SANTA CRUZ MID-COUNTY GROUNDWATER AGENCY

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April 1, 2023

To: California Department of Water Resources

From: Santa Cruz Mid-County Groundwater Agency

Subject: Submittal of the Fourth Annual Report for the Santa Cruz Mid-County Groundwater Agency

The Santa Cruz Mid-County Groundwater Agency (MGA) is the Groundwater Sustainability Agency for the Santa Cruz Mid-County Groundwater Basin, Number 3-001 (Basin). The Basin is classified by the California Department of Water Resources (DWR) as a high priority basin in a state of critical overdraft.

The MGA formed in March 2016 as a Joint Powers Authority, with four member agencies: Central Water District, City of Santa Cruz, County of Santa Cruz, and Soquel Creek Water District. The MGA Board of Directors includes two representatives from each member agency and three private well owner representatives. The MGA initiated development of the Groundwater Sustainability Plan (GSP) in 2017 to guide ongoing management of the Basin with a goal to achieve and maintain groundwater sustainability over a 50-year planning and implementation horizon. GSP development was a collaborative effort among the member agencies and technical consultants, and was informed by input from resource management agencies, community members, and stakeholders.

The GSP was adopted by the MGA Board on November 21, 2019, and approved by DWR in June 2021. The following annual reports have been submitted to DWR: First Annual Report for Water Year 2019 (submitted April 1, 2020); Second Annual Report for Water Year 2020 (submitted April 1, 2021); and Third Annual Report for Water Year 2021 (submitted April 1, 2022).

The MGA is pleased to submit the Fourth Annual Report to the Department of Water Resources, for Water Year 2022, as required by the California Code of Regulations for Groundwater Sustainability Plans.

Feel free to contact me if you have any questions,

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MONTGOMERY & ASSOCIATES
Water Resource Consultants

March 27, 2023

Santa Cruz Mid-County Basin Water Year 2022 Annual Report

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Santa Cruz Mid-County Groundwater Agency

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ACRONYMS & ABBREVIATIONS

ASR................Aquifer Storage and Recovery
Basin ....Santa Cruz Mid-County Basin
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
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
SGMA ....Sustainable Groundwater Management Act
SMC ....sustainable management criteria
SqCWD ....Soquel Creek Water District
SWIP ....Seawater Intrusion Prevention
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 fourth annual report covers Water Year (WY) 2022 which is from October 1, 2021 to September 30, 2022.

As described in the GSP, DWR lists the Basin as a high priority basin in critical overdraft. The 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 because of over-pumping.

WY 2022 was a normal water year following a critically dry year in WY 2021. The water year type designation was influenced by heavy storms that occurred in early WY 2022, while the remainder of the year was relatively dry. While precipitation does impact groundwater recharge, 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. This occurs because recharge areas are some distance from coastal monitoring and production wells. Instead, groundwater levels respond more directly to changes in groundwater extraction than precipitation. Historically, a decade-long period (WY 2005-2014) increase in groundwater levels corresponding with reduced extraction was followed by a period of relatively stable and high groundwater levels during a period of lower extraction (WY 2015-2020). WY 2022 groundwater extraction was similar to the average over the past 7 years and remains lower than pre-2015 extraction. Groundwater levels at most wells declined or remained similar to the previous year.

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) with 5-year moving average groundwater elevations are below their respective minimum threshold (MT) groundwater elevation proxies. For these 7 RMPs, the 5-year moving averages generally declined or remained similar to the previous year.

Chloride concentrations at 4 monitoring wells in the Seascape area–SC-A2RB, SC-A5B, SC-A5A, and SC-A8A–exceeded MTs for seawater intrusion. Both SC-A2RB, SC-A5B exceeded the MT in all samples, with SC-A2RB reporting exceedances in 4 of 4 consecutive samples and SC-A5B reporting exceedances in 3 of 3 consecutive samples. SC-A5A and SC-A8A both had a single MT exceedance in WY 2022. These wells are all screened in the Purisima F-unit near SqCWD's Seascape well.

Since there are 2 or more exceedances in an RMP, undesirable results for seawater intrusion are occurring. Furthermore, because SC-A5B and SC-A2RB have increasing chloride trends, it indicates inland movement of seawater intrusion. This condition warrants early management action, which is recommended in the GSP as reduced extraction from the nearest municipal well. Since it is possible local non-municipal extractions are influencing groundwater hydraulic gradients that drive seawater intrusion in this area more than current municipal pumping, it is recommended that instead of further reducing nearby municipal pumping at this time, the MGA evaluate local non-municipal pumping to assess the magnitude of total extractions influencing seawater intrusion in the area.

In WY 2022, groundwater elevations at 1 of 5 RMPs are below groundwater elevation proxies for depletion of interconnected surface water. Although this qualifies as an undesirable result, it is an improvement from WY 2021 where 3 of 5 RMPs were below the MT. There are no undesirable results for the chronic lowering of groundwater levels and groundwater quality degradation 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, such as those that recharge water or provide alternative supplies, are expected to reduce net groundwater pumping once they are implemented. Work to plan and implement these projects continued in WY 2022. The projects include:

- Pure Water Soquel (PWS) – Construction of treatment plant, pipelines, and Seawater Intrusion Prevention (SWIP) wells by Soquel Creek Water District (SqCWD) is expected to continue with start up by the end of 2024.
- Aquifer Storage and Recovery (ASR) – The City of Santa Cruz Water Department (SCWD) is expected to receive California State Water Resources Control Board action in calendar year 2023 on water rights petitions for change that will lead to phased implementation of full-scale ASR at the SCWD's existing Beltz wells starting in 2023. ASR pilot testing took place in WY 2021 and demonstration study injection and recovery started in WY 2022 and will end in November 2024.
- 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 towards 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 fourth annual report covers Water Year (WY) 2022 (October 1, 2021 through September 30, 2022) 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 2022 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:

- 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.

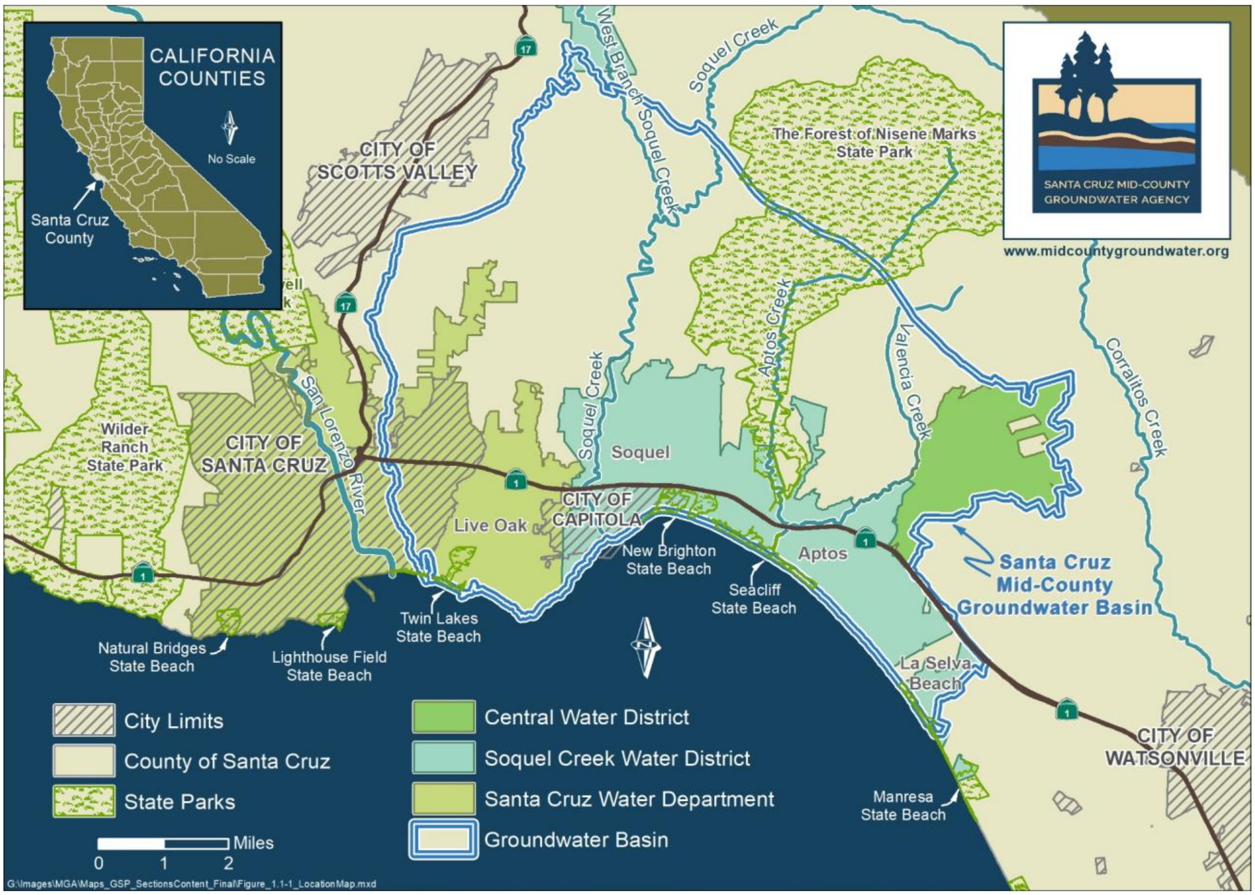

Figure 1. Santa Cruz Mid-County Basin Boundaries

2 BASIN SETTING

2.1 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.

2.2 Precipitation and Water Year Type

Precipitation reported at the Santa Cruz Cooperative climate station in WY 2022 was 22.7 inches. This represents 77% of the long-term average annual precipitation at this station of 29.7 inches per year. Figure 2 charts annual rainfall at the Santa Cruz Cooperative climate station and water year type from WY 1984 to WY 2022. The annual average rainfall of 28.7 inches displayed on Figure 2 is the average since WY 1984, which is lower than the long-term average of 29.7 inches starting in WY 1942.

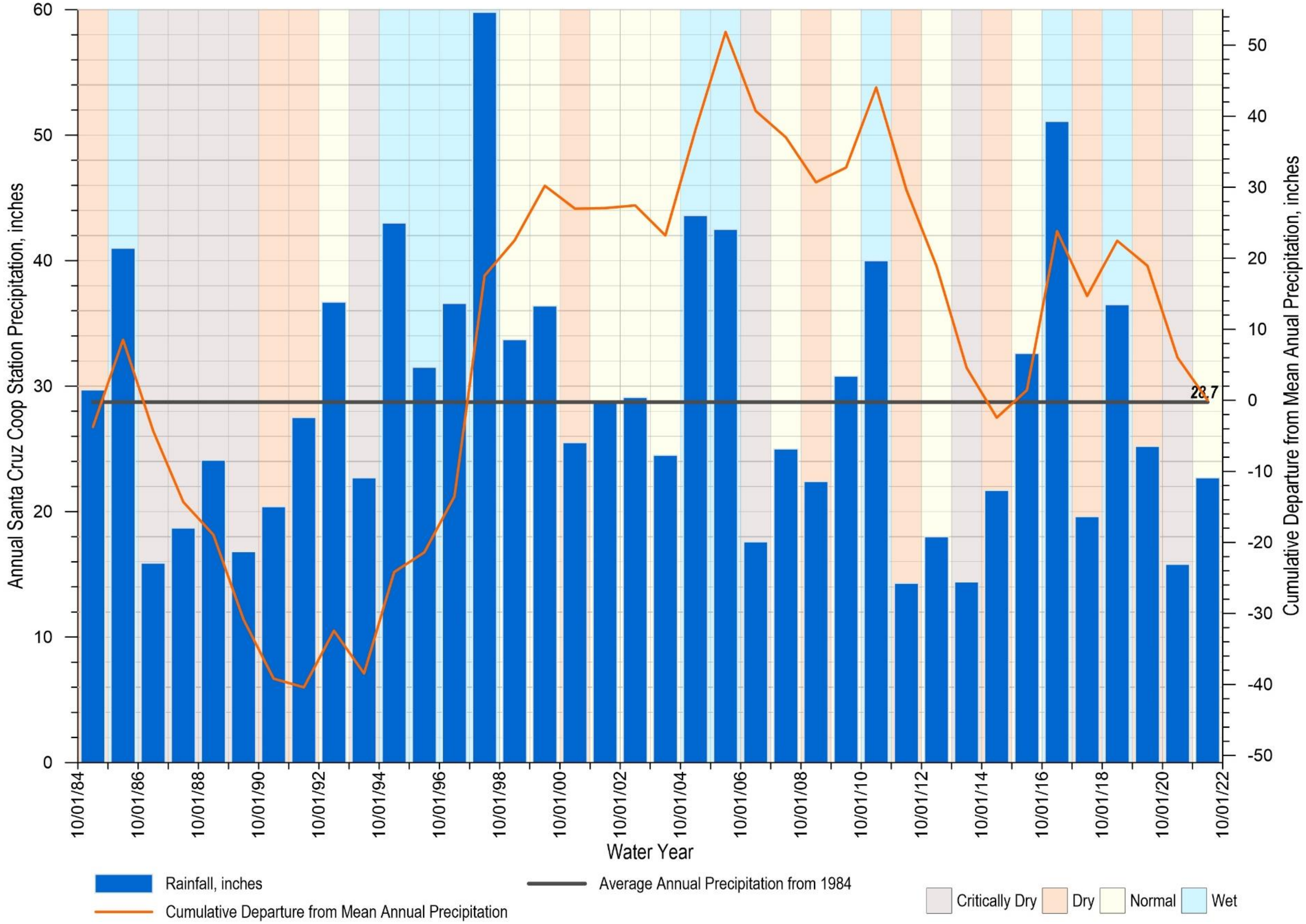

Figure 2. Annual Precipitation and Cumulative Change in Precipitation at Santa Cruz Cooperative Climate Station with Water Year Type

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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 2022 is designated as a normal year. It follows a critically dry year in WY 2021 and a dry year in WY 2020. Because the water year type is based on runoff, the amount of rainfall in the preceding years influences water year type classification. For example, there was more rainfall in 2021 than in 2012, but 2012 is classified as a dry year while 2021 is classified as critically dry. This is because the 2 years preceding 2012 were average/wet rainfall years that resulted in more runoff in 2012. The total annual rainfall for WY 2022 is within the range of previous normal water years shown on Figure 2, though it is the second driest normal water year since 1984.

3 BASIN CONDITIONS

3.1 Groundwater Elevations

Contour maps representing spring and fall groundwater elevations for WY 2022 in each principal aquifer are included on Figure 3 through Figure 12. Spring groundwater elevations represent seasonal high conditions while fall groundwater elevations represent seasonal low conditions.

The contour maps intend to represent seasonal average conditions 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 are less comprehensive of 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 4.3.

Hydrographs updated through WY 2022 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-40: Depletion of Interconnected Surface Water Groundwater Elevation Proxies
- Figures A-41 through A-169: Wells in Monitoring Network not used as RMPs for Groundwater Elevations

Below average rainfall over the past 3 years has resulted in reduced aquifer recharge. However, 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 corresponds 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.

3.1.1 Aromas Red Sands

Contour maps for the Aromas Red Sands are shown on Figure 3 and Figure 4 for spring (March) and fall (September), respectively. Both fall and spring groundwater elevations, including CWD and SqCWD production wells (Country Club, Bonita, San Andreas, and Seascape), have stable groundwater elevations relative to last year.

Groundwater generally flows from inland toward the coast with pumping effects at CWD's Rob Roy wellfield (CWD #10 and #12) and SqCWD's Bonita and San Andreas production wells. Flow from inland includes some flow from the Pajaro Valley Subbasin inland of SqCWD's service area. Groundwater also flows southeast out of the Basin into the Pajaro Valley Subbasin, flowing roughly parallel to the coast. 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 Aromas Red Sands SC-A3A seawater intrusion RMP, WY 2022 groundwater elevations are above the seawater intrusion MT (Appendix Figure A-18).

3.1.2 Purisima F and DEF Units

Contour maps for the Purisima F and DEF units are shown on Figure 5 and Figure 6 for spring (March) and fall (September), respectively. The contour maps show localized pumping depressions around SqCWD's Bonita and San Andreas wells (screened in both the Purisima F and Aromas Red Sands aquifer), around SqCWD's Aptos Jr. High well and CWD's Rob Roy #12 (CWD #12) well (screened in the Purisima F unit), and around SqCWD's T. Hopkins well (screened in the Purisima DEF unit). Compared to WY 2021, the depressions around the Bonita and San Andreas wells remain similar. In WY 2021, the T. Hopkins well experienced some of the highest elevations in its record due to it being pumped much less than normal (Appendix Figure A-83). In WY 2022, a return to normal pumping at the T. Hopkins well and an increase in pumping at the Granite Way well produced pumping depressions in that area similar to those seen in WY 2020. Despite localized pumping depressions, contours indicate groundwater in the Purisima F and DEF units flows towards the coast. There is also groundwater flow into the Purisima F and DEF units from the Pajaro Valley Subbasin.

Groundwater elevations at most coastal wells decreased or remained similar to the previous year. At SC-A8A, fall and spring elevations remain below the MT by about 1 foot (Appendix Figure A-20). The other 3 coastal RMP wells in the Purisima F and DEF units have groundwater elevations above their respective seawater intrusion MTs.

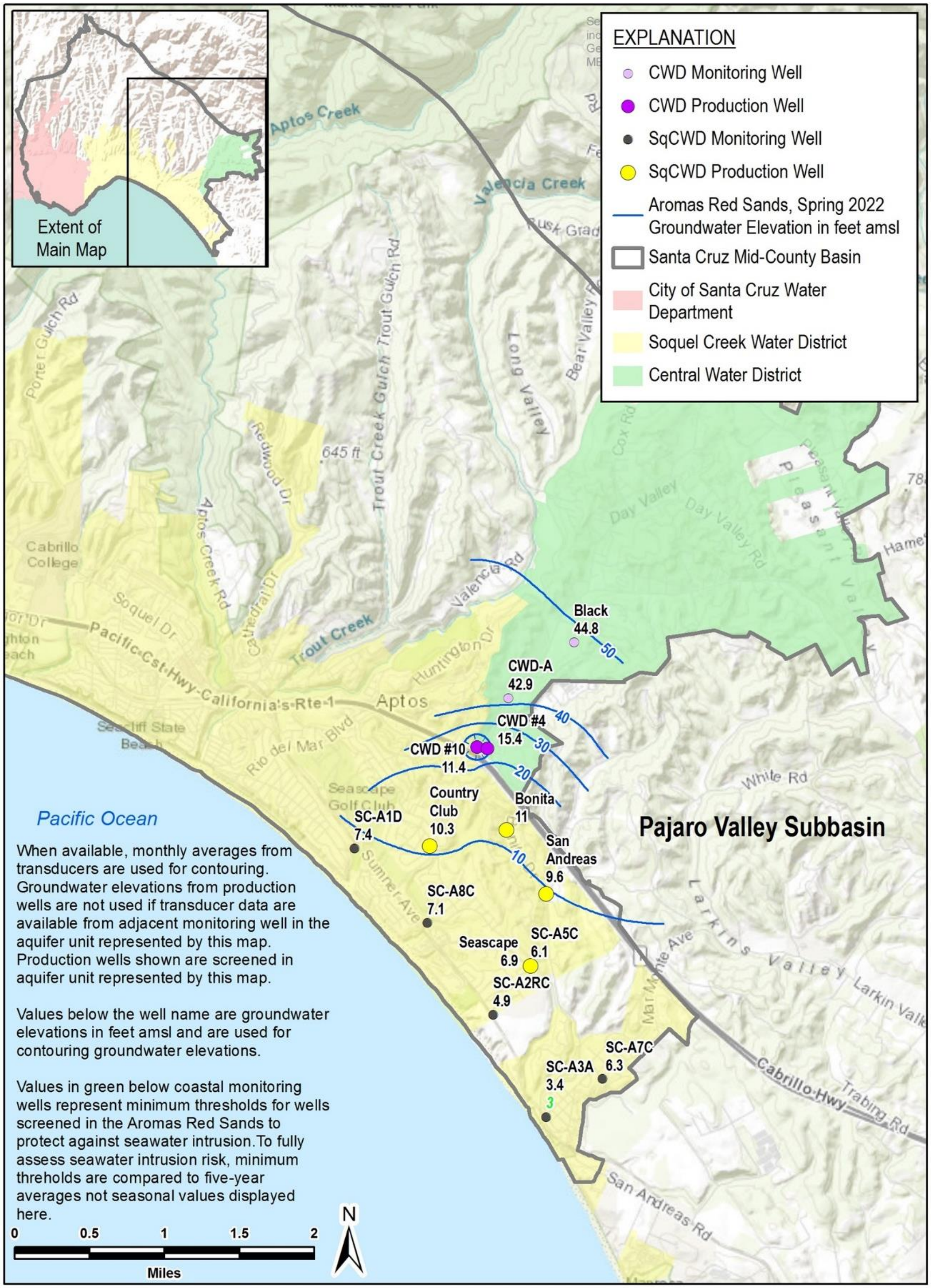

Figure 3. Aromas Red Sands Groundwater Elevations, Spring 2022

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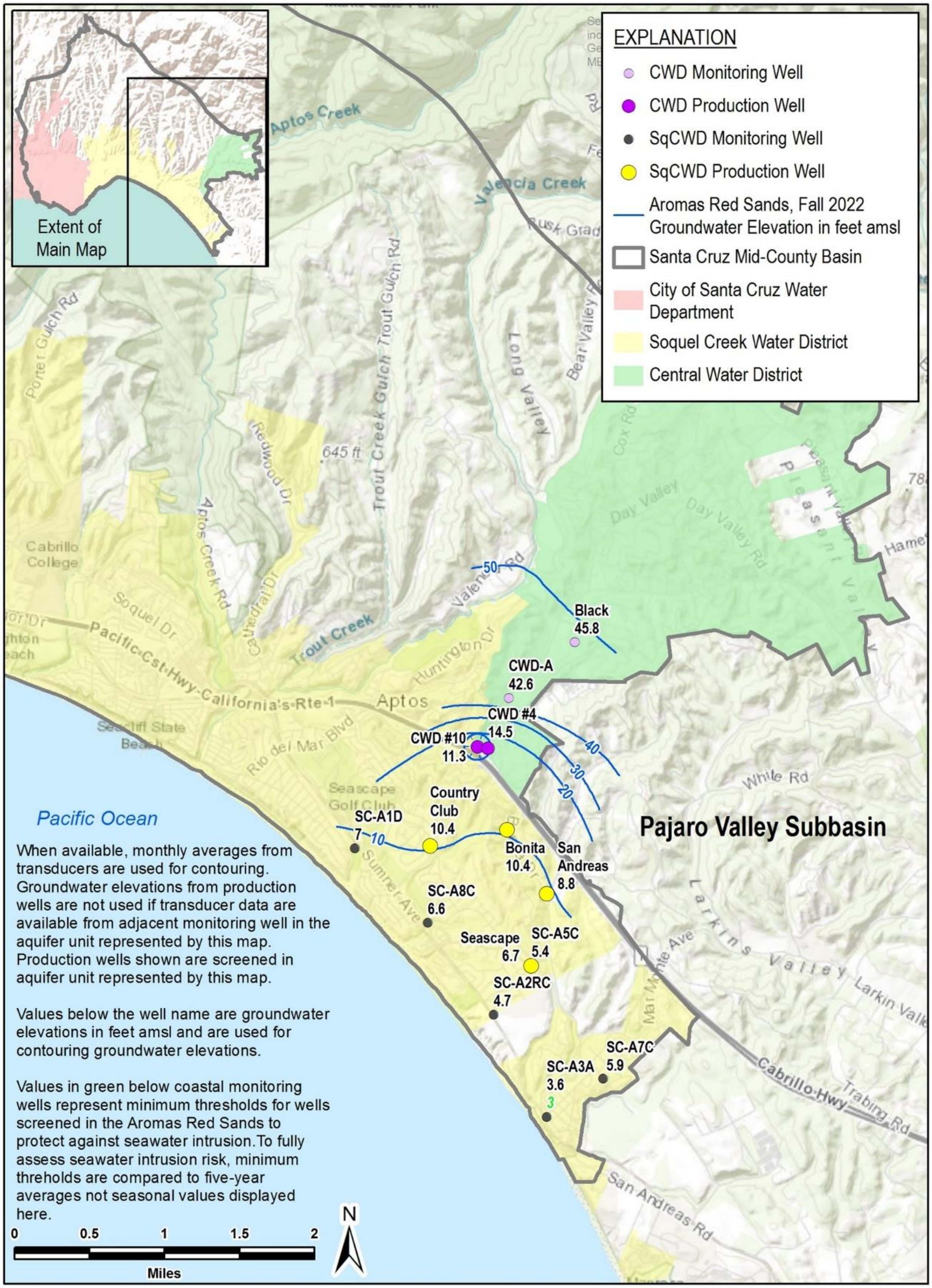

Figure 4. Aromas Red Sands Groundwater Elevations, Fall 2022

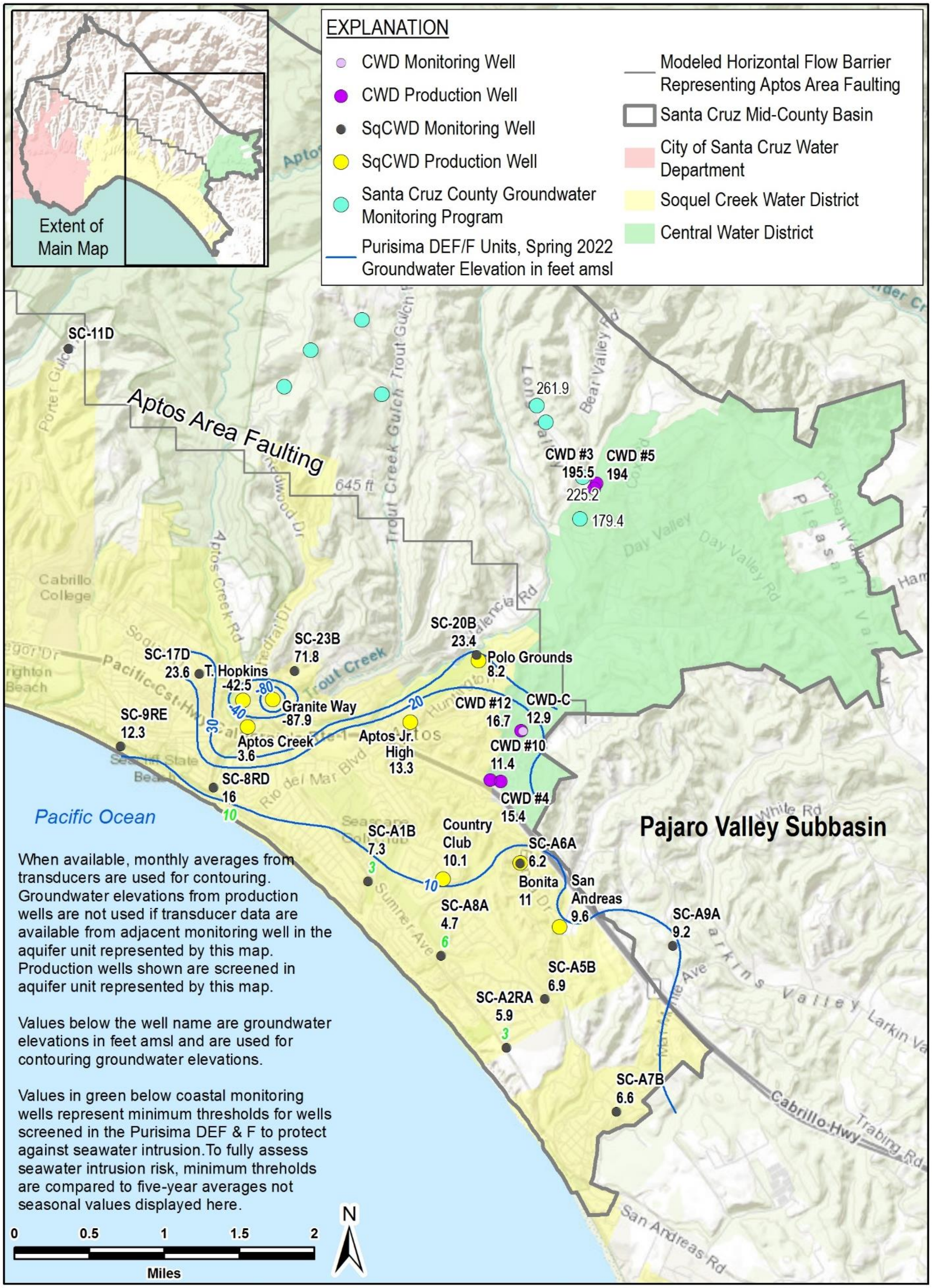

Figure 5. Purisima F and DEF Unit Groundwater Elevations, Spring 2022

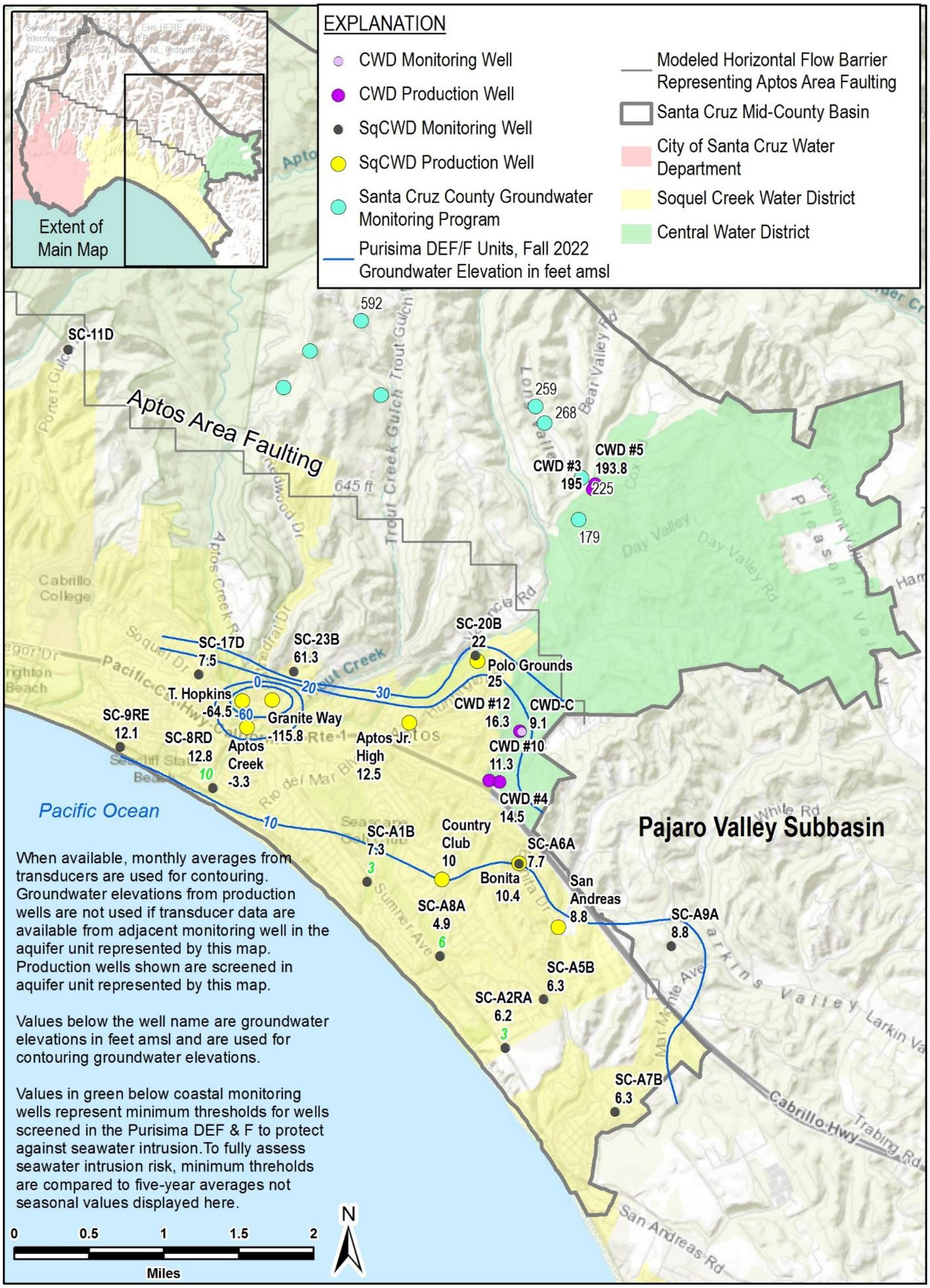

Figure 6. Purisima F and DEF Unit Groundwater Elevations, Fall 2022

3.1.3 Purisima BC Unit

Contour maps for the Purisima BC unit are shown on Figure 7 and Figure 8 for spring (March) and fall (September), respectively. The contour maps show a prominent pumping depression around SqCWD's Ledyard and Madeline production wells. The pumping depression is more developed in the fall when demand is greater. The spring and fall 2022 depressions are larger than in WY 2021 due to increased extraction at the Ledyard well, which increased 130% from the previous water year. This increase reflects a return to a more typical pumping regime, as the Ledyard well had notably low pumping in WY 2021. Contours indicate that groundwater continues to flow inland toward the pumping depression.

Spring groundwater elevations at coastal monitoring wells in the Purisima BC unit increased around 1 to 2 feet from the previous spring. However, possibly because the inland pumping depression increased in fall WY 2022, fall groundwater elevations decreased around 3 feet from the previous fall. Elevations at RMPs SC-9RC and SC-8RB remained below their seawater intrusion MTs (Appendix Figure A-23; Appendix Figure A-24). While spring elevations at SC-9RC were above the MT, the 5-year running average elevations for both wells remains below their respective MTs, with a slight downward trend occurring over the past few years.

3.1.4 Purisima A and AA Unit

Contour maps for the Purisima A and AA units are shown on Figure 9 and Figure 10 for spring (March) and fall (September), respectively. Groundwater generally flows from inland toward the coast with localized depressions due to pumping at SqCWD and SCWD production wells. Pumping depressions are more defined in the fall, particularly at SqCWD's Main Street and Estates production wells (Appendix Figures A-60 and A-55). Relatively low groundwater elevations also occur at an inland location around the SC-10RA (Appendix 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 are above seawater intrusion MTs in the spring, but below in the fall (Appendix Figures A-25 and A-26). At the coastal Purisima A unit Moran Lake and SC-1A RMPs, groundwater elevations are higher than seawater intrusion MTs. However, groundwater elevations at the Purisima AA unit Soquel Point Deep and Pleasure Point Deep RMP are lower than seawater intrusion MTs in fall 2022 (Appendix Figures A-32 and A-33).

A notable groundwater mound is present on this year's spring contour map around SCWD's Beltz #12 well partially screened in the Purisima AA unit (Figure 9). In WY 2022, SCWD injected 154 acre-feet at Beltz #12 and 111 acre-feet at Beltz #8 in the first of 2 years of ASR demonstration testing, for a total of 265 acre-feet of surface water. These same wells pumped 132 and 264 acre-feet annually, respectively. Coastal groundwater elevations east of SC-1A generally increased 1 to 2 feet from the previous year, while at Moran Lake Medium, Soquel Point Medium, and Pleasure Point Medium elevations decreased 1 to 2 feet from the previous year.

3.1.5 Tu Unit

Contour maps for the Tu unit are included on Figure 11 and Figure 12 for spring (March) and fall (September), respectively. Overall, groundwater flows from inland toward the coast with localized spring and fall pumping depressions around the Main Street extraction well.

This year's spring Tu unit contours feature a notable mound surrounding Beltz #12 and Cory #4, the result of 156 acre-feet of injection at Beltz #12 in spring 2022. Spring groundwater elevations in the Tu unit accordingly increased from spring 2021 to spring 2022 (Figure 11). However, fall 2022 groundwater elevations (Figure 12) are generally lower than fall 2021 by 1 to 5 feet. This may have been caused by Beltz #12 pumping at higher rate than usual as part of the ASR demonstration study in the fall. Pumping at Beltz #12 stopped in August, however groundwater levels in the Tu unit fell below sea level in August (e.g., Appendix Figure A-67 for SC-22AAA and Figure A-98 for Cory #4) before recovering to the September groundwater levels shown on Figure 12. The SqCWD's O'Neill well was brought back online toward the end of WY 2022 after being offline for the past 2 water years with more consistent pumping taking place from mid-September.

Spring groundwater elevations at the coastal RMP well SC-13A increased substantially from 2021 elevations and are approximately 18 feet above its seawater intrusion MT (Appendix Figure A-34). Fall groundwater elevations at the end of the water year are about 1 foot lower than elevations at the same time in 2021 and remain below its MT.

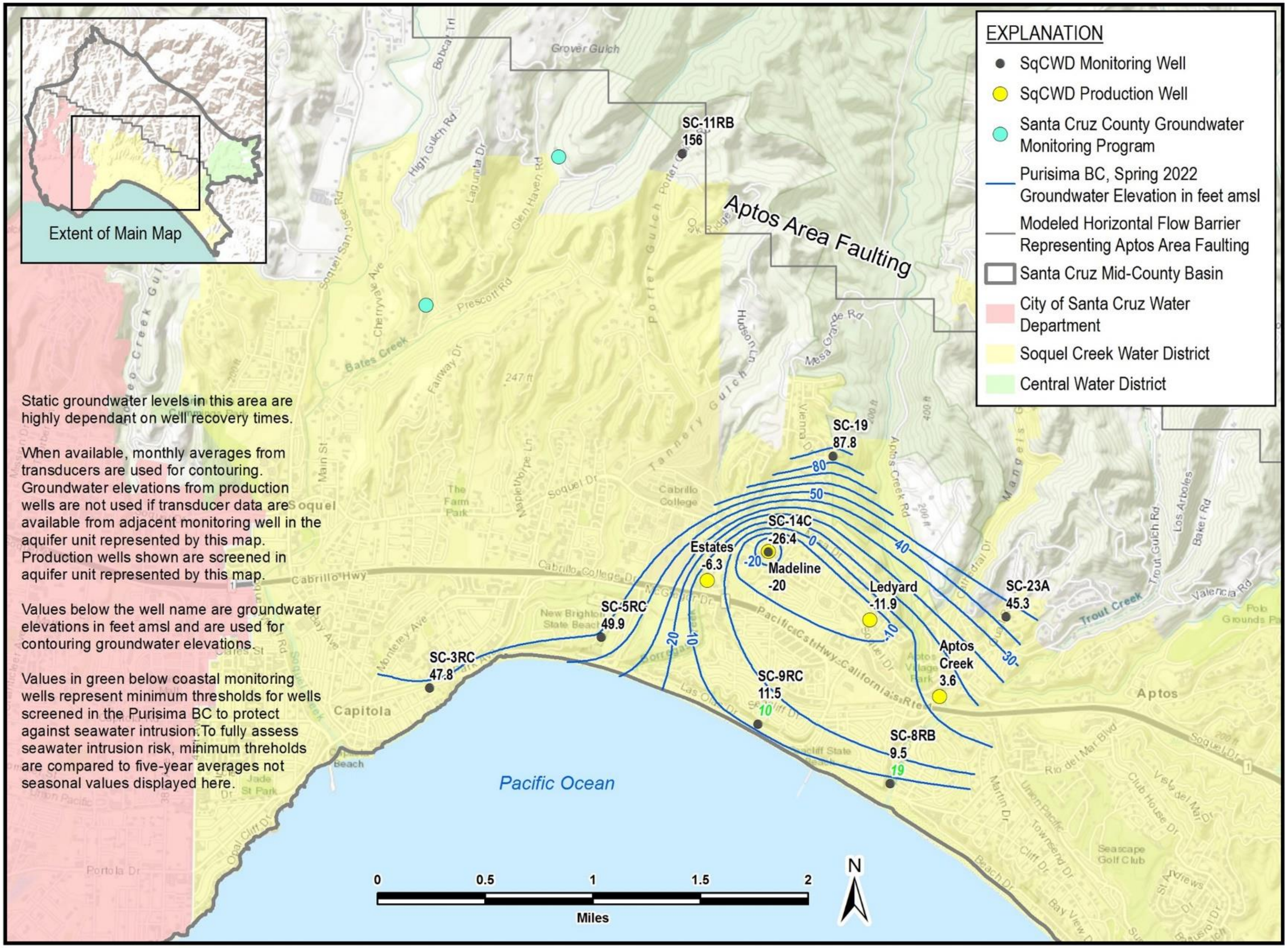

Figure 7. Purisima BC Unit Groundwater Elevations, Spring 2022

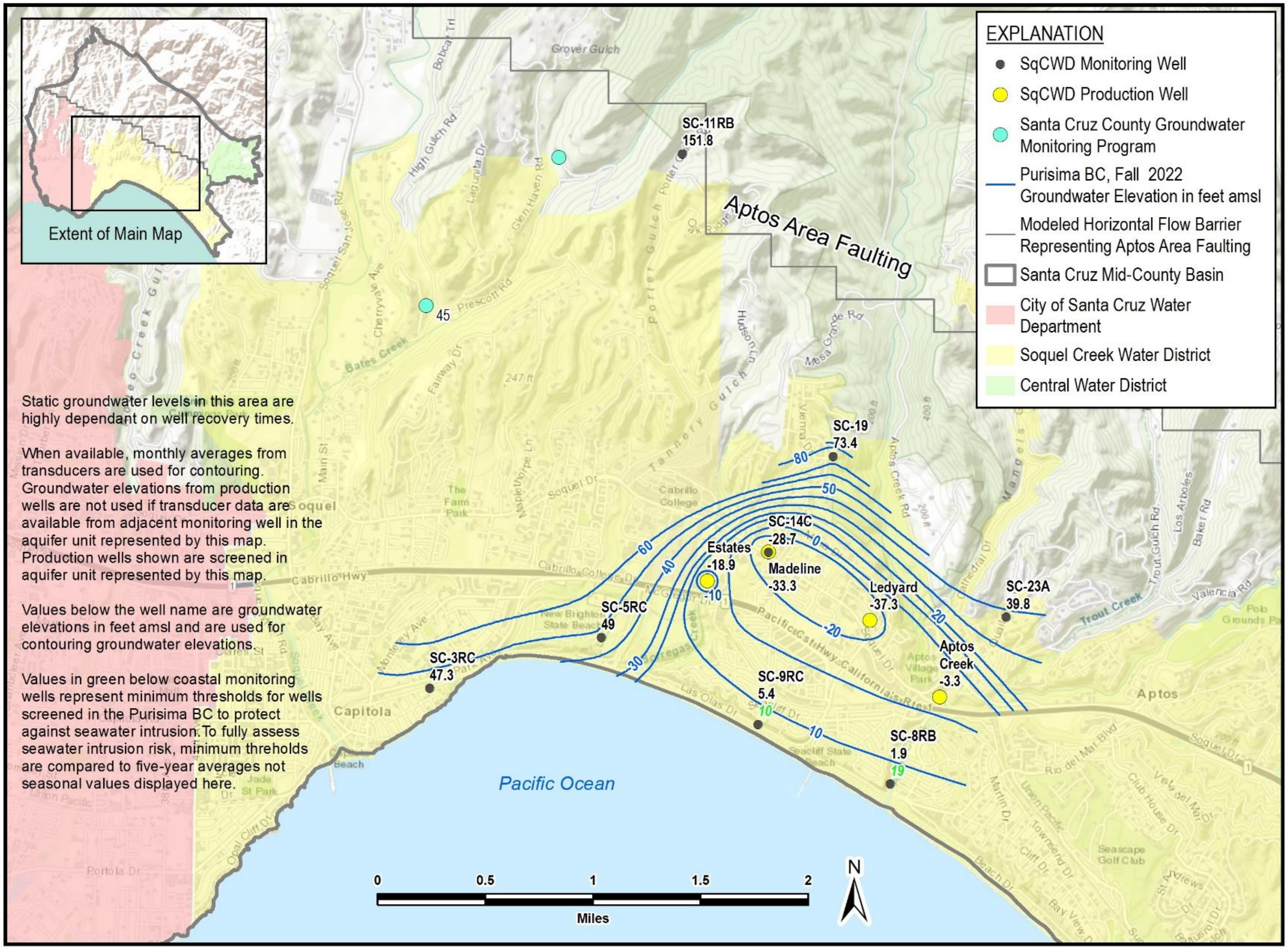

Figure 8. Purisima BC Unit Groundwater Elevations, Fall 2022

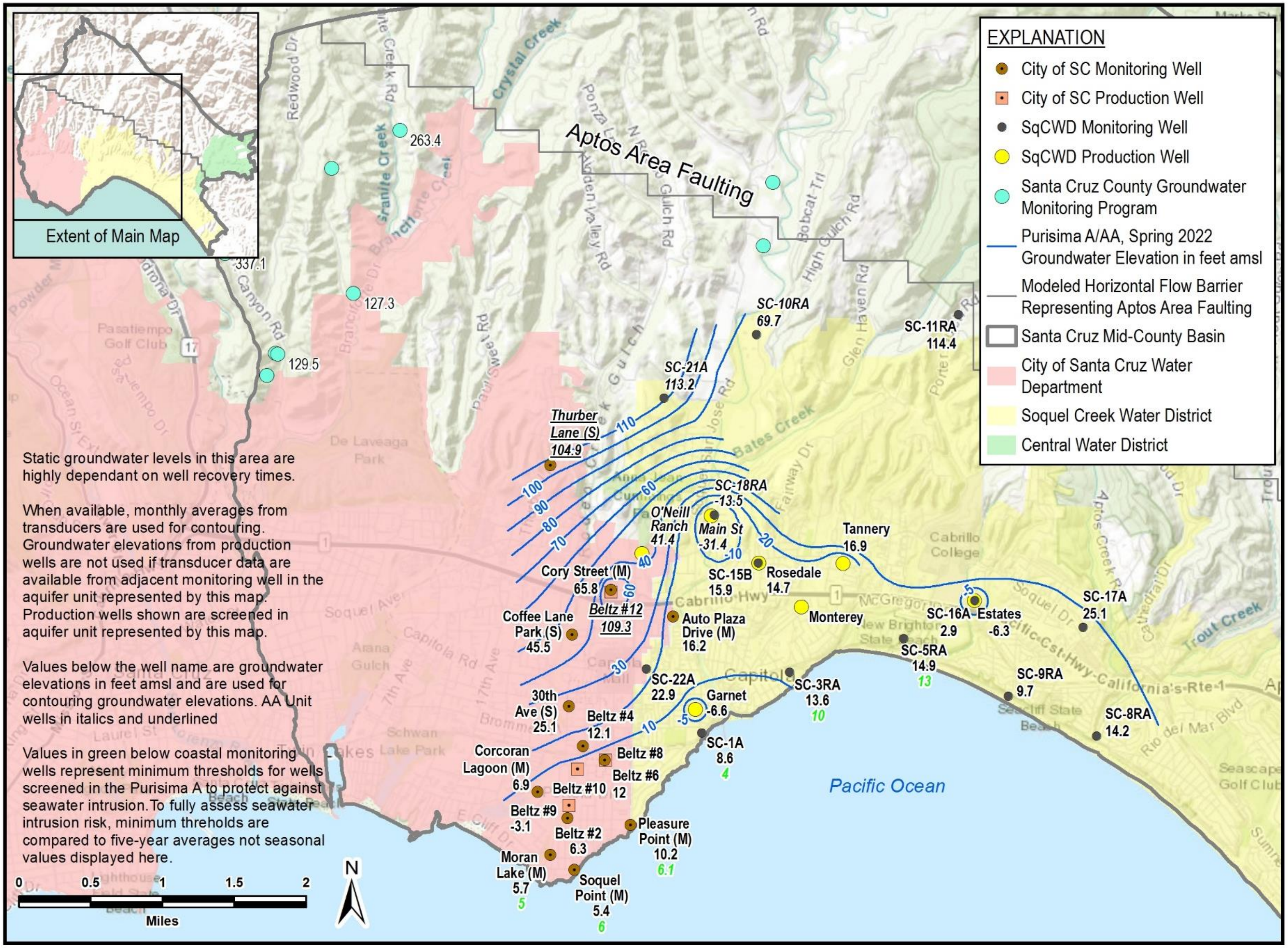

Figure 9. Purisima A and AA Unit Groundwater Elevations, Spring 2022

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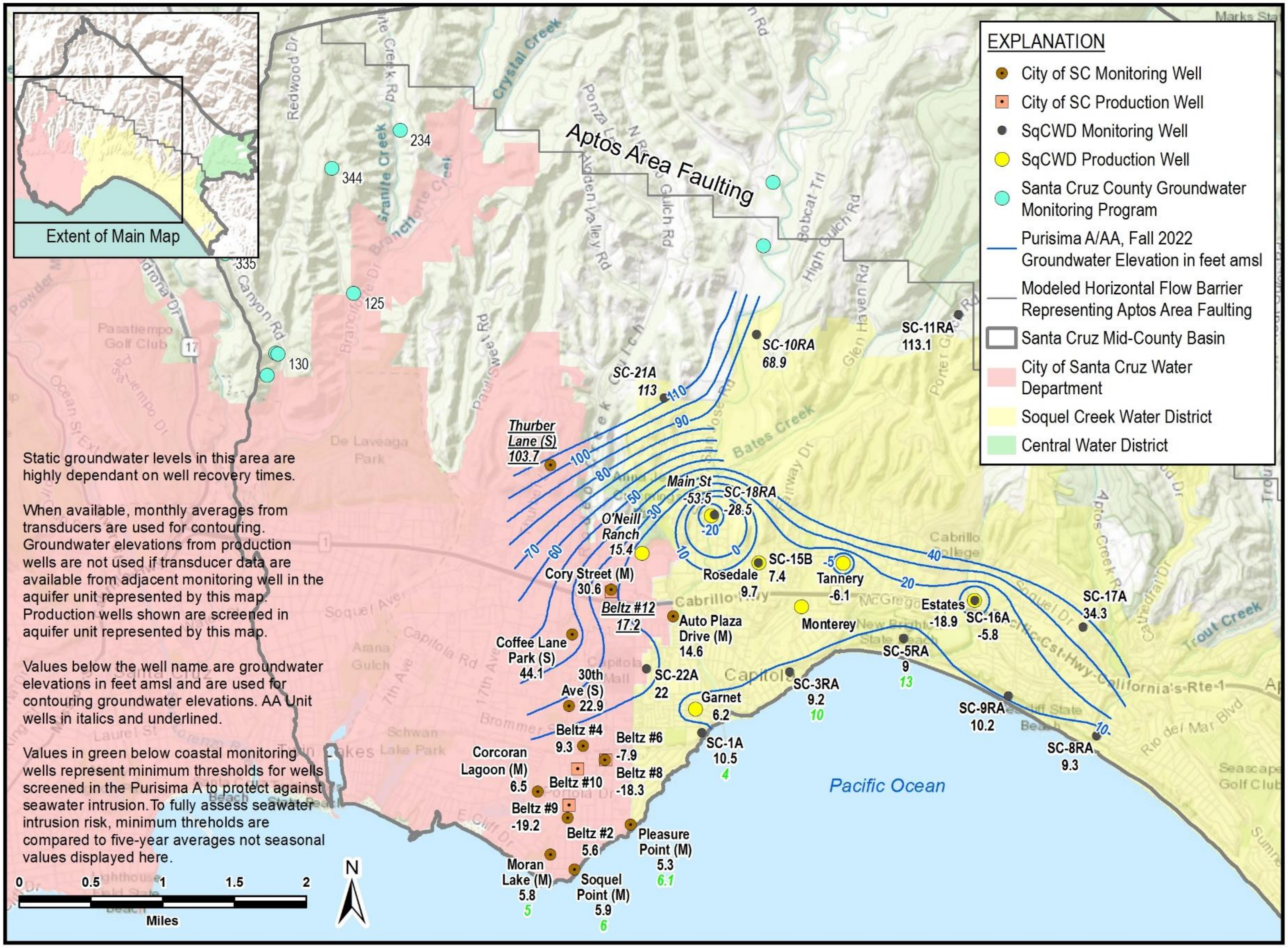

Figure 10. Purisima A and AA Unit Groundwater Elevations, Fall 2022

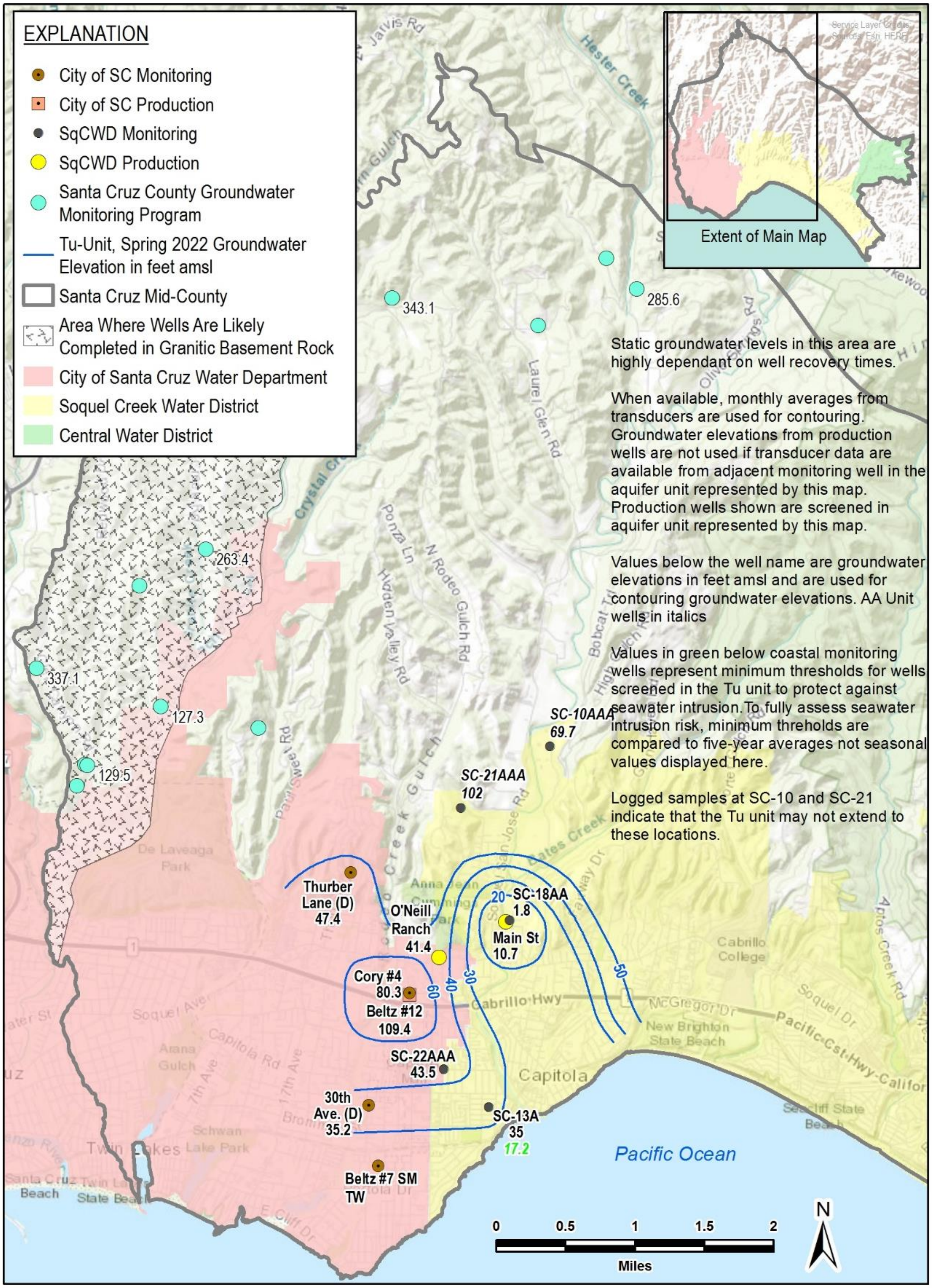

Figure 11. Tu Unit Groundwater Elevations, Spring 2022

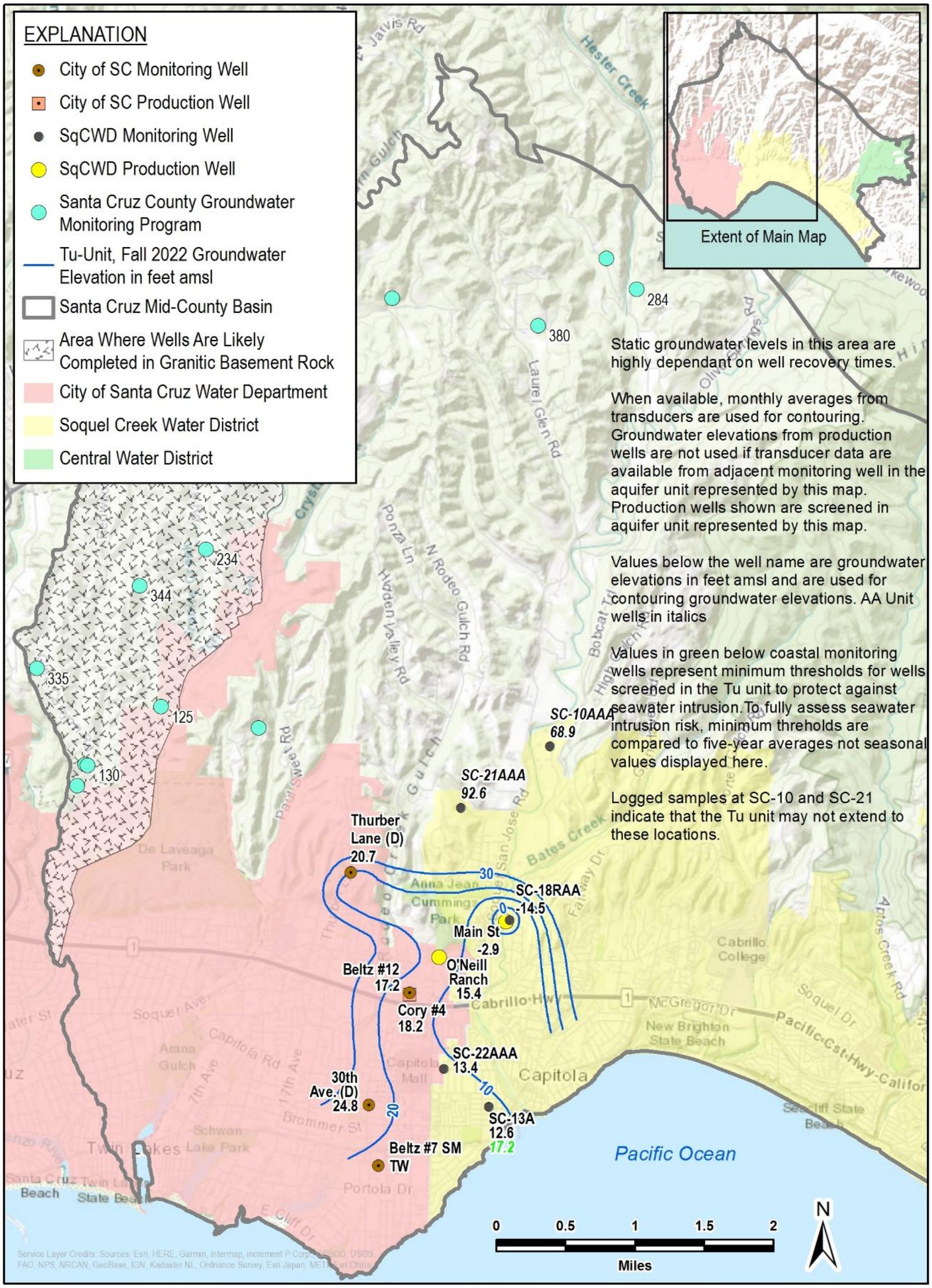

Figure 12.Tu Unit Groundwater Elevations, Fall 2022

3.2 Groundwater Extraction

The volume of Santa Cruz Mid-County Basin groundwater extracted in WY 2022 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 13 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 13 include all groundwater extractions and do not account for injection at Beltz #8 and Beltz #12 during SCWD's ASR demonstration testing in WY 2022.

Table 1. Water Year 2022 Groundwater Extracted in the Santa Cruz Mid-County Basin

Water Use Sector	Aquifer Group			Total (acre-feet)	Percentage
	Aromas Red Sands and Purisima F	Purisima DEF, BC, A and AA	Tu		
Private Domestic [1]	60	413	198	671	12%
Agricultural [2]	209	176	21	406	8%
Institutional [3]	190	71	2	263	5%
Municipal [4]	1,518	1,801	707	4,026	75%
Total	1,977	2,461	928	*5,366*	
Percentage	37%	46%	17%		

[1] 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 2022 is 0.29 acre-feet per connection.

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

[3] 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, 2021 data are used for 2022 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 GFLOW model, irrigation acreage, and turf's crop coefficient (less accurate)

[4] Direct measurement by meters (most accurate); includes 239 acre-feet extracted under SCWD's Aquifer Storage and Recovery testing and <1 acre-foot for aquifer testing of SqCWD Seawater Intrusion Prevention recharge wells.

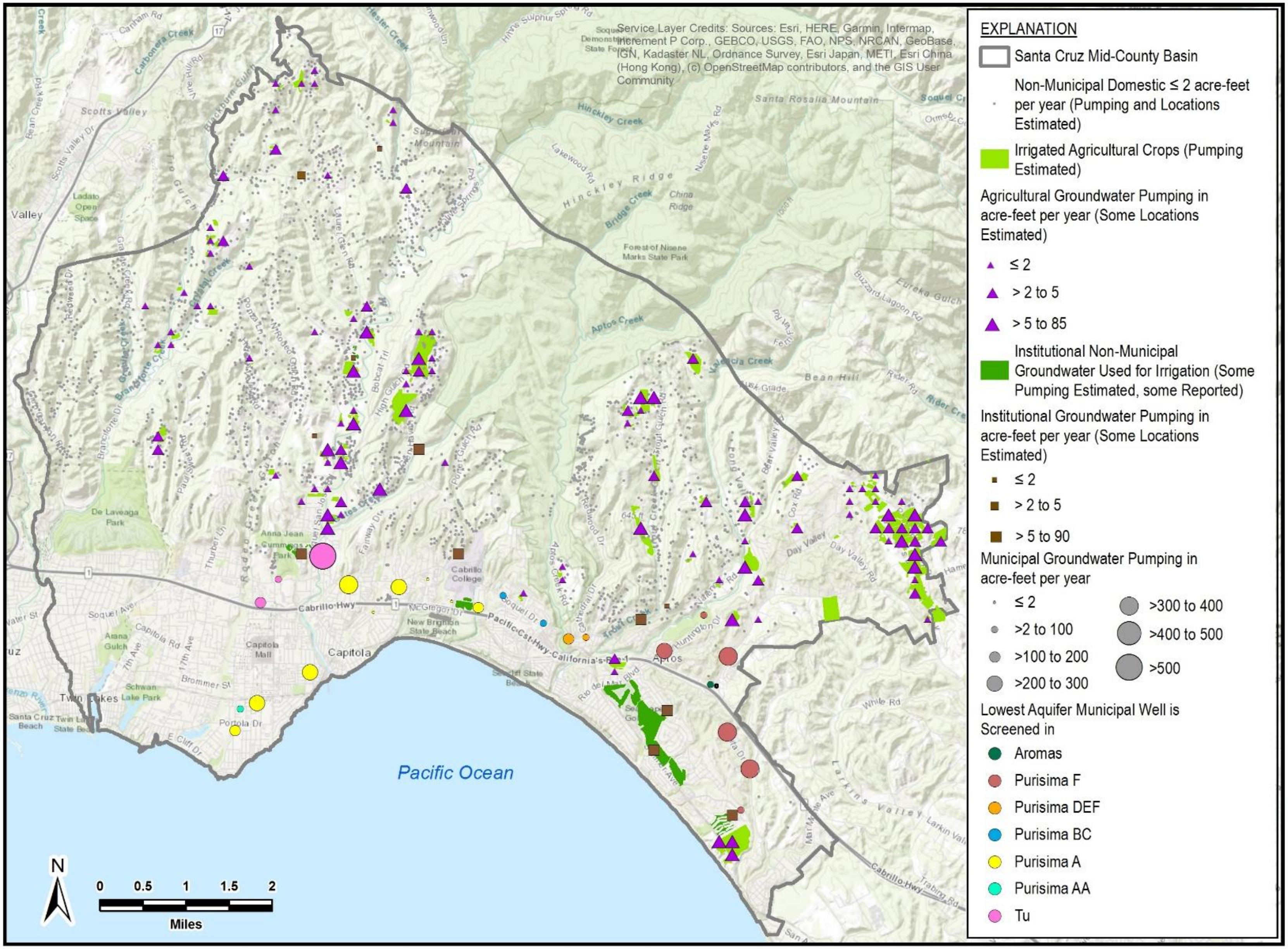

Figure 13. General Location of Water Year 2022 Groundwater Extracted in the Santa Cruz Mid-County Basin

Overall, 401 acre-feet less groundwater was extracted in WY 2022 compared to WY 2021, and 59 acre-feet more than WY 2020. This number does not account for 265 acre-feet of injection that occurred at the SCWD Beltz #8 and #12 wells, which brings net municipal groundwater extraction to 3,761 acre-feet. The Purisima DEF, BC, A, and AA units account for 46% of groundwater pumped, the Aromas Red Sands and Purisima F unit provides 37%, and the Tu unit provides 17% (Table 1). The 3 municipal water supply agencies extract an estimated 75% of groundwater extracted from the Basin. For WY 2022, municipal extraction in Table 1 includes 239 acre-feet extracted under SCWD's Aquifer Storage and Recovery testing and <1 acre-foot extracted groundwater from aquifer testing of SqCWD Seawater Prevention recharge wells.

Unmetered domestic extraction is estimated to be 12% 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. Although there was a slight countywide population increase of about 2.1% from 2021 to 2022, population in unincorporated areas of the County decreased 1.3%, as estimated by the California Department of Finance. The estimate of private domestic extraction in WY 2022 is greater compared to WY 2021 because WY 2022's WUF is 0.29 acre-feet per year, per parcel while WY 2021's WUF was 0.25 acre-feet per year, per parcel. The increased WUF has a greater influence on estimated extraction than population decline. Groundwater extraction reporting by small water systems included in the institutional category has improved over the past few years which has improved accuracy of the extraction estimate for the intuitional use type. Estimates of extraction to meet landscape and agricultural irrigation demand are variable each year because they are based on measured climate data.

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

No surface water from the SCWD to SqCWD for in-lieu use was transferred in WY 2022. Surface water was only used in the Basin for SCWD's continued pilot testing of Aquifer Storage and Recovery that included injection of some of its surface water supply at the Beltz #8 and Beltz #12 wells, into the Purisima A unit, Purisima AA unit, and Tu unit. Table 2 summarizes surface water supply used in the Basin for groundwater recharge and in-lieu use for WY 2022.

Table 2. Water Year 2022 Surface Water Supply for Groundwater Recharge or In-Lieu Use

Purpose	Water User	Description	Total (acre-feet) [1]
Groundwater Recharge	City of Santa Cruz	Demonstration testing of ASR at Beltz #8 & #12	265
In-Lieu Use	Soquel Creek Water District	Pilot Transfer from City of Santa Cruz	0
Emergency Use	Soquel Creek Water District	-	0
Total			*265*

[1] Direct measurement by meters

3.4 Total Water Use

WY 2022 water use volumes in the Santa Cruz Mid-County Basin are included in Table 1. 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 extracted as part of the SCWD's ASR demonstration study or aquifer testing of SqCWD's SWIP recharge wells. ASR demonstration study extraction volumes are considered surface water use because they originate from injected surface water. Testing of SqCWD's SWIP recharge wells is not considered use because the water was pumped to waste and not used for supply.

Table 3. Water Year 2022 Water Use in the Santa Cruz Mid-County Basin

Water Use Sector	Groundwater Use	Surface Water Use[1]	Total Water Use	Percentage of Basin Water Use
	Acre-feet			
Private Domestic[2]	671	Unknown but minimal	671	7%
Agricultural[3]	406	0	406	5%
Institutional[4]	263	0	263	3%
Municipal[5]	3,761	3,594	7,354	85%
Total	5,101	3,594	8,695	

[1] All municipal surface water used in the Basin is sourced outside of the Basin.
[2] 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 2022 was 0.29 acre-feet per connection
[3] Estimated based on irrigation demand determined using the GFLOW model, crop acreage, and crop coefficient (less accurate).
[4] Estimated based on historical water usage for facility use including an estimate of turf irrigation based on irrigation demand determined using the GFLOW model, irrigation acreage, and turf's crop coefficient (less accurate).
[5] 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 groundwater pumped at the Beltz wellfield.

The accuracy of water use measurements is directly correlated with the method used to determine the 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 from WY 2015 through 2022 is lower compared to previous years (Table 4). 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 4). WY 2022 had slightly under average annual groundwater use over this 7-year period, aided by increased injection at the SCWD's Beltz wells and lowered extraction by SqCWD from the previous year. Groundwater from the Basin provided 59% of water supply in WY 2022; surface water from outside the Basin provided 41%.

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

Water Year	Sources Within the Basin							Sources Outside of the Basin		Total Water Use, acre-feet per year
	Groundwater Use, acre-feet per year							Surface Water Use, acre-feet per year		
	Private Domestic Use [1]	Agricultural Use [2]	Institutional Use [3]	Central Water District	City of Santa Cruz	Soquel Creek Water District	Total	City of Santa Cruz[5]	Soquel Creek Water District[4]	
				Municipal Use [4,6]				Municipal Use		
1985	980	352	408	394	181	4,319	6,634	6,413	0	13,047
1986	1,001	329	382	404	102	4,272	6,490	6,561	0	13,051
1987	1,022	398	445	444	526	5,235	8,070	6,415	0	14,485
1988	1,031	372	444	438	943	4,859	8,087	5,314	0	13,401
1989	1,004	355	410	406	756	4,797	7,728	4,993	0	12,721
1990	1,022	361	420	429	842	4,818	7,892	4,295	0	12,187
1991	1,012	349	397	426	254	4,703	7,141	4,628	0	11,769
1992	1,017	394	438	467	716	4,908	7,940	4,695	0	12,635
1993	1,025	331	390	481	260	4,863	7,350	5,191	0	12,541
1994	1,033	329	389	482	463	5,089	7,785	5,178	0	12,963
1995	1,036	273	334	459	212	4,855	7,169	5,564	0	12,733
1996	1,042	337	397	526	143	5,183	7,628	5,998	0	13,626
1997	1,035	386	442	604	245	5,571	8,283	6,381	0	14,664
1998	1,041	249	325	534	268	4,966	7,383	5,616	0	12,999
1999	1,048	304	363	539	359	5,211	7,824	5,829	0	13,653
2000	1,058	325	380	547	593	5,271	8,174	5,587	0	13,761
2001	1,044	337	383	557	95	5,175	7,591	6,157	0	13,748
2002	1,039	336	397	593	336	5,376	8,077	5,731	0	13,808
2003	1,031	327	390	584	416	5,332	8,080	5,653	0	13,733
2004	1,019	380	422	633	421	5,372	8,247	5,765	0	14,012
2005	937	275	330	514	316	4,544	6,916	5,459	0	12,375
2006	935	305	359	544	296	4,549	6,988	5,278	0	12,266
2007	933	362	408	596	420	4,626	7,345	5,054	0	12,399

Water Year	Sources Within the Basin							Sources Outside of the Basin		Total Water Use, acre-feet per year
	Groundwater Use, acre-feet per year							Surface Water Use, acre-feet per year		
	Private Domestic Use [1]	Agricultural Use [2]	Institutional Use [3]	Central Water District	City of Santa Cruz	Soquel Creek Water District	Total	City of Santa Cruz[5]	Soquel Creek Water District[4]	
				Municipal Use [4,6]				Municipal Use		
2008	939	380	439	584	561	4,557	7,460	4,971	0	12,431
2009	874	371	416	594	582	4,162	6,999	4,254	0	11,253
2010	879	304	360	481	451	3,933	6,408	4,311	0	10,719
2011	882	270	311	487	637	4,011	6,598	3,931	0	10,529
2012	890	361	400	535	494	4,159	6,839	4,374	0	11,213
2013	828	423	326	559	515	4,218	6,869	4,560	0	11,429
2014	691	436	310	500	510	3,703	6,150	3,571	0	9,721
2015	553	431	300	391	613	3,154	5,442	3,222	0	8,664
2016	552	375	293	383	450	3,094	5,147	3,472	0	8,619
2017	600	218	288	383	463	3,169	5,121	3,726	0	8,847
2018	599	375	313	377	635	3,340	5,639	3,489	0	9,128
2019	595	336	308	385	83	3,019	4,726	3,794	165	8,685
2020	594	407	318	411	244	3,197	5,171	3,487	111	8,769
2021	586	371	265	406	724	3,262	5,614	2,954	0	8,568
2022	671	406	263	397	315	3,049	5,101	3,594	<1	8,695

[1] 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 2022 was 0.29 acre-feet per connection

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

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

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

[5] 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 groundwater pumped at the Beltz wellfield.

[6] In WY2022, the 265 acre-feet of surface water injected as part of SCWD ASR testing is subtracted from SCWD municipal use.

3.5 Change of Groundwater in Storage

Change of groundwater in storage is estimated using the Basin's integrated surface water/groundwater model (Model). Each year the Model is updated with climate data, metered extraction and injection, and estimates of non-municipal pumping. Change of groundwater in storage is based on water budget output calculated by the updated Basin Model. Appendix 2-D, 2-E, 2-F, and 2-G of the GSP describe development of the Model that incorporated data through WY 2016.

Updated climate data included the following:

- Precipitation data from the Santa Cruz Co-op and Watsonville Waterworks stations sourced from NOAA. Missing data at the Santa Cruz Co-op station were filled using a regression from the Delavega station, resulting in a complete dataset. This improved methodology was also applied to WY 2020-WY 2021 for consistency.
- 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. This improved methodology was also applied to WY 2020-WY2021 for consistency.
- Temperature data for the upper watershed location through December 2021 from DAYMET. Because DAYMET data are only available through December 2021, January 2022 through September 2022 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 2022.

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.
- Non-municipal irrigation demand estimated based on Precipitation Runoff Modeling system watershed simulation of potential and actual evapotranspiration using updated climate data.

As described in Appendix 2-F, the Model was calibrated based on simulation of WY 1985-2015. The Model has not been completely recalibrated for the update through WY 2021. However, 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 (M&A, 2020).

Based on the updated Model simulation through WY 2022, Figure 14 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. For WY 2022, there was a modest increase in groundwater in storage of 322 acre-feet. Cumulative change of groundwater in storage has remained relatively stable since 2005. During this period, the Basin's cumulative change in storage decreases in dry and critically dry years and increases in wet years. During normal years such as WY 2022, the Basin has historically experienced both decreases and increases in cumulative change in storage. For WY 2022, the model simulated a slight net increase in cumulative change in storage.

Figure 15 through Figure 20 show the distribution of modeled WY 2022 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 15). WY 2022 was a normal year with limited recharge, and therefore groundwater in storage in the unconfined Aromas Red Sands aquifer experienced both decreases in the central portion of the Basin and significant increases in the southeastern portions of the Basin. These increases could be related to decreased groundwater pumping in the area; the San Andreas Well pumped 115 acre-feet less than last year and the Bonita Well pumped 49 acre-feet less than last year.

For the other aquifers, areas with the greatest change in storage mostly correspond with where the aquifer outcrops at the surface and there are large areas represented by uncolored cells indicating little change in stored groundwater. The cells surrounding the Purisima A and AA units are notable on Figure 18 and Figure 19 from injection at Beltz #8 and #12.

Overall results from the Model simulation show both decreases (in orange and red) and increases (in green and blue) of groundwater in storage, while large areas show minimal (uncolored) changes. This is consistent with WY 2022 Basin-wide storage shown on Figure 14. 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.

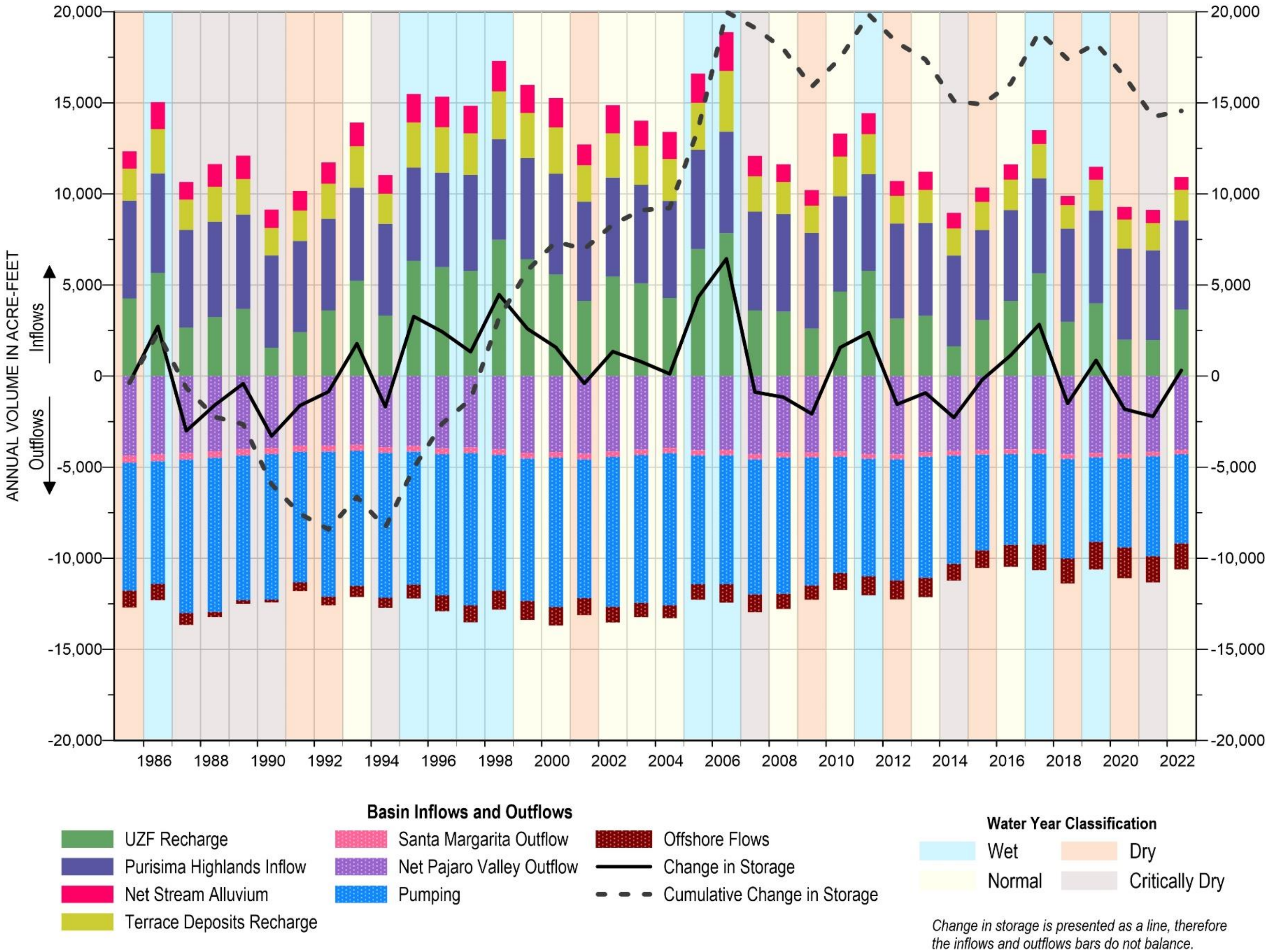

Figure 14. Annual Change in Groundwater in Storage for Santa Cruz Mid-County Basin

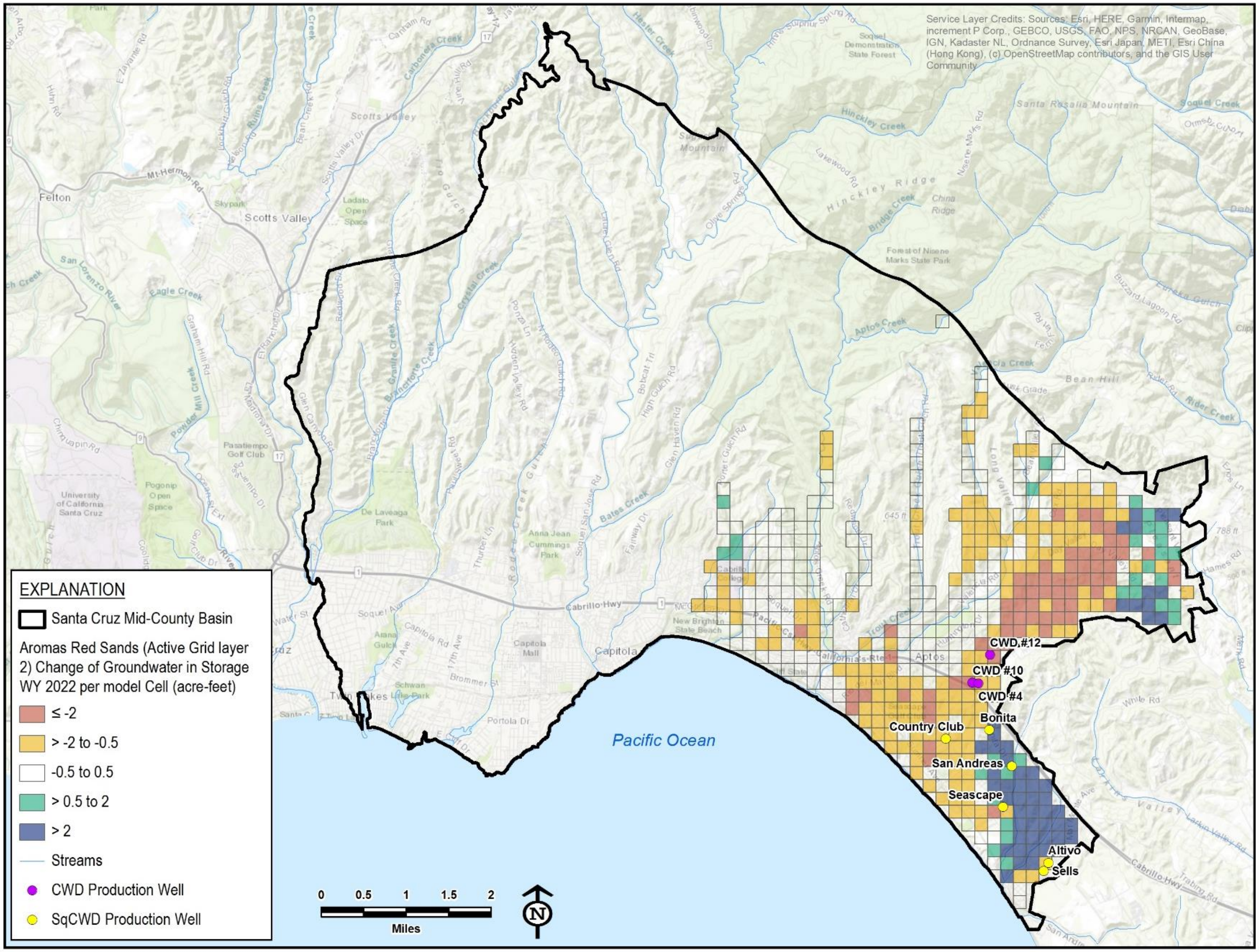

Figure 15. Water Year 2022 Change of Groundwater in Storage in Aromas Red Sands

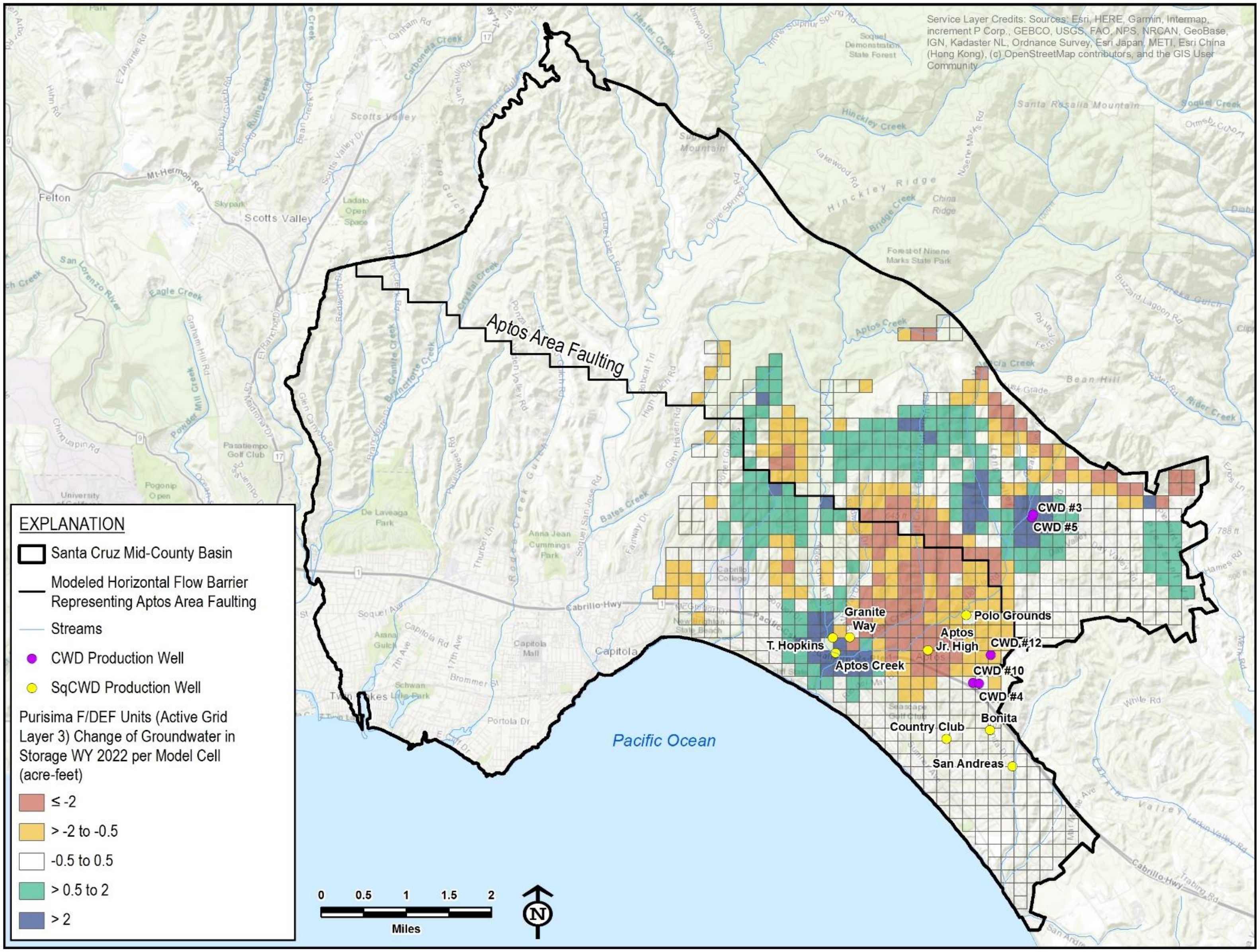

Figure 16. Water Year 2022 Change of Groundwater in Storage in Purisima F/DEF Units

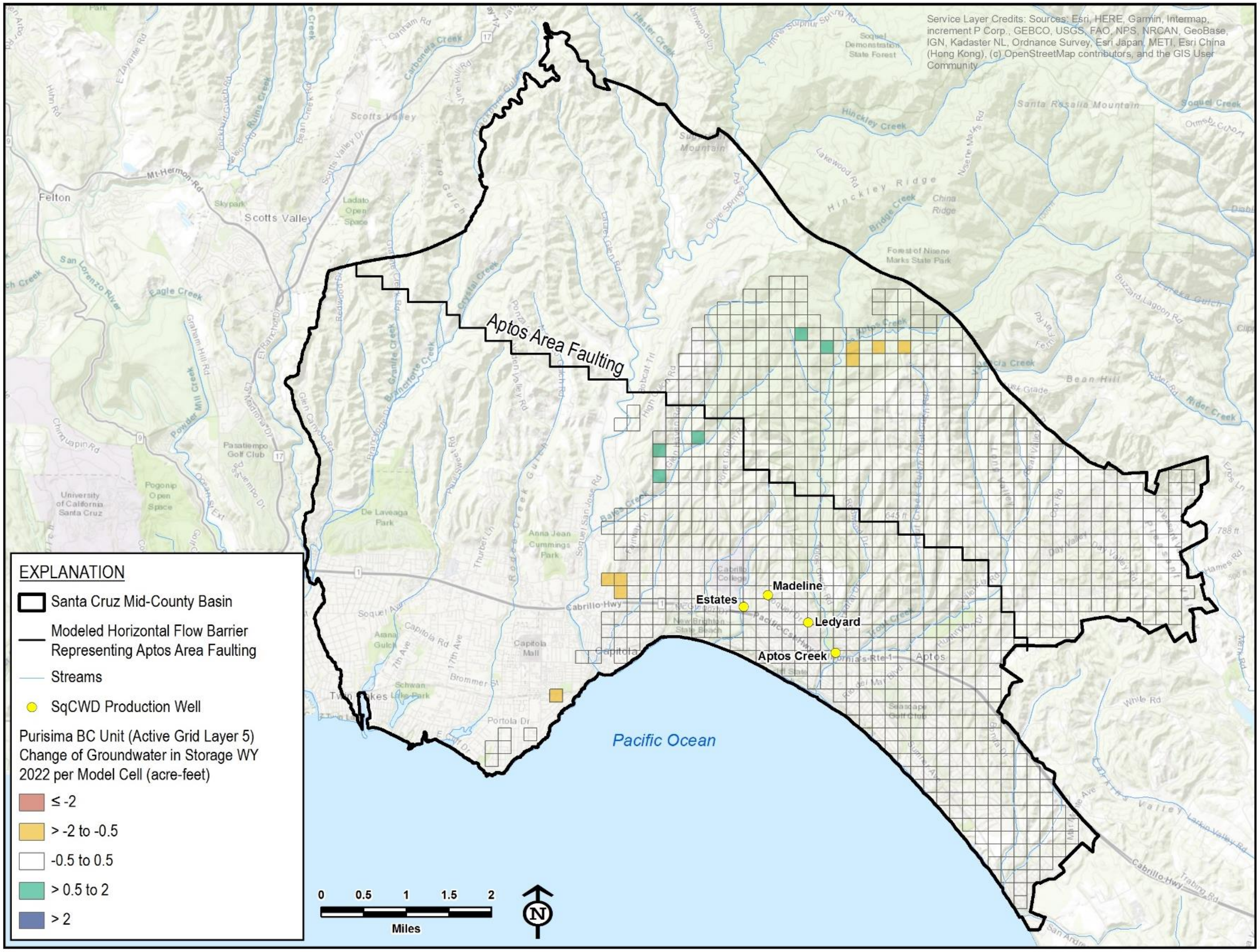

Figure 17. Water Year 2022 Change of Groundwater in Storage in Purisima BC Unit

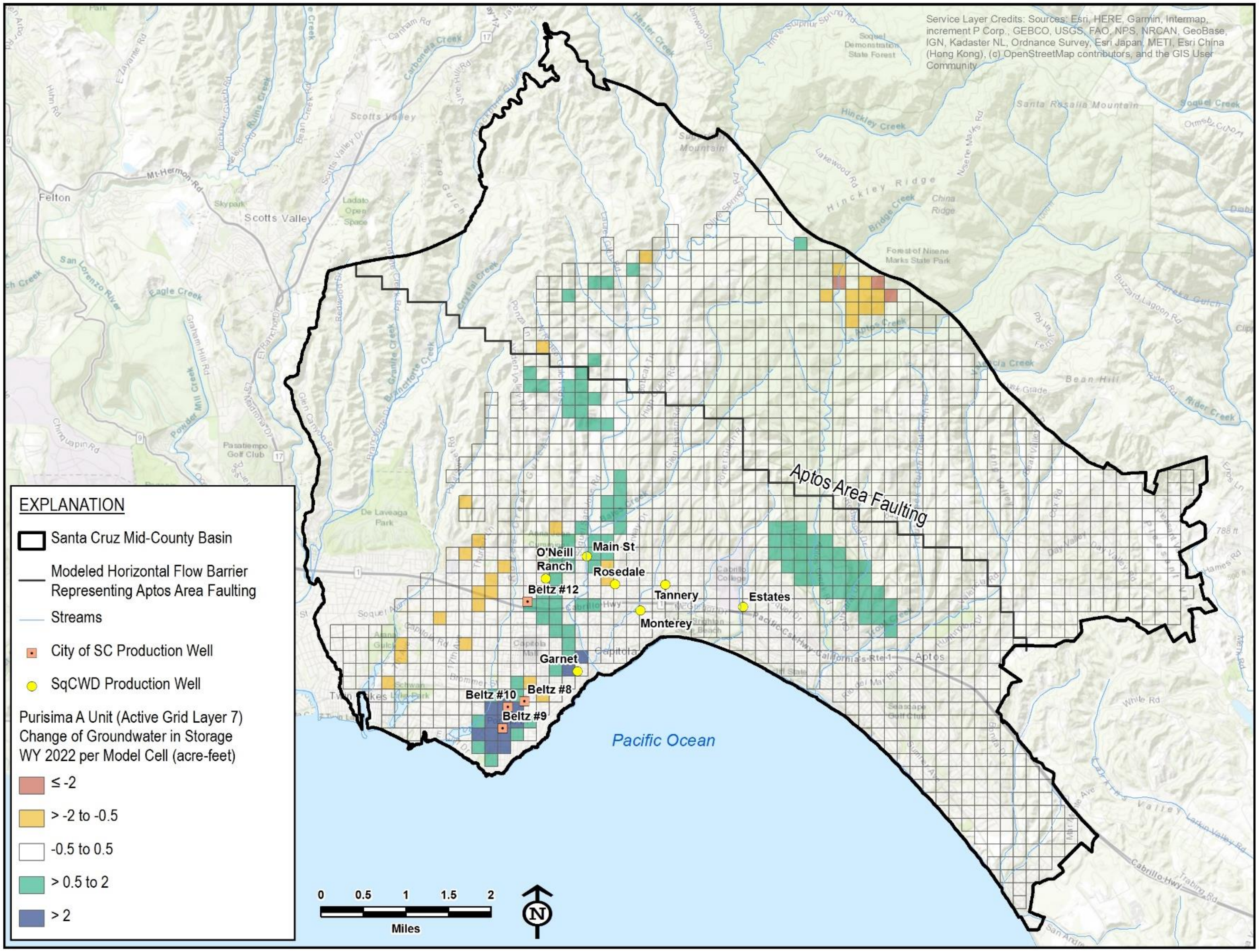

Figure 18. Water Year 2022 Change of Groundwater in Storage in Purisima A Unit

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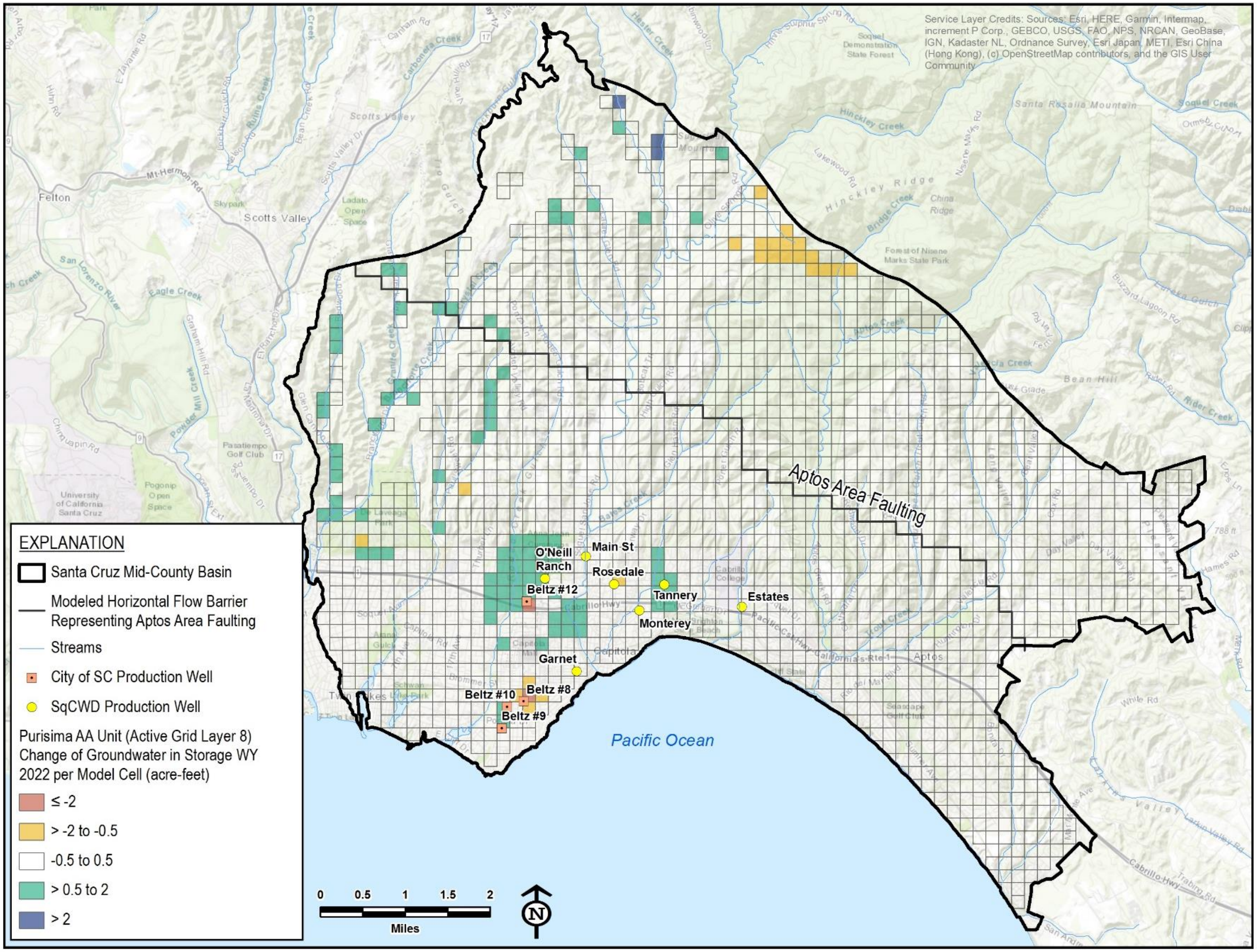

Figure 19. Water Year 2022 Change of Groundwater in Storage in Purisima AA Unit

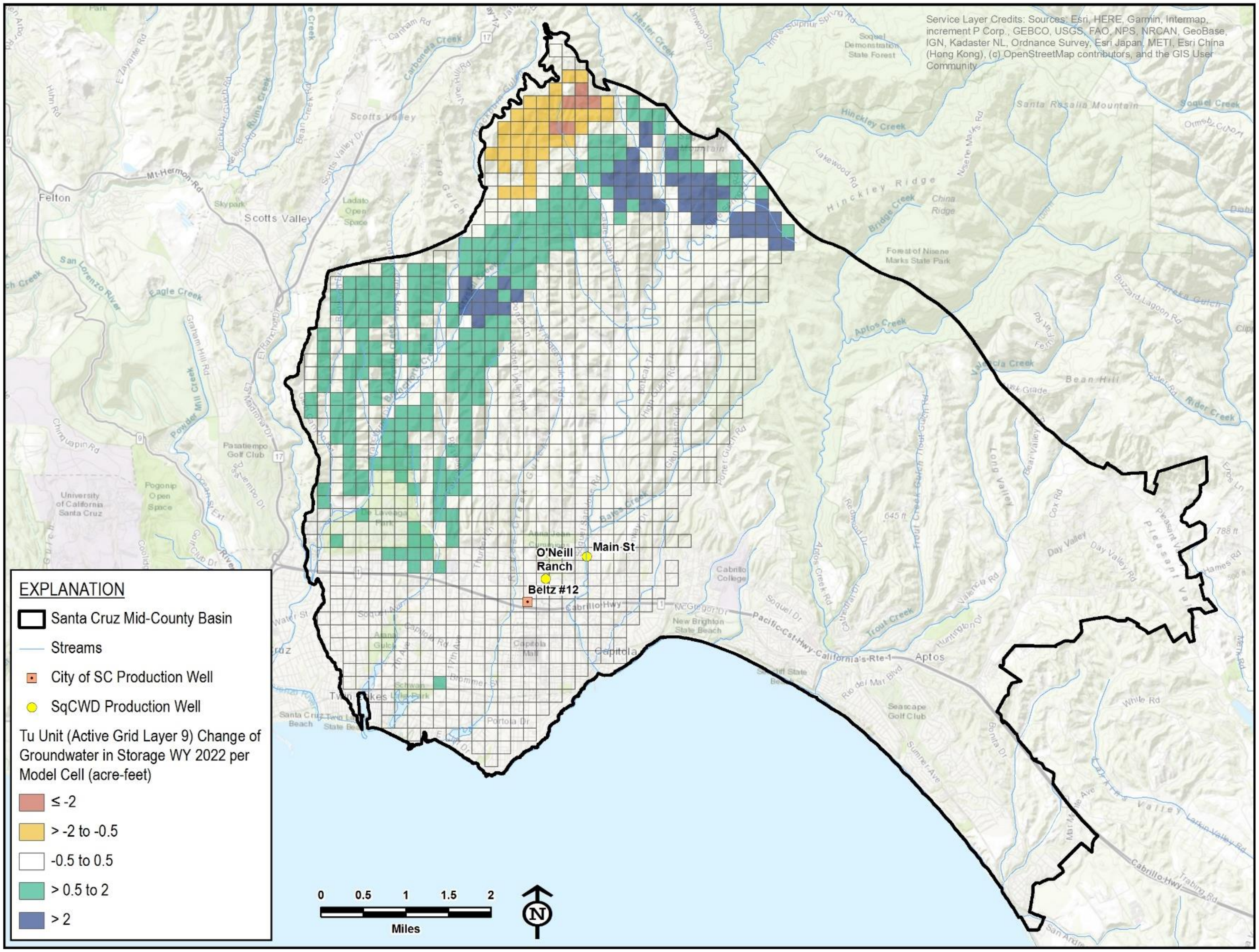

Figure 20. Water Year 2022 Change of Groundwater in Storage in Tu Unit

4 PROGRESS TOWARDS IMPLEMENTING THE PLAN

This section evaluates progress toward implementing the GSP by comparing groundwater conditions in WY 2022 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.

4.1 Chronic Lowering of Groundwater Levels

Table 5 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 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 above MOs for 1 of the 17 RMPs for this indicator. 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 5. 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 2018	WY 2019	WY 2020	WY 2021	WY 2022
			Groundwater Elevation, feet above mean sea level			Minimum Average Monthly Groundwater Elevation, feet above mean sea level				
SC-A7C	Monitoring	Aromas	0	8	8	4.7	6.0	6.0	5.8	5.8
Private Well #2	Production	Purisima F	562	596	596	592.8	596.0	596.4	594.9	592.9
Black	Monitoring	Purisima F	10	41	41	40.5	42.0	46.1	44.1	44.8
CWD-5	Monitoring	Purisima F	140	194	194	192.0	195.3	195.1	194.2	193.8
SC-23C	Monitoring	Purisima F	15	49	49	46.3	45.9	45.8	44.5	44.3
SC-11RD	Monitoring	Purisima DEF	295	318	318	314.3	315.3	315.2	315.2	313.7
SC-23B	Monitoring	Purisima DEF	50	85	85	81.4	80.2	78.8	62.7	60.0
SC-11RB	Monitoring	Purisima BC	120	157	157	155.9	155.3	154.8	152.6	151.8
SC-19	Monitoring	Purisima BC	56	95	95	89.8	88.5	78.4	78.5	73.3
SC-23A	Monitoring	Purisima BC	0	44	44	41.6	39.8	38.8	39.6	39.8
Coffee Lane Shallow	Monitoring	Purisima A	27	47	47	43.6	45.3	44.7	44.8	43.9
SC-22A	Monitoring	Purisima A	2	24	24	20.9	22.3	22.2	22.4	21.6
SC-22AA	Monitoring	Purisima AA	0	22	22	18.6	20.4	20.3	20.7	19.4
SC-10RAA	Monitoring	Purisima AA	35	76	76	70.8	70.3	69.3	69.1	68.2
Private Well #1	Production	Purisima AA/Tu	362	387	387	378.8	387.2	383.5	382.6	379.7
30th Ave Deep	Monitoring	Tu	0	30	30	20.7	24.0	27.4	21.3	21.8
Thurber Lane Deep	Monitoring	Tu	-10	33	33	10.4	12.8	19.1	-1.1	4.6

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

4.2 Reduction of Groundwater in Storage

Table 6 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, the 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 net extraction through WY 2022 unit less than the sustainable yield/MT. The 5-year average net extraction amounts 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 extraction for all 3 aquifer groups through WY 2022 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 2022 did not meet MOs for the 3 aquifer groups.

Table 6. Reduction in Groundwater in Storage Sustainable Management Criteria Compared to Net Extraction

Aquifer Unit Group	Minimum Threshold	Interim Milestone 2025	WY 2018-2022	Measurable Objective	WY 2022
	Five-Year moving average Net Extraction, acre-feet per year			Net Extraction, acre-feet per year	
Aromas Red Sands and Purisima F	1,740	1,930	2,042	1,680	1,977
Purisima DEF, BC, A and AA	2,280	2,110	2,432	960	2,347
Tu	930	720	802	620	823

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

4.3 Seawater Intrusion

4.3.1 Chloride Concentrations

Table 7 shows the SMC for chloride concentrations compared to maximum concentrations for the past 5 years, including WY 2022. Sustainable management criteria for this indicator are met when chloride concentrations are at or below criteria concentrations.

There are 2 wells with consecutive exceedances of MTs during WY 2022: SC-A2RB and SC-A5B, both in the Purisima F unit in the Seascape area. Both wells exceeded the MT in all samples taken this year, with monitoring well SC-A2RB reporting exceedances in 4 of 4 consecutive samples and monitoring well SC-A5B reporting exceedances in 3 of 3 consecutive samples. Any RMP with consecutive samples greater than the MT constitutes an undesirable result for chloride concentrations. These exceedances constitute undesirable results at these wells for the second consecutive year. There are also 2 wells with single MT exceedances during WY 2022: SC-A5A and SC-A8A. These wells are also in the Purisima F unit near SqCWD's Seascape well.

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 well in the Purisima AA unit.

Figure 21 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 7. Chloride Concentrations Adjacent to 250 mg/L Chloride Isocontour for Seawater Intrusion

Representative Monitoring Point	Aquifer	Minimum Threshold	Measurable Objective	Interim Milestone 2025	WY 2018	WY 2019	WY 2020	WY 2021	WY 2022
		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	18,000	18,400	18,500	18,600	19,200
SC-A3B	Aromas	4,330	676	676	1,000	1,100	767	1,070	871
SC-A8A	Purisima F	8,000	7,258	7,258	7,500	7,670	7,670	7,710	9,770
SC-A2RA	Purisima F	18,480	14,259	14,259	15,000	15,000	15,000	15,200	15,400
SC-A2RB	Purisima F	470	355	355	410	470	564	480*	522*
Moran Lake Med	Purisima A	700	147	147	78	60	53	47	46
Soquel Point Med	Purisima A	1,300	1,104	1,104	1,100	1,000	1,200	1,100	1,200
Coastal Monitoring Wells - Unintruded (undesirable results if > 250 mg/L in >=2 of 4 consecutive quarterly samples)									
SC-A8B	Aromas	250	100	100	32	39	35	53	43
SC-A1B	Purisima F	250	100	100	26	28	29	28	28
SC-A1A	Purisima DEF	250	100	100	26	28	29	28	28
SC-8RD	Purisima DEF	250	100	100	66	21	21	20	21
SC-9RC	Purisima BC	250	100	100	31	32	32	31	31
SC-8RB	Purisima BC	250	100	100	NS	19	15	13	18
Pleasure Point Medium	Purisima A	250	100	100	36	35	36	NS	NS
SC-1A	Purisima A	250	100	100	38	44	49	48	47
SC-5RA	Purisima A	250	100	100	58	58	57	56	56
SC-3RA	Purisima A	250	100	100	63	65	51	40	50
Moran Lake Deep	Purisima AA	250	100	100	65	66	66	66	67
Pleasure Point Deep	Purisima AA	250	100	100	22	23	22	22	24
Soquel Point Deep	Purisima AA	250	100	100	160	160	170	160	170

Representative Monitoring Point	Aquifer	Minimum Threshold	Measurable Objective	Interim Milestone 2025	WY 2018	WY 2019	WY 2020	WY 2021	WY 2022
		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	9,310	9,220	10,800*	9,240	11,400
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	130	159	133	173*	164*
San Andreas PW	Purisima F	150	100	100	29	30	22	22	21
Seascape PW	Purisima F	150	100	100	18	19	19	17	18
T. Hopkins PW	Purisima DEF	150	100	100	24	42	50	25	45
Estates PW	Purisima BC & A	150	100	100	50	45	48	13	45
Ledyard PW	Purisima BC	150	100	100	31	33	35	12	42
Garnet PW	Purisima A	150	100	100	76	84	85	86	86
Beltz #2	Purisima A	150	100	100	63	64	69	68	64
Beltz #8 PW	Purisima A	150	100	100	49	50	53	52	48
SC-22AA	Purisima AA	150	100	100	38	46	41	39	39
Corcoran Lagoon Deep	Purisima AA	150	100	100	21	22	23	23	24
Schwan Lake	Purisima AA	150	100	100	93	94	97	93	93

Minimum threshold not met

Minimum threshold achieved but measurable objective not met

Measurable objective met

NS = not sampled

* = Undesirable Result

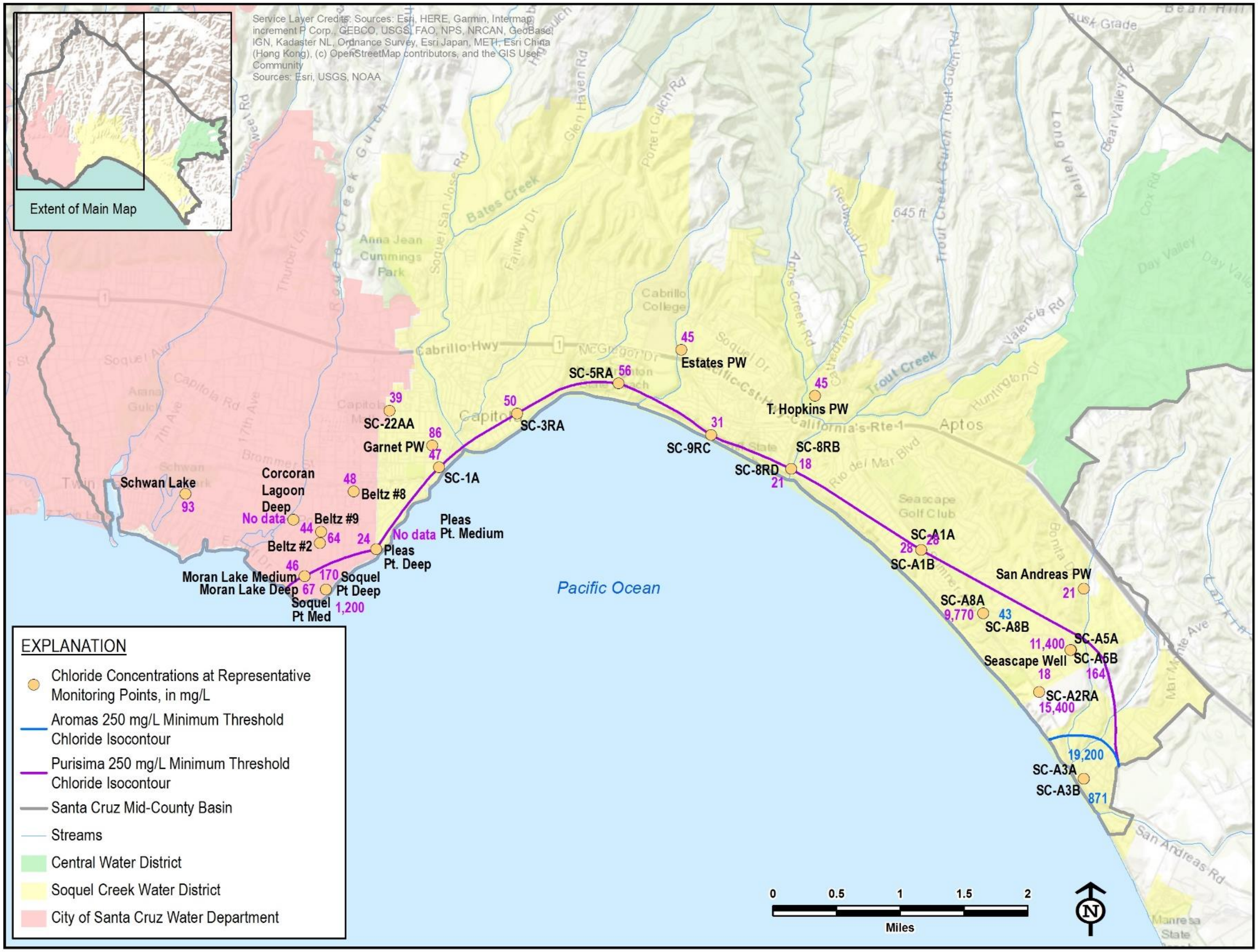

Figure 21. Water Year 2022 Maximum Chloride Concentration Map Compared to Minimum Threshold Isocontour

4.3.2 Groundwater Elevation Proxies

Table 8 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. In WY 2022, the annual minimums of the 5-year moving averages for groundwater elevations in most of the Tu, Purisima AA, A, BC, and DEF unit coastal RMPs remained within a foot of the previous year. The Purisima F unit and Aromas Red Sands coastal monitoring wells have fairly stable groundwater elevations. The 5-year moving average groundwater elevation in SC-A3A in the Aromas Red Sands has remained above its MT for 2 full water years.

Coastal RMPs with 5-year moving average groundwater elevations below MTs did not change from WY2021 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 2021 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 recovery from implementation of projects included in the GSP. Table 8 shows that 13 of 17 RMPs have groundwater elevations higher than WY 2025 interim milestones. Two of those have 5-year moving average groundwater elevations below MTs. The 4 RMPs with groundwater elevations below their 2025 interim milestones are SC-8RB, SC-5RA, Soquel Point Medium, and Soquel Point Deep (Table 8).

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Table 8. Groundwater Elevation Proxies for Seawater Intrusion

Representative Monitoring Point	Aquifer	Minimum Threshold	Measurable Objective	Interim Milestone 2025	WY 2018	WY 2019	WY 2020	WY 2021	WY 2022
		Groundwater Elevation, feet above mean sea level			Annual Minimum of Five-Year Moving Average Groundwater Elevation, feet above mean sea level				
SC-A3A	Aromas	3	4	3	2.9	2.9	2.9	3.1	3.2
SC-A1B	Purisima F	3	5	3	7.5	7.5	7.5	7.4	7.3
SC-A8A	Purisima F	6	7	4.5	5.3	5.4	5.3	5.0	5.0
SC-A2RA	Purisima F	3	4	3	4.5	5.7	6.5	6.6	6.6
SC-8RD	Purisima DEF	10	11	10	9.4	10.1	12.6	13.9	14.0
SC-9RC	Purisima BC	10	11	4.6	2.2	5.2	8.9	9.6	8.2
SC-8RB	Purisima BC	19	20	8.4	0.2	2.7	5.8	5.2	4.9
SC-5RA	Purisima A	13	15	13	7.8	8.5	9.3	10.2	10.1
SC-3RA	Purisima A	10	12	10	9.6	10.6	11.7	11.5	11.3
SC-1A	Purisima A	4	6	4	9.5	9.5	9.7	10.4	10.6
Moran Lake Medium	Purisima A	5	6.8	5	5.6	5.6	5.9	6.2	6.4
Soquel Point Medium	Purisima A	6	7.1	6	5.2	5.3	5.7	5.9	5.9
Pleasure Point Medium	Purisima A	6.1	6.5	6.1	6.8	7.1	7.9	9.3	10.2
Moran Lake Deep	Purisima AA	6.7	16	6.7	6.4	6.5	6.8	7.0	7.2
Soquel Point Deep	Purisima AA	7.5	16	7.5	5.9	6.0	6.3	6.8	6.9
Pleasure Point Deep	Purisima AA	7.7	16	7.7	7.8	8.2	8.7	10.1	10.9
SC-13A	Tu	17.2	19	8.3	not measured	17.1	14.8	15.1	15.4

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

4.3.3 Seawater Intrusion Triggers

Although not required by the SGMA regulations, the GSP includes triggers for preemptive 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 2022, there are 8 wells with annual average chloride concentrations above their MOs: SC-A3A (Aromas Aquifer; Appendix Figure B-1), SC-A2RA (Purisima F Unit; Appendix Figure B-4), SC-A2RB (Purisima F Unit; Appendix Figure B-5), SC-A5A (Purisima F Unit; Appendix Figure B-21), SC-A5B (Purisima F Unit; Appendix Figure B-22), SC-A8A (Purisima F Unit; Appendix Figure B-3, Soquel Point Deep (Purisima A unit; Appendix Figure B-20), and Soquel Point Medium (Purisima A Unit; Appendix Figure B-7).

Of those 8 wells, SC-A5B and SC-A2RB–both in the Purisima F unit–display a clear increasing trend. This indicates there is inland movement 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 is the nearest municipal well as it is on the same site as SC-A5B and SC-A5A, but has a shallower screen. Groundwater extraction at the Seascape well has been limited to less than 47 acre-feet per year since 2015, which is much less than previous years, and is consistent with sustainable pumping described in the GSP. It is also possible local non-municipal extractions are influencing groundwater hydraulic gradients that drive seawater intrusion in this area more than current municipal pumping. Since the Seascape area has the Basin's highest chloride concentrations, it is recommended that the MGA evaluate local non-municipal well construction information and pumping to assess causes of seawater intrusion in the area.

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 2021, 2 wells had 30-day average groundwater elevations that temporarily fell below the trigger level of 2 feet above mean sea level during the year: SC-5RA (Purisima A) and SC-13A (Tu unit). These elevations were likely correlated with increased pumping from the Purisima A unit and Tu unit in WY 2021 due to limitations of pumping at the Ledyard, T. Hopkins, and Granite Way wells from the Purisima BC and DEF units. Restored ability to pump from those wells reduced stress on the Purisima A unit and Tu unit in WY 2022, and SC-5RA remained above the trigger level through the year.

In WY 2022, two wells had 30-day moving average elevations below trigger levels: SC-13A (Tu unit) and SC-8RB (Purisima BC unit), with exceedances at both wells occurring in fall

2022. Elevations at SC-13A were notably high in spring 2022, in part from injection at the Beltz #12 well, but briefly dropped below the trigger level in July and August 2022 at the end of pumping during the Beltz #12 demonstration study when its pumping rate was temporarily increased as part of the study. Elevations at SC-13A rebounded by September and remained above the trigger level through the water year. Elevations at SC-8RB were relatively high in spring 2022 due to the inability to pump the Ledyard well in WY 2021, but dropped in fall 2022 corresponding with resumption of normal pumping at this well. Elevations recovered to just under the trigger level in late WY 2022.

It is recommended SCWD and SqCWD continue to monitor groundwater levels at SC-13A and SC-8RB. For the second year of its ASR demonstration study, SCWD can reduce its recovery pumping rate at Beltz #12 if groundwater levels approach the trigger elevation at SC-13A. 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. Continued coordination between SCWD and SqCWD, and evaluation of how aquifers respond to ASR recharge, recovery, and regular groundwater pumping will be critical to implementing needed groundwater sustainability projects without creating temporary adverse effects.

4.4 Groundwater Quality

Table 9 shows SMC compared to WY 2022 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 2022, iron and manganese concentrations at several RMPs are above MOs set at average concentrations for WY 2013-2017 that were above MTs. Concentrations above measurable objectives indicate an increase in concentration since WY 2013-2017. These MT exceedances are not considered an undesirable result because it is a preexisting natural condition not associated with pumping or managed aquifer recharge.

There was a single detection of 0.7 µg/L of MTBE at the Rosedale 2 pumping well, which is 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 9. Water Year 2022 Groundwater Quality

Aquifer	Representative Monitoring Point	Total Dissolved Solids, mg/L	Chloride, mg/L	Iron, µg/L	Manganese, µg/L	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 2022 Maximum Concentration							
Aromas	CWD-10 PW	NA	NA	NA	NA	NA	NA	6.3	Non-Detect
	SC-A1C	384.0	31.4	NA	NA	NA	NA	NA	NA
	SC-A2RC	400.0	55.3	200.0	17.0	NA	NA	3.9	NA
	SC-A3A	34,800.0	19,200.0	300.0	217.0	NA	NA	0.5	NA
	SC-A3C	366.0	76.4	110.0	12.0	NA	NA	5.7	NA
	SC-A8B	390.0	43.3	20.0	183.0	NA	NA	NA	NA
	SC-A8C	346.0	60.6	NA	NA	NA	NA	NA	NA
Aromas/ Purisima F	Polo Grounds PW	260.0	22.3	50.0	225.0	0.5	1.0	0.1	NA
	Aptos Jr. High 2 PW	628.0	32.5	10.0	274.0	0.5	0.7	0.1	NA
	Country Club PW	NA	NA	NA	NA	NA	NA	5.0	NA
	Bonita PW	312.0	28.3	10.0	5.0	0.5	8.7	2.9	NA
	San Andreas PW	258.0	21.4	10.0	10.0	0.5	13.7	1.6	NA
	Seascape PW	NA	NA	NA	NA	NA	NA	NA	NA
Purisima F	CWD-4 PW	NA	NA	NA	NA	NA	NA	2.9	Non-Detect
	CWD-12 PW	NA	NA	NA	NA	NA	NA	1.3	Non-Detect
	SC-A2RA*	30,200.0	15,400.0	170.0	591.0	NA	NA	0.5	NA
	SC-A8A	13,500.0	9,770.0	NA	NA	NA	NA	NA	NA
Purisima DEF	SC-8RD	330.0	20.9	10.0	5.0	NA	NA	0.0	NA
	SC-9RE	532.0	47.1	70.0	54.0	NA	NA	0.0	NA
	SC-A1A	228.0	27.6	70.0	49.0	NA	NA	NA	NA
	T. Hopkins PW	326.0	44.9	110.0	155.0	1.9	1.8	0.01	NA
	Granite Way PW	298.0	27.1	20.0	18.0	0.5	1.6	0.01	NA
Purisima BC	Madeline 2 PW	432.0	33.6	240.0	8.0	0.5	0.5	0.01	NA
	Aptos Creek PW	NA	NA	NA	NA	NA	NA	NA	NA

Aquifer	Representative Monitoring Point	Total Dissolved Solids, mg/L	Chloride, mg/L	Iron, µg/L	Manganese, µg/L	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 2022 Maximum Concentration							
Purisima A	Ledyard PW	352.0	41.8	80.0	18.0	0.5	0.5	0.01	NA
	SC-23A	274.0	19.5	40.0	5.0	NA	NA	0.01	NA
	SC-8RB	506.0	17.7	20.0	5.0	NA	NA	0.01	NA
	SC-9RC	408.0	31.4	10.0	5.0	NA	NA	0.01	NA
	30th Ave Shallow	790.0	46.0	130.0	1,200.0	NA	NA	0.00	NA
	Pleasure Point Shallow	270.0	33.0	97.0	100.0	NA	NA	0.00	NA
	Estates PW	434.0	45.4	150.0	92.0	0.5	2.5	0.01	NA
	Garnet PW	684.0	85.5	1,480.0	439.0	0.5	1.3	0.01	NA
	Tannery 2 PW	572.0	61.1	240.0	155.0	0.5	0.9	0.01	NA
	Rosedale 2 PW	570.0	44.7	650.0	282.0	0.5	1.9	0.01	0.7 (MTBE)
	Beltz #8 PW	440.0	48.0	1,000.0	200.0	NA	NA	0.00	NA
	Beltz #9 PW	480.0	44.0	1,000.0	220.0	NA	NA	0.00	NA
	SC-3RC	458.0	47.8	60.0	42.0	NA	NA	0.01	NA
	SC-5RA	682.0	55.7	60.0	166.0	NA	NA	0.01	NA
	SC-9RA	368.0	14.3	90.0	12.0	NA	NA	0.01	NA
	SC-10RA	414.0	29.1	630.0	575.0	NA	NA	0.01	NA
	SC-22A	374.0	17.2	480.0	530.0	NA	NA	0.01	NA
Purisima A/AA	Beltz #10 PW	580.0	59.0	530.0	210.0	NA	NA	0.00	NA
Purisima AA	SC-10RAA	230.0	9.8	150.0	54.0	NA	NA	0.01	NA
	SC-22AAA	642.0	62.8	40.0	46.0	NA	NA	0.01	NA
	Coffee Lane Deep	970.0	42.0	14.0	120.0	NA	NA	0.00	NA
	Pleasure Point Deep	630.0	24.0	620.0	210.0	NA	NA	0.00	NA
	Thurber Lane Shallow	Well not sampled since 2006							
	Schwan Lake	400.0	93.0	350.0	110.0	NA	NA	0.00	NA

Aquifer	Representative Monitoring Point	Total Dissolved Solids, mg/L	Chloride, mg/L	Iron, µg/L	Manganese, µg/L	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 2022 Maximum Concentration							
Purisima AA/Tu	O'Neill Ranch PW	450.0	38.0	1,100.0	430.0	NA	NA	NA	NA
	Main Street PW	312.0	26.8	100.0	30.0	0.5	1.9	0.01	NA
	Beltz #12 PW	Well not sampled in Water Year 2022							
Tu	SC-18RAA	232.0	15.4	40.0	17.0	NA	NA	0.01	NA
	Thurber Lane Deep	Well not sampled since 2006							

Maximum of minimum threshold and measurable objective not met

Minimum threshold met but measurable objective not met

Measurable objective met

NA = not analyzed

4.5 Subsidence

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

4.6 Interconnected Surface Water

Table 10 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. 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 10. Groundwater Elevation Proxy for Depletion of Interconnected Surface Water

Well Name	Aquifer	Minimum Threshold	Measurable Objective	Interim Milestone 2025	WY 2018	WY 2019	WY 2020	WY 2021	WY 2022
		Groundwater Elevation, feet above mean sea level			Minimum Average Monthly Groundwater Elevation, feet above mean sea level				
Balogh	Shallow Groundwater	29.1	30.6	29.1	29.2	29.1	29.1	28.7	28.7
Main St. Shallow		22.4	25.3	20.7	22.8	22.5	22.8	22.3	22.6
Wharf Road		11.9	12.1	11.3	12.2	12.1	12.4	12.0	12.1
Nob Hill		8.6	10.3	7.3	8.7	8.7	5.5	8.2	9.0
SC-10RA	Purisima A	68	70	68	69.2	69.2	69.0	69.9	68.9

Minimum threshold not met

Minimum threshold achieved but measurable objective not met

Measurable objective met

4.7 Update on Implementation of Projects and Management Actions

Below are WY 2022 updates on projects and management actions planned or in the process of being implemented.

4.7.1 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 and 25% local cost share are directly focused on addressing groundwater sustainability. The projects include the following:

- Inland groundwater pumping optimization to effectively redistribute SqCWD groundwater pumping away from the coast and add a new SqCWD inland production well
- Including Beltz #8 as an additional ASR well in the SCWD's ASR program
- Increasing the intertie capacity between SqCWD's subarea 1 and subarea 2 to mitigate the bottleneck caused by undersized pipe thereby improving water reliability
- A regional water resources optimization study for Group 1 and 2 projects and management actions identified in the GSP. The study is underway and expected to be completed by end of calendar year 2024.

4.7.2 Pure Water Soquel

The Pure Water Soquel (PWS) project will recharge purified recycled water at 3 Seawater Intrusion Prevention (SWIP) wells to replenish the aquifer and aid in raising groundwater levels above seawater intrusion MTs in the Basin. The project is currently being constructed to produce up to 1,500 acre-feet per year of purified water. The project has completed California Environmental Quality Act environmental review with a certified EIR. The project components include the following:

- 3 SWIP wells – Twin Lakes, Willowbrook, and Monterey SWIP wells
- 9 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, three-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 11 summarizes construction progress of PWS components for WY 2022 and prior years. It is expected construction of all PWS components will be completed in calendar year 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

Table 11. Status of Pure Water Soquel Project Construction

Project Component	Completed in Prior Water Years	Water Year 2022 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	Began pre-construction activities of the site civil infrastructure at SWIP well sites such as the backwash basins and preparing for electrical and other equipment needs.
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
Conveyance pipelines	-	Started in May 2021 and will be completed in WY 2023
Treatment facilities	-	Site preparation and foundation work started in WY 2022 at both facility sites.

4.7.3 Aquifer Storage and Recovery

It is expected the City of Santa Cruz will receive California State Water Resources Control Board action in calendar year 2023 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 began implementation of demonstration studies at both Beltz # 8 and #12 wells in WY 2022 and will continue testing to November 2024. Unlike a pilot test that is conducted as a series of brief incremental cycles of injection and extraction, the purpose of demonstration studies is to reveal any operational issues associated with full-scale injection and extraction rates prior to implementing permanent design changes to these facilities.

4.7.4 Water Transfers / In-Lieu Groundwater Recharge

As described in the GSP, a water transfer pilot test has been underway the past few years. The water transfer involves SCWD delivering treated drinking water to SqCWD to serve a portion of SqCWD's service area. A 5-year extension of the pilot project agreement was executed on March 3, 2021, which allows for transfers starting November 1, 2021, and runs through May 1, 2026.

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.

4.7.5 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 are not currently instrumented. Total estimated average recharge is 20 acre-feet per year though was likely less in WY 2022 given the below average precipitation.

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

4.8 Update on Monitoring Network

4.8.1 Improvement of Monitoring Network

Table 12 summarizes progress on addressing the monitoring feature data gaps identified in the GSP (MGA, 2019). All but 1 of the monitoring features was successfully constructed by the end of October 2022.

Table 12. 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
7 shallow streamflow interaction monitoring wells	6 of 7 wells installed in 2022 (see Table 13)
6 stream gages	6 gages installed (see Table 13); ratings curves will be completed in WY 2023

Table 13 summarizes monitoring features installed during WY 2022 and the beginning of WY 2023. During this period 6 shallow groundwater elevation monitoring wells, 1 deep coastal groundwater elevation monitoring well, and 6 stream gauges were installed. Figure 22 shows the location of these features.

Table 13. Wells and Stream Gauges Installed in Water Year 2022

Monitoring Feature Type	Monitoring Feature Name	Installation Date
Monitoring well	Lupin SW	10/4/2022
	SC-10 SW	10/6/2022
	Balogh SW2	10/12/2022
	Spreckels SW	10/21/2022
	Aptos Village County Park SW	10/24/2022
	Mountain Elementary SW	10/26/2022
	SC-3AA	6/16/2022
Stream gage	East Branch Soquel Creek near the Quarry	8/24/2022
	East Branch Soquel Creek above West Branch Confluence	8/24/2022
	Soquel Creek at Mountain Elementary	7/27/2022
	Soquel Creek at Cherryvale	7/27/2022
	Aptos Creek at Aptos Village County Park	5/3/2022
	Lower Aptos Creek below HWY 1	5/3/2022

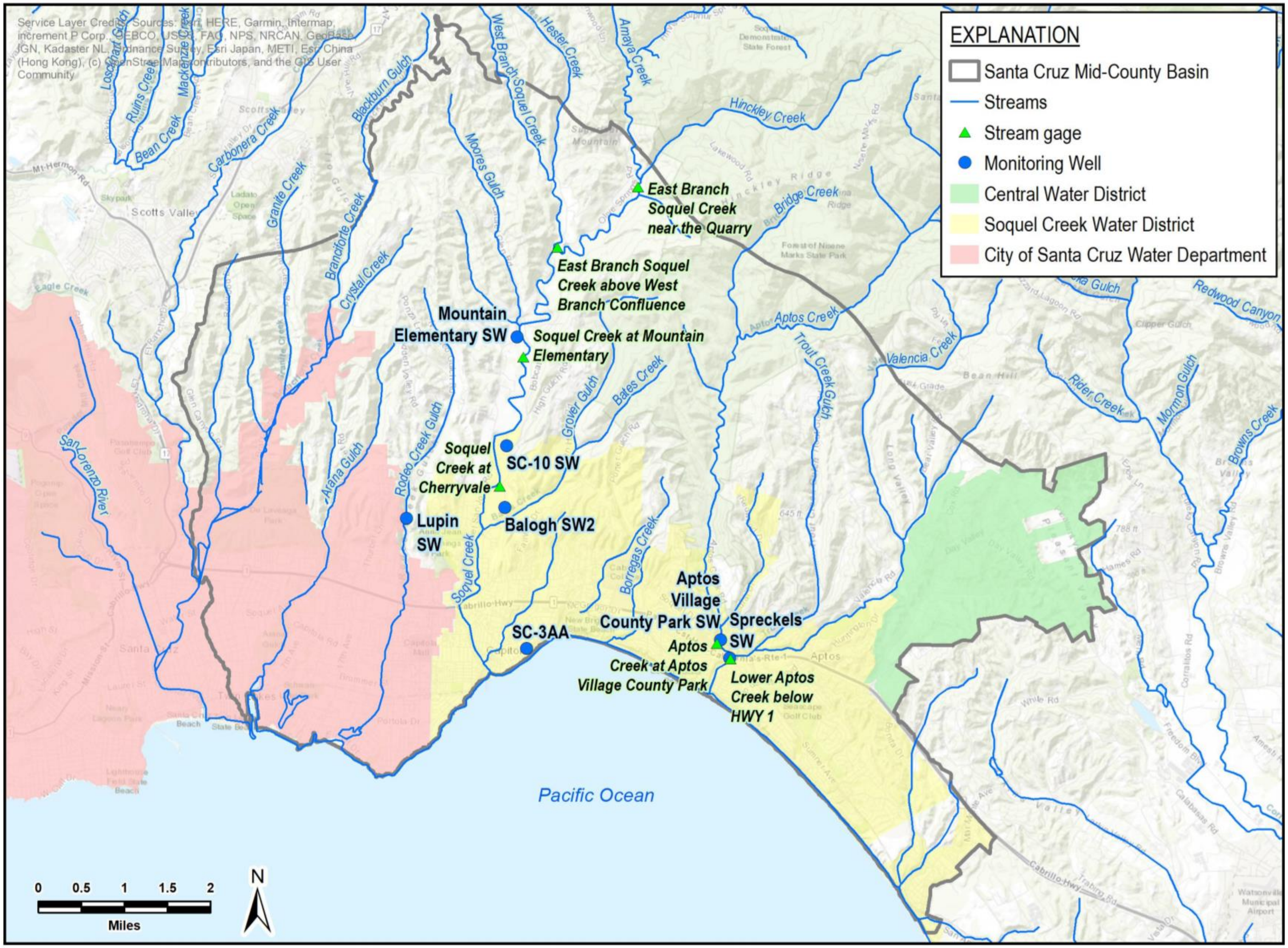


Figure 22. Monitoring Wells and Stream Gages Installed in Water Year 2022

4.8.2 Other Monitoring Network Changes

The SC-A7A monitoring well screened in the Purisima F unit has been removed from the monitoring network and SGMA Portal because it appears there are issues with annular seal leakage. It initially had groundwater levels 50 feet higher than other nearby Purisima F unit wells, but since 2009 its levels exponentially declined and are now approaching levels in SC-A7B which is also screened in the Purisima F unit.

4.9 Data Management System

In WY 2022, MGA member agencies worked with DMS consultant Kisters to develop the WISKI platform for a regional data management system (DMS) with a public portal. The DMS–anticipated to be completed in early 2023– 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.

REFERENCES

[DWR] California Department of Water Resources, 2020. DWR Bulletin 118 Update 2020. Accessed on March 3, 2022 at https://data.cnra.ca.gov/dataset/calgw_update2020

[DWR] California Department of Water Resources, 2021. Santa Cruz Mid-County Groundwater Agency Groundwater Sustainability Plan Determination. Accessed on March 3, 2022 at https://sgma.water.ca.gov/portal/service/gspdocument/download/4472

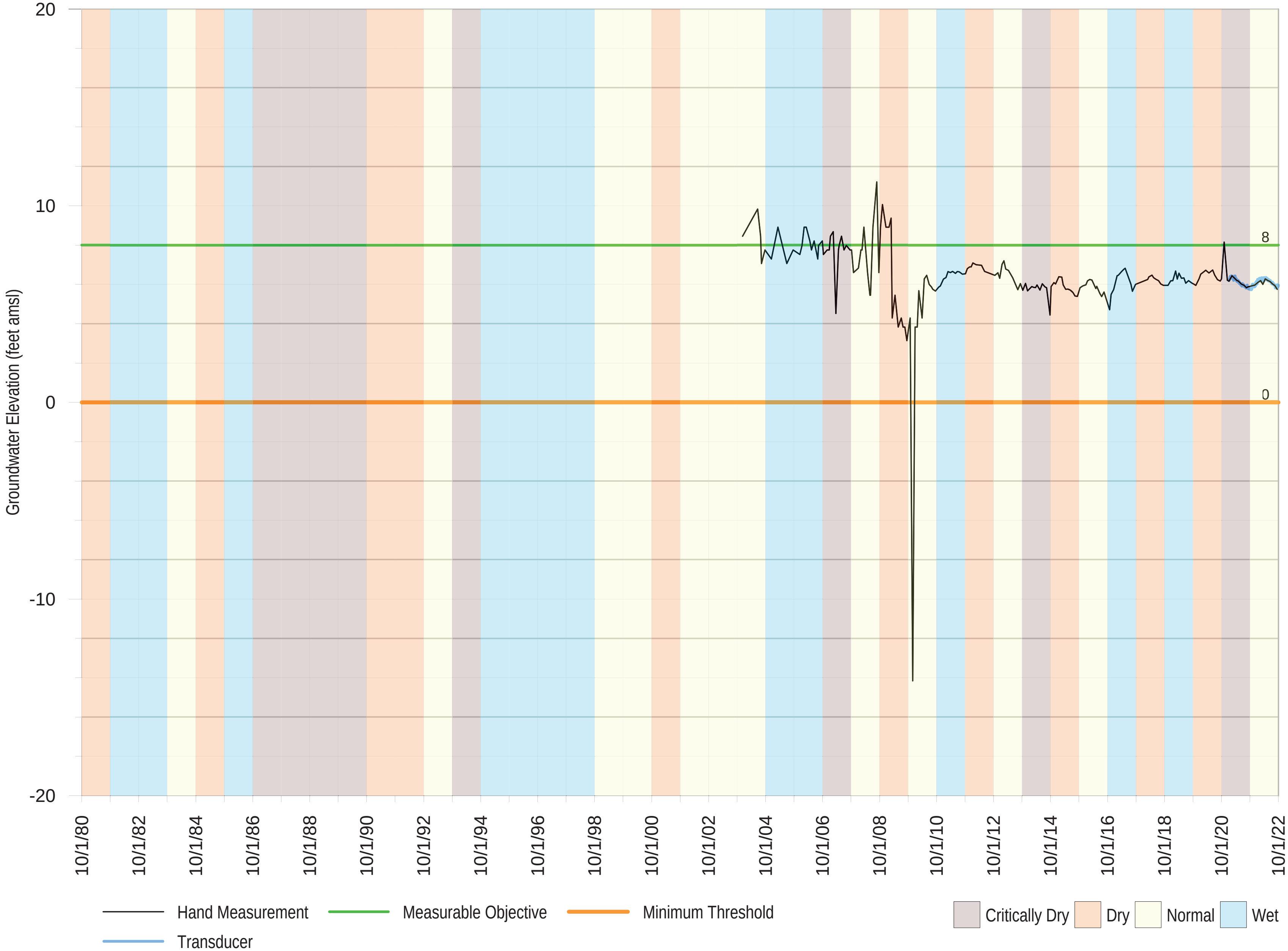
[MGA] Santa Cruz Mid-County Groundwater Agency, 2019. Santa Cruz Mid-County Basin Groundwater Sustainability Plan. November.

Appendix A

Well Hydrographs

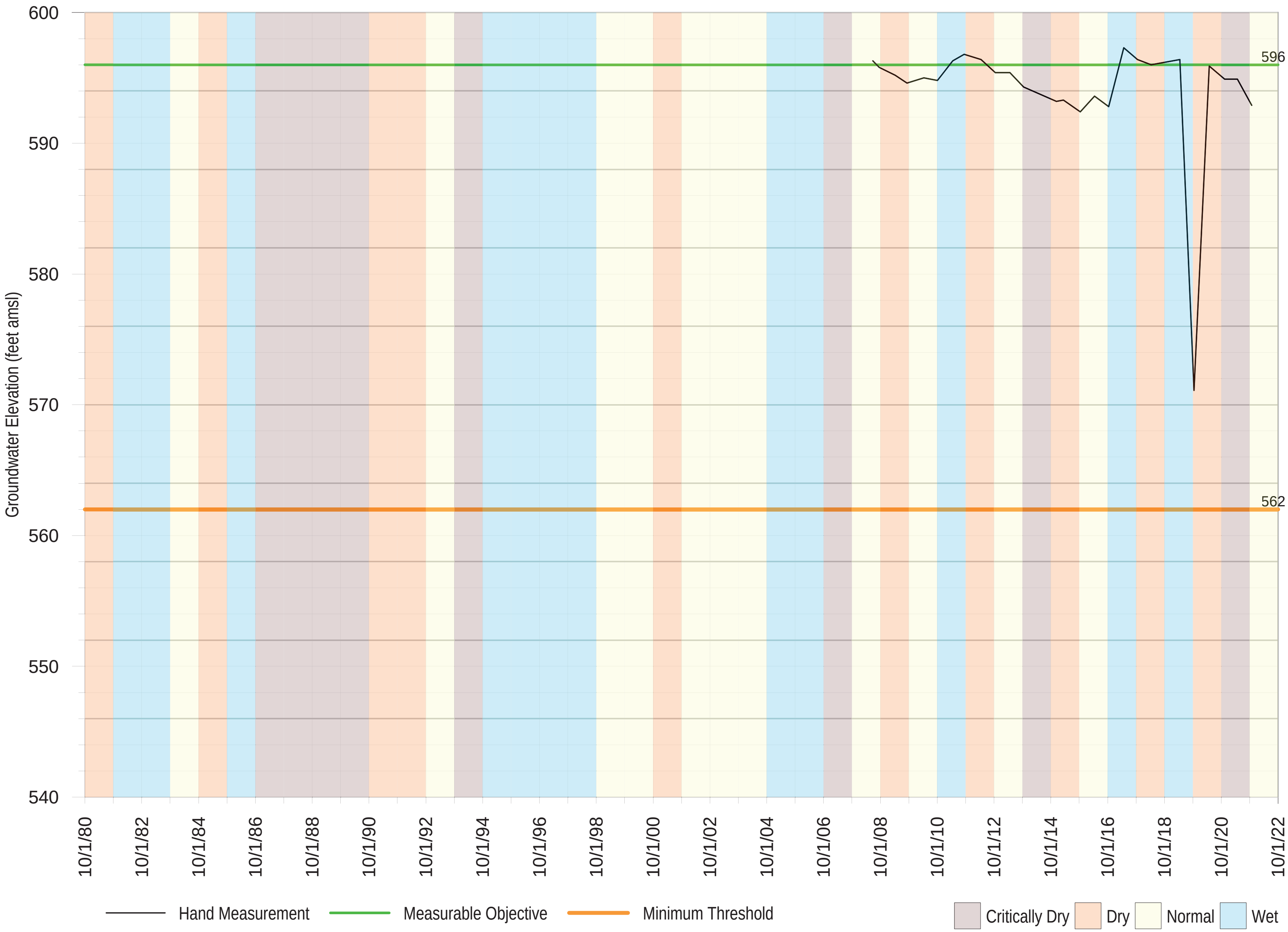
SC-A7C at Canon Del Sol
Aquifer Screened: Aromas

FIGURE A-1



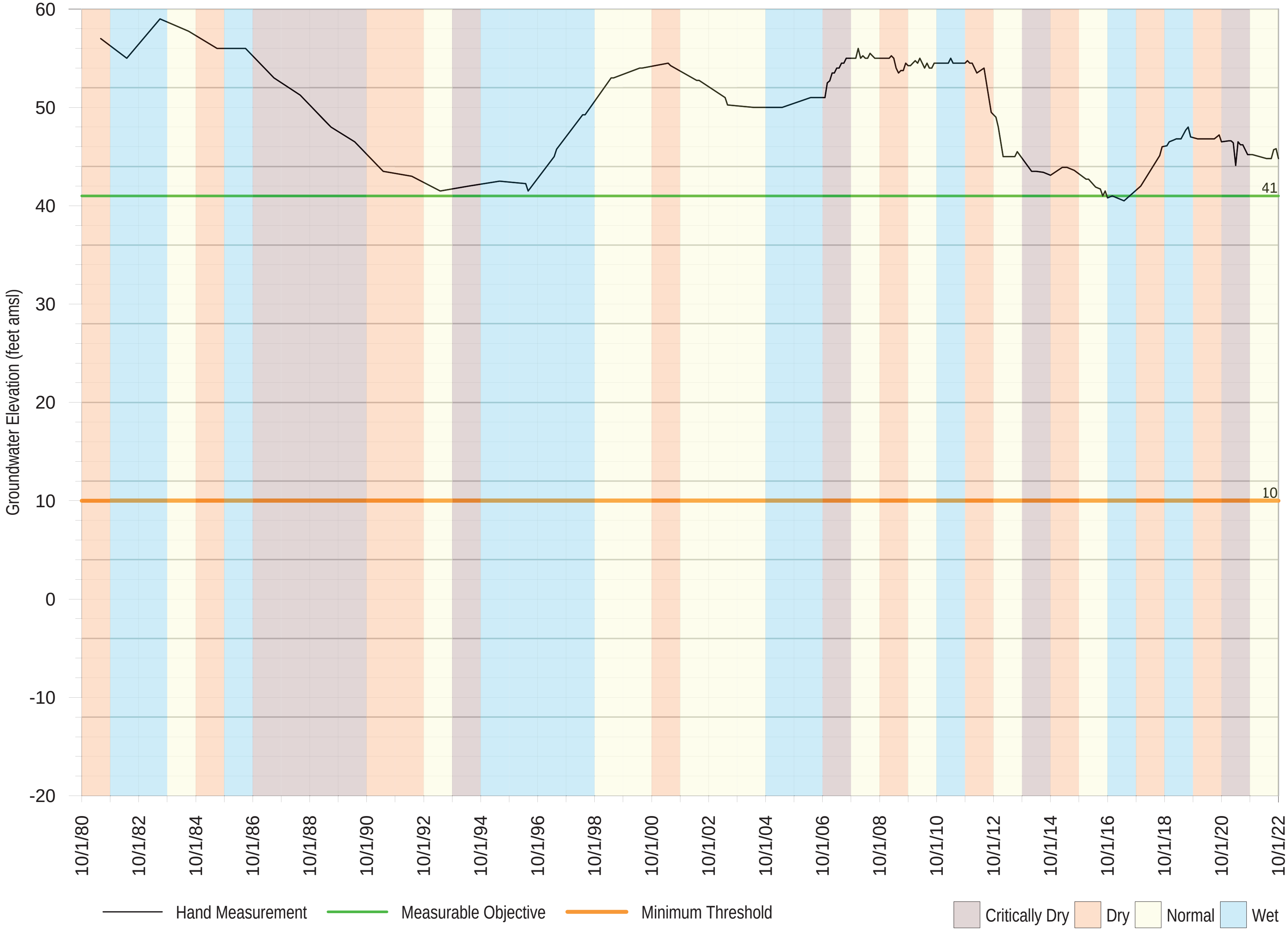
Private Well 2
Aquifer Screened:

FIGURE A-2



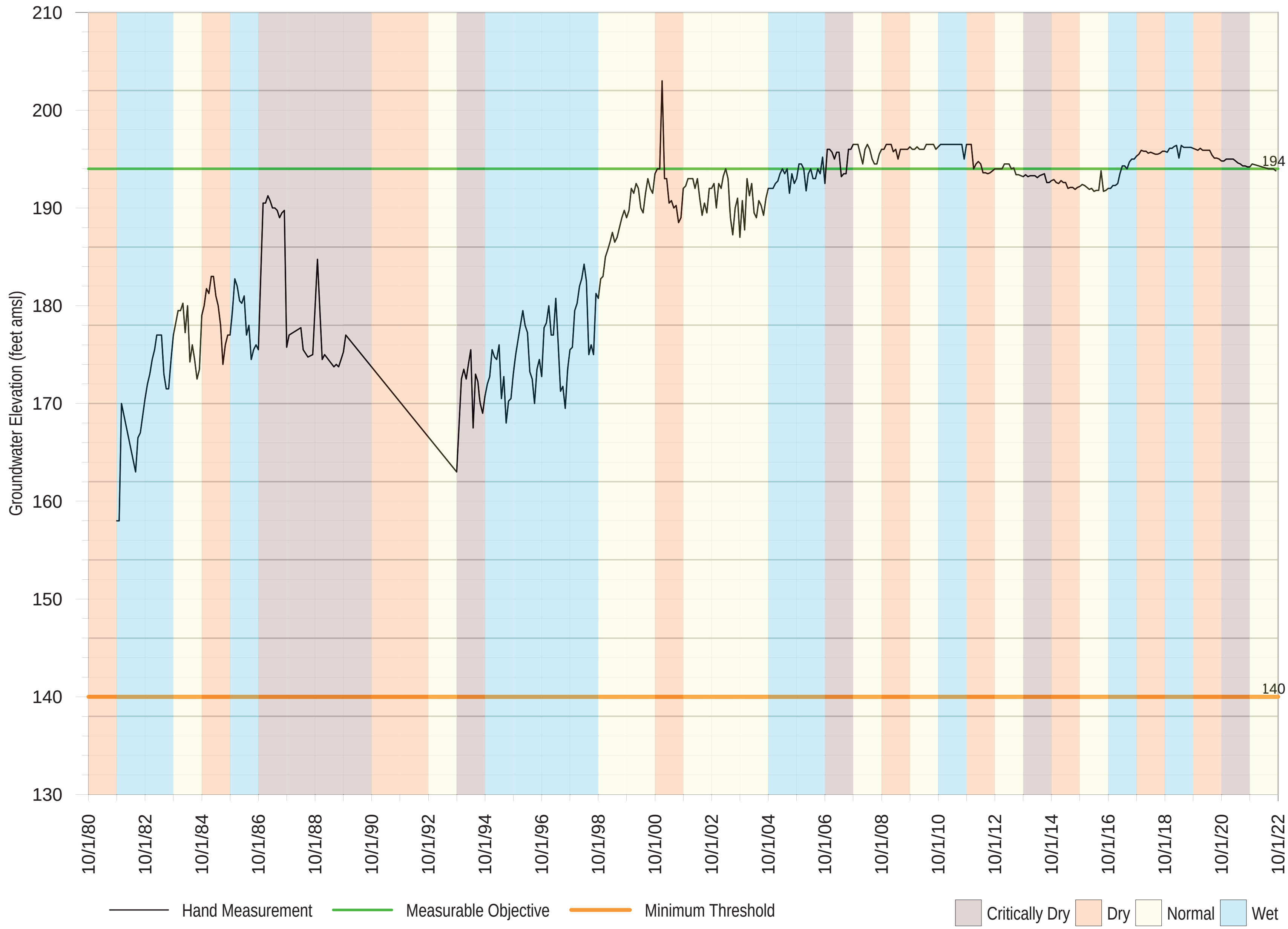
Black
Aquifer Screened: Purisima F

FIGURE A-3



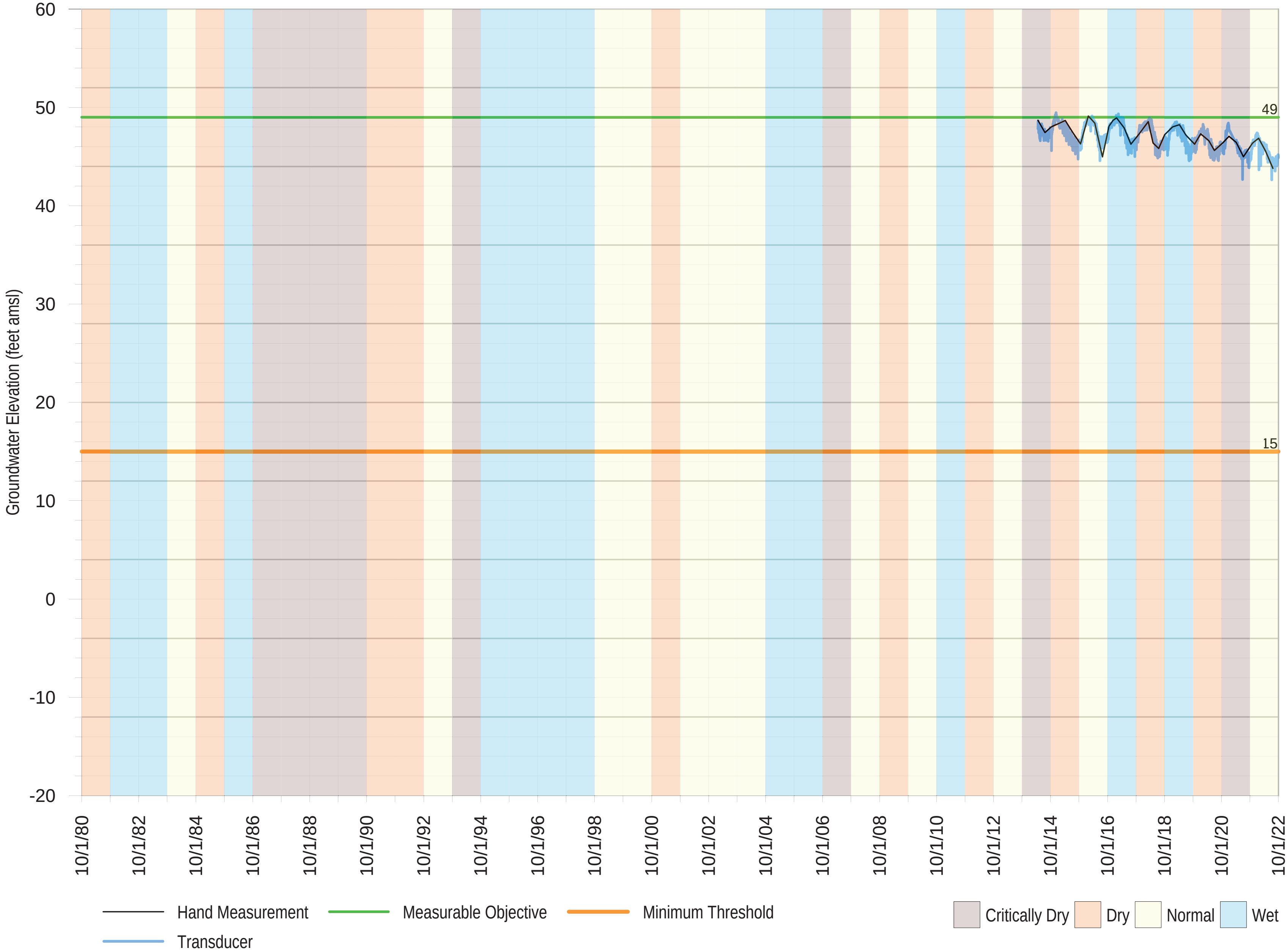
CWD-5
Aquifer Screened: Purisima F

FIGURE A-4



SC-23C at Quail Run
Aquifer Screened: Purisima F

FIGURE A-5



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

FIGURE A-6

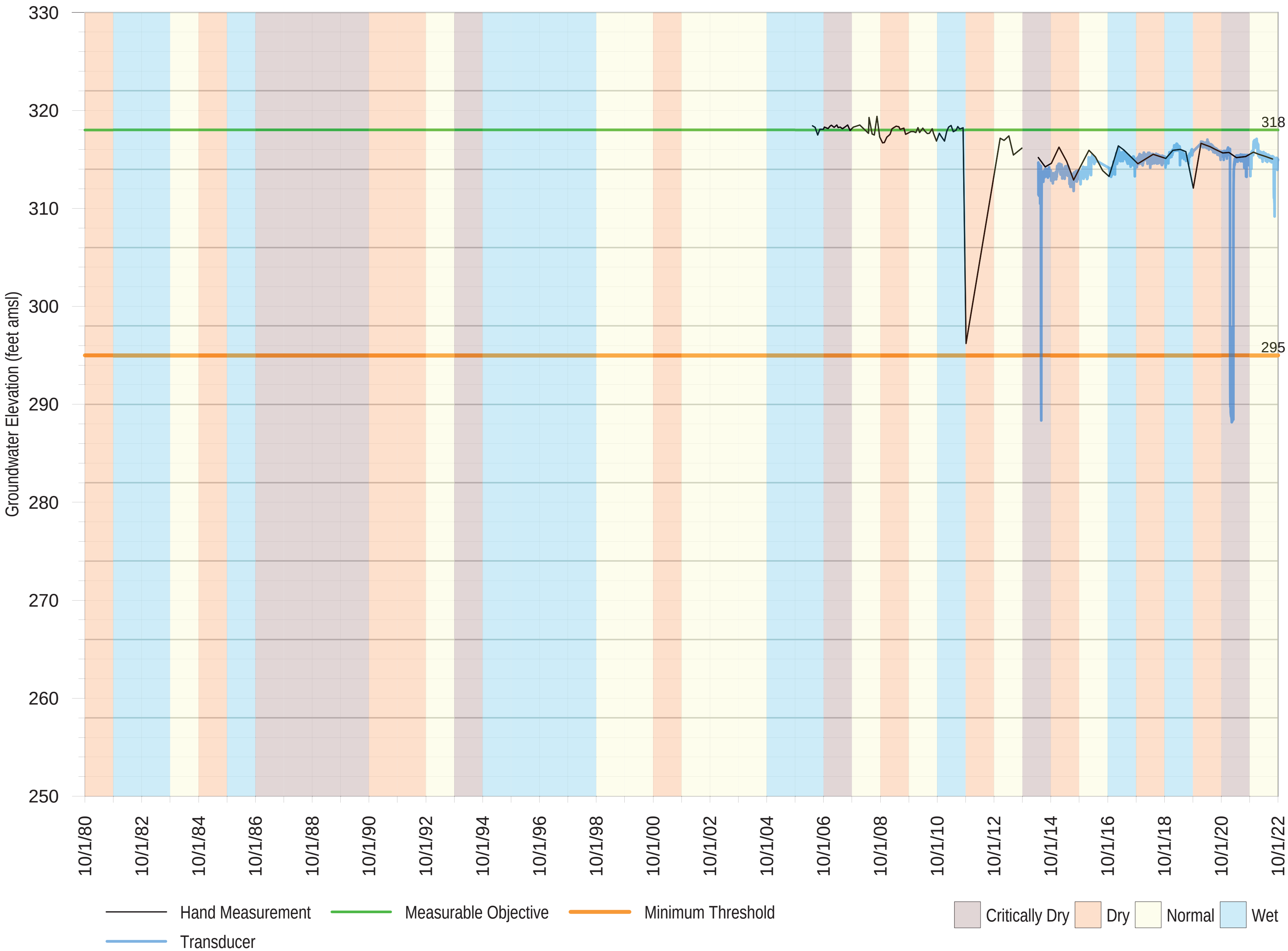
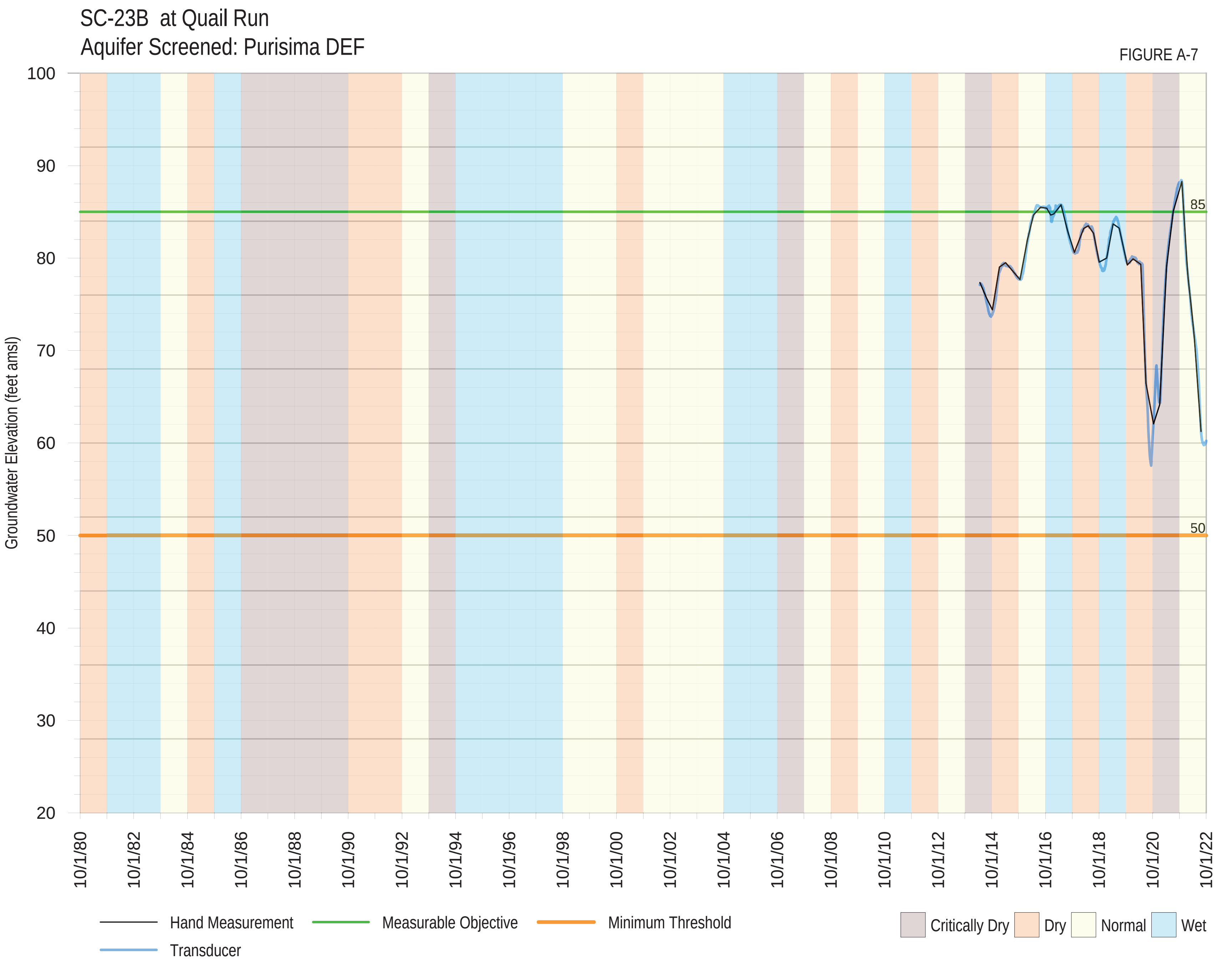
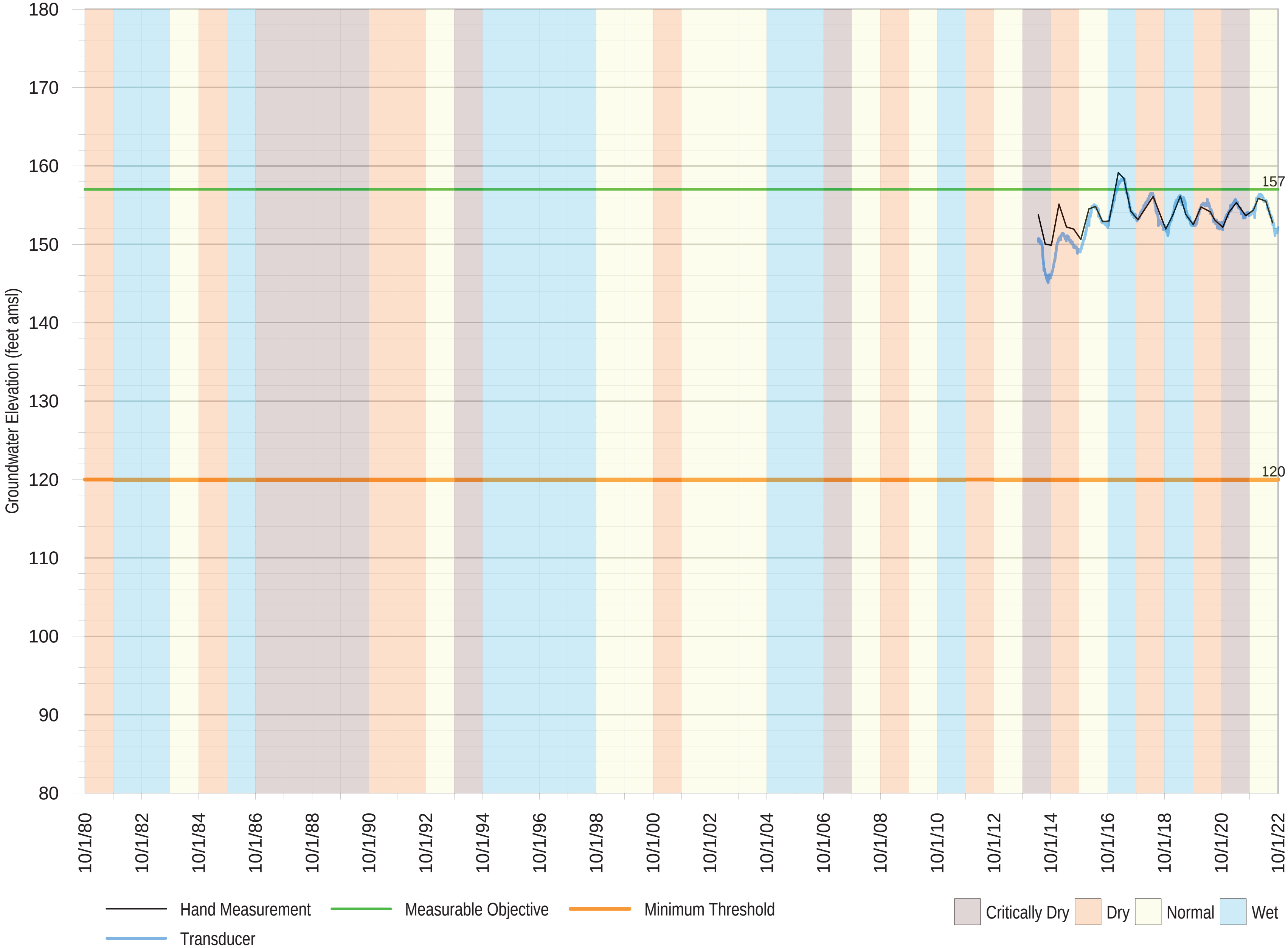


FIGURE A-7


SC-23B at Quail Run
Aquifer Screened: Purisima DEF
Groundwater Elevation (feet amsl)
100
90
80
70
60
50
40
30
20
85
50
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
Hand Measurement
Measurable Objective
Minimum Threshold
Transducer
Critically Dry
Dry
Normal
Wet

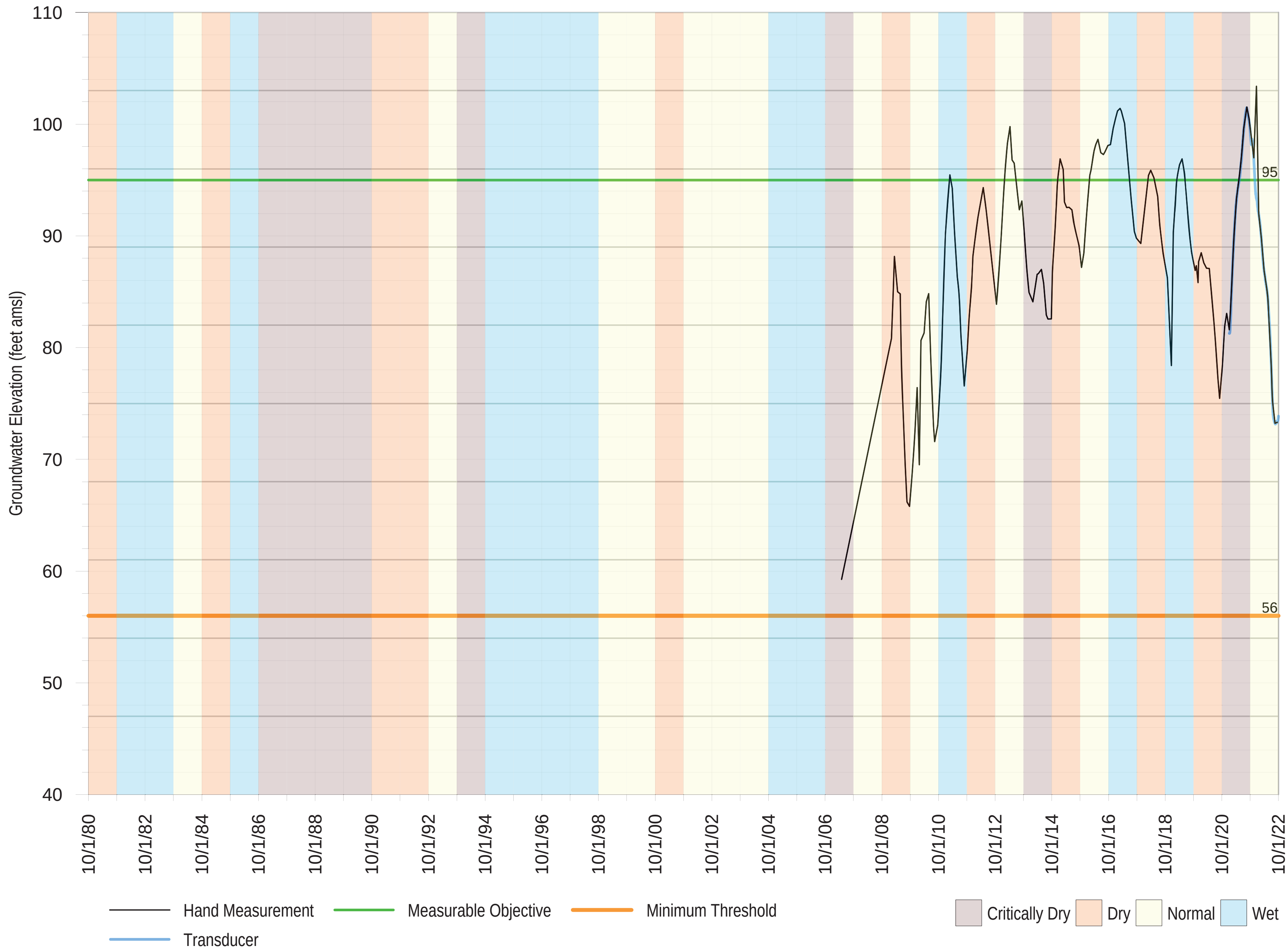
SC-11B at Porter Gulch
Aquifer Screened: Purisima BC

FIGURE A-8



SC-19 at Austrian
Aquifer Screened: Purisima BC

FIGURE A-9



SC-23A at Quail Run
Aquifer Screened: Purisima BC

FIGURE A-10

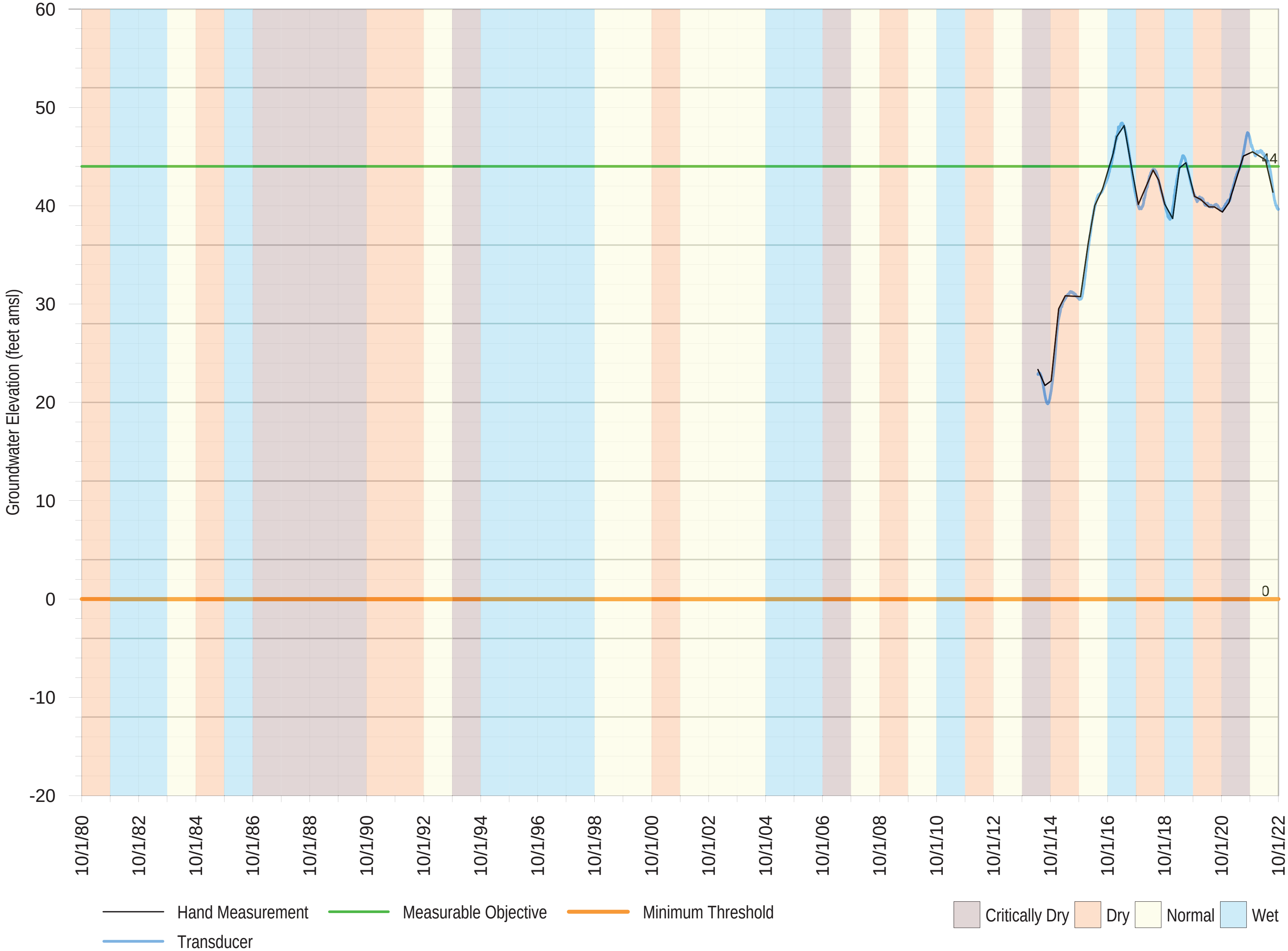
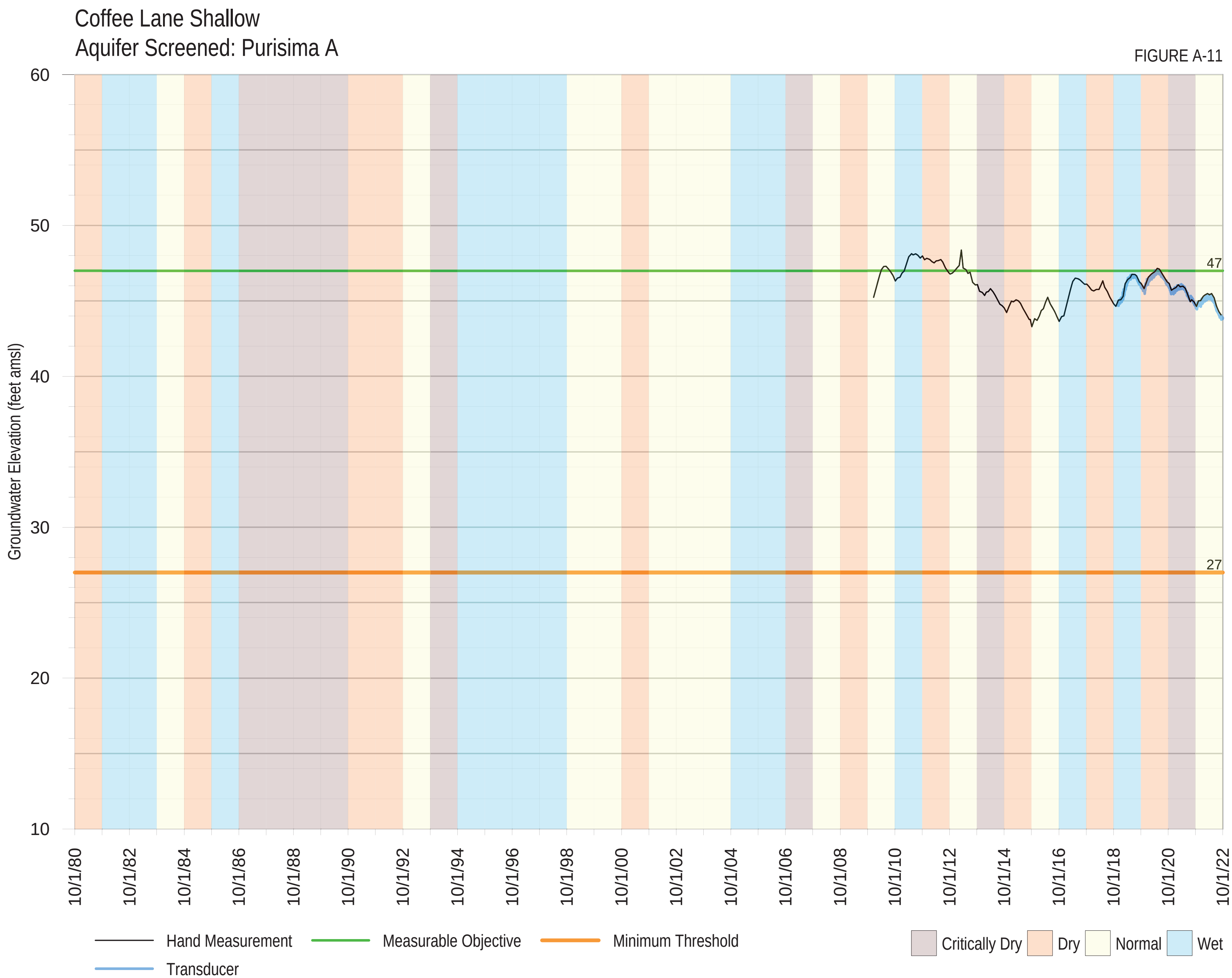
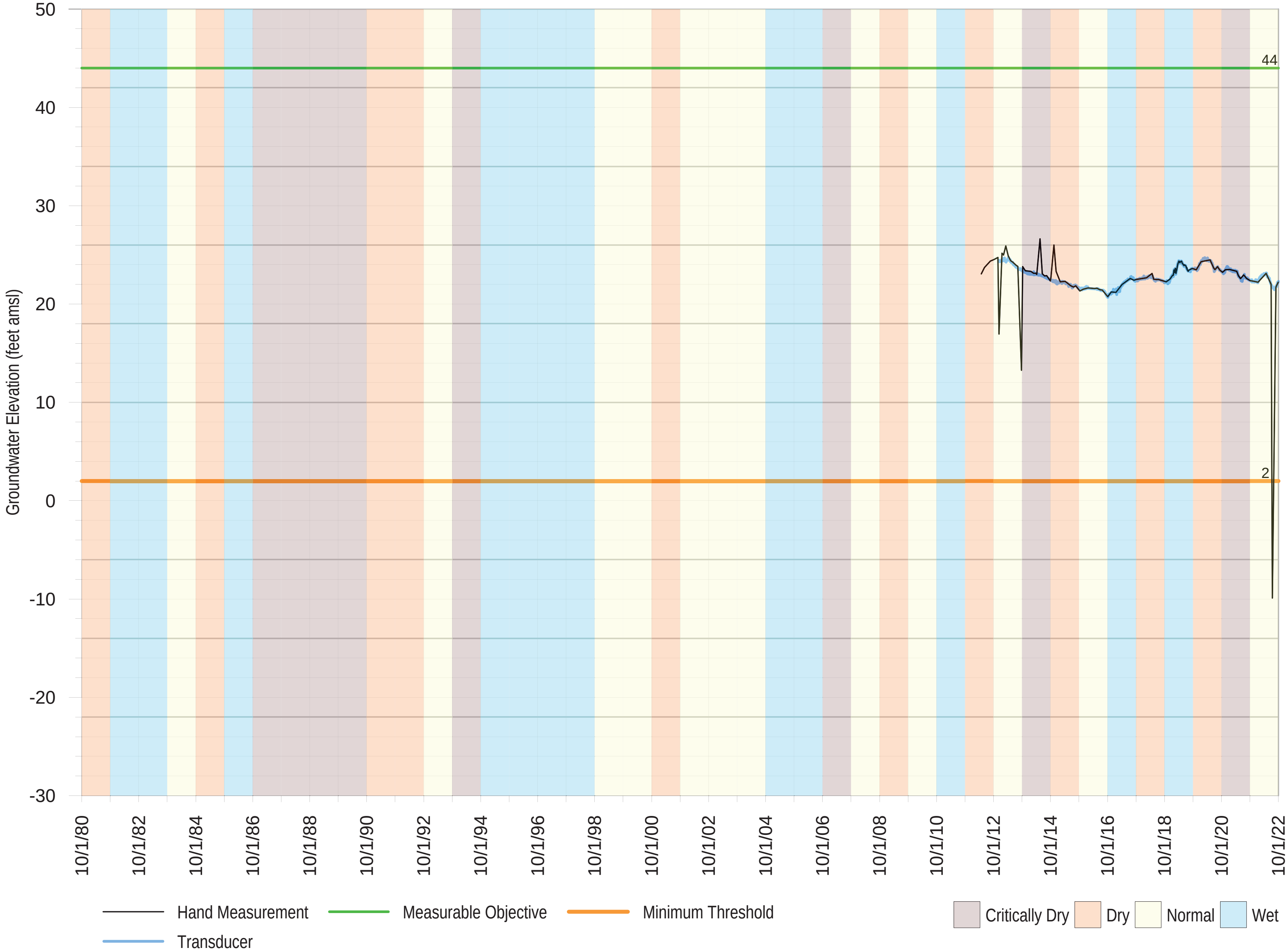


FIGURE A-11


Coffee Lane Shallow
Aquifer Screened: Purisima A
Groundwater Elevation (feet amsl)
60
50
40
30
20
10
47
27
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
Hand Measurement
Measurable Objective
Minimum Threshold
Transducer
Critically Dry
Dry
Normal
Wet

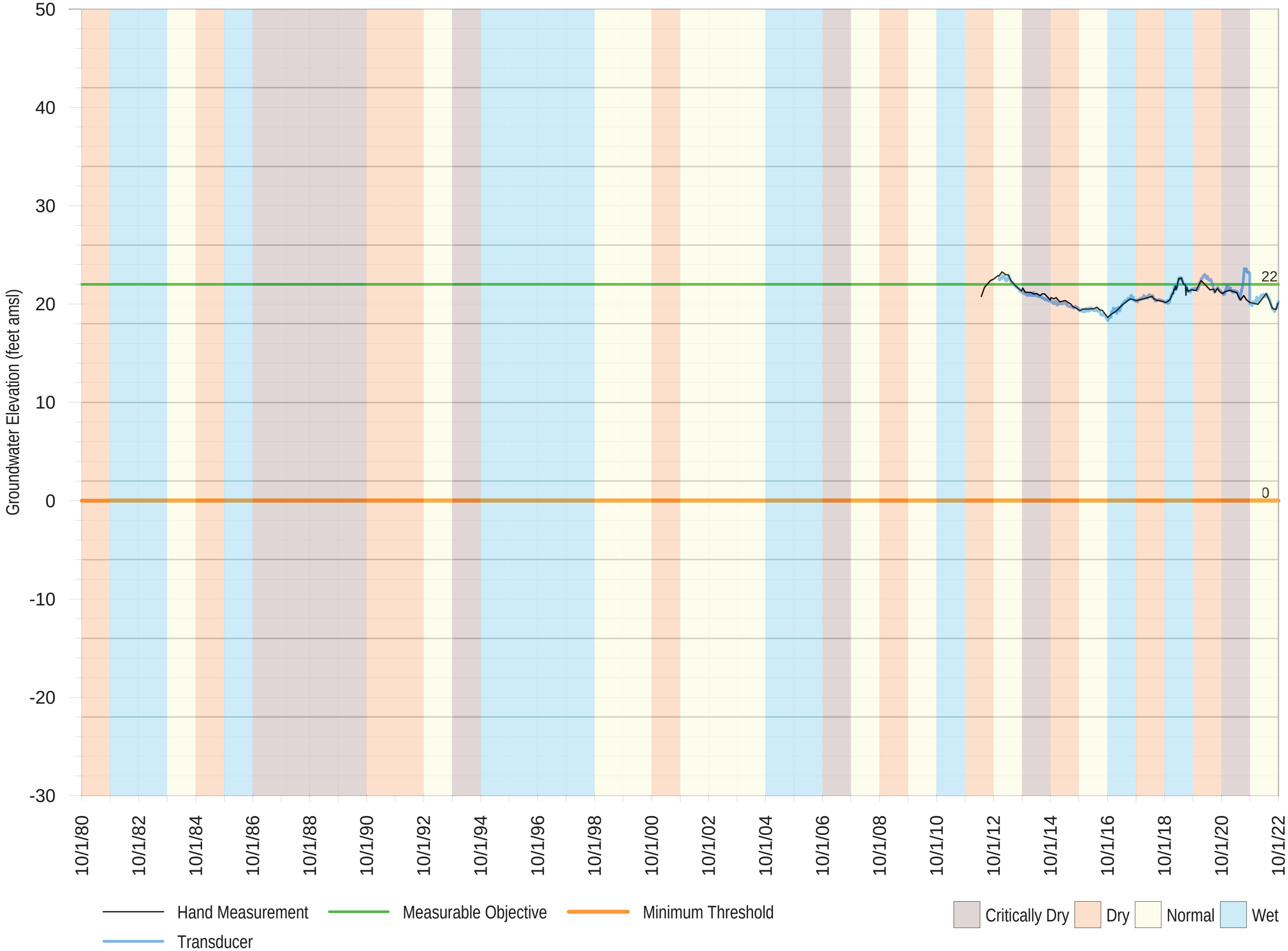
SC-22A at 41st Ave
Aquifer Screened: Purisima A

FIGURE A-12



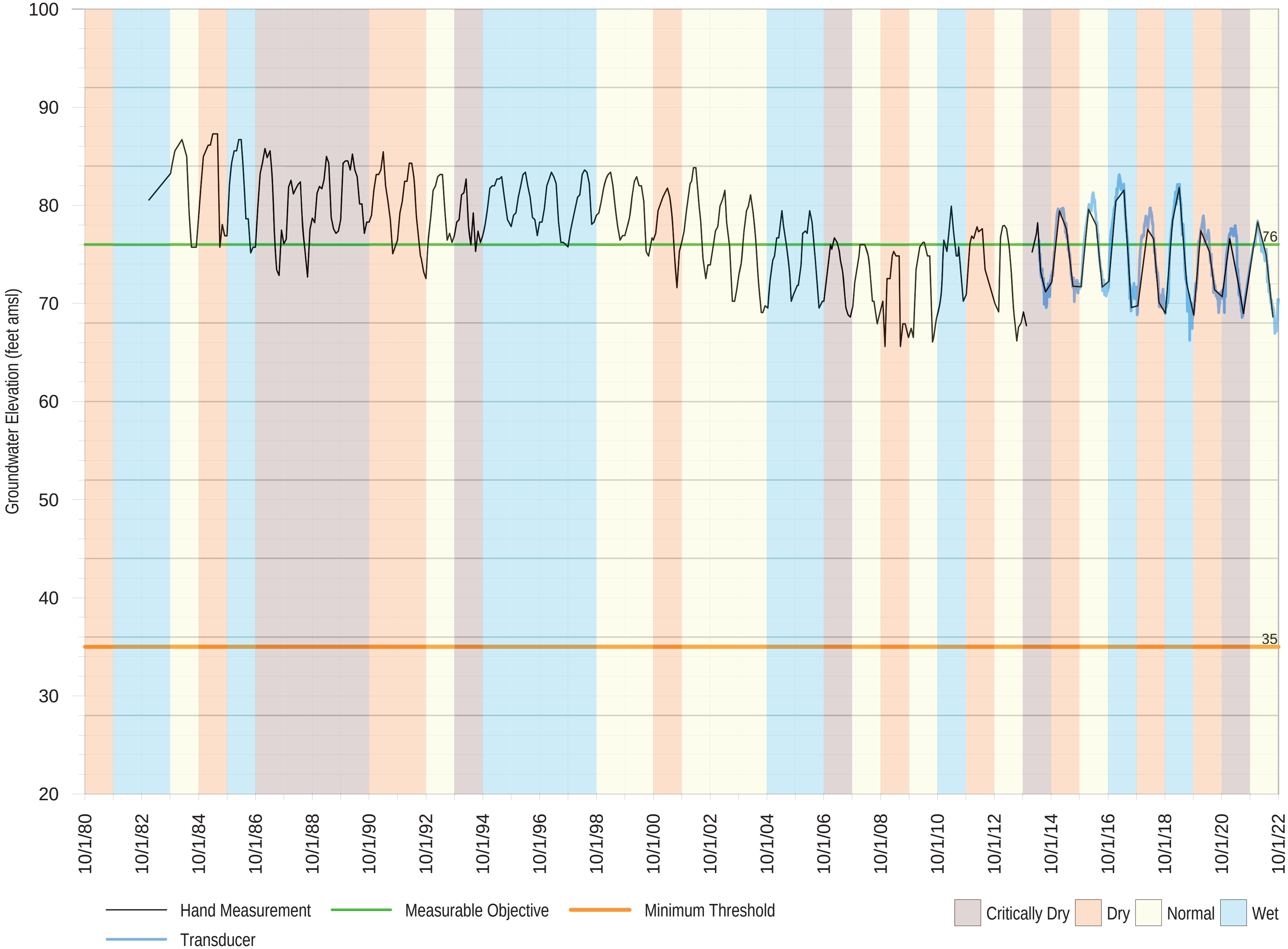
SC-22AA at 41st Ave
Aquifer Screened: Purisima AA

FIGURE A-13



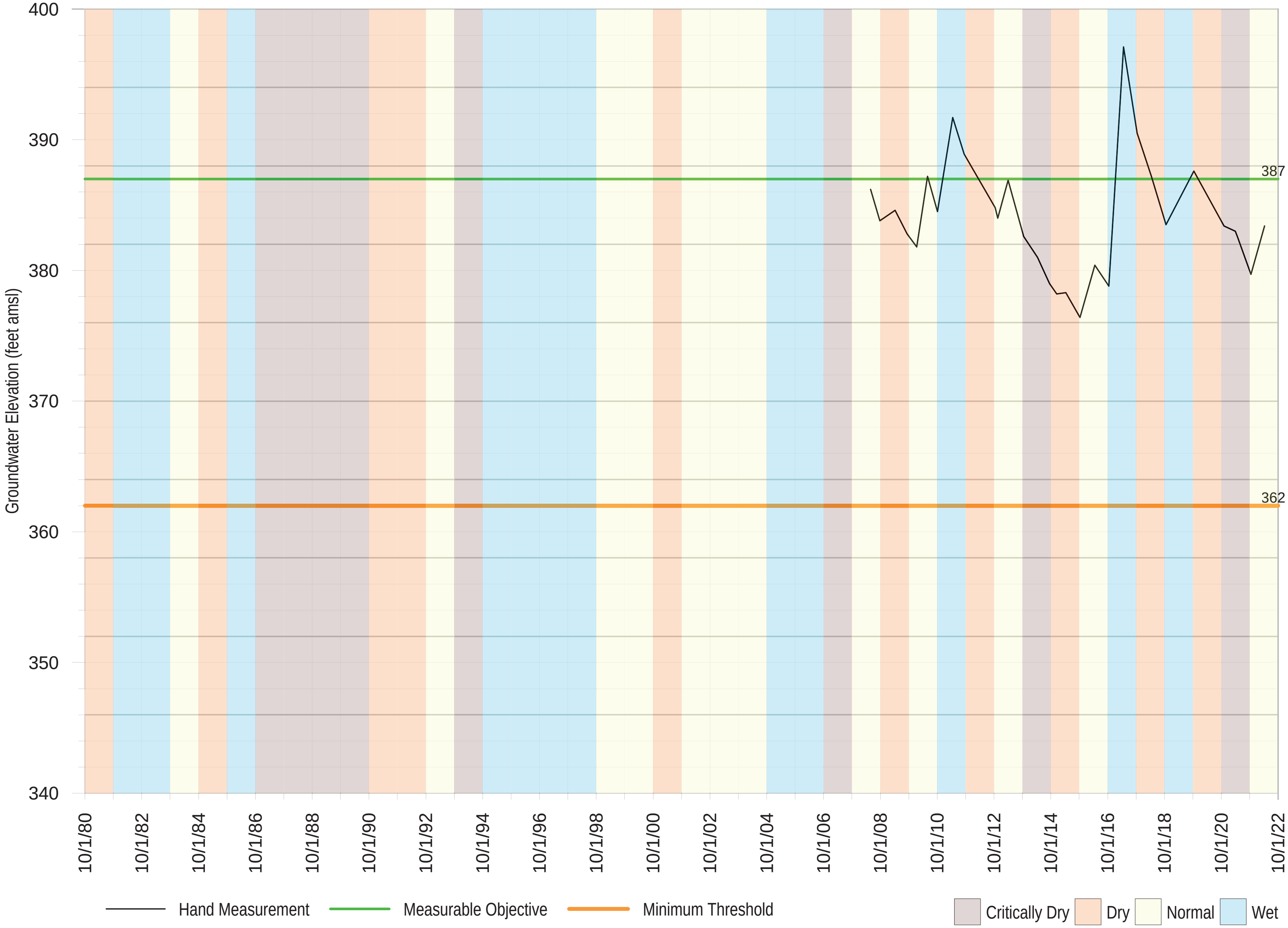
SC-10AA & SC-10RAA at Cherryvale
Aquifer Screened: Purisima AA

FIGURE A-14



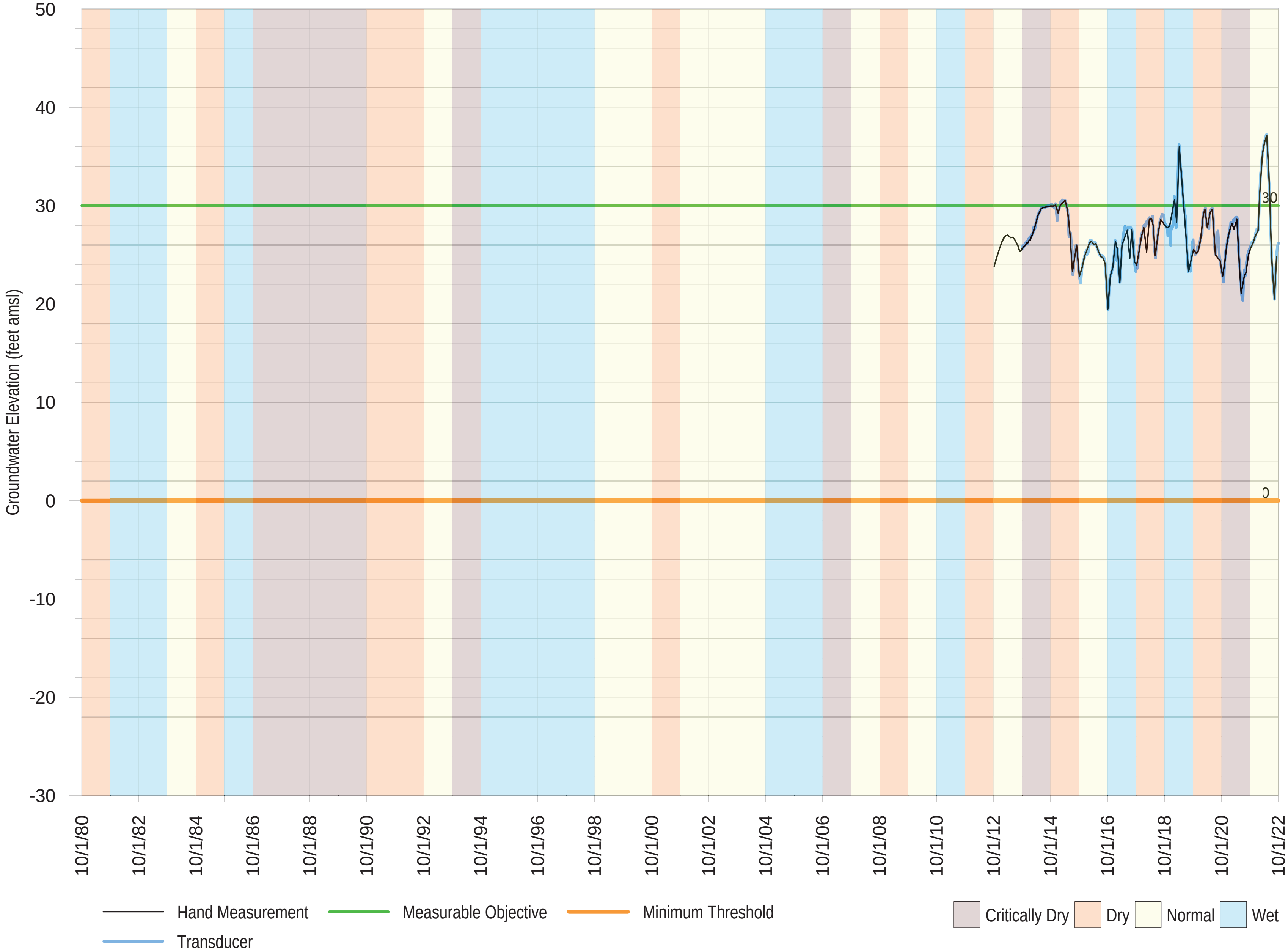
Private Well 1
Aquifer Screened:

FIGURE A-15



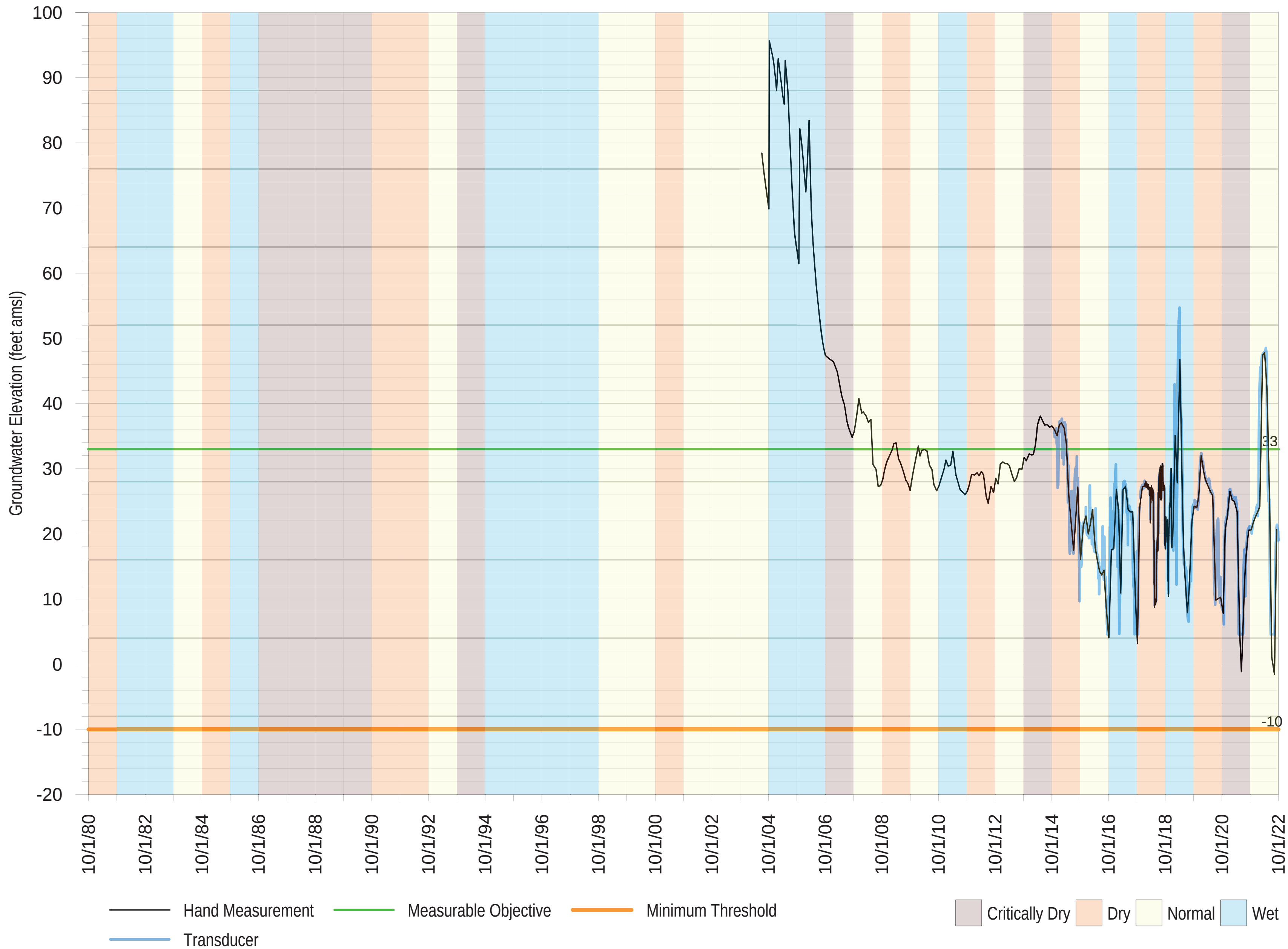
30th Ave Deep
Aquifer Screened: Tu

FIGURE A-16



Thurber Deep
Aquifer Screened: Tu

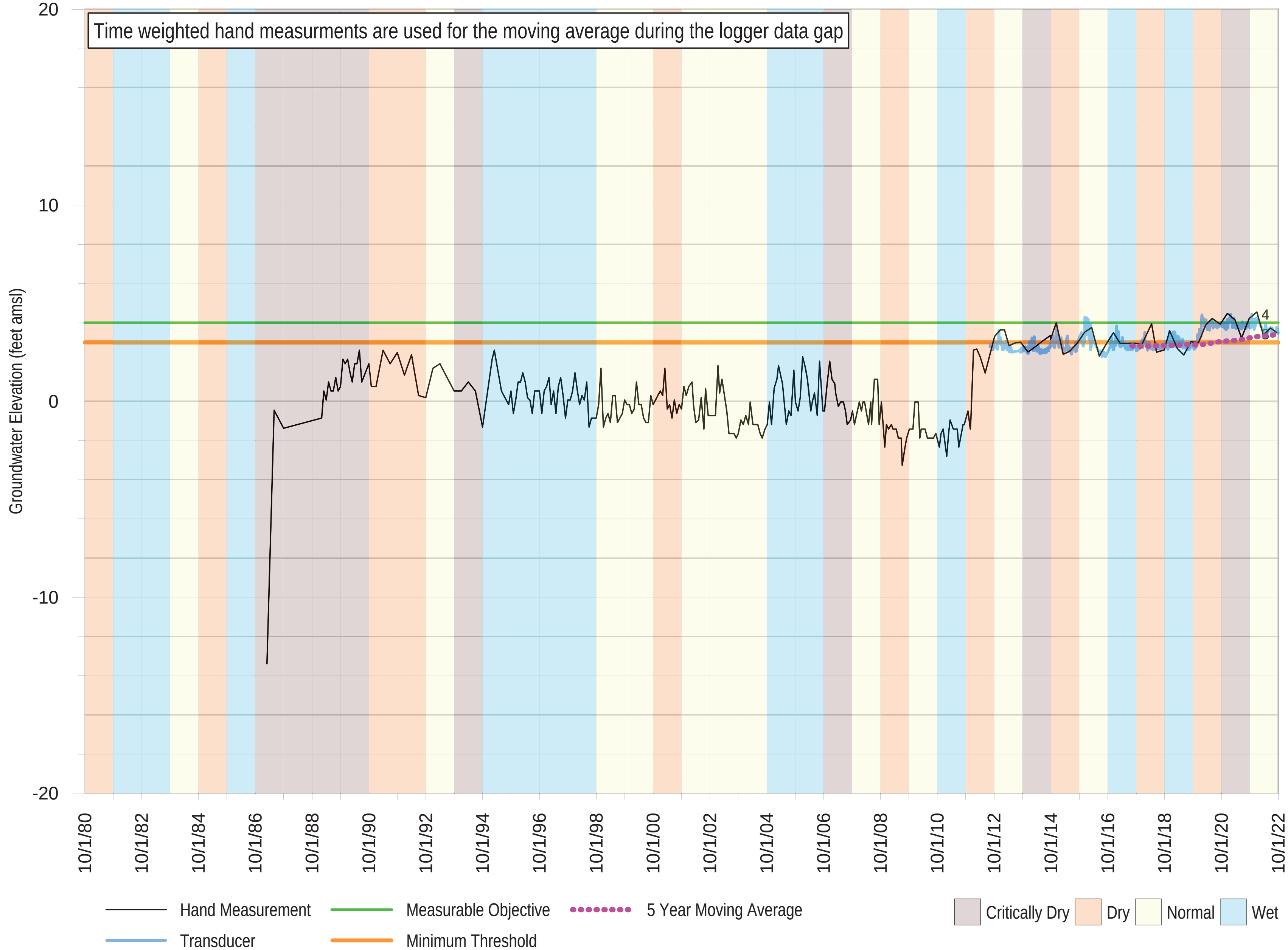
FIGURE A-17



Appendix A

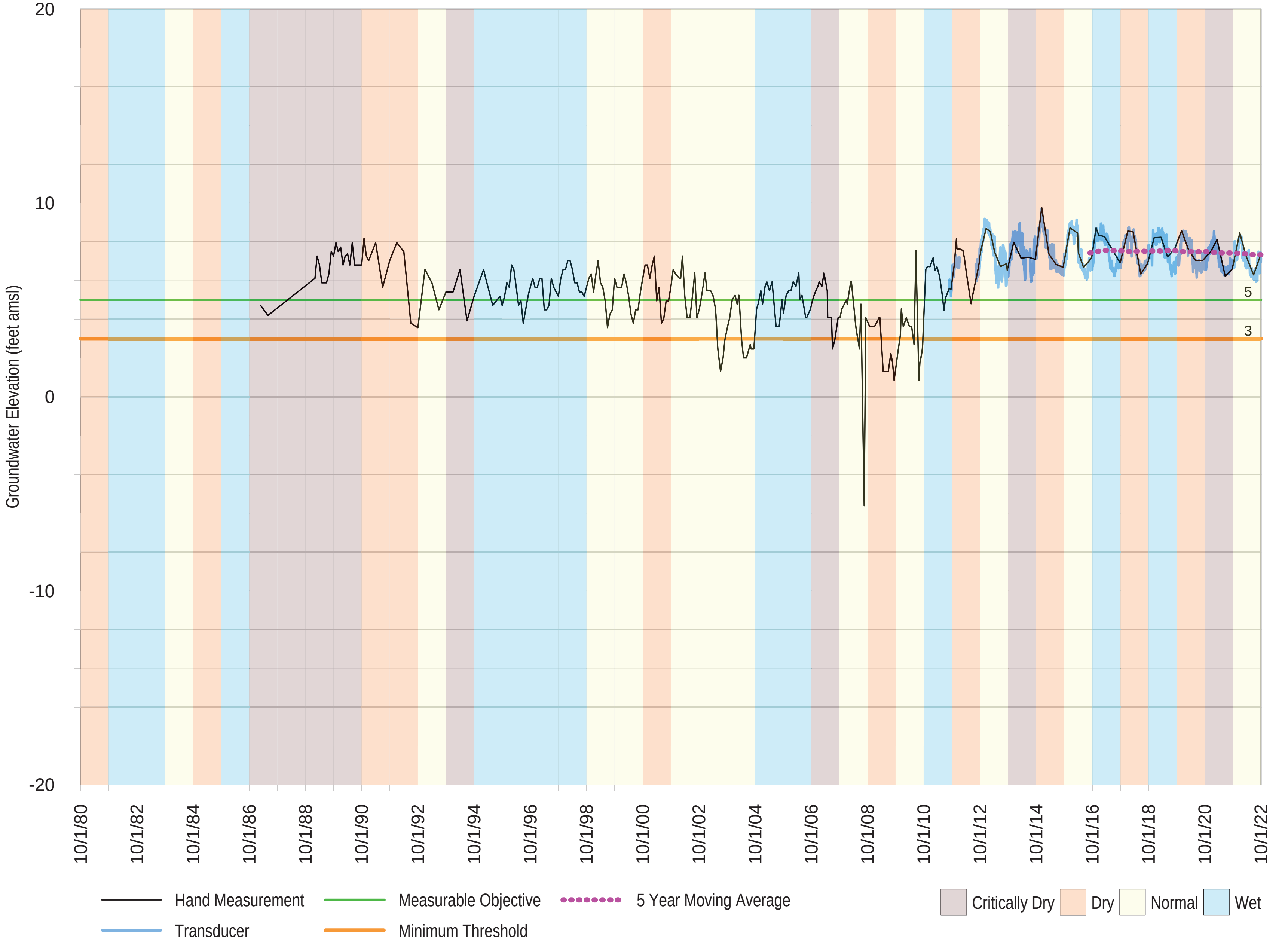
SC-A3A at Playa Visa
Aquifer Screened: Aromas

FIGURE A-18



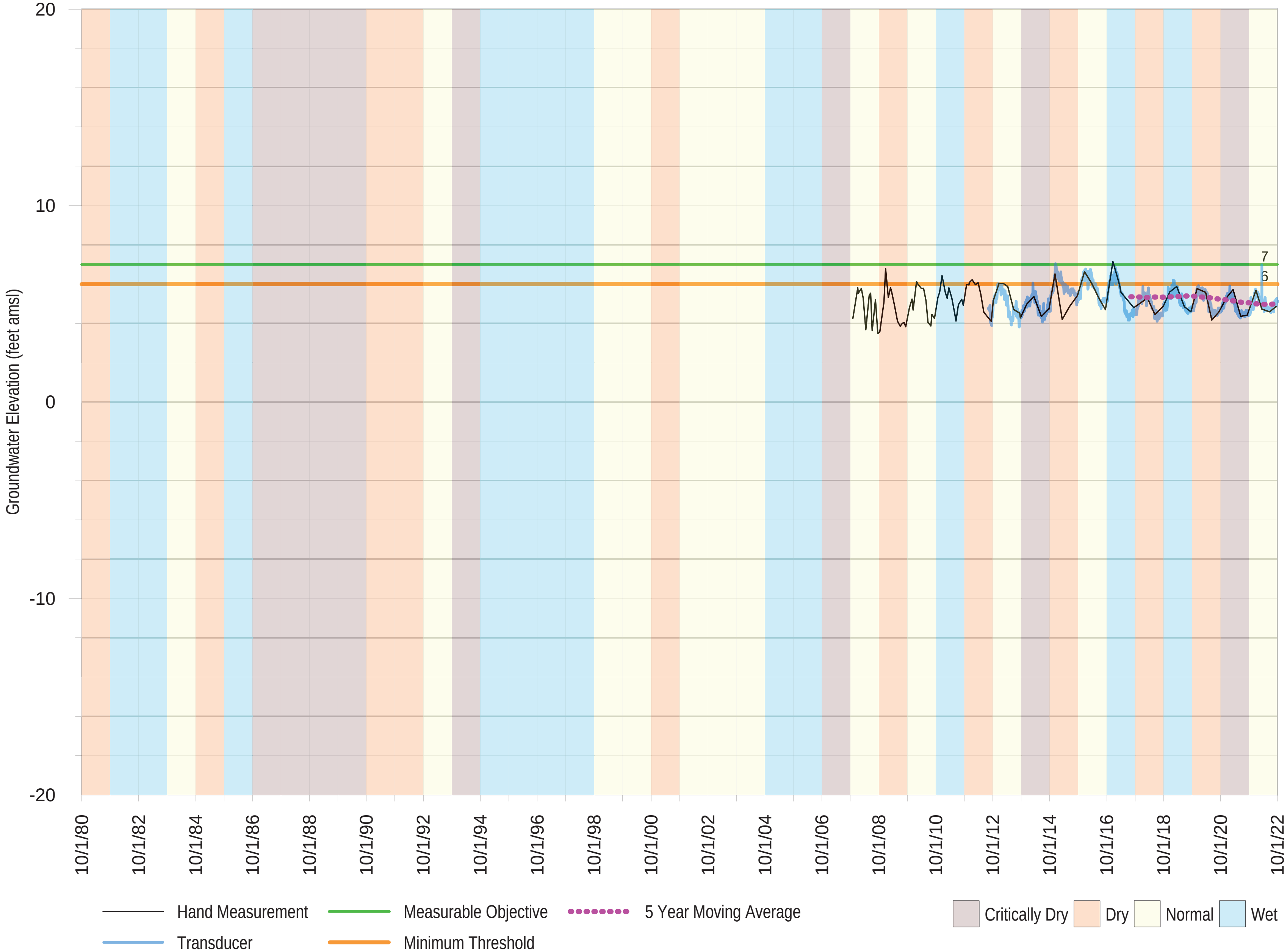
SC-A1B at Cliff Drive
Aquifer Screened: Purisima F

FIGURE A-19



SC-A8A at Dolphin
Aquifer Screened: Purisima F

FIGURE A-20



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

FIGURE A-21

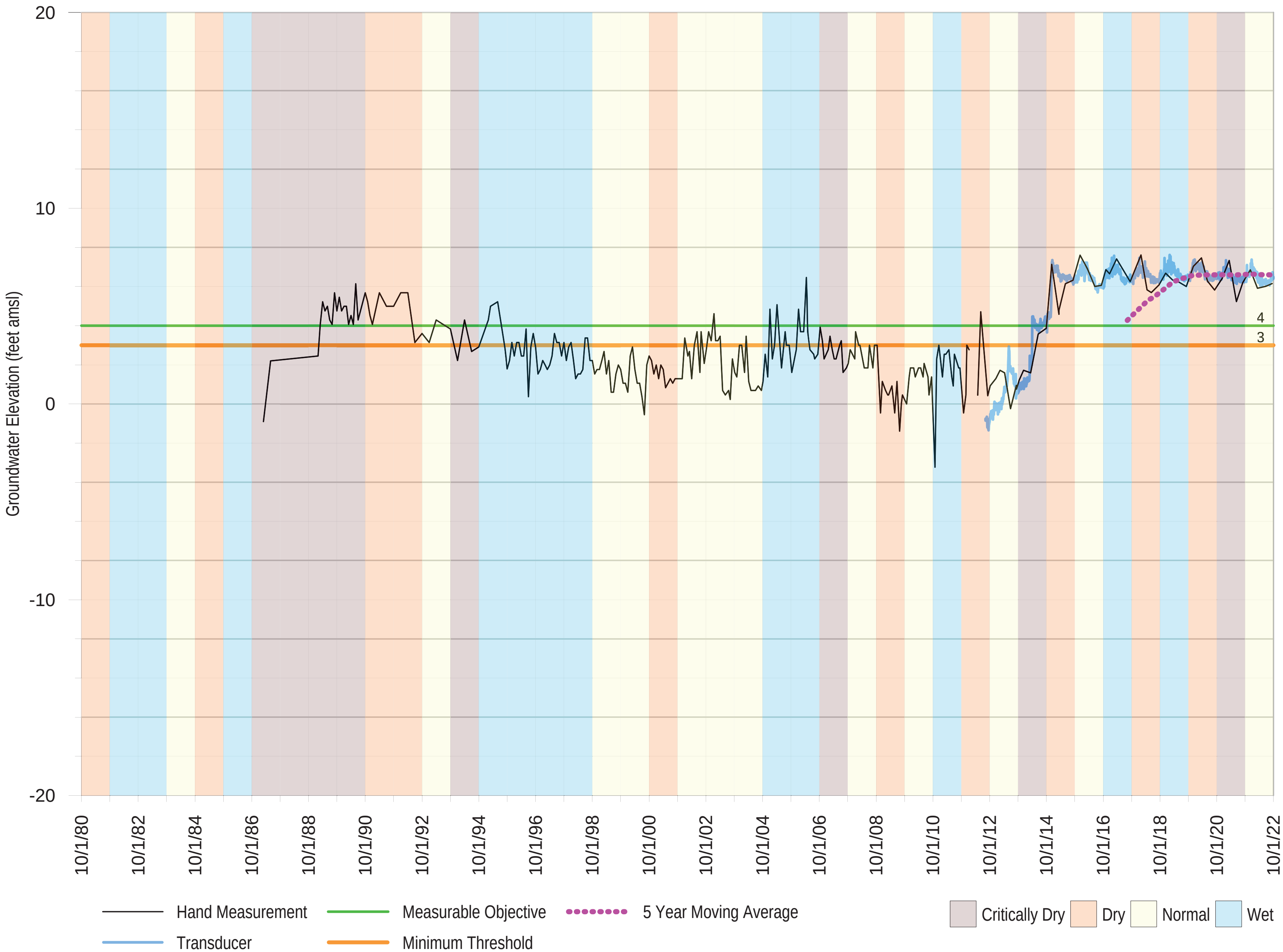
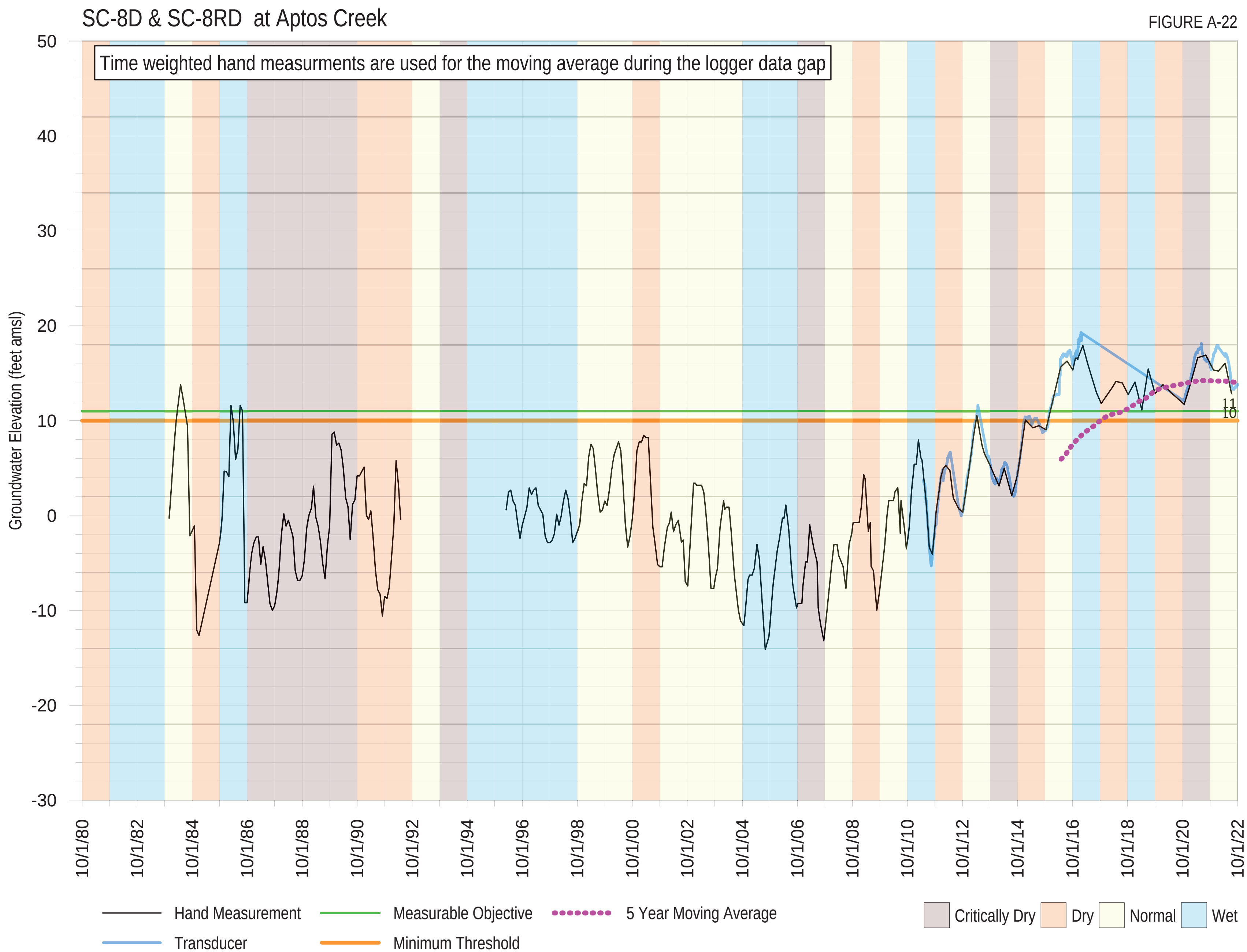


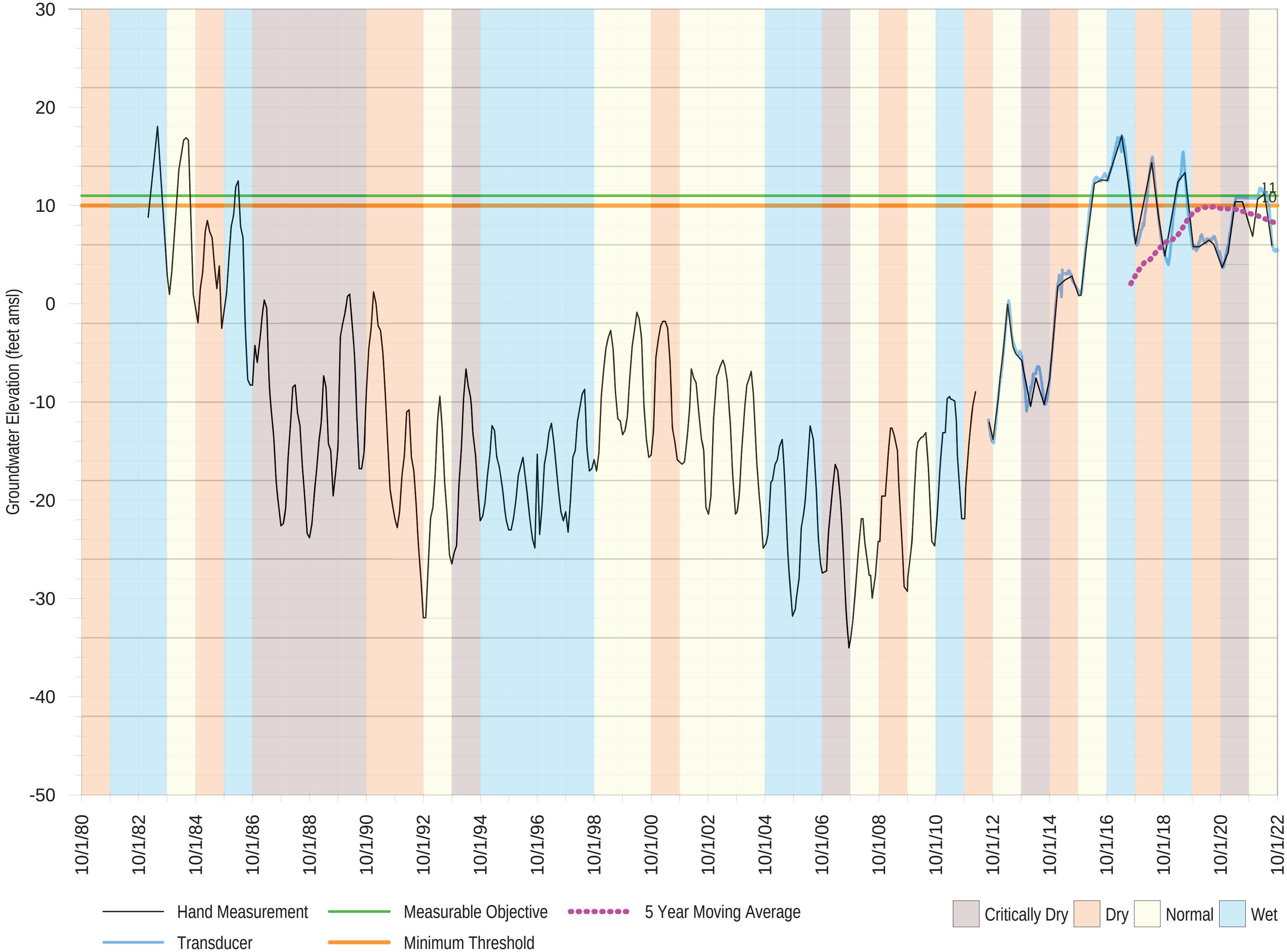
FIGURE A-22


SC-8D & SC-8RD at Aptos Creek
Time weighted hand measurments are used for the moving average during the logger data gap
Groundwater Elevation (feet amsl)
50
40
30
20
10
0
-10
-20
-30
11
10
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
Hand Measurement
Transducer
Measurable Objective
Minimum Threshold
5 Year Moving Average
Critically Dry
Dry
Normal
Wet

Appendix A

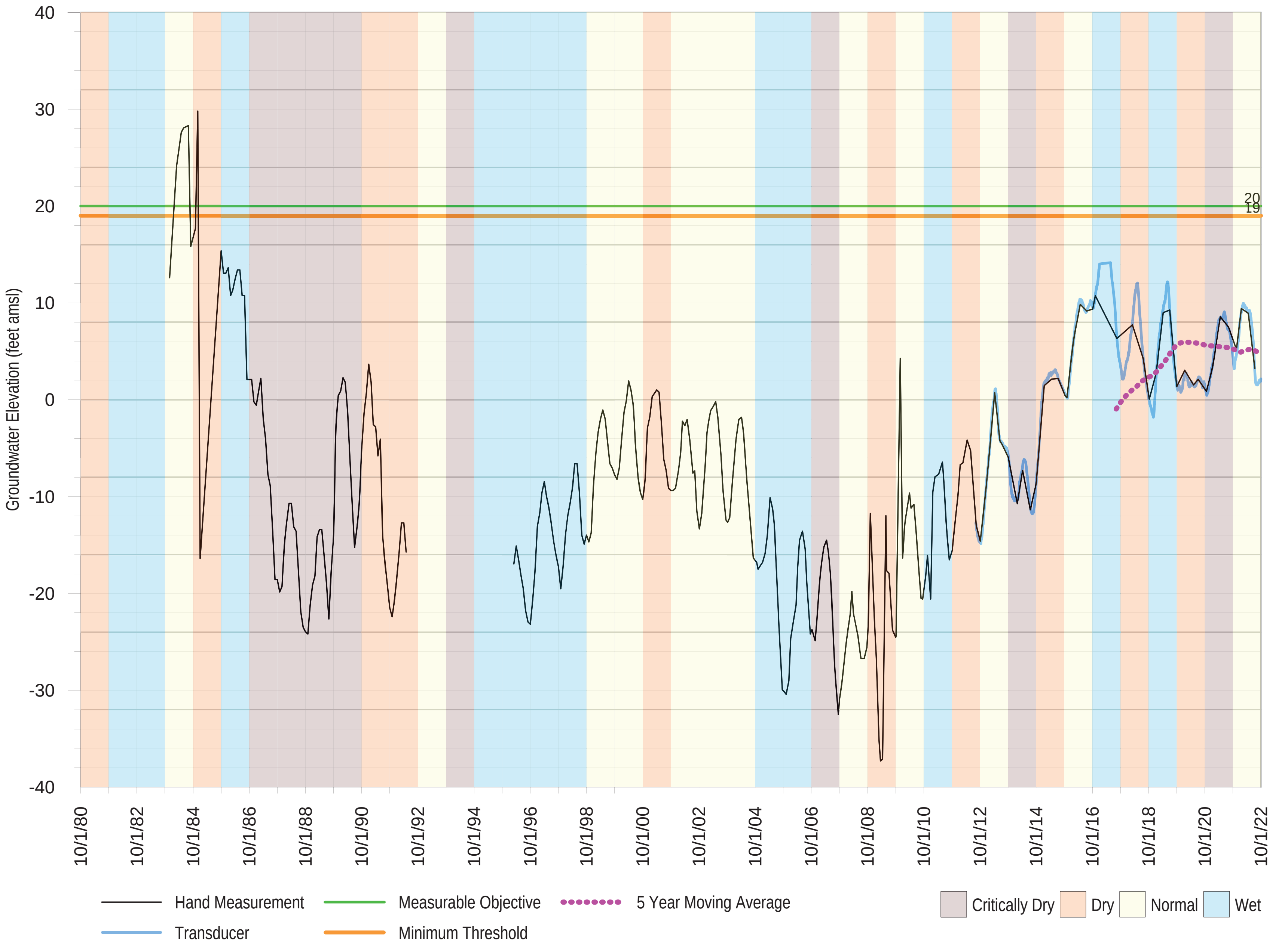
SC-9C & SC-9RC at Seacliff
Aquifer Screened: Purisima BC

FIGURE A-23



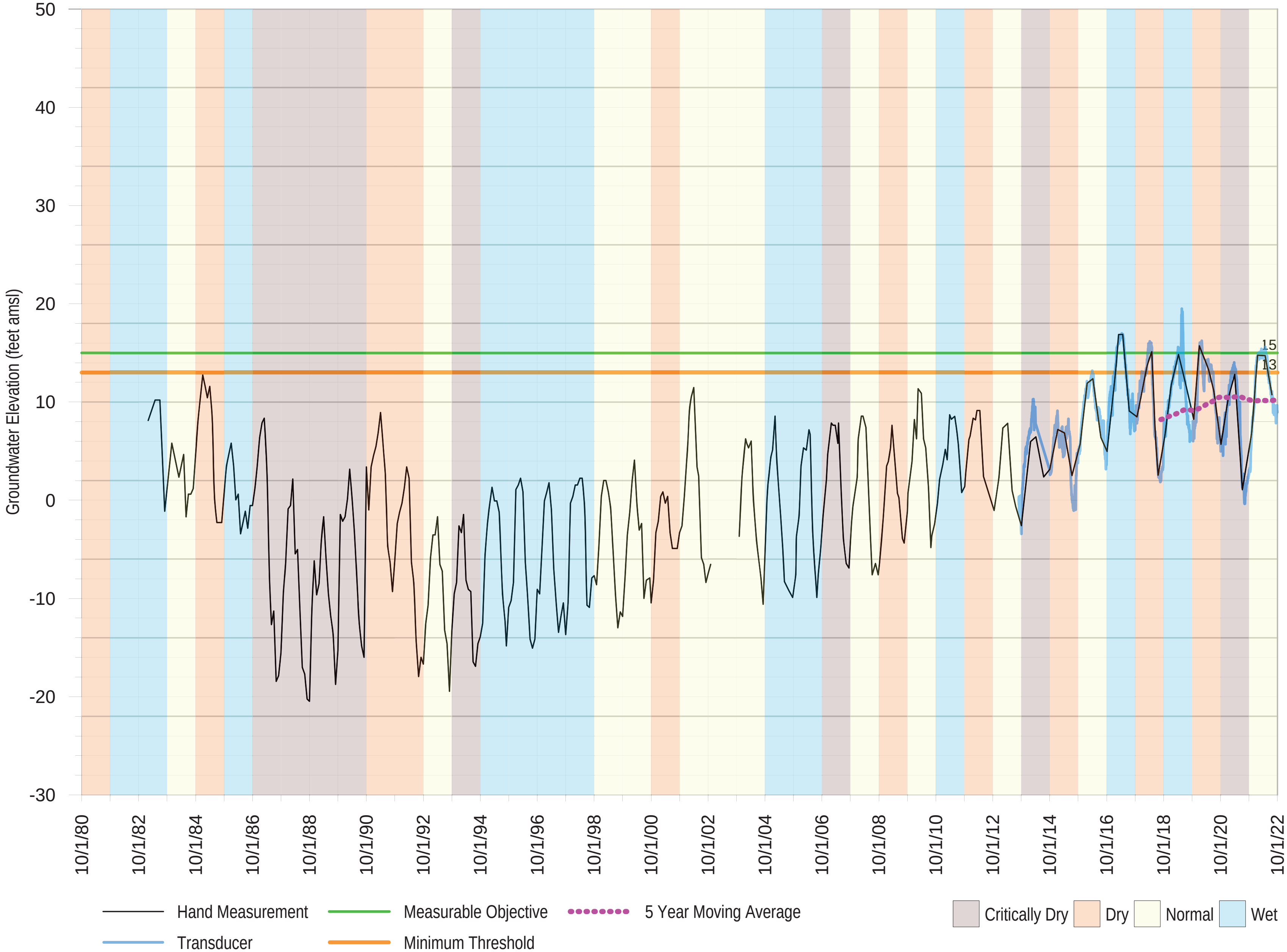
SC-8B & SC-8RB at Aptos Creek
Aquifer Screened: Purisima BC

FIGURE A-24



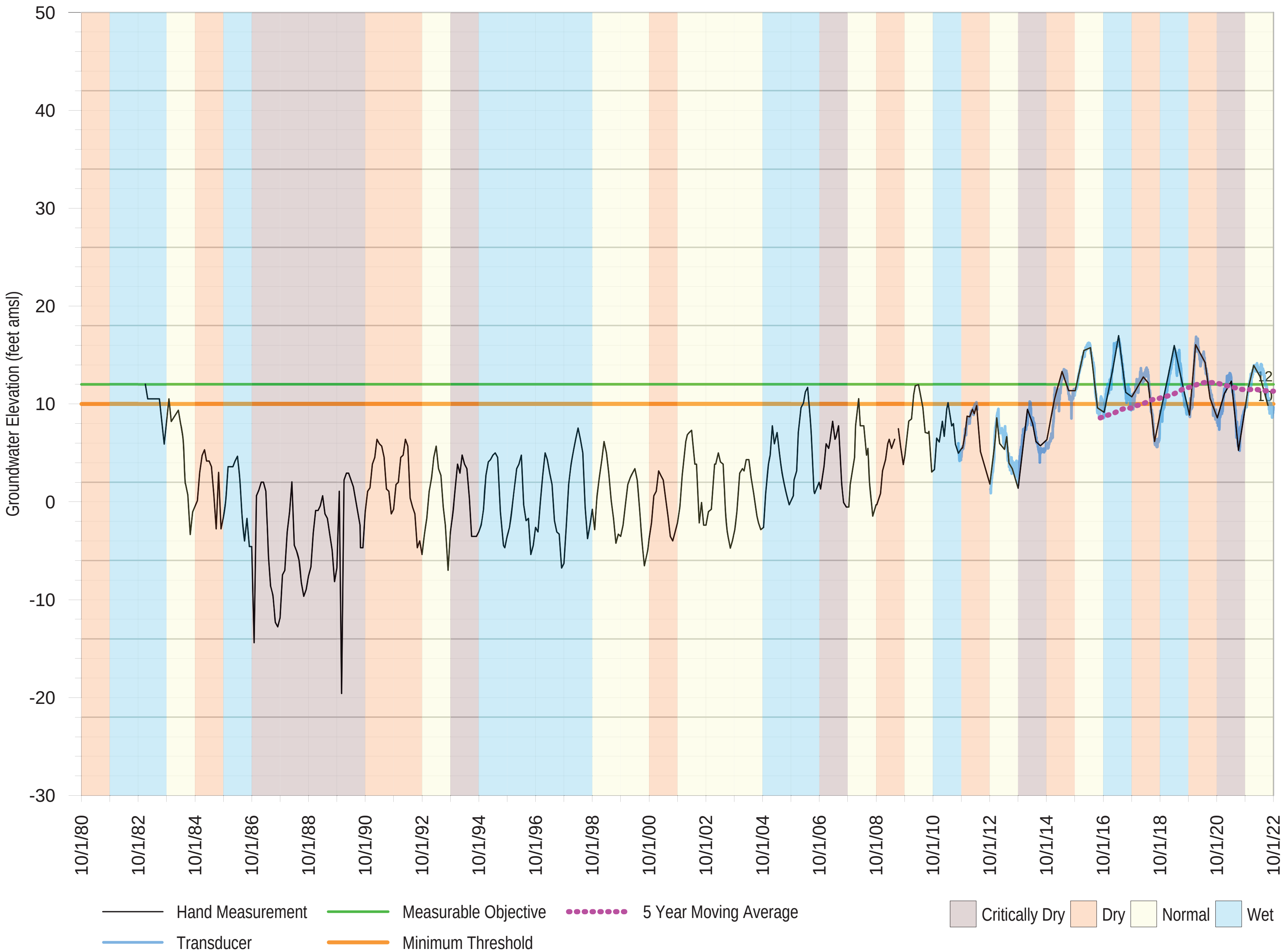
SC-5A & SC-5RA at New Brighton
Aquifer Screened: Purisima A

FIGURE A-25



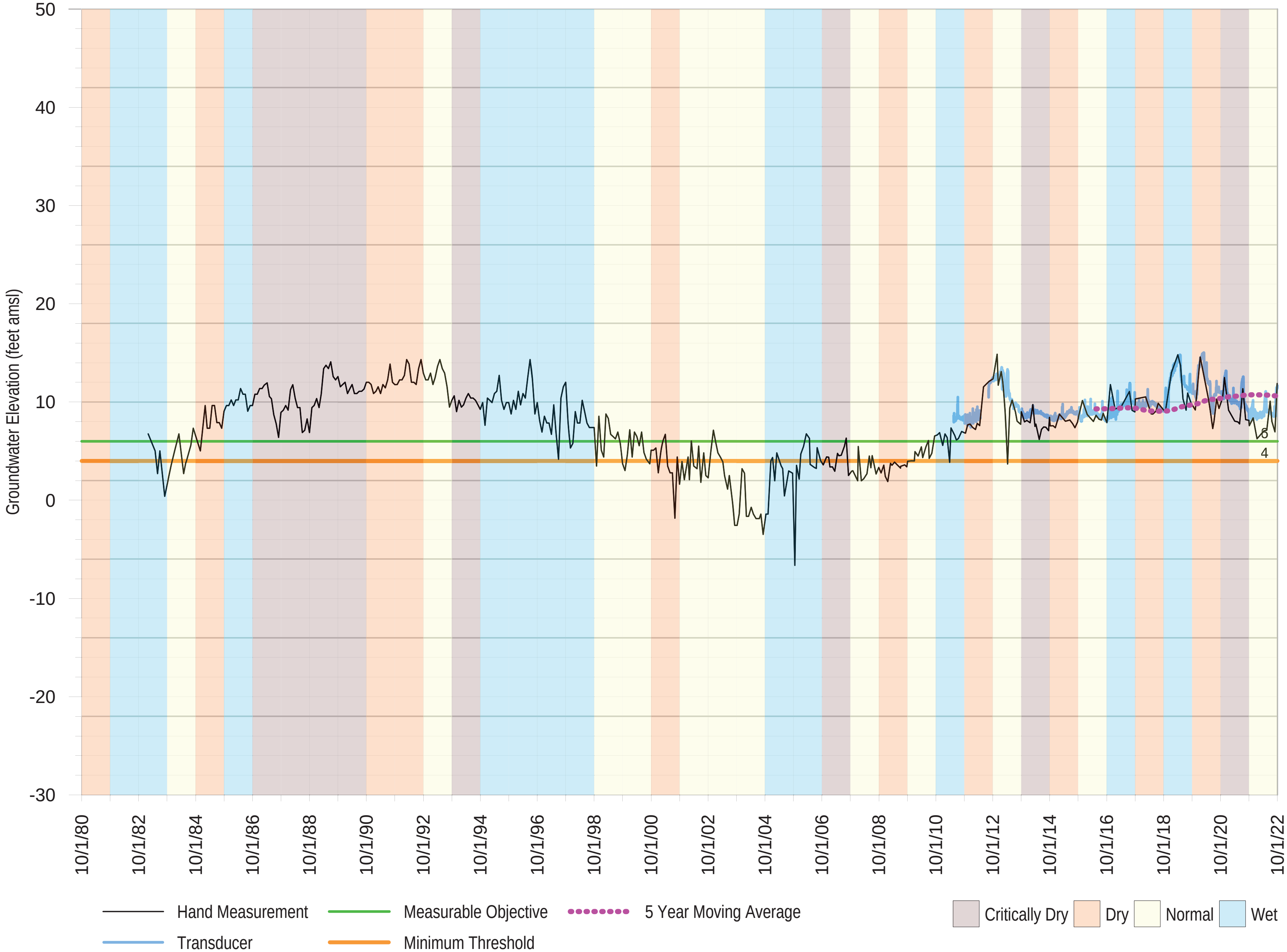
SC-3A & SC-3RA at Escalona
Aquifer Screened: Purisima A/AA

FIGURE A-26



SC-1A at Prospect
Aquifer Screened: Purisima A

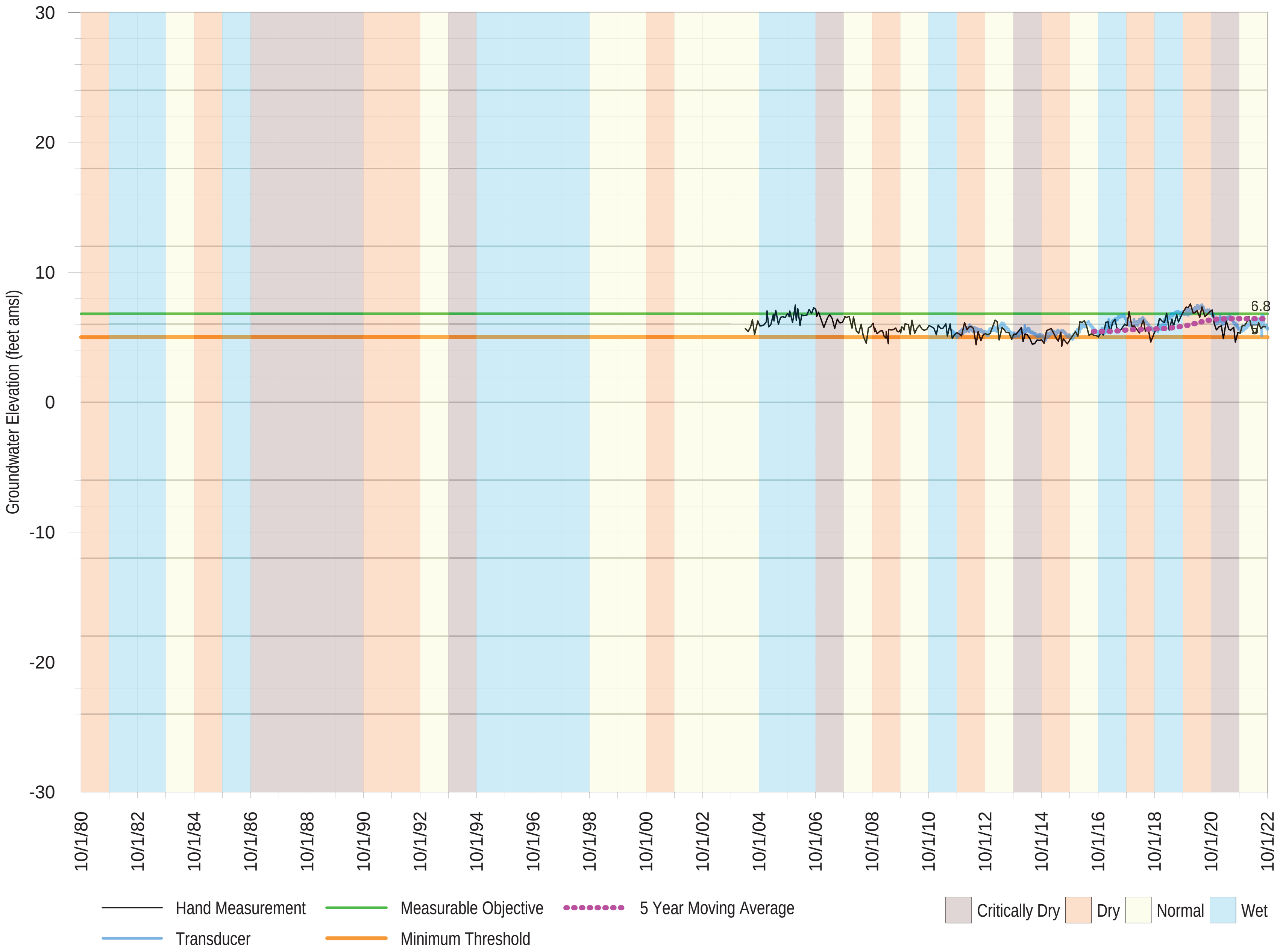
FIGURE A-27



Appendix A

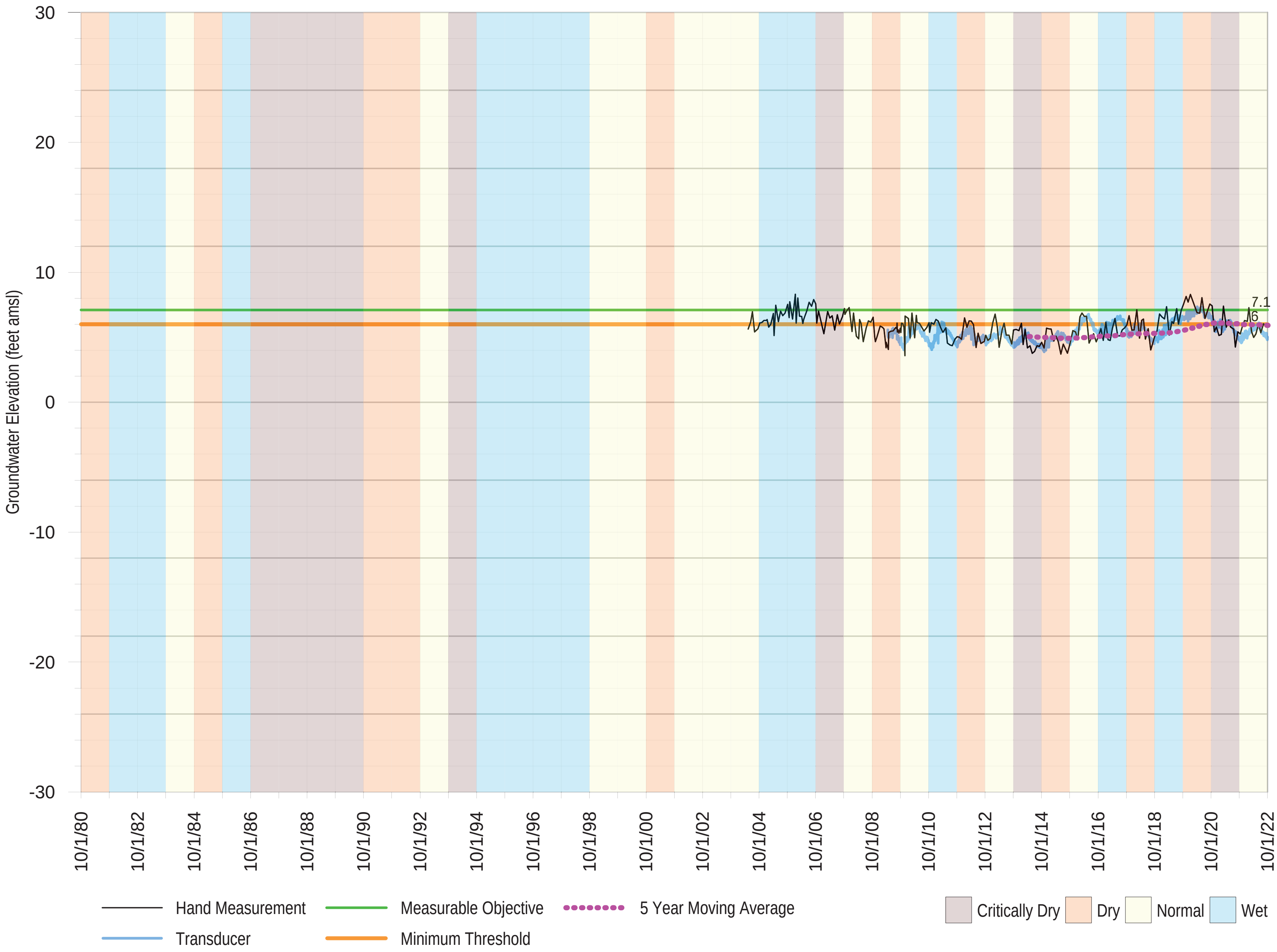
Moran Lake Medium
Aquifer Screened: Purisima A

FIGURE A-28



Soquel Point Medium
Aquifer Screened: Purisima A

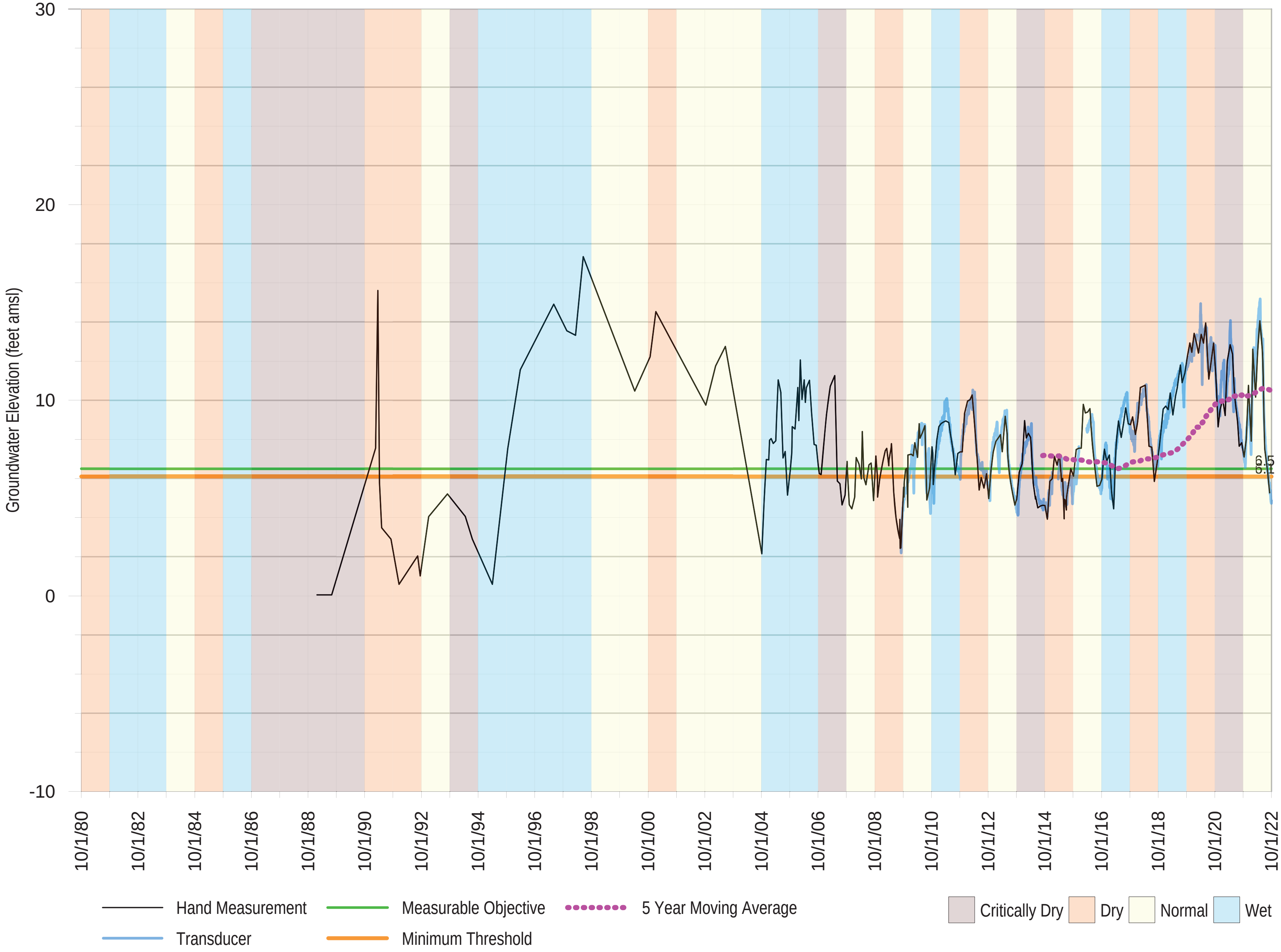
FIGURE A-29



Appendix A

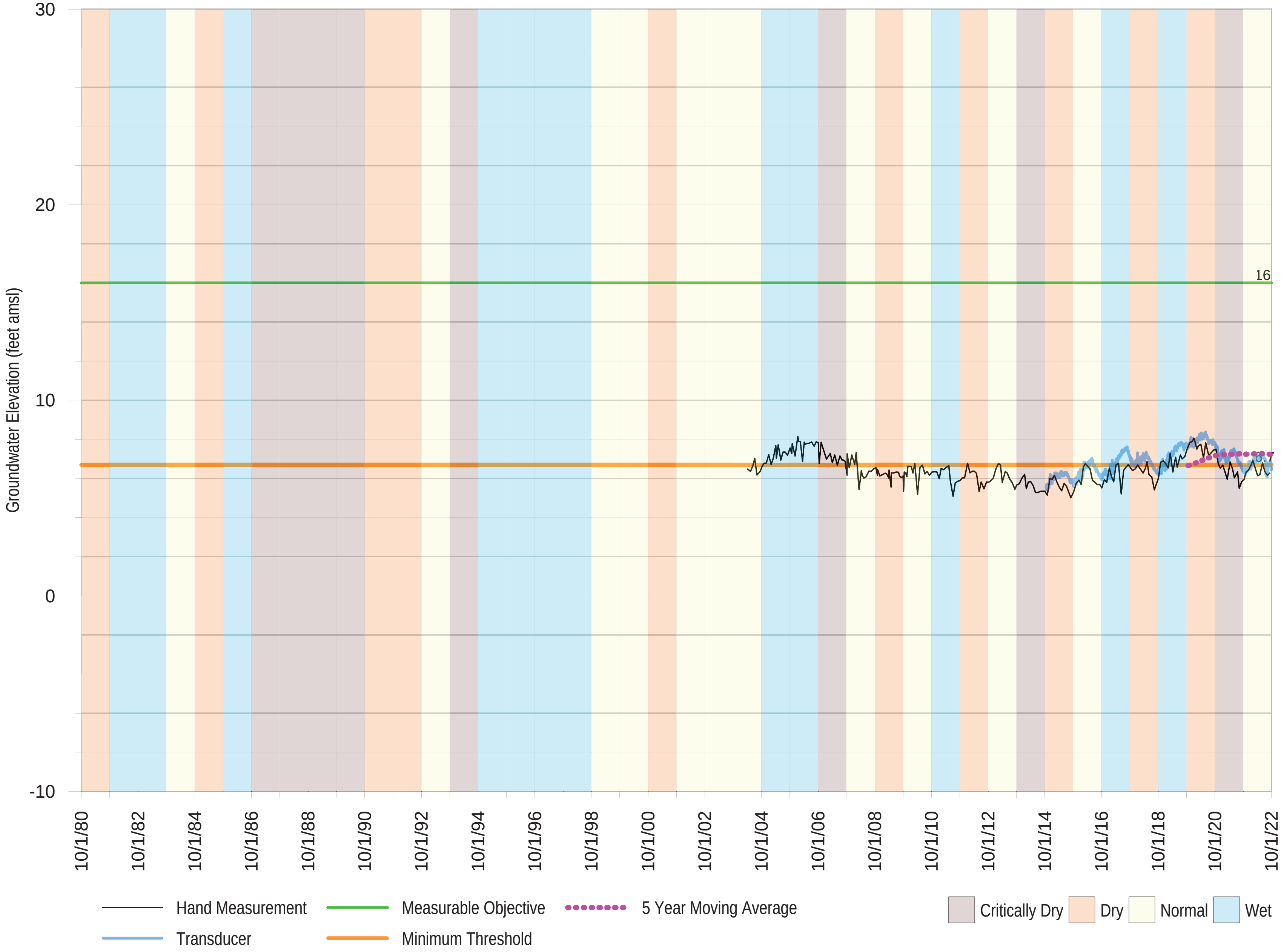
Pleasure Point Medium
Aquifer Screened: Purisima A

FIGURE A-30



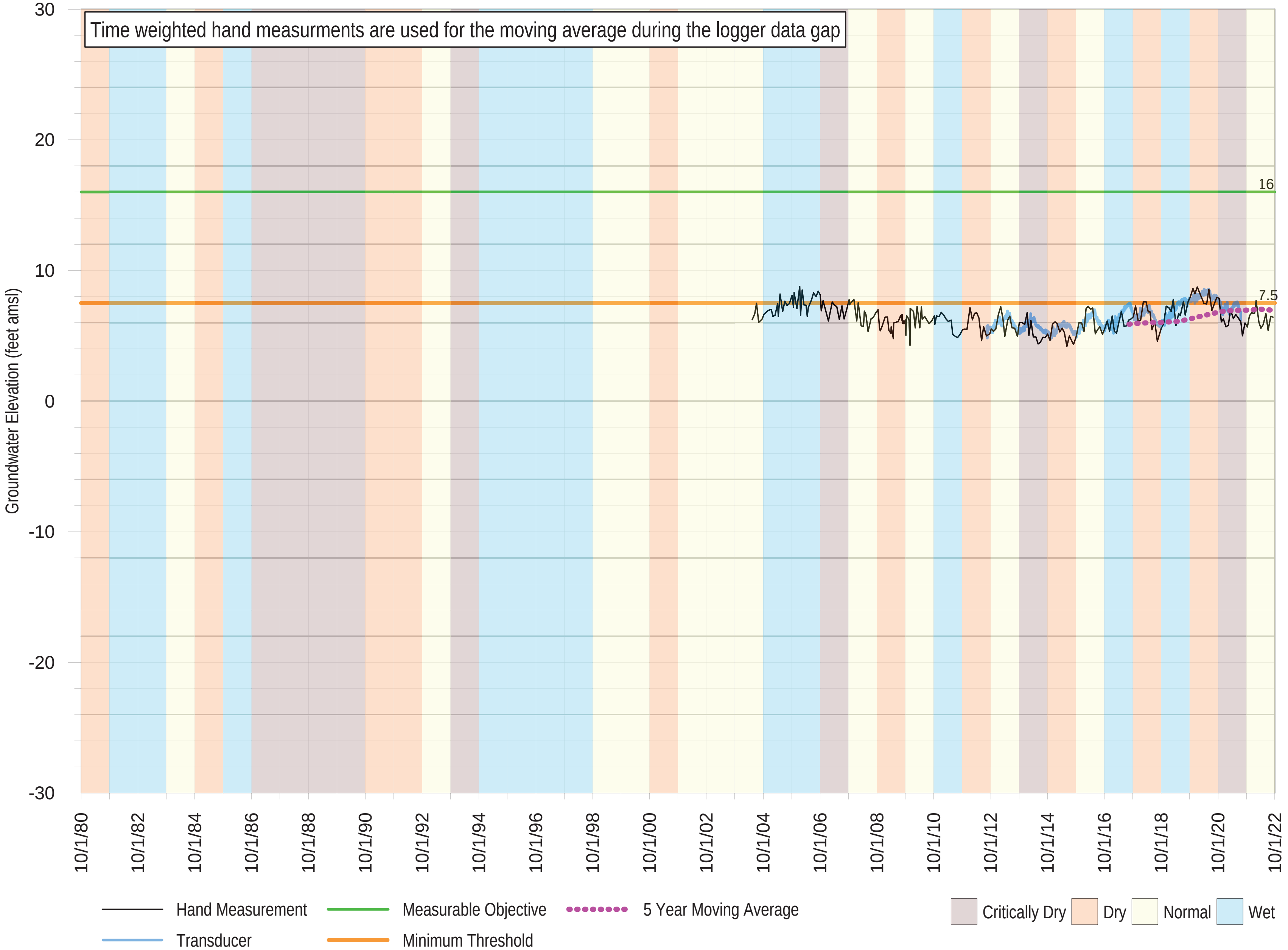
Moran Lake Deep
Aquifer Screened: Purisima AA

FIGURE A-31



Soquel Point Deep
Aquifer Screened: Purisima AA

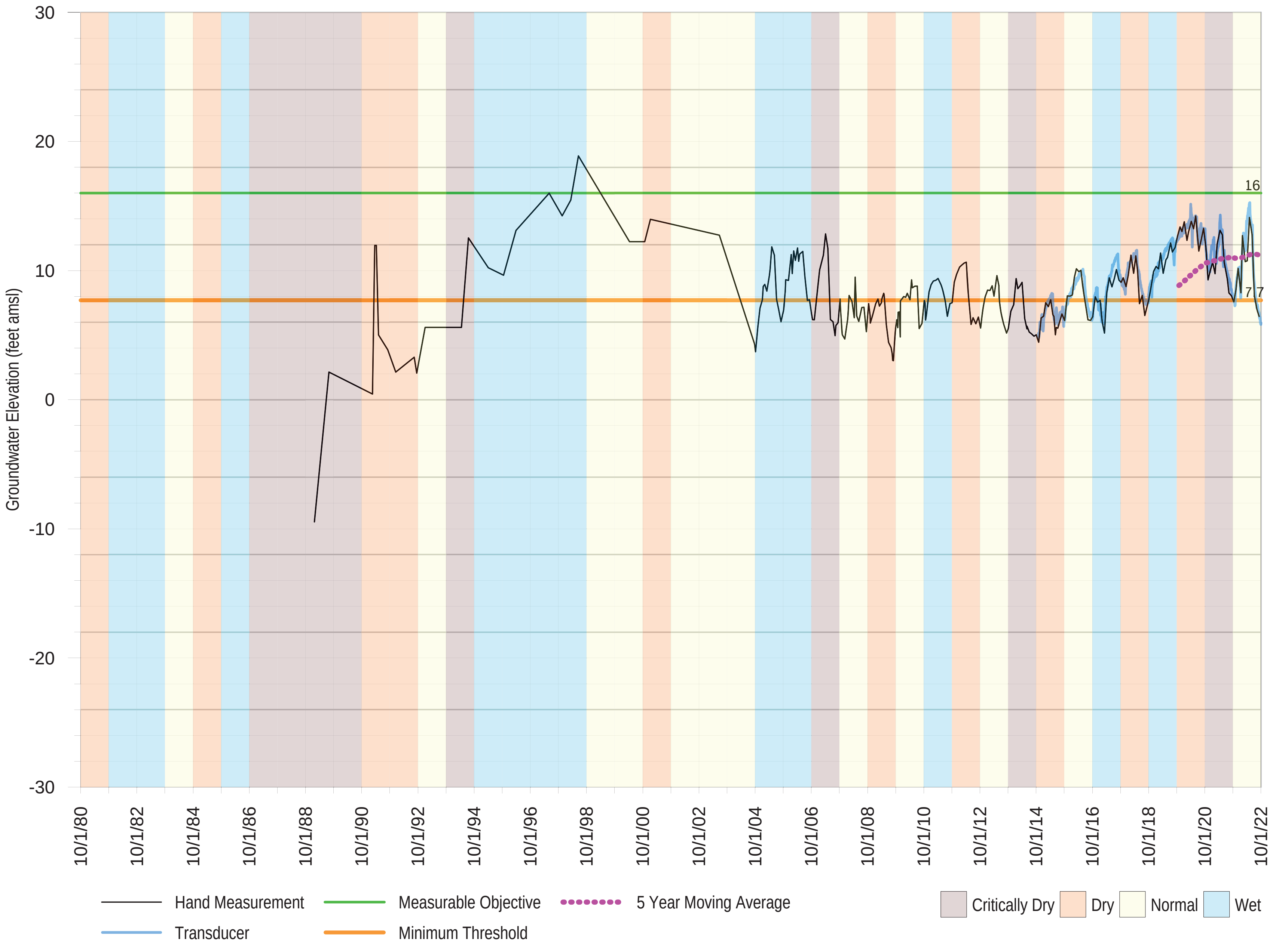
FIGURE A-32



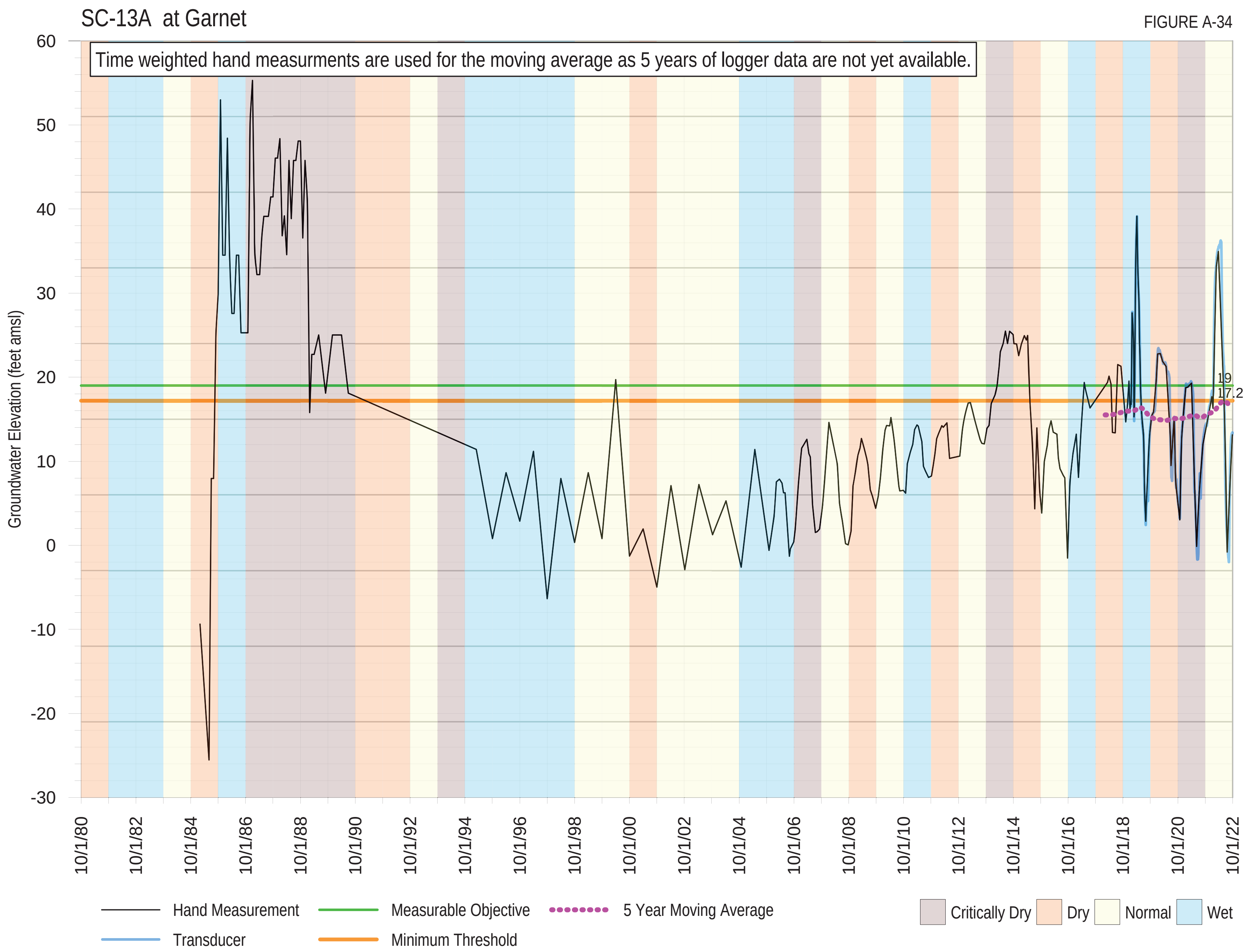
Appendix A

Pleasure Point Deep
Aquifer Screened: Purisima AA

FIGURE A-33



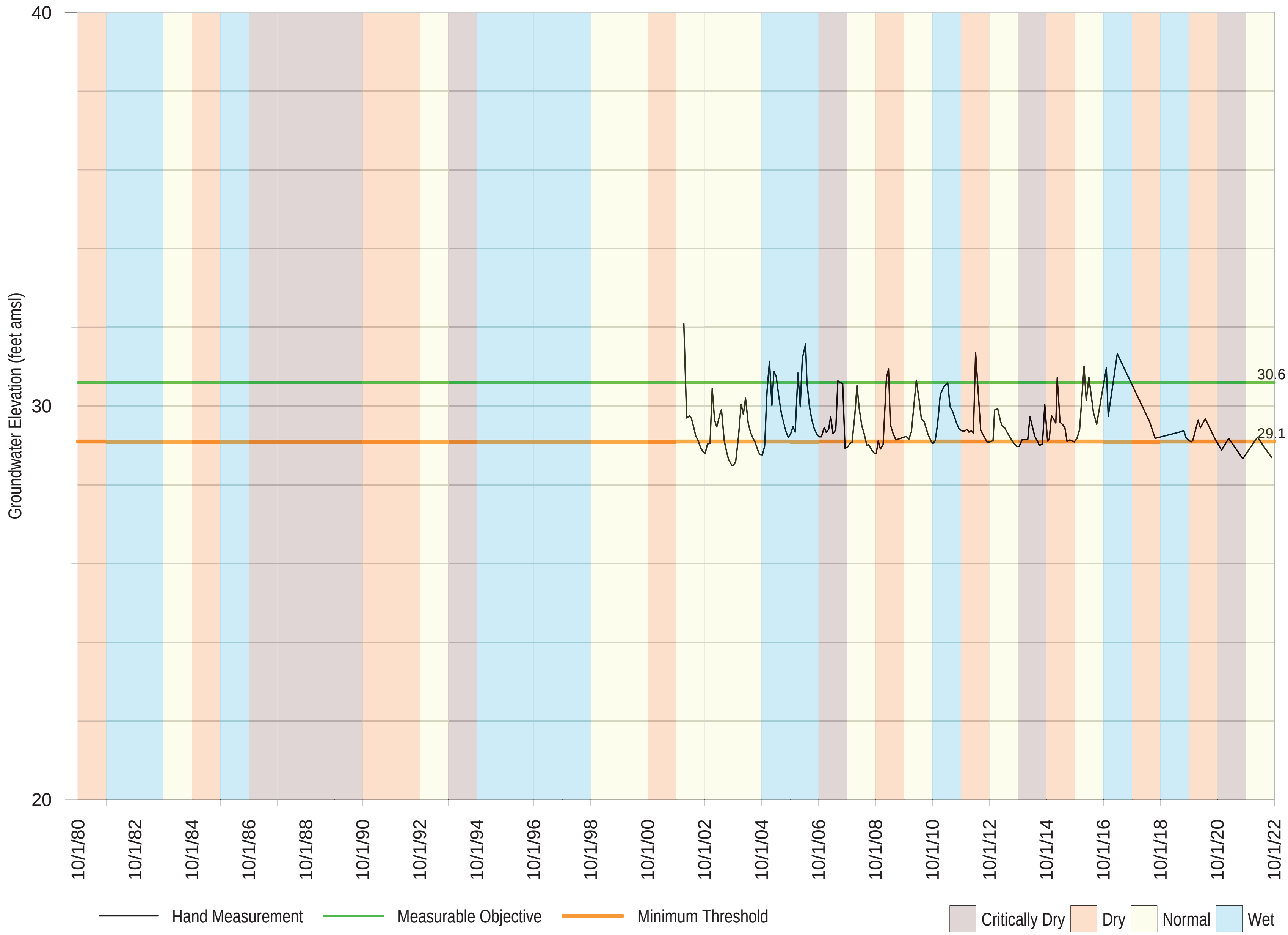
Appendix A



SC-13A at Garnet
FIGURE A-34
Time weighted hand measurments are used for the moving average as 5 years of logger data are not yet available.
Groundwater Elevation (feet amsl)
60
50
40
30
20
10
0
-10
-20
-30
19
17.2
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
Hand Measurement
Transducer
Measurable Objective
Minimum Threshold
5 Year Moving Average
Critically Dry
Dry
Normal
Wet

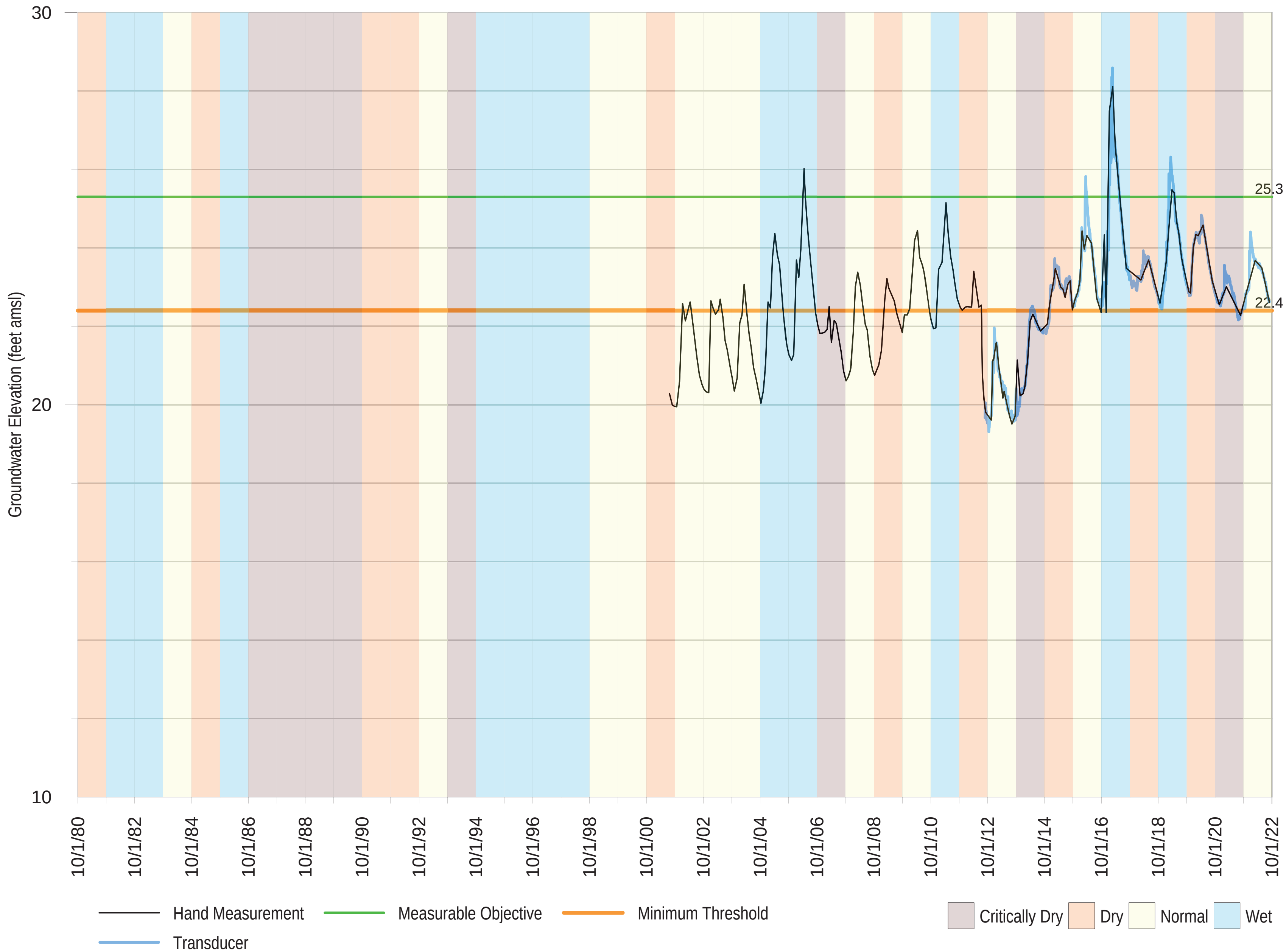
Balogh Shallow Well
Aquifer Screened: Shallow Well for Surface Water Interactions

FIGURE A-35



Main Street Shallow Well 1
Aquifer Screened: Shallow Well for Surface Water Interactions

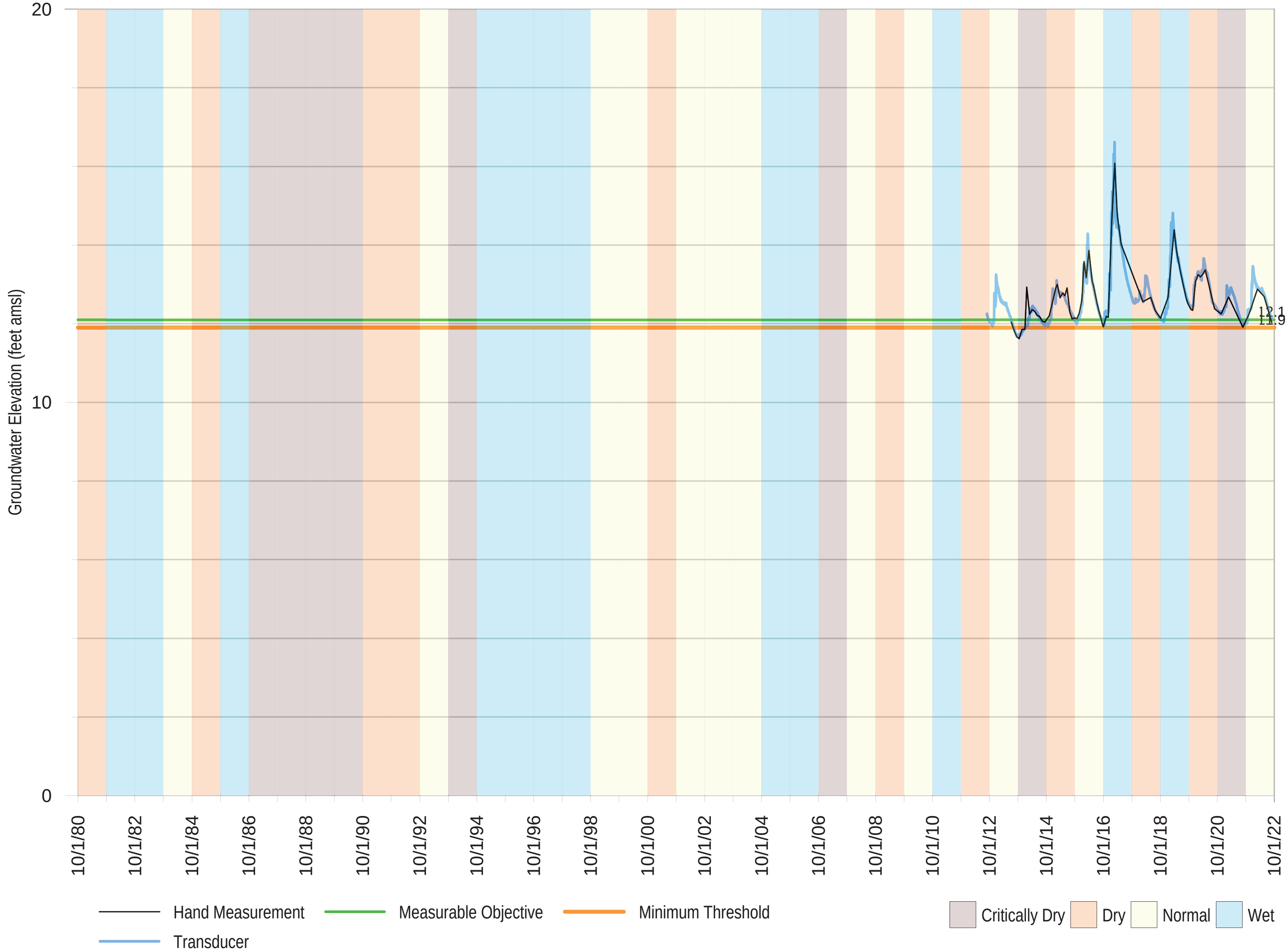
FIGURE A-36



Appendix A

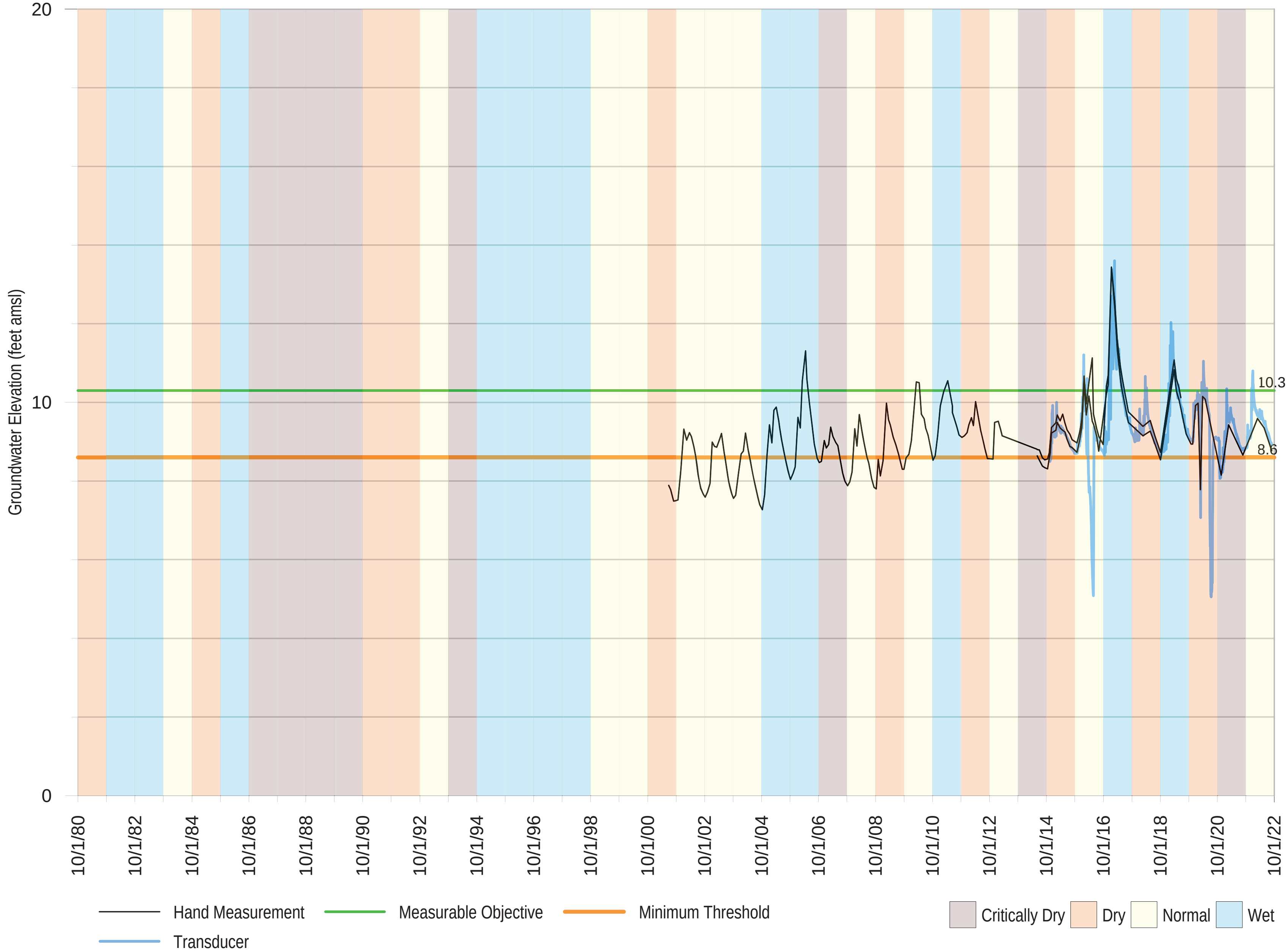
Soquel Wharf Shallow Well
Aquifer Screened: Shallow Well for Surface Water Interactions

FIGURE A-37



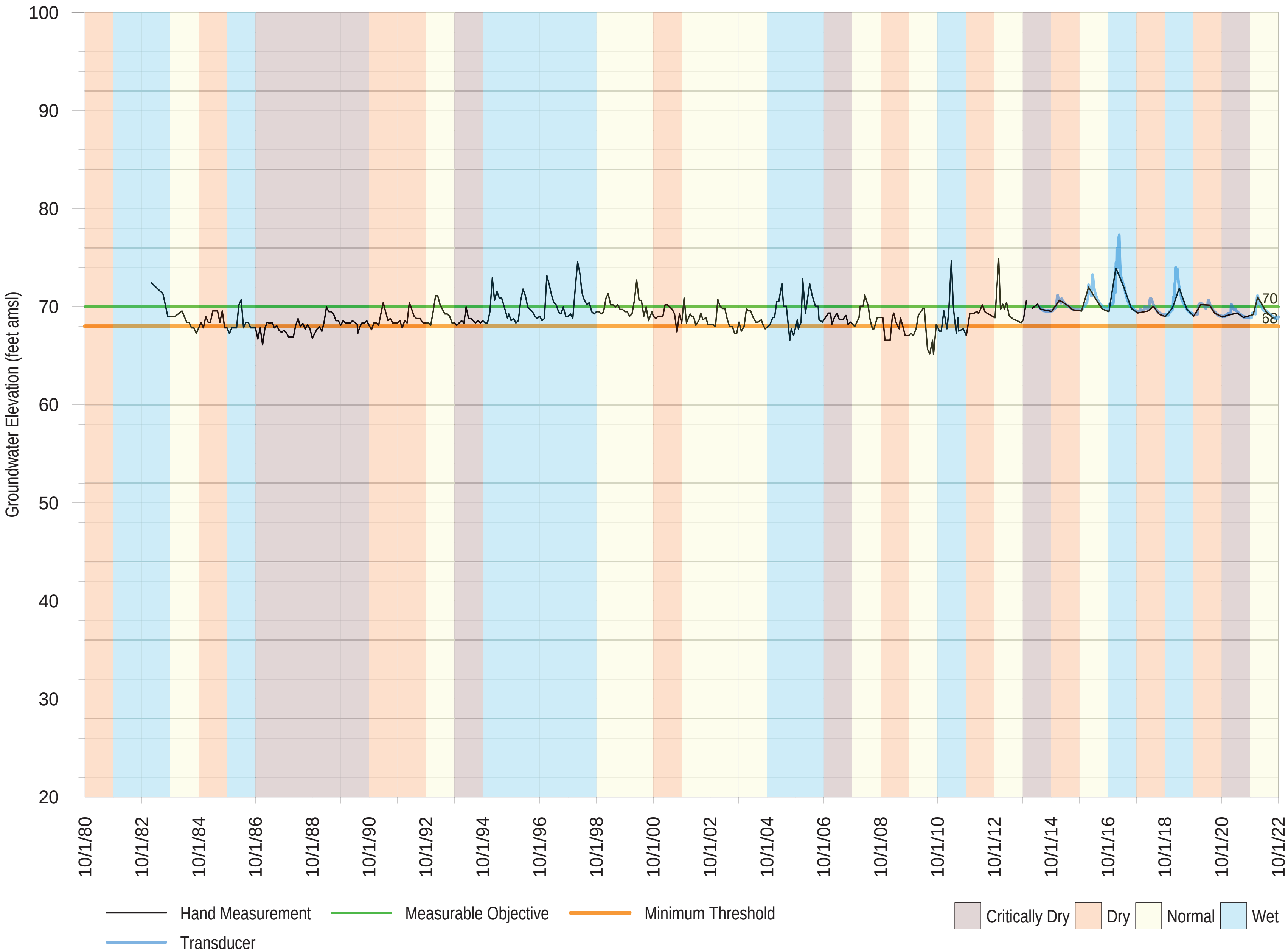
Nob Hill Shallow Well 1 & Nob Hill Shallow Well 2
Aquifer Screened: Shallow Well for Surface Water Interactions

FIGURE A-38



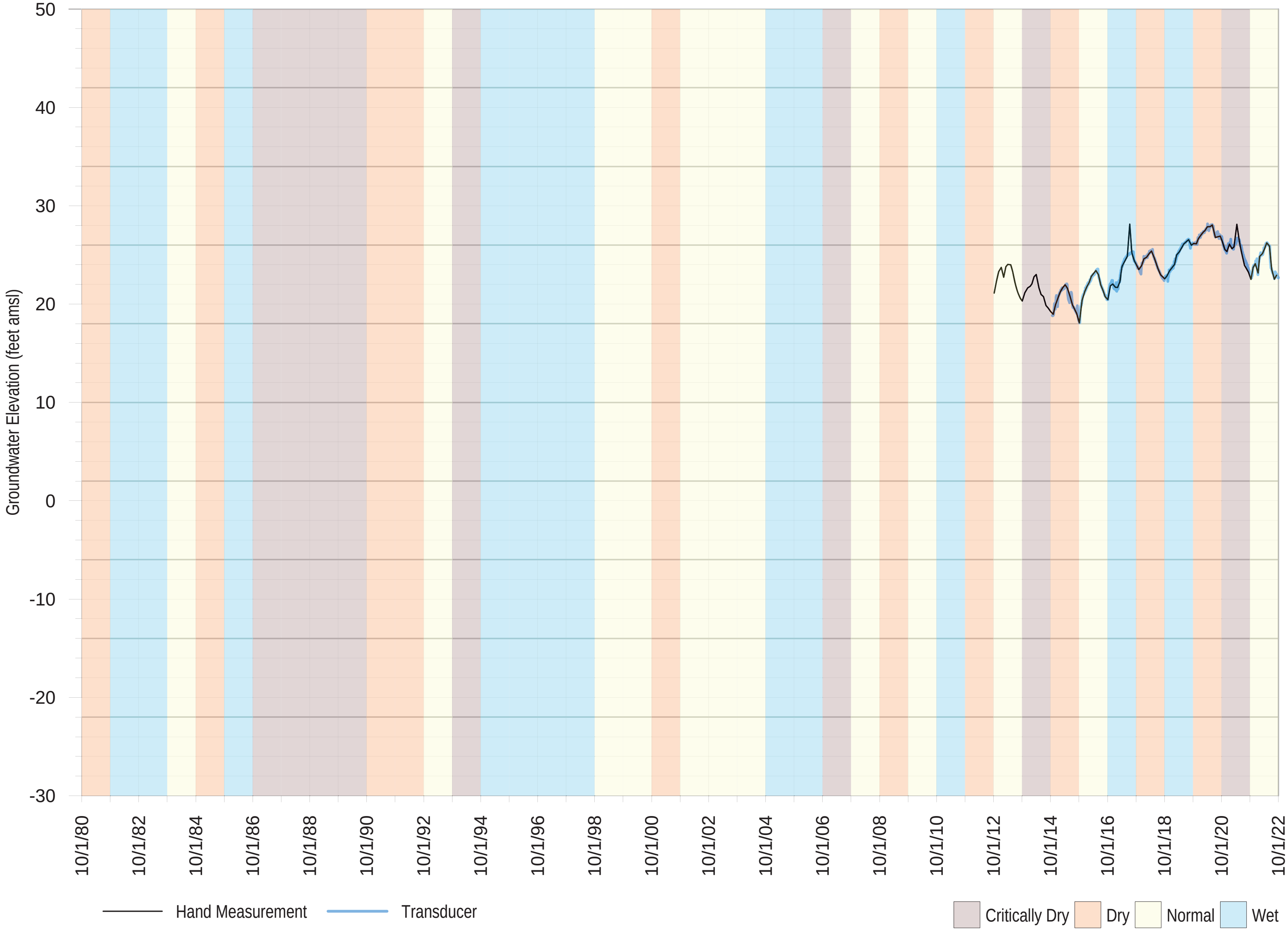
SC-10A & SC-10RA at Cherryvale
Aquifer Screened: Purisima A

FIGURE A-39



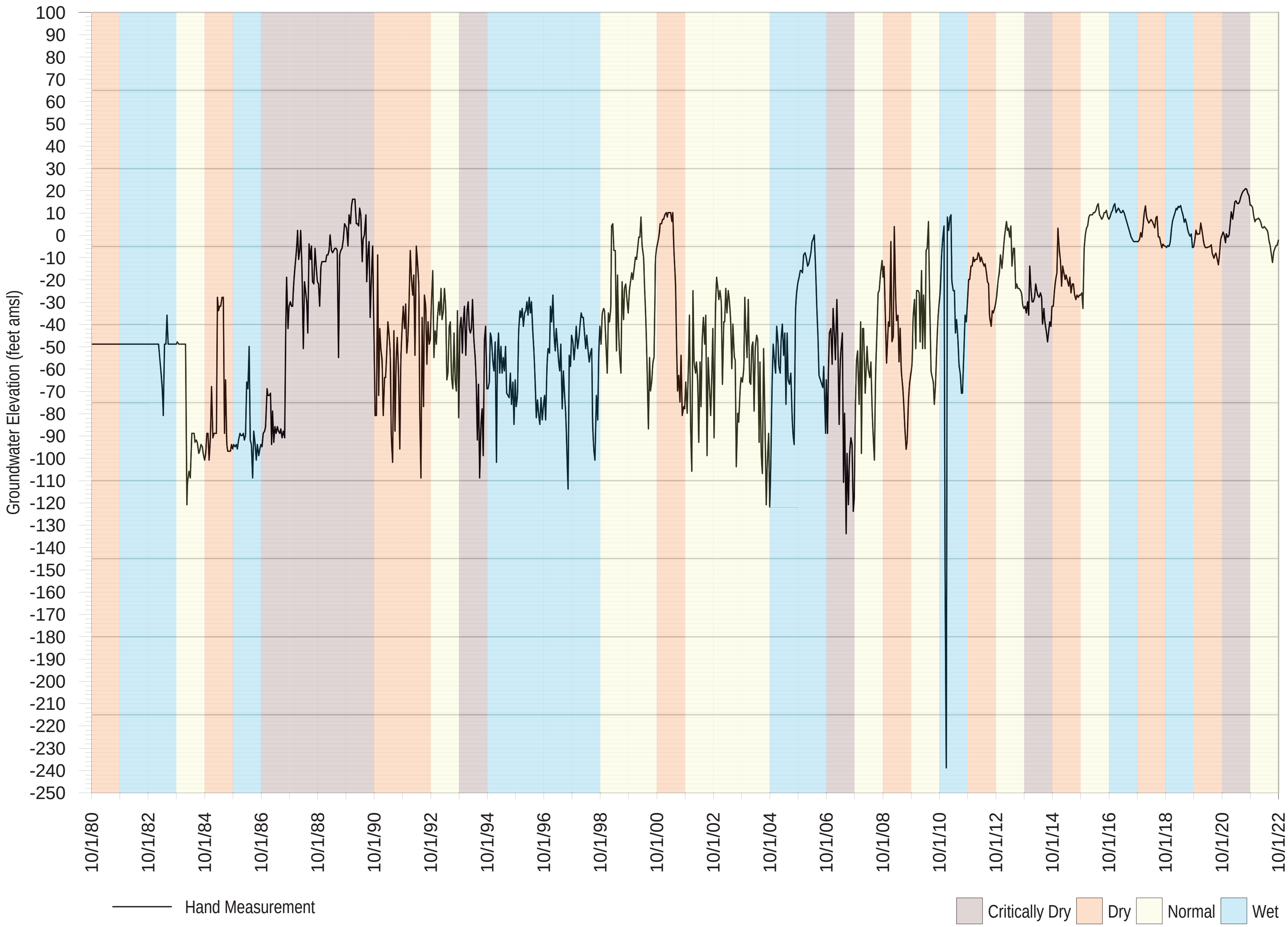
30th Ave Shallow
Aquifer Screened: Purisima A

FIGURE A-40



Aptos Creek PW
Aquifer Screened: Purisima BC

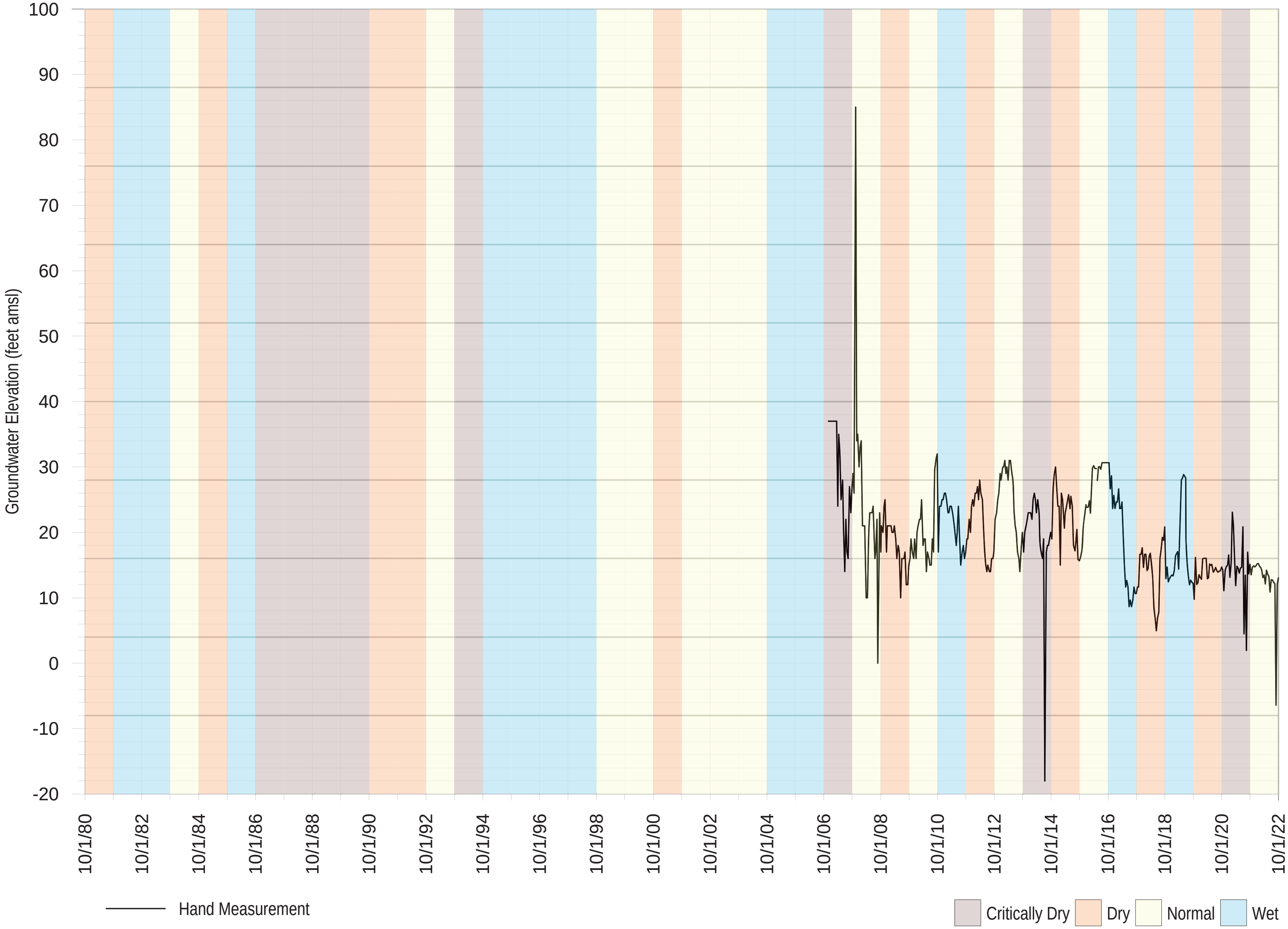
FIGURE A-41



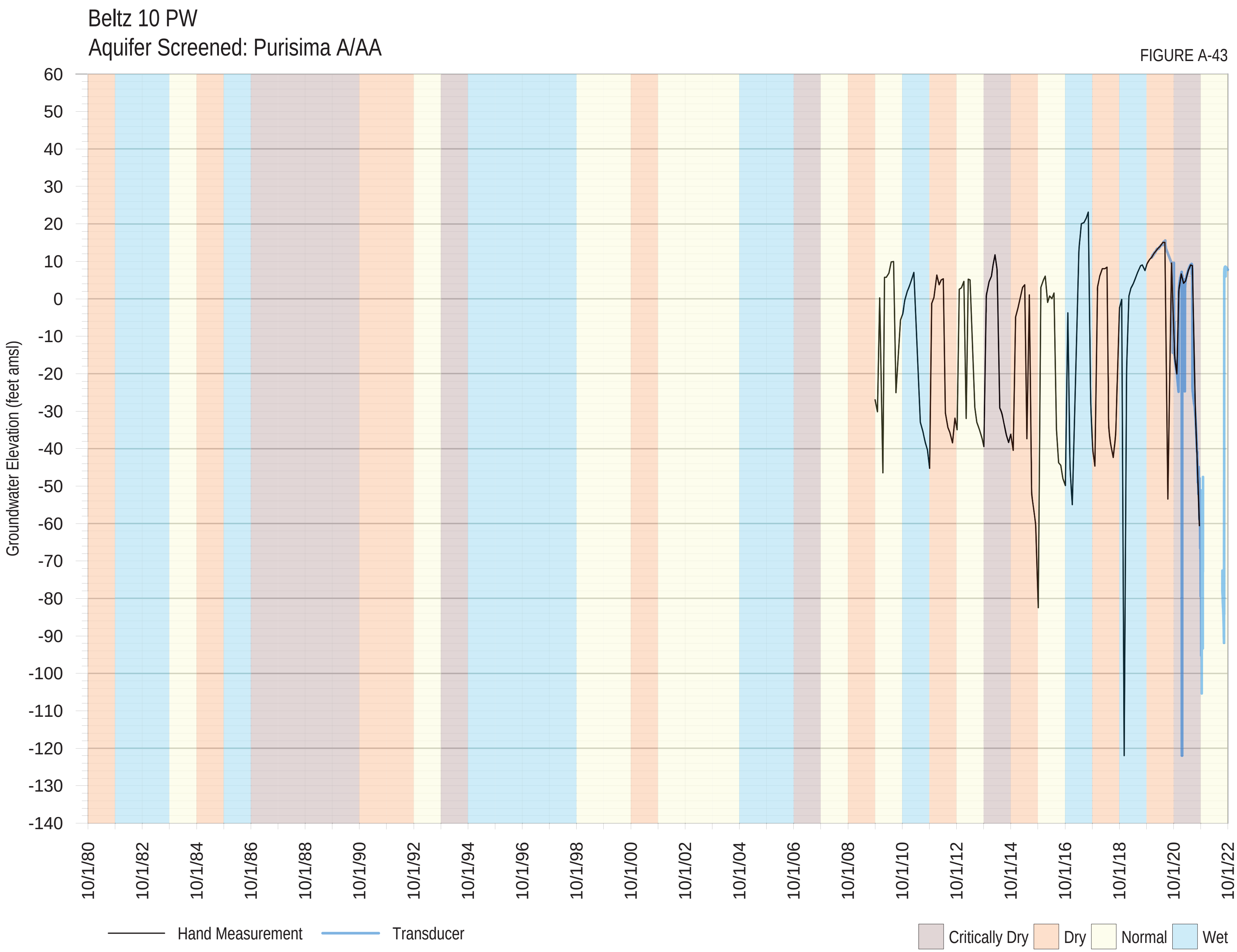
Appendix A

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

FIGURE A-42



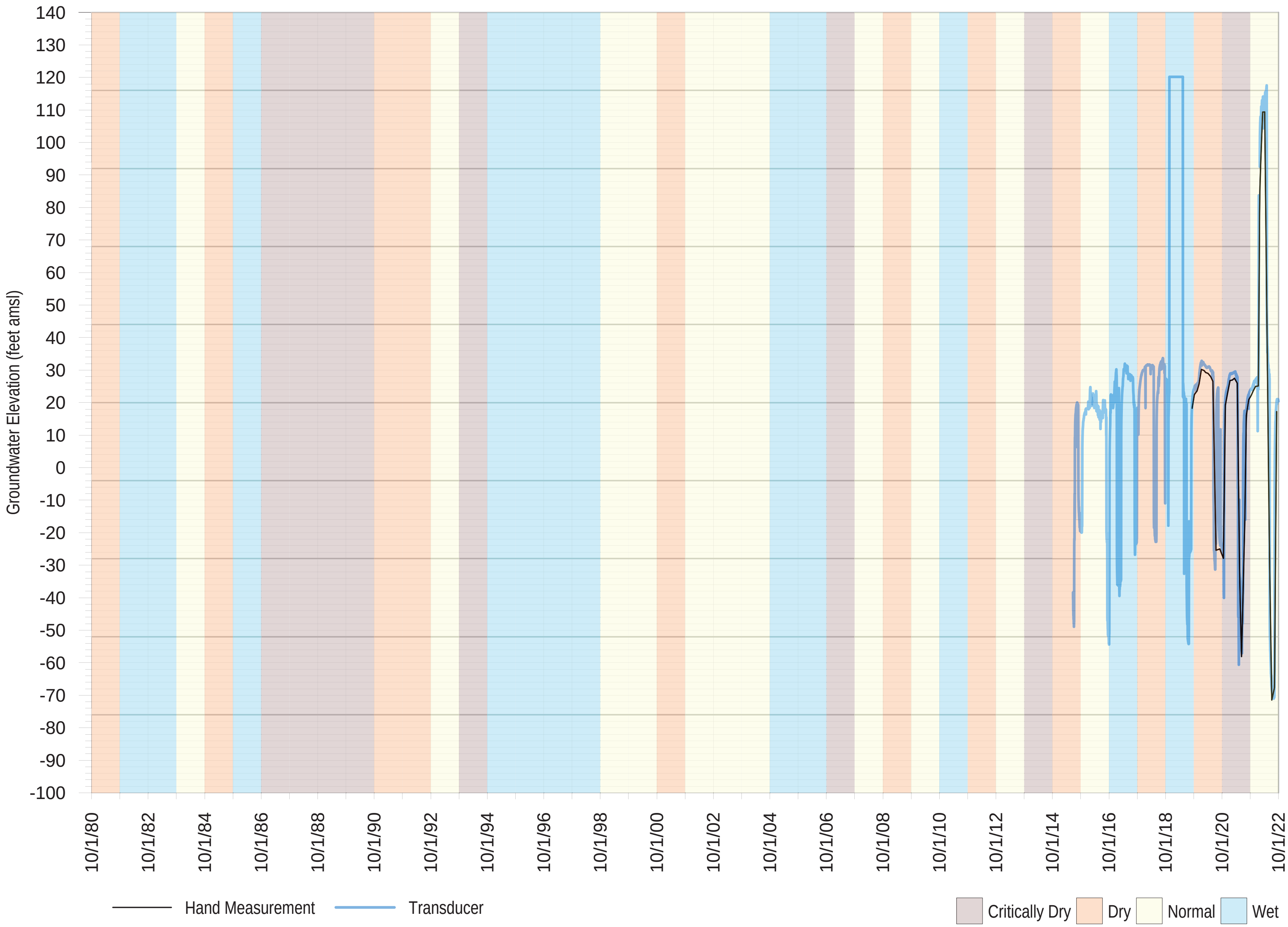
Appendix A



Beltz 10 PW
Aquifer Screened: Purisima A/AA
FIGURE A-43
Groundwater Elevation (feet amsl)
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
-100
-110
-120
-130
-140
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
Hand Measurement
Transducer
Critically Dry
Dry
Normal
Wet

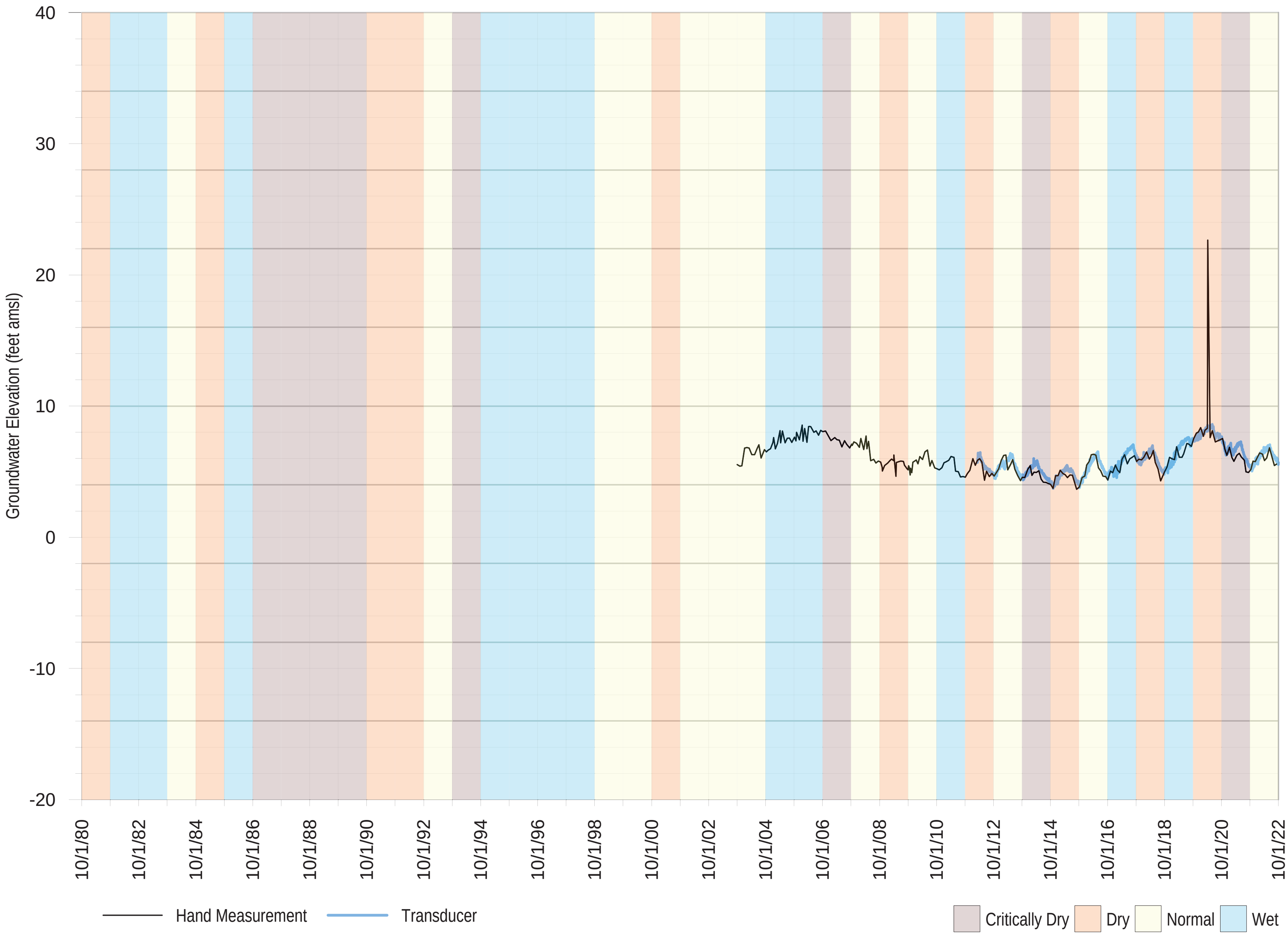
Beltz 12 PW
Aquifer Screened: Purisima AA/Tu

FIGURE A-44



Beltz 2
Aquifer Screened: Purisima A

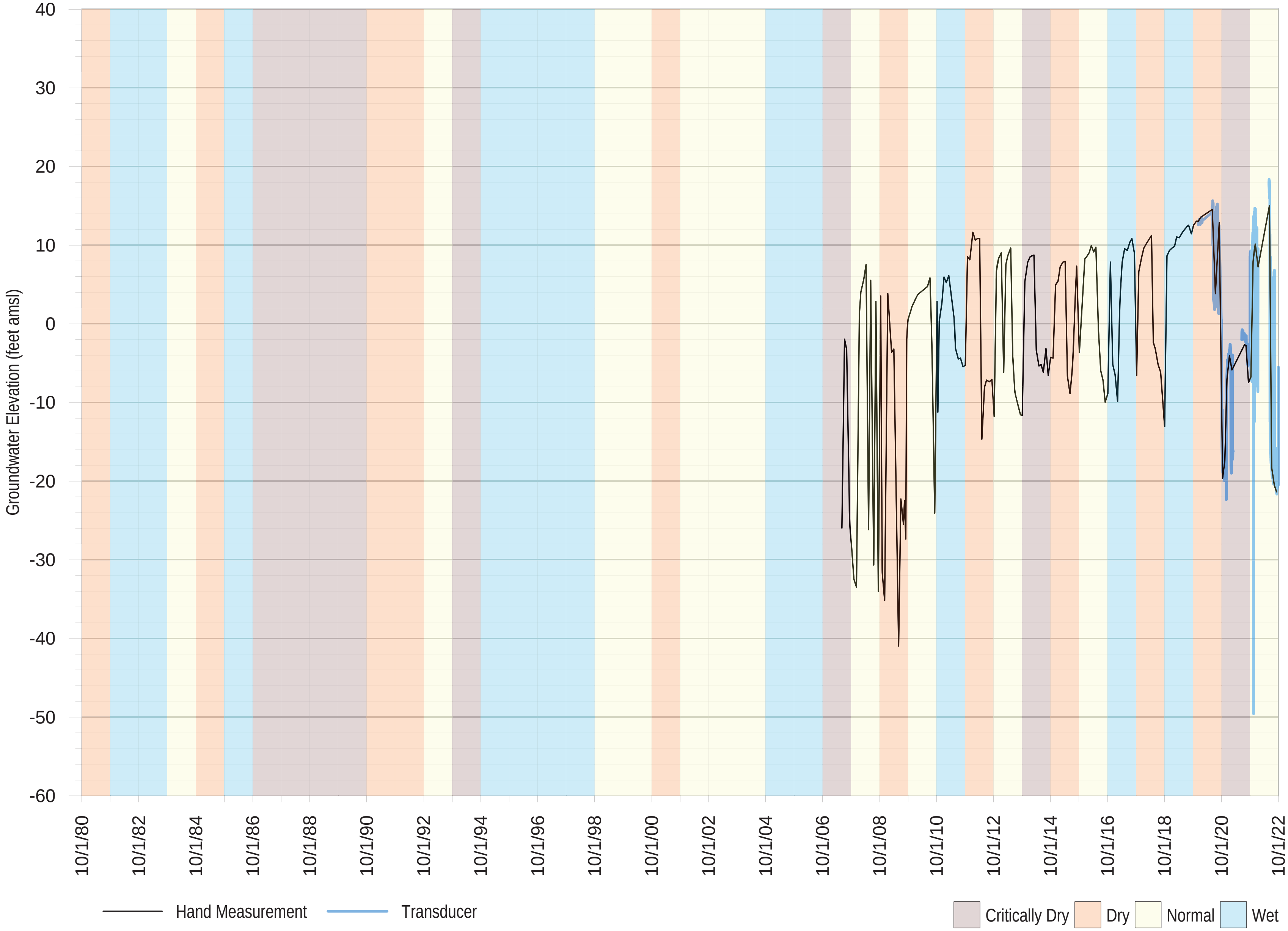
FIGURE A-45



Appendix A

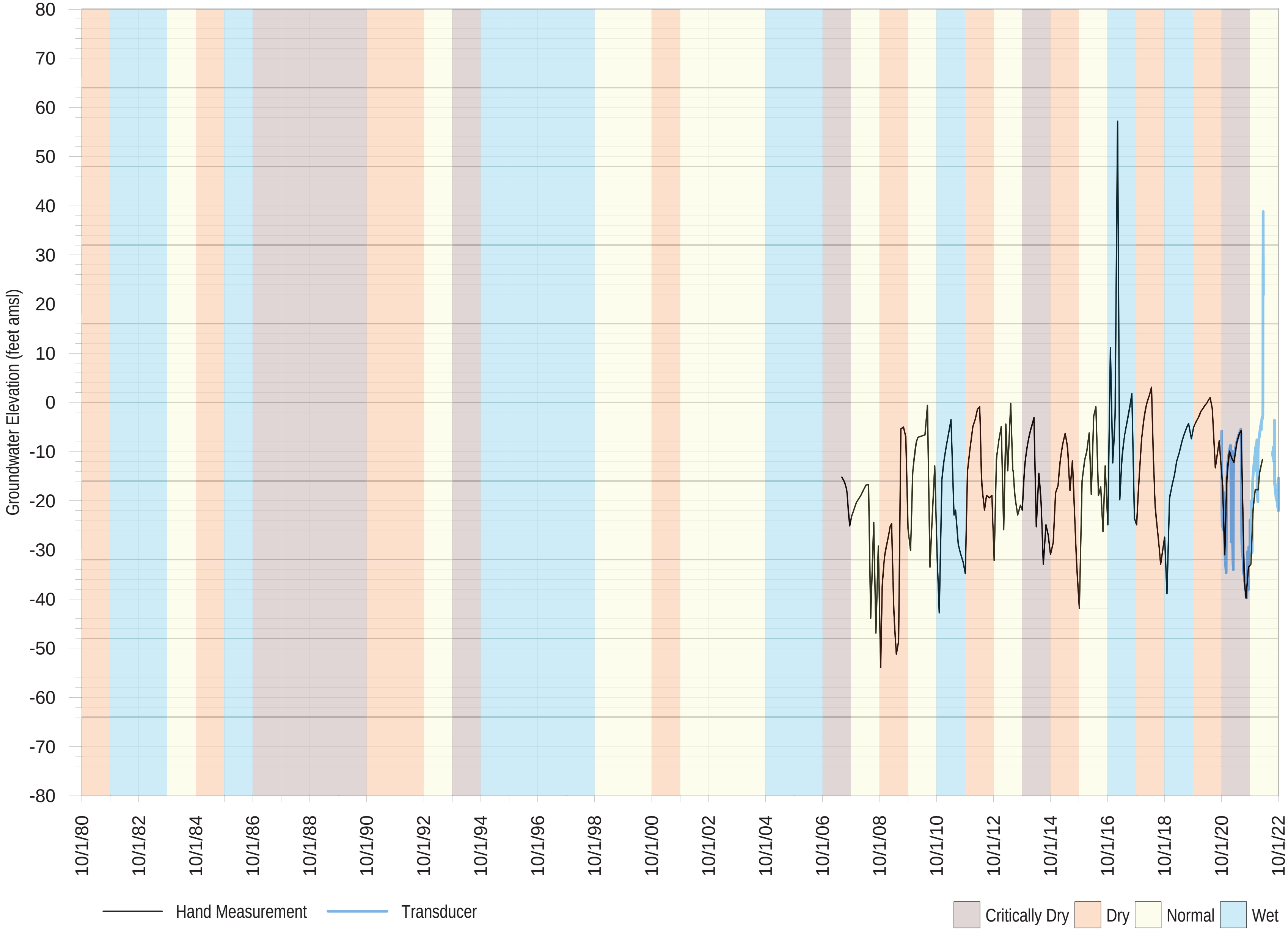
Beltz 8 PW
Aquifer Screened: Purisima A

FIGURE A-46



Beltz 9 PW
Aquifer Screened: Purisima A

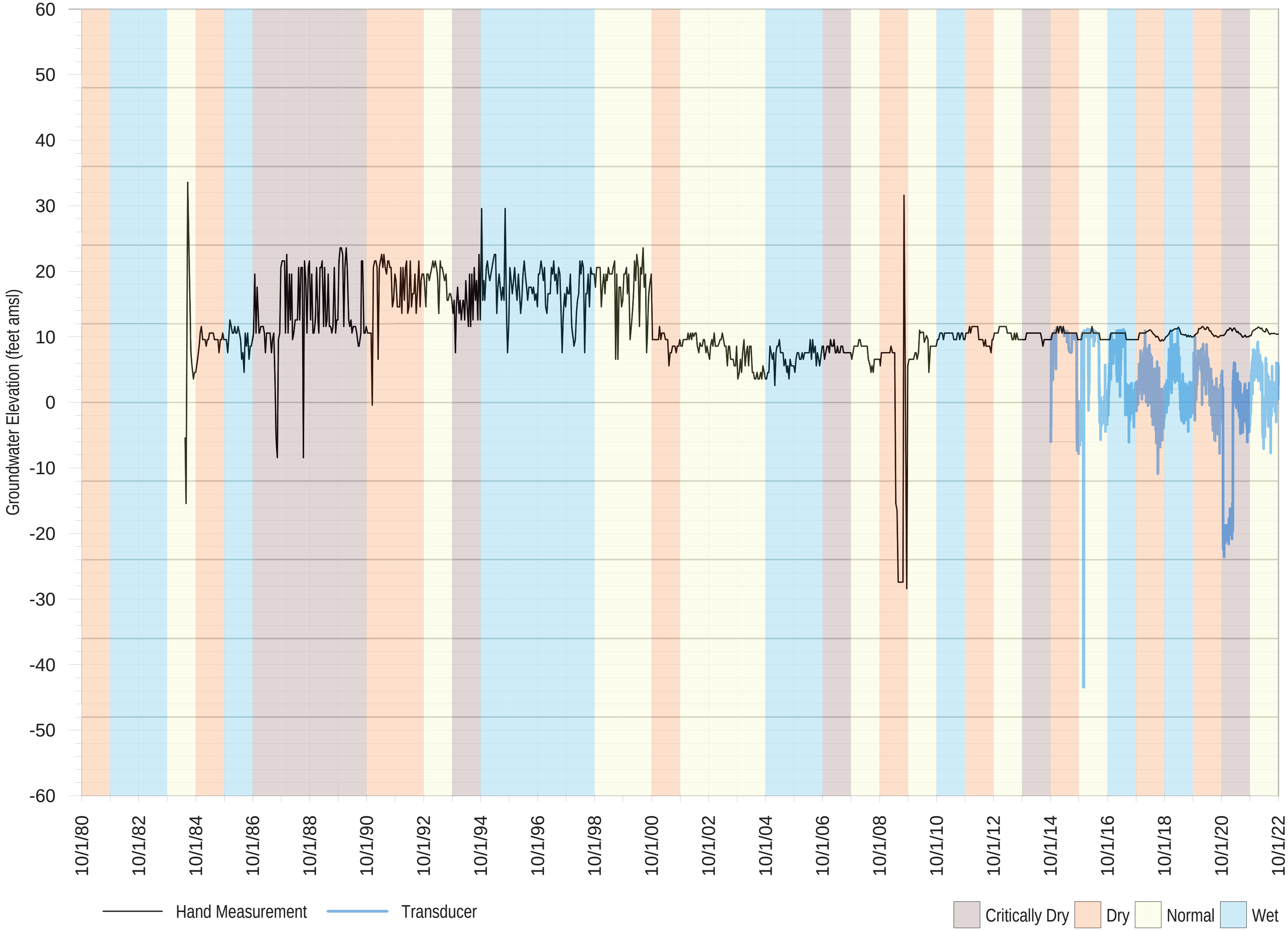
FIGURE A-47



Bonita PW

Aquifer Screened: Aromas/ Purisima F

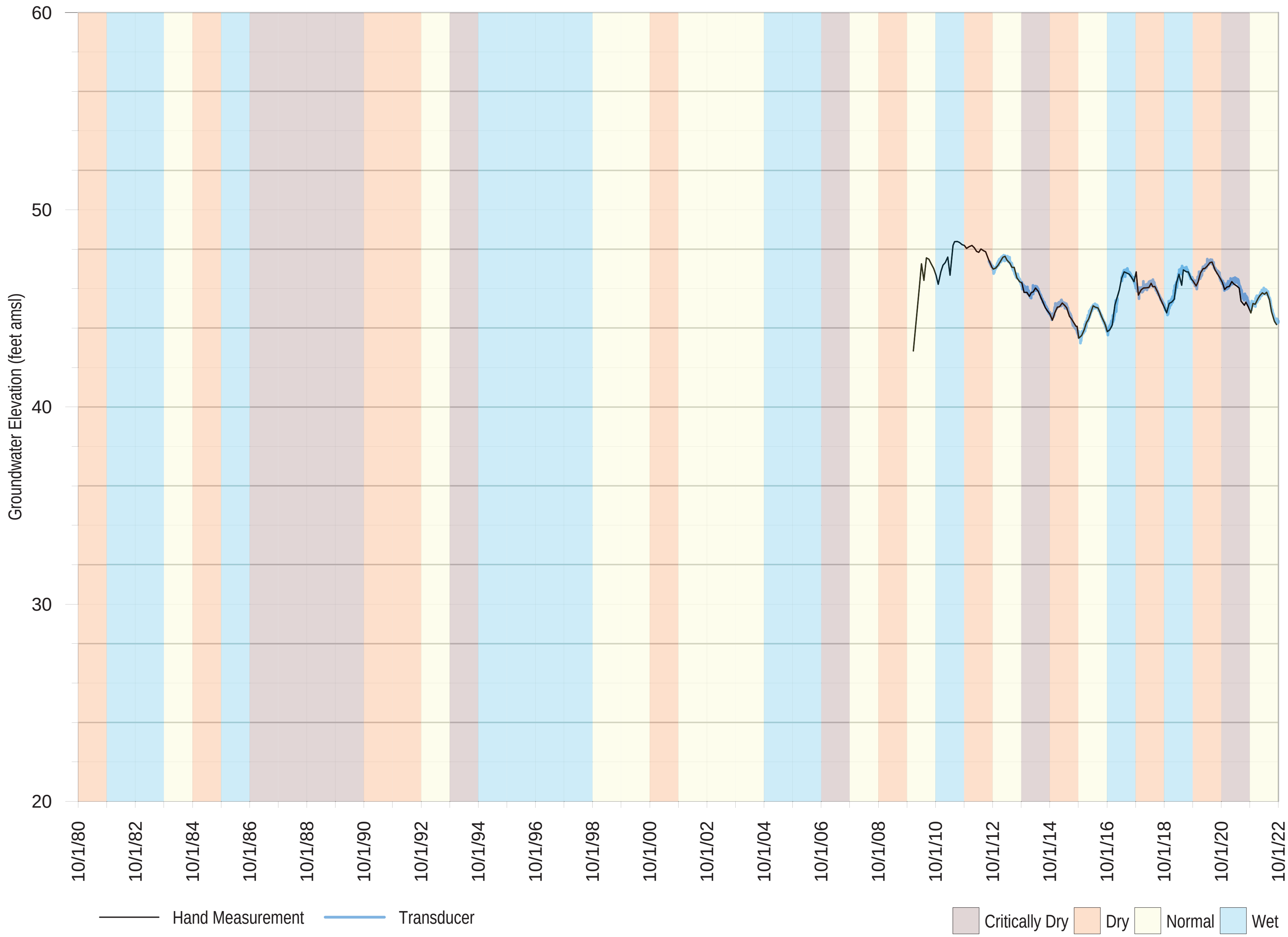
FIGURE A-48



Appendix A

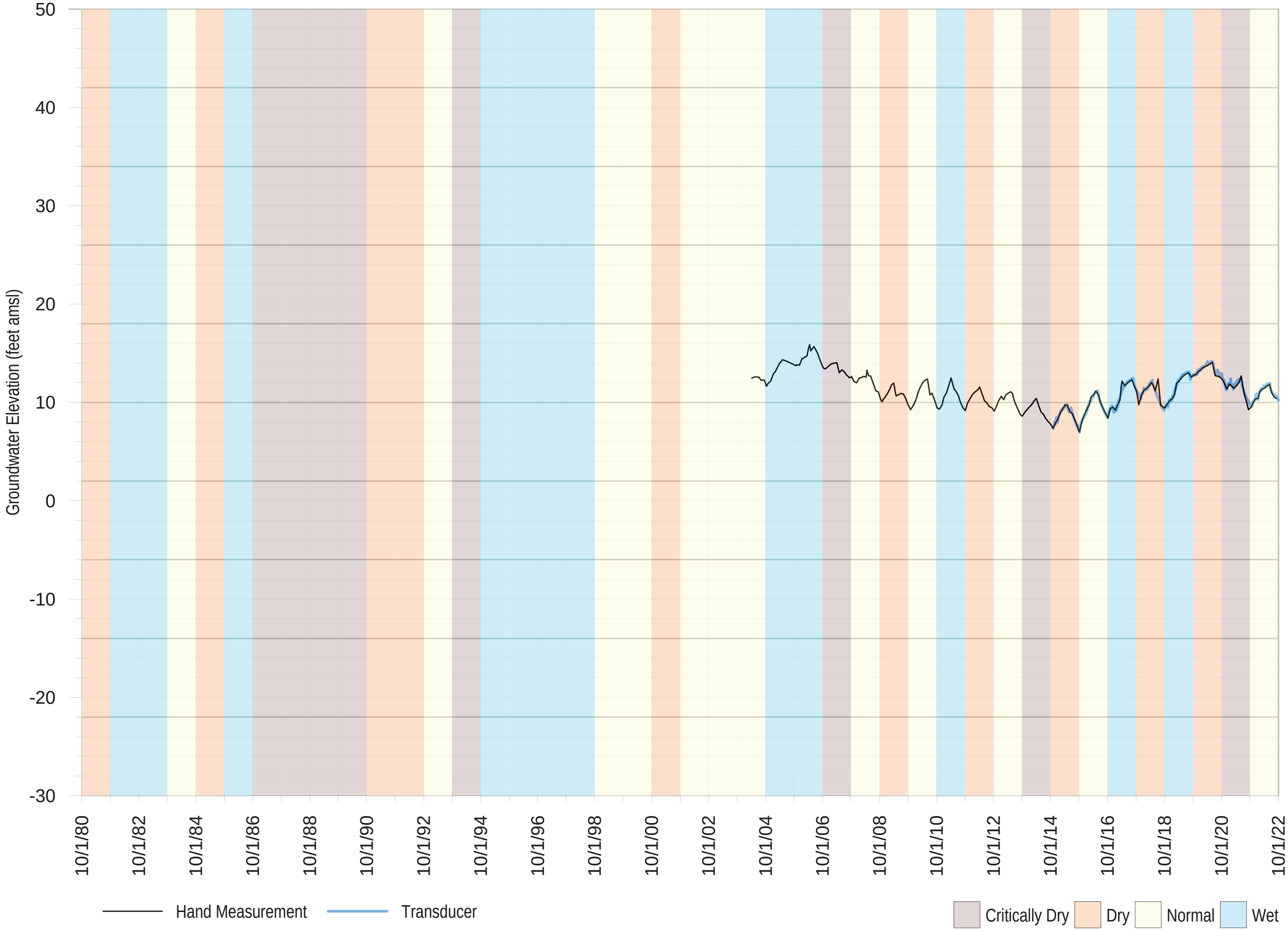
Coffee Lane Deep
Aquifer Screened: Purisima AA

FIGURE A-49



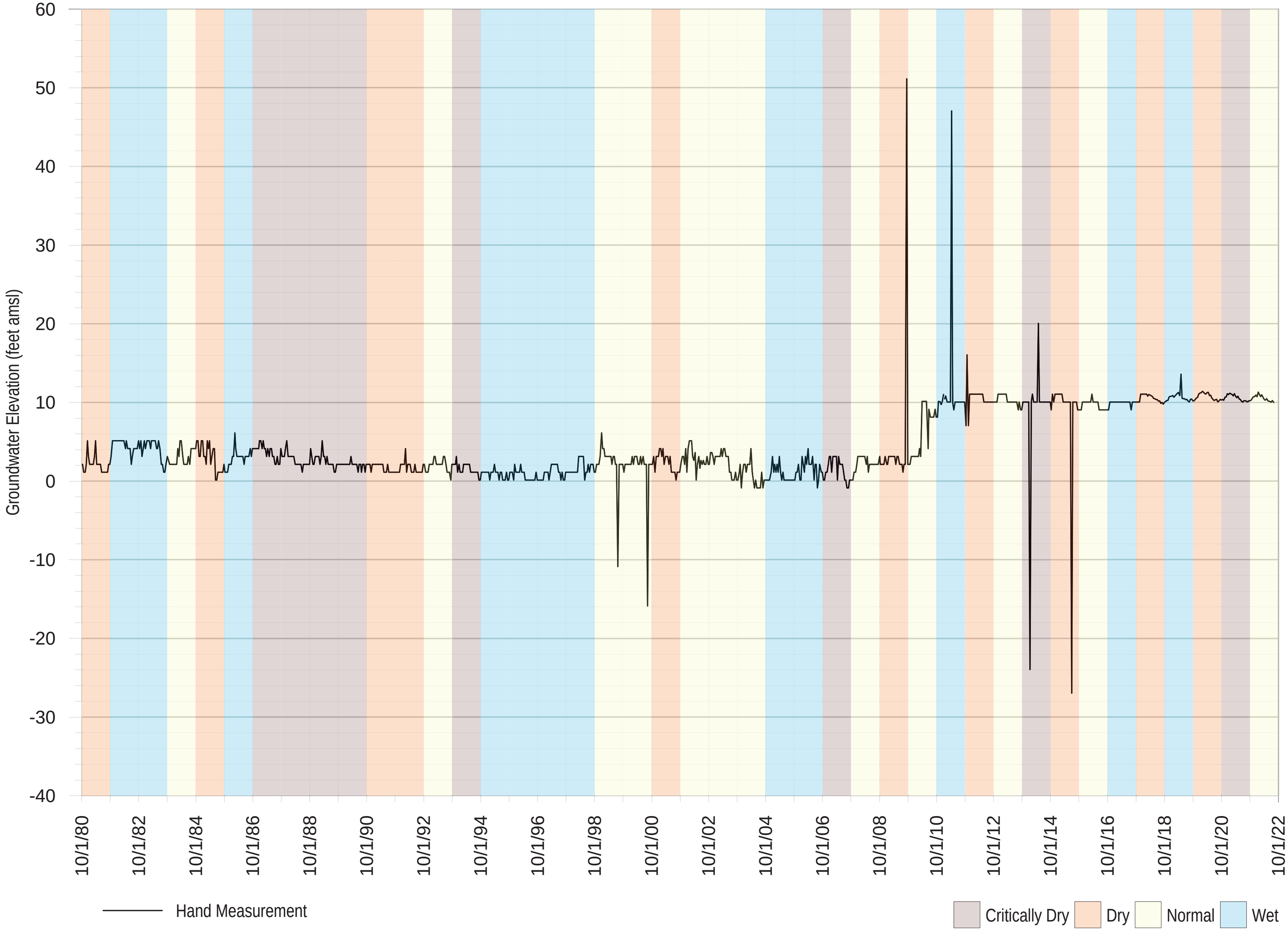
Corcoran Deep
Aquifer Screened: Purisima AA

FIGURE A-50



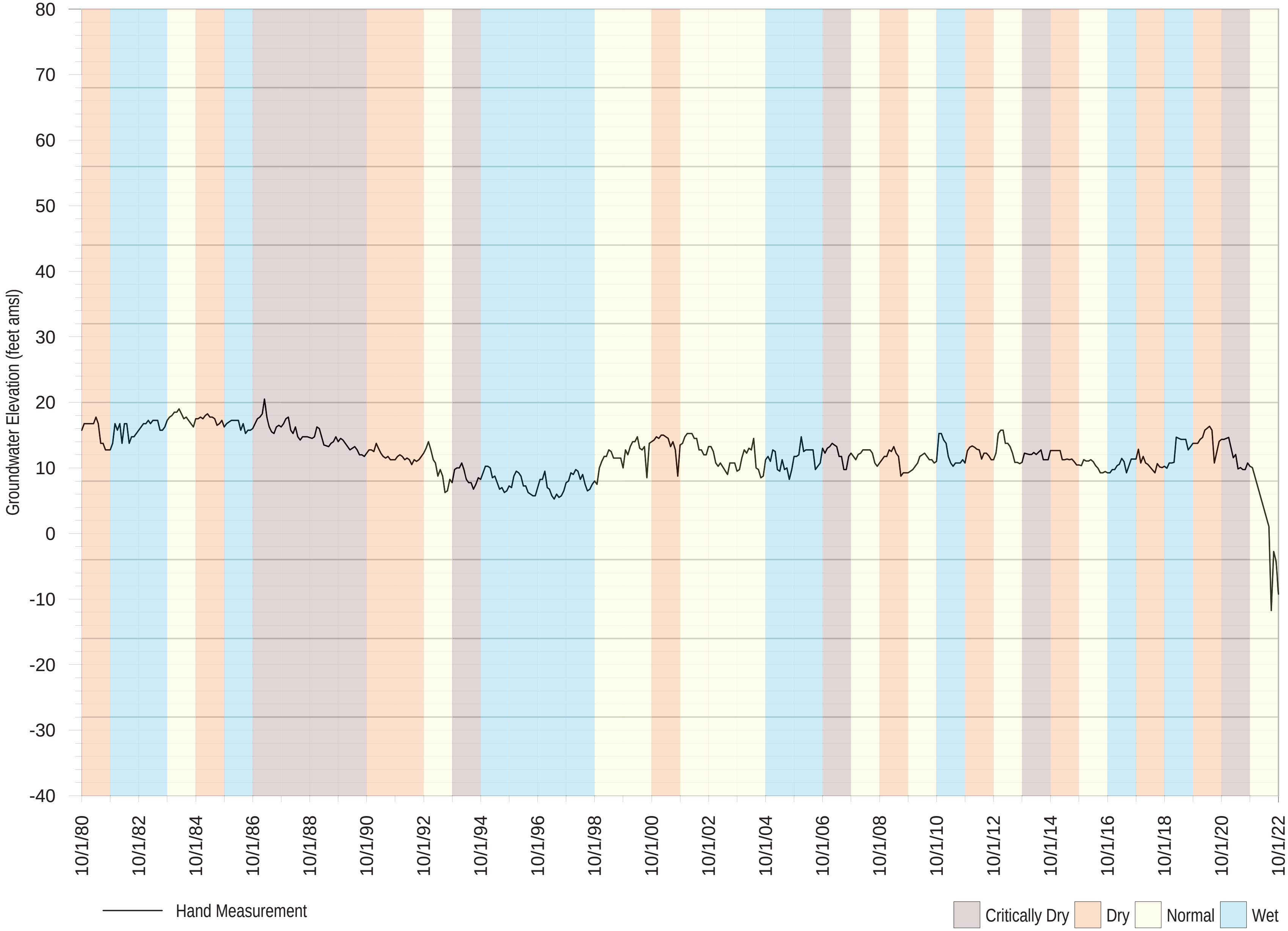
Country Club PW
Aquifer Screened: Aromas/ Purisima F

FIGURE A-51



CWD-10 PW
Aquifer Screened: Aromas

FIGURE A-52

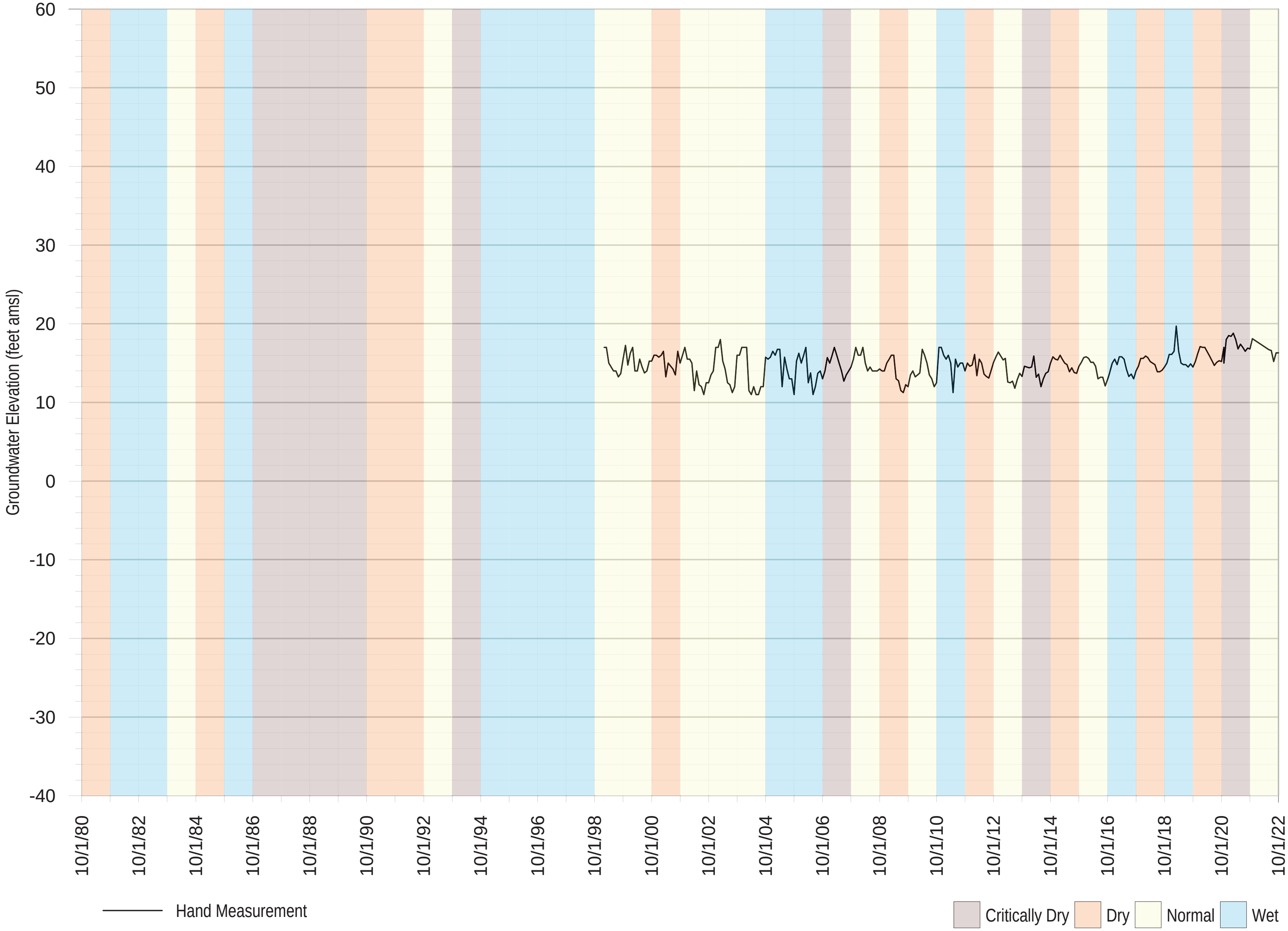


Appendix A

CWD-12 PW

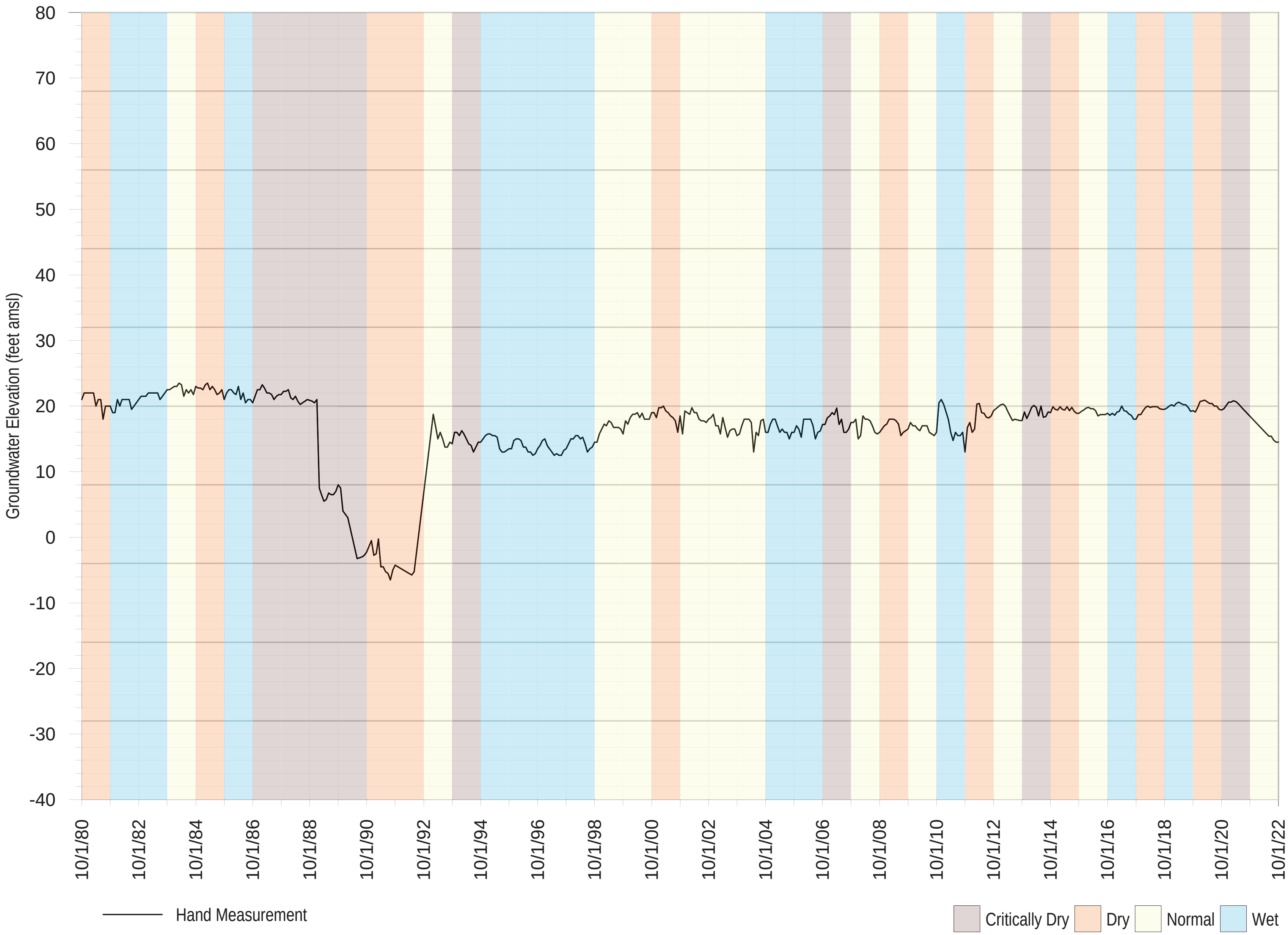
Aquifer Screened: Aromas/ Purisima F

FIGURE A-53



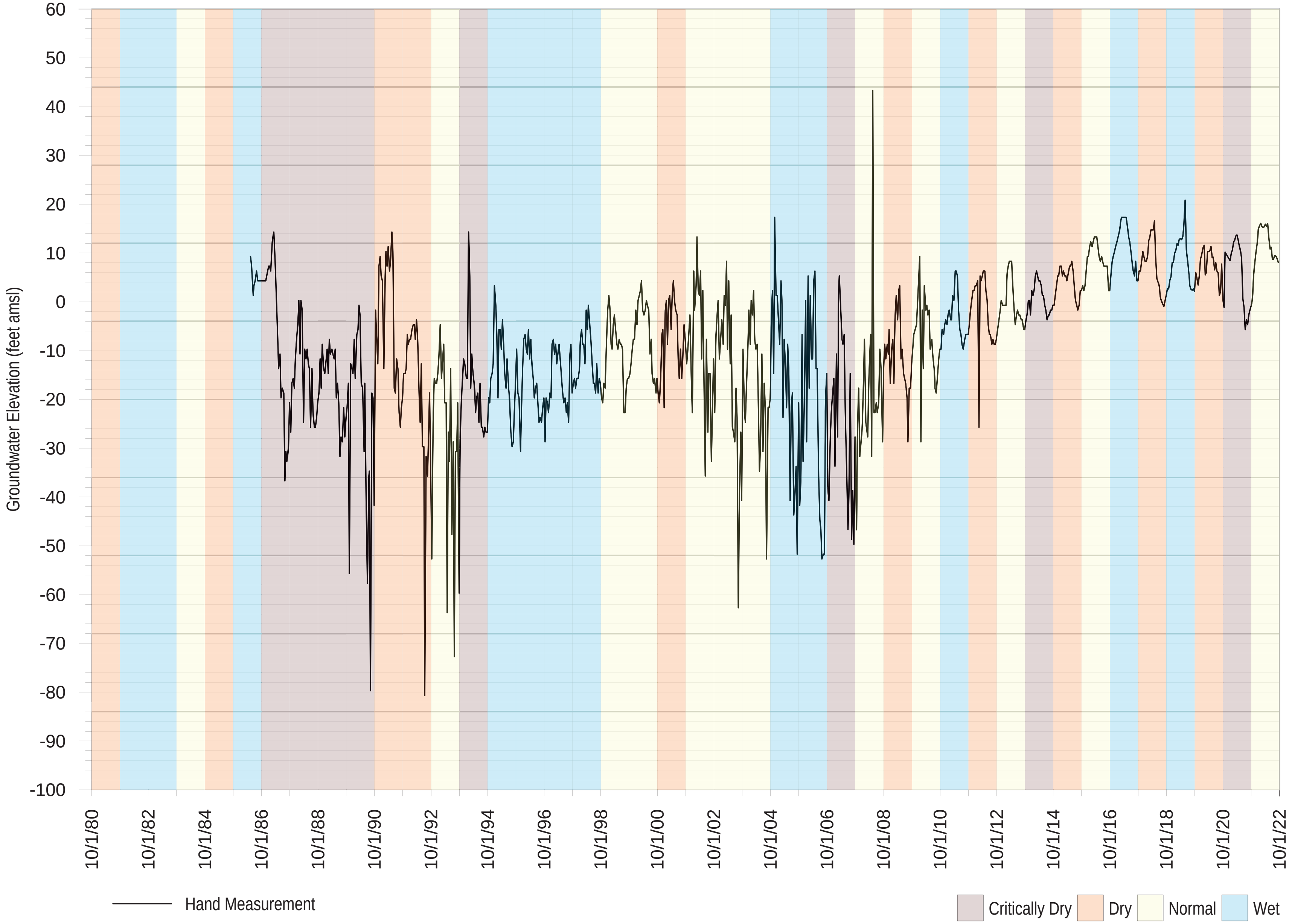
CWD-4 PW
Aquifer Screened: Aromas/ Purisima F

FIGURE A-54



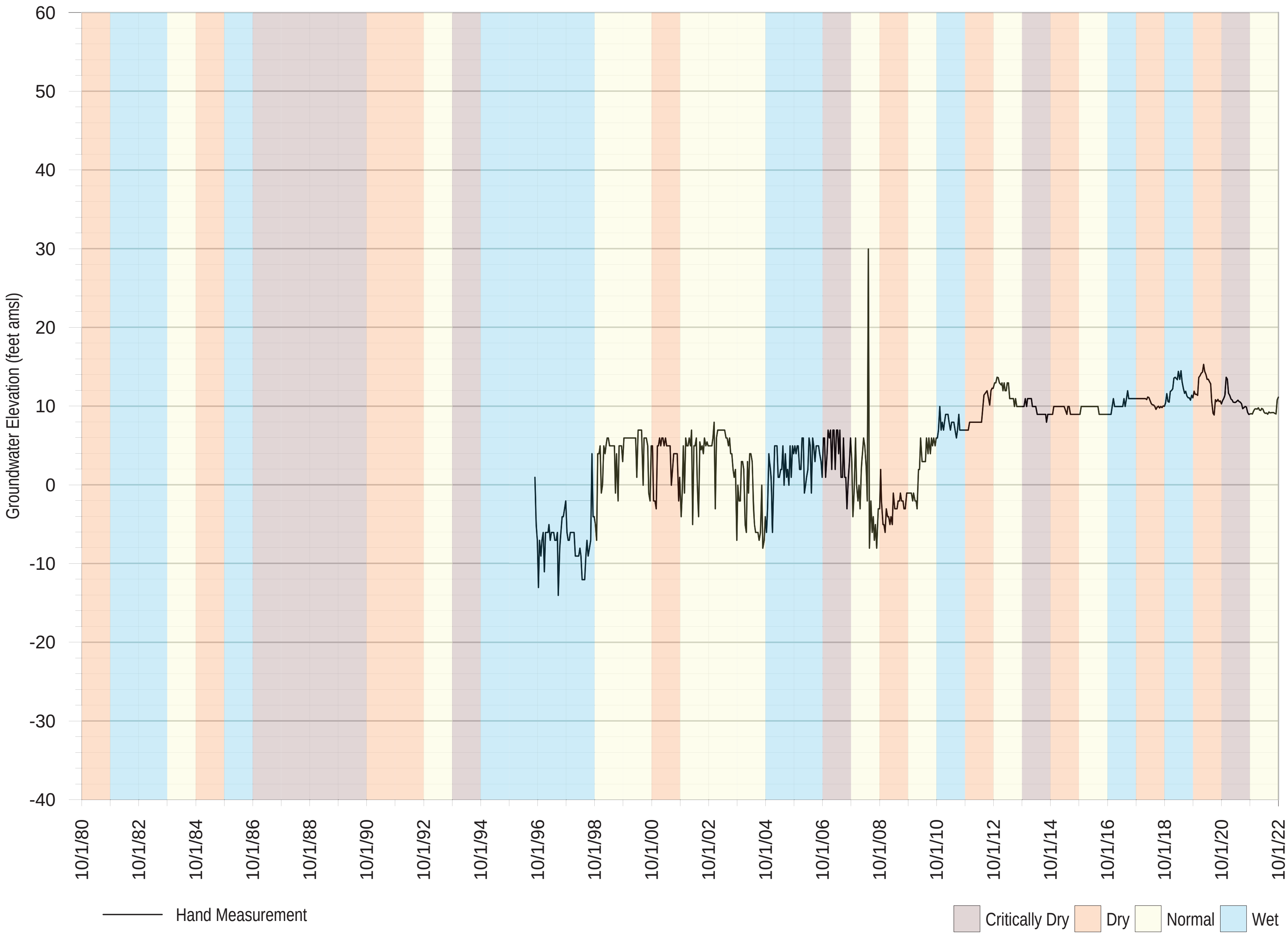
Estates
Aquifer Screened: Purisima A

FIGURE A-55



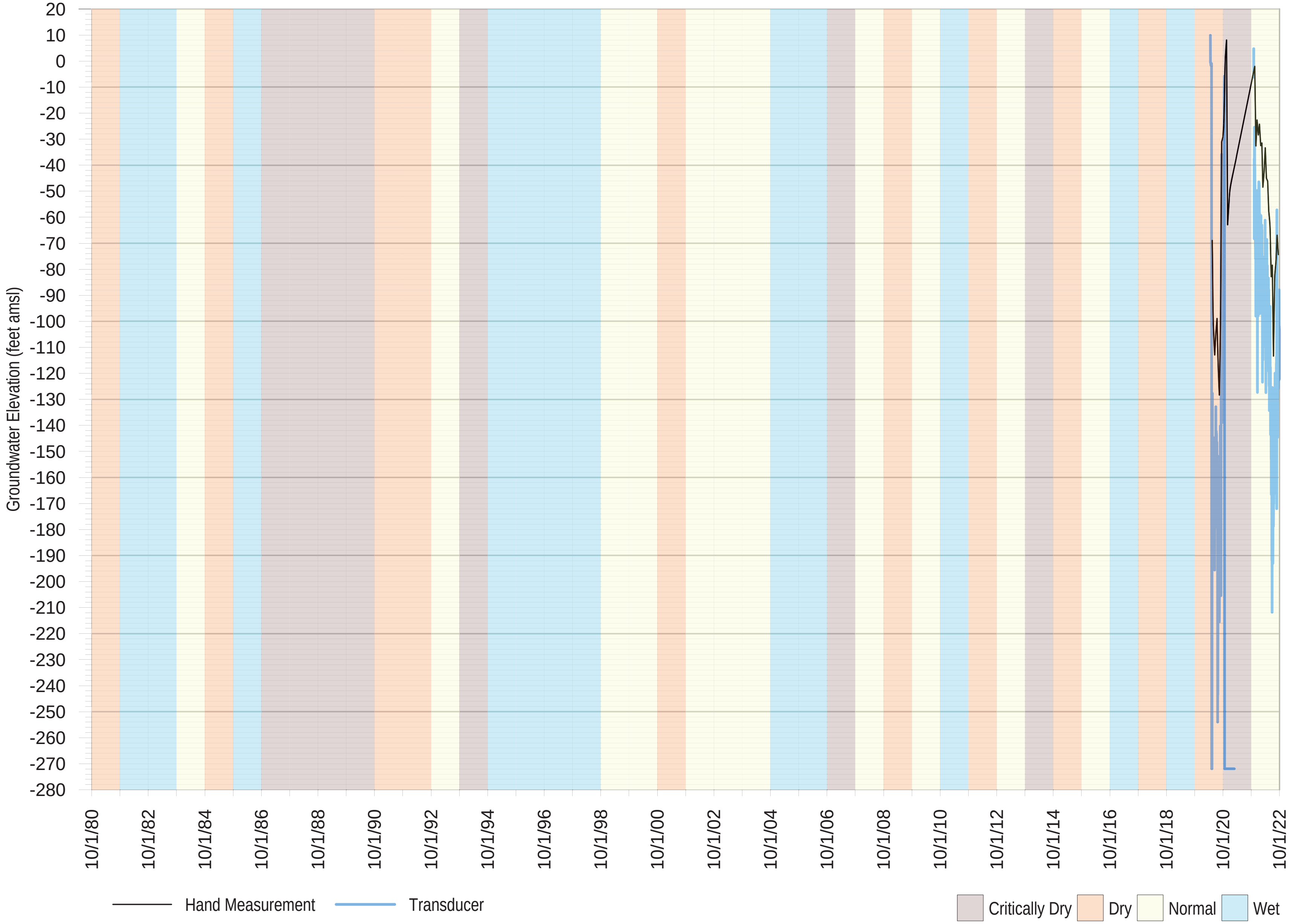
Garnet
Aquifer Screened: Purisima A

FIGURE A-56



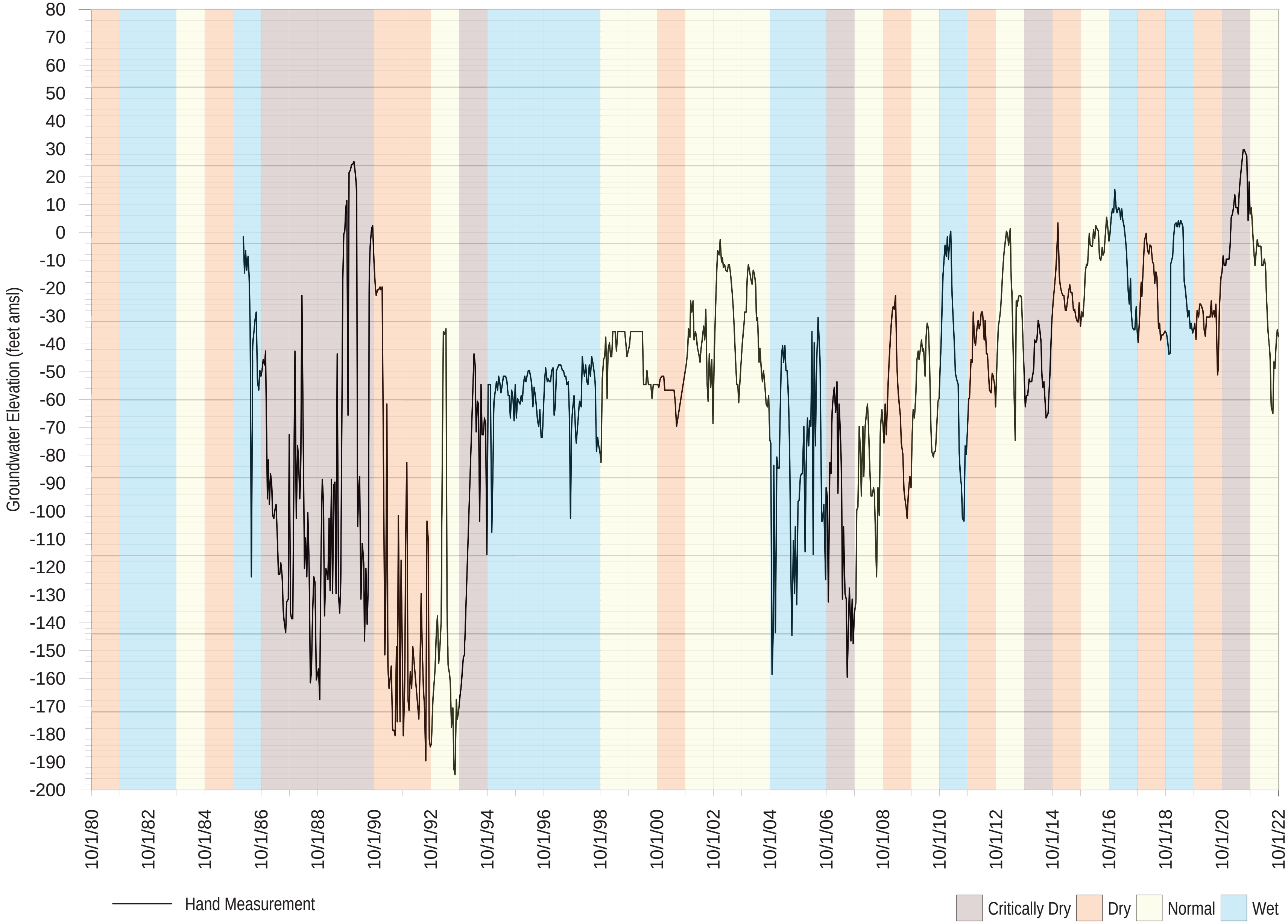
Granite Way PW
Aquifer Screened: Purisima DEF

FIGURE A-57



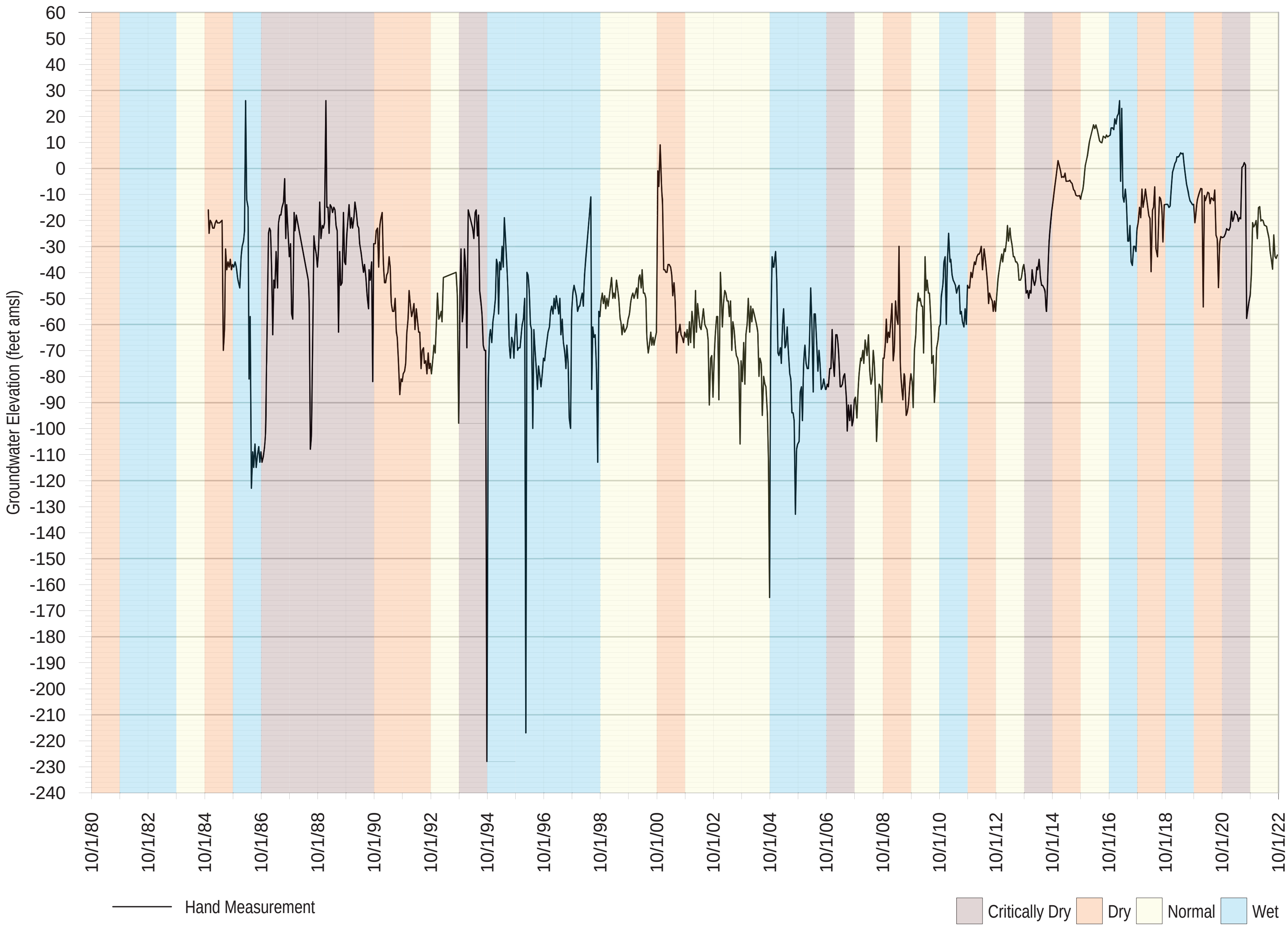
Ledyard
Aquifer Screened: Purisima BC

FIGURE A-58



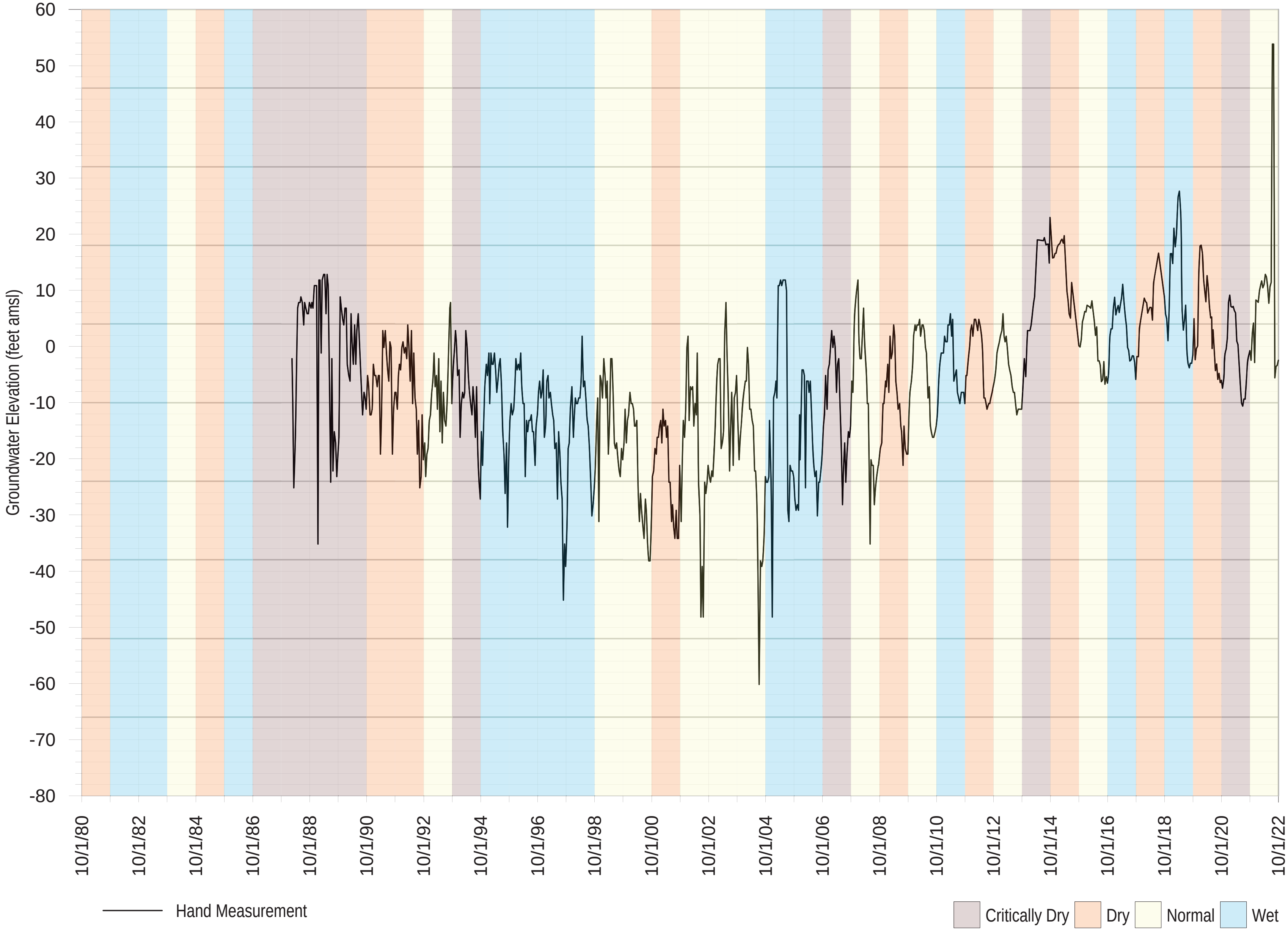
Madeline PW
Aquifer Screened: Purisima BC

FIGURE A-59



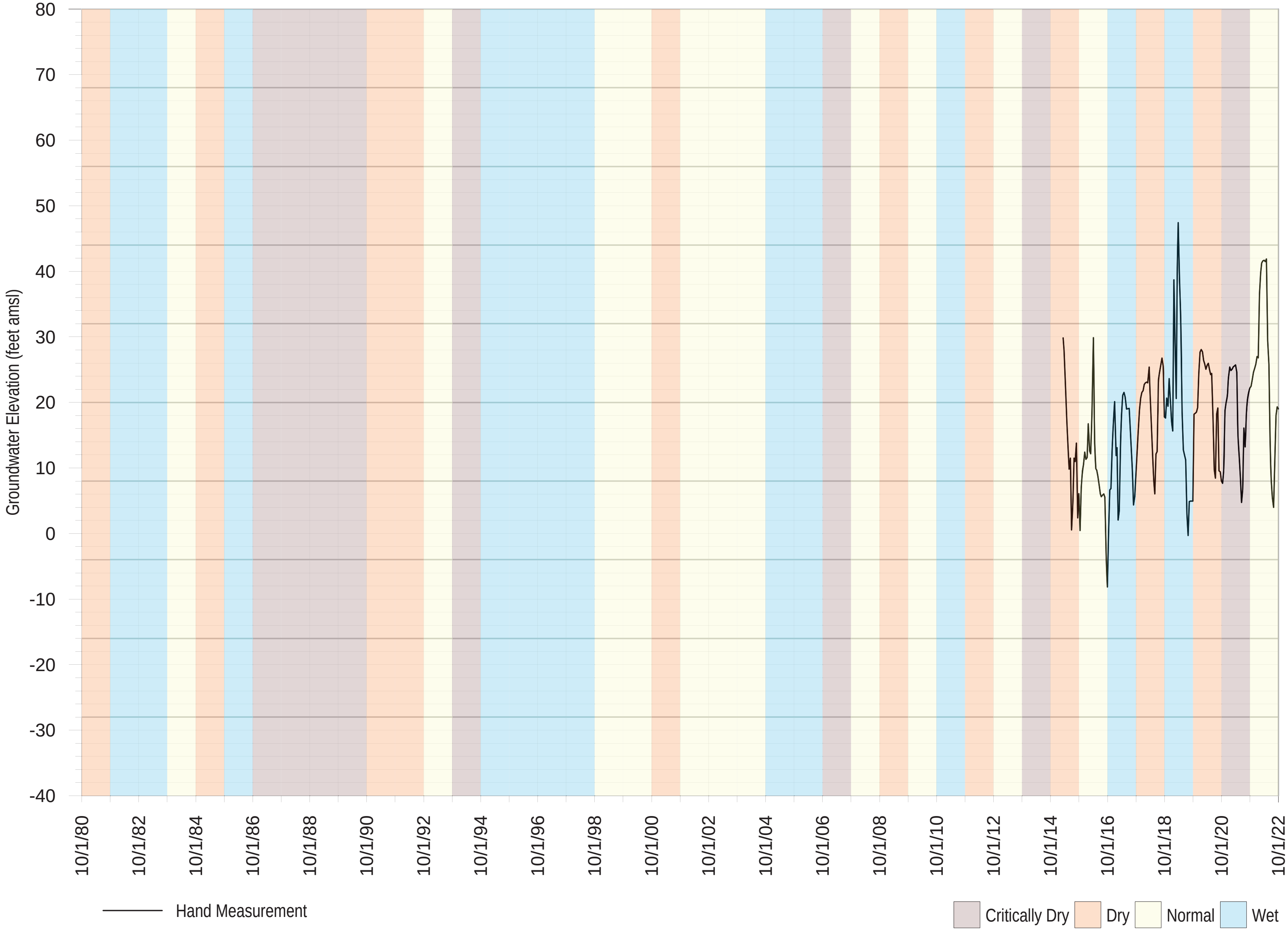
Main Street PW
Aquifer Screened: Purisima A

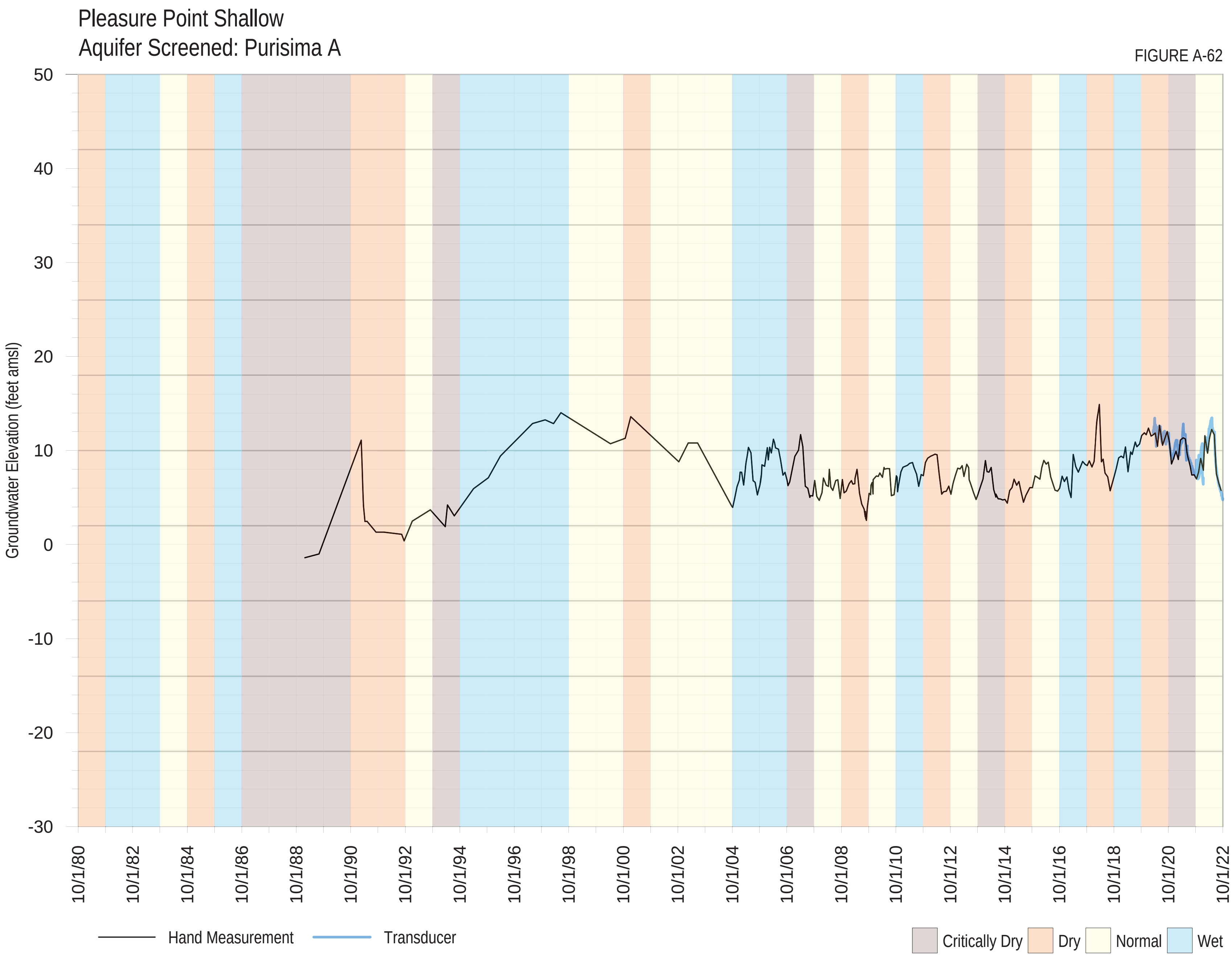
FIGURE A-60



O'Neill Ranch PW
Aquifer Screened: Purisima AA/Tu

FIGURE A-61

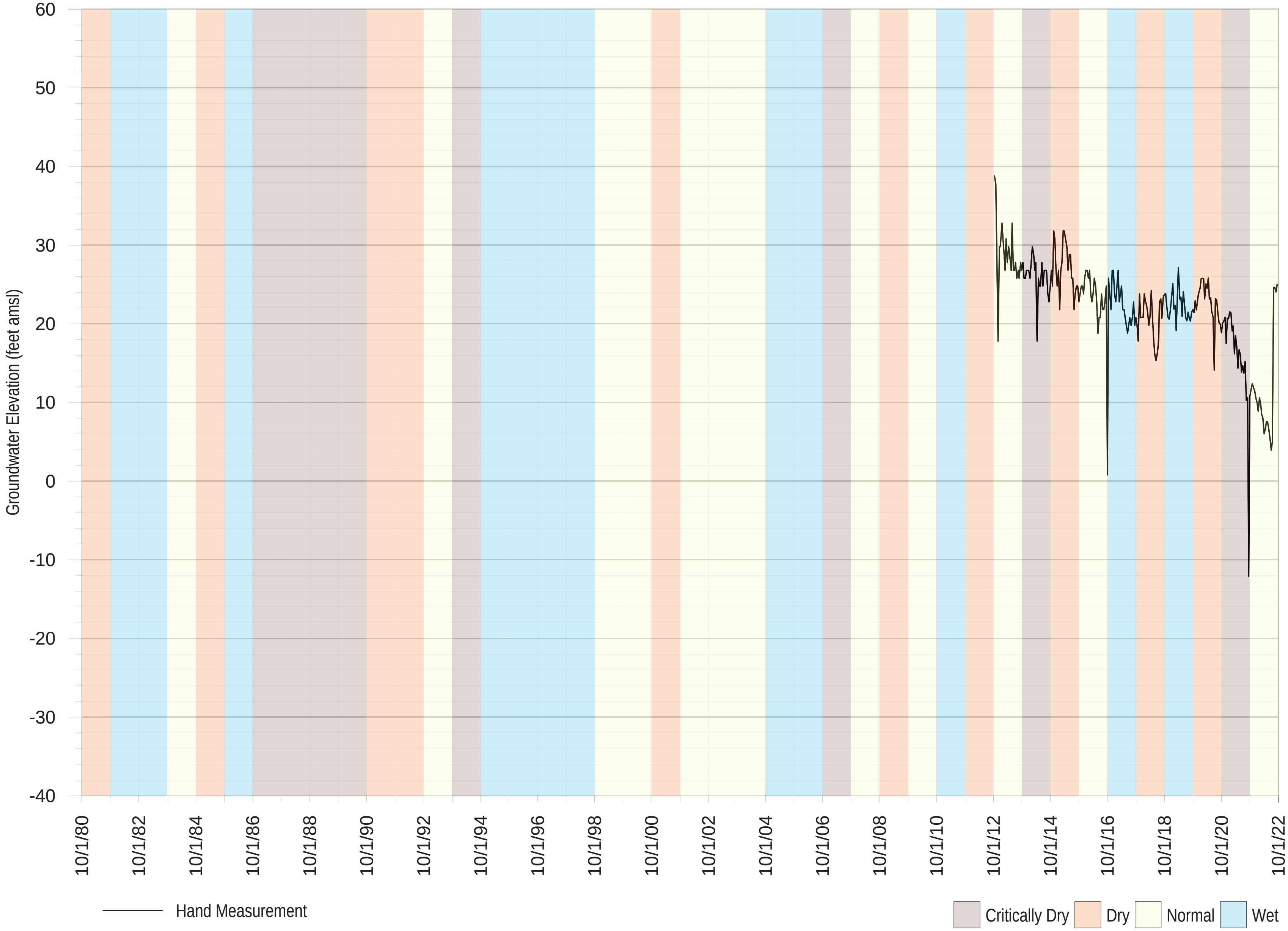



Pleasure Point Shallow
Aquifer Screened: Purisima A
FIGURE A-62
Groundwater Elevation (feet amsl)
50
40
30
20
10
0
-10
-20
-30
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Hand Measurement
Transducer
Critically Dry
Dry
Normal
Wet

Appendix A

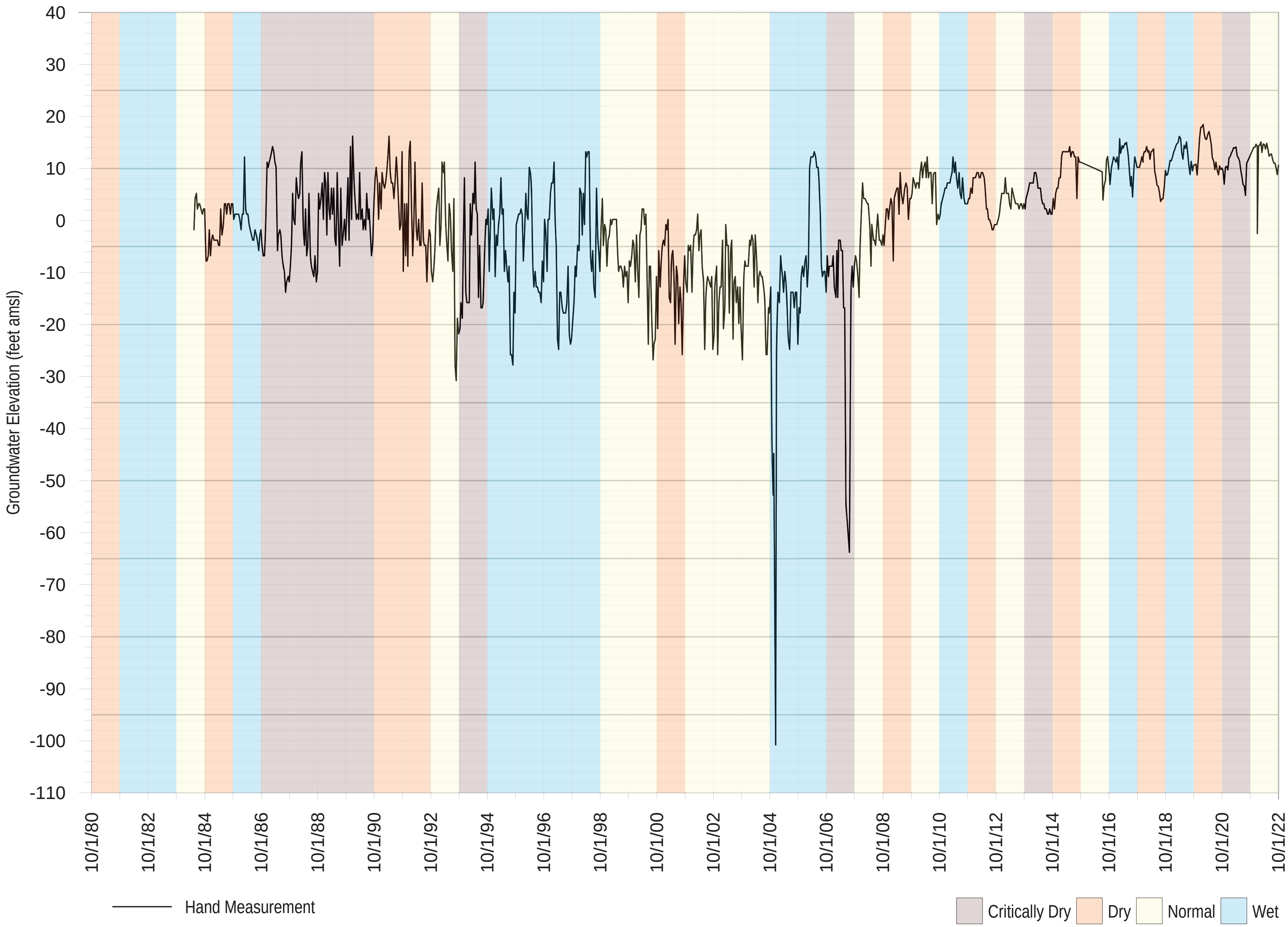
Polo Grounds PW
Aquifer Screened: Aromas/ Purisima F

FIGURE A-63



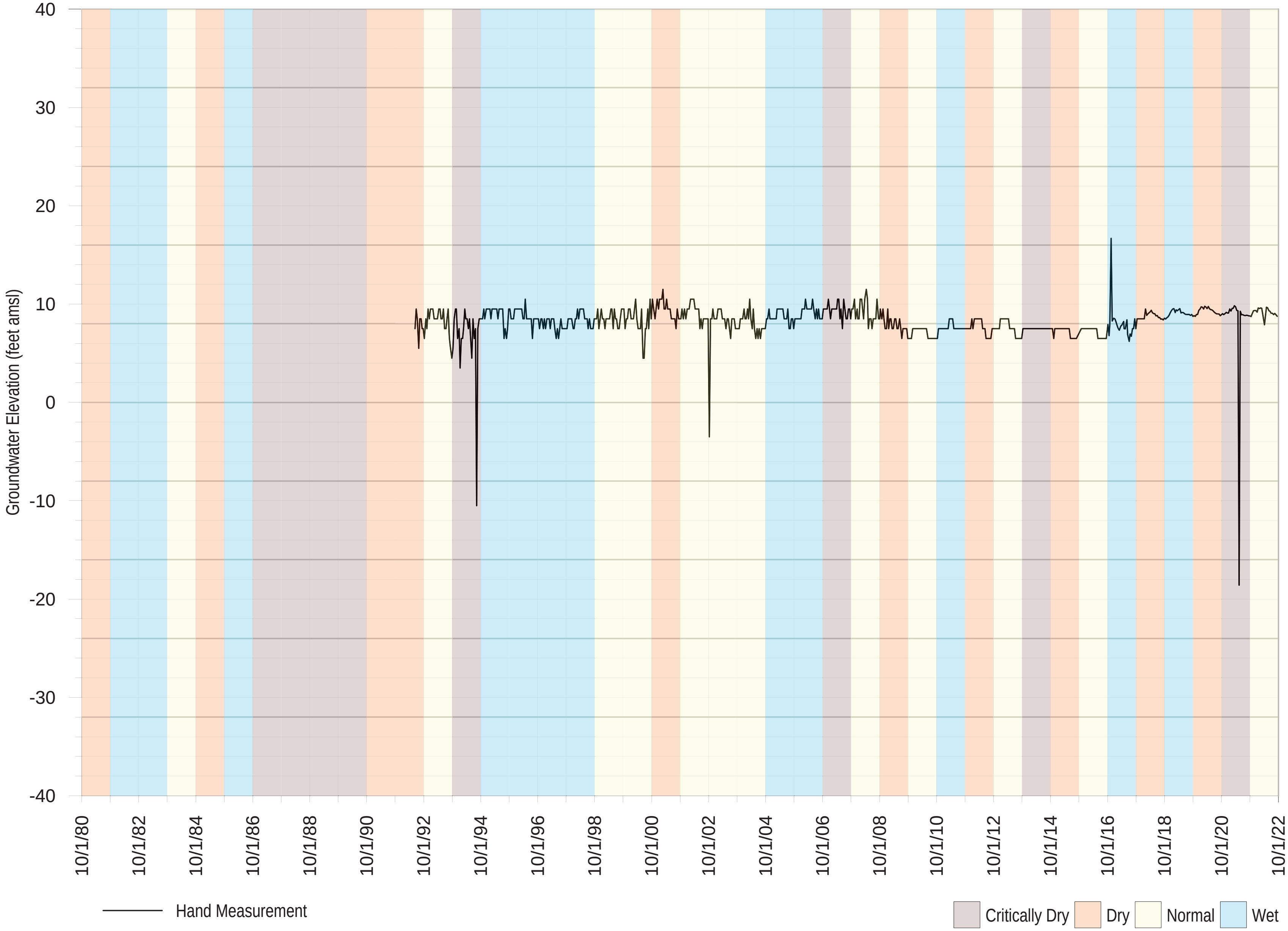
Rosedale PW
Aquifer Screened: Purisima A

FIGURE A-64



San Andreas PW
Aquifer Screened: Aromas/ Purisima F

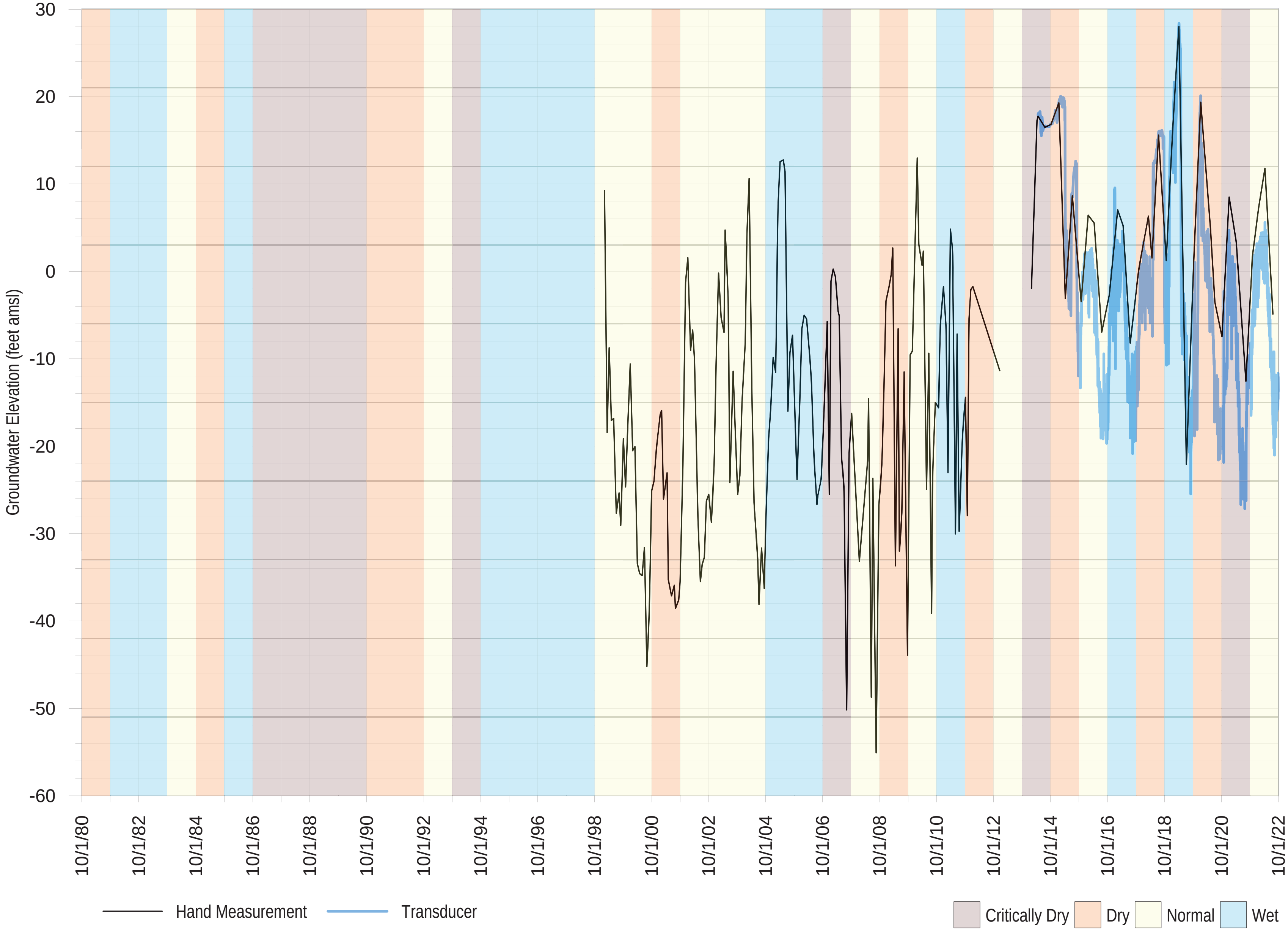
FIGURE A-65



Appendix A

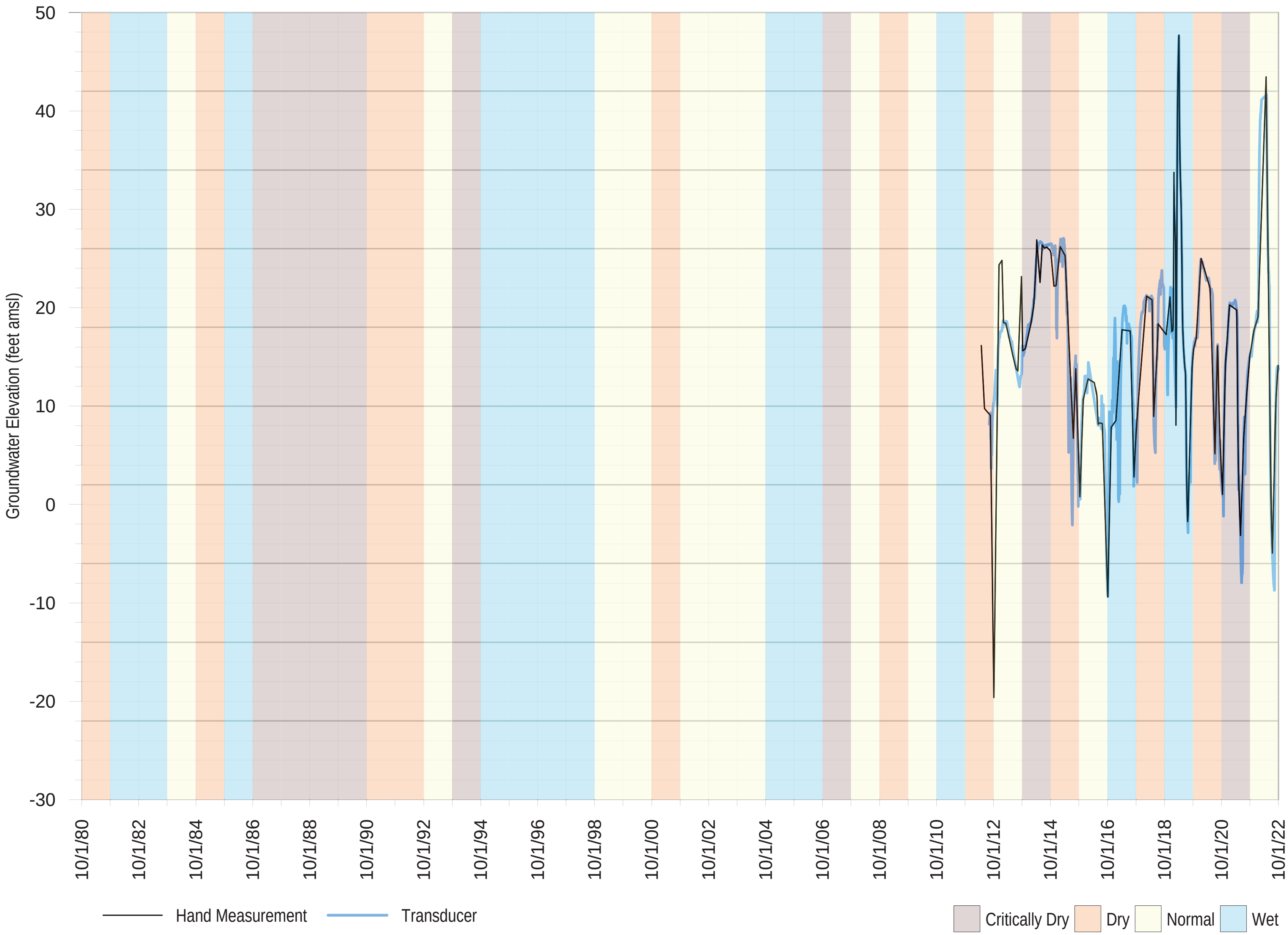
SC-18AA & SC-18RAA at Main Street
Aquifer Screened: Tu

FIGURE A-66



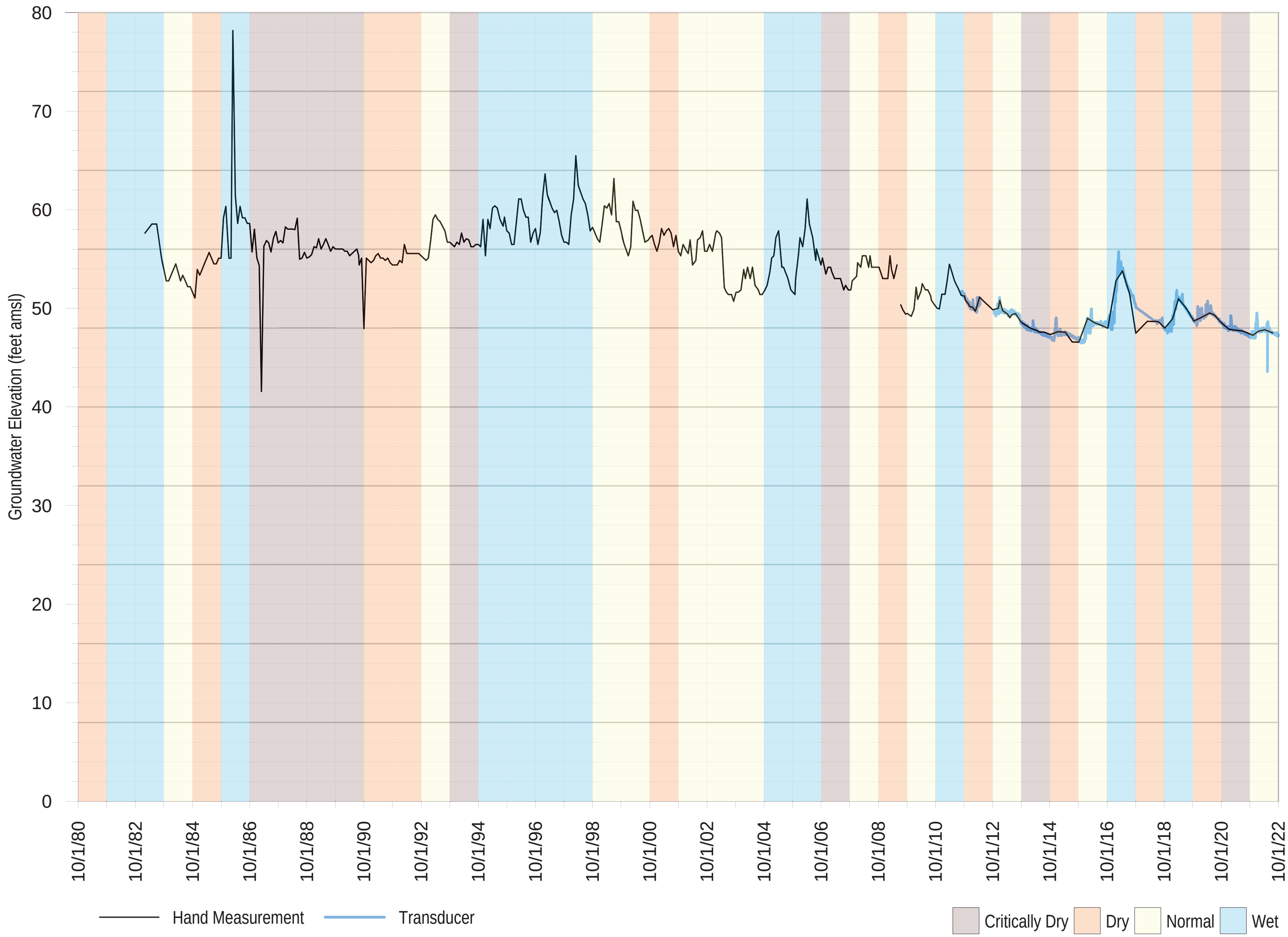
SC-22AAA at 41st Ave
Aquifer Screened: Purisima AA

FIGURE A-67



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

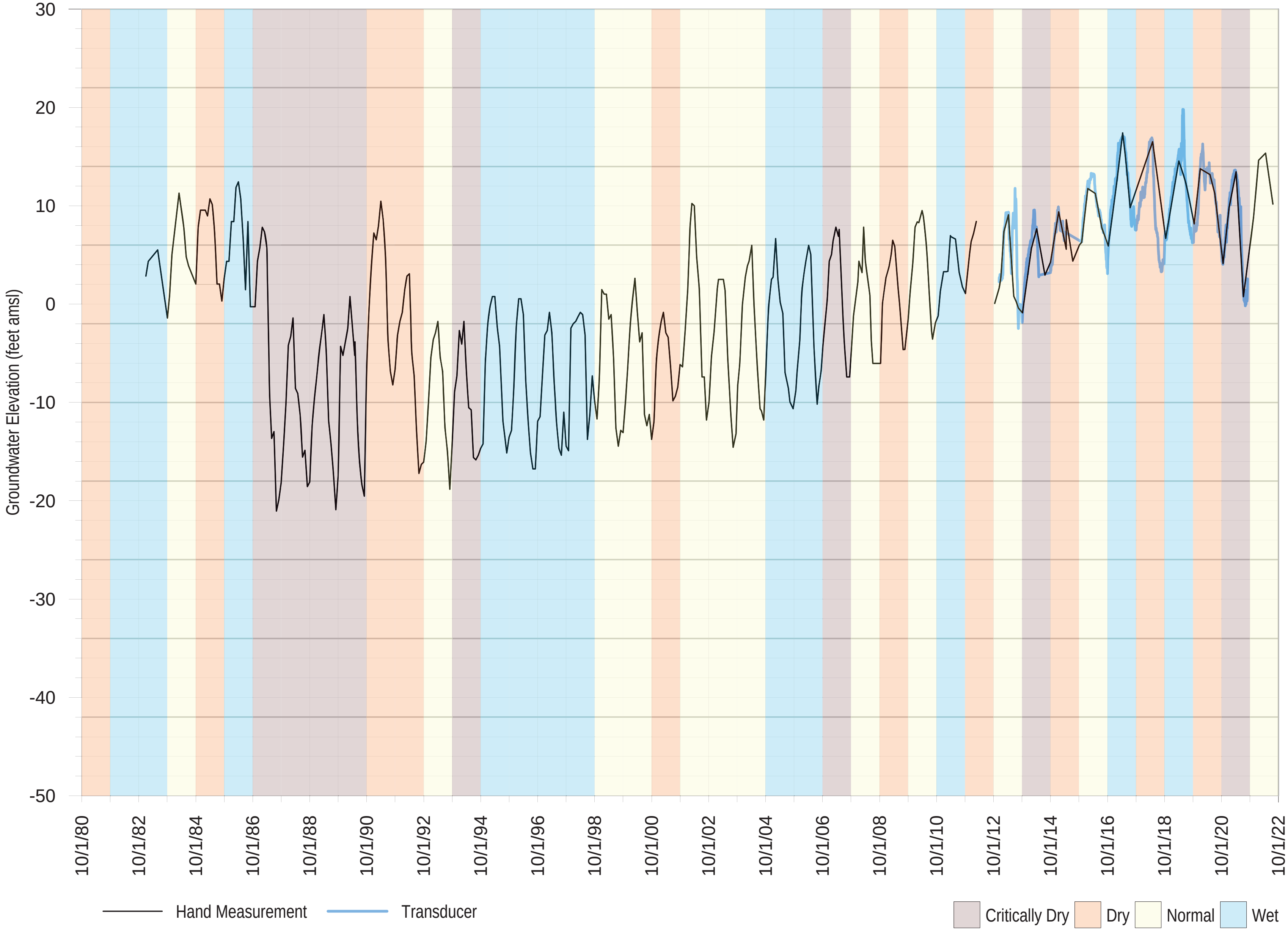
FIGURE A-68



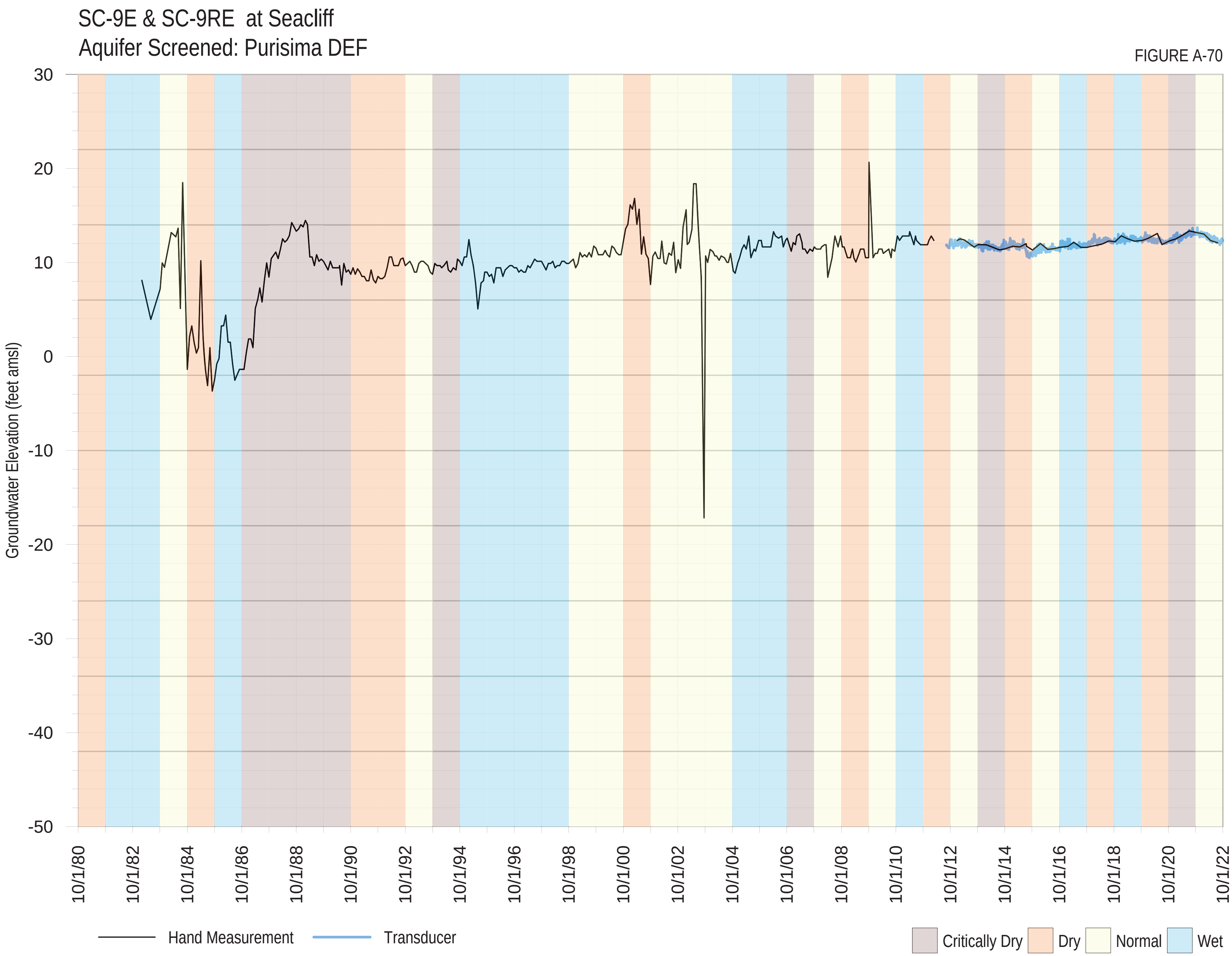
Appendix A

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

FIGURE A-69



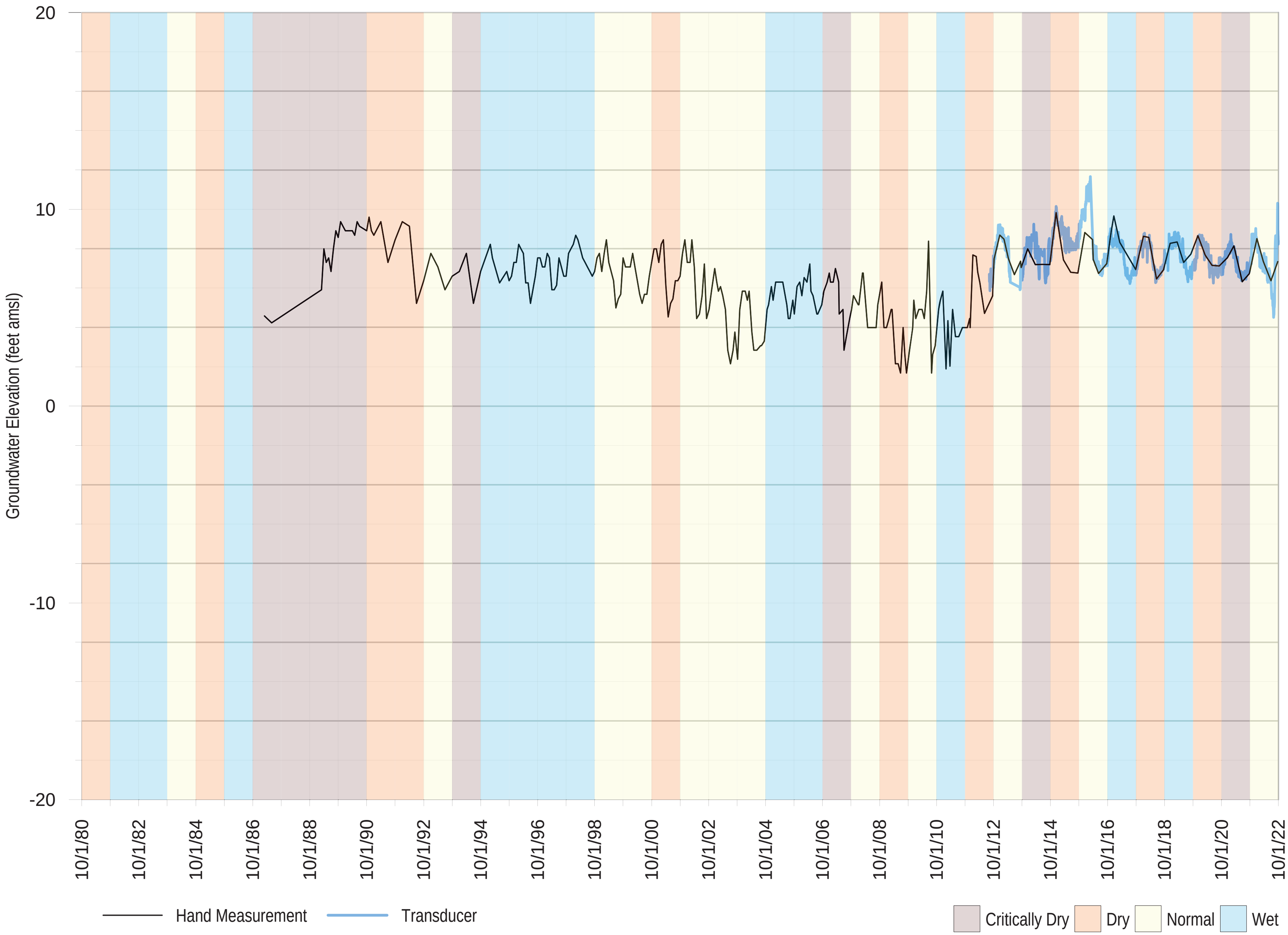
Appendix A



SC-9E & SC-9RE at Seacliff
Aquifer Screened: Purisima DEF
FIGURE A-70
Groundwater Elevation (feet amsl)
30
20
10
0
-10
-20
-30
-40
-50
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
Hand Measurement
Transducer
Critically Dry
Dry
Normal
Wet

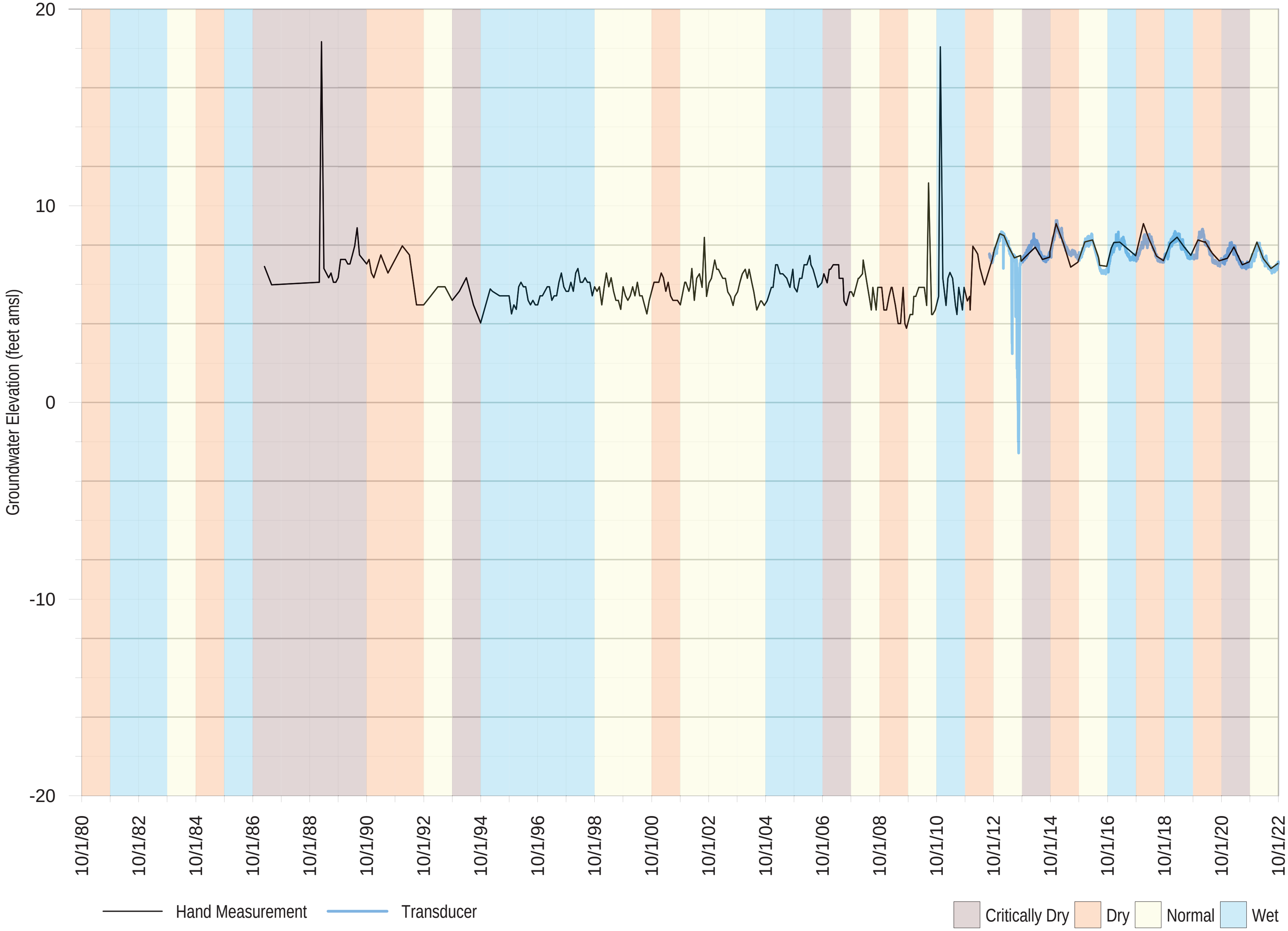
SC-A1A at Cliff Drive
Aquifer Screened: Purisima DEF

FIGURE A-71



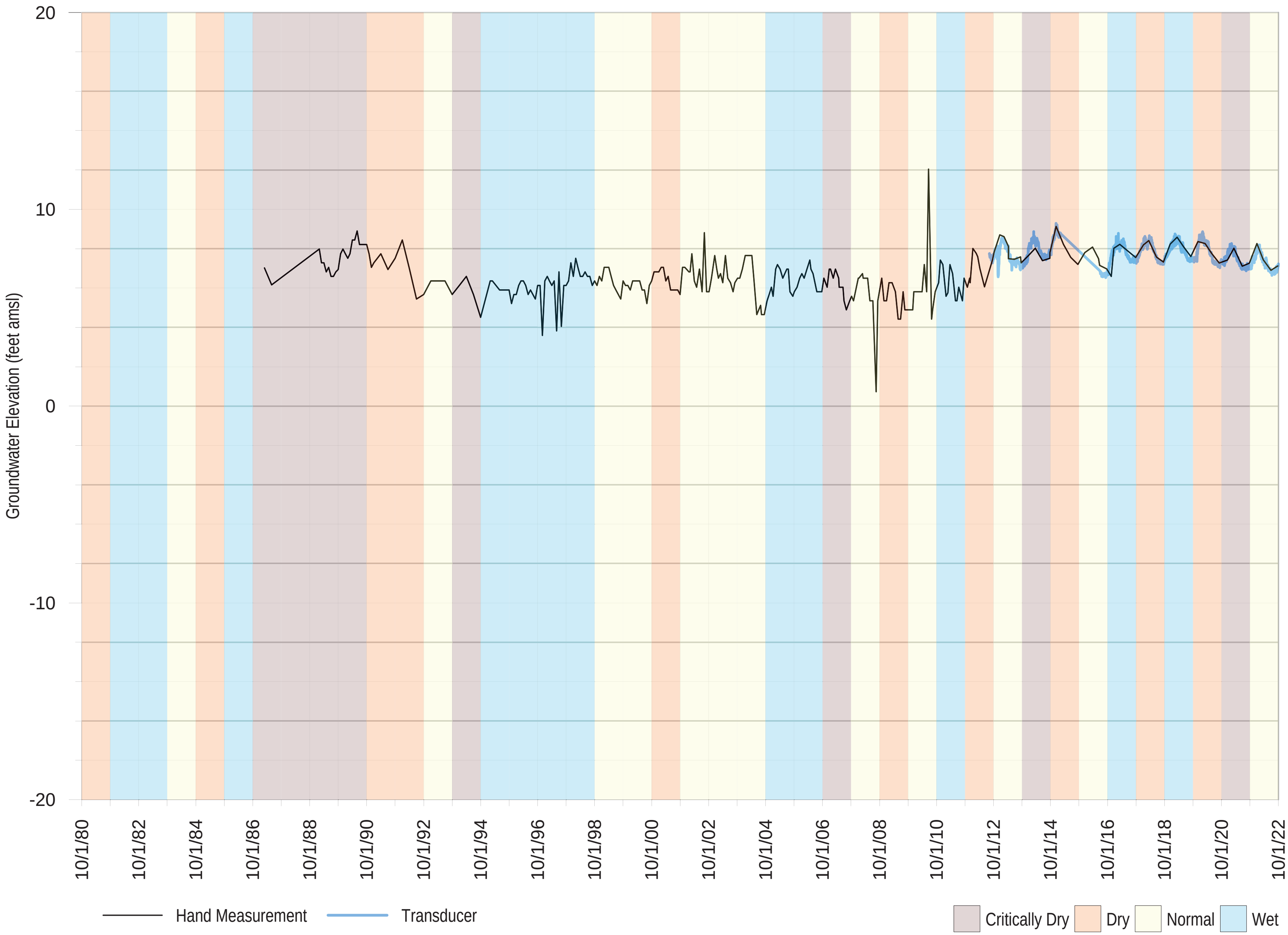
SC-A1C at Cliff Drive
Aquifer Screened: Aromas

FIGURE A-72

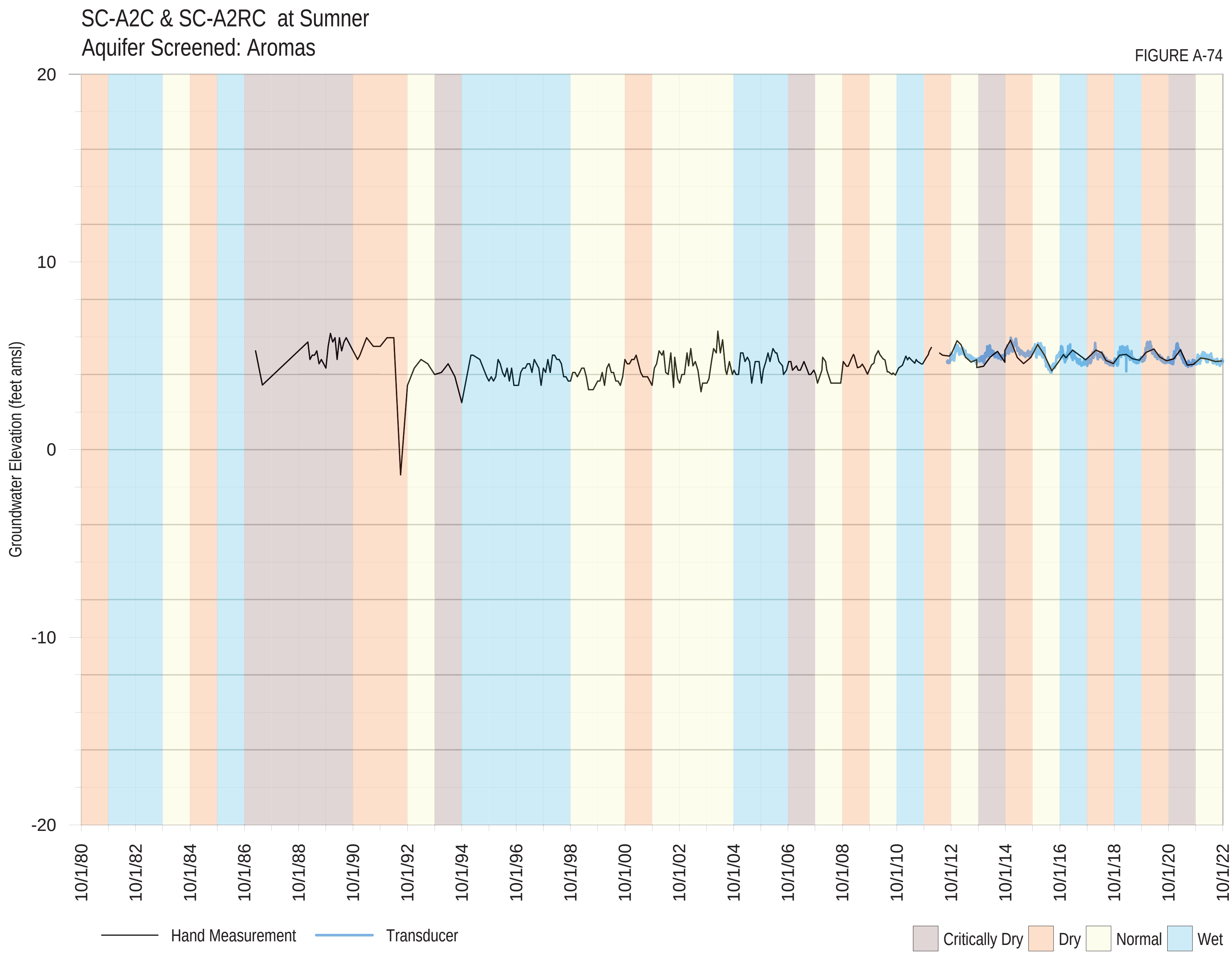


SC-A1D at Cliff Drive
Aquifer Screened: Aromas

FIGURE A-73



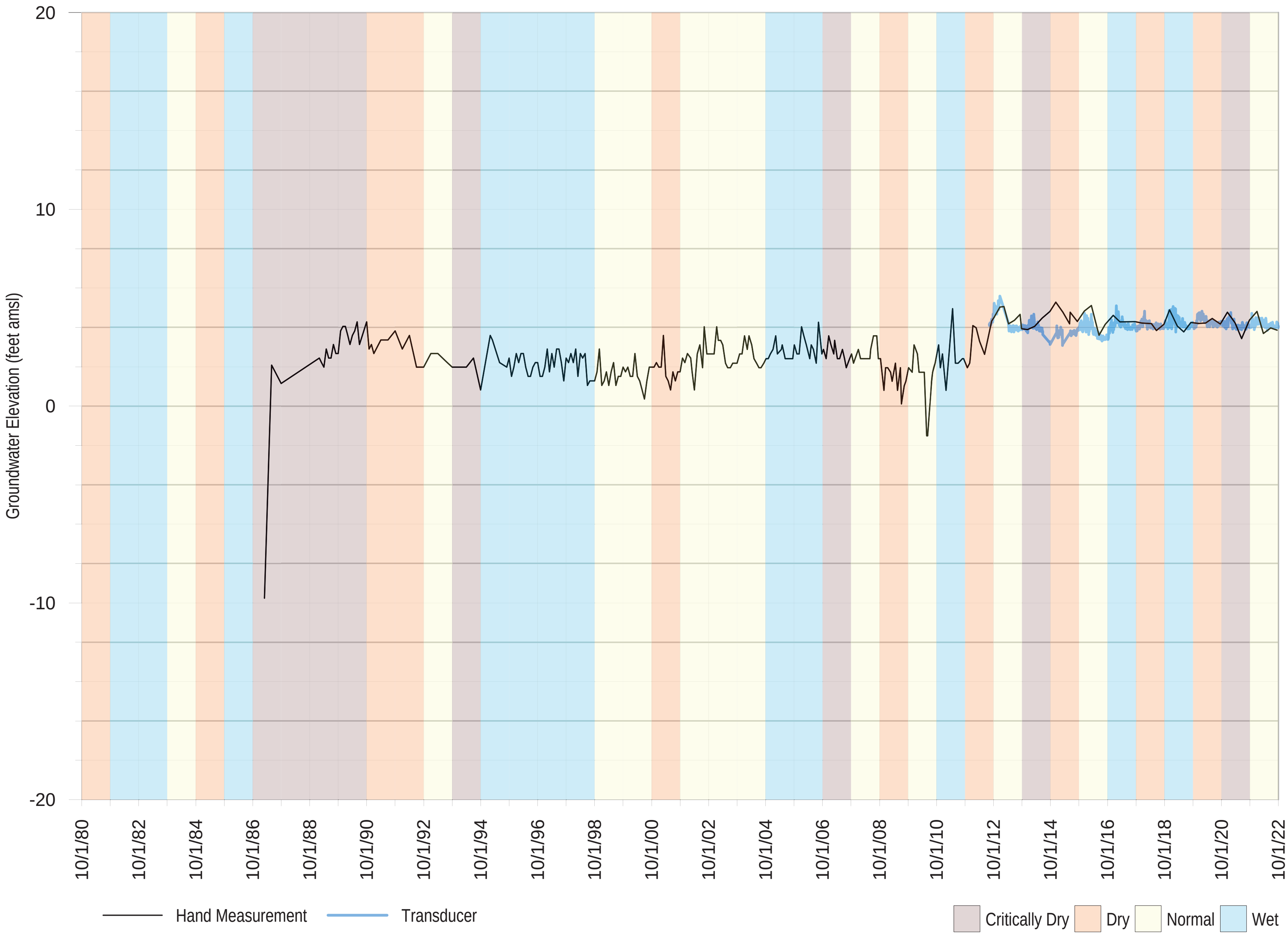
Appendix A



SC-A2C & SC-A2RC at Sumner
Aquifer Screened: Aromas
FIGURE A-74
Groundwater Elevation (feet amsl)
20
10
0
-10
-20
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
Hand Measurement
Transducer
Critically Dry
Dry
Normal
Wet

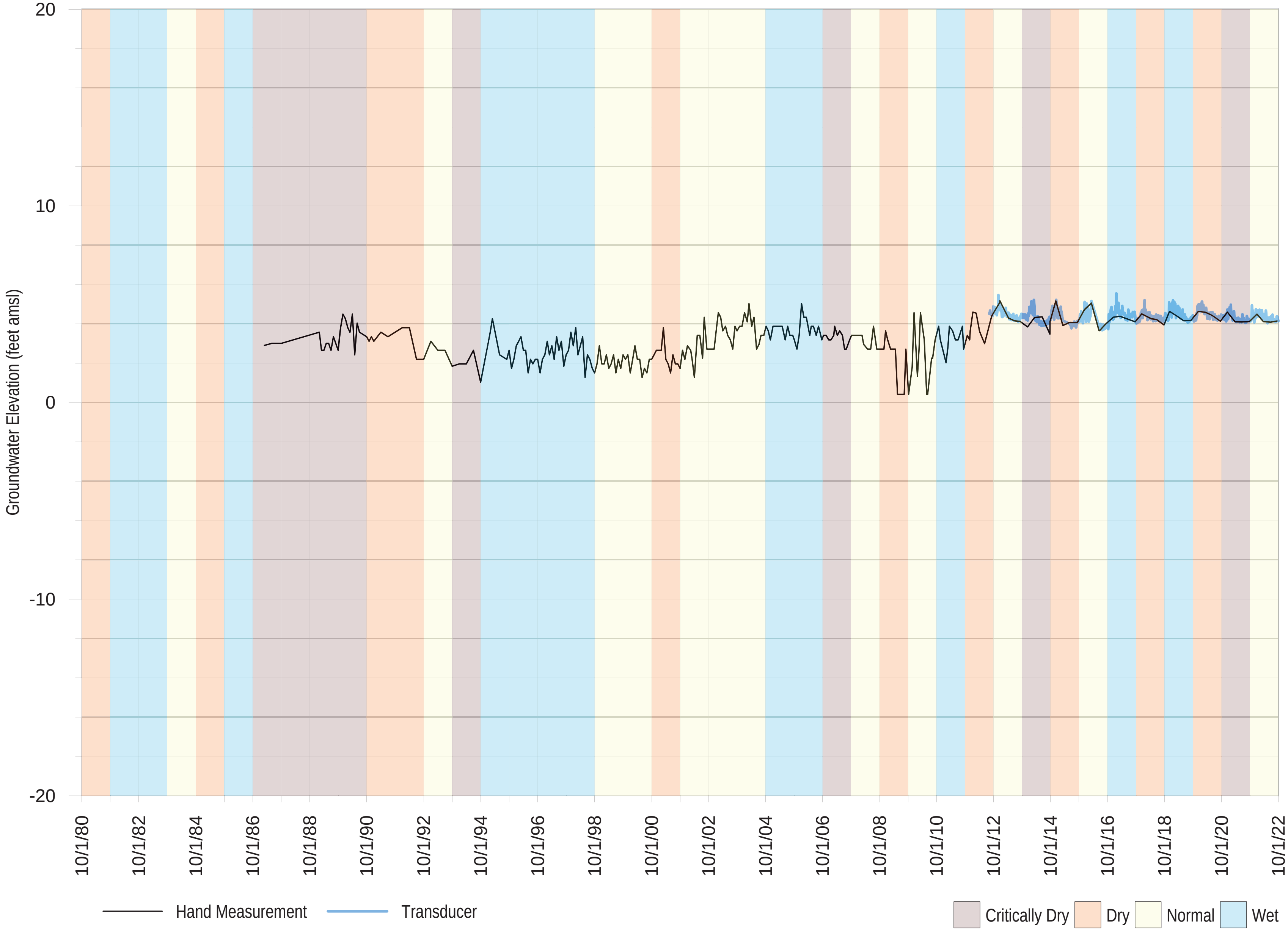
SC-A3B at Playa Vista
Aquifer Screened: Aromas

FIGURE A-75



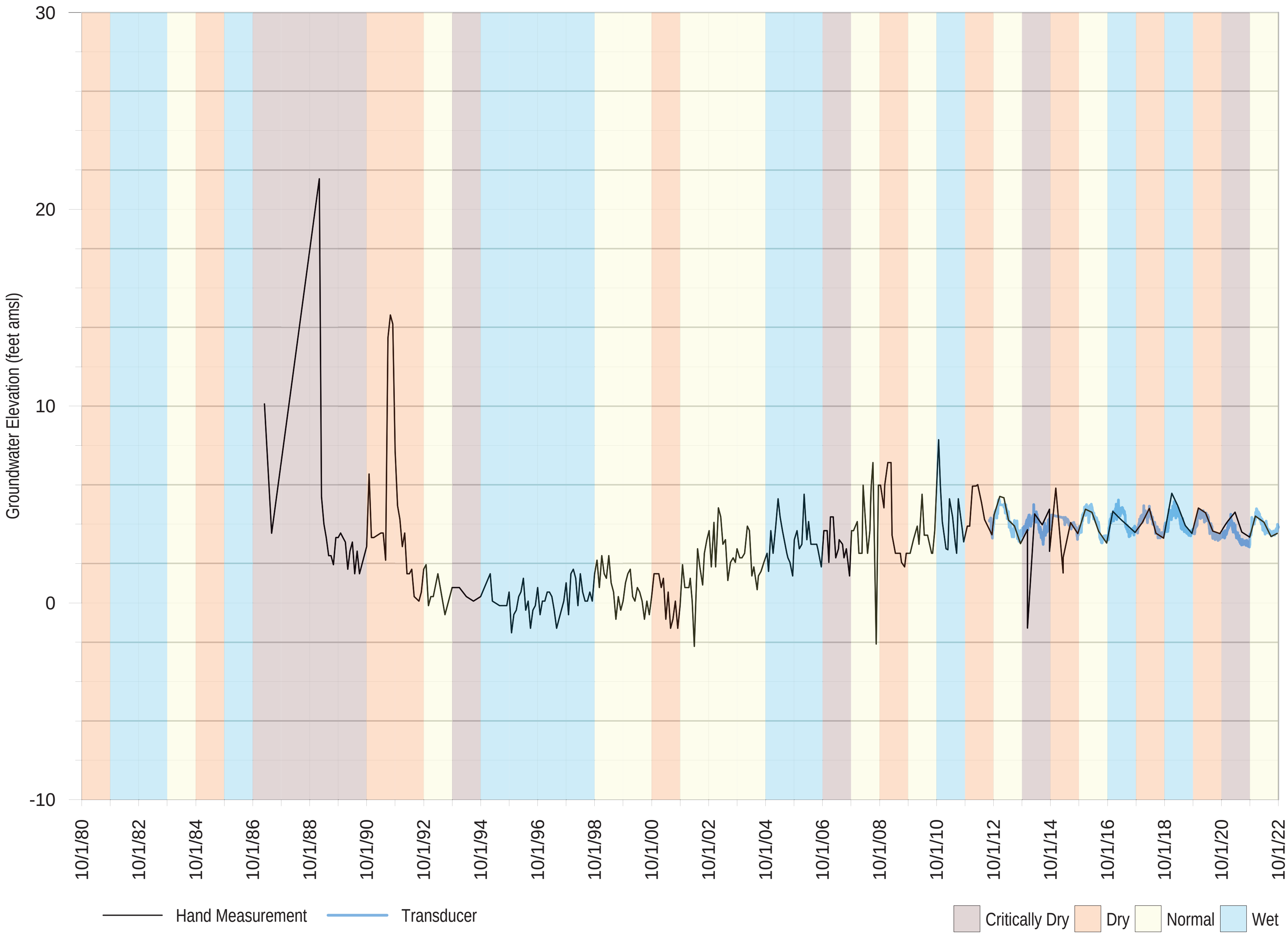
SC-A3C at Playa Vista
Aquifer Screened: Aromas

FIGURE A-76



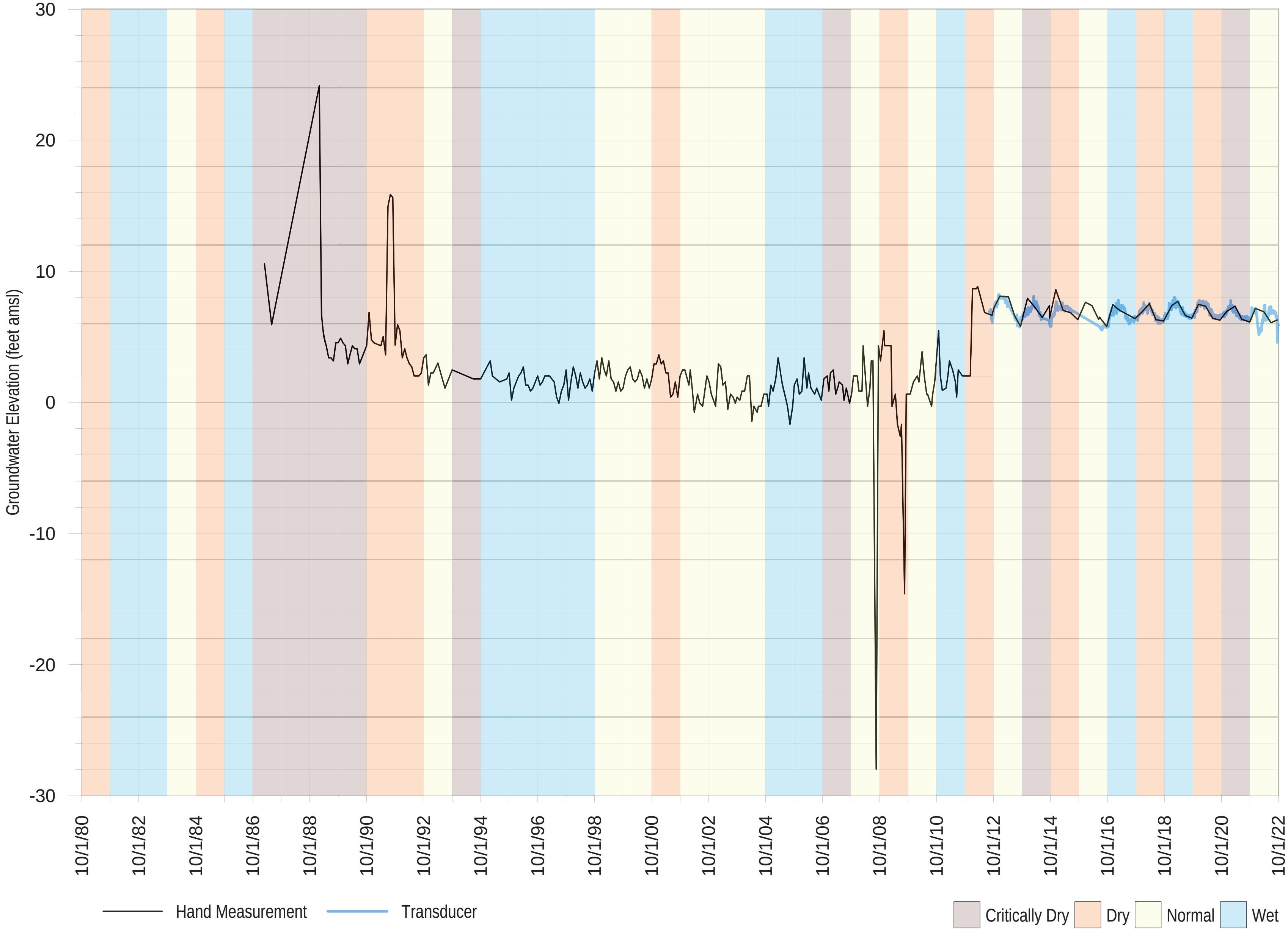
SC-A5A at Seascape
Aquifer Screened: Purisima F

FIGURE A-77



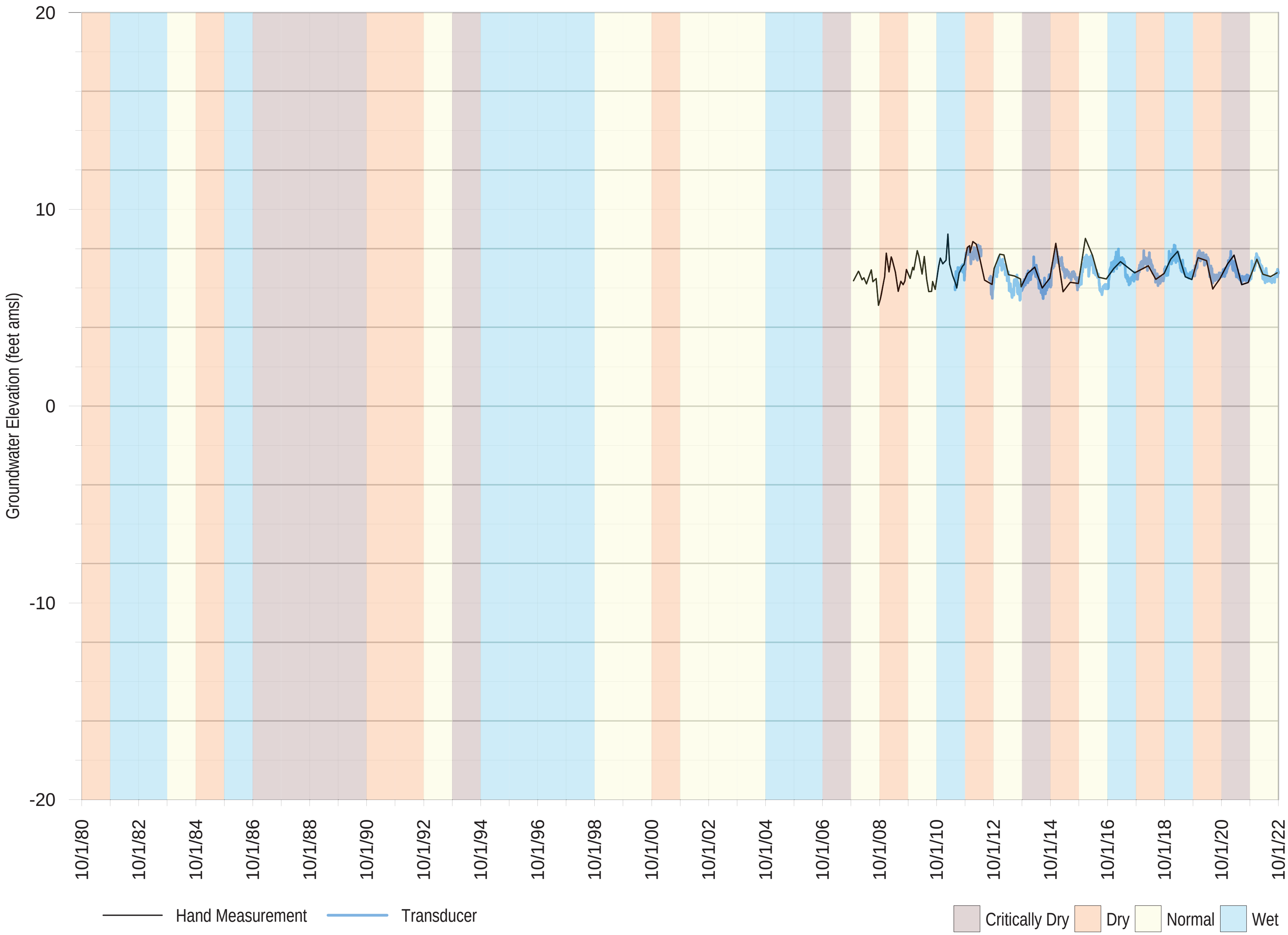
SC-A5B at Seascape
Aquifer Screened: Purisima F

FIGURE A-78



SC-A8B at Dolphin
Aquifer Screened: Aromas

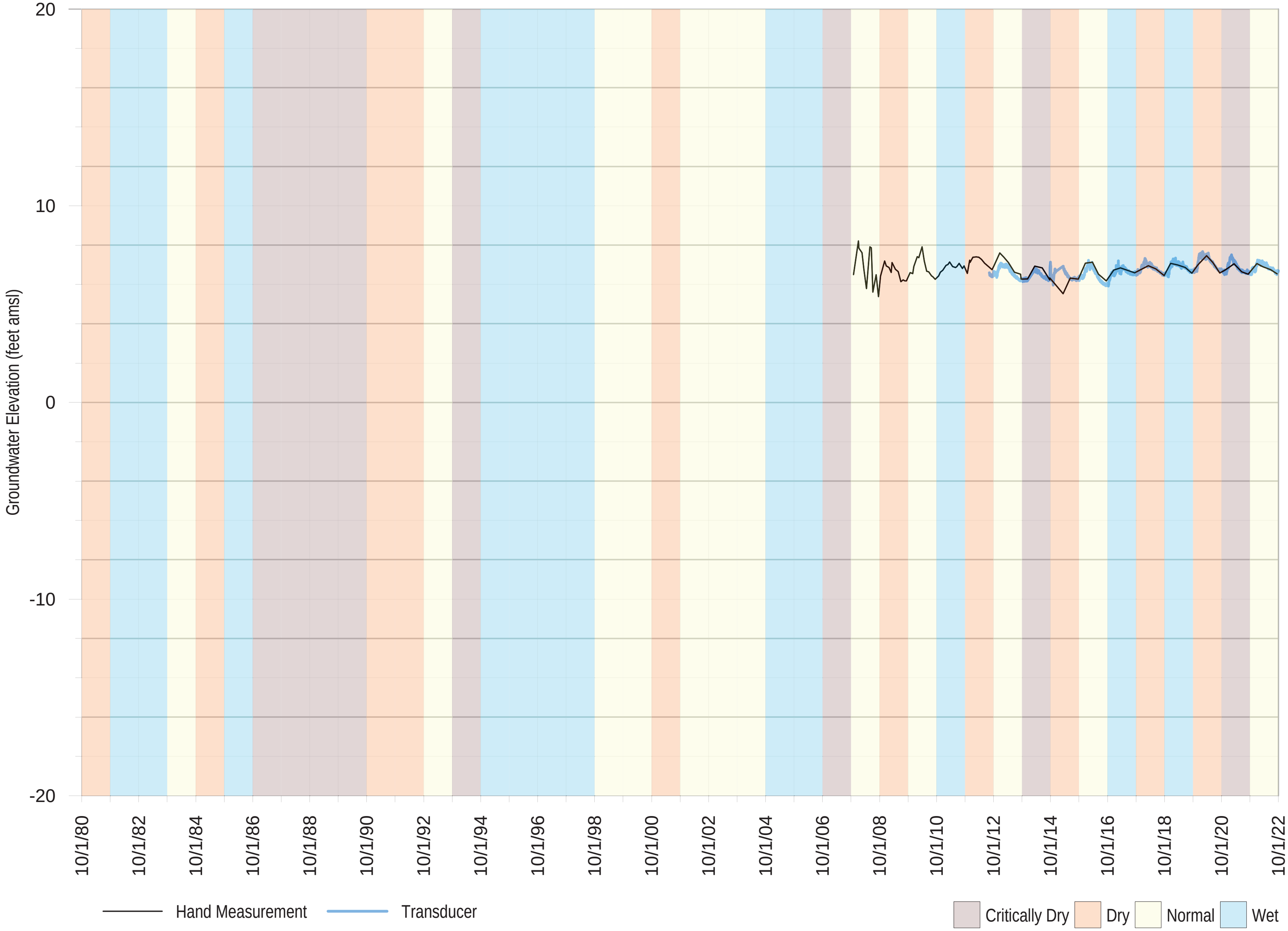
FIGURE A-79



Appendix A

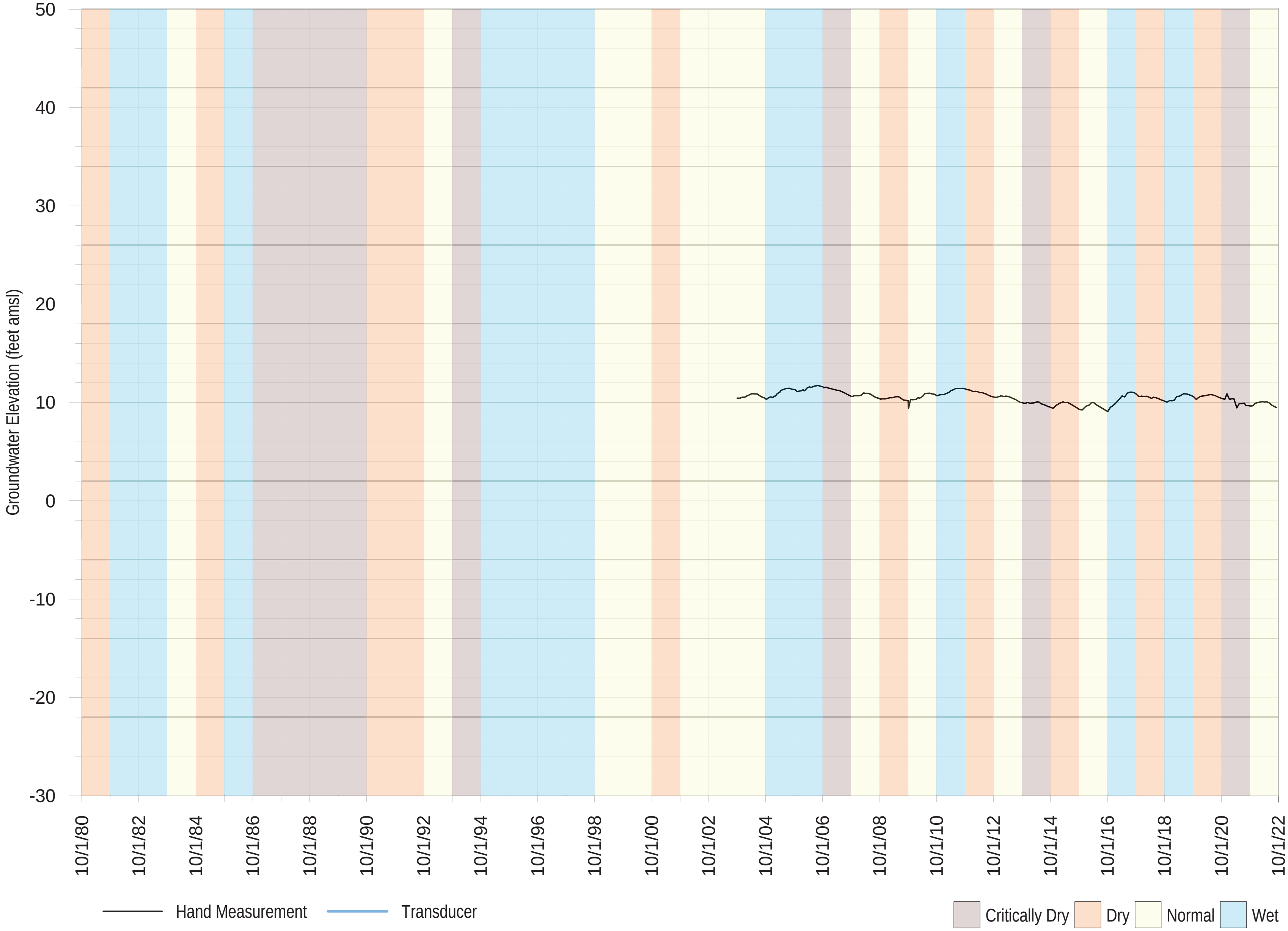
SC-A8C at Dolphin
Aquifer Screened: Aromas

FIGURE A-80



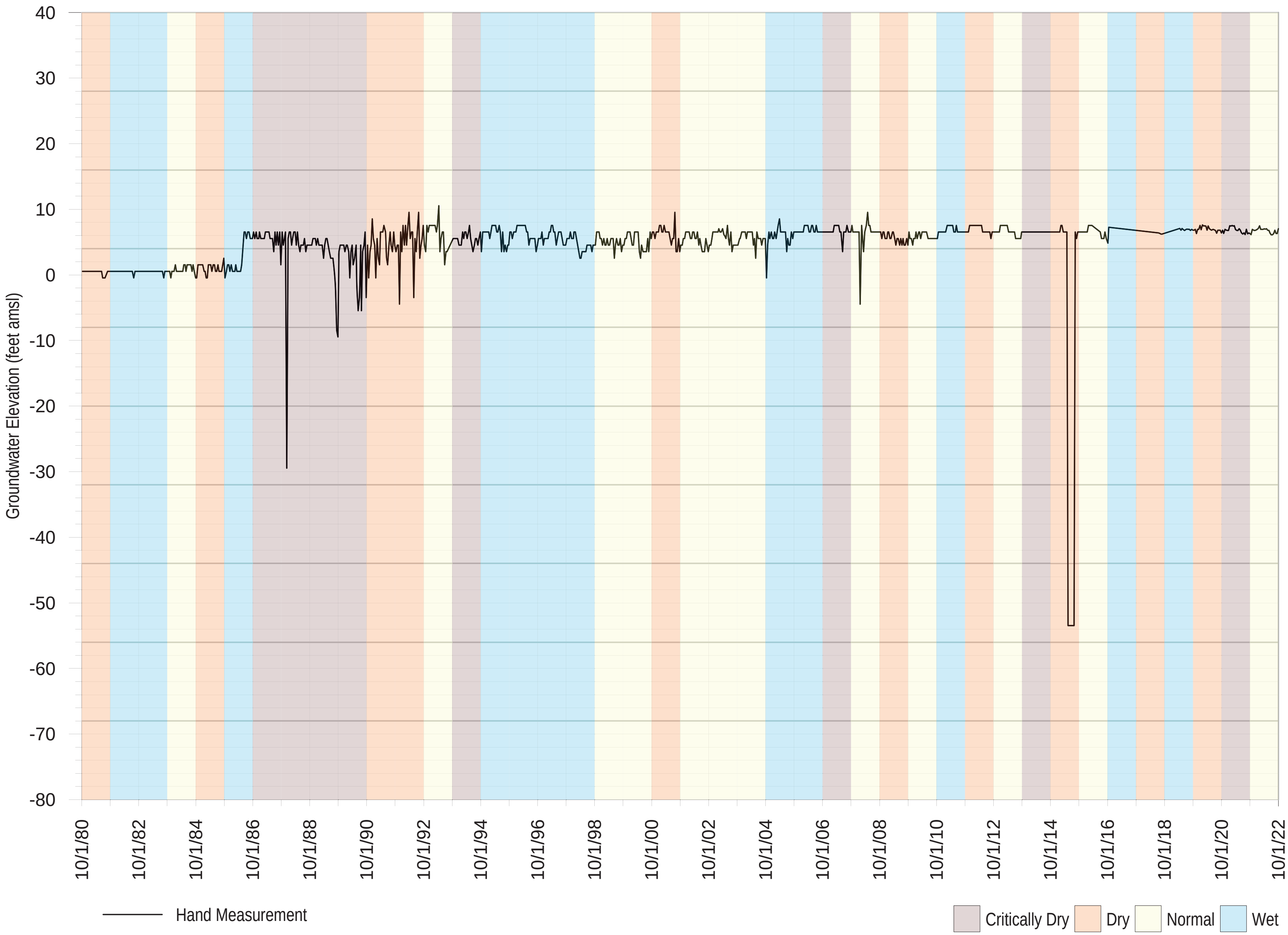
Schwan
Aquifer Screened: Purisima AA

FIGURE A-81



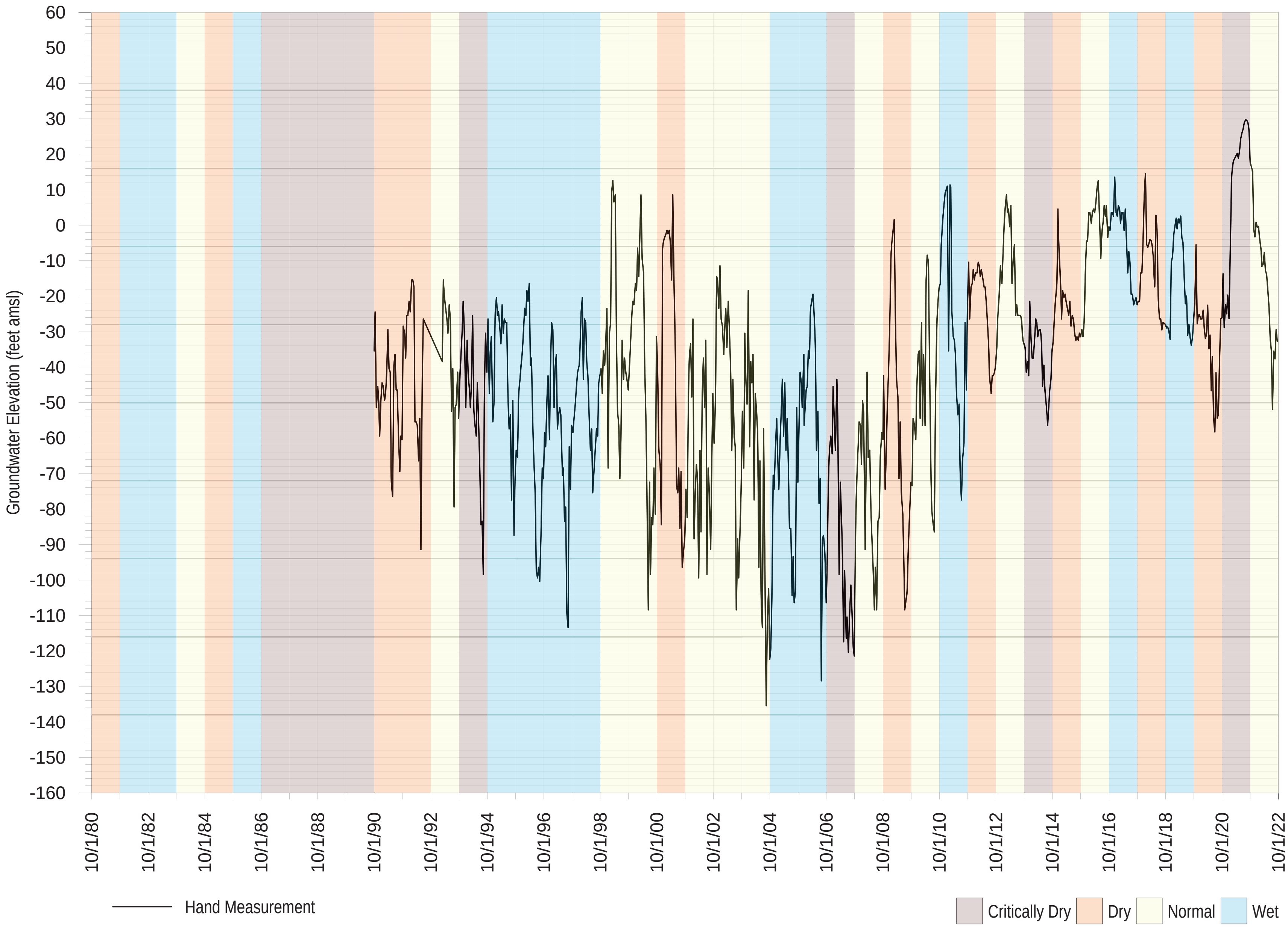
Seascape PW
Aquifer Screened: Aromas/ Purisima F

FIGURE A-82



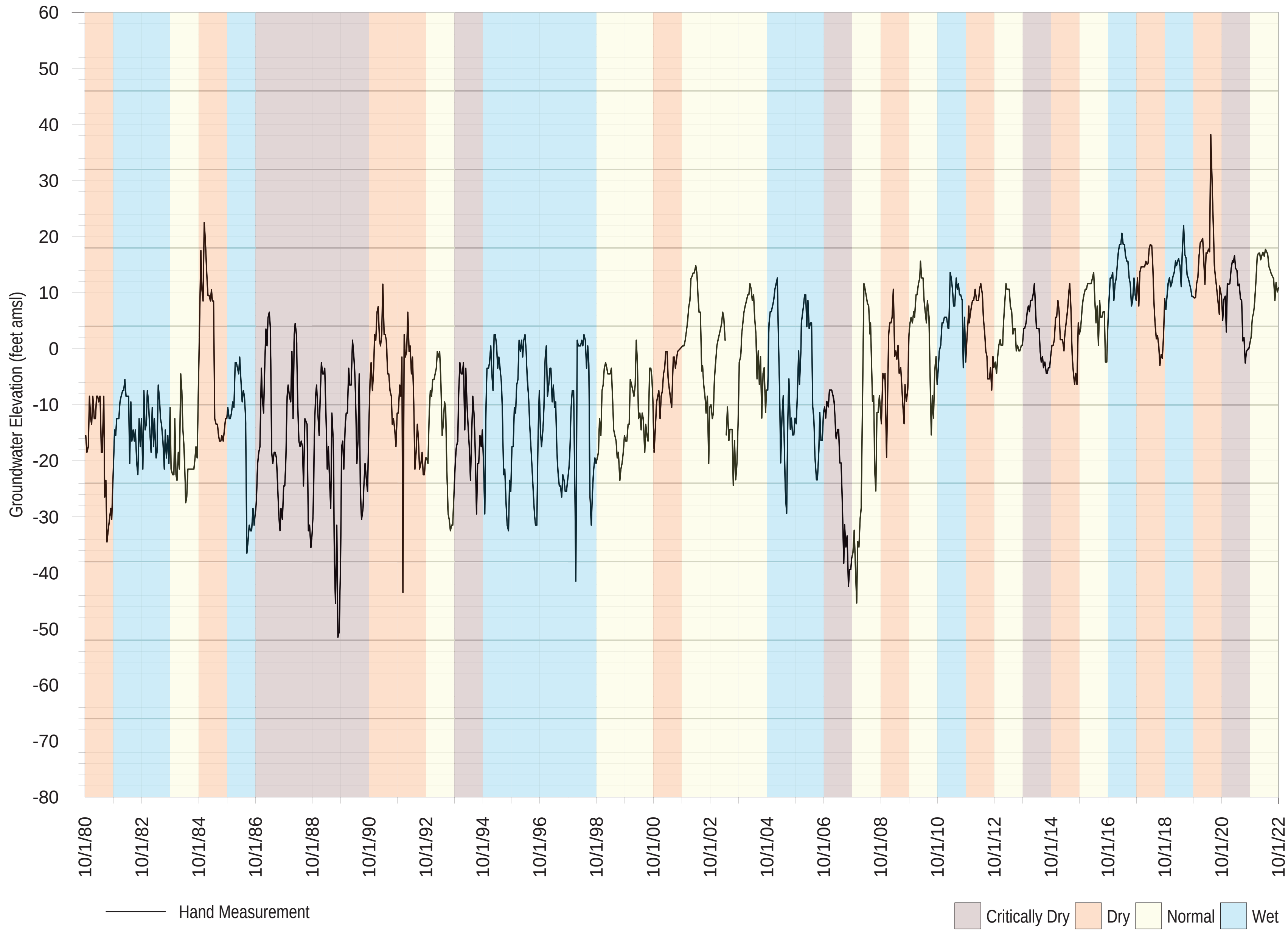
T.Hopkins PW
Aquifer Screened: Purisima DEF

FIGURE A-83



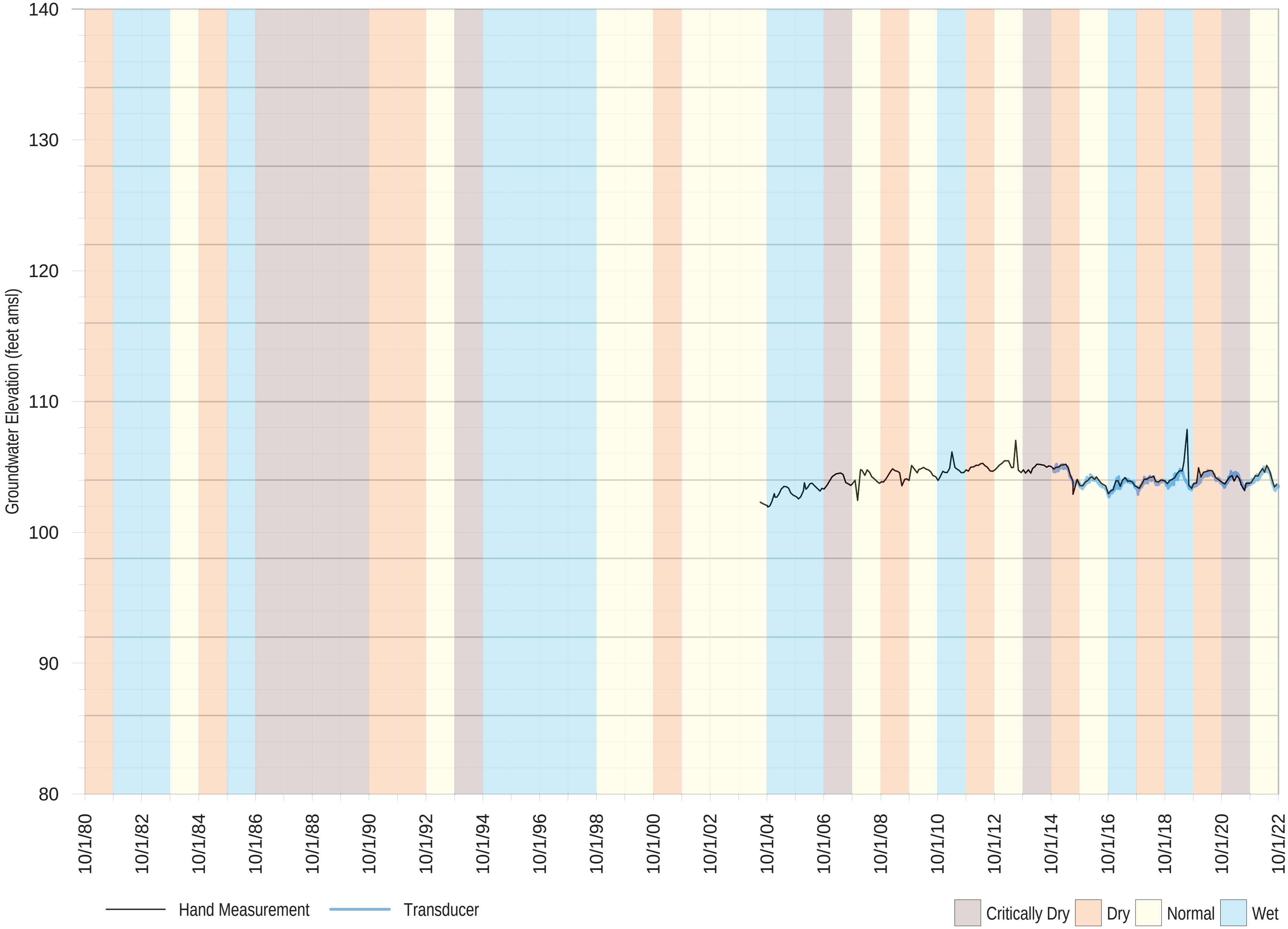
Tannery & Tannery 2 PW
Aquifer Screened: Purisima A

FIGURE A-84



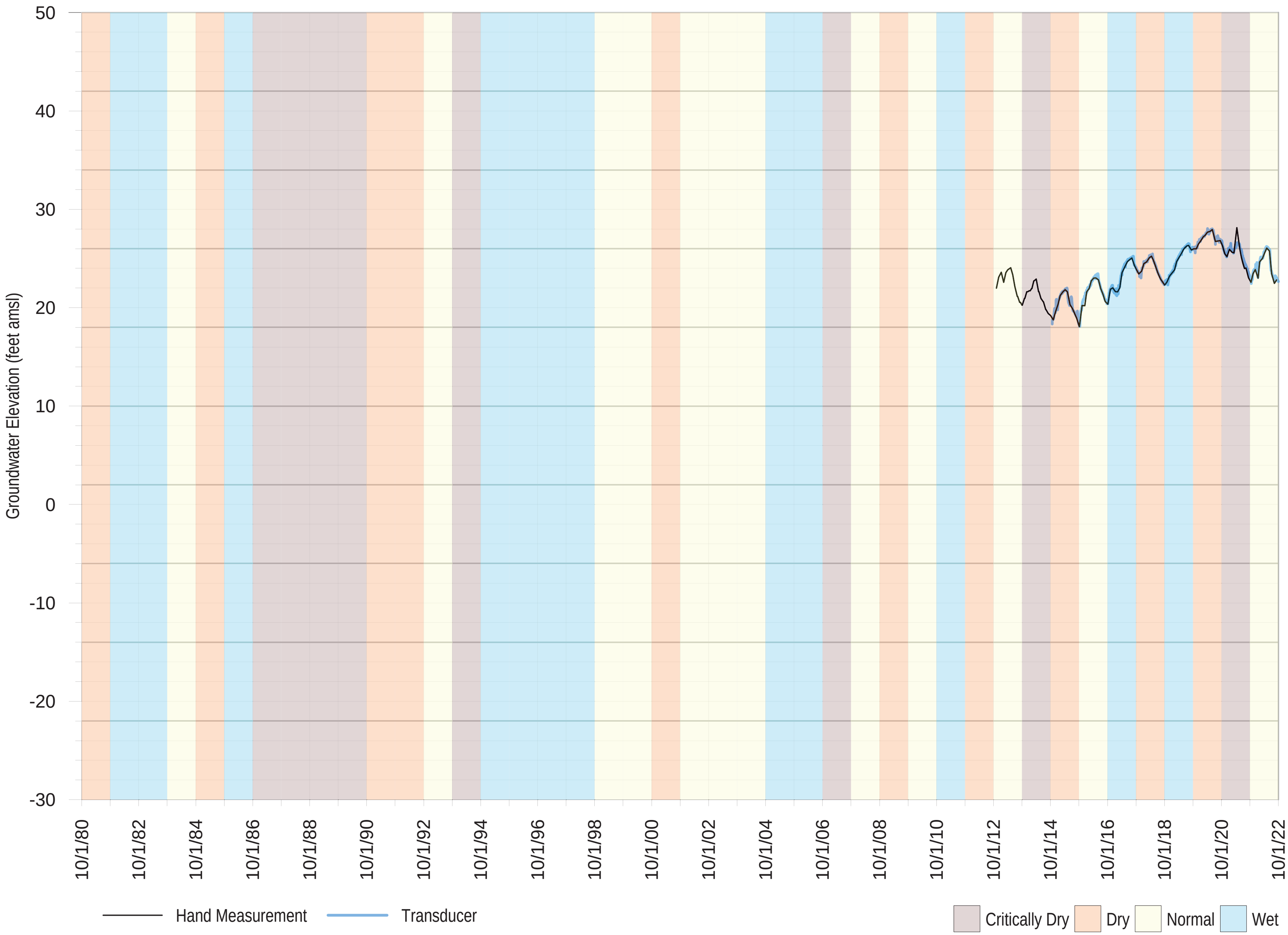
Thurber Shallow
Aquifer Screened: Purisima AA

FIGURE A-85



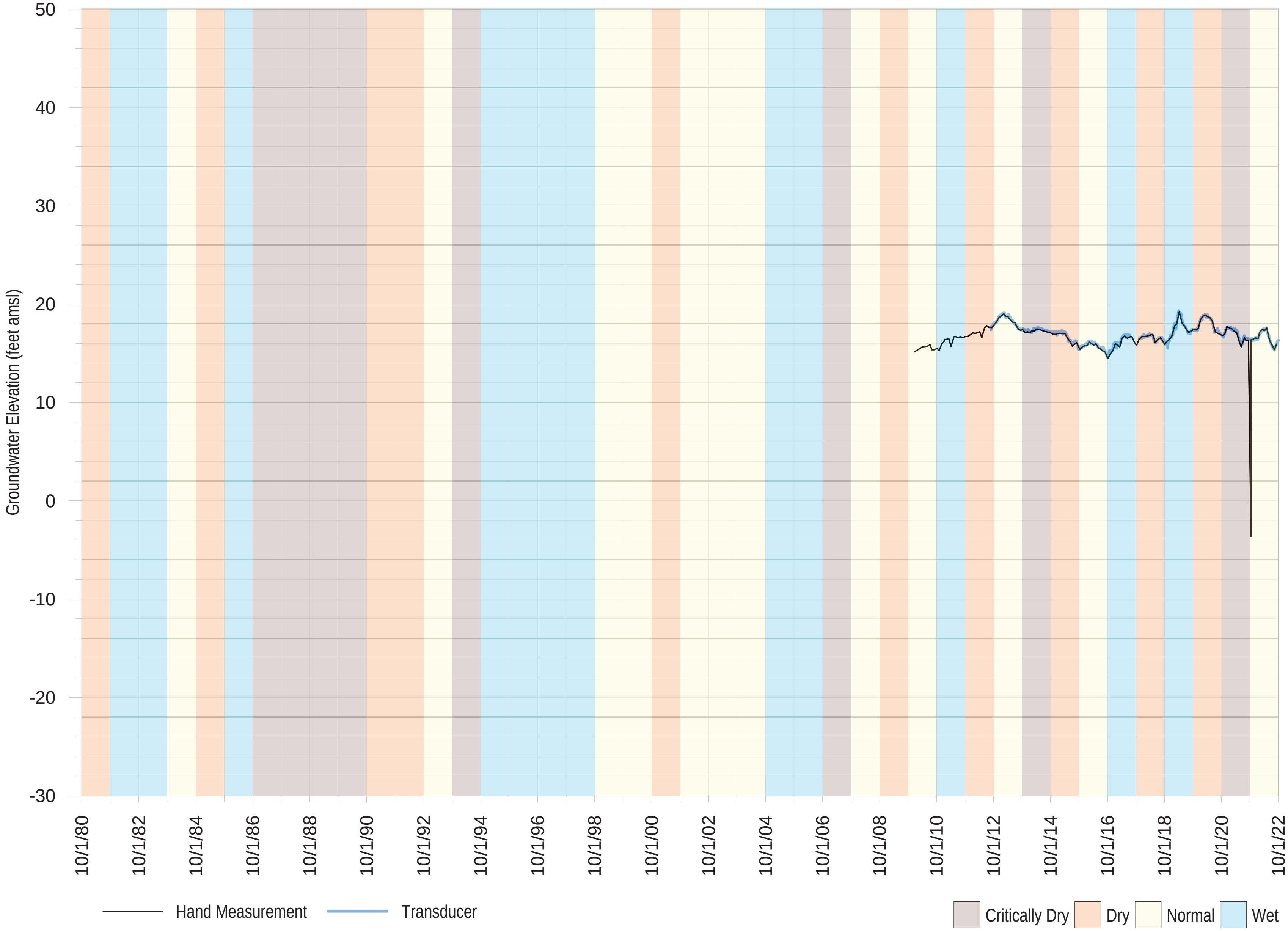
30th Ave Medium
Aquifer Screened: Purisima AA

FIGURE A-86



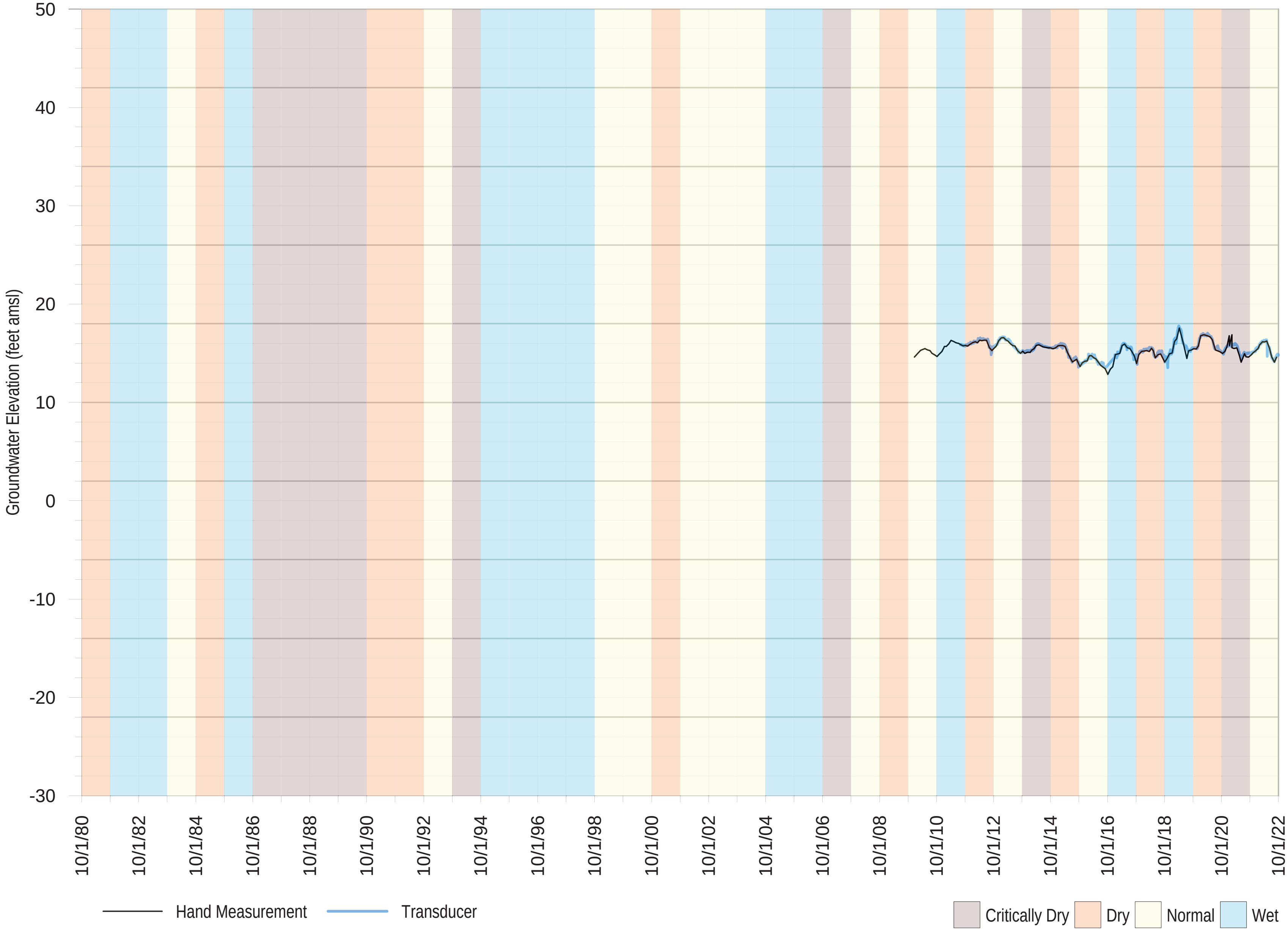
Auto Plaza Deep
Aquifer Screened: Purisima AA

FIGURE A-87



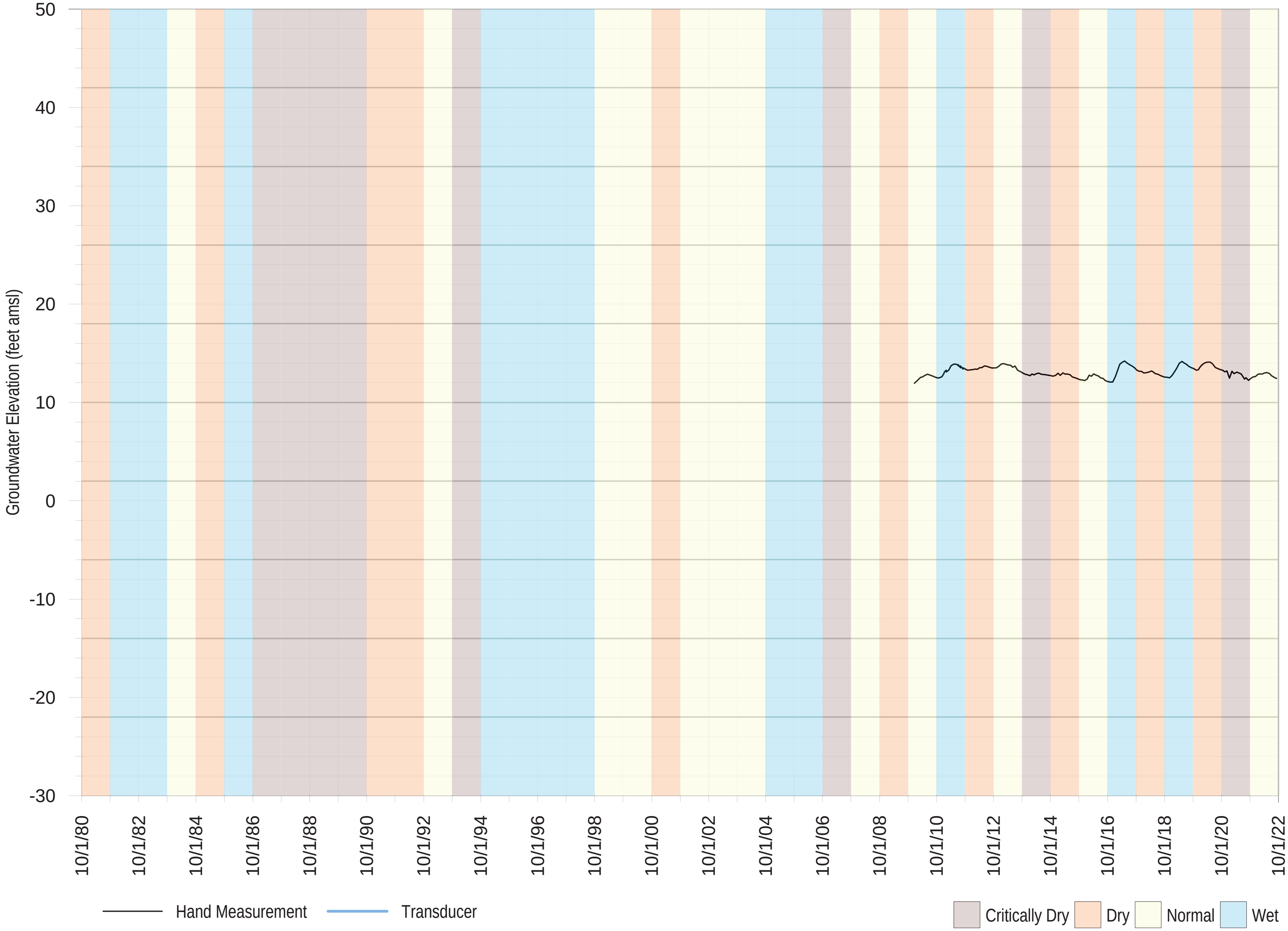
Auto Plaza Medium
Aquifer Screened: Purisima A

FIGURE A-88



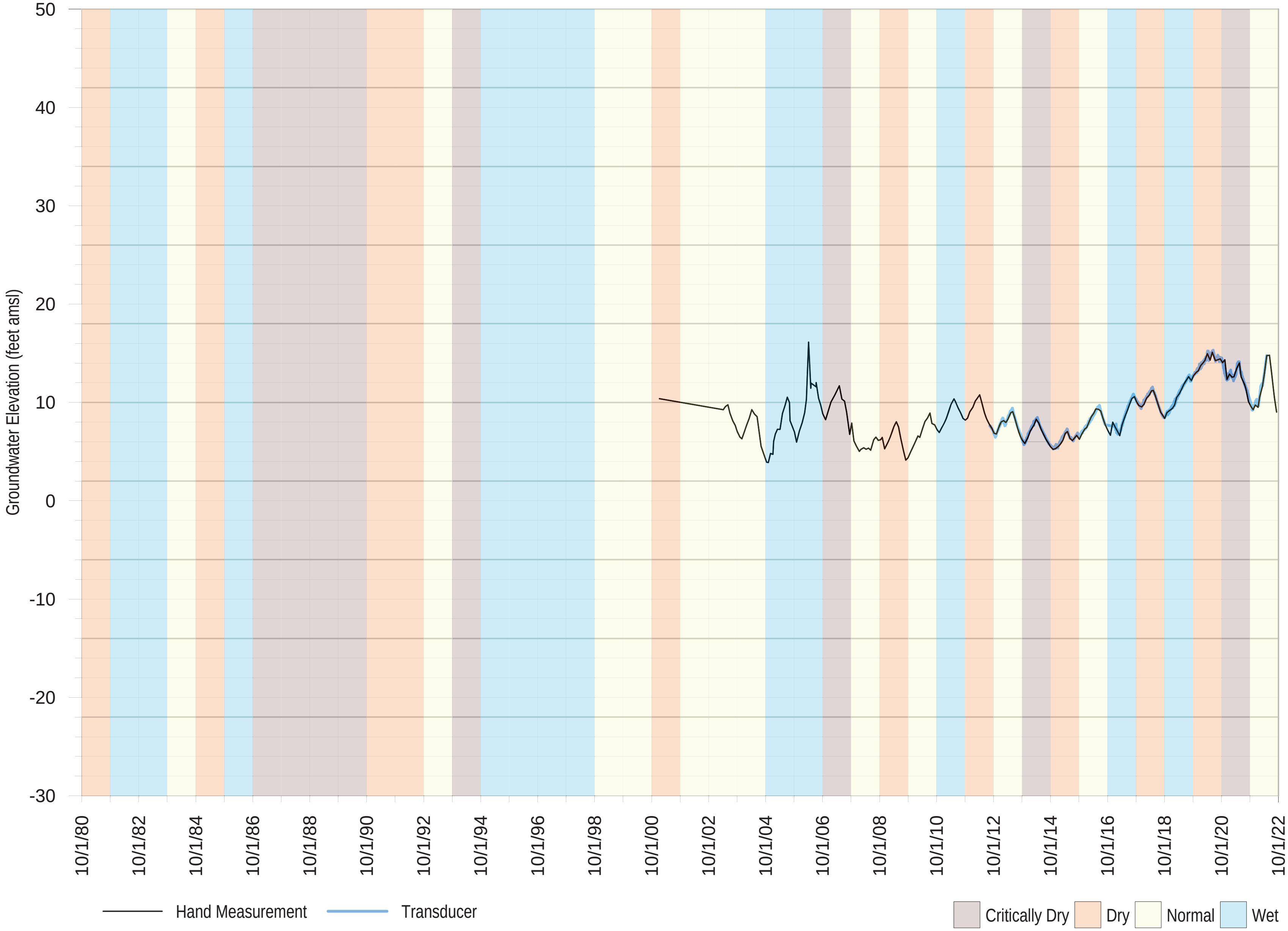
Auto Plaza Shallow
Aquifer Screened: Purisima A

FIGURE A-89



Beltz 4 Deep
Aquifer Screened: Purisima A

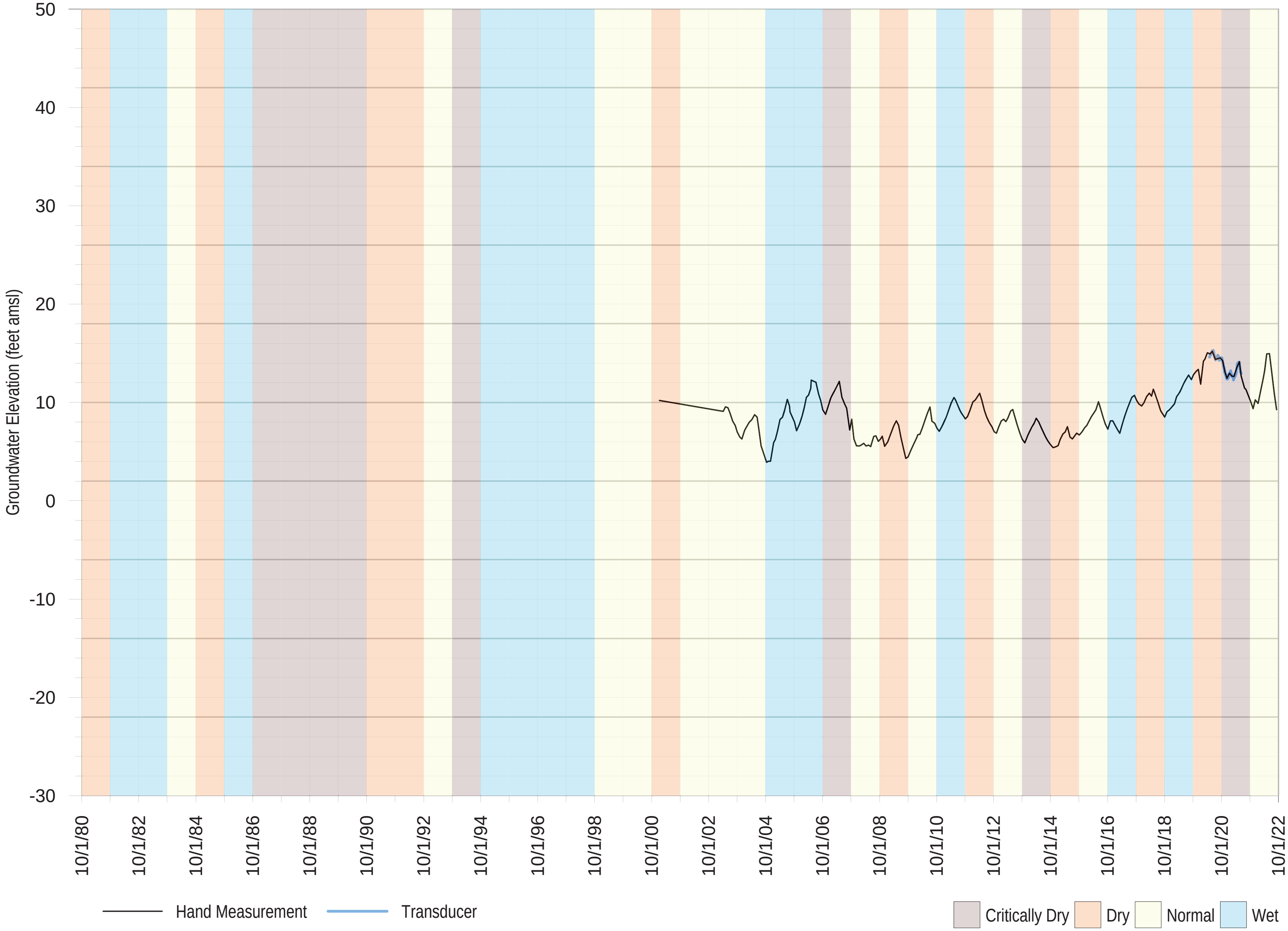
FIGURE A-90



Appendix A

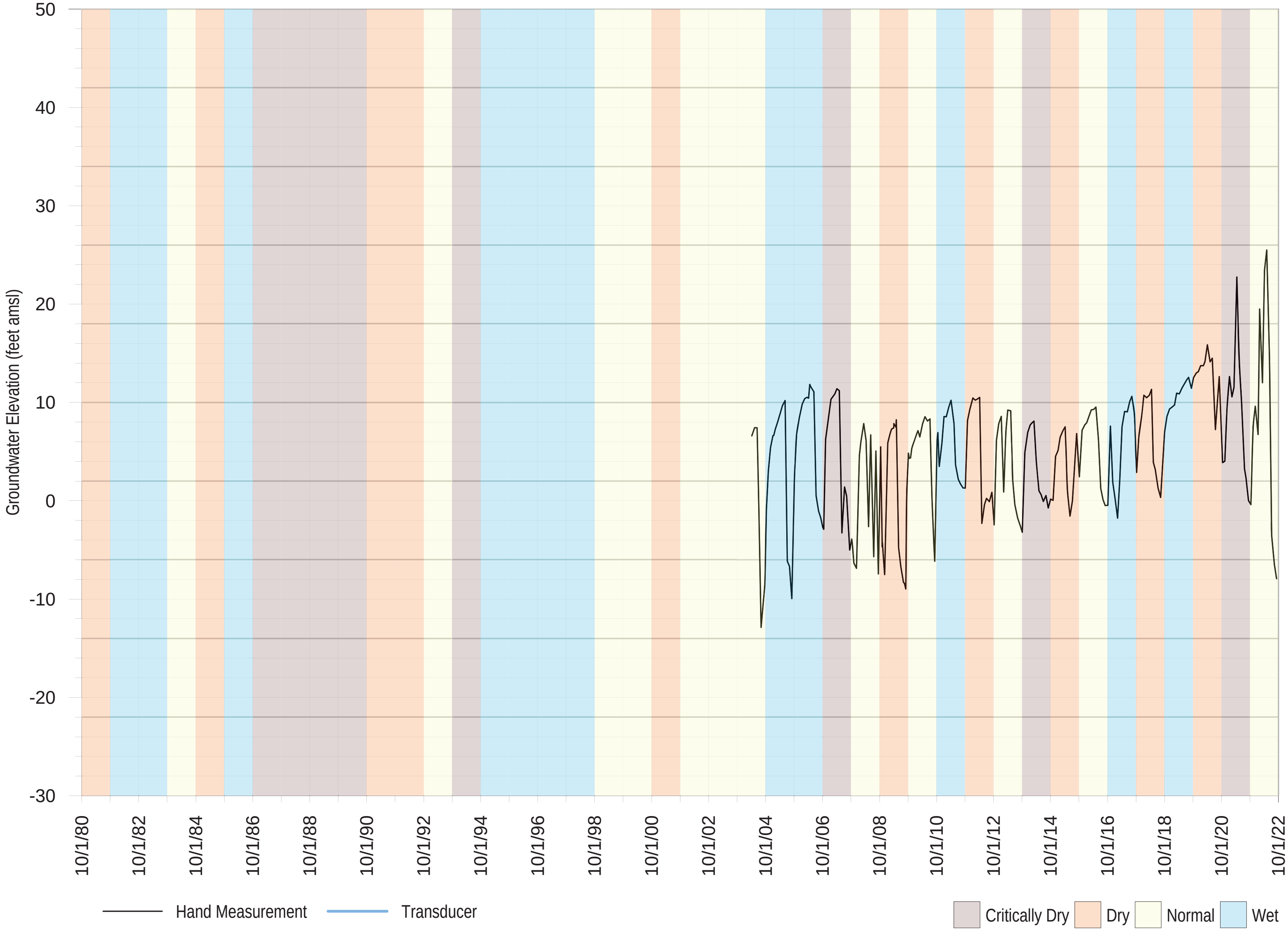
Beltz 4 Shallow
Aquifer Screened: Purisima A

FIGURE A-91



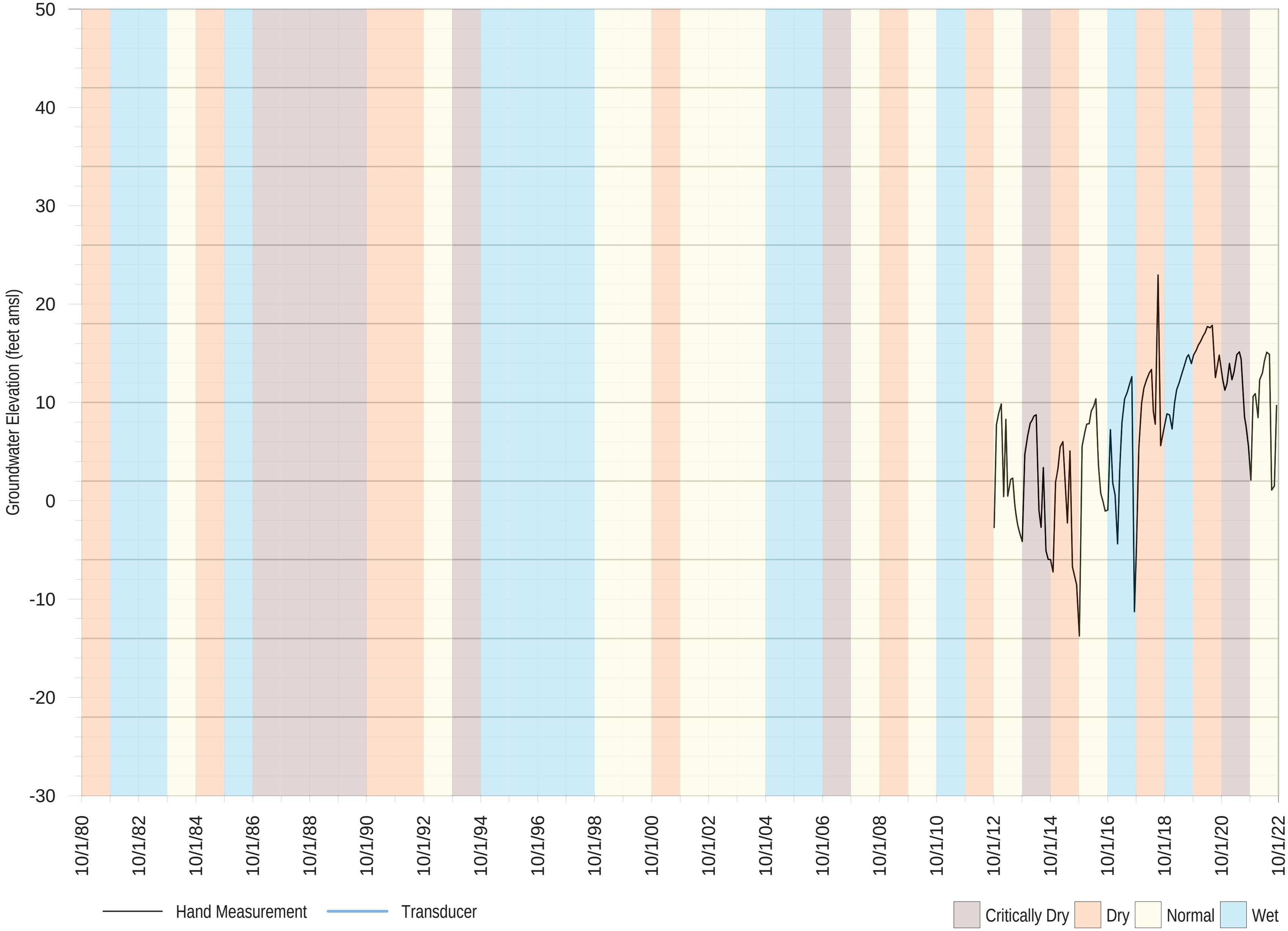
Beltz 6
Aquifer Screened: Purisima A

FIGURE A-92

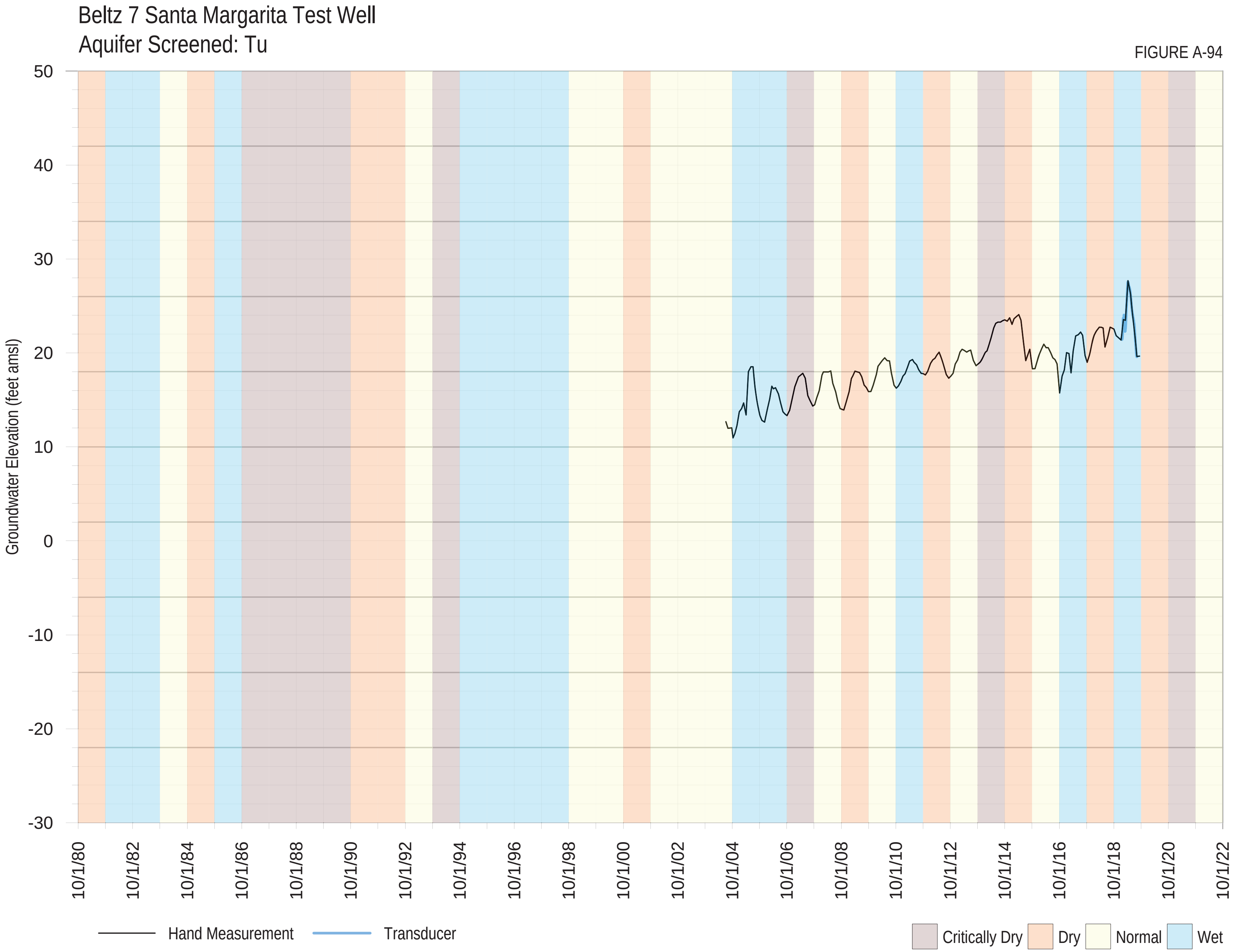


Beltz 7 Deep
Aquifer Screened: Purisima A/AA

FIGURE A-93

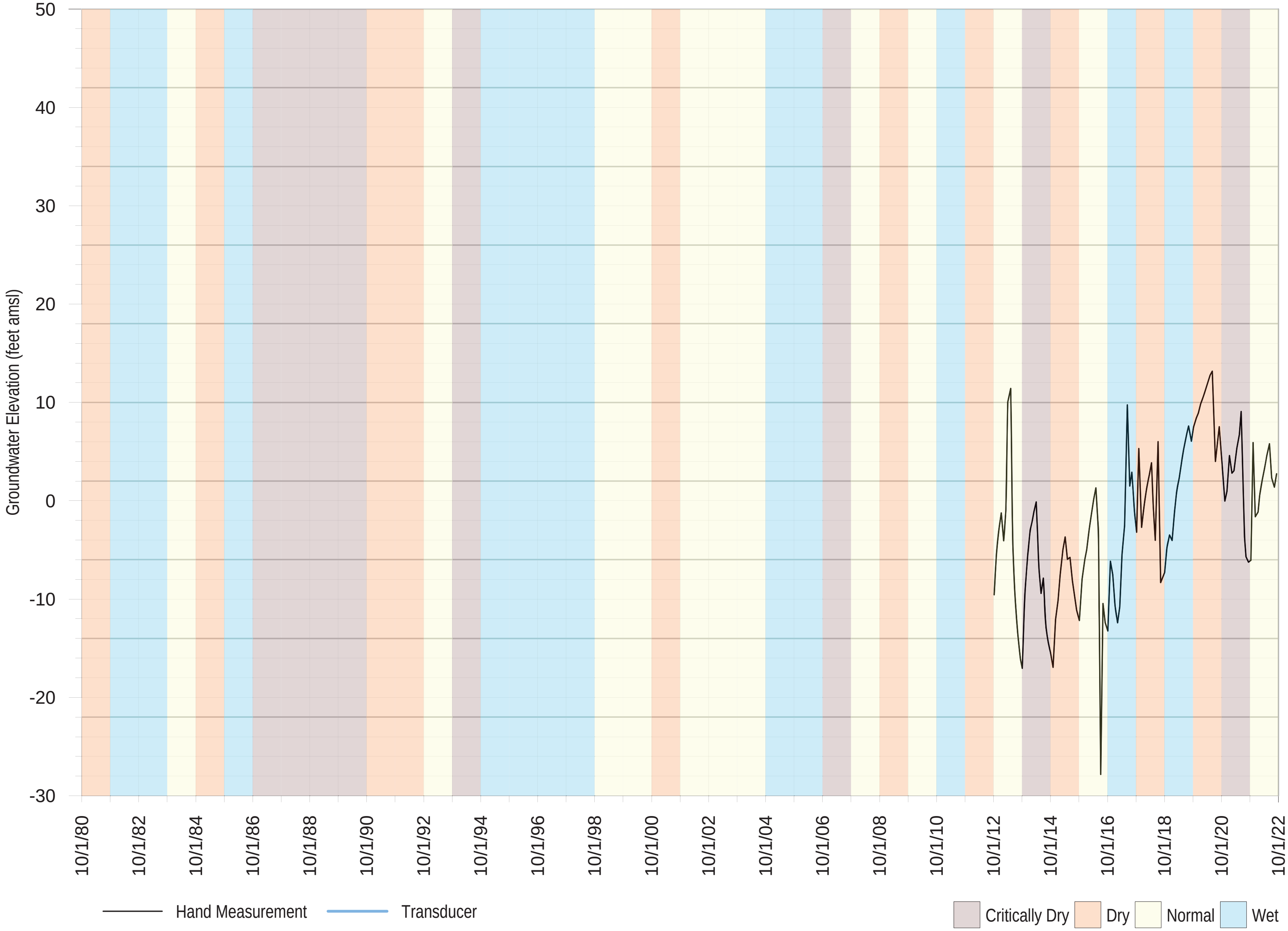


MONTGOMERY & ASSOCIATES



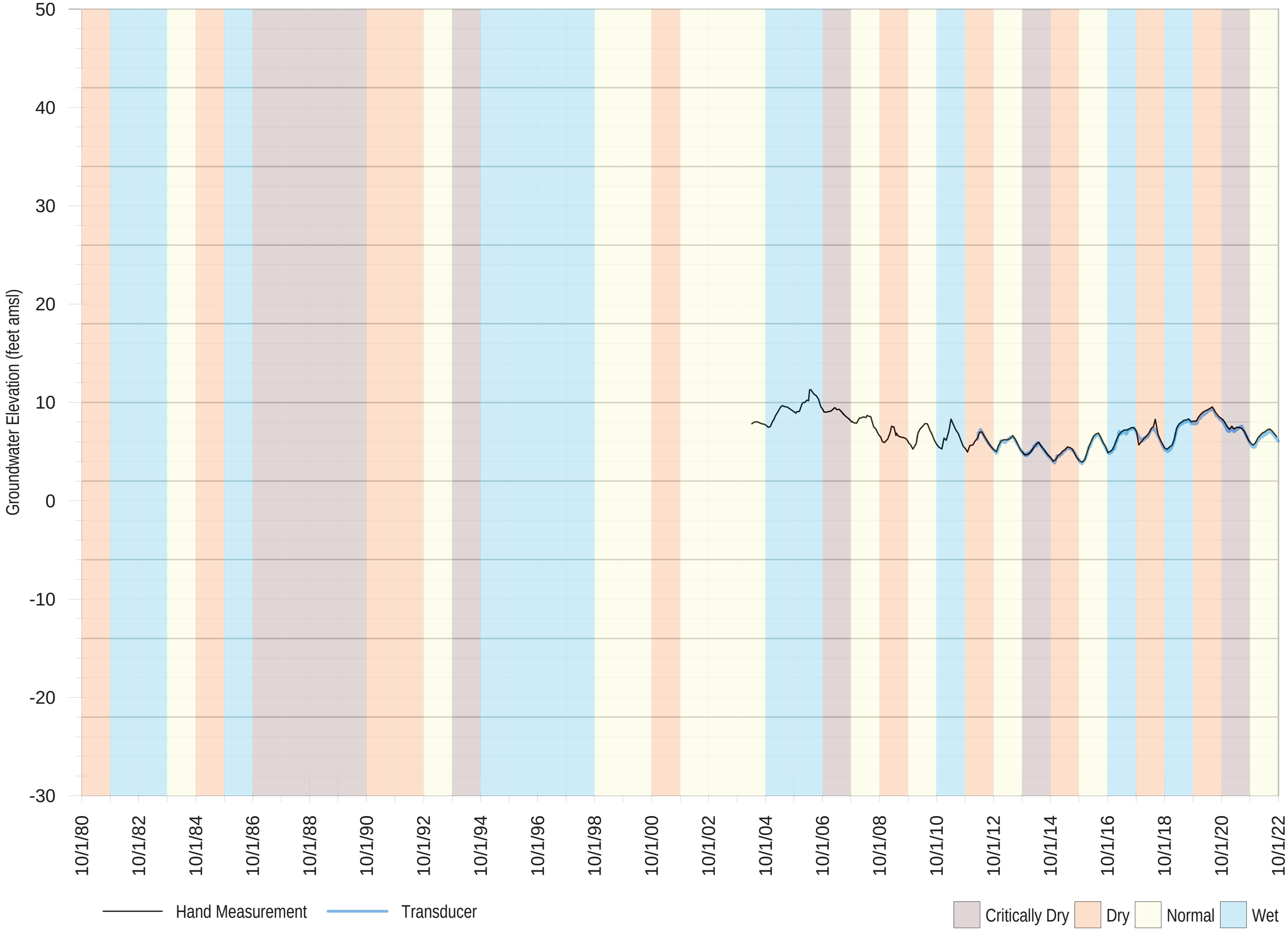
Beltz 7 Shallow
Aquifer Screened: Purisima A

FIGURE A-95



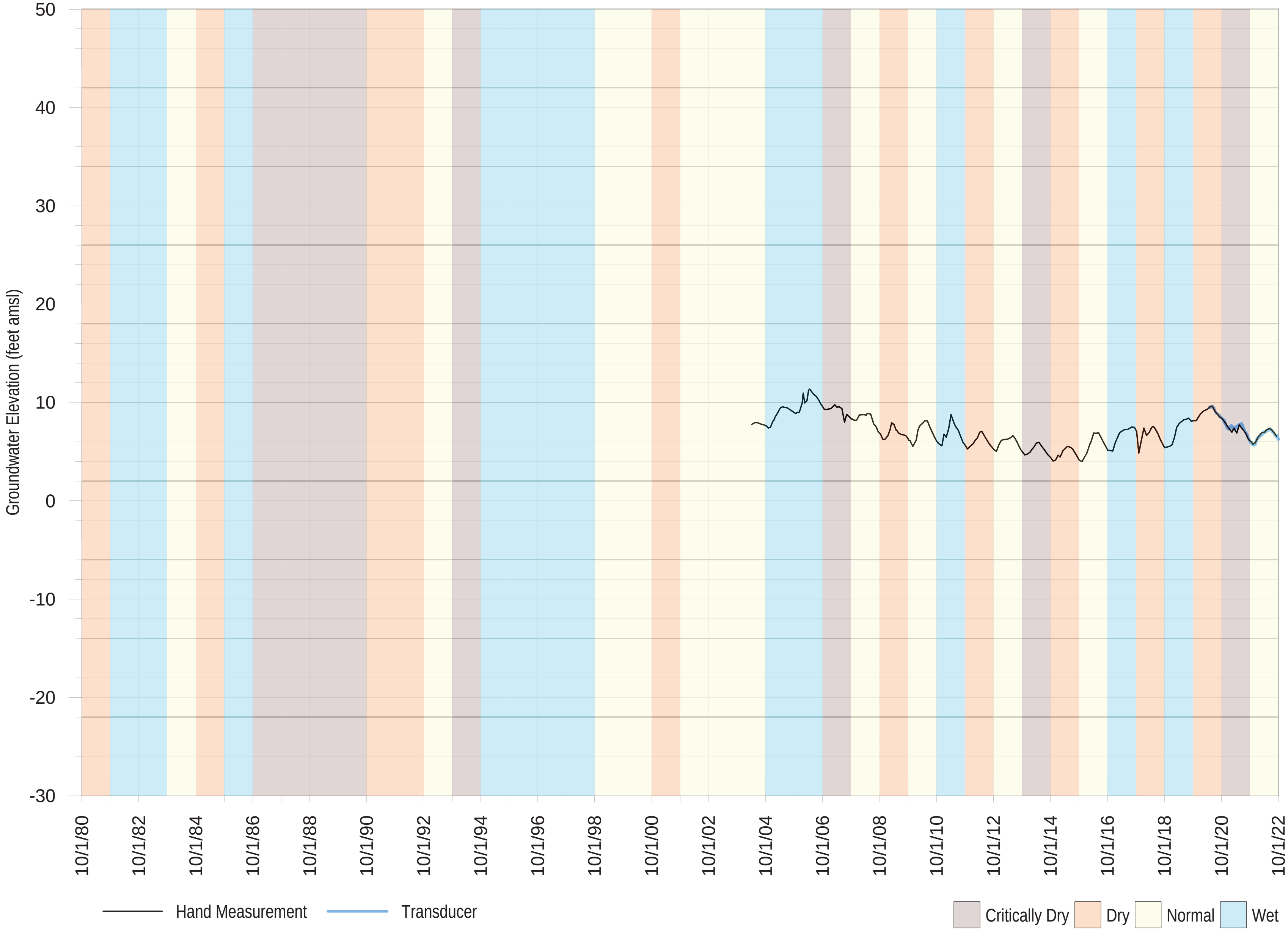
Corcoran Medium
Aquifer Screened: Purisima A

FIGURE A-96



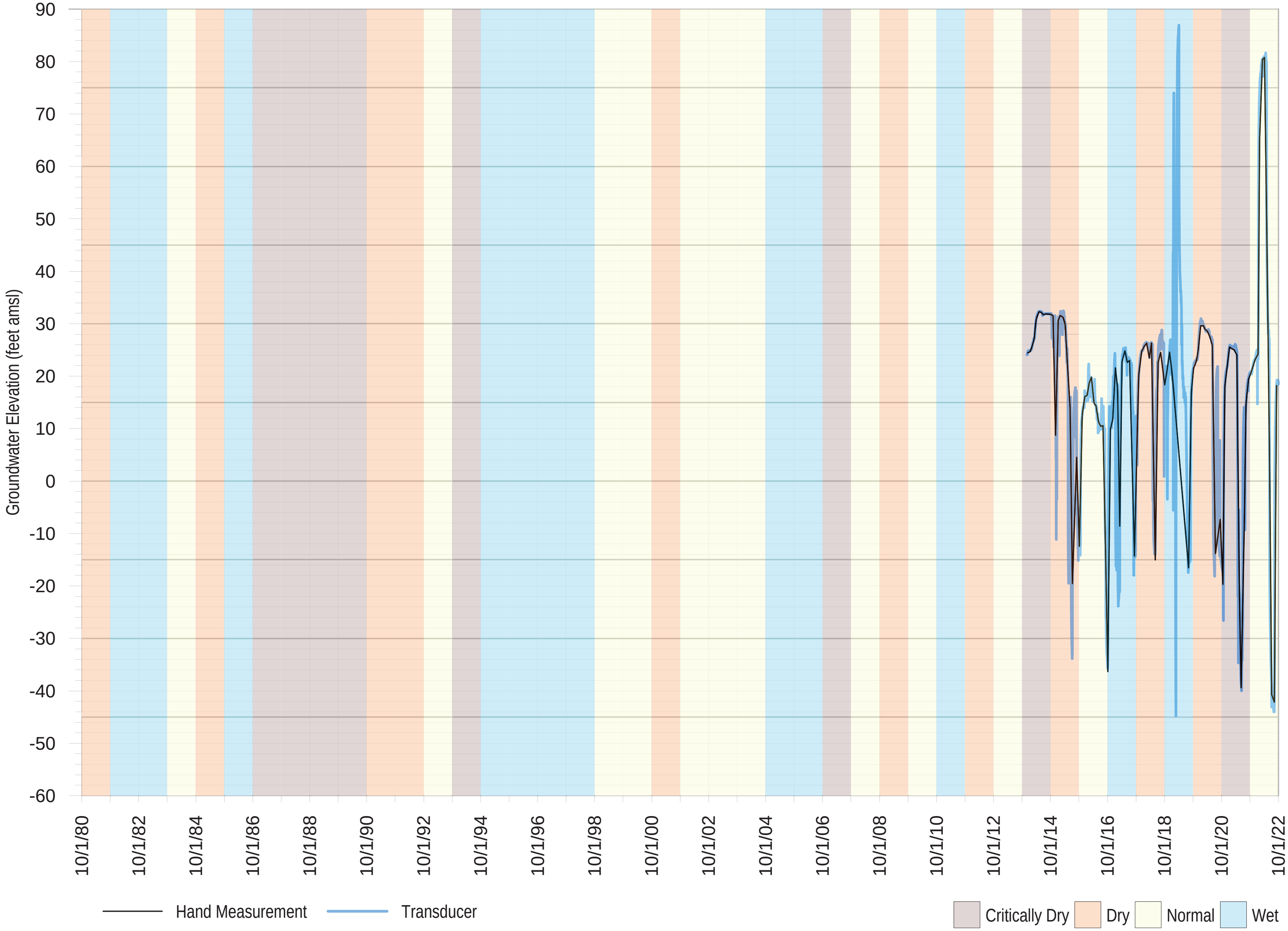
Corcoran Shallow
Aquifer Screened: Purisima A

FIGURE A-97



Cory 4
Aquifer Screened: Tu

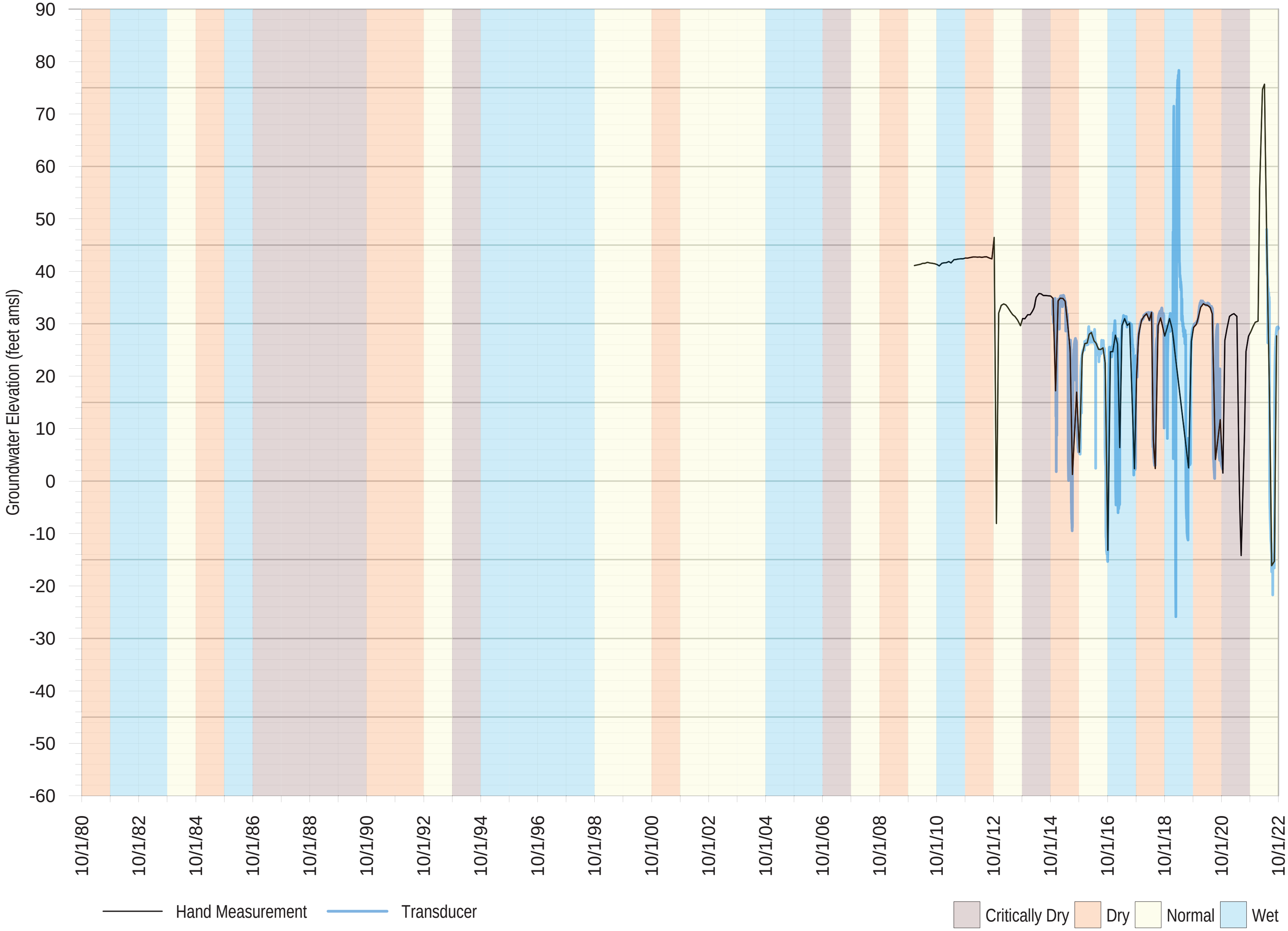
FIGURE A-98



Appendix A

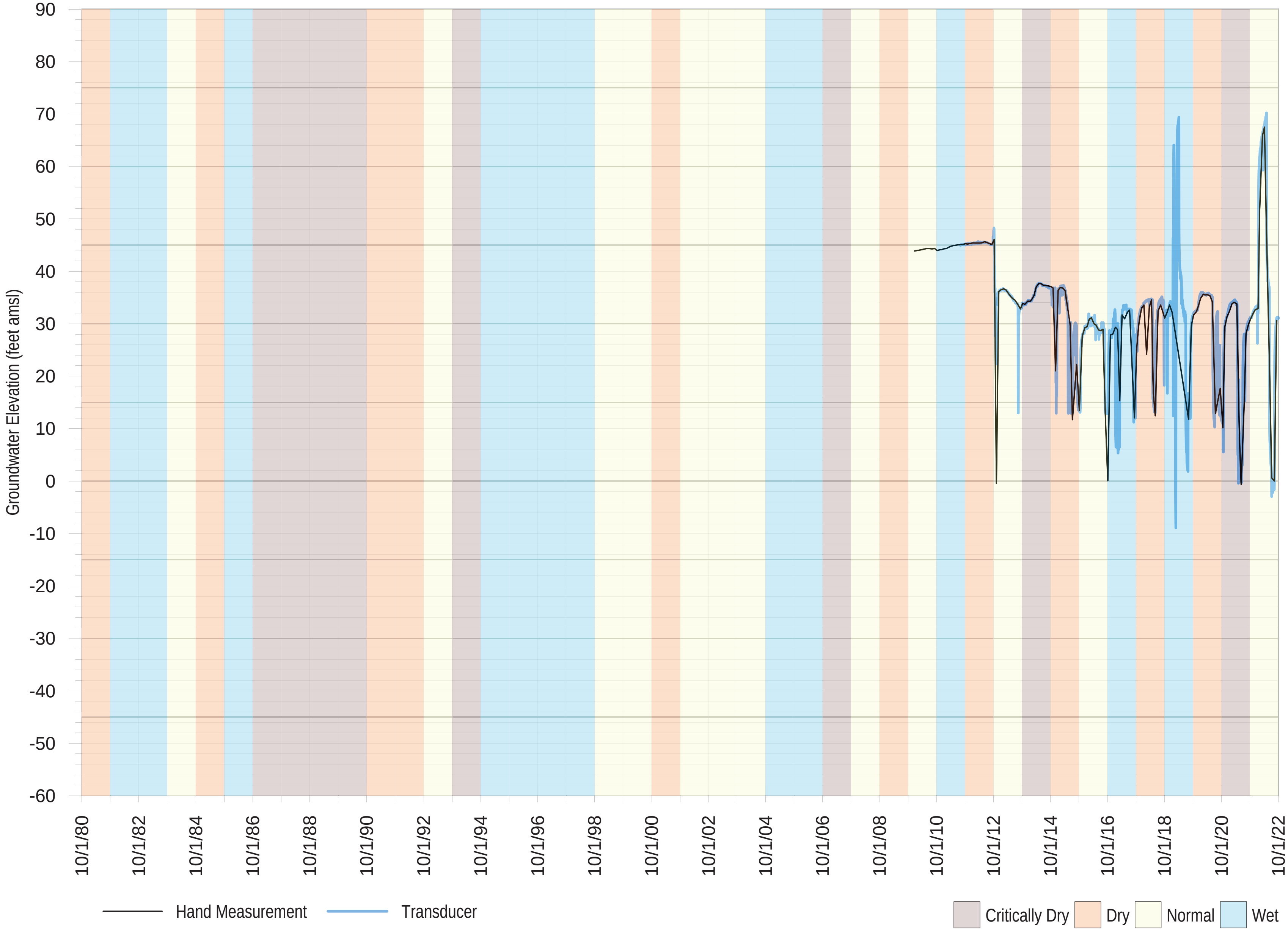
Cory Deep
Aquifer Screened: Purisima AA

FIGURE A-99



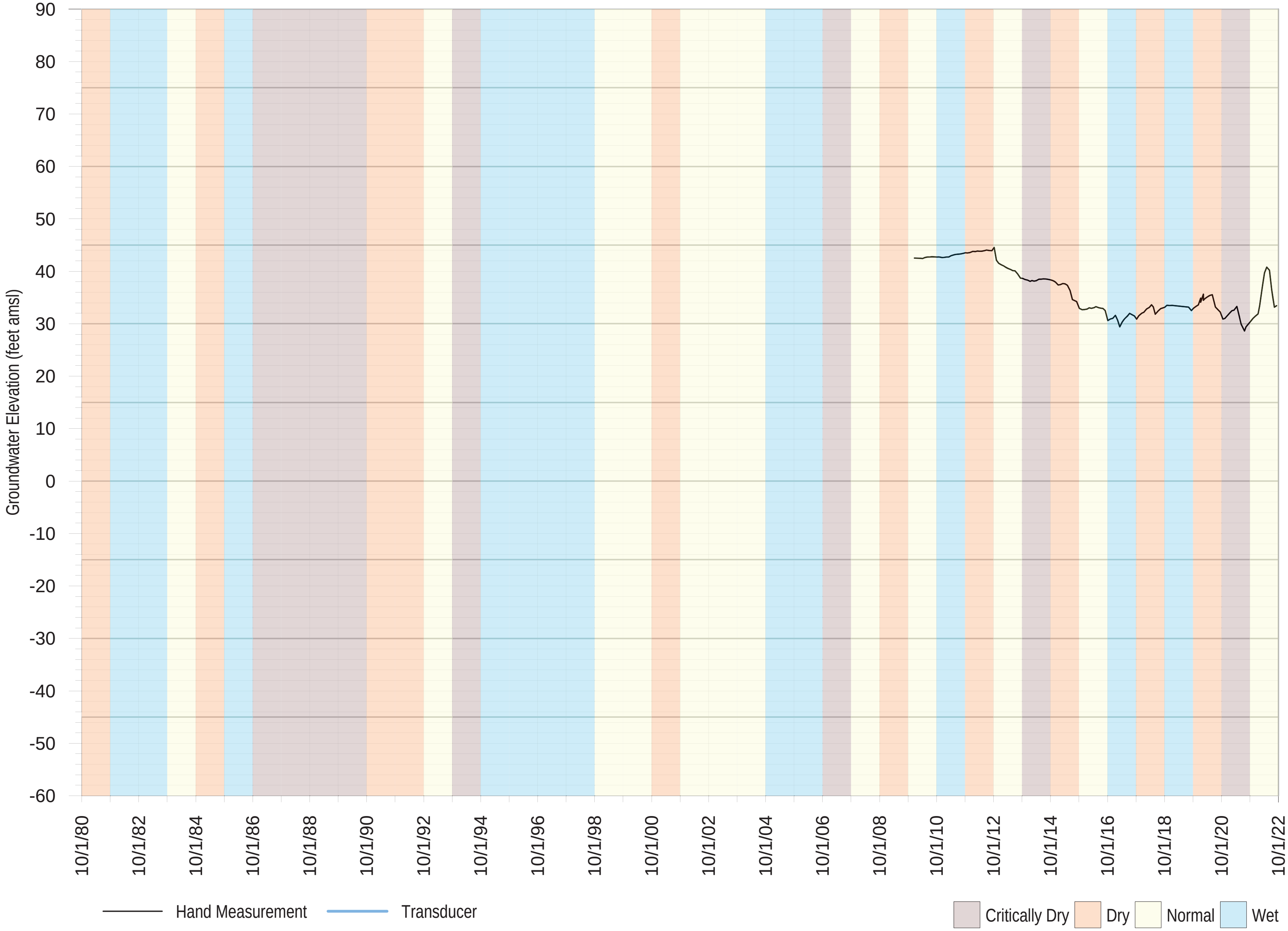
Cory Medium
Aquifer Screened: Purisima A

FIGURE A-100



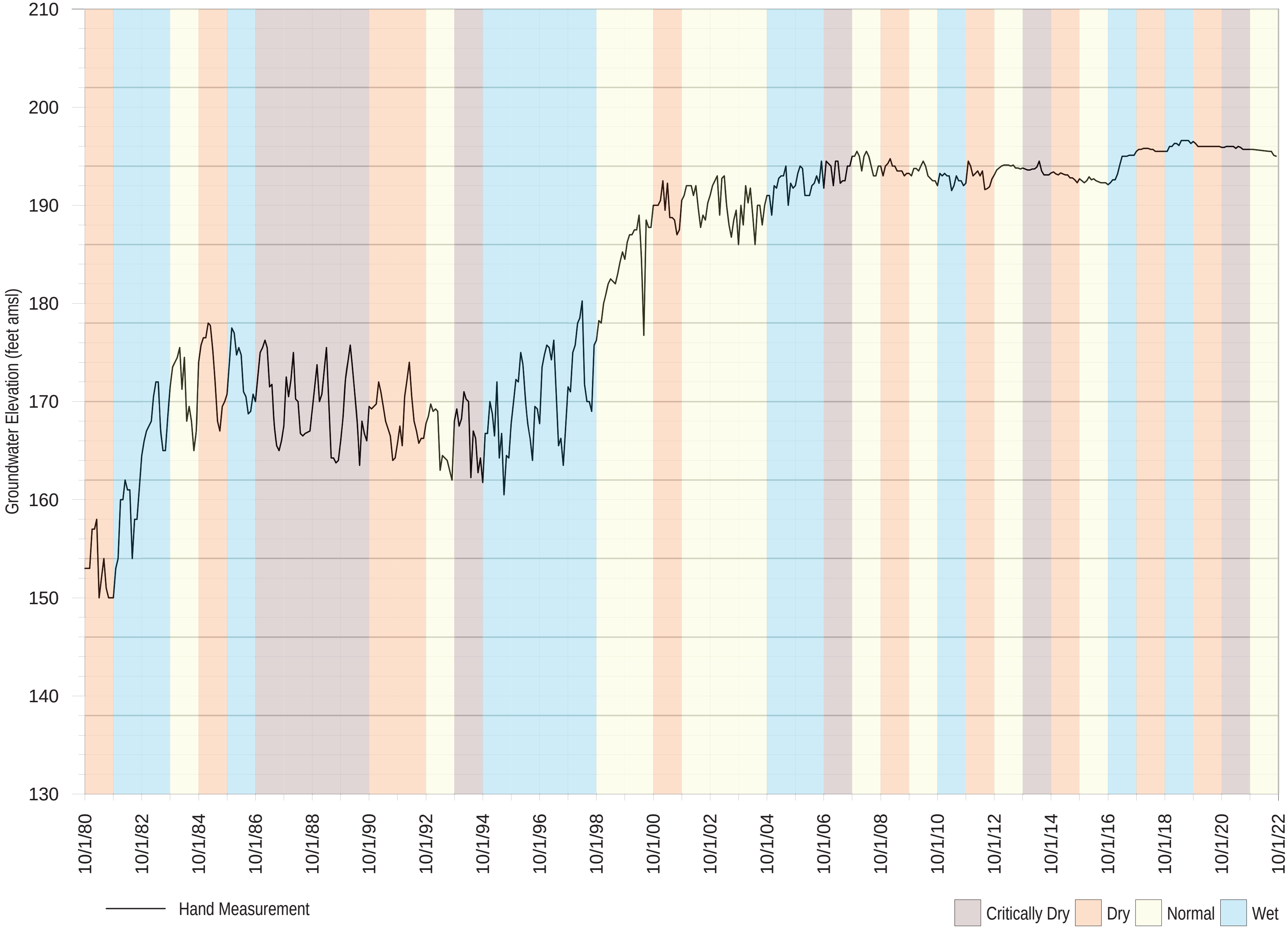
Cory Shallow
Aquifer Screened: Purisima A

FIGURE A-101



CWD-3
Aquifer Screened: Purisima F

FIGURE A-102

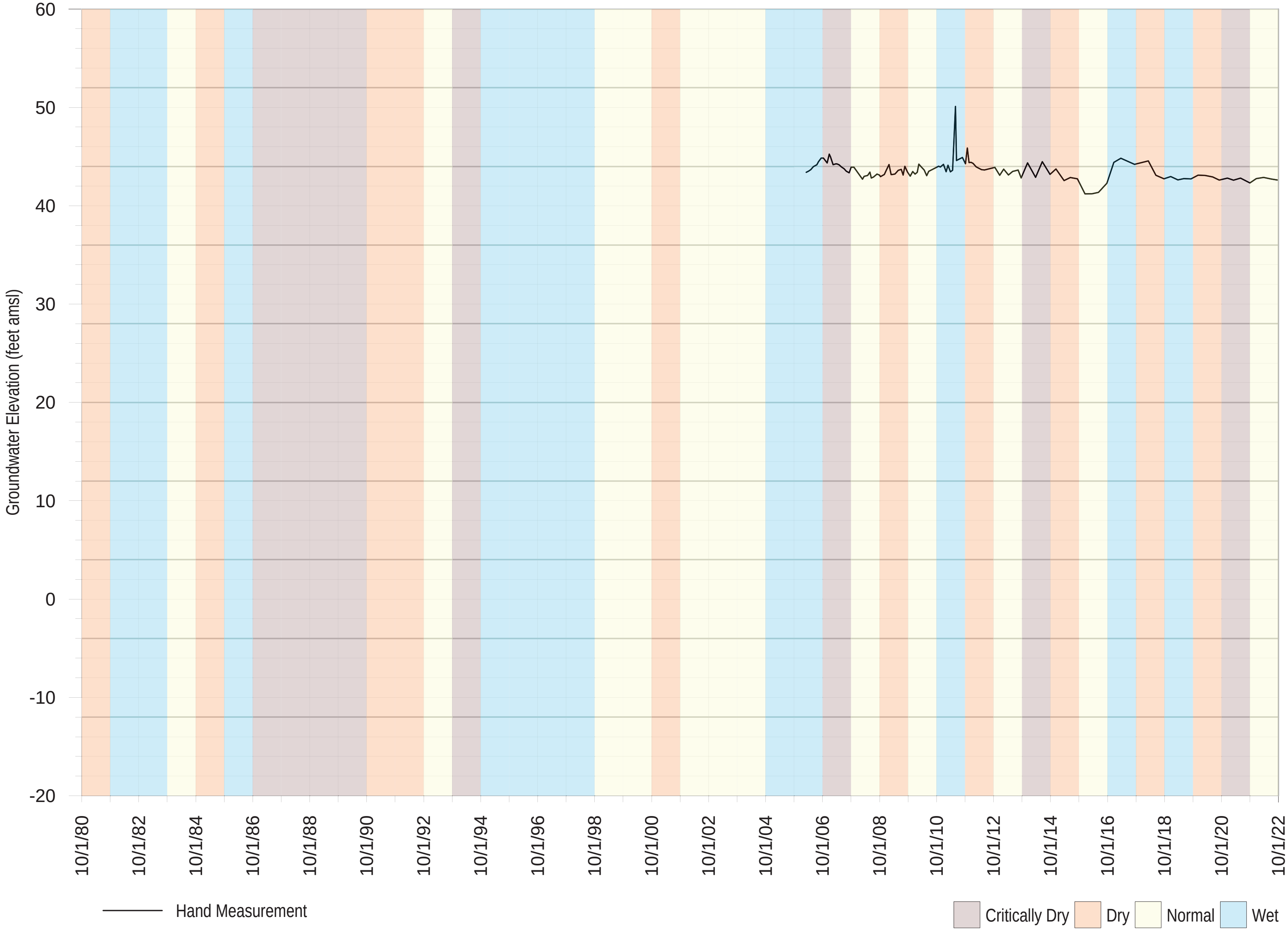


Appendix A

CWD-12A

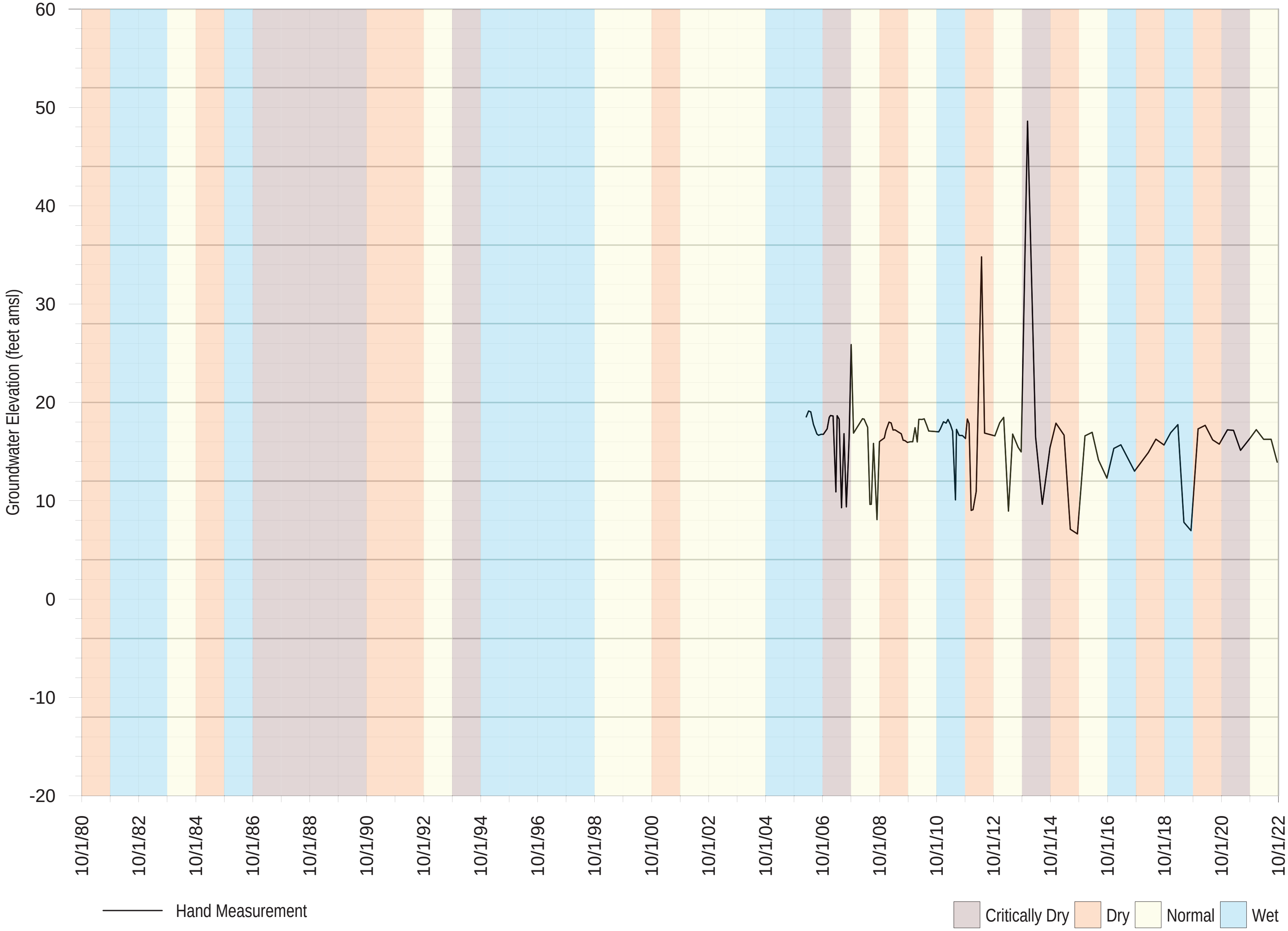
Aquifer Screened: Aromas

FIGURE A-103



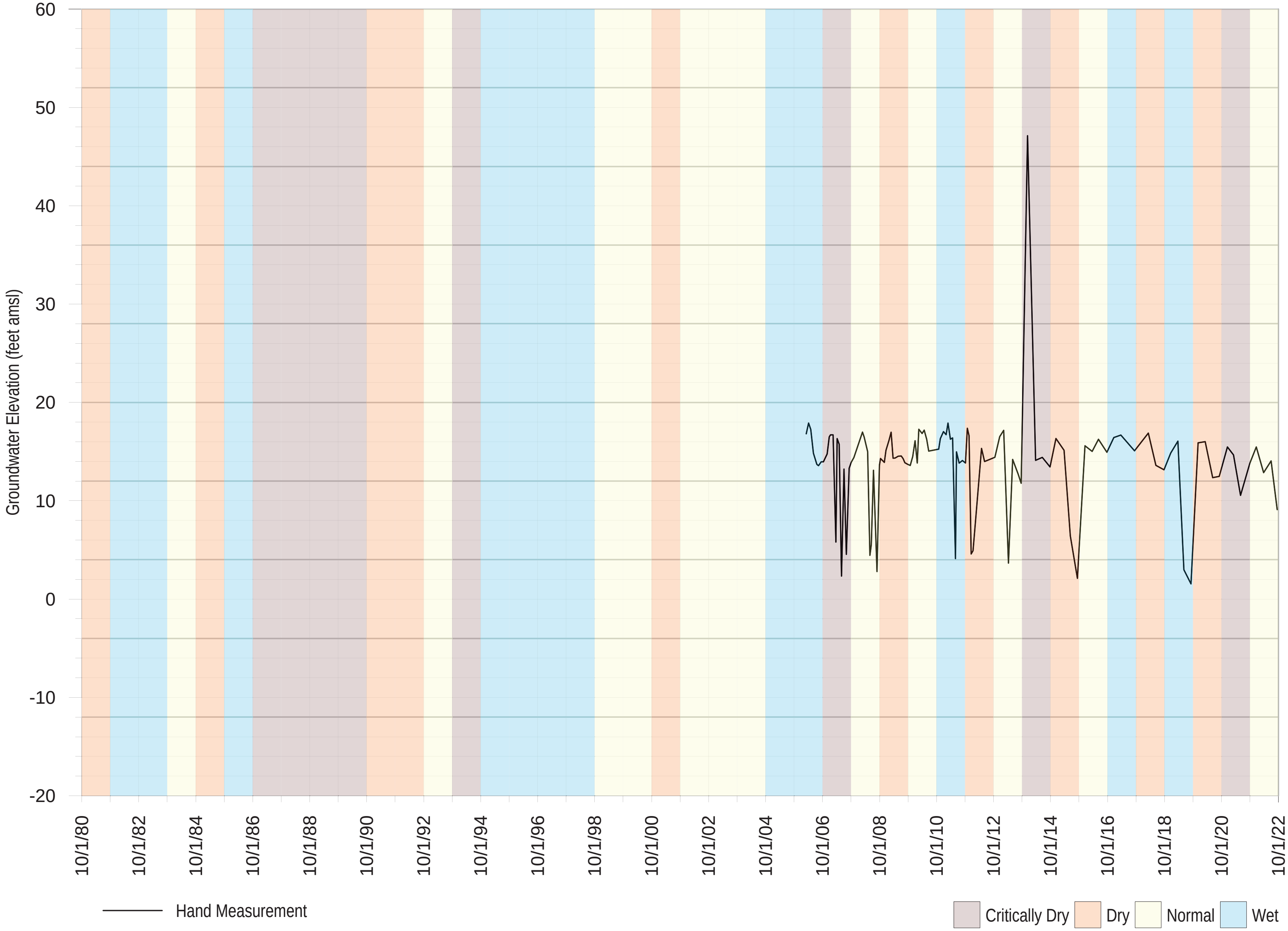
CWD-12B
Aquifer Screened: Aromas

FIGURE A-104



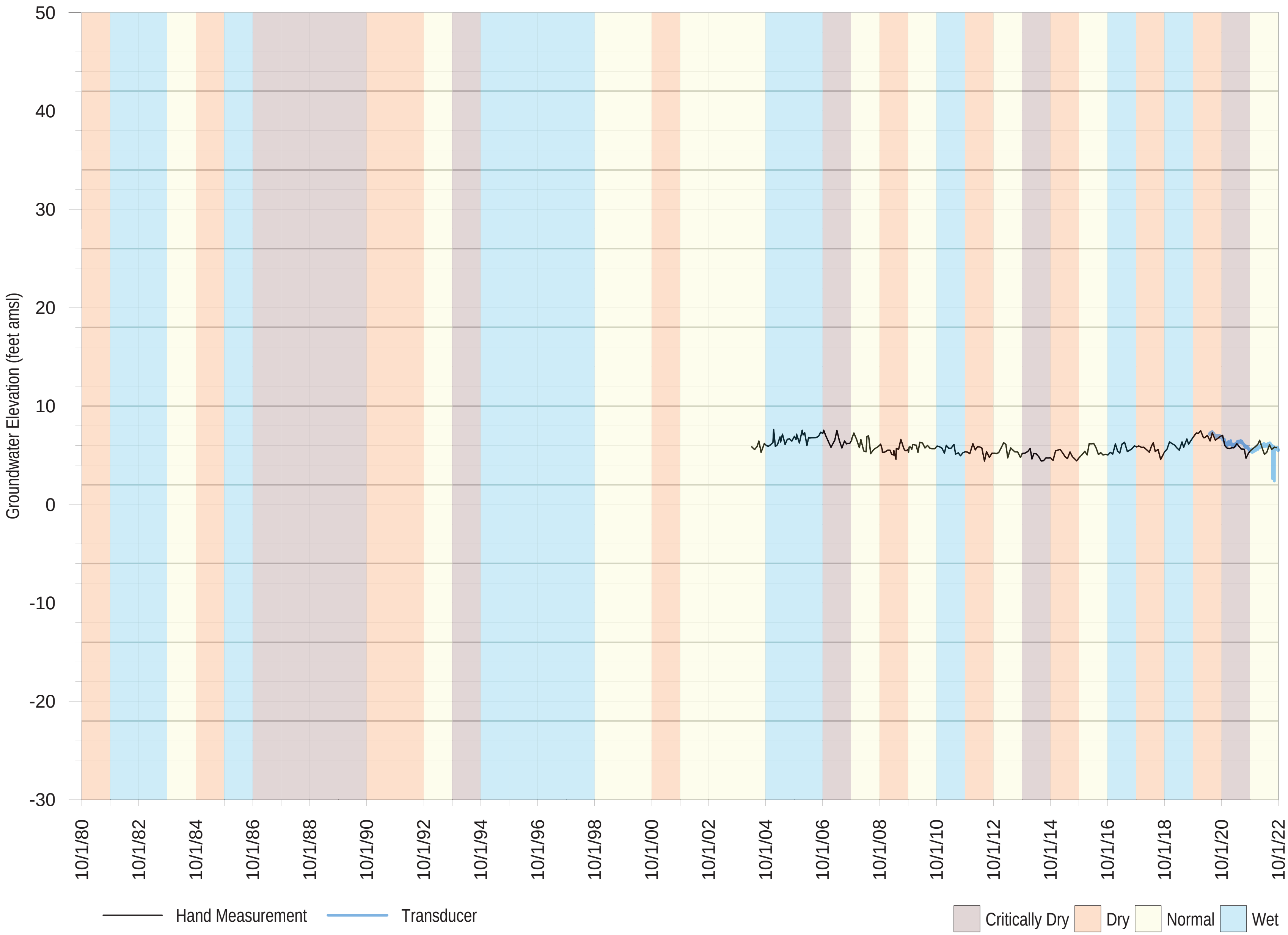
CWD-12C
Aquifer Screened: Purisima F

FIGURE A-105



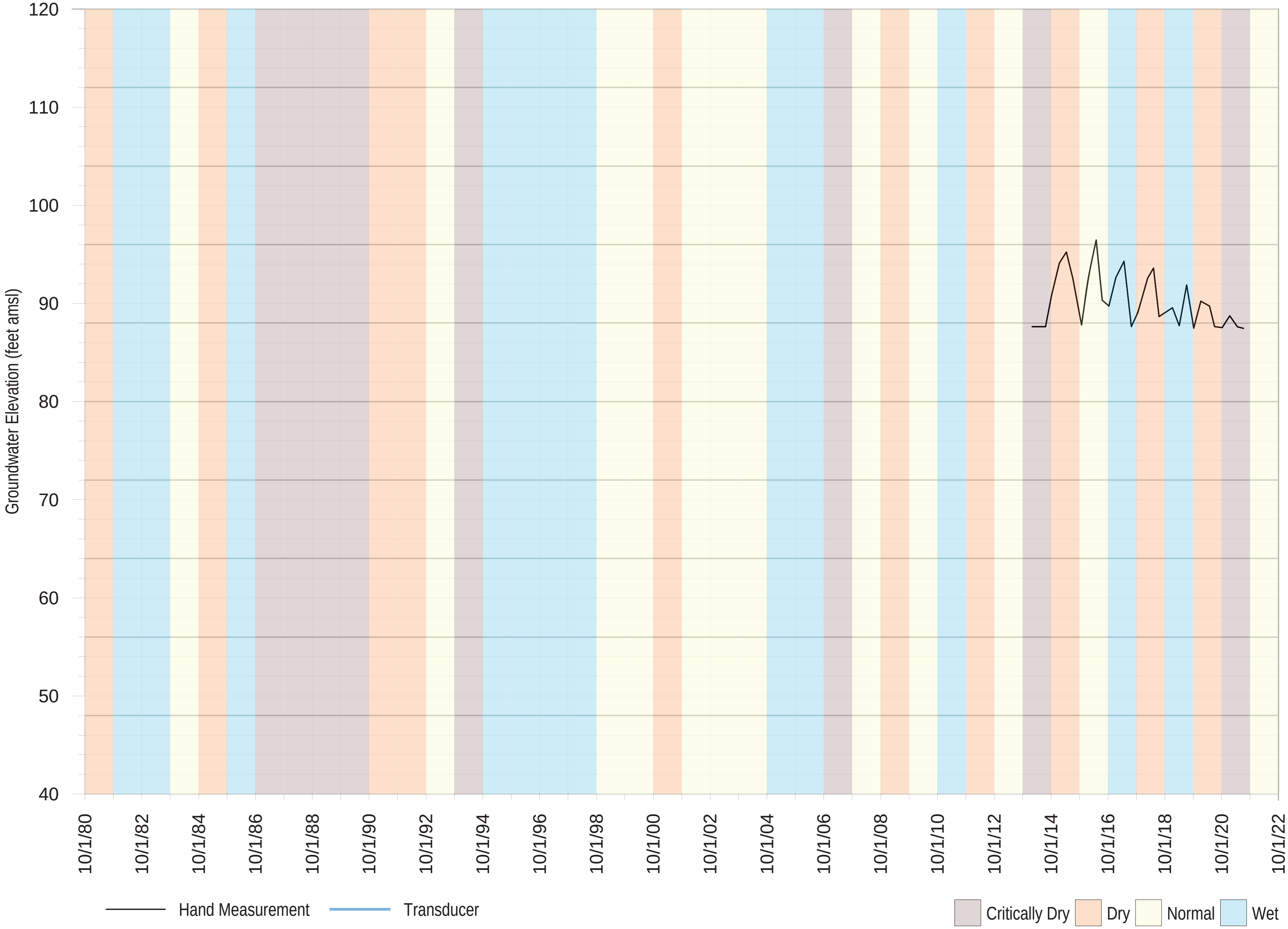
Moran Lake Shallow
Aquifer Screened: Purisima A

FIGURE A-106



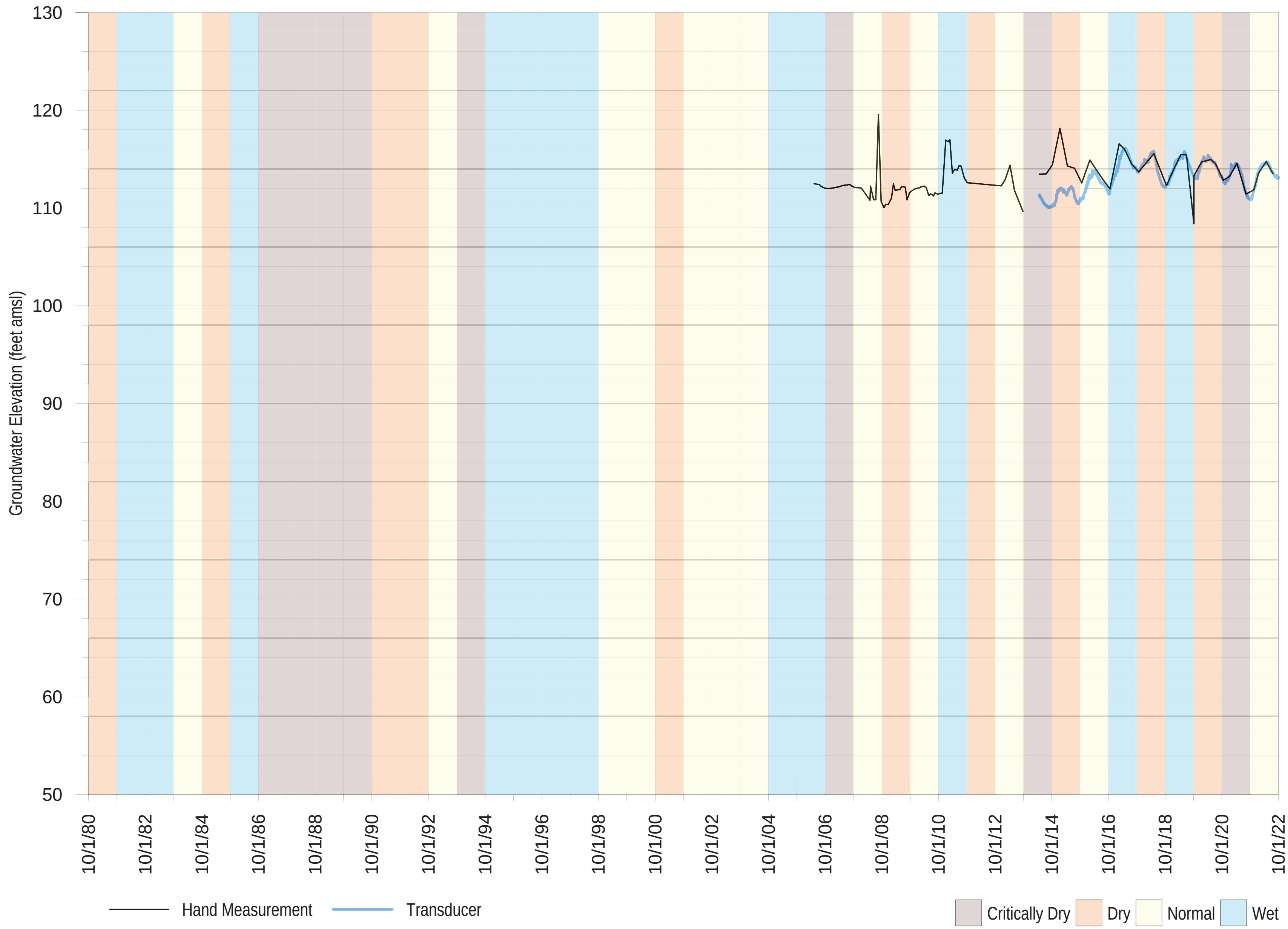
SC-10AAA at Cherryvale
Aquifer Screened: Tu

FIGURE A-107



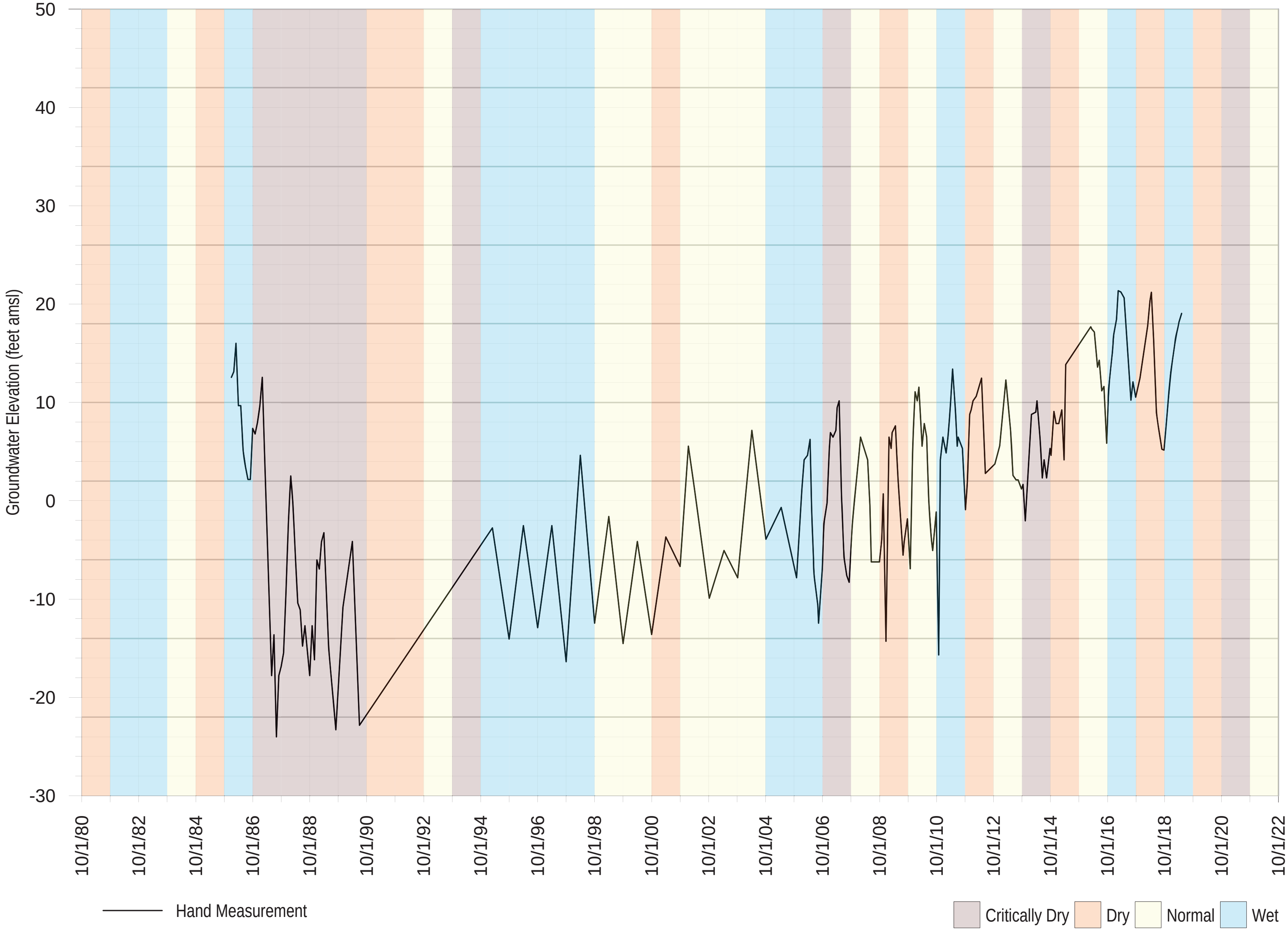
SC-11A & SC-11RA at Porter Gulch
Aquifer Screened: Purisima A/AA

FIGURE A-108



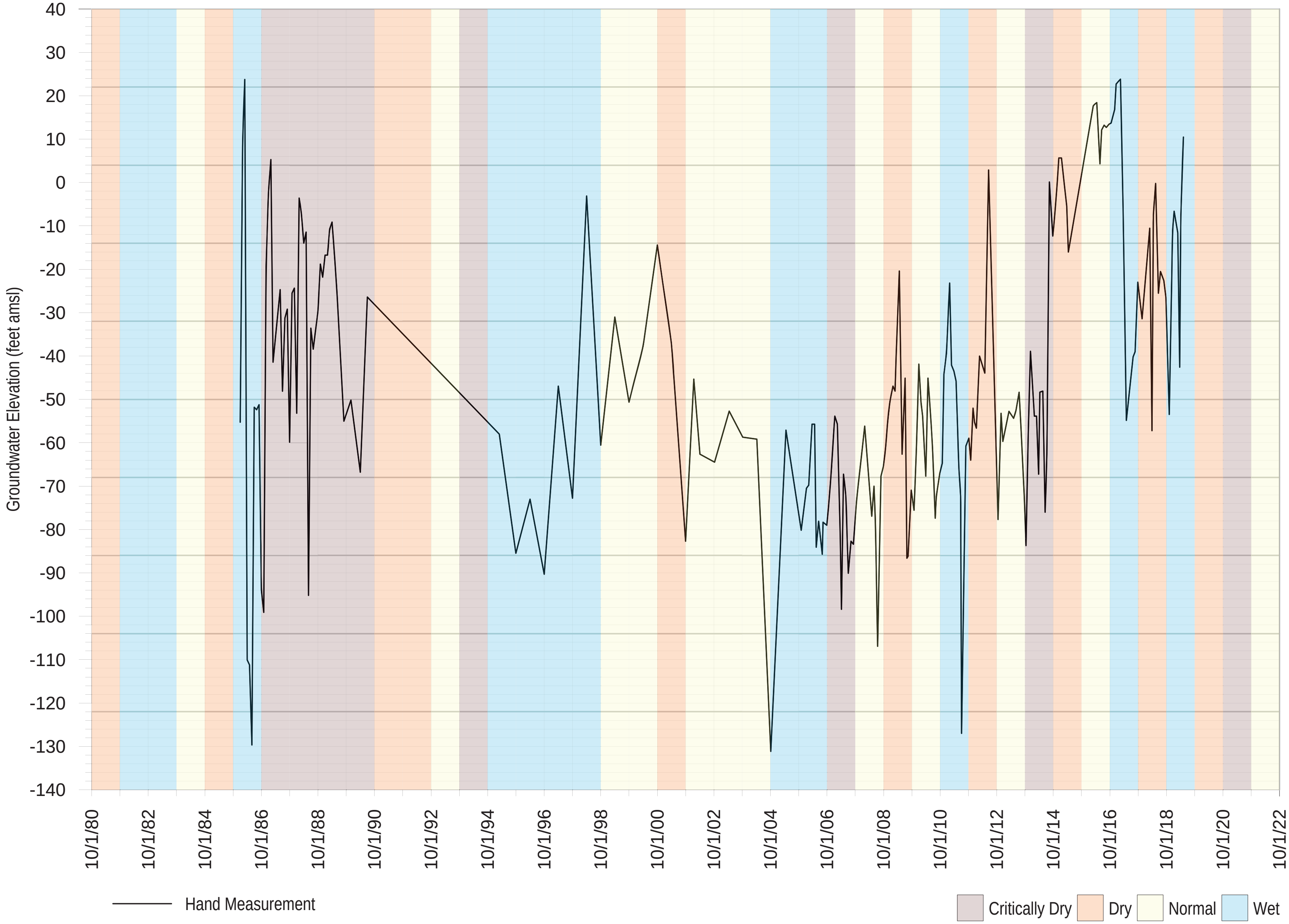
SC-14A at Madeline
Aquifer Screened: Purisima A/AA

FIGURE A-109



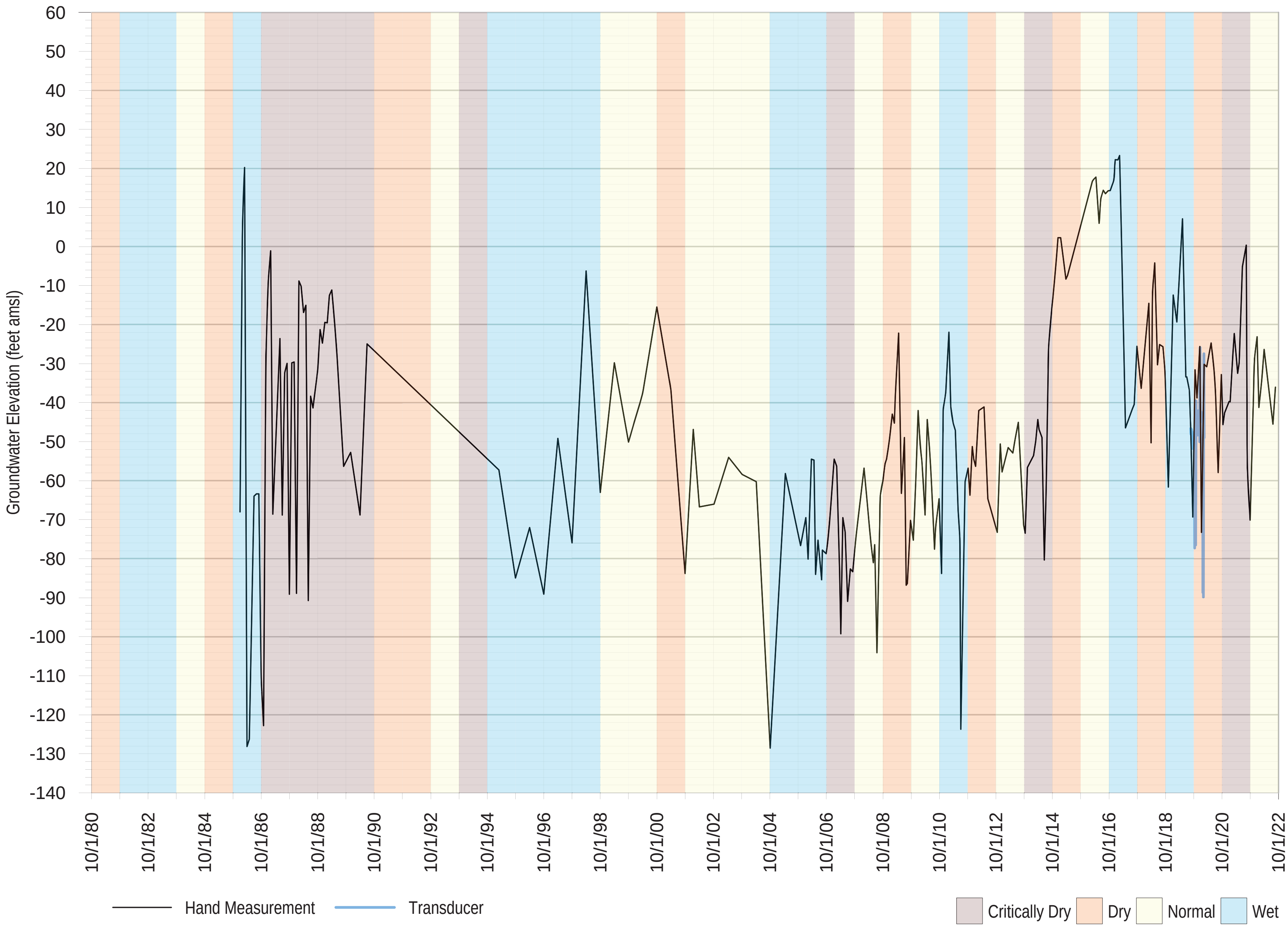
SC-14B at Madeline
Aquifer Screened: Purisima BC

FIGURE A-110



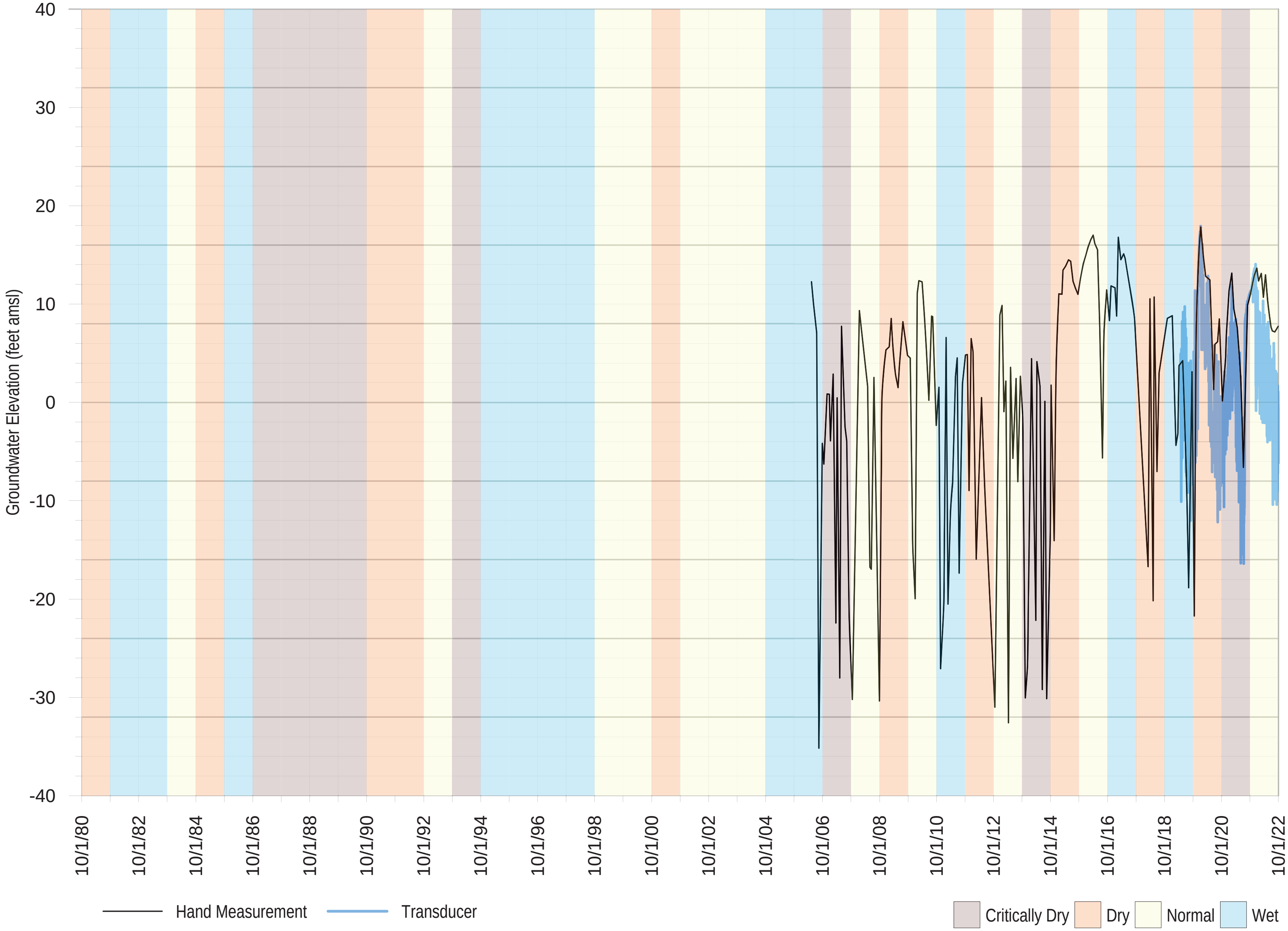
SC-14C at Madeline
Aquifer Screened: Purisima BC

FIGURE A-111



SC-15A at Rosedale
Aquifer Screened: Purisima AA

FIGURE A-112



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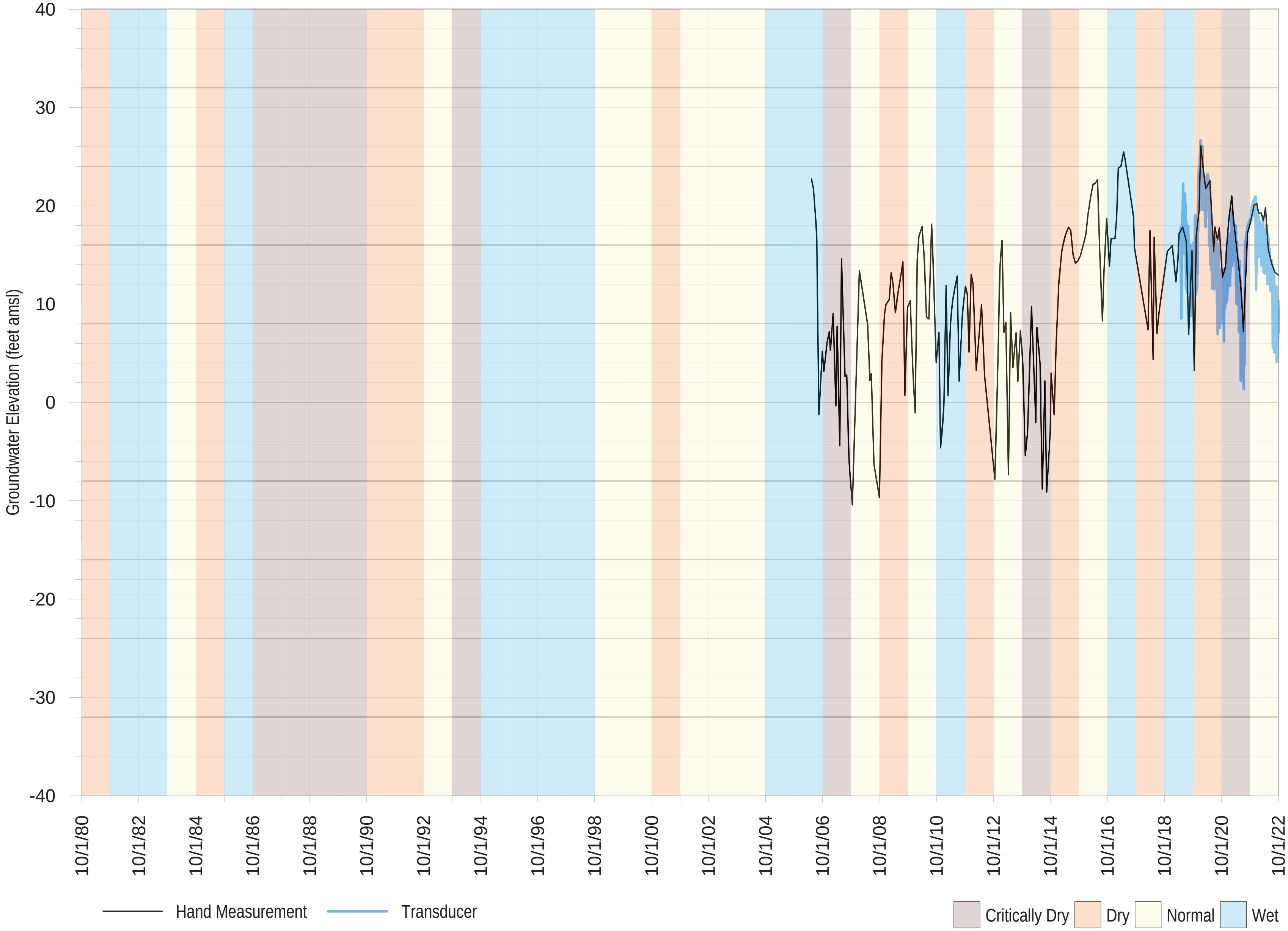
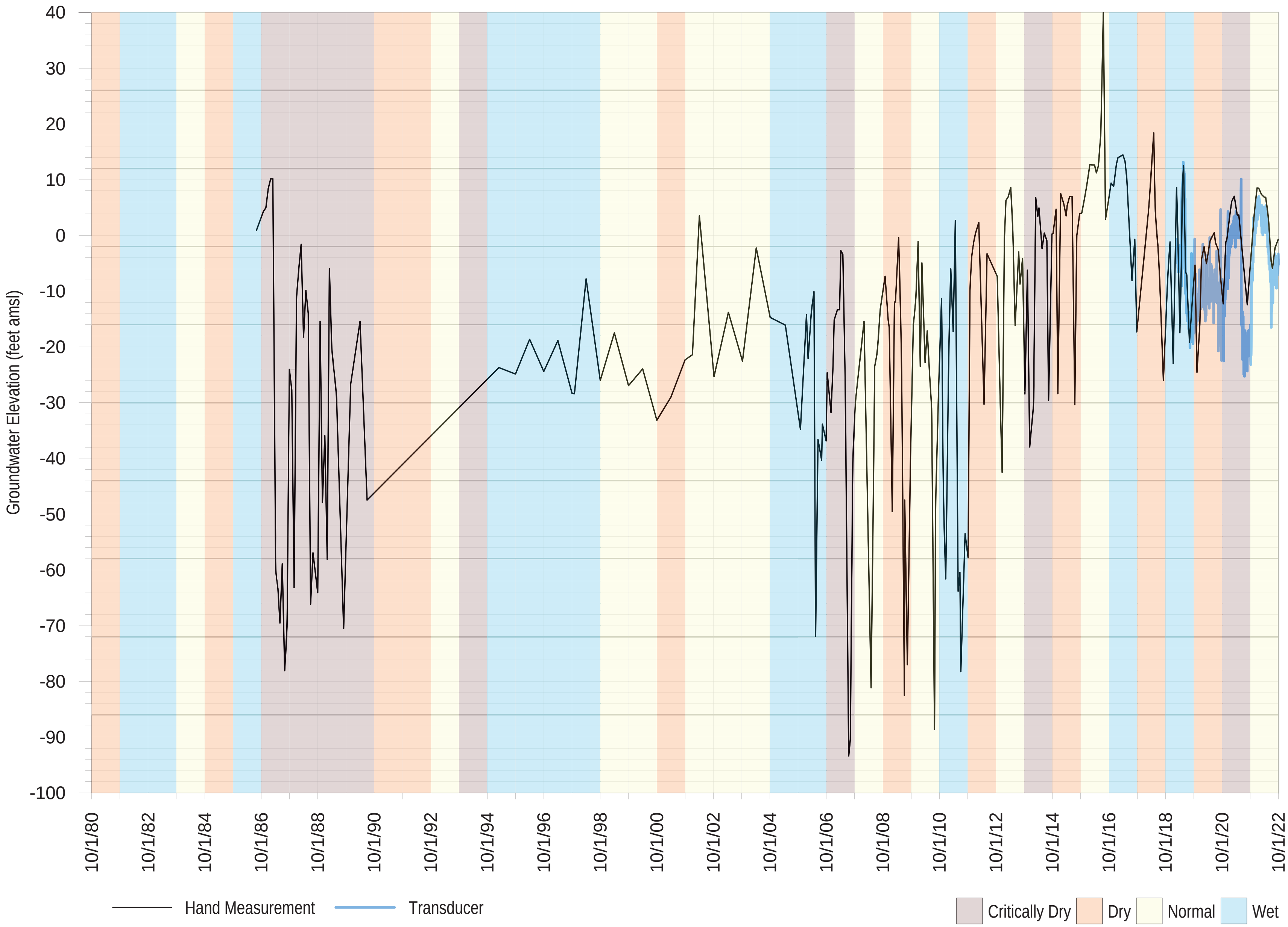
SC-15B at Rosedale
Aquifer Screened: Purisima A

FIGURE A-113



SC-16A at Estates
Aquifer Screened: Purisima A/AA

FIGURE A-114



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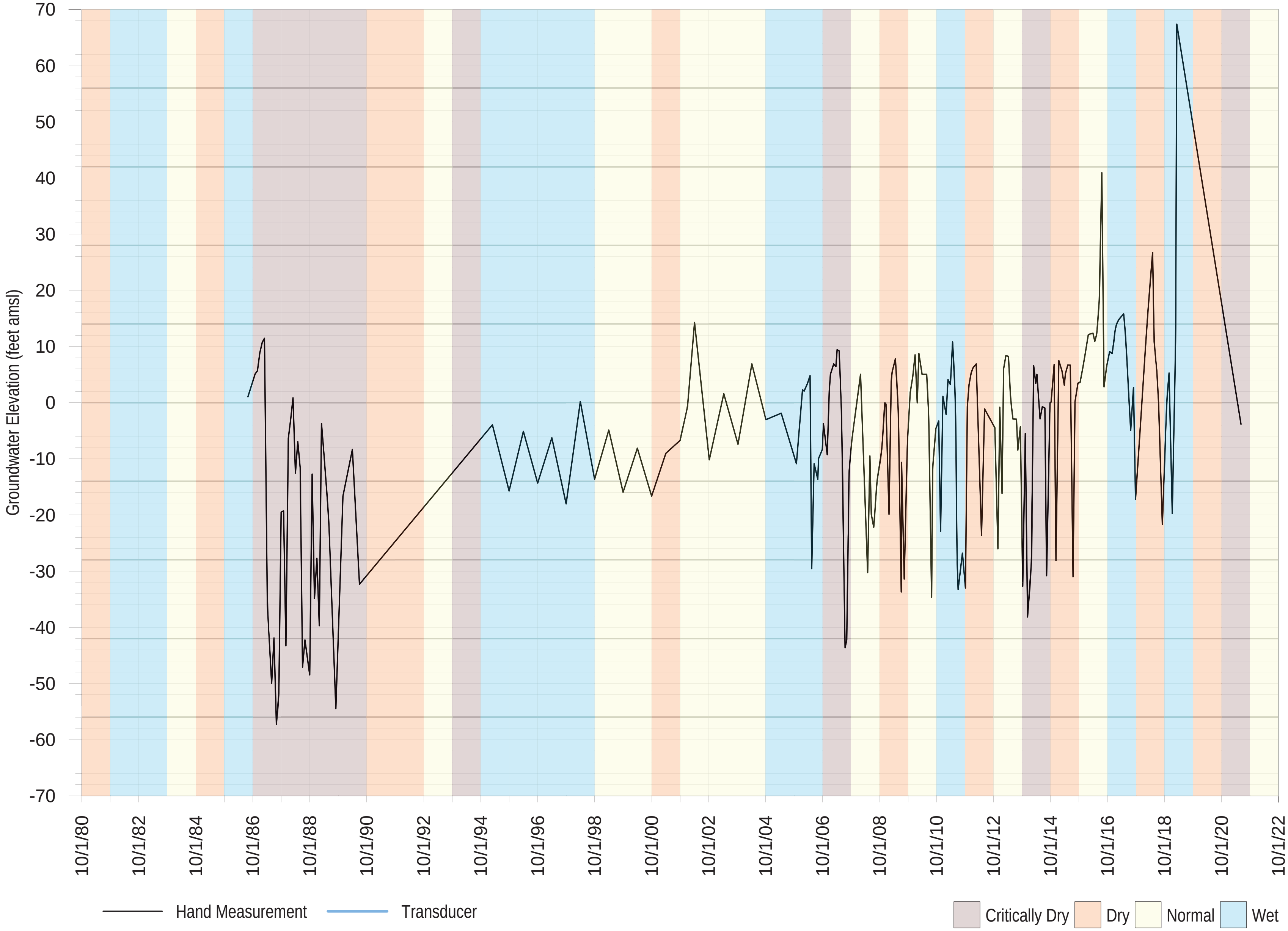
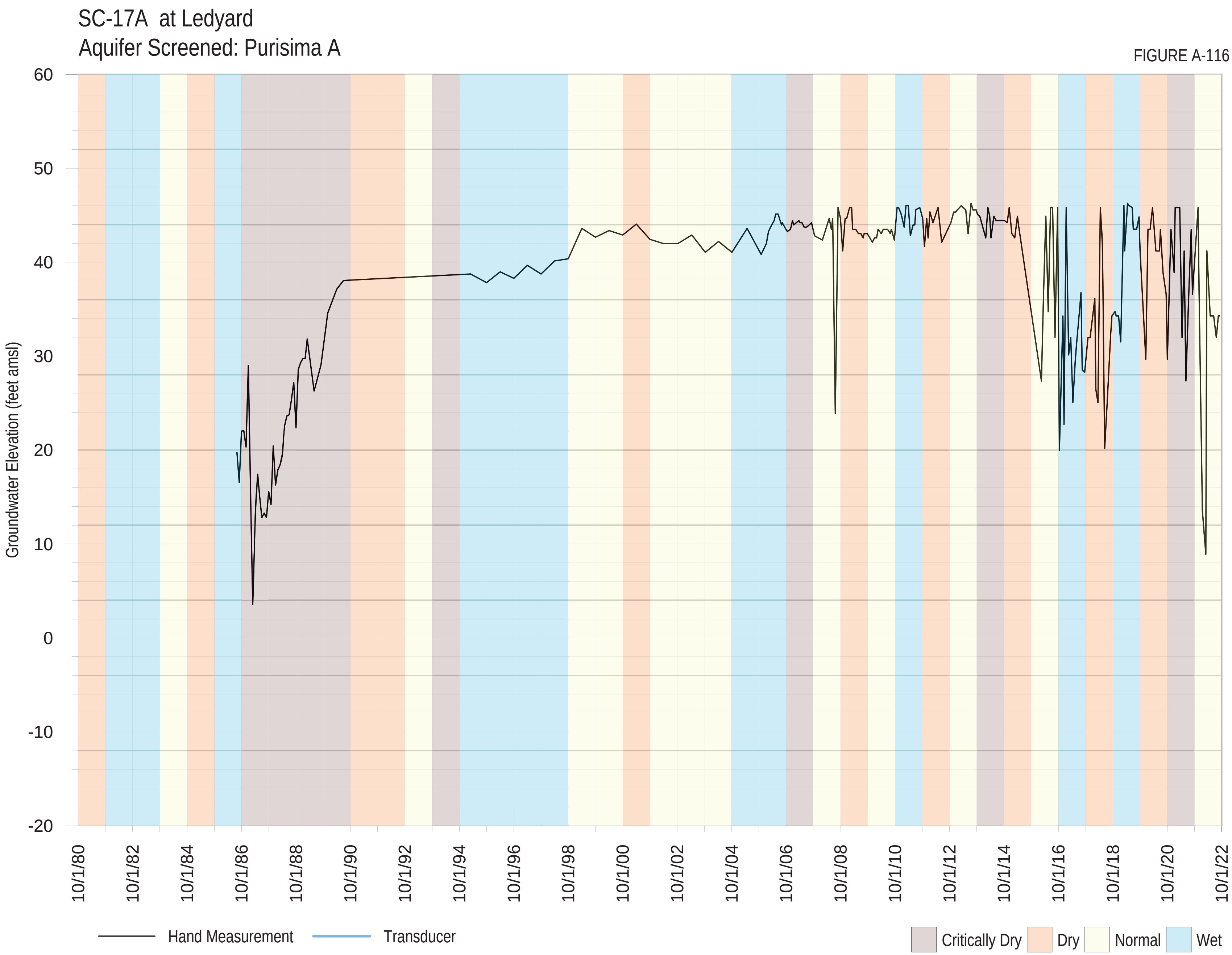
SC-16B at Estates
Aquifer Screened: Purisima BC

FIGURE A-115




SC-17A at Ledyard
Aquifer Screened: Purisima A
FIGURE A-116
Groundwater Elevation (feet amsl)
60
50
40
30
20
10
0
-10
-20
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
Hand Measurement
Transducer
Critically Dry
Dry
Normal
Wet

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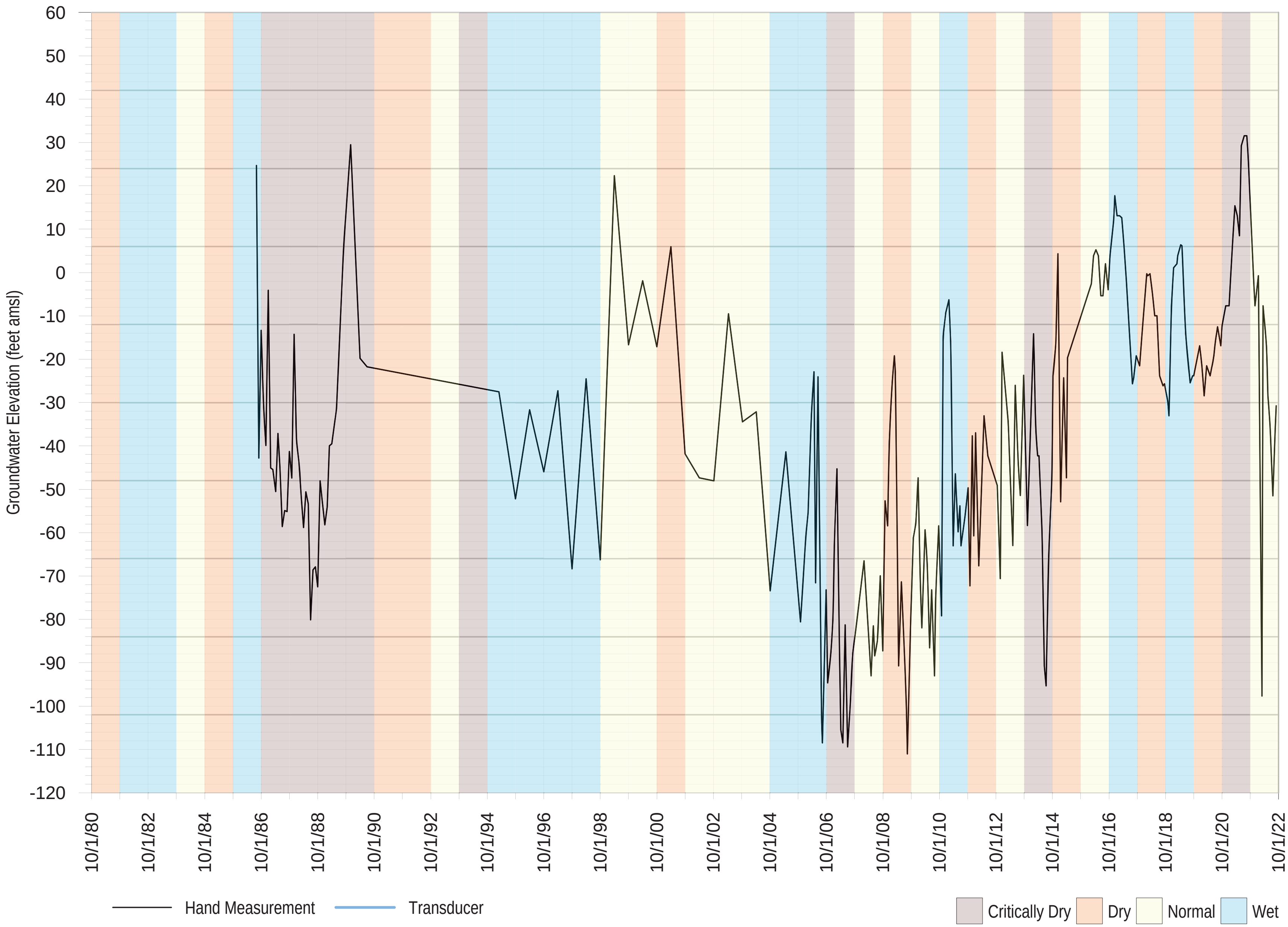
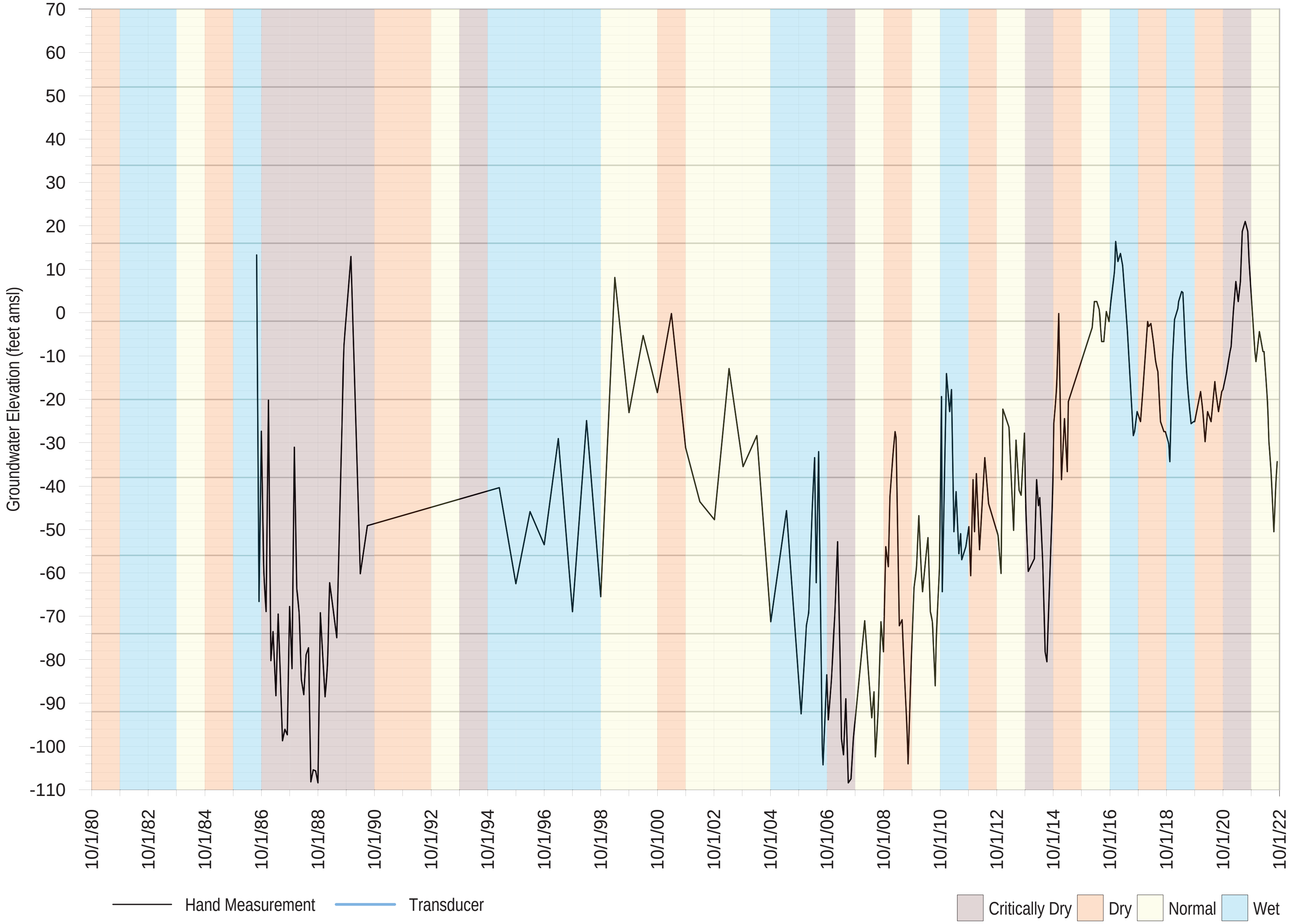
SC-17B at Ledyard
Aquifer Screened: Purisima BC

FIGURE A-117



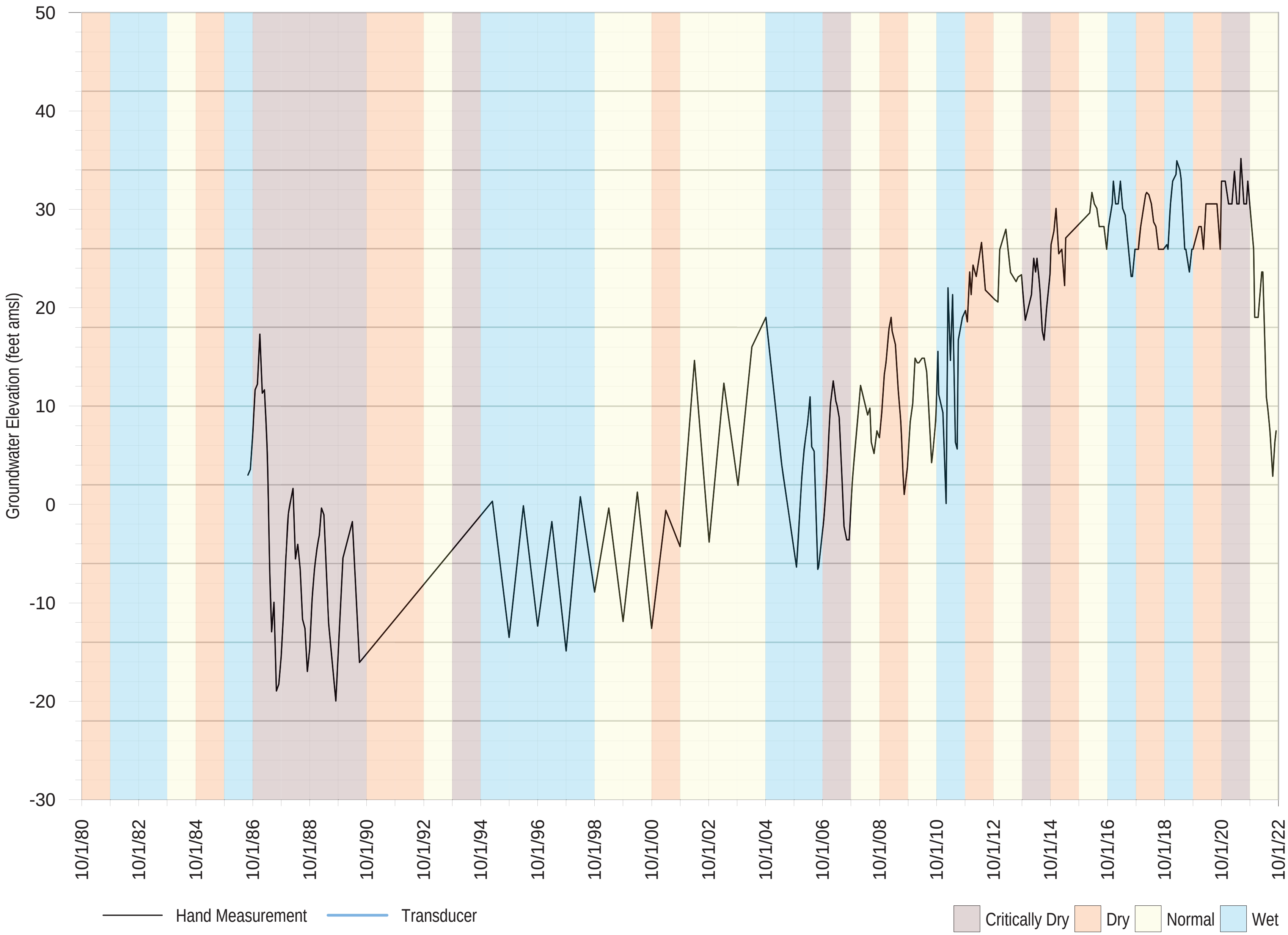
SC-17C at Ledyard
Aquifer Screened: Purisima DEF

FIGURE A-118



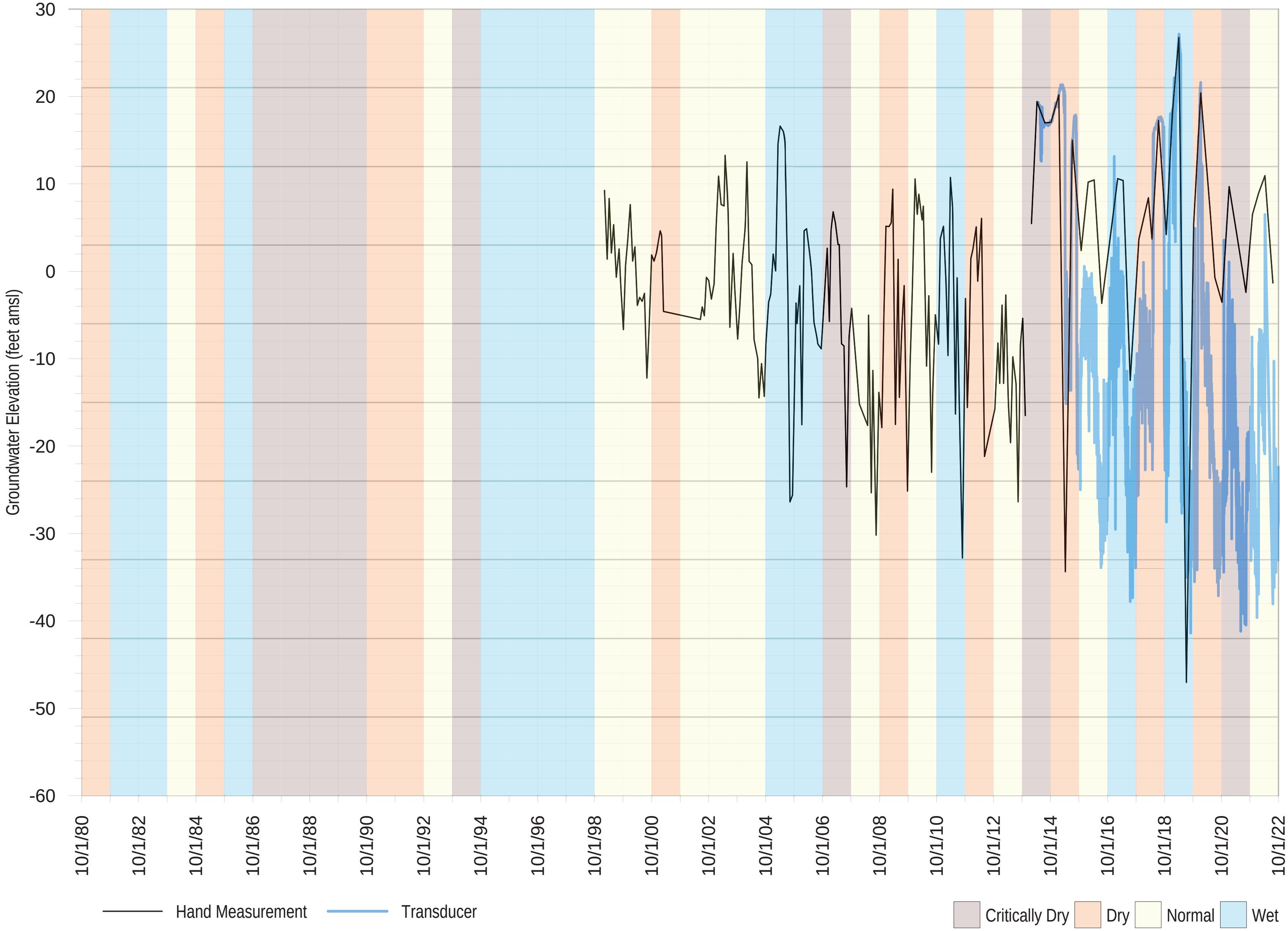
SC-17D at Ledyard
Aquifer Screened: Purisima DEF

FIGURE A-119



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

FIGURE A-120



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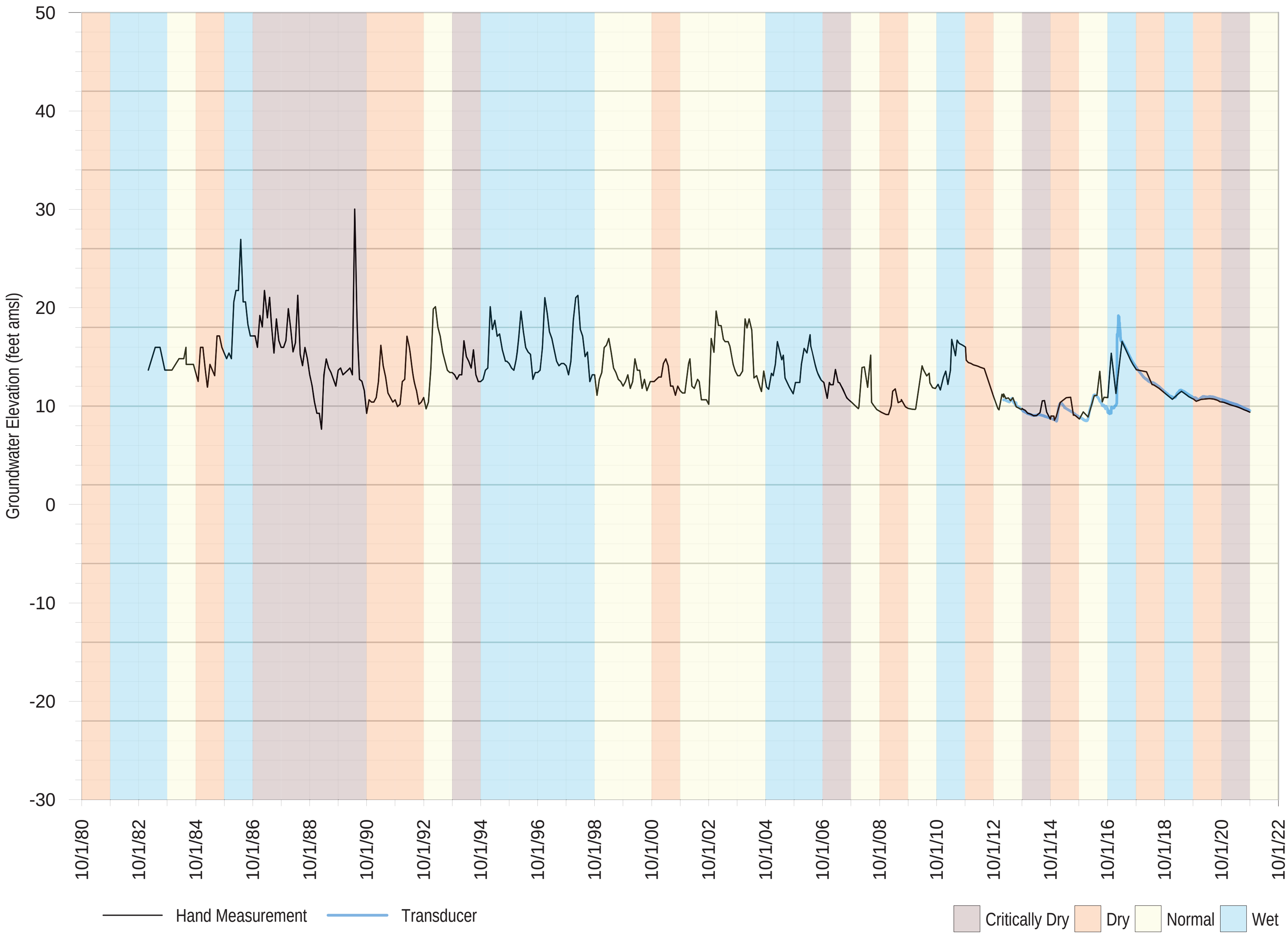
SC-1B at Prospect
Aquifer Screened: Purisima BC

FIGURE A-121



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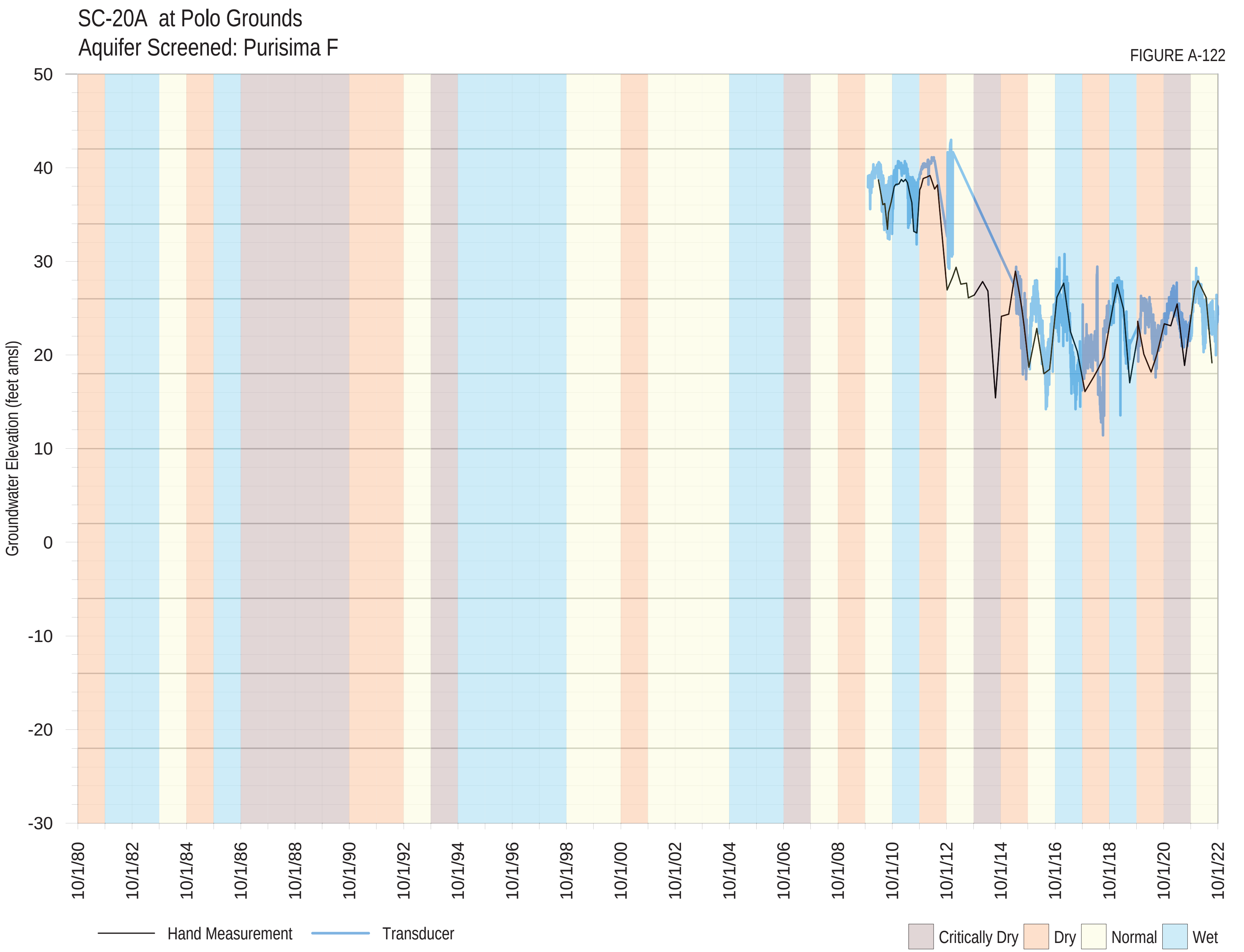

SC-20A at Polo Grounds
Aquifer Screened: Purisima F
FIGURE A-122
Groundwater Elevation (feet amsl)
50
40
30
20
10
0
-10
-20
-30
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Hand Measurement
Transducer
Critically Dry
Dry
Normal
Wet

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

FIGURE A-123

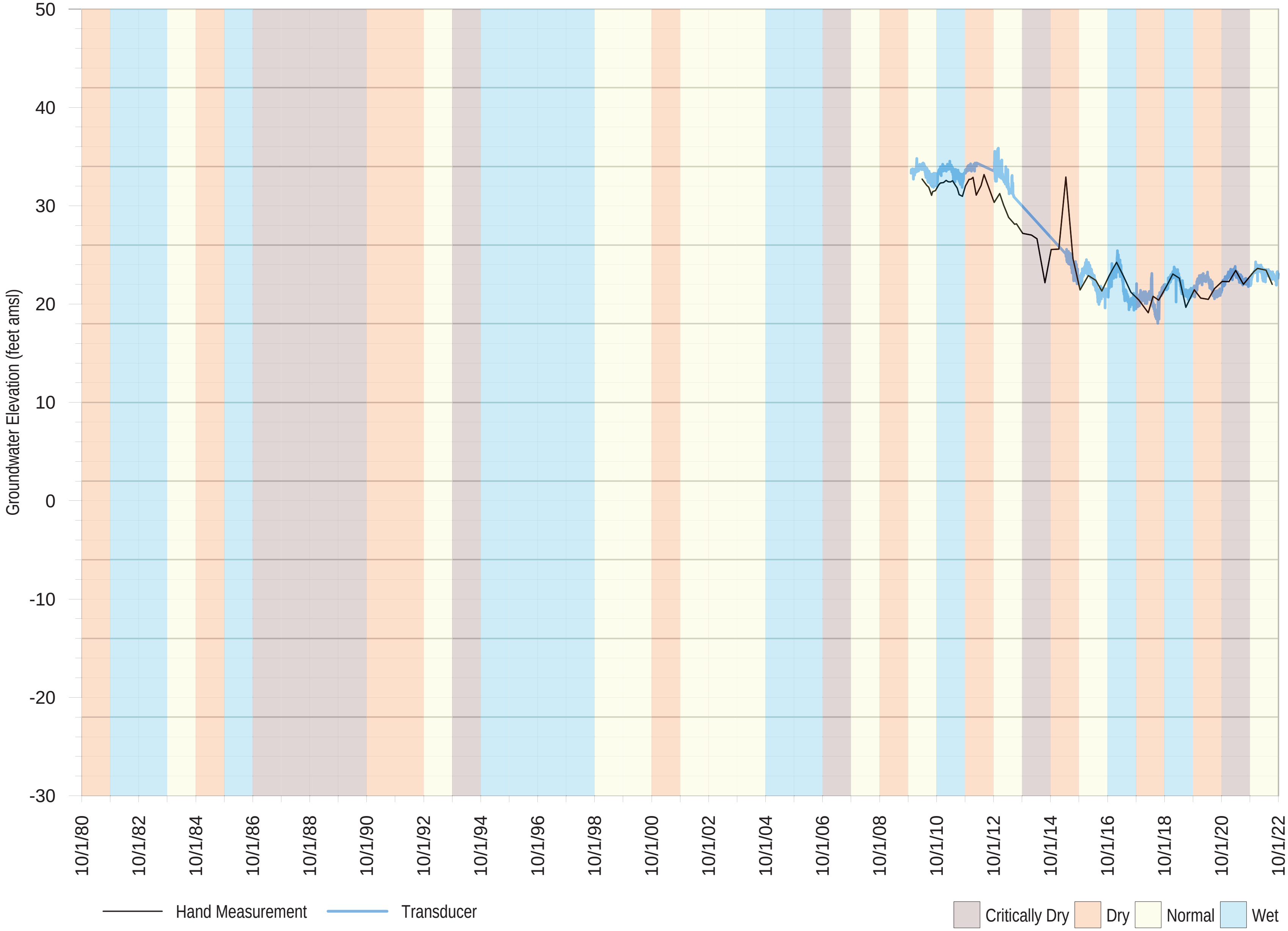

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FIGURE A-124

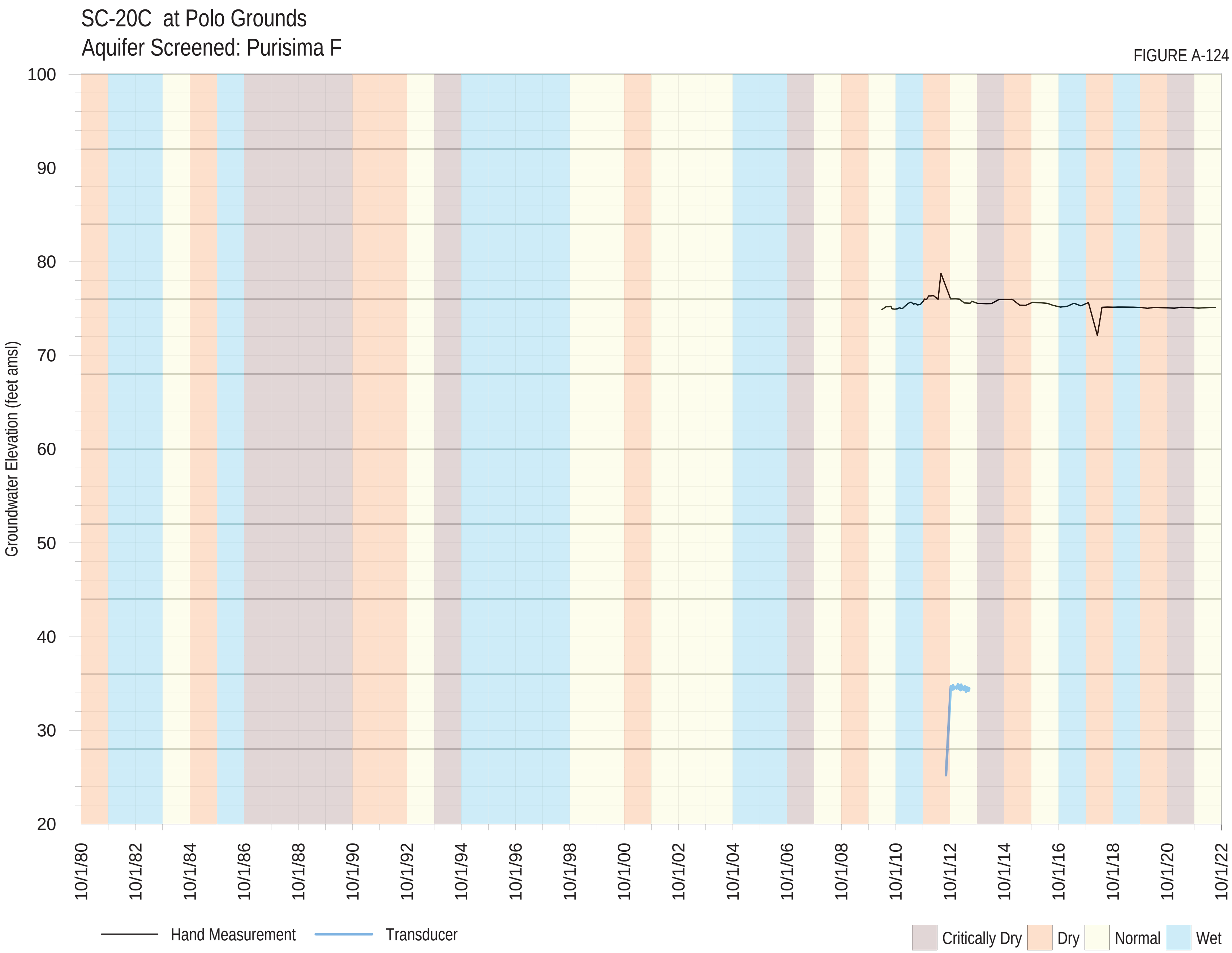
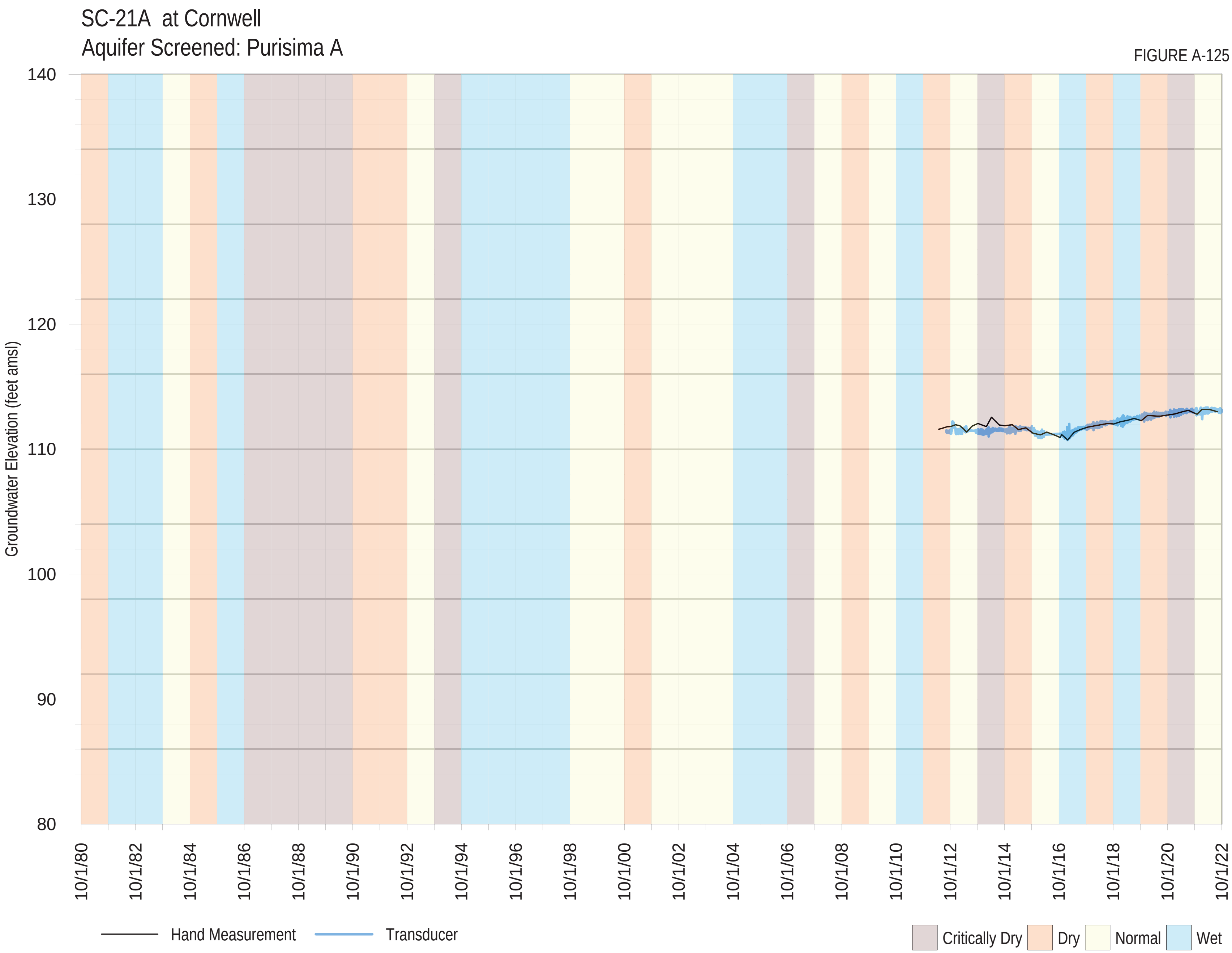
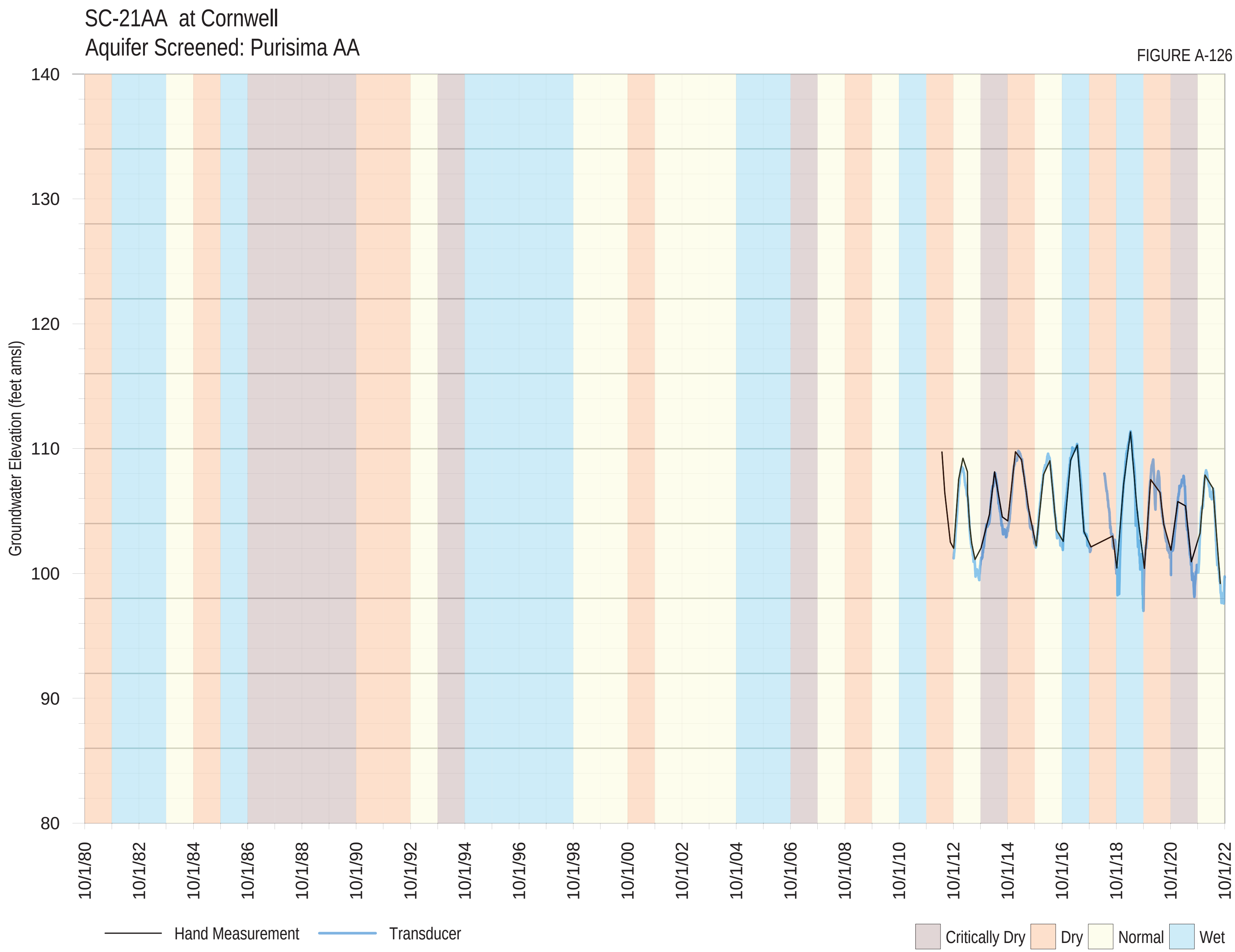


FIGURE A-125

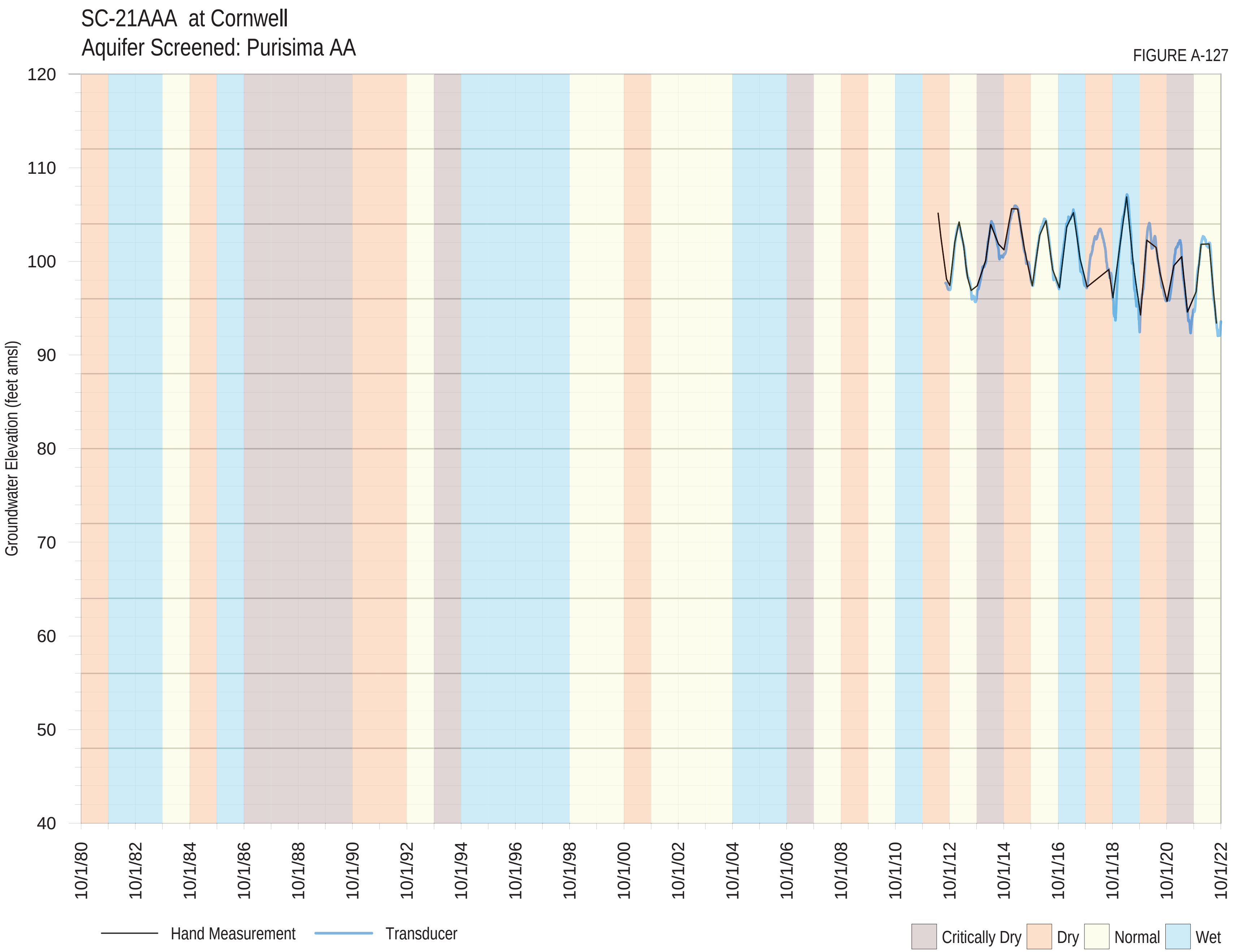

SC-21A at Cornwell
Aquifer Screened: Purisima A
Groundwater Elevation (feet amsl)
140
130
120
110
100
90
80
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Hand Measurement
Transducer
Critically Dry
Dry
Normal
Wet

Appendix A



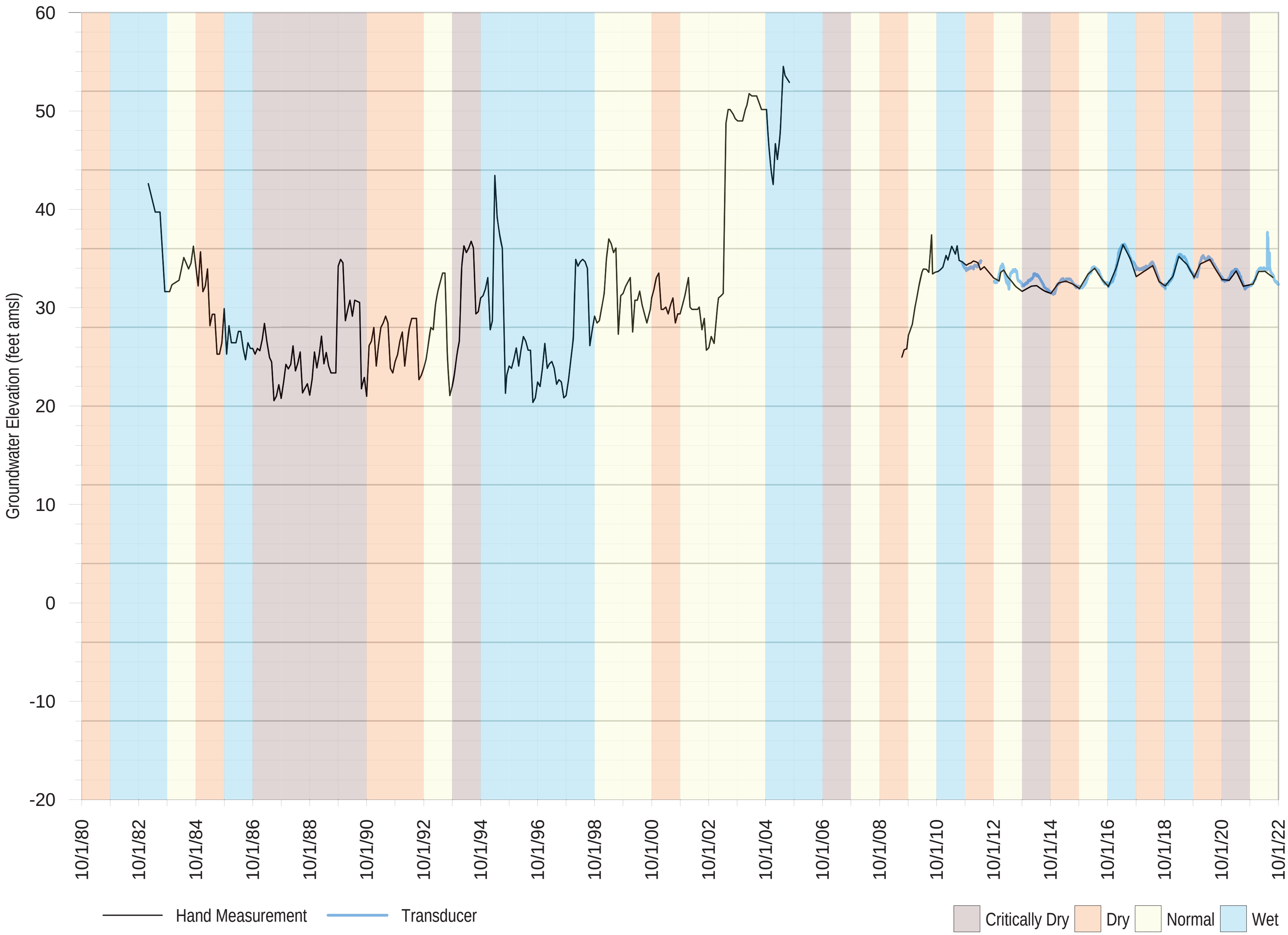
SC-21AA at Cornwell
Aquifer Screened: Purisima AA
FIGURE A-126
Groundwater Elevation (feet amsl)
140
130
120
110
100
90
80
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Hand Measurement
Transducer
Critically Dry
Dry
Normal
Wet

Appendix A


SC-21AAA at Cornwell
Aquifer Screened: Purisima AA
FIGURE A-127
Groundwater Elevation (feet amsl)
120
110
100
90
80
70
60
50
40
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
Hand Measurement
Transducer
Critically Dry
Dry
Normal
Wet

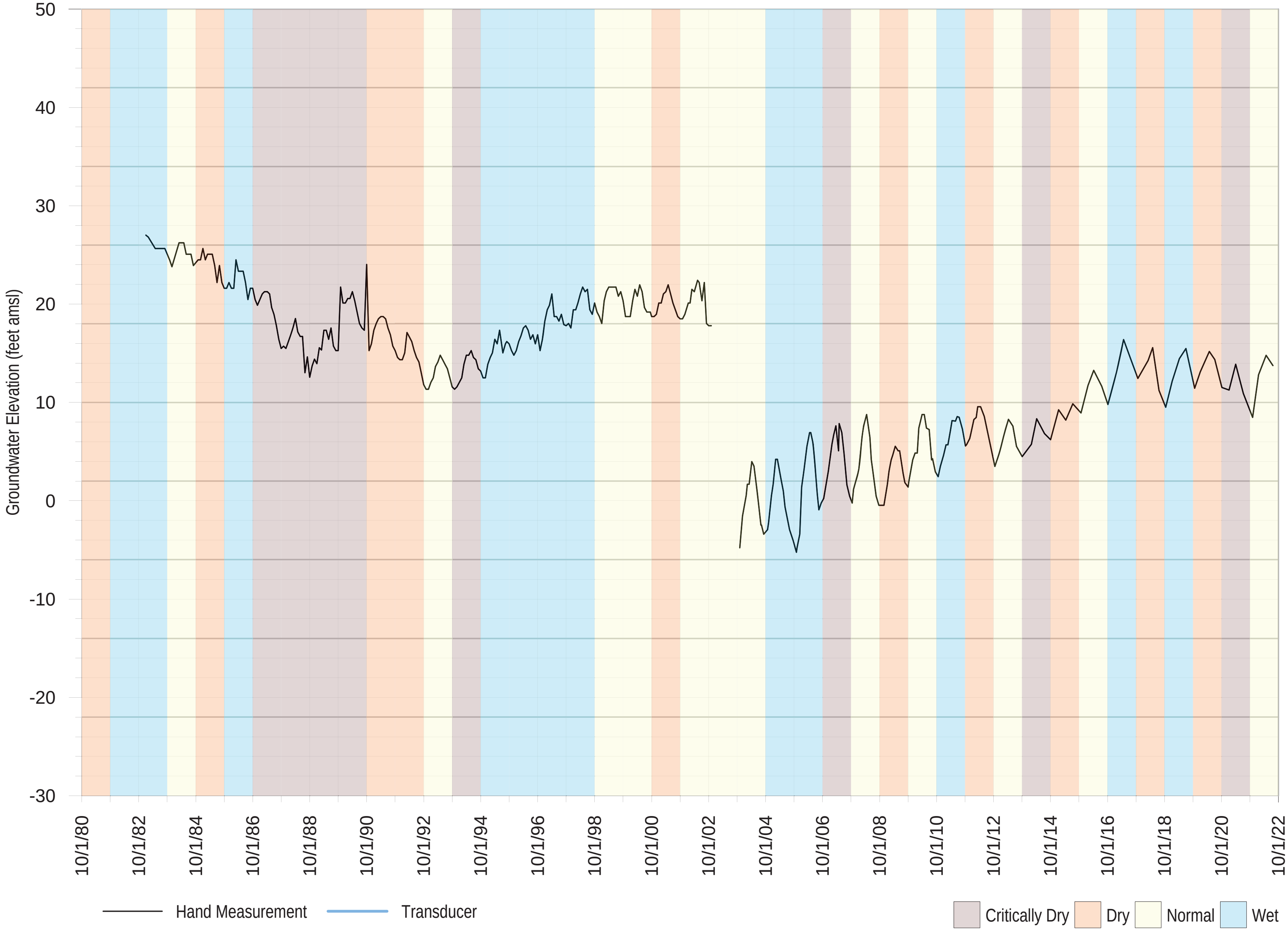
SC-3B & SC-3RB at Escalona
Aquifer Screened: Purisima B

FIGURE A-128



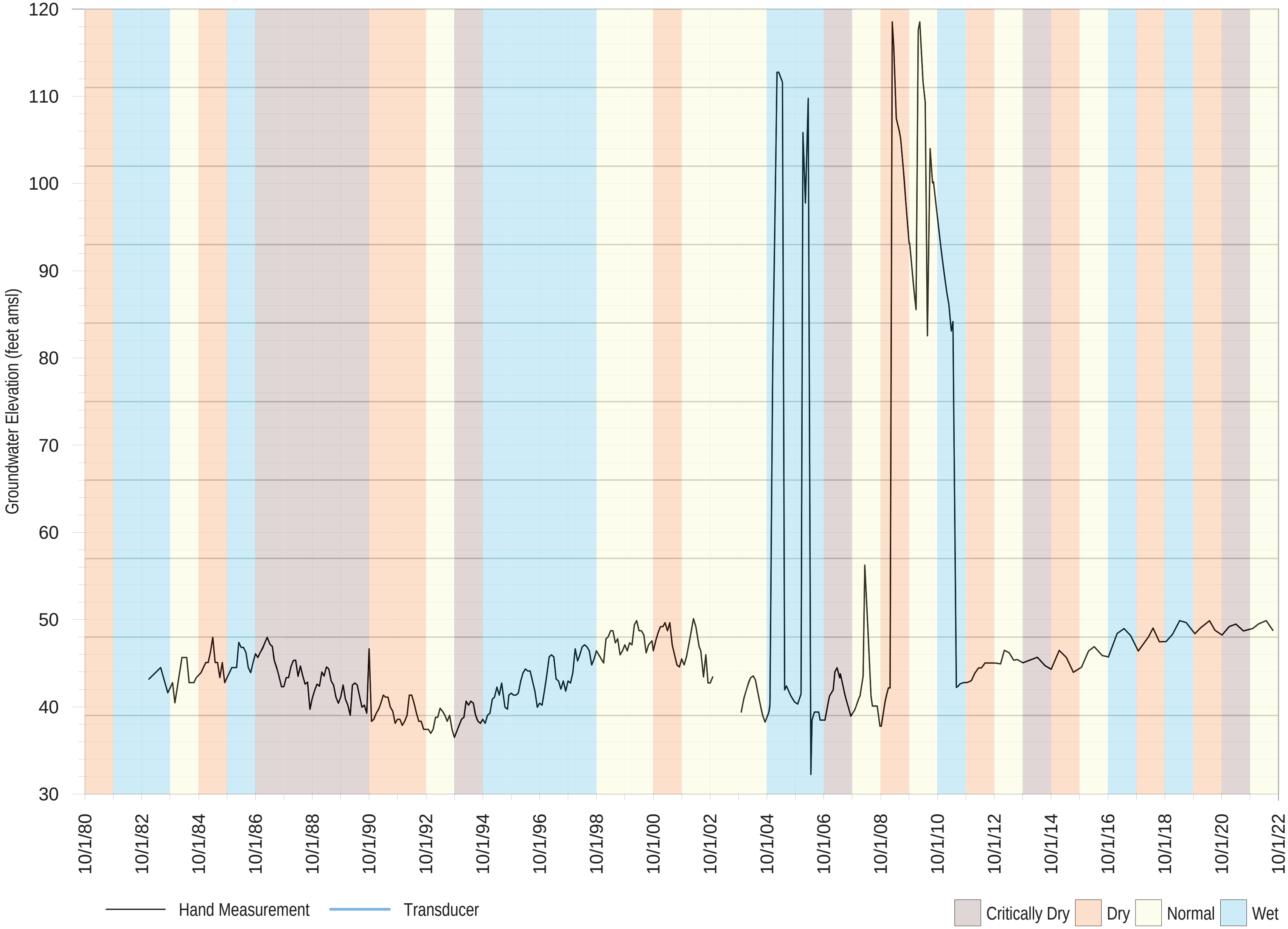
SC-5B & SC-5RB at New Brighton
Aquifer Screened: Purisima B

FIGURE A-129



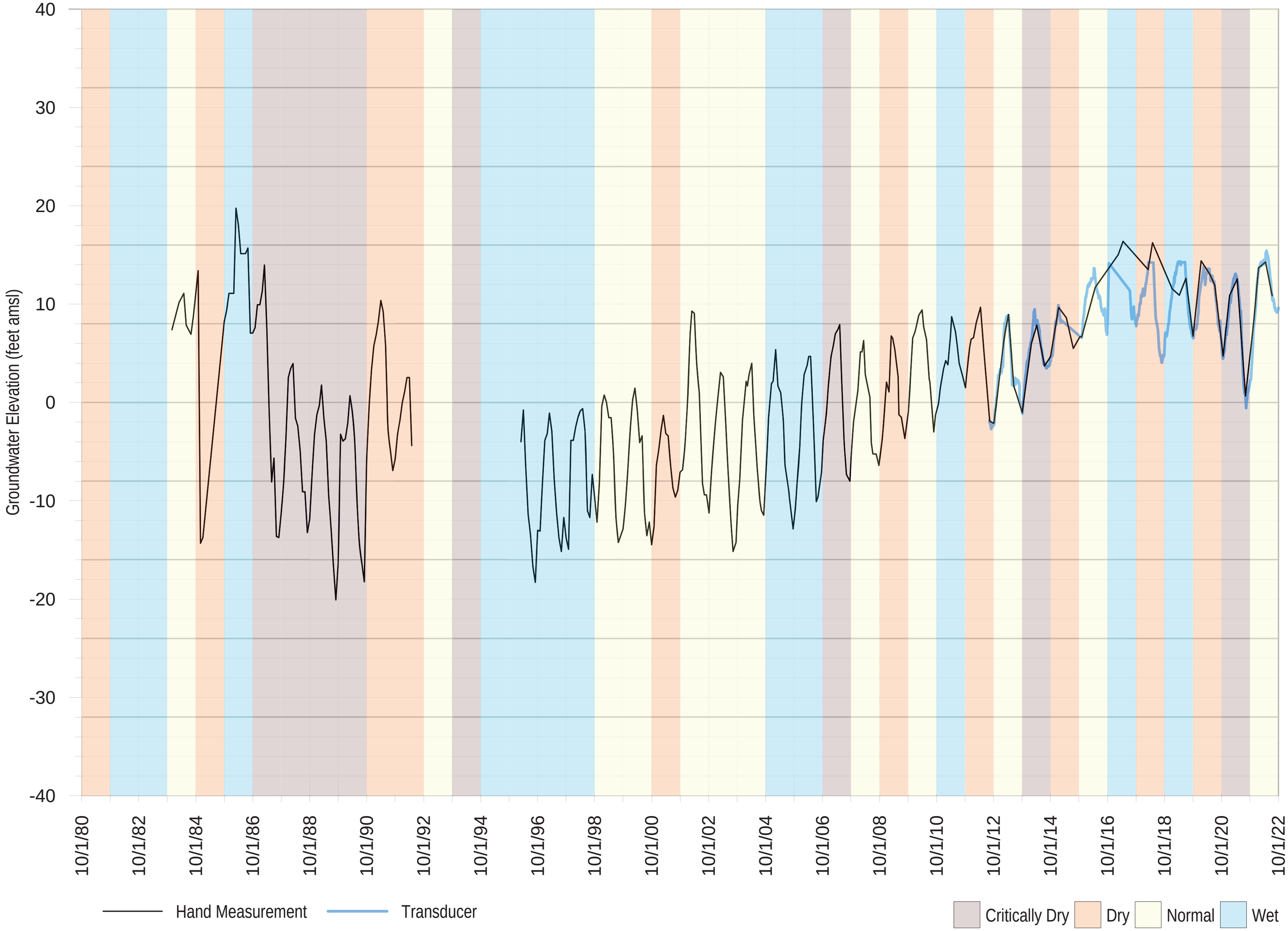
SC-5C & SC-5RC at New Brighton
Aquifer Screened: Purisima BC

FIGURE A-130



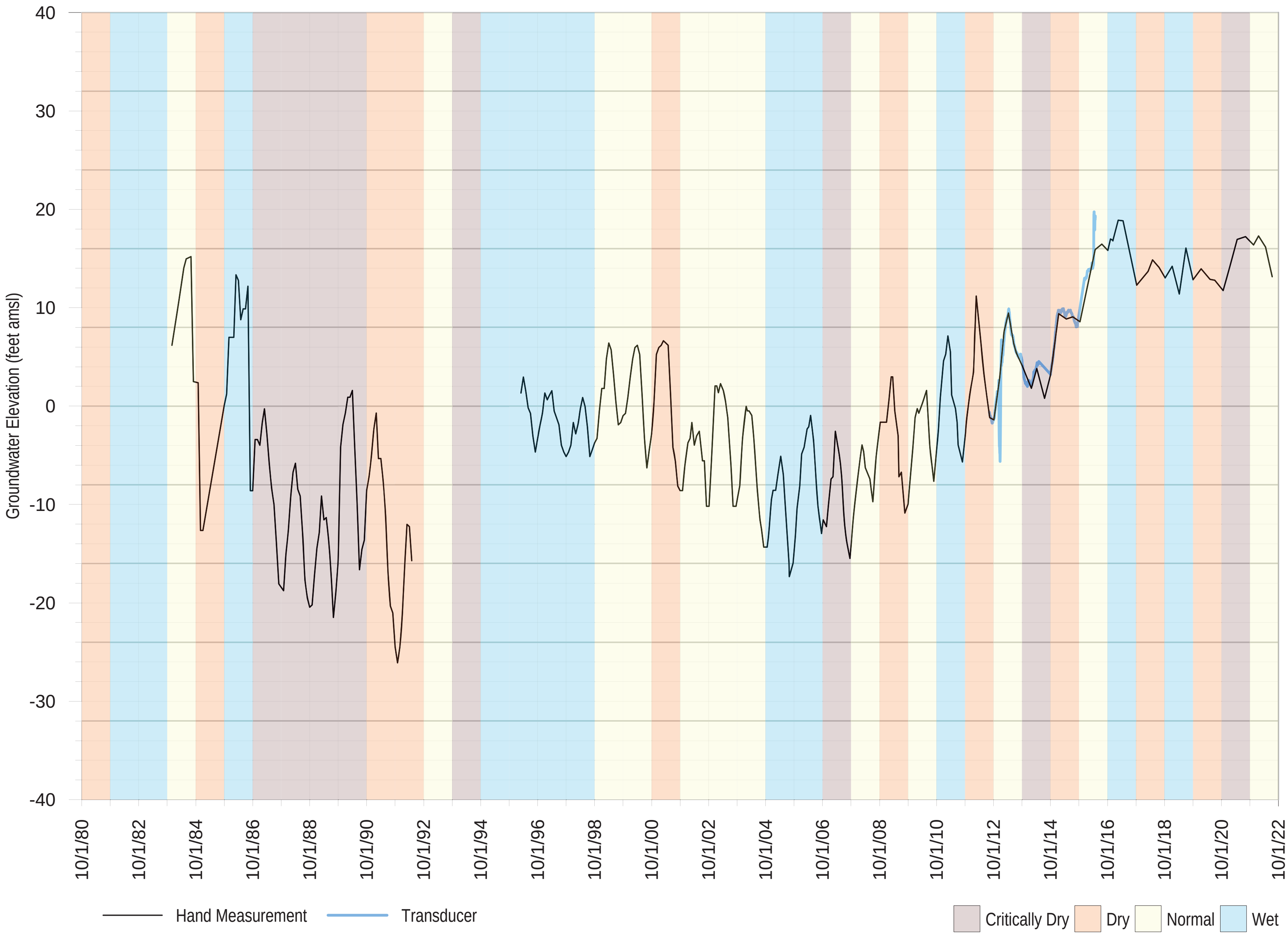
SC-8A & SC-8RA at Aptos Creek
Aquifer Screened: Purisima A

FIGURE A-131



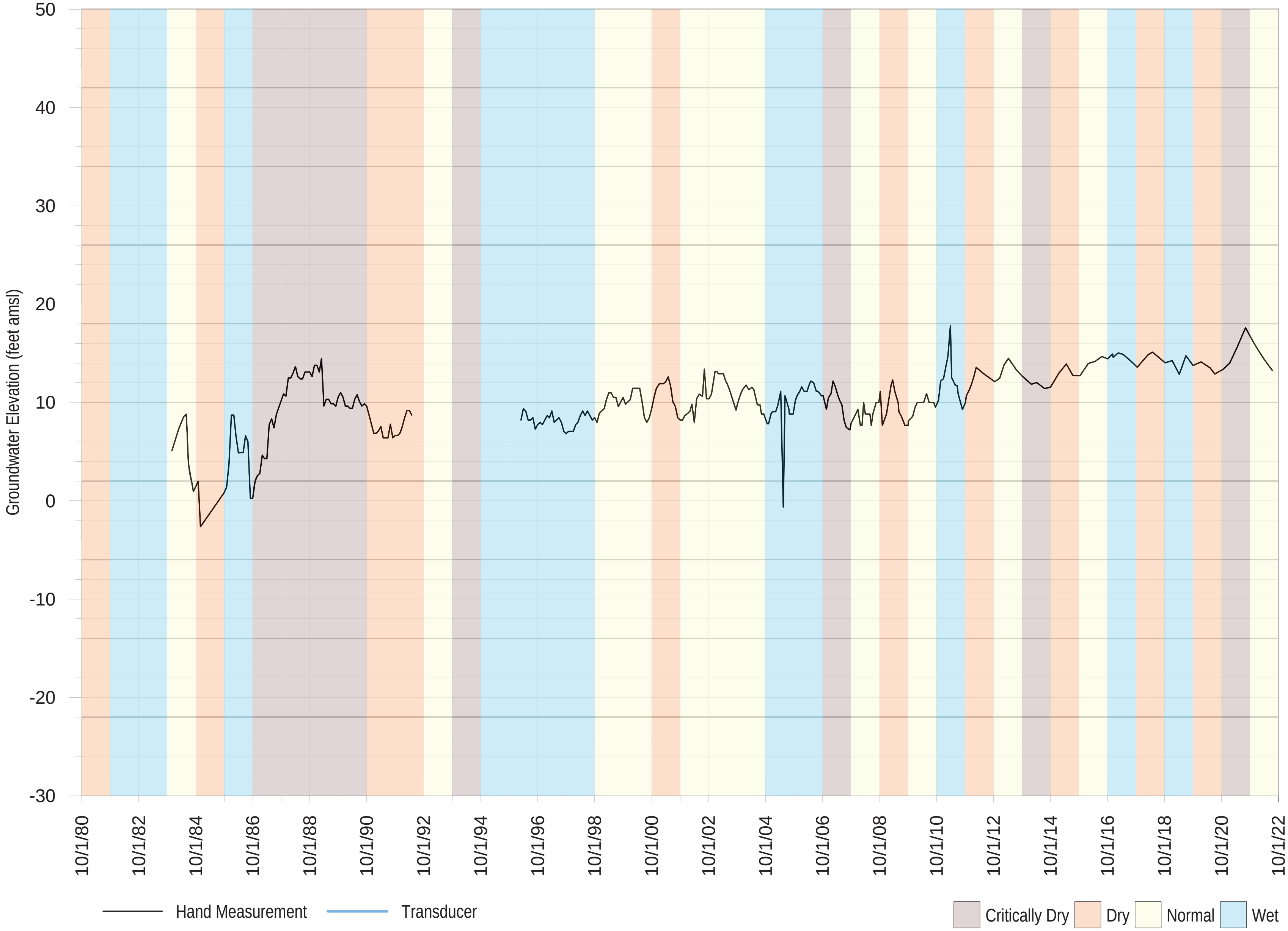
SC-8C & SC-8RC at Aptos Creek
Aquifer Screened: Purisima BC

FIGURE A-132



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

FIGURE A-133



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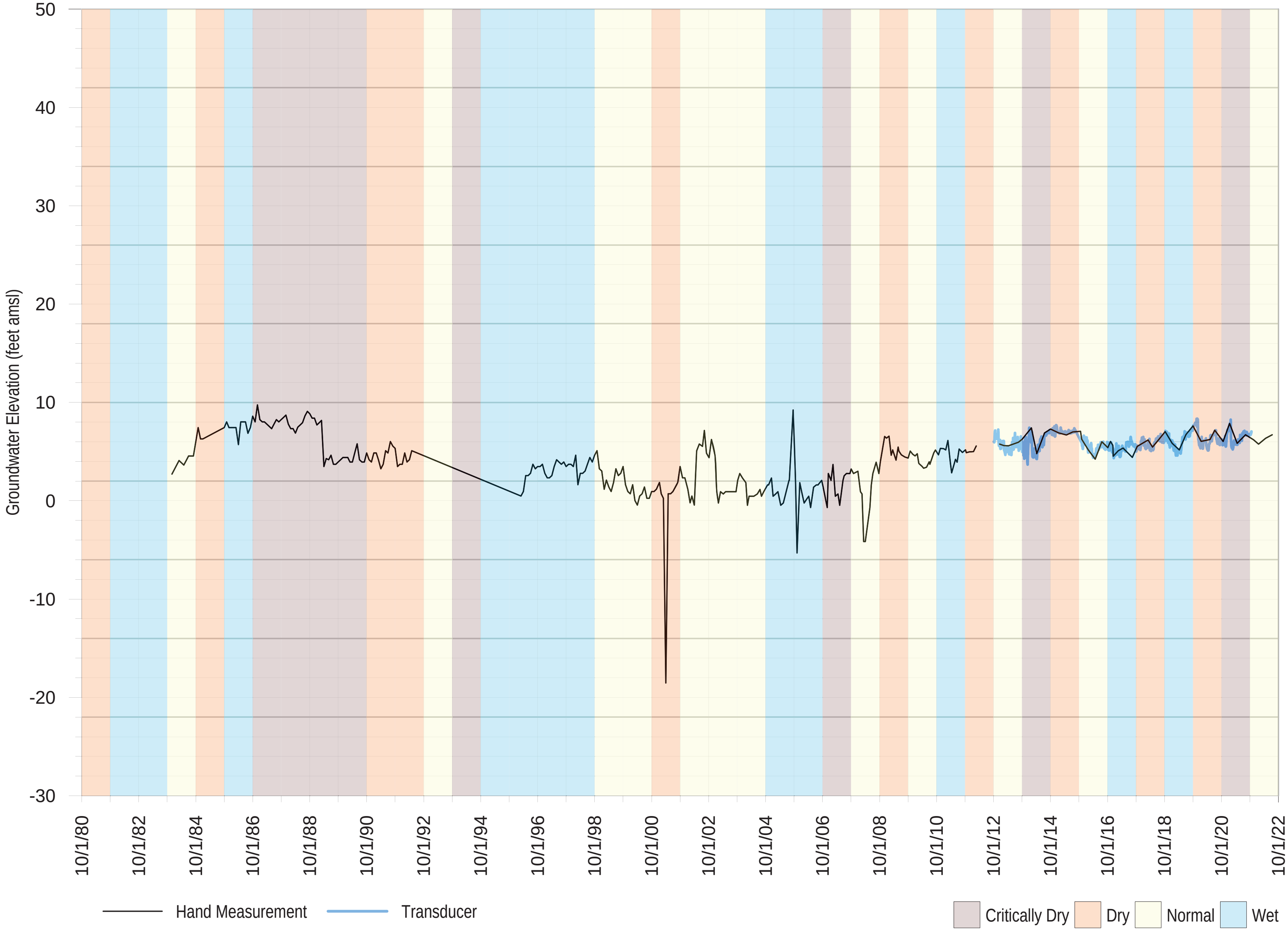
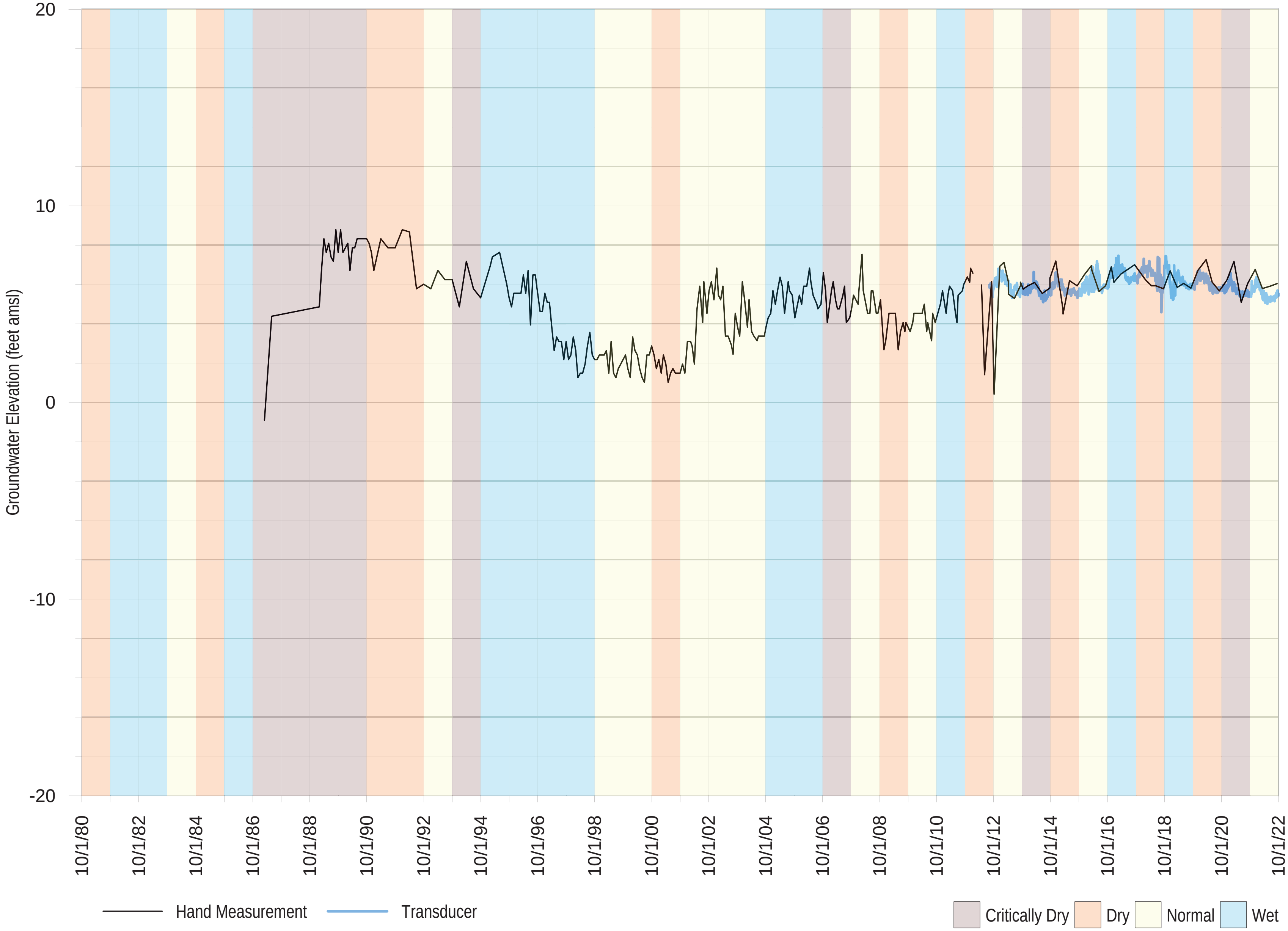
SC-8F & SC-8RF at Aptos Creek
Aquifer Screened: Purisima F

FIGURE A-134



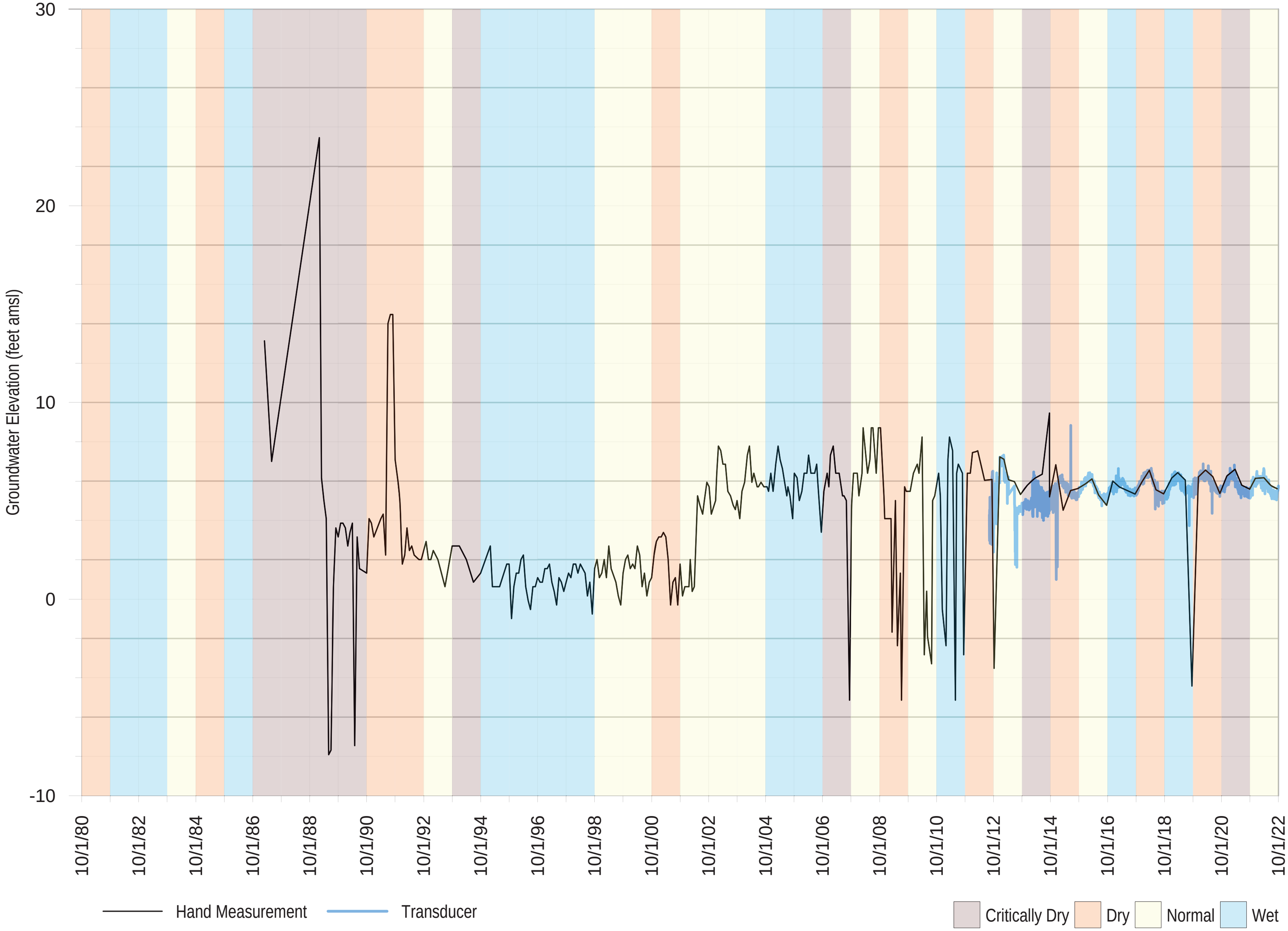
SC-A2B & SC-A2RB at Sumner
Aquifer Screened: Purisima F

FIGURE A-135



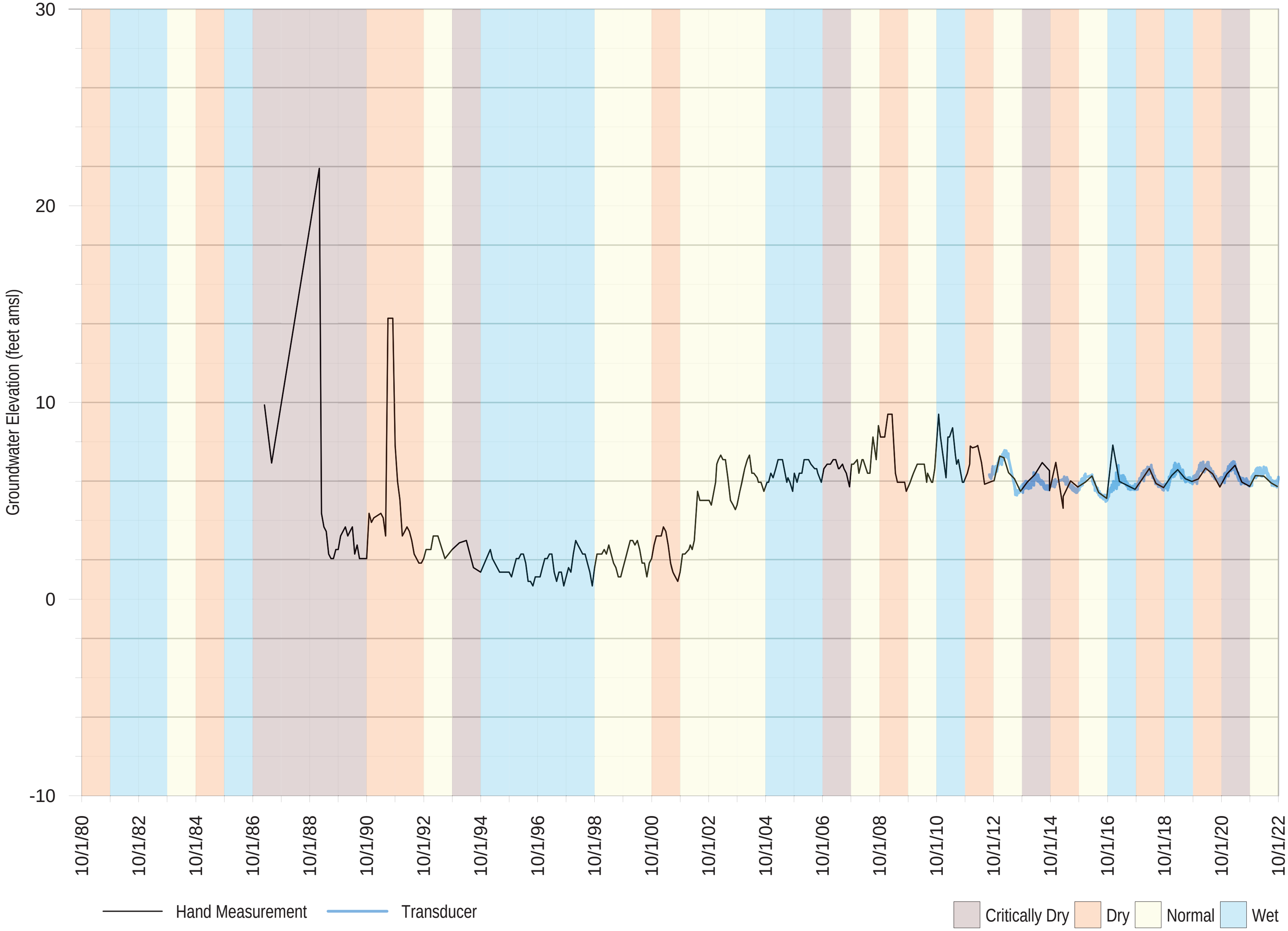
SC-A5C at Seascape
Aquifer Screened: Aromas

FIGURE A-136



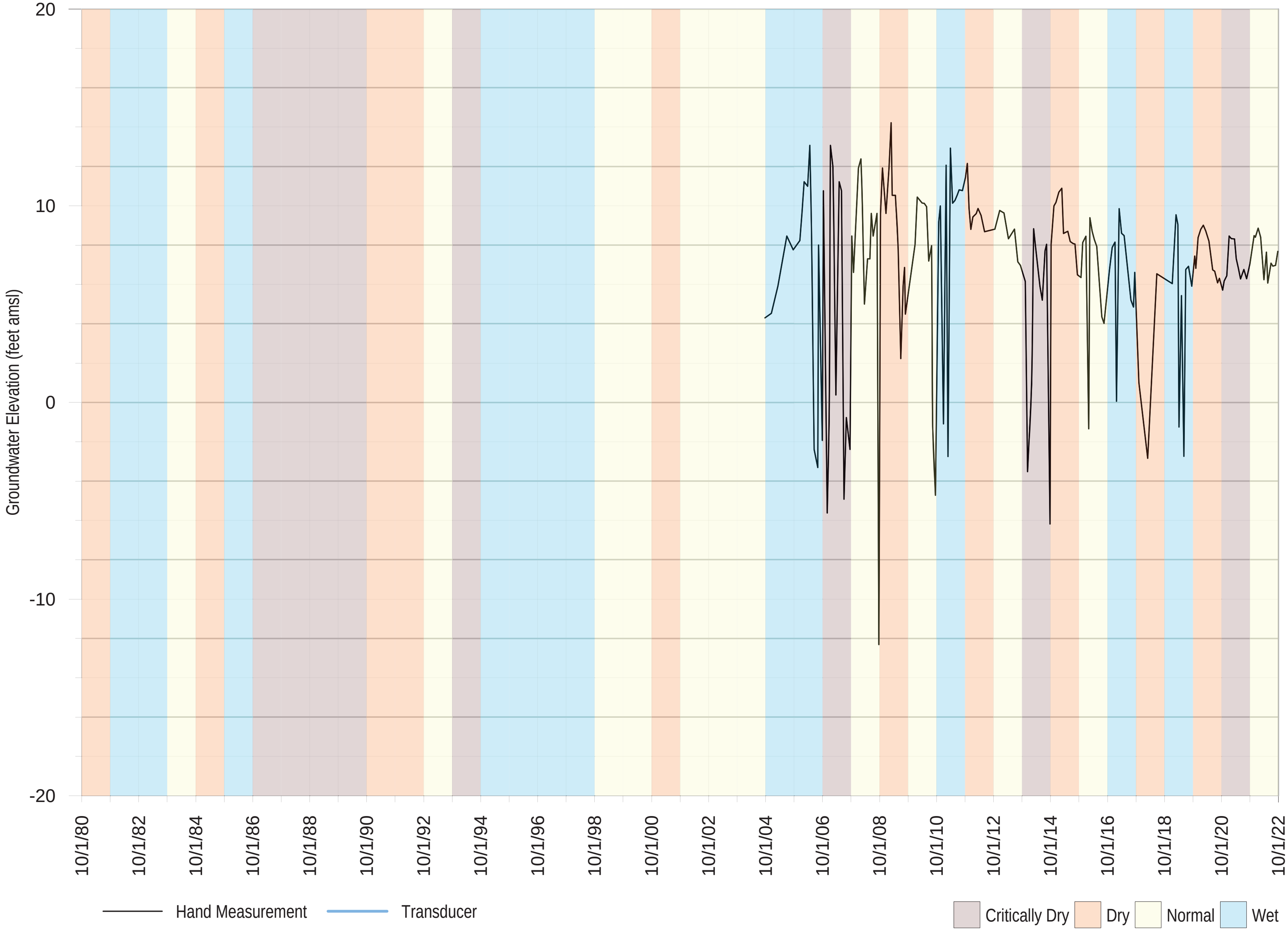
SC-A5D at Seascape
Aquifer Screened: Aromas

FIGURE A-137



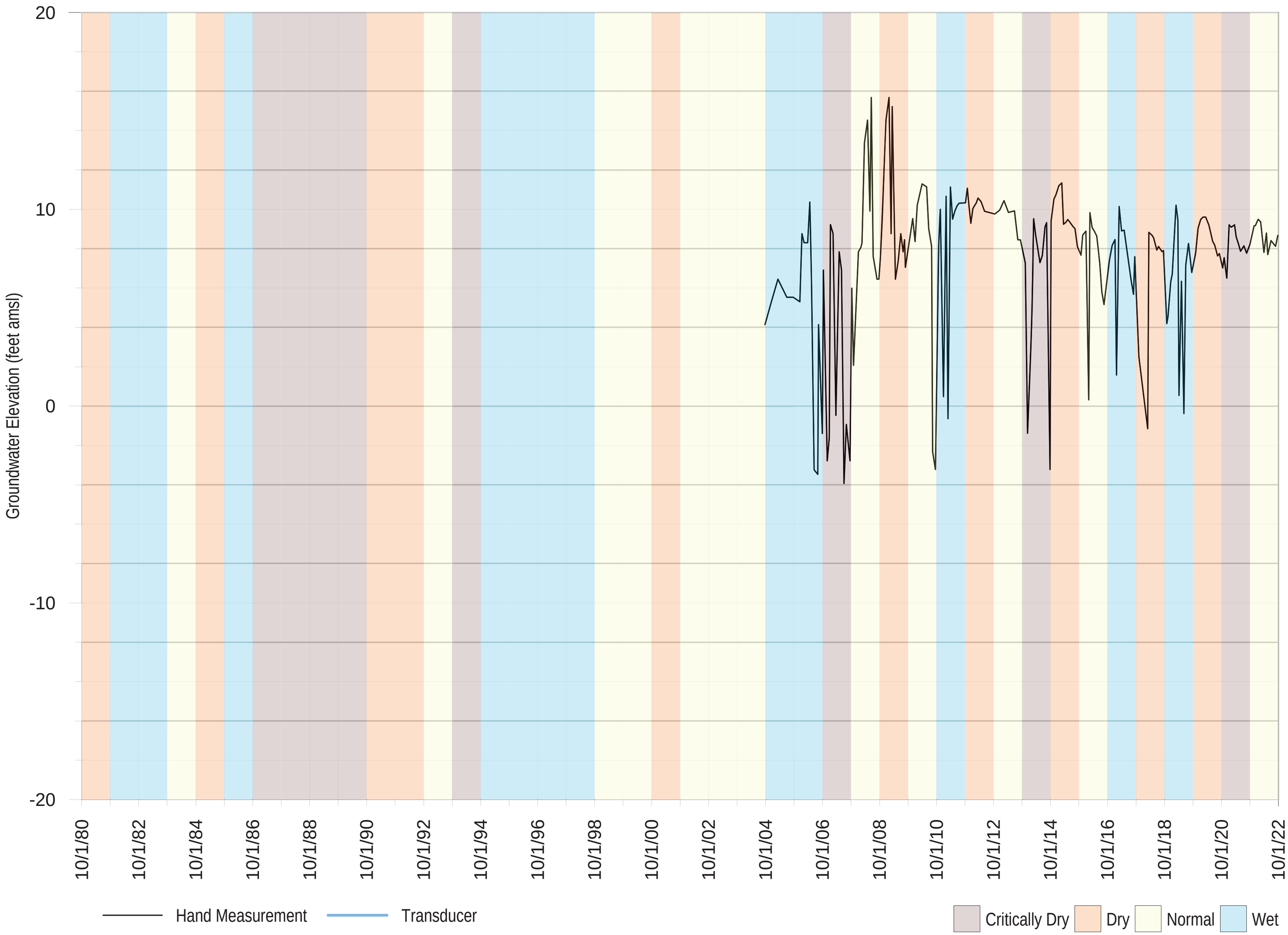
SC-A6A at Bonita
Aquifer Screened: Purisima F

FIGURE A-138



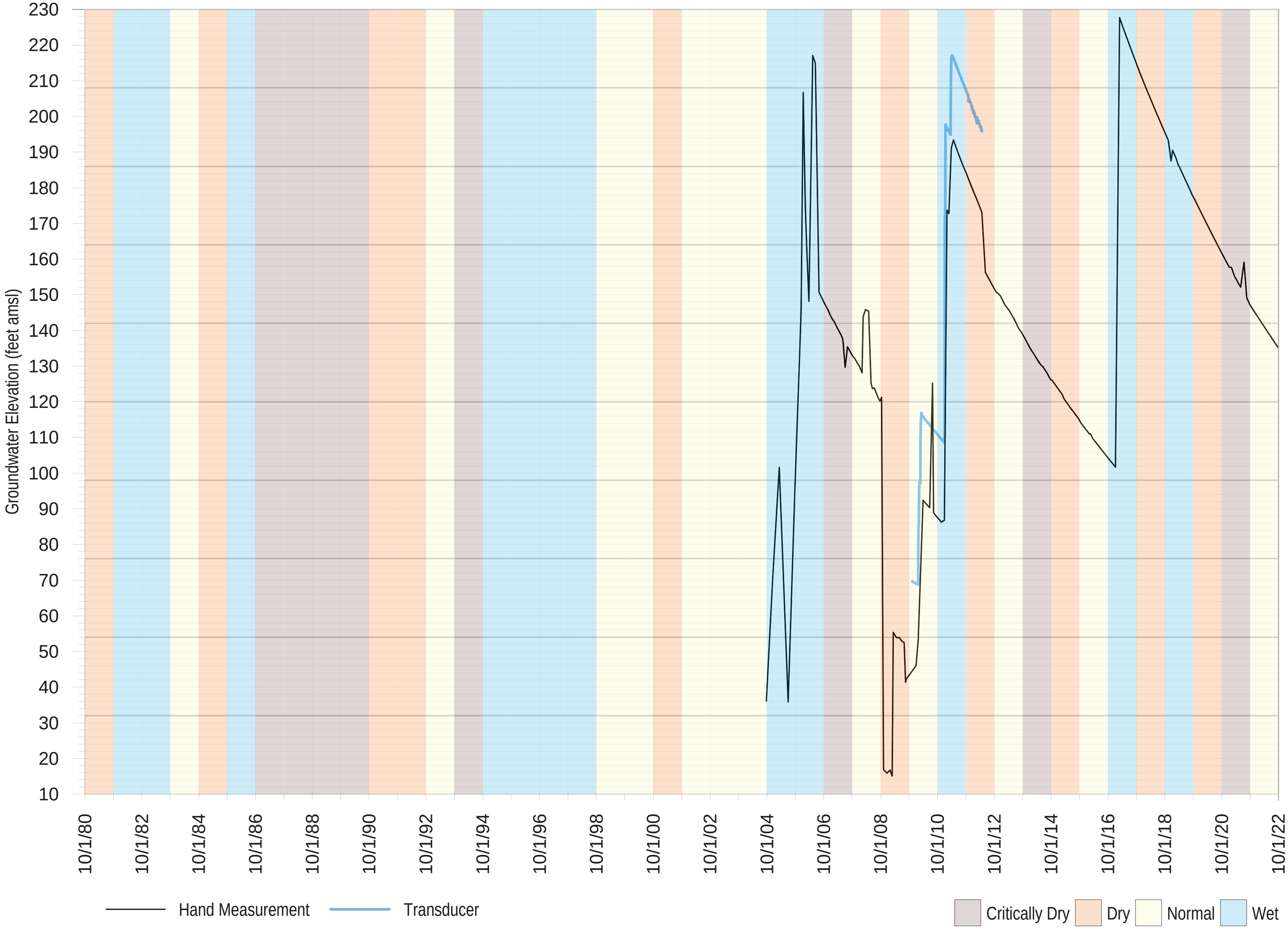
SC-A6B at Bonita
Aquifer Screened: Purisima F

FIGURE A-139



SC-A6C at Bonita
Aquifer Screened: Aromas

FIGURE A-140



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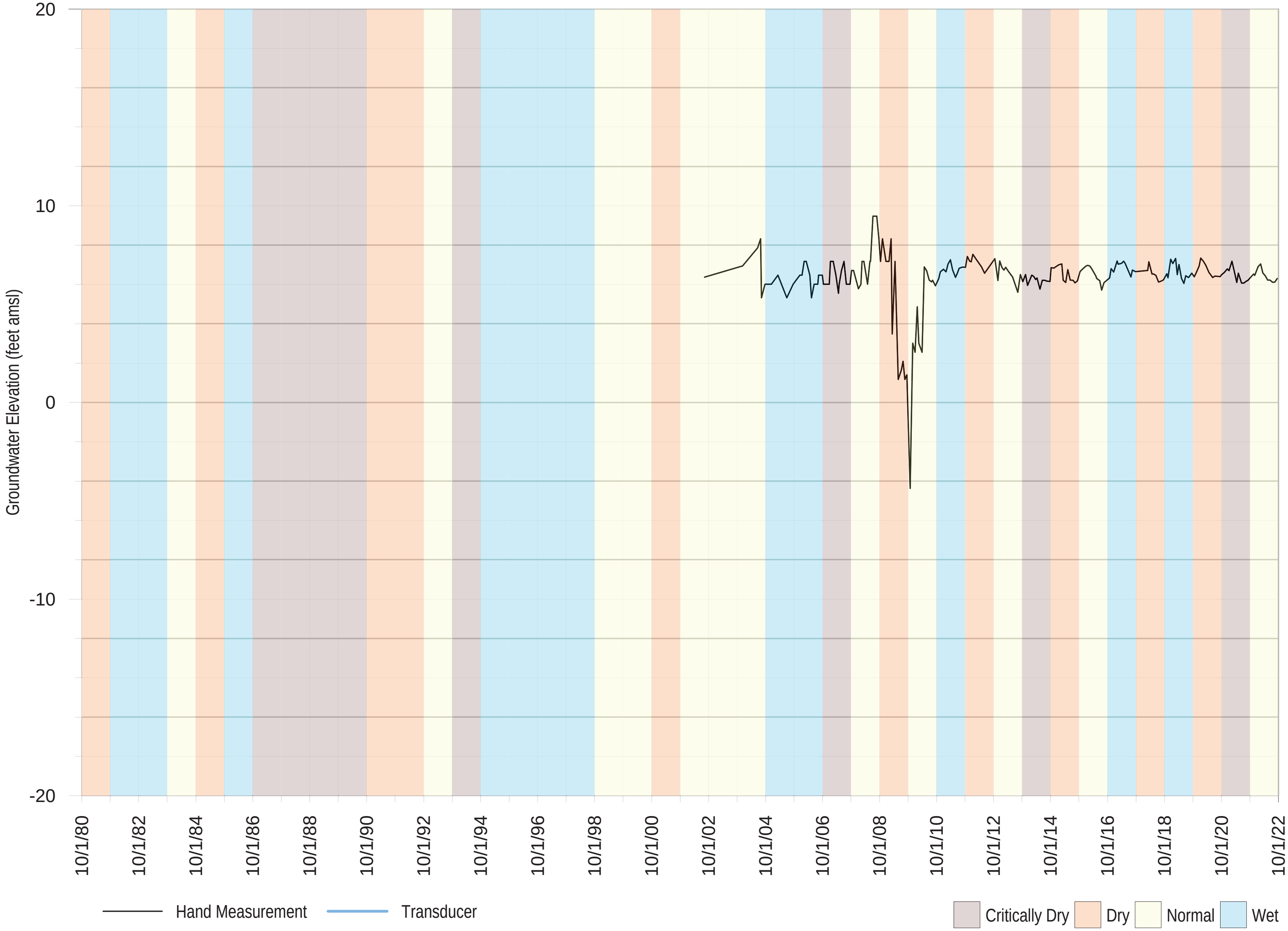
SC-A7B at Sells
Aquifer Screened: Purisima F

FIGURE A-141



SC-A7D at Sells
Aquifer Screened: Aromas

FIGURE A-142

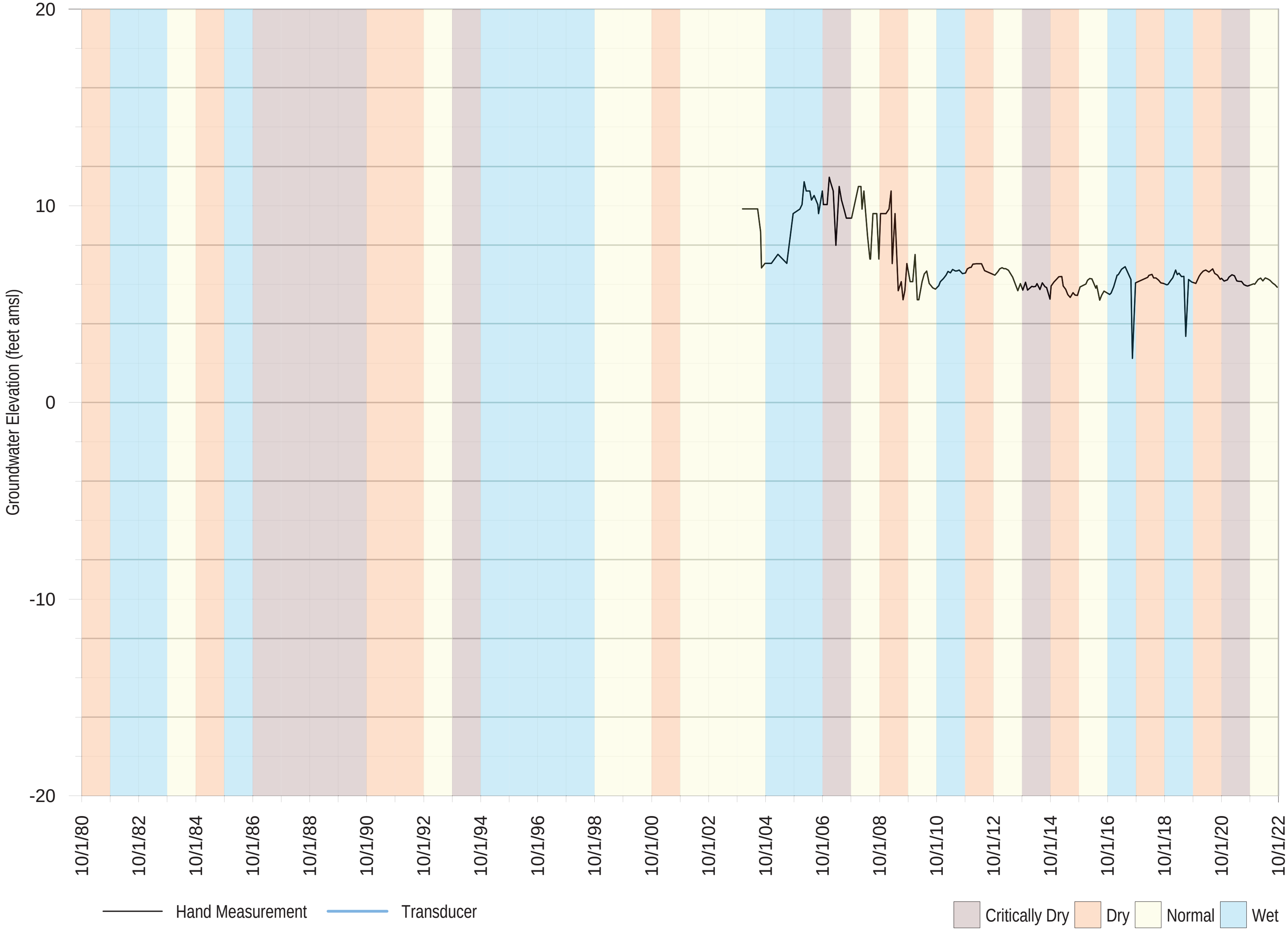
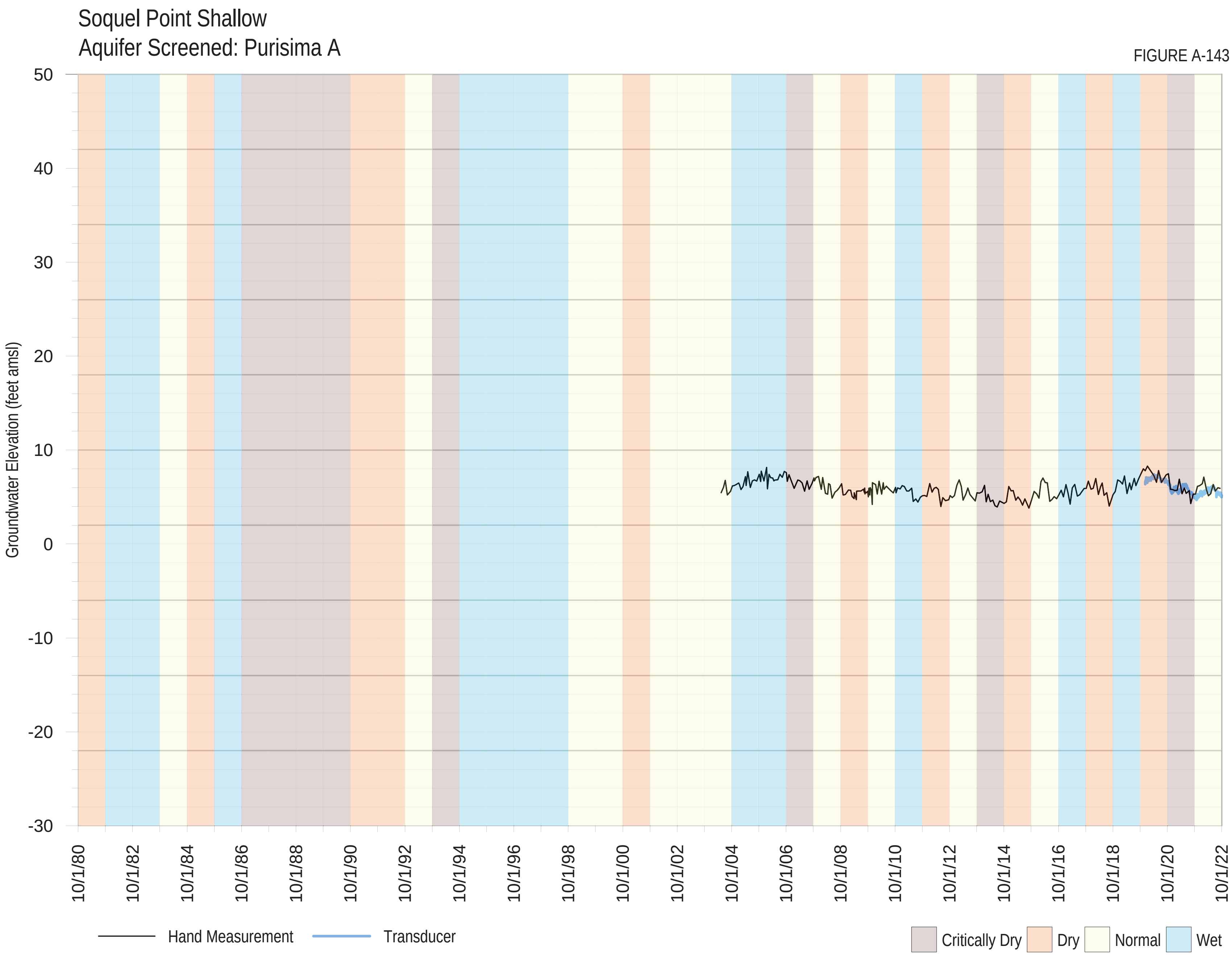


FIGURE A-143

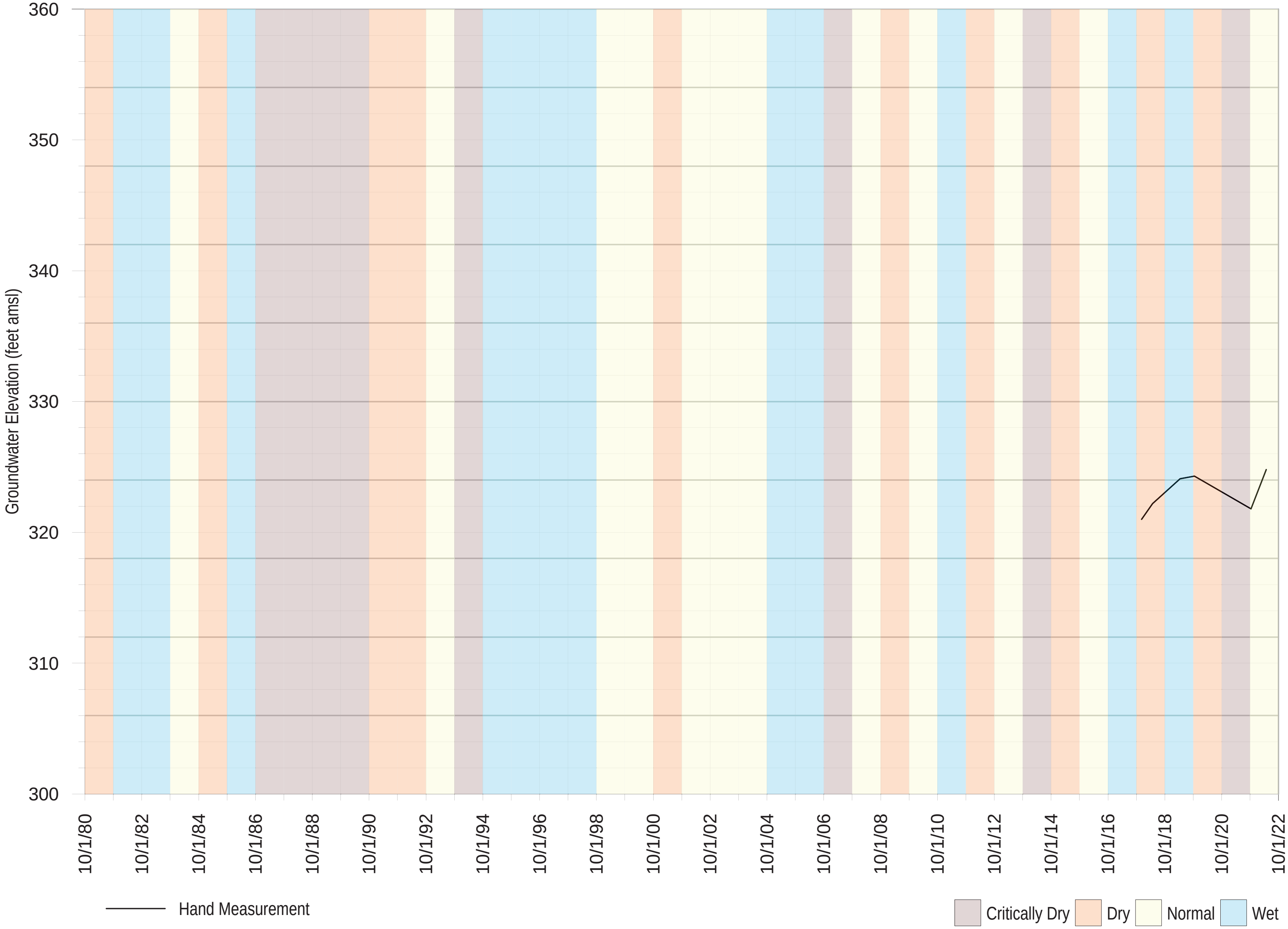


Soquel Point Shallow
Aquifer Screened: Purisima A
Groundwater Elevation (feet amsl)
50
40
30
20
10
0
-10
-20
-30
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Hand Measurement
Transducer
Critically Dry
Dry
Normal
Wet

Appendix A

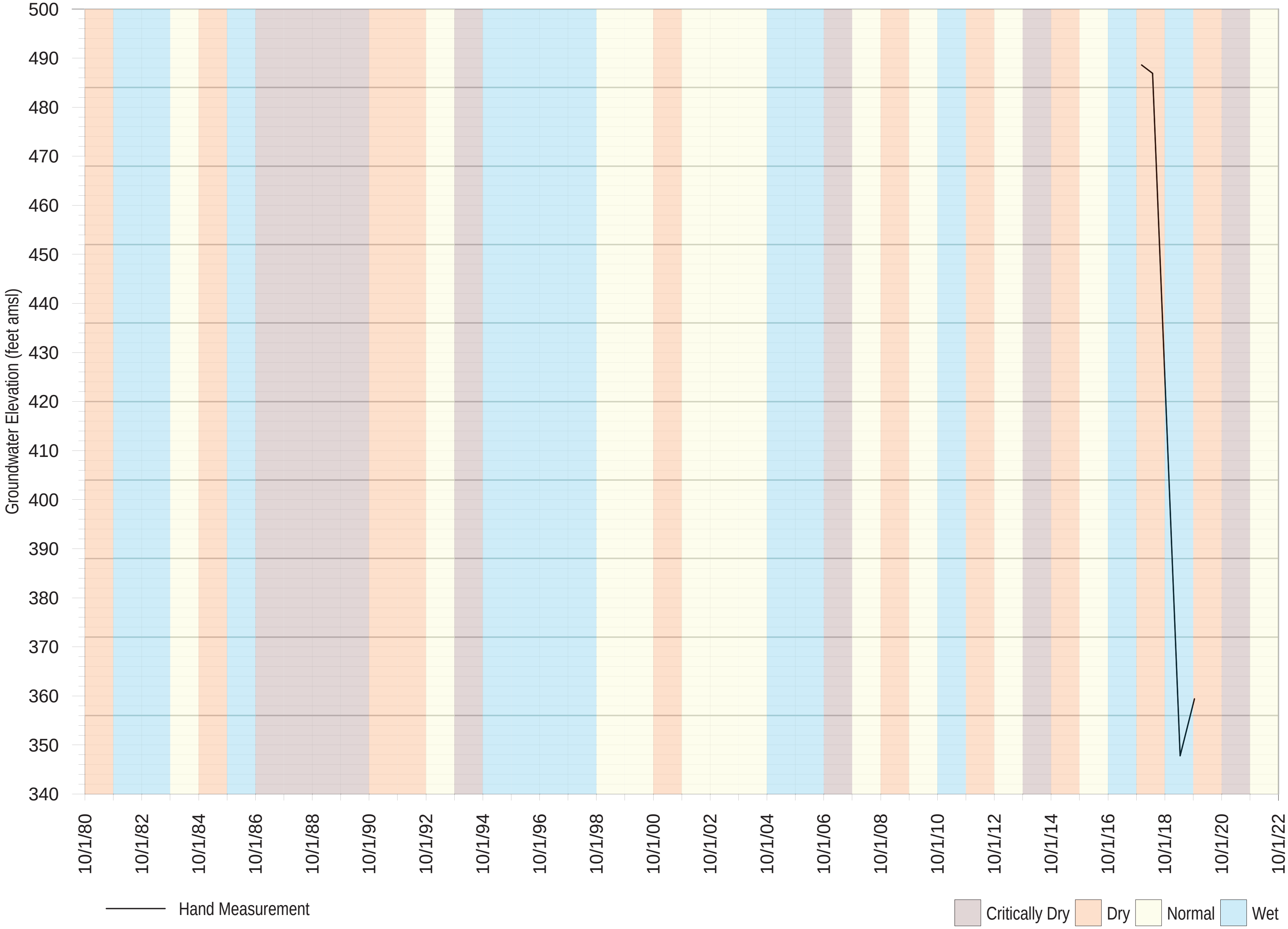
Private Well 3
Aquifer Screened:

FIGURE A-144



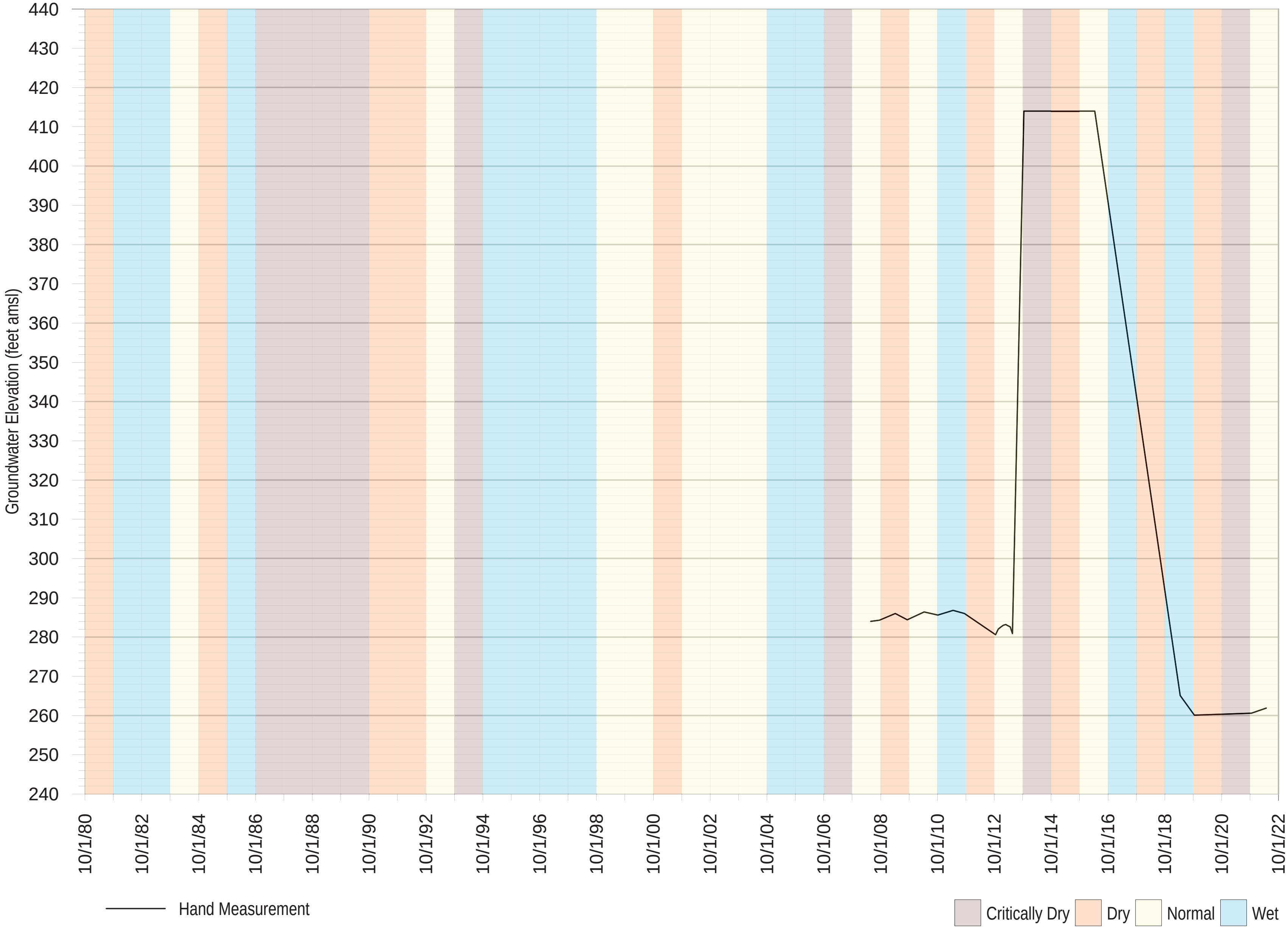
Private Well 4
Aquifer Screened:

FIGURE A-145



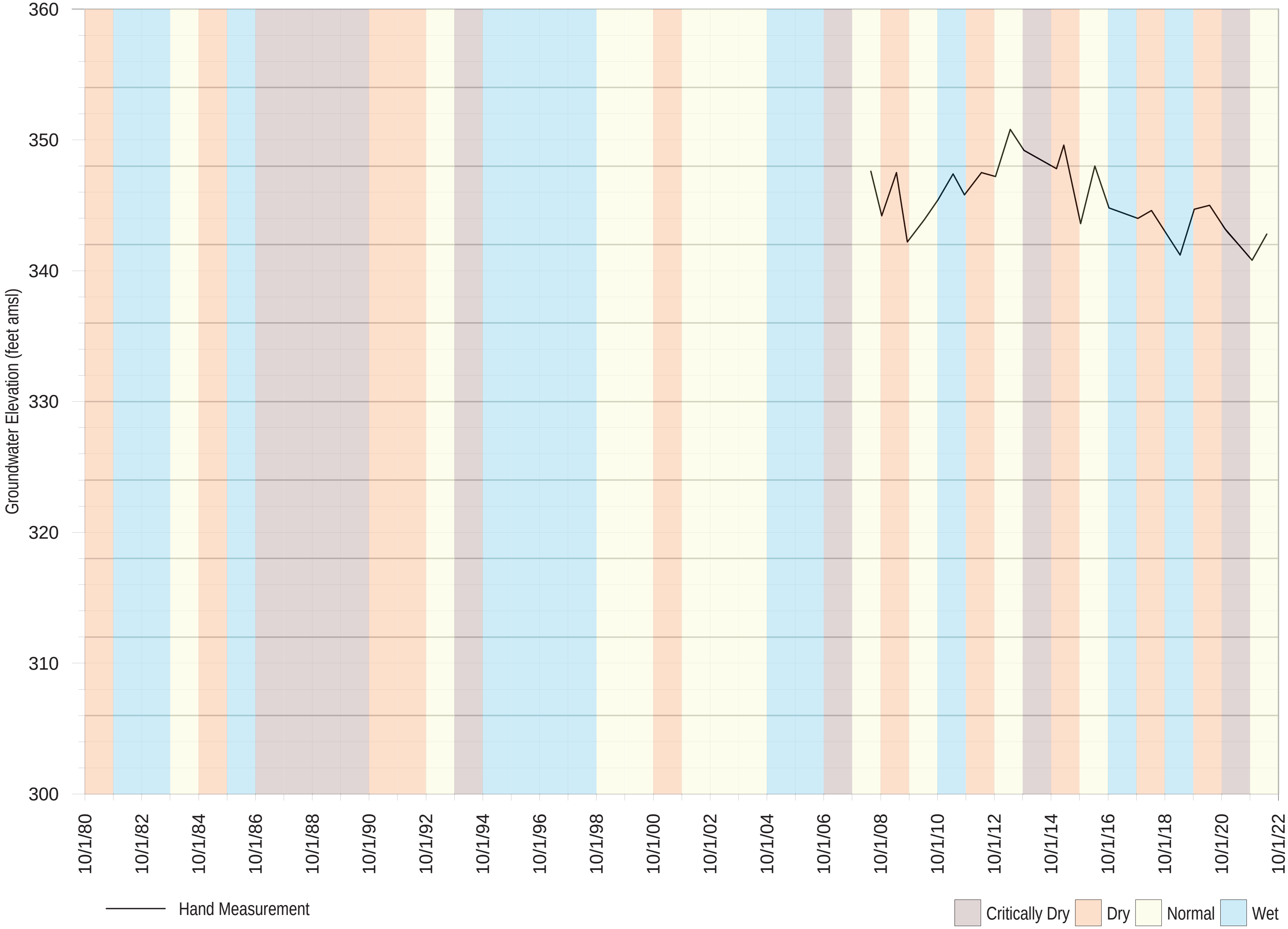
Private Well 5
Aquifer Screened:

FIGURE A-146



Private Well 6
Aquifer Screened:

FIGURE A-147



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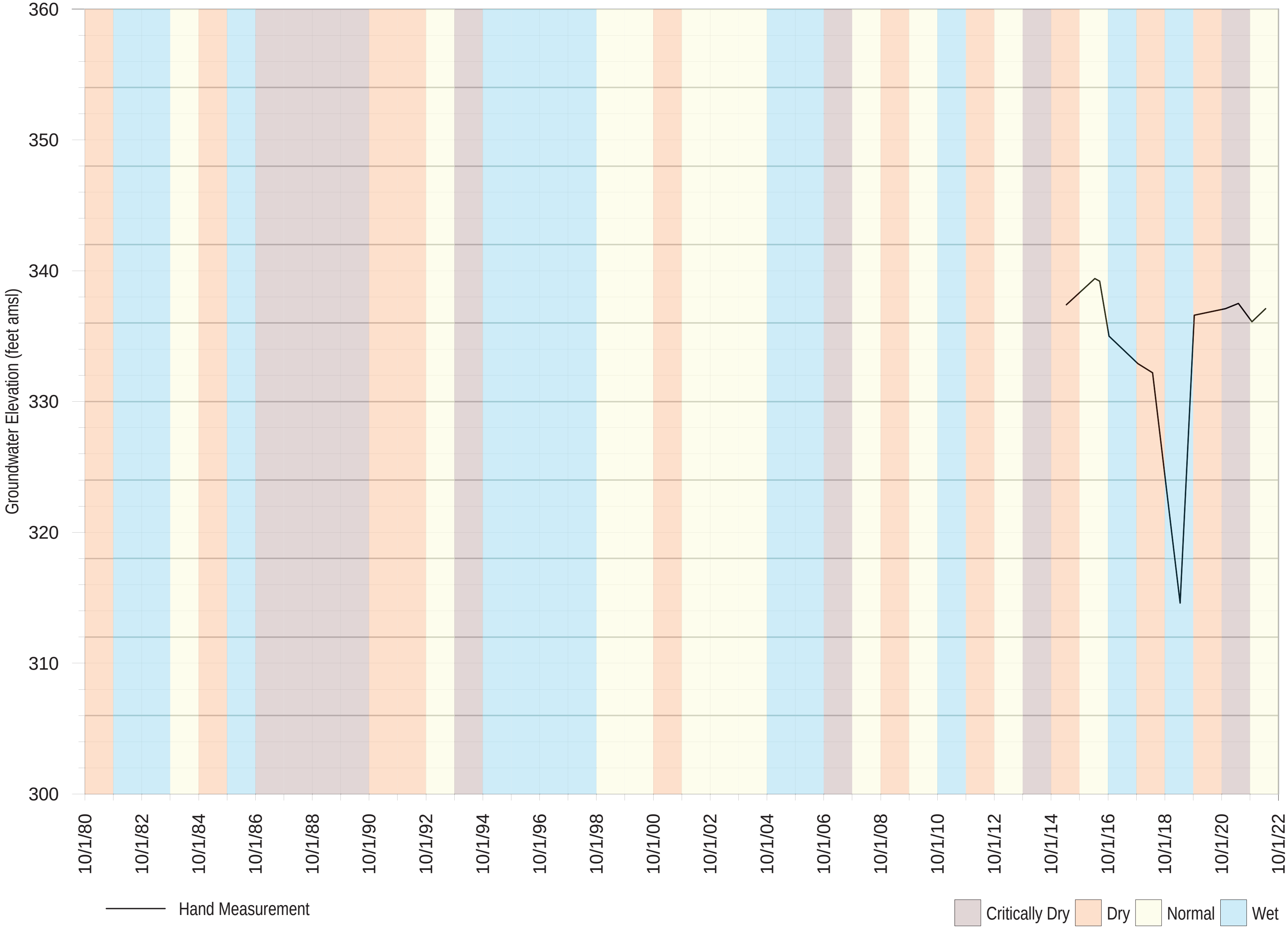
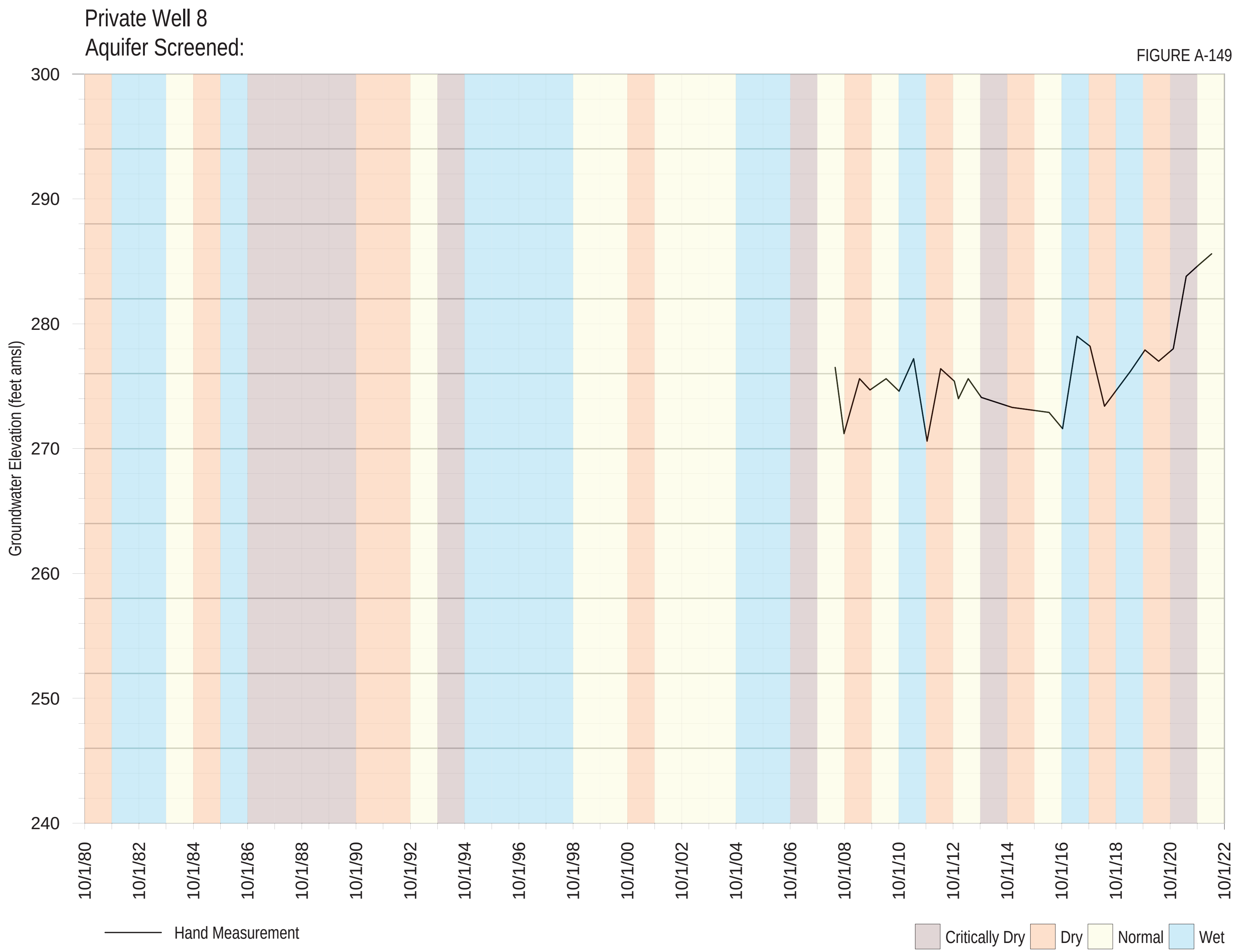
Private Well 7
Aquifer Screened:

FIGURE A-148



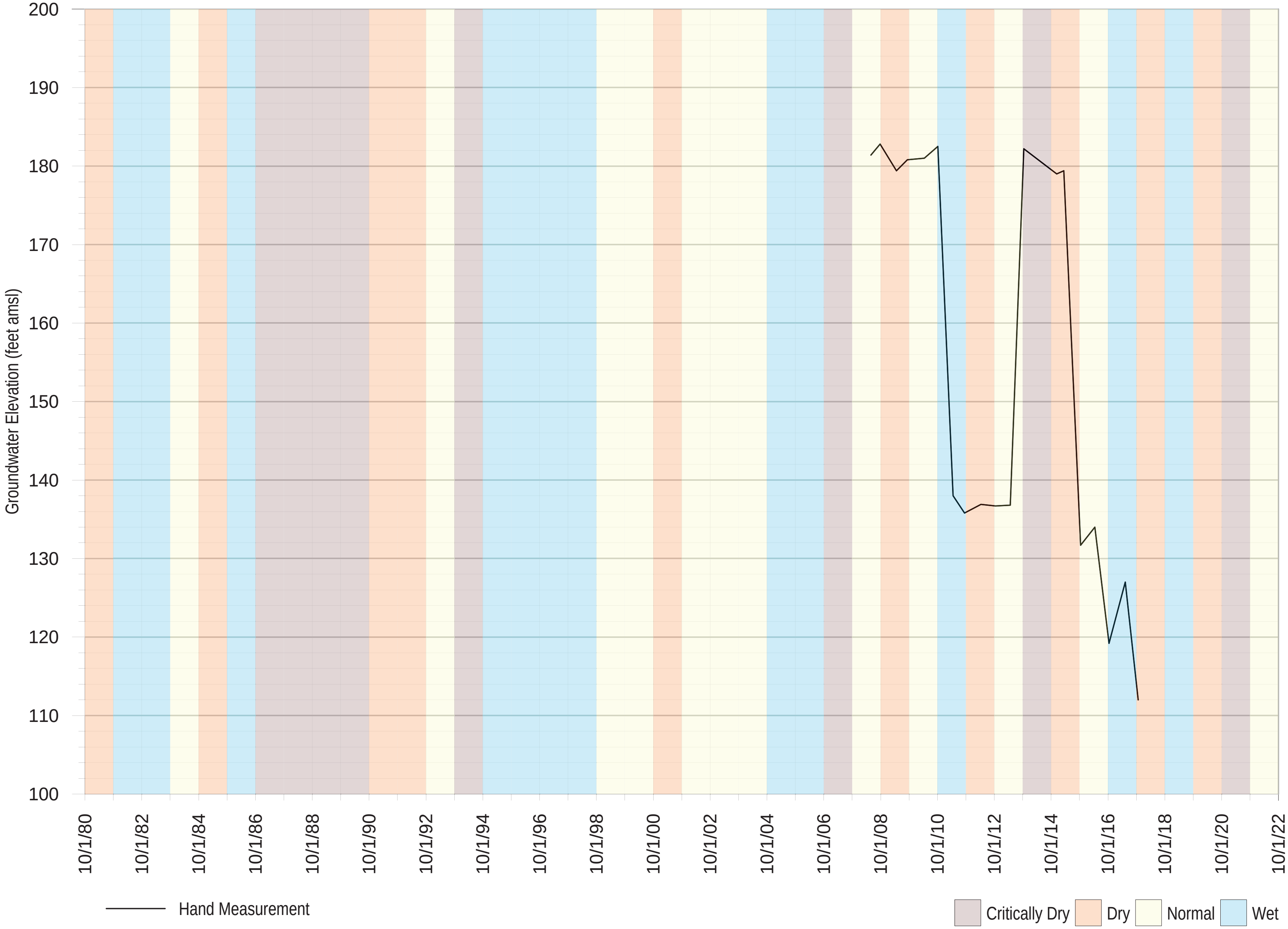


Private Well 8
Aquifer Screened:
FIGURE A-149
Groundwater Elevation (feet amsl)
300
290
280
270
260
250
240
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Hand Measurement
Critically Dry
Dry
Normal
Wet

Appendix A

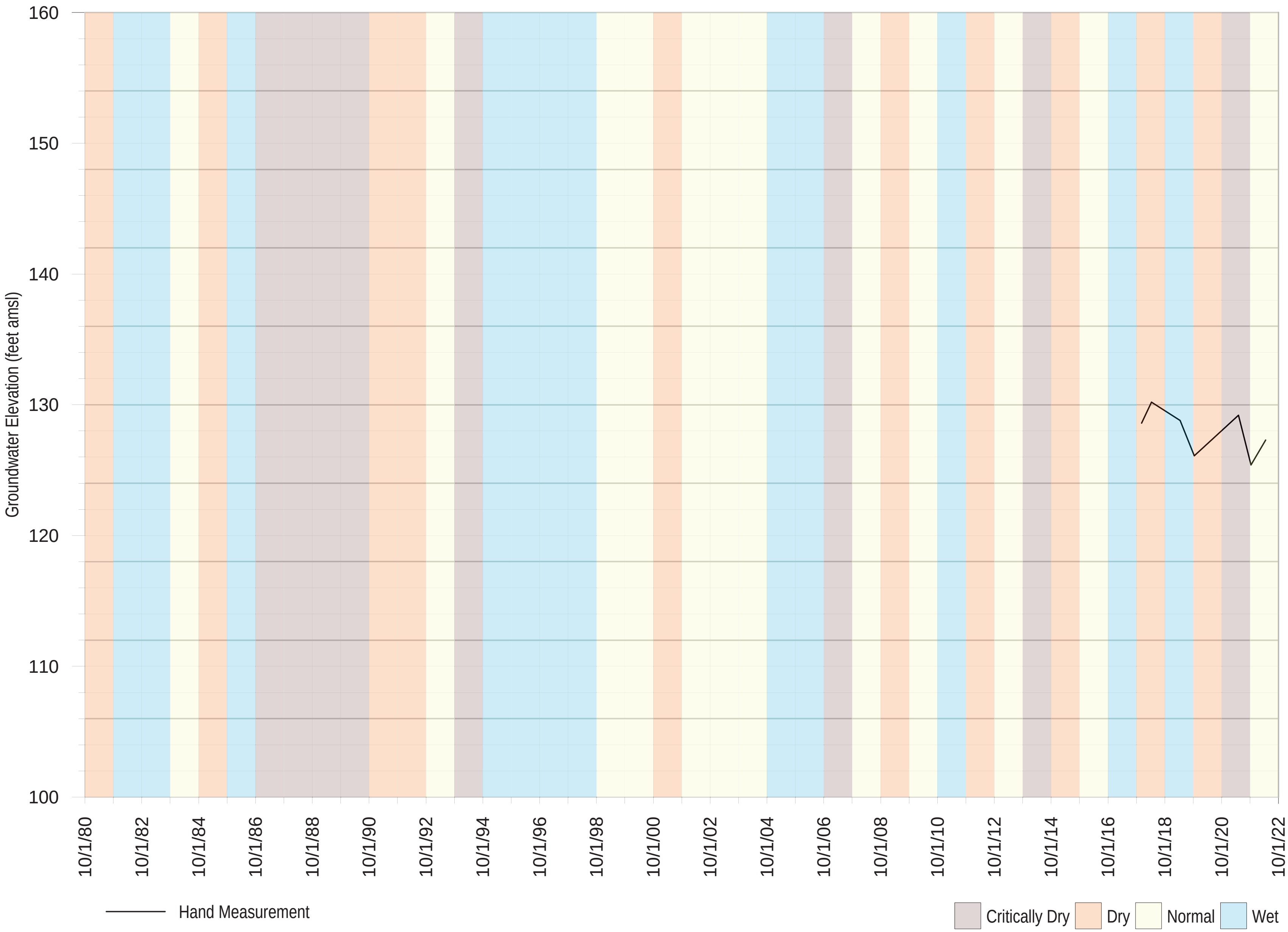
Private Well 9
Aquifer Screened:

FIGURE A-150



Private Well 10
Aquifer Screened:

FIGURE A-151



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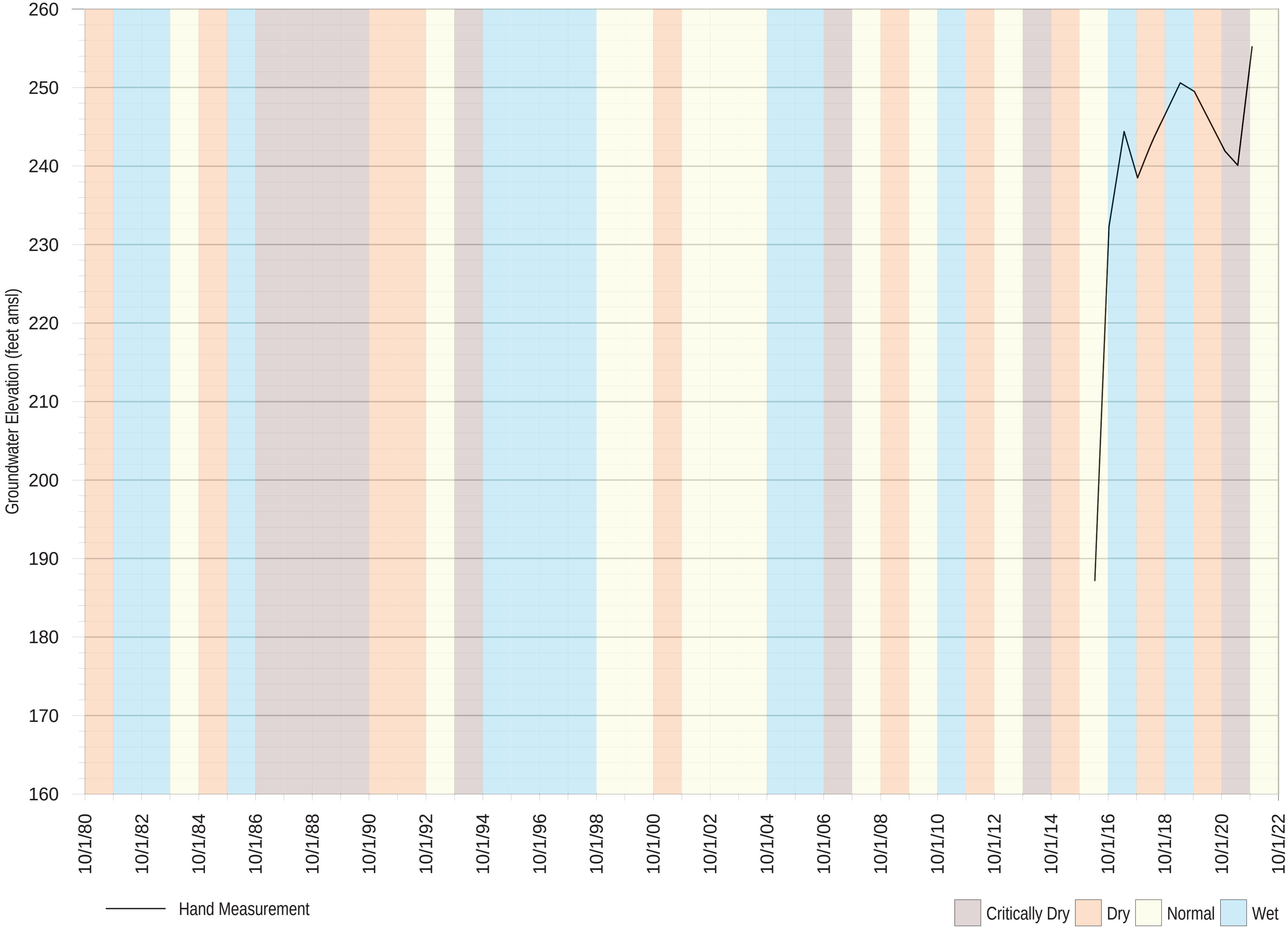
Private Well 11
Aquifer Screened:

FIGURE A-152



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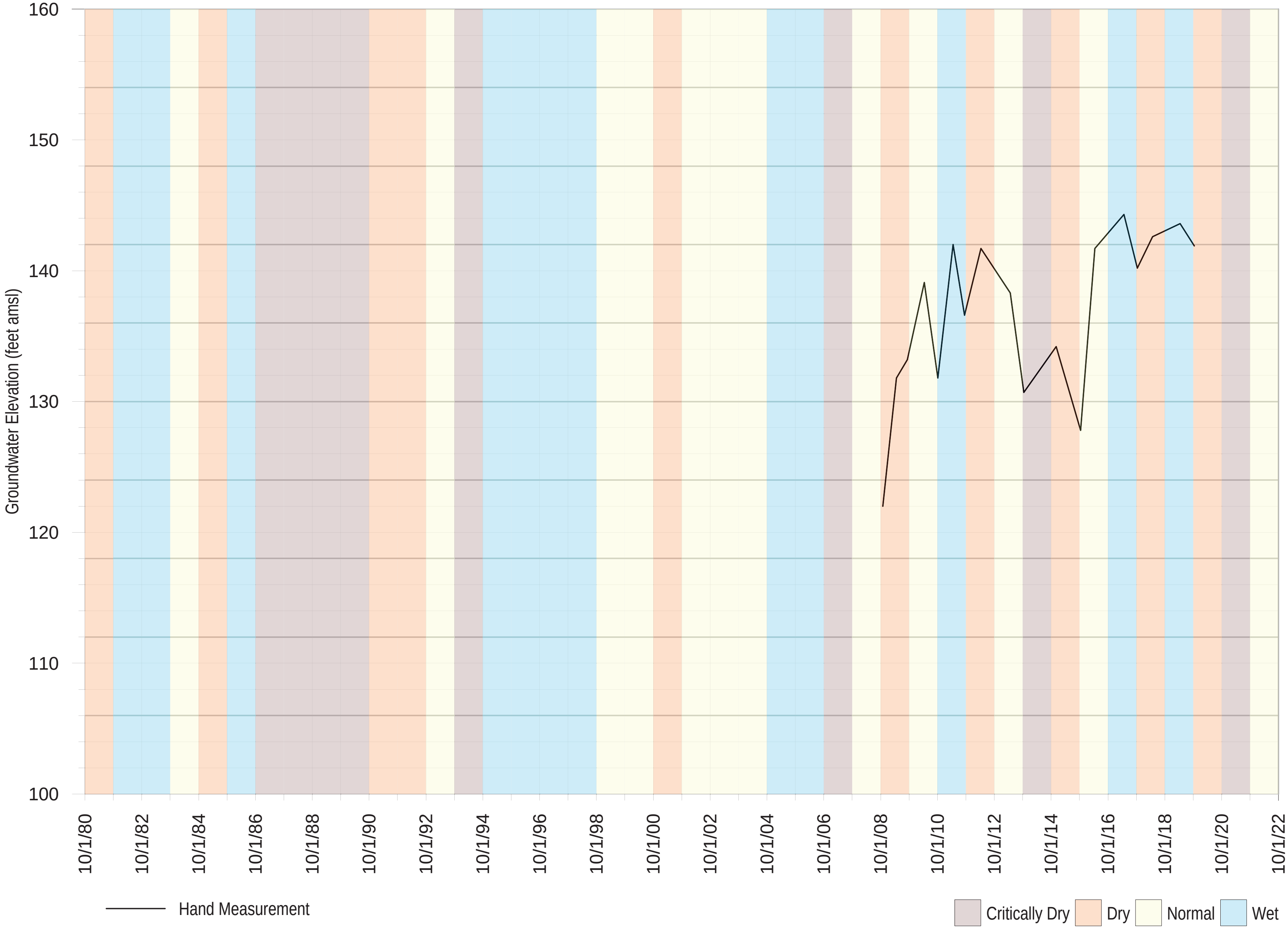
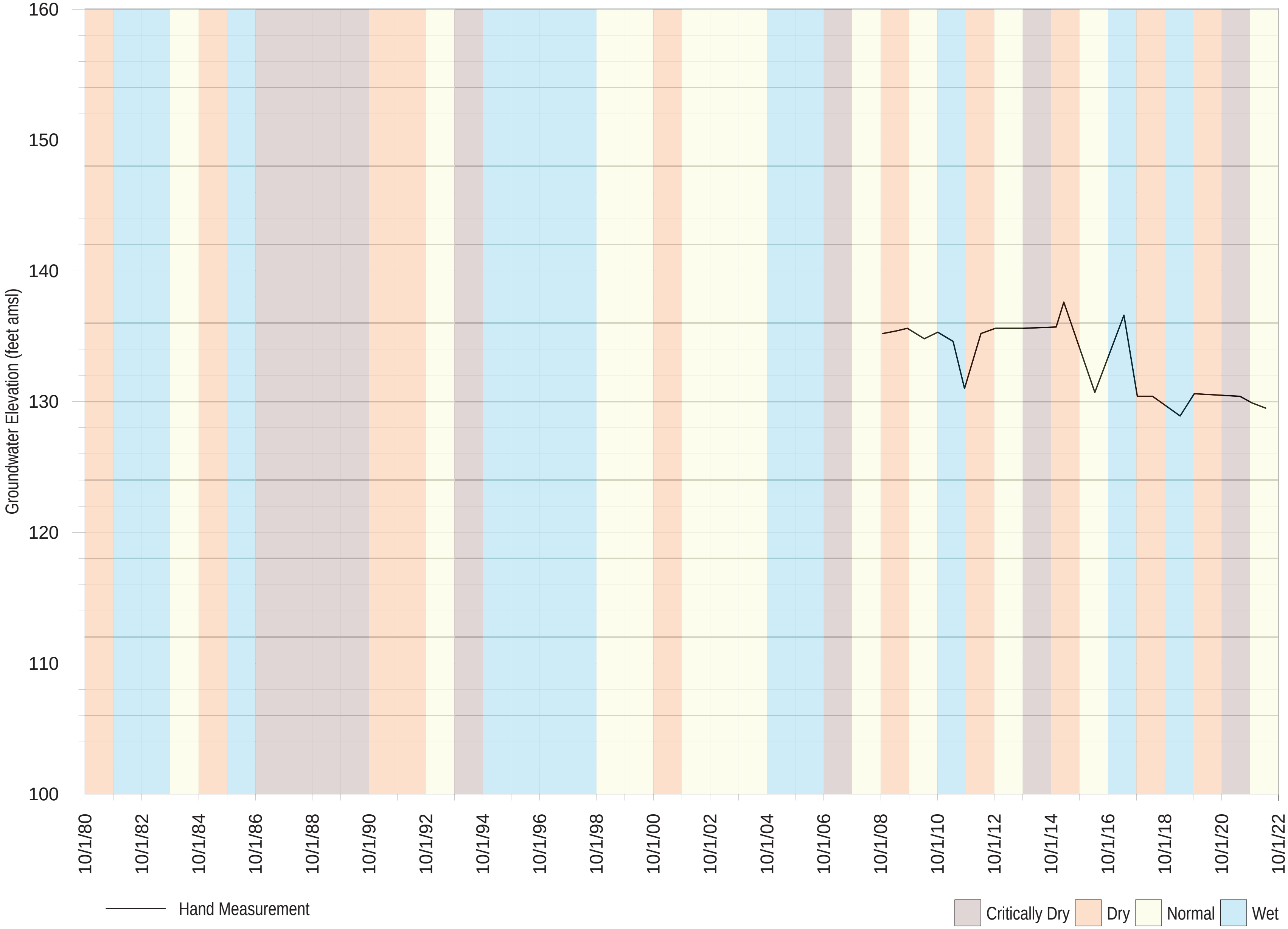
Private Well 12
Aquifer Screened:

FIGURE A-153



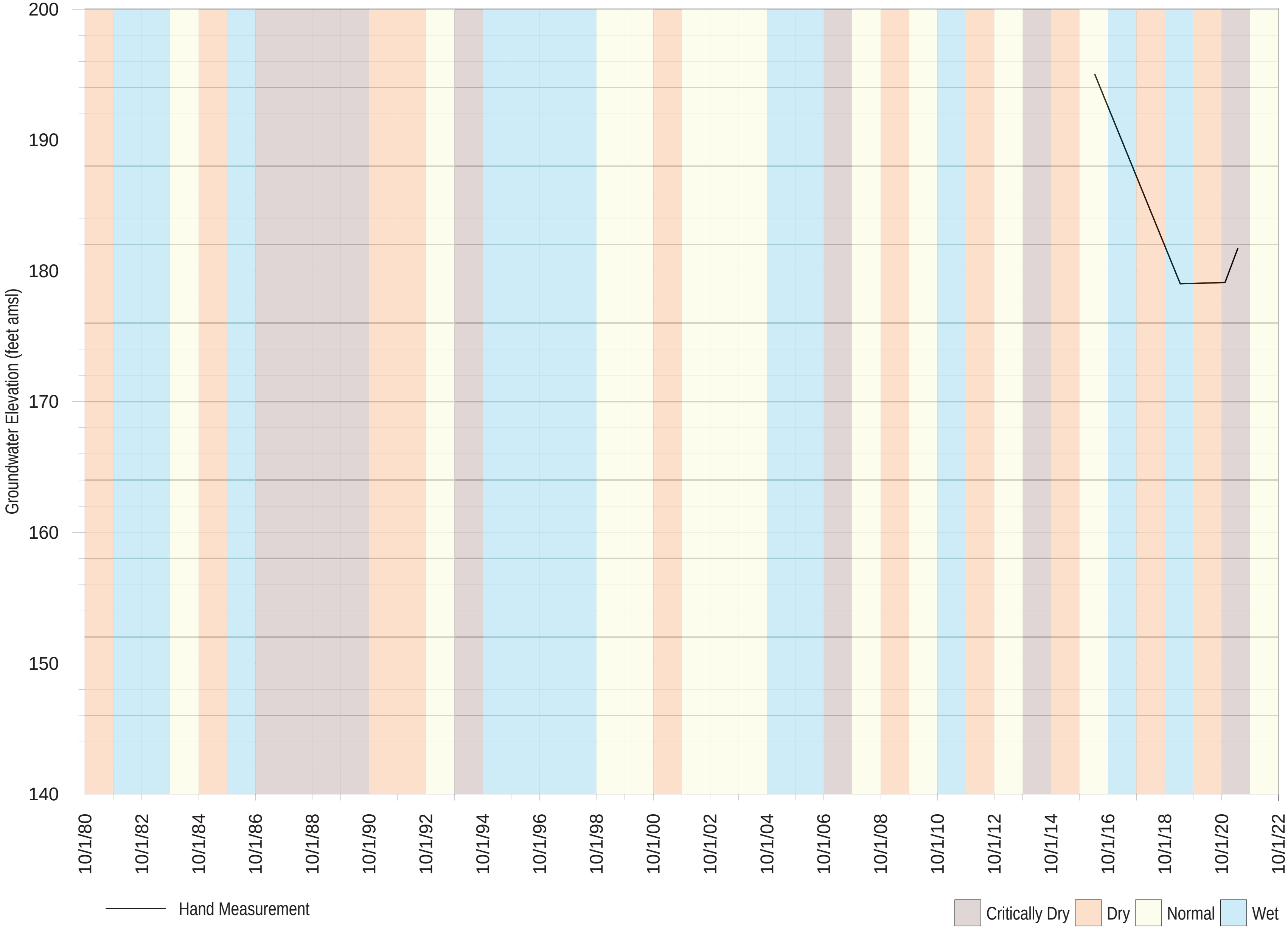
Private Well 13
Aquifer Screened:

FIGURE A-154



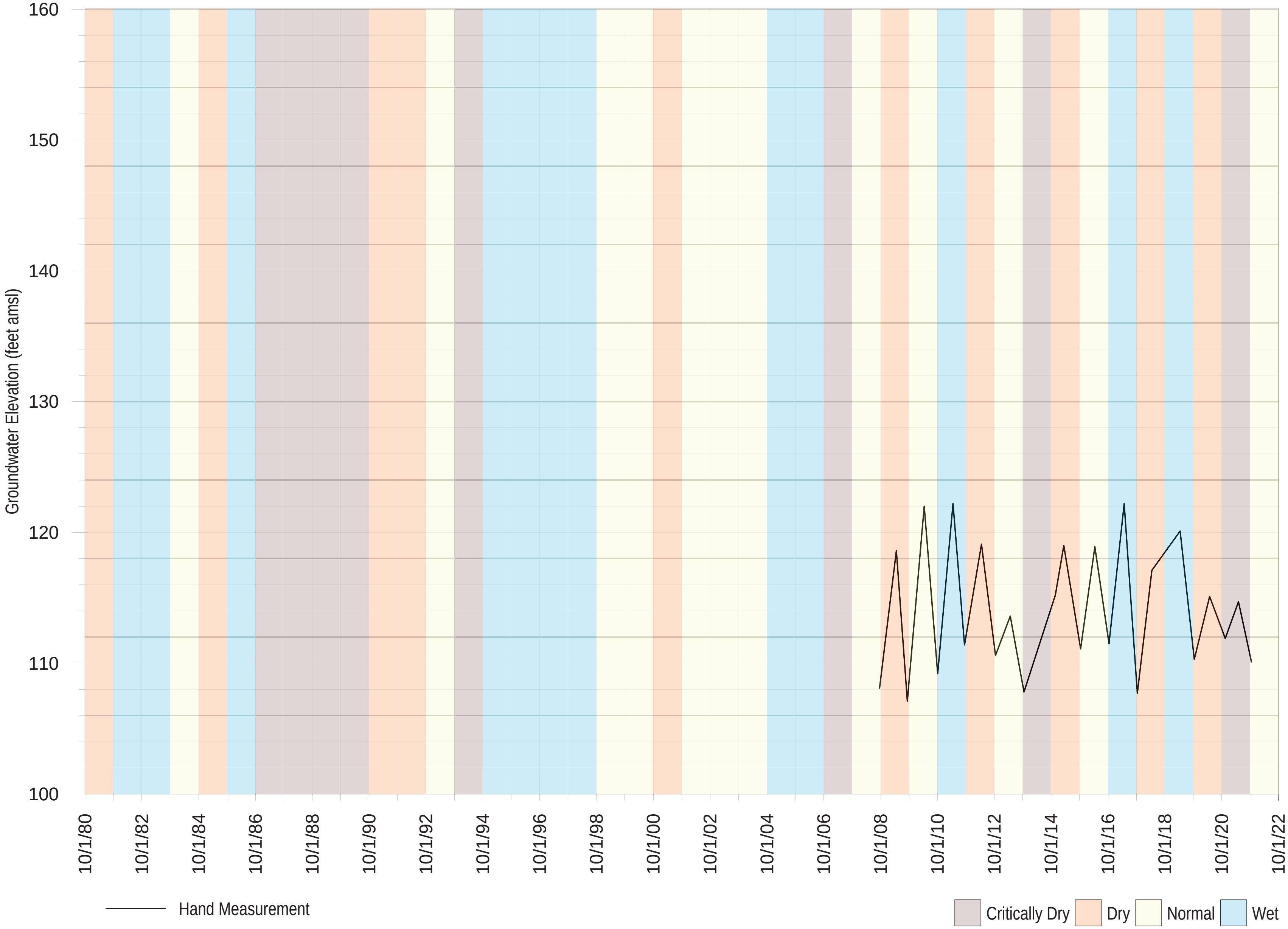
Private Well 14
Aquifer Screened:

FIGURE A-155



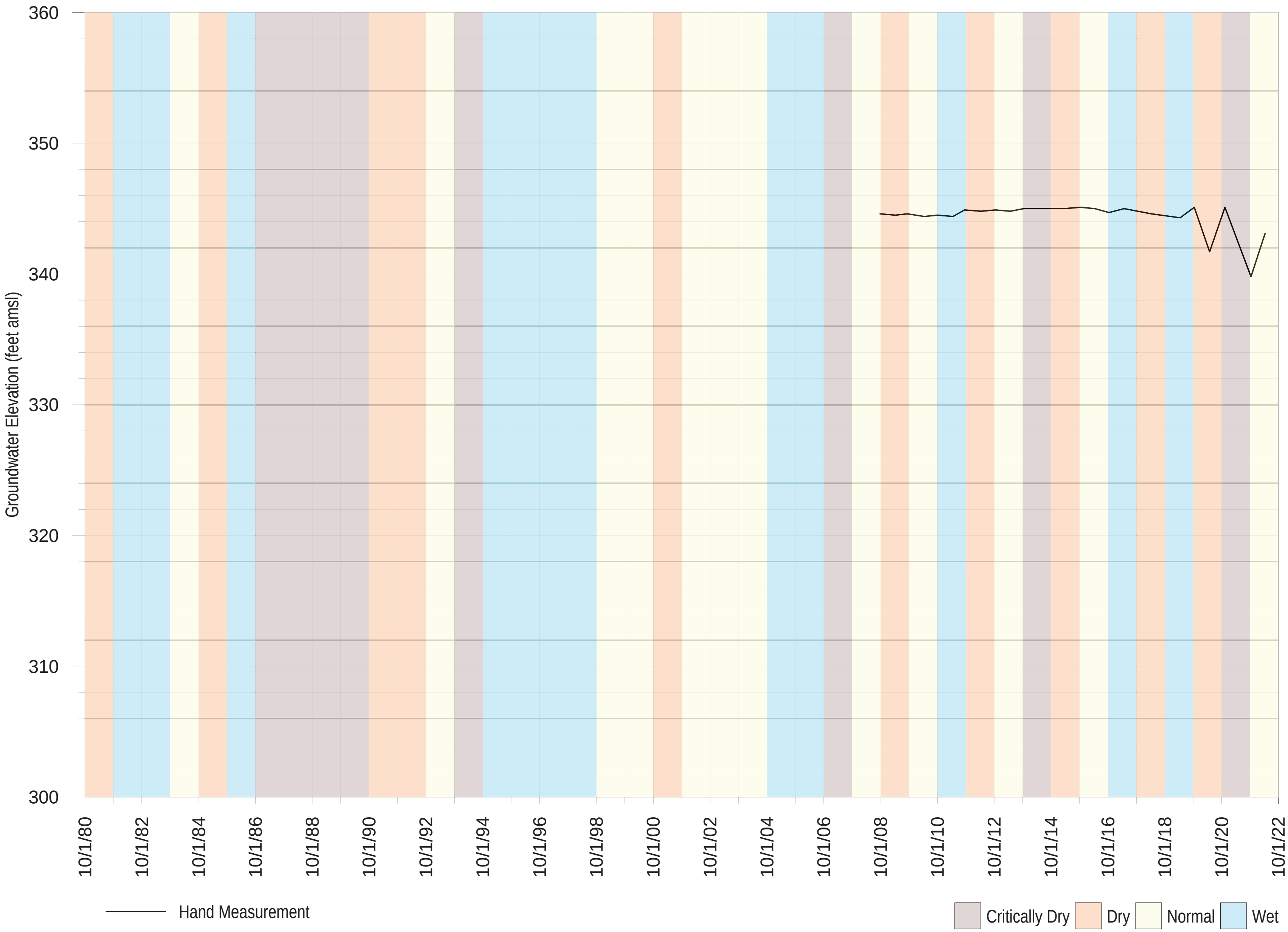
Private Well 15
Aquifer Screened:

FIGURE A-156



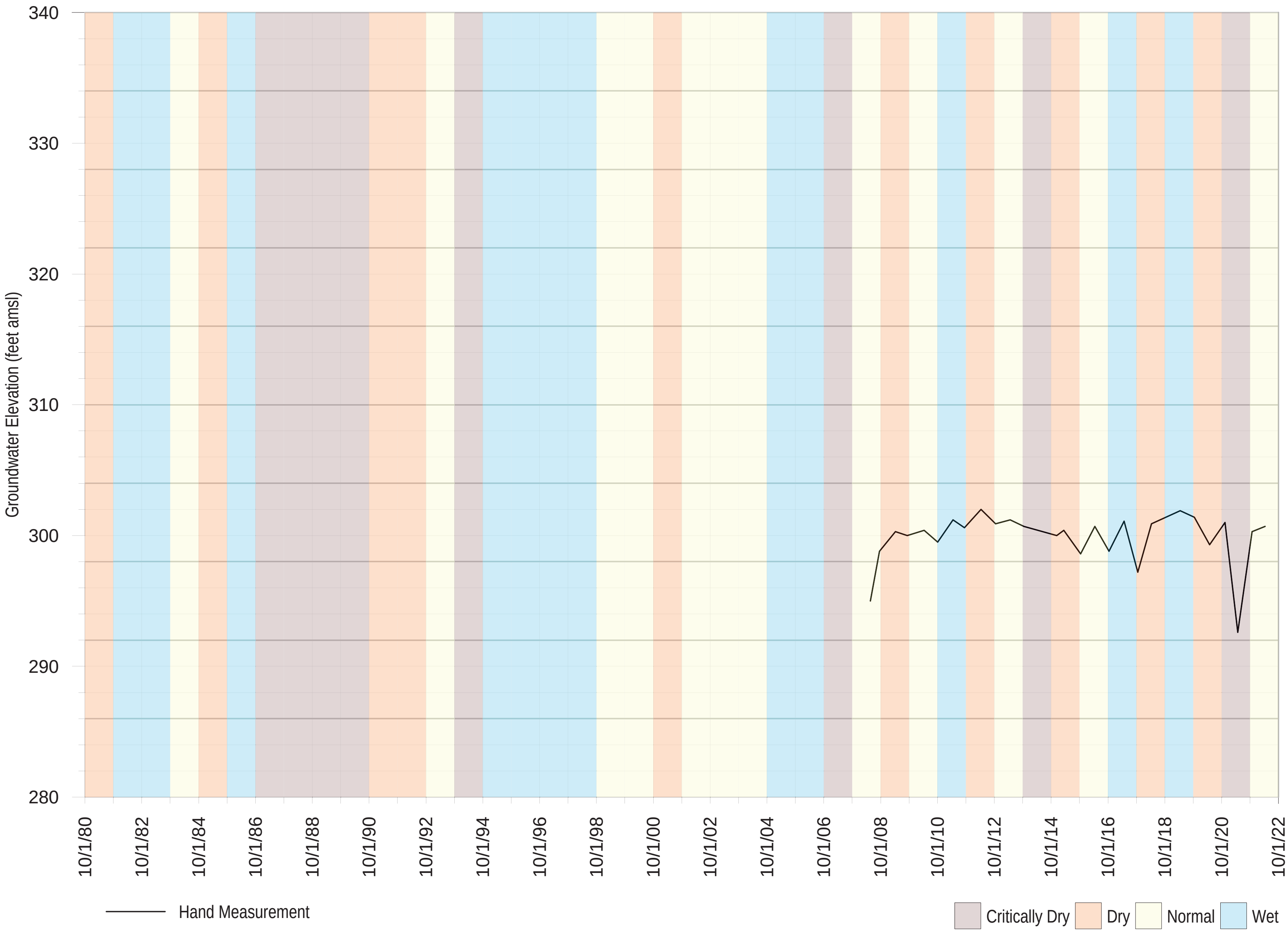
Private Well 16
Aquifer Screened:

FIGURE A-157



Private Well 17
Aquifer Screened:

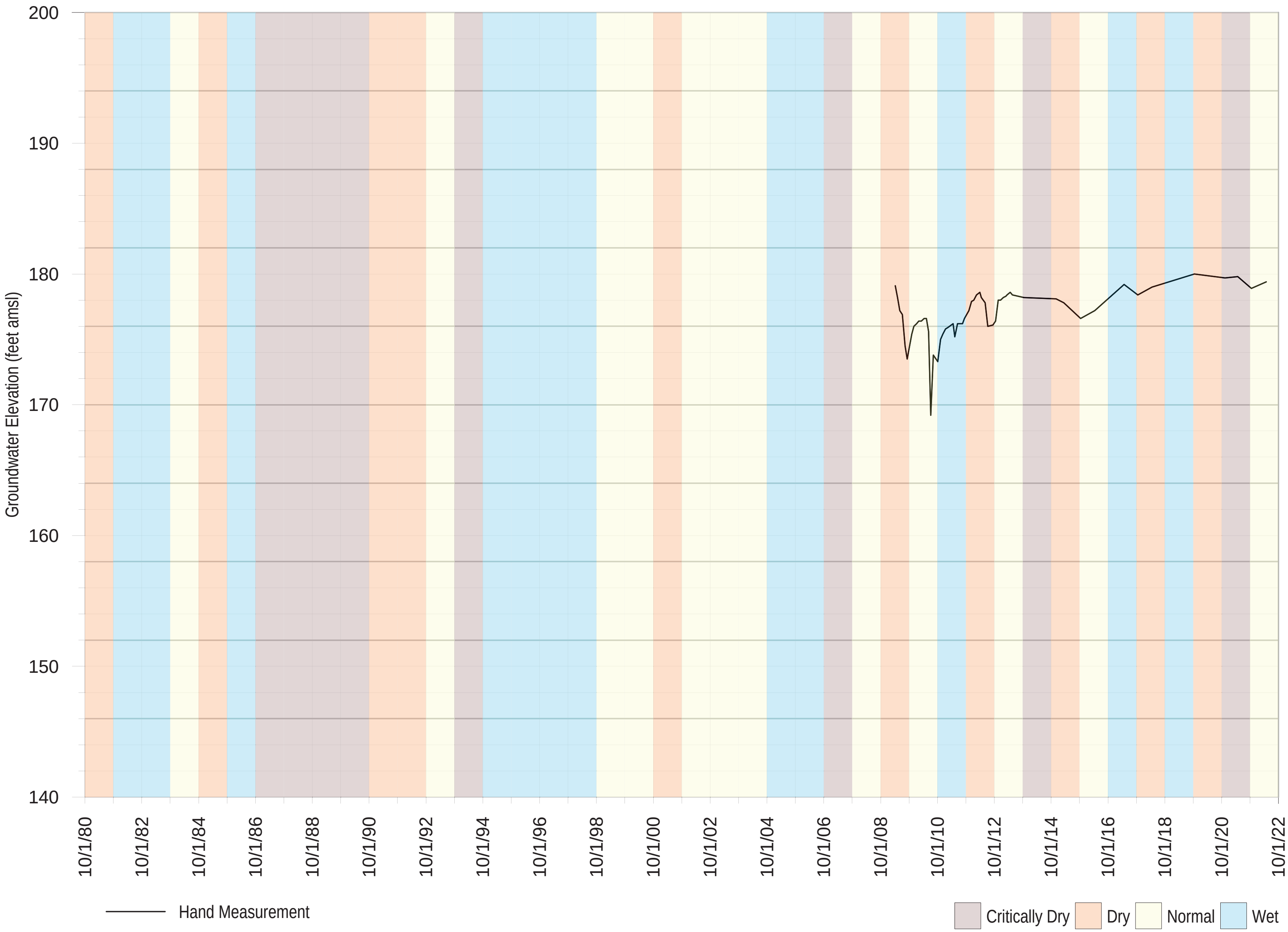
FIGURE A-158



Appendix A

Private Well 18
Aquifer Screened:

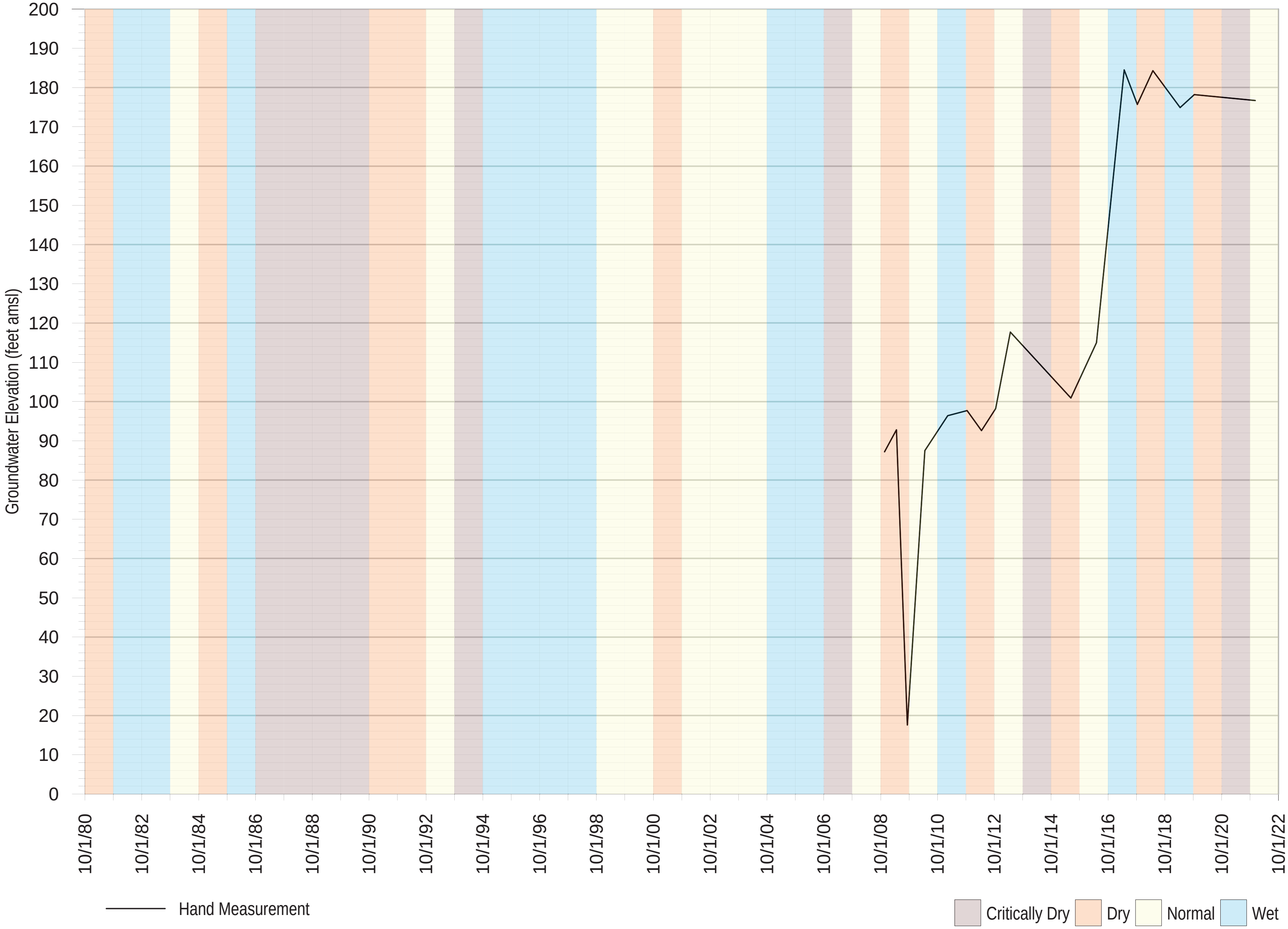
FIGURE A-159



Appendix A

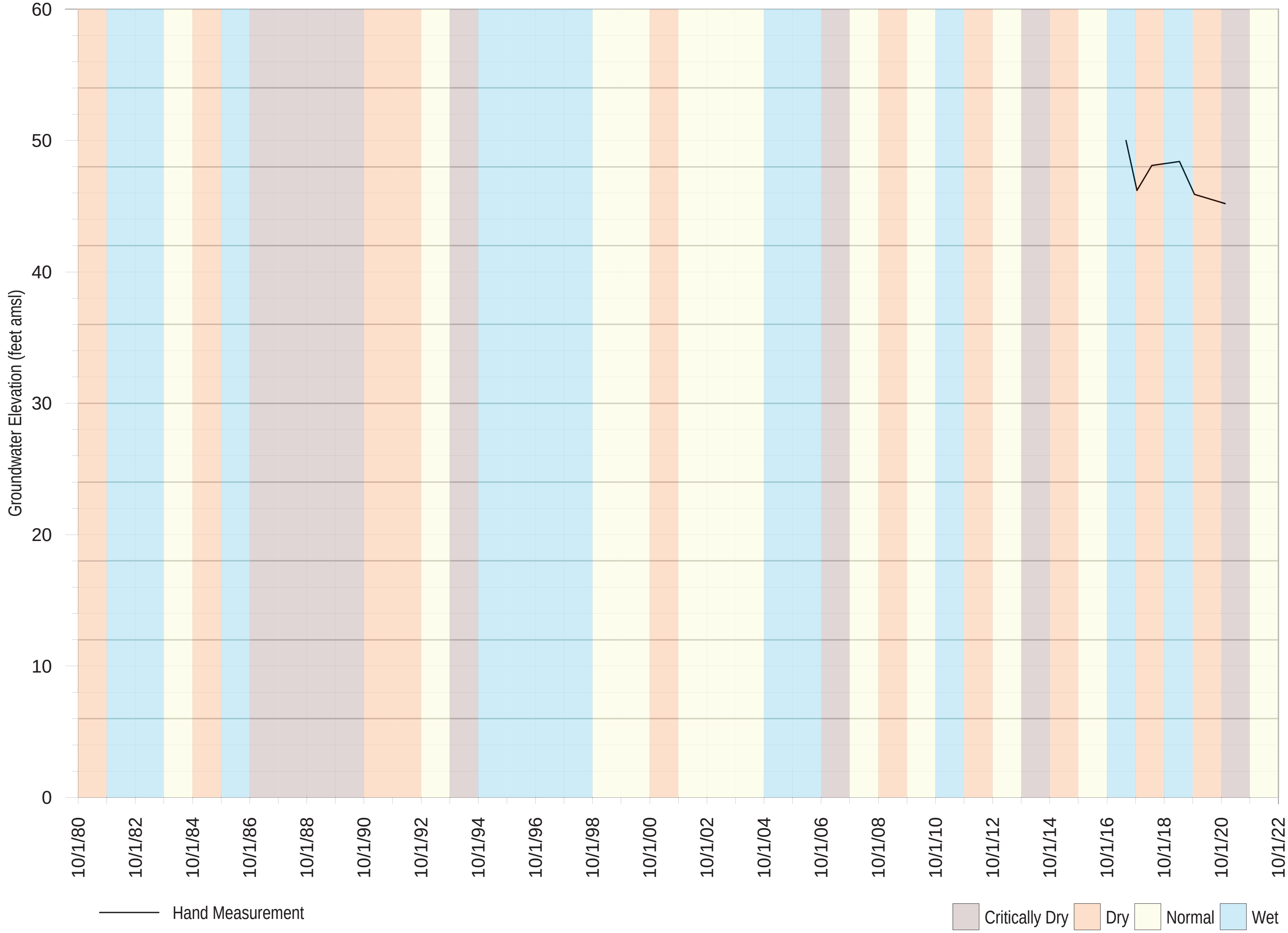
Private Well 19
Aquifer Screened:

FIGURE A-160



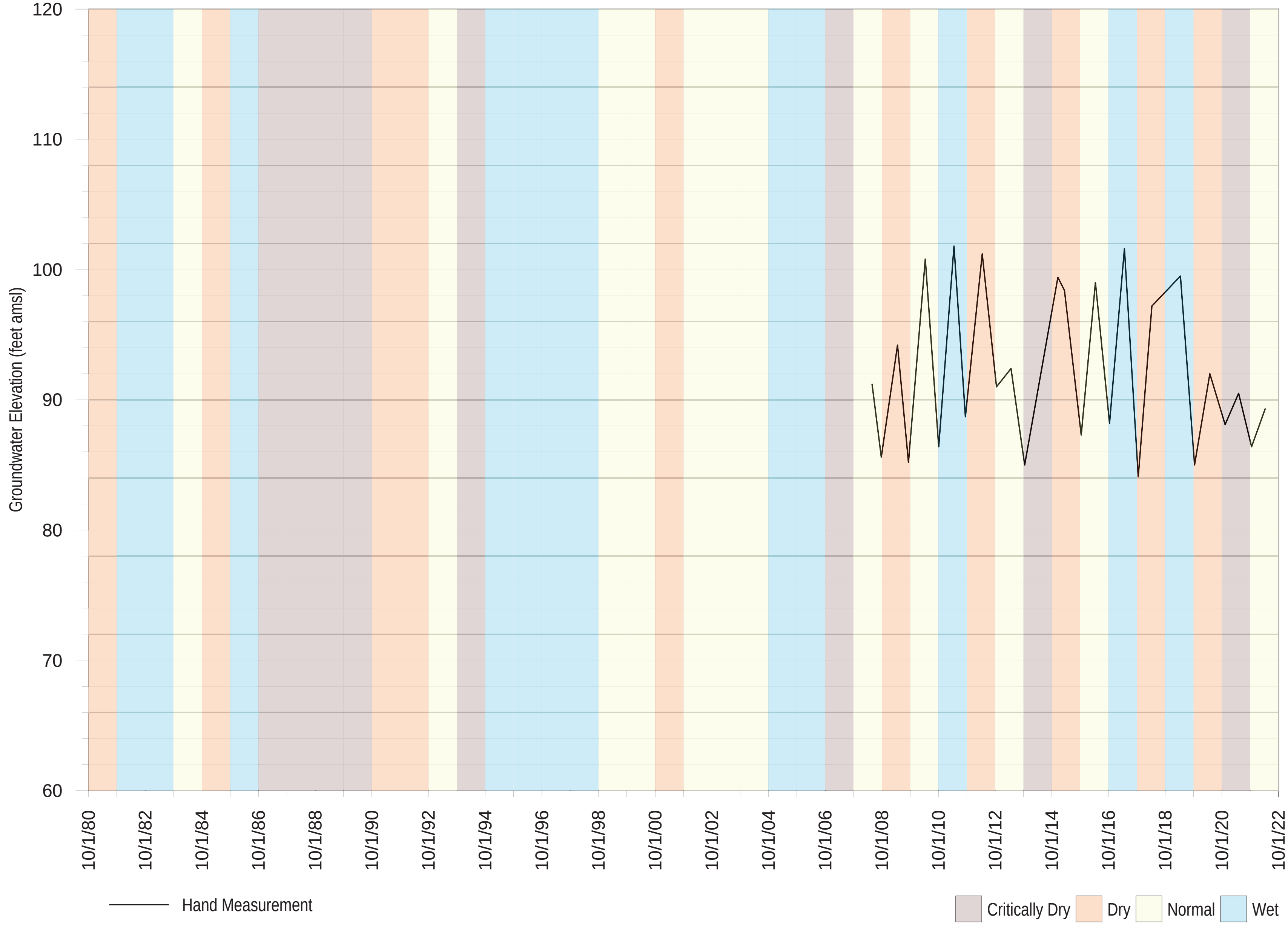
Private Well 20
Aquifer Screened:

FIGURE A-161



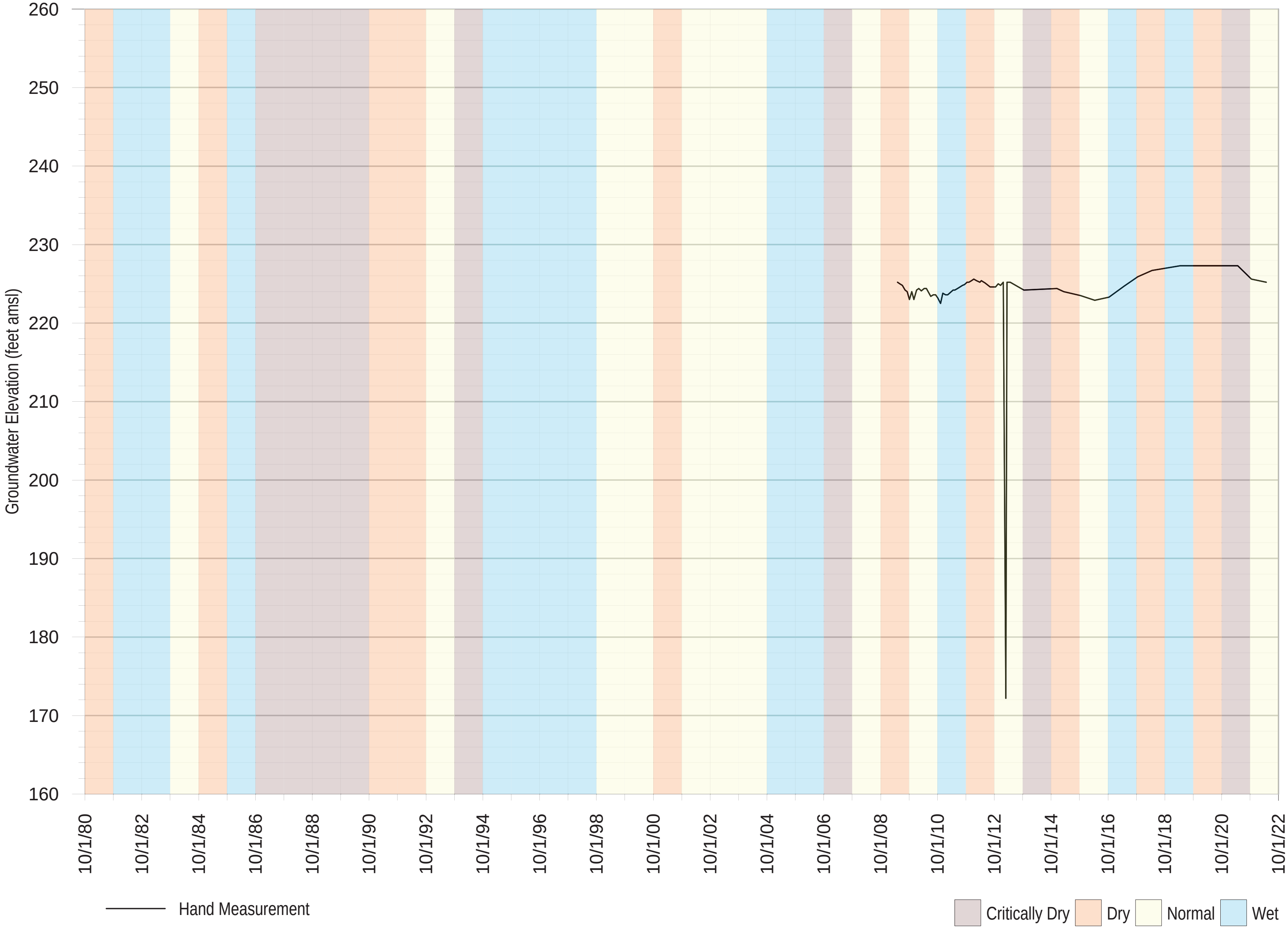
Private Well 21
Aquifer Screened:

FIGURE A-162



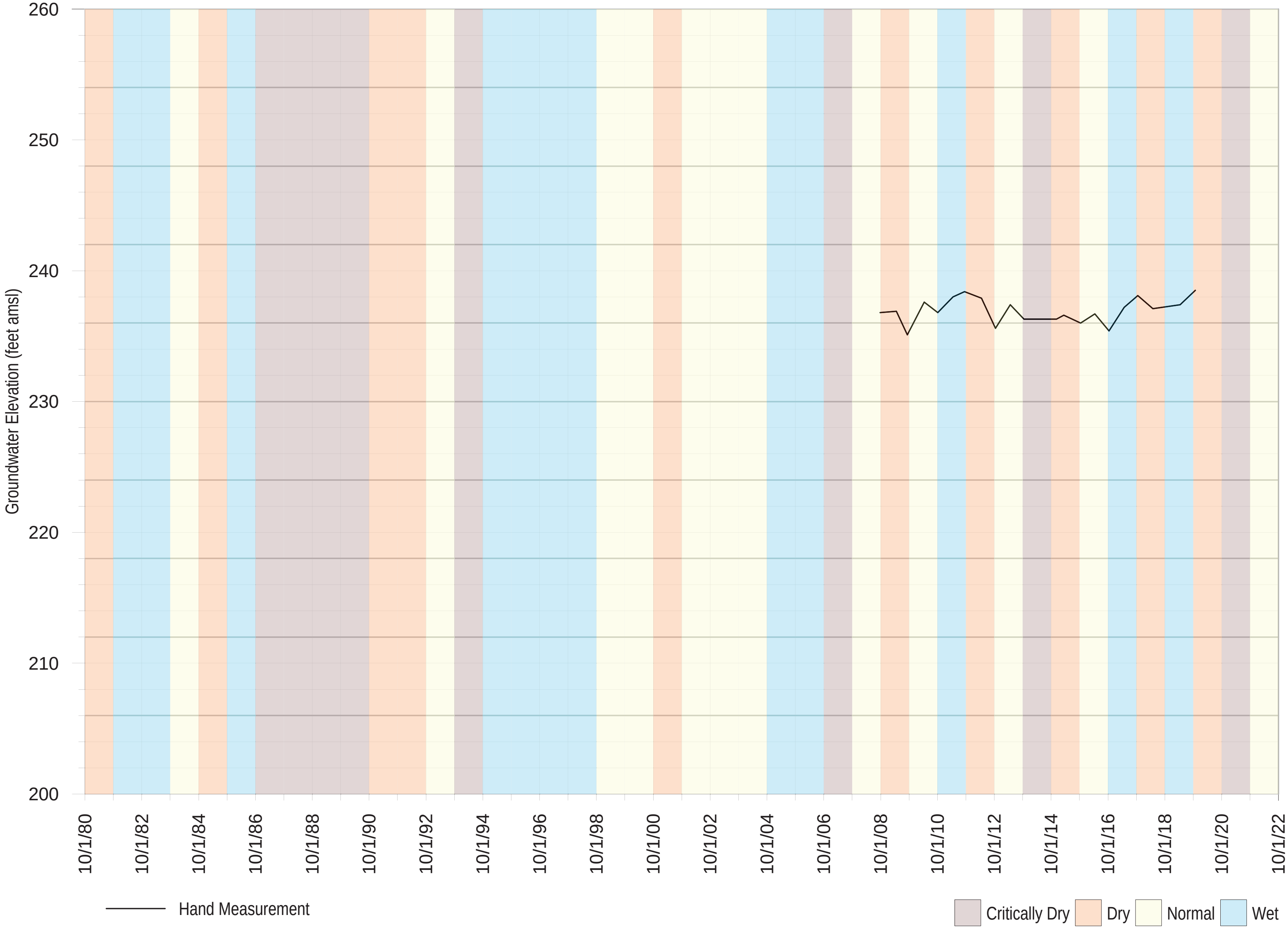
Private Well 22
Aquifer Screened:

FIGURE A-163



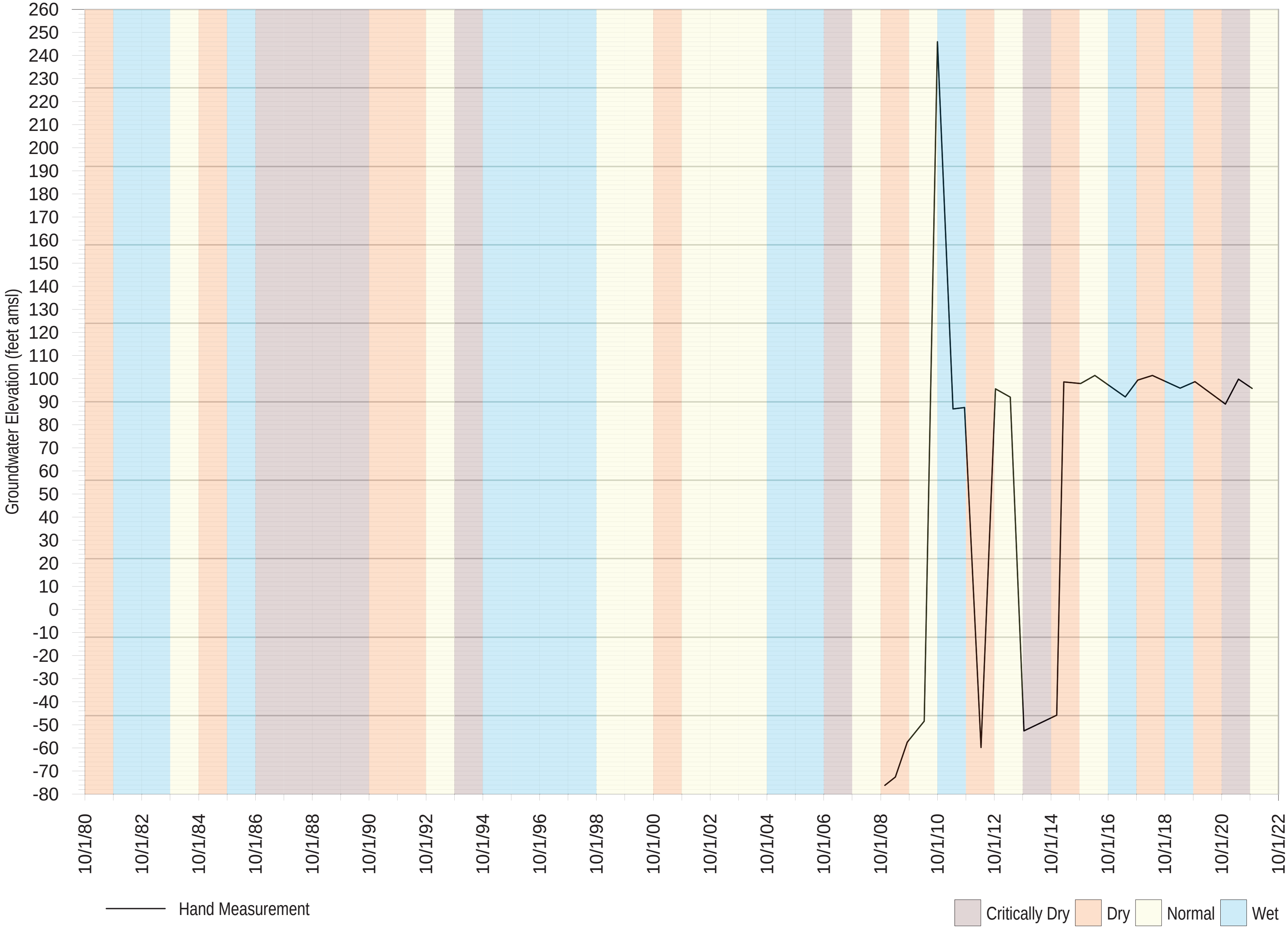
Private Well 23
Aquifer Screened:

FIGURE A-164



Private Well 24
Aquifer Screened:

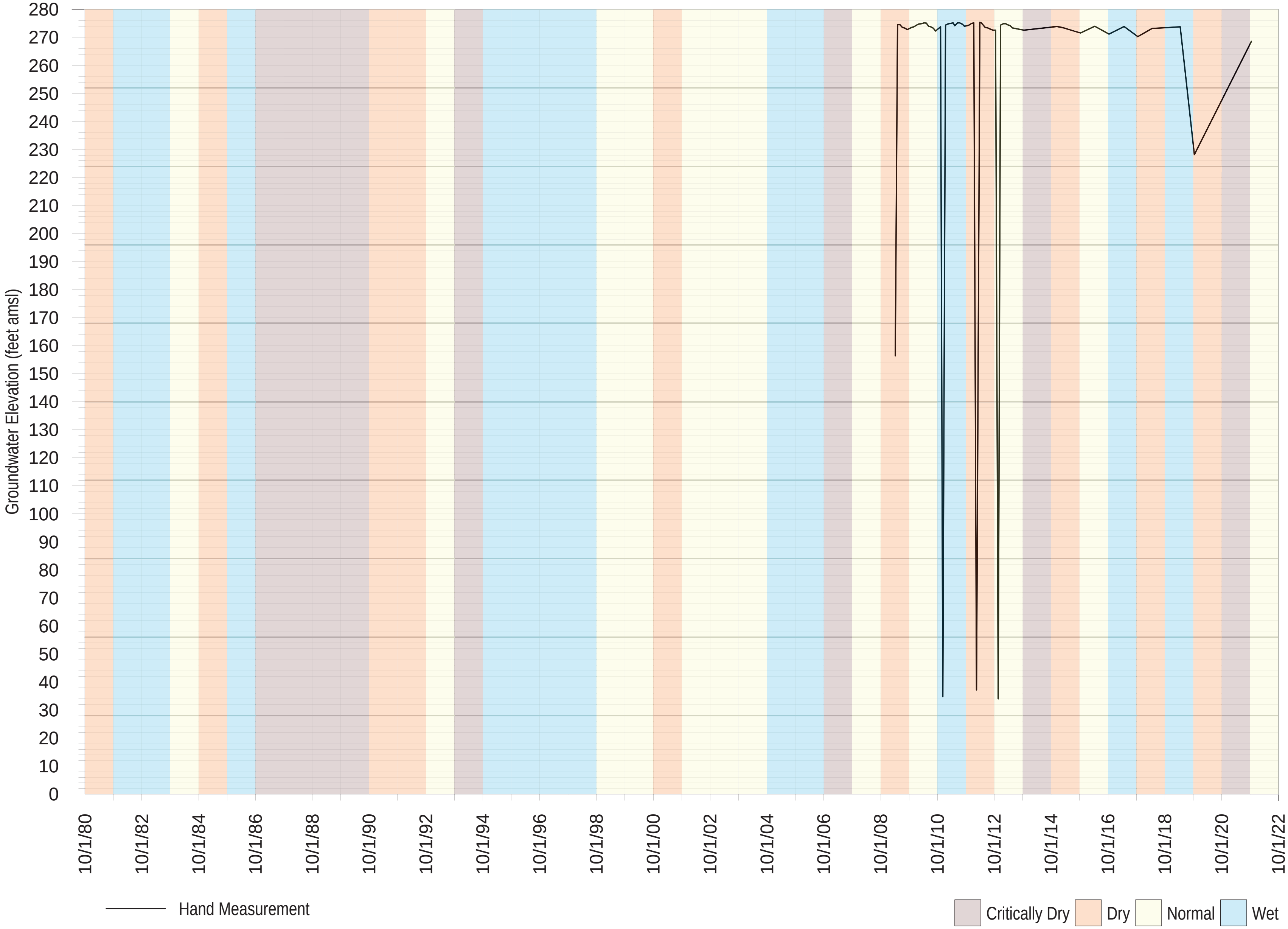
FIGURE A-165



Appendix A

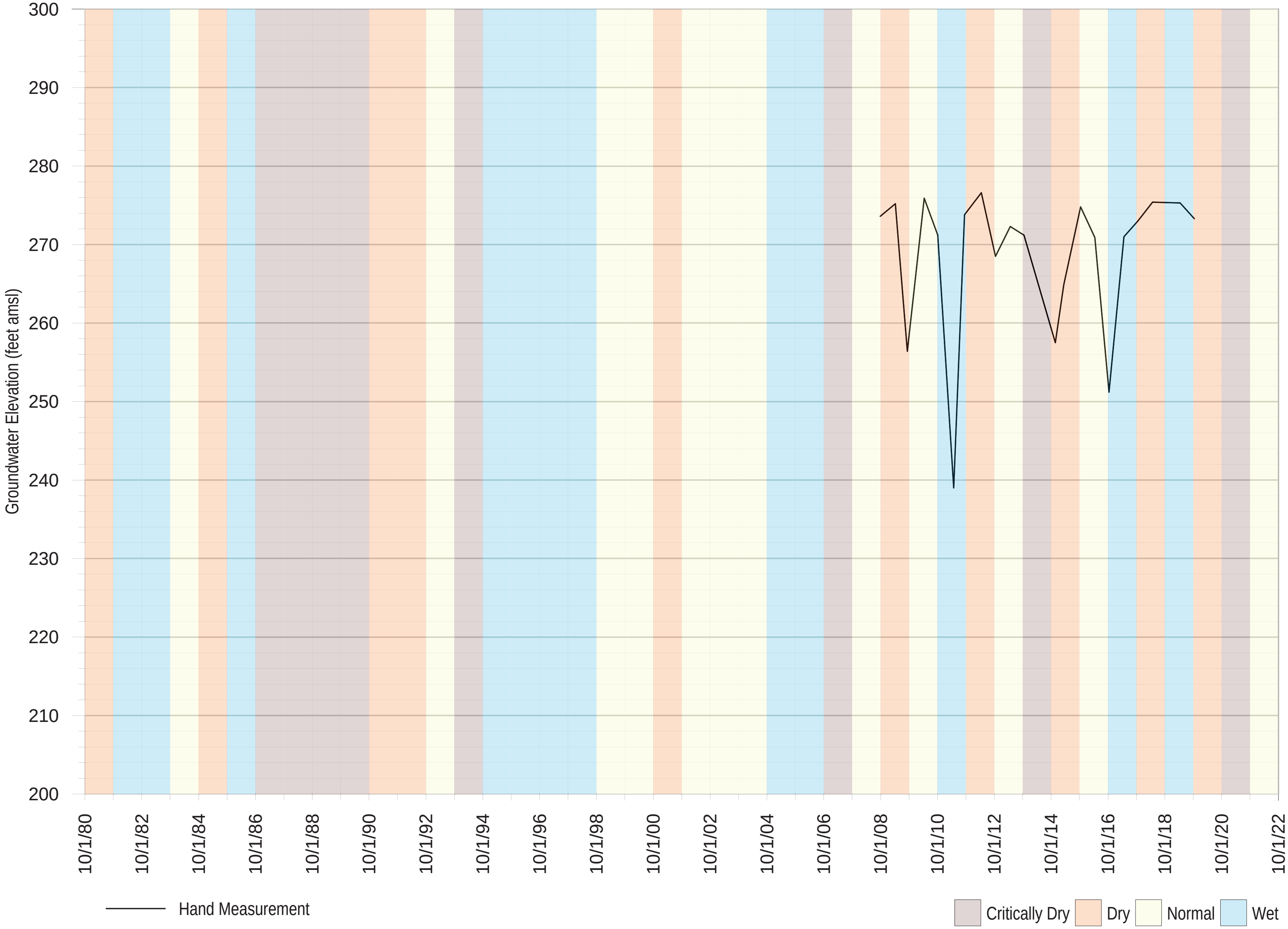
Private Well 25
Aquifer Screened:

FIGURE A-166



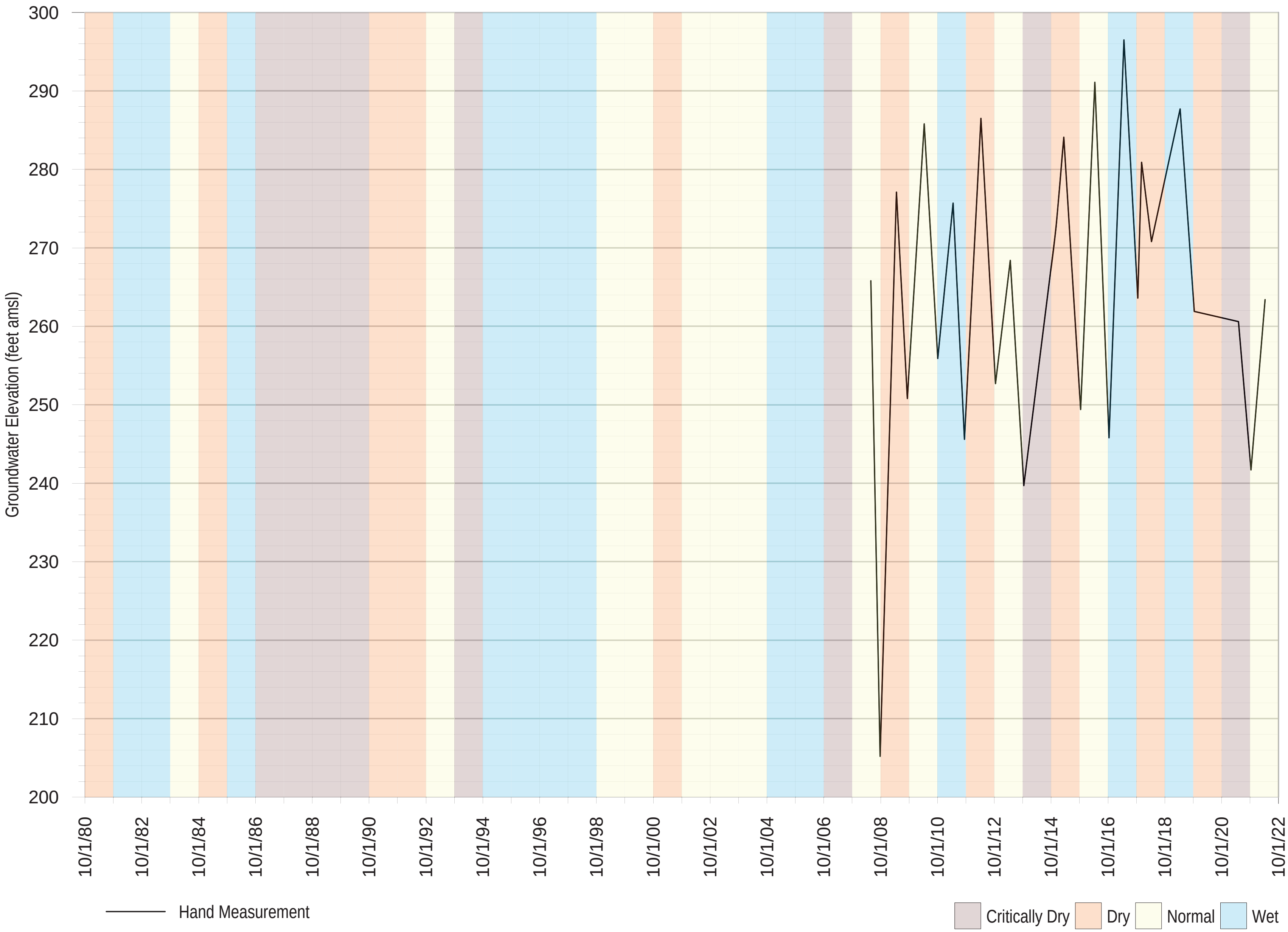
Private Well 26
Aquifer Screened:

FIGURE A-167



Private Well 27
Aquifer Screened:

FIGURE A-168

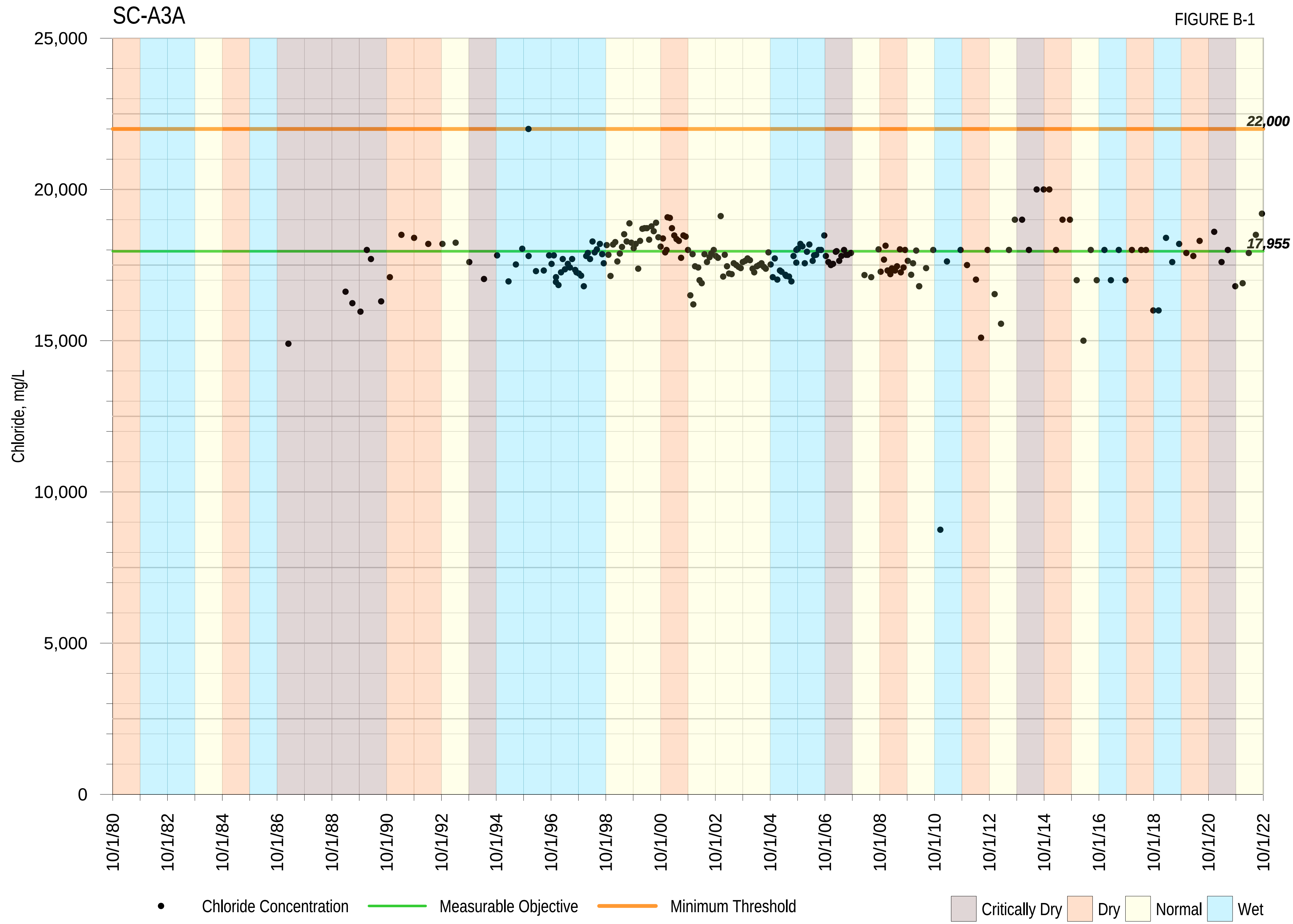


MONTGOMERY
& ASSOCIATES

Appendix B

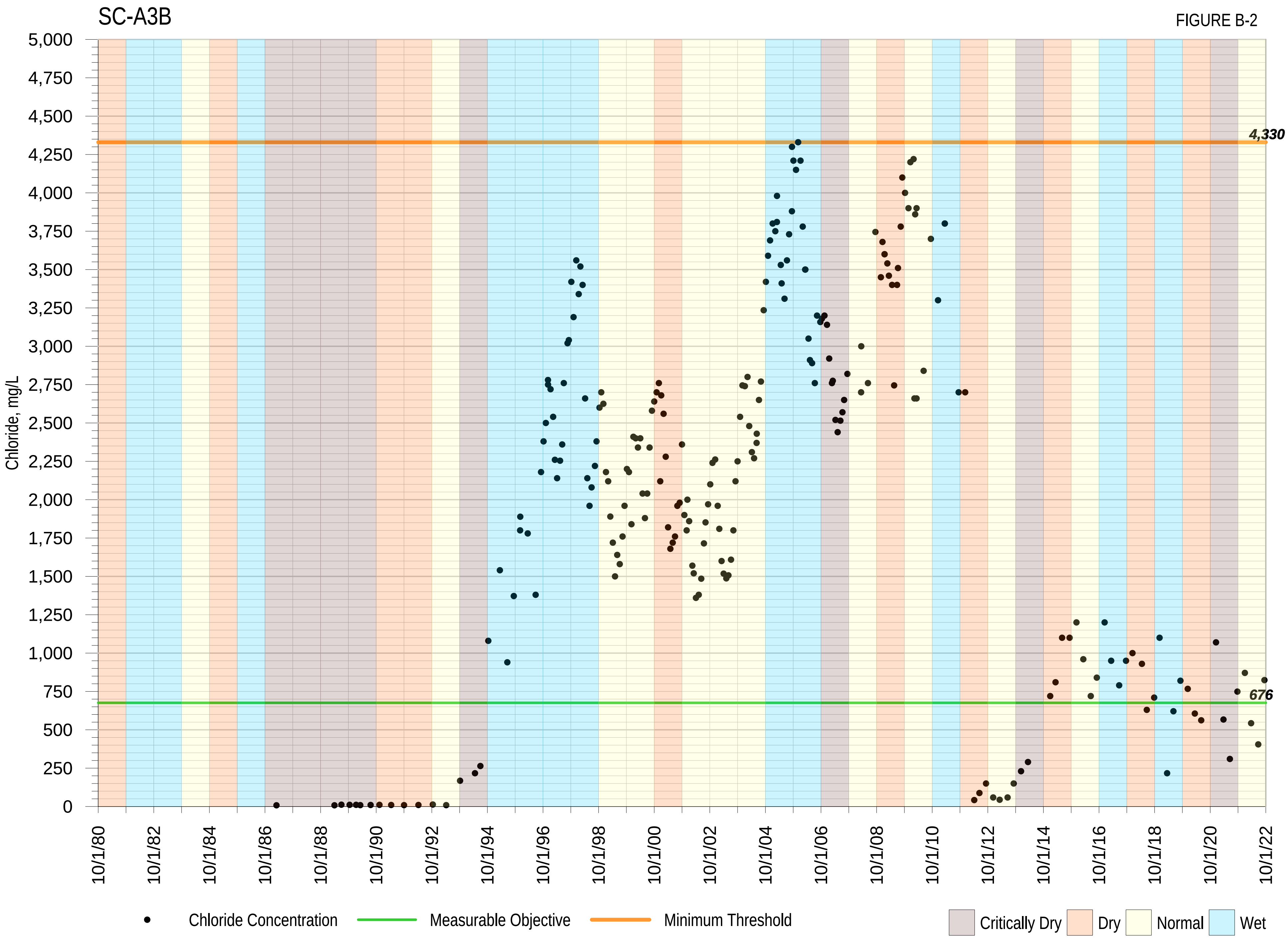
Coastal Monitoring Well Chemographs

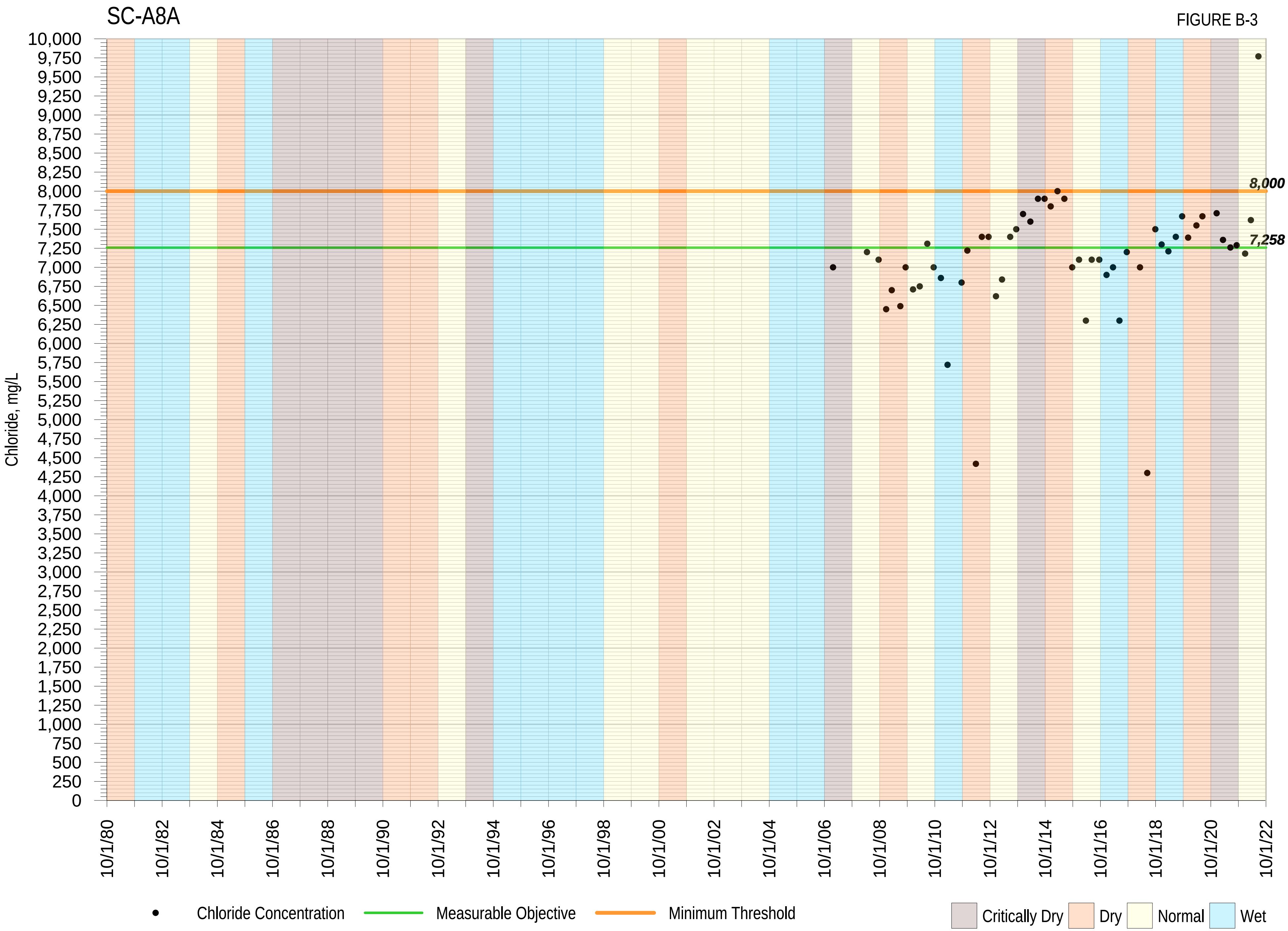
FIGURE B-1



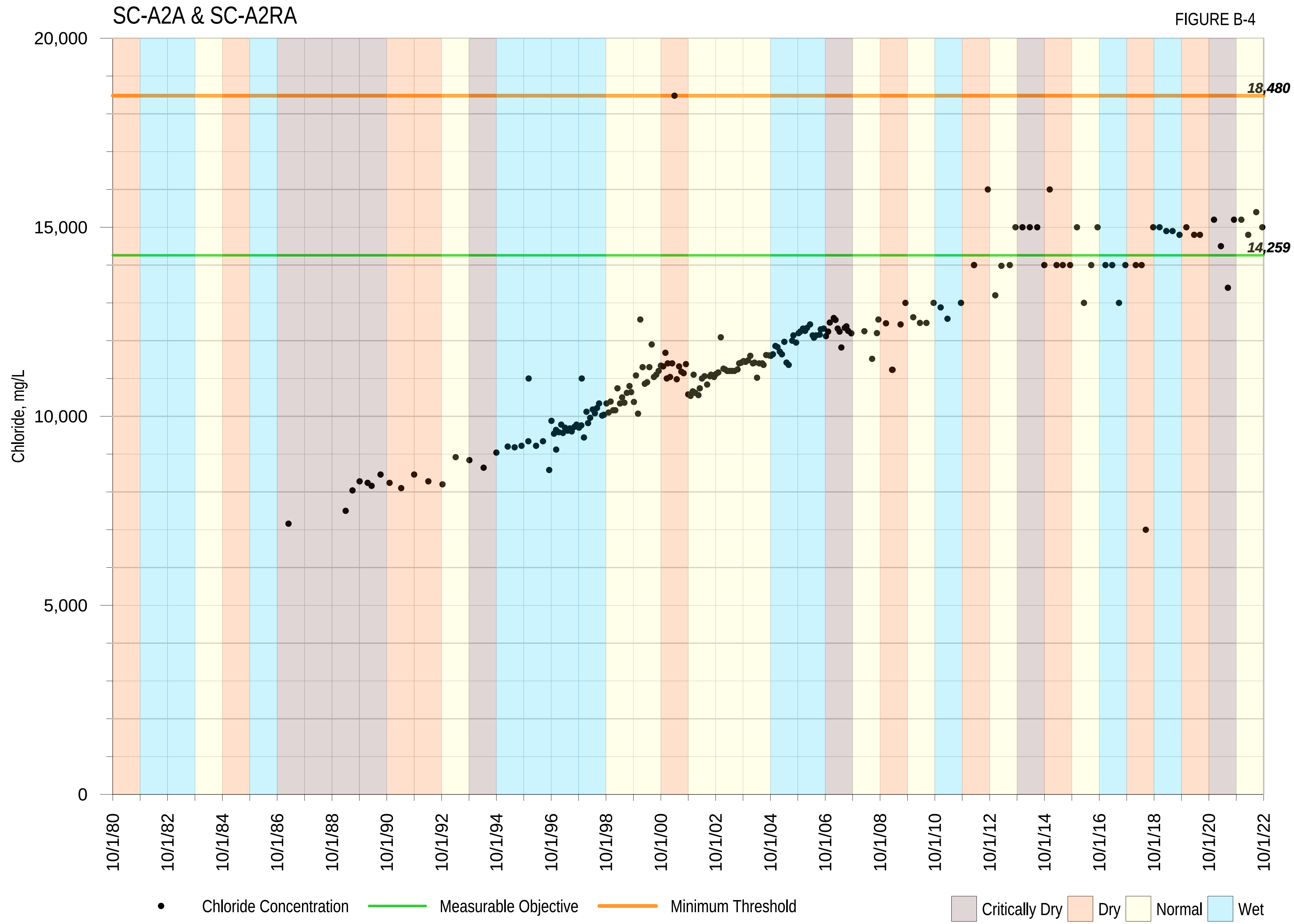
SC-A3A
Chloride, mg/L
25,000
20,000
15,000
10,000
5,000
0
22,000
17,955
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable Objective
Minimum Threshold
Critically Dry
Dry
Normal
Wet

FIGURE B-2


SC-A3B
Chloride, mg/L
5,000
4,750
4,500
4,250
4,000
3,750
3,500
3,250
3,000
2,750
2,500
2,250
2,000
1,750
1,500
1,250
1,000
750
500
250
0
4,330
676
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

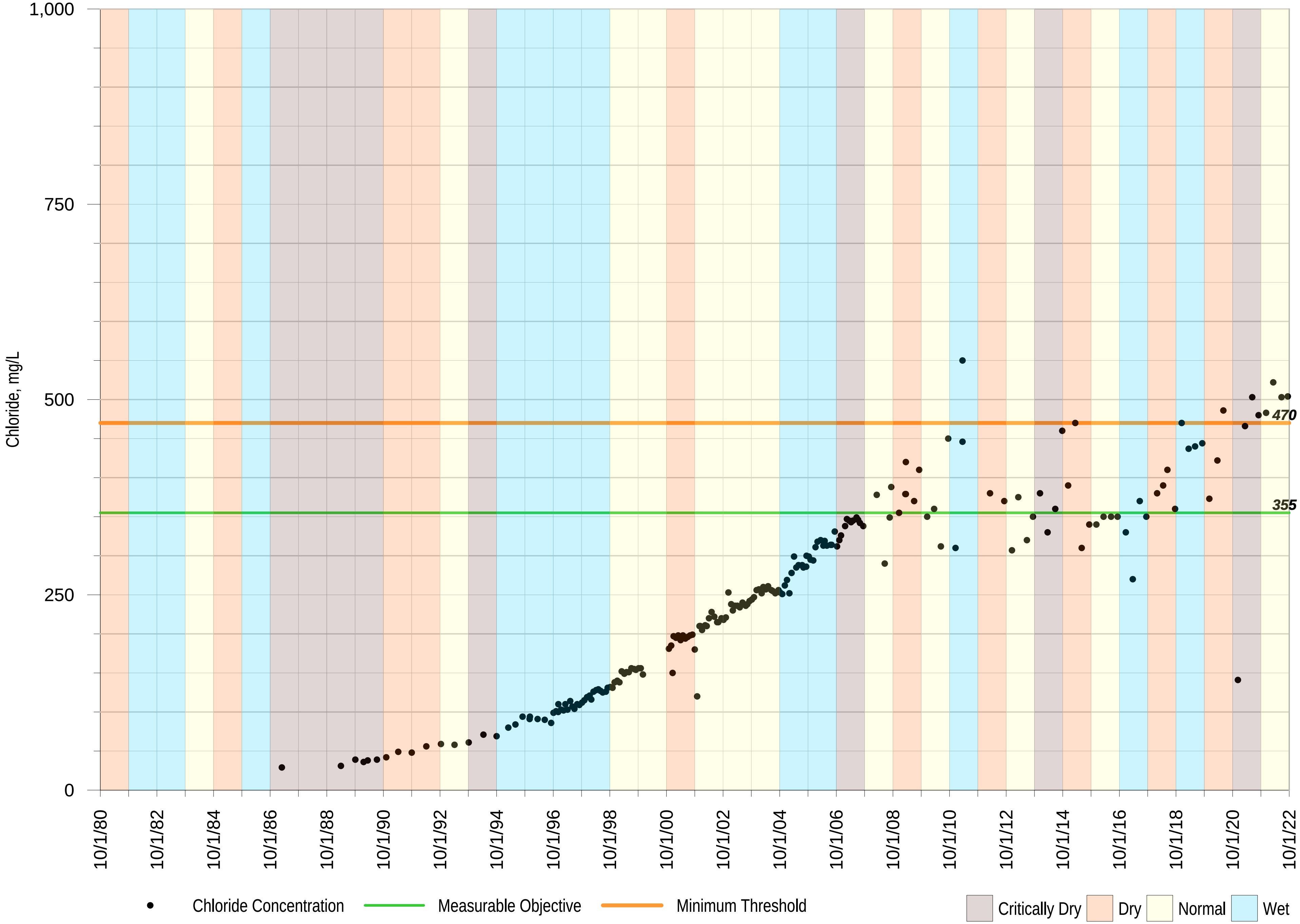


SC-A8A
FIGURE B-3
Chloride, mg/L
10,000
9,750
9,500
9,250
9,000
8,750
8,500
8,250
8,000
7,750
7,500
7,250
7,000
6,750
6,500
6,250
6,000
5,750
5,500
5,250
5,000
4,750
4,500
4,250
4,000
3,750
3,500
3,250
3,000
2,750
2,500
2,250
2,000
1,750
1,500
1,250
1,000
750
500
250
0
8,000
7,258
10/1/80
10/1/82
10/1/84
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


SC-A2A & SC-A2RA
FIGURE B-4
20,000
15,000
10,000
5,000
0
Chloride, mg/L
18,480
14,259
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

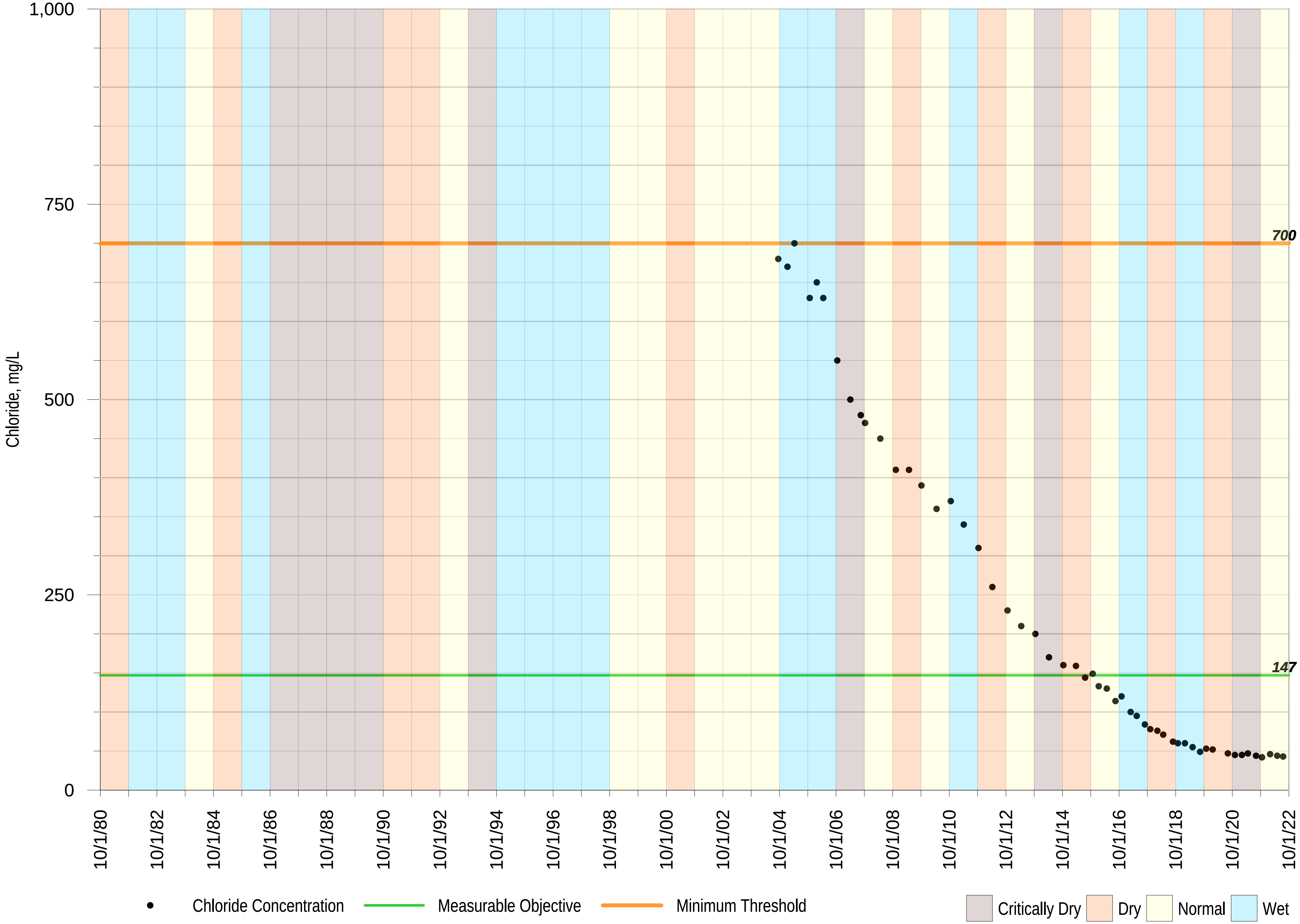
SC-A2B & SC-A2RB

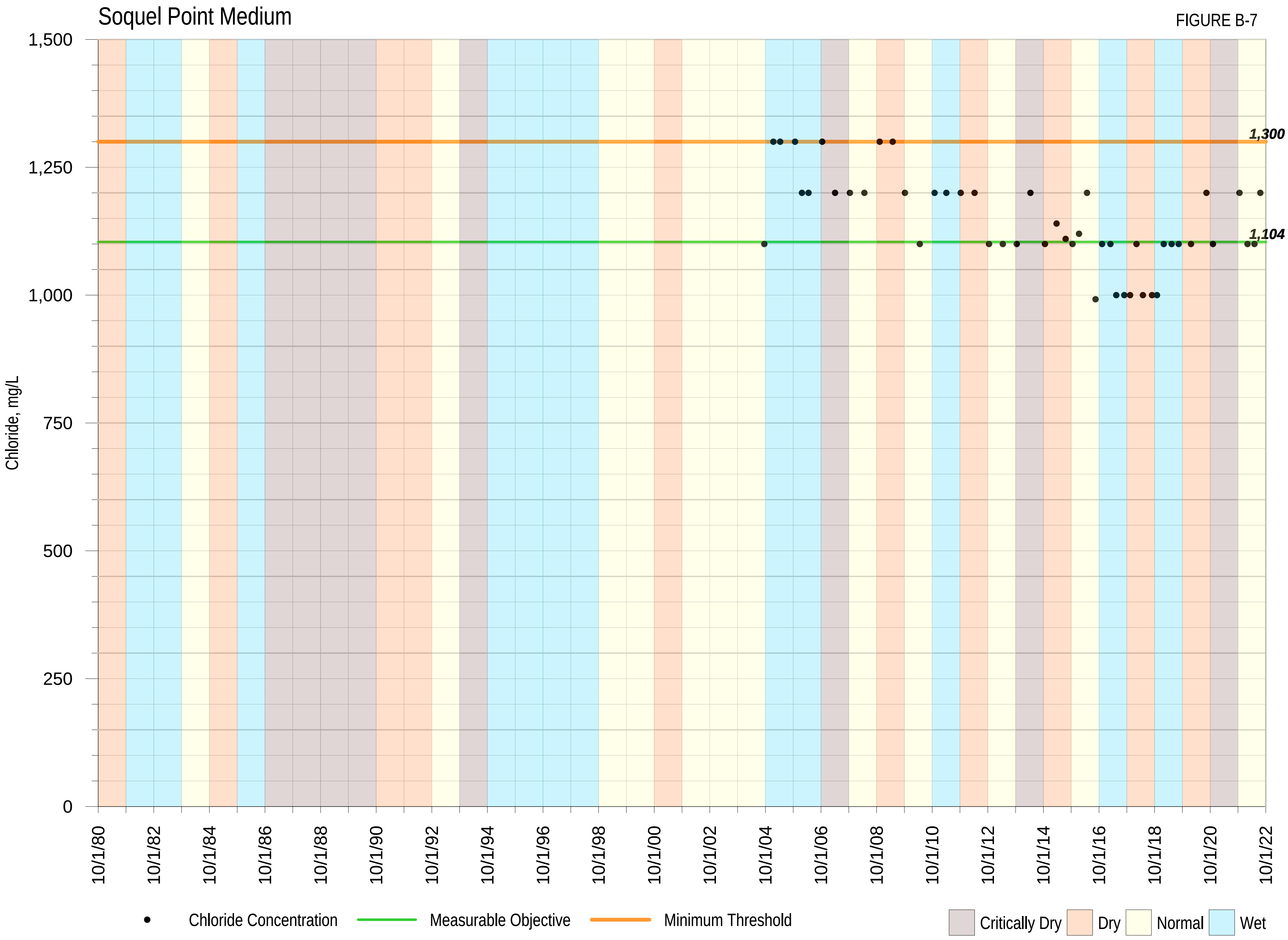
FIGURE B-5



Moran Lake Medium

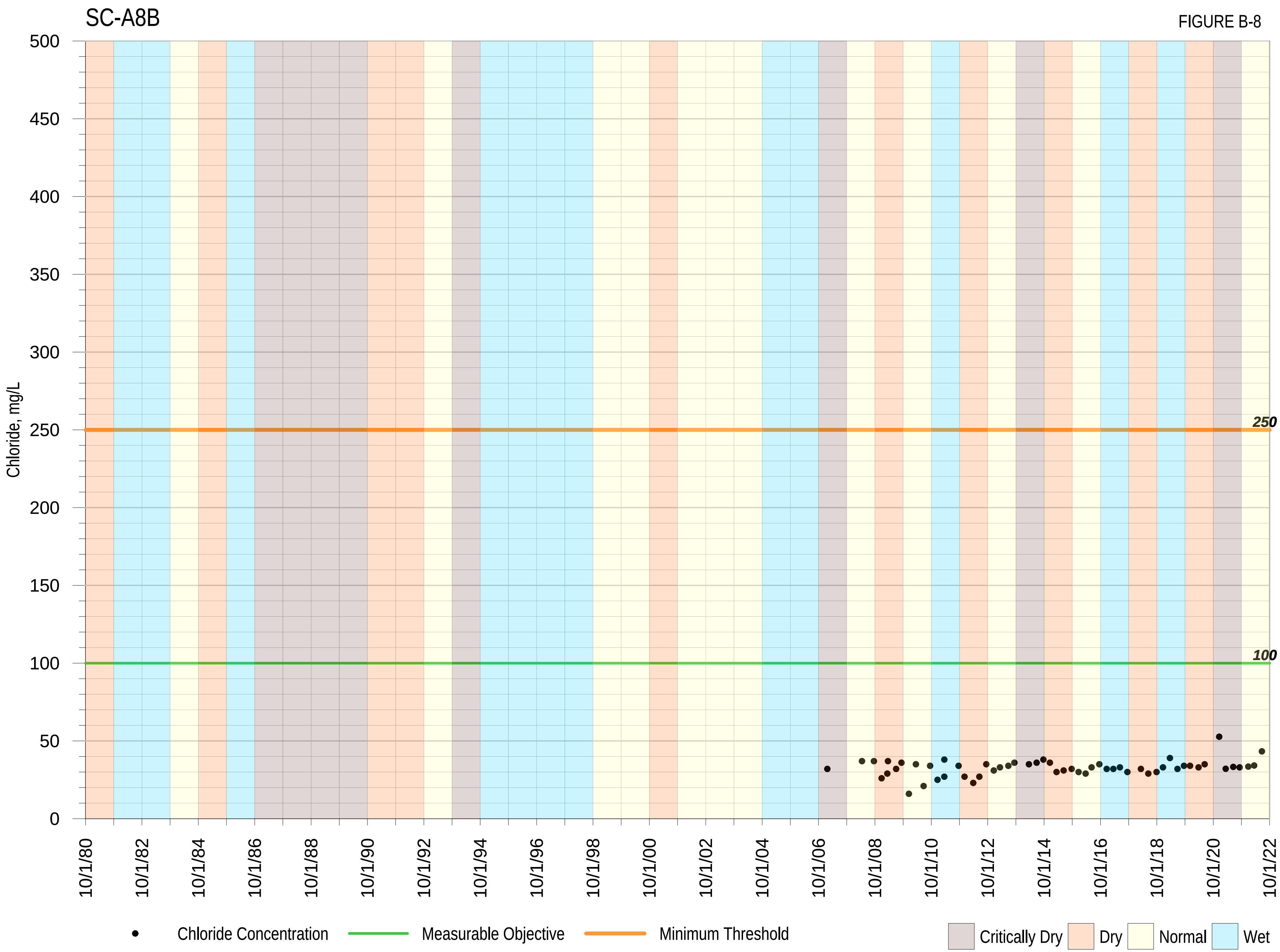
FIGURE B-6





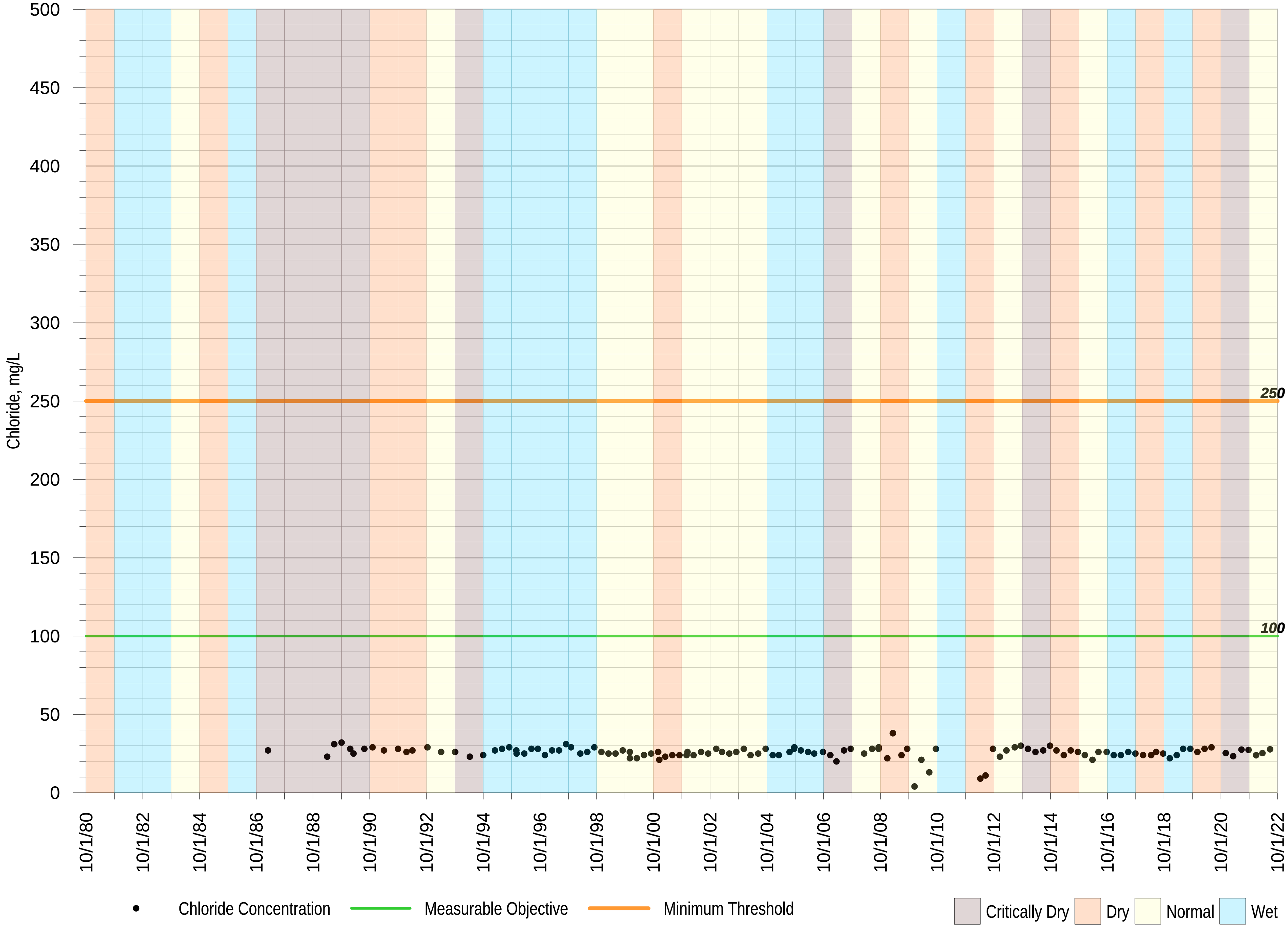
Soquel Point Medium
FIGURE B-7
Chloride, mg/L
1,500
1,250
1,000
750
500
250
0
1,300
1,104
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable Objective
Minimum Threshold
Critically Dry
Dry
Normal
Wet

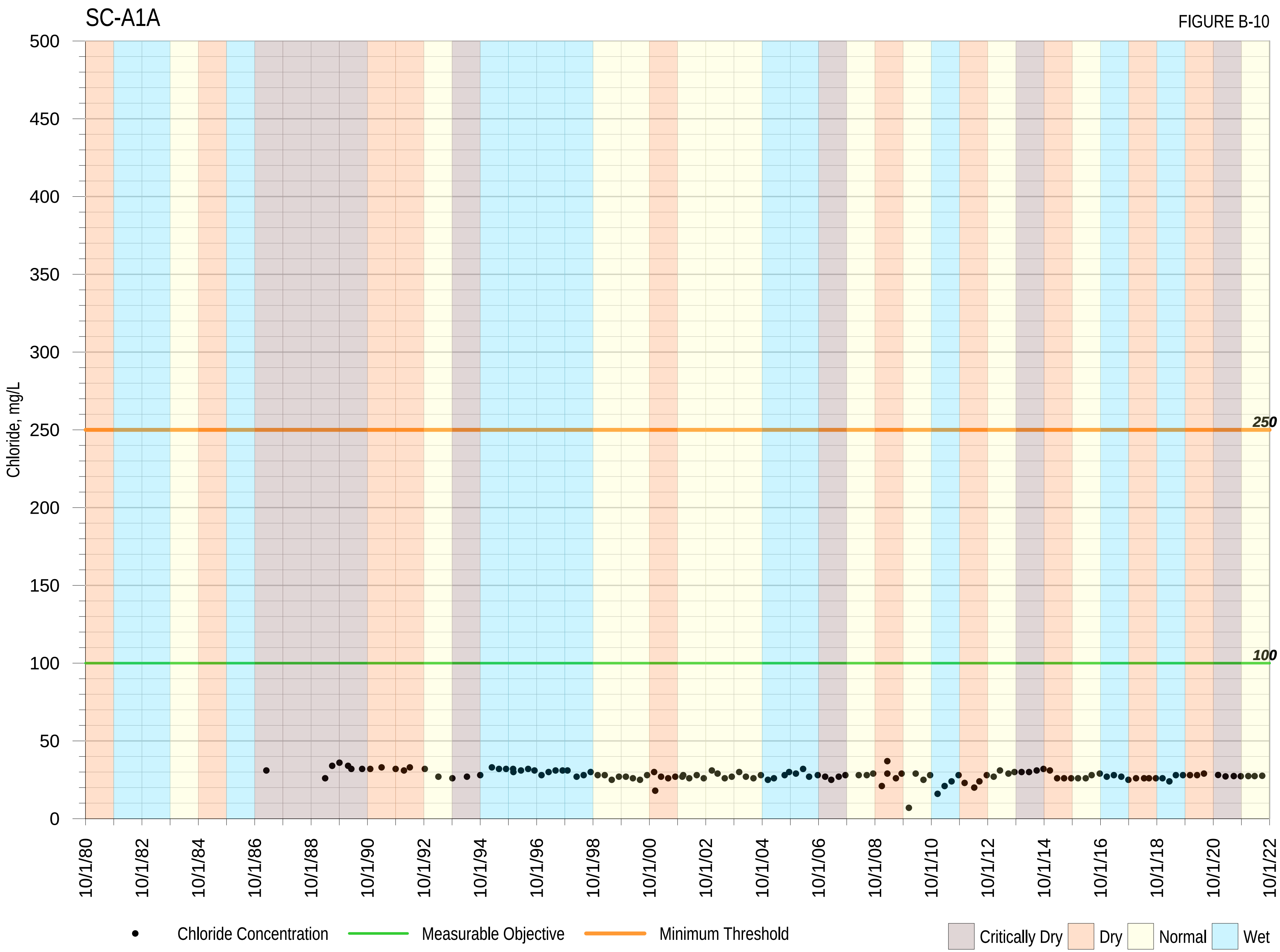
FIGURE B-8


SC-A8B
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
250
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

SC-A1B

FIGURE B-9





SC-A1A
FIGURE B-10
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
250
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

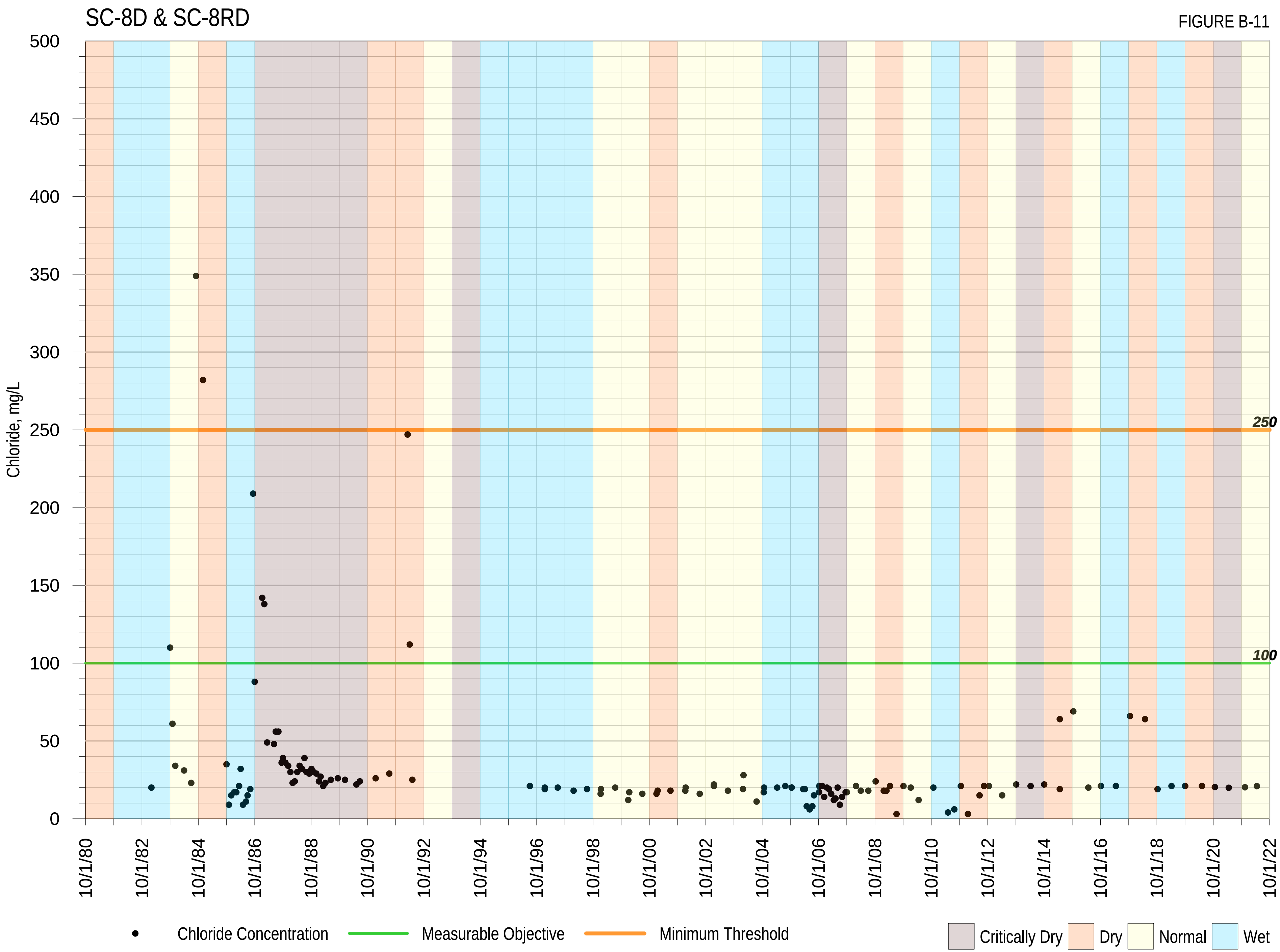
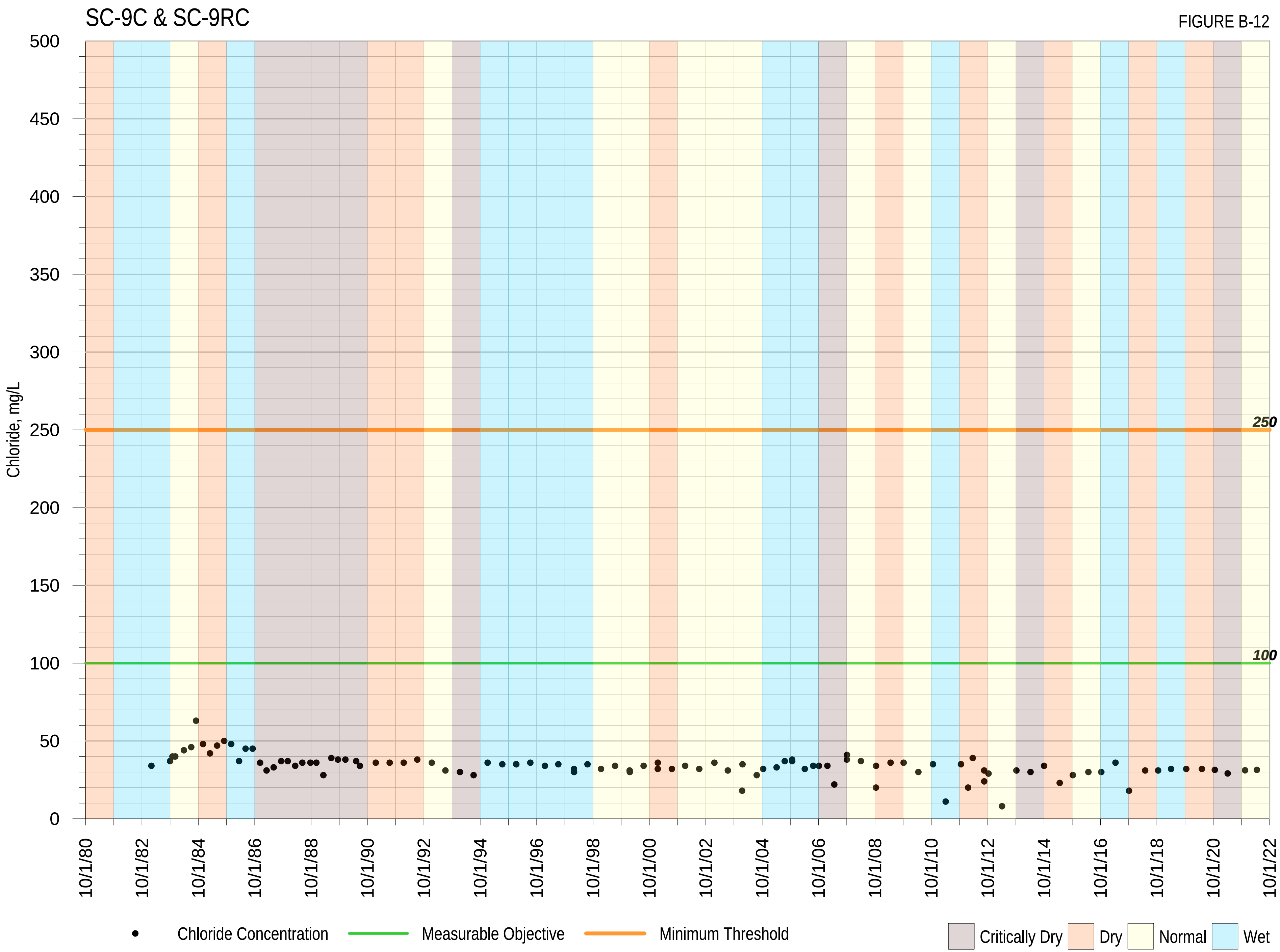
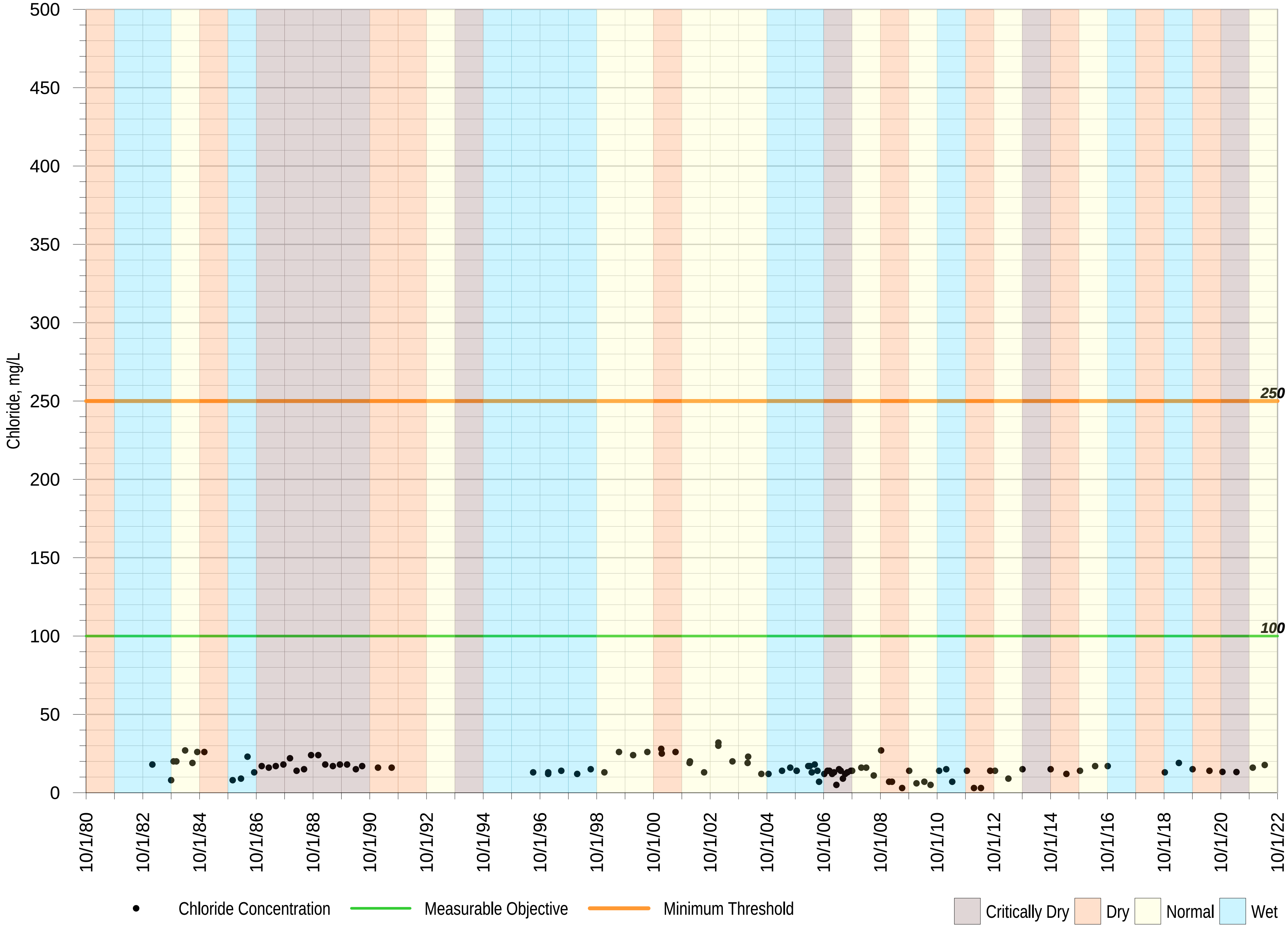

SC-8D & SC-8RD
FIGURE B-11
Chloride, mg/L
0
50
100
150
200
250
300
350
400
450
500
250
100
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable Objective
Minimum Threshold
Critically Dry
Dry
Normal
Wet

FIGURE B-12


SC-9C & SC-9RC
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
250
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

SC-8B & SC-8RB

FIGURE B-13



Pleasure Point Medium

FIGURE B-14

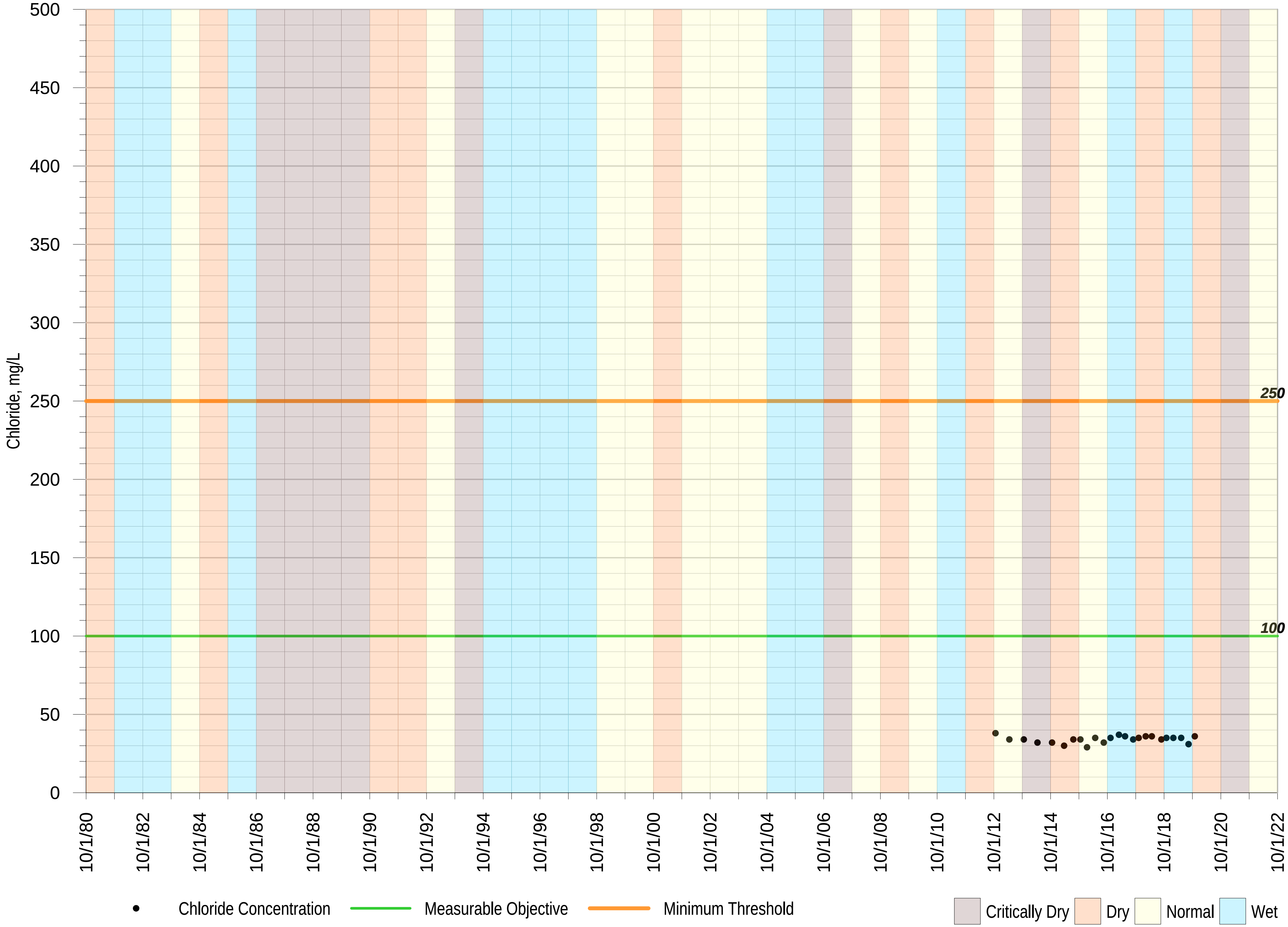
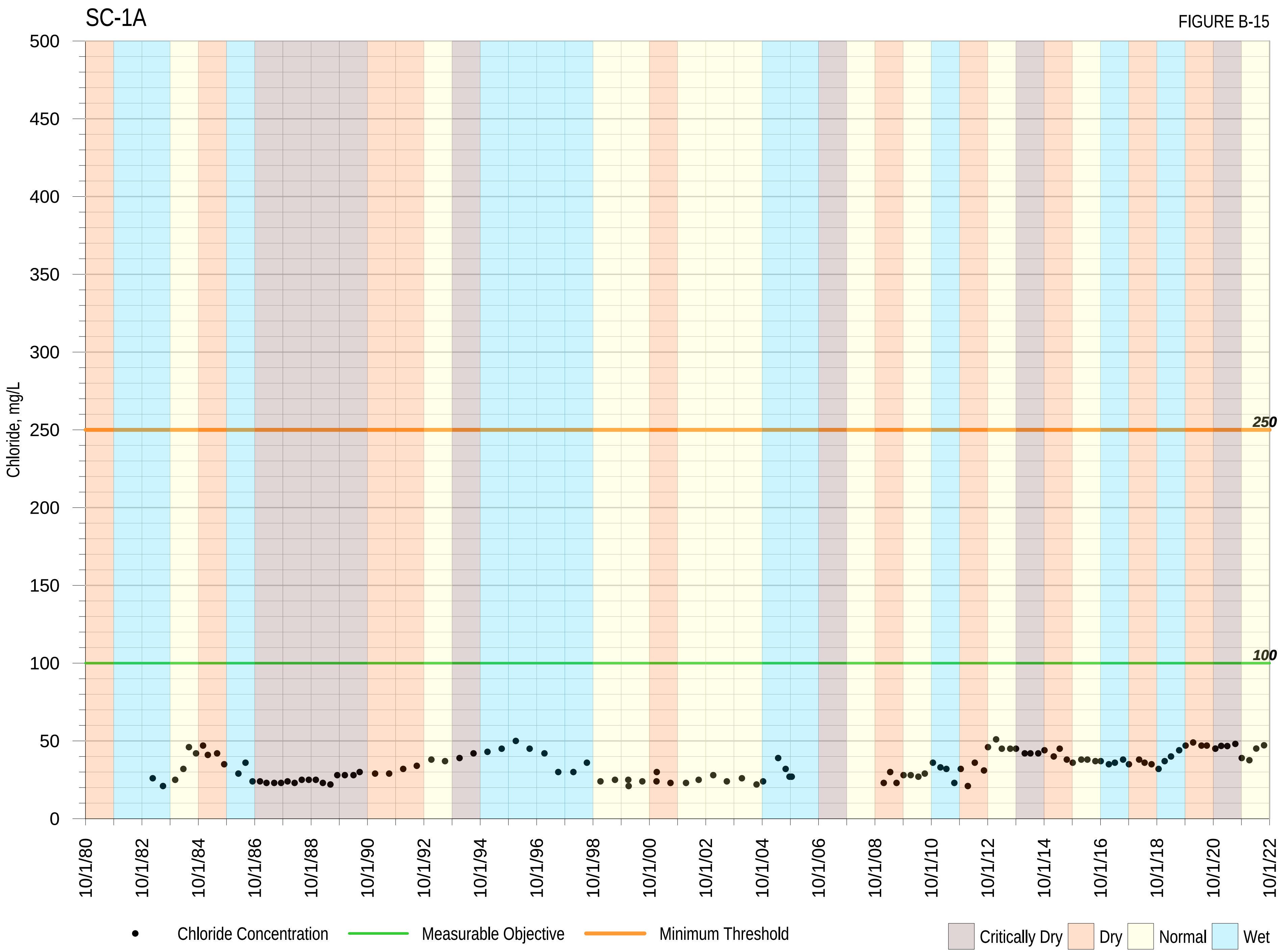
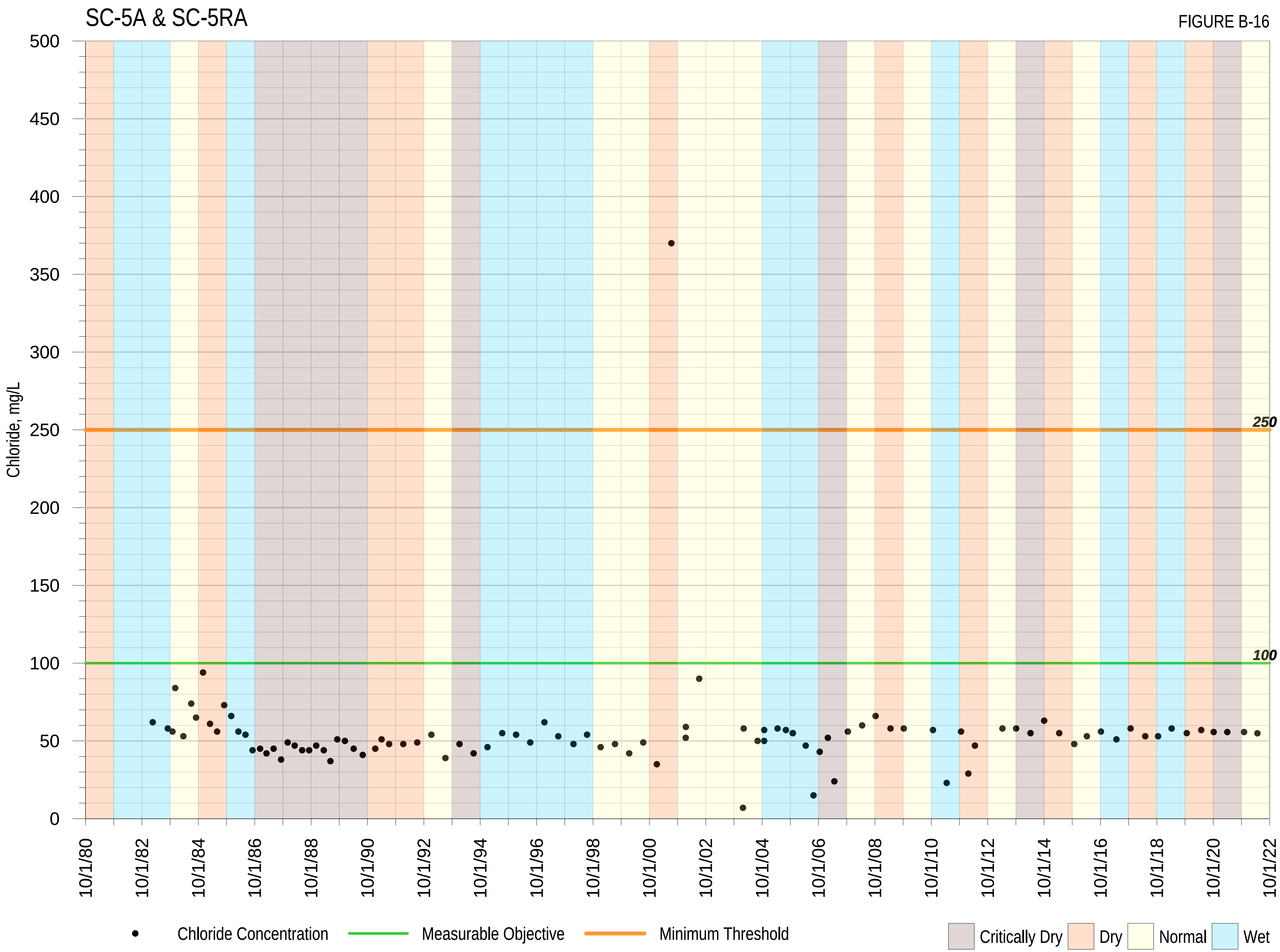


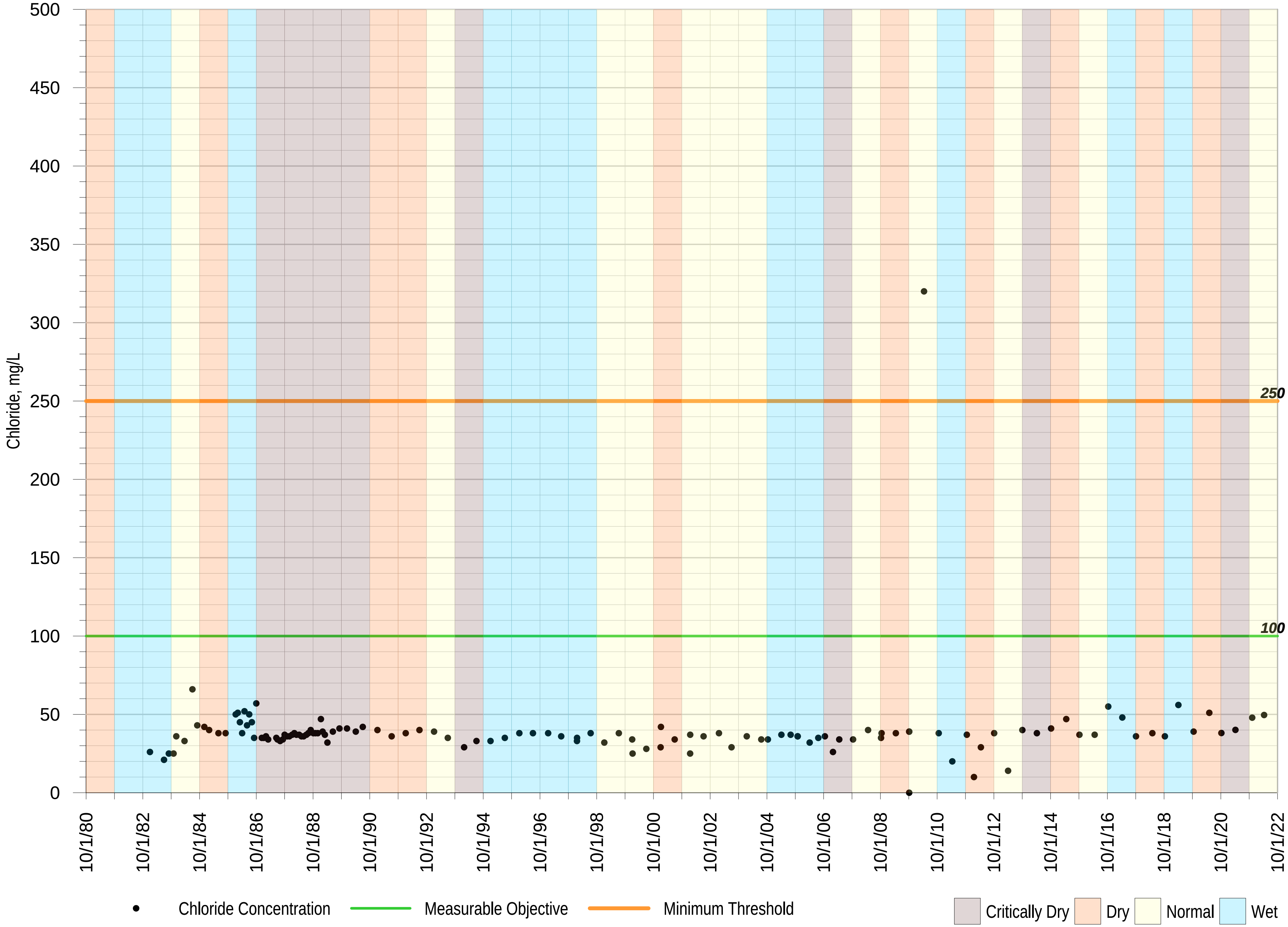
FIGURE B-15


SC-1A
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
250
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


SC-5A & SC-5RA
FIGURE B-16
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
250
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

SC-3A & SC-3RA

FIGURE B-17



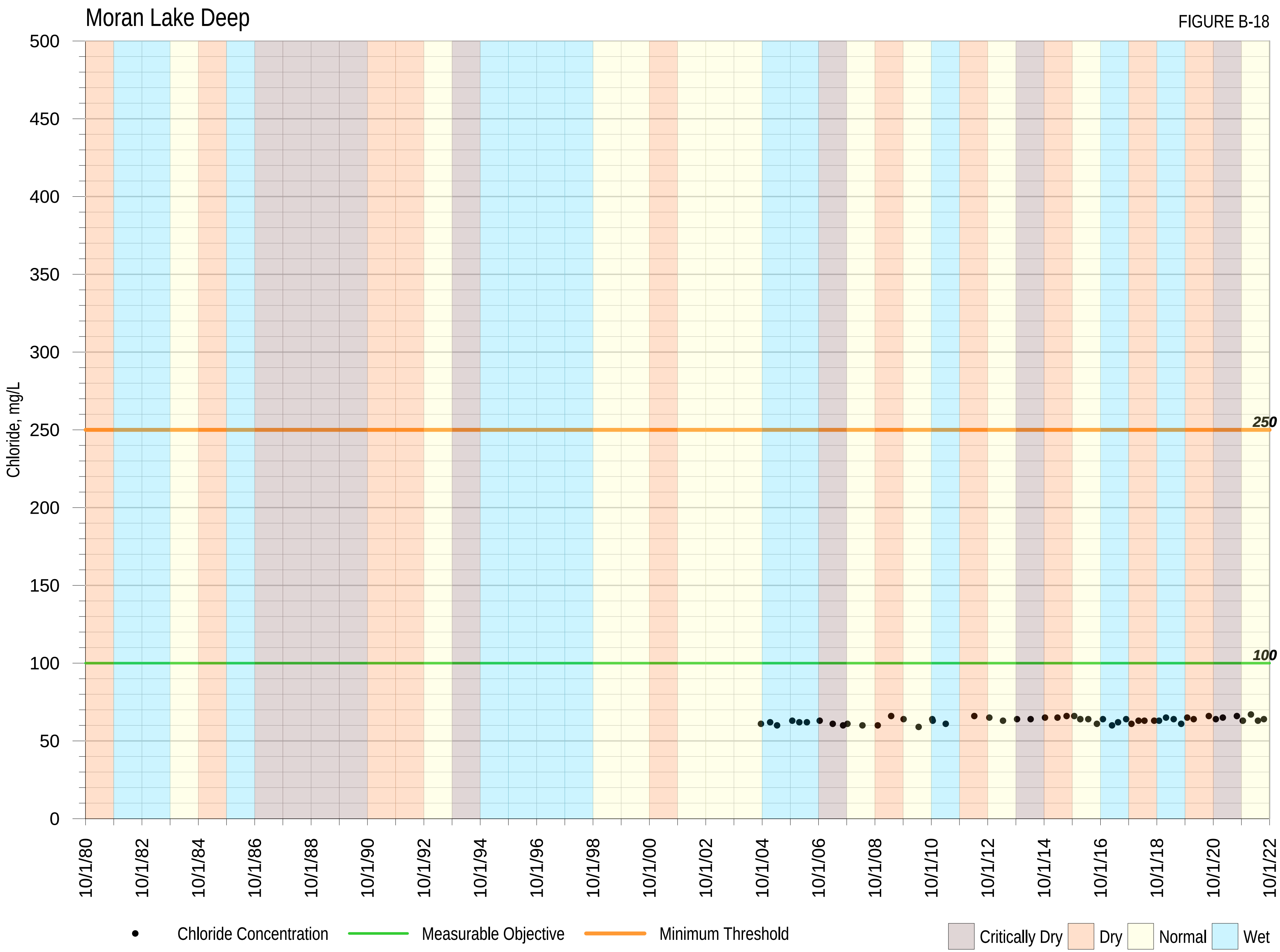

Moran Lake Deep
FIGURE B-18
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
250
100
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable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

FIGURE B-19

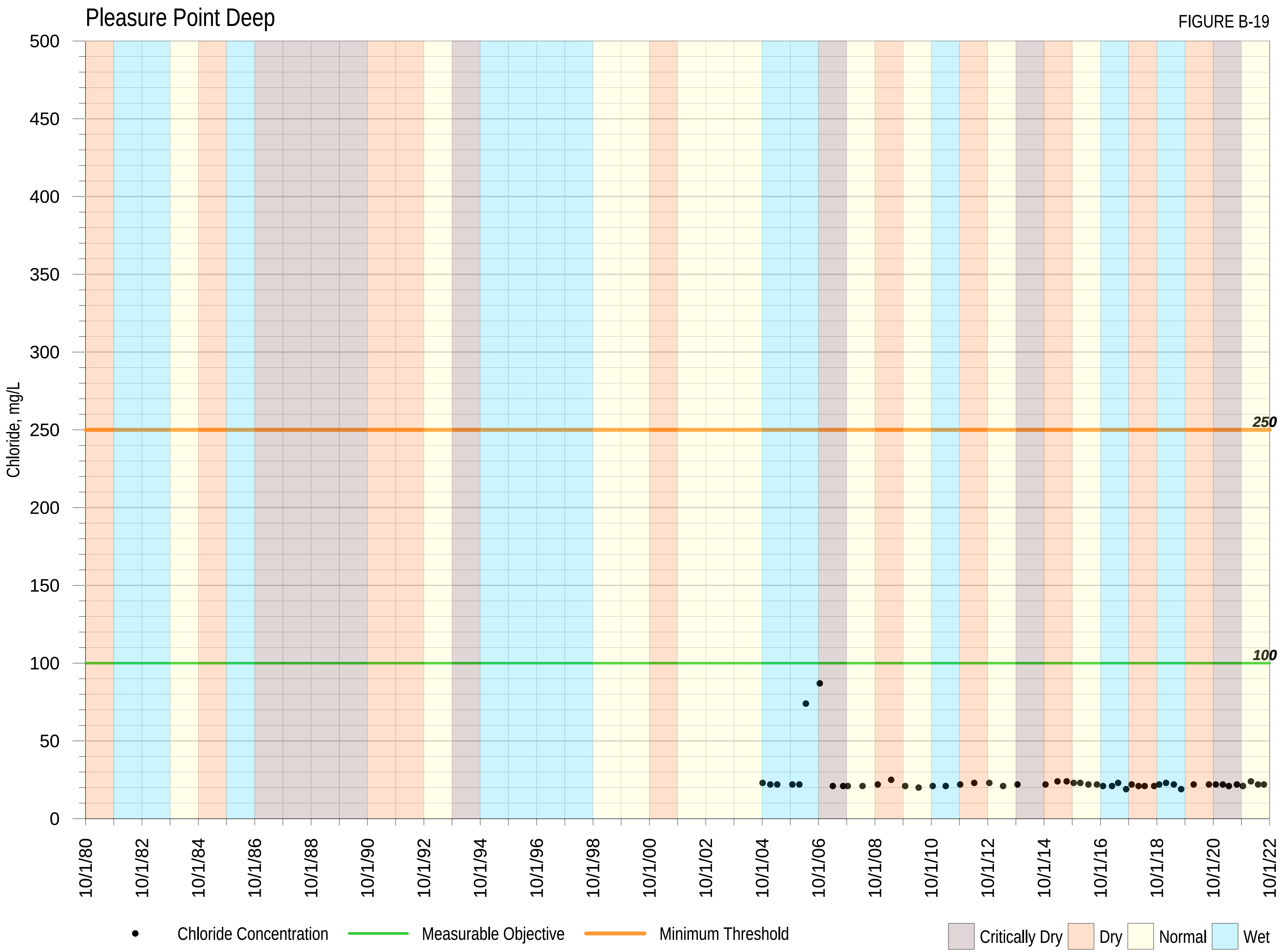
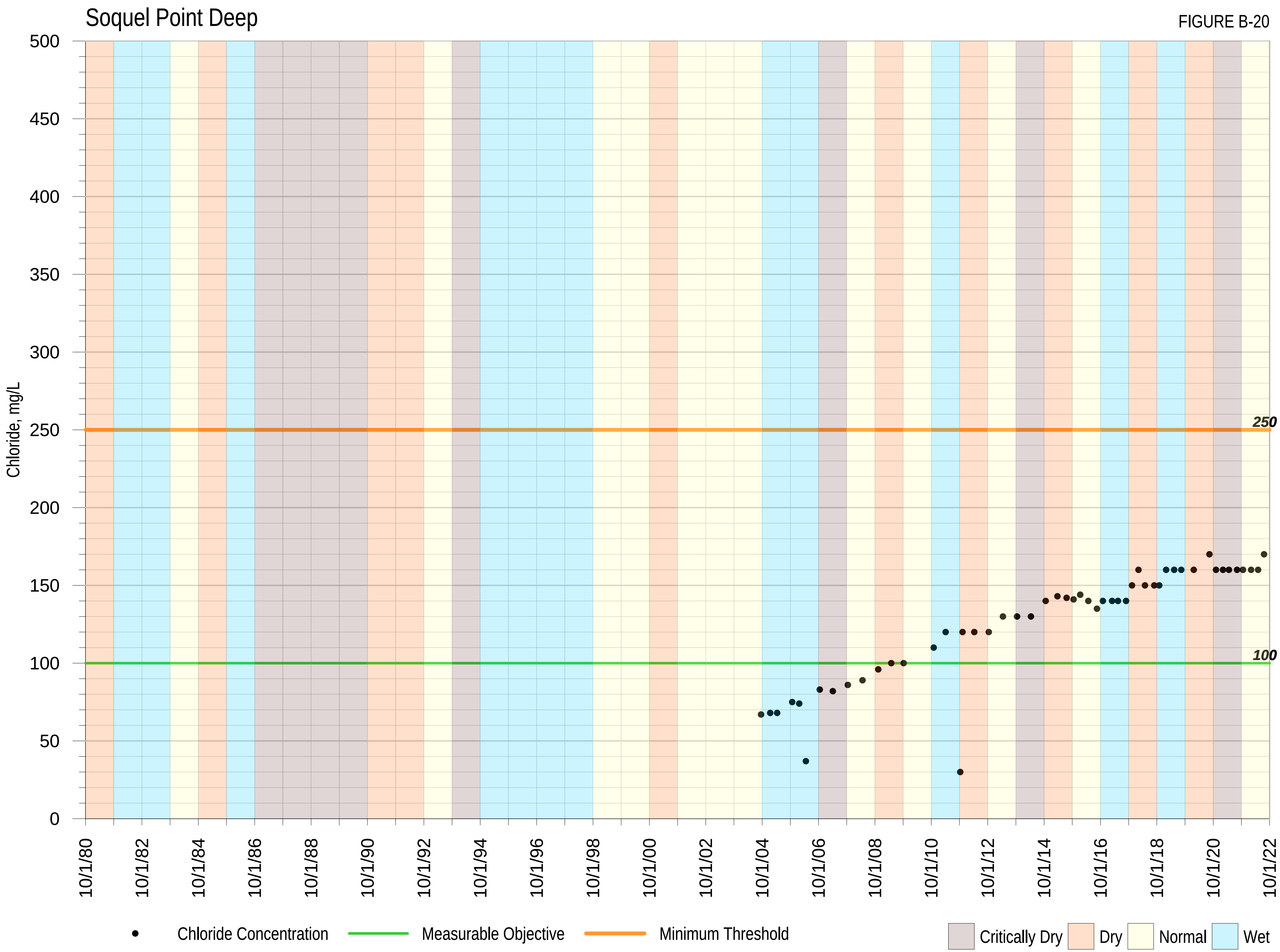
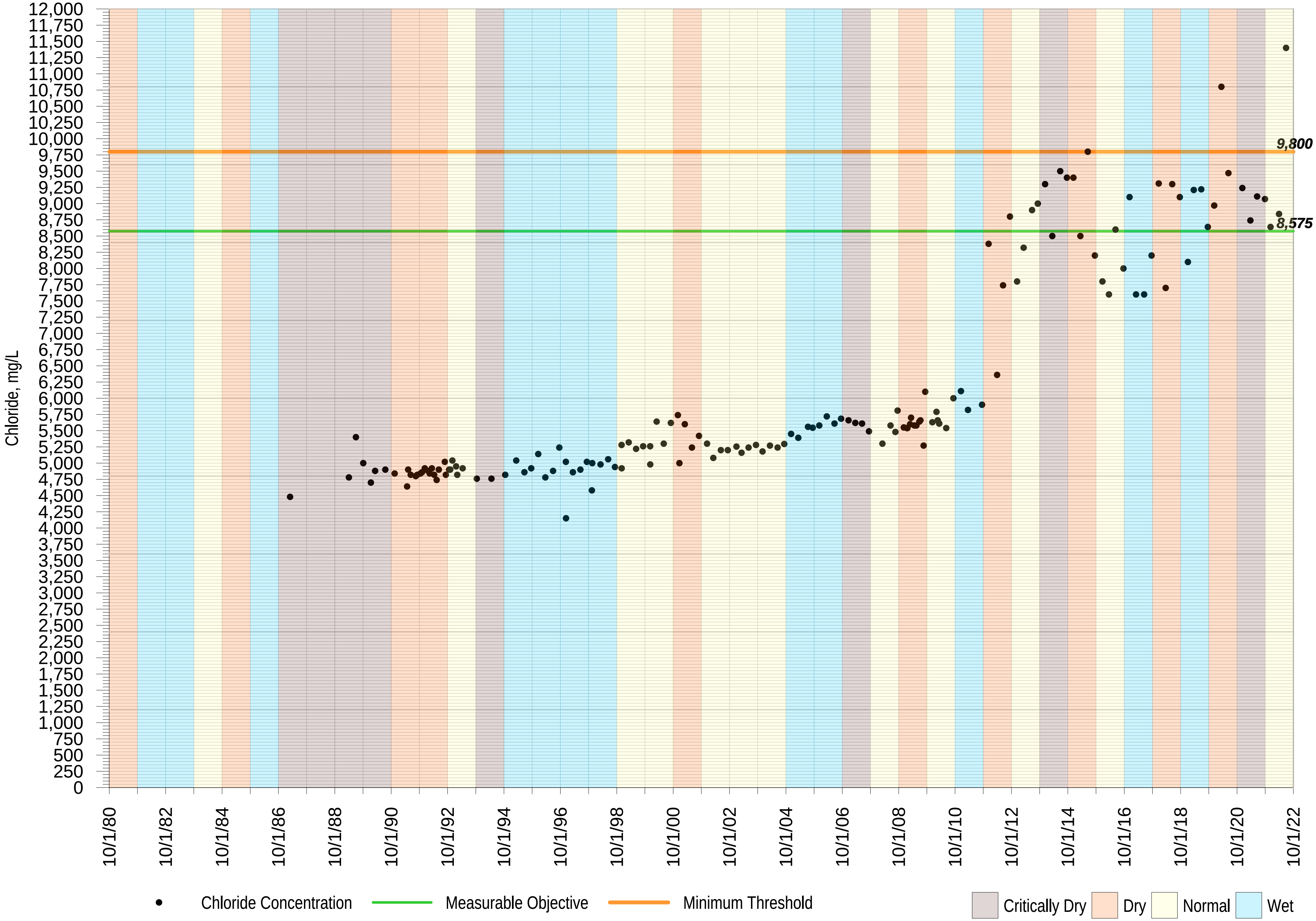

Pleasure Point Deep
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
250
100
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable Objective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

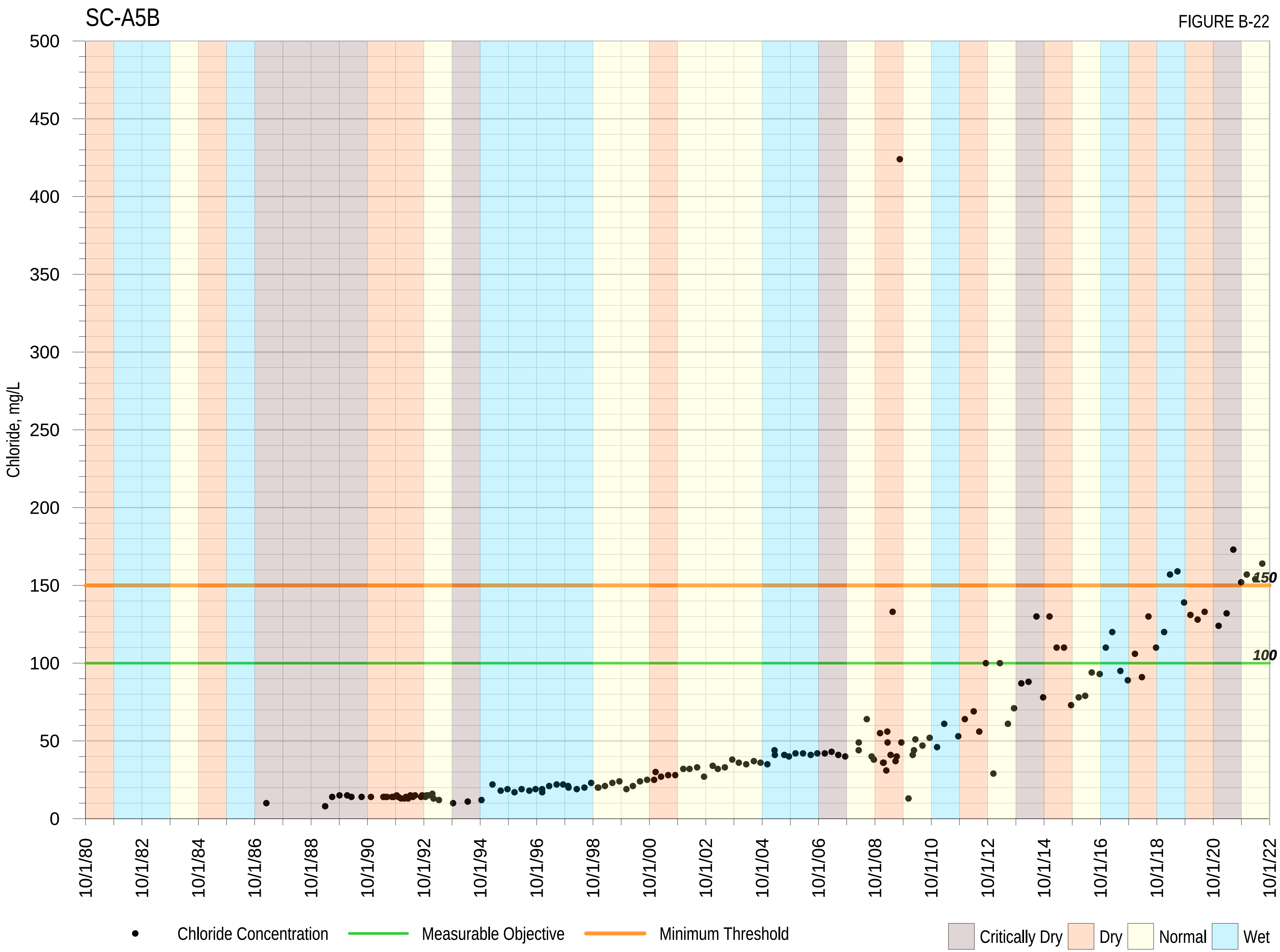
FIGURE B-20


Soquel Point Deep
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
250
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

SC-A5A

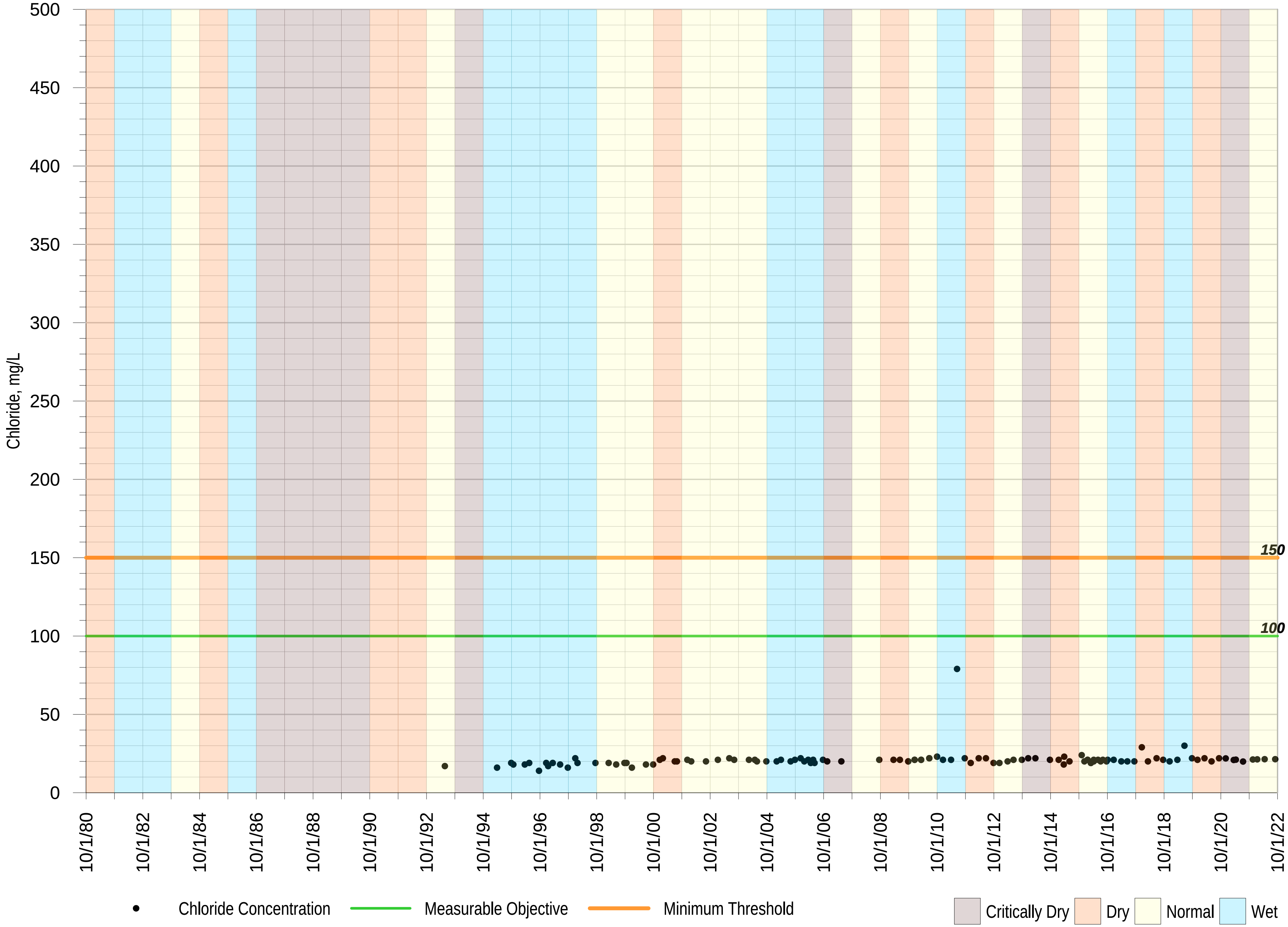
FIGURE B-21




SC-A5B
FIGURE B-22
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

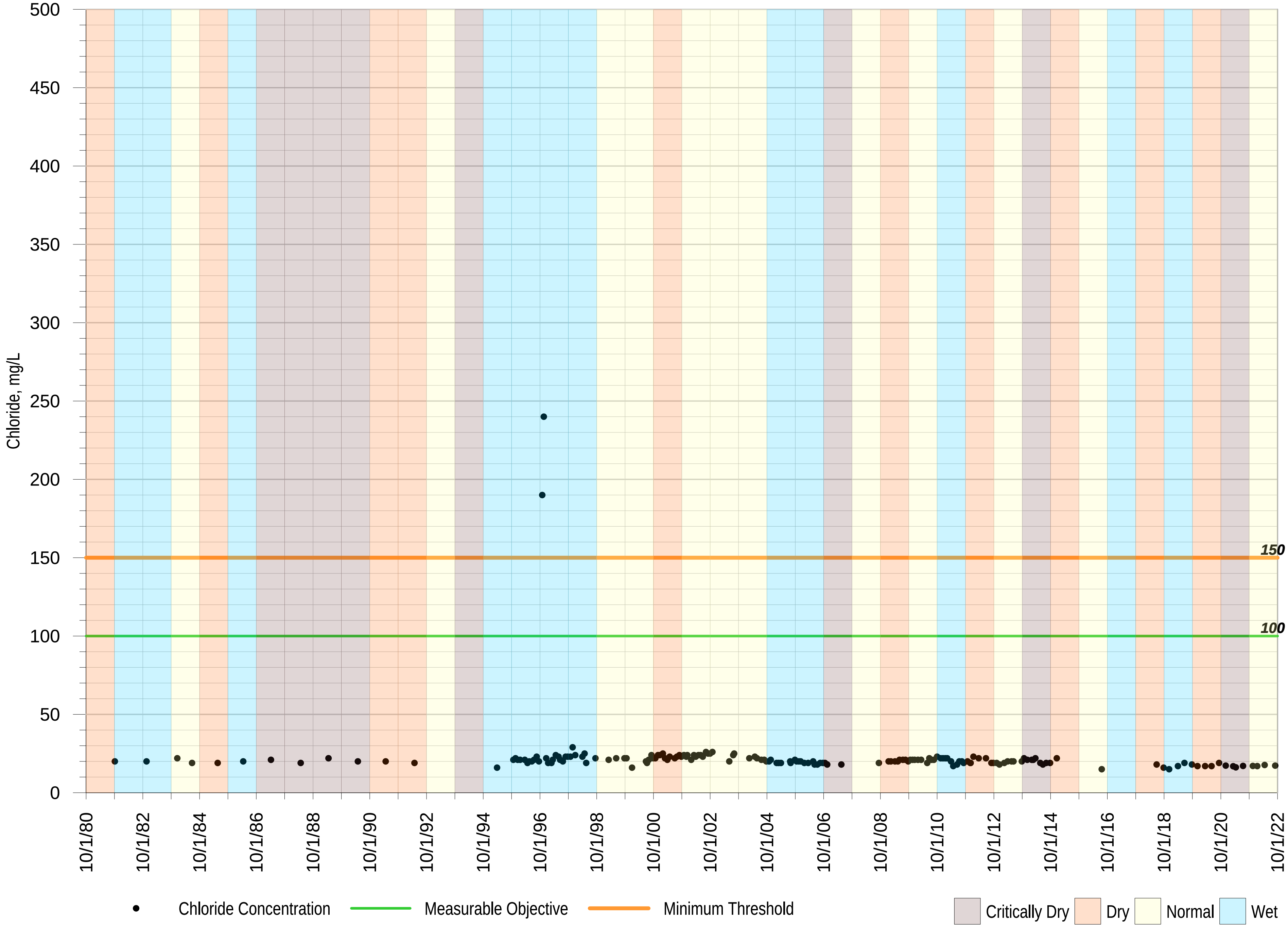
San Andreas

FIGURE B-23



Seascape

FIGURE B-24



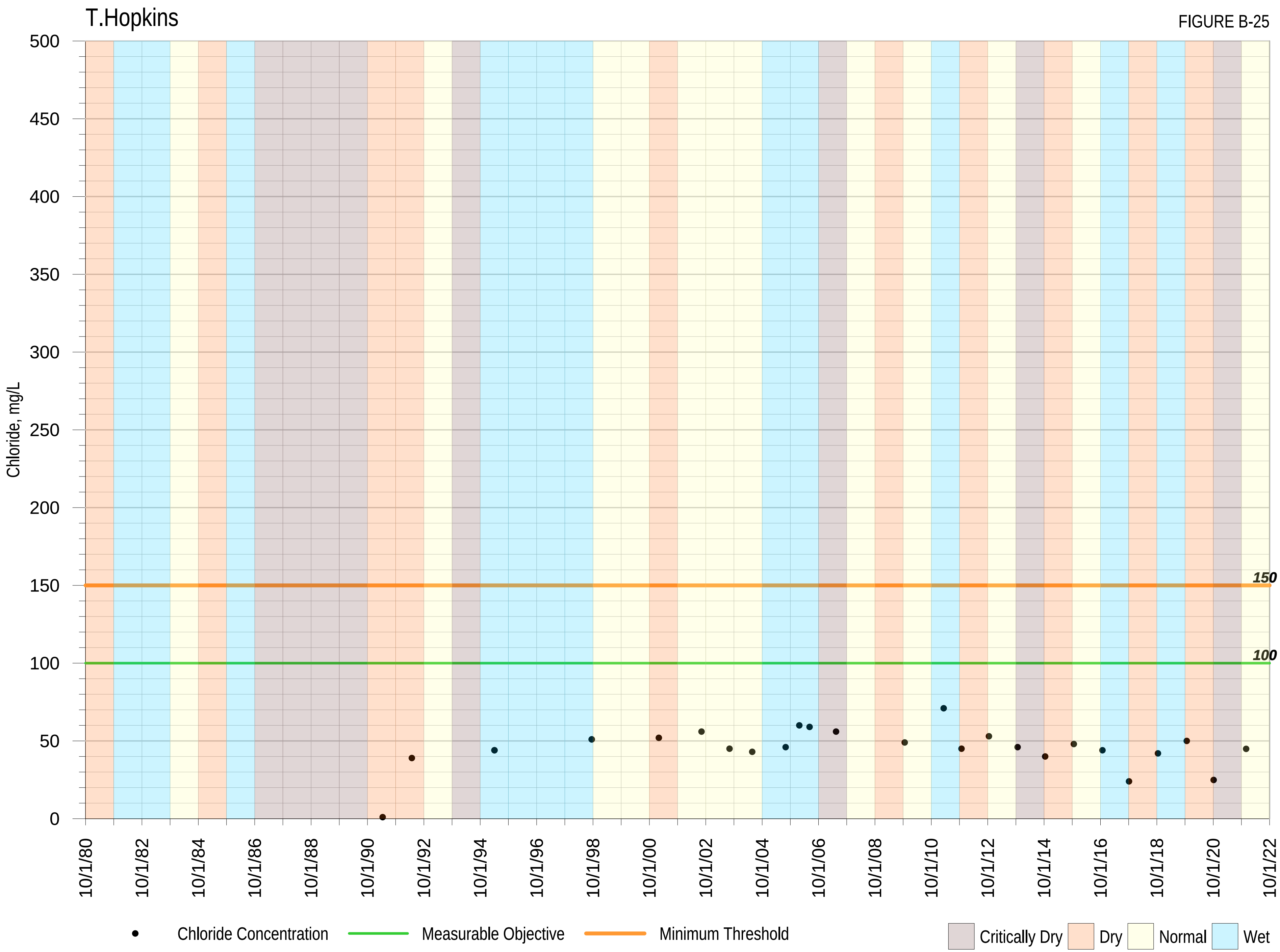

T.Hopkins
FIGURE B-25
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
150
100
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable Objective
Minimum Threshold
Critically Dry
Dry
Normal
Wet

FIGURE B-26

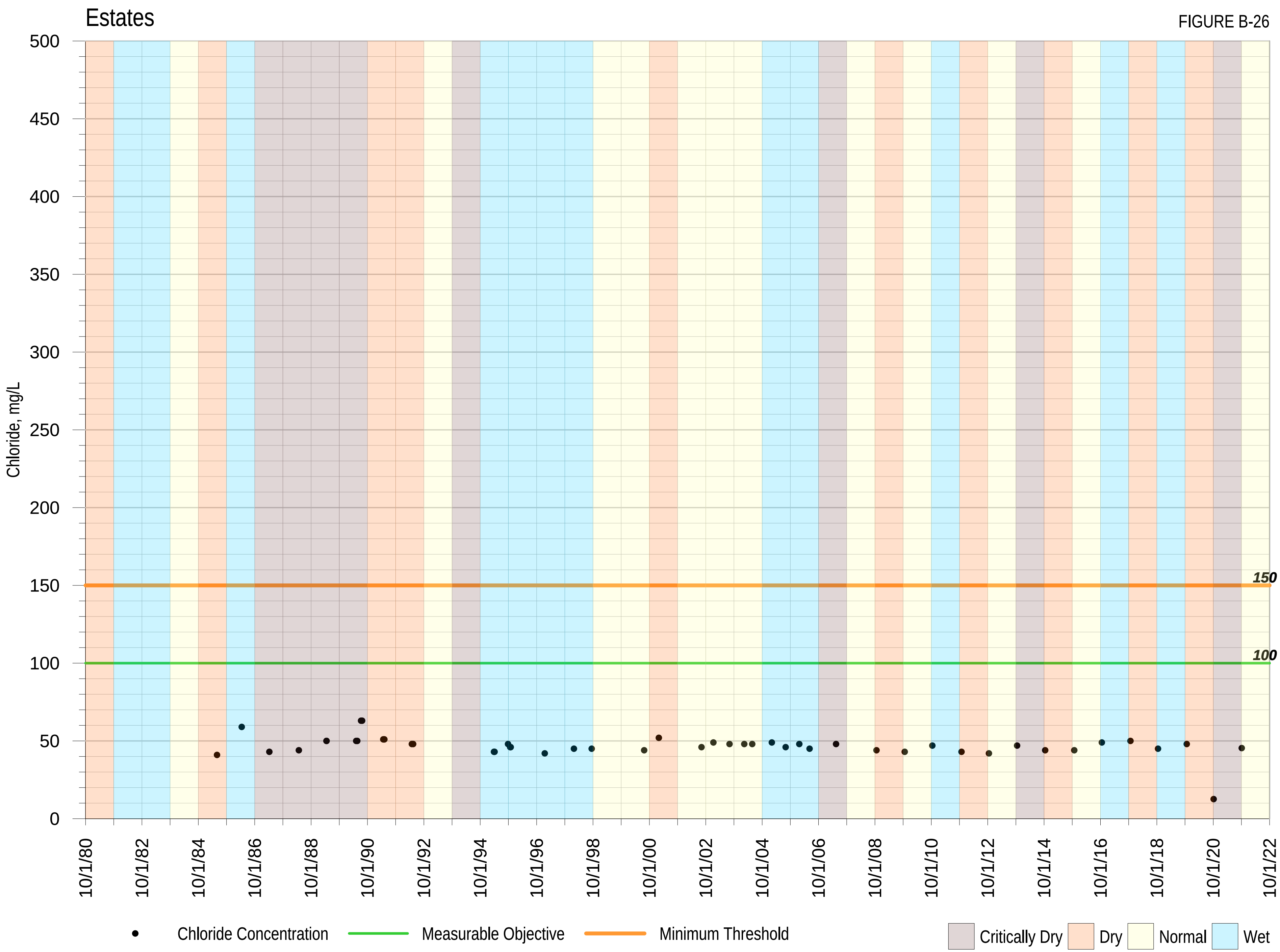

Estates
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
150
100
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable Objective
Minimum Threshold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

FIGURE B-27

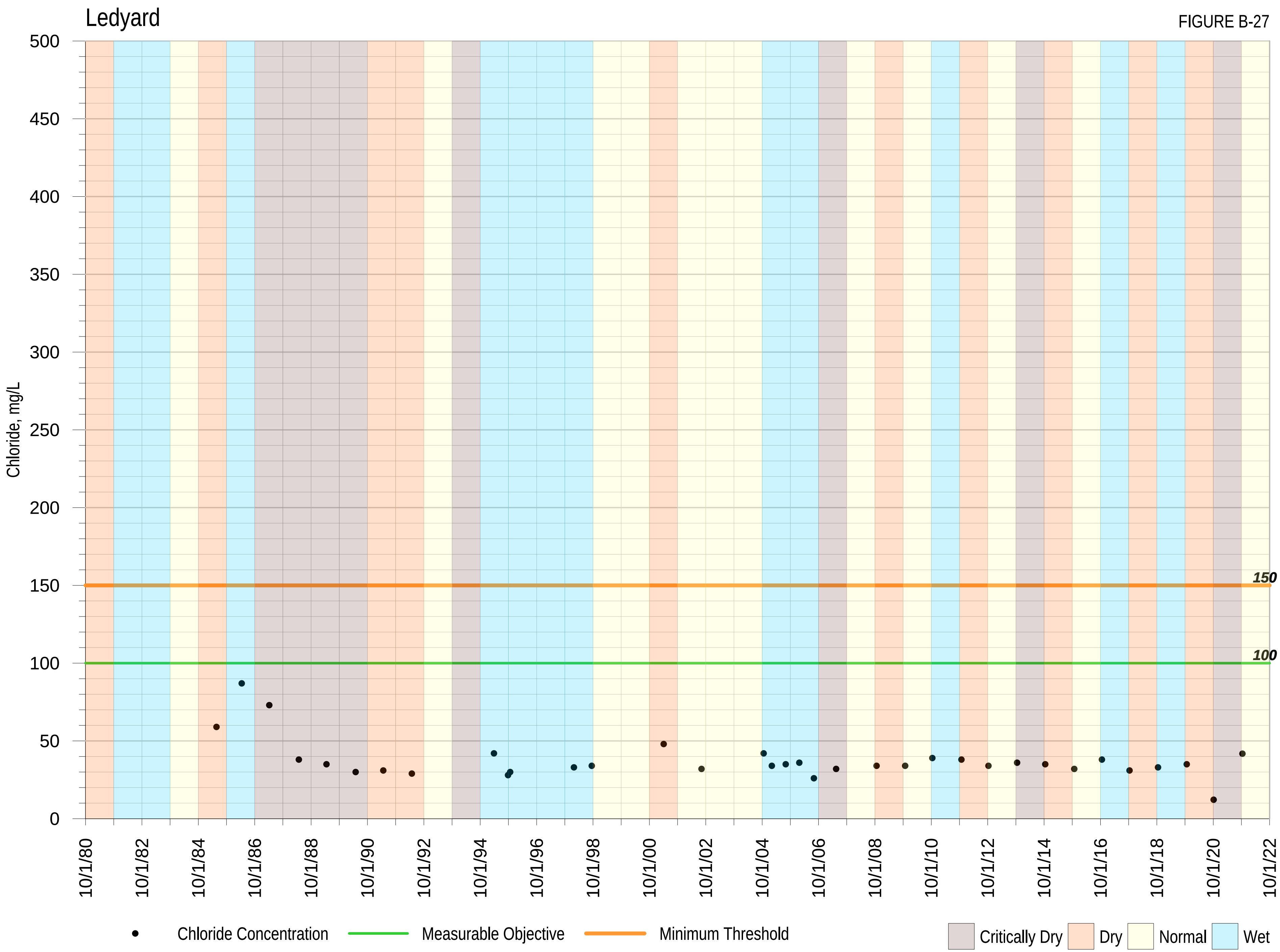

Ledyard
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
150
100
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable Objective
Minimum Threshold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

FIGURE B-28

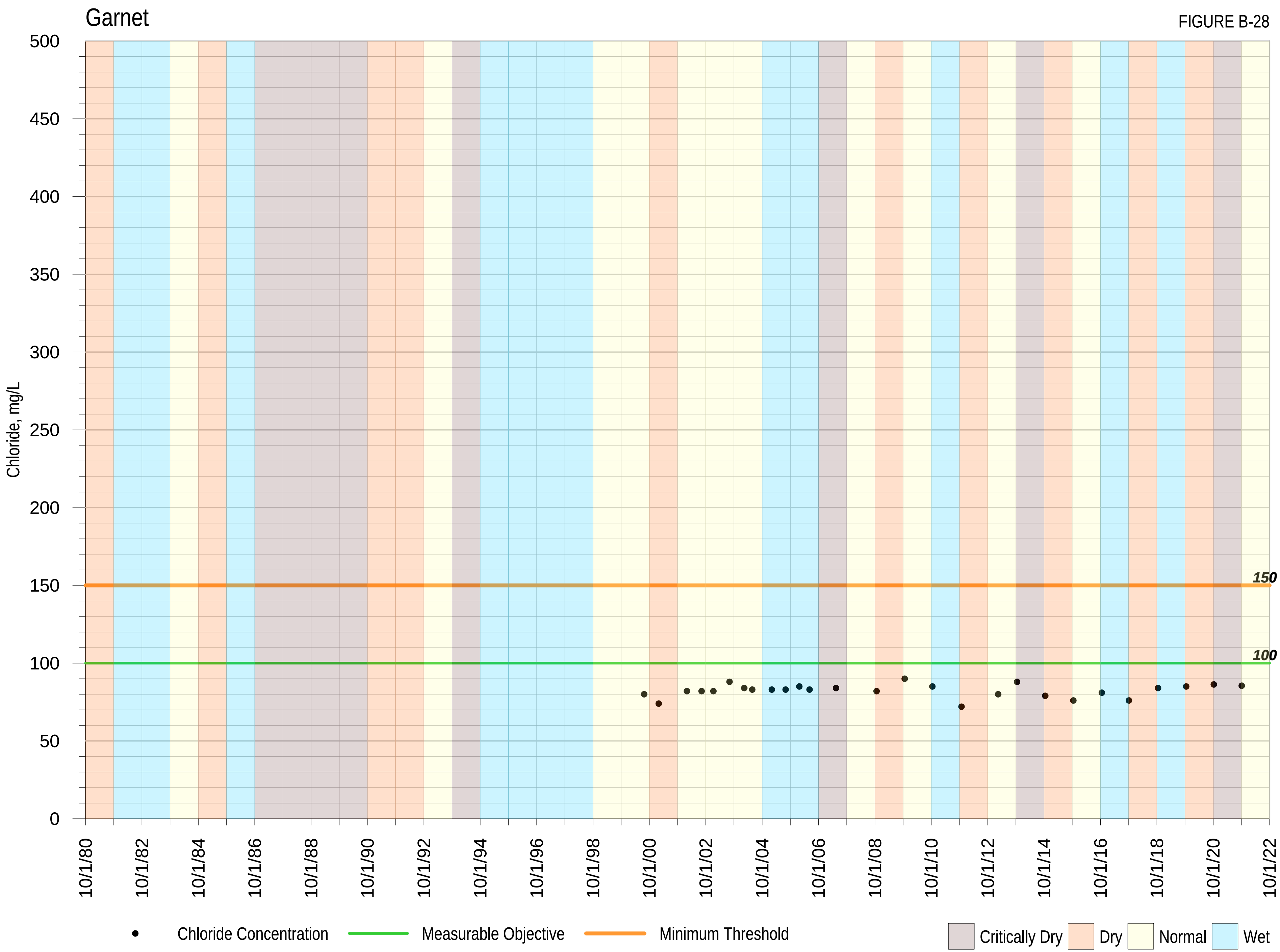

Garnet
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
150
100
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable Objective
Minimum Threshold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

FIGURE B-29

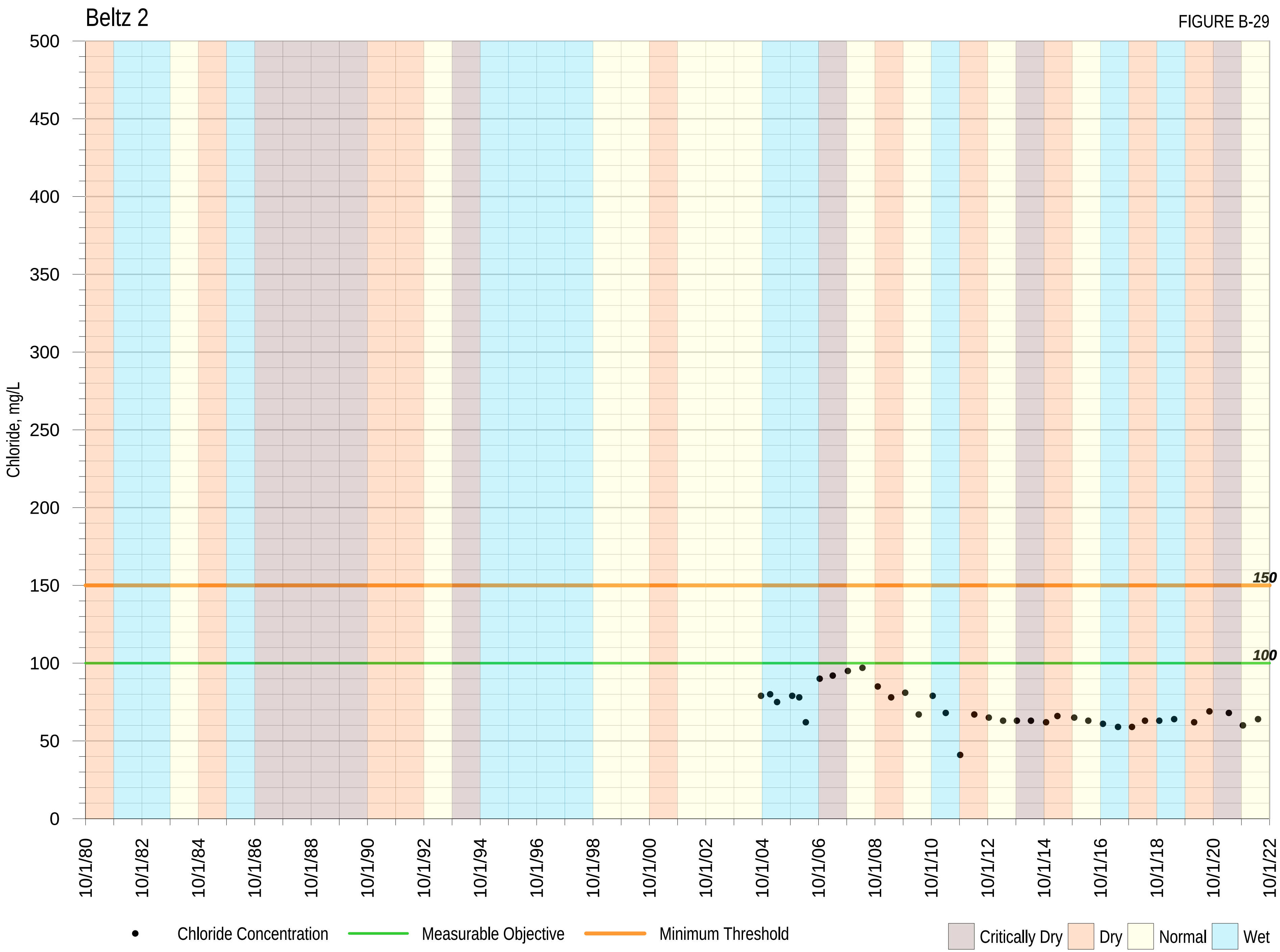
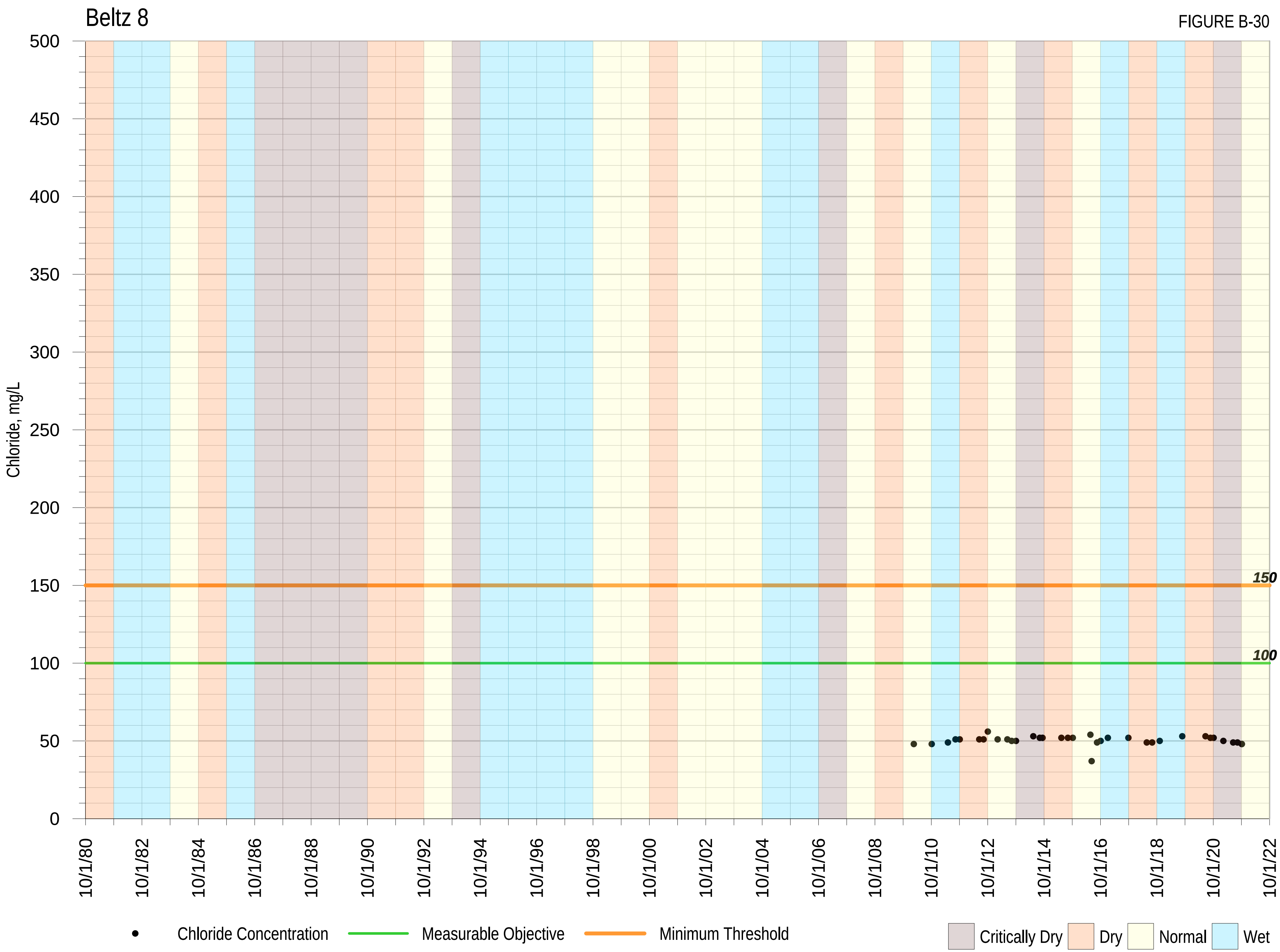
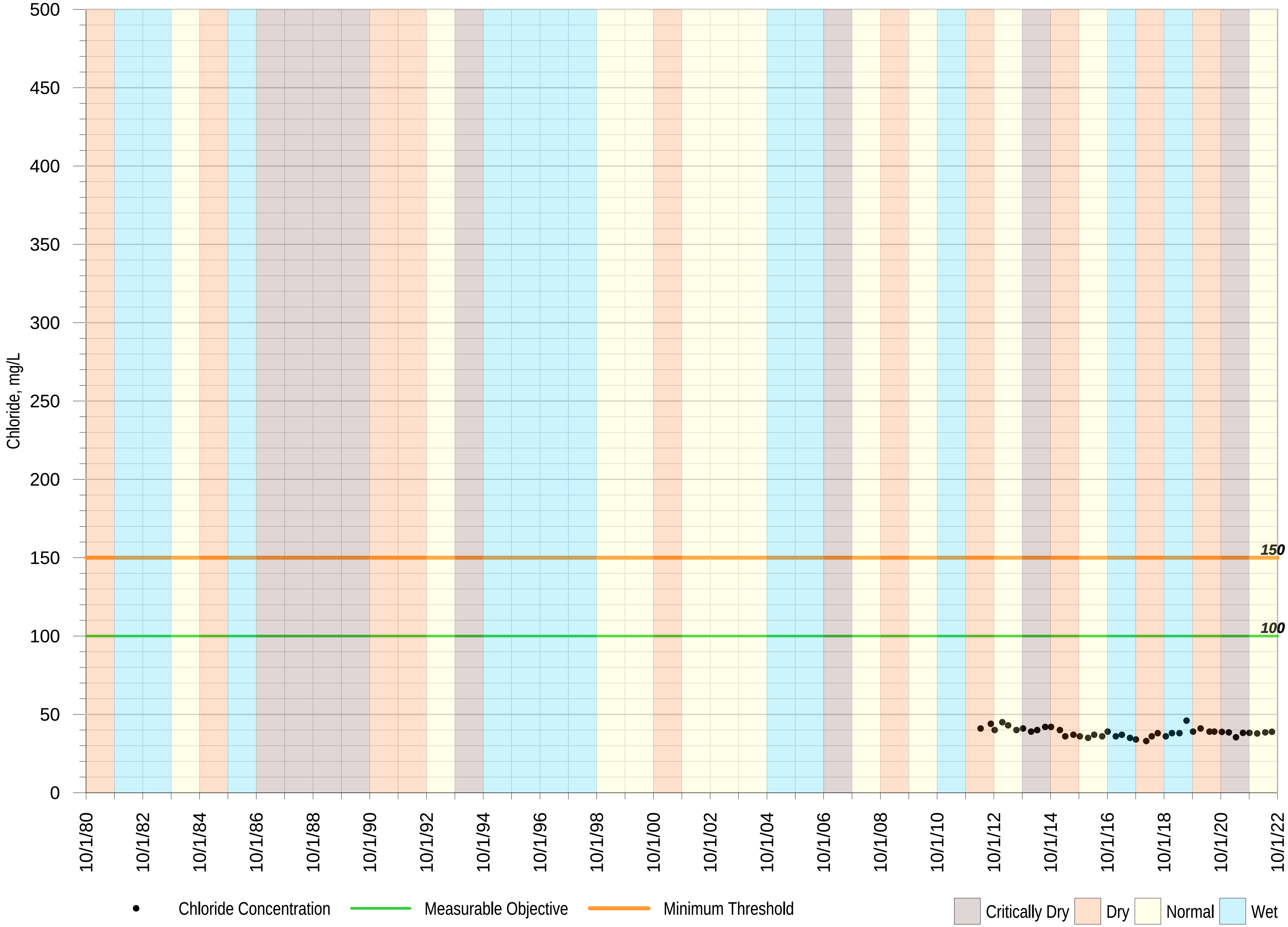

Beltz 2
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
150
100
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable Objective
Minimum Threshold
Critically Dry
Dry
Normal
Wet

FIGURE B-30

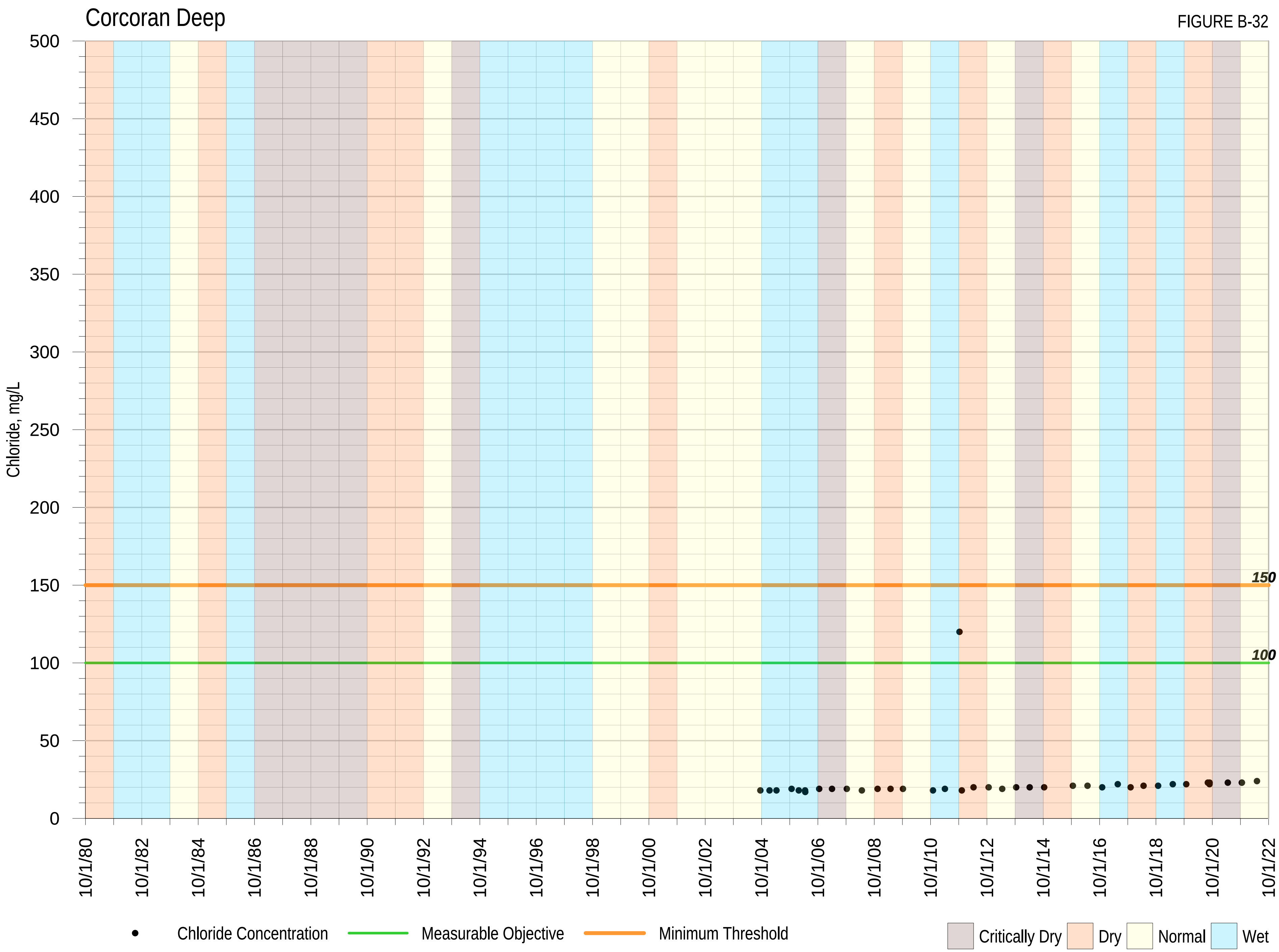

Beltz 8
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
150
100
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable Objective
Minimum Threshold
Critically Dry
Dry
Normal
Wet

SC-22AA

FIGURE B-31



Appendix B



Corcoran Deep
FIGURE B-32
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

FIGURE B-33

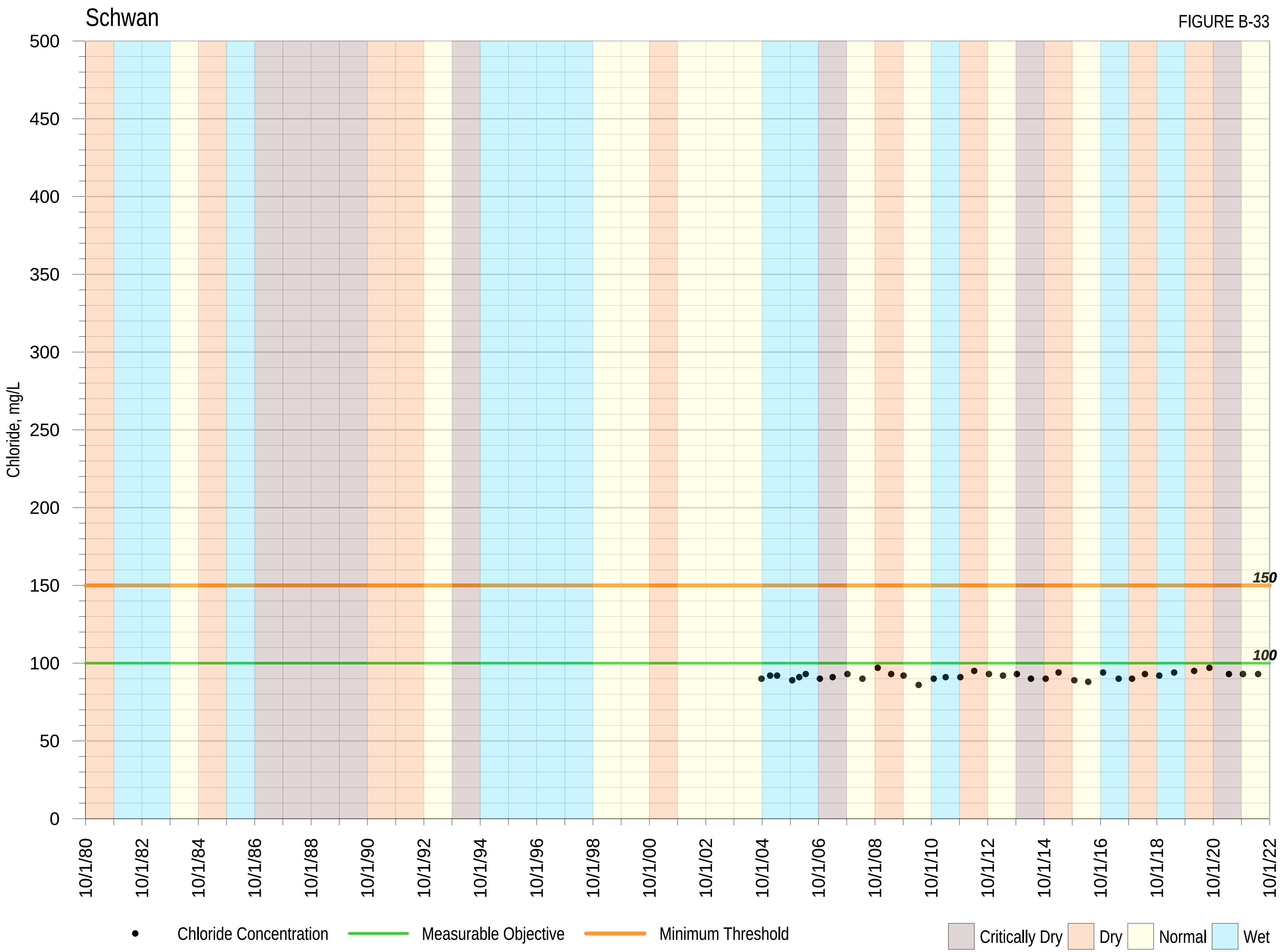
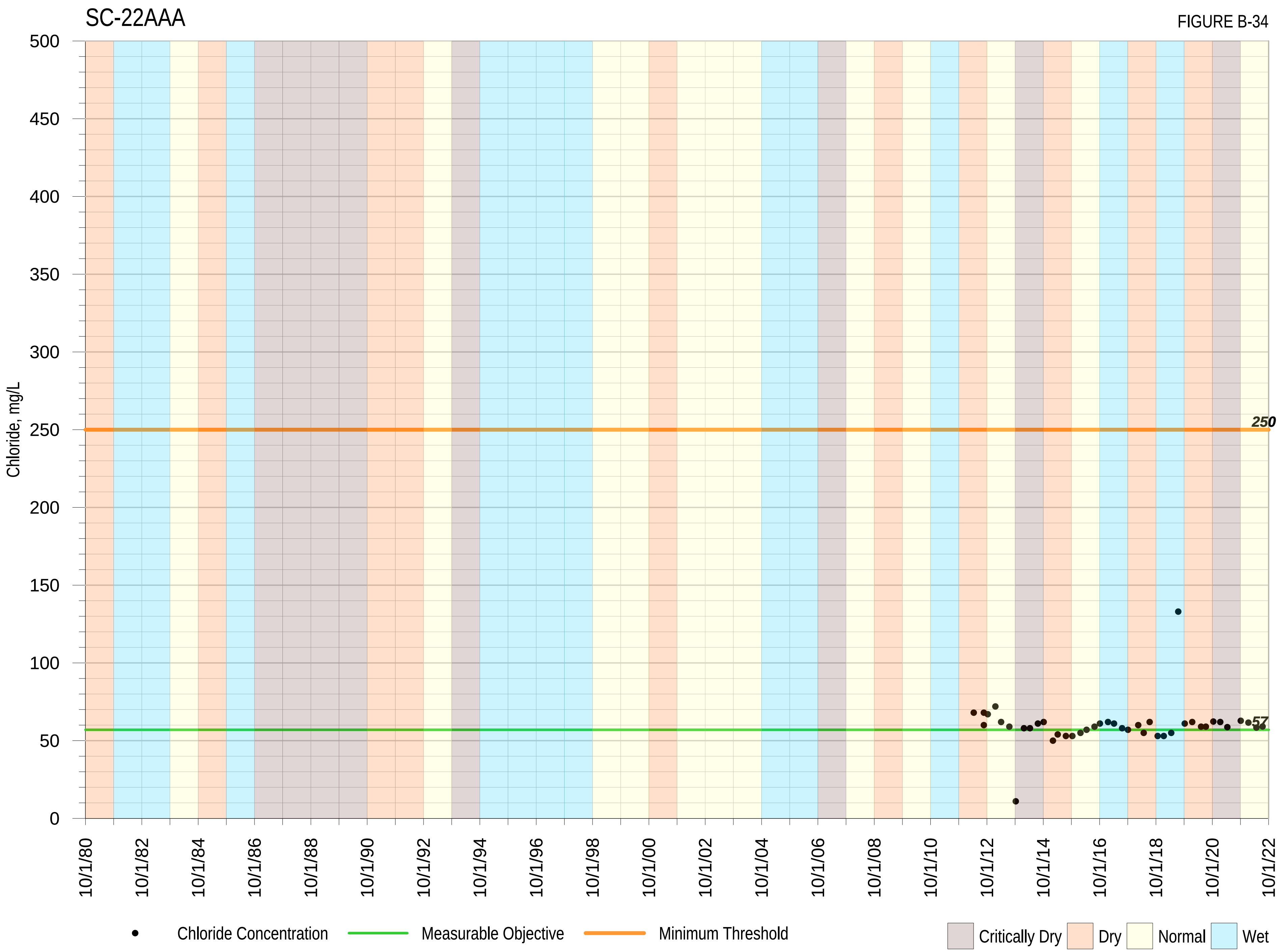

Schwan
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
150
100
10/1/80
10/1/82
10/1/84
10/1/86
10/1/88
10/1/90
10/1/92
10/1/94
10/1/96
10/1/98
10/1/00
10/1/02
10/1/04
10/1/06
10/1/08
10/1/10
10/1/12
10/1/14
10/1/16
10/1/18
10/1/20
10/1/22
Chloride Concentration
Measurable Objective
Minimum Threshold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

FIGURE B-34



SC-22AAA
Chloride, mg/L
500
450
400
350
300
250
200
150
100
50
0
250
57
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