Seaside Groundwater Basin Watermaster
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October 14, 2022

Mr. Tom Luster
California Coastal Commission
Energy and Ocean Resources Unit
445 Market Street, Suite 300
San Francisco, CA 94101

Re: Monterey Peninsula Water Supply Project, CDP Application No. 9-20-0603

Dear Mr. Luster,

The Seaside Groundwater Basin Watermaster is tasked by the Court to administer the Seaside Basin. Our board is comprised of elected officials and others who each have a role in the protection and management of the basin.

Today we once again write regarding the Coastal Development Permit (CDP) for California American Water Company's (CAW) Monterey Peninsula Water Supply Project (MPWSP). The Watermaster also wrote the Commission on October 4, 2019 and August 12, 2020. Please incorporate those prior letters by reference.

The Commission and other stakeholders must understand what is at stake for the Seaside Basin and the water supplies that are dependent on the health and security of the Basin. The long-term health of this basin is of the utmost importance. It has become the most critical water supply resource for the Monterey Peninsula. The Basin provides native groundwater for municipal uses in CAW's Monterey and Laguna Seca service areas and the City of Seaside. The Seaside Basin also provides critical groundwater storage for CAW's Aquifer Storage and Recovery (ASR) diversions from the Carmel River, and provides storage and treatment of recycled water for Monterey One Water's original Pure Water Monterey (PWM) Project as well as its expansion.

The loss of Seaside Basin storage as a result of overdraft and seawater intrusion would have a catastrophic impact on these crucial existing water supplies, not only for CAW's customers on the Monterey Peninsula, but for the other municipal and irrigation users in Monterey County.

<u>We ask that the Commission take notice of the recent updates to our groundwater modeling and water budget analysis</u>. Attached, please find the Summary of Updated Replenishment Water Analyses prepared by our Technical Program Manager. As noted, the original basin studies were performed in 2013. That work, as well as additional modeling, was referenced in prior correspondence. The two 2022 updates simulated groundwater conditions from 2018 through 2050. The most recent used a "hybrid water budget" that contained additional assumptions. In short, our technical team and the consulting hydrologists looked at both a "best case scenario" and a more "conservative" one. Montgomery & Associates presented these studies to our Board at its September 7, 2022 meeting where they were unanimously accepted.

As noted in the attached Executive Summary, our basin is in need of replenishment water. Specifically, it states –

> *"Under the "best case" scenario 1,000 acre-feet-per-year (AFY) of water would need to be injected into the Seaside Basin every year to replenish it and raise groundwater levels high enough to prevent seawater intrusion from occurring. Under the "conservative" scenario the amount needed would be 3,600 AFY every year.*
>
> *Unless replenishment water in these quantities is added annually, the Seaside Basin will be at risk of seawater intrusion, and that risk will increase each year that groundwater levels continue to fall and remain below sea level. Implementation of the PWMX project does not accomplish this, and an additional source of replenishment water will be needed. The only other potential source of replenishment water will be from desalination."*

While the Seaside Basin's need for additional replenishment water is universally recognized, there remains some disagreement as to how much is actually necessary. For instance, the Monterey Peninsula Water Management District's General Manager has argued that the actual amount may be less than what the studies show. Conversely, a presentation by Montgomery & Associates to our Board at its last meeting suggested that the basin needs may actually be greater. Specifically, they questioned "What is the new normal?" for rainfall. They noted that the percentage of critically dry years over the last 25 years was higher than over the last 50 years. This suggests that the negative impacts of climate change might not be fully accounted for in our current modeling.

We cannot stress enough the Seaside Basin's need for water so that it can build protective water levels and stave off seawater intrusion. While some projects appear to address this need, they really just treat the basin like a bank account…depositing, storing, and then removing water. The studies and modeling show what we really need is water that remains in the basin.

Please take our basin needs into account when making your water supply decision.

Sincerely,

Paul B. Bruno
Chairman

Attachment: Summary of Updated Replenishment Water Analyses, Seaside Basin Watermaster, October 10, 2022

SUMMARY OF UPDATED REPLENISHMENT WATER ANALYSES

Prepared by Robert Jaques, P.E., Technical Program Manager, Seaside Basin Watermaster
October 10, 2022

Executive Summary

Two sets of assumptions were used in these analyses. One was a "best case" scenario based on future water demand projections, Aquifer Storage and Recovery (ASR) injection rates, and Pure Water Monterey Expansion (PWMX) injection rates prepared by the Monterey Peninsula Water Management District (MPWMD). The other was a more "conservative" scenario based on future water demand projections and the timing of start-up of Cal Am's desalination plant contained in Cal Am's 2020 Urban Water Management Plan, ASR and PWMX injection rates with a built-in margin of safety, and revised water demands for the City of Seaside's golf courses proposed by Cal Am and the City of Seaside.

Under the "best case" scenario 1,000 acre-feet-per-year (AFY) of water would need to be injected into the Seaside Basin <u>every year</u> to replenish it and raise groundwater levels high enough to prevent seawater intrusion from occurring. Under the "conservative" scenario the amount needed would be 3,600 AFY <u>every year</u>.

Unless replenishment water in these quantities is added annually, the Seaside Basin will be at risk of seawater intrusion, and that risk will increase each year that groundwater levels continue to fall and remain below sea level. Implementation of the PWMX project does not accomplish this, and an additional source of replenishment water will be needed. The only other potential source of replenishment water will be from desalination.

Background

In April 2013, HydroMetrics Water Resources Inc. (now acquired by Montgomery & Associates) performed groundwater modeling to estimate the amount of replenishment water that would be needed to achieve protective groundwater levels in the Basin. In 2022 the 2013 work was updated to account for new assumptions and information gained since the 2013 work was performed, and to incorporate the impacts of projects that have been implemented since the 2013 work was performed, or are expected to be implemented in the next few years. This Summary provides a condensed version of this updated analysis.

In 2009 HydroMetrics Water Resources Inc. performed groundwater modeling to establish "protective elevations" at six wells located along the coastline. The term "protective elevation" refers to an elevation that is sufficiently above sea level such that seawater cannot move inland into the well.

Updated Analysis

The updated analysis simulated groundwater conditions in the Seaside Basin from 2018 through 2050. It focused on the groundwater conditions in the Northern Coastal Subarea of the Basin, within which are located all of the ASR and PWM injection and extraction wells, and the majority of the water supply production wells. This subarea is the one in which all but one (CDM-MW4) of the six protective elevation monitoring wells are located, is the only subarea that sees notable response to the simulated replenishment operations, and is the subarea at greatest risk from seawater intrusion.

In this Summary the term "*Baseline Scenario*" refers to the simulation of future conditions assuming only operation of currently planned projects with no additional replenishment added. The *Baseline Scenario* represents recent conditions from Water Year (WY) 2018 through 2021 based on actual measured pumping, injection, and hydrology. The projected potential future conditions from WY 2022 through WY 2050 are based on pumping to meet the water demands projected by MPWMD, currently operational or planned projects (but not including a desalination plant), and repeating the historical hydrology cycle into the future. That assumes that the same rainfall and drought pattern that has been experienced in recent years (the period 1988 through 2016) will repeat itself beginning in 2022 and up to the end of the analysis period in 2050.

The term "*Baseline Scenario with Replenishment Water Added*" refers to the simulations in which replenishment water in varying amounts was added to the *Baseline Scenario* in order to see how much replenishment water would be needed to achieve protective groundwater elevations in the Basin.

The term "*Alternate Scenario*" refers to the simulation of future conditions with the following different assumptions than those used in the *Baseline Scenario*, as requested by the City of Seaside and Cal Am:

- Revised City of Seaside Golf Course water demand
- Applying a factor of safety on the amount of water that will be supplied by ASR by using a lower daily ASR injection rate of 15 Acre-feet-per-day (AFD) compared to the 20 AFD used in the *Baseline Scenario*
- Use of the water demand figures and the start-up date for the desalination plant in Cal Am's 2020 Urban Water Management Plan
- Starting Cal Am's over-pumping repayment program of 700 Acre-feet-per-year (AFY) coinciding with the start-up of the desalination plant
- Applying a factor of safety on the amount of water that will be supplied by the PWM Expansion project by reducing its projected supply from the 5,750 AFY used in the *Baseline Scenario* to 4,600 AFY

The term "Shallow Aquifers" refers collectively to the Aromas Sands & Older Dune Deposits and the Paso Robles Aquifer. The term "Deep Aquifer" refers to the Santa Margarita Aquifer.

All of the Scenarios take into account:

- The City of Seaside's replacement of groundwater with recycled water for golf course irrigation and the construction of the Security National Guaranty (SNG) and Campus Town developments in the City of Seaside
- The assumption that no proposed Groundwater Sustainability Plan (GSP) projects are implemented in the neighboring Monterey and 180/400 Foot Subbasins, and that groundwater levels along the northern boundary of the Model (located close to the boundary between those two subbasins) remain unchanged as currently represented in the Model boundary conditions
- A projected mean sea level rise of up to 1.3 feet by 2050
- Cal Am's overpumping repayment program assumed at 700 AFY for a period of 25 years

Comparisons of the events and assumptions under the *Baseline Scenario* and the *Alternate Scenario* are shown in Tables 1 and 2. The hydrologic cycle used in each Scenario is shown in Figure 1.

Figure 2 shows the annual net flows going into and out of the Basin's shallow and deep aquifers in the Northern Coastal Subarea under the *Baseline Scenario*. There are a number of flow components that are accounted for in determining the net flows each year, including:

- Inflows consisting of percolation from rainfall and PWM and ASR injected water.
- Outflows consisting of pumping from extraction wells (production wells, ASR wells, and PWM wells).
- Flows into and out of the adjacent subareas and the offshore area, and between the Shallow and Deep aquifers. These can be either flows into or out of the aquifers, depending on the hydraulic gradients between the aquifers and the adjacent subareas or aquifers. Changes in those gradients can change the flow directions as groundwater levels change.

In Figure 2 positive values of net flow mean that inflows were greater than outflows in that Water Year. Negative values mean that outflows were greater than inflows in that Water Year. Figure 3 shows the cumulative change in storage in the aquifers over the simulation period. In years when there is a positive net flow, storage increases and groundwater levels rise. In years when there is a negative net flow, storage decreases and groundwater levels fall.

Figure 4 shows the locations of the six protective elevation wells. Figures 5 through 10 compare the groundwater elevations achieved at each of the protective elevation wells under the *Baseline* and *Baseline with Replenishment Water Added Scenarios*. Those Figures show that without replenishment water being added, protective groundwater elevations cannot be achieved and the Seaside Subbasin will be at risk of seawater intrusion.

Figure 11 shows the magnitude of groundwater loss from the Seaside Subbasin to the adjacent Monterey Subbasin under the *Baseline Scenario*. The losses under all of the scenarios in which replenishment water is added to the Subbasin will be greater than the amounts shown in Figure 11.

Figure 12 shows the amount of additional replenishment needed each year under the *Alternate Scenario* to achieve the same water level increases as in the *Baseline Scenario* (green bars), and to achieve the same level of protective elevations as in the *Baseline Scenario with Replenishment Water Added* (blue line with circle markers). Since the *Baseline Scenario* did not achieve protective elevations, only the amount of water needed under the *Baseline Scenario with Replenishment Water Added* is of significance.

Table 1. Timeline Comparison of the Baseline and Alternate Scenarios

Sim Year	Water Year	Hydrology Source WY	Pumping & Injection	Major Projects Timeline (Does not show the Campus Town and SNG development projects, but the water demands of those projects are accounted for in the analyses)	
				Baseline Scenario	***Alternate Scenario***
1	2018	Actual	Actual		
2	2019	Actual	Actual		
3	2020	Actual	Actual	**PWM Base Project Begins (3,500 AFY)**	**PWM Base Project Begins (3,500 AFY)**
4	2021	Actual	Actual	**Cal-Am ceases pumping in Laguna Seca**	**Cal-Am ceases pumping in Laguna Seca**
5	2022	1988	Projected	**PWM ramps up to 4,100 AFY**	**PWM ramps up to 4,100 AFY**
6	2023	1989	Projected	**Seaside Golf Courses shift to PWM water**	**Seaside Golf Courses shift to PWM water**
7	2024	1990	Projected	**PWM Expansion Begins (5,750 AFY) & Cal Am Overpumping Repayment of 700 AFY Begins**	**PWM Expansion Begins (4,600 AFY)**
8	2025	1991	Projected		
9	2026	1992	Projected		
10	2027	1993	Projected		
11	2028	1994	Projected		
12	2029	1995	Projected		
13	2030	1996	Projected		**Cal Am Desalination Plant Goes On-line & Overpumping Repayment of 700 AFY Begins**
14	2031	1997	Projected		
15	2032	1998	Projected		
16	2033	1999	Projected		
17	2034	2000	Projected		
18	2035	2001	Projected		
19	2036	2002	Projected		
20	2037	2003	Projected		
21	2038	2004	Projected		
22	2039	2005	Projected		
23	2040	2006	Projected		
24	2041	2007	Projected		
25	2042	2008	Projected		
26	2043	2009	Projected		
27	2044	2010	Projected		
28	2045	2011	Projected		
29	2046	2012	Projected		
30	2047	2013	Projected		
31	2048	2014	Projected	**Potential Final Year of Cal-Am Repayment Period**	
32	2049	2015	Projected		
33	2050	2016	Projected		**Cal-Am Repayment Period Does Not End Before the End of the Simulation Period**

Table 2. Differences in Golf Course Demand and ASR Injection Rates Between the Baseline and Alternate Scenarios

Supply or Demand Source	*Baseline Scenario*	*Alternate Scenario*
City of Seaside Golf Course Water Demand, AFY	301	514
ASR Daily Injection Rate, AFD	20	15

Figure 1. Hydrologic Cycle Used in all of the Scenarios

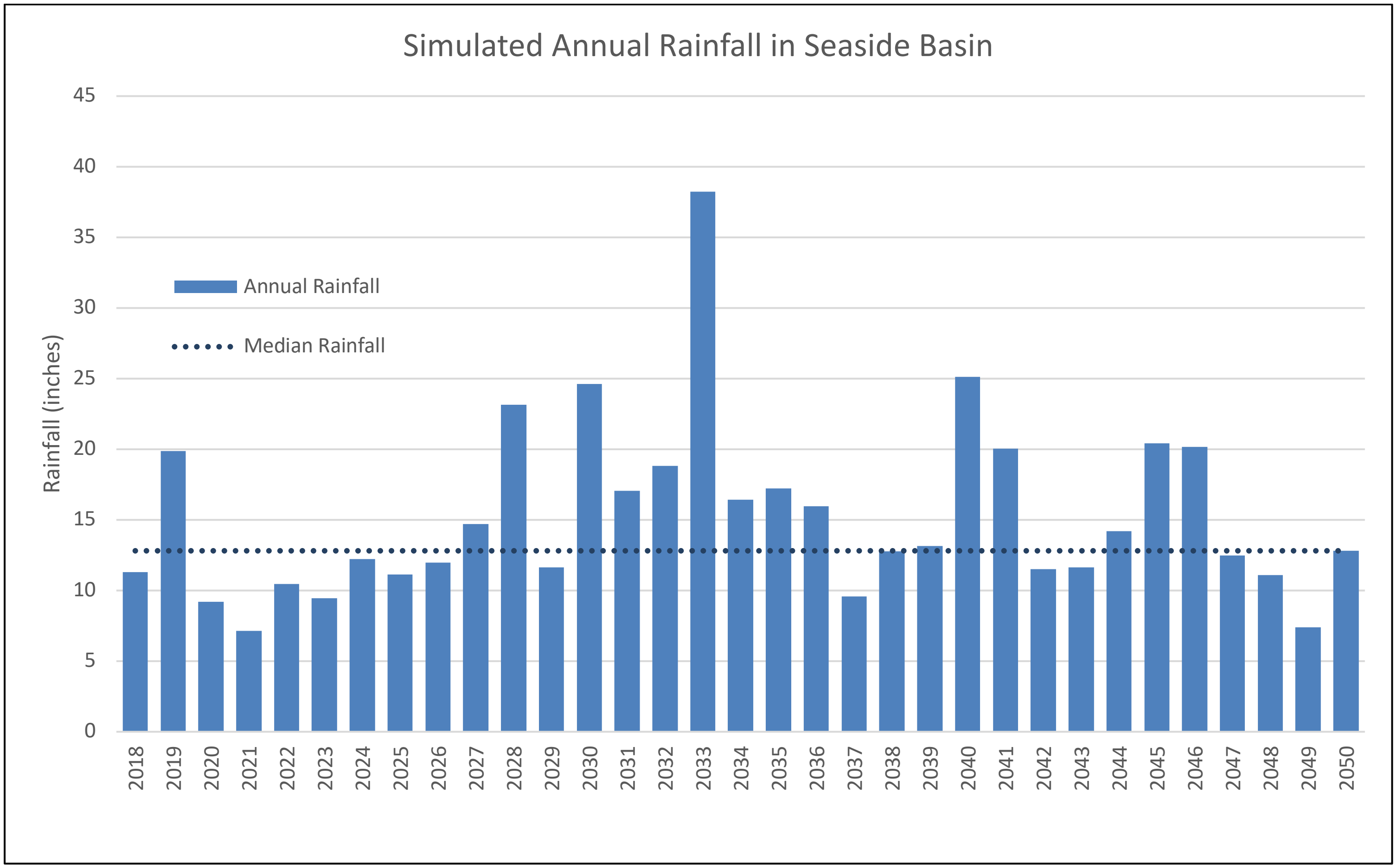


Figure 2. Yearly Flows Into and Out of the Aquifers in the *Baseline Scenario*

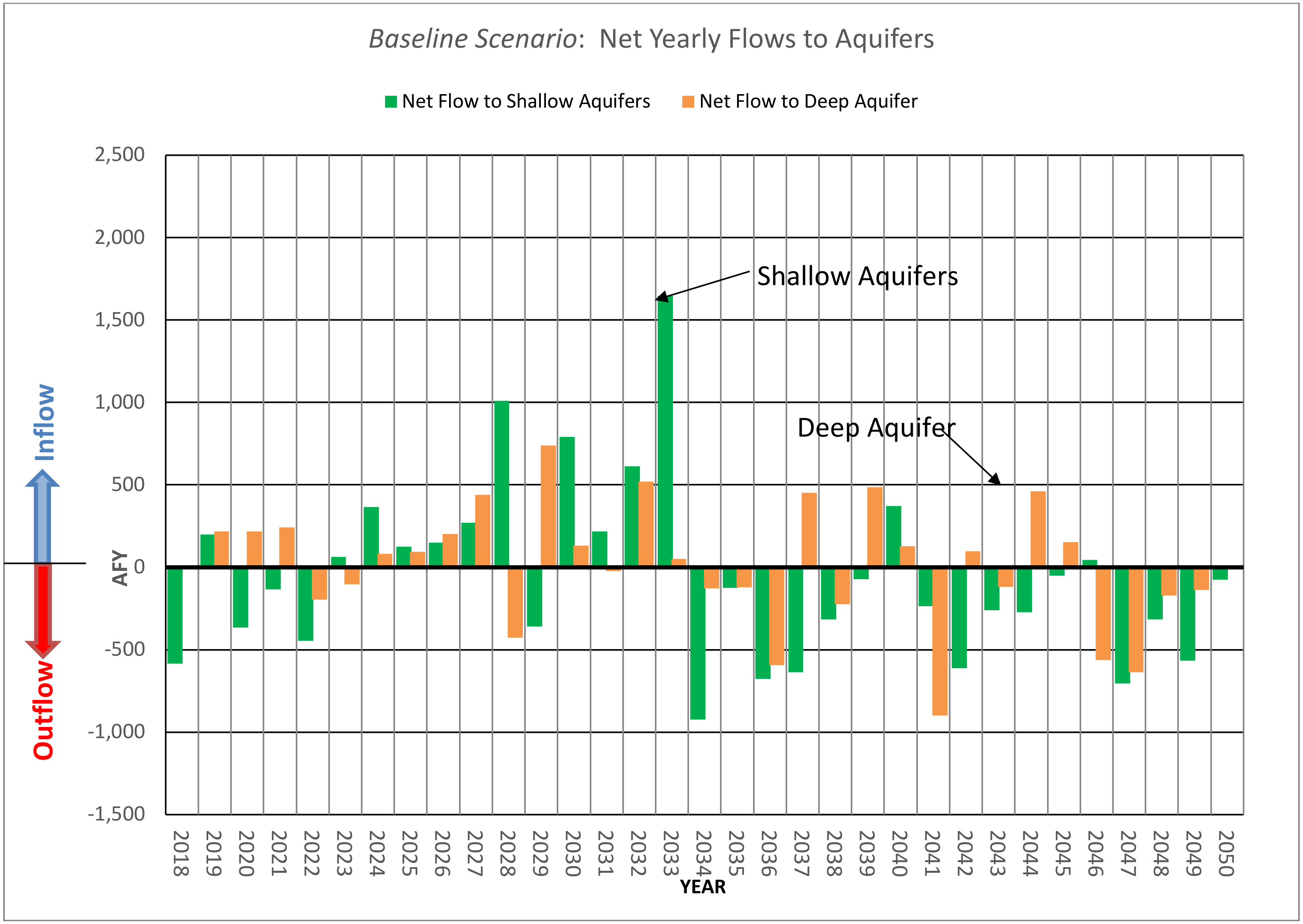


Figure 3. Cumulative Change in Storage in the *Baseline Scenario*

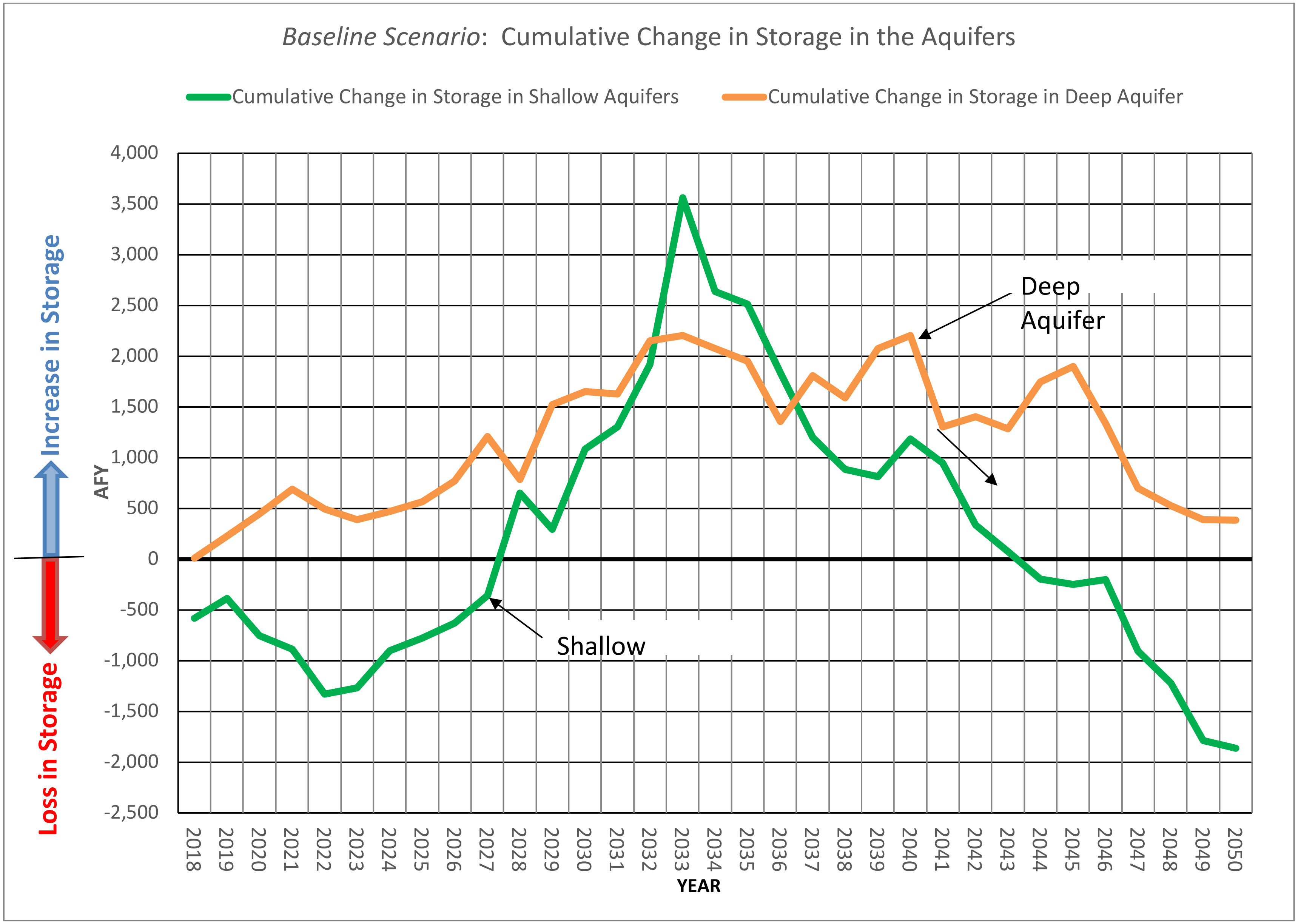


Figure 4. Locations of Protective Elevation Wells

Figure 5. Groundwater Elevations Compared to the Protective Elevation at Sentinel Well #3 Under the *Baseline and Replenishment Water Added Scenarios*

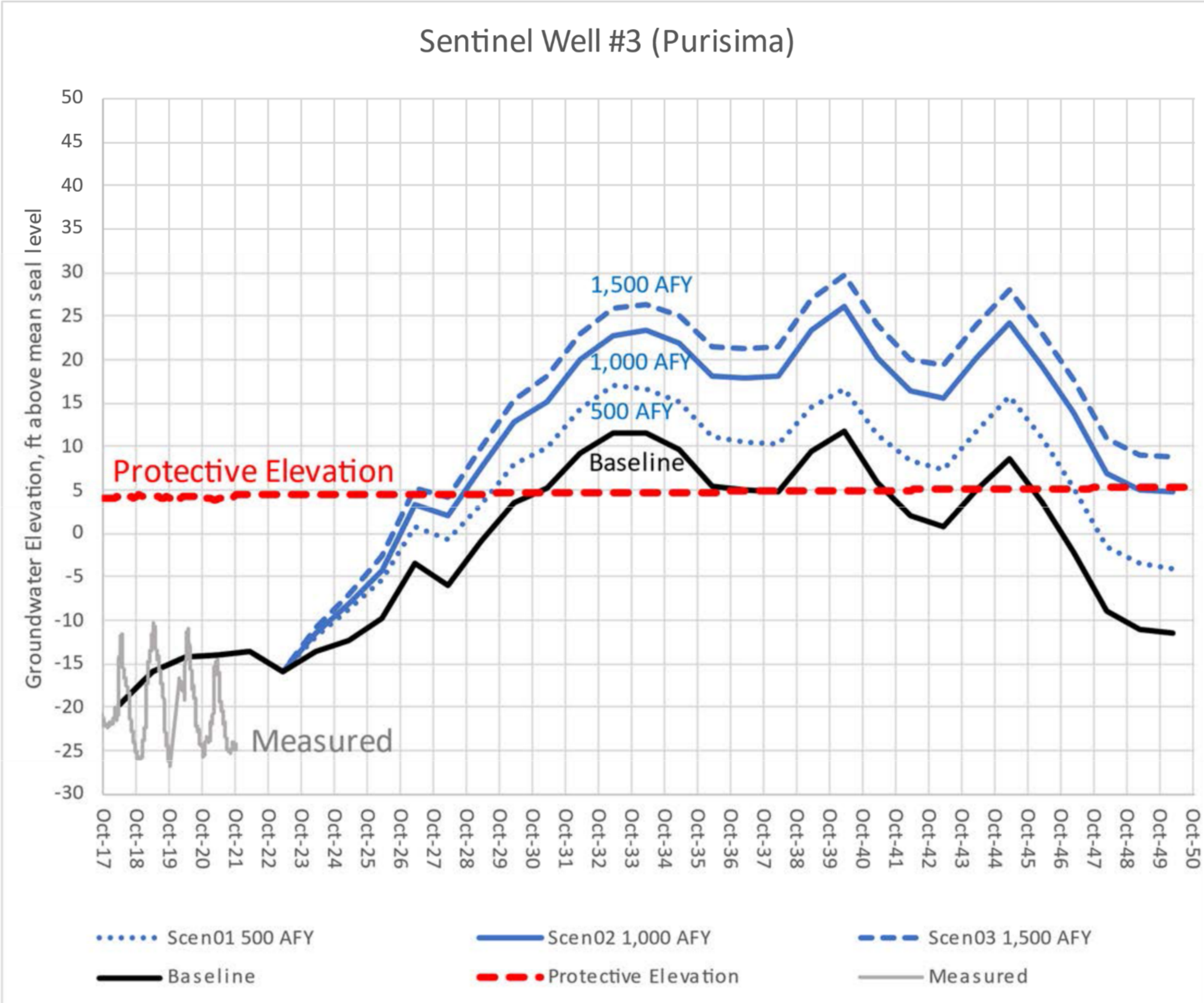


Figure 6. Groundwater Elevations Compared to the Protective Elevation at Well PCA-A West Deep Under the *Baseline and Replenishment Water Added Scenarios*

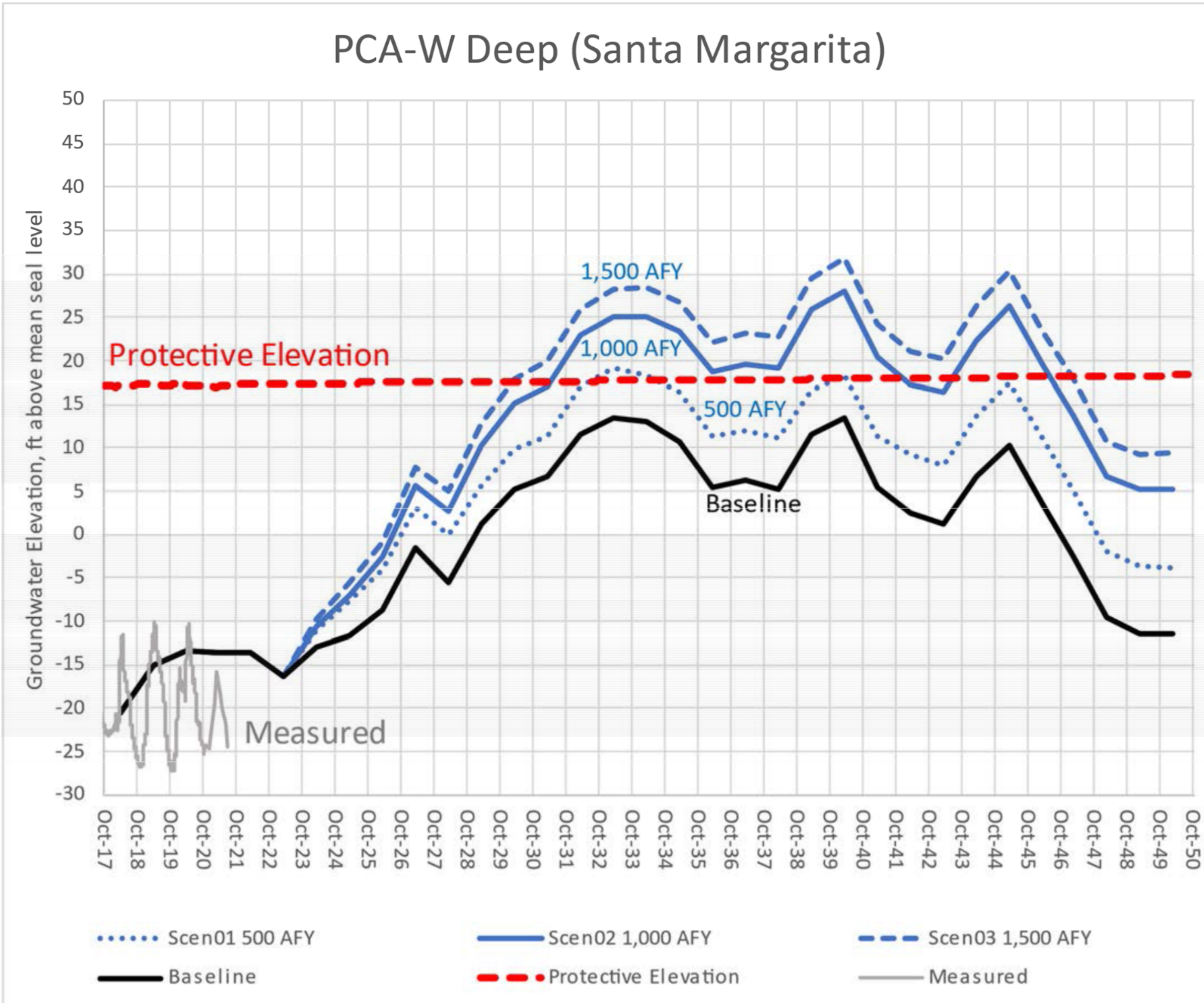


Figure 7. Groundwater Elevations Compared to the Protective Elevation at Well PCA-A West Shallow Under the *Baseline and Replenishment Water Added Scenarios*

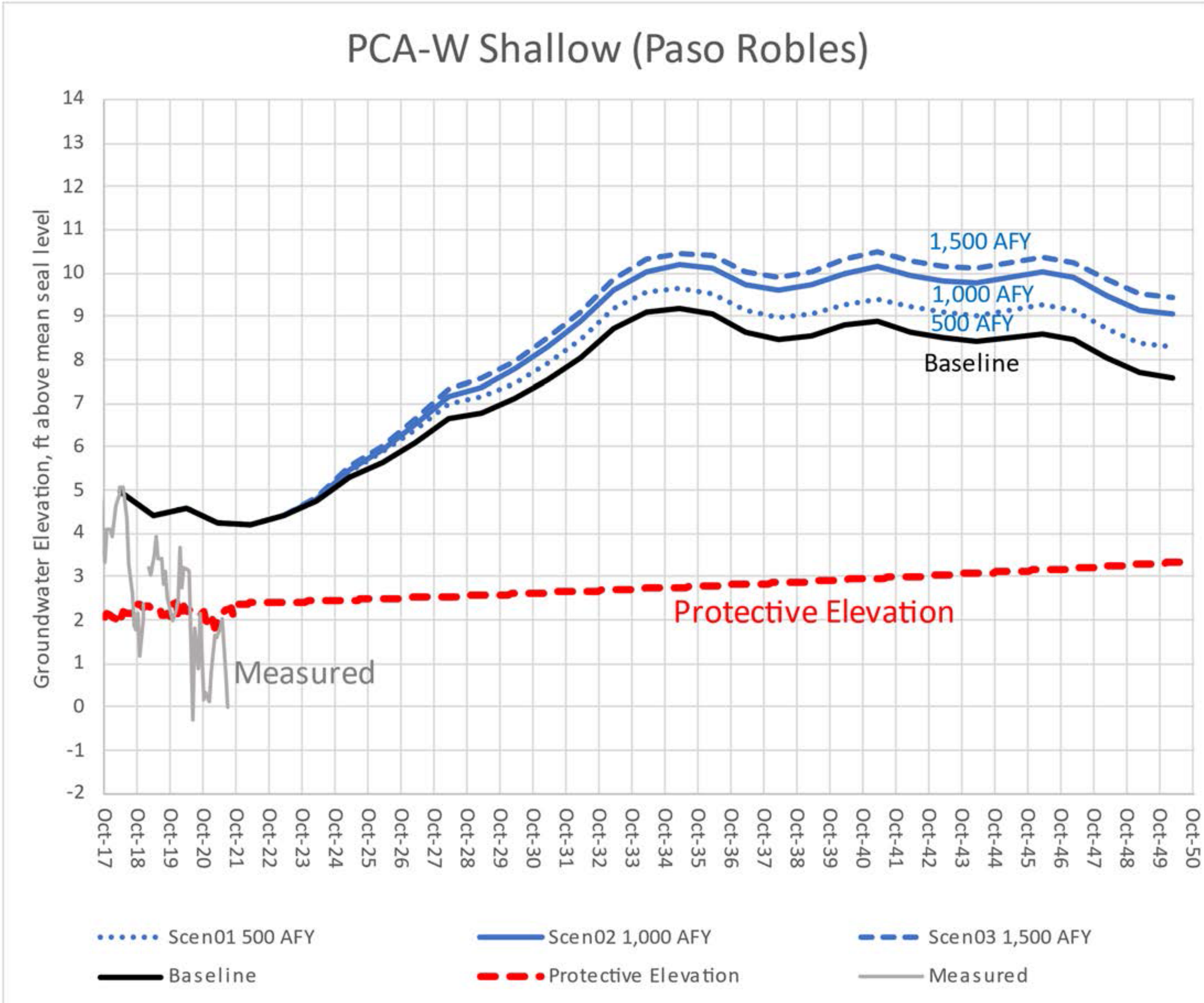


Figure 8. Groundwater Elevations Compared to the Protective Elevation at Well MSC Shallow Under the *Baseline and Replenishment Water Added Scenarios*

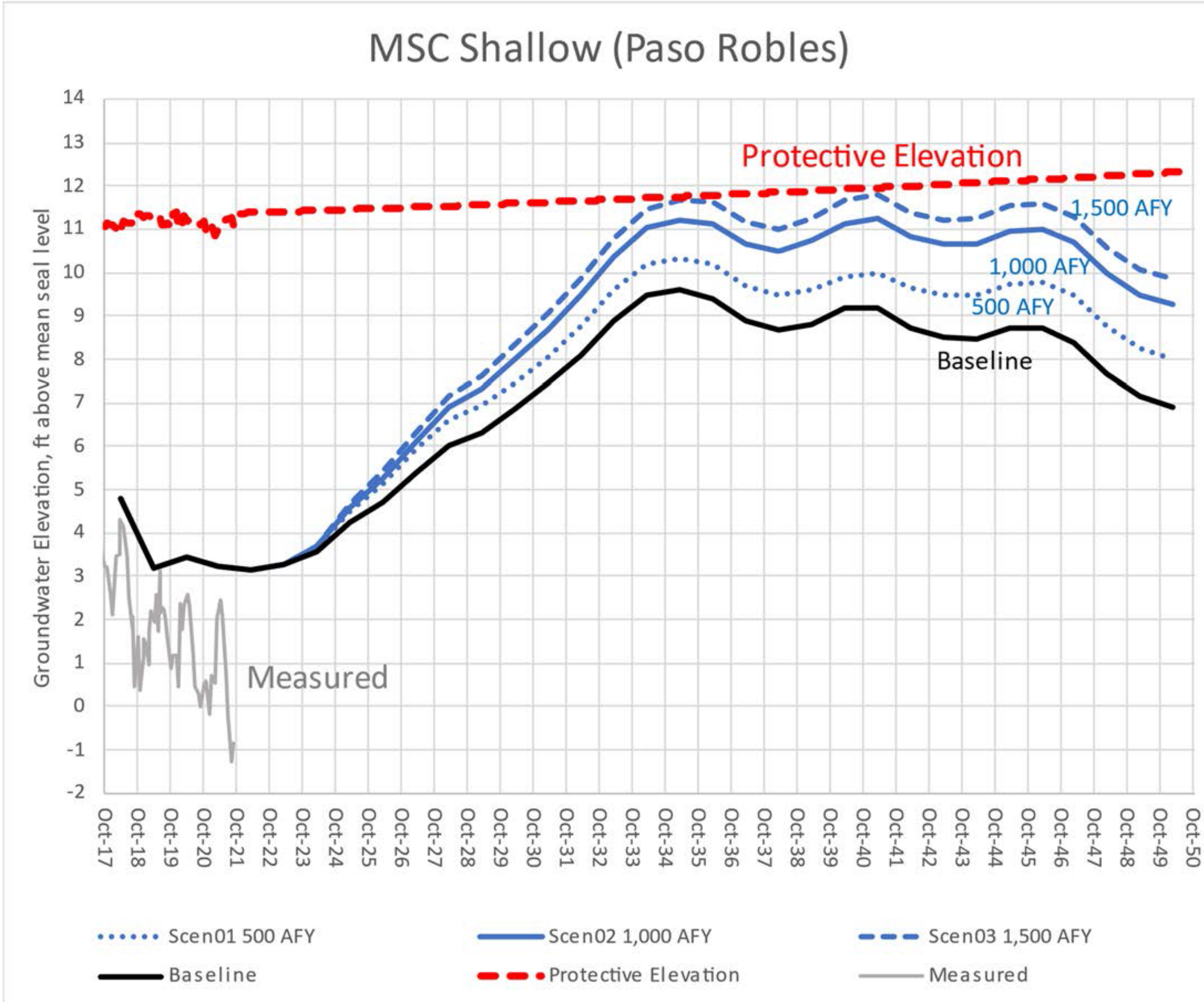


Figure 9. Groundwater Elevations Compared to the Protective Elevation at Well MSC Deep Under the *Baseline and Replenishment Water Added Scenarios*

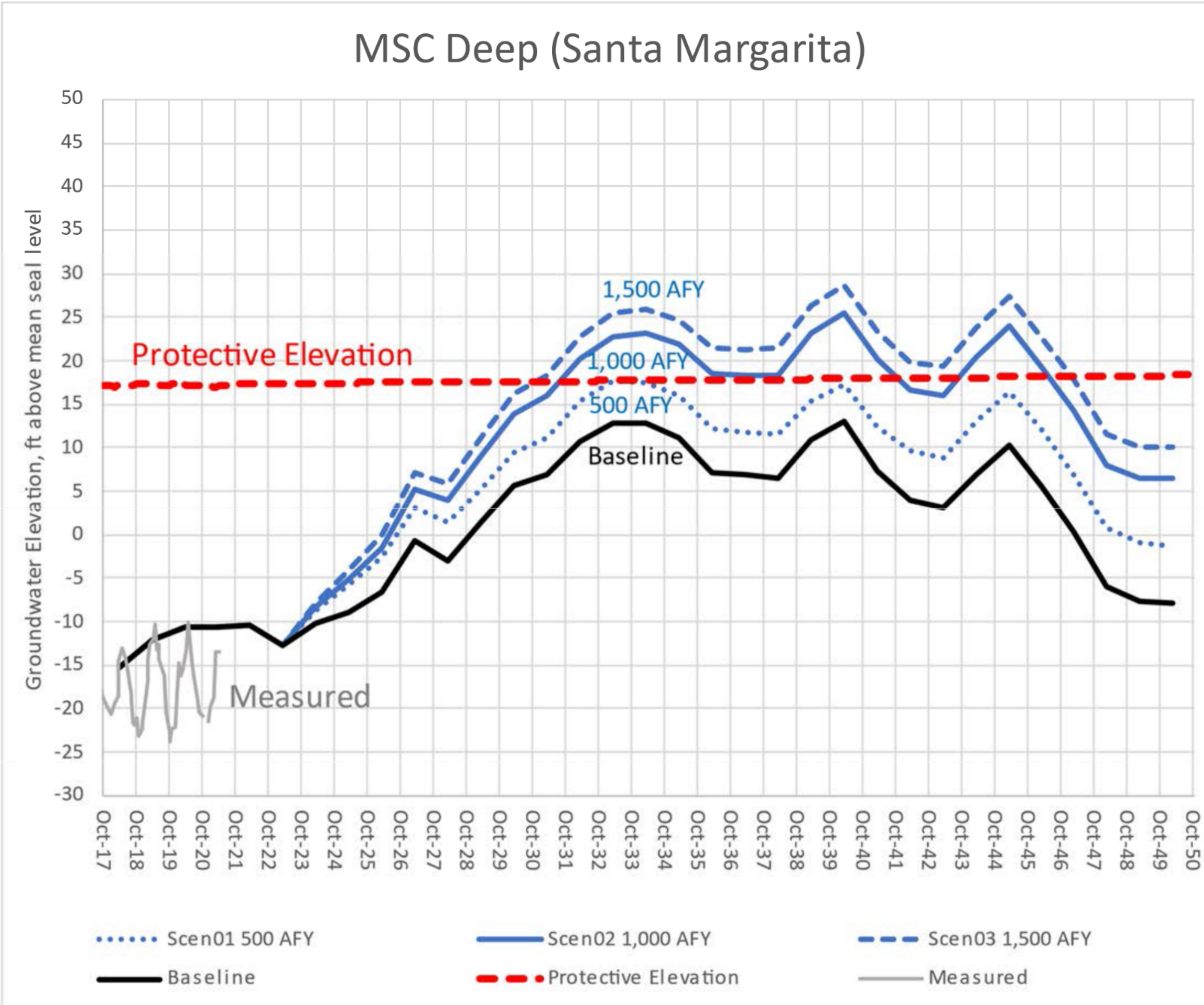


Figure 10. Groundwater Elevations Compared to the Protective Elevation at Well CDM MW-4 Under the *Baseline and Replenishment Water Added Scenarios*

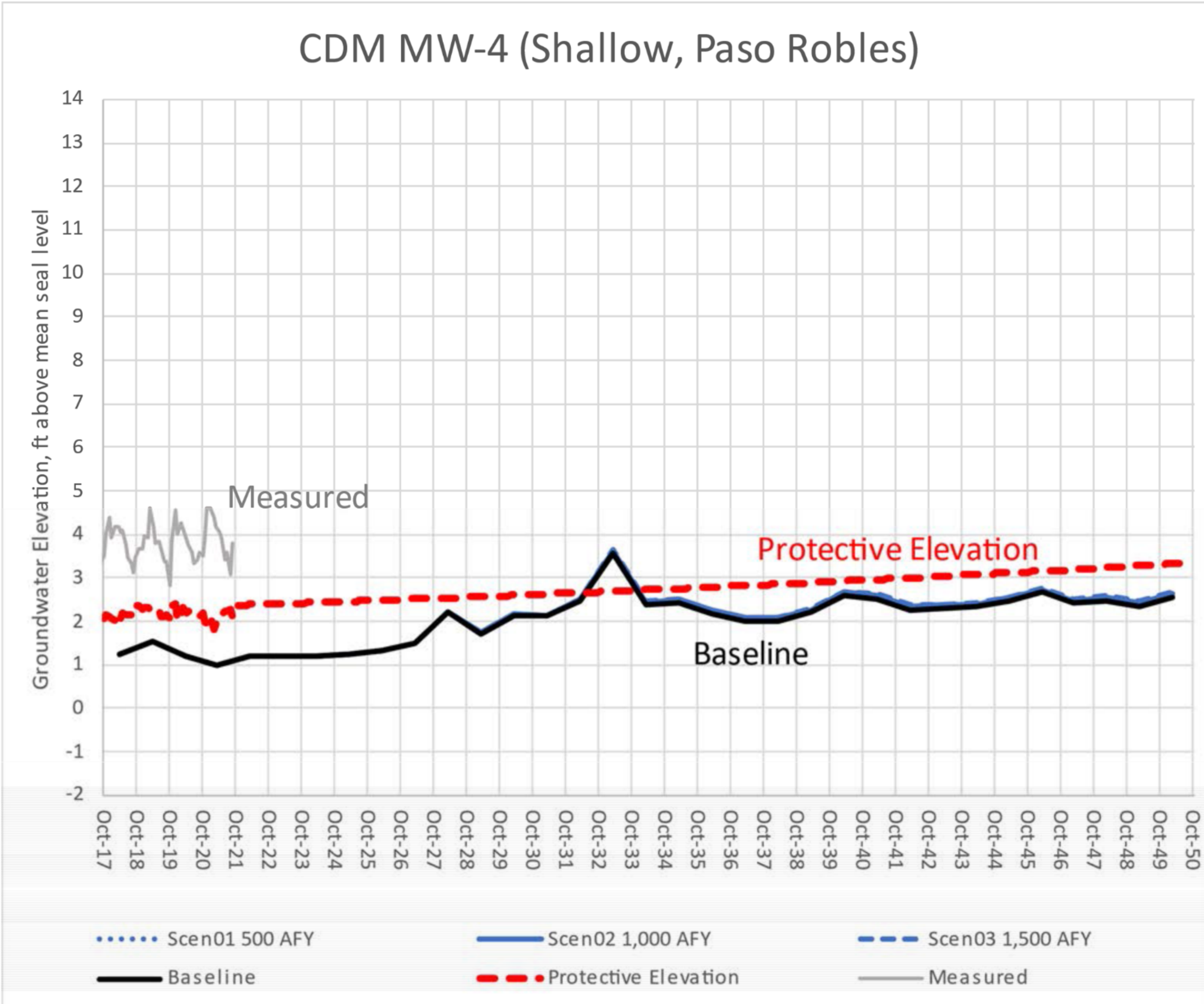


Figure 11 Annual Groundwater Losses from the Seaside Subbasin to the Monterey Subbasin under the *Baseline Scenario*

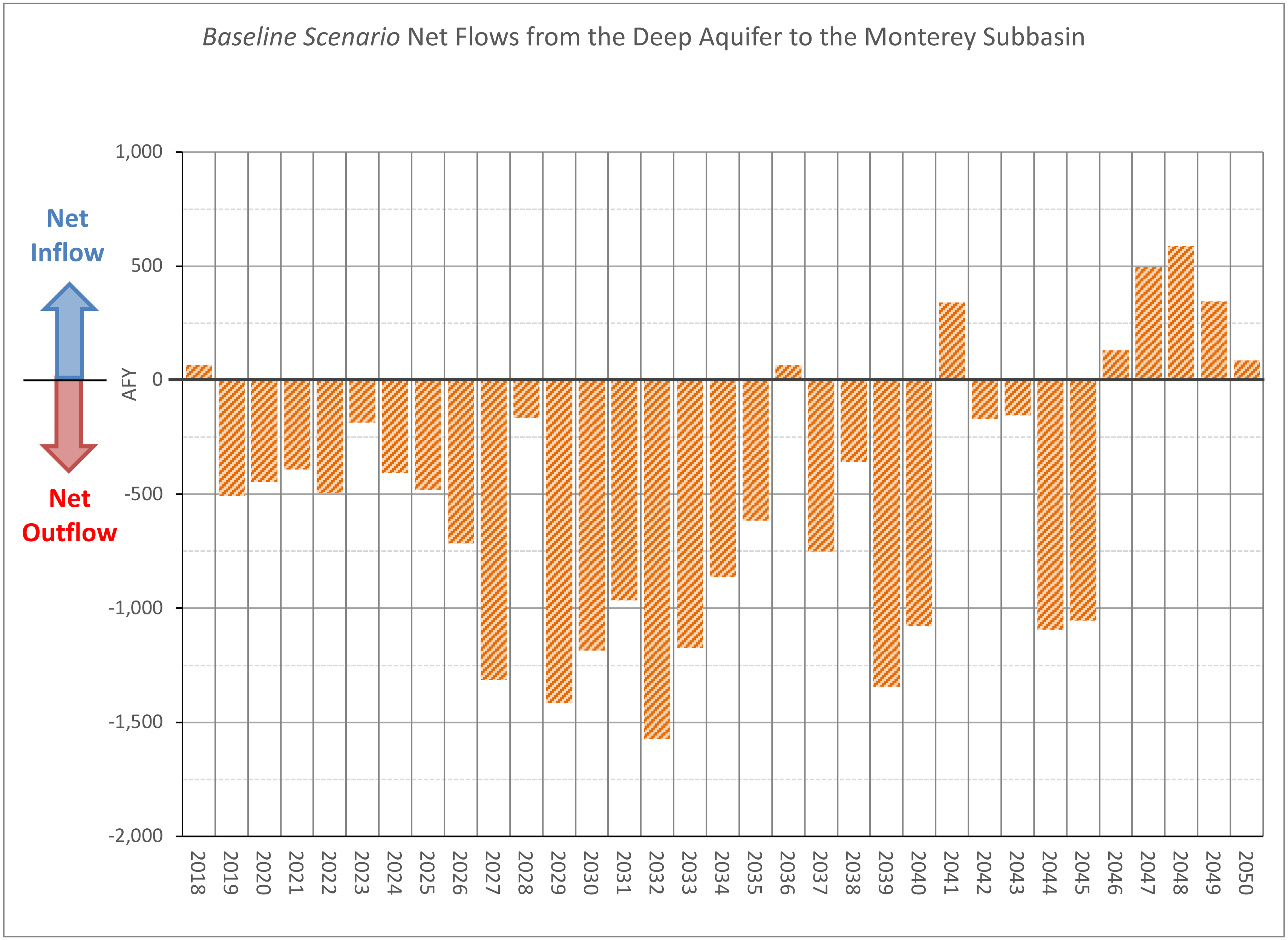
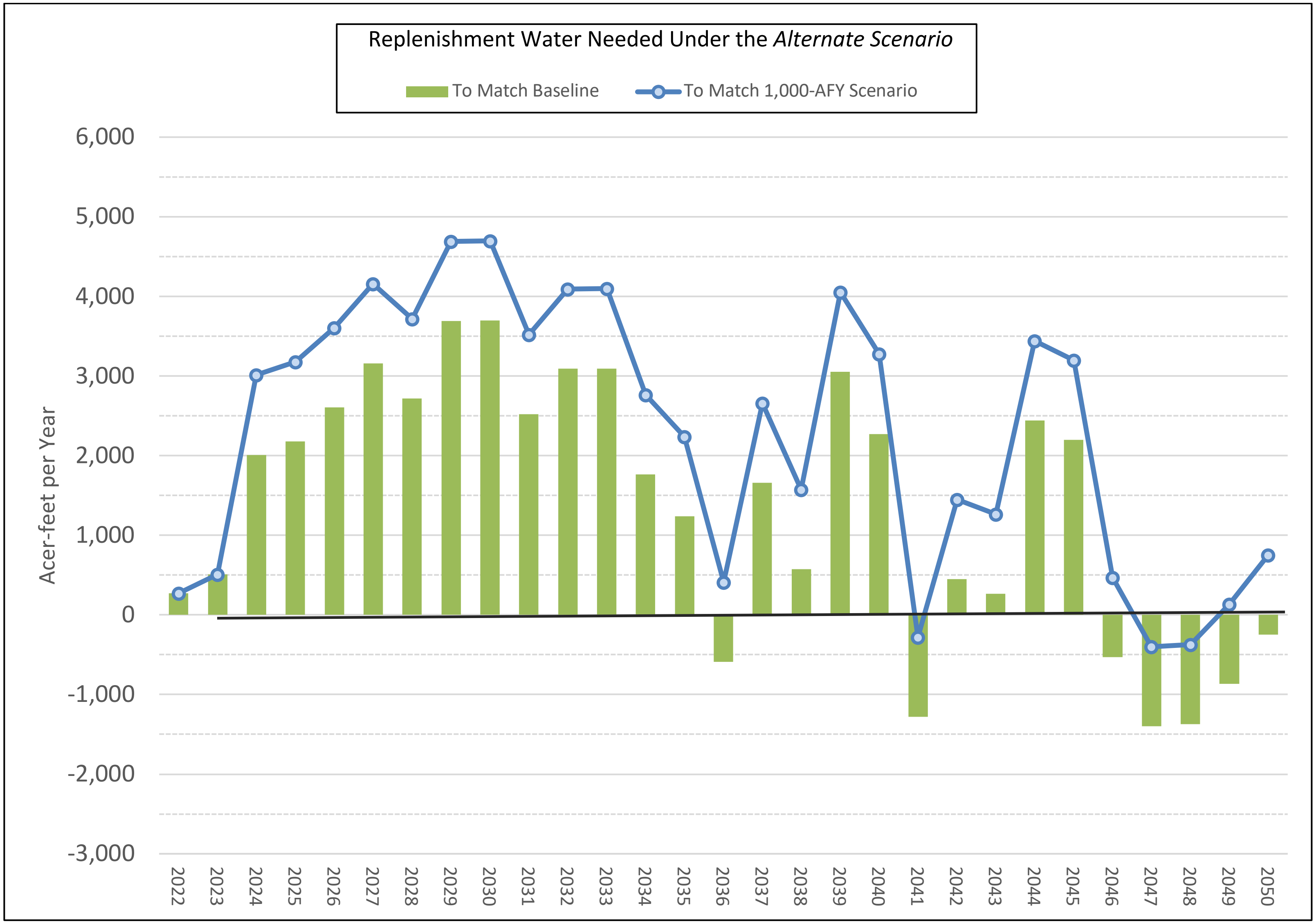


Figure 12. Replenishment Water Needed Annually to Achieve Protective Elevations Under the *Alternate Scenario*



CONCLUSIONS

General:

1. The updated analyses tie ASR and PWM injection and extraction volumes to the hydrologic cycle and illustrate the significant impact that multi-year droughts, and even just below normal rainfall periods, can have on the availability of water for ASR and PWM recharge and on the timing of reaching and maintaining protective elevations.
2. The protective elevations developed in 2009 assumed steady-state conditions that had no time component to them. That modeling work assumed that sufficient time would have passed such that conditions would have equilibrated to a fixed state. That modeling did not consider and did not suggest for how long a period groundwater levels could stay below protective elevations without greatly increasing the risk of sea water intrusion. This is something that would require additional modeling to evaluate, and would also require making an assumption about how far offshore the seawater-fresh water interface is located.
3. Groundwater levels rise quickly in response to replenishment during periods of normal and above-normal water years following the prolonged drought occurring at the start of the simulation period. This suggests that levels would rebound again after the drought that occurs at the end of the simulation period. However, the rapid rebound is also a function of the assumption that Cal-Am will extract ASR water as its last source of supply, after exhausting available water from its native groundwater rights and PWM water. This assumption has the consequence that a very large portion of the injected ASR water is left in storage in the Basin.
4. If groundwater levels in the Monterey Subbasin do not rise, outflows to the Monterey Subbasin will increase in all aquifers as groundwater levels in the Seaside Subbasin rise. An initial net inflow of water from the offshore region into the Seaside Subbasin reverses to a net outflow in all aquifers as groundwater levels increase.
5. Projected sea level rise is not a significant driver of inland flows compared to the changes in water levels associated with changes in injection and extraction in the subbasin.
6. Groundwater conditions in the adjacent Monterey Subbasin have a big effect on the amount of replenishment water needed. For all of the Scenarios in most years outflow from the Seaside Subbasin to the Monterey Subbasin is the single largest net outflow.
7. All of the Scenarios assume that water levels along the boundary between the Monterey Subbasin and the 180-400 Foot Aquifer subbasin stay fixed at recent levels and that no management actions or projects are implemented to increase groundwater levels in these neighboring subbasins during the simulation period.
8. As groundwater levels in the Seaside subbasin begin to rise in response to increased recharge, steeper gradients develop towards the Monterey Subbasin, producing increased outflows to the Monterey Subbasin. This reduces the effectiveness of replenishment activities and necessitates greater volumes of replenishment water to reach protective elevations than would be needed if water levels in the Monterey Subbasin were also increasing over time.
9. Increasing the amount of replenishment water while keeping the injection of this water focused in a narrow strip of the Basin results in localized mounding of groundwater that causes water to be lost to the Monterey Subbasin. It may be that spreading the area of injection of the replenishment water out over a broader area further from the subbasin boundary could reduce the amount of this loss.

Baseline Scenario:

1. Under the *Baseline Scenario*, with no replenishment water added it is not possible for the Basin to achieve protective groundwater elevations. This means the Basin would continue to be vulnerable to seawater intrusion.

Baseline With Replenishment Water Added Scenario:

1. Three amounts of added annual replenishment water were evaluated: 500 AFY, 1,000 AFY, and 1,500 AFY.
2. If only 500 AFY of replenishment water is added protective groundwater elevations are only achieved in some parts of the Basin.
3. If 1,000 AFY of replenishment water is added:
   - Protective groundwater elevations are reached throughout the Basin within 11 years. Average annual groundwater levels remain above protective elevations for over 50% of the water years during Cal Am's 25-year overpumping repayment period, except at one of the protective elevation monitoring wells, at which the protective elevation is reached only once, in WY 2035. After this year, groundwater levels stop increasing and slowly decline due to the impact of drought years in the projected hydrologic cycles. In addition to the constant 1,000 AFY of replenishment water, additional "booster" injections might be necessary following protracted drought periods to make up the lost water.
   - There is a reversal from a net inflow of water from offshore to a net outflow of water to offshore, even when protective elevations are not being met at all protective elevation wells. The additional replenishment water adds an additional buffer to maintain strong net offshore outflows even in drought years.
   - A net annual volume of between 200 to 500 AFY flows out from the Shallow Aquifers to the Monterey Subbasin once water levels in the Shallow Aquifers begin to rise, driven by the increasing relative gradients between the groundwater levels in the Northern Coastal Subarea and the lower groundwater levels in the Monterey Subbasin. A similar magnitude of net outflow occurs to the offshore portions of the Shallow Aquifers.
   - A net annual volume of between 600 to 1,700 AFY flows out from the Deep Aquifer to the Monterey Subbasin as groundwater levels rise. In addition, a small amount flows from the Deep Aquifer to the overlying Shallow Aquifer during peak periods when Deep Aquifer groundwater levels rise above the levels in the Shallow Aquifer.
4. Increasing the addition of replenishment water to 1,500 AFY results in only marginal increases in protective elevations. This is particularly true for the Shallow Aquifers. This suggests that there is limited benefit in trying to raise Shallow Aquifer groundwater levels by increasing the amount of replenishment water injected into the Deep Aquifer. Rather, other alternatives could be considered and evaluated such as redistributing pumping from wells screened completely or partially in the Paso Robles aquifer, increased use of recycled water for irrigation purposes such as at Mission Memorial Park, and additional recharge directly to the Paso Robles aquifer.
5. The simulation period ends just as Cal Am's 700 AFY for 25-years overpumping repayment program comes to an end. Once Cal Am resumes pumping at its full groundwater allocation of 1,474 AFY it is likely that additional replenishment water would be needed to offset this increased level of extraction.

Alternate Scenario

1. The increases in Deep Aquifer groundwater levels under the *Baseline Scenario* and the *Baseline with Replenishment Water Added Scenario* would not occur under the supply and demand

assumptions of the *Alternate Scenario* without very large quantities of replenishment water being added.

2. The amounts of replenishment water needed to achieve protective elevations under the *Alternate Scenario* is significantly greater than under the *Baseline Scenario.* As Figure 12 shows, under the *Alternate Scenario* in some years the amount of replenishment water needed to achieve protective elevations would be more than 4,500 AFY, and an average of 3,600 AFY of replenishment water would be needed annually during the time period of 2024-2035. This compares to the 1,000 AFY of replenishment needed under the *Baseline Scenario*. This highlights the sensitivity of predicted groundwater conditions in the Basin to the assumptions that are made about future water demands, future rainfall patterns, and the availability of water supplied from outside the subbasin, including Carmel River ASR diversion, the expanded Pure Water Monterey Project, and the MPWSP Desalination Plant.