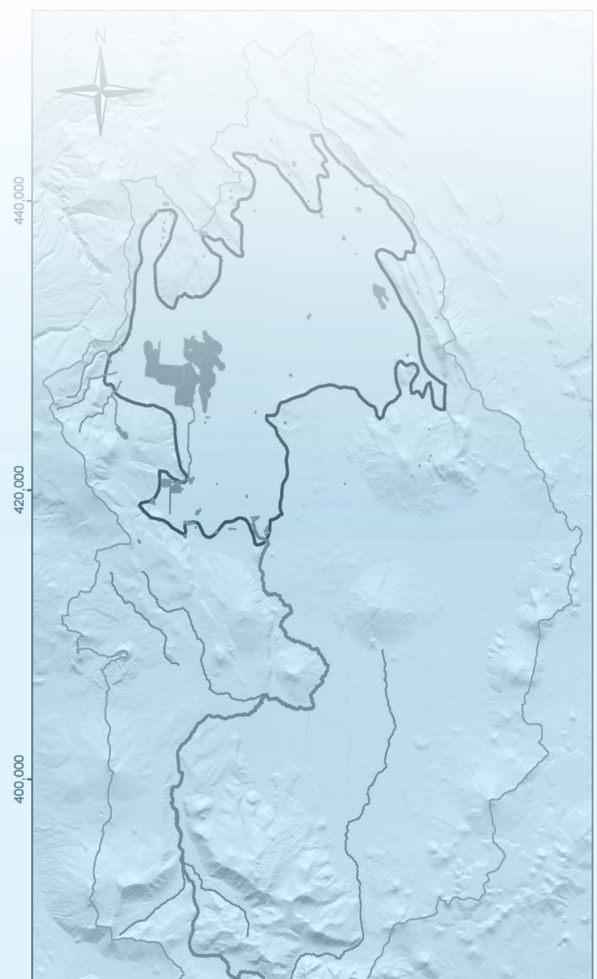
APRIL 2025

SISKIYOU COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT

Butte Valley Groundwater Sustainability Plan – WY 2024 Annual Report



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Executive Summary

The Butte Valley Groundwater Sustainability Plan (GSP) was adopted in December 2021 by the Siskiyou County Flood Control and Water Conservation District, the Groundwater Sustainability Agency (GSA) for the Butte Valley groundwater basin (Basin; see Figure 1). The GSA formed in accordance with the Sustainable Groundwater Management Act (SGMA) of 2014 to coordinate, develop, and implement a GSP for the Basin (DWR Basin No. 1-003). The GSP was submitted to the California Department of Water Resources (DWR) in January 2022, ahead of the January 31, 2022 deadline for high and medium priority basins. On January 18, 2024, the GSA received a letter from DWR with the determination that the Butte Valley GSP was determined to be incomplete. The letter documents DWR's review of the GSP, including outlining deficiencies and corrective actions. The GSA submitted the revised GSP to address the deficiencies and implement the corrective actions identified in the DWR's determination letter on July 12, 2024. The revised GSP was approved by DWR in February 2025.

California Water Code (CWC) §356.2 requires the submission of an annual report to DWR by April 1 of each year following the adoption of the GSP. The annual report includes information for the proceeding water year. This report is the fourth annual report submitted to DWR and provides an update on Basin conditions and GSP implementation progress within the Basin for water year (WY) 2024 (October 1, 2023 to September 30, 2024). It also includes changes in conditions that have occurred between the baseline year assessed in the GSP and the conditions in WY 2024. CWC §356.2 requires annual reports to include general information about the Basin and GSP, groundwater elevation data (contour maps and hydrographs), groundwater extraction, surface water supply, changes in groundwater storage, and a description of progress towards implementation of the GSP since the adoption of the previous annual report. Table 1 provides a summary of the definition of undesirable results included in Chapter 3 of the 2024 resubmitted GSP.

The GSP set a sustainability goal of preventing undesirable results to any of the six sustainability indicators as detailed and quantitatively defined in Chapter 3 of the 2024 resubmitted GSP[1]. A summary of the sustainable management criteria and status of current water year for the sustainability indicators is summarized in Table 1. **Overall, there were no occurrences of undesirable results in WY 2024 for the applicable sustainability indicators.**

In WY 2024 the neighboring valleys continued to experience drought. The State Water Resources Control Board issued a drought emergency curtailment order in the adjacent Shasta and Scott Valley watersheds [2]. The precipitation measured at the Dorris NOAA station for WY 2024 is slightly above the long-term mean recorded at the station, similar to precipitation measured during WY 2023. In Butte Valley, both WY 2024 and 2023 are categorized as *Above Normal* water year type in Butte Valley. This is an improvement from WYs 2020-2022, which were categorized as *Critical*[3].

[1] https://sgma.water.ca.gov/portal/service/gspdocument/download/10224

[2] https://www.waterboards.ca.gov/drought/scott_shasta_rivers/

[3] Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type

Groundwater Levels

Measured groundwater levels in water year 2024 do not indicate the occurrence of undesirable results. Fall 2024 groundwater levels were compared to the MO and MT. The minimum groundwater level measurement taken in September – October 2024 was used for each well ("fall low"). Four wells in the groundwater level representative monitoring point (RMP) network were below their MT in Fall 2024. Undesirable results for Groundwater Levels are defined to occur when 25% of fall measurements in the RMP network are below the MT for 2 consecutive years. Because there were no occurrences of fall measurements below the MT in WY 2023, undesirable results do not occur for Groundwater. Contour maps of groundwater elevation are shown in Section 2.1 and hydrographs are included in Appendix A.

Groundwater Storage

The **Groundwater Storage** uses groundwater levels measured at RMPs as a proxy to assess compliance with the SMCs. Since no RMP wells recorded a fall low groundwater level measurement below the MT for two consecutive years, no undesirable results occurred for the **Groundwater Storage**.

Water Use and Groundwater Budget

Total groundwater extractions for the 2024 water year are estimated to be 67,640 AF (Section 2.2). Total water use is estimated to be 67,640 AF (Section 2.4). The Butte Valley Integrated Hydrologic Model (BVIHM) was used to develop a water budget for the basin to estimate the change in storage of the Butte Basin during water year 2024. As expected since water year 2024 was an above normal year, the estimate of basin storage increased about 6,000 AF during the water year (Section 2.5).

Land Subsidence

Land subsidence was measured by satellite data (i.e., InSAR). Estimated land subsidence was less than 0.1 ft of subsidence, which avoids the occurrence of undesirable results. A map of land subsidence in water year 2024 can be found in Section 4.6.

Groundwater Quality

Groundwater quality SMCs are defined for nitrate, specific conductance and arsenic. Measured groundwater concentrations during water year 2024 are presented in Section 4.5 and do not indicate the occurrence of undesirable results. No RMPs exceeded the MT for nitrate. Specific con-

Dataset Development Report. The results will be finalized once DWR updates the water year type dataset for these years.

ductivity was not measured in any of the RMPS in Water Year 2024, as the monitoring frequency is not annual.

Plan Implementation Progress

Progress continues in the implementation of the GSP. Summary of progress on the implementation of the GSP in water year 2024, including implementation of projects and management actions, and an overview of plan implementation activities anticipated for the coming year can be found in Chapter 5 of this report.

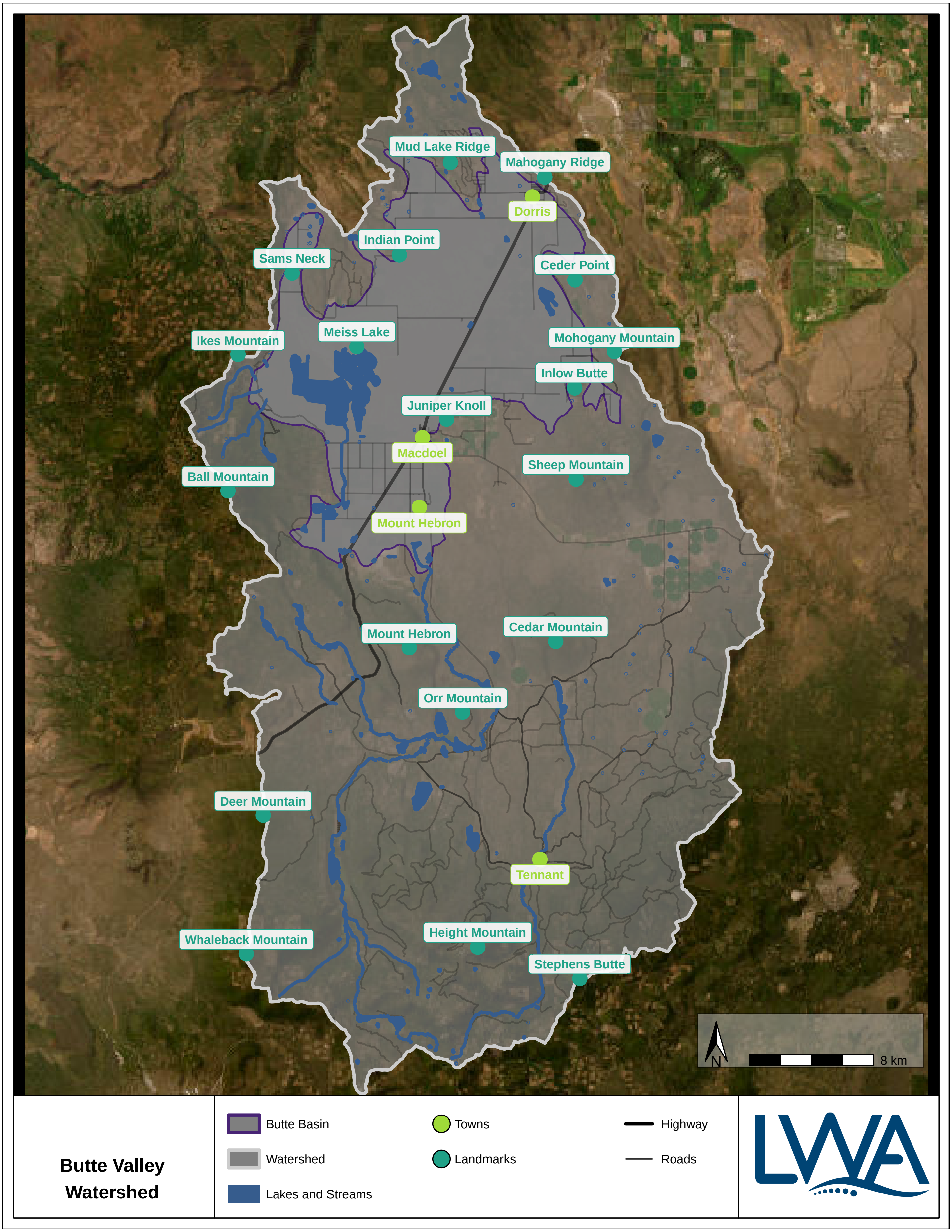


Figure 1: Butte Valley Watershed and Groundwater Basin Boundary

Table 1: Summary of Sustainable Management Criteria.

Sustainability Indicator	Minimum/Maximum Threshold (MT)	Measurable Objective (MO)	Occurrence of Undesirable Results	WY 2024 Annual Report Status
Groundwater Levels	Regression calculated from fall water level measurements between 1999-2014 was used to project the average rate of decline from fall 2014 to fall 2041. 75 percent of the projected decline during this extended period, is determined to be the MT for each RMP.	The upper limit of the MO is the highest observed water level at a RMP during the period 1991 to 2014 and the lower limit of the MO is the lowest observed water level at a RMP during the period 1991 to 2014, regardless of whether the water level was observed in the spring or fall season.	The fall low water level observation in 25% of the RMPs (4/13 wells) in the Basin falls below the respective MT for 2 consecutive years.	No occurrence of undesirable results.
Groundwater Storage	Groundwater levels used as a proxy for this sustainability indicator.		Same as ”Chronic Lowering of Groundwater Levels.”	No occurrence of undesirable results.
Seawater Intrusion	This sustainability indicator is not applicable in the Subbasin.		Not applicable for the Basin.	

Table 1: Summary of Sustainable Management Criteria. *(continued)*

Sustainability Indicator	Minimum/Maximum Threshold (MT)	Measurable Objective (MO)	Occurrence of Undesirable Results	WY 2024 Annual Report Status
Water Quality	Nitrate = 10 mg/L, Specific Conductivity = 900 umhos/cm, Arsenic (only near the City of Dorris) = 10 ug/L	More than 75% of wells monitored for water quality maintain their range of water quality measurements measured during 1990 to 2020. No significant increasing long-term trends should be observed in levels of constituents of concern.	More than 25% of groundwater quality wells exceed the respective MT for concentration and/or concentrations in over 25% of groundwater quality wells increase by more than 15% per year, on average over ten years.	No occurrence of undesirable results.
Land Subsidence	<0.1 ft of subsidence in any one year.	Maintain current ground surface elevations.	Groundwater pumping induced subsidence is greater than the MT of 0.1 ft (0.03 m) in any single year.	No occurrence of undesirable results.
Interconnected Surface Water (ISWs)	Due to the difficulty in quantifying this metric, as well as the general lack of knowledge around the factors that influence depletion of surface water flow in the Basin, the groundwater levels are used as a proxy for this sustainability indicator		Same as ”Groundwater Levels.”	Not completed for 2024, waiting for additional data to set SMCs.

Chapter 1

Introduction

1.1 Purpose

Annual reports will be completed throughout the course of GSP implementation. The purpose of these reports is to provide periodic updates on the progress towards Basin sustainability, current Basin conditions, and any improvements and/or additions to the monitoring networks.

1.2 Butte Valley GSA

The Siskiyou County Flood Control and Water Conservation District is the sole GSA for the Basin. The Siskiyou County Flood Control and Water Conservation District Act (Cal Uncod. Water Deer, Act 1240 §§ 1-38) was adopted by the State Legislature in 1959. This Act established a special district of the same name, and of limited powers that could provide flood protection, water conservation, recreation and aesthetic enhancement within its boundaries. At the time of its creation, the jurisdictional boundaries of the Flood District were smaller than those of the County. In 1983, following County of Siskiyou Local Agency Formation Commission (LAFCO) action, the balance of the County was annexed into the District, making its jurisdictional boundaries coincide with the County. The District is governed by a Board of Directors that is composed of the Board of Supervisors; however, the District is a separate legal entity from the County, with independent rights and limited powers set forth in its originating act. The District's purpose is the conservation and control of storm, flood, and other waters and ensuring beneficial use thereof.

The Siskiyou County Flood Control and Water Conservation District approved the GSP for the Basin in December 2021 and submitted the GSP to DWR in January 2022. The GSA received a letter from DWR with the determination of incomplete for the Butte Valley GSP in January 2024, and submitted the revised GSP in July 2024[1]. Updates that reflects the revised GSP will be presented in this report. By April 1st of each year, the GSA will submit an annual report to DWR documenting the progress in achieving groundwater sustainability. The monitoring data for the preceding water year will be compiled to present current groundwater conditions, and to identify whether the Sustainable Management Criteria (SMC) were met. Additionally, progress in project management action implementation will be presented.

[1] As of February 2025, the Butte Valley revised GSP has been approved by DWR.

1.3 Basin Description

The Basin is a 79,700 acre (125 square mile [sq mi]; 326 square kilometer [sq km]) subbasin within the upper Klamath Groundwater Basin that extends between California and Oregon (Wood 1960; Gannett, Wagner, and Lite Jr. 2012). Under the 2019 basin prioritization conducted by DWR, the Basin (DWR Basin 1-003) is designated as medium priority (DWR 2019). The Butte Valley watershed (Watershed) is roughly three times larger than the Basin and contains two other DWR recognized groundwater basins: Bray Town Area and Red Rock Valley. The Watershed is the drainage area that recharges surface water in the Basin, shown in Figure 1. The Watershed is located immediately northeast of Mount Shasta, whose flank can be seen in the bottom left corner of Figure 1.

The predominately agricultural Basin is in northern Siskiyou County, California, just south of the Oregon border. The 2010 County land use survey assessed 60.8% of the Basin area and identified the following land use percent coverage: agriculture (38.7%), idle land (5.3%), and urban (10.6%). As of 2010 the major crops in Butte Valley were alfalfa, hay, and strawberry, which occupied approximately 18,400 acres, 8,000 acres, and 3,300 acres, respectively (DWR 2010).

The Basin has three notable population centers, all of which are severely disadvantaged communities (SDACs): the City of Dorris (Population: 962), Macdoel (Population: 155), and Mount Hebron (Population: 81) [Figure 1.1; see DWR (2016)]. Due to their small populations, Macdoel and Mount Hebron are described as census-designated places by the United States (U.S.) Census Bureau. These SDACs suffer from a combination of economic, health, and environmental burdens. By definition, disadvantaged communities (DACs) have a median household income (MHI) less than 80% of the statewide MHI while SDACs are below 60%. Dorris has a MHI of $28,963, Macdoel has a MHI of $35,294, and Mount Hebron has a MHI of $28,170 (DWR 2016). All SDAC communities in the Basin rely on groundwater as their sole source of drinking water, using a combination of municipal water district, small water suppliers, and domestic wells.

Butte Valley is a closed drainage basin and the valley floor is almost flat, with elevations spanning a narrow range from 4,226 to 4,236 ft (1,288 to 1,291 m) amsl, shown in Figure 1.2 (Bryant 1990; County of Siskiyou 1996). It is bounded by topographic highs in all directions: the Cascade Mountains in the north, south and west, the Mahogany Mountain ridge in the east and Sheep Mountain and Red Rock Valley in the southeast (DOI 1980; DWR 2004). Butte Valley experiences east-west directed extensional tectonics and north-trending normal faults expressed as block faulting (Bryant 1990).

The Basin contains Meiss Lake, the remnant of a prehistoric lake that once filled Butte Valley, and several streams that flow into the Basin from the surrounding Watershed, as shown in Figure 1 (King 1994). Butte Creek is the largest stream flowing into Butte Valley.

Recent investigations in the Basin suggest sufficient vertical groundwater level variation in adjacent wells that the alluvial aquifer may require delineation, with various water-bearing geologic formatdions consisting of a mixture of alluvial and volcanic formations. Further study of the alluvial aquifer is ongoing to determine if delineation is necessary. Water bearing formations within the Basin aquifer are described in Chapter 2 of the GSP, where the principal water bearing formations are Lake Deposits (Ql and Qal) which may consist of 3 poorly connected zones, Butte Valley Basalt (Qb), and High Cascade Volcanics, and minor formations are Alluvial Fan Deposits and Pyroclastic Rocks (DWR 1998; DWR 2004). The surface geology of Butte Valley and its adjacent regions is primarily volcanic with lake deposits, alluvial fan deposits, and alluvium with some deposits of dune sand and talus (Wood 1960).

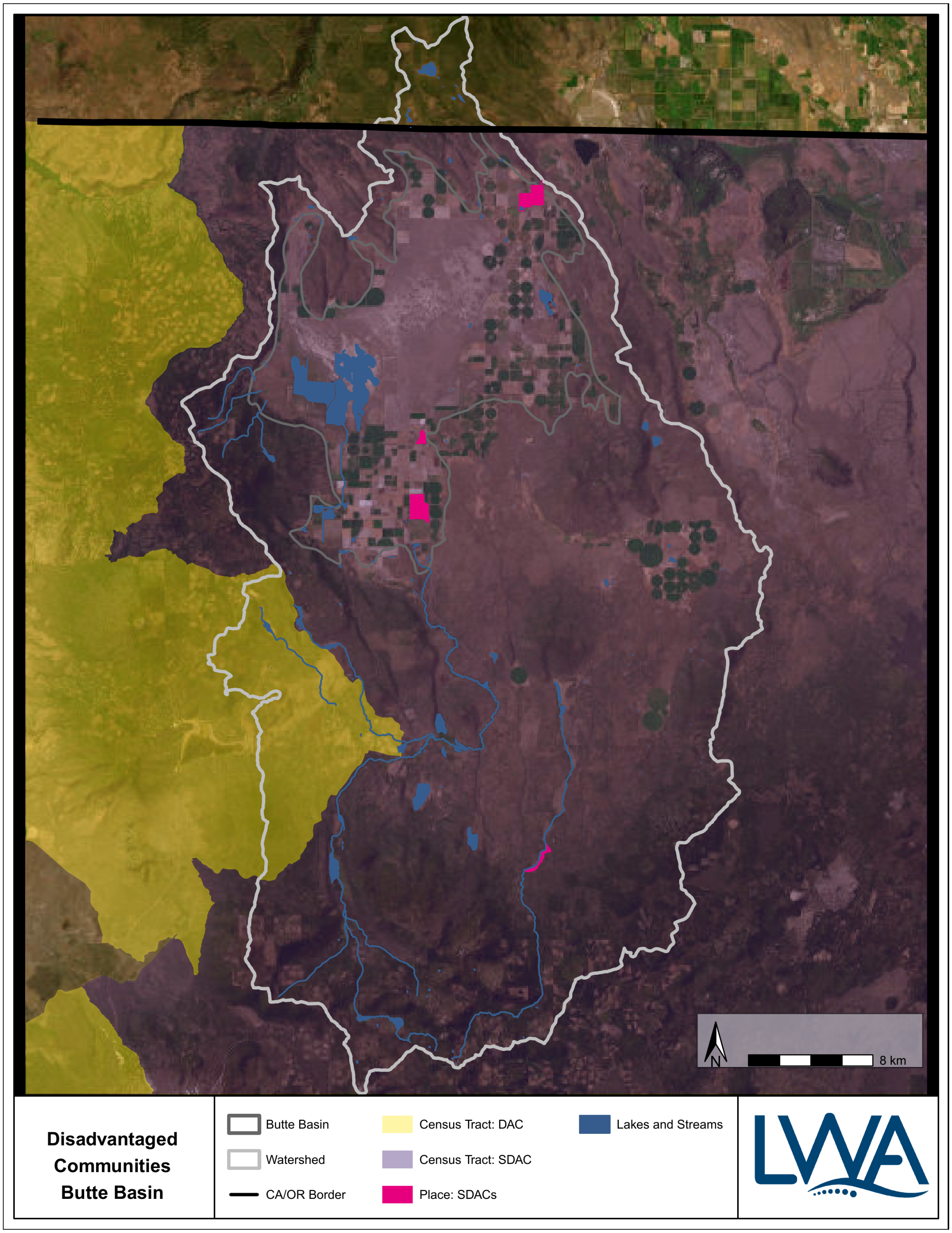


Figure 1.1: Based on the 2016 U.S. Census, place and tract boundaries of Disadvantaged Communities (DACs: $42,737 <= MHI < $56,982) and Severely Disadvantaged Communities (SDACs: MHI < $42,737) in the Butte Valley watershed, using data from the DWR DAC Mapping Tool (DWR 2016b).

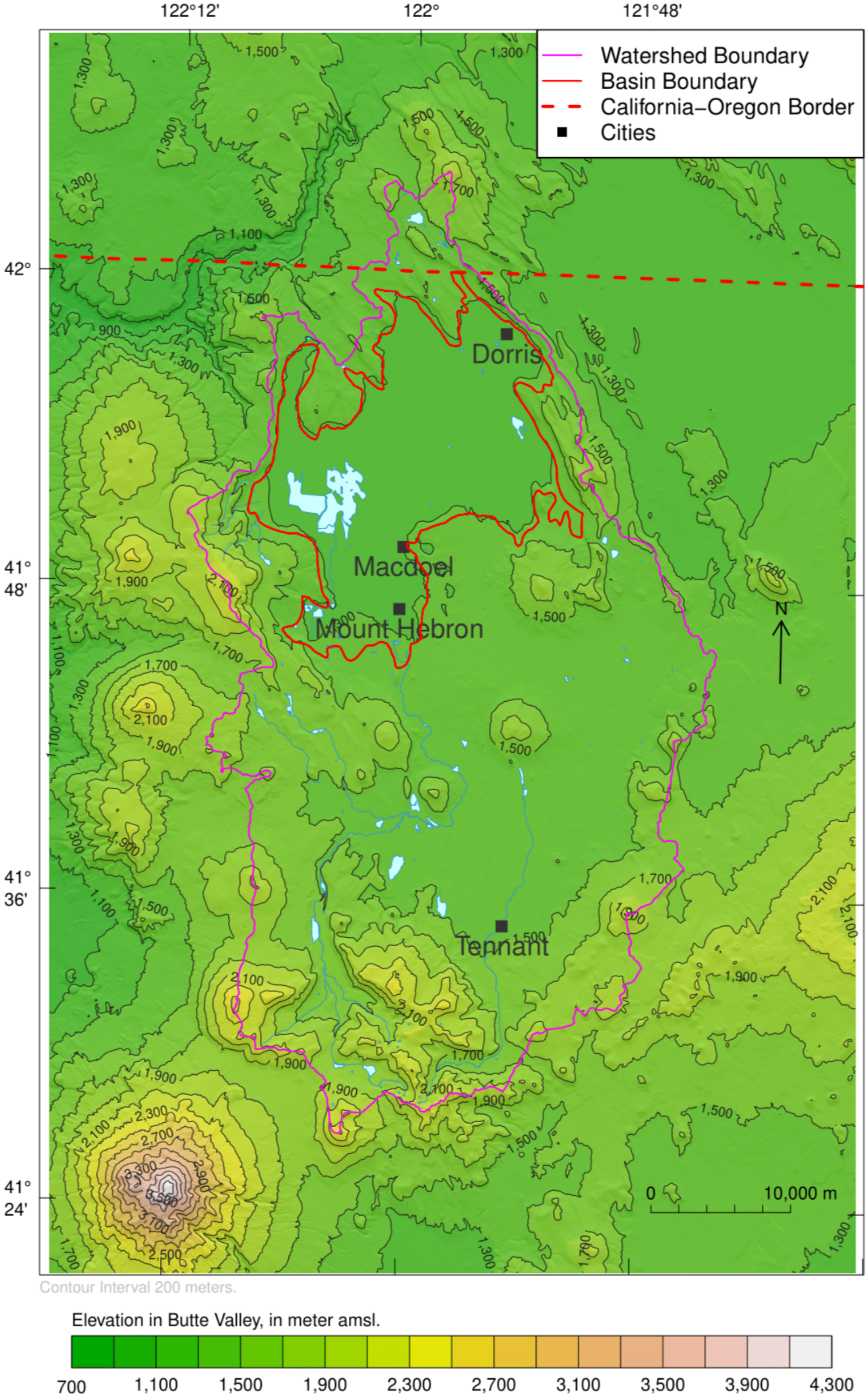


Figure 1.2: Topography of the Butte Valley Groundwater Basin and surrounding Watershed.

1.3.1 Climate

Butte Valley has a semiarid climate characterized by warm, dry summers and cool, wet winters, however brief summer showers or hail are not uncommon. The Cascade Range on the west side of the Basin casts a rain shadow across the Basin, where precipitation is highest on the west side of the valley and decreases eastward (Novick 1996). Annual precipitation also increases northward (DWR 2004). Snow can occur during any month of the year but normally falls between November and March (Novick 1996). July through September are historically the driest months [DOI (1980); see Figure 1.3].

The Basin has experienced decreasing precipitation during much of the period between 1970 to 2020. From the 1940s to 2019, the NOAA station in Mount Hebron has an average annual precipitation of 9.3 inches (Figure 1.3). Between 1942 and 1979, the 10-year trailing rolling average precipitation ranged from 9.5 to 12.4 in (24.1 to 31.5 cm; water years 1953 and 1971, respectively); since 1980, it has ranged between 5.7 to 10.8 in (14.5 to 27.4 cm; water years 2018 and 1980, respectively; see Figure 1.3). Much of the expansion in agricultural land in Butte Valley occurred before 1976, with irrigated land expanding to 27,500 acres, during a period when average rainfall was relatively stable and significantly greater.

The Mount Hebron NOAA station has a data gap for WY 2020 and 2021, and has recorded relatively low precipitation since WY2022 compared to the historical measurements (Figure 1.3). Therefore, data measured at the Dorris NOAA station is included as a reference of recent precipitation measurements (Figure 1.4). The precipitation measured at the Dorris NOAA station for water year 2024 was 10.5 inches, which is also at the long-term mean recorded at the station.

During the GSP implementation, the GSA has been actively maintaining and expanding the monitoring network to address data gaps, and evaluating the recently collected monitoring data. A preliminary local precipitation map was developed for WY 2024 and included in Appendix C to visualize the spatial distribution of precipitation across the watershed.

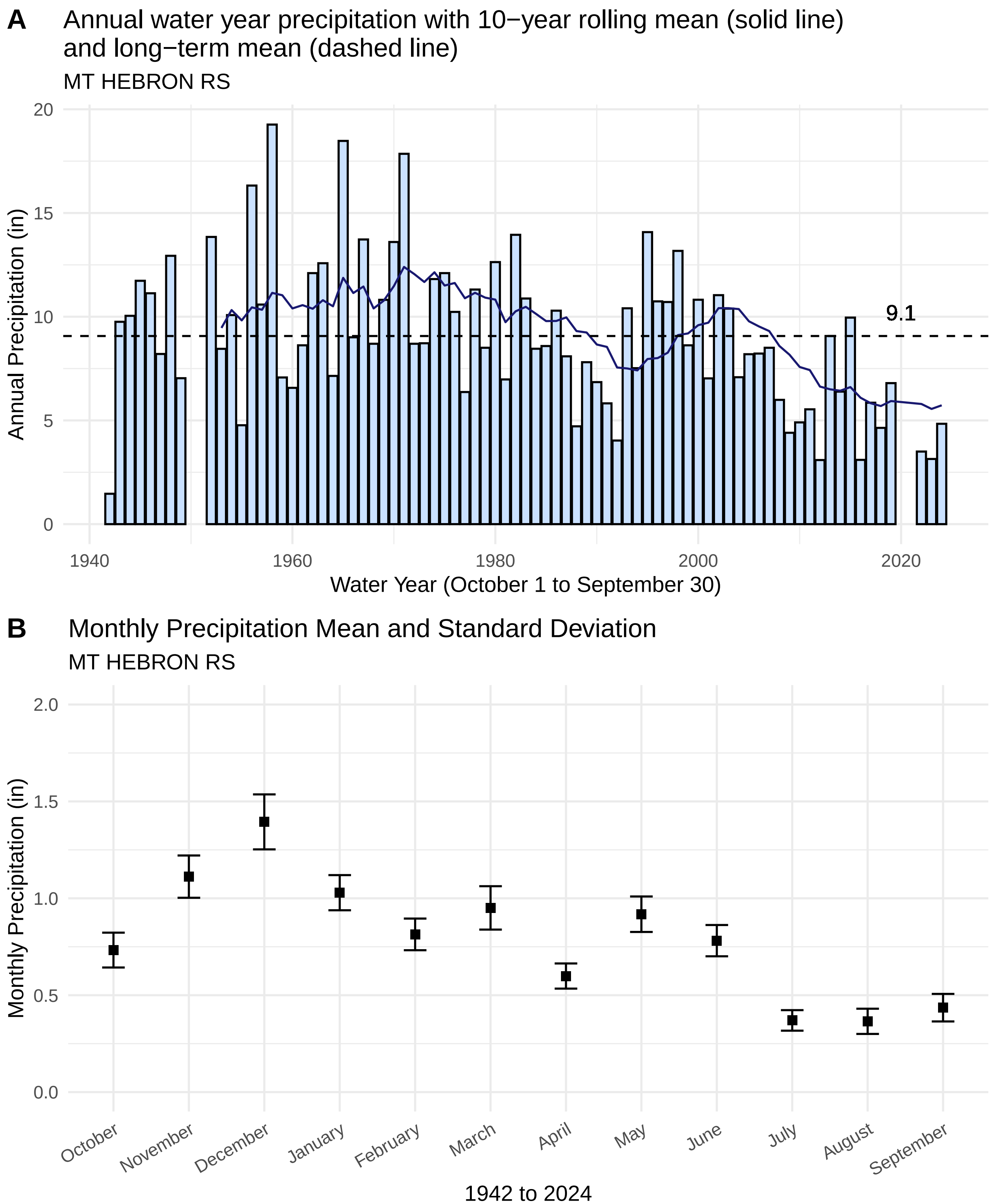


Figure 1.3: Annual (Panel A) and monthly precipitation (Panel B) over the 1942 to 2024 record as measured at the Mount Hebron Ranger weather station (USC00045941). In Panel A, the 10-year rolling average is a solid blue line, and the average over the entire period is shown as a dashed line. Each bar represents one water year, the total precipitation measured during the period between October 1 and September 30. The years 1950, 1951, 2020, and 2021 had significant data gaps and were removed.

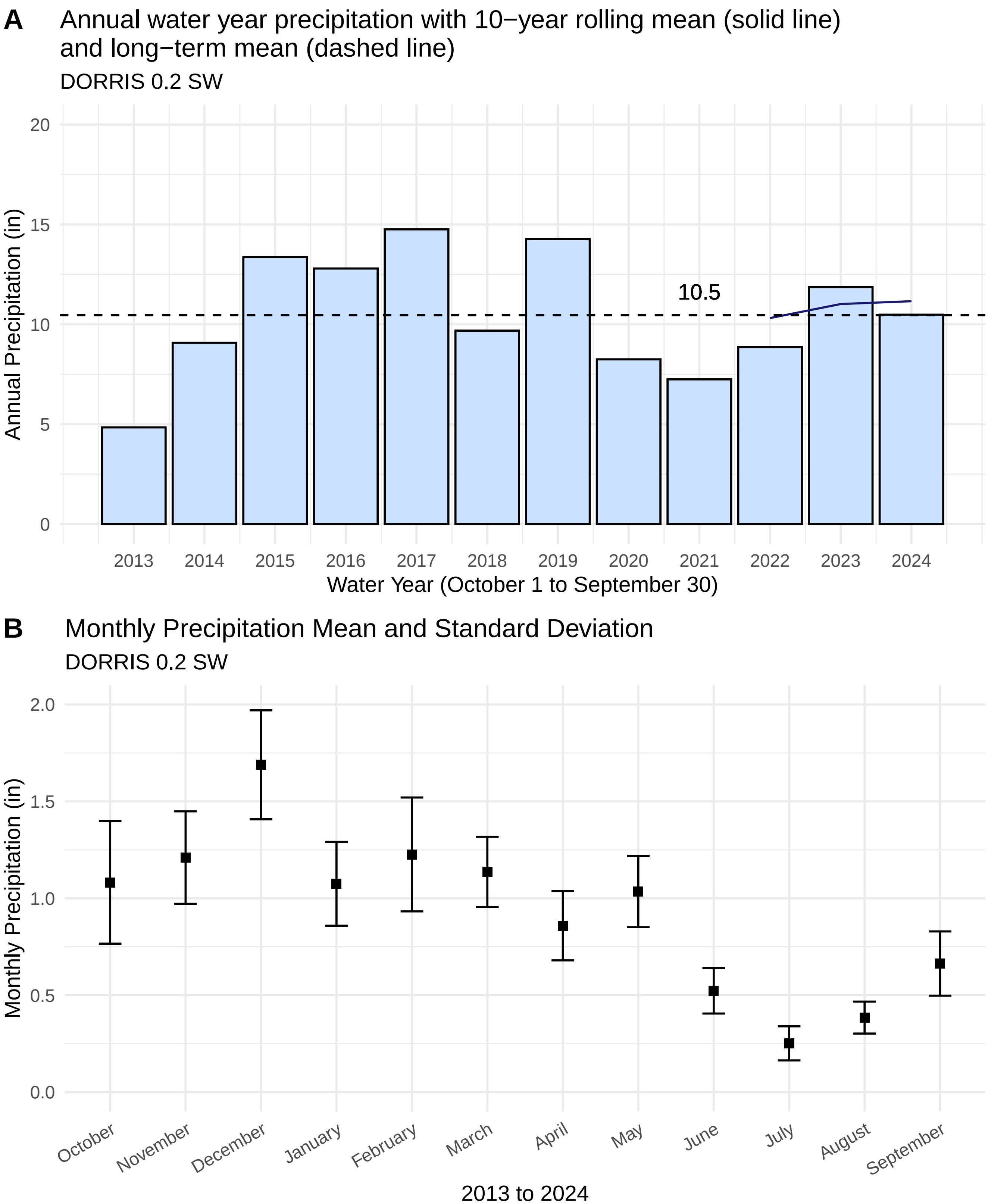


Figure 1.4: Annual (Panel A) and monthly precipitation (Panel B) over the 2013 to 2024 record as measured at the Dorris weather station (US1CASK0010). In Panel A, the 10-year rolling average is a solid blue line available since 2022 when 10-year data become sufficient for the rolling mean calculation, and the average over the entire period is shown as a dashed line. Each bar represents one water year, the total precipitation measured during the period between October 1 and September 30.

Chapter 2

Groundwater Basin Conditions

2.1 Groundwater Elevations

This section describes the change in groundwater elevations in WY 2024 and summarizes general observations of groundwater level declines or increases in the reporting water year. This summary includes quantified changes observed during the water year, hydrographs and contour maps of groundwater elevation. The contour maps and hydrographs below include available data that has undergone quality assurance and quality control processes. As such, coverage is limited and only part of the Basin is represented.

Figure 2.1 shows groundwater elevation time series for select wells to illustrate the historical record and long-term trends throughout the basin. Appendix A.1, Groundwater Elevation Hydrographs for the RMP Network, provides hydrographs of water level wells in the RMP monitoring network. The hydrographs include measurable objectives and minimum thresholds for each RMP. All interim milestones are set to remain within the MO for each RMP.

Wells in addition to the water level RMP wells are used to evaluate groundwater level conditions in the basin. These wells are not RMPs as they do not have defined SMC. Hydrographs for these wells are provided in Appendix A.2, Additional Groundwater Elevation Hydrographs. Figure 2.2 and Figure 2.3 display groundwater elevation contours for the seasonal high and low groundwater conditions, typically observed in March and October, respectively. If available, water level data from additional wells not included in the RMP network is used to create these contour maps. As displayed in the figures, during both seasons measured groundwater levels were low in the eastern portion of the Basin near the town of Dorris. In Fall, water levels are highest in the western portion of the basin, and in Spring, water levels are highest in the central northern portion of the basin.

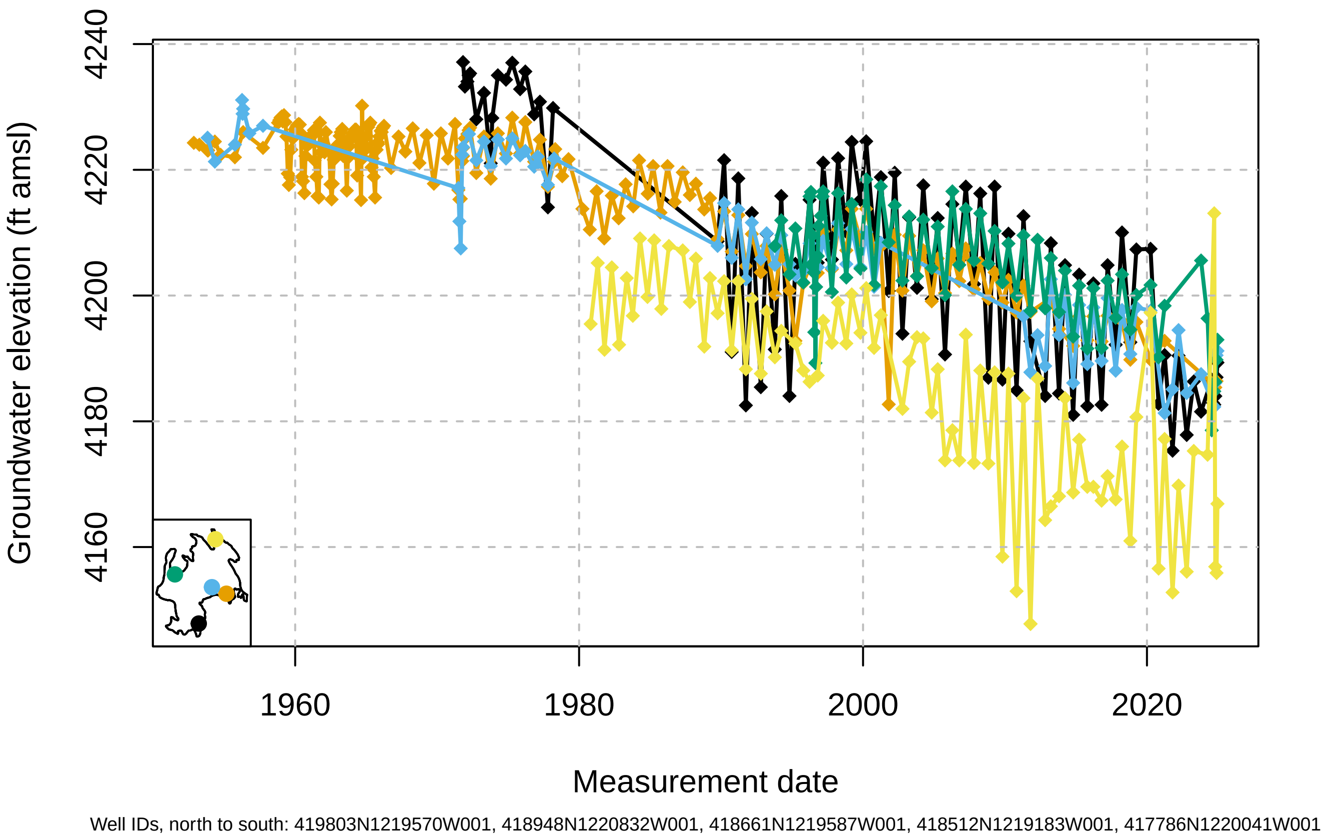


Figure 2.1: Groundwater elevation measurements over time in five wells located throughout Butte Basin, representing long-term groundwater level trends.

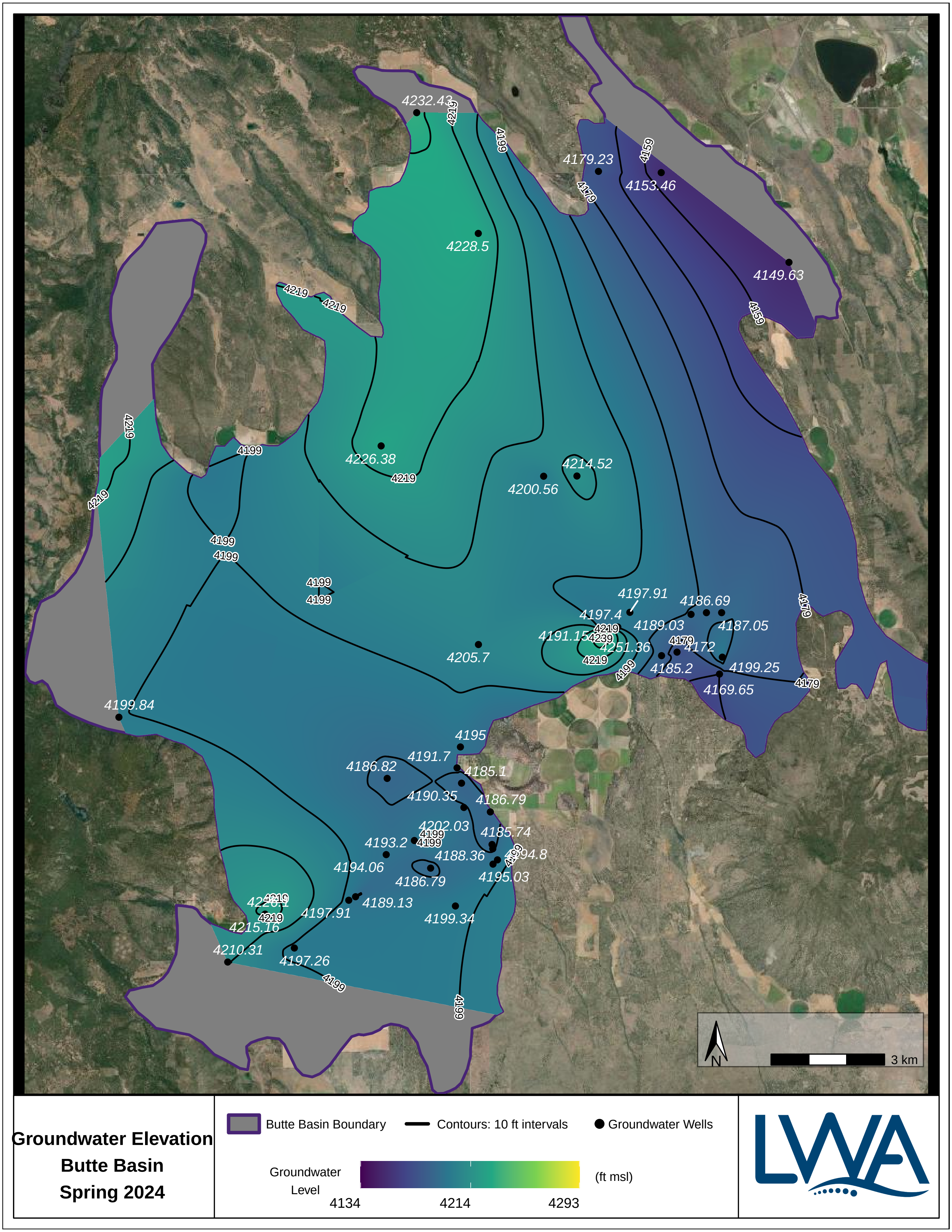


Figure 2.2: Butte Valley Groundwater Elevations, Spring 2024 in terms of feet above mean sea level (ft amsl).

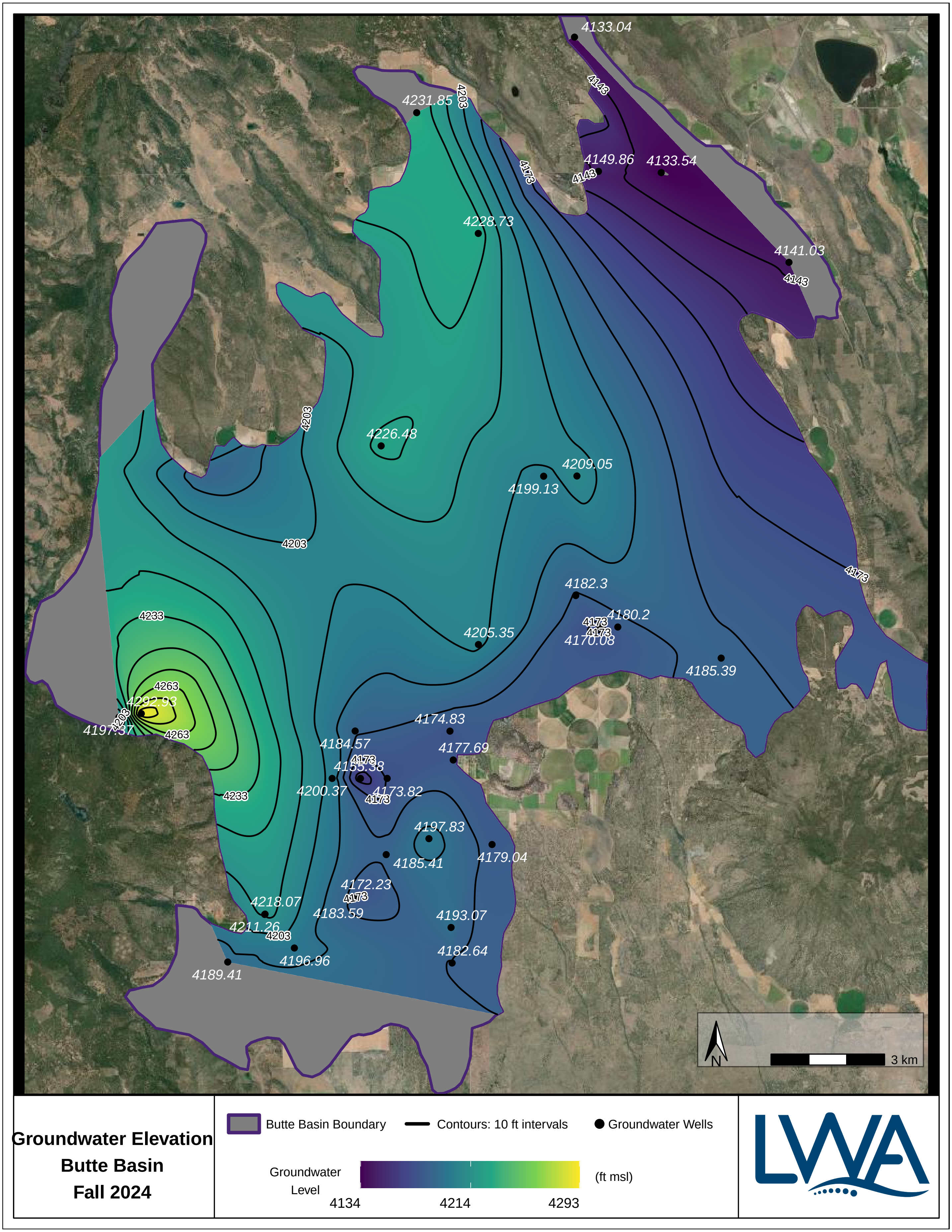


Figure 2.3: Butte Valley Groundwater Elevations, Fall 2024 in terms of feet above mean sea level (ft amsl).

2.2 Groundwater Extractions

For WY 2024 (October 1, 2023 to September 30, 2024), groundwater pumping was estimated using the Butte Valley Integrated Hydrologic Model (BVIHM). The WY 2024 estimated agricultural groundwater extraction from BVIHM in Butte Valley is provided in Figure 2.4 and Figure 2.5 as pumping depth (acre-feet per acre per year) and total pumping volume (acre-feet per year), respectively. Agricultural groundwater pumping is estimated in BVIHM based on the 2020 County Land Use Survey and climate data from NOAA and CIMIS stations, and is estimated to be 65,400 AF for water year 2024. The general location of agricultural pumping is presented in Figure 2.4 or Figure 2.5. An estimate for urban/domestic groundwater extraction is 440 acre-feet based on the basin population reported by DWR [1] (1,464 people) and assuming an average annual water use of 1 acre-foot per 3.5 persons. In Figure 2.6, areas of agricultural land use correspond with regions of agricultural pumping, while Figure 2.7 (panel B) displays the number of production wells in each Public Land Survey System (PLSS) section. The locations of urban and domestic land use is presented in Figure 2.6, and the density of domestic wells is shown in panel A of Figure 2.7. Well density of other categories by PLSS sections are shown in panel C through H in Figure 2.7 and Figure 2.8.

The amount of groundwater pumped for the managed wetlands in the Butte Valley Wildlife Area (BVWA) for WY 2024 is estimated to be 1,800 AF, for around 7 months of pumping to flood and maintain 2,000 acres of BVWA land. The location of the managed wetlands managed by the California Department of Fish and Wildlife (CDFW) and native vegetation managed by the United States Forest Service, including the Butte Valley National Grasslands, are presented in Figure 2.9.

The estimated value for overall groundwater extraction in WY 2024 is 67,640 acre-feet, based on an average of the estimated agriculture pumping range, urban/domestic groundwater extraction, and pumping for managed wetlands. A breakdown of groundwater extraction by water use sector for WY 2024 is provided in Table 2.1 and 2.2. Notable data missing from this estimate is the amount of groundwater used by native vegetation, such as the Butte Valley National Grasslands. The BVIHM is currently undergoing substantial redevelopment, including the addition and evaluation of new data, in response to conversations with DWR staff.

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

Surface water supply continues to be a data gap that will be addressed in WY 2025. All surface water entering the Basin is in-lieu use or recharged to groundwater, however the Basin does not have complete stream gage data for further analysis. The flow data is not yet available due to insufficient rating curve data. At this time rating curve development is underway for the Prather Creek, Harris Creek, and Butte Creek flow stations.

[1] {https://gis.water.ca.gov/app/bp-dashboard/final/}

2.4 Total Water Use

The total water use estimated in WY 2024 is shown in Table 2.2 by water use sector. Note that the estimate does not include groundwater used by native vegetation and surface water supply, which are data gaps pending to be addressed.

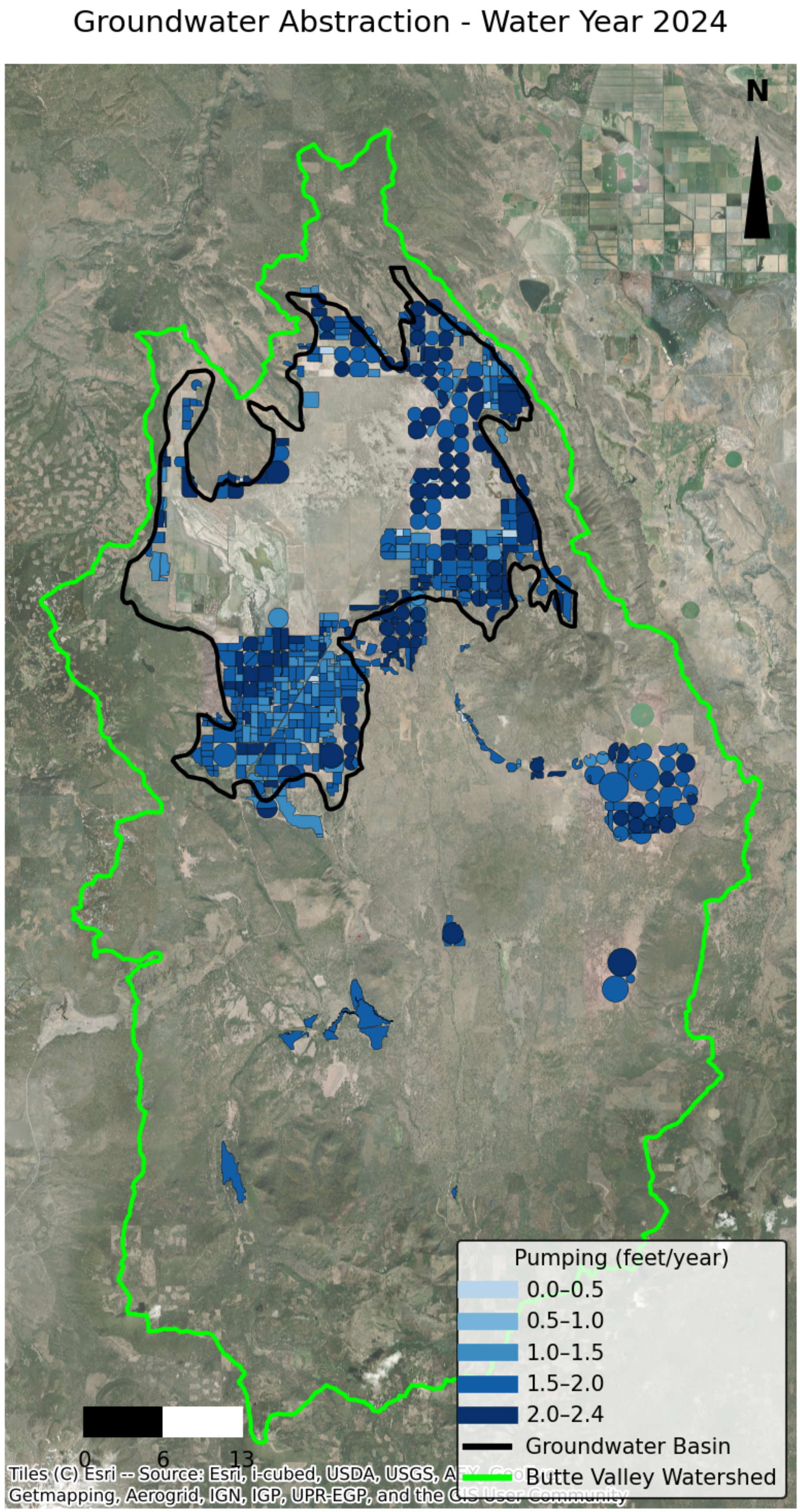


Figure 2.4: Spatial distribution of agricultural groundwater extraction based on the BVIHM groundwater model simulation for WY 2024 in feet per year.

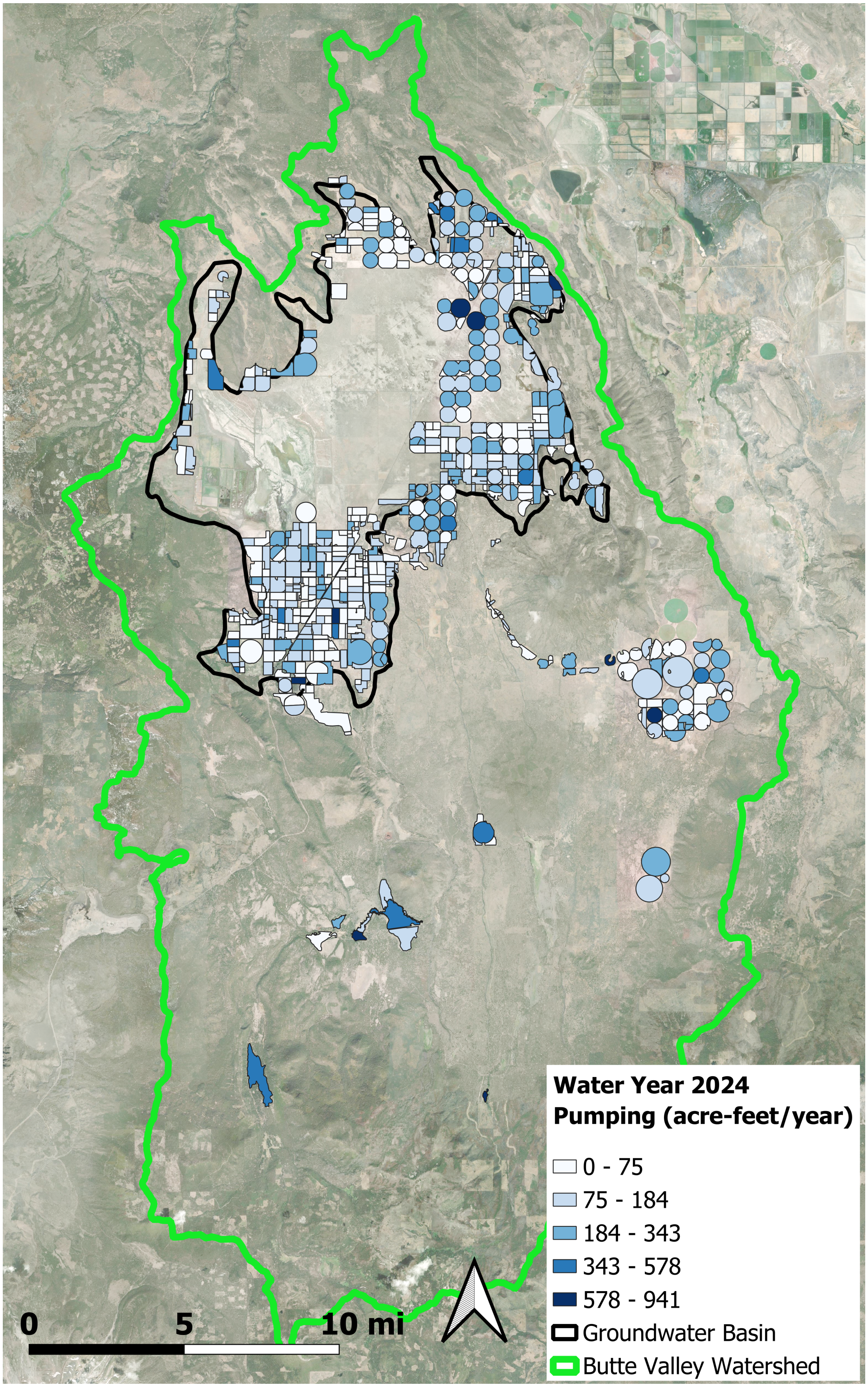


Figure 2.5: Spatial distribution of agricultural groundwater extraction based on the BVIHM groundwater model simulation for WY 2024 in acre feet per year.

Table 2.1: Groundwater Extraction in WY 2024 by Water Use Sector.

Water Use Sector	Groundwater Extraction (AF)	Method	Accuracy
Urban / Domestic	440	Estimate	80-90%
Industrial	0		
Agricultural	65,400	Estimate	60-70%
Managed Wetlands	1,800	Estimate	90-100%
Managed Recharge	0		
Native Vegetation	Data Gap		

Table 2.2: Total Water Use in WY 2024 by Water Use Sector.

Category	Water Use Type/Sector	Applied Water (AF)	Method	Accuracy
WY 2024 Total	Total Water Use	67,640	Estimate	60-70%
Water Source Type	Groundwater	67,640	Estimate	60-70%
	Surface Water	Data Gap		
	Recycled Water	0		
	Reused Water	0		
	Other	0		
Water Use Sector	Urban / Domestic	440	Estimate	80-90%
	Industrial	0		
	Agricultural	65,400	Estimate	60-70%
	Managed Wetlands	1,800	Estimate	80-90%
	Managed Recharge	0		
	Native Vegetation	Data Gap		
	Other	0		

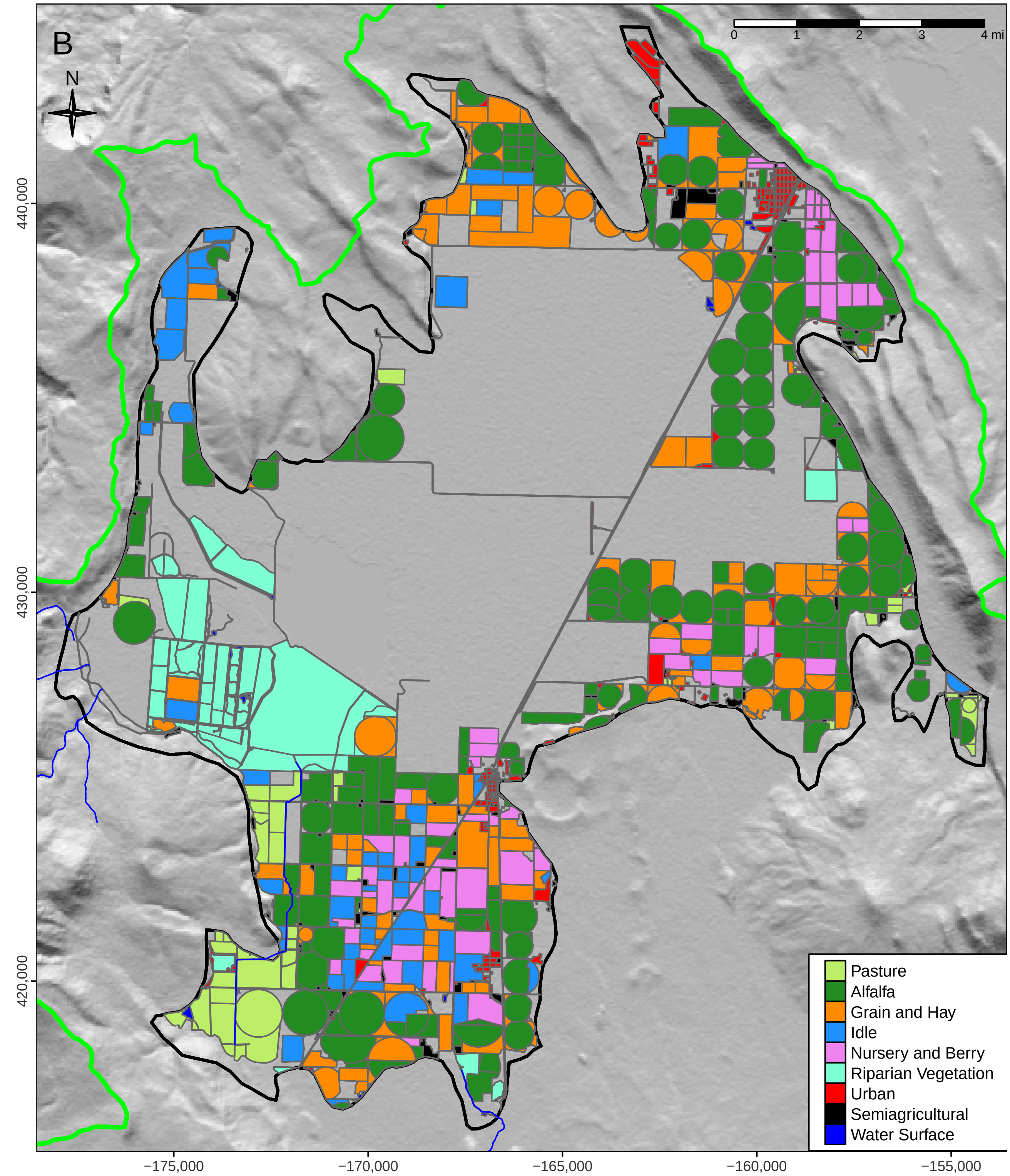


Figure 2.6: Land uses within the Butte Valley Groundwater Basin boundary taken from the DWR 2010 Land Use Survey.

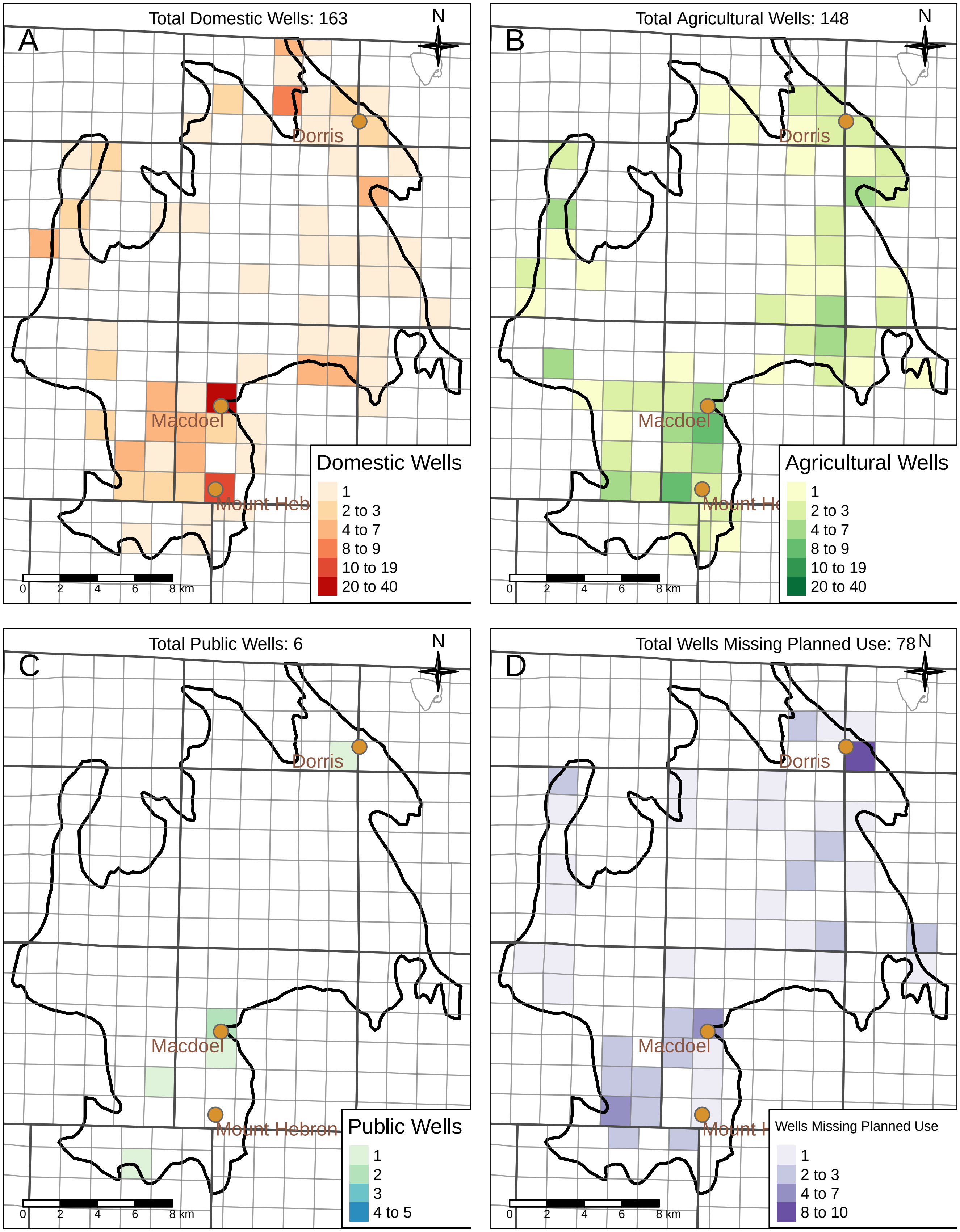


Figure 2.7: Choropleth maps indicating number of domestic (panel A), agricultural production (panel B), public (panel C), and missing planned use (panel D) Well Completion Reports present in each Public Land Survey System (PLSS) section, based on data from the DWR Online System for Well Completion Reports (OSWCR). PLSS sections delineated on maps are nominally one square mile.

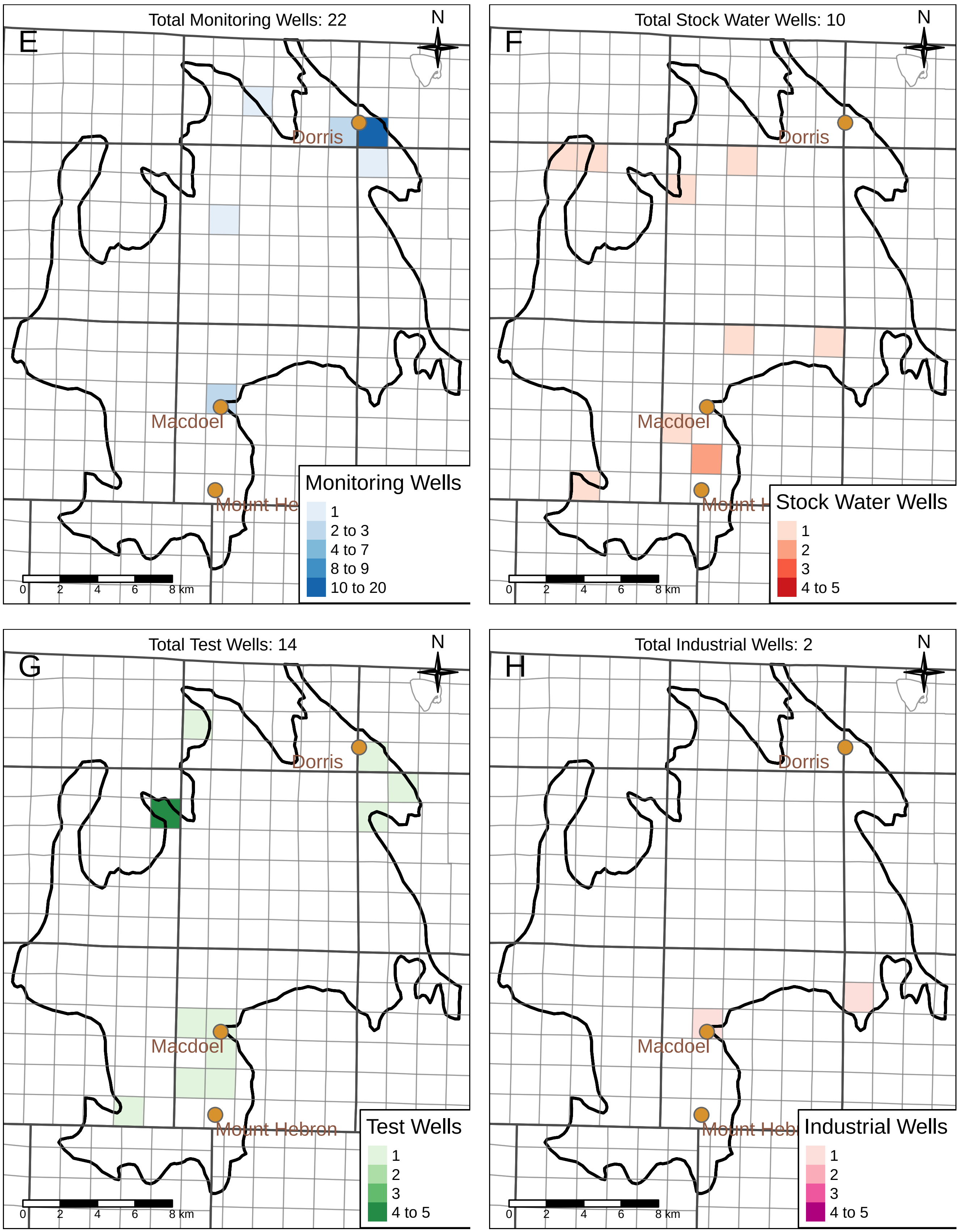


Figure 2.8: Choropleth maps indicating number of monitoring (panel E), stock water (panel F), test (panel G), and industrial (panel H) Well Completion Reports present in each Public Land Survey System (PLSS) section, based on data from the DWR Online System for Well Completion Reports (OSWCR). PLSS sections delineated on maps are nominally one square mile.

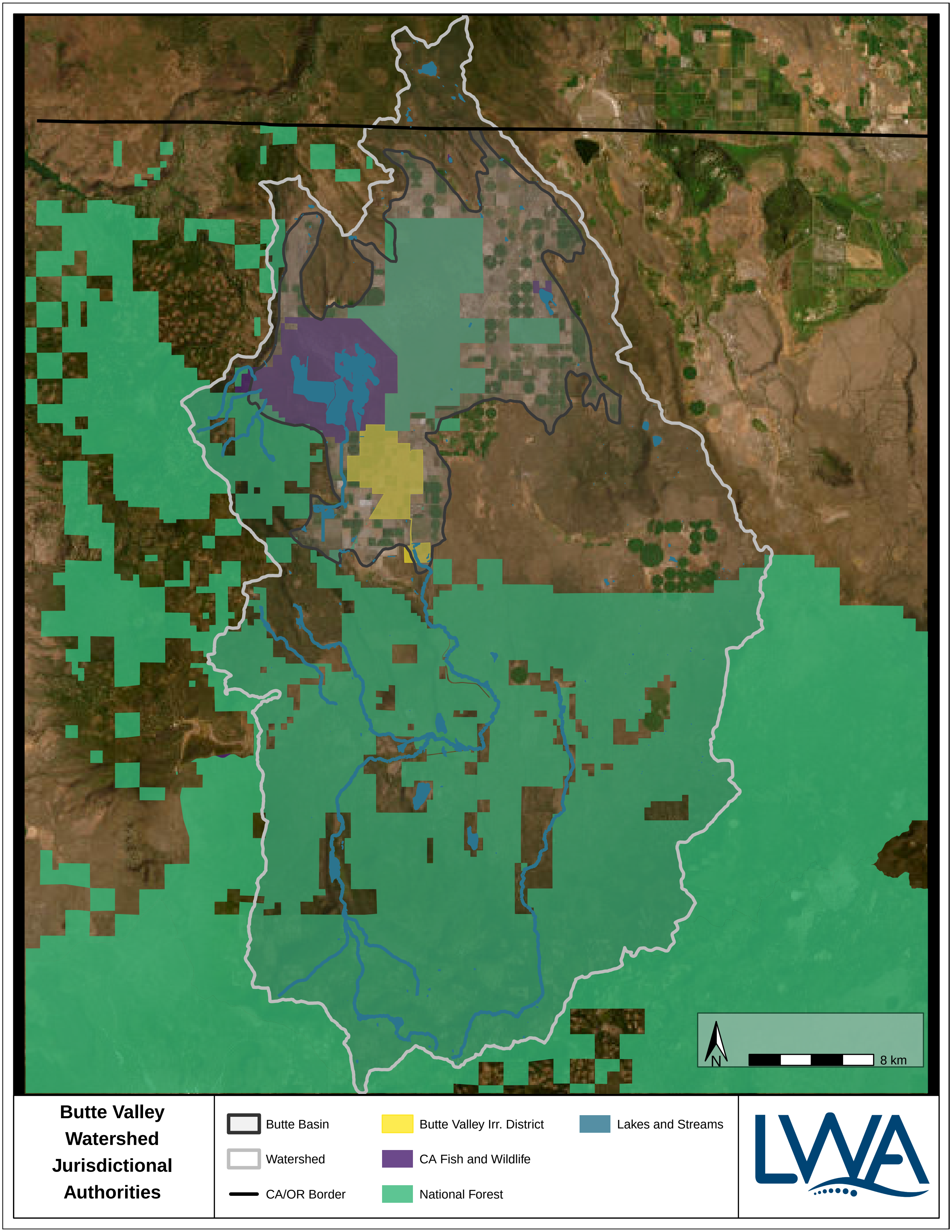


Figure 2.9: Butte Valley Watershed Jurisdictional Authorities.

2.5 Change in Groundwater Storage

This section provides quantified changes observed in groundwater storage based on estimates from the BVIHM for WY 2024. The MOs and interim milestones for the change in groundwater storage sustainability indicator are the same as the chronic lowering of groundwater levels sustainability indicator. Figure 2.10 depicts water year type, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the Basin. Results are extracted from the BVIHM based on historical data to the greatest extent available. The change in storage for WY 2024 is estimated to be 6 TAF (Figure 2.10). The groundwater storage continues to recover due to the above normal precipitation condition during WY 2023 and 2024 compared to the prior three years of drought. Maps showing the spatial change in groundwater storage for the Basin, extracted from the BVIHM, are presented for each geologic layer simulated in the model and are presented in Appendix B.

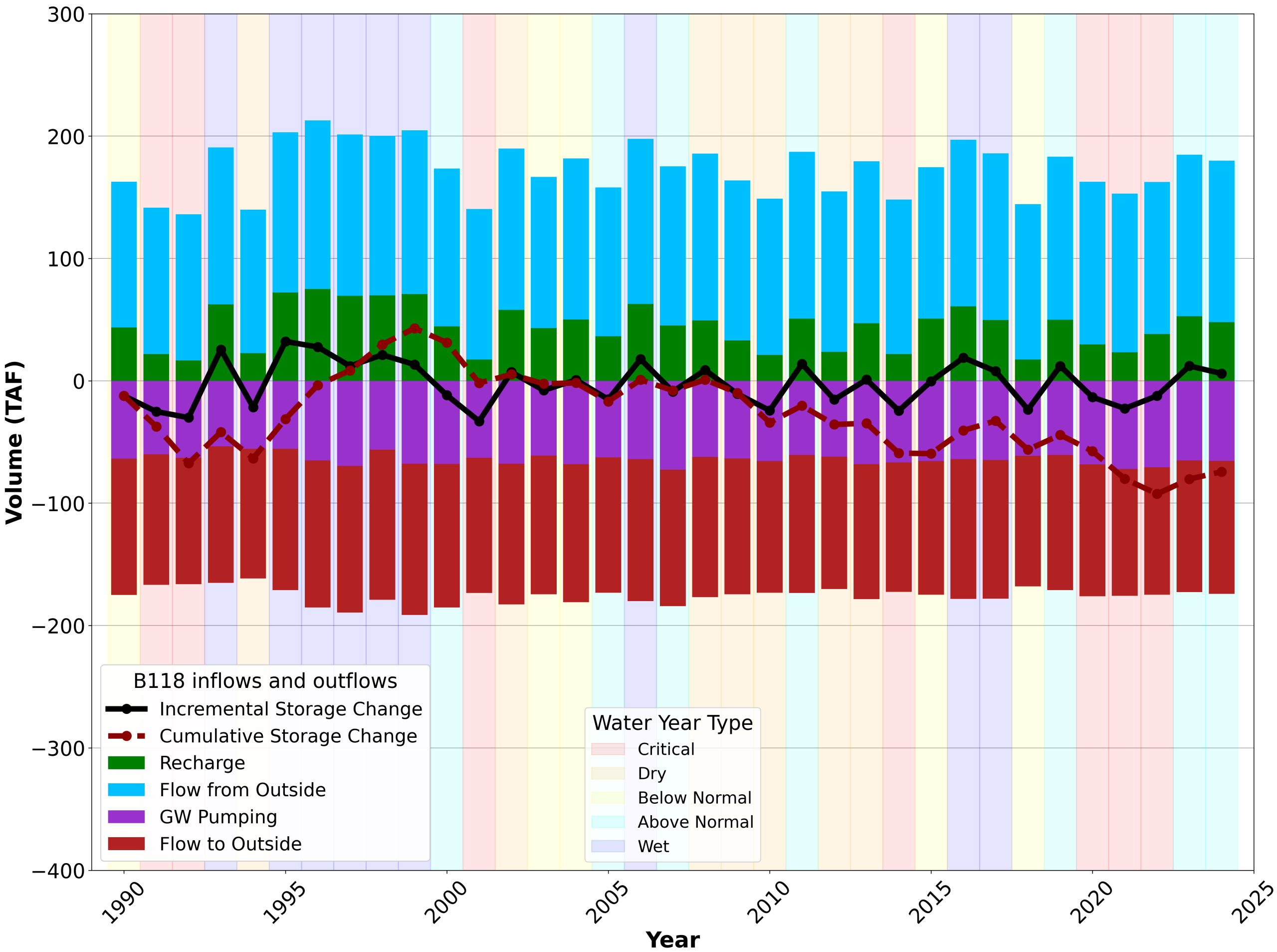


Figure 2.10: Groundwater storage change based on the BVIHM groundwater model simulation. Budget terms 'Flow from Outside' and 'Flow to Outside' refer to flow entering and exiting the groundwater basin boundary. Incremental storage change is equal to annual storage change.

Chapter 3

Monitoring Network

As described in Chapter 2, the groundwater level RMP network is a subset of the full GSP monitoring network. The groundwater level RMP network is used to evaluate SMCs for individual sustainability indices for the Basin and is used to demonstrate the sustainability of the Basin through 2042. The full GSP monitoring network provides further insight into Basin conditions.

The GSP monitoring network consists of wells with continuous monitoring and periodic measurements. Continuous monitoring offers the best data coverage while periodic monitoring is generally completed twice a year (spring and fall). A portion of the monitoring wells are instrumented with continuous dataloggers (temperature and water level measured collected every 15 minutes) and telemetry, and the remaining are from the California Statewide Groundwater Elevation Monitoring (CASGEM) Program and a voluntary monitoring program, with bi-annual monitoring frequency. The continuous monitoring network is undergoing continued maturation and increased data collection. During 2024, 10 continuous groundwater monitoring stations were active in the Butte Valley basin. None of these wells have sufficient history for use as RMPs; however, they may be added to the RMP network during a future GSP update. An update regarding the voluntary monitoring program is further discussed in Chapter 5 (*Progress Toward Plan Implementation*) of this report.

The water quality network used to evaluate SMCs consists of public water supply wells and monitoring wells. Stream flow and stream depletion due to groundwater pumping are measured using flow gages, and subsidence is measured with Interferometric Synthetic Aperture Radar (InSAR) satellite data provided by DWR.

3.1 Groundwater Level Monitoring Network

The groundwater level representative monitoring point (RMP) network consists of thirteen wells. The distribution of monitoring wells is shown in Figure 3.1. The currently designed network satisfies DWR requirements with respect to spatial distribution and may be expanded using recently installed new instruments that will be evaluated over the first five years of implementation.

Water level monitoring network status update

One well in the DWR maintained CASGEM network was removed at the landowner's request. The RMP with CASGEM ID *419021N1219431W001* was removed after collecting twice-annual data almost continuously since 1978. No replacement is currently available for this well. This was the third deepest well in the RMP network and represented a data point in the east side of the valley between Macdoel and the City of Dorris. It was completed to a depth of 1,031 feet bgs making it slightly deeper than nearby irrigation wells which are typically completed between 400 and 600 feet bgs. A DWR Techincal Support Services (TSS) well was drilled nearby at the Butte Valley County Airport which has a similar total drilled depth and is under consideration as a replacement RMP for the discontinued RMP. There is currently insufficient history to select it as an RMP as of Water Year 2024.

3.2 Groundwater Quality Monitoring Network

Existing wells used for monitoring groundwater quality in the Basin include public water supply wells and monitoring wells, which are shown in Figure 3.2. The groundwater quality monitoring network is based on wells that are regularly sampled as part of existing monitoring programs for the constituents for which SMCs are set: arsenic (for selected wells near Dorris), nitrate, and specific conductivity (SC).

Water quality monitoring network status update

The two RMP wells “NEW HQ DOM” and “R168 DOM WELL” which were identified in the GSP are no longer monitored. California Department of Fish and Wildlife was intending to regularly monitor these two wells, but due to staffing changes the regular monitoring is no longer planned to occur. To ensure that current water quality data is available for future annual reports, efforts will be made to contact the monitoring entities of the wells with missing measurements to facilitate continued data collection. If this communication is not successful, a process to plan for the continued collection of representative water quality data will be developed. Options may include planning alternate monitoring entities for the wells, or inclusion of different wells in the network. The City of Dorris has drilled a new public supply well, which has been added to the water quality network (CA4710001_007_007).

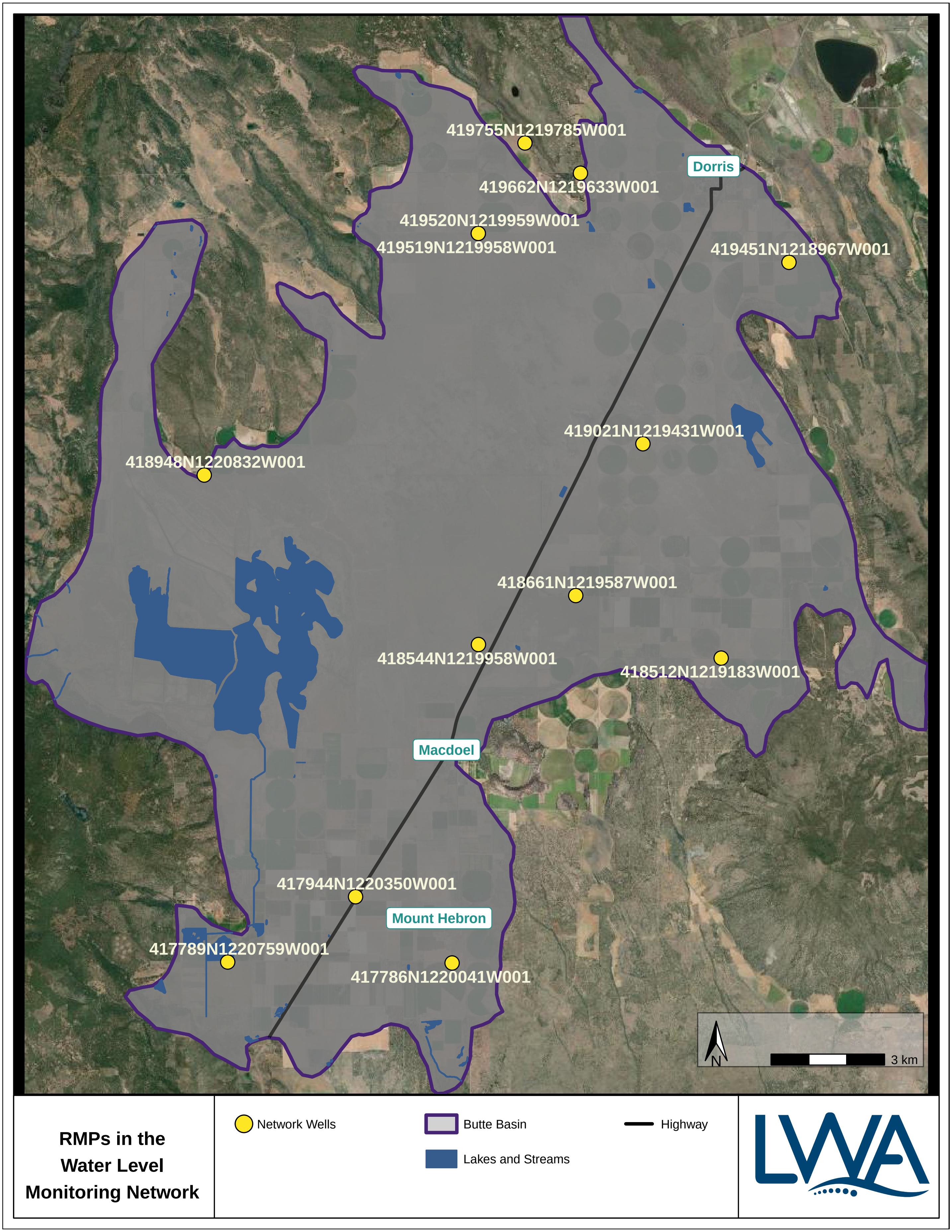


Figure 3.1: RMP Wells in the Water Level Monitoring Network.

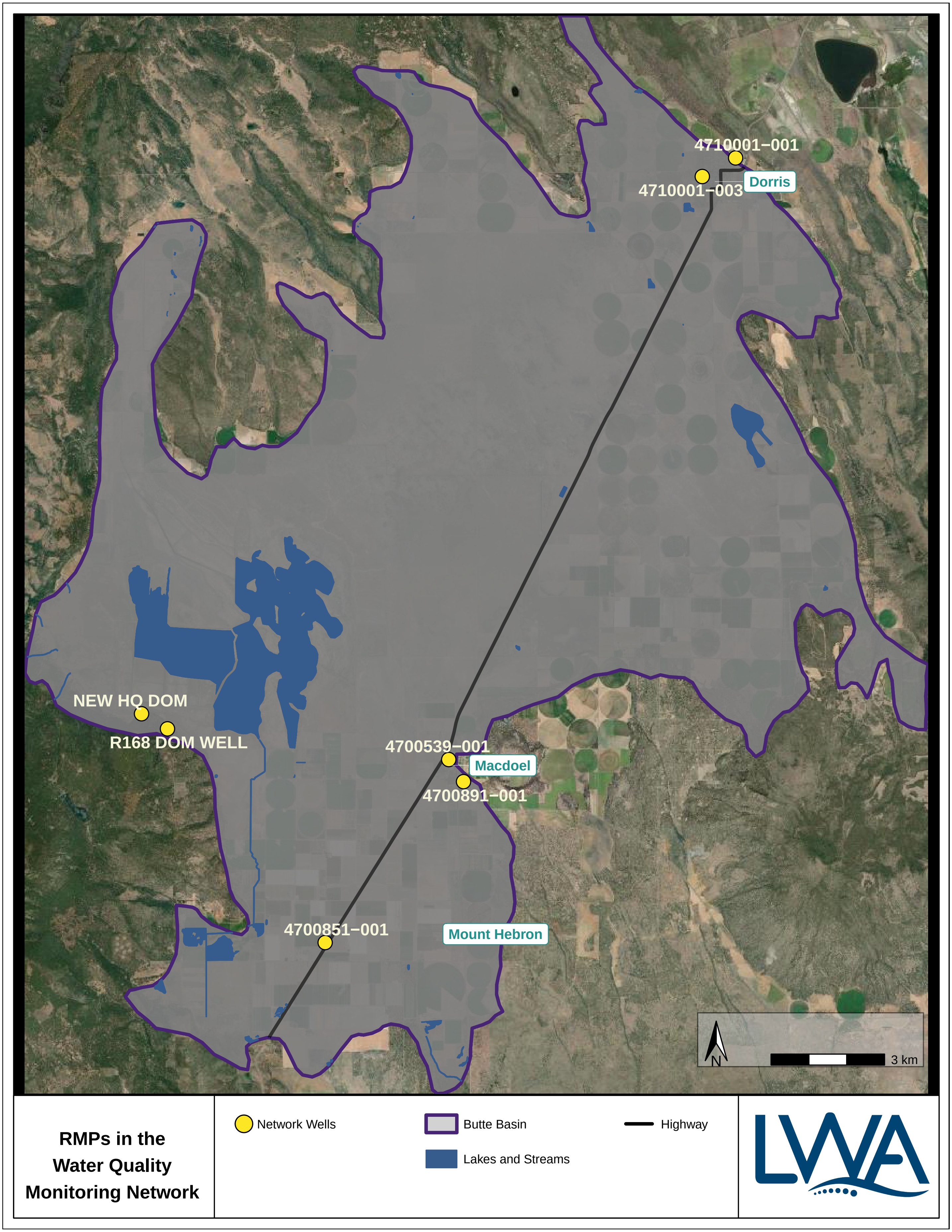


Figure 3.2: RMP wells in the Water Quality Monitoring Network.

Chapter 4

Sustainable Management Criteria

The GSP defines Sustainable Management Criteria (SMC) with respect to quantifiable impacts to beneficial users of groundwater that if exceeded, would lead to the identification of undesirable results. Here, we examine the six sustainability indicators: groundwater levels, groundwater storage, seawater intrusion, water quality, land subsidence, and interconnected surface water; we assess the status of these indicators in WY 2024 by comparing the SMCs to measured data. The SMCs include minimum and maximum thresholds, measurable objectives, and interim milestones.

4.1 Interim Milestones

Interim Milestones are anticipated to be achieved over the course of GSP implementation in increments of five years, pursuant to the CCR definition “Target values representing measurable groundwater conditions, in increments of five years, set by Agency as part of a Plan” [CCR Title 23, Division 2 §351(q)]. Progress toward achieving Interim Milestones since submitting the GSP is provided in the AR Section “Groundwater Basin Conditions”. Further updates are expected in the first Five Year Assessment for the GSP, with status checks provided in future annual reporting.

4.2 Groundwater Levels

Fall 2024 water levels were collected and available for all currently active wells in the RMP network, and their fall low, which is defined as the maximum depth to groundwater during the period of September 15 - October 31, 2024, was used for comparison to their SMCs (Table 4.1). The status of the water levels measured at the RMPs in comparison to their SMCs is shown in Figure 4.1. Measurements are sorted into the following categories: Near or Above Measurable Objective, Within Central Operational Range, or At or Below Minimum Threshold. These ranges are defined below and are based on the MO (minimum) and MT. Note that the groundwater level SMCs were revised during the 2024 GSP revision, and have been used for the WY 2024 groundwater level evaluation.

Above Measurable Objective: measurement (ft amsl) > MO (minimum)

Within Central Operational Range: MT < measurement (ft amsl) < MO (minimum)

At or Below Minimum Threshold: measurement (ft amsl) < MT

As displayed, of the twelve RMPs measured for groundwater levels in water year 2024, two were above their MO, and six were above their MT yet below their MO. The fall low of four RMPs, *417789N1220759W001*, *419755N1219785W001*, *417944N1220350W001*, and *419662N1219633W001* were below their MT during fall 2024. During WY 2023, no monitored RMPs had fall lows below their revised MT (it is note that measurements were not taken due to site accessibility at three wells *417789N1220759W001*, *418512N1219183W001*, and *419451N1218967W001*). Therefore, no RMPs were observed to have fall low water levels below their revised MT for 2 consecutive years, and no undesirable results occurred for groundwater levels in WY 2024. Of the four wells with fall low below their MT during fall 2024, wells *417789N1220759W001* and *419662N1219633W001* are located west of Mount Hebron, and wells *419755N1219785W001* and *417944N1220350W001* are located west of City of Dorris. All of them are either irrigation wells or wells around the agricultural land use area that indicate a higher water consumption during the summer and fall season in the basin.

A few wells in the RMP network have been flagged for measurement issues during WY 2024 monitoring (see Appendix A.1). Issues related to the casing condition such as "oil or foreign substance in casing", or "casing leaking or wet" have been observed in seven of the RMP wells including *417789N1220759W001*, *417944N1220350W001*, *418512N1219183W001*, *418948N1220832W001*, *419451N1218967W001*, *419662N1219633W001*, and *419755N1219785W001*. And a fall measurement was noted with recent pumping in well 418661N1219587W001. The GSA is aware of these issues and is working on an appropriate approach validating the questionable measurements. Options, including field maintenance to the wells, are also under consideration.

Table 4.1: Comparison of Fall 2024 groundwater level measurements to SMC values. Measurements represent units of feet above mean sea level (ft amsl) and fall low is defined as the maximum depth to groundwater during the period September 15 - October 31, 2024.

Representative Monitoring Point/Well	WY 2024 Fall Low (ft amsl)	Measurable Objective Minimum (ft)	Measurable Objective Maximum (ft)	Minimum Threshold (ft)	Status
417786N1220041W001	4182.64	4181	4225	4163	Above MO
417789N1220759W001	4189.41	4213	4237	4203	Below MT
417944N1220350W001	4172.23	4190	4225	4185	Below MT
418512N1219183W001	4185.39	4193	4214	4181	Above MT
418544N1219958W001	4205.35	4211	4224	4195	Above MT
418661N1219587W001	4182.30	4186	4214	4163	Above MT
418948N1220832W001	4184.77	4193	4216	4170	Above MT
419021N1219431W001*	NA	4203	4216	4189	No measurement
419451N1218967W001	4141.03	4129	4158	4124	Above MO
419519N1219958W001	4224.75	4229	4237	4223	Above MT
419520N1219959W001	4228.73	4231	4242	4226	Above MT
419662N1219633W001	4134.06	4161	4199	4139	Below MT
419755N1219785W001	4166.20	4187	4217	4171	Below MT

Note:
(*) Well removed from the RMP network as requested by the land owner.

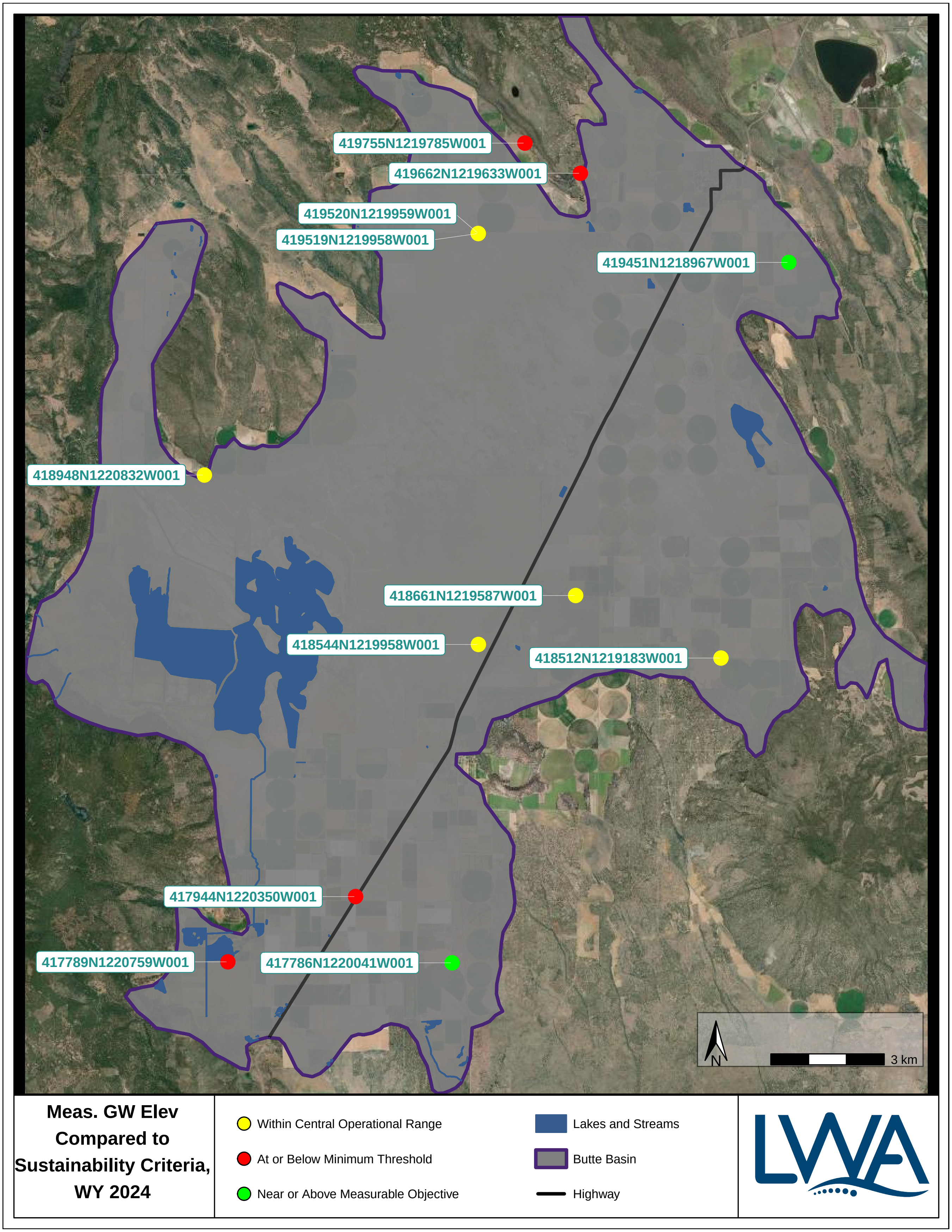


Figure 4.1: Status of the groundwater level RMP networks for Fall 2024.

4.3 Groundwater Storage

Groundwater levels are the proxy for groundwater storage and the sustainability management criteria are identical. According to the United States Geologic Survey, estimates of groundwater storage rely on groundwater level data and sufficiently accurate knowledge of hydrogeologic properties of the aquifer. Direct measurements of groundwater levels can be used to estimate changes in groundwater storage. As groundwater levels fall or rise, the volume of groundwater storage changes accordingly. Unacceptable groundwater decline indicates unacceptable storage loss. The hydrogeologic model outlined in Chapter 2 of the GSP provides the needed hydrogeologic properties of the aquifer. As with the groundwater level sustainability indicator, there is no occurrence of undesirable results for the groundwater storage sustainability indicator in WY 2024.

4.4 Seawater Intrusion

This sustainability indicator is not applicable in this Basin.

4.5 Groundwater Quality

This section compares groundwater quality monitoring to the GSP's SMC and provides a summary of ongoing water quality coordination activities conducted by the GSA. Groundwater quality data for the evaluation is obtained from the Groundwater Ambient Monitoring and Assessment (GAMA) Groundwater Information System.

Water quality data sampled within the RMP network in WY 2024 is shown in Table 4.2. The results are compared to the MT and MO for each of the groundwater quality RMPs in the network for nitrate and specific conductivity. The MT for nitrate as N is 10 mg/L (the Title 22 Primary Maximum Contaminant Level, or MCL), the MT for specific conductivity is 900 micromhos/cm (Title 22 Recommended Secondary Maximum Contaminant Level, or SMCL), and the MT for arsenic (for selected wells near Dorris) is 10 ug/L (the Title 22 Primary MCL). Interim milestones are set equivalent to the MO of each RMP well with the goal of maintaining water quality within the historical range of values. All data collected in water year 2024 is below its respective SMC. As shown in Table 4.2, only one RMP had water quality data for WY 2024, well *CA4710001_003_003* was monitored for nitrate, which is a public supply well for the City of Dorris. The data for this well is below its defined SMC.

The GSP identifies constituents of interest within the groundwater basin: 1,2 Dibromoethane, Arsenic, Benzene, Boron, Nitrate and Specific Conductivity. As per the GSP, SMC are only set for Arsenic, Nitrate, and Specific Conductivity within the RMP network. 1,2 Dibromoethane (ethylene dibromide; EDB) and benzene are already being monitored and managed by the NCRWQCB through the Leaking Underground Storage Tank (LUST) program. Boron is naturally occurring. As such, SMC for EDB, benzene and boron are not needed. SMCs are defined for arsenic because, while it can be naturally occurring, there is arsenic contamination near Dorris from an unknown historical industrial source. Due to the localized contamination, arsenic SMCs are only defined for wells near Dorris. The GSA will monitor the naturally occurring constituents to track any possible mobilization of elevated concentrations. Constituents of interest with no SMCs but tracked by the GSA for mobilization are listed and compared to their MCL in Table 4.3.

Table 4.2: Water quality data from WY 2024 in the RMP network (Nitrate MT is 10 mg/L; Specific Conductance MT is 900 micromhos/cm; Arsenic MT (only near Dorris) = 10 ug/L).

Well ID	GSP ID	Nitrate MO (mg/L)	Nitrate WY 2024 Max Measurement (mg/L)	Status Nitrate	SC MO (umho/cm)	SC WY 2024 Max Measurement (umho/cm)	Status SC	Arsenic MO (ug/L)	Arsenic WY 2024 Max Measurement (ug/L)	Status Arsenic
CA4700539_001_001	4700539-001	5.2	NA	No measurement	430	NA	No measurement	No SMC	No SMC	No SMC
CA4700851_001_001	4700851-001	12	NA	No measurement	560	NA	No measurement	No SMC	No SMC	No SMC
CA4700891_001_001	4700891-001	4.7	NA	No measurement	NA	NA	No measurement	No SMC	No SMC	No SMC
CA4710001_001_001	4710001-001	0.71	NA	No measurement	460	NA	No measurement	18.6	NA	No measurement
CA4710001_003_003	4710001-003	0.4	<0.1	Within MO	349	NA	No measurement	2	NA	No measurement
NEW HQ DOM	NEW HQ DOM	0.26	NA	No measurement	192	NA	No measurement	No SMC	No SMC	No SMC
R168 DOM WELL	R168 DOM WELL	0.22	NA	No measurement	NA	NA	No measurement	No SMC	No SMC	No SMC

Note:
(*) MOs with NAs indicate that the analyte is not historically monitored at the well. Measurements equal to NA indicate that well was not monitored for the analyte in WY2024.

Table 4.3: Water quality data from WY 2024 for constituents without SMCs but tracked by the GSA.

Well ID	Analyte	Date	Result	Units	MCL
CA4700531_003_003	Nitrate as N	2024-04-05	0.35	MG/L	10
CA4710001_007_007	Arsenic	2024-05-15	<2	UG/L	10
CA4710001_007_007	Manganese	2024-05-15	8.8	UG/L	50
CA4710001_007_007	Iron	2024-05-15	<50	UG/L	300
CA4710001_007_007	Nitrate as N	2024-05-15	<0.1	MG/L	10

Table 4.3: Water quality data from WY 2024 for constituents without SMCs but tracked by the GSA. *(continued)*

Well ID	Analyte	Date	Result	Units	MCL
CA4710001_007_007	Specific Conductivity	2024-05-15	346	UMHOS/CM	400 (50% UL), 800 (90% UL)
CA4710001_007_007	Benzene	2024-05-15	<0.5	UG/L	1

4.6 Land Subsidence

To monitor subsidence, the Basin relies on data provided by DWR based on Interferometric Synthetic Aperture Radar (InSAR), a satellite-based remote sensing technique that measures vertical ground surface displacement changes at high degrees of measurement resolution and spatial detail. This data is made available through the DWR SGMA Data Viewer [1] and shows overall subsidence less than 0.1 feet for the entire Basin during the water year 2024, which is within the statistical margin of error for this method based on analysis conducted for the Butte Valley GSP (Figure 4.2). This avoids the occurrence of undesirable results as defined by the GSP.

[1] https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#currentconditions

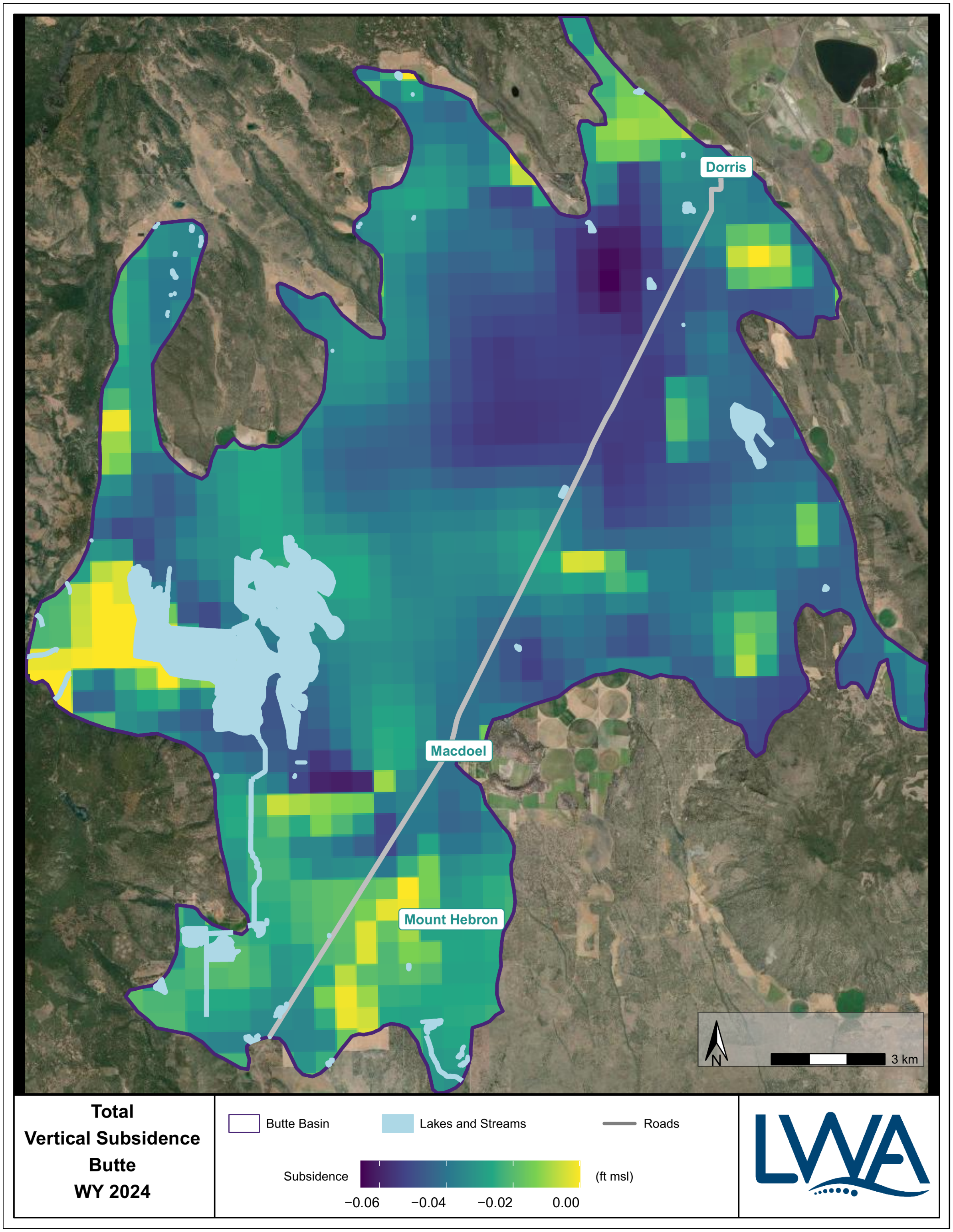


Figure 4.2: InSAR satellite measured total vertical subsidence (feet) in WY 2024. Note that the processed InSAR instrument and GIS conversion error is roughly +/-0.1 feet (https://gis.water.ca.gov/arcgisimg/rest/services/SAR).

4.7 Interconnected Surface Water

Potential interconnected surface waters in the Basin cannot be determined without filling previously identified data gaps, as described in the GSP. With the receipt of grant funding though DWR's SGM Program Implementation Program, funds have been acquired to better evaluate and identify interconnected surface waters in the Basin. Results from this effort will be used to report on this sustainability indicator in future annual reports.

Chapter 5

Progress Toward Plan Implementation

This section provides updates on progress towards implementing the GSP, including implementation of projects and management actions since adoption of the GSP and the most recent annual report. The project and management actions that are described in the 2024 revised GSP are summarized in Table 5.1, which provides the status of the project, the project's management category (i.e., demand management), and project description. Section *Implementation of Projects and Management Actions* focuses on the progress made on GSP implementation and activities during WY 2024, Section *Activities Anticipated for the Coming Year* describes the activities planned for WY 2025, and Section *Coordination* describes additional project activities that the GSA is coordinating with other agencies:

5.1 Implementation of Projects and Management Actions

5.1.1 Addressing Deficiencies for Butte Valley GSP

On January 18, 2024, DWR determined that the Butte Valley GSP was "incomplete" and provided the Basin's GSA with corrective actions with 180 days (by July 16, 2024) to address the identified deficiencies. The major deficiencies are as follows:

A. The GSA should revise the GSP to provide a reasonable assessment of overdraft conditions using the best available information and describe a reasonable means to mitigate overdraft.

B. The GSA must provide a more detailed explanation and justification regarding the selection of the sustainable management criteria for groundwater levels, particularly minimum thresholds and measurable objectives, and quantitatively describe the effects of those criteria on the interests of beneficial uses and users of groundwater.

During the 180-day revision period, the Butte Valley GSA and its technical team collaborated closely with DWR to address the deficiencies. The GSP was extensively revised to reassess current basin conditions and establish an approved plan toward sustainable management. Major changes include updating the sustainable yield, groundwater level SMCs, well failure analysis, and addition of Project Management Actions (PMAs) and SMC for the ISWs and GDEs. In February 2025, the departed completed their review for the revised GSP and approved the plan during their latest round of GSP determinations.

5.1.2 Project activities for WY 2024

Water Level Monitoring Network - The expanded monitoring network is being used to collect new data from new locations across Butte Valley. A voluntary monitoring program has been started to measure 24 wells for depth to groundwater. This data is currently being collected on an evaluation basis for future inclusion in the GSP 5-year update and numerical groundwater models. Currently, the hand-collected voluntary monitoring network is concentrated in the vicinity of the Butte Valley Irrigation District, Macdoel, and northeast of Macdoel near Shady Dell Road. None of these wells have sufficient history for use as RMPs, however they may be included during a future GSP update. The continuous monitoring network is undergoing continued maturation and data collection. During WY 2024, ten continuous groundwater monitoring stations were active in the Butte Valley basin. None of these wells have sufficient history for use as RMPs, however they may be included during a future GSP update.

Data Gaps and Data Collection - Steps were taken to reduce data gaps in the Basin including the installation of continuous groundwater level and surface water monitoring sites to monitor and support the implementation of planned projects and management actions. These sites will also be used to improve representation of the Basin's different hydrogeologic units. During WY 2024, stream gauges were constructed on Prather Creek near Meiss Lake and on Harris Creek near Meiss Lake. At this time rating curve development is underway for the Prather Creek, Harris Creek, and Butte Creek flow stations. Flow data is not yet available due to insufficient rating curve data.

Geophysical data collected during airborne electromagnetic (AEM) surveys was collected and analysis was conducted by the technical team. The AEM data partially covered the Basin, but will increase confidence in the geologic model. Geophysical surveys were conducted near the Butte Valley Irrigation District managed groundwater recharge basin at the terminus of the Butte Creek Diversion Ditch located southeast of the Basin and near the California Irrigation Management Information System (CIMIS) station.

With respect to water quality, additional wells for potential inclusion in the RMP network were scouted and sampled for nitrate and specific conductivity. The intent is to include additional RMP wells in the GSP's RMP network. Additional sampling occurred to evaluate the impact of pesticides associated with cannabis cultivation on groundwater and surface water.

Data collected and used to support GSP efforts was largely made accessible through the Data Management System (DMS)[1]. The DMS provides access to well location and construction details, historical water level data, telemetered water level data (collected by the GSA and DWR), and lithology data.

Butte Valley Integrated Hydrogeologic Model (BVIHM) Model Update - Evaluation and further calibration of the current groundwater numerical model was conducted during WY 2024. Geophysical data collected during the AEM surveys was used to develop and inform the new geological model. Model results extended to WY 2023 were used to refine the water budget and sustainable yield in the revised GSP submitted in July 2024. Since then, the runoff and recharge components of the Upper Klamath River Basin Precipitation Runoff Modeling System (PRMS) model, and the groundwater pumping component of the Butte Valley Soil Water Budget model (SWBM) were extended to WY 2024.

Small Community Drought Relief Grant Funding - This grant was awarded to the City of Dorris in response to drought and well outages, to create a domestic well deepening program, complete

[1] https://siskiyou-sgma.gladata.com/#

repairs to the City water distribution network, and drilling of a new City public supply well. Work conducted during WY 2024 included development and distribution of a domestic well survey, initial field work to identify domestic wells, review of well surveys received, and efforts to identify drillers to conduct the repairs and site visits to wells reporting problems based on survey responses. In early 2023, a well outage survey was developed and distributed to approximately 400 local addresses. Of the 20 survey responses that were received, 10 reported wells needing repair or replacement. Site visits were conducted in June and September 2023 to evaluate the repairs needed. In 2024, four new domestic wells and the new City of Dorris public supply well was drilled.

Well Permitting - The GSA continued to work with the Siskiyou County Environmental Health Department's well permitting staff to develop a new "Well Permitting Guidance Document" that will update the County well permitting policies and comply with the Governors Executive Order (EO N-3-24). The methodology in the draft "Well Permitting Guidance Document" was used on several test cases to further refine the guidance and criteria used to permit future wells.

Well Inventory - During water year 2024, significant progress was made to inventory the wells within the Butte Basin. The well inventory was initiated with the Department's existing Well Completion Report (WCR) dataset. Each well in the WCR dataset was reviewed in satellite imagery for spatial accuracy, and the well's location was corrected to the extent possible. Categories within the well's feature attributes in the WCR were also reviewed and corrected for completeness and accuracy. Outreach on progress and methodology was shared at multiple Advisory Committee meetings. An approach to identify parcels that likely have wells, but do not have wells identified in the WCR dataset, was developed. Development and refinement of the well risk assessment with use of groundwater flow model and updated understanding of the basin's geology continued. This included preparation for scenarios and the evaluation of water level drawdown due to pumping.

Irrigation Efficiency Improvements - Workshops were held in 2024 on efficient water management for forage crops were held in coordination with the University of California Cooperative Extension and the Tehama Resource Conservation District. The Workshop provided information on a Mobile Irrigation Lab that can provide on-site evaluations of irrigation systems and provide comprehensive reports to producers that detail how their irrigation system is performing, including tips, suggestions, and recommendations based on data collected during the inspection.

Upland Management – In WY 2024, various options for upland management projects and studies were evaluated. Existing spatial datasets of prescribed burns, wildfires, and past upland management projects were acquired to assess their impacts on water resources. During water year 2024, these spatial datasets were evaluated, and the locations of fires or management activities were correlated with existing data on streamflow, groundwater levels, precipitation, and snowfall. A methodology was then developed to evaluate their impact on water resources.

Public Outreach - The GSA has continued public outreach by visiting local well owners who report concerns about groundwater levels in their wells and also worked to develop opportunities to improve monitoring and data collection to aid the GSA in characterizing and improving groundwater reliability. Quarterly Advisory Committee meetings, open to the public, were also conducted.

5.2 Activities Anticipated for the Coming Year

The GSA intends to continue activities necessary to implement the GSP and put the Basin on a path toward sustainable management. This section provides an overview of implementation activities anticipated over WY 2025.

Data Gaps and Data Collection - The GSA plans to continue the installation of continuous groundwater level and surface water monitoring sites to support the implementation of planned projects and management actions. These new monitoring sites will improve the representation of groundwater levels throughout the Basin and improve the representation of the different hydrogeologic units. Data gaps related to groundwater-surface water connectivity will continue to be evaluated and addressed in the Basin. Information and data from the newly installed stream gages will be provided in the annual report for the following years when they becomes available. The DMS will continue to be developed. Improvements to the DMS include the addition of water quality data, stream gage data, and GSP specific data including RMPs and associated SMC.

Butte Valley Integrated Hydrogeologic Model (BVIHM) Model Update - Evaluation and further calibration of the current groundwater numerical model will be conducted. The numerical model will be extended and calibrated with updated hydrogeologic data of the basin.

Well Inventory Program – During the upcoming water year the GSA is identifying parcels that likely have wells, but do not have wells identified in the WCR dataset. The parcels with likely wells will be included in the well inventory. A potential next step is to conduct outreach to owners of the parcels to confirm if a well exists no the property. Information from the Well Inventory will continue to be incorporated into the model and also be used to inform the Fee Study conducted to identify options to fund groundwater management in the Basin. The GSA will finalize the well inventory during WY2025.

Well Permitting – The GSA will continue to work with the Siskiyou County Environmental Health Department's well permitting staff to develop an updated "Well Permitting Guidance Document" that will comply with the Governors Executive Order (EO N-3-24).

Upland Management – Data from existing spatial datasets of prescribed burns, wildfires, and past upland management projects will continue to be evaluated to assess their effects on water resources. Streamflow data, and other hydrologic data including precipitation and snowfall, will be used during the evaluation.

5.3 Coordination

State Water Resources Control Board - GSA staff meets biweekly with SWRCB staff to discuss updates and activities related to SWRCB's Emergency Regulation Curtailments. The two parties discuss updates to curtailment actions in place, including Local Cooperative Extensions (LCS) and activities that may have impacts on groundwater management.

Technical Support Services Well - The Technical Support Services (TSS) well was drilled in Butte Valley during spring 2023 by the California DWR. Initial data for the TSS well is available for review and analysis of a partial year of water level data. At the time of this report all data is still provisional and the final well construction report is not yet available. The well is located near the County owned airport in Butte Valley and is completed to multiple depths with target depths of 120 feet, 235 feet, 870 feet, and 1095 feet below ground surface. These intervals providing discrete data on shallow, intermediate shallow, intermediate, and deeper aquifer systems. Although no distinct aquifers were identified in Butte Valley, ages and compositions of water vary with depth, as do the users of water throughout the valley. Domestic wells are typically shallow while irrigation and city production wells are typically deeper. Preliminary data from the TSS well show different responses to pumping at different depths.

Aerial Electro-Magnetic Survey - The data and report from the DWR funded Aerial Electro-Magnetic (AEM) Survey conducted in Butte Valley prior to the release of the GSP was published in late 2022. Data from this report has been reviewed and is included in the revised geologic models or hydrogeologic models of the Basin. Based on initial review, AEM data in the Bulletin 118 study area is sufficient to refine the thickness of some basalt features critical to hydrogeological modeling. Due to a limited number of well logs in the study area and obstacles encountered during flight path selections, some areas needing additional study do not have significant refinement. Critical recharge areas in Butte Valley are in the basin boundary and the upland to the south and south west. These areas were outside the DWR funded AEM study area. The AEM method is most effective at defining sedimentary features, but due to the geology of Butte Valley, significant pumping, transport, and recharge occur in volcanic structures which are poorly defined by AEM study. Additional work is needed to determine the dimensions and interconnectivity of recharge areas around the Bulletin 118 boundary which will be critical for long term water management.

Dorris Water Meter Installation Project - The City of Dorris has received construction funding through the Drinking Water State Revolving Fund (SRF) for installation of residential water meters, school water meters, and replacement of aging water mains. The project quantities are as follows:

- Drilling of a new 1,200 foot deep primary water supply well
- Residential meter installation - 410
- School meters - 2
- 6” water main - 3,850 lineal feet (approximately 7% of the system’s piping)

The domestic meter installation and pipeline replacement programs are ongoing.

Additionally, the City of Dorris was awarded a State of California Department of Housing and Community Development (CDBG) grant for construction of an additional 1 MG water storage reservoir which was completed in 2018.

Table 5.1: Project and Management Actions Summary.

Project Title	**Status**	**Category**	**Project Description**
Well Drilling Permits	Existing/ Ongoing	Demand Management	Siskiyou County Well Drilling Permits (Standards for Wells, Title 5, Chapter 8 of Siskiyou County Code of Ordinances).
Groundwater Use Restrictions	Existing/ Ongoing	Demand Management	Prohibition of the use of groundwater underlying Siskiyou County for cannabis cultivation (Article 7, Chapter 13, Title 3 of Siskiyou County Code of Ordinances).

Table 5.1: Project and Management Actions Summary. *(continued)*

Project Title	Status	Category	Project Description
Permit required for groundwater extraction for use outside the basin from which it was extracted (Siskiyou County Code of Ordinances)	Existing/ Ongoing	Demand Management	Permit requirement for extraction of groundwater underlying the Basin for use outside the Basin.
Abandonment of Sam's Neck Flood Control Facility	Completed	Supply Enhancement	Expand the wetlands in the Butte Valley Wildlife Area to store all Meiss Lake floodwater and eliminate the need for the Sam's Neck Flood Control Facility.
City of Dorris Water Conservation	Active	Demand Management	Water conservation measures outlined in the City of Dorris Municipal Code
Kegg Meadow Enhancement and Butte Creek Channel Restoration	Completed	Supply Enhancement	Restoration of a properly functioning, resilient wetland ecosystem and aquatic habitat in Kegg Meadow by returning streamflow to the original meadow/channel elevations. Reverting stream to original channel will rewet overall meadow and restore riparian habitat. The site is 1 to 2 acres in size.
Permit required for groundwater extraction for use outside the basin from which it was extracted (Siskiyou County Code of Ordinances)	Active	Demand Management	Permit requirement for extraction of groundwater underlying the Basin for use outside the Basin.
Upland Management	Active	Supply Enhancement	Upland management includes removal of excess vegetation. This can occur on US Forest Service, Bureau of Land Management, or private land.
Watermaster Butte Creek Flow Management	Active	Supply Enhancement	A Watermaster manages flow of Butte Creek into Butte Valley.

Table 5.1: Project and Management Actions Summary. *(continued)*

Project Title	**Status**	**Category**	**Project Description**
Well inventory and Mitigation Program	Active	Supply Enhancement	Development and implementation of a program to address well outage issues due to groundwater level declines for domestic well owners.
Preliminary Groundwater Allocation Program	Active	Demand Management	Development of a draft program for groundwater allocation as a potential management action.
City of Dorris Well Deepening and Pipeline Replacement Project	Active	Supply Enhancement	Replace or repair water distribution system, City well and up to 4 Butte Valley wells.
Avoiding Increase of Total Net Groundwater Use Above Sustainable Yield	Planning Phase	Demand Management	Avoid significant future expansion of total net consumptive water use within the Basin and its surrounding watershed through planning and coordination
Dorris Water Meter Installation Project	Invitation for Bids sent out Feb 2021. Contractor proposals due March 18, 2021	Demand Management	The City of Dorris is upgrading their water system by installing water meters and replacing old pipelines.
Irrigation Efficiency Improvements	Active	Demand Management	Increase irrigation efficiency (and in some cases, yields) through infrastructure or equipment improvements. This PMA will focus on low efficiency practices. Exceptions may include landowners that have already implemented irrigation efficiency improvements and best management practices.
Public Outreach	Active	GSA Implementation	Public outreach and education for GSA stakeholders.

Table 5.1: Project and Management Actions Summary. *(continued)*

Project Title	**Status**	**Category**	**Project Description**
Voluntary Managed Land Repurposing	Conceptual Phase	Demand Management	Reduce water use through other voluntary managed land repurposing activities including term contracts, crop rotation, irrigated margin reduction, conservation easements, and other uses
Alternative, lower ET crops	Conceptual Phase	Demand Management	Pilot programs on introducing alternative crops with lower ET but sufficient economic value. Incentivize and provide extension on long-term shift to lower ET crops.
Butte Creek Diversion Relocation	Conceptual Phase	Supply Enhancement	Move the diversion of Butte Creek to Cedar Lake/Dry Lake
Butte Valley National Grassland Groundwater Recharge Project	Conceptual Phase	Recharge	Explore recharge benefits in National Grasslands from Meiss Lake overflow.
Strategic Groundwater Pumping Restriction	Conceptual Phase	Demand Management	Strategic timing of groundwater pumping curtailments. This management action would only be developed if Tier I and Tier II PMAs are insufficient. It would be an alternative for the GSA in support of the groundwater level SMC.

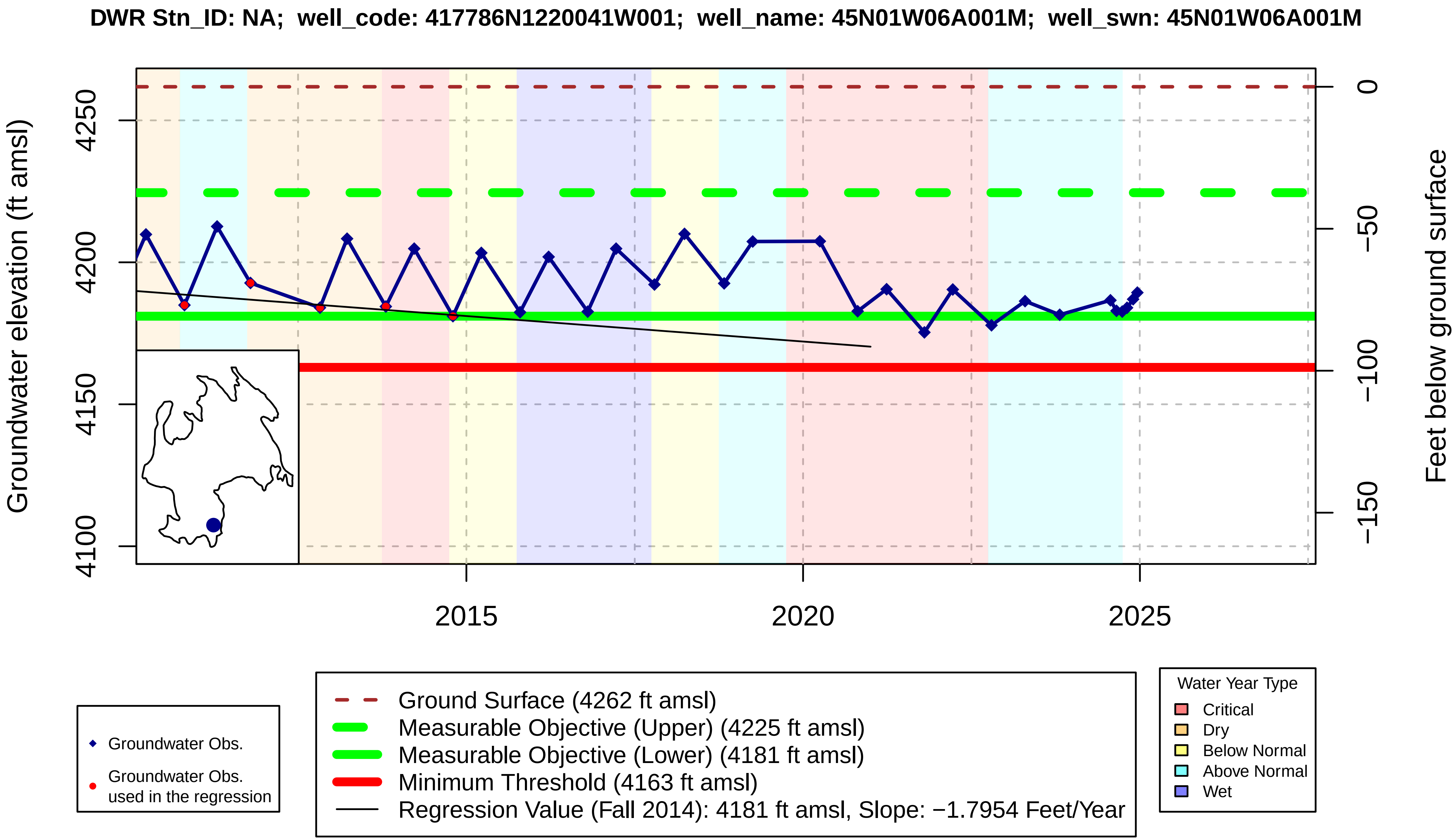
Appendix A - Groundwater Elevation Hydrographs

The hydrographs used to set the minimum thresholds (MT) and measurable objectives (MO) for each representative monitoring point are shown in the following figures (Appendix A.1). Data points used to calculate the MTs and MOs are marked with a red dot. The groundwater level data used in the regression to calculate minimum thresholds have gone through a quality assurance and quality control (QAQC) process that removes data from the analysis for the following reasons:

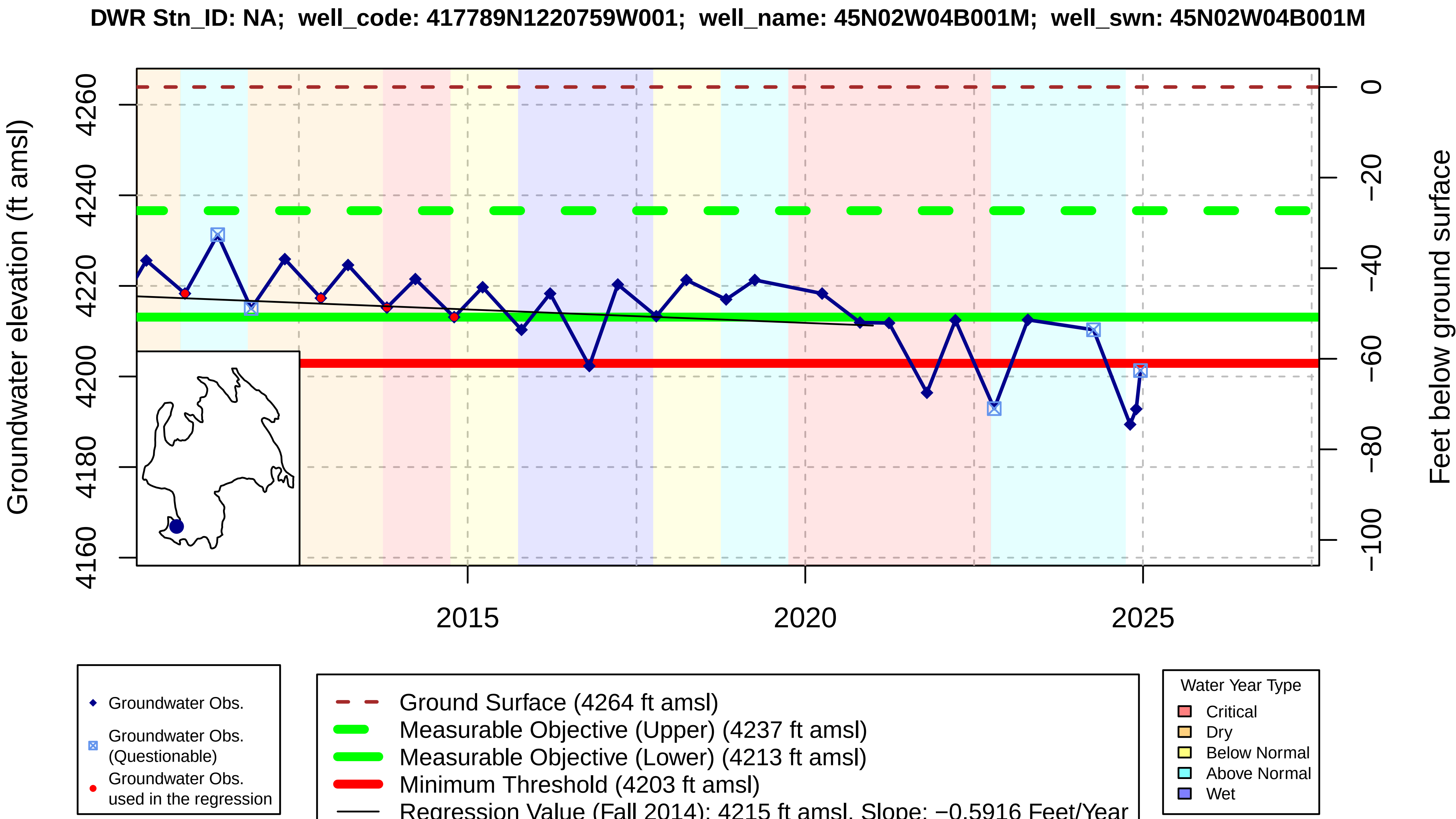
- Oil or other foreign substances were floating at the groundwater surface inside the well and the data had high uncertainty as a result.
- The well was pumped recently.
- During the minimum threshold process and generation of a regression equation, a data point was deemed an outlier, which may result from the interference of drawdown from nearby wells.

Appendix A.2 shows general hydrographs for the larger GSP monitoring network, including wells for which SMCs were not defined. Water Year Types from WY 2019−2024 have been updated in hydrographs below. Note that these are preliminary results calculated based on SGMA Water Year Type Dataset Development Report. The results will be finalized once DWR updates the water year type dataset for these years.

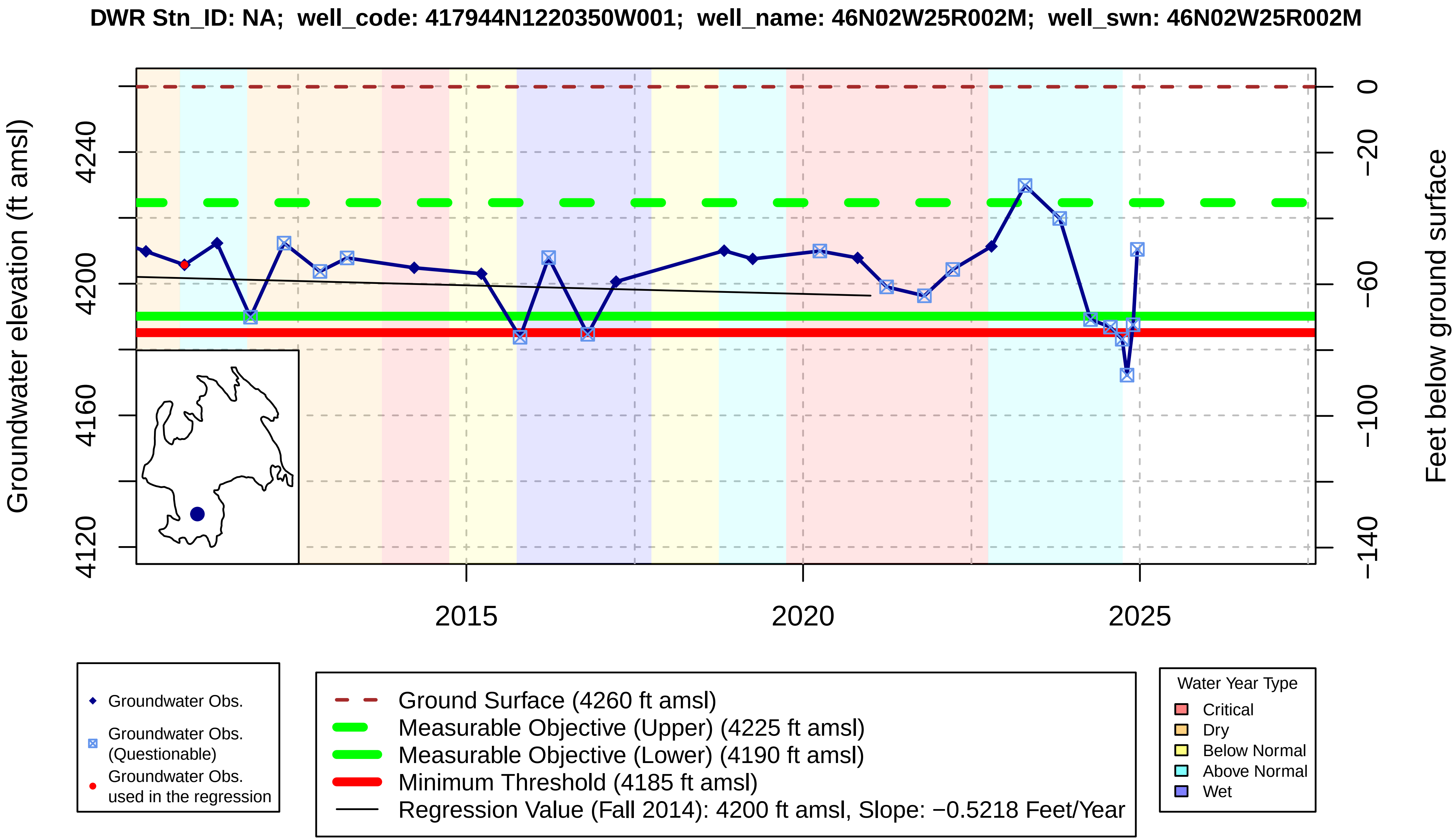
Appendix A.1 - Groundwater Elevation Hydrographs for the RMP Network.



Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.

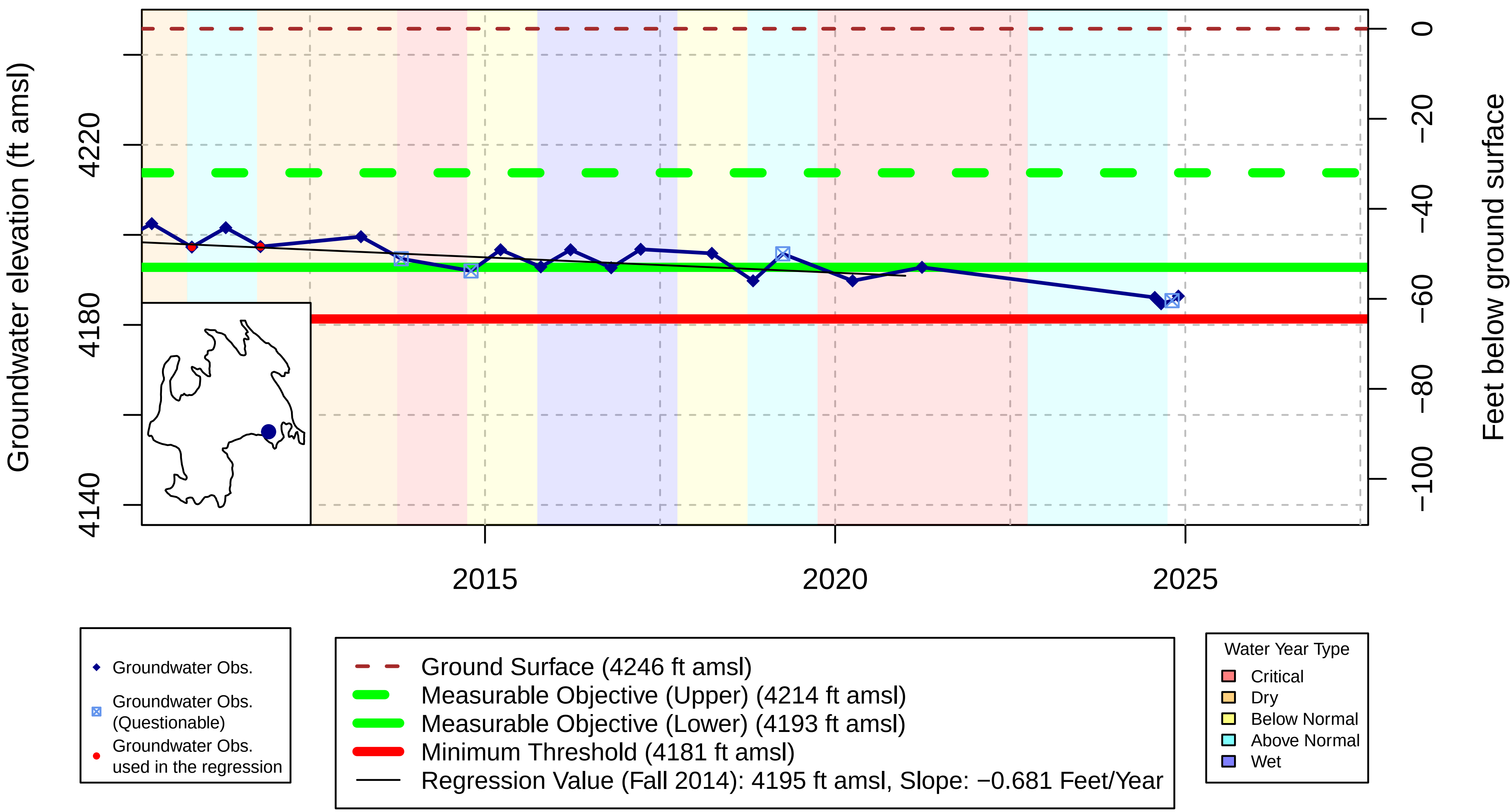


Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.

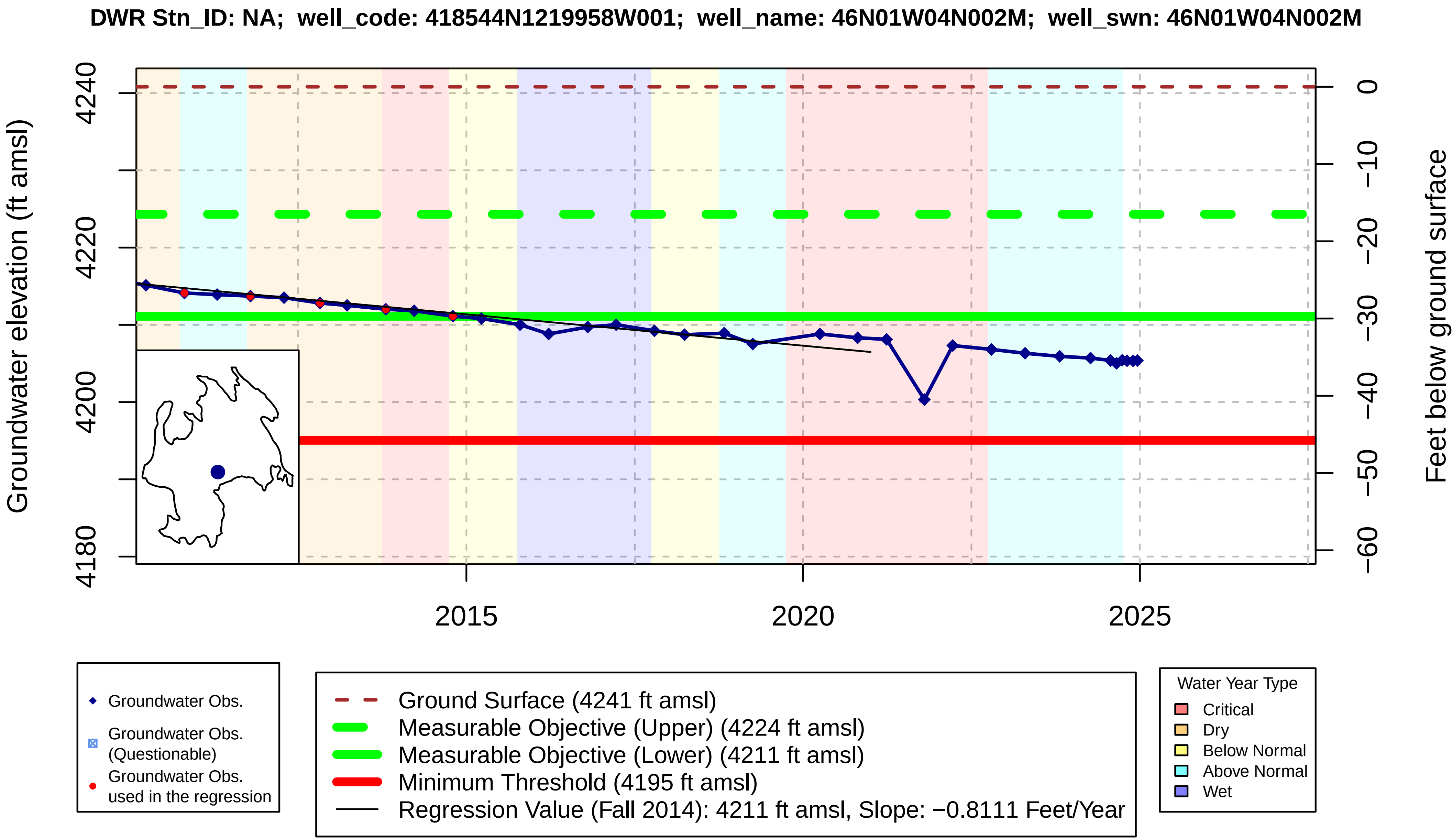


Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report. The results will be finalized once DWR updates the water year type dataset for these years.

DWR Stn_ID: NA; well_code: 418512N1219183W001; well_name: 46N01E06N001M; well_swn: 46N01E06N001M

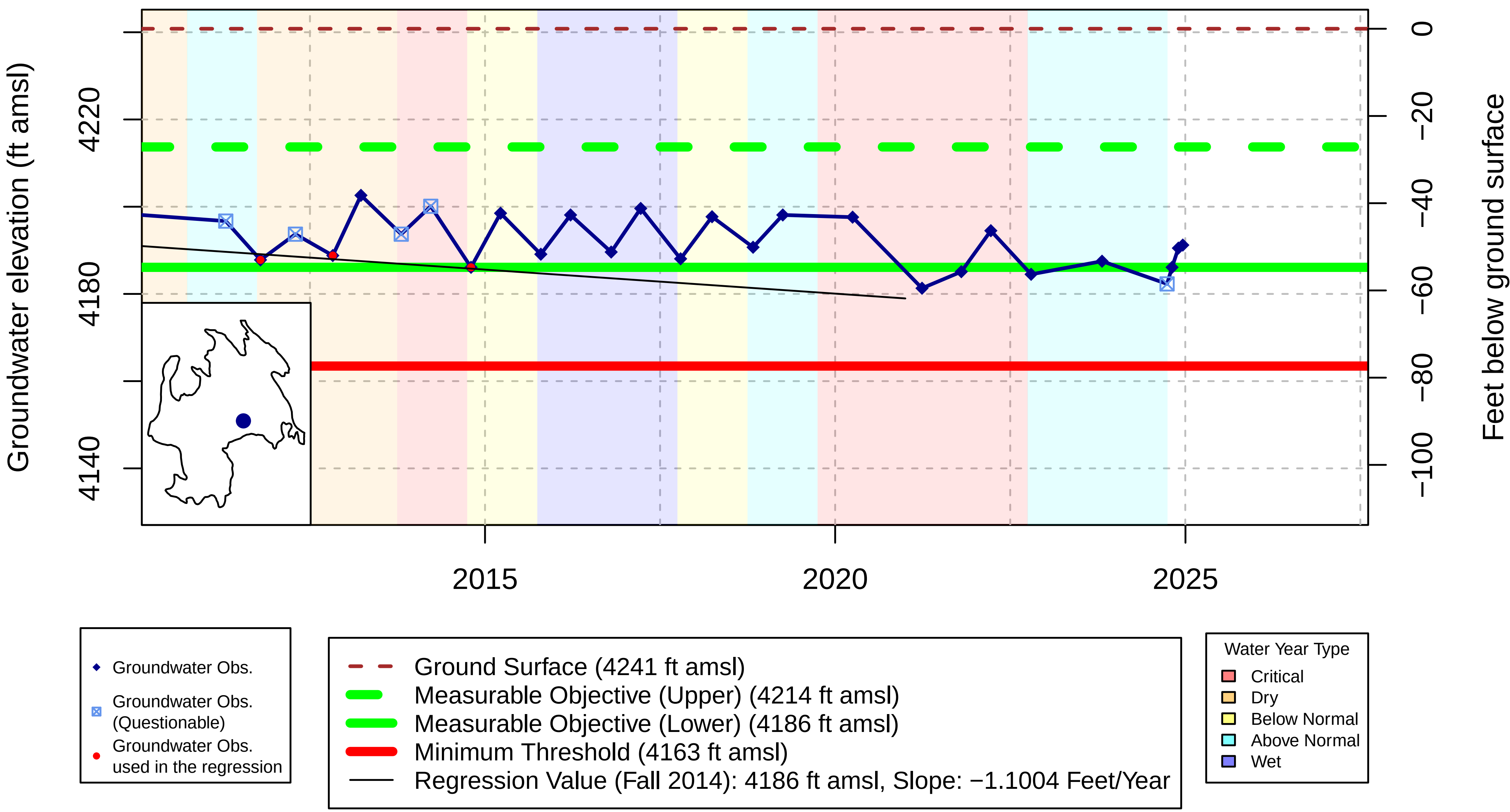


Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.



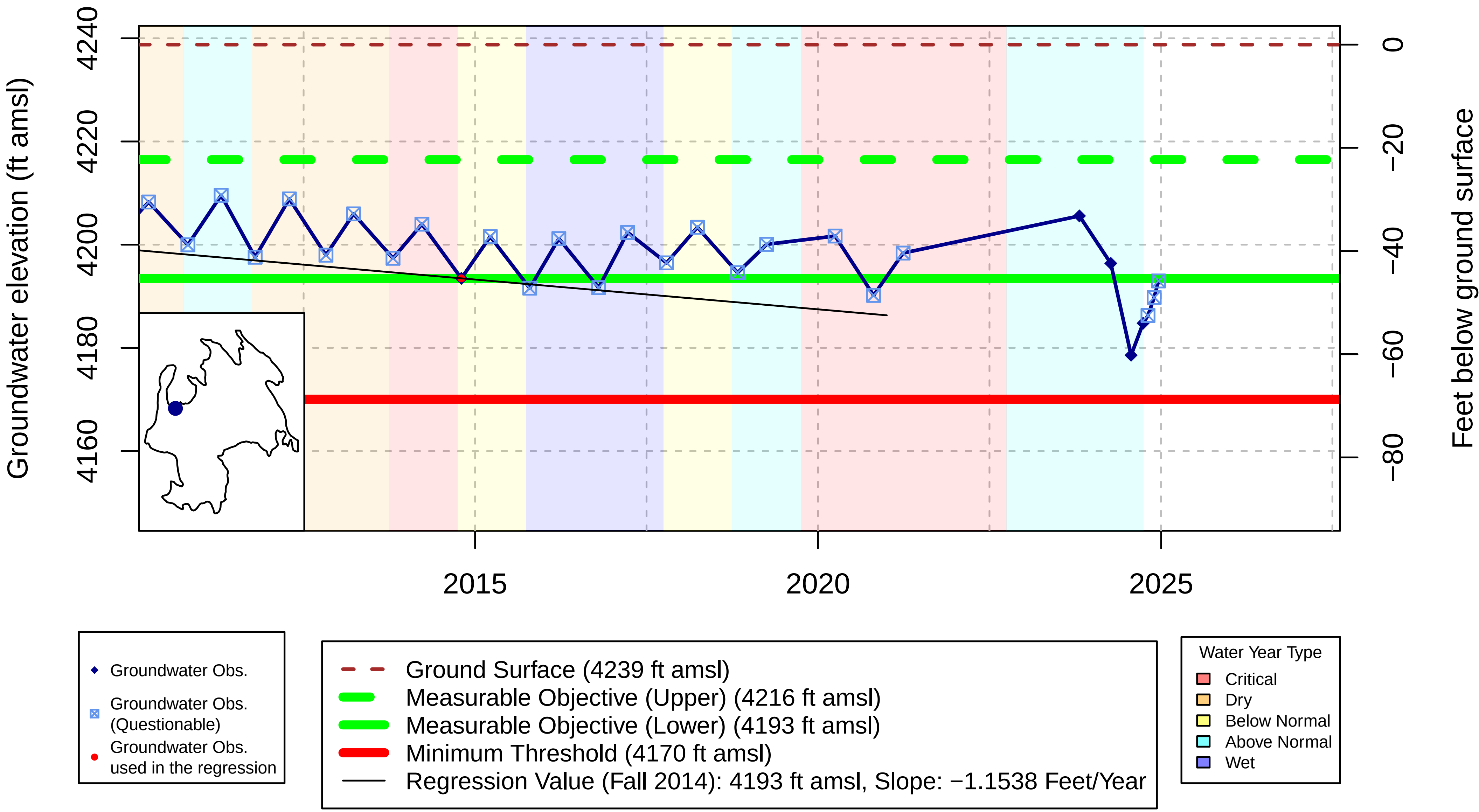
Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report. The results will be finalized once DWR updates the water year type dataset for these years.

DWR Stn_ID: NA; well_code: 418661N1219587W001; well_name: 47N01W34Q001M; well_swn: 47N01W34Q001M

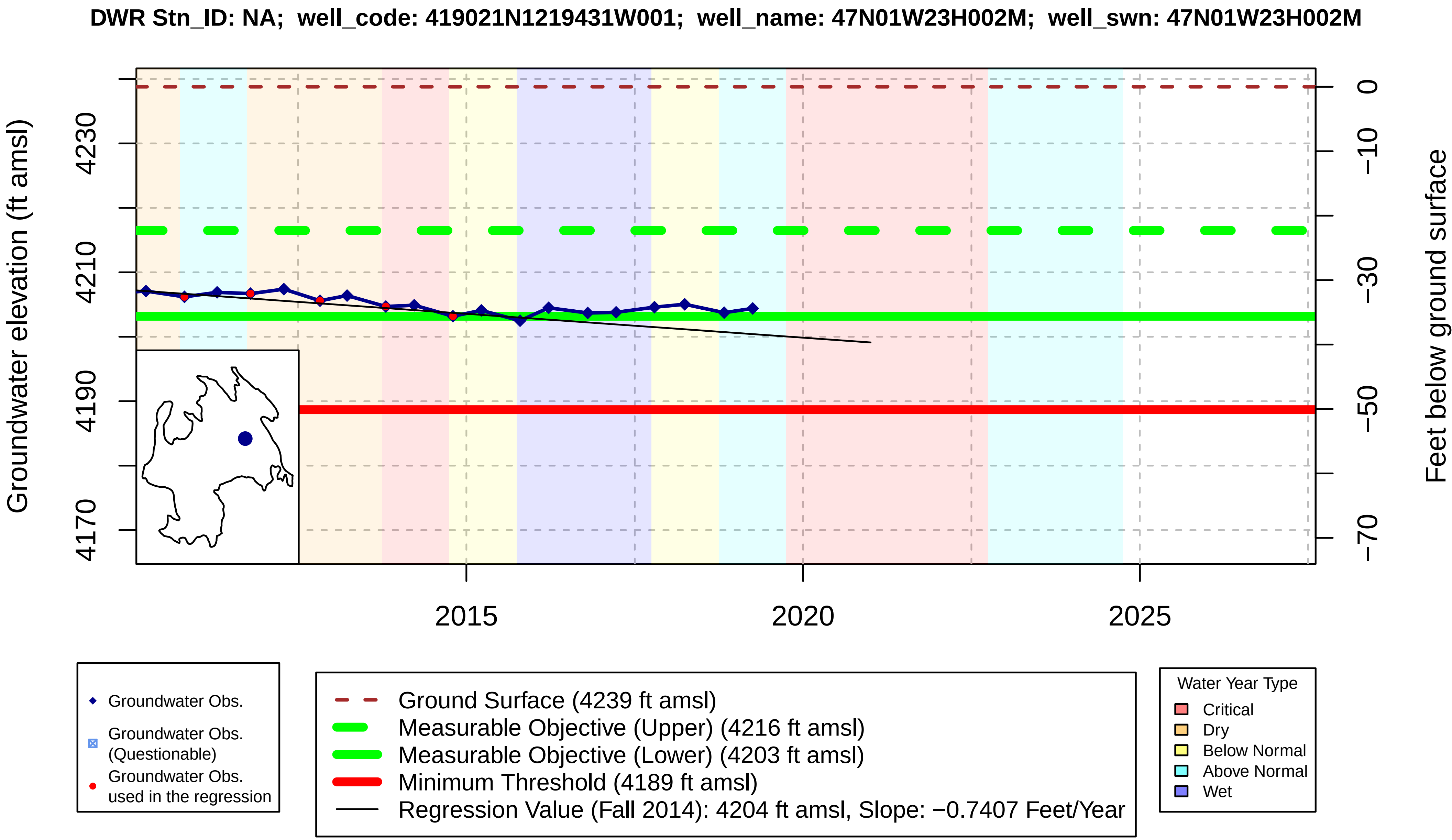


Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.

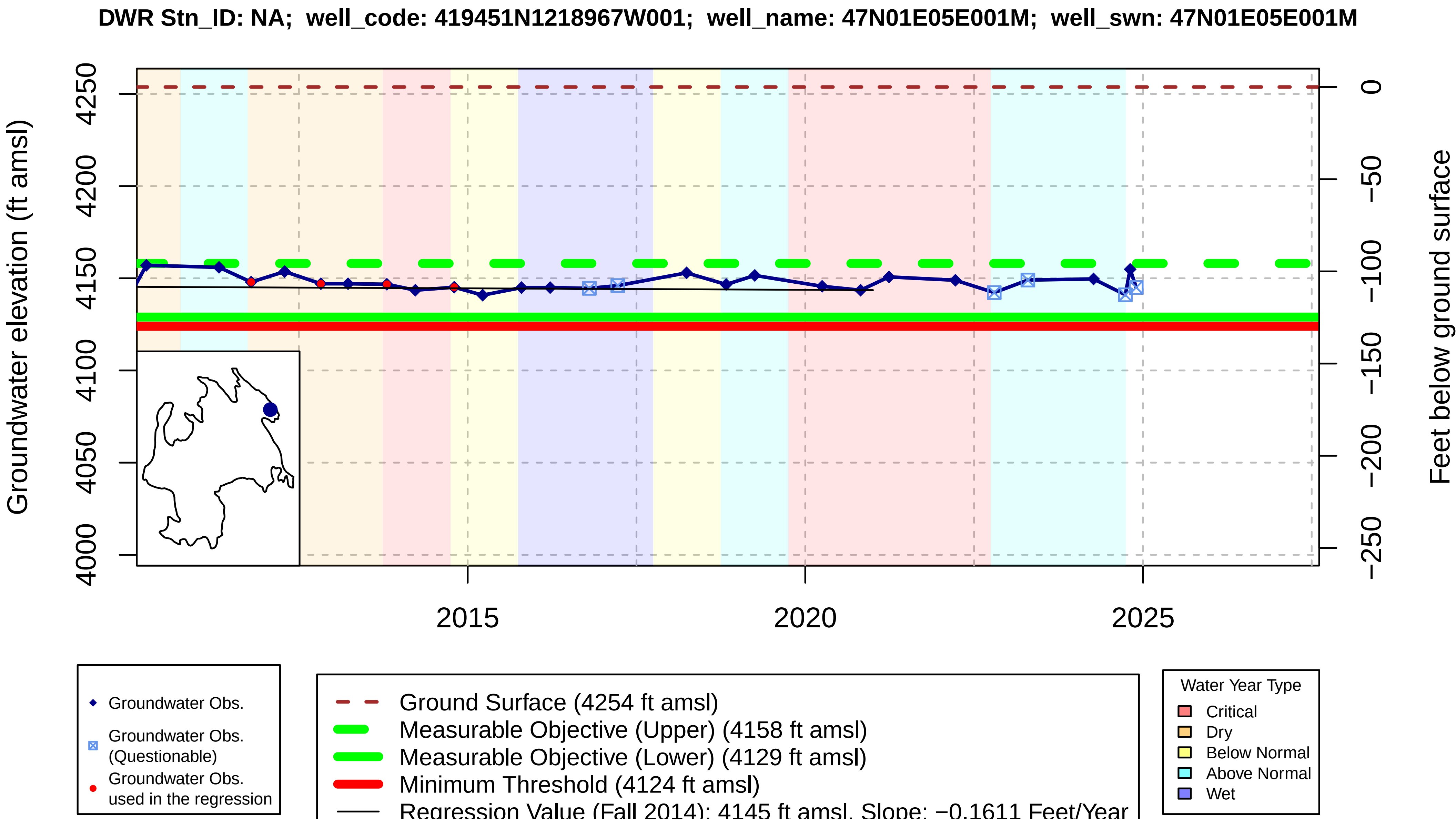
DWR Stn_ID: NA; well_code: 418948N1220832W001; well_name: 47N02W27C001M; well_swn: 47N02W27C001M



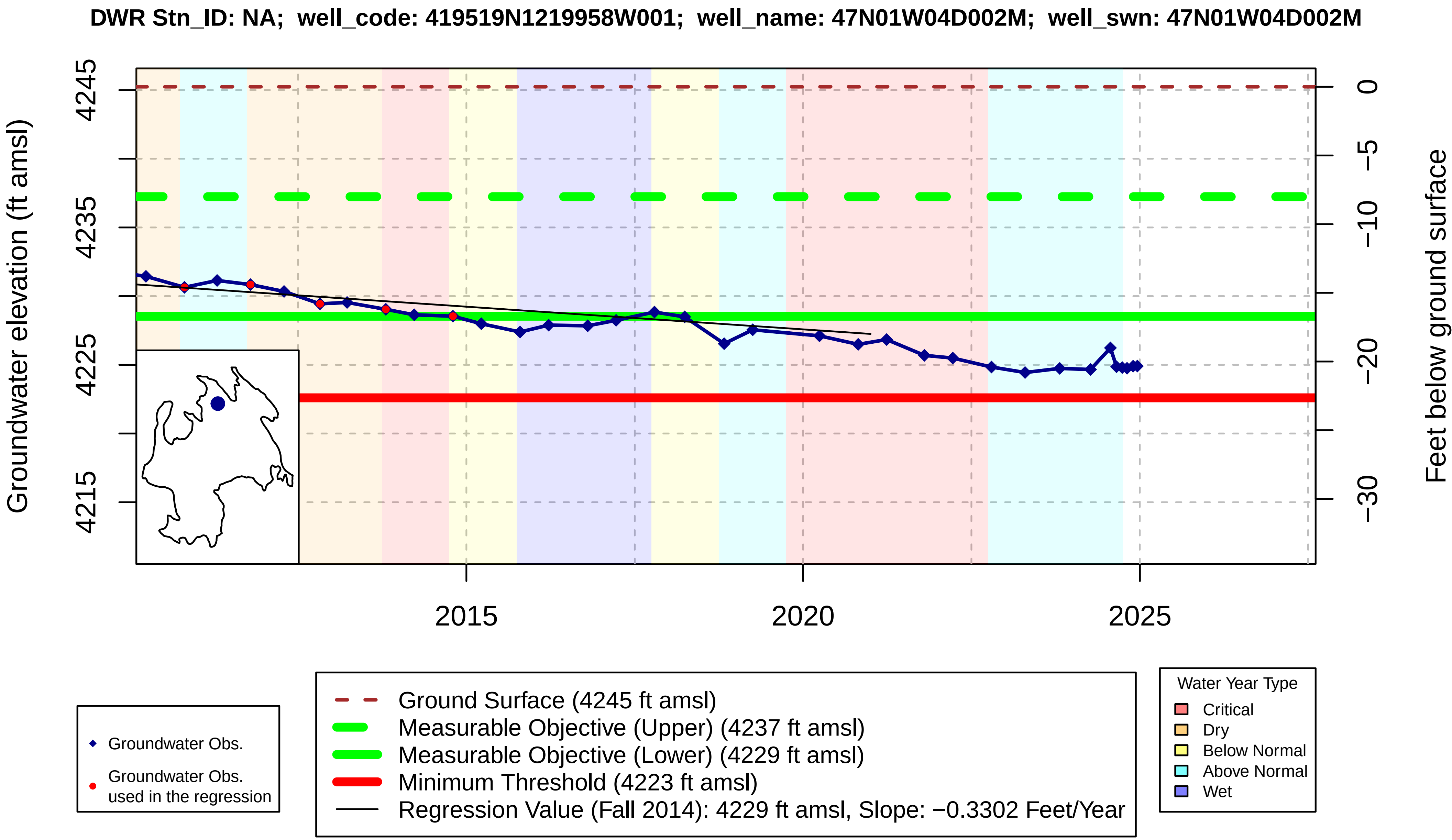
Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.



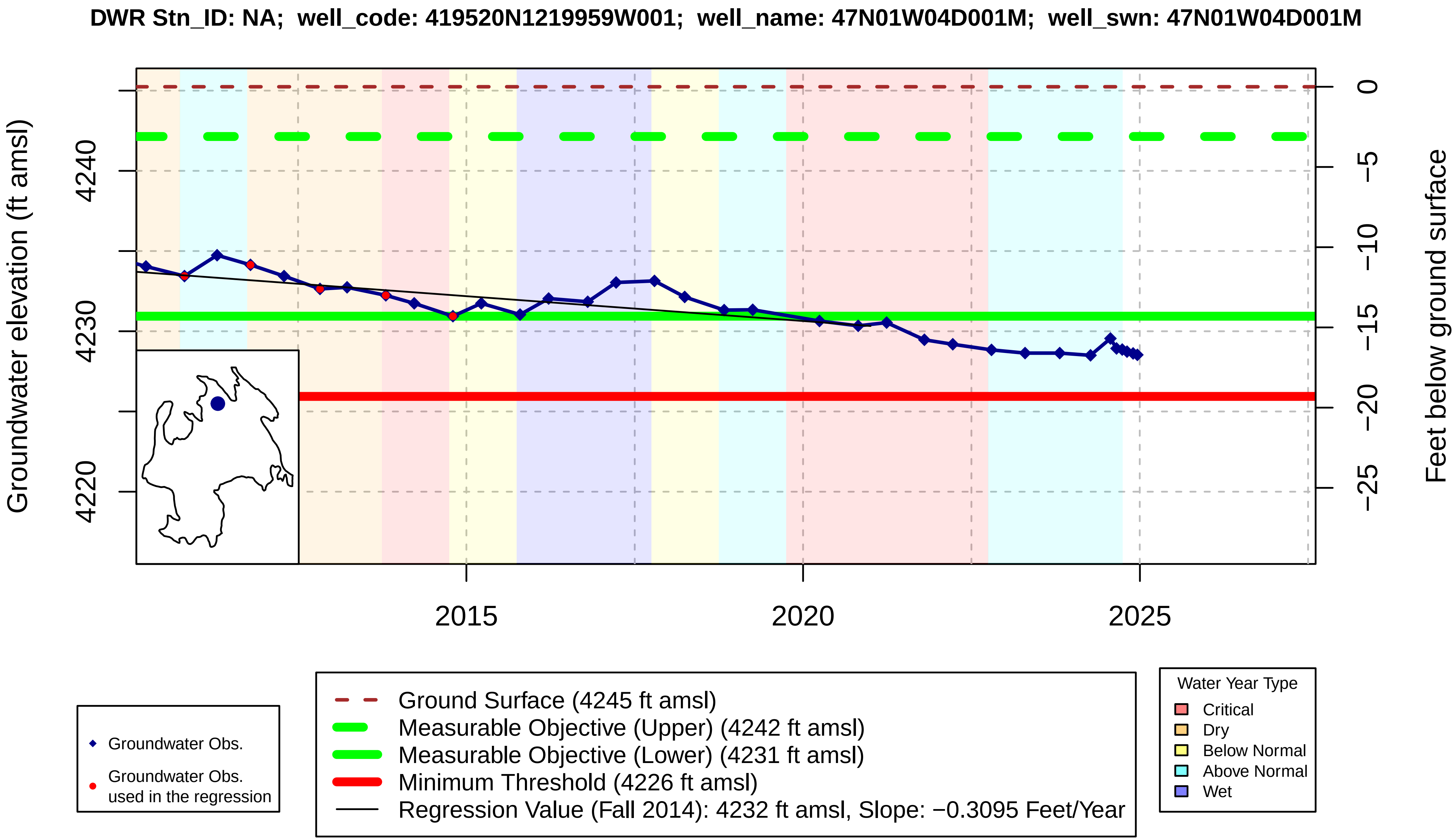
Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report. The results will be finalized once DWR updates the water year type dataset for these years.



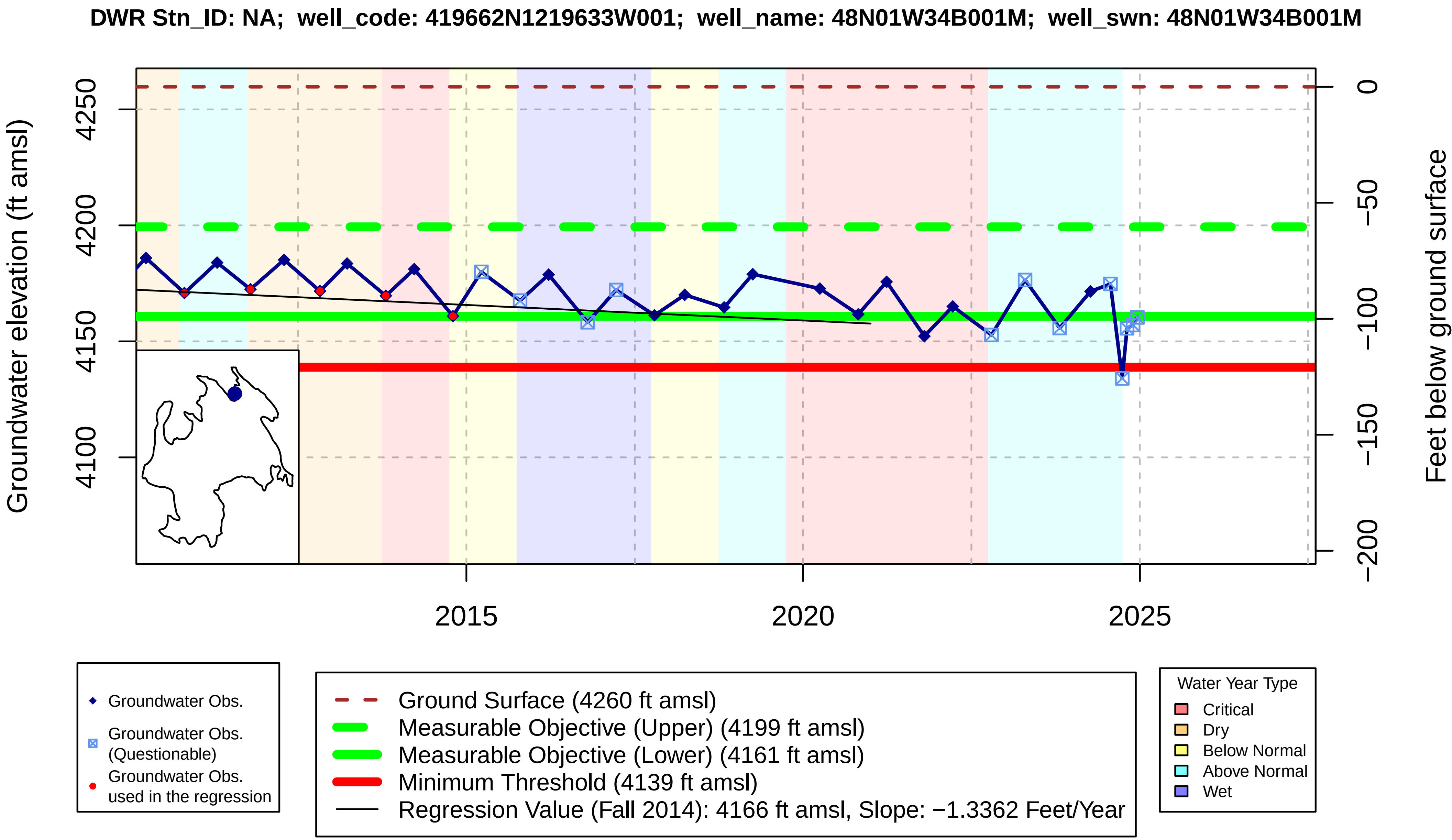
Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.



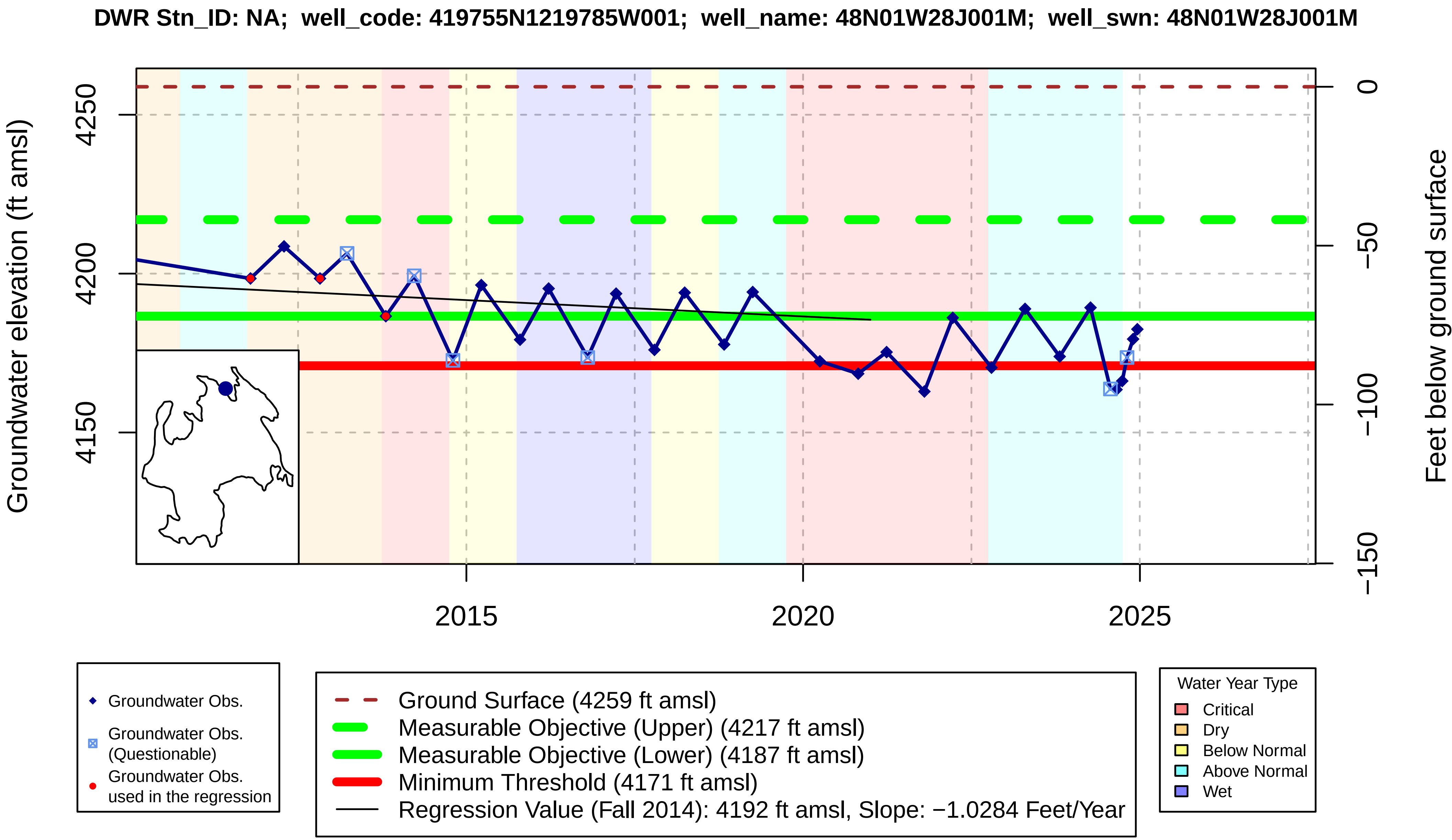
Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.



Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report. The results will be finalized once DWR updates the water year type dataset for these years.

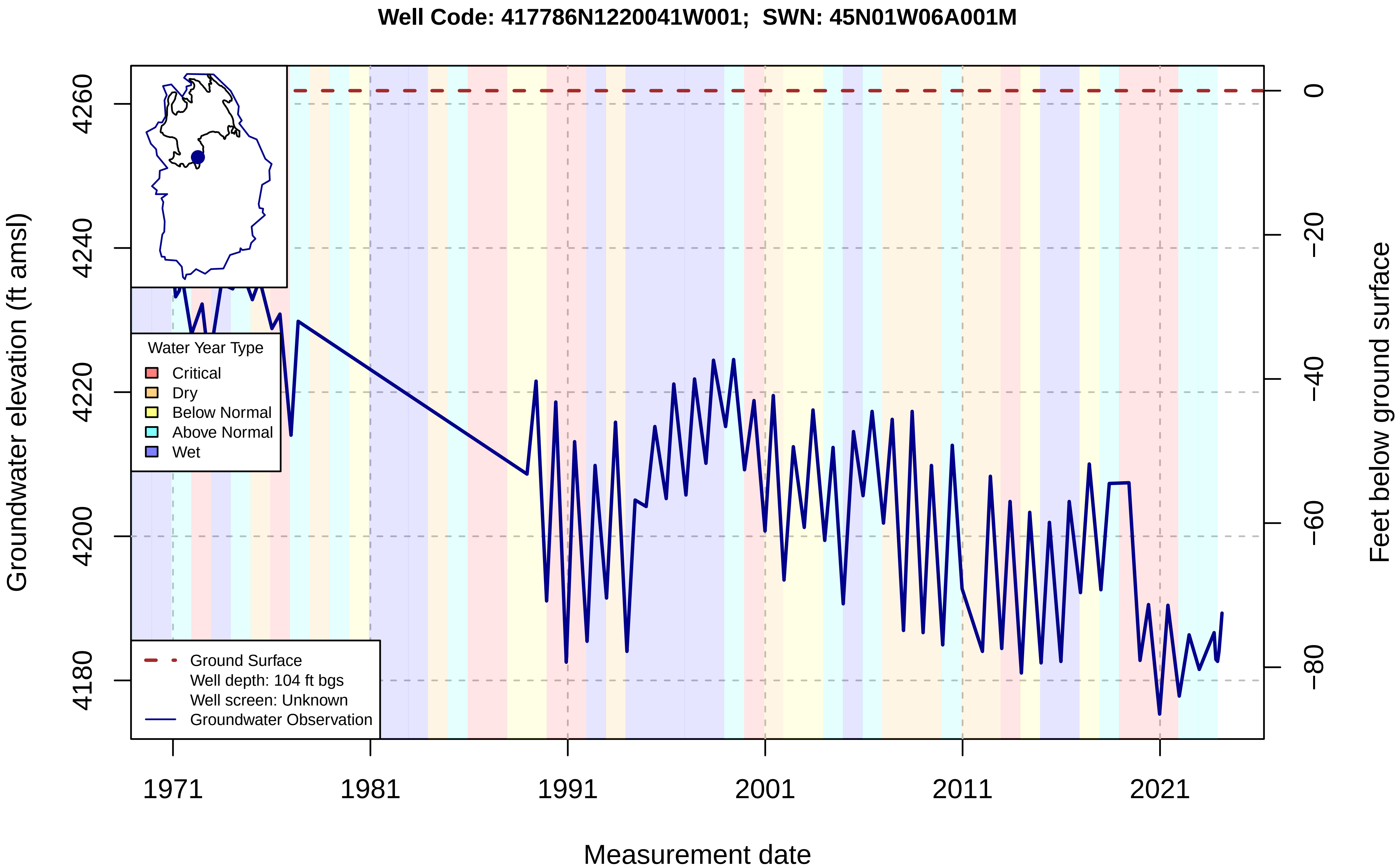


Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report.
The results will be finalized once DWR updates the water year type dataset for these years.

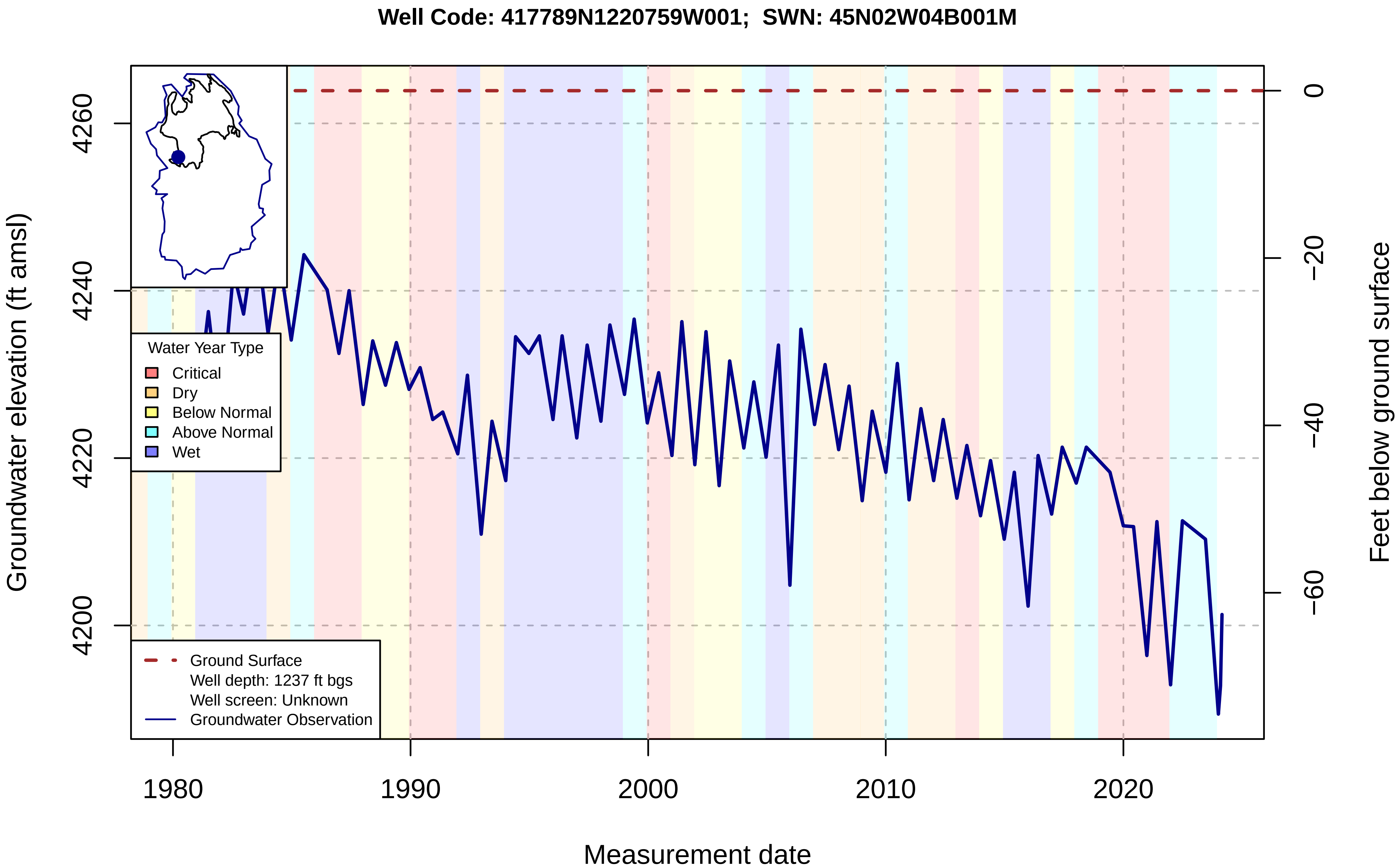


Water Year Types from WY 2019−2024 are preliminary results calculated based on SGMA Water Year Type Dataset Development Report. The results will be finalized once DWR updates the water year type dataset for these years.

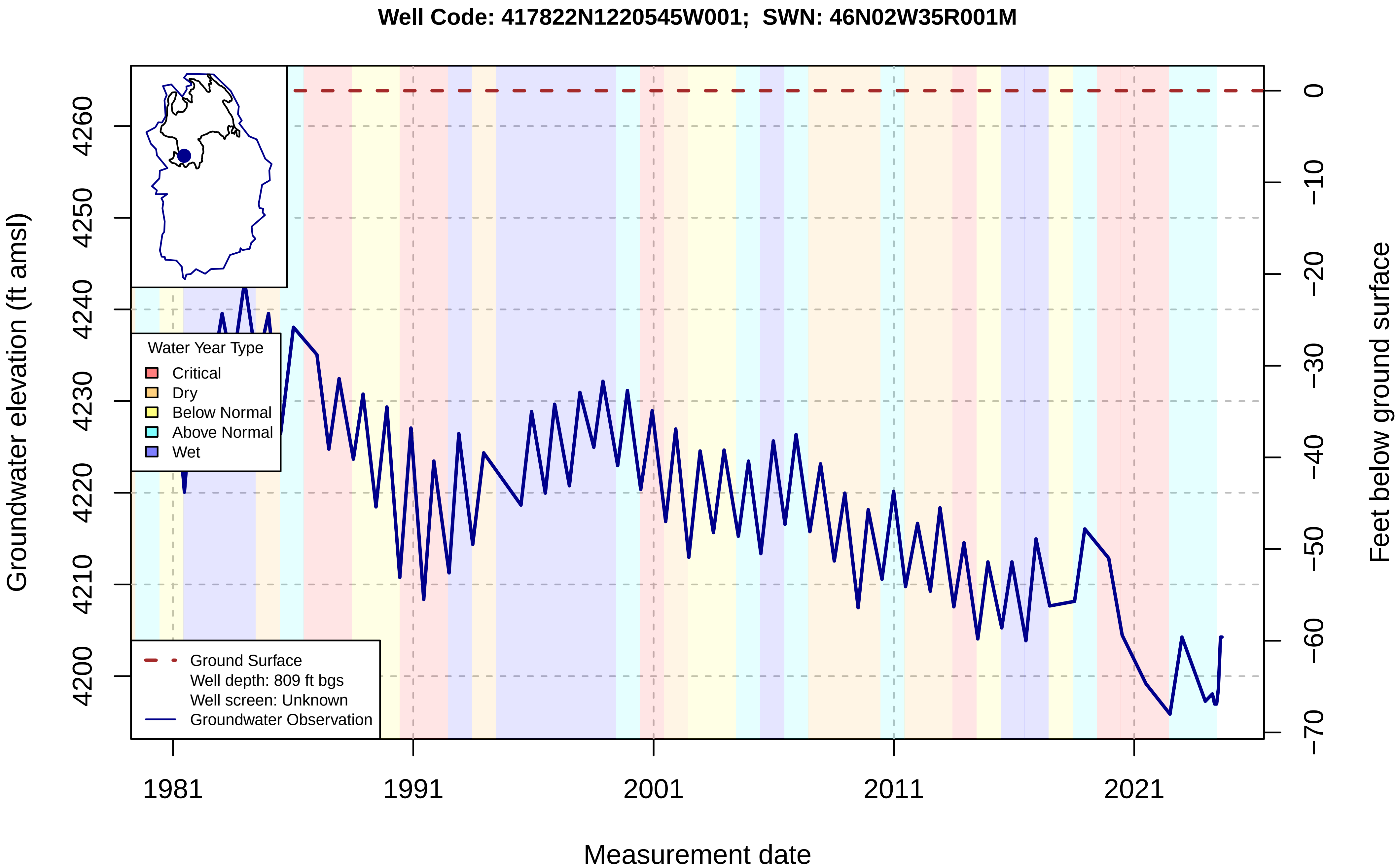
Appendix A.2 - Additional Groundwater Elevation Hydrographs



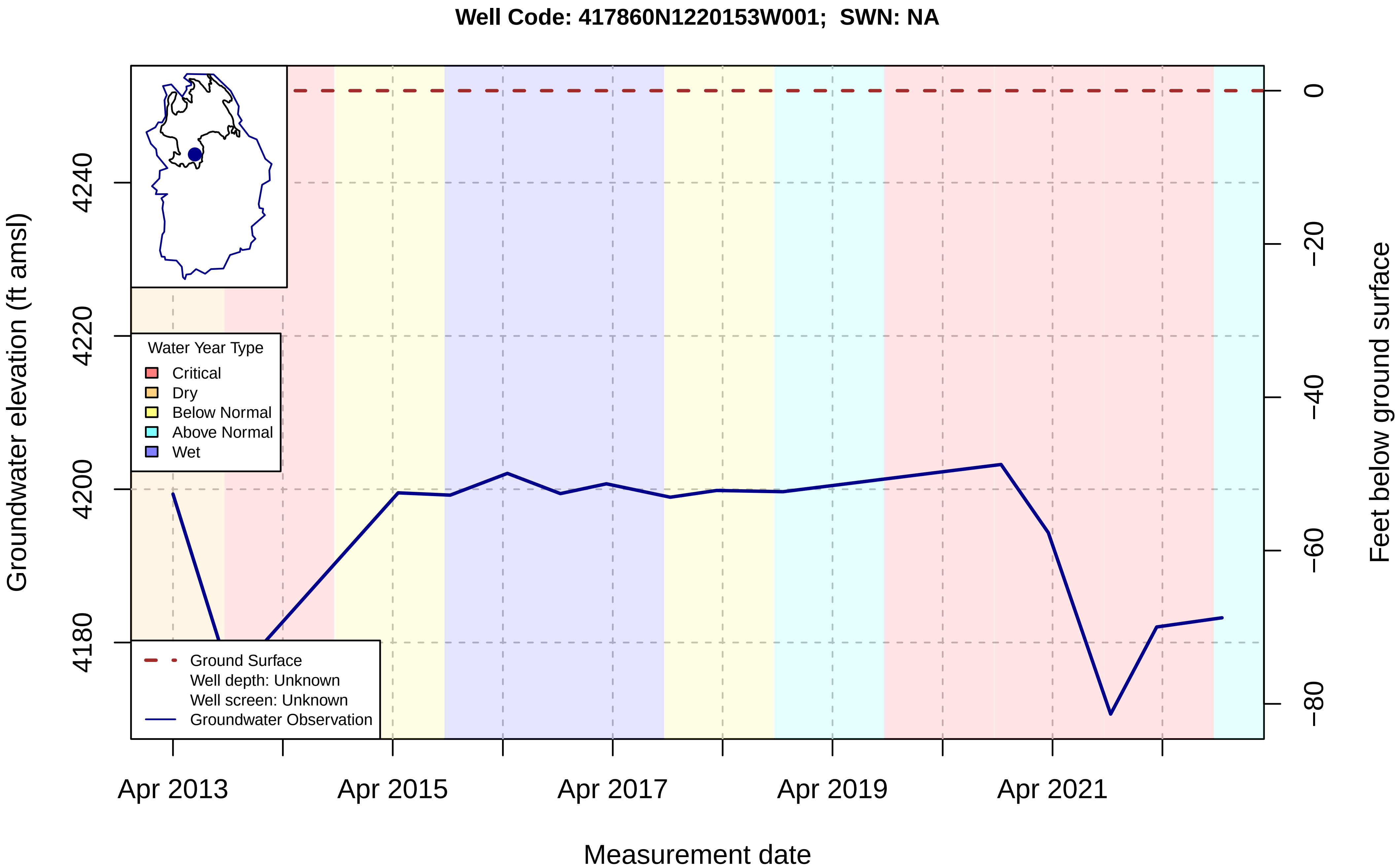
Well Code: 417786N1220041W001; SWN: 45N01W06A001M
Groundwater elevation (ft amsl)
4180
4200
4220
4240
4260
Feet below ground surface
0
−20
−40
−60
−80
Measurement date
1971
1981
1991
2001
2011
2021
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 104 ft bgs
Well screen: Unknown
Groundwater Observation



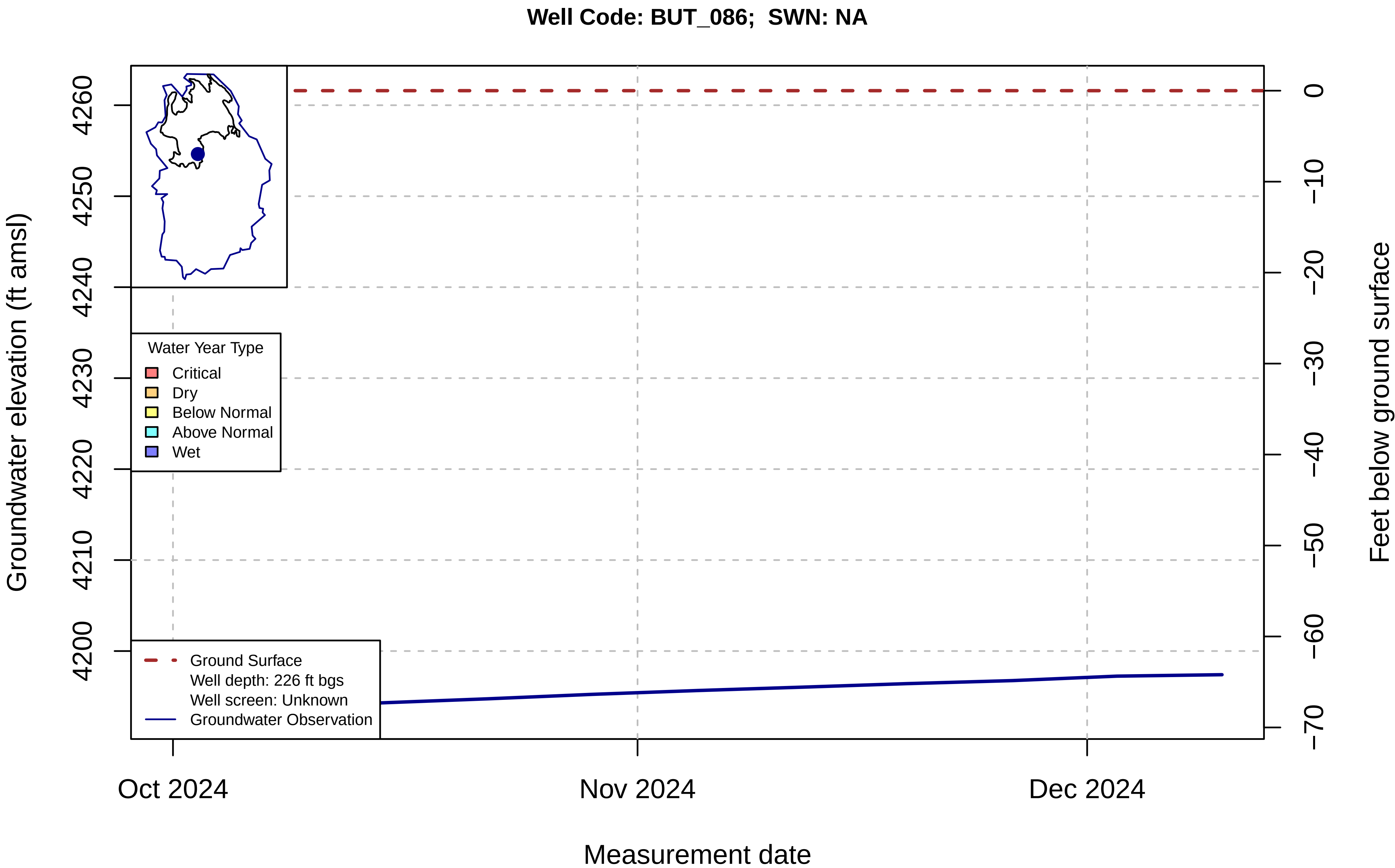
Well Code: 417789N1220759W001; SWN: 45N02W04B001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
4200
4220
4240
4260
0
−20
−40
−60
1980
1990
2000
2010
2020
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 1237 ft bgs
Well screen: Unknown
Groundwater Observation



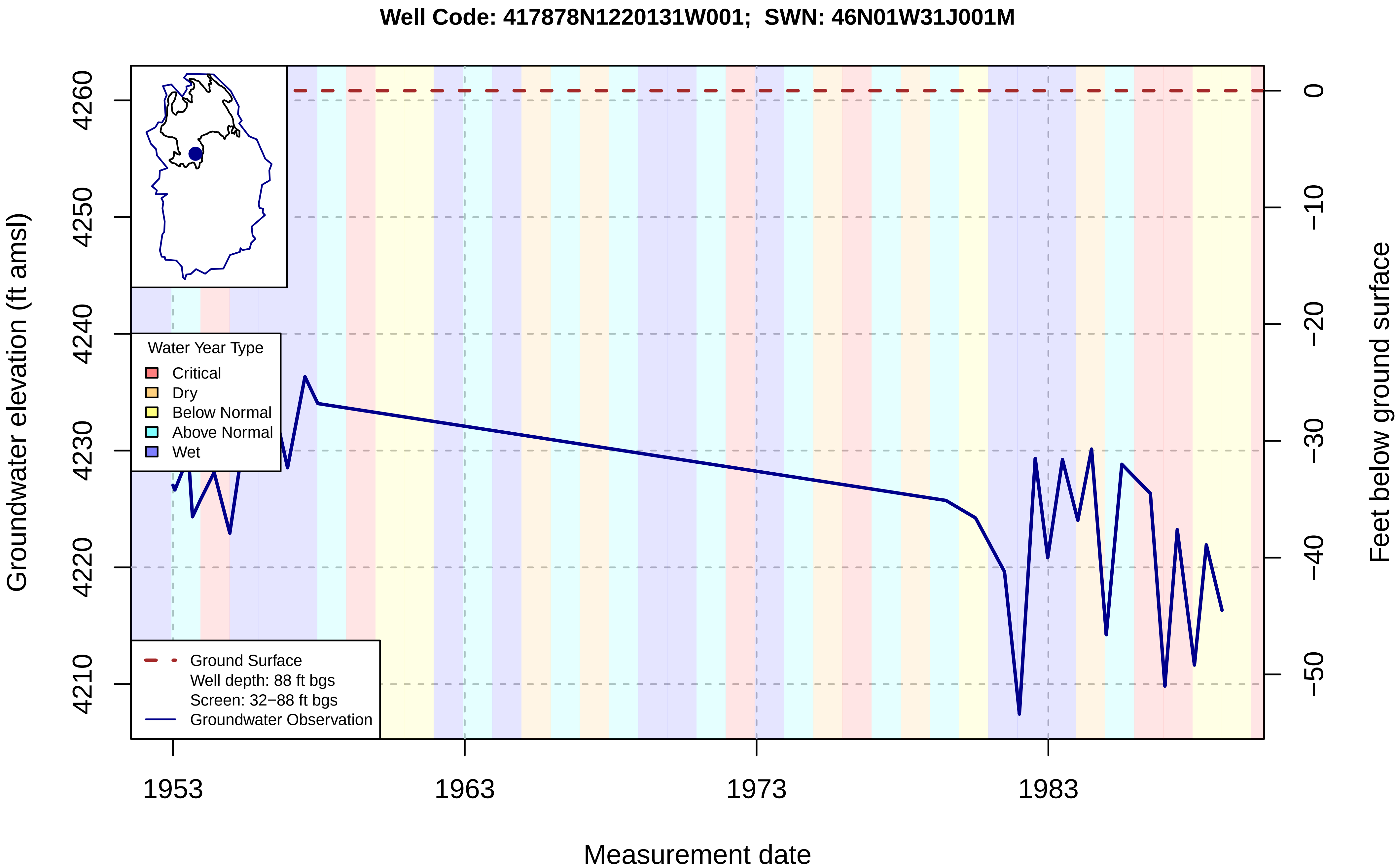
Well Code: 417822N1220545W001; SWN: 46N02W35R001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
4200
4210
4220
4230
4240
4250
4260
0
−10
−20
−30
−40
−50
−60
−70
1981
1991
2001
2011
2021
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 809 ft bgs
Well screen: Unknown
Groundwater Observation



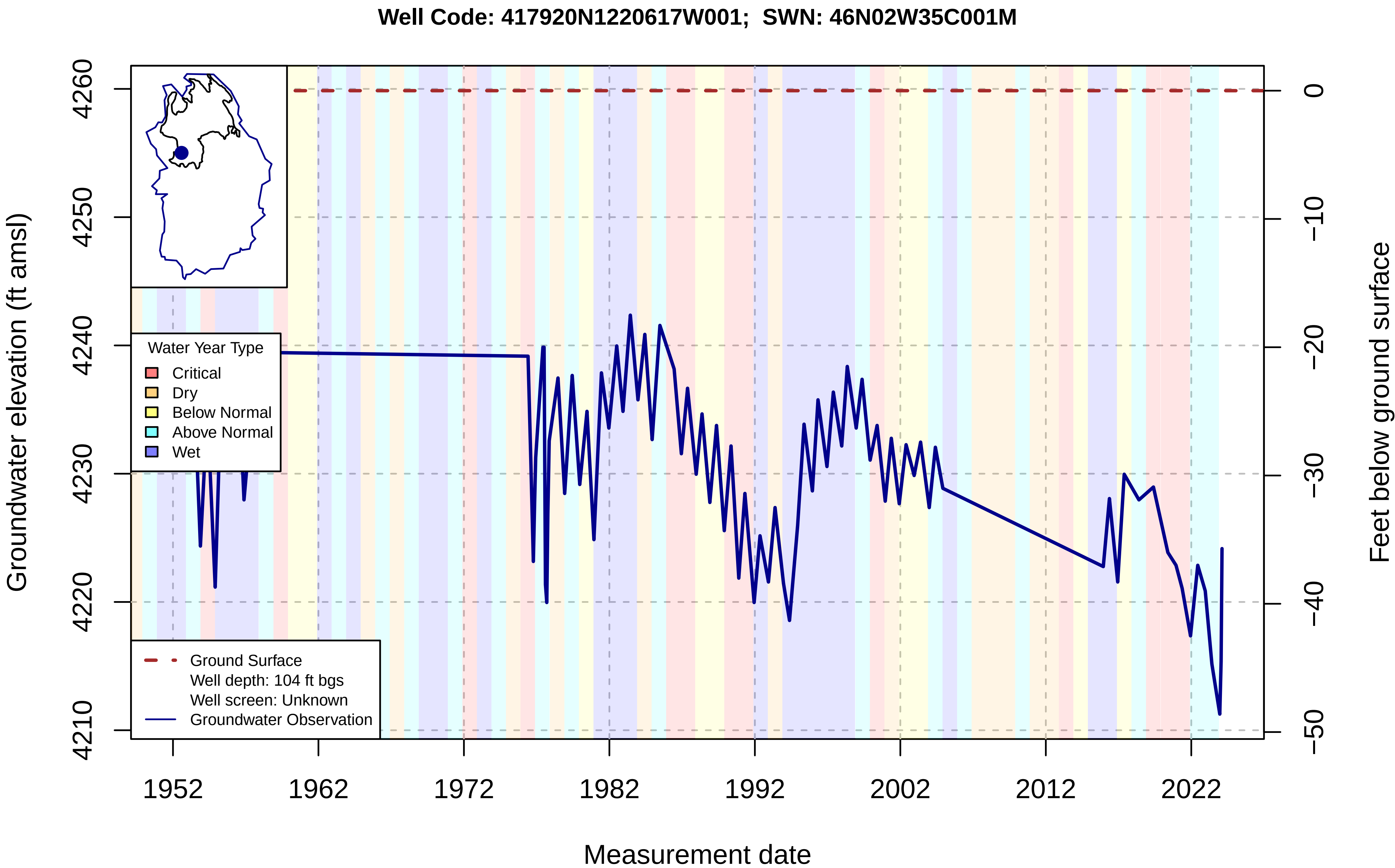
Well Code: 417860N1220153W001; SWN: NA
Groundwater elevation (ft amsl)
4180
4200
4220
4240
Feet below ground surface
0
−20
−40
−60
−80
Apr 2013
Apr 2015
Apr 2017
Apr 2019
Apr 2021
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation



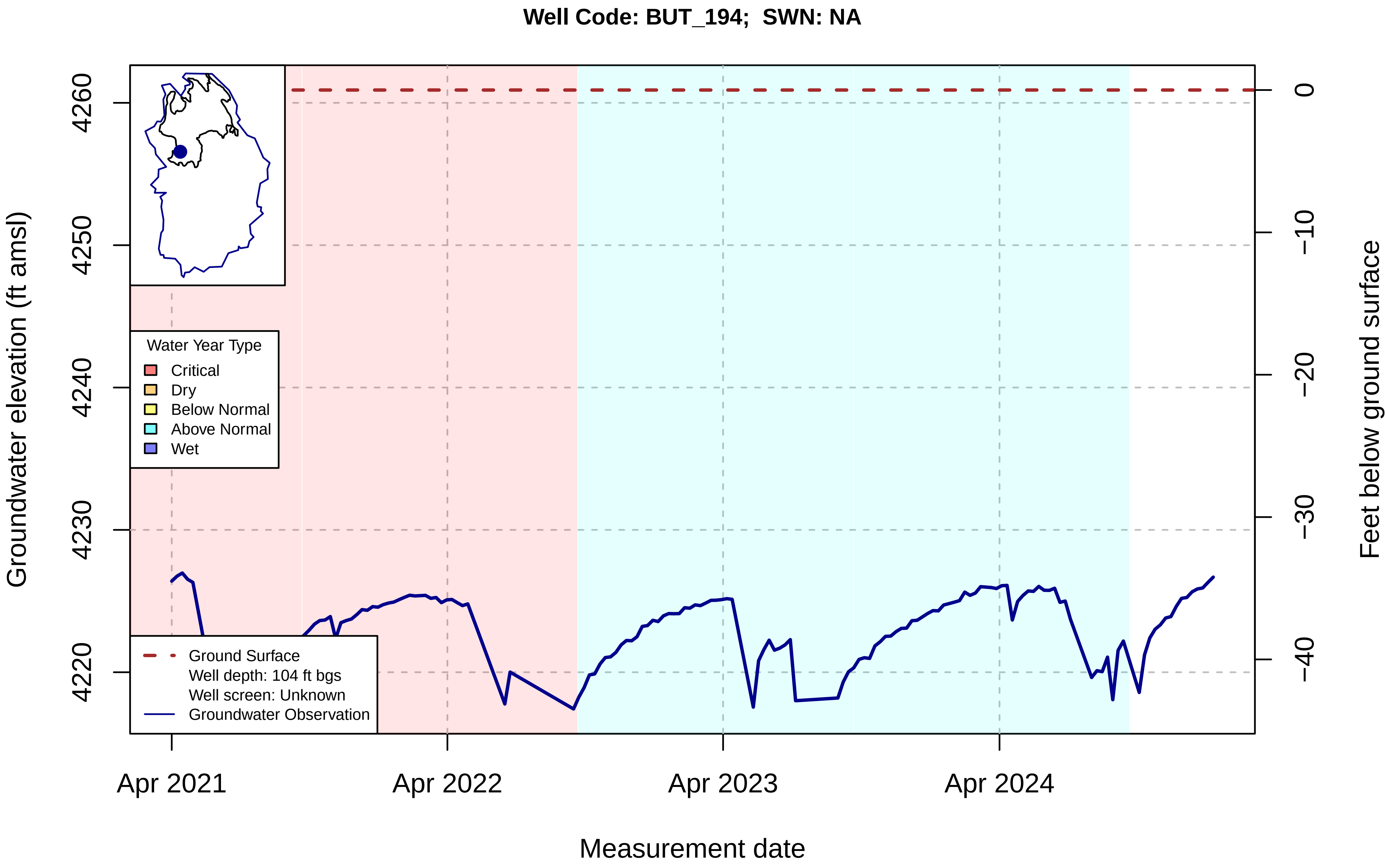
Well Code: BUT_086; SWN: NA
Groundwater elevation (ft amsl)
4200
4210
4220
4230
4240
4250
4260
Feet below ground surface
0
−10
−20
−30
−40
−50
−60
−70
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 226 ft bgs
Well screen: Unknown
Groundwater Observation
Oct 2024
Nov 2024
Dec 2024
Measurement date

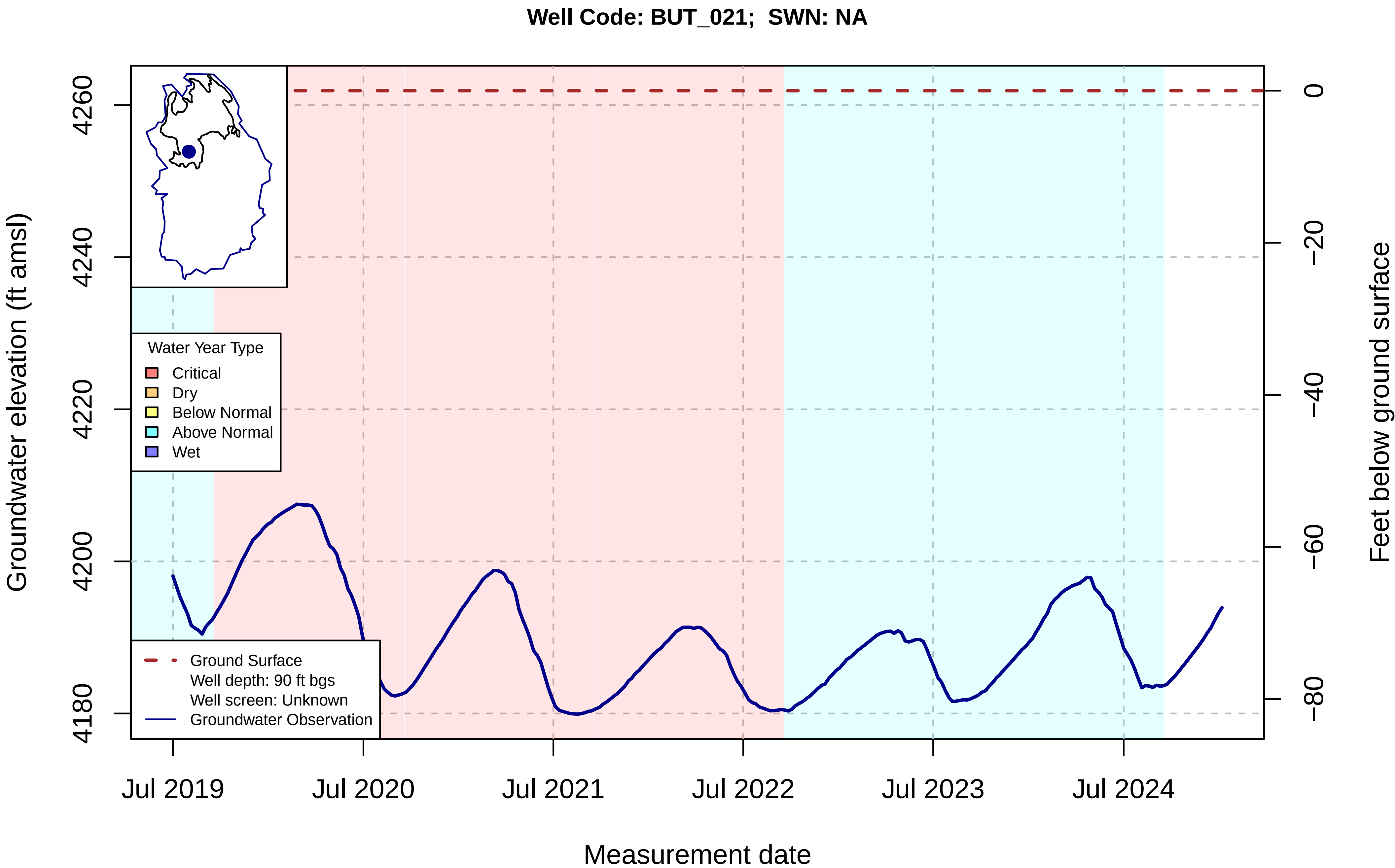


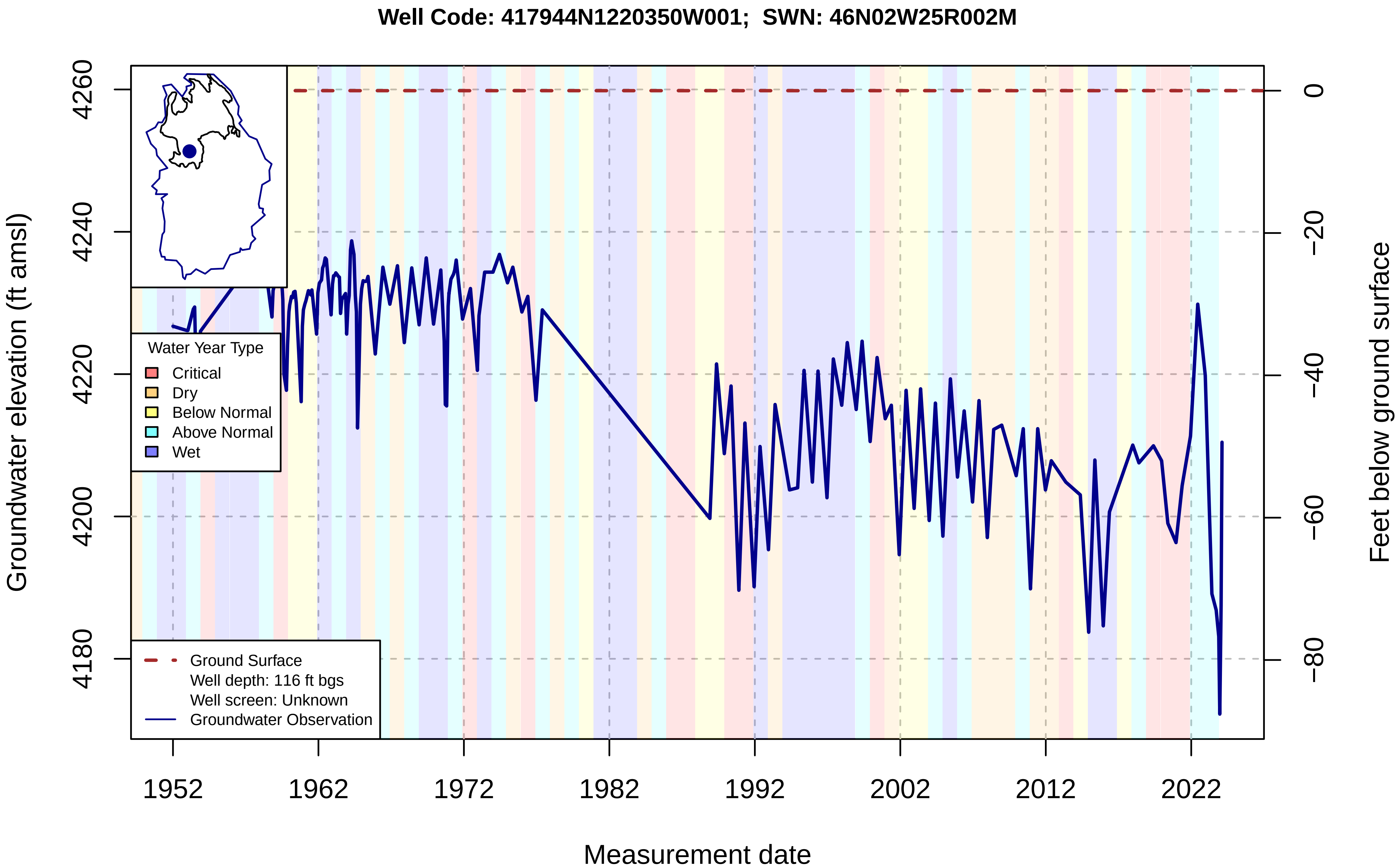
Well Code: 417878N1220131W001; SWN: 46N01W31J001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
4210
4220
4230
4240
4250
4260
0
−10
−20
−30
−40
−50
1953
1963
1973
1983
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 88 ft bgs
Screen: 32−88 ft bgs
Groundwater Observation



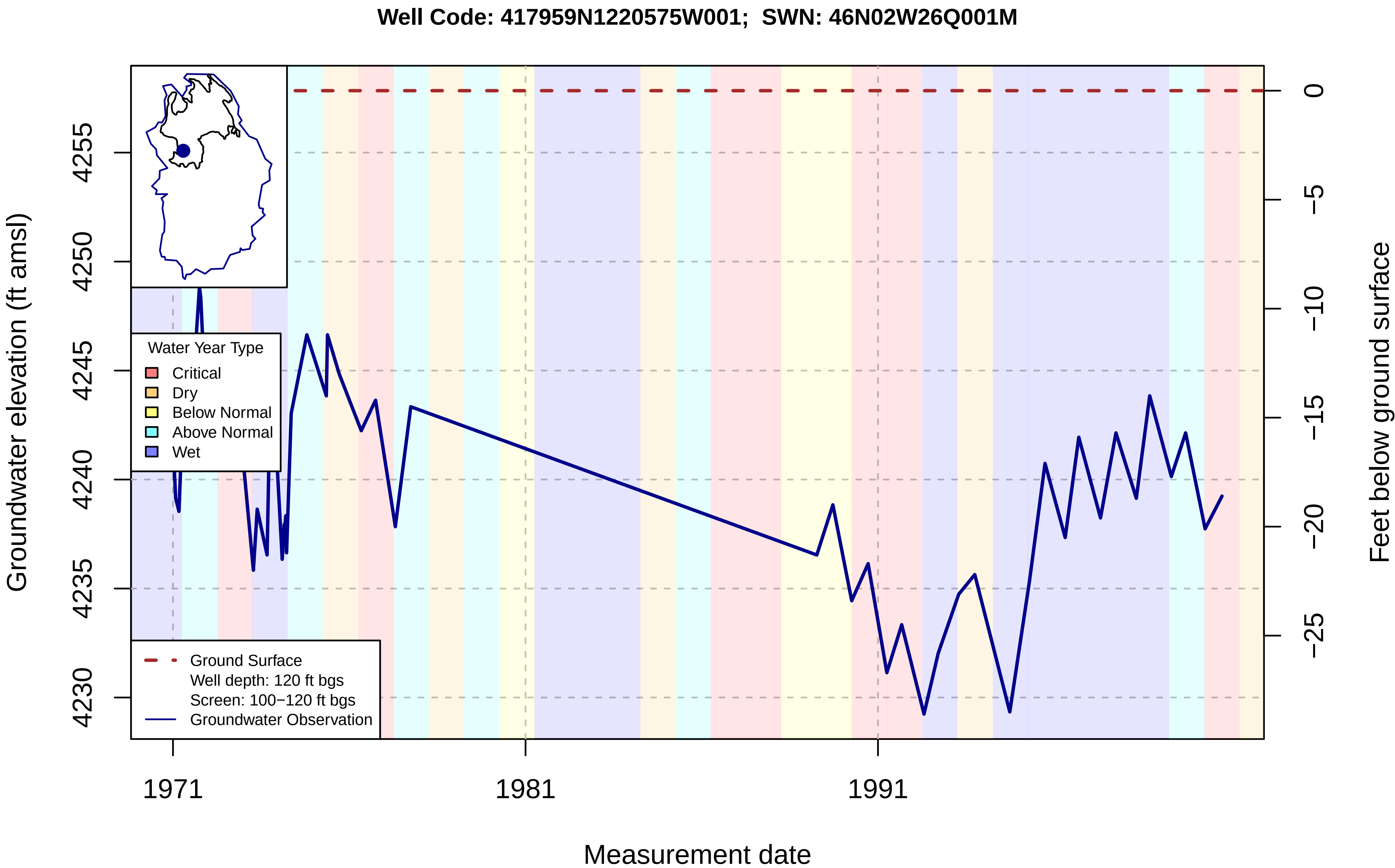
Well Code: 417920N1220617W001; SWN: 46N02W35C001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
4210
4220
4230
4240
4250
4260
0
−10
−20
−30
−40
−50
1952
1962
1972
1982
1992
2002
2012
2022
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 104 ft bgs
Well screen: Unknown
Groundwater Observation


Well Code: BUT_194; SWN: NA
Groundwater elevation (ft amsl)
4260
4250
4240
4230
4220
Feet below ground surface
0
−10
−20
−30
−40
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 104 ft bgs
Well screen: Unknown
Groundwater Observation
Apr 2021
Apr 2022
Apr 2023
Apr 2024
Measurement date

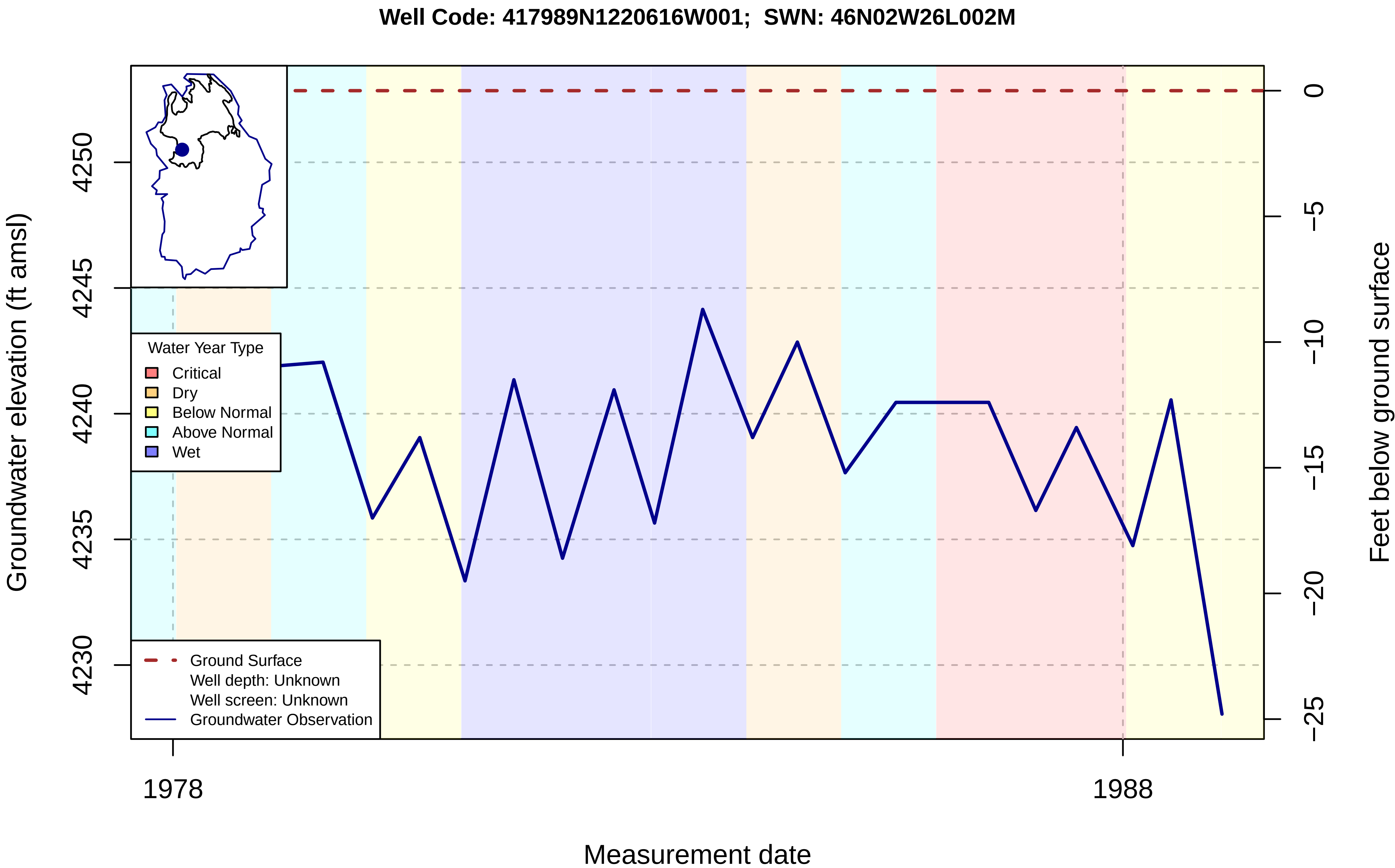

Well Code: BUT_021; SWN: NA
Groundwater elevation (ft amsl)
4180
4200
4220
4240
4260
Feet below ground surface
0
−20
−40
−60
−80
Jul 2019
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Jul 2024
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 90 ft bgs
Well screen: Unknown
Groundwater Observation



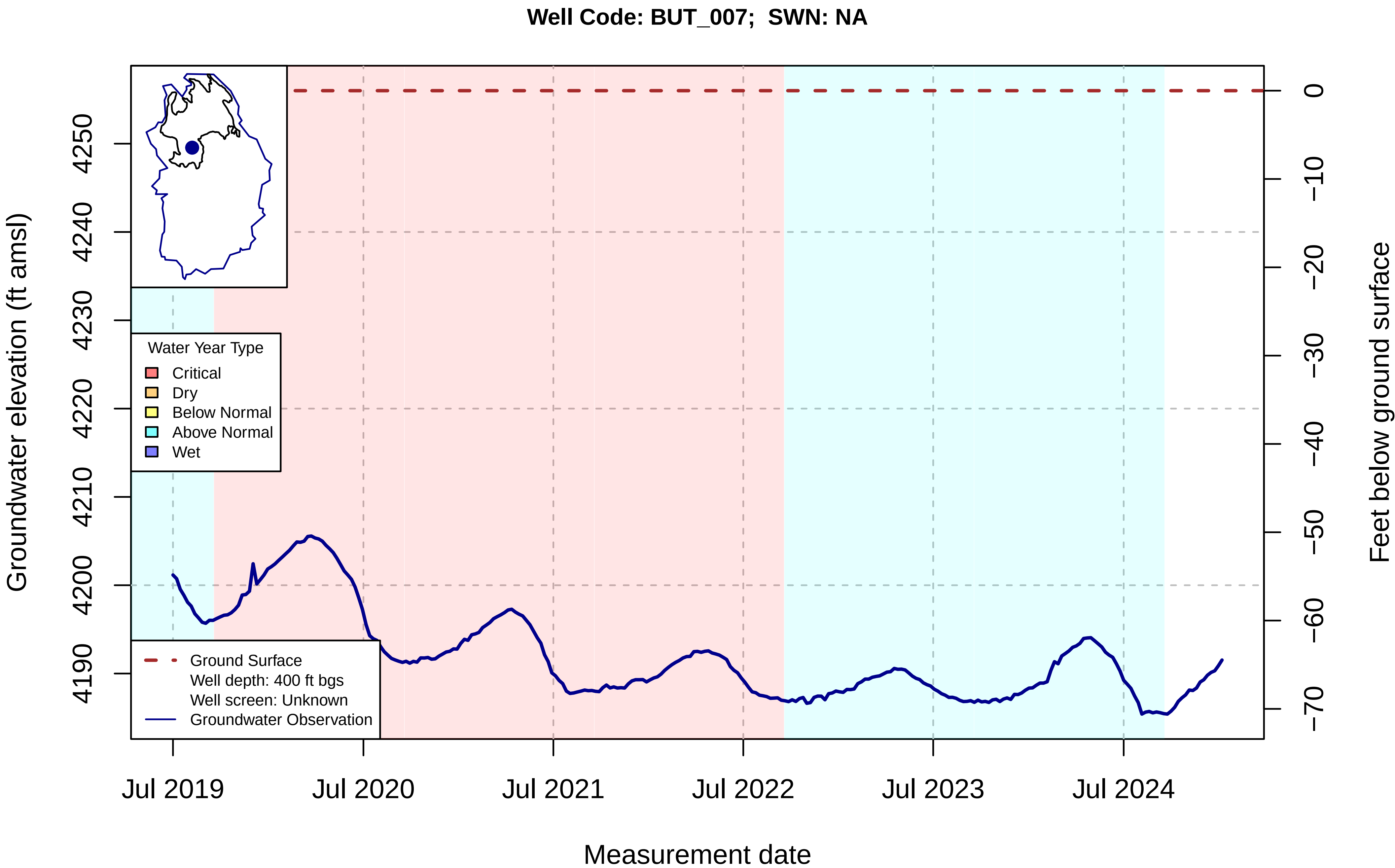
Well Code: 417944N1220350W001; SWN: 46N02W25R002M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
4260
4240
4220
4200
4180
0
−20
−40
−60
−80
1952
1962
1972
1982
1992
2002
2012
2022
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 116 ft bgs
Well screen: Unknown
Groundwater Observation



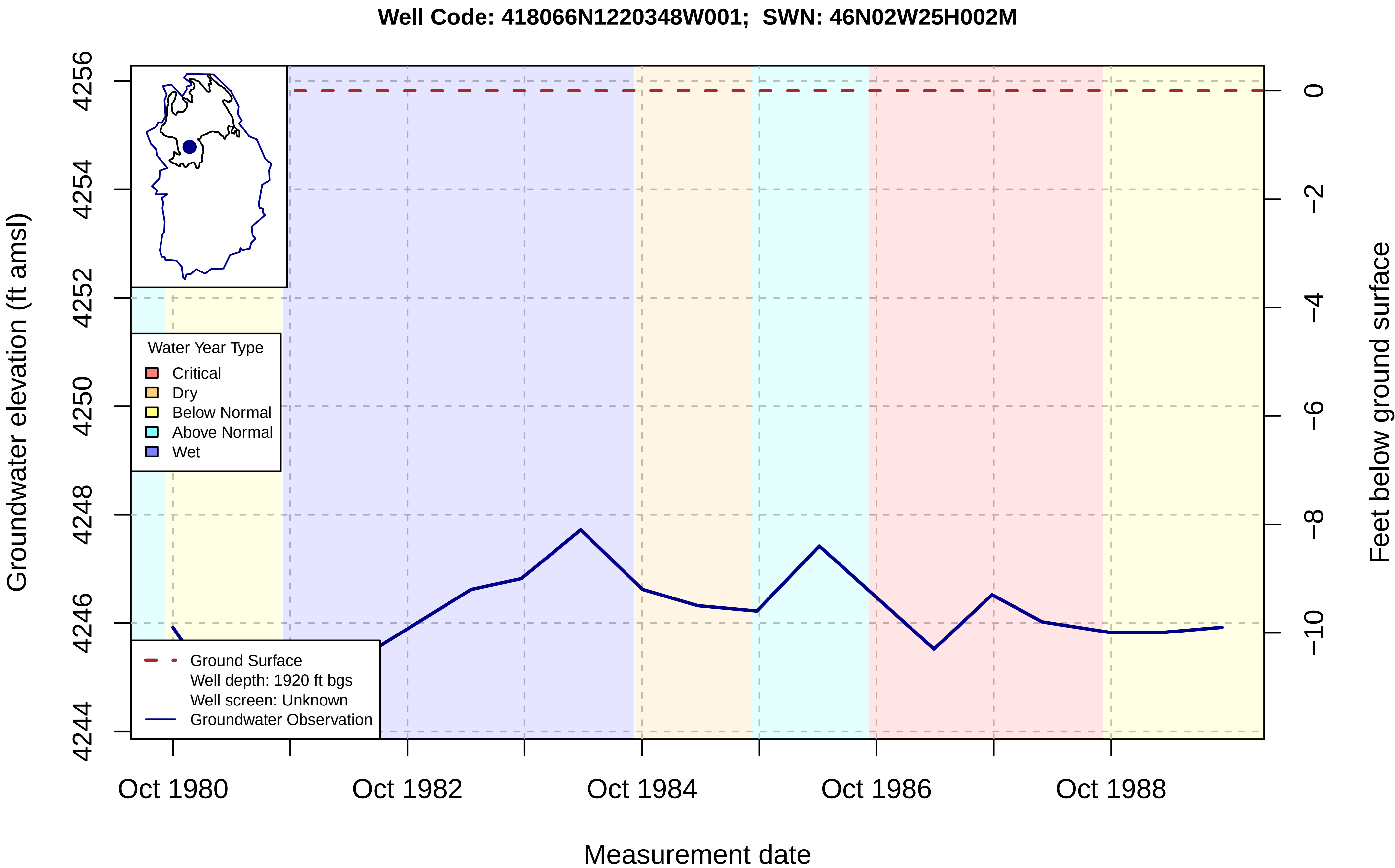
Well Code: 417959N1220575W001; SWN: 46N02W26Q001M
Groundwater elevation (ft amsl)
4230
4235
4240
4245
4250
4255
Feet below ground surface
0
−5
−10
−15
−20
−25
1971
1981
1991
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 120 ft bgs
Screen: 100−120 ft bgs
Groundwater Observation



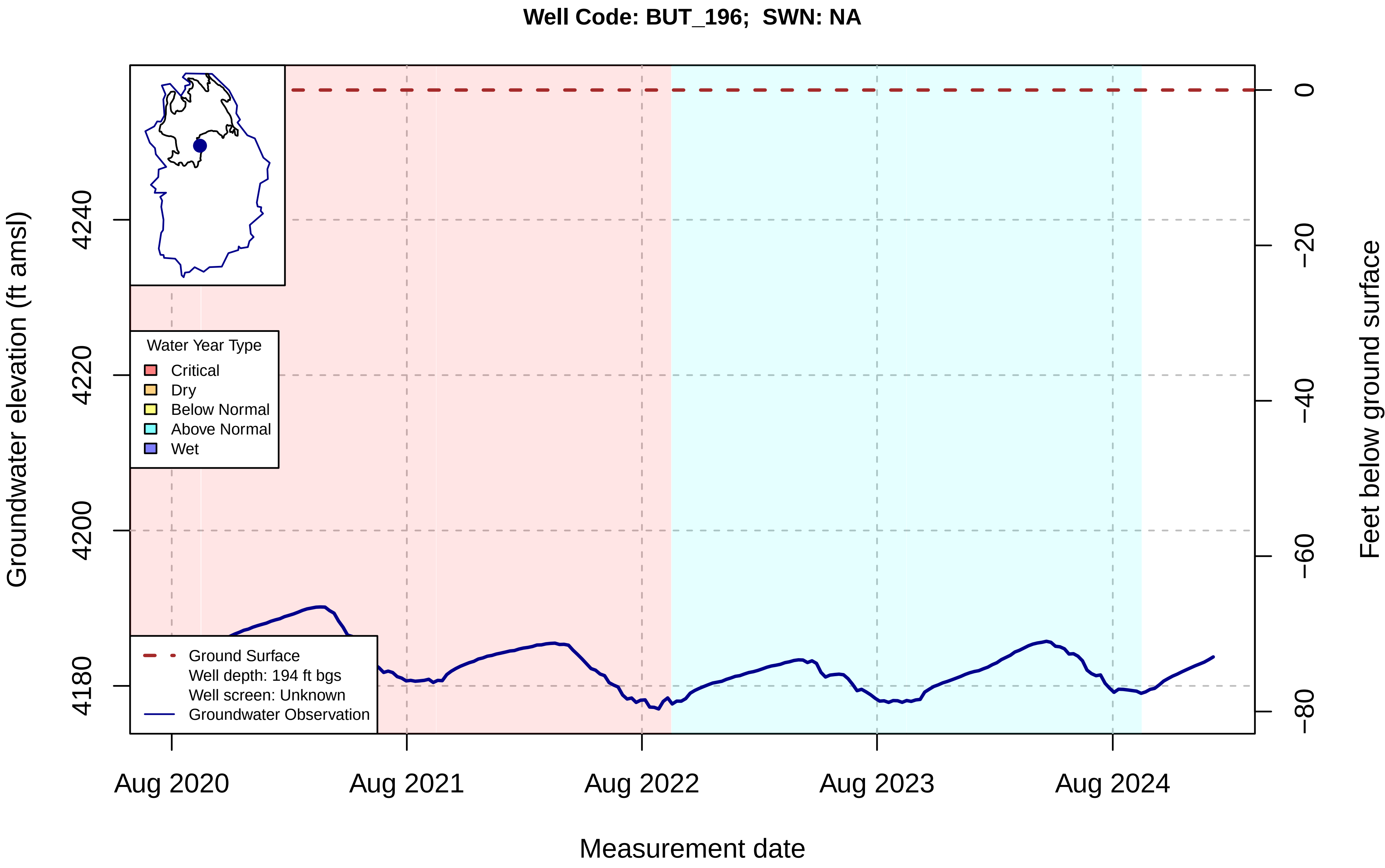
Well Code: 417989N1220616W001; SWN: 46N02W26L002M
Groundwater elevation (ft amsl)
4230
4235
4240
4245
4250
Feet below ground surface
0
−5
−10
−15
−20
−25
Measurement date
1978
1988
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation



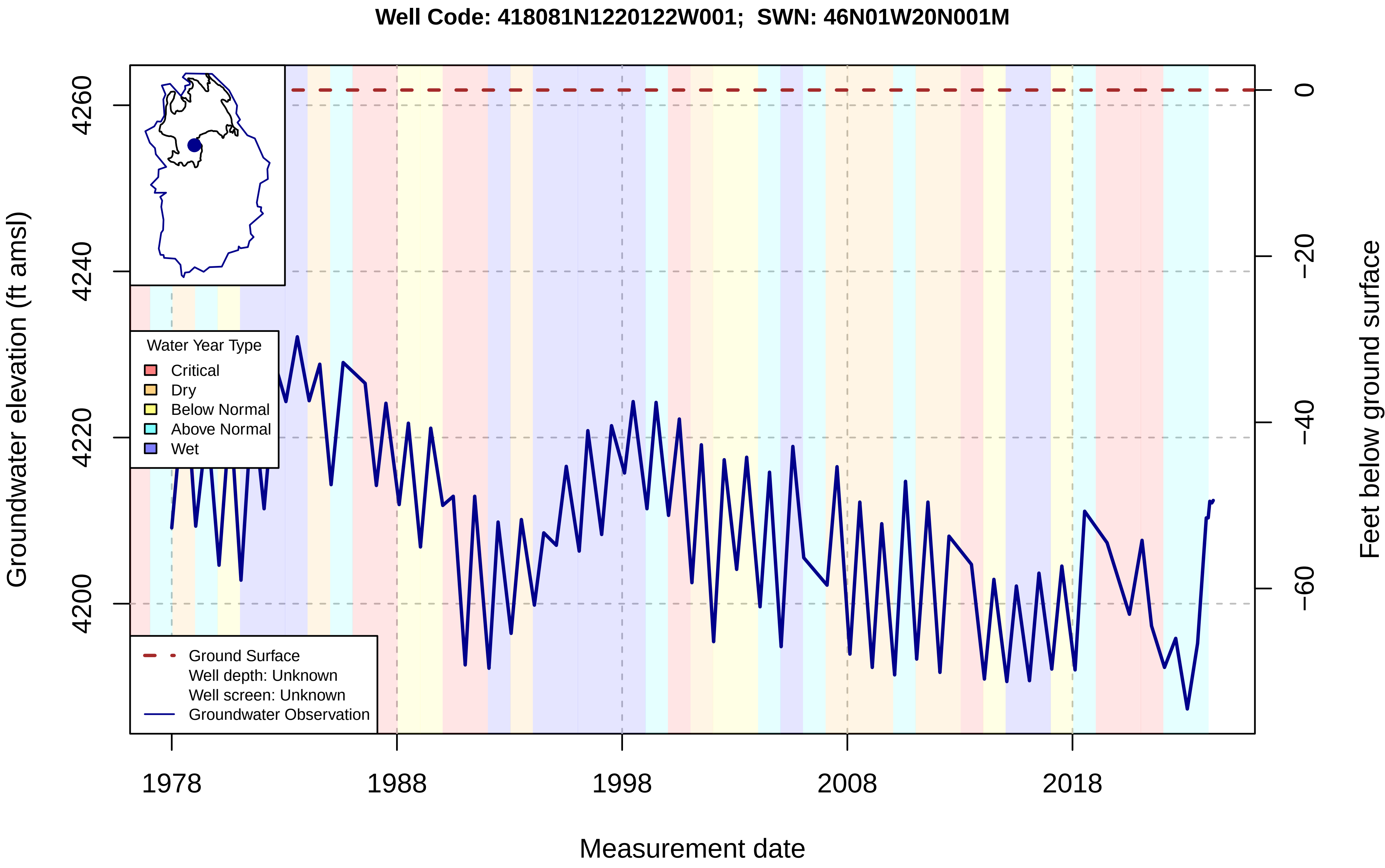
Well Code: BUT_007; SWN: NA
Groundwater elevation (ft amsl)
4190
4200
4210
4220
4230
4240
4250
Feet below ground surface
0
−10
−20
−30
−40
−50
−60
−70
Jul 2019
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Jul 2024
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 400 ft bgs
Well screen: Unknown
Groundwater Observation



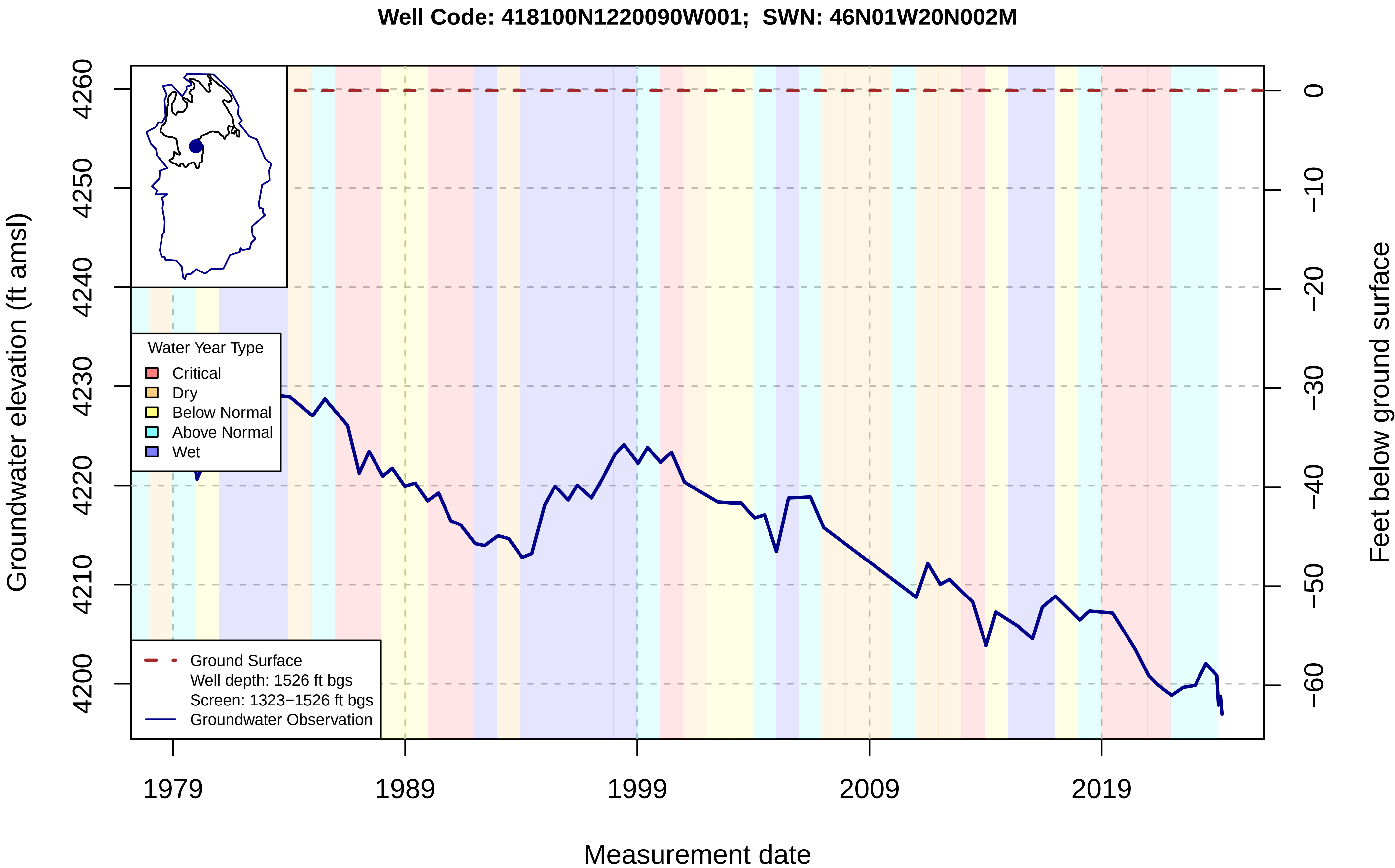
Well Code: 418066N1220348W001; SWN: 46N02W25H002M
Groundwater elevation (ft amsl)
4244
4246
4248
4250
4252
4254
4256
Feet below ground surface
0
−2
−4
−6
−8
−10
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 1920 ft bgs
Well screen: Unknown
Groundwater Observation
Oct 1980
Oct 1982
Oct 1984
Oct 1986
Oct 1988
Measurement date



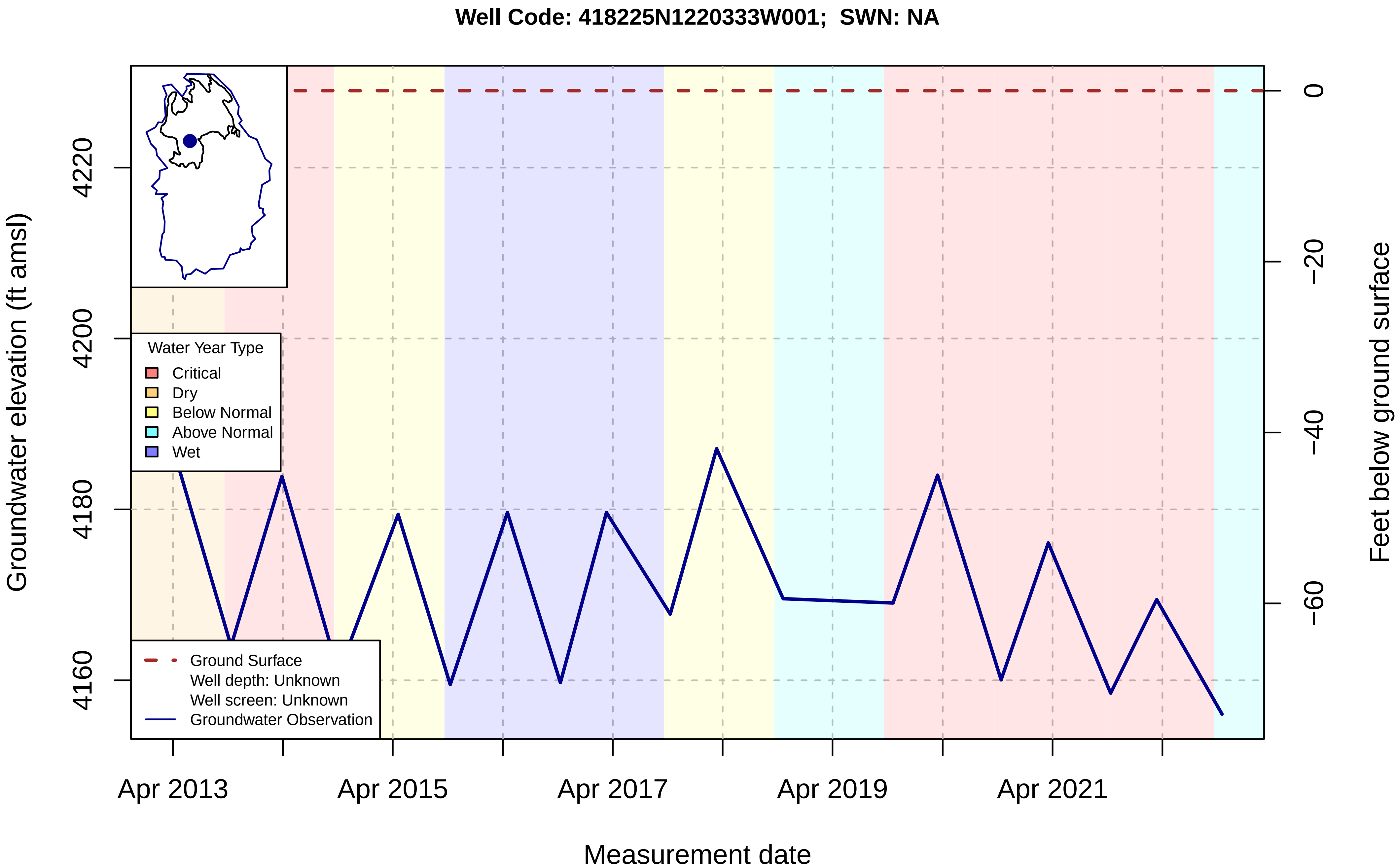
Well Code: BUT_196; SWN: NA
Groundwater elevation (ft amsl)
4240
4220
4200
4180
Feet below ground surface
0
−20
−40
−60
−80
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 194 ft bgs
Well screen: Unknown
Groundwater Observation
Aug 2020
Aug 2021
Aug 2022
Aug 2023
Aug 2024
Measurement date



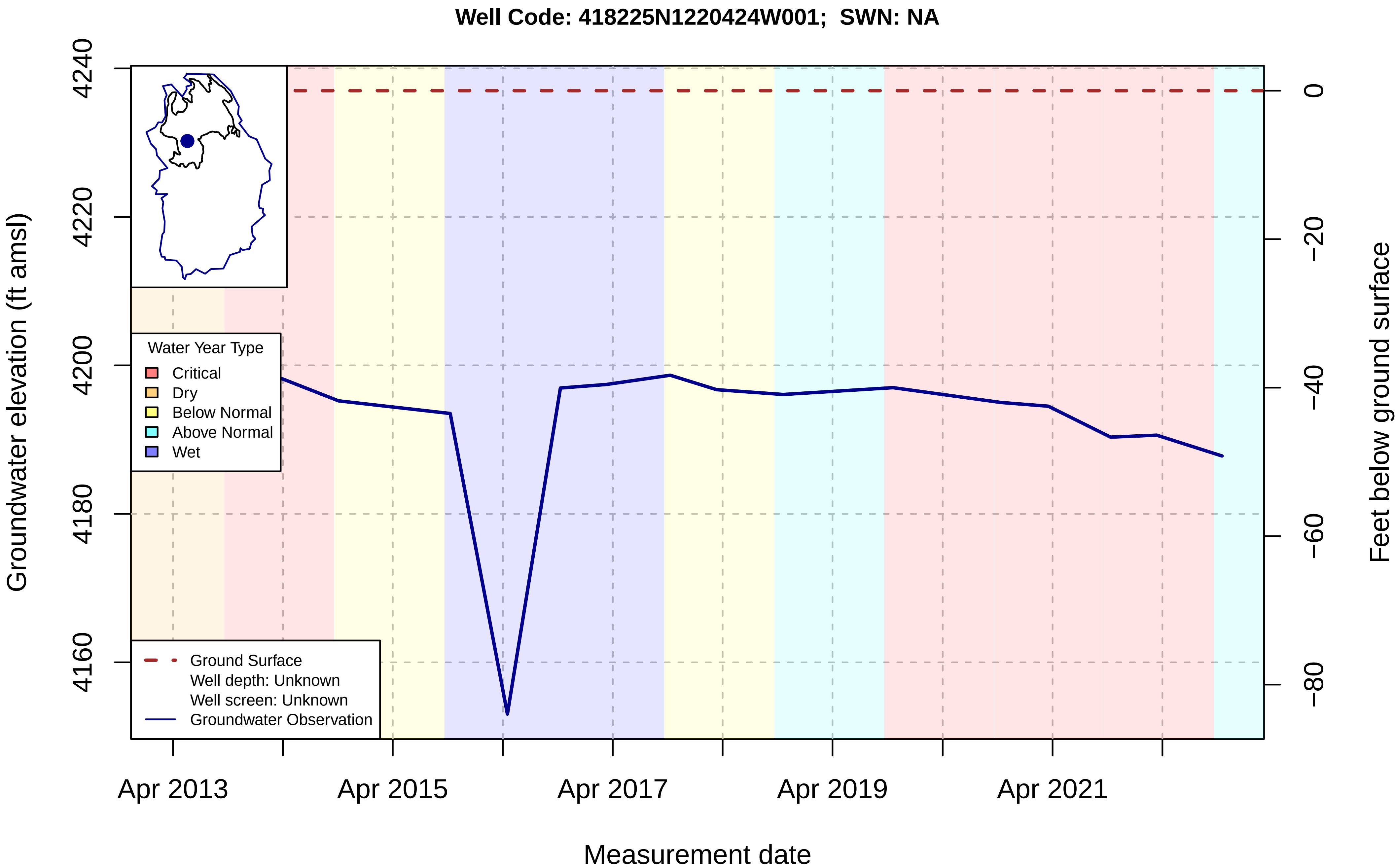
Well Code: 418081N1220122W001; SWN: 46N01W20N001M
Groundwater elevation (ft amsl)
4200
4220
4240
4260
Feet below ground surface
0
−20
−40
−60
1978
1988
1998
2008
2018
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation



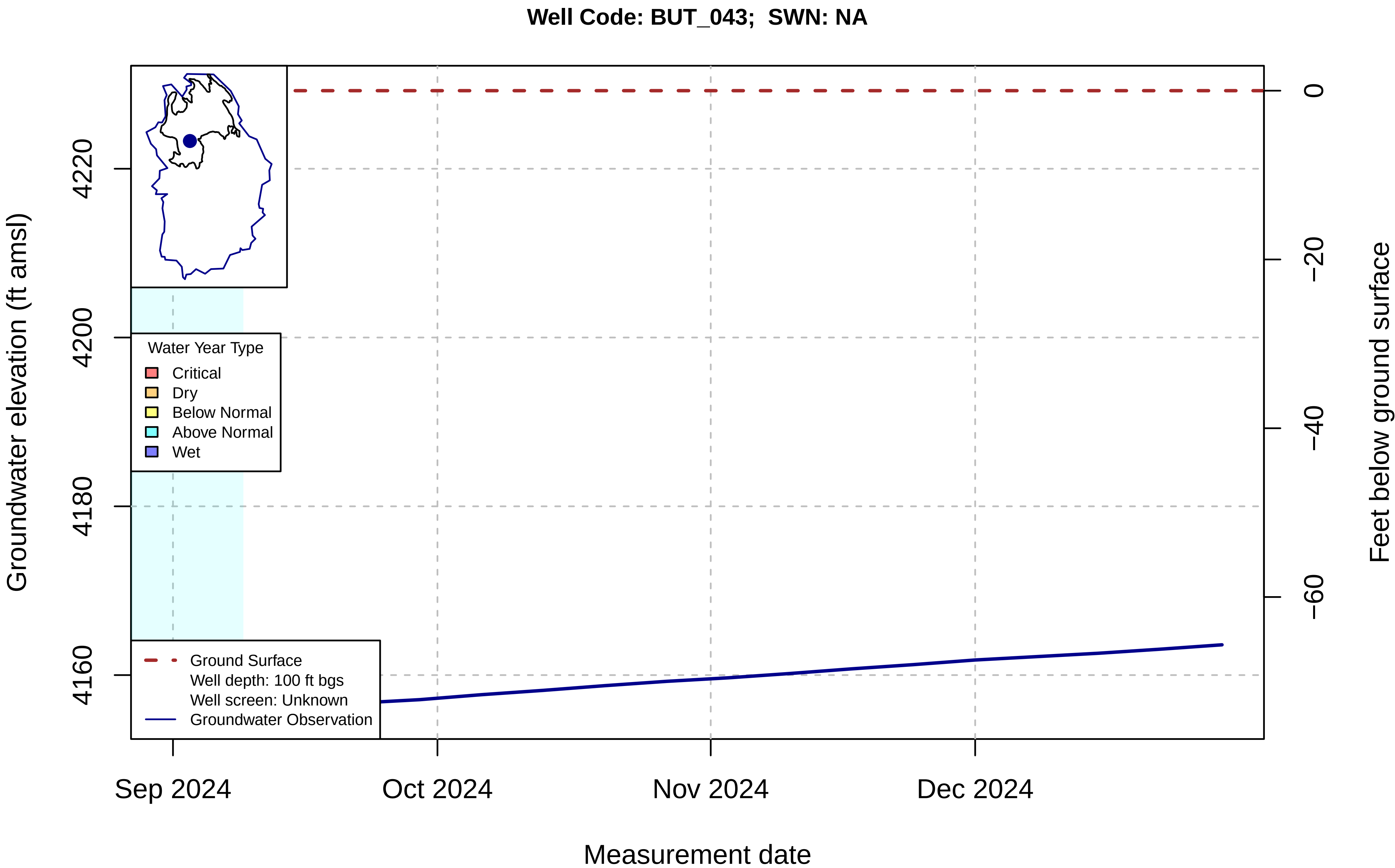
Well Code: 418100N1220090W001; SWN: 46N01W20N002M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
4200
4210
4220
4230
4240
4250
4260
0
−10
−20
−30
−40
−50
−60
1979
1989
1999
2009
2019
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 1526 ft bgs
Screen: 1323−1526 ft bgs
Groundwater Observation



Well Code: 418225N1220333W001; SWN: NA
Groundwater elevation (ft amsl)
4220
4200
4180
4160
Feet below ground surface
0
−20
−40
−60
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation
Apr 2013
Apr 2015
Apr 2017
Apr 2019
Apr 2021
Measurement date

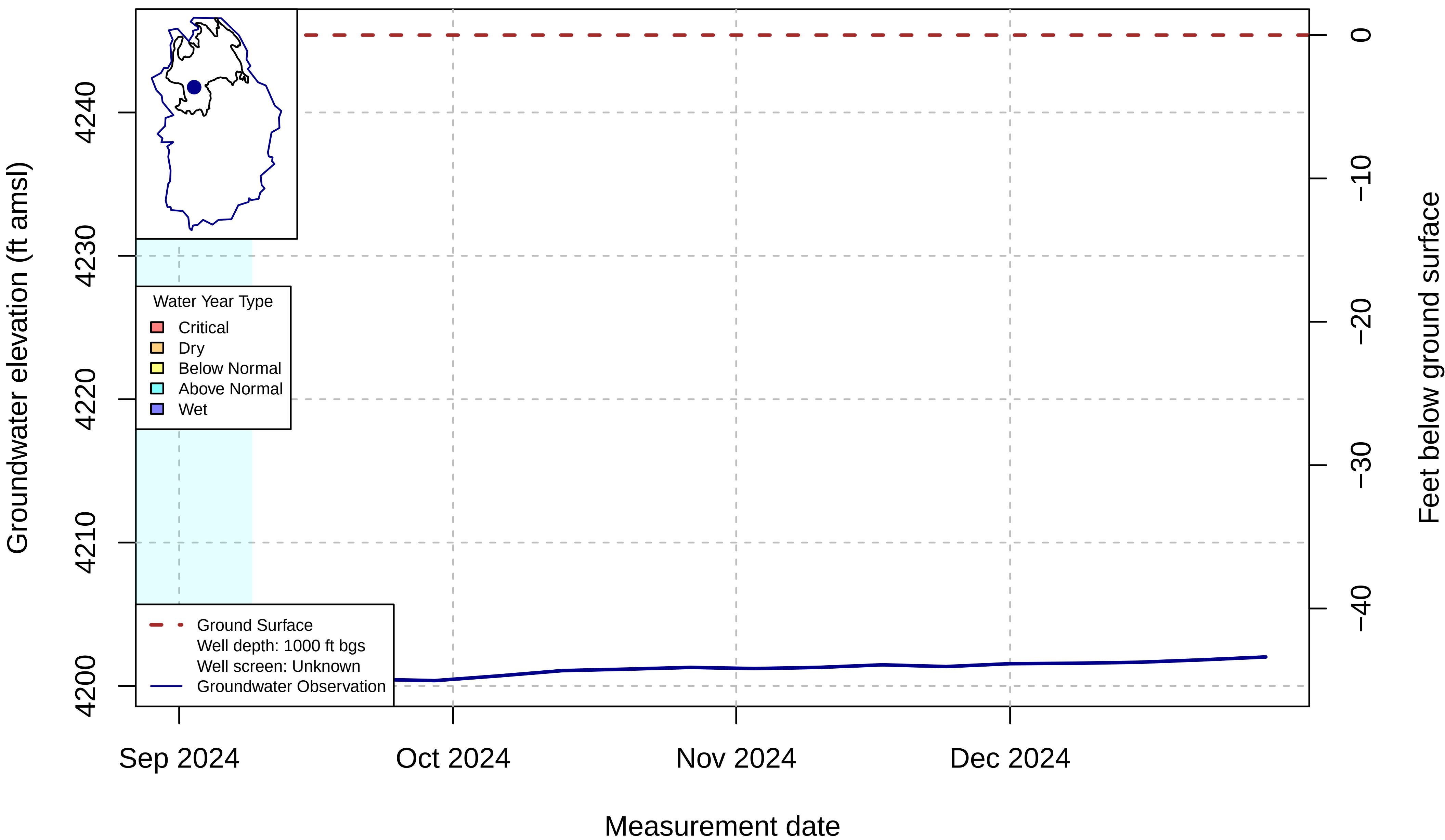


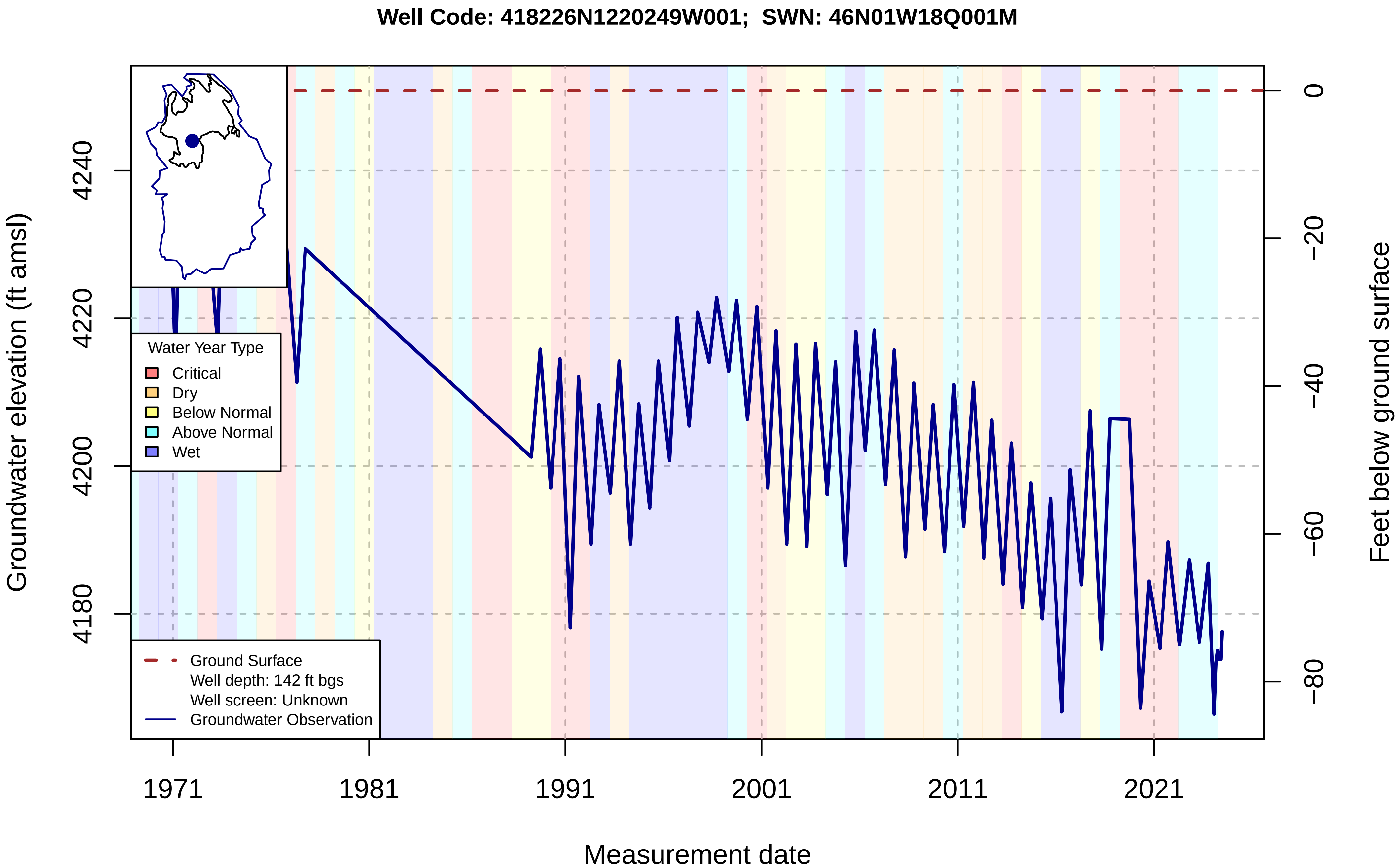
Well Code: 418225N1220424W001; SWN: NA
Groundwater elevation (ft amsl)
4160
4180
4200
4220
4240
Feet below ground surface
0
−20
−40
−60
−80
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation
Apr 2013
Apr 2015
Apr 2017
Apr 2019
Apr 2021
Measurement date



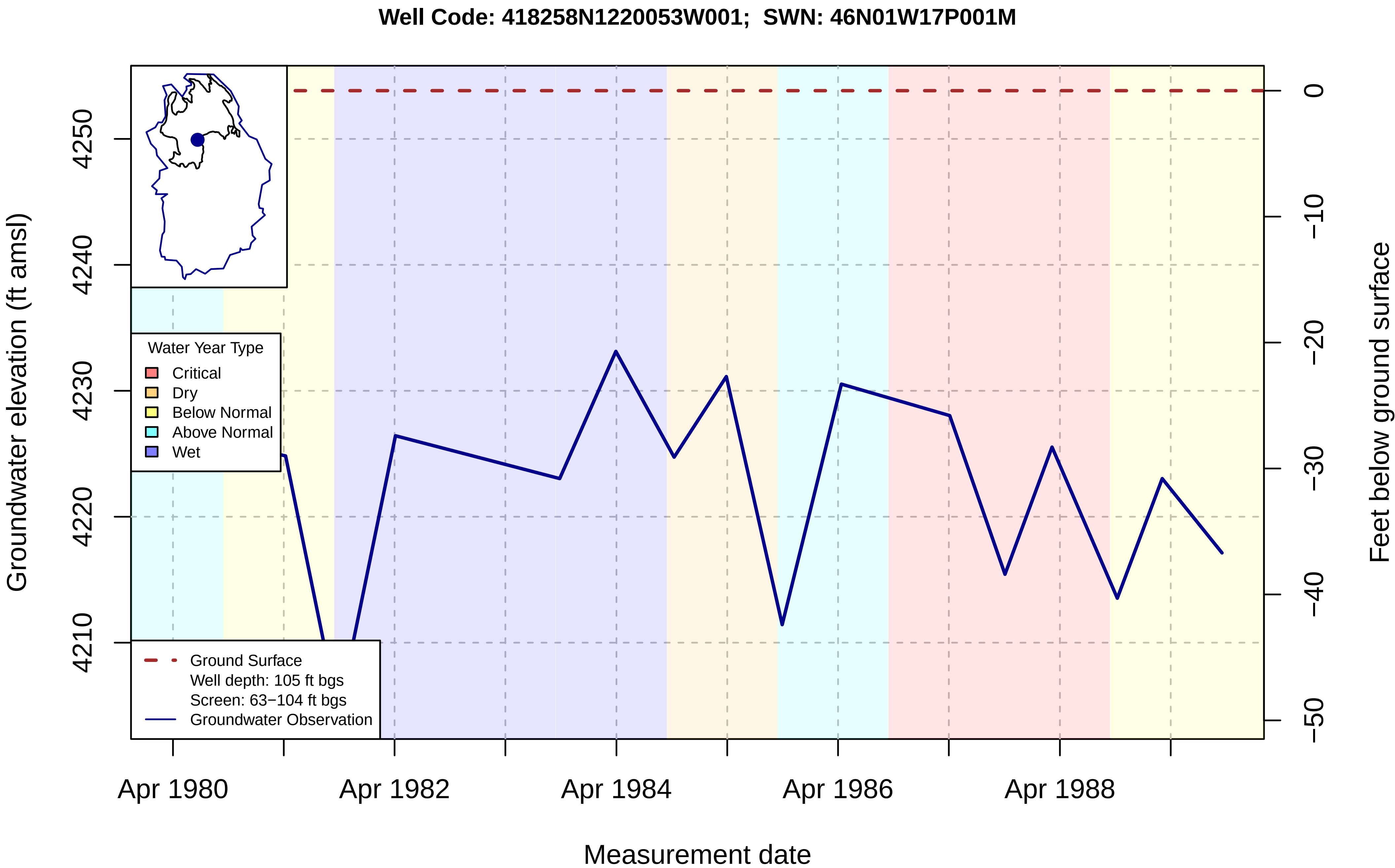
Well Code: BUT_043; SWN: NA
Groundwater elevation (ft amsl)
4160
4180
4200
4220
Feet below ground surface
0
−20
−40
−60
Sep 2024
Oct 2024
Nov 2024
Dec 2024
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 100 ft bgs
Well screen: Unknown
Groundwater Observation

Well Code: BUT_091; SWN: NA

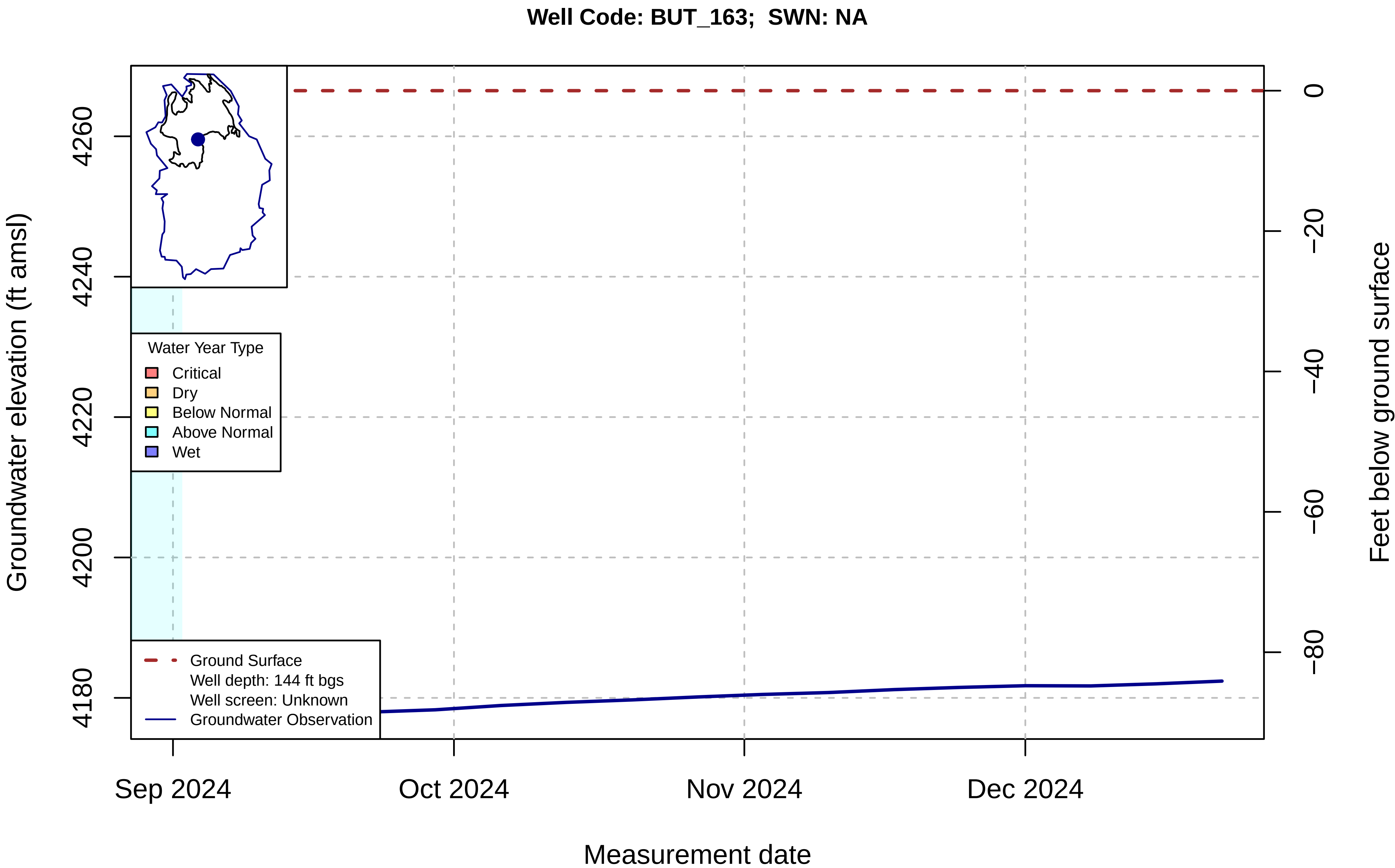




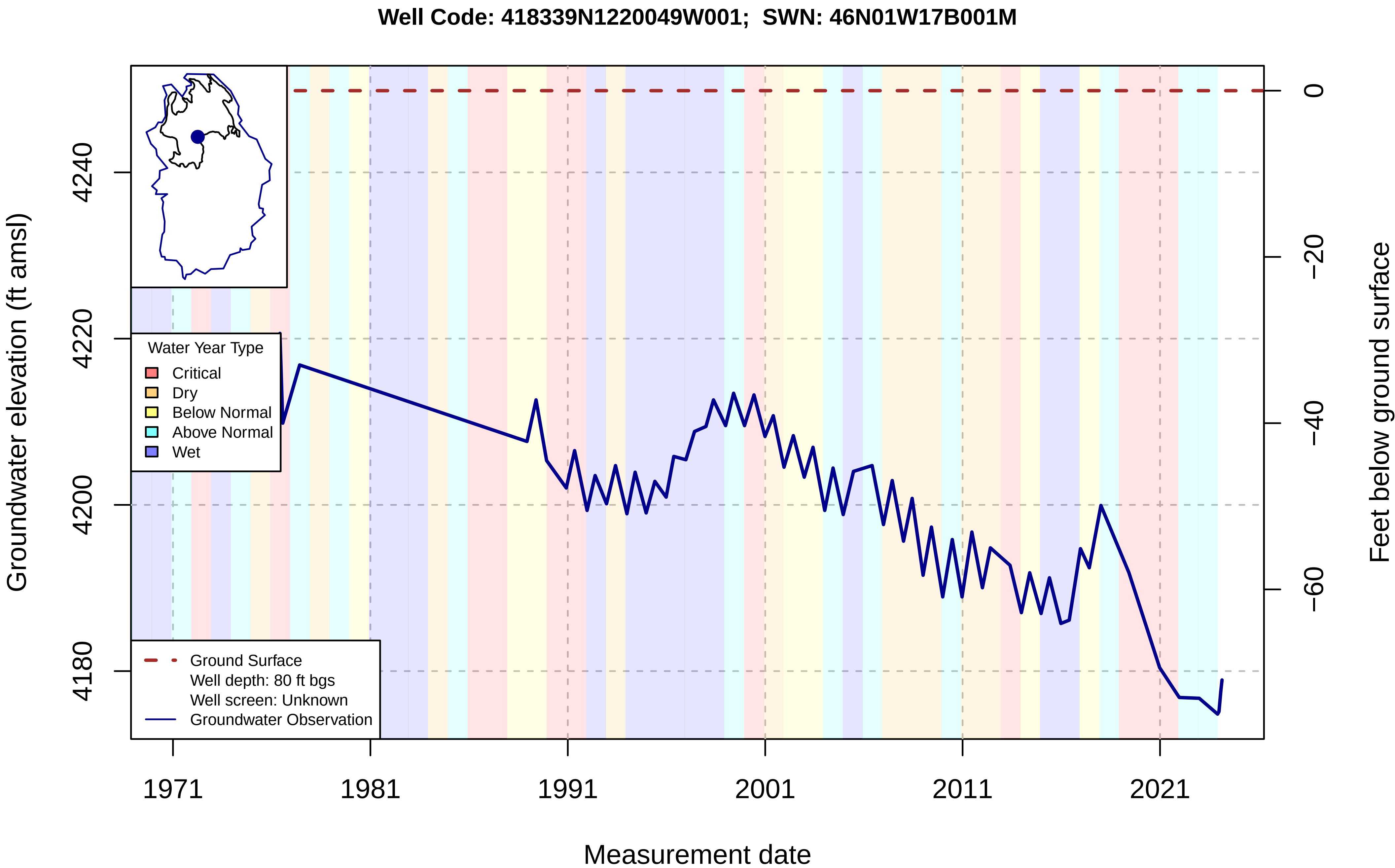
Well Code: 418226N1220249W001; SWN: 46N01W18Q001M
Groundwater elevation (ft amsl)
4180
4200
4220
4240
Feet below ground surface
0
−20
−40
−60
−80
1971
1981
1991
2001
2011
2021
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 142 ft bgs
Well screen: Unknown
Groundwater Observation



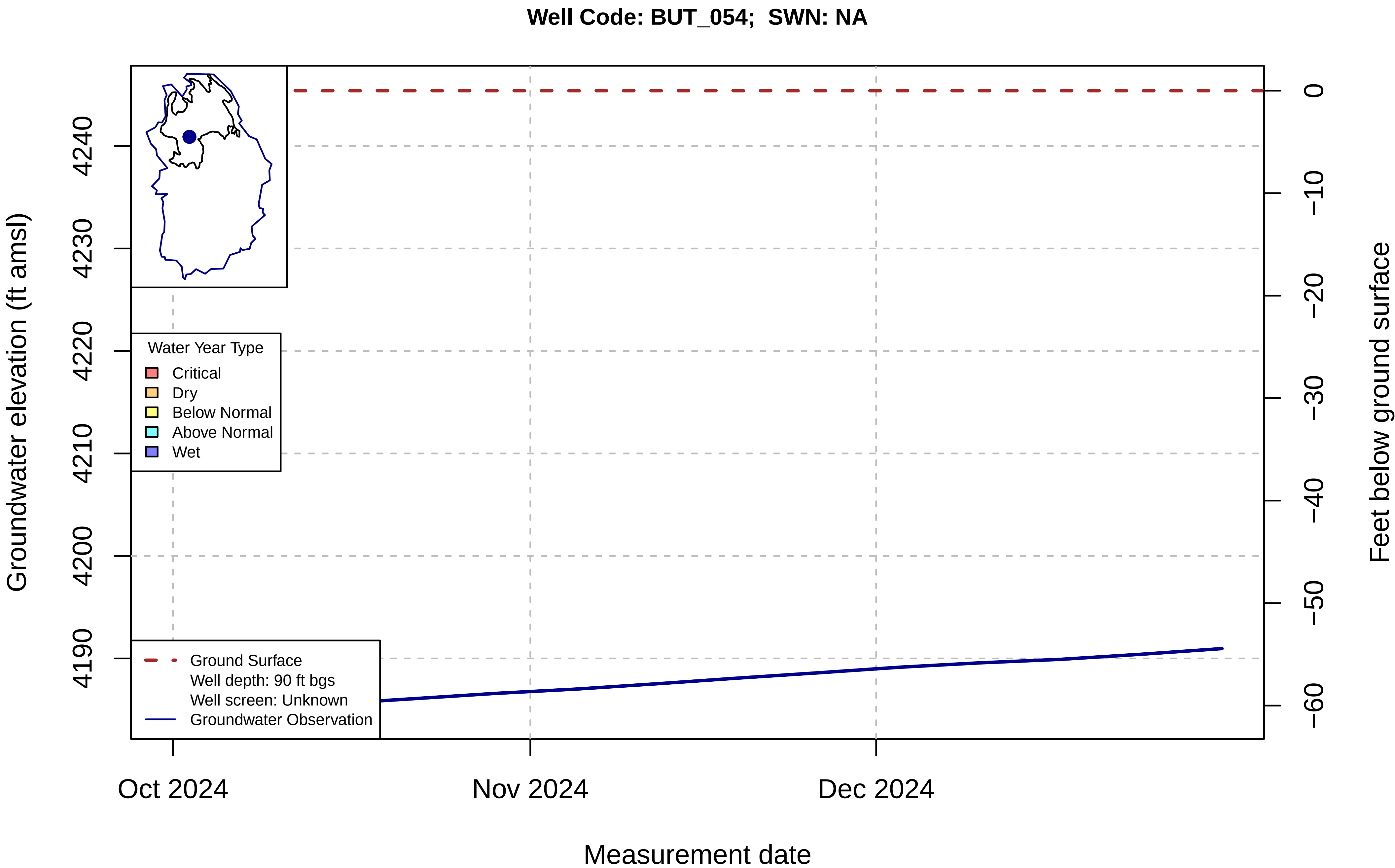
Well Code: 418258N1220053W001; SWN: 46N01W17P001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
Apr 1980
Apr 1982
Apr 1984
Apr 1986
Apr 1988
4210
4220
4230
4240
4250
0
−10
−20
−30
−40
−50
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 105 ft bgs
Screen: 63−104 ft bgs
Groundwater Observation



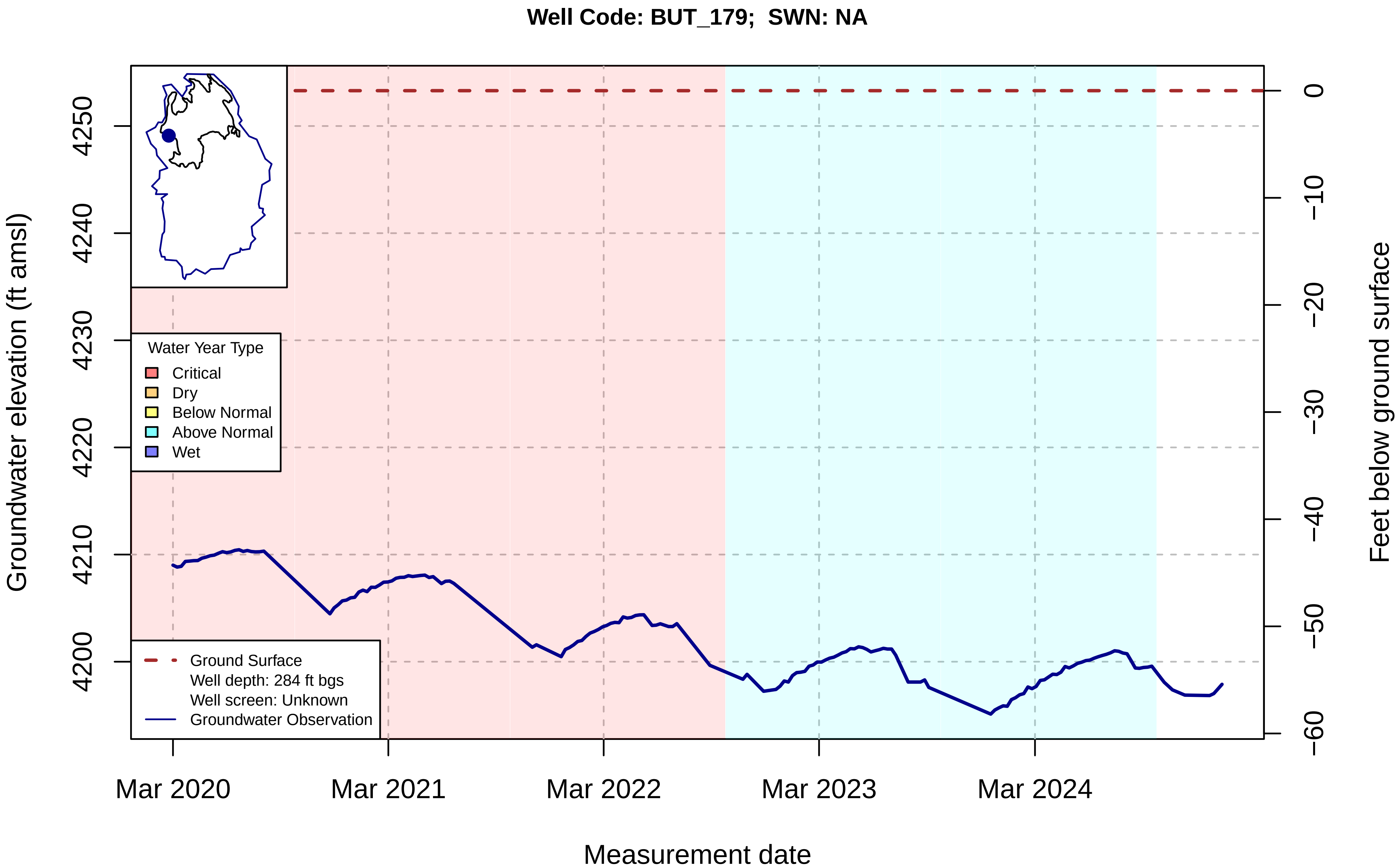
Well Code: BUT_163; SWN: NA
Groundwater elevation (ft amsl)
4180
4200
4220
4240
4260
Feet below ground surface
0
−20
−40
−60
−80
Sep 2024
Oct 2024
Nov 2024
Dec 2024
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 144 ft bgs
Well screen: Unknown
Groundwater Observation



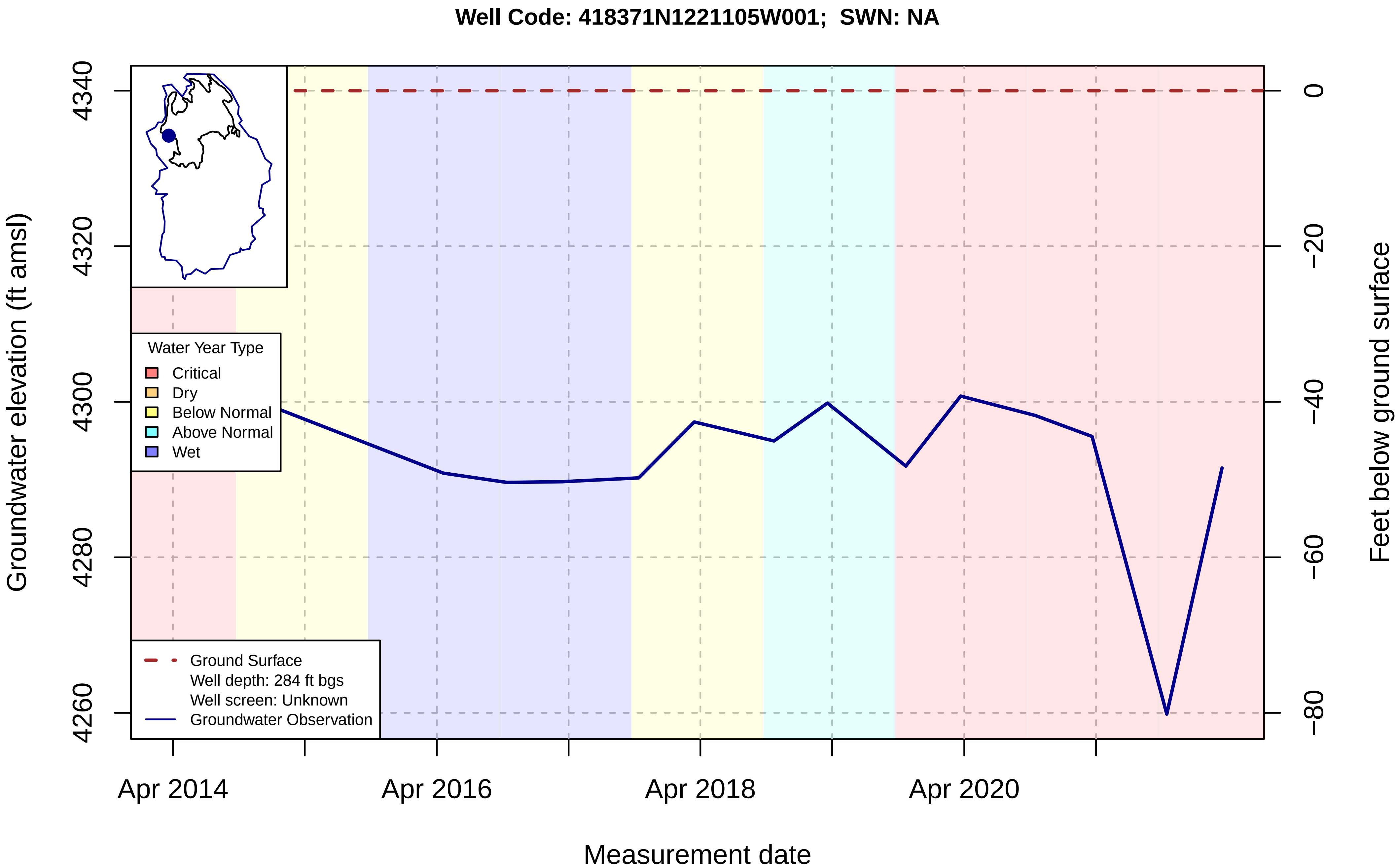
Well Code: 418339N1220049W001; SWN: 46N01W17B001M
Groundwater elevation (ft amsl)
4180
4200
4220
4240
Feet below ground surface
0
−20
−40
−60
1971
1981
1991
2001
2011
2021
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 80 ft bgs
Well screen: Unknown
Groundwater Observation



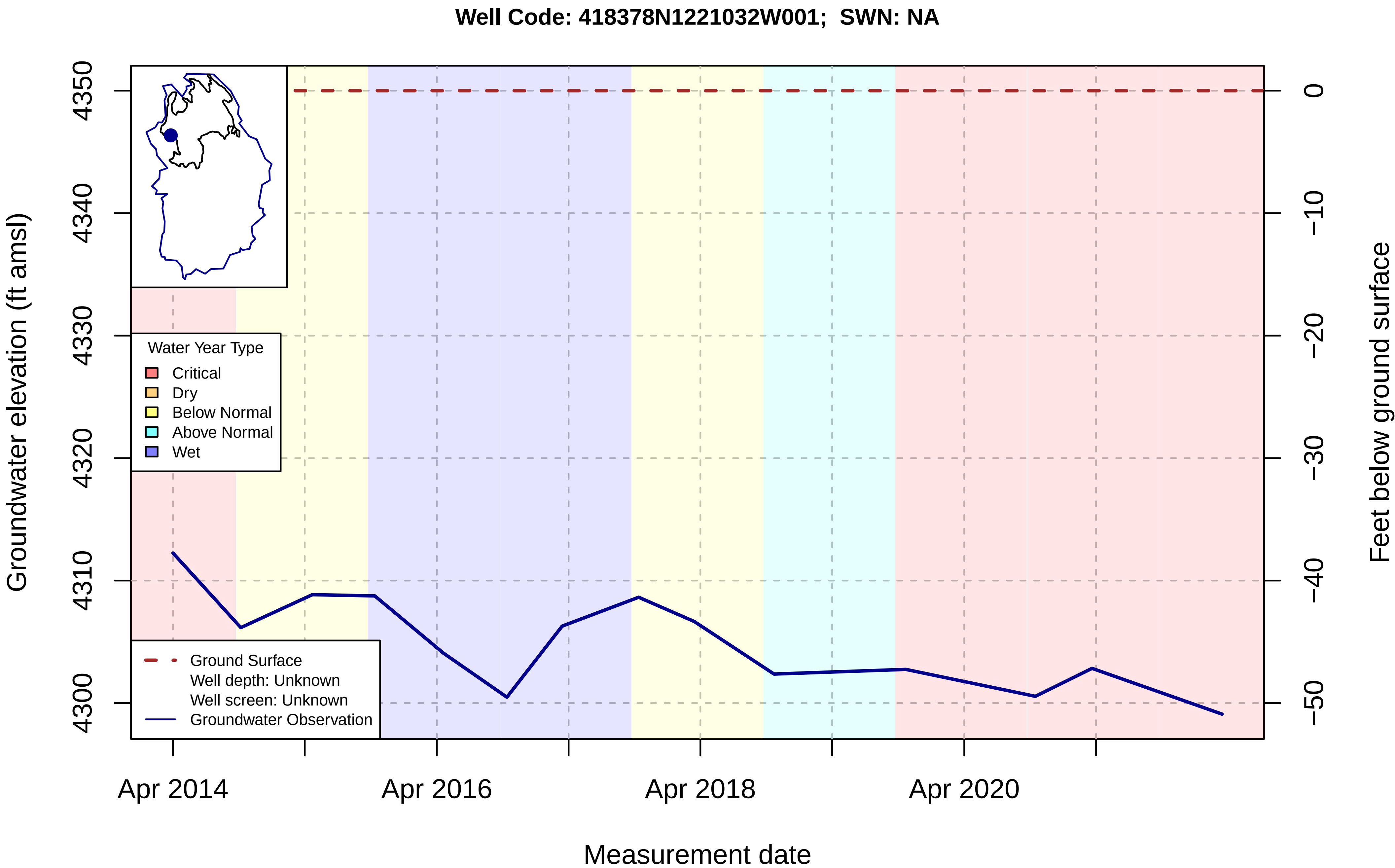
Well Code: BUT_054; SWN: NA
Groundwater elevation (ft amsl)
4240
4230
4220
4210
4200
4190
Feet below ground surface
0
−10
−20
−30
−40
−50
−60
Oct 2024
Nov 2024
Dec 2024
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 90 ft bgs
Well screen: Unknown
Groundwater Observation

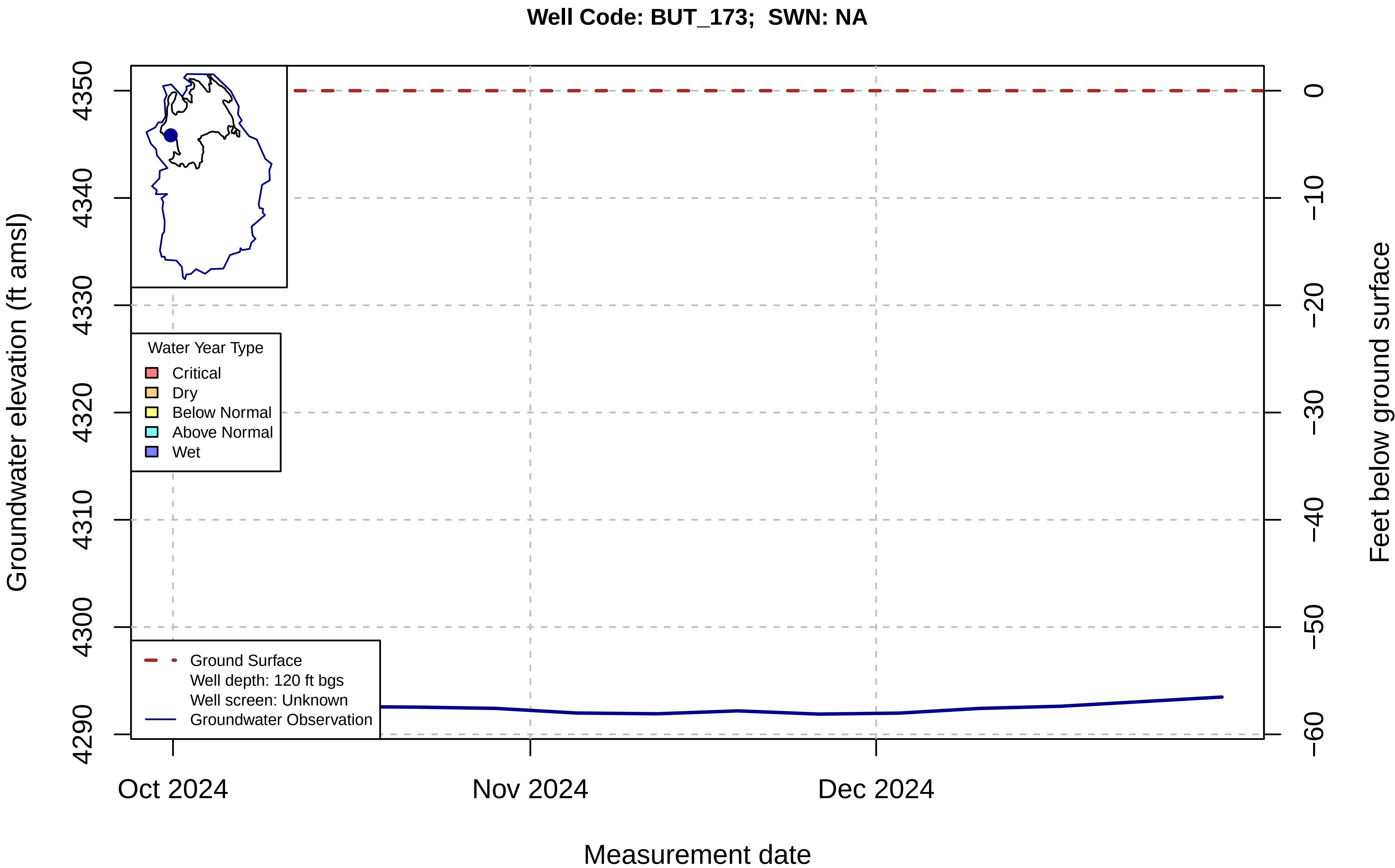


Well Code: BUT_179; SWN: NA
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
4200
4210
4220
4230
4240
4250
0
−10
−20
−30
−40
−50
−60
Mar 2020
Mar 2021
Mar 2022
Mar 2023
Mar 2024
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 284 ft bgs
Well screen: Unknown
Groundwater Observation

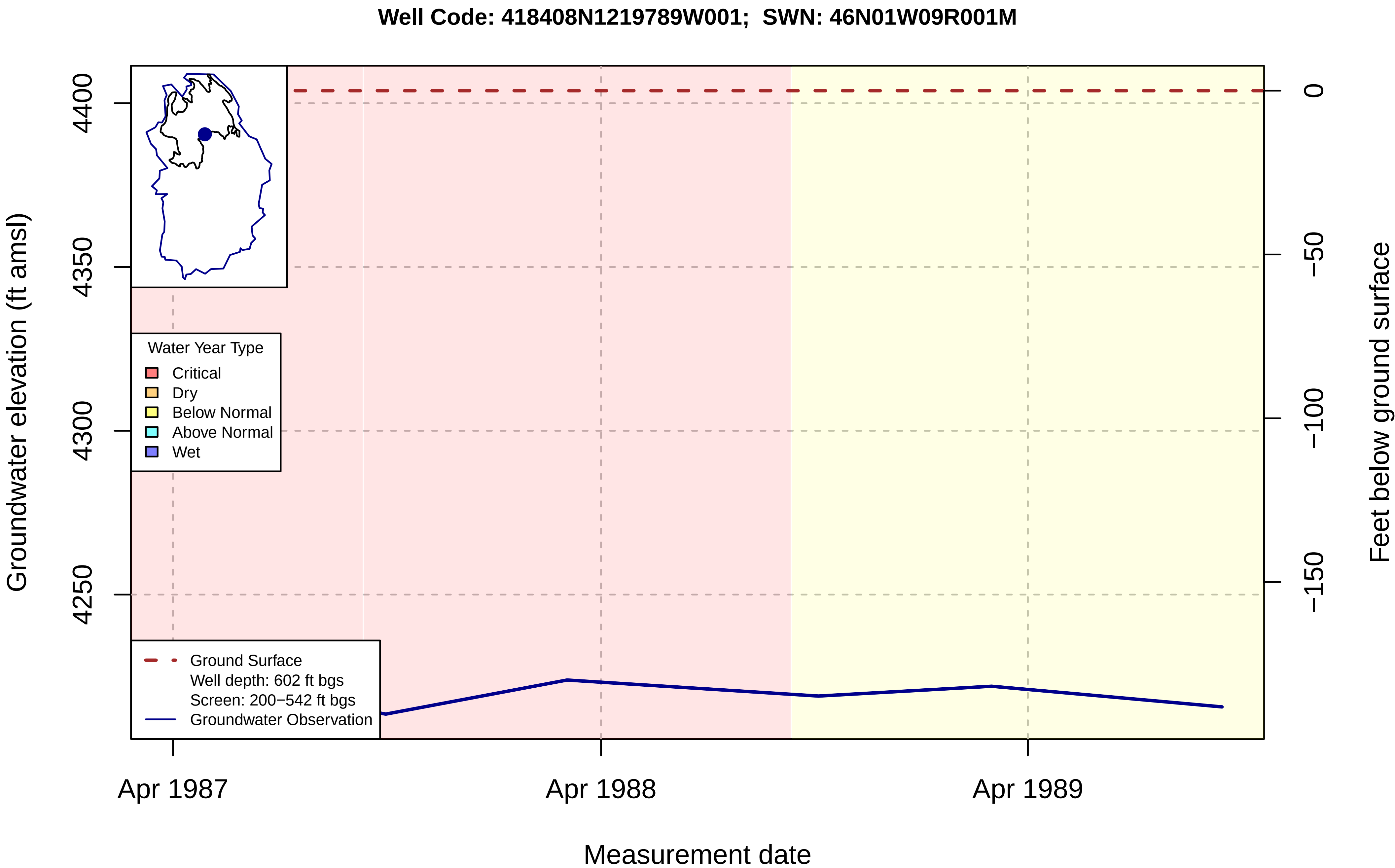


Well Code: 418371N1221105W001; SWN: NA
Groundwater elevation (ft amsl)
4260
4280
4300
4320
4340
Feet below ground surface
0
−20
−40
−60
−80
Apr 2014
Apr 2016
Apr 2018
Apr 2020
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 284 ft bgs
Well screen: Unknown
Groundwater Observation

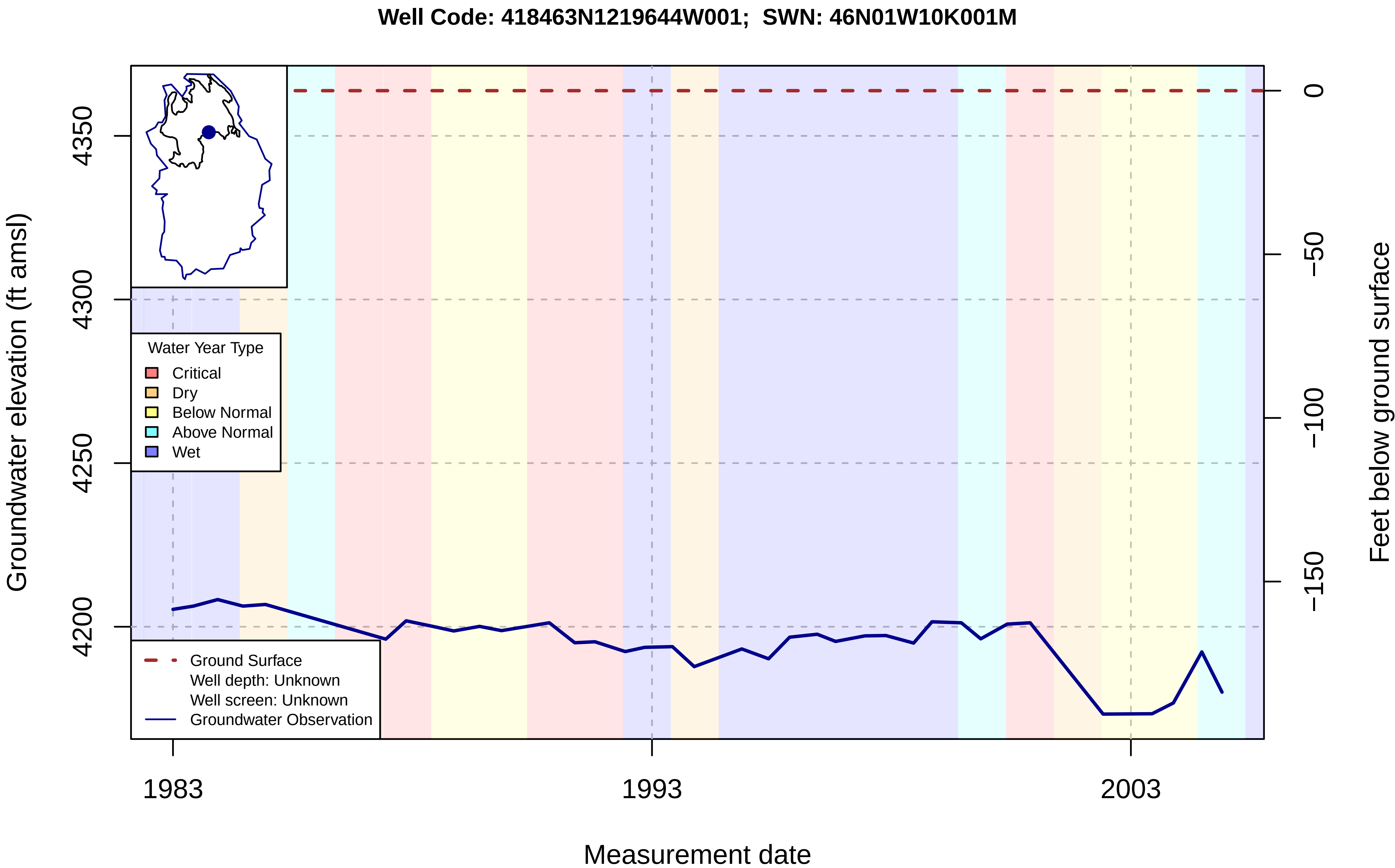

Well Code: 418378N1221032W001; SWN: NA
Groundwater elevation (ft amsl)
4350
4340
4330
4320
4310
4300
Feet below ground surface
0
−10
−20
−30
−40
−50
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation
Apr 2014
Apr 2016
Apr 2018
Apr 2020
Measurement date



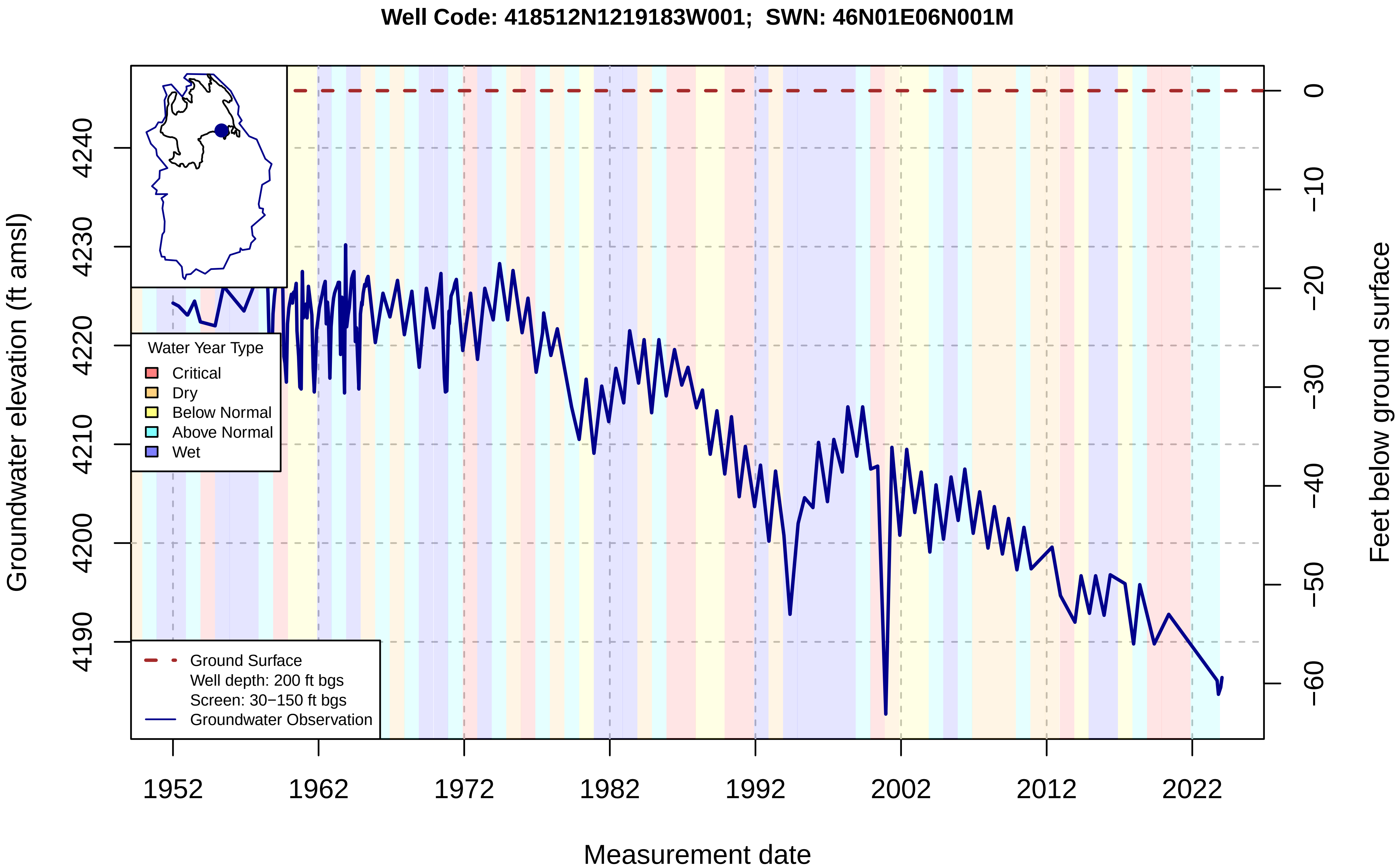
Well Code: BUT_173; SWN: NA
Groundwater elevation (ft amsl)
4290
4300
4310
4320
4330
4340
4350
Feet below ground surface
0
−10
−20
−30
−40
−50
−60
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 120 ft bgs
Well screen: Unknown
Groundwater Observation
Oct 2024
Nov 2024
Dec 2024
Measurement date



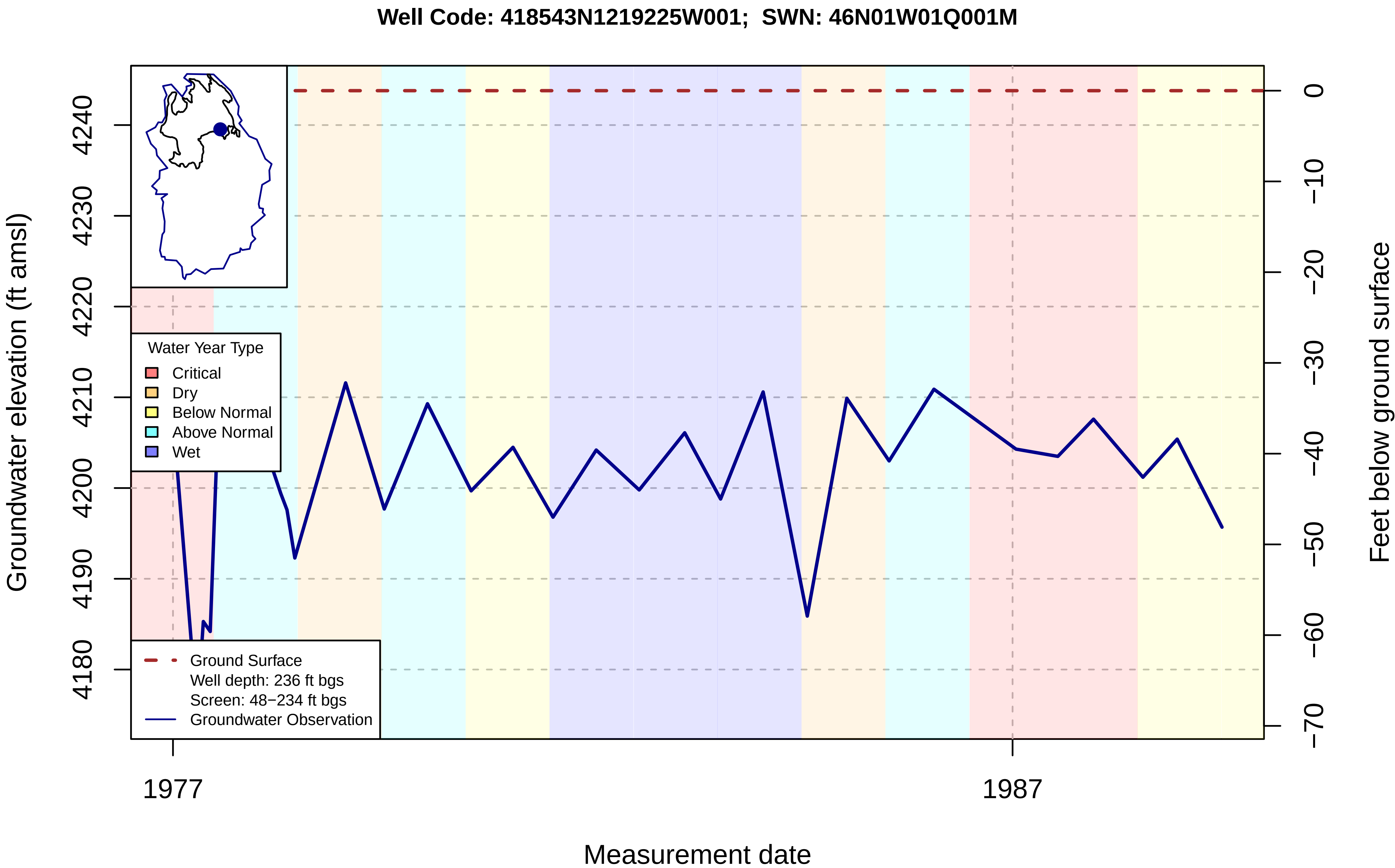
Well Code: 418408N1219789W001; SWN: 46N01W09R001M
Groundwater elevation (ft amsl)
4400
4350
4300
4250
Feet below ground surface
0
−50
−100
−150
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 602 ft bgs
Screen: 200−542 ft bgs
Groundwater Observation
Apr 1987
Apr 1988
Apr 1989
Measurement date



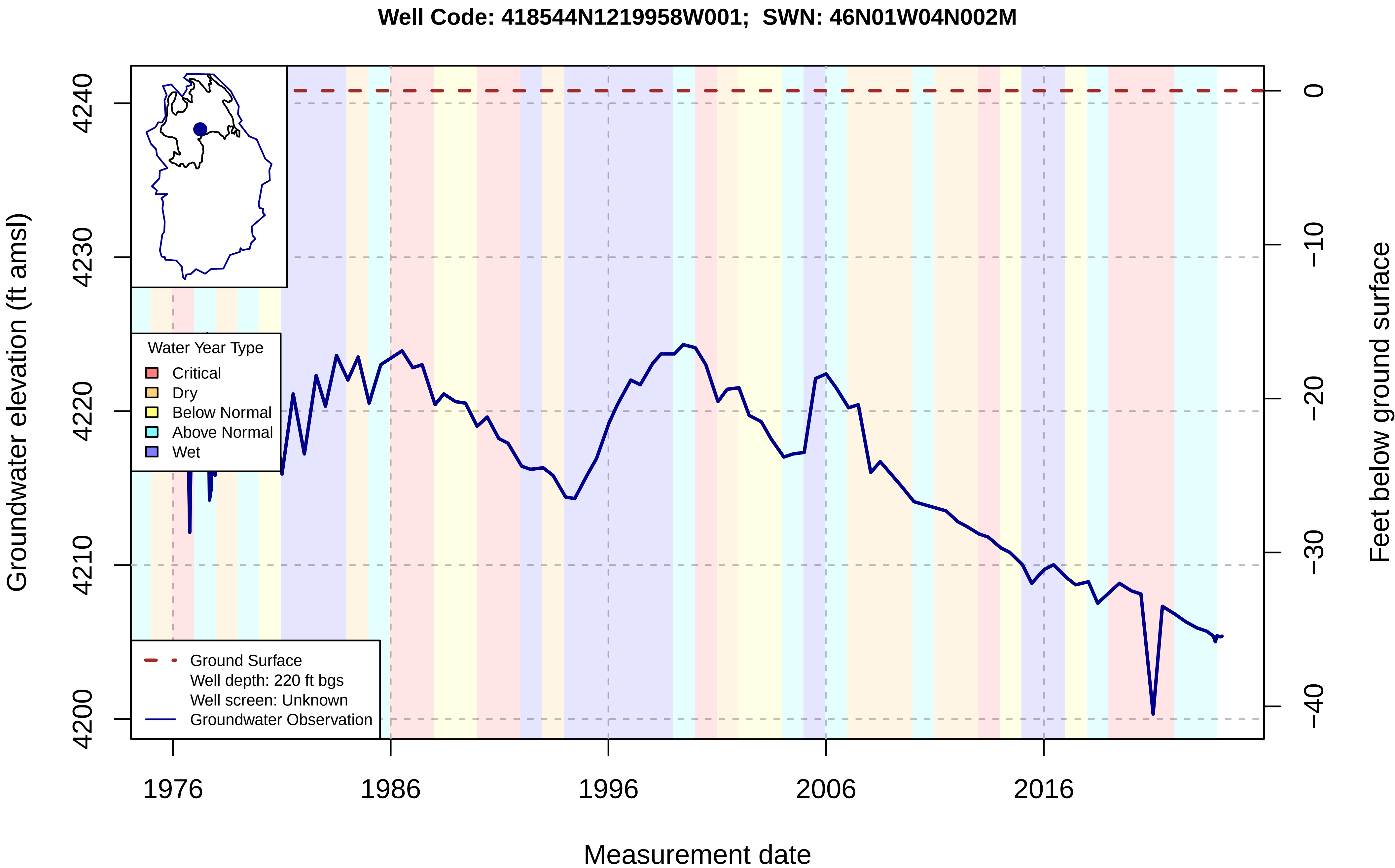
Well Code: 418463N1219644W001; SWN: 46N01W10K001M
Groundwater elevation (ft amsl)
4350
4300
4250
4200
Feet below ground surface
0
−50
−100
−150
1983
1993
2003
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation



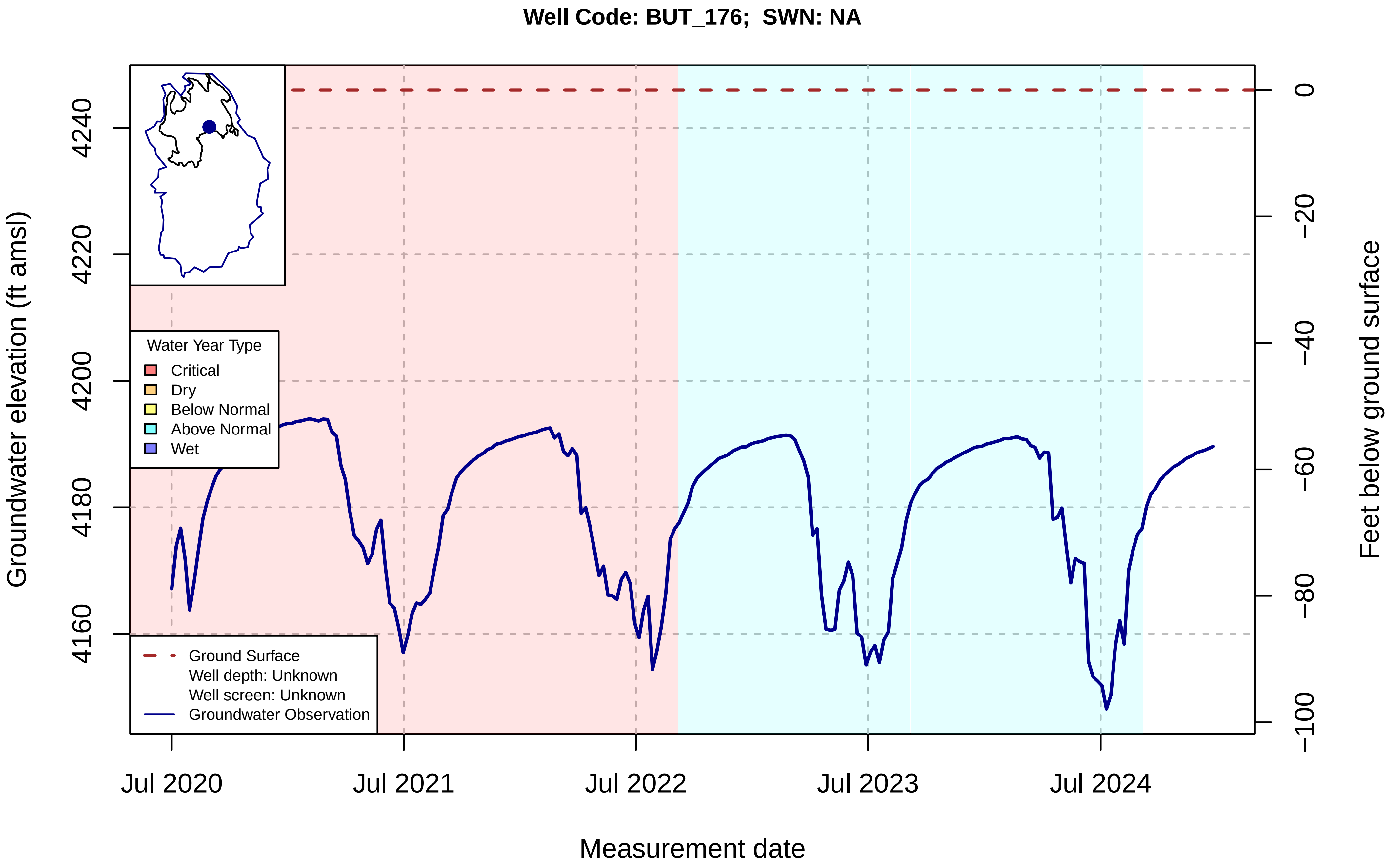
Well Code: 418512N1219183W001; SWN: 46N01E06N001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
4190
4200
4210
4220
4230
4240
0
−10
−20
−30
−40
−50
−60
1952
1962
1972
1982
1992
2002
2012
2022
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 200 ft bgs
Screen: 30−150 ft bgs
Groundwater Observation



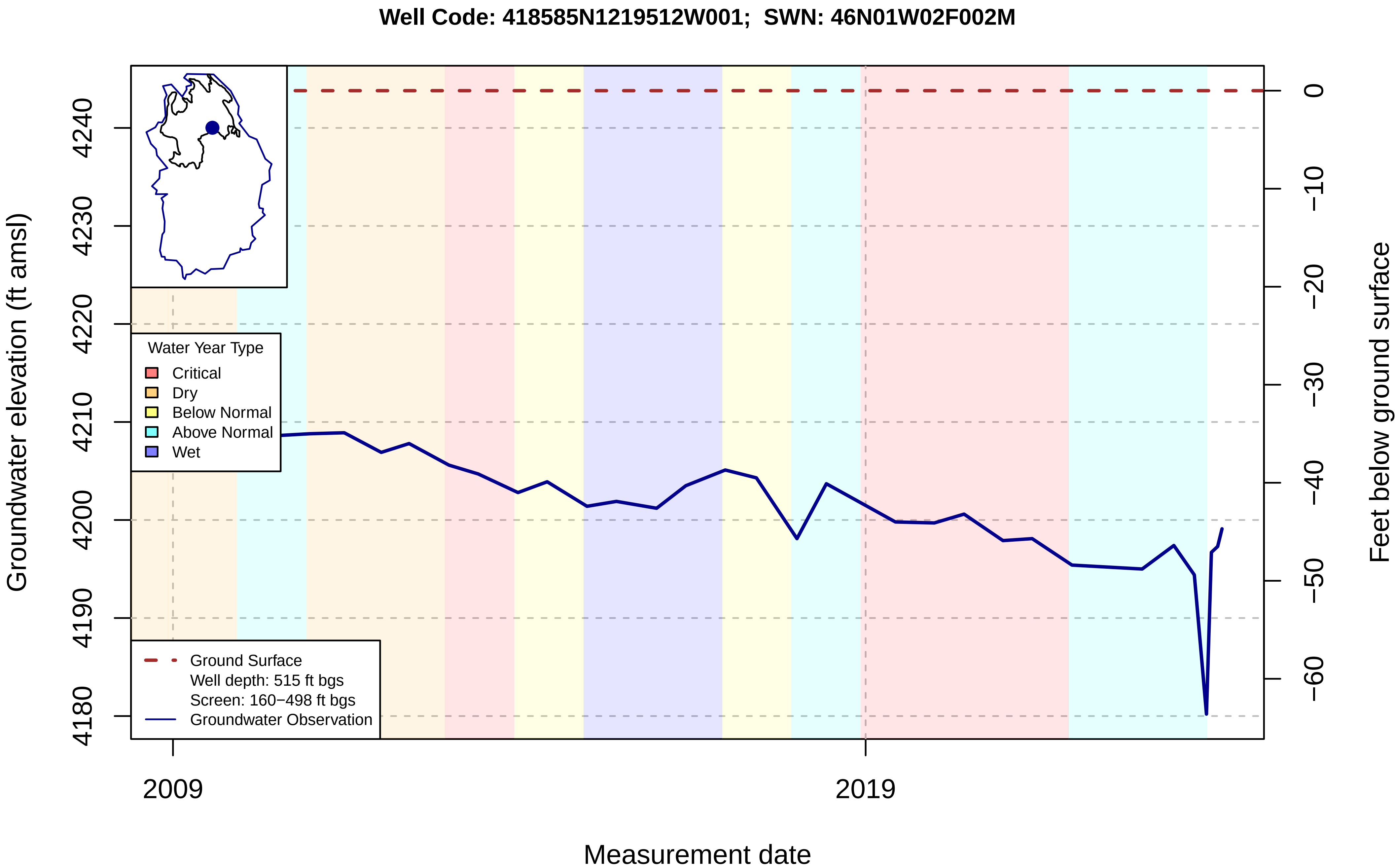
Well Code: 418543N1219225W001; SWN: 46N01W01Q001M
Groundwater elevation (ft amsl)
4180
4190
4200
4210
4220
4230
4240
Feet below ground surface
0
−10
−20
−30
−40
−50
−60
−70
1977
1987
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 236 ft bgs
Screen: 48−234 ft bgs
Groundwater Observation



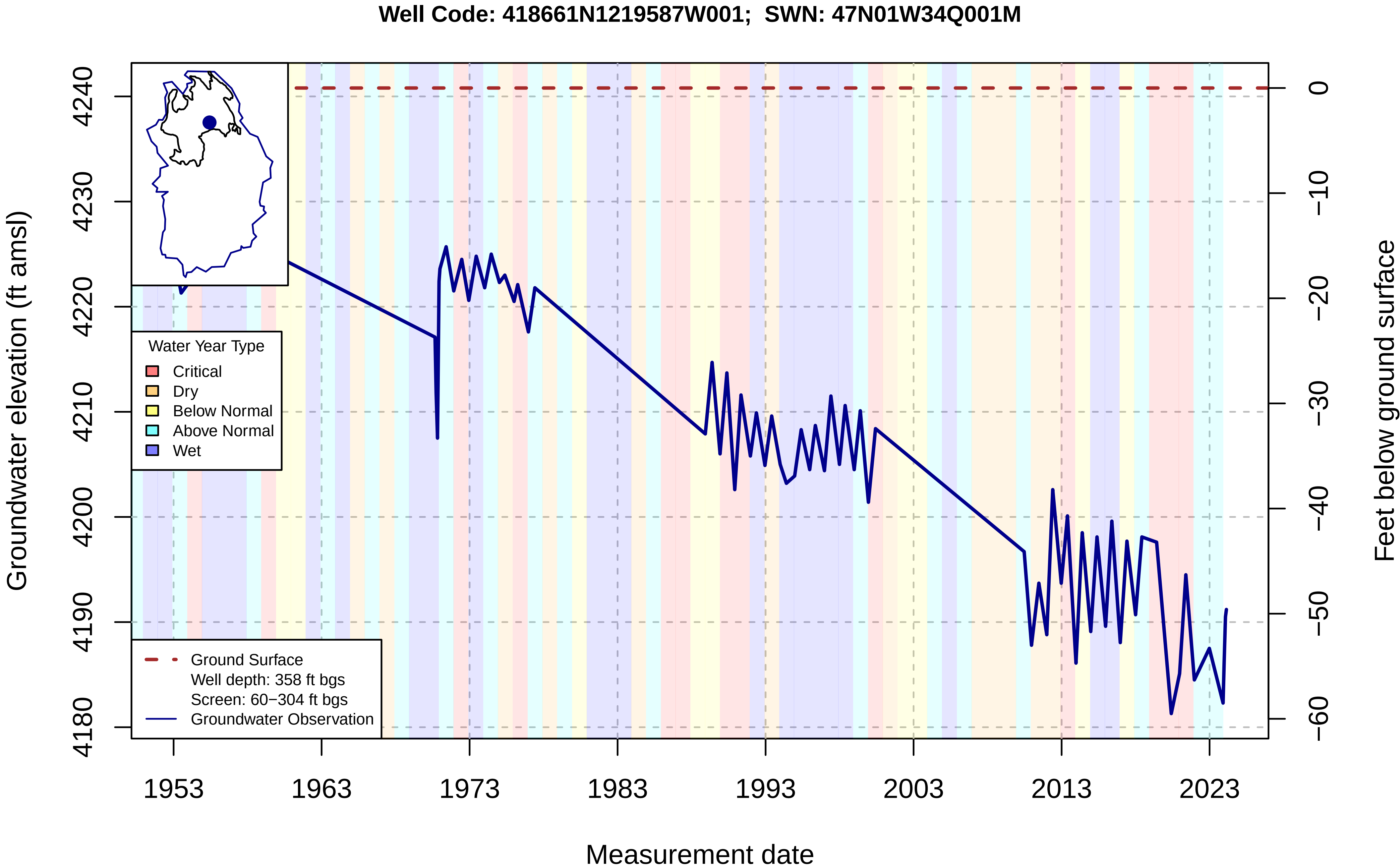
Well Code: 418544N1219958W001; SWN: 46N01W04N002M
Groundwater elevation (ft amsl)
4240
4230
4220
4210
4200
Feet below ground surface
0
−10
−20
−30
−40
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 220 ft bgs
Well screen: Unknown
Groundwater Observation
1976
1986
1996
2006
2016
Measurement date



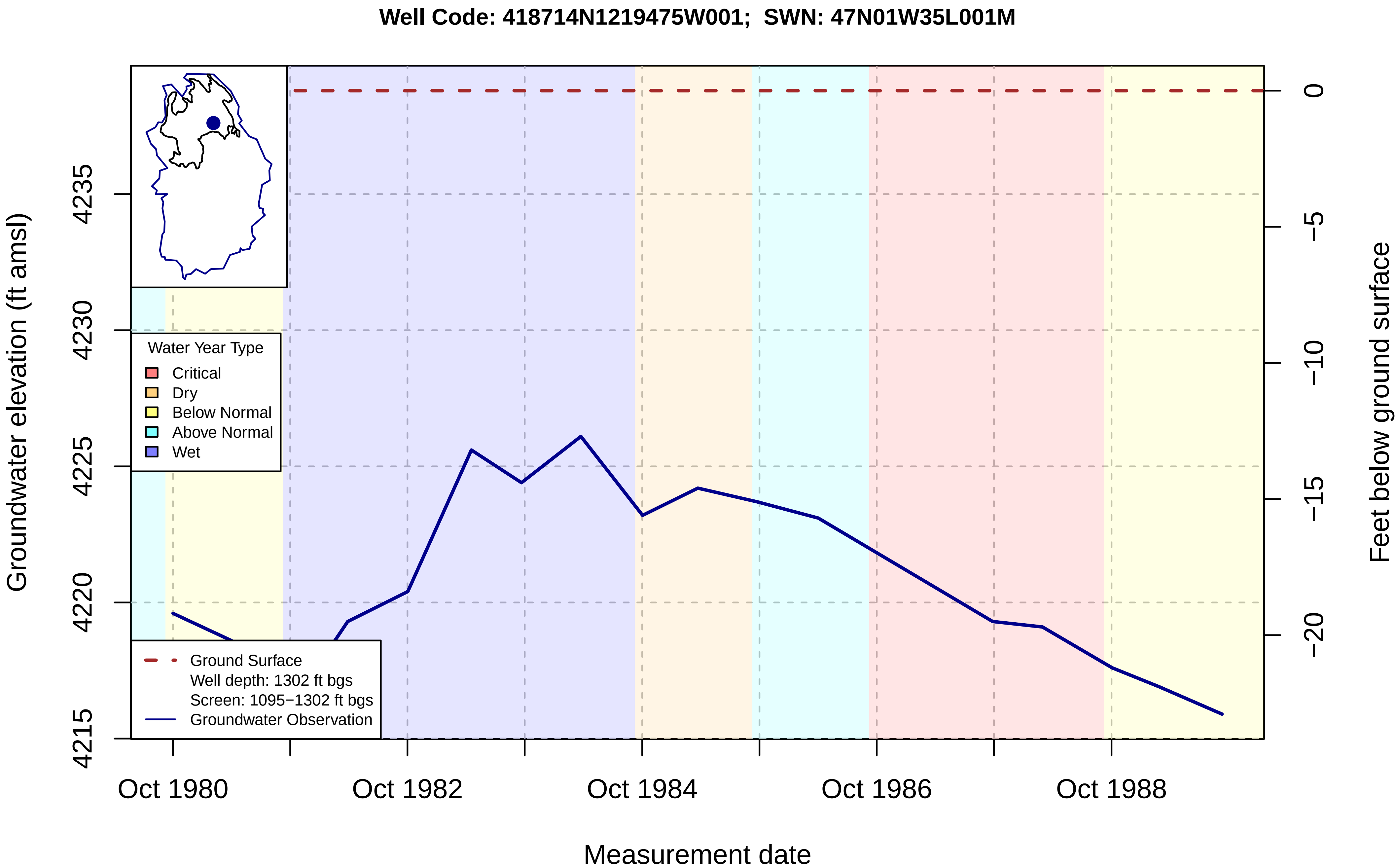
Well Code: BUT_176; SWN: NA
Groundwater elevation (ft amsl)
4240
4220
4200
4180
4160
Feet below ground surface
0
−20
−40
−60
−80
−100
Jul 2020
Jul 2021
Jul 2022
Jul 2023
Jul 2024
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation



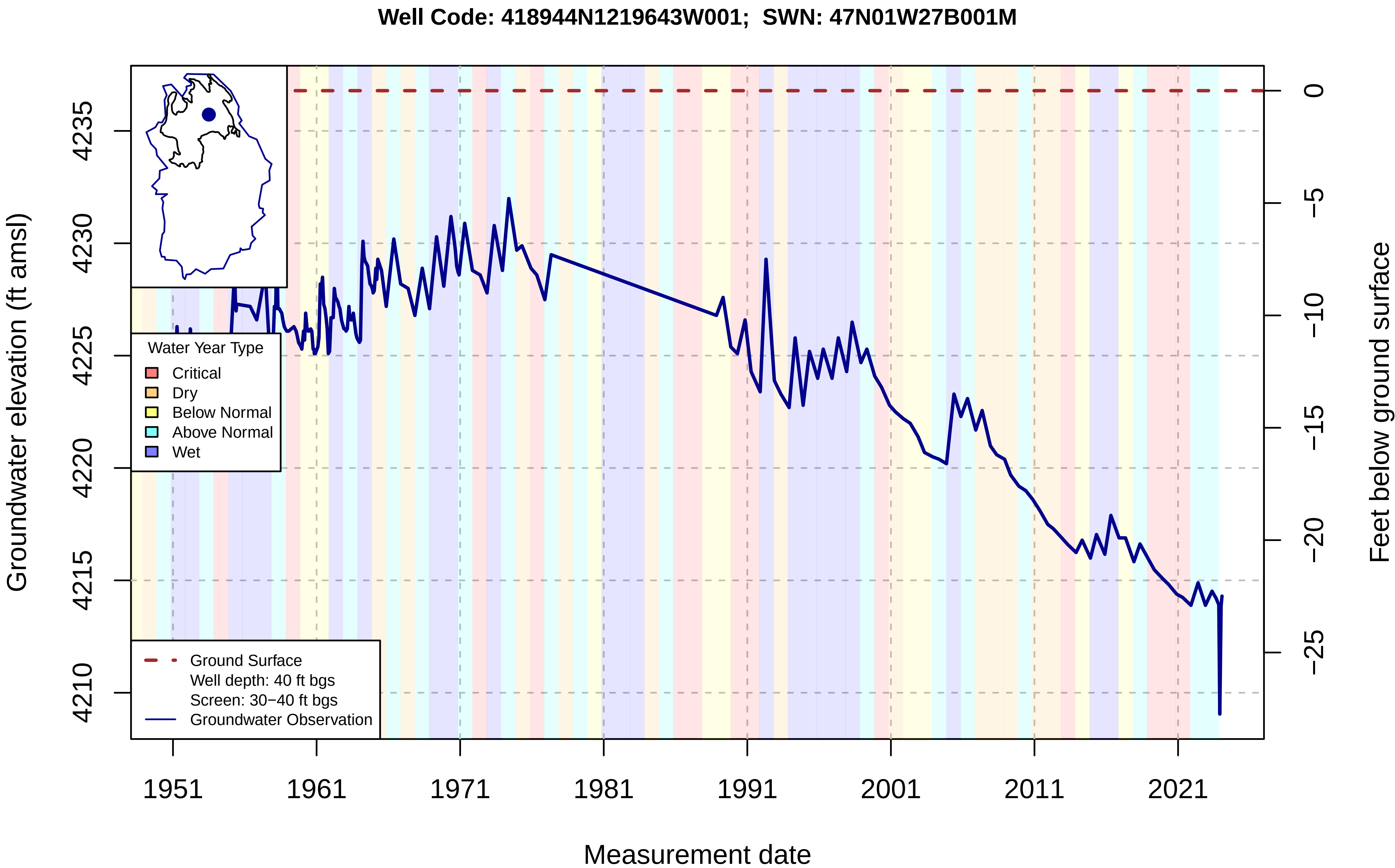
Well Code: 418585N1219512W001; SWN: 46N01W02F002M
Groundwater elevation (ft amsl)
4180
4190
4200
4210
4220
4230
4240
Feet below ground surface
0
−10
−20
−30
−40
−50
−60
2009
2019
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 515 ft bgs
Screen: 160−498 ft bgs
Groundwater Observation



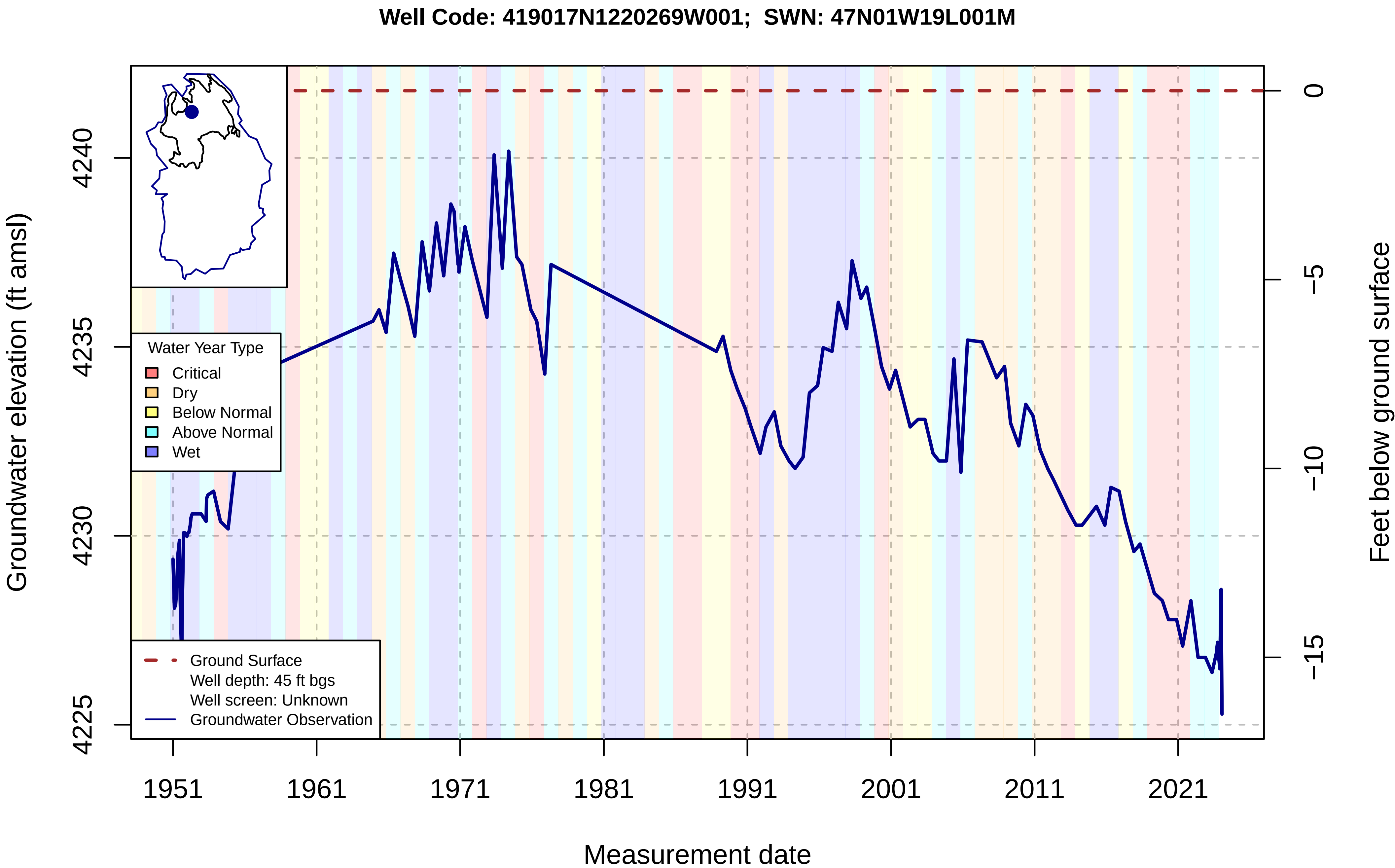
Well Code: 418661N1219587W001; SWN: 47N01W34Q001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
4180
4190
4200
4210
4220
4230
4240
0
−10
−20
−30
−40
−50
−60
1953
1963
1973
1983
1993
2003
2013
2023
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 358 ft bgs
Screen: 60−304 ft bgs
Groundwater Observation

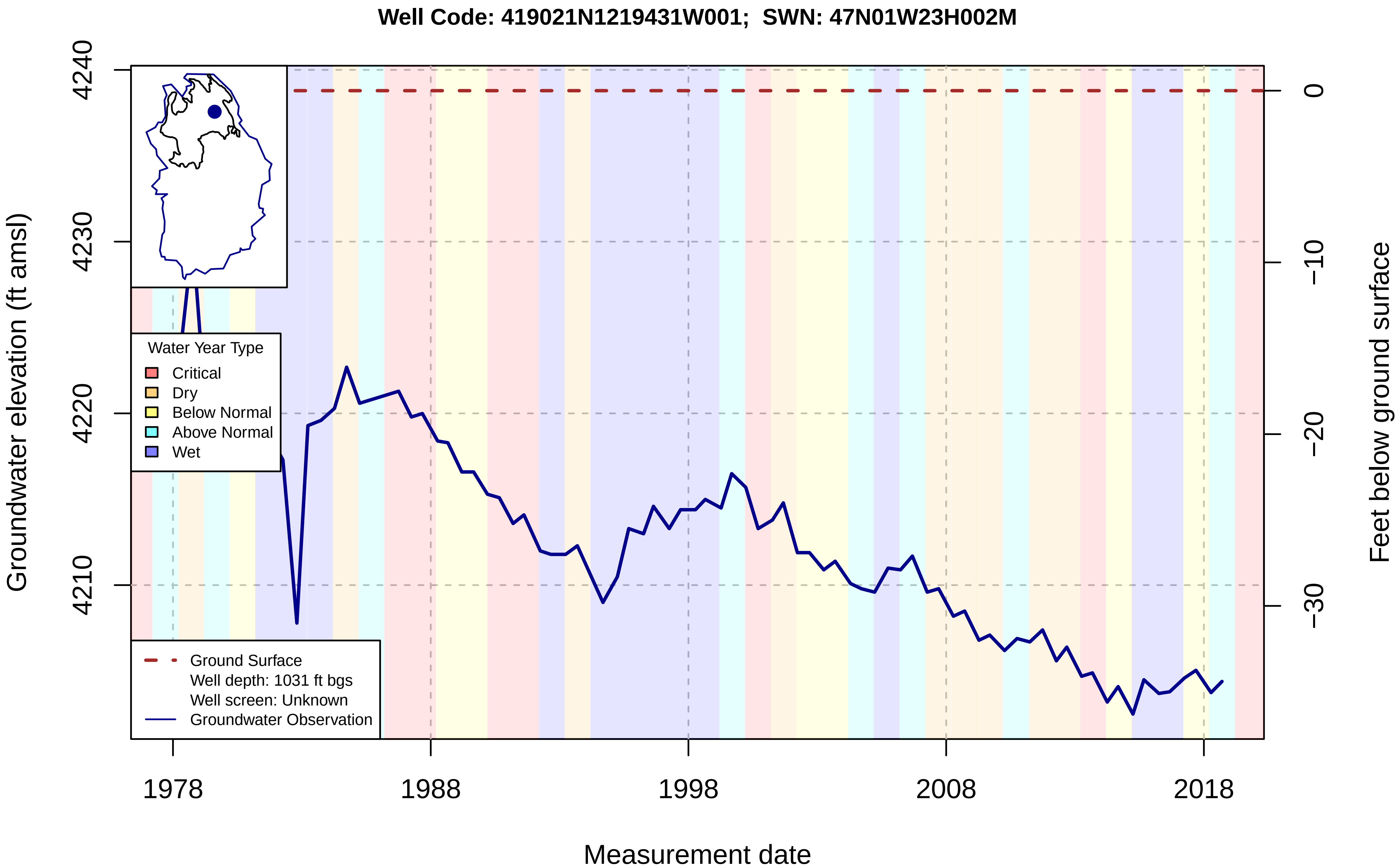


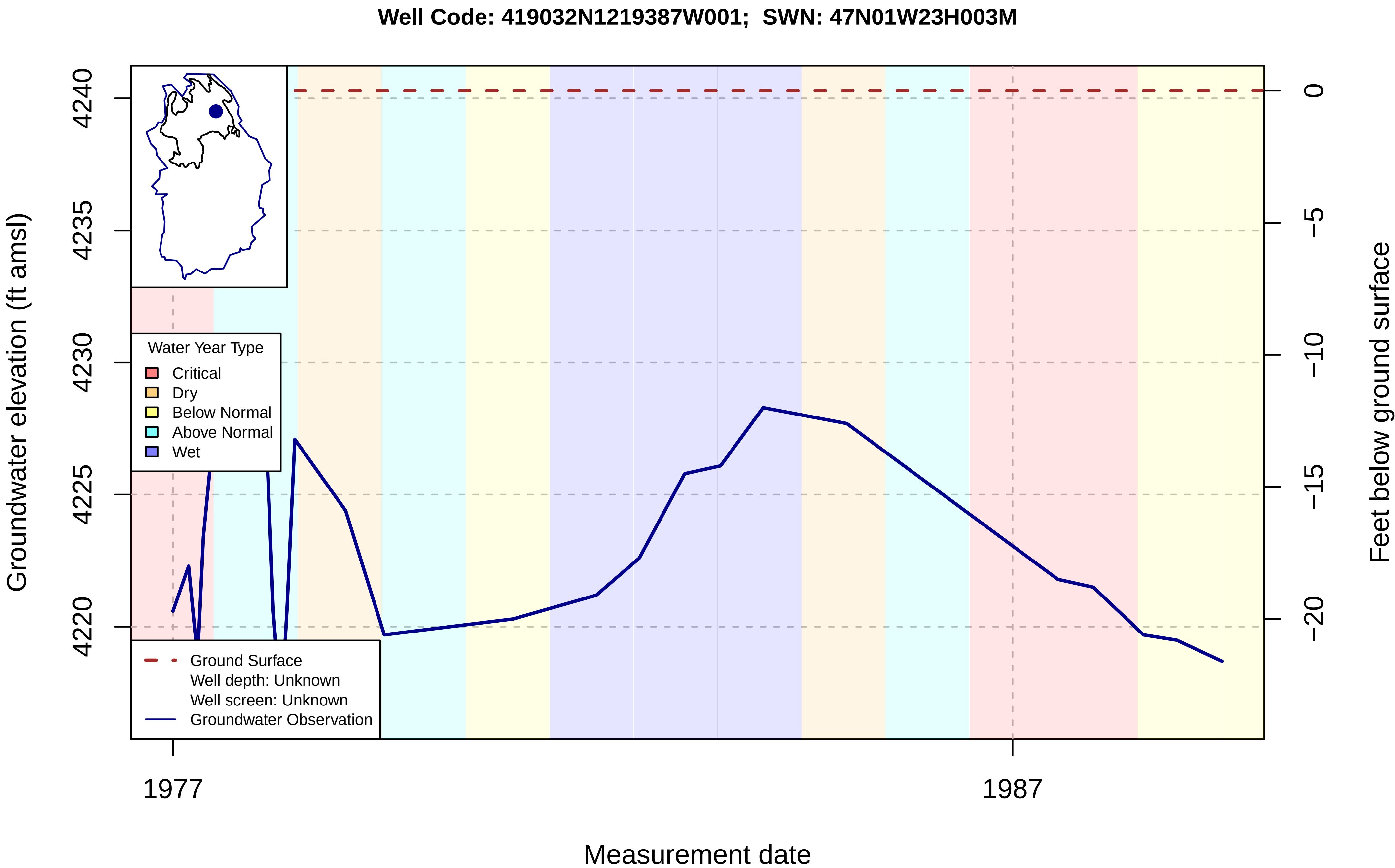
Well Code: 418714N1219475W001; SWN: 47N01W35L001M
Groundwater elevation (ft amsl)
4215
4220
4225
4230
4235
Feet below ground surface
0
−5
−10
−15
−20
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 1302 ft bgs
Screen: 1095−1302 ft bgs
Groundwater Observation
Oct 1980
Oct 1982
Oct 1984
Oct 1986
Oct 1988
Measurement date

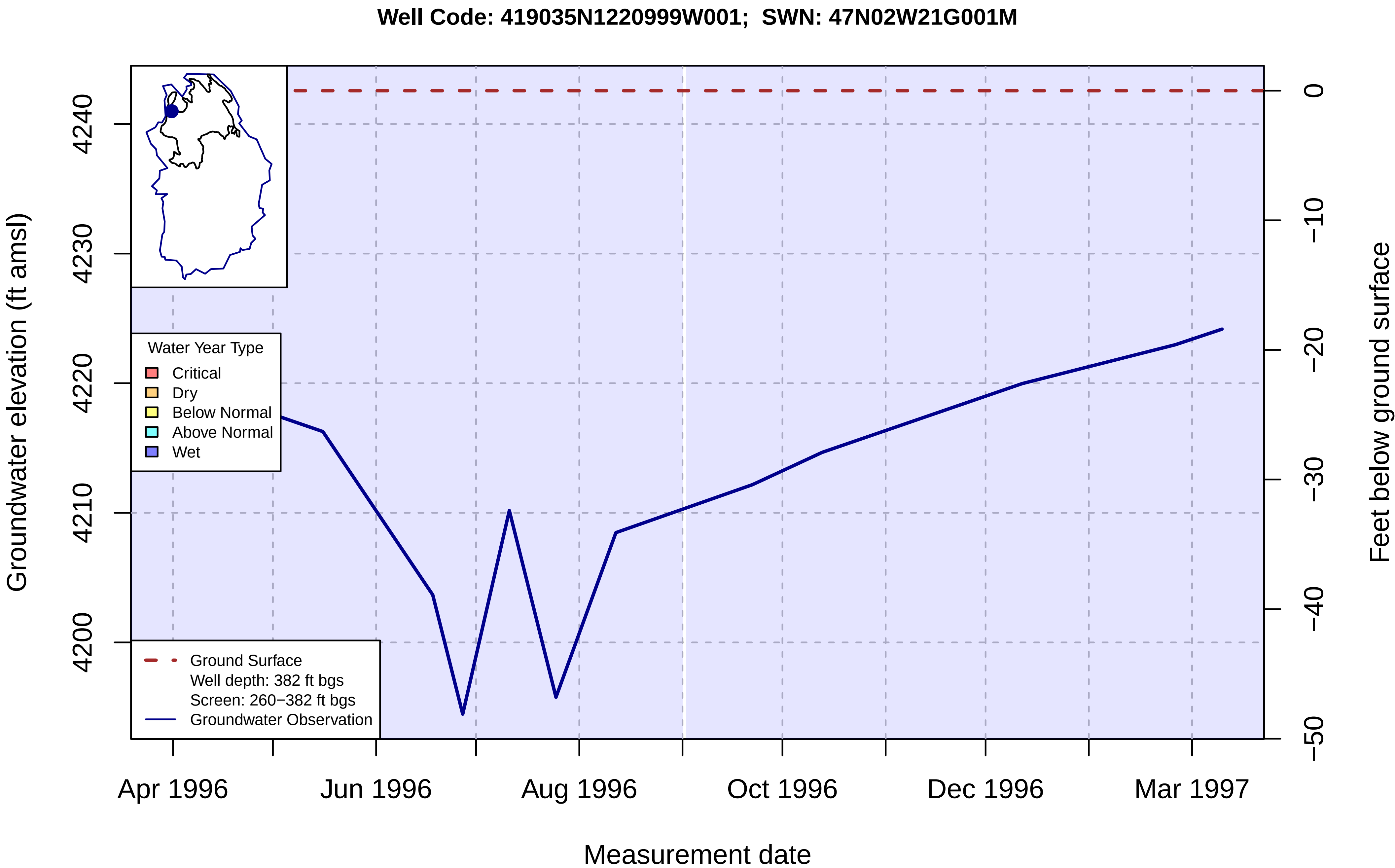


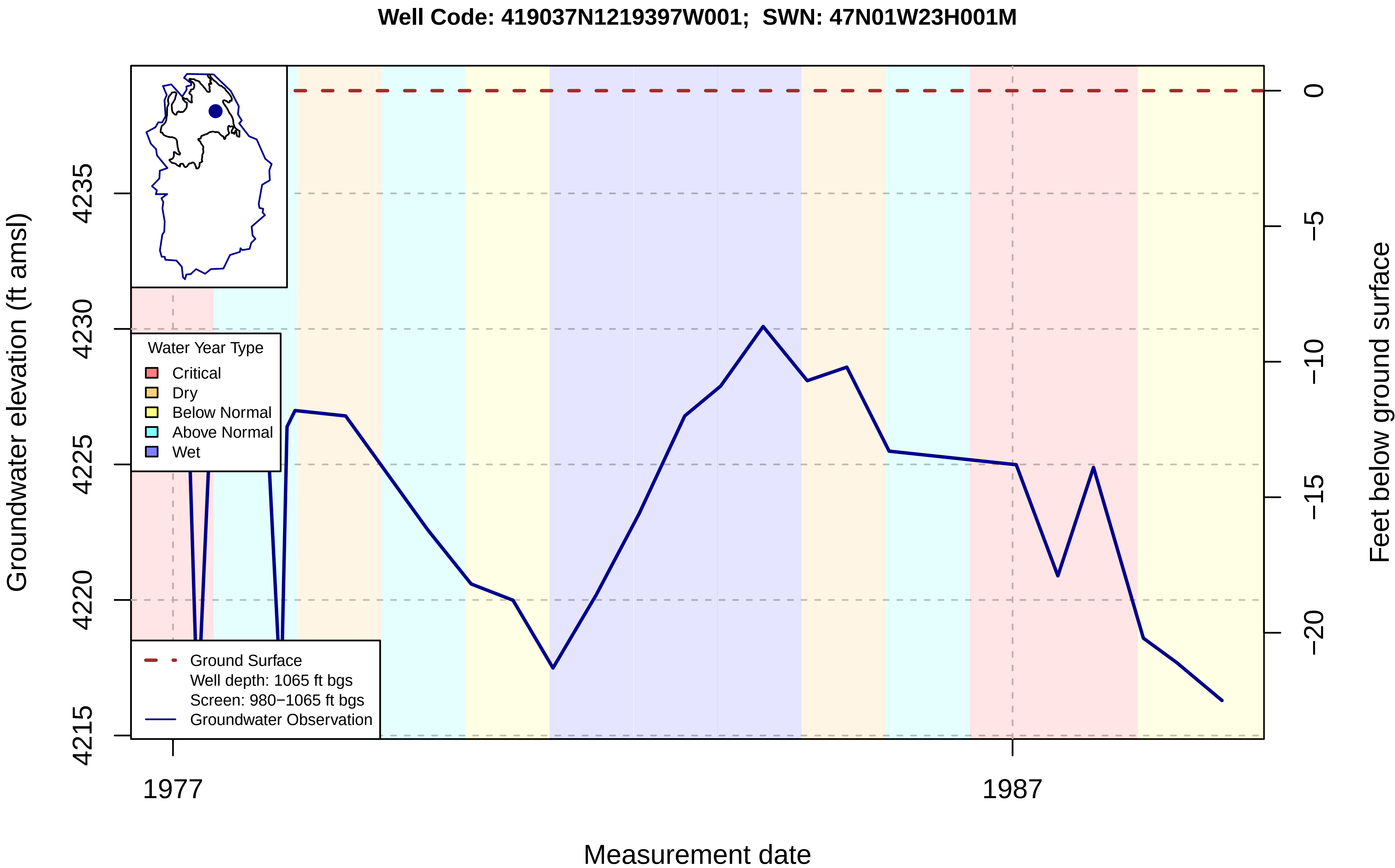
Well Code: 418944N1219643W001; SWN: 47N01W27B001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
4210
4215
4220
4225
4230
4235
0
−5
−10
−15
−20
−25
1951
1961
1971
1981
1991
2001
2011
2021
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 40 ft bgs
Screen: 30−40 ft bgs
Groundwater Observation


Well Code: 419017N1220269W001; SWN: 47N01W19L001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
4225
4230
4235
4240
0
−5
−10
−15
1951
1961
1971
1981
1991
2001
2011
2021
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 45 ft bgs
Well screen: Unknown
Groundwater Observation

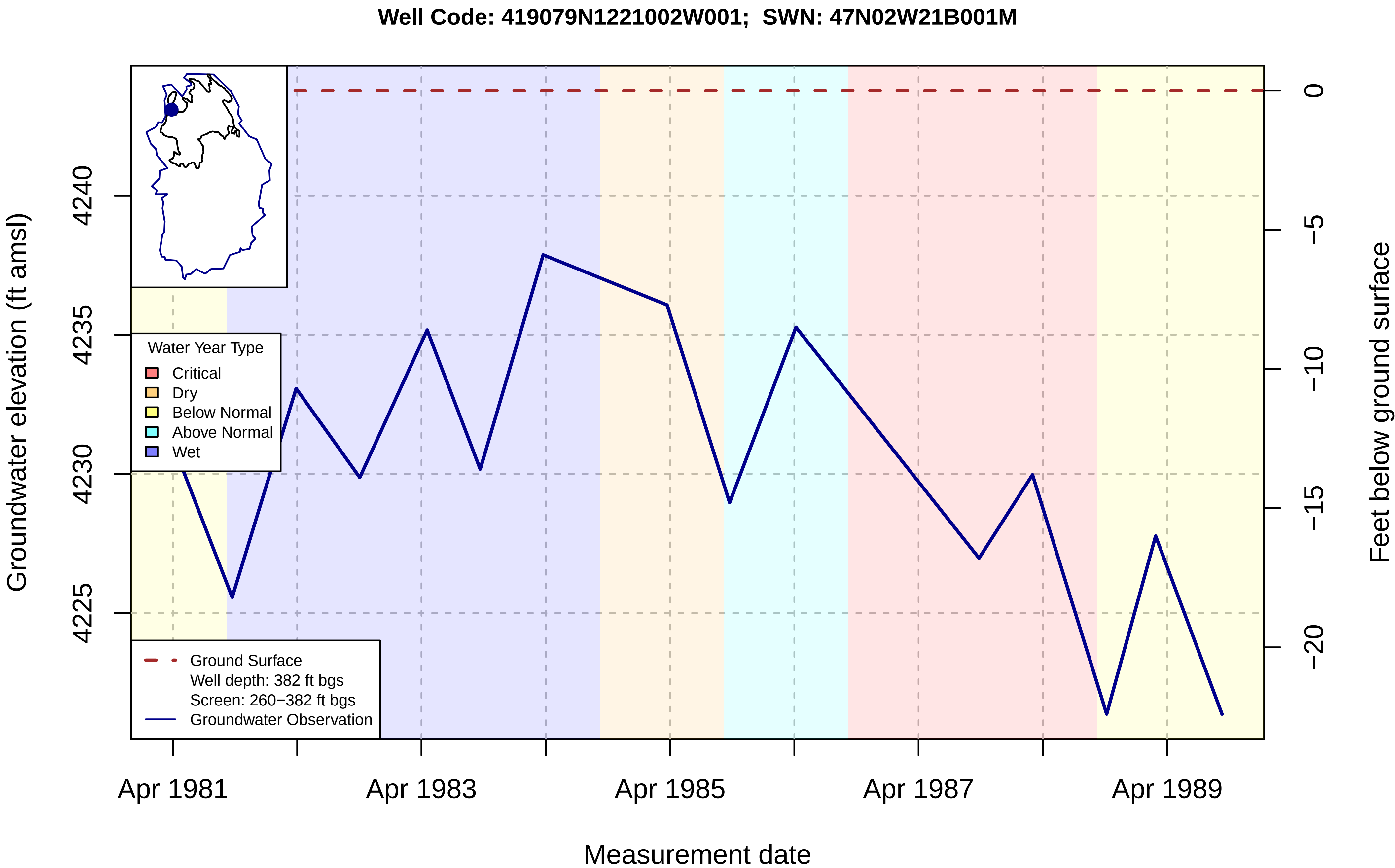

Well Code: 419021N1219431W001; SWN: 47N01W23H002M
Groundwater elevation (ft amsl)
4240
4230
4220
4210
Feet below ground surface
0
−10
−20
−30
1978
1988
1998
2008
2018
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 1031 ft bgs
Well screen: Unknown
Groundwater Observation


Well Code: 419032N1219387W001; SWN: 47N01W23H003M
Groundwater elevation (ft amsl)
4220
4225
4230
4235
4240
Feet below ground surface
0
−5
−10
−15
−20
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation
1977
1987
Measurement date

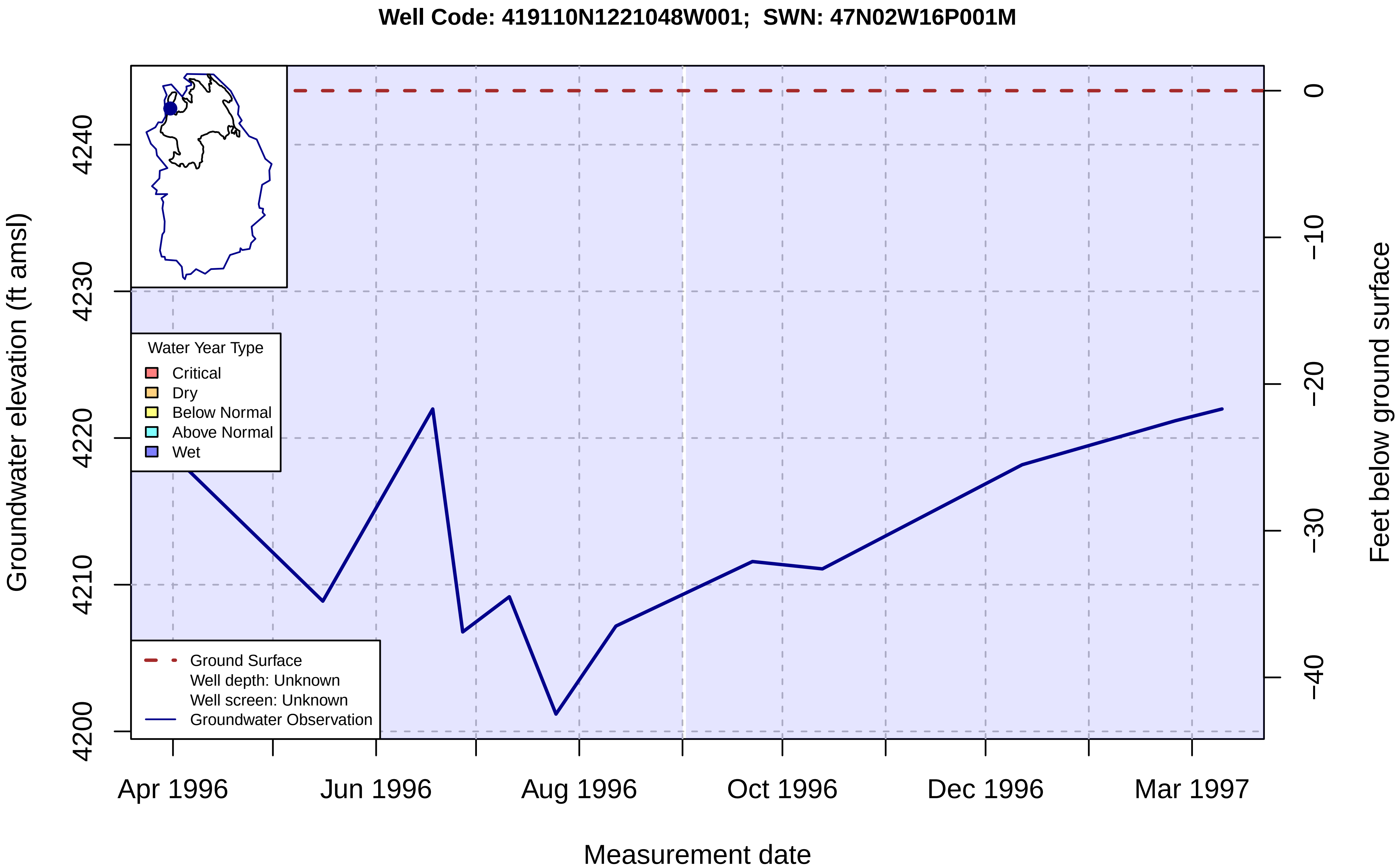

Well Code: 419035N1220999W001; SWN: 47N02W21G001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
Apr 1996
Jun 1996
Aug 1996
Oct 1996
Dec 1996
Mar 1997
4200
4210
4220
4230
4240
0
−10
−20
−30
−40
−50
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 382 ft bgs
Screen: 260−382 ft bgs
Groundwater Observation



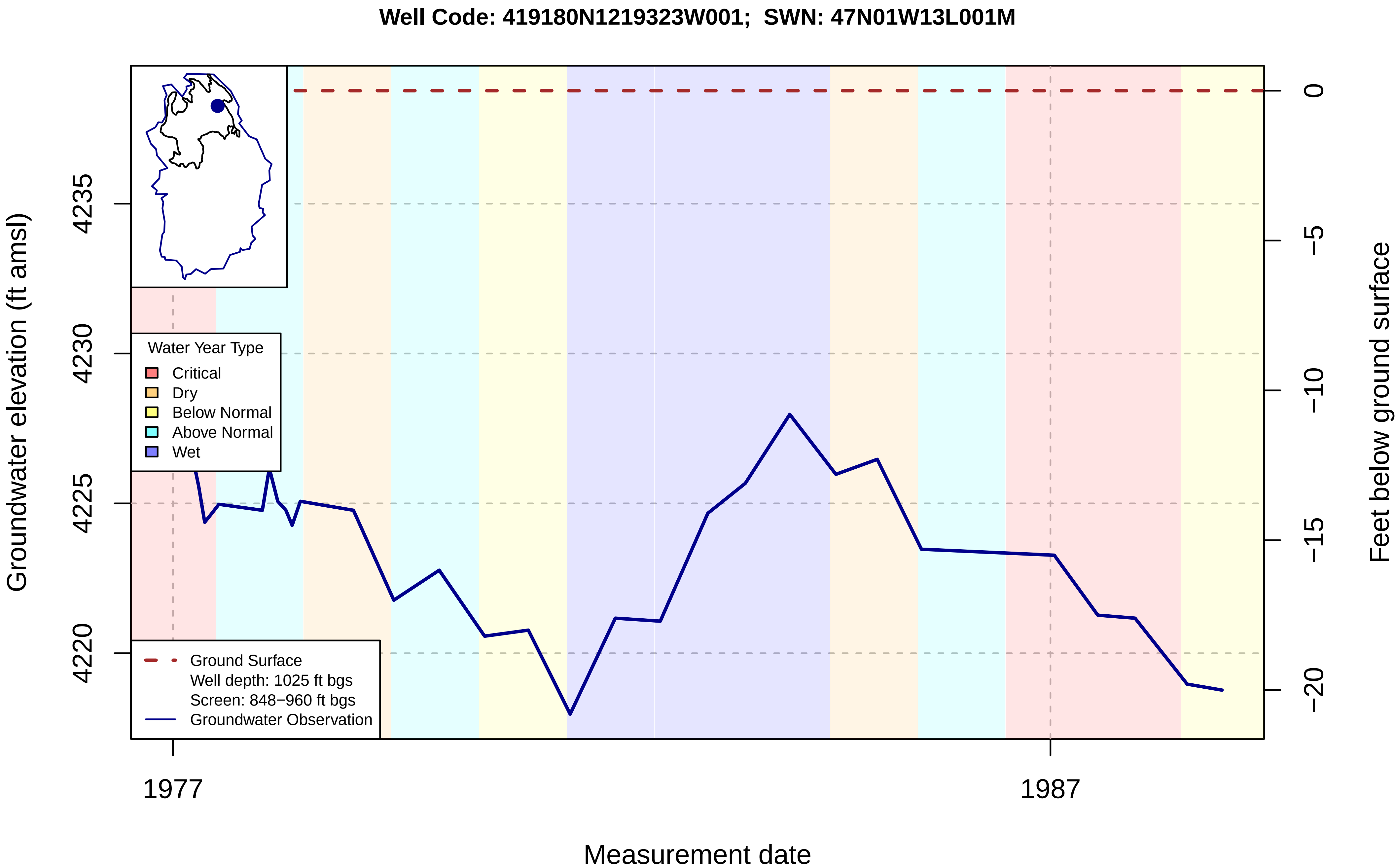
Well Code: 419037N1219397W001; SWN: 47N01W23H001M
Groundwater elevation (ft amsl)
4215
4220
4225
4230
4235
Feet below ground surface
0
−5
−10
−15
−20
1977
1987
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 1065 ft bgs
Screen: 980−1065 ft bgs
Groundwater Observation



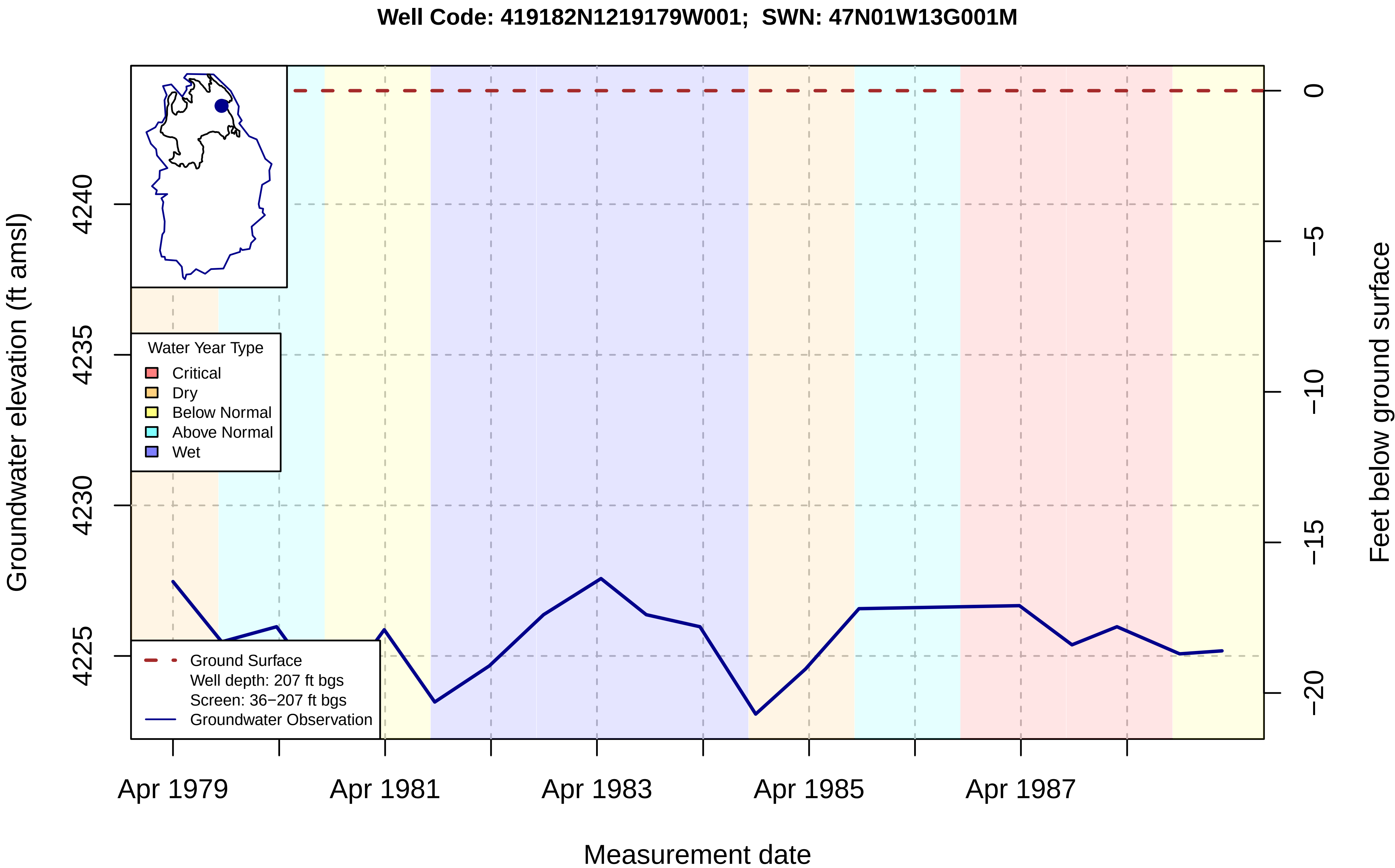
Well Code: 419079N1221002W001; SWN: 47N02W21B001M
Groundwater elevation (ft amsl)
4225
4230
4235
4240
Feet below ground surface
0
−5
−10
−15
−20
Apr 1981
Apr 1983
Apr 1985
Apr 1987
Apr 1989
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 382 ft bgs
Screen: 260−382 ft bgs
Groundwater Observation



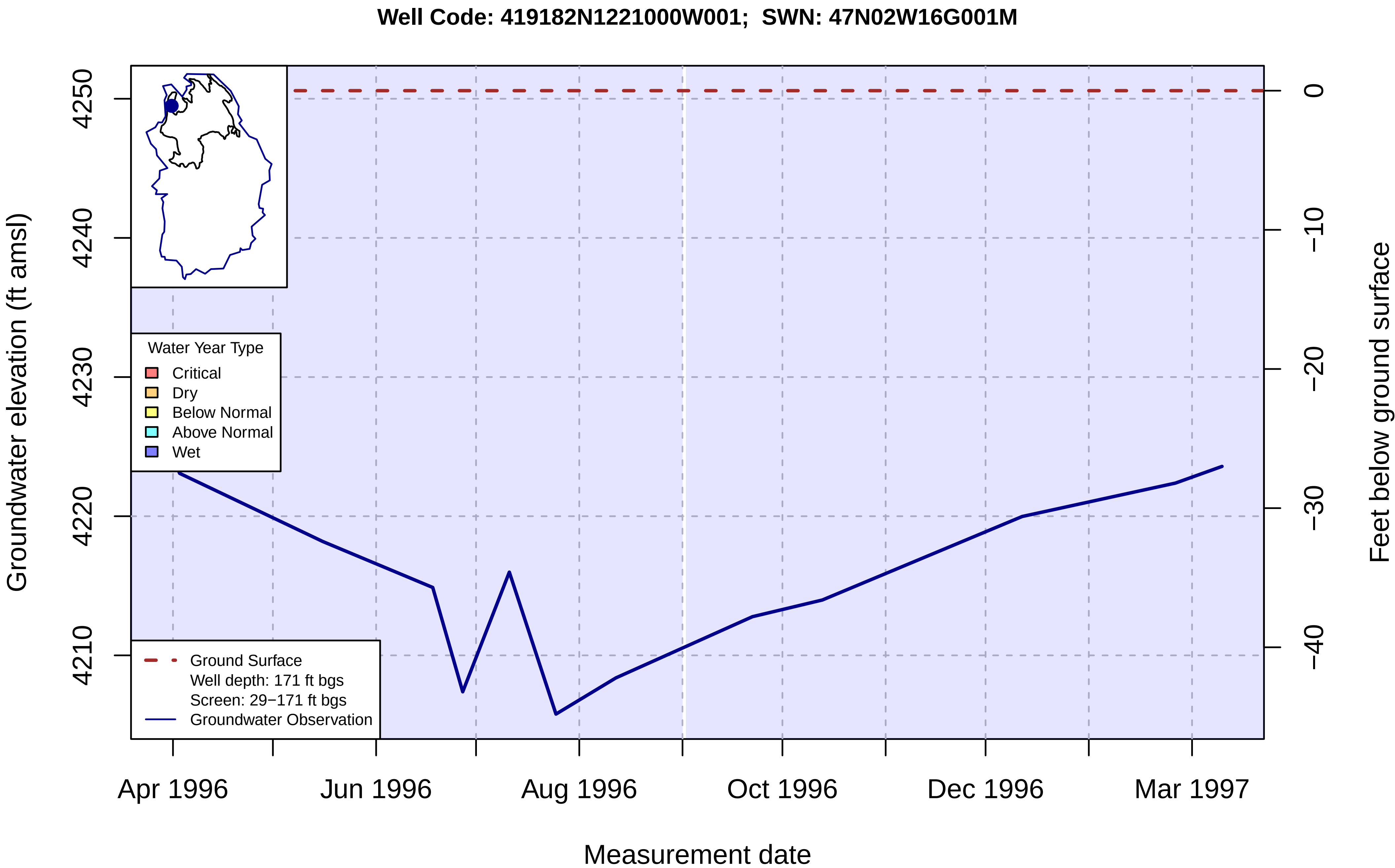
Well Code: 419110N1221048W001; SWN: 47N02W16P001M
Groundwater elevation (ft amsl)
4200
4210
4220
4230
4240
Feet below ground surface
0
−10
−20
−30
−40
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation
Apr 1996
Jun 1996
Aug 1996
Oct 1996
Dec 1996
Mar 1997
Measurement date



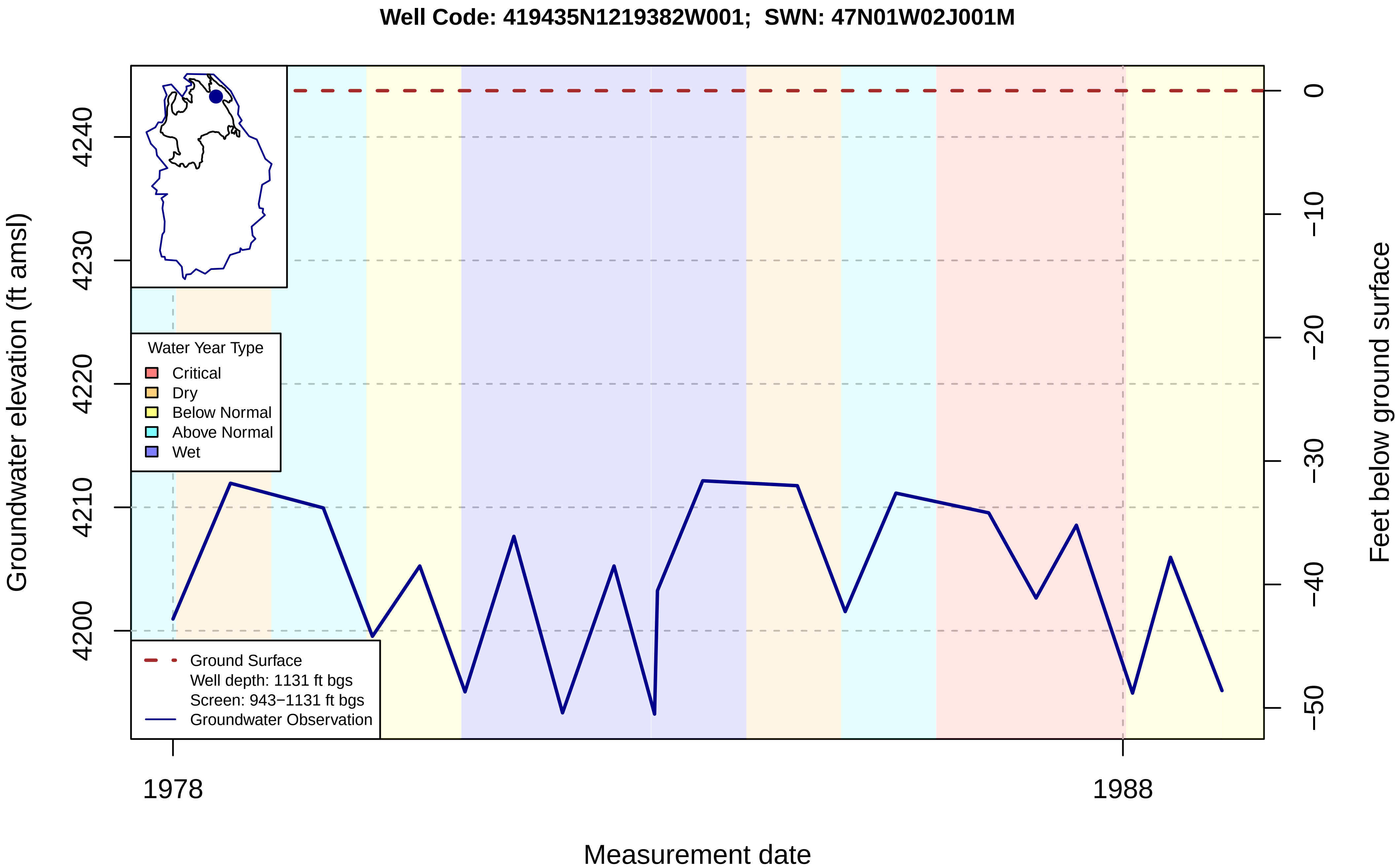
Well Code: 419180N1219323W001; SWN: 47N01W13L001M
Groundwater elevation (ft amsl)
4220
4225
4230
4235
Feet below ground surface
0
−5
−10
−15
−20
1977
1987
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 1025 ft bgs
Screen: 848−960 ft bgs
Groundwater Observation



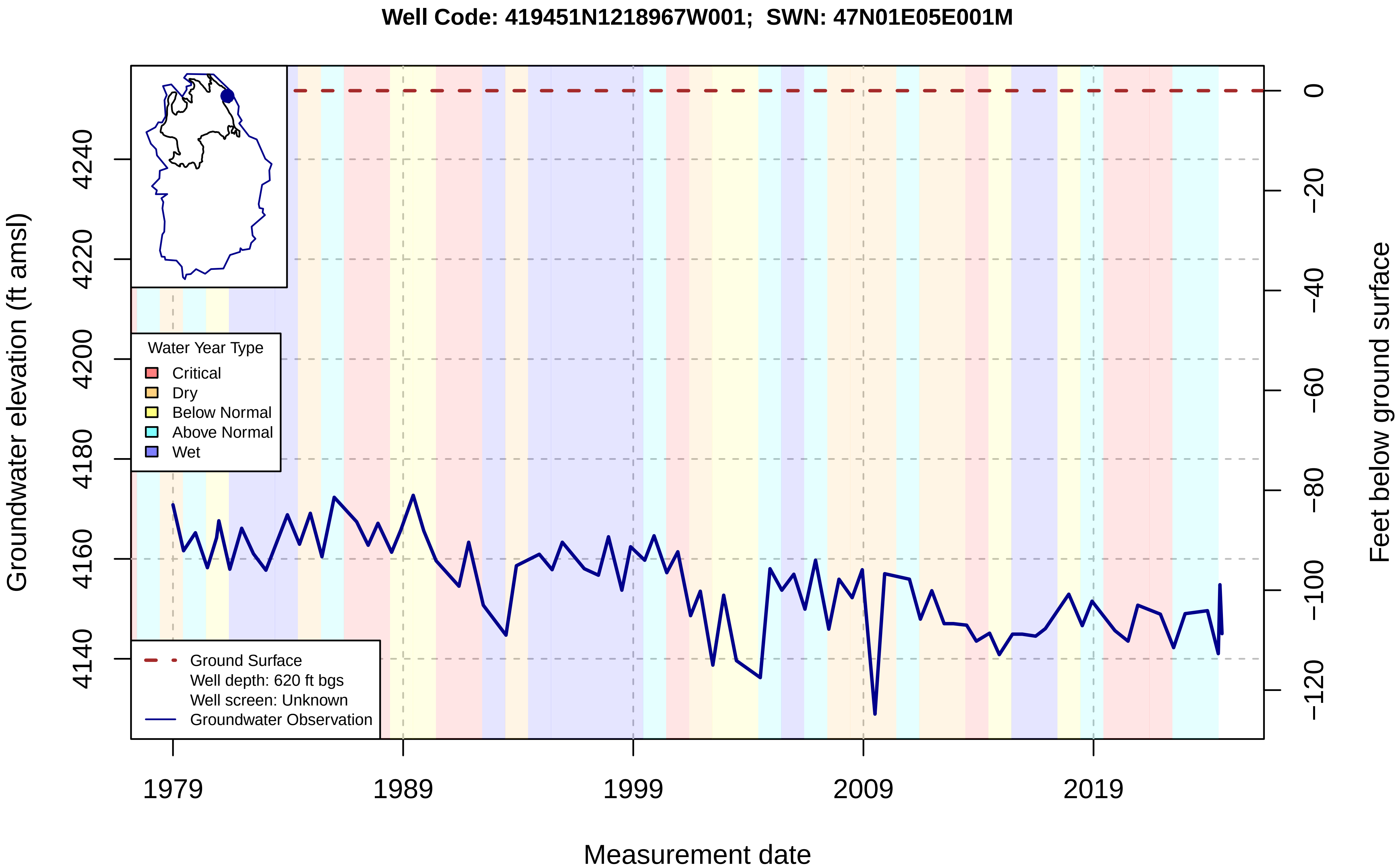
Well Code: 419182N1219179W001; SWN: 47N01W13G001M
Groundwater elevation (ft amsl)
4225
4230
4235
4240
Feet below ground surface
0
−5
−10
−15
−20
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 207 ft bgs
Screen: 36−207 ft bgs
Groundwater Observation
Apr 1979
Apr 1981
Apr 1983
Apr 1985
Apr 1987
Measurement date

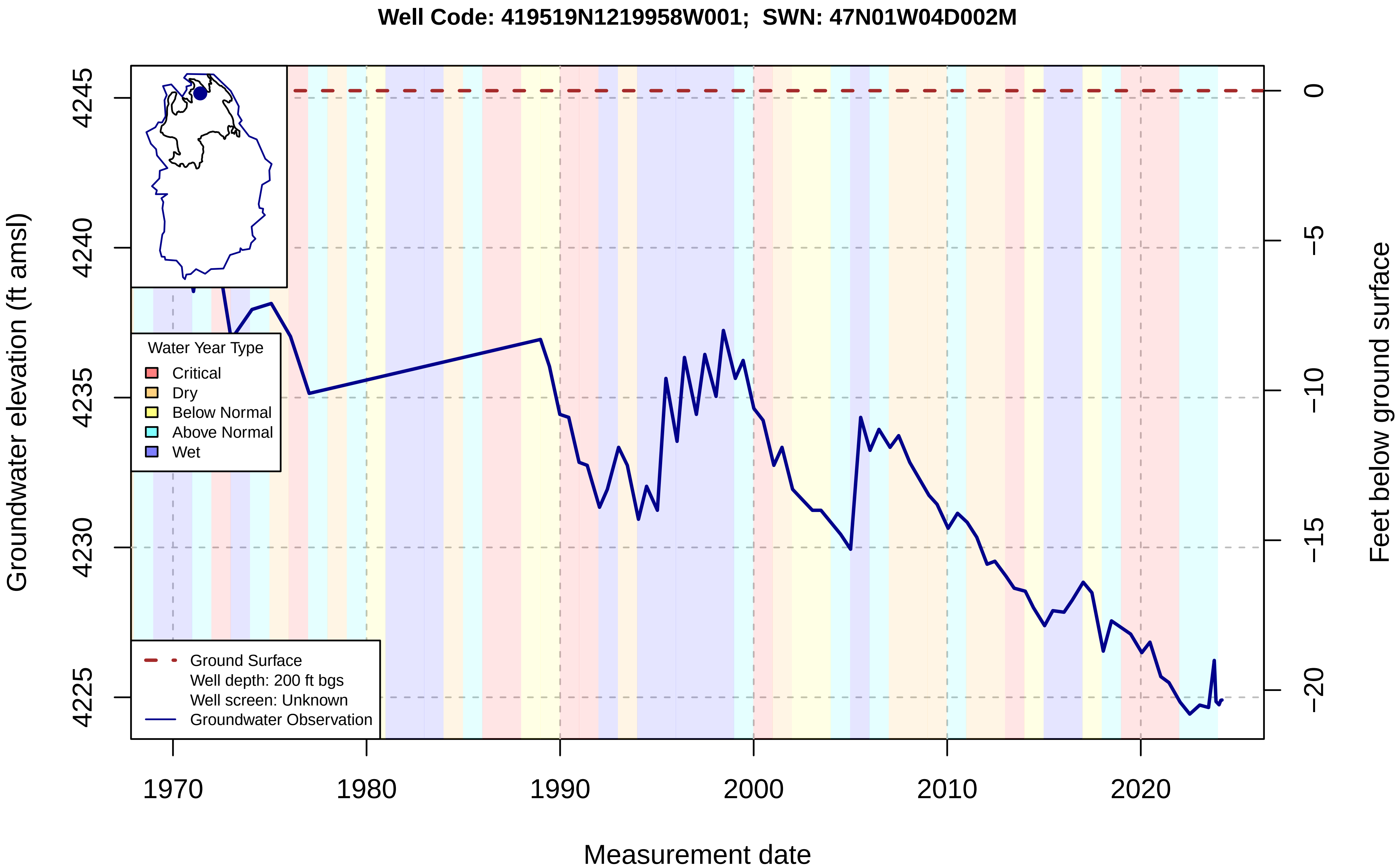


Well Code: 419182N1221000W001; SWN: 47N02W16G001M
Groundwater elevation (ft amsl)
4210
4220
4230
4240
4250
Feet below ground surface
0
−10
−20
−30
−40
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 171 ft bgs
Screen: 29−171 ft bgs
Groundwater Observation
Apr 1996
Jun 1996
Aug 1996
Oct 1996
Dec 1996
Mar 1997
Measurement date

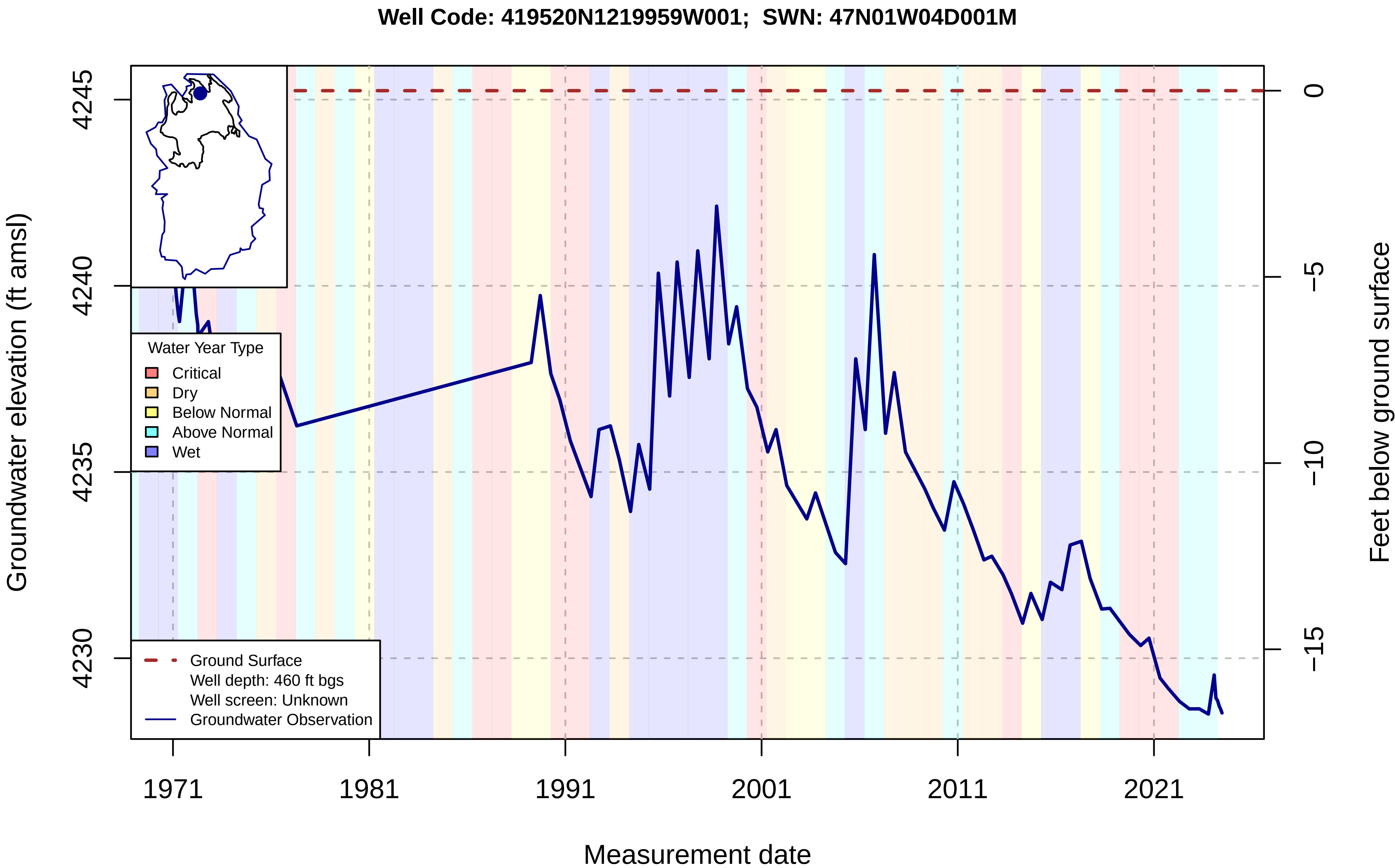


Well Code: 419435N1219382W001; SWN: 47N01W02J001M
Groundwater elevation (ft amsl)
4200
4210
4220
4230
4240
Feet below ground surface
0
−10
−20
−30
−40
−50
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 1131 ft bgs
Screen: 943−1131 ft bgs
Groundwater Observation
1978
1988
Measurement date

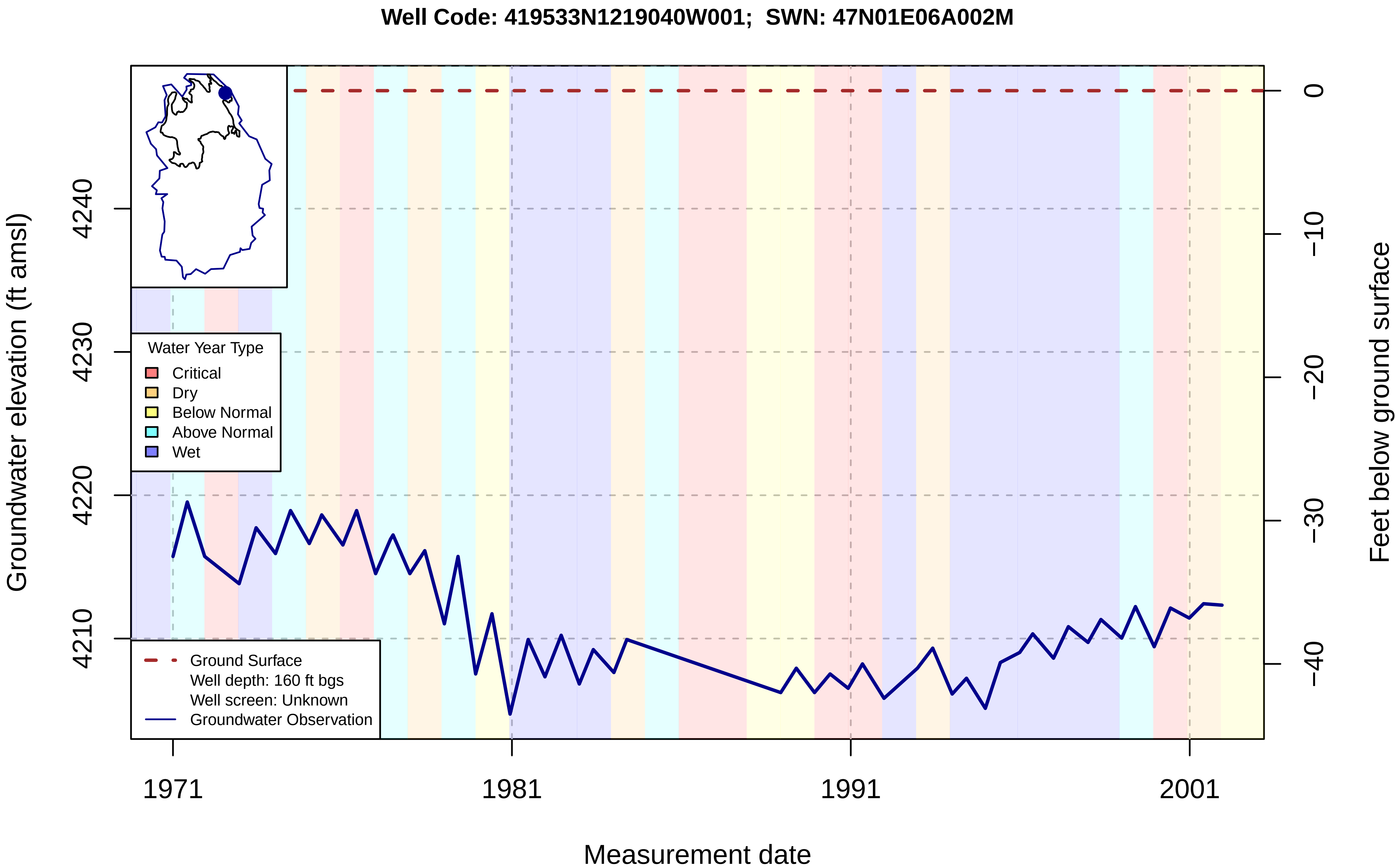

Well Code: 419451N1218967W001; SWN: 47N01E05E001M
Groundwater elevation (ft amsl)
Feet below ground surface
Measurement date
4140
4160
4180
4200
4220
4240
0
−20
−40
−60
−80
−100
−120
1979
1989
1999
2009
2019
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 620 ft bgs
Well screen: Unknown
Groundwater Observation



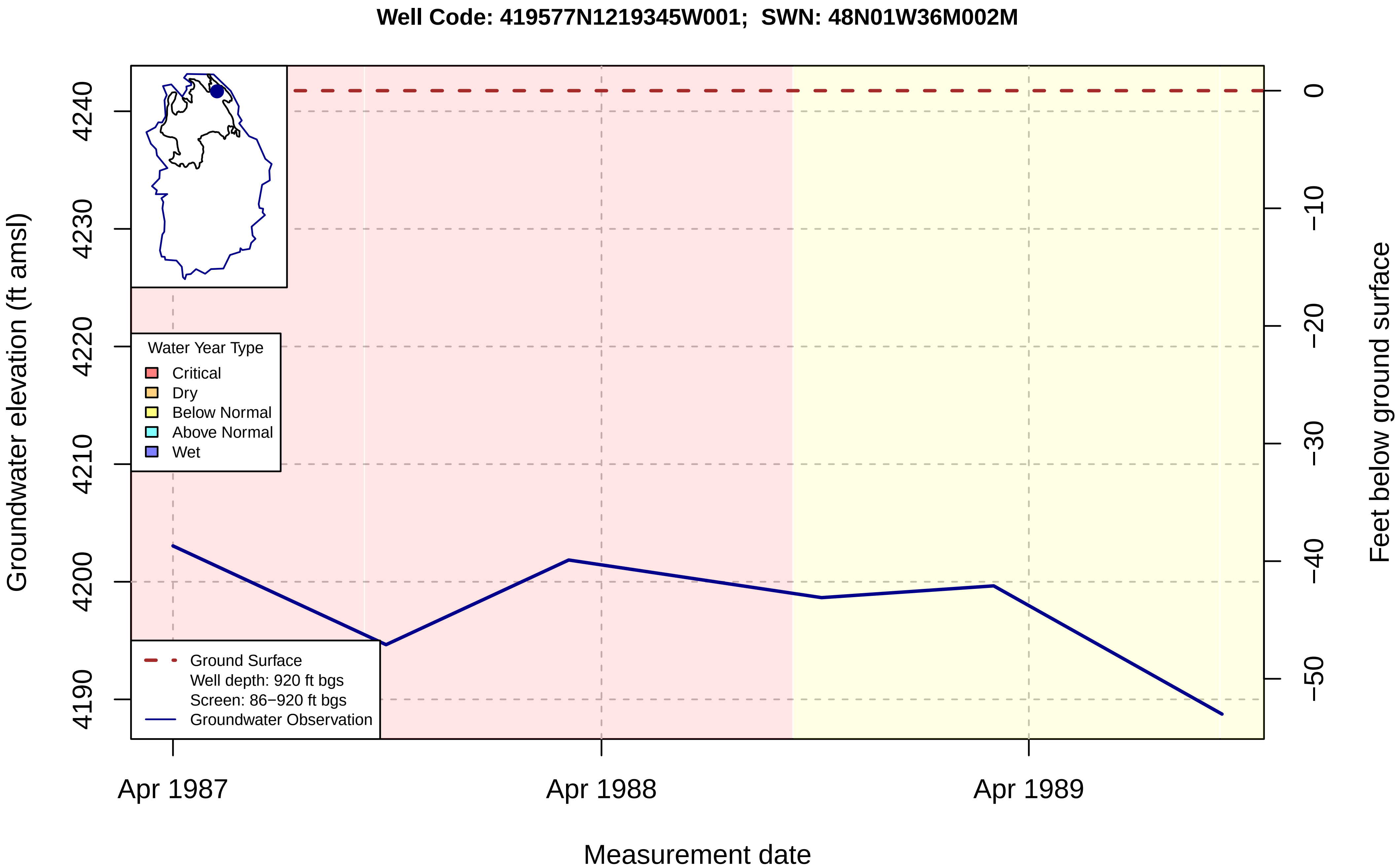
Well Code: 419519N1219958W001; SWN: 47N01W04D002M
Groundwater elevation (ft amsl)
4225
4230
4235
4240
4245
Feet below ground surface
0
−5
−10
−15
−20
1970
1980
1990
2000
2010
2020
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 200 ft bgs
Well screen: Unknown
Groundwater Observation



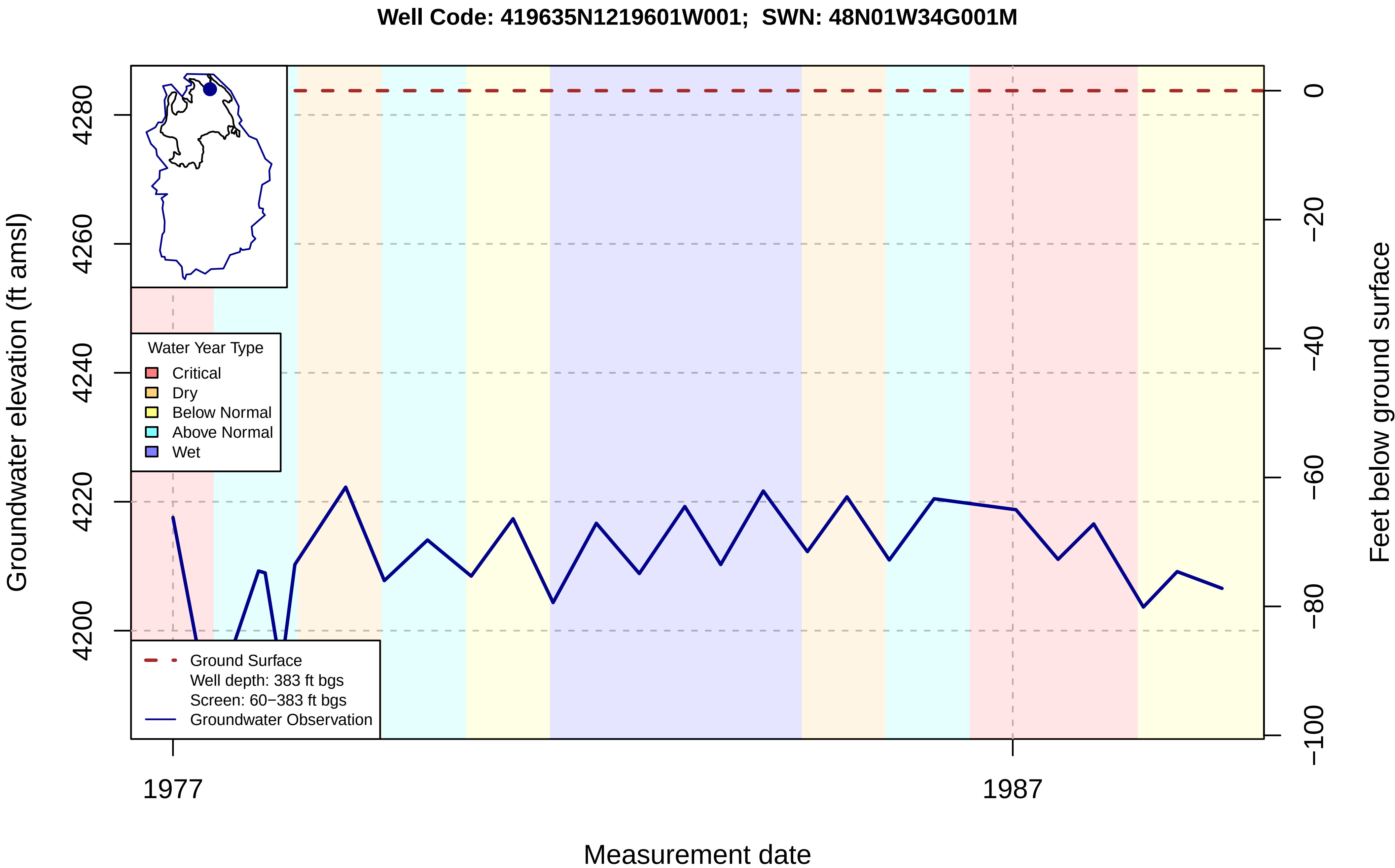
Well Code: 419520N1219959W001; SWN: 47N01W04D001M
Groundwater elevation (ft amsl)
4245
4240
4235
4230
Feet below ground surface
0
−5
−10
−15
1971
1981
1991
2001
2011
2021
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 460 ft bgs
Well screen: Unknown
Groundwater Observation



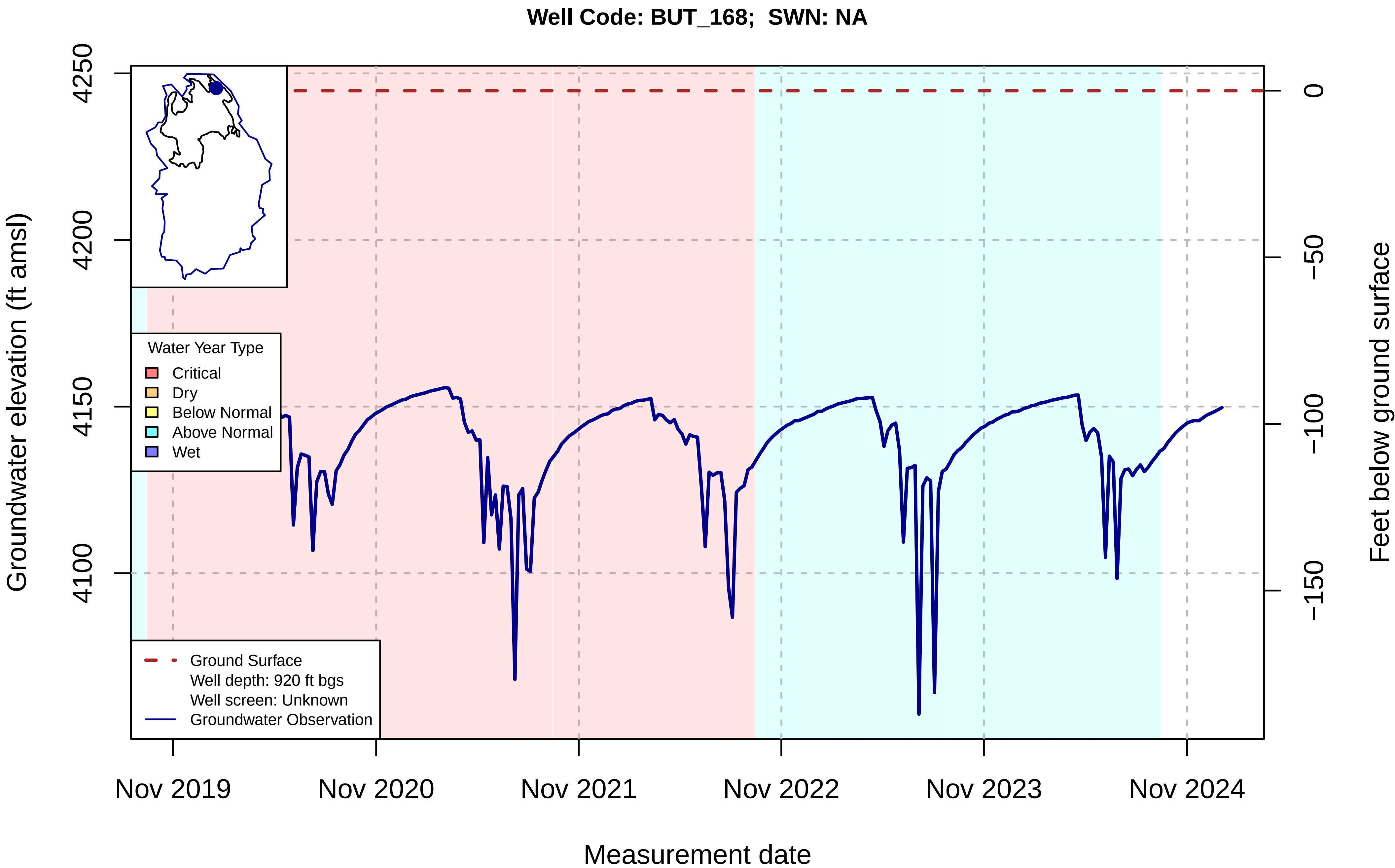
Well Code: 419533N1219040W001; SWN: 47N01E06A002M
Groundwater elevation (ft amsl)
4210
4220
4230
4240
Feet below ground surface
0
−10
−20
−30
−40
1971
1981
1991
2001
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 160 ft bgs
Well screen: Unknown
Groundwater Observation



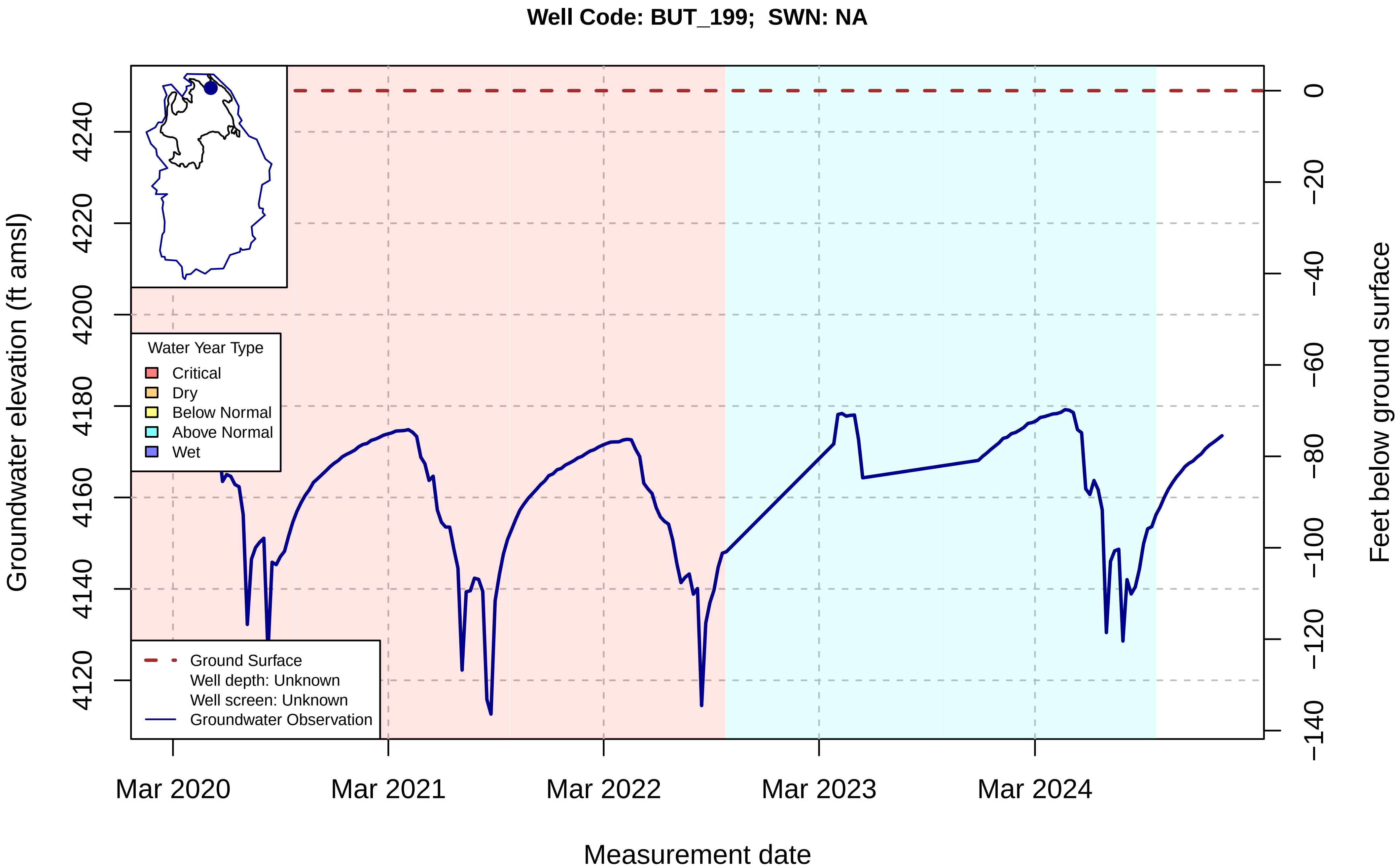
Well Code: 419577N1219345W001; SWN: 48N01W36M002M
Groundwater elevation (ft amsl)
4190
4200
4210
4220
4230
4240
Feet below ground surface
0
−10
−20
−30
−40
−50
Apr 1987
Apr 1988
Apr 1989
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 920 ft bgs
Screen: 86−920 ft bgs
Groundwater Observation



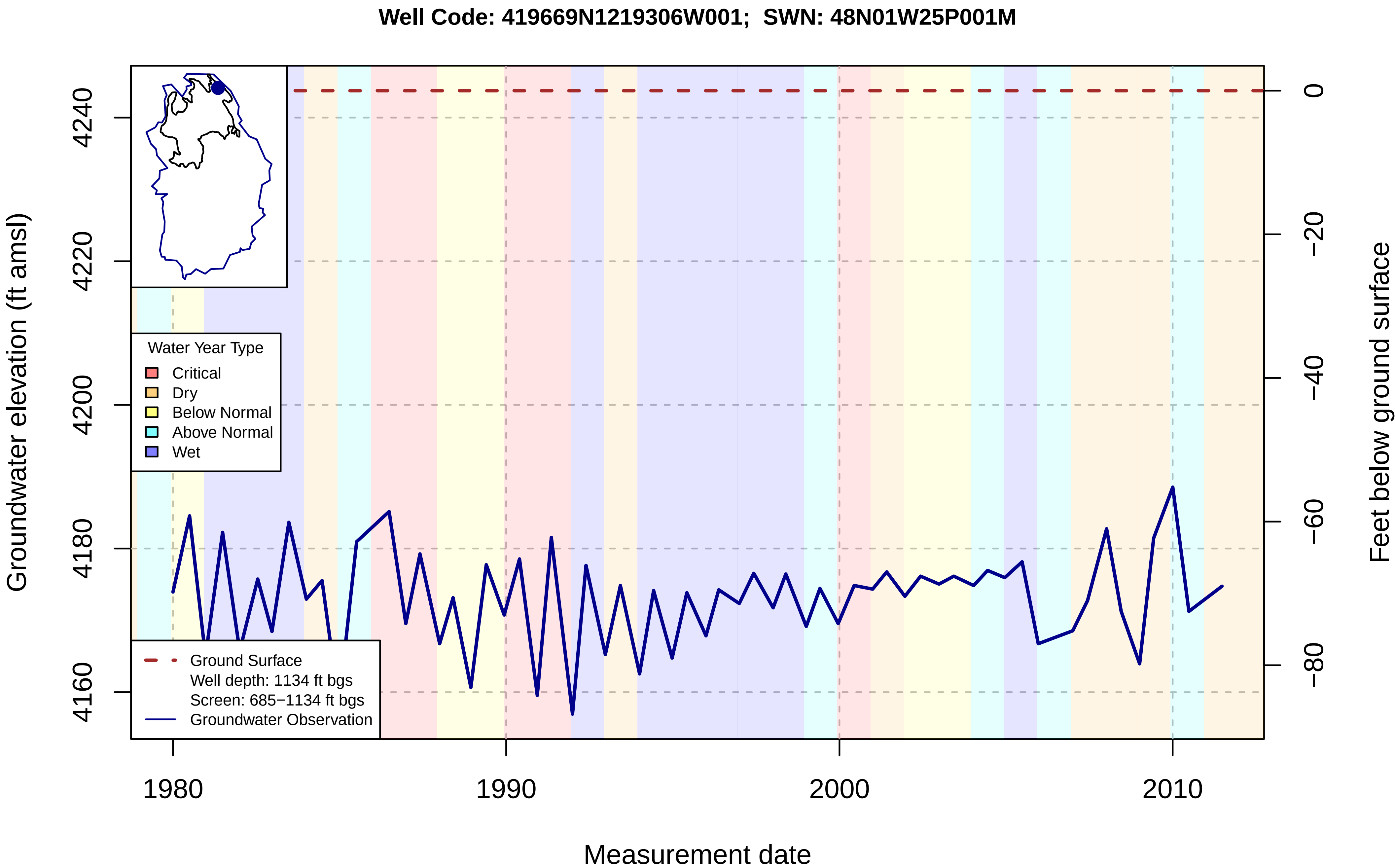
Well Code: 419635N1219601W001; SWN: 48N01W34G001M
Groundwater elevation (ft amsl)
4200
4220
4240
4260
4280
Feet below ground surface
0
−20
−40
−60
−80
−100
1977
1987
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 383 ft bgs
Screen: 60−383 ft bgs
Groundwater Observation



Well Code: BUT_168; SWN: NA
Groundwater elevation (ft amsl)
4250
4200
4150
4100
Feet below ground surface
0
−50
−100
−150
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 920 ft bgs
Well screen: Unknown
Groundwater Observation
Nov 2019
Nov 2020
Nov 2021
Nov 2022
Nov 2023
Nov 2024
Measurement date

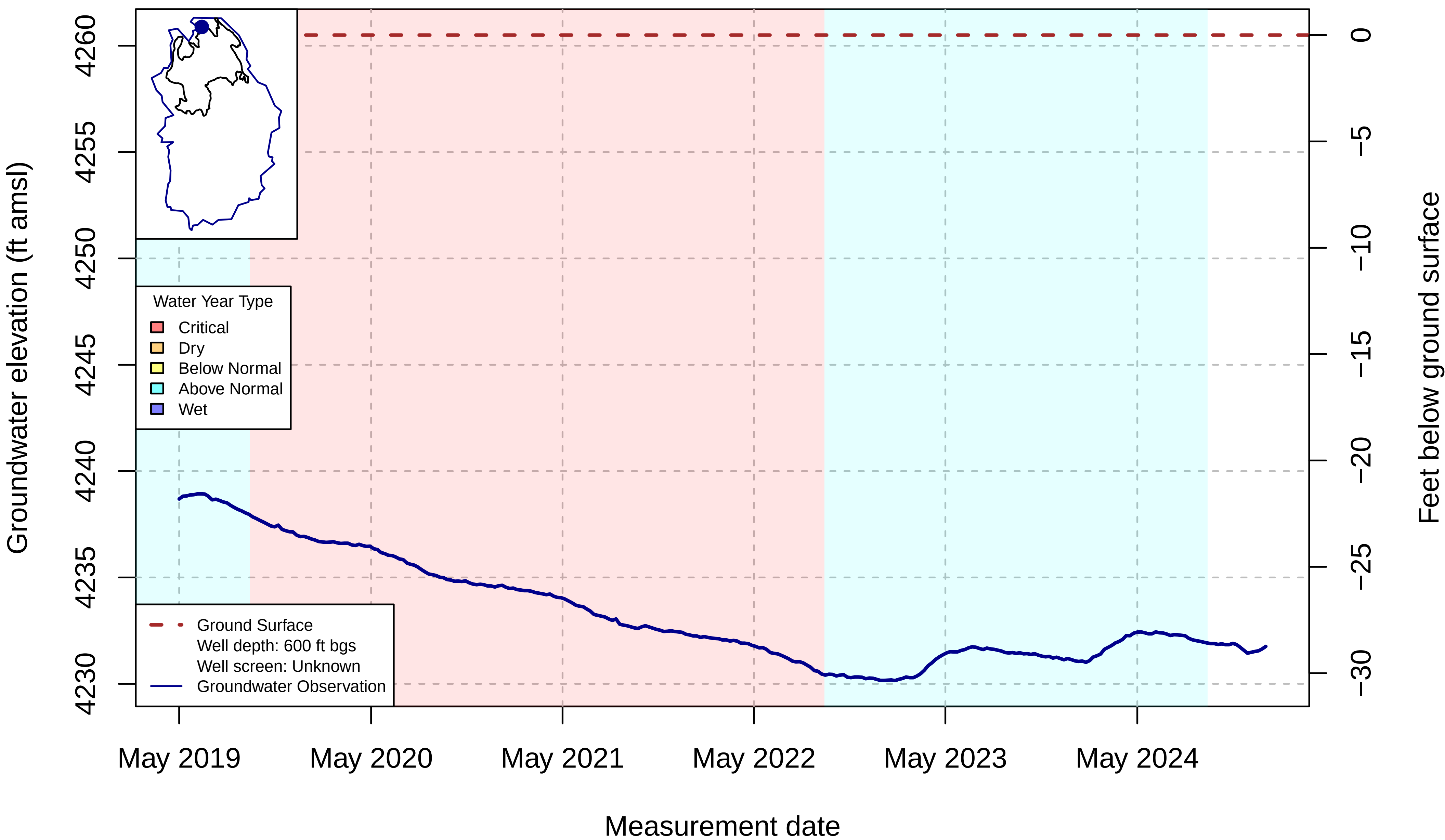


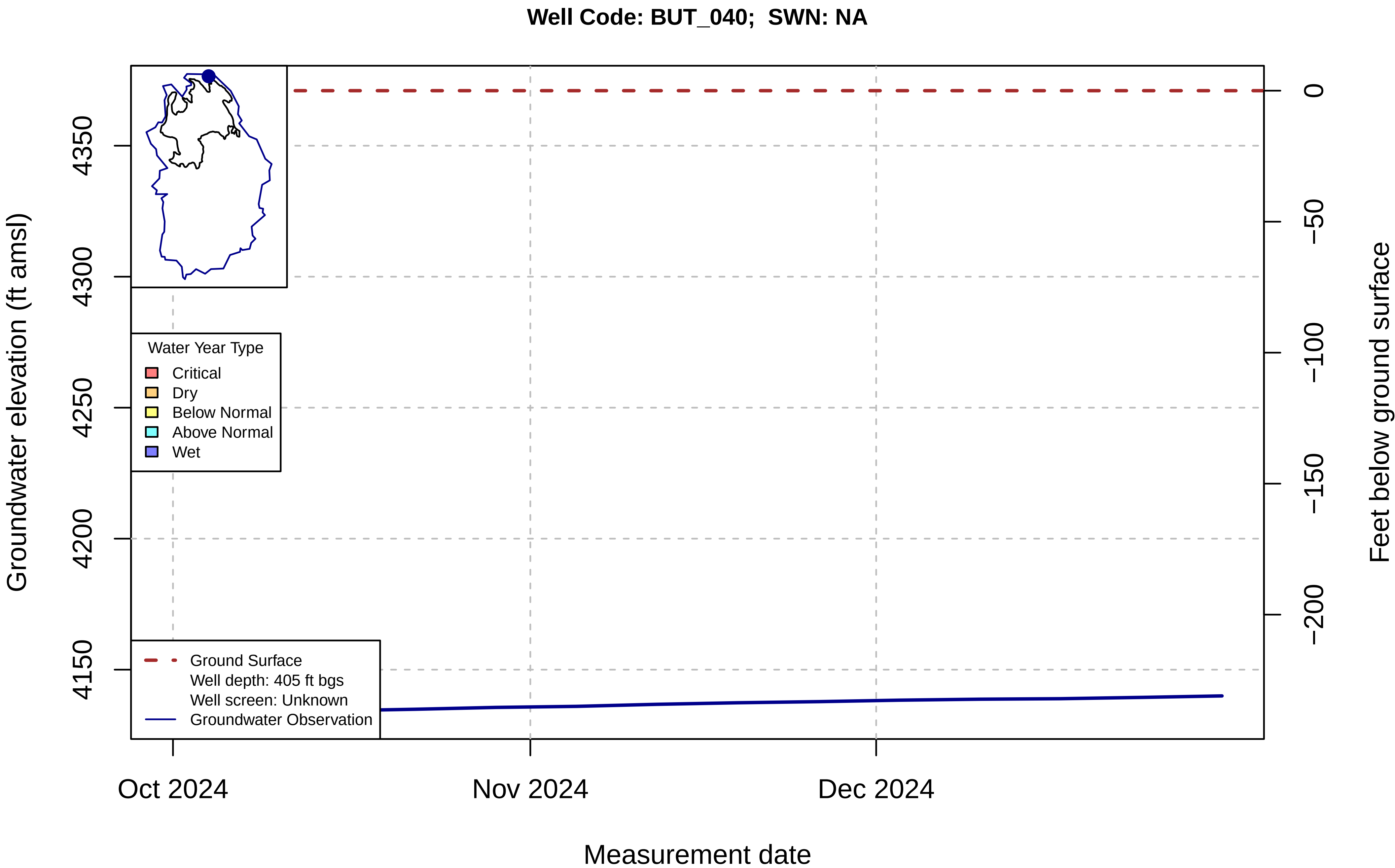
Well Code: BUT_199; SWN: NA
Groundwater elevation (ft amsl)
4120
4140
4160
4180
4200
4220
4240
Feet below ground surface
0
−20
−40
−60
−80
−100
−120
−140
Mar 2020
Mar 2021
Mar 2022
Mar 2023
Mar 2024
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: Unknown
Well screen: Unknown
Groundwater Observation



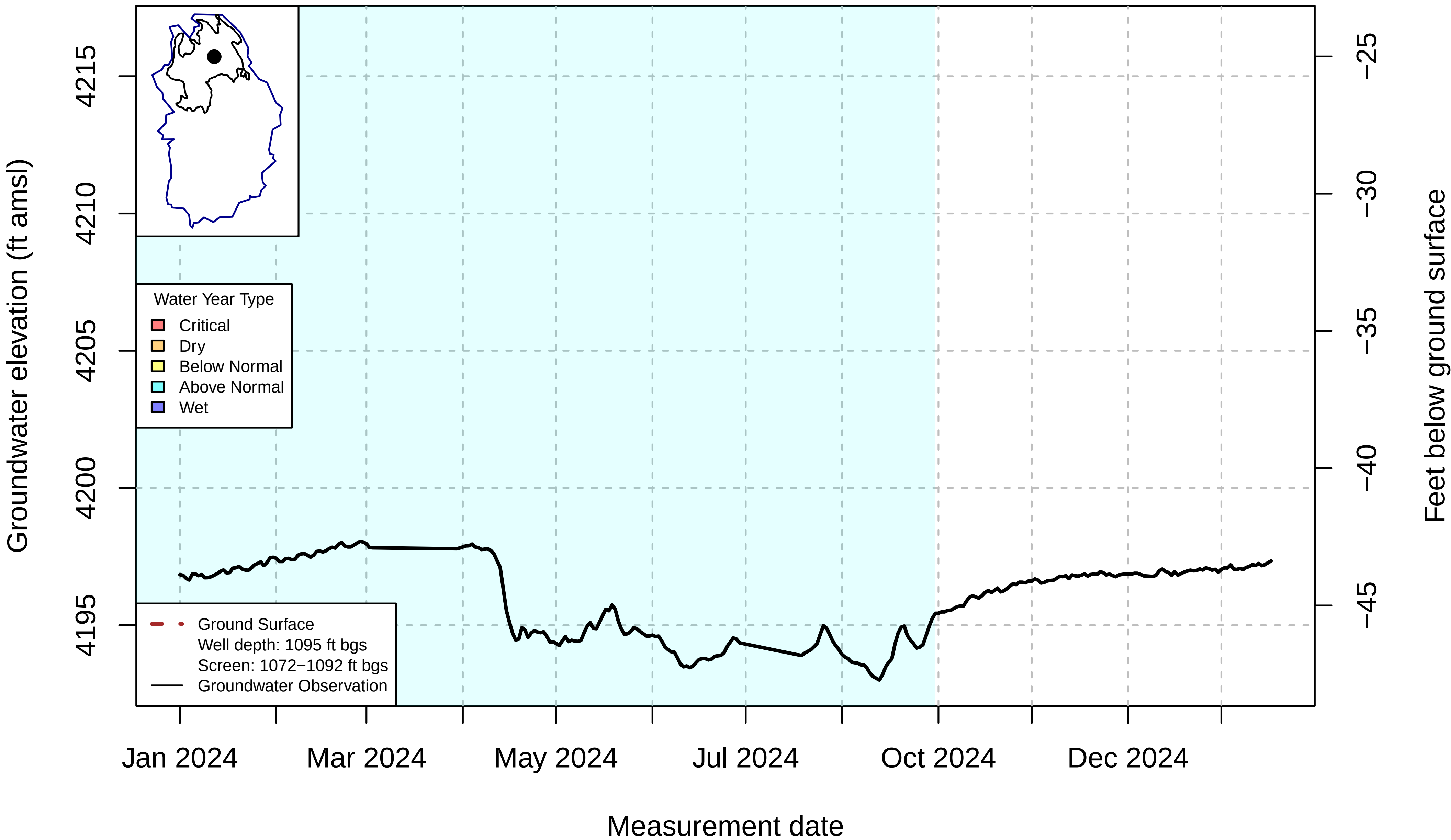
Well Code: 419669N1219306W001; SWN: 48N01W25P001M
Groundwater elevation (ft amsl)
4240
4220
4200
4180
4160
Feet below ground surface
0
−20
−40
−60
−80
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 1134 ft bgs
Screen: 685−1134 ft bgs
Groundwater Observation
1980
1990
2000
2010
Measurement date

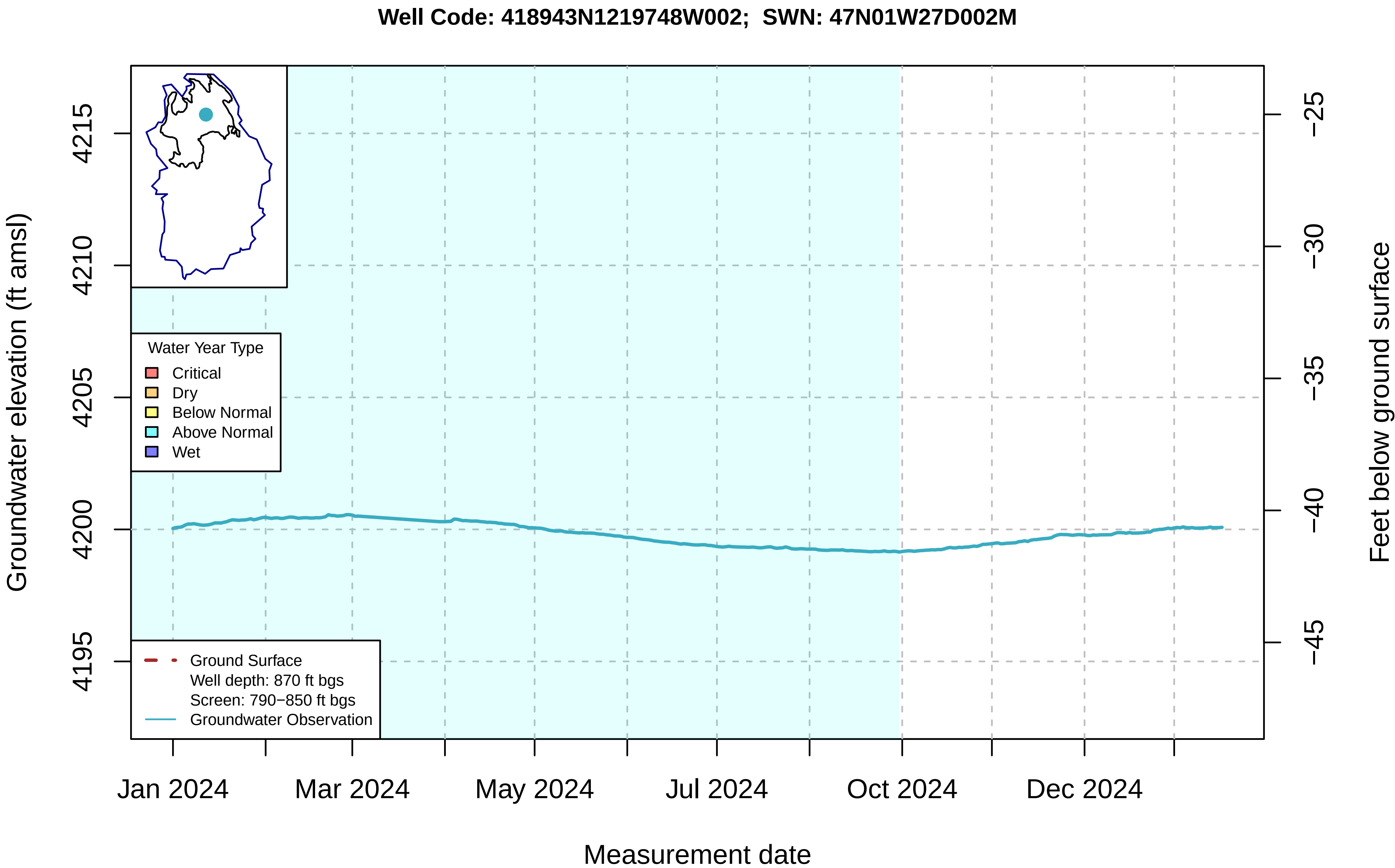
Well Code: BUT_012; SWN: NA



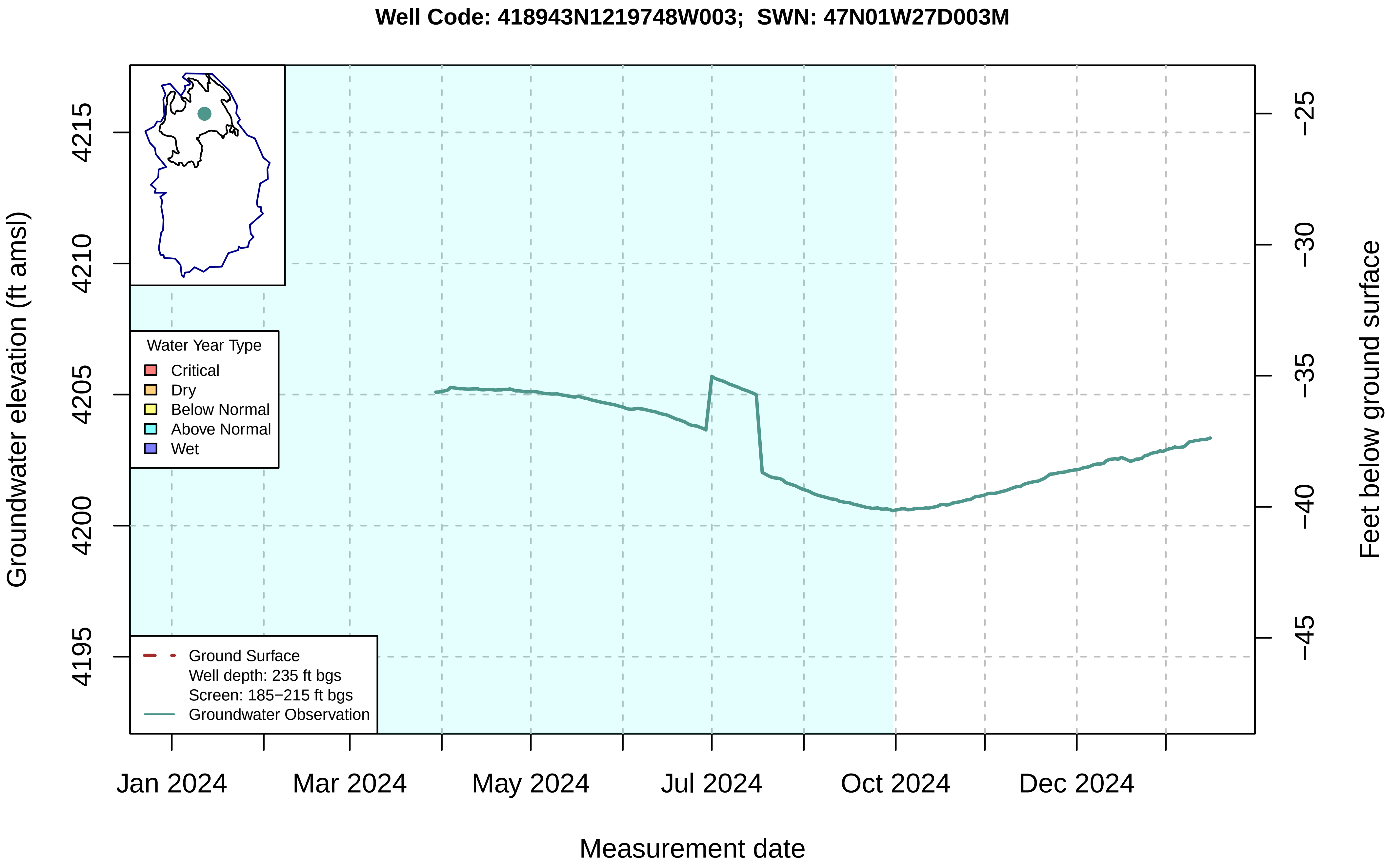

Well Code: BUT_040; SWN: NA
Groundwater elevation (ft amsl)
4350
4300
4250
4200
4150
Feet below ground surface
0
−50
−100
−150
−200
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 405 ft bgs
Well screen: Unknown
Groundwater Observation
Oct 2024
Nov 2024
Dec 2024
Measurement date

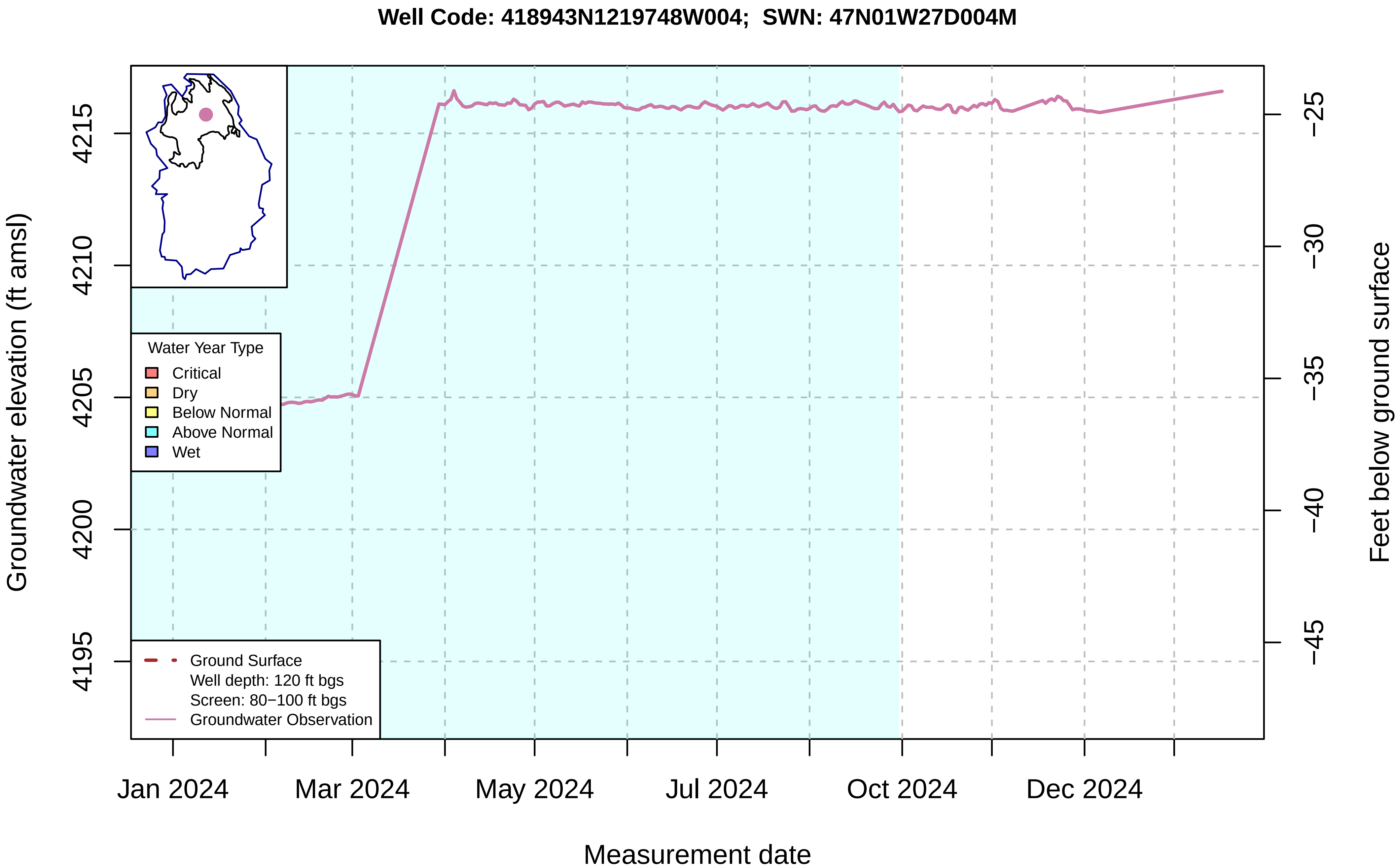
Well Code: 418943N1219748W001; SWN: 47N01W27D001M





Well Code: 418943N1219748W002; SWN: 47N01W27D002M
Groundwater elevation (ft amsl)
4195
4200
4205
4210
4215
Feet below ground surface
−25
−30
−35
−40
−45
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 870 ft bgs
Screen: 790−850 ft bgs
Groundwater Observation
Jan 2024
Mar 2024
May 2024
Jul 2024
Oct 2024
Dec 2024
Measurement date


Well Code: 418943N1219748W003; SWN: 47N01W27D003M
Groundwater elevation (ft amsl)
4195
4200
4205
4210
4215
Feet below ground surface
−25
−30
−35
−40
−45
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 235 ft bgs
Screen: 185−215 ft bgs
Groundwater Observation
Jan 2024
Mar 2024
May 2024
Jul 2024
Oct 2024
Dec 2024
Measurement date



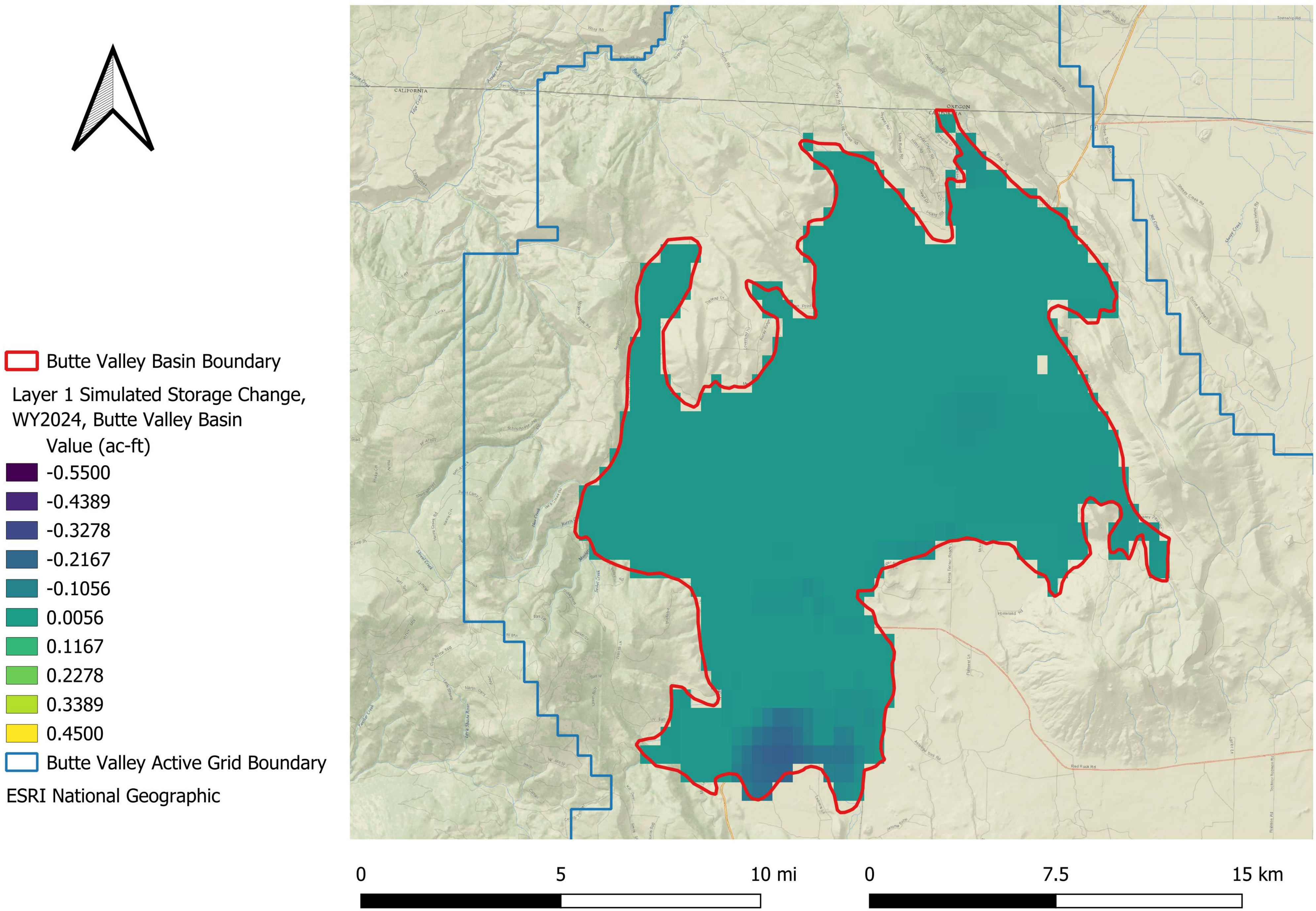
Well Code: 418943N1219748W004; SWN: 47N01W27D004M
Groundwater elevation (ft amsl)
Feet below ground surface
4195
4200
4205
4210
4215
−25
−30
−35
−40
−45
Jan 2024
Mar 2024
May 2024
Jul 2024
Oct 2024
Dec 2024
Measurement date
Water Year Type
Critical
Dry
Below Normal
Above Normal
Wet
Ground Surface
Well depth: 120 ft bgs
Screen: 80−100 ft bgs
Groundwater Observation

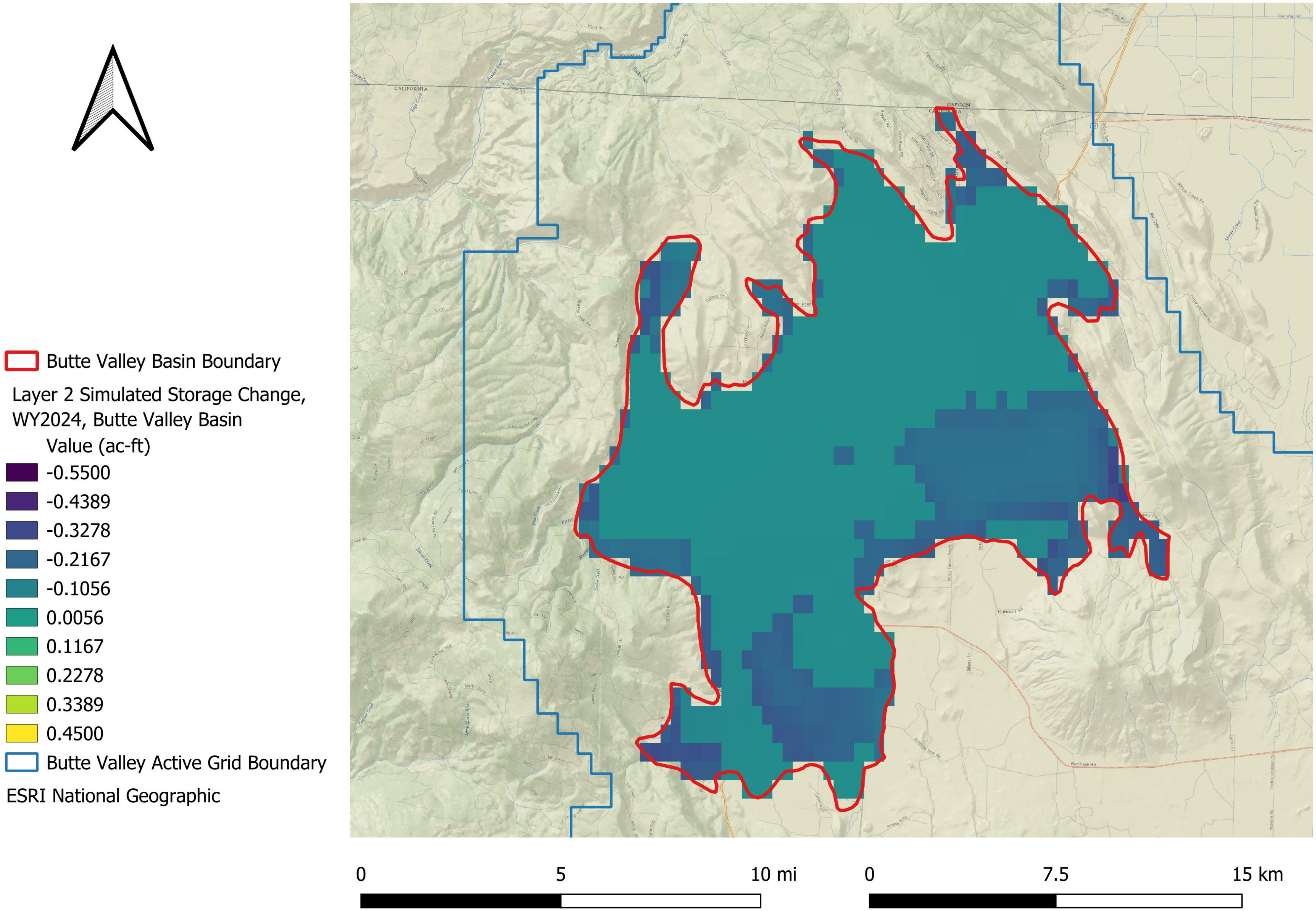
Appendix B - Simulated Groundwater Change in Storage Maps

Groundwater storage change represents the difference between recharge and discharge. The Butte Valley Integrated Hydrologic Model (BVIHM) was used to estimate storage change for each of the basin's 11 aquifer layers for water year 2024. The process involved the following steps:

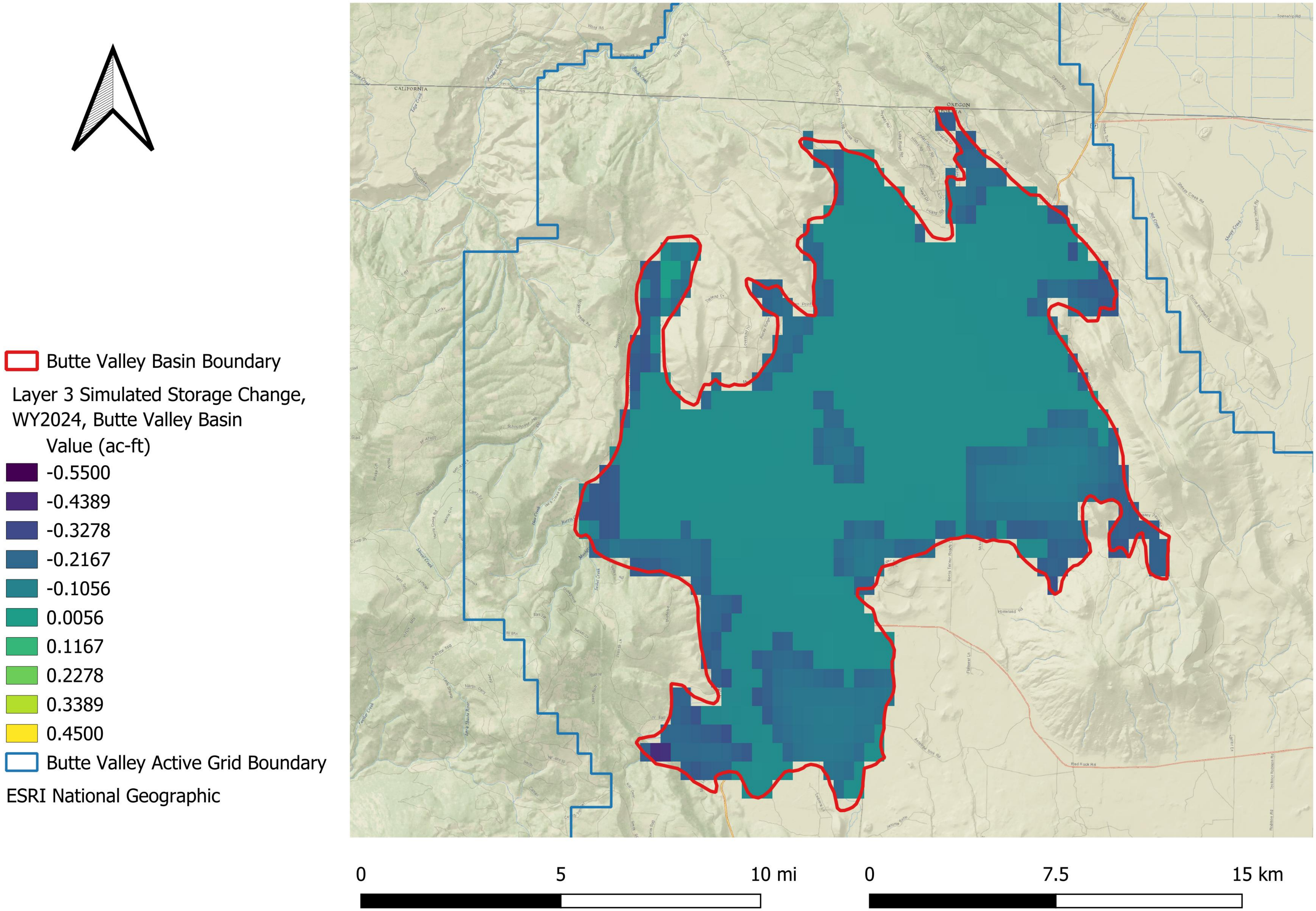
- Simulation of the WY 2024 storage change for the 11 model layers to determine groundwater levels for each discretized cell (or model cell).
- Calculating the difference between groundwater levels at the beginning and end of the year.
- Multiplying this difference by the storage parameter (storativity) and the discretized cell area to quantify storage change.
- Geospatial evaluation to interpolate storage change across the basin.

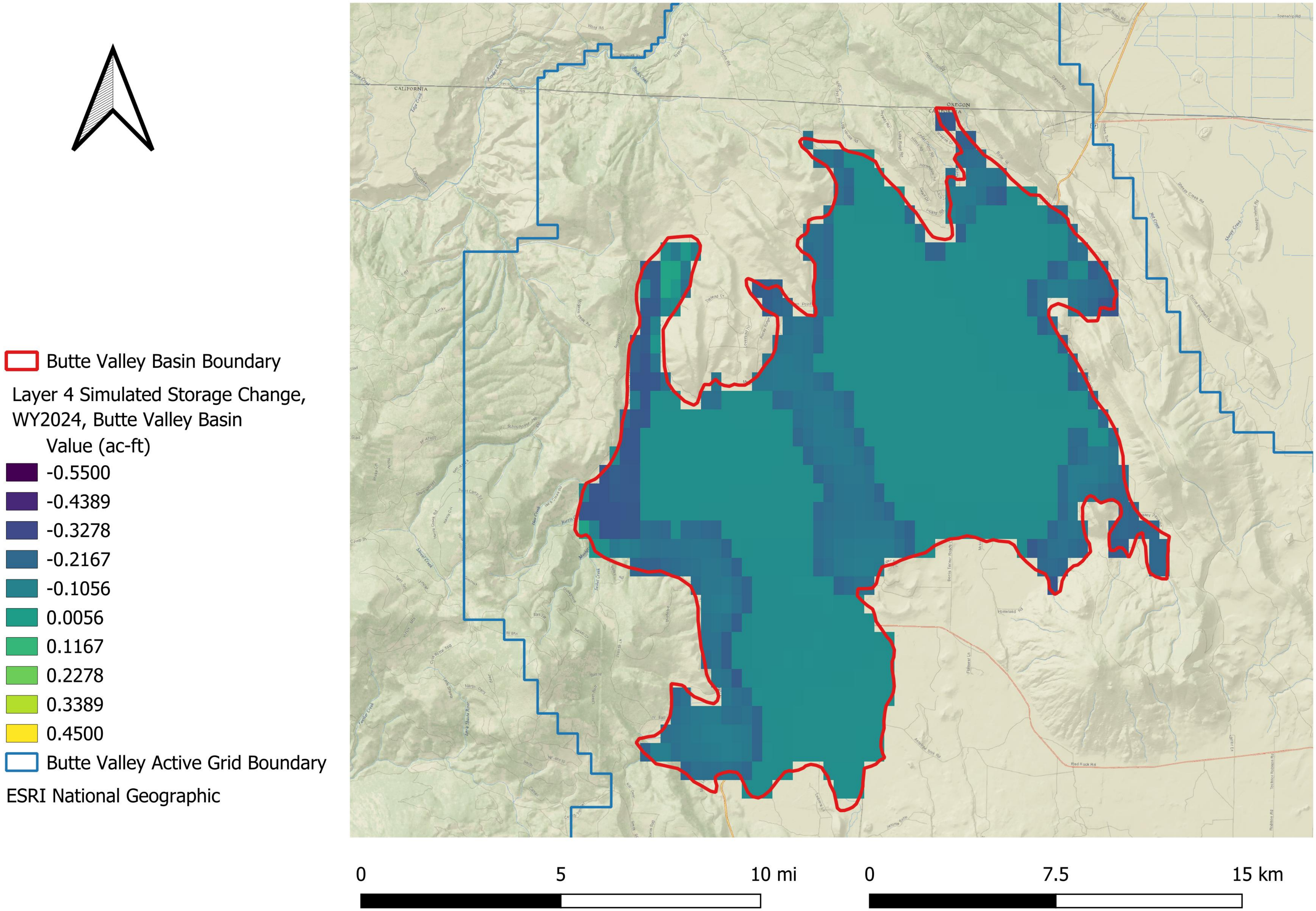
The 11 figures in this appendix illustrate the simulated groundwater storage changes for each model layer in the basin. Negative values indicate a reduction in storage, while positive values represent an increase in storage. For example, groundwater lost to nearby streams supports streamflow, but this results in declining groundwater levels as storage is depleted. Conversely, a positive change in storage reflects an increase in available groundwater over time. As shown in the figure for Layer 1, storage change in WY 2024 is negative in the southern part of the Bulletin 118 area. Images for layers 6 – 11 estimate that these deeper layers lose groundwater storage on the westside of the Basin. In these layers, on the eastern edge of this storage loss, it is simulated that there are positive increases in storage.

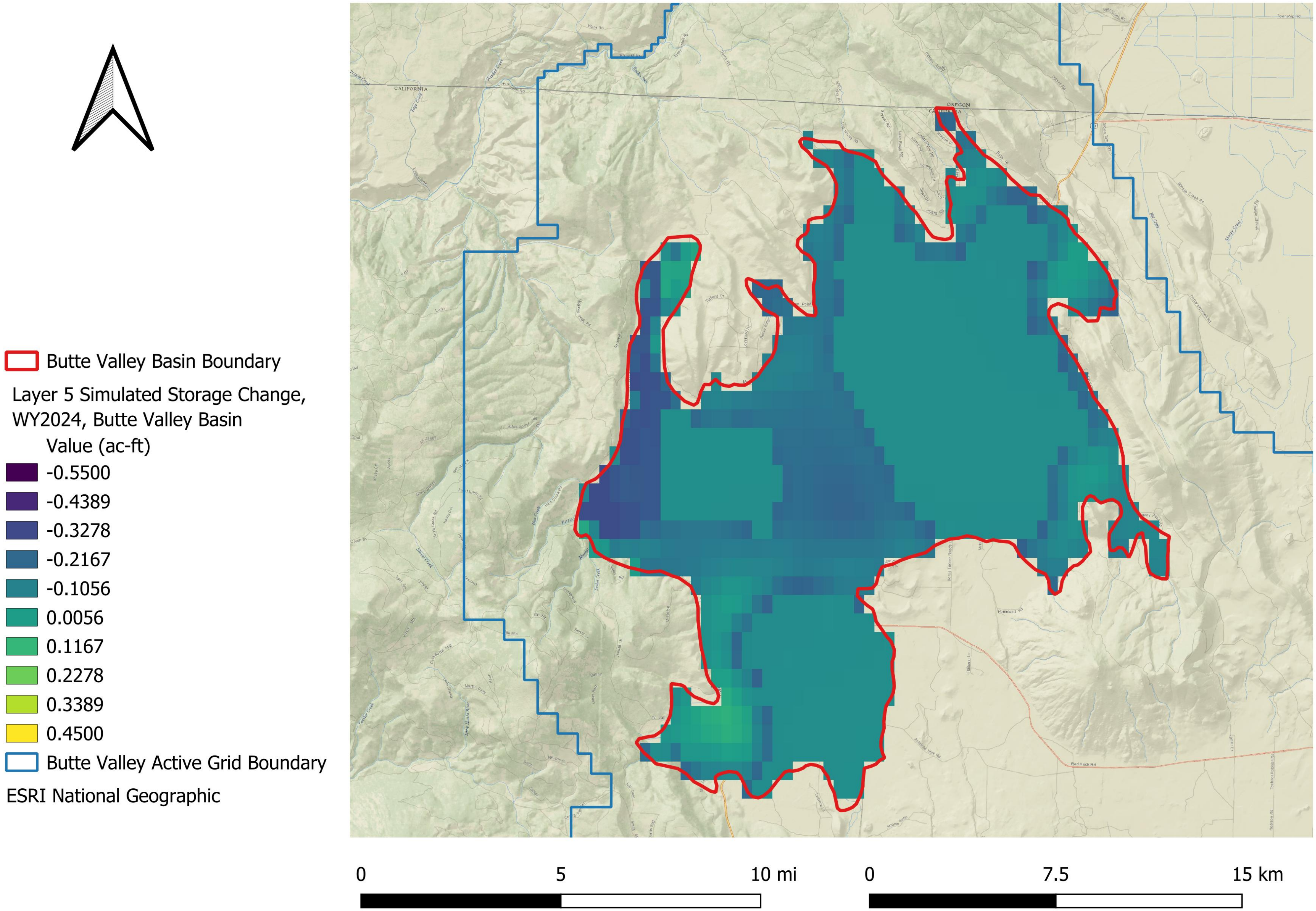

Butte Valley Basin Boundary
Layer 1 Simulated Storage Change,
WY2024, Butte Valley Basin
Value (ac-ft)
-0.5500
-0.4389
-0.3278
-0.2167
-0.1056
0.0056
0.1167
0.2278
0.3389
0.4500
Butte Valley Active Grid Boundary
ESRI National Geographic
0
5
10 mi
0
7.5
15 km



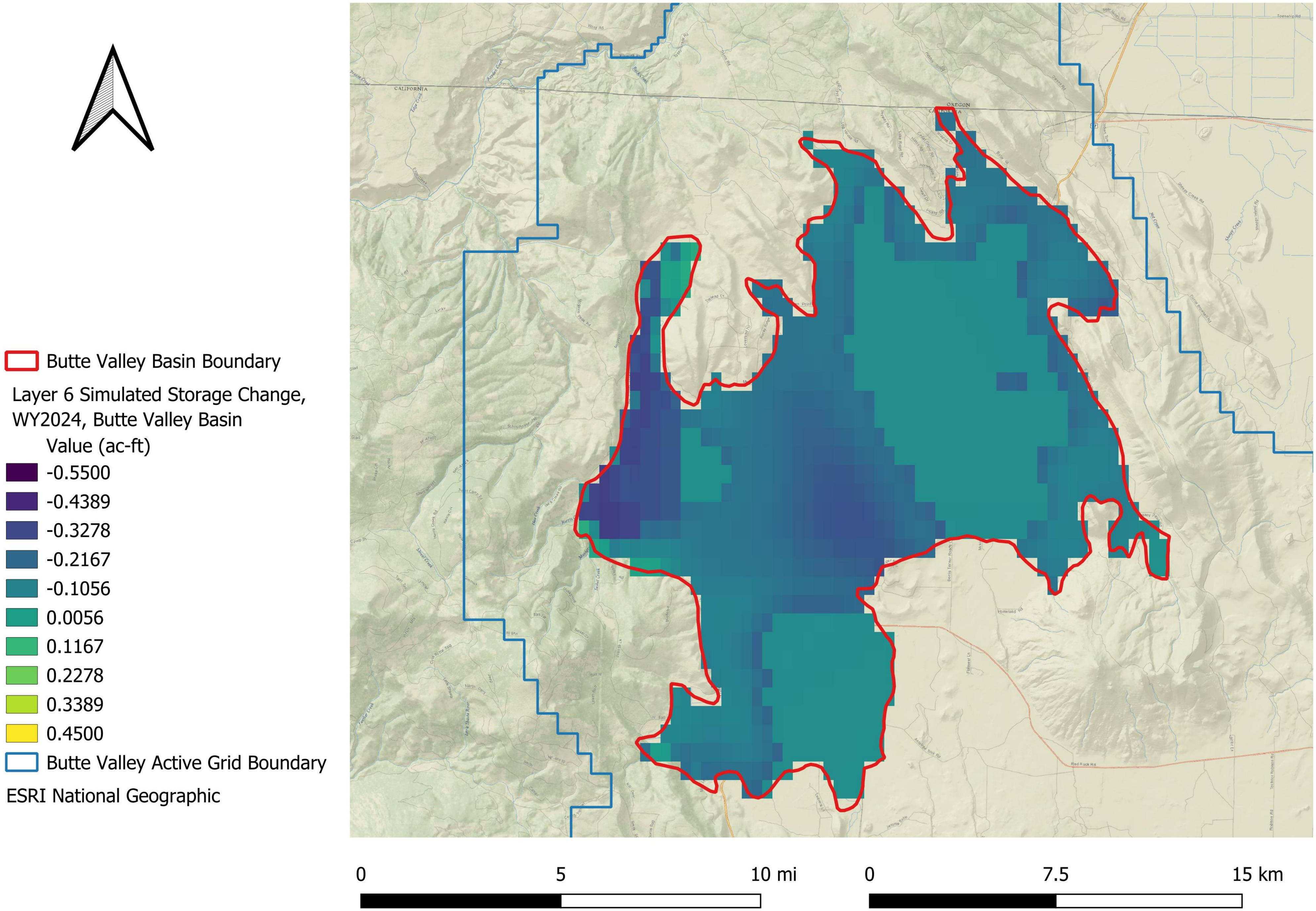
Butte Valley Basin Boundary
Layer 2 Simulated Storage Change, WY2024, Butte Valley Basin
Value (ac-ft)
-0.5500
-0.4389
-0.3278
-0.2167
-0.1056
0.0056
0.1167
0.2278
0.3389
0.4500
Butte Valley Active Grid Boundary
ESRI National Geographic
0
5
10 mi
0
7.5
15 km


Butte Valley Basin Boundary
Layer 3 Simulated Storage Change, WY2024, Butte Valley Basin
Value (ac-ft)
-0.5500
-0.4389
-0.3278
-0.2167
-0.1056
0.0056
0.1167
0.2278
0.3389
0.4500
Butte Valley Active Grid Boundary
ESRI National Geographic
0
5
10 mi
0
7.5
15 km
OREGON
CALIFORNIA

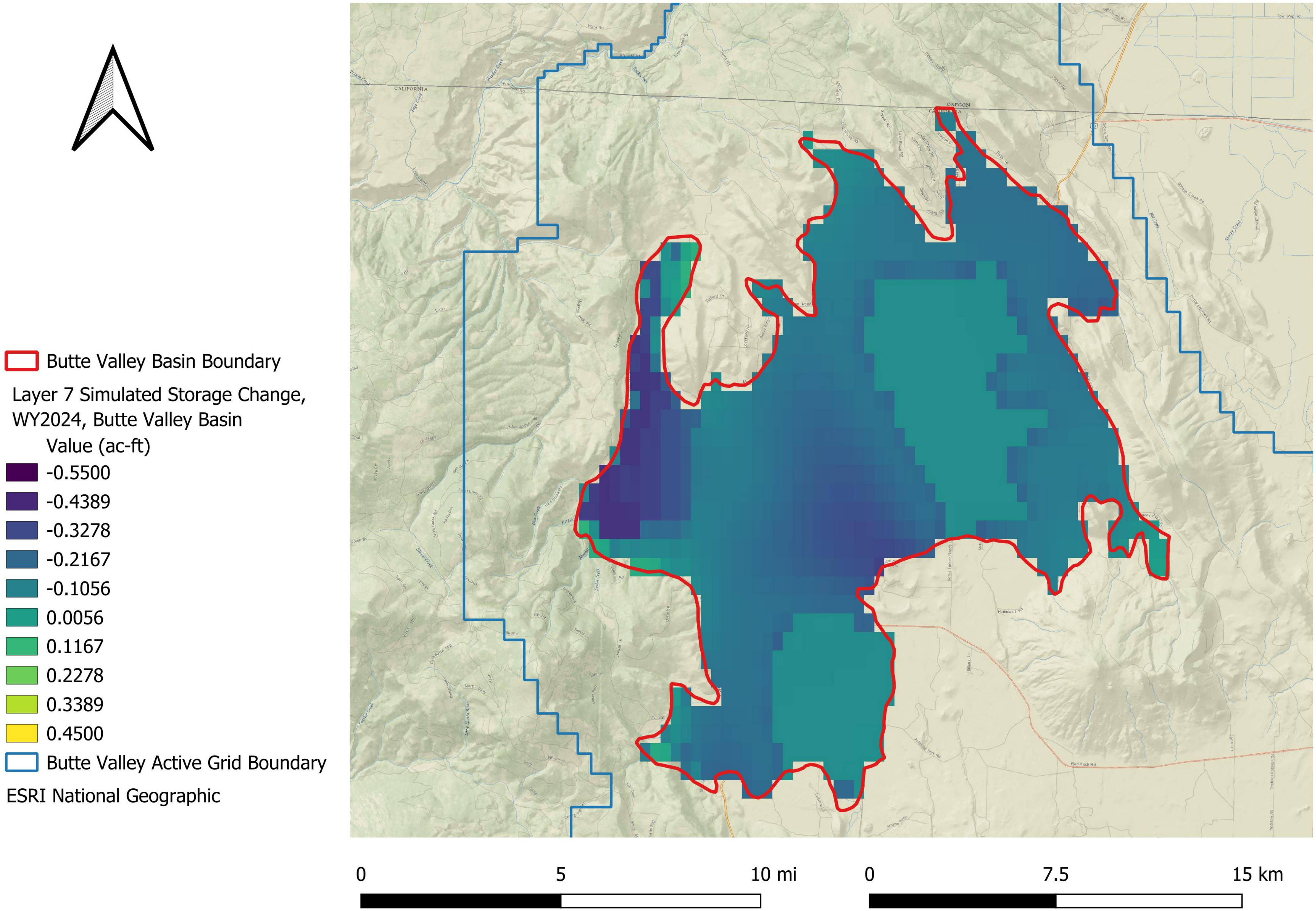

Butte Valley Basin Boundary
Layer 4 Simulated Storage Change, WY2024, Butte Valley Basin
Value (ac-ft)
-0.5500
-0.4389
-0.3278
-0.2167
-0.1056
0.0056
0.1167
0.2278
0.3389
0.4500
Butte Valley Active Grid Boundary
ESRI National Geographic
0
5
10 mi
0
7.5
15 km

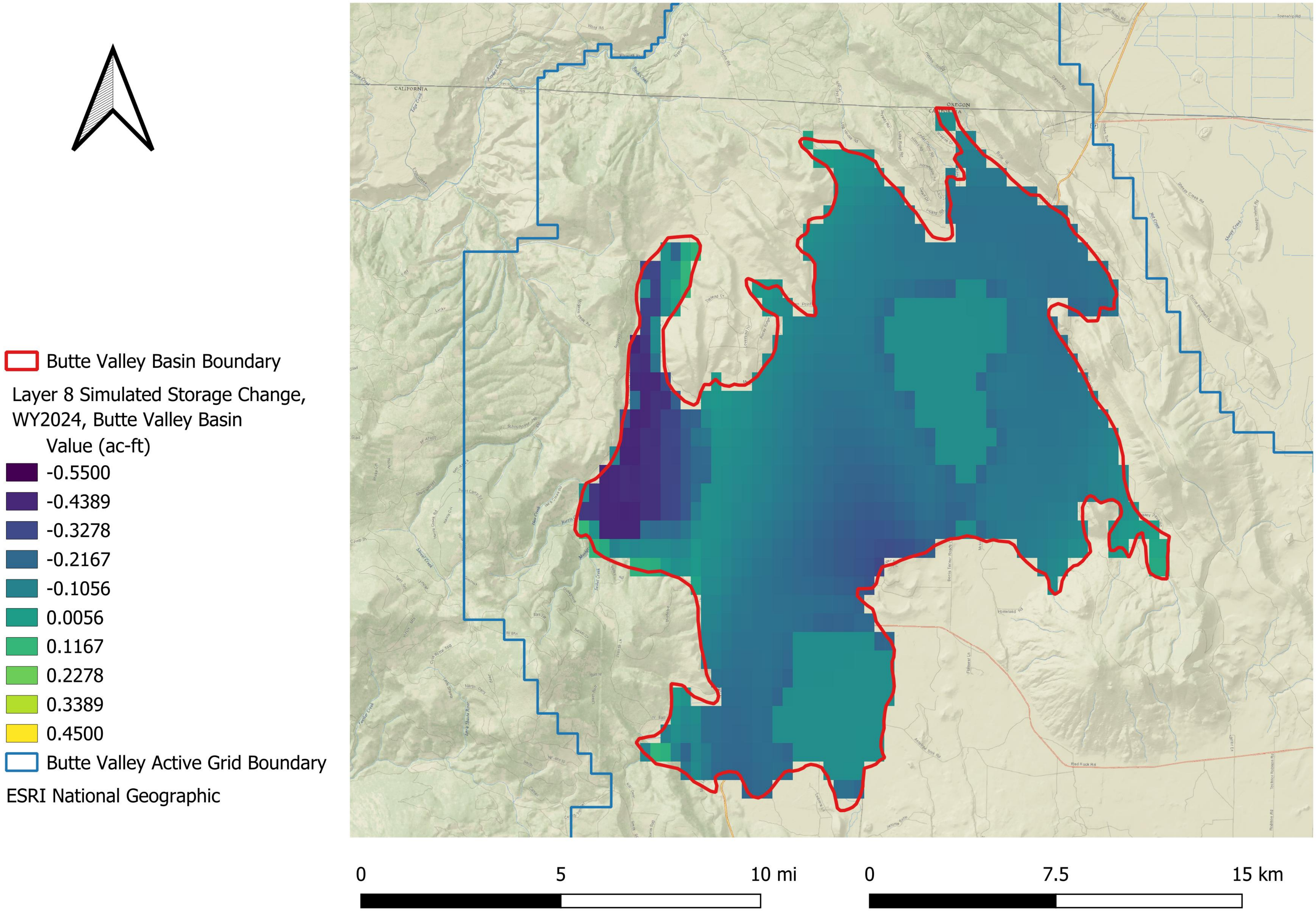


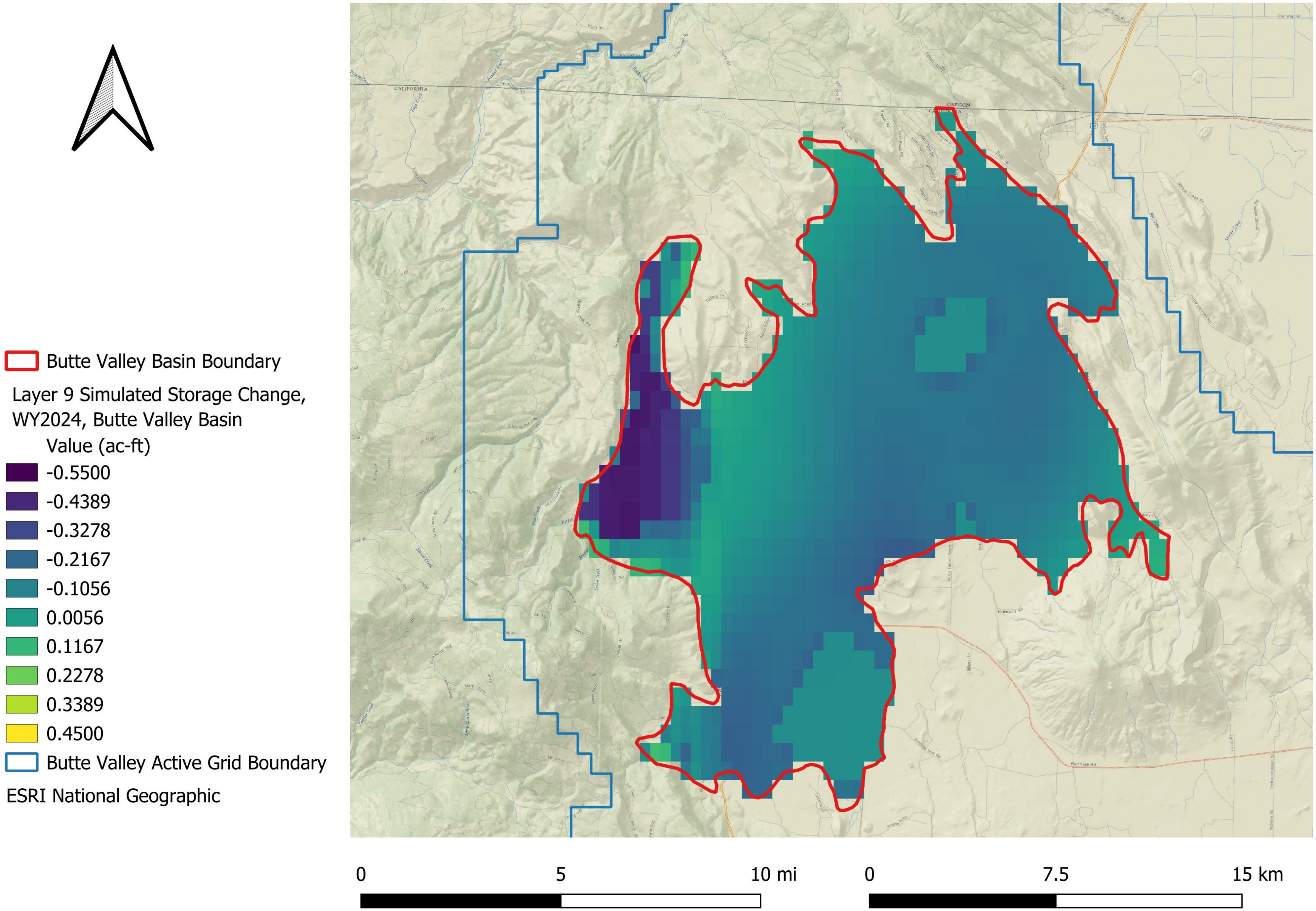
Butte Valley Basin Boundary
Layer 5 Simulated Storage Change, WY2024, Butte Valley Basin
Value (ac-ft)
-0.5500
-0.4389
-0.3278
-0.2167
-0.1056
0.0056
0.1167
0.2278
0.3389
0.4500
Butte Valley Active Grid Boundary
ESRI National Geographic
0
5
10 mi
0
7.5
15 km

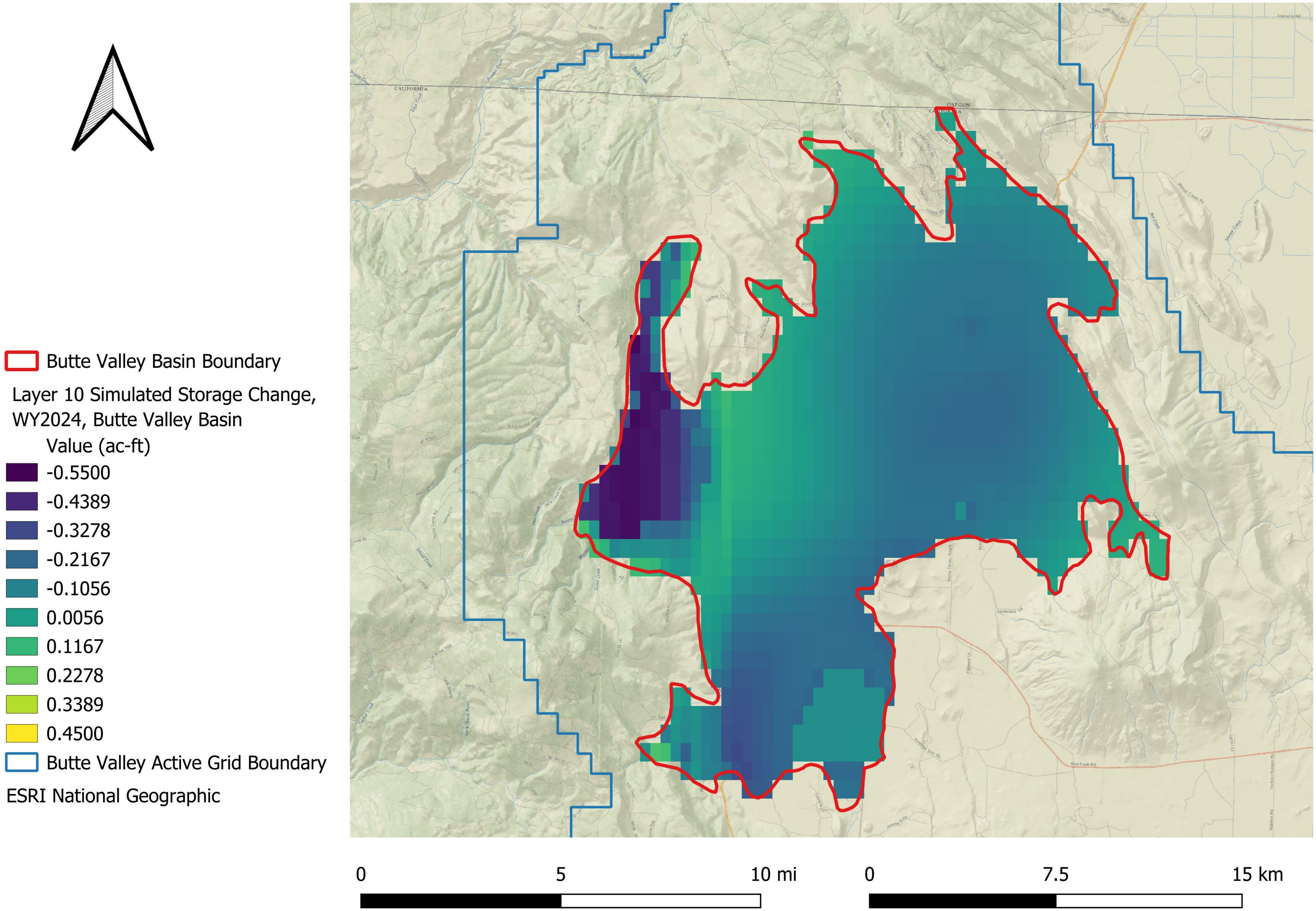


CALIFORNIA
OREGON
Butte Valley Basin Boundary
Layer 6 Simulated Storage Change, WY2024, Butte Valley Basin
Value (ac-ft)
-0.5500
-0.4389
-0.3278
-0.2167
-0.1056
0.0056
0.1167
0.2278
0.3389
0.4500
Butte Valley Active Grid Boundary
ESRI National Geographic
0
5
10 mi
0
7.5
15 km

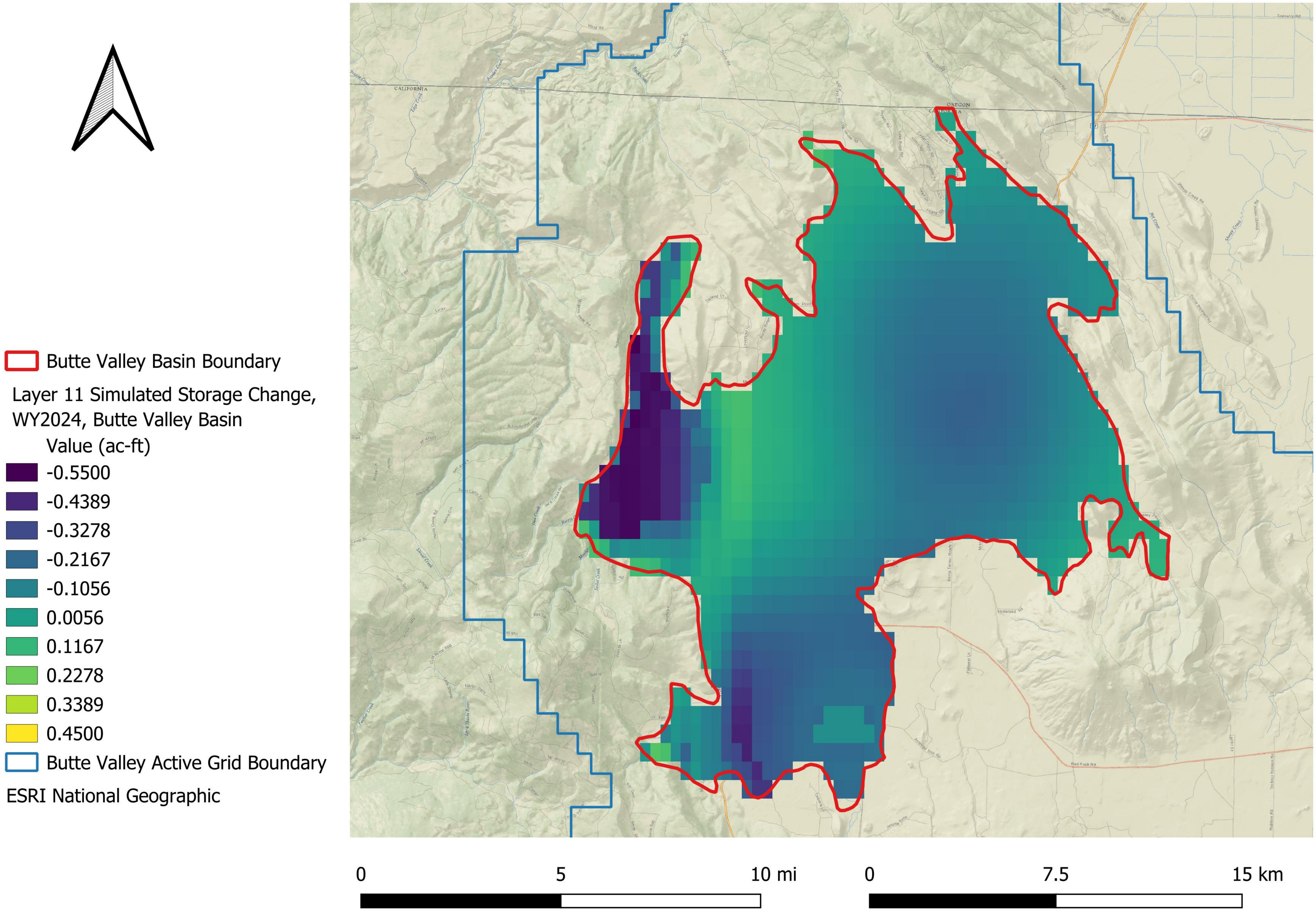

Butte Valley Basin Boundary
Layer 7 Simulated Storage Change, WY2024, Butte Valley Basin
Value (ac-ft)
-0.5500
-0.4389
-0.3278
-0.2167
-0.1056
0.0056
0.1167
0.2278
0.3389
0.4500
Butte Valley Active Grid Boundary
ESRI National Geographic
0
5
10 mi
0
7.5
15 km


Butte Valley Basin Boundary
Layer 8 Simulated Storage Change,
WY2024, Butte Valley Basin
Value (ac-ft)
-0.5500
-0.4389
-0.3278
-0.2167
-0.1056
0.0056
0.1167
0.2278
0.3389
0.4500
Butte Valley Active Grid Boundary
ESRI National Geographic
0
5
10 mi
0
7.5
15 km


Butte Valley Basin Boundary
Layer 9 Simulated Storage Change, WY2024, Butte Valley Basin
Value (ac-ft)
-0.5500
-0.4389
-0.3278
-0.2167
-0.1056
0.0056
0.1167
0.2278
0.3389
0.4500
Butte Valley Active Grid Boundary
ESRI National Geographic
0
5
10 mi
0
7.5
15 km



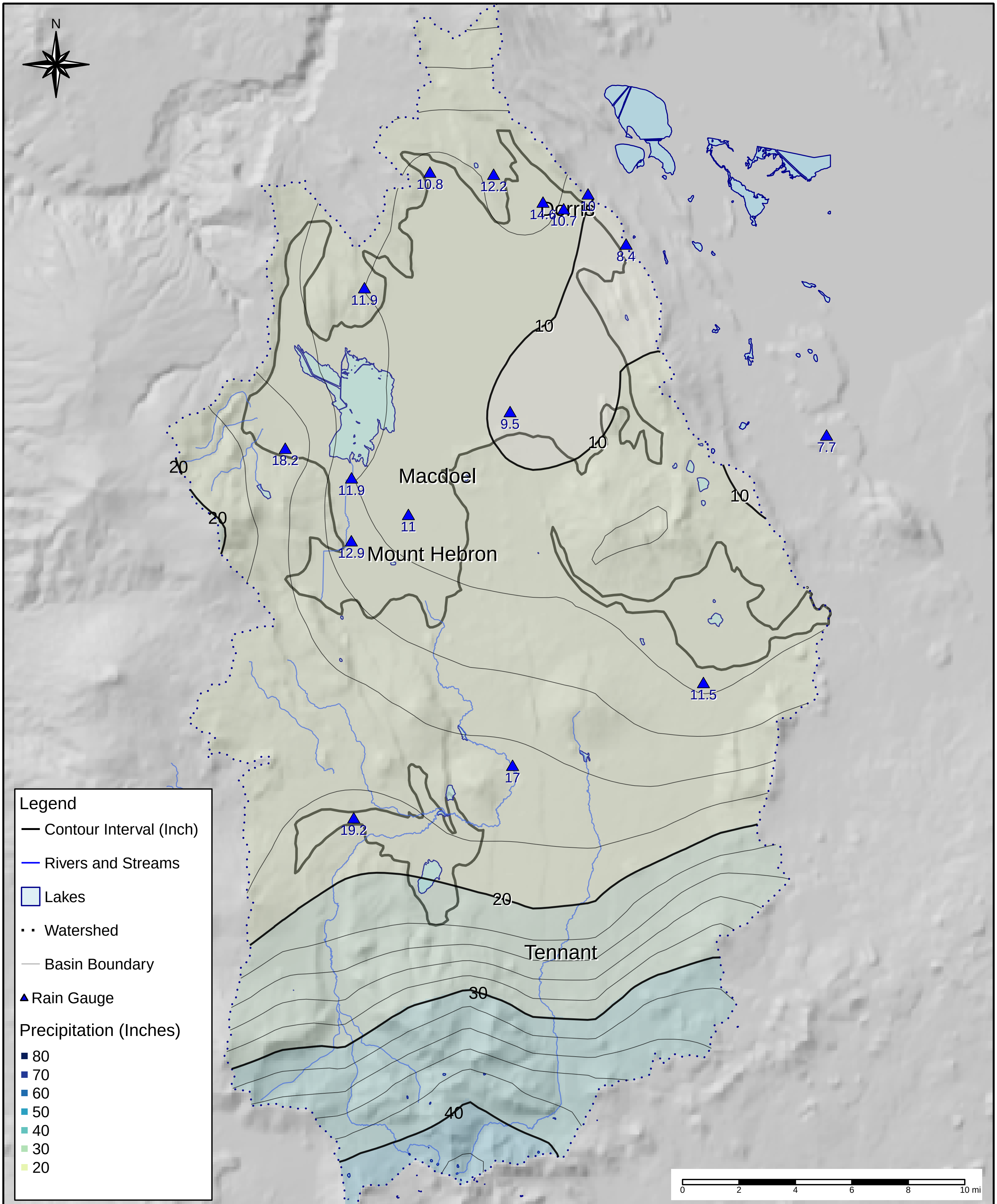
Butte Valley Basin Boundary
Layer 10 Simulated Storage Change, WY2024, Butte Valley Basin
Value (ac-ft)
-0.5500
-0.4389
-0.3278
-0.2167
-0.1056
0.0056
0.1167
0.2278
0.3389
0.4500
Butte Valley Active Grid Boundary
ESRI National Geographic
0
5
10 mi
0
7.5
15 km



Butte Valley Basin Boundary
Layer 11 Simulated Storage Change, WY2024, Butte Valley Basin
Value (ac-ft)
-0.5500
-0.4389
-0.3278
-0.2167
-0.1056
0.0056
0.1167
0.2278
0.3389
0.4500
Butte Valley Active Grid Boundary
ESRI National Geographic
0
5
10 mi
0
7.5
15 km

Appendix C - Spatial Precipitation Map

Precipitation data from multiple sources including networks maintained by the GSA, NOAA, CDEC and Western Weather was used to create a pre- cipitation map. This map represents the observed and interpolated cumulative precipitation for WY 2024. More distant precipitation is from the Parameter-elevation Regression on Independent Slopes Model (PRISM) dataset and primarily represents the upper watershed. Contour lines represent 2-inche changes in rainfall.



Water Year 2024 Precipitation

Combined PRISM and Rain Gauge Observations Map
Butte Valley
Siskiyou County, California

Figure 2

Figure rendered on 2025-01-15

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