Chapter 3. South American Subbasin Monitoring: summary of subbasin monitoring networks, frequency of measurements, and how data is used for groundwater management.

Chapter 4. Groundwater Elevations (§356.2(b)(1)): presentation of monitoring results with groundwater elevation contours for spring and fall monitoring events, and select hydrographs.

Chapter 5. Groundwater Extractions (§356.2(b)(2)): details of reported and estimated volumetric groundwater extractions by land use sector and general location of extractions.

Chapter 6. Surface Water Use (§356.2(b)(3)): summary of reported and estimated volumetric surface water diversions and locations along major rivers.

Chapter 7. Total Water Use (§356.2(b)(4)): tabulated and graphical depictions of total water use by source and sector.

Chapter 8. Change in Groundwater Storage (§356.2(b)(5)): methodology and presentation of changes in groundwater subbasin storage based on spring to spring groundwater elevation differences.

Chapter 9. Progress on Continued Sustainability as Alternative (§356.2(c)): summary of specific management actions taken by SCGA staff and its Board to maintain sustainability of the subbasin.

E.2 Monitoring Findings

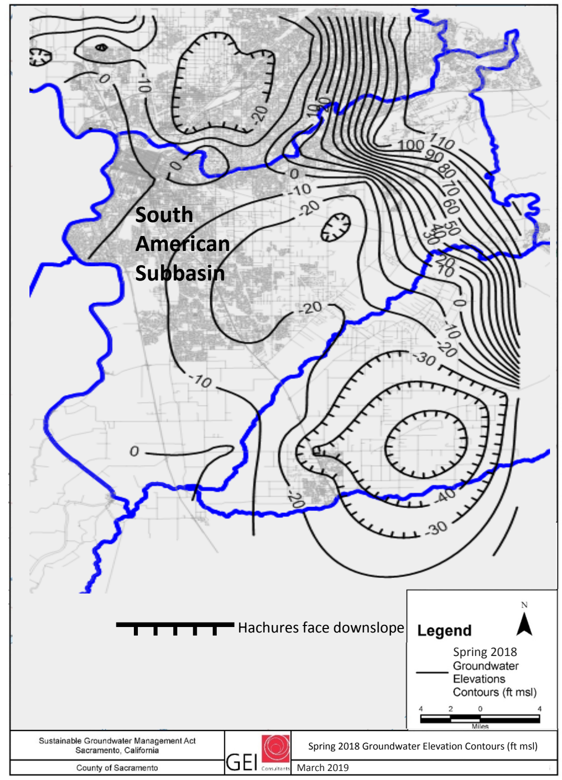


Figure 2. Spring 2018 Groundwater Elevation Contours

Groundwater elevation monitoring for the 2018 Water Year reflects both positive and negative changes in groundwater elevations resulting in a net positive change in storage across the subbasin due to moderate amounts of rainfall and river recharge. Spring and fall regional contours for the 2018 Water Year are shown in **Figure 2** and **Figure 3**, respectively. Spring subbasin conditions show sustainability in: 1) areas of active management, including continued improvements to the Elk Grove cone of depression, identified in the 2006 SCGA Groundwater Management Plan (GMP) as an indicator of basin management and sustainability, 2) portions of the subbasin in close proximity to river recharge, and 3) locations within the subbasin where past storage losses have been documented as a result of, but not limited to, long-term remediation and the recent drought ending in the 2017 Water Year.

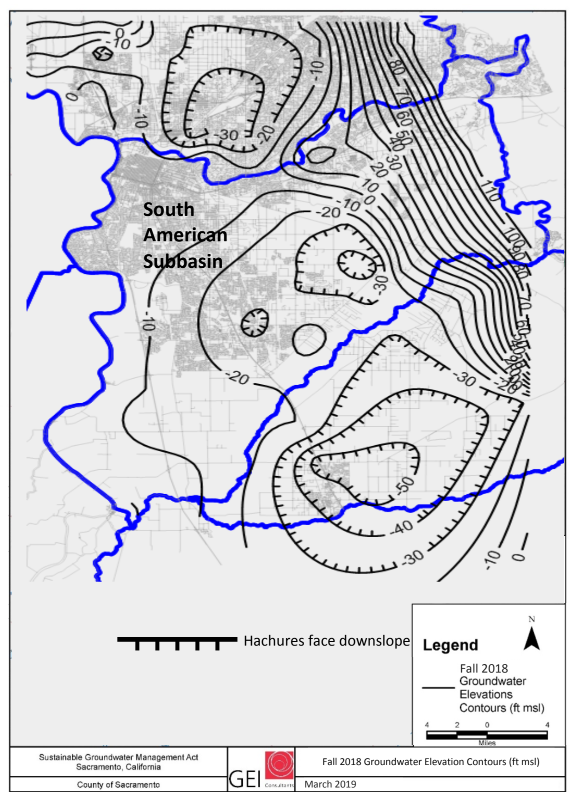


Figure 3. Fall 2018 Groundwater Elevation Contours

Groundwater elevation contours at -30 feet mean sea level and less currently defines the shallow depression where storage losses have occurred located northeast of the original Elk Grove cone of depression. The size and extent of the depression is partially due to the affected area being down gradient of increased pumping for beneficial uses in remediation areas under the direction of USEPA, the Regional Water Quality Control Board, and the Department of Toxic Substance Control, and due to conditions along the subbasin boundary at the Cosumnes River. SCGA believes that these challenges can be addressed through a process of coordination and cooperation, ultimately improving conditions outside of SCGA's jurisdictional control over time.

Positive and negative changes in spring 2018 elevations from spring 2015 (SGMA Baseline) conditions are indicated in **Figure 4**. Positive changes south of the American River near Aerojet's remediation activities continue to indicate areas recharged due to 2017's high river stage and rainfall events in locations where remediation pumping has been taking place for 30+ years, creating large storage capacities in remediated aquifers. Eastern fringe areas noted as being negative in the 2017 Annual Report are now positive as a result of filling identified data gaps (i.e., critical monitoring wells were not sounded due to 2017 flooding). The northern extent of the negative storage area is indicating that remediation activities taking place at Aerojet, Boeing, and Kiefer Landfill have lowered elevations relative to 2015; however, continued lowering trends have halted and elevations show to have reached a temporary equilibrium (i.e., at the current rate of extraction) with slightly improved conditions in spring 2018 relative to spring 2017 elevations.

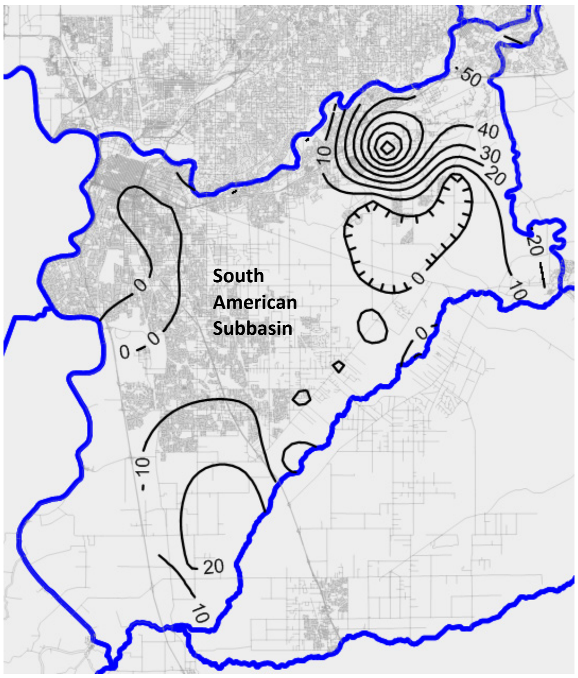


Figure 4. Spring 2018-2015 Difference Contours (feet)

E.3 Groundwater Extractions

Total groundwater extractions in the South American Subbasin for the 2018 Water Year are estimated to be **218,521 AF**. **Table 1** summarizes the total water use by sector for the 2017 thru 2018 Water Years. Approximate points of groundwater extraction were spatially distributed and colorized according to a grid system to represent the relative pumping across the basin in terms of AF per acre (see **Figure 5**). Areas south of the American River experience some of the highest levels of relative pumping in the basin due to the various remediation pumping operations taking place as a beneficial use to improve and protect groundwater quality. Areas dependent on groundwater along the Cosumnes River and in areas of agriculture and municipal uses show a moderate concentration of groundwater pumping in the below average 2018 Water Year.

Table 1. 2017 thru 2018 Water Year Summary of Total Groundwater Extractions by Sector (AF/year)

Water Sector	2017 WY Total[1]	2018 WY Total
Municipal	48,529	41,144
Agricultural	109,675	119,950
Rural Residential	20,766	23,111
Remediation	33,260	34,316
Total	**212,231**	**218,521**

Notes: 1. Reduction of 6,962 AF from reported agriculture demands in 2017 Annual Report to correct water demand spreadsheet reference error in Delta results.

E.4 Total Surface Water Use

Municipal water purveyors who hold surface water entitlements along the Sacramento and American Rivers divert surface water for retail water service to their customers and often cooperate in wholesale and wheeling agreements to distribute surface water to the maximum extent practicable throughout the region.

Agricultural use of surface water takes place at many diversion locations located primarily in the California Delta and along the Cosumnes River. Since riparian and some agricultural appropriative water rights are difficult to quantify, the Sacramento Integrated Groundwater-Surface Water Model (SacIGSM) is used to estimate agriculture's total surface water use in the South American Subbasin.

A summary of the 2017 thru 2018 Water Year surface water use by sector is provided in **Table 2**.

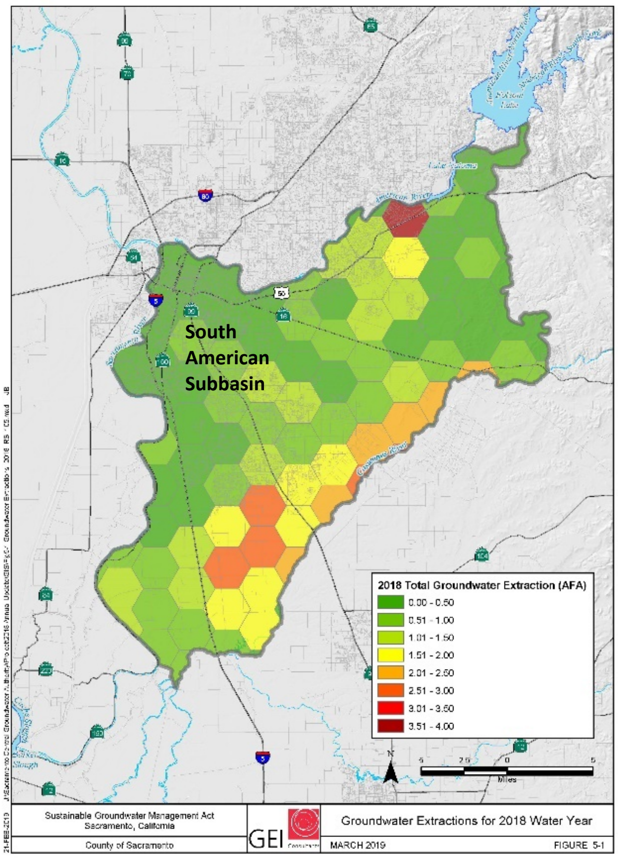


Figure 5. General Location and Rate of Pumping within South American Subbasin

Table 2. 2017 thru 2018 Water Year Surface Water Use by Sector (AF/year)

Water Sector	2017 WY Total	2018 WY Total
Municipal	85,591	90,414
Agricultural	31,219	31,219
Rural Residential	0	0
Remediation	0	0
Total	**116,810**	**121,633**

E.5 Total Water Use

For the 2018 Water Year, the quantification of total water use was completed through reporting of metered water production data from wells, surface water treatment plants, recycled water treatment plants, and from models used to estimate individual agricultural crop water supply requirements. In addition, rural water use was estimated based on standard estimating practices of per capita water use for indoor use and crop estimation for irrigated pasture or landscaping. **Table 3** and **Figure 6** provide a summary of total water use by sector and source in the South American Subbasin.

Table 3. 2017 thru 2018 Water Year Total Water Use by Sector and Source

	Water Use (AF/year)	
Water Use Sector	**2017[1]**	**2018**
Municipal	135,153	131,958
Agriculture	140,894	151,169
Rural	20,522	22,829
Remediation	33,260	34,316
Total	**329,829**	**340,272**

	Volume (AF/year)	
Water Supply Source	**2017**	**2018**
Groundwater	178,971	184,205
Surface Water	116,810	121,633
Recycled Water	788	119
Remediation	33,260	34,316
Total	**329,829**	**340,273**

Notes:

1. Reduction of 6,962 AF from reported agriculture demands in 2017 Annual Report to correct water demand spreadsheet reference error in Delta results.

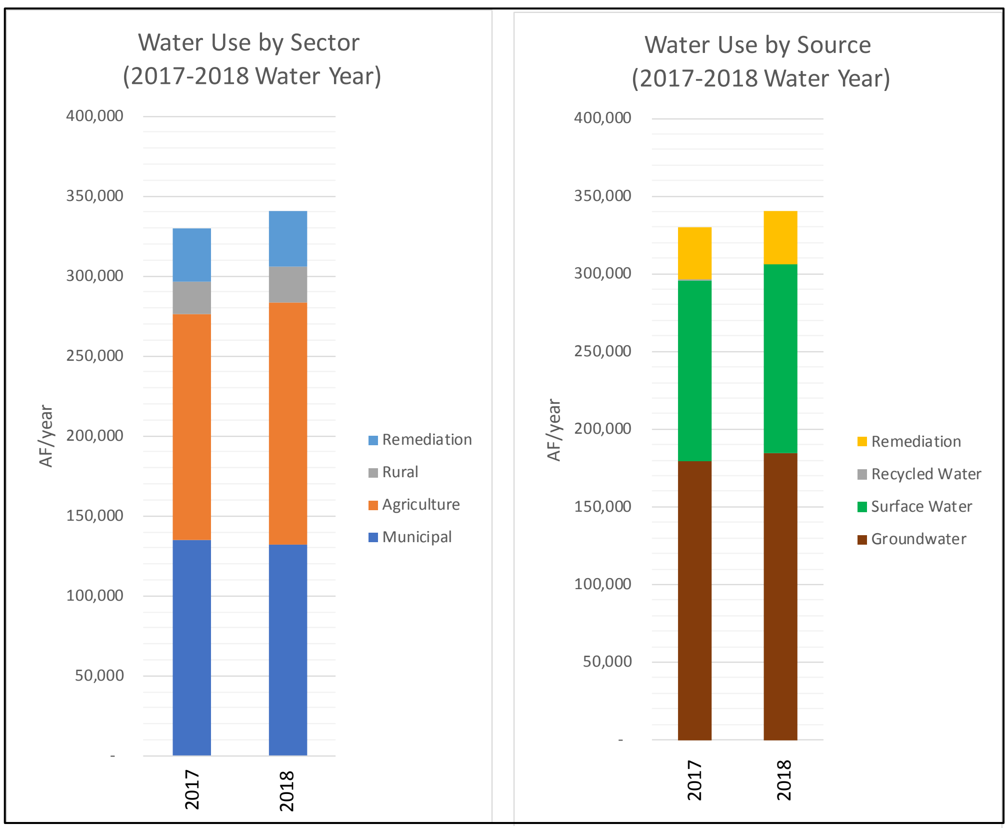


Figure 6. Water Use by Sector and Source

E.6 Change in Storage

The calculation of storage change uses measured groundwater elevation data, taking the difference between contours as the portion of the unconfined aquifer that becomes saturated (storage gain) or dewatered (storage loss). Groundwater elevation measurements taken during spring months are used for purposes of change in storage calculations since the aquifer has recovered from the previous year's pumping and the vertical gradient between principle aquifers is at its minimum (i.e., sufficient time has passed allowing the semi-confined and unconfined aquifer piezometric surfaces to equilibrate to within plus or minus 10 to 20 feet). Spring to spring differences on an annual basis consequently provides the change in storage when the aquifer is closer to static conditions, resulting in a value not influenced by localized heavy pumping that may be occurring during the fall measurements.

Year to year changes in storage starting in 2009, using the methodology described above, are presented along with cumulative change in storage since 2005 (SCGA GMP/Alternative Baseline) and since 2015 (SGMA Baseline) in **Table 4**. The hydrograph of storage changes since 2005 is shown in **Figure 7.** Annual and Cumulative Changes in Groundwater Storage.

Table 4. Annual and Cumulative Changes in Storage

Year	Change in Storage (Ac-Ft)	Cumulative Change in Storage 2005 to 2018 (Ac-Ft)	Cumulative Change in Storage 2015 to 2018 (Ac-Ft)
2005	baseline	0	
2009	42,766	42,766	
2010	(16,046)	26,720	
2011	46,705	73,425	
2012	40,416	113,841	
2013	(16,458)	97,384	
2014	(111,930)	(14,546)	
2015	(58,717)	(73,263)	0
2016	28,833	(44,430)	28,833
2017	189,306	144,876	218,139
2018	70,480	215,356	288,619

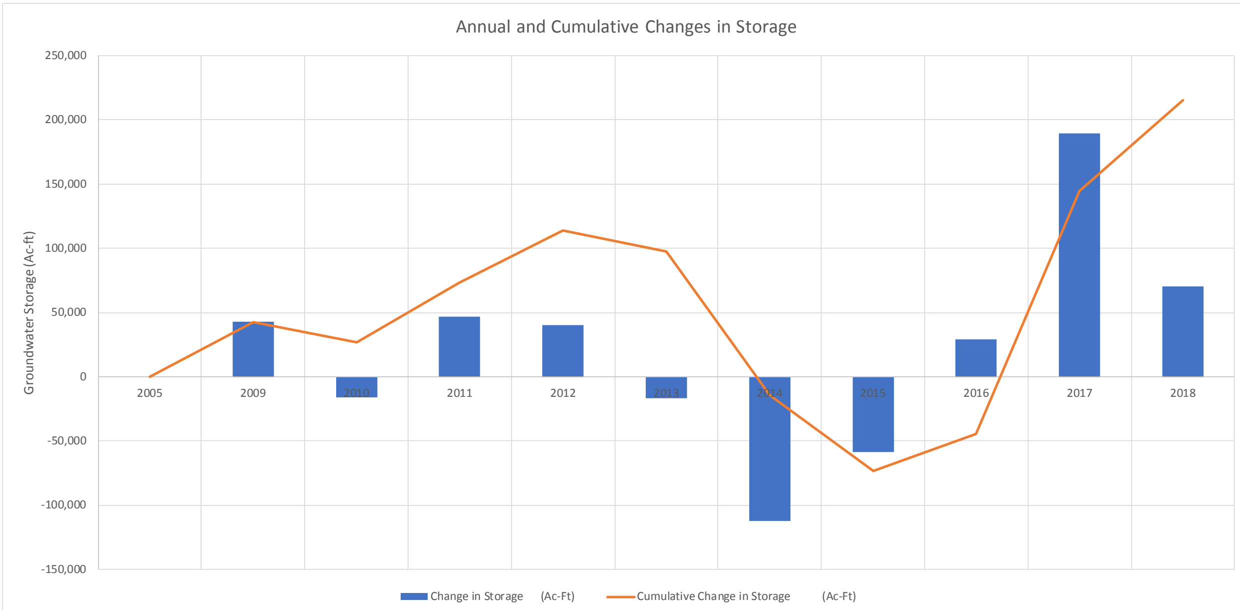


Figure 7. Annual and Cumulative Changes in Groundwater Storage

E.7 Continued Sustainability

As verification of meeting SCGA's annual sustainability goal, **Figure 8** provides visual agreement that in the 2018 Water Year, groundwater extractions did not exceed the long-term average annual sustainable yield of 273,000 AF/year set forth in the 2000 Water Forum Agreement and the 2006 Central Sacramento County Groundwater Management Plan (GMP) including unforeseen groundwater extractions from remediation occurring in the eastern portion of the subbasin.

Additionally, SCGA has recognized that changed conditions outside the direct control of SCGA and its member agencies are occurring in the subbasin due to remediation, lasting drought effects, and increased groundwater pumping in the Cosumnes Subbasin.

SCGA's monthly agendas and presentations in the 2018 Water Year relative to sustainable management and SGMA compliance through the Alternative Submittal process reflect the projects and programs that are on-going or planned by SCGA to continue its management role in the South American Subbasin. Notification from State DWR on the Alternative Submittal review results is a critical decision point for the region's stakeholders which should be announced in 2019.

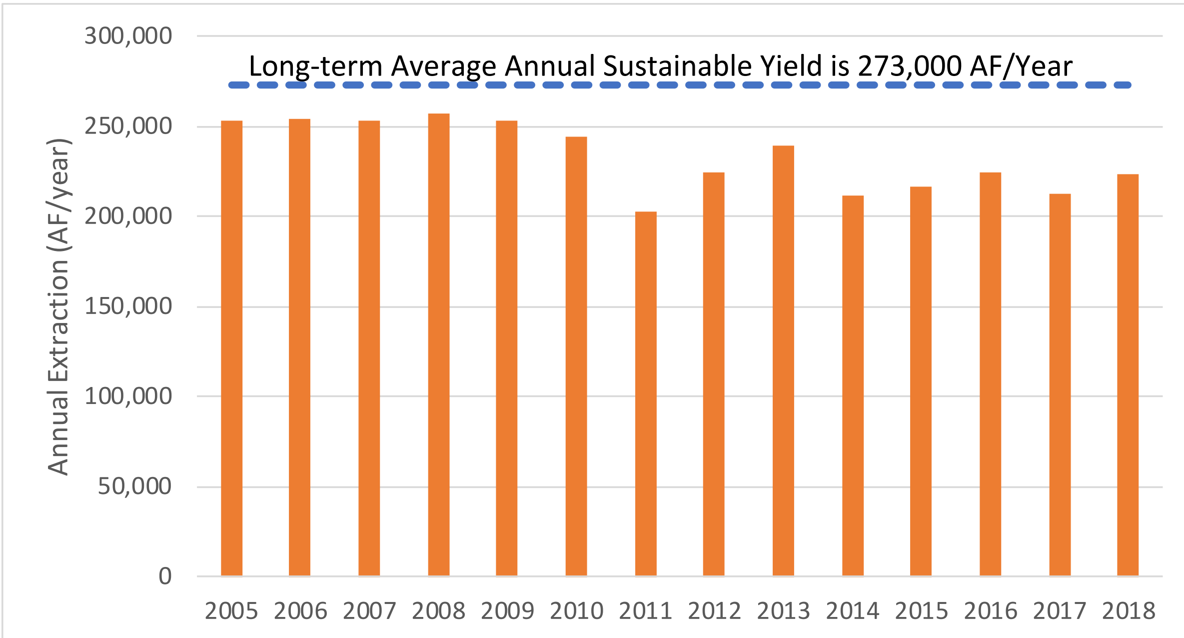


Figure 8. Verification of Annual Sustainability Goal

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Alternative Annual Report Elements Guide

California Code of Regulations - GSP Regulation Sections	*Alternative Elements*	*Document which attachment(s) contains the applicable alternative element.*	*Document which section(s), page number(s), or briefly describe why that Alternative element does not apply to the entity.*
Article 7	**Annual Reports and Periodic Evaluations by the Agency**		
§ 356.2	**Annual Reports**		
	Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:		
	(a) General information, including an executive summary and a location map depicting the basin covered by the report.	Annual Report	Executive Summary (§356.2(a))
	(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:	Annual Report	Section 3.2 Groundwater Elevation Monitoring (§356.2(b))
	(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:	Annual Report	Chapter 4. Groundwater Elevations (§356.2(b)(1))
	(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.	Annual Report	Section 4.2 Seasonal High and Low (Spring and Fall) (§356.2(b)(1)(A))
	(B) Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.	Annual Report	Section 4.3 Select Hydrographs Including 2015 (§356.2(b)(1)(B))
	(2) Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector, and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.	Annual Report	Chapter 5. Groundwater Extractions (§356.2(b)(2))
	(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.	Annual Report	Chapter 6. Surface Water Use (§356.2(b)(3))
	(4) Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.	Annual Report	Chapter 7. Total Water Use (§356.2(b)(4))
	(5) Change in groundwater in storage shall include the following:	Annual Report	Chapter 8. Change in Groundwater Storage (§356.2(b)(5))
	(A) Change in groundwater in storage maps for each principal aquifer in the basin.	Annual Report	Section 8.2 Storage Change Contours (§356.2(b)(5)(A))
	(B) A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.	Annual Report	Section 8.2.2. Incremental and Cumulative change in storage 2005 and 2015 (§356.2(b)(5)(B))
	(c) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.	Annual Report	Chapter 9. Progress on Continued Sustainability as Alternative (§356.2(c))

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Appendix B. State DWR Notice of Annual Report Requirement
Appendix C. South American Subbasin Hydrographs
Appendix D. IDC Update Report

Acronyms

AF – Acre-Feet
AFA – Acre-Feet Annually
AFB – Air Force Base
AF/year – Acre-Feet Annually
Ac-Ft – Acre-Feet

BMO – Basin Management Objective

CASGEM – California State Groundwater Elevation Monitoring Program
CDEC – California Data Exchange Center
CIMIS – California Irrigation Management Information System
CSD – Community Services District

DWR – California State Department of Water Resources

Ft msl – Feet Mean Sea Level

GMP – Groundwater Management Plan
GSP – Groundwater Sustainability Plan

IDC – IWFM Independent Demand Calculator
IGSM – Integrated Groundwater Surface Water Model
IRCTS – Inactive Rancho Cordova Test Site
IWFM – Integrated Water Flow Model

MAF – Millions of Acre-Feet

OHWD – Omochumne-Hartnell Water District

SacIGSM – Sacramento IGSM
SCGA – Sacramento Central Groundwater Authority
SCWA – Sacramento County Water Agency
SGMA – Sustainable Groundwater Management Act
SRI – Sacramento River Index

URs – SGMA Undesirable Results

WY – Water Year

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Chapter 2. 2018 Annual Report Introduction

The 2018 Annual Report for the South American Subbasin has been prepared by the Sacramento Central Groundwater Authority (SCGA) in accordance with the Sustainable Groundwater Management Act (SGMA) and Groundwater Sustainability Plan (GSP) Regulations (§ 356.2. Annual Reports, see **Appendix A. GSP Regulations for Annual Reports**). As per State DWR's interpretation of the regulations, a basin (or subbasin) with a pending GSP Alternative is required to submit an Annual Report for the preceding Water Year to State Department of Water Resources (DWR) by April 1, 2019 (see **Appendix B. State DWR Notice of Annual Report Requirement**, State DWR, February 19, 2019).

2.1 SCGA Background

SCGA (and its SB 1938 compliant Groundwater Management Plan) was formed to implement the groundwater management element of a regional long-term over-arching sustainable water resources plan known as the Sacramento Water Forum Agreement (January 2000). This Agreement is based on the coequal objectives of providing reliable water supplies for the Sacramento region's economy and protecting and enhancing the environment of the lower American River.

SCGA's jurisdictional boundaries cover the central portion of Sacramento County south of the American River and north of the Cosumnes River (see **Figure 2-1**), and was created through a joint powers agreement (JPA) between the County of Sacramento and the cities of Sacramento, Folsom, Elk Grove and Rancho Cordova. As described in the JPA, those jurisdictions appoint members to the SCGA board to achieve a broad representation of groundwater interests within SCGA's jurisdiction. Members include five (5) water supply agencies, as well as representatives of self-supplied groundwater users/interests including:

1. urban public agencies,
2. commercial/industrial/remediation users,
3. agricultural stakeholder groups and districts,
4. agriculture-residential interests, and
5. conservation landowners.

Since 2006, SCGA has had the responsibility of monitoring groundwater elevations and participating in the state's California Statewide Groundwater Elevation Monitoring (CASGEM) program, recording monthly and annual municipal pumping data, and, beginning in 2011, estimating agricultural and private domestic pumping using satellite imagery to accurately estimate evapotranspiration for input into State DWR's IWFM Demand Calculator (IDC). Total recorded and estimated pumping has been used to compare total basin pumping with the negotiated long-term average sustainable yield of 273,000 AF/year set by the Water Forum and adopted by SCGA. Groundwater elevations have been used to: 1) identify areas of declining groundwater, 2) determine if numerical thresholds (or triggers) have been exceeded, 3) understand the source of identified impacts, and 4) inform the SCGA Board to take actions, if necessary, in accordance with the GMP. To date, the basin has operated sustainably.

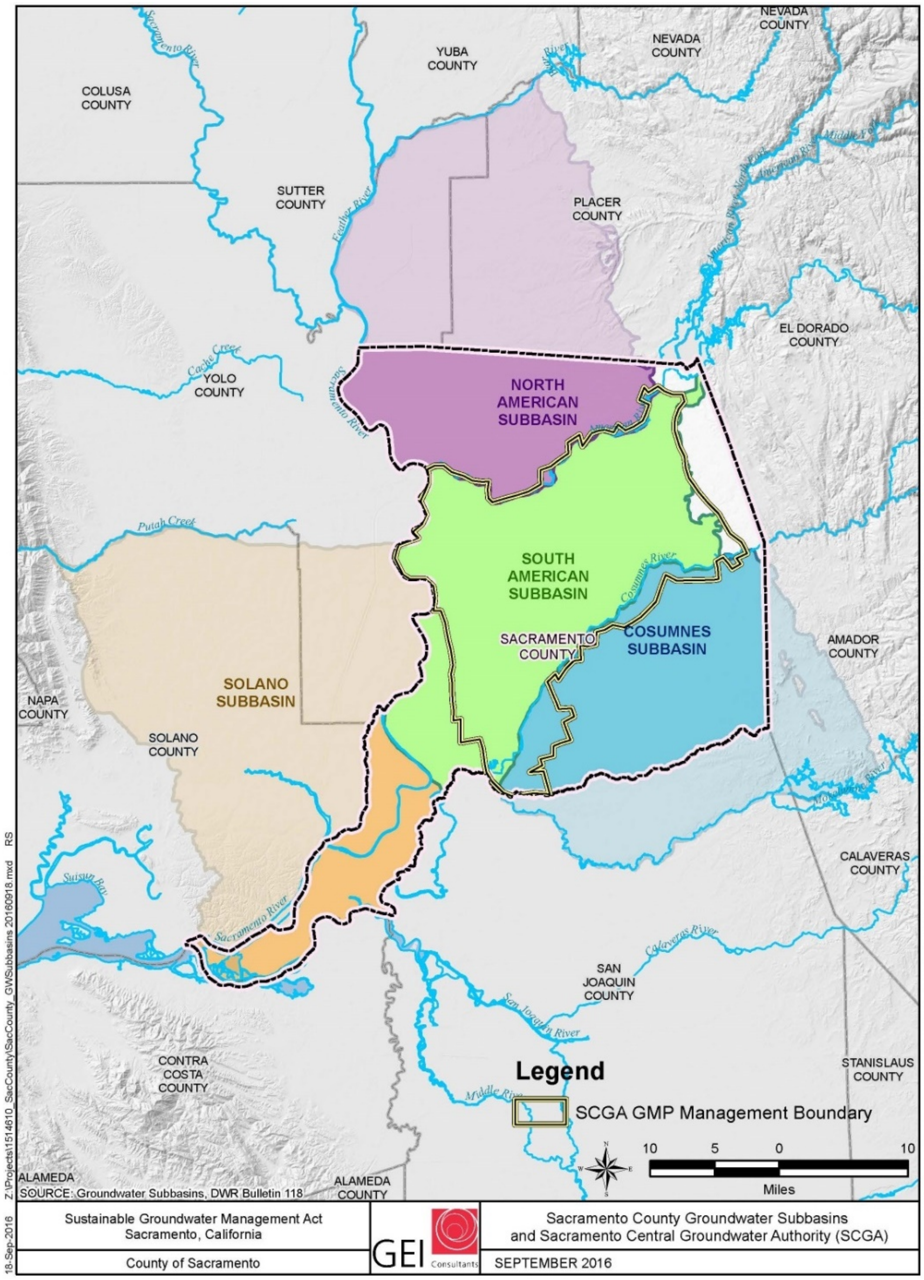

Figure 2-1. SCGA GMP and South American Subbasin Boundaries

2.2 Alternative Submittal

SGMA authorizes a groundwater management agency within a basin compliant with the state's CASGEM program to prepare an Alternative to a GSP; the GSP Alternative (Alternative) was submitted to State DWR by January 1, 2017. According to GSP regulations, Alternatives will be evaluated on the same criteria that will be used to assess GSPs.

On December 14, 2016, the SCGA Board approved submission of the Alternative for the South American subbasin to State DWR pursuant to California Water Code § 10733.6. The Alternative was uploaded to State DWR's SGMA Portal on December 30, 2016, for public comment and state review. To date, no decision has been made by State DWR on the adequacy of the Alternative; regardless, State DWR requires the completion of an annual report (see **Appendix B. State DWR Notice of Annual Report Requirement**).

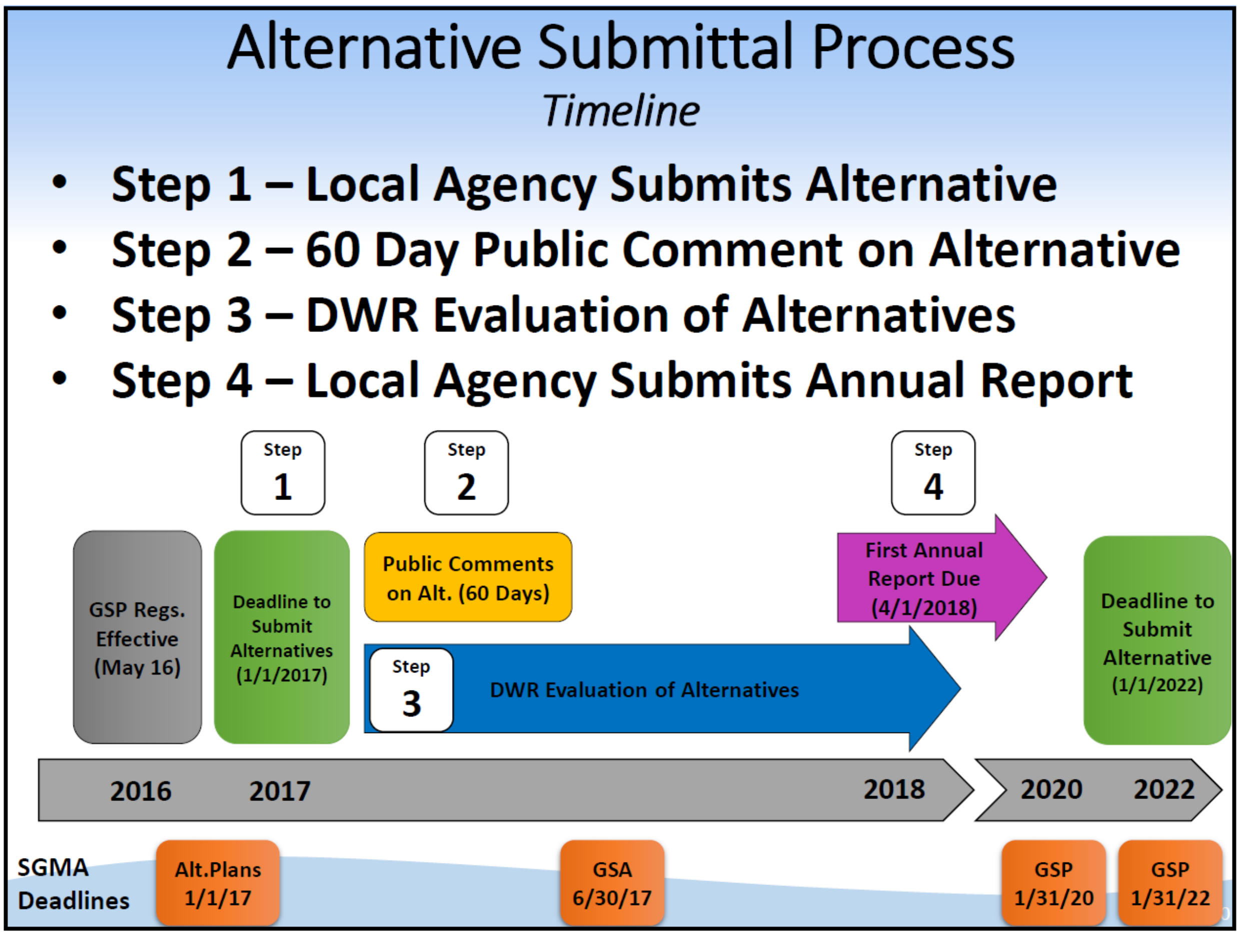

Figure 2-2. Alternative Submittal Process Timeline

2.3 Organization of Report

The required contents of an Annual Report are provided in the GSP Regulations (§ 356.2), included as **Appendix A. GSP Regulations for Annual Reports**. Organization of the report is meant to follow the regulations where possible to assist in the review of the document. The last chapter and additional appendices include documentation of all monitoring and SCGA Board activities used in the management of the subbasin. The chapters, focusing solely on the South American Subbasin, are briefly described as follows:

Chapter 2. 2018 Annual Report Introduction: a brief background of SCGA and report purpose in context with Alternative requirements, and changes from past reporting.

Chapter 3. South American Subbasin Monitoring: summary of subbasin monitoring networks, frequency of measurements, and how data is used for groundwater management.

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Chapter 9. Progress on Continued Sustainability as Alternative (§356.2(c)): summary of specific management actions taken by SCGA staff and its Board to maintain sustainability of the subbasin.

Chapter 3. South American Subbasin Monitoring

3.1 Introduction

This chapter provides a brief description of the groundwater management monitoring programs currently taking place and any notable events affecting monitoring activities or the quality of monitoring results in the reported 2018 Water Year.

3.2 Groundwater Elevation Monitoring (§356.2(b))

Bi-annual groundwater elevation monitoring in the South American Subbasin began prior to the 1950's. Much of the monitoring is comprised of field measurements of spring and fall depths to groundwater in active municipal, agriculture, and private domestic wells. The number of wells has reduced from a high of approximately 65 wells in the 1990's to approximately 36 wells in 2018. The attrition of monitoring wells historically stemmed from a combination of well abandonments, urban development, and reduced funding by monitoring agencies. In 2011, the CASGEM program further reduced the number of monitoring wells based on several criteria to improve the overall quality of data being collected.

3.2.1 Groundwater elevation monitoring locations

Monitoring locations used for groundwater elevation reporting for the 2018 Water Year are shown in **Figure 3-1**. Monitoring wells located outside of the subbasin are used for purposes of 1) developing boundary conditions for contouring over the subbasin, 2) understanding the movement direction of subsurface flows across boundaries, and 3) interpreting the effects of nearby extractions and recharge activities to storage in the South American Subbasin.

Multiple monitoring entities exist within the South American Subbasin with SCGA being the responsible CASGEM agency. Other entities may include state and federal agencies, private well owners, and public universities. All measurements uploaded to the CASGEM database are flagged if known data quality issues exist at the time of measurement including, but not limited to, pump running prior to measurement or pump lubricating oil found on top of water column in the well. When and where noted, measurements with these issues are filtered out of the dataset prior to contouring.

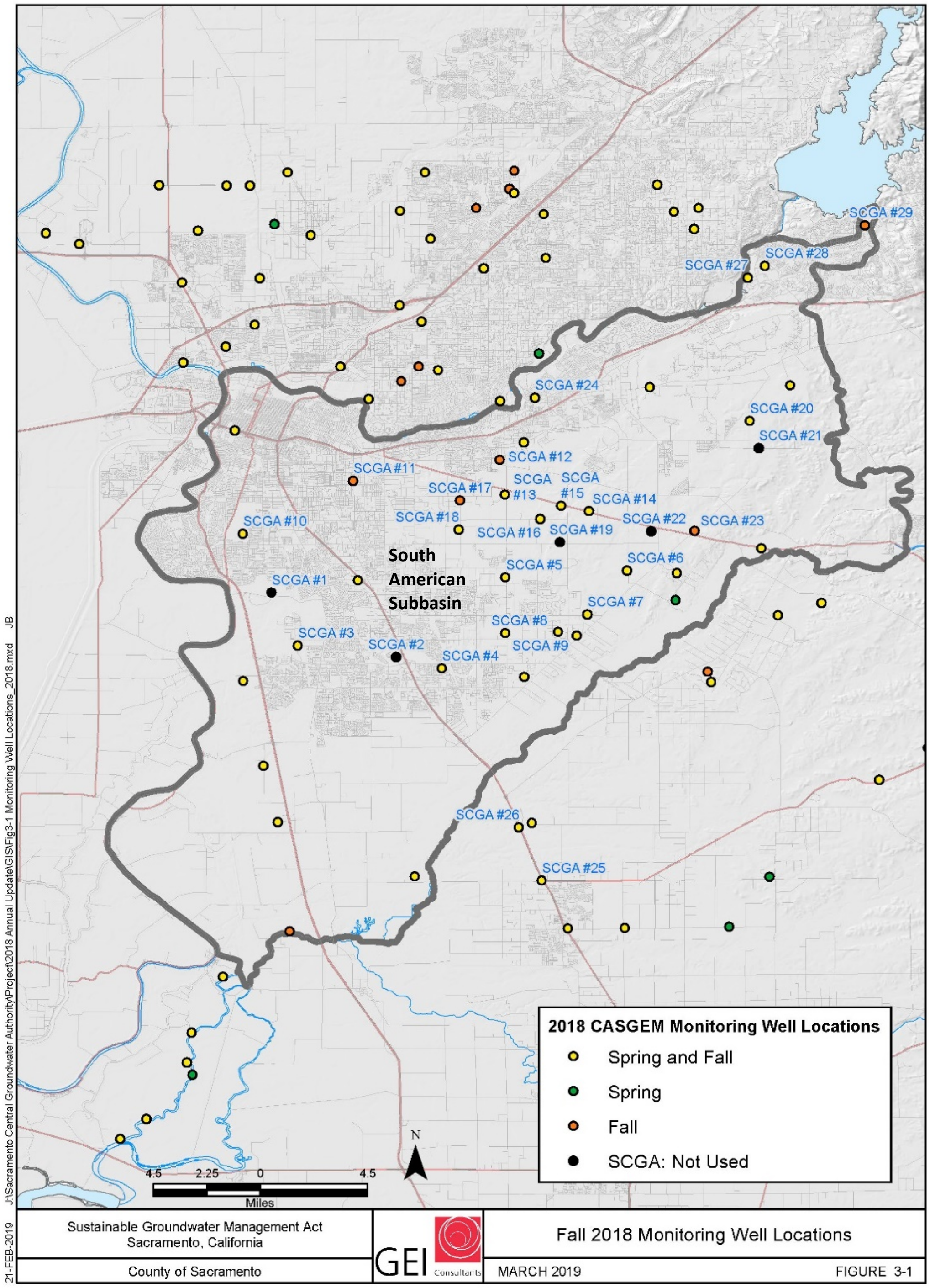

Figure 3-1. Spring and Fall 2018 Monitoring Well Locations

3.2.2 Frequency of monitoring

Monitoring frequencies for the groundwater elevation monitoring network vary from a minimum of bi-annual seasonal spring and fall measurements taken manually each year, to monthly measurements, often taken by private well owners and researchers for various studies. The number of monitoring wells monitored in the spring and fall events can vary depending on when and under what weather conditions the monitoring event occurs. For example, in spring 2018, several CASGEM wells were not monitored within the required window of time due to flooding and inaccessibility.

3.2.3 How data is used for groundwater management

Each CASGEM monitoring event results in data for statewide and local use and is presented to the SCGA Board twice a year to highlight areas of falling and gaining groundwater elevations. Areas of falling elevations are investigated to identify probable causes and to discuss remedy actions, if needed, with affected member agencies and stakeholder representatives. This data is further used to document changes in measured storage in SCGA's reporting process.

3.2.4 CASGEM participation

In 2011/12, SCGA became a participant in State DWR's CASGEM program. Monitoring wells were selected based on their location, depth, and availability of driller log information identifying screen intervals and lithology. **Table 3-1** includes a summary of the CASGEM wells currently monitored by SCGA. Depths of monitoring wells range from 85 feet to 600 feet below ground surface.

Table 3-1. SCGA South American Subbasin CASGEM Wells (February 2012 CASGEM Plan)

Well No.	State Well Number	Subbasin Name	Reference Point Elevation (feet)	Ground Surface Elevation (feet)	Depth (ft)
SCGA #1	07N05E18C001M	South American	12	12	n/a
SCGA #2	07N05E26P002M	South American	30.7	30	n/a
SCGA #3	07N05E29D001M	South American	17.5	17	170
SCGA #4	07N05E36A001M	South American	43.29	43.29	508
SCGA #5	07N06E08H001M	South American	59.5	58.5	225
SCGA #6	07N06E12A001M	South American	115.5	115	340
SCGA #7	07N06E14Q001M	South American	92	90	300
SCGA #8	07N06E20J001M	South American	59	57	n/a
SCGA #9	07N06E22R002M	South American	70.5	70	210
SCGA #10	08N04E36L001M	South American	6	5	172
SCGA #11	08N05E21H002M	South American	40.5	39.5	72
SCGA #12	08N06E17H001M	South American	73.9	71.9	310
SCGA #13	08N06E20R001M	South American	58.2	57.4	n/a
SCGA #14	08N06E26K001M	South American	114	113	160
SCGA #15	08N06E27H002M	South American	92	91	425
SCGA #16	08N06E27N001M	South American	75.7	75	n/a
SCGA #17	08N06E30C001M	South American	51.5	50	160
SCGA #18	08N06E31F001M	South American	52	51	132
SCGA #19	08N06E34R001M	South American	107.4	106.4	300
SCGA #20	08N07E02N001M	South American	258.6	257.6	600
SCGA #21	08N07E14C001M	South American	255.2	254.2	208
SCGA #22	08N07E31J001M	South American	116.6	115.4	300
SCGA #23	08N07E33E001M	South American	145.5	145.3	130
SCGA #24	09N06E33R001M	South American	74.4	73.2	85
SCGA #27	09N07E02N001M	South American	144.1	144.6	170
SCGA #28	09N07E02G001M	South American	182.36	179.86	101
SCGA #29	10N08E29J001M	South American	387.3	384.8	85

3.3 Additional Monitoring

Additional monitoring occurring in the subbasin includes subsidence, water quality (including contaminant plume migration), and agricultural land use.

3.3.1 Subsidence monitoring stations

Long-term subsidence monitoring (extensometer) has taken place in the southwest portion of the subbasin along Interstate Route 5. SCGA participated in State DWR's Sacramento Valley 2017 GPS Survey program to survey and track ground elevations in the northern portion of the subbasin as shown in **Figure 3-2** by the green colored points. The December 2018 findings report found little to no significant subsidence in Sacramento County (see **Figure 3-3**).

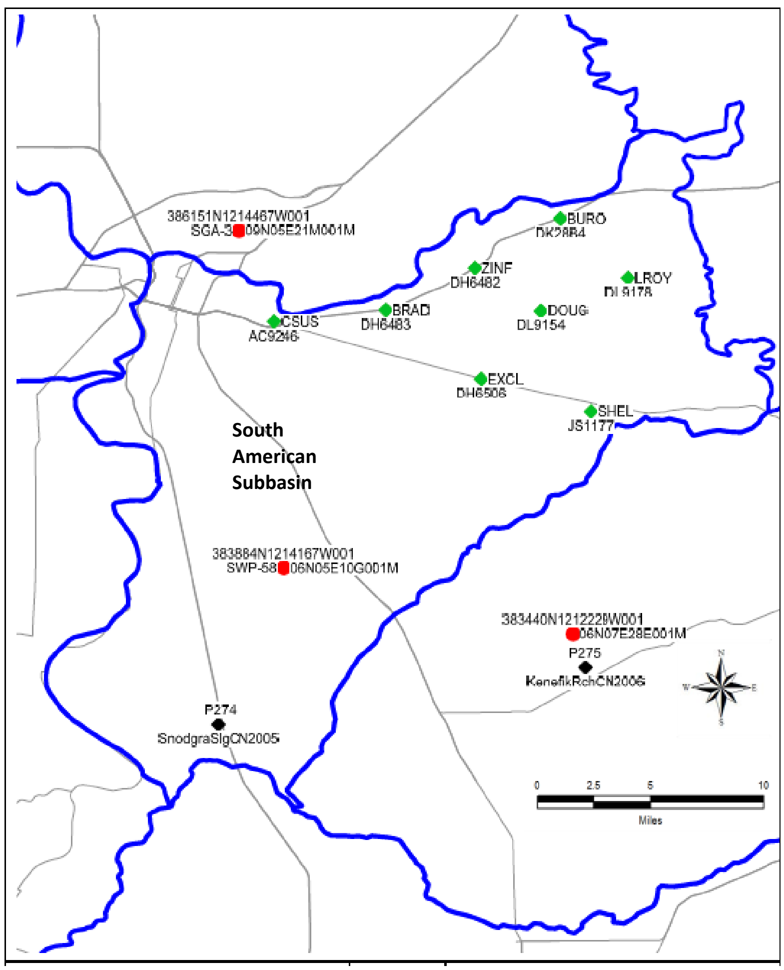

Figure 3-2. Subsidence Monitoring Locations

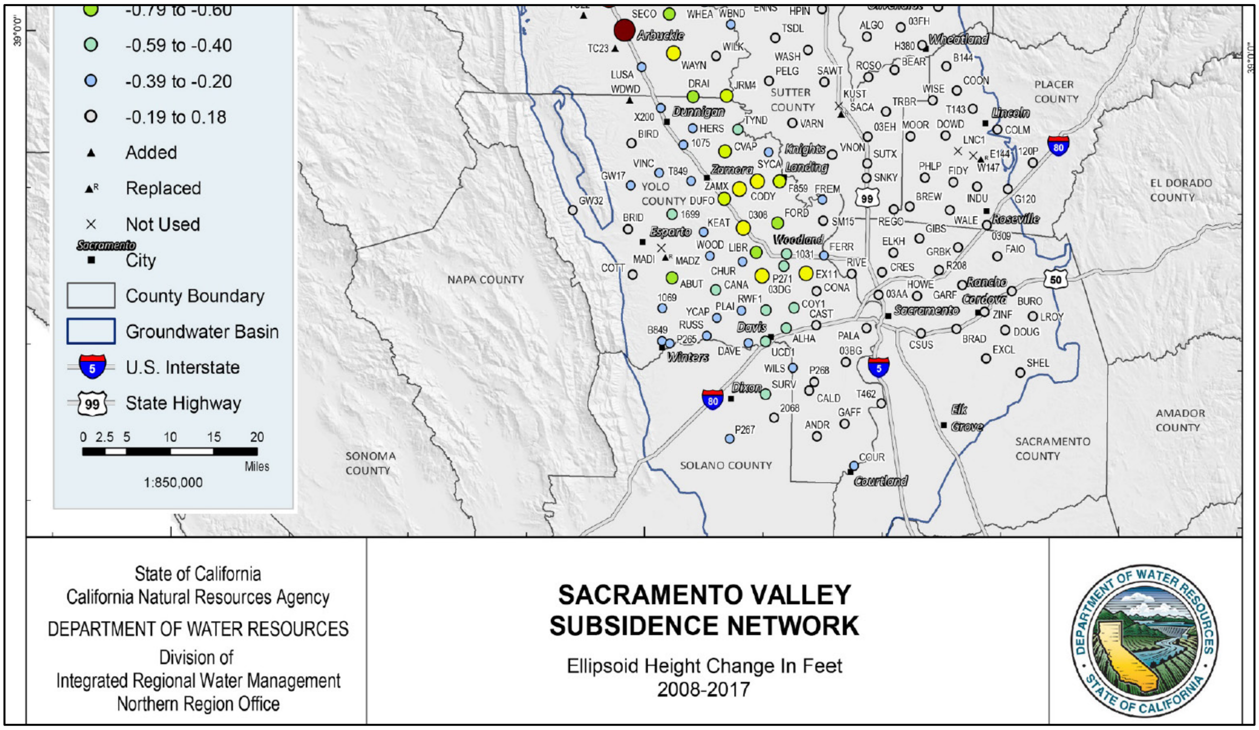

Figure 3-3. Sacramento Regional Portion of 2017 State Subsidence Monitoring Network Results

Source: https://water.ca.gov/-/media/DWR-Website/Web-Pages/Programs/Groundwater-Management/Data-and-Tools/Files/Regional-Reports/2017_GPS_Survey_of_the_Sacramento_Valley_Subsidence_Network.pdf

3.3.2 Municipal and Remediation groundwater extraction data collection

Municipal and Remediation groundwater extractions provided by well and service area are obtained through requests of metered data from the SCGA member and non-member agencies. Two smaller non-member agencies (i.e., Florin County Water District and Tokay Park) are estimated values based on the regional groundwater model.

3.3.3 IDC Modeling (i.e., data collection including CIMIS and land use/cropping elements)

Monitoring data for IDC model estimation of groundwater extractions for irrigated lands include available CIMIS station data, USDA CropScape Cropland Data for non-Delta areas, and DER land-use data for the Delta (see **Figure 3-4** for 2018 CropScape Data).

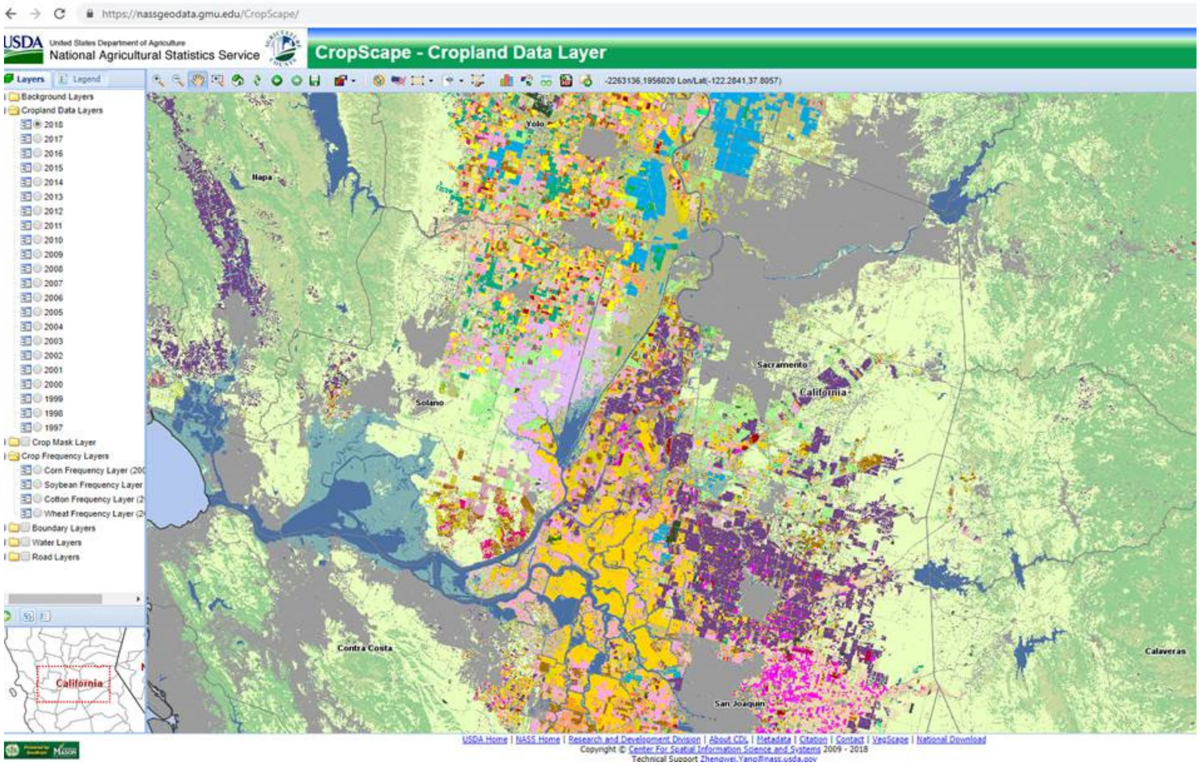

Figure 3-4. Land Use Map

Source: https://nassgeodata.gmu.edu/CropScape/

3.3.4 Groundwater-surface water interconnectedness

SCGA collaborated in the monitoring of surface water and groundwater interconnectedness at the Cosumnes River near Grant Line Road and Highway 99 as shown in **Figure 3-5**, and continues to have interest in monitoring near-levee groundwater elevations along the American River to establish correlations between river stage and groundwater elevations at varying depths. Real-time monitoring data was captured at three locations north of the Cosumnes Corridor for WY 2017 and a portion of WY 2018 to investigate the level of hydraulic connectivity and groundwater response times from high river stage events.

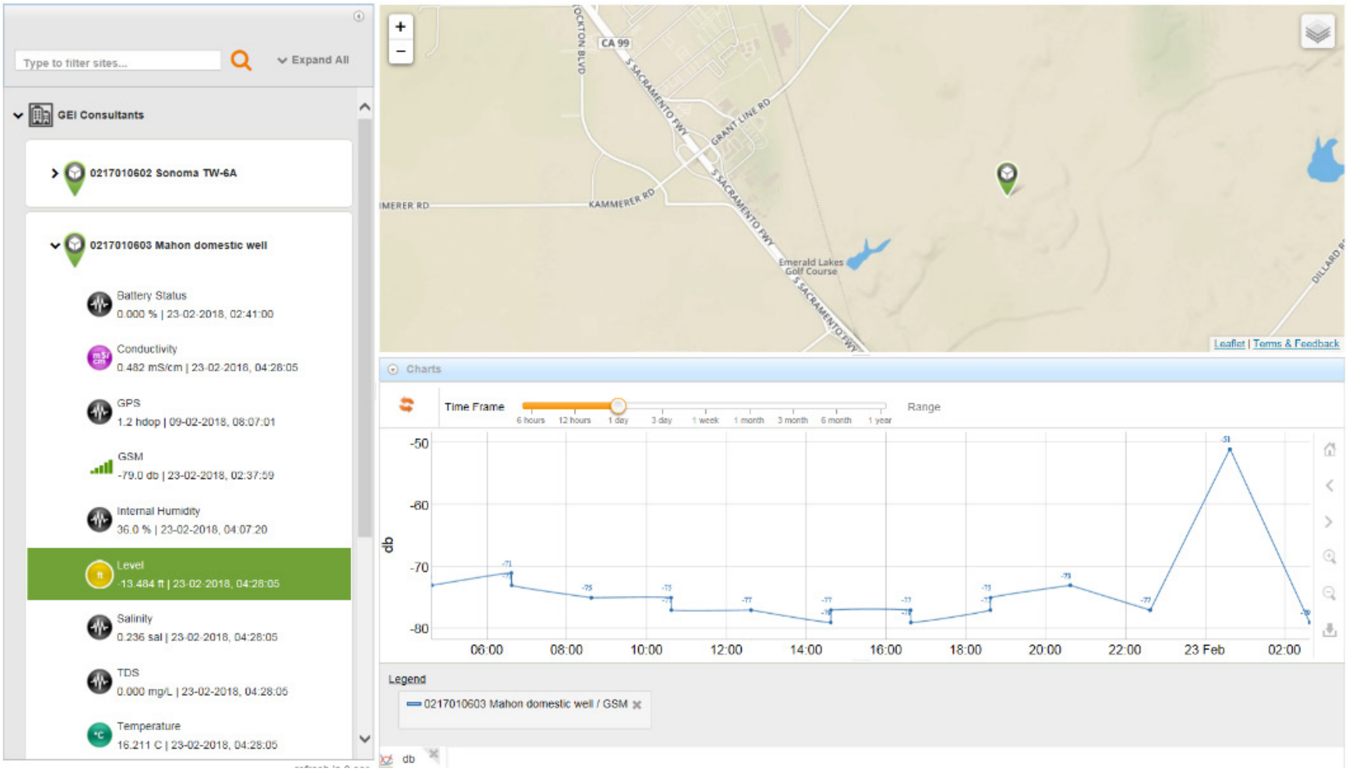

Figure 3-5. Cosumnes River Real-time Monitoring Location and Hydrographs

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Chapter 4. Groundwater Elevations (§356.2(b)(1))

4.1 Introduction

This section provides a detailed report on groundwater elevations for the 2018 reporting water year. Monitoring data is downloaded from the CASGEM database each reporting period and reviewed for quality to provide the highest consistency in the wells used for the spring and fall reporting periods. Monitoring data uploaded by other agencies or private well owners is reviewed to account for missing well construction information and uncertain sampling methods. Prior to applying data for groundwater elevation contouring and storage analysis, well data is validated by assessing if measurements are trending consistent with previous years and with the current year's hydrology and level of extractions.

In cases where data used in this report invite questions (e.g., single measurement drastically changes the contours from previous year), justification is provided, and hydrographs are cited and included with a hyperlink to the state database for further review and consideration by the reader.

4.1.1 Principal aquifers

Ascertaining the depth and screening interval of each monitoring well has not been a requirement for management of the subbasin because aquifer formations are only partially confined in locations where interlaced clay lenses exist between the Laguna and Mehrten Formations (see **Figure 4-1** for conceptual geologic profile).

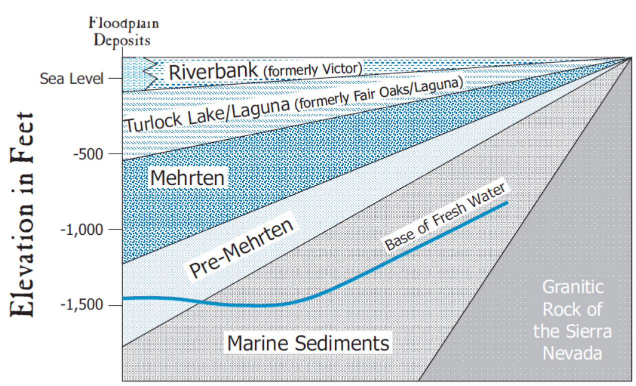


Figure 4-1. Principal Aquifers (west to east cross-section across subbasin)

4.1.1.1 Discussion of hydraulic communication between aquifers

Because of the semi-confinement separation between aquifers, moderate communication does take place between the upper and lower aquifers, maintaining a small vertical gradient between the two aquifers (see **Figure 4-2** for illustrative example). Used predominantly by private well owners, the upper aquifer has the highest quality water. In most areas of municipal pumping, the upper aquifer is protected from upwelling of reduced quality lower aquifer water high in iron and manganese by having those municipal wells intentionally extracting groundwater from the lower aquifer and treating the water prior to customer delivery. During periods of high extractions by either private or public wells, a vertical gradient of up to 10 feet has been measured between the two aquifers.

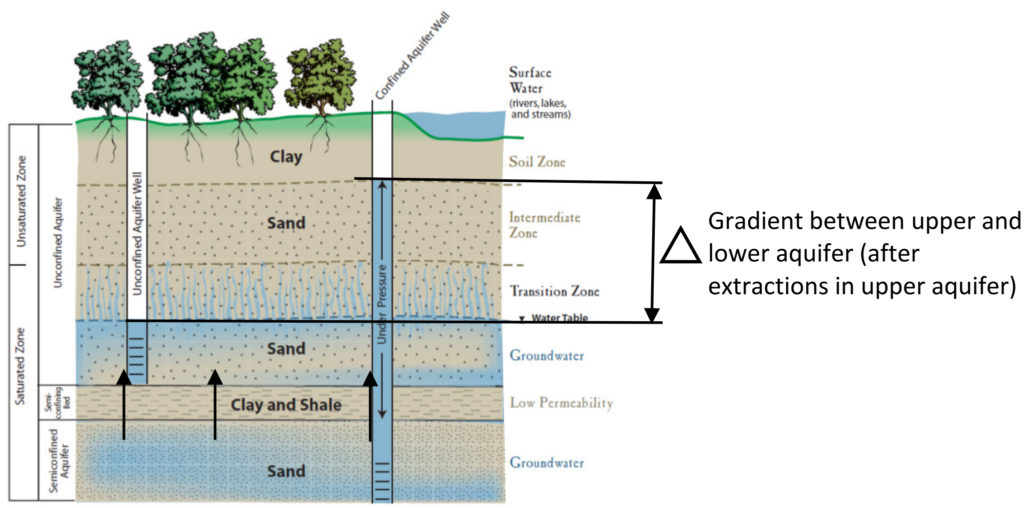


Figure 4-2. Hydraulic Communication between Principal Aquifers

The dynamic difference in heads between the upper and lower aquifer is best visualized in a contour of groundwater model[1] differences across the entire subbasin as shown in **Figure 4-3**. This figure captures fall 2011 conditions after the subbasin has been stressed (i.e., creating the greatest piezometric head difference between the upper and lower aquifers - focusing on those areas where most of the pumping is occurring). Differences are positive near surface water recharge locations where water mounds in the upper aquifer and the lower semi-confined

[1] 2011 SacIGSM model head values in Layer 1 and Layer 2

aquifer responds to pumping activities. Larger differences along the subbasin rim to the east are due to a modeling artifact as the upper aquifer pinches out in some areas and model nodes become dewatered.

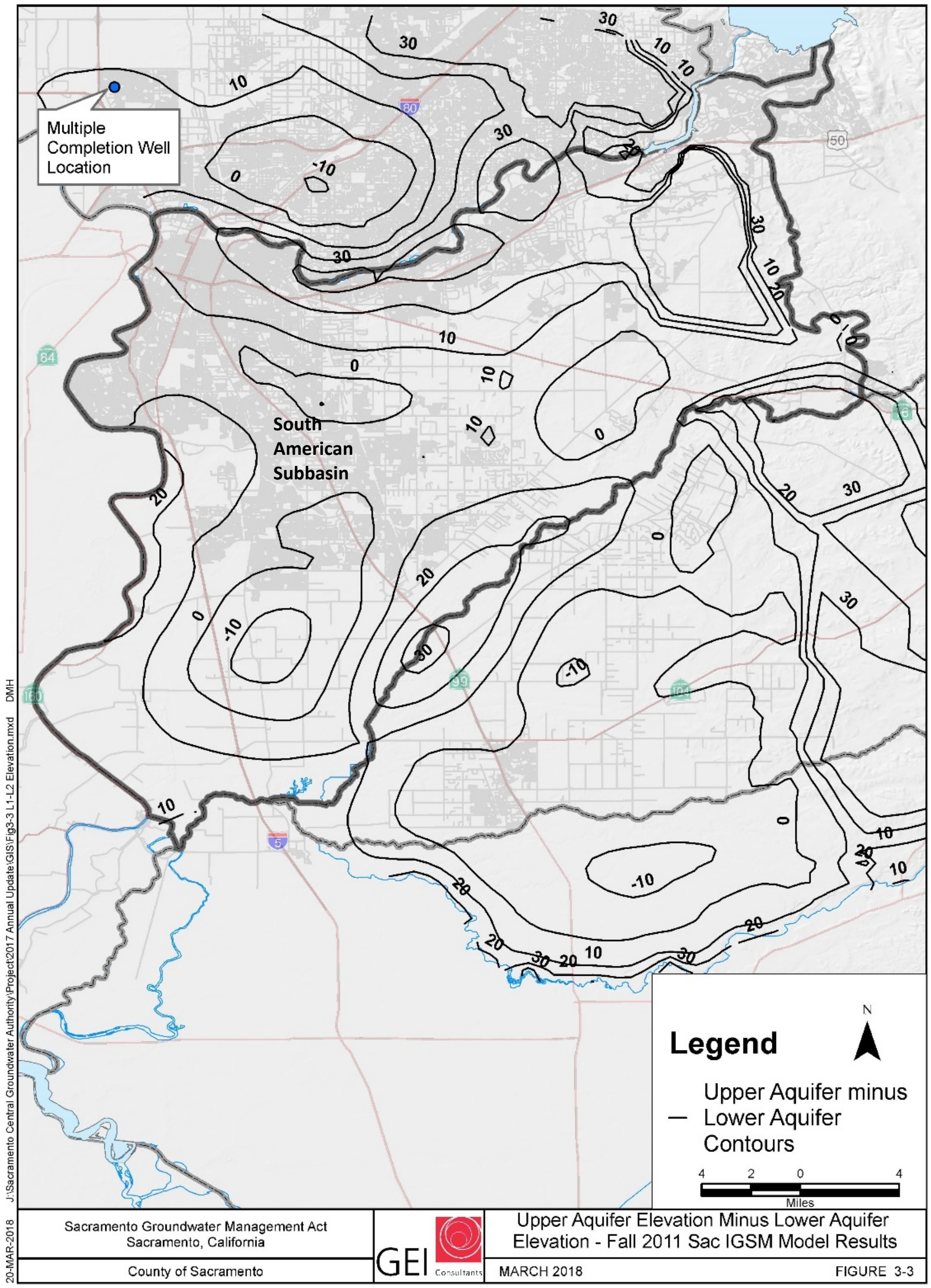


Figure 4-3. Upper Aquifer Elevation Minus Lower Aquifer Elevation - Fall 2011 SacIGSM Model Results

Currently, dedicated multiple completion wells that are part of CASGEM only exist in the North American Subbasin. **Figure 4-4** represents the hydrograph for the multiple completion well shown on **Figure 4-3**. The shallow completion is 220 feet deep and the middle completion is

500 feet deep. The trace in elevations shows response in both wells due to regional pumping, maintaining a 5 to 10 foot difference in their piezometric surface.

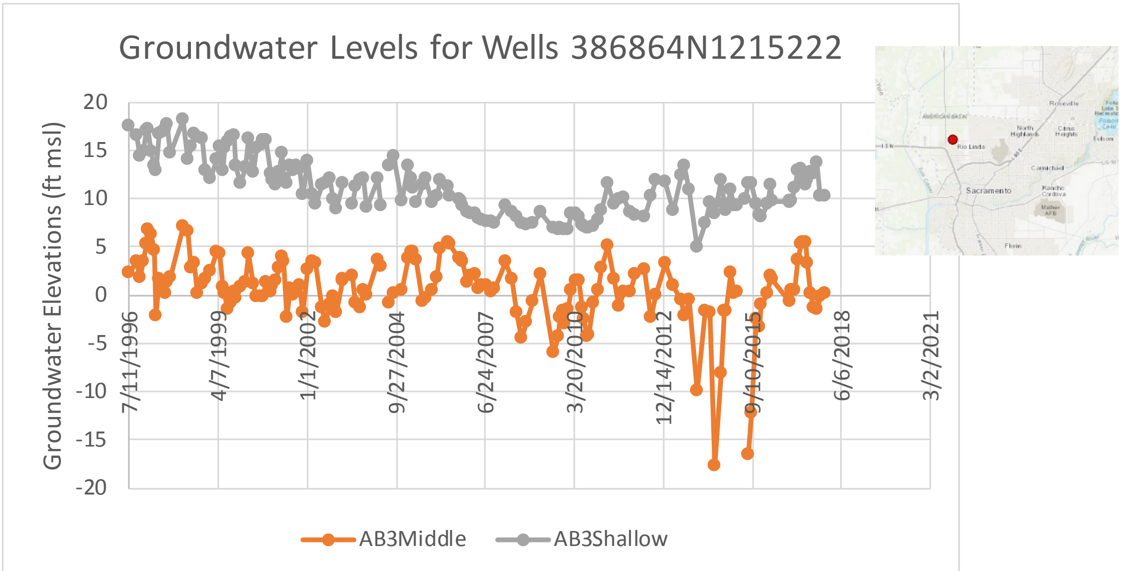
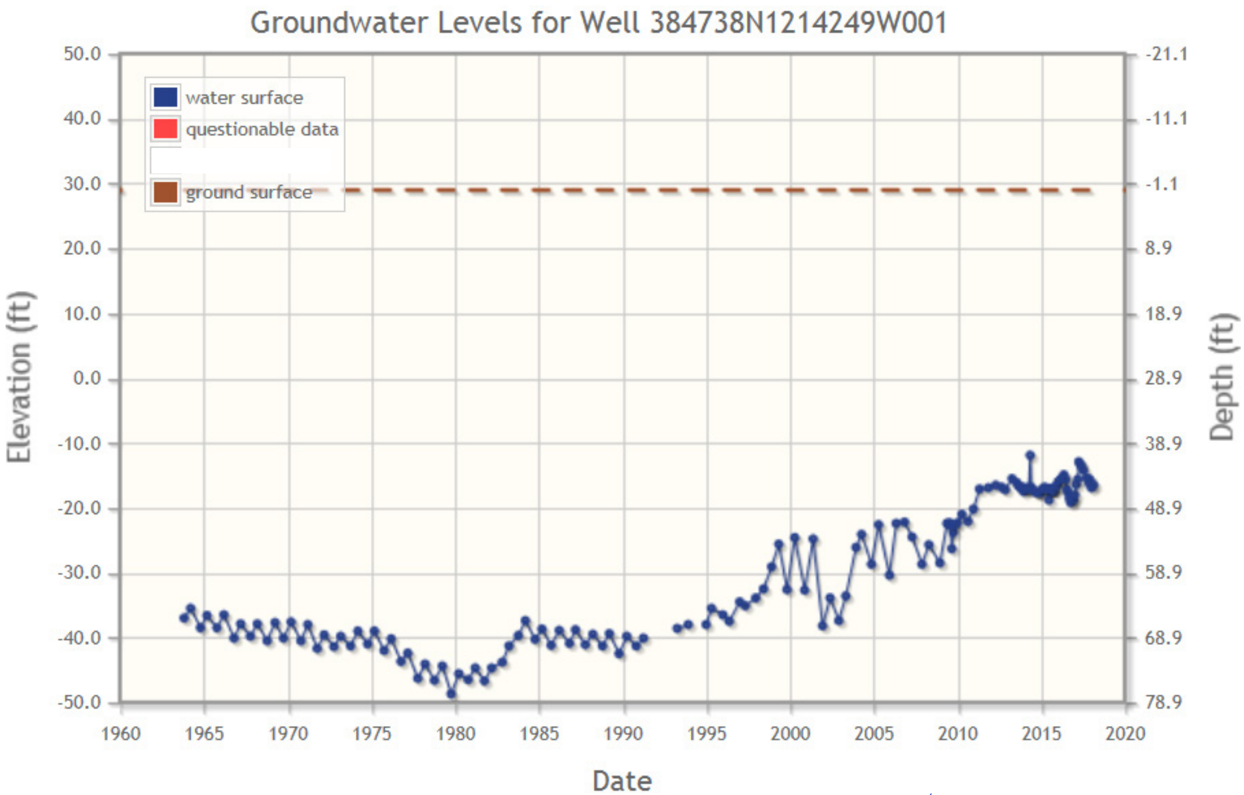


Figure 4-4. Multiple Completion Well in North American Subbasin Illustrating Piezometric Head Difference Between Upper and Lower Aquifers

4.2 Seasonal High and Low (Spring and Fall) (§356.2(b)(1)(A))

The South American Subbasin experiences periods of high and low extractions based on seasonal irrigation and water demand requirements. In wet years where surface water allocations are high, pumping is reduced in all land use sectors that practice conjunctive use allowing the aquifer to recharge naturally from rainfall, mountain fronts, and adjacent river flows. SCGA member agencies rely on natural in-lieu recharge for sustainable long-term management of the subbasin. Currently, a number of programs have been established to reduce groundwater extractions by importing alternative supplies such as surface water, recycled water, and remediated groundwater, and through the historic conversion of agricultural lands to developed uses with less intensive water demand.

Seasonal highs and lows in groundwater elevations occur primarily in the fall and early spring of each Water Year as shown in **Figure 4-5**. This well is in an area where surface water is the predominant source of supply and best represents the regional behavior of the subbasin over an extended period. Monthly measurements have been taken since 2010, with seasonal highs being recorded in the months of February through May, and seasonal lows through the months of August to December. For purposes of representing a point in time for producing groundwater elevation contours, spring data is focused in the months of March, April, and May, and for fall, the month of October. The wider window of time for spring allows for delays in taking measurements due to flooding and other access issues.



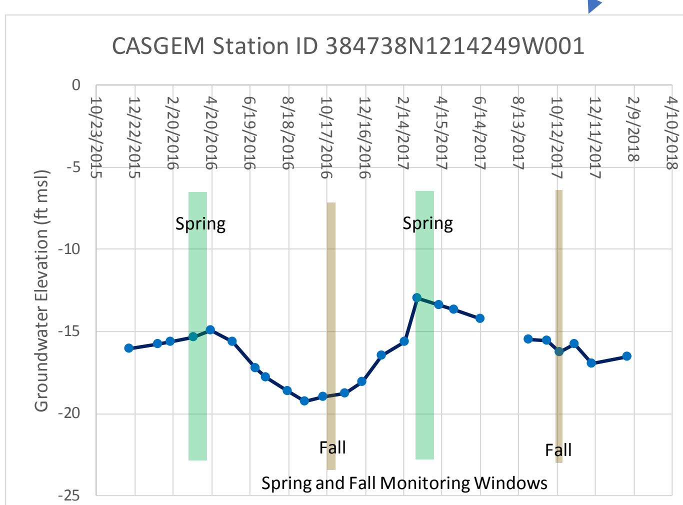


Figure 4-5. Subbasin Hydrograph Illustrating Seasonal High and Low Elevations with Monthly Readings

Source: DWR Groundwater Information Center
http://www.water.ca.gov/waterdatalibrary/groundwater/hydrographs/brr_hydro.cfm?CFGRIDKEY=6168

4.2.1 Seasonal Groundwater Contours

As noted in **Section 4.1.1.1**, the shallow and deep aquifers are hydraulically connected with partial confinement effects occurring at locations and during periods of high extraction/recharge conditions. Elevation data represented in all contour figures includes all monitoring data in the region and does not discriminate between the shallow and deep aquifers.

Groundwater contours for spring and fall 2018 are shown in **Figure 4-6** and **Figure 4-7**, respectively. Each of these figures represents a snapshot in time of the average groundwater elevations throughout the region. Notable in all contour figures are the three cones of depression in the region used as indicators of changing conditions in the North American, South American, and Cosumnes subbasins. Communication between the three subbasins is more apparent along hydraulically disconnected reaches of the major river systems where similar trends are most likely due to subsurface connectivity rather than recharge from surface flows (i.e., American and Cosumnes Rivers).

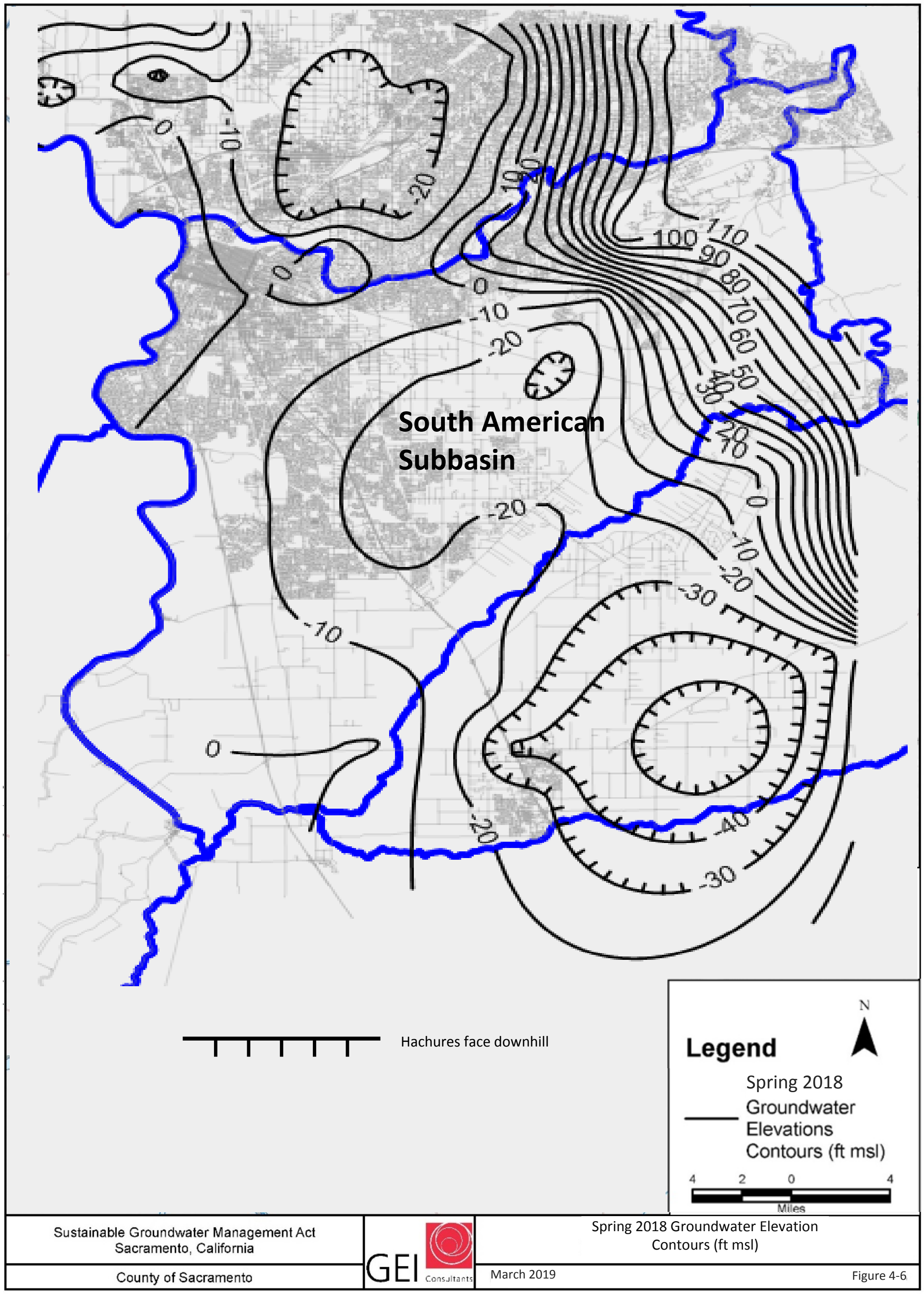


Figure 4-6. Spring 2018 Groundwater Elevations Contours with Monitoring Wells (ft msl)

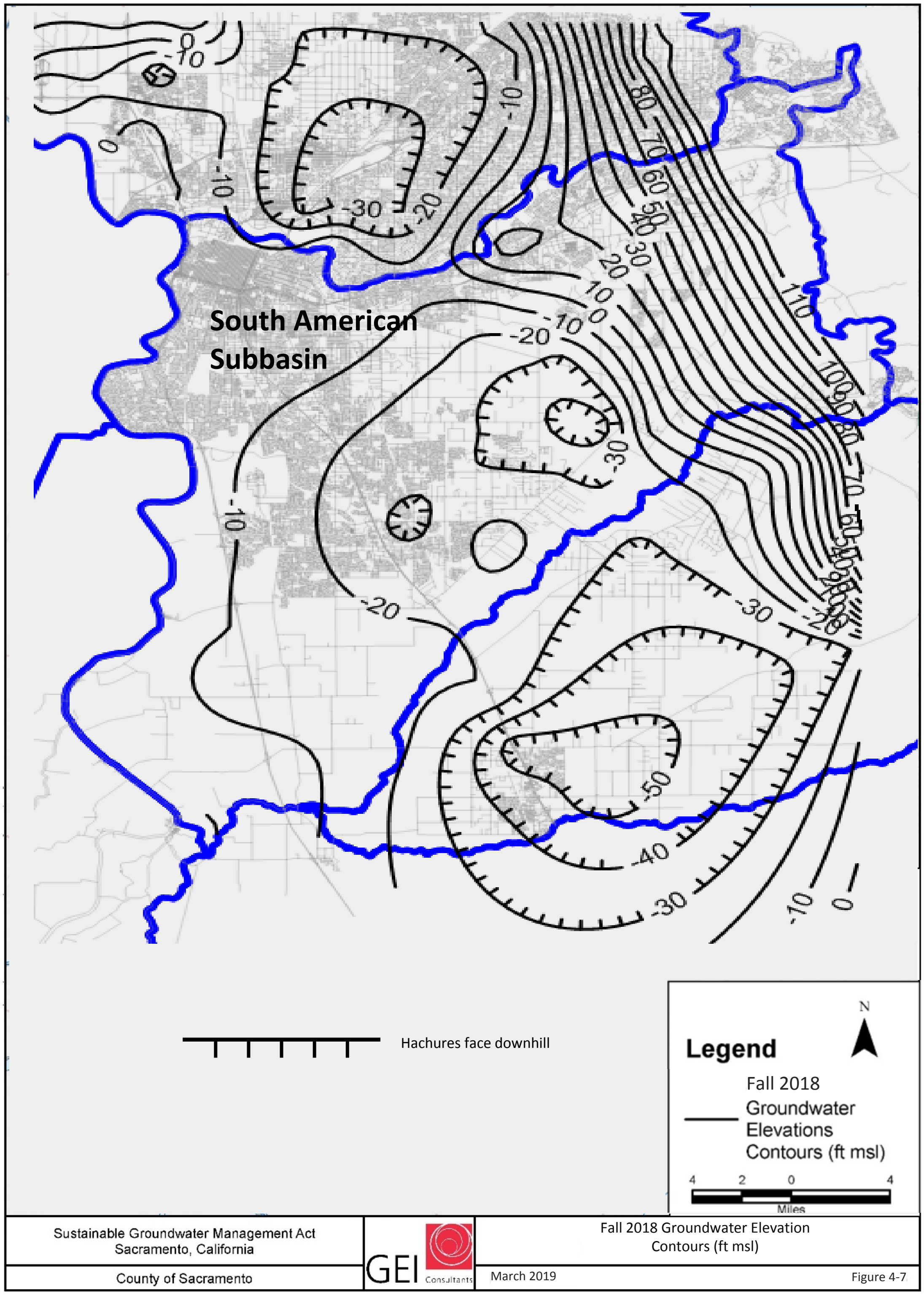


Figure 4-7. Fall 2018 Groundwater Elevations Contours with Monitoring Wells (ft msl)

4.3 Select Hydrographs Including 2015 (§356.2(b)(1)(B))

Groundwater elevation hydrographs are used to evaluate aquifer behavior over time. Changes in groundwater elevation at a given point in the subbasin can result from many influencing factors, with all or some occurring at any given time. Factors can include, but are not limited to, changing hydrologic trends, seasonal variations in precipitation, varying subbasin extractions, changing inflows and outflows along boundaries, availability of recharge from surface water sources, and influence from localized pumping conditions.

Figure 4-8 provides the historic rainfall and corresponding water year types based on the Sacramento River Index (SRI).[2] Water year classifications are typically the first indicator used to evaluate longer term variations in hydrograph elevations absent other factors indicated above. Water Year 2018 is indicated as being the first wet year after an extended period of dry and below normal years, indicating that groundwater elevations should increase in areas where the extended drought had the greatest effect.

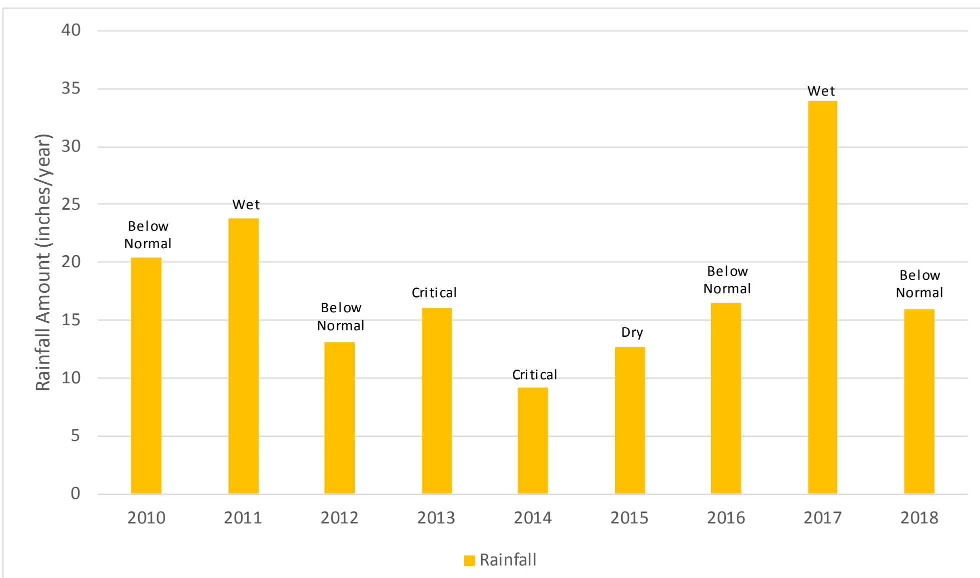


Figure 4-8. Historic Annual Rainfall and Water Year Type

Source: CDEC http://cdec.water.ca.gov/cgi-progs/prevprecip/PRECIPOUT

[2] WY 2018 SRI not published by CDEC at the time of this report. Assumed to be Below Normal Year based on measured rainfall, and Sacramento River and American River flows.

4.3.1 Representative hydrographs

A location map and compilation of all relevant subbasin groundwater elevation hydrographs are included in **Appendix C. South American Subbasin Hydrographs**. Attributes contributing to relevancy incorporate quality of data, extended time series indicating trends, and recent measurements over the 2005 to 2018 time period. Hydrographs included in **Figure 4-9** and **Figure 4-10** are selected based on having Water Years 2016-2018 measurements and uniformity in locations within the subbasin. Each hydrograph includes a standardized elevation axis to allow for direct comparison of the level of change over time. Ground surface elevation, Water Forum solution upper and lower operating thresholds, groundwater level, and water year type are included with each hydrograph to provide the maximum interpretation of performance and sustainability.

The basis and origin for indicated threshold values are described in the 2006 GMP and 2016 Alternative Submittal. The narrower band of threshold values is indicative of areas where basin fluctuations were expected to be lower due to predominant surface water use, distance from regulated rivers, and minimal effects from conjunctive use programs. Broader bands indicate areas of expected fluctuation due to changes in recharge during hydrologically wet and dry periods and the presence of active conjunctive use programs. Hydrographs trending downward below minimum threshold values are seen in several hydrographs and are due to expanded remediation activities (i.e., very little private domestic and municipal pumping occurs in the northeast portion of the subbasin) and increased agricultural pumping along the Cosumnes Corridor and in the Cosumnes Subbasin. Expansion of remediation activities includes increased geospatial extents of contaminant plumes and increased annual extraction volumes to contain further plume migration. Additional lowering of elevations along the Cosumnes River (southeast portion) is primarily due to the drought's impact on the volume of natural recharge from the Cosumnes River and Deer Creek[3], resulting in a deterioration of the natural barrier/boundary that buffers impacts in the subbasin as a result of increased reliance on groundwater in the Cosumnes Subbasin (see also **Figure 4-6** and **Figure 4-7**). The reduced buffer contributes to a higher level of change in the South American Subbasin as a result of changed pumping conditions in the Cosumnes Subbasin, and vice versa, where and when applicable.

[3] Decreased flows in Deer Creek have also occurred due to State Regional Water Quality Control Board regulatory reductions in treated wastewater flow discharges from El Dorado Irrigation District that ultimately flow into Deer Creek and the Cosumnes River.

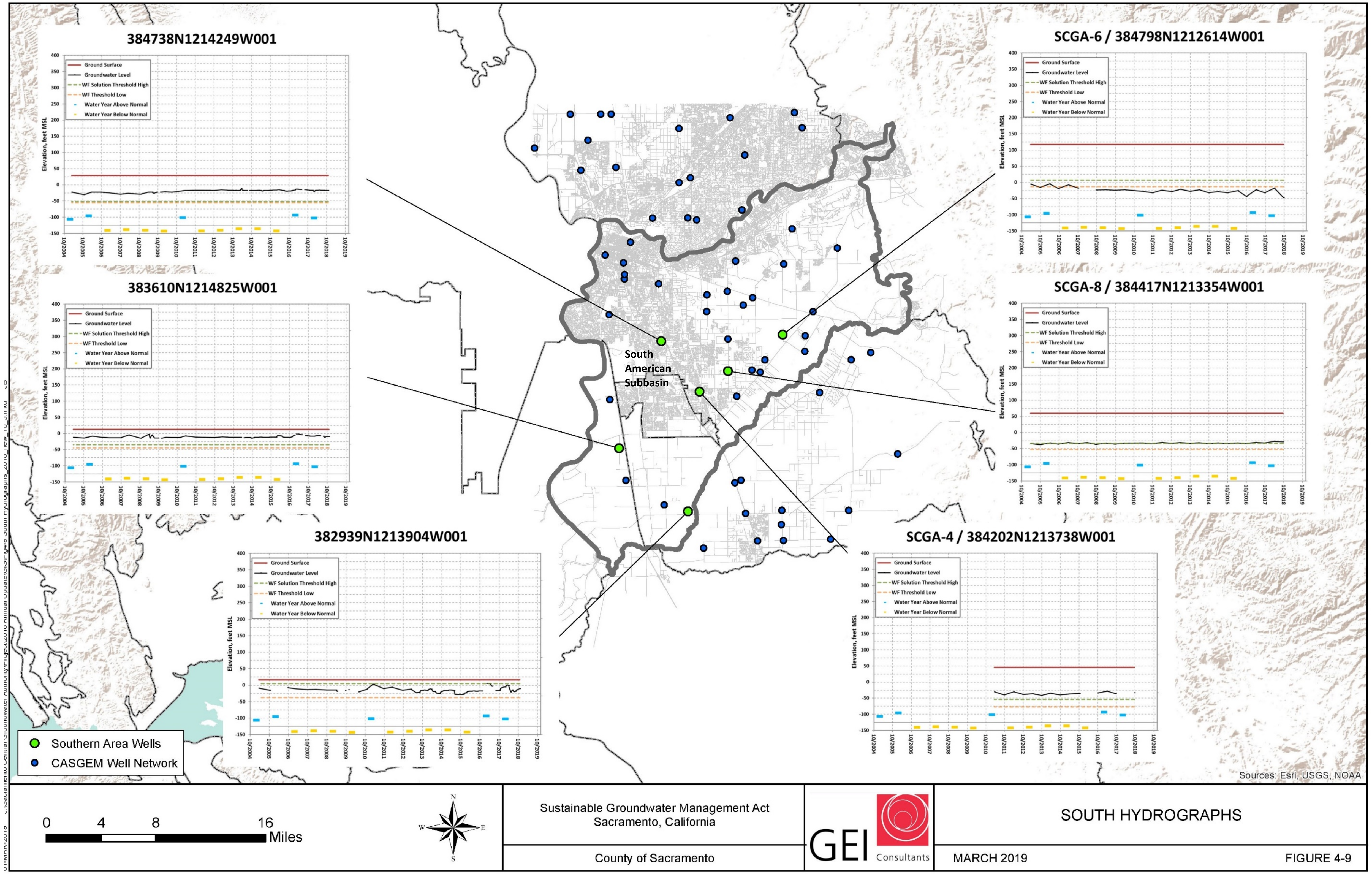


Figure 4-9. South Hydrographs

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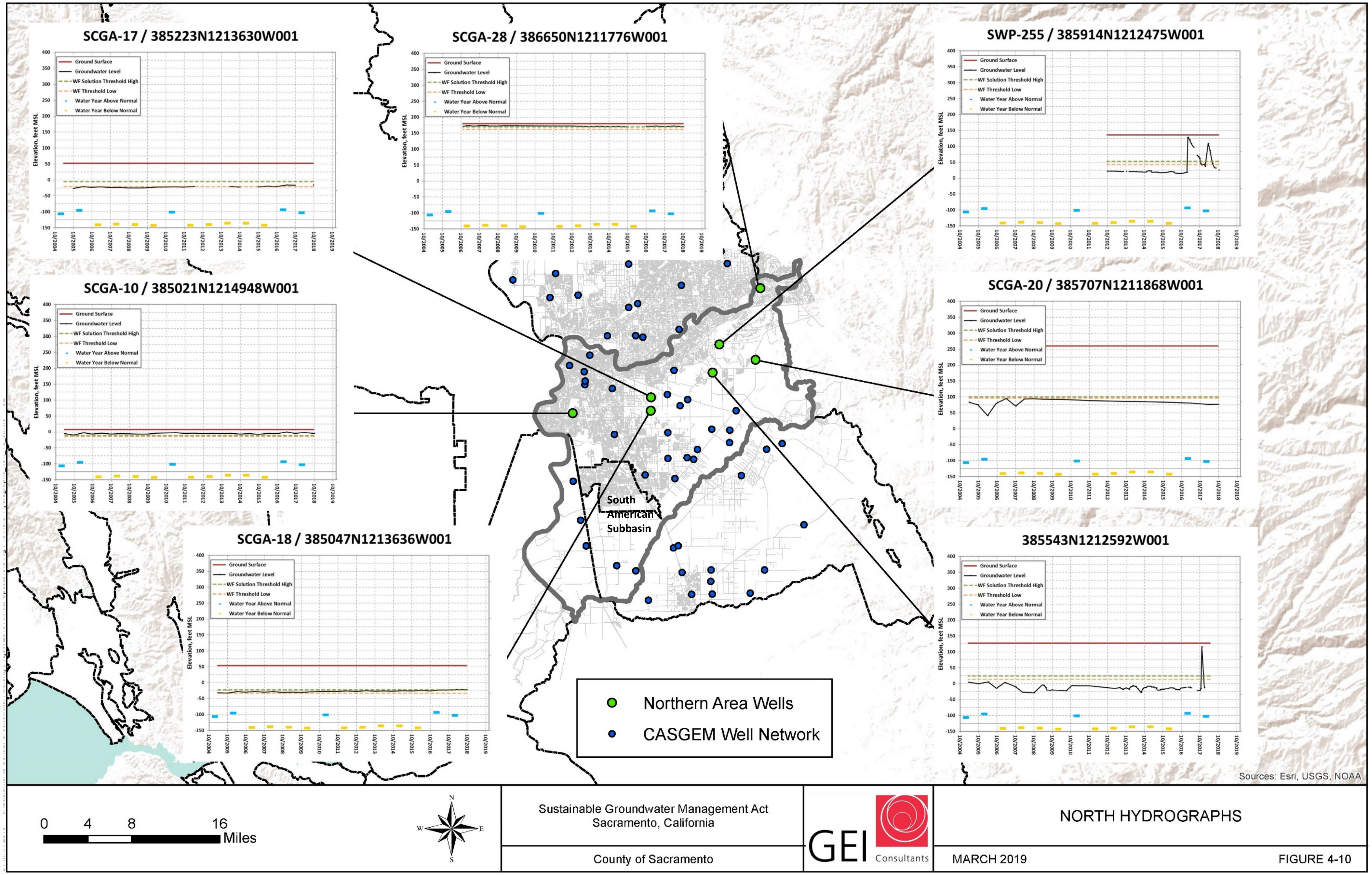

Figure 4-10. North Hydrographs

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Chapter 5. Groundwater Extractions (§356.2(b)(2))

5.1 Introduction

This section presents the metered and estimated groundwater extractions from the South American Subbasin for the 2018 Water Year, and describes the data and methods used to develop extraction estimates. The types of groundwater extraction described in this section include: municipal, agricultural, rural, and remediation. The monthly detailed pumping values for all sectors are shown in **Table 5-1**.

5.2 Municipal and Metered Well Production Data

Municipal groundwater extractions documented herein are primarily metered data; for those without metered data the purveyor's extraction volumes have been estimated from previous years' measurements, modeled results, or population-based per capita water use assumptions.

In preparation for this report, monthly groundwater extraction data requests were sent to participating agencies within SCGA boundaries. All the data shown in **Table 5-2** reflect metered data reported by the respective agencies, with the following exceptions: the community of Courtland, Florin County Water District, and Tokay Park Water District. Florin County Water District and Tokay Park Water District extraction amounts were estimated based on previous modeling efforts using an IGSM platform (SacIGSM). Both areas have had very little change in number of service connections and water system improvements. Extraction volumes for the small Delta community of Courtland were estimated using the US census (2010) population of 357, and an assumed indoor/outdoor water-use per capita of 500 gallons per day per capita. Total municipal extractions within the South American Subbasin are estimated to be **41,144 AF** for the 2018 Water Year. Note that small Delta communities (i.e., Courtland and Hood) are included with Delta agriculture and rural extractions to maintain a separate accounting for Delta management purposes.

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Table 5-1. 2018 Water Year Total Groundwater Use

	Groundwater Extractions (Acre-Feet)												
	2017			*2018*									
Municipal Water Purveyor	**October**	**November**	**December**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**Total**
Cal AM	1,504	924	871	764	745	824	856	1,348	1,538	1,623	1,540	1,288	**13,825**
City of Sacramento	228	219	222	222	194	189	209	217	211	186	212	206	**2,515**
Elk Grove Water District	403	-	-	28	77	132	2	-	69	63	91	462	**1,327**
Florin County Water District	242	194	128	93	112	154	194	251	306	344	331	298	**2,647**
Fruitridge Vista Water Company	225	-	-	113	-	115	-	-	-	-	-	379	**832**
Golden State Water Company	548	372	301	274	309	312	444	407	219	423	342	127	**4,078**
Sacramento County Water Agency	1,251	467	823	1,618	1,293	805	734	1,512	1,907	1,974	1,786	1,483	**15,653**
Tokay Park Water District	14	14	14	25	25	25	25	25	25	25	25	25	**267**
Subtotal	4,415	2,190	2,359	3,137	2,755	2,556	2,464	3,760	4,275	4,638	4,327	4,268	**41,144**
Agricultural and Rural (Non-Delta)													
Agricultural	9,821	-	-	-	-	4,733	5,123	10,560	14,815	18,939	18,440	15,057	**97,488**
Rural Residential - Indoor	56	54	56	56	50	56	54	56	54	56	56	54	**658**
Rural Residential - Outdoor	3,246	-	-	-	-	-	-	4,880	4,187	2,890	2,931	4,037	**22,171**
Subtotal	**13,123**	**54**	**56**	**56**	**50**	**4,789**	**5,177**	**15,496**	**19,056**	**21,885**	**21,427**	**19,148**	**120,317**
Delta Agricultural and Communities													
Courtland	18	15	10	7	8	12	15	19	23	26	25	22	**200**
Hood	3	4	8	6	5	5	6	8	11	9	9	8	**82**
Agriculture and Rural	4,093	-	-	-	-	2,368	2,261	2,430	129	582	4,173	6,426	**22,462**
Subtotal	**4,114**	**19**	**18**	**13**	**13**	**2,385**	**2,282**	**2,457**	**163**	**617**	**4,207**	**6,456**	**22,744**
Remediation													
IRCTS	393	339	378	372	411	468	450	418	467	429	466	476	**5,067**
Aerojet	2,188	2,139	2,345	2,249	1,900	2,203	2,326	2,249	2,114	2,032	2,216	2,114	**26,075**
Mather AFB (Note 1)	186	186	186	186	186	186	186	186	186	186	186	186	**2,232**
Kiefer Landfill (Note 2)	41	41	41	41	41	41	41	41	41	41	41	41	**492**
Sacramento Army Depot (Note 2)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	**18**
Union Pacific Downtown (Note 2)	20	20	20	20	20	20	20	20	20	20	20	20	**240**
Union Pacific Curtis Park (Note 2)	16	16	16	16	16	16	16	16	16	16	16	16	**192**
Subtotal	**2,846**	**2,743**	**2,988**	**2,886**	**2,576**	**2,936**	**3,041**	**2,932**	**2,846**	**2,726**	**2,947**	**2,855**	**34,316**
Total	**24,498**	**5,006**	**5,421**	**6,092**	**5,394**	**12,666**	**12,964**	**24,645**	**26,340**	**29,866**	**32,908**	**32,727**	**218,521**

Notes (assumptions used to fill data gaps for unreported values)

1. Represents the average extractions for the years 2014-2016 spread equally over 12 months
2. Represents the average extractions for the years 2013-2015 spread equally over 12 months

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Table 5-2. 2018 Water Year Municipal Well Production Summary by Water Agency (AF/year)

Water Purveyor	2018 WY Total
Cal Am	13,825
City of Sacramento	2,515
Elk Grove Water Service	1,327
*Florin County WD**	2,647
Fruitridge Vista WC	832
Golden State	4,078
SCWA - Zone 41	15,653
*Tokay Park WD**	267
Total	**41,144**

Notes: * Based on model results from the IGSM efforts in SCGA
**Estimated based on population

5.3 Estimate of Agricultural and Rural Residential Extraction

Agricultural demands within the South American Subbasin constitute a sizeable portion of total groundwater use. To estimate agricultural water use, land use data along with climate and soil data were analyzed and processed using a root zone simulation model (IWFM Demand Calculator, IDC) to calculate the applied water for areas utilizing groundwater. Land use data from both USDA (2018) and DWR (2015) were used to determine the appropriate crop categories and associated irrigation sources. Land use types were grouped within several broader crop categories such as field and truck crops, or orchards and vineyards, each with a respective water demand.

Within the subbasin there are upwards of 2,000 rural residential parcels that rely on private domestic groundwater wells for both indoor uses, as well as outdoor irrigation. Outdoor irrigation demands were estimated using the IDC model (see **Appendix D. IDC Update Report**). Indoor demands were estimated using the number of parcels and an assumed household size and daily per capita water use. The resulting groundwater extractions for agriculture and rural residential demands are summarized in **Table 5-3.** Total estimated rural and agricultural pumping for the 2018 Water Year was **143,061 AF.**

Table 5-3. Agriculture and Rural Residential Pumping Estimates (AF/year)

Agricultural and Rural (Non-Delta)	**2018 WY Total**
Agricultural	97,488
Rural Residential - Indoor	658
Rural Residential - Outdoor	22,171
Subtotal	**120,317**
Delta Agricultural and Communities	
Courtland	200
Hood	82
Agriculture and Rural	22,462
Subtotal	**22,744**
Total	**143,061**

5.4 Remediation

Groundwater remediation is a necessary extraction in the South American Subbasin. On-going remediation activities are implemented under various state and federal regulatory programs at several sites within the basin. These regulatory remediation activities protect drinking water quality for human use and take precedence over the potential risk to groundwater storage and other aquifer impacts resulting from these extractions.

The data presented for 2018 is a combination of reported extractions, and representative values based on previously reported values. Boeing reported monthly extractions for the Inactive Rancho Cordova Test Site (IRCTS) through 2018, as did Aerojet for all their remediation locations. Volumes for the remainder of the remediation sites (Mather AFB, Keifer Landfill, Sacramento Army Depot, Union Pacific Downtown, and Union Pacific Curtis Park) were estimated based on the previous three years of reported data. See **Table 5-1** for monthly groundwater remediation summary for the 2018 Water Year. Total groundwater remediation pumping for the 2018 Water Year totaled **34,316 AF.**

5.5 Total Groundwater Extraction Summary

Total groundwater extractions in the South America Subbasin for the 2018 Water Year are estimated to be **218,521 AF. Table 5-4** summarizes the total water use by sector. Approximate points of extraction were spatially distributed and colorized according to a grid system to represent the relative pumping across the basin in terms of AF per acre (see **Figure 5-1**). Areas south of the American River experience some of the highest levels of relative pumping in the basin due to the various remediation pumping operations taking place to improve and protect water quality. Areas dependent on groundwater along the Cosumnes River and in areas of agriculture and municipal uses show a moderate concentration of groundwater pumping in the below average 2018 Water Year.

Table 5-4. Water Year Summary of Total Extractions by Sector (AF/year)

Water Sector	2018 WY Total
Municipal	41,144
Agricultural	119,950
*Rural Residential**	23,111
Remediation	34,316
Total	**218,521**

*Inclusive of Courtland and Hood

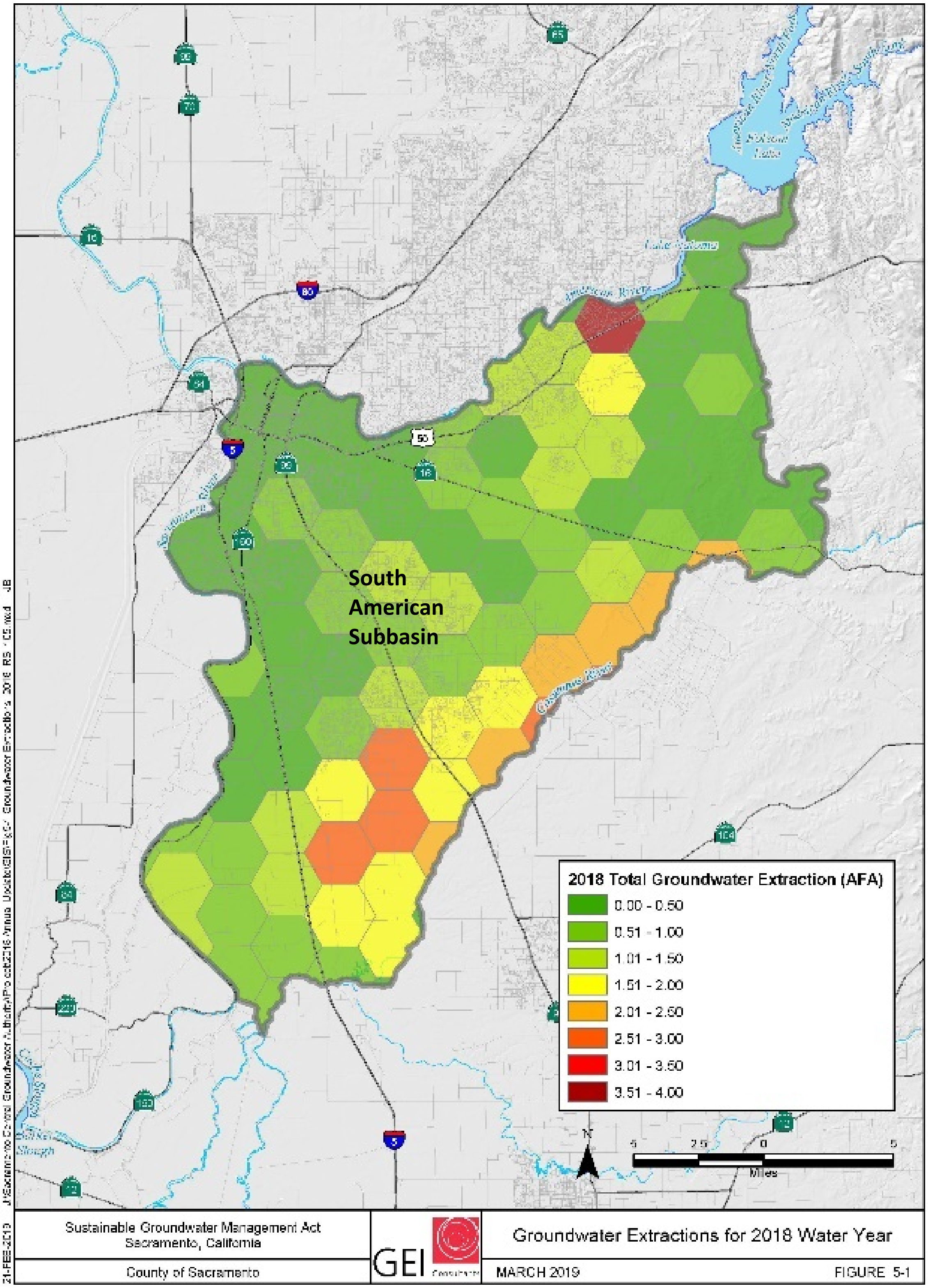

Figure 5-1. General Location and Relative Volume of Groundwater Extractions for the 2018 Water Year (AF/Acre/year)

Chapter 6. Surface Water Use (§356.2(b)(3))

6.1 Introduction

This section addresses the reporting requirement of providing surface water supplies used, or available for use, for groundwater recharge or in-lieu use, and describes the annual volume and sources for the 2018 Water Year. Currently, the subbasin recharge benefits from available surface water entitlements to meet urban and agricultural water demands. Surface water used in-lieu of groundwater pumping from the underlying aquifers provide the highest level of recharge volume, versus spreading basins or direct injection. Approximate locations of many municipal and agricultural diversions contributing surface water to the South American Subbasin are indicated in **Figure 6-1**.

6.2 Surface Water use by Source

Table 6-1 provides a detailed breakdown of major surface water diversions in the South American Subbasin. Municipal water purveyors who hold surface water entitlements along the Sacramento and American Rivers divert surface water for retail water service to their customers and often cooperate in wholesale and wheeling agreements to distribute surface water to the maximum extent practicable throughout the region. For example, a water purveyor's current water year entitlements often exceed the amount delivered to its own customers, allowing for additional wholesale deliveries within the place of use for the given water right. Affordability of treated wholesale surface water is a constraint in making use of the full in-lieu potential of available supplies. The region's commitment to the Water Forum Agreement, General Plan policies, and need for dry year reliability through conjunctive use have worked to increase the region's in-lieu potential over the last 10 years.

Agricultural surface water use along the Cosumnes River is predominantly through unmetered riparian and appropriative water right diversions, and Delta surface water deliveries for agriculture occur at hundreds of points along Delta levees west of Interstate 5. The amount of surface water used by agriculture is estimated within the Delta portion of the subbasin. The amount of surface water used along the Cosumnes is not estimated due to a decreasing reliance on surface water and many farmers opting to use surface water for groundwater recharge to sustain the use of groundwater for drip irrigation technologies.

Environmental uses of surface water to support riparian growth and managed wetlands along the river and stream courses is also recognized but not estimated due to insufficient data to make an estimate of surface water use. It is expected that environmental uses will be quantified in future Annual Reports as more data is collected from participating parties.

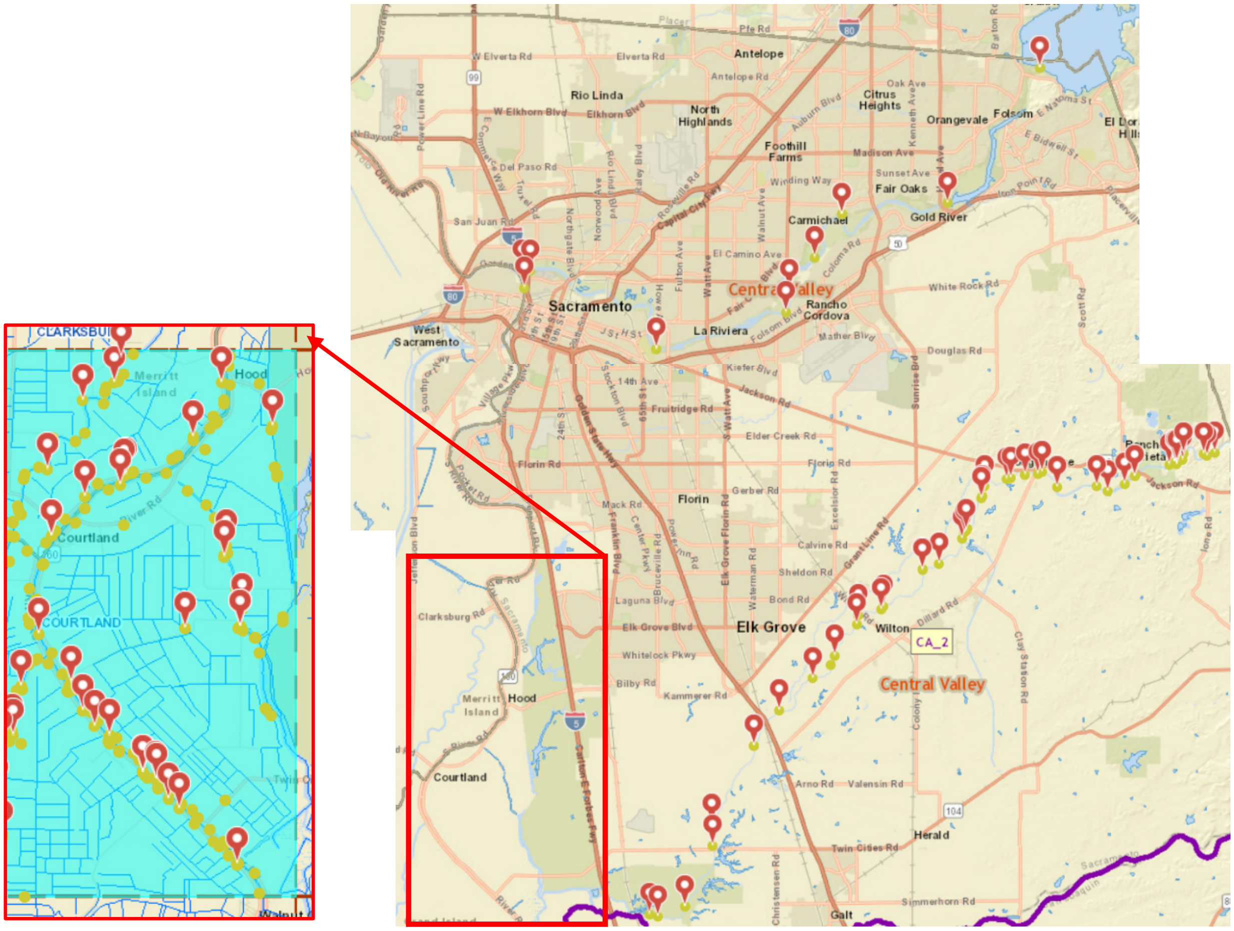

Figure 6-1. Locations of Surface Water Diversions Along Major Rivers in South American Subbasin

Source: https://waterrightsmaps.waterboards.ca.gov/viewer/index.html?viewer=eWRIMS.eWRIMS_gvh#

Table 6-1. 2018 Water Year Surface Water Use

	Surface Water Use (Acre-Feet)												
	2017			2018									
Municipal - Water Purveyor	**October**	**November**	**December**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**Total**
Cal Am (Note 4)													**-**
City of Folsom (Note 3)	914	731	482	349	424	582	731	947	1,155	1,297	1,247	1,122	**9,982**
City of Sacramento - Retail (Note 3)	5,598	3,459	3,263	3,058	3,016	3,149	3,595	5,489	6,643	7,531	7,003	6,108	**57,912**
Wholesale/Wheeling Deliveries (Note 7)	0	0	0	0	0	0	0	-	0	86	83	76	**245**
Elk Grove Water District (Note 4)													-
Florin County Water District (Note 5)													-
Fruitridge Vista Water Company (Note 4)													-
Golden State Water Company (Note 8, 9)	337	0	0	-	-	-	-	450	820	851	839	838	**4,135**
Rancho Murieta CSD (Note 3)	43	34	22	16	20	27	34	44	54	60	58	52	**465**
Sacramento Regional Sanitation District (Note 6)													-
Sacramento County Water Agency (Note 4, 8)	1,967	1,418	906	-	498	1,050	1,217	1,732	2,037	2,363	2,349	2,139	**17,676**
Tokay Park WD (Note 5)													-
Subtotal	**8,859**	**5,642**	**4,674**	**3,424**	**3,957**	**4,808**	**5,578**	**8,662**	**10,708**	**12,188**	**11,578**	**10,336**	**90,414**
Agricultural -Water District													-
Omochumne-Hartnell WD (Note 1)													-
North Delta Water Agency (Note 2)	229	-	-	-	-	-	-	2,576	8,223	10,945	6,923	2,323	**31,219**
Subtotal	**229**	**-**	**-**	**-**	**-**	**-**	**-**	**2,576**	**8,223**	**10,945**	**6,923**	**2,323**	**31,219**
Total	**9,088**	**5,642**	**4,674**	**3,424**	**3,957**	**4,808**	**5,578**	**11,238**	**18,931**	**23,133**	**18,501**	**12,659**	**121,633**

Notes
1. OHWD does not have customers in the traditional sense (i.e., no estimate or metered data available)
2. Represents average estimate of surface water diversions for NDWA Subregion 42 in SACIGSM
3. Surface water amounts estimated based on system operations and service area overlying subbasin
4. Provides retail distribution of purchased surface water (i.e., amount included with wholesale agency)
5. Service area located in City of Sacramento American River POU
6. Wholesale provider for recycled water
7. City of Sacramento wholesales to Fruitridge Vista, and Cal-Am, and wheels “Fazio” CVP water to SCWA
8. Diverts remediated groundwater discharged to American River from Aerojet/Boeing
9. Golden State WC wholesales to SCWA

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6.3 Total Surface Water Use by Sector

A summary of surface water by sector is provided in **Table 6-2.** Like agriculture, some minimal riparian surface water uses may be taking place by rural residential parcels contiguous to the Cosumnes River. To remain conservative on groundwater extraction estimates, a zero value is assumed in this report.

Table 6-2. Surface Water Use by Sector

Water Sector	**2018 WY Total**
Municipal	90,414
Agricultural	31,219
Rural Residential	0
Remediation	0
Total	**121,633**

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Chapter 7. Total Water Use (§356.2(b)(4))

This section describes how the four water resource types, including groundwater, surface water, recycled water, and remediated groundwater, are used to meet environmental, rural, municipal, and agricultural demands within the South American Subbasin. In the context of a water budget, the calculation of total water use requires balancing the quantity of each water resource type to meet the total water demands in the subbasin.

7.1 How Total Water Use Is Measured/Calculated/Estimated from Existing Water Management Plan Or UWMP

Water demands are determined using various methods based on identified applications and available data. For instance, agricultural demands can vary significantly based on crop type, rainfall, and daily ET. For agricultural-residential water users, demands are based on indoor usage, the amount of landscaped area around the home, and the amount of irrigated pasture for parcels that maintain livestock or other farm animals. Municipal water demands are typically based on metered water usage for each of the different residential, commercial, and industrial land use types. Private industry and park district water demands are specific to the type of activity taking place at each site.

For the 2018 Water Year, the quantification of total water use was completed through reporting of metered water production data from wells, surface water treatment plants, recycled water treatment plants, and from models used to estimate individual agricultural crop water supply requirements. In addition, rural water use was estimated based on standard estimating practices of per capita water use for indoor use and crop estimation for irrigated pasture or landscaping.

7.2 Estimated Total Water Use by Sector and Source

Table 7-1 provides a detailed accounting of total water use in the South American Subbasin including surface water, groundwater, and recycled water.

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Table 7-1. 2018 Water Year Total Water Use

	Total Water Use												
	2017			*2018*									
Municipal Water Purveyor	**October**	**November**	**December**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**Total**
Cal Am	1,504	924	871	764	745	824	856	1,348	1,538	1,623	1,540	1,288	13,825
City of Folsom	914	731	482	349	424	582	731	947	1,155	1,297	1,247	1,122	9,981
City of Sacramento	5,826	3,678	3,485	3,280	3,210	3,338	3,804	5,706	6,854	7,803	7,298	6,390	60,672
Elk Grove Water District	403	-	-	28	77	132	2	-	69	63	91	462	1,327
Florin County Water District	242	194	128	93	112	154	194	251	306	344	331	298	2,647
Fruitridge Vista Water Company	225	-	-	113	-	115	-	-	-	-	-	379	832
Golden State Water Company	885	372	301	274	309	312	444	857	1,039	1,274	1,181	965	8,213
Rancho Murieta CSD	43	34	22	16	20	27	34	44	54	60	58	52	464
Sacramento County Water Agency	3,218	1,885	1,729	1,618	1,791	1,855	1,951	3,244	3,944	4,337	4,135	3,622	33,329
Regional San - Recycled Water	90	14	15	-	-	-	-	-	-	-	-	-	119
Tokay Park Water District	14	14	14	25	25	25	25	25	25	25	25	25	267
Subtotal	**13,364**	**7,846**	**7,047**	**6,560**	**6,713**	**7,364**	**8,041**	**12,422**	**14,984**	**16,826**	**15,906**	**14,603**	**131,676**
Agricultural and Rural (Non-Delta)													
Agricultural	9,821	-	-	-	-	4,733	5,123	10,560	14,815	18,939	18,440	15,057	97,488
Rural Residential - Indoor	56	54	56	56	50	56	54	56	54	56	56	54	658
Rural Residential - Outdoor	3,246	-	-	-	-	-	-	4,880	4,187	2,890	2,931	4,037	22,171
Subtotal	**13,123**	**54**	**56**	**56**	**50**	**4,789**	**5,177**	**15,496**	**19,056**	**21,885**	**21,427**	**19,148**	**120,317**
Delta Ag and Communities													
Courtland	18	15	10	7	8	12	15	19	23	26	25	22	200
Hood	3	4	8	6	5	5	6	8	11	9	9	8	82
Agriculture and Rural	4,322	-	-	-	-	2,368	2,261	5,006	8,352	11,527	11,096	8,749	53,681
Subtotal	**4,343**	**19**	**18**	**13**	**13**	**2,385**	**2,282**	**5,033**	**8,386**	**11,562**	**11,130**	**8,779**	**53,963**
Remediation													
IRCTS	393	339	378	372	411	468	450	418	467	429	466	476	**5,067**
Aerojet	2,188	2,139	2,345	2,249	1,900	2,203	2,326	2,249	2,114	2,032	2,216	2,114	**26,075**
Mather AFB	186	186	186	186	186	186	186	186	186	186	186	186	**2,232**
Kiefer Landfill	41	41	41	41	41	41	41	41	41	41	41	41	**492**
Sacramento Army Depot	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	**18**
Union Pacific Downtown	20	20	20	20	20	20	20	20	20	20	20	20	**240**
Union Pacific Curtis Park	16	16	16	16	16	16	16	16	16	16	16	16	**192**
Subtotal	**2,846**	**2,743**	**2,988**	**2,886**	**2,576**	**2,936**	**3,041**	**2,932**	**2,846**	**2,726**	**2,947**	**2,855**	**34,316**
Total	**33,676**	**10,662**	**10,109**	**9,515**	**9,352**	**17,474**	**18,541**	**35,883**	**45,272**	**52,999**	**51,410**	**45,385**	**340,272**

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Table 7-2 and **Figure 7-1** provide a summary of total water use in the South American Subbasin. Environmental water, not shown, is recognized as a water use sector for purposes of completing future water budgets as part of SGMA reporting. Environmental water uses are typically not reported due to the difficulty in isolating riparian areas along waterways and distinguishing the differences between agricultural activities and managed wetlands in a regional-scale soil moisture model.

Table 7-2. 2018 Water Year Total Water Use by Sector and Source

Water Use Sector	Water Use (AF/year)		Water Supply Source	Volume (AF/year)
Municipal	131,958		*Groundwater*	184,205
Agriculture	151,169		*Surface Water*	121,633
Rural	22,829		*Recycled Water*	119
Remediation	34,316		*Remediation*	34,316
Total	**340,272**		**Total**	**340,273**

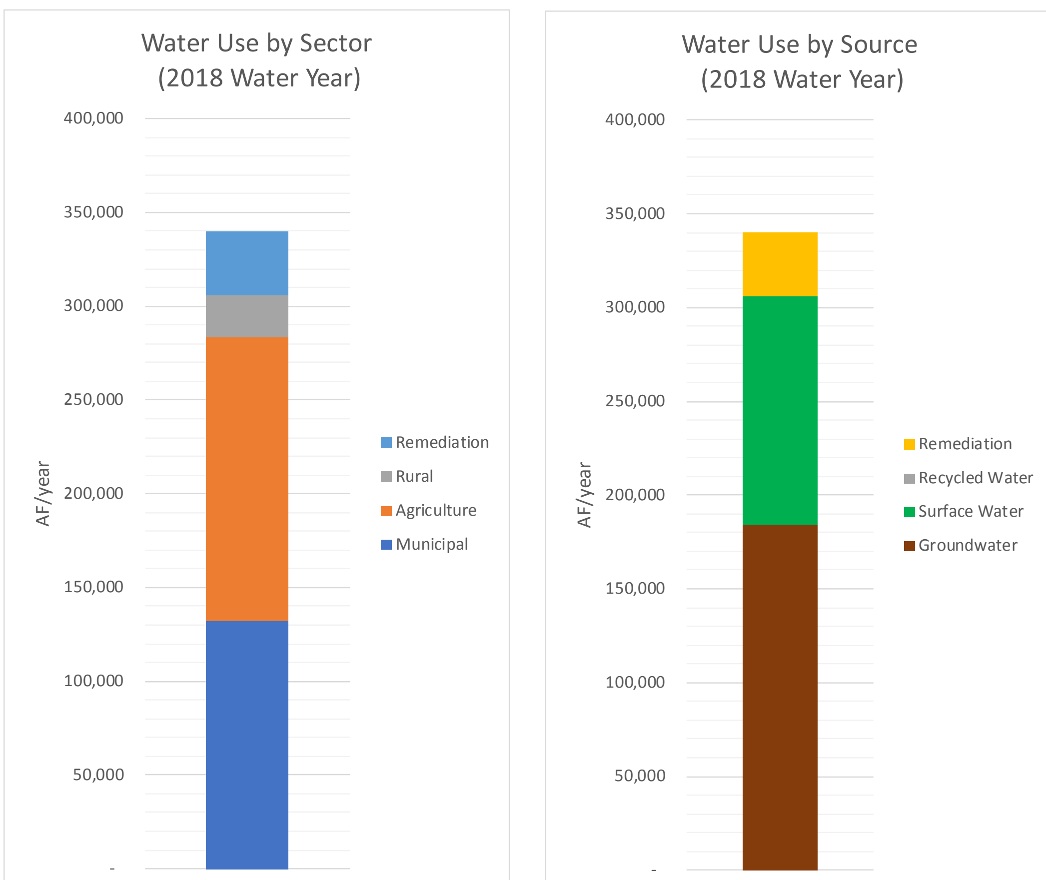

Figure 7-1. Total Water Use by Sector and Source

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Chapter 8. Change in Groundwater Storage (§356.2(b)(5))

8.1 Calculating Storage Change Using Groundwater Elevation Data

Storage change in the South American Subbasin alluvial deposits can be estimated using differences in groundwater elevation. Annual storage change in the aquifer is the change in the volume of water contained within the pore spaces of water bearing formations as shown in **Figure 8-1**. Water either fills or drains from the pore spaces, creating a gain or loss in storage, respectively.

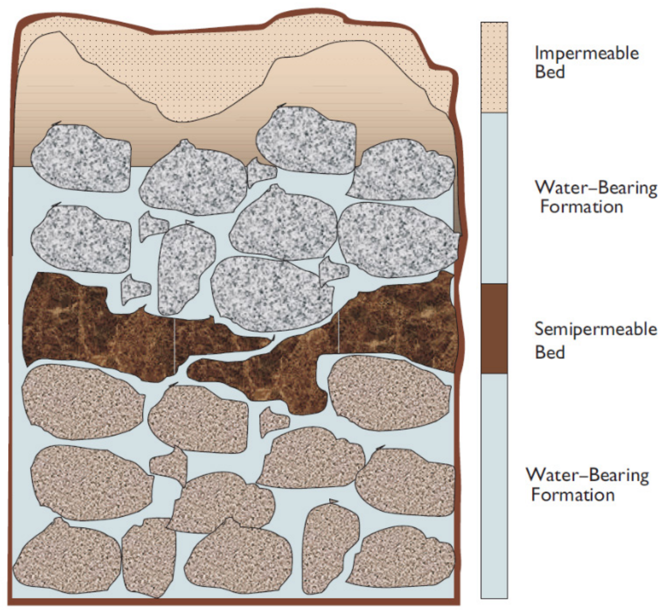

Figure 8-1. Pore Space in Water Bearing Formations

The calculation of storage change using measured groundwater elevation data requires taking the difference between contours calculated for the unconfined aquifer (i.e., saturated soil conditions). As described in **Section 4.1.1**, there are two principal aquifers in the subbasin, separated by a semi-confining layer that allows communication to take place. Past modeling has indicated up to 10 feet of difference in the regional piezometric surfaces when the aquifers are under pumping stress, and gradually come back together after the higher extraction periods. The greater the separation, the greater the vertical gradient between the two aquifers, allowing water to move up or down across the semi-confining layer.

Groundwater elevation measurements taken during spring months are used for purposes of change in storage calculations since the aquifer has recovered from the previous year's pumping and the vertical gradient between aquifers is at its minimum (i.e., sufficient time has passed allowing the semi-confined and unconfined aquifer piezometric surfaces to equilibrate).

Spring to spring differences on an annual basis provides the change in storage when the aquifer is closer to static conditions, resulting in a value not influenced by localized heavy pumping that may be occurring during the fall measurements.

8.2 Storage Change Contours (§356.2(b)(5)(A))

To calculate the change in storage, the spring contours from the previous year (see **Figure 8-2**) are subtracted from the current year. A strict protocol is followed to generate consistent elevation contours before taking the difference between elevation contours and calculating the difference volume. The difference volume calculated represents a total volume, including aquifer material and water, as illustrated in **Figure 8-1**. The effective soil porosity, or the amount of available void space where water can be stored or dewatered in aquifer materials, is estimated to be 12 percent of the total calculated volume.[4]

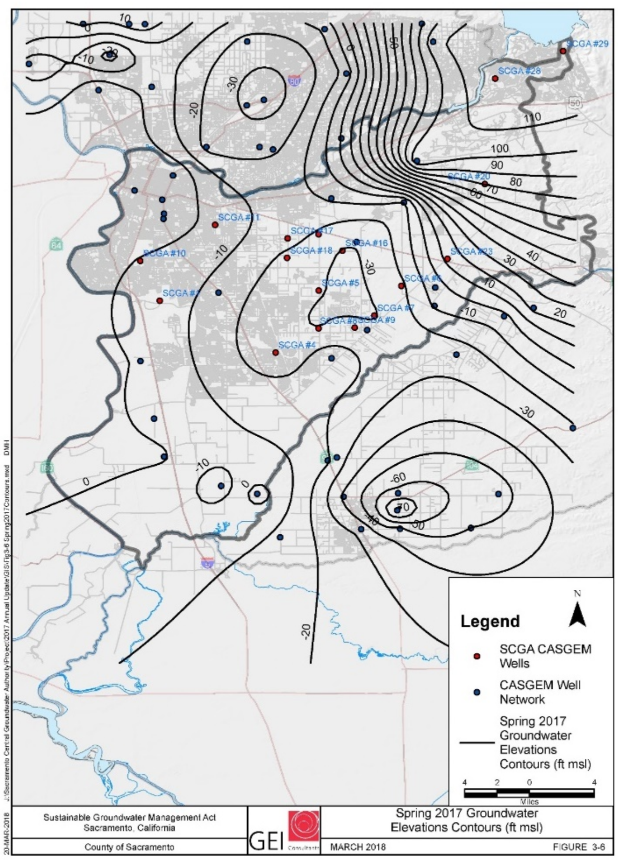

Figure 8-2. Spring 2017 Groundwater Elevation Contours (ft msl)

[4] Effective porosity is taken from calibrated groundwater surface water model (SacIGSM) aquifer parameter file (SCNPARM.dat), a value within the accepted range for clayey sand soil classifications.

8.2.1 Annual change in storage

The spring difference contours (spring 2018-spring 2017) are generated using contouring software capable of using the grid assigned at the time the contours were generated. The grid used for this subbasin is 100 rows by 100 columns (see **Figure 8-3)** using the exact same extents to allow for this calculation at each grid node. The Kriging computational method is used for assigning elevations to each node. The difference contours are based on a mathematical computation done at each node location.

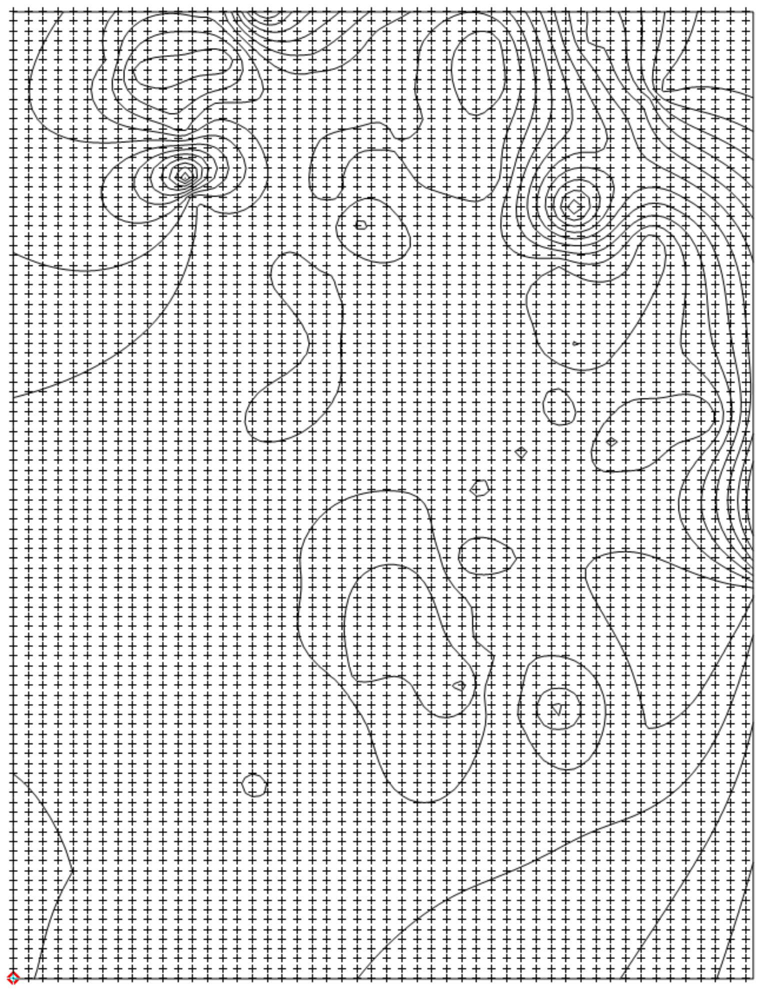

Figure 8-3. Contour Grid Nodes – Difference 2018-2017

Before calculating the total volume change, the difference contours were isolated to the South American Subbasin (excluding the Delta portion of the subbasin). This is done by cropping the active grid nodes to the subbasin boundaries as shown in **Figure 8-4**.

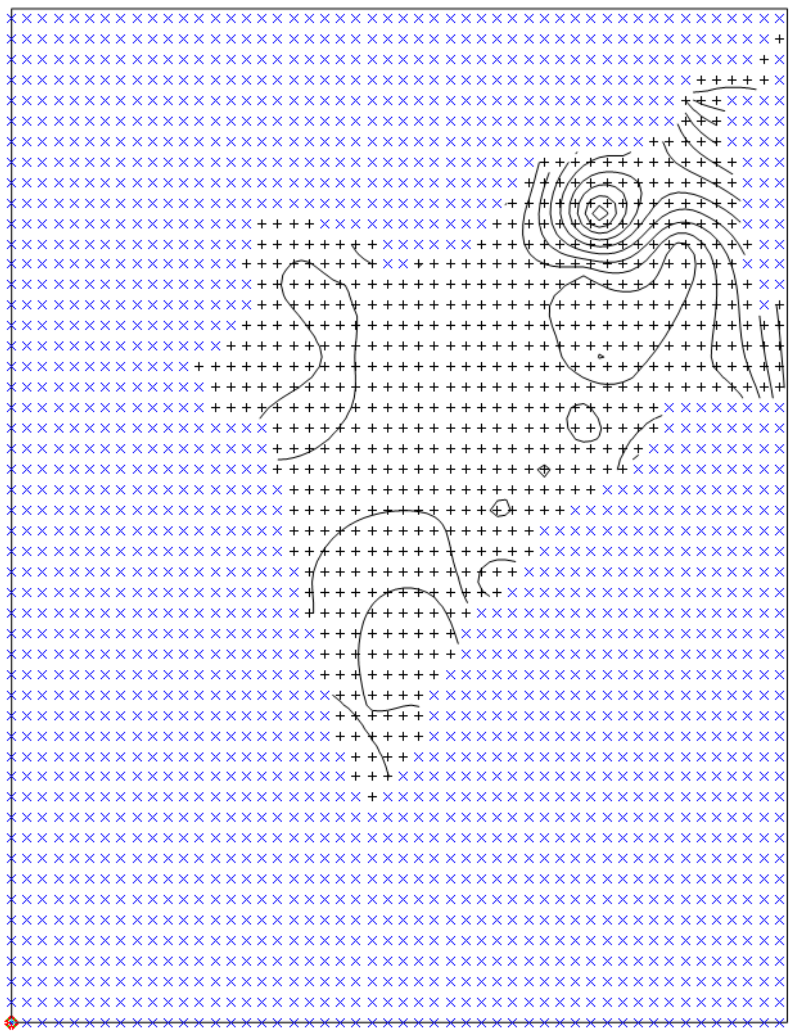

Figure 8-4. Cropped Difference Contours (2018-2017)

The Delta portion of the subbasin, located in the southwest portion of the subbasin, has historically been characterized as an area of high groundwater that is not influenced by on-going pumping to the east. As an area with ground elevations near sea level and groundwater elevations influenced by surface water bodies and tidal effects in the Sacramento Delta, groundwater is often collected at low spots or behind levees and pumped directly to the river bodies to prevent infrastructure and agricultural damage (i.e., saturation of the root zone). Groundwater extractions for drinking water are minimal with groundwater elevations changing very little over time. As a result, monitoring in this area is limited to a few sentry wells to identify if regional pumping to the east of the Delta is influencing elevations in the Delta portion of the subbasin. The hydrograph of one sentry well is shown in **Figure 8-5**, indicating no significant declines over the past 10+ years.

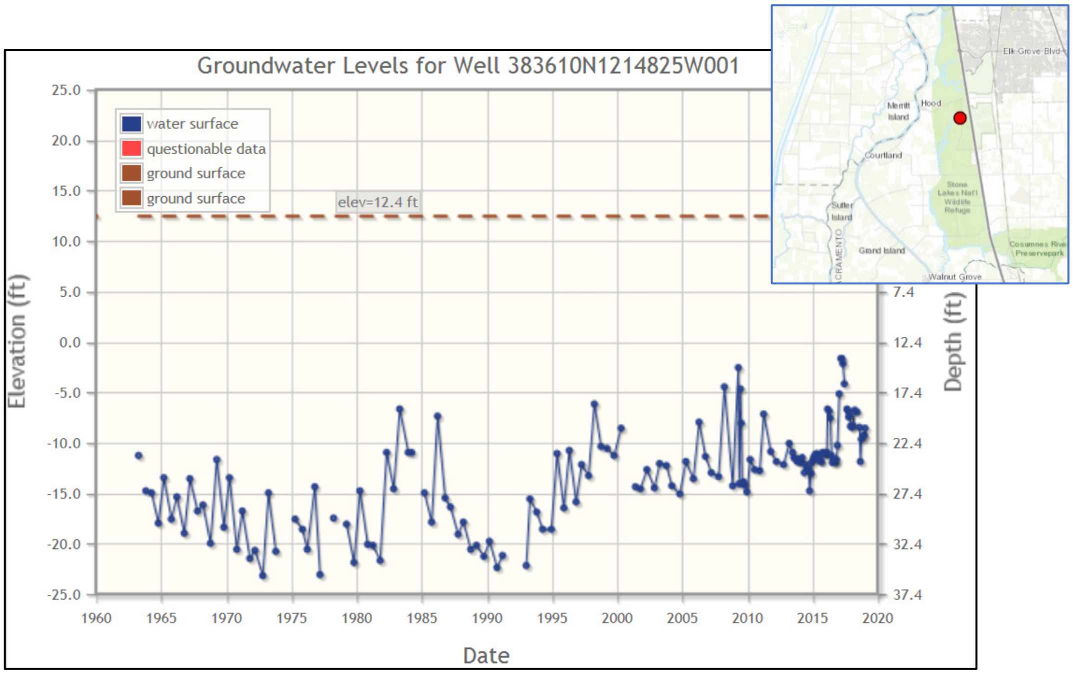

Figure 8-5. Well Hydrograph Located Near Delta

Source: DWR Groundwater Information Center
http://www.water.ca.gov/waterdatalibrary/groundwater/hydrographs/brr_hydro.cfm?CFGRIDKEY=5563

The 2018-2017 annual difference contours are shown in **Figure 8-6**. Showing the location and topography of annual changes in storage can be informative as to the cause and effect relationship of hydrologic conditions and groundwater extractions. Uncertainty can be attributed to annual changes resulting from one or more wells either not being accessible during the monitoring event or the data has to be removed because of apparent data quality issues. Over time, changes in storage (positive or negative) should be self-correcting as future monitoring events capture the missed data.

The 2017 Annual Report indicated a large recharge cone near the American River in the northeast subbasin due to high 2018 American River flows (see **Figure 8-7**) recharging an area where remediation pumping has been taking place for 30+ years. Since the cone was represented by a single well, the level of uncertainty was high, making it necessary to look at storage with and without the data point. The well hydrograph and this year's depiction of storage change indicates that the mounding effect is persistent at the well location, creating confidence that recharge did occur in this portion of the subbasin. The monthly monitoring well hydrograph (see **Figure 8-8)** shows the creation and persistence of the mound, and then shows groundwater elevations decreasing significantly because of pumping and natural dispersion due to porous and highly transmissive aquifer conditions**.**

As indicated in the 2017 Annual Report, CASGEM wells (SCGA 27, 28, and 29 as shown in **Figure 8-6**) located in the northeastern tip of the subbasin need to be removed from the dataset due to the extreme difference in elevation between lower valley measurements of less than 100 ft msl, and foothill measurements of 133 ft, 172 ft, and 370 ft, respectively. Since these wells measure an isolated portion of the subbasin at higher ground and aquifer elevations where little pumping occurs (i.e., experiences little change in elevations as shown in **Figure 8-9**), the "change in storage" calculation should be done separately to avoid biasing data to the west and along the eastern fringe of the subbasin to the south where different aquifer recharge behaviors occur. Until a significant change in groundwater elevation occurs in this area, the storage calculation does not include this area.

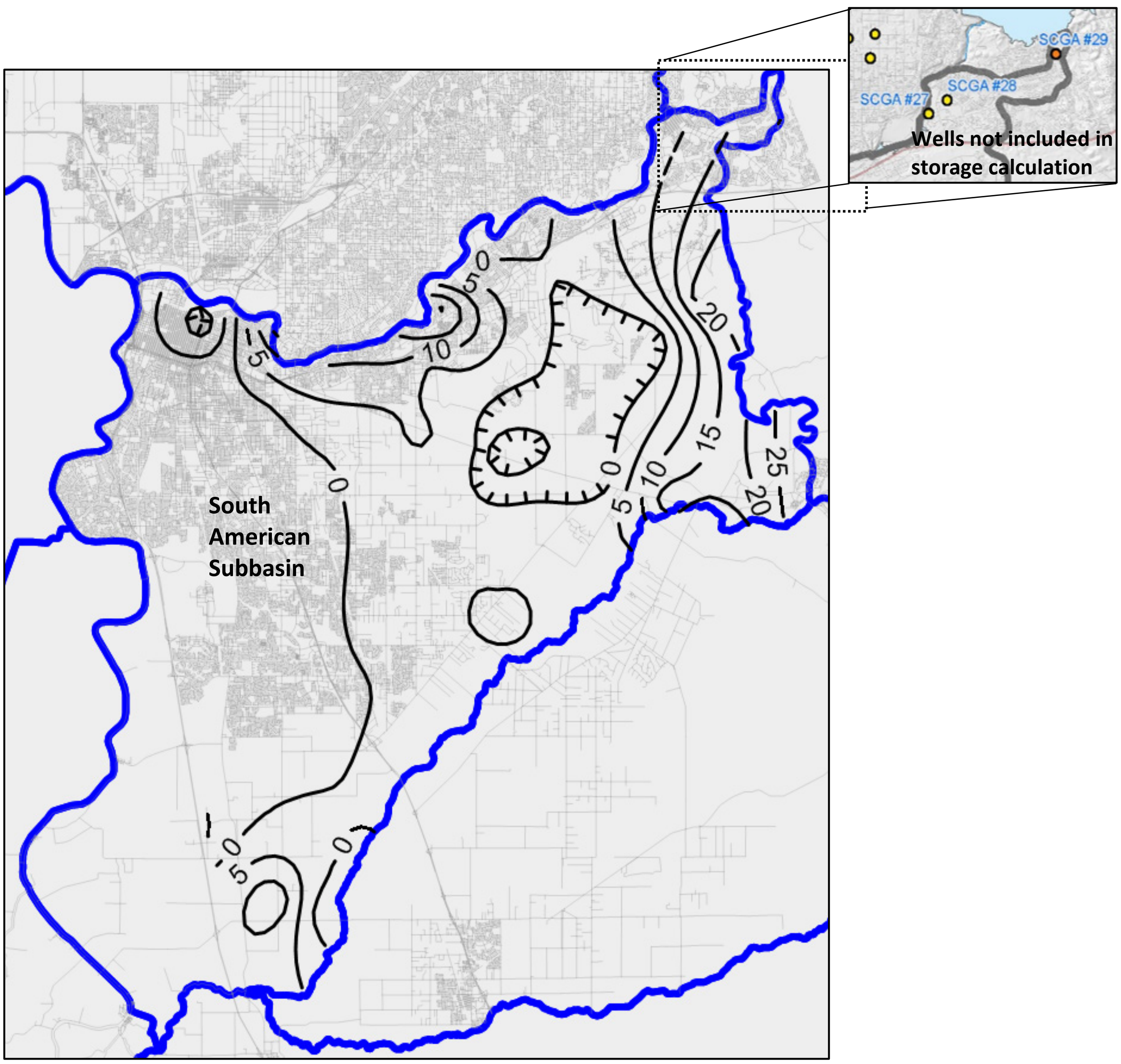

Figure 8-6. 2018 minus 2017 Spring Difference Contours (feet) – Change in Storage

The portion of the subbasin indicated by hachure marks reflects a loss in storage over the 2018 Water Year. This loss is attributed to 2018 being a drier year (i.e., less rainfall and river flow) than 2017 and partially due to pumping for groundwater remediation, irrigation, and drinking water uses in the region. Storage losses are also in areas of steeper flow gradients east of the 30 ft msl cone of depression shown in **Figure 4-6** indicating that groundwater is moving towards the cone without a volume of water (i.e., rainfall percolation and mountain front recharge) entering the subbasin equal to the displaced water. This is not unexpected when considering the hydrologic difference between a wet year (2017) and a below normal (2018) year and the role of rainfall recharge in an area where the aquifer formations strikes upward to meet the ground surface (see **Figure 4-1** for illustrated cross section).

The increase in storage along the American River may partially be attributed to a number of wells not being accessible near the river in spring 2017 and to the travel time needed for high volumes of surface water recharge occurring in 2017 to flow through the vadose zone and affect the hydraulically disconnected groundwater table. Regardless, the location and extent of recharge is consistent with the historic interaction that exists between the American River and groundwater systems because of changes in extractions and hydrologic conditions north and south of the river. Storage increases along the eastern fringe and southwestern “Delta” portion of the subbasin are the result of additional monitoring wells used in these areas for the spring 2018 event as described further in **Section 8.2.2**.

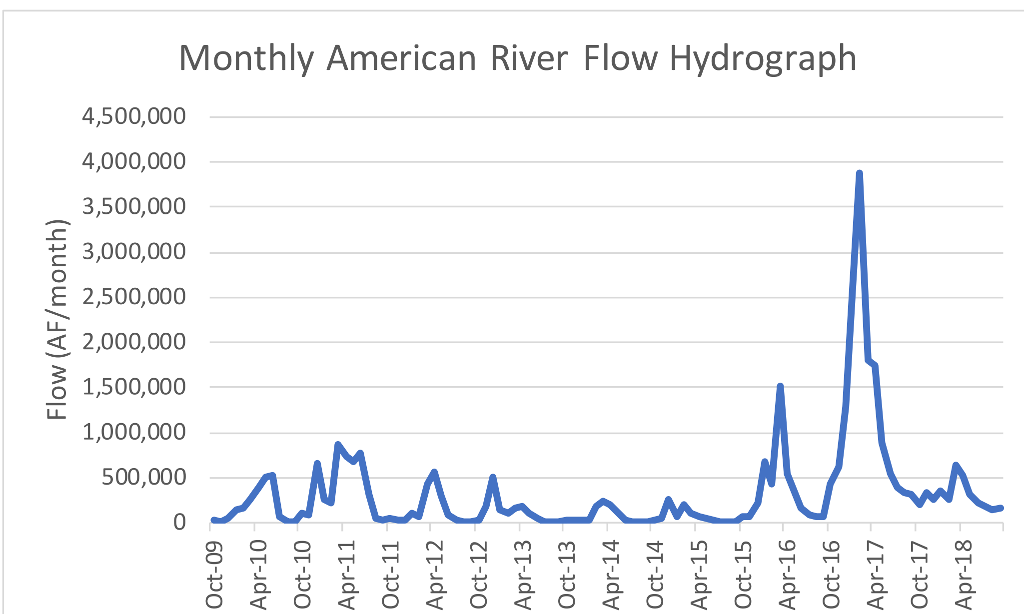

Figure 8-7. American River Flow Hydrograph

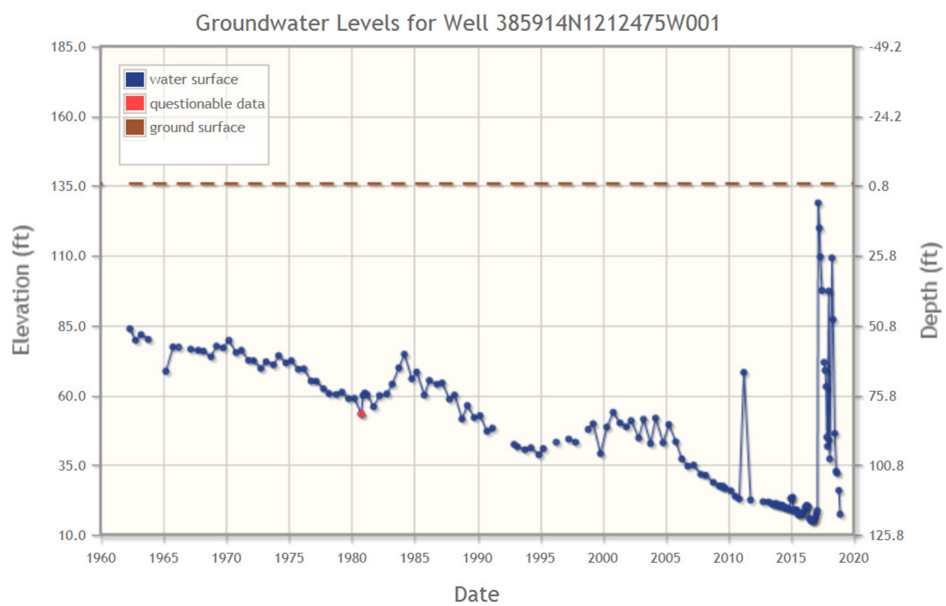

Figure 8-8. Remediation Hydrograph Near American River

Source: DWR Groundwater Information Center
http://www.water.ca.gov/waterdatalibrary/groundwater/hydrographs/brr_hydro.cfm?CFGRIDKEY=9660

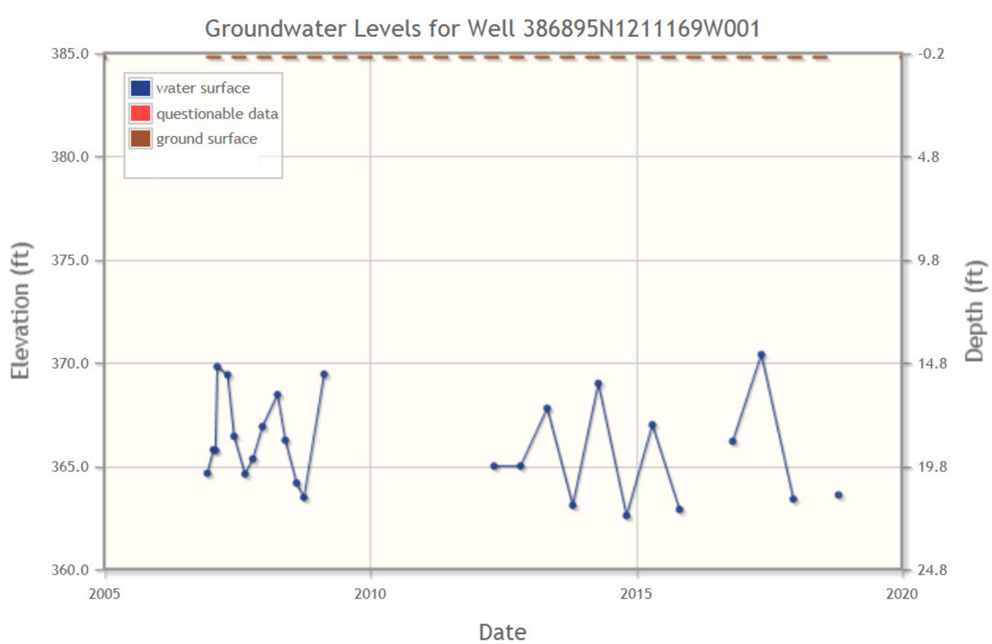

Figure 8-9. CASGEM Well SCGA 29 Located in Northeast Subbasin

Source: DWR Groundwater Information Center
http://www.water.ca.gov/waterdatalibrary/groundwater/hydrographs/brr_hydro.cfm?CFGRIDKEY=24653

8.2.2 Incremental and Cumulative change in storage 2005 and 2015 (§356.2(b)(5)(B))

As a pending Alternative subbasin, SCGA is interested in both change in storage since 2005 (i.e., the beginning of SCGA groundwater management), as well as in 2015, SGMA's baseline year. The 2006 GMP recognizes that both negative and positive changes in storage occur over time due to hydrologic variation that influences the amount of natural recharge that occurs, and levels of conjunctive use implemented by both municipal and agriculture pumpers.

Year to year changes in storage starting in 2009, using the methodology described in **Section 8.2.1**, are presented along with cumulative change in storage since 2005 (GMP Baseline) and since 2015 (SGMA Baseline) in **Table 8-1**. The location and magnitude of changes in storage occurring over the GMP implementation period is shown in **Figure 8-10**.

Table 8-1. Annual and Cumulative Changes in Storage

Year	Change in Storage (Ac-Ft)	Cumulative Change in Storage 2005 to 2018 (Ac-Ft)	Cumulative Change in Storage 2015 to 2018 (Ac-Ft)
2005	baseline	0	
2009	42,766	42,766	
2010	(16,046)	26,720	
2011	46,705	73,425	
2012	40,416	113,841	
2013	(16,458)	97,384	
2014	(111,930)	(14,546)	
2015	(58,717)	(73,263)	0
2016	28,833	(44,430)	28,833
2017	189,306	144,876	218,139
2018	70,480	215,356	288,619

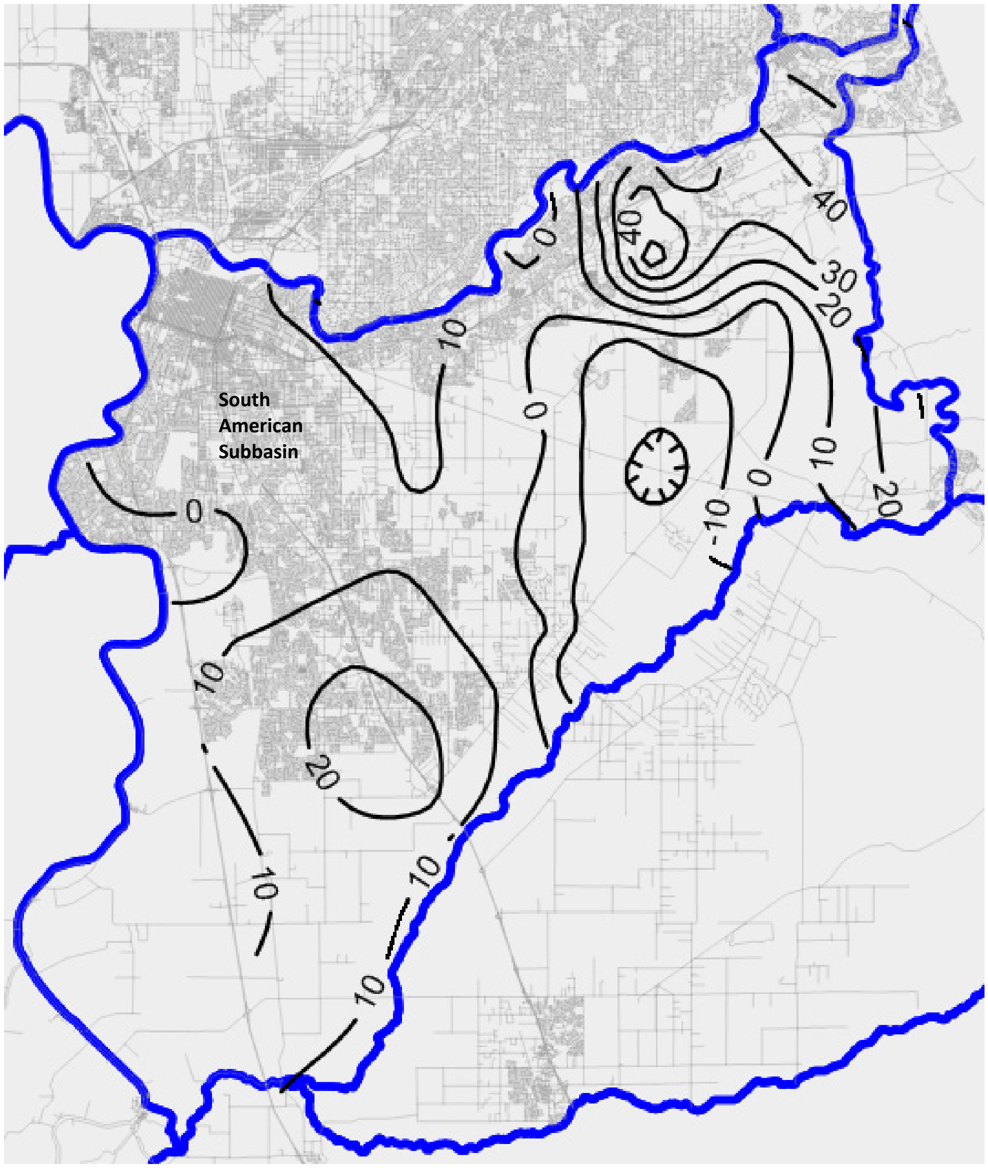

Figure 8-10. 2018 minus 2005 Spring Difference Contours (feet) –Historic Change in Storage from 2005 GMP Baseline

Additional monitoring wells included in the spring 2018 event addressed identified data gaps along the eastern fringe of the subbasin and the southwestern area near the Delta. Results now indicate the expected increase in storage in both areas when comparing current spring conditions with spring 2005 conditions.

8.2.3 Percent of total storage estimated from past studies

As a point of reference, the total State DWR estimated storage capacity for the subbasin assuming a depth range of 20 feet below ground surface to 310 feet below ground surface is

4,816,000 AF, as published in Bulletin 118 using information from 1961.[5] The total calculated annual and cumulative change in storage reported in the table below is less than **5 percent** of the total subbasin's storage capacity. The current published storage capacity also appears to limit useable groundwater to the upper Laguna Formation. Storage capacity in the lower Merhten Formation will need to be included in future Bulletin 118 reporting of total storage capacity to account for the majority of new high producing municipal wells with water treatment that access this aquifer to meet municipal water demands.

8.3 Annual and Cumulative Storage Change Hydrograph Dating Back To 2005 (§356.2(b)(5)(B))

As a visual check, **Figure 8-11** shows a gradual build-up in storage over the years 2005 to 2013 because of increased use of surface water, water conservation, recycled water, and reuse of remediation water discharged to surface water. In 2014, the region received only **9.14 inches** of rainfall (50% of normal), reducing natural recharge from rainfall and rivers, resulting in losses in storage in areas of groundwater remediation and agricultural irrigation. **Figure 8-12** indicates where 2014 Water Year losses in storage occurred, aligning very closely to the locations and pumping rates shown in **Figure 5-1**.

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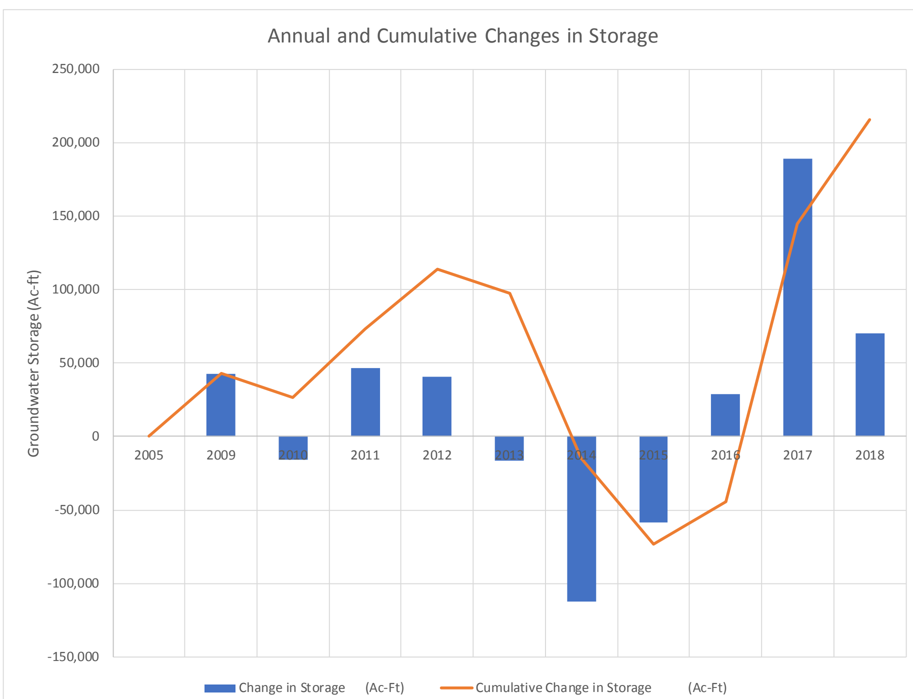

Figure 8-11. Hydrograph Representation of Annual and Cumulative Change in Storage

[5] See < http://www.water.ca.gov/groundwater/bulletin118/basindescriptions/5-21.65.pdf>

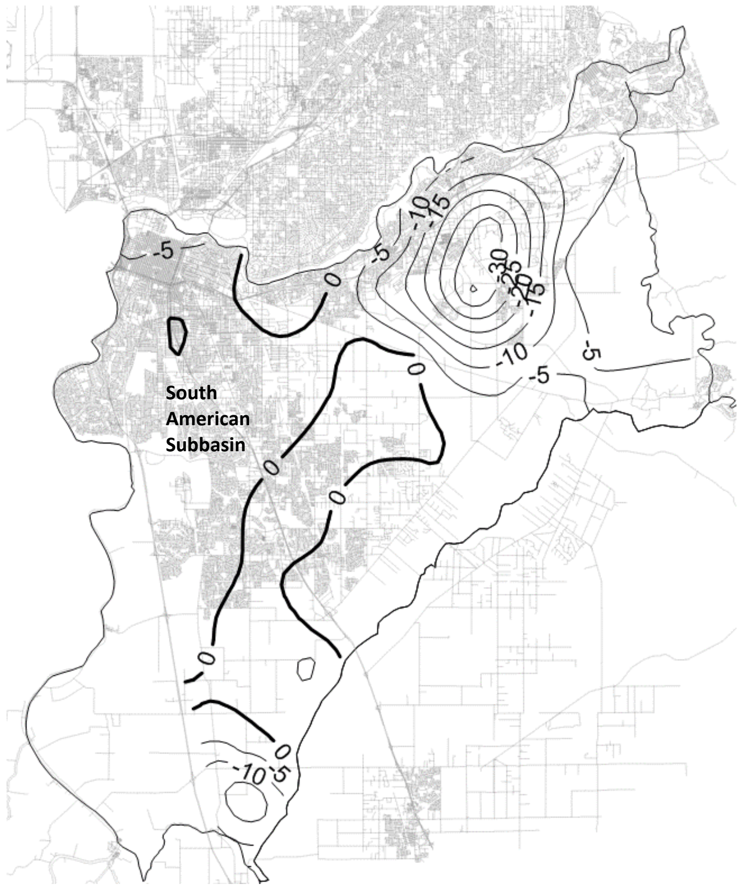

Figure 8-12. 2014 minus 2013 Spring Difference Contours (feet) to Highlight Drought Year Losses in Storage

8.4 SGMA Baseline Storage Comparison

A SGMA baseline comparison between spring 2018 and 2015 results in a net increase in storage over much of the subbasin due to transitioning from dry to above average hydrologic conditions following the multiple year critical drought leading up to 2015. The total gain in storage over the three-year period totals **288,619 AF** with locations and magnitudes of change shown in **Figure 8-13**.

The storage increase in the west and southwest "Delta" portion of the subbasin indicates that drought period losses are recovering. High flow conditions and flooding along the Cosumnes River contributed a significant amount of recharge water that continues to propagate northward. Reduced reliance on groundwater by agriculture in both the South American and Cosumnes subbasins is also contributing to this effect.

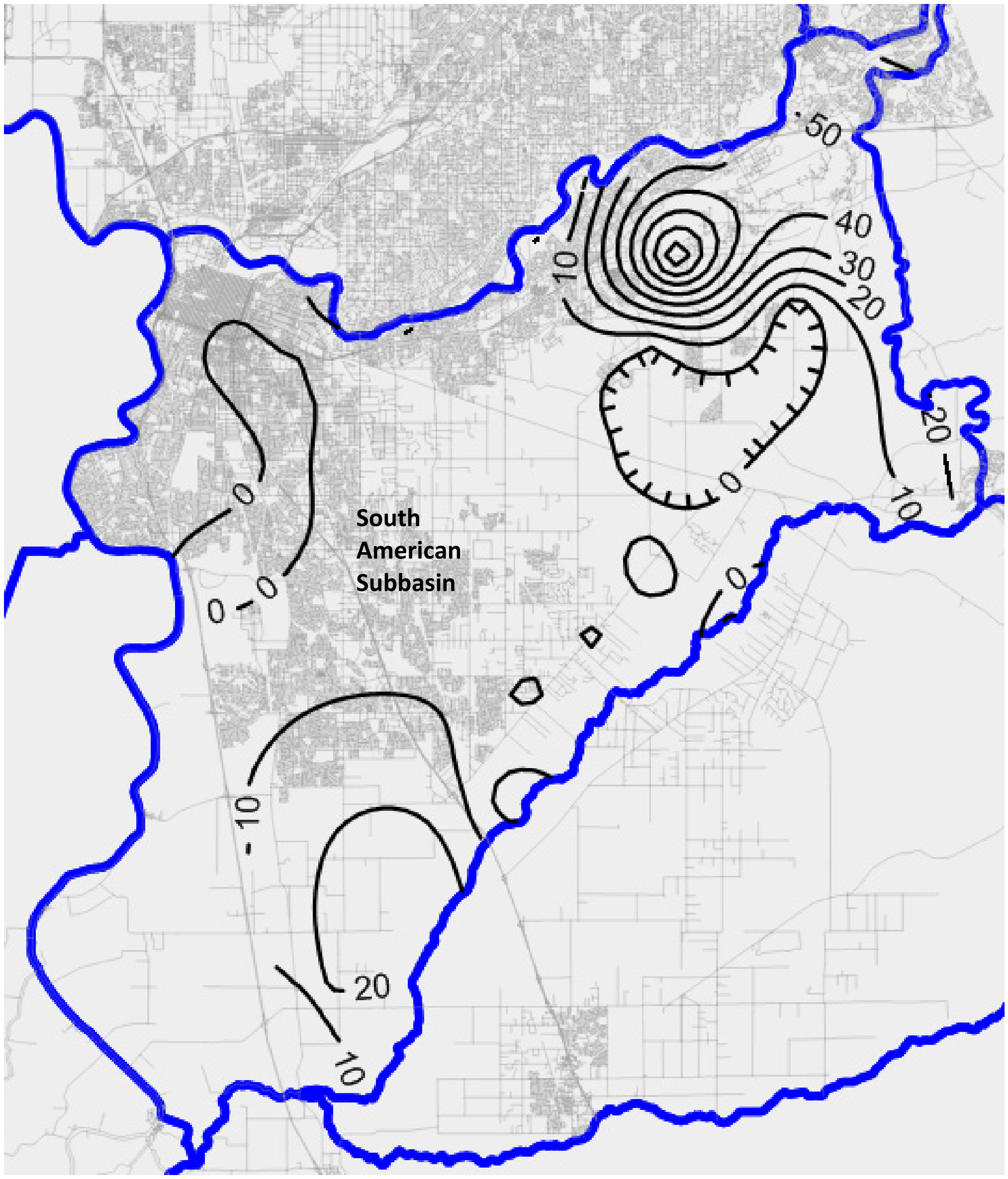

Figure 8-13. 2018 minus 2015 Spring Difference Contours (feet) – SGMA Baseline 3-Year Storage Change

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Chapter 9. Progress on Continued Sustainability as Alternative (§356.2(c))

9.1 Description of Continued Sustainability Under Alternative Submittal

Relative to the Alternative, the 2018 Annual Report indicates continued improvement in groundwater conditions with a net positive increase in total groundwater storage in the subbasin. This same conclusion holds true relative to the SGMA baseline year of 2015.

9.1.1 Changes from differences shown in Alternative

As compared to the Alternative's depiction of the 2015 SGMA baseline year, the 2018 Water Year continues to show persistent increases in storage around areas benefiting from the high river flows that occurred in the 2017 Water Year. Areas of improved conditions are primarily along the Cosumnes and American rivers. The overall balance of the subbasin is being maintained through implementation of land and water use policies requiring conjunctive use programs, increased water conservation, conversion of agricultural lands, increased re-use of remediated groundwater, increased recycled water, and surface water "project" actions along the Cosumnes, Sacramento, and American Rivers, and California Delta (e.g., flash dams, agriculture and urban use of surface water, flooding of croplands, etc.).

As verification of meeting the annual sustainability goal, **Figure 9-1** provides visual agreement that in the 2018 Water Year, groundwater extractions did not exceed the long-term average annual sustainable yield of **273,000 AF/year** set forth in the 2000 Water Forum Agreement and the 2006 Central Sacramento County Groundwater Management Plan (GMP) including unforeseen groundwater extractions from remediation occurring in the eastern portion of the subbasin.

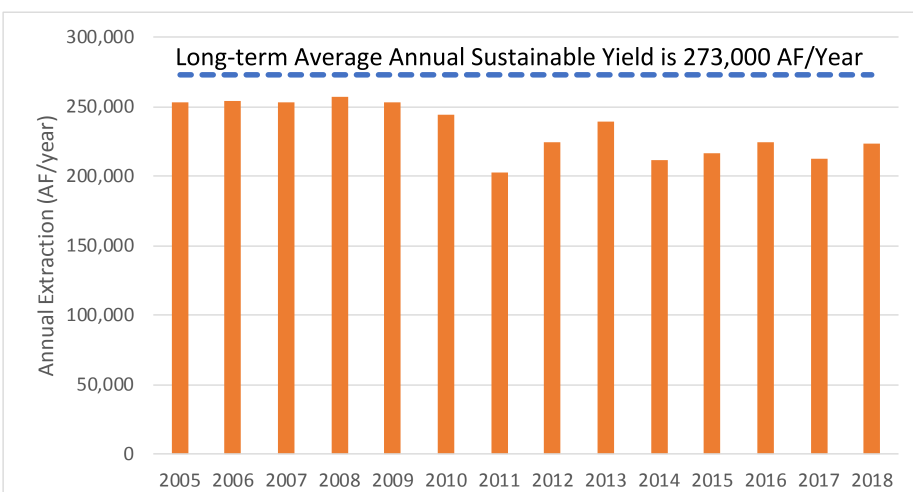

Figure 9-1. Meeting the Long-term Average Annual Sustainable Yield

9.1.2 Path towards (looking ahead) continued sustainability based on changes shown

SCGA has recognized that changed conditions in the subbasin due to remediation, drought, and increased groundwater pumping in the Cosumnes Subbasin are creating challenging conditions for sustainable management. That said, actions are already underway to collect data, and coordinate with affected agencies to develop solutions that address the shared mutual interest in the subbasin's overall sustainability goal and in meeting the spirit of the Water Forum Agreement.

9.2 Progress Towards Meeting GMP Goals and Objectives

Active groundwater management within the South American Subbasin began in the mid-1980's with recognition of groundwater protection through the establishment of specific land use policies including urban protection of groundwater through importation of supplemental supplies. These actions and others resulted in a reversal of the historic reliance on groundwater to support growth and economic prosperity. These actions were ultimately memorialized in the 2000 Water Forum Agreement. The Water Forum Agreement contained a Groundwater Element which served as the basis for the formation of SCGA, a stakeholder-driven governance body. Since its formation in 2006, SCGA has successfully managed groundwater within the subbasin. Thresholds set by SCGA in the 2006 GMP, for the most part, are being met throughout the subbasin. Exceptions include those areas being influenced by activities that are outside the control of SCGA; these include remediation pumping under the direction of USEPA, the Regional Water Quality Control Board, and the Department of Toxic Substance Control, and conditions along the subbasin boundary at the Cosumnes River. SCGA believes that these challenges can be addressed through a process of coordination and cooperation ultimately improving these conditions over time. Continuous improvements to the monitoring network and annual reporting are also to be relied upon in identifying where and why changes are occurring.

9.2.1 Reporting of significant SCGA actions over reporting period

Table 9-1 provides a summary of the SCGA Board actions based on monthly meetings occurring through the 2018 Water Year. Hyperlinks are provided to view monthly agendas and presentations relative to sustainable management and SGMA compliance through the Alternative Submittal process.

Table 9-1. Summary of SCGA Board Actions - 2018 (Water Year)

Hyperlink to Board Agendas (by Water Year Months)	Action Categories	SCGA South American Subbasin Actions (SCGA Website)
Oct-2017	SGMA	1) The Board approved to direct staff to submit an application to State DWR to obtain a grant under the Sustainable Groundwater Planning Grant Program for purposes of supporting the development of a Groundwater Sustainability Plan, if the Alternative is not approved. The Board clarified that pursuit of the Alternative is still the preferred path and that applying for the grant is prudent regardless of Alternative's outcome. 2) October 2017 CASGEM monitoring event took place.
	Gover-nance	3) A focused presentation was provided by Omochumne Hartnell Water District's (OHWD's) to review the history of groundwater management along the Cosumnes River Corridor, and to discuss the on-going construction of an off-season wet weather recharge spreading basin over active croplands (vineyards), including a proposed monitoring network.
Nov-2017	SGMA	4) Presentation was provided by staff on on-going collaborative monitoring activities taking place in the region which have relevance to improving our understanding of natural groundwater recharge processes taking place along rivers and streams.
	Gover-nance	5) Election of SCGA Officers for the 2018 Calendar Year.
Dec-2017	SGMA	6) Approval by Board was provided to staff to coordinate with UC Davis/UC Water to develop a mutually beneficial near and long-term plan for real-time monitoring and advocate for increased transparency in all water resource monitoring activities.
	Gover-nance	7) The first "Supervisor Nottoli Meeting" took place on December 13, 2017 with board members and public to discuss Omochumne Hartnell Water District boundary modification.
Jan-2018	SGMA	8) Presentation of the results of the Fall 2017 CASGEM monitoring.
	Gover-nance	9) Board created and staffed the Annual Budget Subcommittee for FY 2018/19.
Feb-2018	Governance	10) Presentation was provided by the County Environmental Management Department on their oversight role in the construction, modification, repair, inactivation and destruction of wells in Sacramento County. 11) Update presentation was provided by consultant regarding on-going groundwater remediation operations in the eastern portion of the South American Subbasin. 12) Board discussion of summary of "Status and Next Steps," developed by the Water Forum, and distributed it to meeting participants in the December 13, 2017, meeting with Supervisor Nottoli. 13) Budget subcommittee meeting took place on 02/21/2018 for discussion/workshop of SCGA funding in FY 2018/2019.
Mar-2018	SGMA	14) Progress Report given by staff and consultants on developing 2017 Water Year Annual Report. 15) March/April CASGEM Monitoring Event took place.
	Gover-nance	16) Fiscal Year 2016/2017 Audit Report presentation. 17) Budget subcommittee meeting took place on 03/21/2018 to discuss the proposed FY 2018/2019 budget.
Apr-2018	SGMA	18) SCGA staff and consultant provided a presentation on the 2017 Water Year Annual Report.

	Governance	19) Fiscal Year Audit Report (continuation from previous month to respond to questions). 20) Scheduled a special board meeting for May to conduct a workshop on findings of Phase 2 of the SCGA Rate Study. 21) Budget subcommittee Update presentation 22) Budget subcommittee meeting took place on 04/27/2018 to discuss the proposed FY 2018/2019 budget
May-2018	SGMA	23) A Board check-in took place regarding on-going negotiations with Omochumne-Hartnell Water District and Sloughhouse Resource Conservation District, and request for Board direction on future negotiations with Omochumne-Hartnell Water District and Sloughhouse Resource Conservation District regarding overlapping GSAs.
	Governance	24) A presentation was given on the background and progress of the Regional Reliability Plan by the Regional Water Authority. 25) Consultant provided an outreach presentation on a water resources study to be conducted by the University of California in collaboration with Lawrence Berkeley and Lawrence Livermore National Laboratories, “Headwaters to Groundwaters” study of the Cosumnes River. 26) Reported back from Budget Subcommittee on recommended cost option to address uncertainties of Alternative approval by State DWR. 27) Rate Study Workshop took place on May 31, 2018.
Jun-2018	SGMA	28) Approved an On-Call services contract extension for SGMA compliance and other related tasks.
	Gover-nance	29) Approved FY 2018/2019 budget. a) Budget presentation
Jul-2018	Gover-nance	30) Meeting cancelled
Aug-2018	SGMA	31) Provided presentation of the results of the Spring 2018 CASGEM monitoring.
	Gover-nance	32) Entered into a technical contract to support real-time monitoring and collaboration with the UC Water Groundwater Observatory.
Sep-2018	Governance	33) Provided update on progress of the SCGA Rate Study. 34) Presentation was given by SCGA staff on State DWR’s Beta Release of updated fine grid Central Valley Groundwater Model and recommendation to support working with state staff on refining local data.

Appendices

- **Appendix A. GSP Regulations for Annual Reports**
- **Appendix B. State DWR Notice of Annual Report Requirement**
- **Appendix C. South American Subbasin Hydrographs**
- **Appendix D. IDC Update Report**

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Appendix A. GSP Regulations for Annual Reports

§ 356.2. Annual Reports

Each Agency shall submit an annual report to the Department by April 1 of each year following the adoption of the Plan. The annual report shall include the following components for the preceding water year:

(a) General information, including an executive summary and a location map depicting the basin covered by the report.

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:

(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.

(B) Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.

(2) Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector, and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.

(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.

(4) Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.

(5) Change in groundwater in storage shall include the following:

(A) Change in groundwater in storage maps for each principal aquifer in the basin.

(B) A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.

(c) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.

Note: Authority cited: Section 10733.2, Water Code.

Reference: Sections 10727.2, 10728, and 10733.2, Water Code.

Appendix B. State DWR Notice of Annual Report Requirement

STATE OF CALIFORNIA – CALIFORNIA NATURAL RESOURCES AGENCY GAVIN NEWSOM, Governor

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

February 19, 2019

Mr. Darrell Eck
Sacramento Central Groundwater Authority
827 7th Street
Sacramento, California 95814

RE: Annual Report Requirement Associated with Groundwater Sustainability Plan Alternative

Dear Mr. Eck,

You are receiving this letter because you submitted a Groundwater Sustainability Plan Alternative (Alternative) to the Department of Water Resources (DWR) on or before January 1, 2017. DWR is in the process of evaluating the Alternative in accordance with the Groundwater Sustainability Plan Regulations (Regulations) of the California Code of Regulations (CCR) Title 23, Division 2, Chapter 1.5, Subchapter 2.

While DWR has not yet completed its evaluation or determined the Alternative's adequacy, the Regulations require an Annual Report to be submitted electronically utilizing the SGMA Portal – Alternative Reporting System (http://sgma.water.ca.gov/portal/#alt) by April 1 of each year. The annual report for water year 2018 is due by April 1, 2019. CCR 23 §356.2 outlines what must be included in the Annual Report and the Portal provides guidance on how to submit. All materials submitted through the Portal are publicly accessible. Submittal of this annual report does not indicate approval of the Alternative.

If you have any further questions or concerns regarding the Annual Report, please contact me at (916) 651-0870.

Regards,

Craig Altare, PG 8797
Senior Engineering Geologist
Sustainable Groundwater Management Office

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Appendix C. South American Subbasin Hydrographs

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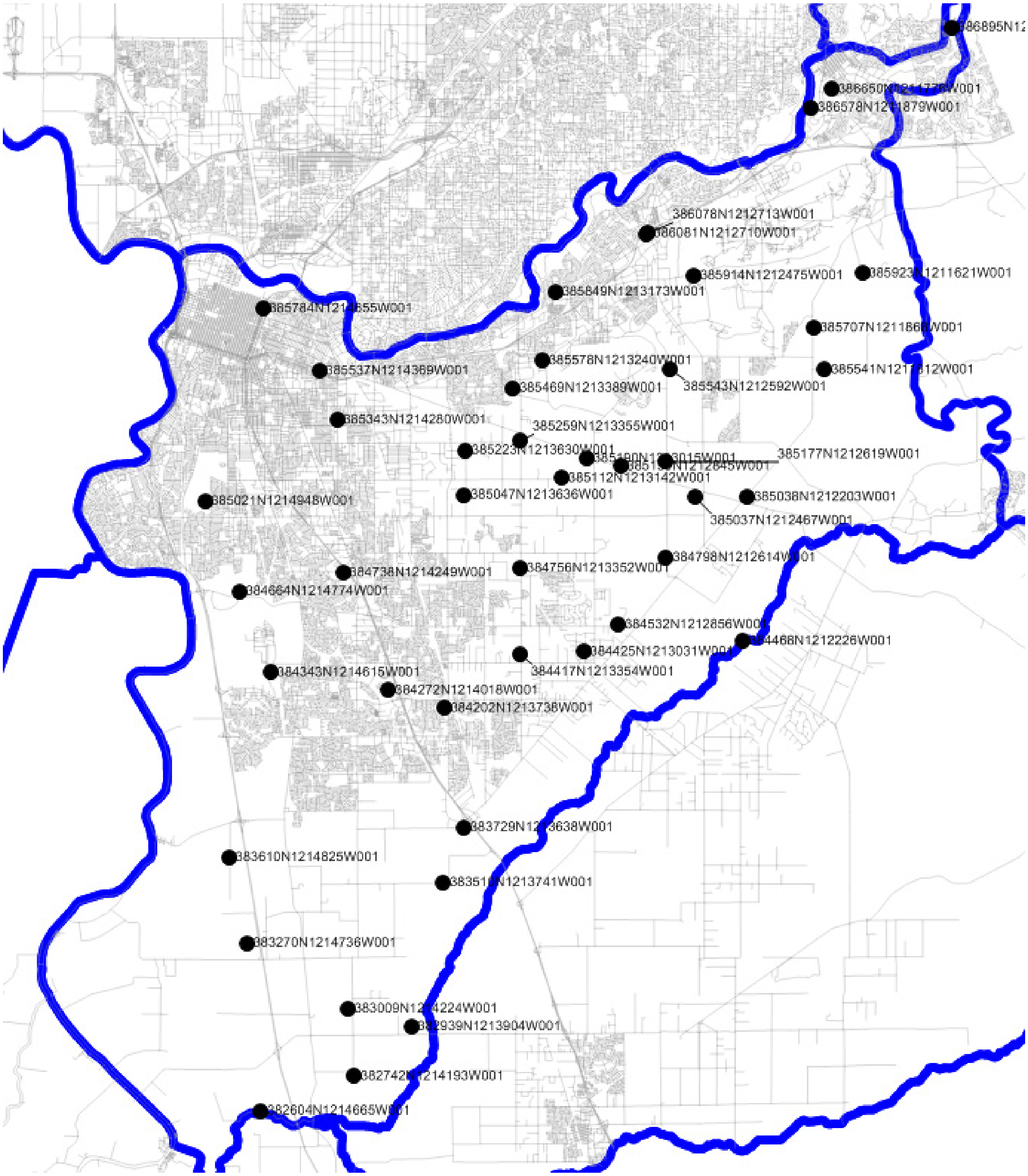

South American Subbasin Hydrograph Location Map

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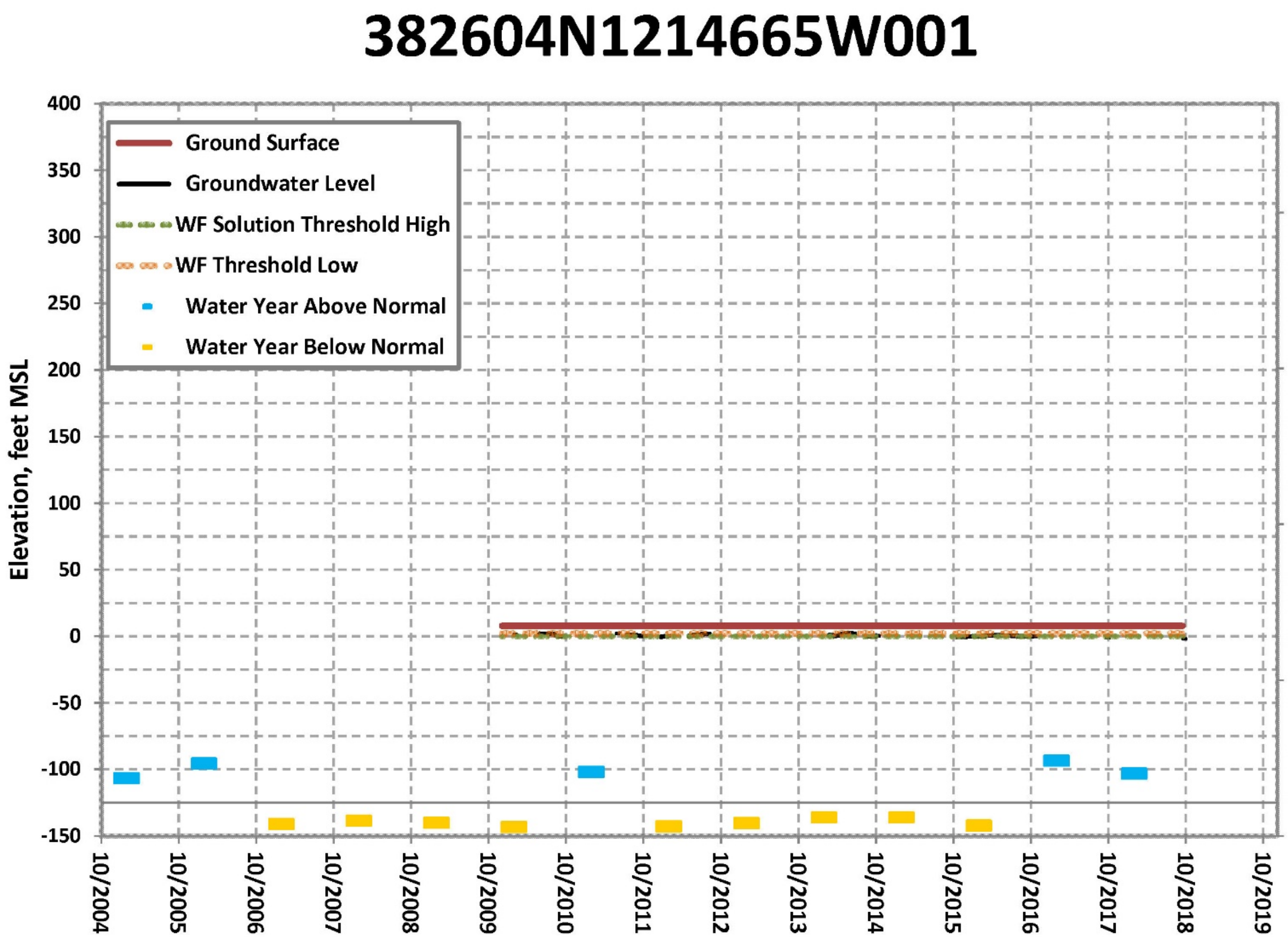
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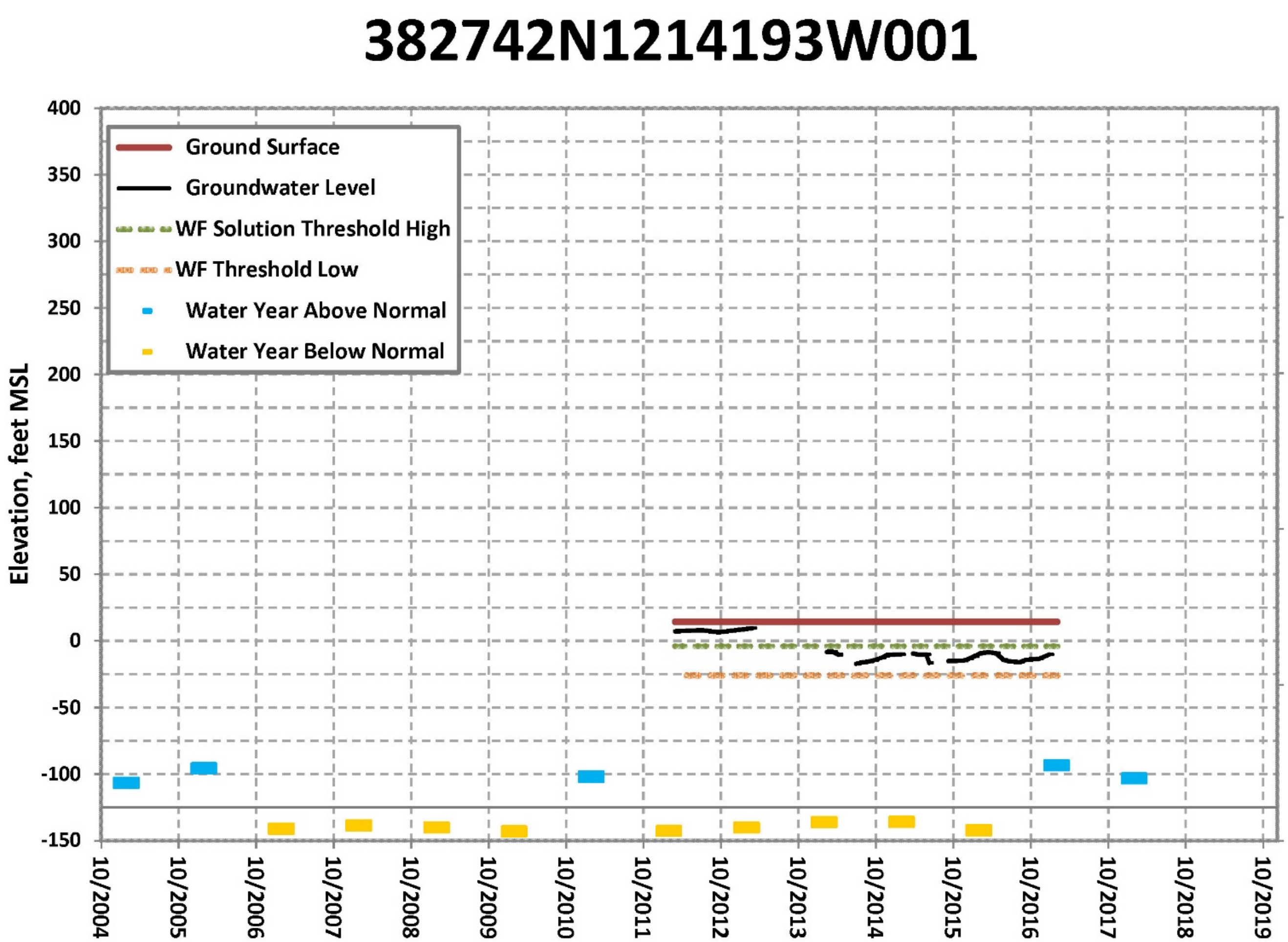
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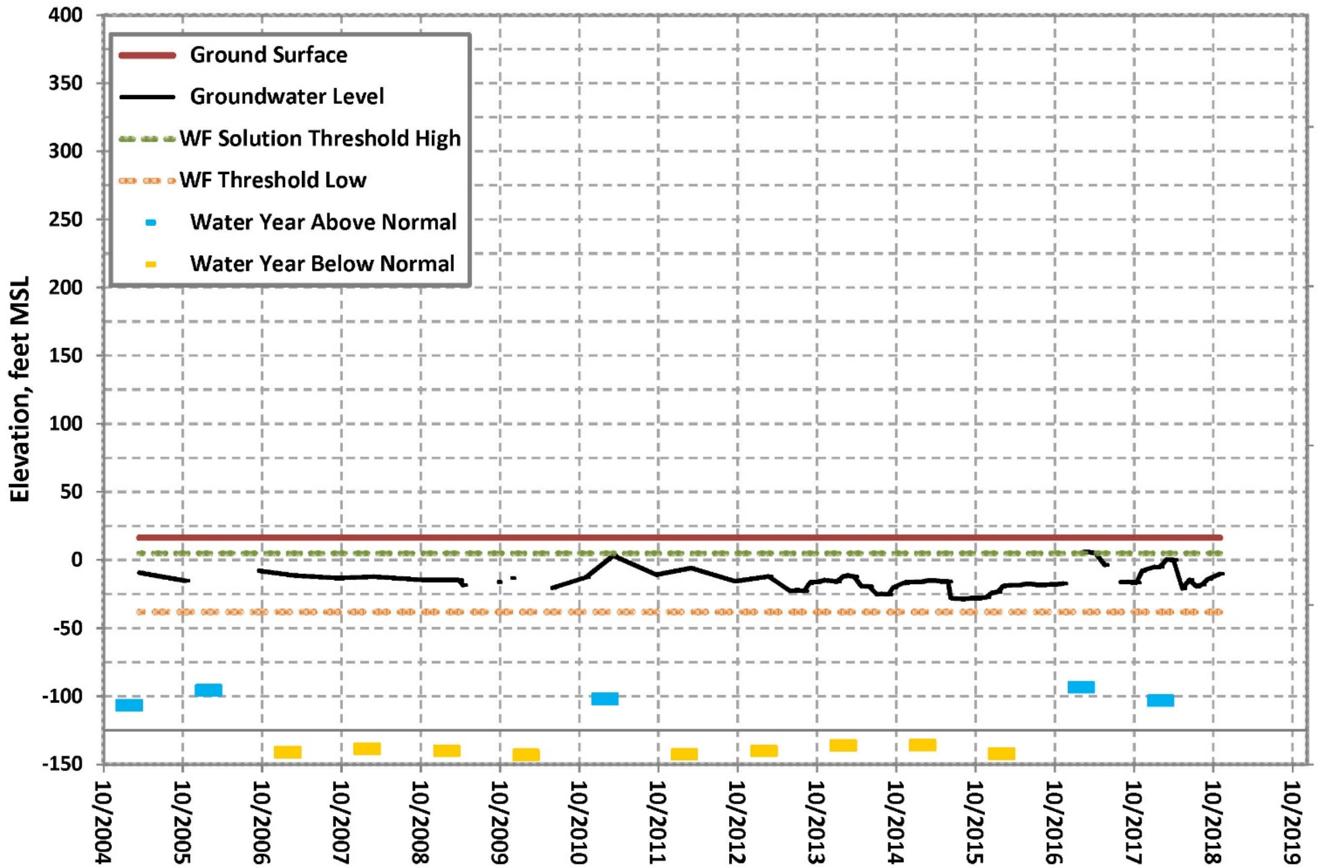

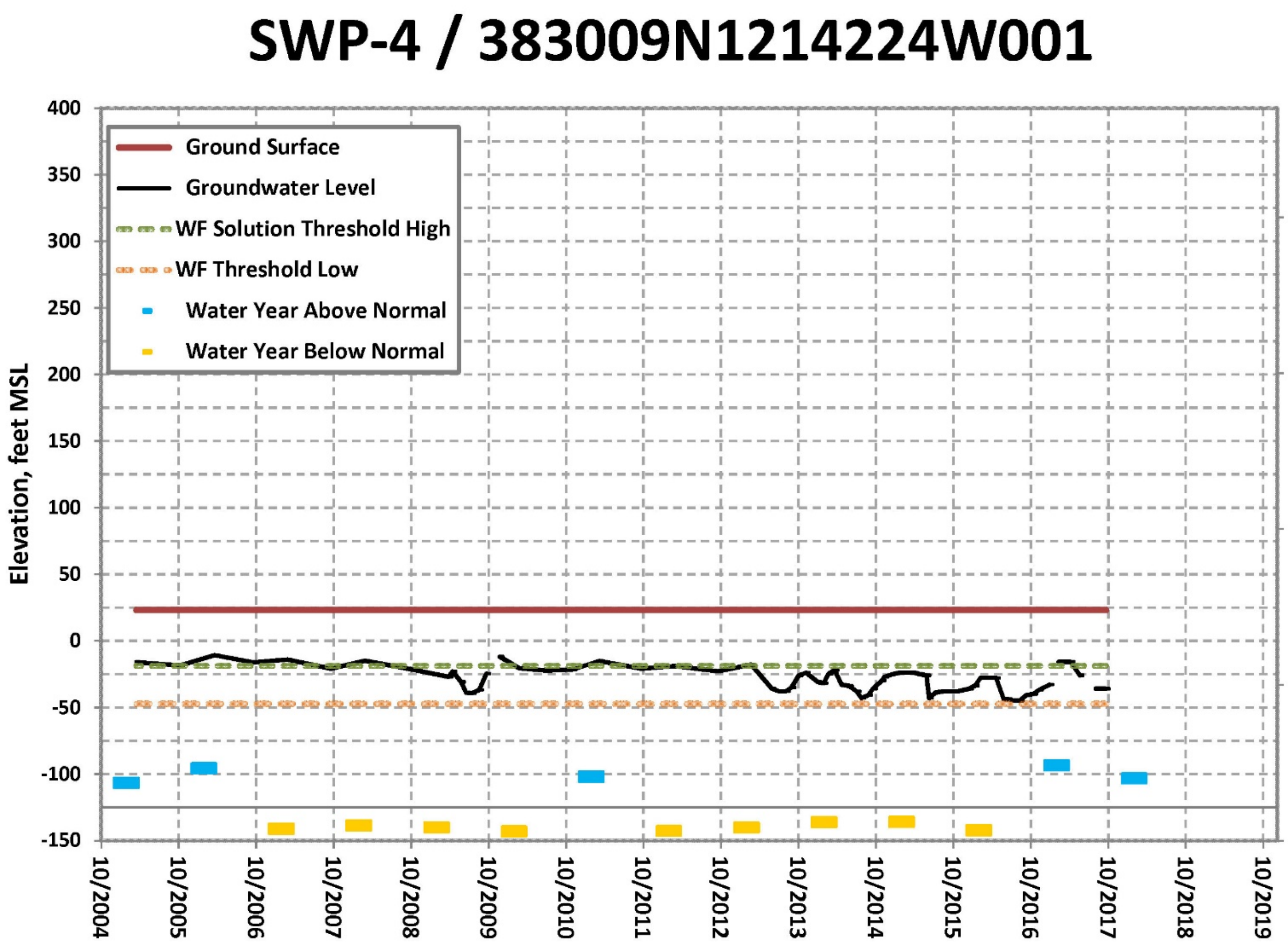
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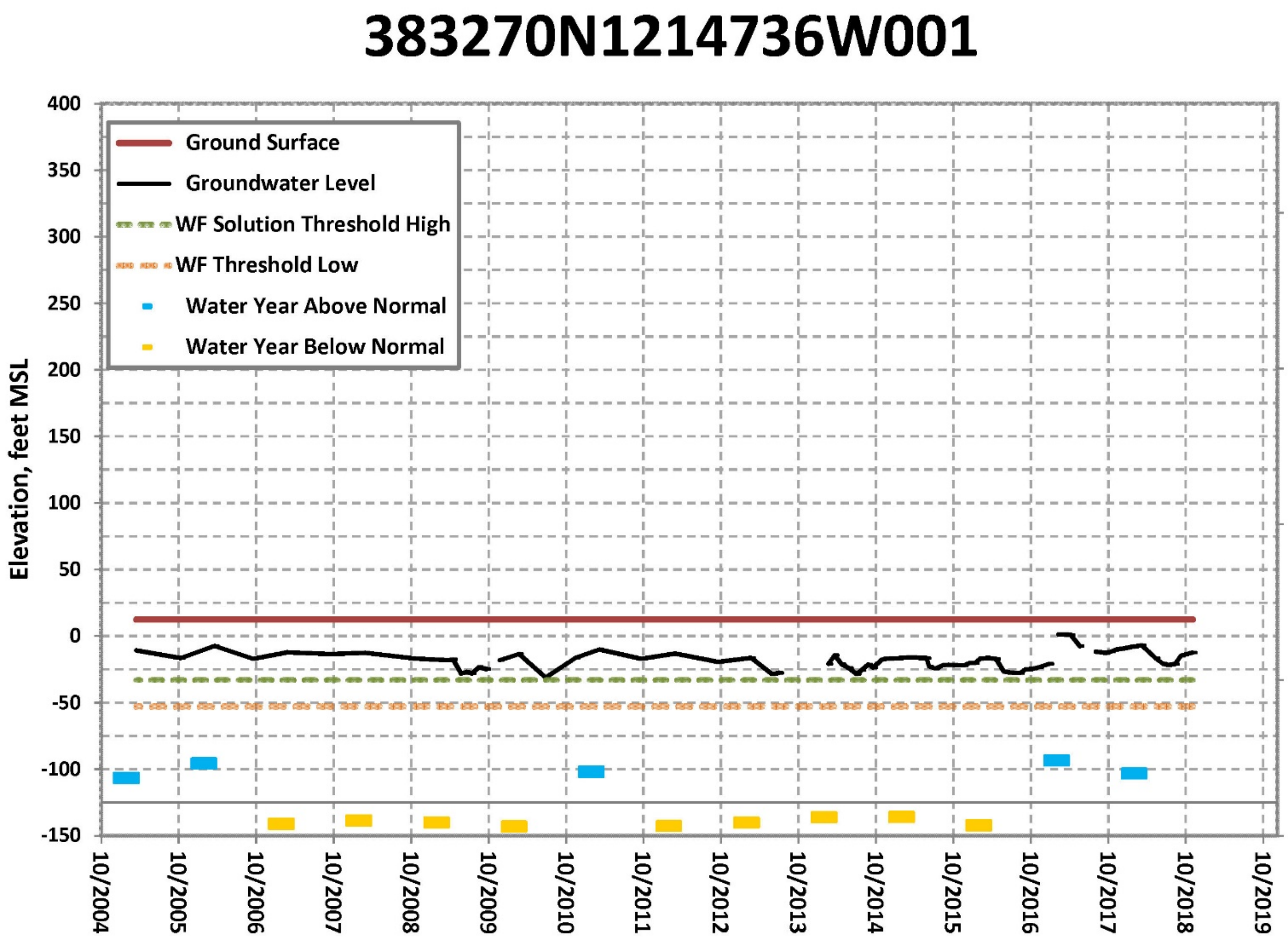
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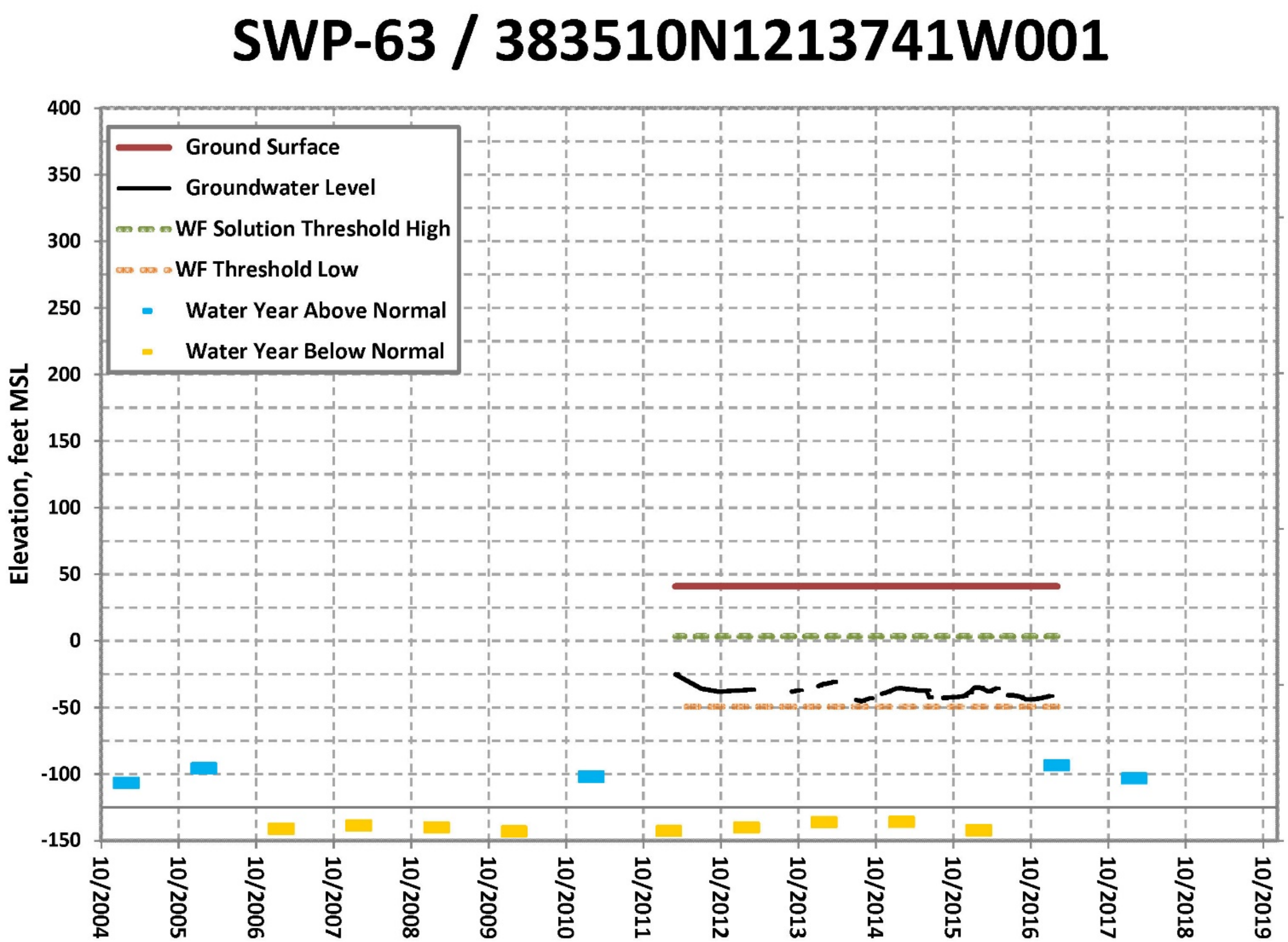
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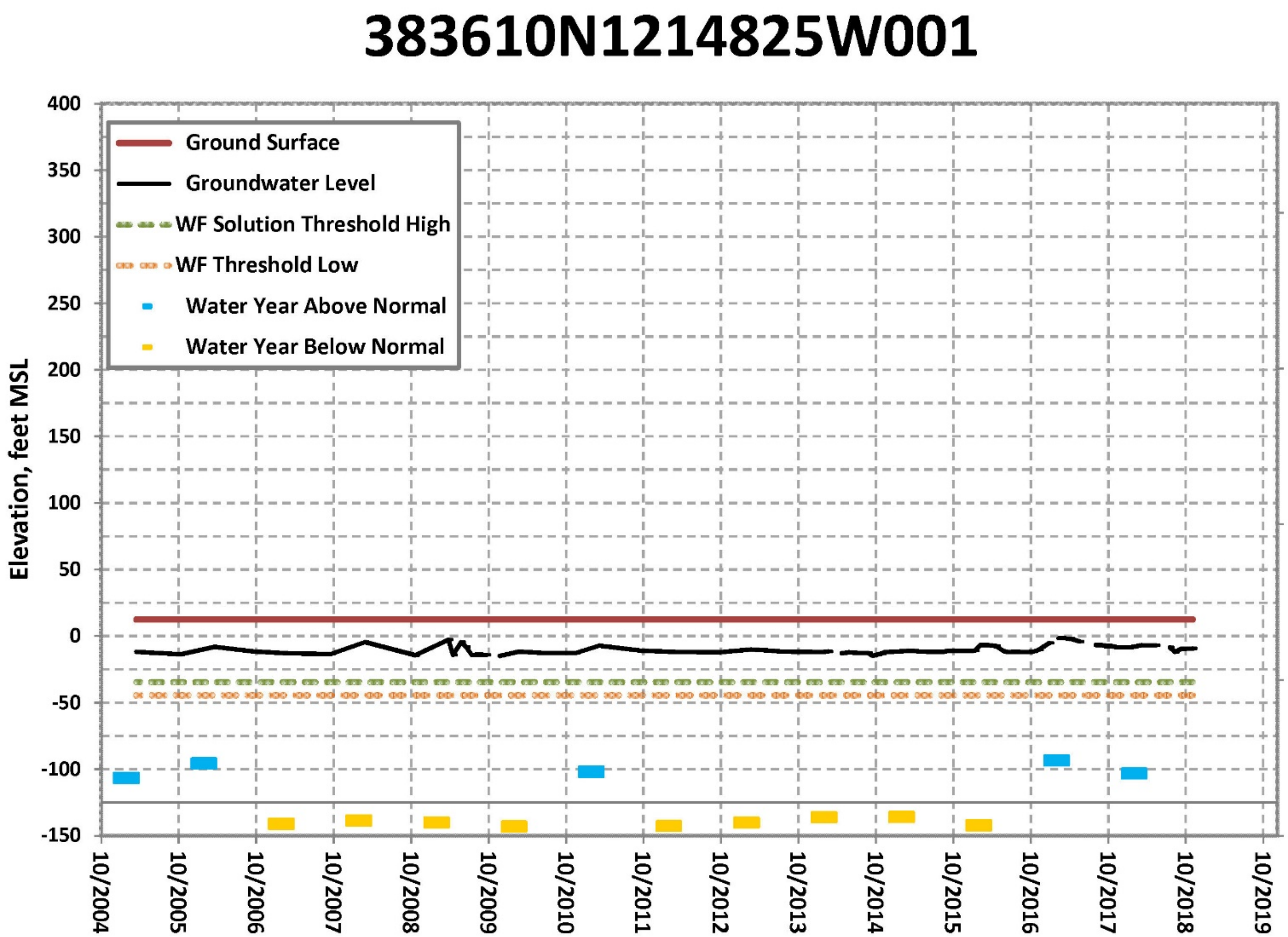
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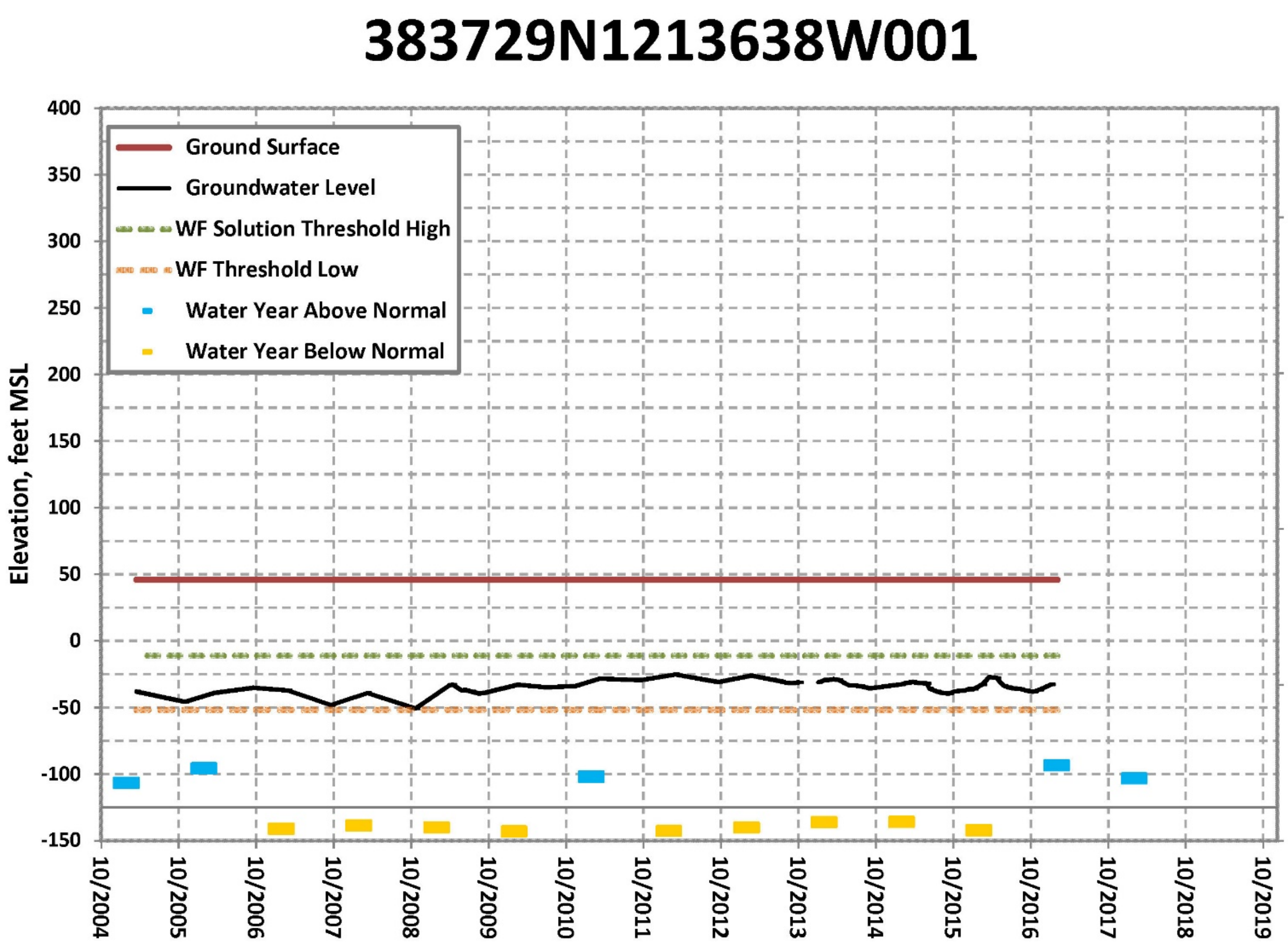
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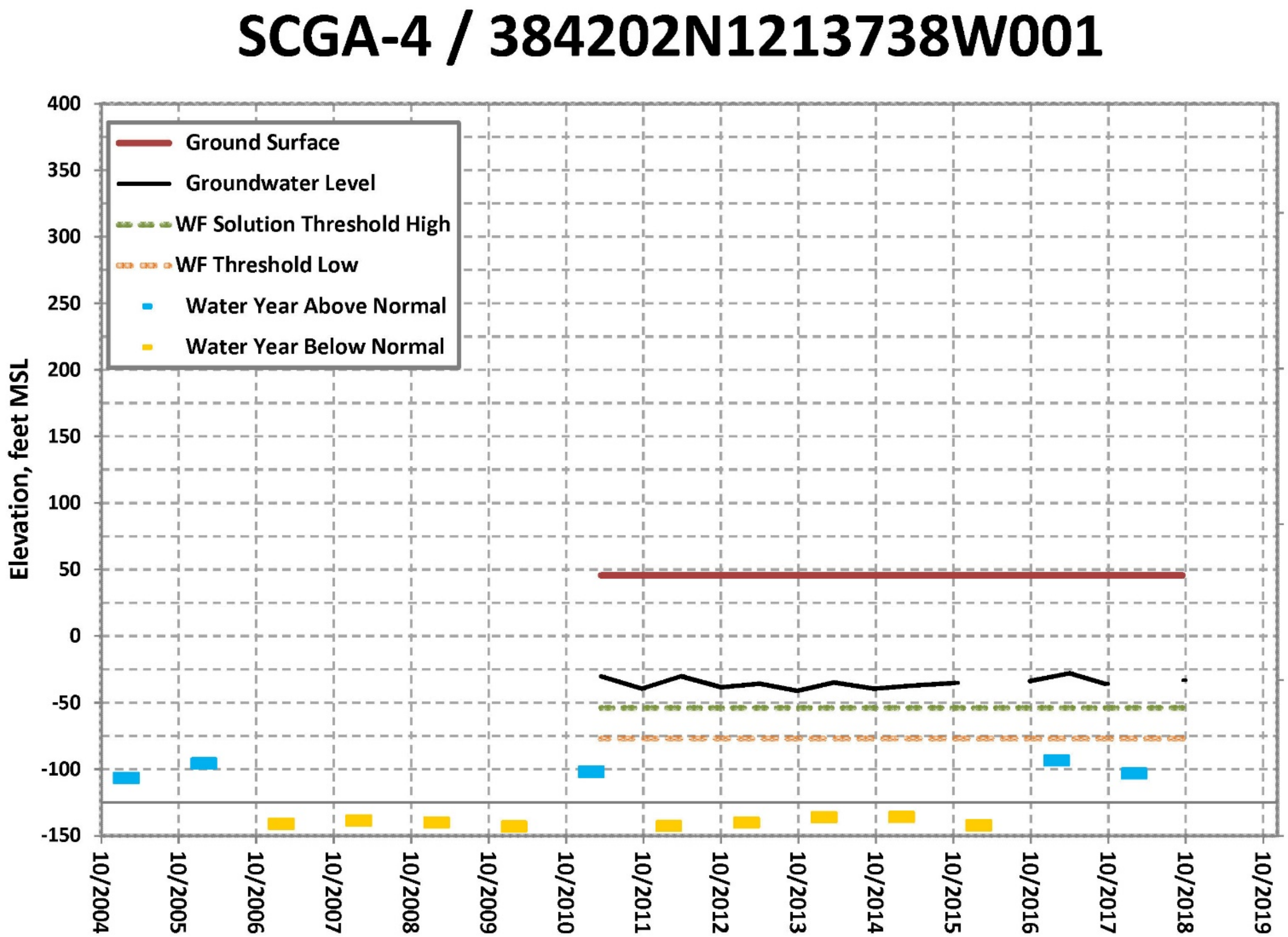
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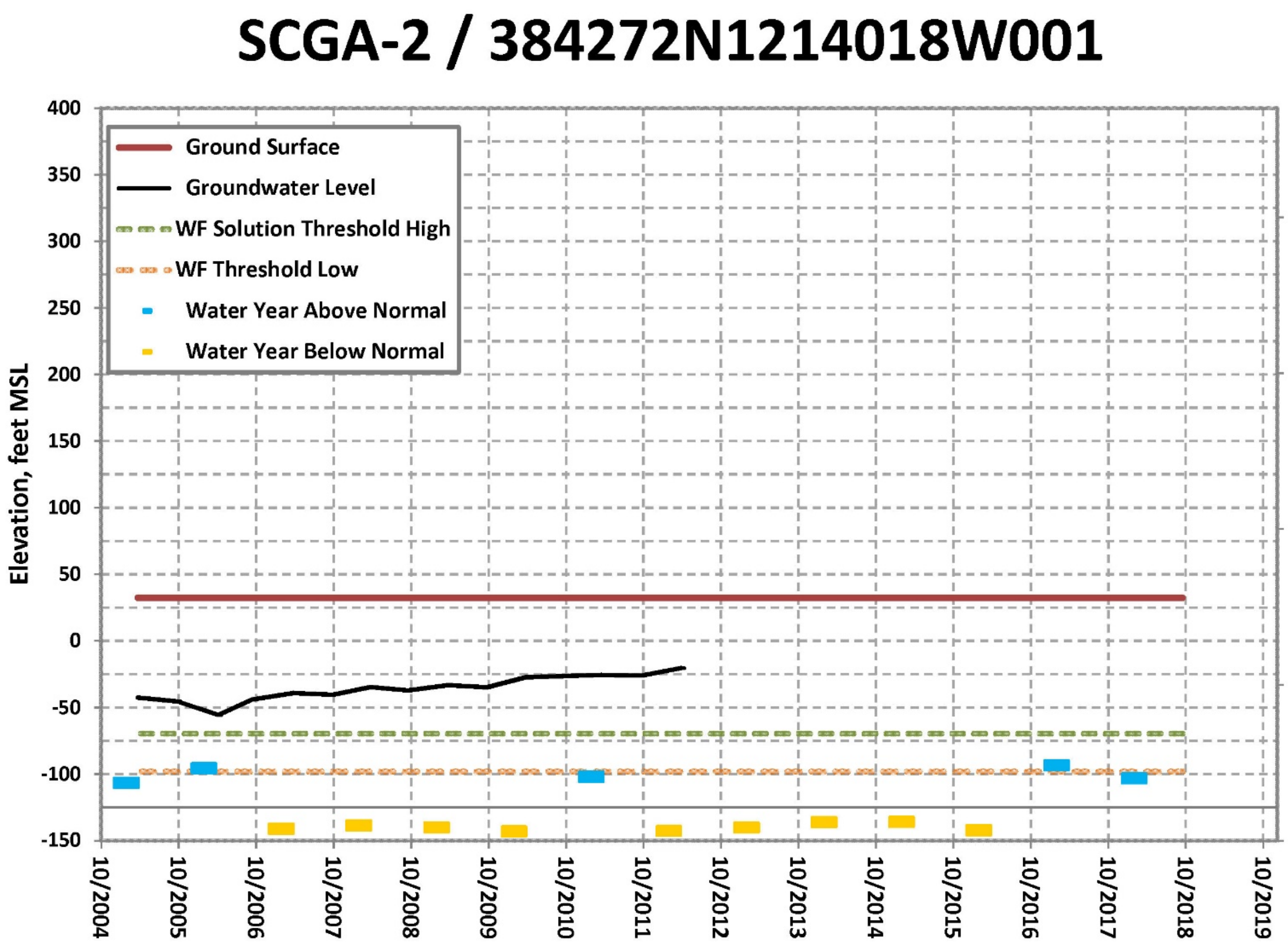
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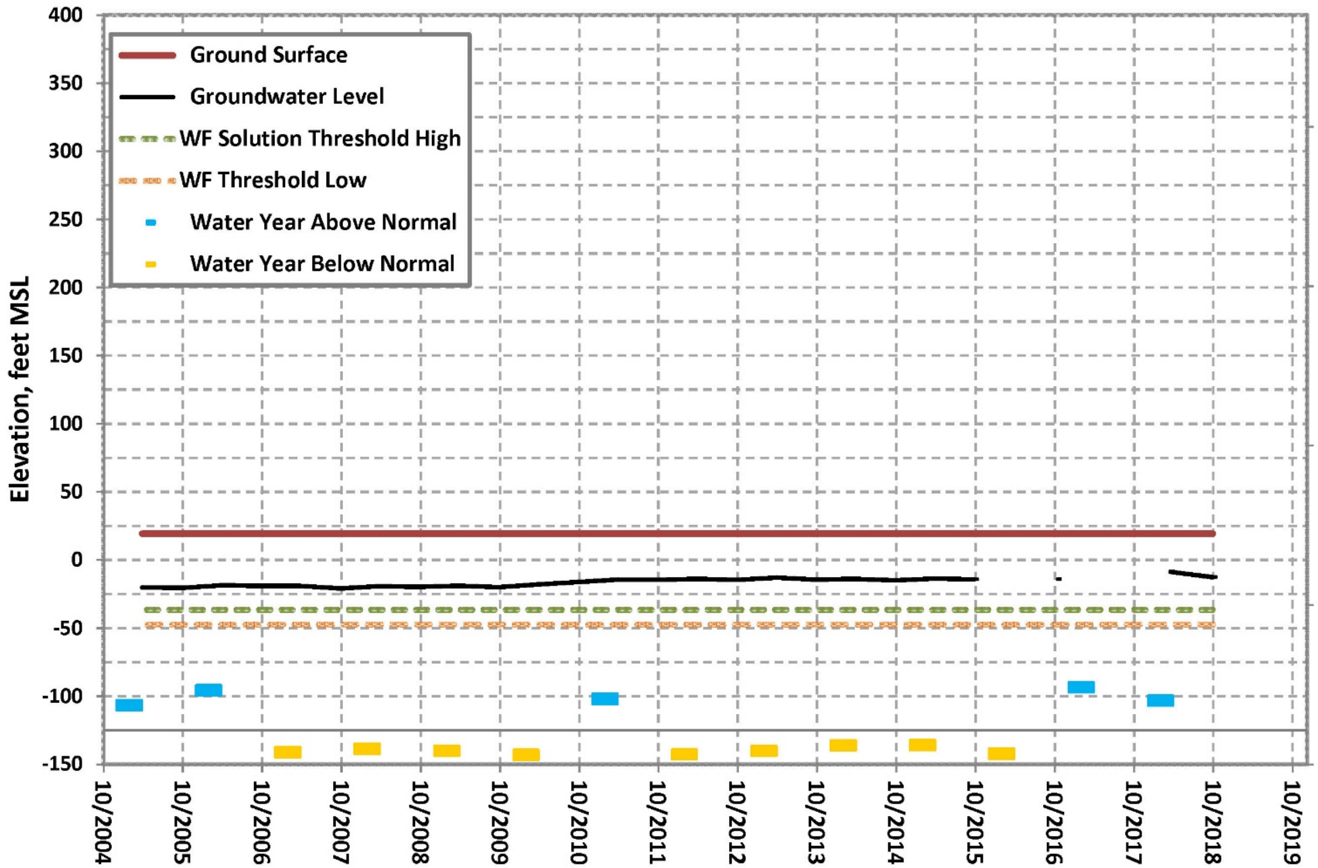

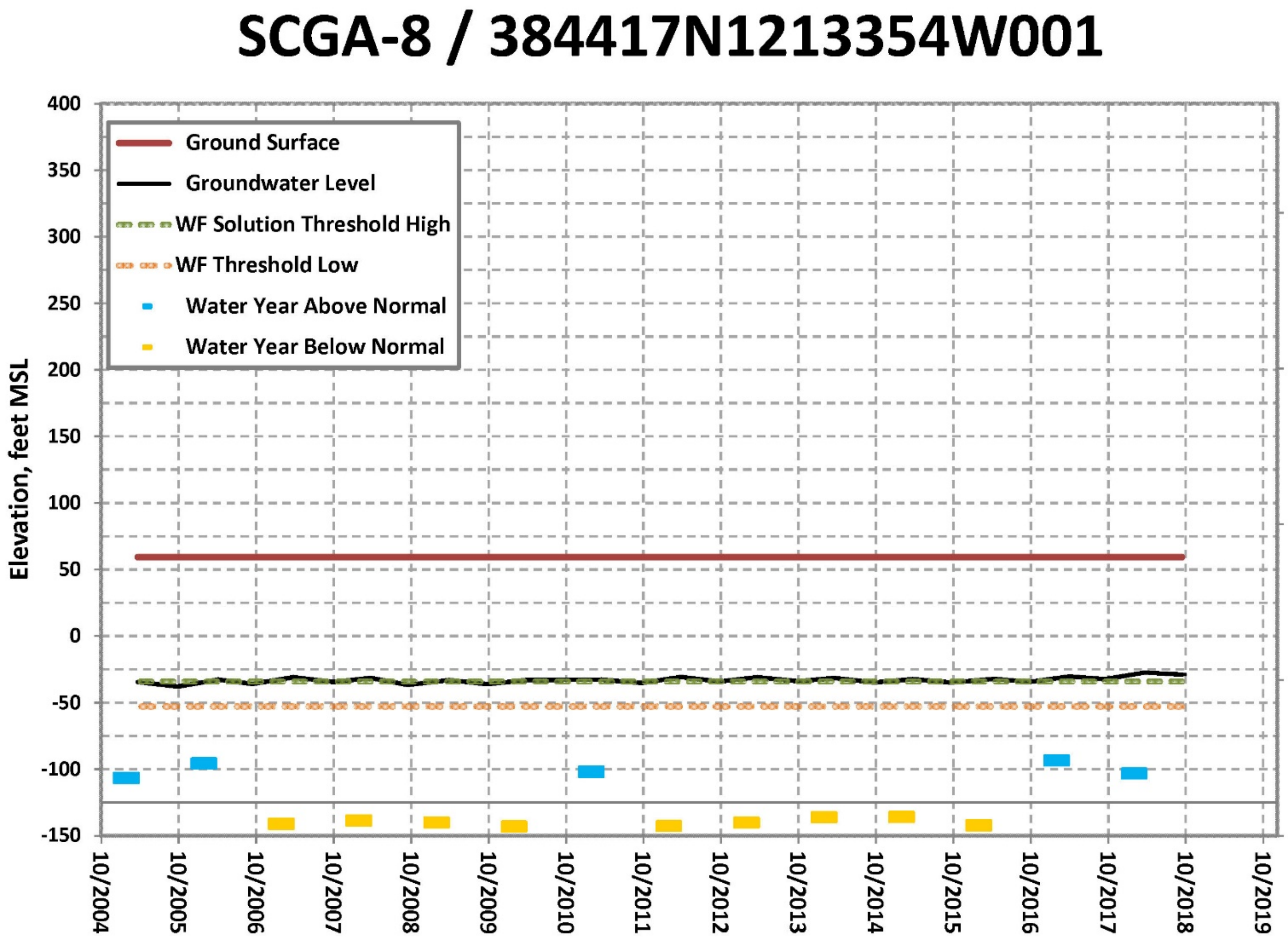
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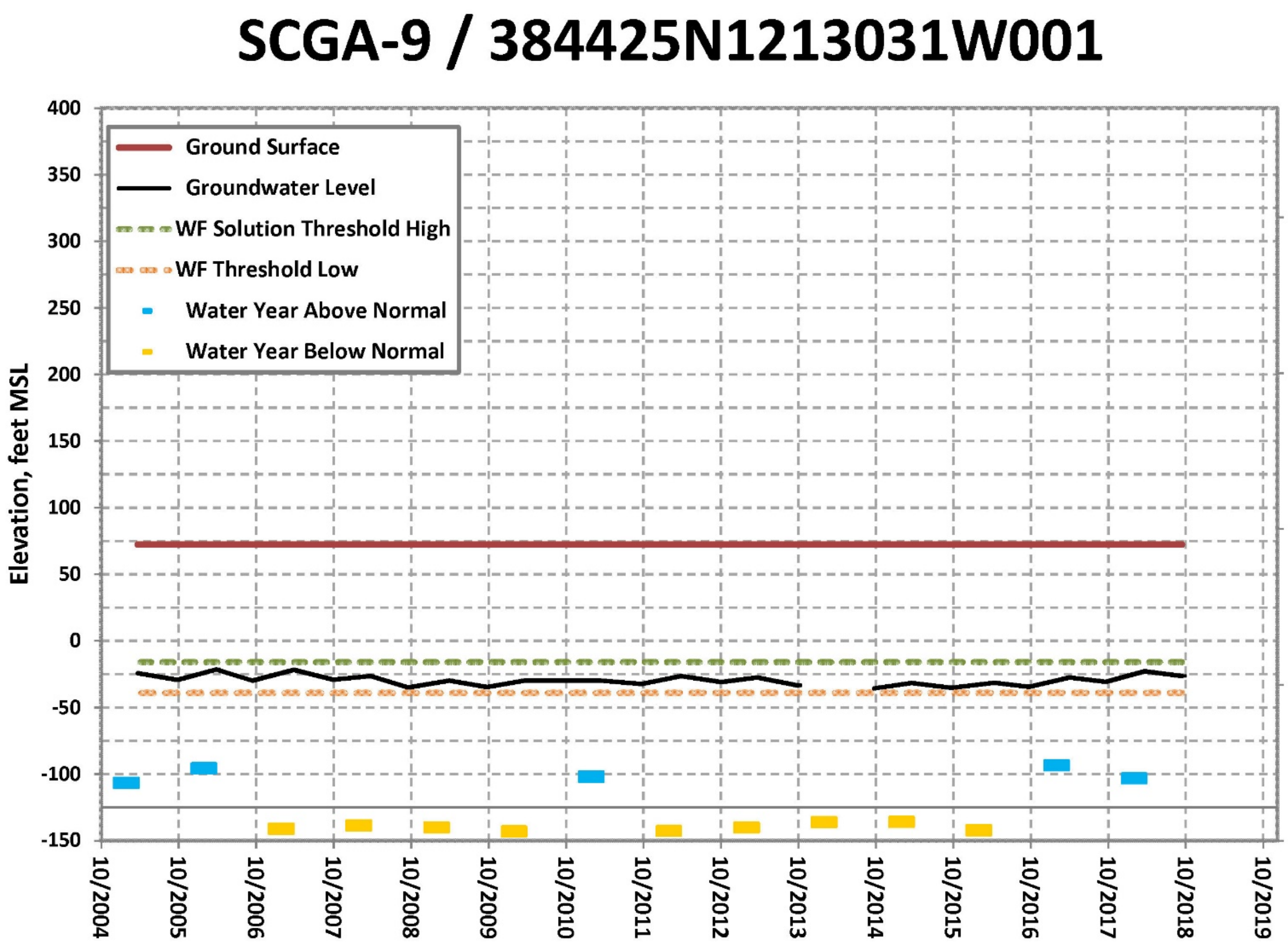
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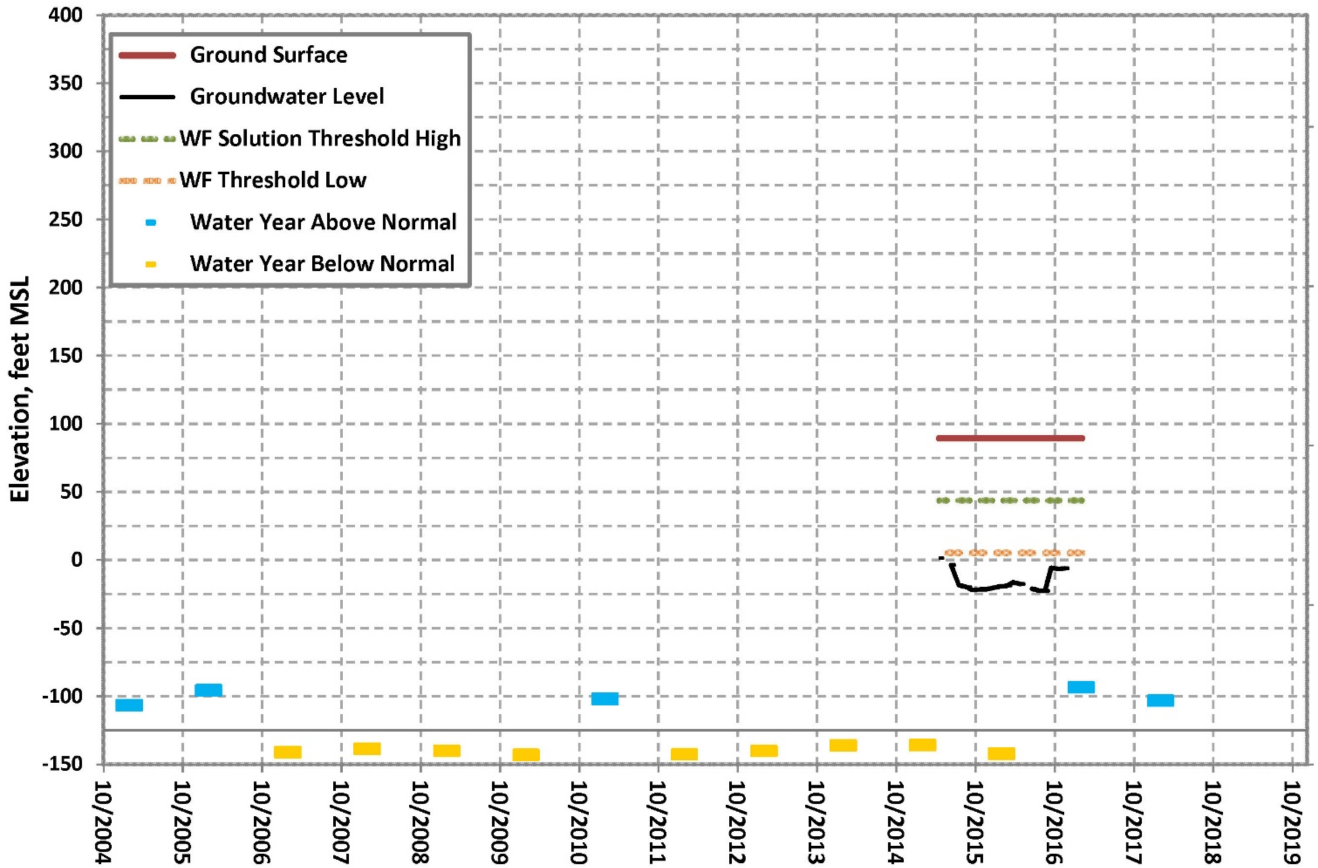

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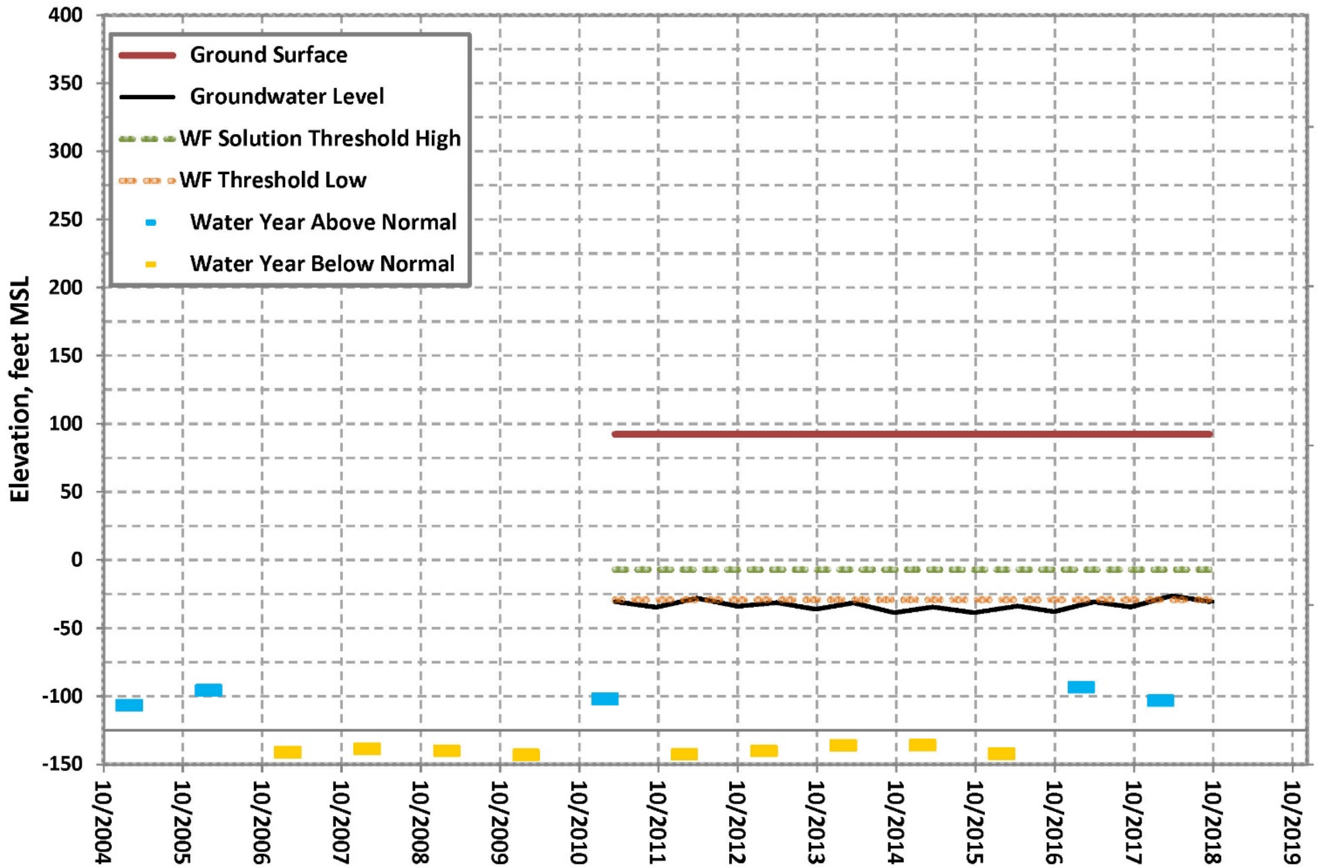

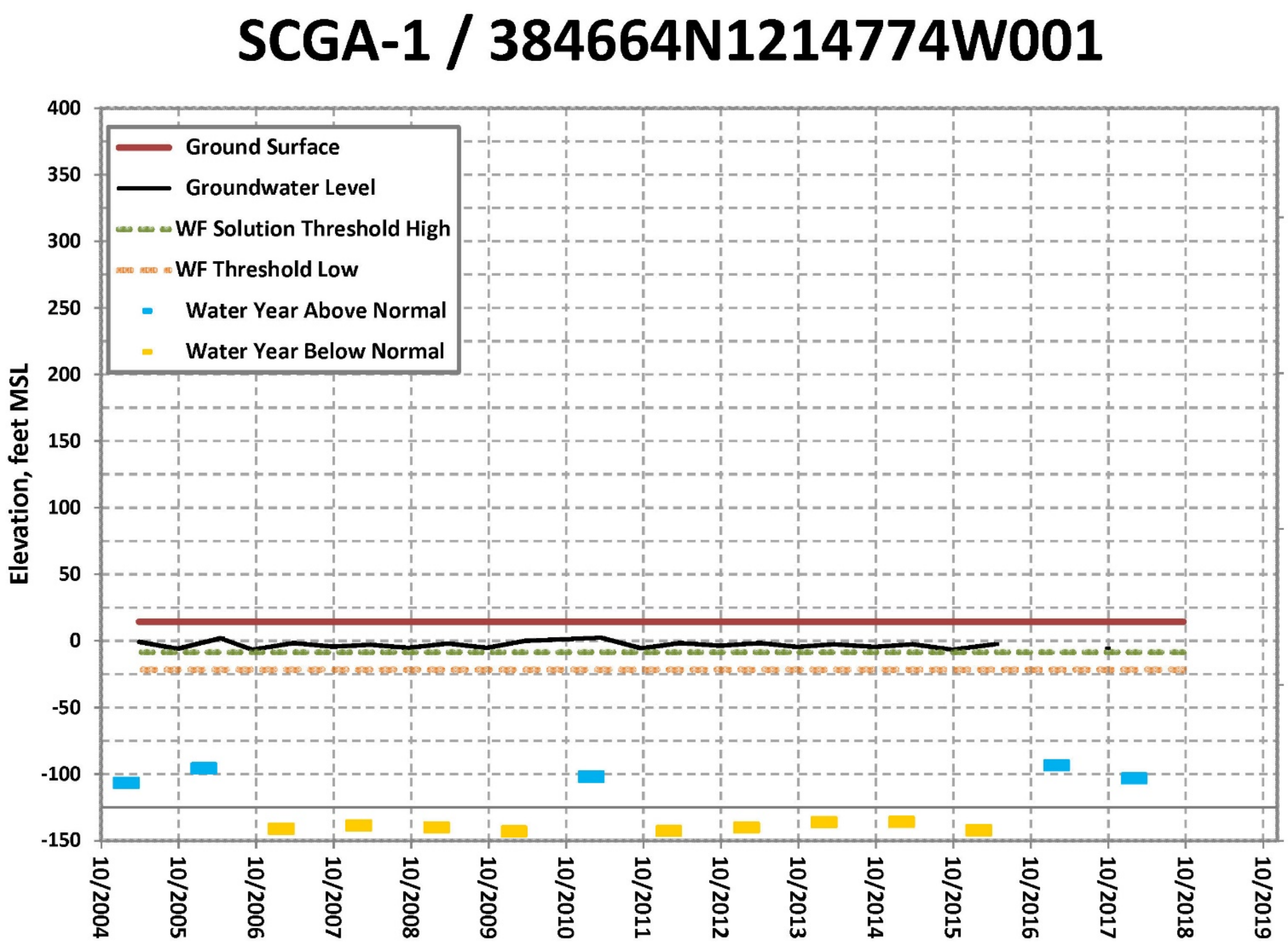
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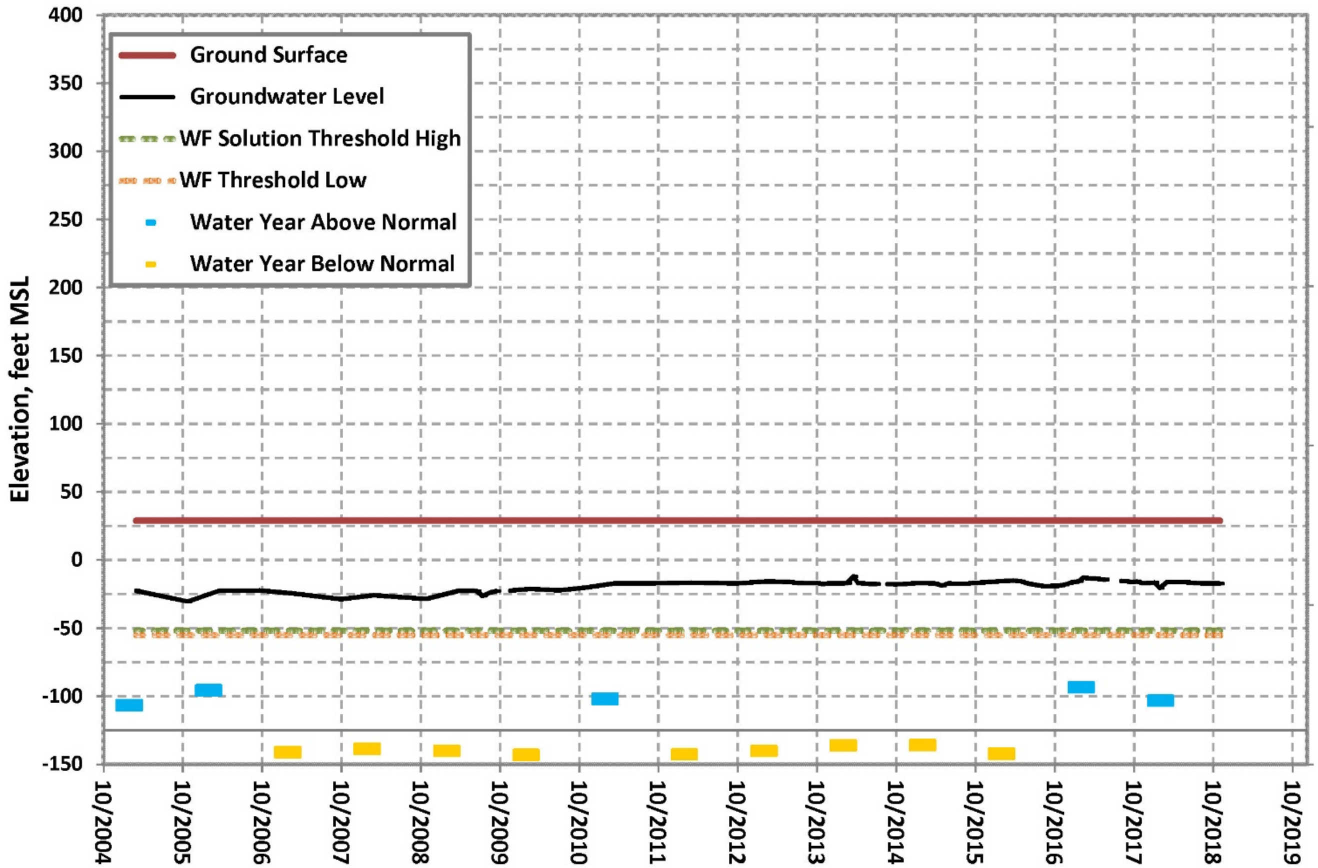

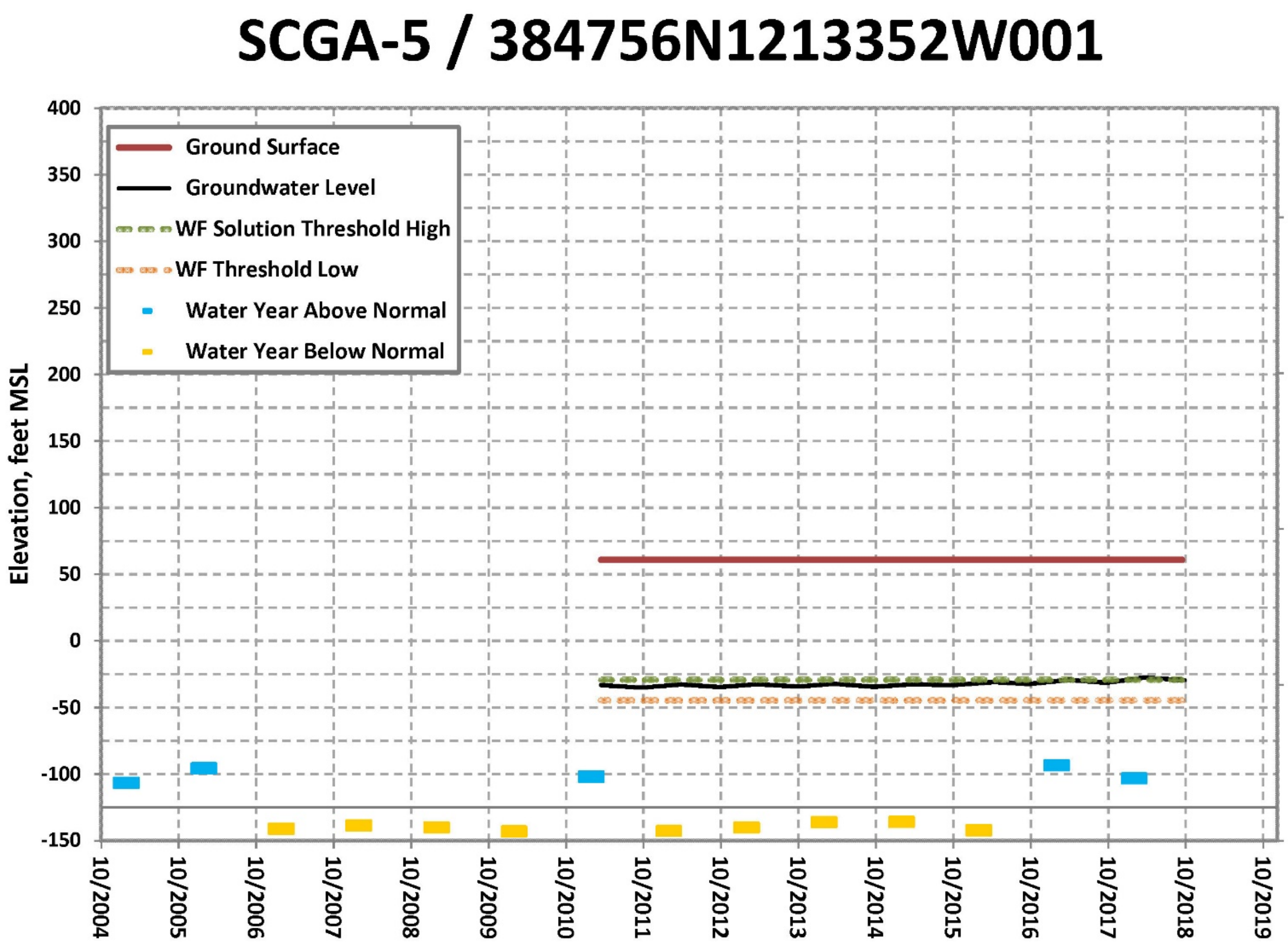
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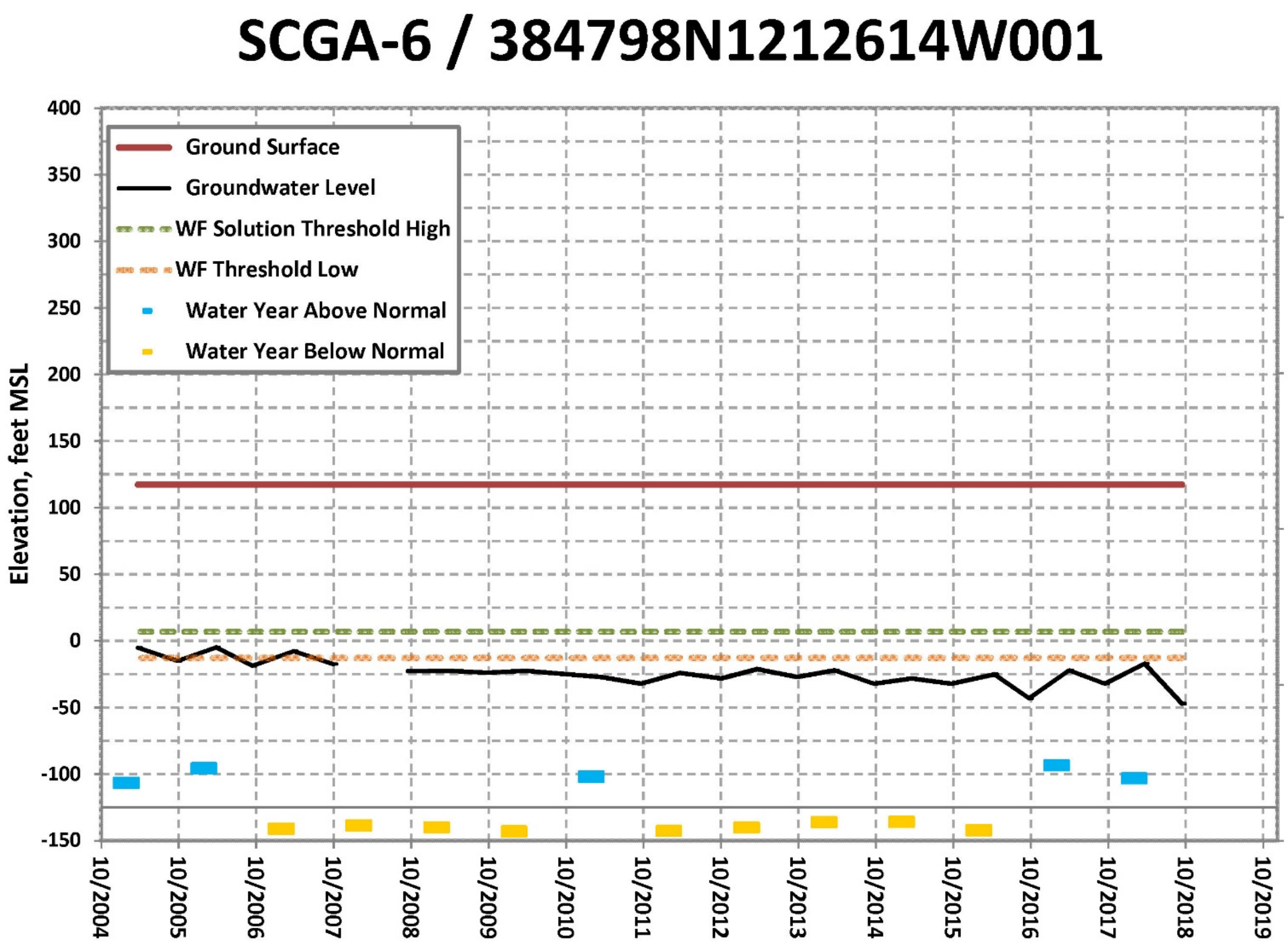
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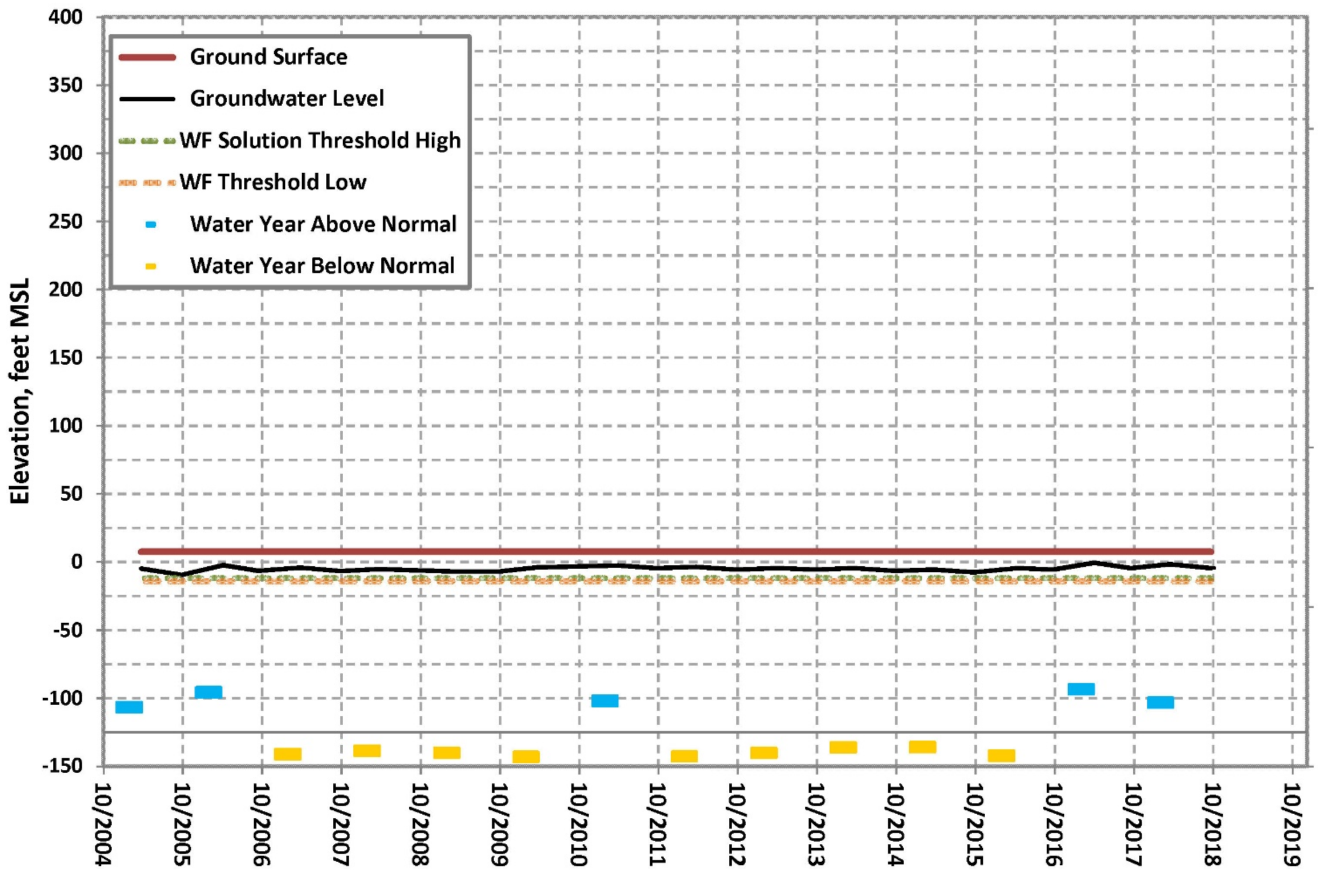

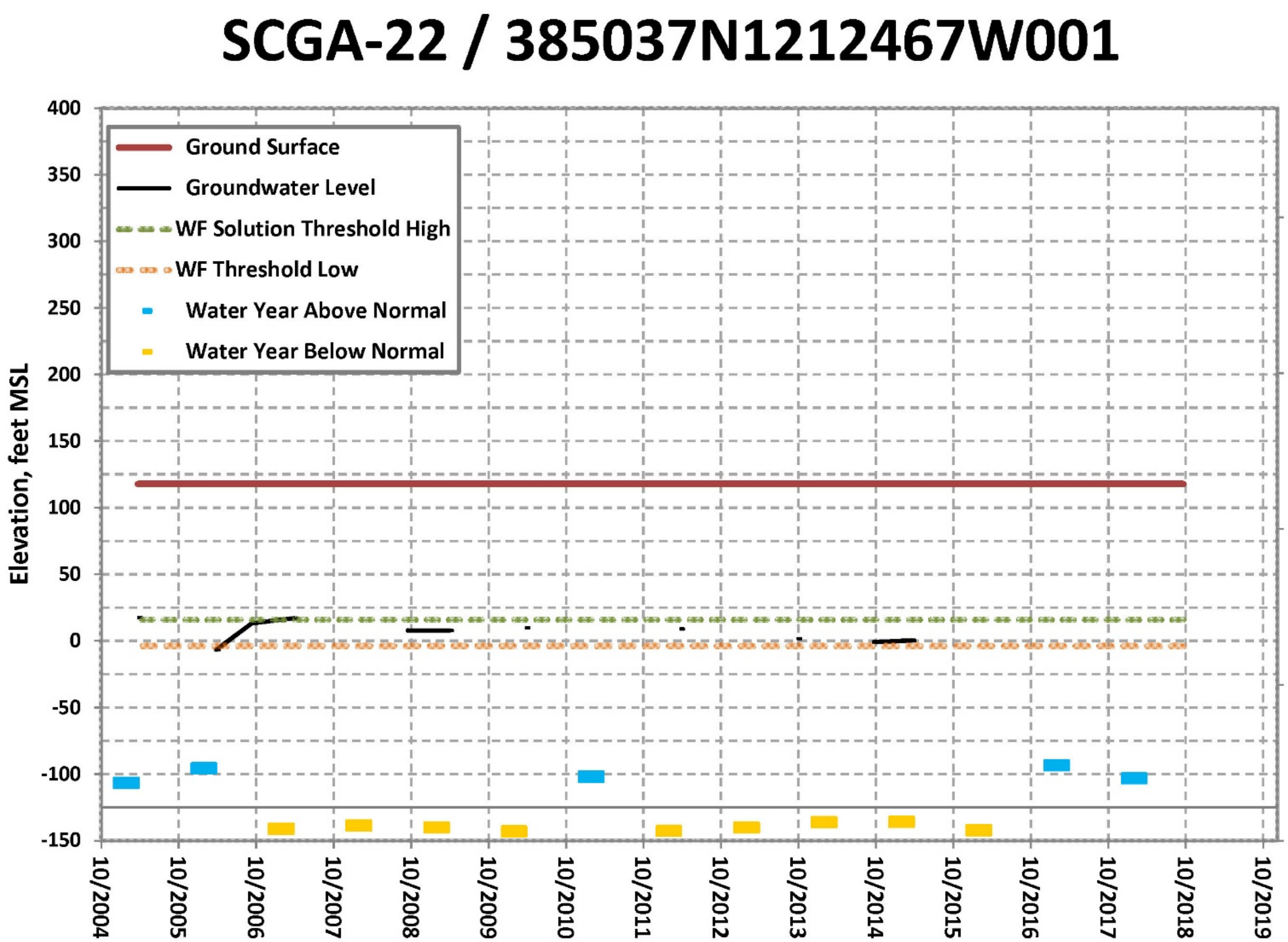
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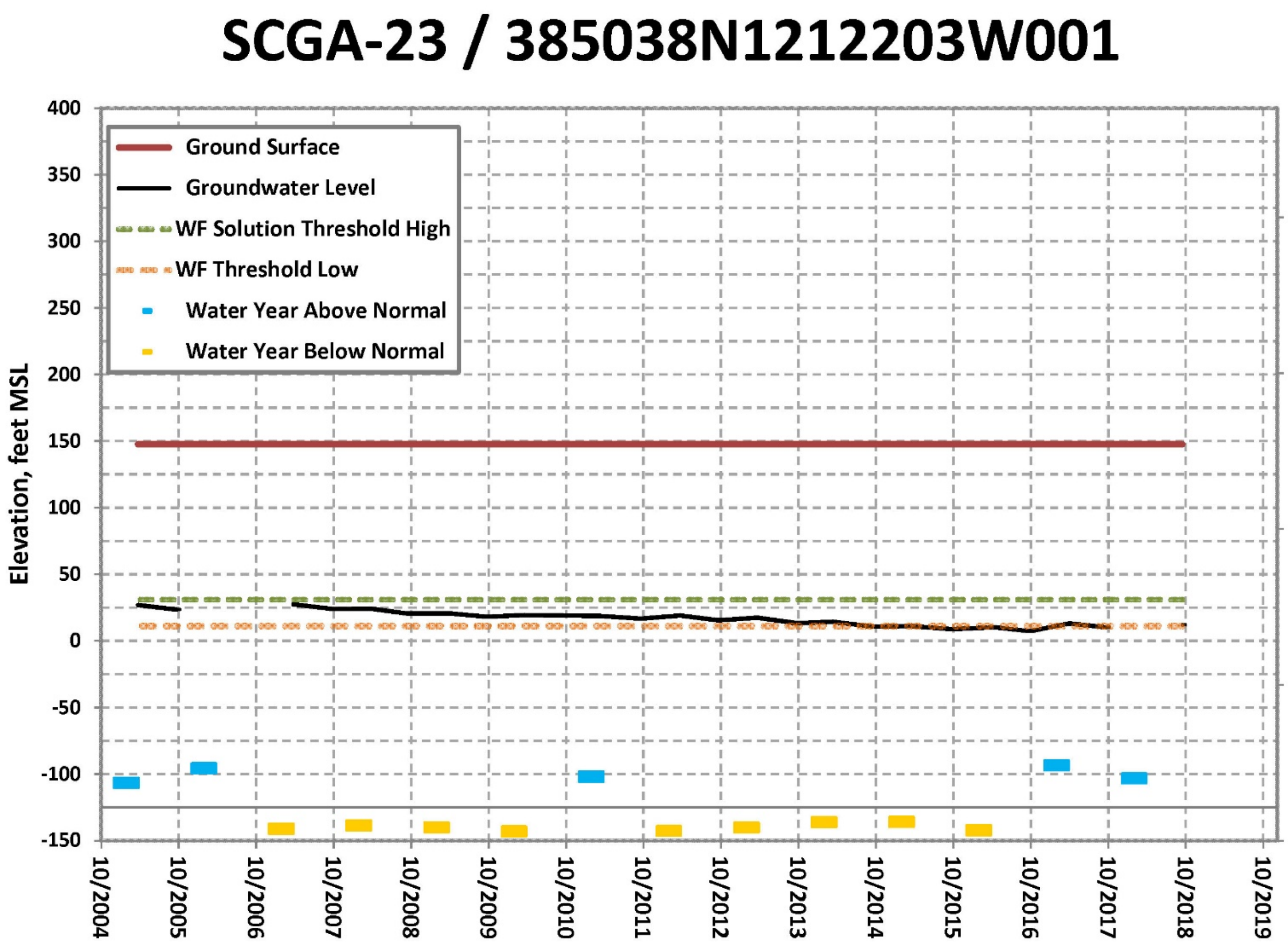
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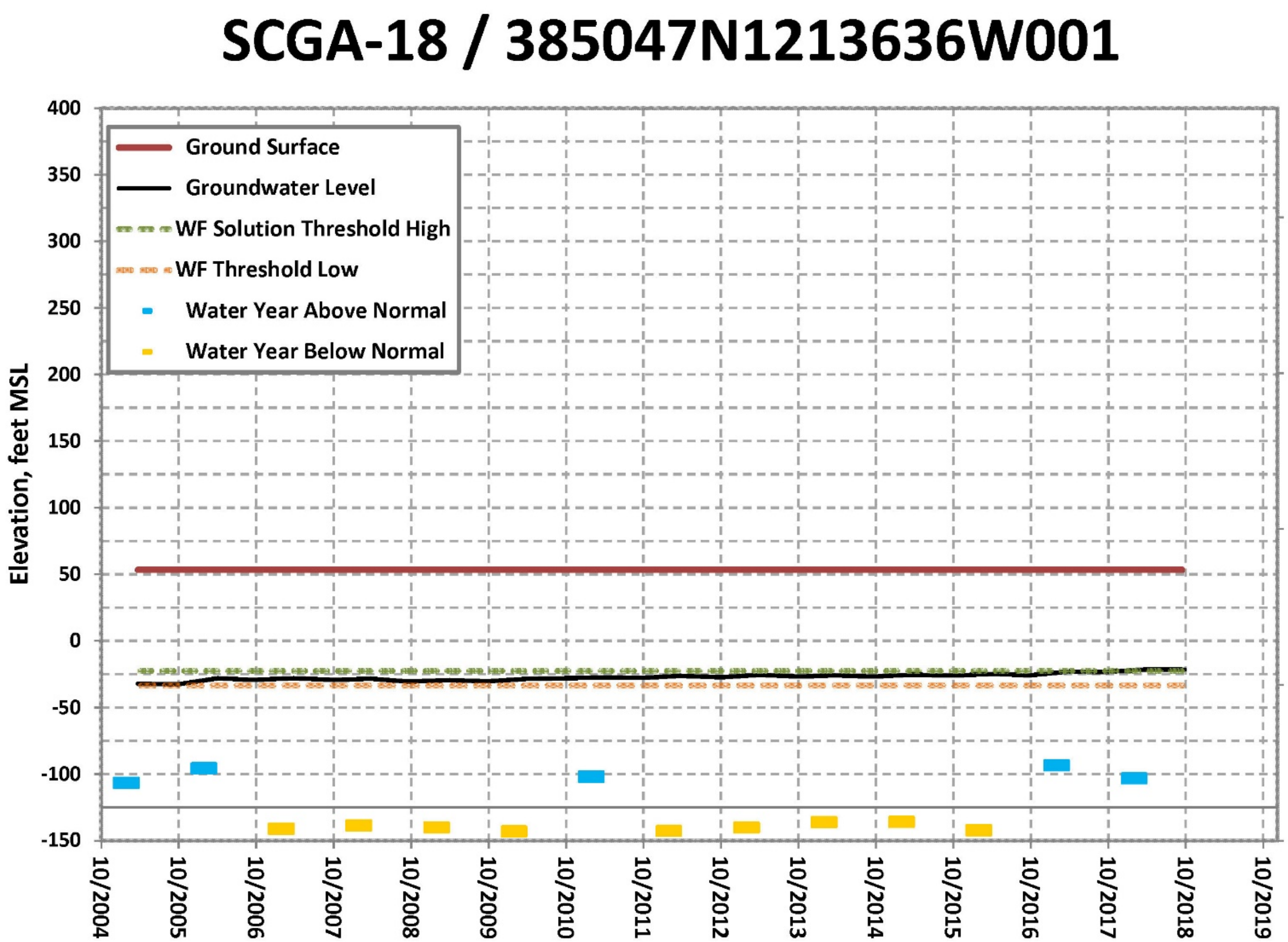
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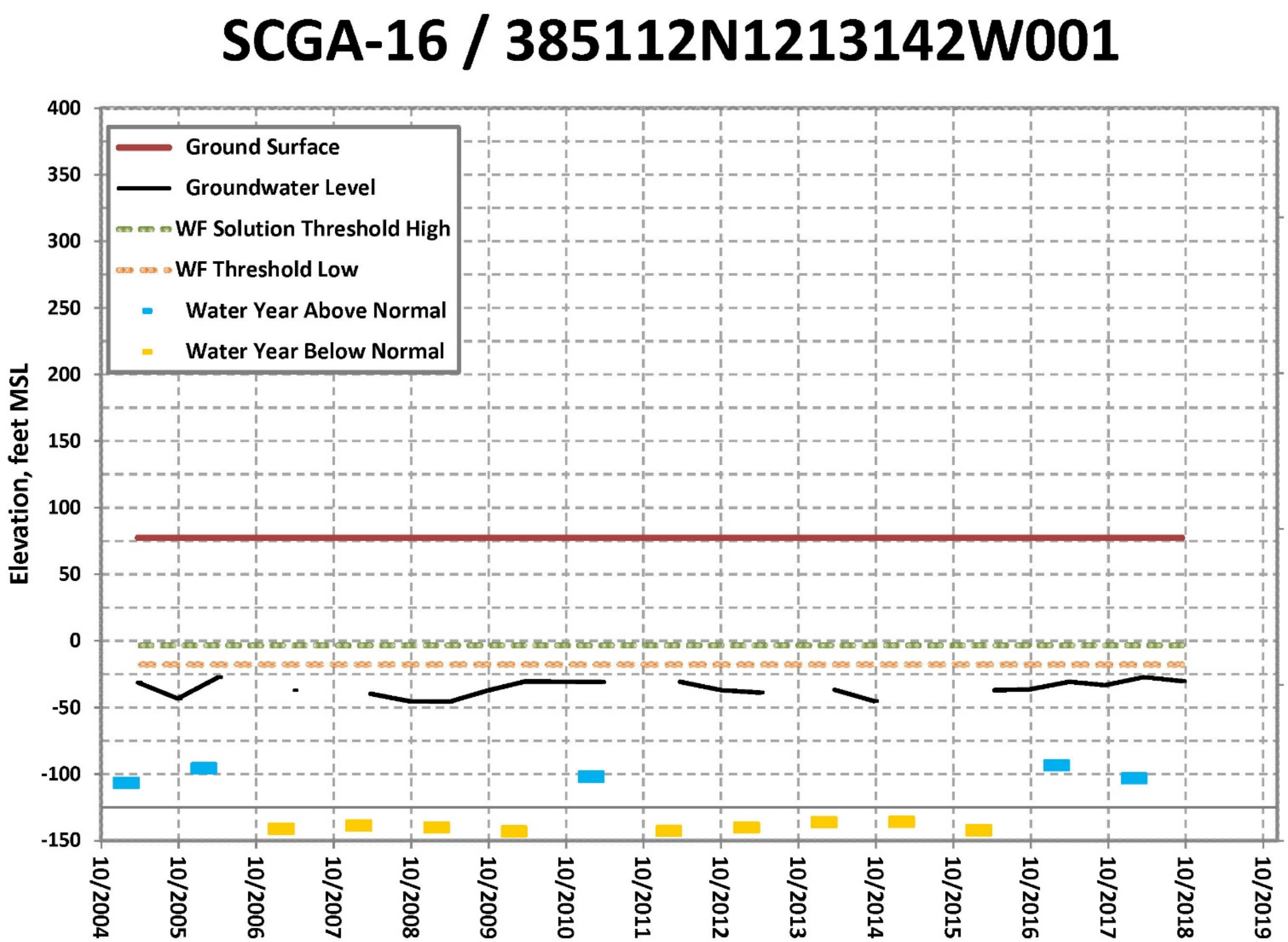
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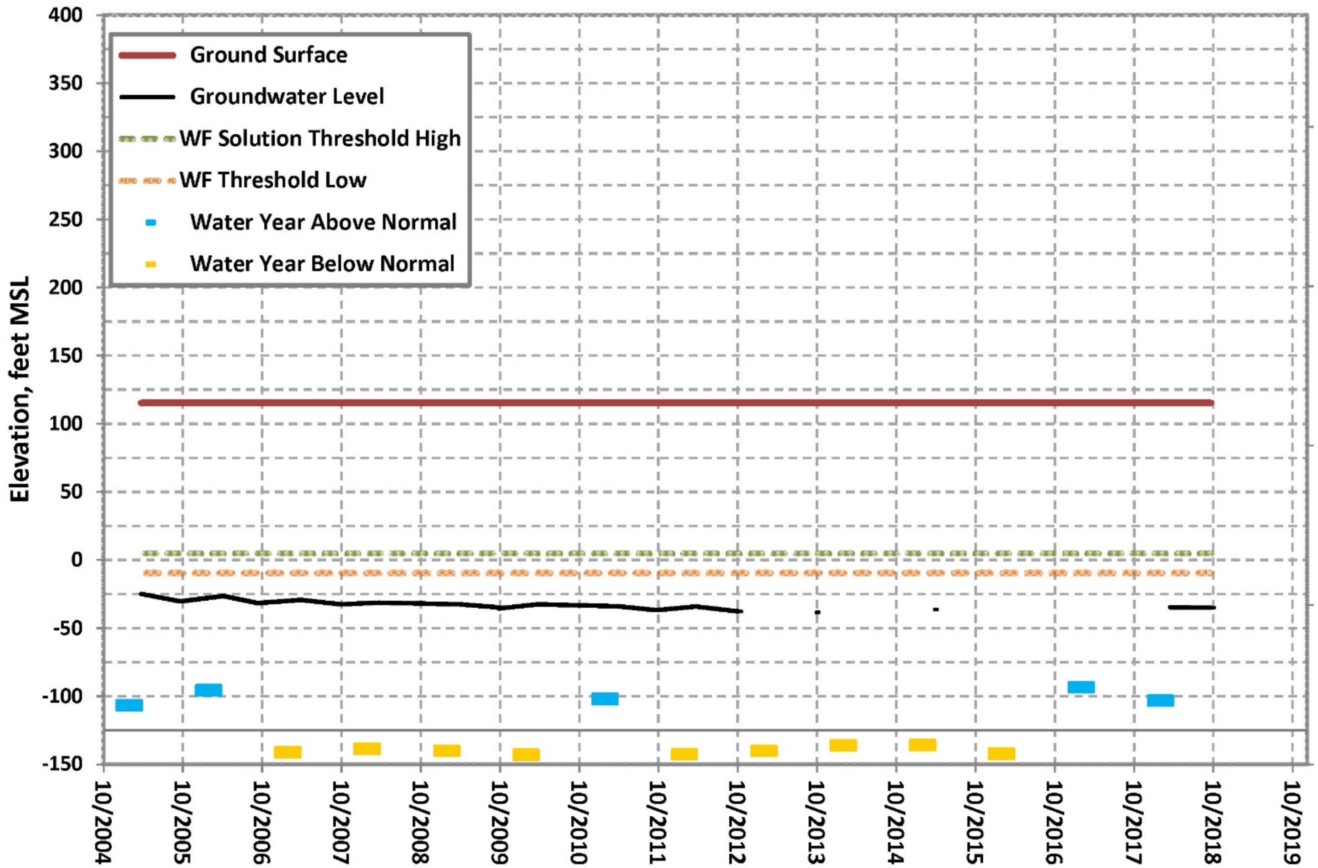

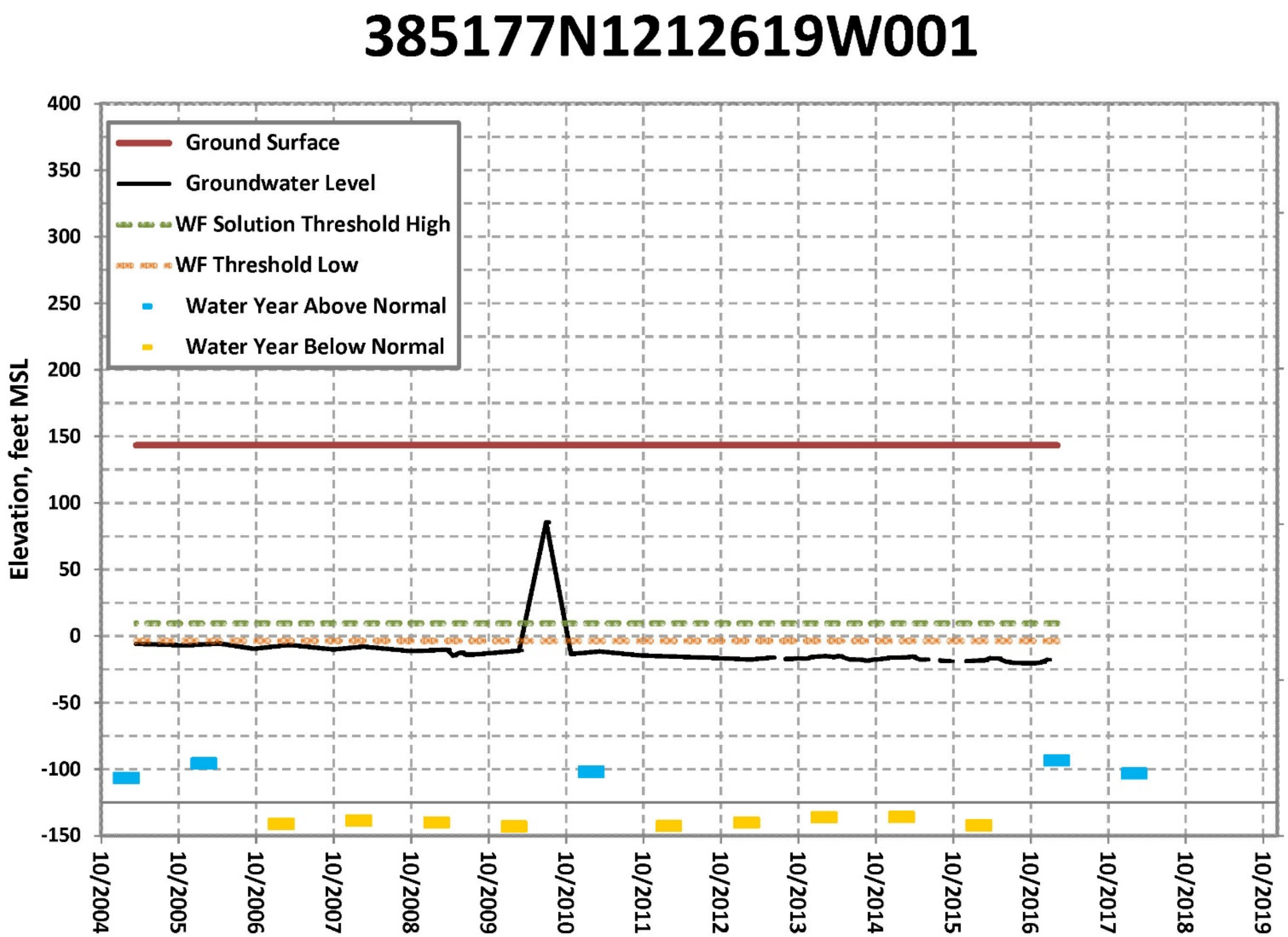
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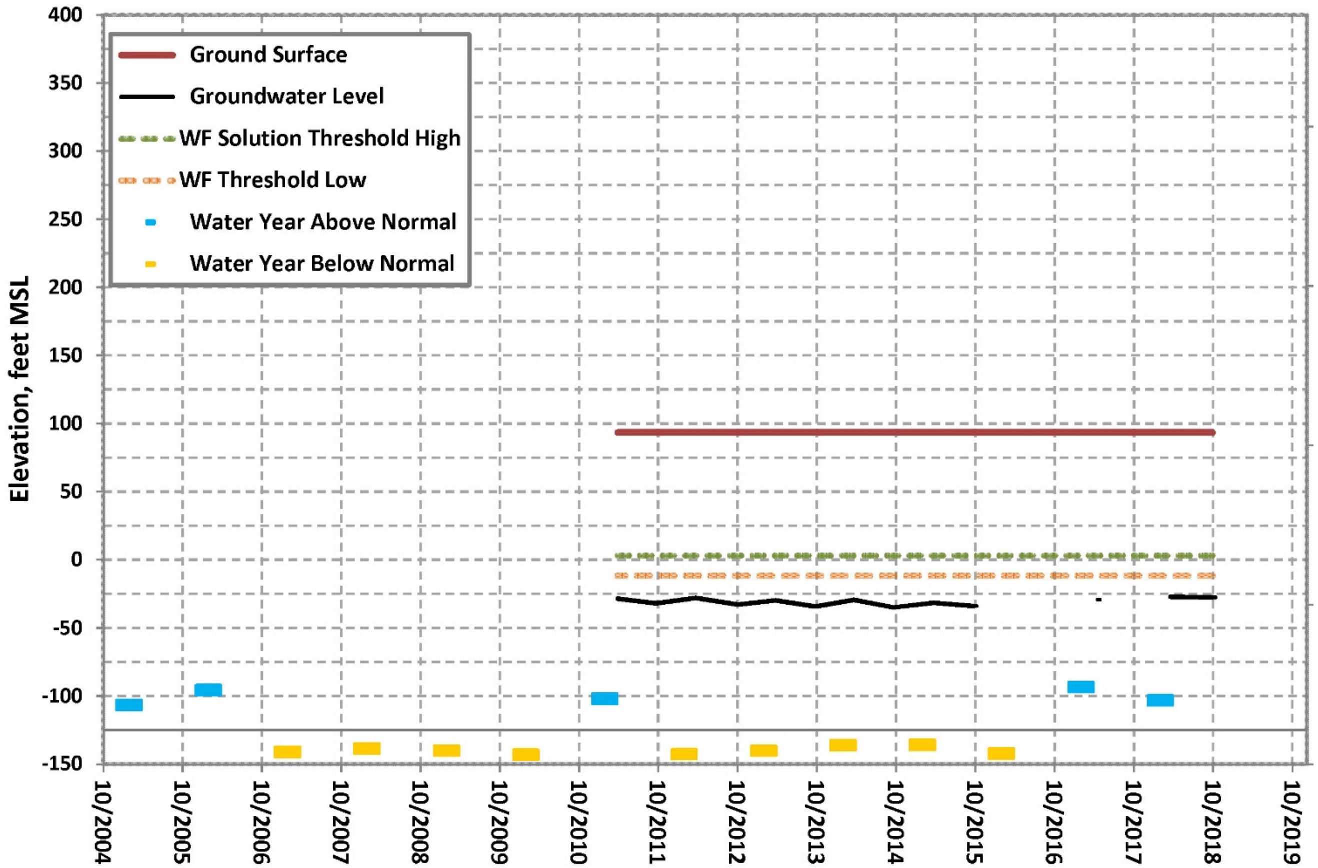

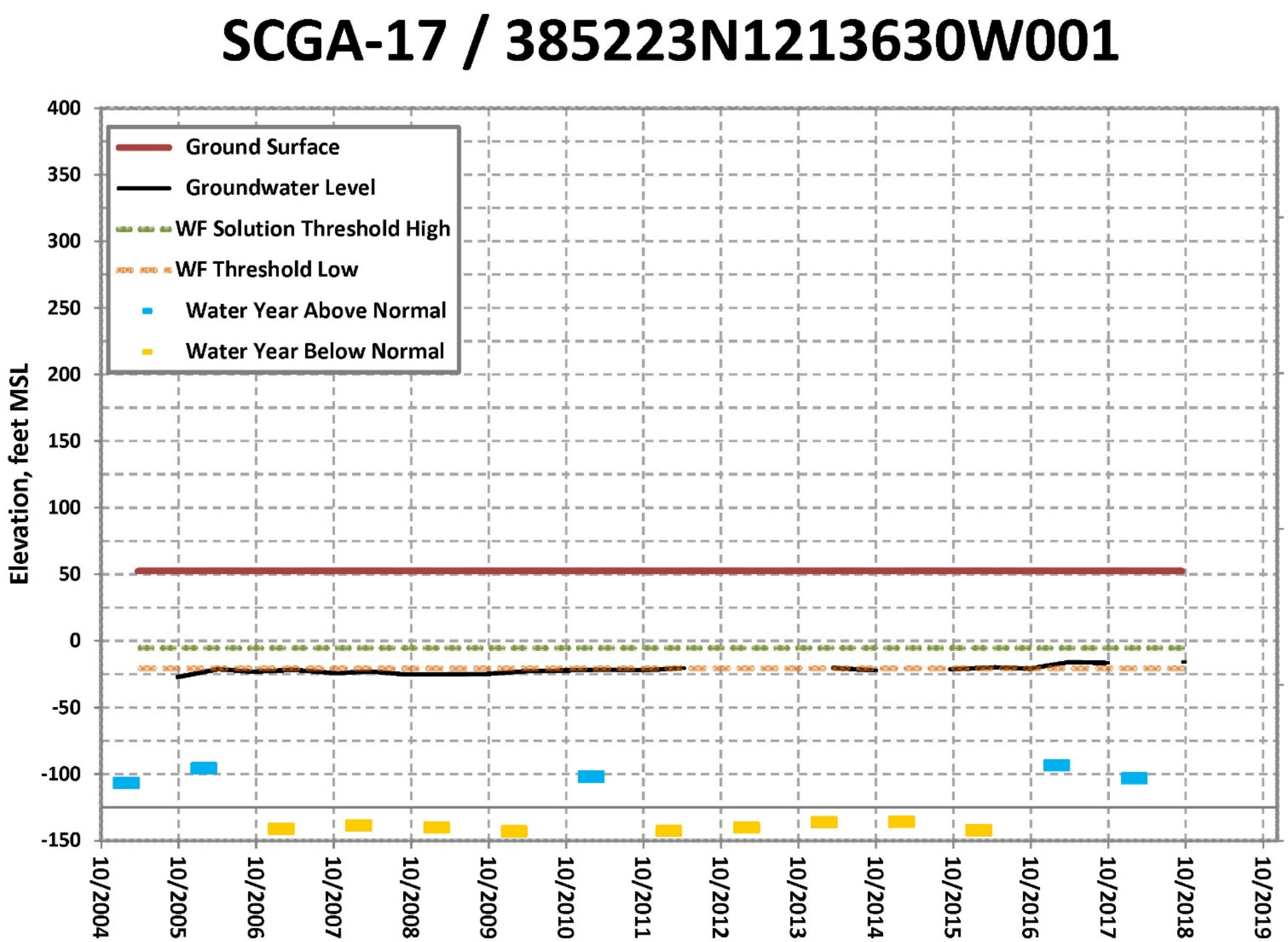
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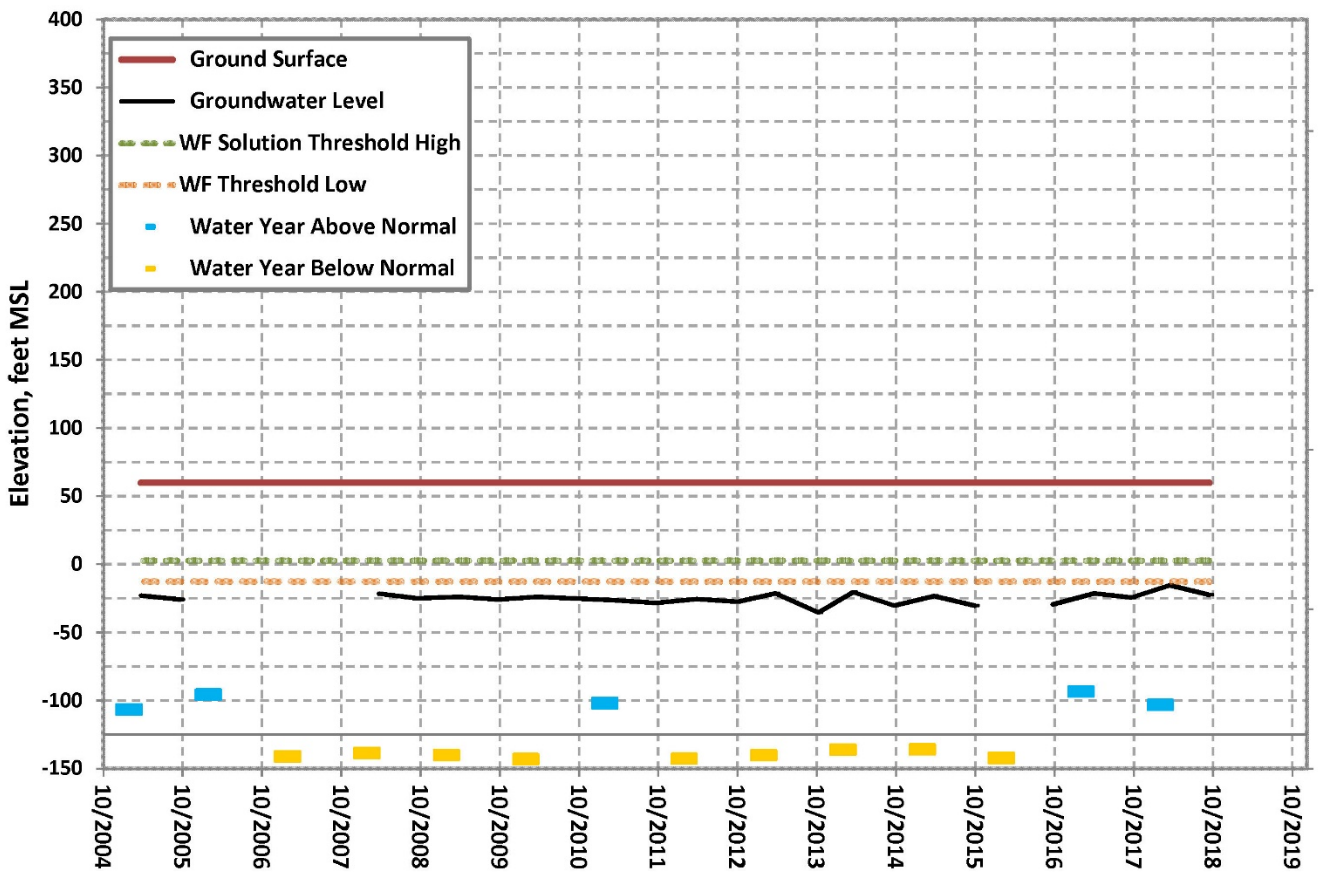

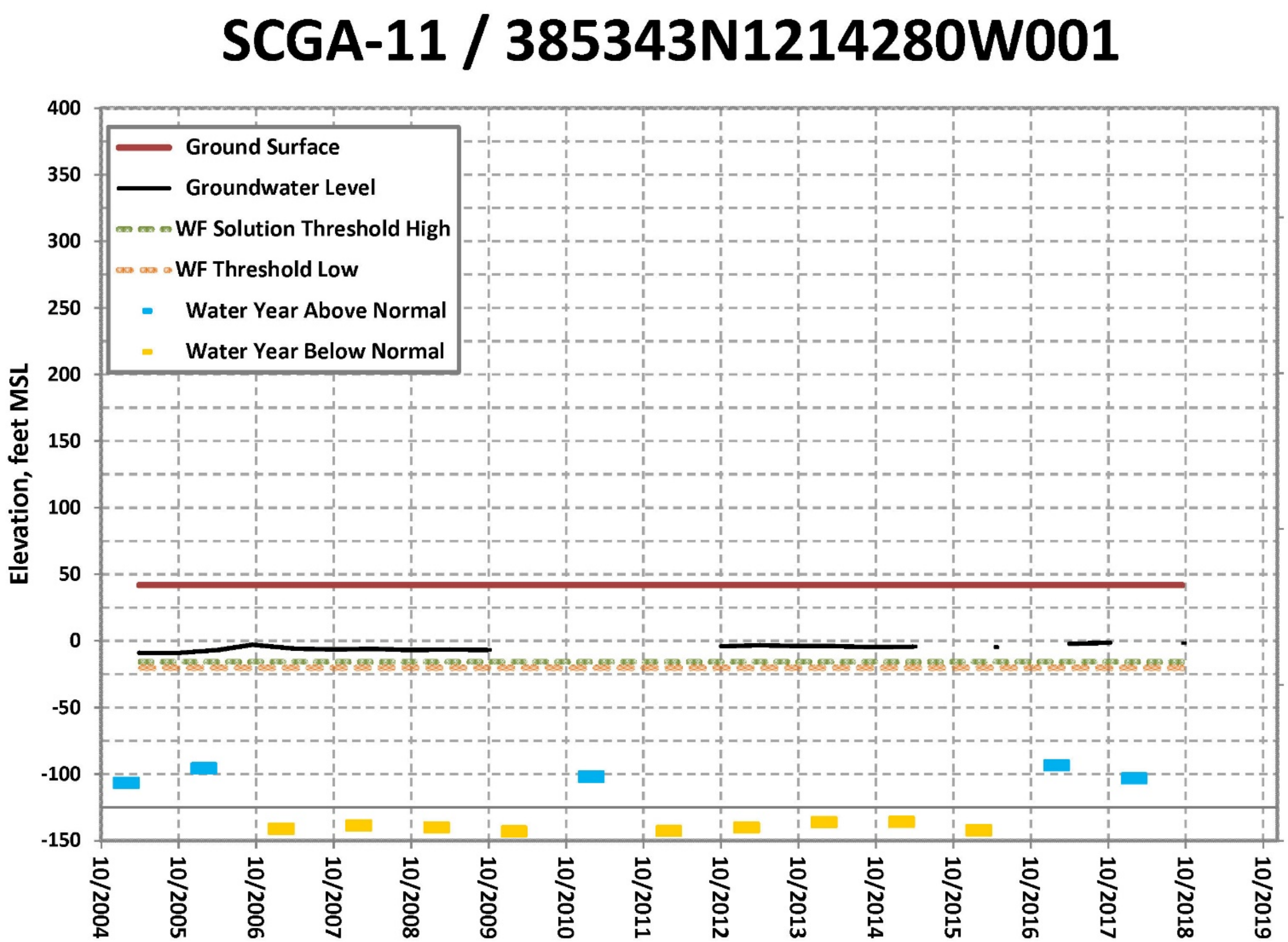
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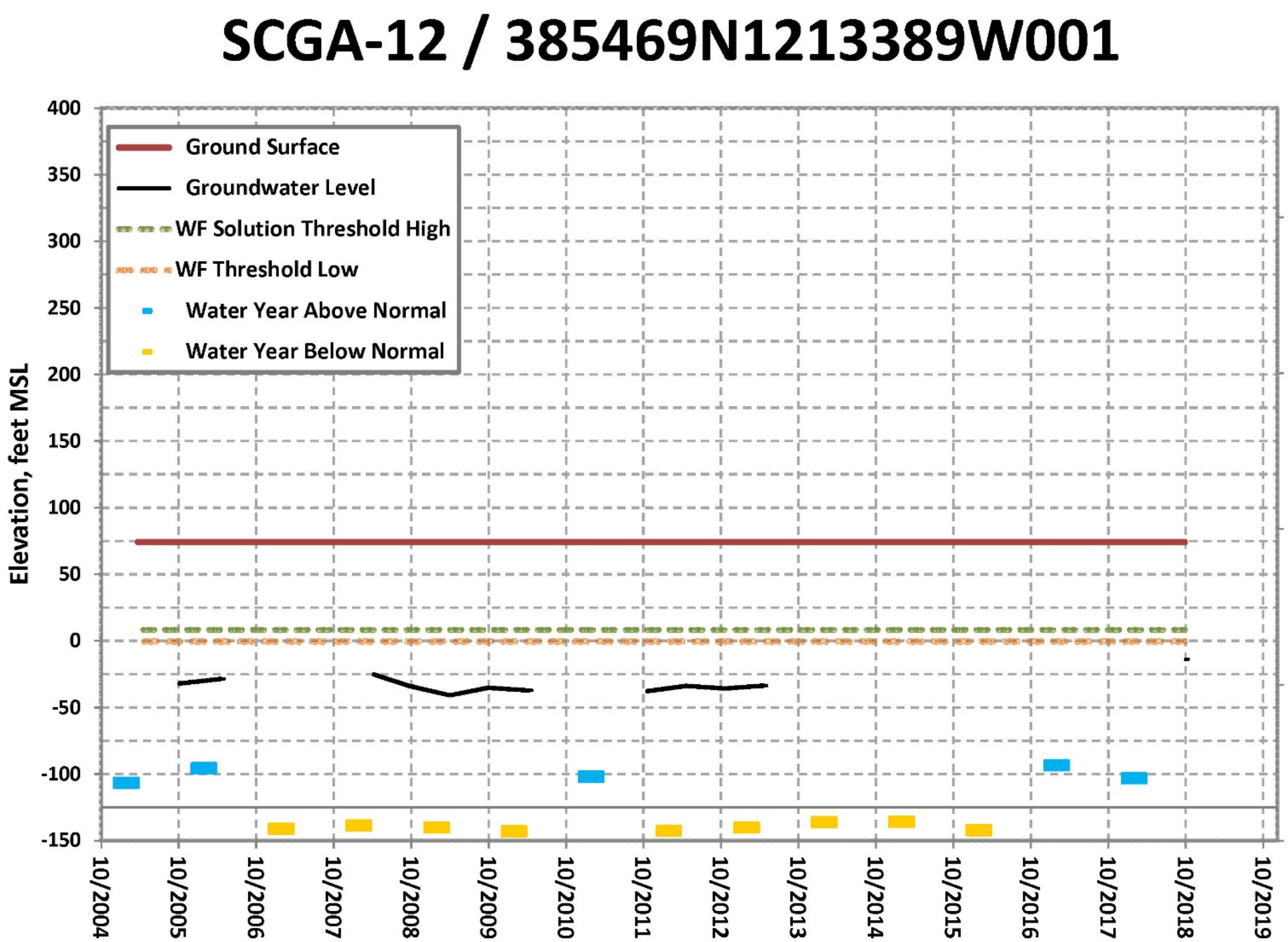
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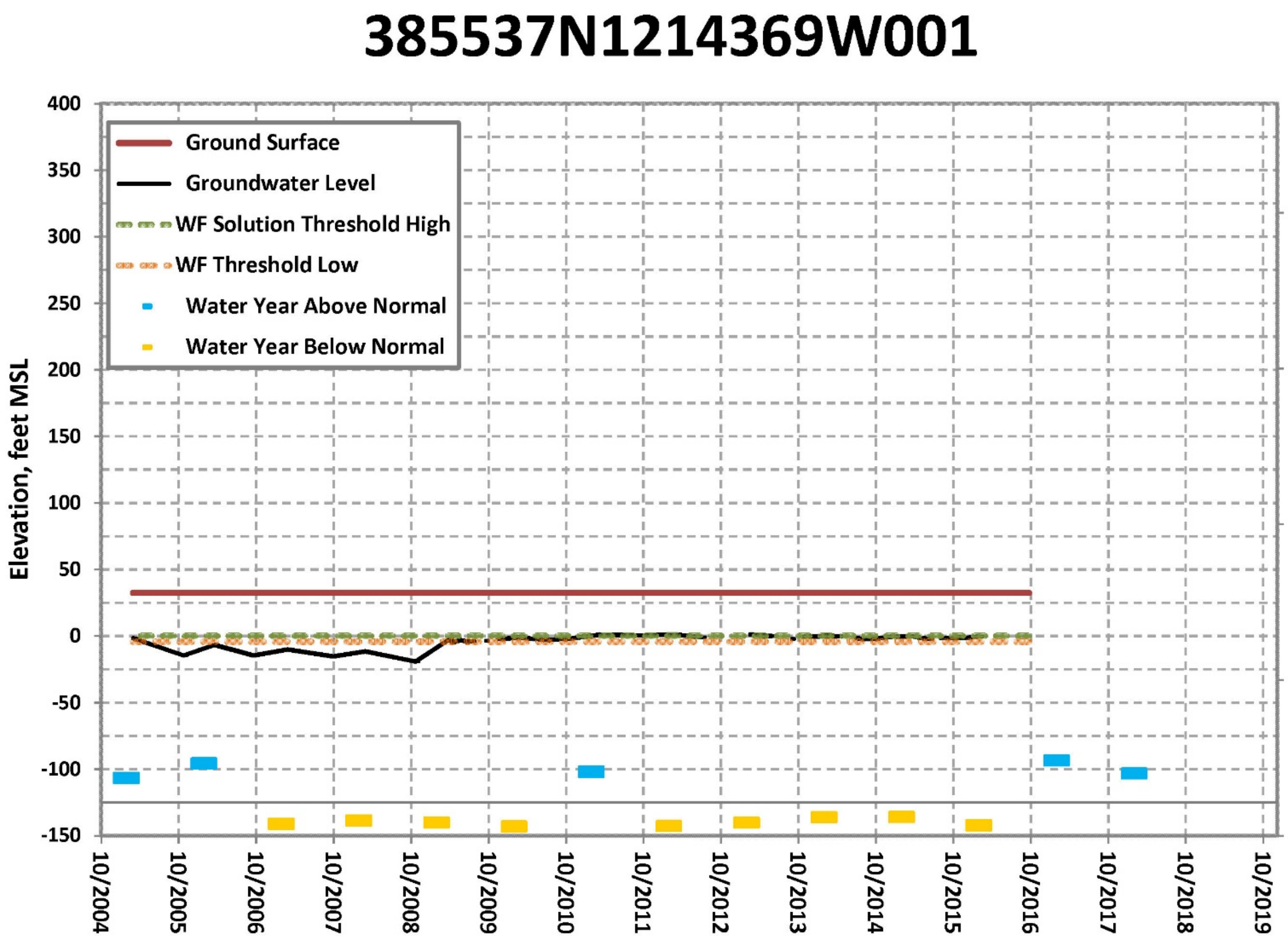
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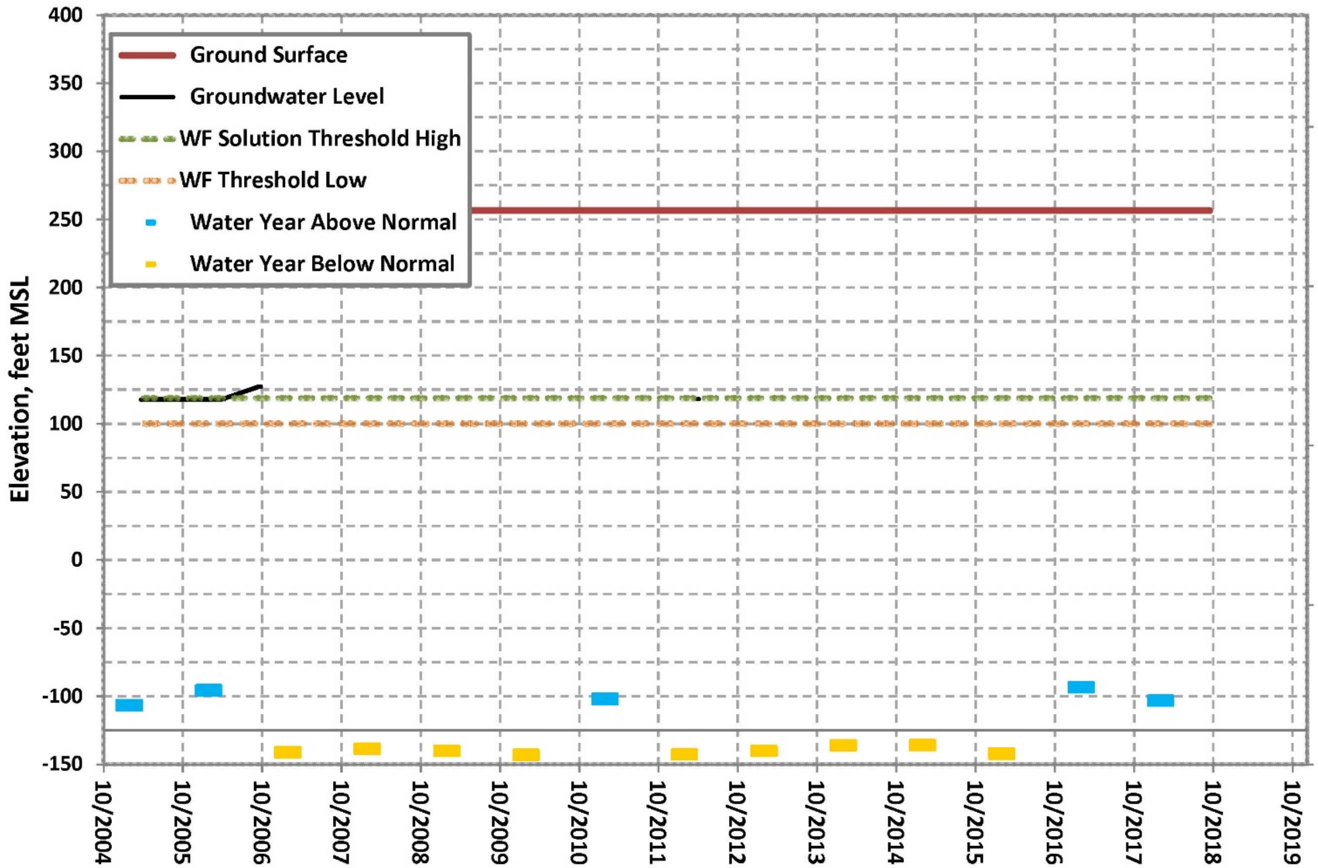

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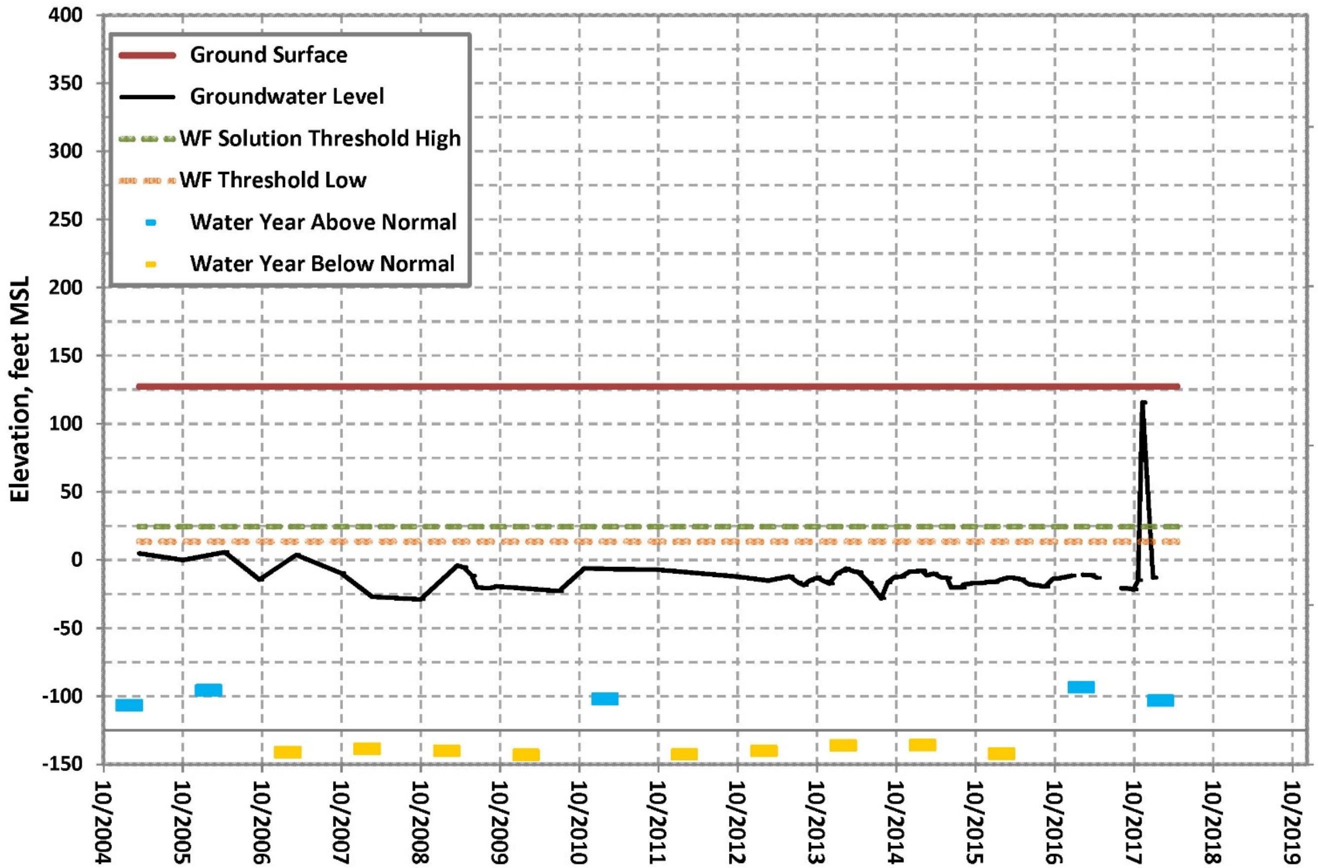

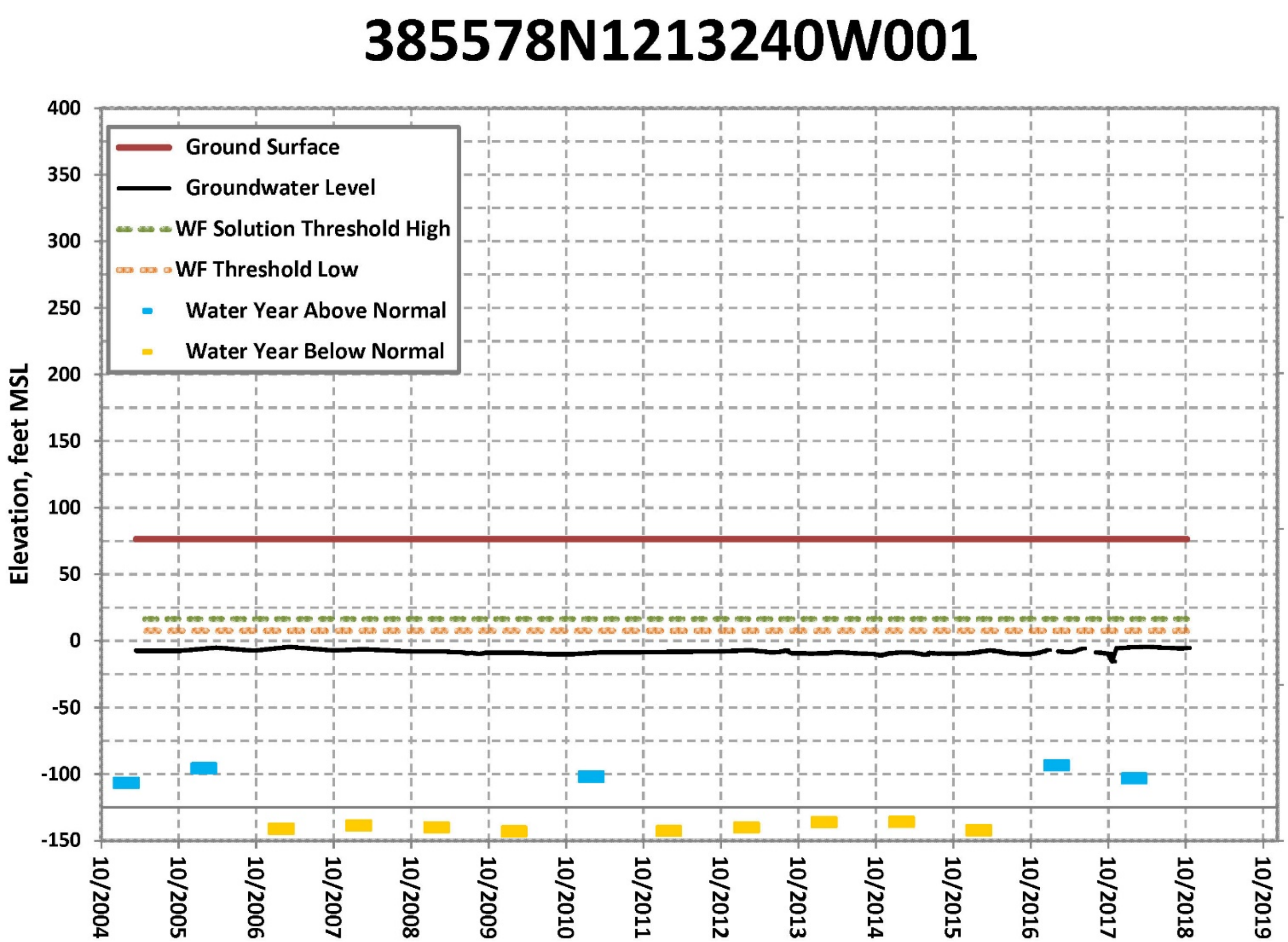
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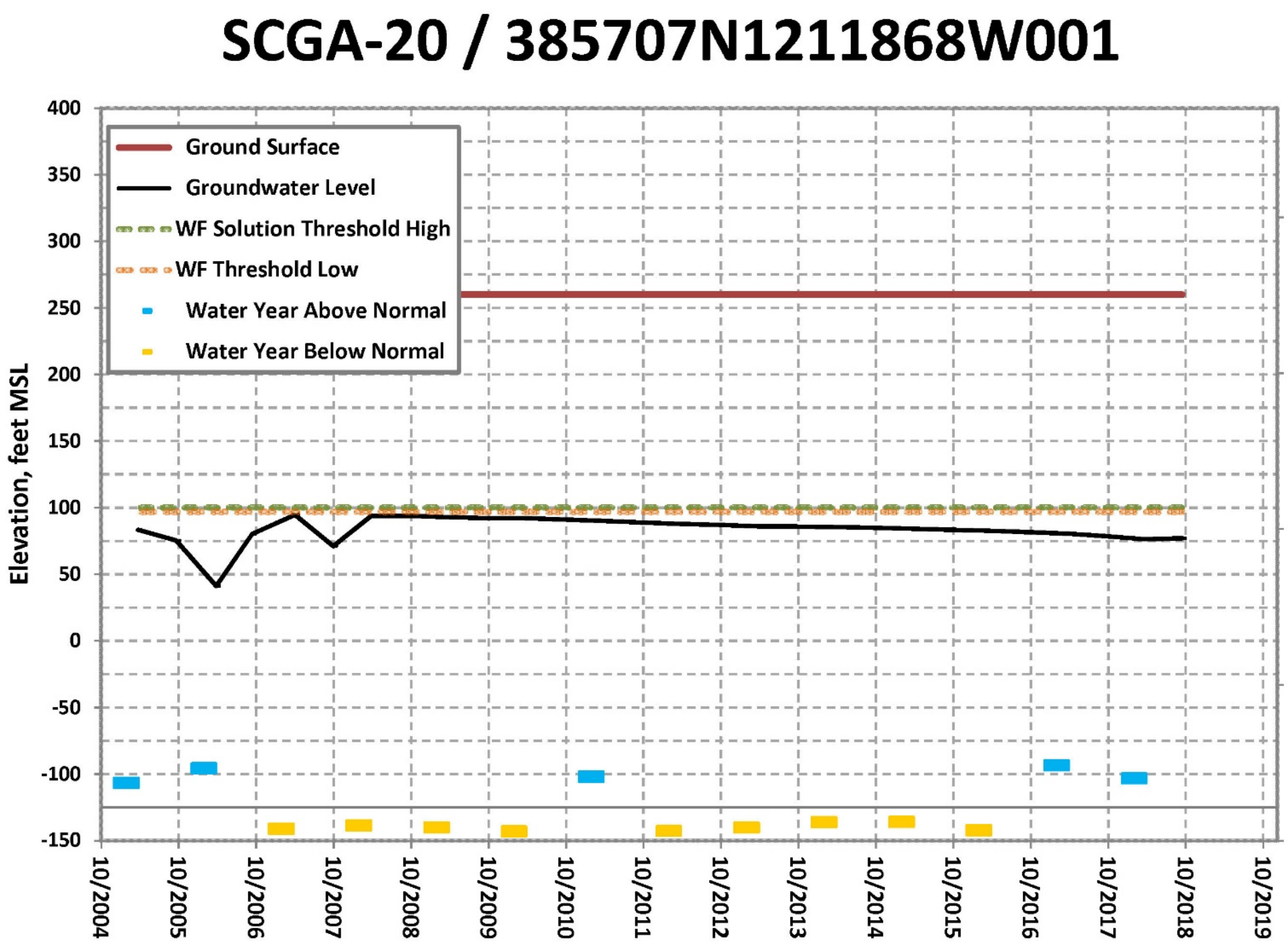
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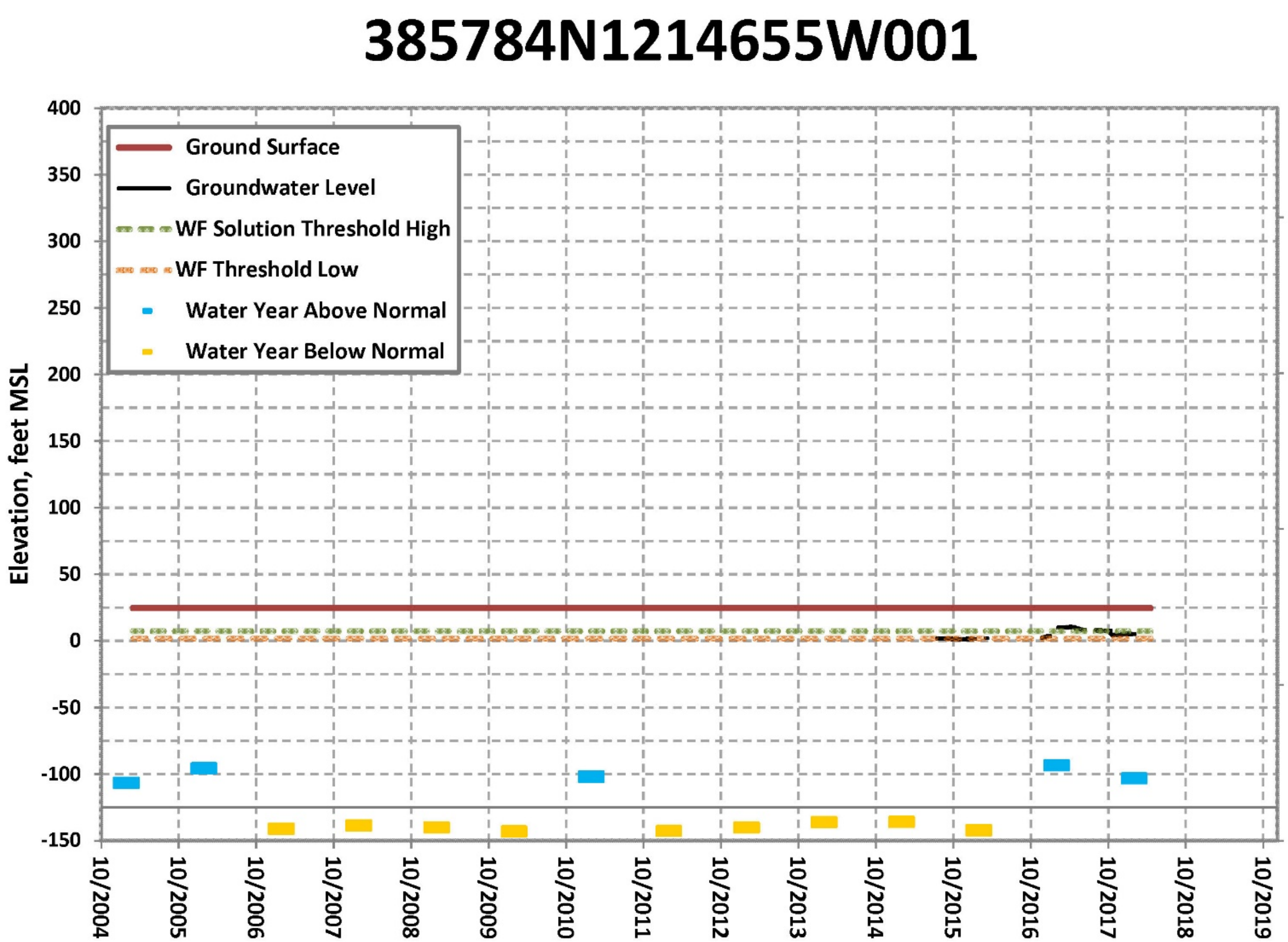
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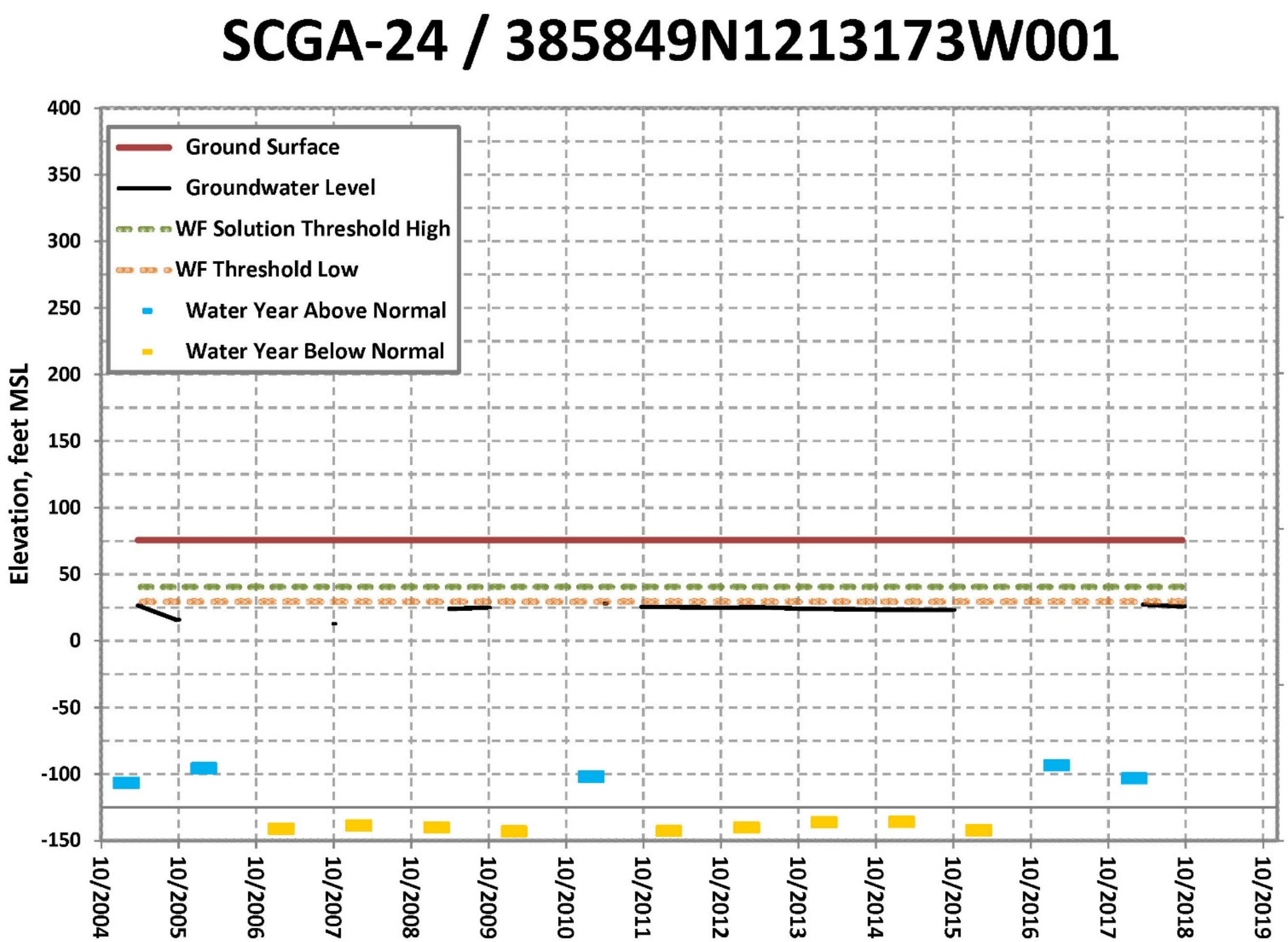
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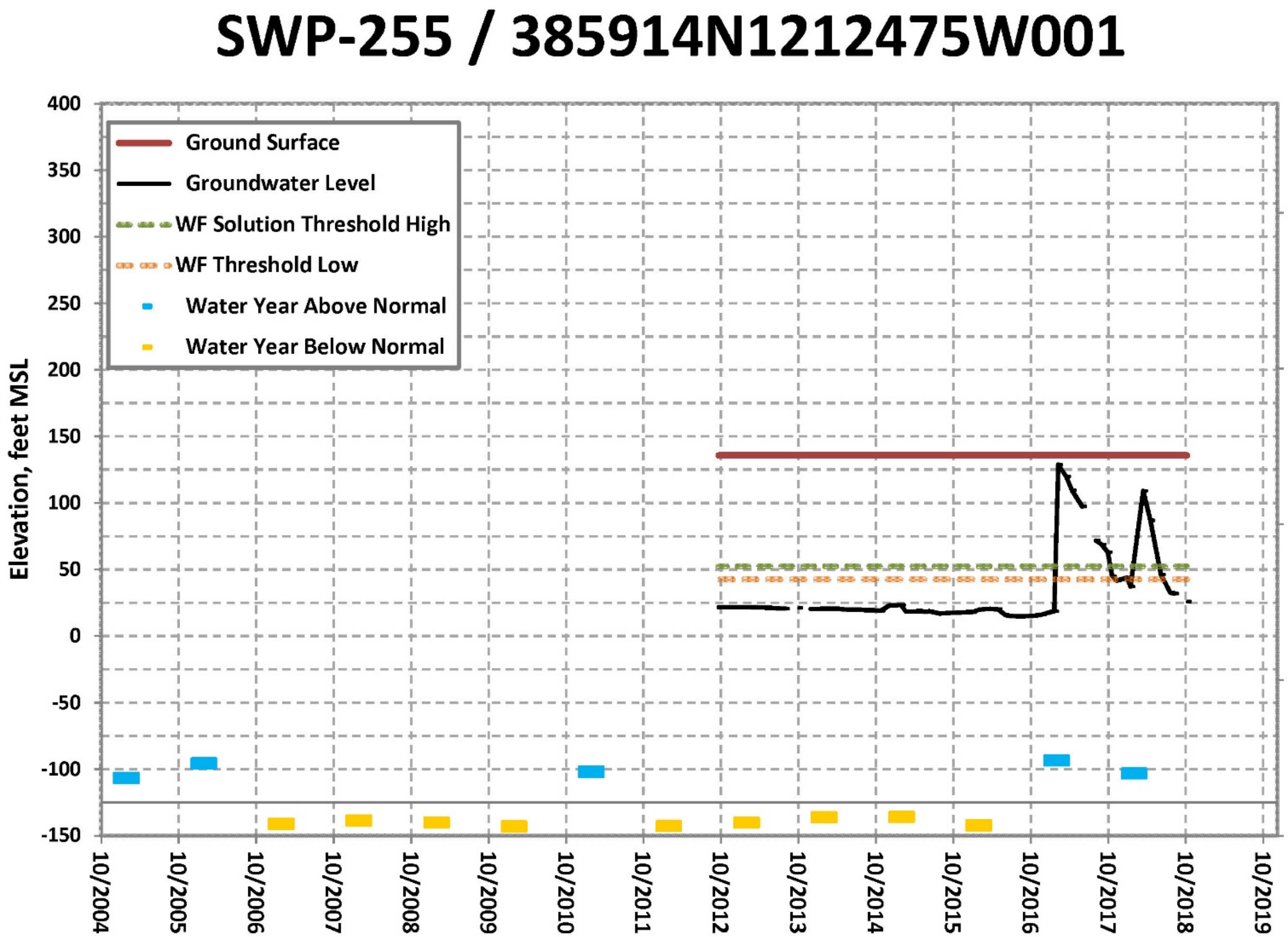
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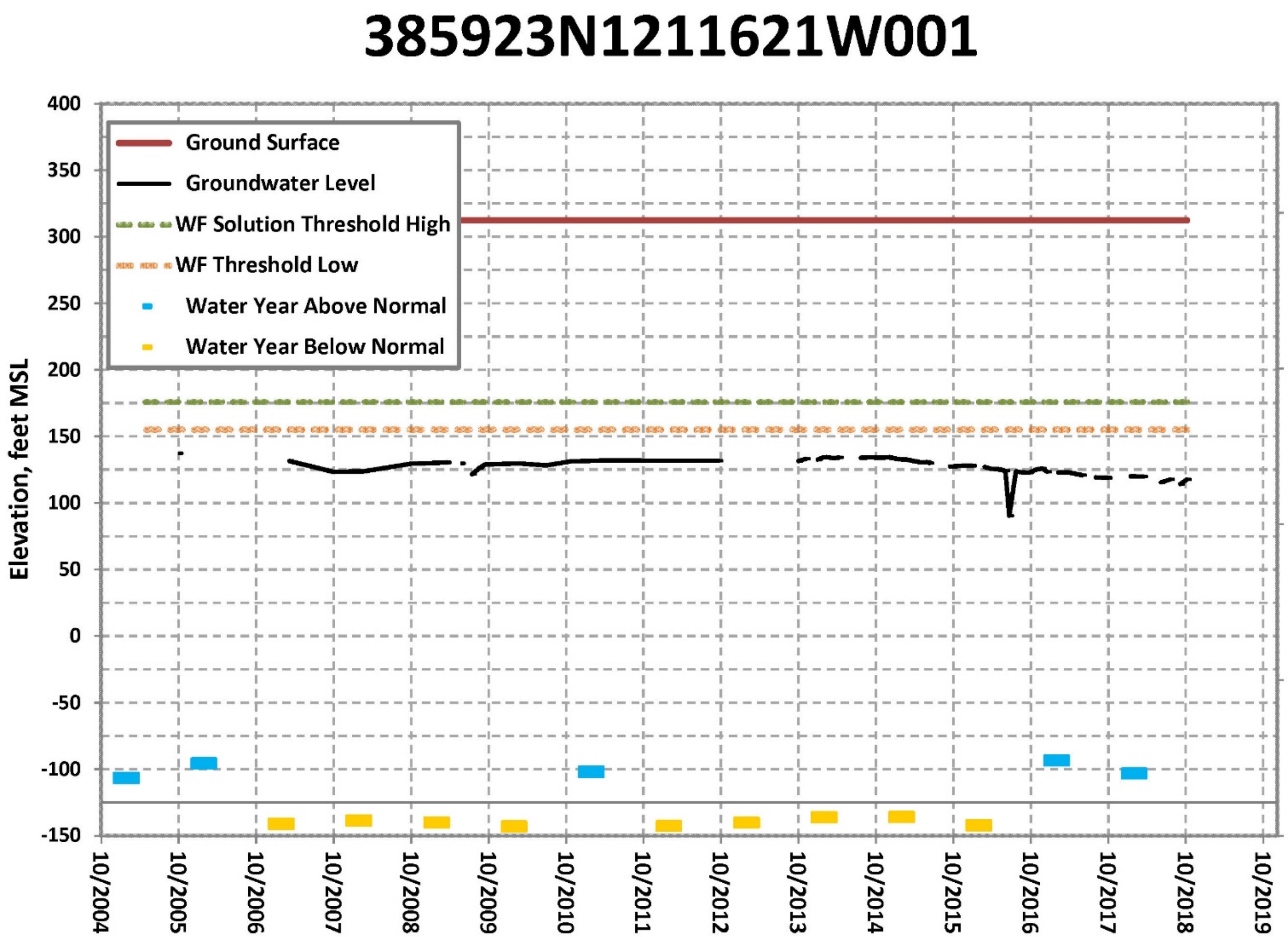
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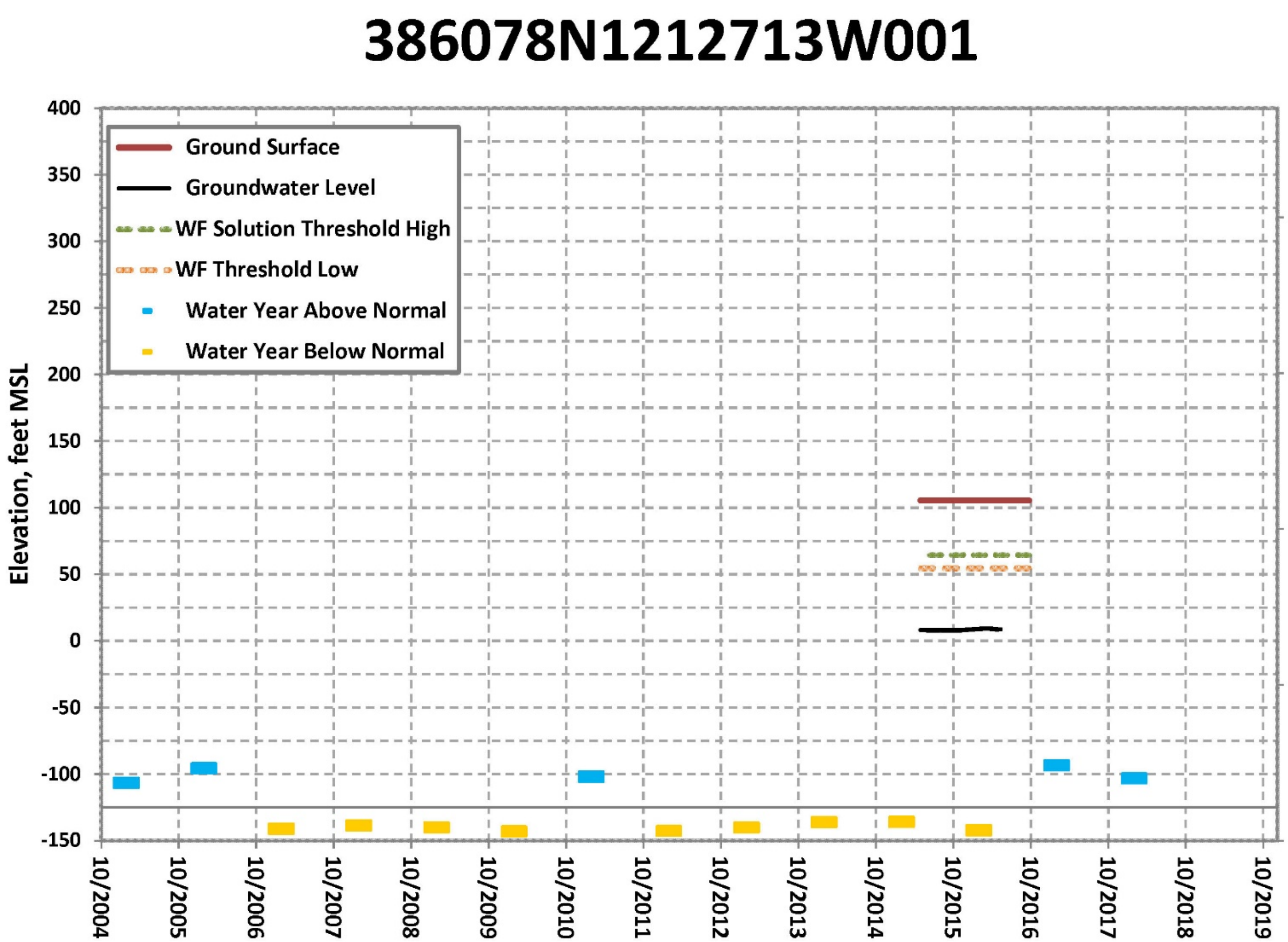
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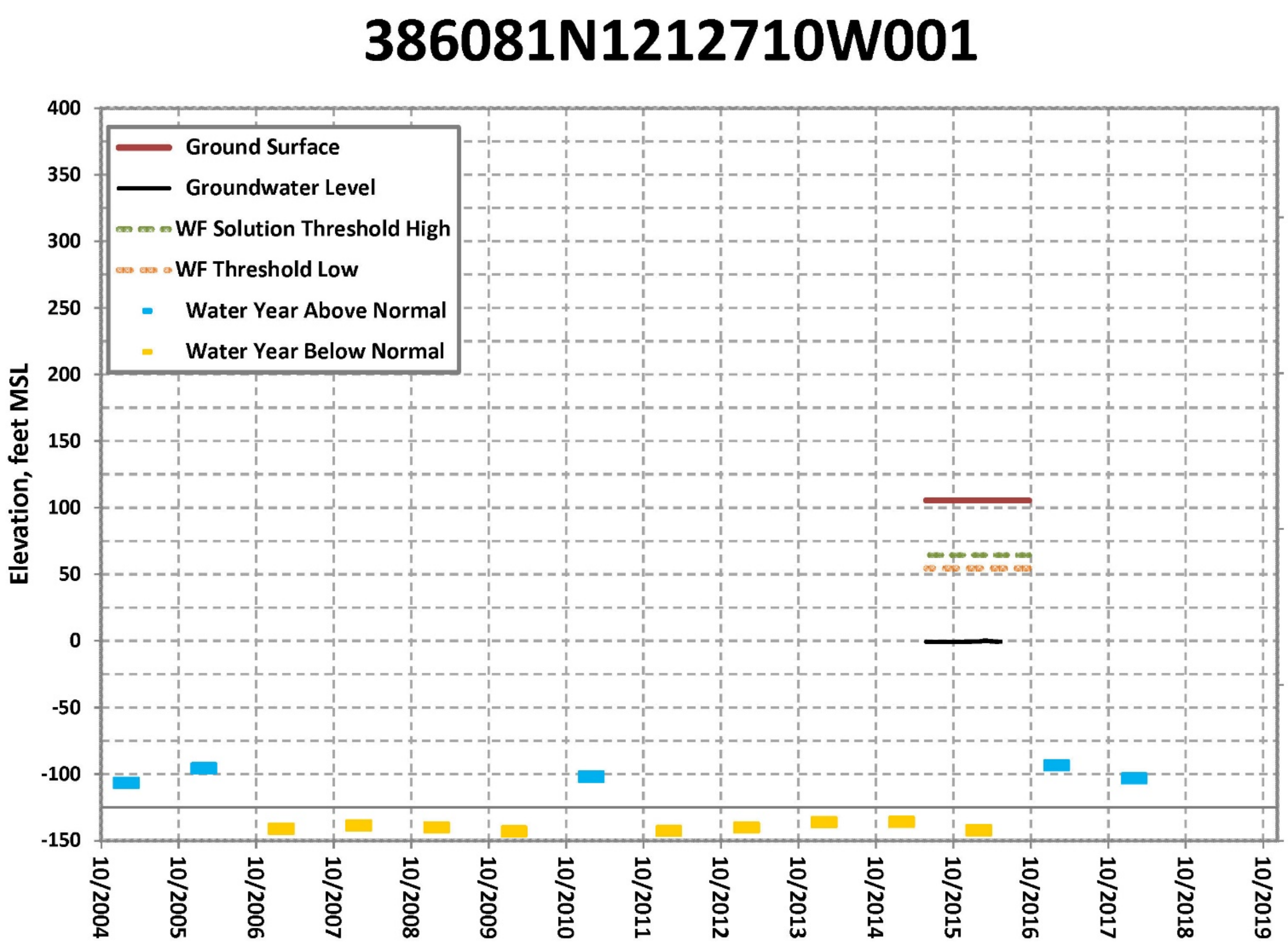
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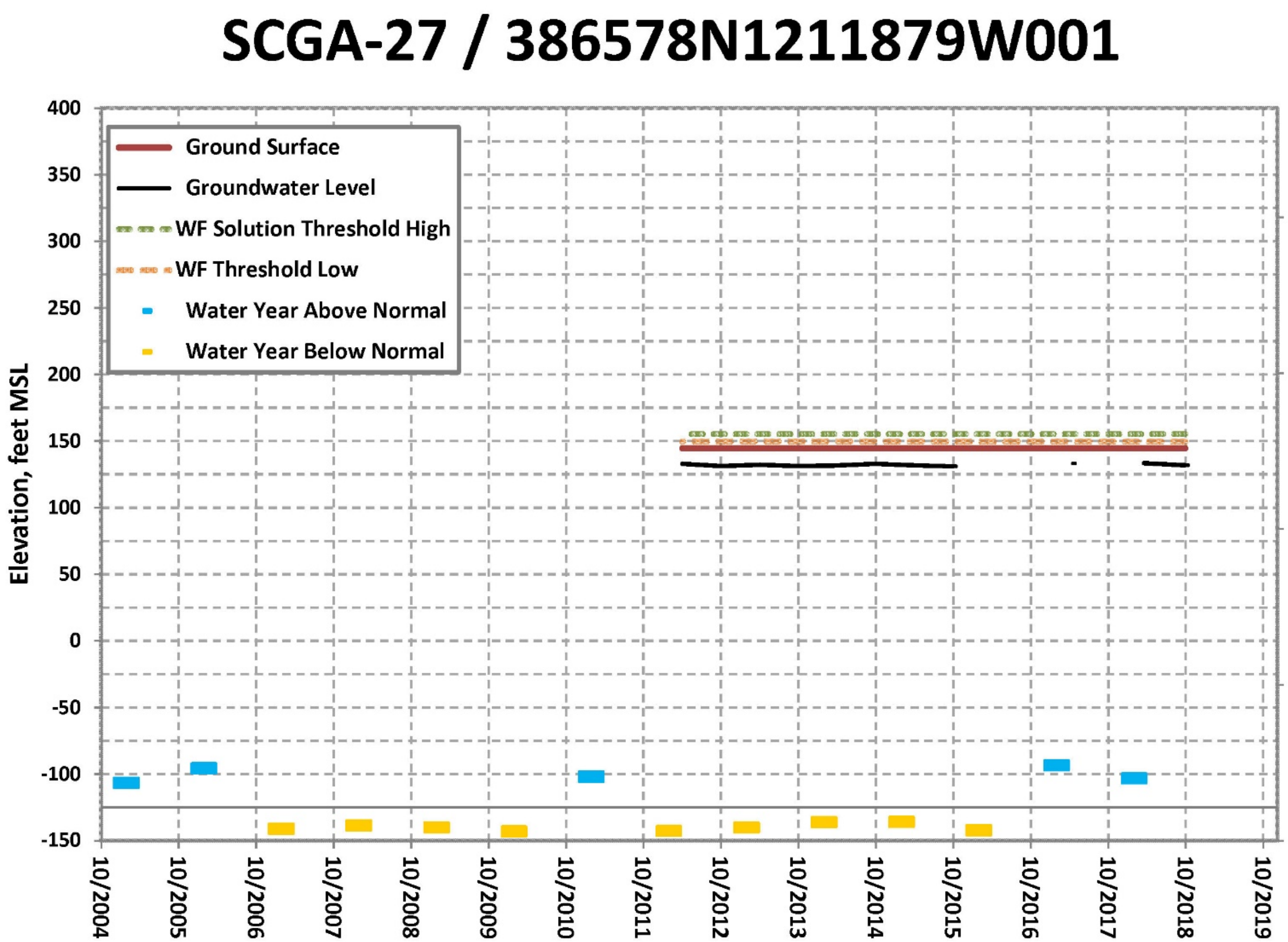
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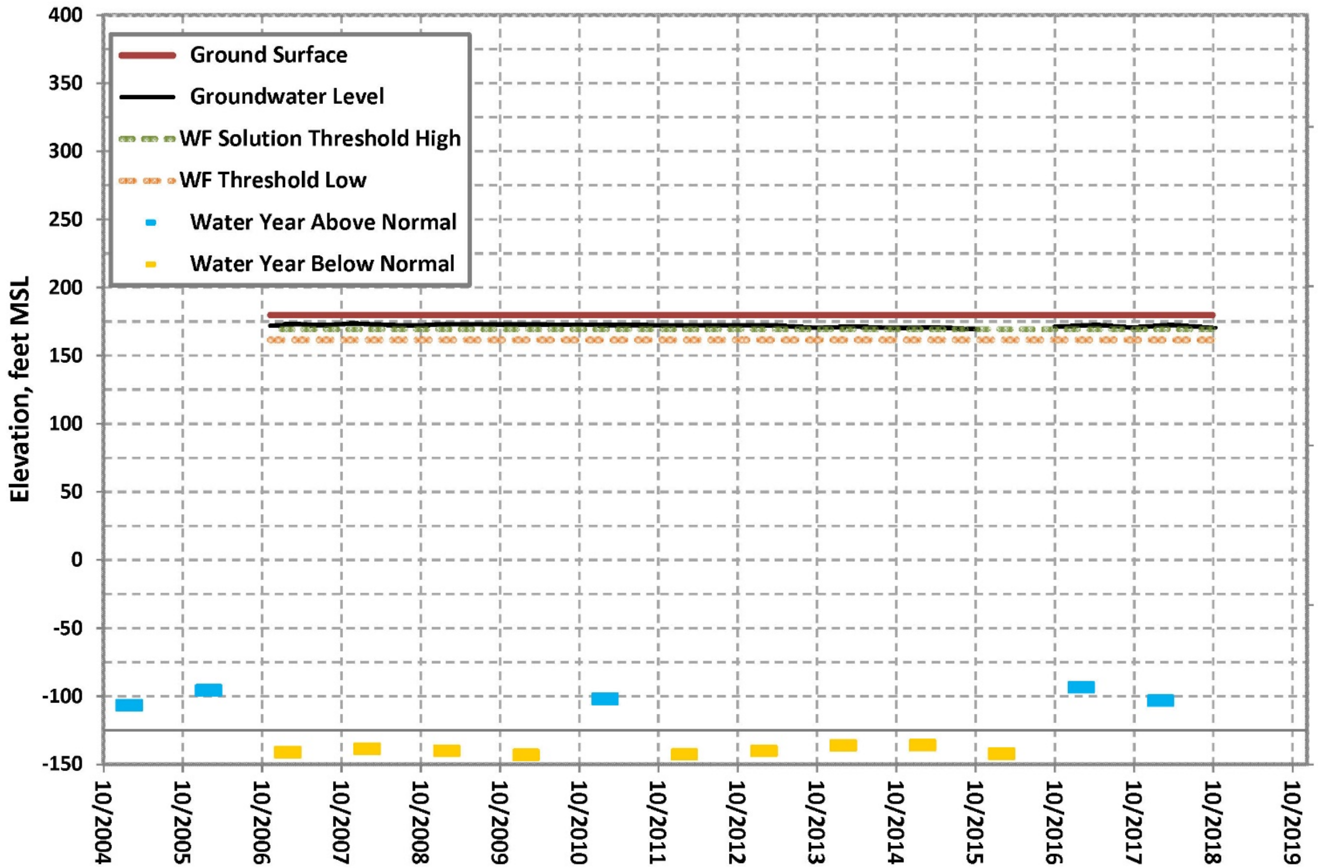

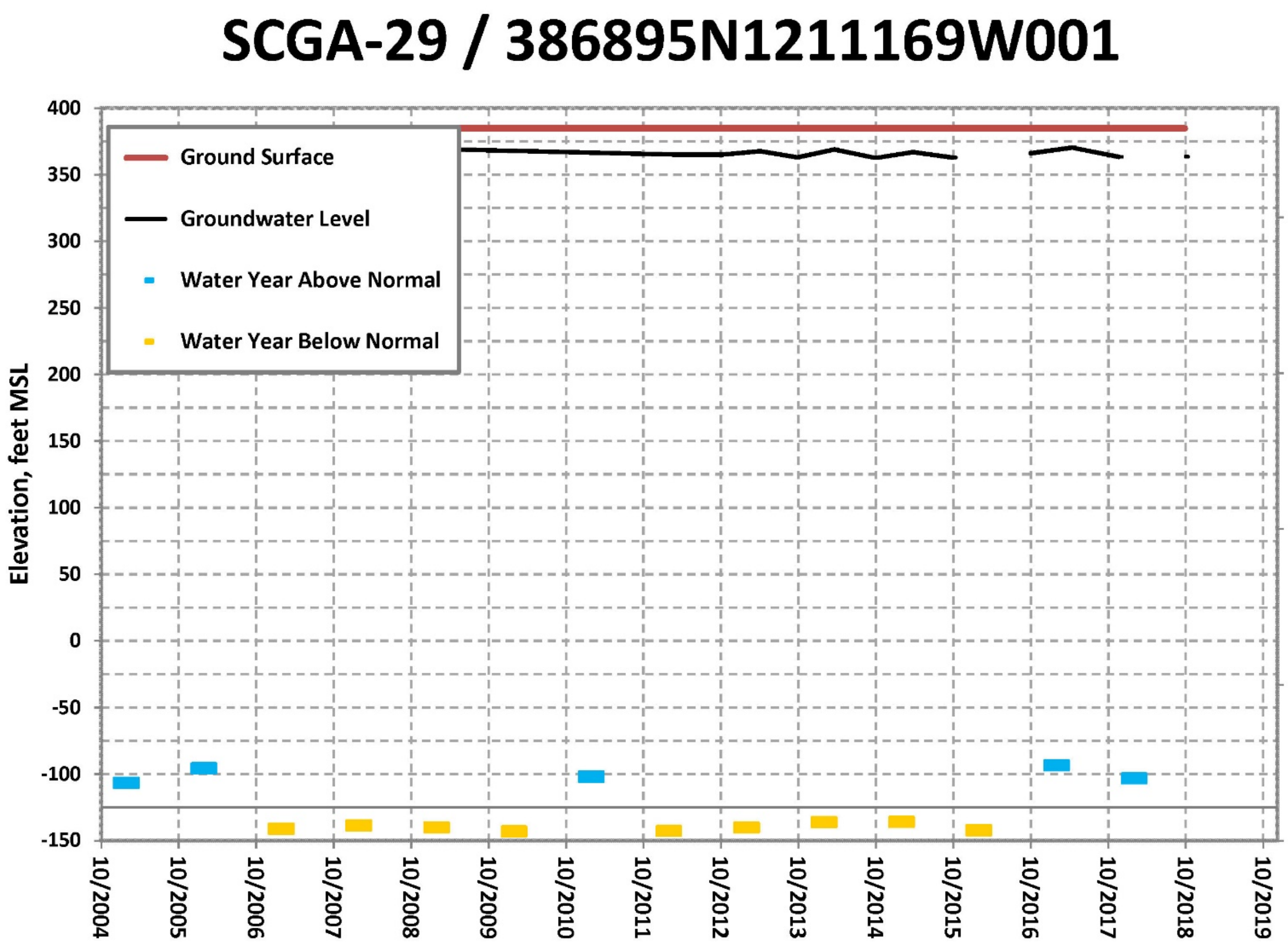
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Appendix D. IDC Update Report

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2018 IDC Update Results Summary

The 2018 update to the Sacramento Central Groundwater Authority (SCGA) IDC Model required updating the annual land-use types, the daily precipitation and reference evapotranspiration (ET_o), executing the model, and then post-processing the results. Pre-existing Excel and Access tools developed by David's Engineering were utilized for packaging the input data and processing the results. The process for the 2018 update used the same process that was updated in 2017. The 2017 update deviated from previous years in two key ways: 1. The area analyzed was modified to only include the South American Subbasin, as opposed to the broader SCGA boundaries, and 2. Agricultural areas to the west of I-5 were included as Delta agriculture.

The method used to estimate total groundwater use for irrigated agriculture in the Delta area relied on IDC results for non-Delta irrigated areas. It should be noted that this estimation method did not include a full root-zone simulation.

In non-Delta irrigated areas, pre-processing tools were used to determine which parcels were served by surface water and the remainder of the parcels were assumed to rely on groundwater to meet crop water demands. For Delta irrigated areas, pervious model inputs from the SacIGSM efforts were used to allocate agricultural demands between surface and groundwater sources. The results for 2018 agriculture water use in the South American Subbasin, based on the IDC simulation, are summarized in Table 1, Figure 1, and Figure 2, below. The results for water applied in Delta agricultural areas does not consider surface water and only accounts for groundwater.

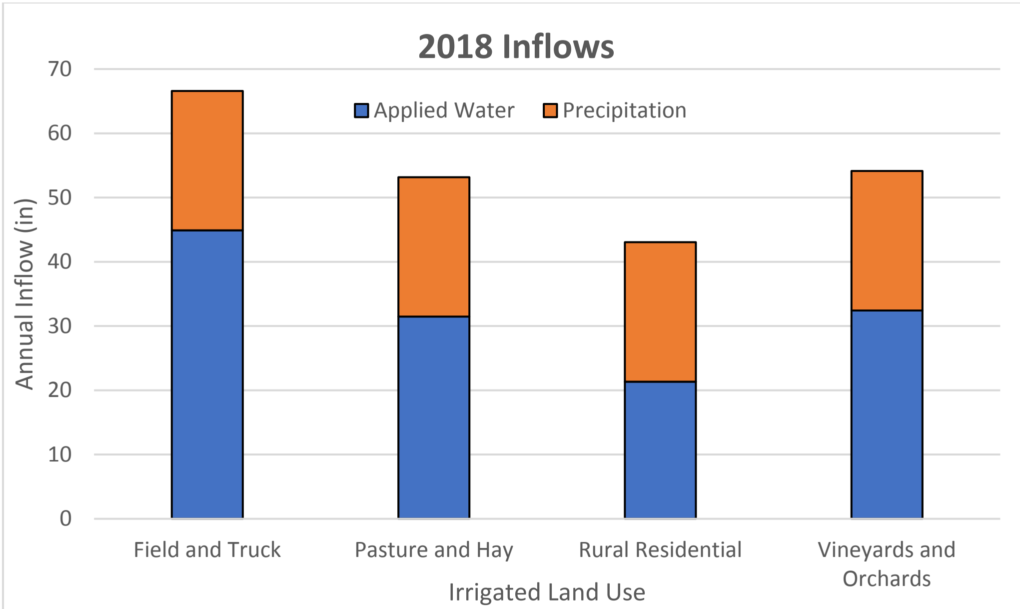
Table 1: Annual Summary of Rootzone Moisture Changes by Crop Type (acre -feet)

Land Use	Agricultural and Rural (Non-Delta) (acre-feet)*						
	AW	Pr	ET_{aw}	ET_{pr}	DP_{pr}	DP_{aw}	RO
Field and Truck	16,595	8,026	12,033	3,962	1,286	4,305	1,789
Pasture and Hay	111,474	76,921	84,635	45,556	12,125	28,190	8,672
Rural Residential	36,750	37,386	23,380	19,642	5,511	13,291	8,507
Vineyards and Orchards	4,075	2,728	3,402	1,702	386	699	256
Irrigated Land Uses	168,894	125,062	123,450	70,863	19,308	46,485	19,225

* See notes on following page

Land Use	Agricultural (Delta) (acre-feet) AW
Field and Truck	7,093
Pasture and Hay	5,995
Vineyards and Orchards	9,374
Irrigated Land Uses	22,462

Notes:
AW – Applied Water
Pr – Precipitation
ET_{aw} – Evapotranspiration of Applied Water
ET_{pr} – Evapotranspiration of Precipitation
DP_{pr} – Deep Percolation of Precipitation
DP_{aw} - Deep Percolation of Applied Water
RO – Run-off



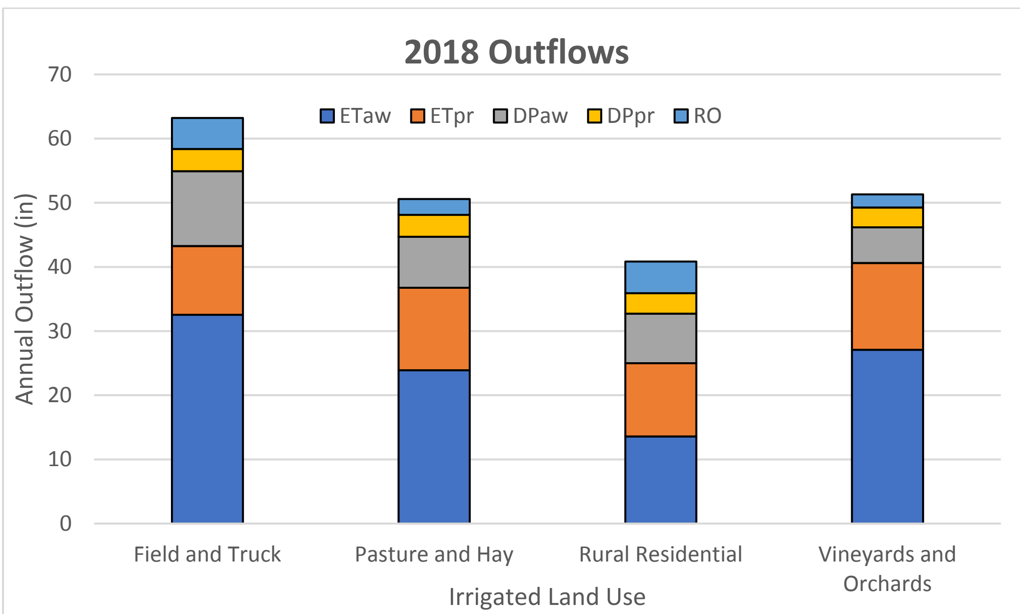


Figure 1: Root Zone Inflow and Outflows for Non-Delta Areas (in)

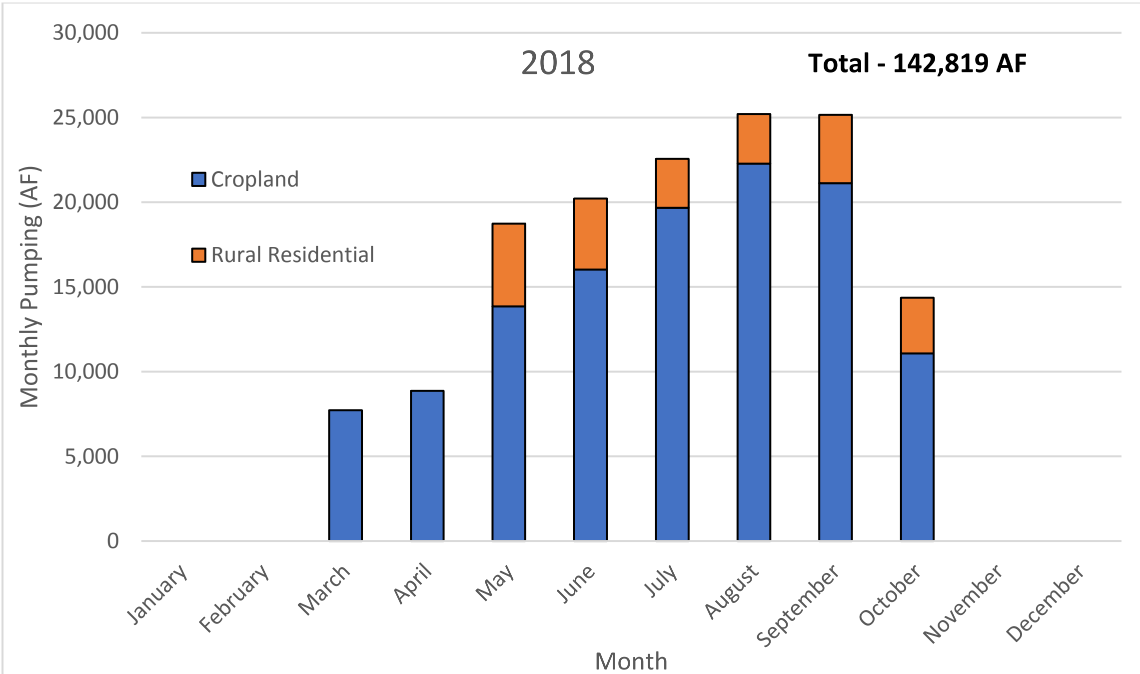


Figure 2: Monthly Groundwater Pumping including Delta and Non-Delta