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Annual Report for the Martis Valley Groundwater Basin

Water Year 2022

June 22, 2023

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Water Year 2022

Prepared for:

Truckee Donner Public Utility District

On behalf of Truckee Donner Public Utility District, Northstar Community Service District, and Placer County Water Agency collectively referred to as the MVGB Agencies.

Prepared by:

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June 22, 2023

TRUCKEE DONNER PUBLIC UTILITY DISTRICT
MARTIS VALLEY GROUNDWATER BASIN ANNUAL REPORT

WATER YEAR 2022

Certifications and Seals

This report and analysis was prepared by the following GEI Consultants Inc. professional geologists. Report sections contained herein based on available data and were prepared by:

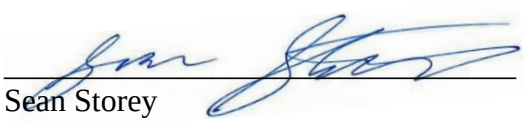

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Table of Contents

List of Figures

List of Tables

Abbreviations and Acronyms

AF	acre-feet
Basin	Martis Valley Groundwater Basin
CASGEM	California Statewide Groundwater Elevation Monitoring
DWR	California Department of Water Resources
GMP	Groundwater Management Plan
MVGB	Martis Valley Groundwater Basin
MVGB Agencies	MVGB Local Water Agencies
NCSD	Northstar Community Services District
SGMA	Sustainable Groundwater Management Act
T-TSA	Tahoe-Truckee Sanitation Agency
TDPUD	Truckee Donner Public Utility District
TRBWG	Truckee River Basin Working Group
TROA	Truckee River Operating Agreement
TSD	Truckee Sanitary District
WY	water year

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Executive Summary

This report provides annual monitoring data and an assessment of groundwater conditions in the Martis Valley Groundwater Basin (MVGB or Basin) for water year 2022. A water year (WY) is defined as October through September of any year.

The MVGB does not have to comply with the Sustainable Groundwater Management Act (SGMA), as the Basin was re-classified in 2018 as a very low priority basin. However, the MVGB Local Water Agencies (MVGB Agencies) recognize the importance of groundwater management and are continuing to implement their 2013 Groundwater Management Plan.

Groundwater levels, groundwater extractions, surface water conditions, groundwater recharge from locally derived and imported wastewater, measured and estimated total water use, and groundwater storage change estimates were compiled and analyzed. Climatic conditions were also evaluated as to their effects on groundwater levels.

WY 2022 received about 26 inches of rainfall but slightly below normal, about 29 inches. Groundwater levels throughout the Basin increased due to precipitation and subsequent reduced groundwater use. In WY 2022, most monitoring wells remained above their lowest measured groundwater levels. The historical record for these wells is limited as prior to 2017 monitoring was only done in the spring and fall, whereas since then the participating agencies have substantially increased the intervals of measurement to monthly at a minimum and are building a new data history to learn and establish summer historic low levels. The detection of the groundwater levels exceeding the lowest levels previously recorded would not have been detected without the MVGB Agencies increasing groundwater level monitoring frequency to a monthly and, in some cases, daily basis.

Total groundwater pumping in the Basin in WY 2022 was 6,900 acre-feet AF. Groundwater pumping in the Basin decreased by about 14 percent, about 700 AF less compared to the previous WY 2021, which was the driest year on record and required more reliance on groundwater pumping. Change in groundwater storage for WY 2022 increased by about 6,000 AF, due to the decreased groundwater pumping (about 700 AF) and mostly from recharge of almost normal precipitation (about 5,300 AF). In comparison, groundwater in storage declined by about 6,800 AF in WY 2021 due to the dry climate conditions and greater groundwater pumping. The total groundwater pumped in WY 2022 was much less than the sustainable yield of 23,000 AF per year, which suggests that the long-term groundwater levels and storage will recover after normal and wet precipitation year(s). In WY 2022, the basin groundwater storage almost recovered from WY 2021, but has still not fully recovered from the drought conditions in WY 2020.

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1. Introduction

The Martis Valley Groundwater Basin (MVGB or Basin) groundwater resources have been evaluated for many years starting in earnest in the 1990s. In 2013, a Groundwater Management Plan (GMP) was developed for the Basin (Brown and Caldwell 2013). In 2014, the Sustainable Groundwater Management Act (SGMA) classified the MVGB as medium priority basin, which required compliance with the SGMA regulations. In December 2016, an Alternative Submittal to a Groundwater Sustainability Plan was submitted to the California Department of Water Resources (DWR) by the Truckee Donner Public Utility District (TDPUD) on behalf its MVGB SGMA Local Agencies, which include TDPUD, Northstar Community Services District (NCSD), Placer County Water Agency (PCWA), the Town of Truckee, Nevada County, and Placer County. As referenced in the MVGB Alternative Submittal, scientific analyses determined the Basin has at least a 25-year history of sustainable groundwater operations and conditions, despite several periods of drought. In compliance with SGMA requirements, an Annual Report for water years (WYs) 2016 and 2017 were developed and submitted to DWR.

Prior to DWR completing its review of the MVGB Alternative Submittal and Annual Reports, DWR was required to review basin prioritizations as part of implementation of SGMA. The MVGB Agencies reviewed DWR's initial prioritization of the Basin and worked extensively with DWR staff to ensure accurate information was being used. In 2018, DWR re-evaluated the Basin and changed its priority to very low priority, thus the Basin was no longer required to comply with SGMA. The MVGB Agencies recognize the importance of groundwater management and have subsequently reconvened to implement the 2013 GMP. As part of this plan, Best Management Objective #1 is to compile an annual report to summarize groundwater conditions and to share the information with interested stakeholders. Since WY 2018, the MVGB Agencies have prepared annual reports and have shared them with stakeholders. This document provides a summary and interpretation of groundwater conditions for WY 2022. This annual report provides historical data for reference along with a more detailed assessment of the conditions since implementation of the GMP.

1.1 Martis Valley Groundwater Basin

The MVGB, Basin No. 6-67, as defined by DWR in Bulletin 118 Interim Update (2016), is a 35,600-acre (57-square-mile) intermontane, fault-bounded basin east of the Sierra Nevada crest. **Figure 1-1** shows the location of the MVGB and pertinent geographic features.

The MVGB Agencies use groundwater almost exclusively for water demands, although several major surface water bodies are present within the Basin. The Truckee River traverses the Basin from the southwest to the northeast in a shallow, incised channel. Principal tributaries to the Truckee River within the MVGB are Donner Creek, Martis Creek, and Prosser Creek; as well as discharge from Boca Reservoir slightly before the Truckee River leaves the Basin. Surface water storage reservoirs inside MVGB include Martis Lake and Prosser Reservoir. Donner Lake and Boca Reservoir lie just outside the MVGB boundaries but release surface water into the MVGB. Although surface water released from reservoirs is not used to satisfy local demands, it is a major and highly regulated component of the Basin's hydrologic

system. Surface water within the MVGB is under the purview of the Truckee River Operating Agreement (TROA), a Bi-State, multi-party Federal Agreement enacted by the US Congress which sets limits on the consumptive use of both groundwater and surface water in the Basin.

Wastewater is generated within the MVGB, within the Truckee River watershed, and outside the watershed (Lake Tahoe area) and sent to a treatment facility operated by the Tahoe-Truckee Sanitation Agency (T-TSA). The treated water is recharged into the groundwater system via two leach fields (**Figure 1-1**), increasing the groundwater contribution to downstream Truckee River flows.

1.2 Climatic Conditions

Water year types were developed for the MVGB using local precipitation data from Truckee Ranger Station No. 049043. Its location is shown on **Figure 1-1**. WY 2022 was considered below normal. The average precipitation at the Truckee Ranger Station (1988-2021) was 28.77 inches while WY 2022 received 25.36 inches, about 12 percent less than normal. The deviation of annual water year precipitation from the mean is shown on **Figure 1-2**. Wet conditions were set at more than one standard deviation above the mean annual water year precipitation total. Above normal conditions were defined as annual precipitation between the mean value and one standard deviation above it. Likewise, below normal conditions were defined as an annual precipitation between the mean value and one standard deviation below it. Dry conditions were defined as an annual precipitation total more than one standard deviation below the mean. WY 2022 was defined as below normal, but was almost double the total in WY 2021, which was the driest on record. Since precipitation is the major source of recharge in the Basin, and precipitation was almost normal in WY 2022, groundwater levels increased in comparison to WY 2021.

1.3 Surface Water Conditions

The Truckee River is the dominant hydrologic feature in the MVGB. It conveys hundreds of thousands of acre-feet (AF) of surface water through the Basin and flows along the lowest portions of the Basin. The measured outflow of the Truckee River at the edge of the Basin was about 700,000 AF in WY 2022.

Figure 1-1. Martis Valley Groundwater Basin Location

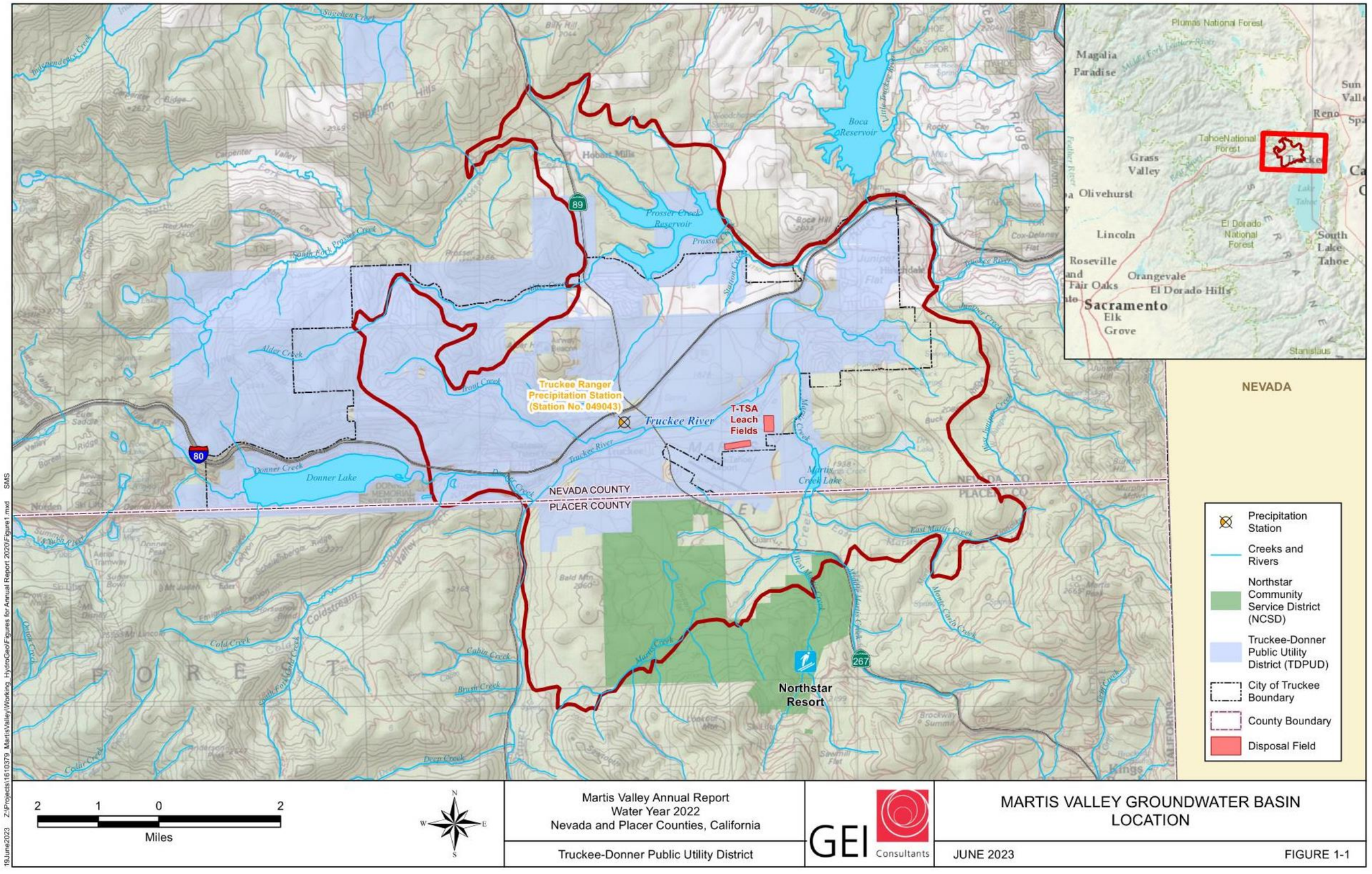

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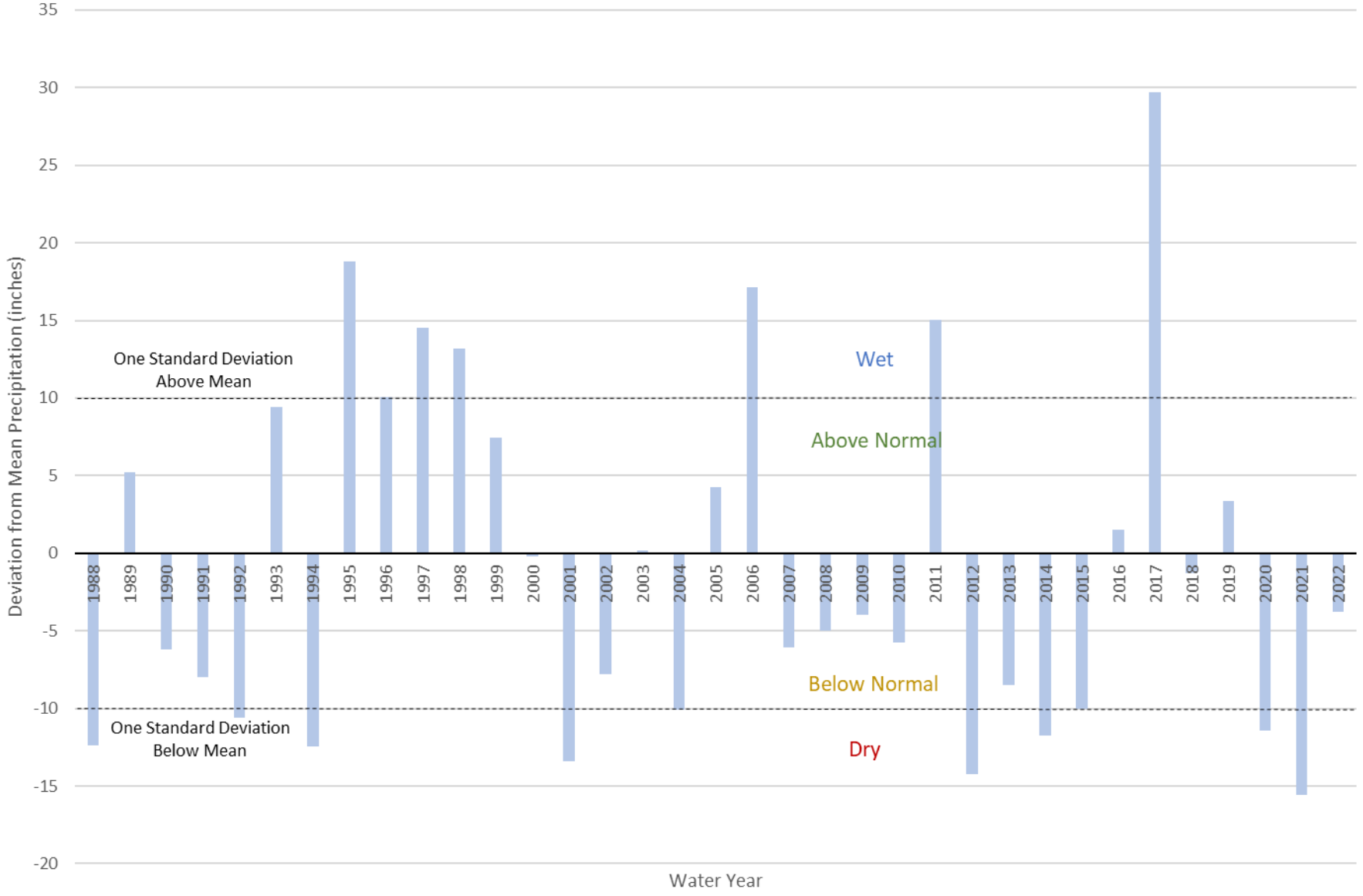
Figure 1-2. Annual Precipitation Deviation from Mean: Truckee Ranger Station No. 049343 for 1988 to 2022



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2. Groundwater Conditions

Wells used for groundwater level monitoring (labeled as CASGEM wells or piezometers) in the MVGB are shown on **Figure 2-1**. Groundwater levels at these wells are monitored by the MVGB Agencies and DWR and are reported to the California Statewide Groundwater Elevation Monitoring (CASGEM) program. These wells are used to help assess the sustainability of the MVGB. Data from the wells were used to generate hydrographs to show groundwater level elevation trends over time at each monitoring location. Groundwater levels in the Basin range from within a few feet of ground surface to as much as 100 feet below ground surface and have consistently remained within this range.

Historically, groundwater level measurements were taken in the spring and fall. In 2017, the MVGB Agencies voluntarily implemented monthly monitoring of groundwater levels for all wells in the CASGEM program. This proactive move to monthly monitoring was, in part, to investigate and address uncertainties in seasonal variations. Monthly groundwater measurements illustrated that peak summer-time groundwater pumping temporarily lowers groundwater levels below the previous fall measurements, as would be expected, but are not depleting reserves. In WY 2022, groundwater level measurements remained above monthly summertime lows.

This evaluation continues to utilize spring and fall measurements to assess the health of the Basin, to show whether the basin has refilled in the spring, and the effects of pumping in the fall. Because of climatic conditions groundwater levels may vary from year to year but should fully recover during normal to wet precipitation years. In WY 2022, many wells were monitored daily, to provide a greater resolution of groundwater data.

Three of the CASGEM monitoring wells (TH-Fibreboard, TH-Prosser Village, and TH-Martis Valley) are located near municipal supply wells that at times affect their measurements. Well 17N17E19K001M was destroyed sometime during the winter of 2021 and is therefore no longer reporting groundwater level measurements. In addition to the CASGEM wells, six temporary piezometers were constructed near Martis Creek for a restoration project and provided some additional information about the groundwater conditions in the Basin. In WY 2019, groundwater level measurements were discontinued at these piezometers.

The MVGB Agencies' monitoring network has good regional distribution (covering over 70 percent of the Basin) and is monitoring groundwater levels near areas of pumping, inflow and outflow. The network has over 30 years of data that can be used to assess changes in the Basin and monitor aquifers that are being used for municipal and industrial purposes.

2.1 Groundwater Levels

Long-term hydrographs, from 1989 through 2022 for all 14 monitoring wells, are presented on **Figure 2-2** along with the water year types. **Figure 2-3** provides a shorter time period than **Figure 2-2** to further assess these seasonal variations in groundwater levels. Hydrographs for each individual monitoring well are presented in **Attachment A**.

Based on spring to spring and fall to fall measurements, groundwater elevations, depending on the location in the Basin, are generally stable remaining within their historical ranges and some levels have increased by more than 3 feet on average since the previous year. In WY 2022, three wells were below their historically low groundwater levels in the fall, this is most likely due to recent groundwater pumping at the time of measurements (17N17E07P001M, 18N17E33L001M, TH-Prosser). Seasonal fluctuations due to climate and pumping patterns are apparent. In general, spring groundwater levels increased overall from WY 2021 to WY 2022, primarily in response to predominately wetter climatic conditions and reduced groundwater pumping (as described in **Section 3**).

Figure 2-1. Martis Valley Groundwater Basin Monitoring Well Locations

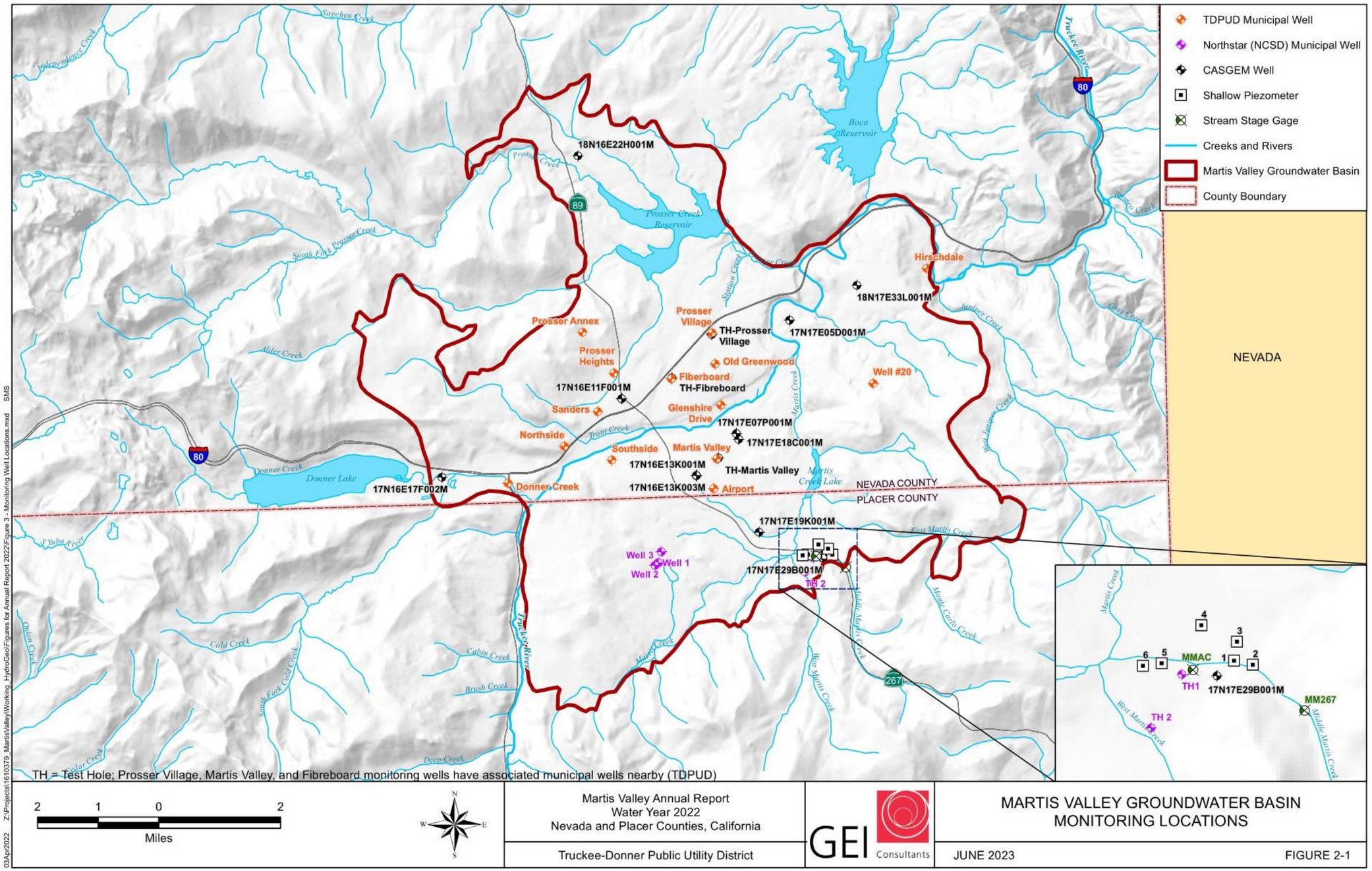

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Figure 2-2. Martis Valley Groundwater Basin Historical Groundwater Level Elevations, Water Years 1989-2022

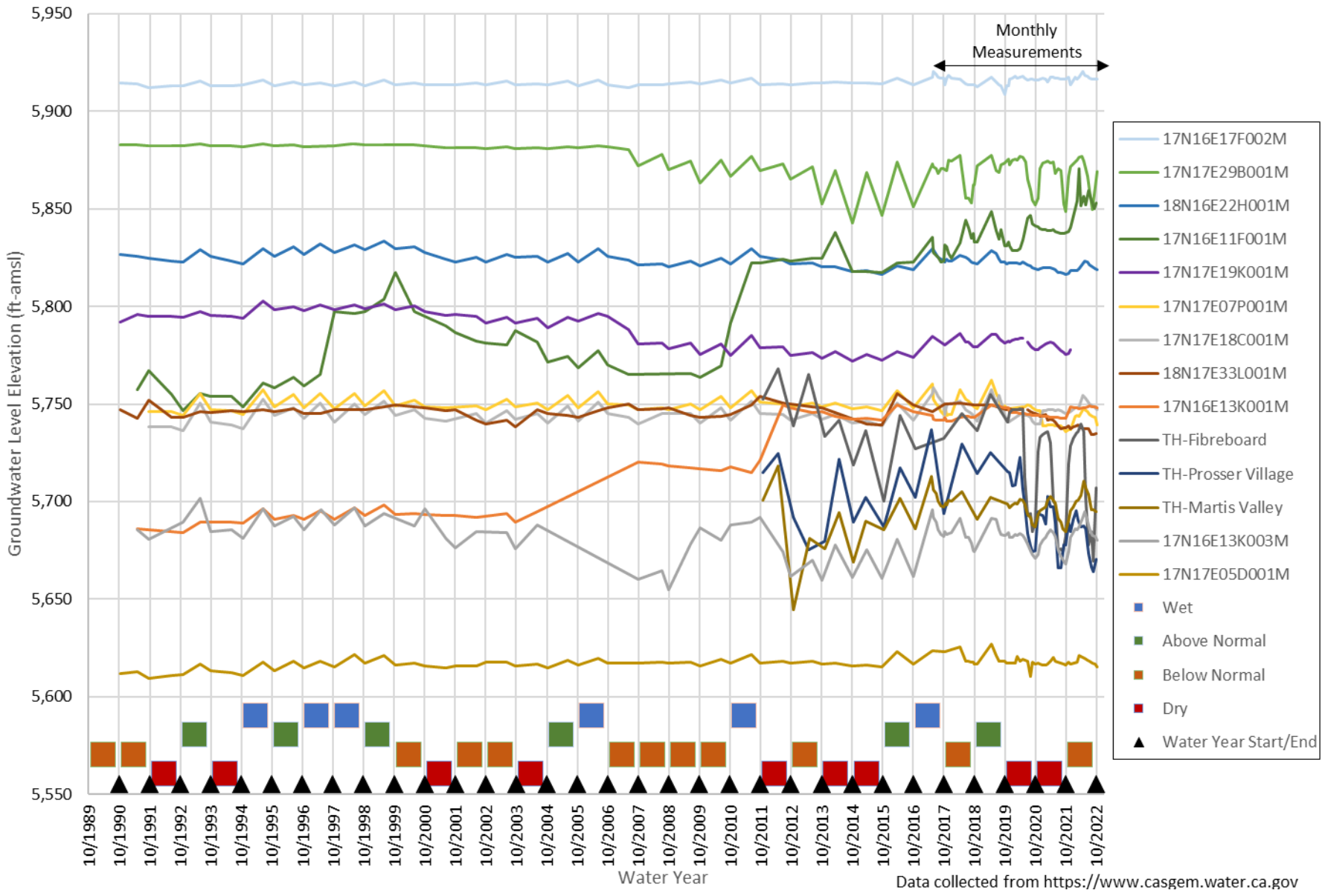
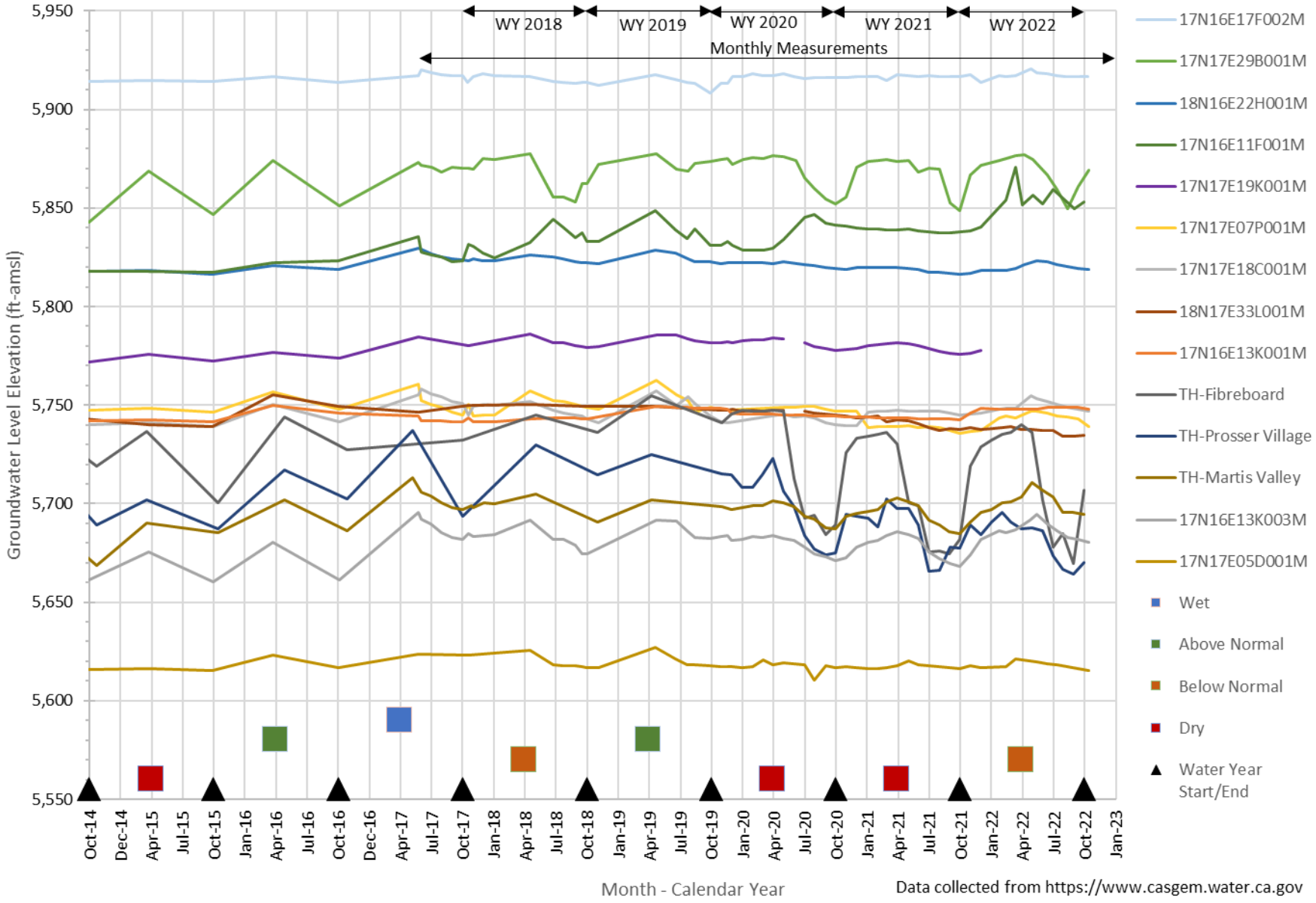


Figure 2-3. Martis Valley Groundwater Basin Historical Groundwater Level Elevations, Water Years 2015-2022



2.2 Groundwater Flow

Seasonal groundwater level elevation contours for spring and fall 2022 are shown on **Figures 2-4 and 2-5**. These contours reflect pumping, recharge, geologic conditions, and discharges to surface water. Monitoring well groundwater levels and bed elevations of gaining surface water reaches were used to develop the groundwater elevation contour maps. Groundwater levels at 17N16E13K003M were used for contouring as 17N16E13K001M appears to reflect groundwater levels in a shallower portion of the aquifer at the same location.

As expected, spring groundwater contours show higher elevations than fall contours. The fall contours exhibit lower groundwater level elevations in the central portions of the Basin, relative to spring conditions, due to increased pumping and less natural recharge.

The groundwater flow patterns remained generally the same compared to previous water years, with flow from the perimeter of the MVGB towards the Truckee River. The groundwater contours show pumping has changed this regional pattern near the airport, but this is not a new development as the historical contours have also reflected this pumping depression. The pumping depression appears to be caused by the Martis Valley municipal well. The extent and depth of the depression has decreased slightly due to the wetter conditions in WY 2022.

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Figure 2-4. Martis Valley Groundwater Basin Spring 2022 Groundwater Elevation Contours

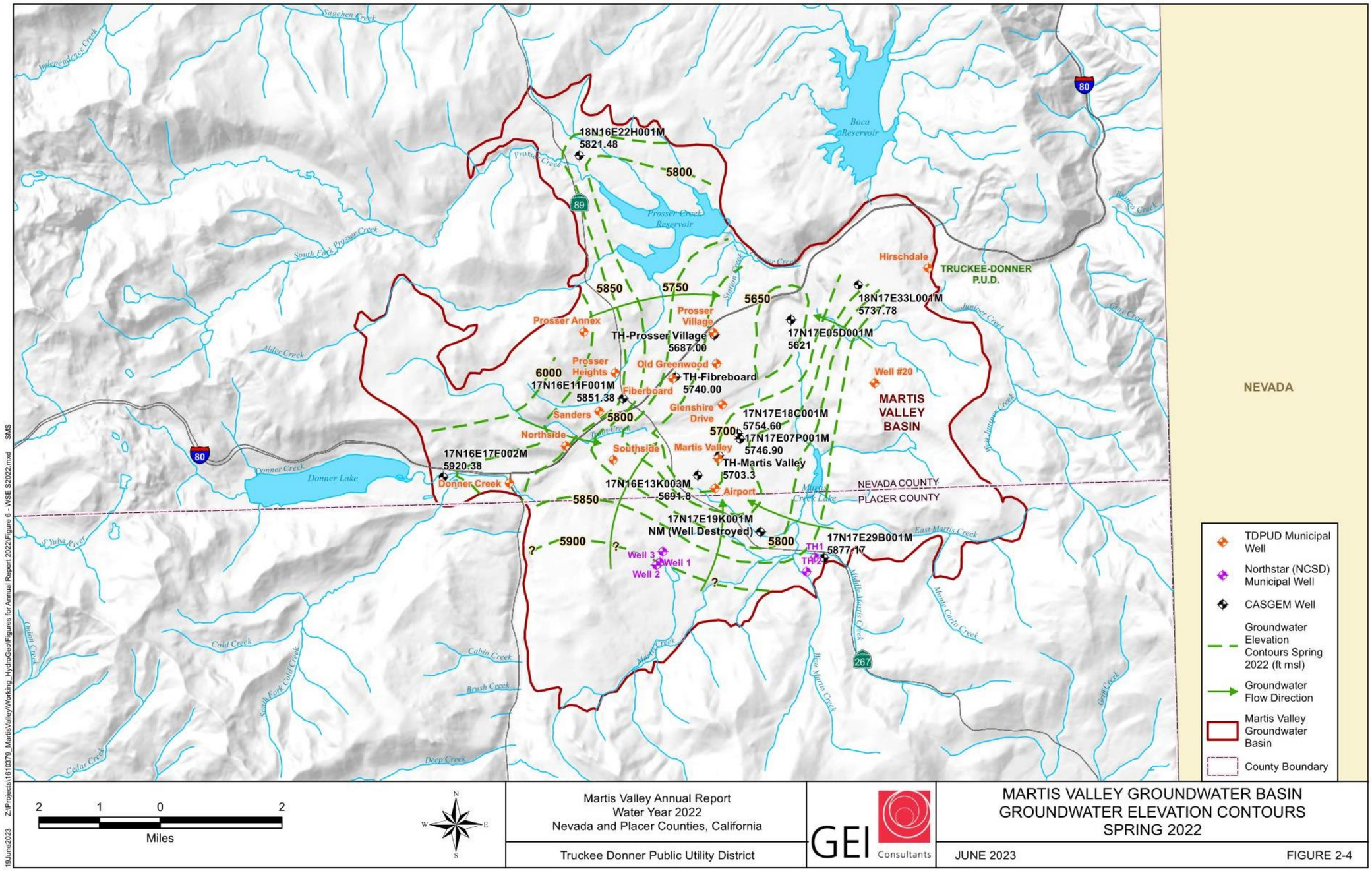
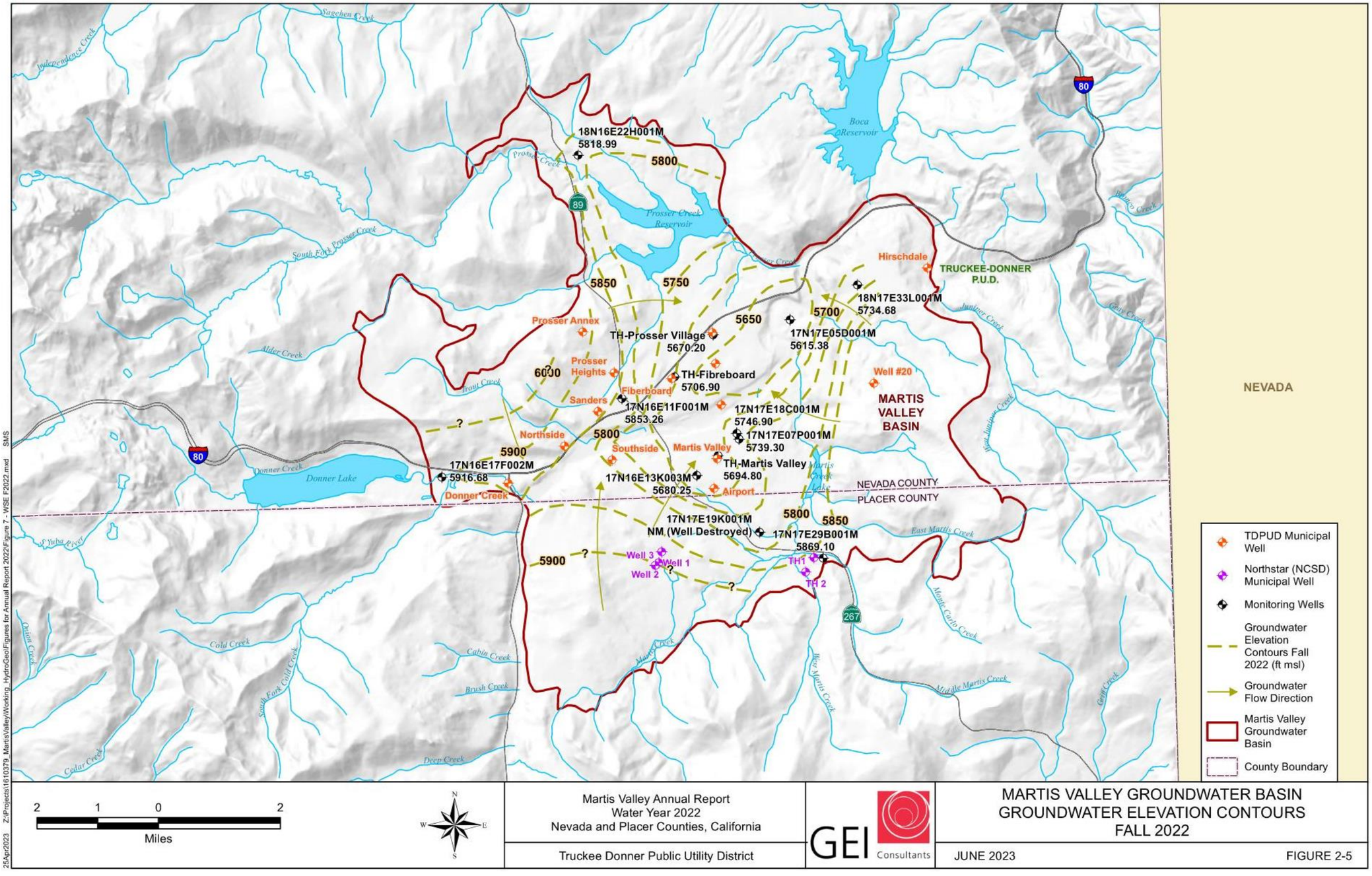


Figure 2-5. Martis Valley Groundwater Basin Fall 2022 Groundwater Elevation Contours



3. Groundwater Extraction

Groundwater extractions for various water use sectors are presented in **Table 3-1** for WY 2022. The methods used to measure extraction data are noted along with water use sector totals. The total water use is based on metered and estimated pumping. The general locations of the community water service areas and non-community water purveyors, along with the location of golf courses, are shown on **Figure 3-1**. Total groundwater extraction in the MVGB was about 6,900 AF for WY 2022, well below the sustainable yield estimate of 23,000 AF.

Metered municipal groundwater extractions made by TDPUD and NCSD account for about 70 percent of the total extractions; therefore, total groundwater extraction is well quantified. Groundwater extraction estimates for non-community uses and golf course irrigation were developed by others and are reported annually to the DWR, State Water Resources Control Board, and TROA program. These estimates are developed on a calendar-year basis, not by water years. The calendar-year extraction data is approximately equal to water year estimates due to the annual cycle of climatic conditions, including freezing temperatures and significant amounts of snow and other precipitation, which typically limits the need to pump groundwater in the winter, spring, and fall months of each year. These estimated values are provided in **Table 3-1**. A full reporting of WY 2022 estimates is not currently available, so estimates were obtained from the most recent data contained in the Annual Inventory of Water Use, Lake Tahoe and Truckee River Basins, Calendar Year 2021 report (DWR 2022).

The locations of wells for the public and community water systems, and general locations of golf courses and non-community entities that also use groundwater in the MVGB, are shown on **Figure 3-1**. The distribution of groundwater extractions for the wells are illustrated by the size of the symbol (magnitude) and color (pumping entity). The largest volume of water extracted at any location in the MVGB is from the Martis Valley municipal well, located near the airport, and has altered the regional groundwater flow direction. Three other wells north of the Truckee River and east of the town of Truckee are the next largest producers in the valley. Groundwater pumping decreased on average by about 700 AF during WY 2022 from WY 2021, decreasing the severity of the groundwater depression. **Figure 3-1** is also useful for comparison with the groundwater contours (presented in **Section 2**) and corresponds with the pumping data.

Graphical representations of monthly and annual pumping for TDPUD and NCSD wells are presented on **Figure 3-2**. Seasonally, groundwater demand peaks in the summer and declines to approximately one-third to one-quarter of that amount during the winter and spring. This distribution suggests that calendar (for non-community users and golf course irrigation) and water year pumping estimates are typically similar in magnitude for this Basin, hence the tabulated totals in **Table 3-1** with calendar year pumping estimates are defensible surrogates to approximate water year pumping estimates. **Figure 7-1** also shows that the overall pumping volume fluctuates from year to year but overall remains consistent unless dry conditions persist, varying by about 1,000 AF over the last 4 years. Groundwater use was higher in WY 2021 than in WY 2022, due to almost double the precipitation in WY 2022.

Table 3-1. Groundwater Pumping for Water Year 2022 (values in acre-feet)

		2021			2022									Annual	
Agency	Metered/ Estimated	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total	Percent
Public Utility Water Purveyors [1]															
Truckee-Donner PUD															
Potable														**Water Year**	
1. Airport Well	Metered	49	22	49	51	37	54	0	0	64	54	52	44	476	
2. Martis Valley Well	Metered	132	126	106	97	104	45	68	98	105	130	124	113	1,248	
3. South Side Well	Metered	0	0	0	0	0	0	0	0	0	0	0	0	0	
4. Glenshire Dr Well	Metered	0	0	0	0	0	10	18	33	53	112	95	56	377	
5. Hirschdale Well	Metered	1	0	1	1	1	1	1	1	0	0	0	0	7	
6. Prosser Annex Well	Metered	12	0	0	0	0	0	0	11	21	25	23	20	112	
7. Prosser Heights Well	Metered	9	0	0	0	0	0	0	4	17	18	18	17	83	
8. Sanders Well	Metered	0	0	0	0	0	0	0	13	39	34	31	23	140	
9. Prosser Village Well	Metered	41	27	41	41	41	61	57	65	88	104	93	76	735	
10. Northside Well	Metered	0	0	0	0	0	0	0	0	3	3	3	13	22	
11. Old Greenwood Well	Metered	37	43	46	66	45	64	68	77	84	102	95	82	809	
12. Well 20	Metered	6	0	0	0	0	0	0	7	14	17	16	12	72	
13. "A" Well	Metered	0	0	0	0	0	0	0	0	0	0	0	0	0	
Non Potable															
14. Fibreboard Well	Metered	23	0	0	0	0	0	13	72	91	112	92	58	461	
15. Donner Creek Well	Metered	10	0	0	0	0	0	2	21	46	55	47	24	205	
16. Southside Well #1	Metered	0	0	0	0	0	0	0	0	0	1	1	1	3	
17. Tahoe Donner GC Wells	Metered	-	-	-	0	0	0	0	7	11	3	4	2	27	
Subtotal		**320**	**218**	**243**	**256**	**228**	**235**	**227**	**409**	**636**	**770**	**694**	**541**	**4,777**	**69%**
Community Water Purveyors [2]															
Northstar C.S.D.														**Water Year**	
TH-1	Metered	6	0	2	0	0	2	1	15	5	2	20	17	71	
TH-2	Metered	5	0	0	7	0	0	0	9	41	51	25	20	157	
Well 1	Metered	18	8	11	1	3	2	0	0	34	41	42	33	192	
Well 2	Metered	17	3	4	11	9	9	10	32	33	39	37	32	235	
Well 3	Metered	0	0	0	0	0	0	0	0	0	0	0	0	0	
Subtotal		**46**	**11**	**16**	**18**	**12**	**13**	**11**	**56**	**113**	**133**	**124**	**102**	**655**	**10%**
Non-Community Water Purveyors [2,3]	*(Estimated using most recent data for calendar year 2021, DWR 2022)*														
														Calendar Year	
Hobart Work Center	Estimated													0	
Aggregates Martis Valley	Estimated													120	
Subtotal														**120**	**2%**
Golf Courses [2,3]	*(Estimated using most recent data for calendar year 2021, DWR 2022)*														
														Calendar Year	
Gray's Crossing [4]	Estimated	(Served by TDPUD and included in their reported pumping)												200	
Old Greenwood [4]	Estimated	(Served by TDPUD and included in their reported pumping)												335	
Ponderosa (9-hole Course)	Estimated	(Private wells not operated by TDPUD, monthly pumping not available)												21	
Coyote Moon [4]	Estimated	(Served by TDPUD and included in their reported pumping)												232	
Schaffer's Mill	Estimated													202	
Lahontan	Estimated													328	
Northstar	Estimated													202	
Martis Camp	Estimated													340	
Tahoe Donner	Estimated	(component of demand provided by TDPUD from wells in basin)												242	
Subtotal														**1,335**	**19%**
													Total	**6,887**	

[1] Values reported in gallons and converted to acre-feet

[2] Values reported in million gallons and converted to acre-feet

[3] Estimated and obtained from Annual Inventory of Water Use Lake Tahoe & Truckee River Basins Calendar Year (DWR 2022)

[4] Groundwater use already accounted for in TDPUD reported pumping and not included in golf course demand subtotal

Figure 3-1. Martis Valley Groundwater Basin Locations of Groundwater Extractions

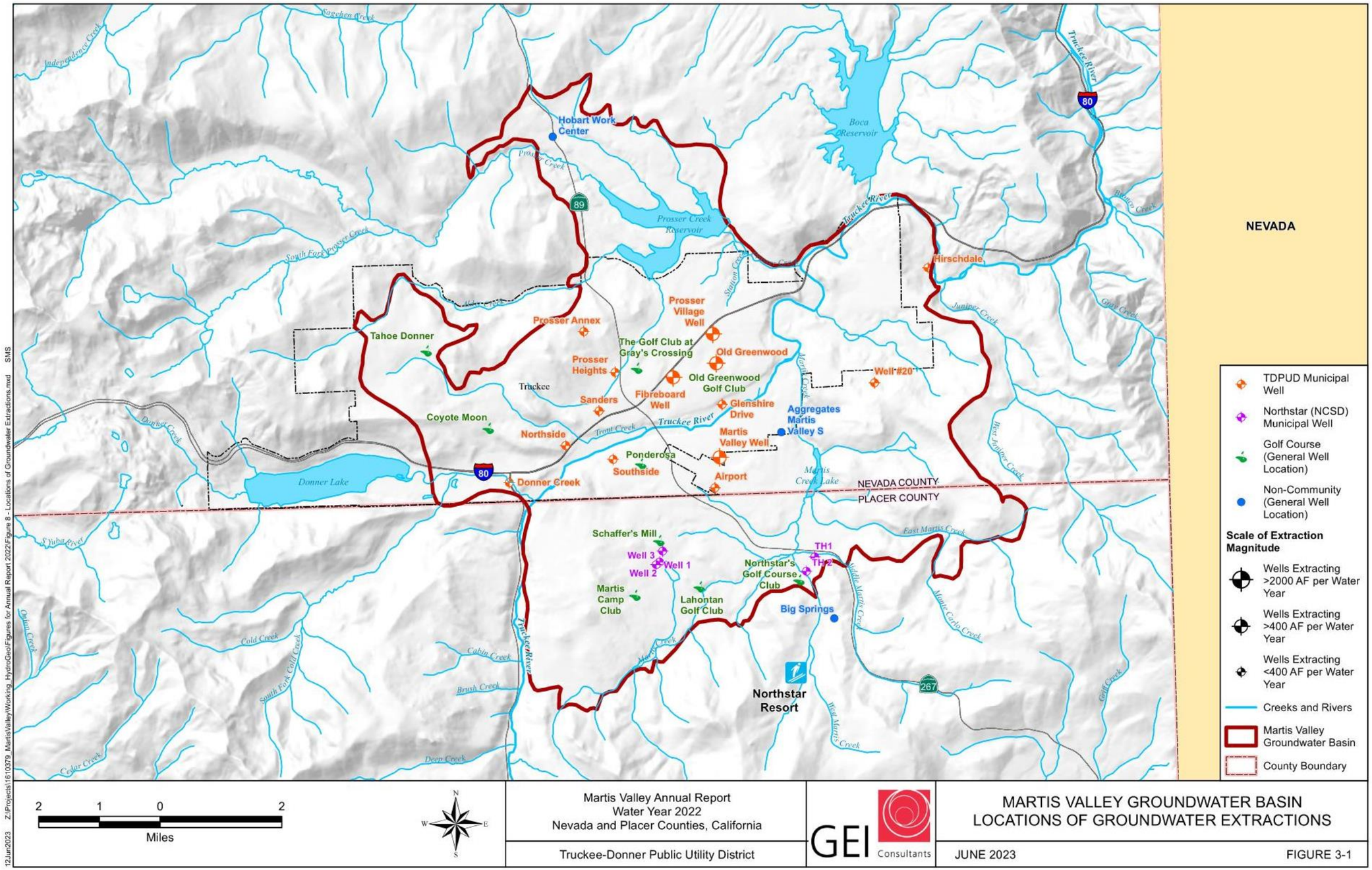


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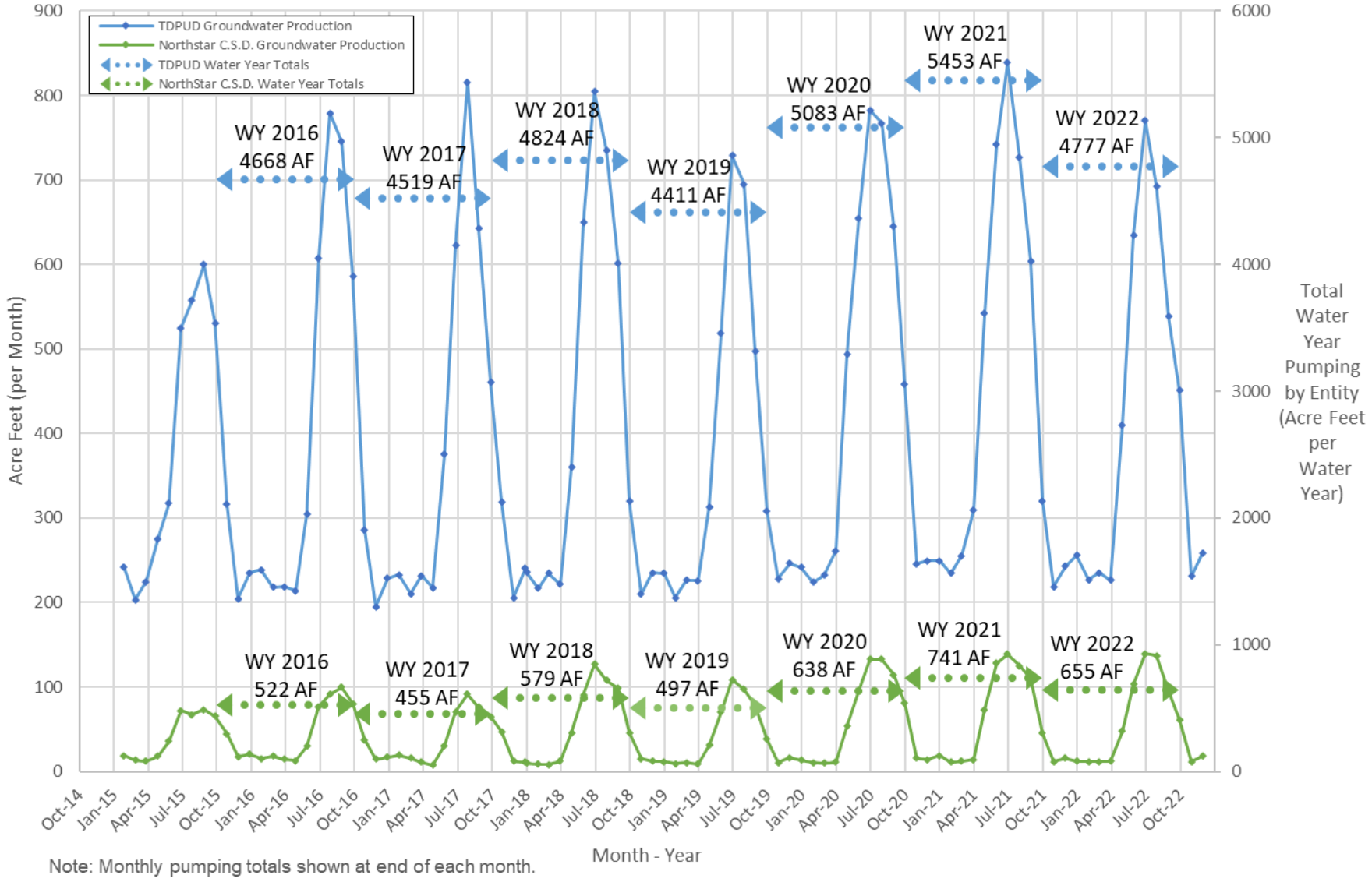
Figure 3-2. Martis Valley Groundwater Basin Community Water System Monthly Pumping Totals



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4. Surface Water Diversions

Although the Truckee River and multiple tributaries course throughout the MVGB, surface water constitutes less than 1 percent of Basin water supply. The total surface water diverted for use is about 590 AF in WY 2022, but not all was diverted within the MVGB.. Estimated surface water diversions are listed in **Table 4-1** for WY 2022.

NCSD has water rights to use water from Big Springs, which is located outside the Basin but within the watershed as shown on **Figure 3-1**. Northstar Resort uses water from the spring, primarily for snowmaking. A portion of this water supplies recharge to the Basin aquifer by storing water as snow, which later melts, becomes runoff, and infiltrates into the Basin. Water from the spring is also used in the Basin, at the Northstar Golf Course, along with other commercial and domestic uses. The amount of groundwater recharge attributable to surface water from Big Springs cannot be quantified at this time.

A second surface water source, from within the MVGB, is used for irrigation at the Ponderosa Golf Course, but its diversion point is unidentified. Some deep percolation from turf irrigation also provides groundwater recharge within the MVGB.

Table 4-1. Surface Water Usage Reported for Water Year 2022 (values in acre-feet)

		2021			2022									Annual
Agency	Metered/ Estimated	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
Public Utility Water Purveyors														
Truckee-Donner PUD [1]	Metered	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal														**0**
Community Water Purveyors	*(Estimated using most recent data for calendar year 2021, DWR 2022)*													
Northstar C.S.D. [2] (M&I)	Metered	*7.3*	5.7	1	0	0	0	0	0	0	0	0	0.4	14
Non-PUD Community Purveyors	Estimated	*(From Non-PUD Community Purveyors)*												409
Subtotal														**423**
Non-Community Water Purveyors	*(Estimated using most recent data for calendar year 2021, DWR 2022)*													
Hobart Work Center	Estimated													0
Aggregates Martis Valley	Estimated													105
Subtotal														**105**
Golf Courses	*(Estimated using most recent data for calendar year 2021, DWR 2022)*													
Ponderosa Golf Course	Estimated													62
Northstar Golf Course (from Big Springs) [2]	Estimated													0
Subtotal														**62**
													Total	**590**

n/a = Not Applicable

[1] TDPUD has an allocation of Truckee River flows but does not use it, has no infrastructure to access it, and has no plans to use it.

[2] NCSD holds ripariain water rights for use of Big Springs, which is outside of the MVGB. A portion of this water is used for limited municipal use within the MVGB and Northstar Golf Course.

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5. Groundwater Recharge

Wastewater is exported from the North Lake Tahoe area and is sent to the T-TSA wastewater treatment plant, located in the MVGB. Total estimated monthly wastewater imports to the MVGB from areas outside the Basin, as well as metered wastewater (weir) derived from within the MVGB, from the Truckee Sanitary District (TSD), were provided by T-TSA and are listed in **Table 5-1** for WY 2022. About 1,700 AF of wastewater was imported into the MVGB in WY 2022.

The treated water from the T-TSA is recharged into the MVGB groundwater system through subsurface leach fields (pipes with holes surrounded by gravel) under permit with the Lahontan Regional Water Quality Control Board. The locations of the leach fields are shown on **Figure 1-1**. About 3,700 AF of treated water was recharged into the MVGB in WY 2022. Wastewater from TSD is partially derived from groundwater pumping within the MVGB and partially offset impacts of local pumping near the Truckee River.

Table 5-1. Estimated Groundwater Recharge from T-TSA for Water Year 2022 (values in acre-feet)

		2021			2022									Annual
Tahoe-Truckee Sanitary Agency (T-TSA) Sources of Inflows [1]	Actual/ Estimated	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Lake Tahoe Area (Imported water)	Estimated	150	140	140	140	150	160	150	140	140	180	120	90	**1,700**
Truckee Sanitary District (TSD)	Metered	120	120	150	190	170	190	170	170	200	220	170	130	**2,000**
													Total	**3,700**

[1] Deliveries to treatment facility from outside the MVGB provided by T-TSA and are converted from million gallons to acre-feet

[2] Metered readings from Granite Flats used to calculate imported wastewater from Lake Tahoe area

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6. Total Water Use

The total estimated groundwater and surface water use in the MVGB by sector is summarized in **Table 6-1**. Over 85 percent of the water use was provided from groundwater, with a total water use of 6,887 AF in 2022. About one-half of the groundwater pumped was returned to the Basin after being treated by T-TSA.

Table 6-1. Total Water Use for Water Year 2022 (values in acre-feet)

Water Use Sector	2022
Municipal and Industrial (M&I)	**6,081**
Groundwater Metered	5,432
Groundwater Estimated	120
Surface Water Metered	14
Surface Water Estimated	514
Golf Courses	**1,397**
Groundwater Estimated	1,335
Surface Water Estimated	62
Subtotal Groundwater	6,887
Subtotal Surface Water	590
Total Water Use	**7,478**
T-TSA Groundwater Recharge	**3,700**
Total	**3,778**

Note: Only includes water sources in MVGB, see Table 4-1 and does not include evapotranspiration from native vegetation.

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7. Change in Groundwater Storage

An empirical approach was used to calculate change in storage using spring groundwater elevation contours for 2016 through 2022. The spring contour surfaces from WY 2021 and WY 2022 were then subtracted to produce water level change distributions. The use of spring-to-spring water level differences was deemed to be the most appropriate when assessing ambient groundwater conditions, because it has less influence of temporal, localized changes due to pumping adjacent to monitoring wells.

Figure 7-1 spatially shows the estimated groundwater elevation changes (current year elevations subtracted from previous year elevations). Portions of the Basin (northwest, southwest, and southeast corners) with no significant pumping nor groundwater level monitoring wells were not contoured. According to DWR files (DWR 2023) there are no irrigation, municipal or domestic wells in the northwest and southwest corners of the Basin. In the southwest corner there are four domestic wells, but their logs show that they encountered lava flows and ash layers, and no sediments so it is unknown whether these wells would provide representative groundwater levels with the rest of the Basin.

Change in storage estimates are dependent upon the assumed specific yield (the percent of sediments with pore space that contains water that can be drained by gravity) or storage coefficient (similar to specific yield but used when aquifers are more confined as is typical with depth) of the aquifer formation. Given the complex and often interbedded nature of the MVGB aquifer system, an average of depth storage coefficients (ranging from 0.1 – 0.05) were used for the analysis. The results and input values are presented in **Table 7-1**. Groundwater in storage in the MVGB increased in WY 2022 and almost replenished the loss of storage in WY 2021. Most of the change in storage is likely due to the increased groundwater recharge due to the wetter conditions in WY 2022, since groundwater pumping only decreased by 700 AF, with the greatest increase being located north of the Truckee River. The change in storage estimates could also be affected by the loss of monitoring at the destroyed well (17N17E19K001M).

Table 7-1. Estimated Change in Storage

Table 5 Estimated Change in Storage

Time Periods for Groundwater Level Elevation Comparisons	Basin Area Used in Analysis [1] (acres)	Average Groundwater Level Change (feet)	Average Storage Coefficients	Estimated Change in Storage (AF)
Spring 2020 - Spring 2021	24,500	-3.72	0.075	-6,841
Spring 2021 - Spring 2022	24,500	3.25	0.075	5,972
		Total Cumulative Change 2021 and 2022 WYs		-869

[1] Basin Area limited to extent of MVGB with groundwater elevation data to limit interpolation error

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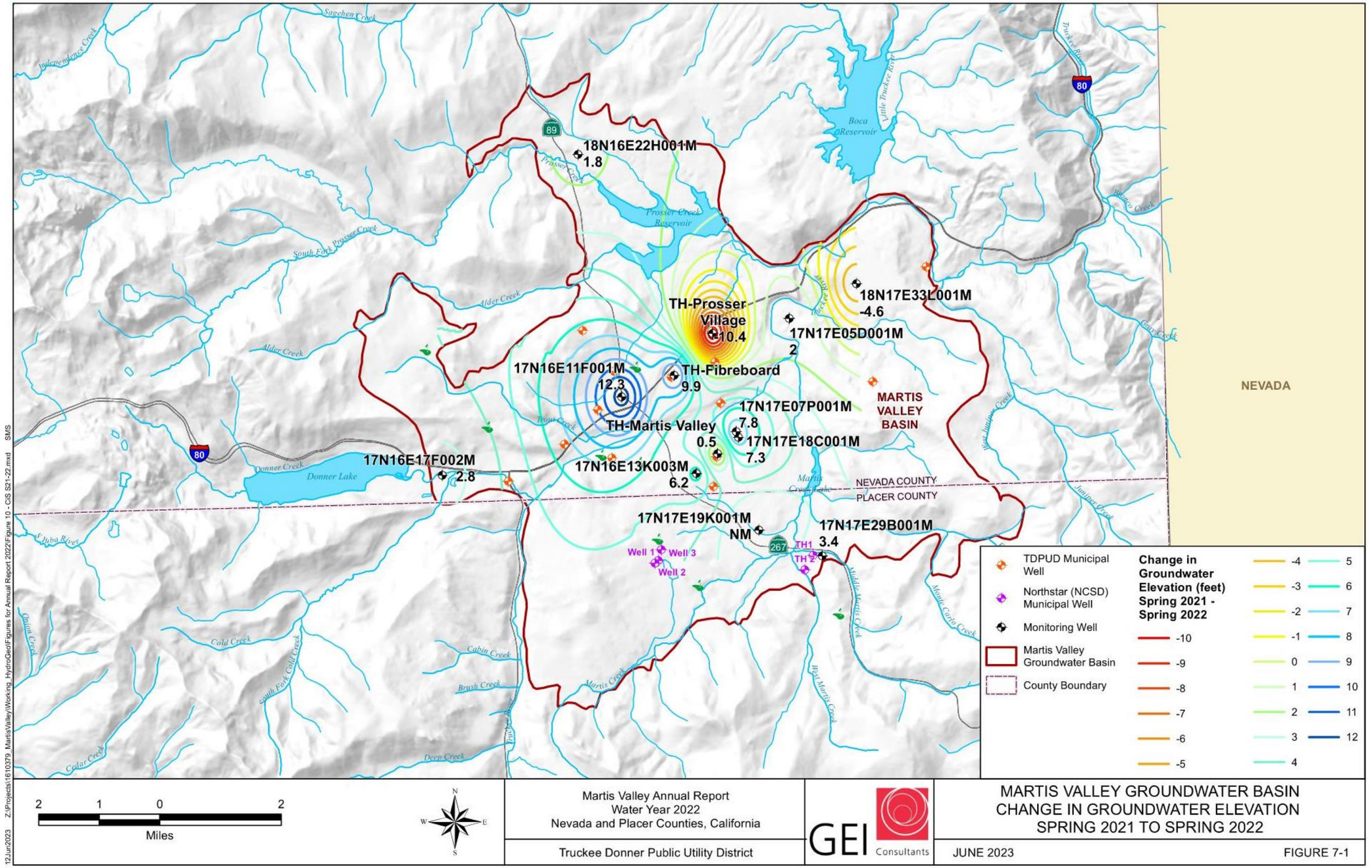
Figure 7-1. Martis Valley Groundwater Basin Change in Groundwater Elevation, Spring 2021-Spring 2022



Historical trends in the estimated annual and cumulative change of groundwater in storage, along with water year type and annual groundwater use, are shown on **Figure 7-2**. The annual change in storage was based on groundwater elevation change and specific yield as described above. Storage change and groundwater use estimates prior to WY 2016 used a different method and therefore are not shown. Over the last water year, groundwater in storage increased by about 6,000 AF as a result of wetter conditions in WY 2022, with increased recharge and less groundwater pumping. Groundwater in storage in the MVGB increased in WY 2022 and almost replenished the loss of storage in WY 2021 but not the losses that occurred during WY2020. For perspective, the Basin has approximately 484,000 AF in storage, so the overall change in WY 2022 is relatively small (about 1 percent increase) in comparison to the total water stored in the Basin.

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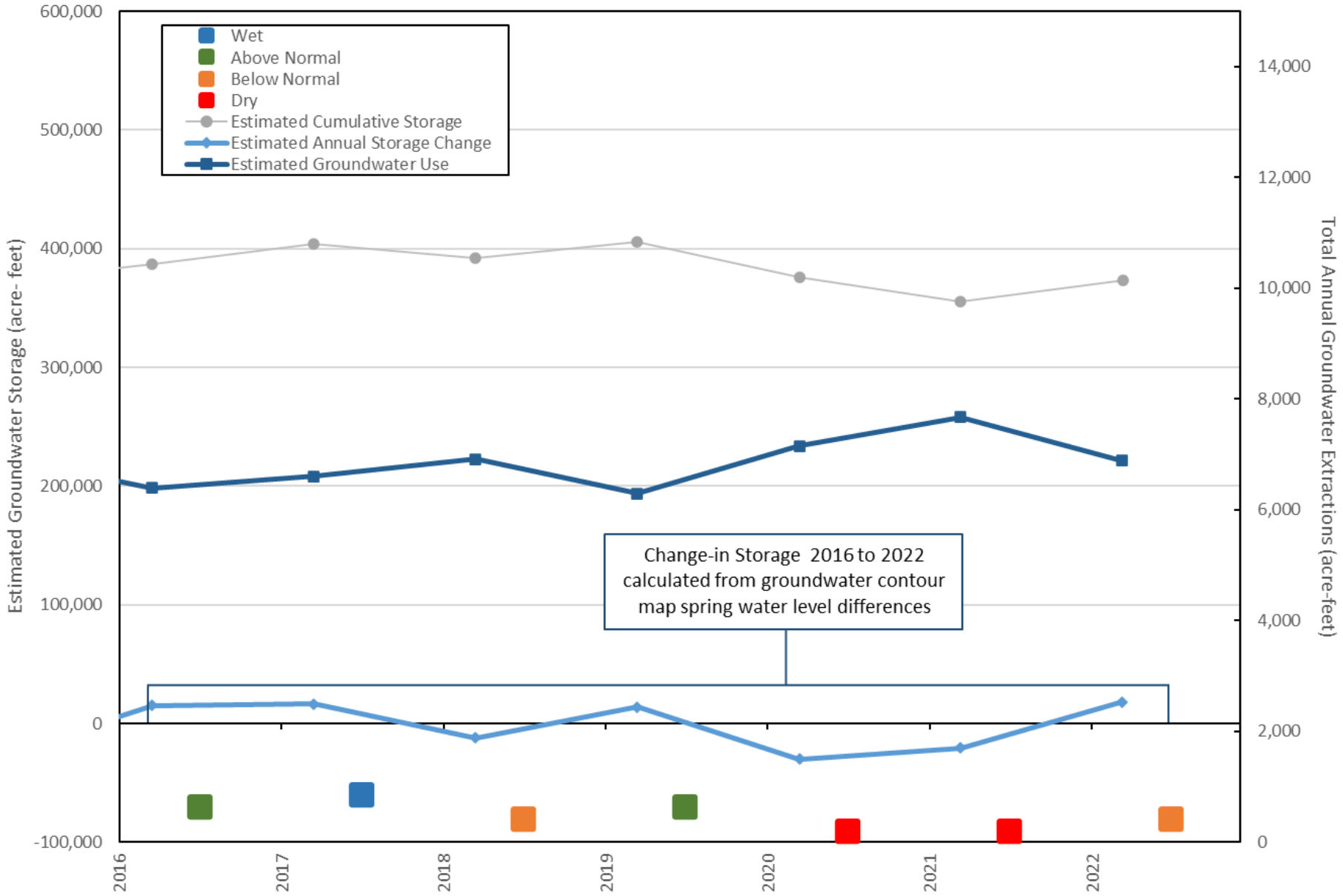
Figure 7-2. Estimated Change in Storage and Groundwater Use



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8. Groundwater Management Activities

The MVGB Agencies continue to invest in the stewardship of the Basin and practicing of adaptive management to proactively ensure that the Basin operates within its sustainable yield. This includes frequent monitoring of key data points and interactions with local stakeholders' meetings.

The most significant management action has been the voluntary implementation of monthly and/or daily monitoring of groundwater levels for all wells in the CASGEM program. This proactive move to monthly monitoring over 5 years ago and well before the mandate was, in part, to investigate and address uncertainties in seasonal variations. Without this proactive change the lower groundwater levels during the summer months noted in previous water years would not have been detected. The results and trends from this improved monitoring program are presented in this report, and both TDPUD and NCSD, who are responsible for the monitoring, intend to continue this monthly monitoring going forward as an MVGB adaptive management strategy.

The MVGB Agencies continue to interact with local environmental interests and MVGB stakeholders to provide information and hear concerns. Primarily, this has been done by the participation in the Truckee River Basin Working Group (TRBWG). The TRBWG was formed with the passage of the TROA 20 years ago and has been strengthened with the support of the newly formed DWR-TROA division. The TRBWG is comprised of the California stakeholders in the river watershed including water purveyors, local governments, environmental interests, recreational interests, DWR, California Department of Fish and Wildlife, United States Forest Service, and others.

The MVGB Agencies shared the findings from the previous Annual Report with stakeholders and are planning to share this report and discuss the findings in the near future.

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9. Conclusions

Groundwater levels increased in the MVGB through WY 2022 in response to the wetter conditions and decreased pumping. Groundwater levels in most monitoring wells have remained above their respective historical low levels when compared to historical spring and fall levels. Only three wells were below most likely due to recent groundwater pumping at the time of measurements (17N17E07P001M, 18N17E33L001M, TH-Prosser). Summer groundwater levels dropped below their historical low fall groundwater level at TH-Fibreboard, however, the monthly and daily monitoring showed groundwater levels quickly recovered, indicating the lower groundwater levels were a localized effect due to pumping. Local agencies are building a new data history to learn and establish summer historic low levels for further analysis.

Groundwater pumping decreased by about 14 percent, averaging 700 AF, compared to the previous water year. In response to the decreased groundwater use in this area the pumping depression that formed during the dry conditions of the previous 2 water years (WY 2020 and WY 2021) has reduced in size.

With an overall increase in groundwater storage due to increased precipitation and lower groundwater use in WY 2022 compared to previous water years, the MVGB is rebounding from the critically dry years of WYs 2020 and 2021, which is similar to other northern California groundwater basins. During this water year, groundwater in storage increased by about 6,000 AF, or about 1 percent of the total storage in the Basin. The increase in storage, when compared to WY 2021, shows pumping only decreased by 700 AF, therefore the increase in precipitation and recharge in WY 2022 was the predominant factor of the recovered storage. The Basin partially recovered in WY 2022 but not enough to balance the losses in storage over the last two drought years.

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_____. 2021. Annual Report for the Martis Valley Groundwater Basin, Water Years 2018 and 2019. January 2021.

_____. 2022. Annual Report for the Martis Valley Groundwater Basin, Water Years 2020 and 2021. June 2022.

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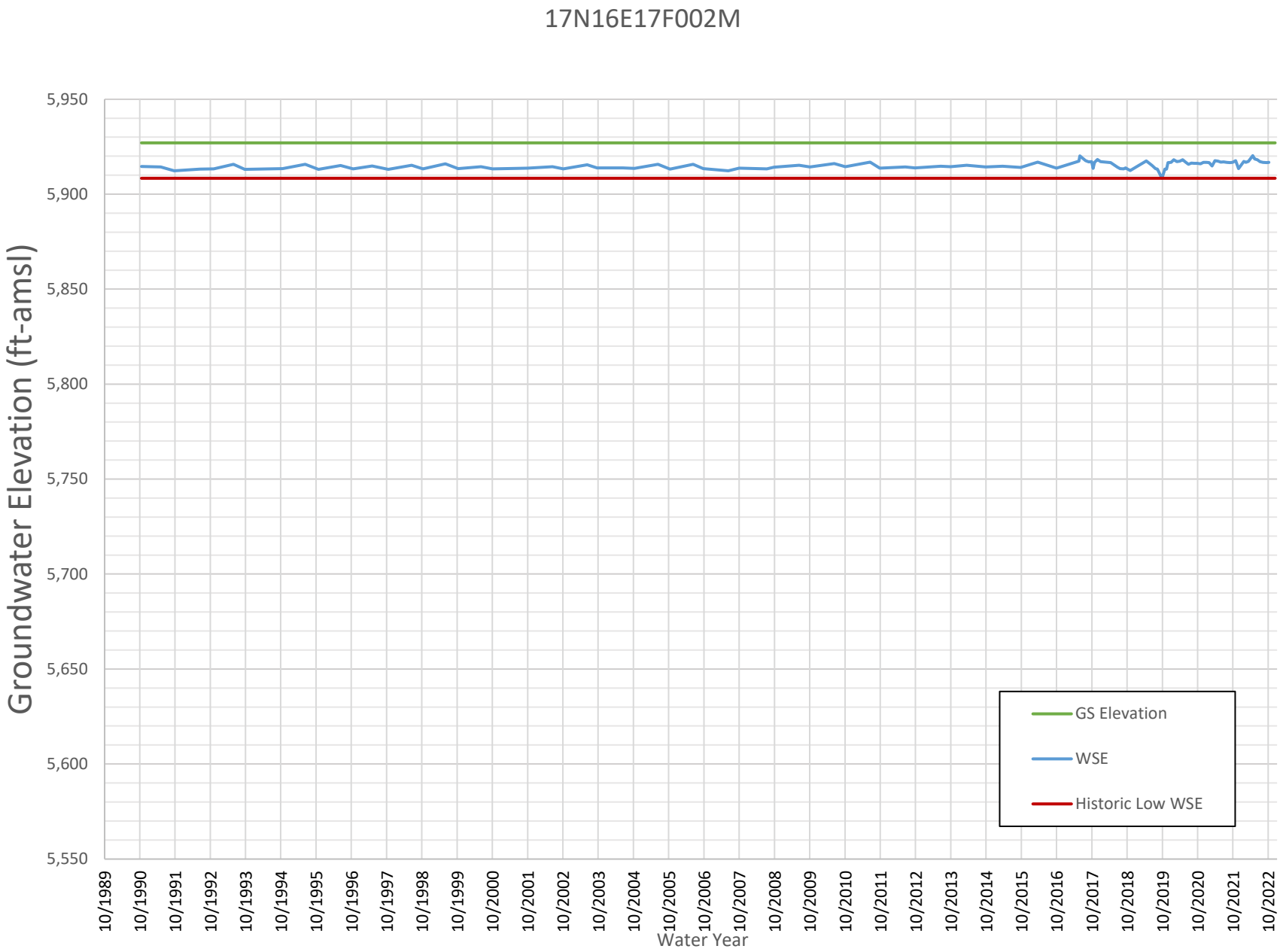
Attachment A. Monitoring Well Hydrographs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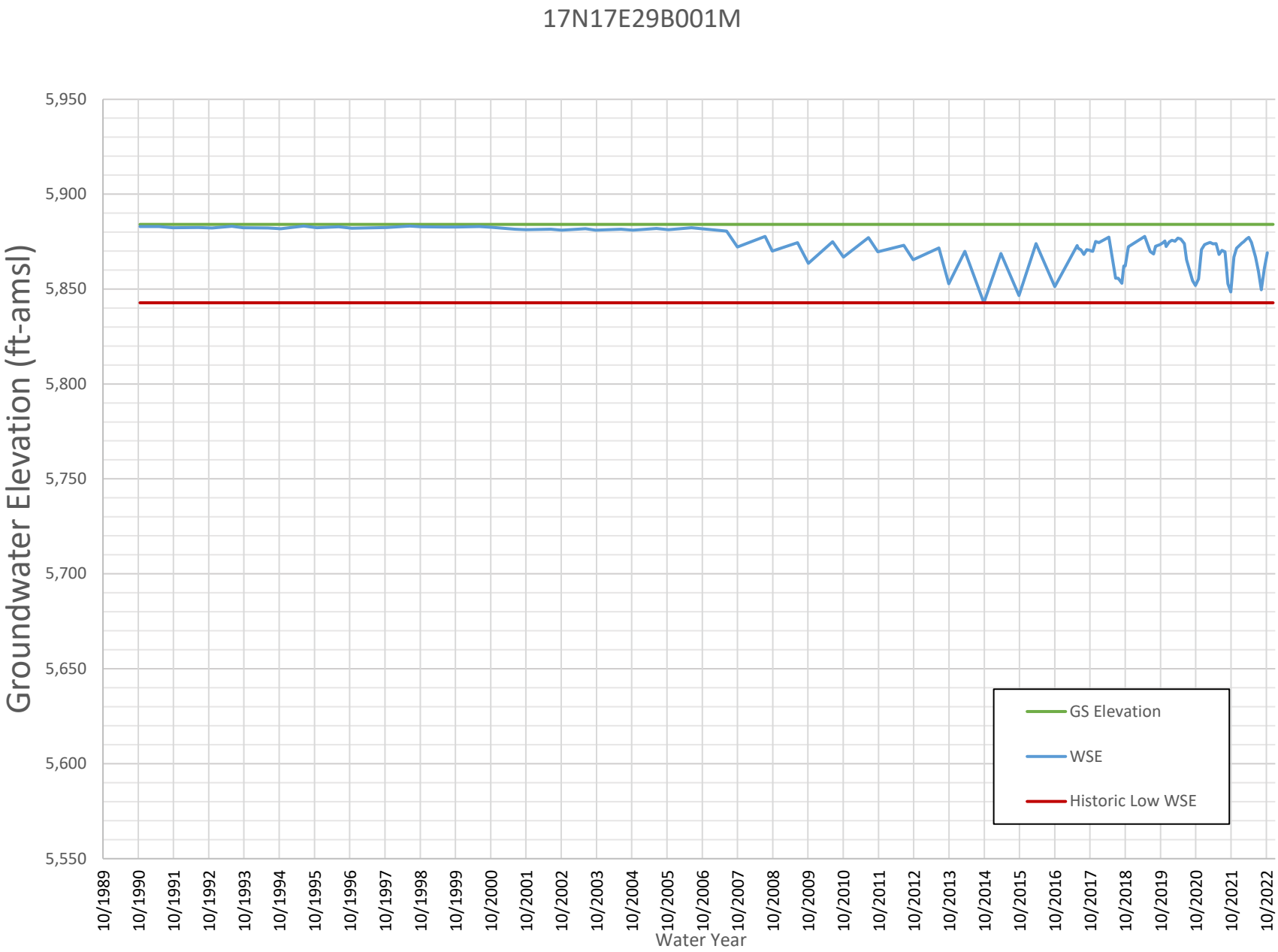
10/2021
10/2022
Water Year
GS Elevation
WSE
Historic Low WSE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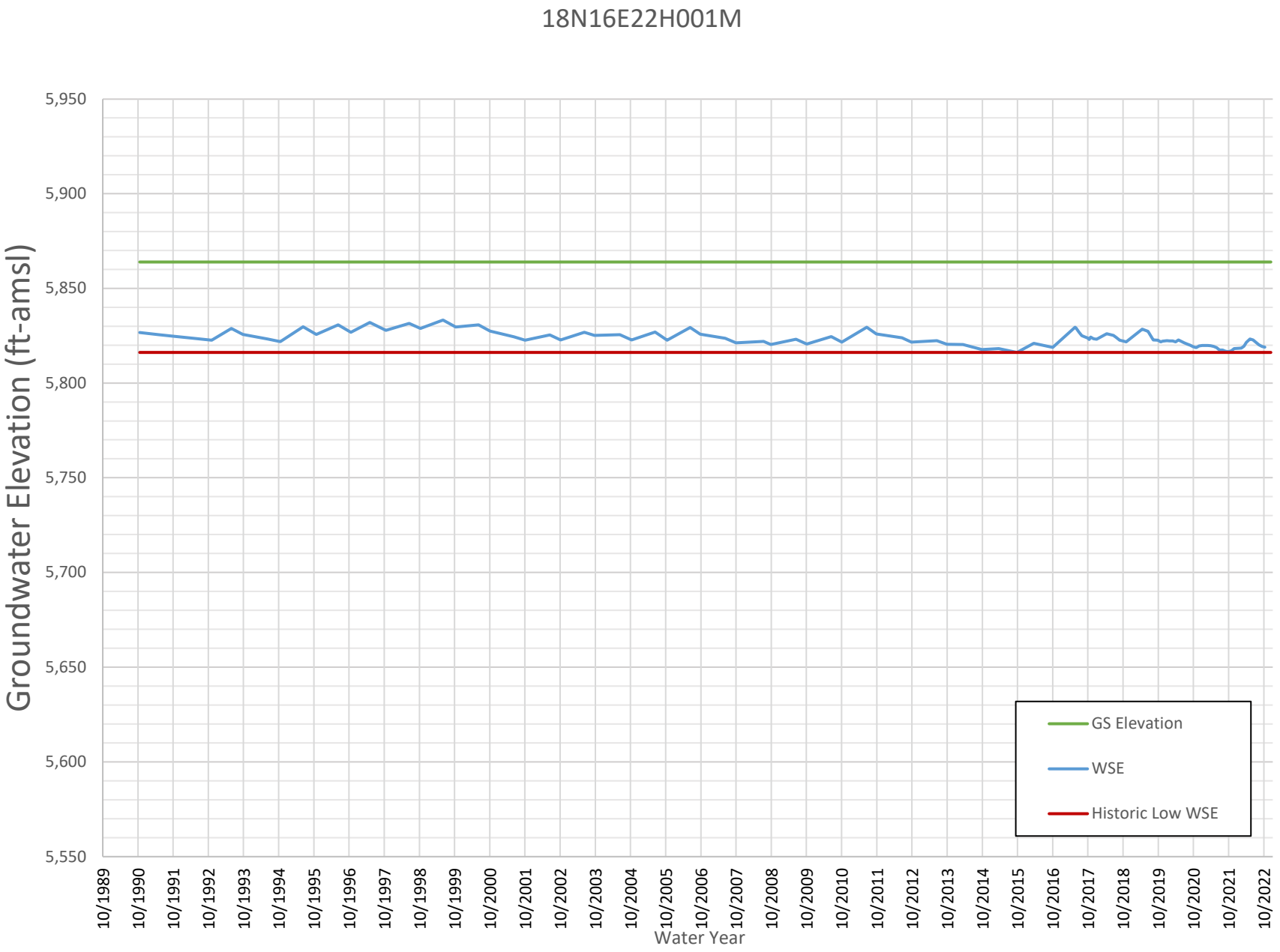
10/2022
Water Year
GS Elevation
WSE
Historic Low WSE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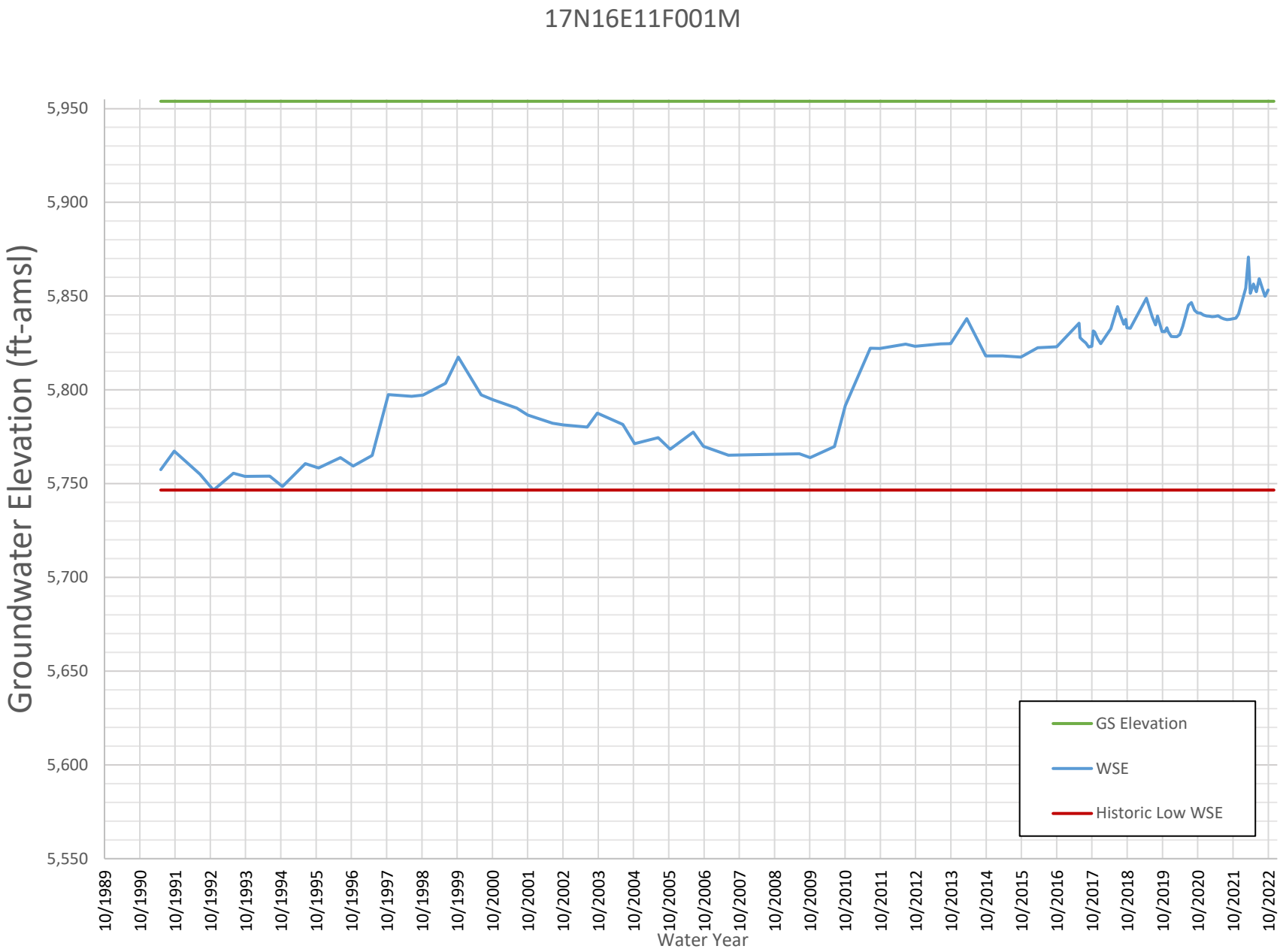
Water Year
GS Elevation
WSE
Historic Low WSE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10/2022
Water Year
GS Elevation
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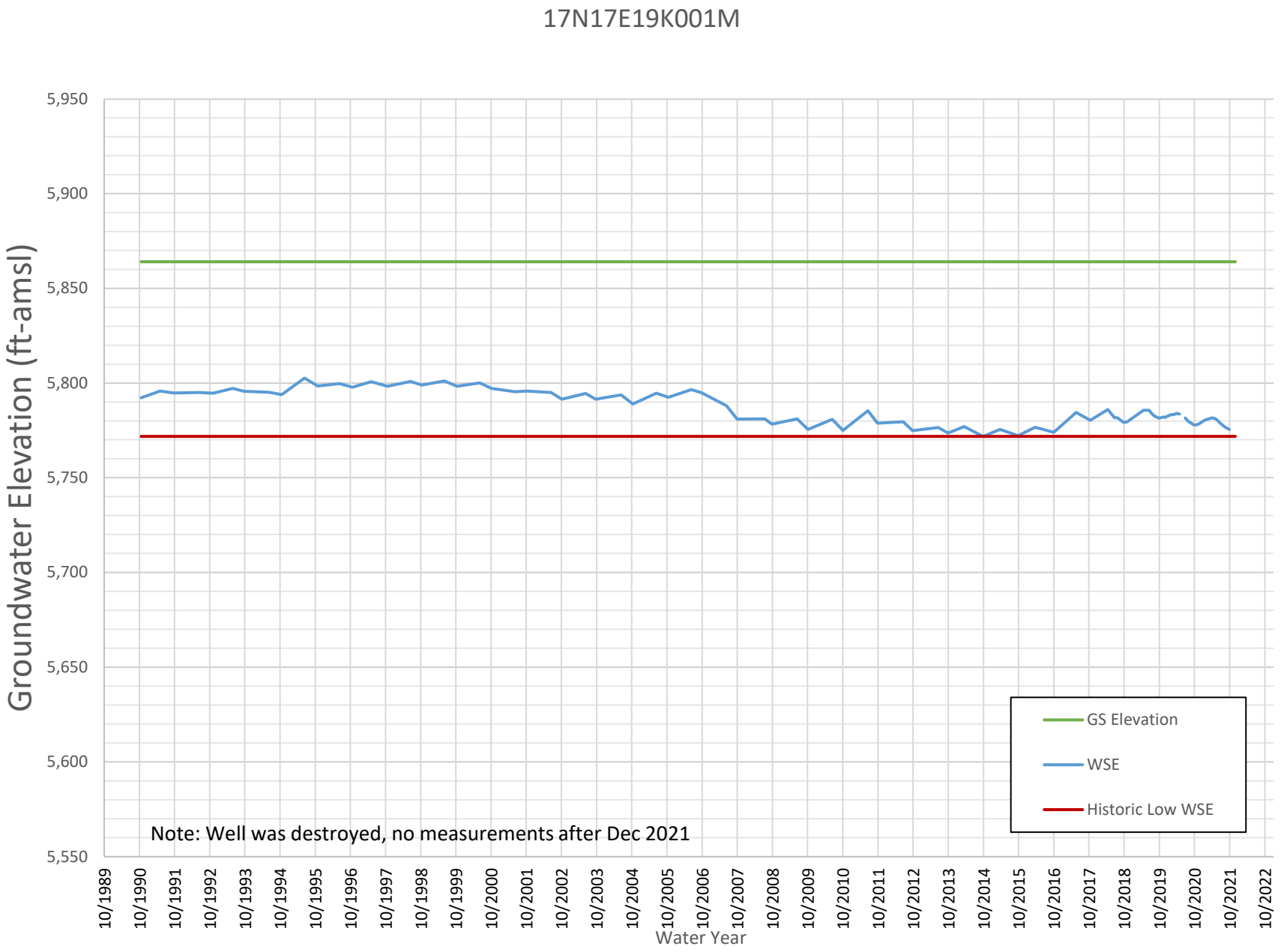
Historic Low WSE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10/2016
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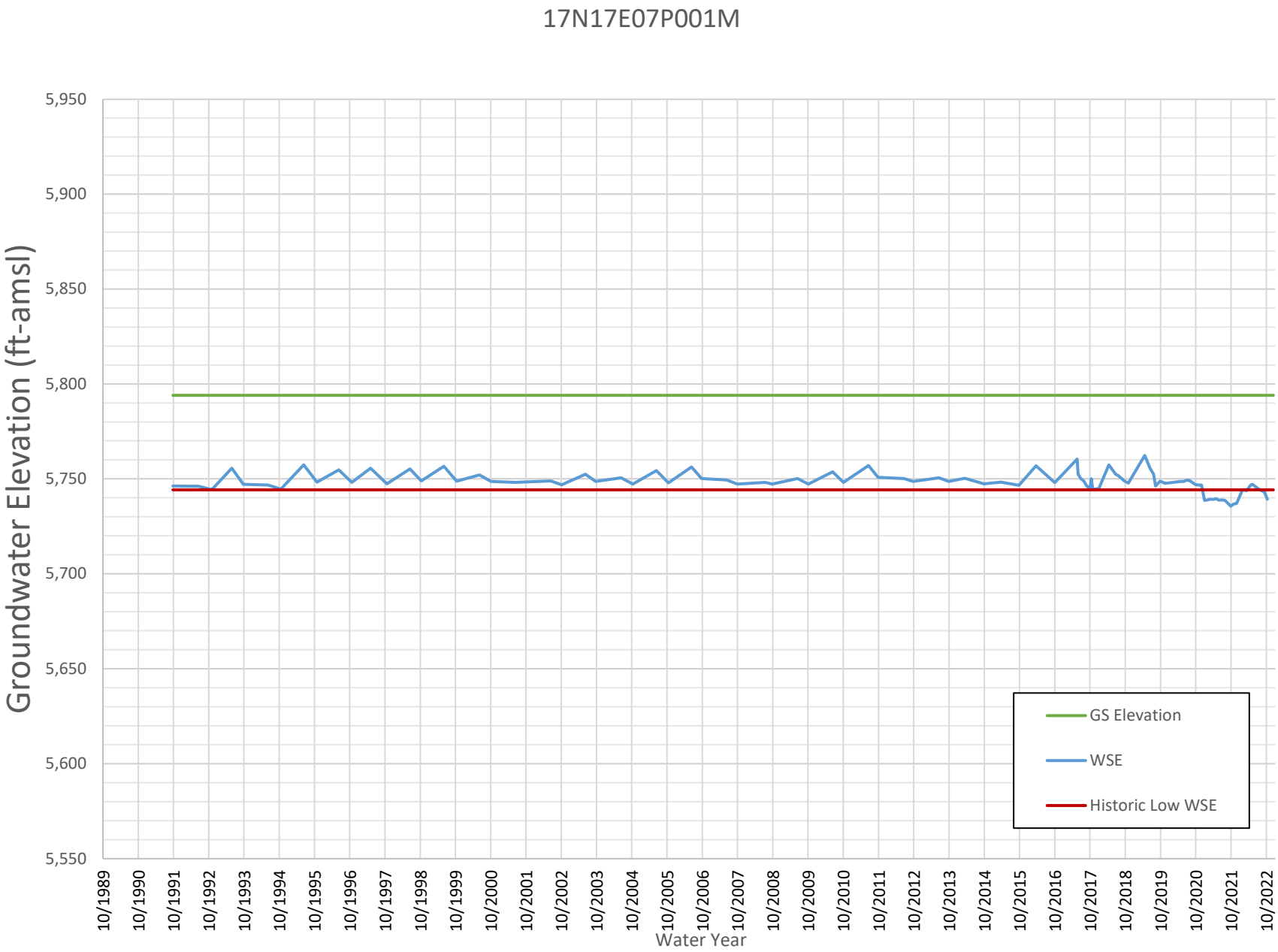
Water Year
GS Elevation
WSE
Historic Low WSE
Note: Well was destroyed, no measurements after Dec 2021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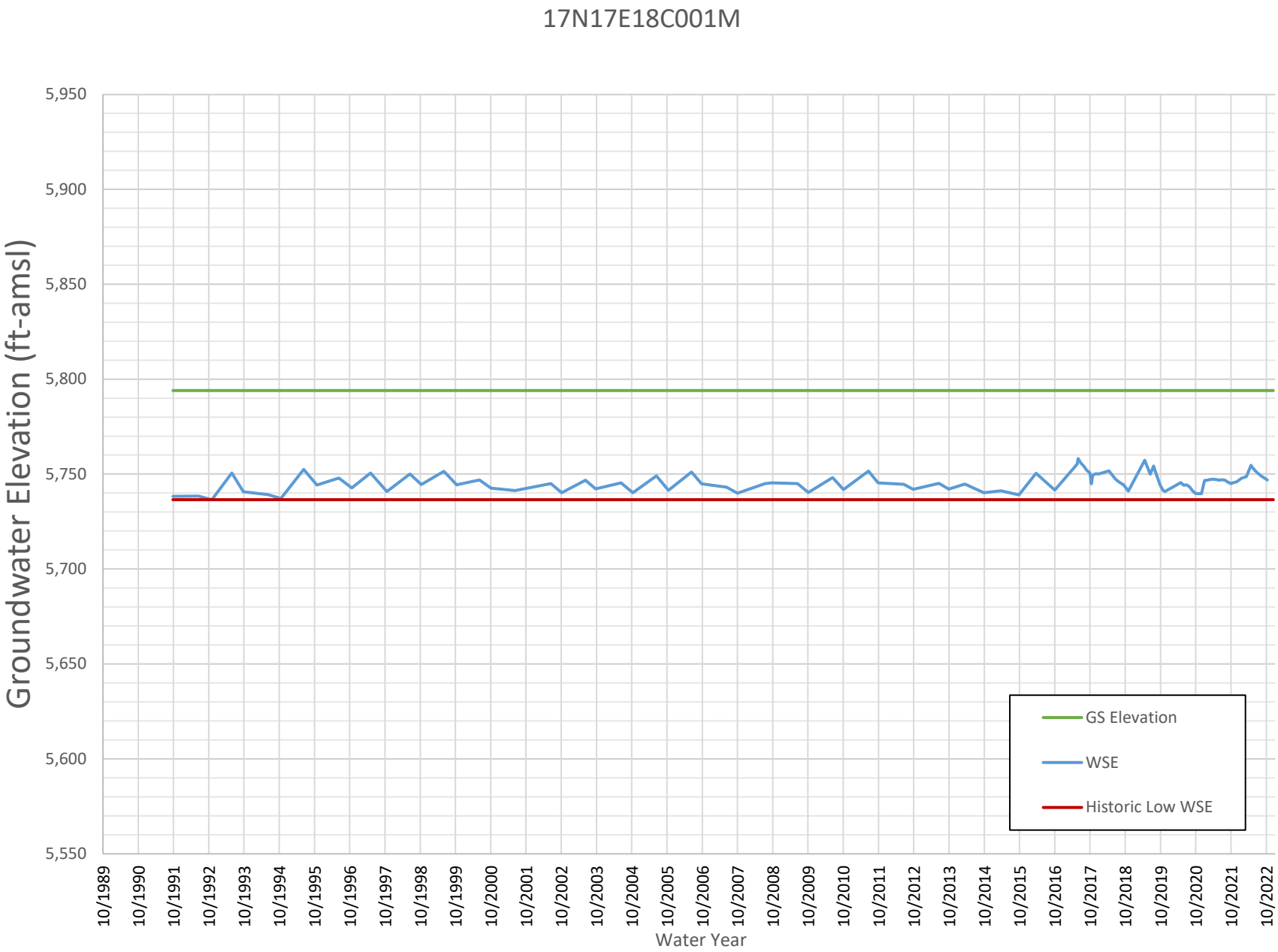
Historic Low WSE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10/2022
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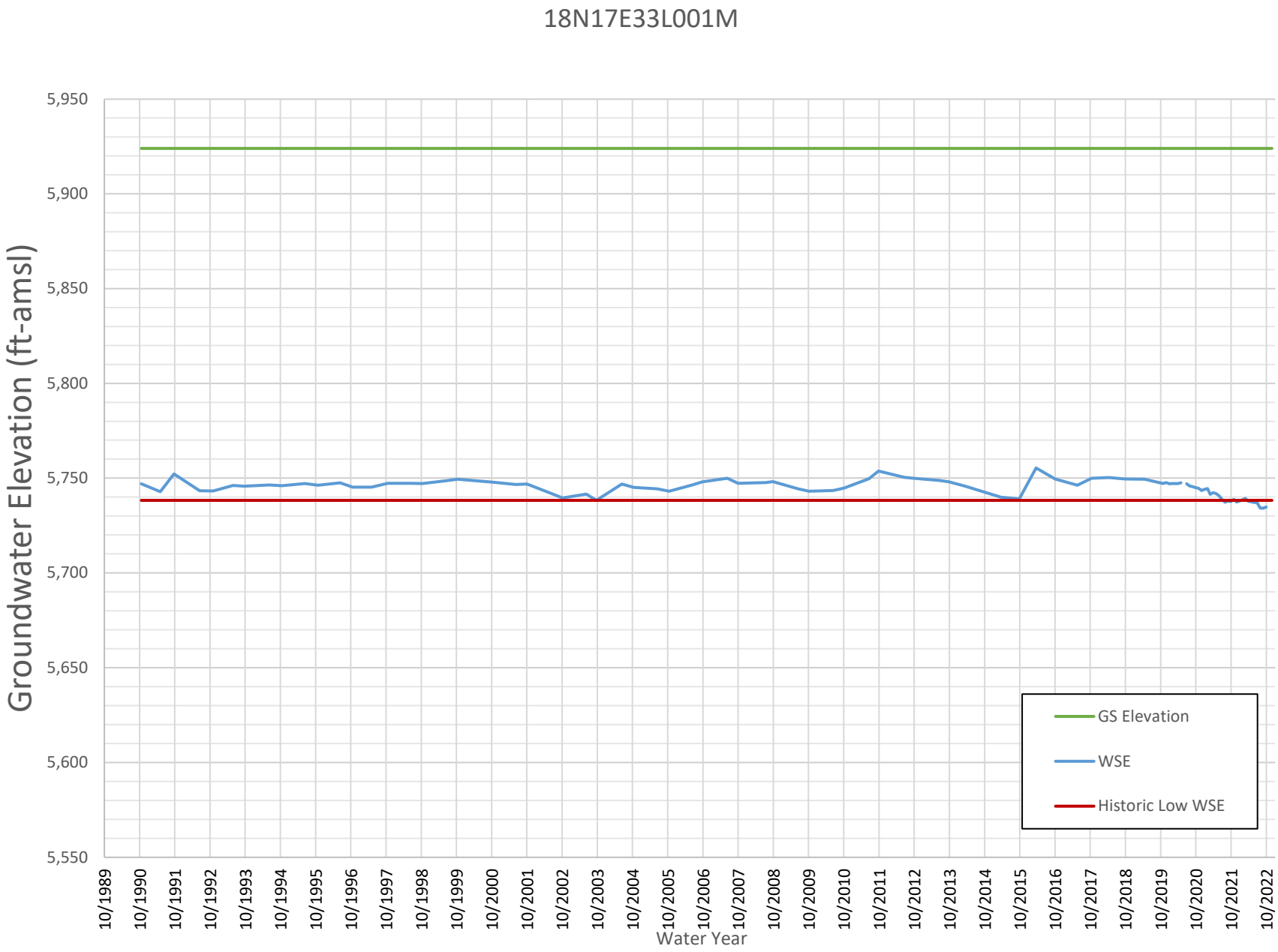
Historic Low WSE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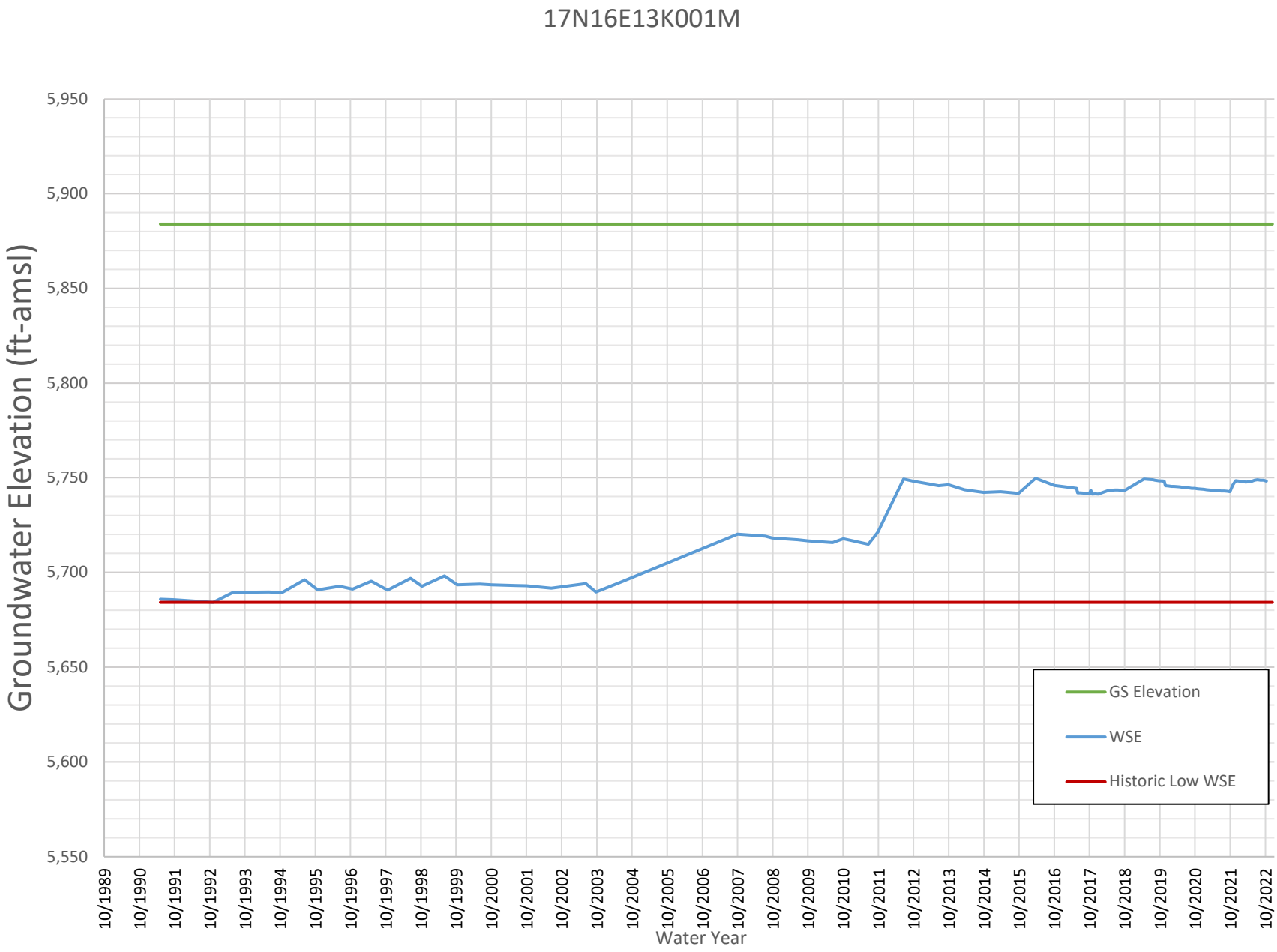
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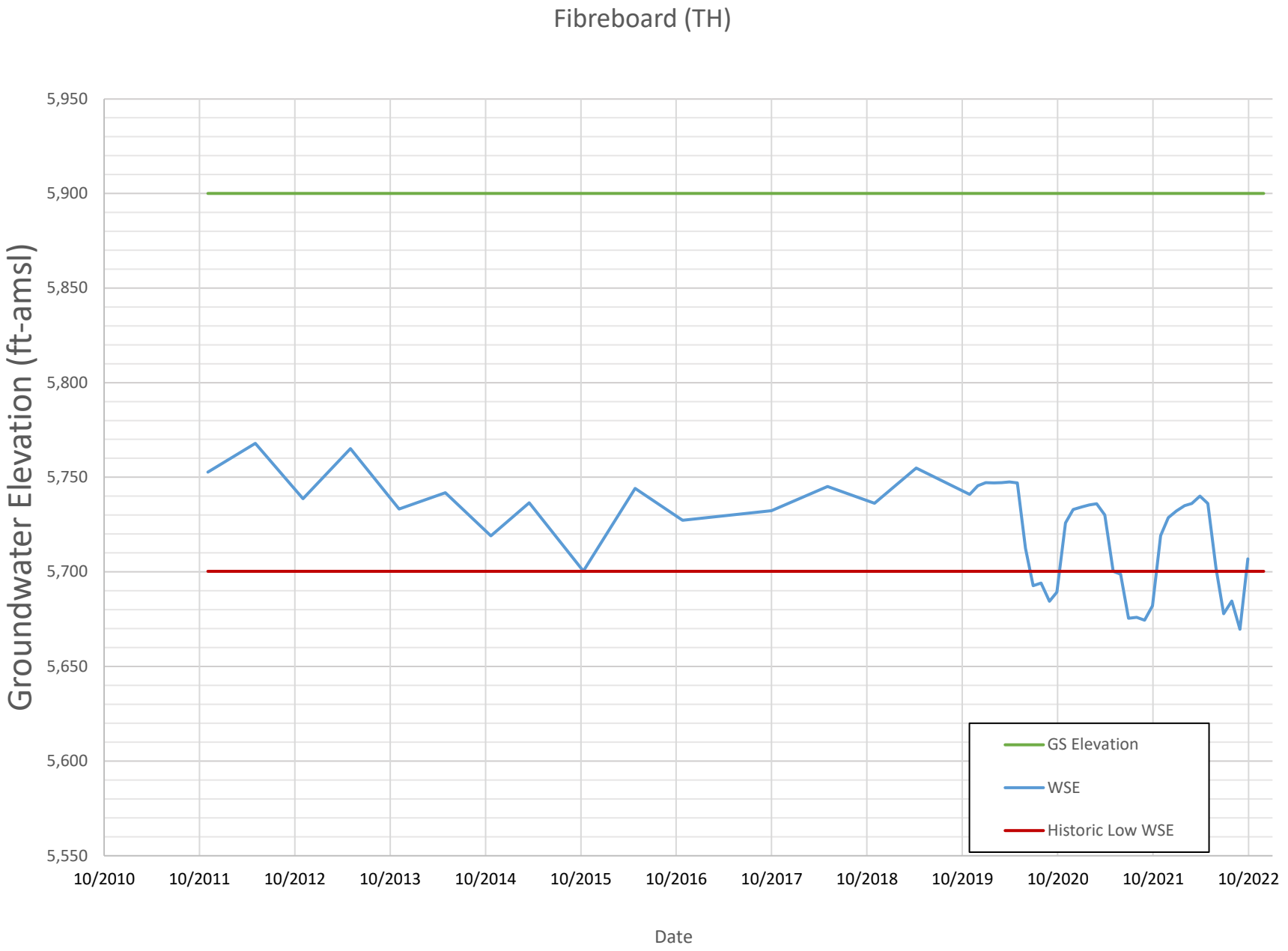
Historic Low WSE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Date
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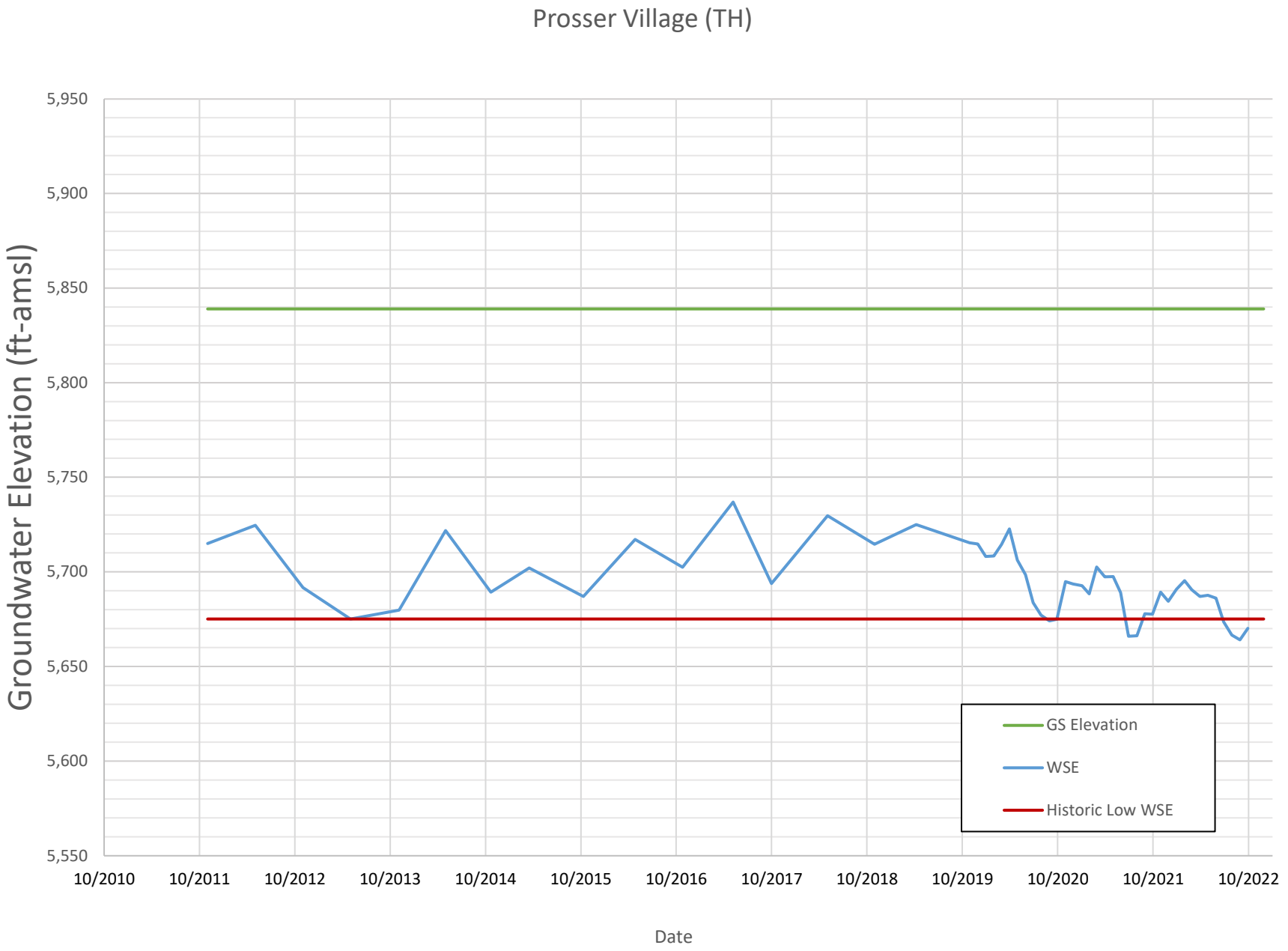
Historic Low WSE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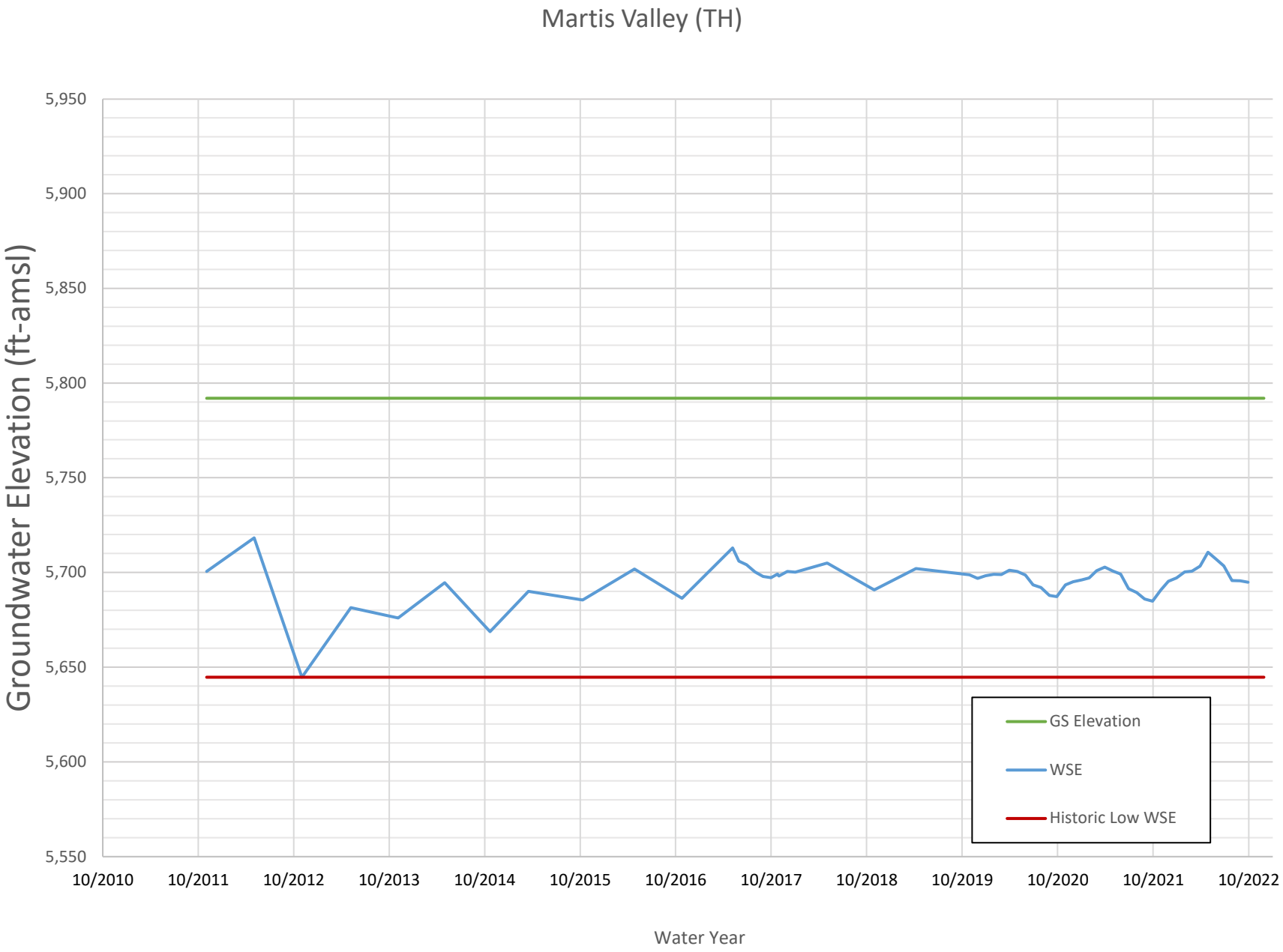
Date
GS Elevation
WSE
Historic Low WSE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10/2011
10/2012
10/2013
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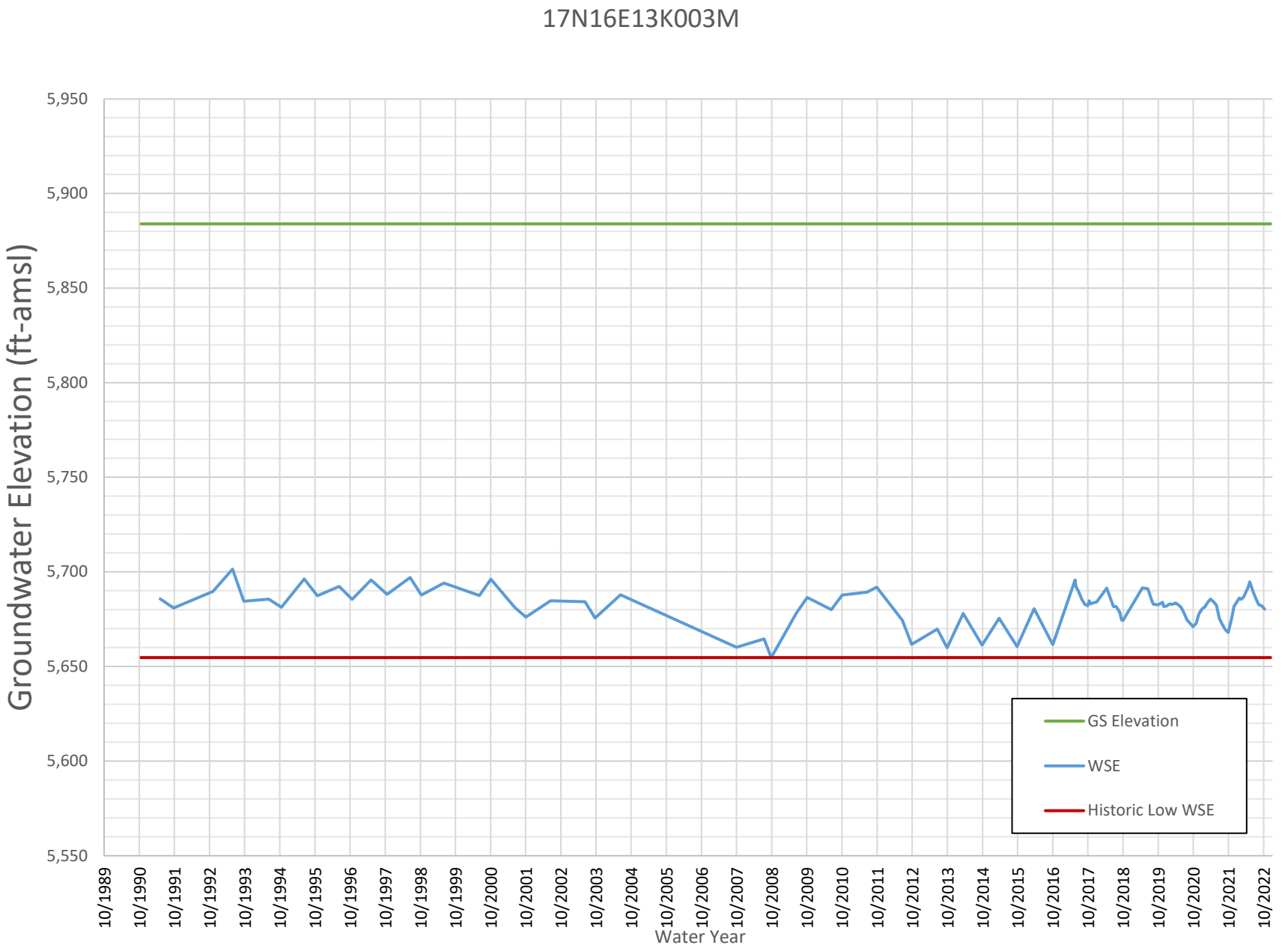
10/2020
10/2021
10/2022
Water Year
GS Elevation
WSE
Historic Low WSE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Water Year
GS Elevation
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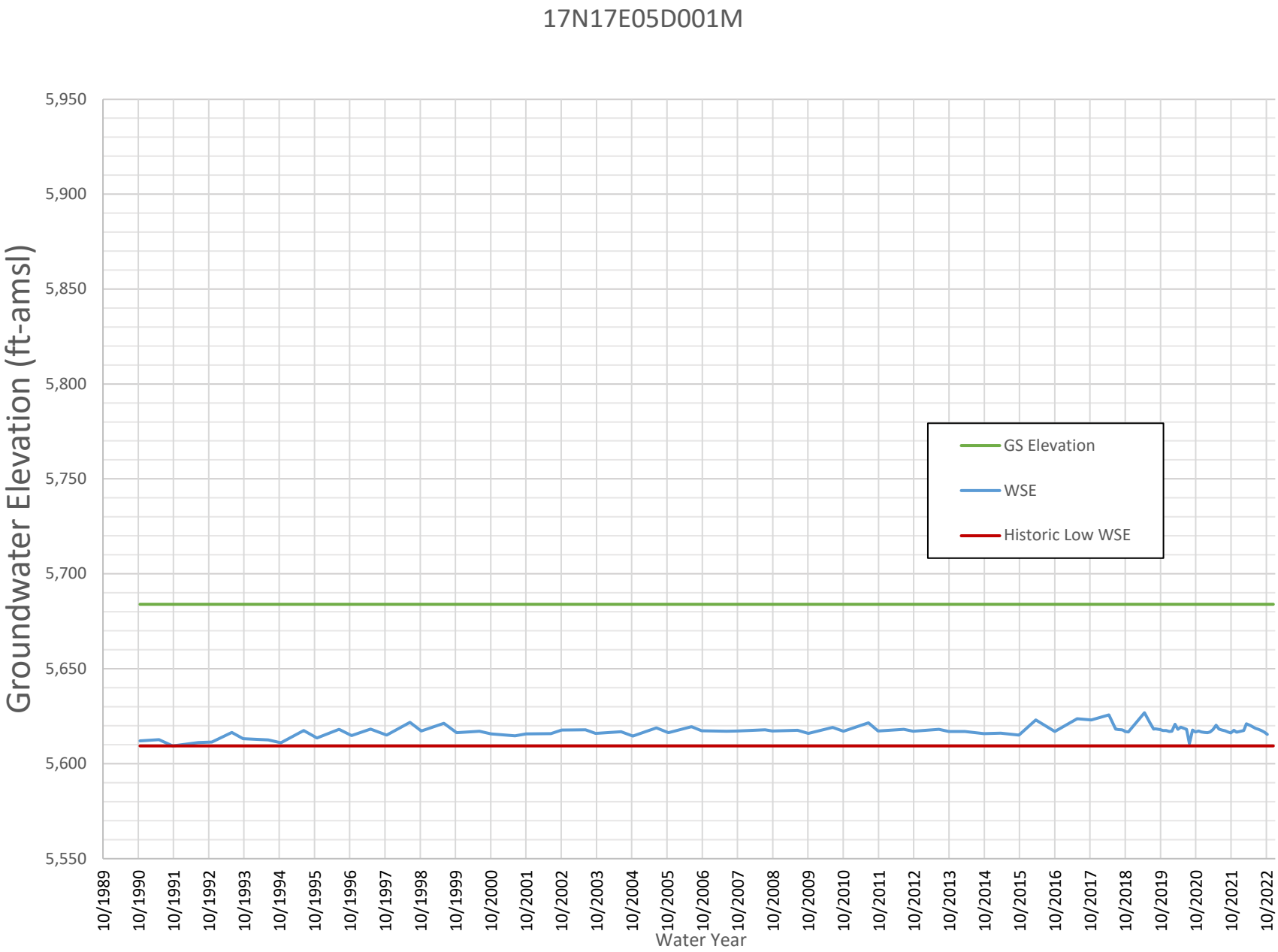
Historic Low WSE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5,900
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5,600
5,550
GS Elevation
WSE
Historic Low WSE
10/1989
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10/2019
10/2020
10/2021
10/2022
Water Year