MONTGOMERY
& ASSOCIATES
Water Resource Consultants

March 27, 2024

Santa Cruz Mid-County Basin Water Year 2023 Annual Report

Prepared for:

SANTA CRUZ MID-COUNTY GROUNDWATER AGENCY

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Prepared by:

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ACRONYMS & ABBREVIATIONS

AF .....acre feet
AFY.....acre-feet per year
ASR.....Aquifer Storage and Recovery
amsl.....above mean sea level
Basin .....Santa Cruz Mid-County Basin
cfs.....cubic feet per second
County.....County of Santa Cruz
CWD .....Central Water District
DSWMAR.....Distributed Storm Water Managed Aquifer Recharge
DWR .....California Department of Water Resources
EIR .....Environmental Impact Report
GSP .....Groundwater Sustainability Plan
MGA .....Santa Cruz Mid-County Groundwater Agency
mg/L.....milligrams per liter
MO .....measurable objective
MT.....minimum threshold
Model .....Santa Cruz Mid-County Basin's integrated surface water/groundwater model
PWS .....Pure Water Soquel Groundwater Replenishment and Seawater Intrusion Prevention Project
RMP .....representative monitoring point
SCWD……City of Santa Cruz Water Department
SCWWTF .....Santa Cruz Wastewater Treatment Facility
SGMA.....Sustainable Groundwater Management Act
SMC .....sustainable management criteria
SqCWD.....Soquel Creek Water District
SWIP .....Seawater Intrusion Prevention
µg/L.....micrograms per liter
WUF.....water use factor
WY .....Water Year (October 1 – September 30)

EXECUTIVE SUMMARY

The Santa Cruz Mid-County Groundwater Agency (MGA) is required to submit an annual report for the Santa Cruz Mid-County Basin (Basin) to the California Department of Water Resources (DWR) by April 1 of each year following the MGA's 2019 adoption of its Groundwater Sustainability Plan (GSP or Plan). DWR approved the GSP on June 3, 2021 (DWR, 2021). This fifth annual report covers Water Year (WY) 2023 which is from October 1, 2022, to September 30, 2023.

As described in the GSP, DWR lists the Basin as a high priority basin in critical overdraft. A high priority designation indicates that water users in the Basin have high dependence on groundwater. The Basin is listed in critical overdraft principally because active seawater intrusion impacts its productive aquifers due to over-pumping. The MGA's sustainability goal is to manage groundwater to ensure beneficial uses and users have access to a safe and reliable groundwater supply that meets current and future Basin demand without causing undesirable results in order to:

- Ensure groundwater is available for beneficial uses and a diverse population of beneficial users
- Protect groundwater supply against seawater intrusion
- Prevent groundwater overdraft within the Basin and resolve problems resulting from prior overdraft
- Maintain or enhance groundwater levels where groundwater dependent ecosystems exist
- Maintain or enhance groundwater contributions to streamflow
- Ensure operational flexibility within the Basin by maintaining a drought reserve
- Support reliable groundwater supply and quality to promote public health and welfare
- Account for changing groundwater conditions related to projected climate change and sea level rise in Basin planning and management
- Do no harm to neighboring groundwater basins in regional efforts to achieve groundwater sustainability

WY 2023 was a wet water year influenced by a series of atmospheric rivers that occurred late December through March. While precipitation readily recharges groundwater in unconfined aquifers, coastal groundwater levels in the semi-confined to confined Purisima aquifers do not typically show a clear response to annual changes in recharge from precipitation because recharge areas are some distance from the coast. Instead, groundwater levels respond more directly to

changes in groundwater extraction than precipitation. Even though WY 2023 groundwater extraction was the second lowest on record, groundwater levels at most monitored wells increased only slightly or remained similar to the previous year. The wet year, however, did result in a substantial 5,229 acre-feet (AF) basin-wide increase of groundwater in storage, primarily in unconfined areas away from the coast.

Total water used in WY 2023 is 8,255 AF: 86% municipal use (7,057 AF), 8% private domestic use (662 AF), 3% intuitional use (271 AF), and 3% agricultural use (265 AF). Groundwater supplies 59% of total water use with the remaining water coming from surface water sources outside of the Basin. The distribution of usage is similar to previous years.

The Basin continues to be in a state of overdraft thereby presenting a significant and unreasonable risk of seawater intrusion. There are undesirable results for seawater intrusion because 7 coastal representative monitoring points (RMPs) have 5-year moving average groundwater elevations below their respective minimum threshold (MT) groundwater elevation proxies. For these 7 RMPs, the 5-year moving averages remained similar to the previous year. Chloride concentrations at 5 RMP for seawater intrusion, all screened in the Purisima F-unit, in the southeastern portion of the Basin exceeded MTs for seawater intrusion. Of these 5 RMPs, 4 exceeded the MT in 2 or more of the last 4 consecutive samples, which constitutes an undesirable result for seawater intrusion. Increasing chloride trends in the RMPs indicate advancing movement of seawater intrusion. This condition has triggered early management action of reducing nearby municipal pumping, which has been in place for several years with little effect. Based on recommendations from last year's annual report, the MGA is investigating potential causes of increasing chlorides in the Seascape area. Preliminary findings are that private irrigation and municipal wells extracting groundwater from the overlying Aromas Red Sands may be causing vertical migration of seawater in the Purisima F unit. Further work will be needed to sample private wells in the area to expand understanding of chloride distribution and to conduct a land-based electromagnetic survey to delineate the inland extent of seawater intrusion to better inform actions to protect the Basin from seawater intrusion.

In WY 2023, groundwater elevations at 1 of 5 RMPs are below groundwater elevation proxies for depletion of interconnected surface water. This is the same well where exceedances have occurred for the previous 2 years. Since undesirable results are defined as any depletion of interconnected surface water RMP having groundwater elevations below its MT, undesirable results for surface water depletion are occurring.

There are no MT exceedances or undesirable results for the chronic lowering of groundwater levels and groundwater quality degradation sustainability indicators.

Net groundwater extraction remains greater than sustainable yields in 2 of 3 aquifer groups: Aromas Red Sands and Purisima F aquifer group and Purisima DEF, BC, A, and AA aquifer group.

Projects included in the GSP that recharge water or provide for alternative supplies, are expected to reduce net groundwater pumping below sustainable yield and reduce undesirable results once they are implemented. Work to plan and implement these projects continued in WY 2023. The projects include the following:

- Pure Water Soquel (PWS) – Construction of treatment plant, pipelines, and Seawater Intrusion Prevention (SWIP) wells by Soquel Creek Water District (SqCWD) is expected to be completed by the end of 2024.
- Aquifer Storage and Recovery (ASR) – The City of Santa Cruz Water Department (SCWD) expects to receive California State Water Resources Control Board action early in calendar year 2024 on water rights petitions for change that will lead to phased implementation of full-scale ASR at the SCWD's existing Beltz wells. The SCWD is currently in the design phase for permanent modifications to convert 2 existing wells to permanent ASR wells and begun pilot testing a third existing extraction well for potential ASR.
- Water Transfers / In-Lieu Groundwater Recharge – an extension of the pilot project agreement between the SCWD and SqCWD runs through May 1, 2026.

1 INTRODUCTION

1.1 Purpose of Annual Report

This annual report is a requirement of Water Code §10733.6 and pertains to the Sustainable Groundwater Management Act (SGMA). As the groundwater sustainability agency for the Santa Cruz Mid-County Basin (Basin), the Santa Cruz Mid-County Groundwater Agency (MGA) is required to submit an annual report to the California Department of Water Resources (DWR) by April 1 of each year following the adoption of its Groundwater Sustainability Plan (GSP or Plan). The MGA Board of Directors unanimously adopted the final GSP after a public hearing on November 21, 2019. The GSP was submitted online to DWR on January 30, 2020, and posted for public comment by DWR on February 19, 2020. DWR approved the GSP on June 3, 2021.

The purpose of annual reports is to demonstrate to DWR during GSP implementation that progress is being made toward meeting interim milestones that are defined in the GSP and that lead to achieving groundwater sustainability. The content requirements of the annual report are outlined in §356.2 of the GSP Regulations.

This fifth annual report covers Water Year (WY) 2023 (October 1, 2022, through September 30, 2023) and includes a description of basin conditions through text, hydrographs, contour maps, estimation of change in groundwater in storage, and distribution of groundwater extraction across the Basin. A comparison of WY 2023 groundwater data against sustainable management criteria (SMC) is provided as a measure of the Basin's progress toward the sustainability goal that must be reached by January 2040.

1.2 Santa Cruz Mid-County Groundwater Sustainability Agency

The MGA was created in March 2016 under a Joint Exercise of Powers Agreement. The MGA is governed by an 11-member Board of Directors consisting of representatives from each member agency and private well representatives within the boundaries of the MGA. The MGA Board is composed of the following:

- Two representatives from the Central Water District (CWD) appointed by the CWD Board of Directors
- Two representatives from the City of Santa Cruz appointed by the City of Santa Cruz City Council
- Two representatives from the County of Santa Cruz (County) appointed by the County of Santa Cruz Board of Supervisors

- Two representatives from the Soquel Creek Water District (SqCWD) appointed by the SqCWD Board of Directors
- Three representatives of private well owners in the Basin appointed by majority vote of the 8 public agency MGA directors

In addition, an alternate representative for each member agency and for the private well owners are appointed to act in the absence of a representative at Board meetings.

The MGA's jurisdictional area coincides exactly with the Santa Cruz Mid-County Basin depicted on Figure 1.

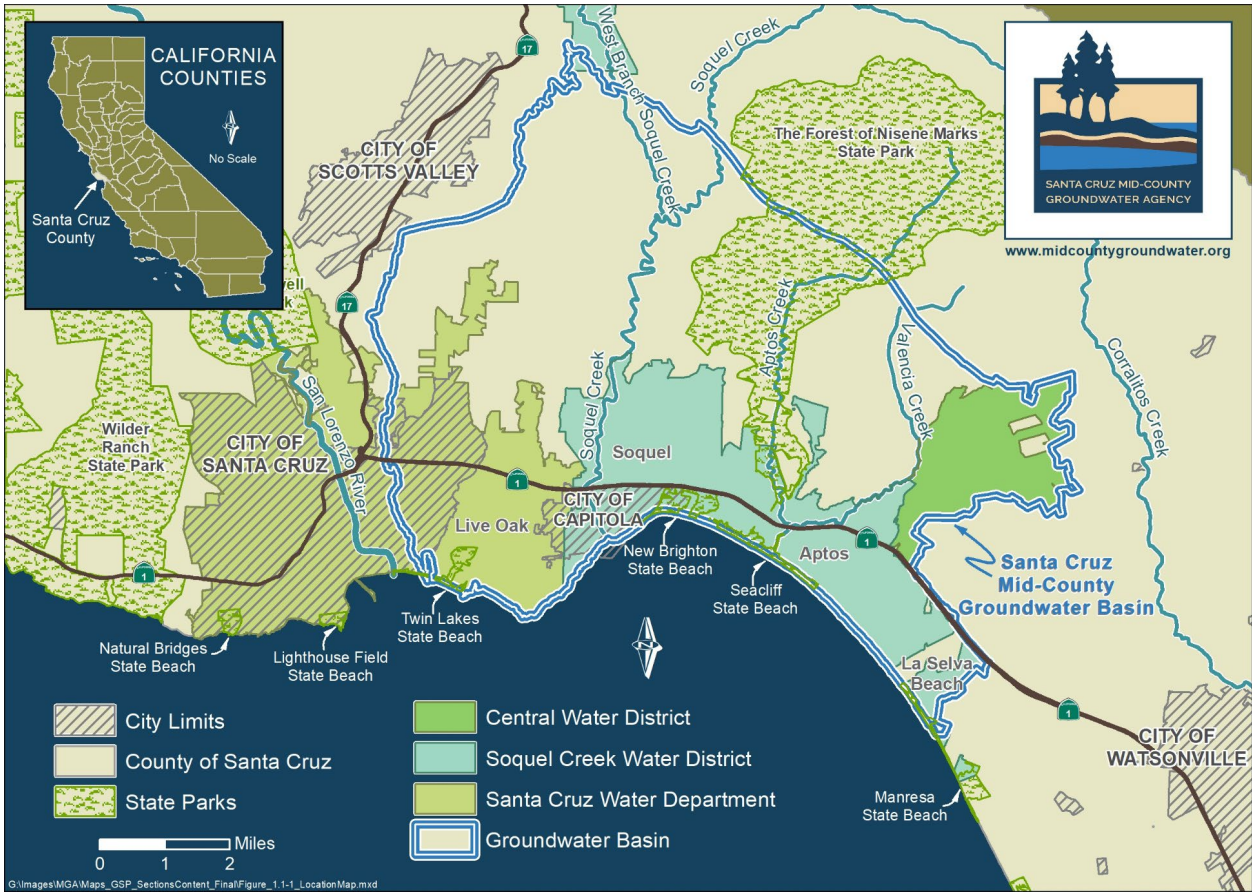

Figure 1. Santa Cruz Mid-County Basin Boundaries

1.3 Basin Description

The Santa Cruz Mid-County Basin is identified by DWR as Basin 3-001 in Bulletin 118 Update 2020 (DWR, 2020). The Basin extends from the Santa Cruz Mountains to the Pacific Ocean and from the edge of the City of Santa Cruz near Twin Lakes in the west to La Selva Beach in the east (Figure 1). The Basin includes portions of the City of Santa Cruz, the entire City of Capitola, and Santa Cruz County census designated places of Twin Lakes, Live Oak, Pleasure Point, Soquel, Seacliff, Aptos, and Rio Del Mar. The Basin also includes portions of Santa Cruz County unincorporated census designated places of Day Valley, Corralitos, Aptos Hills-Larkin Valley, and La Selva Beach (DWR, 2020).

The Basin boundary includes all areas where the stacked aquifer system of the Purisima Formation, Aromas Red Sands, and certain other Tertiary-age aquifer units underlying the Purisima Formation constitute the shared groundwater resource managed by the MGA. The Basin is defined by both geologic and jurisdictional boundaries. Basin boundaries to the west are primarily geologic. Basin boundaries to the east, adjacent to the Pajaro Valley Subbasin managed by Pajaro Valley Water Management Agency, are primarily jurisdictional.

As described in the GSP, DWR lists the Basin as a high priority basin in critical overdraft. The high priority designation indicates that water supply in the Basin has high dependence on groundwater. The Basin is listed in critical overdraft principally because active seawater intrusion impacts its productive aquifers as a result of historical over-pumping of the aquifers.

2 BASIN CONDITIONS

2.1 Precipitation and Water Year Type

Precipitation reported at the Santa Cruz Cooperative climate station in WY 2023 was 45.7 inches. This represents 153% of the 29.9 inches per year long-term average annual precipitation since WY 1942. Figure 2 charts annual rainfall at the Santa Cruz Cooperative climate station and water year type from WY 1984 to WY 2023. The annual average rainfall since WY 1984 of 29.1 inches shown on Figure 2 is lower than the long-term average of 29.9 inches starting in WY 1942.

The water year type in the Santa Cruz area is based on a classification used by the City of Santa Cruz Water Department (SCWD). The classification uses total annual runoff in the San Lorenzo River, the SCWD's most important water source, measured at the Big Trees gage in the Santa Margarita Basin. Under this classification system, WY 2023 is classified as a wet year. It follows a normal year that was preceded by a critically dry year in WY 2021 and a dry year in WY 2020. Water year type is shown on Figure 2.

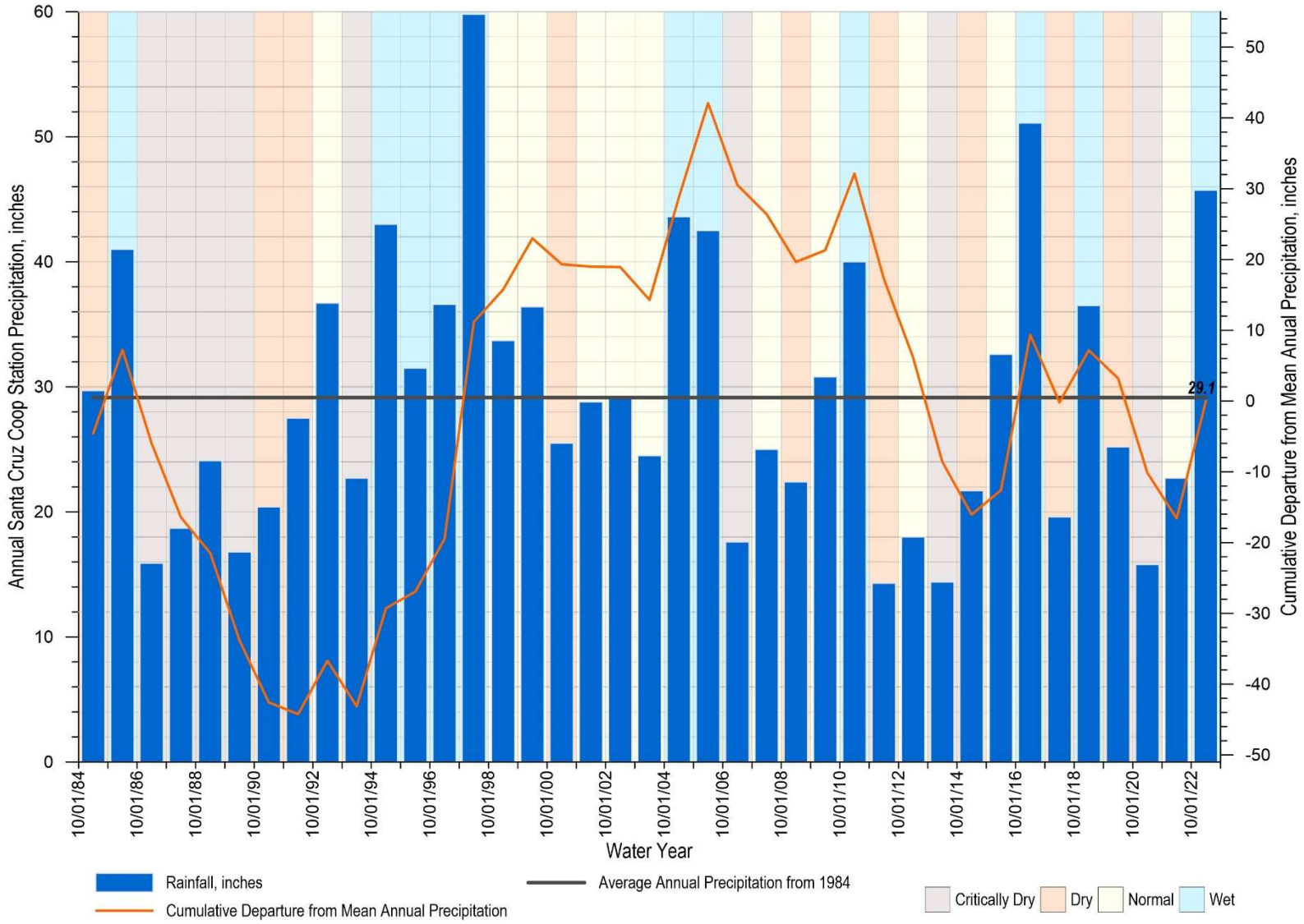

Figure 2. Annual Precipitation and Cumulative Change in Precipitation at Santa Cruz Cooperative Climate Station with Water Year Type

2.2 Surface Water Flow

High winter flows and a significant recession period in the spring and summer led to much greater than average monthly and cumulative streamflow in Soquel Creek for WY 2023. Streamflow at the Soquel Creek at Soquel gage peaked on December 31, 2022, through January 9, 2023, before a second peak on March 10, 2023 (Figure 3). After the March peak, streamflow gradually subsided for the remainder of the water year. Flows at the end of the water year were 4.13 cubic feet per second (cfs) greater than the beginning of the water year. Monthly and cumulative mean streamflow for WY 2023 is compared to the 30-year (WY 1993 to WY 2022) monthly and cumulative average streamflow on Figure 4. Cumulative WY 2023 streamflow was 88,500 AF, which is about 295% of the 30-year cumulative average of 30,000 AF. The monthly streamflow was greater than average in every month except October and November.

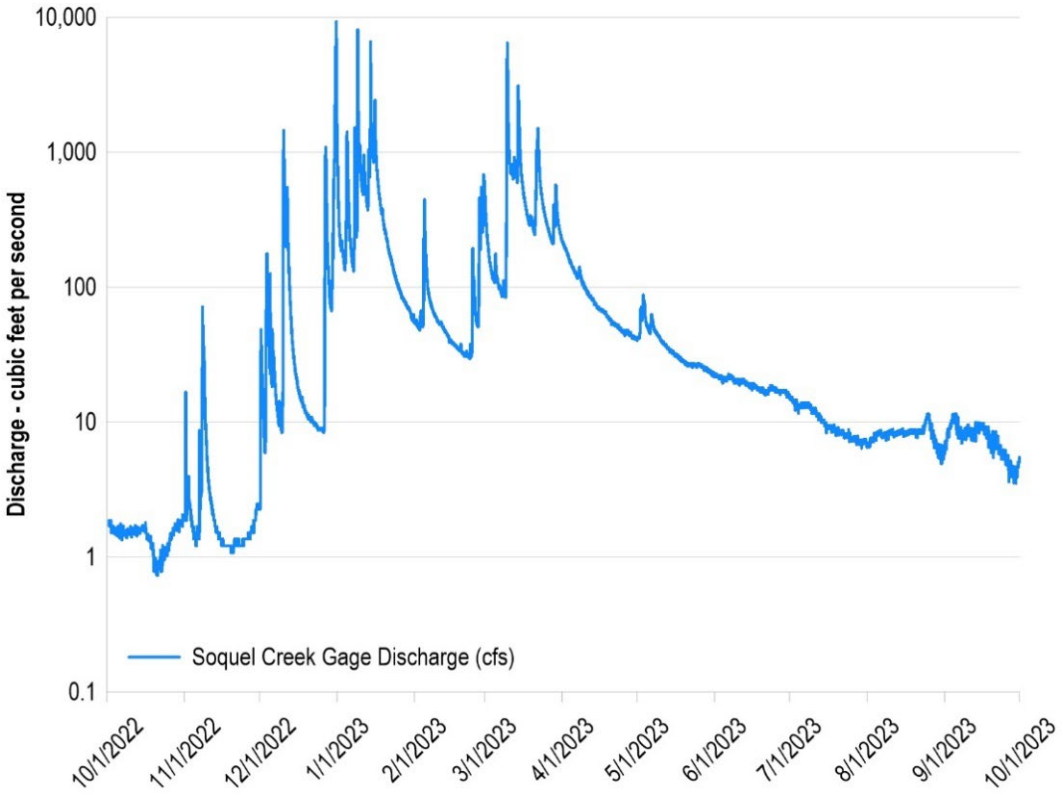

Figure 3. WY 2023 Streamflow at the USGS Soquel Creek at Soquel Streamflow Gage

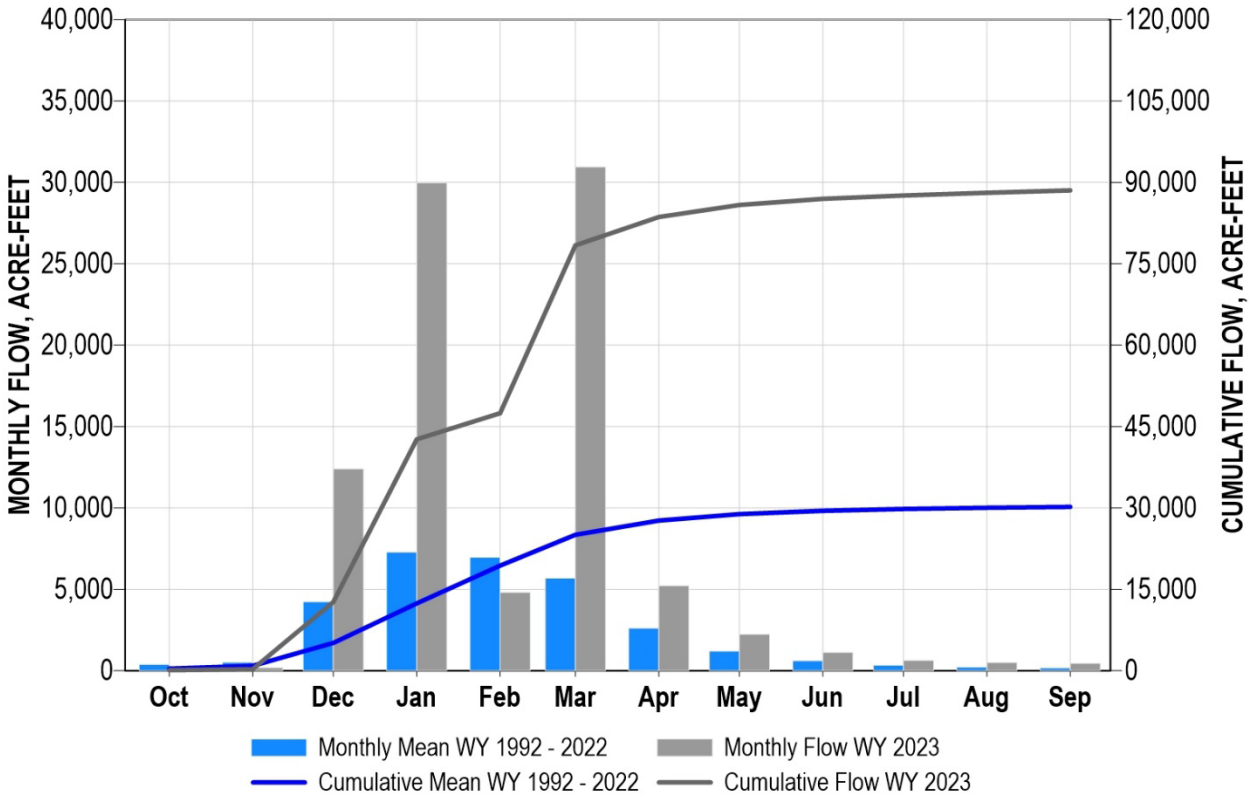

Figure 4. WY 2023 and 30-year Mean Monthly and Cumulative Runoff at USGS Soquel Creek at Soquel Streamflow Gage

2.3 Groundwater Elevations

Contour maps representing spring and fall groundwater elevations for WY 2023 in each principal aquifer are included on Figure 5 through Figure 14. Spring groundwater elevations represent seasonal high conditions while fall groundwater elevations represent seasonal low conditions.

The contour maps intend to represent average conditions for the spring and fall seasons in the aquifer units. Sustainability with respect to seawater intrusion is evaluated based on average groundwater elevations. Therefore, data used for the contour maps are based on the following:

- Average transducer groundwater elevations calculated over March (spring) or September (fall) from monitoring wells, where available.
- Manual monthly measurements from monitoring wells where transducer data are not available, which less comprehensively represent conditions over time but are the best available representation of seasonal average conditions in absence of transducer data.
- Groundwater elevations from monitoring wells adjacent to production wells. Using average groundwater elevations calculated from transducer data that include levels

recorded when the adjacent production well is pumping is the best representation of conditions in the aquifer over this time period.

- Static groundwater elevations from production wells without adjacent monitoring wells. Pumping groundwater elevations from production wells are not representative of groundwater elevations in the aquifers due to pumping inefficiencies. Therefore, static groundwater elevations are preferable over pumping elevations, but remain less representative than average groundwater elevations from adjacent monitoring wells. Static elevations are therefore the best available representation of seasonal average aquifer conditions for these locations without adjacent monitoring wells.

Contour maps include minimum threshold (MT) groundwater elevation proxies labeled in green text at representative monitoring points (RMP) for seawater intrusion. RMPs with MT groundwater elevation proxies for seawater intrusion are included only for the principal aquifer unit where nearby municipal pumping takes place. This is because municipal pumping wells are assumed to be the deepest wells in the coastal areas. MT groundwater elevation proxies are labeled for reference only as contours representing seasonal conditions cannot be used to evaluate exceedances of MT and undesirable results. For that purpose, 5-year moving average groundwater elevations at seawater intrusion RMPs are compared to the MT as described in Section 3.3.

Hydrographs updated through WY 2023 for RMPs and other monitoring network wells used to evaluate Basin conditions are provided in Appendix A. The hydrographs indicate the water year type and extend back through the full period of record for each well. MTs and measurable objectives (MOs) for RMPs are included on the hydrographs (Figures A-1 through A-40).

Hydrographs in Appendix A are grouped based on the sustainability indicator for which groundwater elevations are used as SMC as follows:

- Figures A-1 through A-17: Chronic Lowering of Groundwater Levels
- Figures A-18 through A-34: Seawater Intrusion Groundwater Elevation Proxies
- Figures A-35 through A-39: Depletion of Interconnected Surface Water Groundwater Elevation Proxies
- Figures A-40 through A-171: Wells in Monitoring Network not used as RMPs for Groundwater Elevations

WY 2023 is classified as a wet year, providing relief from 3 preceding years of average or below average rainfall that limited aquifer recharge. Coastal groundwater levels in the semi-confined to confined Purisima aquifers do not typically show a clear response to annual changes in recharge because of their distance from recharge areas, depth, and confinement. Instead, groundwater

levels respond more directly to changes in groundwater extraction than precipitation. A decade-long period (WY 2005-2014) of increasing groundwater levels corresponding with reduced extraction was followed by a period of relatively stable and high groundwater levels during a period of historically low extraction (WY 2015-2020). Elevations then declined overall in WY 2021, potentially in response to increased extraction and continued dry conditions. In WY 2022, groundwater elevations at most wells declined or remained similar to the previous year. In WY 2023, groundwater elevations at most wells increased slightly or remained similar to the previous year.

2.3.1 Aromas Red Sands

Contour maps for the Aromas Red Sands are shown on Figure 5 and Figure 6 for spring (March) and fall (September), respectively. Both spring and fall groundwater elevations, including CWD and SqCWD production wells, have stable groundwater elevations relative to last year. Spring and fall groundwater elevations were unavailable for SqCWD's Country Club Well as it was out of service during the construction of the new Country Club 2 well. Fall static groundwater elevations for CWD-A could not be collected because each time the well was visited there was nearby pumping from CWD-12.

Groundwater generally flows toward the coast with local pumping effects at CWD's Rob Roy wellfield (CWD #4, CWD #10 and CWD #12) and SqCWD's Bonita and San Andreas production wells. Some inflows to the Basin are from the Pajaro Valley Subbasin inland of SqCWD's service area. Groundwater also appears to flow southeast out of the Basin into the Pajaro Valley Subbasin. Groundwater elevations in the Aromas Red Sands are above sea level but between 3 and 8 feet above sea level near the coast. At the SC-A3A seawater intrusion RMP, spring and fall WY 2023 groundwater elevations and the 5-year moving average are above the seawater intrusion MT (Appendix A; Figure A-18).

2.3.2 Purisima F and DEF Units

Contour maps for the Purisima F and DEF units are shown on Figure 7 and Figure 8 for spring (March) and fall (September), respectively. The contour maps show localized pumping depressions around the production wells. Extraction from Bonita and San Andreas wells and around the T. Hopkins and Granite Way wells remained similar in WY 2023 compared to WY 2022 resulting in similar sized pumping depressions. Contours show groundwater in the Purisima F and DEF units generally flows toward the coast even with localized pumping depressions. There is also groundwater flow in the Purisima F and DEF units into the Basin from the Pajaro Valley Subbasin.

Groundwater elevations at most coastal wells generally increased or remained similar to the previous year. At SC-A8A, fall and spring elevations and the 5-year moving average remain below the MT (Appendix A; Figure A-20). The other 3 coastal RMP wells in the Purisima F and DEF units have groundwater elevations in the spring and fall as well as 5-year moving averages above respective seawater intrusion MTs.

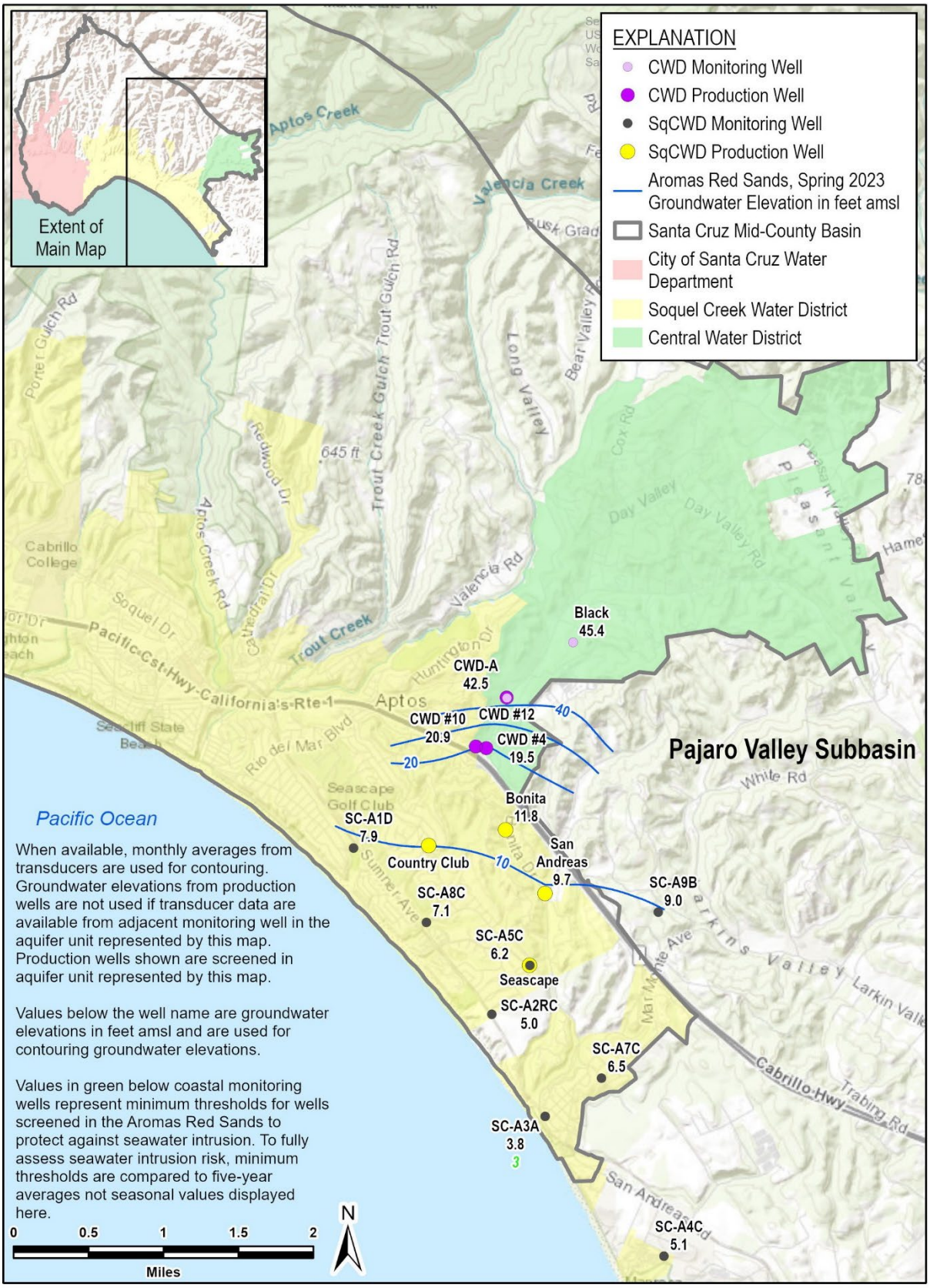

Figure 5. Aromas Red Sands Groundwater Elevations, Spring 2023

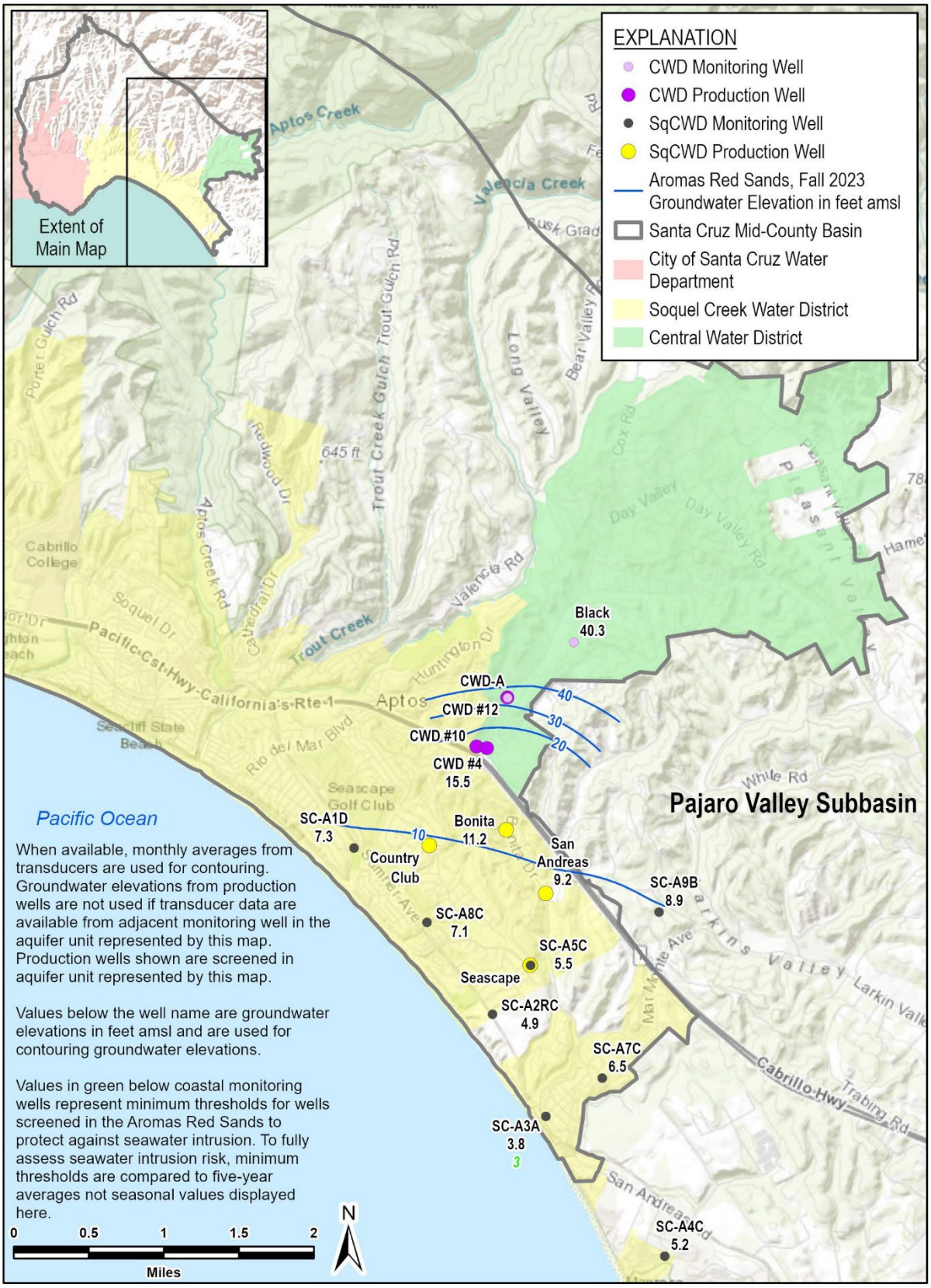

Figure 6. Aromas Red Sands Groundwater Elevations, Fall 2023

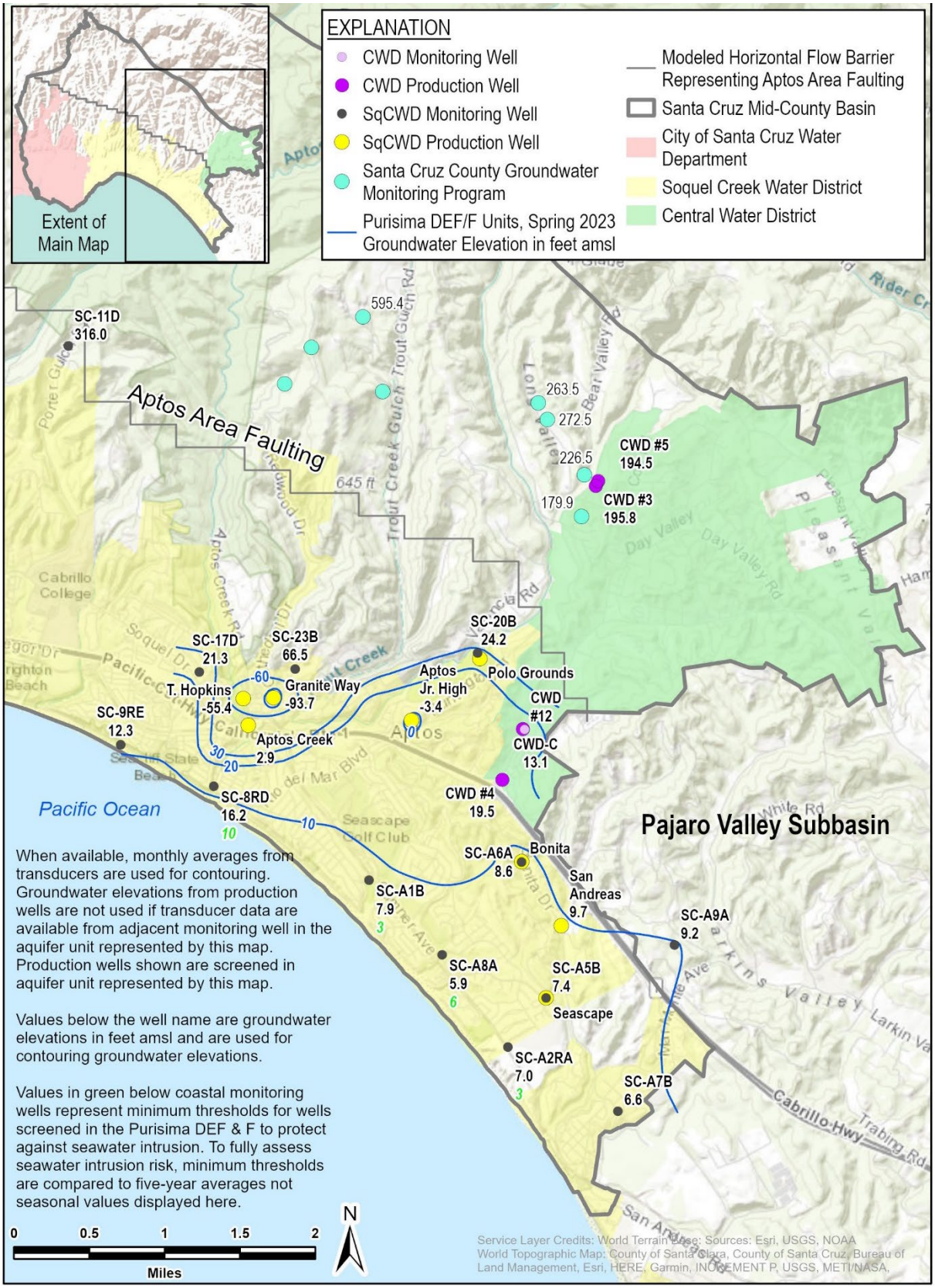

Figure 7. Purisima F and DEF Unit Groundwater Elevations, Spring 2023

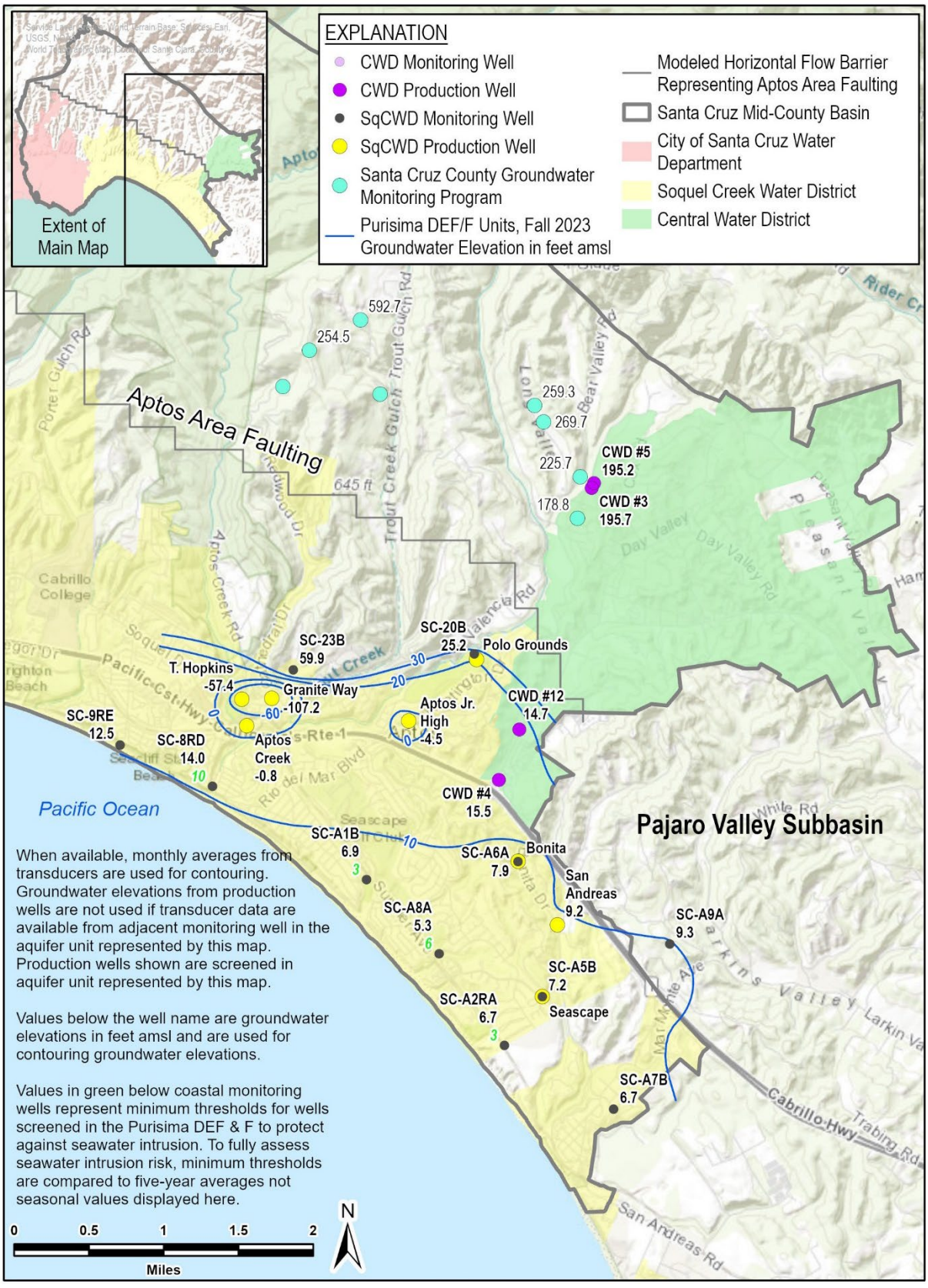

Figure 8. Purisima F and DEF Unit Groundwater Elevations, Fall 2023

2.3.3 Purisima BC Unit

Contour maps for the Purisima BC unit are shown on Figure 9 and Figure 10 for spring (March) and fall (September), respectively. The maps show Sea Water Intrusion Prevention (SWIP) recharge well and PWS monitoring wells screened in the Purisima BC unit. Both contour maps show a prominent pumping depression around SqCWD's Ledyard, Madeline and Estates production wells. The pumping depression is more developed in the fall when demand is greatest. Contours indicate groundwater continues to flow from inland toward the pumping depression.

Spring and fall groundwater elevations at coastal Purisima BC unit monitoring wells remained similar to WY 2022. While spring groundwater elevations at SC-9RC are above the MT, the 5-year moving average groundwater elevations at RMPs SC-9RC and SC-8RB remain below the groundwater elevation as a proxy for seawater intrusion MTs (Appendix A; Figures A-23 and A-24).

2.3.4 Purisima A and AA Unit

Contour maps for the Purisima A and AA units are shown on Figure 11 and Figure 12 for spring (March) and fall (September), respectively. Groundwater generally flows from inland toward the coast with localized pumping depressions around SqCWD and SCWD production wells. Pumping depressions are more defined in the fall when demand is greatest, particularly at SqCWD's Main Street and Estates production wells (Appendix A; Figures A-60 and A-55). Relatively lower groundwater elevations also occur at an inland location around the SC-10RA (Appendix A; Figure A-39) monitoring well, potentially caused by non-municipal pumping since there are no nearby municipal wells.

Groundwater elevations at coastal RMPs SC-3RA and SC-5RA in the Purisima A unit in WY 2023 are above seawater intrusion MTs in both the spring and the fall (Appendix A; Figures A-25 and A-26), though the 5-year moving average groundwater elevations are below the groundwater elevation as a proxy for seawater intrusion MTs. At the coastal Purisima A unit Moran Lake, Pleasure Point Medium, and SC-1A RMPs, spring and fall groundwater elevations, as well as the 5-year moving average groundwater elevations, are higher than seawater intrusion MTs. Soquel Point Medium spring and fall groundwater elevations, as well as the 5-year moving average, continue to be below seawater intrusion MTs. Additionally, the Purisima AA unit Soquel Point Deep RMP continues to have a 5-year moving average below the seawater intrusion MT in WY 2023 (Appendix A; Figure A-32).

Groundwater mounding around Beltz #12 and Beltz #8 is evident on the WY 2023 spring contour map (Figure 11), though the mound around Beltz #12 is smaller than in WY 2022

because less water was stored during ASR demonstration testing. No recovery of stored water by Beltz #12 occurred in WY 2023. Coastal groundwater elevations generally increased from the previous year.

The maps show SWIP recharge wells and PWS monitoring wells screened in the Purisima A unit. In future reports when data are available, these wells will be used as contouring control points. PWS is not yet operational so managed recharge has yet to occur at the SWIP wells.

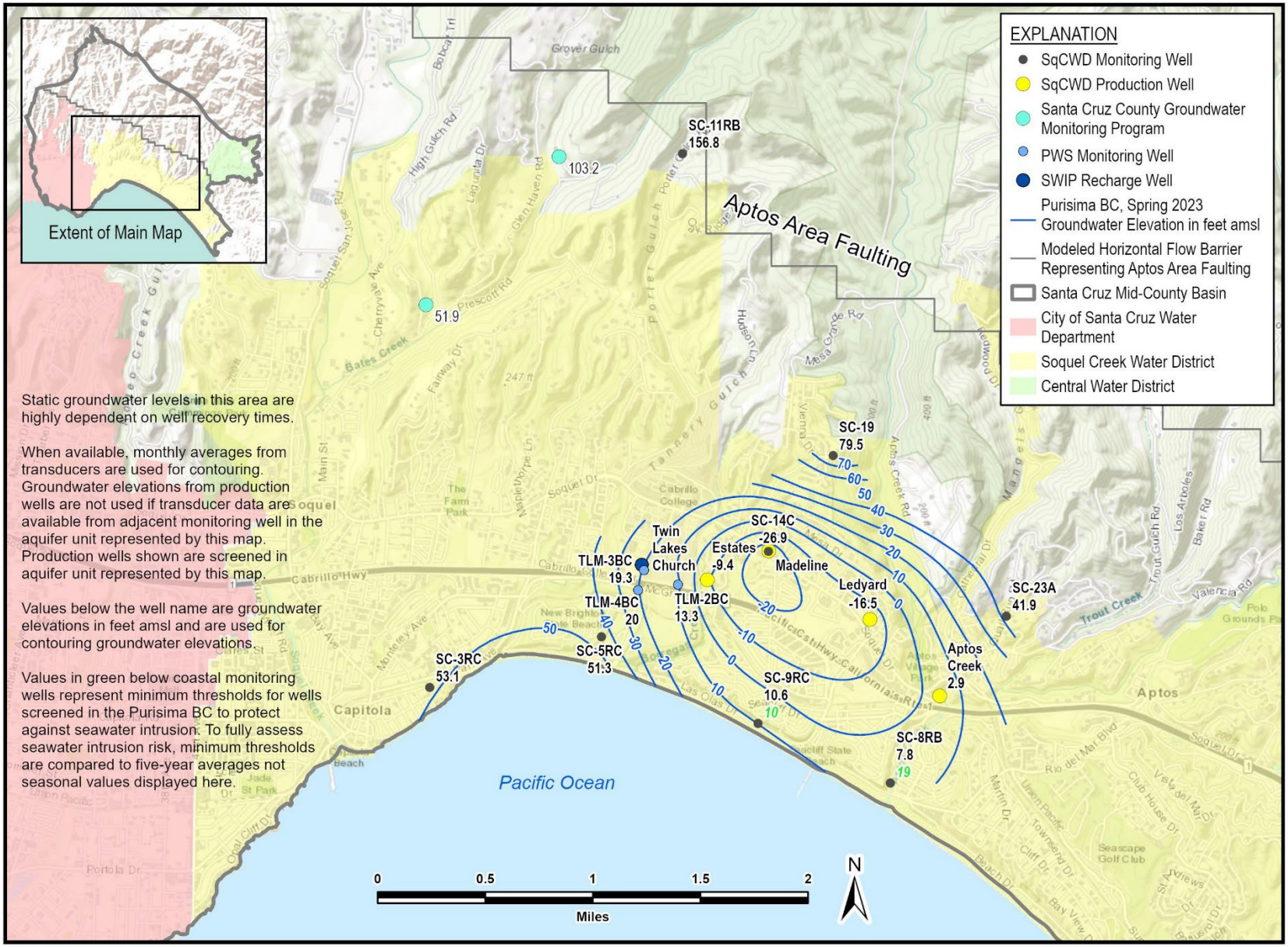

Figure 9. Purisima BC Unit Groundwater Elevations, Spring 2023

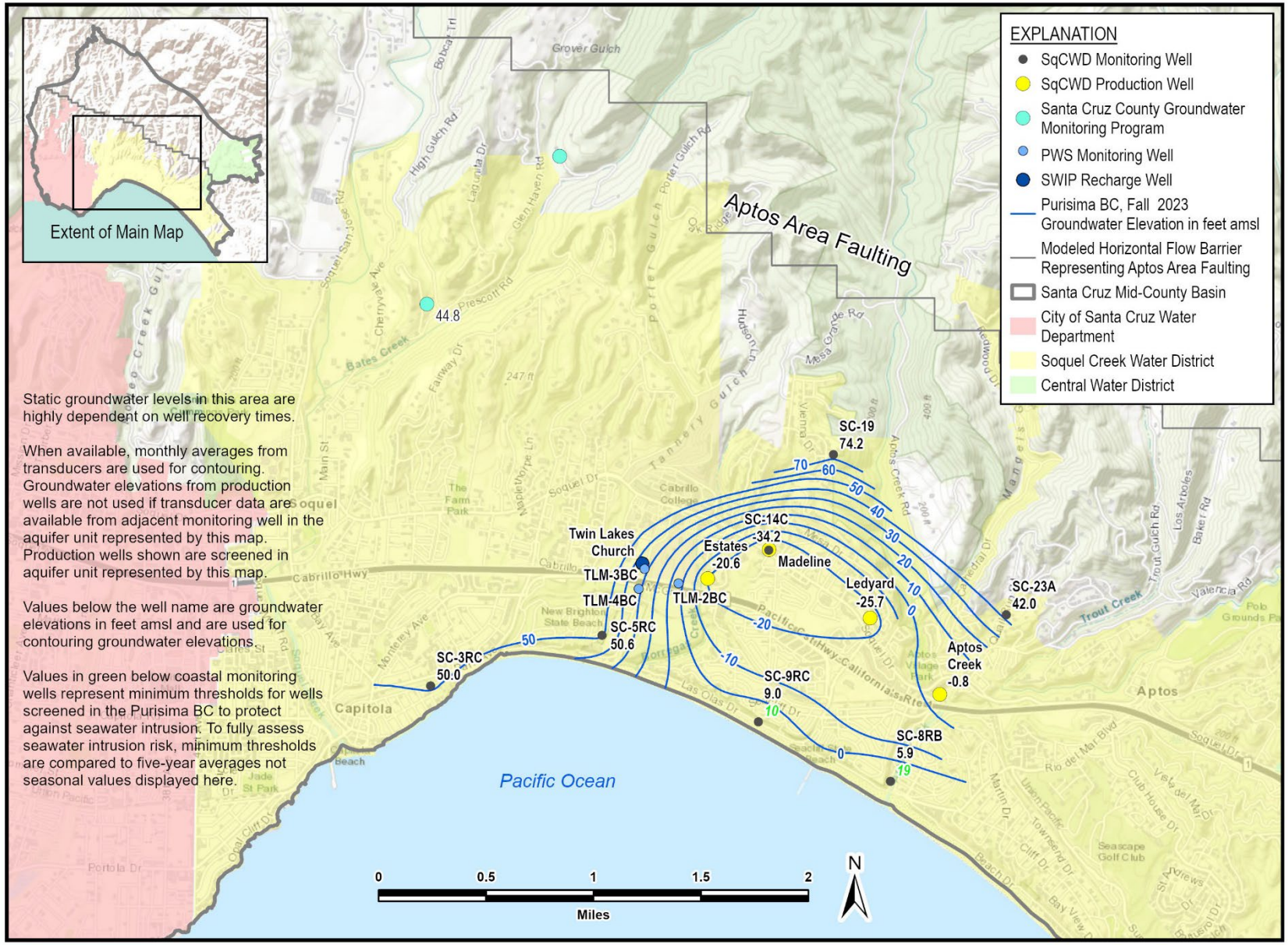

Figure 10. Purisima BC Unit Groundwater Elevations, Fall 2023

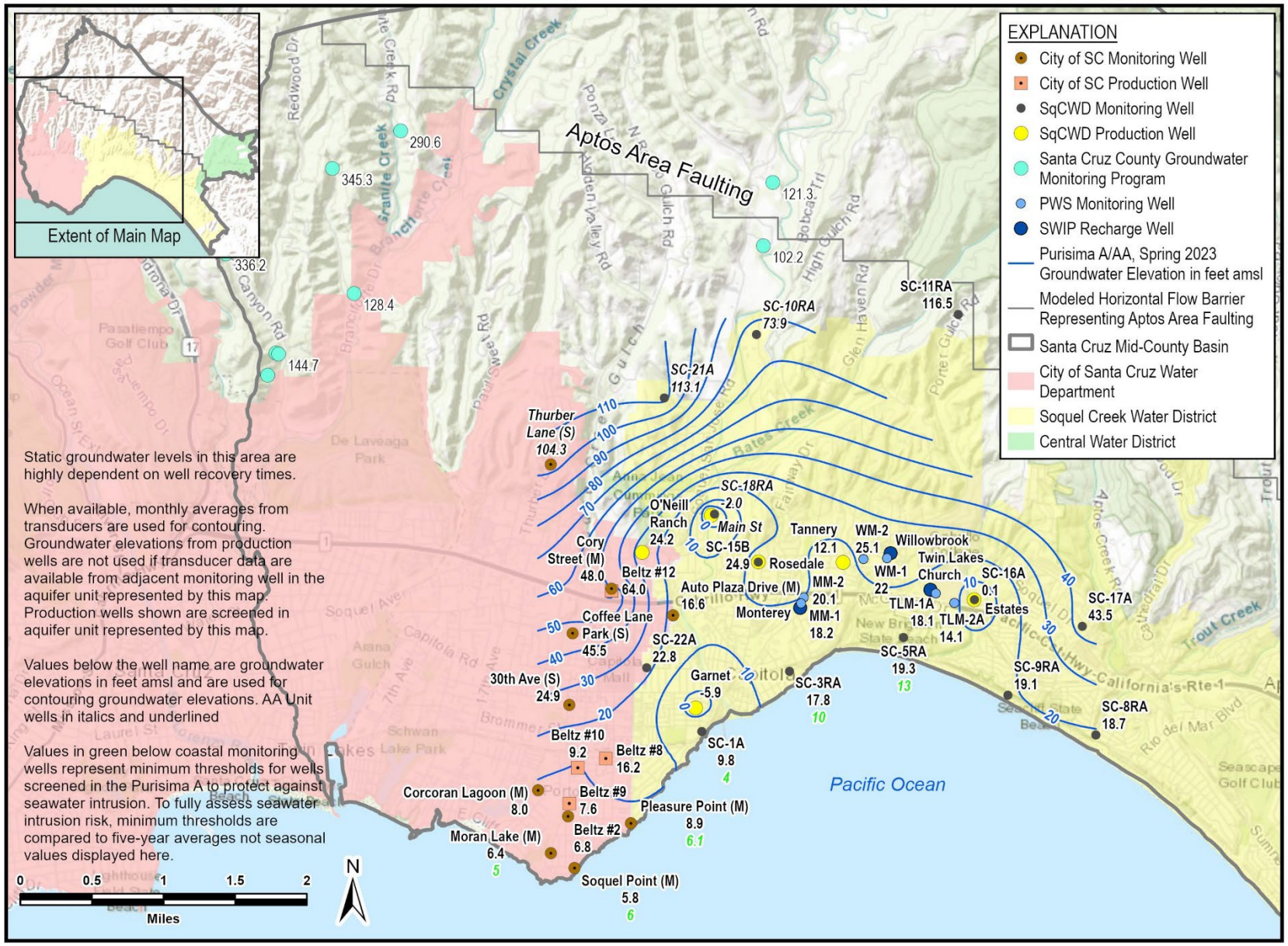

Figure 11. Purisima A and AA Unit Groundwater Elevations, Spring 2023

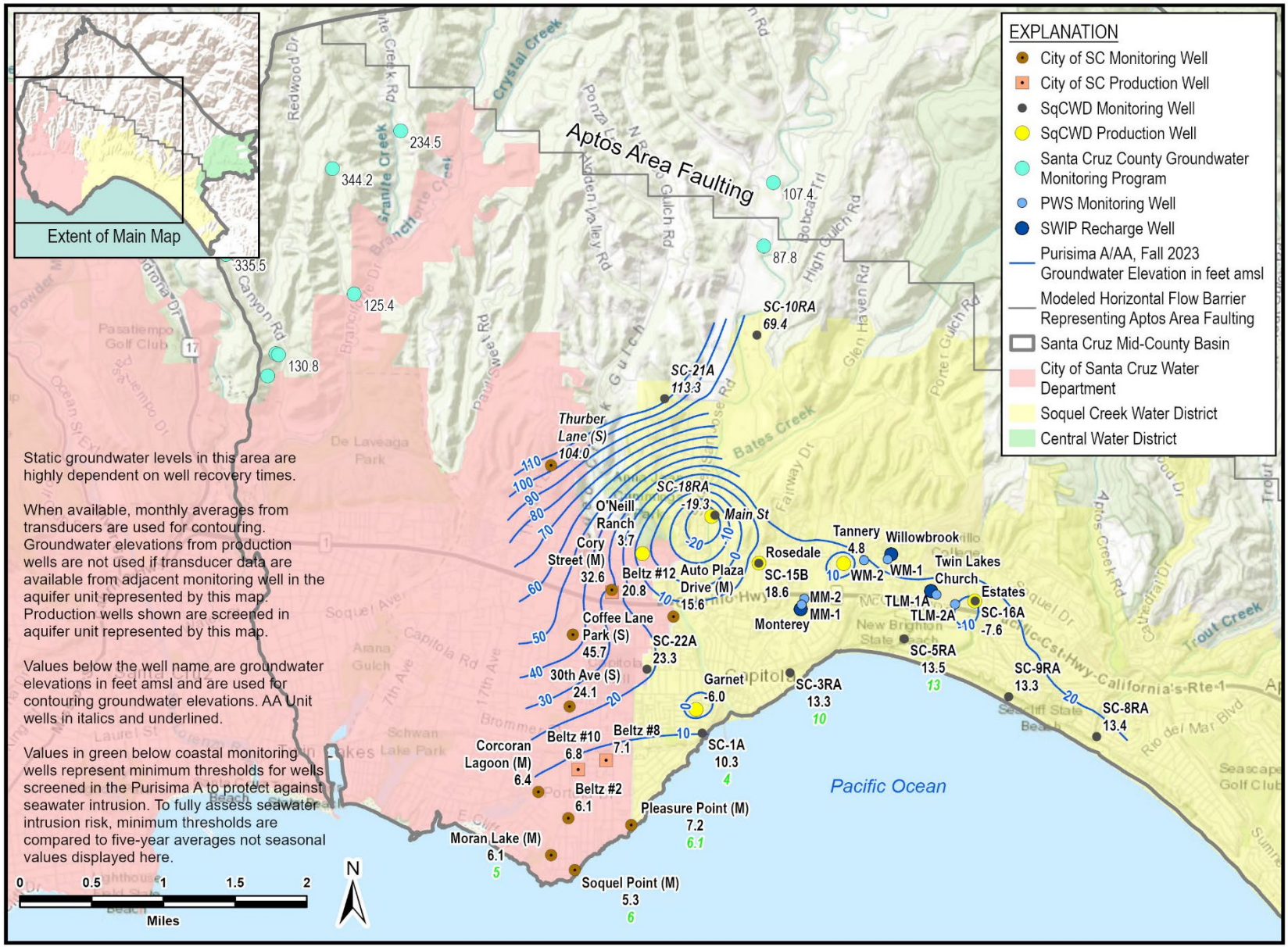

Figure 12. Purisima A and AA Unit Groundwater Elevations, Fall 2023

2.3.5 Tu Unit

Contour maps for the Tu unit are included on Figure 13 and Figure 14 for spring (March) and fall (September), respectively. Overall, groundwater flows toward the coast with localized spring and fall pumping depressions around SqCWD's Main Street municipal supply well.

The Tu unit contour maps show groundwater mounding due to ASR activities at Beltz #12. Spring groundwater elevations (Figure 13) around Beltz #12 are slightly lower than last year because it stored less water than in WY 2022. But fall groundwater elevations (Figure 14) are higher because the stored water was not recovered.

Spring groundwater elevations at coastal RMP well SC-13A dropped by about 10 feet from last spring but are approximately 8 feet above its seawater intrusion MT (Appendix A; Figure A-34). Fall groundwater elevations in SC-13A, when groundwater demand is greatest, are below the MT, even though levels are slightly higher than the previous year. The 5-year moving average groundwater elevation for SC-13A is 16.5 feet above mean sea level (amsl), continues to be below the MT.

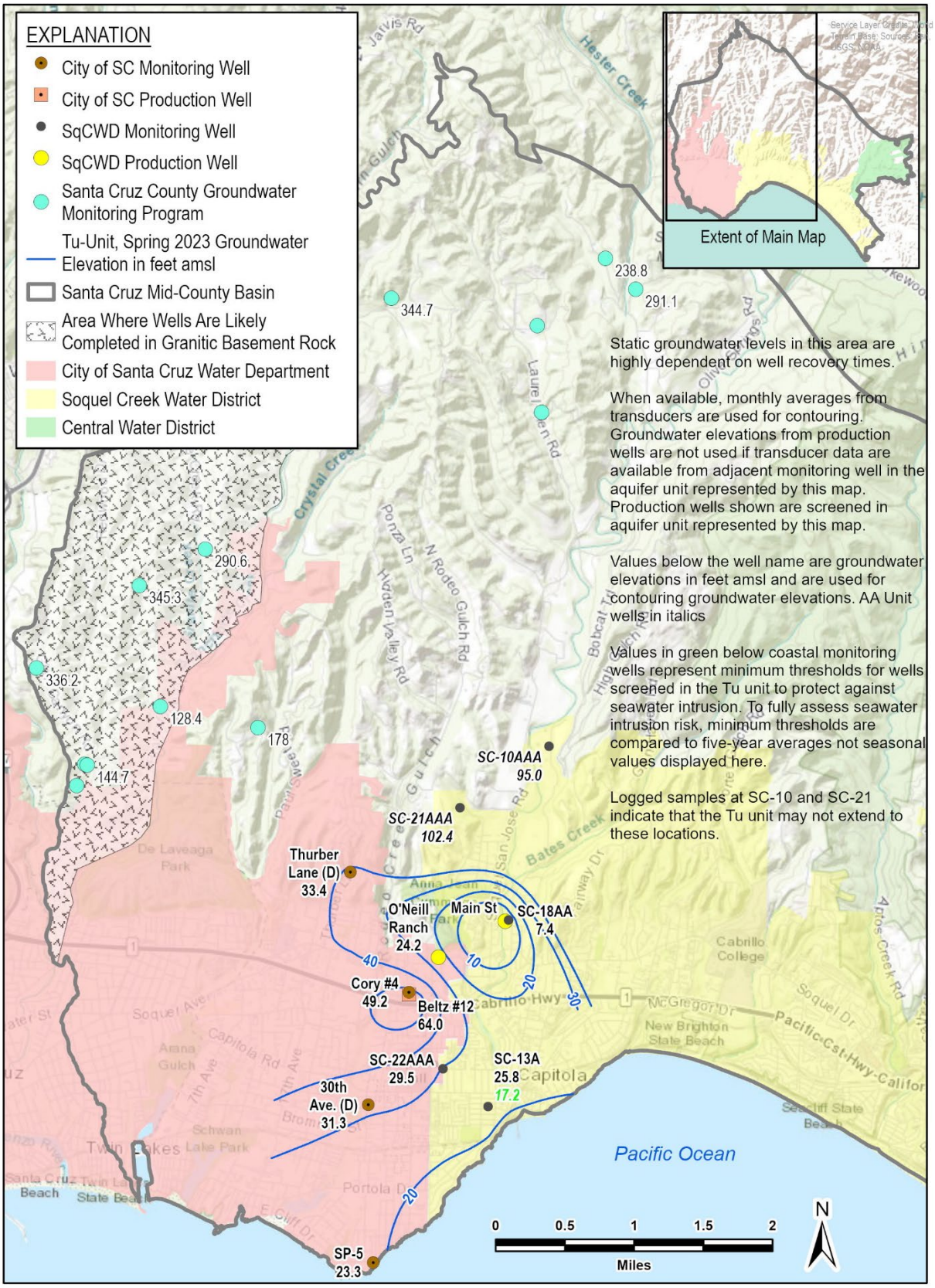

Figure 13.Tu Unit Groundwater Elevations, Spring 2023

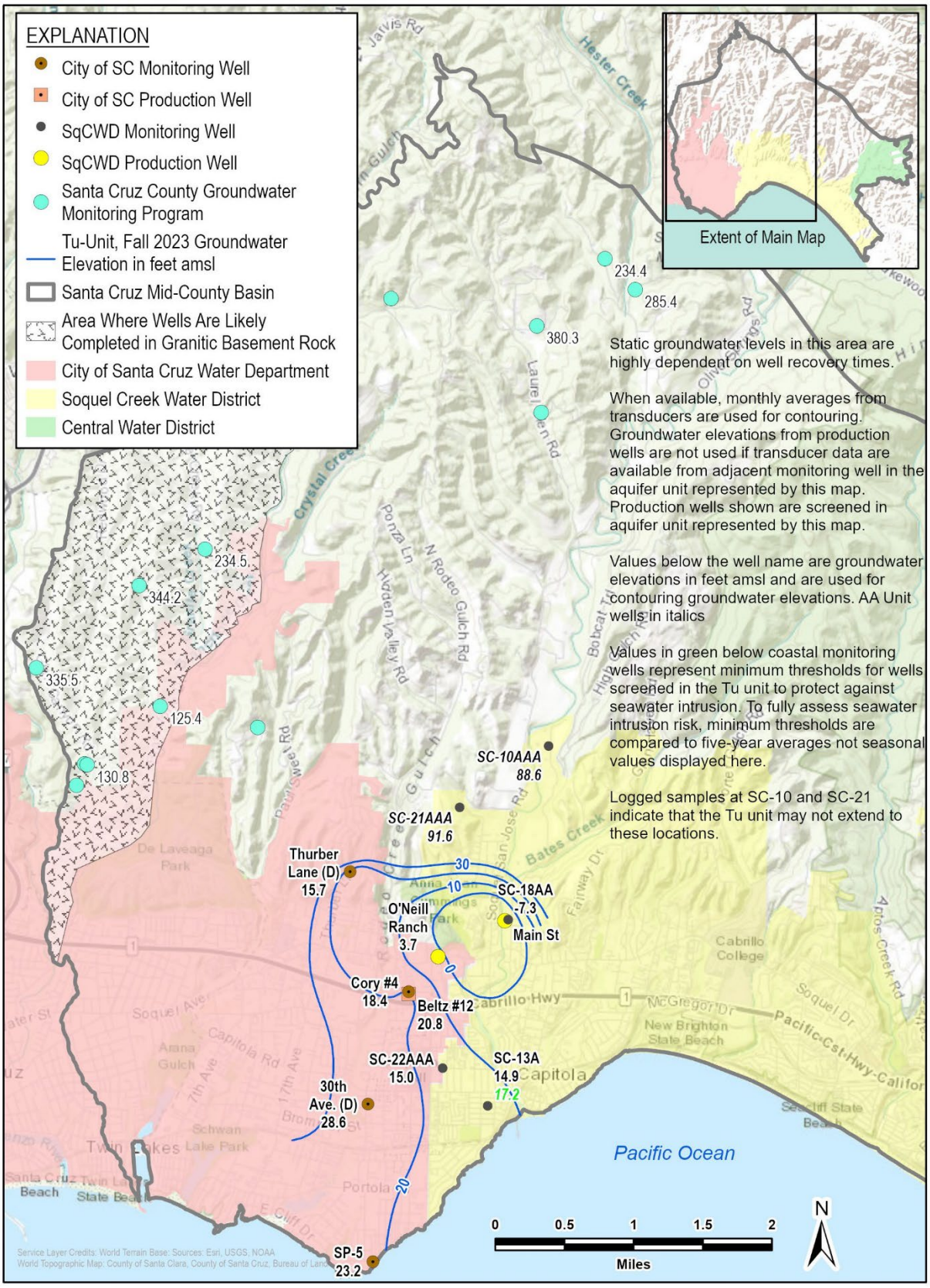

Figure 14.Tu Unit Groundwater Elevations, Fall 2023

2.4 Groundwater Extraction

The volume of groundwater extracted in WY 2023 is included in Table 1. The table summarizes groundwater extractions by water use sector and aquifer group. Table 1 also identifies the method of measurement and accuracy of measurements. Appendix 2-B of the GSP describes the methodology for estimates. Figure 15 shows the general location and volume of groundwater extractions by use type. To meet requirements for annual reports in the SGMA regulations, Table 1 and Figure 15 show all groundwater extracted including water recovered as part of ASR demonstration testing.

Table 1. Water Year 2023 Groundwater Extracted in the Santa Cruz Mid-County Basin

Water Use Sector	Aquifer Group			Total (AF)	Percentage
	Aromas Red Sands and Purisima F	Purisima DEF, BC, A and AA	Tu		
Private Domestic [a]	59	407	196	**662**	**13%**
Agricultural [b]	162	89	14	**265**	**5%**
Institutional [c]	191	79	1	**271**	**6%**
Municipal [d]	1,335	1,751	617	**3,703**	**76%**
Total	**1,747**	**2,326**	**828**	***4,901***	
Percentage	**36%**	**47%**	**17%**		

[a] Estimated based on change in population over the year and an annual water use factor (WUF) per connection determined from metered Small Water Systems applied to each residence outside of municipal water service areas (less accurate). WUF for WY 2023 is 0.29 AF per connection.

[b] Estimated based on irrigation demand determined using the GSFLOW model, crop acreage, and crop coefficient (less accurate).

[c] Most water systems in this category reported metered extractions to the County but timing of reporting is too late for inclusion into the Annual Report. Therefore, 2022 data are used for 2023 extractions (less accurate). The volumes from year to year generally do not vary significantly. Where data are not reported to the County, groundwater extraction is estimated based on historical water usage for facility use including an estimate of turf irrigation based on irrigation demand determined using the GSFLOW model, irrigation acreage, and turf's crop coefficient (less accurate)

[d] Direct measurement by meters (most accurate); includes 21 AF recovered under SCWD's Aquifer Storage and Recovery demonstration testing.

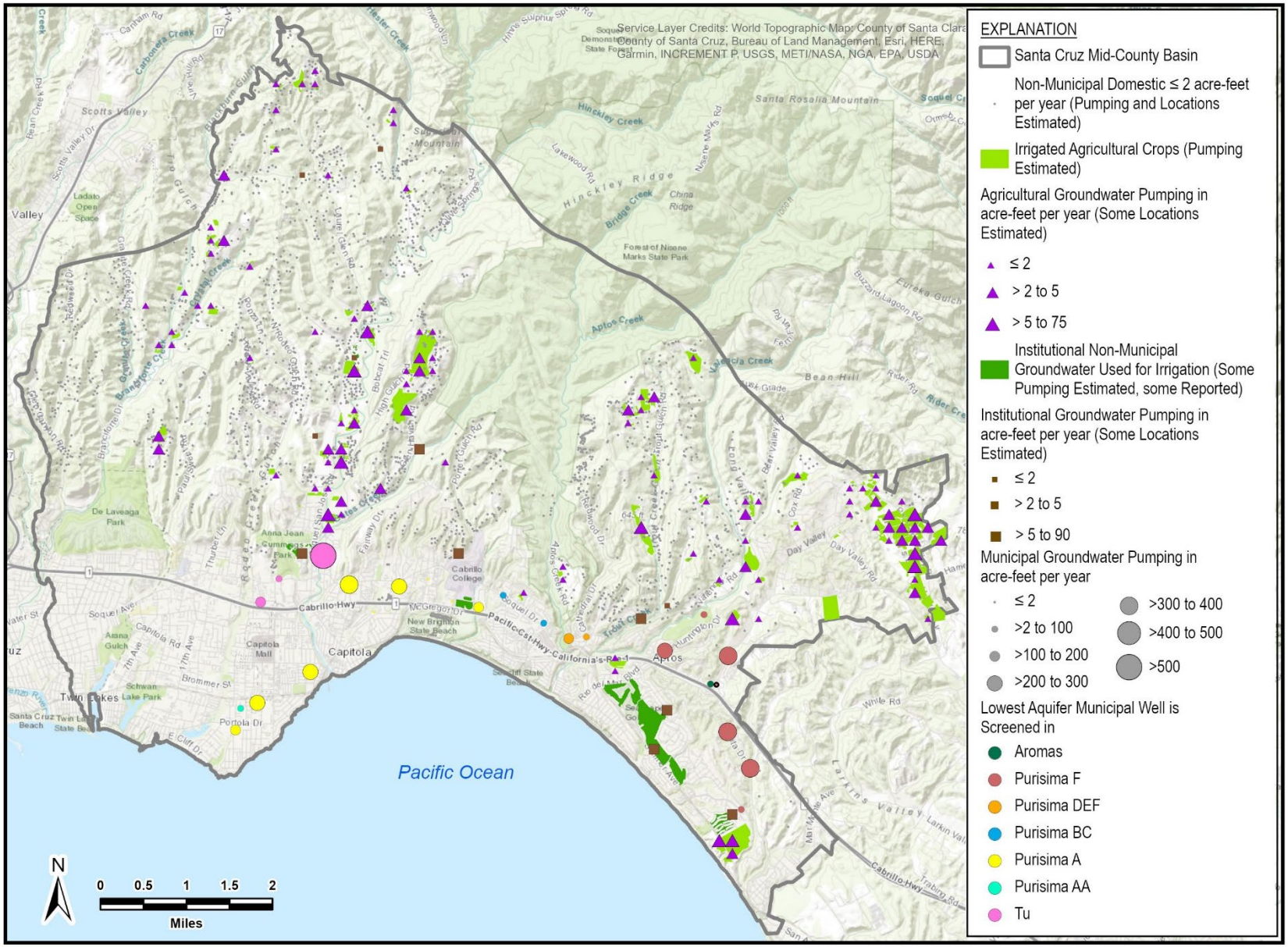

Figure 15. General Location of Water Year 2023 Groundwater Extracted in the Santa Cruz Mid-County Basin

Overall, an estimated 465 AF less groundwater was extracted in WY 2023 compared to WY 2022, which is the second lowest on record after WY 2019, the last wet year. The Purisima DEF, BC, A, and AA units account for 47% of groundwater pumped in the Basin, the Aromas Red Sands and Purisima F units provide 36%, and the Tu unit provides 17% (Table 1). The 3 municipal water supply agencies extract an estimated 76% of all groundwater used in the Basin. For WY 2023, municipal extraction in Table 1 includes 21 AF recovered under SCWD's ASR demonstration testing program.

Unmetered domestic extraction is estimated to be 13% of groundwater extracted (Table 1). Estimated extractions are based on a water use factor (WUF) obtained from metered small water system water use for the year and change in population. According to estimates by the California Department of Finance, 2022's population in unincorporated areas of the County decreased 1.9%. Groundwater extraction by small water systems is reported to the County. Estimates of extraction to meet landscape and agricultural irrigation demand are variable each year because they are modeled based on climate data.

2.5 Surface Water Supply Used for Groundwater Recharge or In-Lieu Use

When SCWD has excess surface water, it can be used in the Basin to (1) either transfer SCWD treated drinking water to SqCWD through a water transfer pilot test program to serve a portion of SqCWD's service area in lieu of using groundwater, or (2) inject at SCWD ASR wells as part of pilot and demonstration testing.

These projects are described in Sections 3.7.3 and 3.7.5.

With WY 2023 being a wet year, there was excess surface water available for both programs. Under the water transfer pilot program, 12 AF was transferred from SCWD to SqCWD for in-lieu use and 63 AF was used for SCWD's continued demonstration testing of ASR that included storage of some of its surface water supply at the Beltz #12 well. Table 2 summarizes WY 2023 surface water supply used in the Basin for ASR and in-lieu use.

Table 2. Water Year 2023 Surface Water Supply for Groundwater Recharge or In-Lieu Use

Purpose	Water User	Description	Total (AF) [a]
Aquifer Storage of Surface Water	City of Santa Cruz	ASR Demonstration Testing	**63**
In-Lieu Use	Soquel Creek Water District	Water Transfer Pilot Testing	**12**
Total			**75**

[a] Direct measurement by meters

Aquifer storage and recovery volumes as a result of SCWD pilot and demonstration testing are summarized in Table 3, by water year and aquifer unit showing annual net storage and cumulative storage.

Table 3. City of Santa Cruz Water Department ASR Summary

Water Year	Purisima A/AA-Unit				Tu- Unit				Total Cumulative Storage
	Beltz #8 Injection/ Storage	Beltz #8 Extraction[1]	Annual Net Storage	Cumulative Storage	Beltz #12 Injection/ Storage	Beltz #12 Extraction[a]	Annual Net Storage	Cumulative Storage	
	acre-feet								
2019	0	0	0	0	64	64	0	0	0
2020	11	11	0	0	0	0	0	0	0
2021	19	19	0	0	0	0	0	0	0
2022	110	110	0	0	153	132	21	21	21
2023	21	21	0	0	42	0	42	63	63

[a] Total extraction includes recovery during testing and other periods.

2.6 Total Water Use

WY 2023 water use volumes in the Santa Cruz Mid-County Basin are included in Table 4. The table summarizes total water use by water use sector, water source type, and identifies the method of measurement. The groundwater portion of water use does not include water recovered as part of the SCWD's ASR demonstration study because it is considered surface water use.

Table 4. Water Year 2023 Water Use in the Santa Cruz Mid-County Basin

Water Use Sector	Groundwater Use[f]	Surface Water Use[a]	Total Water Use	Percentage of Basin Water Use
	AFY			
Private Domestic[b]	662	Unknown but minimal	**662**	**8%**
Agricultural[c]	265	0	**265**	**3%**
Institutional[d]	271	0	**271**	**3%**
Municipal[e]	3,682	3,375	**7,057**	**86%**
Total	**4,880**	**3,375**	**8,255**	
Percentage	**59%**	**41%**		

[a] All municipal surface water used in the Basin is sourced outside of the Basin.
[b] Estimated based on annual water WUF per connection determined from metered Small Water Systems and applied to each residence outside of municipal water service areas (less accurate). WUF for WY 2023 was 0.29 AF per connection.
[c] Estimated based on irrigation demand determined using the GSFLOW model, crop acreage, and crop coefficient (less accurate).
[d] Estimated based on historical water usage for facility use including an estimate of turf irrigation based on irrigation demand determined using the GSFLOW model, irrigation acreage, and turf's crop coefficient (less accurate).
[e] Direct measurement by meters (most accurate) for groundwater; estimated for surface water based on a proportion of metered consumption that falls within the Basin less net groundwater extracted at the Beltz wellfield.
[f] Groundwater use does not include ASR recovered surface water.

The accuracy of water use measurements is directly correlated with the method used to determine water use. Metered municipal data have the greatest accuracy while estimates of water use based on various assumptions (GSP Appendix 2-B) are less accurate. Although to the extent possible, reasonable checks are made to minimize order of magnitude inaccuracies.

Total estimated water use since WY 2015 is lower compared to prior years (Table 5). As most of the water within the Basin is supplied by groundwater, reduced water use has resulted in less groundwater extracted from the Basin over the same period (Table 5). In WY 2023, groundwater from the Basin supplied 59% of water used; surface water from outside the Basin supplied 41%.

Table 5. Annual Water Use in the Santa Cruz Mid-County Basin

Water Year	Sources with the Basin							Sources Outside of the Basin			Total Water Use AFY
	Groundwater Use AFY							Surface Water Use AFY			
	Private Domestic Use [a]	Agricultural Use [b]	Institutional Use [c]	Central Water District [d]	City of Santa Cruz [d, e]	Soquel Creek Water District [d]	Total	City of Santa Cruz [f]	Soquel Creek Water District [d]	Total	
				Municipal Use				Municipal Use			
1985	980	352	408	394	181	4,319	6,634	6,413	0	6,413	13,047
1986	1,001	329	382	404	102	4,272	6,490	6,561	0	6,561	13,051
1987	1,022	398	445	444	526	5,235	8,070	6,415	0	6,415	14,485
1988	1,031	372	444	438	943	4,859	8,087	5,314	0	5,314	13,401
1989	1,004	355	410	406	756	4,797	7,728	4,993	0	4,993	12,721
1990	1,022	361	420	429	842	4,818	7,892	4,295	0	4,295	12,187
1991	1,012	349	397	426	254	4,703	7,141	4,628	0	4,628	11,769
1992	1,017	394	438	467	716	4,908	7,940	4,695	0	4,695	12,635
1993	1,025	331	390	481	260	4,863	7,350	5,191	0	5,191	12,541
1994	1,033	329	389	482	463	5,089	7,785	5,178	0	5,178	12,963
1995	1,036	273	334	459	212	4,855	7,169	5,564	0	5,564	12,733
1996	1,042	337	397	526	143	5,183	7,628	5,998	0	5,998	13,626
1997	1,035	386	442	604	245	5,571	8,283	6,381	0	6,381	14,664
1998	1,041	249	325	534	268	4,966	7,383	5,616	0	5,616	12,999
1999	1,048	304	363	539	359	5,211	7,824	5,829	0	5,829	13,653
2000	1,058	325	380	547	593	5,271	8,174	5,587	0	5,587	13,761
2001	1,044	337	383	557	95	5,175	7,591	6,157	0	6,157	13,748
2002	1,039	336	397	593	336	5,376	8,077	5,731	0	5,731	13,808

Water Year	Sources with the Basin							Sources Outside of the Basin			Total Water Use AFY
	Groundwater Use AFY							Surface Water Use AFY			
	Private Domestic Use [a]	Agricultural Use [b]	Institutional Use [c]	Central Water District [d]	City of Santa Cruz [d, e]	Soquel Creek Water District [d]	Total	City of Santa Cruz [f]	Soquel Creek Water District [d]	Total	
				Municipal Use				Municipal Use			
2003	1,031	327	390	584	416	5,332	8,080	5,653	0	5,653	13,733
2004	1,019	380	422	633	421	5,372	8,247	5,765	0	5,765	14,012
2005	937	275	330	514	316	4,544	6,916	5,459	0	5,459	12,375
2006	935	305	359	544	296	4,549	6,988	5,278	0	5,278	12,266
2007	933	362	408	596	420	4,626	7,345	5,054	0	5,054	12,399
2008	939	380	439	584	561	4,557	7,460	4,971	0	4,971	12,431
2009	874	371	416	594	582	4,162	6,999	4,254	0	4,254	11,253
2010	879	304	360	481	451	3,933	6,408	4,311	0	4,311	10,719
2011	882	270	311	487	637	4,011	6,598	3,931	0	3,931	10,529
2012	890	361	400	535	494	4,159	6,839	4,374	0	4,374	11,213
2013	828	423	326	559	515	4,218	6,869	4,560	0	4,560	11,429
2014	691	436	310	500	510	3,703	6,150	3,571	0	3,571	9,721
2015	553	431	300	391	613	3,154	5,442	3,222	0	3,222	8,664
2016	552	375	293	383	450	3,094	5,147	3,472	0	3,472	8,619
2017	600	218	288	383	463	3,169	5,121	3,726	0	3,726	8,847
2018	599	375	313	377	635	3,340	5,639	3,489	0	3,489	9,128
2019	595	336	308	385	83	3,019	4,726	3,794	165	3,959	8,685
2020	594	407	318	411	244	3,197	5,171	3,487	111	3,598	8,769
2021	586	371	265	406	724	3,262	5,614	2,954	0	2,954	8,568
2022	671	406	263	397	339	3,049	5,125	3,594	<1	3,594	8,719

Water Year	Sources with the Basin							Sources Outside of the Basin			Total Water Use AFY
	Groundwater Use AFY							Surface Water Use AFY			
	Private Domestic Use [a]	Agricultural Use [b]	Institutional Use [c]	Central Water District [d]	City of Santa Cruz [d, e]	Soquel Creek Water District [d]	Total	City of Santa Cruz [f]	Soquel Creek Water District [d]	Total	
				Municipal Use				Municipal Use			
2023	661	265	271	357	524	2,801	4,880	3,363	12	3,375	8,255

[a] Estimated based on annual WUF per connection determined from metered Small Water Systems and applied to each residence outside of municipal water service areas (less accurate). WUF for WY 2023 was 0.29 AF per connection

[b] Estimated based on irrigation demand determined using the GSFLOW model, crop acreage, and crop coefficient (less accurate).

[c] Estimated based on historical water usage for facility use including an estimate of turf irrigation based on irrigation demand determined using the GSFLOW model, irrigation acreage, and turf's crop coefficient (less accurate).

[d] Direct measurement by meters (most accurate).

[e] Includes extraction exceeding injection/storage at any Beltz ASR well. Revised to subtract 110 AF of injection for Beltz #8 in WY 2022. Excludes 21 AF of injection at Beltz #8 for WY 2023; WY 2022 and WY 2023 does not include extraction for Beltz #12 because extraction did not exceed injection.

[f] SCWD surface water use in the Basin is not directly metered since the City service area is also outside of the Basin. For purposes of reporting, surface water use in the Basin is estimated based on a proportion of metered consumption that falls within the Basin less SCWD groundwater use as described in footnote e.

2.7 Change of Groundwater in Storage

Change of groundwater in storage is estimated using water budget output calculated by the Basin's integrated surface water/groundwater GSFLOW model (Model). Appendix 2-D, 2-E, 2-F, and 2-G of the GSP describe development of the Model's historical period (WY 1985-2015). Each year, as part of Annual Report preparation, the Model is updated through the water year being reported on. The Model currently simulates WY 1985-2023.

As described in Appendix 2-F, the entire Model area was calibrated over WY 1985-2015 to support GSP development. The Model has not been completely recalibrated through WY 2023. However, the following localized recalibration efforts have been undertaken to ensure new groundwater sustainability and management projects are accurately simulated in the model:

- A small portion of the Model near the Pure Water Soquel project was recalibrated based on information from pilot testing of the Twin Lakes Church SWIP recharge well (PWS, 2023).
- The Model's simulation of groundwater elevations and surface water discharge was validated from WY 2015 to 2022 to support the Basin Optimization Study. This effort indicated that the Model's accuracy over WY 2015 to 2022 remained similar to the fully calibrated WY 1985 to 2015 period, but that simulation of local aquifer response to ASR pilot testing at the City's Beltz #8 and Betz #12 could be improved (M&A, 2023). Following this, additional local recalibration was conducted over the WY 2016 to 2022 period.

Each year the Model is updated with climate data, metered extraction, metered recharge, and estimates of non-municipal pumping. Updates to these inputs for WY 2023 are detailed below.

Updated climate data included the following:

- Precipitation data from the Santa Cruz Co-op and Watsonville Waterworks stations sourced from NOAA and Delavega CIMIS station.
- Temperature data from the Santa Cruz Co-op station sourced from NOAA. Missing data were filled using a regression from temperature data from the Watsonville Waterworks station.
- Temperature data for the upper watershed location through December 2022 from DAYMET. Because DAYMET data are only available through December 2022, January 2023 through September 2023 temperature data are derived from a regression

of historical DAYMET data (1 km by 1 km grid) with coarser gridded (4 km by 4 km grid) Parameter-elevation Relationships on Independent Slopes Model (PRISM) data, which are available through September 2023.

Updated pumping data included the following:

- Metered municipal pumping and recharge volumes provided by CWD, SCWD, and SqCWD
- Domestic water use factor of 0.29 acre-feet per year (AFY) and population estimates
- Non-municipal irrigation demand estimated based on Precipitation Runoff Modeling System (PRMS) watershed simulation of potential and actual evapotranspiration with the Model using updated climate data

Based on the updated Model simulation through WY 2023, Figure 16 shows the annual groundwater budget for the Basin including annual change of groundwater in storage and cumulative change of groundwater in storage. Change in storage is presented as a line where negative numbers indicate a loss in storage and positive numbers indicate a gain in storage. WY 2023 had a substantial increase in groundwater in storage of 5,229 AF. Cumulative change of groundwater in storage has remained relatively stable since 2005. Since 2005, the cumulative change in storage decreases in dry and critically dry years and increases in wet years. The storage increase in WY 2023 is the largest increase since 2006, which was also a wet year. In this coastal basin, groundwater in storage increases are reduced by offshore flows. Offshore flows help prevent seawater intrusion but net offshore flows for the Basin do not necessarily prevent localized seawater intrusion.

Figure 17 through Figure 22 show the distribution of modeled WY 2023 change of storage across the Basin for the principal aquifer units: Aromas Red Sands, Purisima F/DEF units, Purisima BC unit, Purisima A unit, Purisima AA unit, and Tu unit. While these maps are required for the annual report, their main use is for evaluating how recharge over the water year has changed groundwater in storage in the unconfined areas of the Basin (Figure 17). WY 2023 was a wet year with substantial recharge; groundwater in storage in the unconfined Aromas Red Sands aquifer experienced moderate increases in the central portion of the Basin and substantial increases in the southeastern portions of the Basin. These increases are largely related to significant recharge of the unconfined aquifer associated with the wet year.

For the other aquifers, areas with the greatest change in storage mostly correspond with where the aquifer outcrops at the surface. Large areas represented by uncolored cells indicate little change in stored groundwater. The cells surrounding Beltz #8 and #12 in the Purisima A and AA units have noticeable storage changes on Figure 20 and Figure 21, responding to ASR demonstration operations. Increased storage on Figure 21, inland of the Main Street,

Rosedale, and Tanery wells, may be a result of reduced groundwater extraction compared to last year.

Overall results from the Model simulation show substantial increases (in green and blue) and limited areas of decrease (in orange and red) of groundwater in storage, while large areas show minimal (uncolored) changes. This is consistent with WY 2023 Basin-wide storage shown on Figure 16. In general, larger changes of groundwater in storage are limited to where aquifers are unconfined. Therefore, these maps do not fully represent groundwater conditions in the Basin as many of the SMC defining undesirable results relate to groundwater elevations in the confined areas of the aquifer units. In confined areas, groundwater elevations can change substantially with very small changes of groundwater in storage. For example, RMPs with groundwater elevation proxies for the seawater intrusion sustainability indicator are in the confined area and this indicator cannot be evaluated by these maps. The maps also do not represent where more groundwater is extracted at wells as changes in groundwater in storage can be a relatively small contribution of flow to wells, or it can appear that more groundwater is lost from storage for lower flows to wells due to lower transmissivity of the aquifer unit.

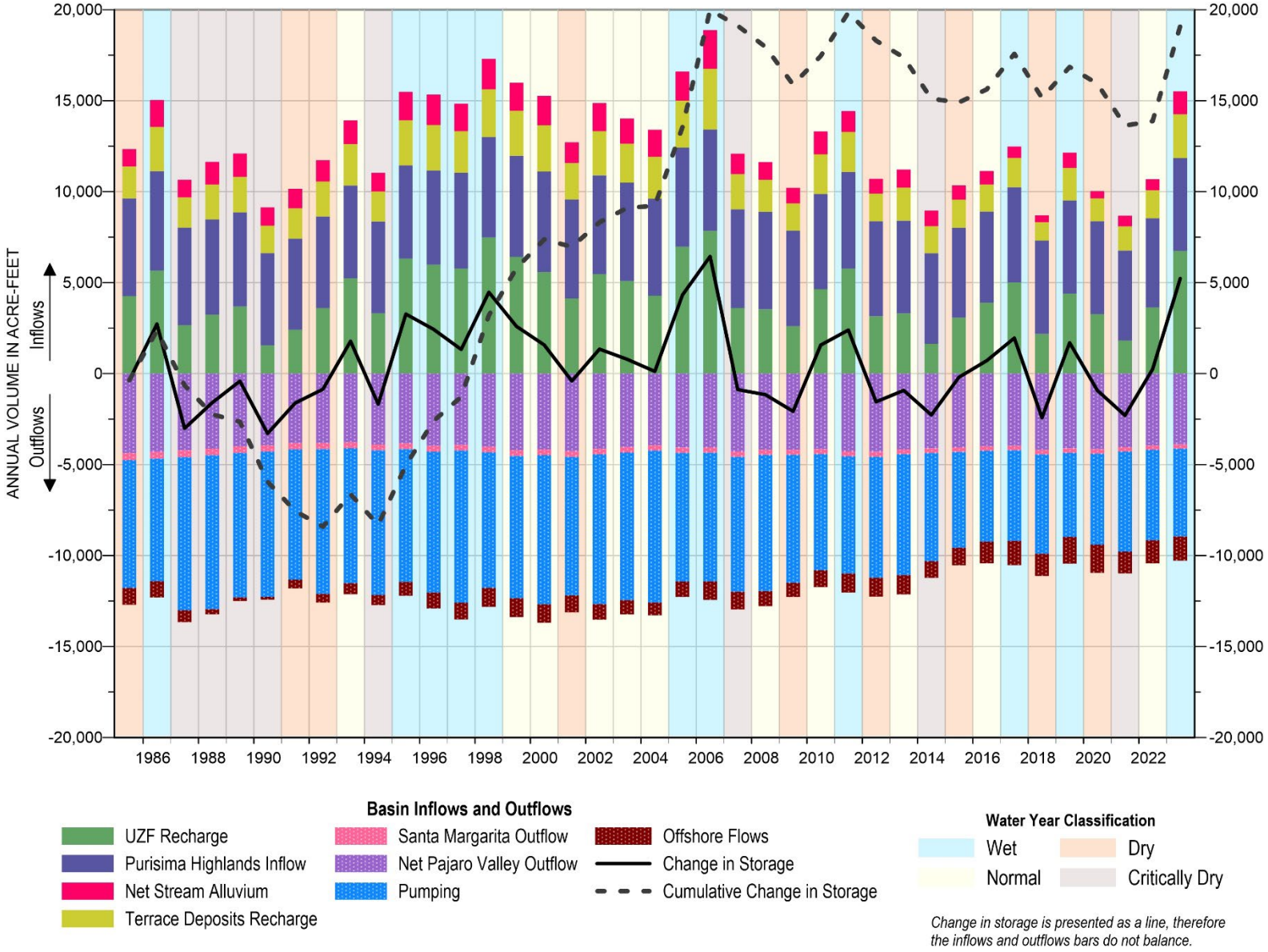

Figure 16. Annual Change in Groundwater in Storage for Santa Cruz Mid-County Basin

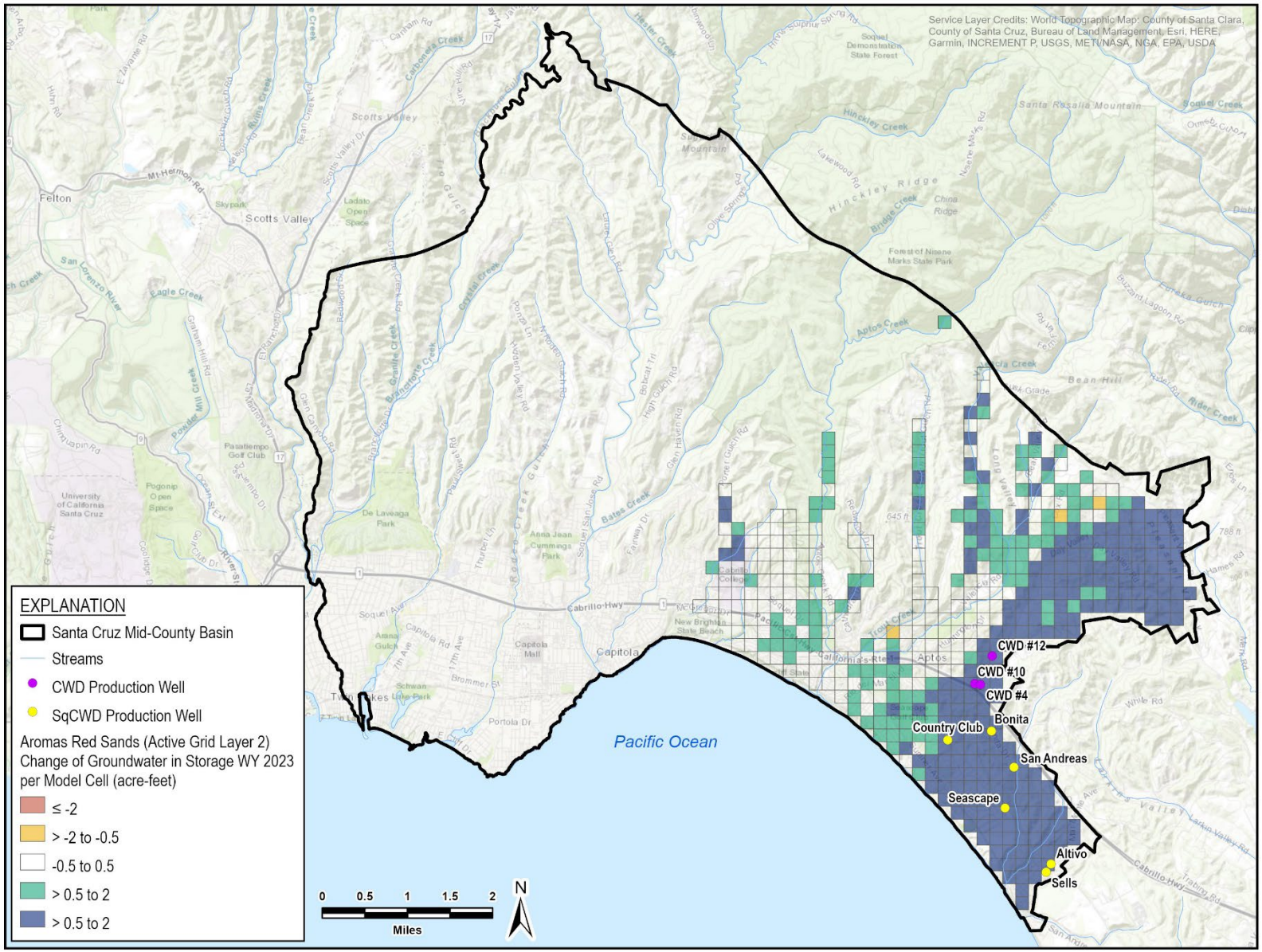

Figure 17. Water Year 2023 Change of Groundwater in Storage in Aromas Red Sands

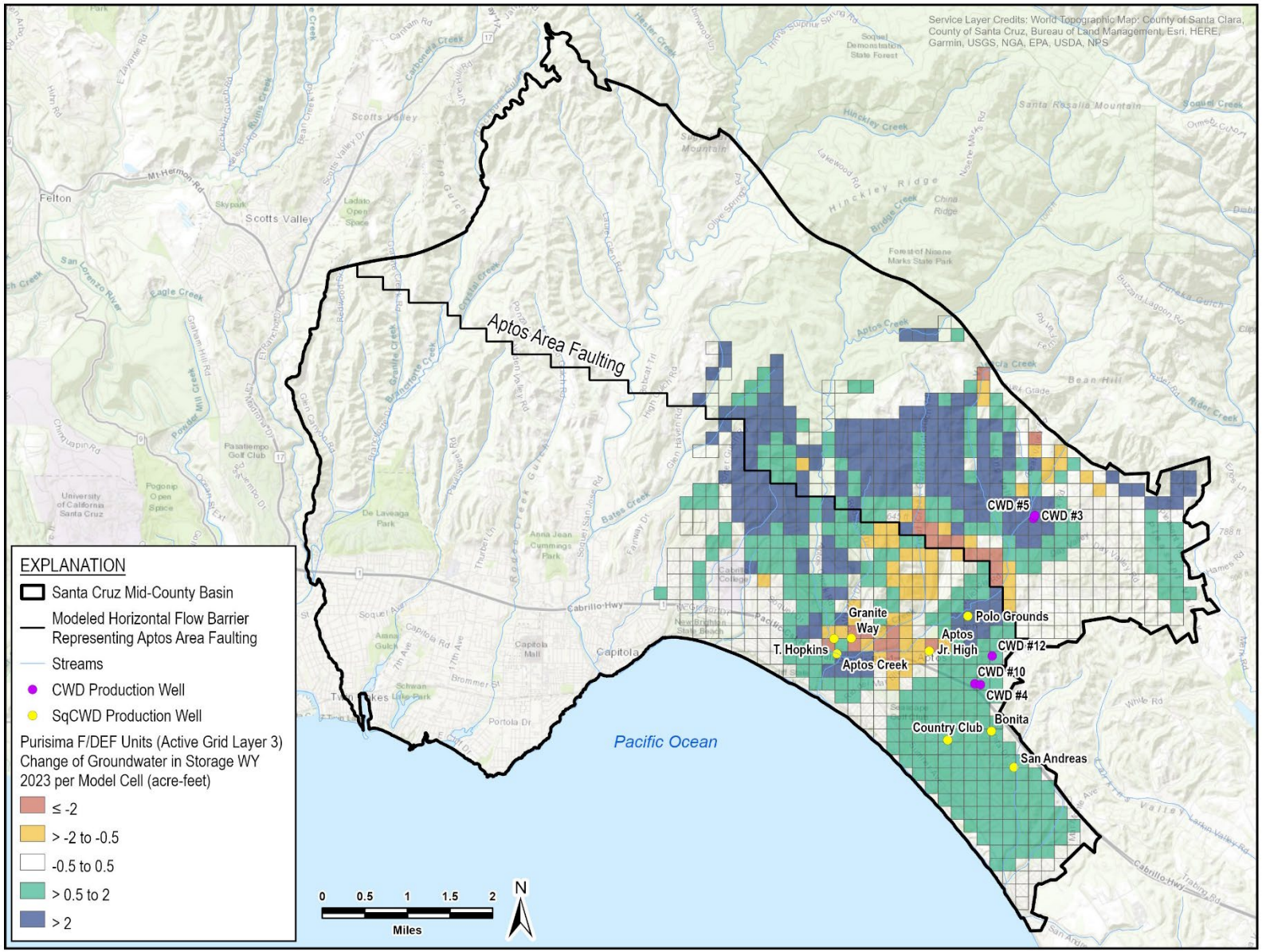

Figure 18. Water Year 2023 Change of Groundwater in Storage in Purisima F/DEF Units

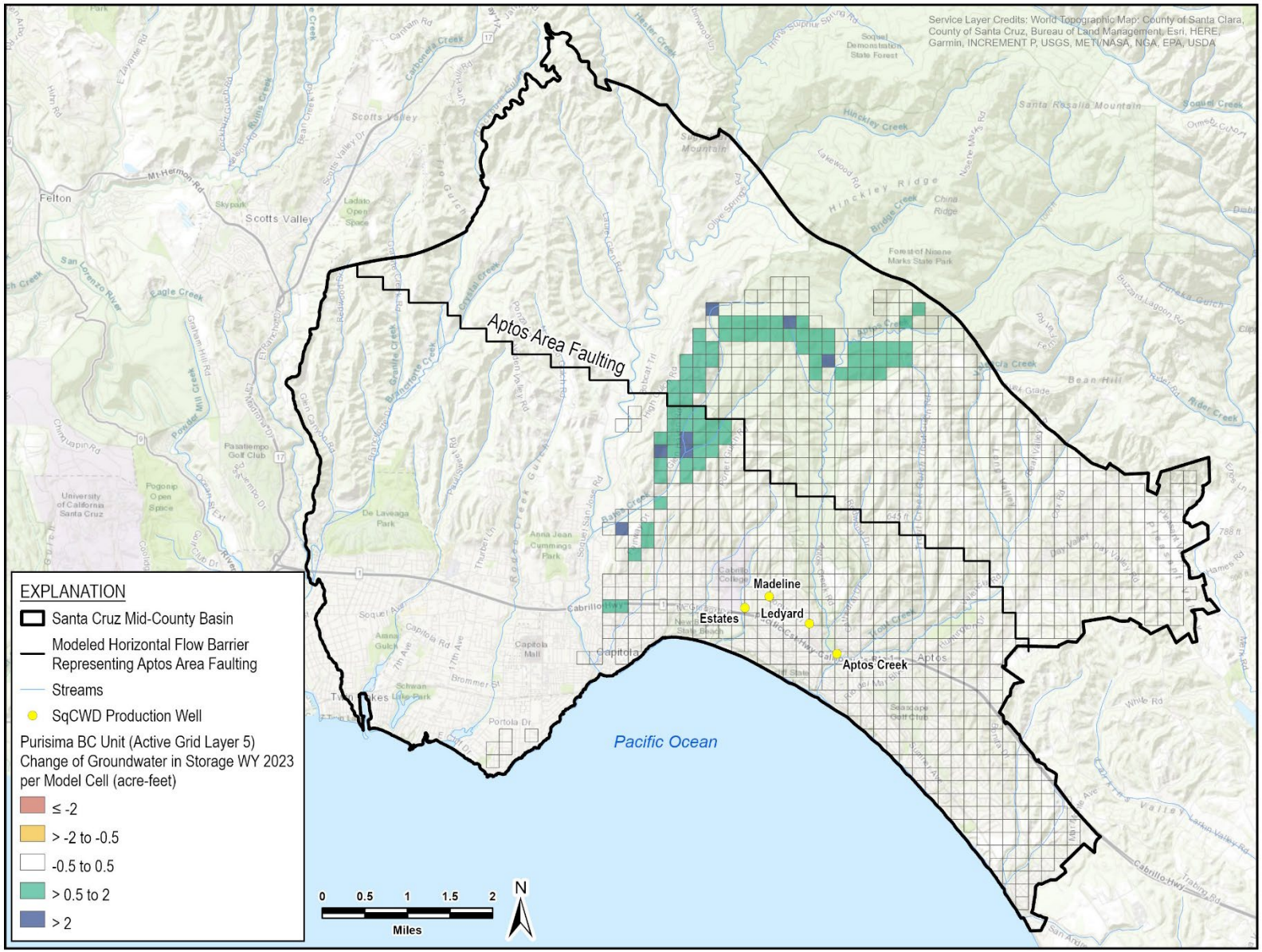

Figure 19. Water Year 2023 Change of Groundwater in Storage in Purisima BC Unit

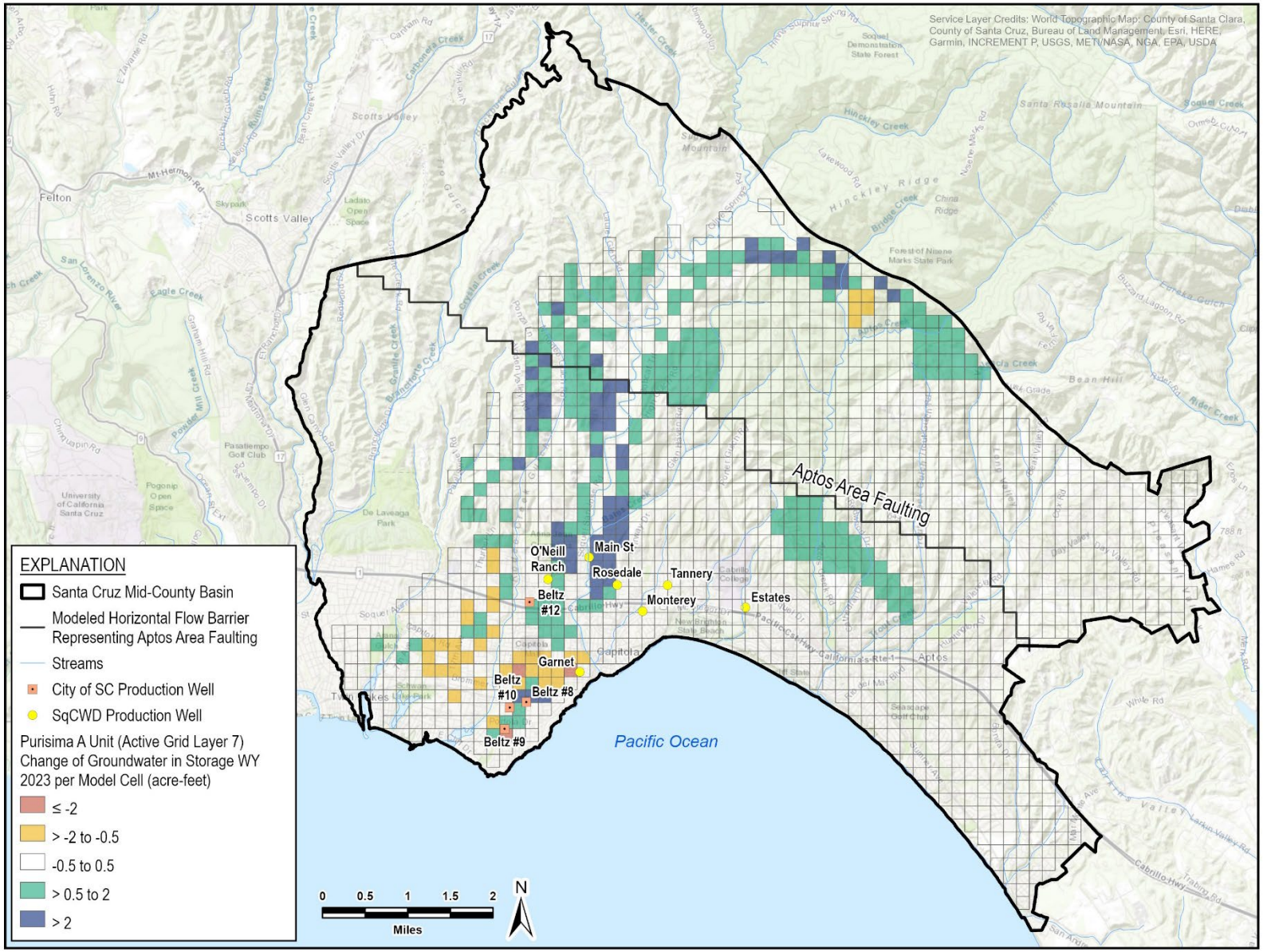

Figure 20. Water Year 2023 Change of Groundwater in Storage in Purisima A Unit

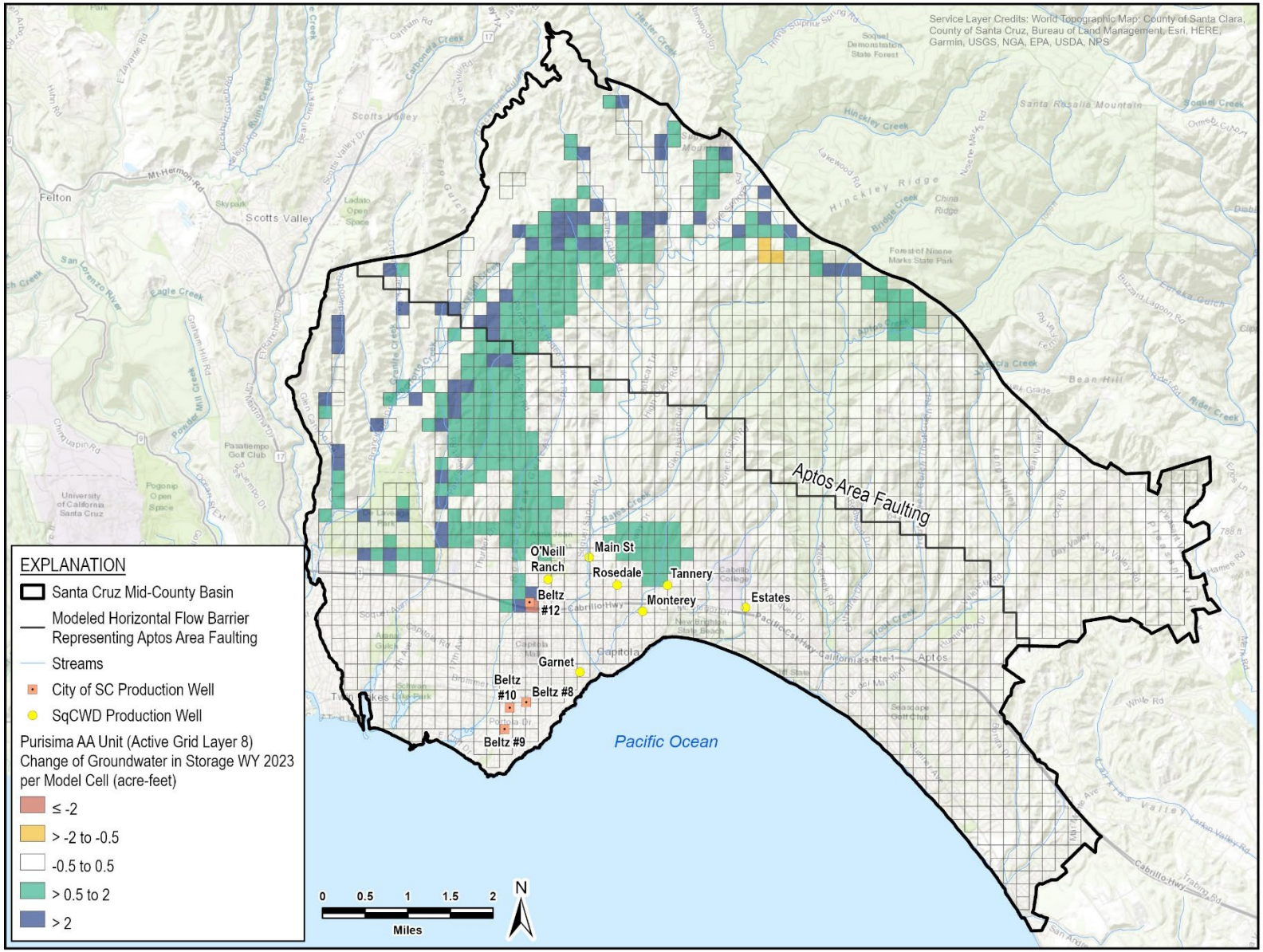

Figure 21. Water Year 2023 Change of Groundwater in Storage in Purisima AA Unit

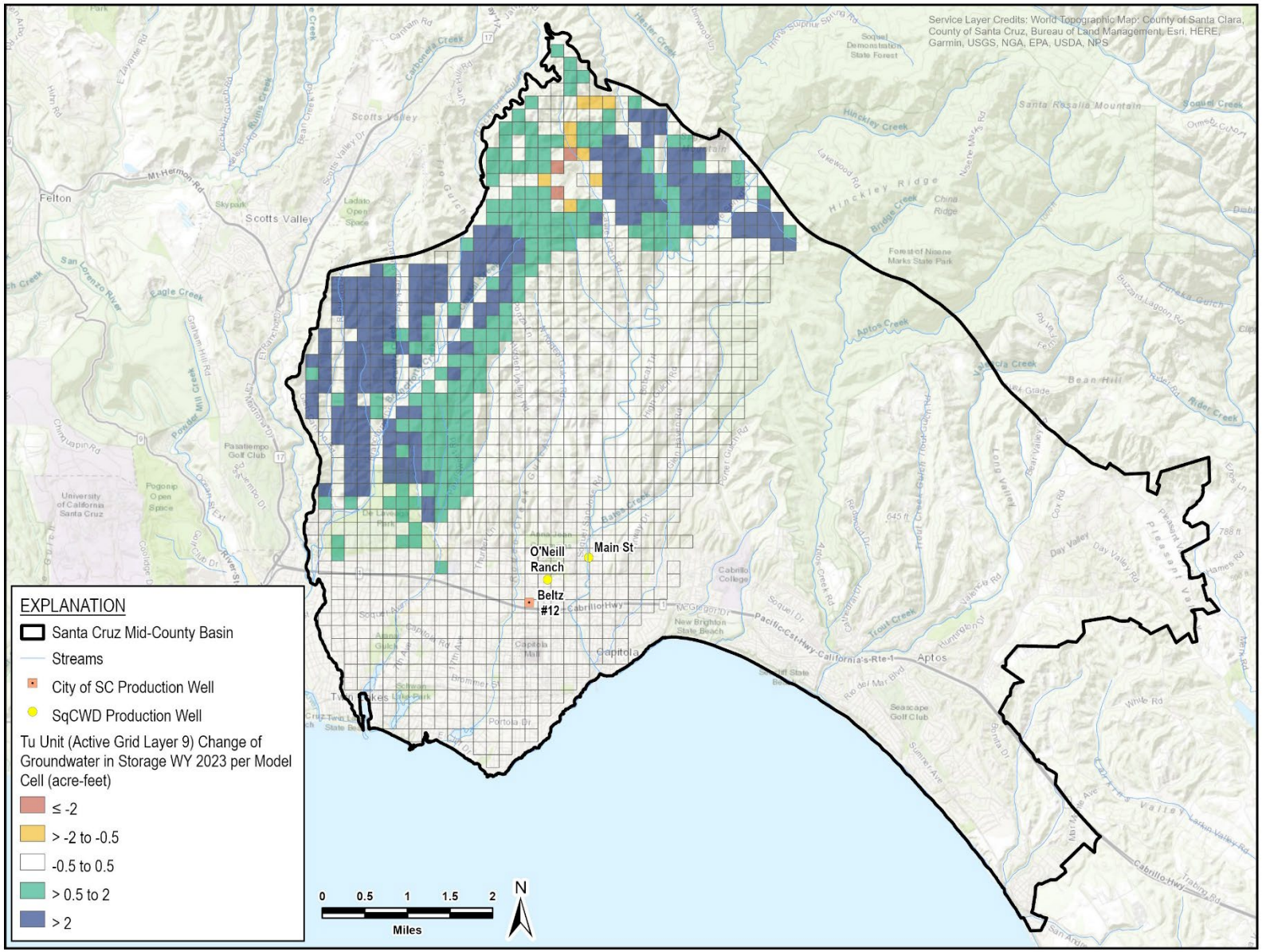

Figure 22. Water Year 2023 Change of Groundwater in Storage in Tu Unit

3 PROGRESS TOWARD IMPLEMENTING THE PLAN

This section evaluates progress toward implementing the GSP by comparing groundwater conditions in WY 2023 to SMC for each of the sustainability indicators required for SGMA. The section concludes with an update of implementation of projects and management actions to achieve sustainability.

3.1 Chronic Lowering of Groundwater Levels

Table 6 shows SMC at RMPs for chronic lowering of groundwater levels. Sustainable management criteria for this indicator are met when groundwater elevations are at or above the criteria. Hydrographs for chronic lowering of groundwater levels RMPs (Appendix A; Figures A-1 through A-17) plot groundwater elevations above MTs at all RMPs so there are no undesirable results for chronic lowering of groundwater levels. Groundwater elevations are below the MOs for all of the 17 RMPs for this indicator in WY 2023. Interim milestones are the same as the long-term MOs based on conditions prior to GSP development, so the GSP has a goal to meet MOs throughout the GSP implementation period.

Table 6. Chronic Lowering of Groundwater Levels Sustainable Management Criteria Compared to Representative Monitoring Point Groundwater Elevations

Representative Monitoring Point	Well Type	Aquifer	Minimum Threshold	Measurable Objective	Interim Milestone 2025	WY 2019	WY 2020	WY 2021	WY 2022	WY 2023
			Groundwater Elevation feet amsl			Minimum Average Monthly Groundwater Elevation feet amsl				
SC-A7C	Monitoring	Aromas	0	8	8	6.0	6.0	5.8	5.8	5.8
Private Well #2	Production	Purisima F	562	596	596	596.0	596.4	594.9	592.9	592.3
Black	Monitoring		10	41	41	42.0	46.1	44.1	44.8	40.3
CWD-5	Monitoring		140	194	194	195.3	195.1	194.2	193.8	193.8
SC-23C	Monitoring		15	49	49	45.9	45.8	44.5	44.3	44.5
SC-11RD	Monitoring	Purisima DEF	295	318	318	315.3	315.2	315.2	313.7	314.7
SC-23B	Monitoring		50	85	85	80.2	78.8	62.7	60.0	60.2
SC-11RB	Monitoring	Purisima BC	120	157	157	155.3	154.8	152.6	151.8	152.0
SC-19	Monitoring		56	95	95	88.5	78.4	78.5	73.3	74.2
SC-23A	Monitoring		0	44	44	39.8	38.8	39.6	39.8	39.4
Coffee Lane Shallow	Monitoring	Purisima A	27	47	47	45.3	44.7	44.8	43.9	43.9
SC-22A	Monitoring		2	24	24	22.3	22.2	22.4	21.6	22.2
SC-22AA	Monitoring	Purisima AA	0	22	22	20.4	20.3	20.7	19.4	20.1
SC-10RAA	Monitoring		35	76	76	70.3	69.3	69.1	68.2	70.8
Private Well #1	Production	Purisima AA/Tu	362	387	387	387.2	383.5	382.6	379.7	380.2
30th Ave Deep	Monitoring	Tu	0	30	30	24.0	27.4	21.3	21.8	26.3
Thurber Lane Deep	Monitoring		-10	33	33	12.8	19.1	-1.1	4.6	15.1

Minimum threshold not met
Minimum threshold achieved but measurable objective not met
Measurable objective met

3.2 Reduction of Groundwater in Storage

Table 7 shows SMC for reduction of groundwater in storage, which is based on sustainable yields for 3 aquifer groups estimated for the GSP. Sustainable management criteria for this indicator are met when net extraction (all groundwater extraction less injection) is at or below criteria for sustainable yields. Because sustainable yield is primarily based on eliminating critical overdraft related to seawater intrusion, a 5-year moving average net extraction is applied to be consistent with 5-year moving averages used for seawater intrusion MT groundwater elevation proxies. Five-year moving average net extraction below the MT is considered sustainable.

The Tu unit is the only aquifer group with 5-year average net extraction through WY 2023 less than the sustainable yield/MT. The 5-year average net extraction volumes for the Aromas Red Sands and Purisima F aquifer group and Purisima DEF, BC, A, and AA aquifer group are greater than their respective MTs. These exceedances indicate undesirable results for this sustainability indicator. Net extraction needs to be reduced to or below MTs to eliminate undesirable results.

The interim milestone for 2025 is based on planned schedule for implementation of projects and management actions to reduce net extraction to below sustainable yield. The 5-year net average extraction for all 3 aquifer groups through WY 2023 did not meet these interim milestones as planned projects and management actions have not been implemented yet.

The measurable objective (MO) is based on annual net extraction that could occur while ensuring net annual groundwater extractions greater than the MT will not occur for any 1 of the 3 aquifer groups even if there were 4 subsequent years of maximum projected net groundwater extraction. Net extraction in WY 2023 did not meet MOs for the 3 aquifer groups.

Table 7. Reduction in Groundwater in Storage Sustainable Management Criteria Compared to Net Extraction

Aquifer Unit Group	Minimum Threshold	Interim Milestone 2025	WY 2019-2023	Measurable Objective	WY 2023
	Five-Year moving average Net Extraction AFY			Net Extraction AFY	
Aromas Red Sands and Purisima F	1,740	1,930	1,982	1,680	1,747
Purisima DEF, BC, A and AA	2,280	2,110	2,311	960	2,326
Tu	930	720	827	620	786

Minimum threshold not met	Measurable objective not met
Minimum threshold met	Measurable objective met

3.3 Seawater Intrusion

3.3.1 Chloride Concentrations

Table 8 shows the SMC for chloride concentrations compared to maximum concentrations for the past 5 years, including WY 2023. Sustainable management criteria for this indicator are met when chloride concentrations are at or below criteria concentrations.

There are 4 wells with 2 or more of the last 4 consecutive exceedances of MTs during WY 2023. All these wells are in the Purisima F unit in the southeastern portion of the Basin. All 4 wells exceeded the MT in all samples collected in WY 2023:

- Monitoring well SC-A8A chloride concentrations exceeded the MT in 2 of 4 consecutive samples
- Monitoring well SC-A2RB chloride concentrations exceeded the MT in 2 of 4 consecutive samples
- Monitoring well SC-A5A chloride concentrations exceeded the MT in 2 of 4 consecutive samples
- Monitoring well SC-A5B chloride concentrations exceeded the MT in 4 of 4 consecutive samples.

Any RMP with 2 or more of the last 4 consecutive quarterly samples greater than the MT constitutes an undesirable result for seawater intrusion. Undesirable results are occurring for the first time in monitoring wells SC-A8A and SC-A5A. Undesirable results have been occurring at monitoring well SC-A2RB for the fourth consecutive year and at SC-A5B for the third consecutive year. Monitoring well SC-A2RA only had a single MT exceedance which does not constitute an undesirable result. Because SC-A2RA's chloride concentration exceedance reported from the sample collected in September 2023 was 4,900 milligrams per liter (mg/L) greater than the previous maximum, it could potentially be an outlier. The high concentration will be verified when SC-A2RA is sampled in first quarter of 2024.

The MGA is investigating potential causes of increasing chlorides in the Seascape area (M&A, 2024). Preliminary findings are that nearby private irrigation and SqCWD municipal wells extracting groundwater from the Aromas Red Sands may be causing upward migration of seawater in the Purisima F unit. These pumping dynamics increase chloride concentrations in the upper Purisima F unit, as seen at SC-A5B. Seawater intrusion in the area at depth has likely been present prior to the first documented well log (Seascape Well) identifying high salinity water in 1970. AEM data provided by DWR also shows inland seawater intrusion. The poor water quality forced water supply and agricultural wells in the area to be completed

shallower than planned, typically in the Aromas Red Sands. Planned next steps are to sample private wells in the area to expand understanding of chloride distribution and to conduct a land-based electromagnetic survey to delineate the inland extent of seawater intrusion to better inform actions to protect the Basin from seawater intrusion.

Interim milestones are the same as MOs for chloride concentrations. At RMPs in the Aromas Red Sands and Purisima F units other than those mentioned above, chloride concentrations met MTs but did not meet MOs. All RMPs in the deeper Purisima units met MOs except at the Soquel Point Deep monitoring well in the Purisima AA unit.

Figure 23 shows maximum chloride concentrations mapped with the chloride isocontour established as a MT in the GSP. Appendix B includes chemographs for chloride concentrations at coastal monitoring wells.

Table 8. Chloride Concentrations Adjacent to 250 mg/L Chloride Isocontour for Seawater Intrusion

Representative Monitoring Point	Aquifer	Minimum Threshold	Measurable Objective	Interim Milestone 2025	WY 2019	WY 2020	WY 2021	WY 2022	WY 2023
		Maximum Chloride Concentration, mg/L							
Coastal Monitoring Wells – Intruded (undesirable results if > minimum threshold in >=2 of 4 consecutive quarterly samples)									
SC-A3A	Aromas	22,000	17,955	17,955	18,400	18,500	18,600	19,200	18,400
SC-A3B	Aromas	4,330	676	676	1,100	767	1,070	871	876
SC-A8A	Purisima F	8,000	7,258	7,258	7,670	7,670	7,710	9,770	9,310*
SC-A2RA	Purisima F	18,480	14,259	14,259	15,000	15,000	15,200	15,400	20,300
SC-A2RB	Purisima F	470	355	355	470	564*	480*	522*	584*
Moran Lake Med	Purisima A	700	147	147	60	53	47	46	47
Soquel Point Med	Purisima A	1,300	1,104	1,104	1,000	1,200	1,200	1,200	1,100
Coastal Monitoring Wells - Unintruded (undesirable results if > 250 mg/L in >=2 of 4 consecutive quarterly samples)									
SC-A8B	Aromas	250	100	100	39	35	53	43	36
SC-A1B	Purisima F	250	100	100	28	29	28	28	28
SC-A1A	Purisima DEF	250	100	100	28	29	28	28	29
SC-8RD	Purisima DEF	250	100	100	21	21	20	21	21
SC-9RC	Purisima BC	250	100	100	32	32	31	31	32
SC-8RB	Purisima BC	250	100	100	19	15	13	18	14
Pleasure Point Medium	Purisima A	250	100	100	35	36	NS**	NS**	NS**
SC-1A	Purisima A	250	100	100	44	49	48	47	48
SC-5RA	Purisima A	250	100	100	58	57	56	56	59
SC-3RA	Purisima A	250	100	100	65	51	40	50	60
Moran Lake Deep	Purisima AA	250	100	100	66	66	66	67	69
Pleasure Point Deep	Purisima AA	250	100	100	23	22	22	24	26
Soquel Point Deep	Purisima AA	250	100	100	160	170	160	170	170
SC-13A	Tu	250	100	100	NS	NS	62	66	69

Representative Monitoring Point	Aquifer	Minimum Threshold	Measurable Objective	Interim Milestone 2025	WY 2019	WY 2020	WY 2021	WY 2022	WY 2023
		Maximum Chloride Concentration, mg/L							
Inland Monitoring Well- Intruded (undesirable results if > minimum threshold in >=2 of 4 consecutive quarterly samples)									
SC-A5A	Purisima F	9,800	8,575	8,575	9,220	10,800*	9,240	11,400	13,100*
Inland Production and Monitoring Wells- Unintruded (undesirable results if > 150 mg/L in >=2 of 4 consecutive quarterly samples)									
SC-A5B	Purisima F	150	100	100	159	133	173*	164*	195*
San Andreas PW	Purisima F	150	100	100	30	22	22	21	22
Seascape PW	Purisima F	150	100	100	19	19	17	18	18
T. Hopkins PW	Purisima DEF	150	100	100	42	50	25	45	60
Estates PW	Purisima BC & A	150	100	100	45	48	13	45	47
Ledyard PW	Purisima BC	150	100	100	33	35	12	42	38
Garnet PW	Purisima A	150	100	100	84	85	86	86	88
Beltz #2	Purisima A	150	100	100	64	69	68	64	66
Beltz #8 PW	Purisima A	150	100	100	50	53	52	48	49
SC-22AA	Purisima AA	150	100	100	46	41	39	39	39
Corcoran Lagoon Deep	Purisima AA	150	100	100	22	23	23	NS	27
Schwan Lake	Purisima AA	150	100	100	94	97	93	93	98

Minimum threshold not met	NS = not sampled
Minimum threshold achieved but measurable objective not met	NS** = not sampled due to stuck sampling equipment
Measurable objective met	* = Undesirable Result

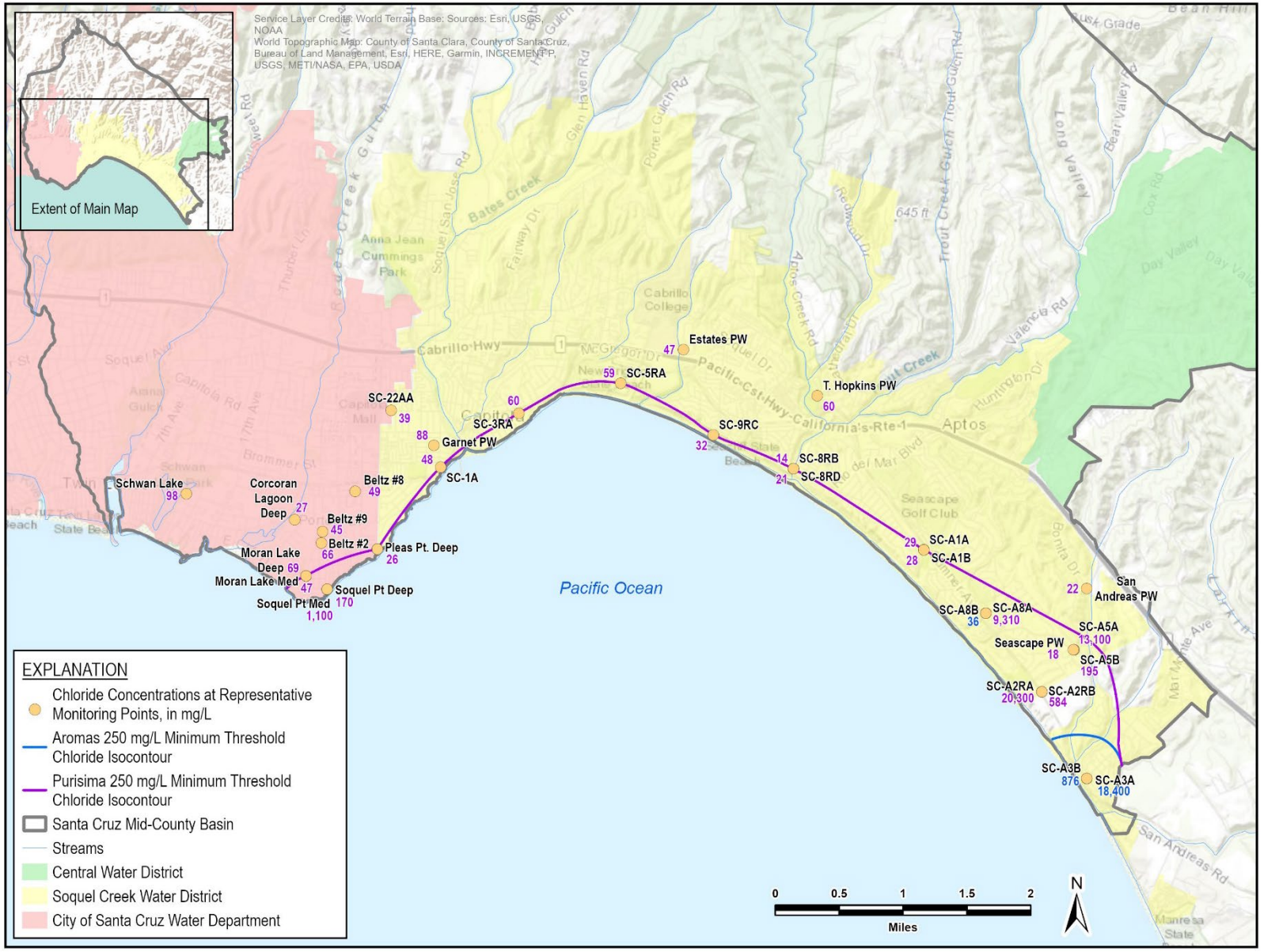

Figure 23. Water Year 2023 Maximum Chloride Concentration Map Compared to Minimum Threshold Isocontour

3.3.2 Groundwater Elevation Proxies

Table 9 lists groundwater elevation proxies used for seawater intrusion SMC. These groundwater elevations are protective elevations estimated to prevent further seawater intrusion over the long-term. Sustainable management criteria for this indicator are met at a specific RMP when 5-year moving average groundwater elevations are at or above the groundwater elevation proxy for the RMP.

Hydrographs for seawater intrusion groundwater elevation proxy RMPs (Figures A-18 through A-34) show 5-year moving averages in comparison to groundwater elevation proxies for seawater intrusion SMC. Annual minimums of the 5-year moving averages for groundwater elevations in the Tu, Purisima AA, A, BC, and DEF unit coastal RMPs remained within 6 inches of the previous year. The Purisima F unit and Aromas Red Sands coastal monitoring wells have very stable groundwater elevations that only changed by a tenth of a foot from the previous year. The 5-year moving average groundwater elevation in SC-A3A in the Aromas Red Sands has remained above its MT for the third consecutive water year.

Coastal RMPs with 5-year moving average groundwater elevations below MTs did not change from WY 2022 and include the following:

- One of 3 Purisima F unit RMPs (SC-A8A)
- Both RMPs in the Purisima BC unit: SC-9RC and SC-8RB
- Two of 6 RMPs in the Purisima A unit: SC-5RA and Soquel Point Medium
- One of 3 Purisima AA RMPs (Soquel Point Deep)
- The single Tu unit RMP (SC-13A)

Since there are RMPs with 5-year moving average groundwater elevations below MTs, undesirable results for seawater intrusion continue to occur and the Basin remains in a state of critical overdraft. For RMPs with undesirable results, the 5-year moving averages generally remained similar to WY 2022 or experienced slight declines after showing an increasing trend in prior years. Measurable objectives for groundwater elevation proxies are met at several RMPs screened in the Purisima F, DEF, and A units.

Interim milestones for WY 2025 are based on modeled groundwater level resultant from implementation of projects included in the GSP. Table 9 shows that 13 of 17 RMPs have groundwater elevations higher than WY 2025 interim milestones. The 4 RMPs with groundwater elevations below their 2025 interim milestones are SC-8RB, SC-5RA, Soquel Point Medium, and Soquel Point Deep (Table 9). The 3 RMPs that have MT exceedances but are above 2025 interim milestones are SC-A8A, SC-9RC, and SC-13A. =

Table 9. Groundwater Elevation Proxies for Seawater Intrusion

Representative Monitoring Point	Aquifer	Minimum Threshold	Measurable Objective	Interim Milestone 2025	WY 2019	WY 2020	WY 2021	WY 2022	WY 2023
		Groundwater Elevation feet amsl			Annual Minimum of 5-Year Moving Average Groundwater Elevation, feet amsl				
SC-A3A	Aromas	3	4	3	2.9	2.9	3.1	3.2	3.4
SC-A1B	Purisima F	3	5	3	7.5	7.5	7.4	7.3	7.3
SC-A8A	Purisima F	6	7	4.5	5.4	5.3	5.0	5.0	5.0
SC-A2RA	Purisima F	3	4	3	5.7	6.5	6.6	6.6	6.6
SC-8RD	Purisima DEF	10	11	10	10.1	12.6	13.9	14.0	14.3
SC-9RC	Purisima BC	10	11	4.6	5.2	8.9	9.6	8.2	8.1
SC-8RB	Purisima BC	19	20	8.4	2.7	5.8	5.2	4.9	4.9
SC-5RA	Purisima A	13	15	13	8.5	9.3	10.2	10.1	10.2
SC-3RA	Purisima A	10	12	10	10.6	11.7	11.5	11.3	11.3
SC-1A	Purisima A	4	6	4	9.5	9.7	10.4	10.6	10.7
Moran Lake Medium	Purisima A	5	6.8	5	5.6	5.9	6.2	6.4	6.3
Soquel Point Medium	Purisima A	6	7.1	6	5.3	5.7	5.9	5.9	5.8
Pleasure Point Medium	Purisima A	6.1	6.5	6.1	7.1	7.9	9.3	10.2	9.9
Moran Lake Deep	Purisima AA	6.7	16	6.7	6.5	6.8	7.0	7.2	7.1
Soquel Point Deep	Purisima AA	7.5	16	7.5	6.0	6.3	6.8	6.9	6.9
Pleasure Point Deep	Purisima AA	7.7	16	7.7	8.2	8.7	10.1	10.9	10.6
SC-13A	Tu	17.2	19	8.3	17.1	14.8	15.1	15.4	16.5

Minimum threshold not met

Minimum threshold achieved but measurable objective not met

Measurable objective met

3.3.3 Seawater Intrusion Triggers

Although not required by the SGMA regulations, the GSP includes triggers for early management actions to prevent significant and unreasonable seawater intrusion, the indicator for which the Basin is in critical overdraft. Chloride concentration triggers are exceeded when annual average concentrations exceed 2013-2017 average concentration (i.e., MO) and show an increasing trend. In WY 2023, there are 7 wells with annual average chloride concentrations above their MOs: SC-A3A (Aromas Aquifer; Appendix B; Figure B-1), SC-A2RA (Purisima F Unit; Appendix B; Figure B-4), SC-A2RB (Purisima F Unit; Appendix B; Figure B-5), SC-A5A (Purisima F Unit; Appendix B; Figure B-21), SC-A5B (Purisima F Unit; Appendix B; Figure B-22), SC-A8A (Purisima F Unit; Appendix B; Figure B-3, and Soquel Point Deep (Purisima A unit; Appendix B; Figure B-20).

Of those 7 wells, SC-A5A, SC-A5B, and SC-A2RB–all in the Purisima F unit–have definitive increasing trends. This indicates advancement of seawater intrusion that may lead to undesirable results and therefore warrants early management action. The GSP recommends reducing extractions from the nearest municipal well as an early management action. SqCWD's Seascape well, screened in the overlying Aromas Red Sands, is the nearest municipal well as it is on the same site as SC-A5B and SC-A5A. Groundwater extraction at the Seascape well has been limited to less than 50 AFY since 2015, which is much less than previous years, and is consistent with sustainable pumping described in the GSP. As described in Section 3.3.1, the MGA is investigating the cause of increasing chlorides in this area and has identified local private irrigation wells pumping in the Aromas Red Sands in addition to nearby SqCWD municipal wells that may be changing local groundwater flow dynamics in such a way to cause vertical migration of deeper seawater intrusion. In WY 2024, the MGA will collect additional data to better inform actions to protect the Basin from seawater intrusion impacts.

The GSP also includes triggers for groundwater elevation proxies which are at lower elevations than MTs. These triggers are evaluated using 30-day average elevations, rather than the 5-year moving average, to prompt a management action on a shorter time scale. In WY 2023, only SC-8RB (Purisima BC unit) had 30-day moving average elevations below trigger levels with the exceedance (0.07 feet below 2-foot trigger level) occurring for 6 days in Fall 2022 until it rose above the trigger level on October 7, 2022, and remained above the trigger level for the rest of the water year.

It is recommended SqCWD continue to monitor groundwater levels at SC-8RB. If groundwater levels approach the trigger elevation at SC-8RB, the response will be for SqCWD to redistribute pumping to avoid 30-day averages below the elevation. The closest municipal well in the Purisima BC unit is the SqCWD Aptos Creek well, which has been

offline for several years. The next closest SqCWD well to prioritize for a pumping reduction is the Ledyard well.

3.4 Groundwater Quality

Table 10 shows SMC compared to WY 2023 maximum concentrations at RMPs for the degraded groundwater quality indicator. Sustainable management criteria are met when concentrations are at or below criteria. Minimum thresholds are based on drinking water standards for each constituent of concern. Maximum concentrations at RMPs are also compared to MOs specific to each well based on average WY 2013-2017 concentrations. Interim milestones for groundwater quality are the same as MOs. Exceedances of MT (red shading in the table) for chloride and total dissolved solids are related to seawater intrusion and addressed by that indicator.

In WY 2023, iron and manganese concentrations at several RMPs are greater than MOs that are higher than MTs. The reason MOs are higher than MTs is because MOs are set at average WY 2013-2017 concentrations, which due to naturally high iron and manganese concentrations are often higher than the drinking water standard used for the MTs. Concentrations above MOs indicate an increase in concentration since WY 2013-2017. Iron and manganese MT exceedances are not considered an undesirable result because it is a preexisting natural condition not associated with pumping or managed aquifer recharge.

There were 2 trace detections of 0.65 and 0.78 micrograms per liter (µg/L) of MTBE at the Rosedale 2 production well, which are well below the primary drinking water standard of 13 µg/L. There were no other detections of organic compounds, including 1,2,3-TCP, in any active municipal extraction wells in the Basin.

Table 10. Water Year 2023 Groundwater Quality

Aquifer	Representative Monitoring Point	Total Dissolved Solids mg/L	Chloride mg/L	Iron µg/L[a]	Manganese µg/L[a]	Arsenic µg/L	Chromium (Total) µg/L	Nitrate as Nitrogen mg/L	Organic Compound Detects µg/L
	Minimum Threshold	**1,000**	**250**	**300**	**50**	**10**	**50**	**10**	
		Water Year 2023 Maximum Concentration							
Aromas	CWD-10 PW	350.0	35.0	ND	ND	ND	ND	5.9	ND
	SC-A1C	354.0	32.9	ND	**1,240.0**	NA	NA	1.2	NA
	SC-A2RC	360.0	43.9	3,150.0	204.0	NA	NA	3.8	NA
	SC-A3A	33,000.0	18,400.0	**360.0**	**298.0**	NA	NA	6.9	NA
	SC-A3C	404.0	83.8	164.0	8.0	NA	NA	7.9	NA
	SC-A8B	345.0	36.1	14.0	**189.0**	NA	NA	ND	NA
	SC-A8C	336.0	52.6	ND	ND	NA	NA	5.1	NA
Aromas/ Purisima F	Polo Grounds PW	262.0	22.8	24.0	**191.0**	ND	ND	ND	ND
	Aptos Jr. High 2 PW	280.0	32.7	14.0	**276.0**	0.6	ND	ND	ND
	Country Club PW [a]	350.0	33.0	ND	ND	ND	3.2	4.1	ND
	Bonita PW	303.0	29.6	ND	ND	0.6	12.2	3.2	ND
	San Andreas PW	246.0	21.7	ND	ND	ND	14.5	1.5	ND
	Seascape PW	202.0	17.7	ND	ND	ND	14.4	1.0	ND
Purisima F	CWD-4 PW	350.0	28.0	ND	ND	ND	ND	4.2	ND
	CWD-12 PW	310.0	24.0	ND	ND	ND	ND	1.3	ND
	SC-A2RA	28,900.0	20,300.0	**127.0**	**532.0**	NA	NA	6.2	NA
	SC-A8A	19,300.0	9,310.0	**454.0**	**3,820.0**	NA	NA	ND	NA
Purisima DEF	SC-8RD	324.0	21.1	ND	ND	NA	NA	ND	NA
	SC-9RE	537.0	53.5	**71.0**	**52.0**	NA	NA	ND	NA
	SC-A1A	238.0	29.1	71.0	**49.0**	NA	NA	ND	NA
	T. Hopkins PW	362.0	59.9	100.0	154.0	2.6	1.3	ND	ND
	Granite Way PW	278.0	27.9	31.0	18.0	ND	0.7	ND	ND
Purisima BC	Madeline 2 PW	426.0	34.5	233.0	7.0	ND	1.7	ND	ND

Aquifer	Representative Monitoring Point	Total Dissolved Solids mg/L	Chloride mg/L	Iron µg/L[a]	Manganese µg/L[a]	Arsenic µg/L	Chromium (Total) µg/L	Nitrate as Nitrogen mg/L	Organic Compound Detects µg/L
	Minimum Threshold	**1,000**	**250**	**300**	**50**	**10**	**50**	**10**	
		Water Year 2023 Maximum Concentration							
	Aptos Creek PW	NA	NA	**NA**	**NA**	NA	NA	NA	NA
	Ledyard PW	346.0	37.7	96.0	12.0	ND	1.2	ND	ND
	SC-23A	286.0	20.1	ND	ND	NA	NA	ND	NA
	SC-8RB	500.0	14.4	23.0	ND	NA	NA	ND	NA
	SC-9RC	410.0	31.6	ND	ND	NA	NA	ND	NA
Purisima A	30th Ave Shallow	790.0	53.0	120.0	**1,200.0**	NA	NA	ND	NA
	Pleasure Point Shallow	270.0	34.0	110.0	**100.0**	NA	NA	ND	NA
	Estates PW	460.0	46.9	177.0	**91.0**	ND	1.1	ND	ND
	Garnet PW	648.0	87.9	1,390.0	**418.0**	0.7	0.9	ND	ND
	Tannery 2 PW	558.0	63.6	230.0	**152.0**	0.7	1.0	ND	ND
	Rosedale 2 PW	464.0	46.8	749.0	**280.0**	0.6	1.5	ND	0.8 (MTBE)
	Beltz #8 PW	440.0	48.8	860.0	**220.0**	1.9	ND	ND	ND
	Beltz #9 PW	490.0	44.9	1,100.0	**240.0**	ND	0.3	ND	ND
	SC-3RC	434.0	48.9	60.0	40.0	NA	NA	ND	NA
	SC-5RA	506.0	58.7	**74.0**	**182.0**	NA	NA	ND	NA
	SC-9RA	378.0	15.0	**336.0**	14.0	NA	NA	ND	NA
	SC-10RA	430.0	30.8	608.0	**544.0**	NA	NA	ND	NA
	SC-22A	372.0	17.9	**473.0**	**535.0**	NA	NA	ND	NA
Purisima A/AA	Beltz #10 PW	NA	NA	**NA**	**NA**	NA	NA	NA	NA
Purisima AA	SC-10RAA	238.0	10.3	151.0	**54.0**	NA	NA	ND	NA
	SC-22AAA	640.0	61.1	29.0	34.0	NA	NA	ND	NA
	Coffee Lane Deep	1,000.0	48.0	34.0	**130.0**	NA	NA	ND	NA
	Pleasure Point Deep	630.0	26.0	**630.0**	**210.0**	NA	NA	ND	NA
	Thurber Lane Shallow	Well not sampled since 2006							

Aquifer	Representative Monitoring Point	Total Dissolved Solids mg/L	Chloride mg/L	Iron µg/L[a]	Manganese µg/L[a]	Arsenic µg/L	Chromium (Total) µg/L	Nitrate as Nitrogen mg/L	Organic Compound Detects µg/L
	Minimum Threshold	**1,000**	**250**	**300**	**50**	**10**	**50**	**10**	
		Water Year 2023 Maximum Concentration							
	Schwan Lake	400.0	98.0	**320.0**	**110.0**	NA	NA	ND	NA
Purisima AA/Tu	O'Neill Ranch PW	426.0	48.7	**1,070.0**	**436.0**	ND	0.5	ND	ND
	Main Street PW	316.0	28.5	85.0	27.0	ND	0.8	ND	ND
	Beltz #12 PW	NA	NA	**NA**	**NA**	NA	NA	NA	NA
Tu	SC-18RAA	256.0	17.5	44.0	**19.0**	NA	NA	ND	NA
	Thurber Lane Deep	Well not sampled since 2006							

Maximum concentration between minimum threshold and measurable objective not met (see note b below)

Minimum threshold met but measurable objective not met in wells with MO less than MT

Measurable objective met

NA = not analyzed

ND = non-detect at the reporting limit

Note: Water quality data are compared to MOs based on 2013-2017 average concentrations that are constituent and well specific. Refer to the GSP to see well specific MOs.

[a] Data from Country Club #2 PW instead of County Club #1 PW. Water quality samples collected during pumping test June 2023. Country Club #2 PW has not yet been put into service.

[b] Values in **bold** indicate where MO is higher than MT due to natural causes. In these cases, concentrations higher than the MT are not undesirable results.

3.5 Subsidence

Subsidence is not applicable in the Santa Cruz Mid-County Basin as an indicator of groundwater sustainability.

3.6 Interconnected Surface Water

Table 11 shows groundwater elevation proxies for SMC at RMPs for depletion of interconnected surface water. Sustainable management criteria for this indicator are met when groundwater elevations are at or above proxy elevations.

Hydrographs for 5 depletion of interconnected surface water groundwater elevation proxy RMPs are shown on Figures A-35 through A-39; Appendix A. Of the 5 RMPs, the Balogh monitoring well is the only RMP with minimum average monthly groundwater elevations below its MT groundwater elevation proxies. The other 4 shallow RMPs along Soquel Creek have minimum average monthly groundwater elevations above MT groundwater elevation proxies. Since undesirable results are defined as any depletion of interconnected surface water RMP having groundwater elevations below its MT, undesirable results for surface water depletion are occurring. One RMP, Wharf Road monitoring well, had groundwater elevations that met its MO.

Table 11. Groundwater Elevation Proxy for Depletion of Interconnected Surface Water

Well Name	Aquifer	Minimum Threshold	Measurable Objective	Interim Milestone 2025	WY 2019	WY 2020	WY 2021	WY 2022	WY 2023
		Groundwater Elevation feet amsl			Minimum Average Monthly Groundwater Elevation feet amsl				
Balogh	Shallow Groundwater	29.1	30.6	29.1	29.1	29.1	28.7	28.7	28.8
Main St. Shallow		22.4	25.3	20.7	22.5	22.8	22.3	22.6	22.4
Wharf Road		11.9	12.1	11.3	12.1	12.4	12.0	12.1	12.1
Nob Hill		8.6	10.3	7.3	8.7	5.5	8.2	9.0	8.9
SC-10RA	Purisima A	68	70	68	69.2	69.0	69.9	68.9	69.0

Minimum threshold not met

Minimum threshold achieved but measurable objective not met

Measurable objective met

3.7 Update on Project and Management Action Implementation

Below are WY 2023 updates on projects and management actions planned or in the process of being implemented.

3.7.1 Implementation Funding

In May 2022, the MGA was awarded a $7.6 million Sustainable Groundwater Management Implementation Round 1 Grant. Projects to be funded by the grant are directly focused on addressing groundwater sustainability. Projects funded are summarized in Table 12.

Table 12. SGMA Implementation Grant Round 1 Funding Projects

SGMA Implementation Grant Round 1 Component	Status
Inland groundwater pumping optimization to effectively redistribute SqCWD groundwater pumping away from the coast and add a new SqCWD inland production well	Pumping optimization planning is included in the regional optimization study included in the last row of this table. A new inland production well will be completed and equipped in WY 2025
Include Beltz #8 as an additional ASR well in the SCWD's ASR program	See Section 3.7.3
Increase the intertie capacity between SqCWD's subarea 1 and subarea 2 to mitigate the bottleneck caused by undersized pipe thereby improving water reliability	Construction started August 2023 Put into service December 2023
A regional water resources optimization study for Group 1 and 2 projects and management actions identified in the GSP.	Study is underway and expected to be completed April 2025. See Section 3.7.4

3.7.2 Pure Water Soquel

The PWS project will recharge purified recycled water at 3 SWIP wells to replenish the aquifer and aid in raising groundwater levels above seawater intrusion MTs. The project is currently being constructed to produce up to 1,500 AFY of purified water. The project has completed California Environmental Quality Act environmental review with a certified Environmental Impact Report. Project components include the following:

- Three SWIP wells – Twin Lakes, Willowbrook, and Monterey SWIP wells
- Nine Monitoring wells – 9 well monitoring system for the PWS project strategically located adjacent to SWIP wells. The monitoring wells will be used to monitor

groundwater quality and groundwater levels throughout the operation of Pure Water Soquel.

- Conveyance – construction of about 8 miles of pipelines to convey water to and from the Santa Cruz Wastewater Treatment Facility to the Chanticleer Water Purification Center, and to convey purified water from the Water Purification Center to the 3 SWIP wells to recharge the Basin. The pipelines were designed and are being constructed for future expansion of the project, if needed, to be double the current design capacity.
- Treatment facilities - 2 new water treatment facilities. One is a recycled water treatment facility, and the other is a water purification center.
    - New Recycled Water Facility: located at the Santa Cruz Wastewater Treatment Facility. A pump station (source water pump station and electrical transformer) and brine return pipeline, PG&E metering enclosure near the corner of Bay Street and California Street, a radio communication pole, and tertiary treatment system (cloth filter and UV system) to produce recycled water to be used on site as well for a future construction water fill station and irrigation at a nearby park.
    - New Water Purification Center located in the Live Oak area, at the corner of Soquel Avenue and Chanticleer Avenue The new center is where recycled water will pass through a state-of-the-science, 3-step advanced purification process: microfiltration, reverse osmosis, and ultraviolet light with advanced oxidation with an ozone pre-treatment. The treatment process produces ultra-clean, purified water, to be pumped to SWIP wells, and then underground to replenish the groundwater basin. The new center will also be home to an educational learning center.

Table 13 summarizes construction progress of PWS components for WY 2023 and prior years. It is expected construction of all PWS components will be completed in calendar year 2024.

Table 13. Status of Pure Water Soquel Project Construction

Project Component	Completed in Prior Water Years	Water Year 2023 Progress
3 SWIP wells	1. Twin Lakes Church Well constructed and developed in WY 2019, redeveloped in WY 2020 2. Willowbrook Well started construction in WY 2020; completed construction and development in WY 2021 3. Monterey Well constructed and developed in WY 2021	Construction activities of the site civil infrastructure at SWIP well sites such as the backwash basins are complete. Some electrical components and permits will be completed in WY 2024.
9 SWIP monitoring wells	All 9 SWIP monitoring wells were constructed and developed in WY 2022 Twin Lakes Church SWIP monitoring wells: TLM-1A, TLM-2A, TLM-2BC, TLM-3BC, & TLM-4BC Willowbrook SWIP monitoring wells: WM-1 and WM-2 Monterey SWIP monitoring wells: MM-1 and MM-2	Background groundwater quality sampling in WY 2023 and WY 2024
Conveyance pipelines	Construction of the conveyance pipelines started in May 2021.	Pipeline construction continued in WY 2023 and will be completed in WY 2024
Treatment facilities	Construction of the treatment facilities at the Santa Cruz Wastewater Treatment Facility (SCWWTF) and the Water Purification Center at Chanticleer site started in WY 2022.	Construction at both facility sites continued in WY 2023 and will be completed in WY 2024

SqCWD maintains an informative outreach and education program specific to the PWS that includes a dedicated section on its website: https://www.soquelcreekwater.org/pws and PWS Project updates in the SqCWD's monthly email blast. Weekly construction updates are also emailed out and included on the website: https://www.soquelcreekwater.org/256/Construction-Updates

3.7.3 Aquifer Storage and Recovery

It is expected the SCWD will receive California State Water Resources Control Board action in calendar year 2024 on water rights petitions for change that will lead to phased implementation of full-scale ASR at the SCWD's existing Beltz wells. The SCWD completed implementation of demonstration studies at both Beltz # 8 and #12 wells. It is now in the design phase for permanent modifications to convert these 2 wells to permanent ASR wells. This work is scheduled for completion in calendar year 2025. In addition, the SCWD has begun pilot testing at Beltz #9. Similar to Beltz #8 and #12, pilot and demonstration testing is

conducted as a series of brief incremental cycles of injection and extraction to evaluate water quality and basin impacts. Pilot testing at Beltz #9, if successful, would be followed by demonstration studies to reveal any operational issues associated with full-scale injection and extraction rates prior to implementing permanent design changes to these facilities.

3.7.4 Optimization Study

SCWD and SqCWD are currently collaborating on the Basin Optimization Study. The study uses the Santa Cruz Mid-County Basin GSFLOW groundwater model to iteratively simulate scenarios and water resources projects. The overarching goal of the study is to identify projects and management alternatives that meet the water supply needs of SCWD and SqCWD while maintaining GSP sustainability goals. The work started in January 2023 with anticipated completion by April 2025.

Work conducted at the time of this report includes:

- Validating simulated groundwater levels and stream flow in the uncalibrated 2015-2022 period.
- Model calibration near SCWD's Beltz wells over the 2015-2022 period to ensure accurate simulation of recent ASR pilot testing.
- Iterative simulation of diverse projects and management actions to identify feasible and sustainable alternatives that meet SCWD and SqCWD supply, with model simulations guided by machine learning for optimization.

The study is currently performing the last bullet above. The study will provide several feasible and sustainable project and management action alternatives that will inform future long-term operations and provide shared regional benefits.

3.7.5 Water Transfers / In-Lieu Groundwater Recharge

As described in the GSP, a water transfer pilot test has been underway. The water transfer involves SCWD delivering treated surface water to SqCWD to serve a portion of SqCWD's service area. Currently, an extension of the pilot project agreement allows for transfers through May 1, 2026. In WY 2023, 12 AF of water was transferred to SqCWD to test calibration of its hydraulic model. Water transfers are currently limited while SCWD's tertiary non-potable water system is upgraded.

Longer-term implementation of water transfers will require a new agreement, including compliance with Proposition 218 requirements to set the cost of service for water delivered

and, depending on the annual quantity transferred, waiting for resolution of the places of use changes of the SCWD's San Lorenzo River water rights.

3.7.6 Distributed Storm Water Managed Aquifer Recharge

The County continues to operate 2 Distributed Storm Water Managed Aquifer Recharge (DSWMAR) projects, 1 in Aptos at Polo Grounds County Park, and another in Live Oak at Brommer Street Park. The dry wells recharging stormwater are not currently instrumented. Total estimated average recharge is 20 AFY though was likely more in WY 2023 given the significant precipitation.

The timetable for development at additional DSWMAR project sites is not available and continues to be speculative at this time.

3.8 Update on Monitoring Network

3.8.1 Improvement of Monitoring Network

All but 1 monitoring feature has been installed to address data gaps identified in the 2020 GSP. Table 14 summarizes when data gap monitoring features were installed and Figure 24 shows the location of all features added to the monitoring network.

Table 14. Status of Monitoring Features Identified as Data Gaps in the Groundwater Sustainability Plan

Monitoring Feature	Status
Deep Tu unit well (SP-5) near Soquel Point	Completed in WY 2020
Deep Purisima AA unit well near SC-3A	Well SC-3AA installed in WY 2022
8 shallow streamflow interaction monitoring wells	6 shallow wells installed in 2022 1 well installed in January 2024 A second Balogh well could not be drilled due to lack of access
6 stream gages	6 gages installed (see Figure 24) Rating curves established in WY 2023

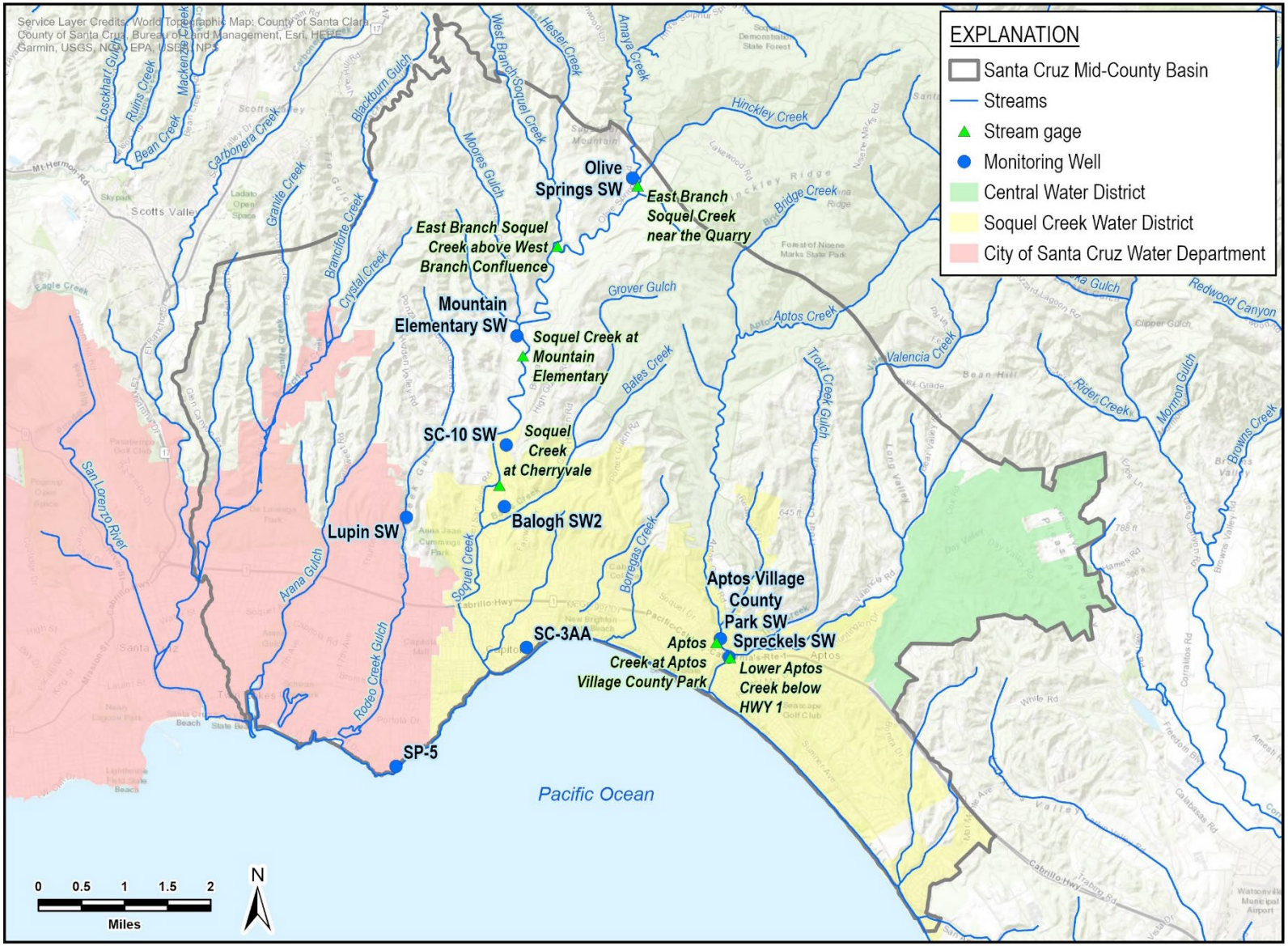

Figure 24. Monitoring Wells and Stream Gages Installed to Address 2020 GSP Data Gaps

3.8.2 Other Monitoring Network Changes

There are 8 wells in the 2020 GSP monitoring network that cannot be used to collect groundwater levels. Two of those wells have already been removed from the MGA groundwater level monitoring network:

- SC-A7A in the Purisima F Unit has not been included in the MGA Annual Reports since Water Year 2021. It can no longer be used to collect groundwater level measurements because it likely has a broken seal and does not provide reliable data. SC-A7B also screened in the Purisima F unit can be used in its place to collect groundwater level data.
- SC-14B in the Purisima BC unit. SqCWD has not been able to measure depth to water since 2018 due to stuck airline. SC-14C also screened in the Purisima BC unit can be used in its place to collect groundwater level data.

The other 6 wells tentatively remain in the network even though they are currently inaccessible. It is planned to attempt to remove airline equipment stuck in these wells and to resume data collection if equipment removal is successful. The monitoring wells of concern are:

- Purisima A unit wells: SC-14A and SC-17A
- Purisima BC unit: SC-16B and SC-17B
- Purisima DEF unit: SC-17C and SC-17D

A full re-evaluation of the monitoring networks will be conducted for the 2025 Periodic Evaluation.

3.9 Data Management System

A regional data management system (DMS) with a public portal, based on Kister's WISKI platform, was completed in WY 2023. The DMS contains groundwater level, groundwater quality, groundwater extraction, and stream flow data for wells and creeks in the Santa Cruz Mid-County Basin and Santa Margarita Basin.

Website to access public portal: https://sccwaterdata.us/#/html/home

4 REFERENCES

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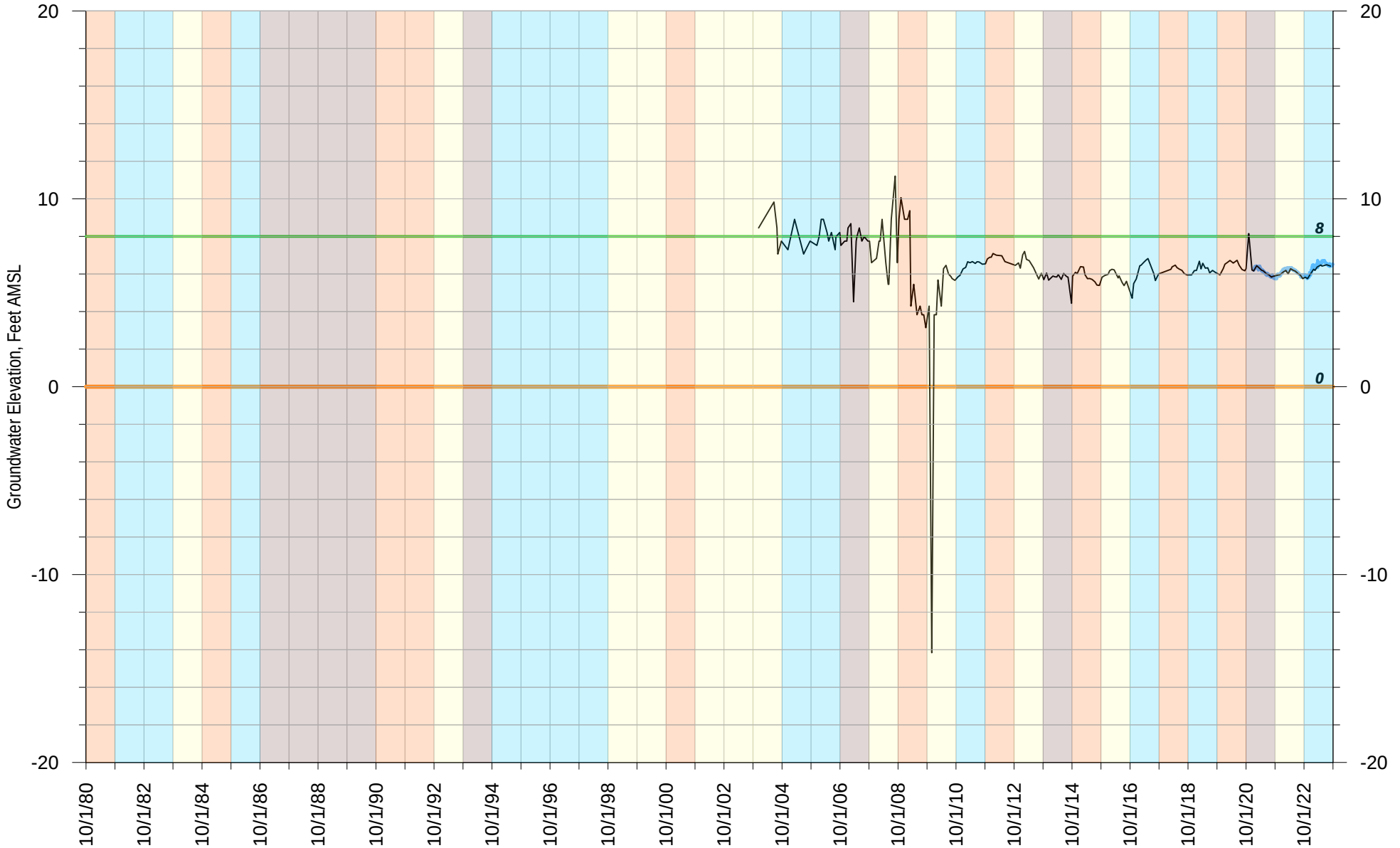
Appendix A

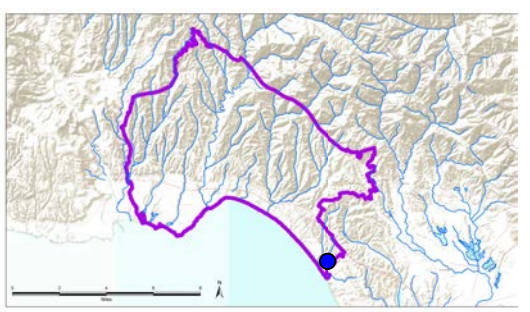
Well Hydrographs

SC-A7C at Canon Del Sol
Aquifer Screened: Aromas

Appendix A

FIGURE A-1





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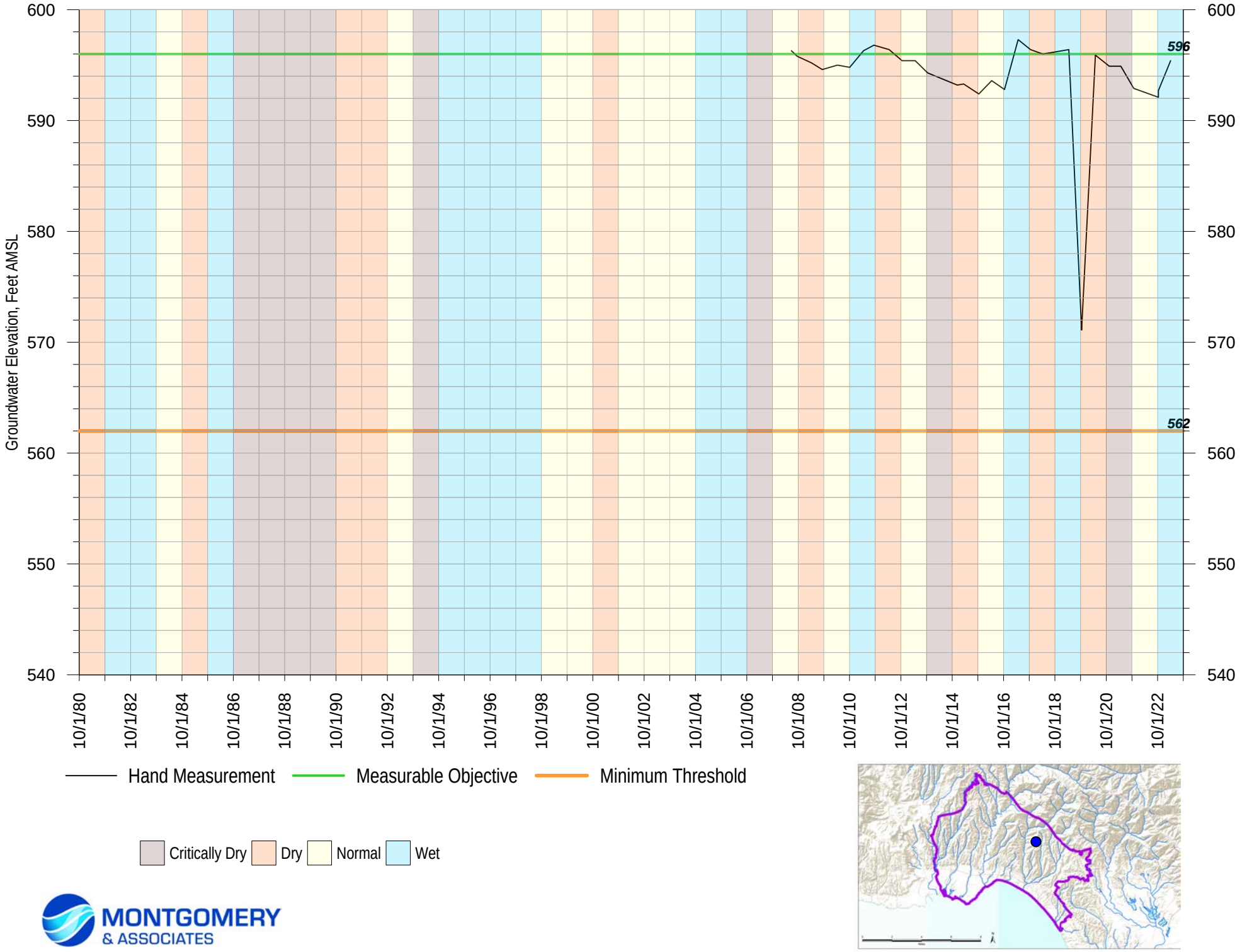
Private Well 2
Aquifer Screened:

Appendix A

FIGURE A-2



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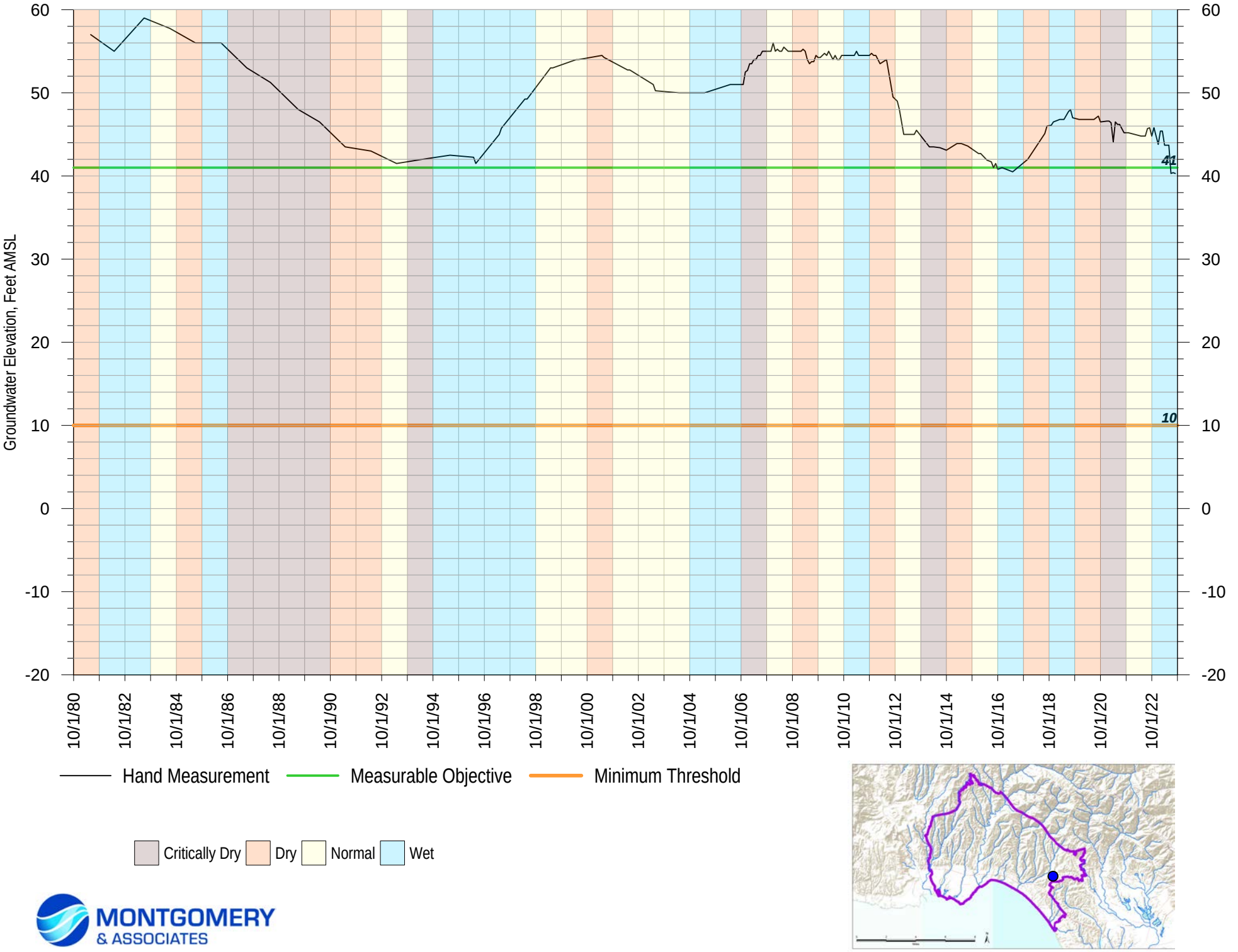
Black

Aquifer Screened: Purisima F

Appendix A

FIGURE A-3



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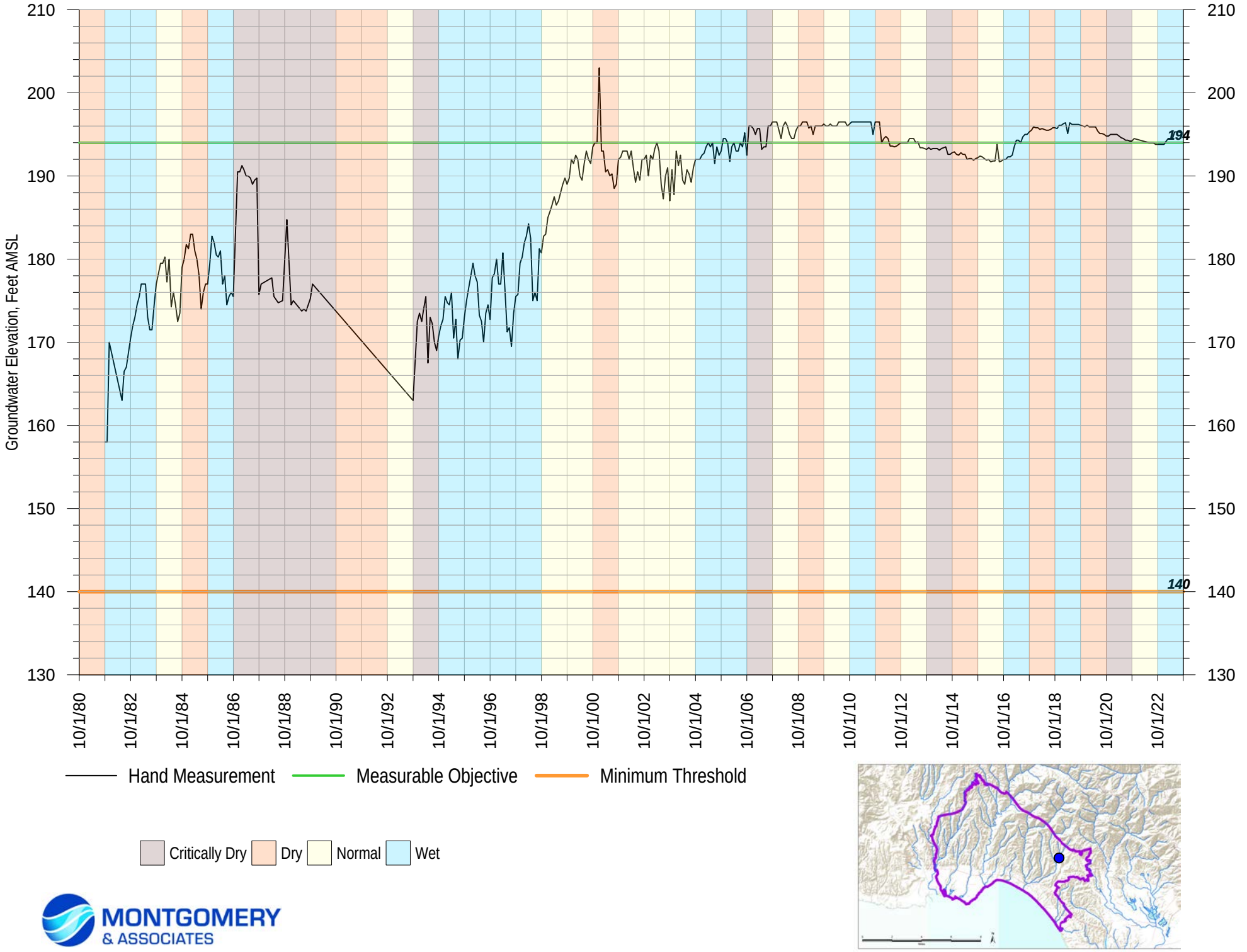
CWD-5

Aquifer Screened: Purisima F

Appendix A

FIGURE A-4



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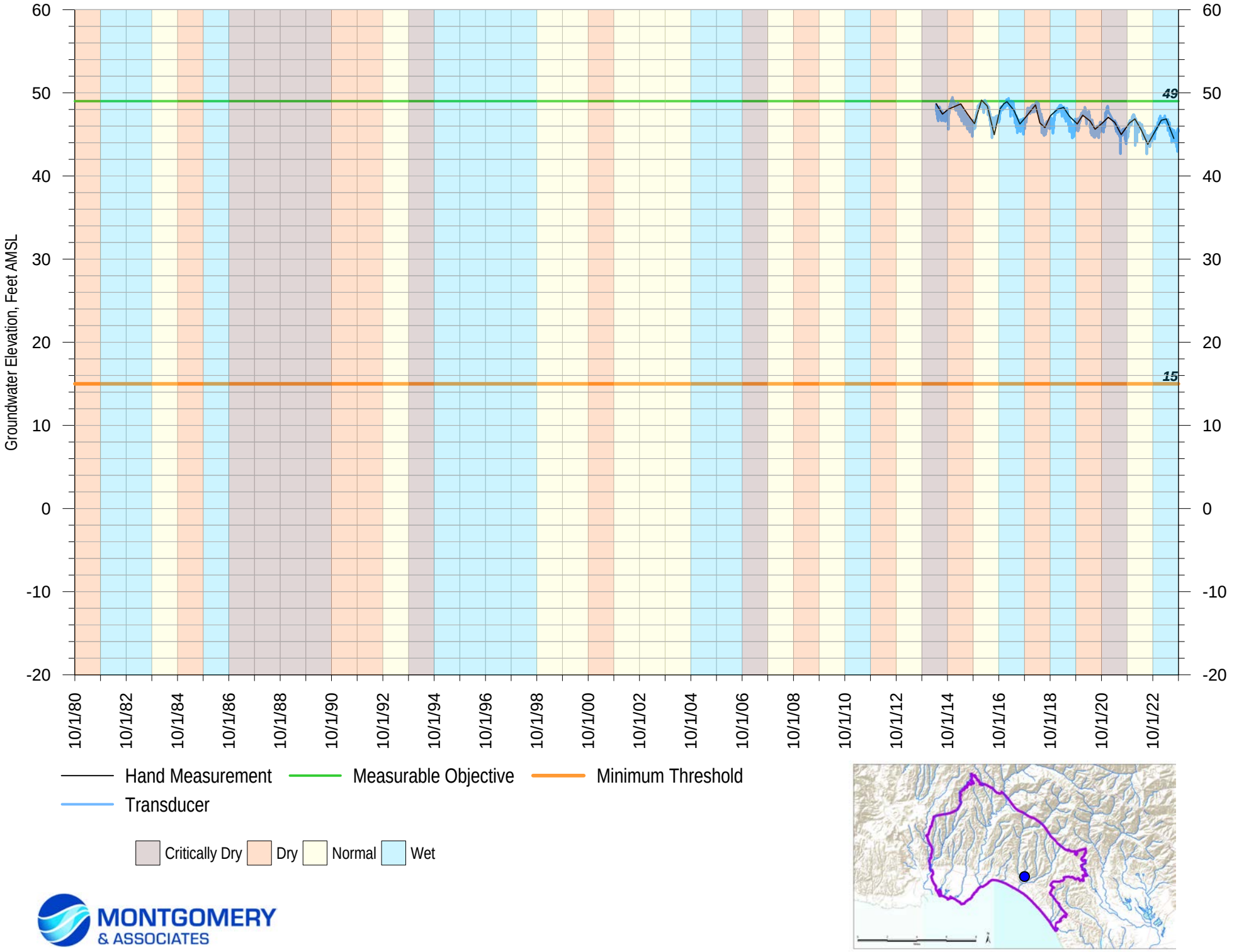
SC-23C at Quail Run

Aquifer Screened: Purisima F

Appendix A

FIGURE A-5



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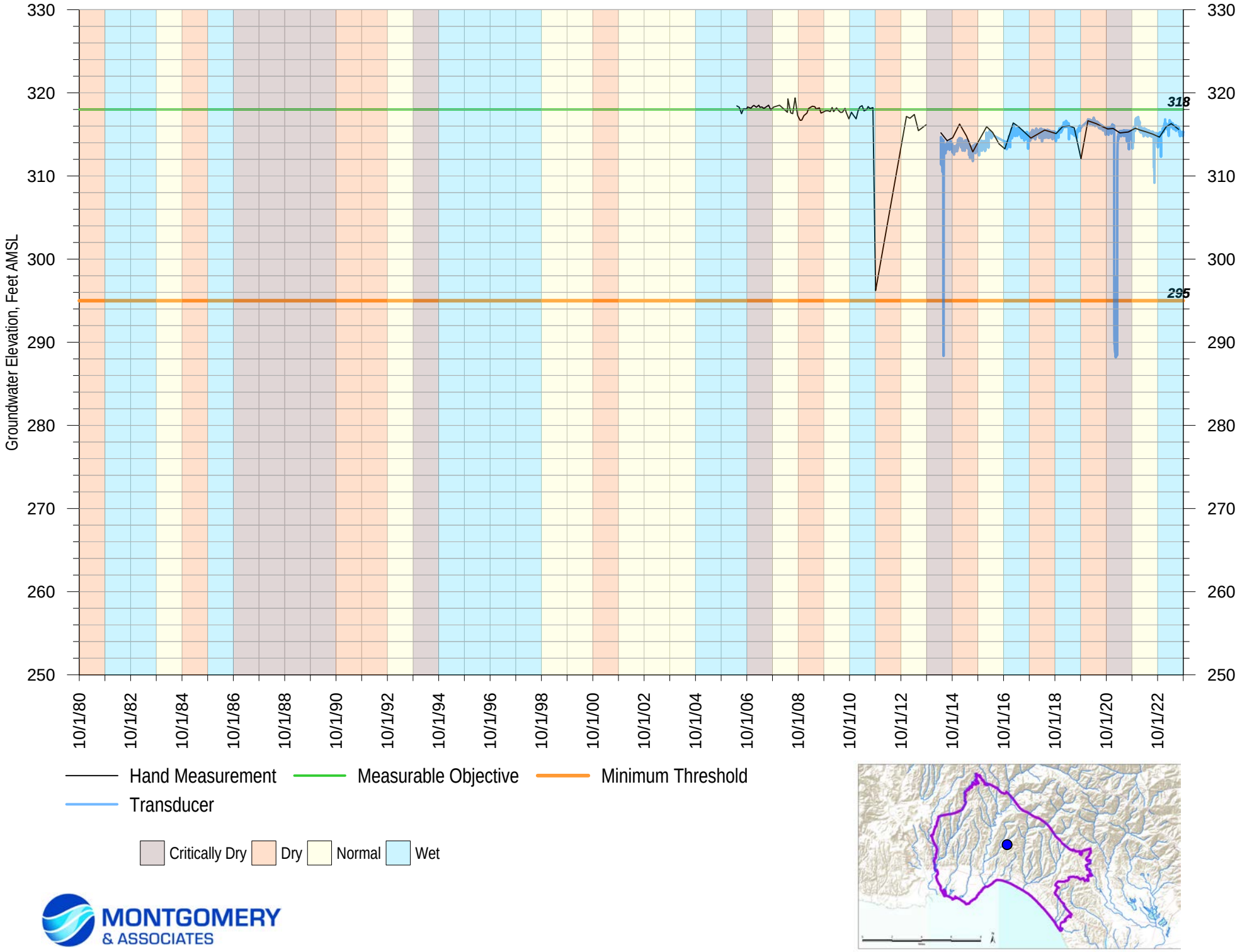
SC-11D & SC-11RD at Porter Gulch
Aquifer Screened: Purisima DEF

Appendix A

FIGURE A-6



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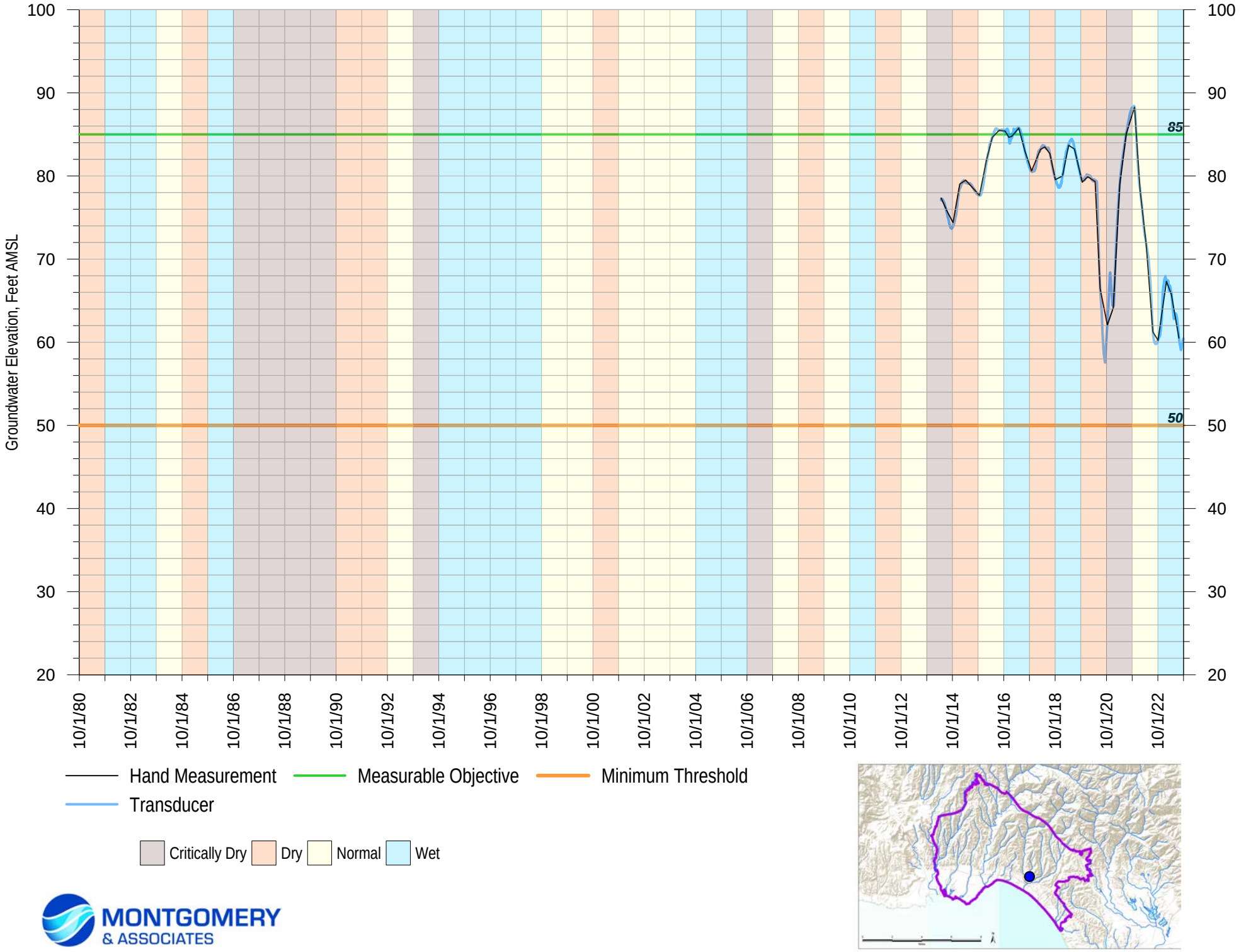
SC-23B at Quail Run
Aquifer Screened: Purisima DEF

Appendix A

FIGURE A-7



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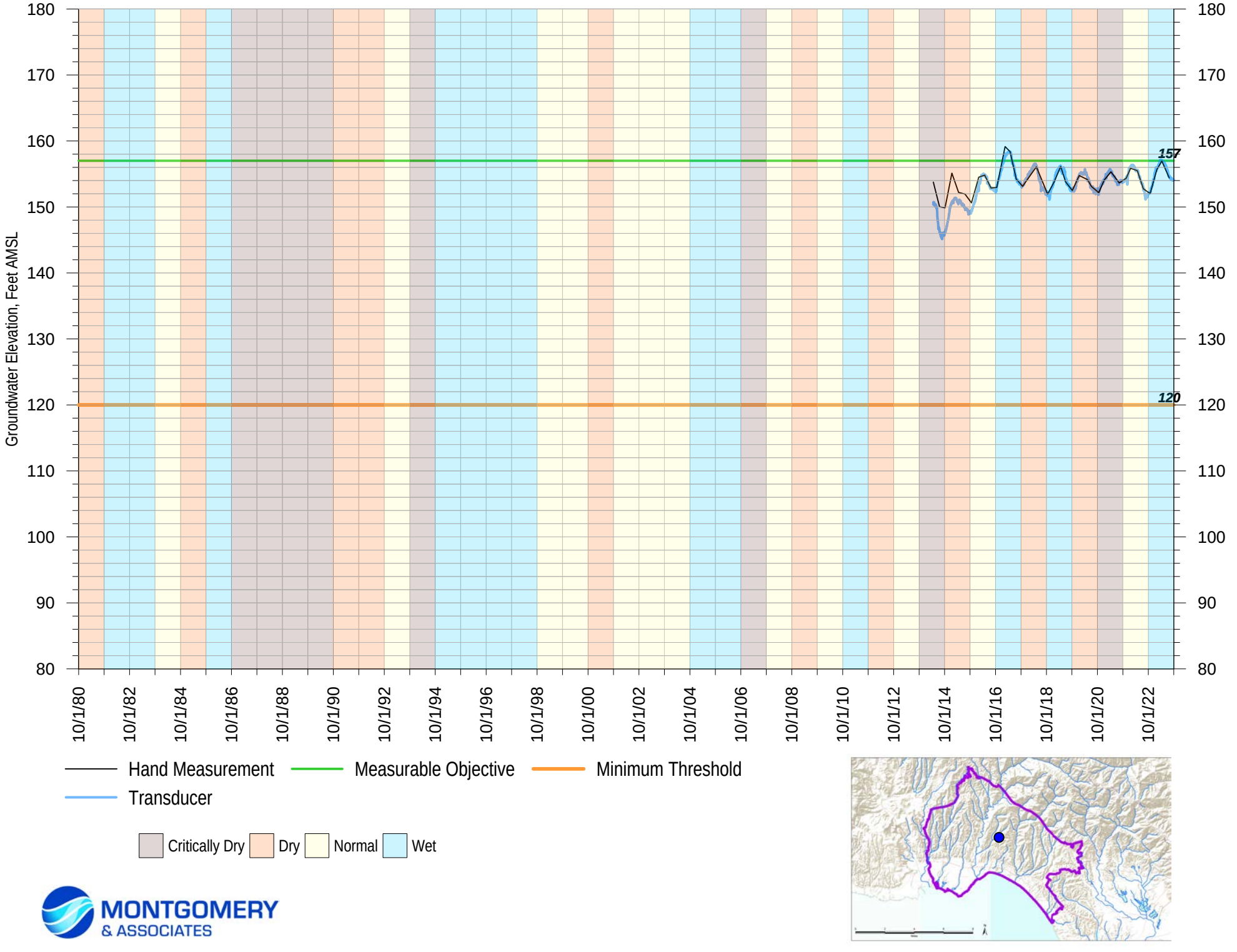
SC-11B at Porter Gulch

Aquifer Screened: Purisima BC

Appendix A

FIGURE A-8



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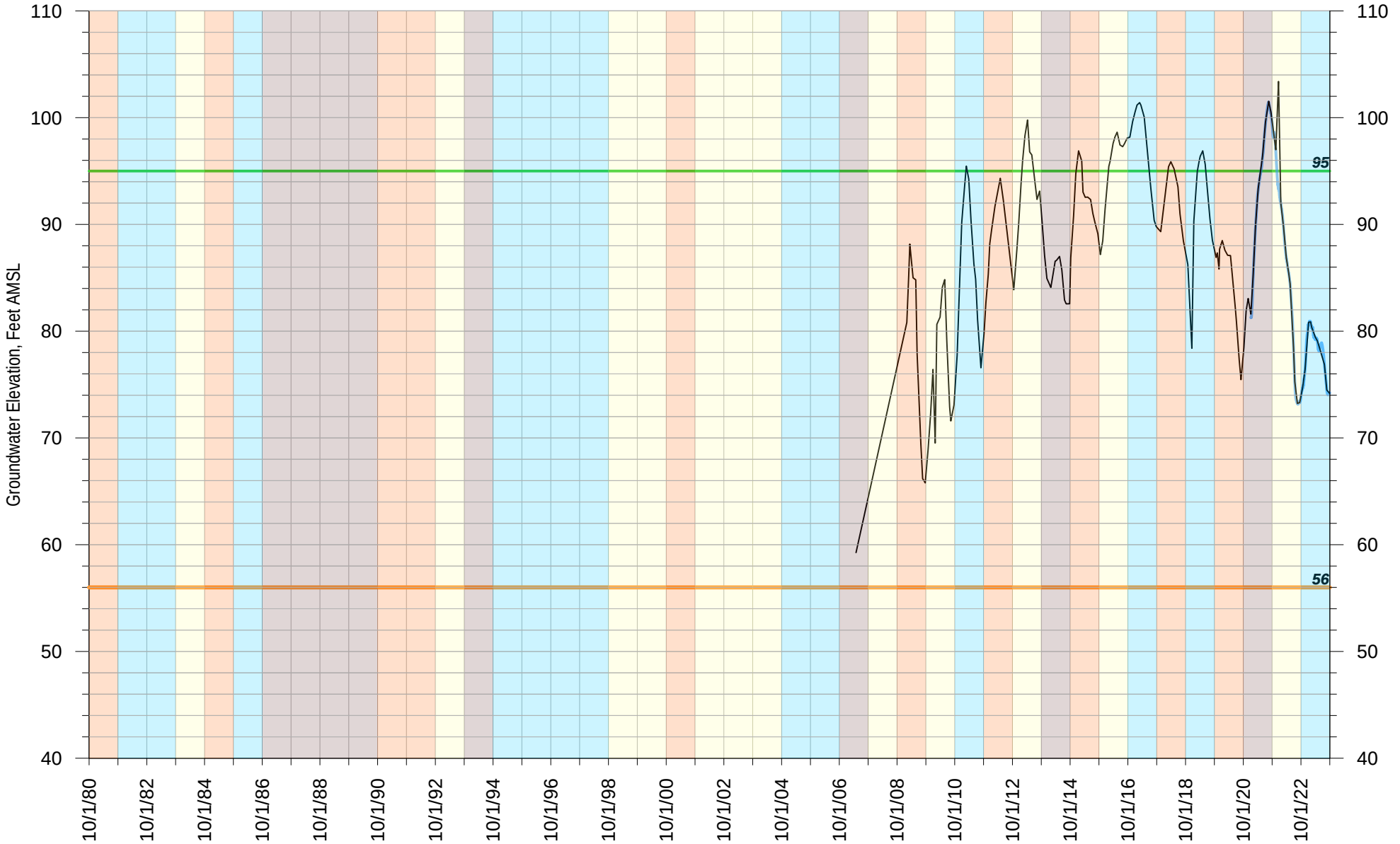
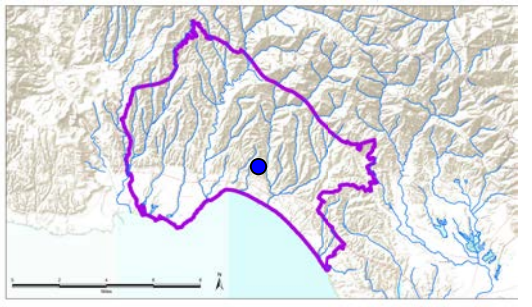
SC-19 at Austrian

Aquifer Screened: Purisima BC

Appendix A

FIGURE A-9





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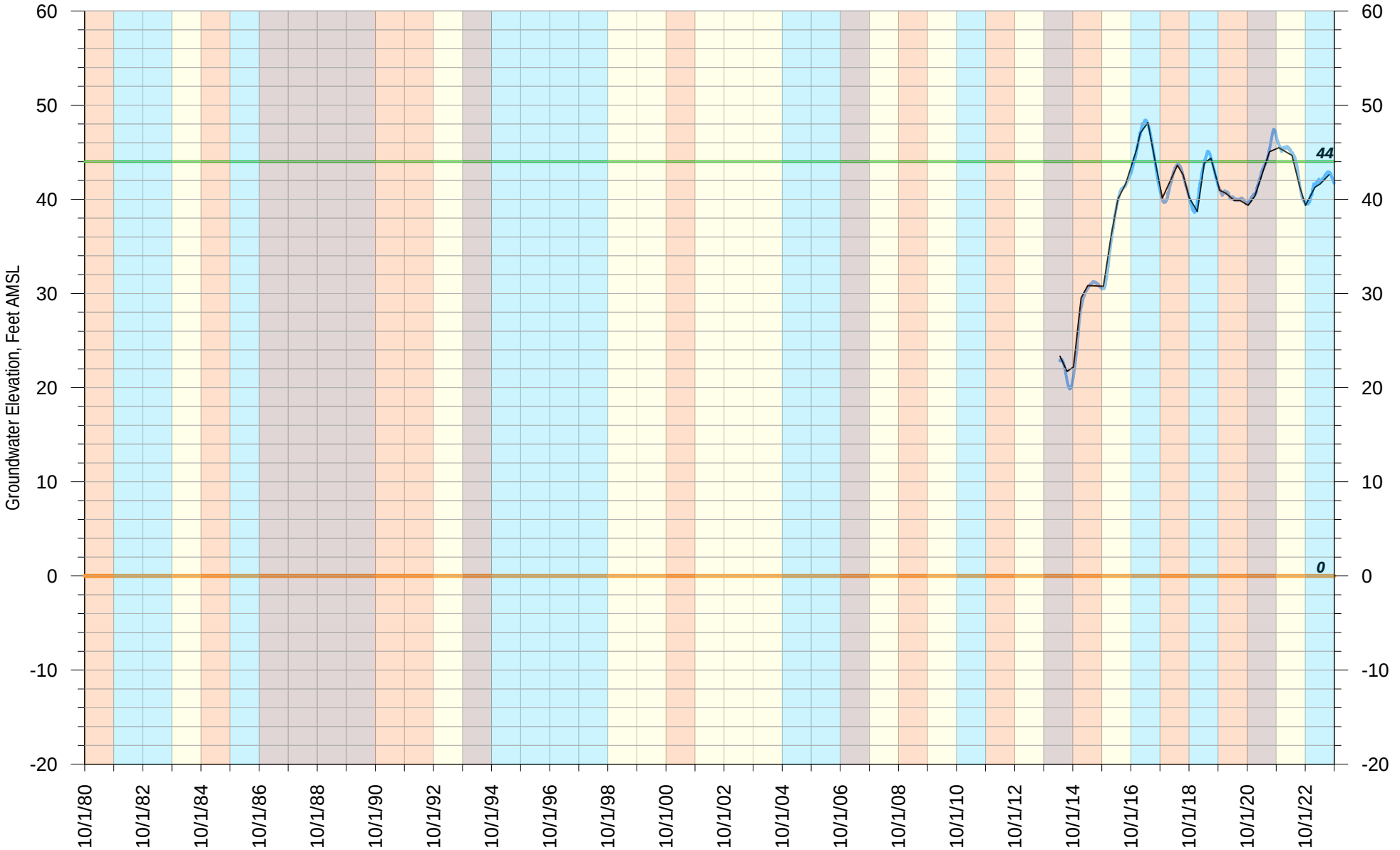
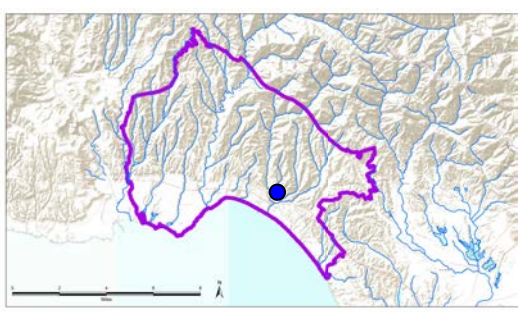
SC-23A at Quail Run

Aquifer Screened: Purisima BC

Appendix A

FIGURE A-10





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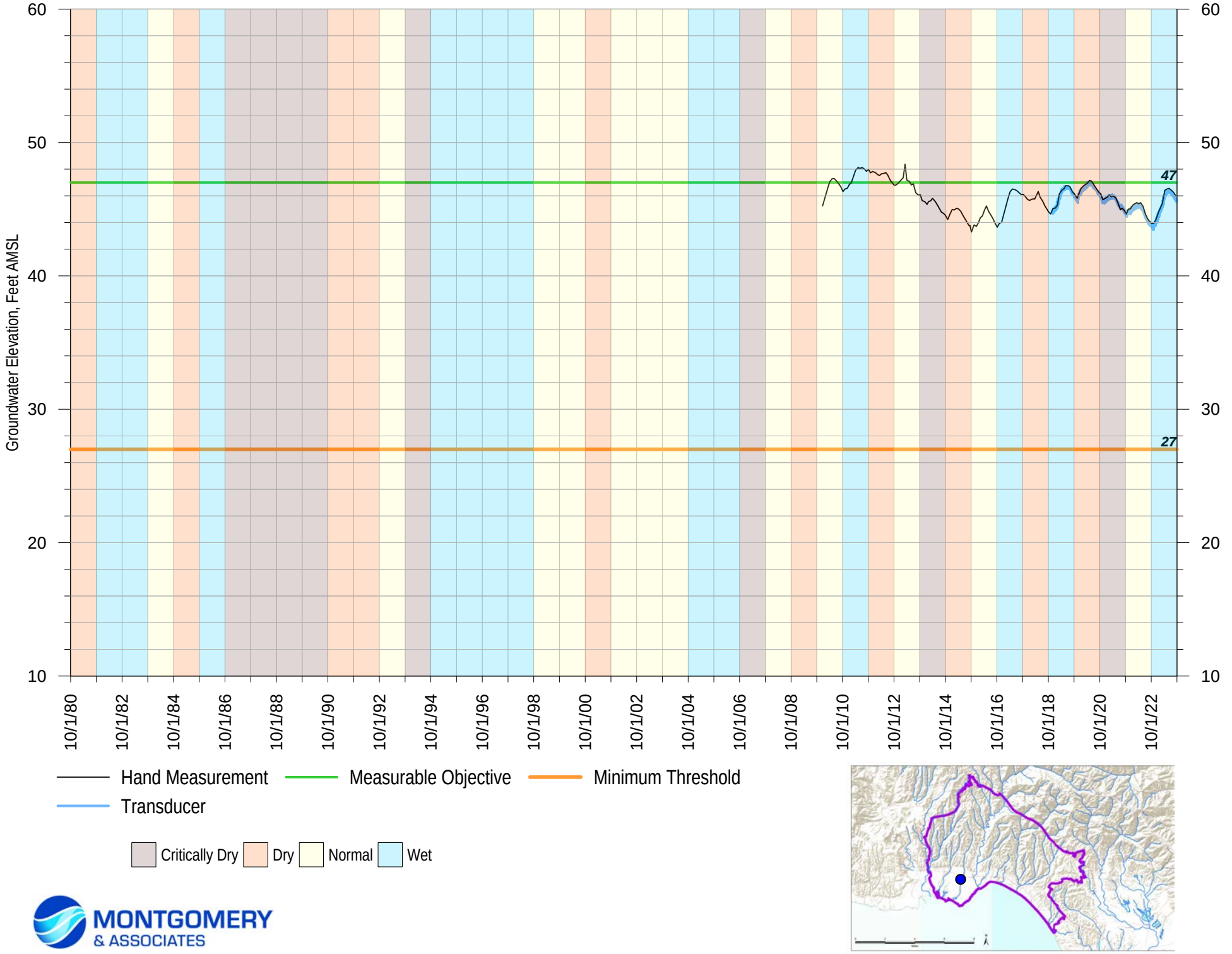
Coffee Lane Shallow
Aquifer Screened: Purisima A

Appendix A

FIGURE A-11



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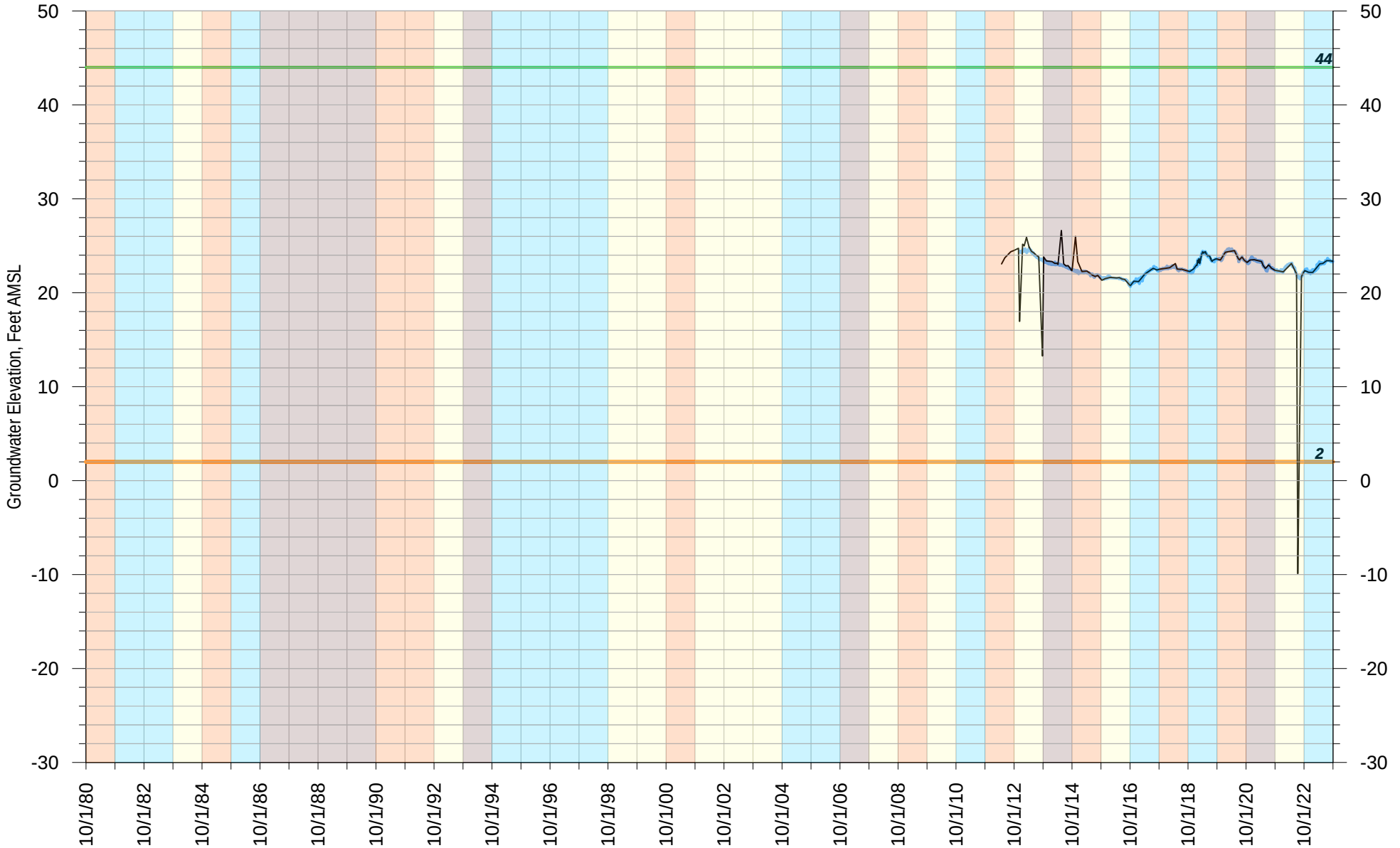
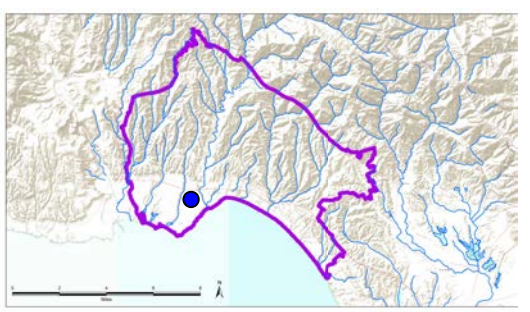
SC-22A at 41st Ave
Aquifer Screened: Purisima A

Appendix A
FIGURE A-12





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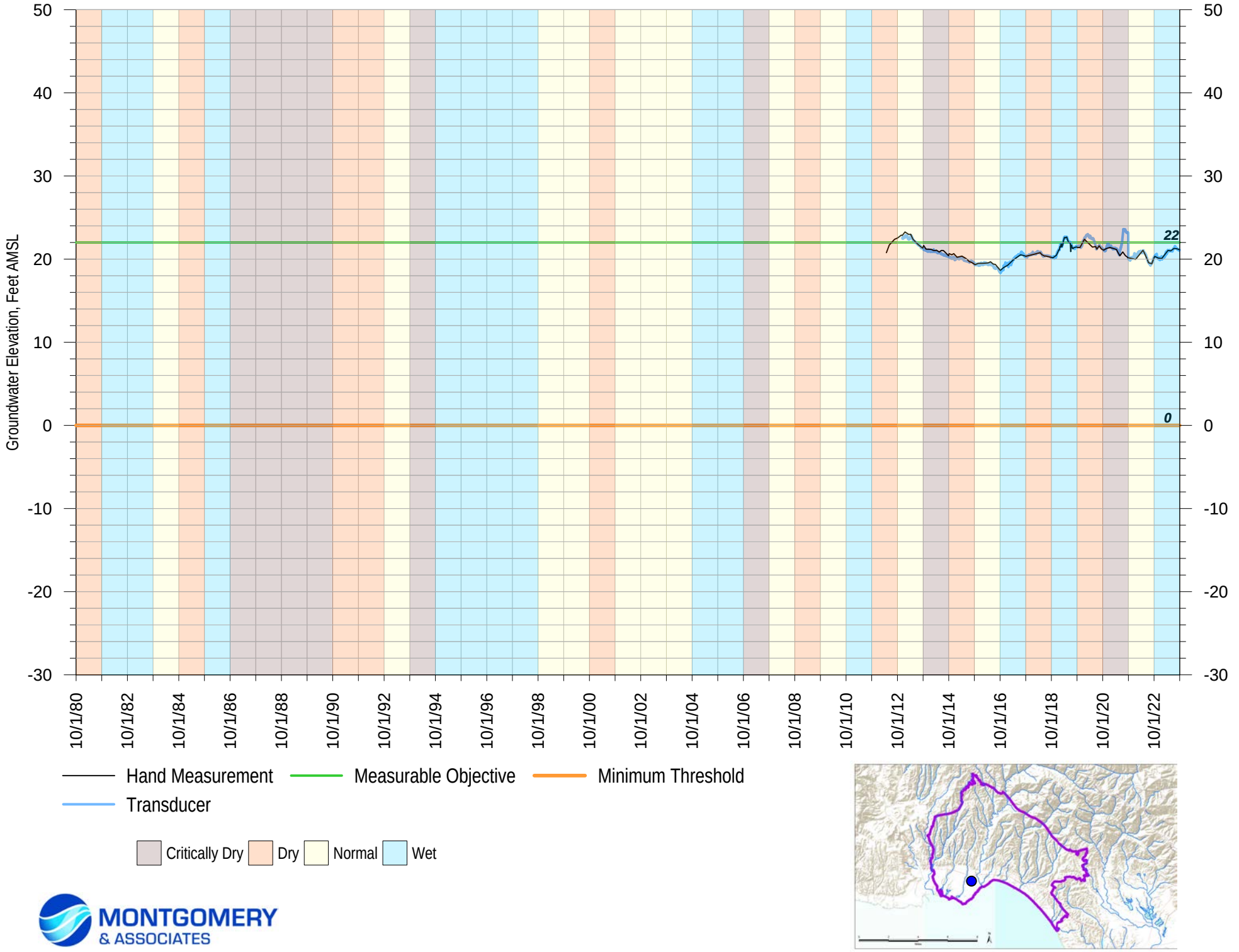
SC-22AA at 41st Ave
Aquifer Screened: Purisima AA

Appendix A

FIGURE A-13



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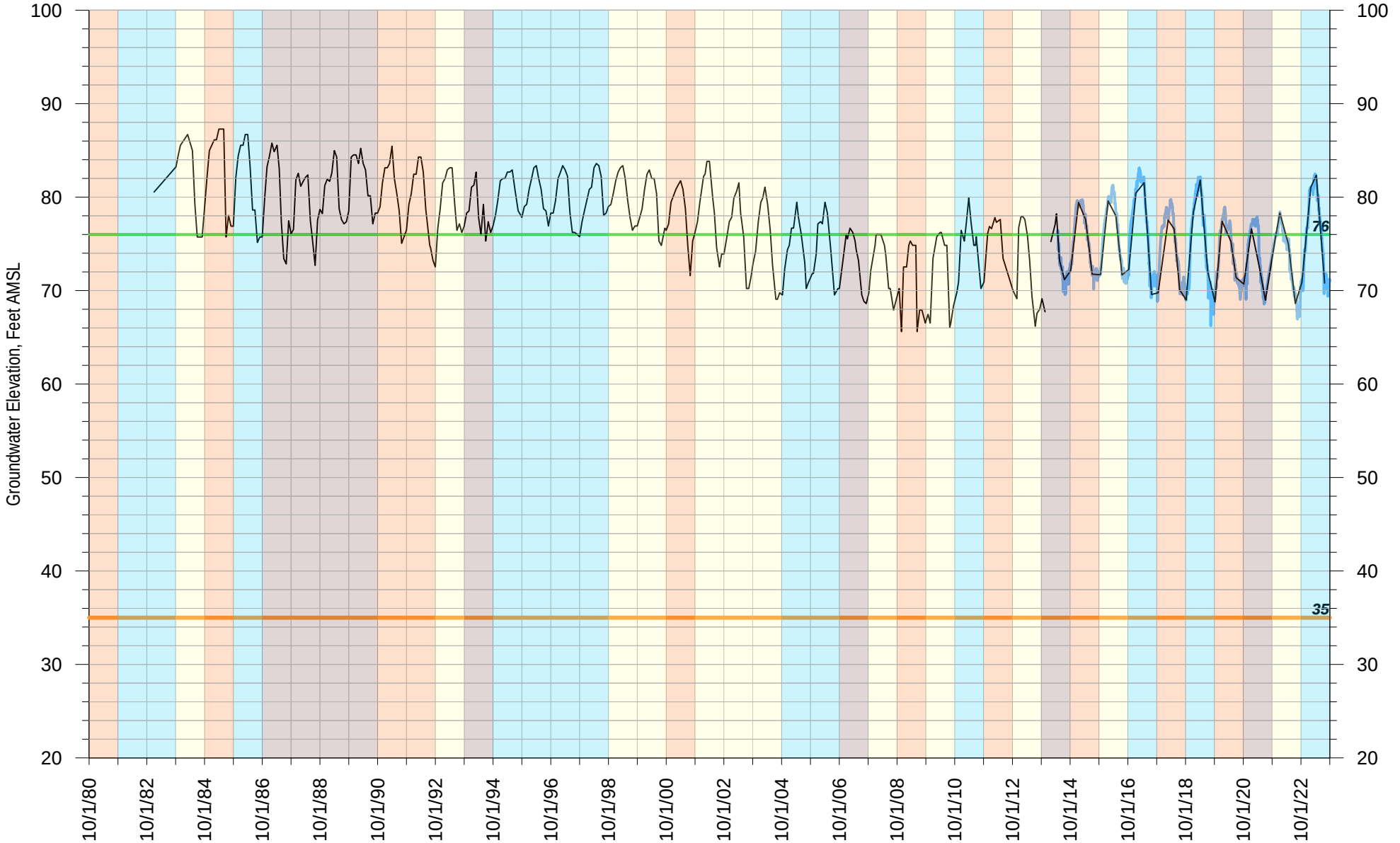
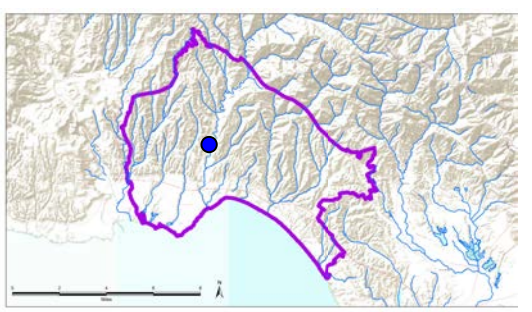
SC-10AA & SC-10RAA at Cherryvale
Aquifer Screened: Purisima AA

Appendix A

FIGURE A-14





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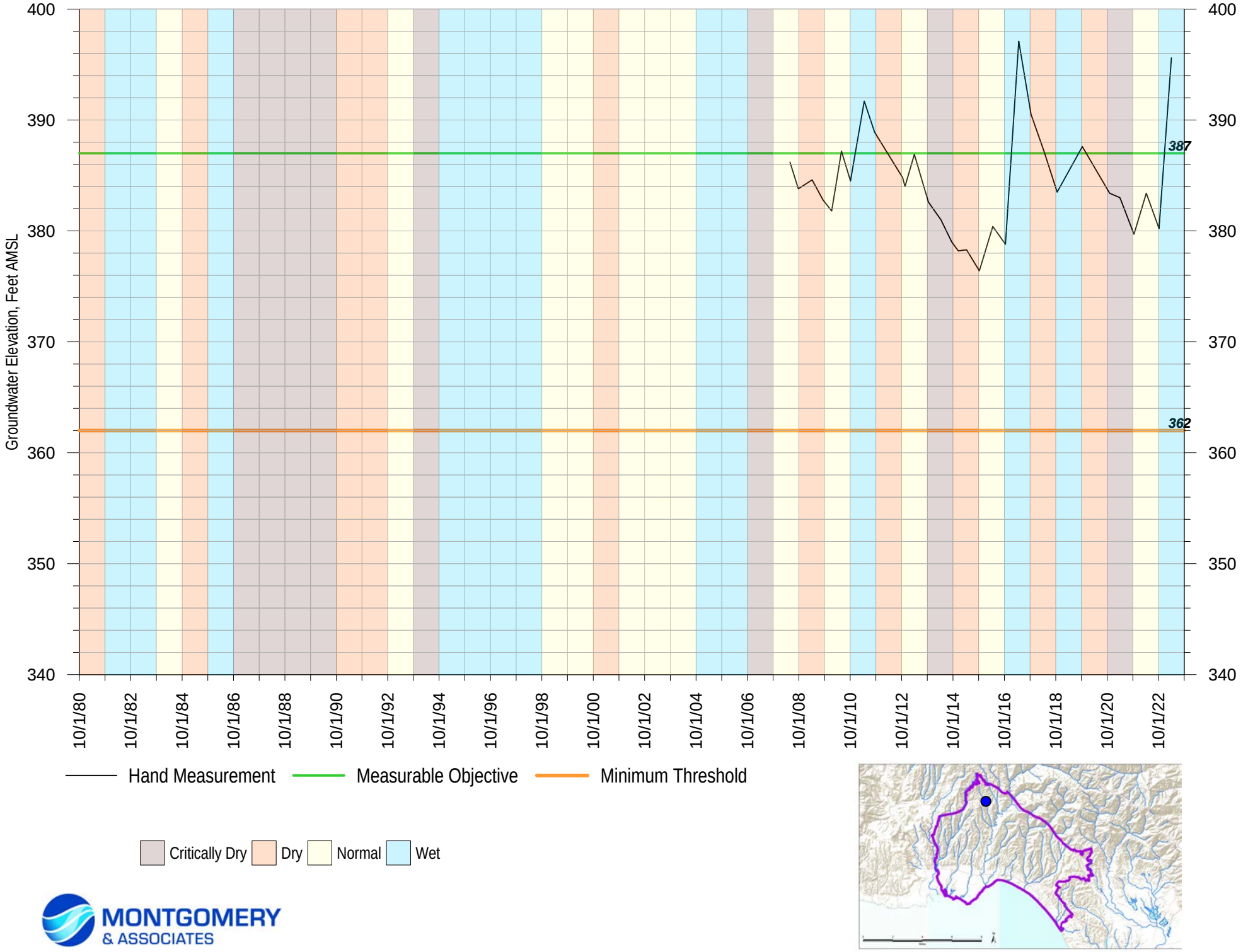
Private Well 1
Aquifer Screened:

Appendix A

FIGURE A-15



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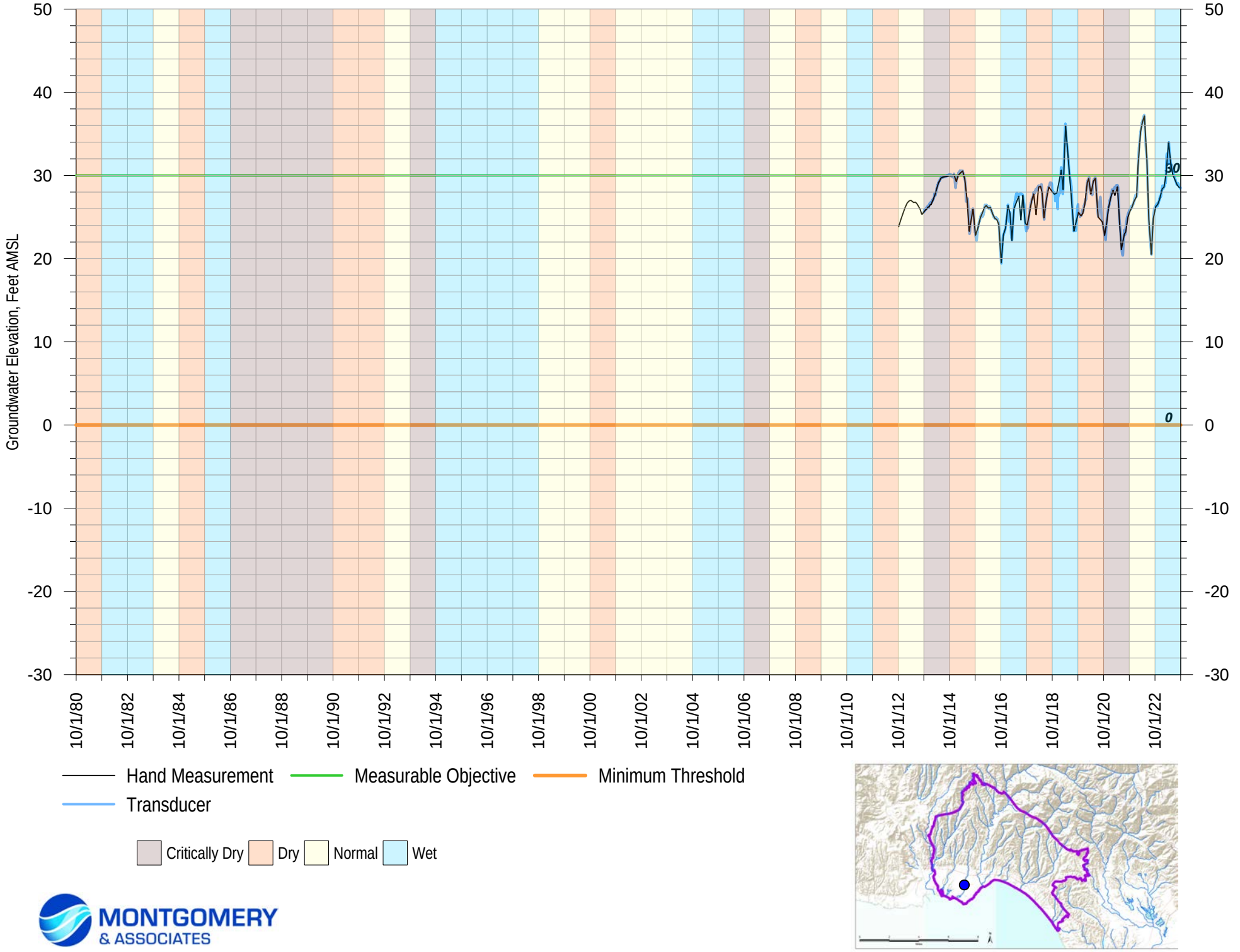
30th Ave Deep
Aquifer Screened: Tu

Appendix A

FIGURE A-16



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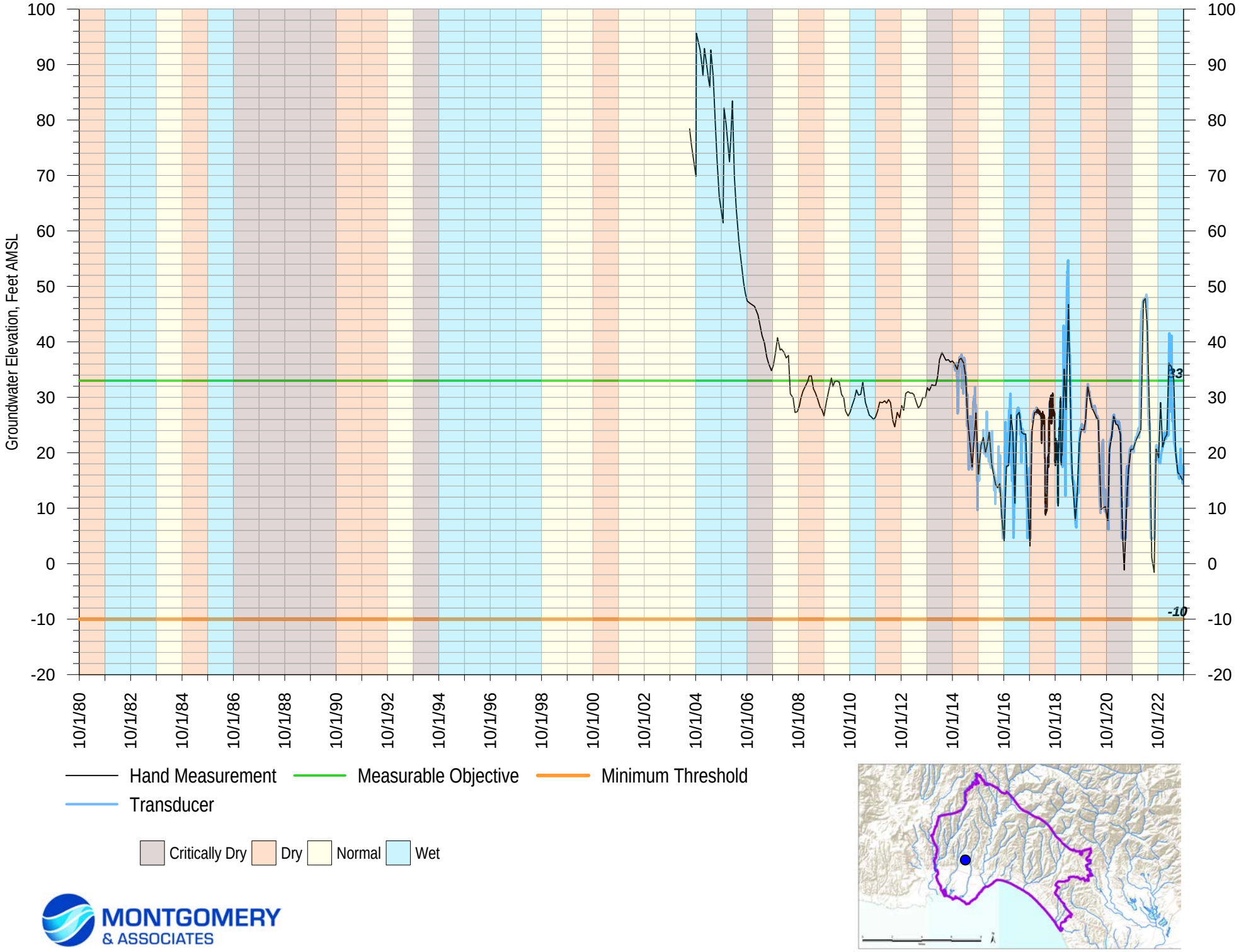
Thurber Deep
Aquifer Screened: Tu

Appendix A
FIGURE A-17



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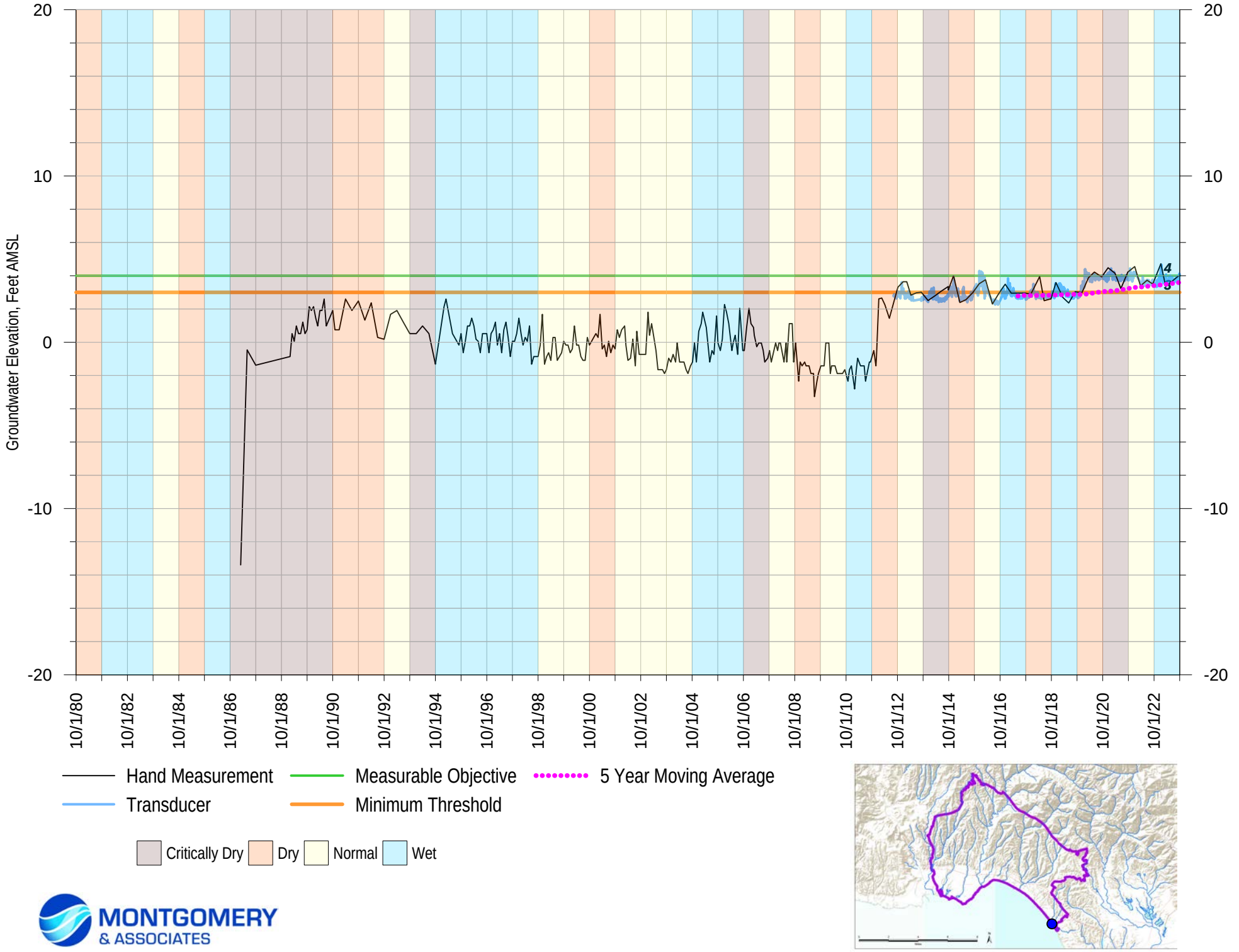
SC-A3A at Playa Visa
Aquifer Screened: Aromas

Appendix A

FIGURE A-18



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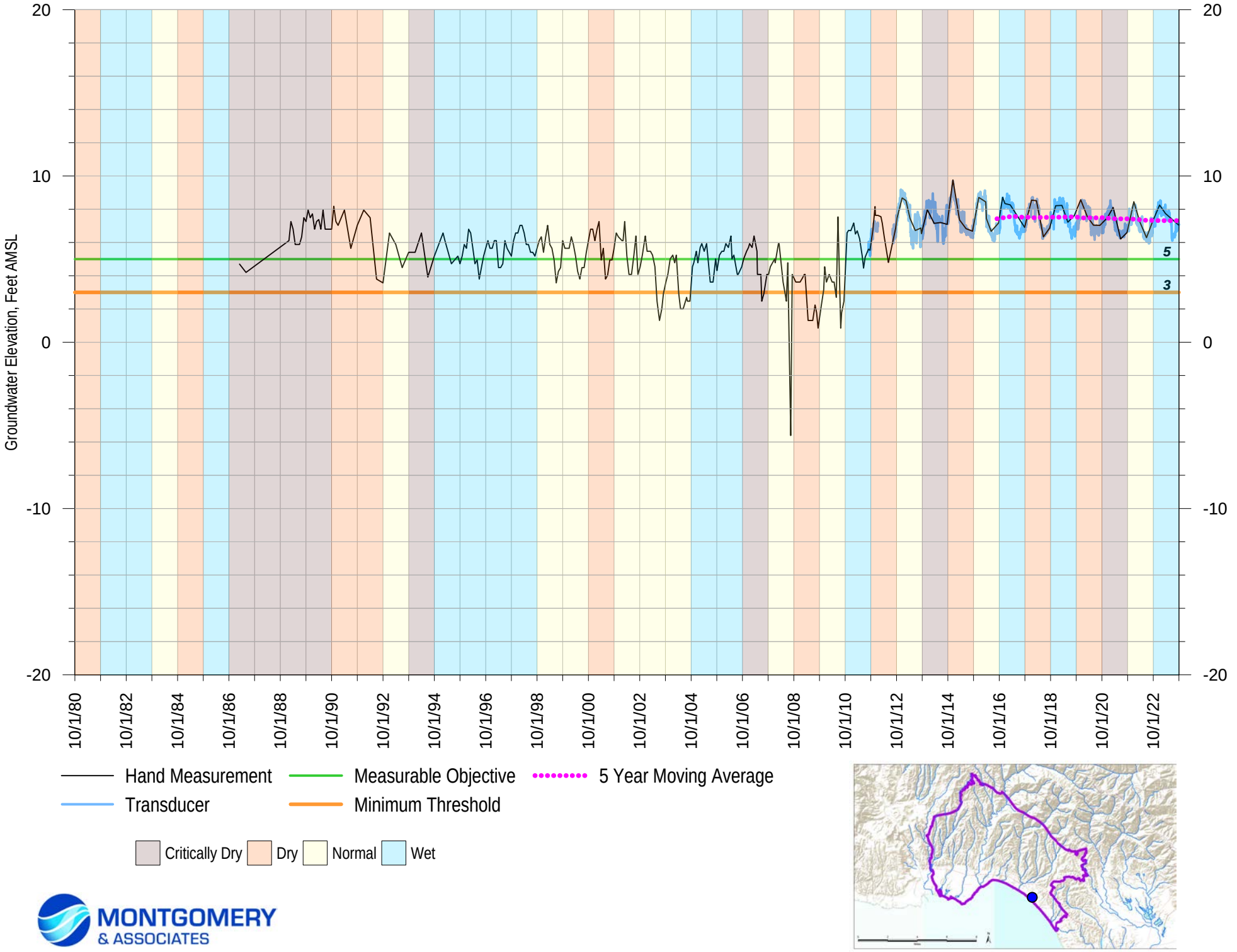
SC-A1B at Cliff Drive
Aquifer Screened: Purisima F

Appendix A
FIGURE A-19



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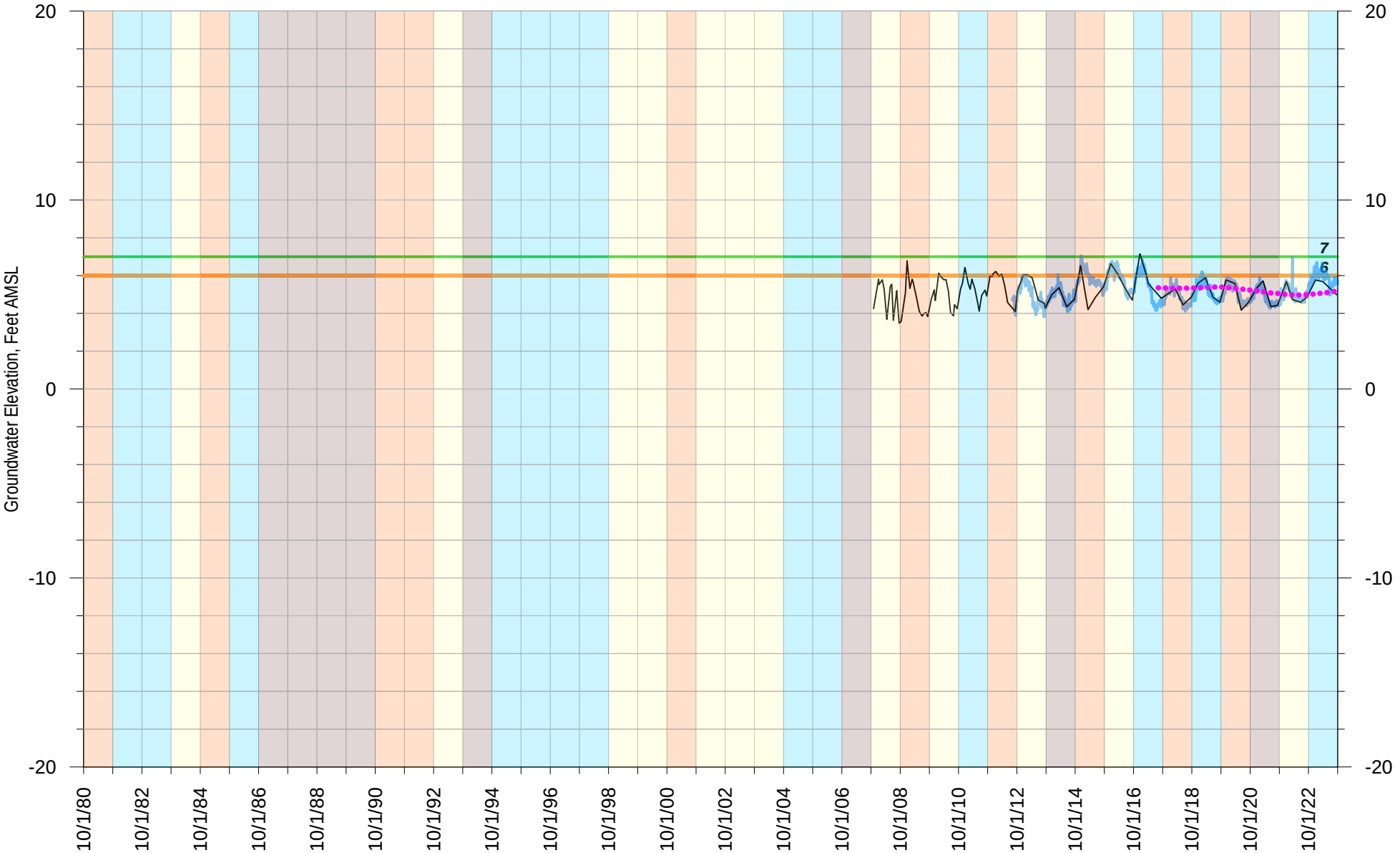
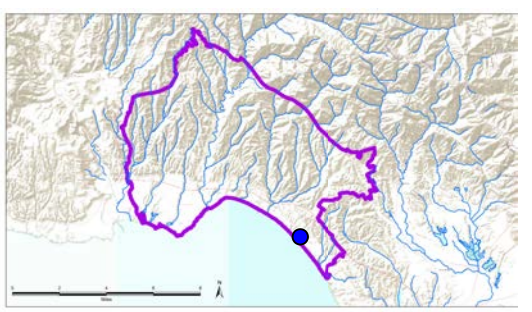
SC-A8A at Dolphin

Aquifer Screened: Purisima F

Appendix A

FIGURE A-20





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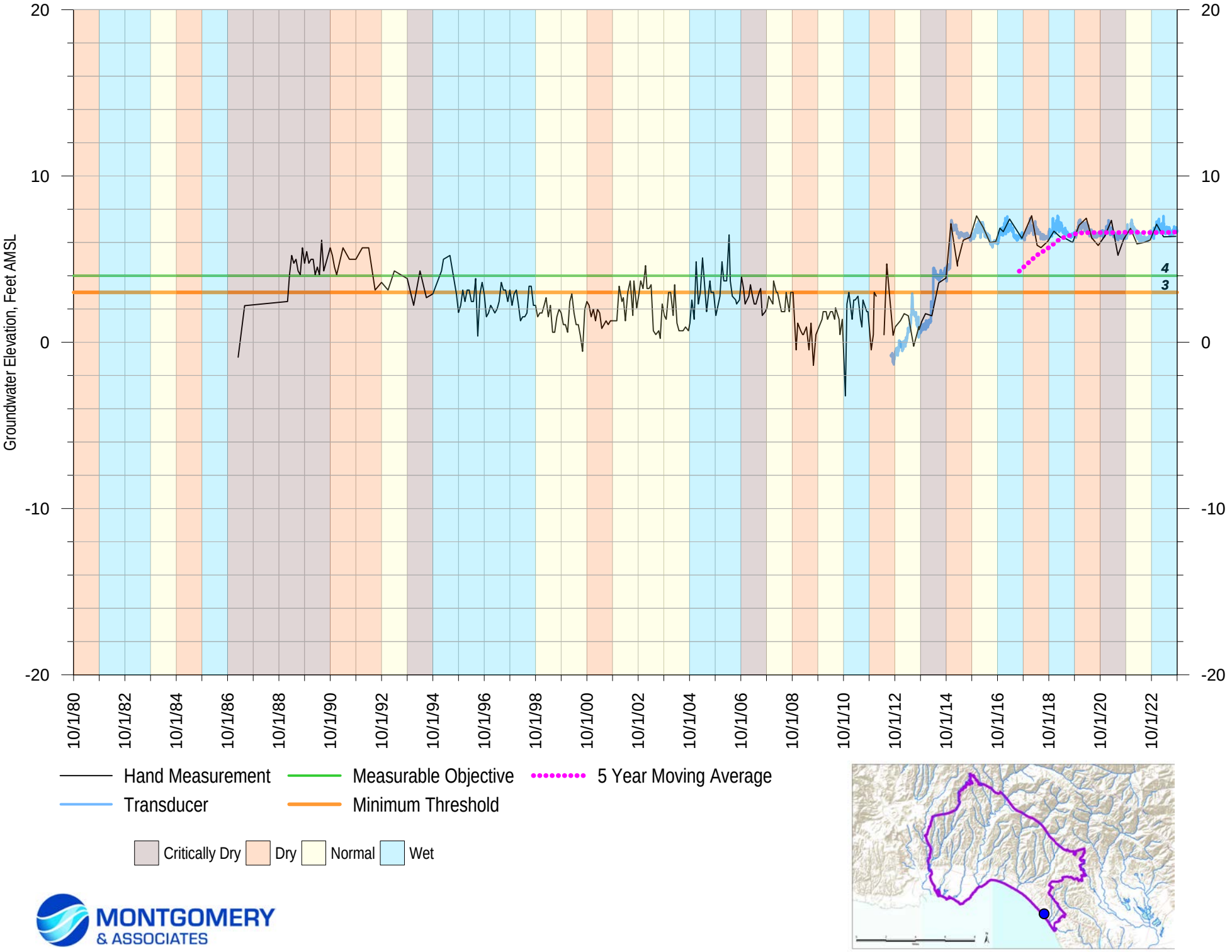
SC-A2A & SC-A2RA at Sumner
Aquifer Screened: Purisima F

Appendix A

FIGURE A-21



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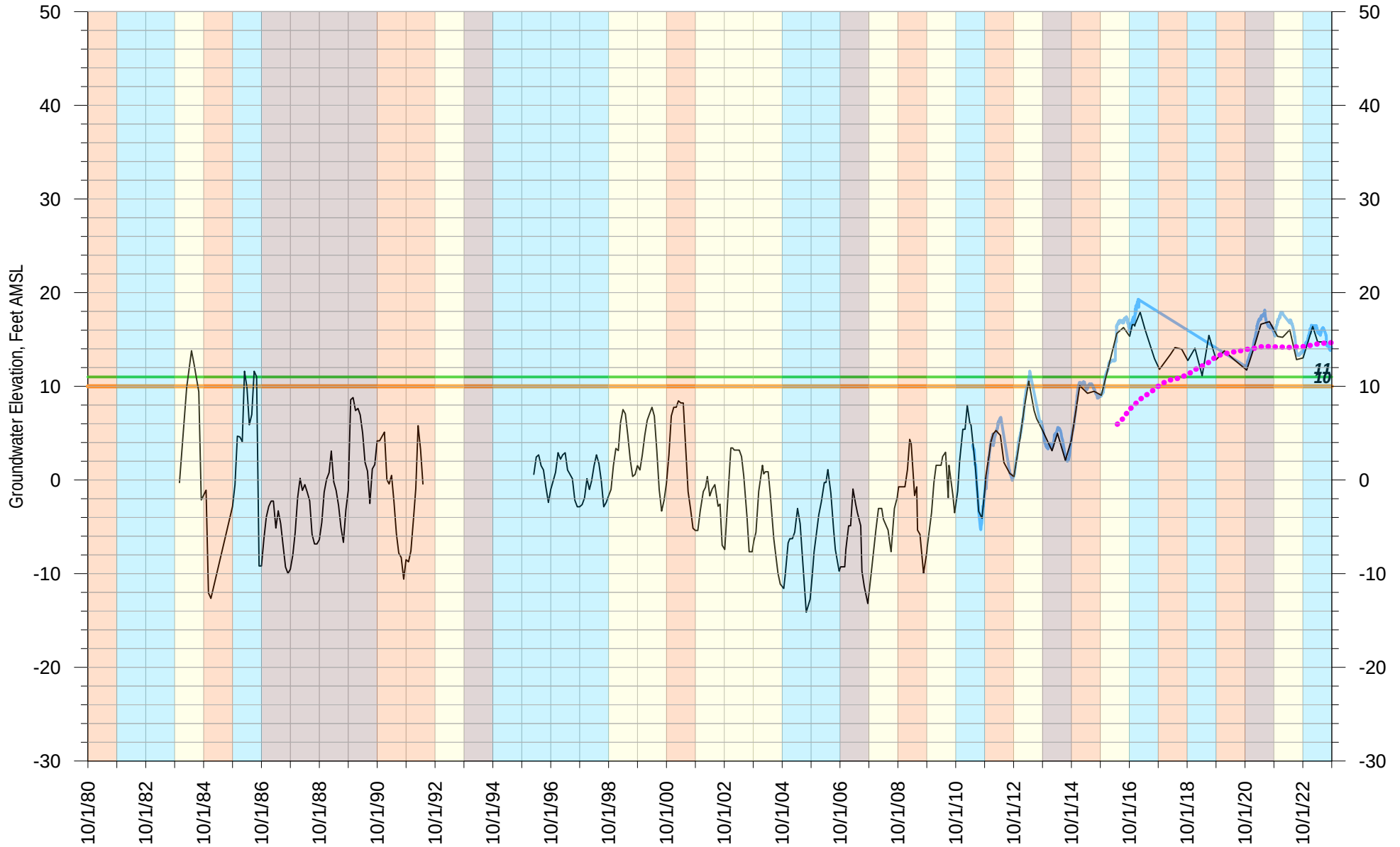
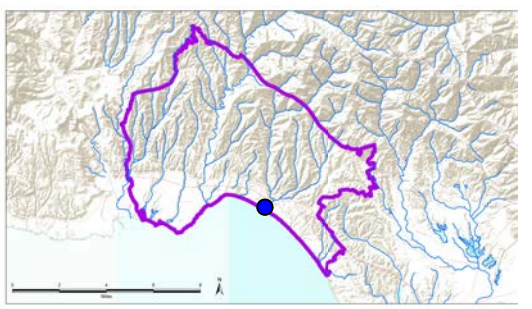
SC-8D & SC-8RD at Aptos Creek
Aquifer Screened: Purisima DEF

Appendix A

FIGURE A-22





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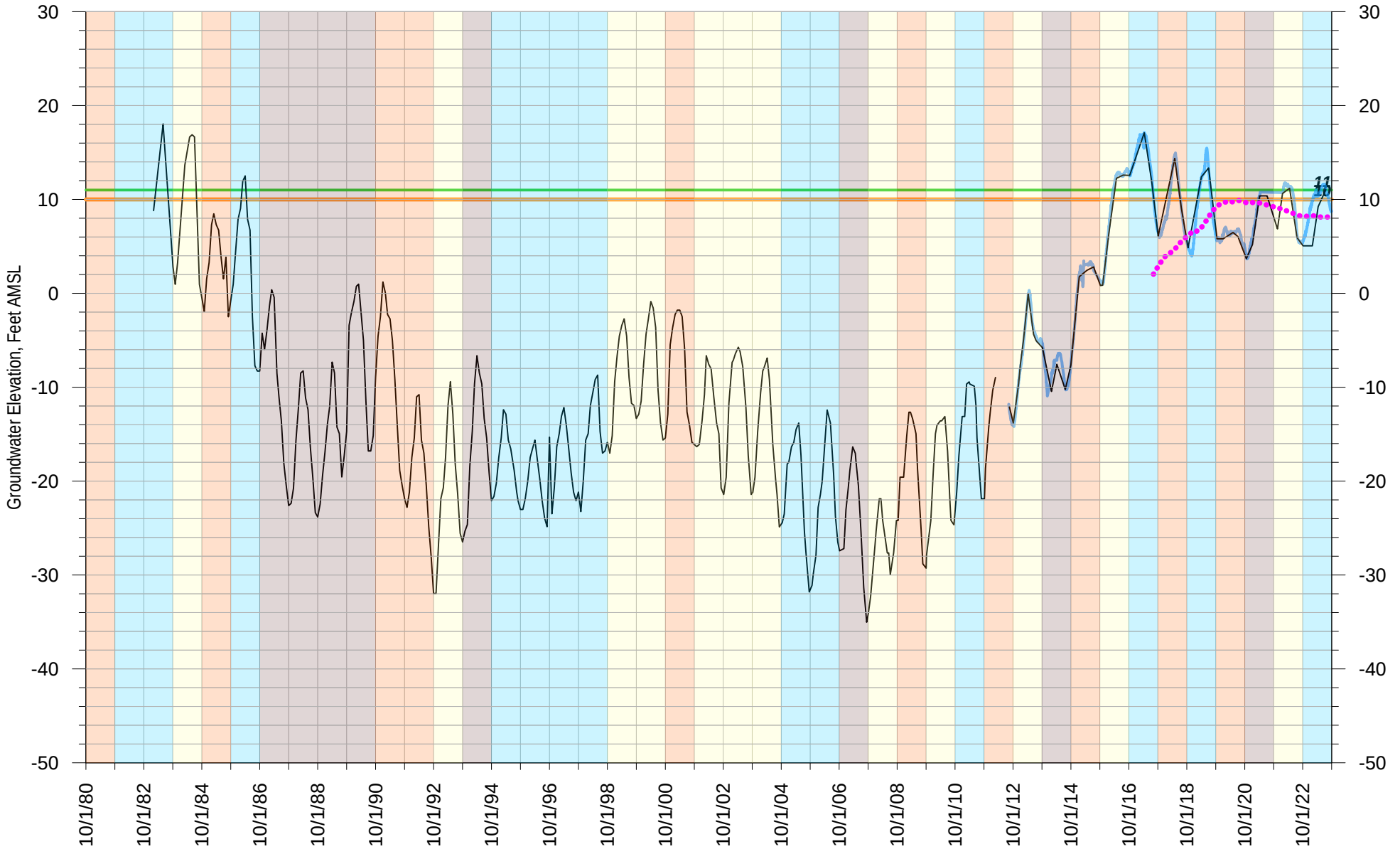
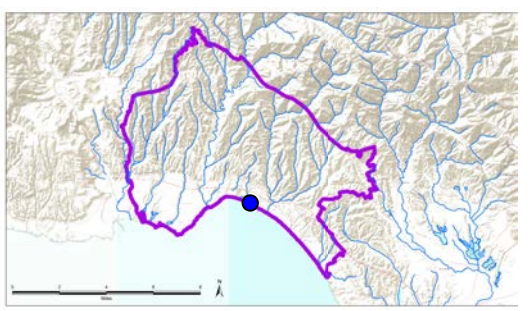
SC-9C & SC-9RC at Seacliff
Aquifer Screened: Purisima BC

Appendix A

FIGURE A-23





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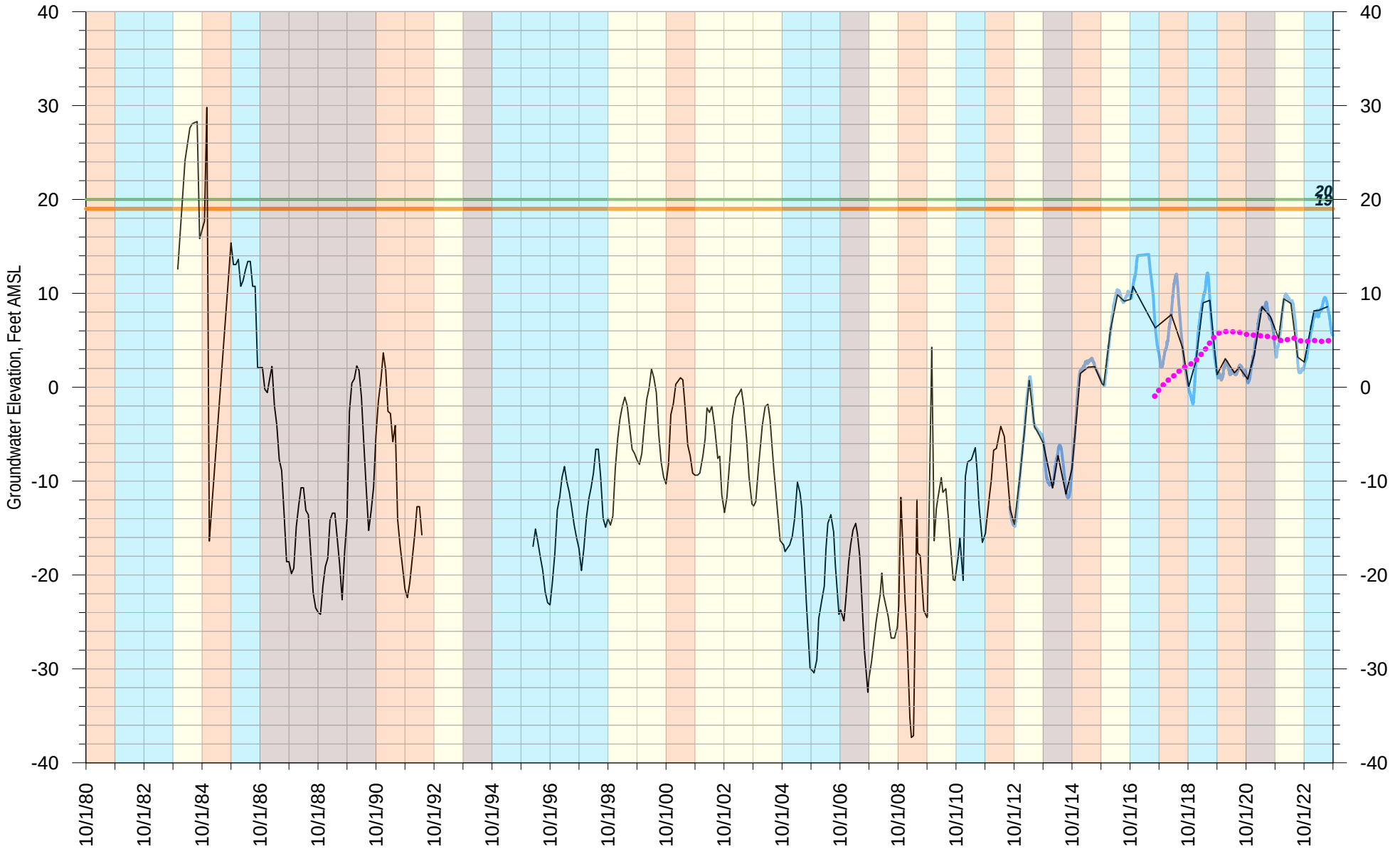
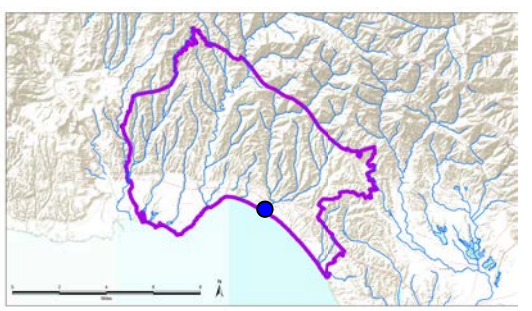
SC-8B & SC-8RB at Aptos Creek
Aquifer Screened: Purisima BC

Appendix A

FIGURE A-24





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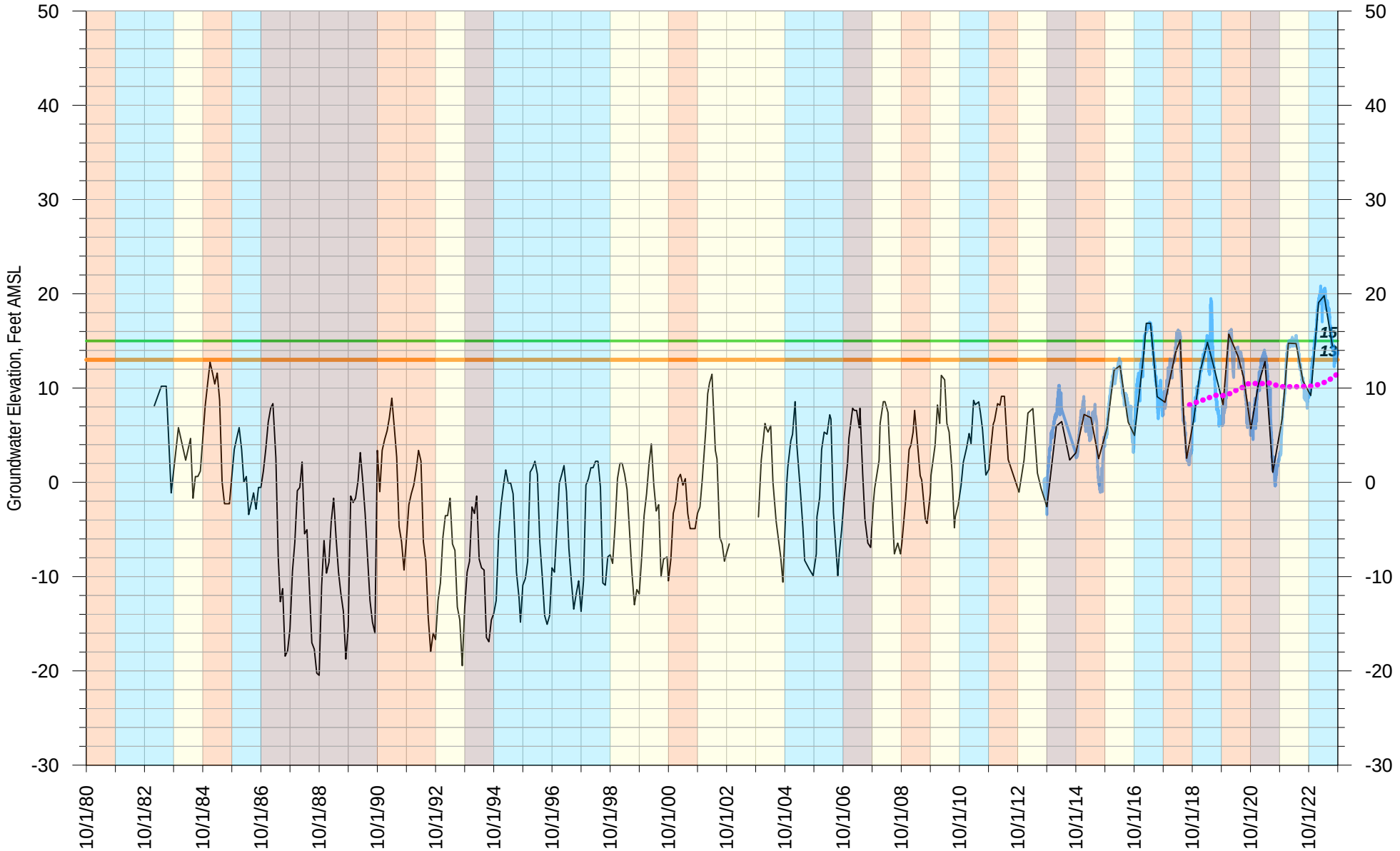
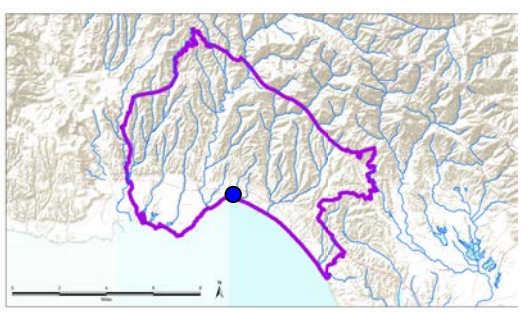
SC-5A & SC-5RA at New Brighton
Aquifer Screened: Purisima A

Appendix A

FIGURE A-25





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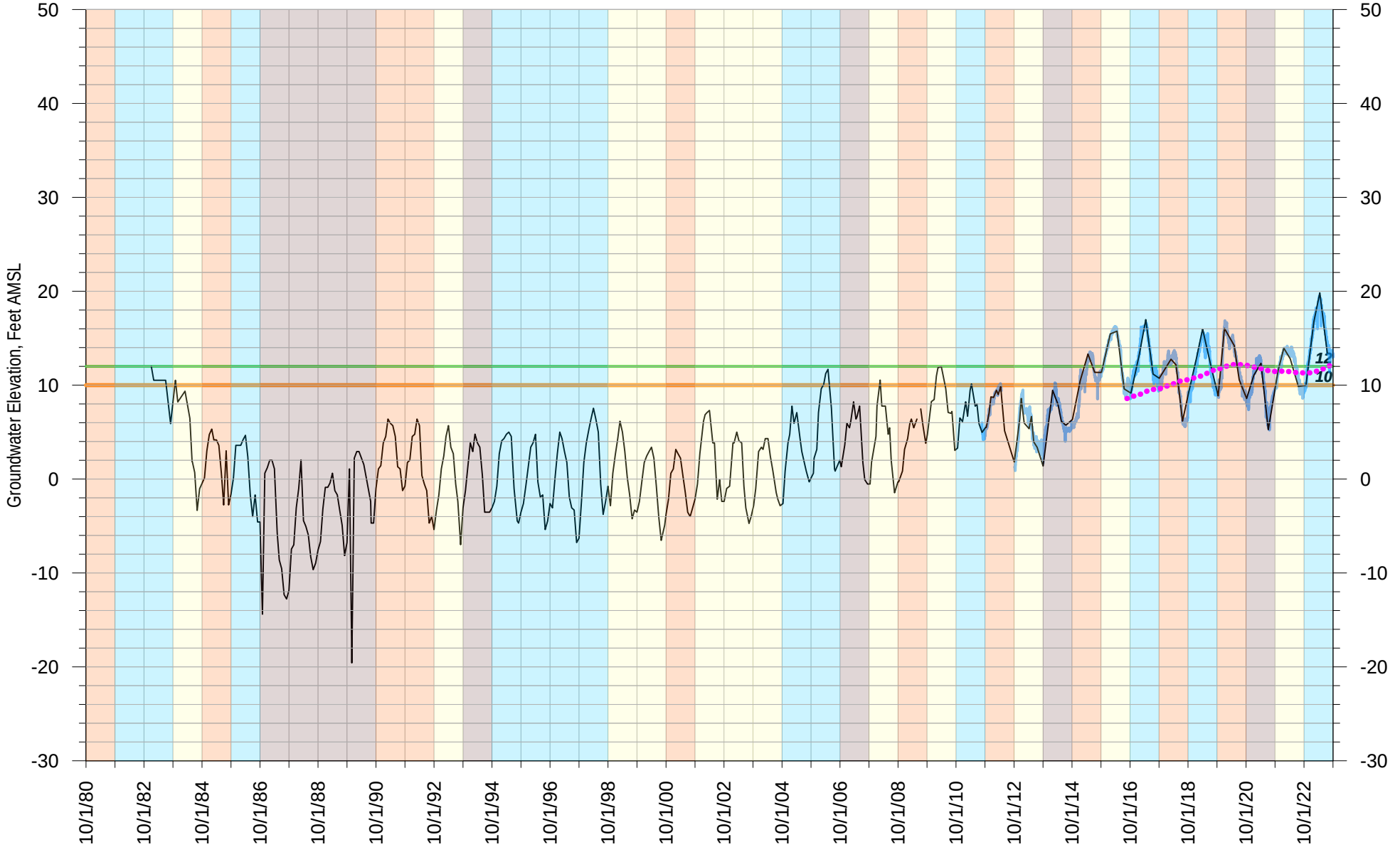
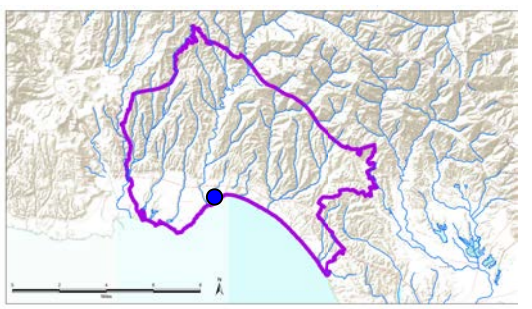
SC-3A & SC-3RA at Escalona
Aquifer Screened: Purisima A/AA

Appendix A
FIGURE A-26

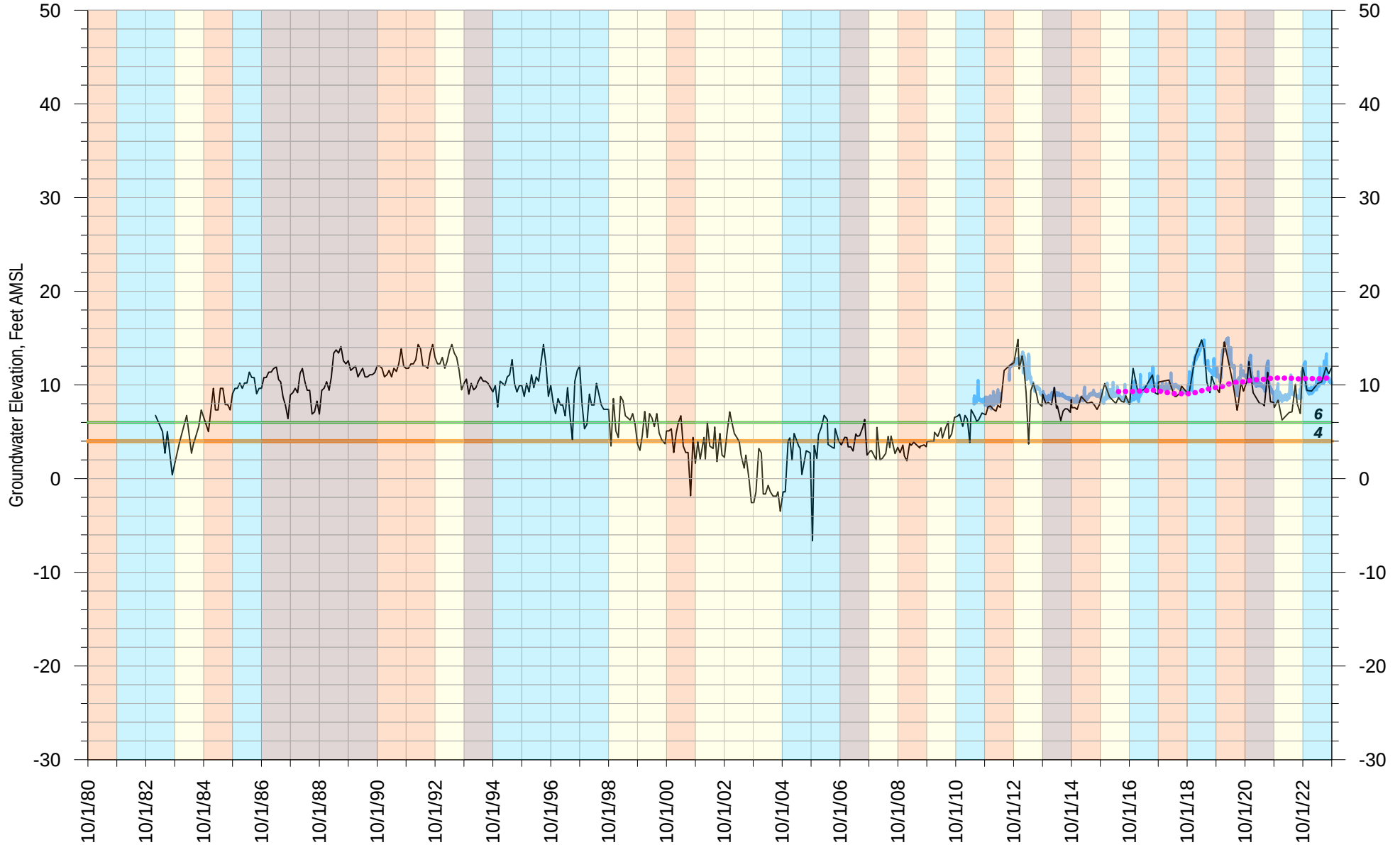


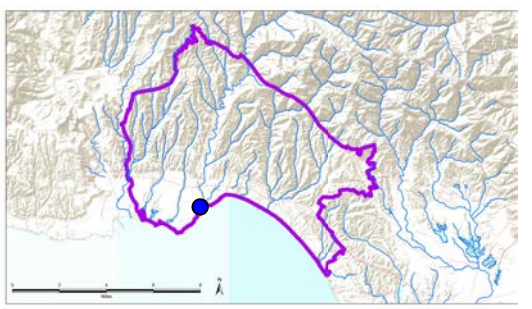


MONTGOMERY & ASSOCIATES

SC-1A at Prospect
Aquifer Screened: Purisima A

Appendix A
FIGURE A-27



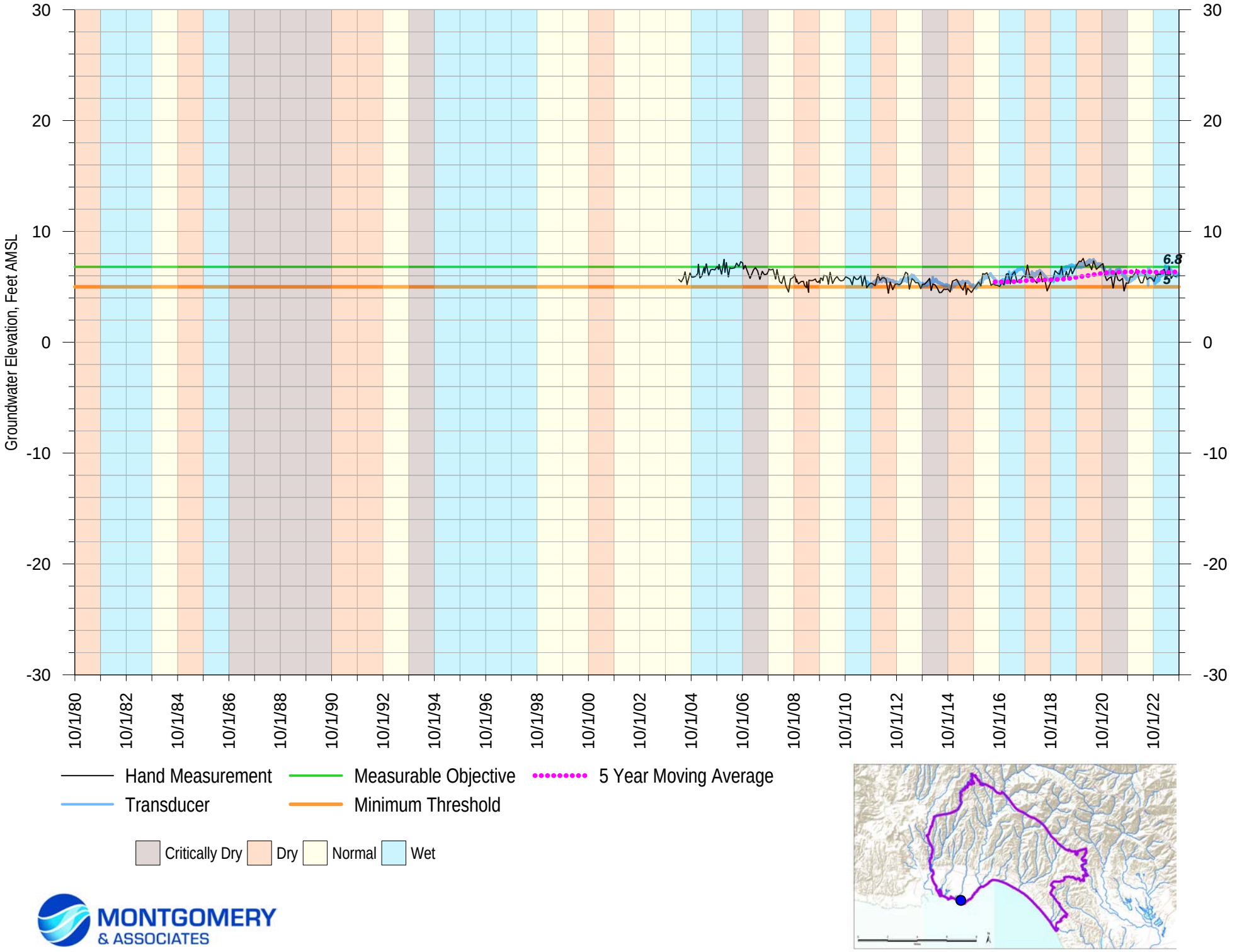


MONTGOMERY & ASSOCIATES

Moran Lake Medium
Aquifer Screened: Purisima A

Appendix A

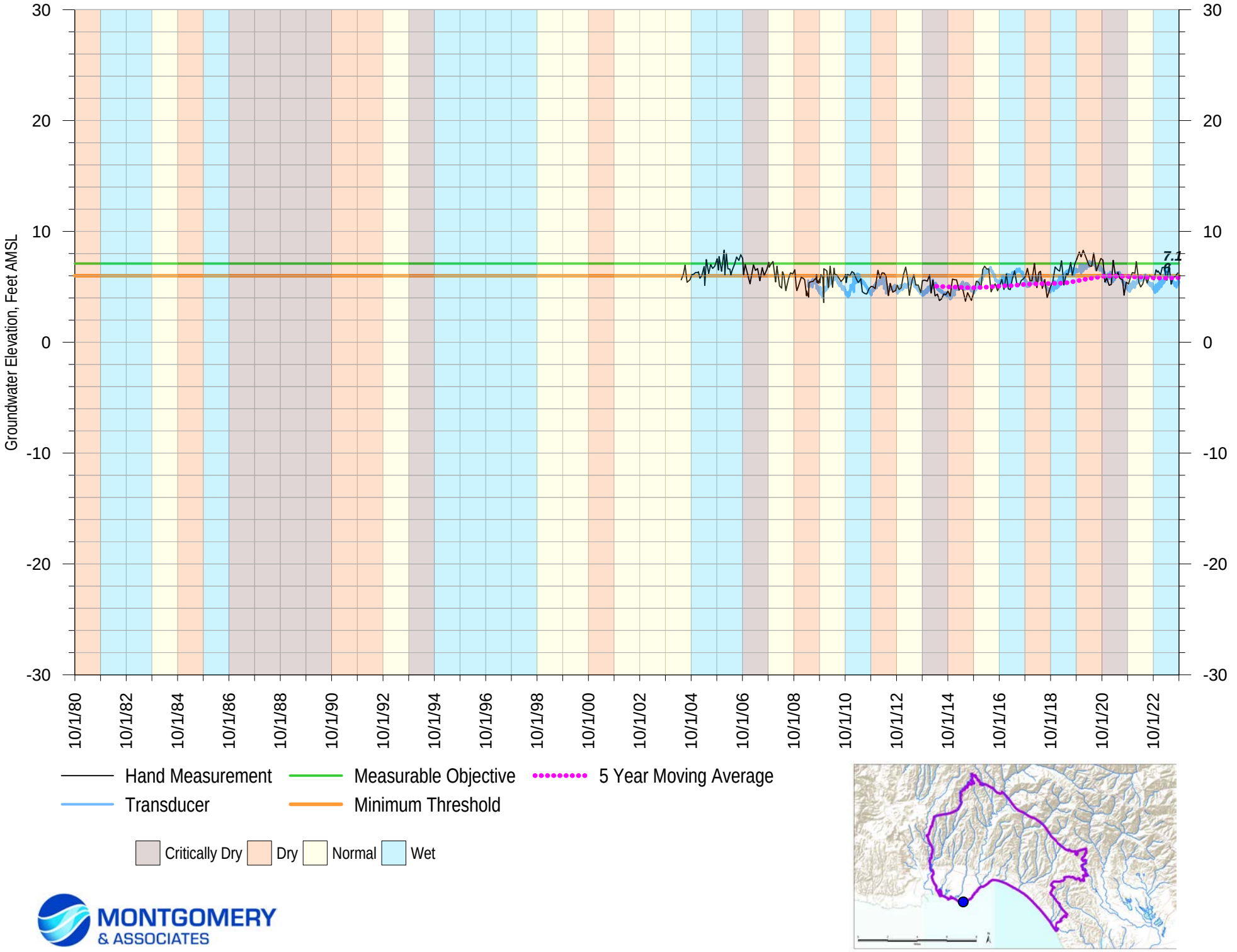
FIGURE A-28



MONTGOMERY & ASSOCIATES

Soquel Point Medium
Aquifer Screened: Purisima A

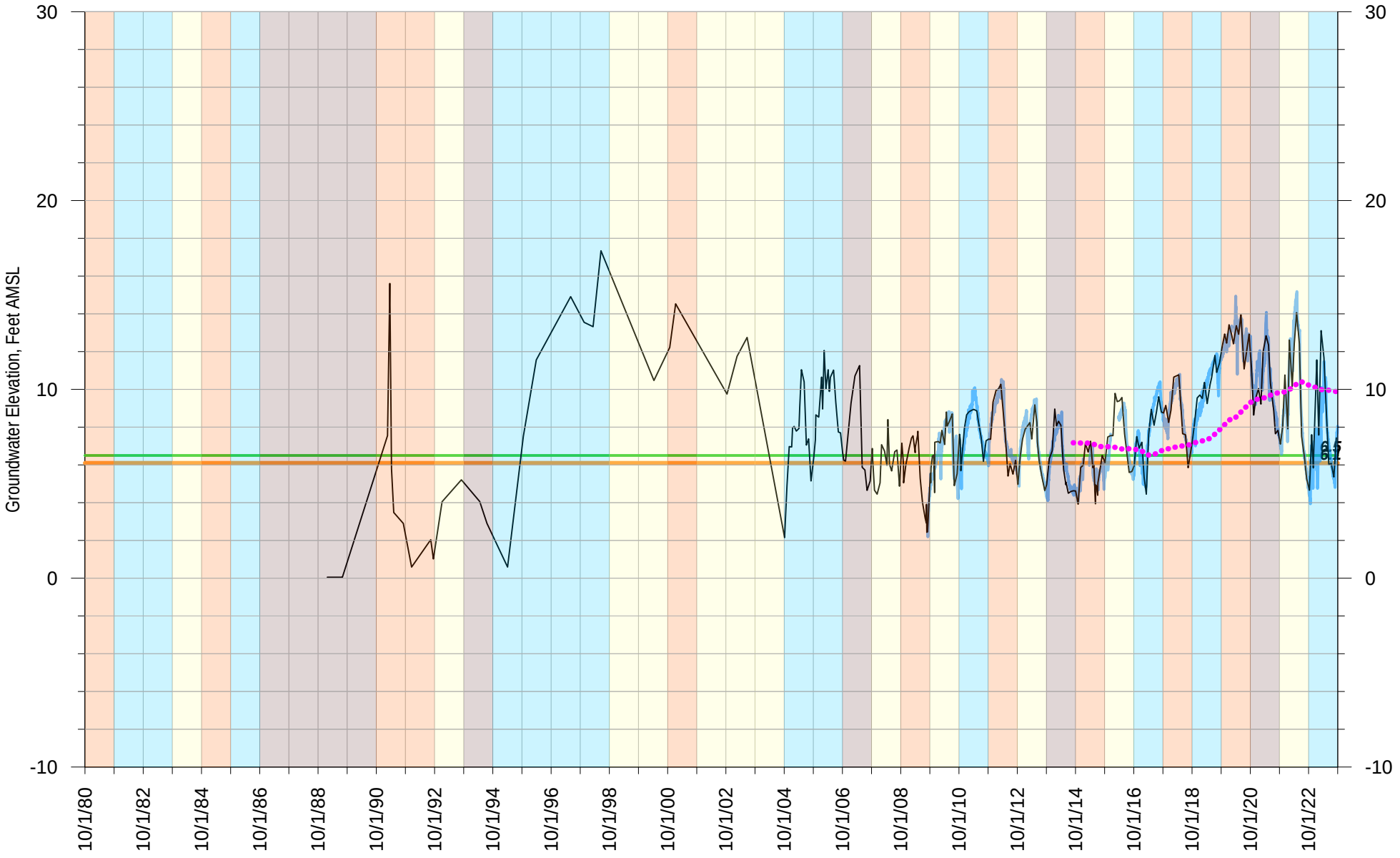
Appendix A
FIGURE A-29

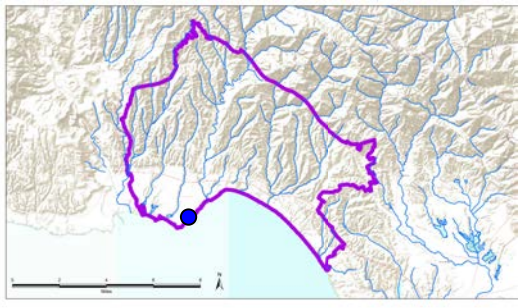


MONTGOMERY & ASSOCIATES

Pleasure Point Medium
Aquifer Screened: Purisima A

Appendix A
FIGURE A-30





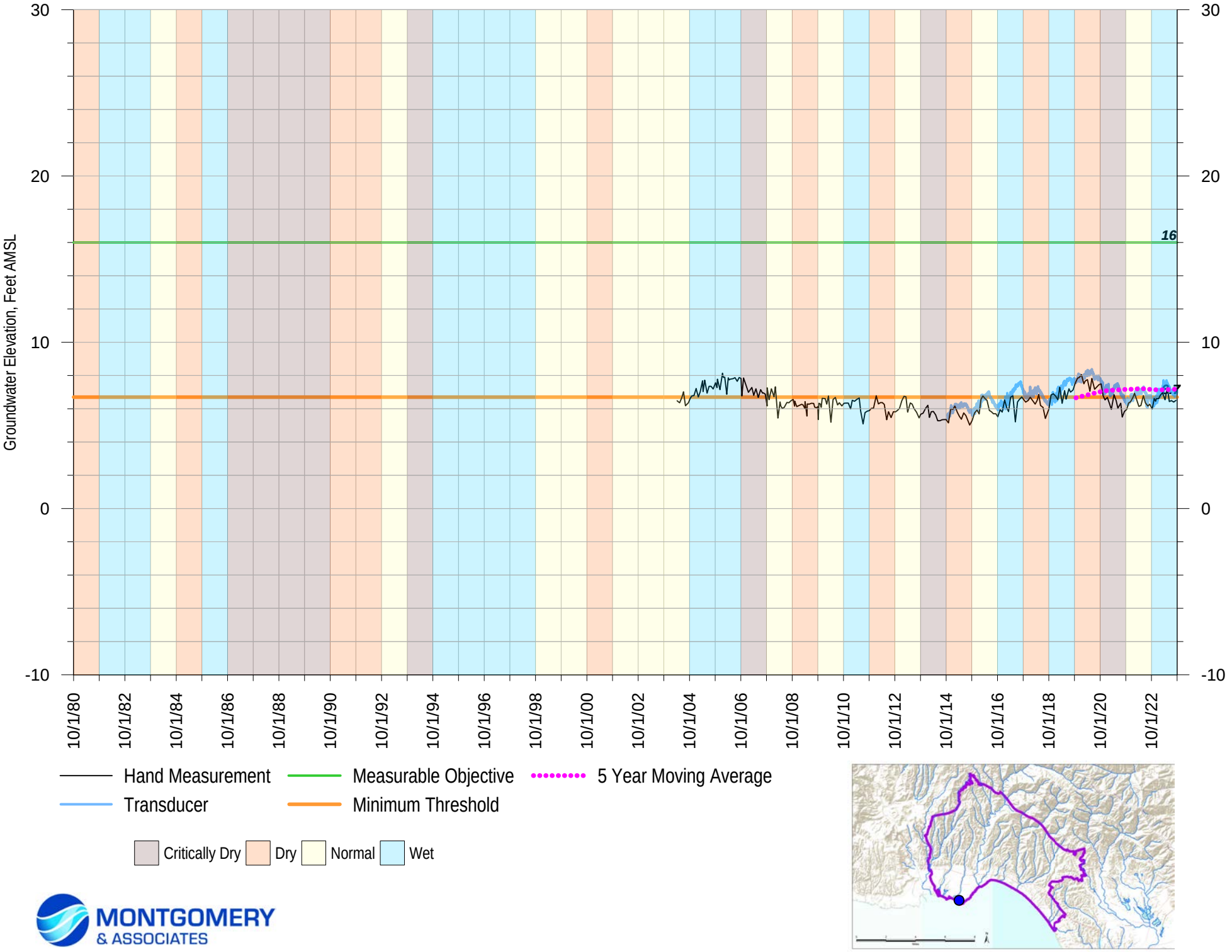
MONTGOMERY & ASSOCIATES

Moran Lake Deep

Aquifer Screened: Purisima AA

Appendix A

FIGURE A-31

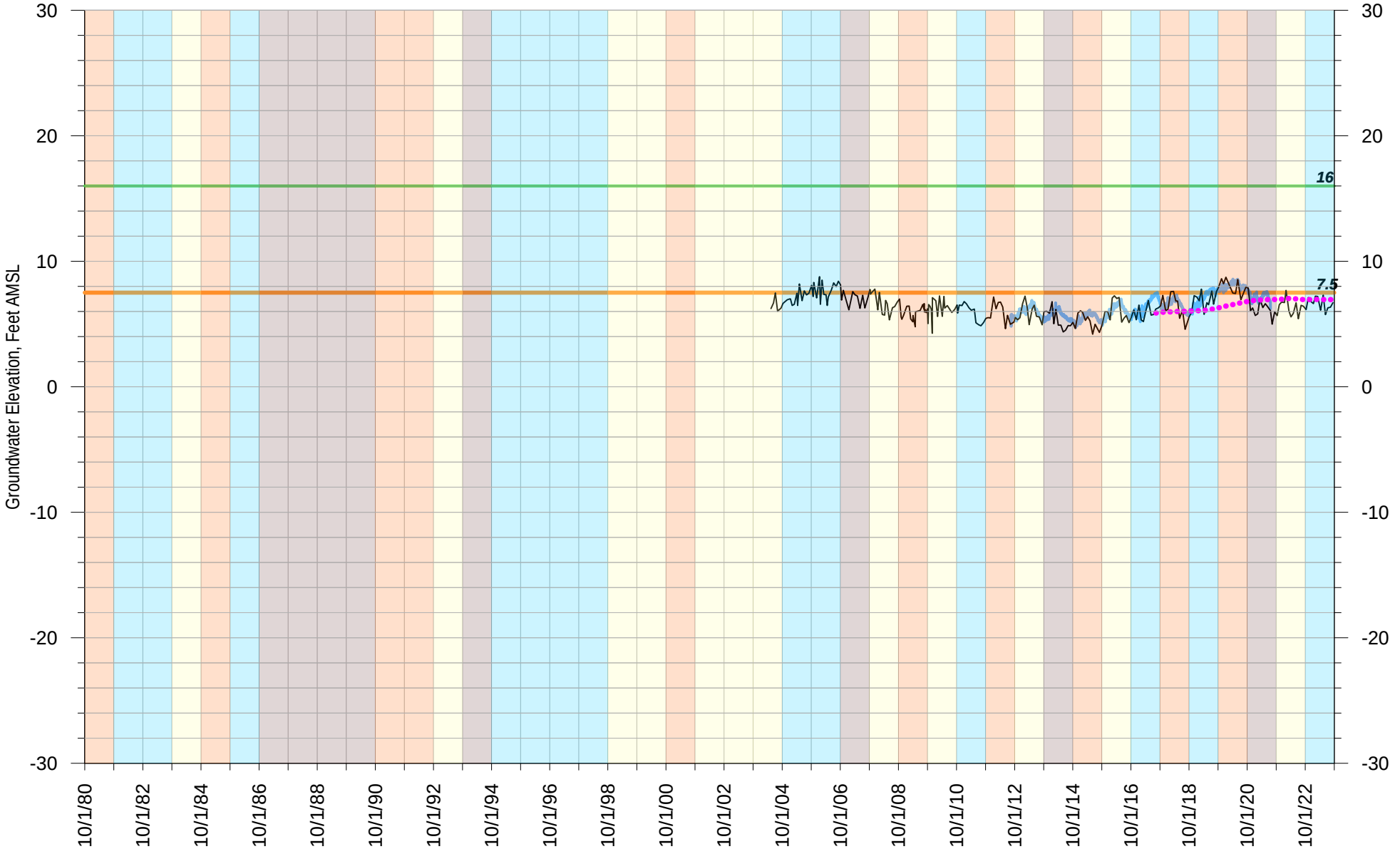


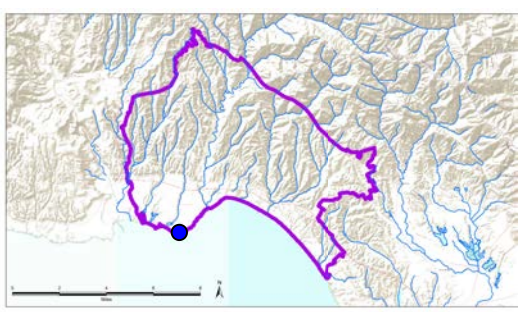
MONTGOMERY & ASSOCIATES

Soquel Point Deep
Aquifer Screened: Purisima AA

Appendix A

FIGURE A-32

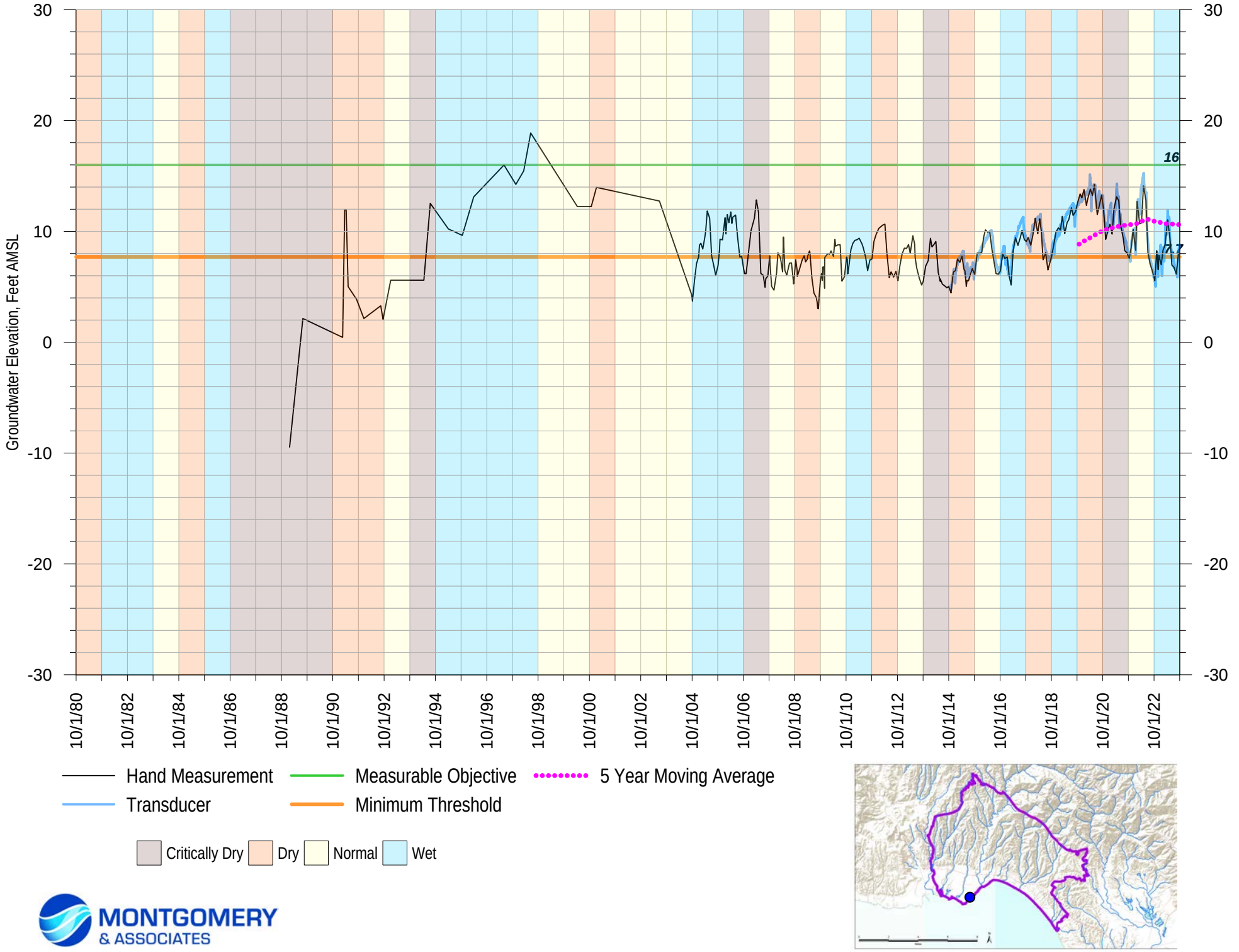




MONTGOMERY & ASSOCIATES

Pleasure Point Deep
Aquifer Screened: Purisima AA

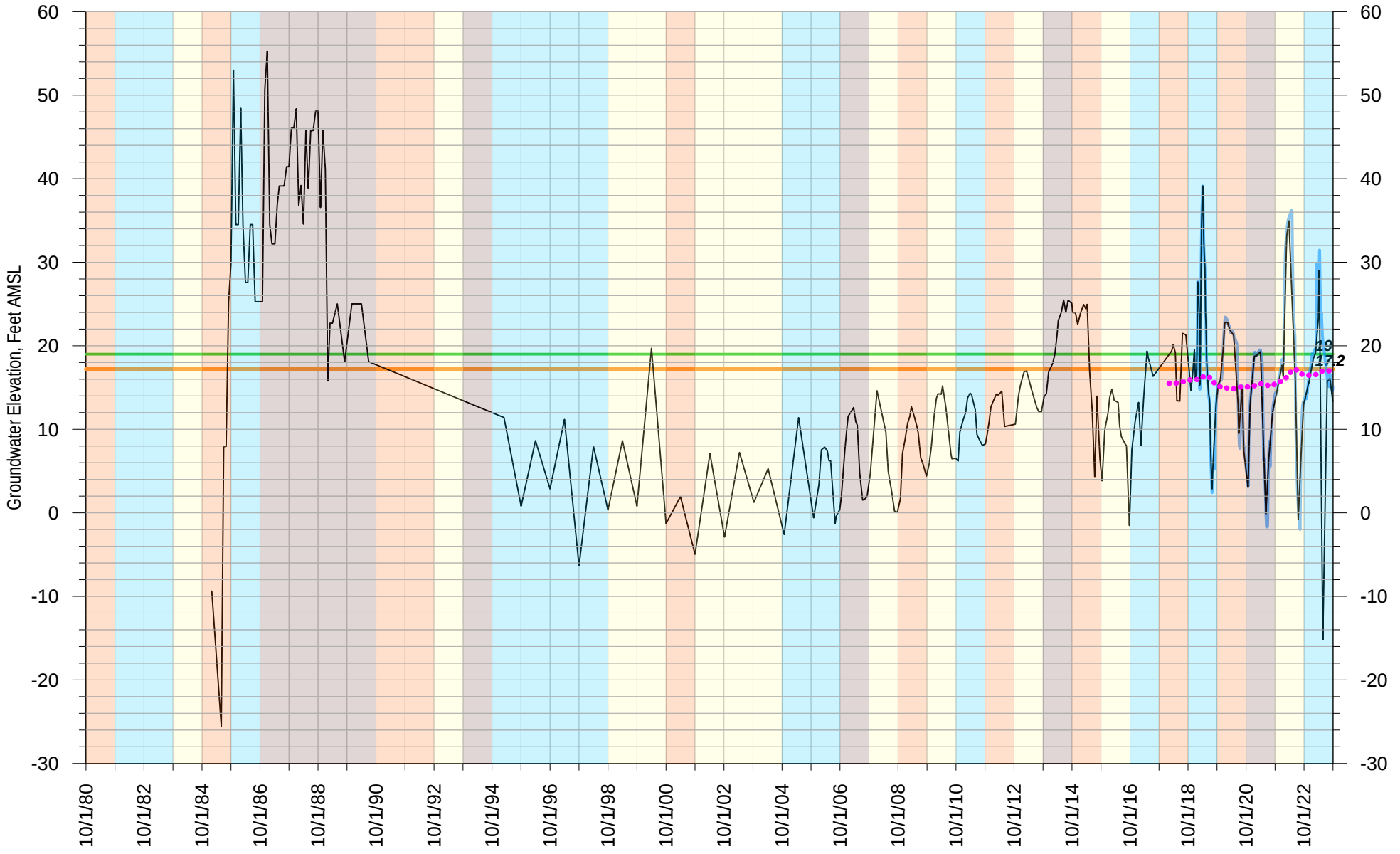
Appendix A
FIGURE A-33

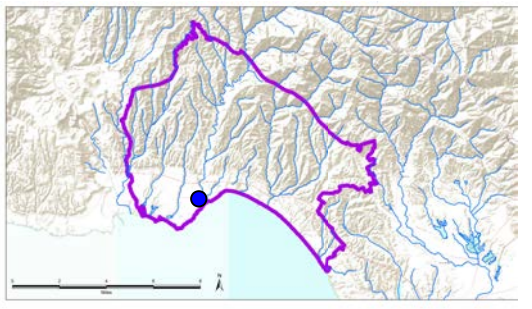


MONTGOMERY & ASSOCIATES

SC-13A at Garnet
Aquifer Screened: Tu

Appendix A
FIGURE A-34





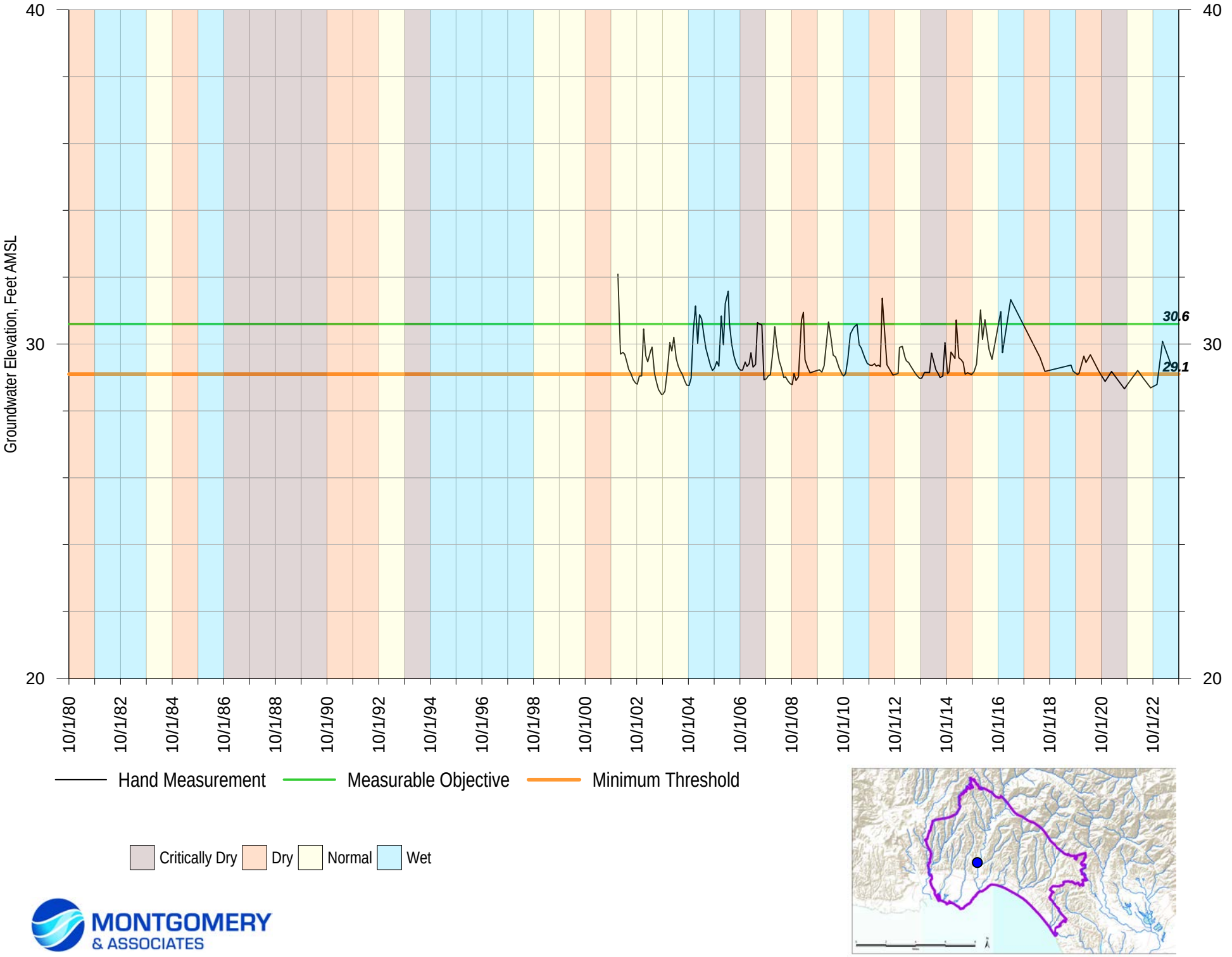
MONTGOMERY & ASSOCIATES

Balogh Shallow Well

Aquifer Screened: Shallow Well for Surface Water Interactions

Appendix A

FIGURE A-35



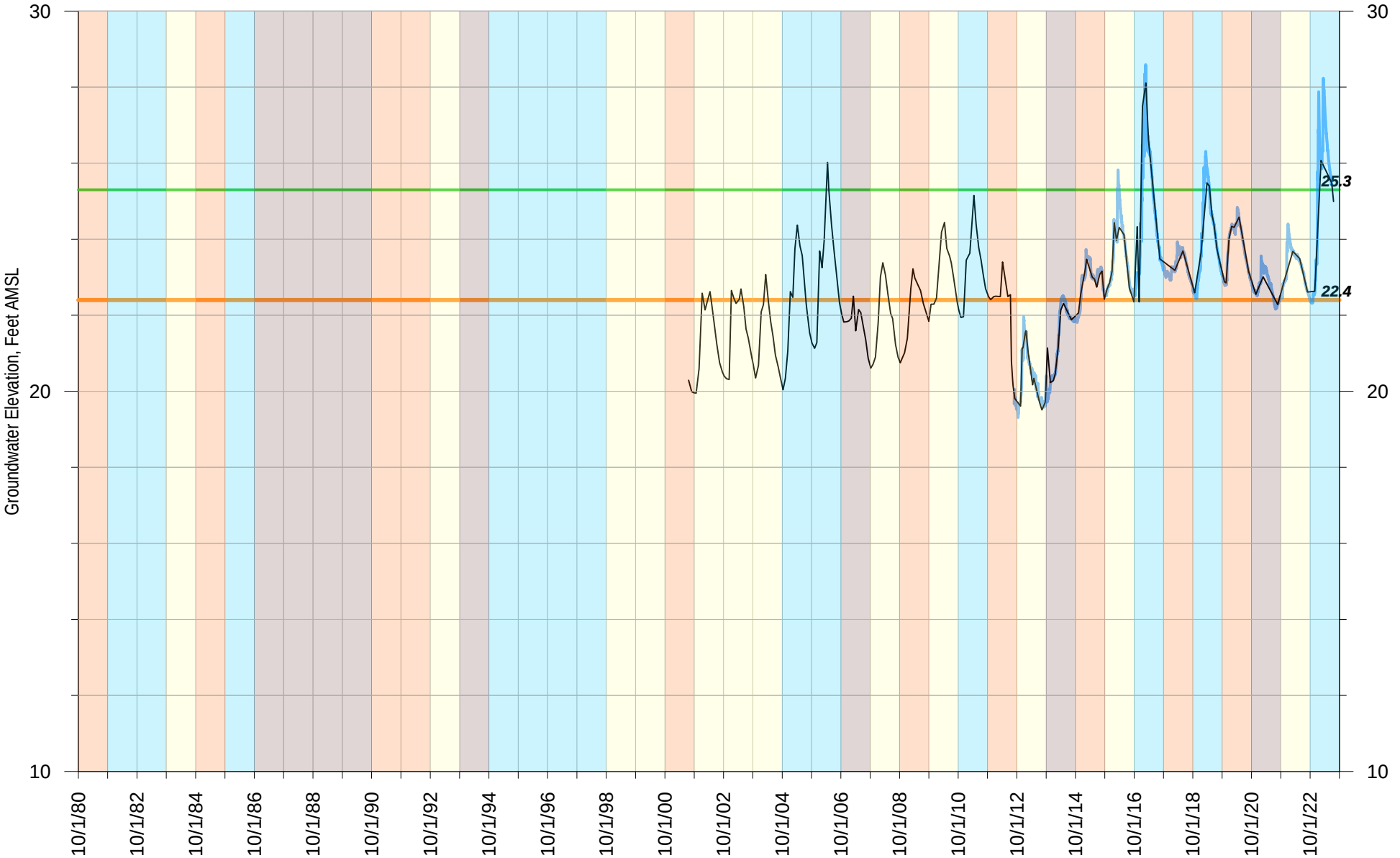
MONTGOMERY & ASSOCIATES

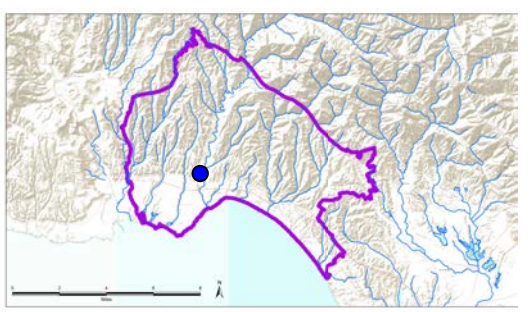
Main Street Shallow Well 1

Aquifer Screened: Shallow Well for Surface Water Interactions

Appendix A

FIGURE A-36





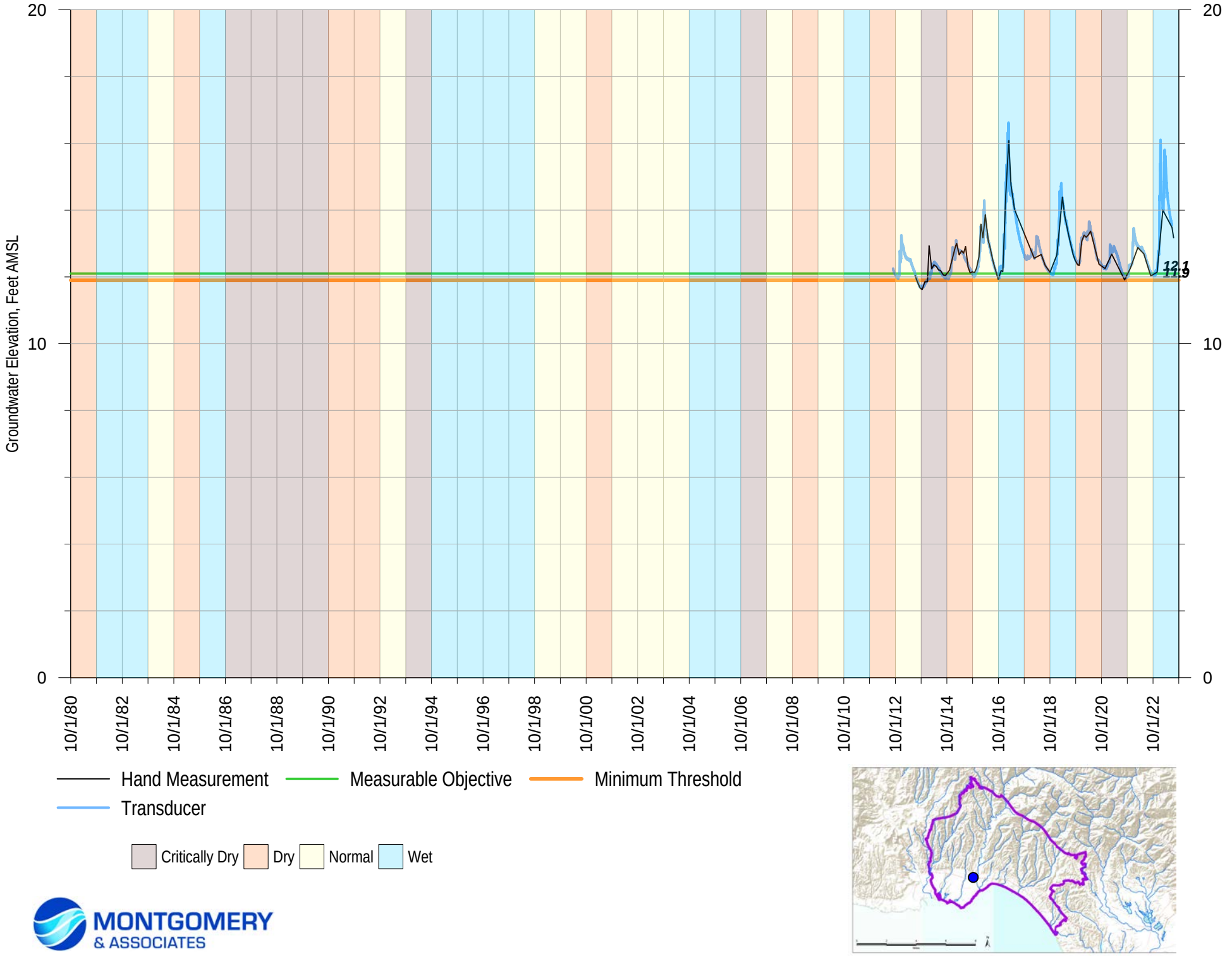
MONTGOMERY & ASSOCIATES

Soquel Wharf Shallow Well

Aquifer Screened: Shallow Well for Surface Water Interactions

Appendix A

FIGURE A-37



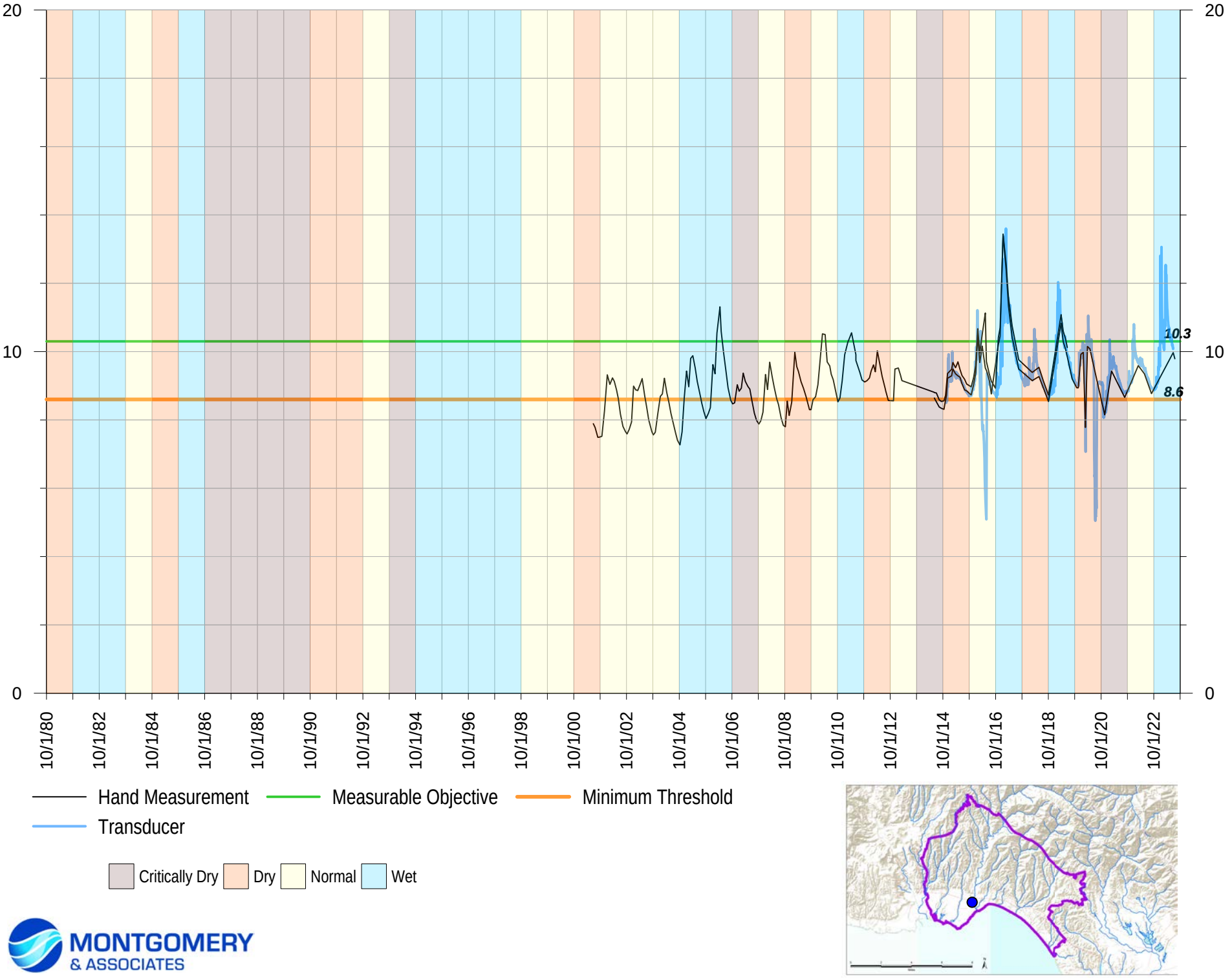
MONTGOMERY & ASSOCIATES

Nob Hill Shallow Well 1 & Nob Hill Shallow Well 2

Aquifer Screened: Shallow Well for Surface Water Interactions

Appendix A

FIGURE A-38

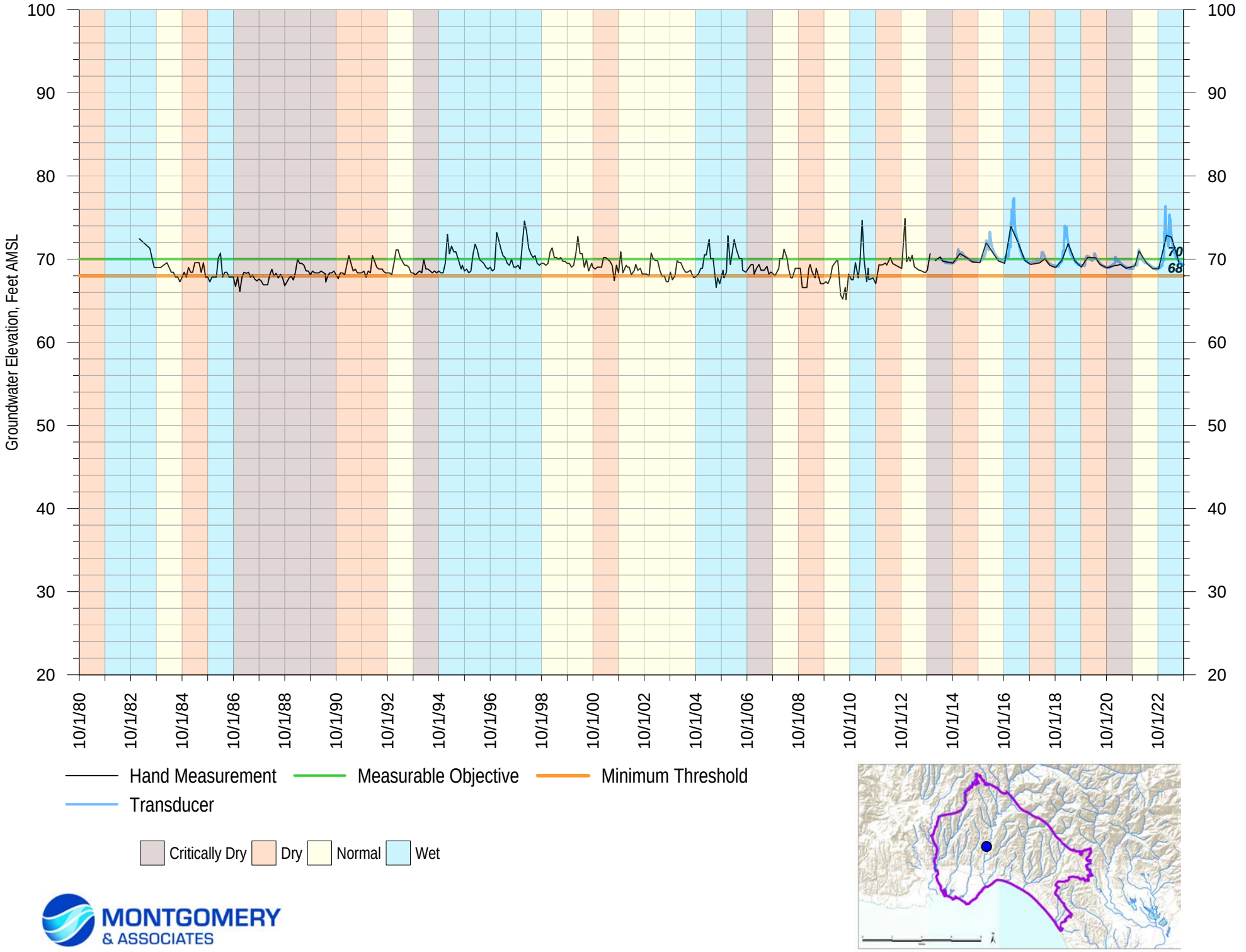


MONTGOMERY & ASSOCIATES

SC-10A & SC-10RA at Cherryvale
Aquifer Screened: Purisima A

Appendix A

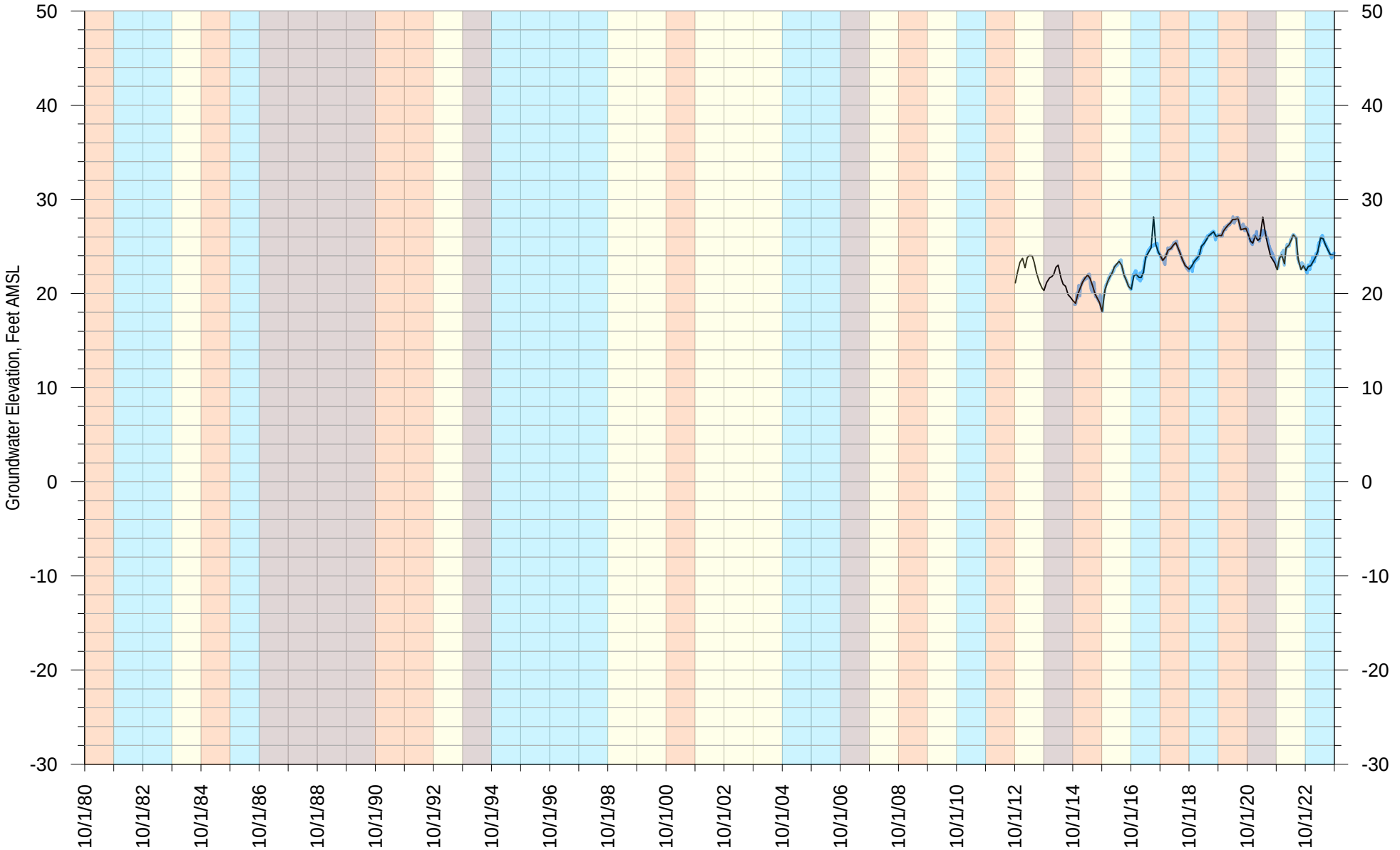
FIGURE A-39

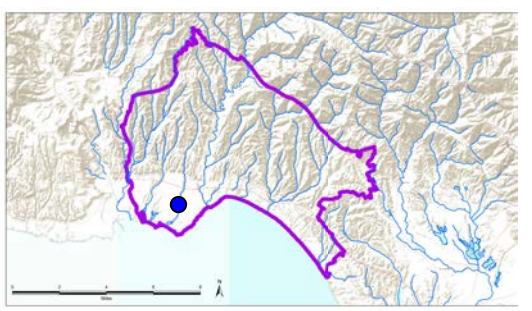


MONTGOMERY & ASSOCIATES

30th Ave Shallow
Aquifer Screened: Purisima A

Appendix A
FIGURE A-40





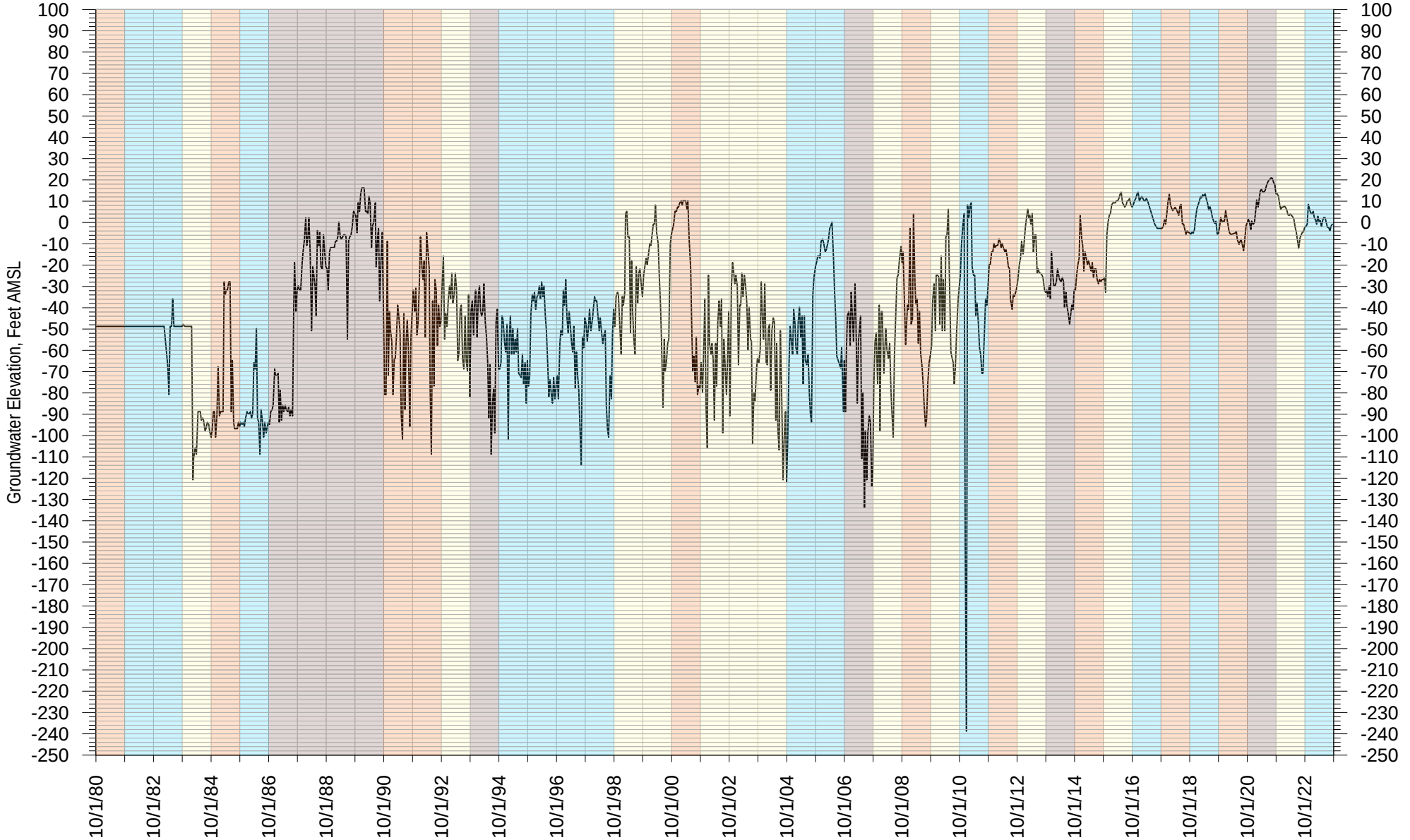
MONTGOMERY & ASSOCIATES

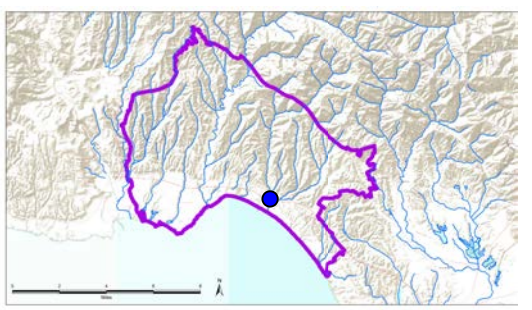
Aptos Creek PW

Aquifer Screened: Purisima BC

Appendix A

FIGURE A-41



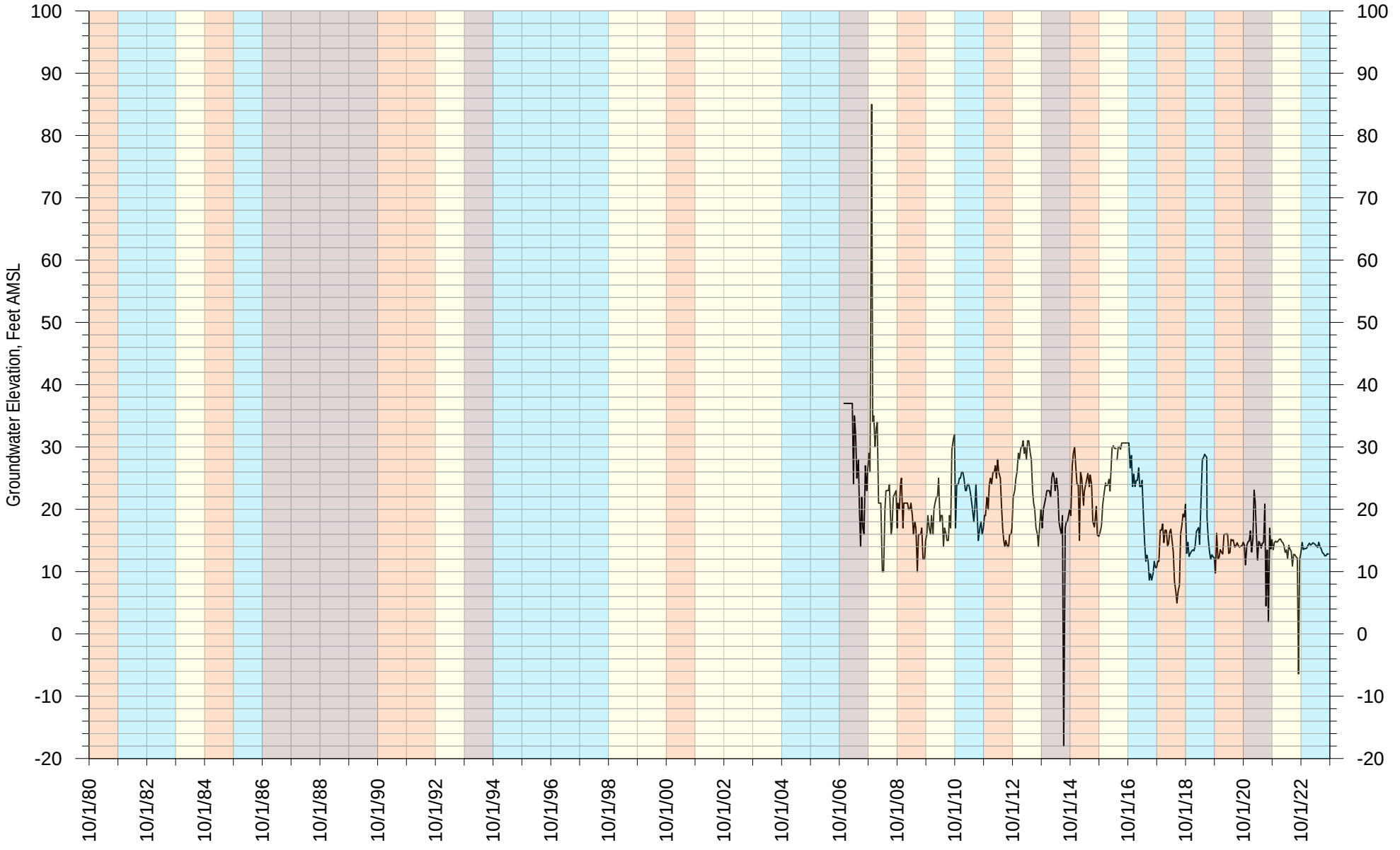


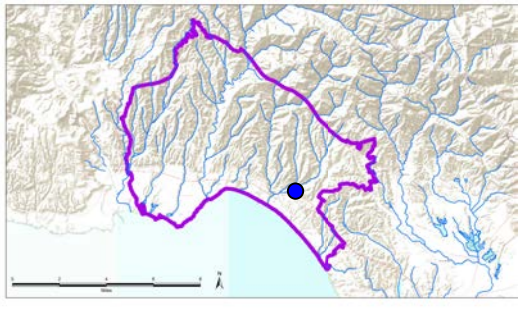
MONTGOMERY & ASSOCIATES

Aptos Jr High & Aptos Jr High 2 PW
Aquifer Screened: Aromas/ Purisima F

Appendix A

FIGURE A-42





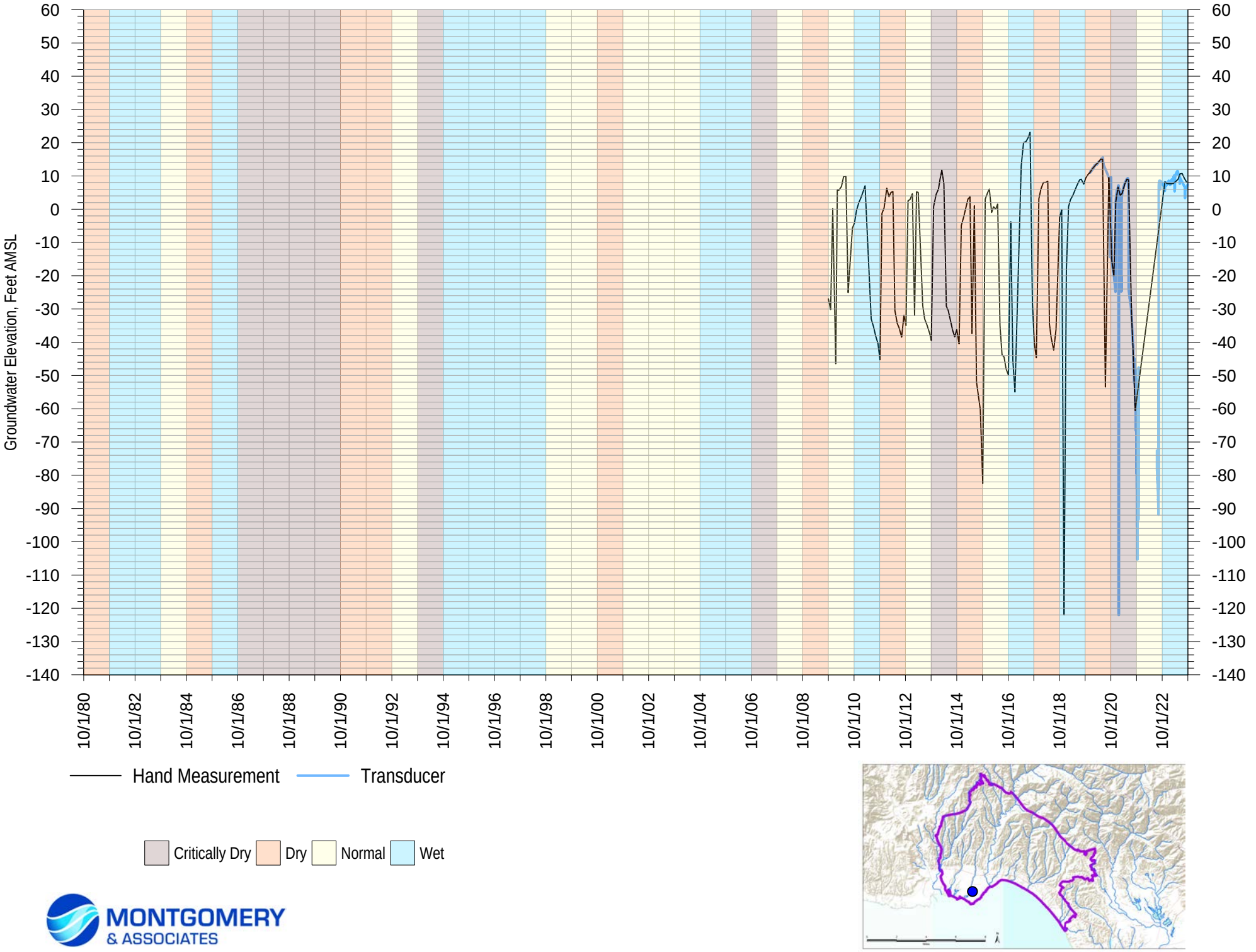
MONTGOMERY & ASSOCIATES

Beltz 10 PW

Aquifer Screened: Purisima A/AA

Appendix A

FIGURE A-43



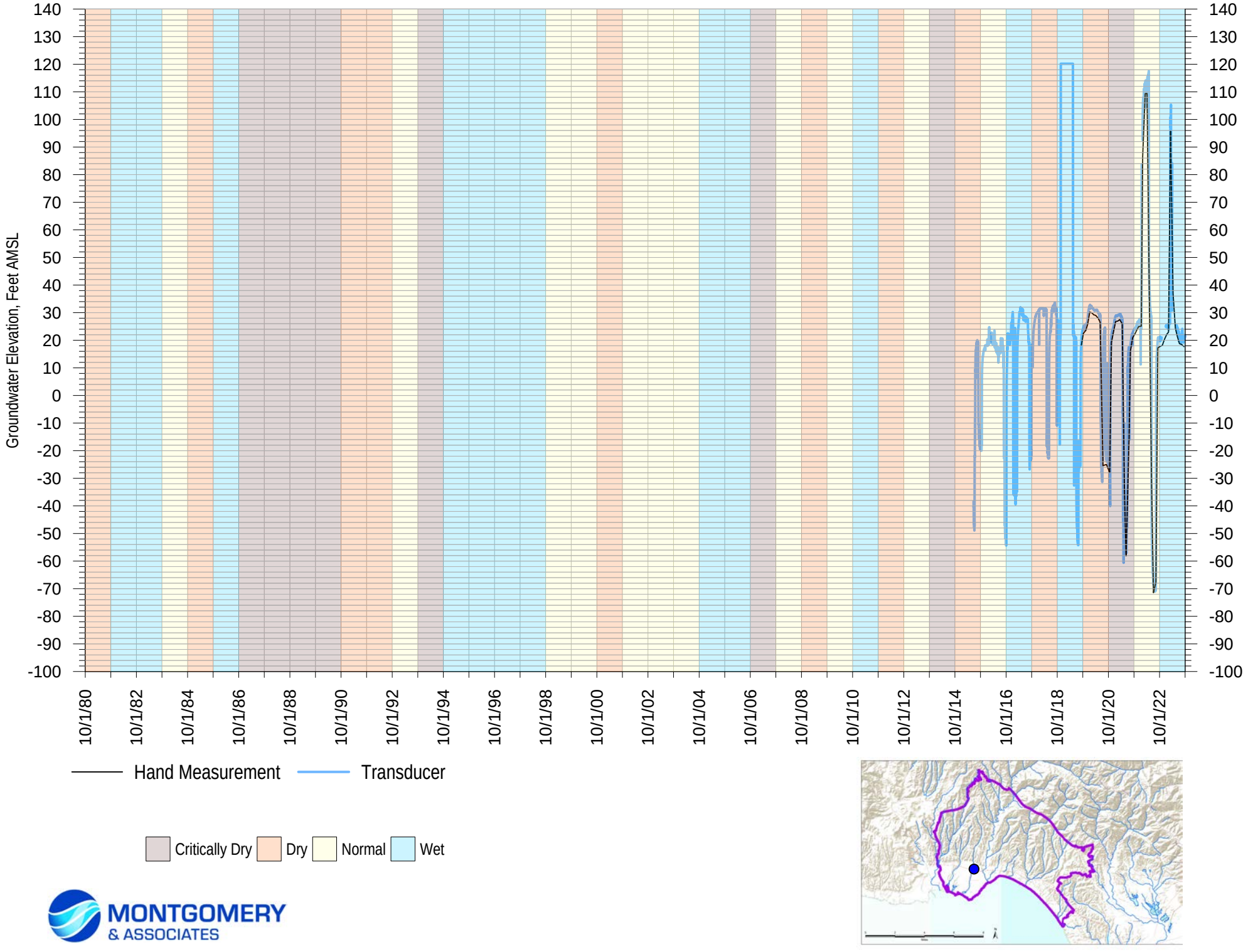
MONTGOMERY & ASSOCIATES

Beltz 12 PW

Aquifer Screened: Purisima AA/Tu

Appendix A

FIGURE A-44



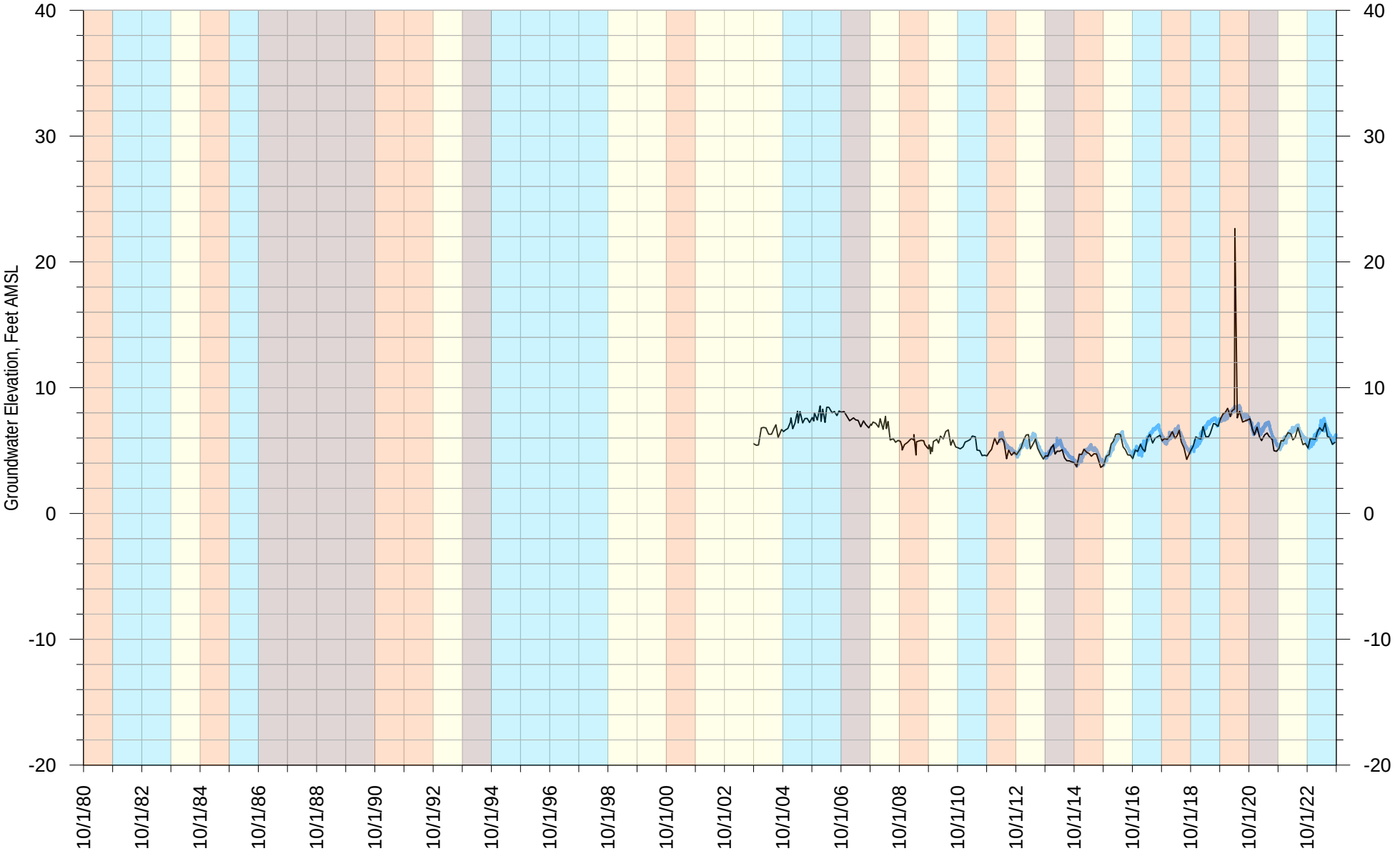
MONTGOMERY & ASSOCIATES

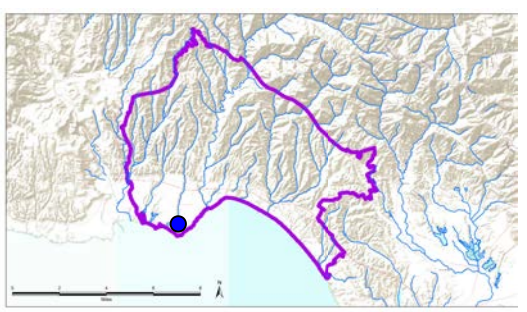
Beltz 2

Aquifer Screened: Purisima A

Appendix A

FIGURE A-45





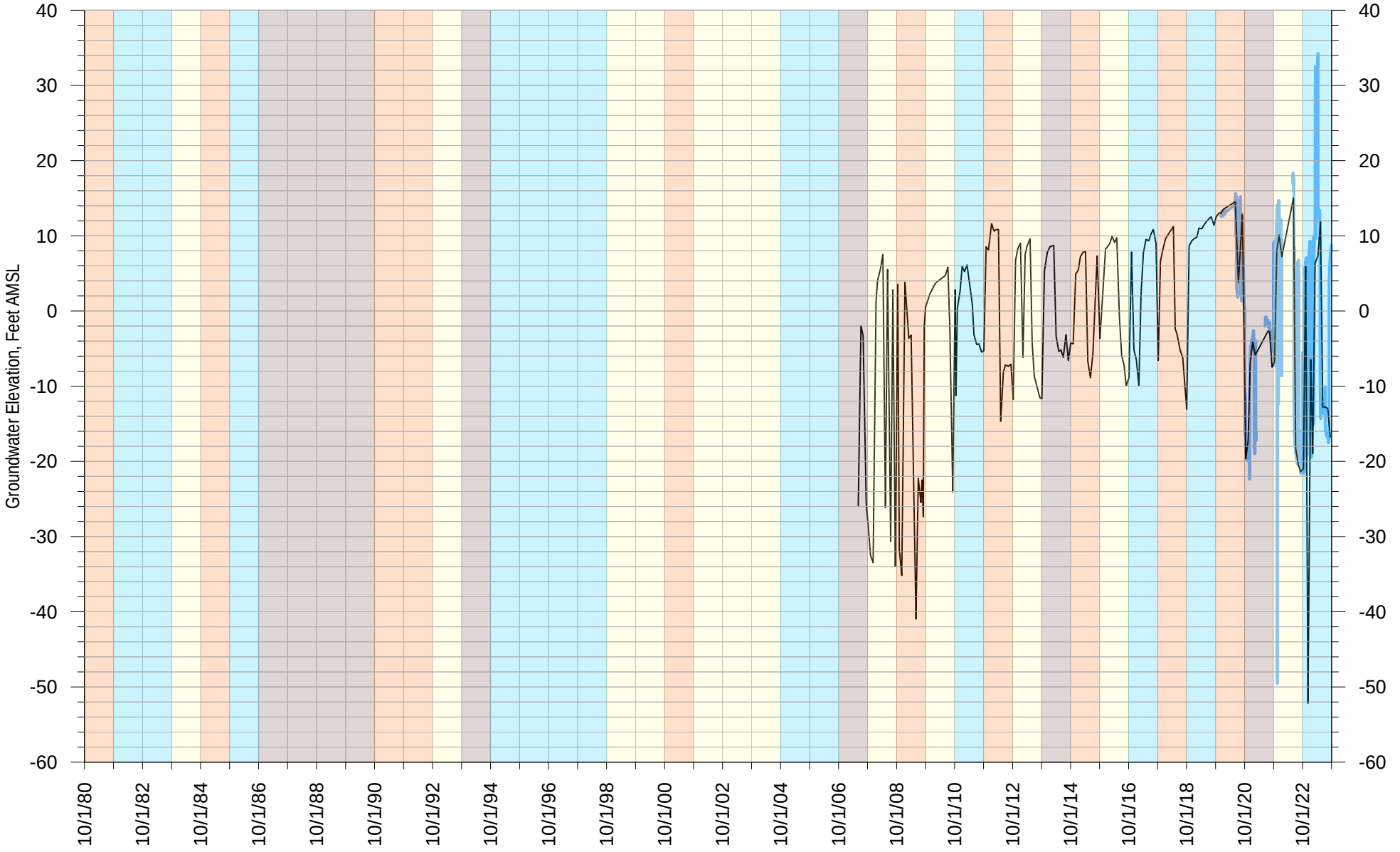
MONTGOMERY & ASSOCIATES

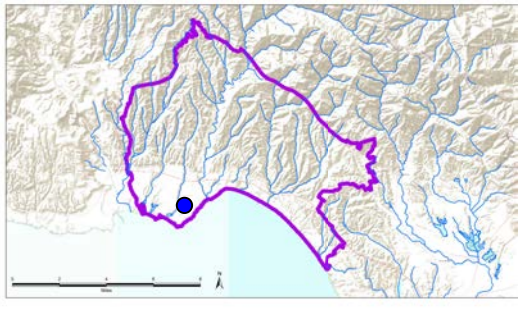
Beltz 8 PW

Aquifer Screened: Purisima A

Appendix A

FIGURE A-46





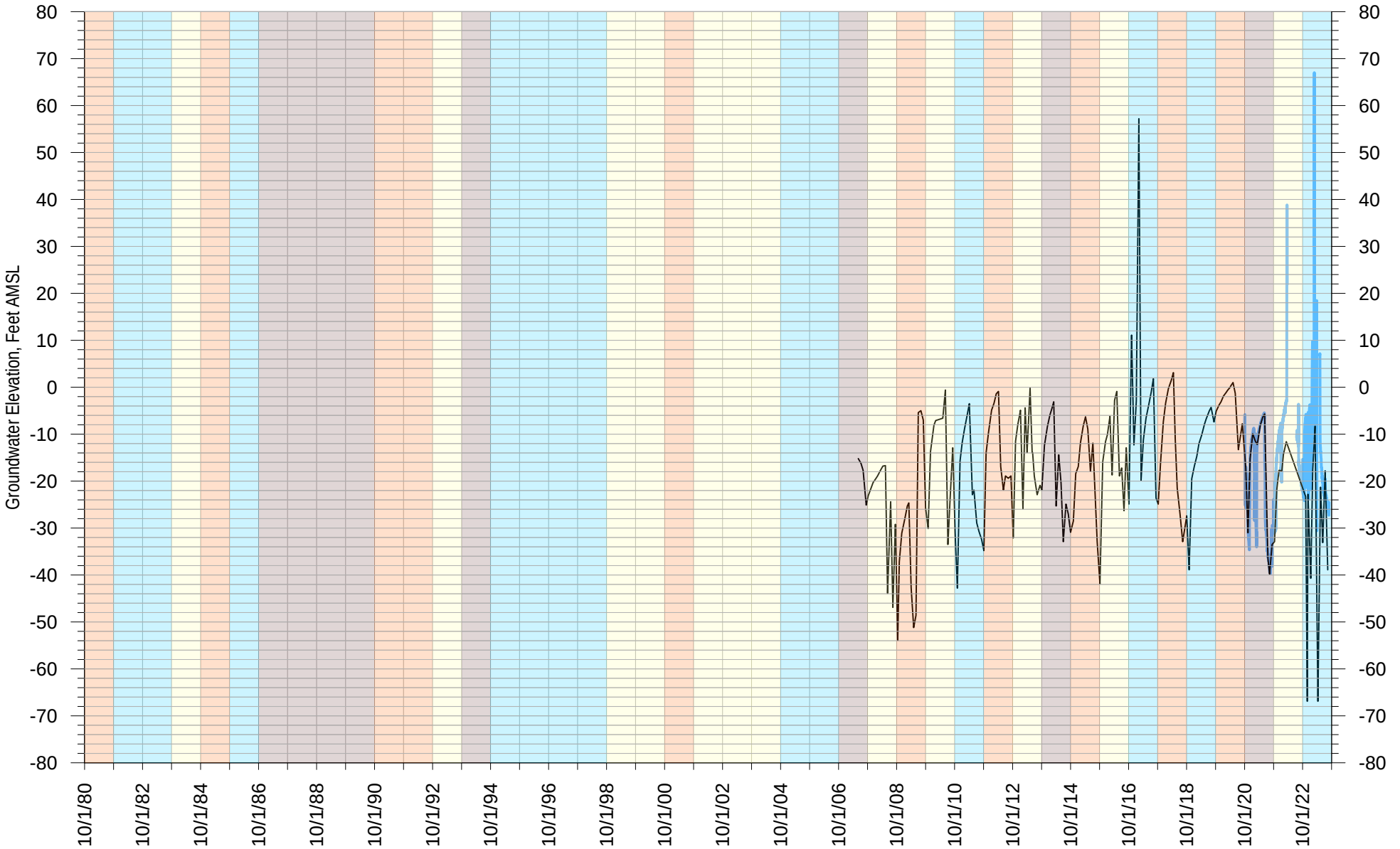
MONTGOMERY & ASSOCIATES

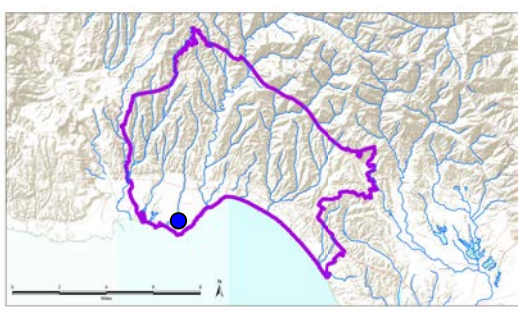
Beltz 9 PW

Aquifer Screened: Purisima A

Appendix A

FIGURE A-47





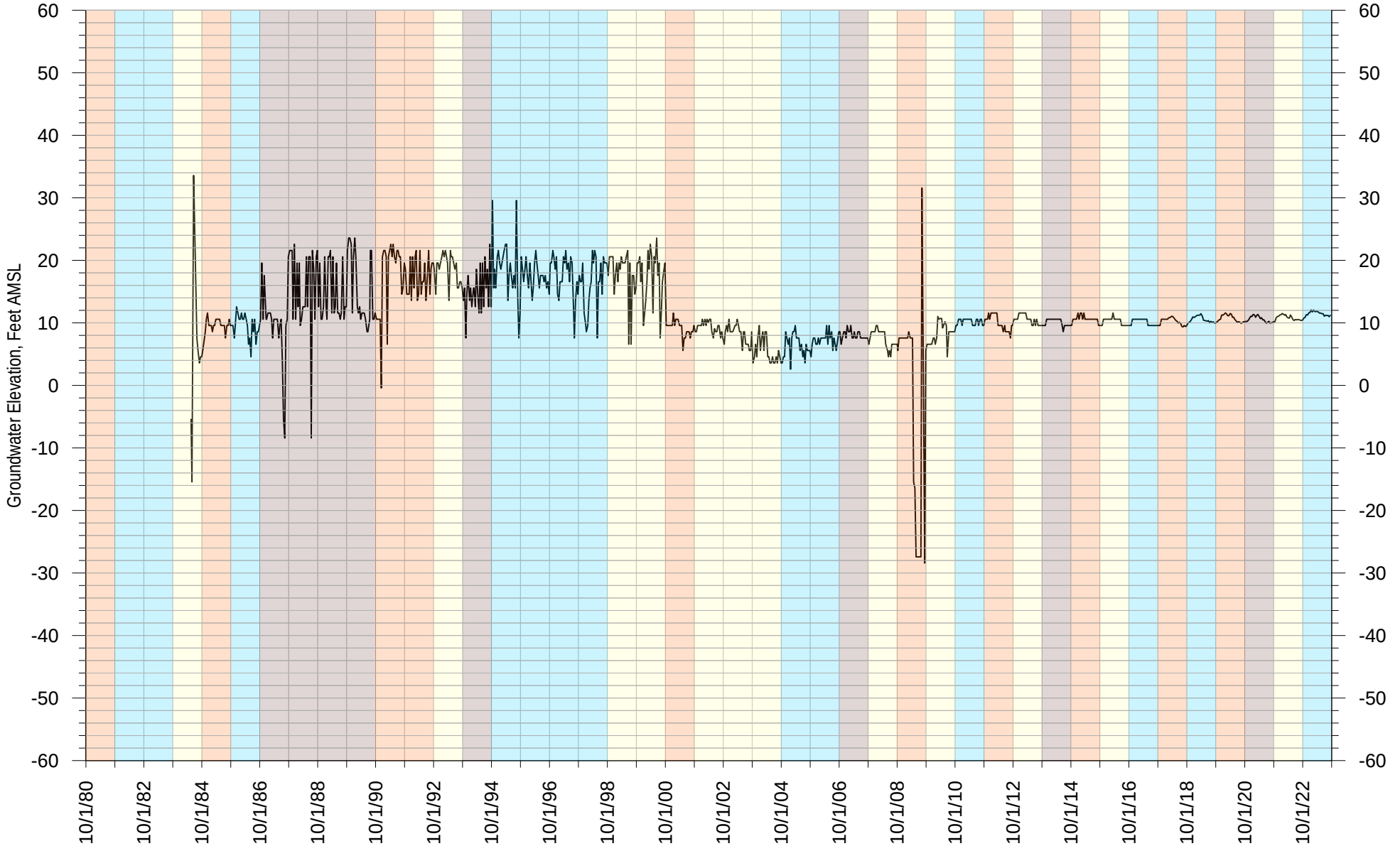
MONTGOMERY & ASSOCIATES

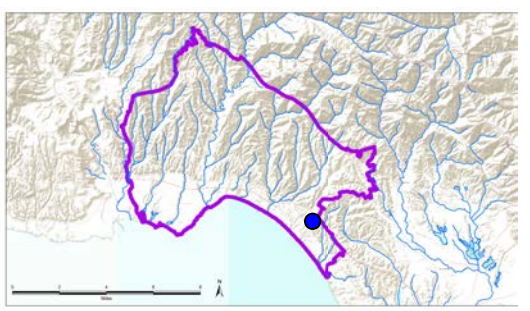
Bonita PW

Aquifer Screened: Aromas/ Purisima F

Appendix A

FIGURE A-48



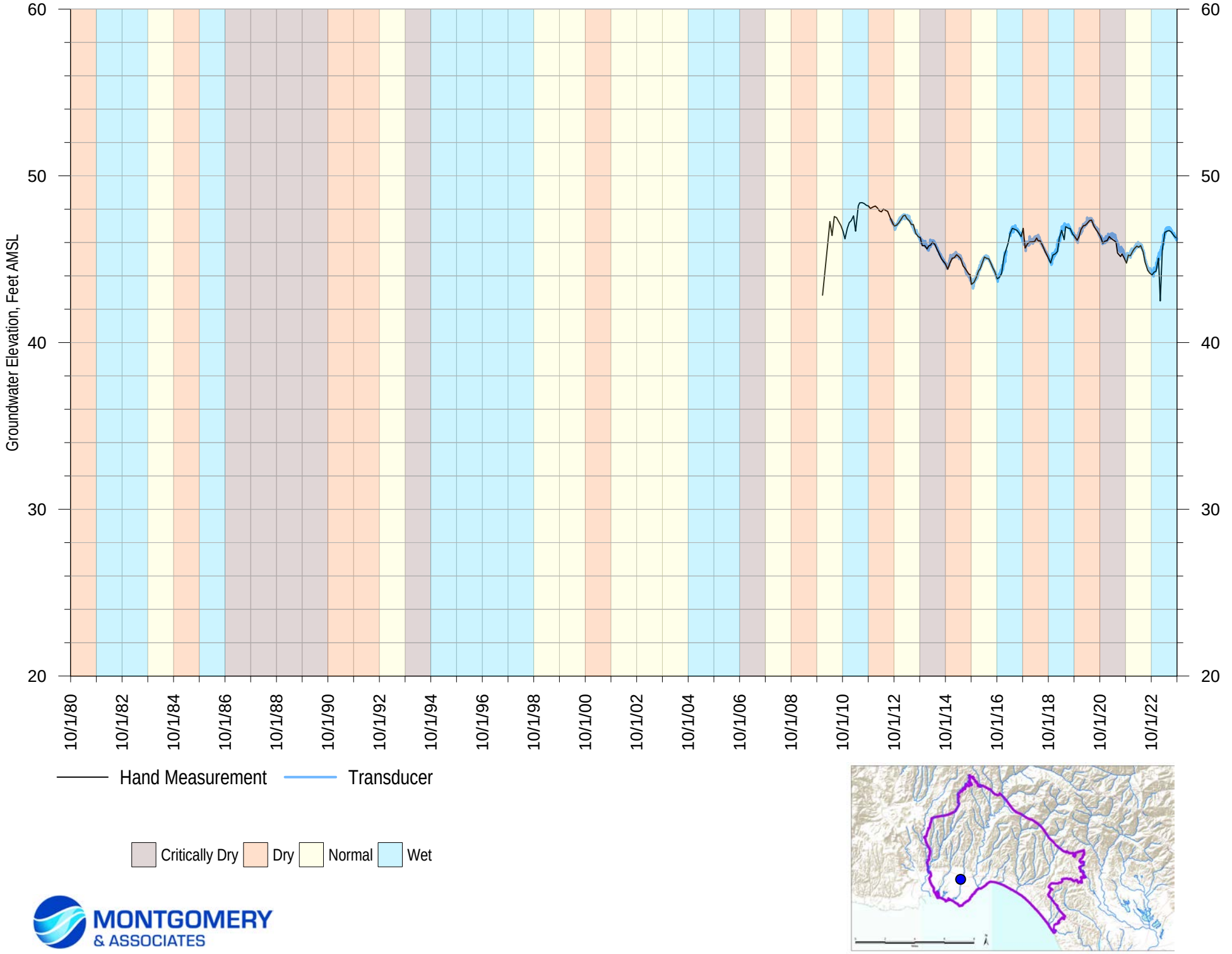


MONTGOMERY & ASSOCIATES

Coffee Lane Deep
Aquifer Screened: Purisima AA

Appendix A

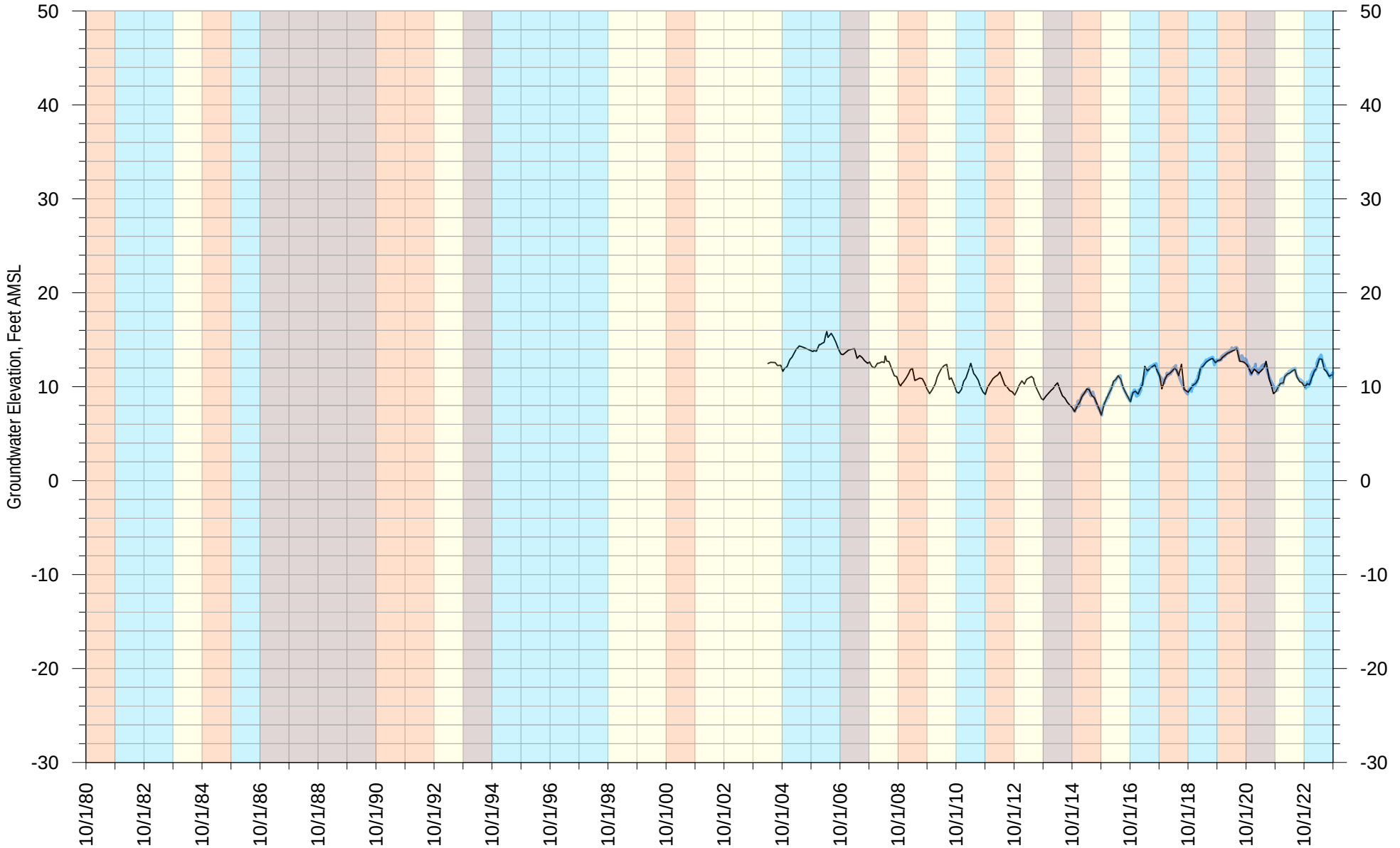
FIGURE A-49

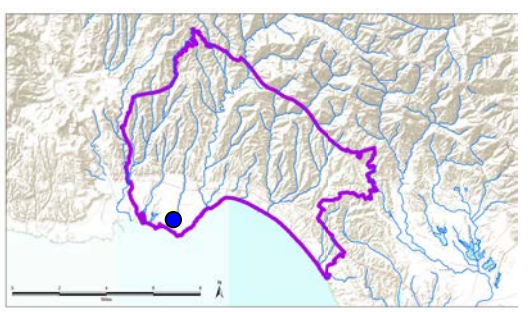


MONTGOMERY & ASSOCIATES

Corcoran Deep
Aquifer Screened: Purisima AA

Appendix A
FIGURE A-50

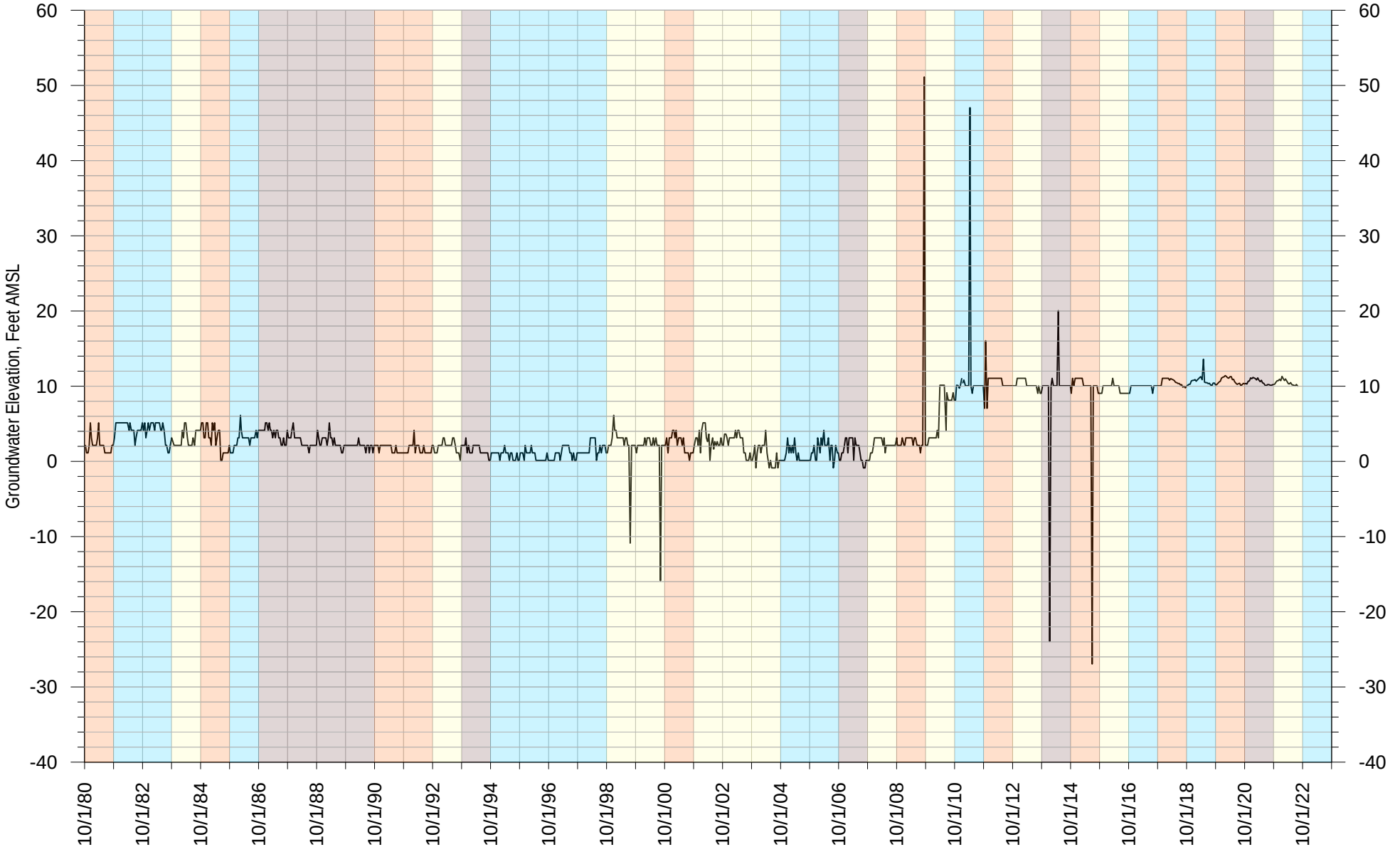


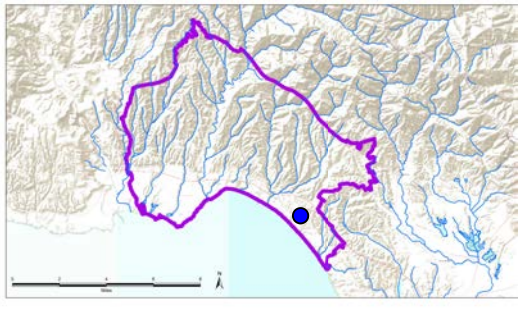


MONTGOMERY & ASSOCIATES

Country Club PW
Aquifer Screened: Aromas/ Purisima F

Appendix A
FIGURE A-51

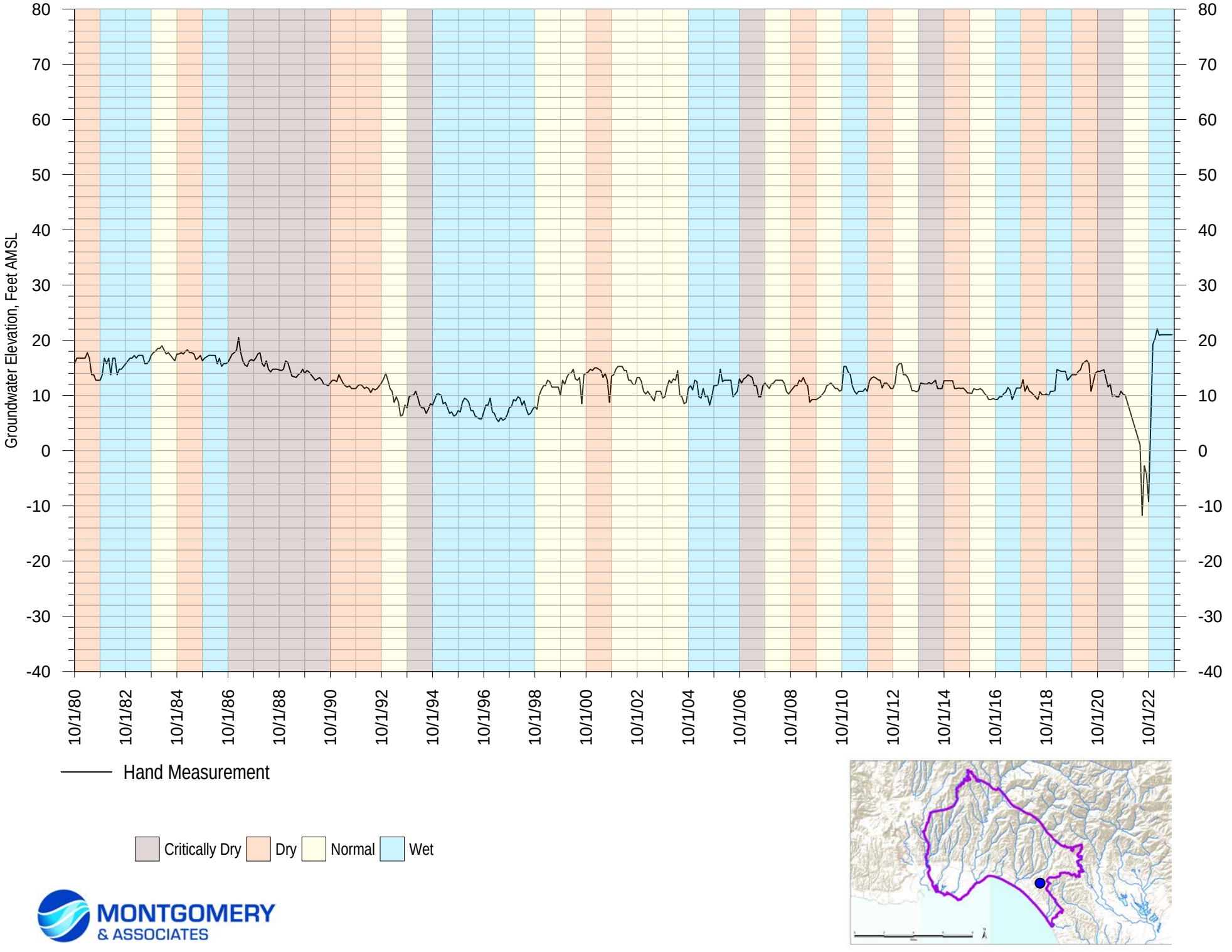




MONTGOMERY & ASSOCIATES

CWD-10 PW
Aquifer Screened: Aromas

Appendix A
FIGURE A-52



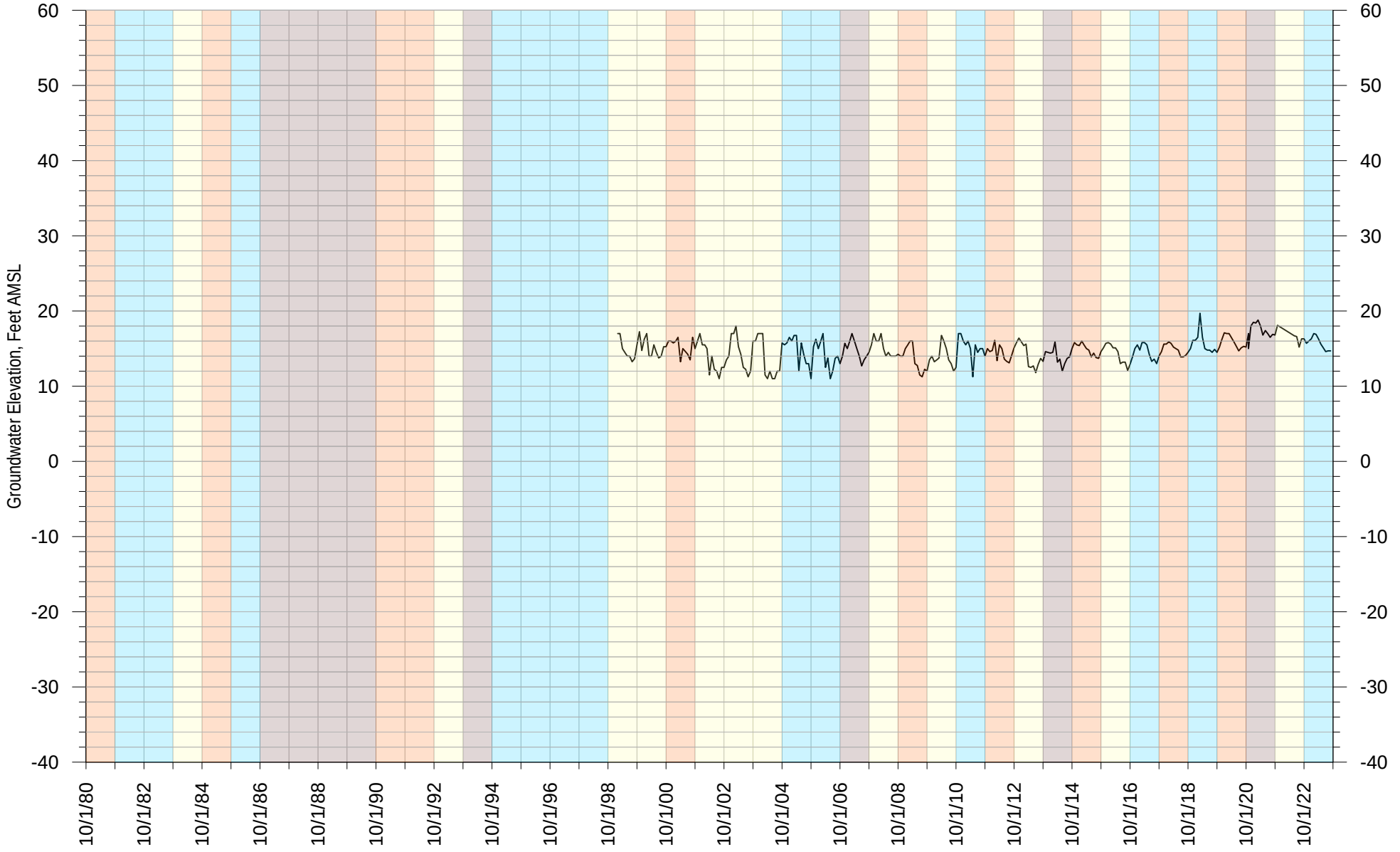
MONTGOMERY & ASSOCIATES

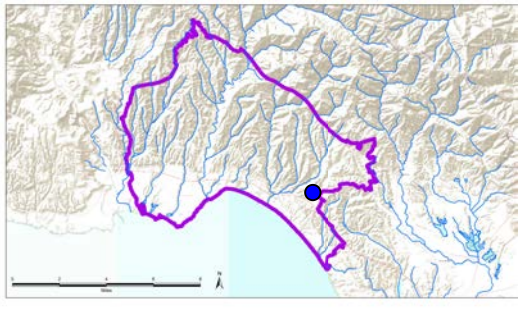
CWD-12 PW

Aquifer Screened: Aromas/ Purisima F

Appendix A

FIGURE A-53





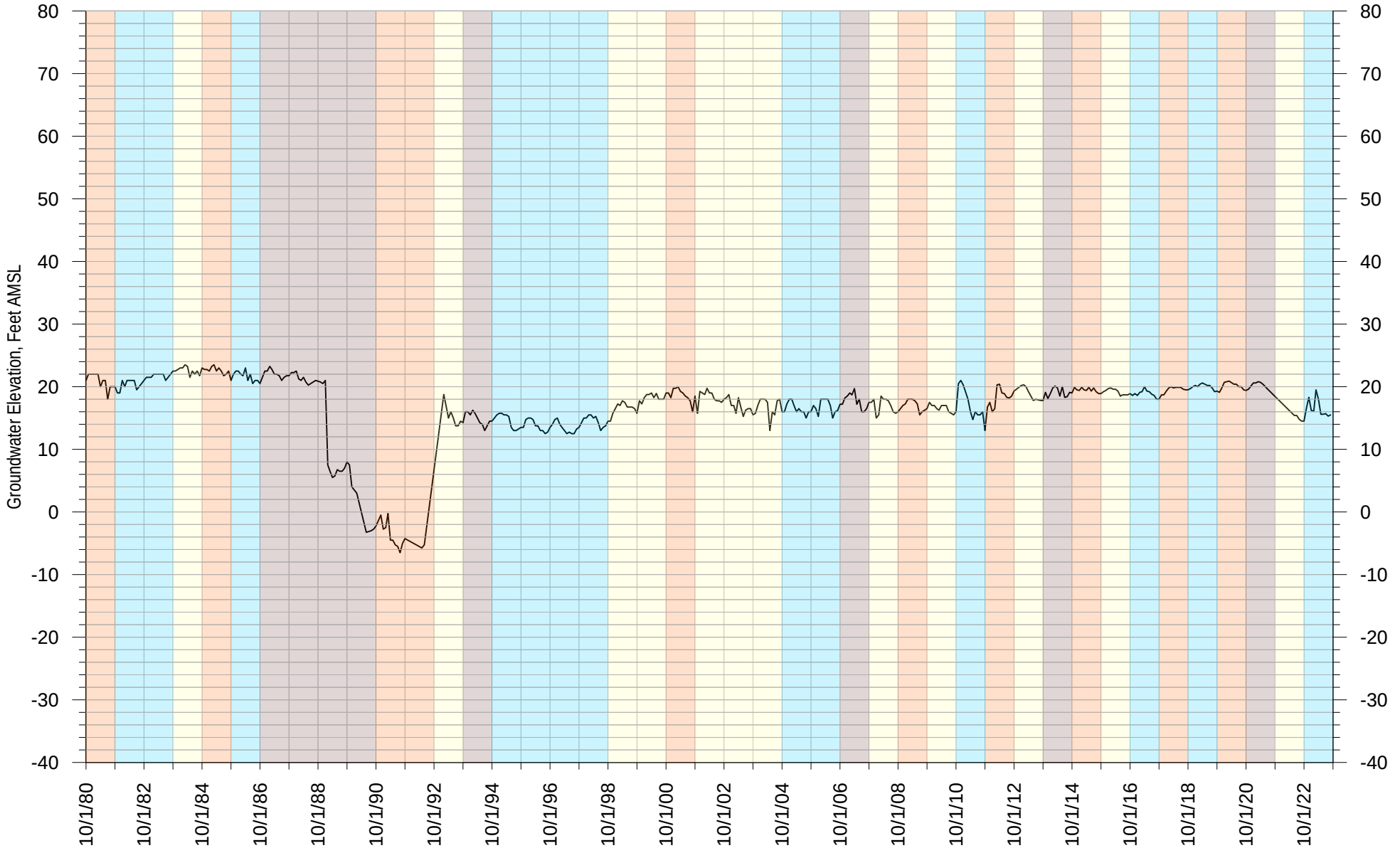
MONTGOMERY & ASSOCIATES

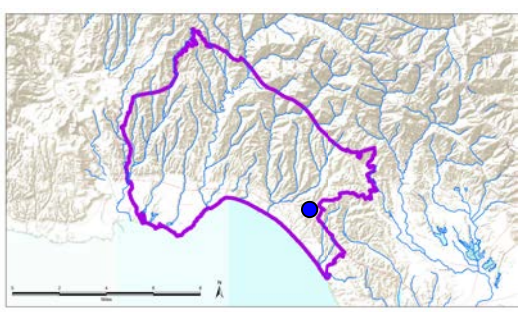
CWD-4 PW

Aquifer Screened: Aromas/ Purisima F

Appendix A

FIGURE A-54





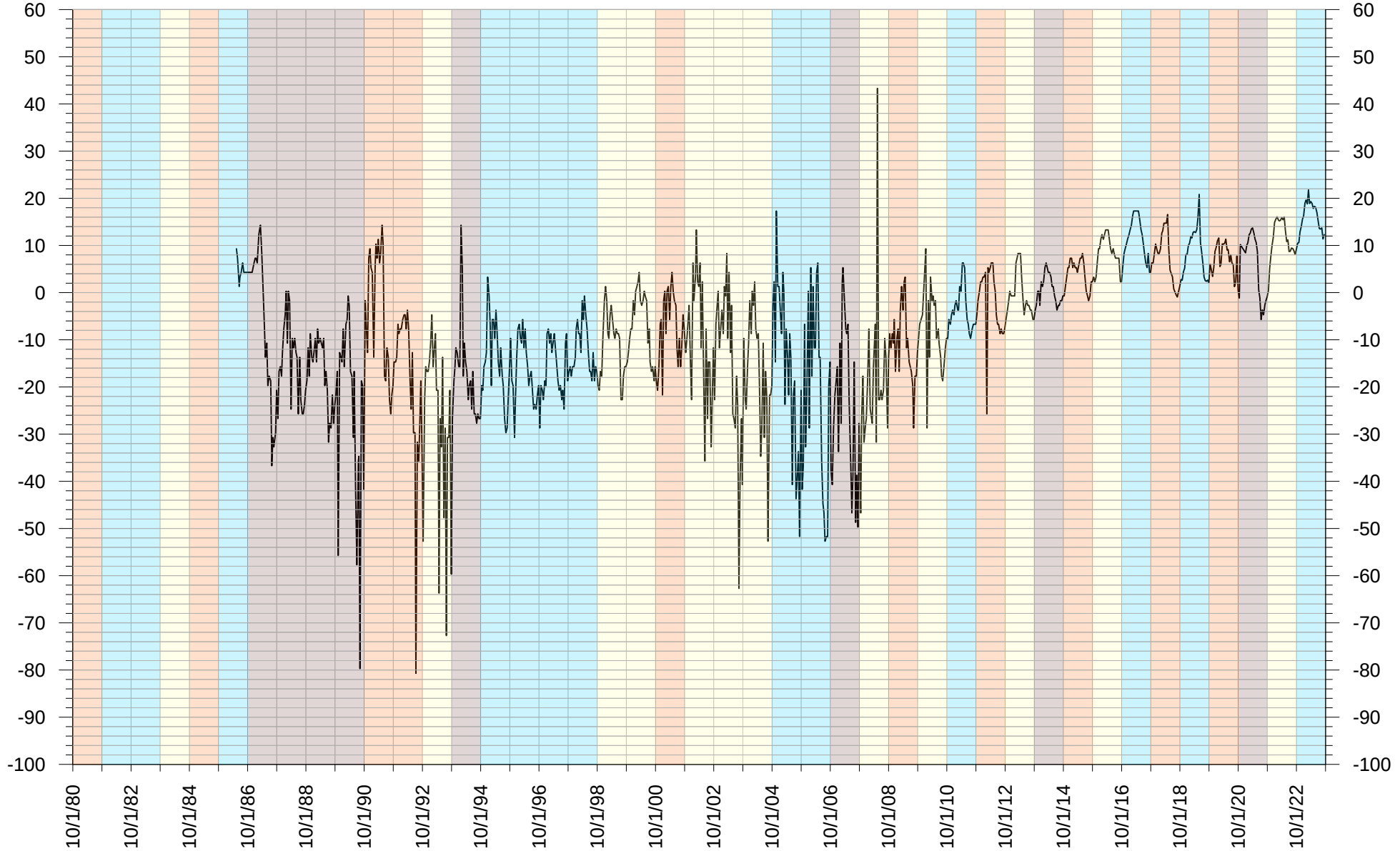
MONTGOMERY & ASSOCIATES

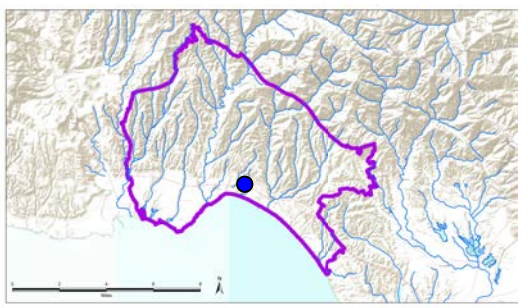
Estates

Aquifer Screened: Purisima A

Appendix A

FIGURE A-55





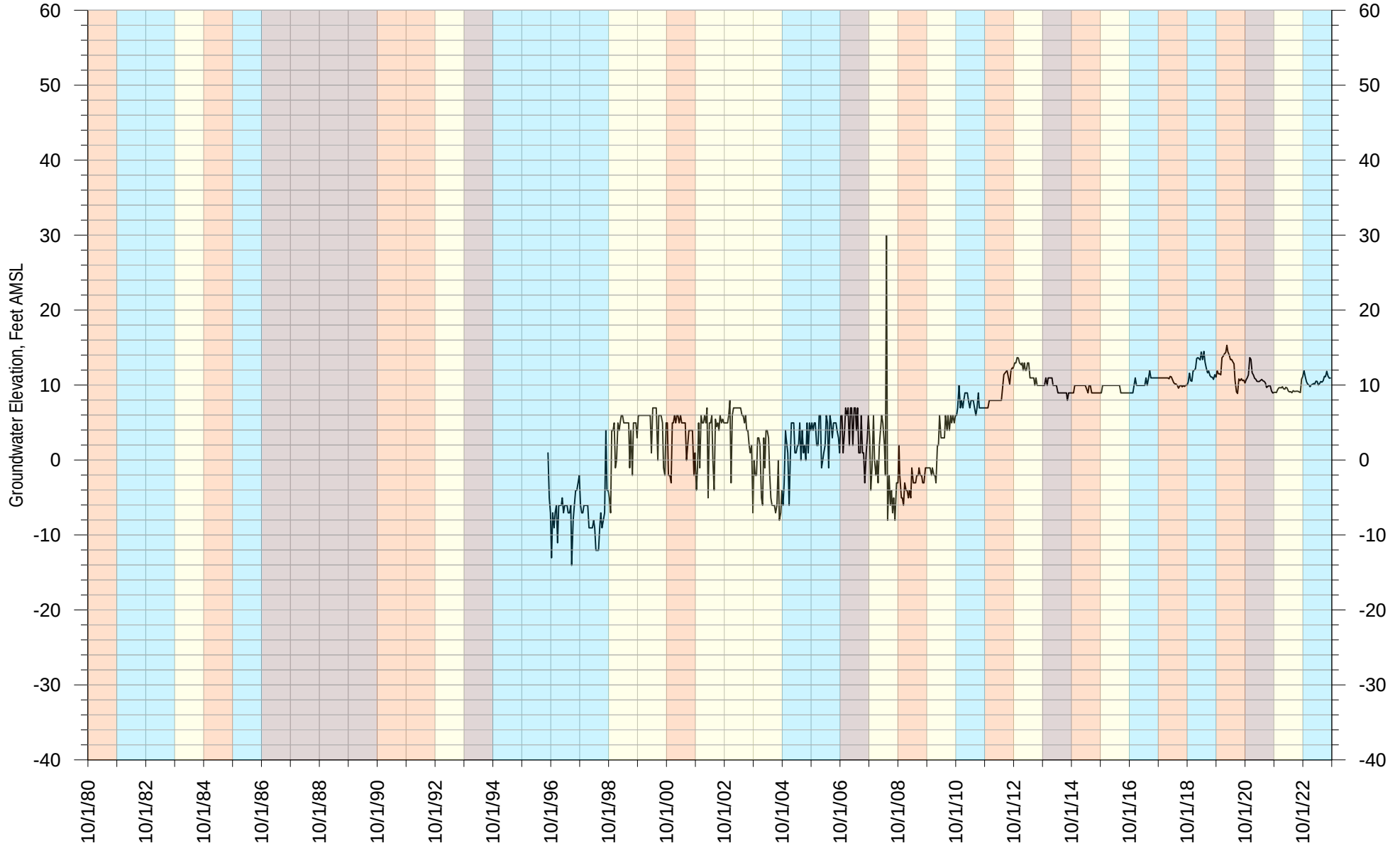
MONTGOMERY & ASSOCIATES

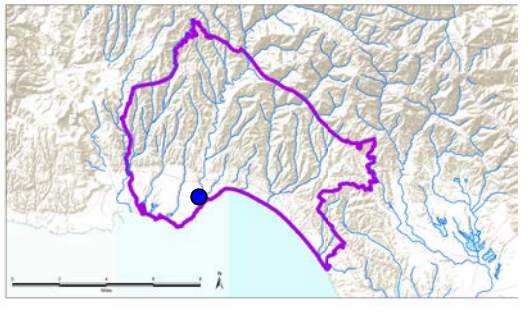
Garnet

Aquifer Screened: Purisima A

Appendix A

FIGURE A-56



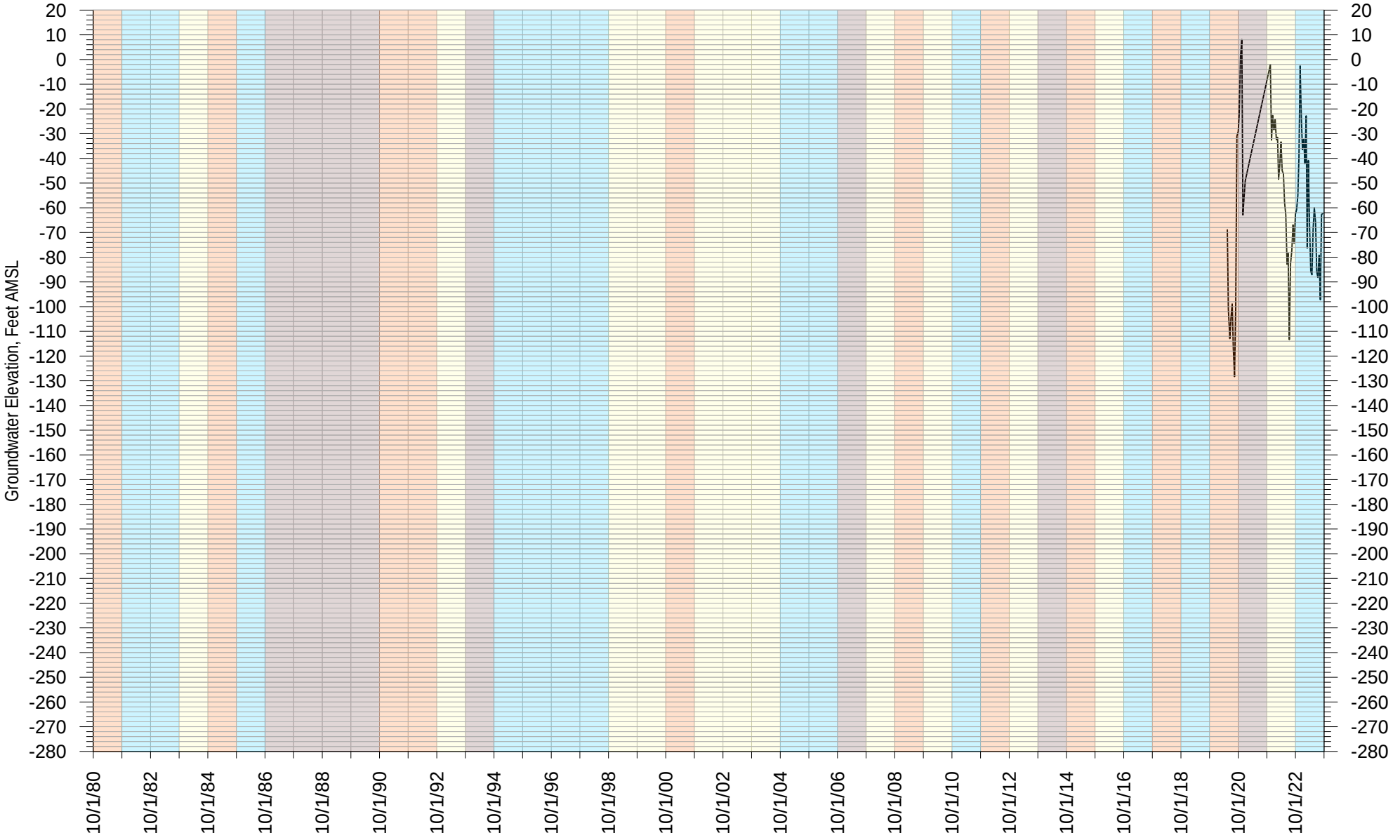


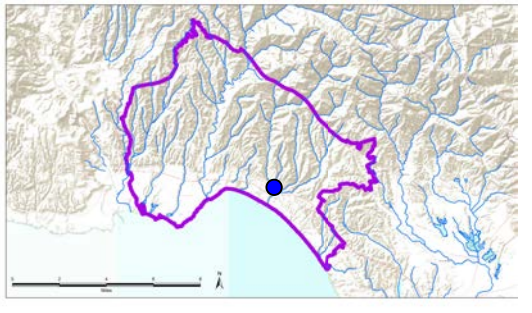
MONTGOMERY & ASSOCIATES

Granite Way PW
Aquifer Screened: Purisima DEF

Appendix A

FIGURE A-57





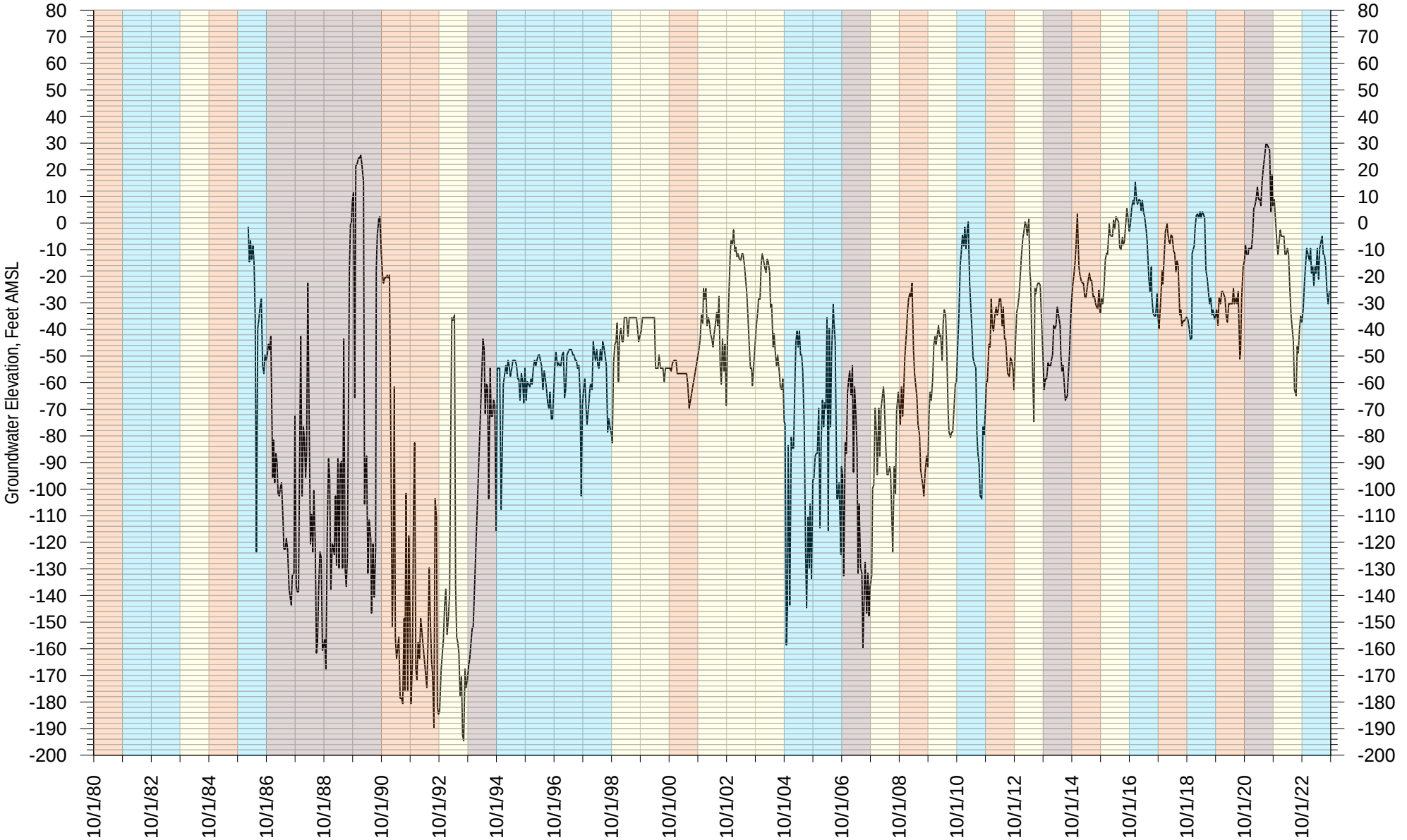
MONTGOMERY & ASSOCIATES

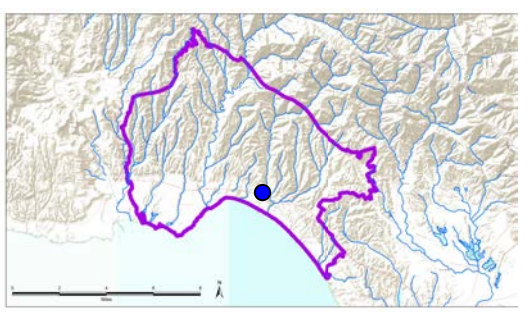
Ledyard

Aquifer Screened: Purisima BC

Appendix A

FIGURE A-58





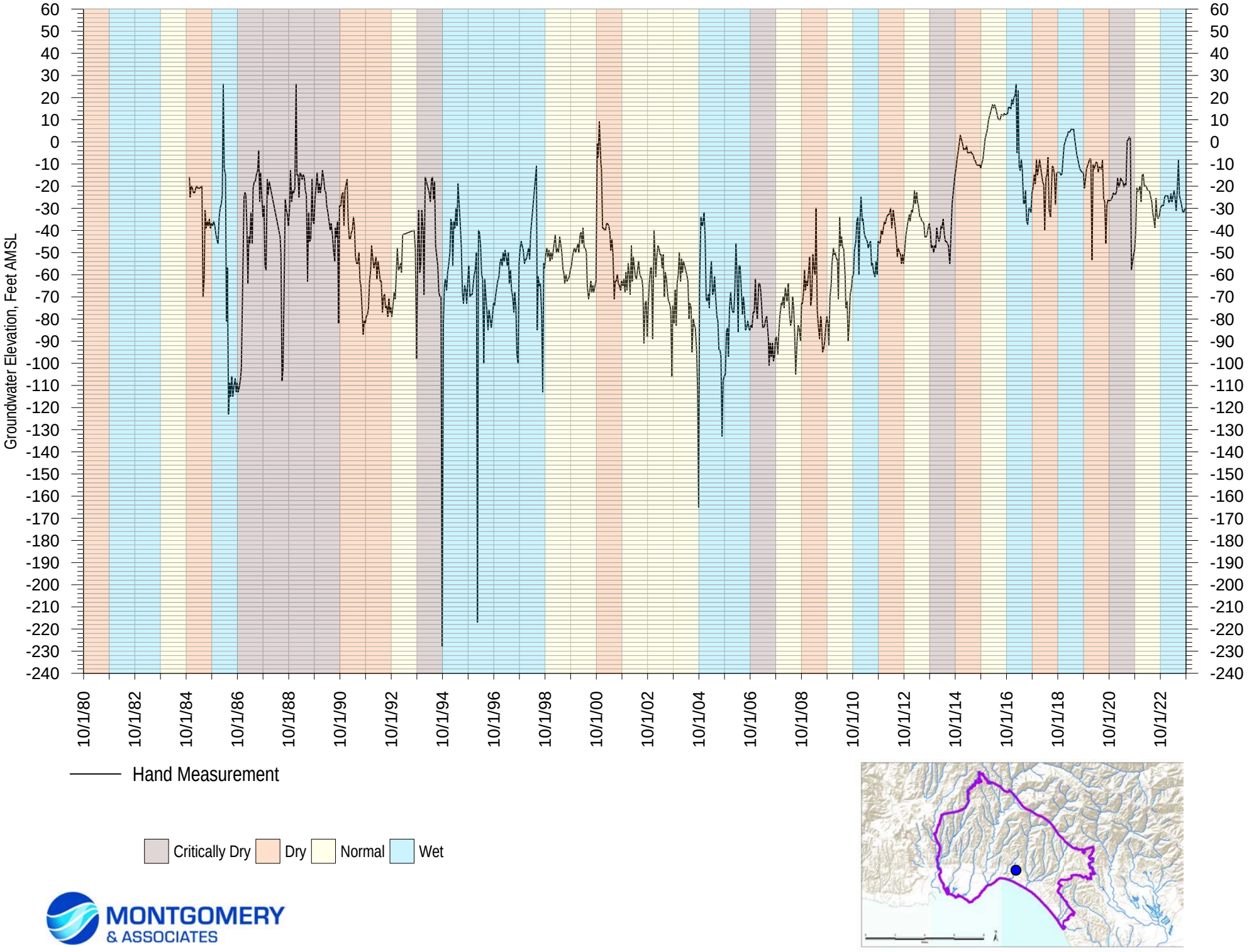
MONTGOMERY & ASSOCIATES

Madeline PW

Aquifer Screened: Purisima BC

Appendix A

FIGURE A-59



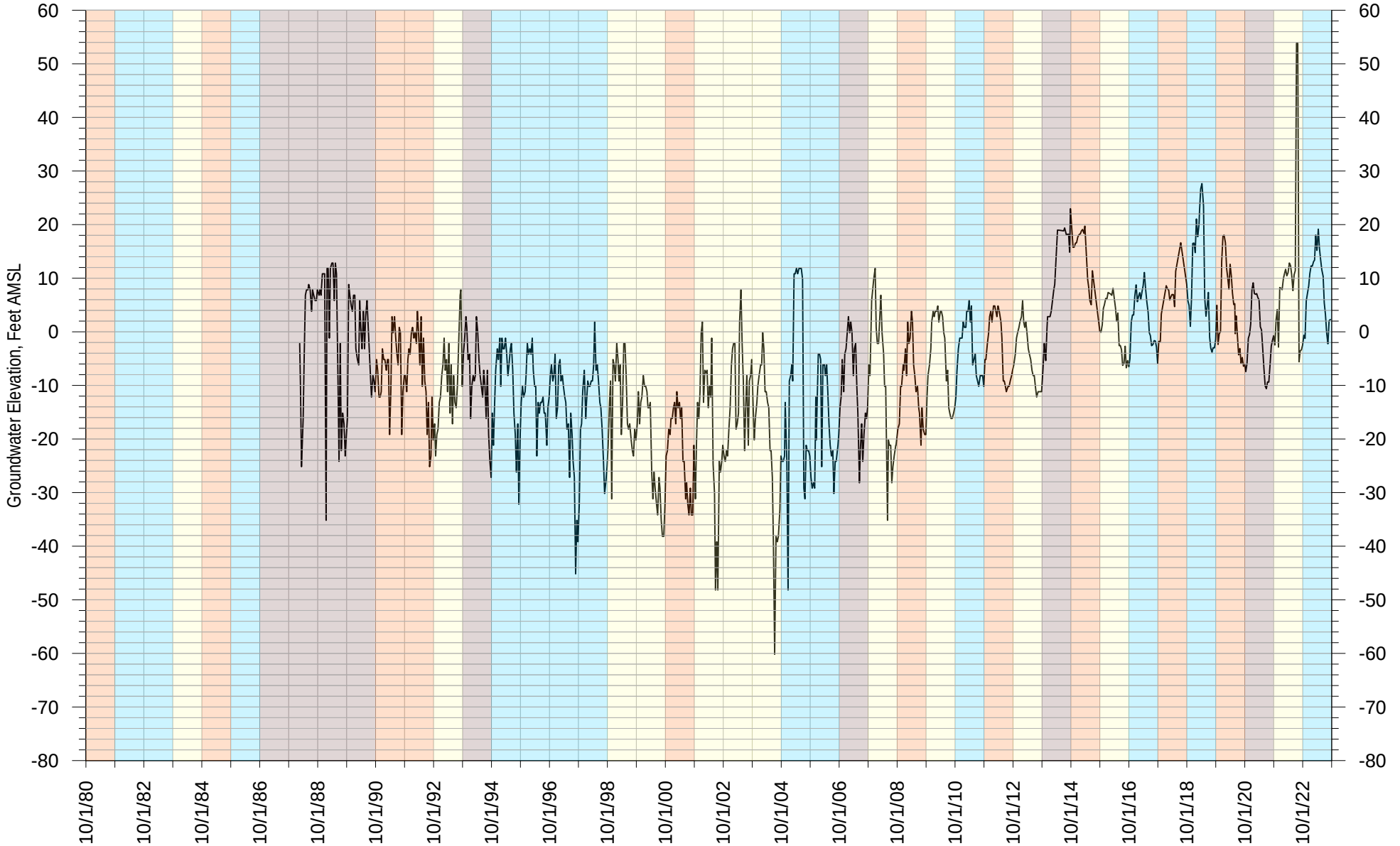
MONTGOMERY & ASSOCIATES

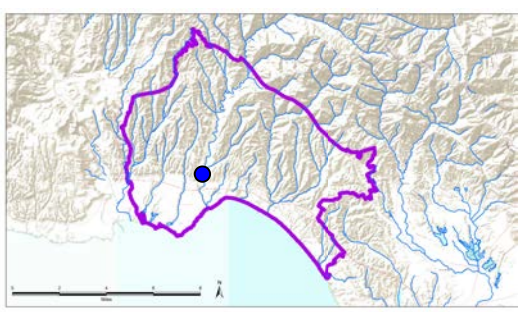
Main Street PW

Aquifer Screened: Purisima A

Appendix A

FIGURE A-60





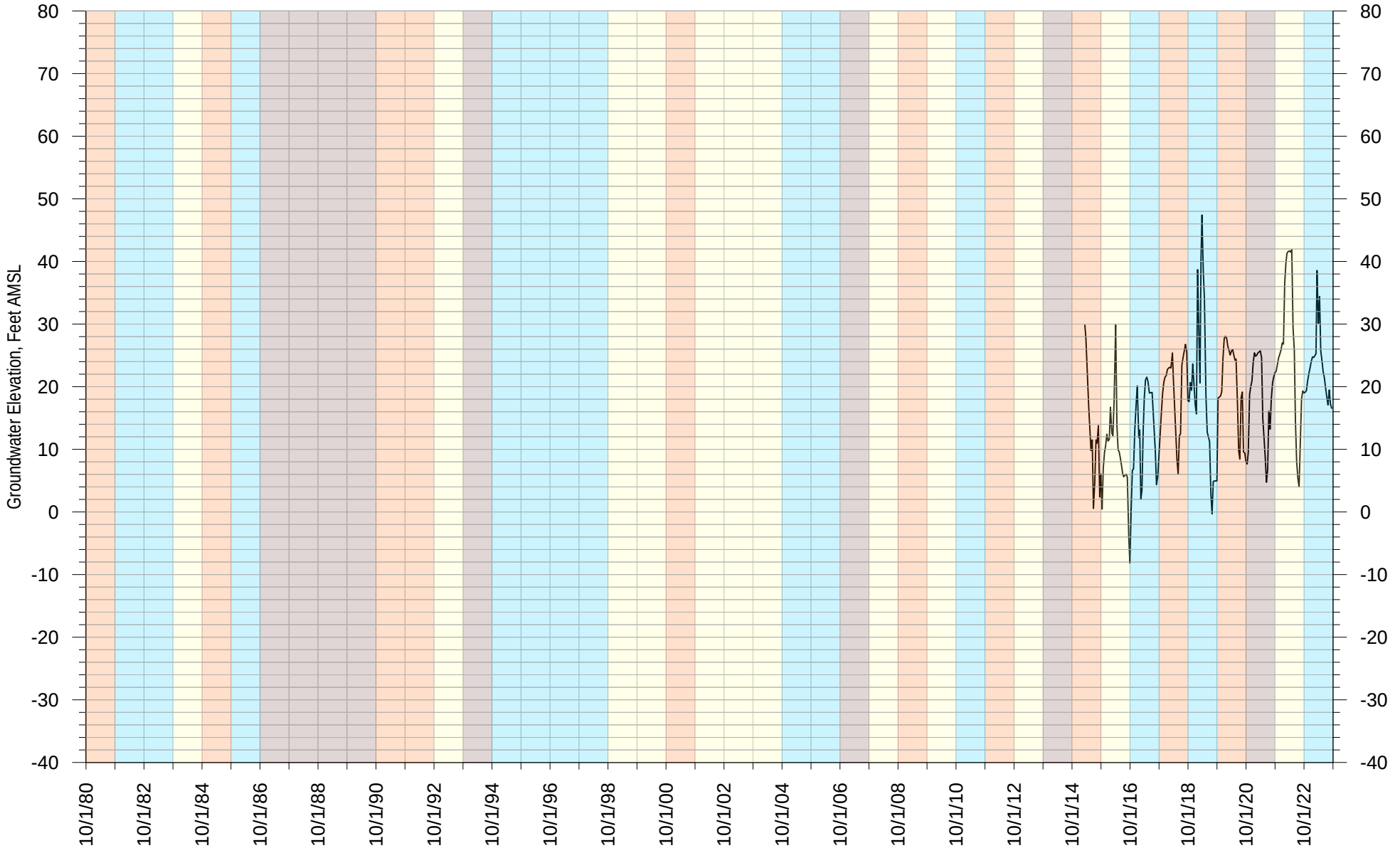
MONTGOMERY & ASSOCIATES

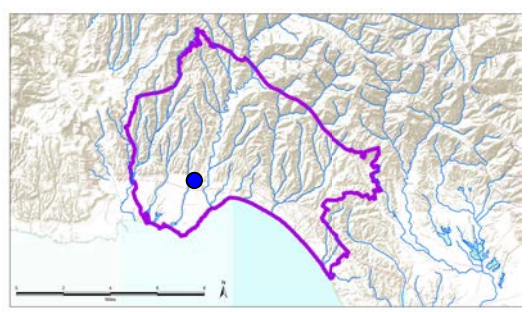
O'Neill Ranch PW

Aquifer Screened: Purisima AA/Tu

Appendix A

FIGURE A-61

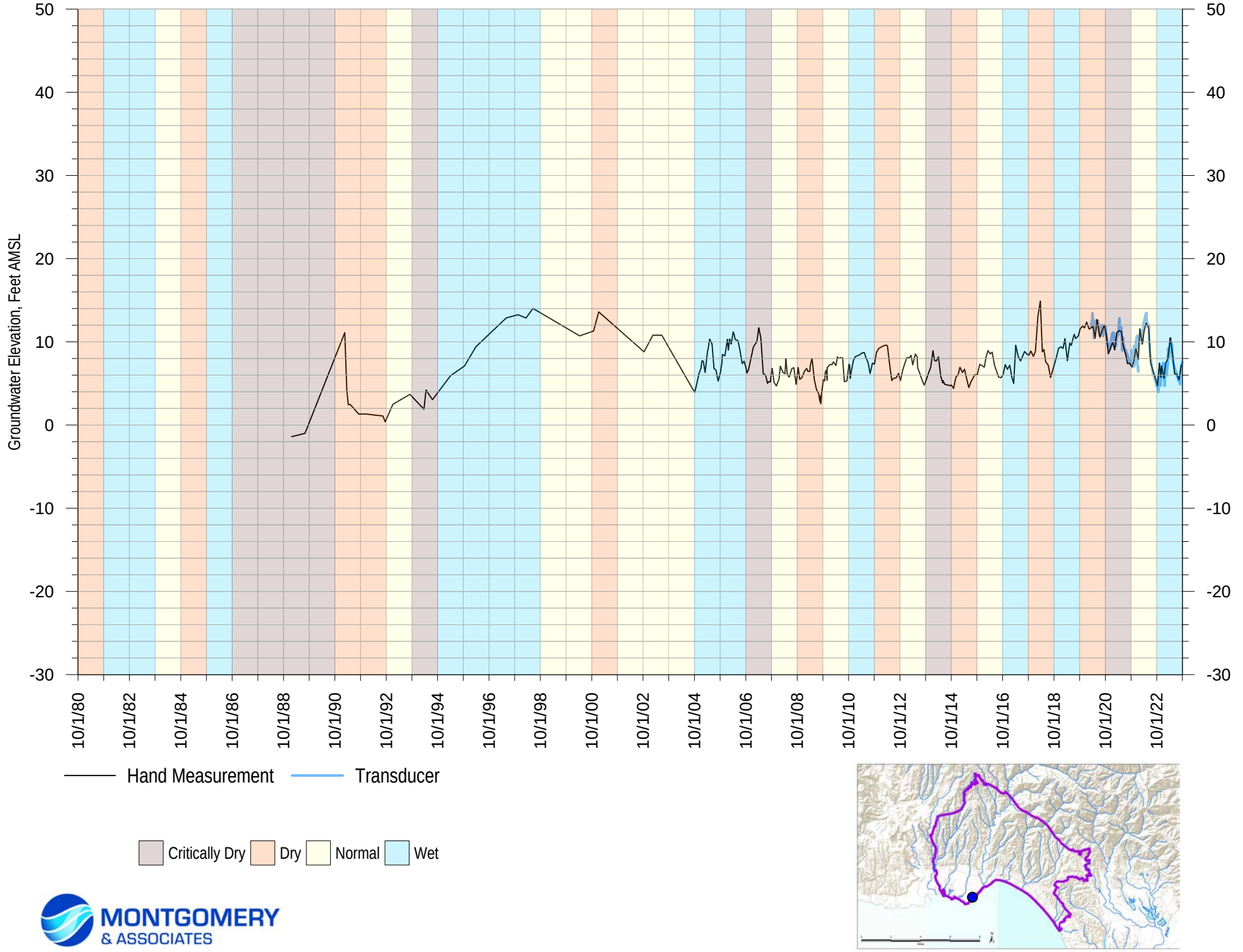




MONTGOMERY & ASSOCIATES

Pleasure Point Shallow
Aquifer Screened: Purisima A

Appendix A
FIGURE A-62



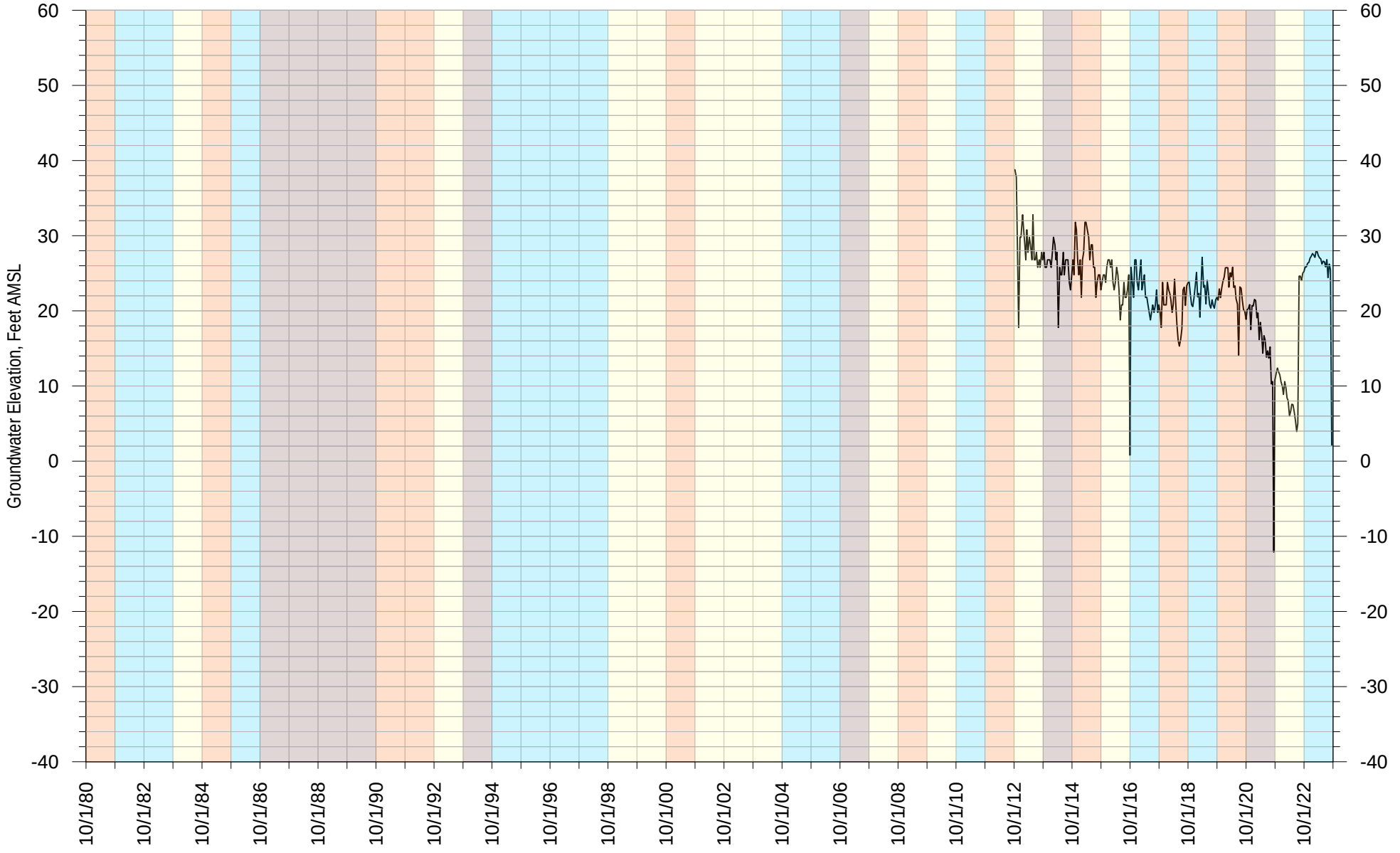
MONTGOMERY & ASSOCIATES

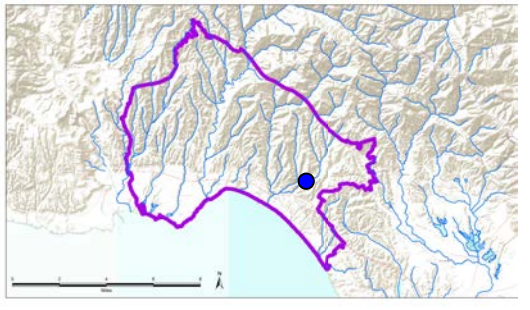
Polo Grounds PW

Aquifer Screened: Aromas/ Purisima F

Appendix A

FIGURE A-63





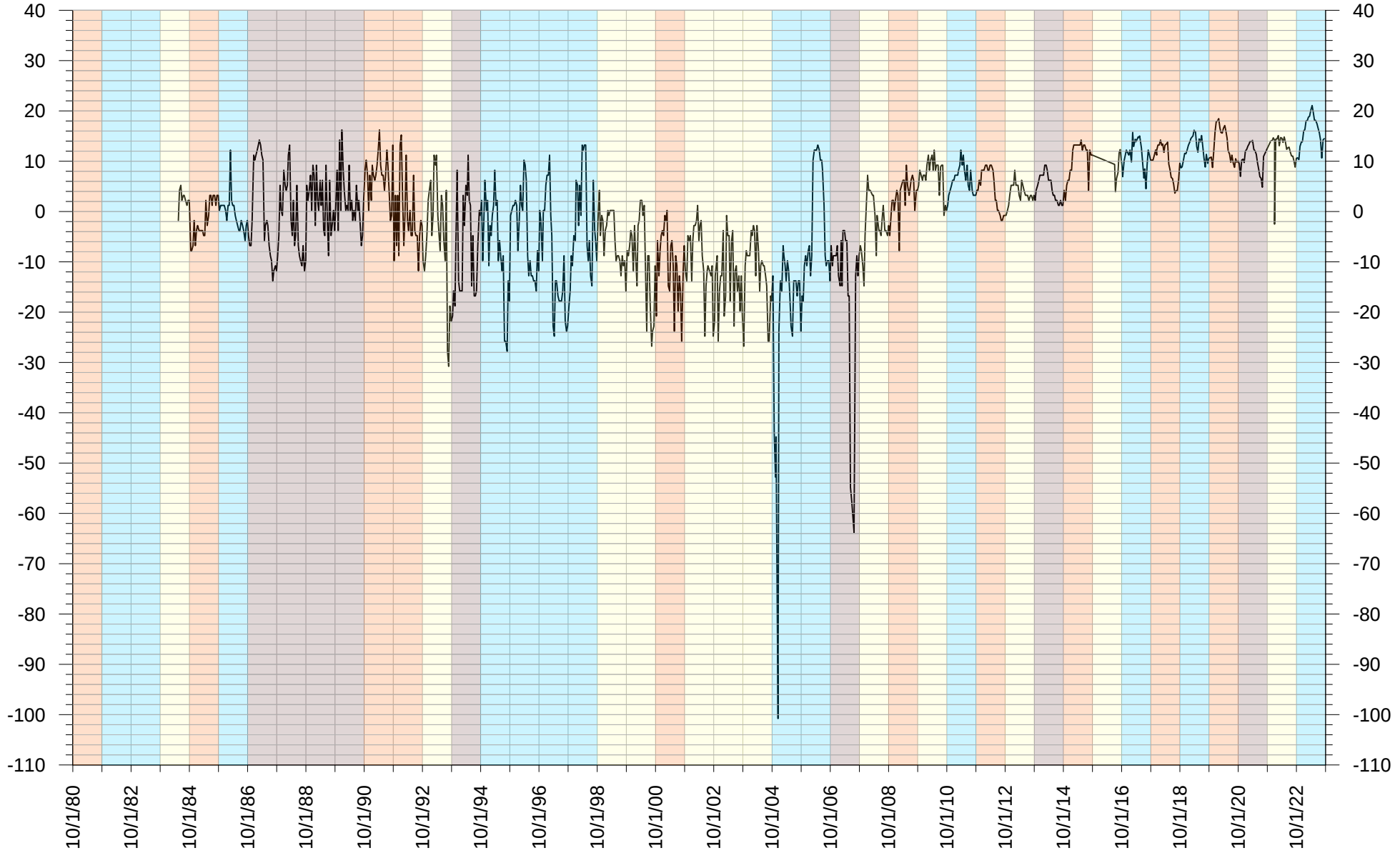
MONTGOMERY & ASSOCIATES

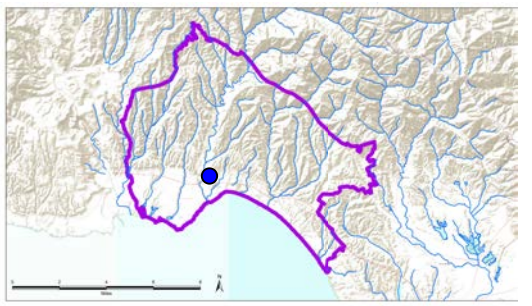
Rosedale PW

Aquifer Screened: Purisima A

Appendix A

FIGURE A-64





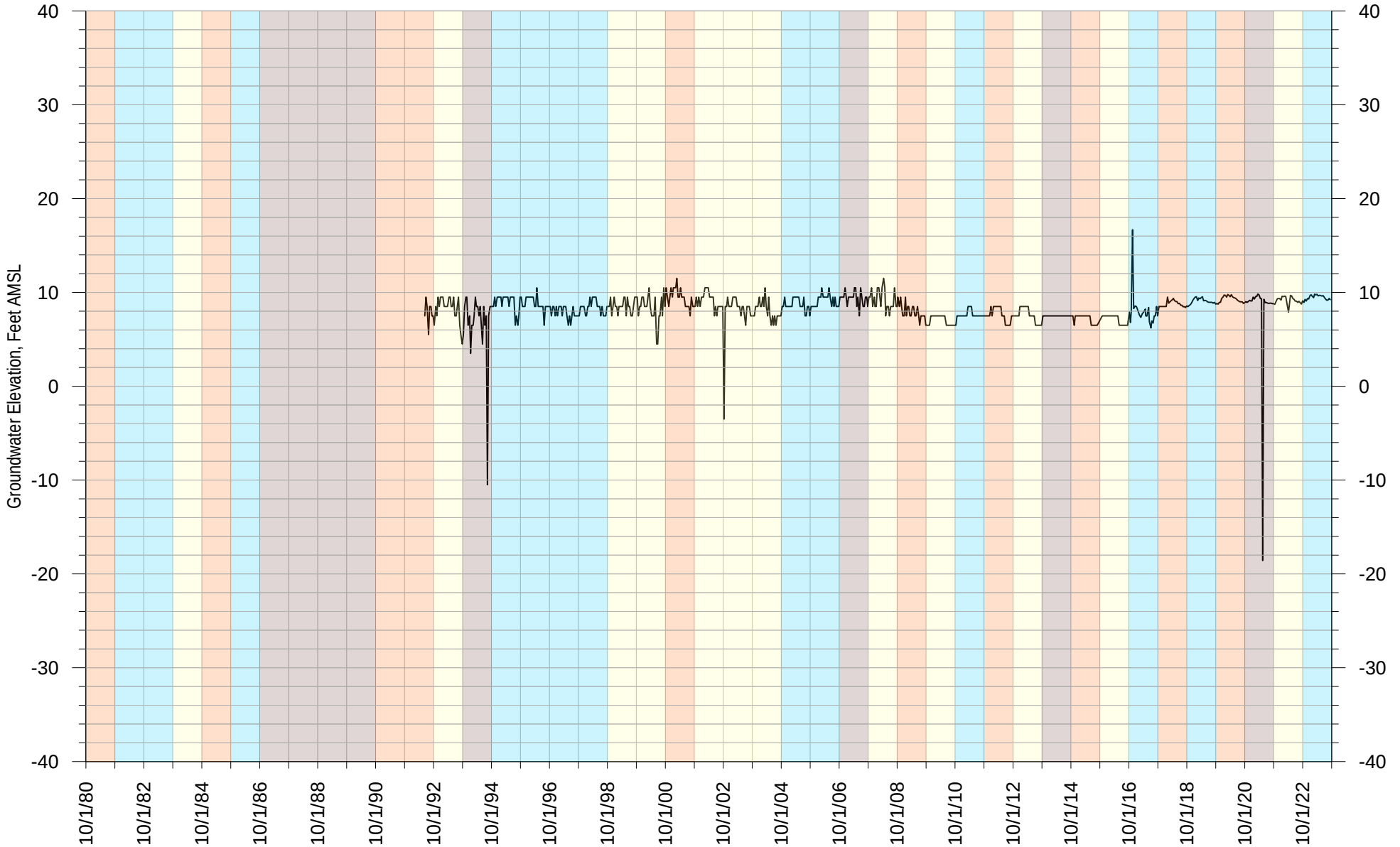
MONTGOMERY & ASSOCIATES

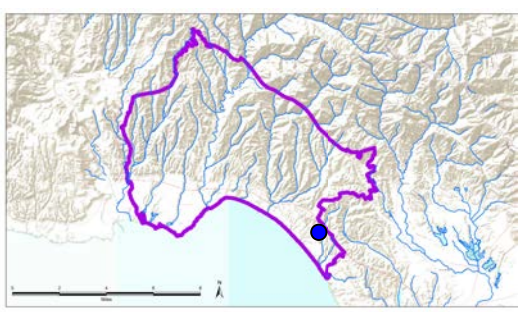
San Andreas PW

Aquifer Screened: Aromas/ Purisima F

Appendix A

FIGURE A-65

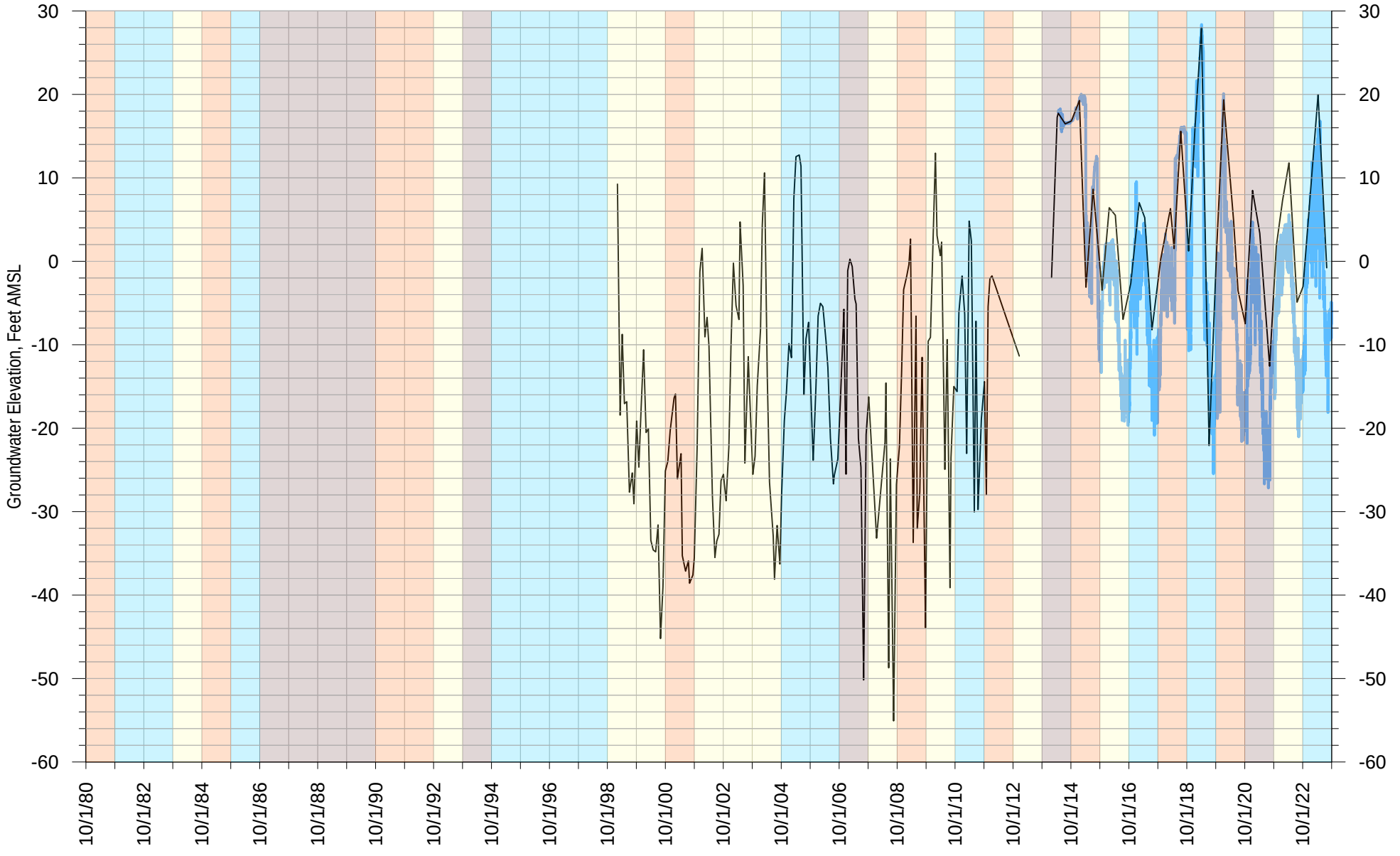


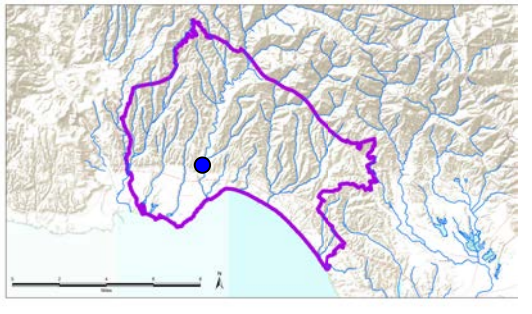


MONTGOMERY & ASSOCIATES

SC-18AA & SC-18RAA at Main Street
Aquifer Screened: Tu

Appendix A
FIGURE A-66

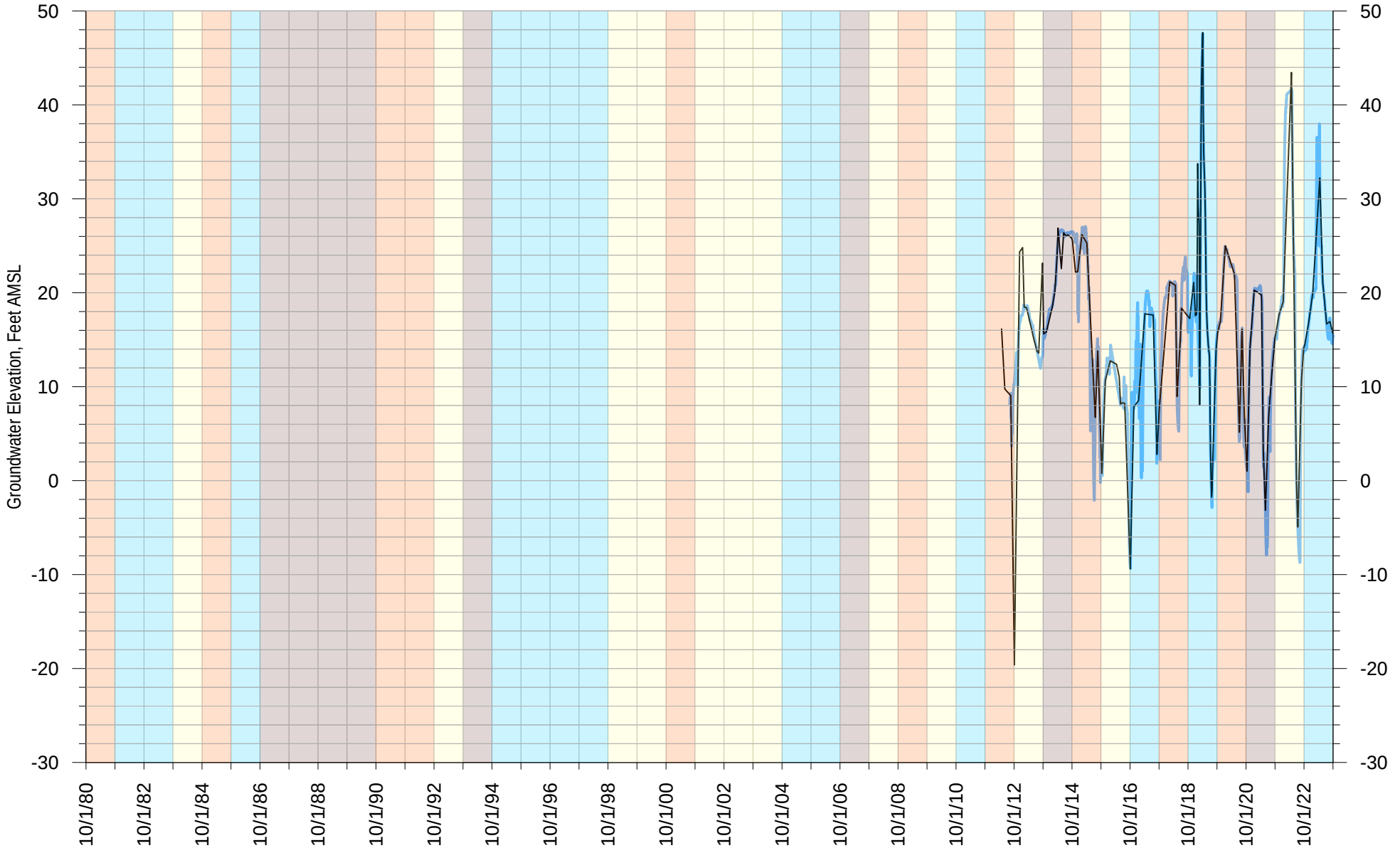


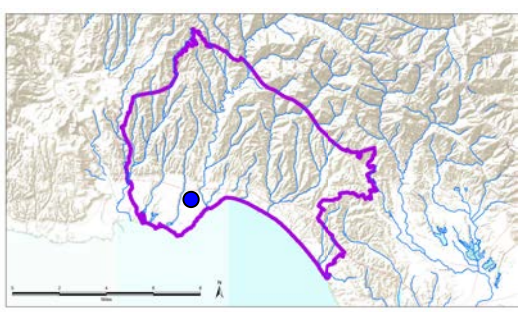


MONTGOMERY & ASSOCIATES

SC-22AAA at 41st Ave
Aquifer Screened: Purisima AA

Appendix A
FIGURE A-67



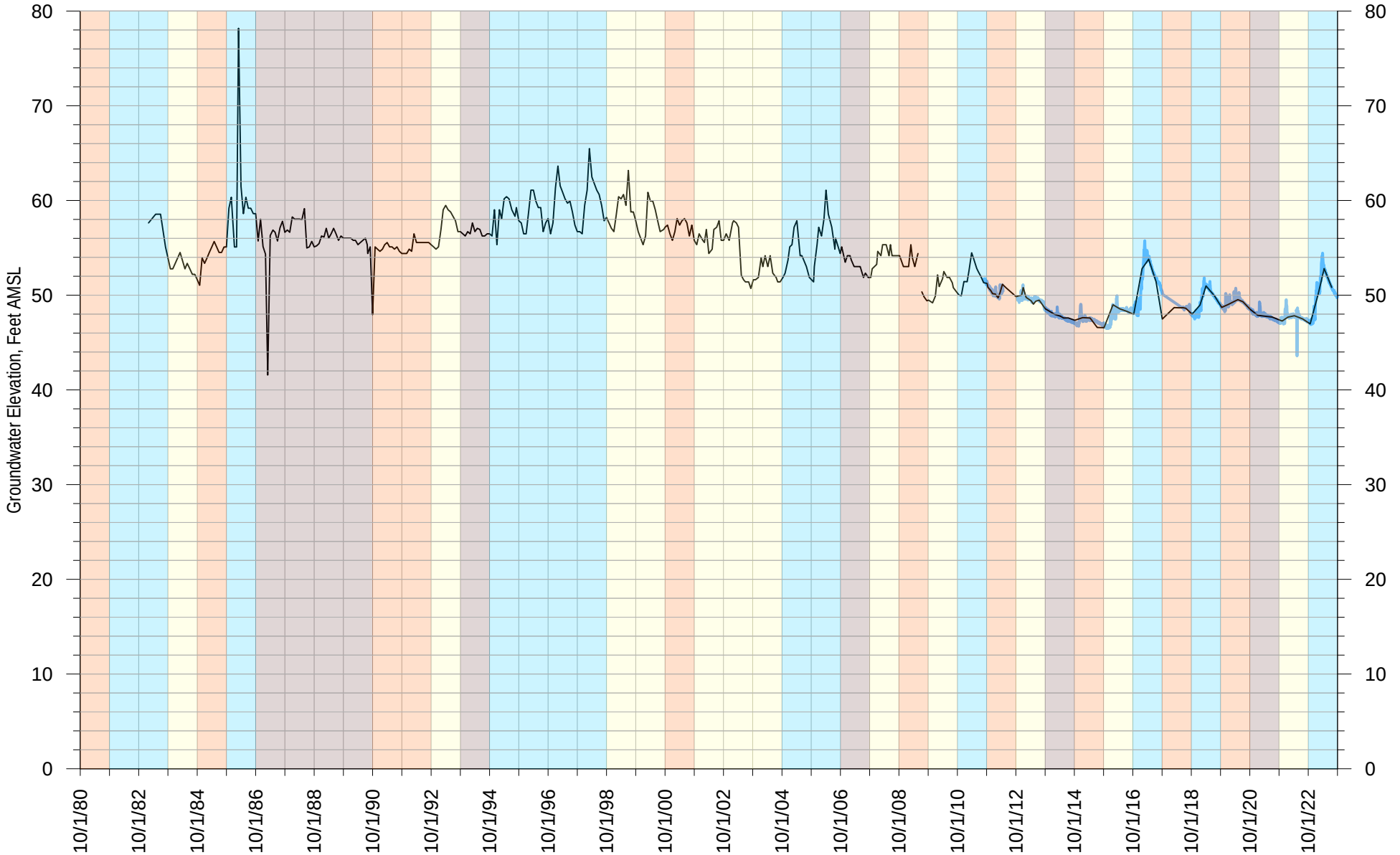


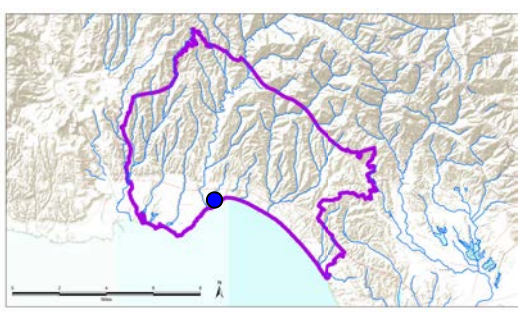
MONTGOMERY & ASSOCIATES

SC-3C & SC-3RC at Escalona
Aquifer Screened: Purisima BC

Appendix A

FIGURE A-68



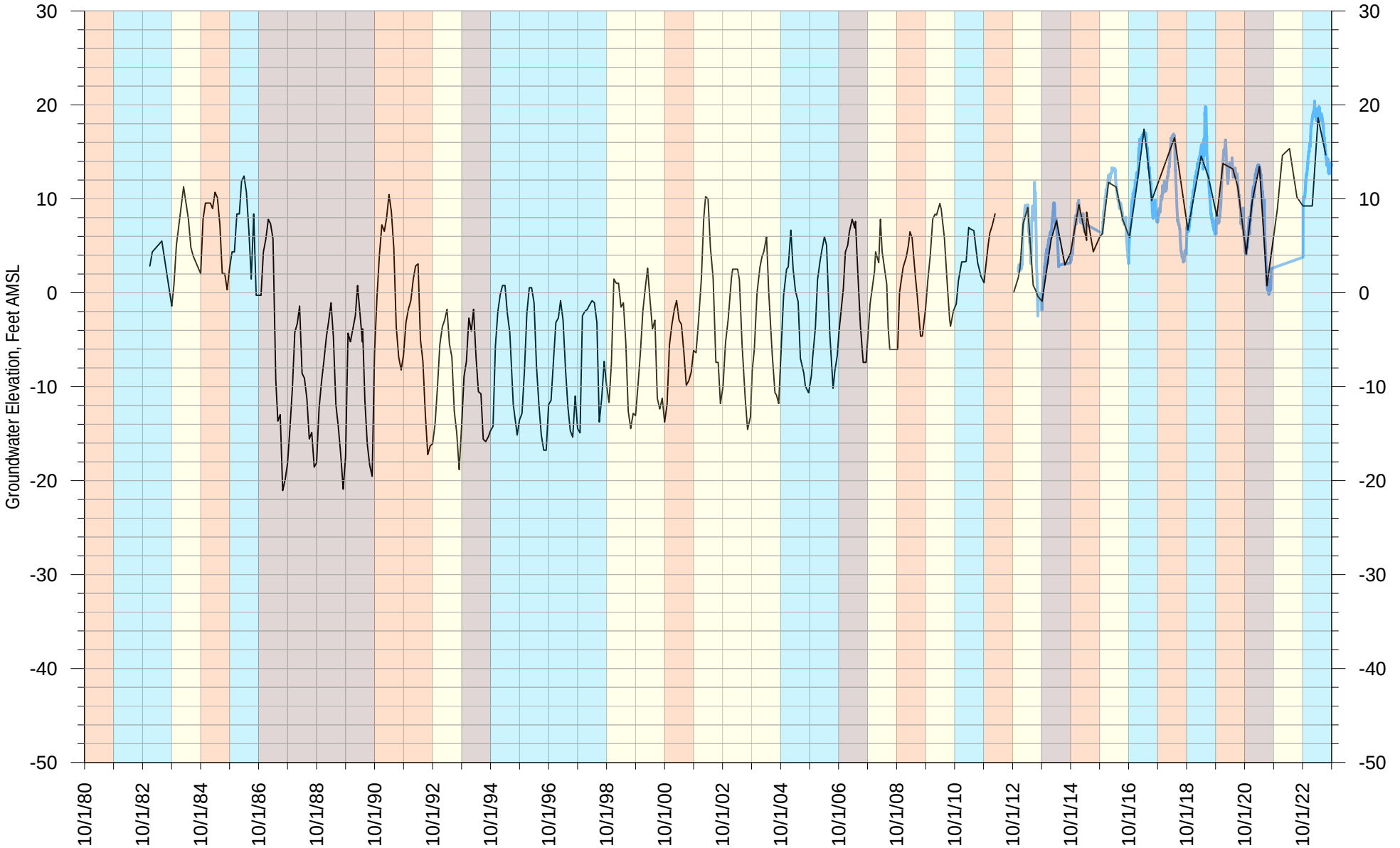


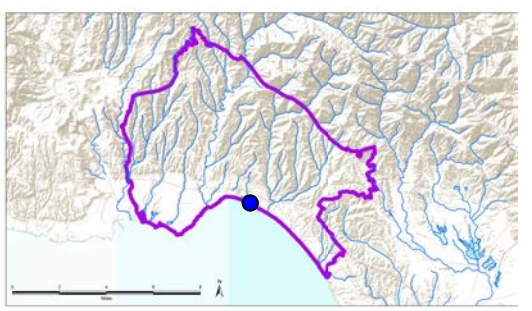
MONTGOMERY & ASSOCIATES

SC-9A & SC-9RA at Seacliff
Aquifer Screened: Purisima A

Appendix A

FIGURE A-69



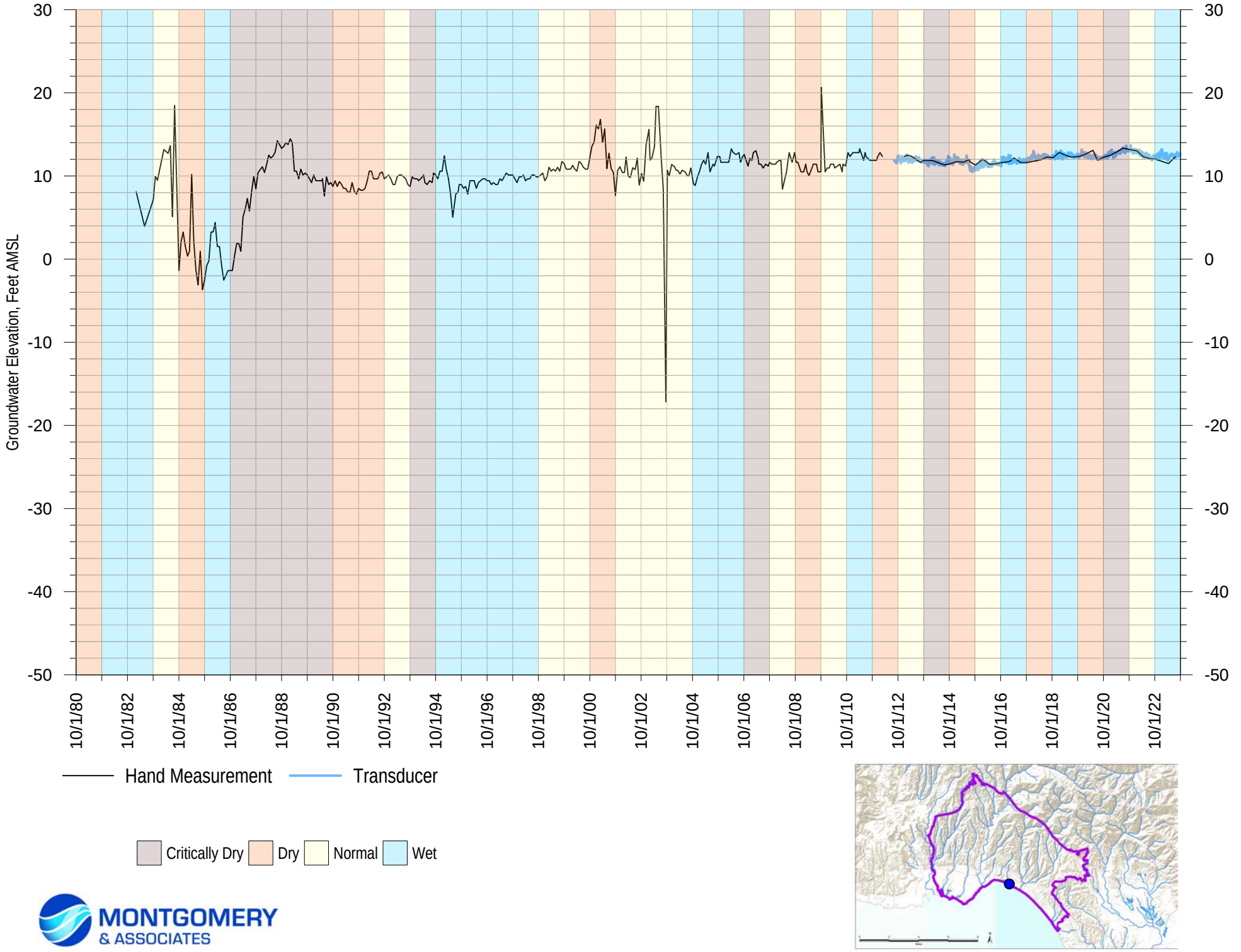


MONTGOMERY & ASSOCIATES

SC-9E & SC-9RE at Seacliff
Aquifer Screened: Purisima DEF

Appendix A

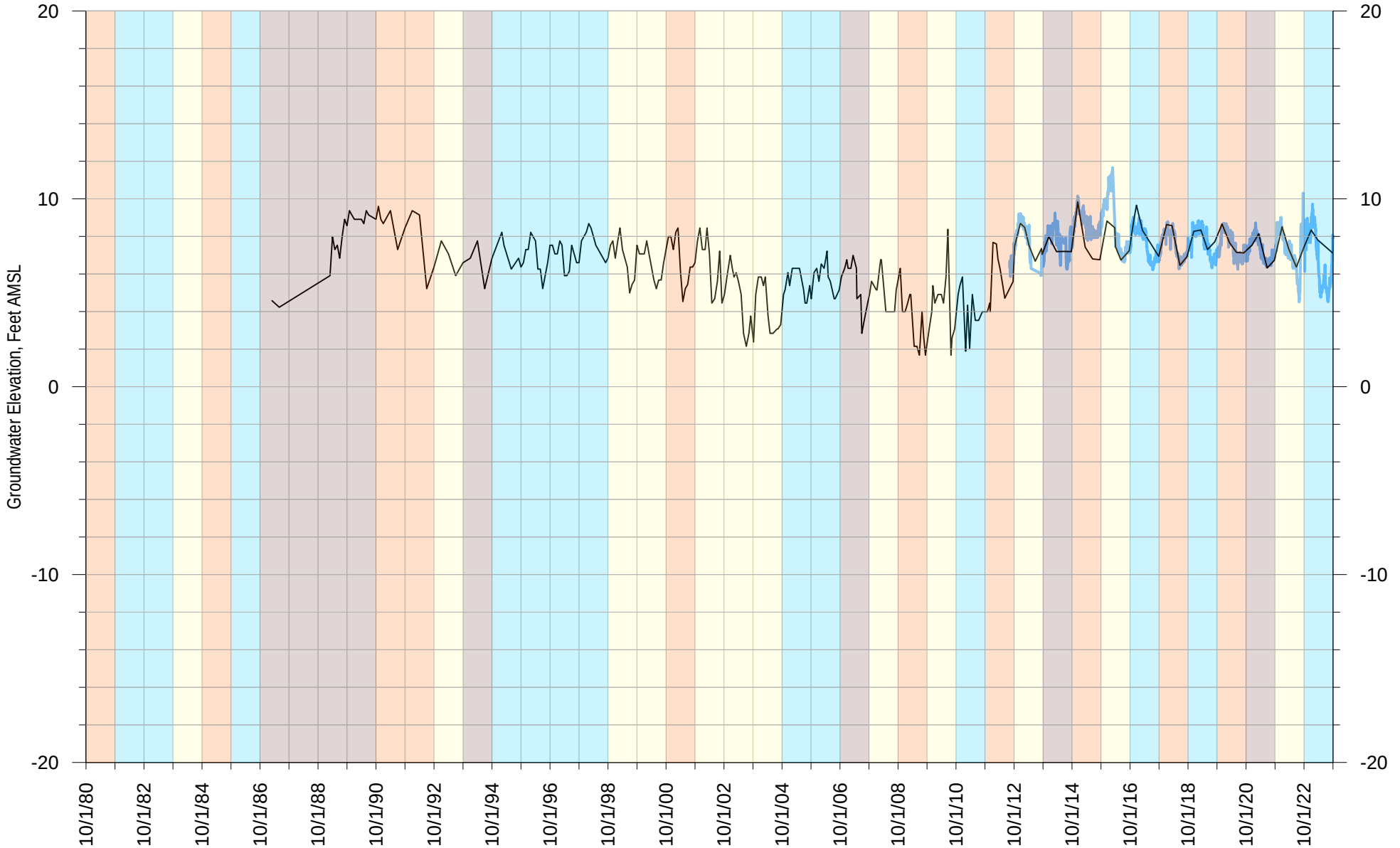
FIGURE A-70

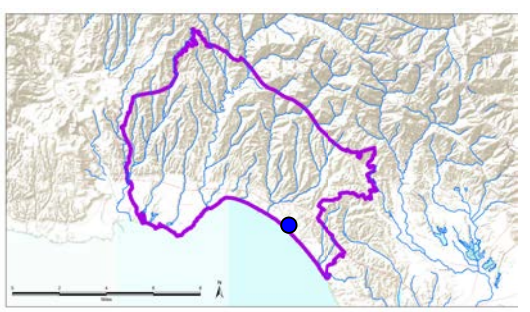


MONTGOMERY & ASSOCIATES

SC-A1A at Cliff Drive
Aquifer Screened: Purisima DEF

Appendix A
FIGURE A-71



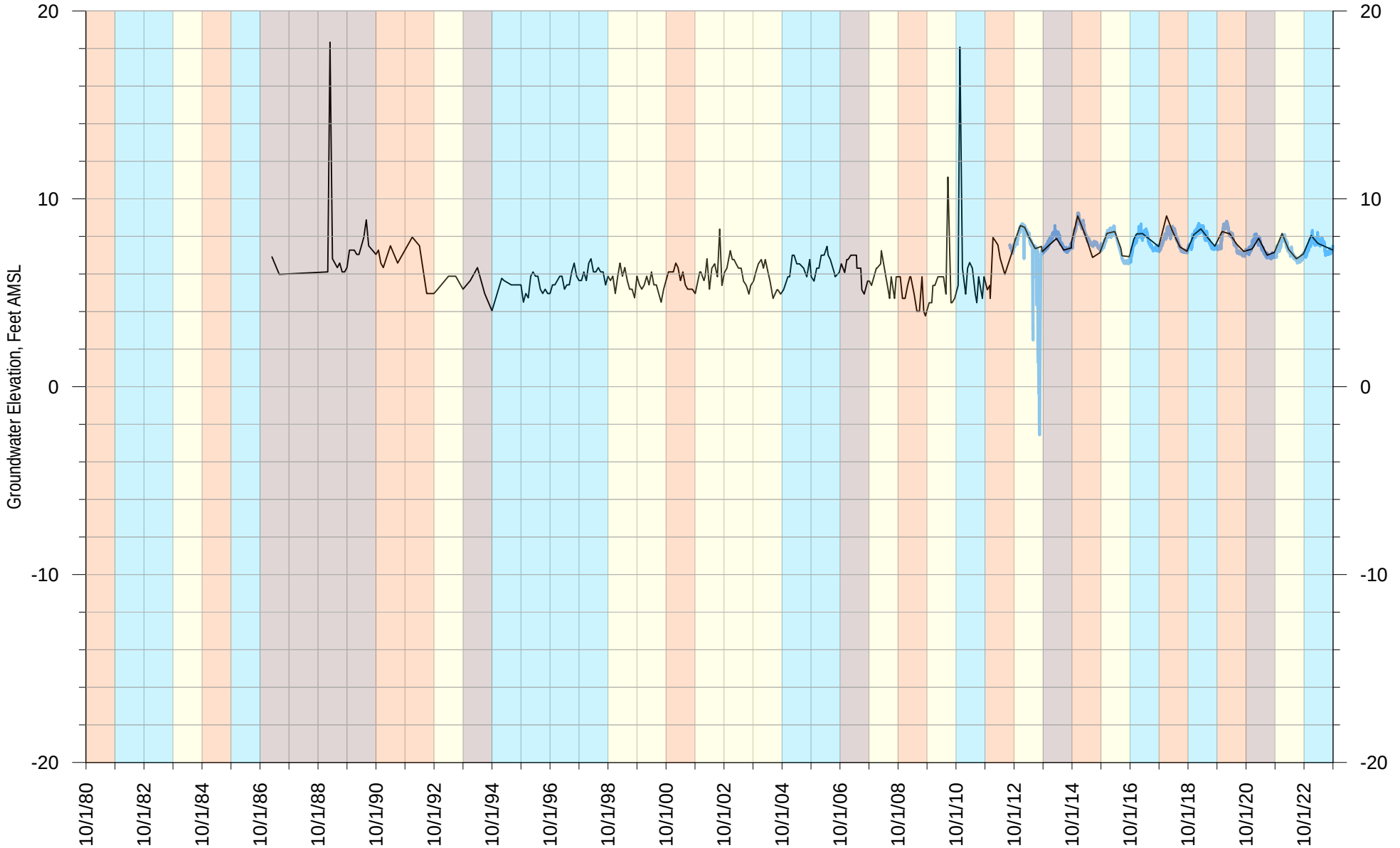


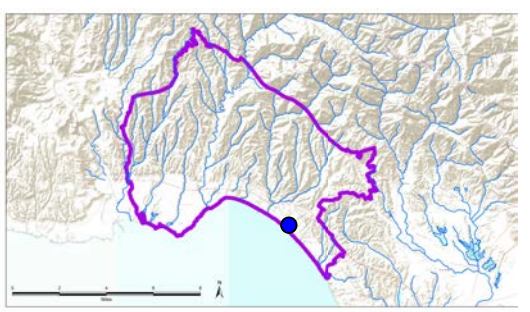
MONTGOMERY & ASSOCIATES

SC-A1C at Cliff Drive
Aquifer Screened: Aromas

Appendix A

FIGURE A-72



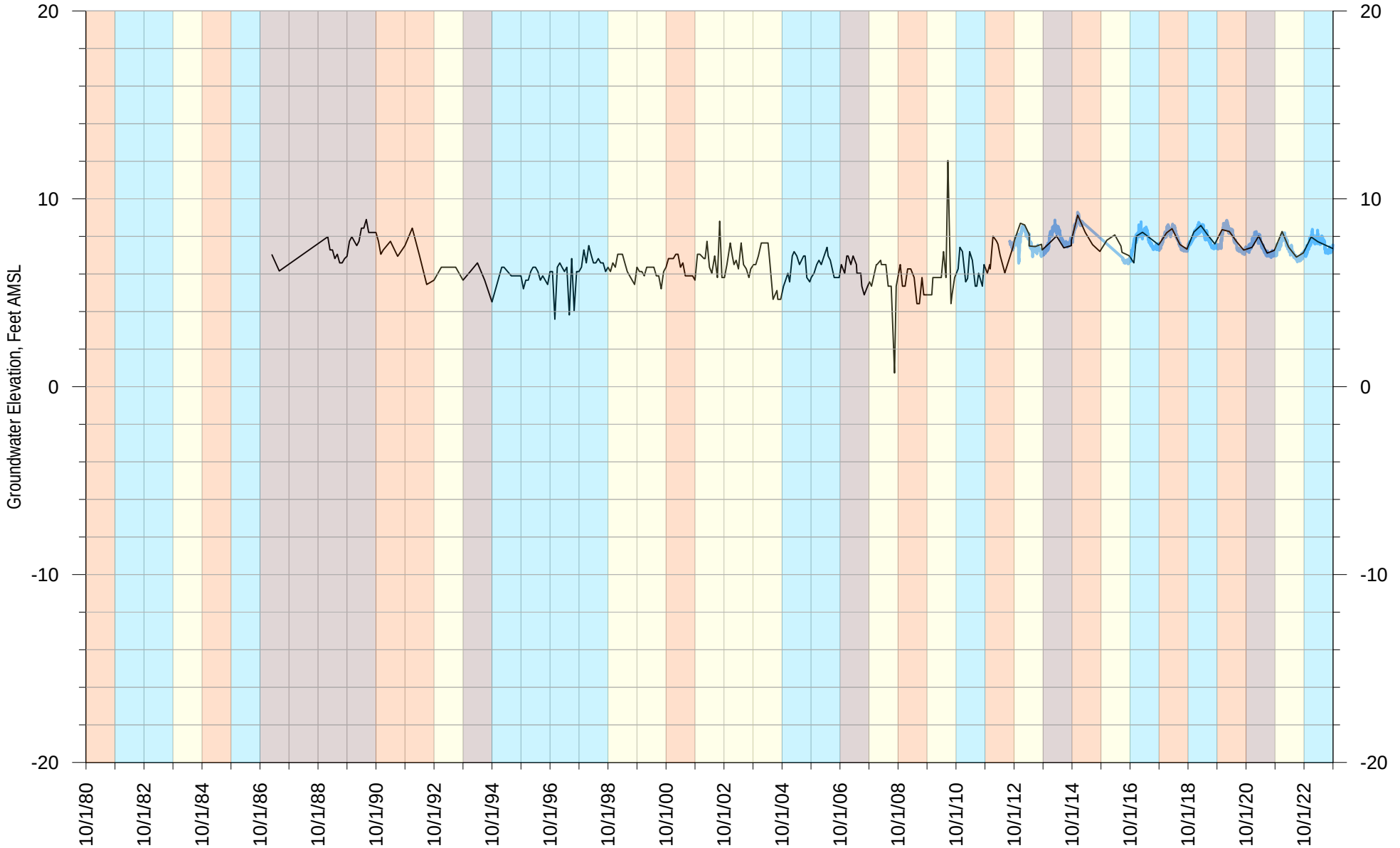


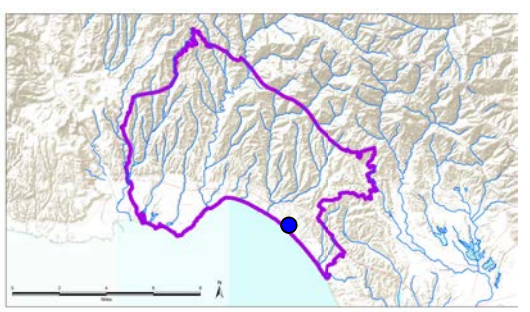
MONTGOMERY & ASSOCIATES

SC-A1D at Cliff Drive
Aquifer Screened: Aromas

Appendix A

FIGURE A-73

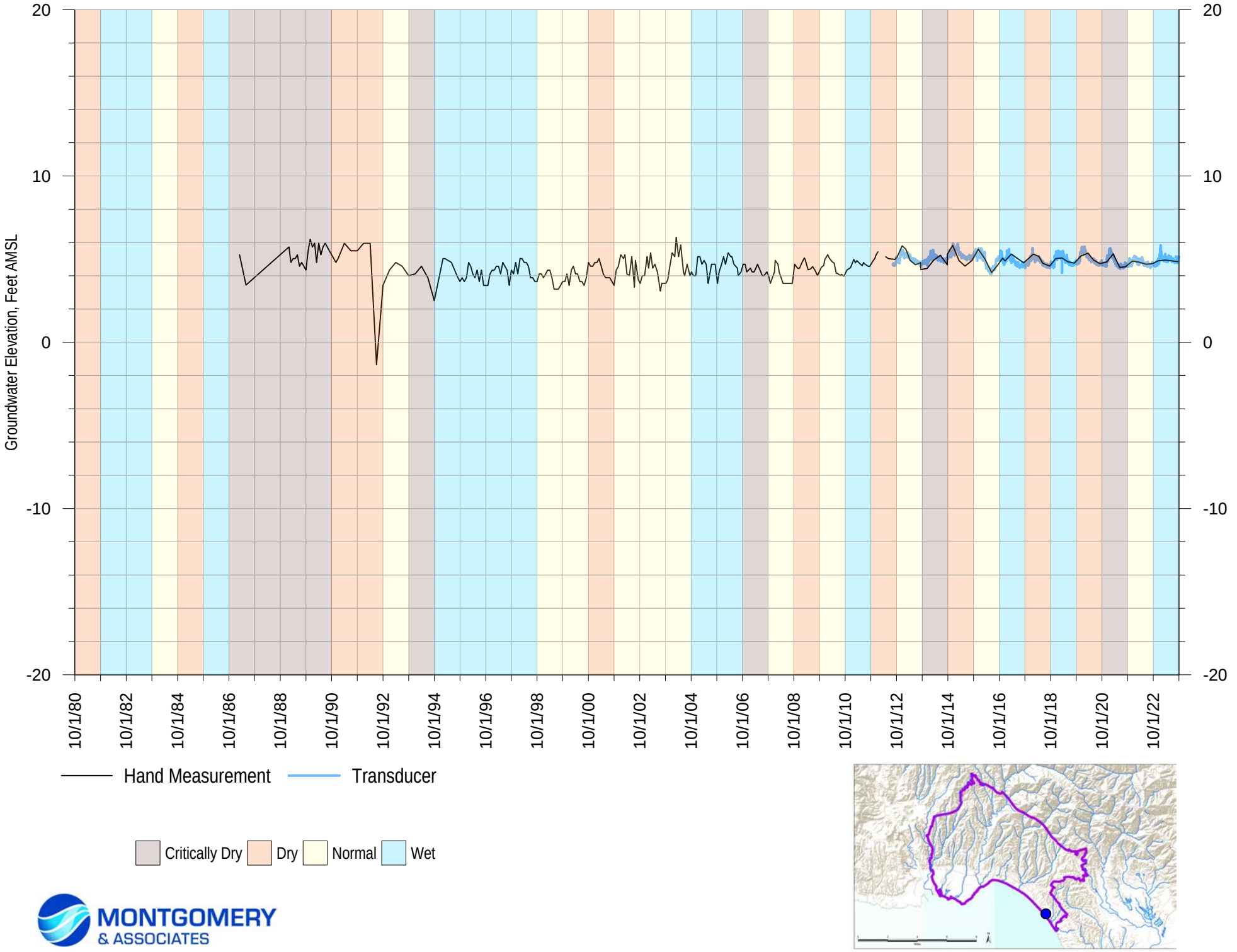




MONTGOMERY & ASSOCIATES

SC-A2C & SC-A2RC at Sumner
Aquifer Screened: Aromas

Appendix A
FIGURE A-74

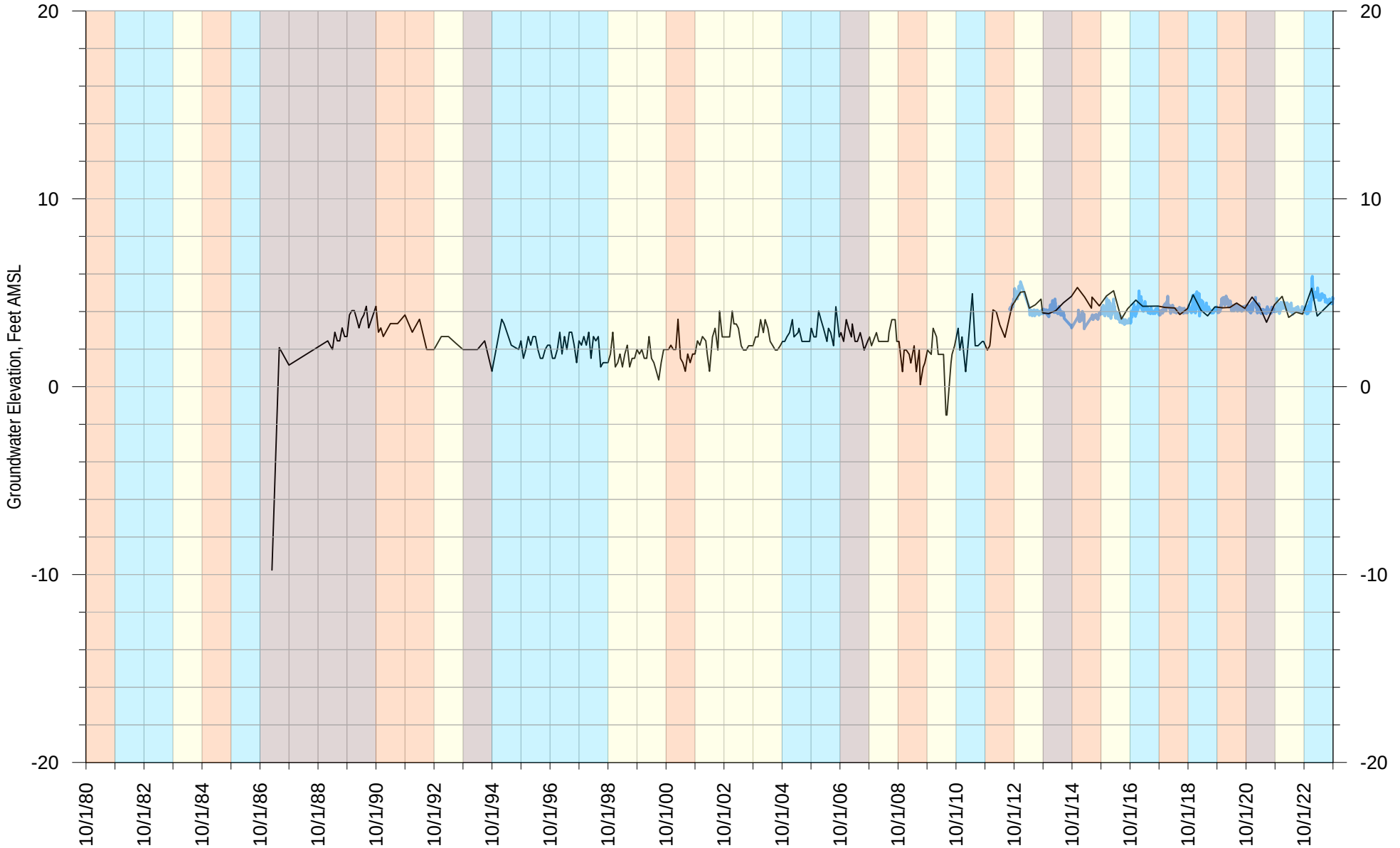


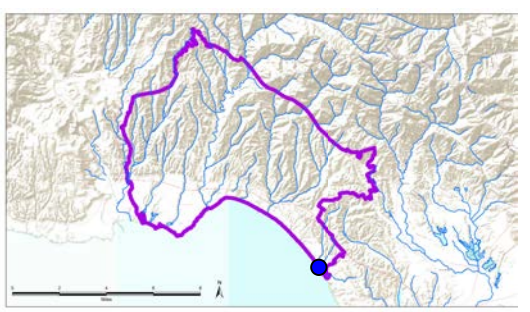
MONTGOMERY & ASSOCIATES

SC-A3B at Playa Vista
Aquifer Screened: Aromas

Appendix A

FIGURE A-75



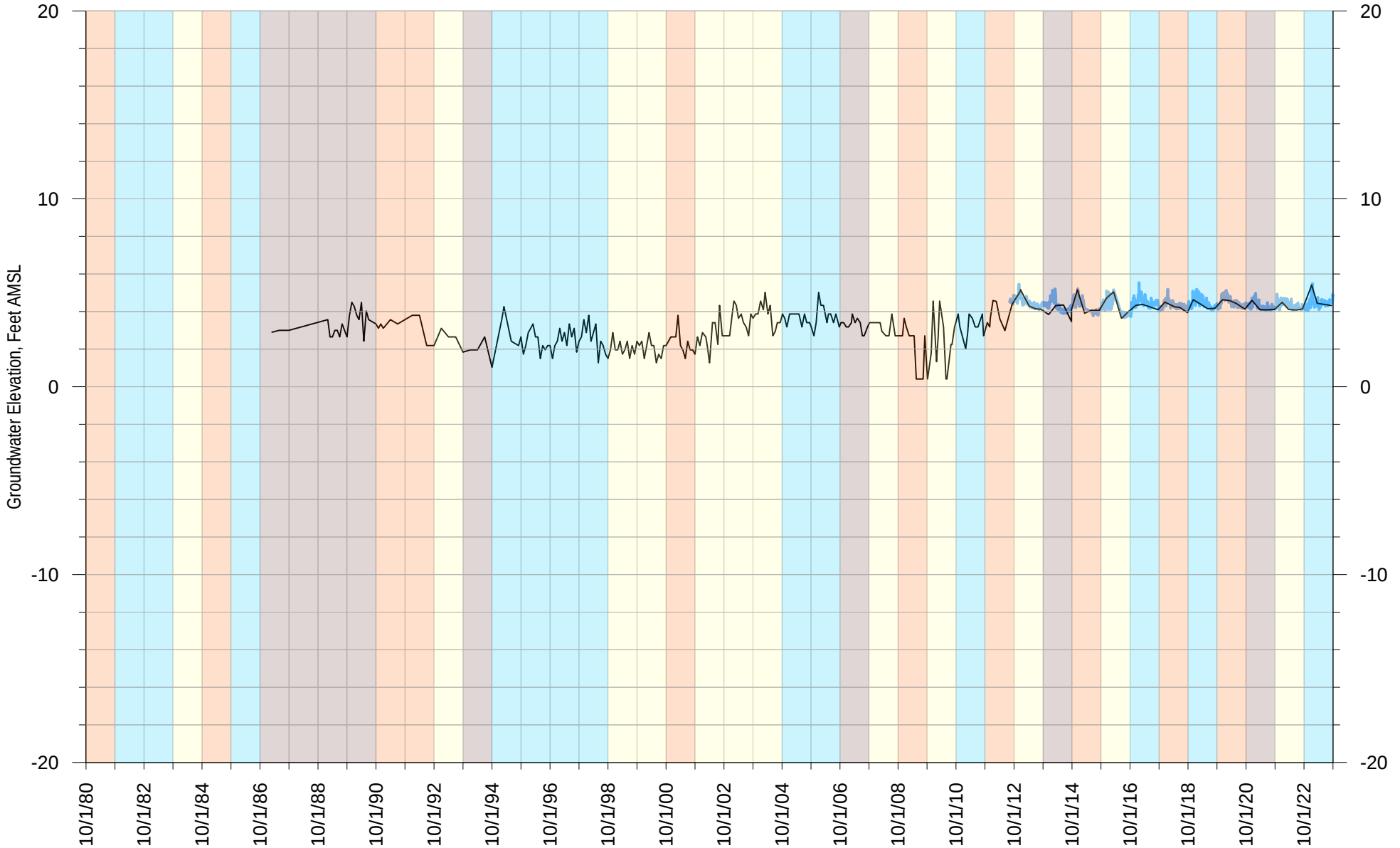


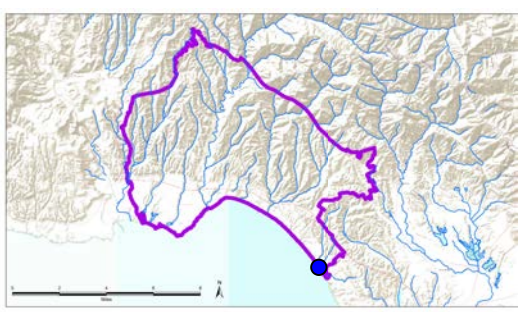
MONTGOMERY & ASSOCIATES

SC-A3C at Playa Vista
Aquifer Screened: Aromas

Appendix A

FIGURE A-76





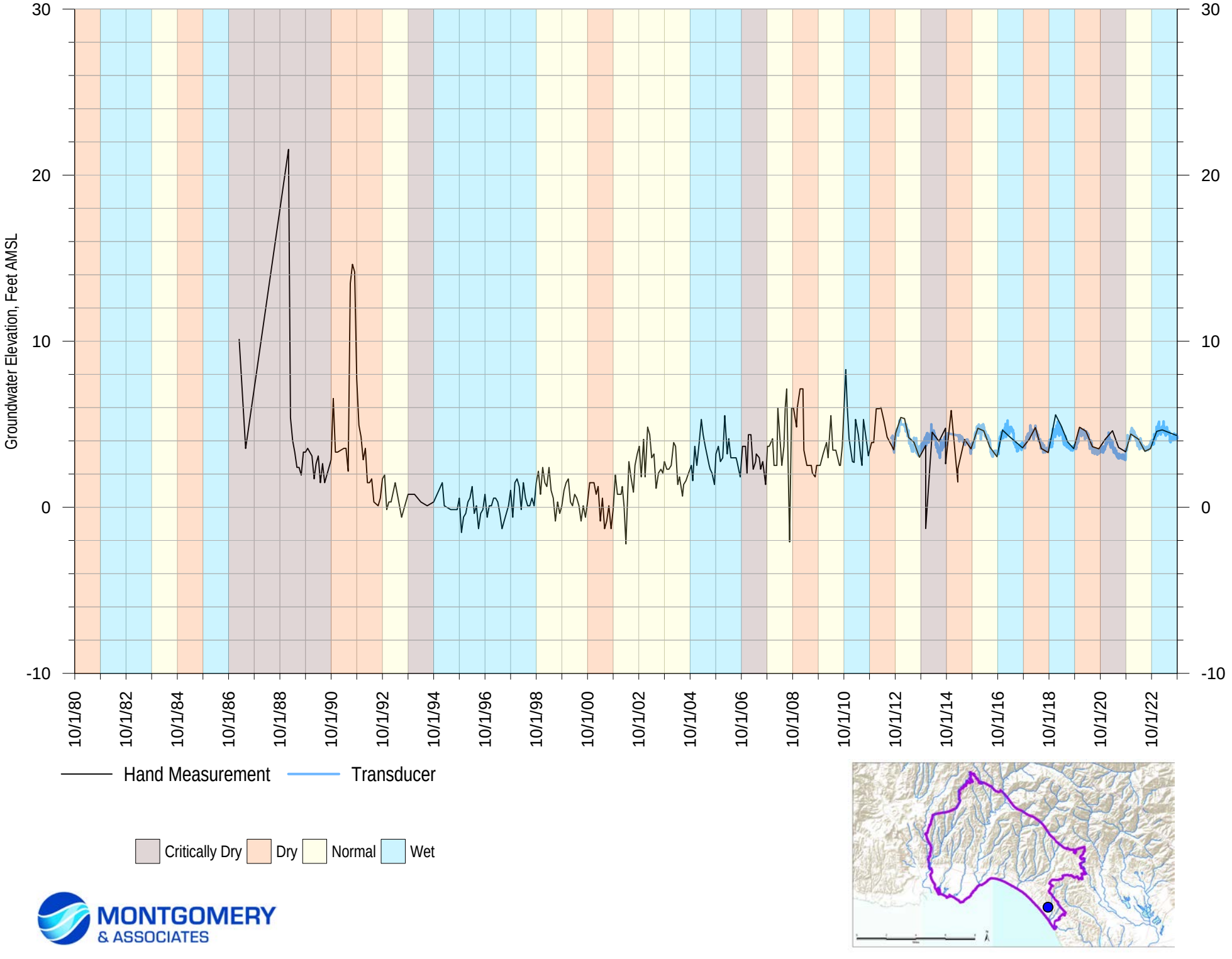
MONTGOMERY & ASSOCIATES

SC-A5A at Seascape

Aquifer Screened: Purisima F

Appendix A

FIGURE A-77



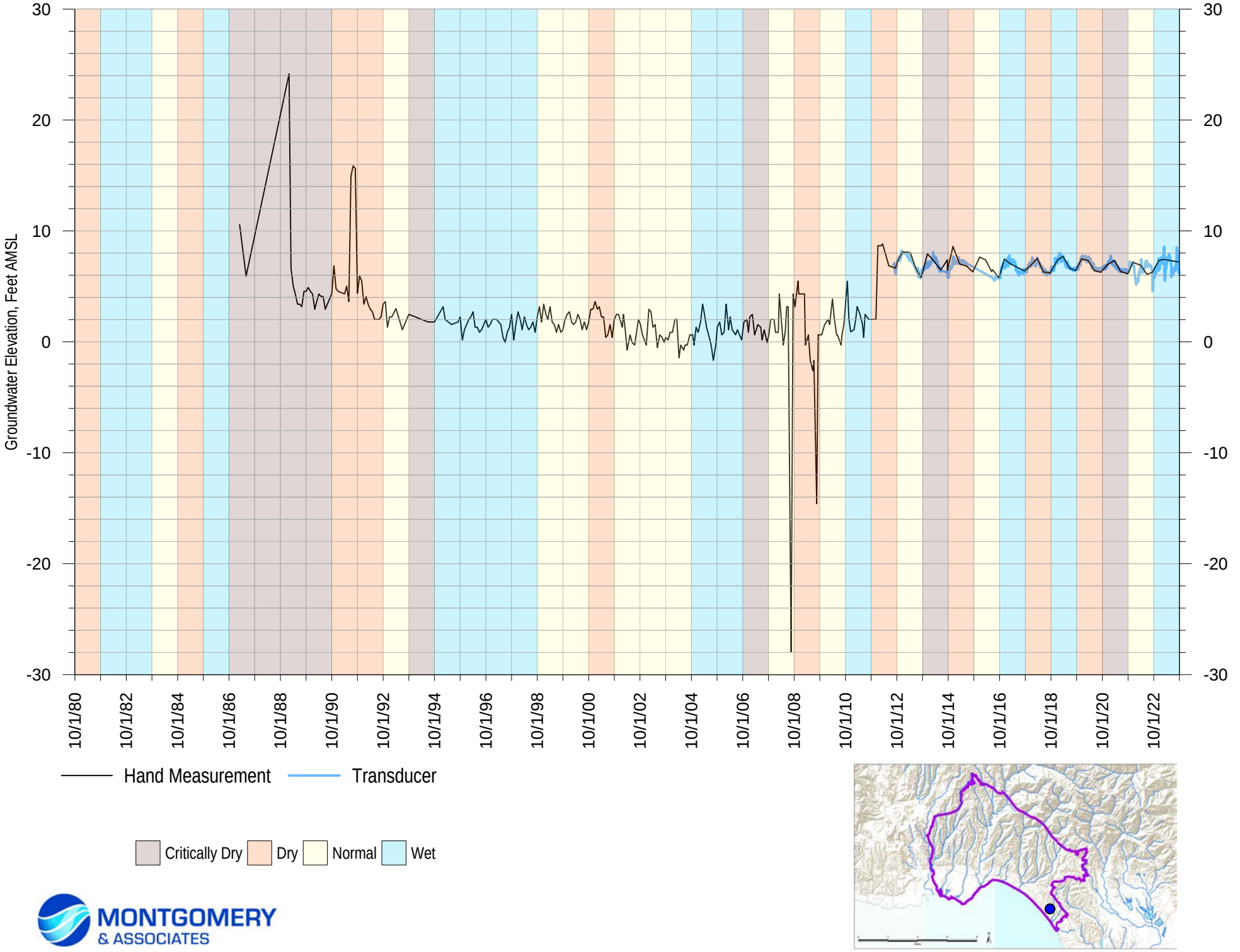
MONTGOMERY & ASSOCIATES

SC-A5B at Seascape

Aquifer Screened: Purisima F

Appendix A

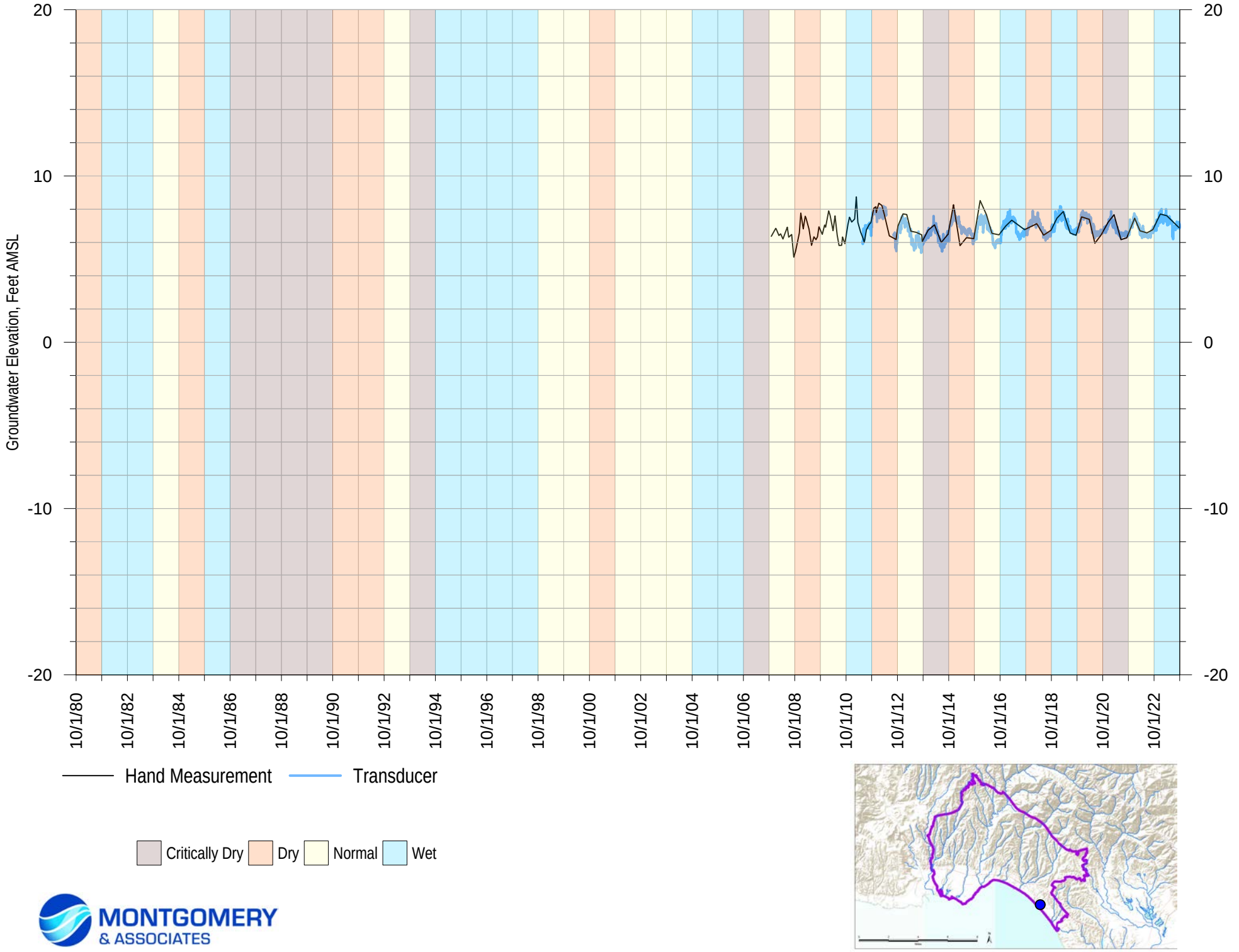
FIGURE A-78



MONTGOMERY & ASSOCIATES

SC-A8B at Dolphin
Aquifer Screened: Aromas

Appendix A
FIGURE A-79

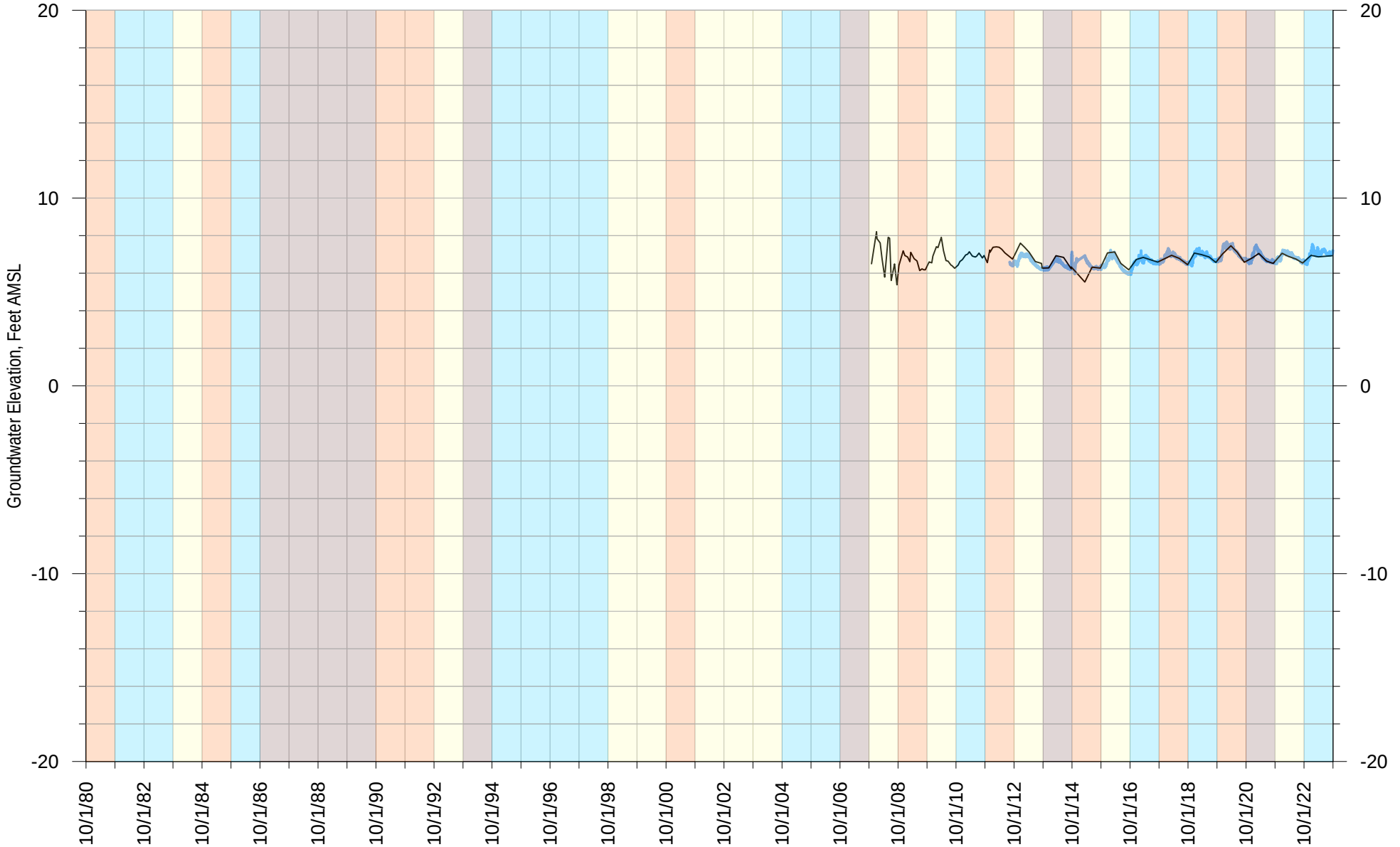


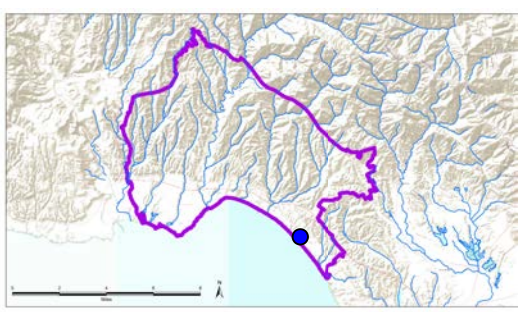
MONTGOMERY & ASSOCIATES

SC-A8C at Dolphin
Aquifer Screened: Aromas

Appendix A

FIGURE A-80





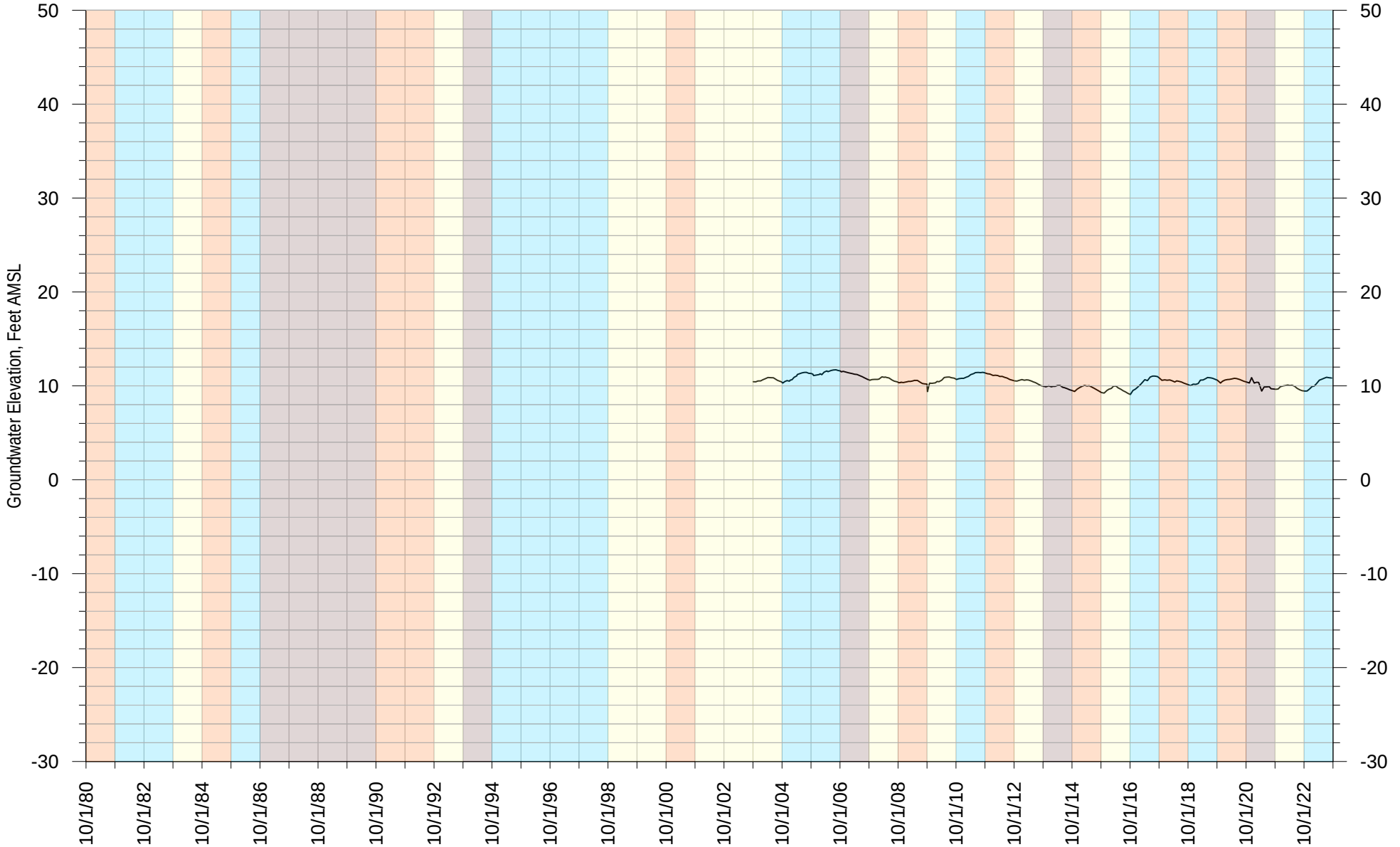
MONTGOMERY & ASSOCIATES

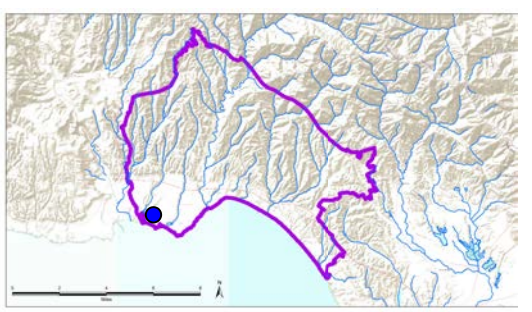
Schwan

Aquifer Screened: Purisima AA

Appendix A

FIGURE A-81





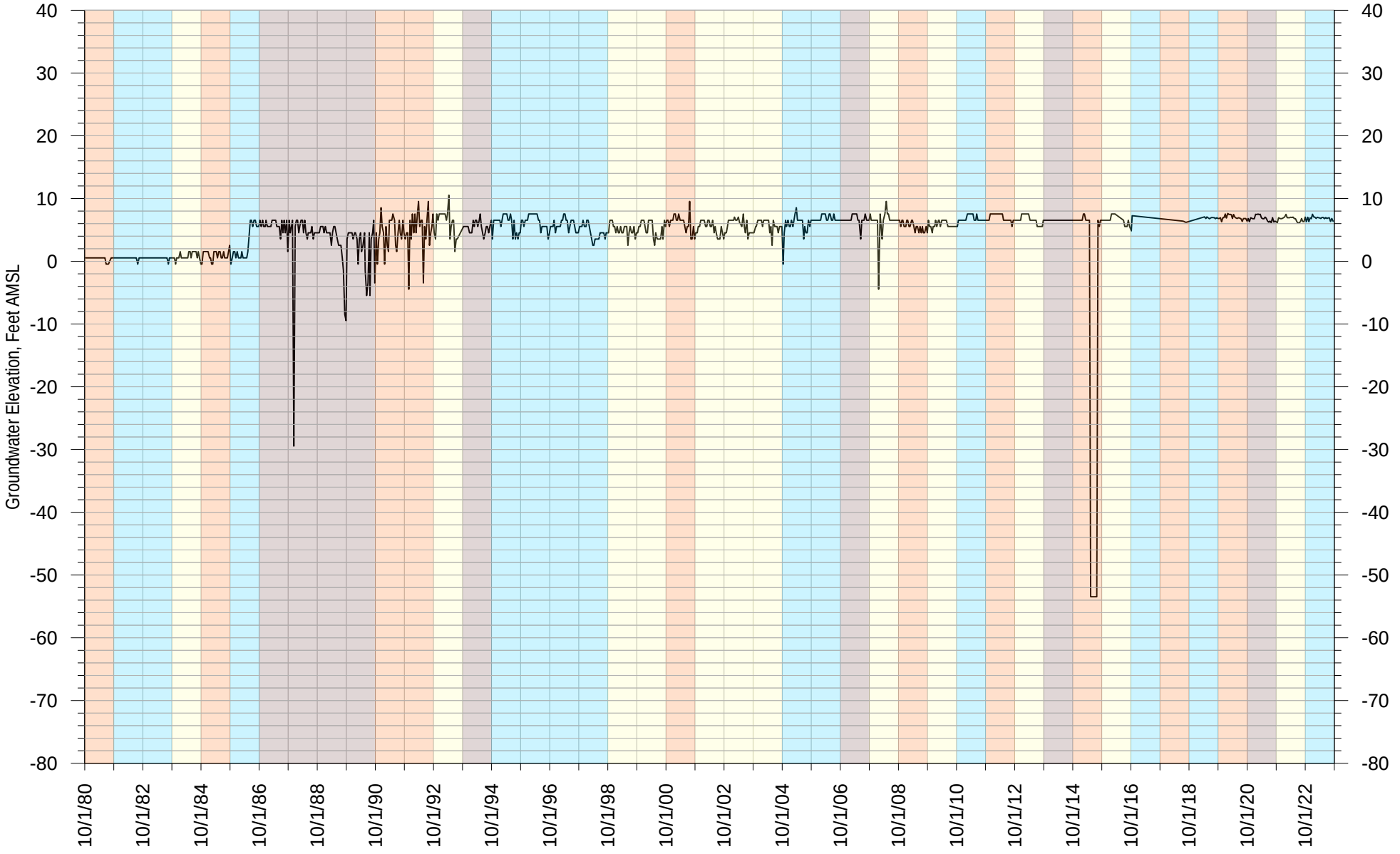
MONTGOMERY & ASSOCIATES

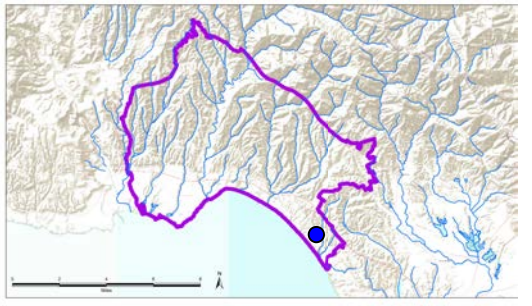
Seascape PW

Aquifer Screened: Aromas/ Purisima F

Appendix A

FIGURE A-82





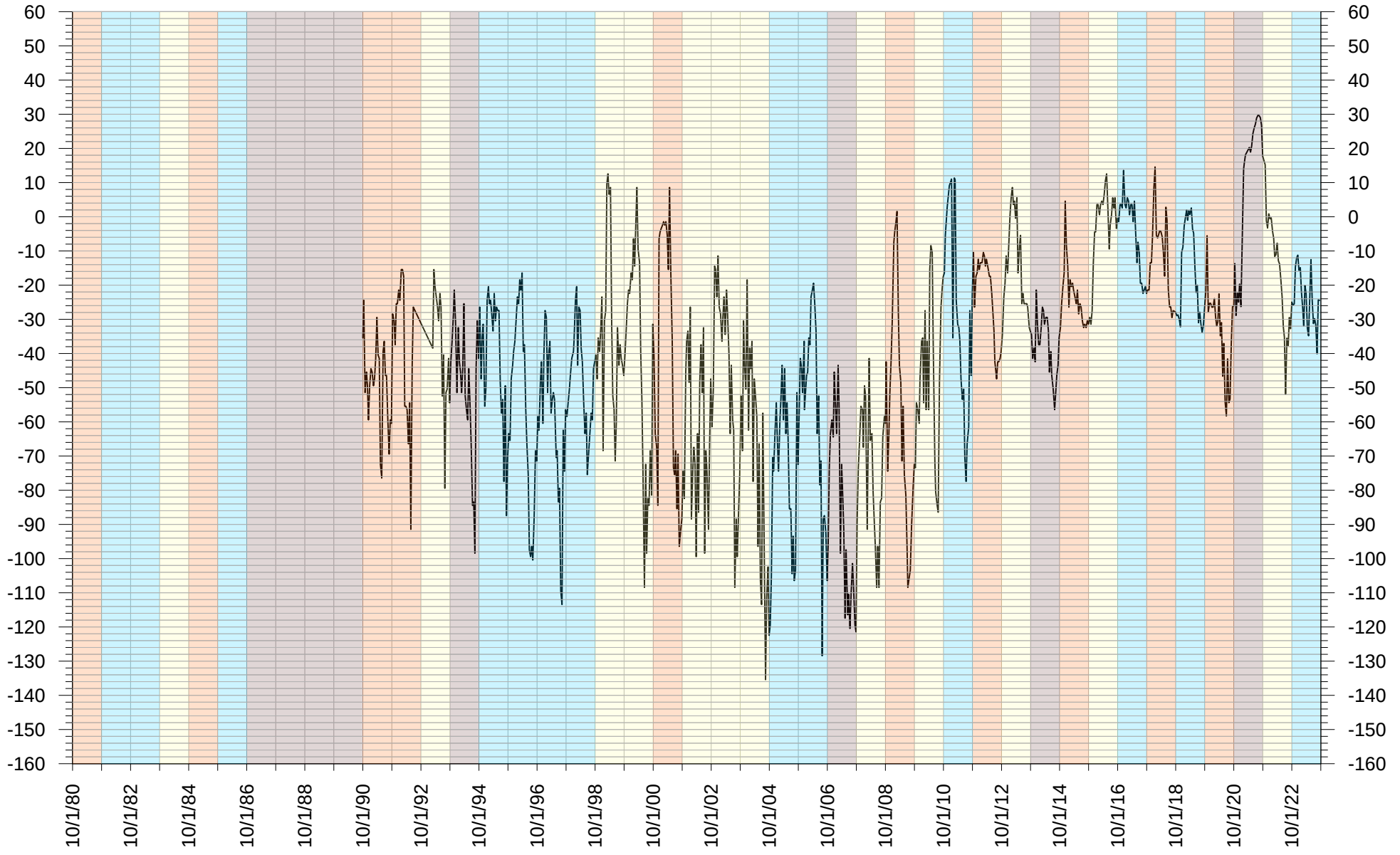
MONTGOMERY & ASSOCIATES

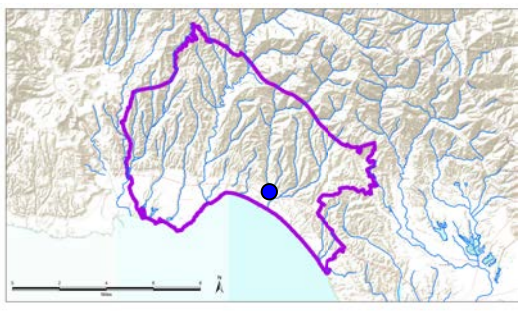
T.Hopkins PW

Aquifer Screened: Purisima DEF

Appendix A

FIGURE A-83

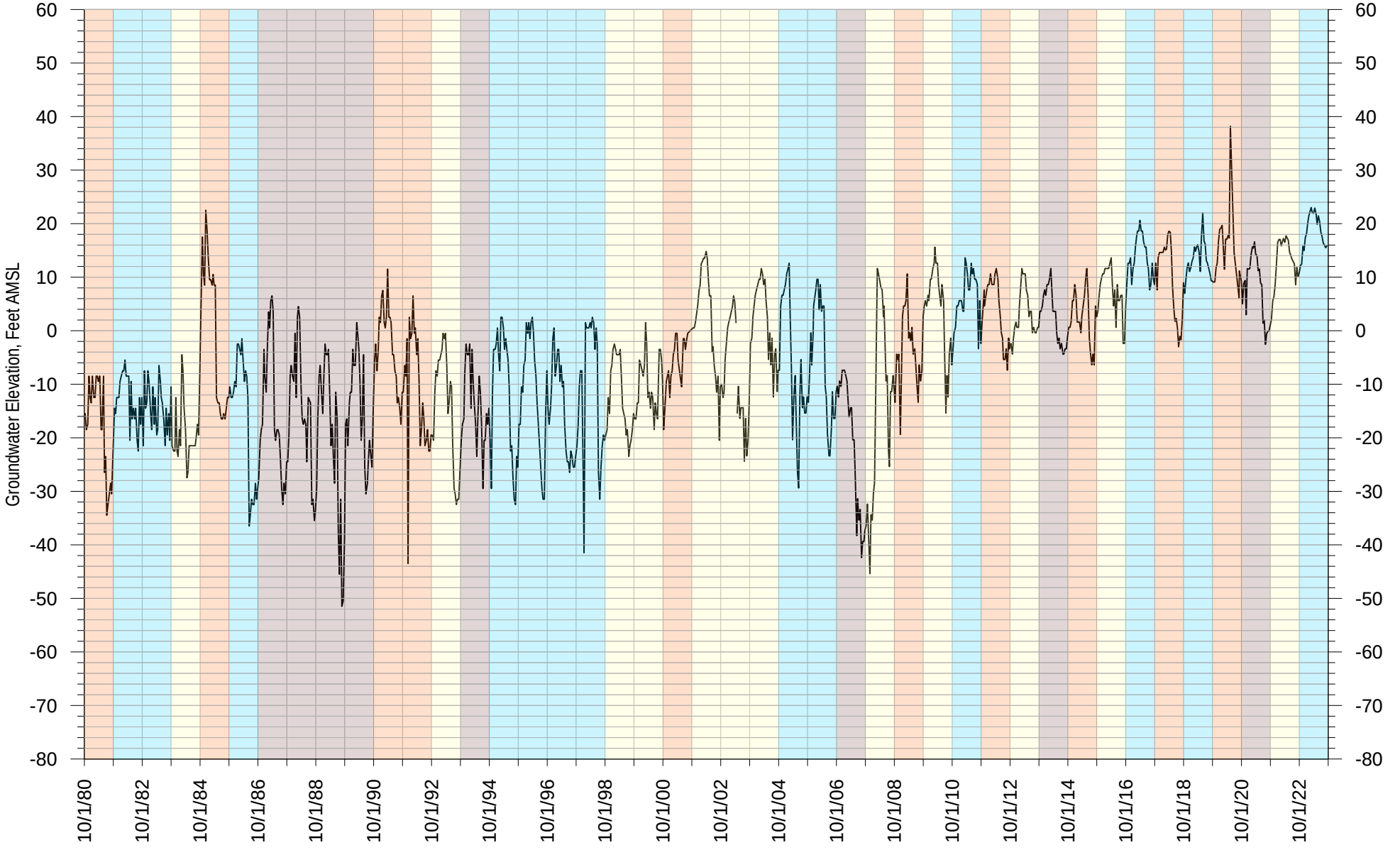


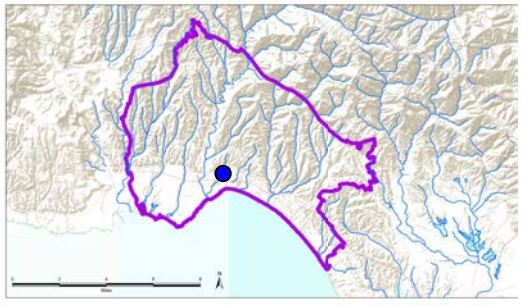


MONTGOMERY & ASSOCIATES

Tannery & Tannery 2 PW
Aquifer Screened: Purisima A

Appendix A
FIGURE A-84

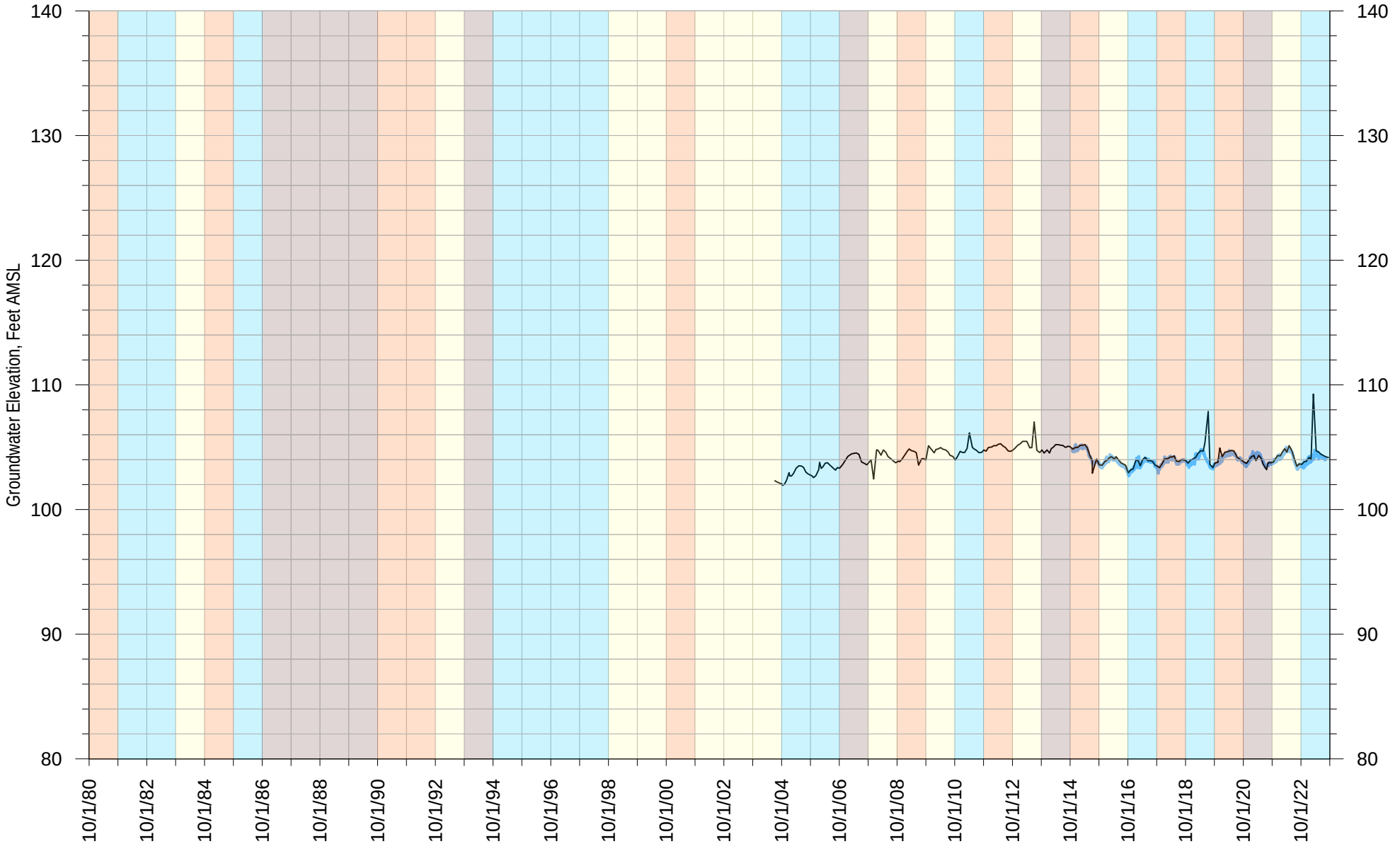


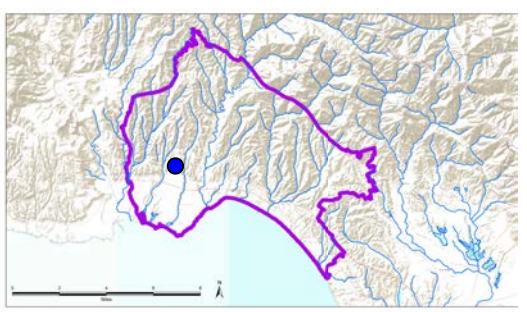


MONTGOMERY & ASSOCIATES

Thurber Shallow
Aquifer Screened: Purisima AA

Appendix A
FIGURE A-85

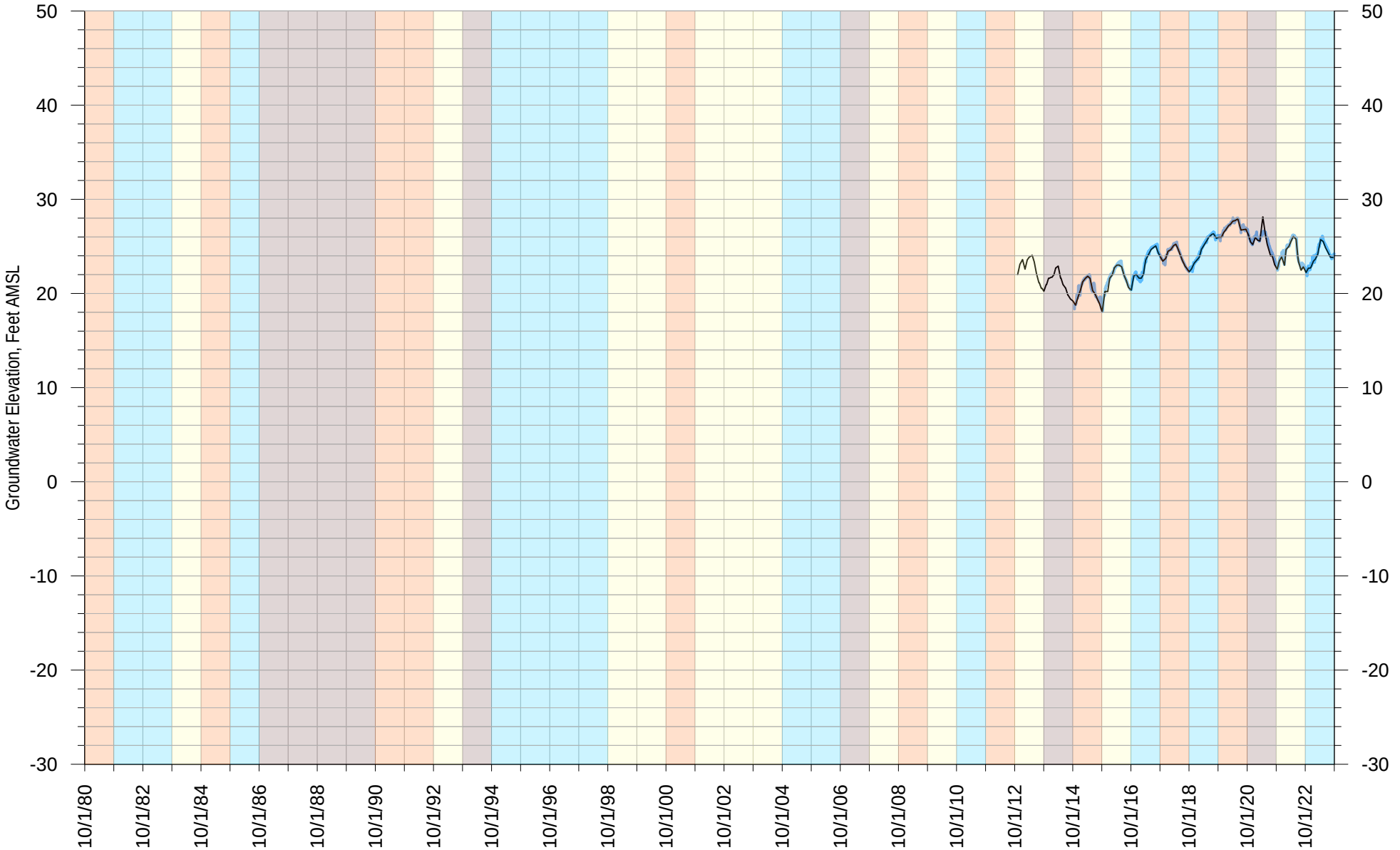


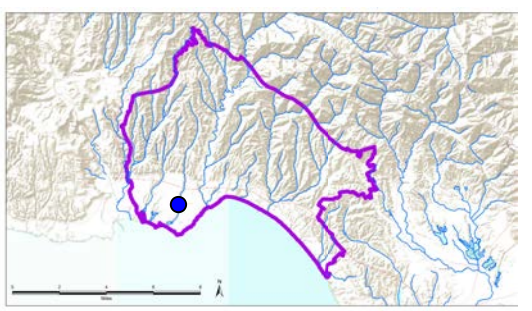


MONTGOMERY & ASSOCIATES

30th Ave Medium
Aquifer Screened: Purisima AA

Appendix A
FIGURE A-86

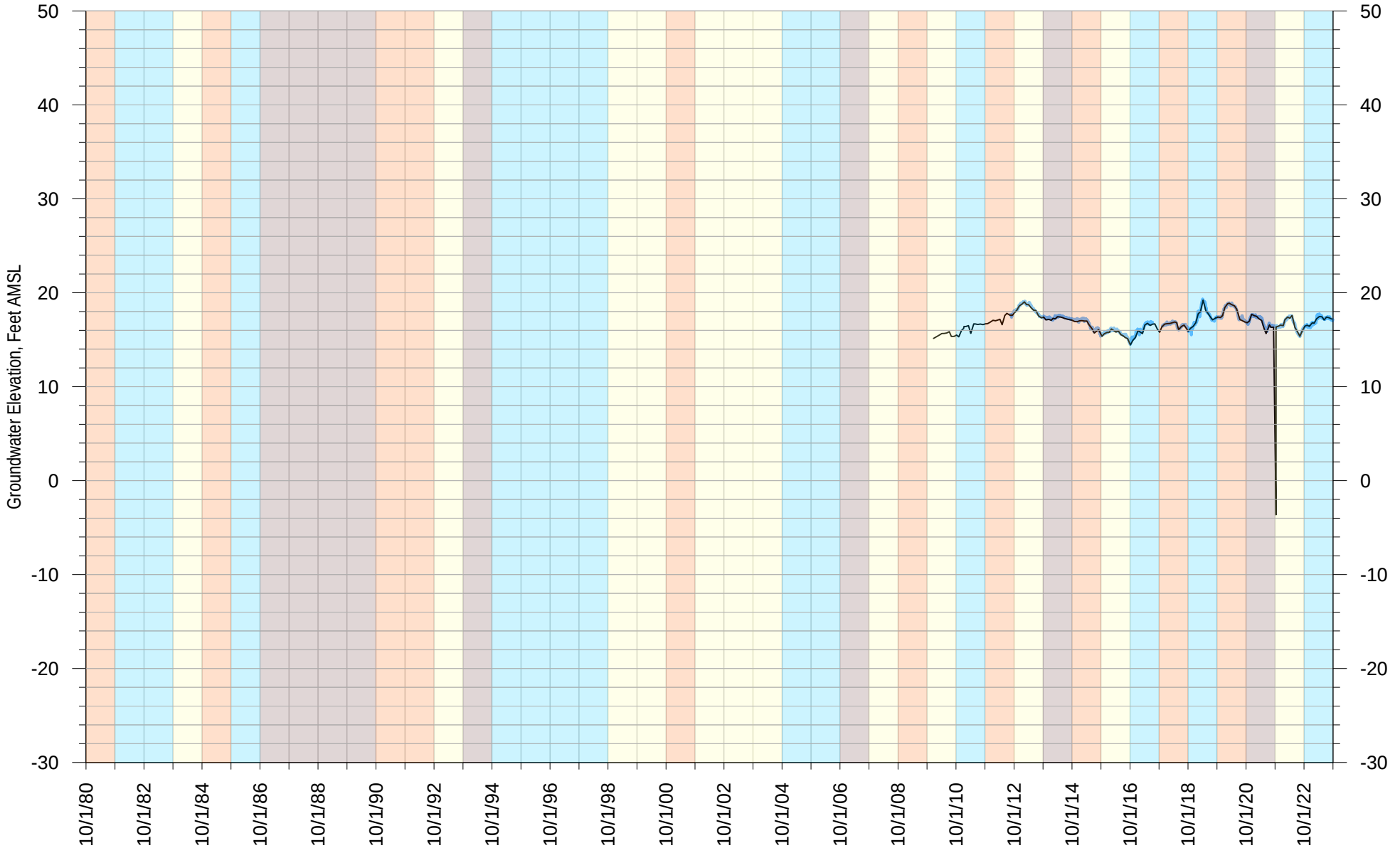


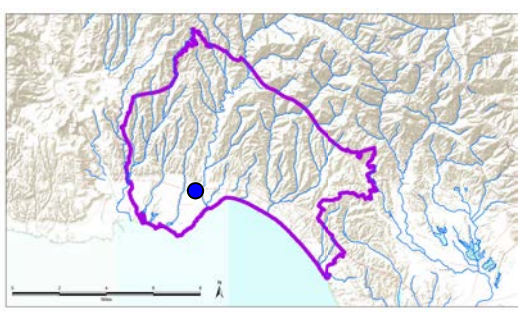


MONTGOMERY & ASSOCIATES

Auto Plaza Deep
Aquifer Screened: Purisima AA

Appendix A
FIGURE A-87

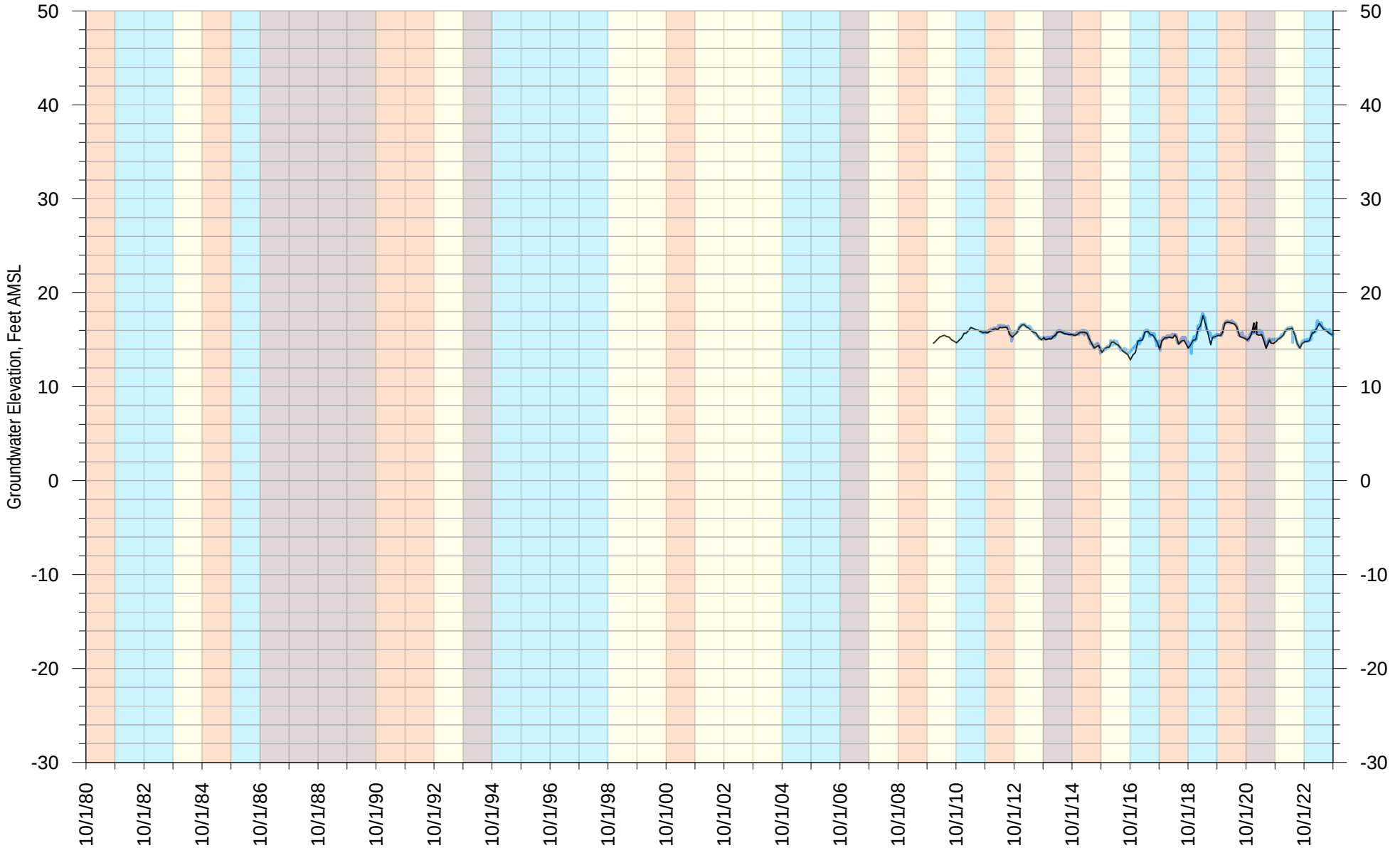


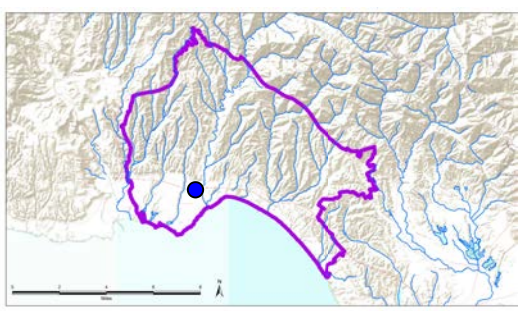


MONTGOMERY & ASSOCIATES

Auto Plaza Medium
Aquifer Screened: Purisima A

Appendix A
FIGURE A-88

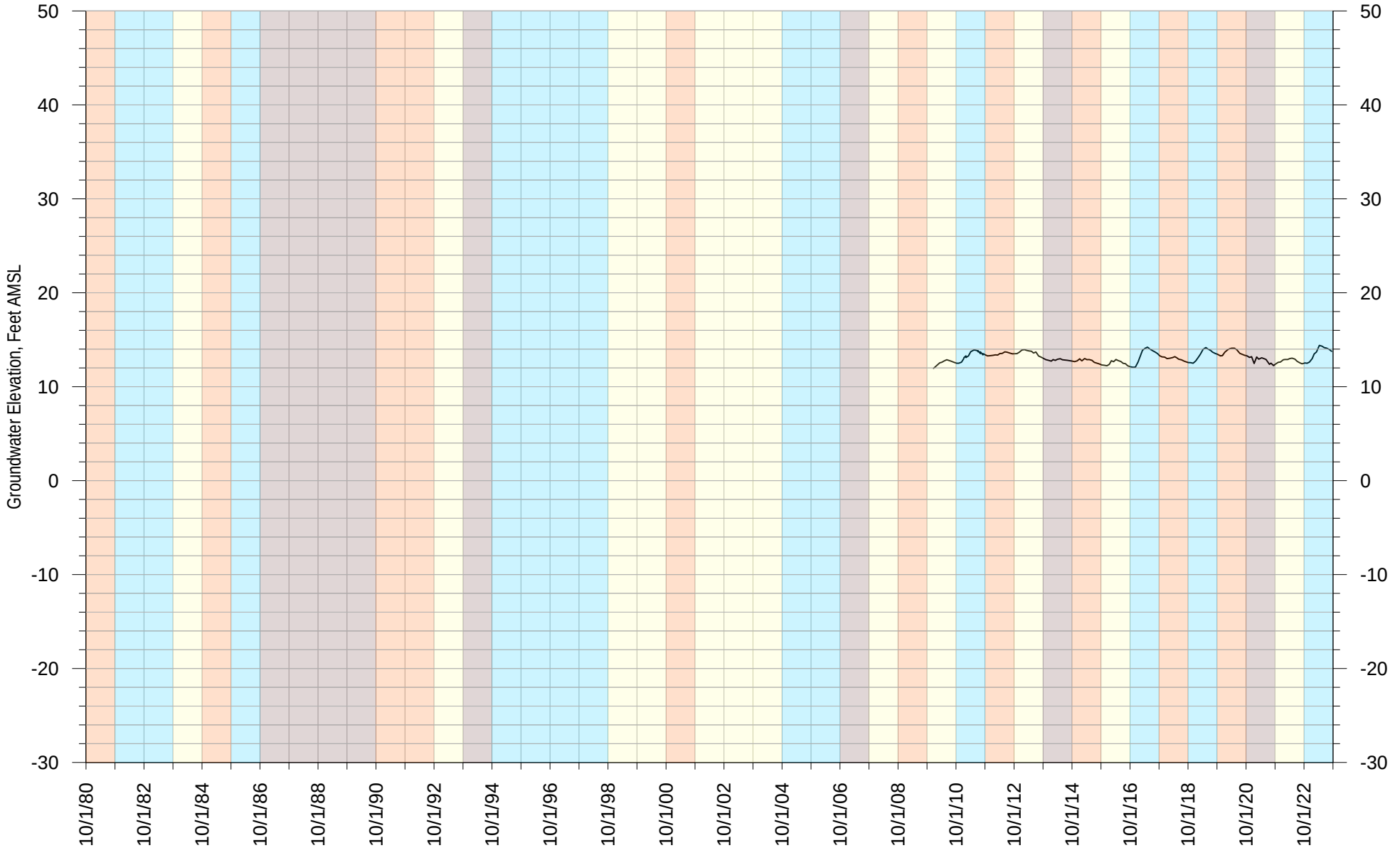


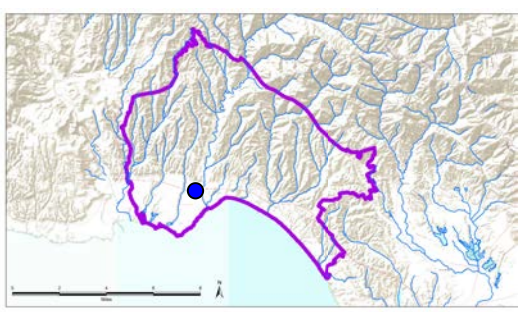


MONTGOMERY & ASSOCIATES

Auto Plaza Shallow
Aquifer Screened: Purisima A

Appendix A
FIGURE A-89





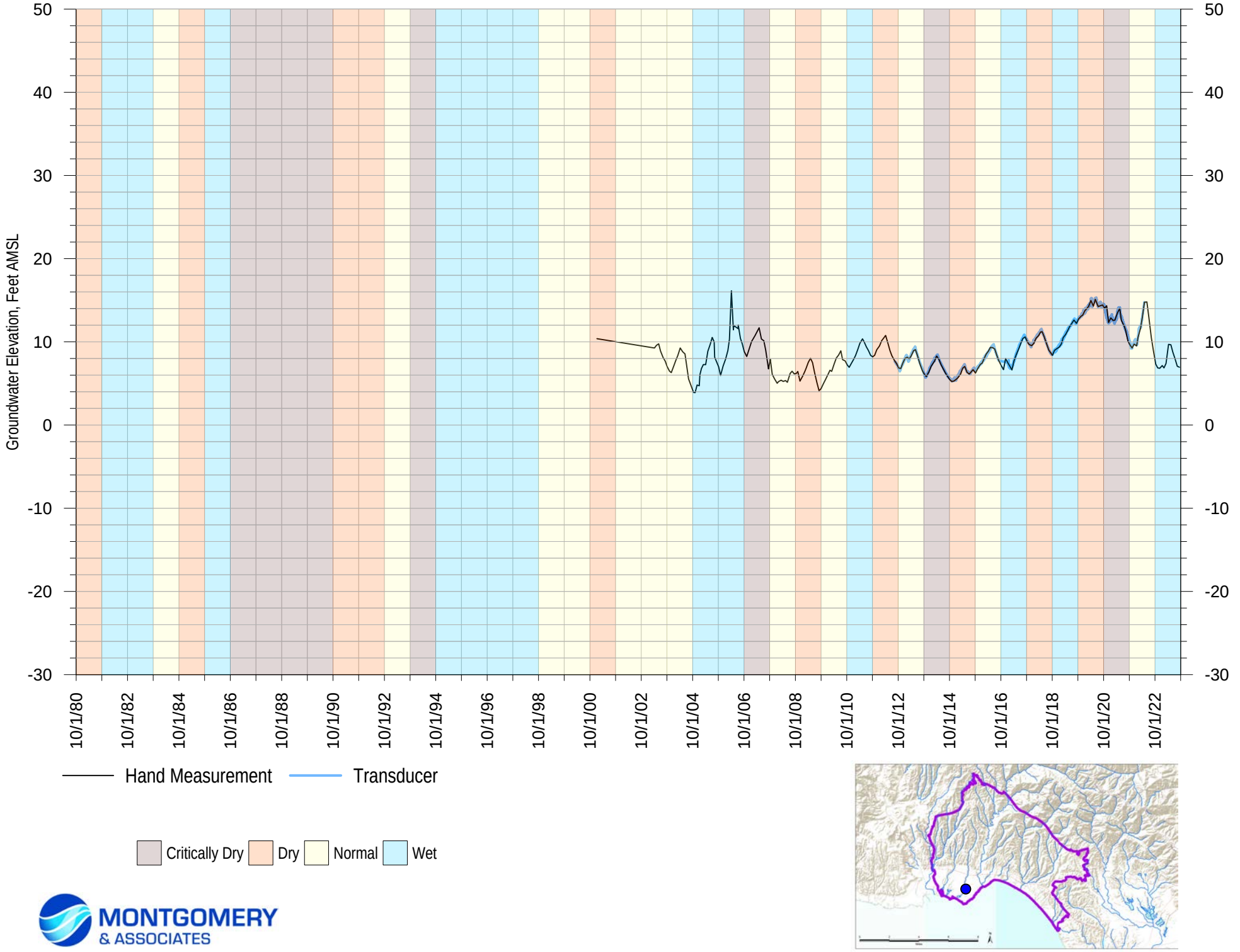
MONTGOMERY & ASSOCIATES

Beltz 4 Deep

Aquifer Screened: Purisima A

Appendix A

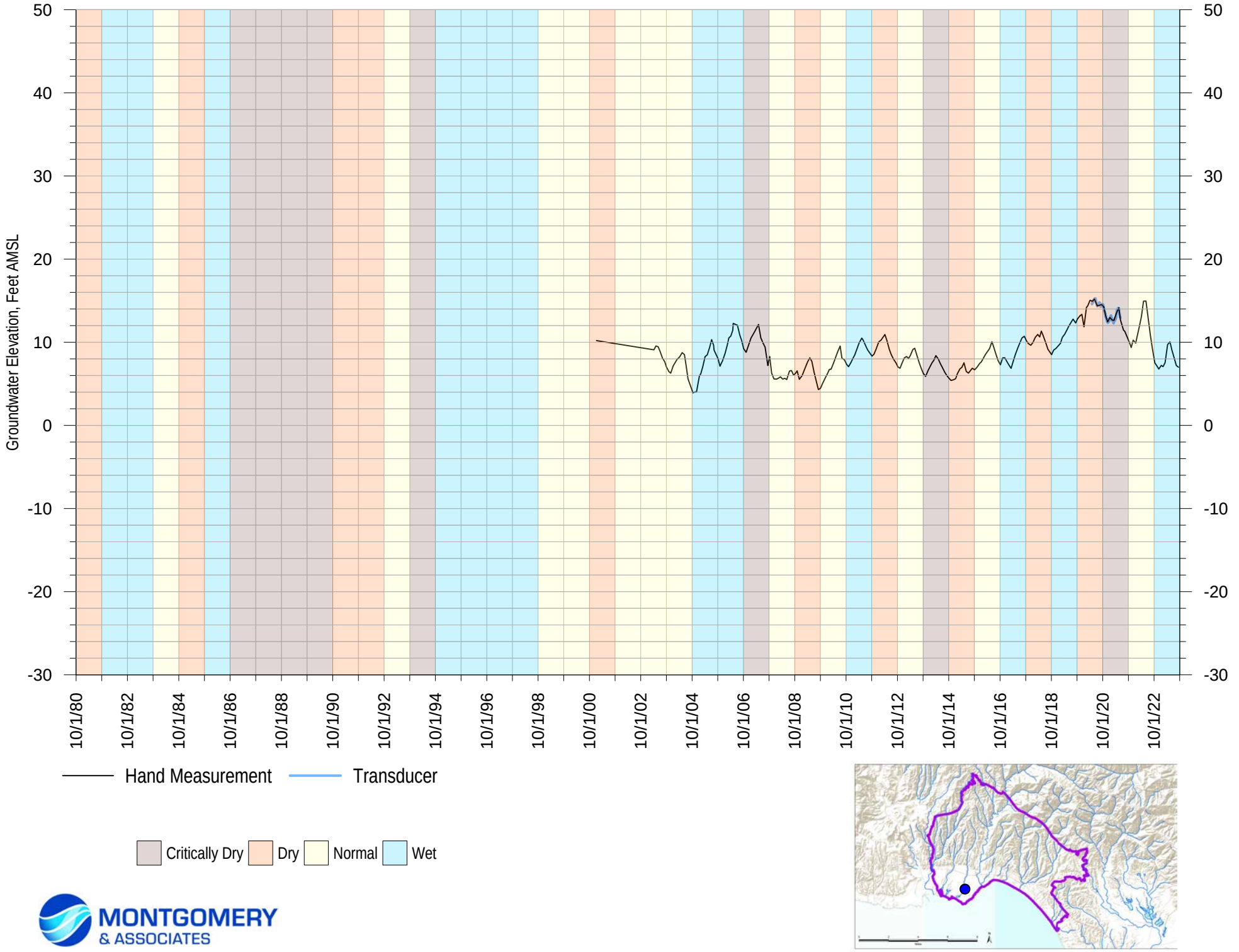
FIGURE A-90



MONTGOMERY & ASSOCIATES

Beltz 4 Shallow
Aquifer Screened: Purisima A

Appendix A
FIGURE A-91



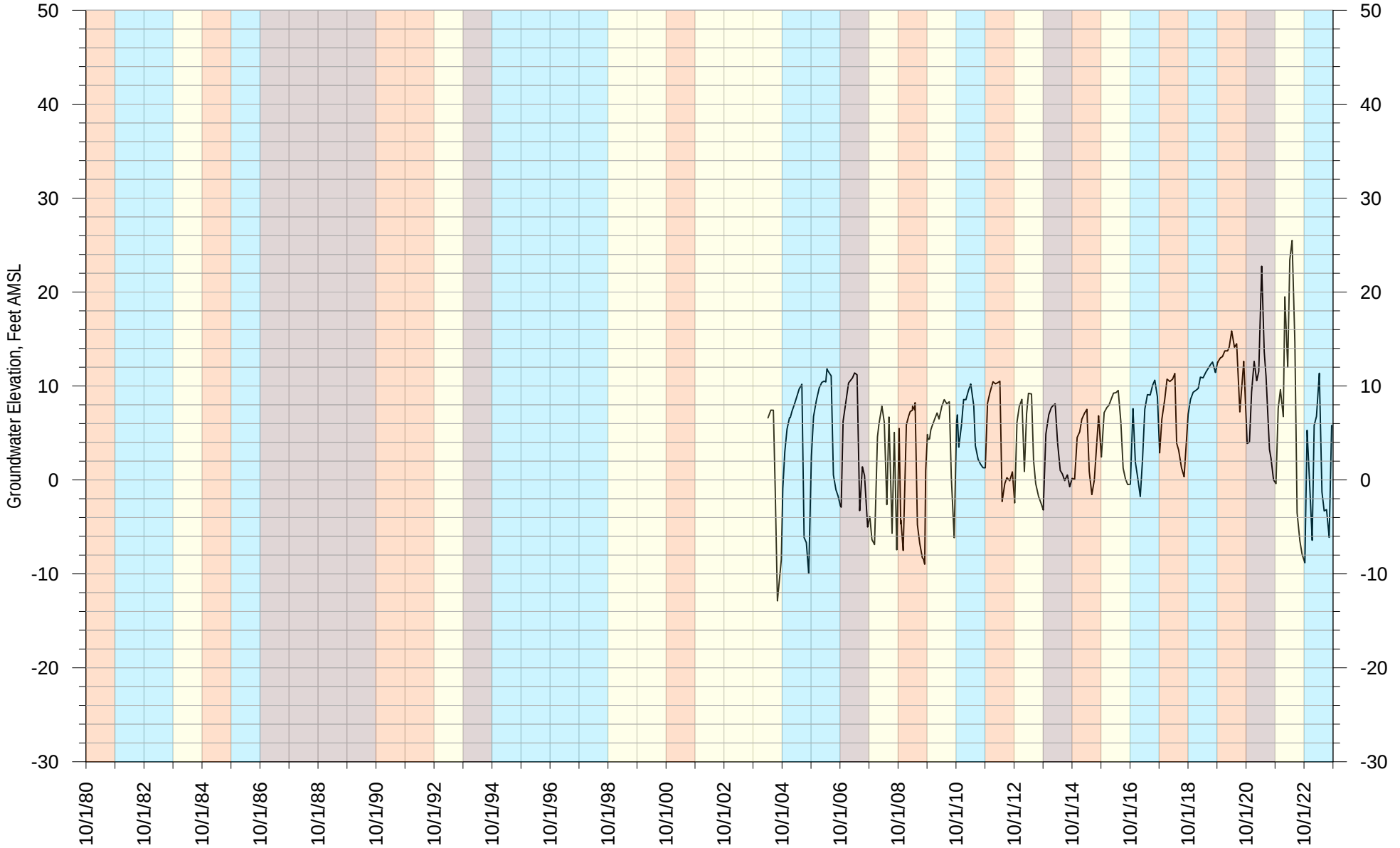
MONTGOMERY & ASSOCIATES

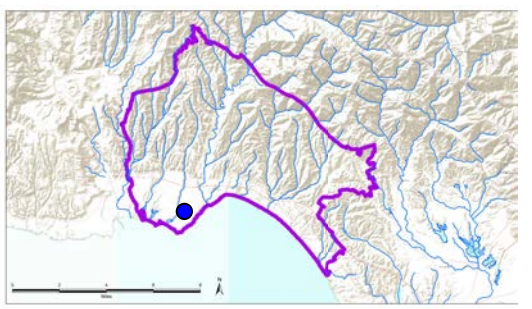
Beltz 6

Aquifer Screened: Purisima A

Appendix A

FIGURE A-92

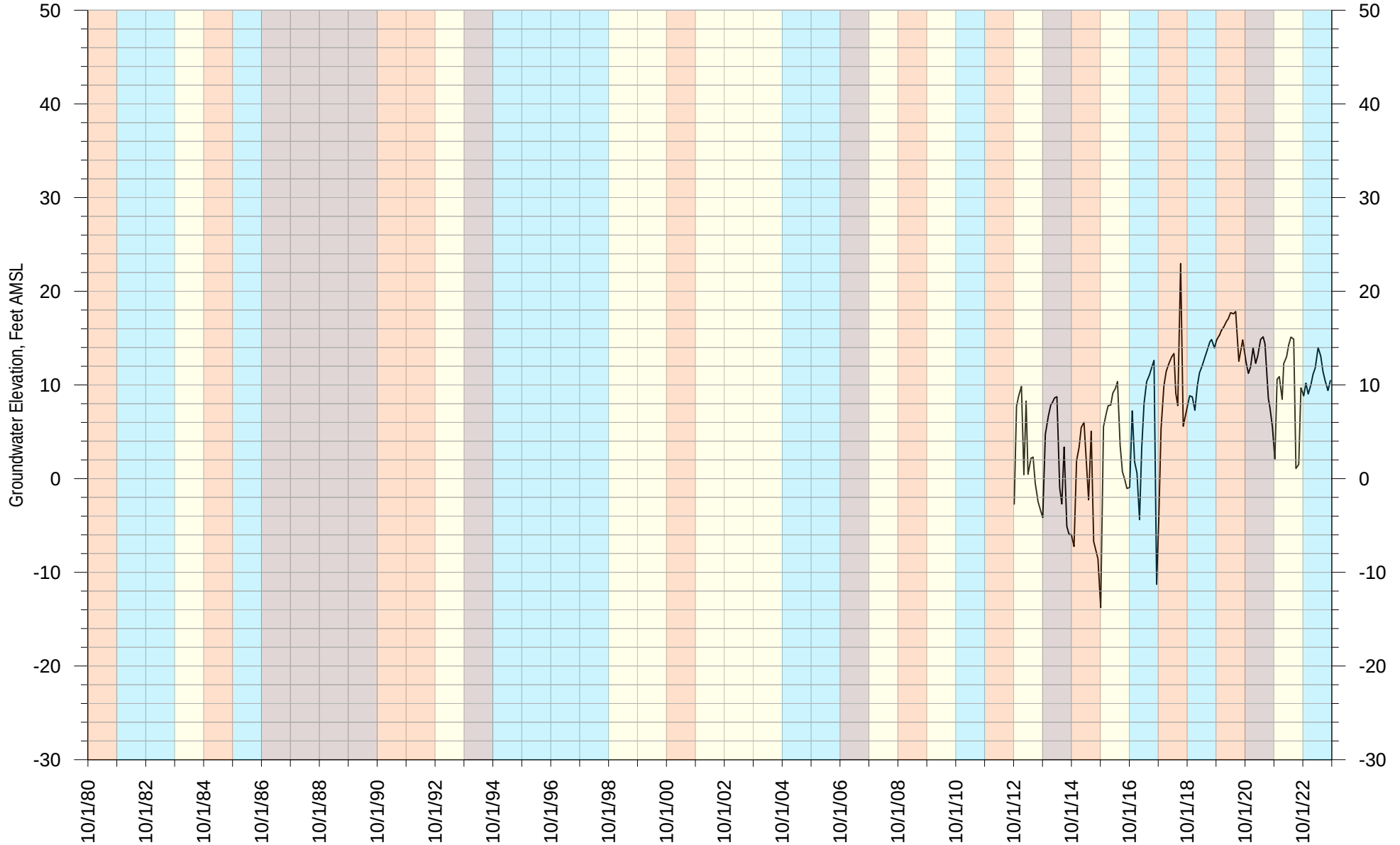


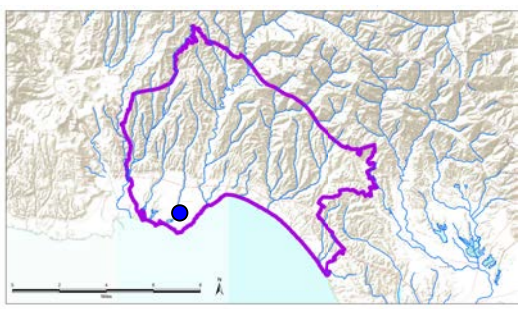


MONTGOMERY & ASSOCIATES

Beltz 7 Deep
Aquifer Screened: Purisima A/AA

Appendix A
FIGURE A-93

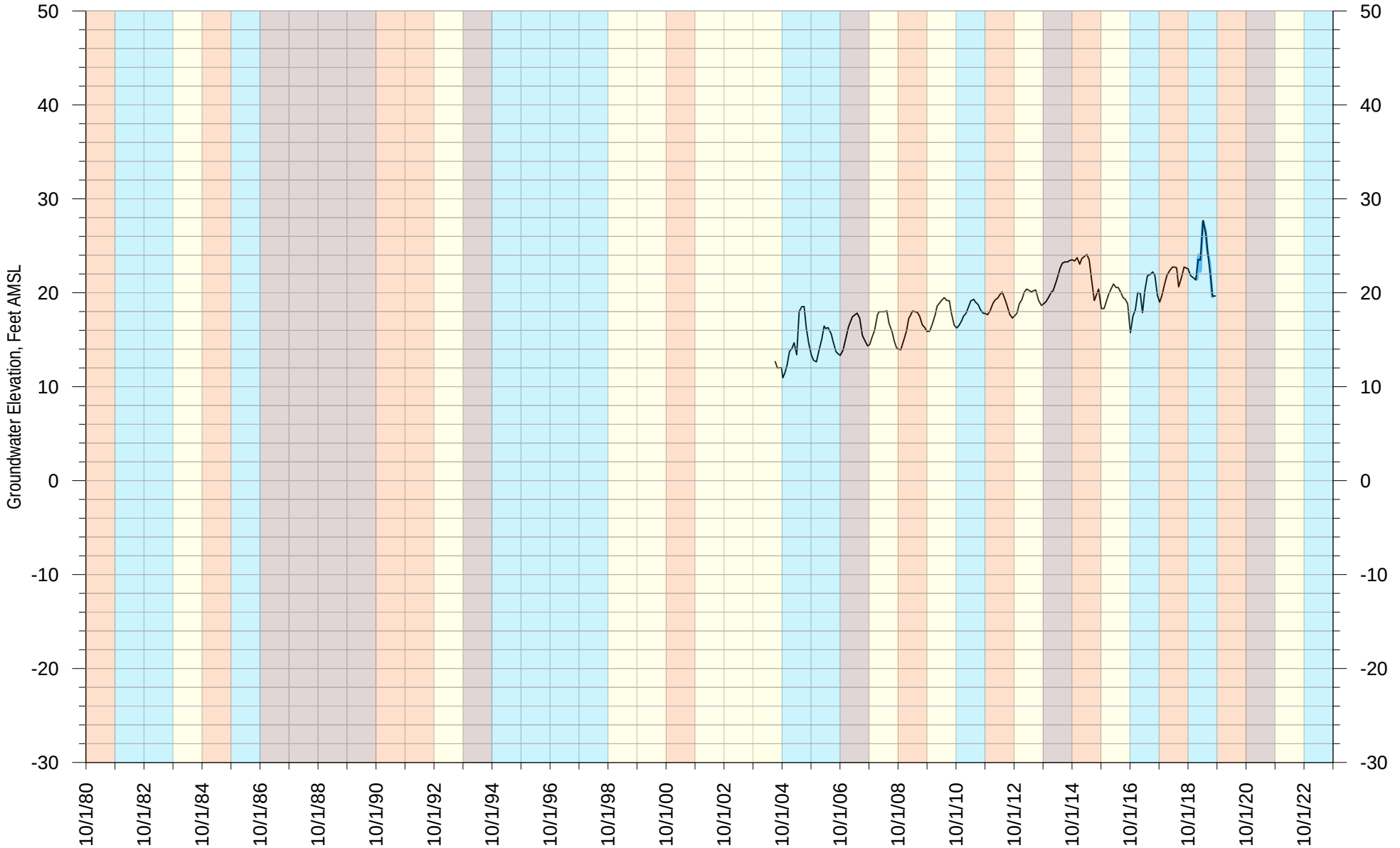


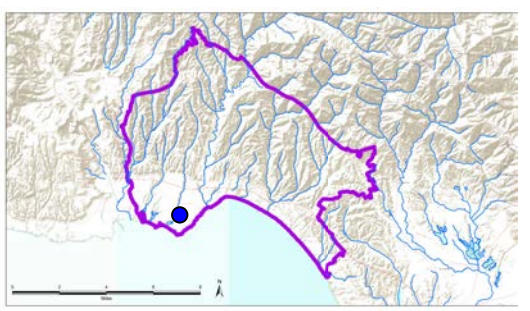


MONTGOMERY & ASSOCIATES

Beltz 7 Santa Margarita Test Well
Aquifer Screened: Tu

Appendix A
FIGURE A-94

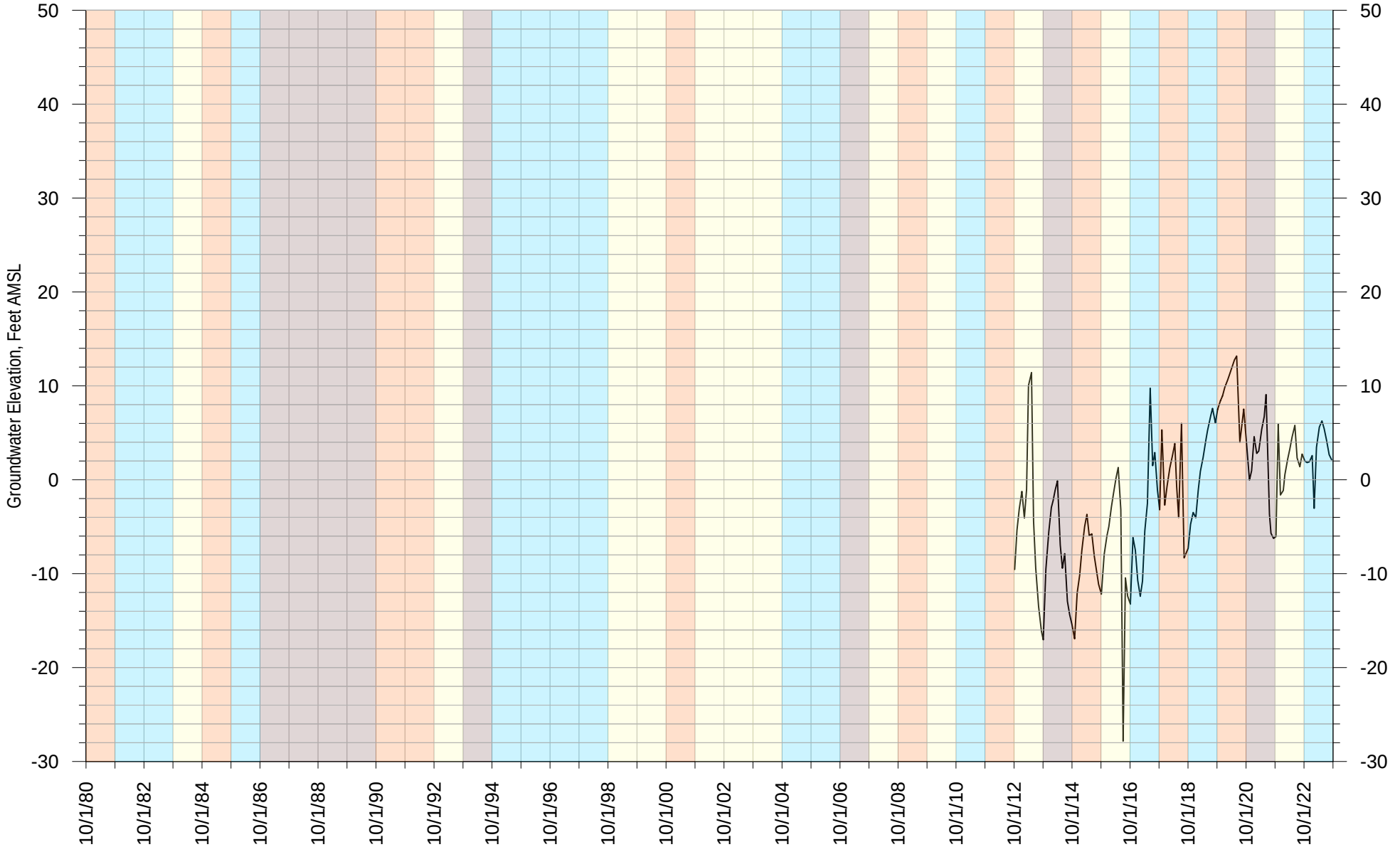


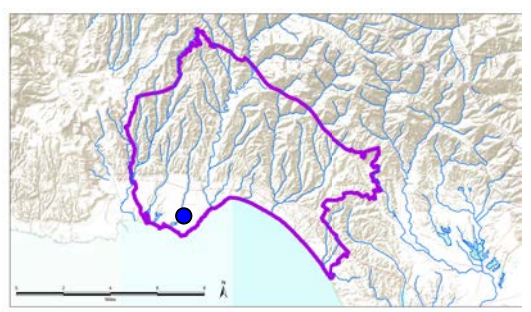


MONTGOMERY & ASSOCIATES

Beltz 7 Shallow
Aquifer Screened: Purisima A

Appendix A
FIGURE A-95

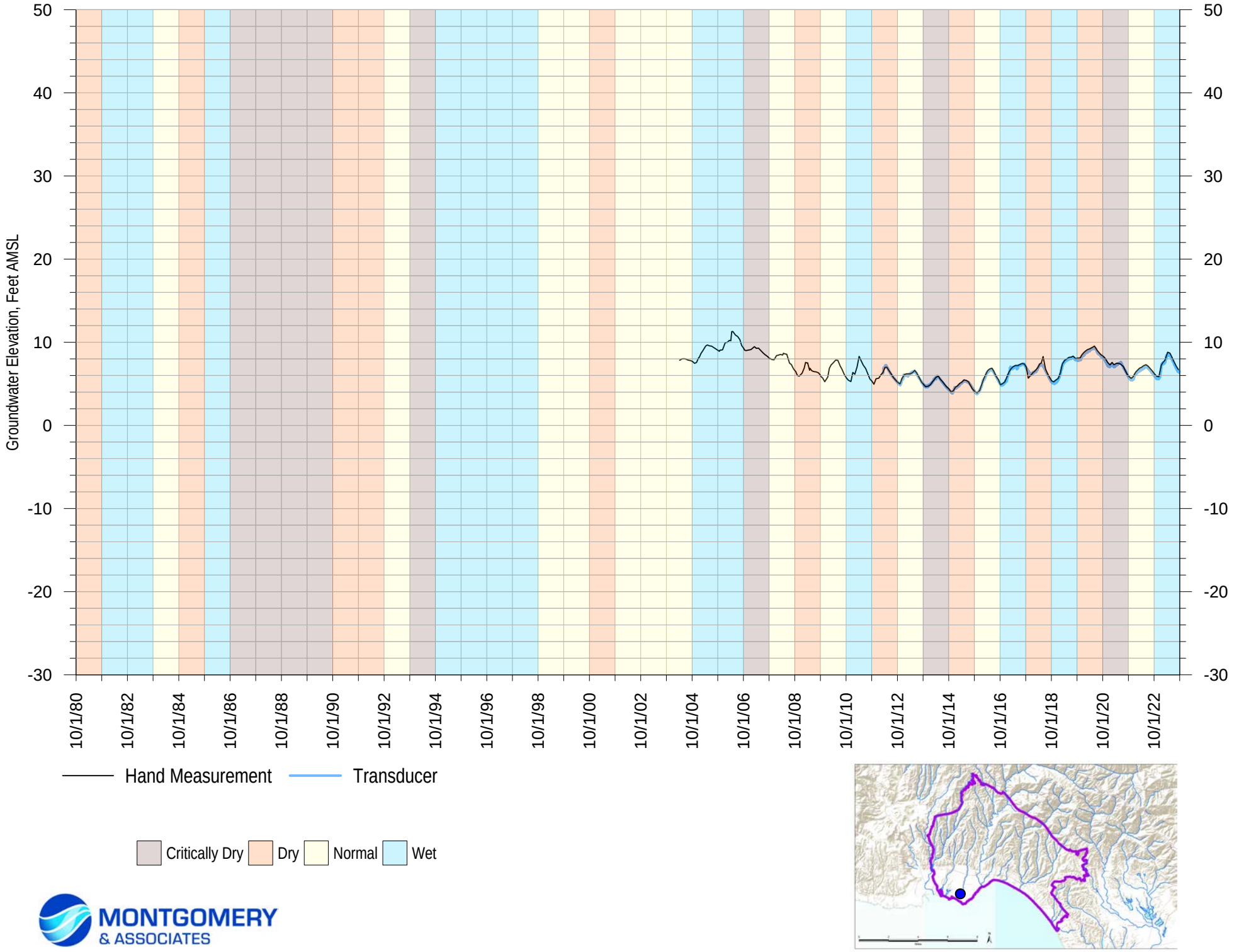




MONTGOMERY & ASSOCIATES

Corcoran Medium
Aquifer Screened: Purisima A

Appendix A
FIGURE A-96

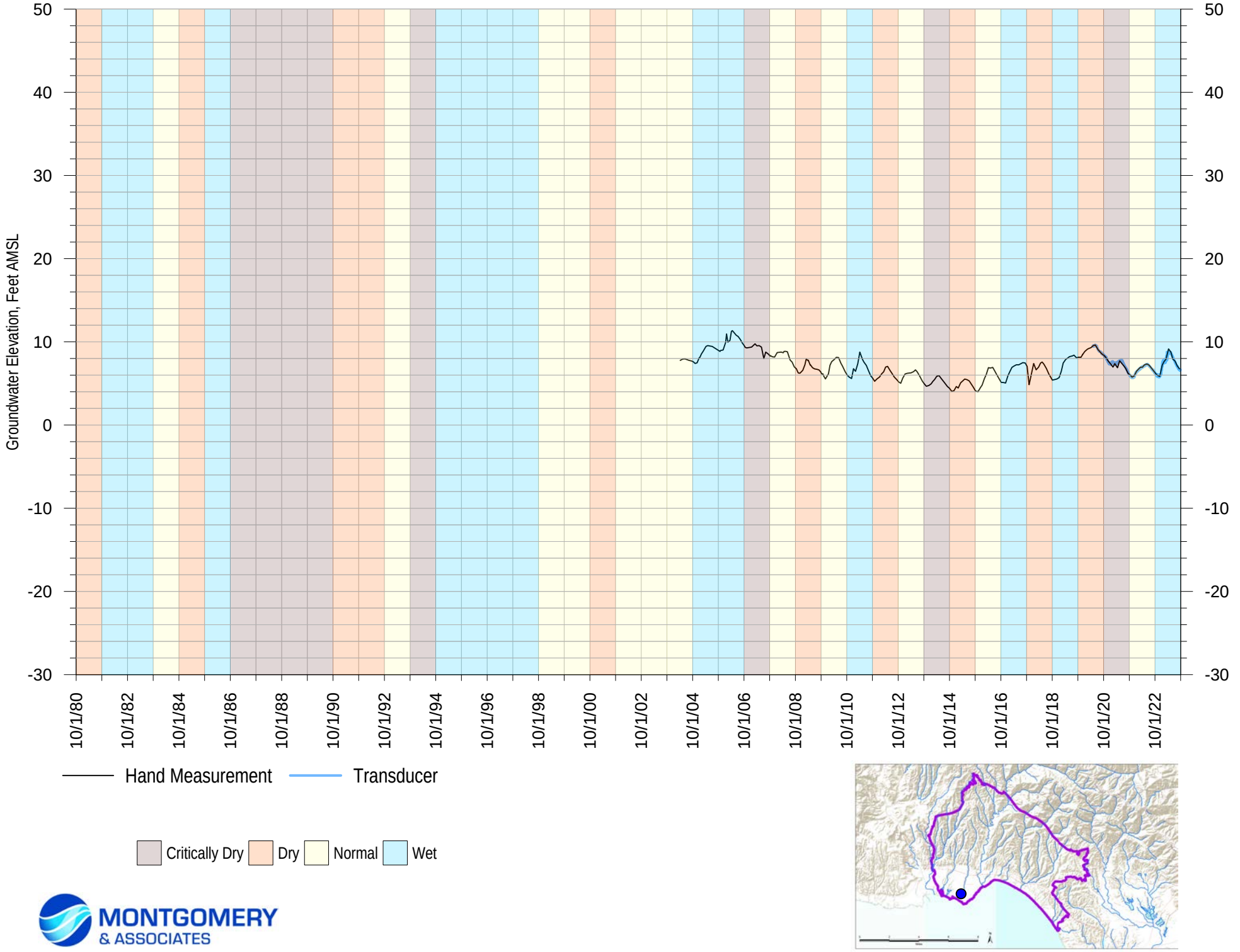


MONTGOMERY & ASSOCIATES

Corcoran Shallow
Aquifer Screened: Purisima A

Appendix A

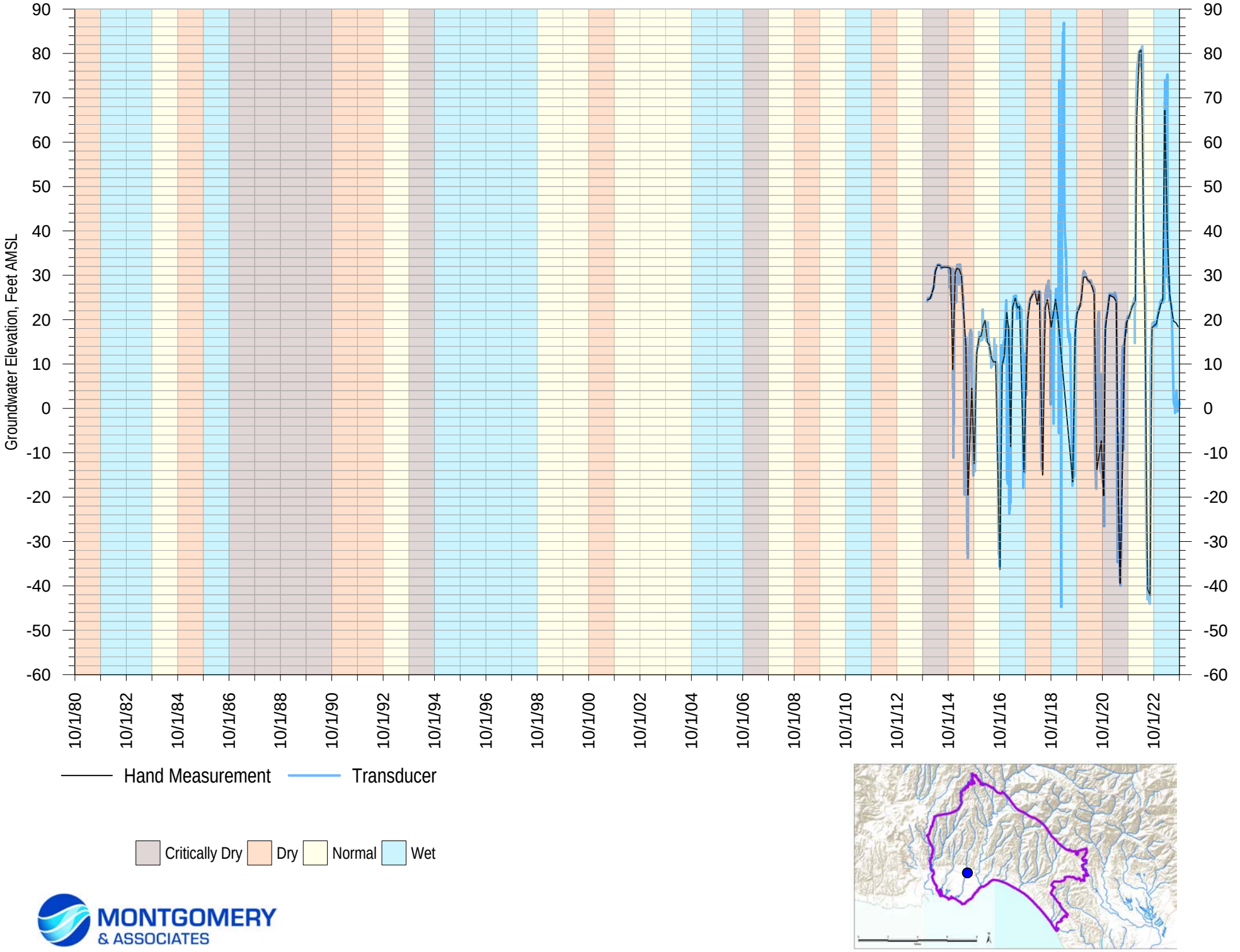
FIGURE A-97



MONTGOMERY & ASSOCIATES

Cory 4
Aquifer Screened: Tu

Appendix A
FIGURE A-98



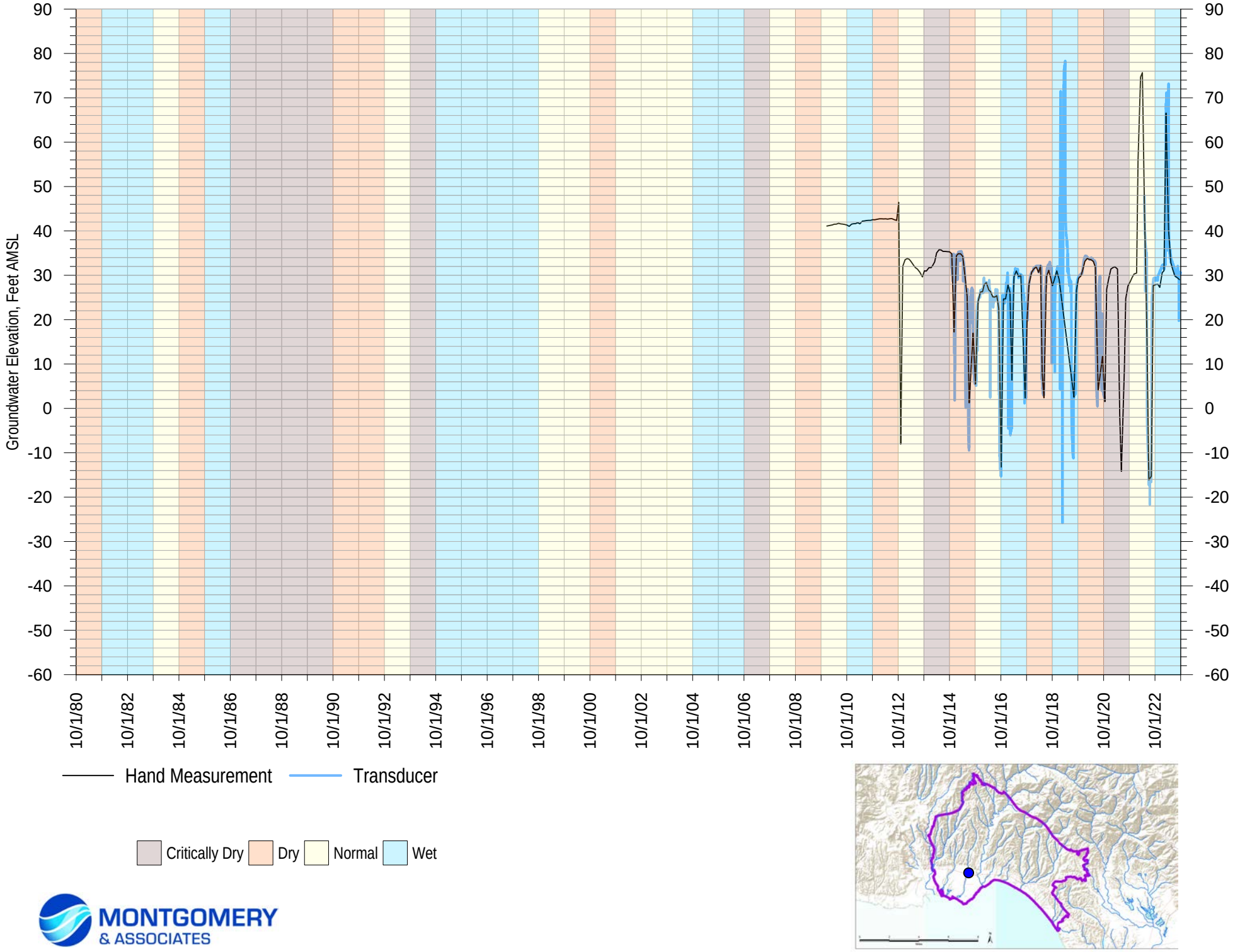
MONTGOMERY & ASSOCIATES

Cory Deep

Aquifer Screened: Purisima AA

Appendix A

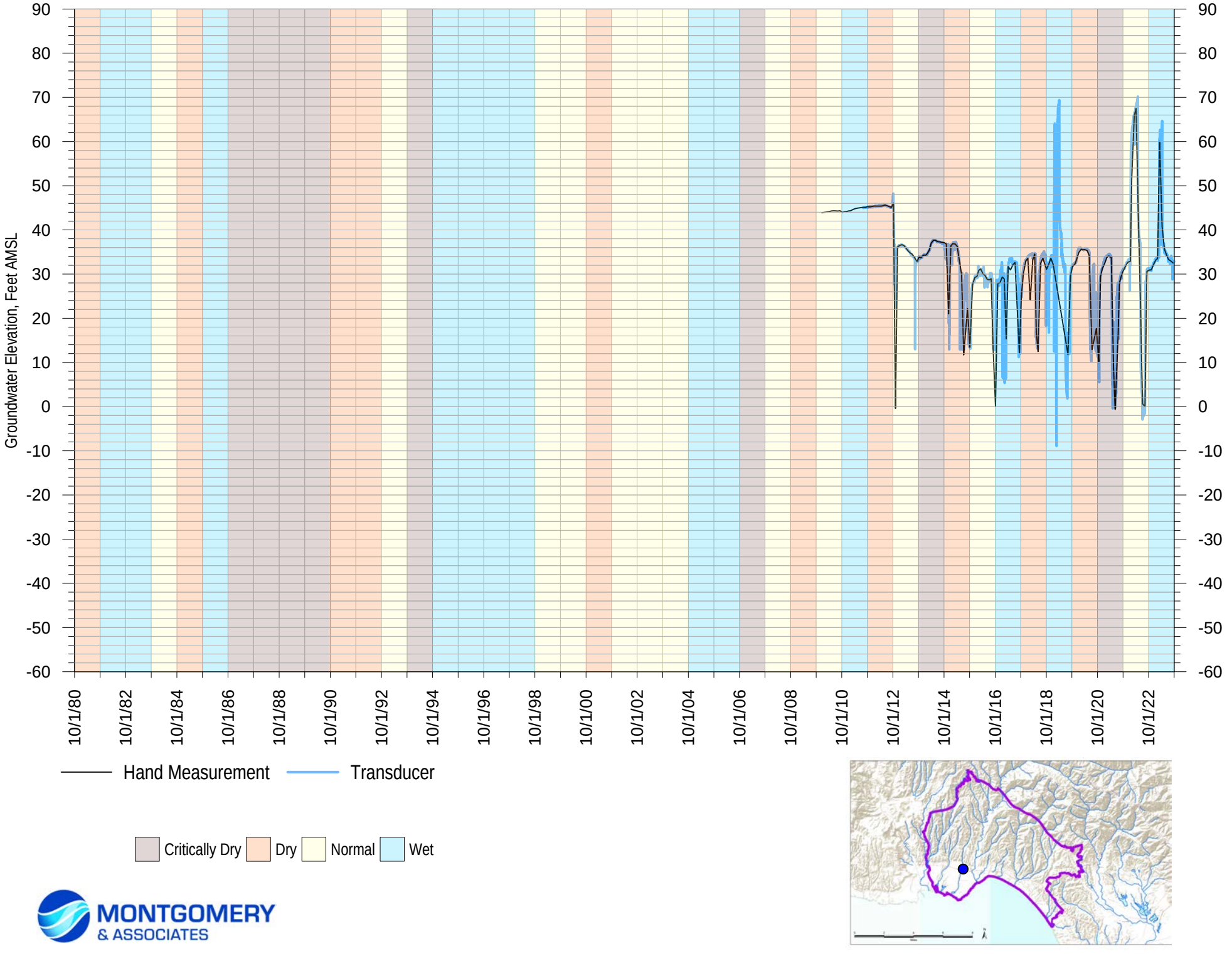
FIGURE A-99



MONTGOMERY & ASSOCIATES

Cory Medium
Aquifer Screened: Purisima A

Appendix A
FIGURE A-100

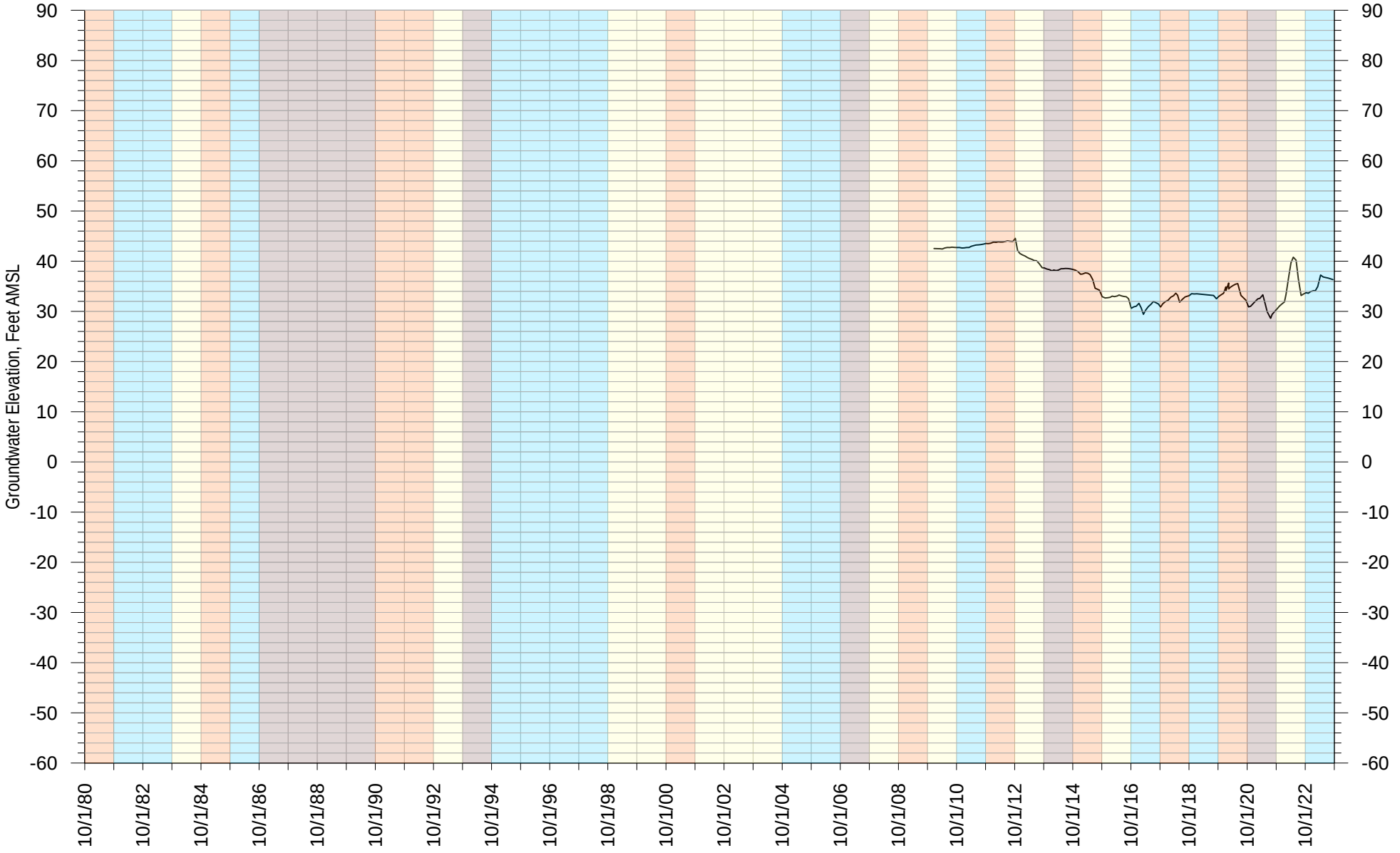


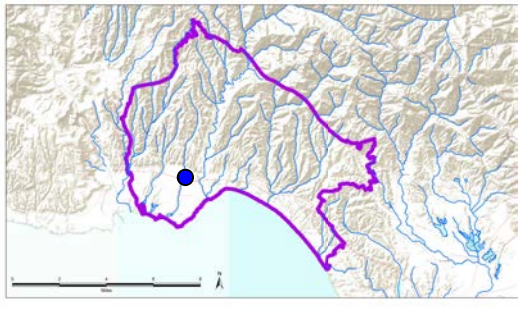
MONTGOMERY & ASSOCIATES

Cory Shallow
Aquifer Screened: Purisima A

Appendix A

FIGURE A-101





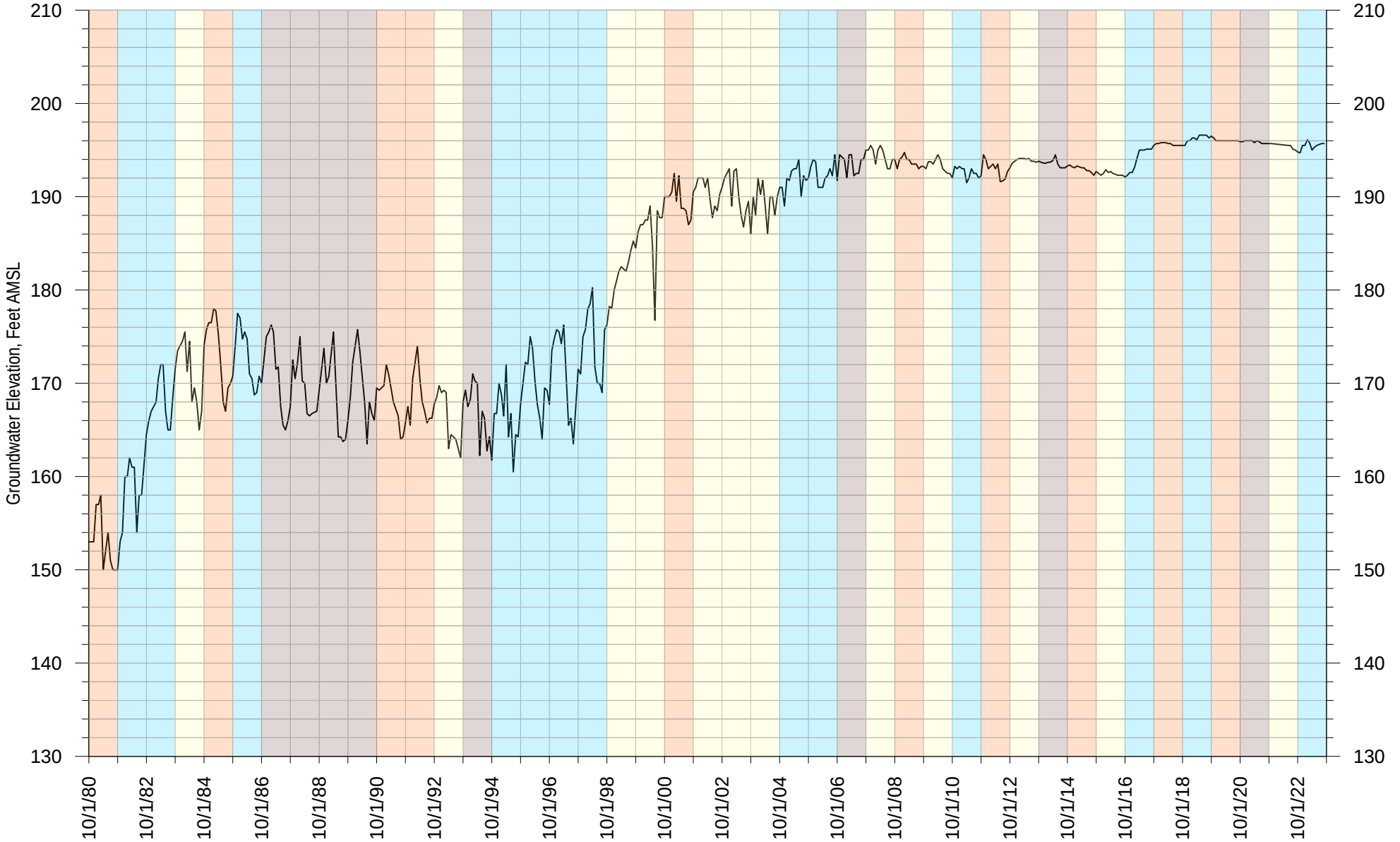
MONTGOMERY & ASSOCIATES

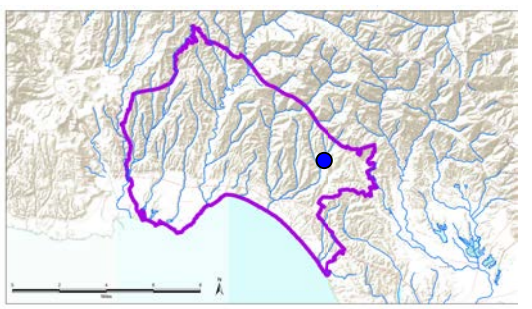
CWD-3

Aquifer Screened: Purisima F

Appendix A

FIGURE A-102

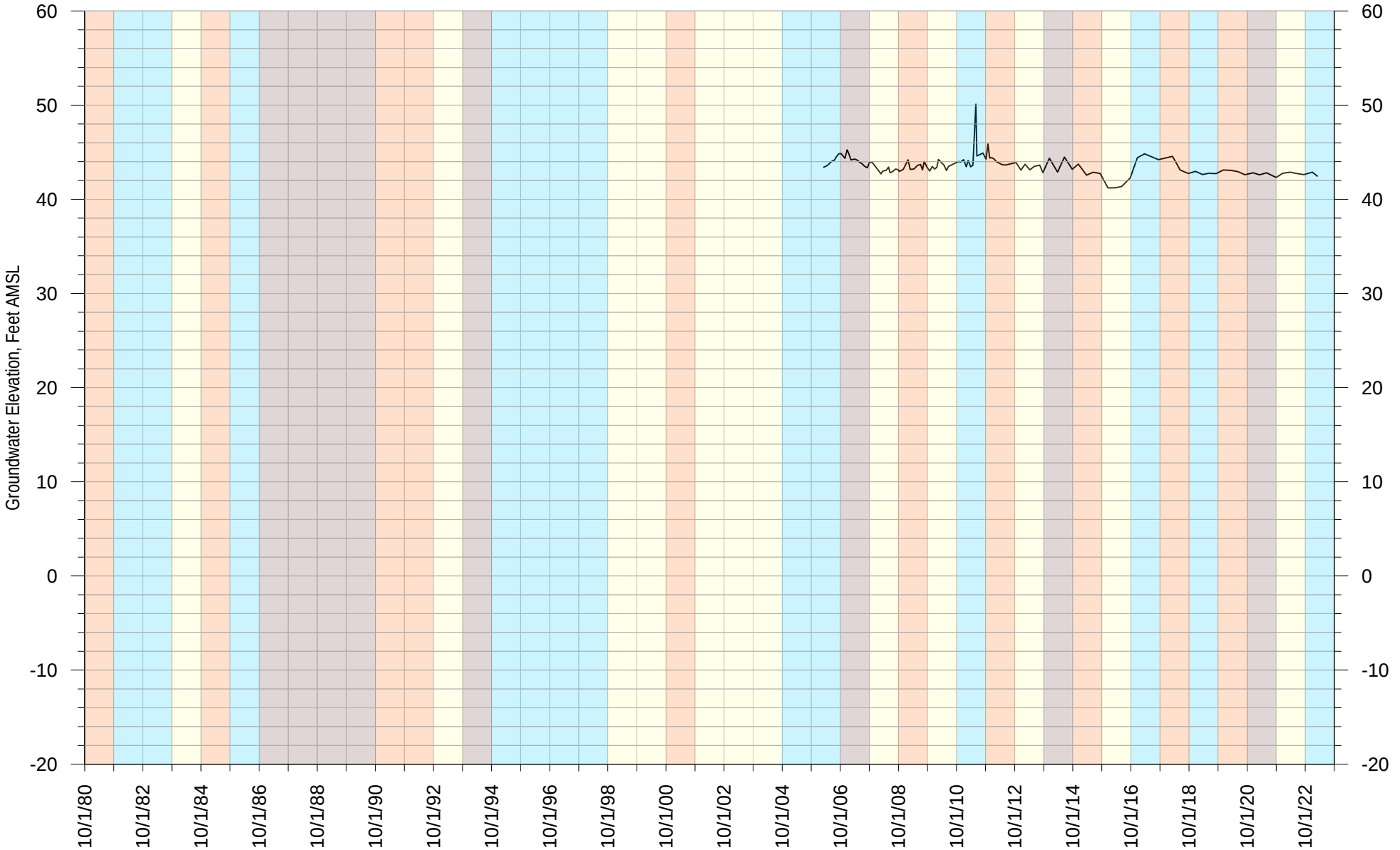


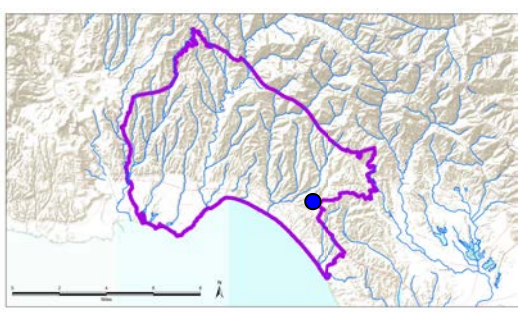


MONTGOMERY & ASSOCIATES

CWD-12A
Aquifer Screened: Aromas

Appendix A
FIGURE A-103





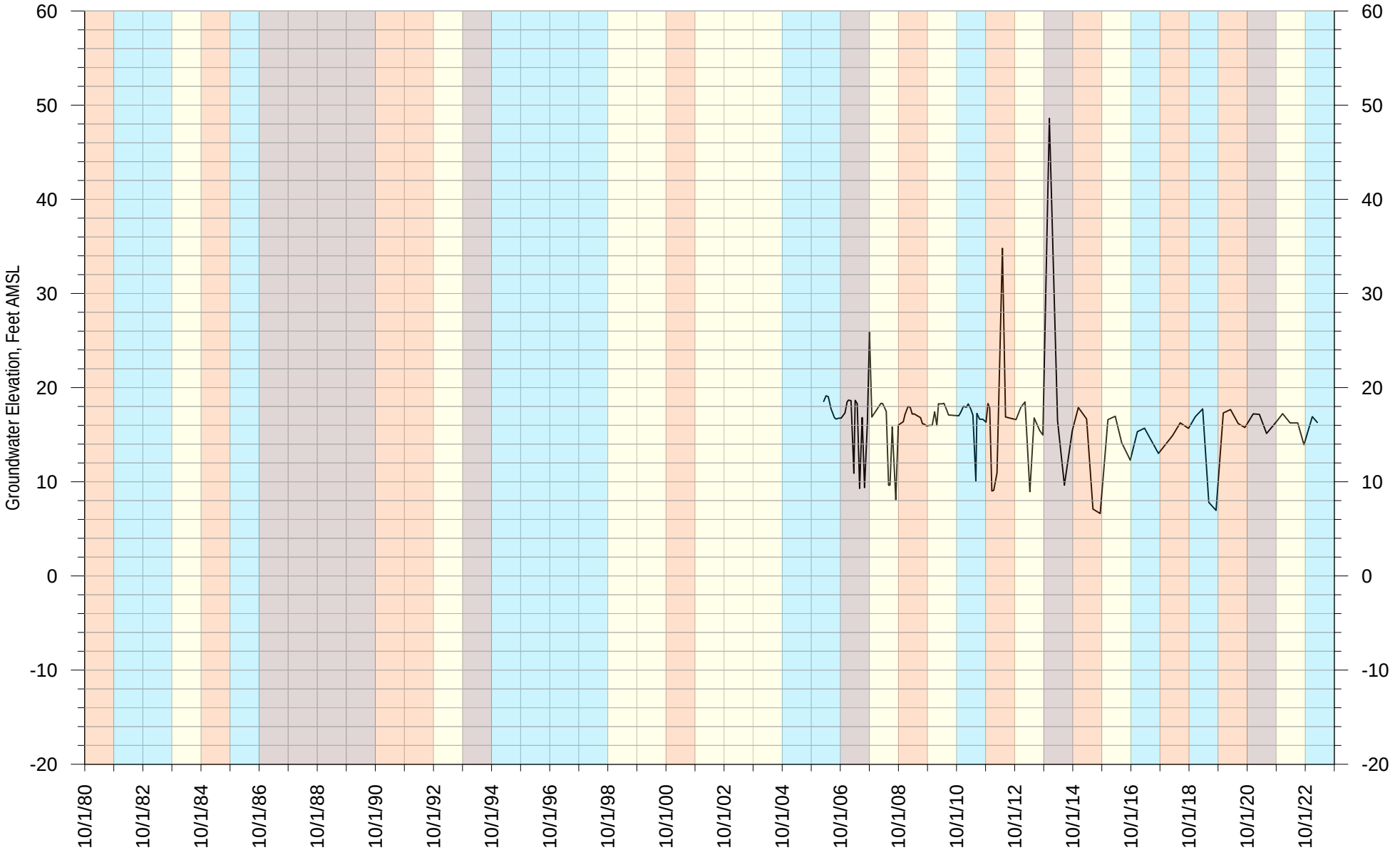
MONTGOMERY & ASSOCIATES

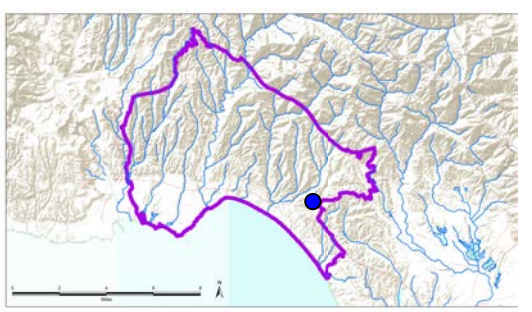
CWD-12B

Aquifer Screened: Aromas

Appendix A

FIGURE A-104





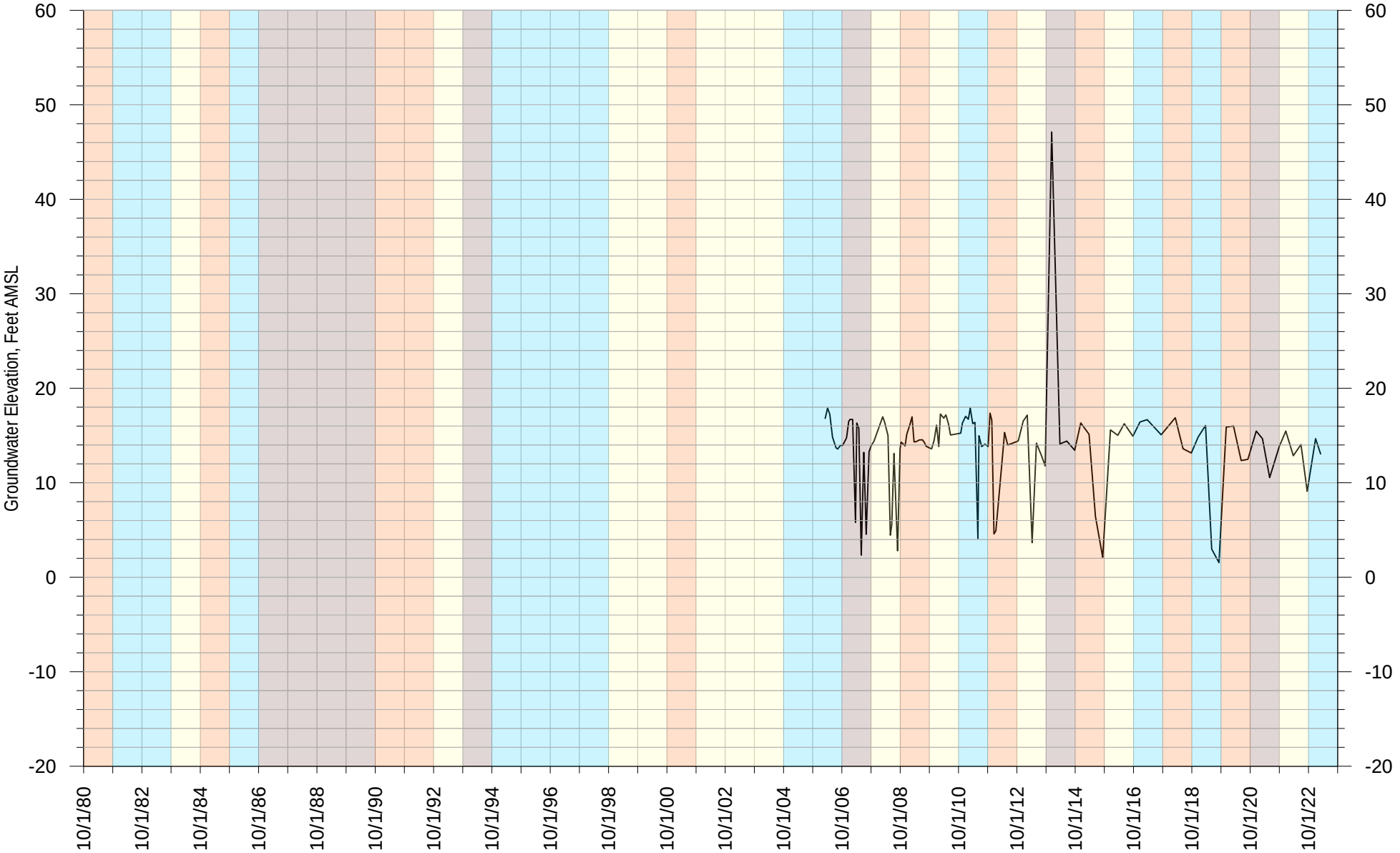
MONTGOMERY & ASSOCIATES

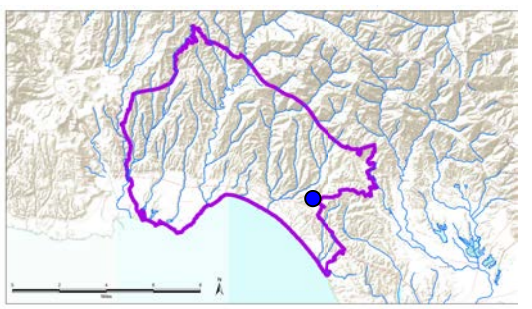
CWD-12C

Aquifer Screened: Purisima F

Appendix A

FIGURE A-105

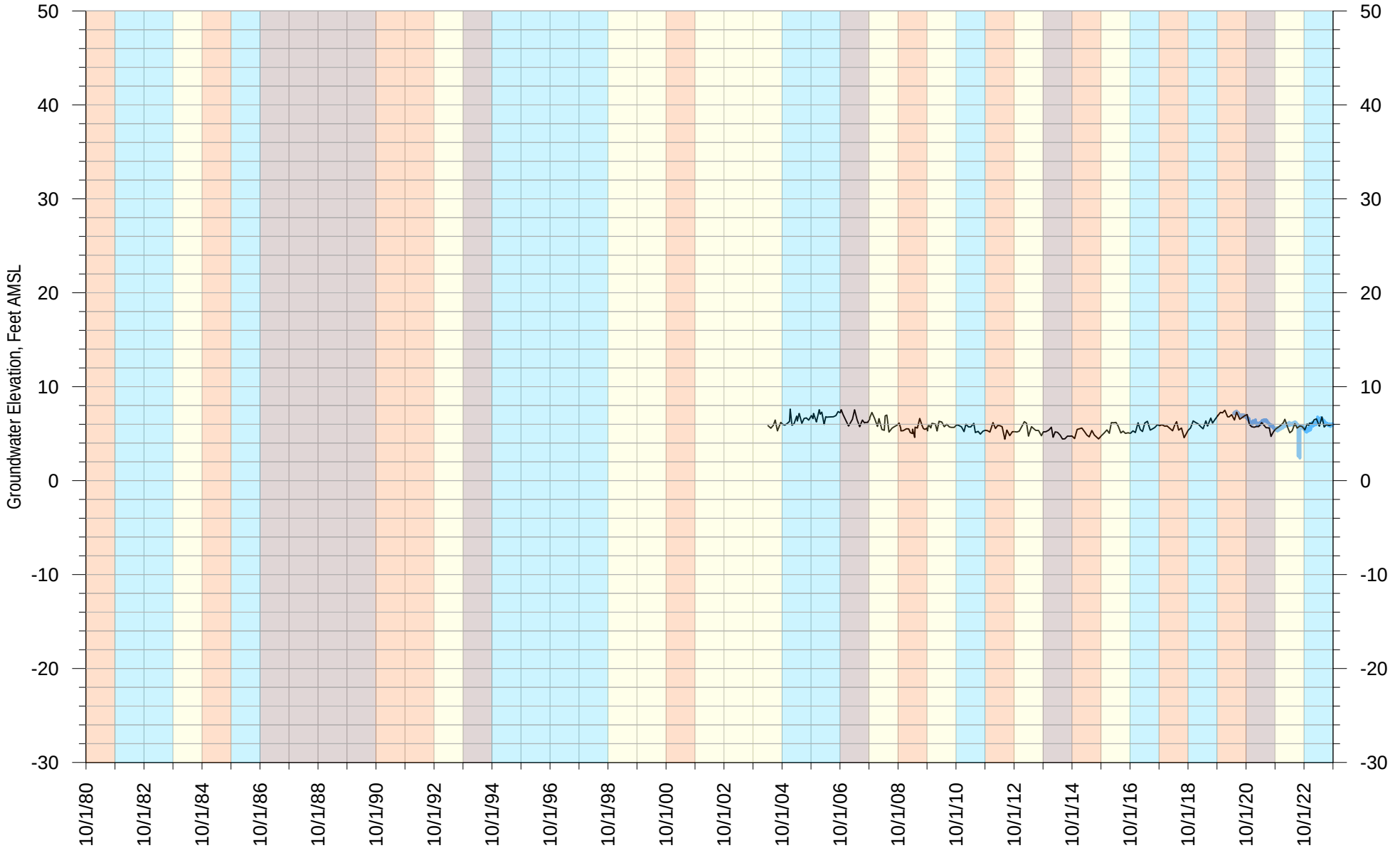


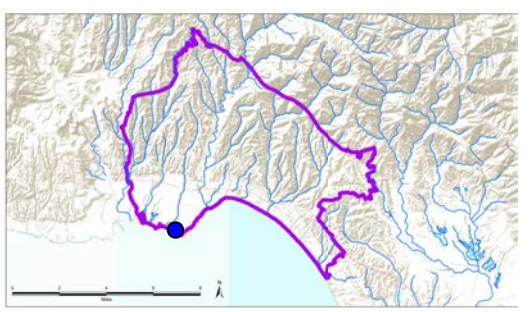


MONTGOMERY & ASSOCIATES

Moran Lake Shallow
Aquifer Screened: Purisima A

Appendix A
FIGURE A-106



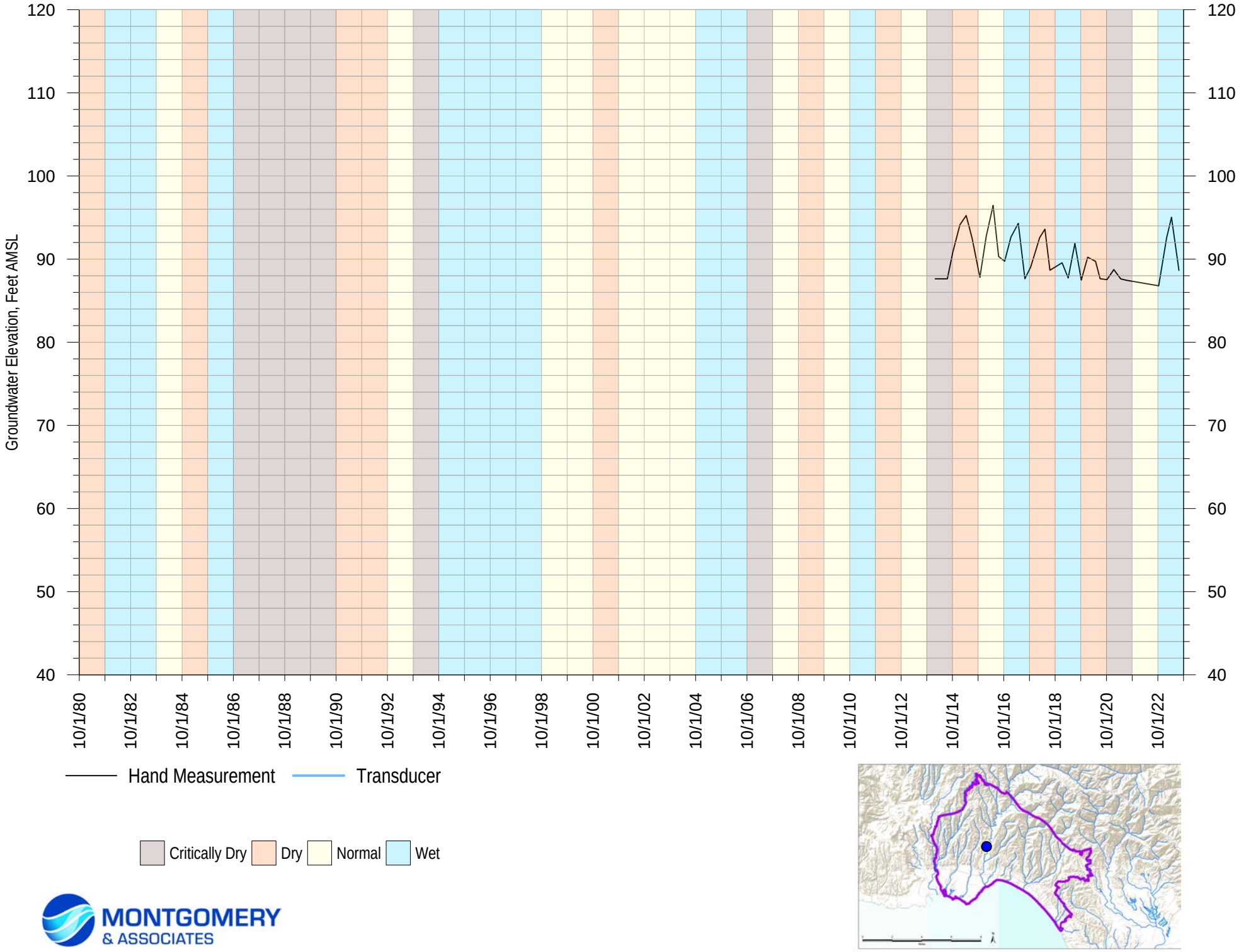


MONTGOMERY & ASSOCIATES

SC-10AAA at Cherryvale
Aquifer Screened: Tu

Appendix A

FIGURE A-107

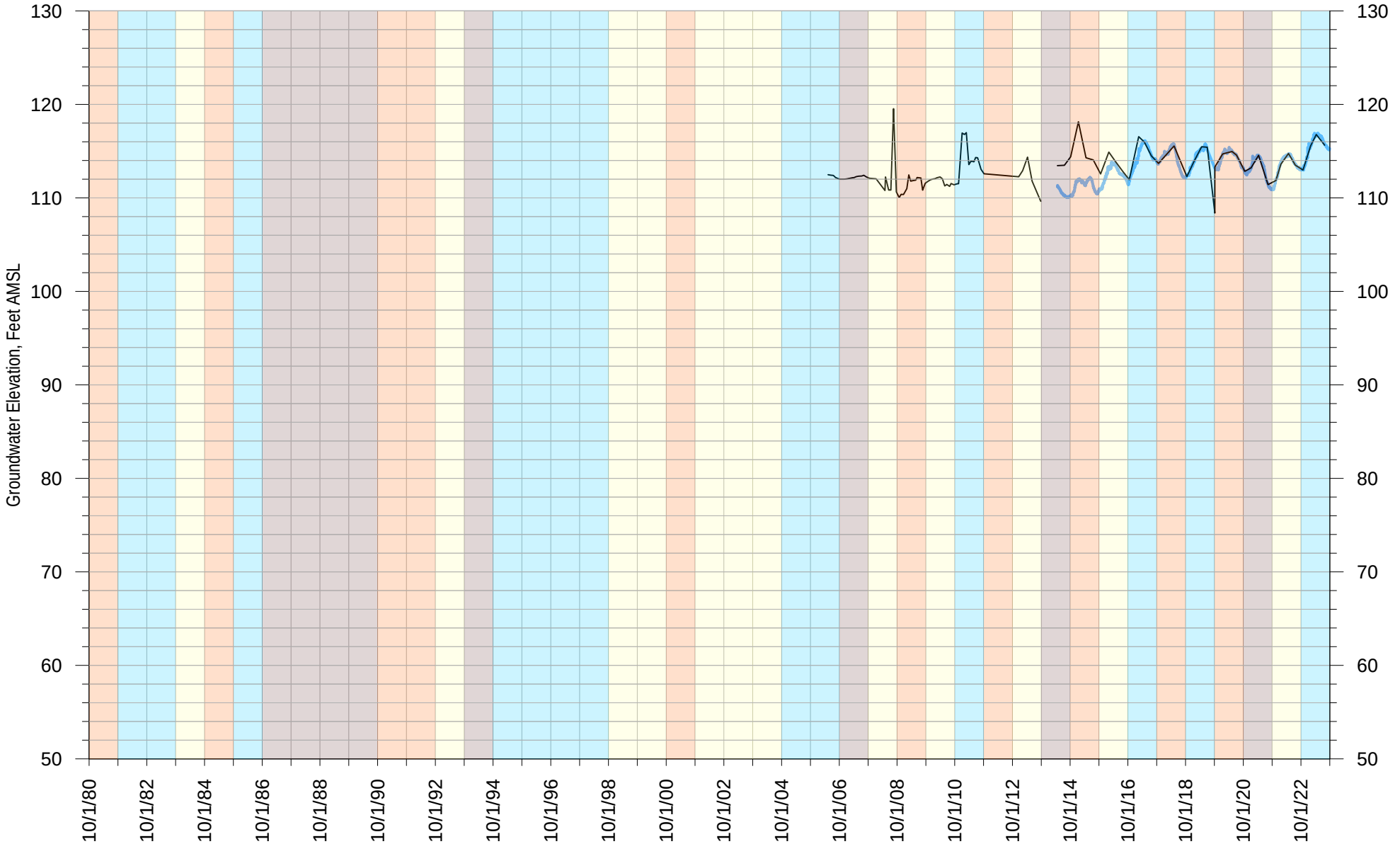


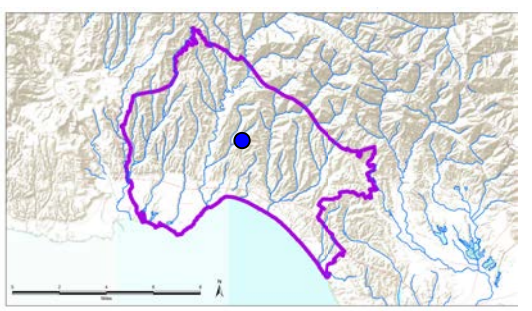
MONTGOMERY & ASSOCIATES

SC-11A & SC-11RA at Porter Gulch
Aquifer Screened: Purisima A/AA

Appendix A

FIGURE A-108





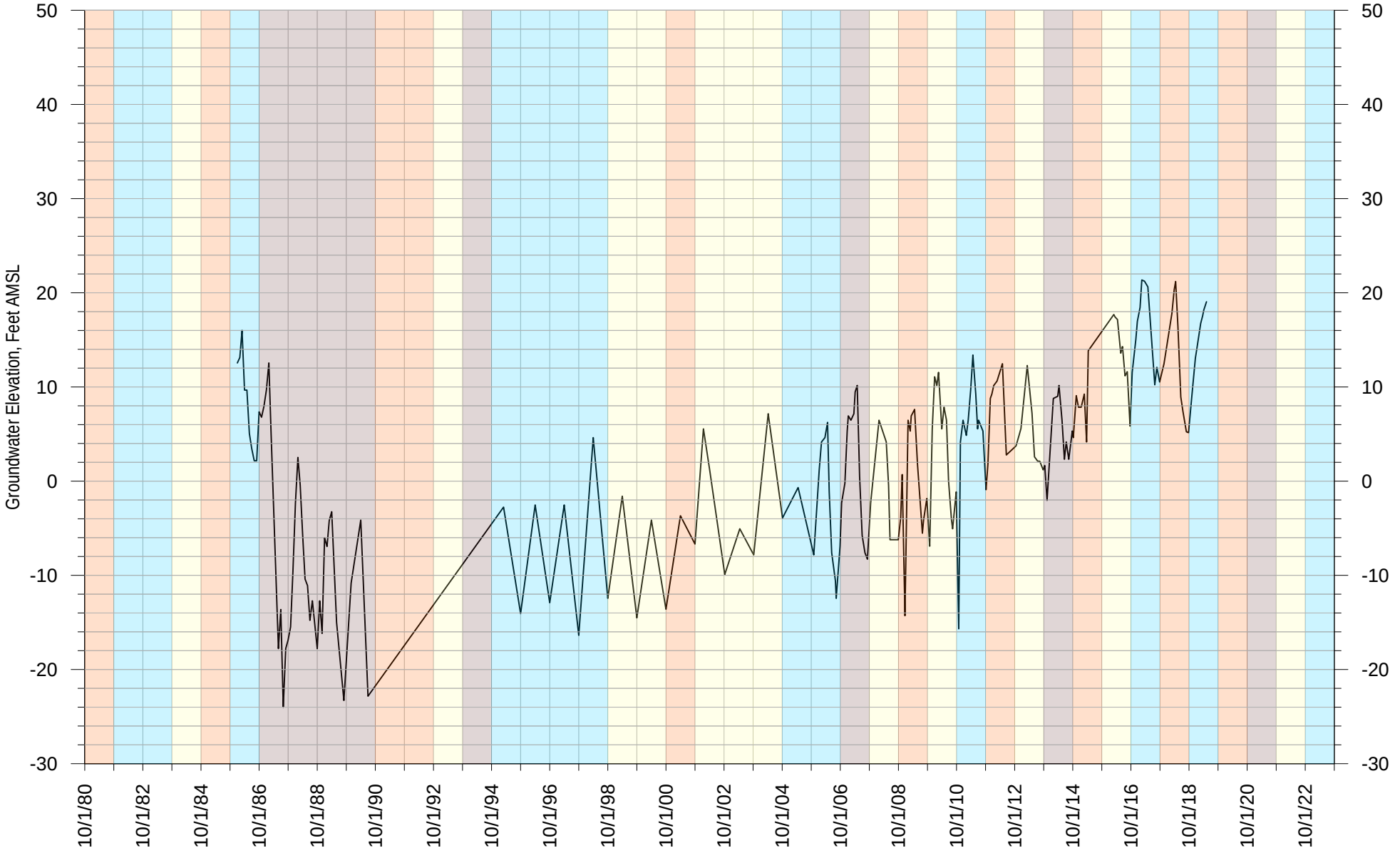
MONTGOMERY & ASSOCIATES

SC-14A at Madeline

Aquifer Screened: Purisima A/AA

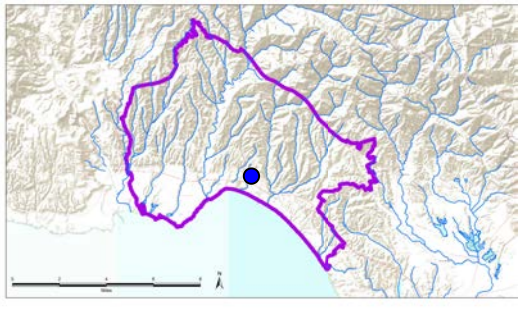
Appendix A

FIGURE A-109



Hand Measurement

Critically Dry | Dry | Normal | Wet



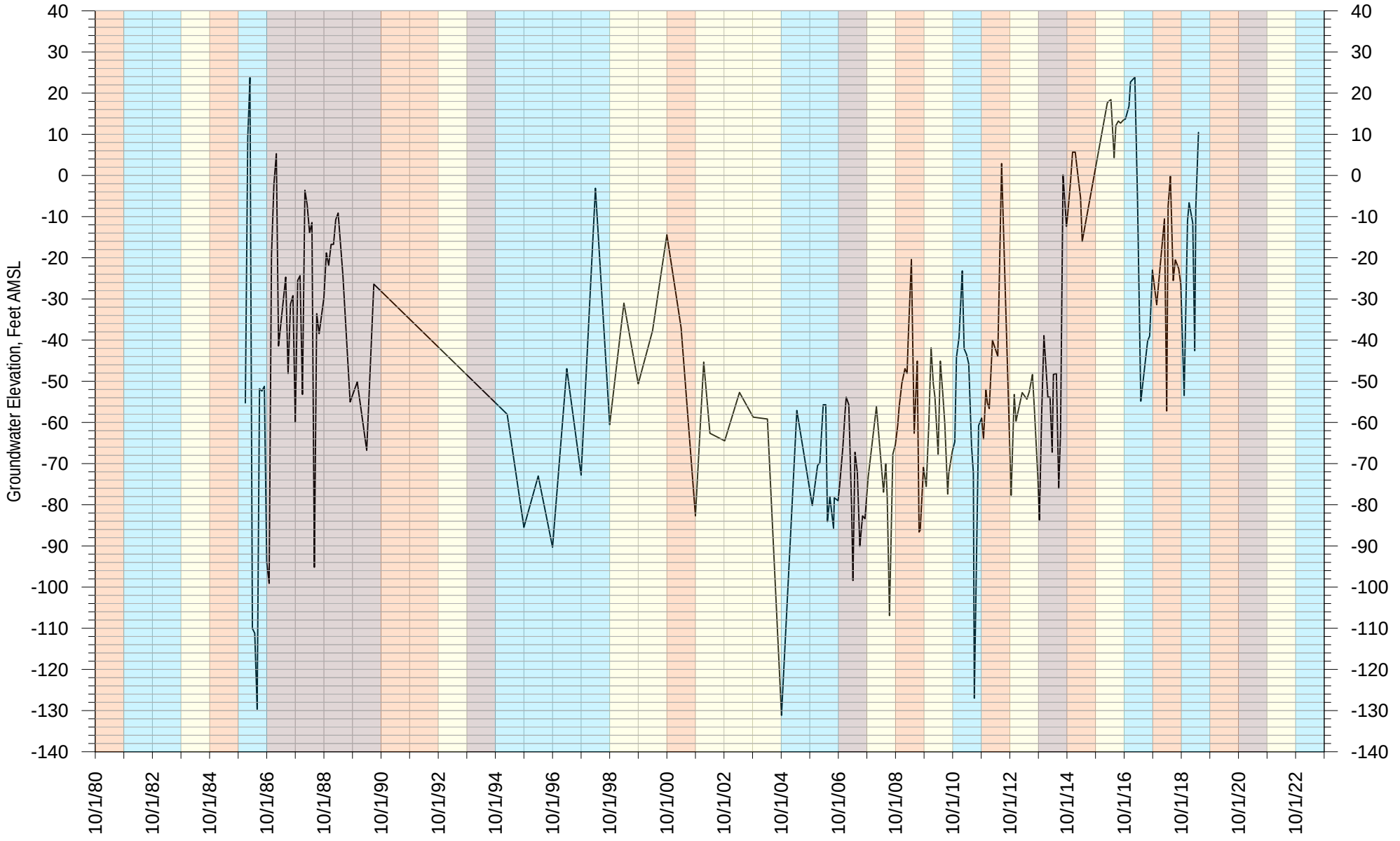
MONTGOMERY & ASSOCIATES

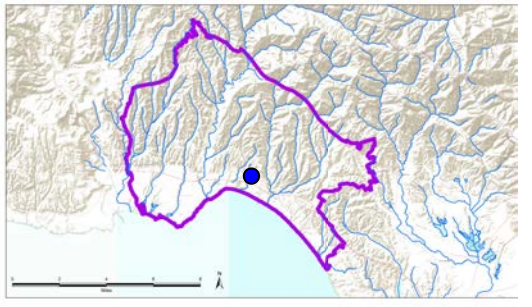
SC-14B at Madeline

Aquifer Screened: Purisima BC

Appendix A

FIGURE A-110





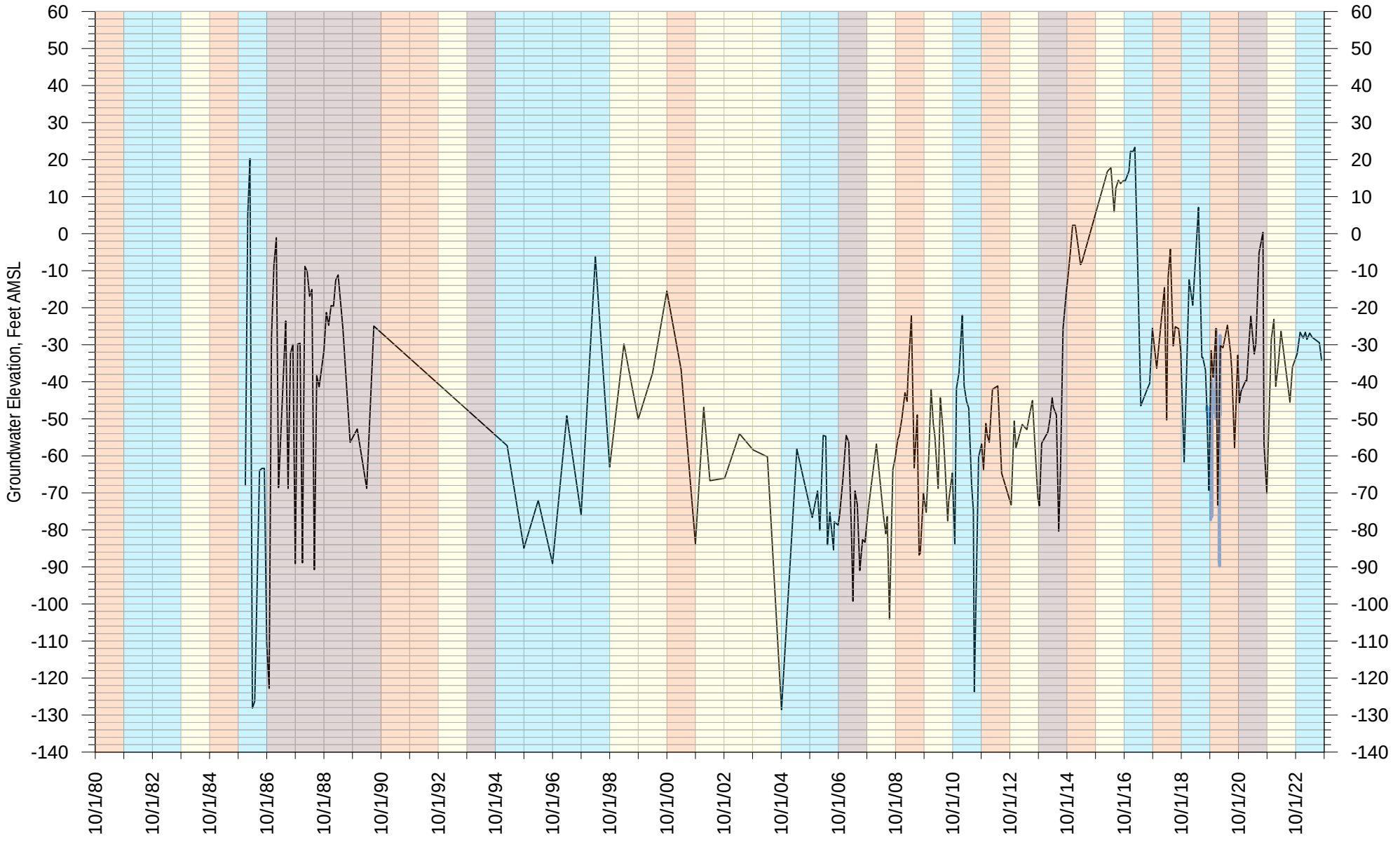
MONTGOMERY & ASSOCIATES

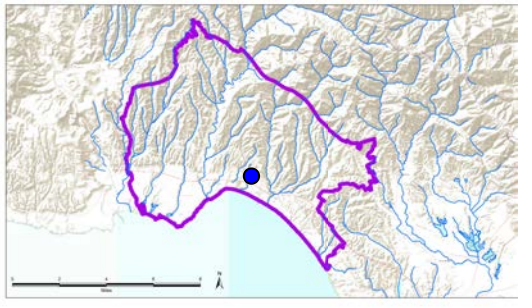
SC-14C at Madeline

Aquifer Screened: Purisima BC

Appendix A

FIGURE A-111





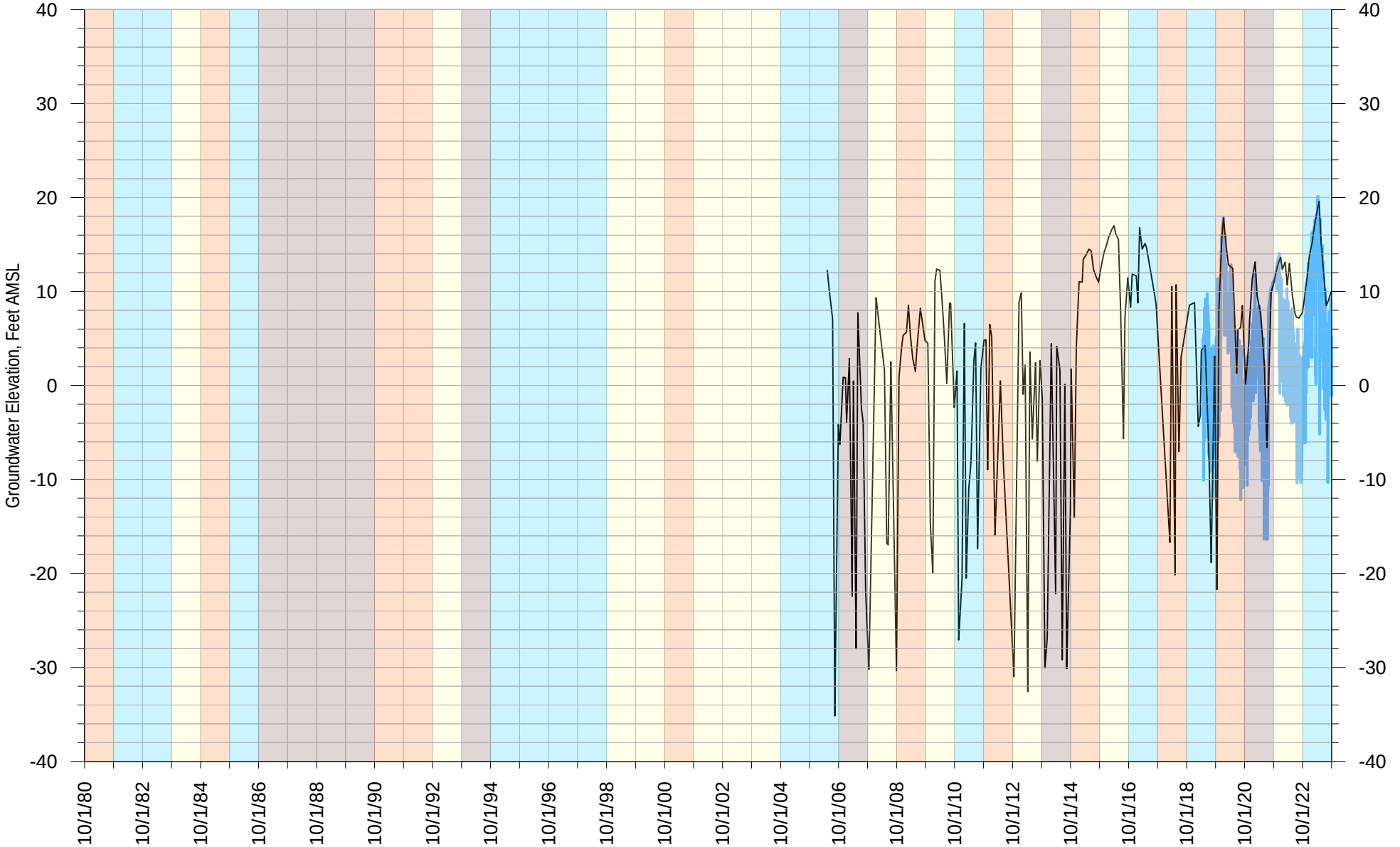
MONTGOMERY & ASSOCIATES

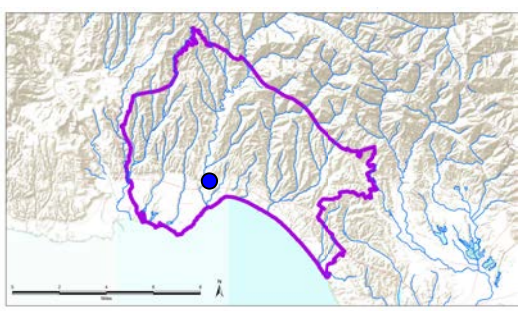
SC-15A at Rosedale

Aquifer Screened: Purisima AA

Appendix A

FIGURE A-112

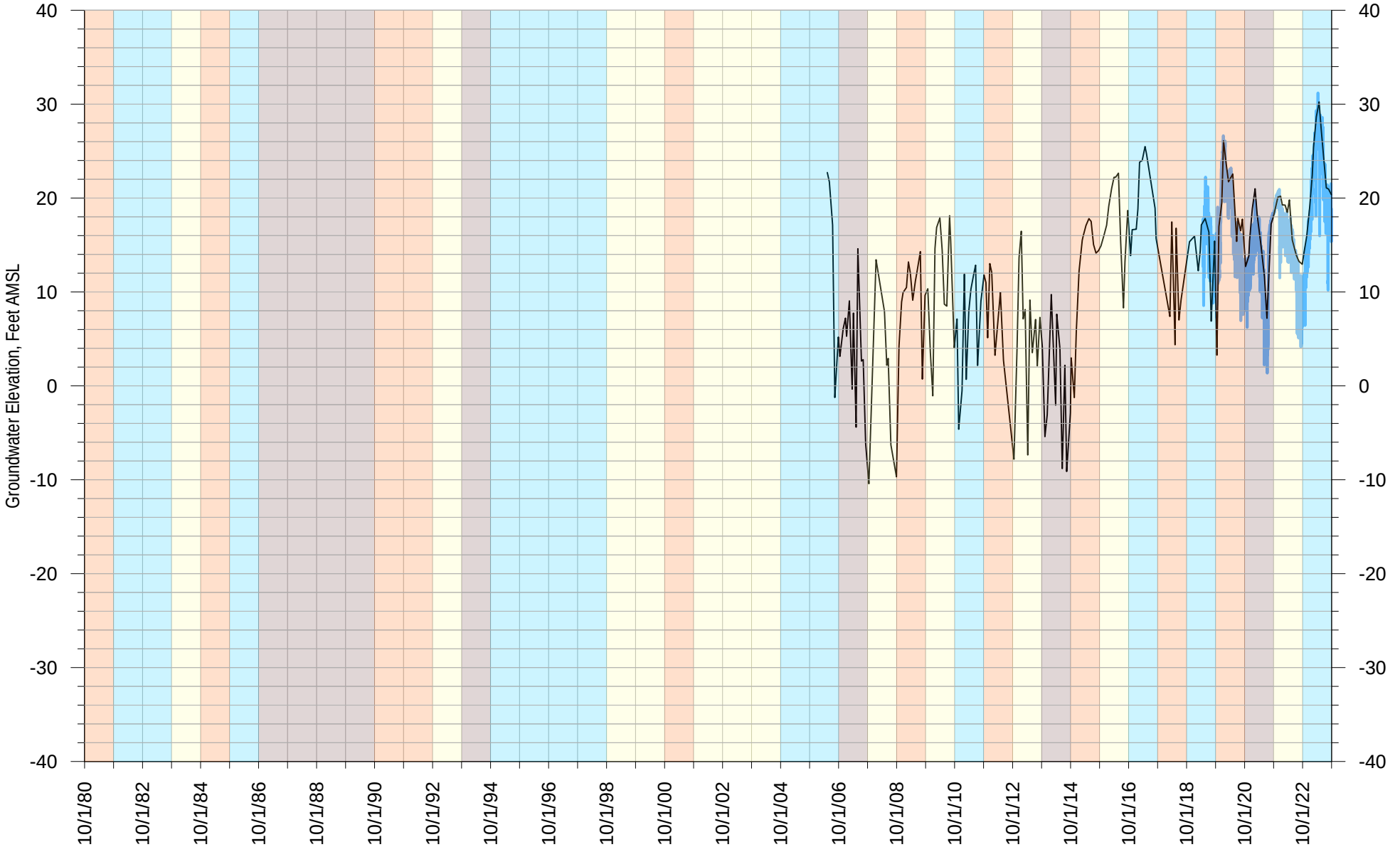


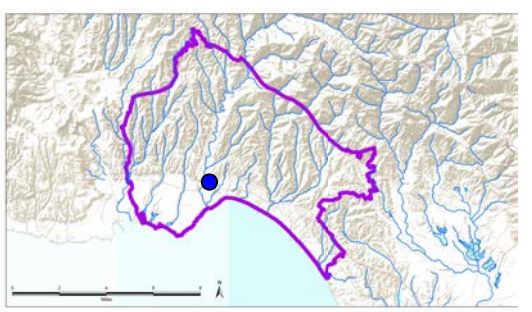


MONTGOMERY & ASSOCIATES

SC-15B at Rosedale
Aquifer Screened: Purisima A

Appendix A
FIGURE A-113





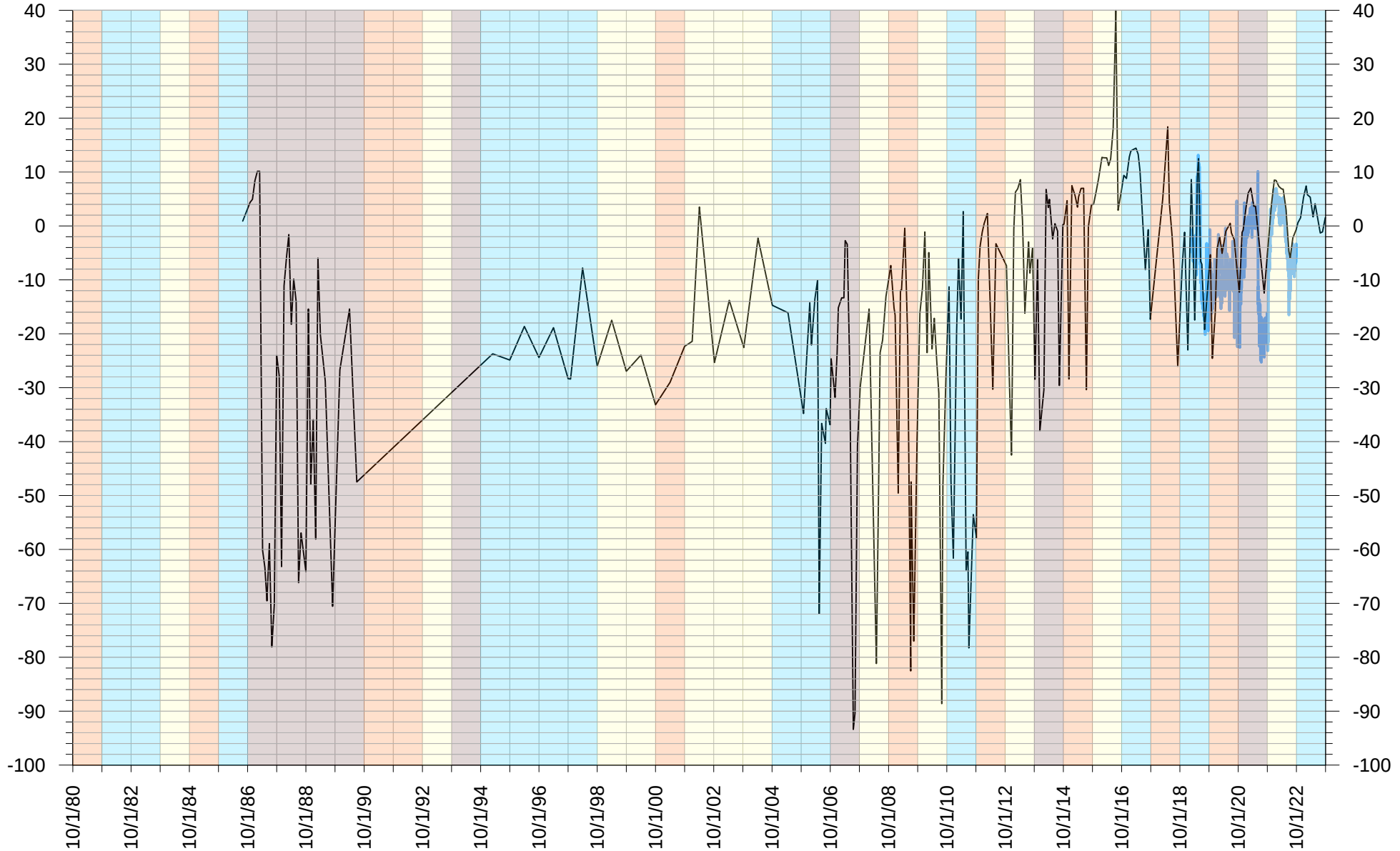
MONTGOMERY & ASSOCIATES

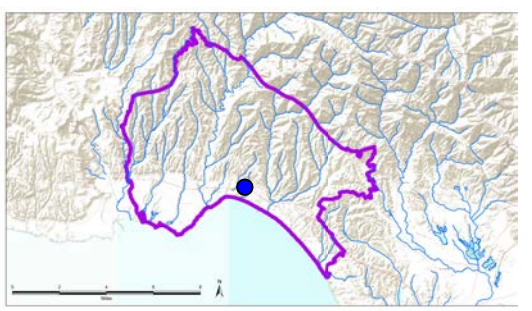
SC-16A at Estates

Aquifer Screened: Purisima A/AA

Appendix A

FIGURE A-114





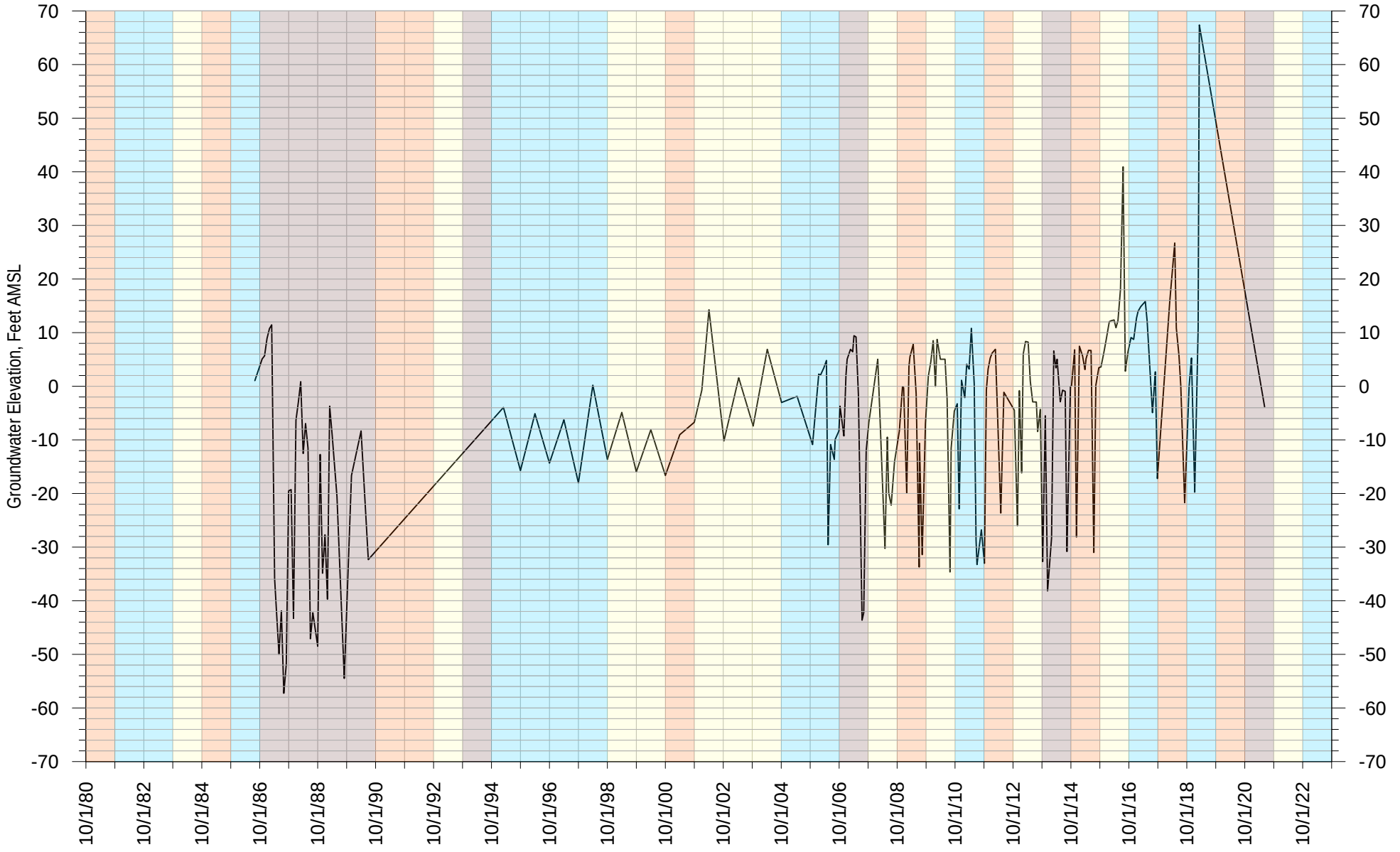
MONTGOMERY & ASSOCIATES

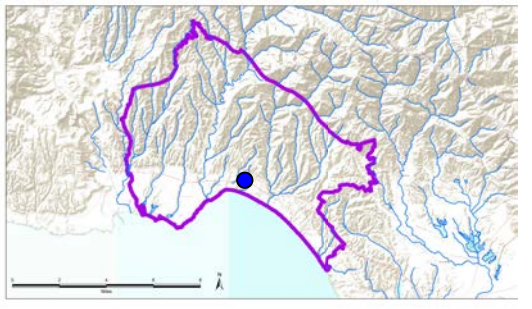
SC-16B at Estates

Aquifer Screened: Purisima BC

Appendix A

FIGURE A-115





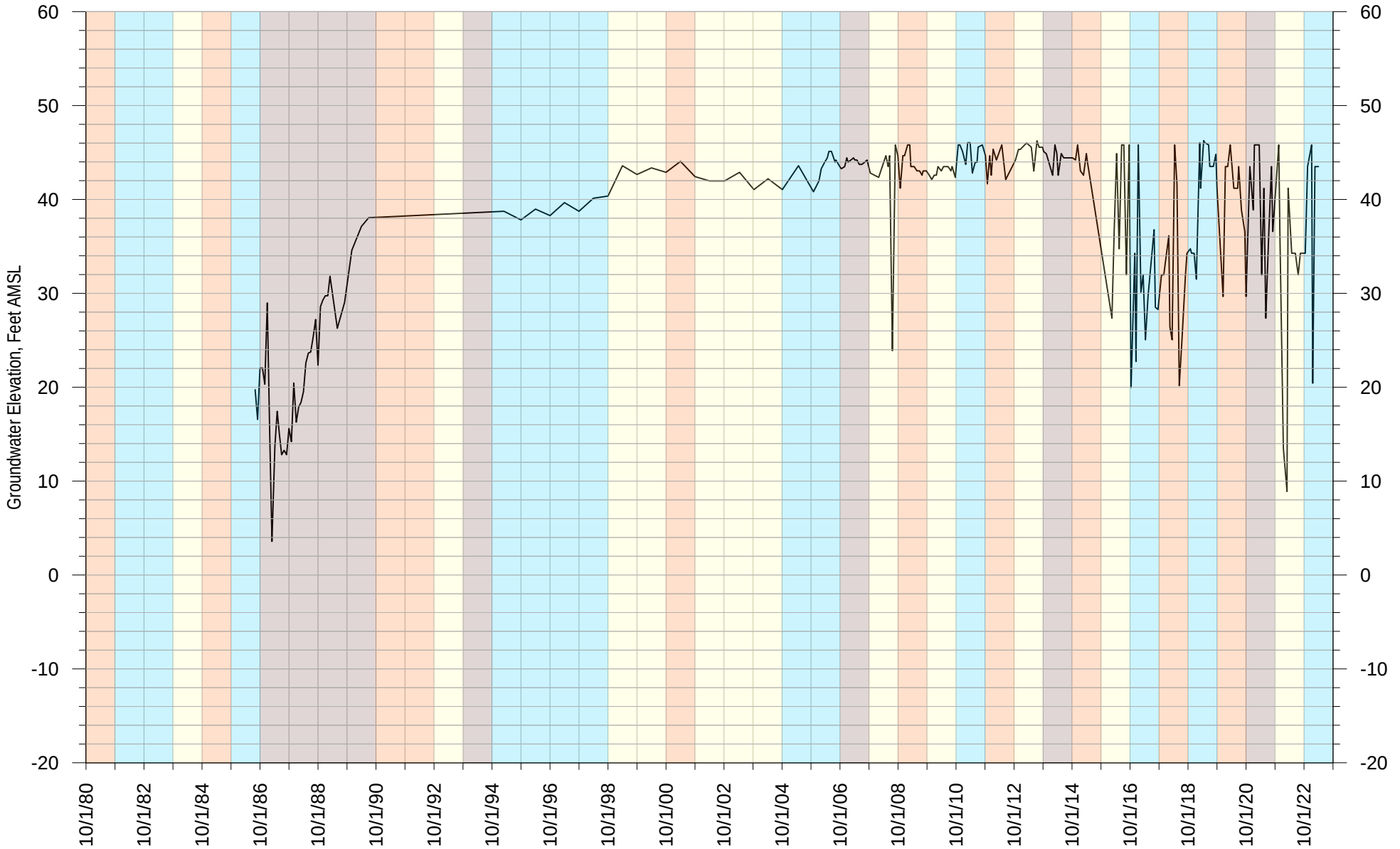
MONTGOMERY & ASSOCIATES

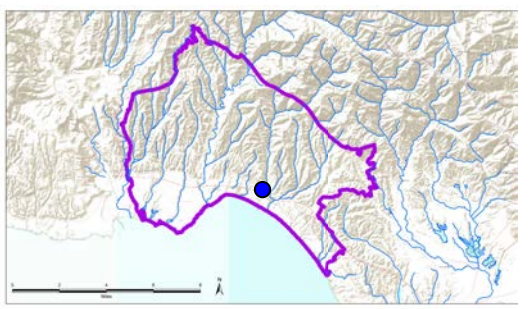
SC-17A at Ledyard

Aquifer Screened: Purisima A

Appendix A

FIGURE A-116





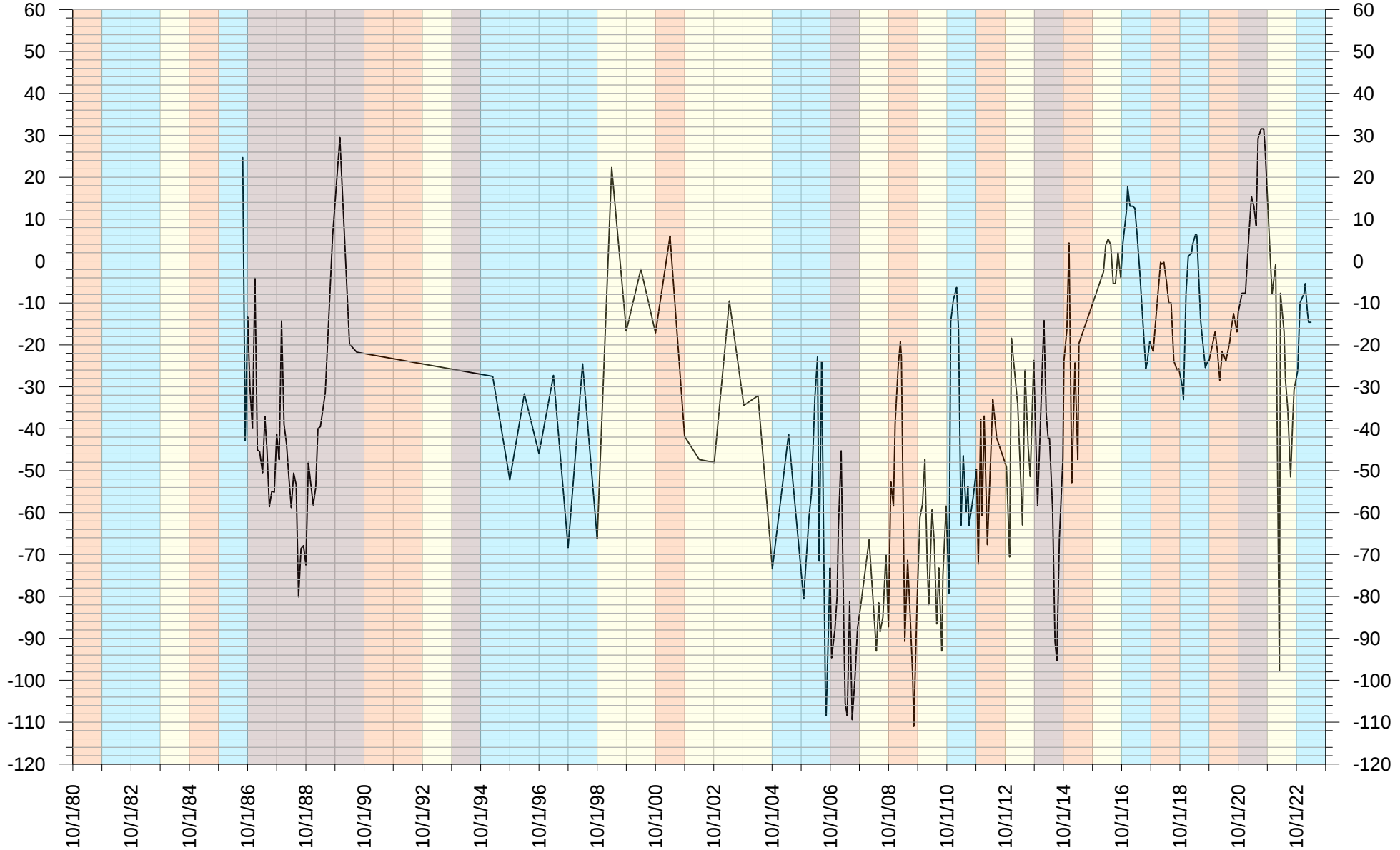
MONTGOMERY & ASSOCIATES

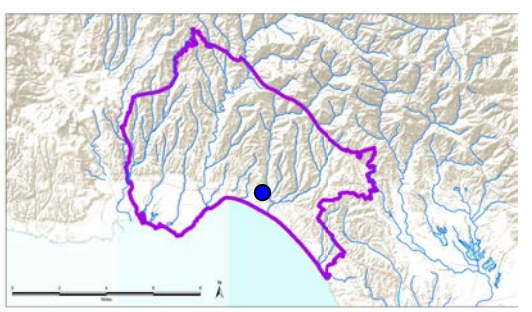
SC-17B at Ledyard

Aquifer Screened: Purisima BC

Appendix A

FIGURE A-117





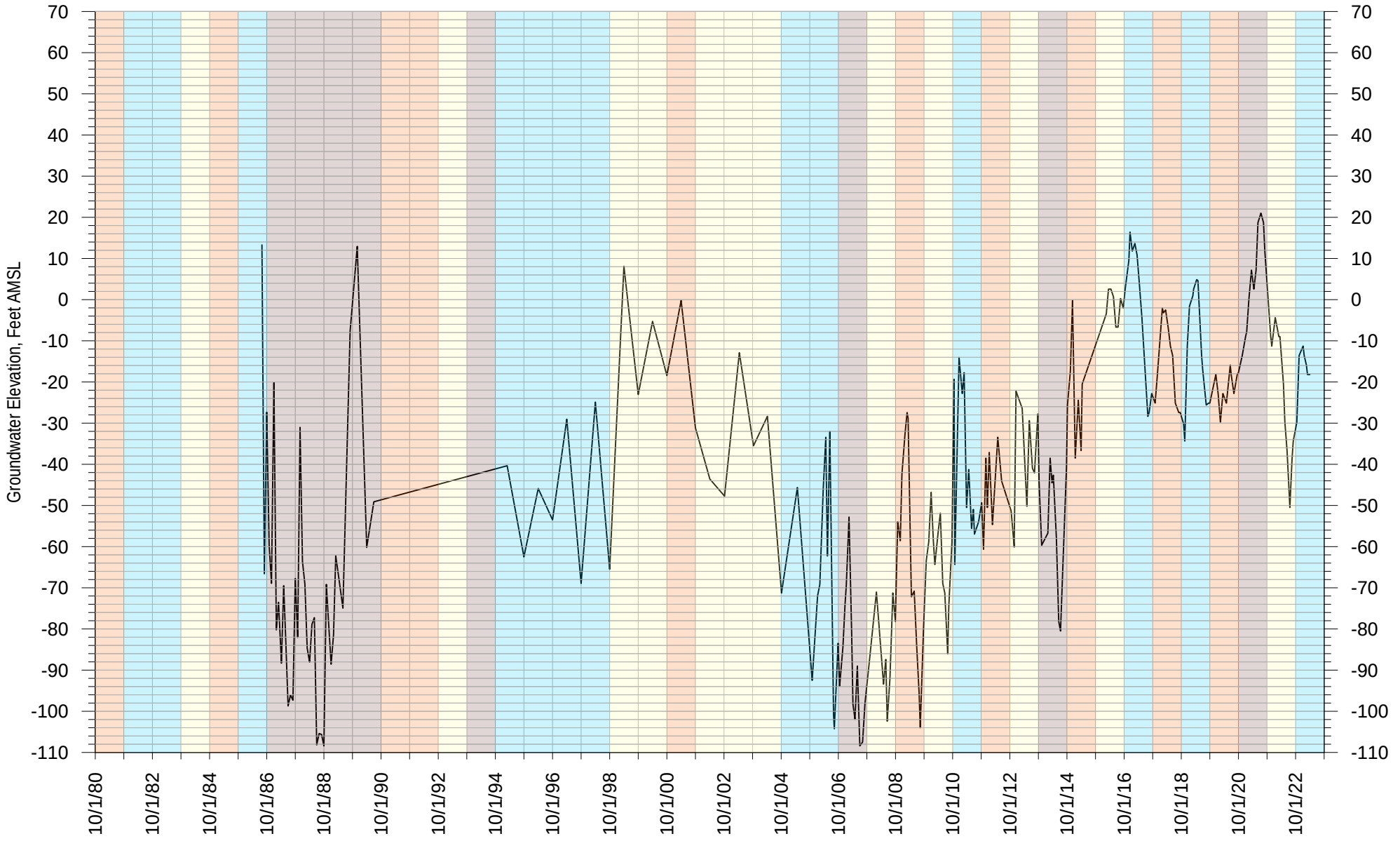
MONTGOMERY & ASSOCIATES

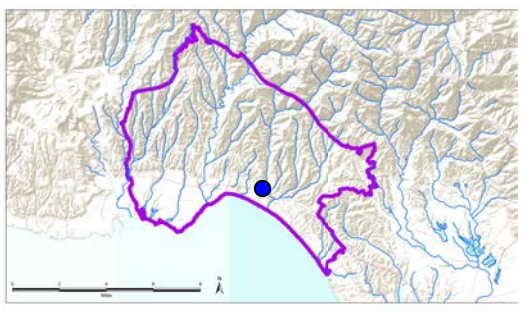
SC-17C at Ledyard

Aquifer Screened: Purisima DEF

Appendix A

FIGURE A-118





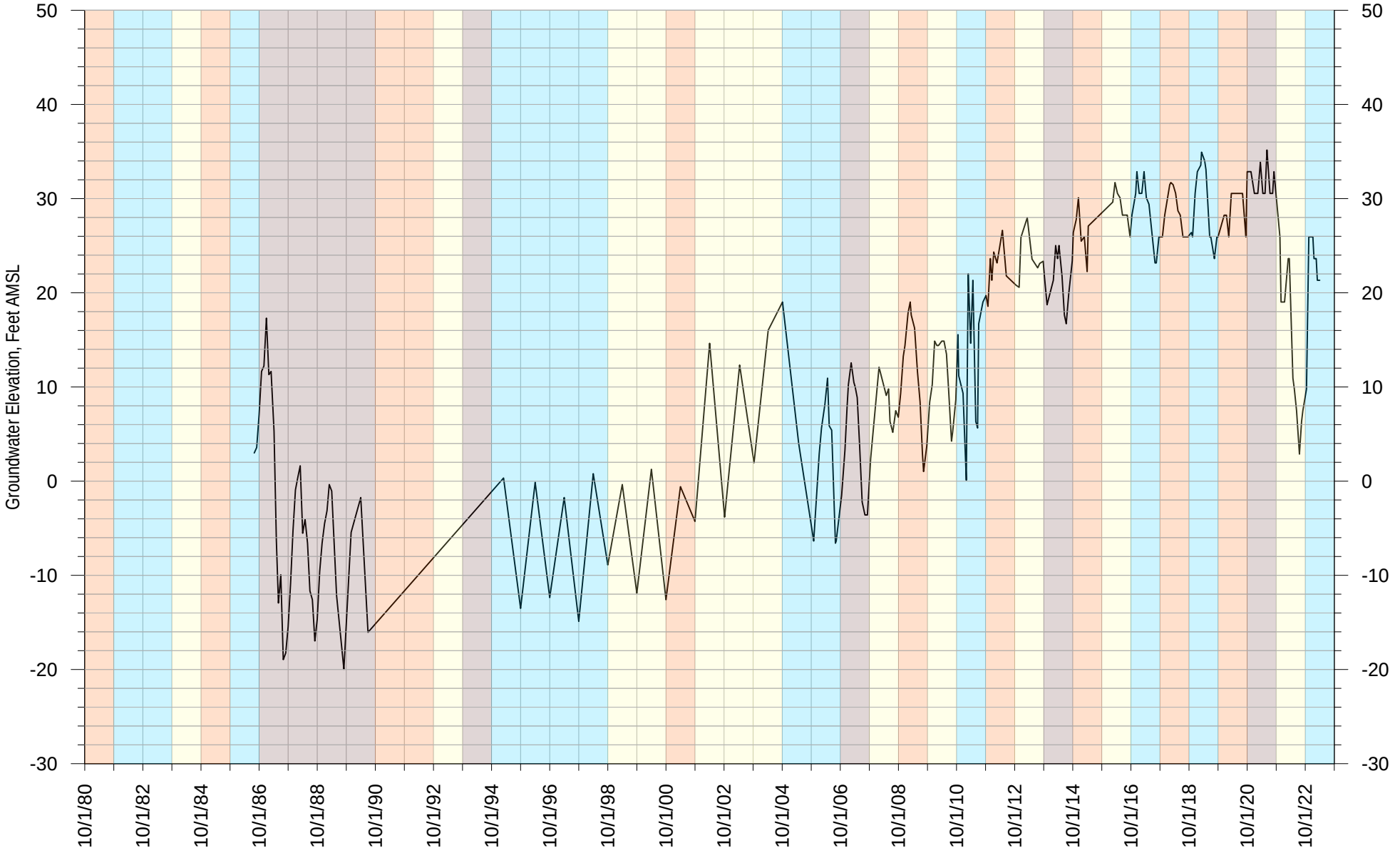
MONTGOMERY & ASSOCIATES

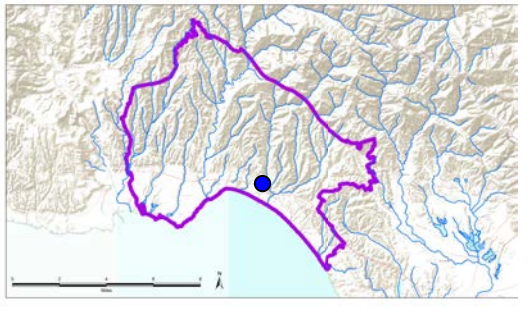
SC-17D at Ledyard

Aquifer Screened: Purisima DEF

Appendix A

FIGURE A-119



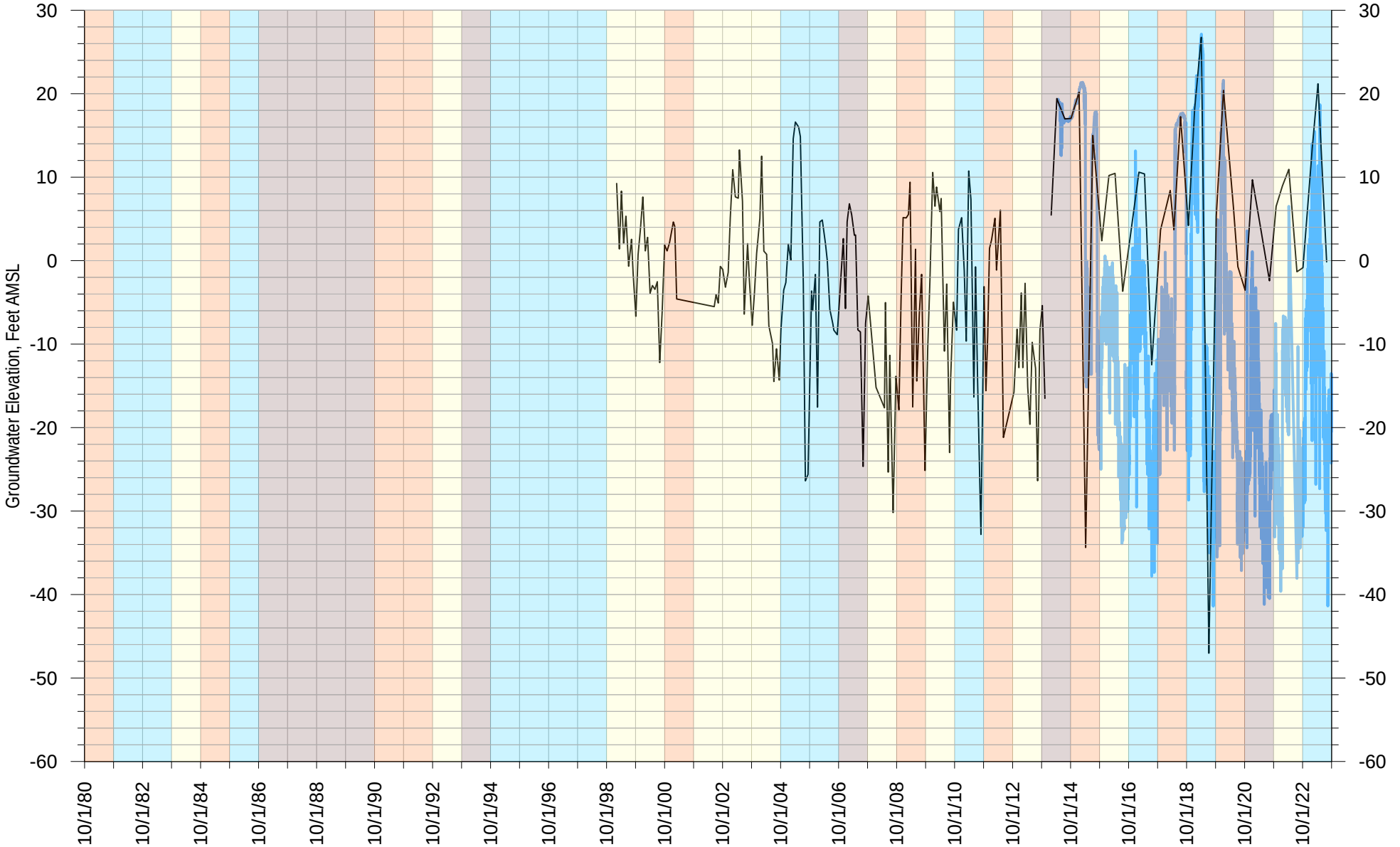


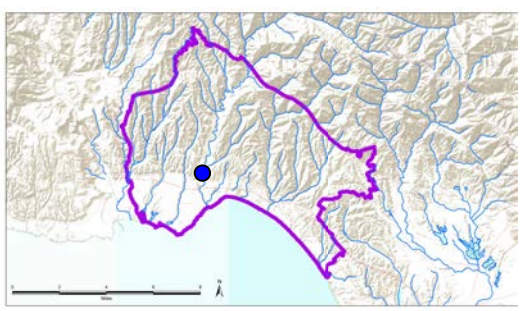
MONTGOMERY & ASSOCIATES

SC-18A & SC-18RA at Main Street
Aquifer Screened: Purisima AA

Appendix A

FIGURE A-120

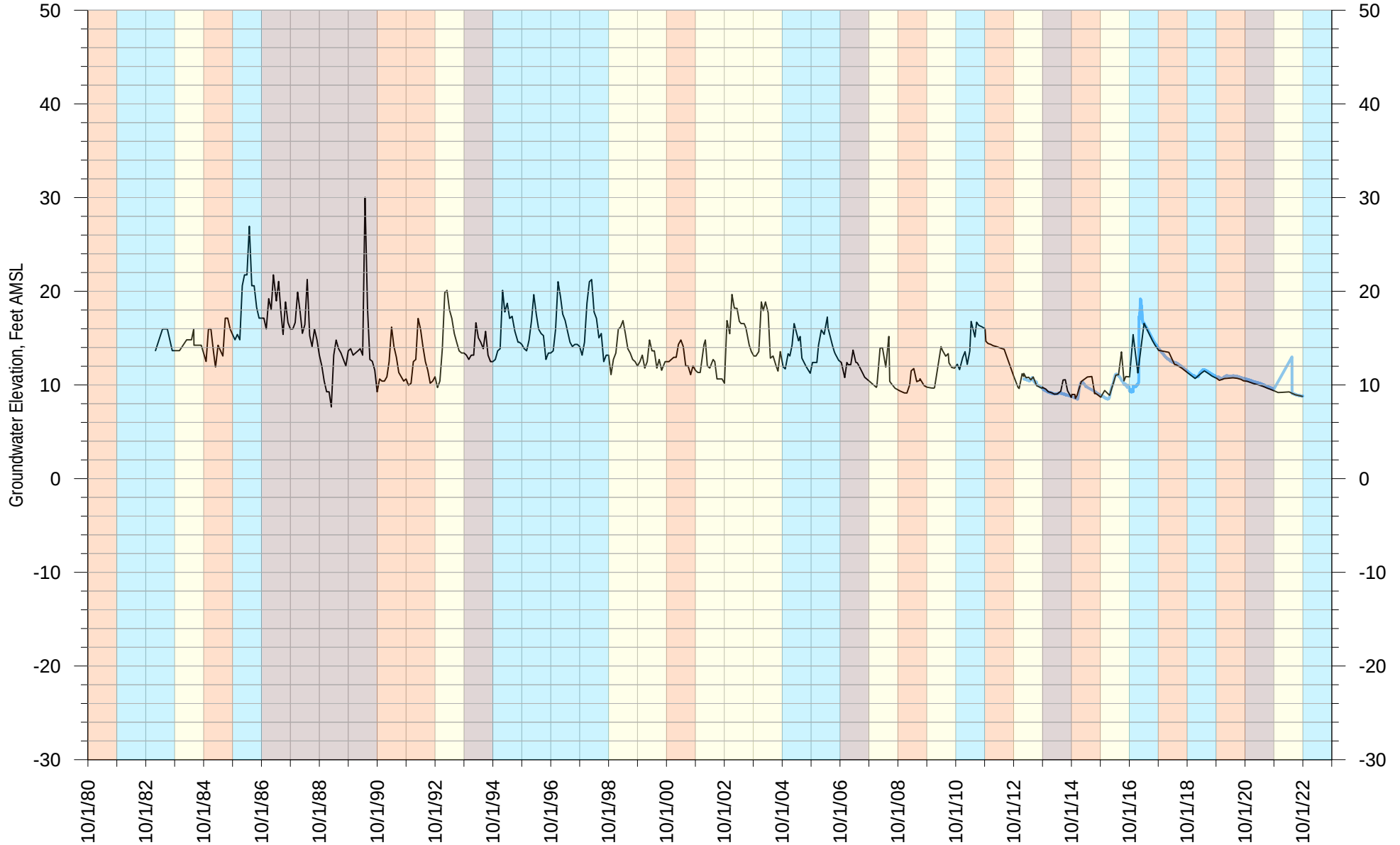


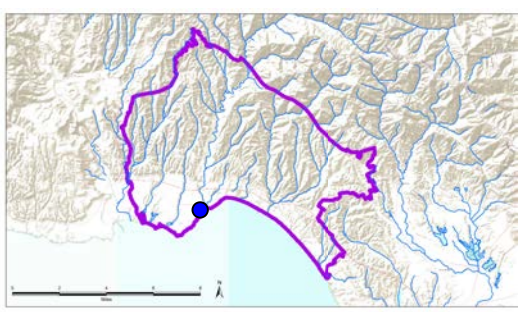


MONTGOMERY & ASSOCIATES

SC-1B at Prospect
Aquifer Screened: Purisima BC

Appendix A
FIGURE A-121



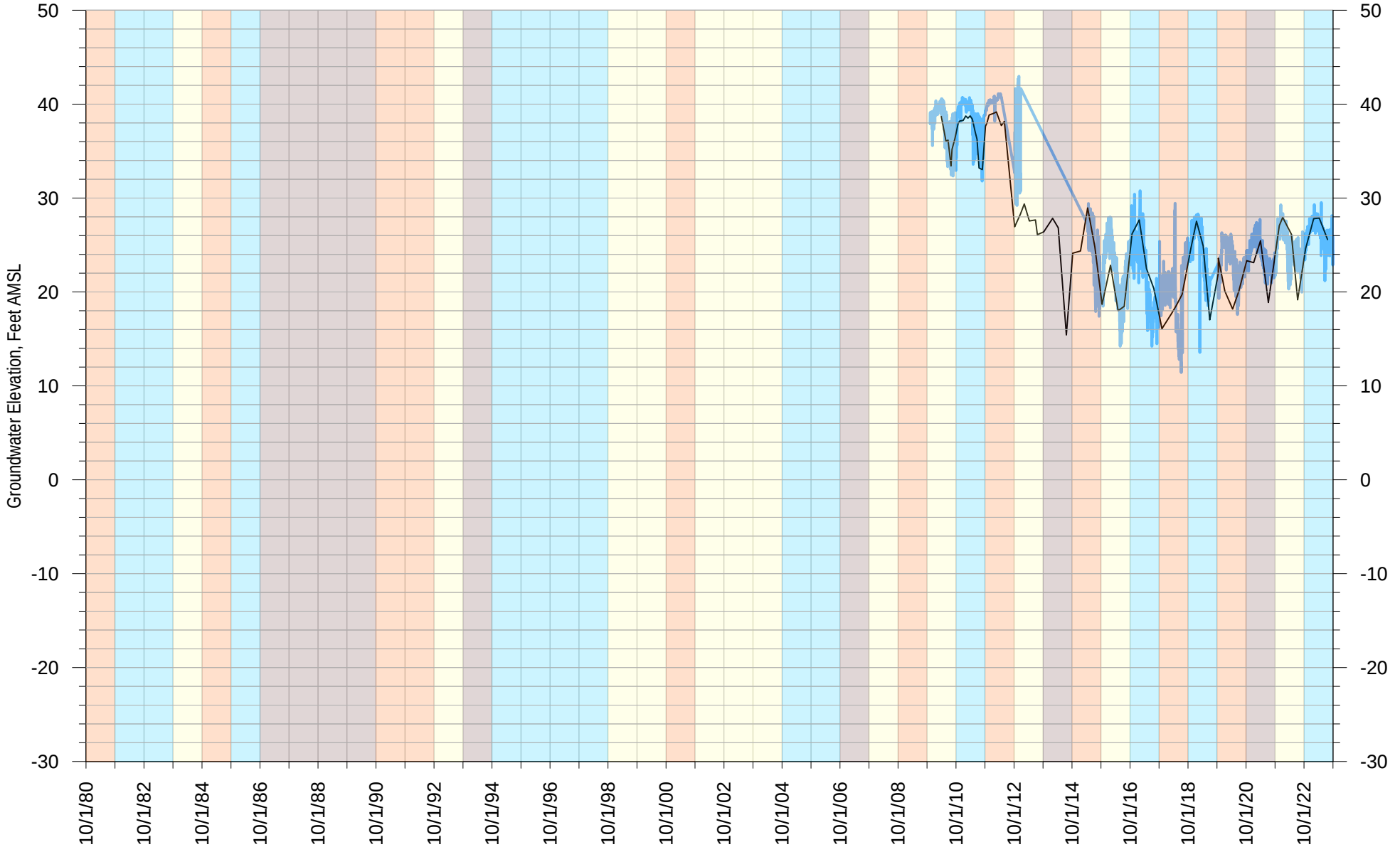


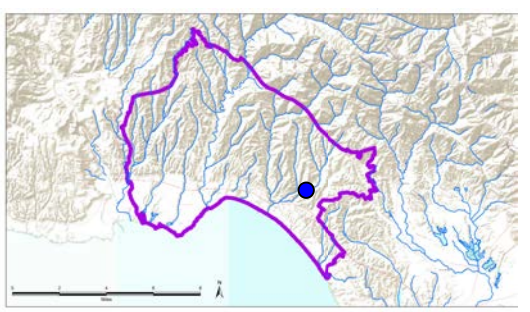
MONTGOMERY & ASSOCIATES

SC-20A at Polo Grounds
Aquifer Screened: Purisima F

Appendix A

FIGURE A-122

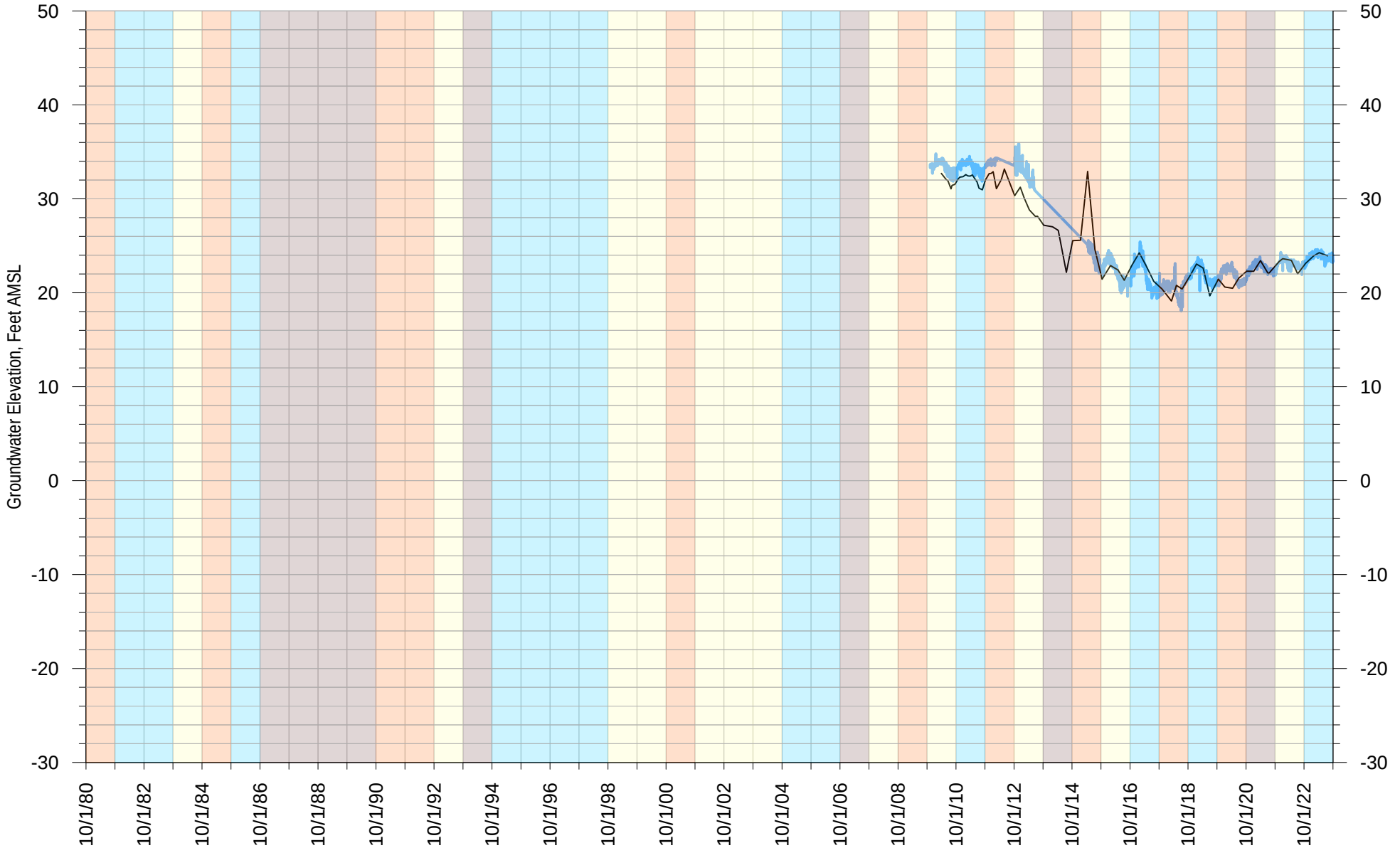


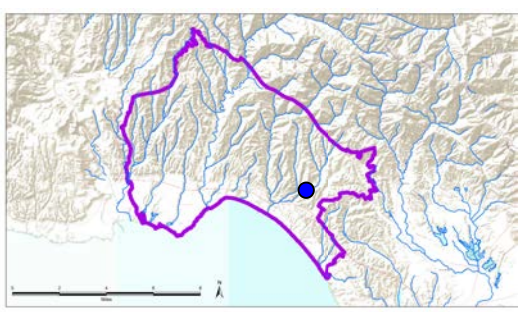


MONTGOMERY & ASSOCIATES

SC-20B at Polo Grounds
Aquifer Screened: Purisima F

Appendix A
FIGURE A-123





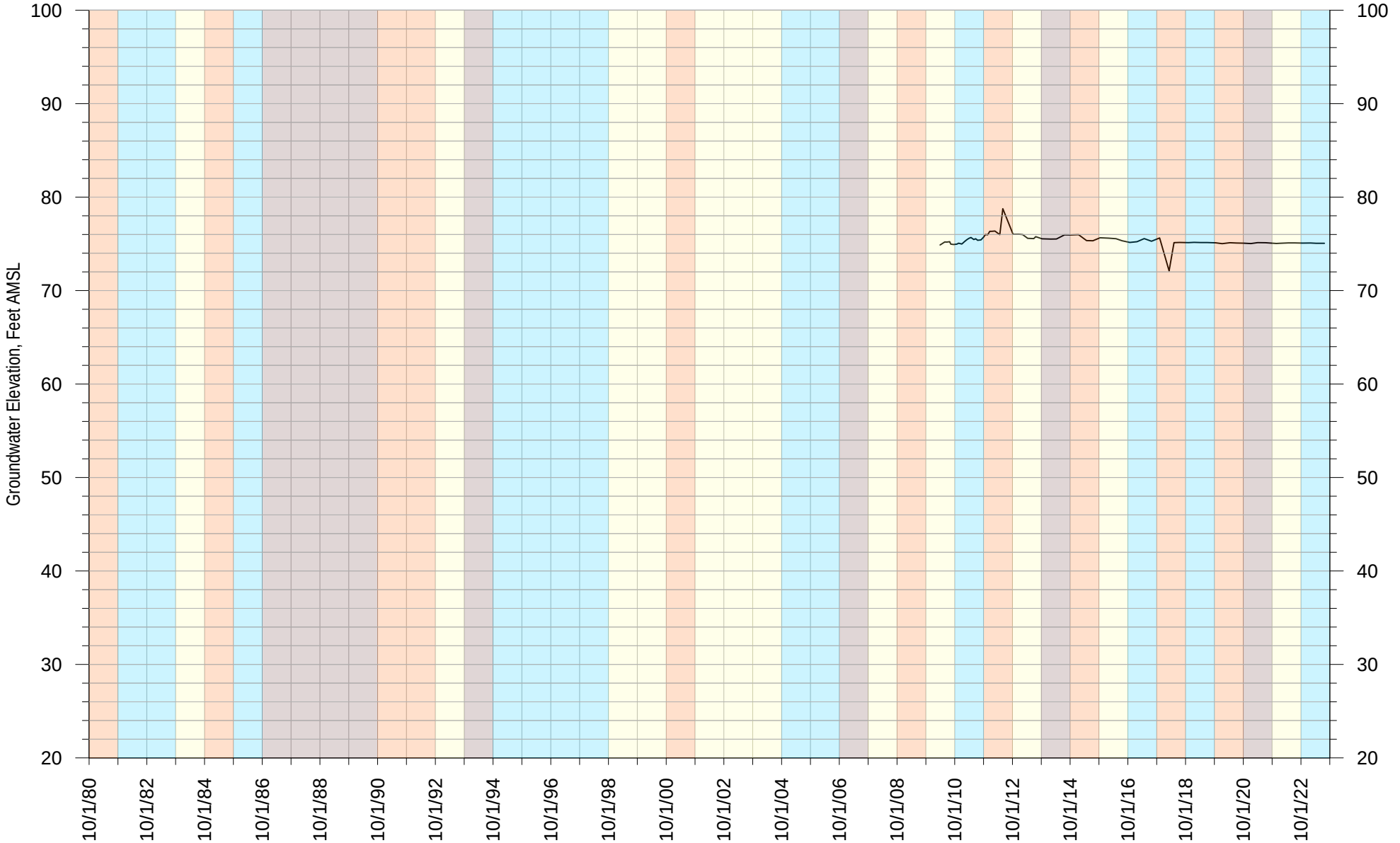
MONTGOMERY & ASSOCIATES

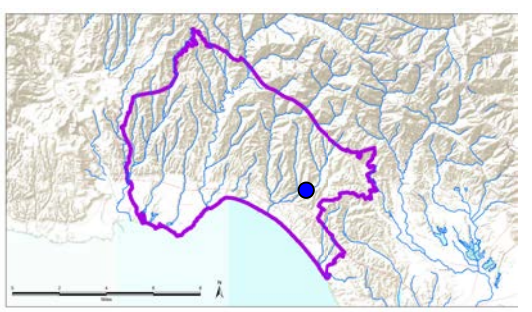
SC-20C at Polo Grounds

Aquifer Screened: Purisima F

Appendix A

FIGURE A-124





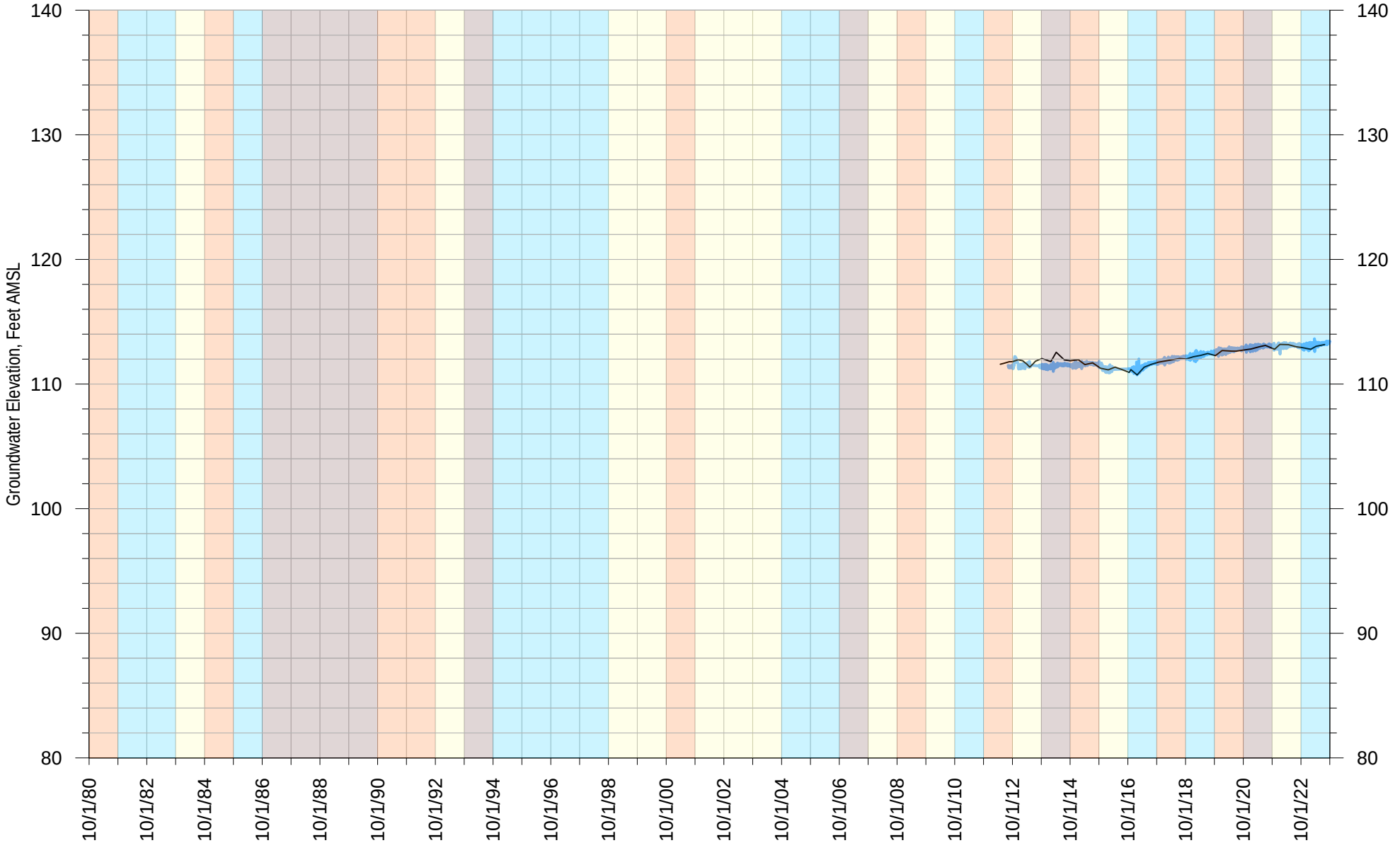
MONTGOMERY & ASSOCIATES

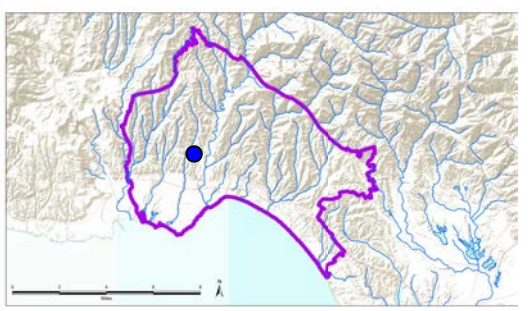
SC-21A at Cornwell

Aquifer Screened: Purisima A

Appendix A

FIGURE A-125





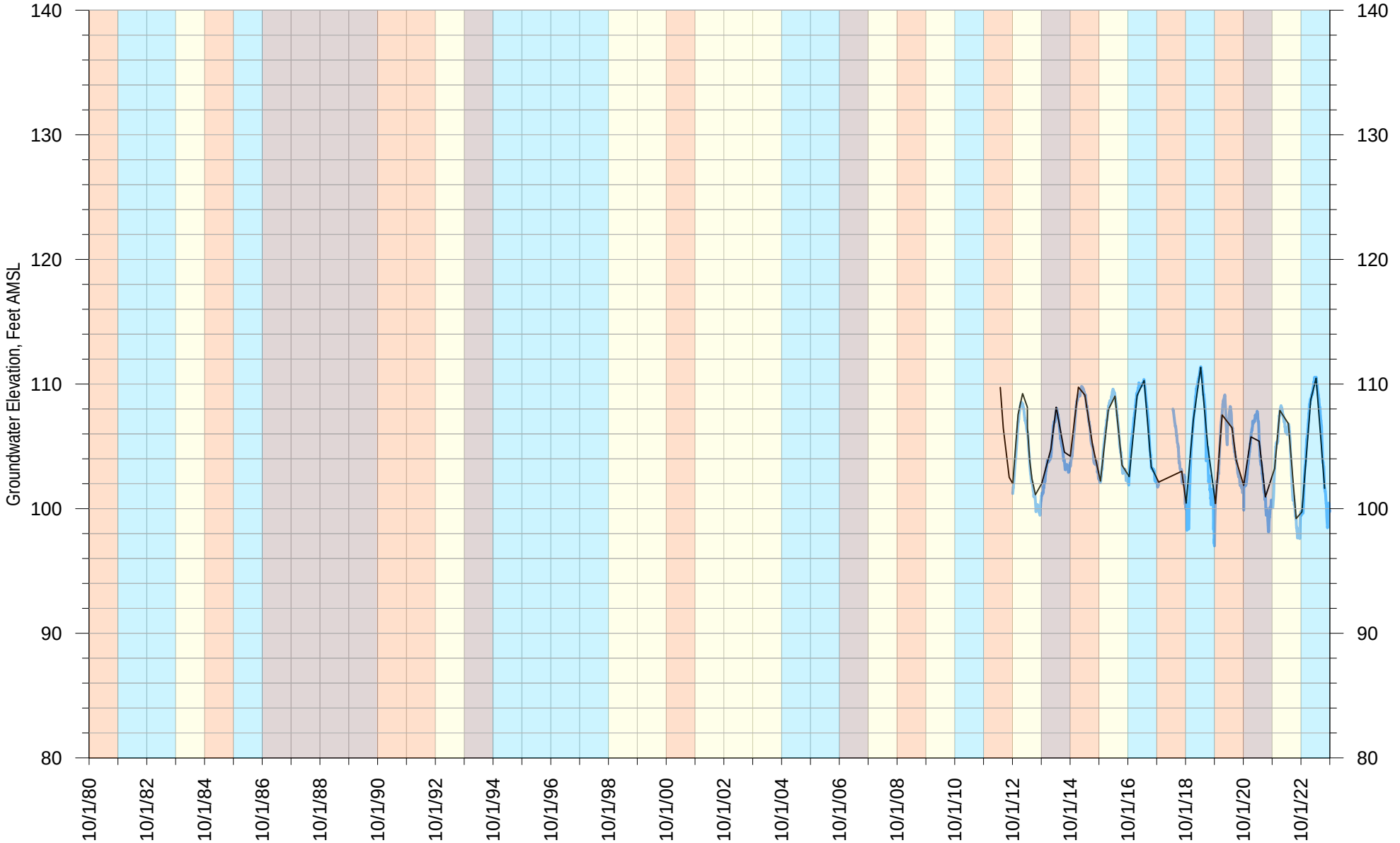
MONTGOMERY & ASSOCIATES

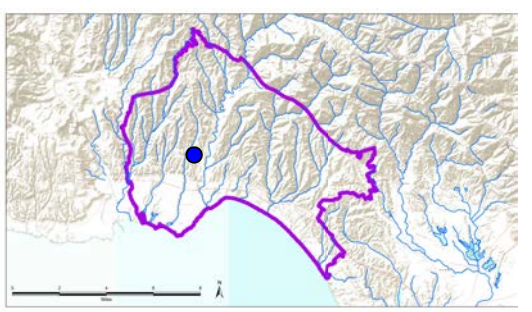
SC-21AA at Cornwell

Aquifer Screened: Purisima AA

Appendix A

FIGURE A-126





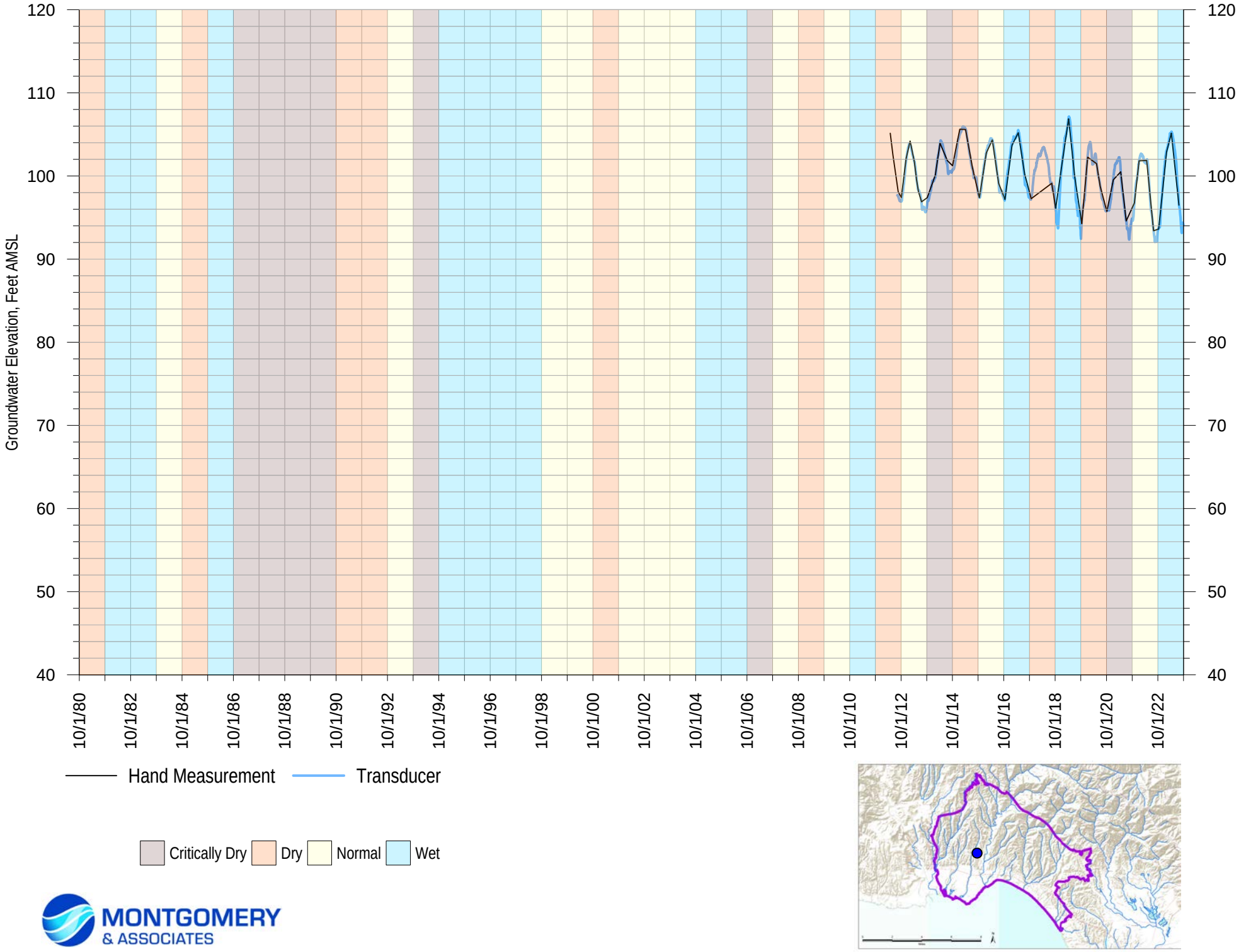
MONTGOMERY & ASSOCIATES

SC-21AAA at Cornwell

Aquifer Screened: Purisima AA

Appendix A

FIGURE A-127

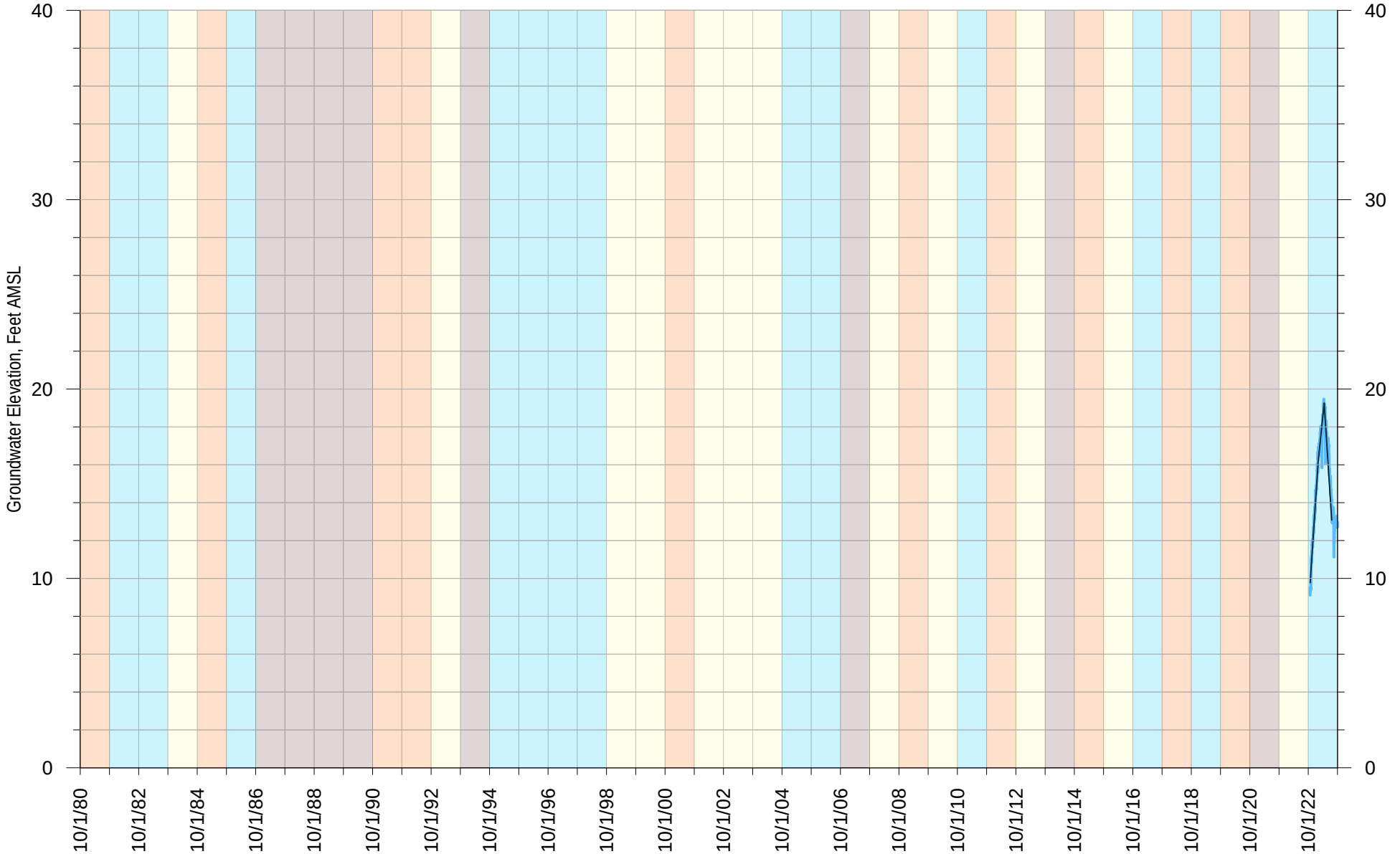


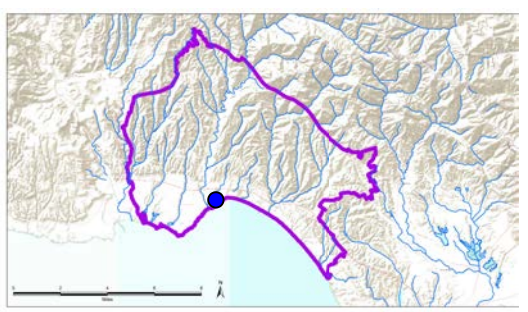
MONTGOMERY & ASSOCIATES

SC-3AA at Escalona
Aquifer Screened: Purisima AA

Appendix A

FIGURE A-128

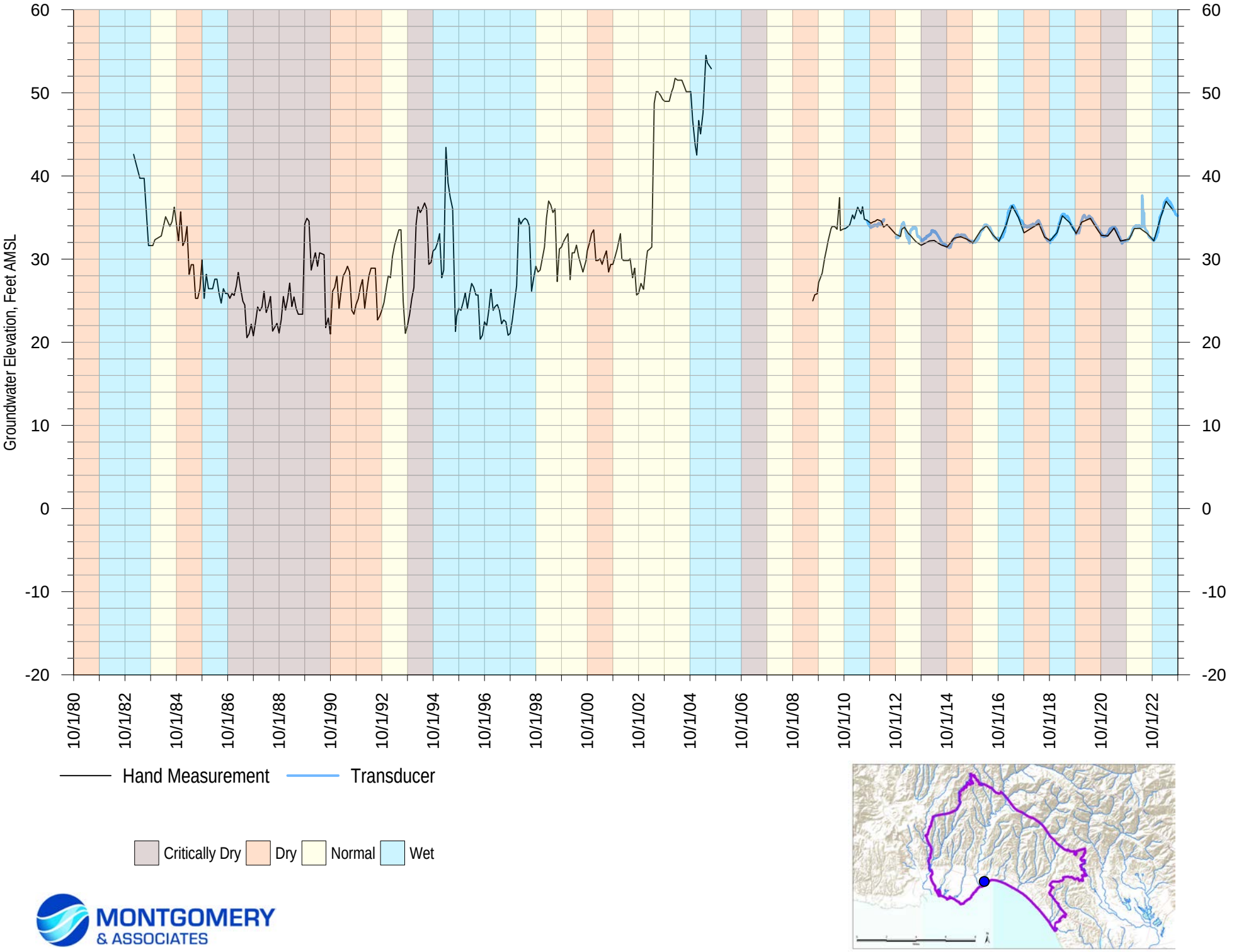




MONTGOMERY & ASSOCIATES

SC-3B & SC-3RB at Escalona
Aquifer Screened: Purisima B

Appendix A
FIGURE A-129

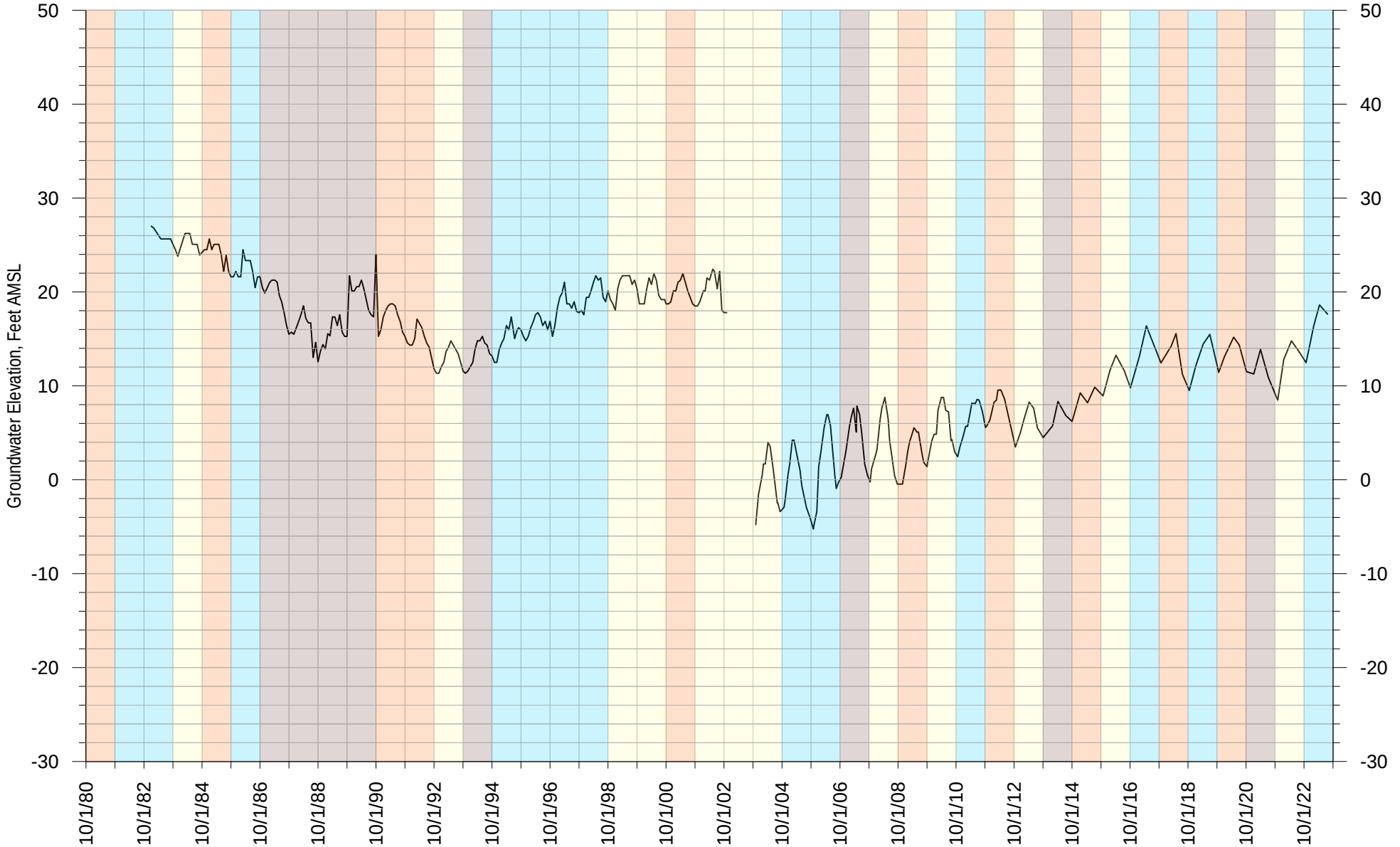


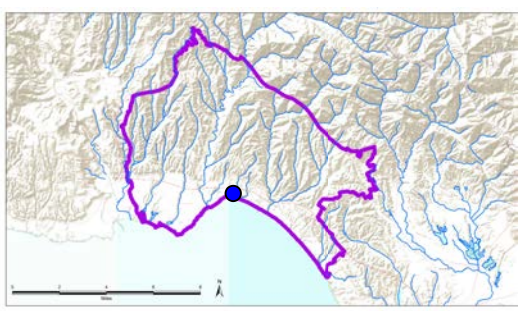
MONTGOMERY & ASSOCIATES

SC-5B & SC-5RB at New Brighton
Aquifer Screened: Purisima B

Appendix A

FIGURE A-130



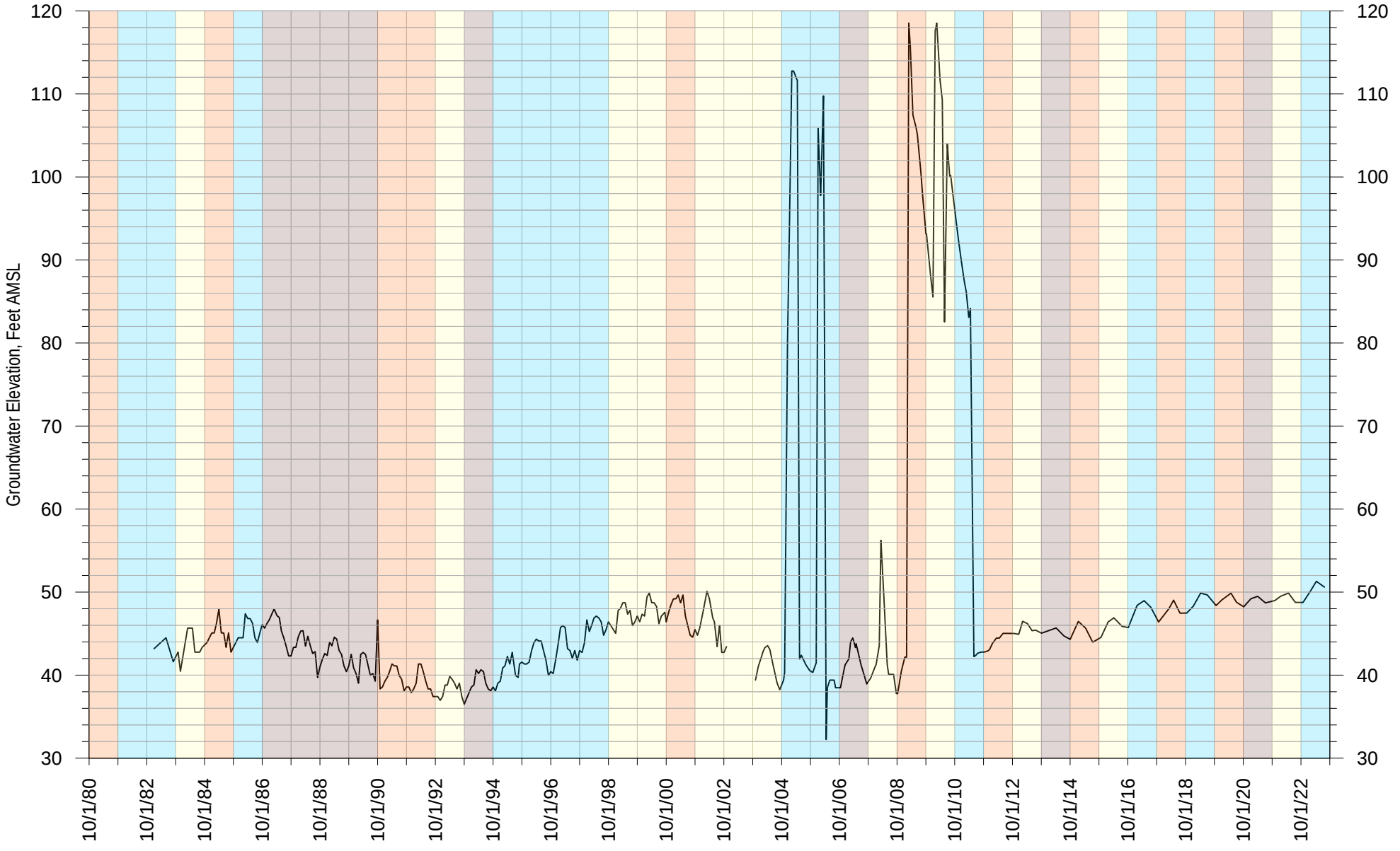


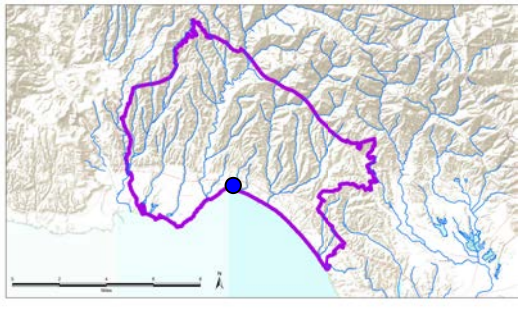
MONTGOMERY & ASSOCIATES

SC-5C & SC-5RC at New Brighton
Aquifer Screened: Purisima BC

Appendix A

FIGURE A-131

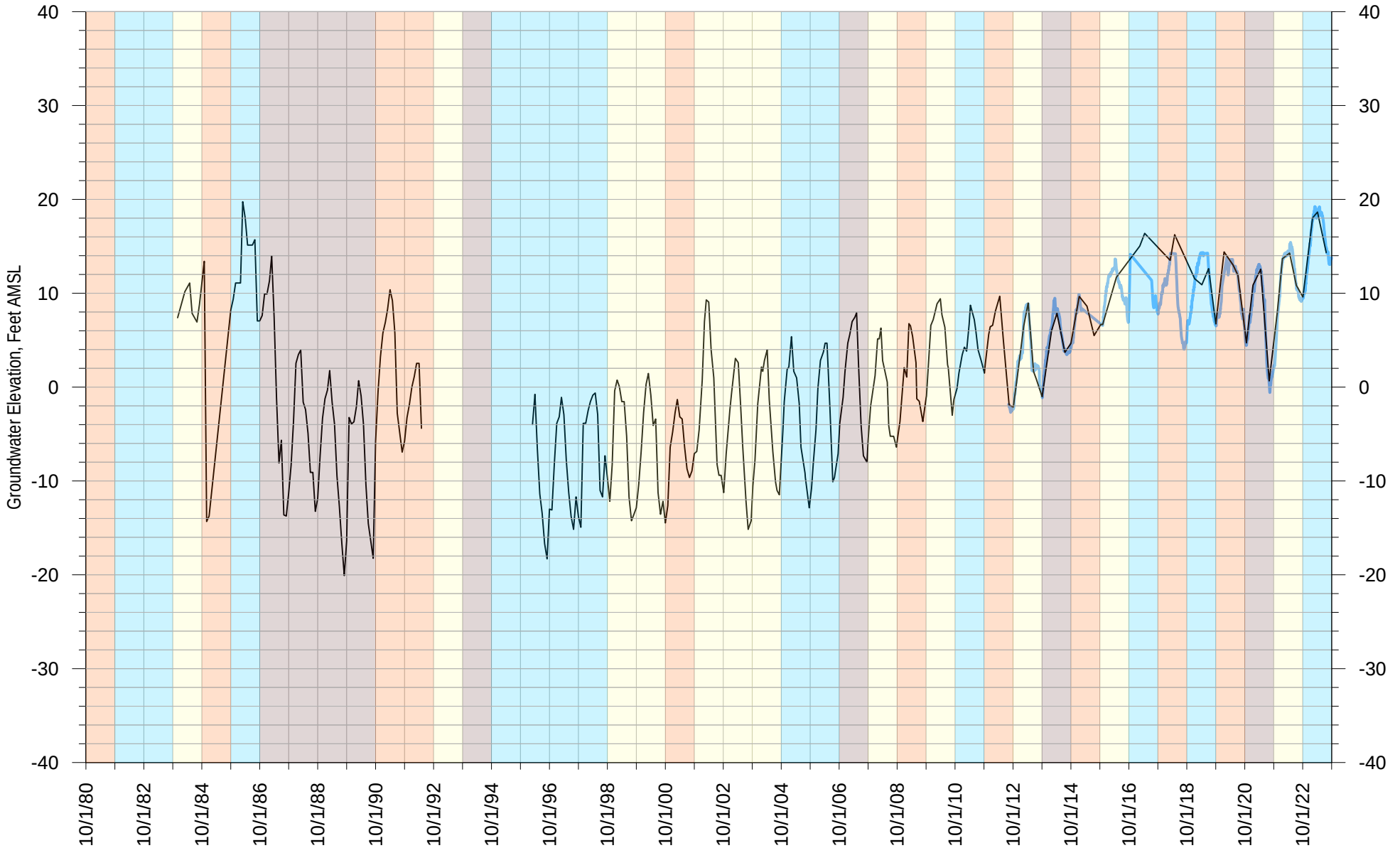


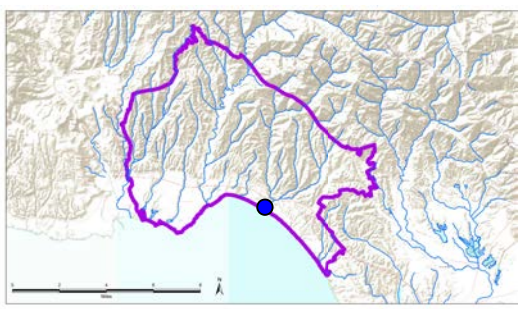


MONTGOMERY & ASSOCIATES

SC-8A & SC-8RA at Aptos Creek
Aquifer Screened: Purisima A

Appendix A
FIGURE A-132



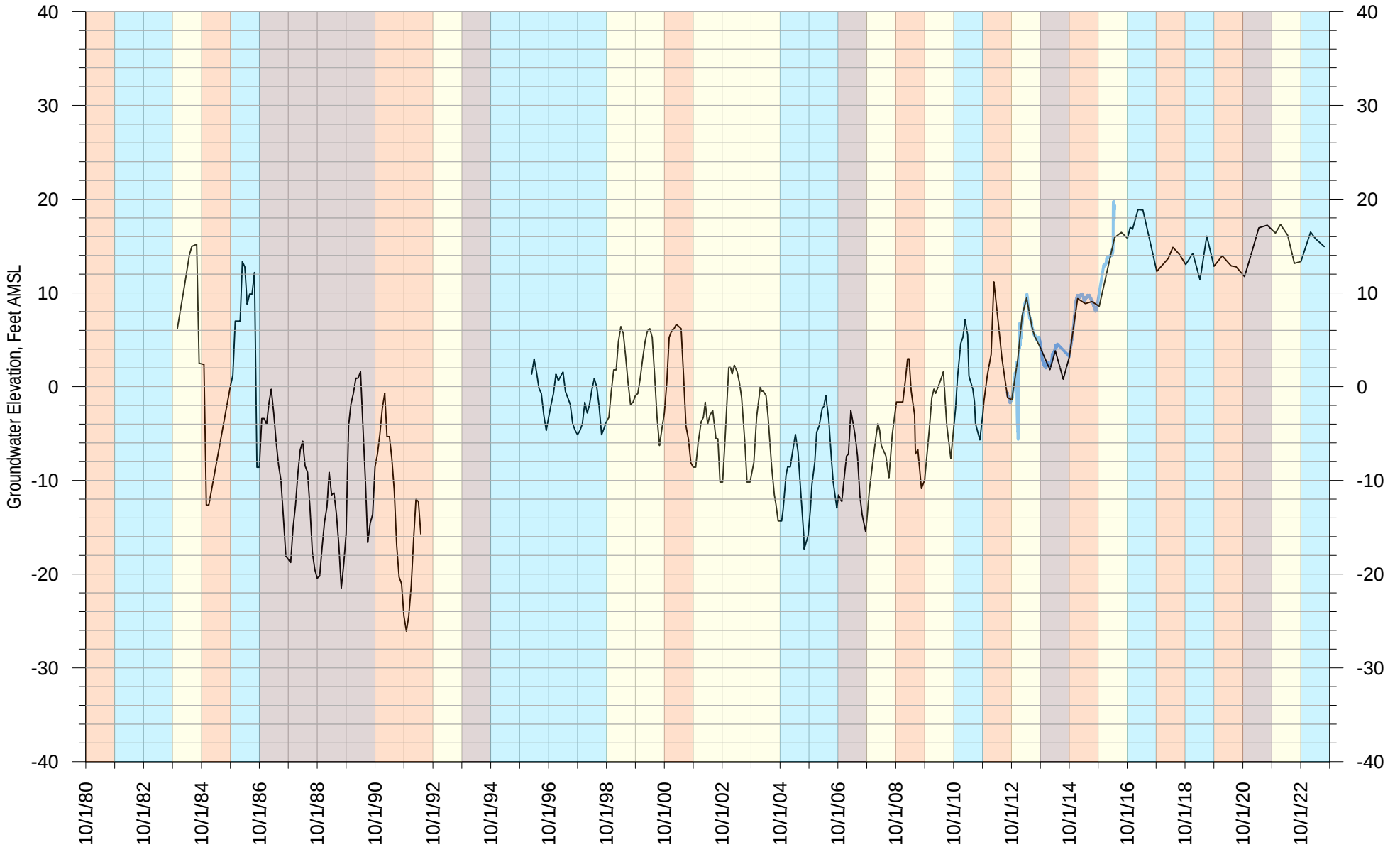


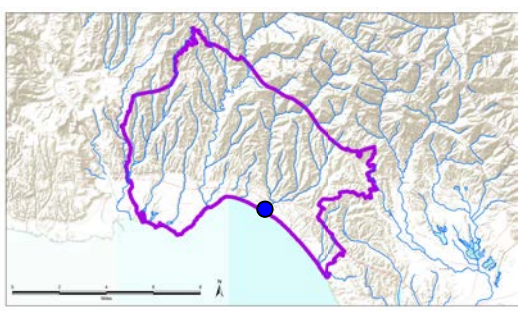
MONTGOMERY & ASSOCIATES

SC-8C & SC-8RC at Aptos Creek
Aquifer Screened: Purisima BC

Appendix A

FIGURE A-133



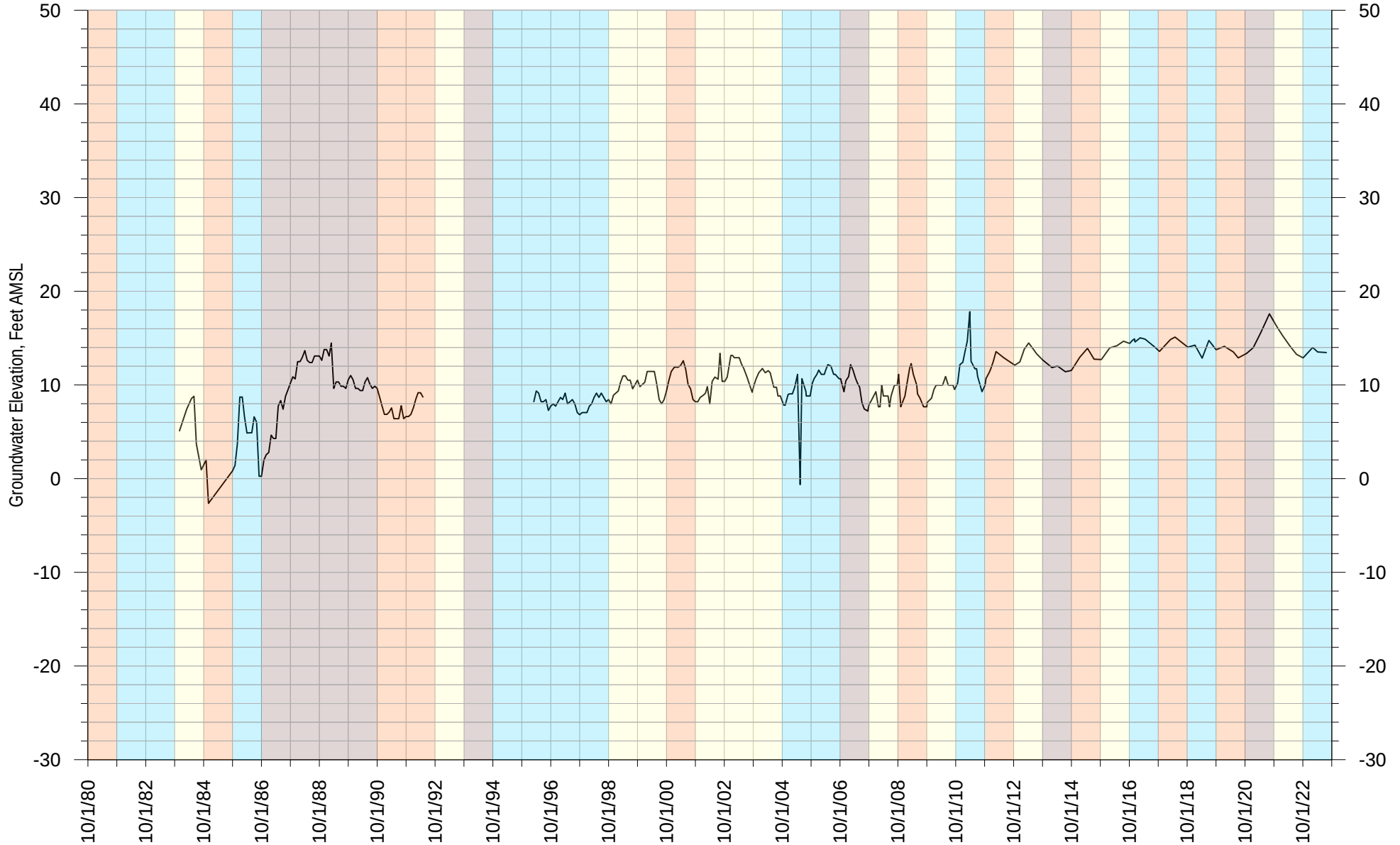


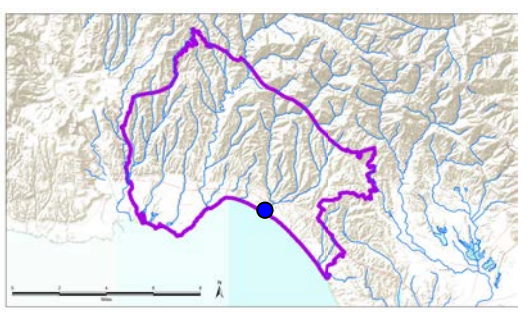
MONTGOMERY & ASSOCIATES

SC-8E & SC-8RE at Aptos Creek
Aquifer Screened: Purisima DEF

Appendix A

FIGURE A-134



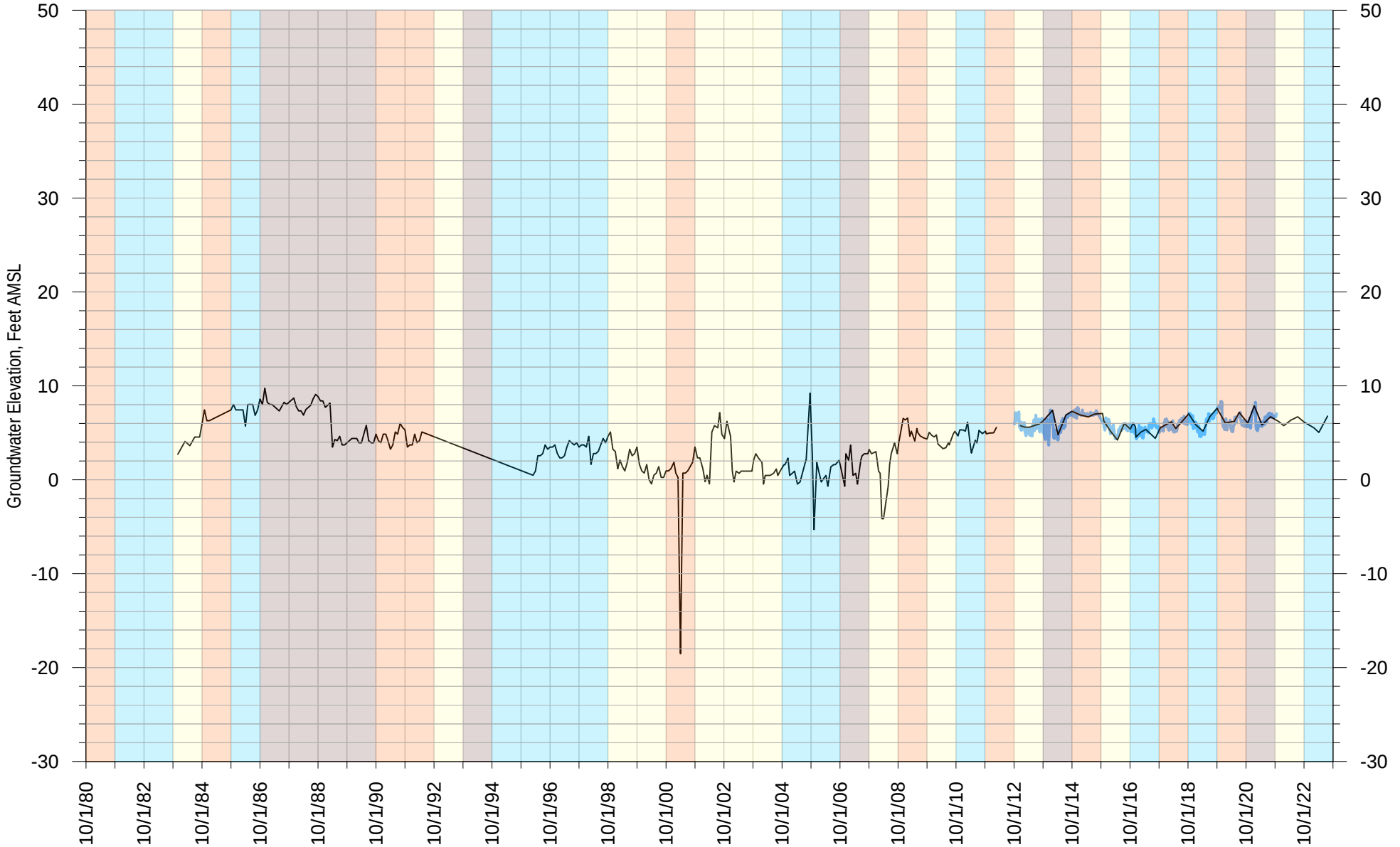


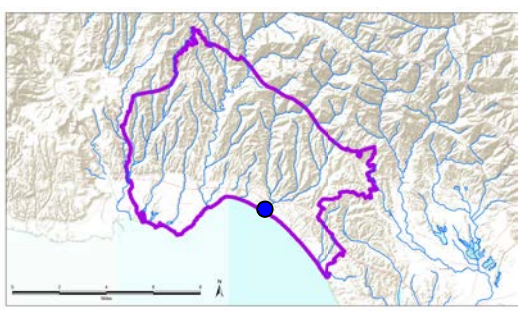
MONTGOMERY & ASSOCIATES

SC-8F & SC-8RF at Aptos Creek
Aquifer Screened: Purisima F

Appendix A

FIGURE A-135

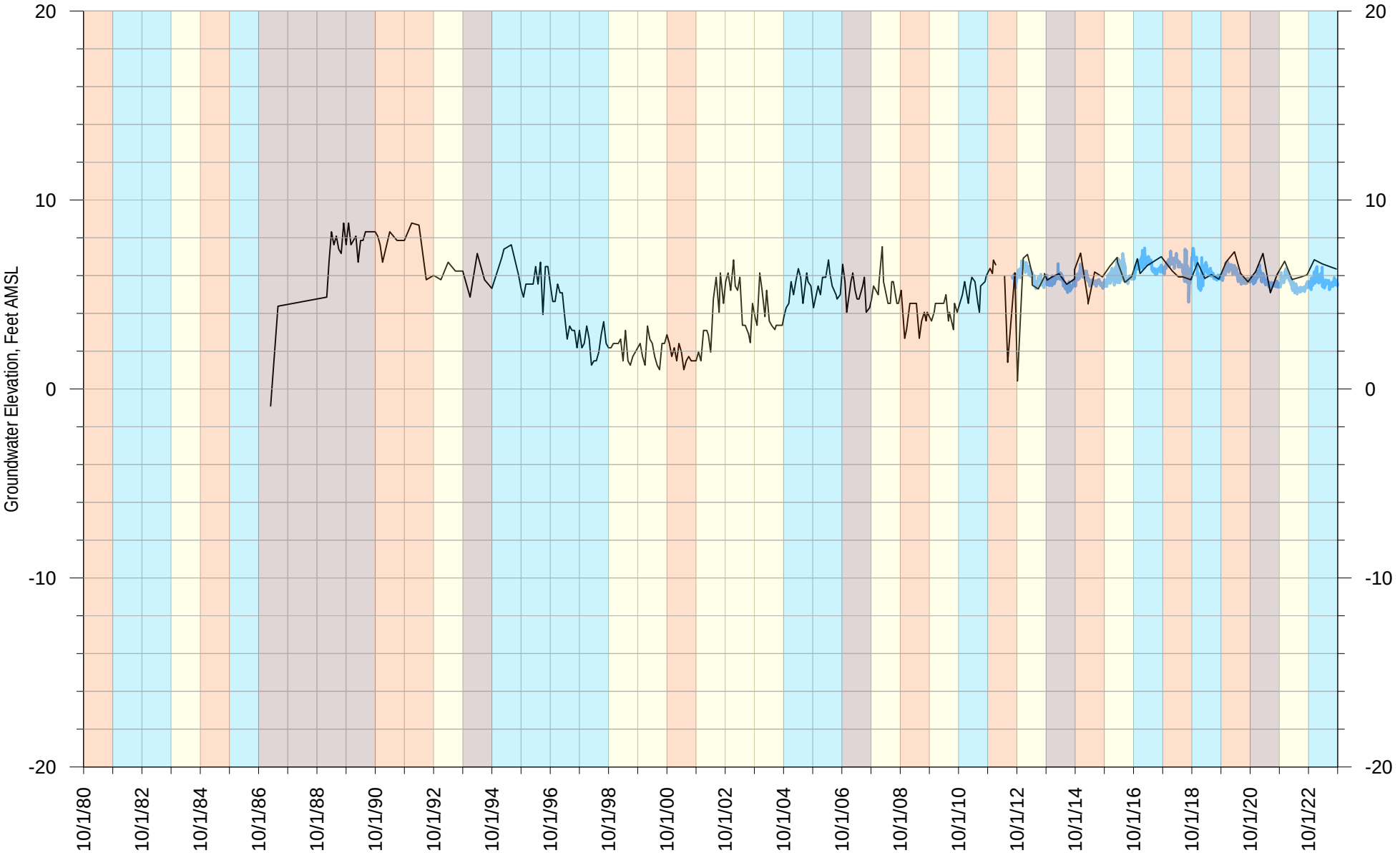


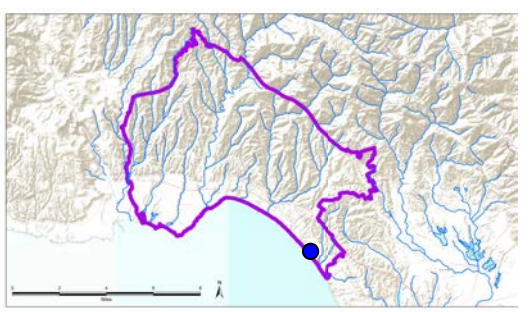


MONTGOMERY & ASSOCIATES

SC-A2B & SC-A2RB at Sumner
Aquifer Screened: Purisima F

Appendix A
FIGURE A-136



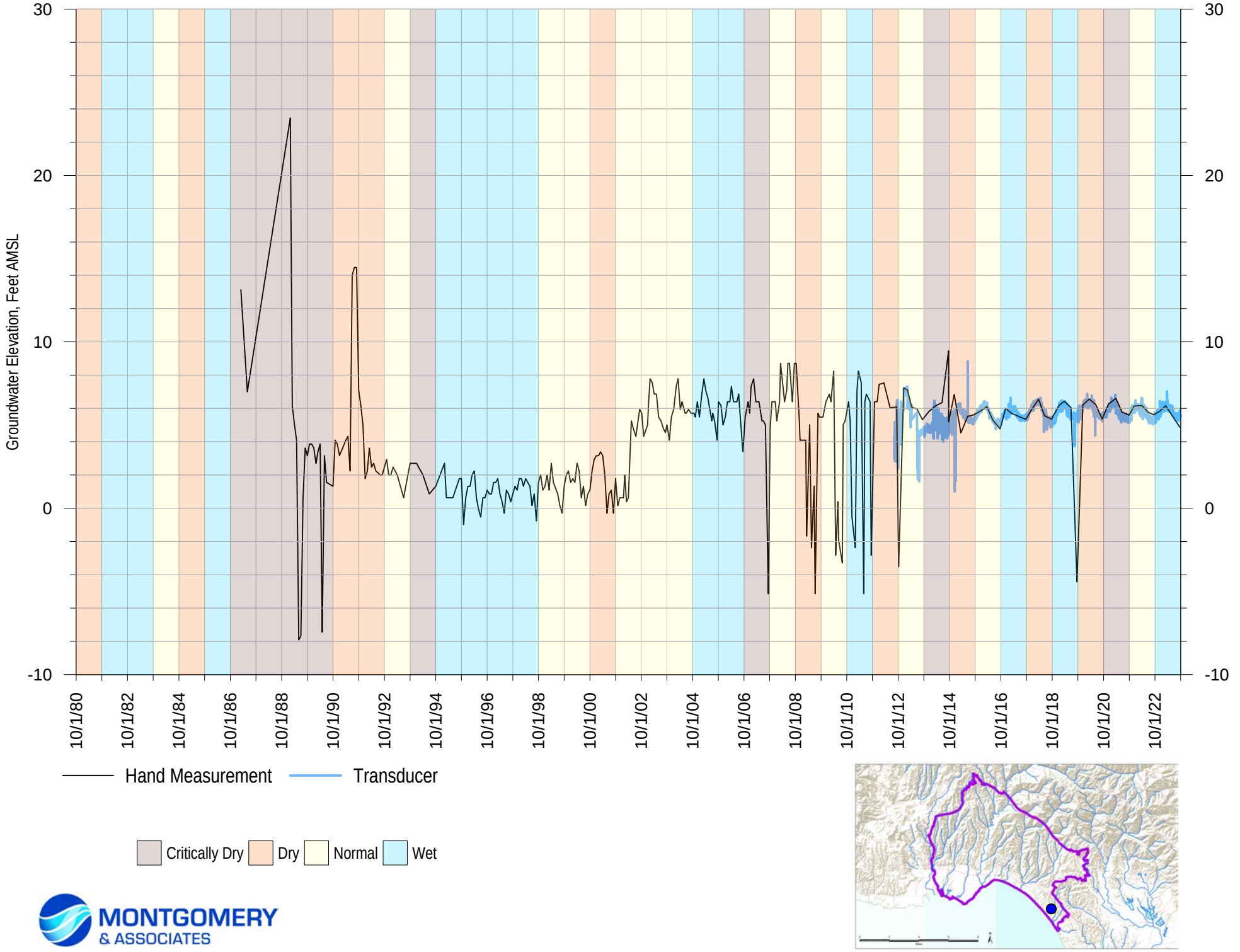


MONTGOMERY & ASSOCIATES

SC-A5C at Seascape
Aquifer Screened: Aromas

Appendix A

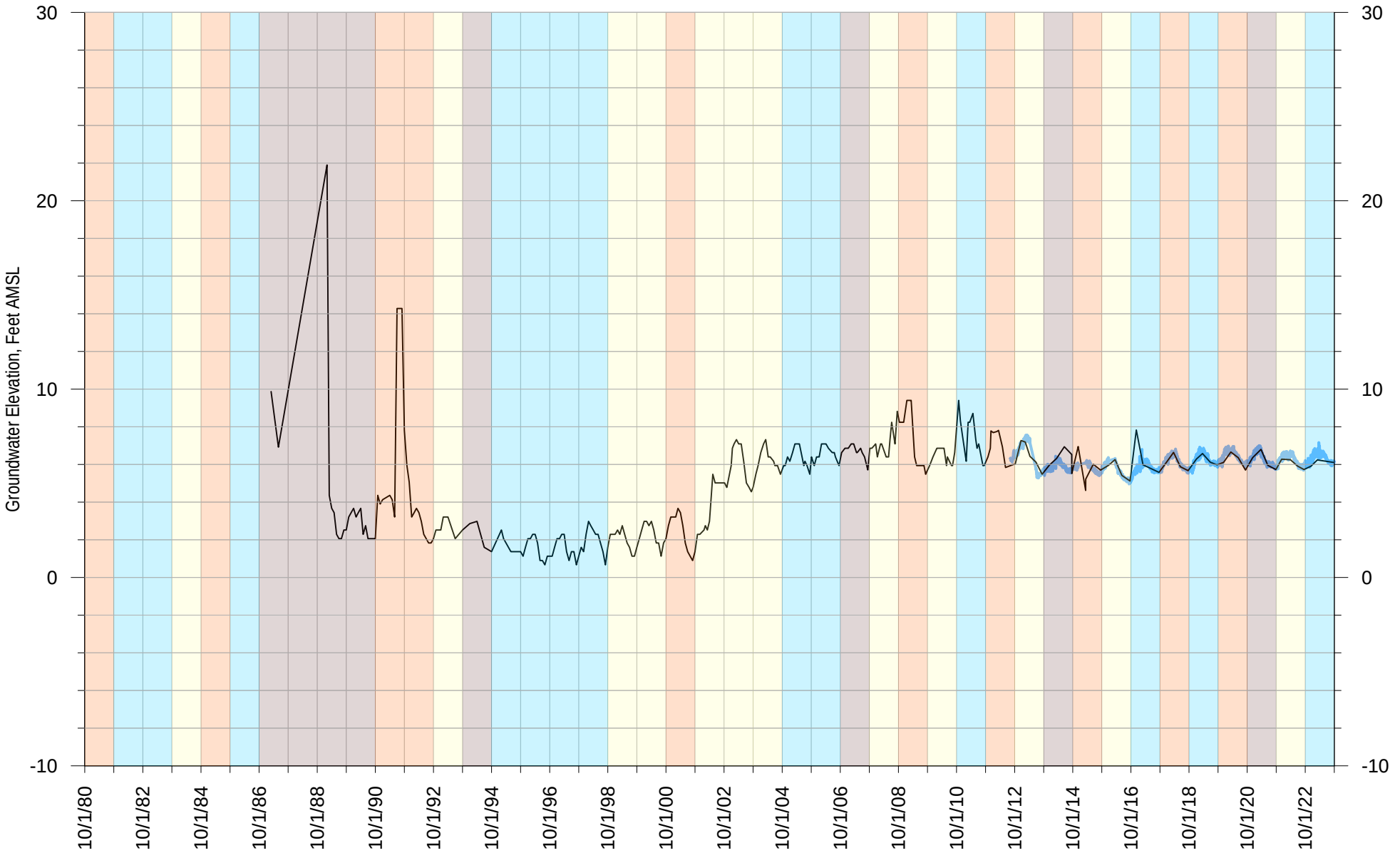
FIGURE A-137

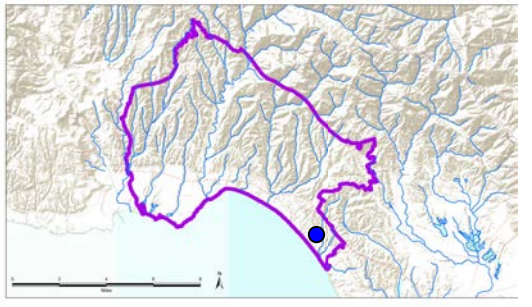


MONTGOMERY & ASSOCIATES

SC-A5D at Seascape
Aquifer Screened: Aromas

Appendix A
FIGURE A-138

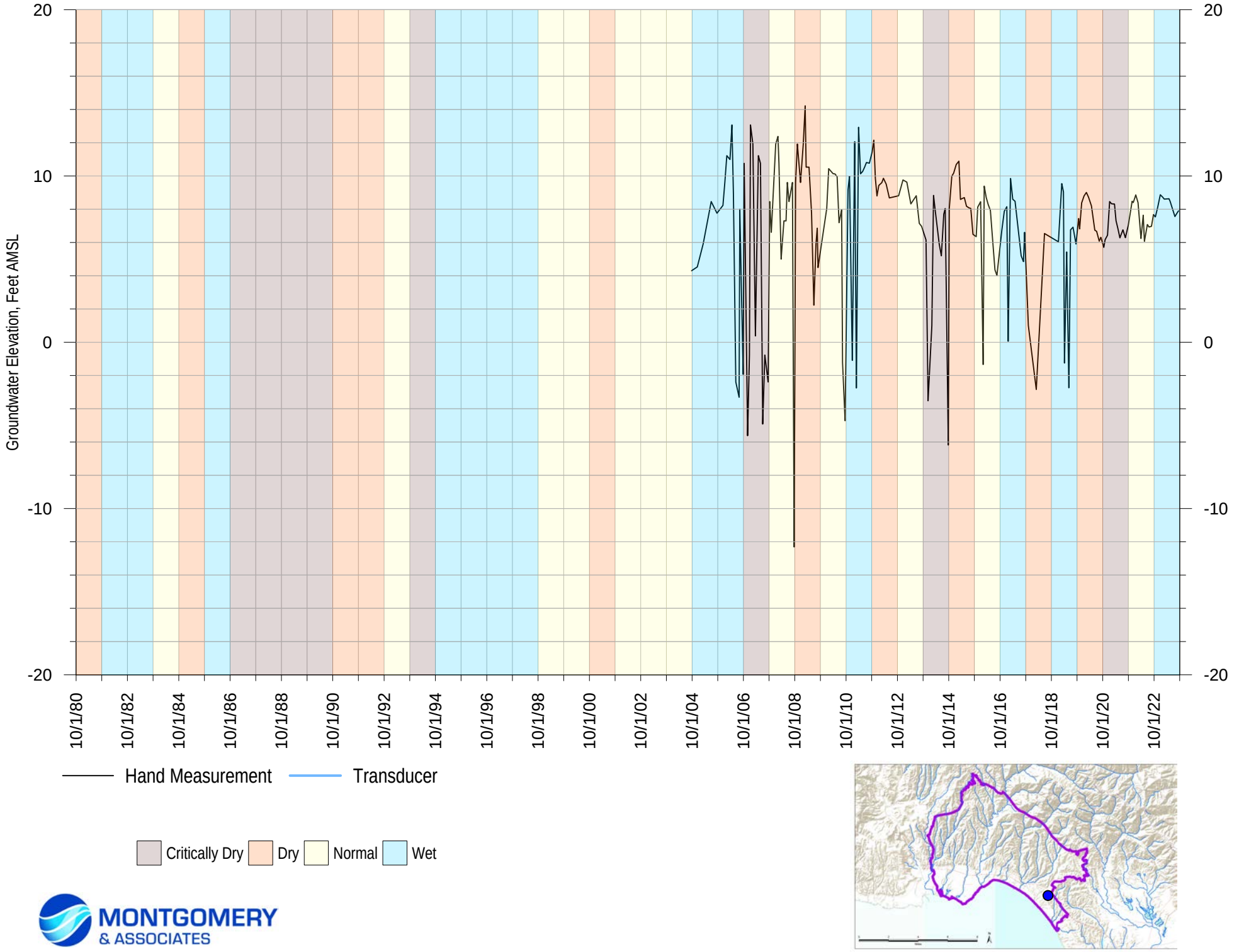




MONTGOMERY & ASSOCIATES

SC-A6A at Bonita
Aquifer Screened: Purisima F

Appendix A
FIGURE A-139



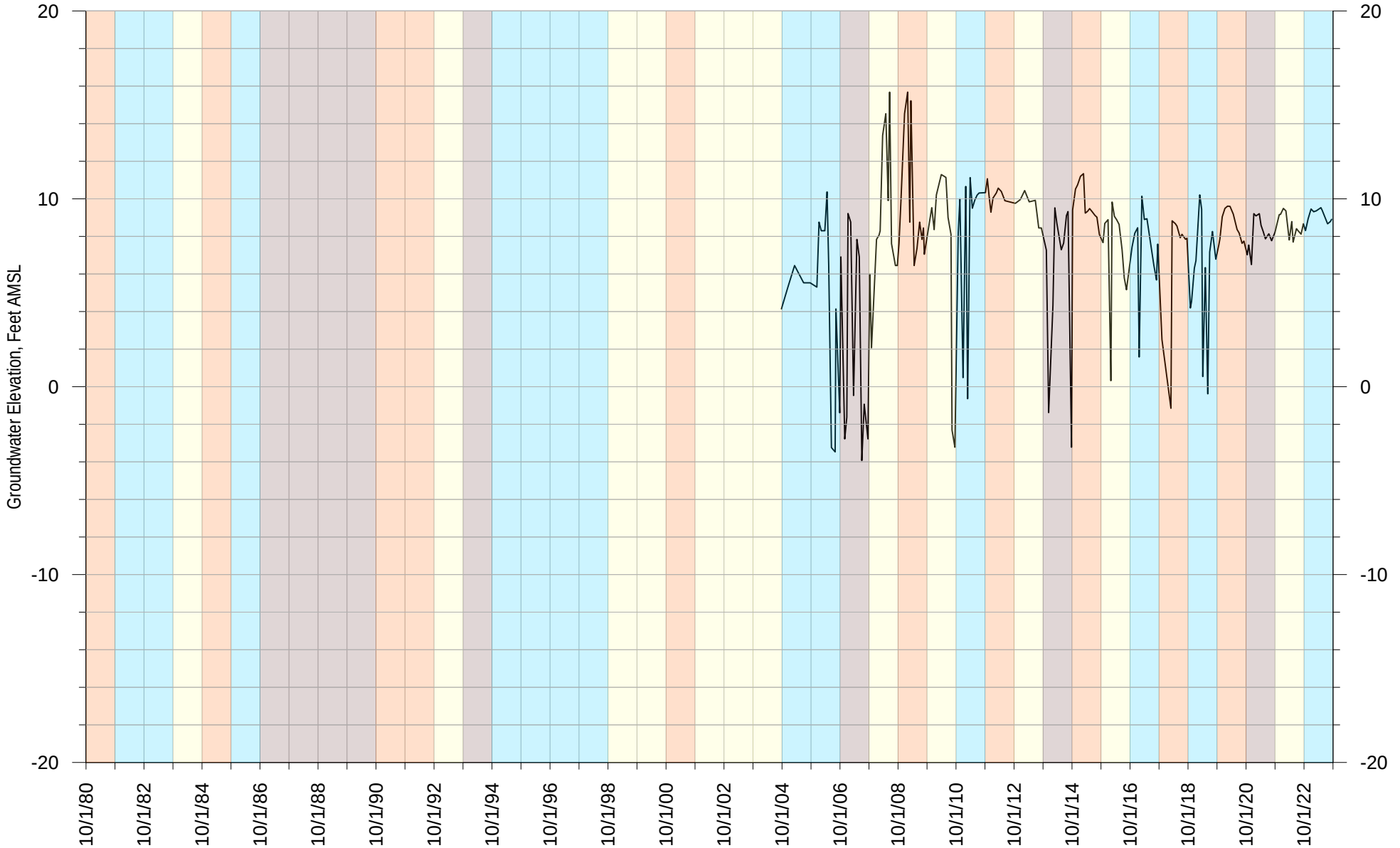
MONTGOMERY & ASSOCIATES

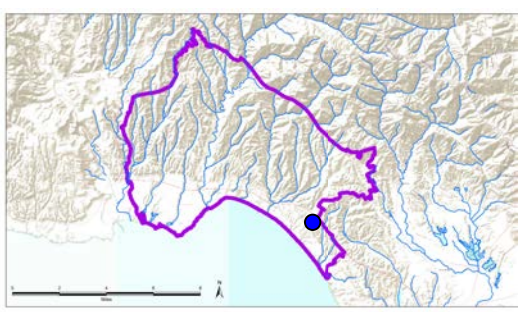
SC-A6B at Bonita

Aquifer Screened: Purisima F

Appendix A

FIGURE A-140





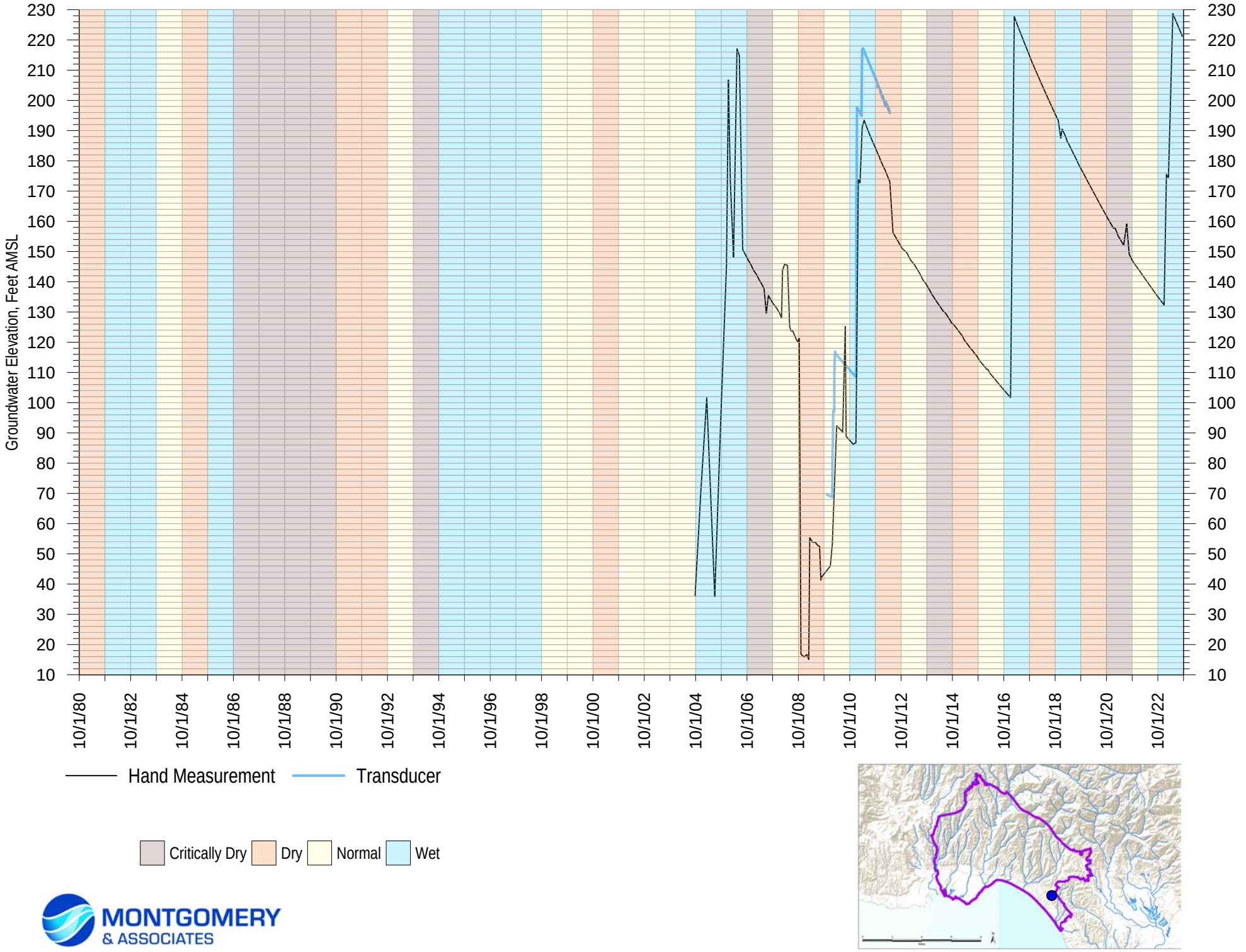
MONTGOMERY & ASSOCIATES

SC-A6C at Bonita

Aquifer Screened: Aromas

Appendix A

FIGURE A-141



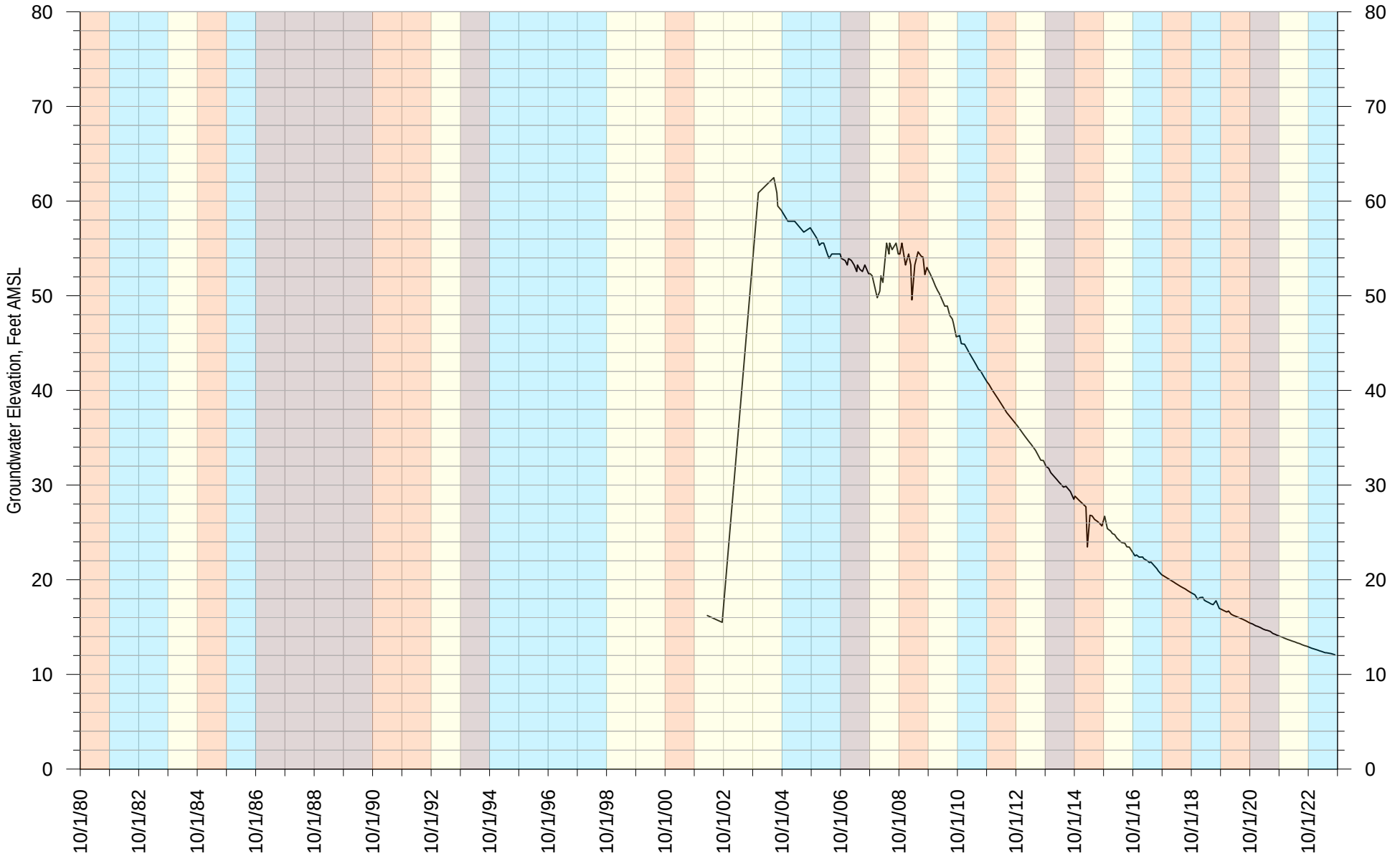
MONTGOMERY & ASSOCIATES

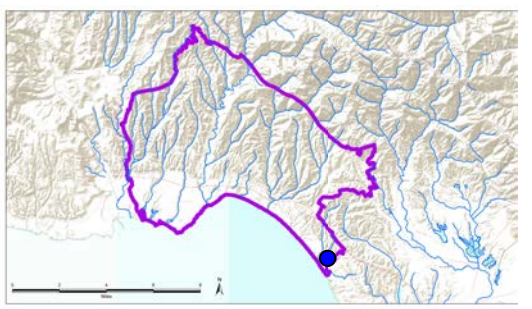
SC-A7A at Sells

Aquifer Screened: Purisima F

Appendix A

FIGURE A-142





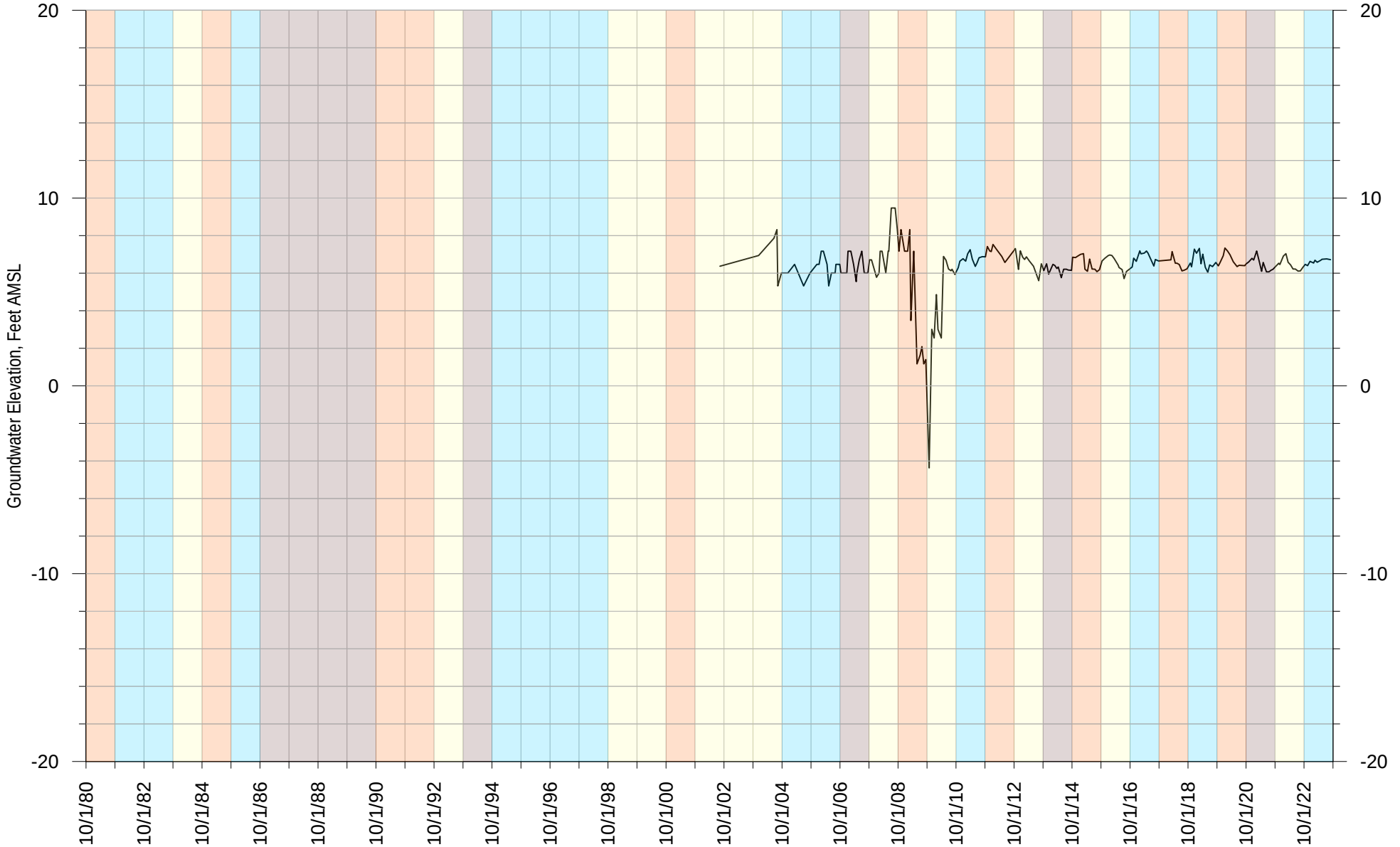
MONTGOMERY & ASSOCIATES

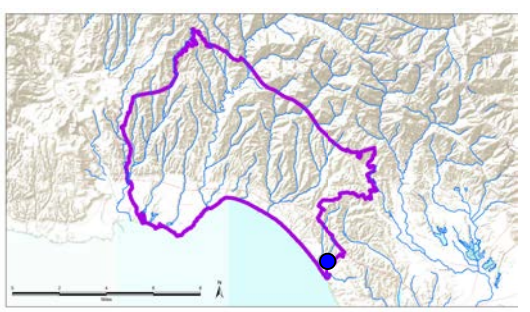
SC-A7B at Sells

Aquifer Screened: Purisima F

Appendix A

FIGURE A-143

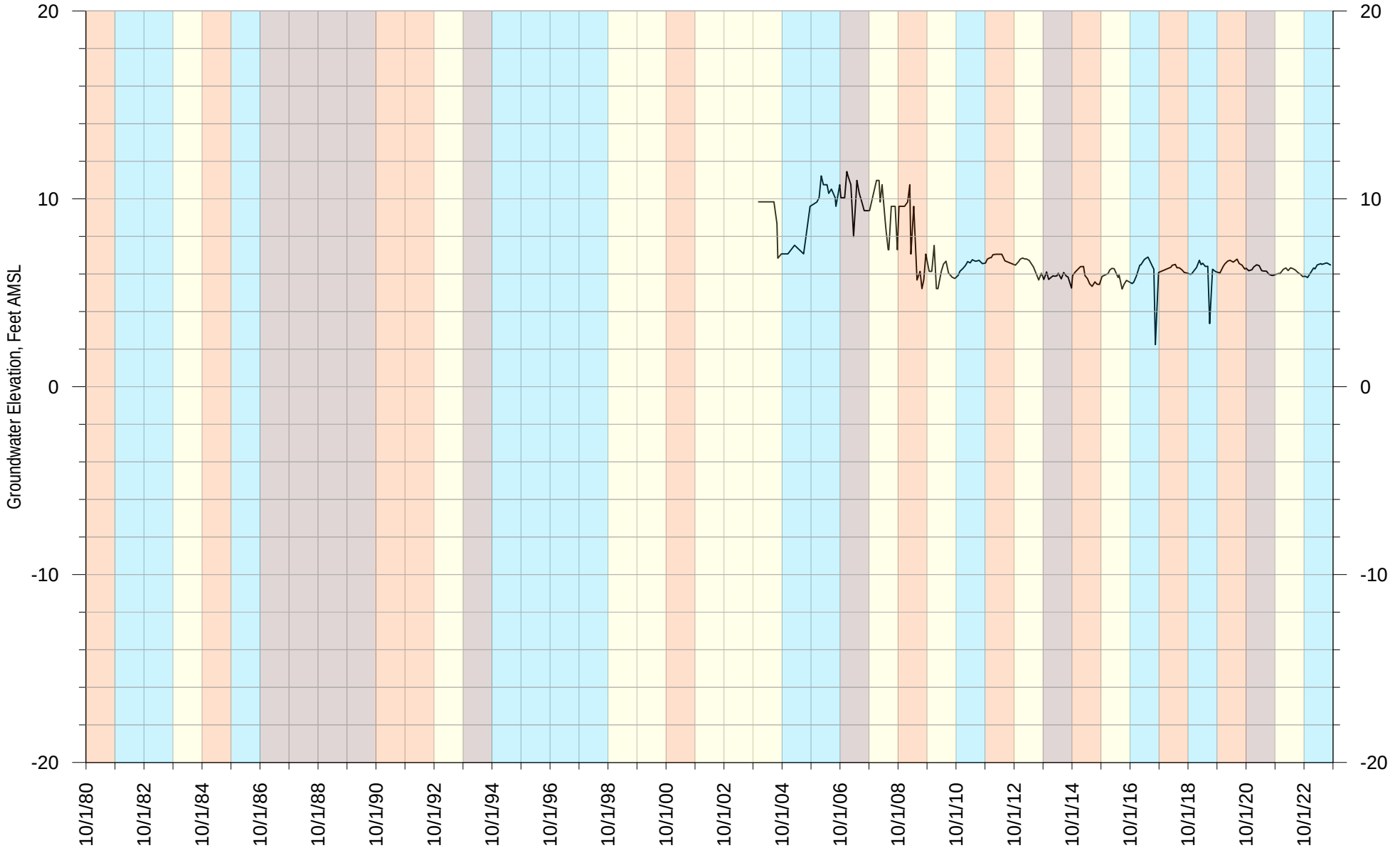


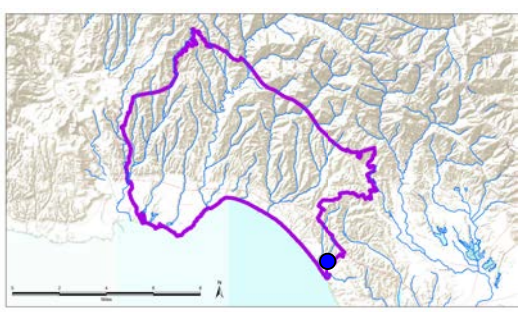


MONTGOMERY & ASSOCIATES

SC-A7D at Sells
Aquifer Screened: Aromas

Appendix A
FIGURE A-144

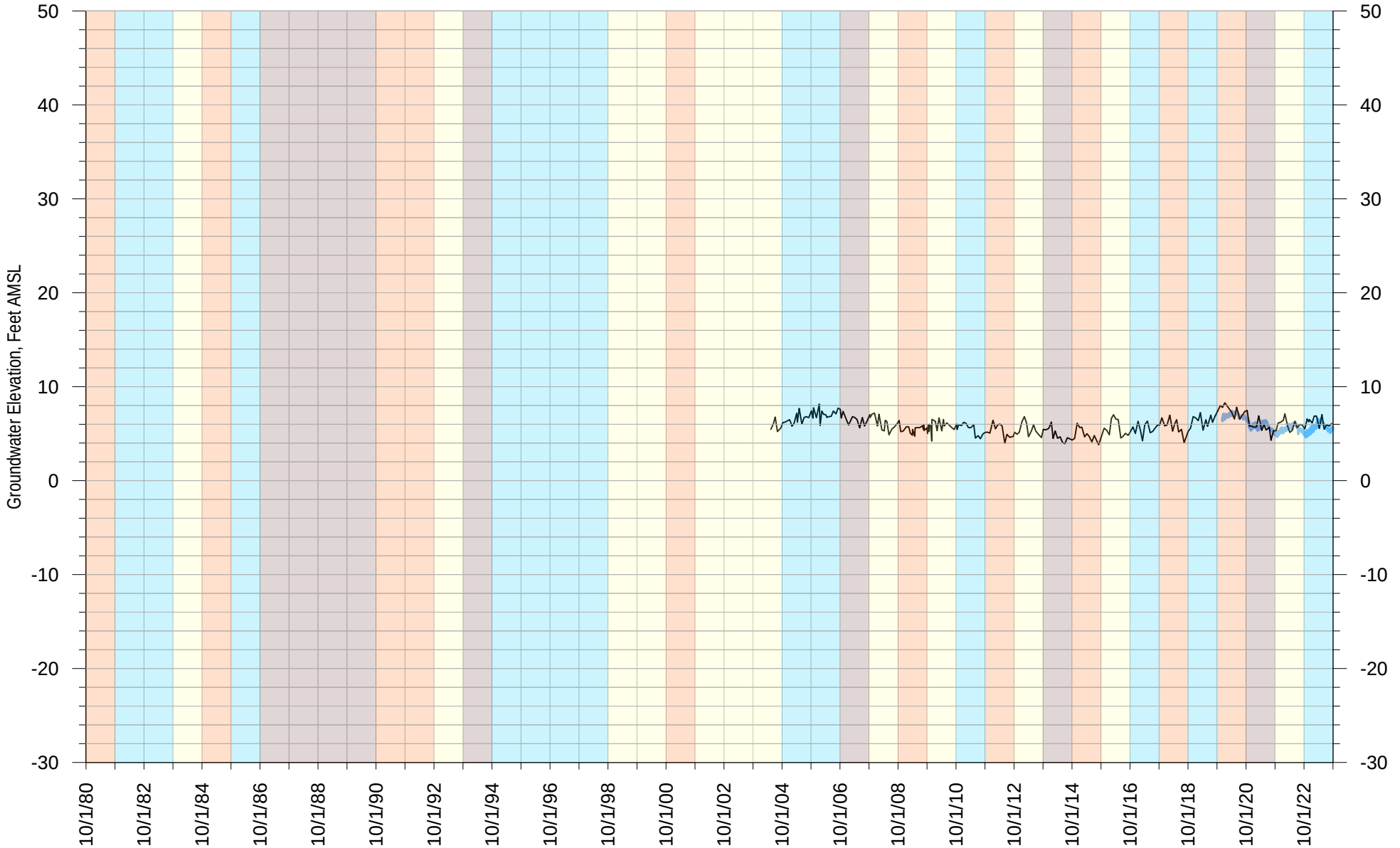


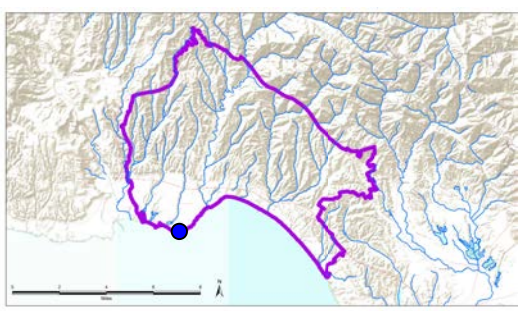


MONTGOMERY & ASSOCIATES

Soquel Point Shallow
Aquifer Screened: Purisima A

Appendix A
FIGURE A-145



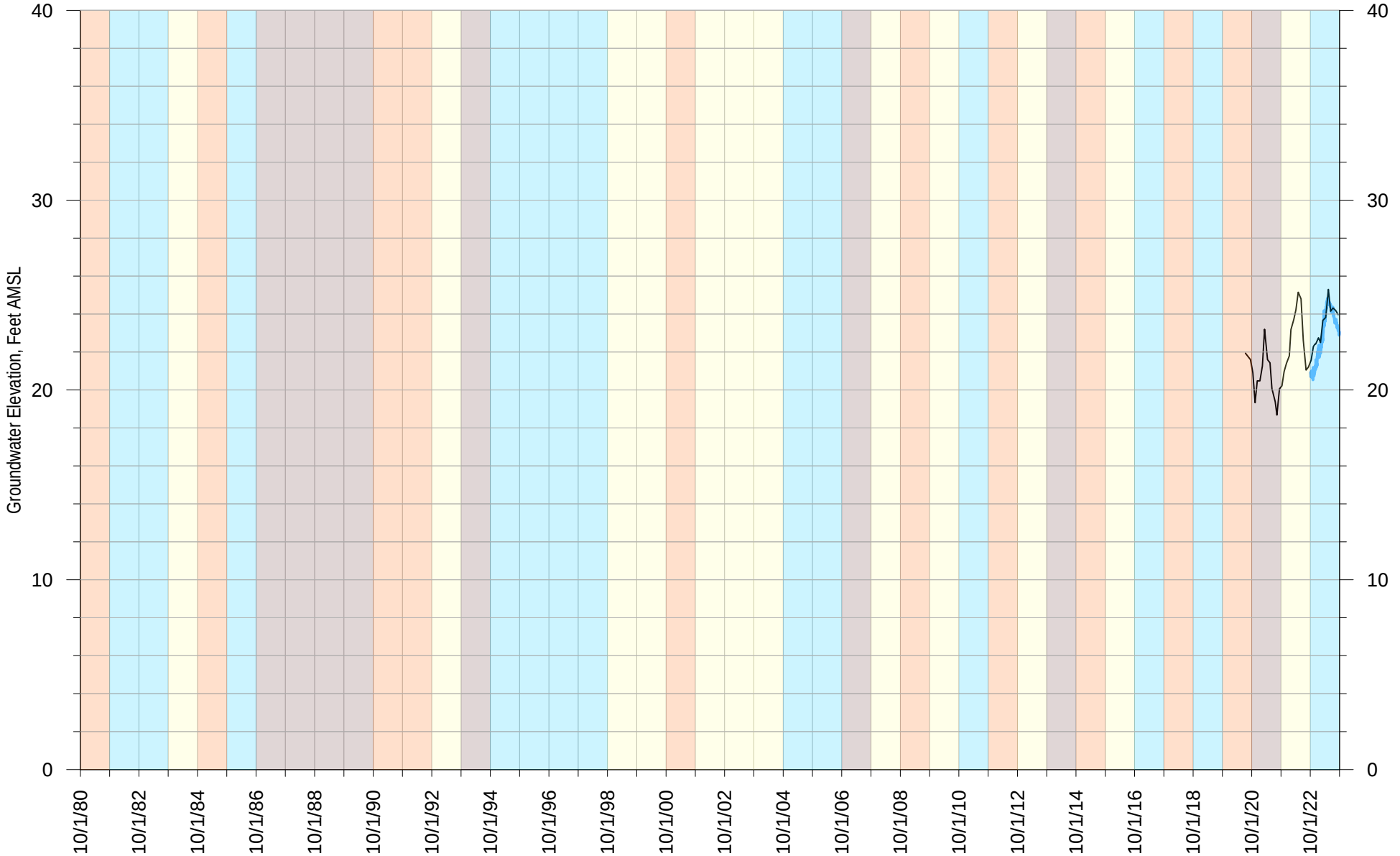


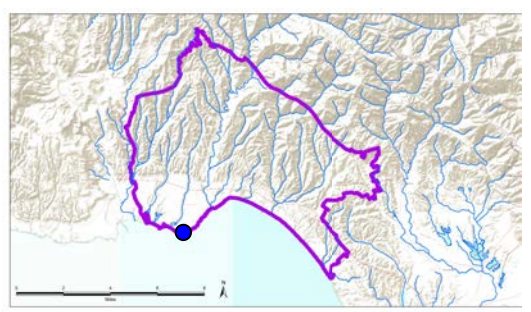
MONTGOMERY & ASSOCIATES

SP-5 at Soquel Point
Aquifer Screened: Tu

Appendix A

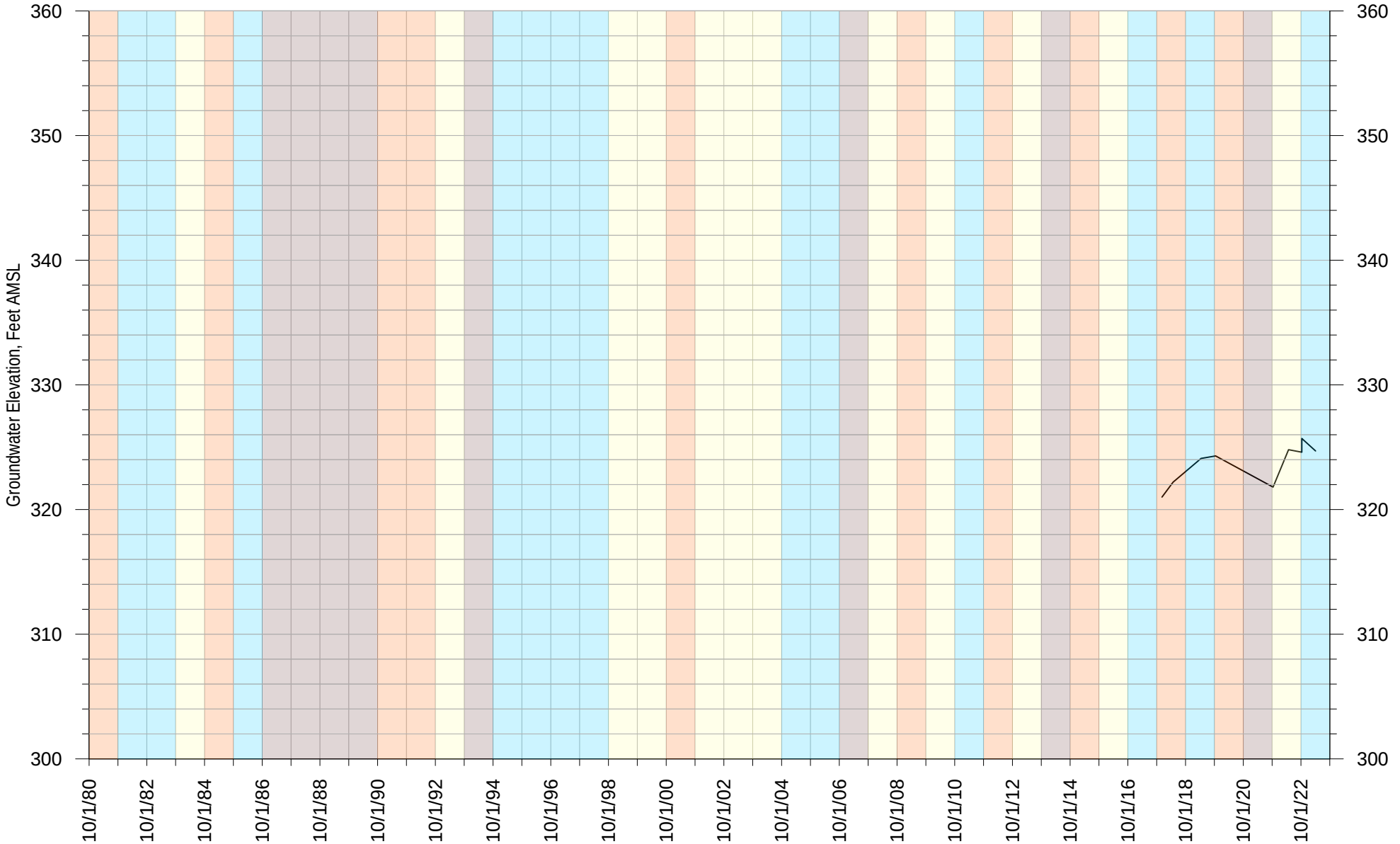
FIGURE A-146

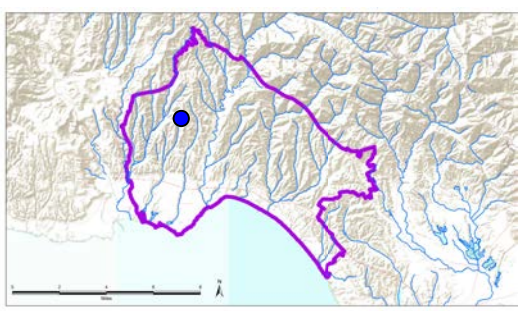




MONTGOMERY & ASSOCIATES

Private Well 3
Aquifer Screened:





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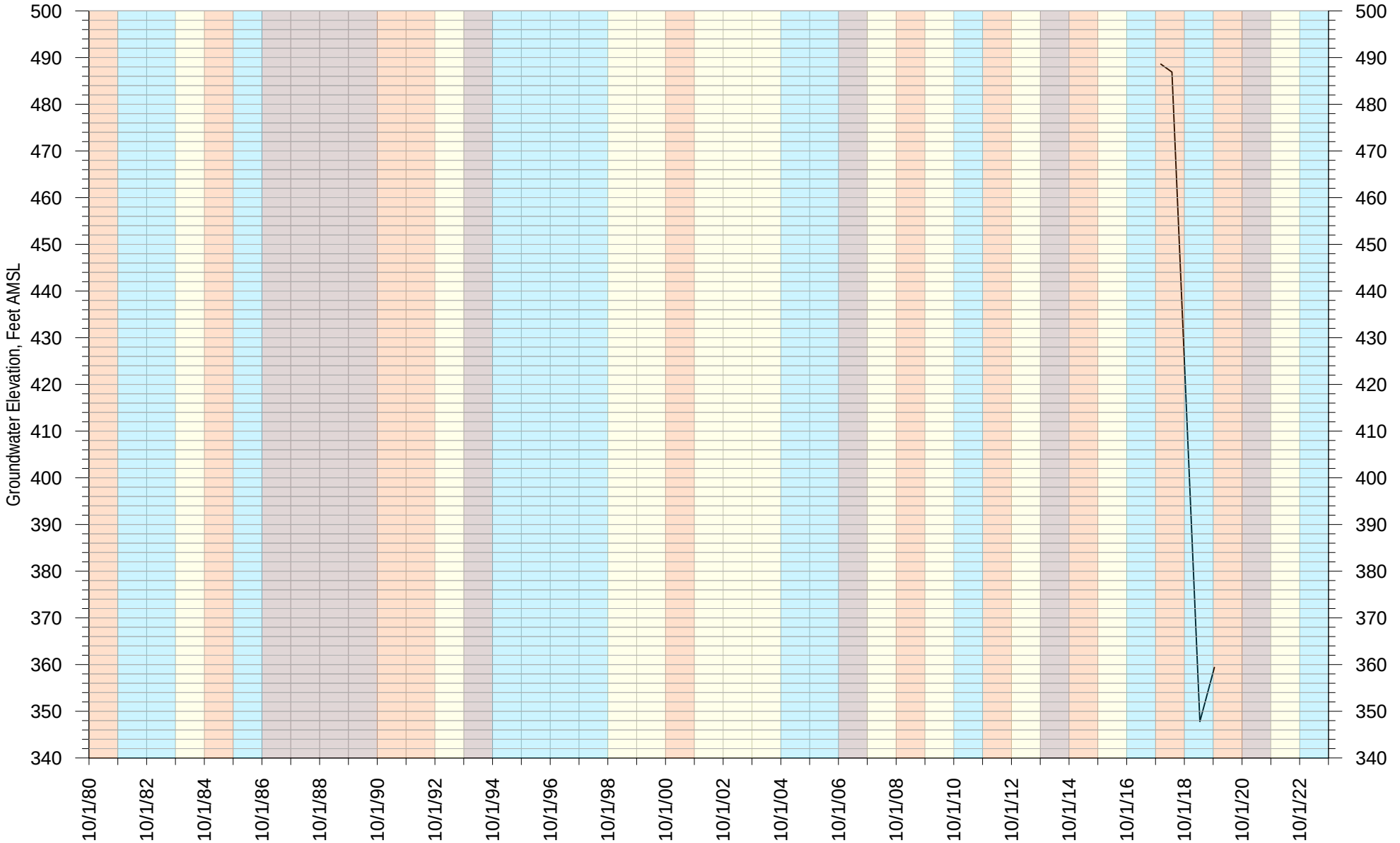
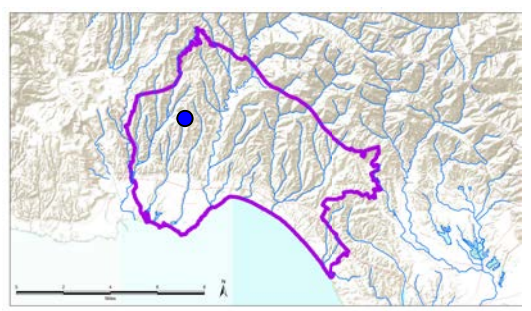
Private Well 4
Aquifer Screened:

Appendix A

FIGURE A-148





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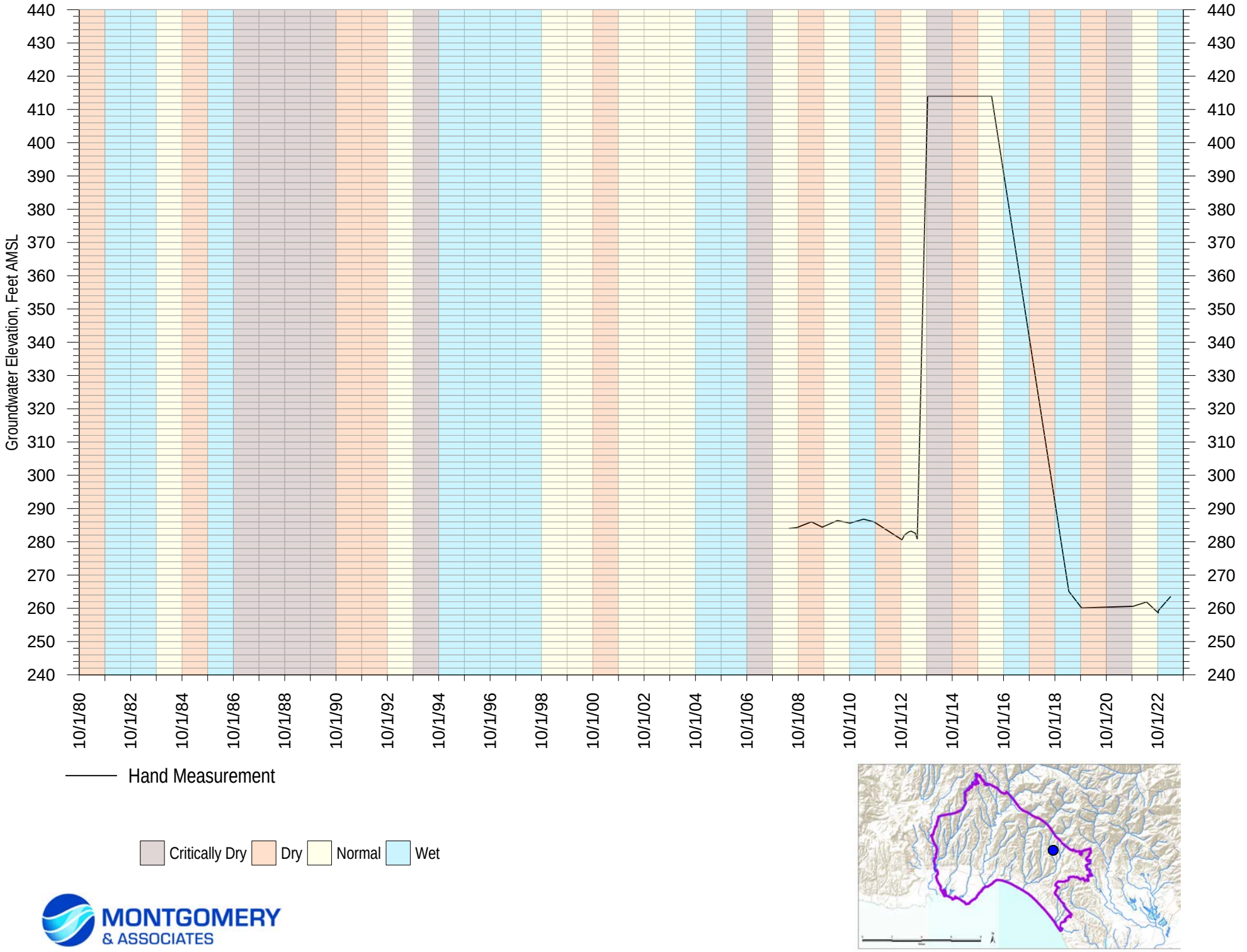
Private Well 5
Aquifer Screened:

Appendix A

FIGURE A-149



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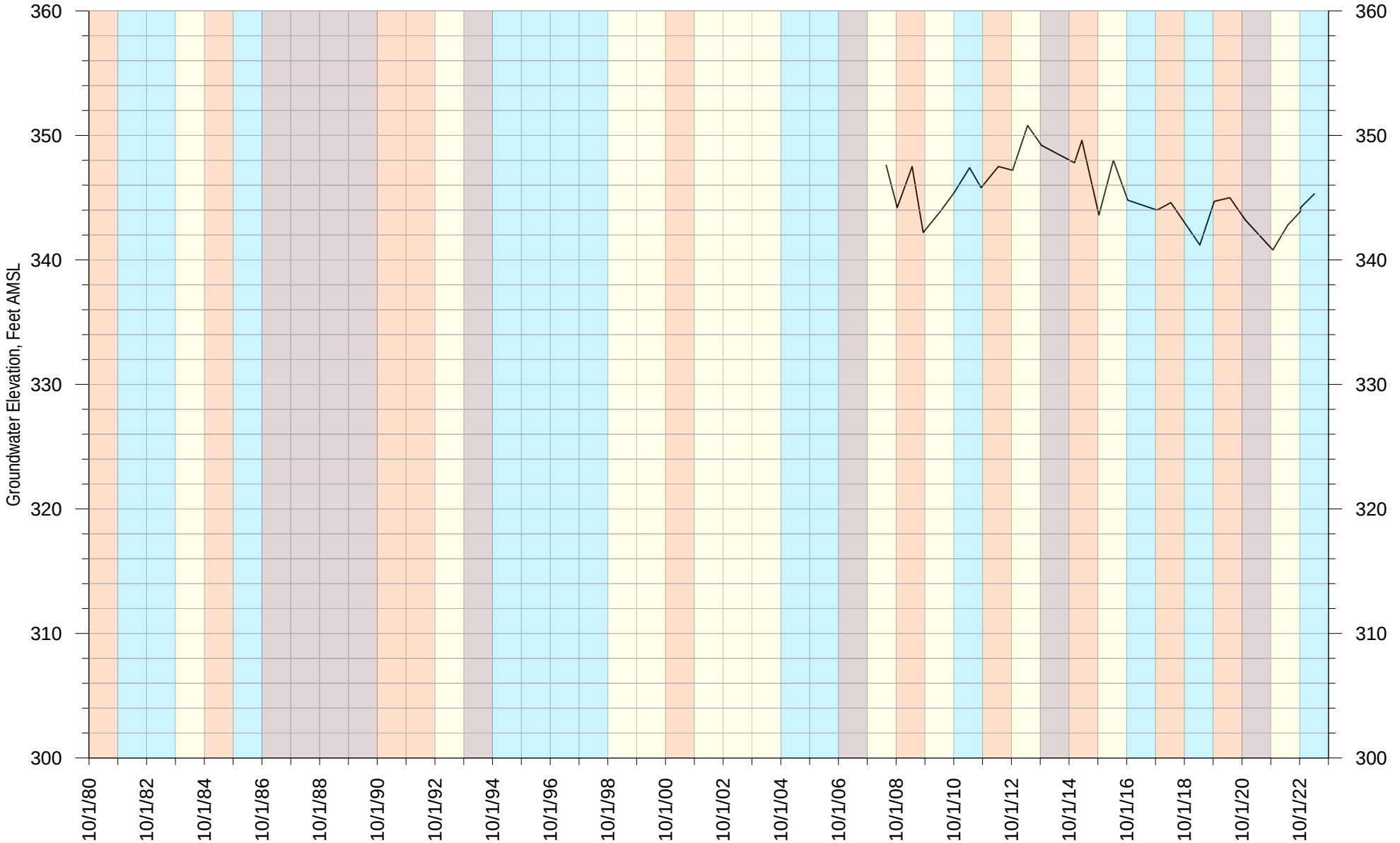
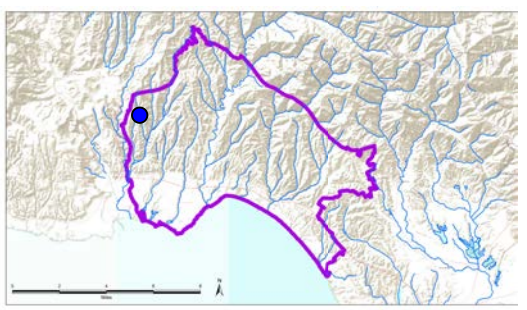
Private Well 6
Aquifer Screened:

Appendix A

FIGURE A-150





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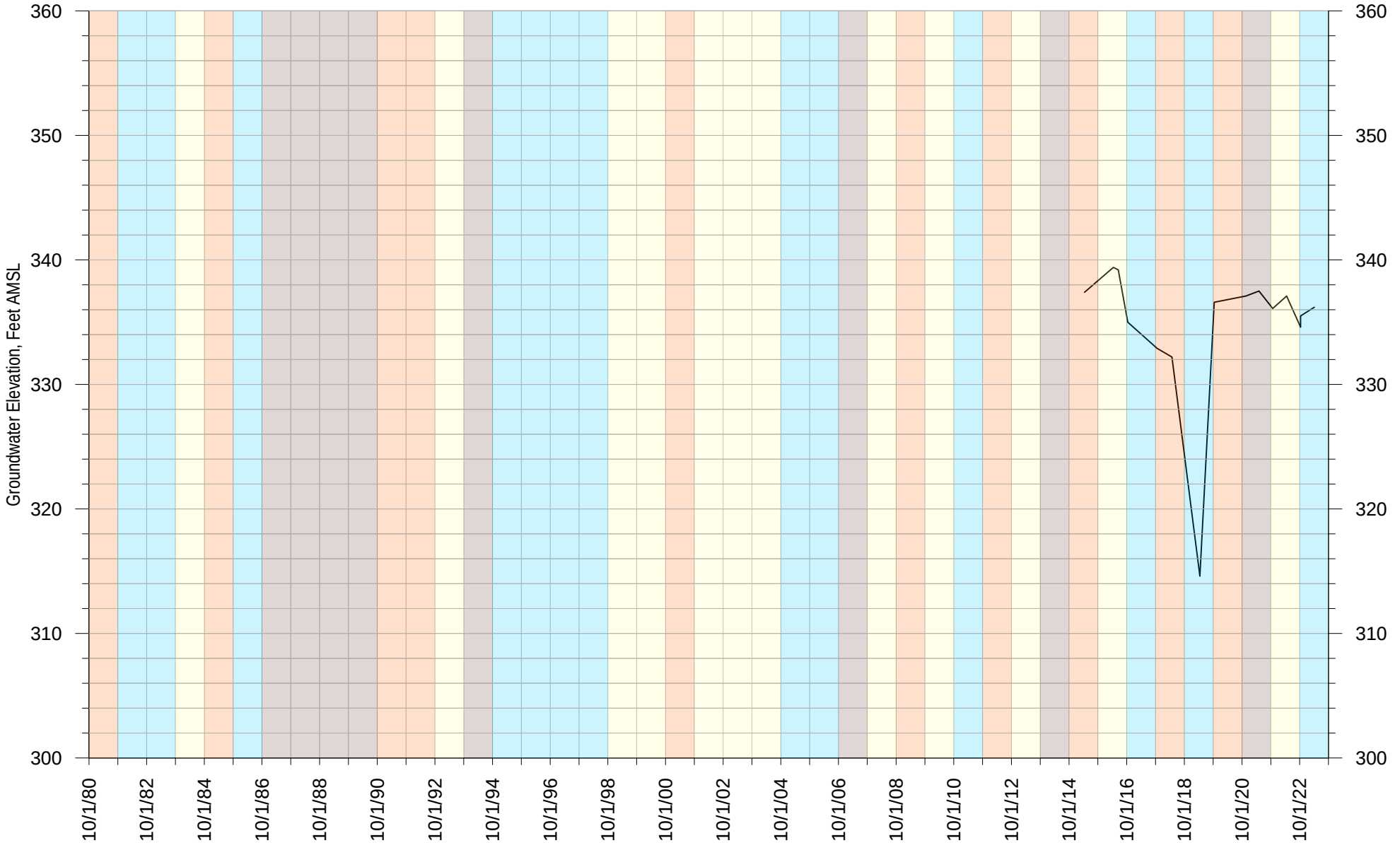
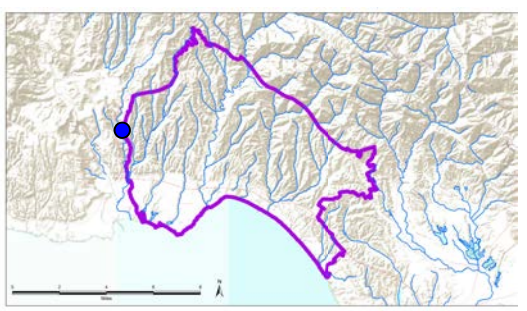
Private Well 7
Aquifer Screened:

Appendix A

FIGURE A-151





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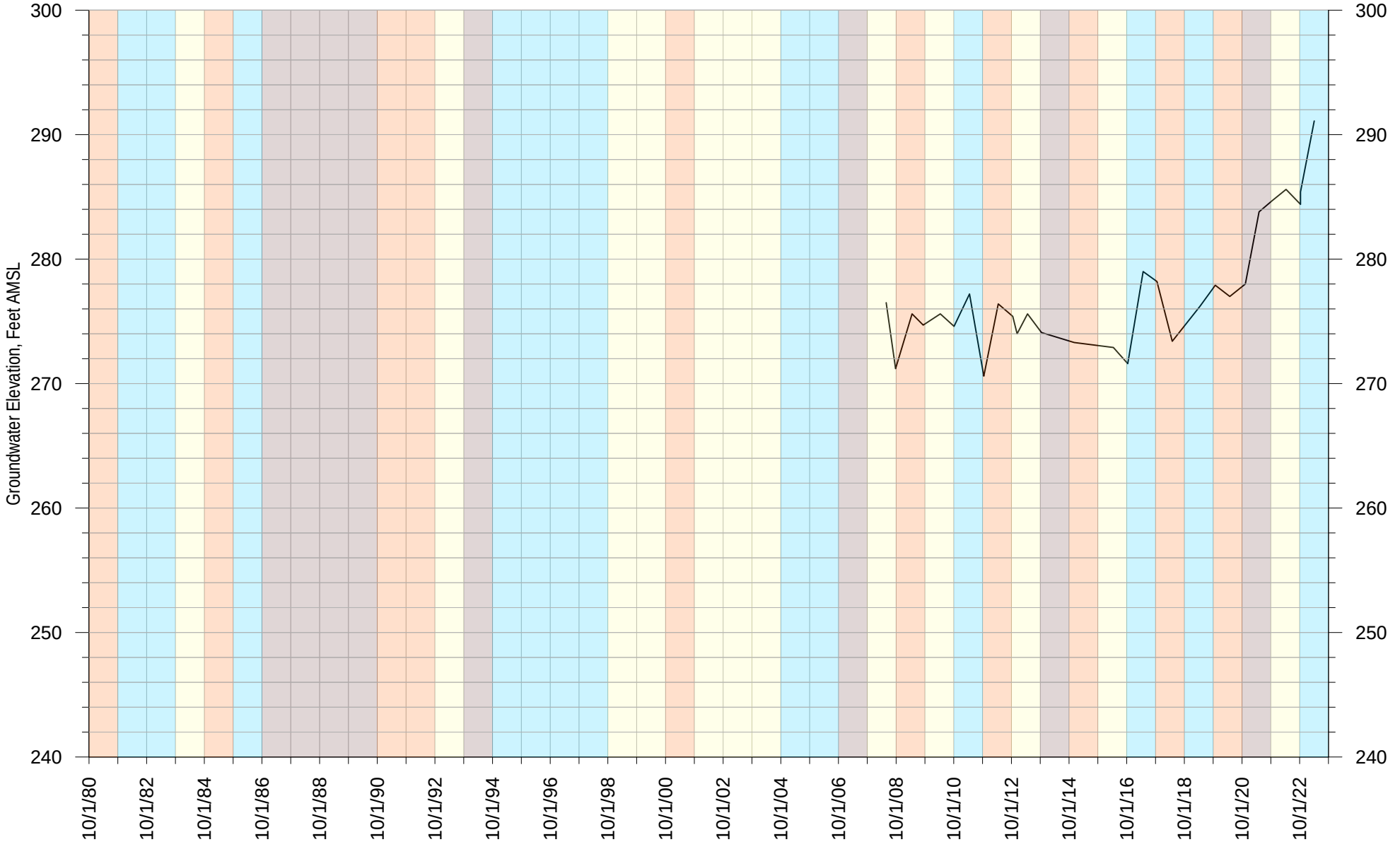
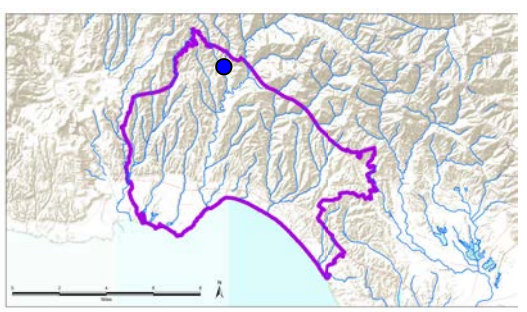
Private Well 8
Aquifer Screened:

Appendix A

FIGURE A-152





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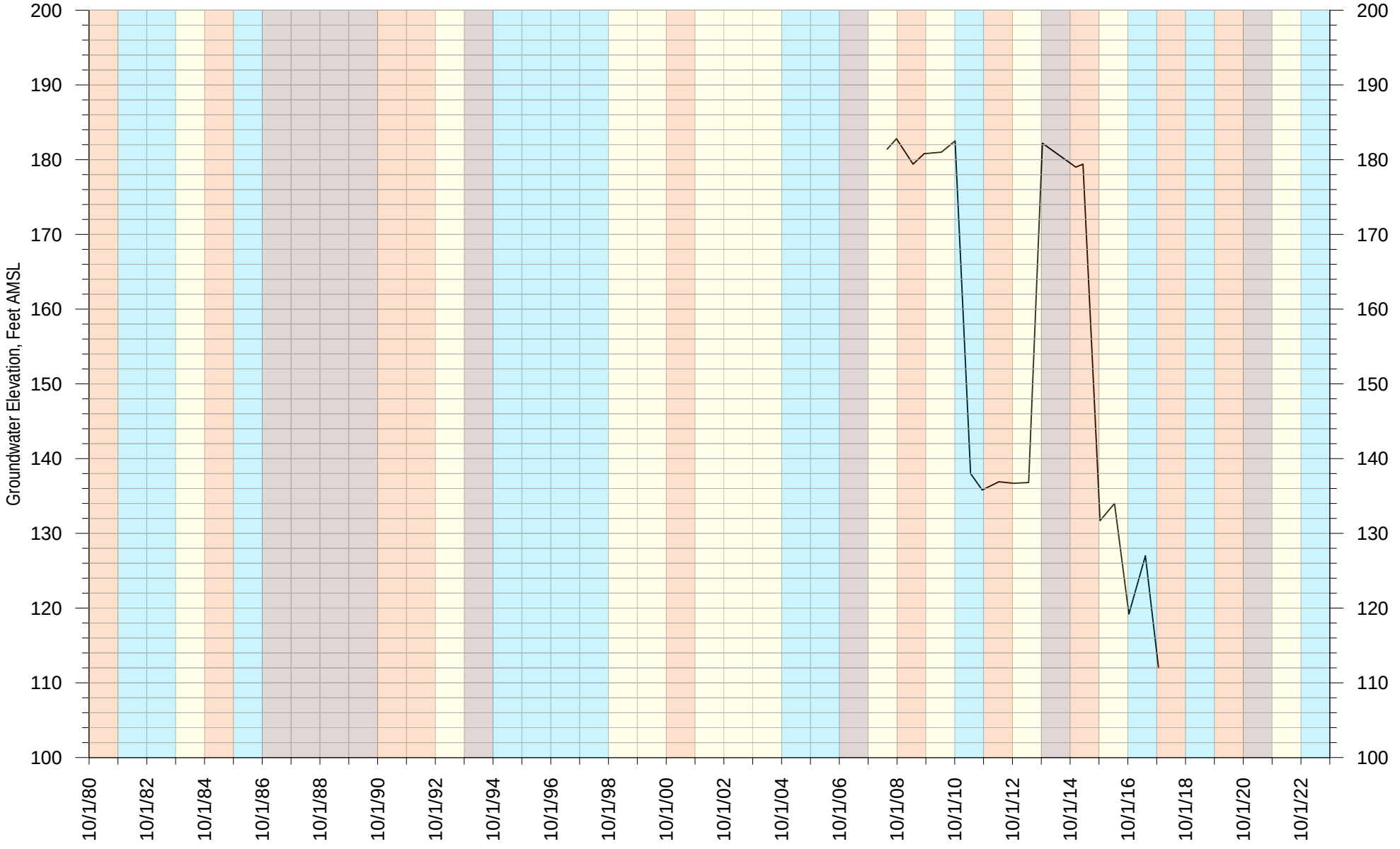
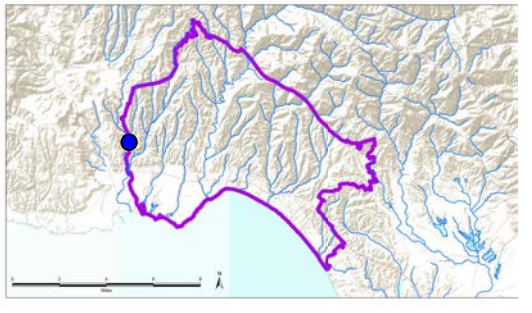
Private Well 9
Aquifer Screened:

Appendix A

FIGURE A-153





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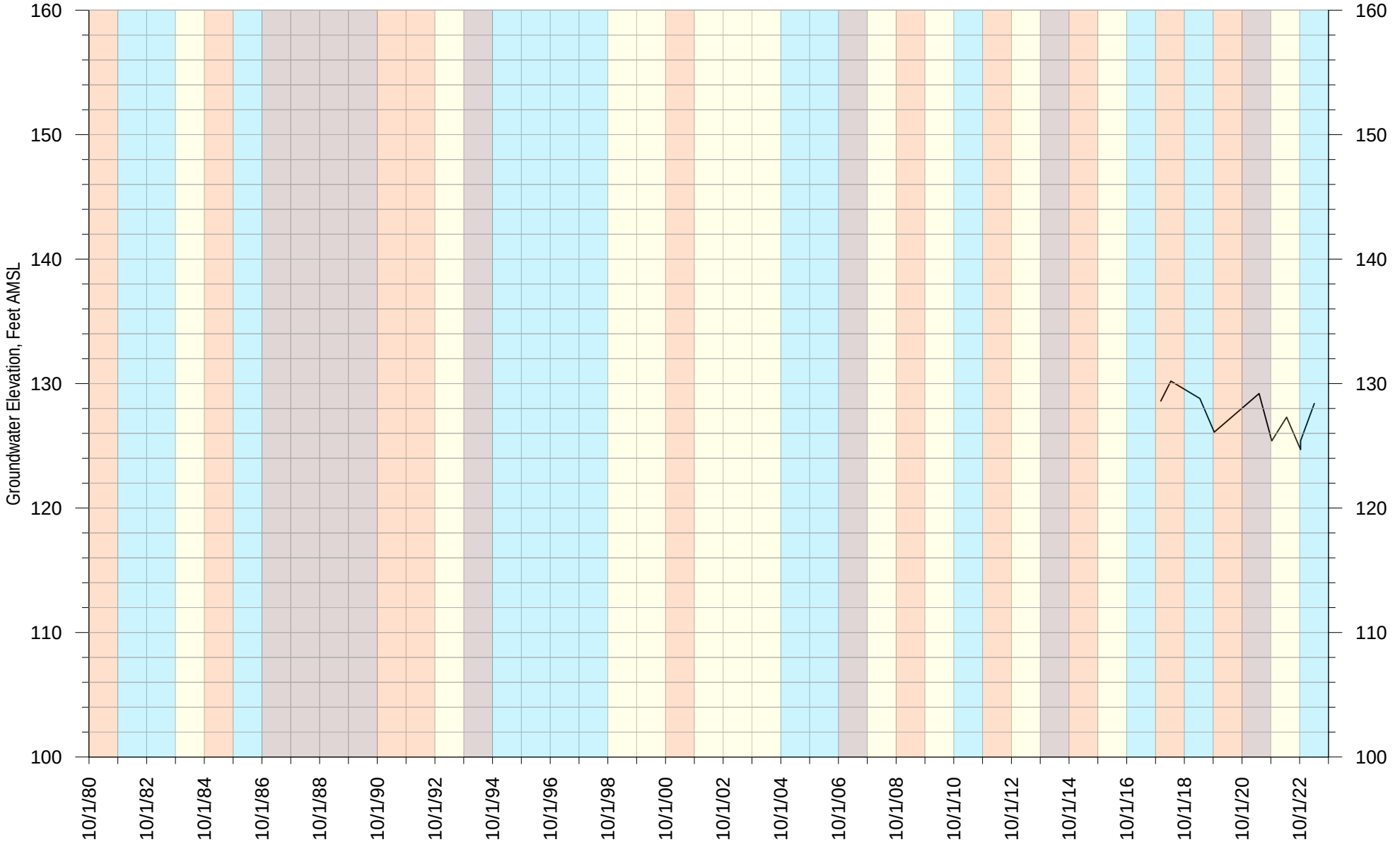
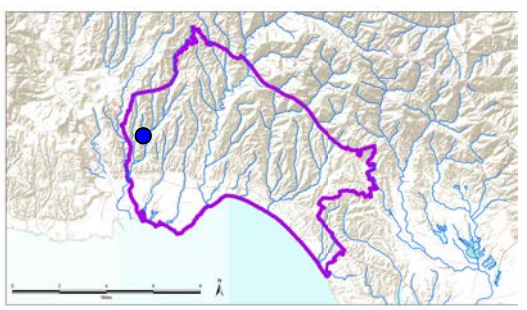
Private Well 10
Aquifer Screened:

Appendix A

FIGURE A-154





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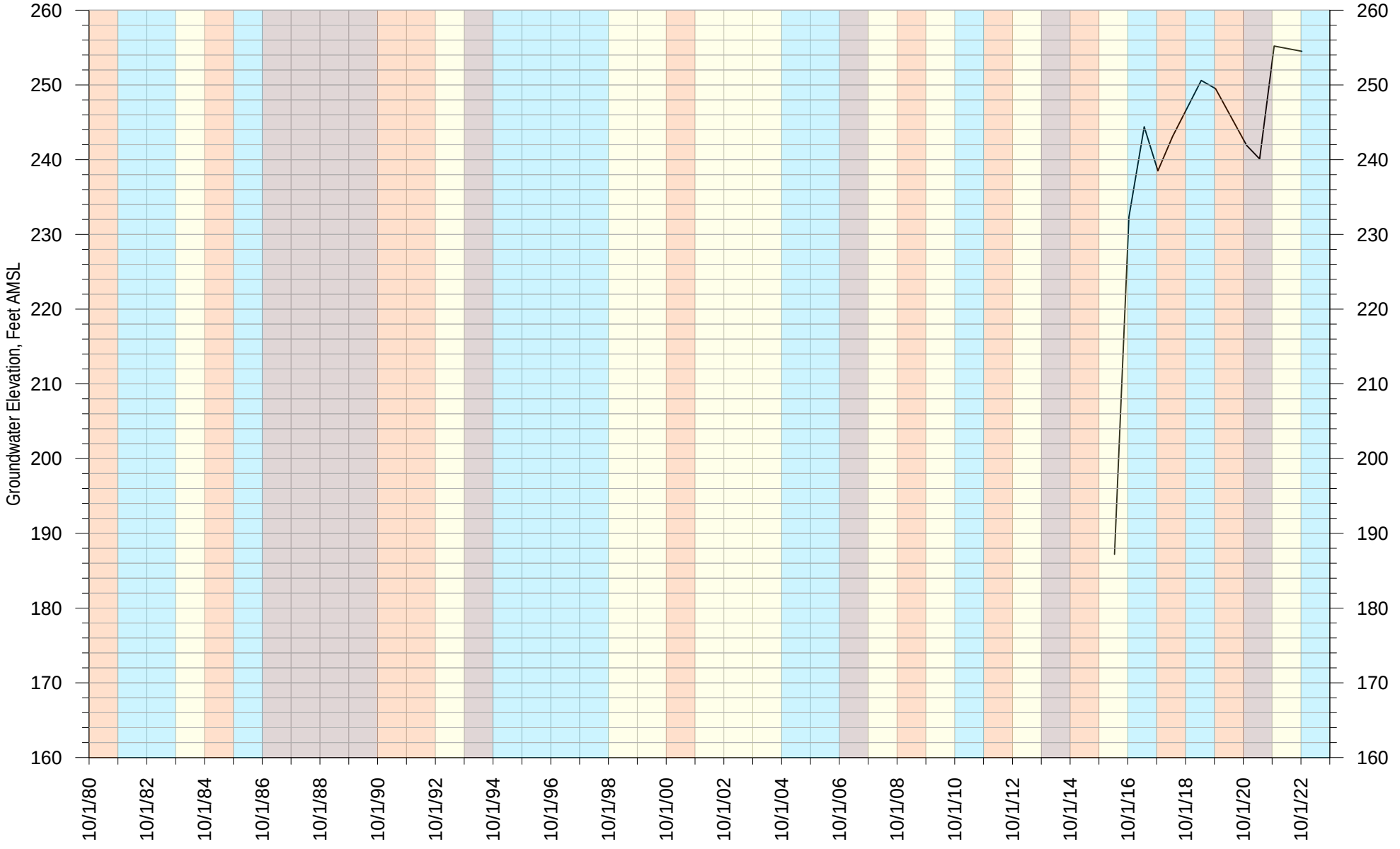
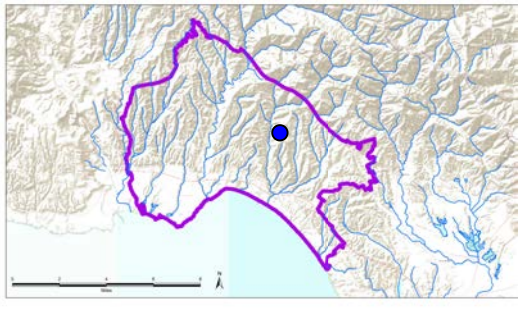
Private Well 11
Aquifer Screened:

Appendix A

FIGURE A-155





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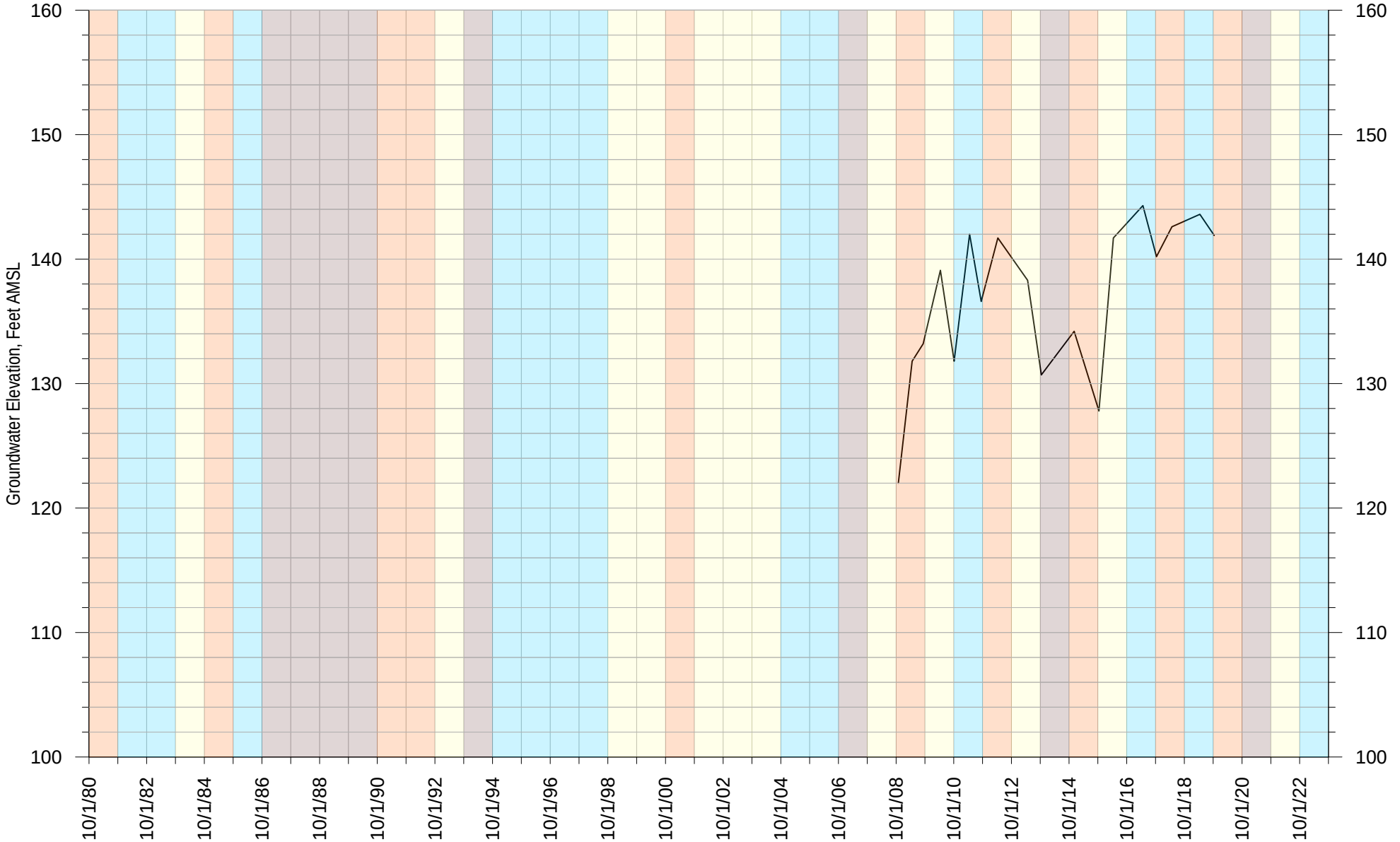
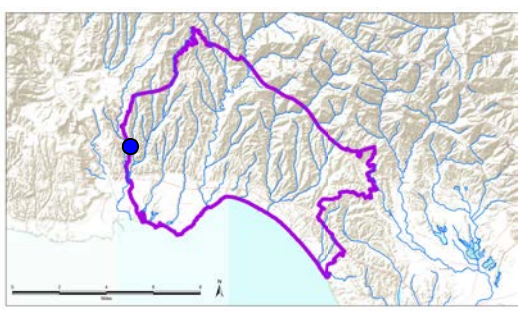
Private Well 12
Aquifer Screened:

Appendix A

FIGURE A-156





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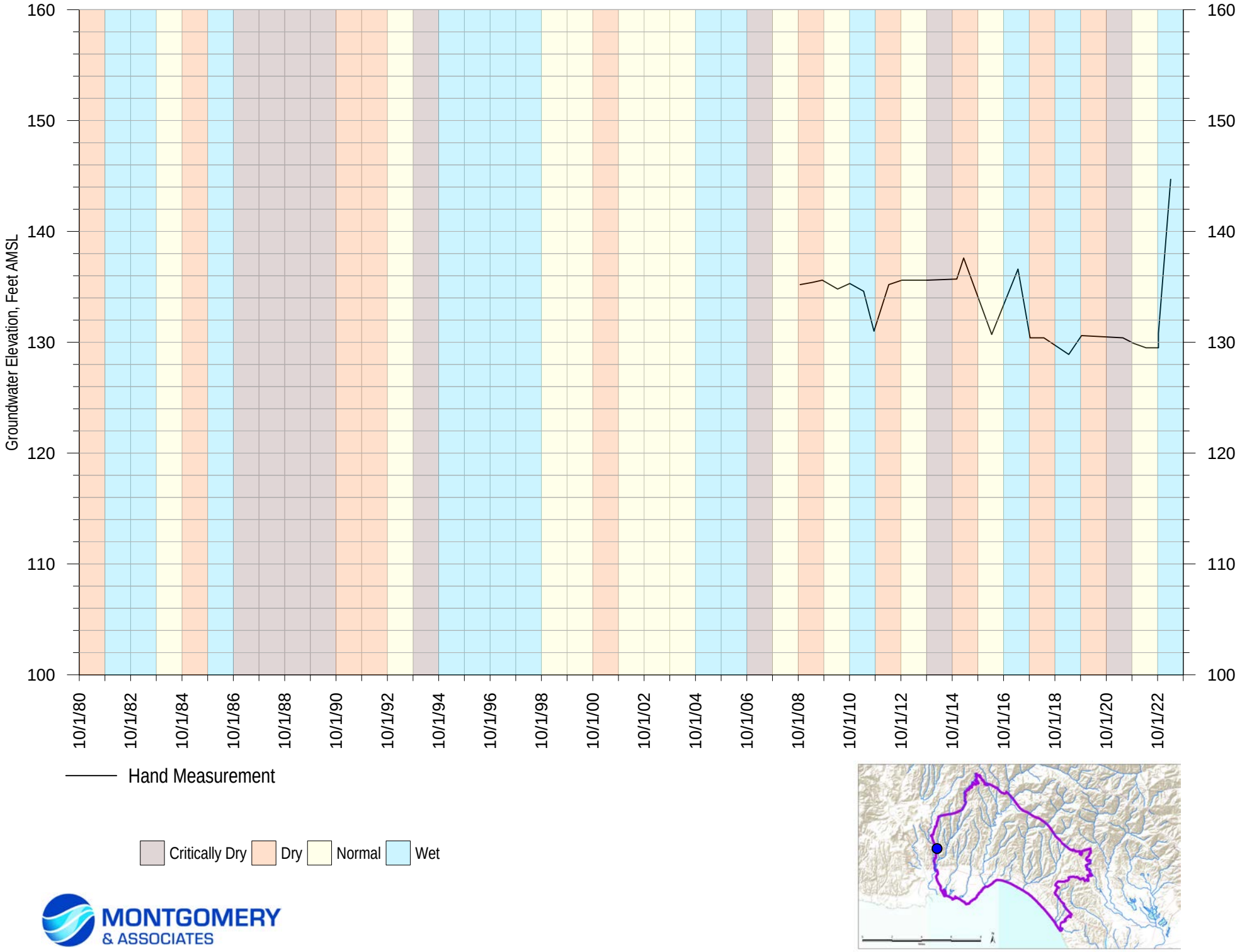
Private Well 13
Aquifer Screened:

Appendix A

FIGURE A-157



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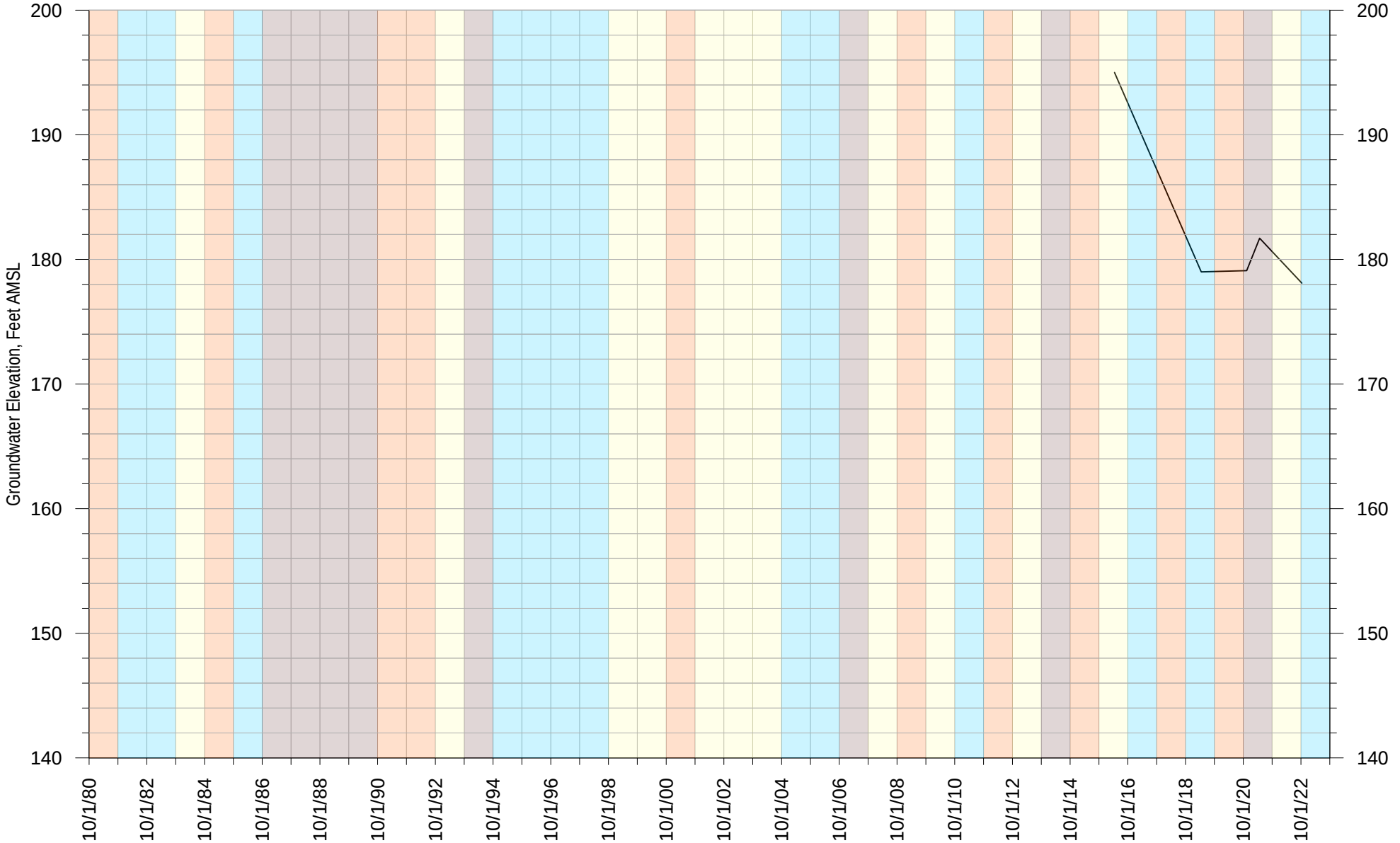
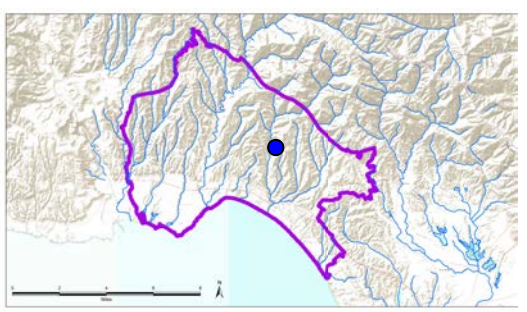
Private Well 14
Aquifer Screened:

Appendix A

FIGURE A-158





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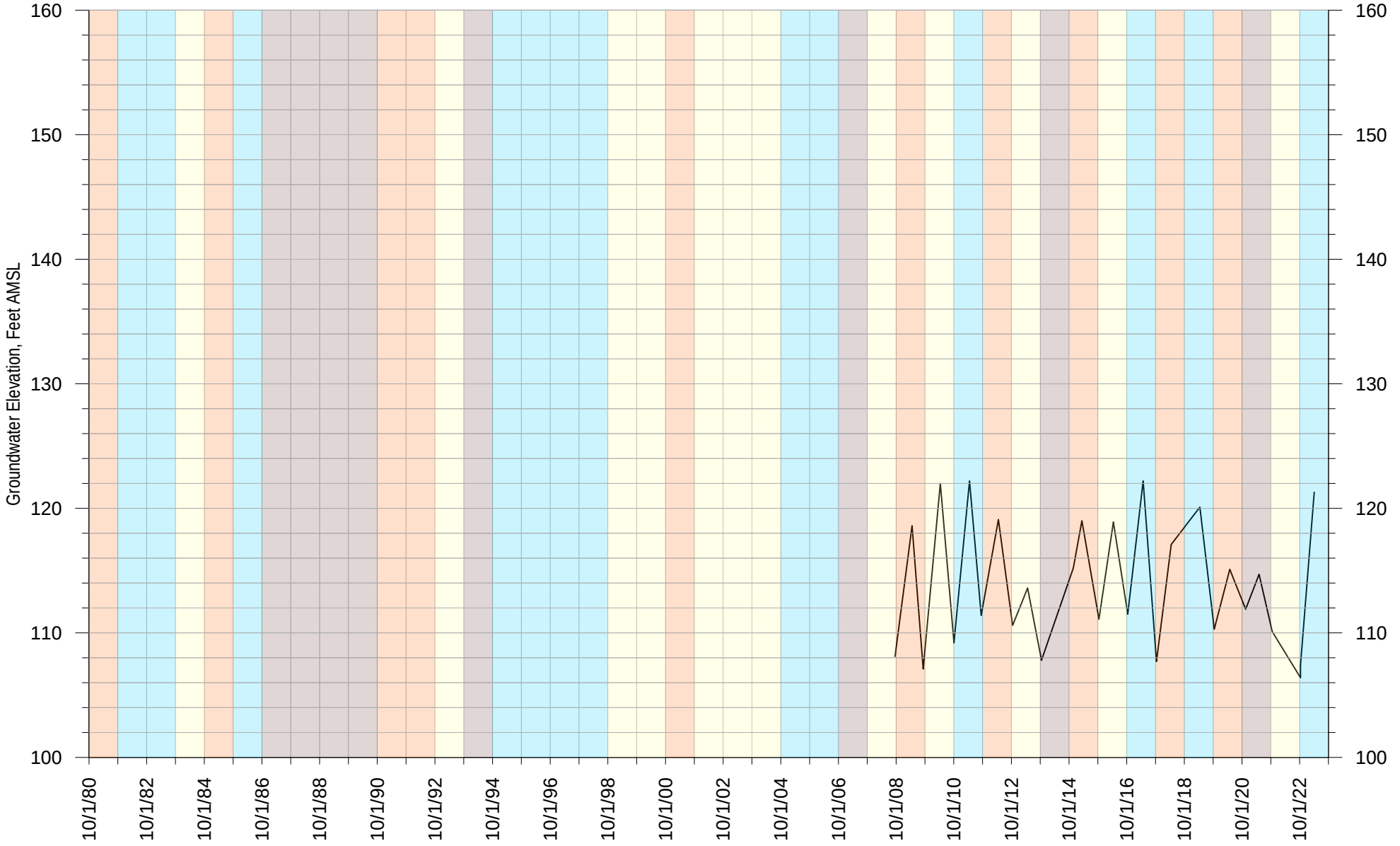
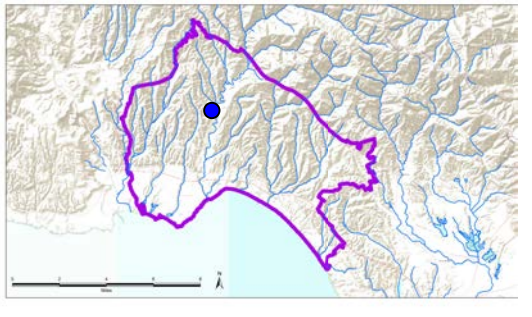
Private Well 15
Aquifer Screened:

Appendix A

FIGURE A-159





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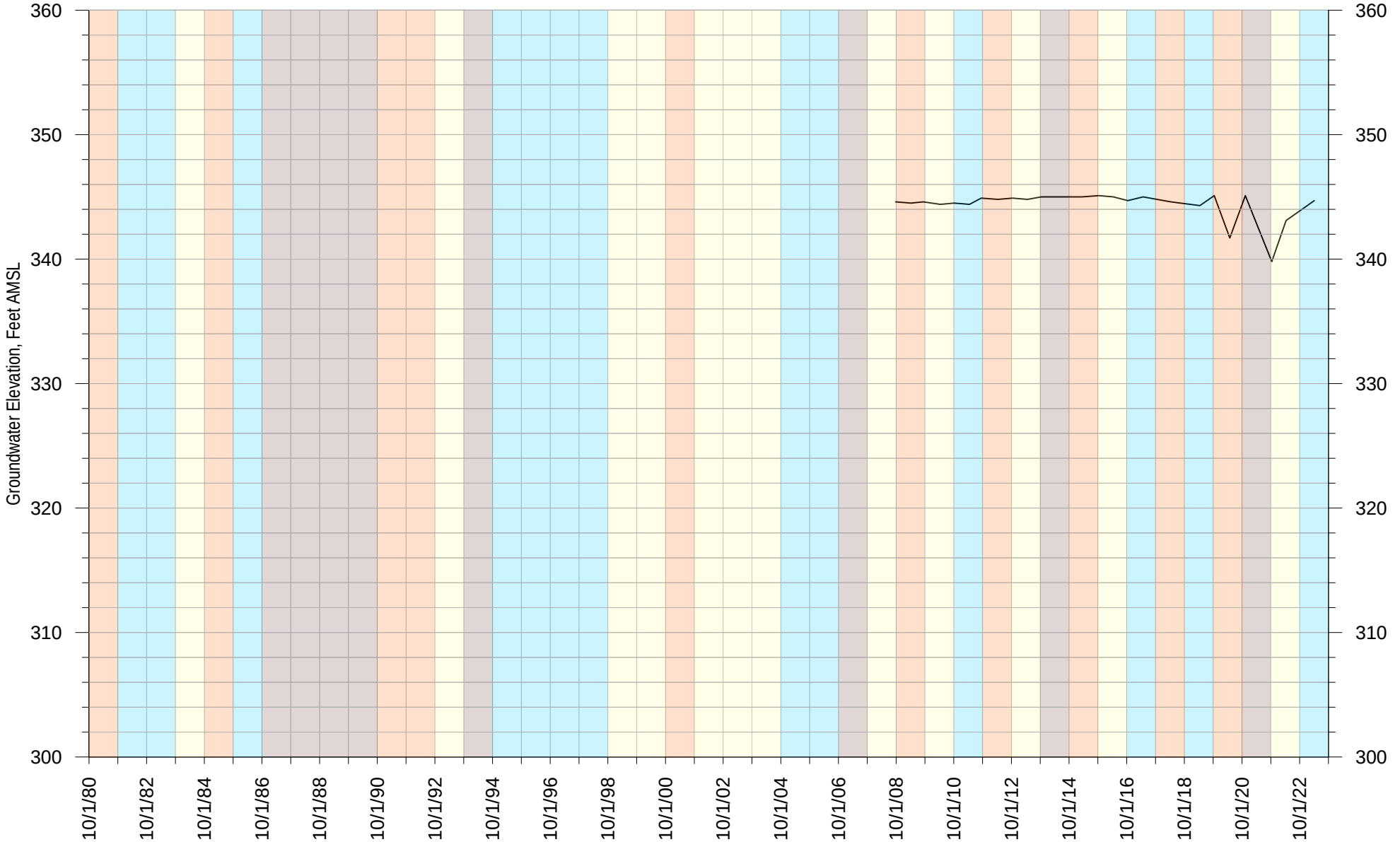
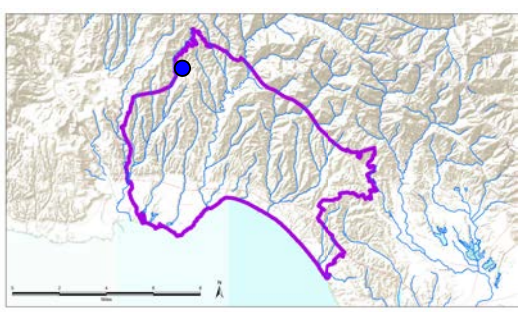
Private Well 16
Aquifer Screened:

Appendix A

FIGURE A-160





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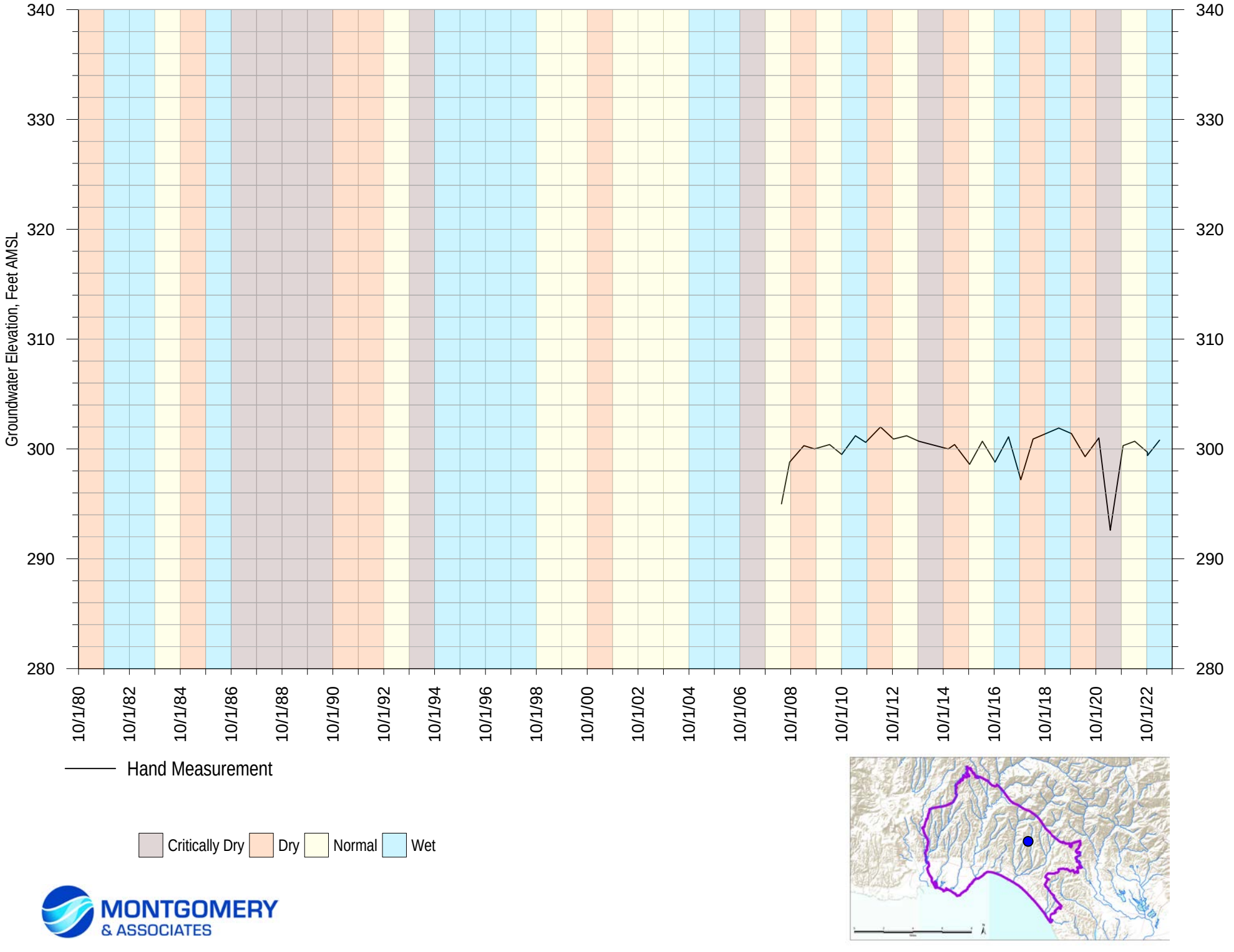
Private Well 17
Aquifer Screened:

Appendix A

FIGURE A-161



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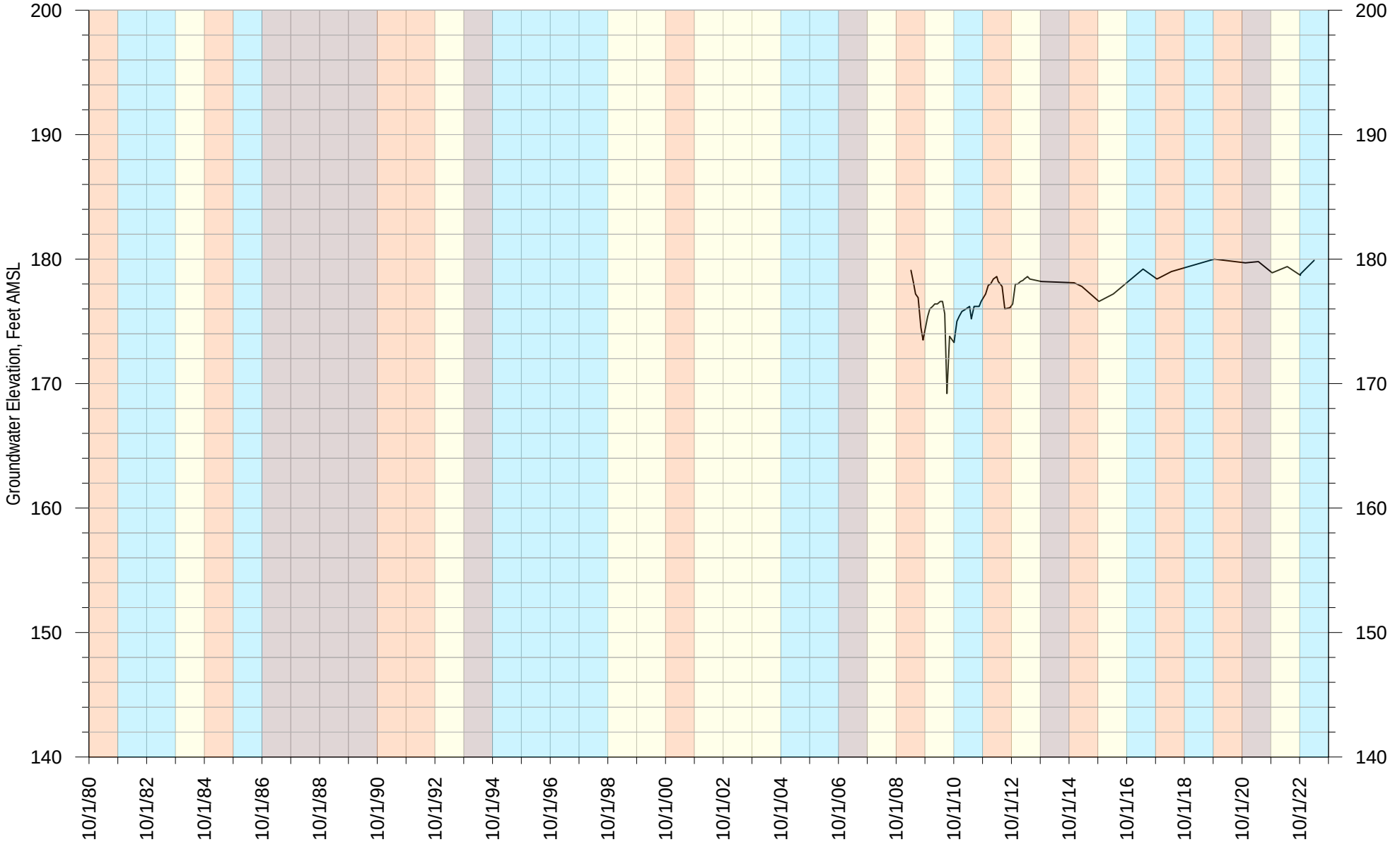
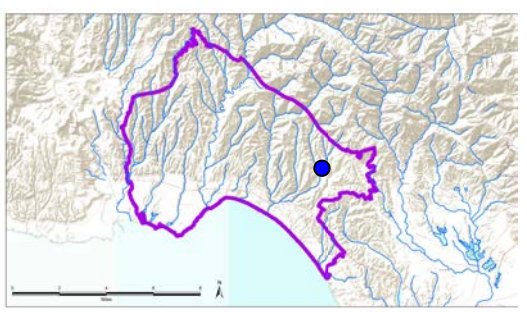
Private Well 18
Aquifer Screened:

Appendix A

FIGURE A-162





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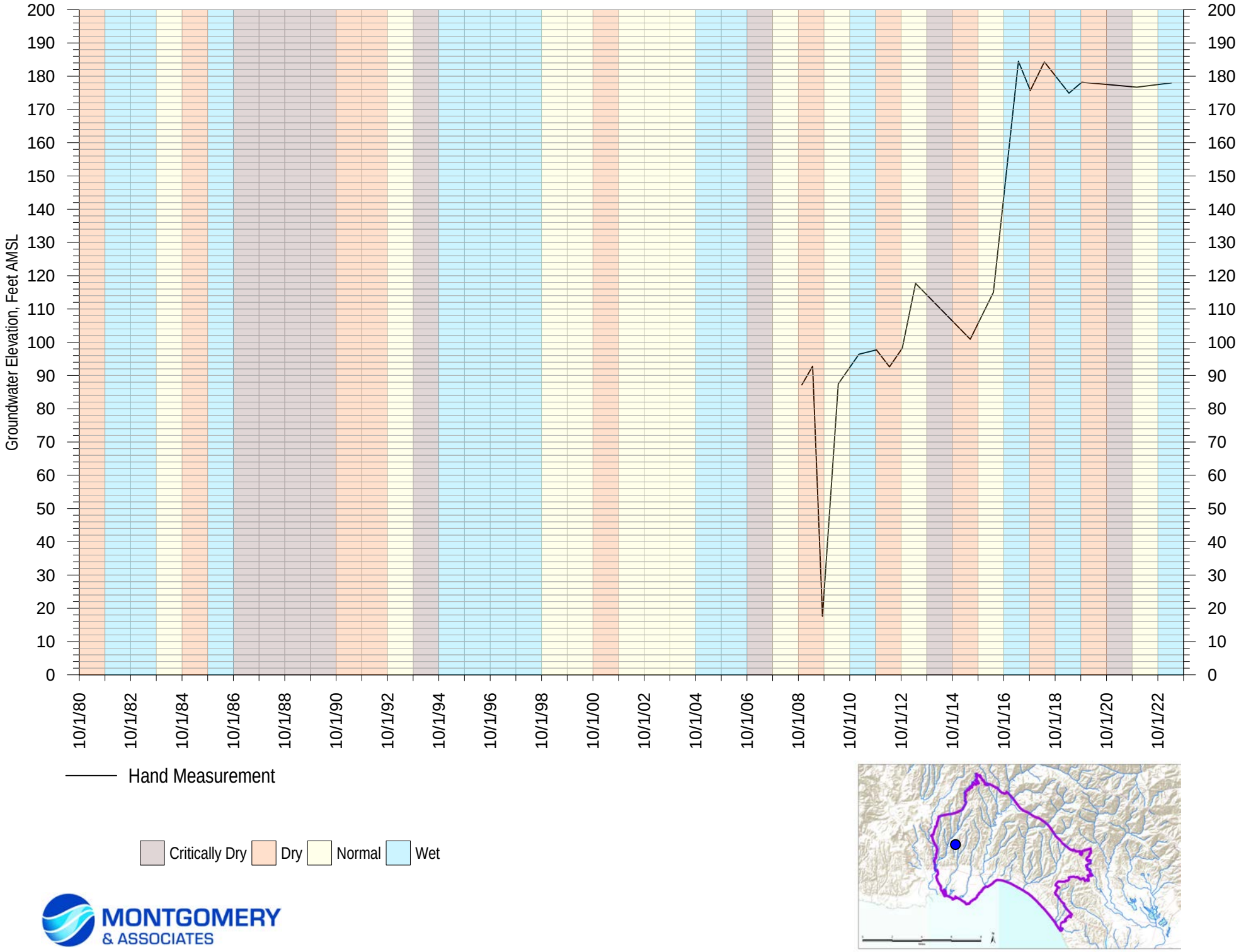
Private Well 19
Aquifer Screened:

Appendix A

FIGURE A-163



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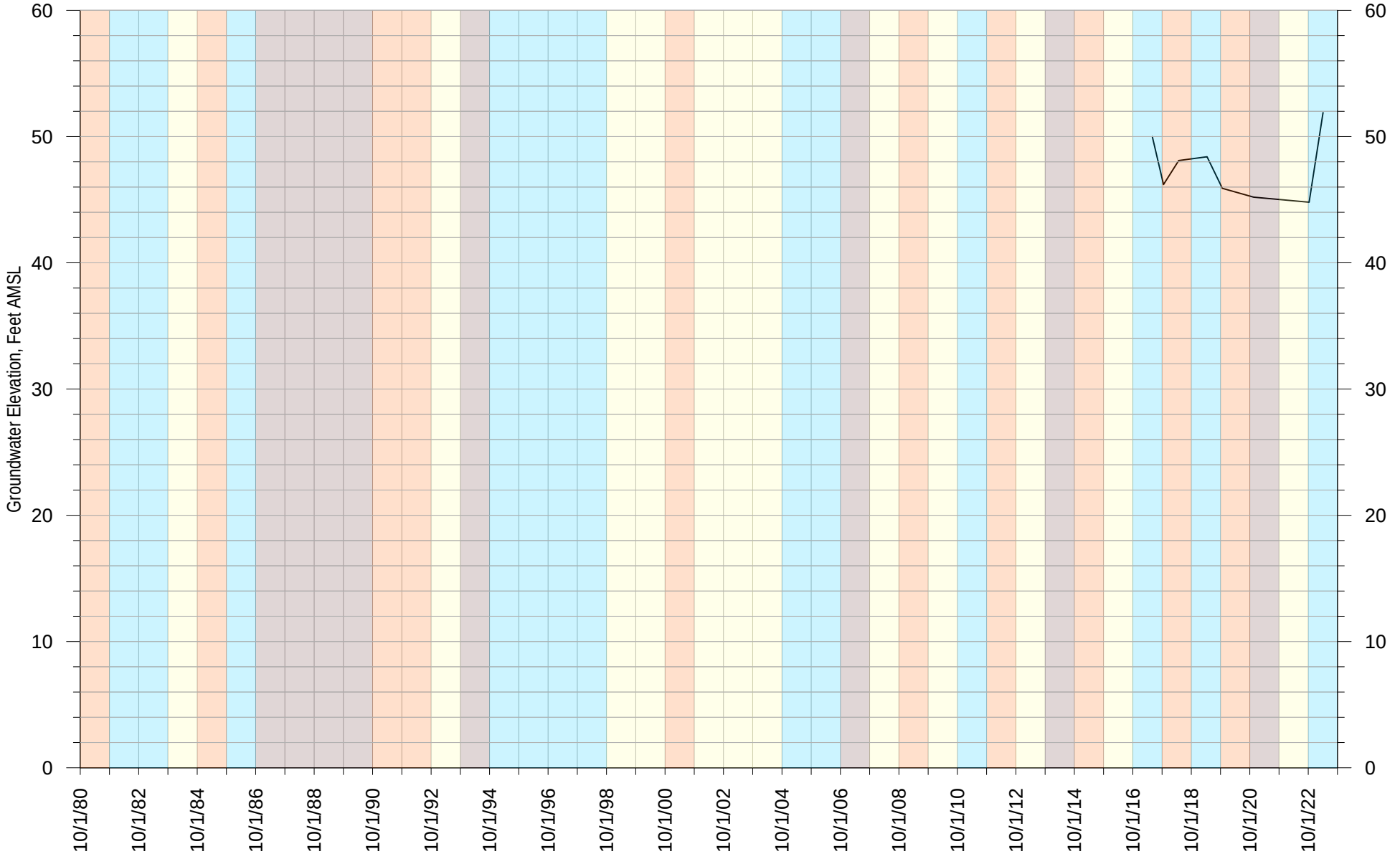
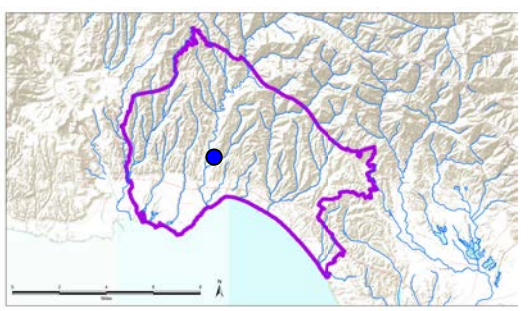
Private Well 20
Aquifer Screened:

Appendix A

FIGURE A-164





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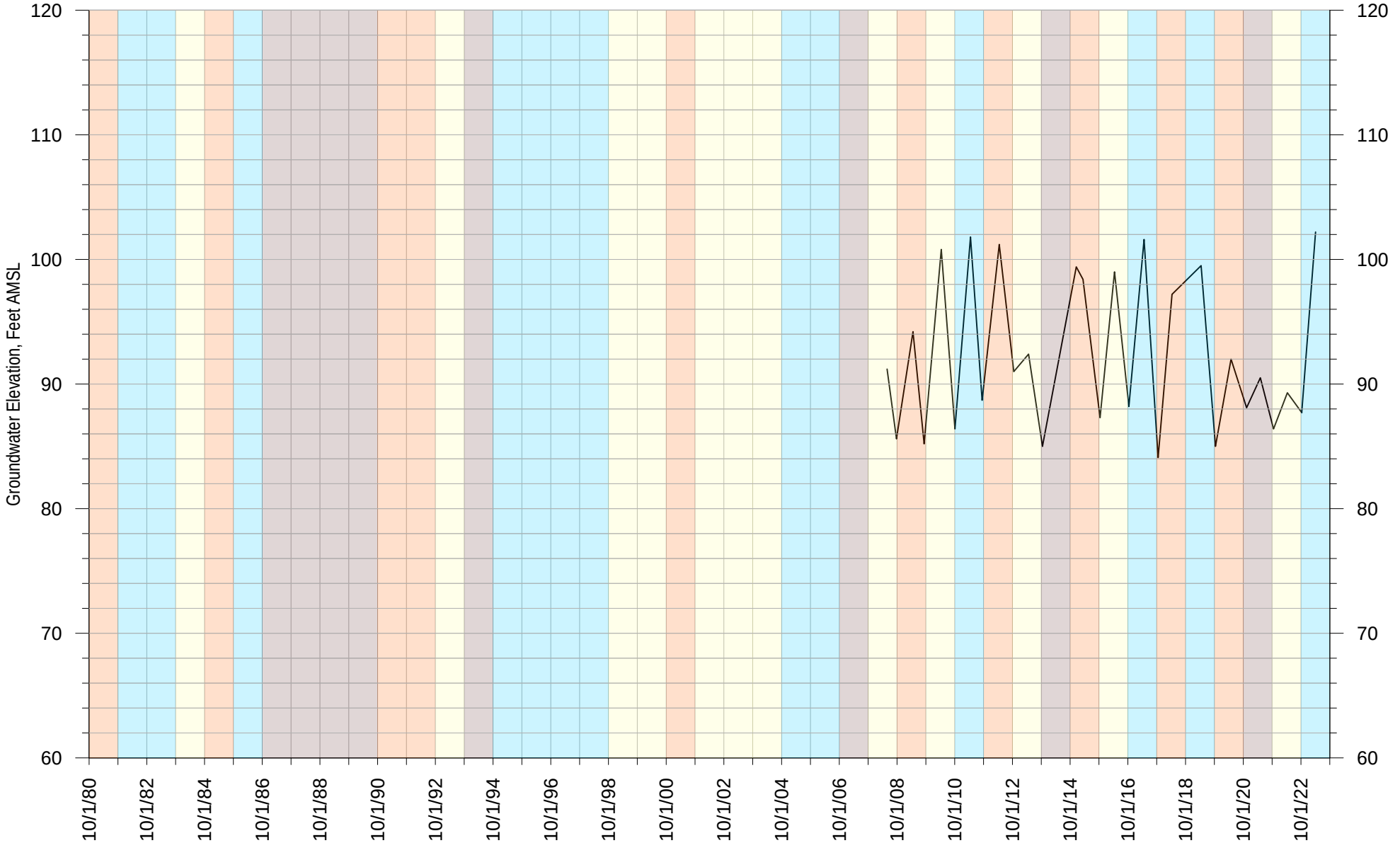
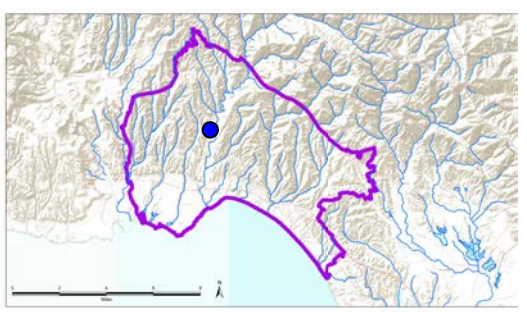
Private Well 21
Aquifer Screened:

Appendix A

FIGURE A-165





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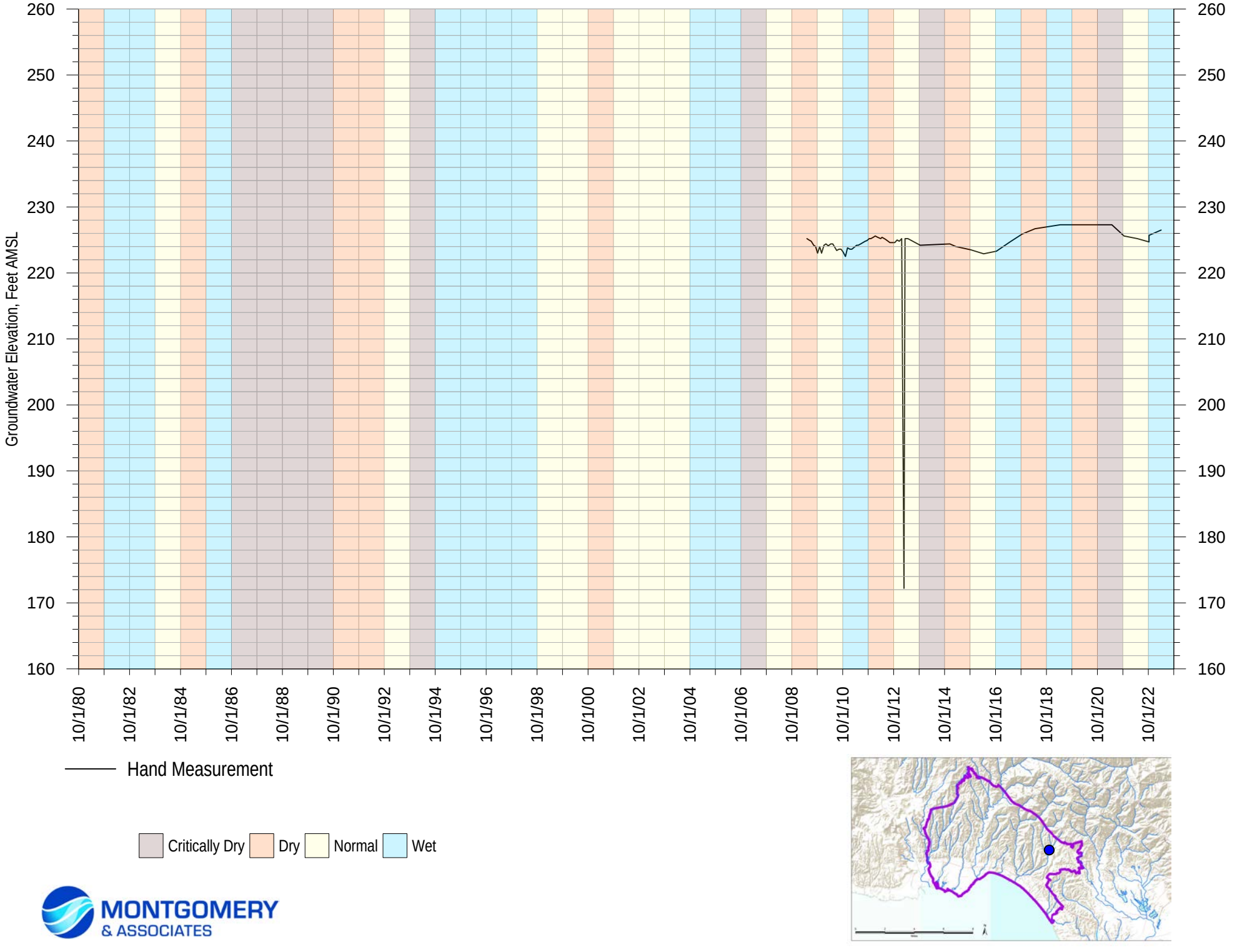
Private Well 22
Aquifer Screened:

Appendix A

FIGURE A-166



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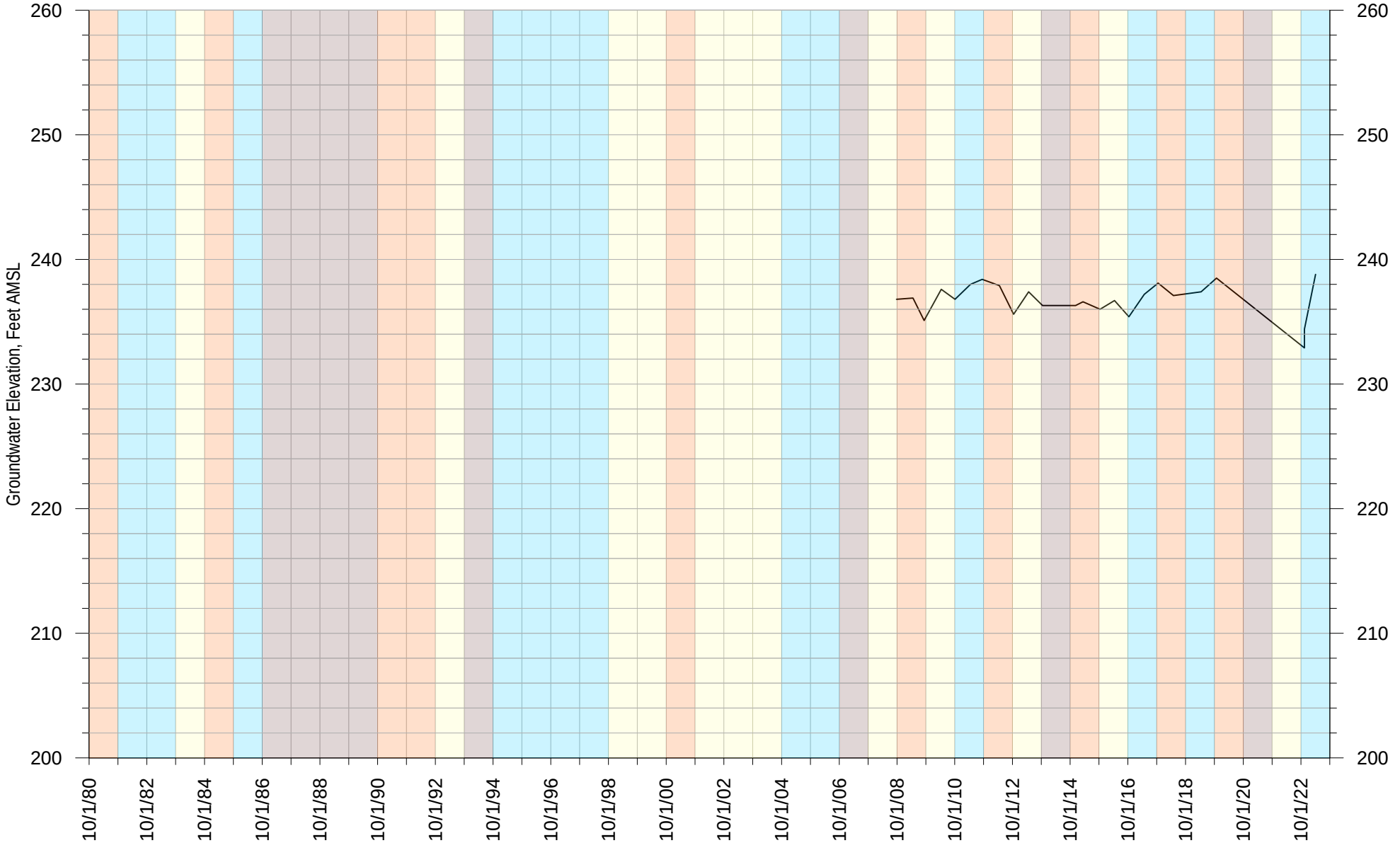
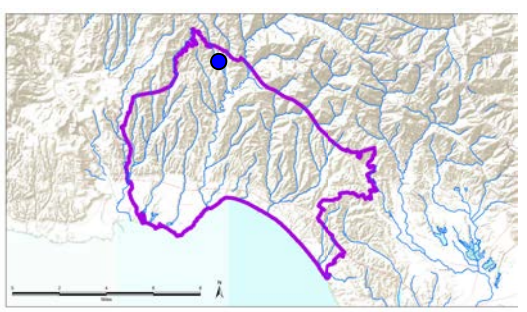
Private Well 23
Aquifer Screened:

Appendix A

FIGURE A-167





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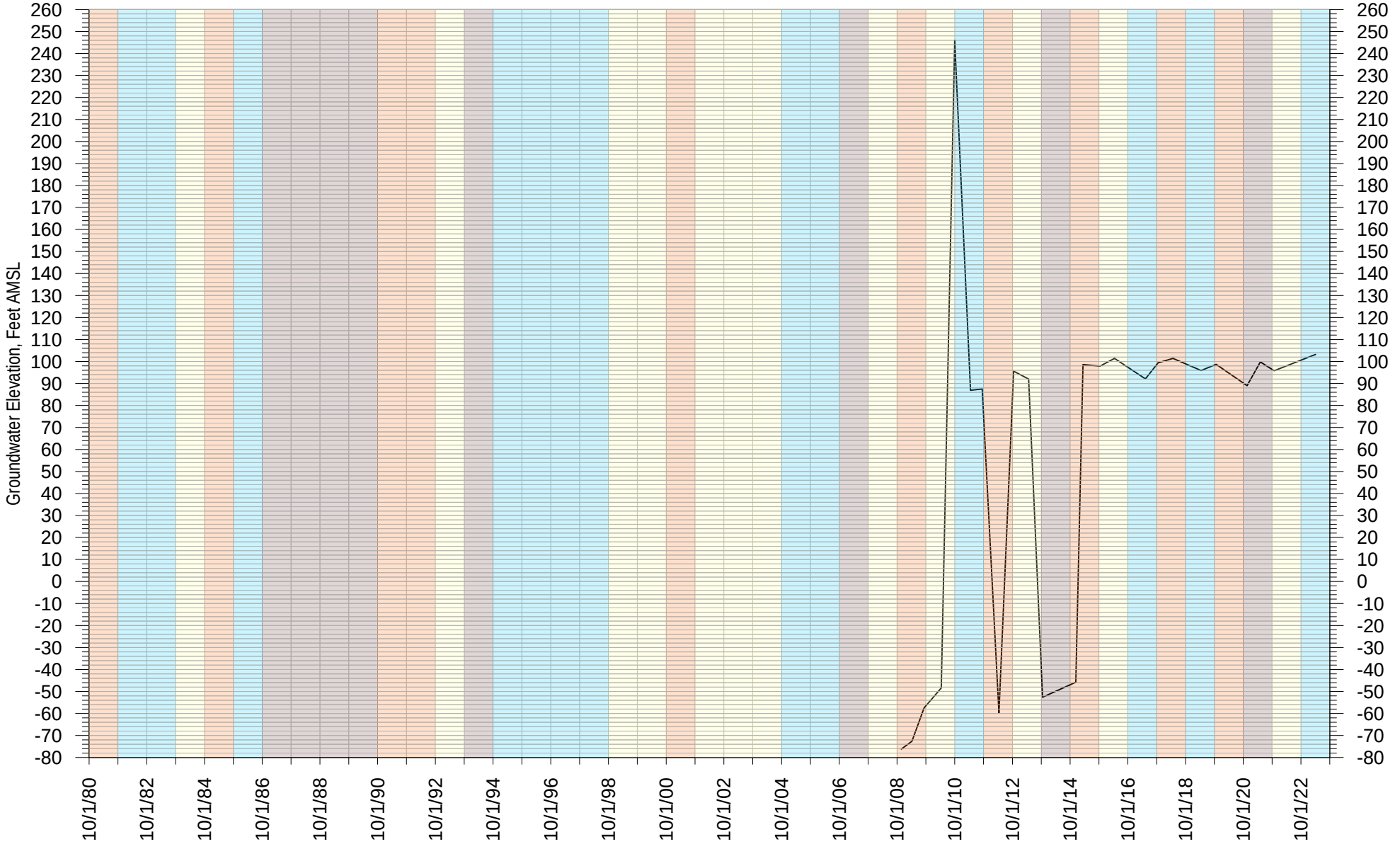
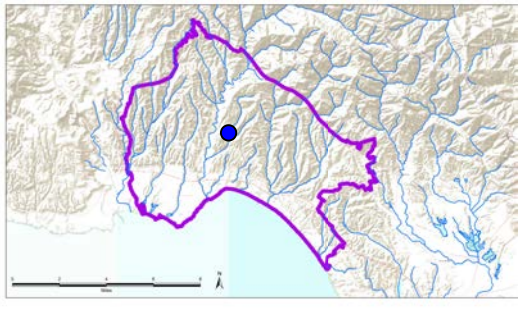
Private Well 24

Aquifer Screened:

Appendix A

FIGURE A-168





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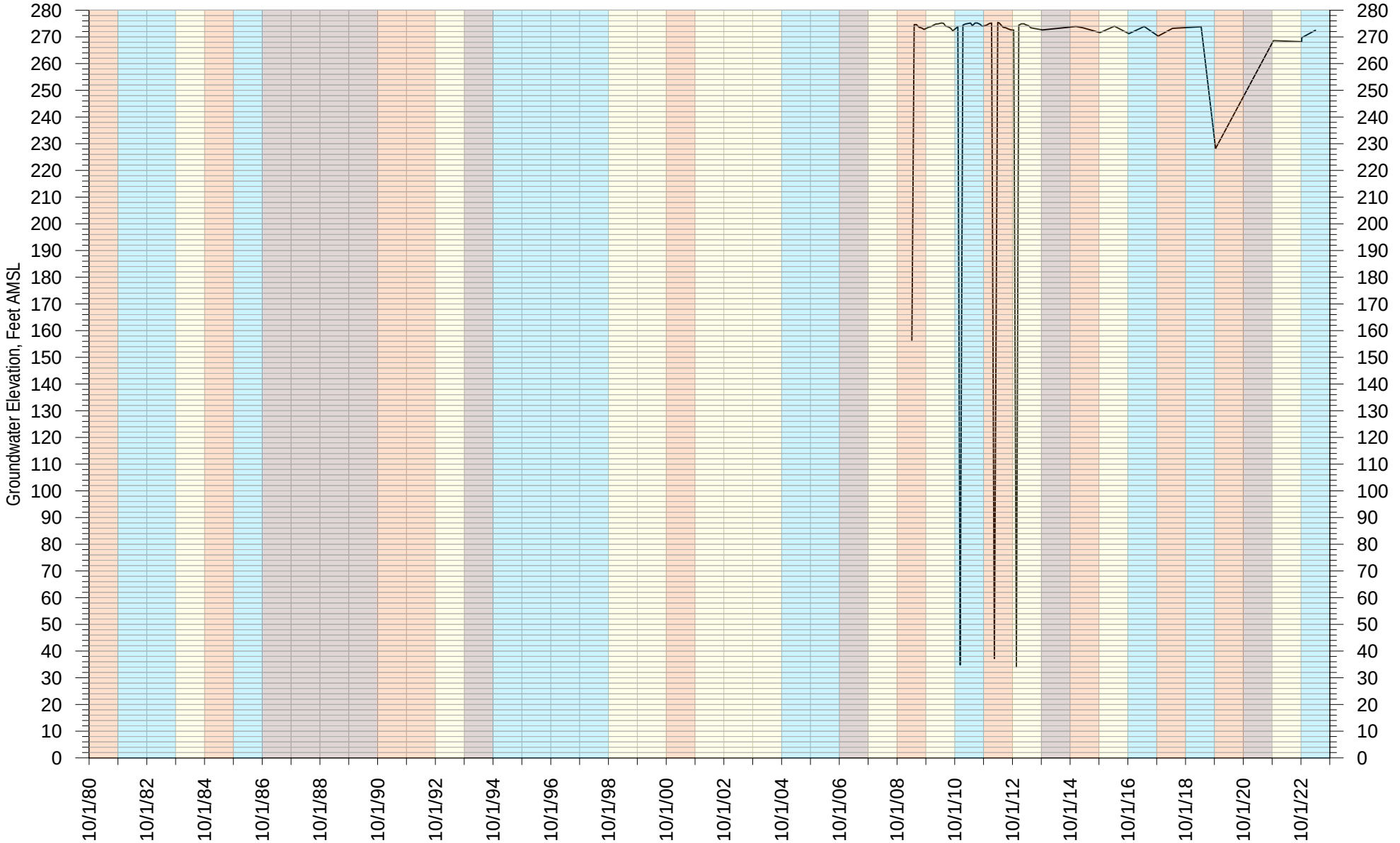
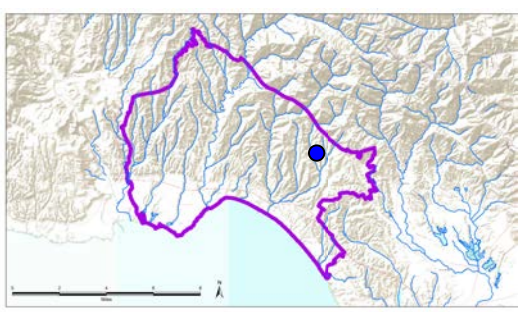
Private Well 25
Aquifer Screened:

Appendix A

FIGURE A-169





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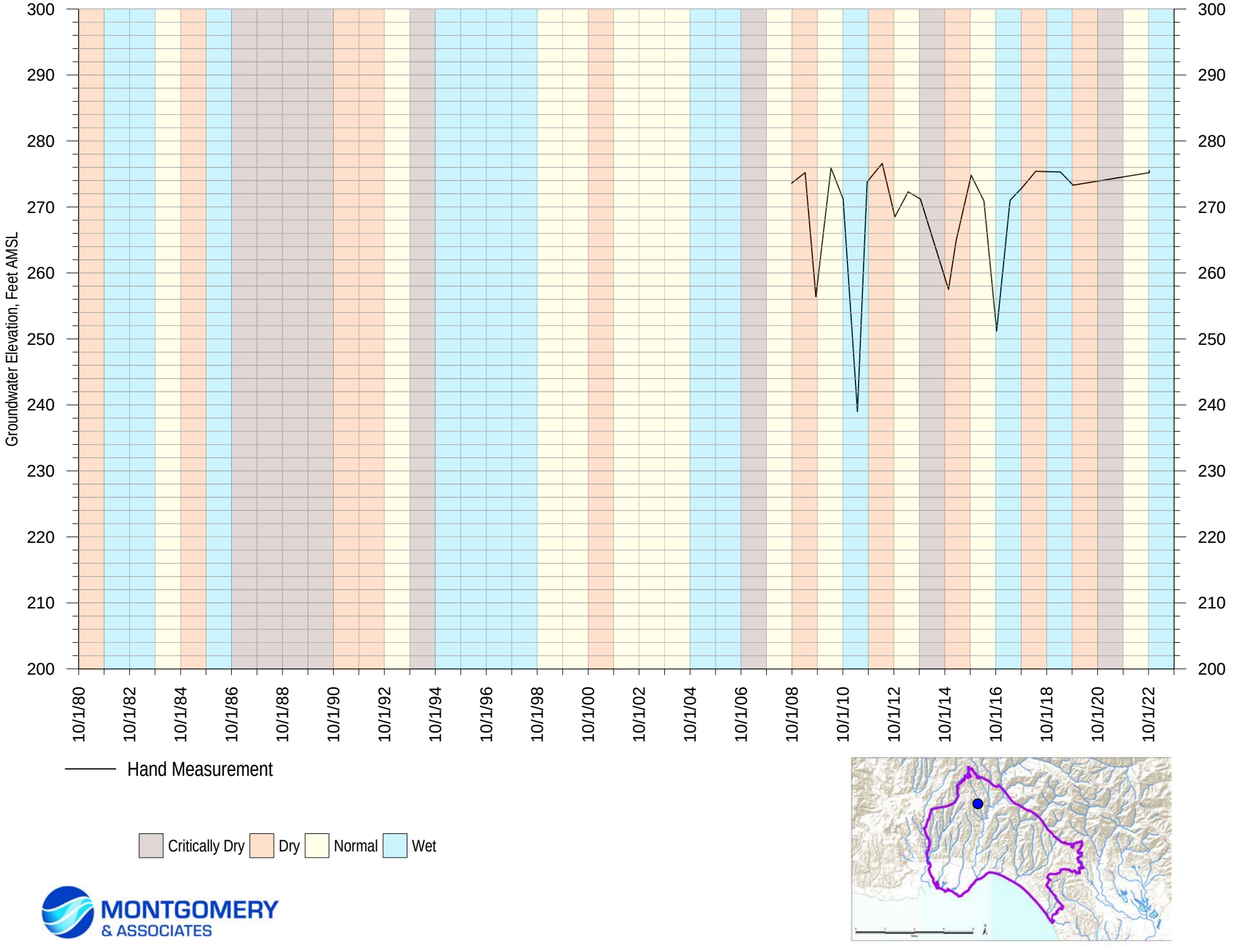
Private Well 26
Aquifer Screened:

Appendix A

FIGURE A-170



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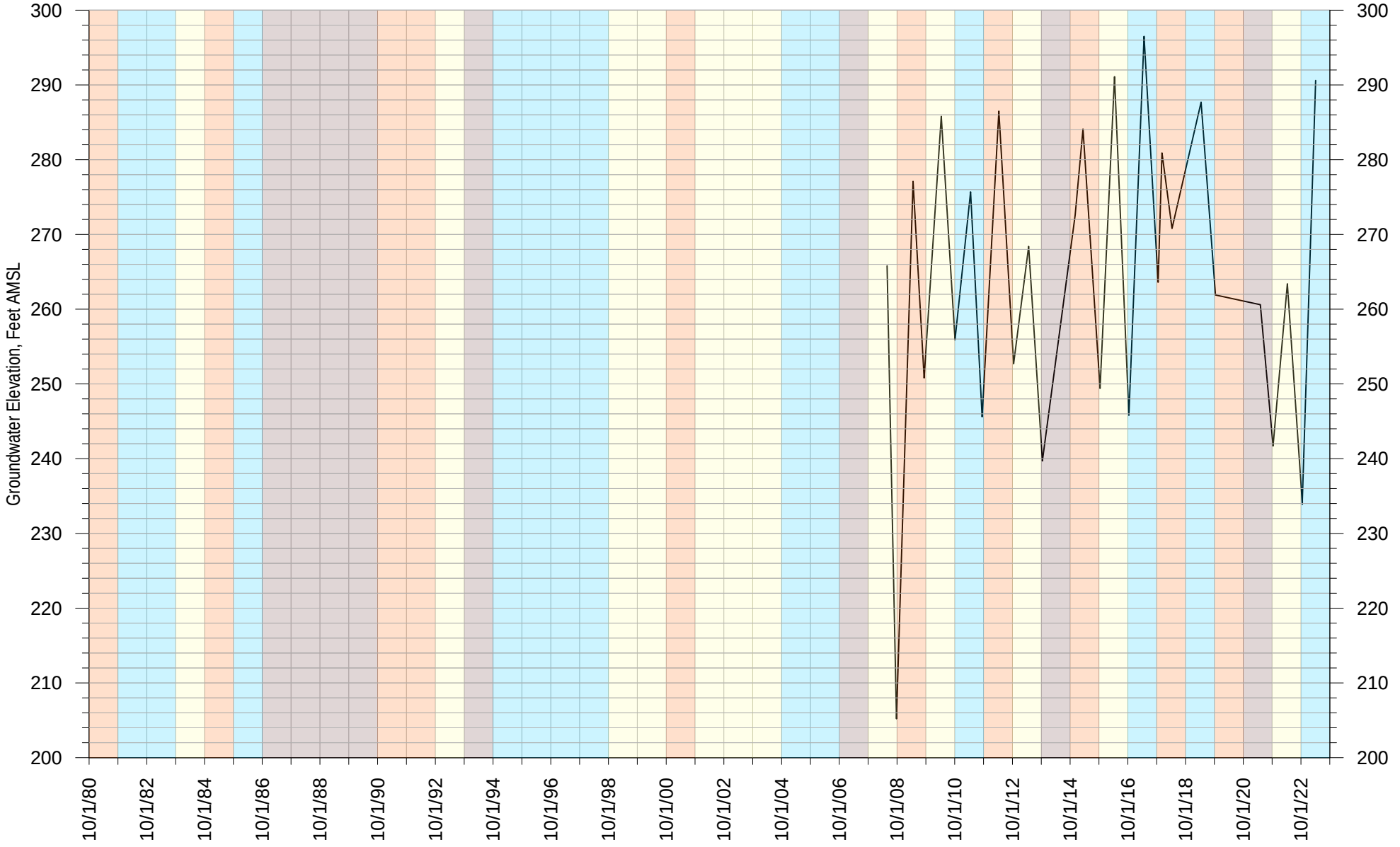
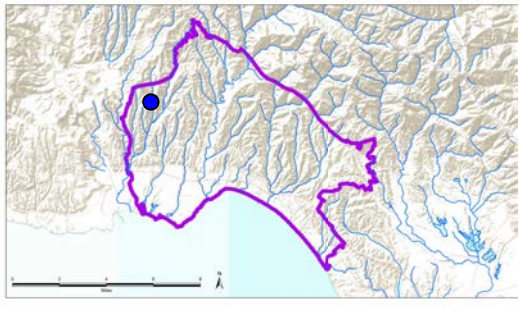
Private Well 27

Aquifer Screened:

Appendix A

FIGURE A-171





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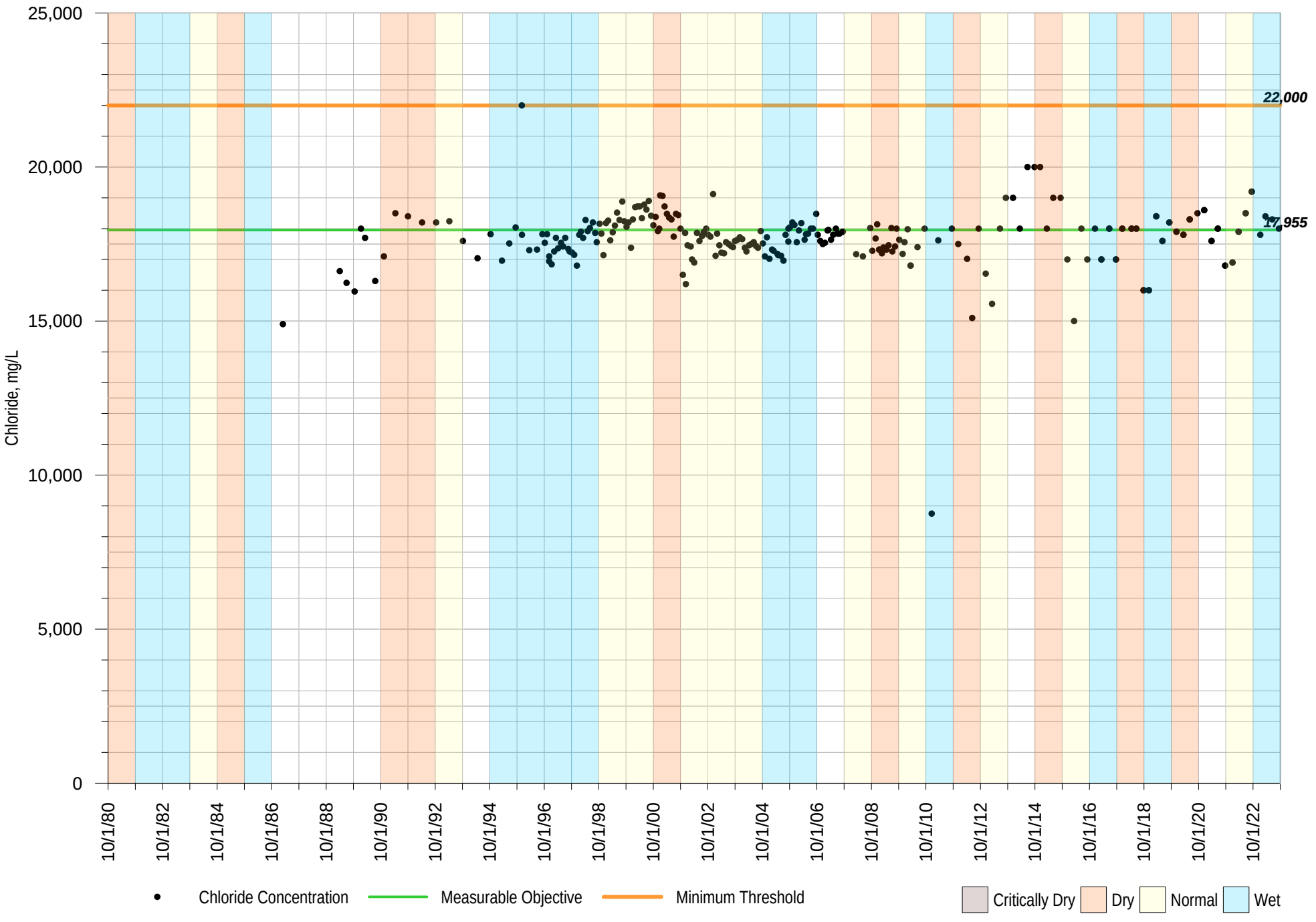
Appendix B

Coastal Monitoring Well Chemographs

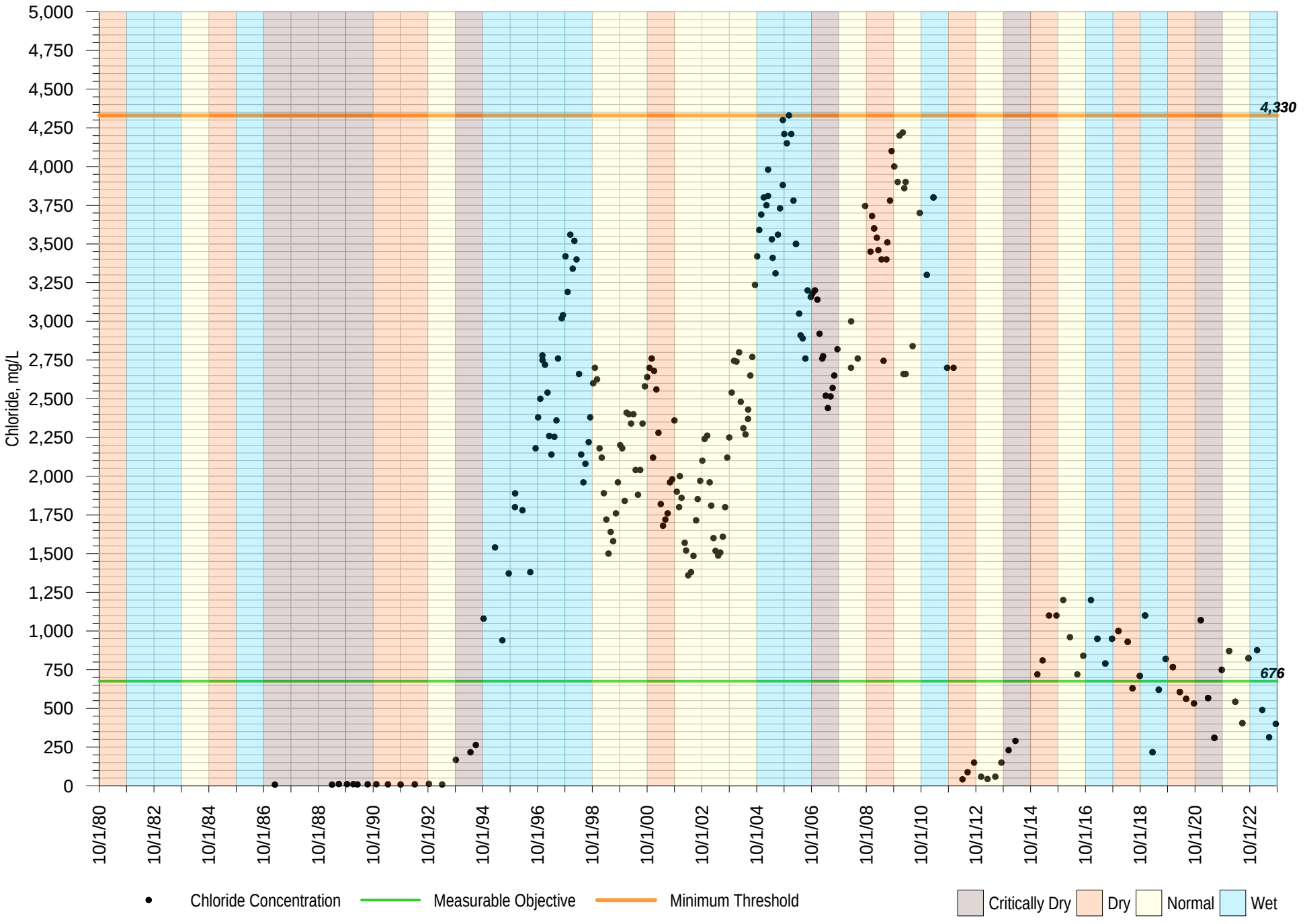
SC-A3A

FIGURE B-1



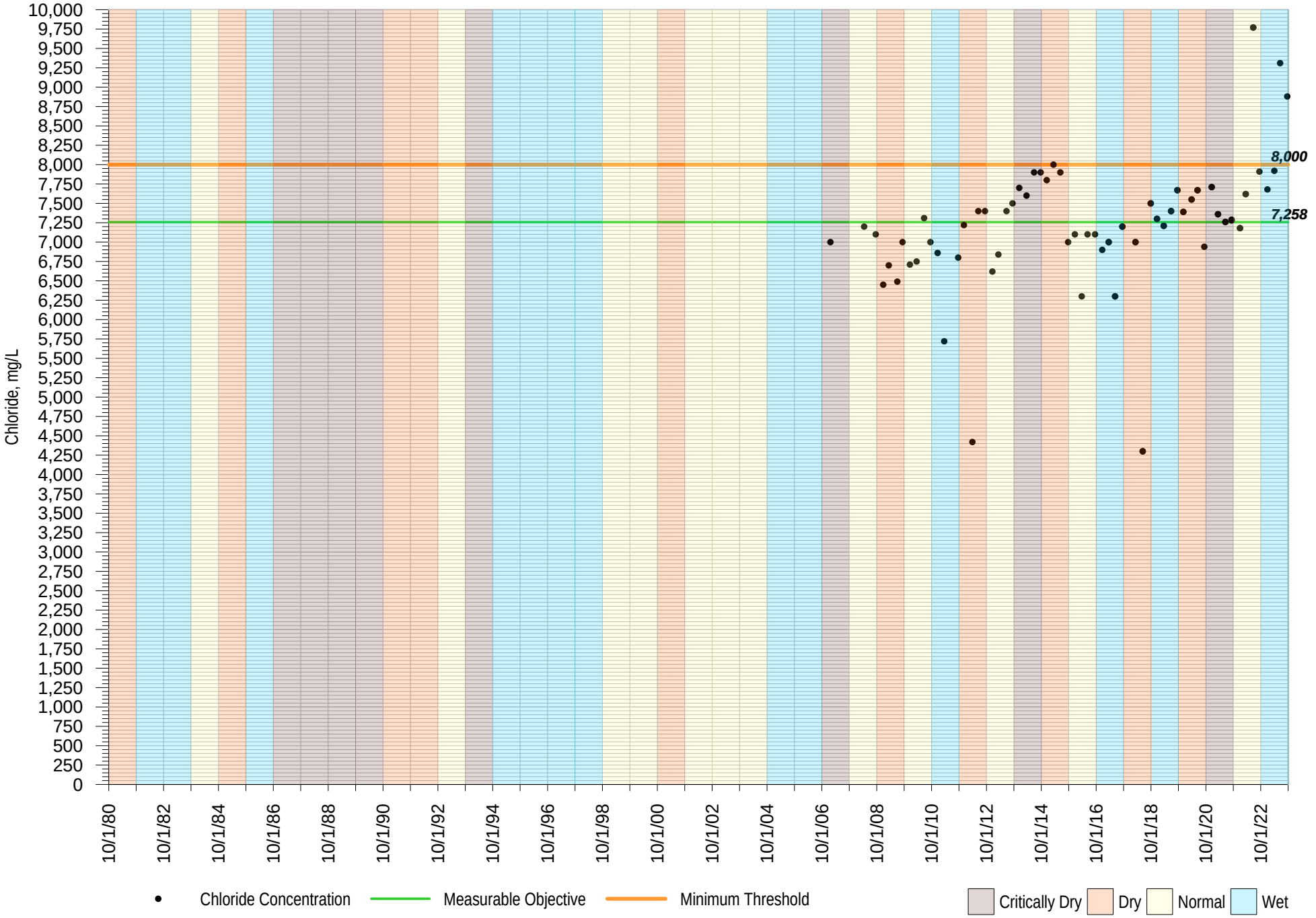
SC-A3B

FIGURE B-2



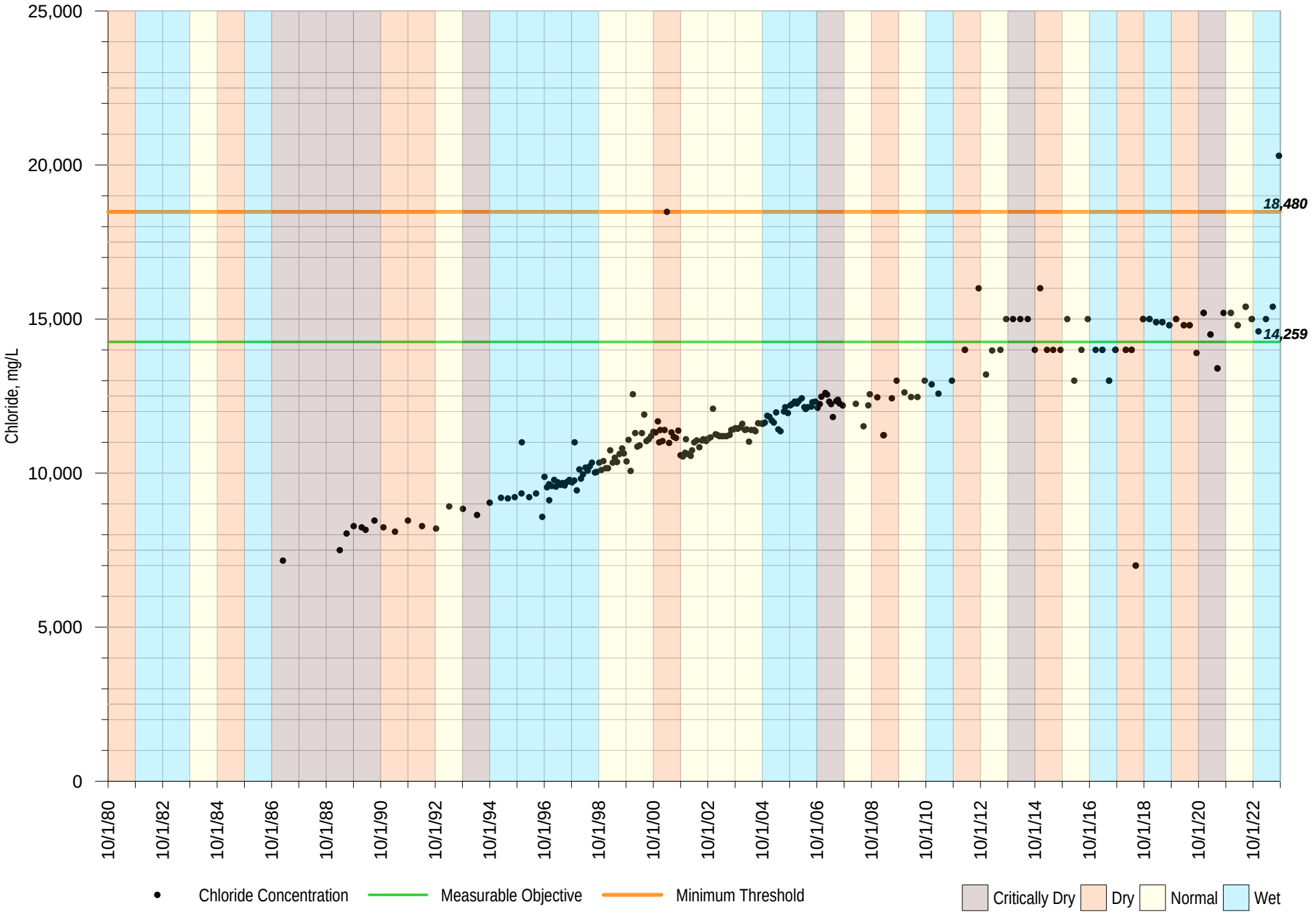
SC-A8A

FIGURE B-3



SC-A2A & SC-A2RA

FIGURE B-4



SC-A2B & SC-A2RB

FIGURE B-5

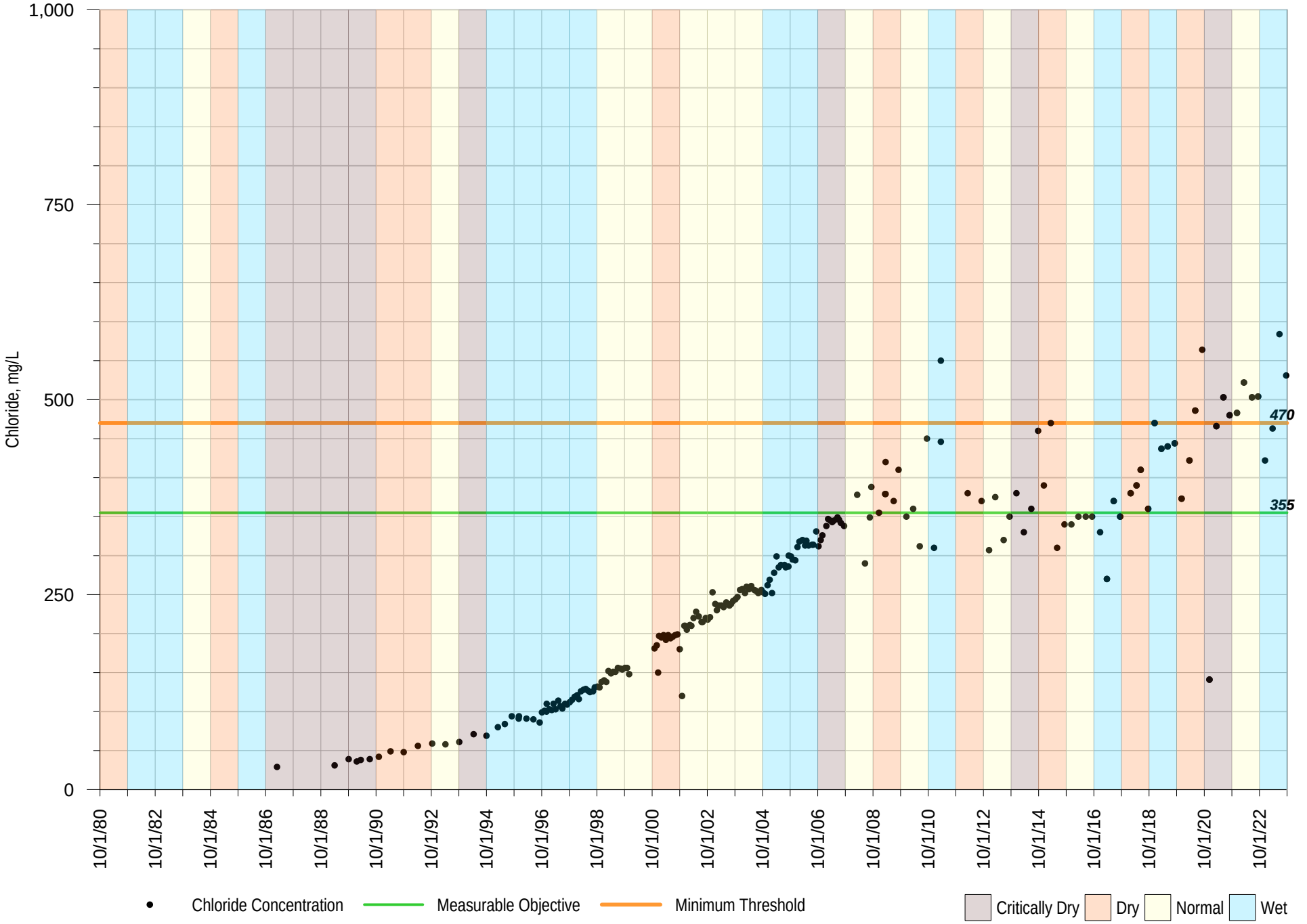
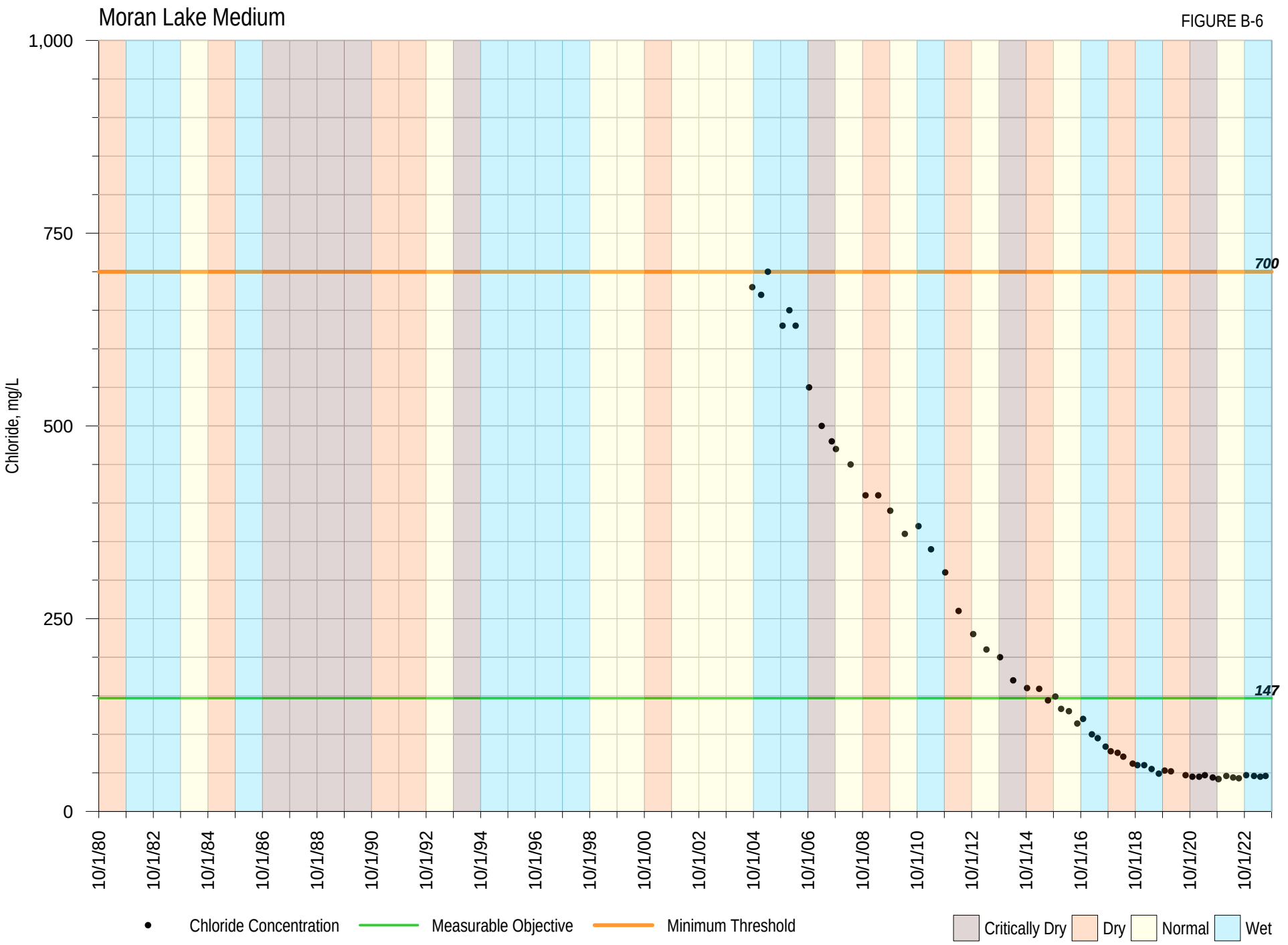
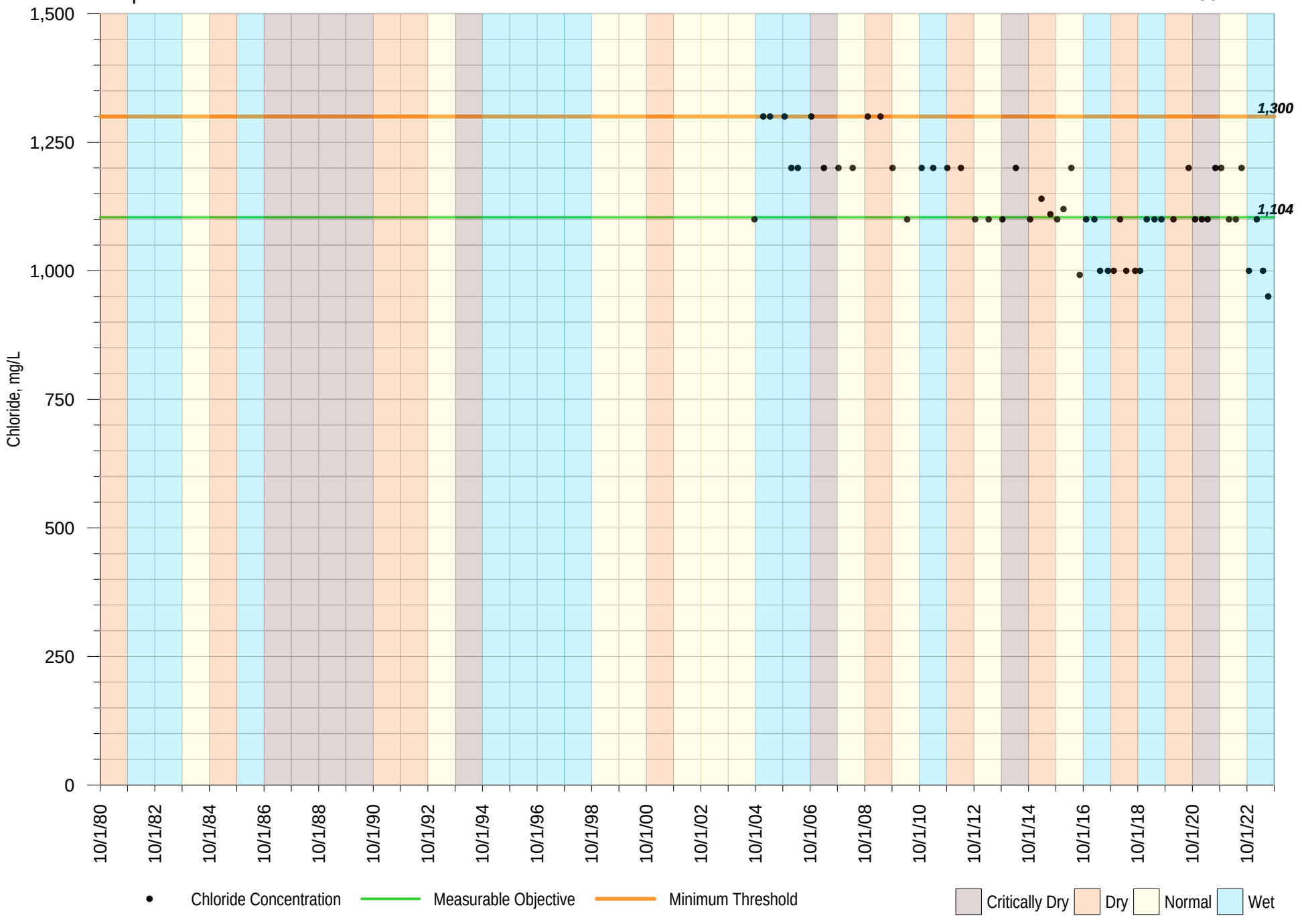


FIGURE B-6


Moran Lake Medium
1,000
750
500
250
0
Chloride, mg/L
700
147
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable Objective
Minimum Threshold
Critically Dry
Dry
Normal
Wet

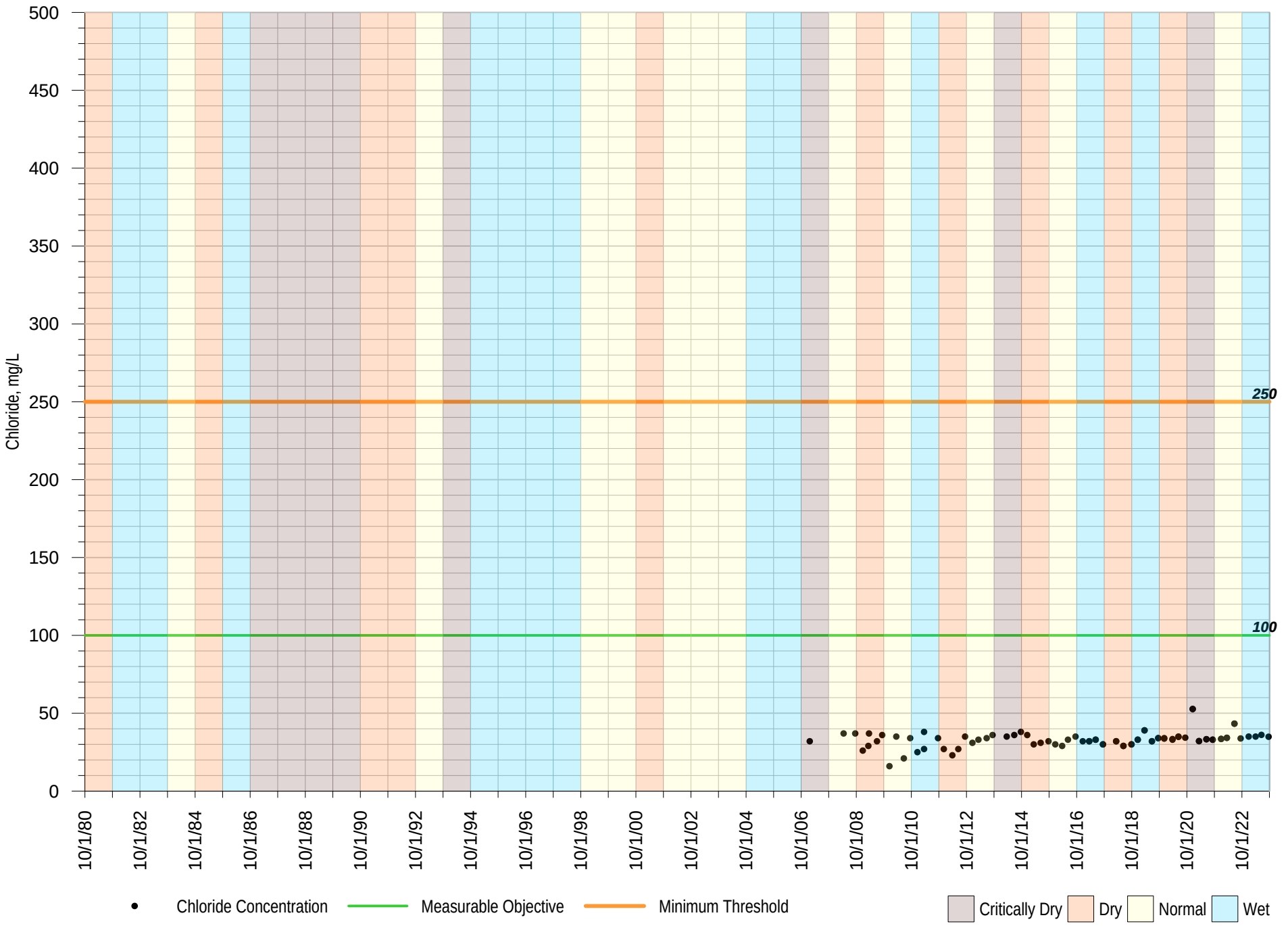
Soquel Point Medium

FIGURE B-7



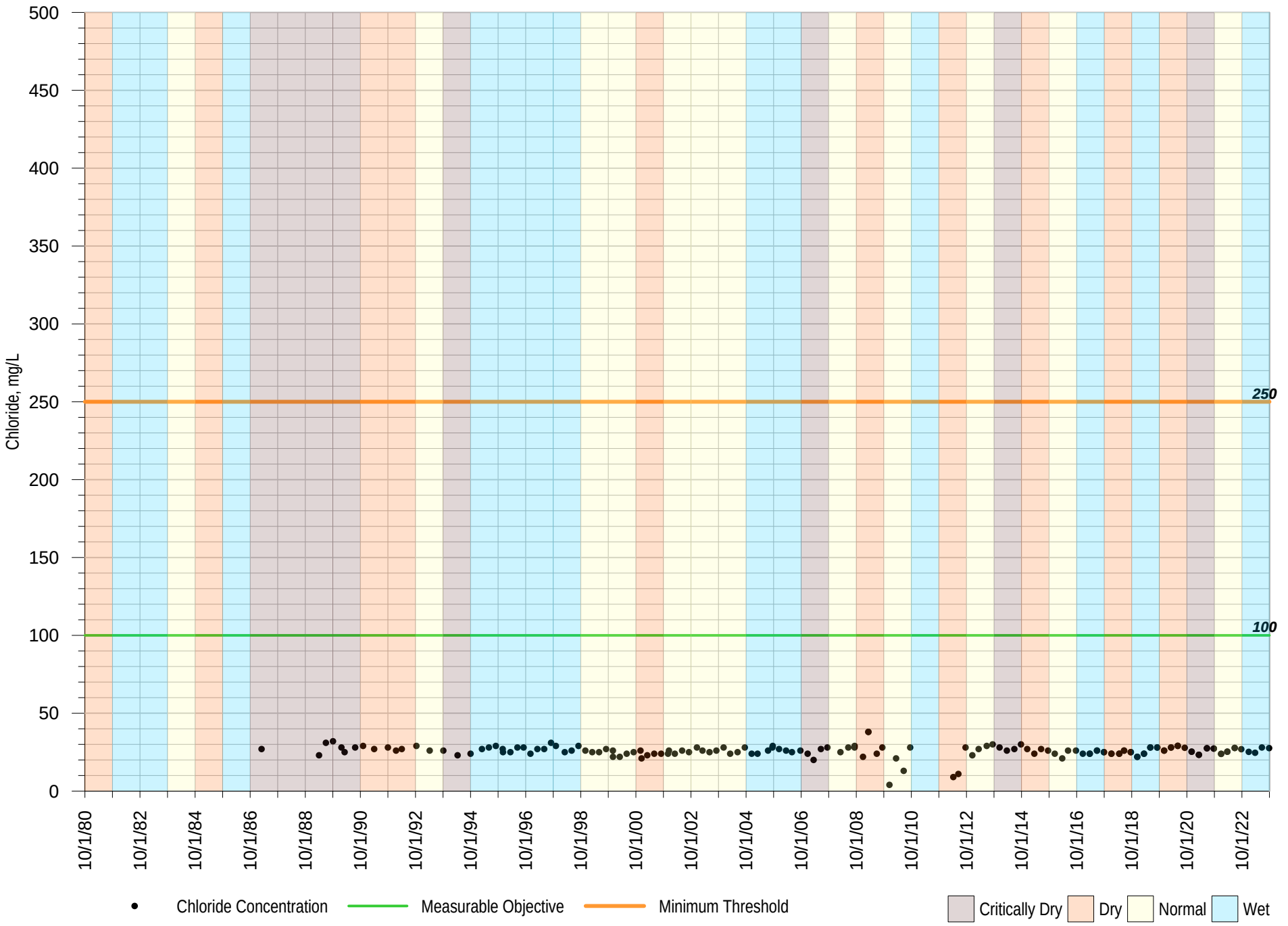
SC-A8B

FIGURE B-8



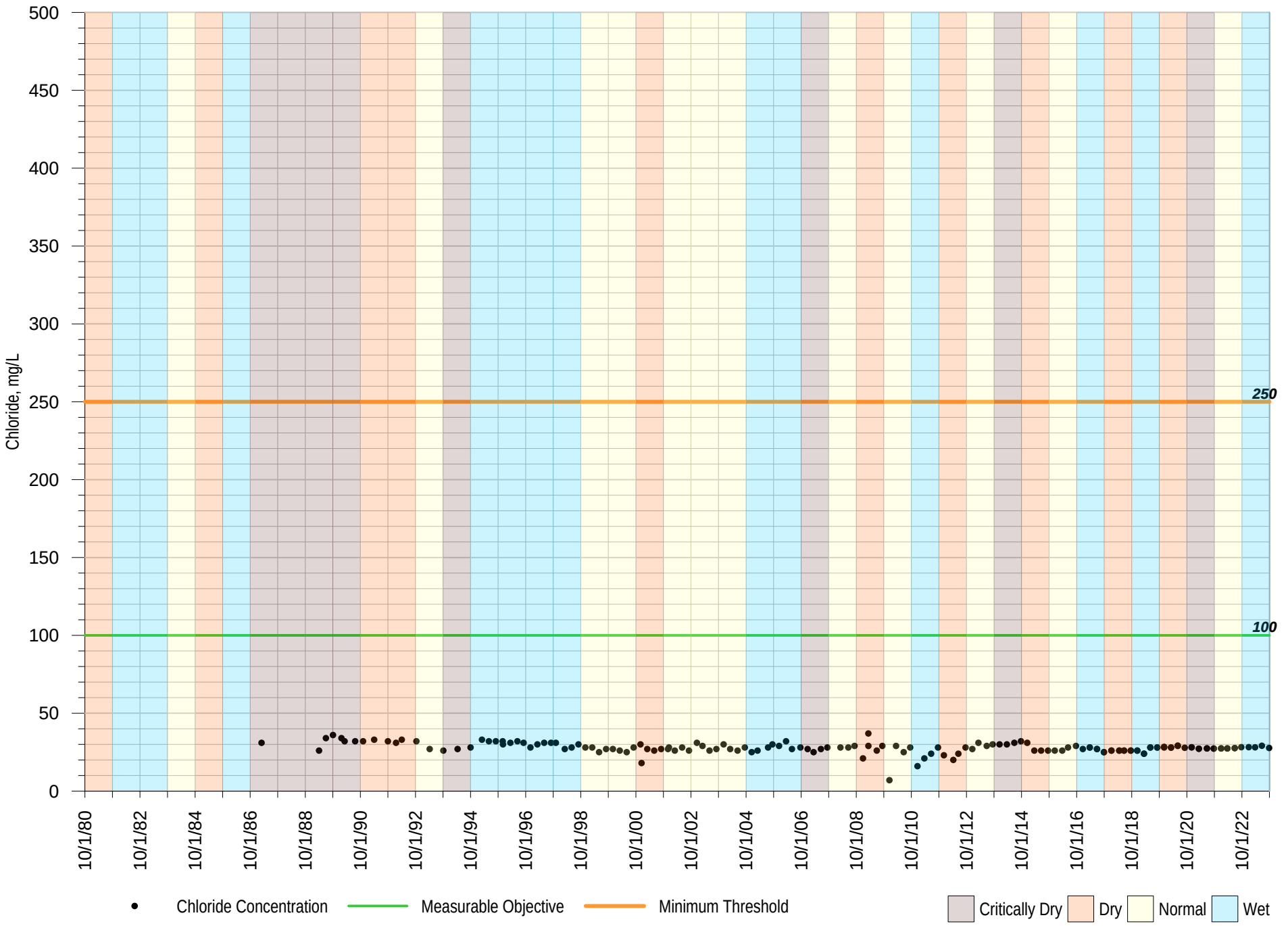
SC-A1B

FIGURE B-9



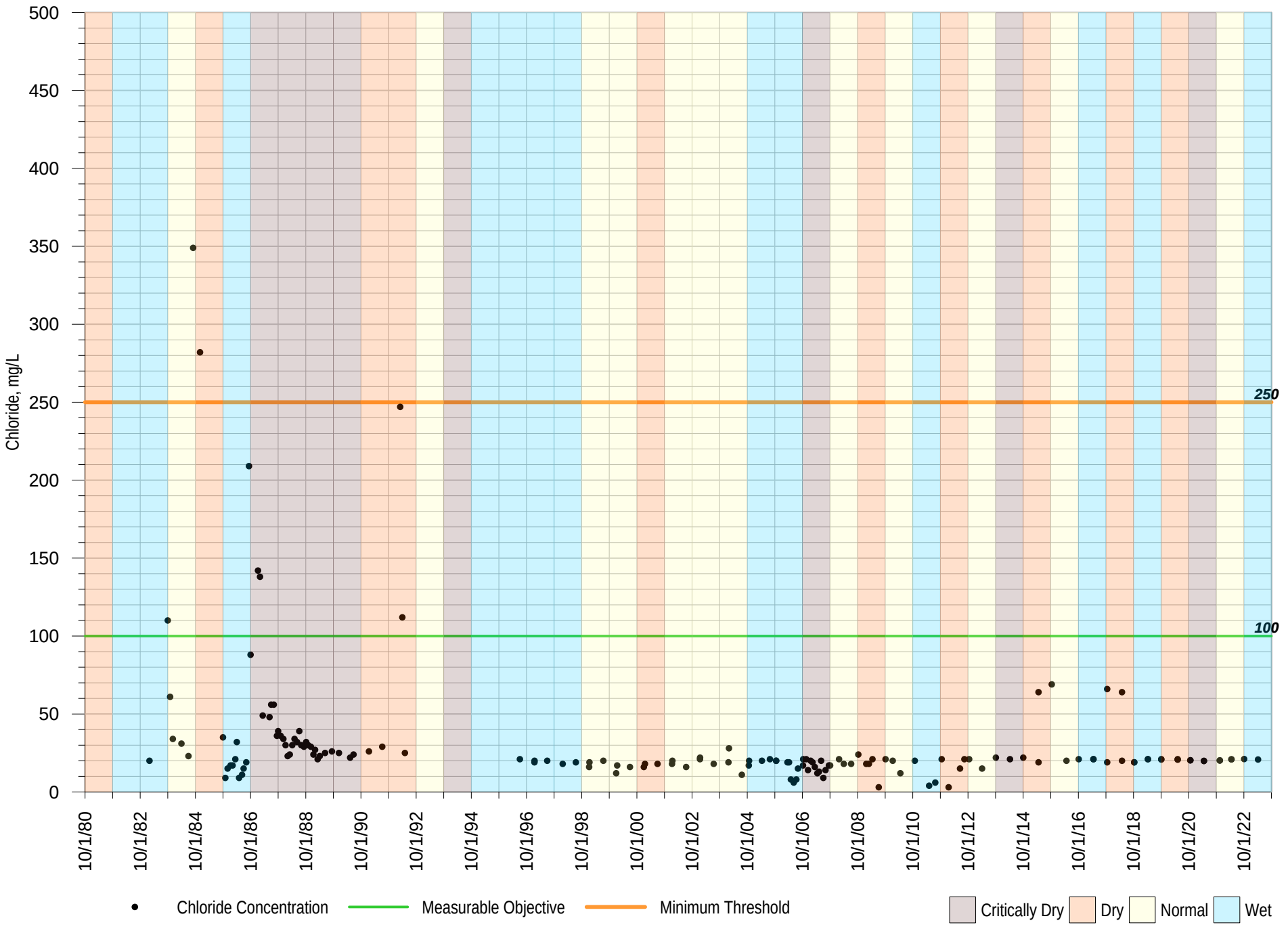
SC-A1A

FIGURE B-10



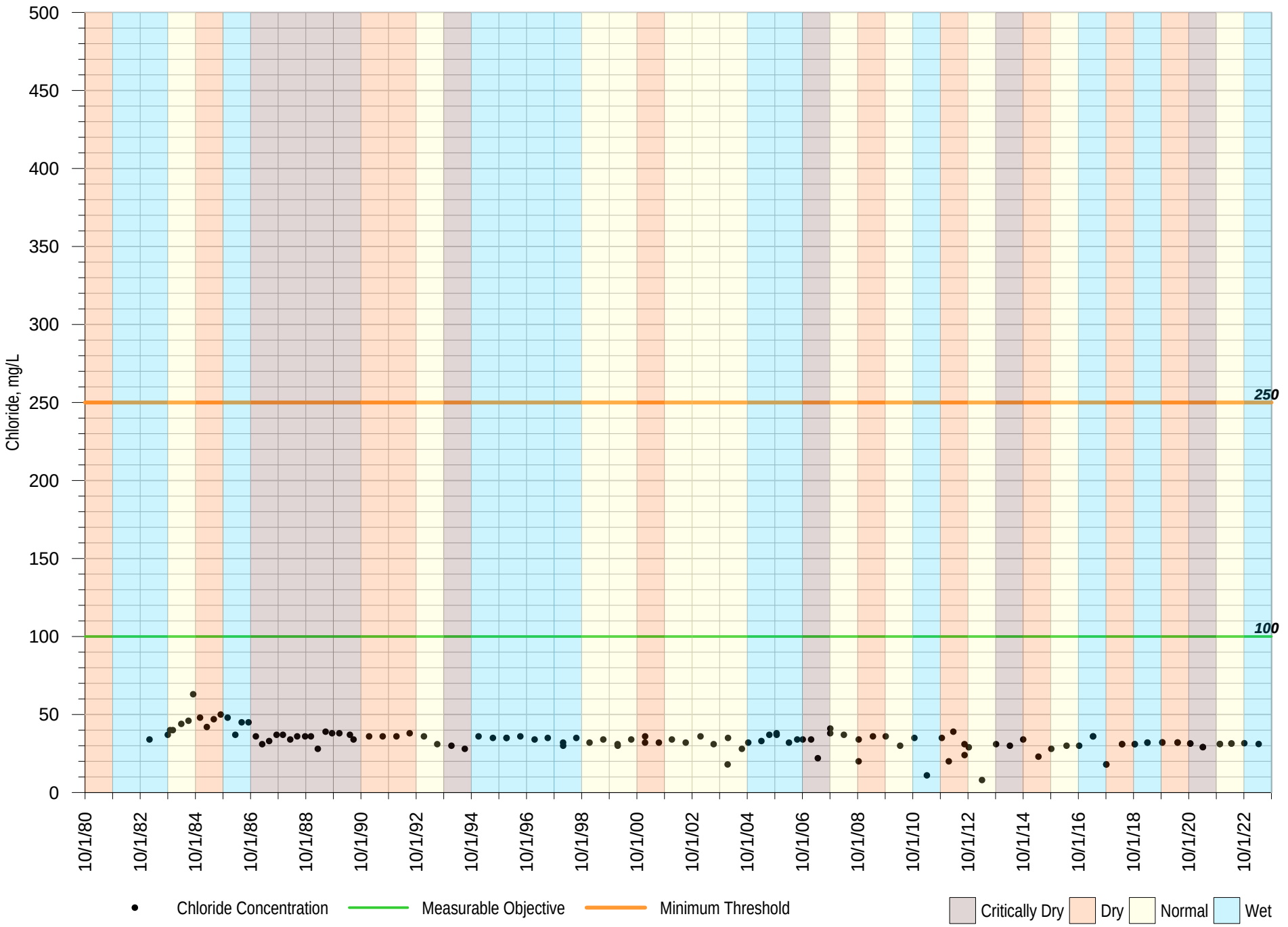
SC-8D & SC-8RD

FIGURE B-11



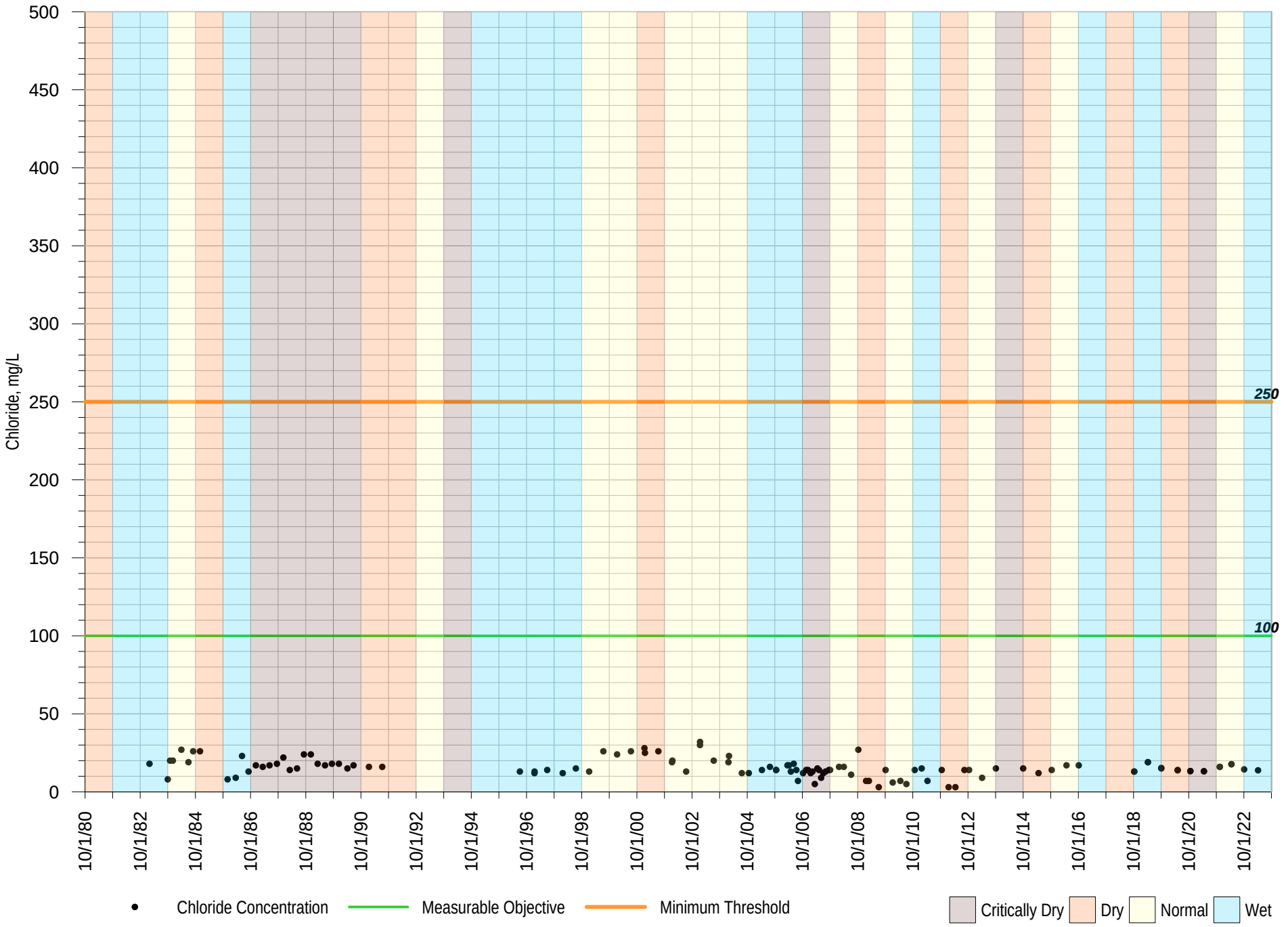
SC-9C & SC-9RC

FIGURE B-12



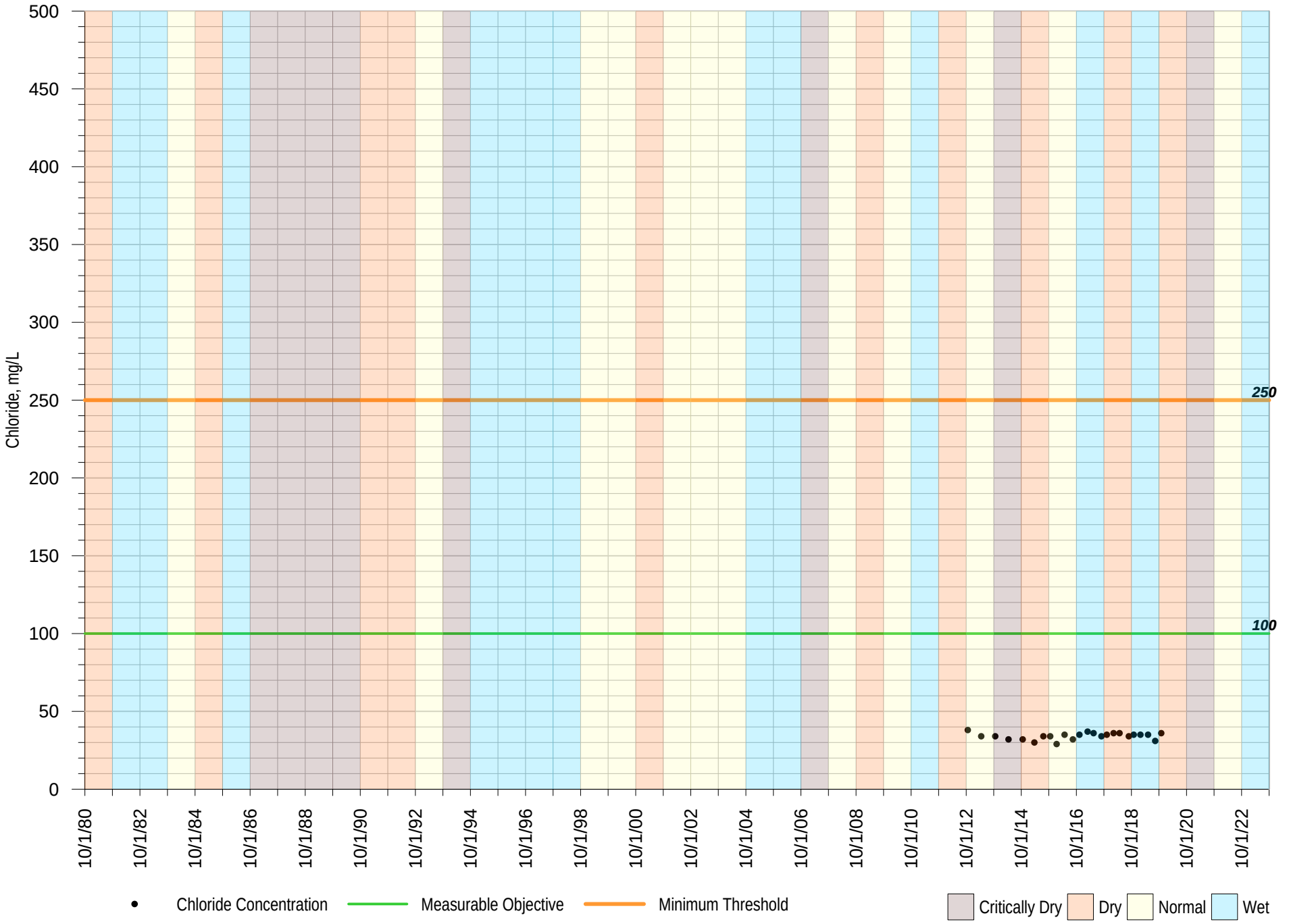
SC-8B & SC-8RB

FIGURE B-13



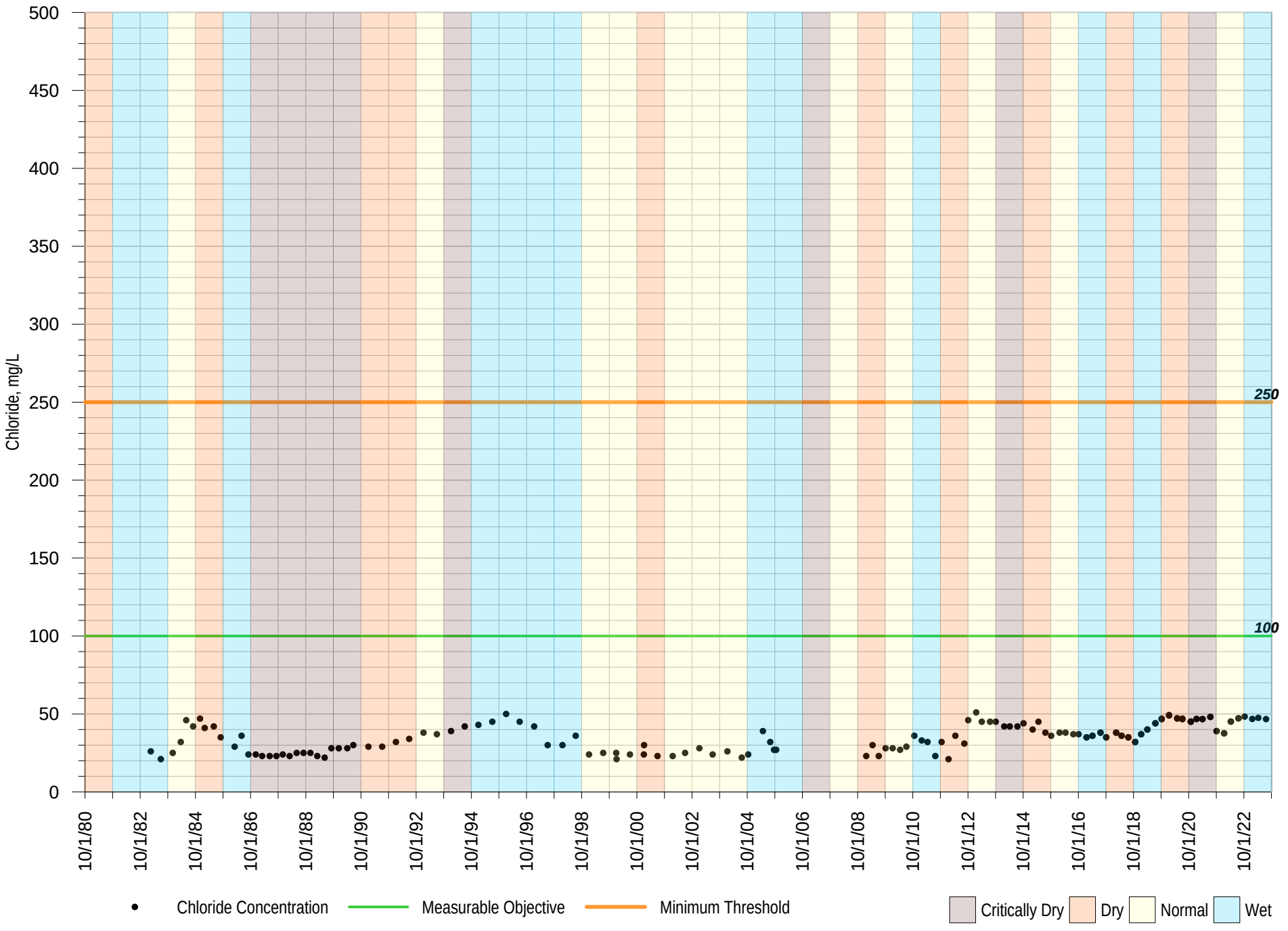
Pleasure Point Medium

FIGURE B-14



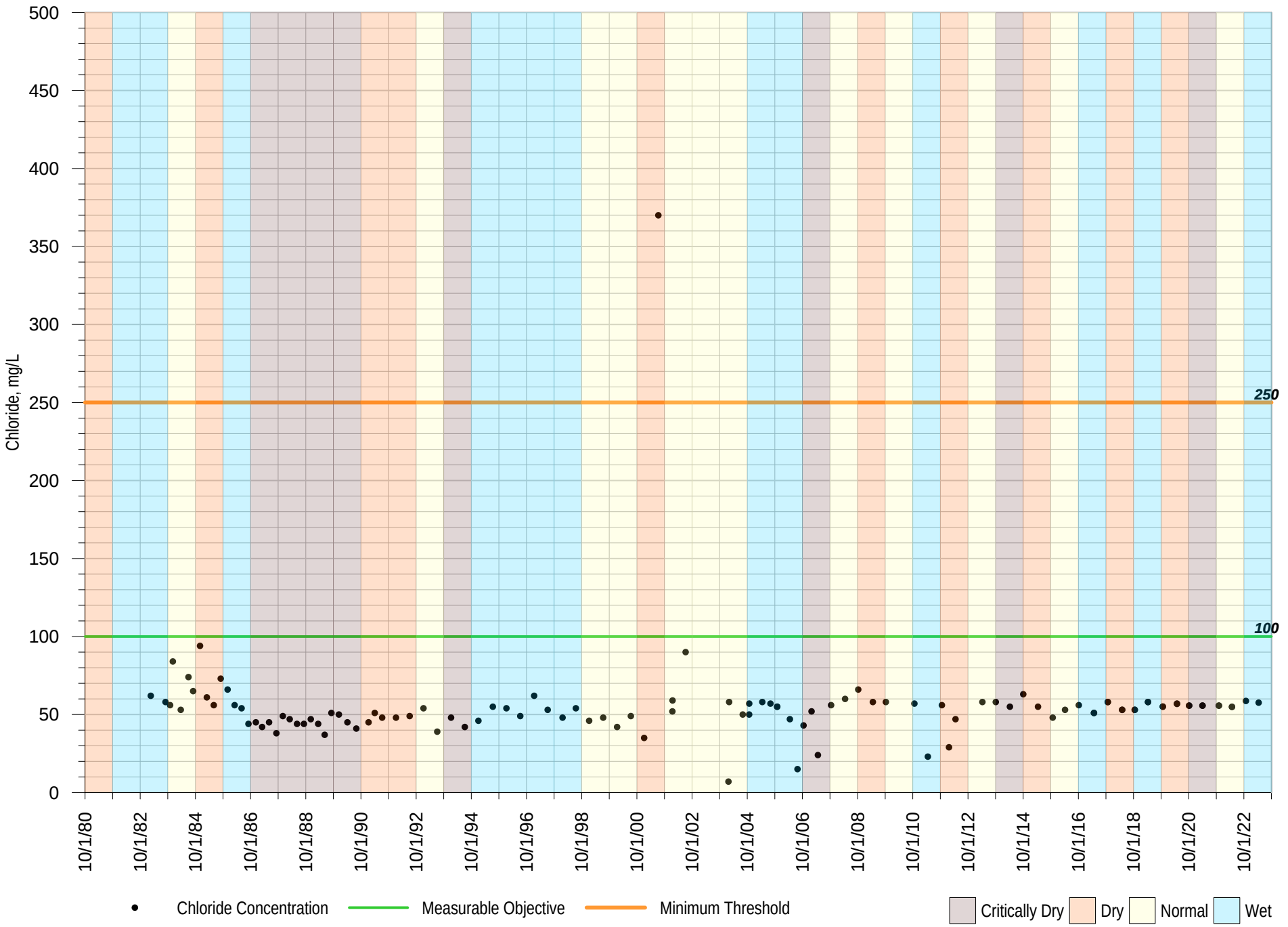
SC-1A

FIGURE B-15



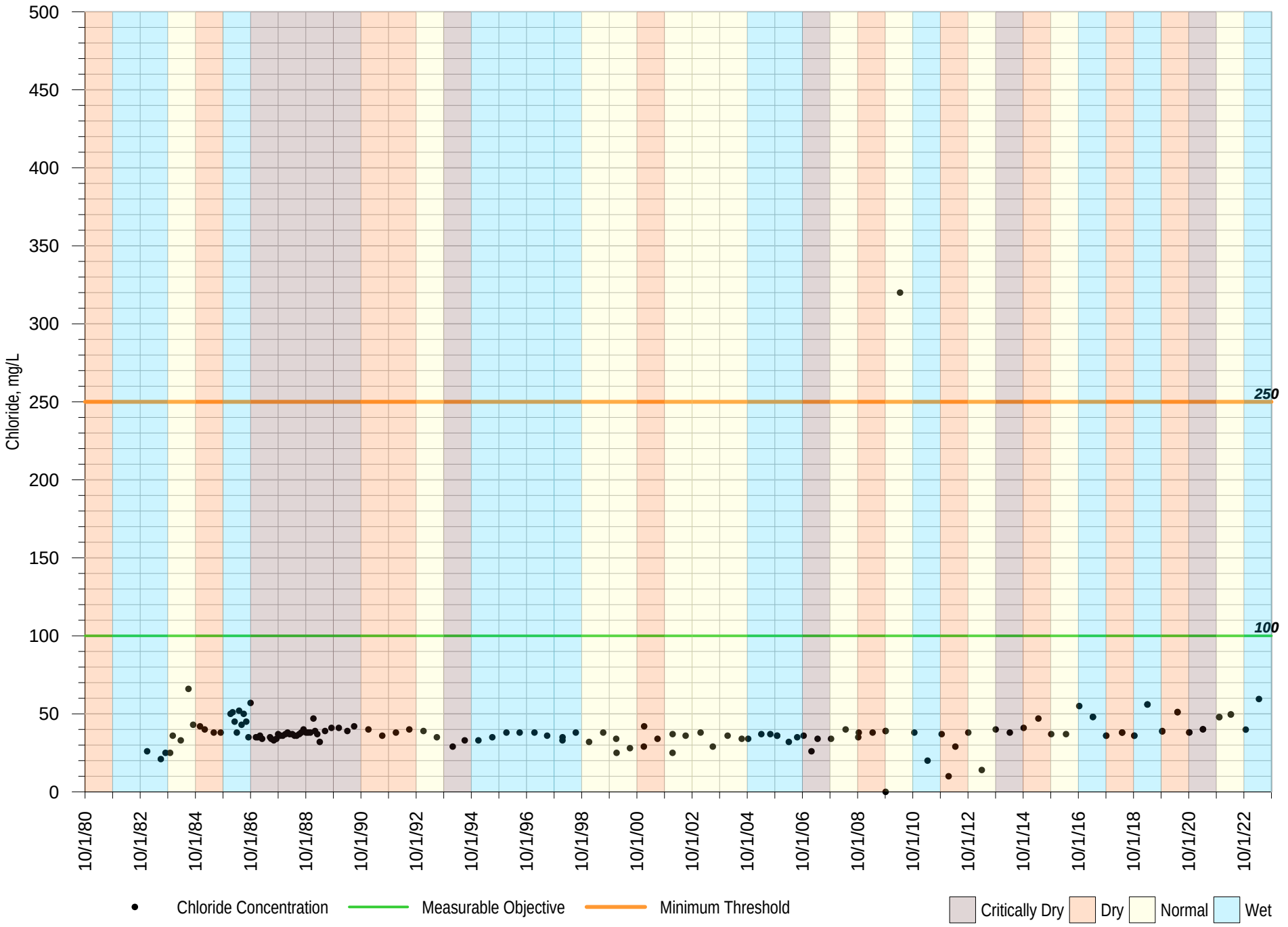
SC-5A & SC-5RA

FIGURE B-16



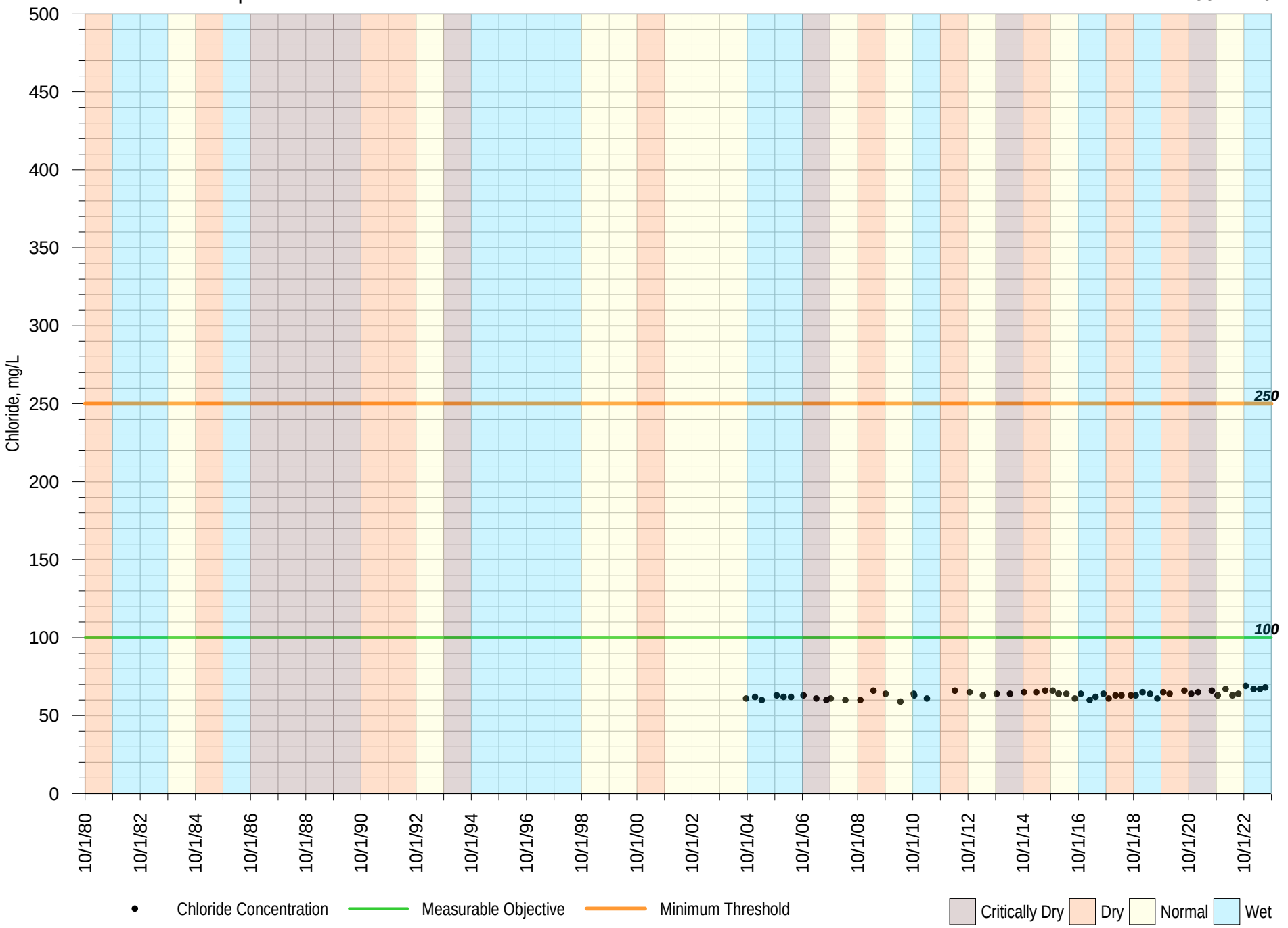
SC-3A & SC-3RA

FIGURE B-17



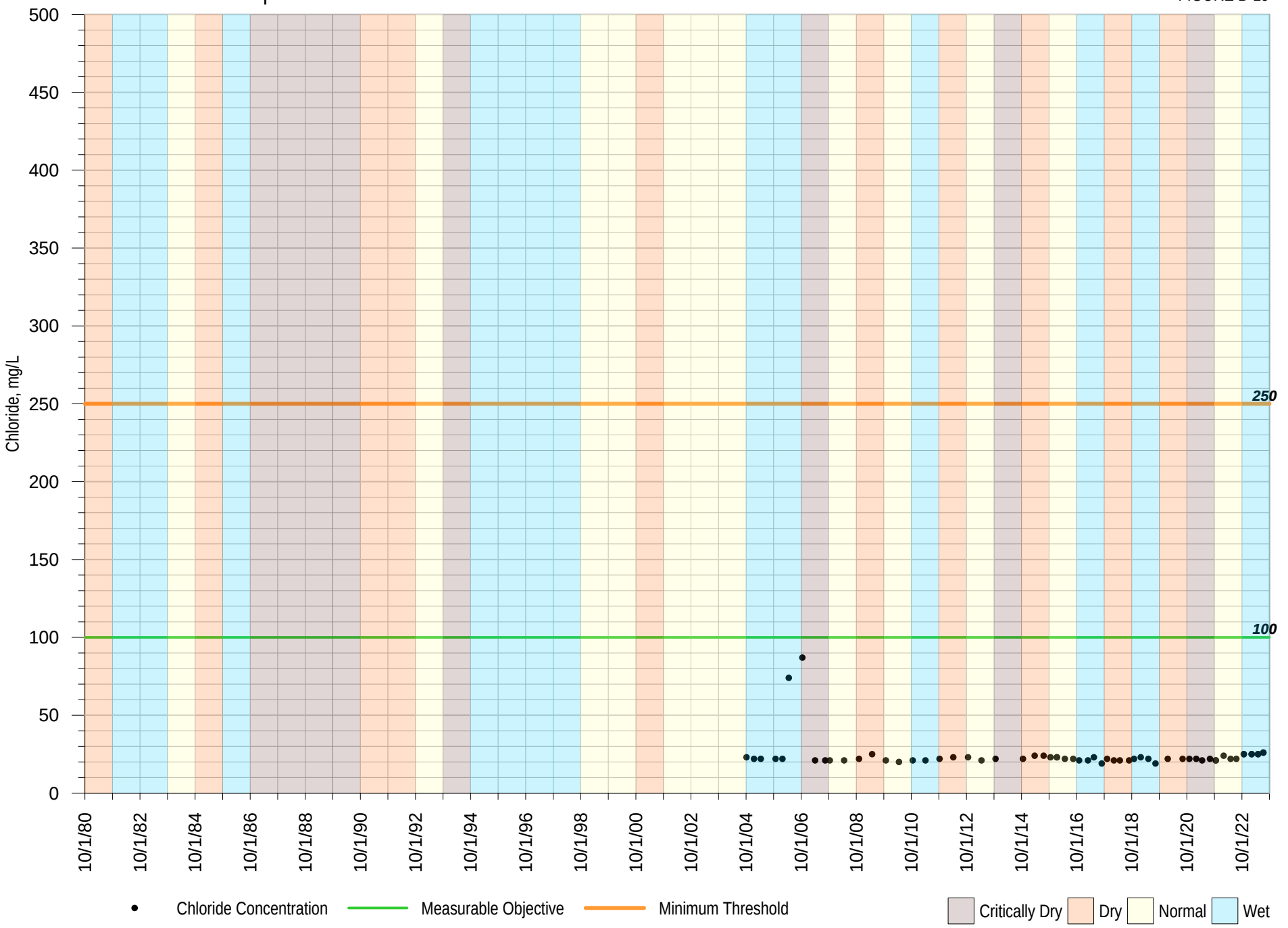
Moran Lake Deep

FIGURE B-18



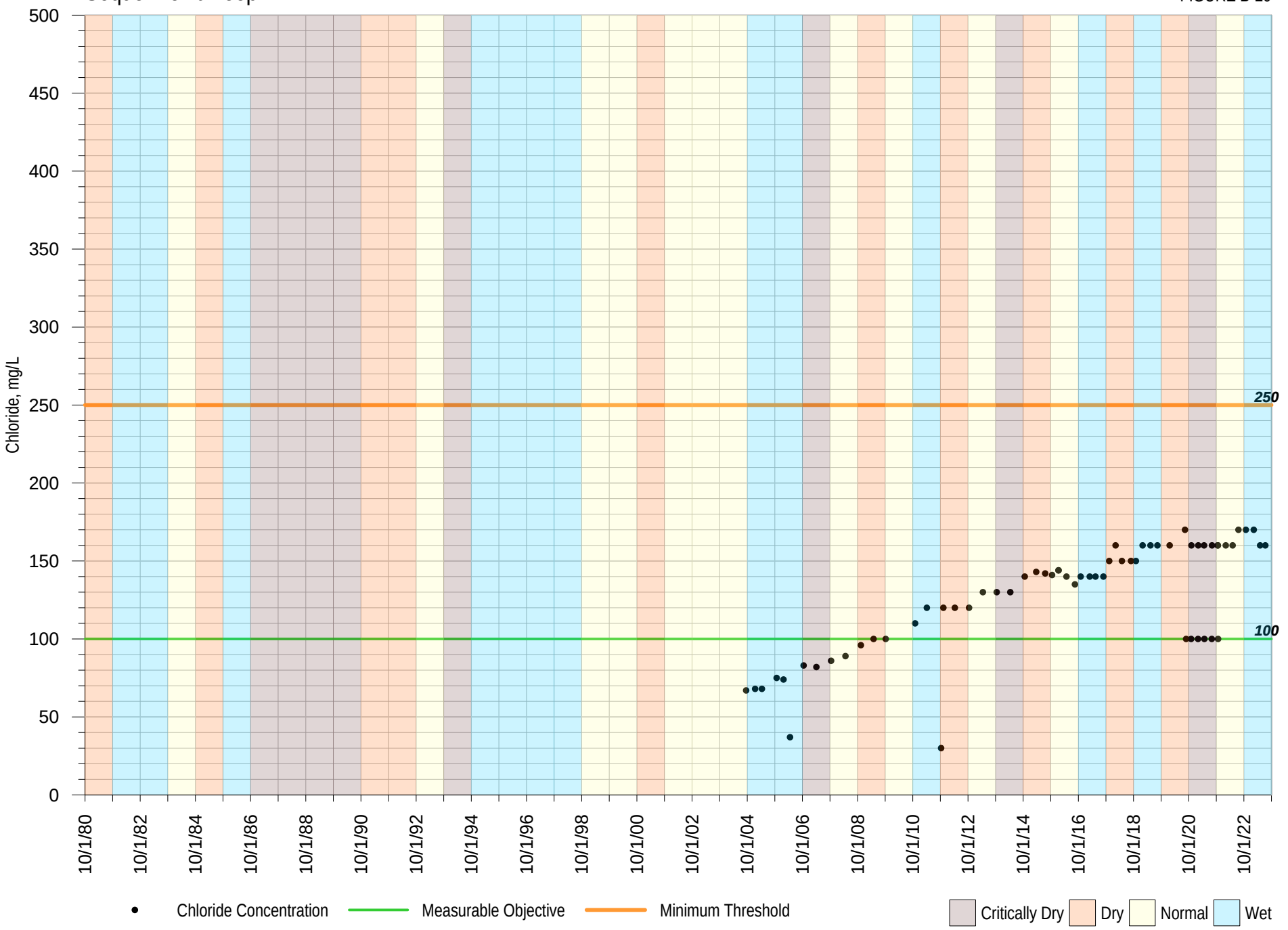
Pleasure Point Deep

FIGURE B-19



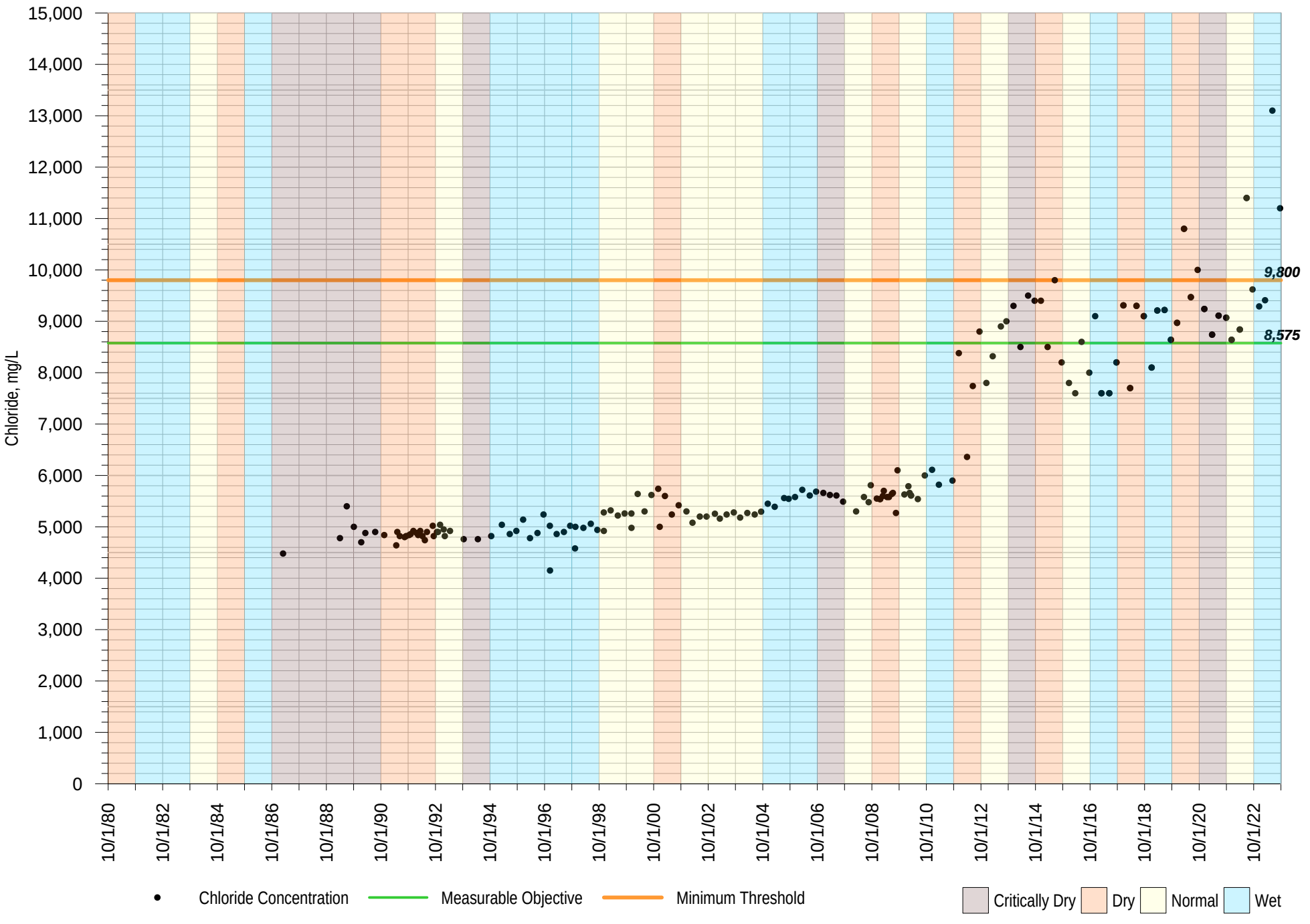
Soquel Point Deep

FIGURE B-20



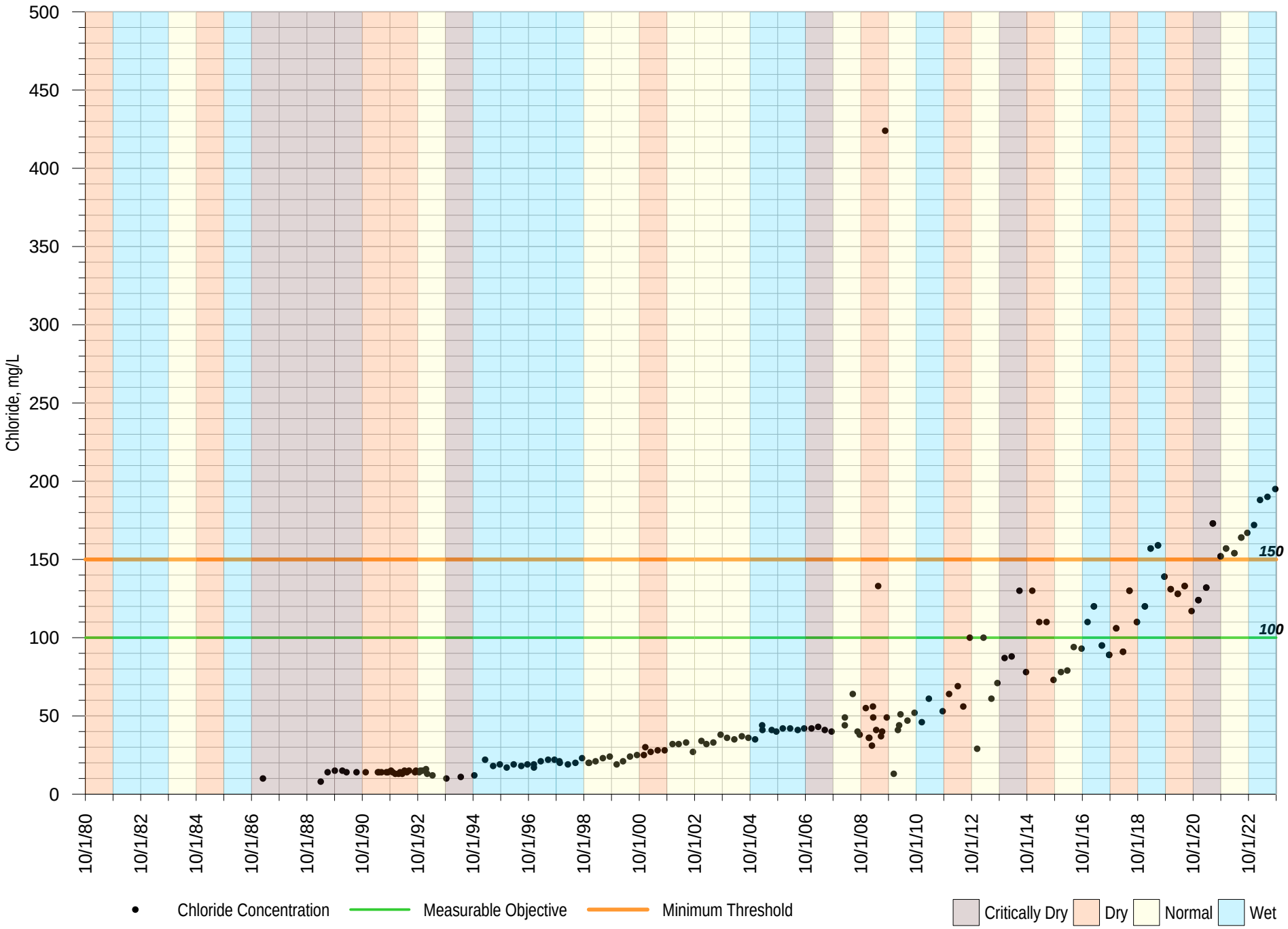
SC-A5A

FIGURE B-21



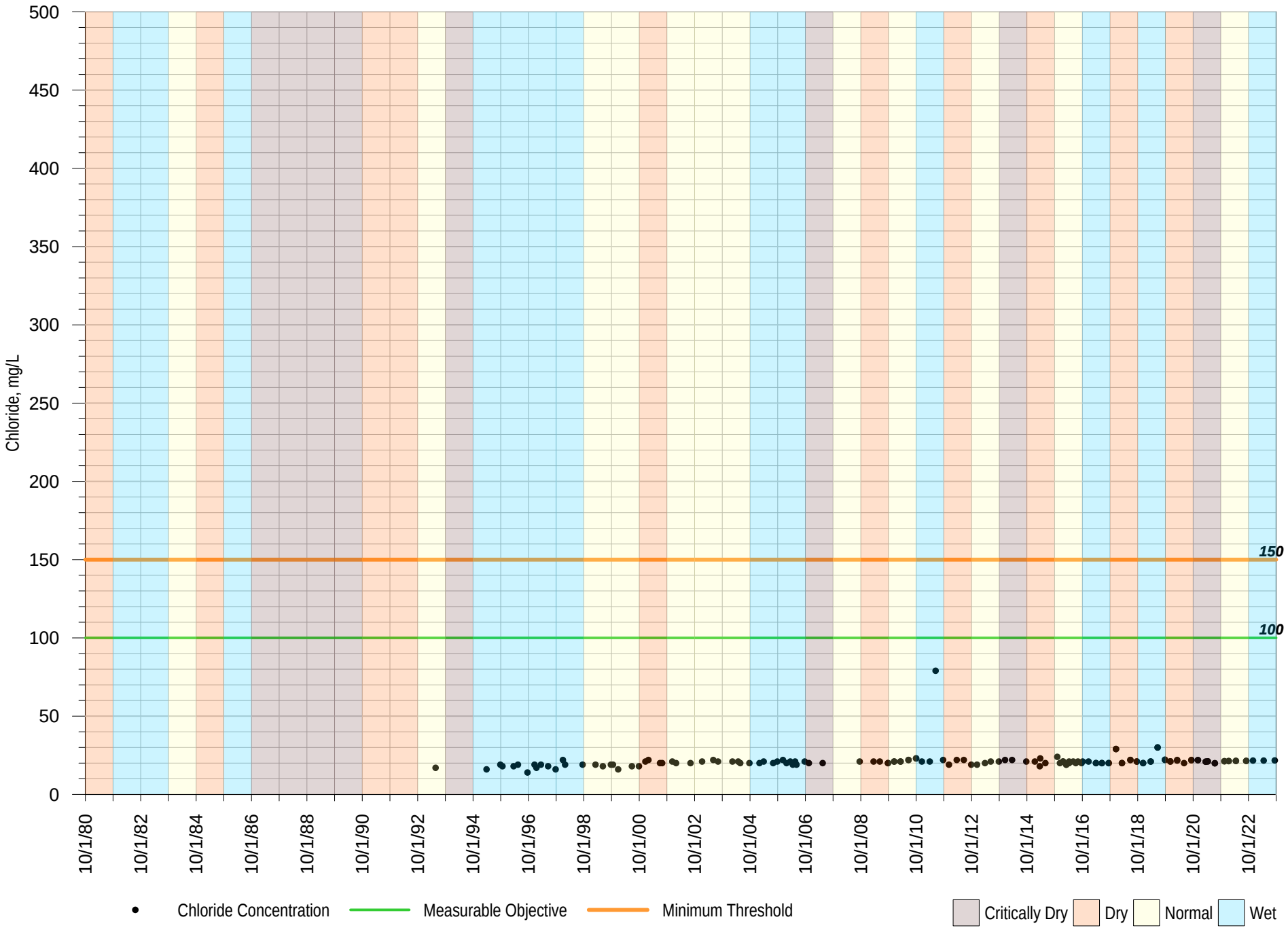
SC-A5B

FIGURE B-22



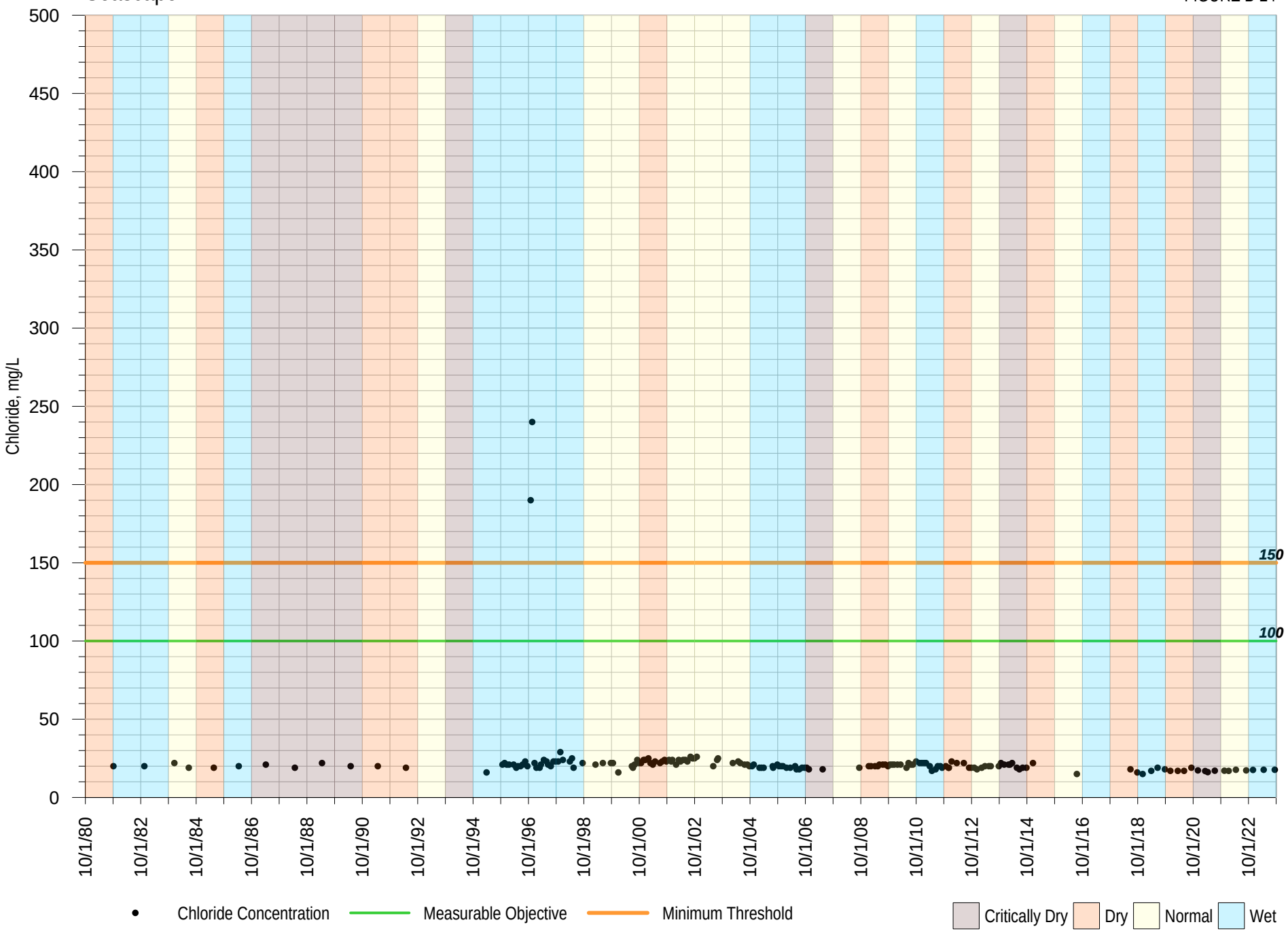
San Andreas

FIGURE B-23



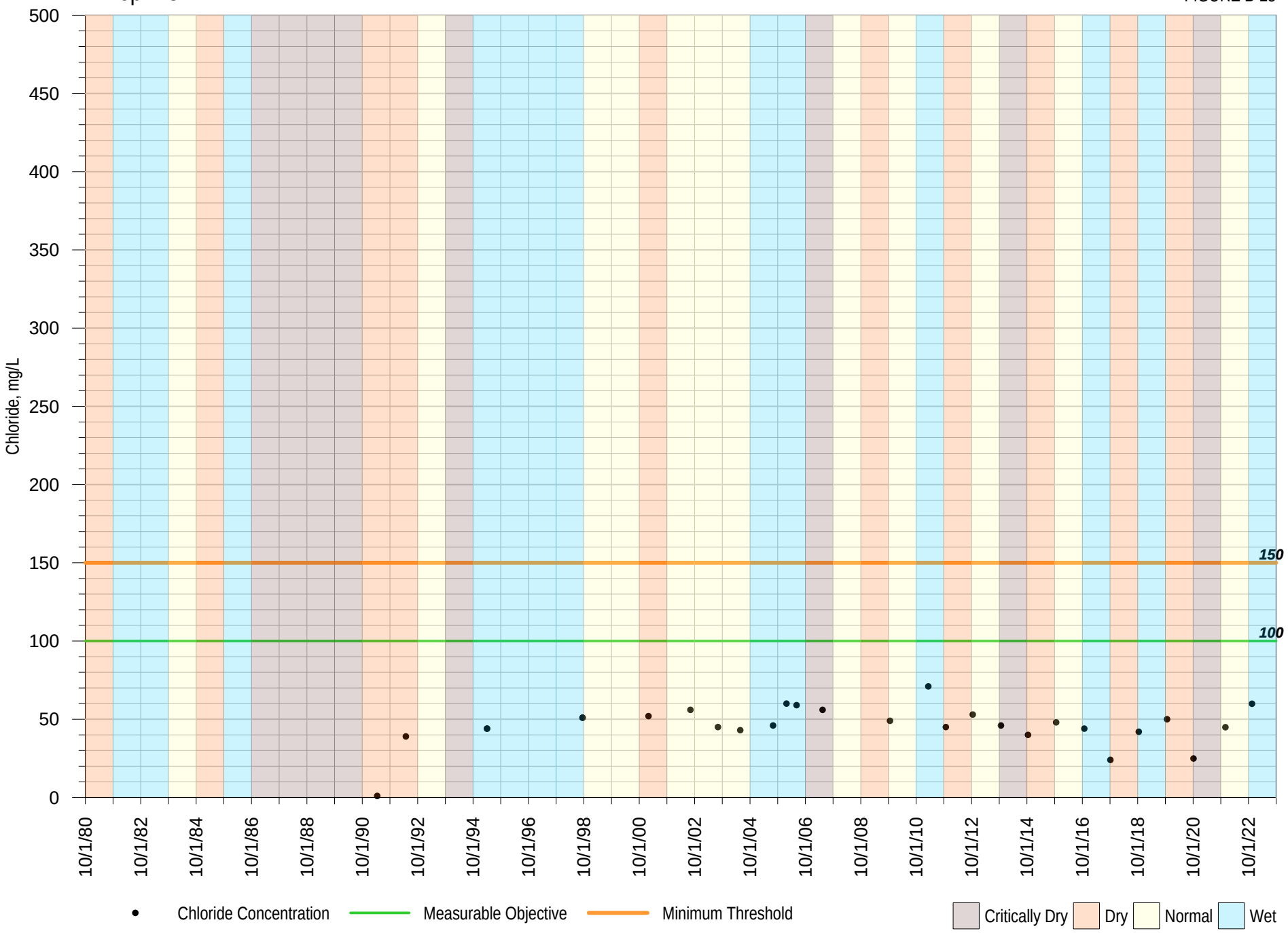
Seascape

FIGURE B-24



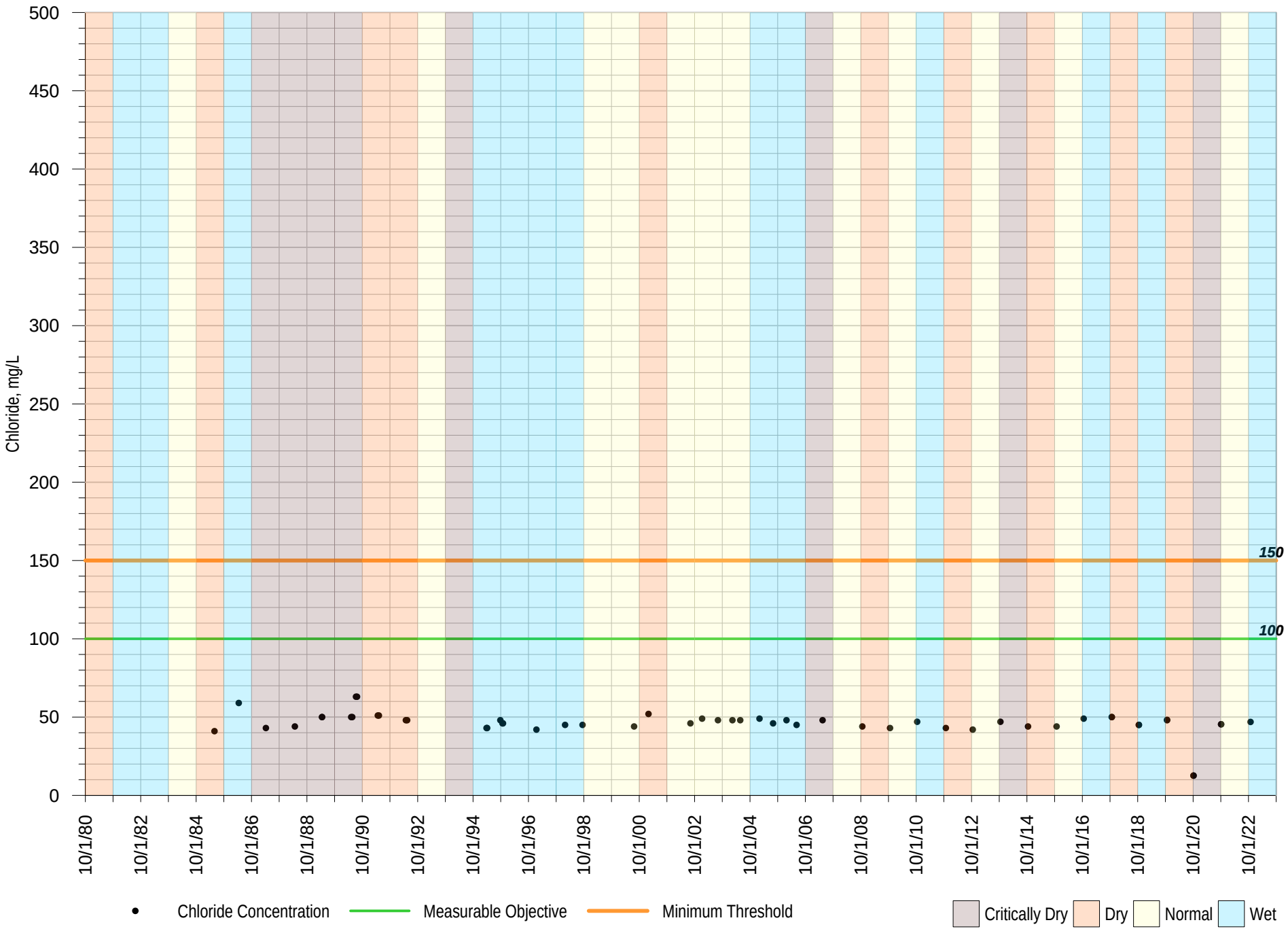
T.Hopkins

FIGURE B-25



Estates

FIGURE B-26



Ledyard

FIGURE B-27

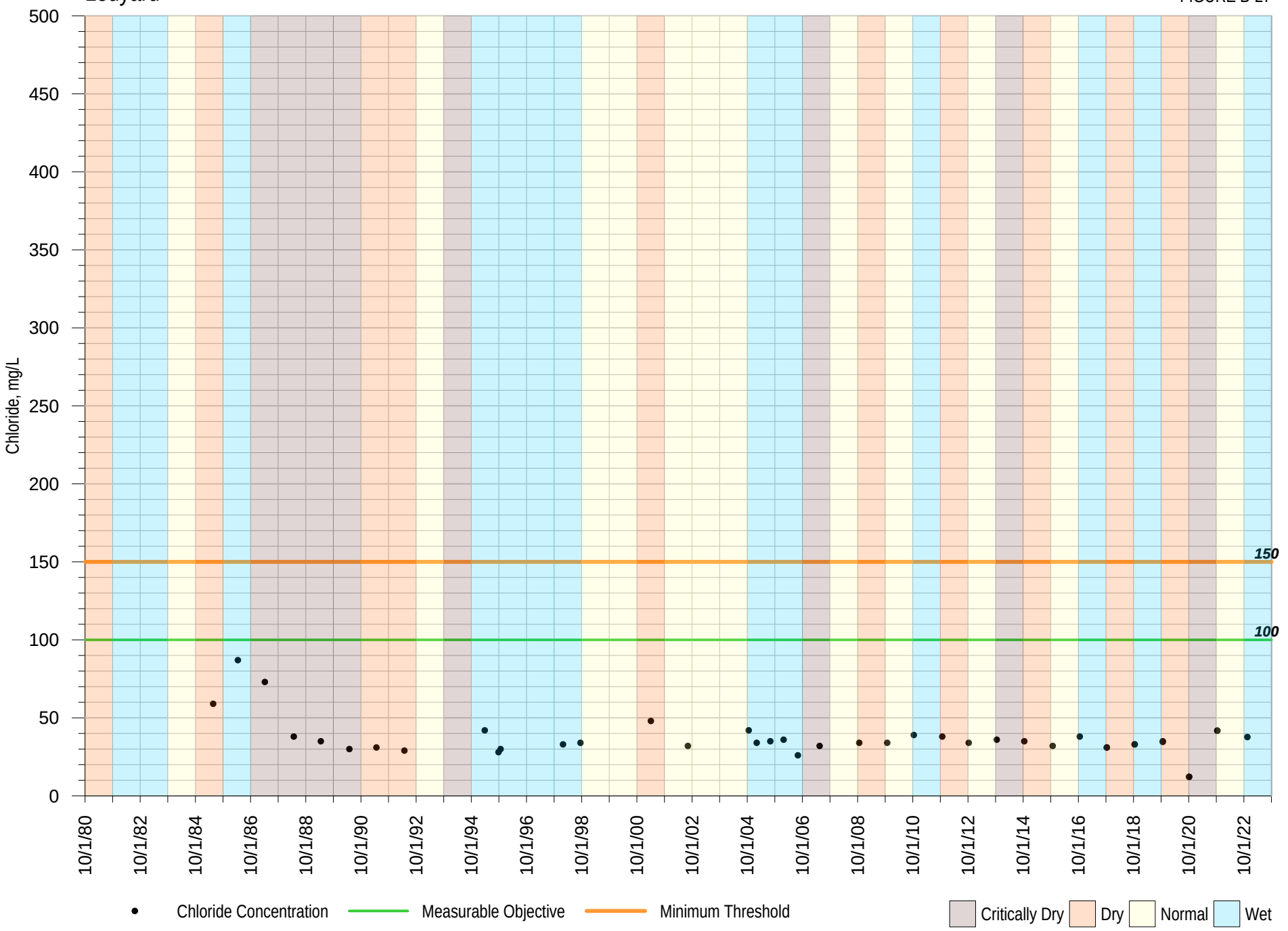
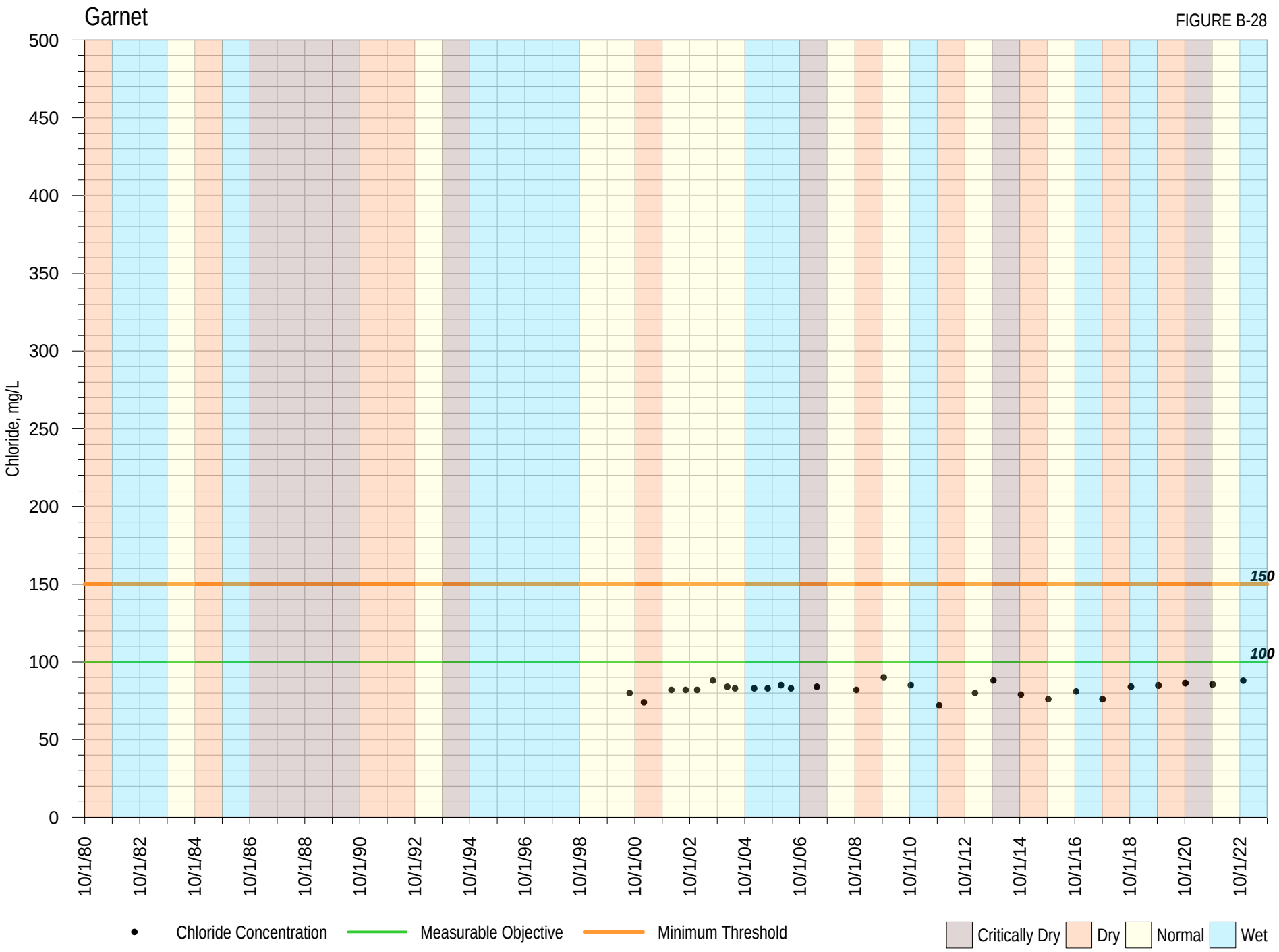
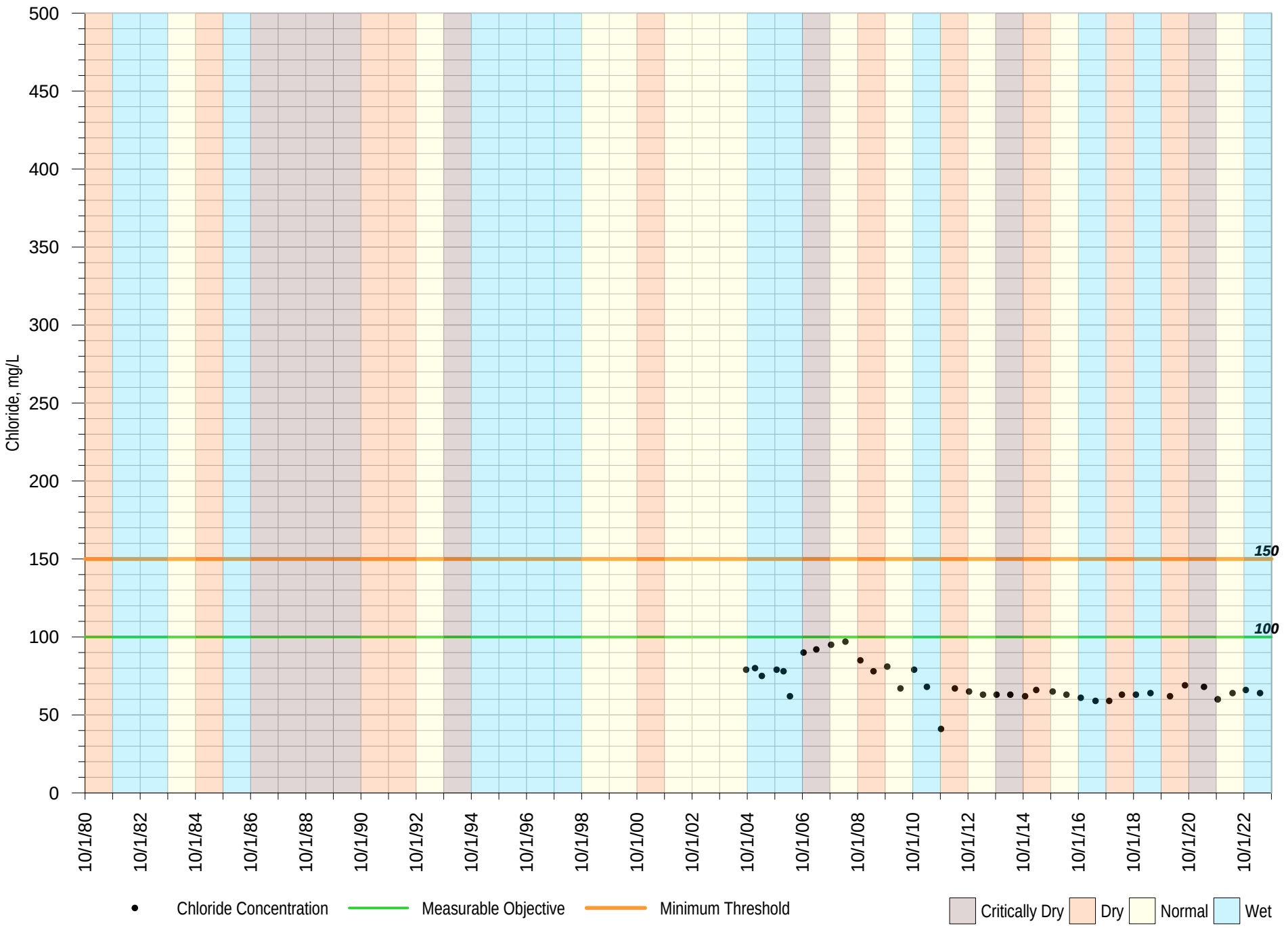


FIGURE B-28


Garnet
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
150
100
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable Objective
Minimum Threshold
Critically Dry
Dry
Normal
Wet

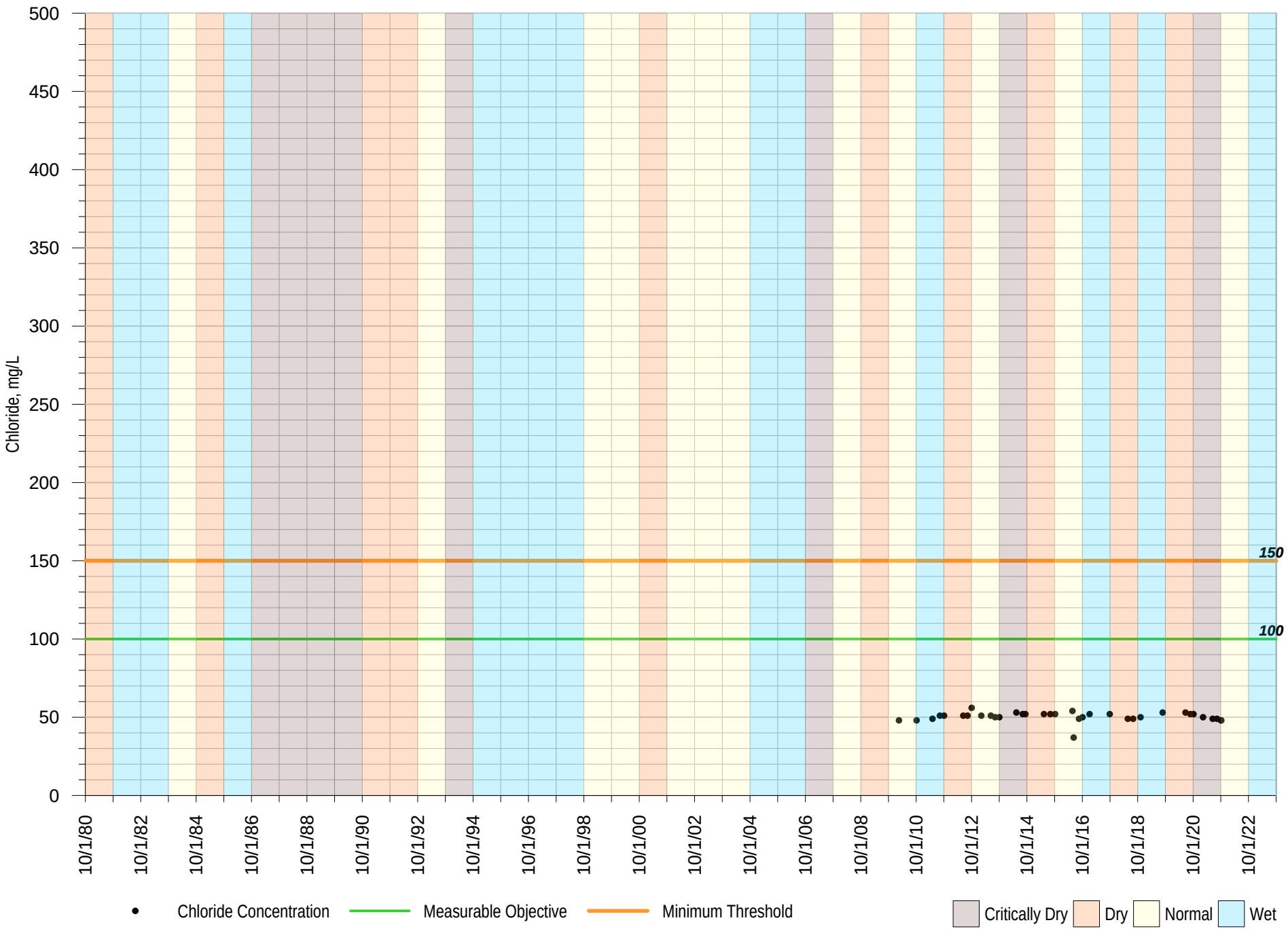
Beltz 2

FIGURE B-29



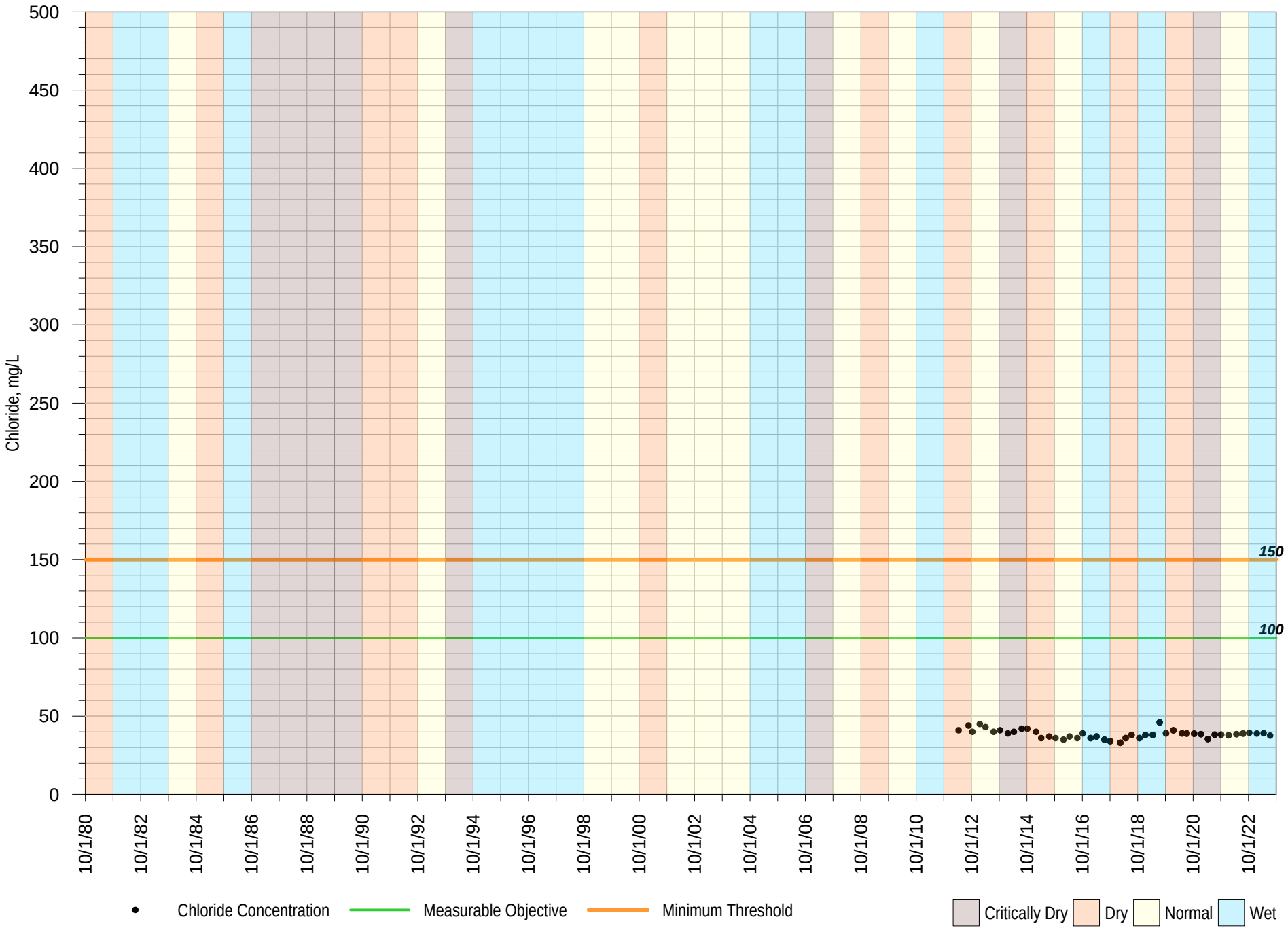
Beltz 8

FIGURE B-30



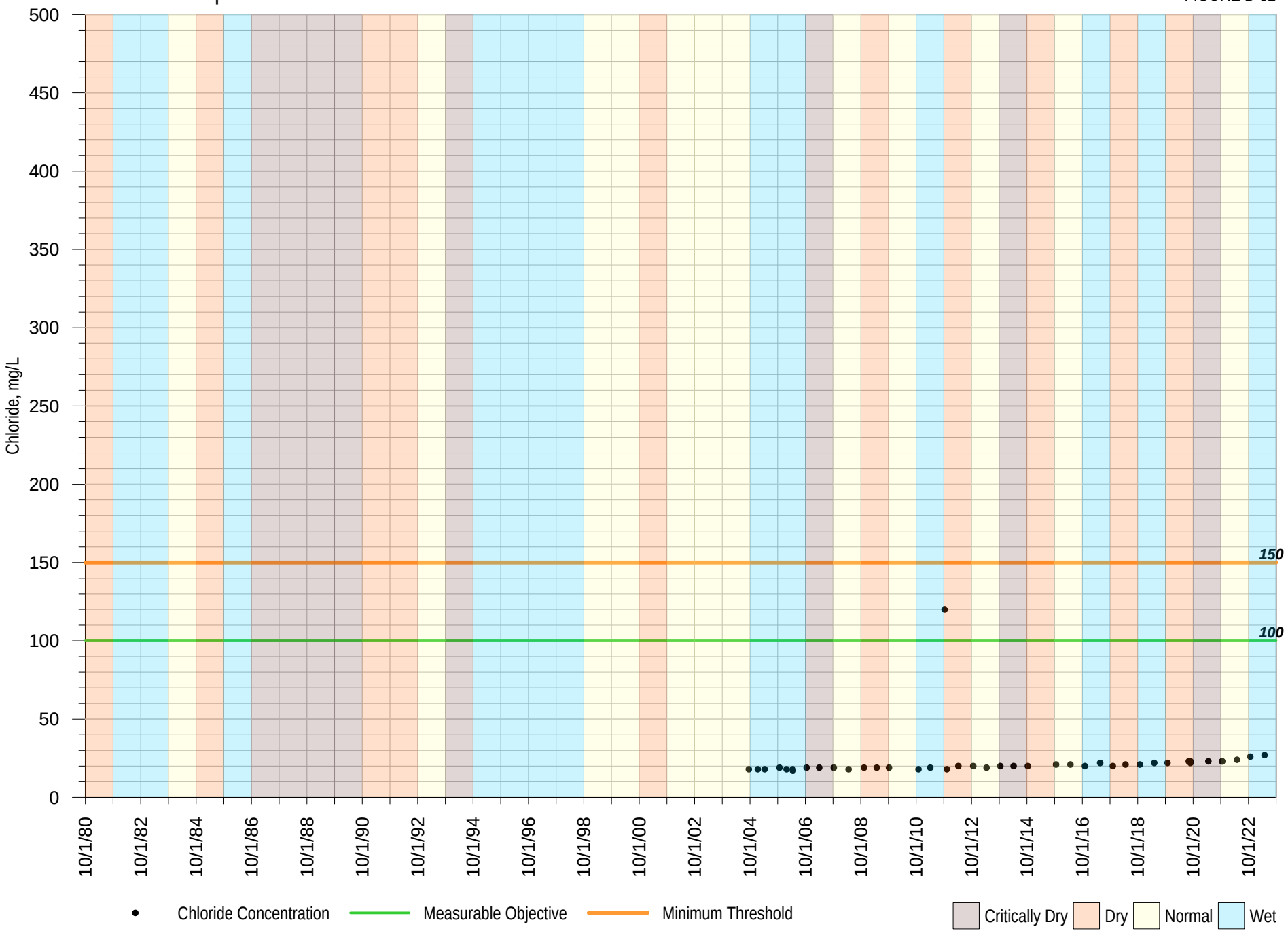
SC-22AA

FIGURE B-31



Corcoran Deep

FIGURE B-32



Schwan

FIGURE B-33