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Seaside Groundwater Basin
2024 Seawater Intrusion Analysis Report

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ACRONYMS & ABBREVIATIONS

amsl ....above mean sea level
ASR................aquifer storage and recovery
bgs ....below ground surface
Ca ....calcium
CAWC............California American Water Company
Cl....................chloride
CO_3.................carbonate
FO ....Fort Ord
HCO_3..............bicarbonate
K.....................potassium
MCWD GSA...Marina Coast Water District Groundwater Sustainability Agency
MCWRA ....Monterey County Water Resources Agency
Mg ....magnesium
mg/L ....milligrams per liter
MPWMD........Monterey Peninsula Water Management District
MSC ....Monterey Sand Company
MWCRA ....Monterey County Water Resources Agency
Na ....sodium
PCA................Pacific Cement Aggregates
PVWMA ....Pajaro Valley Water Management Agency
PWM ....Pure Water Monterey
SIAR ....Seawater Intrusion Analysis Report
SIRP ....Seawater Intrusion Response Plan
SO_4 ....sulfate
µmhos/cm.......micromhos per centimeter
WY ....Water Year

EXECUTIVE SUMMARY

This report fulfills part of the annual reporting requirements contained in the Seaside Groundwater Basin Adjudication (California American Water v. City of Seaside, Monterey County Superior Court, Case Number M66343). The annual report addresses the potential for, and extent of, seawater intrusion in the Seaside Groundwater Basin.

Seawater intrusion may occur under basic hydrogeologic conditions as a wedge beneath fresh groundwater or in more complex hydrogeology with various intrusion interfaces among the different aquifers. Continued pumping in excess of recharge and freshwater inflows, coastal groundwater levels well below sea level, and ongoing seawater intrusion in the nearby Salinas Valley all suggest that seawater intrusion could occur in the Seaside Basin.

Seawater intrusion is typically identified through regular chemical analyses of groundwater which can identify geochemical changes in response to seawater intrusion. No single analysis definitively identifies seawater intrusion, however by examining various analyses it is possible to determine when fresh groundwater mixes with seawater. At low chloride concentrations, it is often difficult to identify incipient seawater intrusion. This is due to the natural variation in freshwater chemistry at chloride concentrations below 1,000 milligrams per liter (mg/L). Mixing trends between groundwater and seawater are more easily defined when chloride concentrations exceed 1,000 mg/L. Common geochemical indicators of seawater intrusion are cation and anion ratios, chloride trends, sodium/chloride ratios, and electric induction logging.

Groundwater levels below sea level, the cumulative effect of pumping in excess of recharge and freshwater inflows, and ongoing seawater intrusion in the nearby Salinas Valley all suggest that seawater intrusion has the potential to occur in the Seaside Groundwater Basin.

Data collected in WY 2024 from monitoring and production wells do not indicate seawater intrusion is occurring within the Seaside Groundwater Basin. However, induction logging shows incremental increases in conductivity over time in Sentinel wells SBWM-1, 2, and 4 within zones of the Paso Robles Formation that are not screened in nearby monitoring wells. Continual increases in conductivity may be a precursor to seawater intrusion.

Based on the findings of this report, the following ongoing detrimental groundwater conditions pose a direct threat of seawater intrusion:

- Both the Paso Robles and Santa Margarita aquifers in the Seaside Groundwater Basin are susceptible to seawater intrusion. The Paso Robles aquifer is in direct hydrogeologic connection with Monterey Bay, and seawater will eventually flow into it if inland groundwater levels continue to be below sea level. It is uncertain whether the Santa Margarita aquifer is in direct connection with Monterey Bay. If it is not in direct connection, then seawater intrusion will take longer as seawater in the Paso Robles aquifer would need to move down through the clay rich deposits overlying the Santa Margarita aquifer before entering the aquifer itself and making its way into Santa Margarita production wells. It is not if, but when, seawater intrusion into these aquifers will occur if protective water elevations are not achieved.

- Sentinel wells SBWM-1 and SBWM-2, located north of the Seaside Basin, and SBWM-4, located in the Northern Coastal subarea where most of the Seaside Basin's groundwater extraction occurs, exhibit overall increases in conductivity over time within defined coarser-grained zones of the Paso Robles Formation. It is believed the increased conductivity in the shallow portions of SBWM-1 and SBWM-2 are associated with the mapped extent of seawater intrusion emanating from the Salinas Valley Basin shown on Figure 21. Since SBWM-3 does not have increasing conductivity in the Paso Robles Formation like the other three Sentinel wells, the cause of increasing conductivity in SBWM-4 may be different than SBWM-1 and SBWM-2 to the north. Evaluation of SBWM-4 conductivity data collected prior to 2019 indicates conductivity has been increasing within this zone from at least 2007 when induction logging started. An estimate of the total dissolved solids (TDS) increase associated with the logged change in conductivity in SBWM-4 since 2007 is approximately 1,000 mg/L. The Secondary Drinking Water limit is 500 mg/L. This indicates a significant salinity increase in the Paso Robles Formation. An induction log performed on monitoring well PCA-West Deep—located 780 feet southwest of SBWM-4—to verify increasing conductivity in this area does indicate high salinity within the Paso Robles Formation. However, several years of logs are needed to compare against the first baseline before it can be determined if conductivity is increasing at that well too.
- Groundwater levels in some portions of both the Paso Robles and Santa Margarita aquifers in the Northern Coastal subarea continue to be below sea level year-round. Groundwater levels below sea level create hydraulic conditions causing onshore flow. WY 2024 fourth quarter (summer/fall) groundwater levels in the Santa Margarita aquifer are approximately 20 feet below sea level. The Northern Coastal subarea pumping depression in the Santa Margarita aquifer is similar to last year. The pumping depression in the Paso Robles aquifer is slightly reduced from last year's pumping depression.
- Groundwater levels remain below protective elevations in all three Santa Margarita aquifer protective elevation monitoring wells (MSC deep, PCA-W Deep, and Sentinel well SBWM-3), and in one of the three Paso Robles aquifer protective elevation monitoring wells (MSC Shallow). All three Santa Margarita monitoring well

groundwater elevations continued increasing from WY 2022 which had the lowest levels on record. Groundwater elevations at all three Paso Robles protective elevation monitoring wells also increased. In WY 2024, PCA-West Shallow rose above the protective elevation for the first time since WY 2017. The increase is due to Bayonet/Blackhorse golf courses irrigation switching from locally pumped groundwater to recycled water.

The following evidence from this report demonstrates that seawater intrusion has not been detected in monitoring and production wells from which groundwater quality samples are collected:

- Most groundwater samples for WY 2024 from depth-discreet monitoring wells generally plot in a single cluster on Piper diagrams, with no water chemistry changes toward seawater.
- In some production wells, groundwater quality plots on Piper diagrams are different than groundwater quality in monitoring wells. This may be a result of mixed water quality because these wells are perforated in both the Paso Robles and Santa Margarita aquifers. None of the production wells' groundwater qualities are indicative of seawater intrusion.
- None of the Stiff diagrams for monitoring and production wells show the characteristic chloride spike that typically indicates seawater intrusion in Stiff diagrams. The stiff diagram for FO-10 Deep, which showed a spike of increased chloride in WY 2022, returned to a shape consistent with its historical shape.
- Maps of chloride concentrations for the shallow aquifer do not show chlorides increasing toward the coast. Santa Margarita aquifer chloride concentration maps show that the highest chloride concentrations are limited to coastal monitoring wells PCA-West Deep and MSC Deep, but these are not indicative of seawater intrusion since their concentrations are less than 160 mg/L and they do not have increasing trends.

Other important findings from the analysis contained in this report include the following:

- It is evident from comparing the long-term groundwater level trends of PCA-West Shallow and PCA-East Shallow, both in the Paso Robles aquifer, that golf course irrigation pumping is the cause of groundwater levels falling below protective elevations at PCA-West Shallow over the past 6 years. Using recycled water for golf course irrigation has allowed shallow groundwater levels to recover to above the protective elevations at PCA-West Shallow in WY 2024.
- Due to its distance from the coast, seawater intrusion is not an issue of concern in the Laguna Seca subarea. However, groundwater levels in the eastern Laguna Seca subarea

have historically declined at rates of 0.6 feet per year in the shallow aquifers, and up to 4 feet per year in the deep aquifers. These declines have occurred since 2001 despite triennial reductions in allowable pumping and CAWC ceasing pumping its Ryan Ranch and Bishop wells. The cause of the declines is the subarea's limited groundwater inflows and natural recharge compounded by the influence of wells pumping east of the Seaside Basin in the Monterey Subbasin Corral de Tierra Management Area. Since WY 2021, groundwater elevations in the area have appeared to experience some stabilization and recovery, potentially correlated with a cessation of pumping at California American Water Company's (CAWC) Ryan Ranch and Bishop wells.

- Native groundwater production in the Seaside Basin for WY 2024 was 2,350 acre-feet, which is 177 acre-feet more than WY 2023 and 650 acre-feet less than the Decision-ordered Operating Yield of 3,000 acre-feet. In addition to WY 2024 being an above average year for rainfall, recovery of 3,355 acre-feet of recycled water from Pure Water Monterey and use of recycled water at the Bayonet/Blackhorse golf courses helped offset pumping of native groundwater. As outlined in the Basin Management Action Plan (M&A, 2018a), it is vital the Watermaster continues to identify ways to reduce pumping native groundwater and/or to recover groundwater elevations with water that is left in the Seaside Basin and is not extracted out as water supply.

It is important to remain vigilant and to closely monitor groundwater quality at different depths through the Seaside Basin's aquifers. Although existing monitoring and production wells are not detecting seawater intrusion, it does not mean seawater intrusion is not occurring. The discovery of increasing conductivity in specific zones in the Sentinel wells that are not screened in nearby monitoring wells illustrates this fact. Using geophysical methods such as induction logging and electromagnetic surveys to identify salinity provides a more complete "scan" of the depth of the Seaside Basin that discreetly screened wells cannot provide.

Based on the findings of this report, the following recommendations should be implemented to monitor and track potential seawater intrusion.

1. **Actions Regarding Increased Conductivity Observed in Induction Logs in SBWM-1, SBWM-2, and SBWM-4**

    - EKI and Marina Coast Water District Groundwater Sustainability Agency (MCWD GSA) should be informed that Sentinel wells SBWM-1 and SBWM-2 continue to show increases in conductivity from 520-540 and 340-390 feet bgs respectively in defined coarser-grained zones in the Paso Robles aquifer. These monitoring wells are located outside of the Seaside Basin and are within the Marina-Ord Management Area of the Monterey Subbasin.

- Annual induction logs in PCA-West Deep and PCA-East Deep should continue to be performed to expand the area being monitored by geophysical methods.

- The Watermaster should consider performing land-based subsurface electromagnetic geophysics in the vicinity of SBWM-4 and PCA-West Deep, if feasible, to see if such data will add to the hydrogeologic understanding of this area.

2. Verify Chloride Concentrations and Water Chemistry in the 140 – 200 foot Zone of SBWM-4

It is recommended that options for verifying seawater intrusion occurring in the Paso Robles Formation at or near SBWM-4 continue be evaluated in WY 2025. This may involve finding a site for a new monitoring well, adapting an existing well, evaluating the feasibility of using a Cone Penetration Testing (CPT) drill rig to non-intrusively collect once-off groundwater quality samples at specified depths without needing a permanent well, or some other solution. The fall 2024 induction logging results at SBWM-4 show that conductivity has been stable over the past year, however the Watermaster should continue to conduct induction logging at PCA-W Deep and PCA-E Deep and explore options to see if it would be feasible to monitor groundwater quality in the affected zone.

3. Destroy the SNG Well

It is recommended that the privately owned SNG well be destroyed if it is found, as believed, to have a leaking casing that is allowing high salinity water to flow down from the seawater intruded Dune Sands into the Paso Robles Formation where the well is likely screened. In early 2021, the chloride concentration from water pumped from the well was 8,660 mg/L.

4. Destroy and Replace FO-10 Shallow and FO-10 Deep

It is recommended that FO-10 Shallow and FO-10 Deep be destroyed and replaced to maintain continuous water quality monitoring and to prevent cross contamination between the Paso Robles and Santa Margarita aquifers and the overlying Dune Sands. These wells are located outside of the Seaside Basin, so destruction would need to be conducted by the well owner, MPWMD, and replacement wells would need to be installed by the MCWD GSA.

5. **Continue to Analyze and Report on Water Quality Annually**

   Seawater intrusion is a threat to the Seaside Basin, and data must be collected and analyzed regularly to identify incipient intrusion. Maps, graphs, and analyses similar to what are found in this report should continue to be developed every year.

1 BACKGROUND AND INTRODUCTION

Historical and persistent low groundwater elevations caused by pumping in the Seaside Groundwater Basin have led to concerns that seawater intrusion may threaten the Basin's groundwater resources. This report addresses the potential for, and extent of, seawater intrusion in the Seaside Groundwater Basin. The report first reviews seawater intrusion mechanisms, analyzes historical water quality data for indications of seawater intrusion in the Seaside Groundwater Basin, and finally reaches conclusions on the extent of seawater intrusion and proposes recommendations for continued monitoring.

This report fulfills part of the annual reporting requirements contained in the Seaside Groundwater Basin Adjudication (California American Water v. City of Seaside, Monterey County Superior Court, Case Number M66343). The analyses in this report were developed by Montgomery & Associates in cooperation with members of the Watermaster Technical Advisory Committee. Staff from the Monterey County Water Resources Agency (MWCRA) and Monterey Peninsula Water Management District (MPWMD) provided invaluable assistance, data, and review during the preparation of this report.

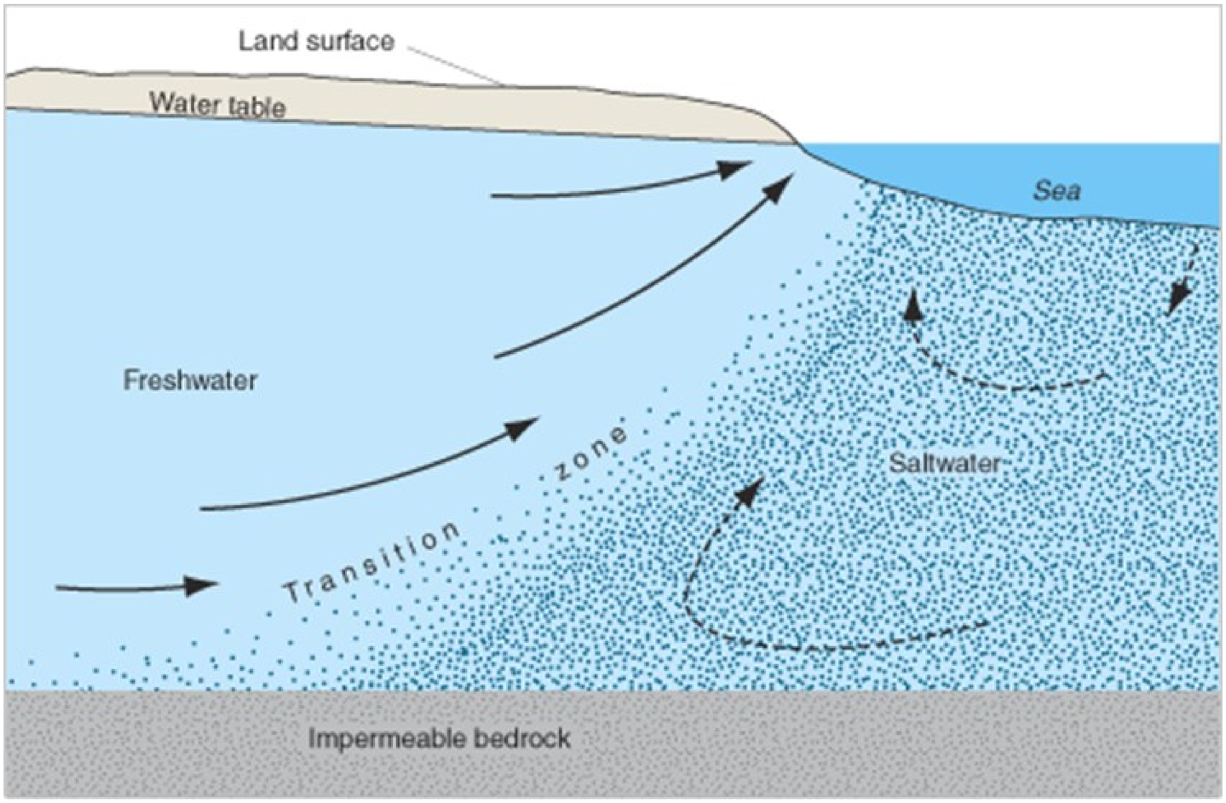
This report is the eighteenth in a series of Seawater Intrusion Analysis Reports (SIAR) which are produced annually by the Watermaster. It builds on the work conducted in the preceding SIARs.

1.1 Overview of Seawater Intrusion

Seawater intrusion is a threat to many coastal groundwater basins along the California Coast. It has been observed and documented in a number of groundwater basins in both southern and central California.

In general, groundwater in coastal basins flows from recharge areas in local highlands toward discharge areas along the coast. In most undeveloped coastal groundwater basins, there is a net outflow of fresh water into the ocean. Seawater intrusion occurs when the outflow of freshwater ceases and seawater flows into the groundwater basin from the ocean.

In the simplest condition, seawater intrudes as a wedge beneath the fresh groundwater (Figure 1). This wedge shape is a result of seawater being denser than freshwater.



(Source: Barlow, 2003)

Figure 1. Seawater Wedge in a Simple Coastal Aquifer

In more complex, layered groundwater systems, the location of the seawater/freshwater interface may vary among the different aquifers. Coarser-grained sediments that transmit water easily are separated by aquitards, which transmit water relatively slowly. Each aquifer has a unique rate of outflow to the ocean, and therefore a unique location of the seawater interface. In these more complex situations, the locations of the seawater/freshwater interfaces are a complex function of the horizontal groundwater gradient in each aquifer, the aquifer hydraulic conductivities, and the vertical conductivity of the inter-layer aquitards.

Under non-pumping conditions, the seawater interface in confined units can be located farther offshore than in surficial unconfined aquifers which allows the seawater interface to exist near shore. Fresh water in the lower confined aquifers must seep out slowly through the overlying confining units. The slow seepage rates allow the fresh water to maintain pressure beneath the sea floor, pushing the seawater interface away from the coastline.

1.2 Groundwater Pumping and Seawater Intrusion

Pumping groundwater in a coastal aquifer reduces the amount of water discharging to the ocean. Sufficient pumping can eliminate ocean discharges, either locally or basin-wide, triggering seawater intrusion. The response of the seawater interface to groundwater pumping is manifested in two related ways: upconing and interface migration. Upconing refers to the ability of a pumping well to draw seawater up from below and only occurs if seawater exists directly below a pumping well. Because no seawater intrusion has been observed in the Seaside Groundwater Basin, upconing cannot occur and only seawater interface migration will be further addressed in this report.

As mentioned earlier, groundwater pumping reduces the amount of freshwater outflow to the ocean. This allows the interface to migrate shoreward. Substantial pumping can allow the interface to move onshore, potentially impacting municipal, private, and agricultural wells. The degree of interface migration depends on the amount of water pumped from a particular aquifer, as well as the amount of leakage from overlying or underlying aquifers. Groundwater extracted from a lower aquifer might be replaced by rainfall recharge, by seawater migrating shoreward, or by groundwater leaking from an overlying aquifer.

An additional issue that must be considered with seawater interface migration is the initial location of the seawater interface. An interface that starts far from the shore may take a considerable amount of time, often on the order of decades, to reach any production or monitoring well. Furthermore, the farther the interface is from the pumping well, the more area is available for fresh water to leak from overlying aquifers into the producing aquifer. This slows, or may completely stop, seawater intrusion in the pumped aquifer. Downward leakage, however, removes fresh water from overlying aquifers. This leakage may therefore exacerbate seawater intrusion in the overlying aquifer.

1.3 Indicators of Seawater Intrusion

Seawater intrusion is generally identified through chemical analyses of groundwater. Groundwater levels below or near sea level indicate an opportunity for seawater intrusion, but the actual seawater intrusion is indicated by various geochemical changes in groundwater.

No single analysis definitively identifies seawater intrusion, however by looking at various analyses we can ascertain when fresh groundwater mixes with seawater. At low chloride concentrations, it is often difficult to identify incipient seawater intrusion. This is due to the natural variation in freshwater chemistry at chloride concentrations below 1,000 milligrams per liter (mg/L) (Richter and Kreitler, 1993). Mixing trends between groundwater and seawater are more easily defined when chloride concentrations exceed 1,000 mg/L.

Common geochemical indicators of seawater intrusion are discussed and example analyses are presented in the following sections.

1.3.1 Cation/Anion Ratios

Molar ratios of cations and anions can prove distinctive for various groundwater systems. Seawater intrusion is often indicated by graphically analyzing shifts in these molar ratios. Two common graphical techniques for these analyses are Piper diagrams and Stiff diagrams.

1.3.1.1 Piper Diagrams

Example Piper diagrams are shown for data from the Pajaro Valley and Salinas Valley on Figure 2 and Figure 3, respectively. These figures are included to demonstrate the utility of Piper diagrams and show how they have been used in nearby basins. These figures are not provided for directly comparing data between basins; groundwater quality trends in the Seaside Basin will not necessarily correlate with trends in other basins.

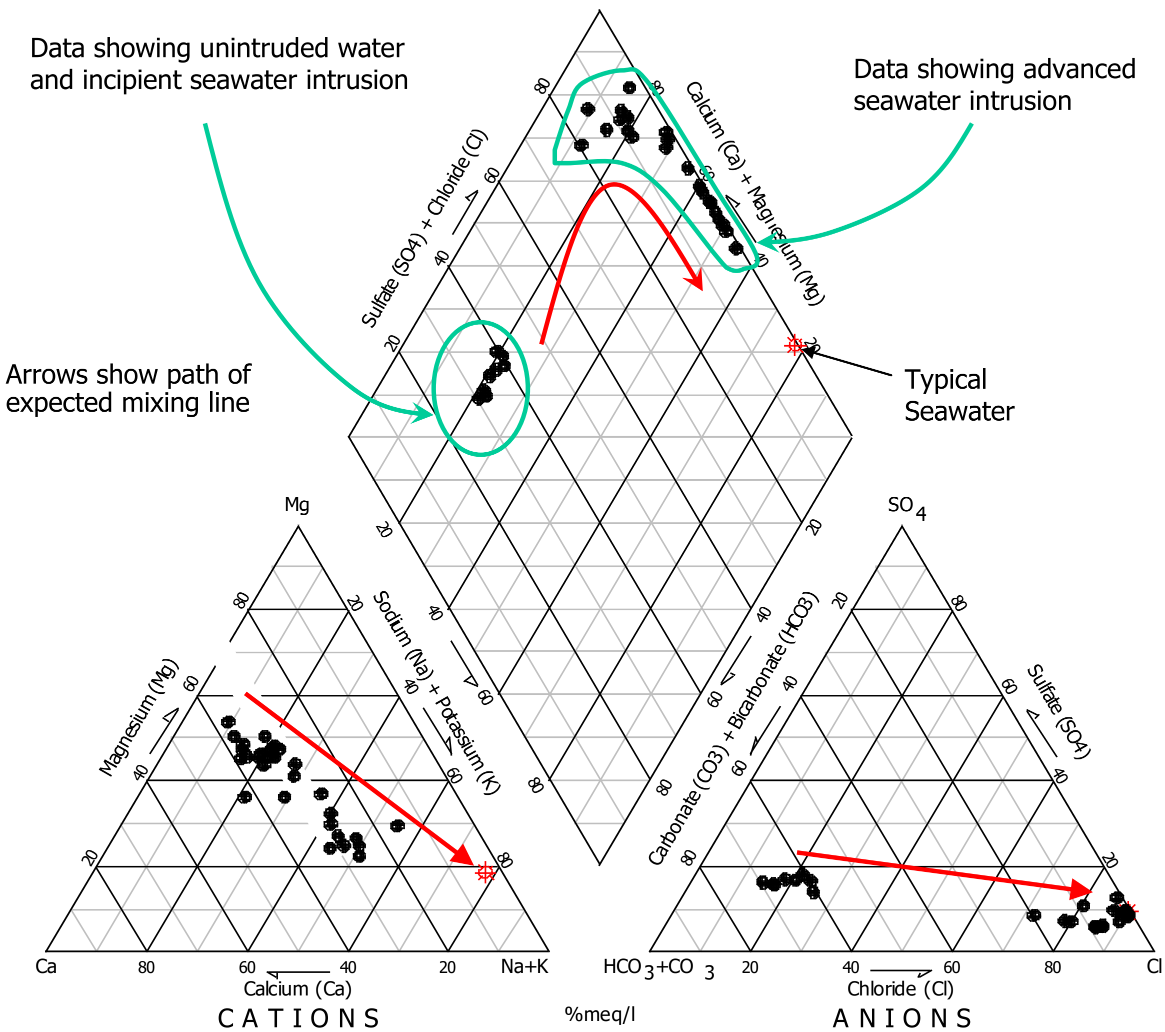
On these Piper diagrams, the relative abundances of individual cations and anions are plotted in the left and right triangles, respectively, and their combined distribution is plotted in the central diamond. Waters from similar or related sources will generally plot together. When seawater intrusion is present, the data points will generally plot along a straight line heading towards sodium (Na) in the left triangle and chloride (Cl) in the right triangle (Figure 2). Within the central diamond, the trend toward seawater intrusion plots along a curved path as shown on Figure 2. The red arrows track the evolution of water chemistry from freshwater to seawater.

1.3.1.2 Stiff Diagrams

Example Stiff diagrams from the Salinas Valley are shown on Figure 4 and Figure 5. These figures are included to demonstrate the utility of Stiff diagrams and show how they have been used in nearby basins. On Stiff diagrams, the relative abundances of individual cations are plotted on the left side of the graph and the relative abundances of anions are plotted on the right side of the graph. Waters with similar chemistries will have similarly shaped Stiff diagrams.

Figure 4 shows Stiff diagrams characteristic of the unintruded portions of the Salinas Valley Pressure 400-Foot Aquifer. By contrast, Figure 5 shows Stiff diagrams from the intruded portion of the Salinas Valley Pressure 400-Foot Aquifer. The significantly higher chloride levels in the intruded aquifer result in the noticeable spike at the upper right side of the Stiff diagrams on Figure 5. This spike is indicative of incipient seawater intrusion.

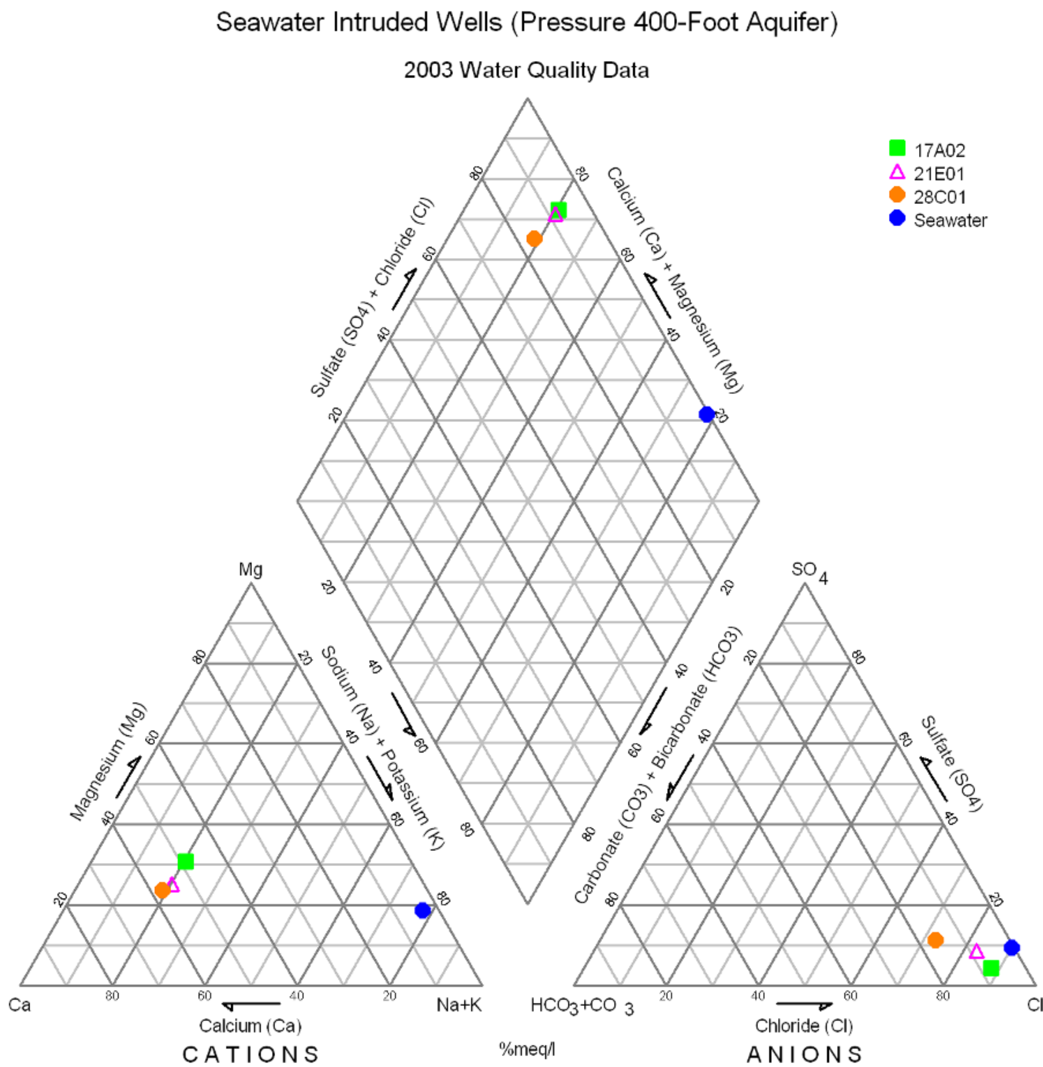
The Stiff diagrams shown on Figure 5 are from wells that have acknowledged seawater intrusion based on multiple lines of evidence. The Stiff diagrams alone are often not sufficient to identify seawater intrusion because there is no standard for Stiff diagram shapes; the diagrams are most useful as a comparative tool, showing the evolution of water chemistry over time and space. The shape of these Stiff diagrams is considered indicative of seawater intrusion in the Salinas Valley only because considerable data analyses have shown that in that location, Stiff diagrams adopt this shape as seawater encroaches.



(Data source: Pajaro Valley Water Management Agency [PVWMA])

Figure 2. Piper Diagram for Groundwater in Pajaro Valley

The Stiff diagrams of seawater intruded wells on Figure 5 show calcium concentrations greater than sodium concentrations, although sodium is the dominant cation in seawater. Incipient seawater intrusion is often characterized by increasing calcium and decreasing sodium, due to cation exchange between sodium and calcium on the aquifer material. This concept is discussed further on page 18.



(Source: Monterey County Water Resources Agency [MCWRA])

Figure 3. Piper Diagram for Groundwater in Salinas Valley

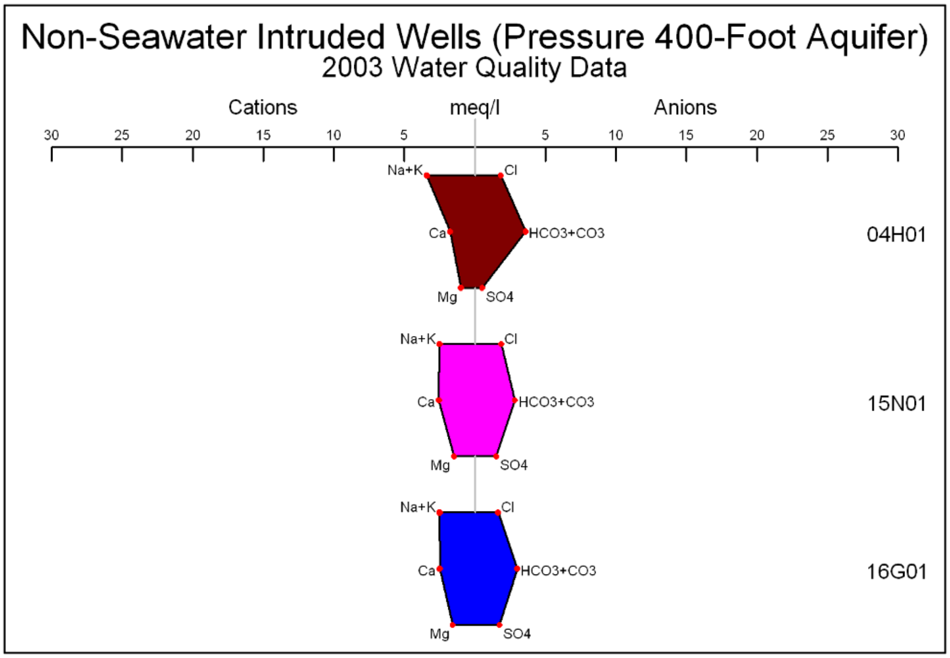
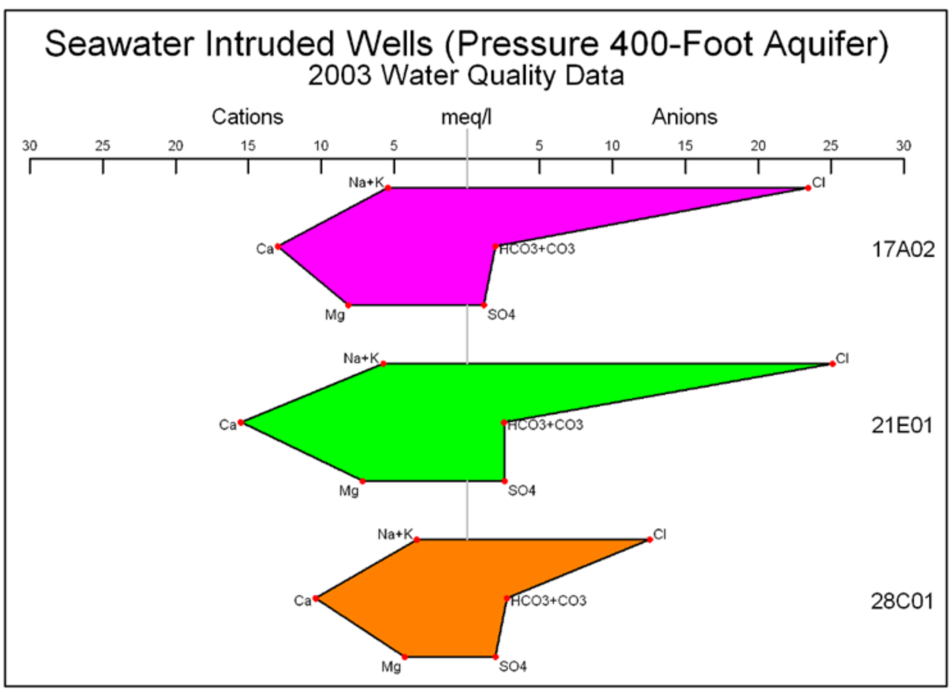


Figure 4. Stiff Diagrams from Salinas Valley Wells without Seawater Intrusion



(Source: MCWRA)

Figure 5. Stiff Diagrams from Salinas Valley Wells with Seawater Intrusion

1.3.2 Increasing Chloride Concentrations

Seawater is chloride rich, whereas bicarbonate or sulfate are the dominant anions in many groundwater systems. Steadily increasing chloride concentrations over time is one of the most commonly used indicators of seawater intrusion. At low chloride concentrations, trends are often as important as absolute concentrations because of natural variations in groundwater chemistry. As an example, in 2004 the coastal shallow Pacific Cement Aggregates (PCA) West well had a chloride concentration of 46 mg/L, whereas the much more inland well 2701882-016, located in the Laguna Seca subarea, had a chloride concentration of 225 mg/L. The higher chloride concentration in well 2701882-016 is fairly consistent, showing no increasing trend, and is clearly not an indicator of seawater intrusion.

Example graphs showing historical chloride concentration increases indicative of seawater intrusion are shown on Figure 6 and Figure 7. Figure 6 graphs steadily increasing chloride concentrations in a shallow well in the Salinas Valley and Figure 7 graphs increasing chloride concentrations in a well in the Pajaro Valley. Both of these graphs show that the rise in chlorides is a lengthy and persistent process; chloride concentrations began to increase in the representative Salinas Valley well in 1982, and took six years before exceeding the Safe Drinking Water Act secondary drinking water standard of 250 mg/L. This long-term and relatively slow increase in chlorides suggests that while chloride concentrations are strongly indicative of seawater intrusion, it often takes time for the increasing chloride trend to be recognizable.

1.3.3 Sodium/Chloride Molar Ratios

As mentioned earlier in this report, sodium often replaces calcium on the aquifer matrix through ion exchange in advance of the seawater front. This effectively removes sodium from the water and sodium/chloride ratios drop in advance of the seawater front. This can sometimes be used as an early indicator of seawater intrusion. Sodium/chloride ratios can also be used to differentiate between seawater intrusion and other sources of saltwater. Jones *et al*. (1999) suggest that sodium/chloride ratios in advance of a seawater intrusion front will be below 0.86 (molar ratio). This distinguishes seawater intrusion from domestic waste water, which typically has sodium/chloride ratios above 1.

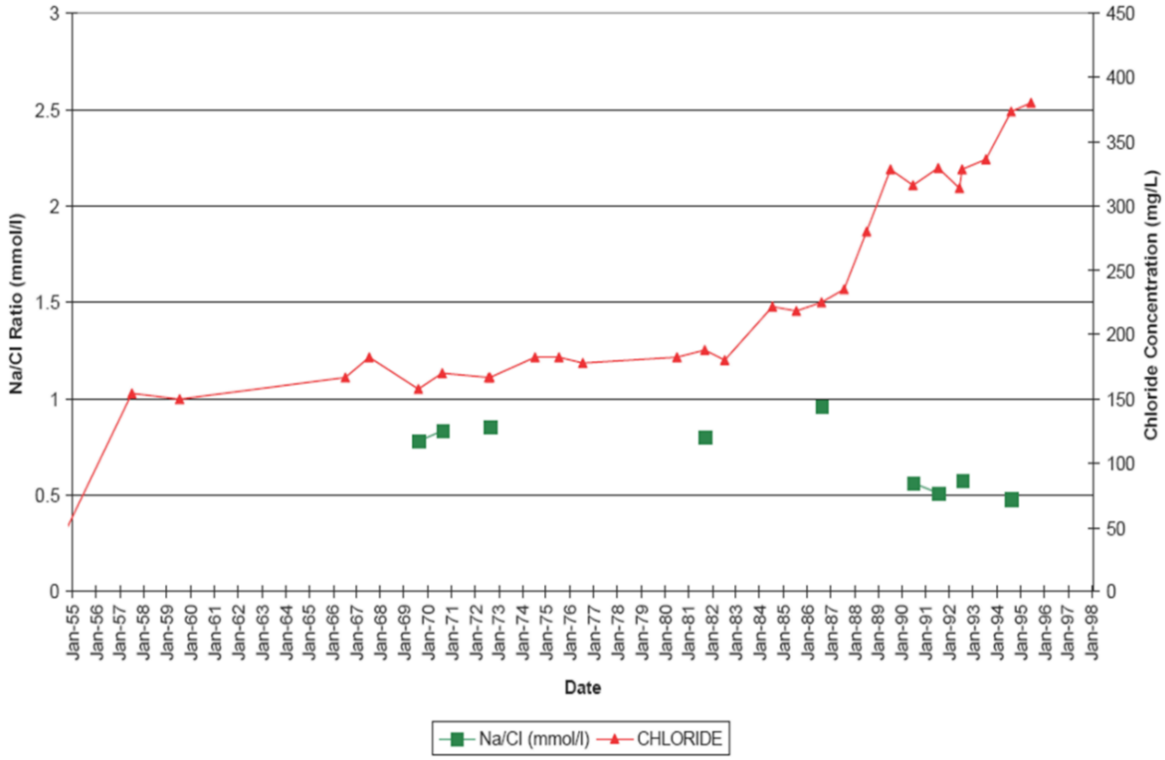


Figure 6. Historical Chloride Concentrations and Sodium/Chloride Ratios for a Well in Salinas Valley Showing Incipient Intrusion (Data source: MCWRA)

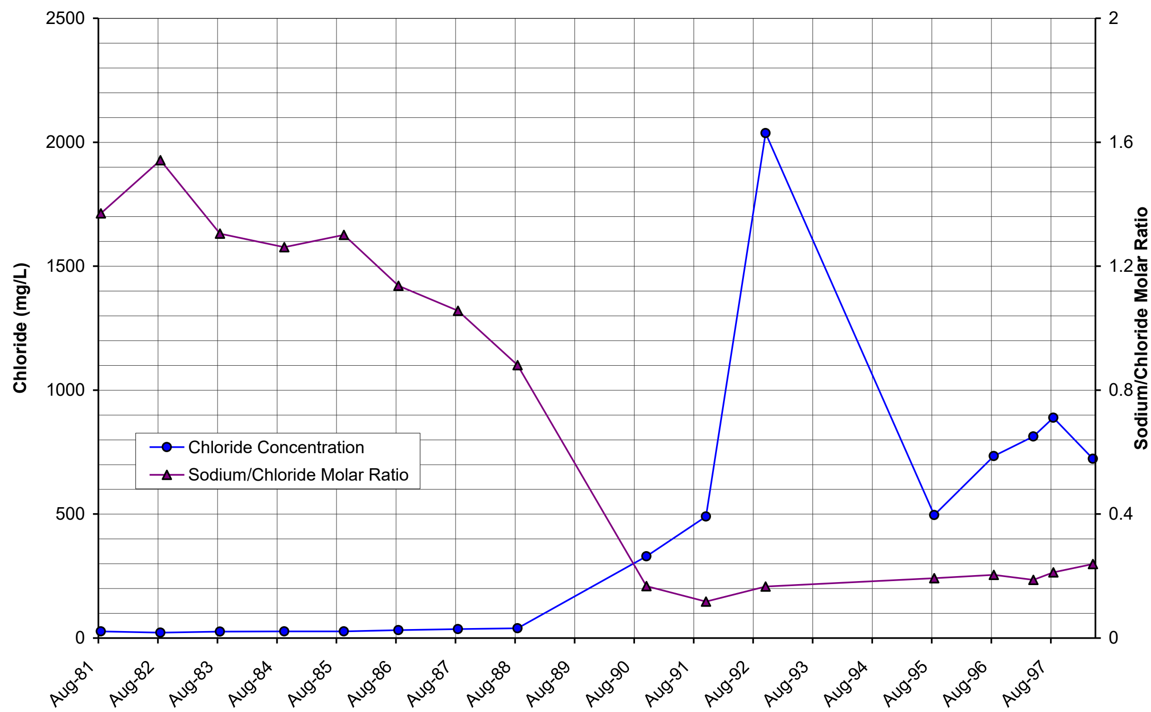


Figure 7. Historical Chloride Concentrations and Sodium/Chloride Ratios for a Well in Pajaro Valley Showing Incipient Intrusion (Data source: PVWMA)

In addition to plotting increasing chloride concentrations, decreasing sodium/chloride ratios are plotted on Figure 6 and Figure 7. The strong correlation between the two indicators of seawater intrusion can be observed on these two figures. The potential utility of sodium/chloride ratios as an early indicator of seawater intrusion is shown on Figure 7. This figure shows that by August 1988, chloride concentrations in the Pajaro Valley well had remained relatively constant yet sodium/chloride ratios were beginning to drop, suggesting incipient seawater intrusion. By September 1990, the rising chloride levels can be clearly correlated to dropping sodium/chloride ratios; definitively associating the high chlorides with seawater intrusion.

1.3.4 Chloride-Bicarbonate Ratios

The ratio of chloride to bicarbonate-plus-carbonate contrasts the relative abundance of the dominant seawater and freshwater anions. As a ratio of concentrations expressed in mg/L, the ratio for seawater exceeds 100 and values for groundwater unaffected by seawater are generally less than 0.3. For groundwater with relatively low total dissolved solids, this ratio provides little benefit over evaluating chloride concentrations alone and therefore is not used in the current analyses.

1.3.5 Electric Induction Logs

Changes in formation salinity can be measured from within a well using electric induction logging. Induction logging within the well measures the fluid conductivity within the adjacent formation up to a distance of 3 feet from the well casing. This technique can be used in wells that are completed with PVC casings and screens.

This method can be used as a cost-effective method of detecting seawater intrusion by measuring the electrical conductivity of the formation throughout the depth of the well. If over time, the conductivity increases relative to the baseline value, it could indicate seawater intrusion. One limitation of this method is that it does not provide concentrations of chloride or other ions that contribute to salinity. Therefore, the use of electric induction logs can only be used qualitatively.

Induction logging has been performed on the Watermaster's coastal Sentinel Wells since their completion in 2007.

1.3.6 Other Indicators

Hem (1989) suggested several other indicators for seawater intrusion, including the concentration ratio of calcium to magnesium (approximately 0.3 in seawater and greater in fresh water); the percentage of sulfate among all ions (approximately 8% in seawater and larger in fresh water); and the concentrations of minor constituents such as iodide, bromide, boron, and barium. These other indicators are not used in the current analyses for the following reasons:

1. The analyses presented in the following sections suggest seawater intrusion has not advanced onshore in the Seaside Groundwater Basin, although there is increasing salinity in the Paso Robles Formation (see Section 2.5).
2. The Watermaster analyzed samples from selected coastal monitoring and production wells for iodide, bromide, boron, and barium from 2012 to 2022. Because it was felt that 10 years of barium and chloride data was sufficient for baseline purposes, analysis for these two constituents was discontinued starting in Water Year (WY) 2023.

It is not necessary to use the above two indicators because as discussed in the preceding sections, there are other methods available for indicating seawater intrusion. Should the other methods start showing seawater intrusion, the minor constituents of iodide, bromide, boron, and/or barium could be included in future water quality analyses so that they can be used as supplemental indicators.

2 SEAWATER INTRUSION IN THE SEASIDE GROUNDWATER BASIN

The geochemical criteria discussed above, along with various maps showing spatial distributions of concentrations, can be used to estimate the presence or lack of seawater intrusion in the Seaside Groundwater Basin. While no single analysis is a definitive indicator of seawater intrusion, the combined weight of all analyses may be instrumental in detecting seawater intrusion.

2.1 Analysis Approach

As was used in previous Seawater Intrusion Analysis Reports (RBF, 2007; HydroMetrics LLC, 2008; HydroMetrics LLC, 2009a; HydroMetrics WRI, 2010; HydroMetrics WRI, 2011; HydroMetrics WRI, 2012; HydroMetrics WRI, 2013a; HydroMetrics WRI, 2014; HydroMetrics WRI, 2015; HydroMetrics WRI, 2016b; HydroMetrics WRI, 2017b; Montgomery & Associates, 2018b; M&A, 2019; M&A, 2020; M&A, 2021; M&A, 2022; M&A, 2023), this SIAR includes multiple approaches to evaluate seawater intrusion. Results from all groundwater quality testing in WY 2024 are included in Appendix A.

Data for the second quarter of WY 2024 (sampled and measured January-March 2024) and fourth quarter of WY 2024 (sampled and measured July-September 2024) are analyzed and mapped to show the spatial distribution of groundwater quality and groundwater elevations. In addition to spatial mapping, historical data are graphed to assess geochemical trends. Data from the second quarter represent conditions during the wet time of the year; data from the fourth quarter represent conditions during the dry time of the year. In some cases when samples or measurements are not collected strictly within the second or fourth quarter, the quarter in which they were collected is provided with the data.

Where possible, analyses are separated by depth zone. Two depth zones have been chosen, following the system of Yates *et al.* (2005). Wells assigned to the shallow depth zone generally correlate to the Paso Robles Formation where it exists. This shallow zone is roughly at the same depth as the Salinas Valley Pressure 400-Foot Aquifer. Wells assigned to the deep zone correlate with the Santa Margarita Sandstone where it exists in the Seaside Groundwater Basin. The deep zone is roughly at the same depth as the Salinas Valley Pressure Deep Aquifers (900-foot and 1,500-foot Aquifers).

Analysis of current and historical precipitation is also included to help inform trends in groundwater elevations and production.

2.2 Cation/Anion Ratios

For the WY 2024 SIAR, 17 monitoring wells and 13 production wells were used for geochemical trend analyses. Locations of all monitoring and production wells used in the SIAR analysis are shown on Figure 8. Some of the production wells included in previous years' analysis are not included in this year's analysis because they were not pumped during the year and thus not sampled. Groundwater quality data are not collected in the Sentinel Wells for seawater intrusion analysis because in early 2017 it was concluded that groundwater samples collected using the low flow sampler were more representative of water within the well casing and not from the groundwater in the aquifer surrounding the well (HydroMetrics LLC, 2017a).

Eight monitoring wells used in this analysis represent one or both well pairs from the MPWMD monitoring well network and a single non-paired monitoring well (Del Monte Test) (Figure 8). A well pair comprises two wells drilled close to one another: one perforated in the Paso Robles aquifer (shallow zone) and the other perforated in the Santa Margarita aquifer (deep zone). Each well pair is represented with a unique color and symbol on the Piper and Stiff diagrams.

Production wells included in the analysis are water purveyor wells that are sampled annually for general inorganic minerals per the Seaside Basin Monitoring and Management Program (Seaside Groundwater Basin Watermaster, 2006). The current schedule includes quarterly sampling at selected coastal monitoring wells. All other monitoring and production wells are sampled annually during the fourth quarter. Where samples are not available for analysis, the text and figures indicate as such.

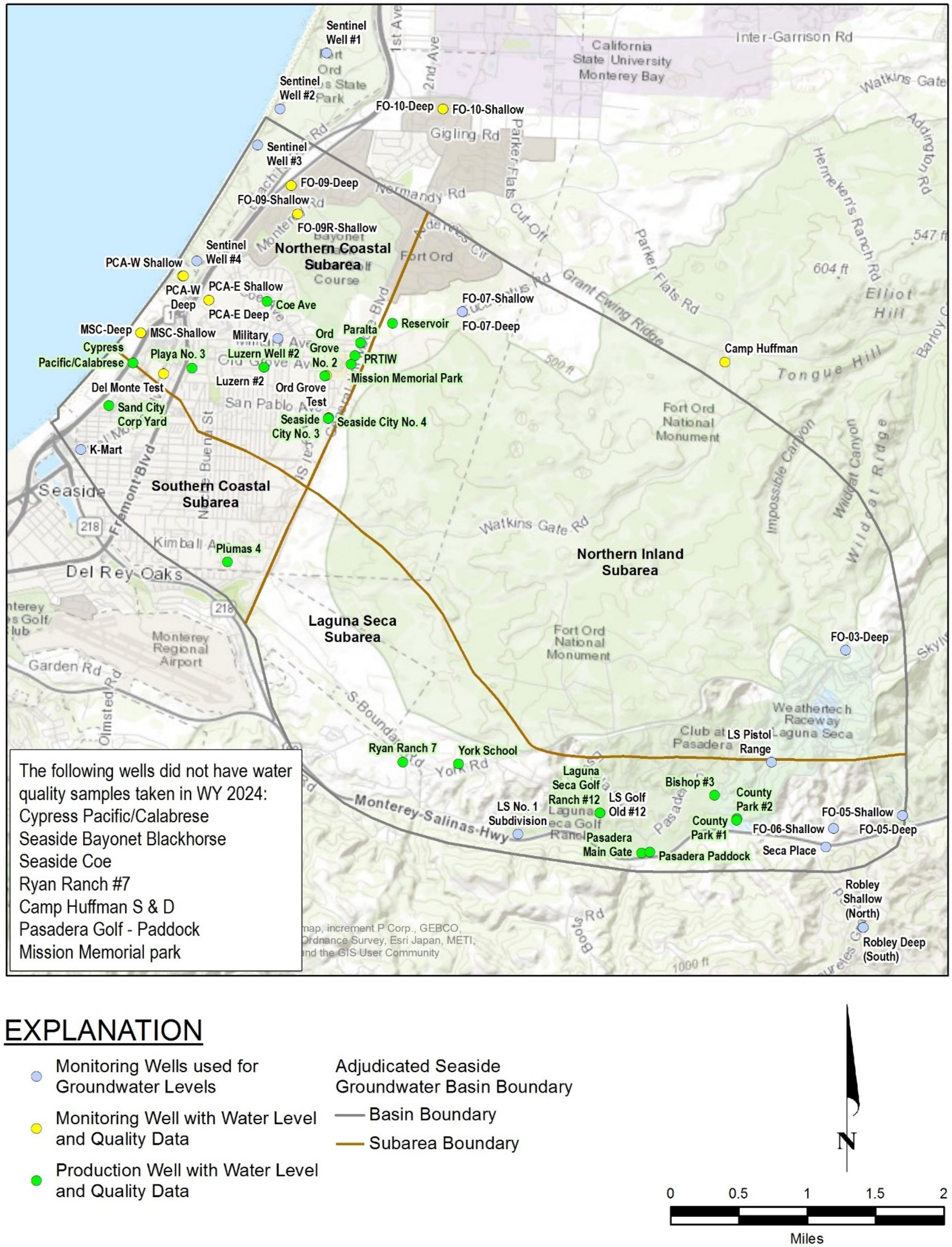


Figure 8. Wells Used for Seawater Intrusion Analyses Second Quarter Water Year 2024 (January-March 2024)

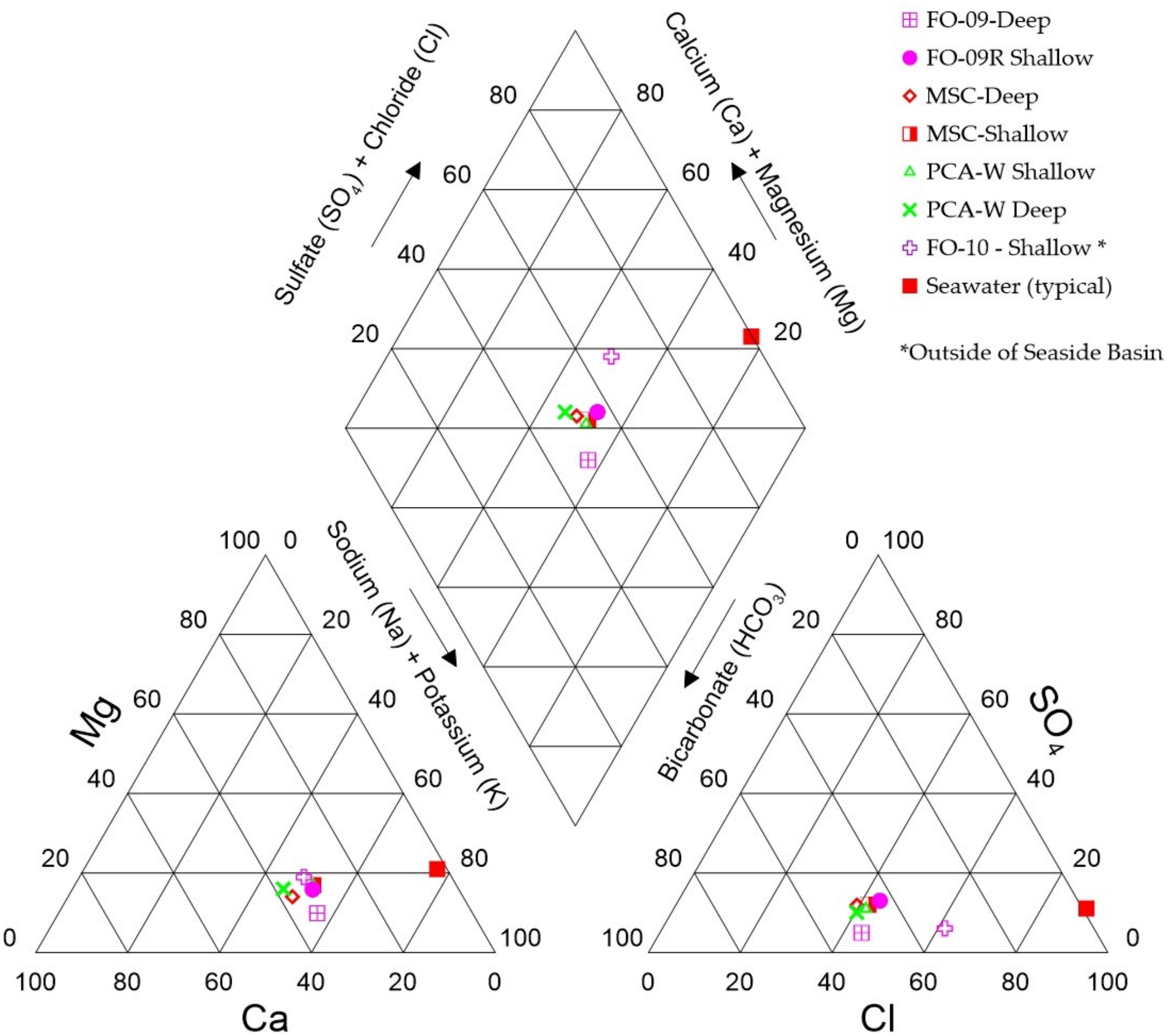
2.2.1 Second Quarter Water Year 2024 (January-March 2024)

A Piper diagram plotting 7 monitoring wells in the Northern Coastal subarea for the second quarter WY 2024 (January-March 2024) is shown on Figure 9. Analyses from only 7 wells are shown because the Sentinel Wells are only used for induction logging and are no longer sampled, and most of the monitoring well pairs are only sampled in the fourth quarter. Monitoring well FO-09 Shallow was destroyed in 2021 due to a compromised casing and was replaced by FO-09R Shallow in 2023. Appendix C includes individual Piper diagrams for each well to track their anions and cations over time. Note that bicarbonate (HCO_3) presented on Piper and Stiff diagrams is derived from Total Alkalinity (as CaCO3).

The anions and cations for most monitoring wells on Figure 9 generally cluster in a single area on the Piper diagram consistent with previous data thereby indicating the chemistry is not changing. Consistent with the previous 4 years, monitoring well FO-10 Shallow plots differently than the other wells on the Piper diagram (Figure 9). Its chloride concentrations increased suddenly in WY 2020, departing significantly from its historical trends (Appendix D: Figure D-9). In WY 2024, FO-10 Shallow's anions and cations on the Piper diagram (Appendix C: Figure C-11) plot similarly to the previous year.

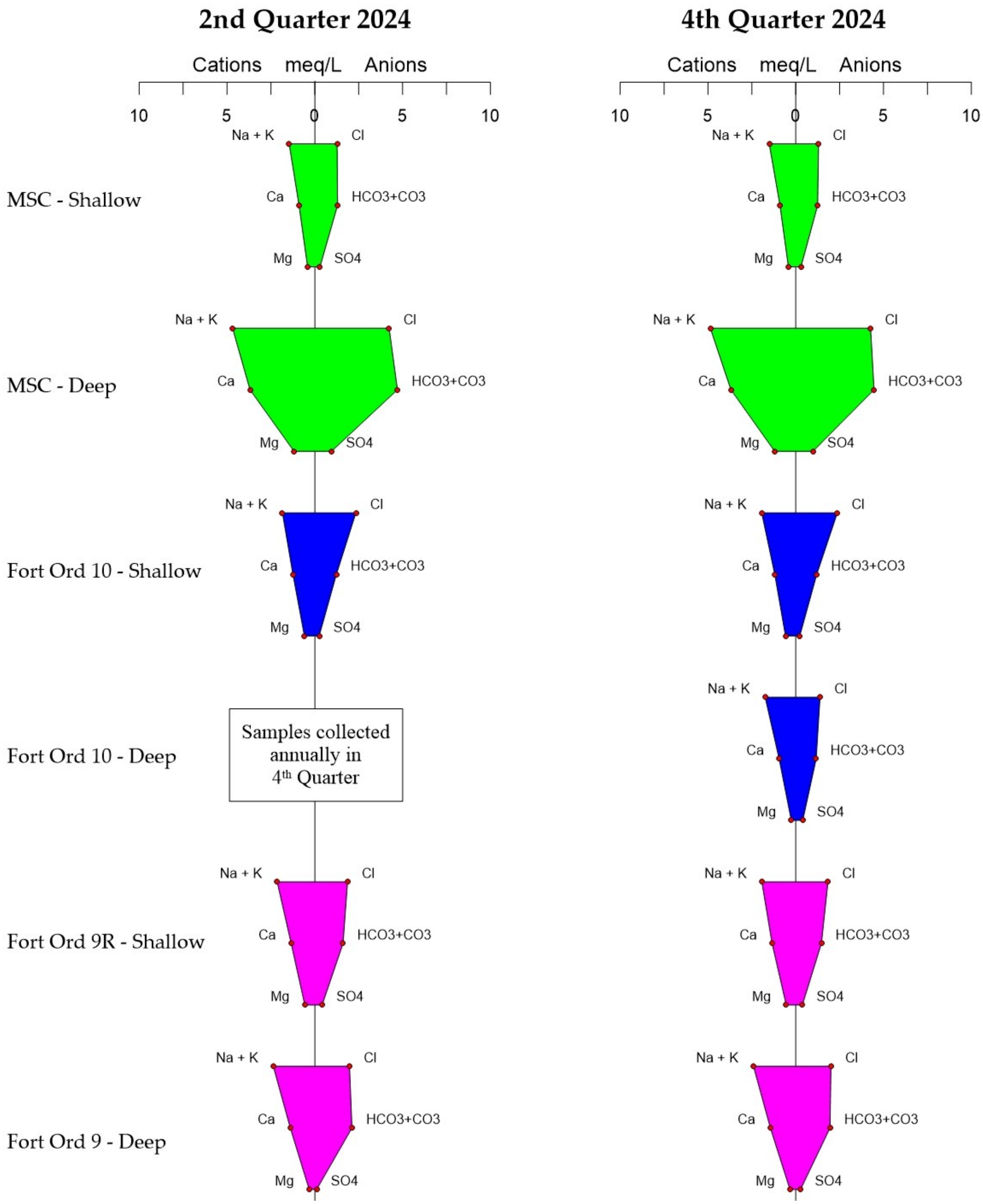
Downhole logging in the FO-10 Deep well and subsequent historical record search identified a 1,300 foot, 2-inch steel tremie pipe that has been left in the FO-10 borehole since the well's construction (Feeney, 2021; Feeney 2022). While comparison of WY 2021 resistivity at the well against a historical resistivity log does shows increased conductivity in the well, which may be a sign of seawater intrusion, the presence of the steel pipe prevents making water quality determinations because the pipe mutes the induction log response. Further, the steel pipe may act as a conduit allowing flow between overlying intruded Dune Sands sediments and the underlying aquifer. FO-10 Deep's anions and cations plot in a cluster indicating that the samples are from similar or related sources (Appendix C: Figure C-12).

Stiff diagrams for the monitoring wells sampled during the second quarter of WY 2024 are shown in the left column on Figure 10 through Figure 12. The Camp Huffman Well is only sampled every five years and was last sampled in 2023, as reported in the Watermaster's 2022 Annual Report. None of the Stiff diagrams, including monitoring wells FO-10 Shallow and FO-10 Deep, show the high chloride spike that indicates seawater intrusion shown on Figure 5. FO-10 Shallow does show a slightly different shape than other shallow wells because of elevated chloride. The shape of FO-10 Deep's stiff diagram is the same as shallow wells completed in the Paso Robles aquifer. Because of the steel pipe's interference and potential as a conduit allowing flow between overlying intruded Dune Sands sediments and the underlying aquifer, it was recommended by the Watermaster to MPWMD (the well owner) and MCWD (where the well is located) that the nested well pair be destroyed and replaced.



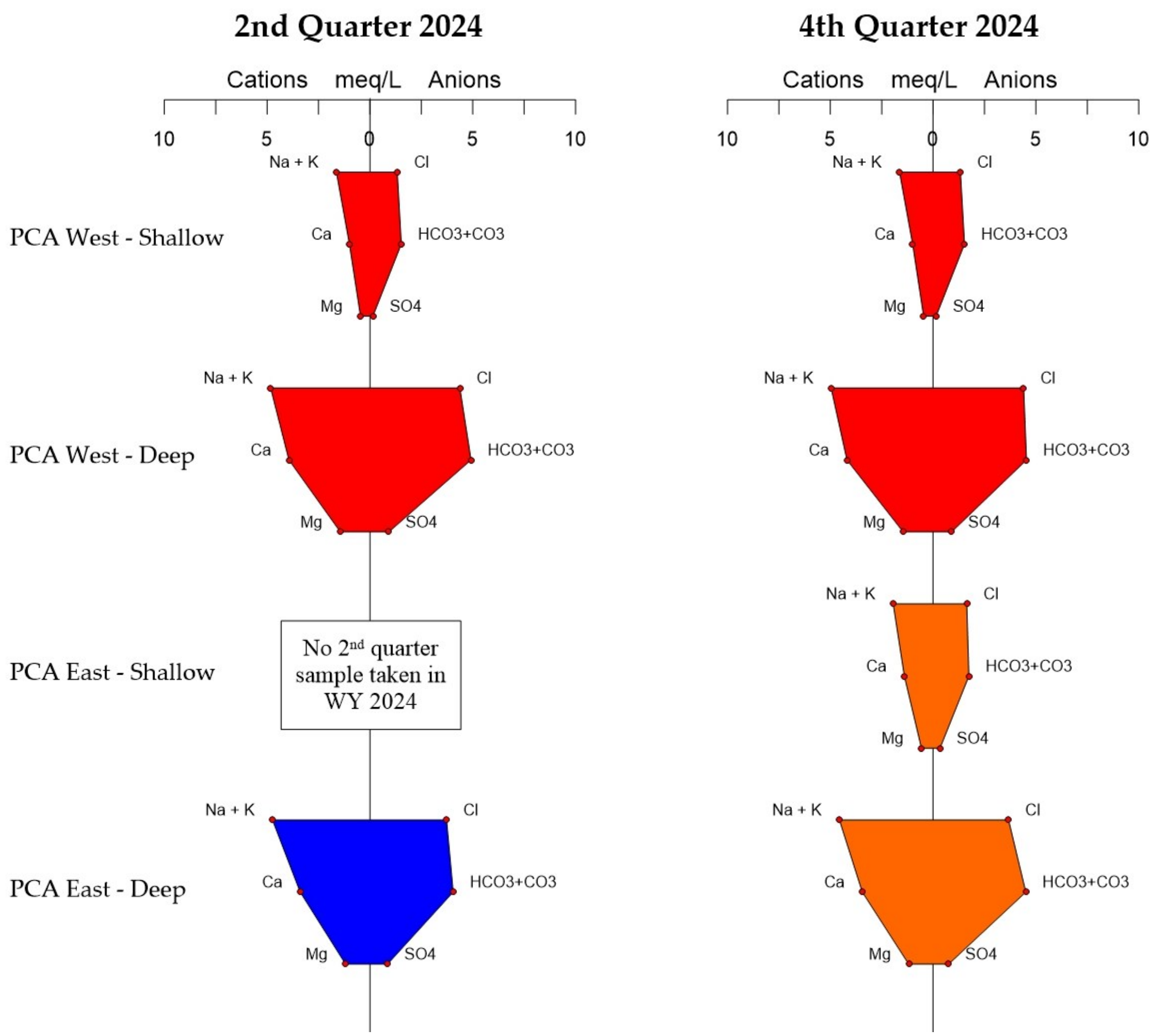
(Data source: Watermaster)

Figure 9. Piper Diagram for Seaside Groundwater Basin Monitoring Wells, Second Quarter Water Year 2024 (January-March 2024)



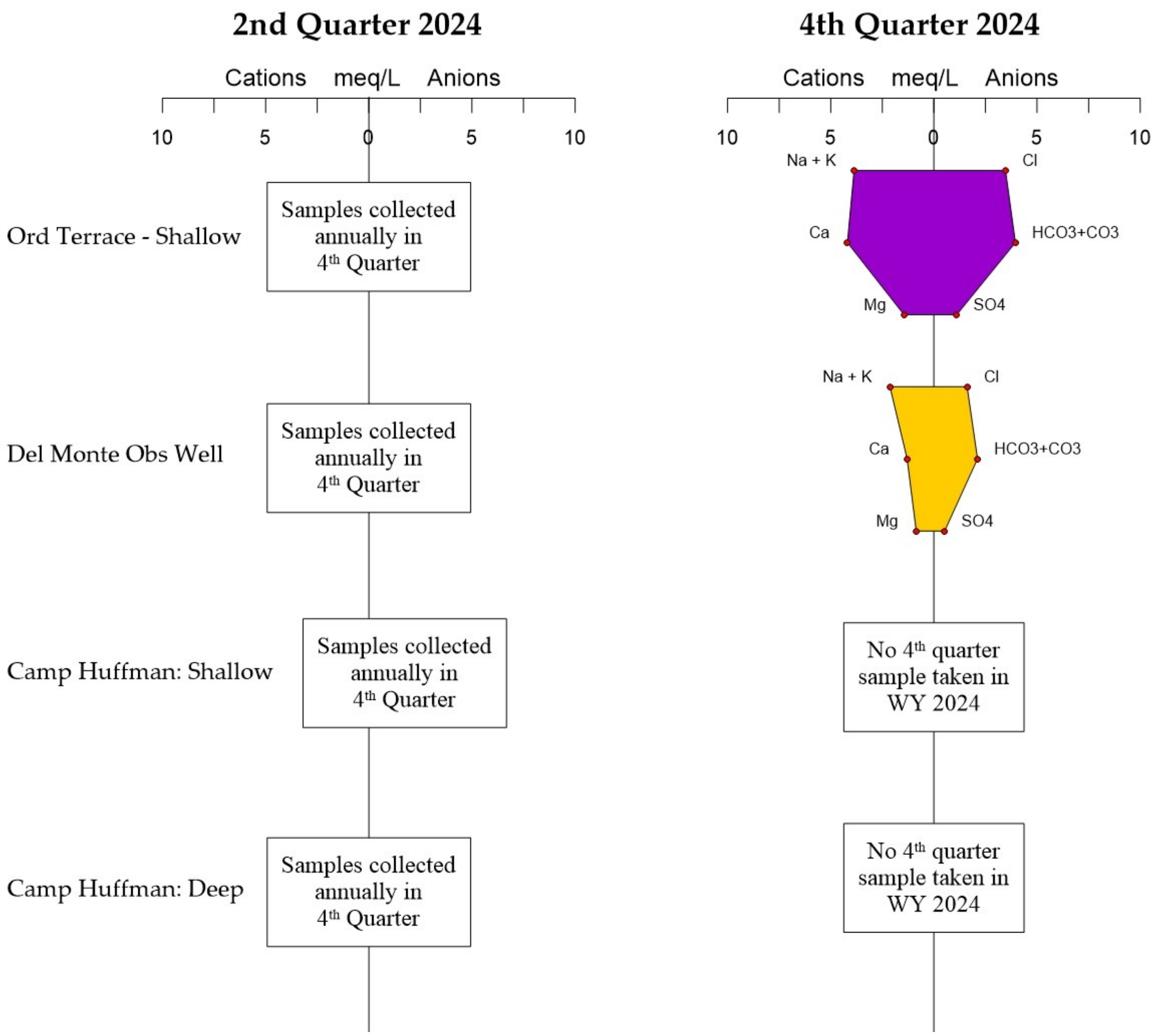
(Data source: Watermaster)

Figure 10. Stiff Diagrams for Monterey Sand Company (MSC), Fort Ord 9, and Fort Ord 10 Wells



(Data source: Watermaster)

Figure 11. Stiff Diagrams for PCA-West and PCA-East Wells



(Data source: Watermaster and MPWMD)

Figure 12. Stiff Diagrams for Watermaster Ord Terrace, Del Monte, and Camp Huffman Wells

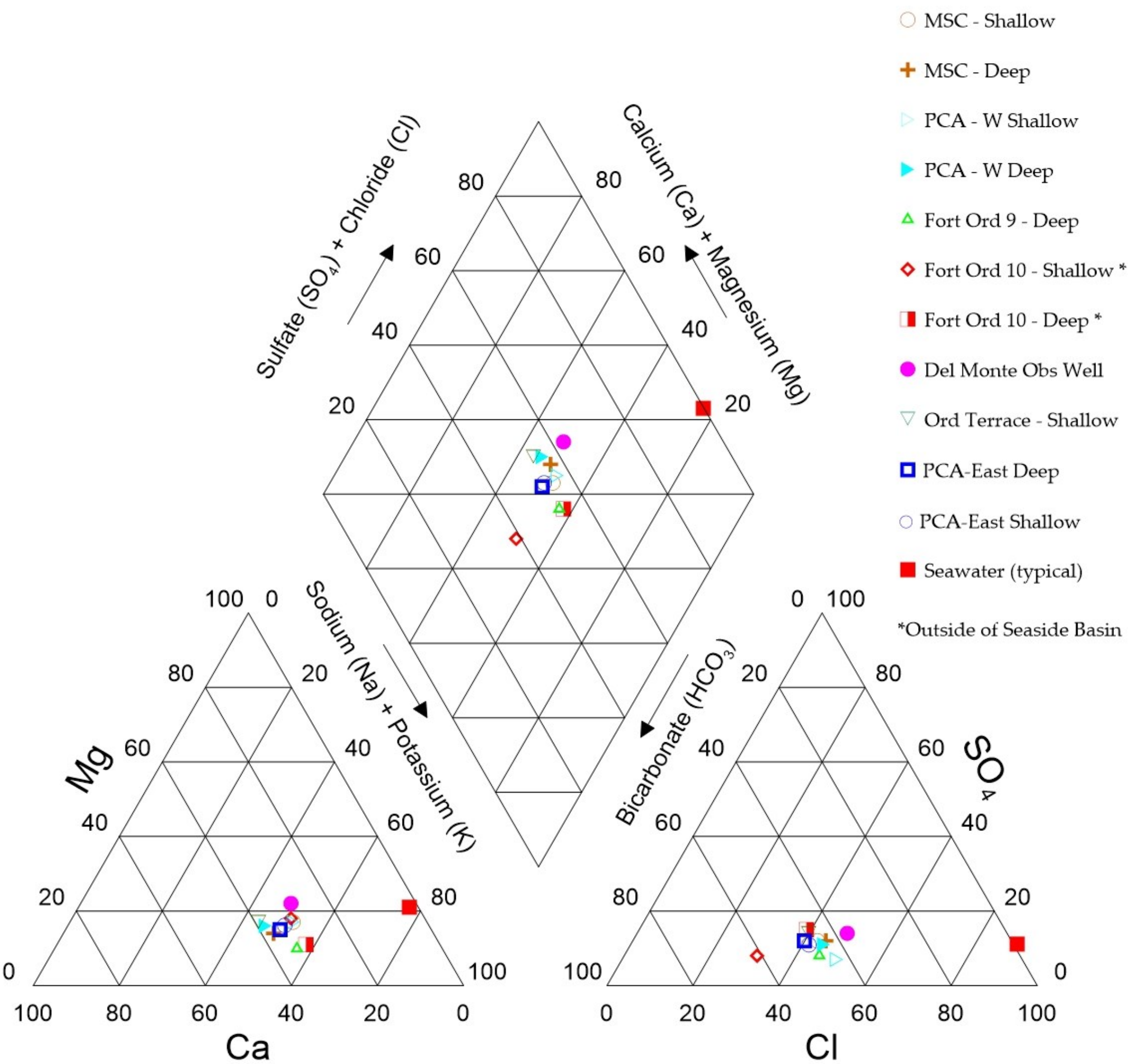
2.2.2 Fourth Quarter Water Year 2024 (July-September 2024)

Piper diagrams displaying groundwater quality data from 11 monitoring wells and 14 production wells in the Seaside Groundwater Basin for the fourth quarter of WY 2024 (July-September 2024) are shown on Figure 13 and Figure 14, respectively. Appendix C includes individual Piper diagrams for each well to show trends over time.

The Piper diagram for monitoring wells (Figure 13) shows groundwater quality data clustering generally in a single area on the diagram. Groundwater is generally of a sodium-chloride/sodium-bicarbonate type and is not impacted by seawater. Monitoring well FO-10 Shallow plots differently on both Piper (Figure 13) and Stiff (Figure 10) diagrams due to higher chloride than most other wells. As described in Section 2.2.1, it is still inconclusive as to whether this is a result of seawater intrusion.

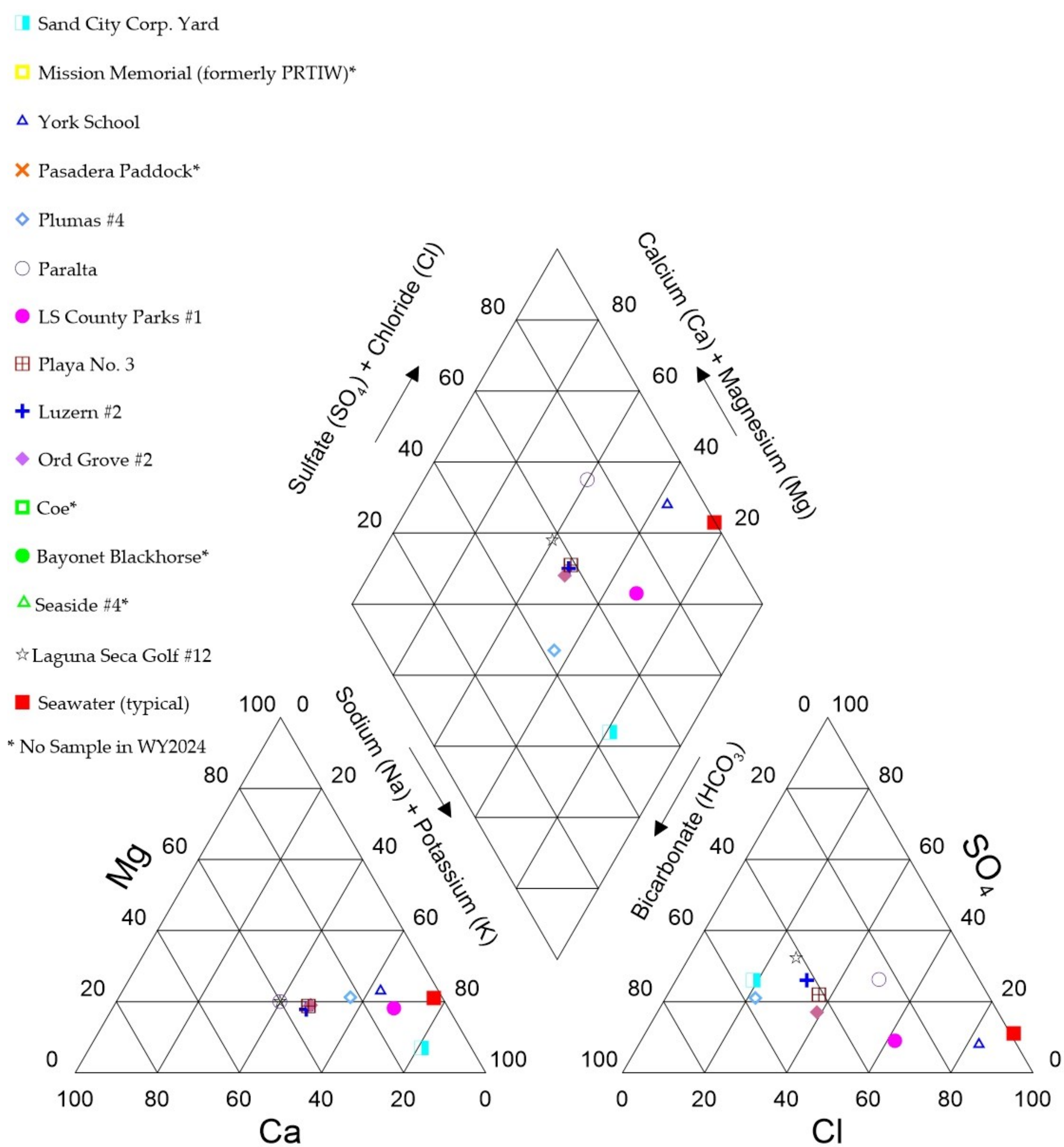
Figure 14 presents a Piper diagram for fourth quarter groundwater from production wells. The production wells plot in roughly the same location on the Piper diagram as most monitoring wells on Figure 13. The variation of the plot location on the Piper diagram for production wells is due to higher sulfate and chloride anions than in the monitoring wells. Groundwater from these wells is characterized as sodium-sulfate-chloride type waters. In the Laguna Seca subarea, the York School well plots closest to typical seawater on this diagram; however, its inland location precludes seawater intrusion as the cause for its observed water chemistry. The Piper diagrams show no indication of seawater intrusion at any of the production wells.

Stiff diagrams for 11 monitoring wells sampled during the fourth quarter of WY 2024 are shown in the right column on Figure 10 through Figure 12. The shapes of the Stiff diagrams for the paired monitoring wells are similar to Stiff diagrams for most prior years, with the exception of FO-10 Shallow, which has a greater chloride equivalent concentration than HCO_3 compared to other shallow coastal wells.



(Data source: Watermaster)

Figure 13. Piper Diagram for Seaside Groundwater Basin Monitoring Wells, Fourth Quarter Water Year 2024 (July- September 2024)



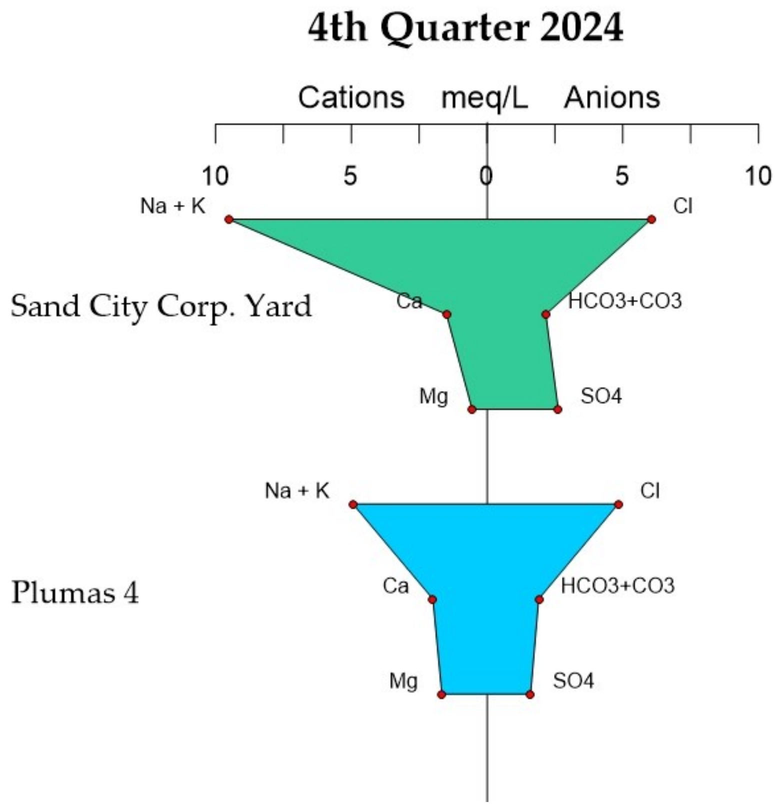
(Data source: Watermaster)

Figure 14. Piper Diagram for Seaside Groundwater Basin Production Wells, Fourth Quarter Water Year 2024 (July-September 2024)

Stiff diagrams for 13 production wells sampled during the fourth quarter of WY 2024 are shown on Figure 15 through Figure 18. Production well Stiff diagrams show no significant changes from the shapes observed in previous years. Ryan Ranch #7, #8, and #11 production wells were disconnected from CAWC's distribution system in June 2021 and destroyed in May 2024, and therefore groundwater quality data are no longer available for these wells. Groundwater quality samples are also not available for wells that did not produce water during the year. These include the City of Seaside golf course wells (Coe and Bayonet Blackhorse) and Cypress Pacific. The City of Seaside golf course started using recycled water for golf course irrigation in February 2023.

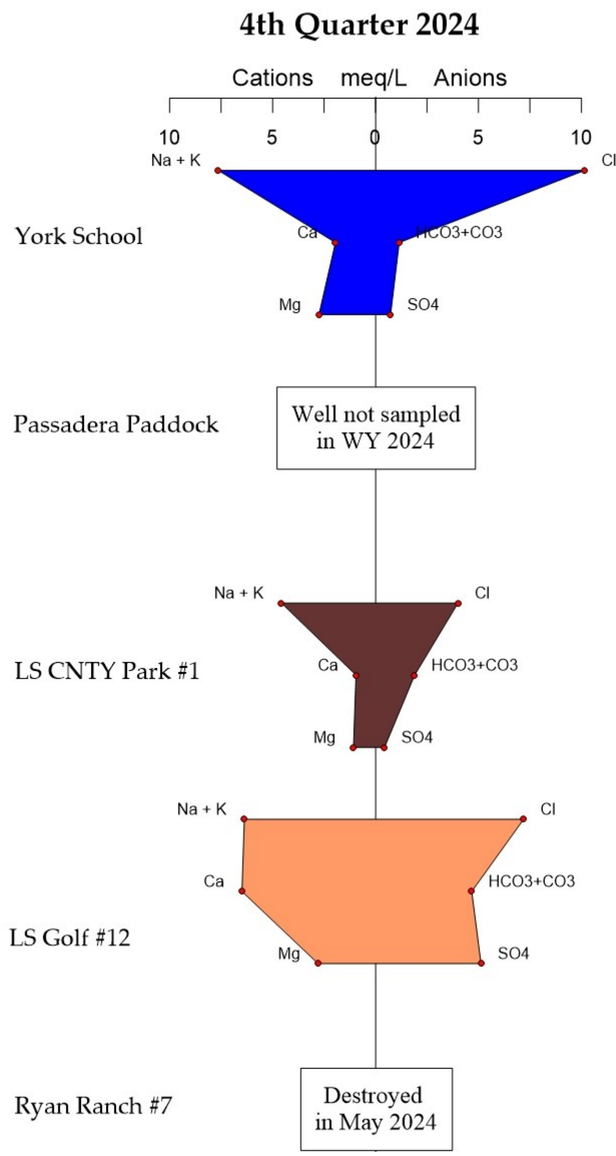
In the Laguna Seca subarea, LS County Park #1 and LS Golf #12 production wells have Stiff diagram shapes that are slightly different from other wells' chemistry. The cause of this could be localized mineralization. The Laguna Seca subarea is known to have higher salinity groundwater than the rest of the Seaside Basin due to the underlying Monterey shale that was deposited in a marine environment. The Pasadera Paddock production well was not sampled in WY 2024.

The Sand City's Public Works Corp Yard production well in the Southern Coastal subarea and the York School production well in the Laguna Seca subarea typically have Stiff diagrams quite different from most other wells' groundwater quality. However, they do not have a large chloride spike associated with seawater intrusion as shown on Figure 5. None of the production wells sampled in WY 2024 and analyzed using Stiff and Piper diagrams show an indication of seawater intrusion.



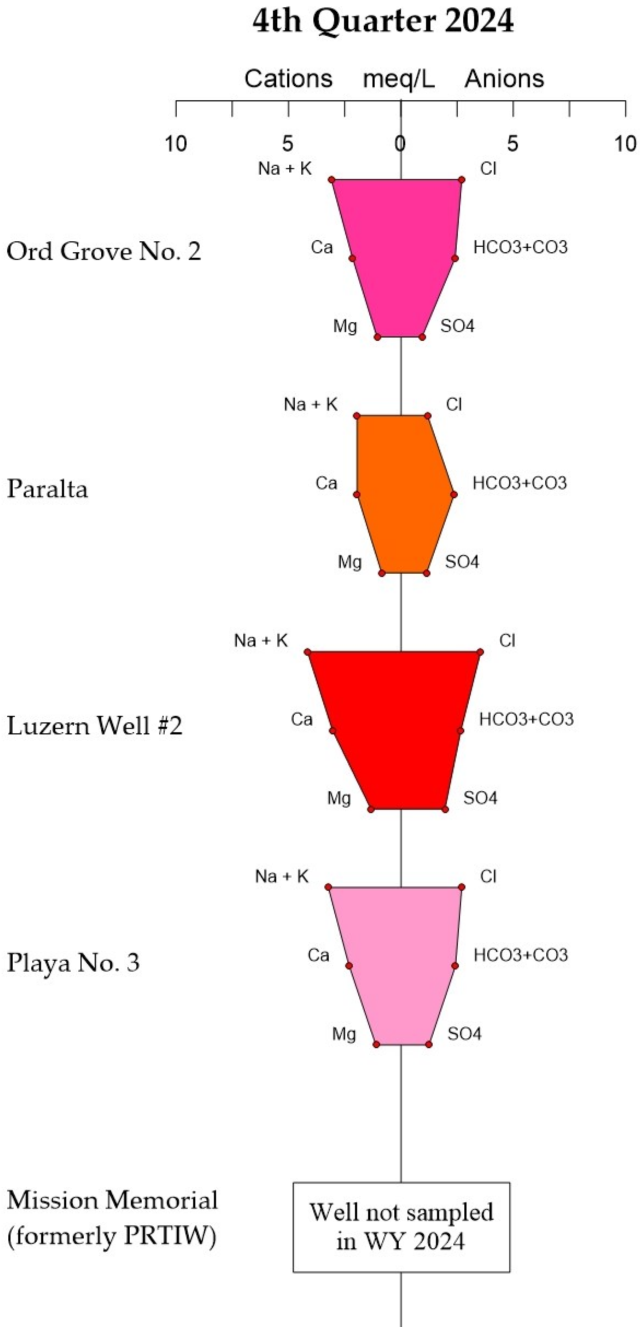
(Data source: Watermaster)

Figure 15. Stiff Diagrams for Southern Coastal Subarea Production Wells



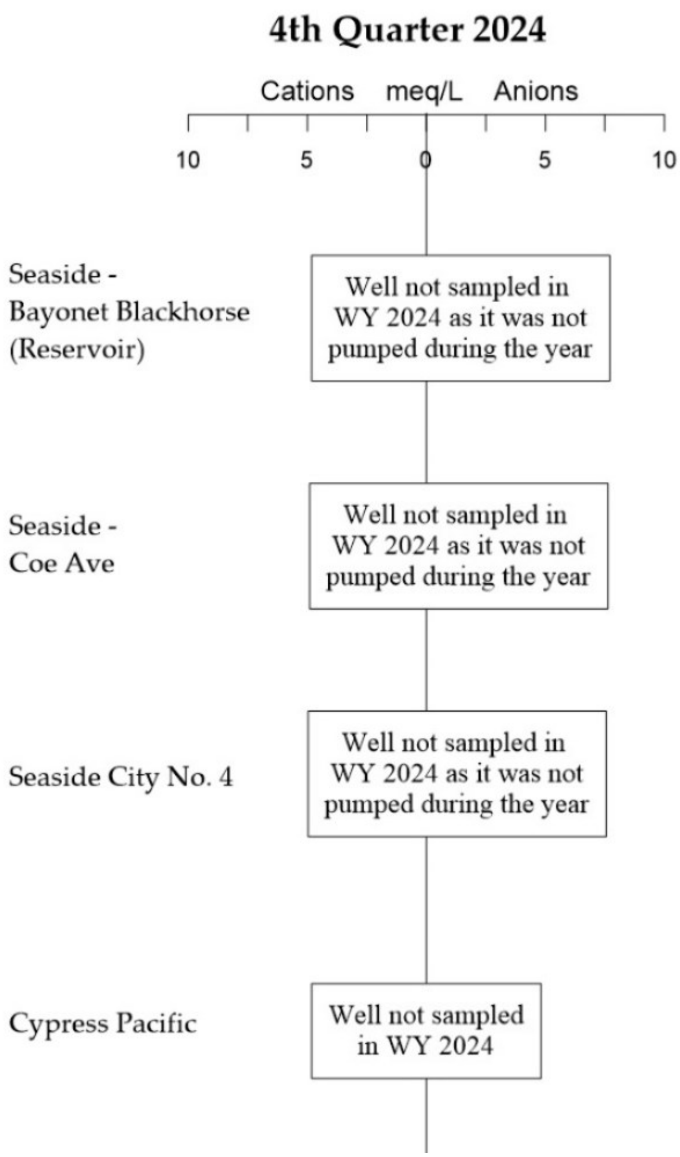
(Data source: Watermaster)

Figure 16. Stiff Diagrams for Laguna Seca Subarea Production Wells



(Data source: Watermaster)

Figure 17. Stiff Diagrams for Northern Coastal Subarea CAWC and Mission Memorial Production Wells



(Data source: Watermaster)

Figure 18. Stiff Diagrams for Northern Coastal Subarea City of Seaside and Cypress Pacific Wells

2.3 Chloride Concentrations

2.3.1 Chloride Trends

Chemographs showing chloride concentrations over time are plotted for each of the monitoring wells shown on the Piper and Stiff diagrams. An example plot displaying chloride concentrations for the shallow PCA-West Shallow monitoring well is shown on Figure 19. A complete set of chemographs is included in Appendix D. Chloride trends for most monitoring wells remain stable or fluctuate within a historical range.

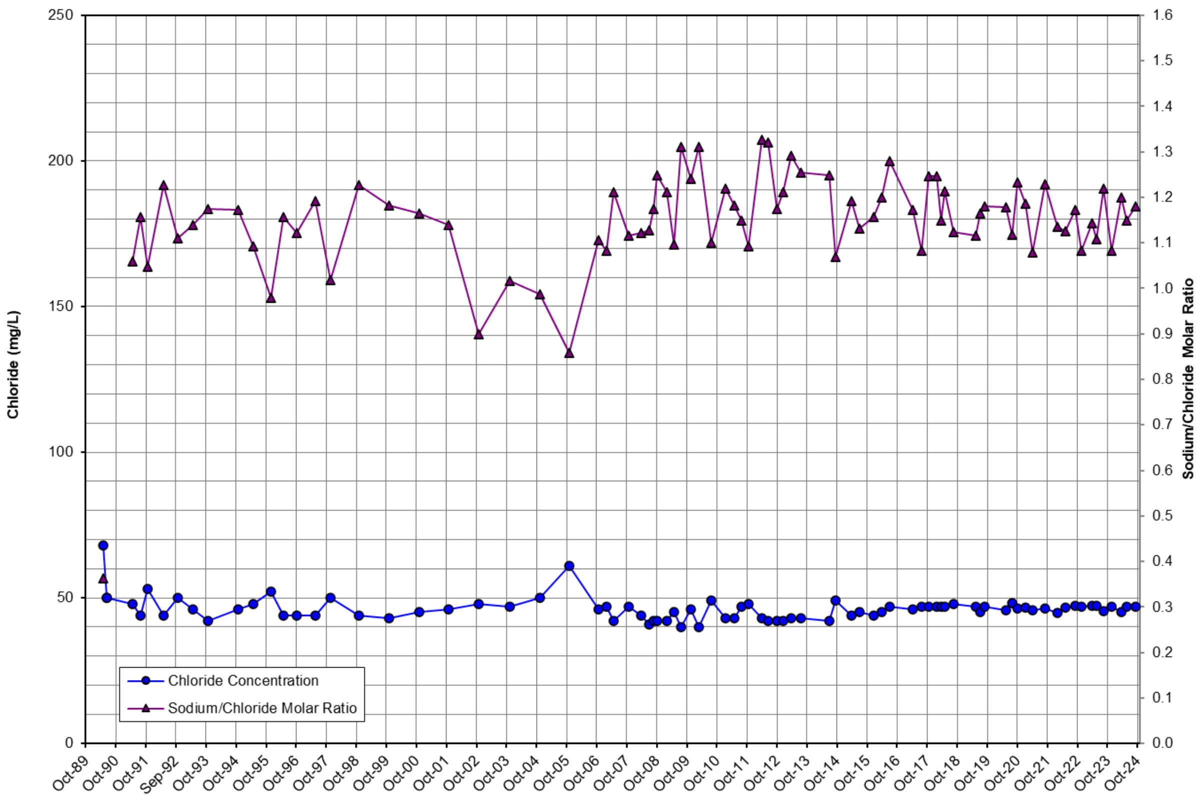


Figure 19. Historical Chloride and Sodium/Chloride Molar Ratios, PCA-West Shallow

Since WY 2020, chloride concentrations in FO-10 Shallow have been elevated from historical baseline concentrations of less than 70 mg/L (Figure 20) and have been hovering around 90 mg/L. Of the 4 samples collected from the well in WY 2024, the first two in November 2023 and March 2024 were above 90 mg/L, while the May and September 2024 samples were below 90 mg/L.

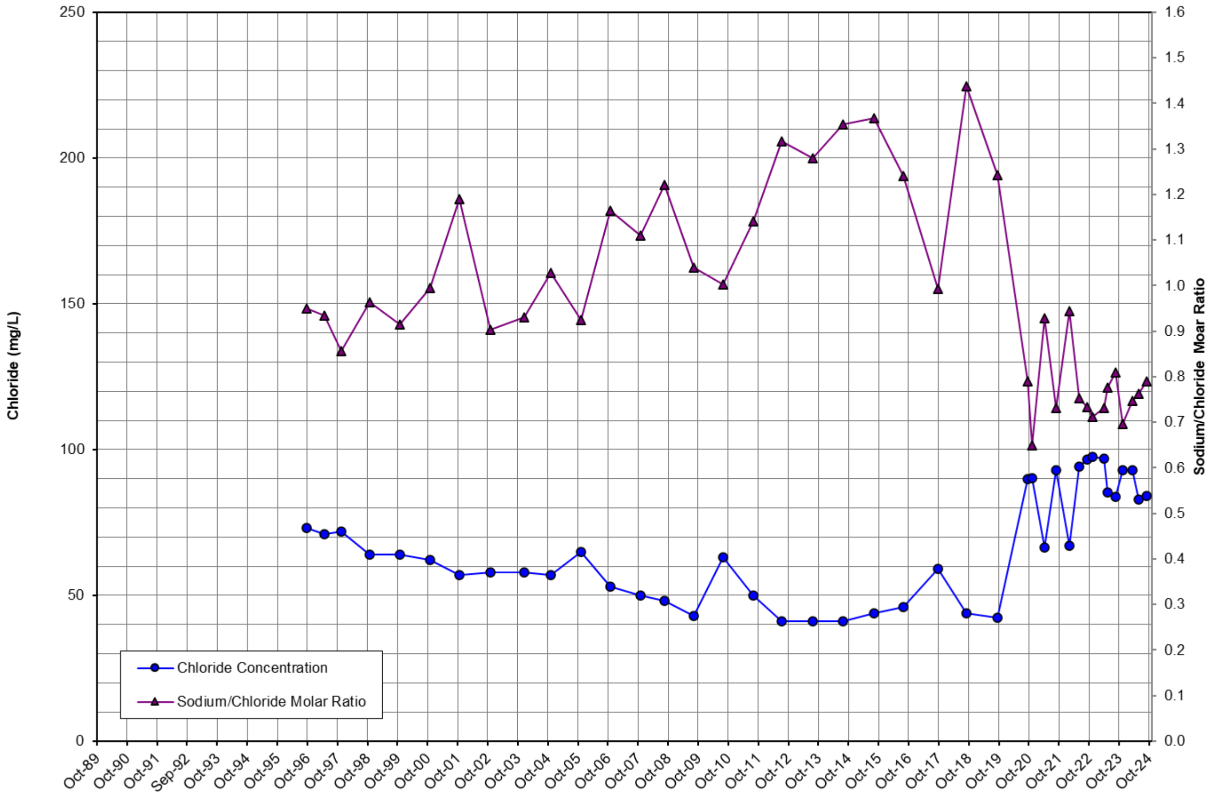


Figure 20. Historical Chloride and Sodium/Chloride Molar Ratios, FO-10 Shallow

In WY 2021, FO-09 Shallow was destroyed due to its damaged casing and was replaced in October 2023. This monitoring well's increasing chloride concentrations are believed to have been caused by the cracked casing that introduced shallower high chloride water into the well. Data from the FO-09 Shallow replacement well show that chloride concentrations are not increasing and are similar to concentrations in the original FO-9 Shallow monitoring well measured prior to 2019.

2.3.2 Chloride Concentration Maps

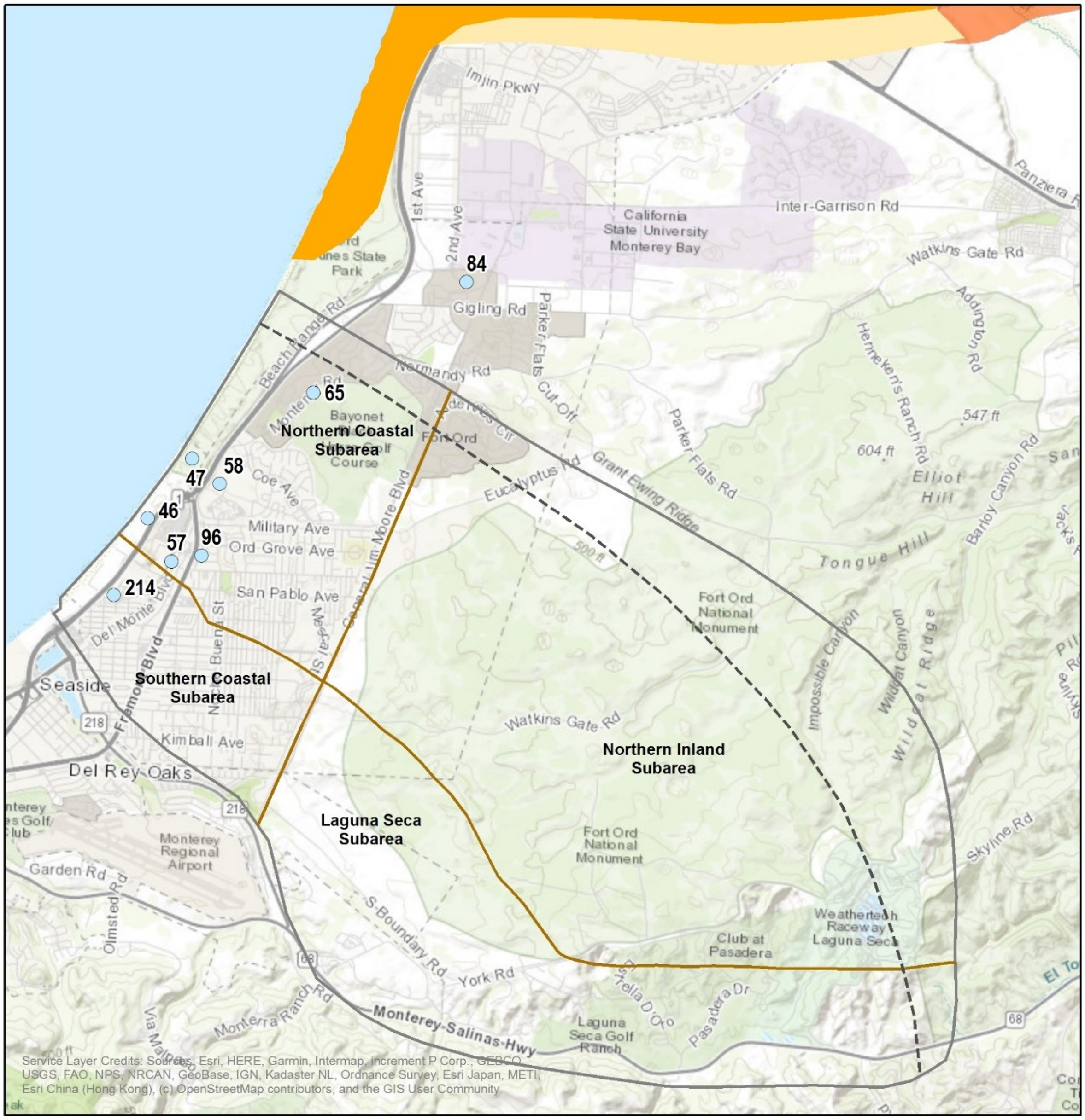
Fourth quarter WY 2024 chloride concentrations are mapped using data from August and September 2024. The maps for the Paso Robles (shallow) and Santa Margarita (deep) aquifer zones are included on Figure 21 and Figure 22, respectively.

The Paso Robles (shallow) aquifer fourth quarter WY 2024 chloride concentration map on Figure 21 does not show a spatial distribution that can be readily contoured because of relatively large differences in concentrations in wells near each other. Except for FO-10 Shallow, Paso Robles aquifer chloride concentrations have not varied much from previous water years.

Figure 21 shows chloride concentrations in the northern coastal portion of the Northern Coastal subarea are typically 46 to 58 mg/L. The more inland Northern Coastal subarea wells have slightly higher chloride concentrations that may be due to depositional mineralization differences in the Paso Robles Formation. Within the Monterey Subbasin, north of the Seaside Basin, chloride concentrations increase in a northward direction toward the currently understood extent of seawater intrusion (see Monterey Subbasin Groundwater Sustainability Plan (GSP) Figure 5-29). Figure 21 shows an area of known seawater intrusion (orange color) close to the Seaside Basin boundary as mapped by the MCWRA.

Sand City's Public Works Corp Yard well in the Southern Coastal subarea has historically had the highest chloride concentration of all shallow coastal wells (Appendix D, Figure D-13). The Piper and Stiff diagrams and sodium/chloride molar ratio for the well suggest the source of high chloride in the well's groundwater is not seawater. It is notable that there was a significant decline in its chloride concentration of approximately 88 mg/L in WY 2023. Concentrations subsequently rose 20 mg/L in WY 2024.

The Santa Margarita aquifer fourth quarter WY 2024 chloride concentration map is shown on Figure 22. Chloride concentrations for the Sentinel Wells are not shown on this map because it was found that groundwater samples collected from them are not representative of the aquifer. Santa Margarita aquifer chloride concentrations near the coast range roughly between 70 mg/L and 160 mg/L and have risen slightly in comparison to last year. Chloride concentrations in the eastern portion of the Northern Coastal subarea are generally within the 100 to 130 mg/L range of historical concentrations. Also in the Northern Coastal subarea, the Ord Grove #2 production well has experienced an ongoing decline in chloride concentrations since WY 2022, decreasing from 134 mg/L in WY 2021 to 96 mg/L in WY 2024. The lowering of chloride concentrations may be related to recharge activities at the ASR wells, as Ord Grove #2 is near the area of influence of injection in the deep zone. Since the chloride data show no discernible spatial distribution with high concentrations close to low concentrations, the data cannot be readily contoured.



EXPLANATION

- 4th Quarter WY 2024 Chloride Concentration in mg/L
- Approximate Shallow Aquifer Northern Boundary

Adjudicated Seaside Groundwater Basin Boundary

- Basin Boundary
- Subarea Boundary
- Area of Known Seawater Intrusion
- Area of Potential Seawater Intrusion
- >500 mg/L Chloride Areas - 400 ft Aquifer in Salinas Valley

N

0 0.5 1 1.5 2
Miles

Figure 21. Paso Robles Aquifer (Shallow Zone) Chloride Concentration Map – Fourth Quarter Water Year 2024

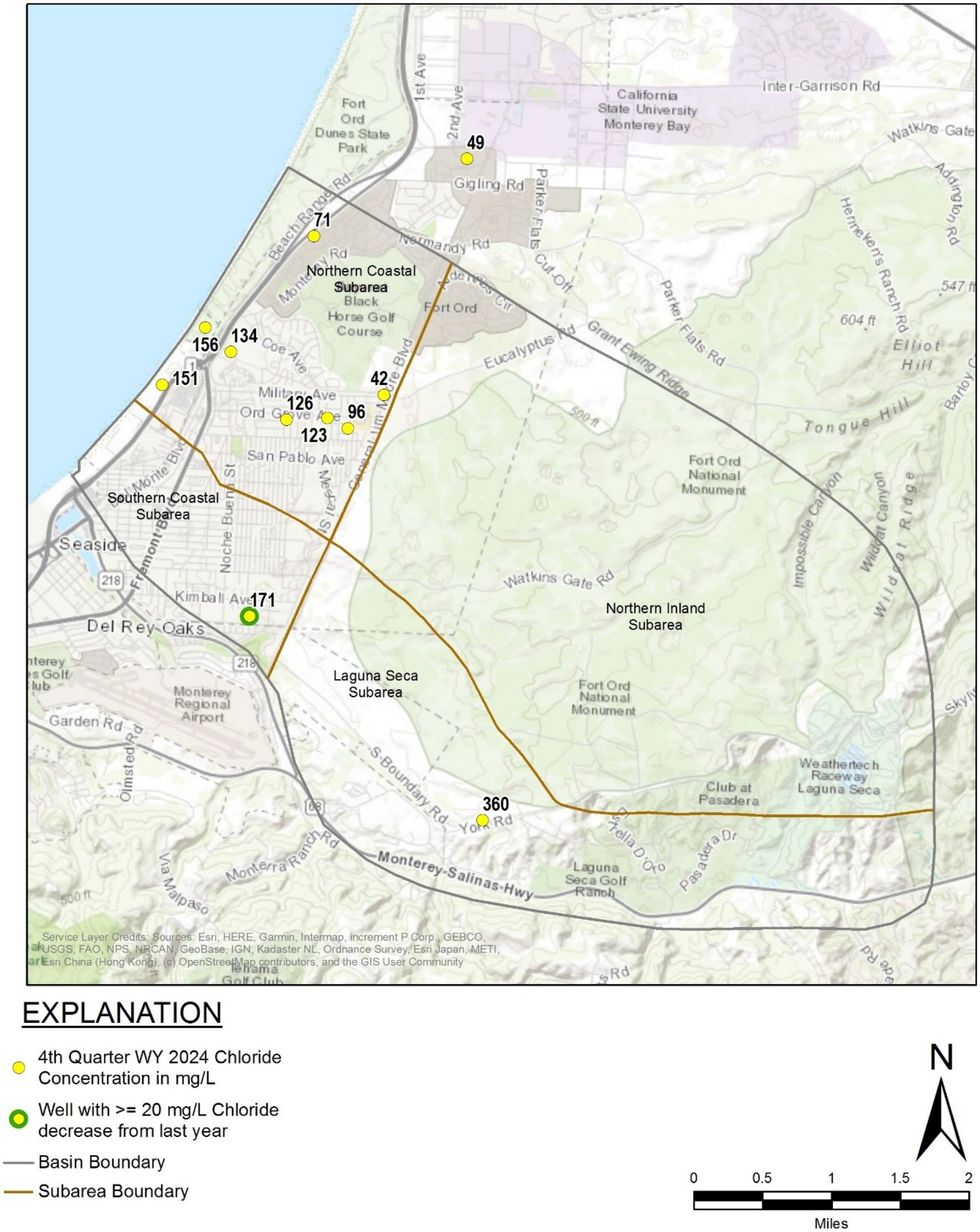


Figure 22. Santa Margarita Aquifer (Deep Zone) Chloride Concentration Map – Fourth Quarter Water Year 2024

2.4 Sodium/Chloride Molar Ratios

Chemographs showing long-term sodium/chloride molar ratios over time are plotted for 12 monitoring wells and 1 production well; included is the chemograph for monitoring well Ord Terrace Deep that is no longer sampled due to a stuck pump which prevents access. An example plot displaying sodium/chloride molar ratios for the PCA-West Shallow well is shown on Figure 19. A complete set of chemographs is included in Appendix D.

Most of the sodium/chloride molar ratios in the monitoring wells remained constant or increased over the past year. Ten of the last 11 samples from FO-10 Shallow have sodium/chloride molar ratios less than 0.86 (Appendix D: Figure D-9). Sodium/chloride ratios below 0.86 are significant because Jones *et al*. (1999) suggest that sodium/chloride ratios in advance of a seawater intrusion front will be below 0.86. The increasing chloride trend and decreasing sodium/chloride molar ratio indicate that FO-10 Shallow may be showing signs of incipient seawater intrusion. As described above, analysis of ongoing seawater intrusion at this well is complicated by the discovery of a steel pipe in the well's borehole. It was previusly recommended that the FO-10 Deep and Shallow wells be destroyed and replaced to maintain a robust water quality record in the area.

2.5 Electric Induction Logs

One induction logging event took place in the four Sentinel Wells in October 2024. Although logging took place in very early WY 2025, the data are included in this WY 2024 SIAR. Pacific Surveys conducted the logging as they have done since August 2014.

Three different induction tools have been used during the project history, and while different tools show responses that are different in terms of absolute values, each tool has had internally consistent "same-tool" responses. The current induction tool (Tool 3 LIM) displays repeatable responses and is consistent with the other two induction tools used historically on site (Feeney 2020). Moving forward, all data presentations will be referenced to the current tool, as was done in 2014 when the tool change previously occurred.

Feeney (2007) described the original 2007 baseline induction logs for each of the wells as follows:

> *SBWM-1 — The upper 50 feet of this well shows very high conductivities. This signature is present in all of the wells and is the result of the 50-foot steel conductor casing. However, because the water table is below the conductor casing at all locations, the steel casing does not interfere with data collection within the saturated sediments below. Below the conductor casing in SBWM-1, the sediment materials are dry to a depth of*

approximately 115 feet. Below this depth, there is approximately 10 feet of sand containing fresh water. Below 125 feet and extending to approximately 350 – 400 feet is sand containing saline water with conductivities measuring as high as 10,000 mhos/cm. This saline water is contained within the Dune /Beach Sand Deposits and the Aromas Sand. Below this depth, conductivities are relatively low with the exception of the thick marine clay between approximately 600 -700 feet. The other conductive zones also correlate with clay zones.

SBWM-2 — As in SBWM-1 there is a thin layer of fresh water overlying a zone of saline water to approximately 130 feet within the Beach/Dune Sands and Aromas Sand. Below this depth, the materials become increasingly clayey, complicating the interpretation. Below this depth, there are no obvious zones of anomalous conductivity; that is, the zones that are more conductive correlate with clay zones.

SBWM-3 — In SBWM-3 saline water extends to a depth of approximately 100 feet within the Dune/Beach Sand and Aromas Deposits. Below 100 feet, the materials become clay and conductivities rapidly decline. Again, below the shallow saline water in the sand deposits, all zones of increased conductivity correlate with clay zones.

SBWM-4 — As with the other wells, the induction log reveals a thin layer of fresh water overlying saline water with the Dune Sands/Beach Deposits to a depth of approximately 100 feet. Below this depth the materials become clay and there are no additional zones of increased conductivity uncorrelated with clay zones.

Salinity changes shown on Figure 23 through Figure 26 for Sentinel Wells 1–4 respectively, are only relative and do not allow direct measurement of TDS or chloride concentrations in the aquifer. They do, however, provide a means to determine changes in salinity over time. Induction logging has always indicated salinity in the Dune Sands and Aromas Formation overlaying the main production aquifers fluctuating from season to season; becoming more saline in the fall months when stresses on the aquifer are greatest.

The SBWM-1, 2, and 4 induction logs show overall increases in conductivity over time within the Paso Robles Formation. Conductivity increases are mostly incremental but there are some time periods where conductivity fluctuates. Excluding localized conductivity increases in the Paso Robles Formation shown on zone of interest induction logs (Figure 27 through Figure 29), the remaining parts of the induction logs plot similarly to previous years. This suggests increased conductivity is preferentially confined to coarser-grained zones in the Paso Robles Formation and does not extend throughout the Paso Robles Formation or into the Santa Margarita Formation. Zones of increasing conductivity are as follows:

- SBWM-1, 520 – 540 feet below ground surface (bgs) (-423 – -443 feet above mean sea level (amsl)); see Figure 23 and Figure 27
- SBWM-2, 340 – 390 feet bgs (-266 – - 316 feet amsl); see Figure 24 and Figure 28
- SBWM-4, 140 – 200 feet bgs (-78 – -138 feet amsl); see Figure 26 and Figure 29 to Figure 31

Sentinel wells SBWM-1 and SBWM-2 are north of the Seaside Basin and within the extent of the known seawater intrusion in the Salinas Valley – Monterey Subbasin Marina-Ord Management Area. Of the three Sentinel wells with increasing conductivity, SBWM-2 has had the greatest increase since 2019, approximately 2,500 µmhos/cm at an approximate depth of 350 feet bgs (-276 feet amsl). SBWM-1 has had a modest increase in conductivity since 2019, approximately 400 µmhos/cm at an approximate depth of 530 feet bgs (-433 feet amsl).

Evaluation of SBWM 4 conductivity data collected since 2007 indicates conductivity has been increasing within this zone annually. A rough rule-of-thumb is that conductivity in µmhos/cm multiplied by 0.67 approximates the concentration of total dissolved solids (TDS) in mg/L. Based on this conversion factor, the TDS increase associated with the change in cumulative conductivity with three different induction tools (Figure 29 to Figure 31) of 1,480 µmhos/cm in SBWM-4 since 2007 is roughly 1,000 mg/L. This indicates a significant salinity increase in the Paso Robles Formation over the past 17 years. For reference, the Secondary Drinking Water limit is 500 mg/L. SBWM-4 is located in the central coastal portion of the Northern Coastal subarea (Figure 8) where the majority of the Seaside Basin's groundwater extraction occurs. The closest extraction well in the Paso Robles Formation to SBWM-4 is the Bayonet and Black Horse golf course's Coe Ave irrigation well approximately 0.6 miles away. All the golf course irrigation wells are screened partially in the Paso Robles Formation. Currently, groundwater is not used for golf course irrigation wells because irrigation was switched over to recycled water in February 2023. Almost all water supply wells in the Northern Coastal subarea are screened in both the Paso Robles and Santa Margarita Formations. CAWC's closest water supply wells to SBWM-4 are Playa #3 (0.8 miles to the south) and Luzern Well #2 (0.9 miles to the southeast). Other CAWC and City of Seaside water supply wells are over 1 mile away.

SBWM-2 is located in the Salinas Valley – Monterey Subbasin Marina-Ord Management area. It is unclear if the increase in conductivity in SBWM-2 at a depth of approximately 350 feet bgs (-276 feet amsl) is related to a seawater intrusion front advancing from the coastline, or saline and brackish waters from the Salinas Valley – Monterey Subbasin Marina-Ord Management Area migrating laterally from north to south (Pidlisecky *et al*., 2016). There does not appear to be groundwater pumping in the vicinity of SBWM-2, so the cause of the increase in conductivity at this location is not well understood.

The Seaside Basin's Seawater Intrusion Response Plan (SIRP; HydroMetrics, 2009c) identifies chloride concentrations, sodium/chloride molar ratios, cation and anions molar equivalent concentrations, and spatial chloride changes as indicators of seawater intrusion. Since the Sentinel wells are no longer sampled because of inconsistent results due to their long screens, water quality as an additional line of evidence from the Sentinel wells are not available. Further, the SIRP provides threshold values in certain monitoring wells that trigger a series of intrusion contingency actions included in the SIRP. The closest monitoring well to SBWM-4 is PCA-West Shallow located 790 feet away. PCA West Shallow is screened from 525 to 575 feet bgs (-460 to 510 feet amsl) and cannot be used to verify chloride concentrations at SBWM-4 because its screen is 350 feet below the zone of increasing conductivity in SBWM-4 (Figure 29). PCA-West Shallow will likely not show any increase in chloride because of the heterogeneous nature of the Paso Robles Formation that appears to confine, at least for now, the increasing conductivity zone to the coarse-grained portions of the formation.

A February 22, 2024, meeting of Seaside Watermaster technical experts discussed the issue of increasing conductivity in SBWM-4 and recommended the following:

- Induction logging PCA-West Deep and PCA-East Deep
- Examining the Sentinel well induction logging data prior to 2019 to see if the increasing conductivity trends date back further in time
- Destroying the nearby privately owned SNG well if it is found, as believed, to have a leaking casing that is allowing high salinity water to flow downward from the intruded Dune Sands into the Paso Robles Formation. In early 2021, the chloride concentration from water pumped from the well was 8,660 mg/L
- Not reverting to semi-annual from annual induction logging because the trend of increasing conductivity is already apparent

Possibly installing a new monitoring well east of Highway 1 in the vicinity of SBWM-4 in order to obtain water quality data from the current zone of interest in SBWM-4. The new monitoring well could also be induction logged

Based on the recommendations above, an induction log was performed in PCA-West Deep (see Figure 32). Although the induction tool could not be lowered the full depth of the well due an obstruction, it was able to log past the zone of interest in the Paso Robles Formation. An induction log was also completed in PCA-East Deep (Figure 33) which is located 1,300 feet inland of PCA-West Deep (Figure 8). Based on the conductivity values for PCA-West Deep (see Figure 32), there appear to be high conductivity zones at 75 – 130 feet and 230 – 280 feet; these are zones to monitor closely going forward. In comparison, PCA-East Deep has relatively low conductivity values throughout the Paso Robles Formation but shows a large spike in conductivity at a depth of approximately 650 to 700 feet bgs (-582 to -632 feet amsl; Figure 33). Since these are the first induction logs for the monitoring wells, they serve as baselines from which to compare subsequent logs to determine if increased conductivity is occurring in the Paso Robles Formation.

Conductivity data obtained from induction logs at PCA-West and PCA-East may inform the distance from the coast and screen depth for a new monitoring well. However, sites for a new monitoring well east of Highway 1 are limited due to permitting and approval requirements. The site where SBWM-4 is located is being re-vegetated to restore it to its pre-development condition and no new facilities could be constructed there. In WY 2025, the Watermaster should look for opportunities to use existing wells and explore sites for a new monitoring well, adapting an existing well, evaluating the feasibility of using a Cone Penetration Testing[1] (CPT) drill rig to non-intrusively collect once-off groundwater quality samples at specified depths without needing a permanent well, or some other solution to verify chloride concentrations in the Paso Robles Formation near SBWM-4.

In addition to the recommendations from the February 22, 2024 meeting, the Watermaster should consider performing land-based subsurface electromagnetic geophysics in the vicinity of SBWM-4 and PCA-West Deep, if feasible, to see if such data will add to the hydrogeologic understanding of this area.

[1] A Cone Penetration Testing drill rig pushes a cone into the ground while measuring “tip resistance” and “sleeve friction” to calculate “friction ratio”. Soil type (clay, sand, silt, gravel) can be inferred from these measurements. A first hole would collect geologic information and a second hole would be used to collect depth discrete samples without disturbing the drilling area using the “Hydropunch” method. After being advanced to the desired depth the device is pulled back to expose a screen used to collect groundwater quality samples. The advantages of this method is that it is quick, clean, and generates no waste.

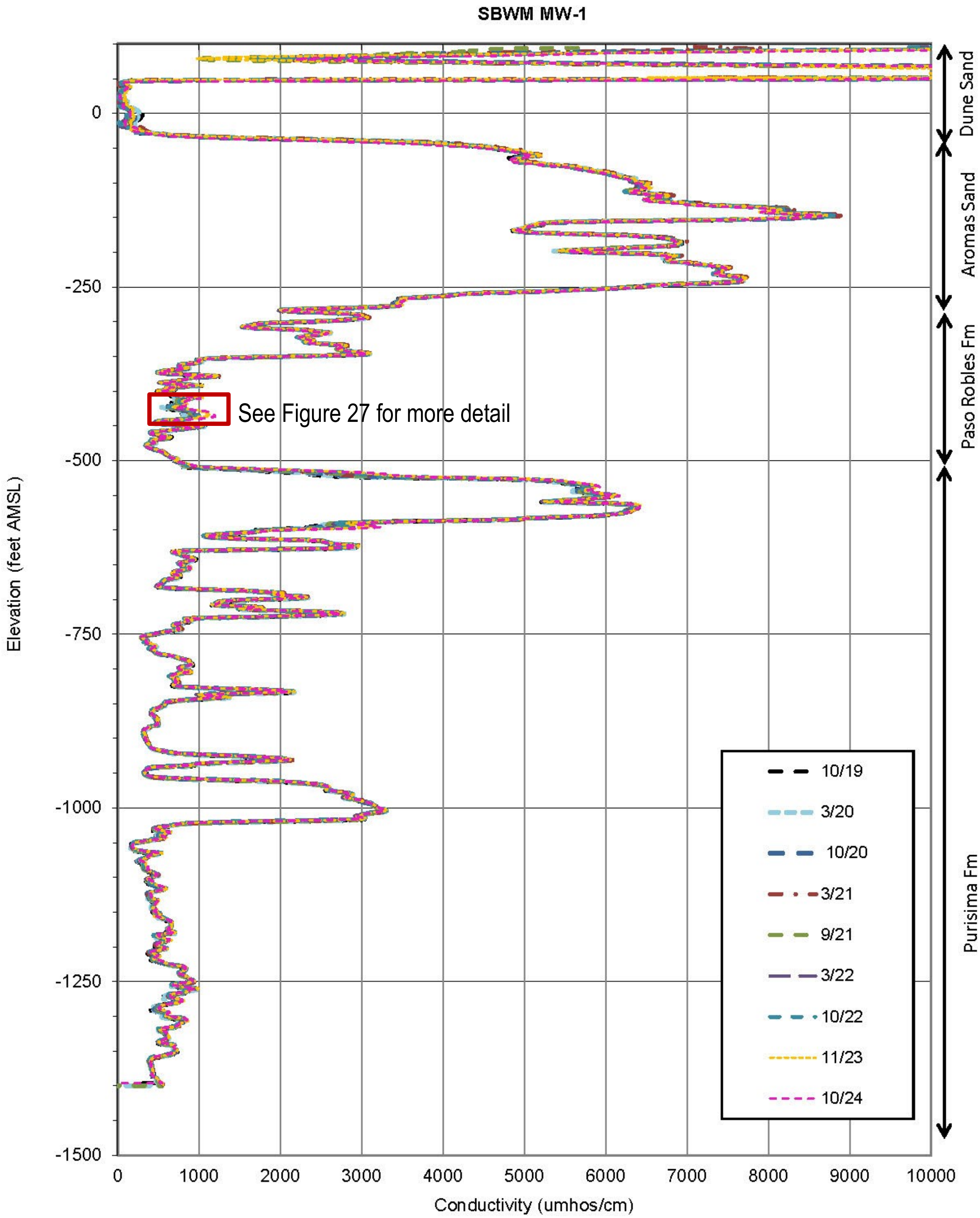


Figure 23. Sentinel Well SBWM MW-1 Induction Log

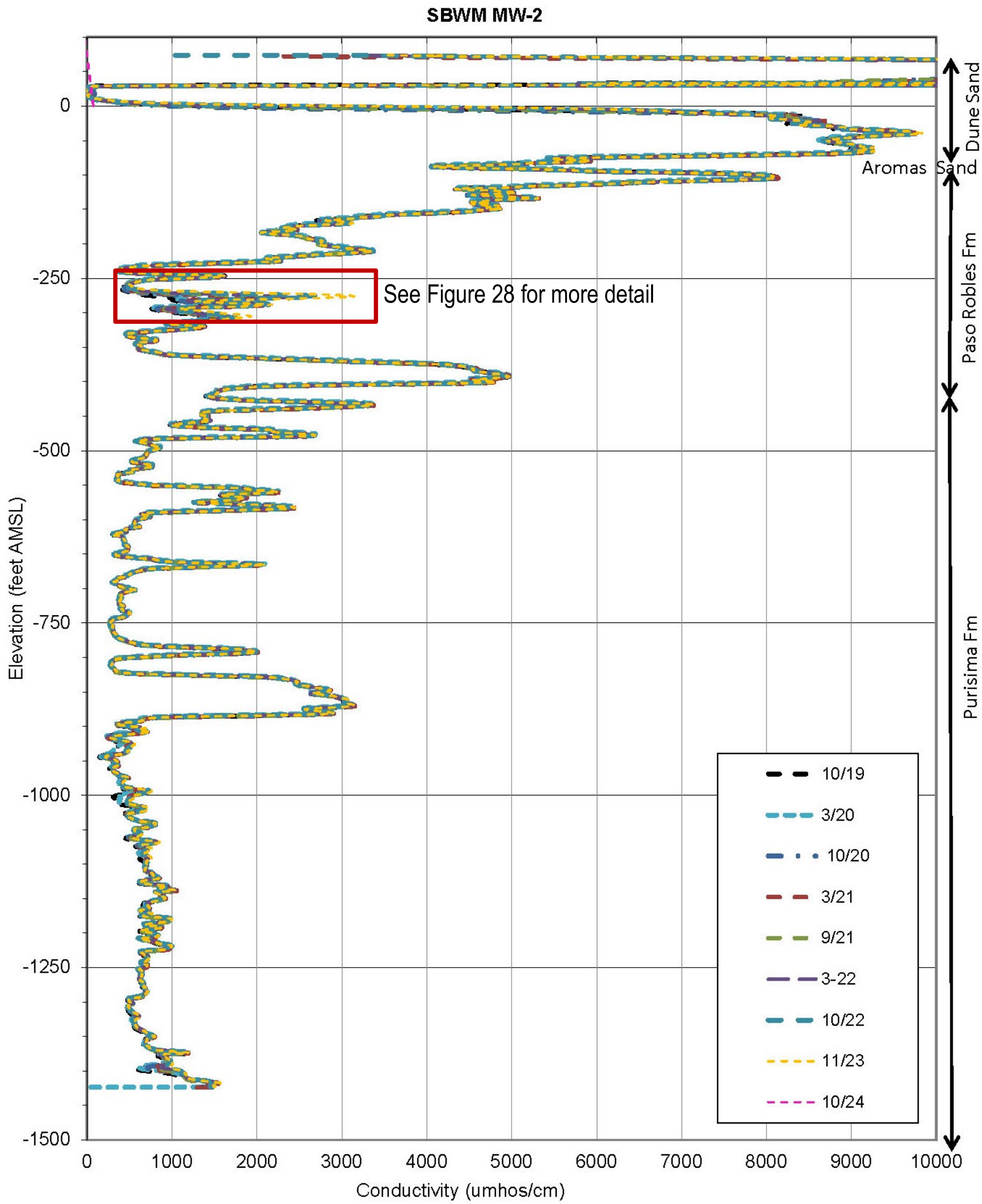


Figure 24. Sentinel Well SBWM MW-2 Induction Log

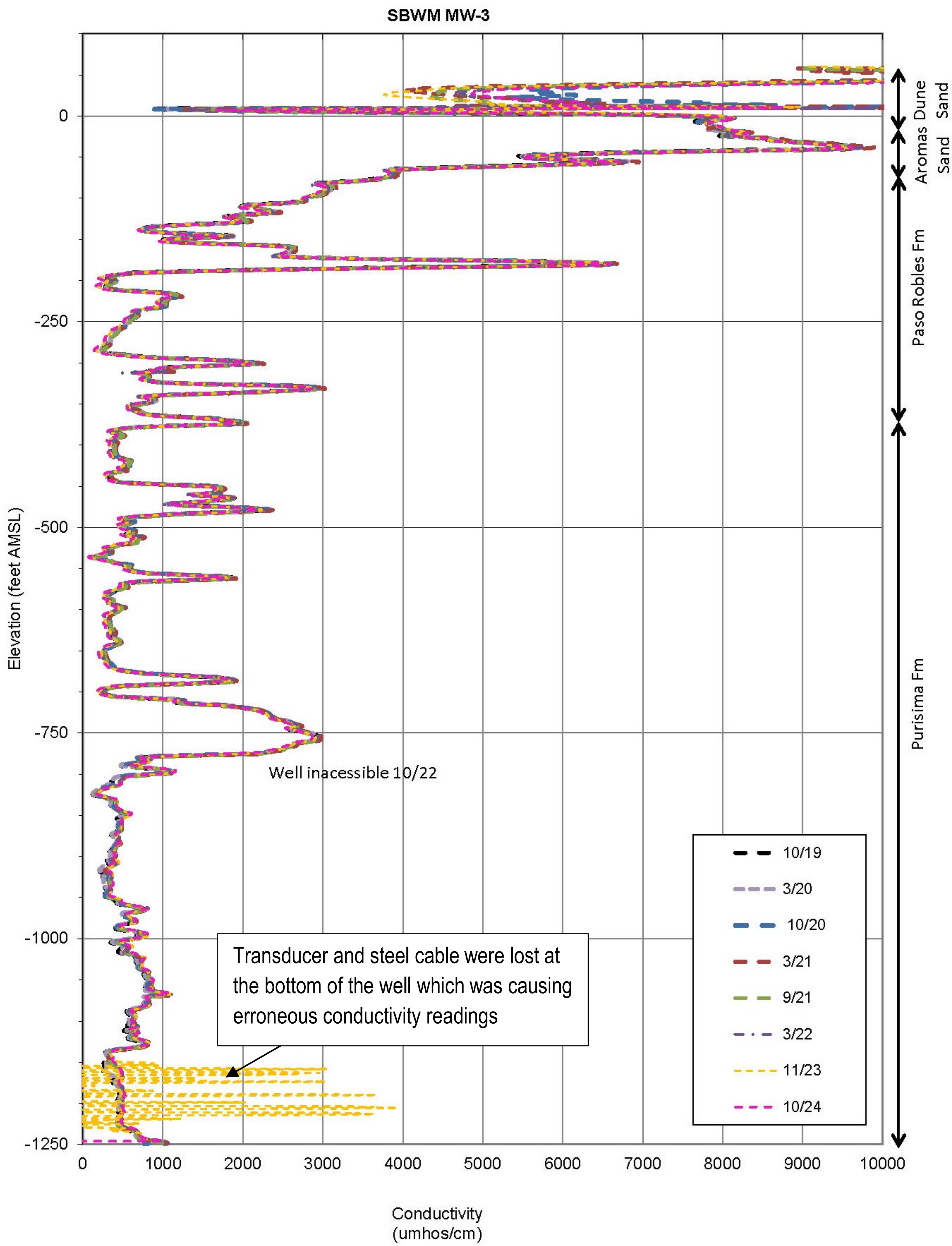


Figure 25. Sentinel Well SBWM MW-3 Induction Log

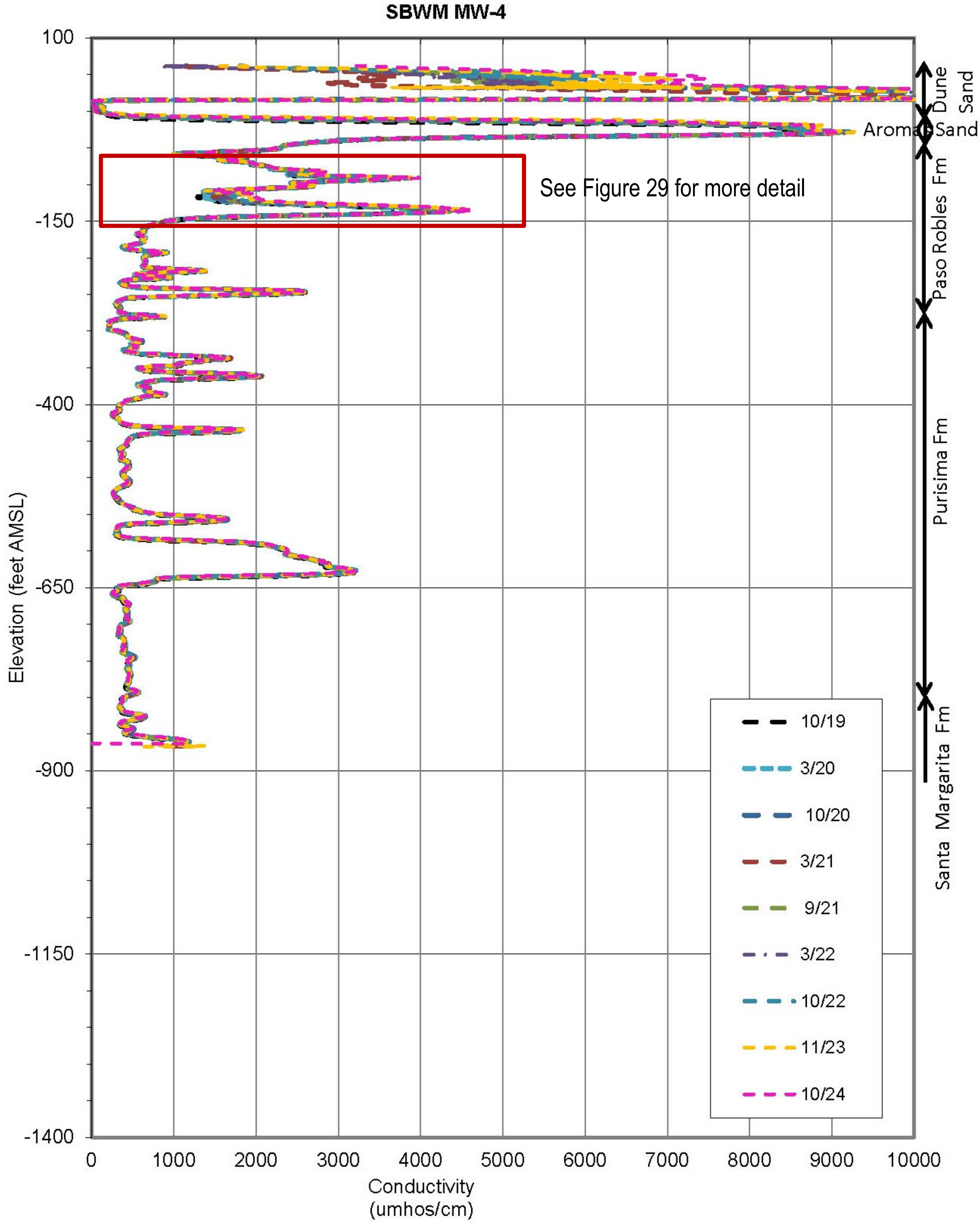


Figure 26. Sentinel Well SBWM MW-4 Induction Log

MONTGOMERY & ASSOCIATES

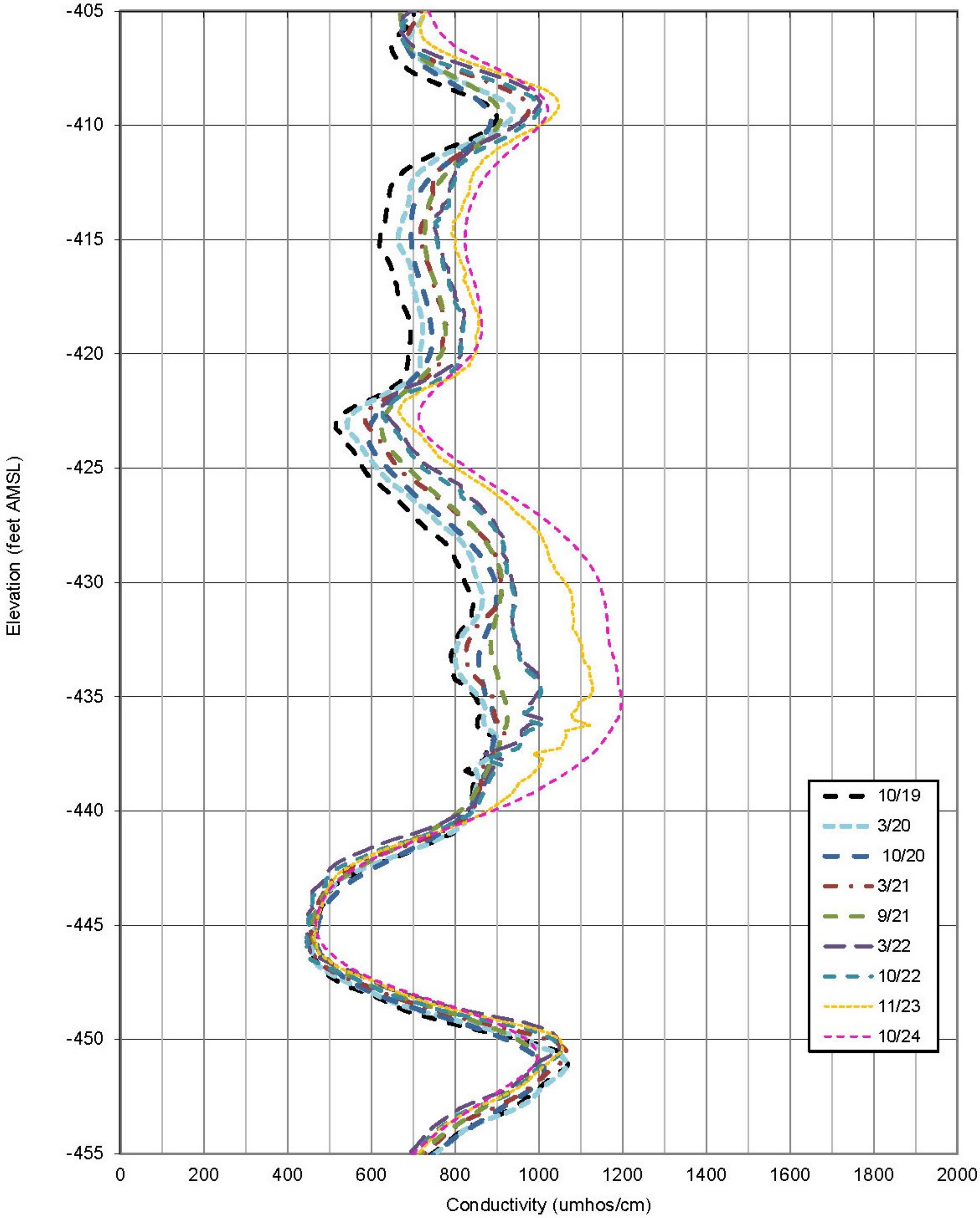


Figure 27. Sentinel Well SBWM-1 Zone of Interest on Induction Log

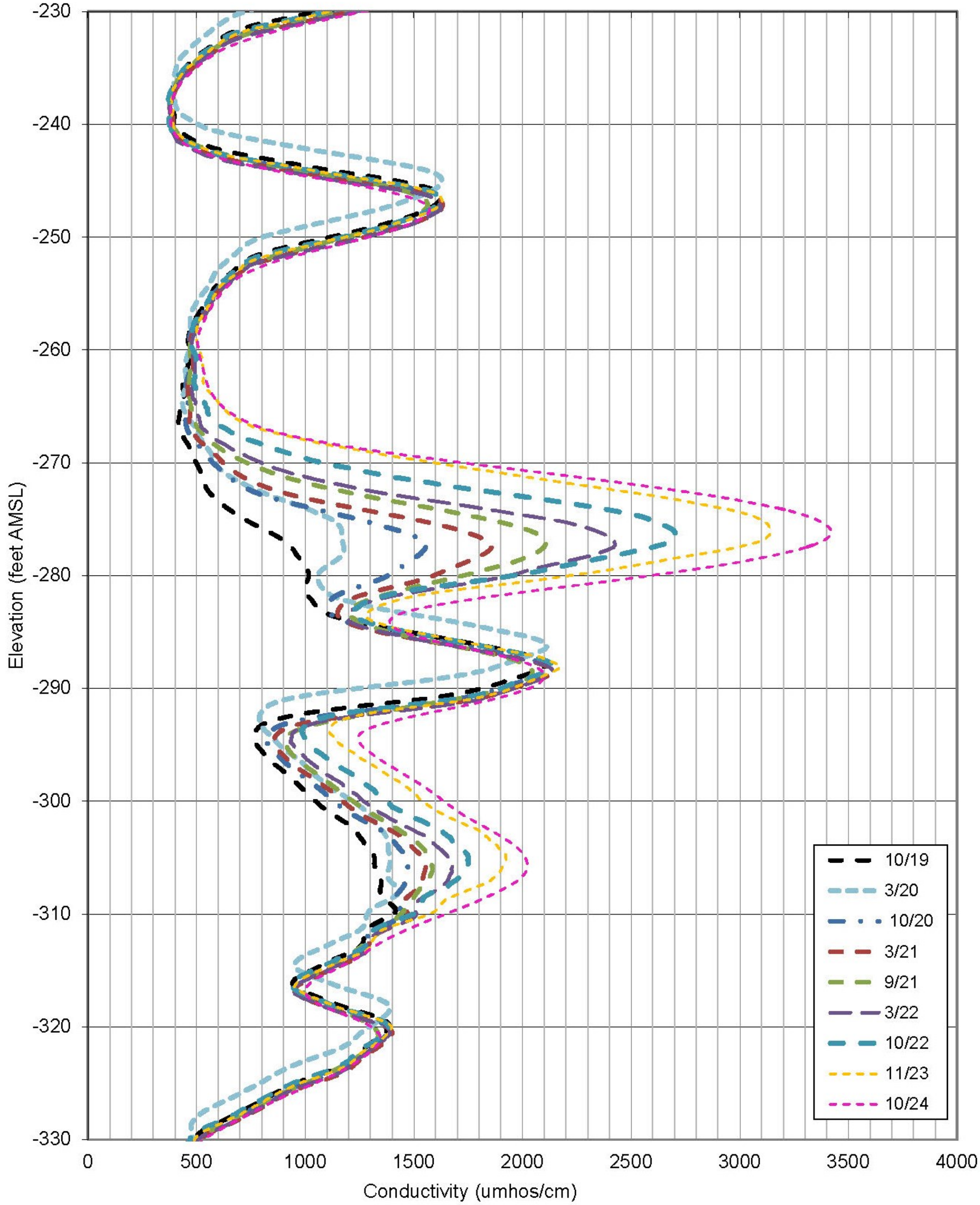


Figure 28. Sentinel Well SBWM-2 Zone of Interest on Induction Log

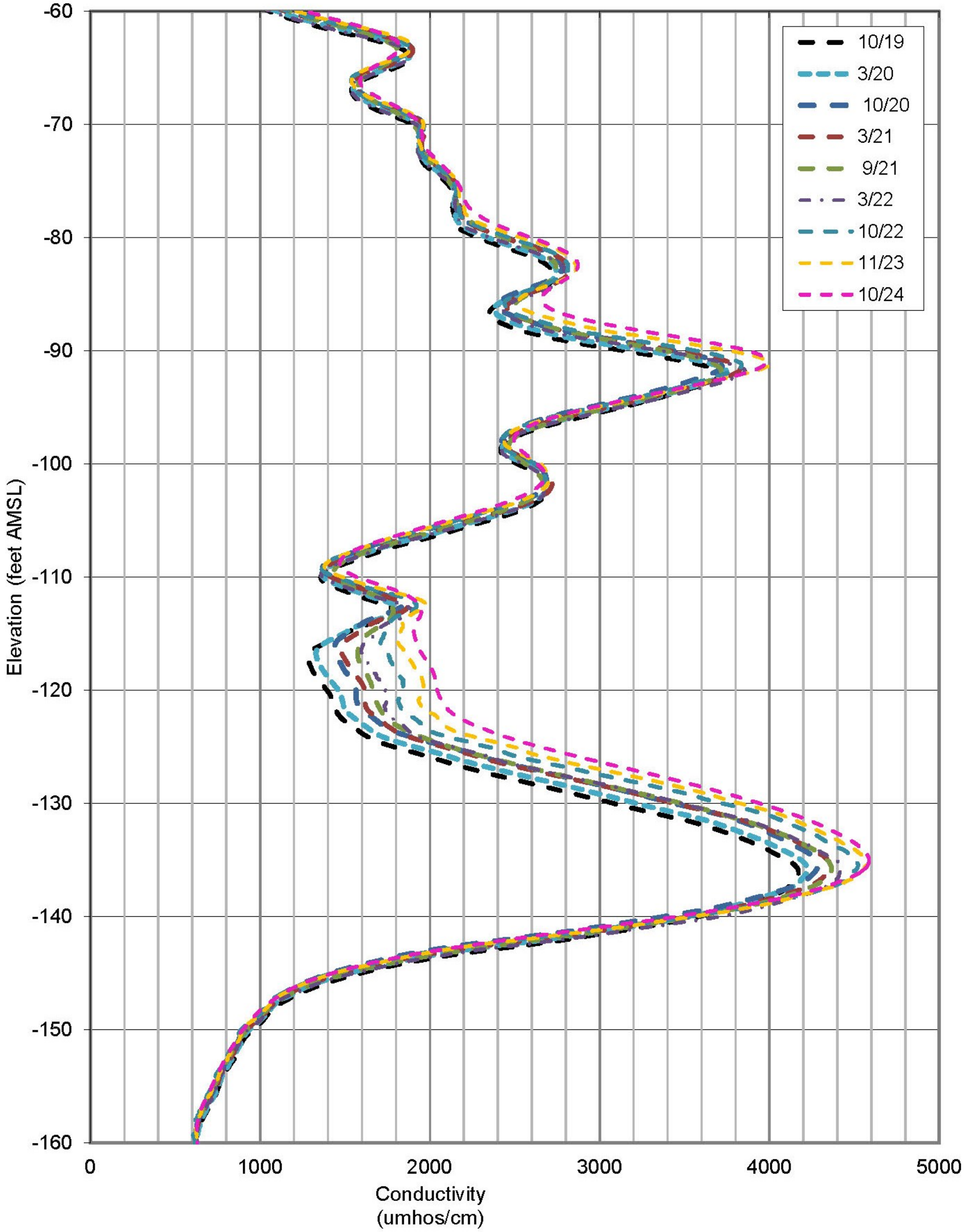


Figure 29. Sentinel Well SBWM-4 Zone of Interest on Induction Log (Induction Tool 3 from Oct 2019 – Oct 2024)

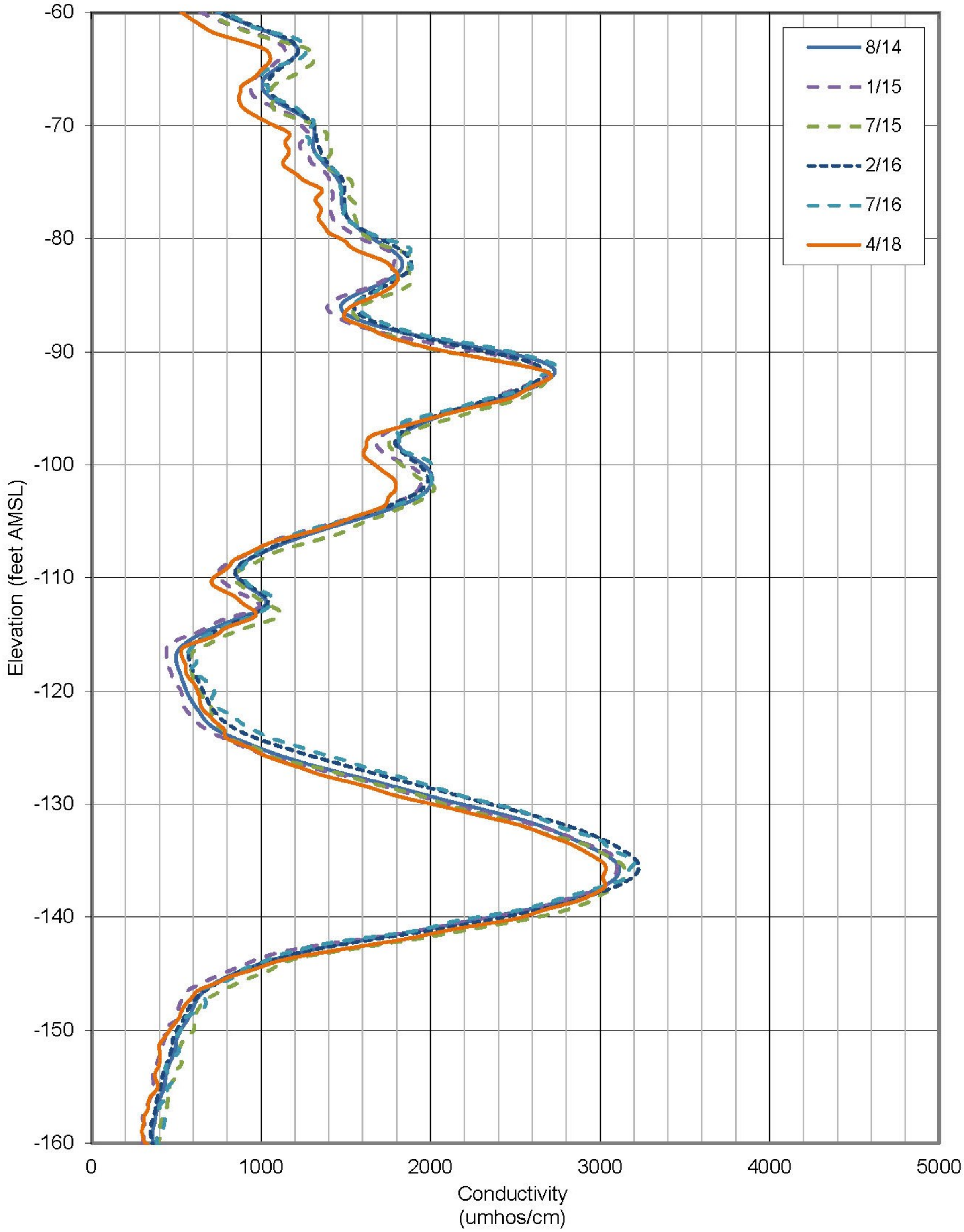


Figure 30. Sentinel Well SBWM-4 Zone of Interest on Induction Log (Induction Tool 2 from Aug 2014 – Apr 2018)

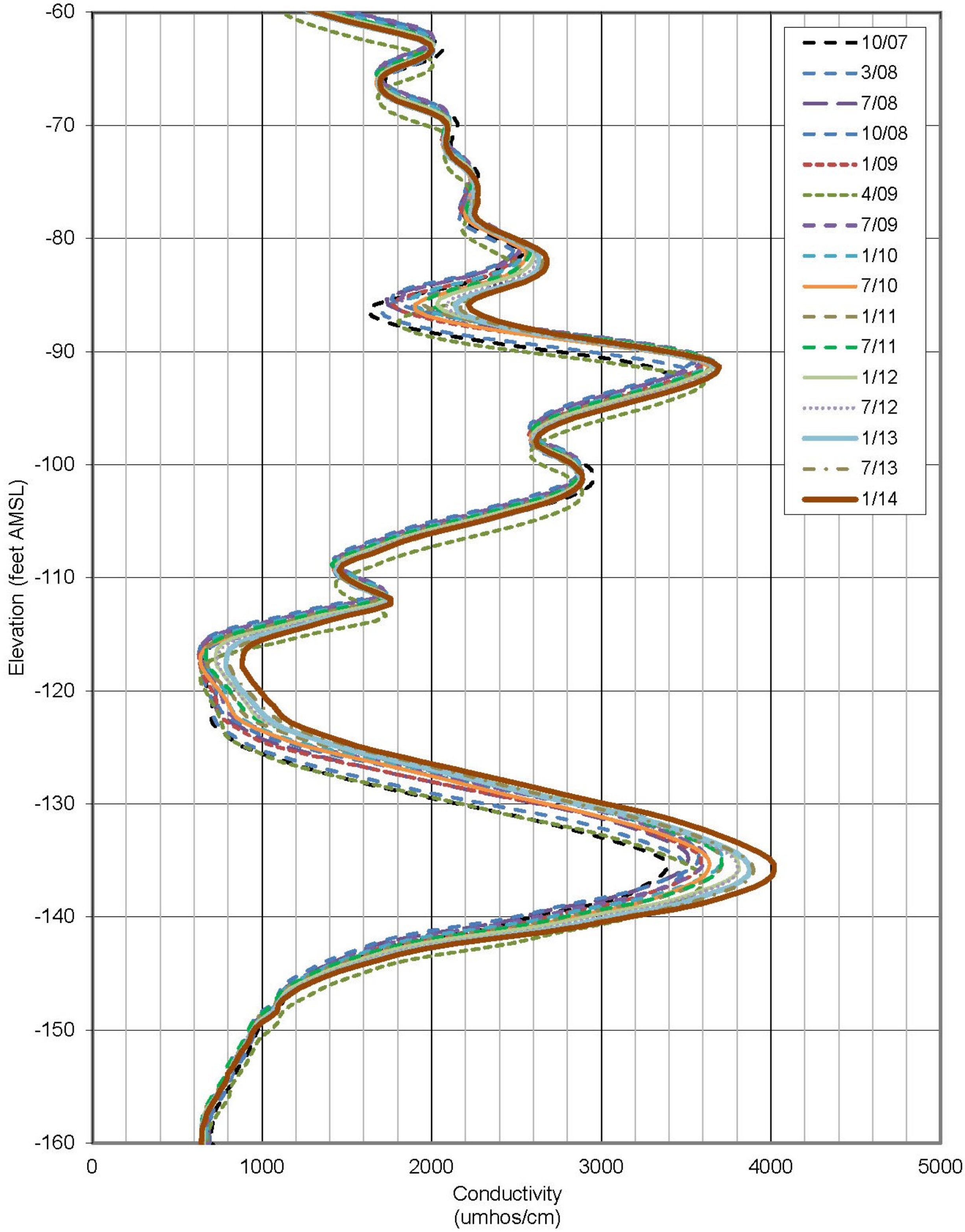


Figure 31. Sentinel Well SBWM-4 Zone of Interest on Induction Log (Induction Tool 1 from Oct 2007 – Jan 2014)

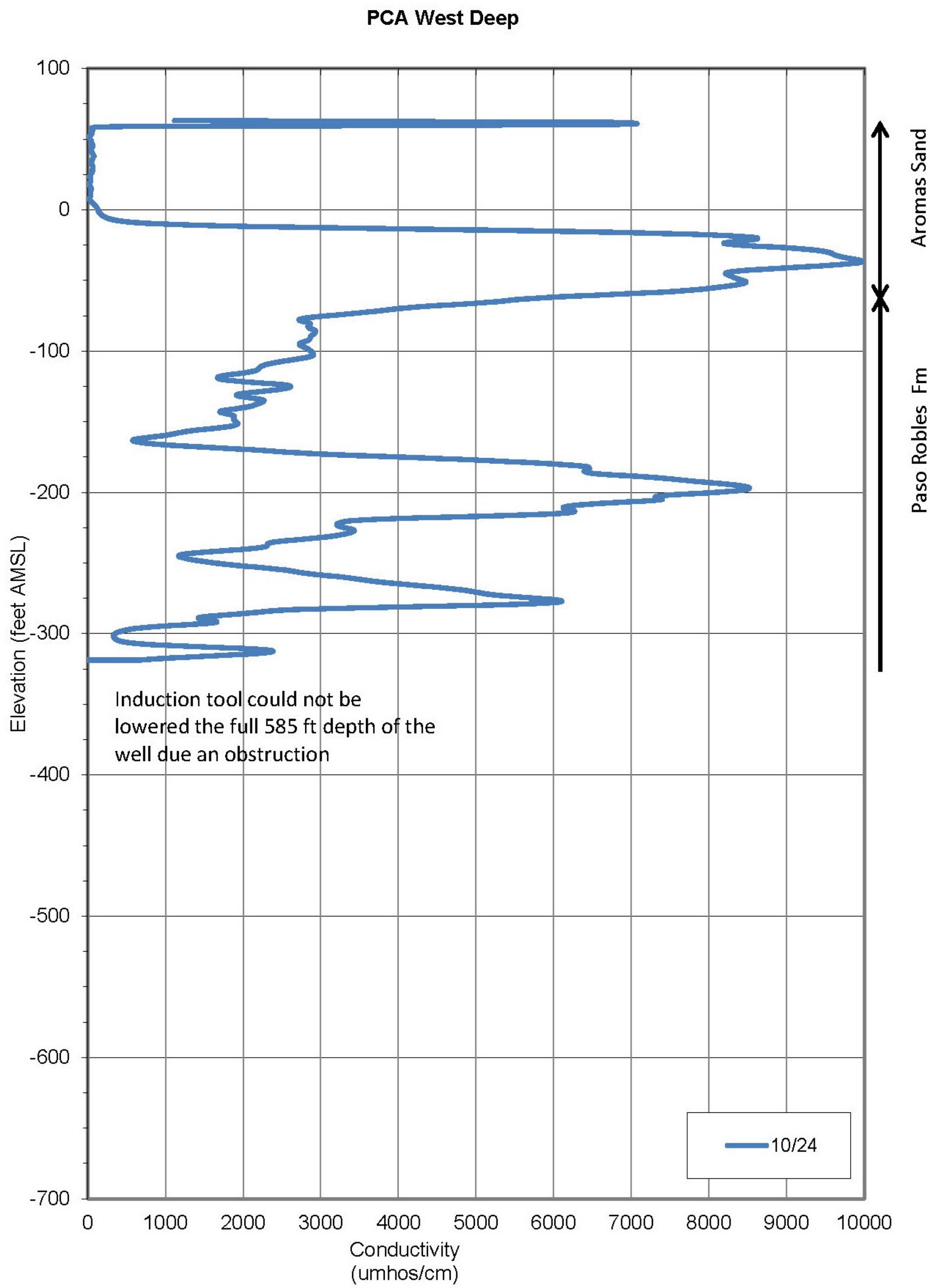


Figure 32. PCA-West Deep Induction Log

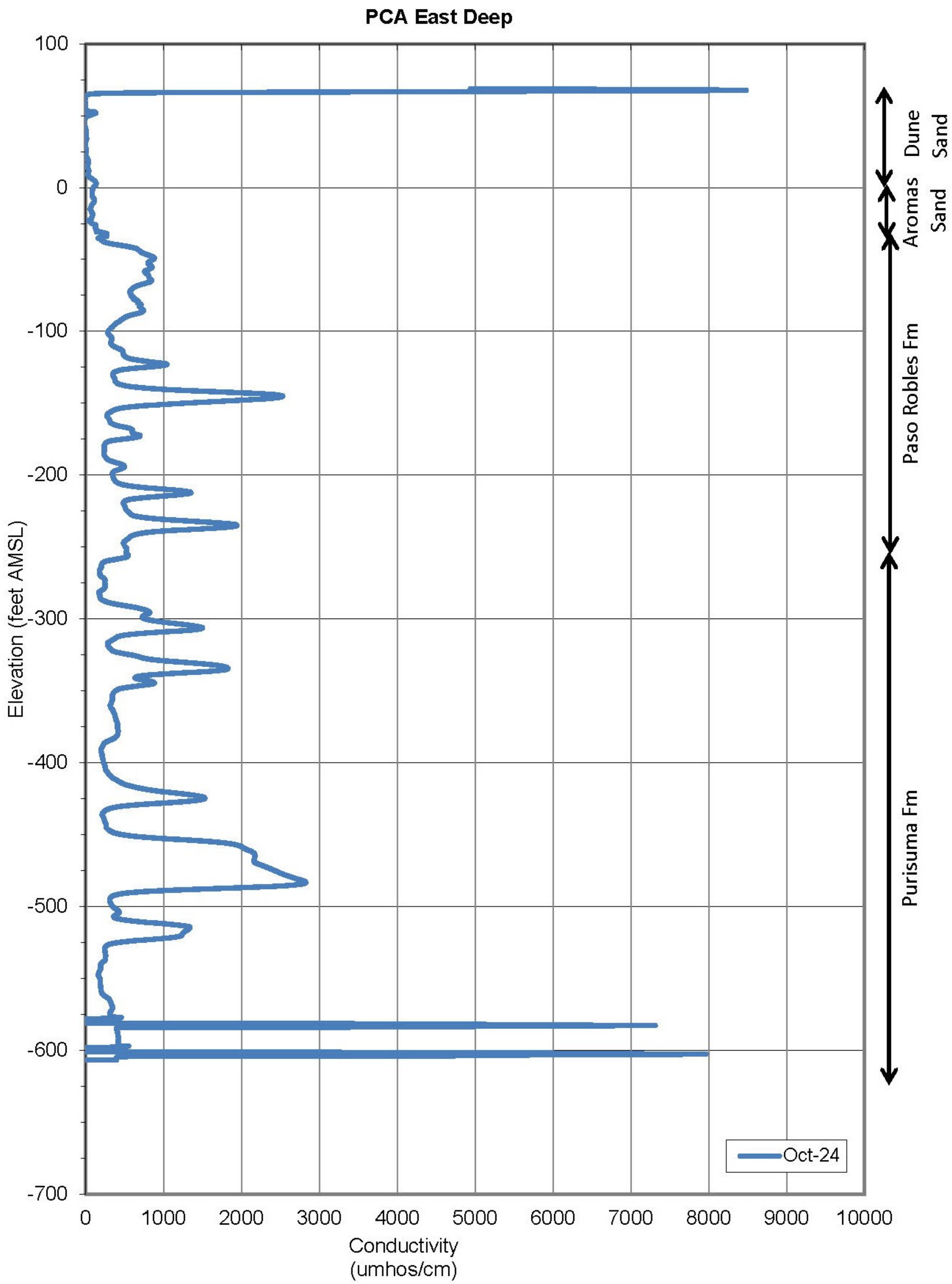


Figure 33. PCA-East Deep Induction Log

2.6 Groundwater Levels

Groundwater levels are not direct indicators of seawater intrusion, but indirectly suggest opportunities for seawater intrusion. Coastal groundwater levels at or near sea level are insufficient to repel seawater intrusion and will likely allow some amount of seawater intrusion unless groundwater levels increase. All groundwater level data collected in WY 2024 are included in Appendix B.

2.6.1 Precipitation

Precipitation is described here because of its relationship to groundwater recharge, which is one of the factors influencing groundwater levels. Figure 34 displays annual precipitation averaged for two National Oceanic and Atmospheric Administration climate stations in the Seaside area: the Monterey airport station (USC00045795) and the Salinas Airport station (USW00023233). Taking the average precipitation from these two stations results in a value representative of the precipitation across the Seaside Basin.

In WY 2024, precipitation from the two stations averaged 17.6 inches, which is above the historical average of 15.7 inches. While there was higher than average precipitation in WY 2024, as there was in WY 2019 and WY 2023, the three years in between were substantially below average. WY 2024's high rainfall certainly resulted in above average groundwater recharge to the Seaside Basin. Typically, the effects of recharge are first seen in the shallow aquifer, which is unconfined by clay layers and most directly impacted. The deep aquifer exhibits more delayed recharge impacts because of its depth and confined nature.

The solid line on Figure 34 tracks cumulative departure of annual precipitation from the historical average (dashed line). The cumulative departure from average annual precipitation in relation to groundwater indicates the ongoing deviation from the typical yearly precipitation levels over time, essentially showing whether a region is experiencing a prolonged period of drought (negative departure or downward trend) or wet conditions (positive departure or upward trend), which directly impacts the amount of groundwater recharge and can be reflected in fluctuating groundwater levels.

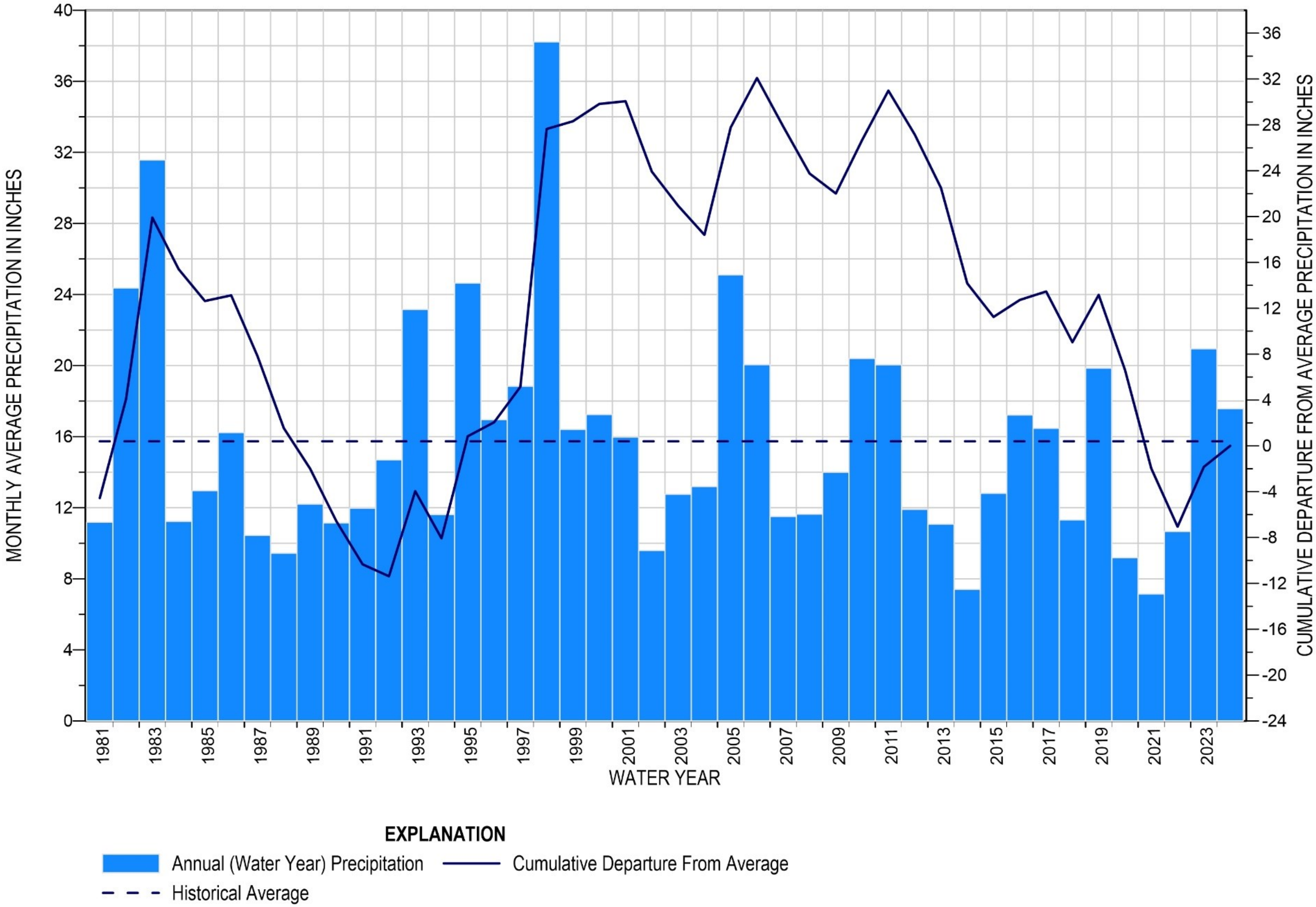


Figure 34. Seaside Basin Annual Precipitation (Average of Monterey Airport and Salinas Airport Stations)

2.6.2 Groundwater Level Trends

The subsections below describe groundwater elevation trends for the Northern Coastal, Southern Coastal, and Laguna Seca subareas. Only one well is monitored in the Northern Inland subarea.

2.6.2.1 Northern Coastal Subarea

Groundwater levels measured at the PCA-East well (Figure 35) are generally representative of groundwater levels in the Northern Coastal subarea, west of nearby production wells. The hydrograph shows peaks and lows that are strongly influenced by pumping by the nearby CAWC production wells which draw from the deep aquifer, and injection of Carmel River ASR water and Pure Water Monterey (PWM) highly treated recycled water at the eastern boundary of the subarea. Other influences are also recognized, such as tides which can cause up to a 1-foot fluctuation in PCA-East Deep. Because of all the possible influences on groundwater levels, it is difficult to compare the present year to the previous year directly. It is more important to look at long-term trends.

The Santa Margarita aquifer (deep zone) has limited, if any, connection to the ocean and is highly confined by the layers above it. This means that the amount of recharge entering the Santa Margarita aquifer is limited. As is the case in any aquifer, it is susceptible to depletion if more water is pumped than is being recharged.

PCA-East Deep (blue line on Figure 35) shows an overall decline in groundwater levels until WY 2009. Thereafter, levels increase and then more or less stabilize over the next two years. Then from WY 2011 to WY 2016 they continue to decline. Groundwater levels recovered slightly in WY 2017 due to slightly above average rainfall and remained fairly stable from WY 2018 through WY 2020. Levels in WY 2022 fell to historical lows but have increased successively over the past three years. The start of the overall long-term decline in groundwater levels in PCA-East Deep corresponds with the shift in CAWC's production from their shallow Paso Robles aquifer wells to deeper Santa Margarita aquifer wells in 1994.

Seasonal fluctuations are noticeable in the winter season when Santa Margarita groundwater elevations are at their highest for the year. For example, the 2017 winter high in PCA-East Deep increased to a level last seen in 1995, because 2,345 acre-feet of excess Carmel River water was injected through the ASR program as it was a very wet year. WY 2024 was a wetter than average year resulting in 1,519 AF of available Carmel River Water for ASR injection. Typically, recharged water is pumped out in the same year that it was recharged, however, this year it was not recovered. The higher than average ASR injection and 3,355 AF of PWM injection resulted in an increase in the seasonal high groundwater elevations shown on Figure 35. In WY 2024, both seasonal high and low groundwater elevations are higher than the previous six years.

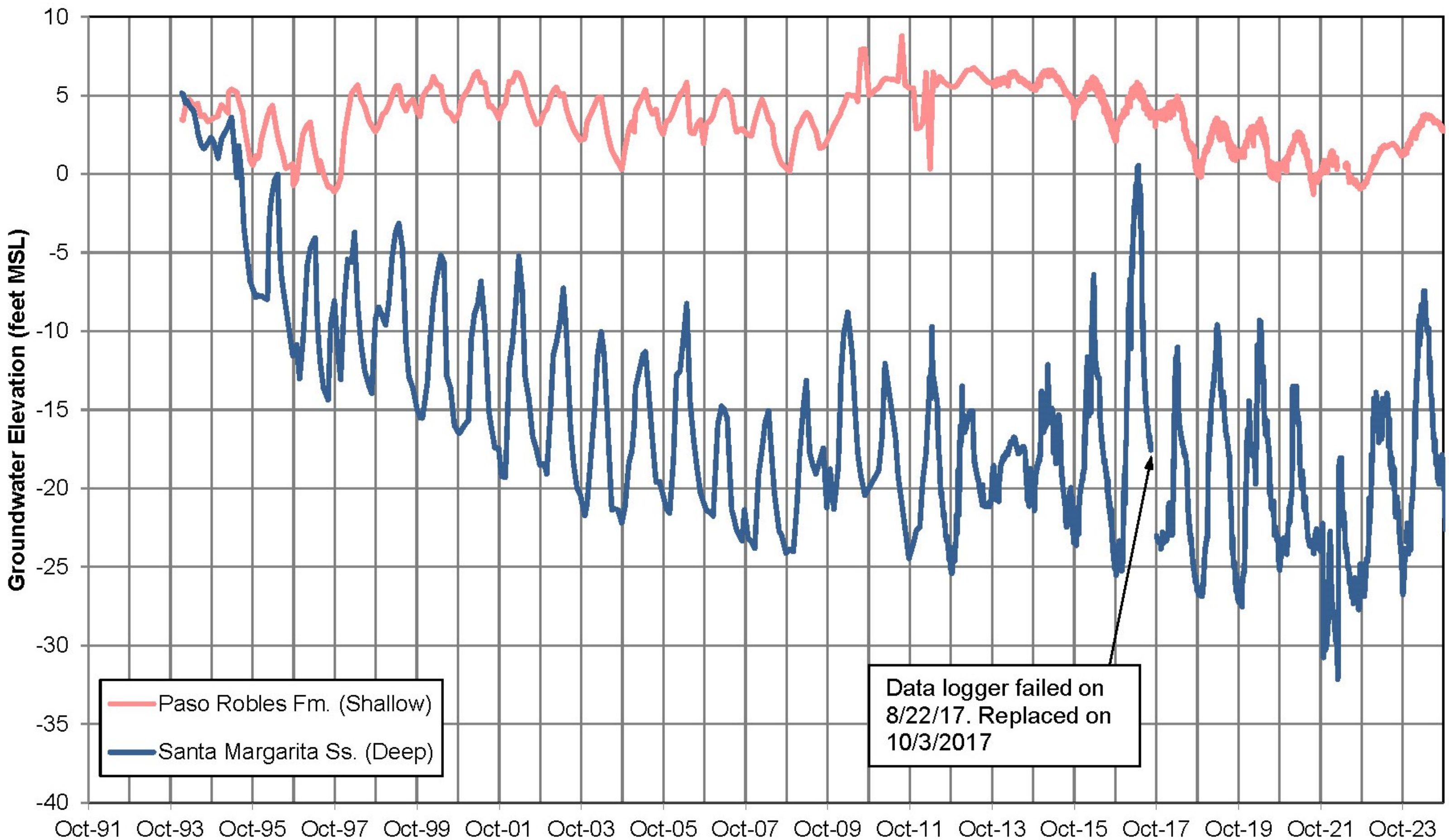


Figure 35. PCA-East Deep and Shallow Monitoring Well Hydrograph

Figure 36 displays groundwater elevations from the deep aquifer in a larger set of Santa Margarita aquifer Northern Coastal subarea wells, including PCA-East. Elevations in all these wells have been below sea level since the late 1990s. The discrepancy between wells near the center of the inland pumping depression (around Ord Grove Test) and coastal and inland wells helps illustrate the gradient of the deep aquifer's pumping depression over time, shown for WY 2024 on Figure 43 and Figure 45. This discrepancy is illustrative of conditions near the center of the pumping depression as compared to further from its center.

The difference in groundwater elevations at Ord Grove Test and others in the Northern Coastal Subarea tends to increase during dry periods in response to reduced recharge and increased groundwater demand; see October 2012 through October 2016 on Figure 36. Over the past six years, the groundwater elevation difference has decreased for two reasons. First, elevations in the deeper portion of the pumping depression have risen, likely a result of ASR injection in wet years since WY 2019 and PWM injection since WY 2021 (see October 2018 through October 2024 on Figure 36). Second, groundwater elevations in some of the wells further from the center of the pumping depression have not increased at the same rate as Ord Grove Test (FO-07 Deep, FO-09 Deep, PCA-West Deep, MSC-Deep). From this it can be concluded that although the pumping depression's depth has decreased in the past few years, its lateral extent continues to grow during dry periods. However, the pumping depression's extent shrunk somewhat in WY 2024, in response to higher than normal precipitation, recycled water usage, ASR injection, and PWM injection. How the shape and gradient of the deep pumping depression evolves over time should continue to be examined in these annual reports to inform projects and sustainability in the Northern Coastal subarea.

Figure 37 includes hydrographs of groundwater elevations for the four deep coastal Sentinel wells. Groundwater elevations on this chart are collected from dataloggers in each well that record levels every 30 minutes. The hydrographs plot daily average elevations, thereby smoothing out the more detailed data which are affected by tidal variations. Hydrographs for the Sentinel Wells are similar to the PCA-East Deep hydrograph and show that groundwater elevations over winter and spring were the highest in WY 2017 because of increased ASR injection.

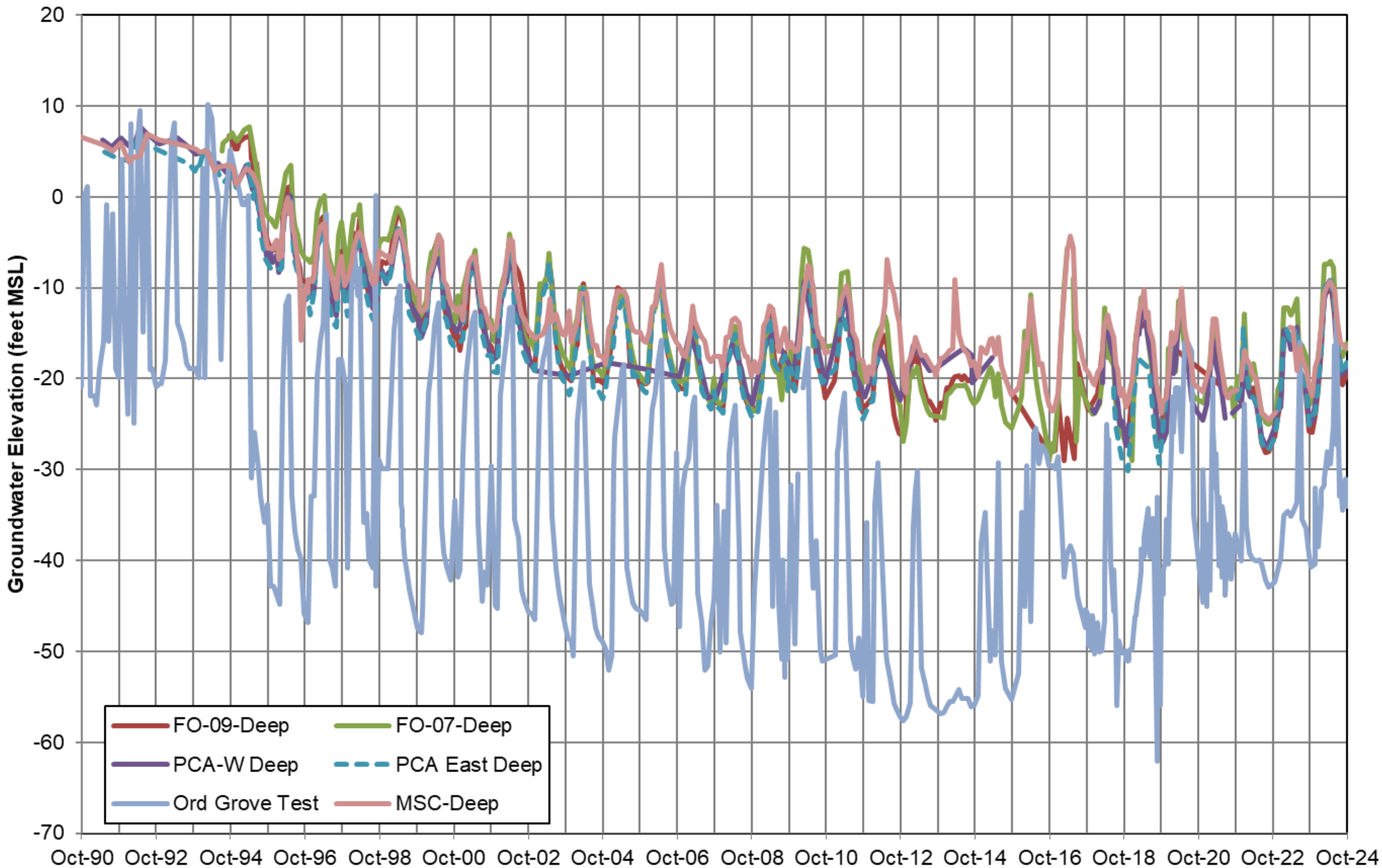


Figure 36. Santa Margarita Aquifer Northern Coastal Subarea Wells

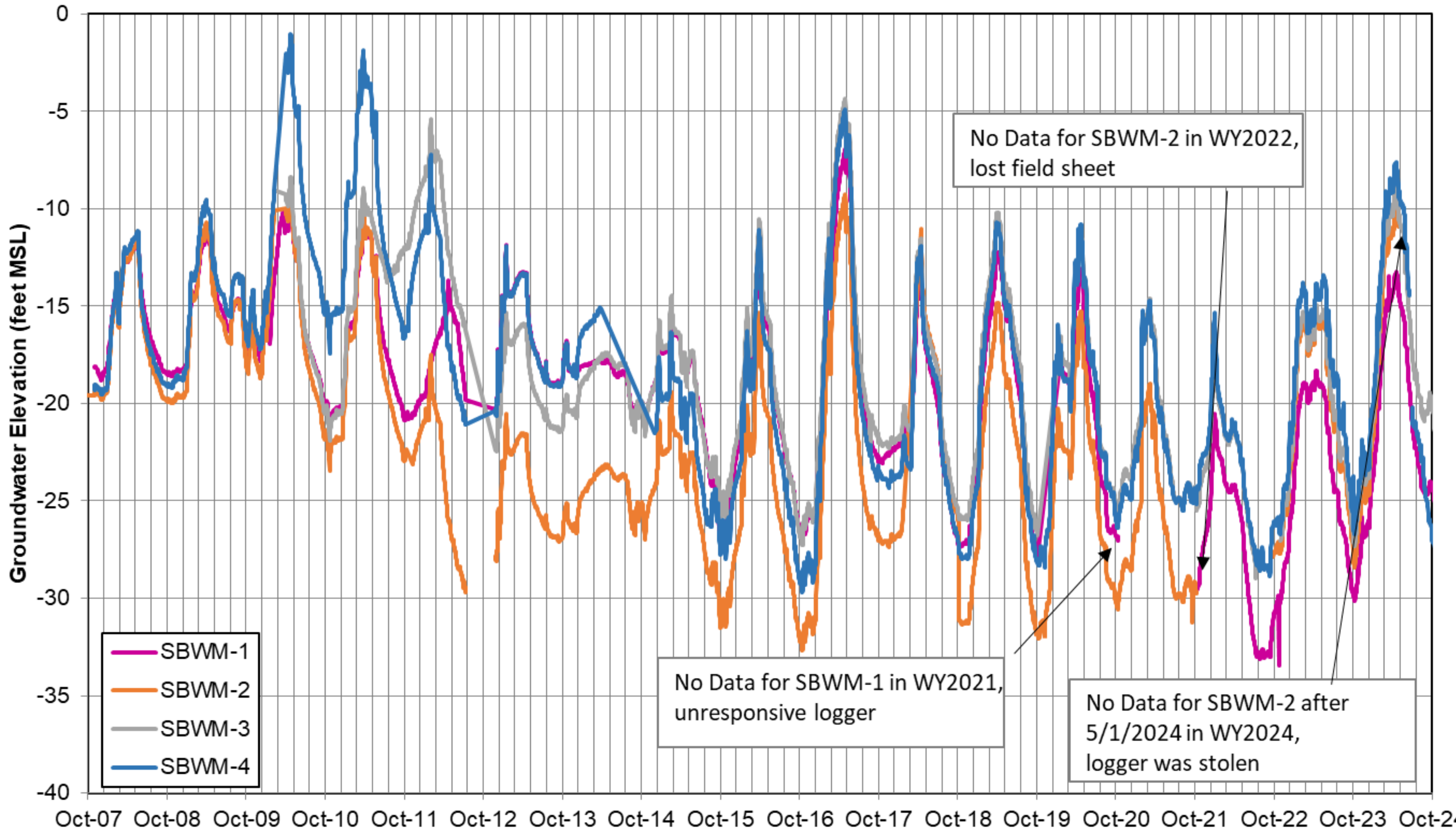


Figure 37. Sentinel Well Hydrographs

In WY 2024, seasonal high groundwater elevations in the Sentinel wells are 5 to 6 feet higher than the previous year. Similarly, seasonal low elevations are roughly 1 to 5 feet higher than the previous year, likely a result of above normal rainfall and available surface water to support ASR and PWM injection (Section 2.6.1; Section 2.7). Seasonal high groundwater elevations in WY 2024 are the highest since 2017. Data from SBWM-2 are missing after May 1, 2024 because the transducer was stolen.

The hydrograph of Paso Robles (shallow) aquifer groundwater levels in monitoring well PCA-East Shallow (Figure 35) shows sustained periods of declining groundwater levels (WY 2002 to WY 2008 and WY 2015 to WY 2022) corresponding to when the City of Seaside's golf course wells were pumping for irrigation, and increasing trends correspond to when the golf course used MCWD groundwater pumped outside of the Seaside Basin or recycled water in lieu of pumping groundwater from within the Seaside Basin (WY 2009 to WY 2014 and WY 2023 to present). Groundwater elevations were below sea level in the summer/fall of the three years prior to recycled water use which started in February 2023. With the golf course irrigation wells not pumping, groundwater levels have increased at roughly two feet per year and are again above sea level.

Protective elevation monitoring well PCA-West Shallow directly coastward of PCA-East Shallow has similar groundwater level trends to PCA-East Shallow. Section 2.6.4 describes the protective elevation and hydrograph for PCA-West Shallow; its groundwater levels and protective elevation is shown on Figure 47. It is evident from comparing the hydrographs of these two Paso Robles aquifer monitoring wells that golf course irrigation pumping is the cause of groundwater levels falling below protective elevations at PCA-West Shallow over the past six years. Using recycled water for golf course irrigation has allowed shallow groundwater levels to recover to above the protective elevations at PCA-West Shallow in WY 2024.

Seasonal changes in the Paso Robles aquifer groundwater levels are usually related to reduced wintertime production and increased pumping during summer. Although the Paso Robles aquifer seasonal fluctuations correspond with Santa Margarita aquifer fluctuations, it is because seasonal pumping occurs in both aquifers, and not because the aquifers are closely connected.

2.6.2.2 Southern Coastal Subarea

In the Southern Coastal subarea, the K-Mart and CDM MW4 monitoring wells are representative of groundwater levels near the coast. Figure 38 shows WY 2024 groundwater elevations have remained above sea level and are similar to the previous year. K-Mart well groundwater elevations have increased slightly over the period of record with the last two years being the highest levels on record.

2.6.2.3 Laguna Seca Subarea

Although the Laguna Seca subarea is far enough from the coast not to have seawater intrusion, there is concern that since 2001 this area has experienced ongoing groundwater level declines that have not been controlled or improved by triennial pumping reductions. It is believed this is occurring due to the subarea's limited groundwater inflows and natural recharge compounded by the influence of wells pumping east of the Seaside Basin in the Monterey Subbasin Corral de Tierra Management Area (HydroMetrics WRI, 2016a). Figure 8 shows the location of wells with hydrographs on Figure 39 while Figure 41 shows the location of all wells, including production wells in the eastern Laguna Seca subarea.

In the eastern portion of the subarea between 1999 and 2014, Paso Robles aquifer groundwater levels declined at a rate of approximately 0.6 feet per year and Santa Margarita groundwater levels declined up to 4 feet per year, as shown on Figure 39. The rate of decline reduced starting in WY 2014 and has since been a rate of roughly 0.5 feet per year in both the Paso Robles and Santa Margarita aquifer systems. Over the past two years, the declining trend appears to have stabilized with the exception of Fort Ord #5 Shallow and Fort Ord #6 Shallow which are the monitoring wells closest to the Monterey Subbasin Corral de Tierra Management Area. Similar trends are present in the central portion of the subarea, as shown on Figure 40. The exception is at Bishop #3 where groundwater elevations continue to rise in response to CAWC ceasing pumping in the Bishop unit; at this well there has been approximately 40 feet of recovery since 2020.

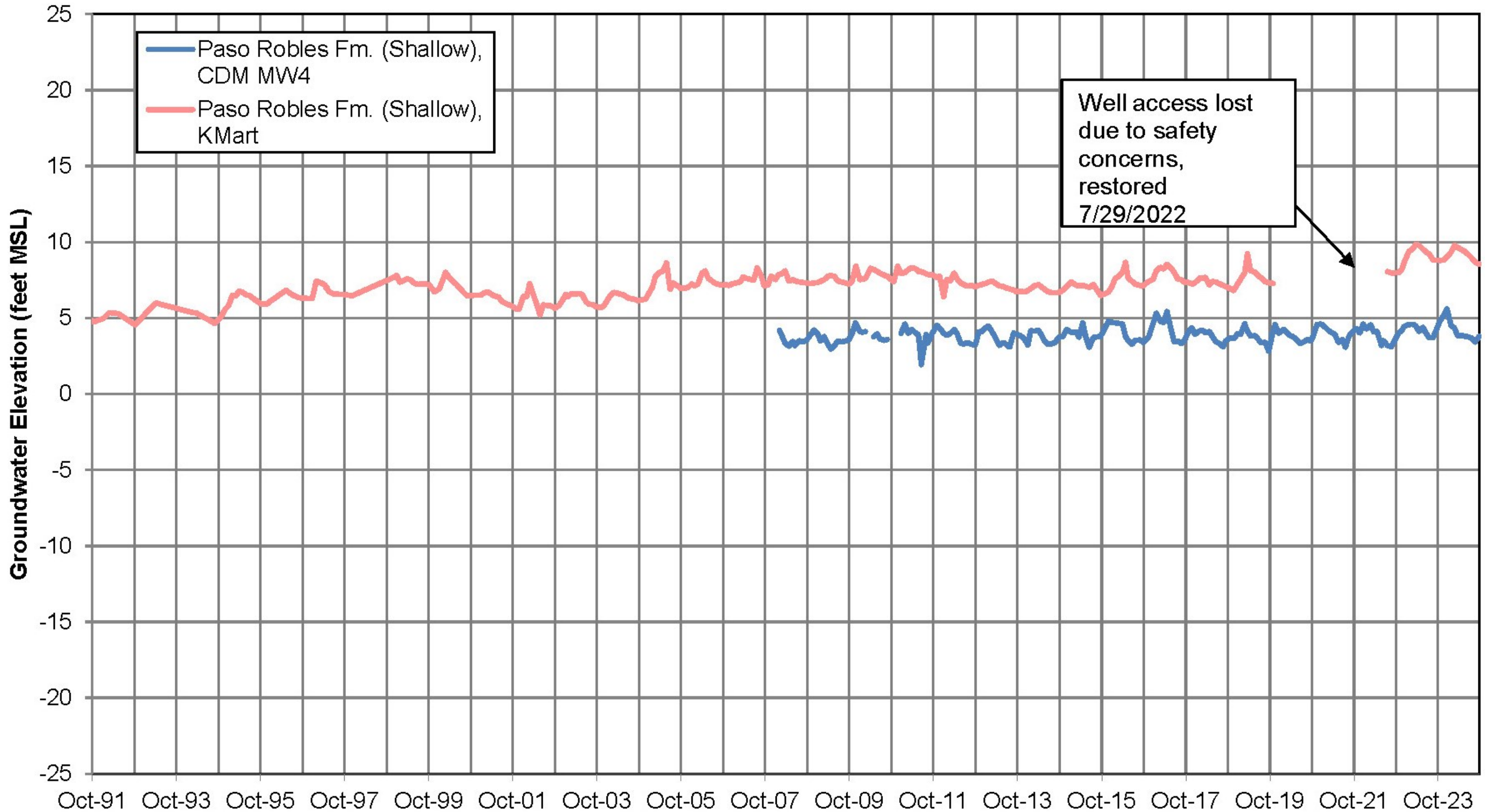


Figure 38. K-Mart and CDM MW4 Hydrographs, Southern Coastal Subarea

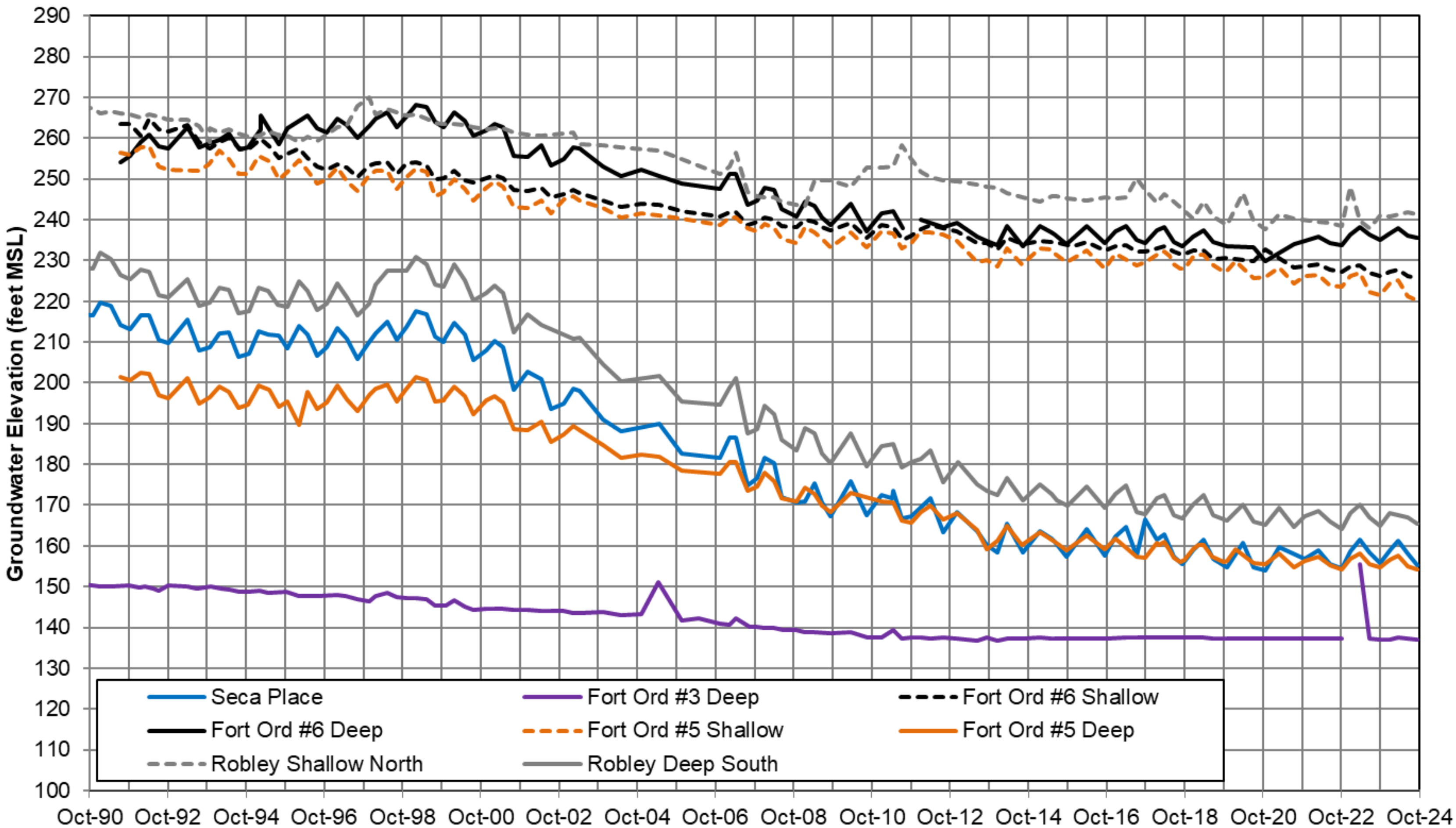


Figure 39. Eastern Laguna Seca Subarea Monitoring Well Hydrographs

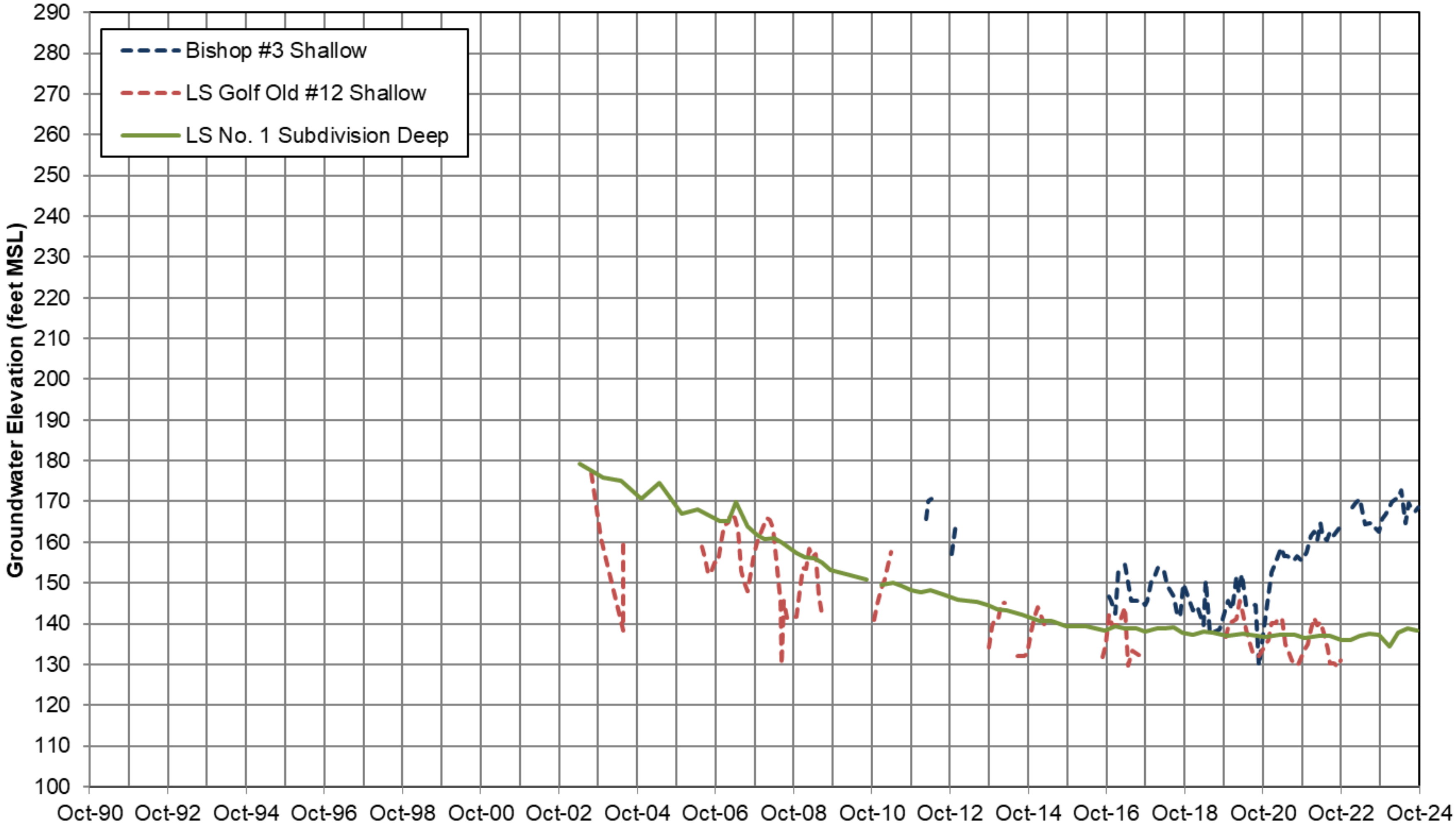
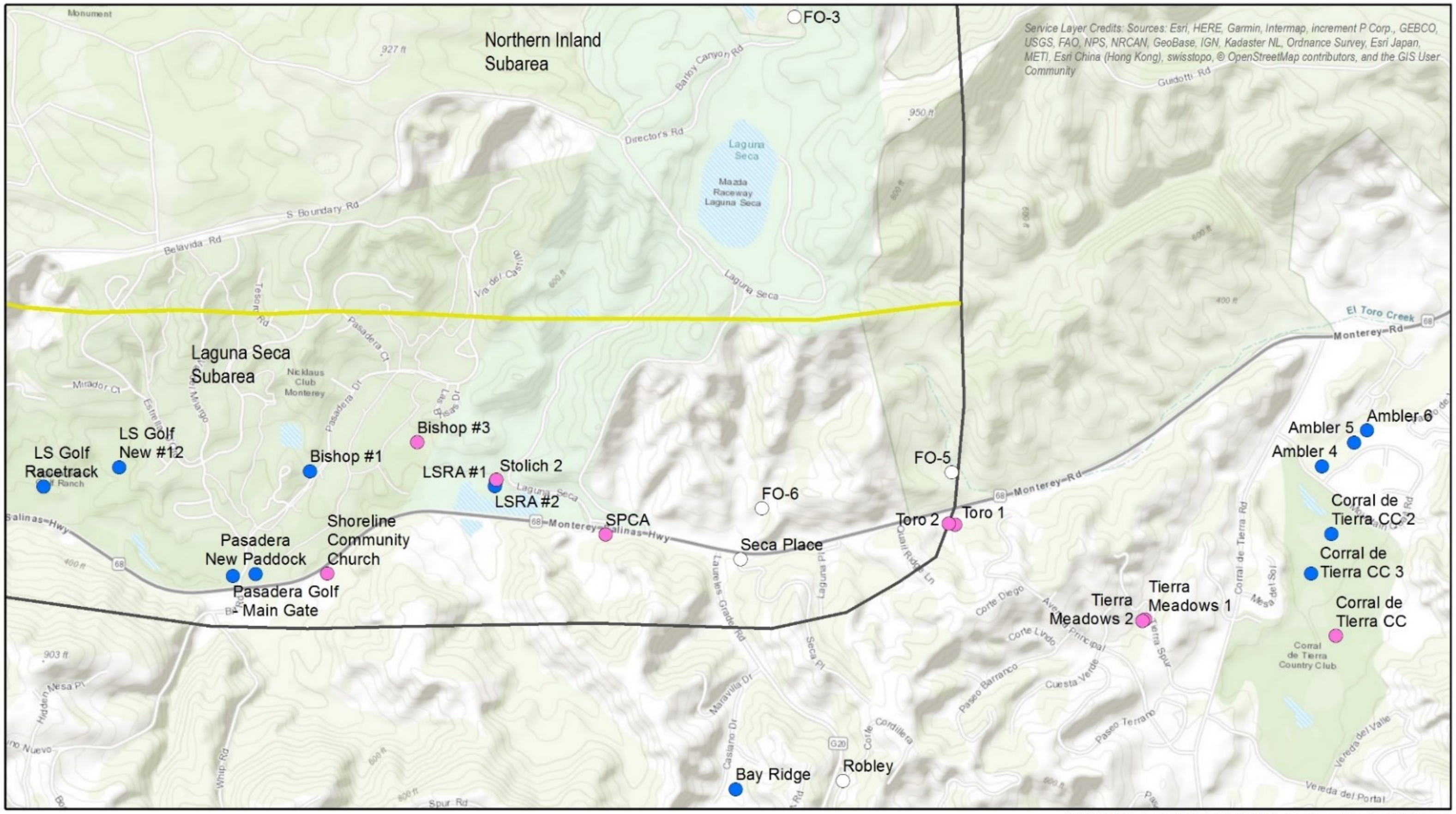


Figure 40. Eastern Laguna Seca Subarea Production Well Hydrographs



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EXPLANATION

Adjudicated Seaside Groundwater Basin
- Basin Boundary
- Subarea Boundary
- Select Monitoring Wells

Production Wells
- Well Screened Interval Entirely Within Paso Robles Aquifer (Shallow)
- Well Screened Interval Includes Santa Margarita Aquifer (Deep)

N

0 1,000 2,000 3,000 4,000
Feet

Figure 41. Eastern Laguna Seca Subarea Wells

2.6.3 Groundwater Elevation Maps

The subsections below map and describe groundwater elevation contours for the Seaside Basin for both the second quarter (January – March 2024) and fourth quarter (July – September 2024).

2.6.3.1 Second Quarter Water Year 2024 (January-March 2024)

Groundwater level maps for the Paso Robles aquifer (shallow) and Santa Margarita (deep) aquifers for the second quarter of WY 2024 are shown on Figure 42 and Figure 43, respectively. The maps now feature groundwater elevations derived from ASR and PWM monitoring wells in WY 2024. Groundwater level data from PWM monitoring wells were only available for second quarter of 2024. The area of influence from injection is identified by an opaque blue shaded area, which approximates the influence of injection on each aquifer. Under current injection operations, the influence of PWM injection is significantly larger in the Santa Margarita aquifer than the Paso Robles aquifer.

The following are observations on the second quarter groundwater elevation contours for the Paso Robles aquifer (Figure 42):

- Closer to the coast in the Northern Coastal subarea and just north of the subarea (outside of the Seaside Basin), second quarter elevations for WY 2024 increased 1 to 2 feet.
- The extent of the pumping depression in the Northern Coastal subarea was similarly constrained by PWM injection and ASR operations as in the previous year.
- The Southern Coastal subarea had a 1-foot increase in groundwater elevations in WY 2024.
- Available data indicate that the pumping depression caused by the Laguna Seca Golf Ranch wells in the central Laguna Seca subarea has likely become smaller due to reduced pumping in WY 2024 and increased recharge from above-normal rainfall. No groundwater elevations data were available from the Bishop #3 well, as it was destroyed in May 2024.
- Second quarter groundwater elevations in the eastern Laguna Seca subarea are similar to the previous year.
- In the eastern portion of the Northern Inland subarea, an area of the Paso Robles aquifer is indicated to be potentially dry due to geologic structural control.

In the Santa Margarita aquifer, second quarter groundwater levels are usually higher than fourth quarter (fall) groundwater levels by up to 10 feet due to seasonal groundwater demand during the warmer months. Other than in areas of active groundwater pumping, the Santa Margarita aquifer does not show seasonal fluctuations to the same extent as the Paso Robles aquifer.

The following are observations on the second quarter groundwater elevation contours for the Santa Margarita aquifer (Figure 43):

- In the Northern Coastal subarea, along the coast and just north of the subarea, Santa Margarita groundwater levels decreased by about 1 foot from last spring.
- The Santa Margarita aquifer pumping depression in the Northern Coastal subarea has been similar in extent since WY 2022, with the -20 feet msl contour line remaining within the Seaside Basin and not extending farther north into the Salinas Valley - Monterey Subbasin Marina-Ord Management Area.
- PWM monitoring well data were available in WY 2024; elevations in these monitoring wells continue to be above sea level, including MW-2AD which rose above sea level in WY 2024.
- Available data indicate the pumping depression associated with pumping at the Laguna Seca golf courses is similar to spring levels last year.

  The eastern portion of the Laguna Seca subarea has groundwater levels similar to last year, with minor increases and decreases in groundwater elevations across wells of about 1 foot.

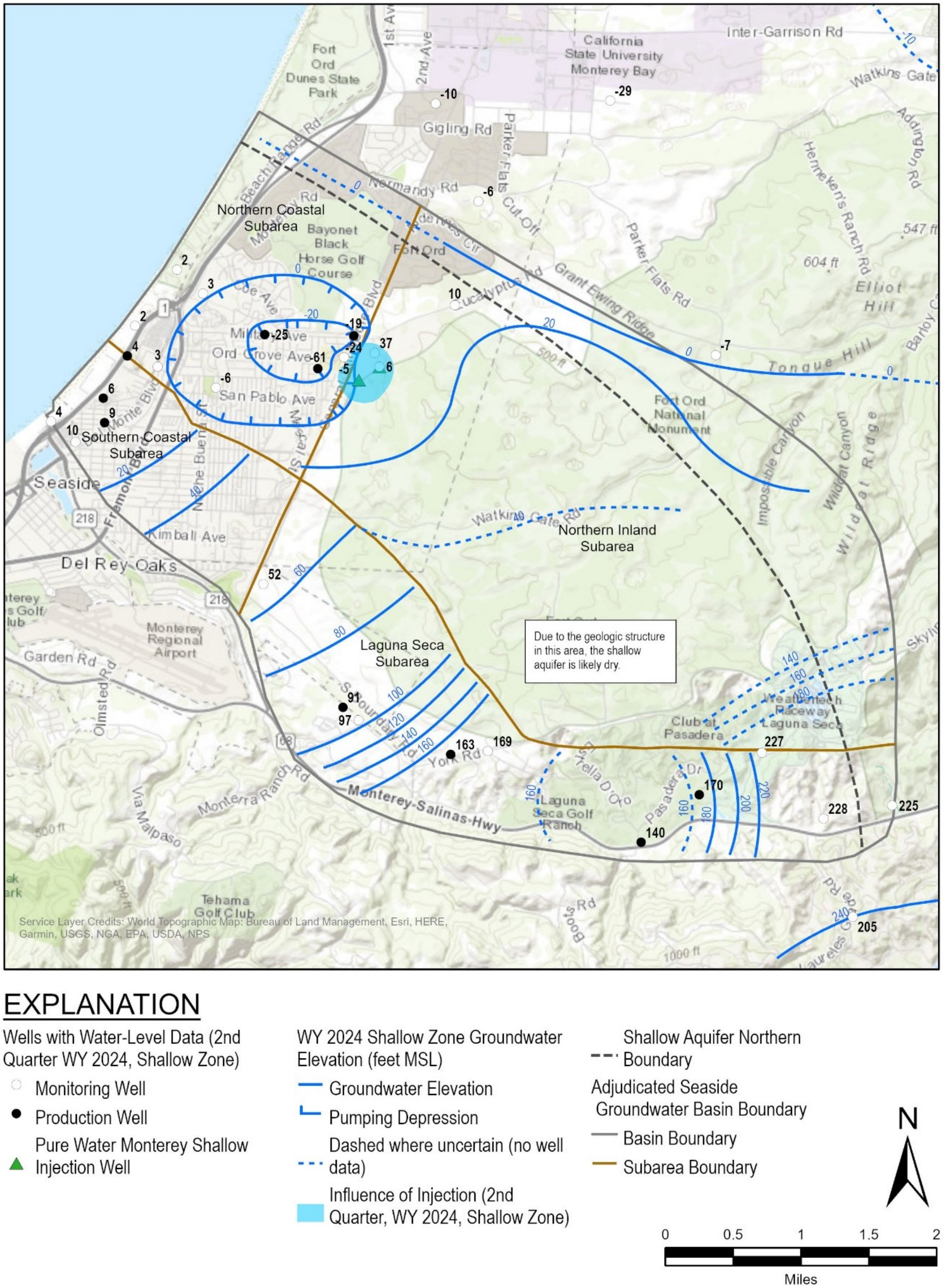
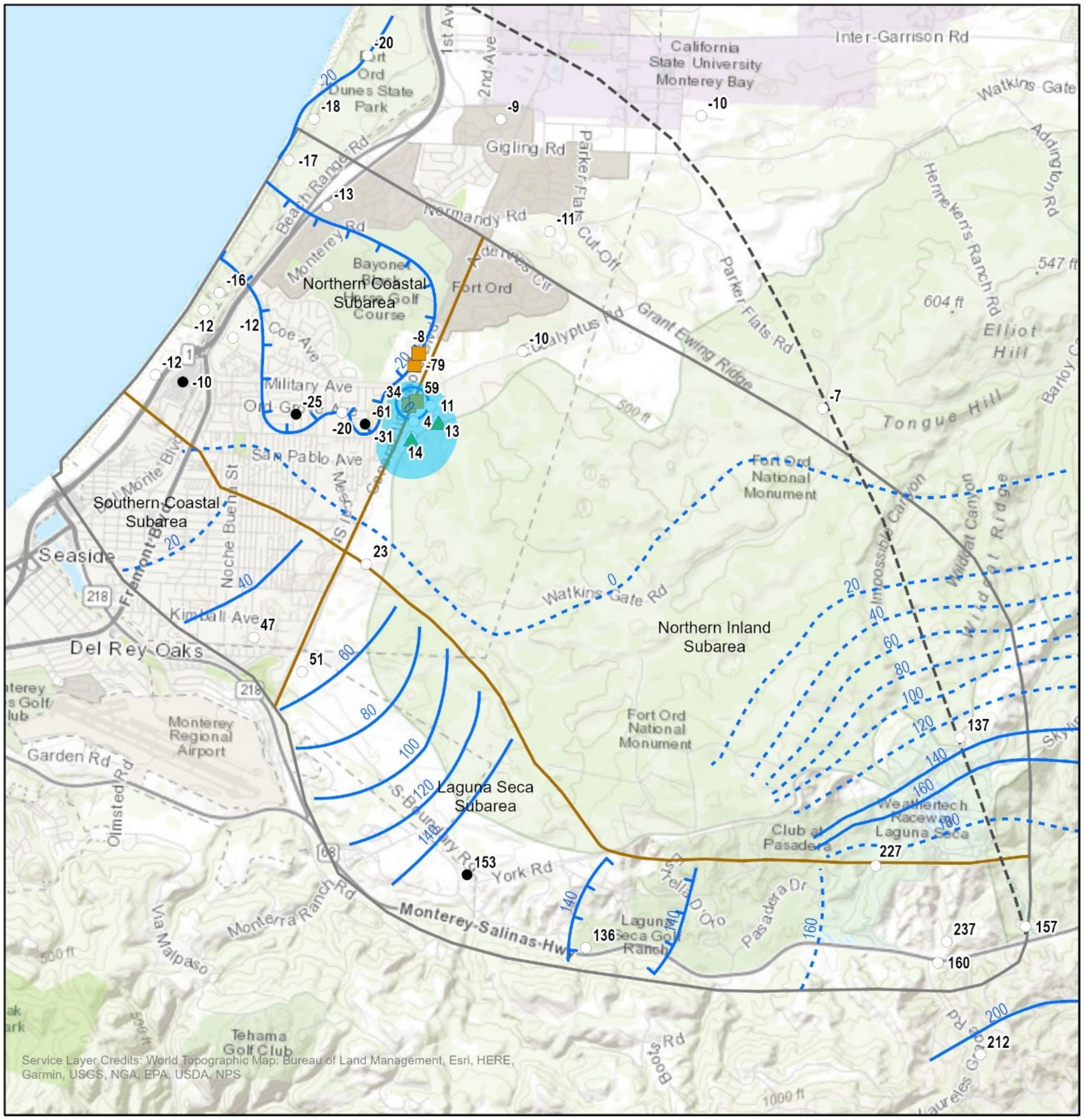


Figure 42. Paso Robles Aquifer (Shallow Zone) Water Elevation Map – Second Quarter Water Year 2024 (January-March 2024)



EXPLANATION

Wells with Water-Level Data (2nd Quarter WY 2024, Deep Zone)
- Monitoring Well
- Production Well
- ASR Wells
- Pure Water Monterey Deep Injection Well

WY 2024 Deep Zone Groundwater Elevation (feet MSL)
- Groundwater Elevation
- Pumping Depression
- Dashed where uncertain (no well data)
- Influence of Injection (2nd Quarter, WY 2024, Deep Zone)

- Deep Aquifer Northern Boundary

Adjudicated Seaside Groundwater Basin Boundary
- Basin Boundary
- Subarea Boundary

N

0 0.5 1 1.5 2
Miles

Figure 43. Santa Margarita Aquifer (Deep Zone) Water Elevation Map – Second Quarter Water Year 2024 (January-March 2024)

2.6.3.2 Fourth Quarter Water Year 2024 (July-September 2024)

Groundwater elevation maps for the Paso Robles (shallow) and Santa Margarita (deep) aquifers for the fourth quarter of WY 2024 are shown on Figure 44 and Figure 45, respectively.

The following are observations on the fourth quarter groundwater elevation contours for the Paso Robles aquifer (Figure 44):

- Northern Coastal subarea, including just outside of the northern Seaside Basin boundary groundwater elevations remained similar to WY 2023, while groundwater elevations along the coast within the Seaside Basin Boundary increased by 23 feet from the fourth quarter of WY 2023.
- The area of the Northern Coastal subarea below sea level in the shallow aquifer slightly reduced in size in WY 2024. This is primarily due to higher groundwater elevations in the Sand City area and at Fort Ord #9 Shallow.
- Southern Coastal subarea groundwater elevations remained similar to the previous year.
- Elevations in the eastern portion of the Laguna Seca subarea remain similar to last year.

The following are observations on the fourth quarter groundwater elevation contours for the Santa Margarita aquifer (Figure 45):

- North of the Northern Coastal subarea, Santa Margarita aquifer groundwater elevations were unchanged from last year. The northern -20-foot contour has shrunk due to a 3-foot rise in groundwater elevations at monitoring well FO-08 Deep.
- At the coast, Santa Margarita aquifer groundwater levels in the Northern Coastal subarea increased 3 to 6 feet from the previous year.
- The Northern Coastal subarea deep aquifer's pumping depression extent is the same as last year. The depression's southeastern extent is strongly influenced by ASR and PWM operations where there was a combined total of 5,195 acre-feet injected and 3,355 acre-feet recovered in WY 2024.
- The pumping depression associated with pumping at the Laguna Seca golf courses is similar to fall levels last year.
- The eastern portion of the Laguna Seca Subarea has groundwater levels similar to last year.

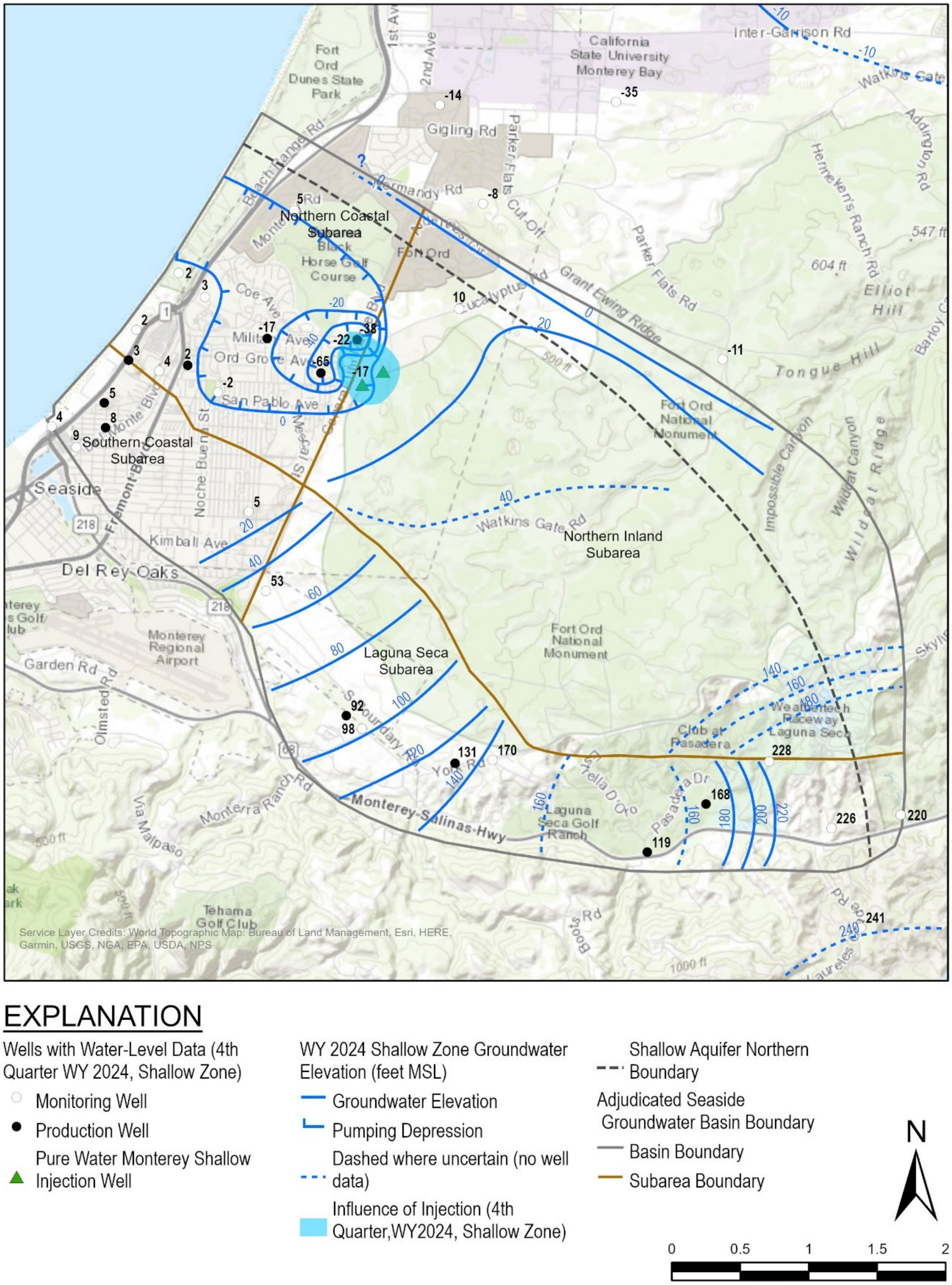


Figure 44. Paso Robles Aquifer (Shallow Zone) Water Elevation Map – Fourth Quarter Water Year 2024 (August/September 2024)

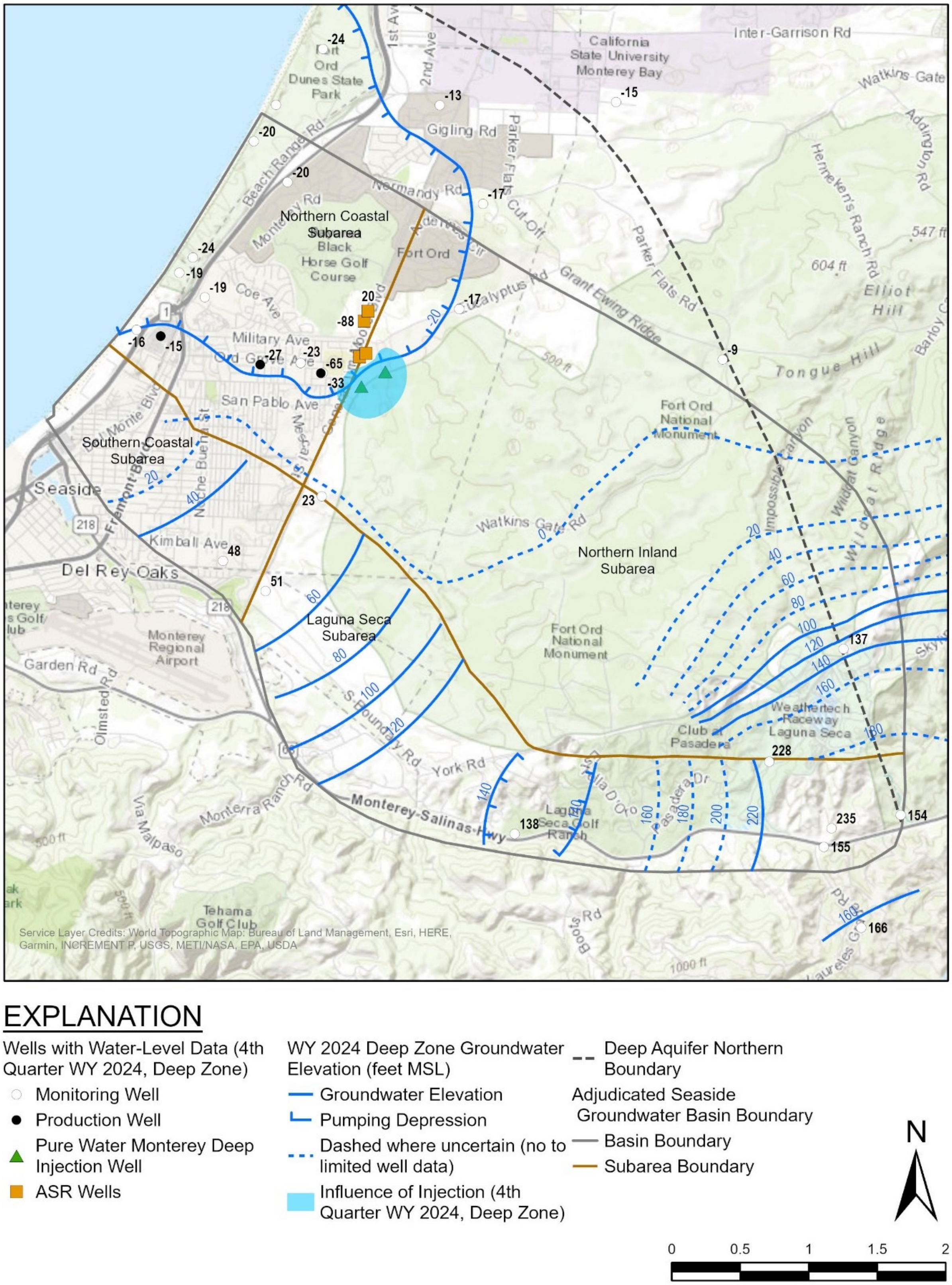


Figure 45. Santa Margarita Aquifer (Deep Zone) Water Elevation Map – Fourth Quarter Water Year 2024 (July/September 2024)

2.6.4 Protective Groundwater Elevations

Protective groundwater elevations were determined in 2009 using the Seaside Groundwater Basin groundwater flow model and cross-sectional modeling (HydroMetrics LLC, 2009b). A subsequent study in 2013 to revisit and update the protective groundwater elevations concluded that the calibrated parameters in the basin-wide model do not indicate that protective elevations should be lowered (HydroMetrics WRI, 2013b). Protective elevations for both the Santa Margarita (deep) and Paso Robles (shallow) aquifers were established for monitoring well pairs with both a shallow and deep completion. Protective elevations for the six wells with protective elevations are shown in Table 1. Groundwater levels below protective elevations have a greater potential to cause seawater intrusion that will impact production wells.

Table 1. Summary of Protective Elevations at Coastal Monitoring Wells

Subarea	Well	Completion	Protective Elevation, Feet above sea level	Currently Above or Below Protective Elevations
Northern Coastal	MSC	Santa Margarita (Deep)	17	below
		Paso Robles (Shallow)	11	below
	PCA-W	Santa Margarita (Deep)	17	below
		Paso Robles (Shallow)	2	above
	Sentinel Well 3	Santa Margarita (Deep)	4	below
Southern Coastal	CDM-MW4	Paso Robles (Shallow)	2	above

Figure 46 through Figure 49 show the historical groundwater elevations at each of the target protective elevation monitoring wells. Groundwater levels continue to be below protective elevations in all Santa Margarita target monitoring wells (MSC deep, PCA-West Deep, and Sentinel Well 3). In WY 2024, groundwater levels at all three Santa Margarita (deep) monitoring wells increased by 2 to 3 feet over the previous year. In WY 2024, groundwater levels at PCA-West Shallow rose above the protective groundwater elevation. Monitoring well CDM-MW4 and PCA-West Shallow are the only Paso Robles wells (2 of 3 Paso Robles wells total) with groundwater elevations above protective elevations. Groundwater elevations in the MSC Shallow monitoring well continue to be below its protective elevation.

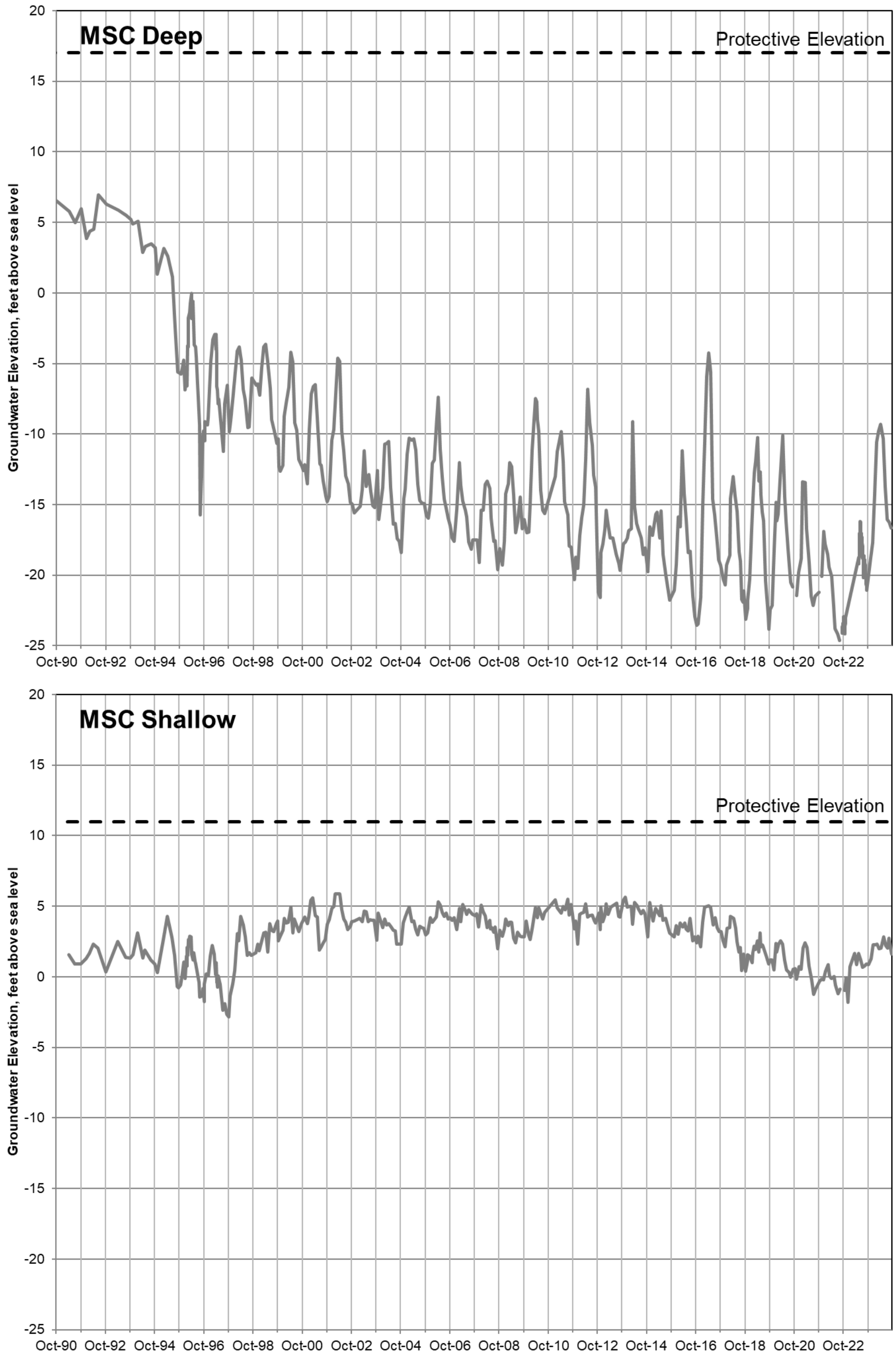


Figure 46. MSC Deep and Shallow Groundwater and Protective Elevations

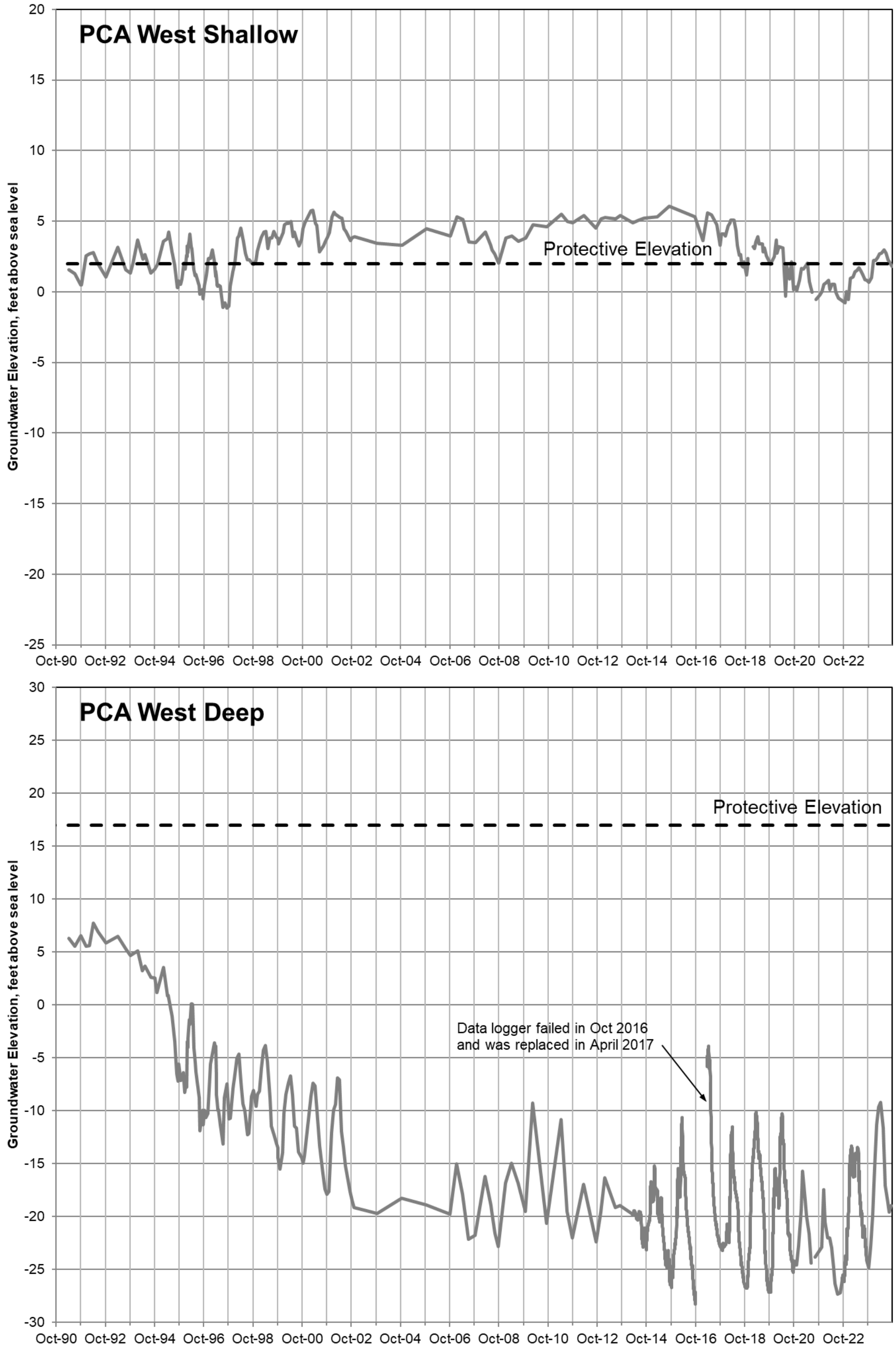


Figure 47. PCA-West Deep and Shallow Groundwater and Protective Elevations

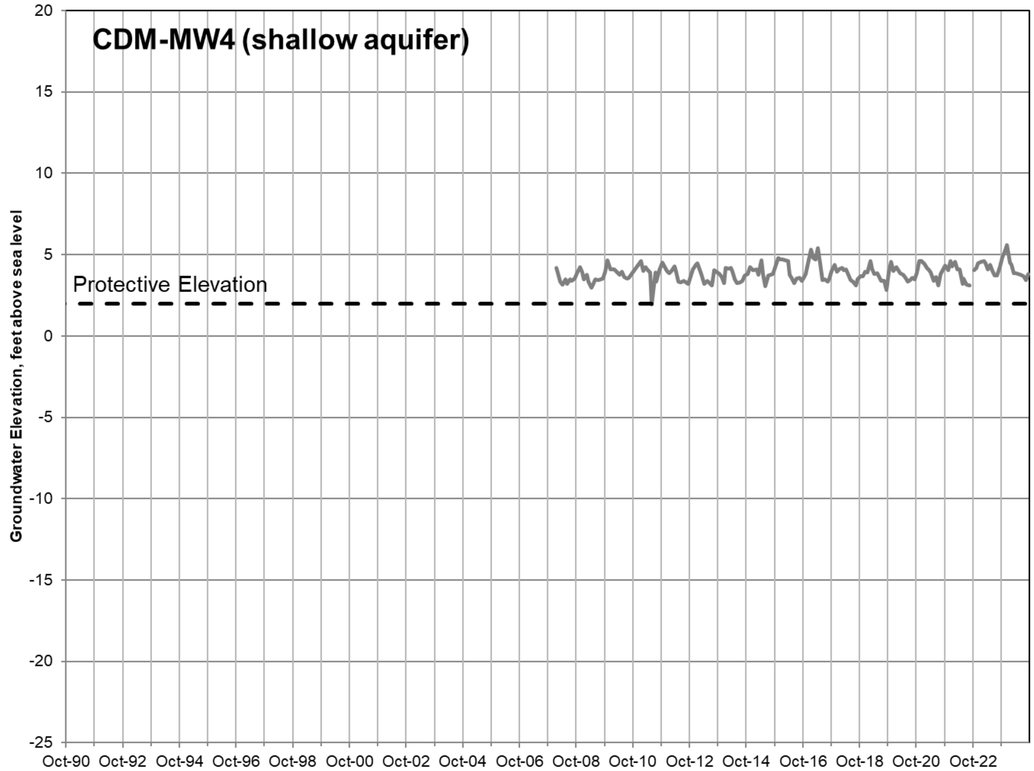


Figure 48. CDM-MW4 Groundwater and Protective Elevations

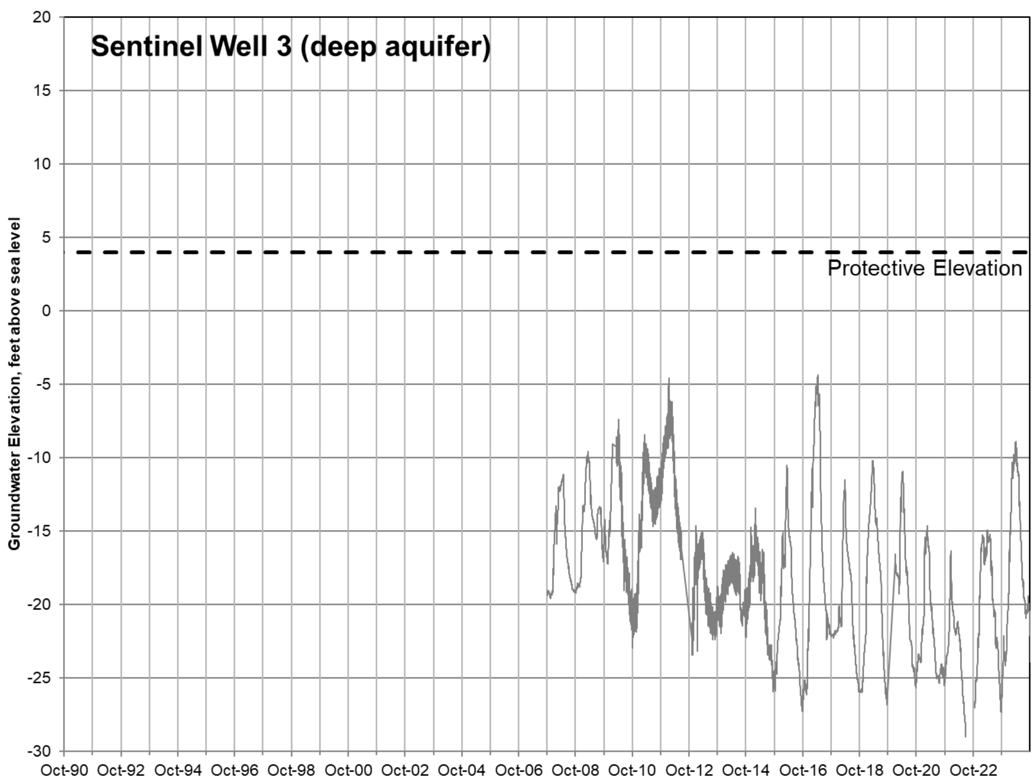


Figure 49. Sentinel Well 3 Groundwater and Protective Elevations

2.7 Groundwater Production

Groundwater pumping and subsurface outflows to adjacent basins in excess of freshwater recharge and subsurface inflow from adjacent areas is the primary cause of seawater intrusion. Mapping pumping volumes gives an indirect indication of the threat of seawater intrusion. Ideally, to avoid seawater intrusion, pumping should be equally distributed throughout a basin and occur inland of the coast.

Gross pumping by Watermaster producers in WY 2024 was 5,705 acre-feet, which includes 3,355 acre-feet of recovery from PWM. Net or native groundwater pumping is the amount of groundwater pumped after both ASR and PWM recovery are considered. It is possible that in years when there is water injected and recovered, more water may be pumped from CAWC's wells to recover water injected the previous operational year.

In WY 2024, ASR and PWM wells injected 1,519 and 3,676 acre-feet, respectively, for a total of 5,195 acre-feet of injection. There was no ASR recovery but PWM recovered 3,355 acre-feet of its injected water (Figure 50). As reported by the Watermaster, net or native groundwater production was 2,350 acre-feet (gross pumping less recovery), which is 650 acre-feet below the Decision-ordered Operating Yield of 3,000 acre-feet (Figure 50). The net or native groundwater produced from the Seaside Basin in WY 2024 was only about 177 acre-feet more than in WY 2023. The Decision-ordered Operating Yield will continue to be 3,000 acre-feet unless a revised Sustainable Yield is developed.

Figure 51 shows the distribution of pumping across the Seaside Basin and the volumes pumped at each production well for the past 2 years. The blue bar charts on Figure 51 reflect the actual or gross amounts pumped from each well and the green bar charts reflect the volume of ASR or PWM injection. In WY 2024, the majority of pumping in the Seaside Basin occurred at CAWC's Ord Grove No. 2, Santa Margarita #1, Santa Margarita #3, and Paralta production wells.

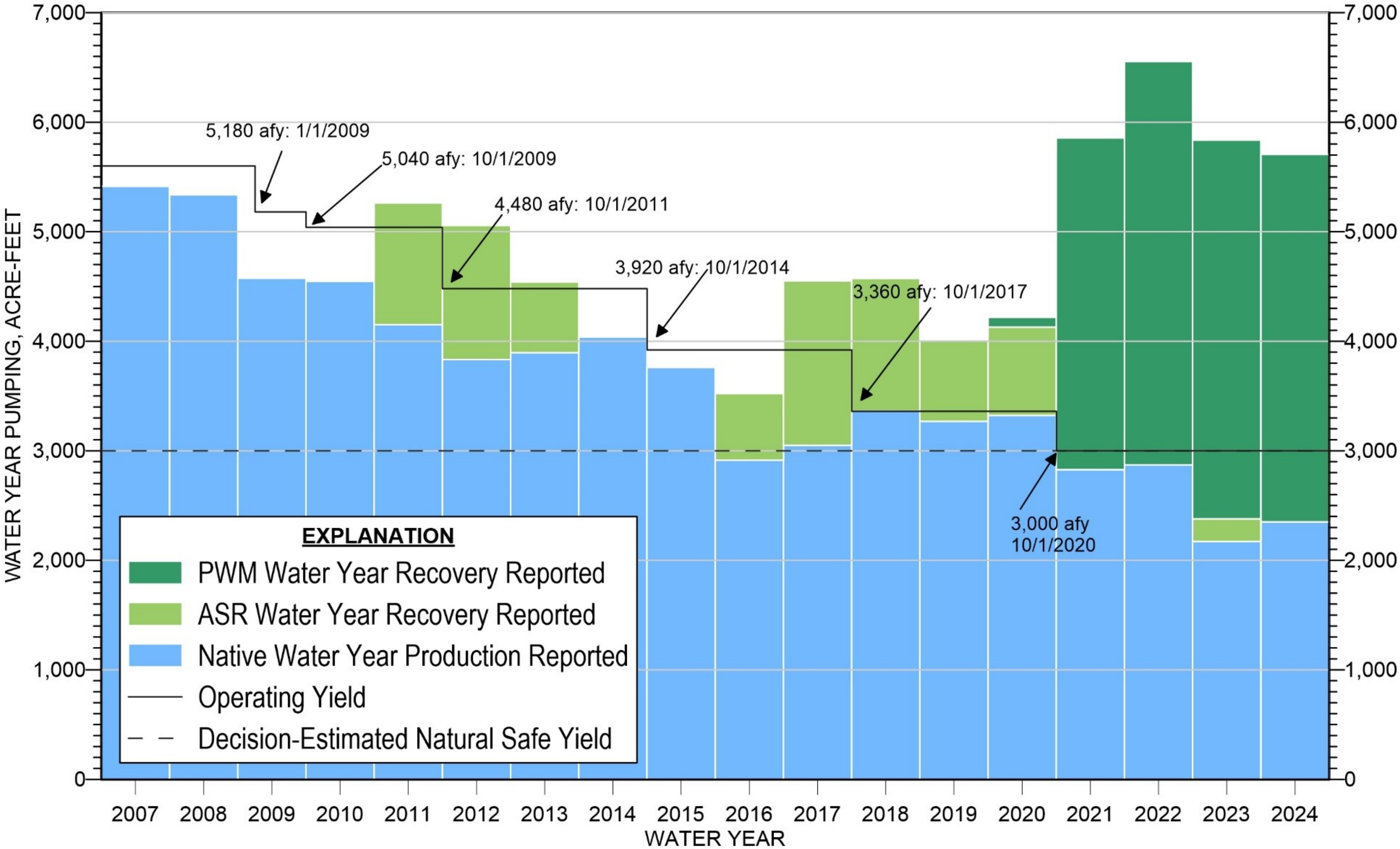


Figure 50. Annual Reported Groundwater Production and Operating Yield for Watermaster Producers

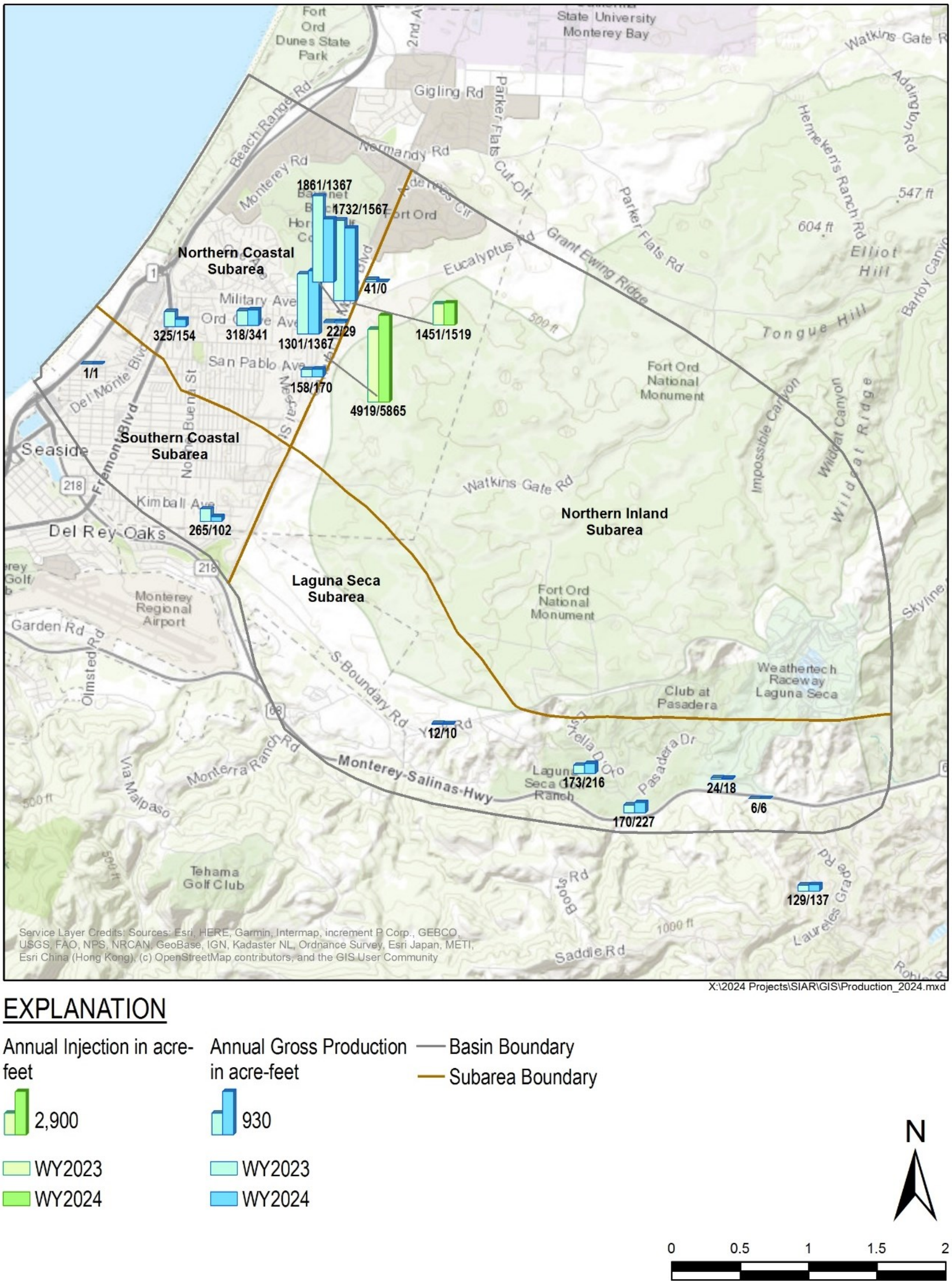


Figure 51. Watermaster Producers' Pumping Distribution for Water Years 2023 and 2024

3 CONCLUSIONS

Groundwater levels below sea level, the cumulative effect of pumping in excess of recharge and freshwater inflows, and ongoing seawater intrusion in the nearby Salinas Valley all suggest that seawater intrusion has the potential to occur in the Seaside Groundwater Basin.

Data collected in WY 2024 from monitoring and production wells do not indicate seawater intrusion is occurring within the Seaside Groundwater Basin. However, induction logging shows incremental increases in conductivity over time in Sentinel wells SBWM-1, 2, and 4 within zones of the Paso Robles Formation that are not screened in nearby monitoring wells. Continual increases in conductivity may be a precursor to seawater intrusion.

Based on the findings of this report, the following ongoing detrimental groundwater conditions pose a direct threat of seawater intrusion:

- Both the Paso Robles and Santa Margarita aquifers in the Seaside Groundwater Basin are susceptible to seawater intrusion. The Paso Robles aquifer is in direct hydrogeologic connection with Monterey Bay, and seawater will eventually flow into it if inland groundwater levels continue to be below sea level. It is uncertain whether the Santa Margarita aquifer is in direct connection with Monterey Bay. If it is not in direct connection, then seawater intrusion will take longer as seawater in the Paso Robles aquifer would need to move down through the clay rich deposits overlying the Santa Margarita aquifer before entering the aquifer itself and making its way into Santa Margarita production wells. It is not if, but when, seawater intrusion into these aquifers will occur if protective water elevations are not achieved.
- Sentinel wells SBWM-1 and SBWM-2, located north of the Seaside Basin, and SBWM-4, located in the Northern Coastal subarea where most of the Seaside Basin's groundwater extraction occurs, exhibit overall increases in conductivity over time within defined coarser-grained zones of the Paso Robles Formation. It is believed the increased conductivity in the shallow portions of SBWM-1 and SBWM-2 are associated with the mapped extent of seawater intrusion emanating from the Salinas Valley Basin shown on Figure 21. Since SBWM-3 does not have increasing conductivity in the Paso Robles Formation like the other three Sentinel wells, the cause of increasing conductivity in SBWM-4 may be different than SBWM-1 and SBWM-2 to the north. Evaluation of SBWM-4 conductivity data collected prior to 2019 indicates conductivity has been increasing within this zone from at least 2007 when induction logging started. An estimate of the total dissolved solids (TDS) increase associated with the logged change in conductivity in SBWM-4 since 2007 is approximately 1,000 mg/L. The Secondary Drinking Water limit is 500 mg/L. This indicates a significant salinity increase in the

Paso Robles Formation. An induction log performed on monitoring well PCA-West Deep—located 780 feet southwest of SBWM-4—to verify increasing conductivity in this area does indicate high salinity within the Paso Robles Formation. However, several years of logs are needed to compare against the first baseline before it can be determined if conductivity is increasing at that well too.

- Groundwater levels in some portions of both the Paso Robles and Santa Margarita aquifers in the Northern Coastal subarea continue to be below sea level year-round. Groundwater levels below sea level create hydraulic conditions causing onshore flow. WY 2024 fourth quarter (summer/fall) groundwater levels in the Santa Margarita aquifer are approximately 20 feet below sea level. The Northern Coastal subarea pumping depression in the Santa Margarita aquifer is similar to last year. The pumping depression in the Paso Robles aquifer is slightly reduced from last year's pumping depression.

- Groundwater levels remain below protective elevations in all three Santa Margarita aquifer protective elevation monitoring wells (MSC deep, PCA-W Deep, and Sentinel well SBWM-3), and in one of the three Paso Robles aquifer protective elevation monitoring wells (MSC Shallow). All three Santa Margarita monitoring well groundwater elevations continued increasing from WY 2022 which had the lowest levels on record. Groundwater elevations at all three Paso Robles protective elevation monitoring wells also increased. In WY 2024, PCA-West Shallow rose above the protective elevation for the first time since WY 2017. The increase is due to Bayonet/Blackhorse golf courses irrigation switching from locally pumped groundwater to recycled water.

The following evidence from this report demonstrates that seawater intrusion has not been detected in monitoring and production wells from which groundwater quality samples are collected:

- Most groundwater samples for WY 2024 from depth-discreet monitoring wells generally plot in a single cluster on Piper diagrams, with no water chemistry changes toward seawater.

- In some production wells, groundwater quality plots on Piper diagrams are different than groundwater quality in monitoring wells. This may be a result of mixed water quality because these wells are perforated in both the Paso Robles and Santa Margarita aquifers. None of the production wells' groundwater qualities are indicative of seawater intrusion.

- None of the Stiff diagrams for monitoring and production wells show the characteristic chloride spike that typically indicates seawater intrusion in Stiff diagrams. The stiff diagram for FO-10 Deep, which showed a spike of increased chloride in WY 2022, returned to a shape consistent with its historical shape.

- Maps of chloride concentrations for the shallow aquifer do not show chlorides increasing toward the coast. Santa Margarita aquifer chloride concentration maps show that the highest chloride concentrations are limited to coastal monitoring wells PCA-West Deep and MSC Deep, but these are not indicative of seawater intrusion since their concentrations are less than 160 mg/L and they do not have increasing trends.

Other important findings from the analysis contained in this report include the following:

- It is evident from comparing the long-term groundwater level trends of PCA-West Shallow and PCA-East Shallow, both in the Paso Robles aquifer, that golf course irrigation pumping is the cause of groundwater levels falling below protective elevations at PCA-West Shallow over the past 6 years. Using recycled water for golf course irrigation has allowed shallow groundwater levels to recover to above the protective elevations at PCA-West Shallow in WY 2024.
- Due to its distance from the coast, seawater intrusion is not an issue of concern in the Laguna Seca subarea. However, groundwater levels in the eastern Laguna Seca subarea have historically declined at rates of 0.6 feet per year in the shallow aquifers, and up to 4 feet per year in the deep aquifers. These declines have occurred since 2001 despite triennial reductions in allowable pumping and CAWC ceasing pumping its Ryan Ranch and Bishop wells. The cause of the declines is the subarea's limited groundwater inflows and natural recharge compounded by the influence of wells pumping east of the Seaside Basin in the Monterey Subbasin Corral de Tierra Management Area. Since WY 2021, groundwater elevations in the area have appeared to experience some stabilization and recovery, potentially correlated with a cessation of pumping at California American Water Company's (CAWC) Ryan Ranch and Bishop wells.
- Native groundwater production in the Seaside Basin for WY 2024 was 2,350 acre-feet, which is 177 acre-feet more than WY 2023 and 650 acre-feet less than the Decision-ordered Operating Yield of 3,000 acre-feet. In addition to WY 2024 being an above average year for rainfall, recovery of 3,355 acre-feet of recycled water from Pure Water Monterey and use of recycled water at the Bayonet/Blackhorse golf courses helped offset pumping of native groundwater. As outlined in the Basin Management Action Plan (M&A, 2018a), it is vital the Watermaster continues to identify ways to reduce pumping native groundwater and/or to recover groundwater elevations with water that is left in the Seaside Basin and is not extracted out as water supply.

It is important to remain vigilant and to closely monitor groundwater quality at different depths through the Seaside Basin's aquifers. Although existing monitoring and production wells are not detecting seawater intrusion, it does not mean seawater intrusion is not occurring. The discovery of increasing conductivity in specific zones in the Sentinel wells that are not screened in nearby monitoring wells illustrates this fact. Using geophysical methods such as induction logging and electromagnetic surveys to identify salinity provides a more complete "scan" of the depth of the Seaside Basin that discreetly screened wells cannot provide.

4 RECOMMENDATIONS

Actions Regarding Increased Conductivity Observed in Induction Logs in SBWM-1, SBWM-2, and SBWM-4

- EKI and Marina Coast Water District Groundwater Sustainability Agency (MCWD GSA) should be informed that Sentinel wells SBWM-1 and SBWM-2 continue to show increases in conductivity from 520 – 540 and 340 – 390 feet bgs respectively in defined coarser-grained zones in the Paso Robles aquifer. These monitoring wells are located outside of the Seaside Basin and are within the Marina-Ord Management Area of the Monterey Subbasin.
- Annual induction logs in PCA-West Deep and PCA-East Deep should continue to be performed to expand the area being monitored by geophysical methods.
- The Watermaster should consider performing land-based subsurface electromagnetic geophysics in the vicinity of SBWM-4 and PCA-West Deep, if feasible, to see if such data will add to the hydrogeologic understanding of this area.

Verify Chloride Concentrations and Water Chemistry in the 140 – 200 foot Zone of SBWM-4

It is recommended that options for verifying seawater intrusion occurring in the Paso Robles Formation at or near SBWM-4 continue be evaluated in WY 2025. This may involve finding a site for a new monitoring well, adapting an existing well, evaluating the feasibility of using a Cone Penetration Testing (CPT) drill rig to non-intrusively collect once-off groundwater quality samples at specified depths without needing a permanent well, or some other solution. The fall 2024 induction logging results at SBWM-4 show that conductivity has been stable over the past year, however the Watermaster should continue to conduct induction logging at PCA-W Deep and PCA-E Deep and explore options to see if it would be feasible to monitor groundwater quality in the affected zone.

Destroy the SNG Well

It is recommended that the privately owned SNG well be destroyed if it is found, as believed, to have a leaking casing that is allowing high salinity water to flow down from the seawater intruded Dune Sands into the Paso Robles Formation where the well is likely screened. In early 2021, the chloride concentration from water pumped from the well was 8,660 mg/L.

Destroy and Replace FO-10 Shallow and FO-10 Deep

It is recommended that FO-10 Shallow and FO-10 Deep be destroyed and replaced to maintain continuous water quality monitoring and to prevent cross contamination between the Paso Robles and Santa Margarita aquifers and the overlying Dune Sands. These wells are located outside of the Seaside Basin, so destruction would need to be conducted by the well owner, MPWMD, and replacement wells would need to be installed by the MCWD GSA.

Continue to Analyze and Report on Water Quality Annually

Seawater intrusion is a threat to the Seaside Basin, and data must be collected and analyzed regularly to identify incipient intrusion. Maps, graphs, and analyses similar to what are found in this report should continue to be developed every year.

5 REFERENCES

Barlow, P. M., 2003. Ground Water in freshwater-saltwater environments of the Atlantic coast, U.S. Geological Survey Circular 1262, 113 p.

Feeney, M.B., 2007. Seaside Groundwater Basin Watermaster seawater Sentinel Wells project - summary of operations, prepared for Seaside Groundwater Basin Watermaster.

———, 2020. *Sentinel well program – change in induction tool*. Technical memorandum, prepared for the Seaside Basin Watermaster. June 5.

———, 2021. Geophysical Investigation Fort Ord Monitoring Wells FO-9 and FO-10 – Preliminary Findings, prepared for Seaside Groundwater Basin Watermaster. April 5.

———, 2022. Addendum to Geophysical Investigation of Fort Ord Monitoring Well FO-10, prepared for Seaside Groundwater Basin Watermaster. February 28.

Hem, J.D., 1989. Study and interpretation of the chemical characteristics of natural water, USGS water supply paper 2254, 3rd edition.

HydroMetrics LLC, 2008. *Seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, October.

———, 2009a. *Water year 2009 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, October.

———, 2009b. *Seaside groundwater basin modeling and protective groundwater elevations*, prepared for the Seaside Groundwater Basin Watermaster, October.

———, 2009c. S*eawater intrusion response plan, Seaside Basin, Monterey County, California*, prepared for the Seaside Groundwater Basin Watermaster, February.

———, 2010. *Water year 2010 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, October.

———, 2011. *Water year 2011 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, November.

———, 2012a. *Water year 2012 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, November.

———, 2013a. *Water year 2013 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, December.

———, 2013b. *Groundwater Modeling Results of Replenishment Repayment in the Seaside Basin.* Technical memorandum prepared for the Seaside Groundwater Basin Watermaster, April 4.

———, 2014. *Water year 2014 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, December.

———, 2015. *Water year 2015 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, December.

———, 2016a. Groundwater Flow Divides within and East of the Laguna Seca Subarea. Technical Memorandum prepared for the Seaside Groundwater Basin Watermaster. January.

———, 2016b. *Water year 2016 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, December.

———, 2017a. Technical memorandum: Seaside groundwater basin analysis of wells sampled in December 2016, prepared for the Seaside Groundwater Basin Watermaster, February 21.

———, 2017b. *Water year 2017 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, December.

Jones, B.F., A. Vengosh, E. Rosenthal, and Y. Yechieli, 1999. Geochemical investigations, *in* Bear, Jacob, and others, eds., *Seawater intrusion in coastal aquifers—Concepts, methods and practices*, Dordrecht, The Netherlands, Kluwer Academic Publishers, p. 51–71.

Marina Coast Water District Groundwater Sustainability Agency and Salinas Valley Basin Groundwater Sustainability Agency (MCWD GSA and SVBGSA), 2022. *Groundwater Sustainability Plan*, Retrieved from https://svbgsa.org/monterey-subbasin/ on 11/2/2022.

Montgomery & Associates (M&A), 2018a. *Seaside Groundwater Basin 2018 basin management plan,* prepared for the Seaside Groundwater Basin Watermaster, July 19.

———, 2018b. *Water year 2018 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, November 28.

———, 2019. *Water year 2019 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, November 25.

———, 2020. *Water year 2020 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, November 19.

———, 2021. *Water year 2021 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, December 31.

———, 2022. *Water year 2022 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, November 23.

———, 2023. *Water year 2023 seawater intrusion analysis report*, prepared for the Seaside Groundwater Basin Watermaster, February 27.

Pidlisecky, A., Moran, T., Hansen, B. & Knight, R., 2016. Electrical Resistivity Imaging of Seawater Intrusion into the Monterey Bay Aquifer System, Ground Water, 54(2), 255–261.

RBF, 2007. Seawater intrusion analysis report, Seaside Groundwater Basin, Monterey County, California, prepared for Seaside Groundwater Basin Watermaster by RBF and HydroMetrics, LLC.

Richter, B.C., and C.W. Kreitler, 1993. *Geochemical techniques for identifying sources of ground-water salinization*, Boca Raton, Fla., C.K. Smoley (CRC Press, Inc.), 258 p.

Seaside Groundwater Basin Watermaster, 2006. *Seaside Basin Monitoring and Management Program*, May 17, 24 pp.

Yates, E.B., M.B. Feeney, and L.I. Rosenberg, 2005. *Seaside groundwater basin: update on water resources conditions*, prepared for Monterey Peninsula Water Management District.

MONTGOMERY & ASSOCIATES

Appendix A

Seaside Basin Monitoring
Groundwater Quality Data for WY 2024

Seaside Basin Monitoring Groundwater Quality Data for WY 2024

ASR MW-1 — **WM No. 257**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
231121_58-02	11/21/2023	42	36	11.3	2.6	158	56	0.2	33.9	0.4		<15		<0.1	0.2	7.7	274	486
240319_062-01	3/19/2024	46	40	12.5	2.9	185	63	0.1	30	0.2		<15		<0.1	0.2	7.9	298	521
240524_010-01	5/23/2024	50	41	13	3.1	180	63	0.2	32	0.2		<15		<0.1	0.1	8	304	539
240904_085-01	9/4/2024	41	40	11.6	3	160	64	0.2	32	0.2		<15		<0.1	0.1	8	310	495

Del Monte Test — **WM No. 231**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
240913_011-01	9/12/2024	26	47	10.4	3.4	129	25	0.1	57	1.9		0.086		<0.1	0.2	7.55	272	469

FO09(S)2023 — **WM No. 331**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
240314_65-03	3/14/2024	27	49	6.8	3.8	109	22	0.1	65	<0.1		0.065		0.1	0.2	7.4	270	439
240522_134-01	5/22/2024	27	47	6.9	3.9	98	20	0.1	66	<0.1		0.064		0.1	0.2	8	266	458
240904_083-03	9/4/2024	27	42	6.6	4.1	89	18	<0.1	65	<0.1		0.063		<0.1	0.2	8	250	396

FO-09-Deep — **WM No. 112**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
231121_60-01	11/21/2023	28	49	3.8	4.1	128	5	<0.1	69	<0.1		0.024		<0.1	0.2	7.2	246	450

< = not detected above detection limit of value following <   all values other than pH and EC are in mg/L

240315_076-01	3/15/2024	29	53	4	4.4	132	6	0.1	67	<0.1		0.021		<0.1	0.2	6.9	264	448
240524_011-03	5/23/2024	28	52	3.9	3.9	129	5	0.1	70	<0.1		0.015		0.1	0.2	7.7	264	452
240904_083-02	9/4/2024	29	53	4	4	119	13	<0.1	71	<0.1		0.018		<0.1	0.2	7.9	276	453

FO-10-Deep **WM No. 114**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
240924_002-01	9/23/2024	19	38	3.1	3.6	71	19	0.1	49	<0.1		0.071		0.1	0.2	8	224	324

FO-10-Shallow **WM No. 113**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
231120_70-01	11/20/2023	26	42	7.8	2.4	67	10	<0.1	93	<0.1		<15		<0.1	0.3	7.1	340	452
240315_076-02	3/15/2024	27	45	8.5	2.6	86	9	<0.1	93	<0.1		<15		<0.1	0.3	7.5	298	471
240529_050-01	5/29/2024	25	41	7.2	2.4	75	12	0.1	83	0.3		0.007		<0.1	0.3	7.9	282	424
240904_083-01	9/4/2024	24	43	7.1	2.8	73	11	<0.1	84	0.4		<15		<0.1	0.3	7.9	272	425

LS Golf New #12 **WM No. 203**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
240926_016-01	9/26/2024	130	143	33.9	5.9	285	246	0.6	255	0.1		0.054		0.1	0.9	7	1090	1709

LSRA #1 **WM No. 197**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
AC84833	9/4/2024	19	104	13	2	115.9	21	0.13	142	1.4	<100	0.017		<50	0.51	6.3	410	719

< = not detected above detection limit of value following <   all values other than pH and EC are in mg/L

LSRA #2 **WM No. 196**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
240924_063-01	9/24/2024	20	103	13	2.7	105	21	0.2	146	0.6		0.018		0.1	0.5	6.9	410	718

Luzern #2 **WM No. 159**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
240912_041-01	9/12/2024	61	93	16.2	4.4	163	94	0.2	126	4.6	0.016	0.014		0.2	0.4	7.27	528	903

MSC - Shallow **WM No. 101**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
231120_70-02	11/20/2023	18	31	5	2.7	74	14	<0.1	44	0.2		<15		<0.1	0.1	6.7	168	309
240314_65-04	3/14/2024	19	34	5.3	3	80	14	0.1	42	0.2		<15		<0.1	0.1	7.2	202	302
240524_011-01	5/23/2024	18	32	5	2.7	79	14	0.1	45	0.2		<15		<0.1	0.1	7.2	194	311
240905_060-01	9/5/2024	18	33	5.1	2.9	76	14	<0.1	46	0.2		<15		<0.1	0.1	7.2	222	308

MSC-Deep **WM No. 102**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
231128_47-01	11/28/2023	78	100	14.2	4.4	289	45	0.2	148	<0.1		0.05		<0.1	0.5	7.4	582	1017
240320_033-01	3/20/2024	74	108	14.6	4.9	297	45	0.2	142	<0.1		0.046		0.1	0.5	7.7	574	1005
240524_011-02	5/23/2024	74	105	14.4	4.5	287	46	0.2	150	<0.1		0.043		0.1	0.5	7.9	588	1011
240905_060-02	9/5/2024	74	109	14.6	4.8	272	47	0.2	151	<0.1		0.042		0.1	0.5	8	574	1003

< = not detected above detection limit of value following < all values other than pH and EC are in mg/L

Ord Grove #2 — WM No. 153

Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
		Major Cations				Major Anions					Major Ions					Physical		
240912_042-01	9/12/2024	43	69	12.9	3.7	147	45	0.1	96	2	0.01	0.006		0.1	0.3	7.19	384	668

Ord Terrace-Shallow — WM No. 109

Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
		Major Cations				Major Anions					Major Ions					Physical		
240924_002-02	9/23/2024	84	86	17.6	5	241	53	0.4	123	2.4		0.71		0.1	0.4	7.4	528	908

Paddock 16 — WM No. 1028

Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
		Major Cations				Major Anions					Major Ions					Physical		
240924_063-03	9/24/2024	127	117	31.1	4.7	262	176	0.5	188	0.7		0.036		0.1	0.6	7.1	860	1361

Paralta — WM No. 169

Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
		Major Cations				Major Anions					Major Ions					Physical		
231128_64-03	11/28/2023	34	42	8.9	2.8	143	40	0.3	54	0.6		<15		0.1	0.2	7.4	270	468
240319_062-04	3/19/2024	39	39	10.7	3.2	150	53	0.2	40	0.4		0.008		0.1	0.2	7.5	284	489
240524_010-03	5/23/2024	40	42	10.9	2.9	157	61	0.2	39	0.2		0.007		0.1	0.1	7.8	290	519
240909_021-01	9/9/2024	38	44	10.5	3	142	56	0.3	41	0.3		<15		<0.1	0.2	7.9	284	491
240912_040-01	9/12/2024	39	43	10.4	2.9	145	55	0.3	42	0.3		0.007		0.1	0.2	7.8	290	495

< = not detected above detection limit of value following <   all values other than pH and EC are in mg/L

Paralta Test Well

WM No. 108

Sample Id	Sample Date	Major Cations Ca	Na	Mg	K	Major Anions HCO3	SO4	F	Cl	N	Major Ions Fe	Mn	HPO4	B	Br	Physical pH	TDS	EC (us/cm)
231128_64-02	11/28/2023	25	46	<0.5	2.5	94	28	<0.1	73	0.7		<15		<0.1	0.2	7.9	260	451
240319_062-02	3/19/2024	29	49	7.8	2.6	120	34	<0.1	68	1.1		0.013		<0.1	0.2	7.8	290	502
240524_010-02	5/23/2024	27	48	8	2.5	104	31	0.1	70	1		0.007		<0.1	0.2	7.9	282	485
240909_020-01	9/9/2024	26	51	8.3	2.8	94	29	<0.1	72	0.8		0.01		<0.1	0.2	7.9	264	460

PCA East Deep

WM No. 106

Sample Id	Sample Date	Major Cations Ca	Na	Mg	K	Major Anions HCO3	SO4	F	Cl	N	Major Ions Fe	Mn	HPO4	B	Br	Physical pH	TDS	EC (us/cm)
231121_58-01	11/21/2023	65	94	13.2	4.4	267	38	0.2	131	<0.1		0.677		0.1	0.4	7.3	514	906
240319_062-03	3/19/2024	64	102	13.8	5	279	40	0.2	128	<0.1		0.428		0.1	0.4	7.4	534	922
240522_130-01	5/22/2024	68	106	14.4	5.1	247	41	0.2	132	<0.1		0.417		0.1	0.4	6.8	550	932
240905_057-01	9/5/2024	64	103	13.7	5	272	35	0.2	134	<0.1		0.347		0.1	0.4	7.8	536	940
240918_086-01	9/19/2024	69	102	14.4	4.7	275	36	0.2	130	<0.1		0.367		0.1	0.4	7.8	544	958

PCA-E Shallow

WM No. 105

Sample Id	Sample Date	Major Cations Ca	Na	Mg	K	Major Anions HCO3	SO4	F	Cl	N	Major Ions Fe	Mn	HPO4	B	Br	Physical pH	TDS	EC (us/cm)
240918_086-02	9/19/2024	28	43	6.9	2.8	106	16	0.1	58	<0.1		<15		<0.1	0.2	7.8	248	414

PCA-W Deep

WM No. 104

Sample Id	Sample Date	Major Cations Ca	Na	Mg	K	Major Anions HCO3	SO4	F	Cl	N	Major Ions Fe	Mn	HPO4	B	Br	Physical pH	TDS	EC (us/cm)
231120_70-04	11/20/2023	78	103	16.9	4.9	304	42	0.2	152	<0.1		0.279		0.1	0.5	7	582	1026

< = not detected above detection limit of value following <

all values other than pH and EC are in mg/L

240314_65-02	3/14/2024	79	107	17.1	5.2	311	41	0.2	147	<0.1		0.286		0.1	0.5	7.3	554	1038
240521_066-01	5/21/2024	79	108	17.5	5.2	300	44	0.3	155	<0.1		0.282		0.1	0.5	7.6	604	1090
240903_086-02	9/3/2024	84	111	17.7	5.3	277	43	0.2	156	<0.1		0.273		0.1	0.5	7.7	580	1036

PCA-W Shallow **WM No. 103**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
231120_70-03	11/20/2023	19	33	5.3	2.6	80	12	<0.1	47	0.7		<15		<0.1	0.1	6.6	200	324
240314_65-01	3/14/2024	19	35	5.5	2.8	86	12	0.1	45	0.7		<15		<0.1	0.2	7.1	198	316
240521_066-02	5/21/2024	19	35	5.4	2.6	82	12	0.1	47	0.6		<15		<0.1	0.2	7.2	200	357
240903_086-01	9/3/2024	20	36	5.6	2.7	93	7	<0.1	47	<0.1		<15		<0.1	0.1	7.2	210	331

Playa #3 **WM No. 162**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
240913_011-02	9/12/2024	46	72	13.5	3.8	148	60	0.1	96	2.4	0.01	<5		0.1	0.4	7.7	404	705

Plumas #4 **WM No. 177**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
240913_011-03	9/12/2024	40	111	20.2	4.1	116	77	0.1	171	4.8	0.043	<5		<0.1	0.5	6.8	526	946

Sand City Corp Yard **WM No. 165**

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
240924_063-02	9/24/2024	30	216	6.7	4.6	132	126	3.1	214	6.5		0.021		0.9	0.7	7.5	702	1255

< = not detected above detection limit of value following <   all values other than pH and EC are in mg/L

Seaside Muni #4 — WM No. 173

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
231019_07-01	10/19/2023	36	55	11.4	2.5		31	<0.1	83.9	1		<15		<0.1	0.3	7.4	340	559

York School 2001 — WM No. 212

		Major Cations				Major Anions					Major Ions					Physical		
Sample Id	Sample Date	Ca	Na	Mg	K	HCO3	SO4	F	Cl	N	Fe	Mn	HPO4	B	Br	pH	TDS	EC (us/cm)
240924_063-04	9/24/2024	39	173	33.4	4.4	70	35	0.2	360	1.3		<15		<0.1	1.1	6.8	784	1385

< = not detected above detection limit of value following <   all values other than pH and EC are in mg/L

MONTGOMERY & ASSOCIATES

Appendix B

Seaside Basin Monitoring
Groundwater Level Data for WY 2024

Seaside Basin Monitoring
Groundwater Level Data for WY 2024

Bay Ridge Watermaster No. 226 Southern Inland

Owner: California American Water Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	383.5	545.92	162.42	0
11/30/2023	423.1	545.92	122.82	0
12/28/2023	386.2	545.92	159.72	0
01/25/2024	374.7	545.92	171.22	
02/29/2024	380.4	545.92	165.52	
03/28/2024	379.9	545.92	166.02	
04/25/2024	413.1	545.92	132.82	
05/30/2024	382	545.92	163.92	
06/27/2024	418	545.92	127.92	
07/25/2024	374	545.92	171.92	
08/29/2024	379	545.92	166.92	
09/26/2024	415	545.92	130.92	

Bishop #1 (west) Watermaster No. 209 Southern Inland

Owner: California American Water Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	258	398.81	140.81	0
11/30/2023	248.6	398.81	150.21	0
12/28/2023	255.2	398.81	143.61	0
01/25/2024	245.3	398.81	153.51	
02/29/2024	244.6	398.81	154.21	

03/28/2024	243.5	398.81	155.31	
04/25/2024	243.2	398.81	155.61	
05/30/2024	249	398.81	149.81	
06/27/2024	249	398.81	149.81	
07/25/2024	242	398.81	156.81	
08/29/2024	249	398.81	149.81	
09/26/2024	250	398.81	148.81	

Bishop #3 Watermaster No. 262 Southern Inland

Owner: CAW Aquifer Unit:

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	255	420.58	165.58	0
11/30/2023	253.8	420.58	166.78	0
12/28/2023	252.5	420.58	168.08	0
01/25/2024	250.8	420.58	169.78	
02/29/2024	249.9	420.58	170.68	
03/28/2024	249.9	420.58	170.68	
04/25/2024	247.8	420.58	172.78	
05/30/2024	256	420.58	164.58	
06/27/2024	251	420.58	169.58	
07/25/2024	252	420.58	168.58	
08/29/2024	253	420.58	167.58	
09/26/2024	252	420.58	168.58	

Blue Larkspur-East End Watermaster No. 143 Southern Inland

Owner: Laguna Seca Resorts

Aquifer Unit:

Well Type: Monitor

All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
01/02/2024	116.82	253.29	136.47	0
03/26/2024	115.9	253.29	137.39	0
06/25/2024	115.11	253.29	138.18	0
09/20/2024	115.43	253.29	137.86	0

CalAm Granite Construction Watermaster No. 242 Southern Inland

Owner: California American Water

Aquifer Unit: Tsm

Well Type: Monitor

All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
01/02/2024	135	226.43	91.43	0
03/26/2024	134.88	226.43	91.55	0
06/25/2024	134.9	226.43	91.53	0
09/23/2024	134.85	226.43	91.58	0

Camp Huffman (D) Watermaster No. 250 Salinas Valley, Monterey

Owner: Seaside Groundwater Basin Watermas

Aquifer Unit:

Well Type: Monitor

All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	414.19	401.21	-12.98	
11/30/2023	413.42	401.21	-12.21	0
12/29/2023	412.45	401.21	-11.24	0
01/29/2024	410.31	401.21	-9.10	
02/28/2024	408	401.21	-6.79	0
03/28/2024	407.1	401.21	-5.89	0
05/01/2024	406.53	401.21	-5.32	
05/29/2024	406.84	401.21	-5.63	0

06/26/2024	408.84	401.21	-7.63	0
07/25/2024	410.2	401.21	-8.99	0
08/26/2024	410.95	401.21	-9.74	
09/30/2024	410.32	401.21	-9.11	0

Camp Huffman (S) Watermaster No. 249 Salinas Valley, Monterey

Owner: Seaside Groundwater Basin Watermas Aquifer Unit:

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	410.9	401.21	-9.69	
11/30/2023	410.12	401.21	-8.91	0
12/29/2023	409.35	401.21	-8.14	0
01/29/2024	408.46	401.21	-7.25	
02/28/2024	407.95	401.21	-6.74	0
03/28/2024	408.01	401.21	-6.80	0
05/01/2024	408.17	401.21	-6.96	
05/29/2024	409.66	401.21	-8.45	0
06/26/2024	410.41	401.21	-9.20	0
07/25/2024	411.71	401.21	-10.50	0
08/26/2024	412.09	401.21	-10.88	
09/30/2024	411.86	401.21	-10.65	0

CDM MW#4 Watermaster No. 238 Southern Coastal

Owner: MPWMD Aquifer Unit: Qod

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	13.86	18.69	4.83	0
11/30/2023	13.5	18.69	5.19	0
12/28/2023	13.09	18.69	5.60	0

02/02/2024	14.19	18.69	4.50	0
03/01/2024	14.34	18.69	4.35	0
03/28/2024	14.83	18.69	3.86	0
04/30/2024	14.83	18.69	3.86	0
06/27/2024	14.93	18.69	3.76	0
07/29/2024	15.02	18.69	3.67	0
08/26/2024	15.27	18.69	3.42	0
10/02/2024	14.89	18.69	3.80	0

CDM MW-1 Watermaster No. 251 Northern Coastal

Owner: MPWMD Aquifer Unit: Qod/Qar

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2023	88.72	93.53	4.81	0
11/29/2023	88.62	93.53	4.91	0
12/29/2023	87.94	93.53	5.59	0
01/29/2024	88.36	93.53	5.17	0
02/29/2024	88.49	93.53	5.04	0
03/28/2024	88.89	93.53	4.64	0
05/01/2024	89.38	93.53	4.15	0
06/04/2024	89.79	93.53	3.74	0
06/27/2024	89.8	93.53	3.73	0
07/25/2024	89.92	93.53	3.61	0
08/28/2024	90.61	93.53	2.92	0
09/30/2024	90.22	93.53	3.31	

CDM MW-2 Watermaster No. 252 Northern Coastal

Owner: MPWMD Aquifer Unit: Qod/Qar

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/03/2023	59.92	63.86	3.94	0
11/29/2023	58.96	63.86	4.90	0
12/29/2023	57.92	63.86	5.94	0
01/29/2024	58.93	63.86	4.93	0
02/29/2024	59.37	63.86	4.49	0
03/28/2024	59.56	63.86	4.30	0
05/01/2024	60.04	63.86	3.82	0
06/04/2024	60.55	63.86	3.31	0
06/27/2024	60.49	63.86	3.37	0
07/25/2024	60.65	63.86	3.21	0
08/28/2024	61.44	63.86	2.42	0
09/30/2024	60.86	63.86	3.00	

CDM MW-3 Watermaster No. 239 Southern Coastal

Owner: MPWMD Aquifer Unit: Qod/Qar

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	30.72	33.81	3.09	0
11/30/2023	30.42	33.81	3.39	0
12/28/2023	28.12	33.81	5.69	0
01/30/2024	30.57	33.81	3.24	0
02/28/2024	30.5	33.81	3.31	0
03/27/2024	31.22	33.81	2.59	0
04/30/2024	32.28	33.81	1.53	0

05/29/2024	33.37	33.81	0.44	0
06/27/2024	32.63	33.81	1.18	0
07/29/2024	33.11	33.81	0.70	0
08/26/2024	33.66	33.81	0.15	0
10/02/2024	32.2	33.81	1.61	0

Cypress Pacific Production Watermaster No. 150 Southern Coastal

Owner: Paul Bruno Aquifer Unit: QTc

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	46.67	50.23	3.56	
11/30/2023	46.67	50.23	3.56	
12/28/2023	46.4	50.23	3.83	0
01/30/2024	46.25	50.23	3.98	0
02/28/2024	46.09	50.23	4.14	
03/27/2024	46.18	50.23	4.05	
04/30/2024	46.7	50.23	3.53	
05/29/2024	40.85	50.23	9.38	0
06/27/2024	46.98	50.23	3.25	0
07/29/2024	47.2	50.23	3.03	
08/26/2024	47.37	50.23	2.86	0
09/27/2024	47.43	50.23	2.80	0

Del Monte Test Watermaster No. 231 Northern Coastal

Owner: California American Water Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	27.2	32.62	5.42	0
11/30/2023	30	32.62	2.62	0

12/28/2023	29	32.62	3.62	0
01/25/2024	29.5	32.62	3.12	
02/29/2024	29	32.62	3.62	
03/28/2024	29	32.62	3.62	
04/25/2024	29.3	32.62	3.32	
05/30/2024	29	32.62	3.62	
06/27/2024	29	32.62	3.62	
07/25/2024	29	32.62	3.62	
08/29/2024	29	32.62	3.62	
09/26/2024	29	32.62	3.62	

Design Ctr. Watermaster No. 167 Southern Coastal

Owner: City of Sand City Aquifer Unit: Qod/Qar/QTc

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	13.21	21.31	8.10	0
11/29/2023	13.22	21.31	8.09	0
12/29/2023	13.02	21.31	8.29	0
01/29/2024	12.71	21.31	8.60	0
02/29/2024	12.82	21.31	8.49	0
03/29/2024	12.64	21.31	8.67	0
04/30/2024	12.79	21.31	8.52	0
06/04/2024	12.95	21.31	8.36	0
07/02/2024	12.96	21.31	8.35	0
07/29/2024	13.29	21.31	8.02	0
08/27/2024	13.47	21.31	7.84	0
09/27/2024	13.64	21.31	7.67	0

FO-01-Deep Watermaster No. 116 Northern Inland

Owner: MPWMD Aquifer Unit: Tm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
01/02/2024	342.65	365.57	22.92	0
03/26/2024	342.24	365.57	23.33	0
06/25/2024	342.23	365.57	23.34	0
09/20/2024	342.37	365.57	23.20	0

FO-01-Shallow Watermaster No. 115 Northern Inland

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
01/02/2024	203.91	362.61	158.70	0
03/26/2024	204.07	362.61	158.54	0
06/25/2024	204.1	362.61	158.51	0
09/20/2024	204.11	362.61	158.50	0

FO-03-Deep Watermaster No. 127 Southern Inland

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/05/2023	637.67	774.74	137.07	0
10/05/2023	637.67	774.74	137.07	0
01/02/2024	637.72	774.74	137.02	0
03/25/2024	637.34	774.74	137.40	0
06/25/2024	637.57	774.74	137.17	0
09/23/2024	637.7	774.74	137.04	0

FO-04-Deep (W) Watermaster No. 130 Southern Inland

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	117.55	167.44	49.89	0
11/29/2023	117.2	167.44	50.24	0
12/28/2023	116.94	167.44	50.50	0
01/29/2024	116.73	167.44	50.71	0
02/29/2024	117.08	167.44	50.36	0
03/29/2024	116.67	167.44	50.77	0
05/02/2024	116.4	167.44	51.04	0
06/04/2024	116.34	167.44	51.10	0
07/02/2024	116.8	167.44	50.64	0
07/29/2024	116.15	167.44	51.29	0
08/27/2024	115.8	167.44	51.64	0
10/02/2024	115.42	167.44	52.02	0

FO-04-Shallow (E) Watermaster No. 129 Southern Inland

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	117.35	168.23	50.88	0
11/29/2023	116.7	168.23	51.53	0
12/28/2023	116.19	168.23	52.04	0
01/29/2024	116.32	168.23	51.91	0
02/29/2024	116.87	168.23	51.36	0
03/29/2024	115.84	168.23	52.39	0
05/02/2024	115.58	168.23	52.65	0

06/04/2024	115.62	168.23	52.61	0
07/02/2024	115.12	168.23	53.11	0
07/29/2024	115.48	168.23	52.75	0
08/27/2024	114.97	168.23	53.26	0
10/02/2024	114.52	168.23	53.71	0

FO-05-Deep Watermaster No. 132 Southern Inland

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/03/2023	324.67	479.29	154.62	
10/03/2023	324.67	479.29	154.62	0
01/02/2024	322.78	479.29	156.51	0
03/25/2024	321.64	479.29	157.65	0
06/25/2024	324.32	479.29	154.97	0
09/18/2024	325	479.29	154.29	

FO-05-Shallow Watermaster No. 131 Southern Inland

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/03/2023	257.43	478.97	221.54	0
10/03/2023	257.43	478.97	221.54	0
01/02/2024	254.57	478.97	224.40	0
03/25/2024	253.82	478.97	225.15	0
06/25/2024	257.73	478.97	221.24	0
09/18/2024	258.85	478.97	220.12	

FO-06-Deep

Watermaster No. 134

Southern Inland

Owner: MPWMD

Aquifer Unit: Tsm

Well Type: Monitor

All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/04/2023	235.61	470.63	235.02	0
10/04/2023	235.61	470.63	235.02	0
01/02/2024	233.98	470.63	236.65	0
03/25/2024	232.67	470.63	237.96	0
06/25/2024	234.52	470.63	236.11	0
09/20/2024	235.15	470.63	235.48	0

FO-06-Shallow

Watermaster No. 133

Southern Inland

Owner: MPWMD

Aquifer Unit: QTc

Well Type: Monitor

All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/04/2023	243.91	470.13	226.22	0
10/04/2023	243.91	470.13	226.22	0
01/02/2024	242.82	470.13	227.31	0
03/25/2024	242.41	470.13	227.72	0
06/25/2024	243.99	470.13	226.14	0
09/20/2024	244.46	470.13	225.67	0

FO-07-Deep

Watermaster No. 119

Northern Inland

Owner: MPWMD

Aquifer Unit: Tsm

Well Type: Monitor

All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2023	492.7	470.15	-22.55	
11/30/2023	492.11	470.15	-21.96	0
12/28/2023	487.78	470.15	-17.63	0
01/30/2024	484.44	470.15	-14.29	

02/28/2024	477.54	470.15	-7.39	0
03/28/2024	477.63	470.15	-7.48	0
04/29/2024	477.23	470.15	-7.08	
05/29/2024	477.92	470.15	-7.77	
06/26/2024	484.42	470.15	-14.27	0
07/25/2024	487.47	470.15	-17.32	0
08/23/2024	487.71	470.15	-17.56	0
09/30/2024	486.24	470.15	-16.09	0

FO-07-Shallow Watermaster No. 118 Northern Inland

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2023	464.22	473.44	9.22	
11/30/2023	464.05	473.44	9.39	0
12/28/2023	463.93	473.44	9.51	
01/30/2024	463.4	473.44	10.04	
02/28/2024	463.04	473.44	10.40	0
03/28/2024	462.79	473.44	10.65	0
04/29/2024	462.57	473.44	10.87	
05/29/2024	462.46	473.44	10.98	0
06/26/2024	462.38	473.44	11.06	0
07/25/2024	463.03	473.44	10.41	0
08/26/2024	463.3	473.44	10.14	
09/30/2024	463.18	473.44	10.26	0

FO-08-Deep Watermaster No. 121 Northern Inland

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2023				
11/29/2023				
02/02/2024	391.49	378.1	-13.39	
03/01/2024	386.9	378.1	-8.80	0
04/05/2024	386.5	378.1	-8.40	0
05/03/2024	387.19	378.1	-9.09	
06/04/2024	389.17	378.1	-11.07	0
06/27/2024	392.51	378.1	-14.41	0
07/25/2024	394.76	378.1	-16.66	0
09/09/2024	395.1	378.1	-17.00	
10/02/2024	395.03	378.1	-16.93	0

FO-08-Shallow Watermaster No. 120 Northern Inland

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2023				
11/29/2023				
02/02/2024	384.3	378.04	-6.26	0
03/01/2024	383.74	378.04	-5.70	0
04/05/2024	383.3	378.04	-5.26	0
05/03/2024	383.35	378.04	-5.31	0
06/04/2024	383.96	378.04	-5.92	0
06/27/2024	384.39	378.04	-6.35	0

07/25/2024	385.25	378.04	-7.21	0
09/09/2024	385.65	378.04	-7.61	0
10/02/2024	385.65	378.04	-7.61	0

FO09(S)2023 Watermaster No. 331

Owner: Aquifer Unit:

Well Type: All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/30/2023	164.8	168	3.20	
12/29/2023	164.24	168	3.76	0
01/31/2024	163.72	168	4.28	0
02/28/2024	163.36	168	4.64	0
03/28/2024	163.03	168	4.97	0
05/01/2024	162.7	168	5.30	0
06/04/2024	162.47	168	5.53	0
06/27/2024	162.75	168	5.25	0
07/25/2024	162.89	168	5.11	
08/27/2024	163.16	168	4.84	
09/27/2024	163.33	168	4.67	0

FO-09-Deep Watermaster No. 112 Northern Coastal

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	144.71	118.85	-25.86	
11/30/2023	142.85	118.85	-24.00	
12/29/2023	139.8	118.85	-20.95	
01/31/2024	135.58	118.85	-16.73	
02/28/2024	129.65	118.85	-10.80	

03/28/2024	129.3	118.85	-10.45	
05/01/2024	128.95	118.85	-10.10	
06/04/2024	131.68	118.85	-12.83	0
06/27/2024	135.25	118.85	-16.40	
07/25/2024	137.47	118.85	-18.62	0
08/27/2024	139.52	118.85	-20.67	
09/27/2024	138.36	118.85	-19.51	0

FO-10-Deep Watermaster No. 114 Northern Coastal

Owner: MPWMD Aquifer Unit: Tp

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2023	214.95	201.03	-13.92	0
11/30/2023	213.97	201.03	-12.94	0
12/29/2023	212.61	201.03	-11.58	0
01/29/2024	211.26	201.03	-10.23	0
02/28/2024	210.17	201.03	-9.14	0
03/28/2024	209.82	201.03	-8.79	0
05/01/2024	210.1	201.03	-9.07	0
05/29/2024	211.29	201.03	-10.26	0
06/27/2024	213.44	201.03	-12.41	0
07/25/2024	213.55	201.03	-12.52	0
08/26/2024	214.21	201.03	-13.18	0
09/27/2024	214.49	201.03	-13.46	0

FO-10-Shallow Watermaster No. 113 Northern Coastal

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2023	215.1	200.85	-14.25	0
11/30/2023	214.15	200.85	-13.30	0
12/29/2023	212.77	200.85	-11.92	0
01/29/2024	211.73	200.85	-10.88	0
02/28/2024	210.99	200.85	-10.14	0
03/28/2024	210.77	200.85	-9.92	0
05/01/2024	211.06	200.85	-10.21	0
05/29/2024	212.37	200.85	-11.52	0
06/27/2024	210.6	200.85	-9.75	0
07/25/2024	214.37	200.85	-13.52	0
08/26/2024	215.05	200.85	-14.20	0
09/27/2024	215.3	200.85	-14.45	0

FO-11-Deep Watermaster No. 123 Northern Inland

Owner: MPWMD Aquifer Unit: Tp

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2023	348.27	332.96	-15.31	0
11/30/2023	346.52	332.96	-13.56	0
12/29/2023	345.03	332.96	-12.07	0
01/29/2024	343.45	332.96	-10.49	0
02/28/2024	342.45	332.96	-9.49	0
03/28/2024	342.53	332.96	-9.57	0
05/01/2024	342.65	332.96	-9.69	0

06/04/2024	344.6	332.96	-11.64	0
06/27/2024	345.72	332.96	-12.76	0
07/25/2024	347.46	332.96	-14.50	0
08/26/2024	347.93	332.96	-14.97	0
09/30/2024	347.93	332.96	-14.97	0

FO-11-Shallow Watermaster No. 122 Northern Inland

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2023	366.82	332.93	-33.89	0
11/30/2023	365.92	332.93	-32.99	0
12/29/2023	364.29	332.93	-31.36	0
01/29/2024	362.41	332.93	-29.48	0
02/28/2024	361.4	332.93	-28.47	0
03/28/2024	361.07	332.93	-28.14	0
05/01/2024	361.83	332.93	-28.90	0
06/04/2024	363.99	332.93	-31.06	0
06/27/2024	365.37	332.93	-32.44	0
07/25/2024	366.97	332.93	-34.04	0
08/26/2024	368.18	332.93	-35.25	0
09/30/2024	368.29	332.93	-35.36	0

Hilby MGT Watermaster No. 244 Southern Coastal

Owner: California American Water Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	243	248.04	5.04	0
11/30/2023	242	248.04	6.04	0

12/28/2023	242	248.04	6.04	0
01/25/2024	252.1	248.04	-4.06	
02/06/2024	249.9	248.04	-1.86	0
02/29/2024	254	248.04	-5.96	
03/28/2024	243	248.04	5.04	
04/25/2024	249.5	248.04	-1.46	
05/03/2024	249.87	248.04	-1.83	
05/30/2024	249	248.04	-0.96	
06/27/2024	250	248.04	-1.96	
07/25/2024	249	248.04	-0.96	
08/29/2024	245	248.04	3.04	
09/26/2024	242	248.04	6.04	

Justin Court Watermaster No. 135 Southern Inland

Owner: California American Water Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
01/02/2024	142.78	240.28	97.50	0
03/26/2024	142.79	240.28	97.49	0
06/25/2024	142.69	240.28	97.59	0
09/23/2024	142.5	240.28	97.78	0

K-Mart Watermaster No. 125 Southern Coastal

Owner: MPWMD Aquifer Unit: Qod/Qar

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	21.86	30.65	8.79	0
11/29/2023	21.84	30.65	8.81	0
12/29/2023	21.6	30.65	9.05	0

01/29/2024	21.33	30.65	9.32	0
02/29/2024	20.88	30.65	9.77	0
03/28/2024	21	30.65	9.65	0
04/30/2024	21.15	30.65	9.50	0
06/04/2024	21.3	30.65	9.35	0
07/02/2024	21.5	30.65	9.15	0
07/29/2024	21.7	30.65	8.95	
09/03/2024	22.01	30.65	8.64	0
10/02/2024	22.1	30.65	8.55	0

LS No. 1 Subdivision Watermaster No. 142 Southern Inland

Owner: Laguna Seca Resorts Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
01/02/2024	142.69	277.13	134.44	0
03/26/2024	139.27	277.13	137.86	0
06/25/2024	138.31	277.13	138.82	0
09/20/2024	138.76	277.13	138.37	0

LS Pistol Range Watermaster No. 136 Southern Inland

Owner: County of Monterey Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/04/2023	288.95	514.39	225.44	0
10/04/2023	288.95	514.39	225.44	0
01/02/2024	287.66	514.39	226.73	0
03/25/2024	287.11	514.39	227.28	0
06/25/2024	286.82	514.39	227.57	0
09/20/2024	286.6	514.39	227.79	

Luxton Watermaster No. 243 Northern Coastal

Owner: California American Water Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	90.9	89.12	-1.78	0
11/30/2023	94	89.12	-4.88	0
12/28/2023	93.8	89.12	-4.68	0
01/25/2024	96	89.12	-6.88	
02/06/2024	94.28	89.12	-5.16	0
02/29/2024	95	89.12	-5.88	
03/28/2024	94	89.12	-4.88	
04/25/2024	94	89.12	-4.88	
05/03/2024	90.45	89.12	-1.33	
05/30/2024	90	89.12	-0.88	
06/27/2024	90	89.12	-0.88	
07/25/2024	90	89.12	-0.88	
08/29/2024	91	89.12	-1.88	
09/26/2024	92	89.12	-2.88	

Luzern #2 Watermaster No. 159 Northern Coastal

Owner: California American Water Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	196.8	156.99	-39.81	0
11/30/2023	197	156.99	-40.01	0
12/28/2023	196.8	156.99	-39.81	0
01/25/2024	192.8	156.99	-35.81	
02/29/2024	176	156.99	-19.01	

03/28/2024	177	156.99	-20.01
04/25/2024	169.5	156.99	-12.51
05/30/2024	188	156.99	-31.01
06/27/2024	170.4	156.99	-13.41
07/25/2024	188.3	156.99	-31.31
08/29/2024	192	156.99	-35.01
09/26/2024	176	156.99	-19.01

Military Watermaster No. 151 Northern Coastal

Owner: California American Water Aquifer Unit: QTc

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	157.7	135.8	-21.90	0
11/30/2023	162	135.8	-26.20	0
12/28/2023	161.8	135.8	-26.00	0
01/25/2024	161.4	135.8	-25.60	
02/06/2024	155.87	135.8	-20.07	0
02/29/2024	160	135.8	-24.20	
03/28/2024	164	135.8	-28.20	
04/25/2024	149.2	135.8	-13.40	
05/03/2024	148.59	135.8	-12.79	
05/30/2024	150	135.8	-14.20	
06/27/2024	150	135.8	-14.20	
07/25/2024	150	135.8	-14.20	
08/29/2024	152	135.8	-16.20	
09/26/2024	154	135.8	-18.20	

MMP monitor Watermaster No. 154 Northern Coastal

Owner: Mission Memorial Park Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
11/02/2023	344.16	315.42	-28.74	
11/29/2023	341.48	315.42	-26.06	
12/28/2023	338.61	315.42	-23.19	
01/26/2024	329.02	315.42	-13.60	
02/28/2024	317.51	315.42	-2.09	
03/29/2024	316.22	315.42	-0.80	
05/03/2024				
06/27/2024				
07/25/2024		315.42		
08/27/2024		315.42		
09/16/2024	333.32	315.42	-17.90	
09/30/2024	331.66	315.42	-16.24	

MSC - Shallow Watermaster No. 101 Northern Coastal

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	79.23	80.1	0.87	0
11/28/2023	78.82	80.1	1.28	0
12/28/2023	77.83	80.1	2.27	0
01/29/2024	77.84	80.1	2.26	0
02/28/2024	77.79	80.1	2.31	0
03/29/2024	78.12	80.1	1.98	0
04/30/2024	78.08	80.1	2.02	0

06/04/2024	77.26	80.1	2.84	0
07/02/2024	77.9	80.1	2.20	0
08/02/2024	78.05	80.1	2.05	0
08/27/2024	77.36	80.1	2.74	0
09/27/2024	78.51	80.1	1.59	0

MSC-Deep Watermaster No. 102 Northern Coastal

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	102.2	80.29	-21.91	0
11/28/2023	99.08	80.29	-18.79	0
12/28/2023	97.97	80.29	-17.68	0
01/29/2024	94.55	80.29	-14.26	0
02/28/2024	90.86	80.29	-10.57	0
03/29/2024	90.05	80.29	-9.76	0
04/30/2024	89.6	80.29	-9.31	
06/04/2024	90.63	80.29	-10.34	0
07/02/2024	94.05	80.29	-13.76	0
08/02/2024	96.36	80.29	-16.07	0
08/27/2024	96.55	80.29	-16.26	
09/27/2024	96.97	80.29	-16.68	0

MW-BW-08-A Watermaster No. 240 Southern Coastal

Owner: U.S.A. Fort Ord Aquifer Unit: Qod/Qar

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	60.8	205.18	144.38	0
11/29/2023	60.79	205.18	144.39	0

12/28/2023	60.89	205.18	144.29	0
01/26/2024	60.87	205.18	144.31	0
02/28/2024	60.55	205.18	144.63	0
03/29/2024	60.4	205.18	144.78	0
05/02/2024	60.45	205.18	144.73	0
06/05/2024	60.48	205.18	144.70	0
06/27/2024	60.52	205.18	144.66	0
07/25/2024	60.58	205.18	144.60	0
08/27/2024	60.68	205.18	144.50	0
09/30/2024	60.77	205.18	144.41	0

MW-BW-09-180 Watermaster No. 241 Southern Coastal

Owner: U.S.A. Fort Ord

Aquifer Unit: QTc

Well Type: Monitor

All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	210.24	206.22	-4.02	0
11/29/2023	209.82	206.22	-3.60	0
12/28/2023	209.92	206.22	-3.70	0
01/26/2024	209.94	206.22	-3.72	0
02/28/2024	209.63	206.22	-3.41	0
03/29/2024	209.28	206.22	-3.06	0
05/02/2024	209.47	206.22	-3.25	0
06/05/2024	209.27	206.22	-3.05	0
06/27/2024	209.27	206.22	-3.05	0
07/25/2024	209.24	206.22	-3.02	0
08/27/2024	209.09	206.22	-2.87	0
09/30/2024	208.83	206.22	-2.61	0

Ord Grove #2 Watermaster No. 153 Northern Coastal

Owner: California American Water Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	357.1	292.39	-64.71	0
11/30/2023	363	292.39	-70.61	0
12/28/2023	360	292.39	-67.61	0
01/25/2024	352	292.39	-59.61	
02/29/2024	355	292.39	-62.61	
03/28/2024	352	292.39	-59.61	
04/25/2024	352	292.39	-59.61	
05/30/2024	352	292.39	-59.61	
06/27/2024	306	292.39	-13.61	
07/25/2024	356	292.39	-63.61	
08/29/2024	357	292.39	-64.61	
09/26/2024	358	292.39	-65.61	

Ord Grove Test Watermaster No. 107 Northern Coastal

Owner: California American Water Aquifer Unit: QTc/Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2023	334.69	294	-40.69	0
11/29/2023	334.34	294	-40.34	
11/30/2023	326	294	-32.00	0
12/28/2023	332.48	294	-38.48	0
01/25/2024	327.9	294	-33.90	
01/26/2024	326.21	294	-32.21	
02/28/2024	325.72	294	-31.72	0

02/29/2024	325	294	-31.00	
03/28/2024	322	294	-28.00	
03/29/2024	323.7	294	-29.70	0
04/25/2024	322	294	-28.00	
04/30/2024	323.3	294	-29.30	
05/30/2024	319	294	-25.00	
06/04/2024	310.3	294	-16.30	0
06/27/2024	306.82	294	-12.82	0
06/27/2024	321.2	294	-27.20	
07/25/2024	324	294	-30.00	
07/25/2024	326.9	294	-32.90	0
08/27/2024	328.5	294	-34.50	
08/29/2024	327	294	-33.00	
09/26/2024	325	294	-31.00	
09/30/2024	328.05	294	-34.05	0

Ord Terrace-Shallow Watermaster No. 109 Northern Coastal

Owner: MPWMD Aquifer Unit: Tsm (upper)

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/25/2023	257.68	228.65	-29.03	0
11/29/2023	257.44	228.65	-28.79	0
12/28/2023	256.56	228.65	-27.91	0
01/26/2024	250.53	228.65	-21.88	
02/28/2024	248.23	228.65	-19.58	0
03/29/2024	246.26	228.65	-17.61	0
04/30/2024	245.45	228.65	-16.80	
06/04/2024	245.46	228.65	-16.81	0

06/27/2024	243.33	228.65	-14.68	0
07/25/2024	249.06	228.65	-20.41	0
08/27/2024	251.52	228.65	-22.87	
09/30/2024	251.32	228.65	-22.67	0

Paddock 16 Watermaster No. 102882

Owner: Aquifer Unit:

Well Type: All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/30/2023	236.47	352.69	116.22	
12/04/2023	221.1	352.69	131.59	
01/02/2024	216.22	352.69	136.47	
01/31/2024	213.54	352.69	139.15	
02/29/2024	212.14	352.69	140.55	
04/05/2024	211.45			
06/05/2024	269.3			
07/09/2024	272.15			
08/28/2024	274.4			
10/14/2024	275.64			

Paralta Watermaster No. 169 Northern Coastal

Owner: California American Water Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	361	324.49	-36.51	0
11/30/2023	361	324.49	-36.51	0
12/28/2023	361	324.49	-36.51	0
01/25/2024	350	324.49	-25.51	
02/29/2024	346	324.49	-21.51	

03/28/2024	348	324.49	-23.51	
04/25/2024	342	324.49	-17.51	
05/30/2024	358	324.49	-33.51	
06/27/2024	361	324.49	-36.51	
07/25/2024	358	324.49	-33.51	
08/29/2024	364	324.49	-39.51	
09/26/2024	361	324.49	-36.51	

Paralta Test Well Watermaster No. 108 Northern Coastal

Owner: MPWMD Aquifer Unit: QTc/Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	363	330.72	-32.28	0
11/29/2023	358	330.72	-27.28	
12/28/2023	364	330.72	-33.28	0
01/25/2024	348	330.72	-17.28	
01/29/2024	353	330.72	-22.28	0
02/28/2024	343	330.72	-12.28	0
02/29/2024	349	330.72	-18.28	
03/28/2024	355	330.72	-24.28	
03/29/2024	348	330.72	-17.28	
04/25/2024	354	330.72	-23.28	
05/02/2024	350	330.72	-19.28	
05/30/2024	353	330.72	-22.28	
06/05/2024	347	330.72	-16.28	
06/27/2024	353	330.72	-22.28	
07/02/2024	353	330.72	-22.28	
07/25/2024	353	330.72	-22.28	

08/06/2024	354	330.72	-23.28	
08/27/2024	353.5	330.72	-22.78	
08/29/2024	353	330.72	-22.28	
09/26/2024	354	330.72	-23.28	
09/30/2024	351	330.72	-20.28	

PCA East Deep Watermaster No. 106 Northern Coastal

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/30/2023	92.51	68.54	-23.97	0
11/30/2023	92.31	68.54	-23.77	0
12/28/2023	89.38	68.54	-20.84	0
01/30/2024	84.95	68.54	-16.41	
02/28/2024	78.7	68.54	-10.16	0
03/29/2024	77.56	68.54	-9.02	0
05/02/2024	77.9	68.54	-9.36	
06/04/2024	80.53	68.54	-11.99	0
06/27/2024	83.64	68.54	-15.10	0
08/01/2024	86.94	68.54	-18.40	0
08/27/2024	87.99	68.54	-19.45	
09/27/2024	86.72	68.54	-18.18	0

PCA-E Shallow Watermaster No. 105 Northern Coastal

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/30/2023	67.19	68.51	1.32	0
11/30/2023	67.05	68.51	1.46	0

12/28/2023	66.3	68.51	2.21	0
01/30/2024	65.9	68.51	2.61	
02/28/2024	65.6	68.51	2.91	0
03/29/2024	65.2	68.51	3.31	0
05/02/2024	65.1	68.51	3.41	
06/04/2024	65.01	68.51	3.50	0
06/27/2024	65.22	68.51	3.29	0
08/01/2024	65.4	68.51	3.11	0
08/27/2024	65.45	68.51	3.06	
09/27/2024	65.61	68.51	2.90	0

PCA-W Deep Watermaster No. 104 Northern Coastal

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	90.02	65.18	-24.84	0
11/29/2023	87.99	65.18	-22.81	0
12/28/2023	85.04	65.18	-19.86	0
01/29/2024	80.56	65.18	-15.38	
02/28/2024	76.48	65.18	-11.30	0
03/29/2024	74.82	65.18	-9.64	0
04/30/2024	74.4	65.18	-9.22	
06/04/2024	76.79	65.18	-11.61	
07/02/2024	82.24	65.18	-17.06	
08/02/2024	83.44	65.18	-18.26	
08/28/2024	84.74	65.18	-19.56	
10/02/2024	84.12	65.18	-18.94	

PCA-W Shallow Watermaster No. 103 Northern Coastal

Owner: MPWMD Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	63.53	64.22	0.69	0
11/29/2023	63.2	64.22	1.02	0
12/28/2023	62.01	64.22	2.21	0
01/29/2024	62	64.22	2.22	0
02/28/2024	61.82	64.22	2.40	0
03/29/2024	61.55	64.22	2.67	
04/30/2024	61.47	64.22	2.75	
06/04/2024	61.25	64.22	2.97	0
07/02/2024	61.49	64.22	2.73	0
08/02/2024	61.96	64.22	2.26	
08/28/2024	62.08	64.22	2.14	0
10/02/2024	62.4	64.22	1.82	0

Playa #3 Watermaster No. 162 Northern Coastal

Owner: California American Water Aquifer Unit: QTc

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	138.2	53.02	-85.18	0
11/30/2023	154	53.02	-100.98	0
12/28/2023	54.9	53.02	-1.88	0
01/25/2024	154.9	53.02	-101.88	
02/29/2024	156	53.02	-102.98	
03/28/2024	54	53.02	-0.98	
04/25/2024	52.6	53.02	0.42	

05/30/2024	154	53.02	-100.98	
06/27/2024	51.2	53.02	1.82	
07/25/2024	51	53.02	2.02	
08/29/2024	51.1	53.02	1.92	
09/26/2024	51	53.02	2.02	

Plumas #4 Watermaster No. 177 Southern Coastal

Owner: California American Water Aquifer Unit: Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	256.8	161.48	-95.32	0
11/30/2023	242	161.48	-80.52	0
12/28/2023	119.6	161.48	41.88	0
01/25/2024	253	161.48	-91.52	
02/29/2024	253	161.48	-91.52	
03/28/2024	118	161.48	43.48	
04/25/2024	117.2	161.48	44.28	
05/30/2024	251	161.48	-89.52	
06/27/2024	116.2	161.48	45.28	
07/25/2024	116.7	161.48	44.78	
08/29/2024	115	161.48	46.48	
09/26/2024	114	161.48	47.48	

Plumas Test 1990 Watermaster No. 124 Southern Coastal

Owner: MPWMD Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	112.18	157.83	45.65	0
11/29/2023	111.43	157.83	46.40	0

12/28/2023	111.39	157.83	46.44	
01/29/2024	111.2	157.83	46.63	
02/28/2024	111.57	157.83	46.26	0
03/29/2024	111.06	157.83	46.77	0
05/02/2024	110.68	157.83	47.15	0
06/05/2024	110.62	157.83	47.21	0
06/27/2024	110.3	157.83	47.53	0
07/29/2024	110.32	157.83	47.51	0
08/27/2024	109.88	157.83	47.95	0
09/30/2024	109.49	157.83	48.34	0

Robley Deep (South) Watermaster No. 140 Southern Inland

Owner: County of Monterey Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/05/2023	401.53	566.44	164.91	0
10/05/2023	401.53	566.44	164.91	0
01/08/2024	398.48	566.44	167.96	0
03/25/2024	310.77	566.44	255.67	
06/25/2024	399.4	566.44	167.04	0
09/18/2024	400.92	566.44	165.52	0

Robley Shallow (North) Watermaster No. 139 Southern Inland

Owner: County of Monterey Aquifer Unit: QTc

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/05/2023	325.56	566.54	240.98	0
10/05/2023	325.56	566.54	240.98	0
01/08/2024	325.69	566.54	240.85	0

03/25/2024	396.66	566.54	169.88	0
06/25/2024	324.76	566.54	241.78	0
09/18/2024	325.1	566.54	241.44	0

Ryan Ranch #11 Watermaster No. 215 Southern Inland

Owner: California American Water Aquifer Unit: Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	156.8	307.59	150.79	0
11/30/2023	158.2	307.59	149.39	0
12/28/2023	156.5	307.59	151.09	0
01/25/2024	154.5	307.59	153.09	
02/29/2024	155.1	307.59	152.49	
03/28/2024	154.4	307.59	153.19	
04/25/2024	154.1	307.59	153.49	

Ryan Ranch #7 Watermaster No. 213 Southern Inland

Owner: California American Water Aquifer Unit: Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	145.1	294	148.90	0
11/30/2023	144.7	294	149.30	0
12/28/2023	144.6	294	149.40	0
01/25/2024	143.9	294	150.10	
02/29/2024	143.5	294	150.50	
03/28/2024	140.9	294	153.10	
04/25/2024	145.1	294	148.90	

Ryan Ranch #8 Watermaster No. 216 Southern Inland

Owner: California American Water Aquifer Unit: Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/26/2023	155.7	306.86	151.16	0
11/30/2023	155.3	306.86	151.56	0
12/28/2023	155.2	306.86	151.66	0
01/25/2024	154.6	306.86	152.26	
02/29/2024	154.1	306.86	152.76	
03/28/2024	152.8	306.86	154.06	
04/25/2024	157.5	306.86	149.36	

Sand City Corp Yard Watermaster No. 165 Southern Coastal

Owner: City of Sand City Aquifer Unit: Qod/Qar/QTc

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	41.89	47.25	5.36	
11/29/2023	42.04	47.25	5.21	
12/29/2023	41.16	47.25	6.09	
01/29/2024	41.18	47.25	6.07	
02/29/2024	41.21	47.25	6.04	
03/29/2024	41.4	47.25	5.85	
04/30/2024	41.7	47.25	5.55	
06/04/2024	41.66	47.25	5.59	
07/02/2024	41.95	47.25	5.30	
07/29/2024	42	47.25	5.25	
09/03/2024	42.28	47.25	4.97	
09/27/2024	42.16	47.25	5.09	

Seaside Muni #3 Watermaster No. 174 Northern Coastal

Owner: City of Seaside Aquifer Unit: QTc, Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2023	263.5	307.19	43.69	0
11/01/2023	264.1	307.19	43.09	
12/01/2023	261.5	307.19	45.69	
01/01/2024	263.5	307.19	43.69	
02/01/2024	263.4	307.19	43.79	
03/01/2024	263	307.19	44.19	
04/01/2024	260	307.19	47.19	
05/01/2024	261	307.19	46.19	
06/01/2024	261	307.19	46.19	
07/01/2024	255	307.19	52.19	
08/01/2024	260	307.19	47.19	
09/01/2024	260	307.19	47.19	

Seaside Muni #4 Watermaster No. 173 Northern Coastal

Owner: City of Seaside Aquifer Unit: QTc, Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/01/2023	267.3	312.12	44.82	
11/01/2023	335.74	312.12	-23.62	
12/01/2023	336.23	312.12	-24.11	
01/01/2024	334.4	312.12	-22.28	
02/01/2024	332.12	312.12	-20.00	
03/01/2024	330	312.12	-17.88	
04/01/2024	327.32	312.12	-15.20	

05/01/2024	328.05	312.12	-15.93	
06/01/2024	328.22	312.12	-16.10	
07/01/2024	333.4	312.12	-21.28	
08/01/2024	331.17	312.12	-19.05	
09/01/2024	357.44	312.12	-45.32	

Seca Place Watermaster No. 138 Southern Inland

Owner: County of Monterey Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/05/2023	271.75	427.58	155.83	0
10/05/2023	271.75	427.58	155.83	0
01/09/2024	268.41	427.58	159.17	0
03/25/2024	266.28	427.58	161.30	0
06/25/2024	269.58	427.58	158.00	0
09/18/2024	272.3	427.58	155.28	0

Sentinel MW #1 Watermaster No. 245 Northern Coastal

Owner: Seaside Groundwater Basin Watermas Aquifer Unit: Tsm/Tp

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/04/2023	122.23	93.03	-29.20	0
10/04/2023	122.23	93.03	-29.20	0
10/25/2023	121.93	93.03	-28.90	
11/16/2023	119.38	93.03	-26.35	
01/30/2024	112.94	93.03	-19.91	0
05/01/2024	107.61	93.03	-14.58	
09/09/2024	117.43	93.03	-24.40	

Sentinel MW #2 Watermaster No. 246 Northern Coastal

Owner: Seaside Groundwater Basin Watermas Aquifer Unit: Tp

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/04/2023	98.14	70.73	-27.41	0
10/04/2023	98.14	70.73	-27.41	0
11/16/2023	94.42	70.73	-23.69	
01/30/2024	88.32	70.73	-17.59	0
05/01/2024	82.7	70.73	-11.97	

Sentinel MW #3 Watermaster No. 247 Northern Coastal

Owner: Seaside Groundwater Basin Watermas Aquifer Unit: Tp

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/04/2023	82.78	56.53	-26.25	0
10/04/2023	82.78	56.53	-26.25	0
11/16/2023	79.5	56.53	-22.97	
01/30/2024	73.25	56.53	-16.72	0
05/01/2024	67.51	56.53	-10.98	

Sentinel MW #4 Watermaster No. 248 Northern Coastal

Owner: Seaside Groundwater Basin Watermas Aquifer Unit: Tsm/Tp

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/04/2023	85.05	59.43	-25.62	0
10/04/2023	85.05	59.43	-25.62	0
11/16/2023	81.95	59.43	-22.52	
01/30/2024	75.44	59.43	-16.01	0
05/01/2024	69.15	59.43	-9.72	

Target Well Watermaster No. 152 Northern Coastal

Owner: DBO Development Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/27/2023	64.64	44.42	-20.22	0
11/30/2023	62.6	44.42	-18.18	0
12/28/2023	61.47	44.42	-17.05	0
01/30/2024	57.8	44.42	-13.38	
02/28/2024	54.05	44.42	-9.63	0
03/27/2024	52.4	44.42	-7.98	0
04/30/2024	52	44.42	-7.58	0
06/04/2024	53.95	44.42	-9.53	0
06/27/2024	56.32	44.42	-11.90	0
08/02/2024	58.8	44.42	-14.38	0
08/26/2024	60	44.42	-15.58	0
10/02/2024	59.53	44.42	-15.11	0

York Rd-West Watermaster No. 137 Southern Inland

Owner: County of Monterey Aquifer Unit: Tsm

Well Type: Monitor All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/04/2023	321.98	490.28	168.30	0
10/04/2023	321.98	490.28	168.30	0
01/02/2024	321.53	490.28	168.75	0
03/25/2024	320.11	490.28	170.17	0
06/25/2024	319.49	490.28	170.79	0
09/20/2024	319.98	490.28	170.30	0

York School 2001 Watermaster No. 212 Southern Inland

Owner: York School Aquifer Unit: QTc/Tsm

Well Type: Producer All Values in Feet

Date Measured	Depth to Water	Reference Point	Water Elevation	Comments
10/06/2023	275.88	384.3	108.42	Meter:361721
10/06/2023	275.88	384.3	108.42	
11/09/2023	221	384.3	163.30	
12/04/2023	265.12	384.3	119.18	
01/02/2024	219.86	384.3	164.44	
01/30/2024	222.94	384.3	161.36	
05/14/2024	224	384.3	160.30	
06/05/2024	275.6	384.3	108.70	
07/03/2024	274.8	384.3	109.50	
07/29/2024	285.2	384.3	99.10	
08/28/2024	220.45	384.3	163.85	
10/14/2024	290.1	384.3	94.20	

MONTGOMERY & ASSOCIATES

Appendix C

Piper Diagrams

Appendix C Contents

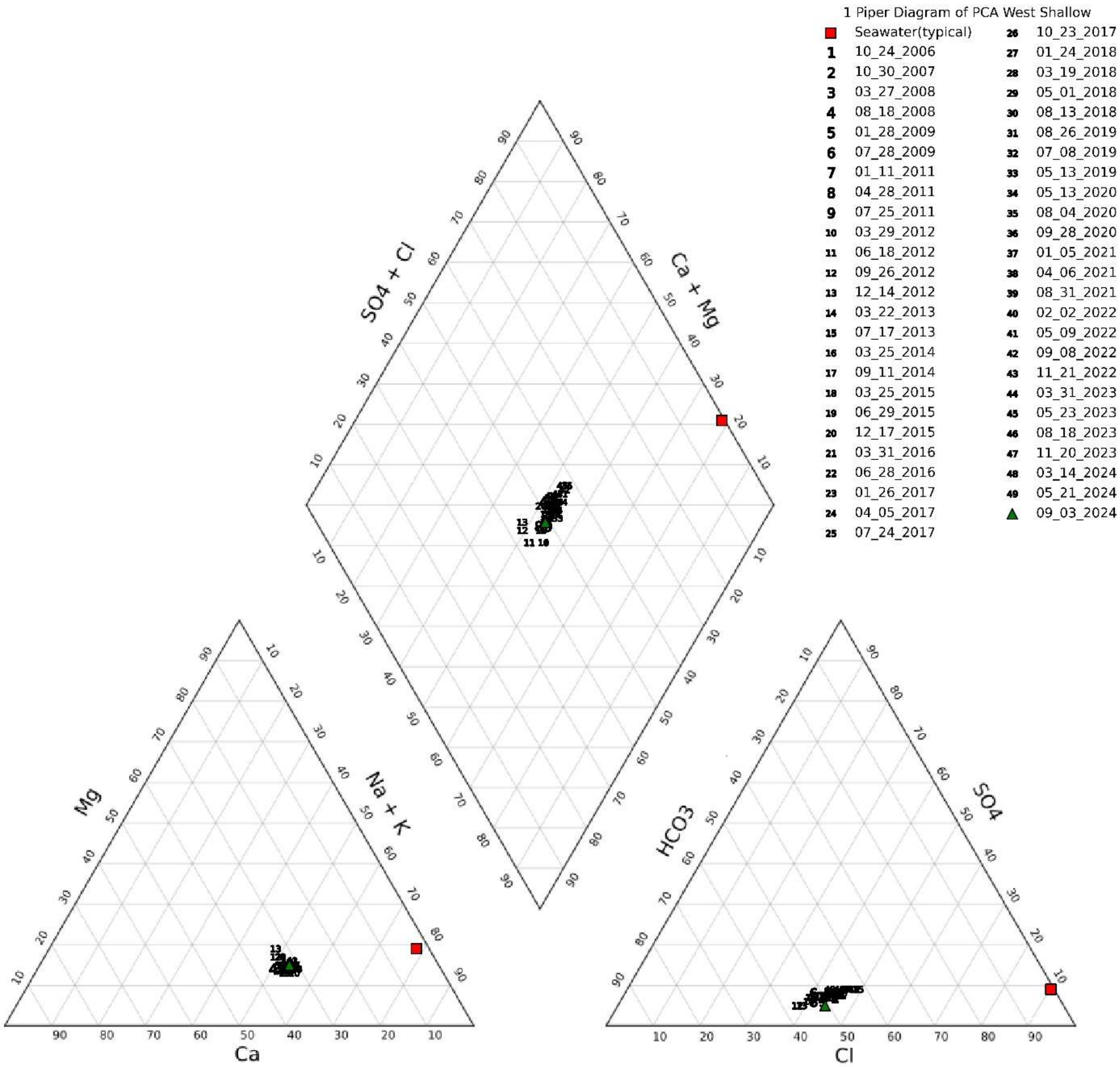


Figure C-1. Piper Diagram of PCA West Shallow

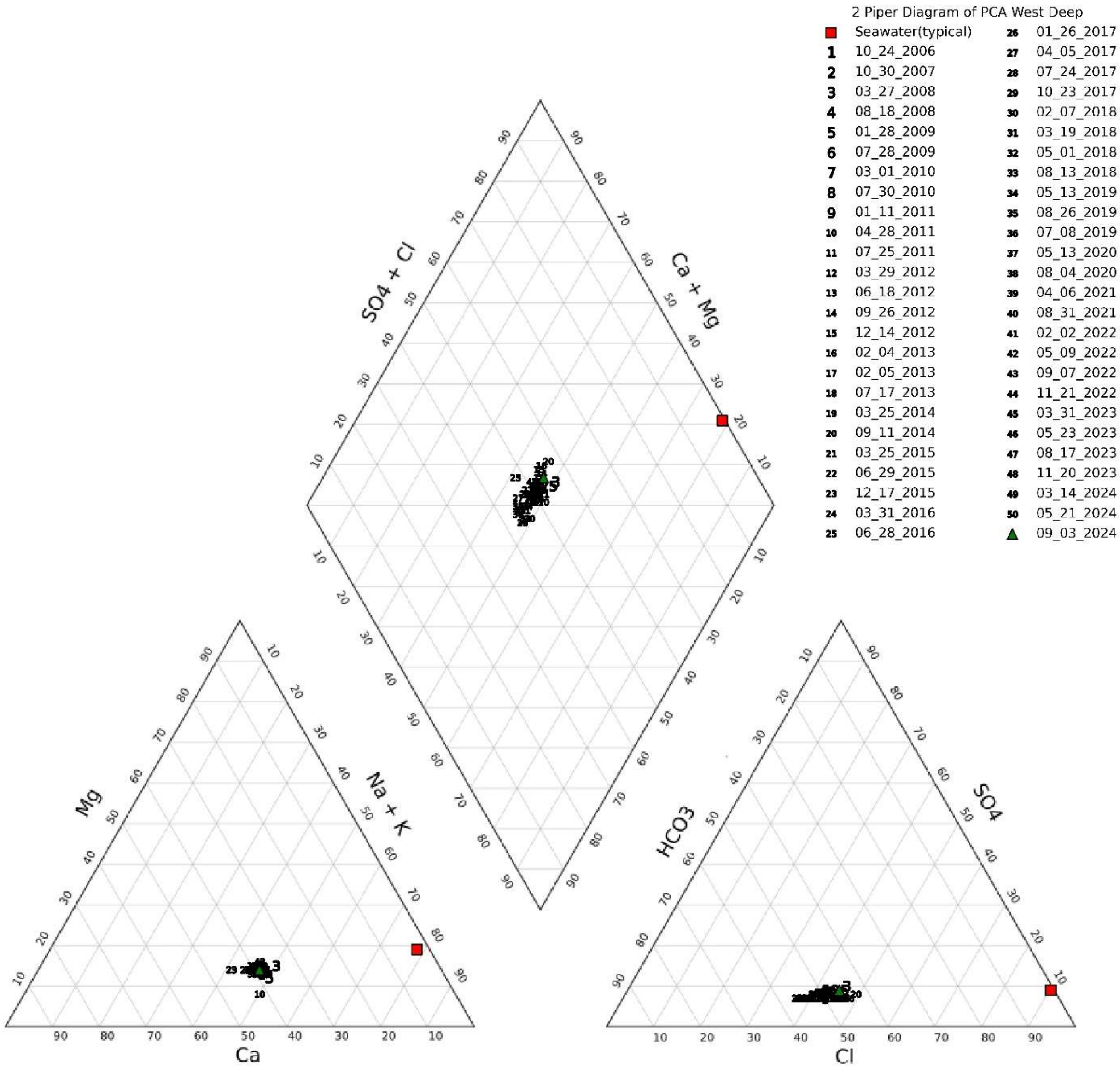


Figure C-2. Piper Diagram of PCA West Deep

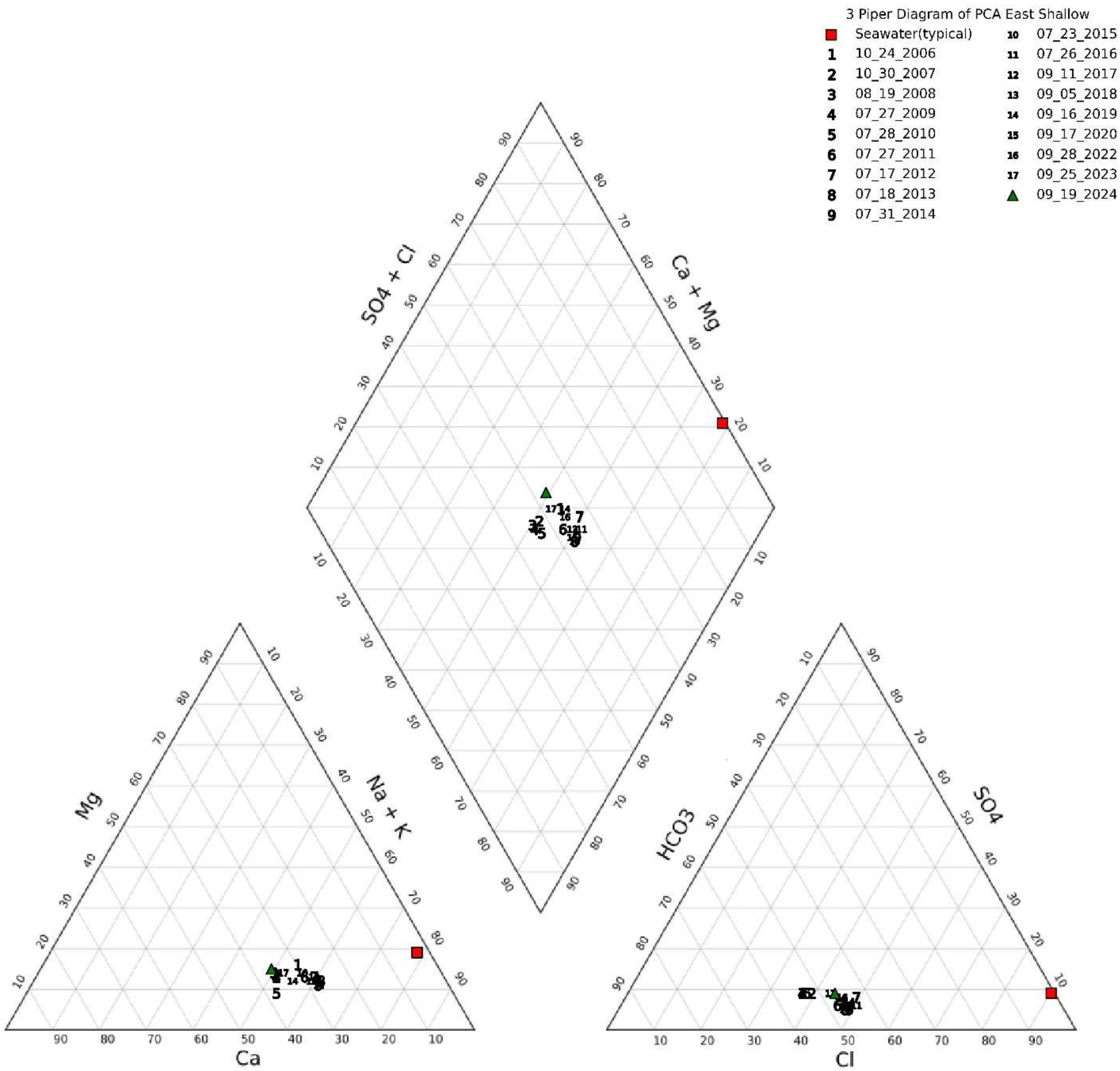


Figure C-3. Piper Diagram of PCA East Shallow

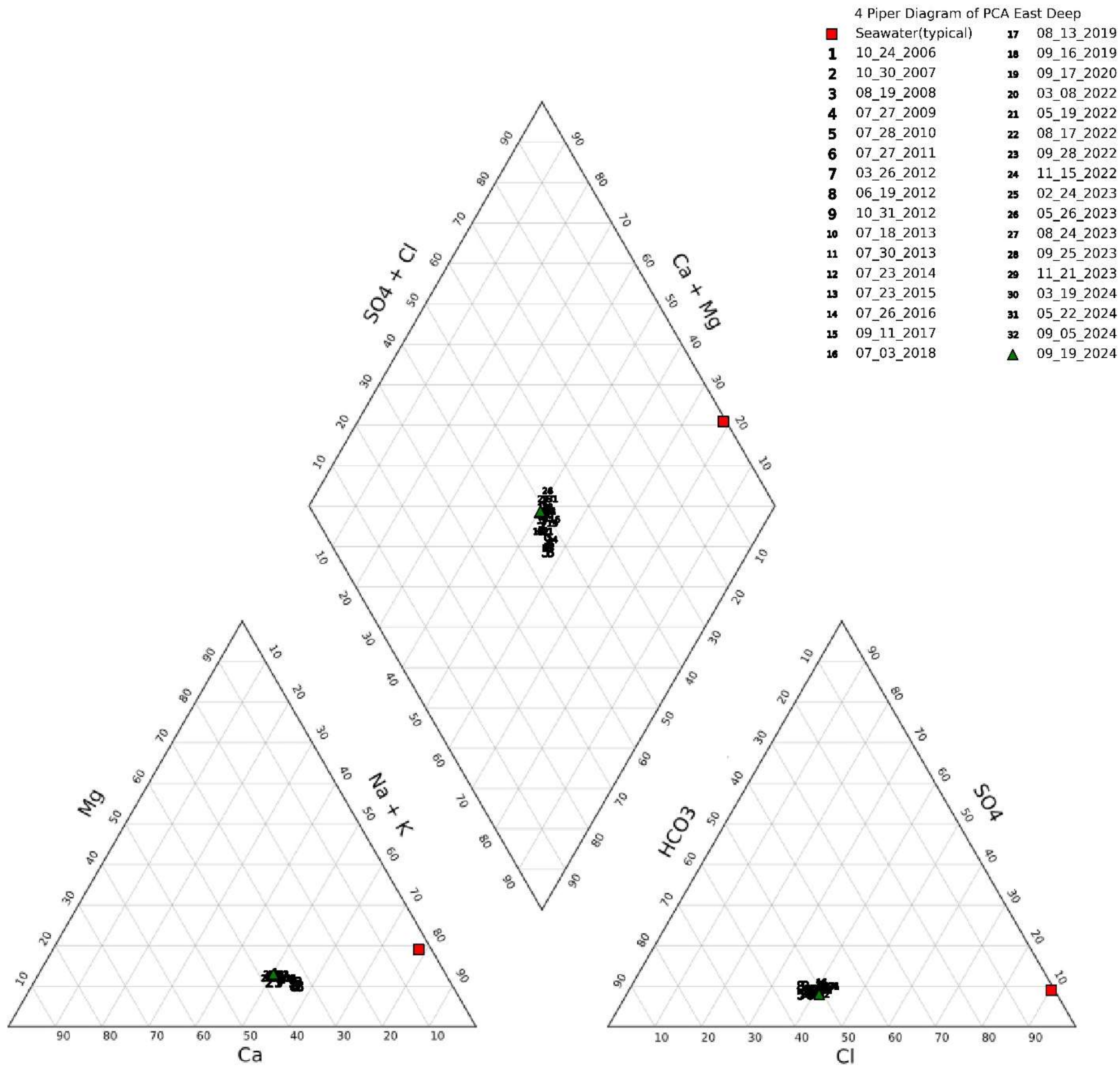


Figure C-4. Piper Diagram of PCA East Deep

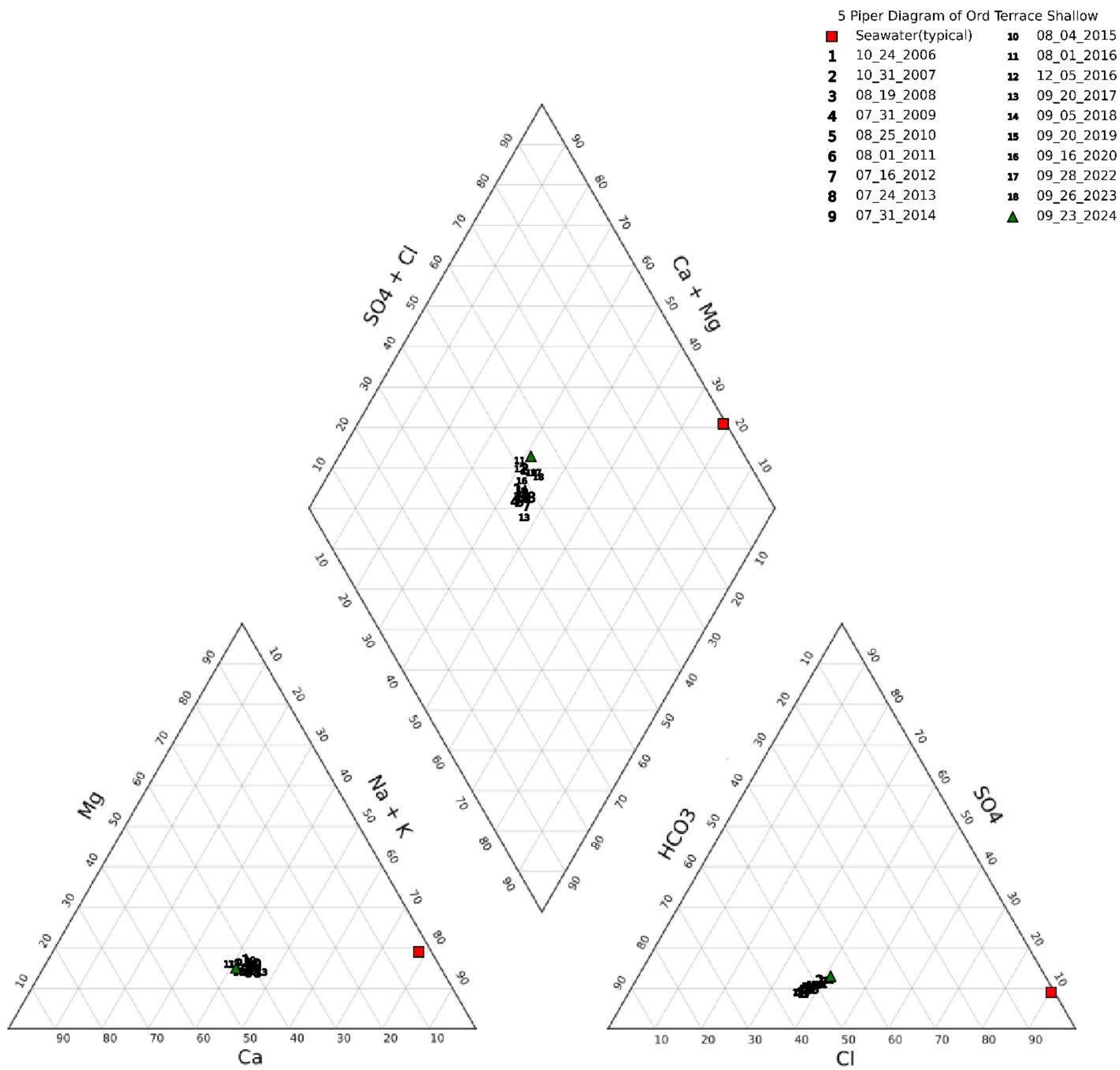


Figure C-5. Piper Diagram of Ord Terrace Shallow

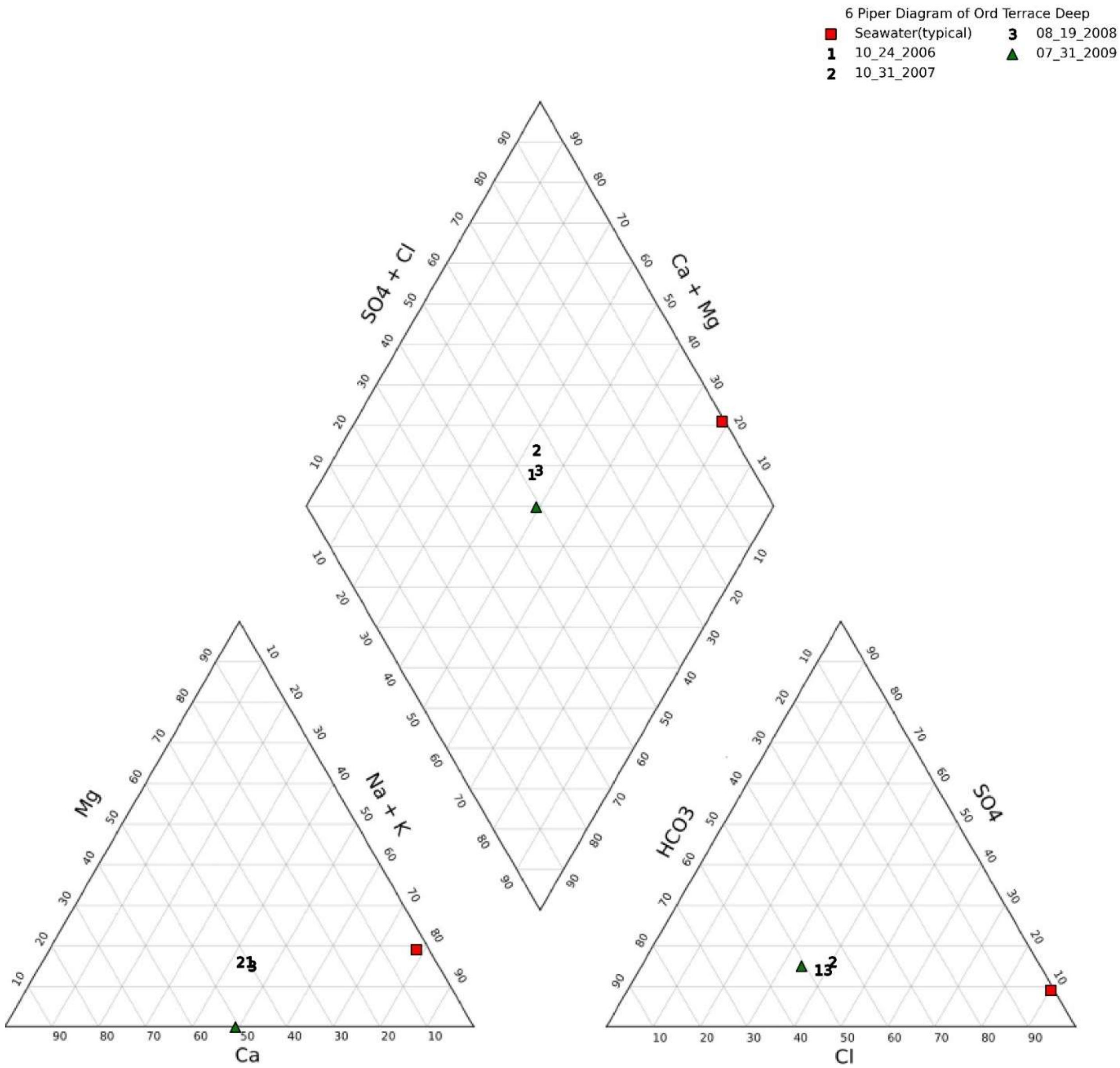


Figure C-6. Piper Diagram of Ord Terrace Deep

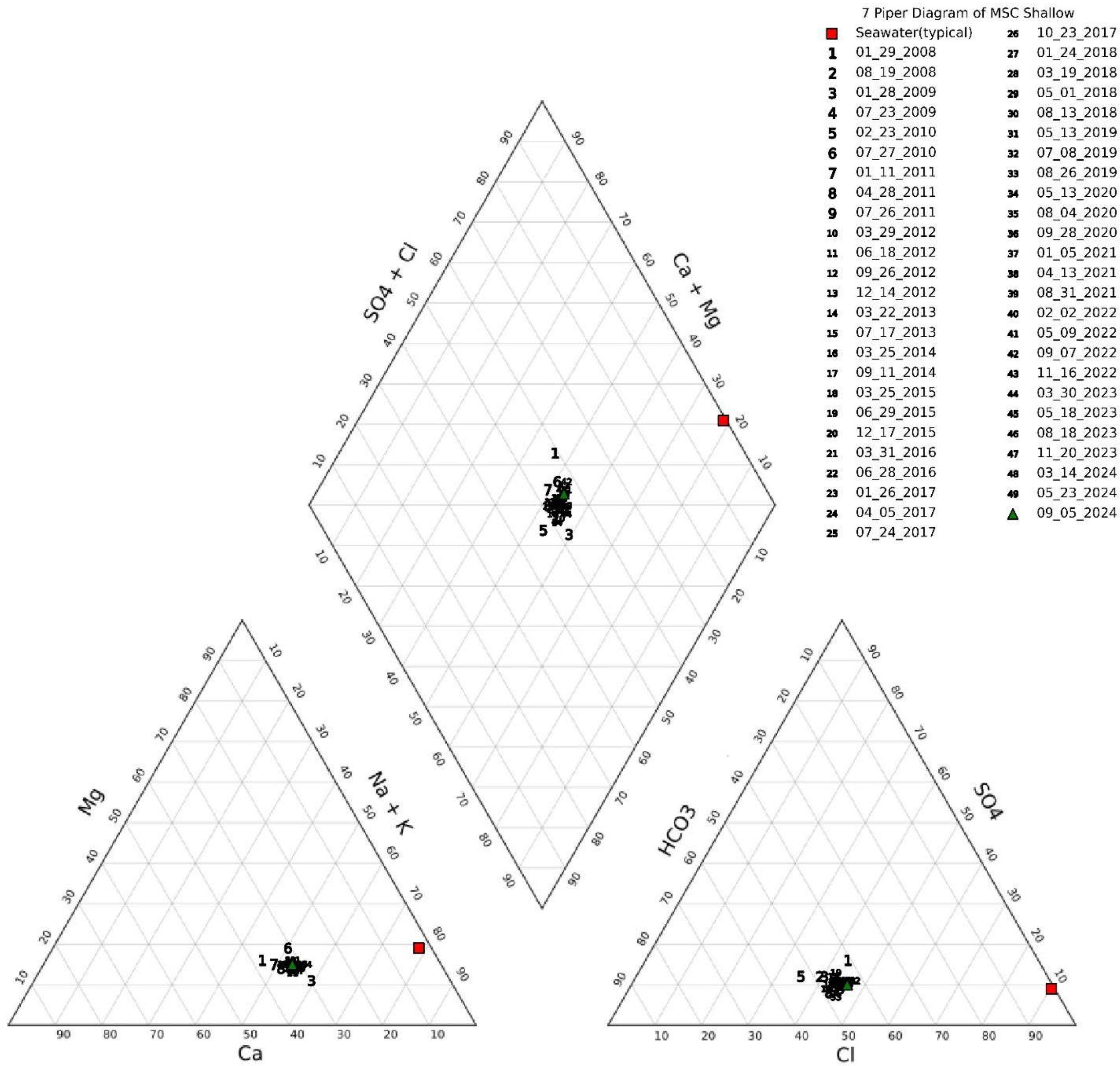


Figure C-7. Piper Diagram of MSC Shallow

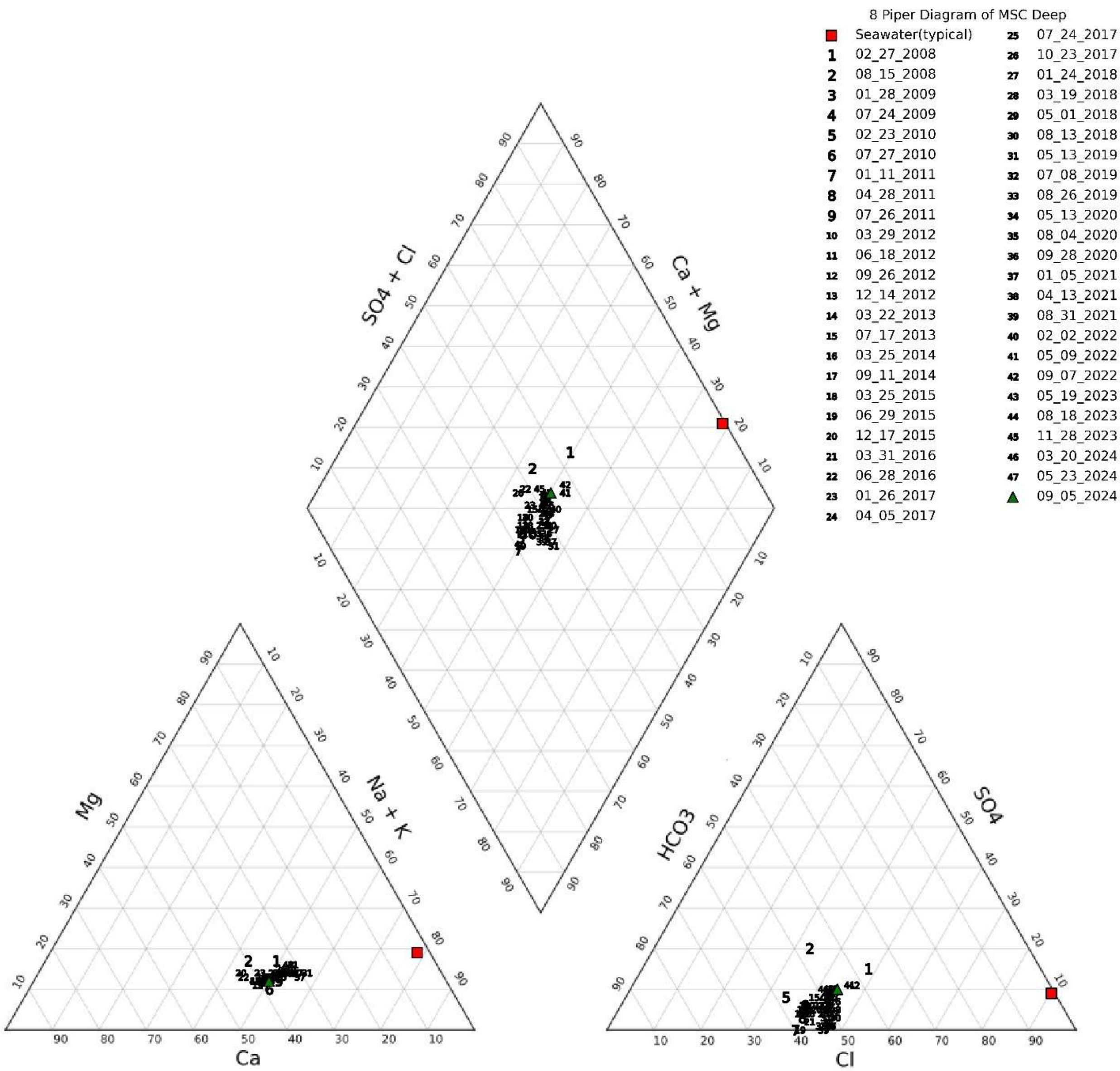


Figure C-8. Piper Diagram of MSC Deep

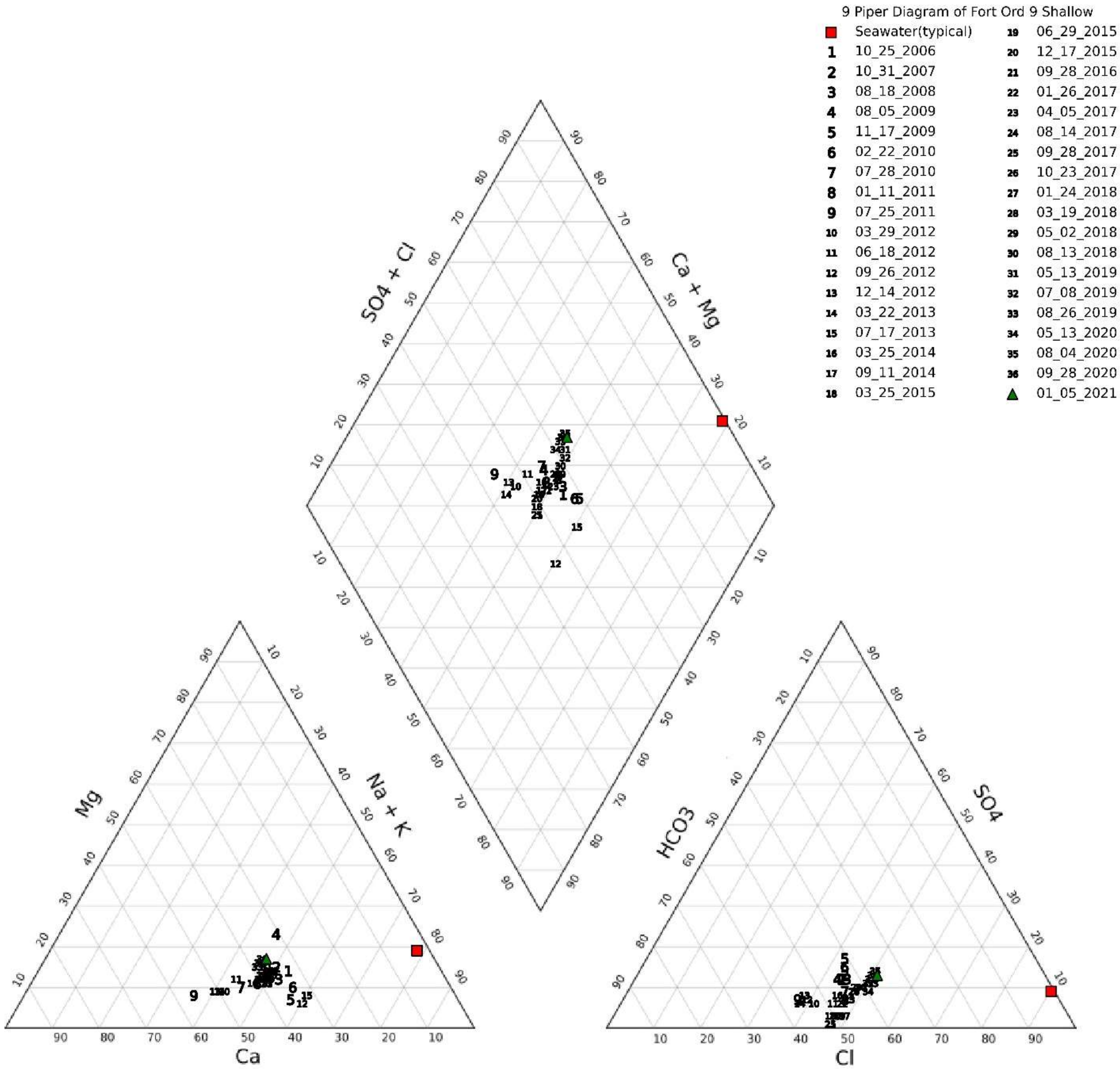


Figure C-9. Piper Diagram of Fort Ord 9 Shallow

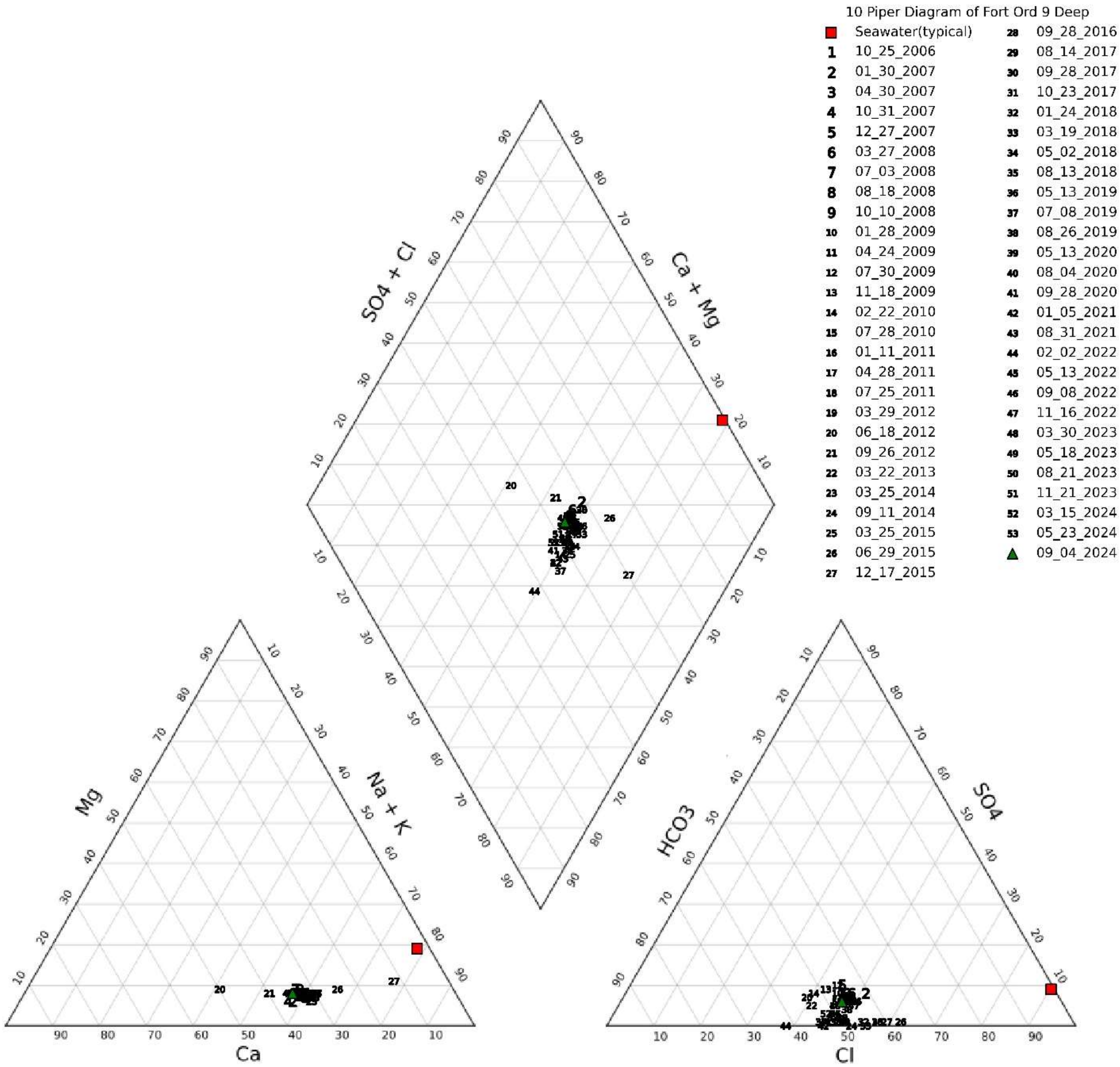


Figure C-10. Piper Diagram of Fort Ord 9 Deep

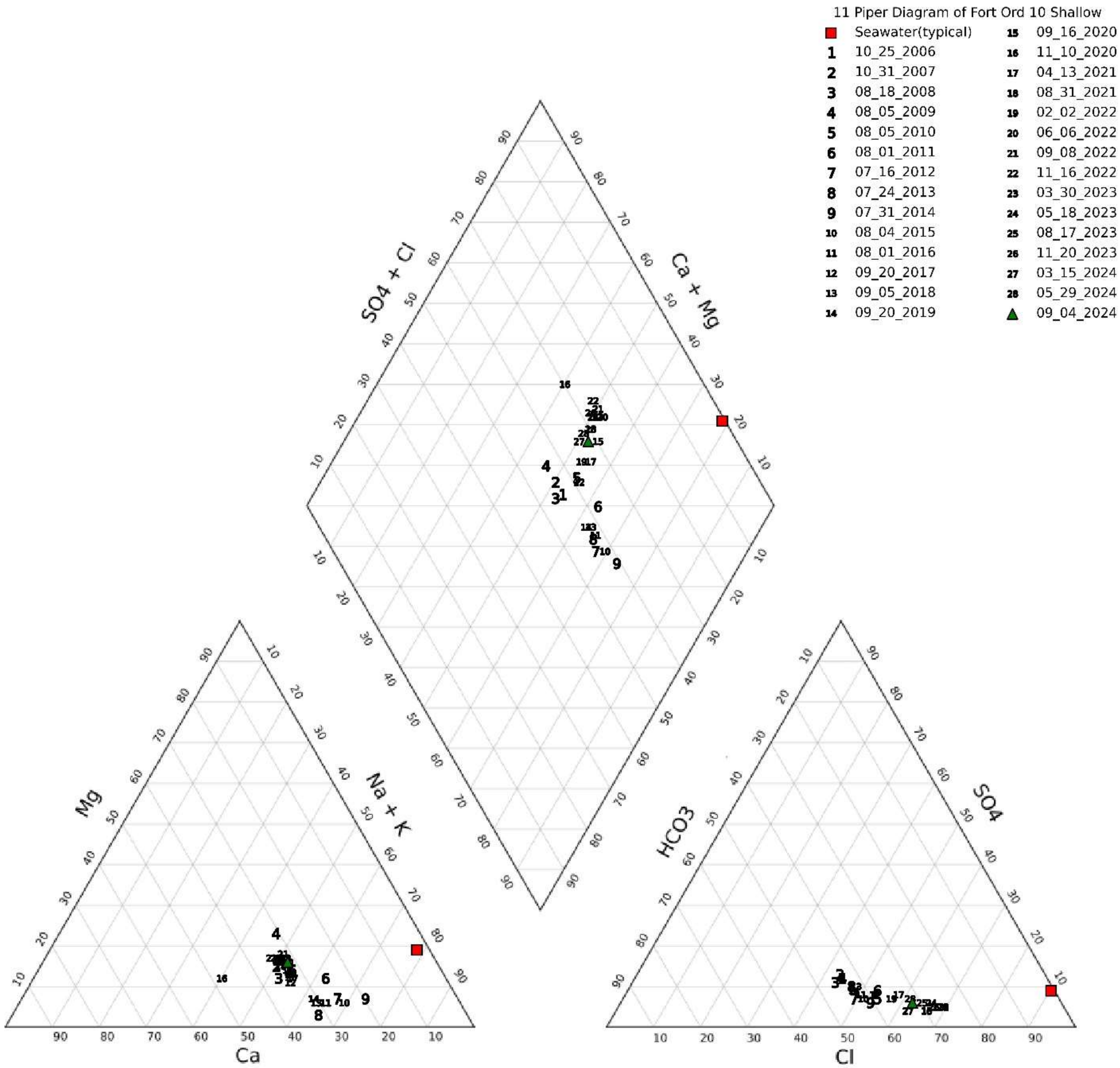


Figure C-11. Piper Diagram of Fort Ord 10 Shallow

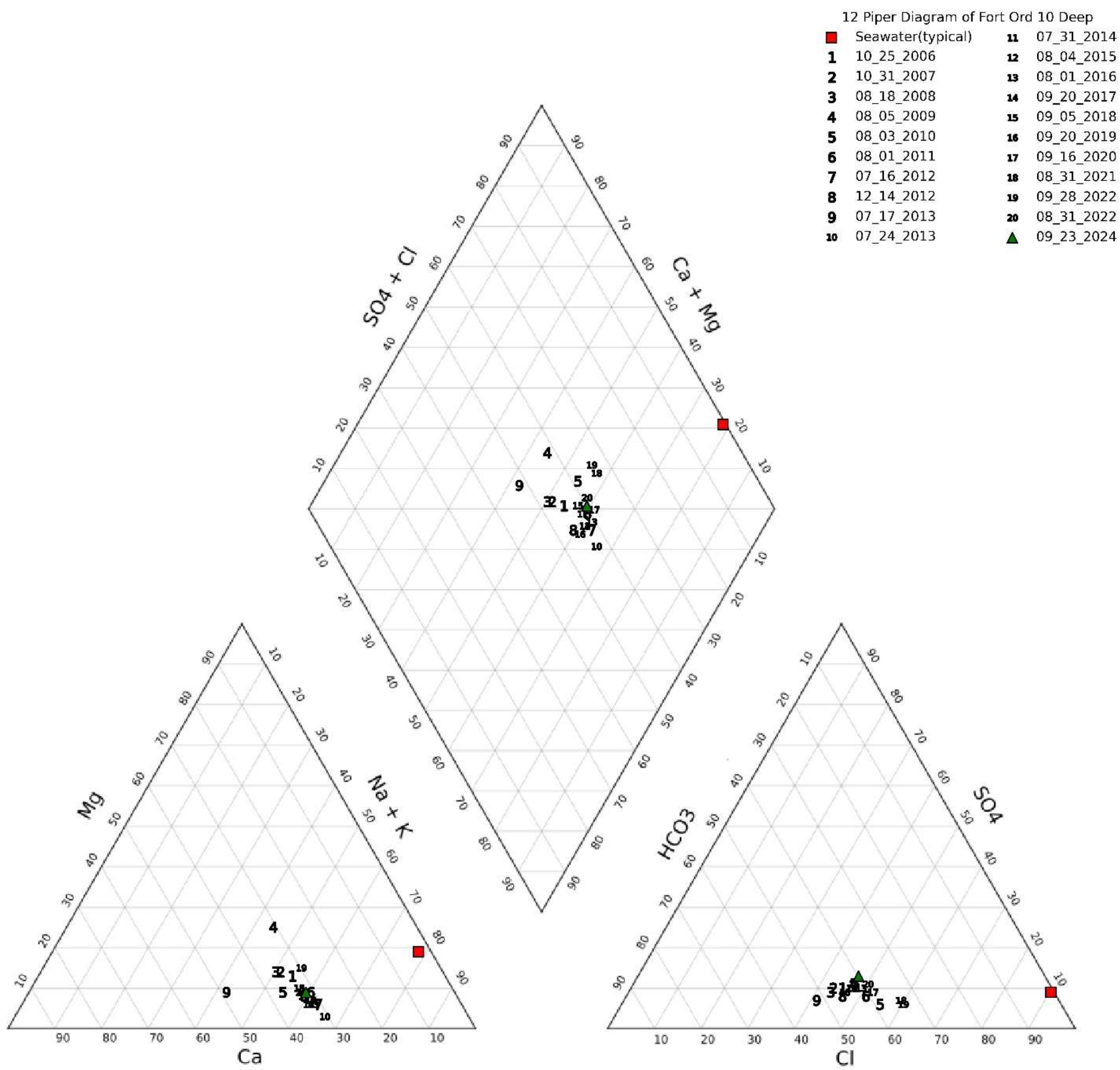


Figure C-12. Piper Diagram of Fort Ord 10 Deep

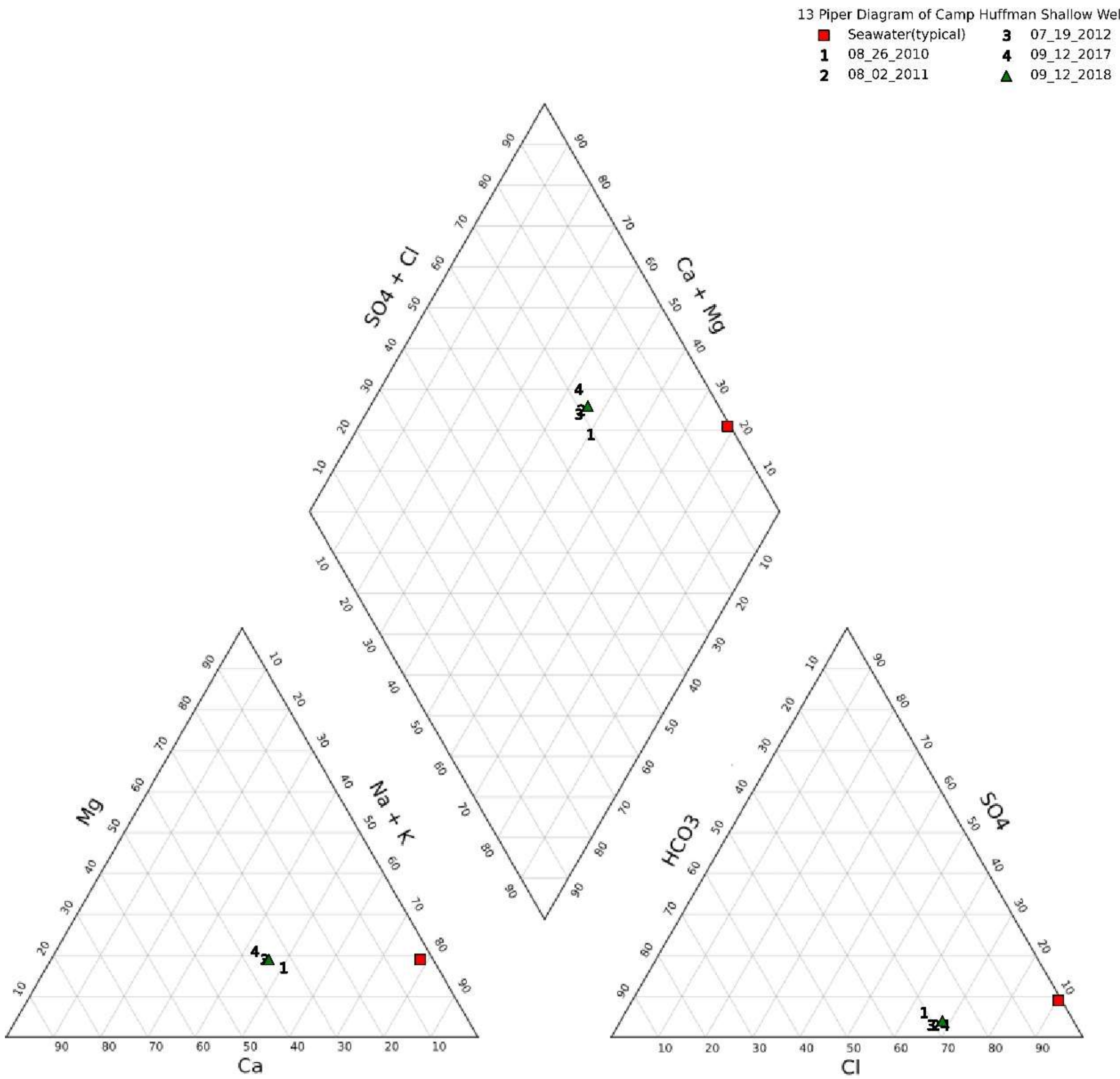


Figure C-13. Piper Diagram of Camp Huffman Shallow Well

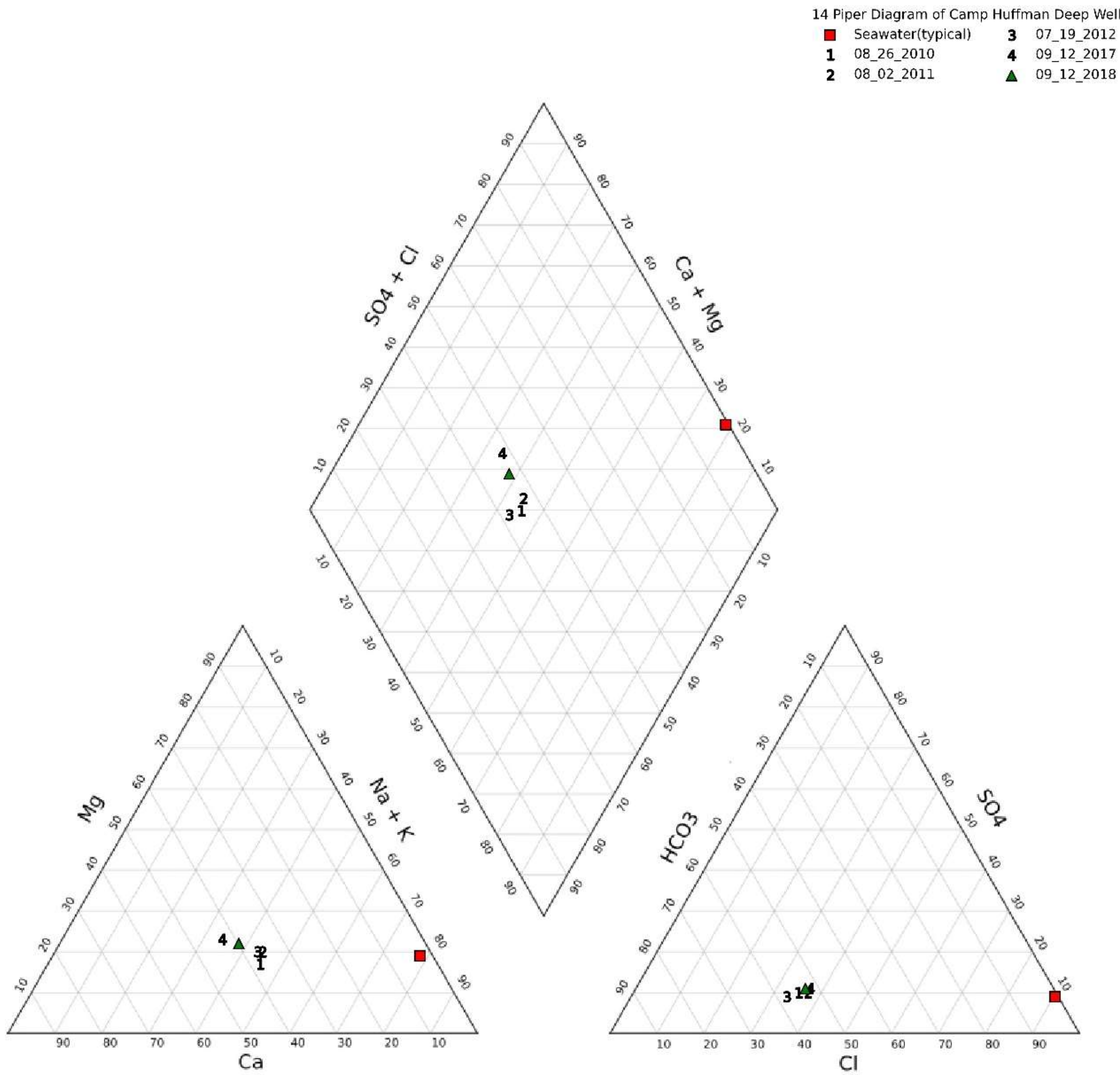


Figure C-14. Piper Diagram of Camp Huffman Deep Well

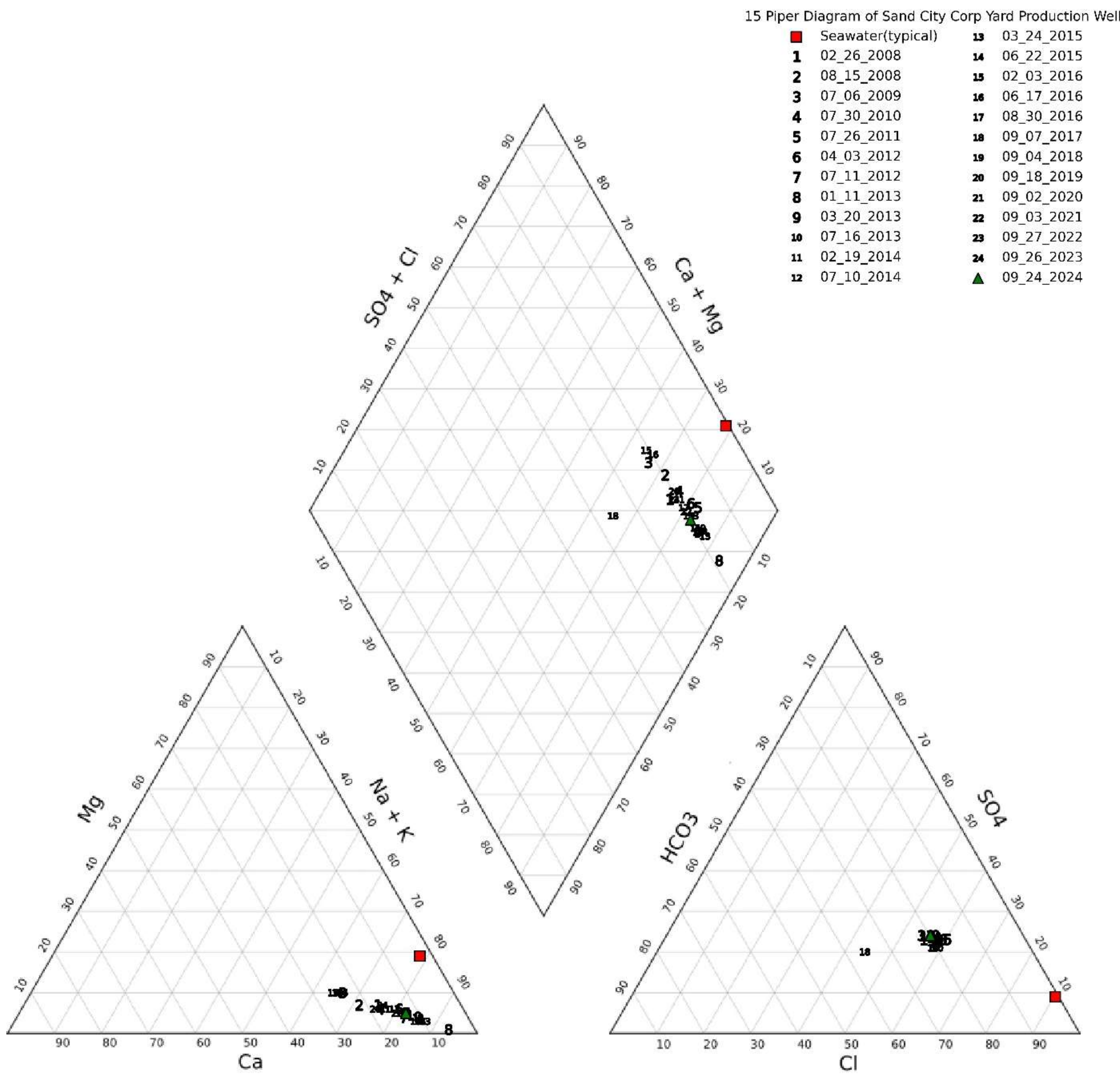


Figure C-15. Piper Diagram of Sand City Corp. Yard Production Well

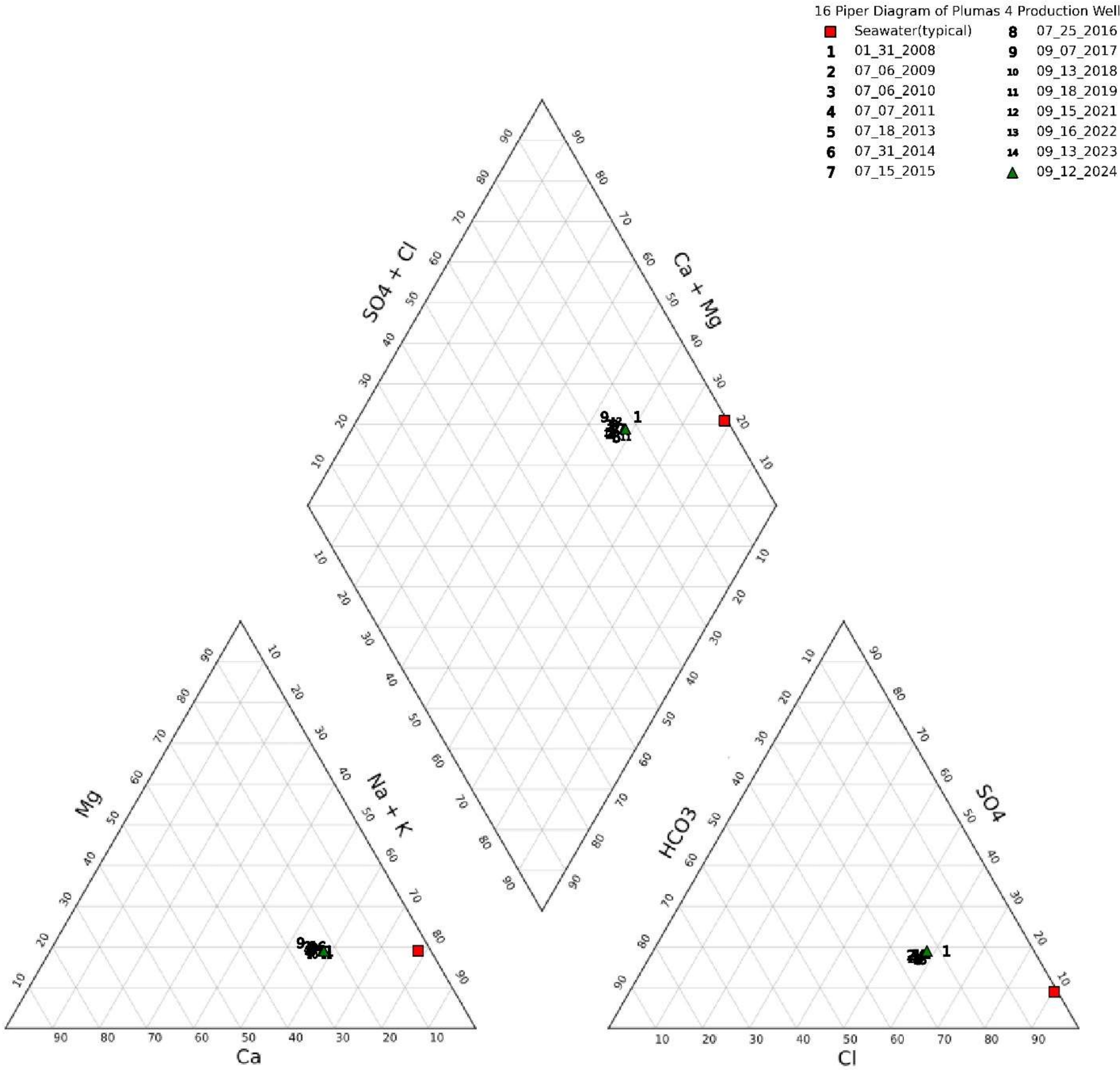


Figure C-16. Piper Diagram of Plumas 4 Production Well

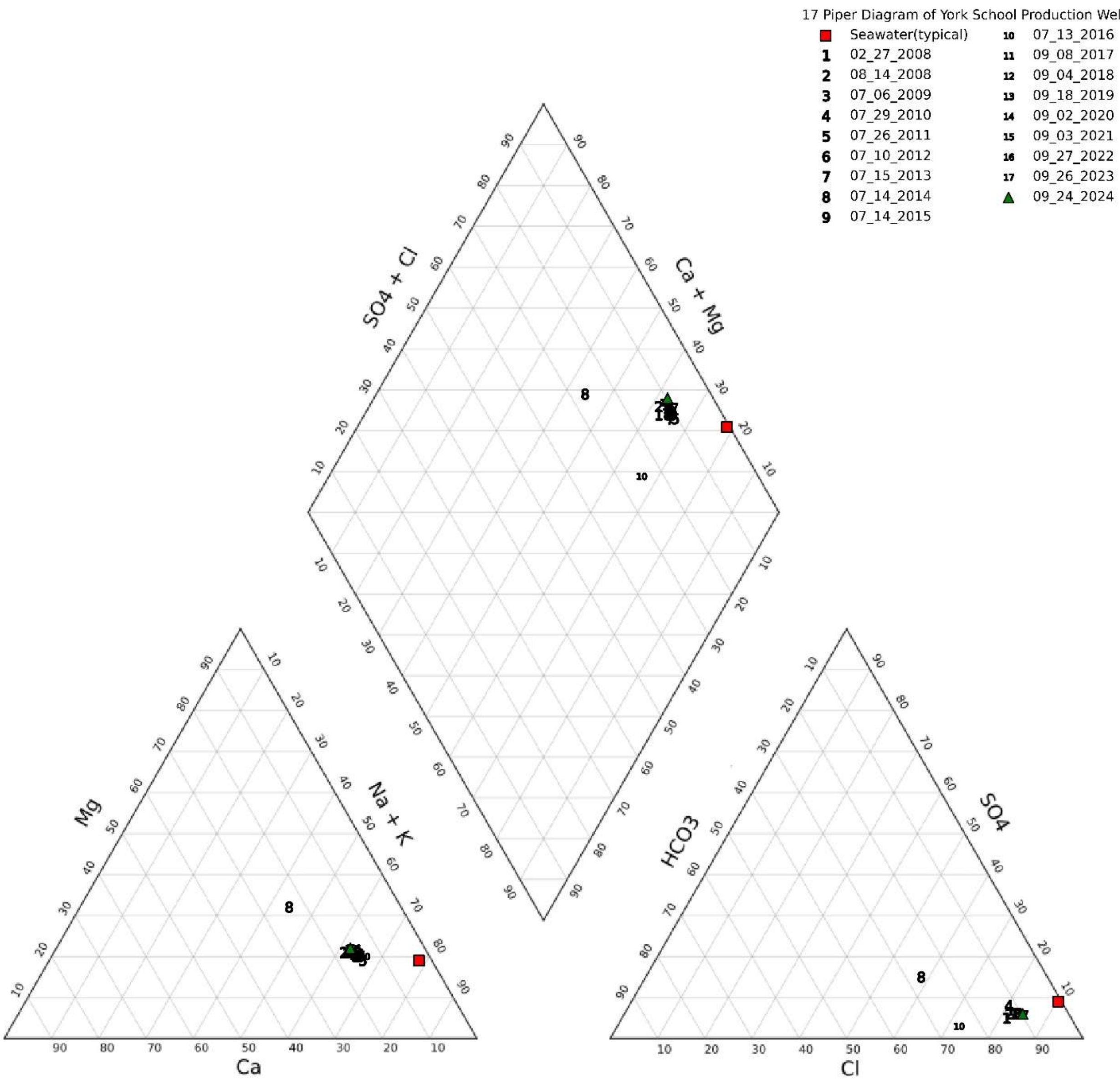


Figure C-17. Piper Diagram of York School Production Well

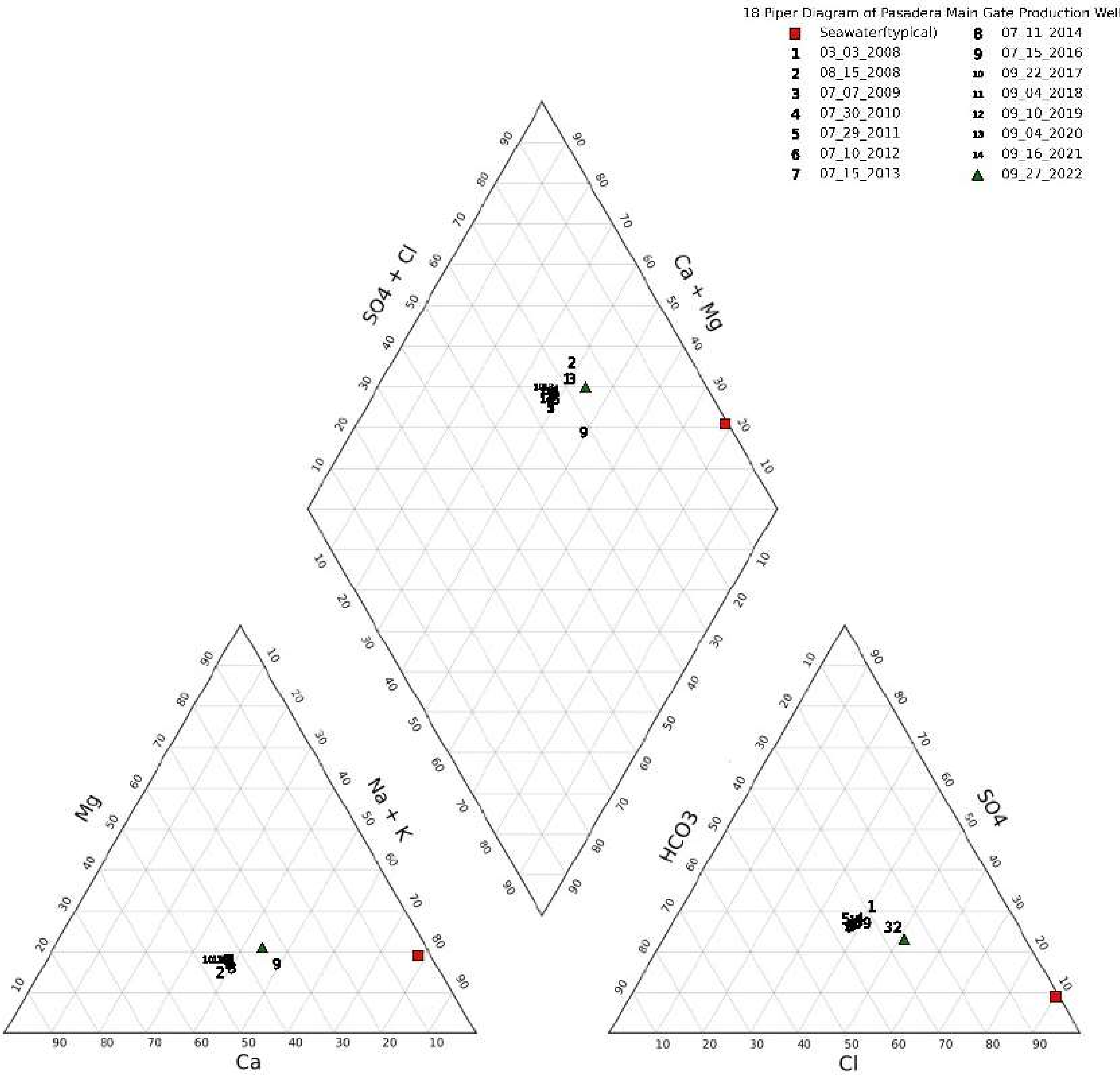


Figure C-18. Piper Diagram of Pasadera Main Gate Production Well

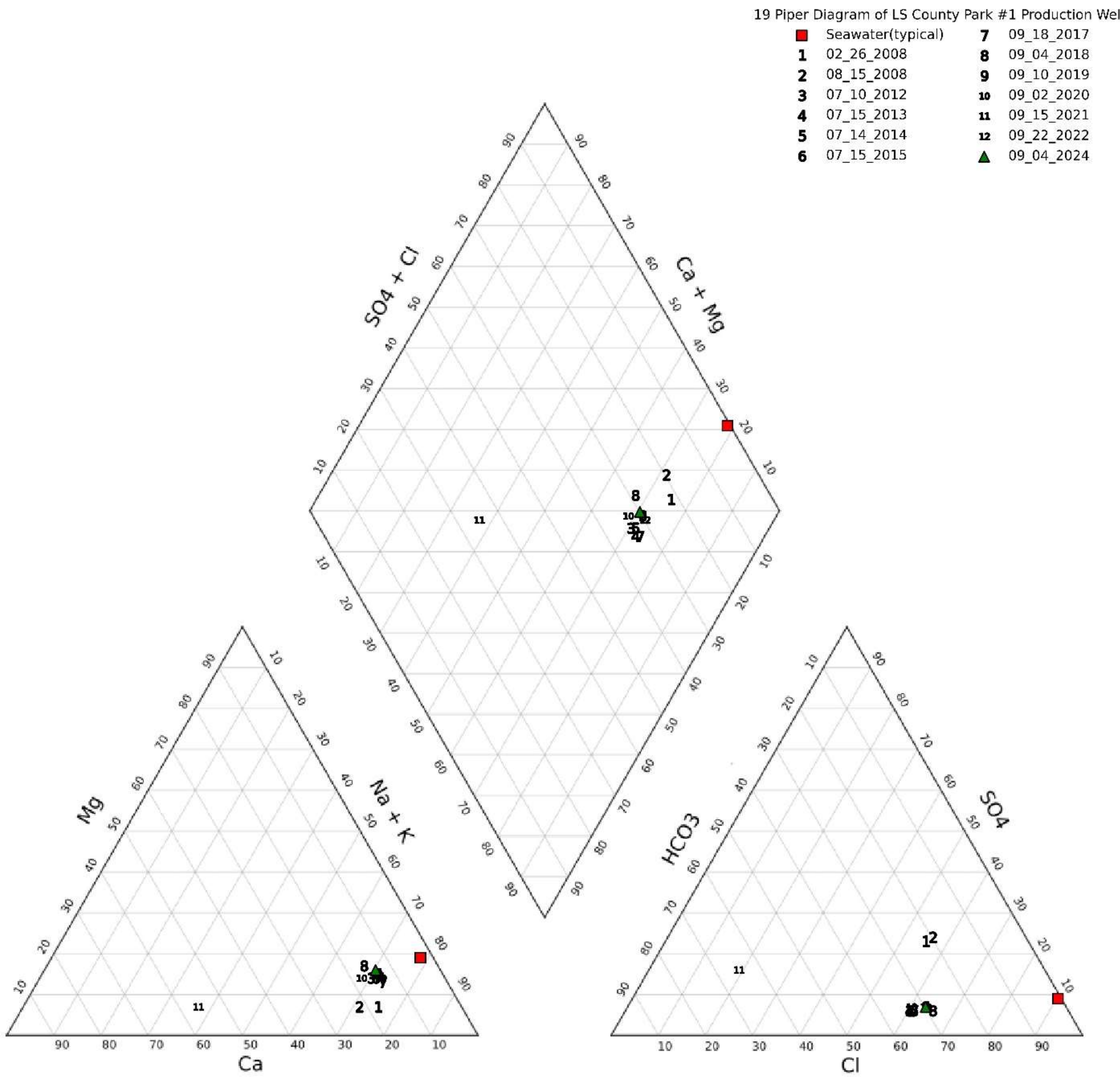


Figure C-19. Piper Diagram of LS County Park #1 Production Well

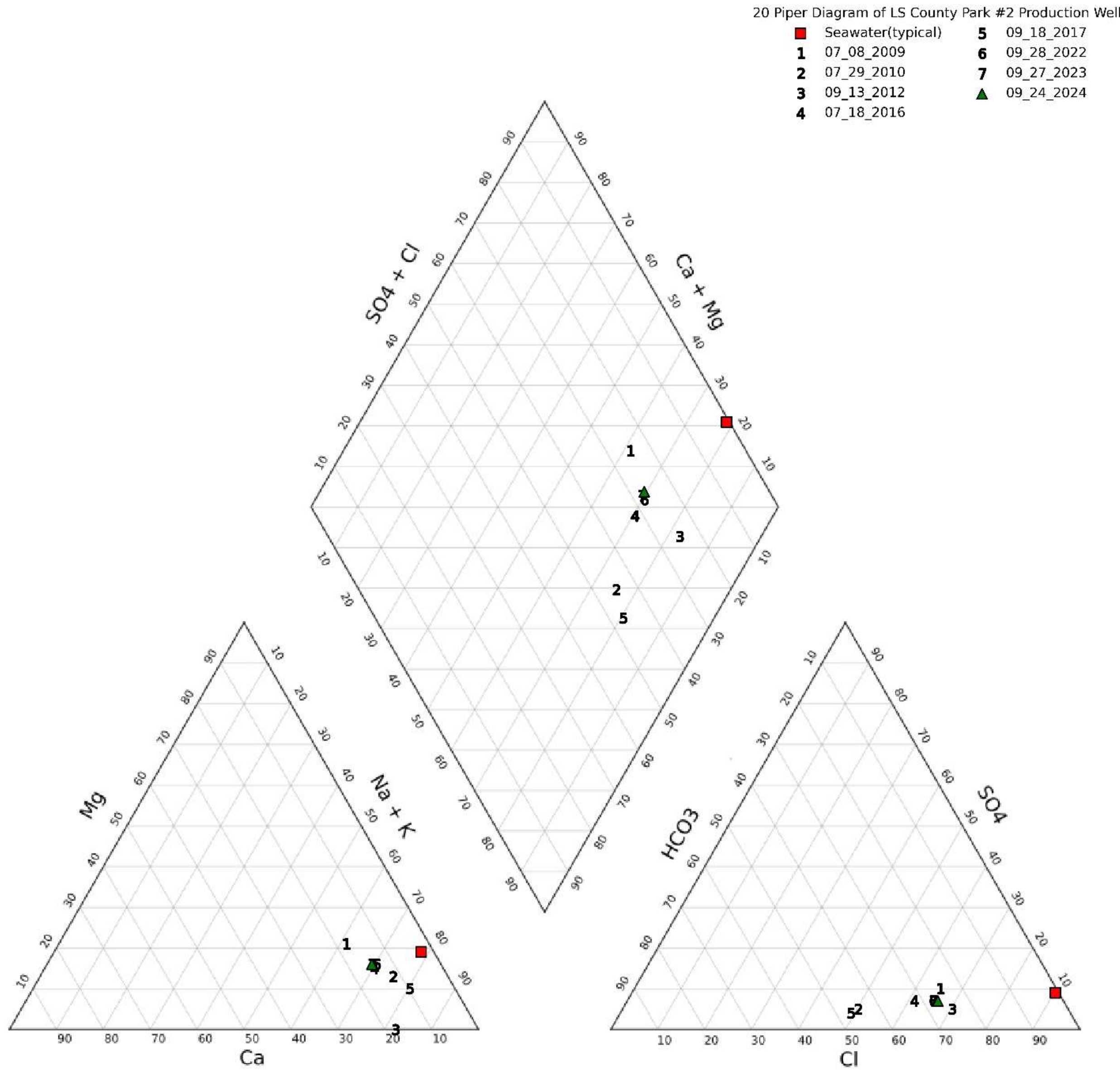


Figure C-20. Piper Diagram of LS County Park #2 Production Well

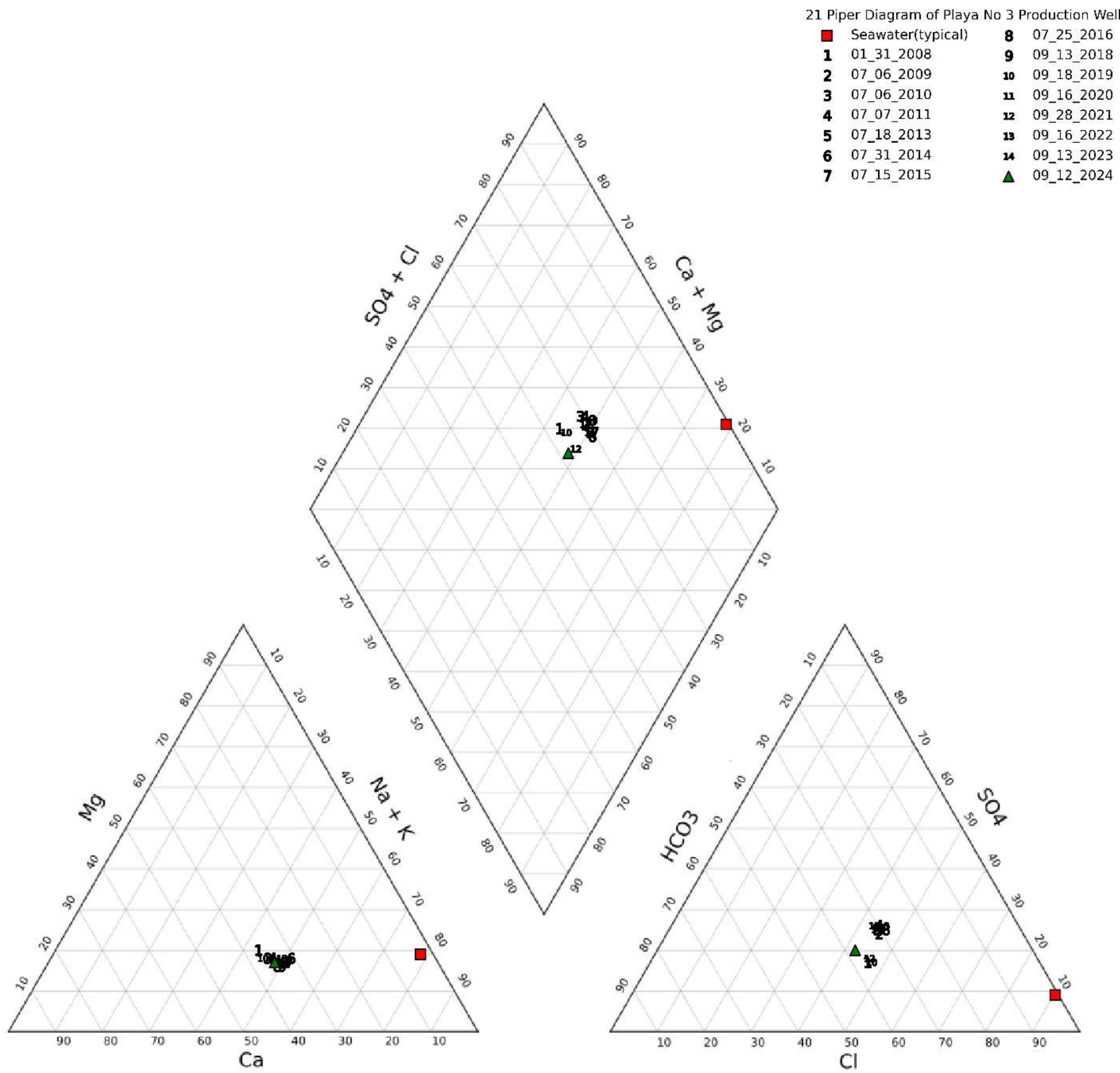


Figure C-21. Piper Diagram of Playa No. 3 Production Well

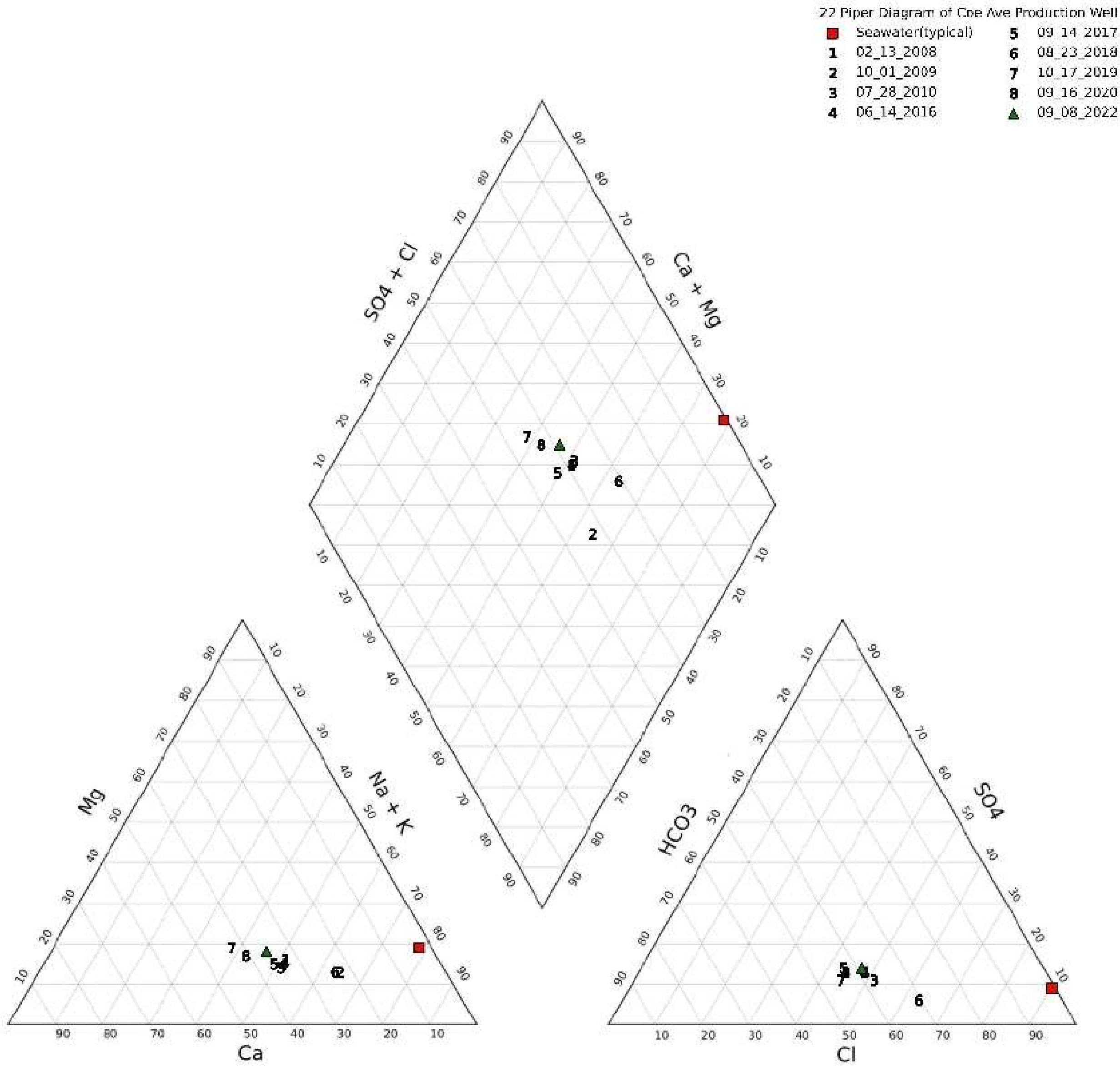


Figure C-22. Piper Diagram of Coe Ave. Production Well

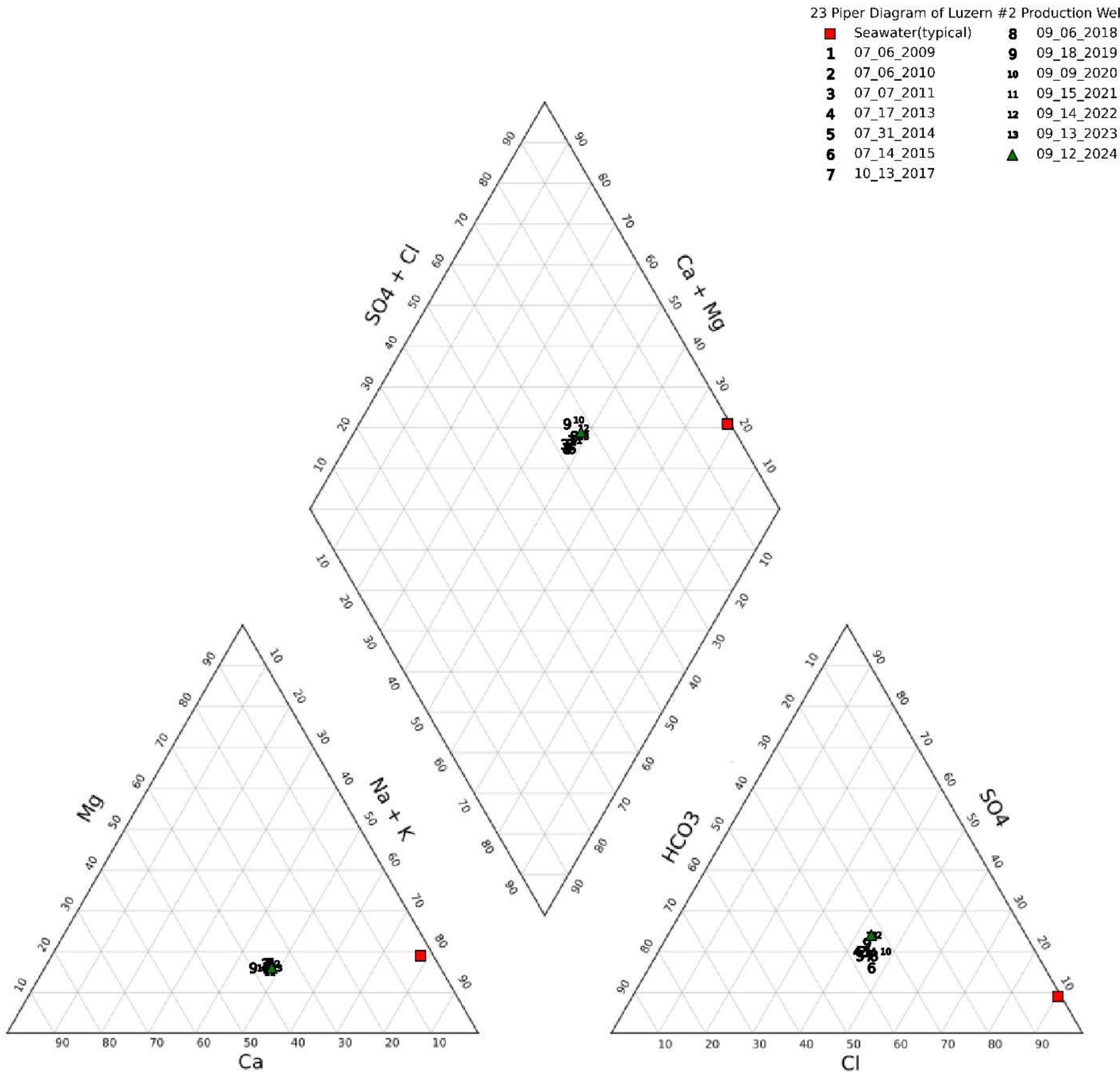


Figure C-23. Piper Diagram of Luzern #2 Production Well

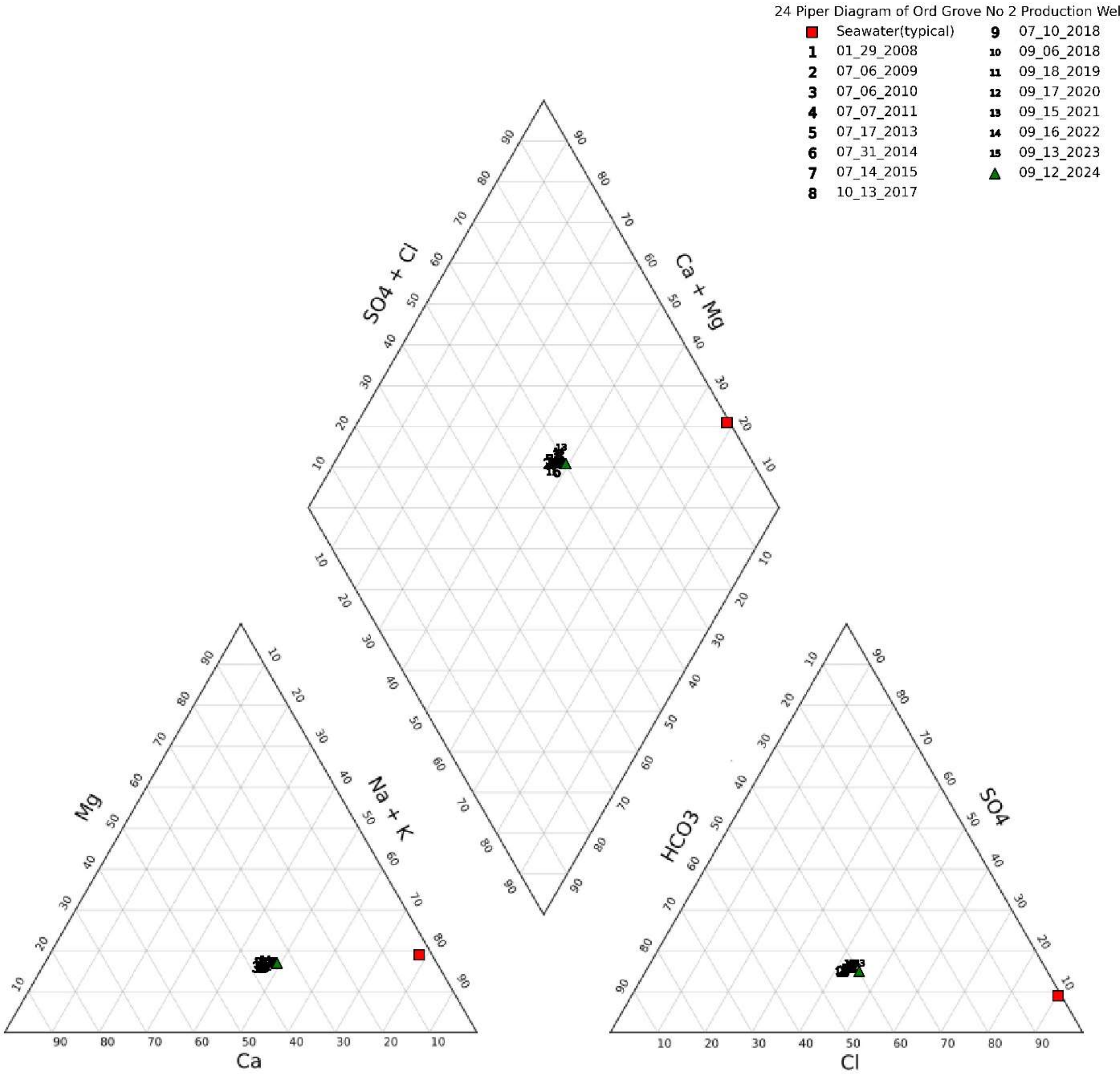


Figure C-24. Piper Diagram of Ord Grove No. 2 Production Well

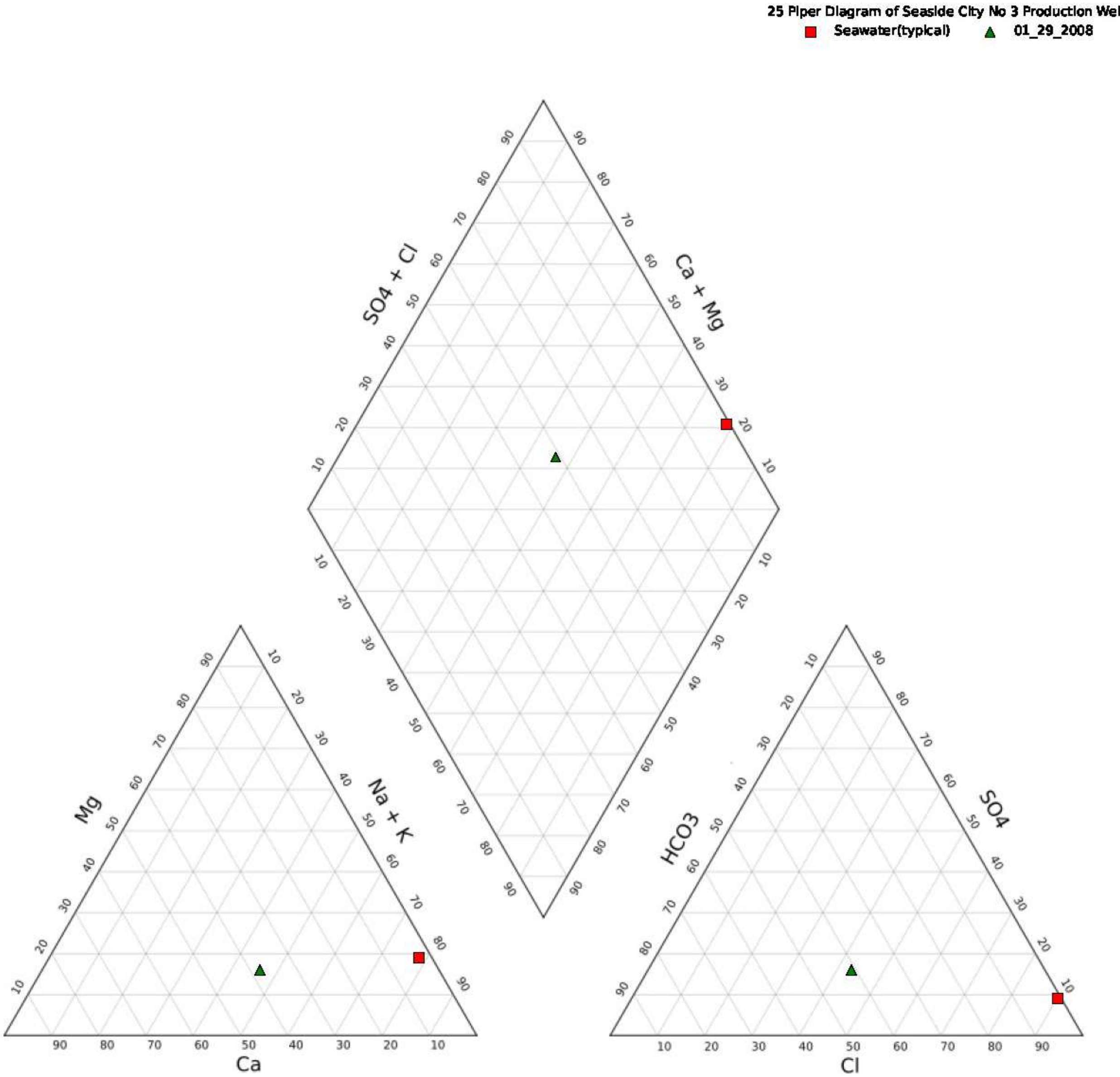


Figure C-25. Piper Diagram of Seaside City No. 3 Production Well

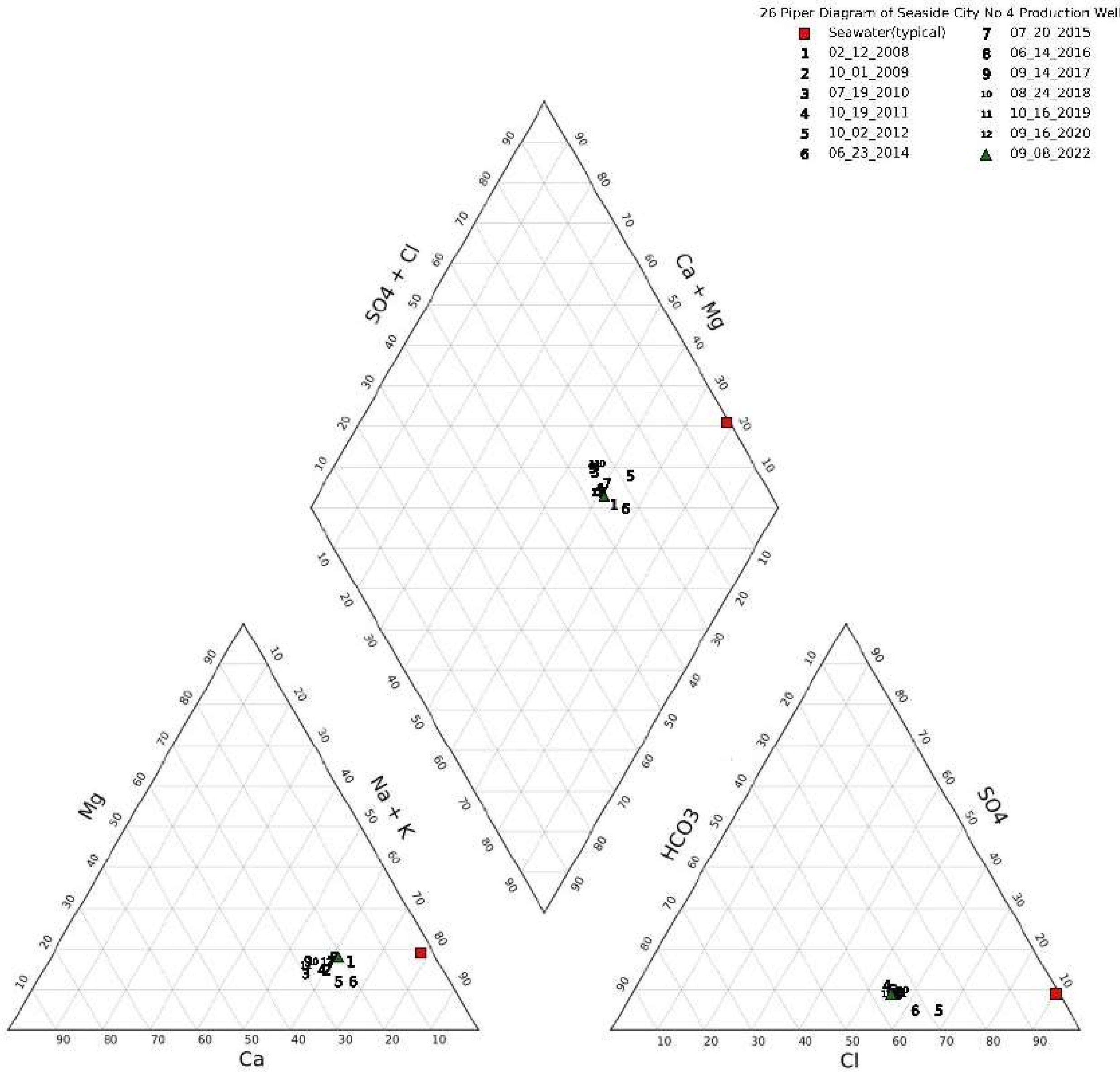


Figure C-26. Piper Diagram of Seaside City No. 4 Production Well

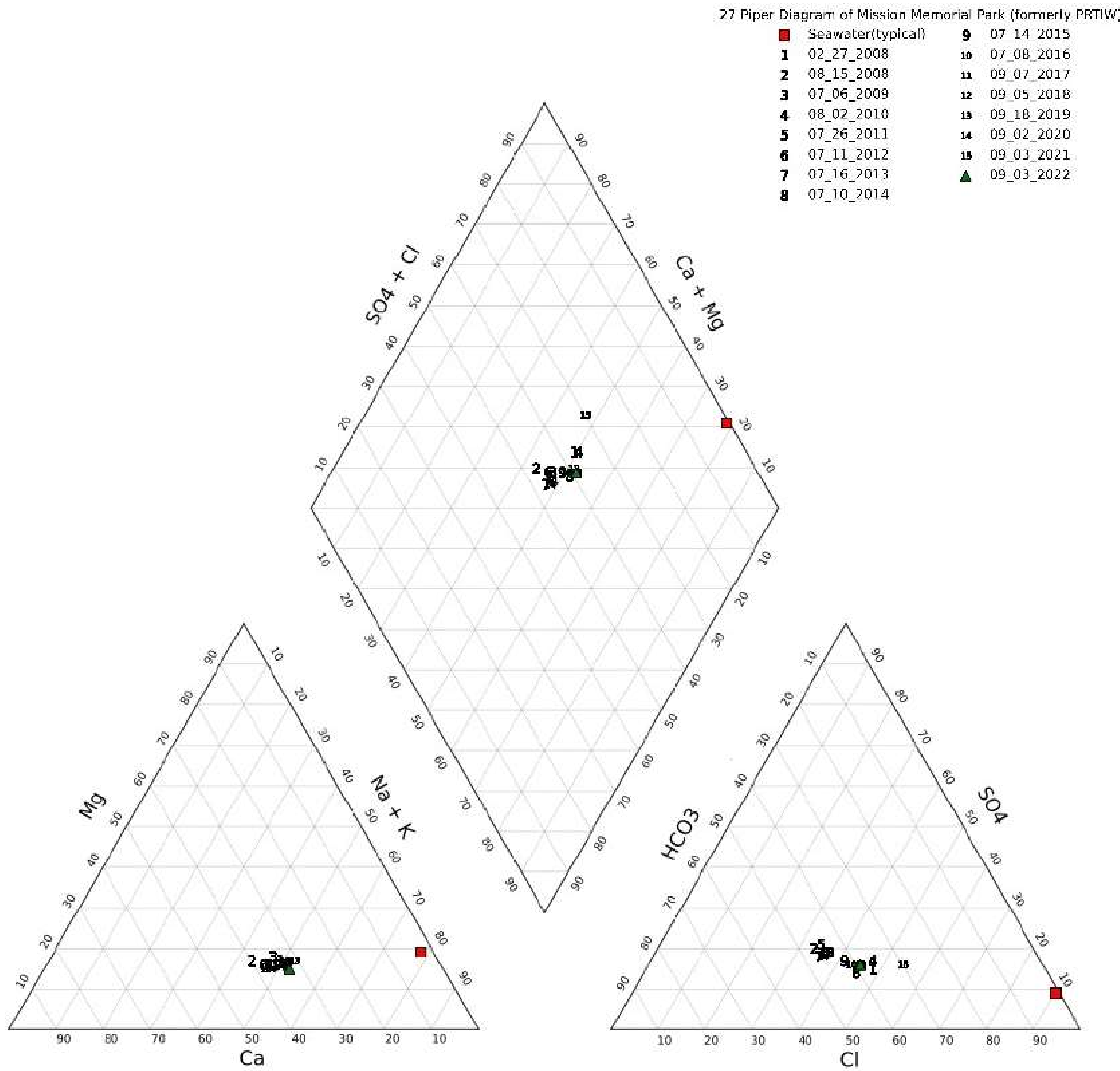


Figure C-27. Piper Diagram of Mission Memorial Park (formerly PRTIW)

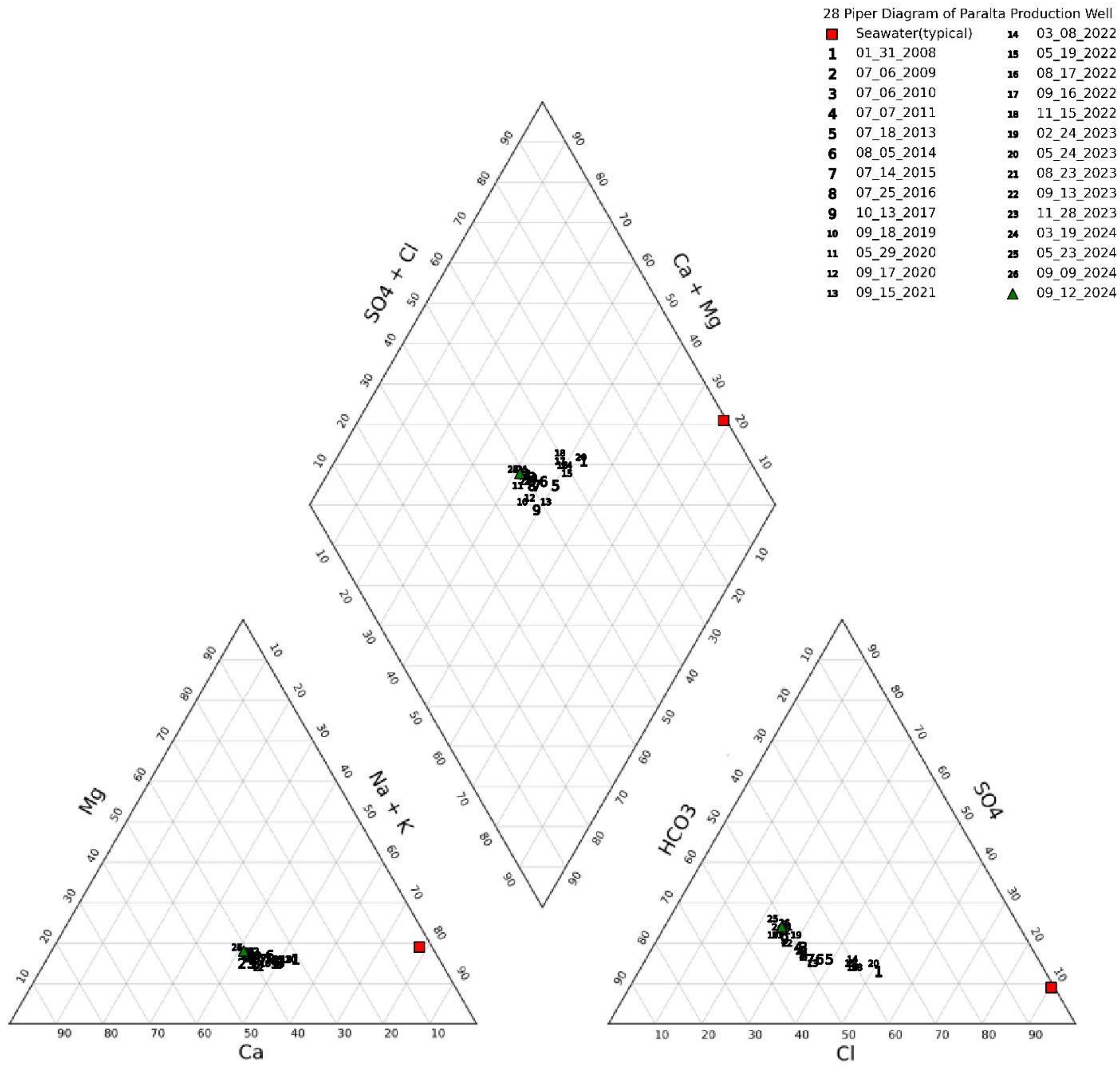


Figure C-28. Piper Diagram of Paralta Production Well

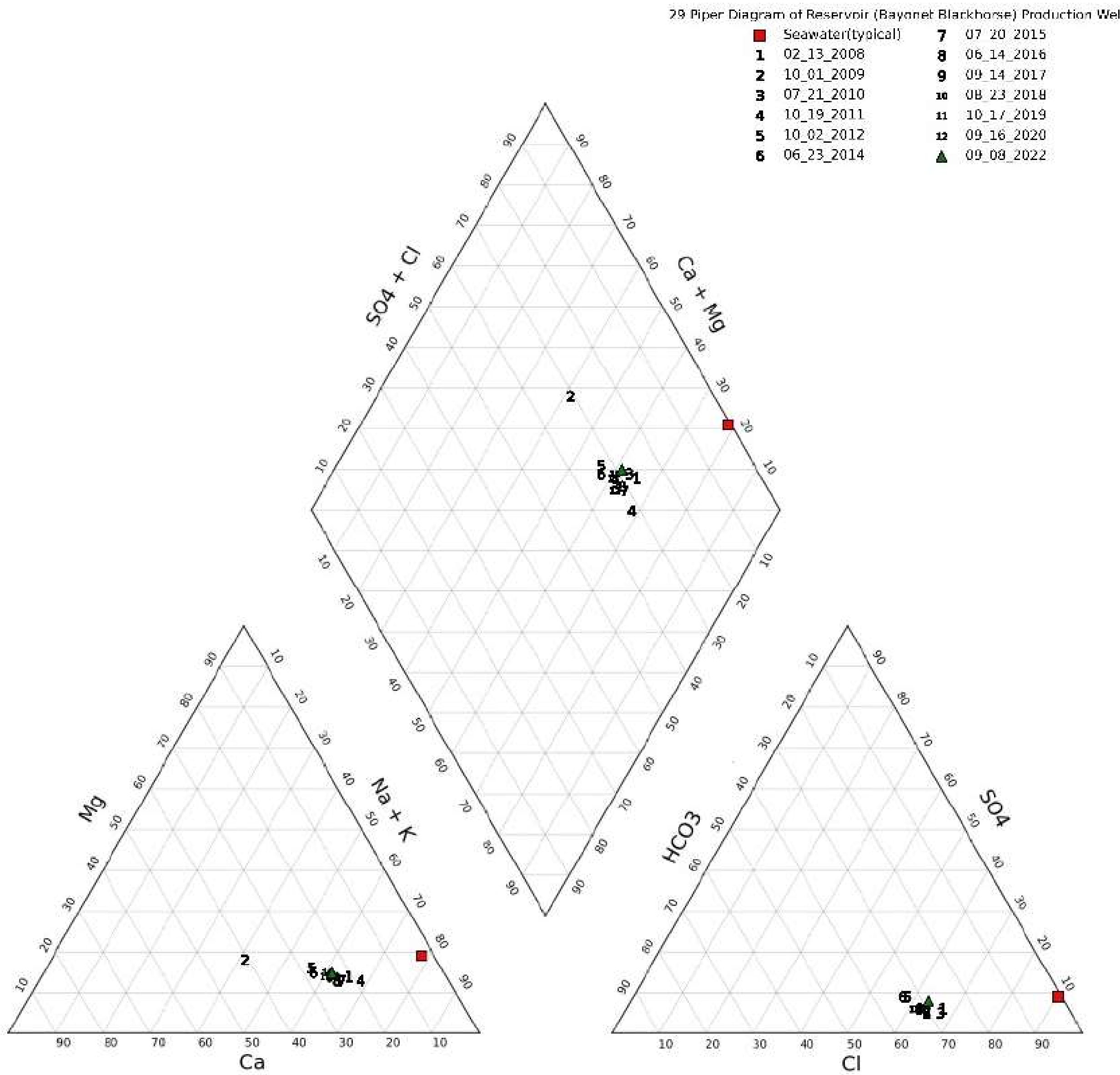


Figure C-29. Piper Diagram of Reservoir (Bayonet Blackhorse) Production Well

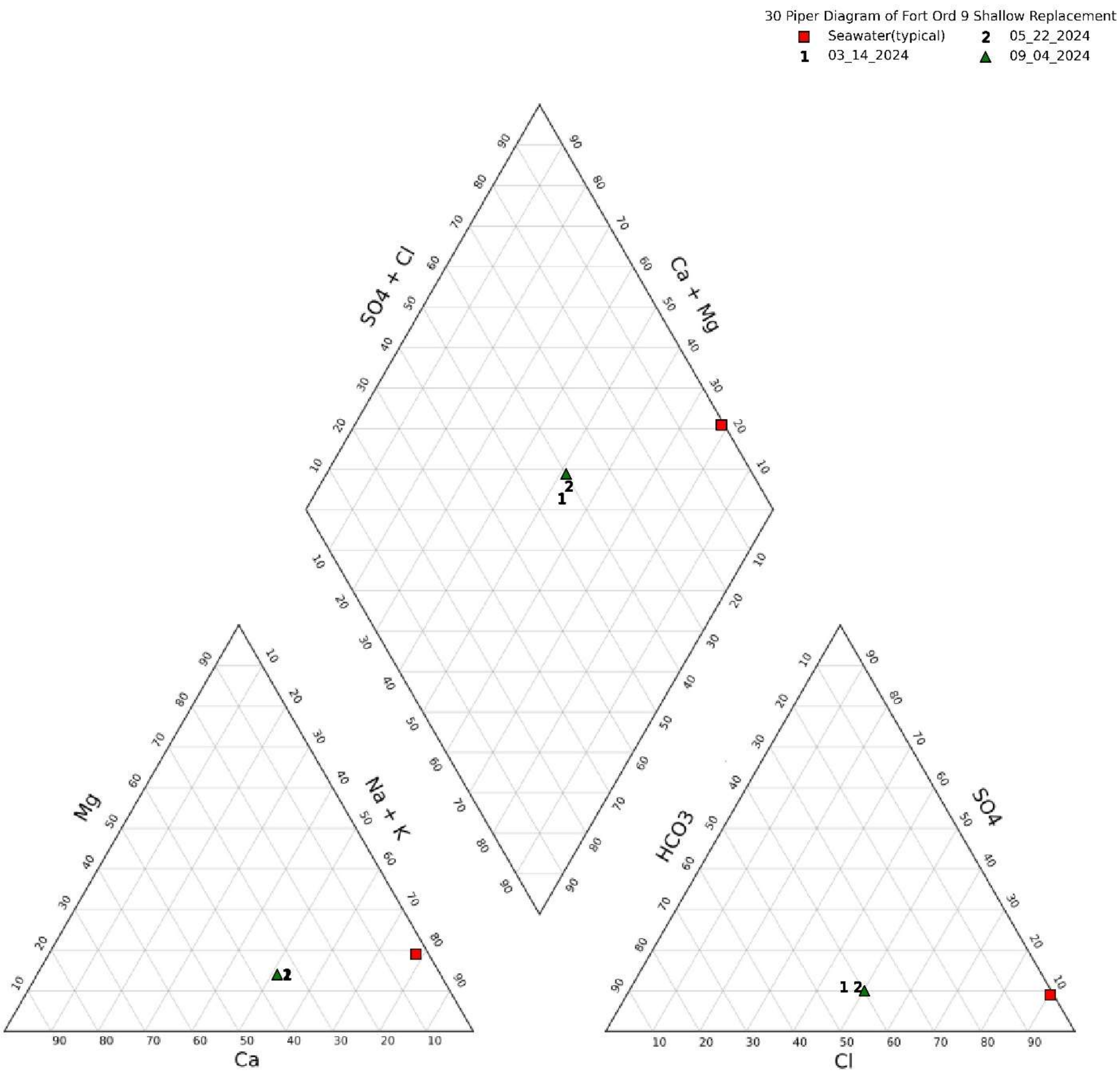


Figure C-30. Piper Diagram of Fort Ord 9 Shallow Replacement Well

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Appendix D

Chloride and Sodium/Chloride Molar Ratio Graphs

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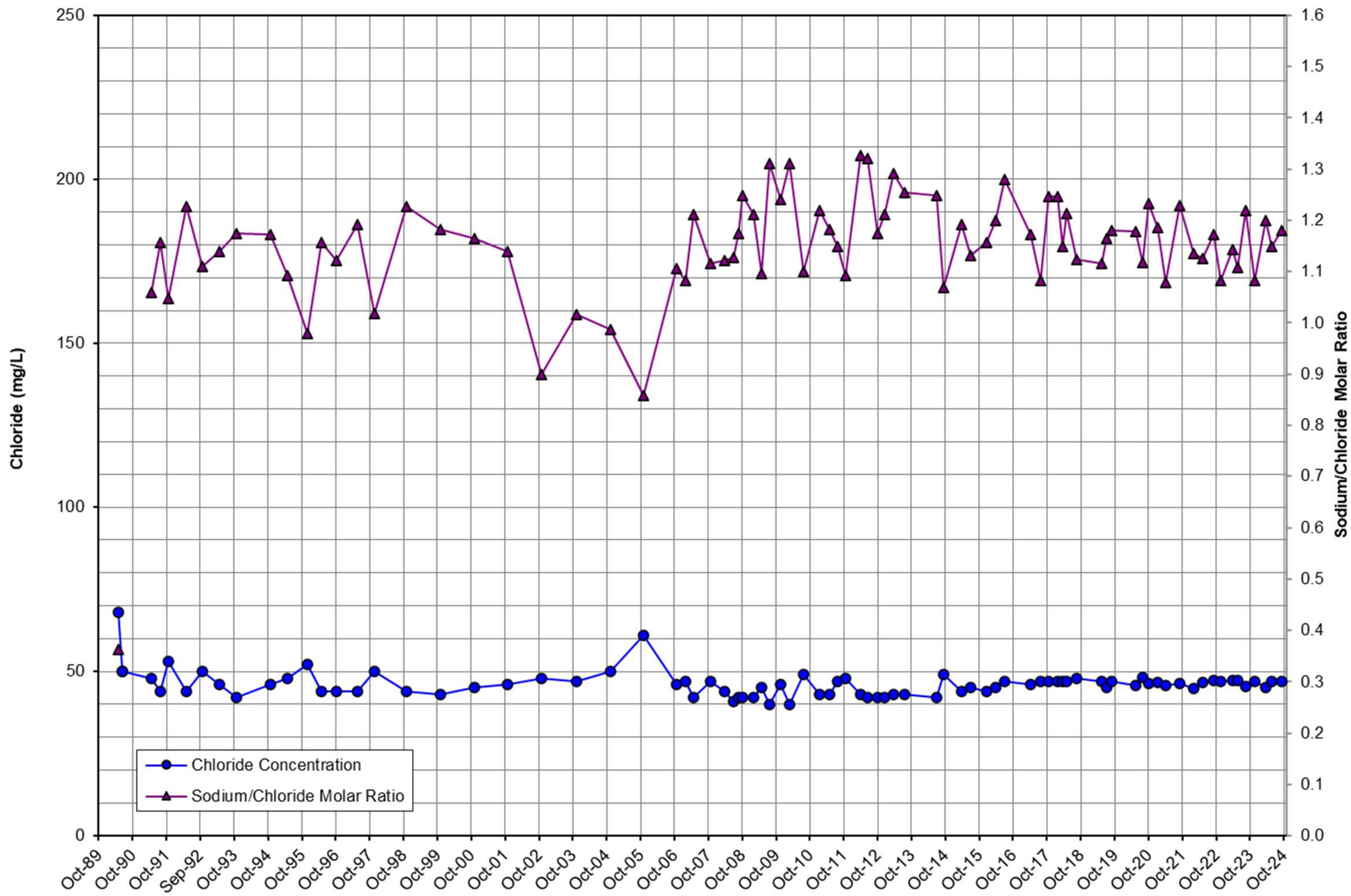

Figure D-1. PCA West Shallow Well Chloride and Sodium/Chloride Molar Ratio Graph

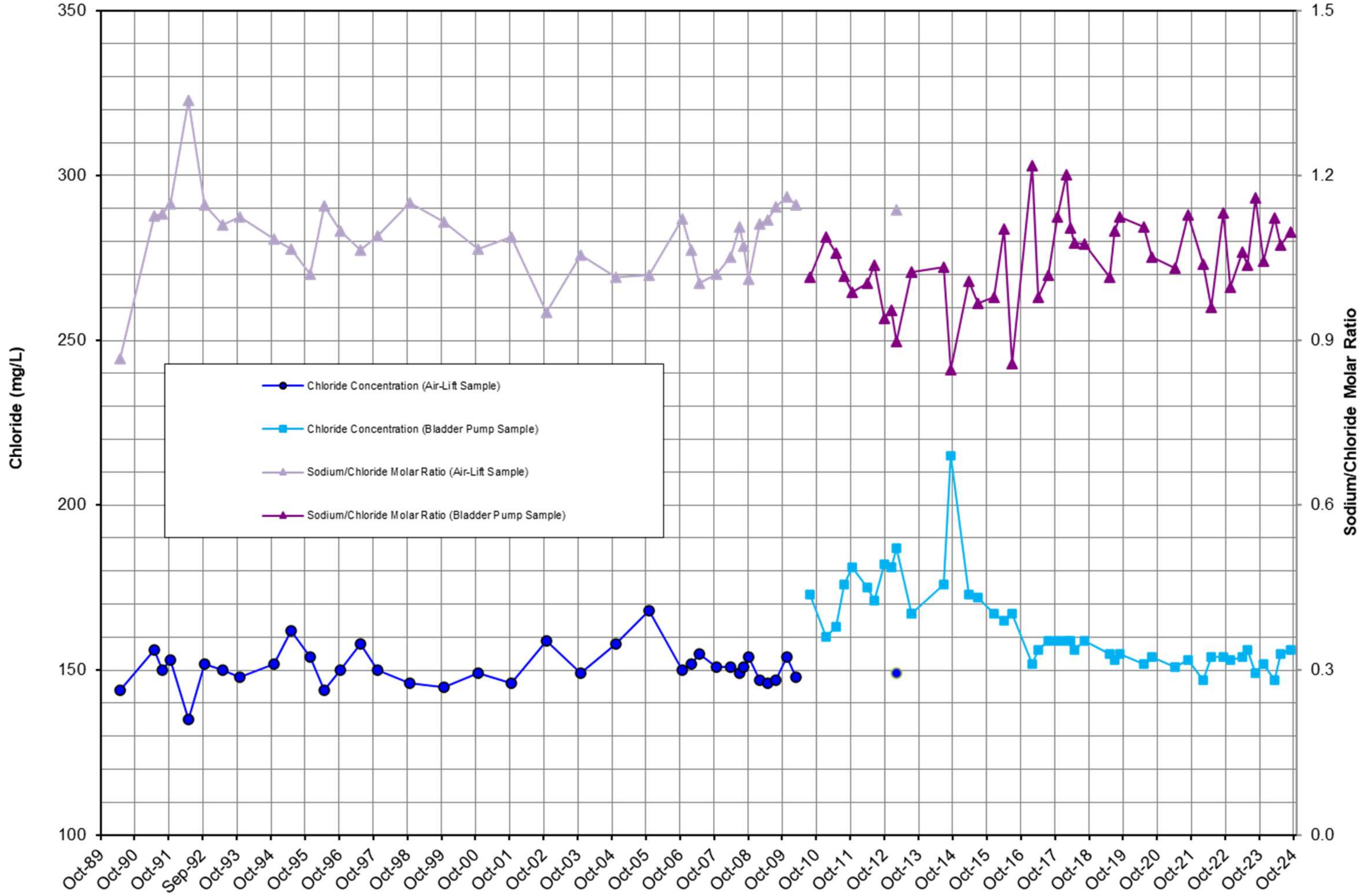

Figure D-2. PCA West Deep Well Chloride and Sodium/Chloride Molar Ratio Graph

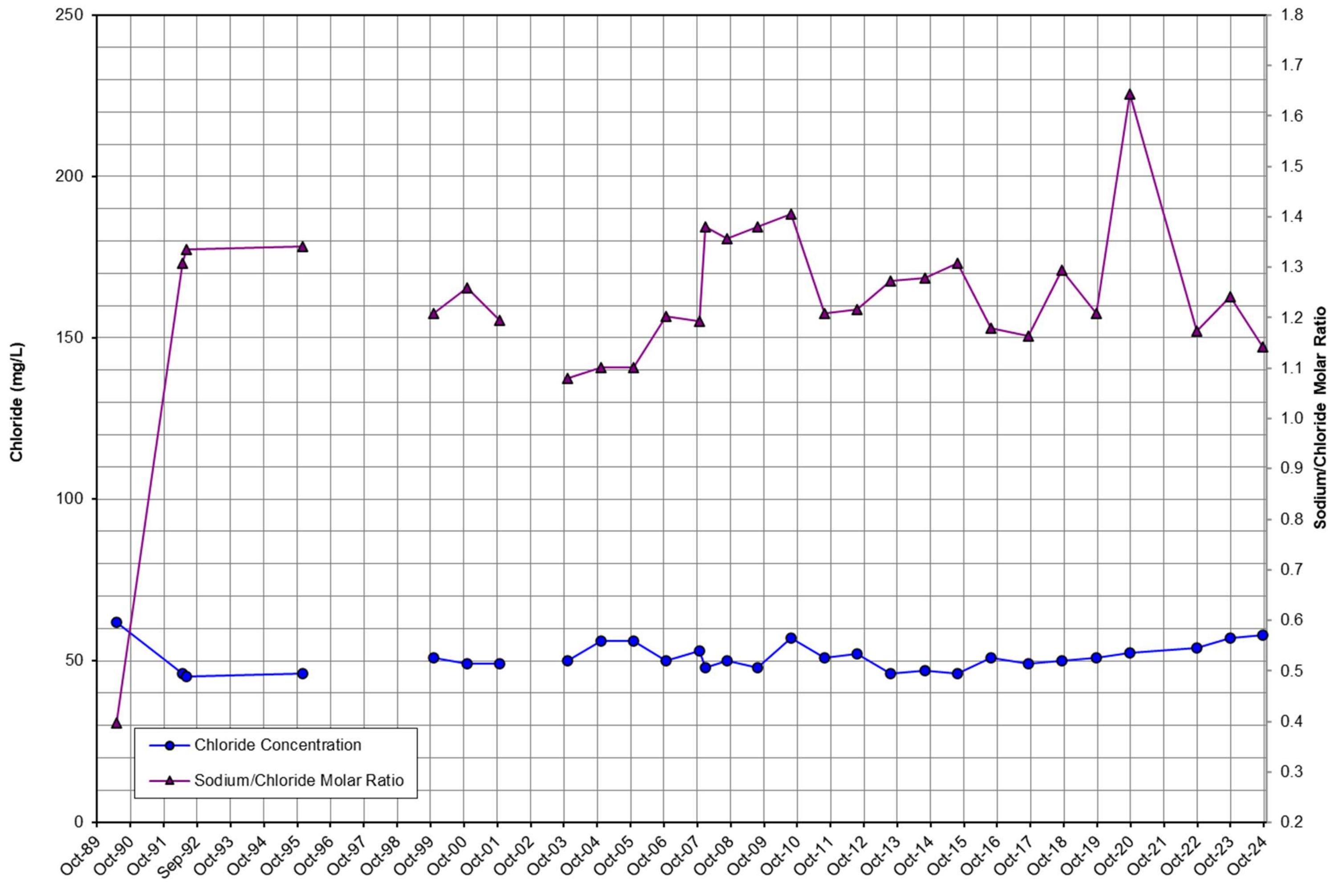

Figure D-3. PCA East Shallow Well Chloride and Sodium/Chloride Molar Ratio Graph

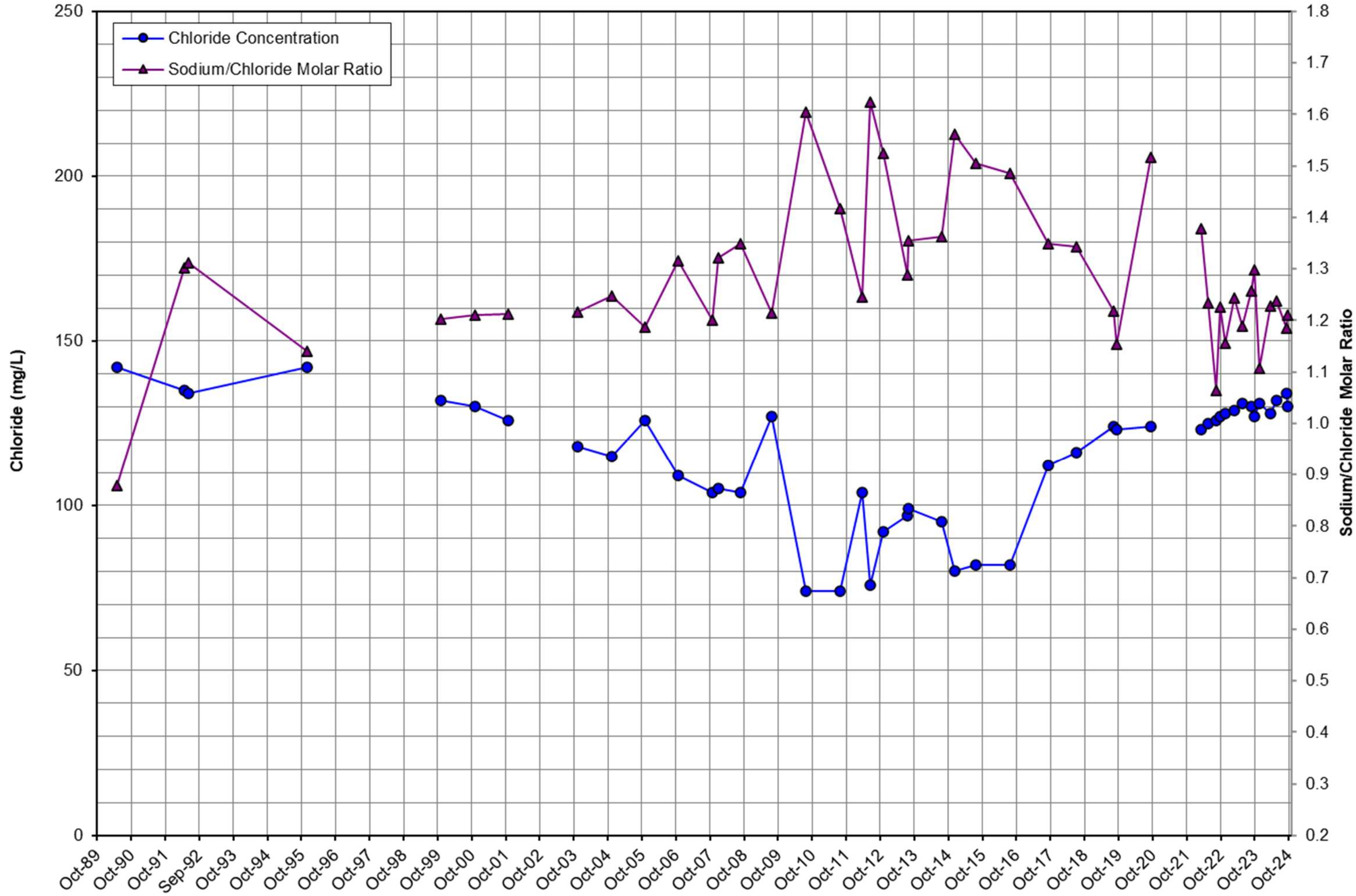

Figure D-4. PCA East Deep Well Chloride and Sodium/Chloride Molar Ratio Graph

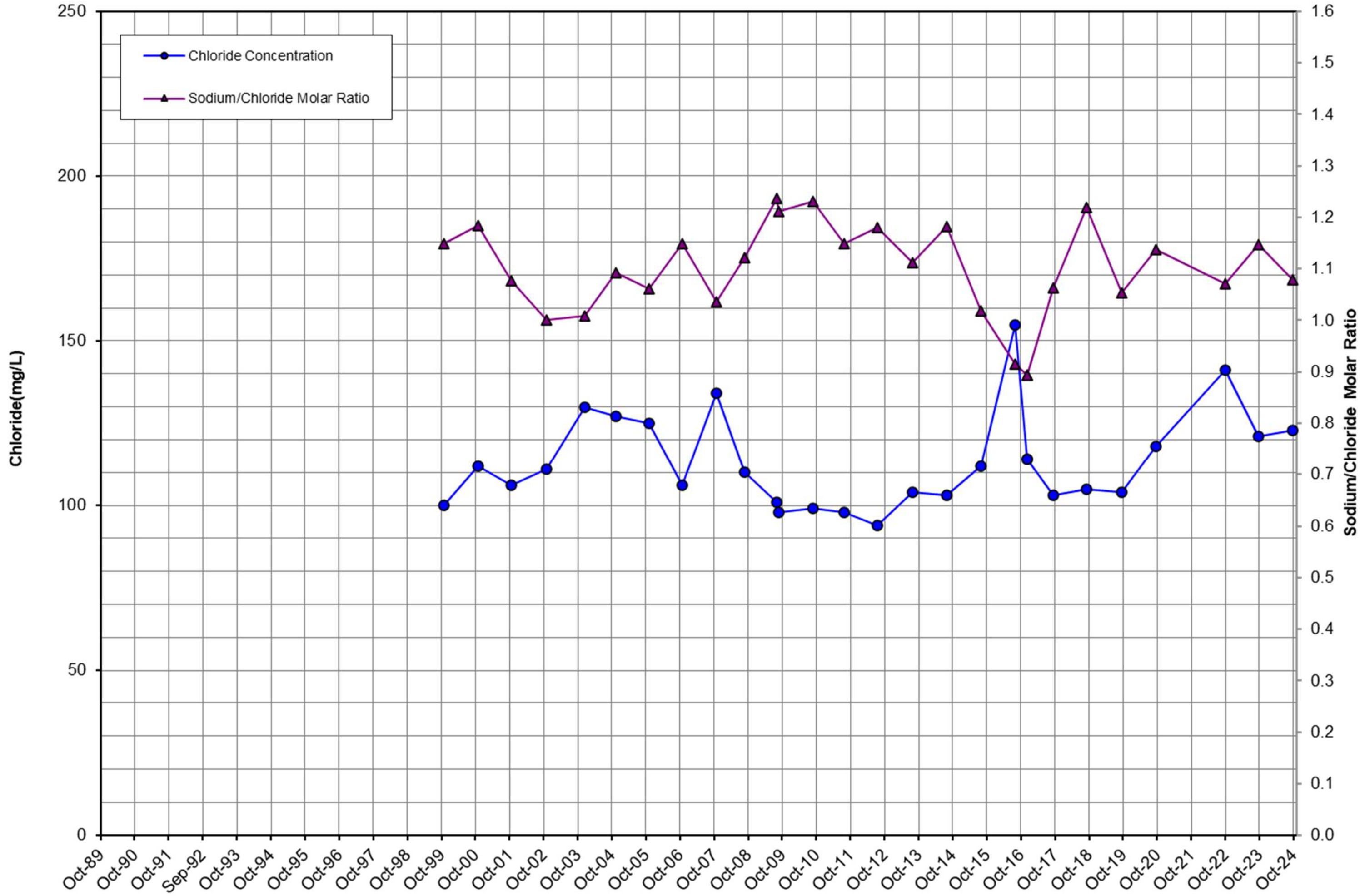

Figure D-5. Ord Terrace Shallow Well Chloride and Sodium/Chloride Molar Ratio Graph

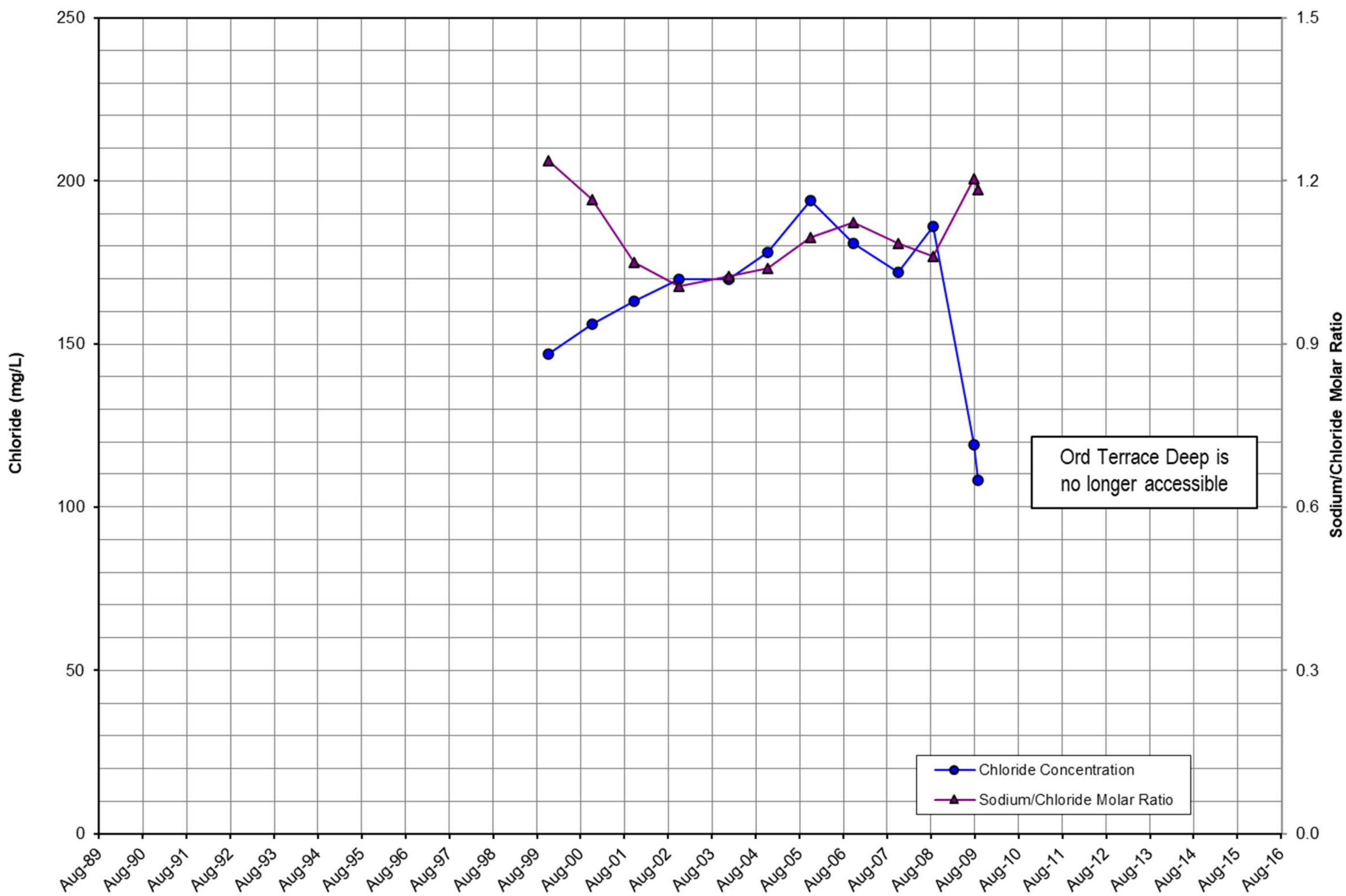

Figure D-6. Ord Terrace Deep Well Chloride and Sodium/Chloride Molar Ratio Graph

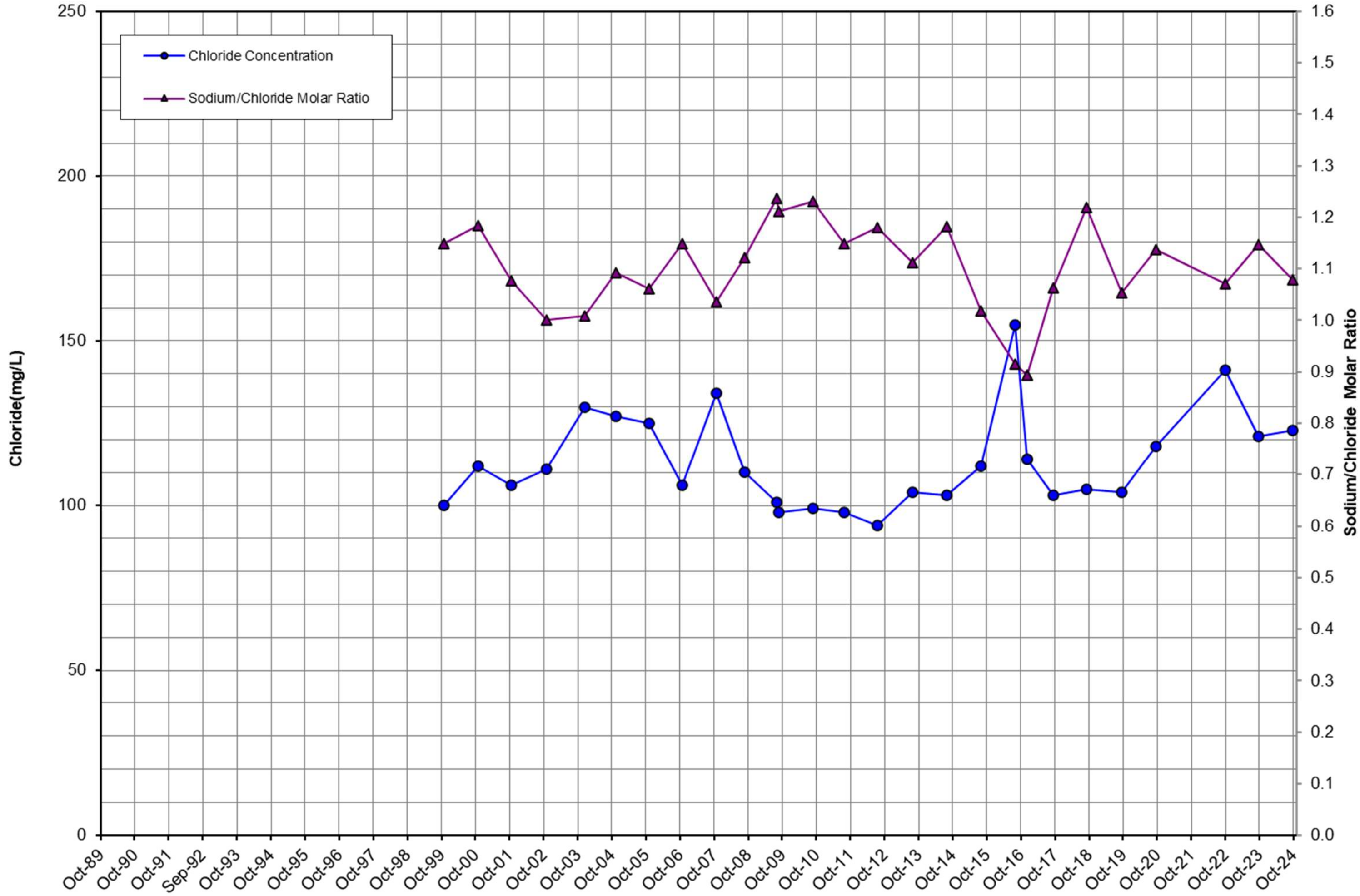

Figure D-7. MSC Shallow Well Chloride and Sodium/Chloride Molar Ratio Graph

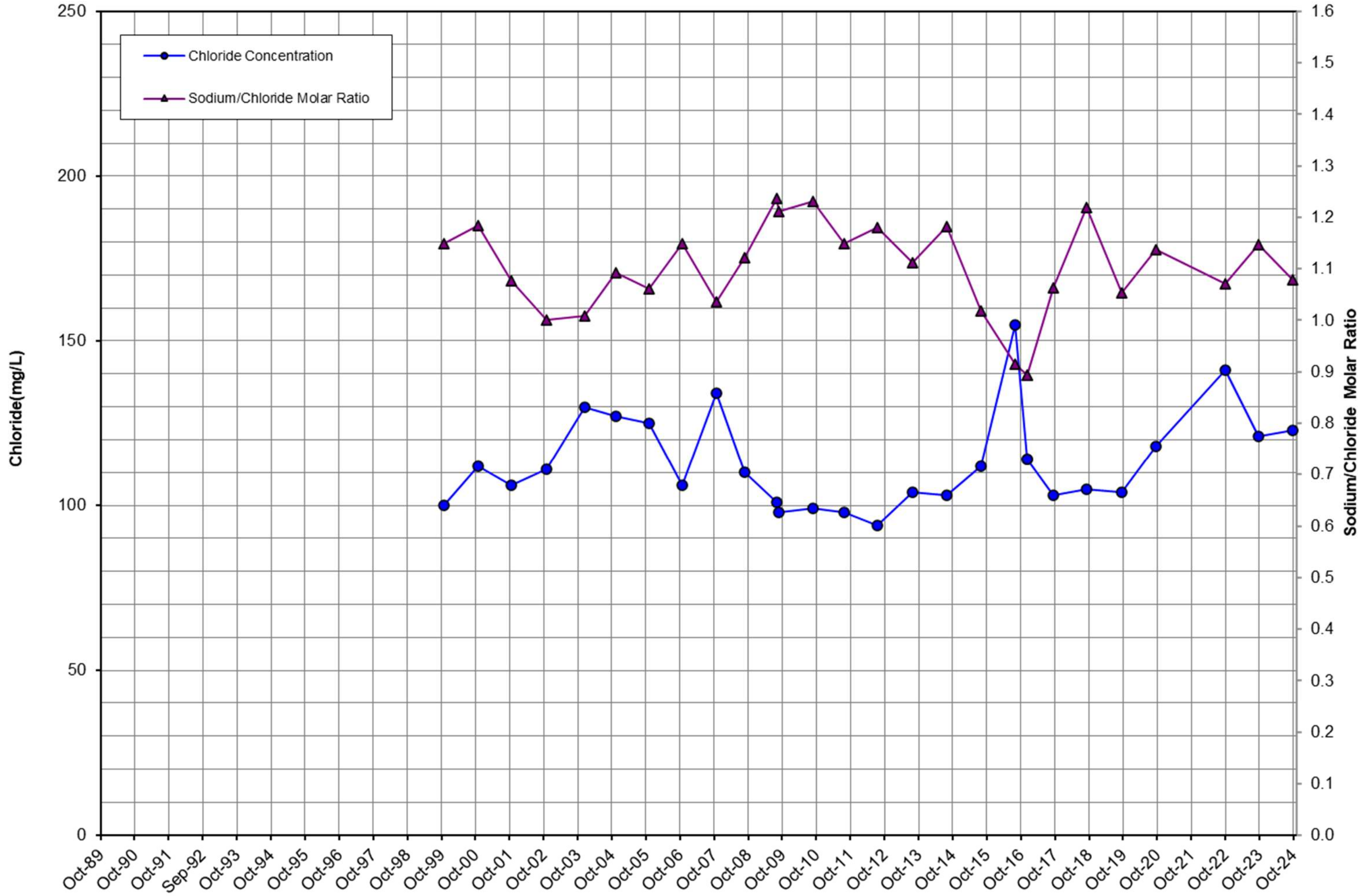

Figure D-8. MSC Deep Well Chloride and Sodium/Chloride Molar Ratio Graph

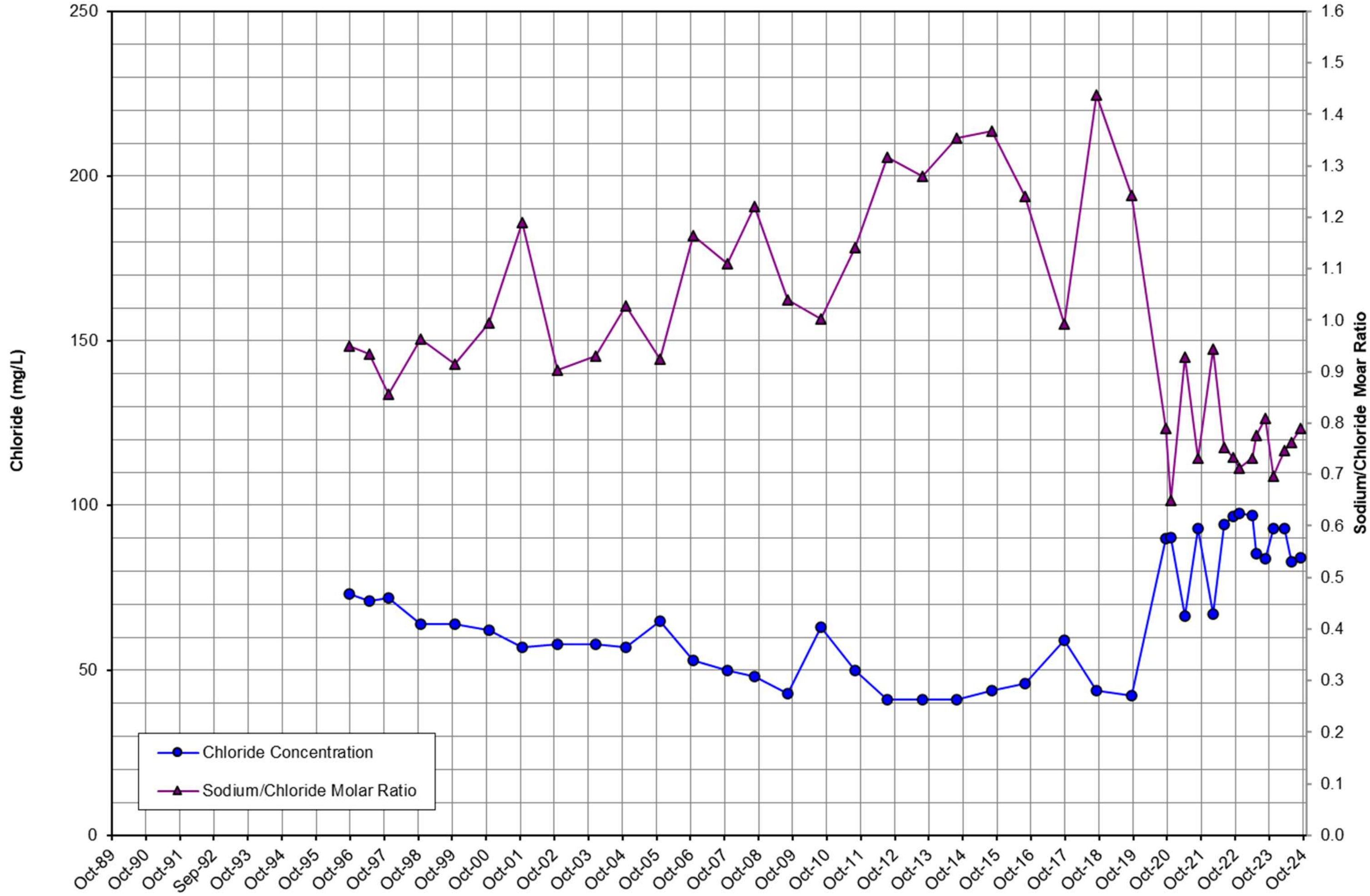

Figure D-9. Fort Ord 10 Shallow Well Chloride and Sodium/Chloride Molar Ratio Graph

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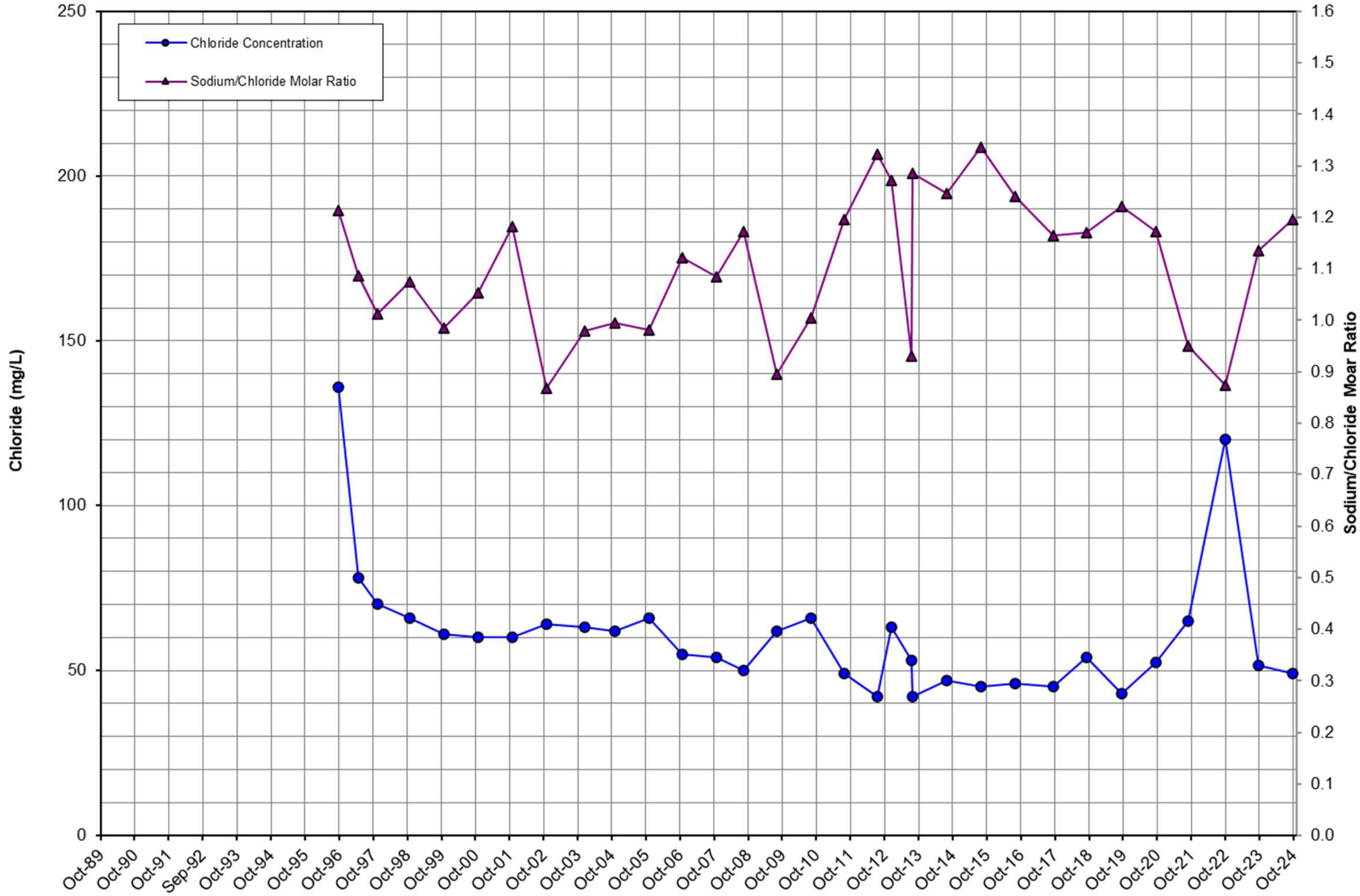

Figure D-10. Fort Ord 10 Deep Well Chloride and Sodium/Chloride Molar Ratio Graph

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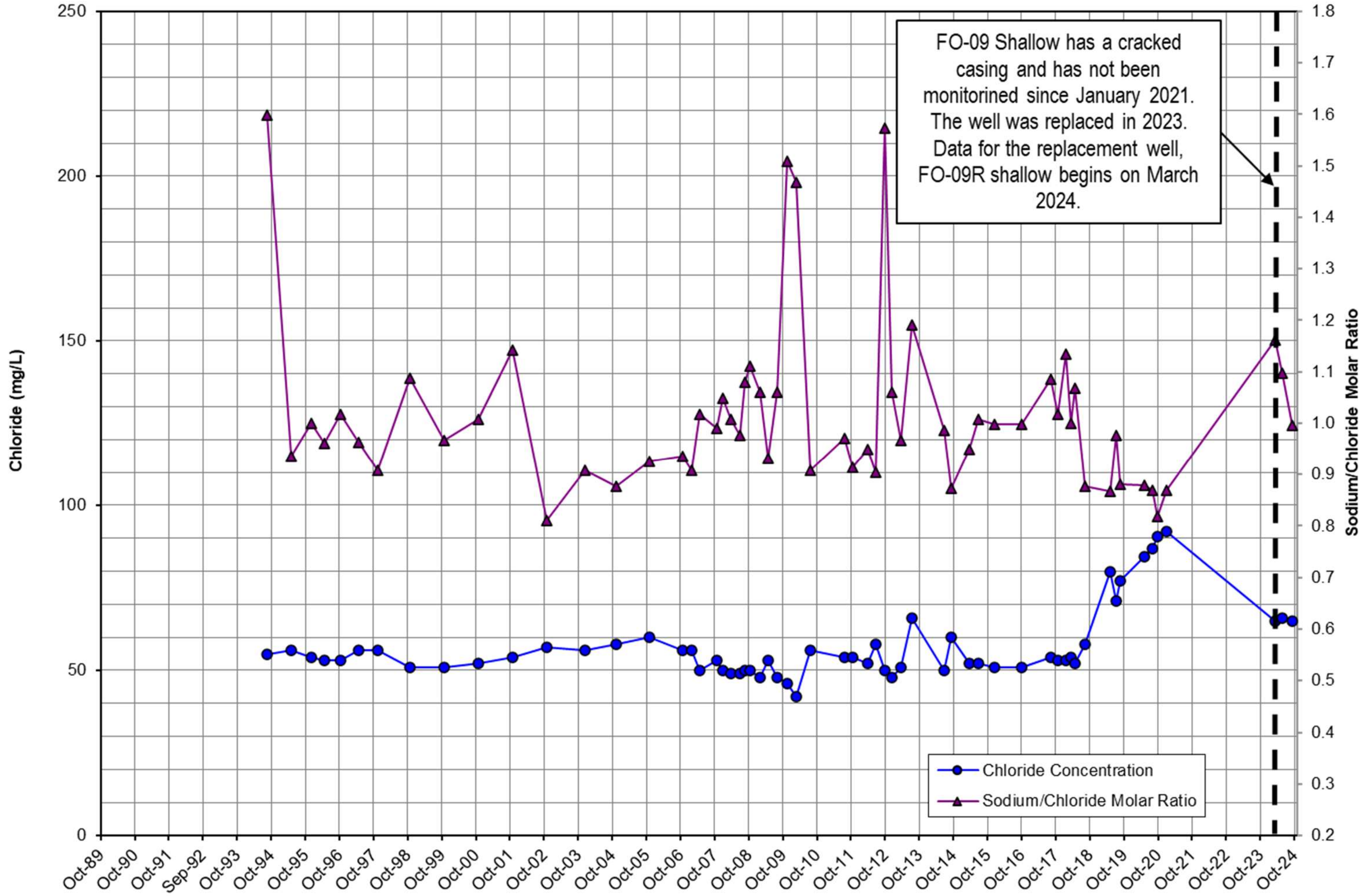

Figure D-11. Fort Ord 9 Shallow Well Chloride and Sodium/Chloride Molar Ratio Graph

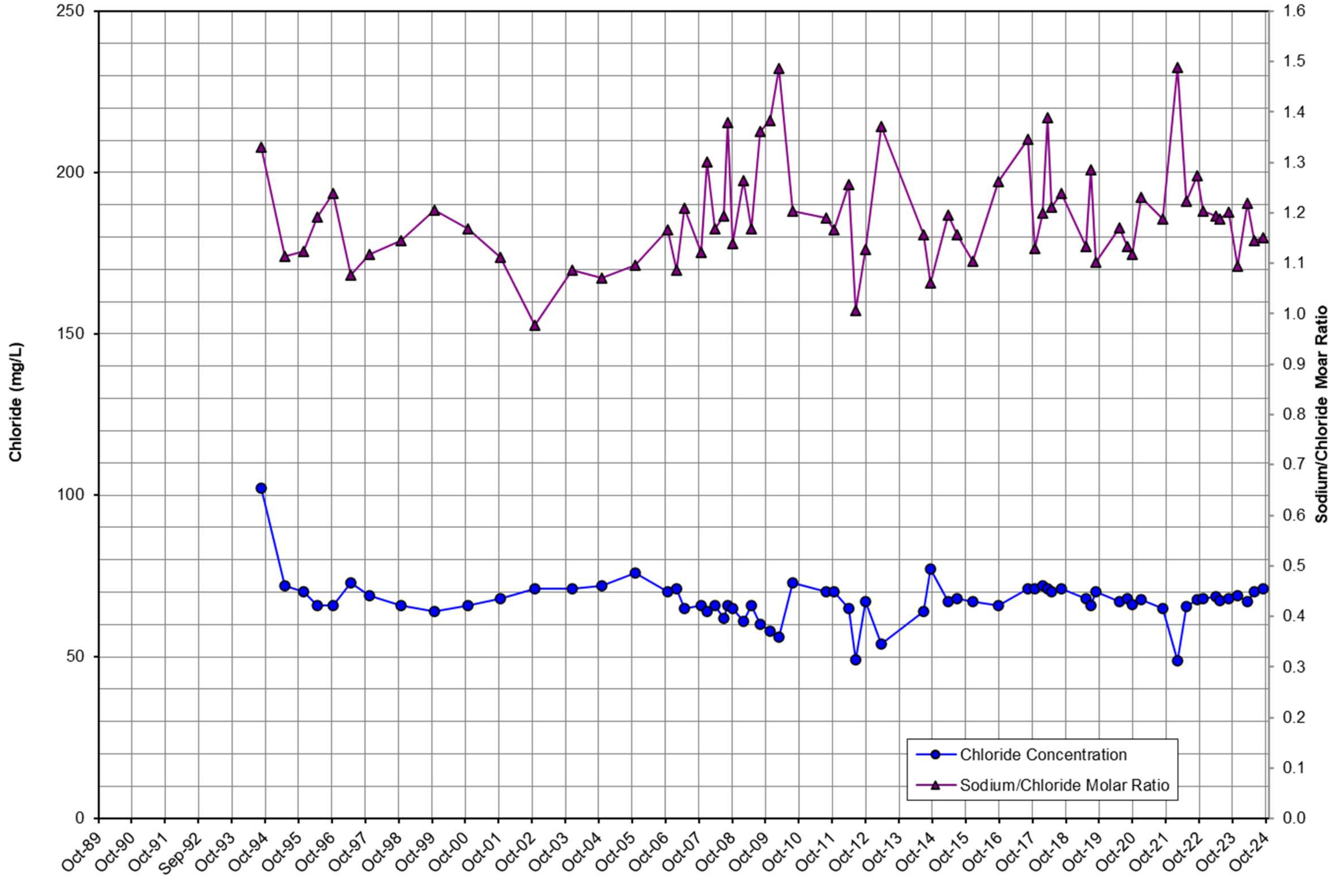

Figure D-12. Fort Ord 9 Deep Well Chloride and Sodium/Chloride Molar Ratio Graph

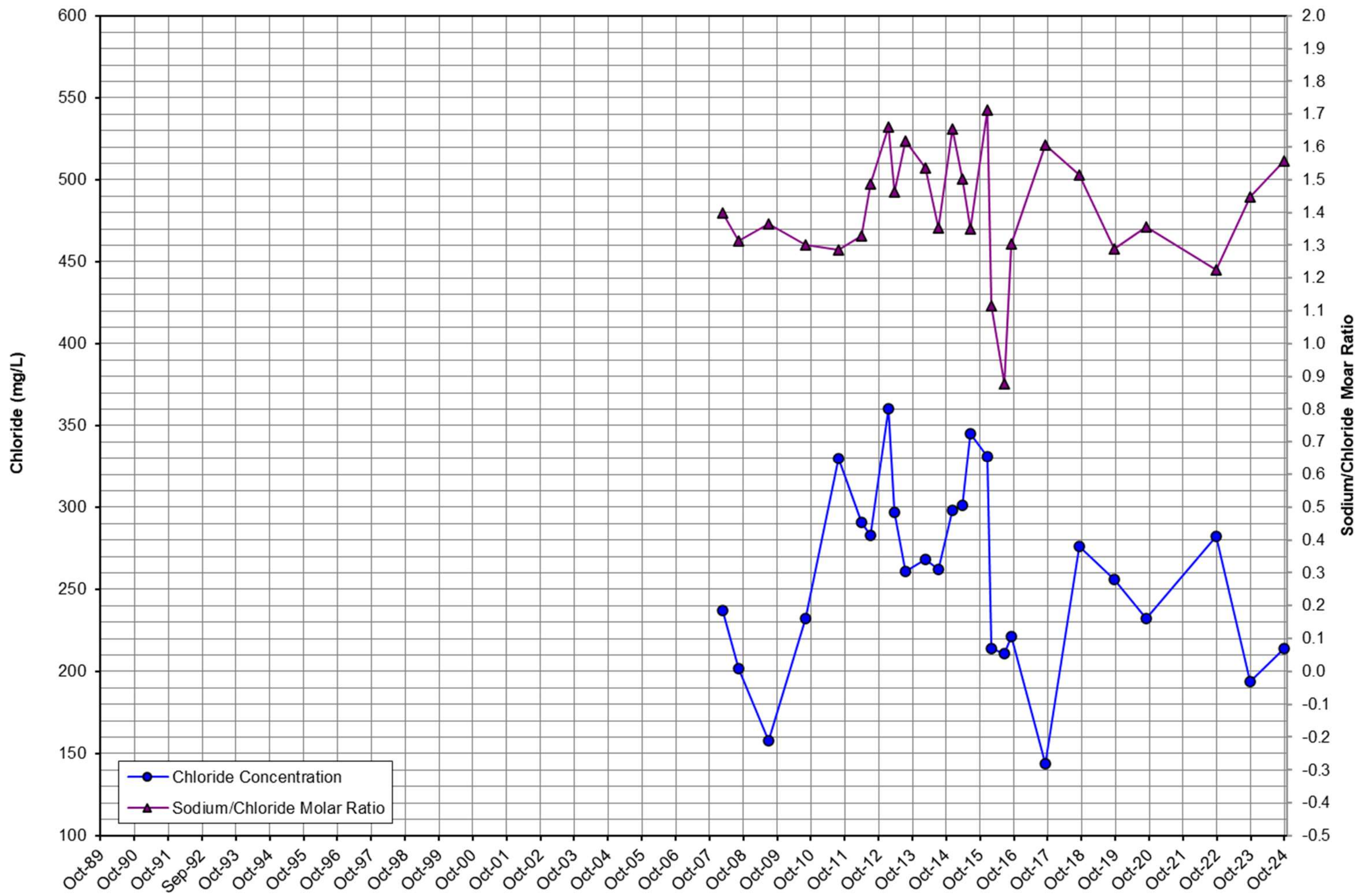

Figure D-13. Sand City Corp Yard Production Well Chloride and Sodium/Chloride Molar Ratio Graph