STATE OF CALIFORNIA

ENVIRONMENTAL PROTECTION AGENCY

STATE WATER RESOURCES CONTROL BOARD

FINAL REPORT OF THE BOARD AS REFEREE

in

City of Marina v. RMC Lonestar

Superior Court of California, County of Monterey, Case No. 20CV001387

Hon. Thomas Wills, Department 15

Prepared by the Administrative Hearings Office,

State Water Resources Control Board

June 25, 2025

Approved by:

June 25, 2025

Date

Eric Oppenheimer
Executive Director
State Water Resources Control Board

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1 INTRODUCTION

The State Water Resources Control Board (State Water Board or Board) submits this Final Report of the Board as Referee to the Superior Court of the County of Monterey in the matter of *City of Marina v. RMC Lonestar* (Monterey Sup. Ct. Case No. 20CV001387.) This report is submitted pursuant to the court's order of October 7, 2021, seeking the expert opinion of the State Water Board on eight questions included in the order.

2 BACKGROUND

2.1 Proposed Project

California-American Water Company (Cal-Am) proposed the Monterey Peninsula Water Supply Project (MPWSP or proposed project) as a desalination project that would draw water from slant wells drilled from a location near the shoreline of the Pacific Ocean within the City of Marina (Marina or City), in Monterey County, beneath Monterey Bay. (See Figure 1 – General Area Map.)

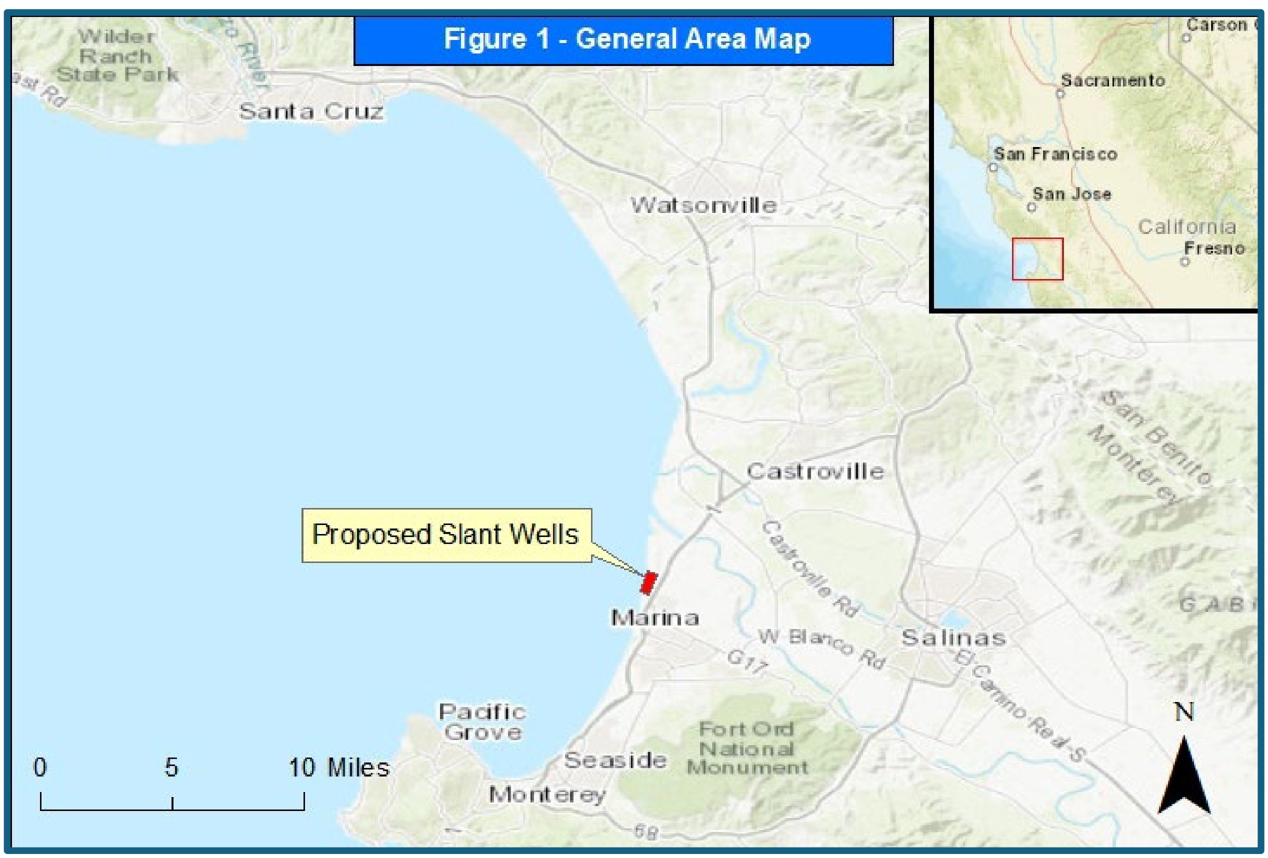

Figure 1 – General Area Map

The MPWSP consists of several components, including a source water intake system, a desalination plant, a brine discharge system, product water conveyance pipelines, water storage facilities, an Aquifer Storage and Recovery program, and a water purchase agreement for 3,500 acre-feet per year (afy) of product water from the Pure Water Monterey Groundwater Replenishment Project. (2025-01-31 City of Marina's Comments on 12-31-24 Draft Report, p. 6; 2018-09-20 CPUC Dec.18-09-017, pp. 16, 18; Exh. Cal-Am-38(d), pp. 5.4–51-58, Figure 5.4-5, Tbl. 5.4 9.)[1]

2.2 *City of Marina v. RMC Lonestar*, Monterey County Superior Court

2.2.1 Summary

Marina filed the lawsuit underlying this administrative proceeding in Monterey County Superior Court, *City of Marina v. RMC Lonestar*, Case No. 20CV001387. The City asserts two claims against the defendants: (1) a declaratory relief claim that defendant CEMEX violated the 1996 Annexation Agreement and Groundwater Mitigation Framework for Marina Area Lands (1996 Agreement) (Exh. Marina-8)[2] by purporting to grant an easement to Cal-Am over a 39-acre portion of its property for operation of the proposed project; and (2) a declaratory relief claim that operation of the proposed project would violate the Monterey County Water Resources Agency Act.

Marina Coast Water District (MCWD) subsequently filed a cross-complaint in which MCWD claims, among other allegations, that Cal-Am's operation of the proposed project (1) will injure MCWD's right to extract groundwater from the groundwater basin, (2) constitutes an unreasonable method of extracting groundwater in violation of article X, section 2, of the California Constitution, and (3) violates the 1996 Agreement. (2020-11-03 MCWD's First Amended Cross-Complaint.)

[1] For the court's and parties' convenience, staff from the Administrative Hearings Office (AHO) has copied all documents in the administrative record that are cited in this report, except for the parties' exhibits, and placed them in a new folder called "Copies of Administrative Record Supporting Documents" in the administrative record for this proceeding. These documents are saved with the date followed by the original file name.

[2] Unless the context indicates otherwise, references in this report to exhibits are to exhibits accepted into evidence during the hearing in this proceeding. These exhibits are filed in a folder titled "Parties' Hearing Exhibits" within the Hearing Documents folder in the administrative record for this proceeding. Within the Parties' Hearing Exhibits folder, there is a separate subfolder for the exhibits of each party that participated in the hearing, and within each subfolder for each party, there is a subfolder titled "Accepted Exhibits" that contain the parties' exhibits accepted into evidence.

2.2.2 Parties

The parties to this proceeding and the underlying lawsuit pending in Monterey County Superior Court are Cal-Am, MCWD, Marina, and RMC Pacific Materials, LLC (RMC Pacific or CEMEX).[3]

Cal-Am is a California corporation with its principal place of business in San Diego. (Cal-Am Proposed Report Part 1, p. 3.)[4] Cal-Am is an investor-owned water utility regulated by the California Public Utilities Commission (CPUC). In Monterey County, Cal-Am serves approximately 100,000 people in portions of the Monterey Peninsula, including Carmel-by-the-Sea, Monterey, Pacific Grove, Seaside, Del Rey Oaks, Sand City, and some unincorporated areas. (*Ibid.*) Cal-Am does not supply any potable water to the City of Marina. (Exh. Marina-1, p. 5, ¶ 12.)

MCWD is a special district formed in 1960 for the purpose of installing and operating a water supply system, water distribution system, and wastewater collection system for Marina and neighboring communities in Monterey County. (Exh. MCWD-1, p. 4.) MCWD serves approximately 35,000 people in Marina, Seaside, the Ord military community, and neighboring areas. (*Ibid.*) MCWD's service area is north of and adjacent to Cal-Am's service area on the Monterey Peninsula. (*Ibid.*) MCWD's production wells are located generally in and around Marina.

Marina is an incorporated municipality of approximately 22,500 residents located along the coast of the Pacific Ocean in northern Monterey County. (MCWD-Marina Proposed Report Part 1, p. 3.) Marina receives all its drinking water from MCWD, which is sourced from MCWD's groundwater production wells in the Salinas Valley Groundwater Basin (SVGB). (*Id.* at p. 4.) The "CEMEX Property," where Cal-Am proposes to site the wells for the MPWSP, is located within Marina's boundaries. (Exh. Marina-1, p. 5, ¶ 17.)

RMC Pacific is a Delaware limited liability company. (Cal-Am Proposed Report Part 1, p. 4.) RMC Pacific owns the CEMEX Property, where RMC Pacific's and its

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[3] Monterey County Water Resources Agency is also a defendant in the underlying lawsuit but did not participate in this proceeding.

[4] The AHO has saved the parties' proposed reports of referee and closing briefs in the folder marked "Closing Briefs" in the "Hearing Documents" folder in the administrative record for this proceeding. Unless otherwise indicated, citations in this order to page numbers of documents and exhibits are to the pages of the PDF files. These page numbers often are different from the text page numbers in the documents or exhibits. In some instances, we have also provided the printed page numbers in brackets, following the PDF page numbers.

predecessors previously operated a sand mining facility known as the Lapis Sand Plant. (*Ibid.)* RMC Pacific does business as CEMEX. (*Ibid.)*

2.2.3 Referral to the State Water Resources Control Board

On August 30, 2021, Cal-Am, joined by RMC Pacific, filed a motion for the court to refer certain water rights-related issues that MCWD raised in its cross-complaint to the State Water Board under Water Code sections 2000 to 2048. (2021-08-30 Cal-Am Not. of Mtn. for State Board Referral; see also 2021-08-30 Cal-Am Memo. ISO Mtn. for Reference to SWRCB; 2021-08-31 RMC Pacific Material's Not. of Joinder Cal-Am Mtn. for Ct. Reference.) Marina and MCWD opposed the motion. (2021-09-13 City of Marina MPA Opp. to Ref. to State Bd.; 2021-09-13 Marina CWD's Opp. to Ref. to SWRCB.) On October 7, 2021, the court granted Cal-Am's motion. (2021-10-07 Order After Hearing.)[5]

The Court seeks the opinion of the State Water Board on the following eight issues, reproduced here:

1. *Where are the subsurface drawing source points (including capture zones) for each of the currently proposed Cal-Am wells located in relation to:*
    a. *seawater in the ocean itself;*
    b. *drawing source points for the Marina Coast Water District ("MCWD") production wells;*
    c. *the Subbasin Interface Zone;*
    d. *the 180/400-foot Aquifer Subbasin;*
    e. *the Monterey Subbasin;*
    f. *the Cemex property;*
    g. *the MCWD wells.*

2. *Would water drawn by any of the currently proposed Cal-Am wells come from any source other than seawater from directly beneath the Ocean?*
    a. *If so, from which sources? And which if any of these sources lie in whole or in part beneath the Cemex property?*
    b. *If so, can one approximate with reasonable certainty in what quantities the water would be drawn from each source? Can this be expressed in percentages?*

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[5] As noted in footnote 1, for ease of reference, the AHO has placed copies of documents from the underlying court proceeding cited in this report in the "Copies of Administrative Record Supporting Documents" folder in the administrative record for this proceeding. These documents are also saved in the folder called "Documents from Court's Files" in the administrative record. The AHO has retained original naming conventions, and in some instances, these are inconsistent as between documents (e.g., "2nd" instead of "Second").

   c. *If so, do the relative amounts drawn from each source vary depending upon amounts drawn by the slant wells?*
   d. *If so, can it be said with reasonable certainty that the amount drawn by the Cal-Am wells will not exceed 500 acre-feet per year ("afy") from any water source beneath the Cemex property?*

3. *What is the hydrogeological connectivity, if any, between the areas from which Cal-Am proposes to draw water and the areas from which MCWD extracts water?*

4. *Is it likely that any of the proposed draw for the Cal-Am wells would (a.) result in or (b.) increase any seawater intrusion into the Subbasin Interface Zone, the 180/400 [F]oot Aquifer or the Monterey Aquifer, or any source for the MCWD production wells? If so, what is the likely extent of the intrusion?*

5. *Is it likely that any of the proposed draw will (a.) lower the groundwater table or (b.) reduce the storage space in any source other than seawater and if so, can the extent be approximated?*

6. *Has MCWD been pumping water from the Subbasin Interface Zone and, if so, for approximately what period of time?*

7. *What effect, if any, would the proposed draw by Cal-Am slant wells have upon any primary or paramount water right of Marina or MCWD?*

8. *Does SWRCB have an opinion as to whether:*
   a. *there is any legal theory upon which Cal-Am may rely to extract the proposed draw; and*
   b. *the proposed Cal-Am extraction would infringe upon MCWD's appropriative rights to groundwater?*

(*Id.* at pp. 1–3.)

2.3 Location and Physical Setting

2.3.1 Salinas Valley Groundwater Basin (SVGB)

The SVGB underlies the Salinas Valley. The Salinas Valley is bounded by the Gabilan Range on the east and the Sierra de Salinas and Santa Lucia Range on the west. The valley is drained by the Salinas River, which flows into Monterey Bay. (DWR Bull. 118, 180/400-Foot Aquifer Subbasin Description, p. 4.)[6]

The SVGB is made up of nine subbasins. (California's Groundwater Update 2020 App. F (Bull. 118) Tbl. F-3, p. 8, & Tbl. F-6, p. 18.) Those subbasins are: 180/400-Foot Aquifer, Monterey, East Side Aquifer, Forebay Aquifer, Langley Aquifer, Paso Robles Area, Upper Valley Aquifer, Atascadero Area and Seaside Subbasins. (*Ibid*.) The 180/400-Foot Aquifer Subbasin (180/400 Subbasin) and the Monterey Subbasin are directly relevant to this proceeding.

2.3.2 180/400-Foot Aquifer Subbasin

The 180/400 Subbasin encompasses 89,700 acres in the northern SVGB. The California Department of Water Resources (DWR) designated it as a high priority and critically overdrafted subbasin.[7] (Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA) Combined GSP 2020-0123, pp. ES-3, 1-1, 5-33.)[8] On June 3, 2021, DWR approved the 180/400-Foot Aquifer Subbasin Groundwater Sustainability Plan (180/400 Subbasin GSP) developed by the SVBGSA. (Exh. MCWD-132.)

2.3.3 Monterey Subbasin

The Monterey Subbasin encompasses 30,850 acres in the northwestern SVGB. DWR designated it as a medium priority subbasin. (Monterey Subbasin GSP, p. 28.) On April 27, 2023, DWR approved the Monterey Subbasin Groundwater Sustainability Plan developed by the Marina Coast Water District Groundwater Sustainability Agency and the SVBGSA. (Exh. MCWD-133.)

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[6] As noted in footnote 1, for ease of reference, the AHO has placed copies of the cited documents related to DWR Bulletin 118 in the "Copies of Administrative Record Supporting Documents" folder in the administrative record. A copy of this document and all documents in the record related to DWR Bulletin 118 are available in the administrative record, in a folder called "Historical Documents" in a subfolder marked "DWR Bulletin 118 documents."

[7] DWR defines the boundaries of the state's alluvial groundwater basins and subbasins and designates them as either high, medium, low, or very low priority. Local public agencies in high and medium priority basins are required to comply with the Sustainable Groundwater Management Act (SGMA) by forming groundwater sustainability agencies (GSAs) that must develop and implement groundwater sustainability plans (GSPs or plans), as discussed further in Section 2.6.4.

[8] We take official notice of this document under California Code of Regulations, title 22, section 648.2 and California Evidence Code section 452, subdivisions (c) and (h). Groundwater sustainability plans are maintained on DWR's webpage under the "SGMA Portal" at https://sgma.water.ca.gov/portal/gsp/all. The AHO saved a copy of this document in the folder called "Copies of Administrative Record Supporting Documents."

2.3.4 Hydrogeologic Features

There are four primary aquifer units and three aquitards[9] within the SVGB in the areas of the proposed project and the MCWD production wells. The Dune Sand, 180-Foot, 400-Foot, and Deep Aquifers are separated or partially separated by the Fort Ord-Salinas Valley Aquitard (FO-SVA), and the 180/400-Foot and 400-Foot/Deep Aquitards. The 180-Foot Aquifer is further divided into the Upper and Lower 180-Foot Aquifers, separated by the 180-Foot Intermediate Aquitard. Figure 2 shows a schematic cross-section of the area with the relative locations of these aquifers and aquitards, the ocean, the CEMEX Property, the Test Slant Well (see Section 2.4.5), and the MCWD production wells.[10] Figure 2 also shows the approximate extents of seawater intrusion in the 180-Foot and 400-Foot Aquifers (labeled "Seawater Intrusion Front").

The precise locations, extents, and physical properties of these aquifers, aquitards, and seawater intrusion fronts are somewhat uncertain, and the parties disagree about some of these characteristics. The parties generally object to this report's descriptions of physical features and use of exhibits if the description or exhibit is inconsistent with the party's view of the characteristics of that physical feature. (See 2024-06-25 Cal-Am Initial Objections to Draft Report of Referee Part 1; 2024-06-25 Marina Comments on 5-22-24 Draft Report; 2024-06-25 MCWD Comments on 5-22-24 AHO Partial Draft Report of Referee & 2024-07-08 Errata to MCWD Comments on Partial Draft Report of Referee; 2024-07-08 MCWD Request for Immediate Status Conference or MTS New Evidence; 2024-07-09 Cal-Am's Opposition to MCWD Request for Immediate Status Conference, or in the Alternative, Motion to Strike.)

We use these exhibits and describe the physical features in this section to introduce the general and relative locations of the physical features, but do not propose factual findings with respect to these disputed characteristics. We note that there may be some inaccuracies in an exhibit or description where the precise locations are not known and where the parties' technical experts have differing opinions.

We do not list or attempt to resolve these disagreements in this report. Instead, we invited the parties' technical experts to work collaboratively to resolve the disagreements during this proceeding as they developed groundwater models intended to address the court's questions. (See Section 4.2.) The parties' experts were not able to resolve every disagreement, and the remaining disagreements are reflected in the

[9] The AHO has included a glossary of technical concepts and terms in Section 8 of this report.

[10] The AHO has included certain figures and tables from the parties' exhibits and used the word "adapted" to indicate that the AHO has cropped these figures for size (but has not made other changes to the content of these figures and tables). The AHO has included copies of the parties' original exhibits in an appendix at the end of this report.

construction of the parties' respective groundwater models. We use the results from these models to depict a range of outcomes to address the court's technical questions and for our analysis of the legal issues without resolving most of these remaining disputes.

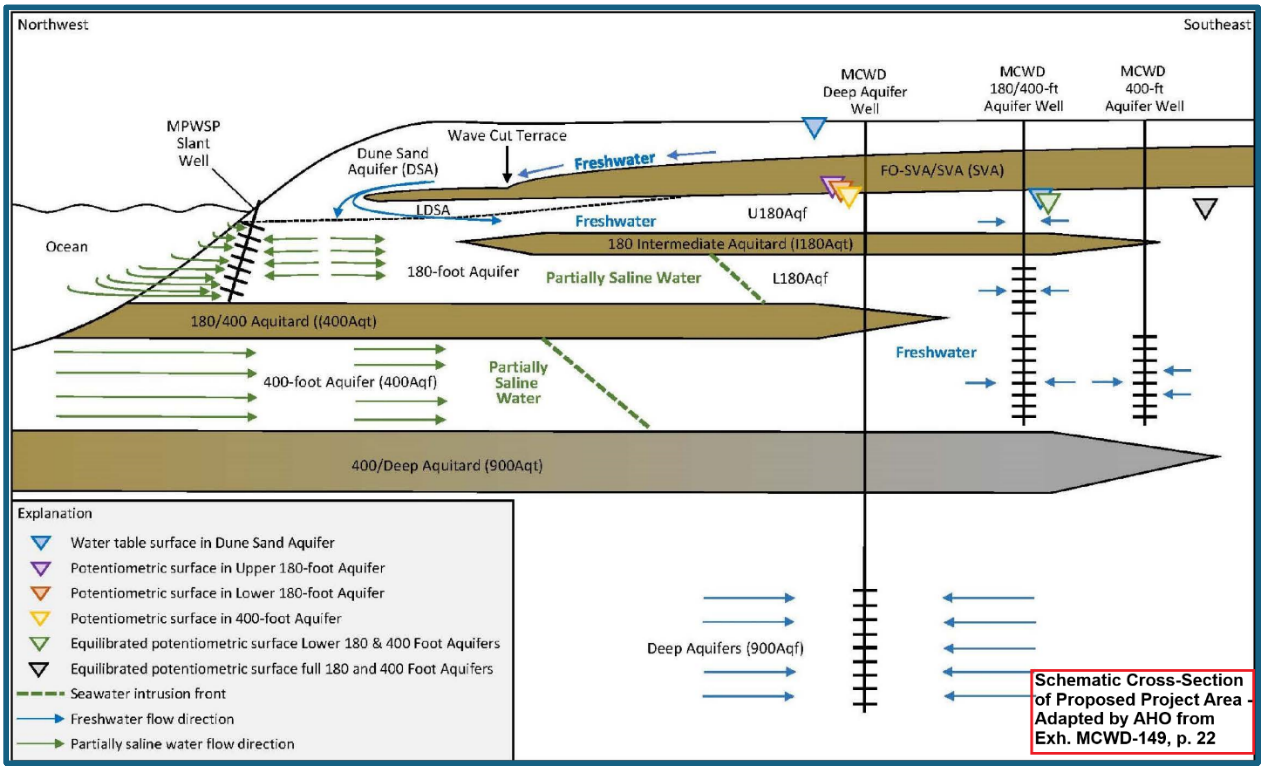

Figure 2 – Schematic cross-section showing hydrogeologic features in the area of the proposed project

2.3.5 Dune Sand Aquifer

The unconfined Dune Sand Aquifer is the uppermost aquifer in the area of the proposed slant wells. In the vicinity immediately surrounding the proposed slant wells and within the CEMEX Property, the Dune Sand Aquifer extends to depths up to 110 feet below the ground surface (Exh. Cal-Am-38(a), p. 8 [4.4-8])[11] and lies directly above the 180-Foot

[11] Cal-Am introduced the CalAm Monterey Peninsula Water Supply Project Final Environmental Impact Report / Environmental Impact Statement SCH #2006101004 (EIR/EIS) as Exhibit Cal-Am-38 and included a link to all the sections of the EIR: https://ia.cpuc.ca.gov/Environment/info/esa/mpwsp/comms_n_docs.html
For ease of reference, the AHO has downloaded sections of the EIR/EIS that we cite in this report, labeled them exhibits Cal-Am-38(a) through -38(g), and saved them in the Cal-Am subfolder in the Parties' Hearing Documents folder. We also revised Cal-Am's Exhibit Identification Index and saved a copy in the administrative record, showing the addition of these new exhibit numbers. We refer here to PDF page numbers, and we have also added printed page numbers in brackets.

Aquifer with no confining layer separating them, such that the two aquifers are hydraulically connected. (*Id.* at p.10 [4.4-10]; Exh. MCWD-149, p. 22.) Further inland, the Dune Sand Aquifer is separated from the 180-Foot Aquifer by the Fort Ord-Salinas Valley Aquitard. (Exh. MCWD-149, p. 22.)

Much of the water in the Dune Sand Aquifer along the coast has been intruded by seawater and is considered saline to brackish. (Exh. Cal-Am-38(a), p.8 [4.4-8].) Inland, there are fewer effects of seawater intrusion because infiltration of precipitation and applied agricultural water has a greater influence on groundwater quality. (*Ibid.*)

2.3.6 180-Foot Aquifer

In the area of the proposed slant wells, the 180-Foot Aquifer is semi-confined and extends to depths up to 240 to 255 feet below the ground surface. (Exh. Cal-Am-38(a), p. 13 [4.4-13].) In this location, the 180-Foot Aquifer lies directly beneath and is hydraulically connected to the Dune Sand Aquifer and lies above the 180/400-Foot Aquitard. (*Ibid.*) Further inland, the 180-Foot Aquifer is separated into the Upper and Lower 180-Foot Aquifers by an intermediate aquitard. (Exh. MCWD-165 p. 11; Exh. Cal-Am-141, p. 17.)

Seawater intrusion, here defined as chloride concentrations in excess of 500 mg/L, is present in the 180-Foot Aquifer extending inland beyond the area of the proposed project toward the MCWD production wells. (Exh. Cal-Am-38(a), Figure 4.4-10, p. 32 [4.4-32].)

2.3.7 400-Foot Aquifer

In the areas of the proposed slant wells and the MCWD production wells, the 400-Foot Aquifer is located beneath the 180/400-Foot Aquitard and above a low-permeability clay layer referred to as the 400-Foot/Deep Aquitard. (Exh. Cal-Am-38(a), p. 13 [4.4-13].) The 180/400-Foot Aquitard is somewhat discontinuous inland from the project site. (Exh. Cal-Am-141, p.89; Exh. MCWD-131 (revised), p. 6.)

Seawater intrusion, again defined as chloride concentrations in excess of 500 mg/L, is present in the 400-Foot Aquifer extending inland beyond the area of the proposed project toward MCWD production wells. (Exh. Cal-Am-38(a), Figure 4.4-11 [p. 4.4-33].)

2.3.8 Deep Aquifer

The Deep Aquifer, as we refer to it in this report, is an aquifer zone made up of two separate hydrological units below the 400-Foot/Deep Aquitard in the area of the proposed slant wells and the MCWD production wells. (Exh. Cal-Am-38(a), pp. 13–14 [4.4-13-14].)

2.3.9 Subbasin Interface Zone

MCWD introduced the term "Subbasin Interface Zone" in its First Amended Cross-Complaint as a label for an area south of the Salinas River, encompassing adjacent portions of the 180/400 and Monterey Subbasins. MCWD contends that within the Subbasin Interface Zone, the adjacent portions of the subbasins are "substantially hydrologically connected" by and through the alluvial materials and aquifers, and that "the groundwater beneath the whole of the Subbasin Interface Zone constitute a common source for their production wells and the proposed slant wells." (2020-11-03 Marina CWD's First Amended Cross-Complaint, p. 14, ¶¶ 39–41.)

MCWD expert Vera Nelson testified that MCWD defined the Subbasin Interface Zone "for the purposes of the cross-complaint to easily be able to discuss this area which includes both the slant wells and the MCWD's wells." (Combined Hearing Transcript, p. 1534:15-19.)[12] The proposed slant wells and MCWD's production wells are in different groundwater subbasins, and Ms. Nelson testified that MCWD's use of a single term for the area is intended to "explain that although there is this political boundary which DWR has drawn between these two subbasins, there's no physical reason that the groundwater can't move between the two areas." (*Id.* at p. 1536:18-22.)

Cal-Am objects that the area MCWD labeled as the Subbasin Interface Zone is not a technical hydrogeological term, nor is it a place, location, or term utilized in DWR's groundwater basin identification system. Cal-Am's expert testified that the Subbasin Interface Zone is a label MCWD created for an undefined amorphous area, so its location in relation to Cal-Am's proposed slant wells cannot be identified and is irrelevant to the issues raised in the underlying lawsuit. (Exh. Cal-Am-3, p. 3, ¶ 7, & p. 6, ¶ 19.)

We conclude for the purposes of this report, consideration of the Subbasin Interface Zone as a distinct area is not relevant to the technical or legal issues presented by the

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[12] For convenience, the AHO created a combined file of the reporter's transcripts for all the hearing days, except for December 8 and 9, 2022, which were not transcribed. The combined file is called "Combined Hearing Transcript." This report cites to that document as the record of testimony or statements made during the hearing. The audio and video recordings are the Board's official record of the proceedings, however, and would control in the case of any conflict with the reporter's transcripts. As noted in footnote 2, the files cited here are in the "Copies of Administrative Record Supporting Documents" folder in the record. The hearing recordings are in the "Hearing Documents" folder in the "Hearing Recordings and Transcripts" subfolder in the administrative record. The court reporter's transcripts, which were used to create the Combined Hearing Transcript, are in the "Court Reporter Hearing Transcripts" subfolder in the administrative record.

court. The parties do not dispute that the groundwater subbasin boundary between the proposed slant wells and MCWD's production wells does not describe a physical boundary and that the portions of the aquifers that are within the 180/400 Subbasin are hydrologically connected to the respective portions of the aquifers within the Monterey Subbasin. The Subbasin Interface Zone as a distinct area is similarly irrelevant to the legal issues the court referred to the Board because the area does not describe any regulatory or management boundary.

In Sections 6.1 and 6.6 we directly address the court's questions regarding the undisputed locations of the proposed slant wells in relation to the Subbasin Interface Zone and the undisputed length of time MCWD has been pumping from within the Subbasin Interface Zone. We do not, however, further address the Subbasin Interface Zone with respect to the proposed project's impacts on seawater intrusion because these impacts are incorporated in our discussion of the expected impacts to the 180/400 and Monterey Subbasins.

2.4 Proposed Monterey Peninsula Water Supply Project

2.4.1 California Public Utilities Commission Permit

In April 2012, Cal-Am submitted Application A.12-04-019 to the CPUC, seeking approval of the MPWSP and authorization to recover present and future costs of the project through increased rates. (Exh. Cal-Am.38(g) [2012-10 CPUC Notice of Preparation - EIR for CalAm Monterey Peninsula Water Supply Project], p. 3.) The MPWSP consists of several components, including a source water intake system utilizing slant wells, a raw water pipeline, a desalination plant, a brine discharge system, product water conveyance pipelines, water storage facilities, an aquifer storage and recovery program, and a water purchase agreement for 3,500 afy of product water from the Pure Water Monterey Groundwater Replenishment Project. (CPUC Dec. 18-09-017, pp. 13, 178;[13] Exh. Cal-Am-38(d), pp. 5.4-51, Figure 5.4-5, Tbl. 5.4-9.)

The source water intake system for the 6.4 million gallons per day (mgd) production capacity project[14] would consist of "seven new subsurface slant wells (five active and two on standby; these would consist of the converted test slant well and six new wells)" on the CEMEX Property. (CPUC Dec. 18-09-017, p. 178.) The slant wells would be grouped into six well sites, including three sites with one well each and two sites with

[13] The two documents saved as "2018-09-13 CPUC Decision Issuing CPCN and certifying EIR-EIS" and "2018-09-20 CPUC Dec. 18-09-017 Approving Project and Certifying FEIR" appear to be identical. For ease of reference, the AHO cites to content contained in these identical documents as "CPUC Decision 18-09-017."

[14] The 6.4 mgd production capacity project would draw 15.5 mgd from the source. 6.4 mgd is equivalent to approximately 7,300 afy.

two wells. (Exh. Cal-Am-38(d), Tbl. 5.4 9.) In a 2016 Amended Application, Cal-Am revised the proposed location of the slant wells to be further inland. (2025-01-31 City of Marina's Comments on 12-31-24 Draft Report, p. 12.)

2.4.2 Environmental Review and Findings

The CPUC and the National Oceanic and Atmospheric Administration (NOAA) were the lead agencies for the proposed project under the California Environmental Quality Act and the National Environmental Policy Act, respectively. The CPUC and NOAA were responsible for preparing the combined environmental impact report (EIR) and environmental impact statement (EIS). The CPUC issued a Final EIR/EIS in March 2018 and certified the Final EIR/EIS on September 13, 2018, when the CPUC approved the proposed project. (CPUC Dec. 18-09-017.)

The Final EIR/EIS analyzes a 9.6 mgd production capacity project as initially proposed by Cal-Am in its application to the CPUC, as well as a reduced production capacity project of 6.4 mgd. (CPUC Dec. 18-09-017, p. 81.) For the purpose of environmental analysis, the Final EIR/EIS assumed the wells would operate 24 hours per day, 365 days per year. (Exh. Cal-Am- 38(b), p. 3-58.) The analysis relies on the North Marina Groundwater Model discussed in Section 4.1.

The CPUC concluded that the No-Project/No-Action Alternative was the environmentally superior alternative but that it failed to meet the basic project objectives and therefore was not feasible. (CPUC Dec. 18-09-017, p. 82.) Of the feasible alternatives, the CPUC found that the reduced production capacity project of 6.4 mgd was the environmentally superior alternative. The CPUC concluded in the Final EIR/EIS that operation of the proposed project would have a less than significant impact on groundwater supplies and groundwater quality. (Exh. Cal-Am- 38(a), pp. 4.4-61–4.4-107; Tbl. 4.4-9.)

2.4.3 Return Water Settlement Agreement

The Return Water Settlement Agreement is incorporated as a condition of the CPUC's approval of the MPWSP that requires Cal-Am to supply water to the SVGB in an amount equal to the percentage of non-brackish water extracted from the SVGB by the proposed project based on the calculation methodology included in the agreement. (2018-09-20 CPUC Dec. 18-09-017, pp. 2, 111, 161, 207 & 215; Exh. Cal-Am-67.) The Return Water Settlement Agreement assumes the freshwater component of the Ocean Water Percentage (OWP) calculation consists of groundwater that has a total dissolved solids (TDS) concentration of 500 mg/L[15] and the remaining component is ocean water. (Exh. Cal-Am-67, p. 119.)[16]

The “return water” would be made available by Cal-Am as municipal water to the Castroville Community Services District and agricultural water to the Castroville Seawater Intrusion Project which is operated by the Monterey County Water Resources Agency (MCWRA). *(*Exh. Cal-Am-67, p. 5.) The Castroville Community Services District and the agricultural users supplied by the Castroville Seawater Intrusion Project would refrain from pumping groundwater in an amount equal to the return water supplied by Cal-Am. (*Id.* at pp. 8–10.) The agreement establishes the rates to be paid by Castroville Community Services District and MCWRA for each acre-foot of return water supplied by Cal-Am. (*Id.* at p. 15.)

The amount of return water that must be made available by Cal-Am each year would be calculated in accordance with the “Base Return Water Obligation Methodology” in Appendix H of the Return Water Settlement Agreement. (Exh. Cal-Am-67, p. 119.) This methodology utilizes measurement by an accredited laboratory of TDS values of the water extracted from the project’s wells, to determine the percentages of seawater and “fresh” groundwater extracted from the SVGB. (Exh. Cal-Am-42, p. 2.) Absent other changes to groundwater conditions in the basin, the ratio of seawater to groundwater that makes up the source of water for the proposed project is expected to change over time, with the percentage of seawater becoming higher. (*Id.* at p. 14.) As a result, the amount of return water that Cal-Am would be obligated to make available may decrease over time.

If the agreements between Cal-Am and Castroville Community Services District and MCWRA for the purchase of return water are terminated or expire after the initial term of 30 years, Cal-Am must continue to make return water available for delivery within the SVGB for use in lieu of groundwater unless Cal-Am demonstrates that return water is not needed to prevent legal injury to senior groundwater right holders or to avoid significant adverse effects on groundwater conditions within the basin. (Exh. Cal-Am-67, pp. 13–14, ¶ 8.) The Return Water Settlement Agreement acknowledges that Cal-Am could be legally required by a regulatory agency or by a court to make water deliveries to other locations overlying the SVGB to mitigate impacts to groundwater conditions caused by operation of the proposed project. (Exh. Cal-Am-67, p. 11, ¶ 4.) Cal-Am’s

[15] As discussed in Section 6.4.1, the maximum recommended contaminant level for TDS in drinking water is 500 mg/L. In comparison, in presenting model results, the parties utilized the TDS concentration isocontour of 1,500 mg/L to identify the boundary of seawater intrusion in the basin.

[16] The proportion of the water drawn by the proposed slant wells that originates from the ocean is referred to as the “ocean water percentage” (OWP).

obligation to make return water available to Castroville Community Services District and MCWRA would be reduced in the event and to the extent that a regulatory agency or court requires Cal-Am to deliver water in a manner or to a location that is different from that specified in the agreement. (*Ibid.*)

2.4.4 Groundwater Monitoring Program

The CPUC adopted the mitigation and monitoring measures identified in the Mitigation, Monitoring, and Reporting Program (MMRP) attached as Appendix D to the Final Environmental Impact Report, as conditions of its approval of the project. (Exh. Cal-Am-131.) The MMRP includes a measure 4.4-3, titled "Groundwater Monitoring and Avoidance of Well Damage." (*Id.* at pp. 13–14.) According to this measure, prior to construction of the slant wells, Cal-Am must develop a groundwater monitoring and reporting program to the satisfaction of MCWRA that augments MCWRA's existing regional groundwater monitoring network to focus on areas that could be affected by the proposed project. (*Ibid.*)

The groundwater monitoring program requires Cal-Am to offer an opportunity for owners of active supply wells within the monitoring area to enroll their wells in the program. Before pumping from the proposed slant wells begins, MCWRA must retain and direct a California-certified hydrogeologist to evaluate the conditions and characteristics of enrolled active supply wells. If MCWRA identifies (1) a "consistent and measurable drawdown in groundwater levels" after the MPWSP begins operations, and (2) MCWRA determines that the drawdown is potentially attributable to Cal-Am's slant well pumping and is "independent of seasonal or multi-year groundwater level fluctuations or any regional trends," then the hydrogeologist will determine whether the observed degree of drawdown would damage or adversely affect any of the active supply wells in the program. The hydrogeologist will also consider active supply wells not enrolled in the program for potential damage if the owners submit "substantial, credible evidence … concerning damage or adverse effects" and Cal-Am and the hydrogeologist verify the effects. (Exh. Cal-Am-131, p. 14.) If the hydrogeologist verifies damage or adverse effects caused by MPWSP pumping, Cal-Am and the hydrogeologist shall coordinate with the well owner to develop and implement a remedy, which may include deepening the existing well, improving well efficiency, facilitating a replacement supply of water (of the same or better quality), constructing a new well, or compensating the owner for increased pumping costs.

2.4.5 Coastal Development Permit

On June 22, 2018, Cal-Am applied to Marina for a Coastal Development Permit (CDP) to install components of the MPWSP located within Marina's defined coastal zone. (Exh. Marina-11, p. 1.) The components included, among other things, subsurface slant intake wells, pipeline vaults, electrical enclosures, surge tanks, pipelines, and outfall pipeline components. (*Ibid*.) The Marina Planning Commission reviewed the application, including holding a public workshop and public hearings, and denied it on March 7, 2019. (*Id.* at pp. 1–3.)

Following the Marina Planning Commission's denial of Cal-Am's application for a CDP, Cal-Am appealed the decision to the California Coastal Commission (Coastal Commission). (Exh. Cal-Am-118.) The Coastal Commission held a hearing in November 2019 on Cal-Am's appeal and CDP application. (*Id.* at p. 3.) The Coastal Commission did not act at this hearing but directed Cal-Am to provide additional information. (*Ibid.*) Cal-Am subsequently withdrew its consolidated CDP application and resubmitted its application in November 2020. Cal-Am further modified the application in October 2022. (*Id.* at p. 48.) On November 17, 2022, the Coastal Commission held a public hearing and approved the CDP, with conditions, for the MPWSP. (*Id.* at pp. 11–12; Exh. MCWD-125, p. 11.)

Special Condition 1 of the development permit requires Cal-Am to submit a final judgment in *City of Marina v. RMC Lonestar, et al.*, Monterey County Superior Court No. 20CV001387 or a Final Report of Referee from the State Water Board. (Exh. MCWD-125, pp. 12–13.) Special Condition 1 further provides that the permit shall not issue if the final judgement or report demonstrates that "(a) the Applicant does not have, and cannot feasibly obtain, water rights (to the extent applicable) for the Project or (b) Cal-Am's Project would cause harm to any aquifer that is a source of drinking water to the City of Marina or the Marina Coast Water District." (*Id.* at p. 13.)

Like the CPUC, the Coastal Commission required in Special Condition 12 of the development permit that Cal-Am develop and comply with a groundwater monitoring plan. (*Id.* at pp. 29–31.) The groundwater monitoring plan must include a statement of monitoring goals to detect any change in the rate of seawater intrusion that may be caused by operation of the proposed slant wells, a description of monitoring methods and frequency, thresholds for TDS to indicate or predict potential harm to groundwater supplies, a method of data analysis (which may include groundwater modeling) to assess impacts to groundwater, proposed remedial measures and operational controls if thresholds are reached, and annual reporting. (*Ibid*.)

On December 29, 2022, the City of Marina, Monterey Peninsula Water Management District, MCWD, and MCWD Groundwater Sustainability Agency jointly filed a Petition for Writ of Mandate and Complaint for Declaratory and Injunctive Relief in Monterey County Superior Court (Case No. 22CV004063) against the Coastal Commission challenging the Commission's CDP approval decisions. (2023-11-13 Cal-Am's Proposed Draft Referee's Report, p. 21.)

2.4.6 Test Slant Well

To evaluate potential impacts from operation of the proposed project, Cal-Am installed a Test Slant Well and nested monitoring wells on the CEMEX Property. (Exh. Cal-Am-3.) The Test Slant Well is approximately 724 feet in length, drilled at an angle of 19 degrees below horizontal, and screened in the Dune Sand Aquifer at 40 to 145 feet and in the 180-Foot Aquifer at 400 to 710 feet. (Exh. Cal-Am-38(c), p. 39.) Cal-Am completed construction of the Test Slant Well in 2015.

Cal-Am conducted short-term and long-term pumping tests using the Test Slant Well. (Exh. Cal-Am-38(c), pp. 21, 55–57.) The long-term pumping test at 2,000 gallons per minute (gpm) started in April 2015 and extended through February 2018. (Exh. Cal-Am-3, p. 9:7–9.) The long-term pumping test was briefly interrupted between June and October 2015 to address a change in permit conditions and between March and May 2016 to address a mechanical issue. (*Id.* at p. 9:9–11.) During the pumping test, Cal-Am collected water level data and conducted periodic collection of water to test the water quality. (*Id.* at pp. 11–16; Exh. Cal-Am-38(c), p. 57.)

2.5 Prior State Water Board Involvement

2.5.1 State Water Board Orders

Three orders issued by the State Water Board in 1995, 2009, and 2016, are relevant to this proceeding because they required Cal-Am to significantly reduce its diversion from the Carmel River and prompted Cal-Am to seek alternate sources of water to supply its customers. The MPSWP is Cal-Am's primary proposal for developing an alternate source of water.

2.5.2 Order WR 95-10

Cal-Am owns and operates the water supply system serving the Monterey Peninsula. (Order WR 95-10, pp. 5, 6, & 18.)[17] Prior to the Board's 1995 order, the Carmel River was the source of approximately 70 percent of the municipal water Cal-Am supplied in the region. (*Id.* at p. 2.) On July 6, 1995, the State Water Board adopted Order WR 95-10, in which the Board concluded that Cal-Am had a legal right to pump 3,376 afy from

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[17] We cite to the official Water Board orders found on the State Water Board's webpage at https://www.waterboards.ca.gov/waterrights/board_decisions/adopted_orders/. For ease of reference, the AHO has included copies of the orders cited in this report, where the orders were not otherwise included among the parties' exhibits, in the folder called "Copies of Administrative Record Supporting Documents."

the Carmel River system but did not have a legal right to 10,730 additional afy that it was diverting from the river. (*Id.* at pp. 25, 39.)

The State Water Board recognized that Cal-Am could not immediately reduce its diversion of water from the river because the "people and businesses on the Monterey Peninsula must continue to be served water from the Carmel River in order to protect public health and safety." (Order WR 95-10, p. 37.) The order directed Cal-Am to "(a) diligently proceed in accord with a time schedule to obtain rights to cover its existing diversion and use of water and (b) implement measures to minimize harm to public trust resources." (*Id*. at pp. 2 & 40–44.) The order also directed Cal-Am to develop and implement urban water management and irrigation conservation plans and other specific reduction and mitigation actions. (*Id.* at pp. 40–44.)

2.5.3 Order WR 2009-0060

On October 20, 2009, the State Water Board adopted Cease and Desist Order WR 2009-0060 to address Cal-Am's failure to comply with the requirements of Order WR 95-10. (Exh. Cal-Am-92.) The State Water Board found that Cal-Am had failed to "diligently implement actions to terminate its unlawful diversions" (*id*. at p. 27) and had diverted an average of 7,632 afy without a basis of right for the prior 13 years. (*Id*. at pp. 33–34). WR 2009-0060 ordered Cal-Am to "diligently implement actions to terminate its unlawful diversions from the Carmel River" and "terminate all unlawful diversions from the river no later than December 31, 2016." (*Id*. at p. 57.)

2.5.4 Order WR 2016-0016

On July 19, 2016, the State Water Board adopted Order WR 2016-0016, which extended the deadline for Cal-Am to terminate its unlawful diversions from the Carmel River until December 31, 2021. (Order WR 2016-0016, pp. 1–2.) The order recognized that Cal-Am could not meet the December 31, 2016, deadline and adopted a new compliance schedule based on milestones for Cal-Am's proposed alternative projects. The order required, however, that "unauthorized diversions end by December 31, 2021, regardless of whether the envisioned projects are timely built." (*Id*. at p. 2.)

According to testimony by Cal-Am's witnesses during this proceeding, Cal-Am is now complying with the maximum diversion limit of 3,376 acre-feet annually from the Carmel River, in accordance with its water right. (Combined Hearing Transcript, p. 74:18–22.)

2.5.5 2013 State Water Board Staff Report

In September 2012, the CPUC asked the State Water Board to prepare a report analyzing whether Cal-Am would likely possess or be able to obtain legal rights to the source water for the proposed project and avoid injury to other legal users of water in the basin. (2012-09-26 CPUC ltr. to SWRCB.)

On July 31, 2013, the State Water Board transmitted a staff report to the CPUC entitled "State Water Resources Control Board Final Review of California American Water Company's Monterey Peninsula Water Supply Project." (2013-07-31 SWRCB review of Cal-Am MPWSP.) The State Water Board submitted the 2013 Staff Report to the CPUC "in an advisory role only" and stated that the report is "not binding on any party or entity…." (*Id.* at p. 59.) In the report, State Water Board staff concluded that the information provided to the State Water Board was insufficient for staff to "definitively address the issue of how the proposed project would affect water rights in the [Salinas Valley Groundwater] Basin." (*Id.* at p. 11.) The report includes recommendations for additional studies to clarify the hydrogeologic conditions in the area. (*Id.* at pp. 10, 77.)

2.6 Other Legal and Administrative Background

2.6.1 Annexation Agreement and Groundwater Framework

In 1996, MCWD, Marina, MCWRA, RMC Lonestar, and other neighboring property owners executed a document entitled the "Annexation Agreement and Groundwater Mitigation Framework for Marina Area Lands" (1996 Annexation Agreement). (Exh. Marina-8.) The 1996 Annexation Agreement was intended "to help reduce seawater intrusion and protect the groundwater resource and preserve the environment of the Salinas River Groundwater Basin through voluntary commitments by the Parties to limit, conserve and manage the use of groundwater from [this basin] and to provide the terms and conditions for the annexation of certain territory in the Marina area to the Monterey County Water Resources Agency's benefit assessment Zones 2 and 2A." (*Id.* at p. 10.) One of the properties proposed to be annexed was the CEMEX Property. (*Id.* at p. 14, § 4 [describing Exhibit D, the "Lonestar Property"].)

A term and condition of the 1996 Annexation Agreement is that RMC Lonestar will "limit the withdrawal and use of groundwater from the Basin to Lonestar's historical use of 500 afy [acre-foot per year] of groundwater." (*Id.* at p. 26, § 7.2.) The Agreement defines "Basin" as "the Salinas River Groundwater Basin." (*Id.* at p. 11.)[18] Marina and MCWD contend that this 500 afy groundwater extraction limit is a restrictive covenant or equitable servitude that runs with the land and is binding on all future owners, easement holders and all other persons who have or claim interests in the CEMEX Property, including CEMEX and Cal-Am. (2020-10-15 City of Marina 2nd Amend. Compl. for Dec Relief, p. 9, ¶ 29; 2020-11-03 Marina CWD's First Amended Cross-Complaint, p. 10, ¶ 19.)

The validity, applicability, and meaning of the 1996 Annexation Agreement is a contested issue in the lawsuit from which this administrative proceeding arises but is not

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[18] The Salinas Valley Groundwater Basin is sometimes also referred to as the "Salinas River Groundwater Basin."

an issue the court referred to the State Water Board. The Court does ask, however, whether the Board can say "with reasonable certainty that the amount drawn by the Cal-Am wells will not exceed 500 acre-feet per year from any water source beneath the Cemex property." (2021-10-07 Order After Hearing, p. 2.)

2.6.2 Cal-Am Option Agreement and Easement to Occupy CEMEX Property

CEMEX and Cal-Am entered into an Option Agreement dated November 4, 2014, which grants an option for Cal-Am to purchase permanent easements to construct and operate slant wells, pipelines, roads and other facilities contemplated for the MPWSP. (Exh. Marina-10.) Section 9(d) of the Option Agreement states: "California American Water is not granted any groundwater rights or withdrawal rights by CEMEX under this Agreement, the Option, or the Permanent Easements." (*Id*. at p. 8.) This section further requires Cal-Am to "obtain and maintain any and all necessary rights to pump, withdraw, and use water in compliance with any and all applicable water rights laws and the 1996 Annexation Agreement if, and to the extent, the Annexation Agreement is applicable ...." (*Ibid*.)

In 2018, CEMEX conveyed a permanent easement to Cal-Am for portions of the CEMEX Property to authorize construction and operation of the slant wells, related facilities, pipelines, roads, and other coastal structures for the MPWSP. The permanent easement area for the slant wells, related facilities, and pipelines covers 35.9 acres of beach and sand dune areas adjacent to the Mean High Water line and an access easement for 3.5 acres of other beach and dune land. (Exh. Marina-9, pp. 7 & 11.) Marina and MCWD contest the validity of the easement CEMEX conveyed to Cal-Am, although the court did not refer that issue to the State Water Board and the issue is not further addressed in this report.

2.6.3 Sustainable Groundwater Management Act

The purpose of the 2014 Sustainable Groundwater Management Act (SGMA) is to provide for the sustainable management of groundwater basins in California. (Wat. Code, § 10720.1.) SGMA provides for groundwater management by local agencies to the extent feasible, with state intervention only to the extent necessary to achieve sustainable management. (*Id.* subd. (h).) DWR prioritized the alluvial groundwater basins or subbasins in the state to identify those that require management. (See Wat. Code, § 10720.1.) Local public agencies in all basins or subbasins[19] DWR designated as high- or medium-priority were required to form one or more GSAs to develop, adopt,

[19] SGMA defines "basin" to mean a groundwater basin or subbasin identified and defined in Bulletin 118. (Wat. Code, § 10721, subd. (b).) Subbasins identified in Bulletin 118 "refer generally to any subdivision of a basin based on geologic and hydrologic barriers or institutional boundaries …." (Cal. Code Regs., tit. 23, § 341, subd. (g)(2).)

and implement one or more groundwater sustainability plans (GSPs) to meet SGMA's sustainability goal. (Wat. Code, §§ 10721, subd. (n), 10720.7, 10723, subd. (a), 10727, 10735.2, subd. (a)(1).) Once a groundwater sustainability agency (GSA) is formed and undergoes specific noticing procedures, it becomes the exclusive GSA within its service area, as described in its notice. (Wat. Code, § 10723.8, subd. (d).) If two or more agencies file overlapping notices, none are exclusive, and the area remains unmanaged. If an area is unmanaged, SGMA provides that the county where the unmanaged area lies will be presumed to be the GSA unless it declines this role. (*Id.* at § 10724.)

GSAs for high- and medium-priority groundwater basins or subbasins were required to develop and submit to DWR for review a GSP that includes "[m]easurable objectives, as well as interim milestones in increments of five years, to achieve the sustainability goal in the basin within 20 years of the implementation of the plan." (Wat. Code, § 10727.2, subds. (a)-(c).) The "sustainability goal" is the implementation of a plan for the basin or subbasin that achieves "sustainable groundwater management" and ensures that the basin or subbasin is operated within its "sustainable yield." (Wat. Code, § 10721, subd. (u).) SGMA defines "sustainable groundwater management" as the management and use of groundwater in a manner that does not cause undesirable results and defines "sustainable yield" as the maximum quantity of water that can be withdrawn annually from a groundwater supply without causing an undesirable result. (*Id.*, subds. (v), (w).)

As defined by SGMA, an undesirable result is one or more of the following effects caused by groundwater conditions occurring throughout the basin (or subbasin):

(1) Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply if continued;
(2) significant and unreasonable reduction in groundwater storage,
(3) significant and unreasonable seawater intrusion,
(4) significant and unreasonable degraded water quality,
(5) significant and unreasonable land subsidence, and
(6) Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

(*Id.*, subd. (x).)

In enacting SGMA it was the "intent of the Legislature to preserve the security of water rights in the state to the greatest extent possible consistent with the sustainable management of groundwater." (Wat. Code, § 10720.1, subd. (b).) SGMA does not alter the law governing rights to groundwater or surface water. "Nothing in this part or in any groundwater management plan …determines or alters surface water rights or groundwater rights under common law or any provision of law that determines or grants surface water rights." (*Id.* at § 10720.5, subd (b).) "Nothing in this part shall be construed as authorizing a local agency to make a binding determination of the water rights of any person or entity …." (*Id.* at § 10726.8, subd. (b).)

The year following SGMA's passage, the Legislature amended both SGMA and the Code of Civil Procedure to include provisions harmonizing SGMA with comprehensive adjudications. Courts are required to conduct any groundwater adjudication consistent with SGMA, and "shall not approve entry of judgment in an adjudication action for a basin required to have a groundwater sustainability plan … unless the court finds that the judgment will not substantially impair the ability of a [GSA], the board, or the department to comply with this part and to achieve sustainable groundwater management." (Wat. Code, §10737.8; Code Civ. Proc., § 850, subd. (b).) In determining rights to groundwater, SGMA states that "[t]he approval of a groundwater sustainability plan by the department shall not be construed [by the court in an adjudication] to be a determination by or otherwise an opinion of the department that the allocation of groundwater pumping rights in the plan are consistent with groundwater rights law." (Wat. Code, §10738.)

As described above in Section 2.3.1, the 180/400 and Monterey Subbasins are high- and medium-priority subbasins, respectively. In 2017, MCWD posted a notice of intent to become the GSA for the City of Marina and the former Fort Ord Area portions of the 180/400 Subbasin and SVBGSA posted a notice of intent to become the GSA for the 180/400 Subbasin, including the Fort Ord and CEMEX areas. Marina subsequently posted a notice of intent to become the GSA for the 180/400 Subbasin CEMEX area. These overlapping notices caused the Fort Ord and CEMEX areas to remain unmanaged. In 2019, MCWD and SVBGSA resolved the overlap regarding the Fort Ord area but Marina and SVBGSA did not resolve their overlap, leaving the CEMEX area unmanaged. Subsequently, the County of Monterey chose to serve as the GSA under Water Code section 10724. The County then entered into a coordination agreement with SVBGSA for the CEMEX area. (See *City of Marina v. County of Monterey* (2023) 97 Cal.App.5th 17 [affirming SVBGSA as the exclusive GSA for the CEMEX area].) The SVBGSA therefore has the authority to regulate Cal-Am's groundwater extractions from the 180/400 Subbasin. With respect to the Monterey Subbasin, MCWD and SVBGSA agreed to cooperatively develop one GSP. As a result, both subbasins are managed pursuant to GSPs that DWR approved and that separate GSAs adopted, each with exclusive jurisdiction of their respective subbasins. SGMA also requires DWR to periodically review GSPs, including to determine whether a GSP "adversely affects the ability of an adjacent basin to implement their [GSP] or impedes achievement of sustainability goals in an adjacent basin." (Wat. Code, § 10733.)

3 ADMINISTRATIVE HEARINGS OFFICE PROCEEDING

3.1 Procedural Background

3.1.1 Assignment to the Administrative Hearings Office

Water Code section 1110 established the AHO within the State Water Board. Water Code section 1112, subdivision (c)(2), provides that the Board may assign an adjudicative hearing to the AHO. Water Code section 1112, subdivision (c)(3), provides that an AHO hearing officer may perform additional work requested by the Board, including, but not limited to, presiding over hearings on non-adjudicative matters, mediations, and overseeing investigations.

On November 17, 2021, the Executive Director for the State Water Board transmitted a memorandum to the Presiding Hearing Officer of the AHO, assigning this court reference to the AHO to conduct an adjudicative hearing and any necessary related proceedings, and to prepare a proposed report of referee answering Questions 1 through 8 in the court's October 7, 2021 Order, for transmittal to and consideration by the Board. (2021-12-13 Notice of Assignment and Status Conference.)

3.1.2 Statutory Procedure for Court References

Water Code section 2000 authorizes a court to order a reference to the State Water Board of any or all issues involved in a suit concerning a determination of rights to water. Water Code section 2001 further authorizes a court to refer to the State Water Board for investigation of, and report upon, any or all the physical facts involved in the suit.

The Board may base its report solely upon its own investigations or may additionally hold hearings and take testimony. (Wat. Code, § 2010.) The report of the Board acting as referee may contain opinions on the law and facts as the Board deems proper in view of the issues submitted to it by the court. (*Id.* at § 2011.) The Board must include in its report the findings of fact and conclusions of law required by the court's order of reference. (*Id.* at § 2012.)

Before the Board files a final report of referee with the court, the Board must issue a draft report and provide notice to the parties or their attorneys. (Wat. Code, §§ 2013 & 2014.) Within thirty days after the date the Board mails the draft to the parties, or such further time as the court may for good cause allow, any party may file objections to the draft report with the Board. (*Id.* at § 2015.) After the Board has considered any objections and conducted any additional hearing, the Board must file its report of referee with the clerk of the court and give notice of the filing of the report to the parties or their attorneys. (*Id.* at § 2016.)

The Board's report of referee is subject to review by the court based on any exceptions filed by any party with the clerk of the court within thirty days from receiving notice of the Board's filing of the final report with the clerk of the court. (Wat. Code, § 2017.) No exception to the report shall be considered by the court, except in the court's discretion or for good cause shown, unless the issue was submitted to the Board as an objection to the draft report. (*Id*. at § 2018.) The Board's report of referee is prima facie evidence of the physical facts found in the report. (*Id*. at § 2019.)

3.2 Public Hearing

The AHO conducted 26 days of hearing, a site visit, and 14 pre-hearing or status conferences to prepare an adequate evidentiary and administrative record on which to base this report. The evidentiary portion of the hearing extended over the course of a year, beginning on October 26, 2022, and concluding on October 12, 2023.

The hearing officer required the parties to submit witness testimony in writing in advance of the hearing. (2022-05-06 AHO Hearing Notice, p. 13.) Before the public hearing began, the hearing officer allowed the parties to take depositions of witnesses for whom the parties had submitted written testimony. (*Id.* at pp. 6–7.) During the hearing, the parties were permitted to provide an opening statement, present summaries of their witnesses' direct testimony, and cross-examine opposing parties' witnesses. (*Id.* at pp. 19–20.)

3.2.1 Site Visit

Then-Presiding Hearing Officer Alan Lilly and State Water Board staff assisting the hearing officer, and representatives of Cal-Am, MCWD, and Marina, participated in a site visit on November 2, 2022. (2022-11-01 Notice of Site Visit.) The purpose of the site visit was for the AHO personnel to view facilities and topographical features relevant to this proceeding and the court's questions.[20] Each location of the site visit is described in the November 1, 2022 Notice of Site Visit, but generally included several of MCWD's wells, the CEMEX Property, the proposed location of the desalination plant, the locations of certain monitoring wells, and a location in Castroville where pumping from existing wells would be reduced or eliminated pursuant to the Return Water Settlement Agreement.

3.2.2 Hearing Phases 1, 2, and 3

Phase 1 of the hearing addressed the court's questions as reproduced in the May 6, 2022, Notice of Hearing and consisted of opening statements, presentation of summaries of written testimony, and cross-examination of witnesses. (2022-05-06 AHO

[20] Audio and video recordings of each location on the site visit and photographs from the site visit are included in the administrative record in a folder titled "Site Visit" within the Hearing Documents folder.

Hearing Notice, pp. 3–4.) The AHO conducted hearing days in Phase 1 of the proceeding on October 26 through 28, and 31, 2022; November 1 and 3, 2022; December 7-9, 12, and 14-15, 2022; January 31, 2023; February 2, 2023; and March 1 and 16, 2023. After the parties had presented their witnesses and conducted cross-examination, concluding on December 12, 2022, the parties, their expert witnesses, and the hearing officer discussed approaches to resolving disagreements over Cal-Am's modeling approach, the need for additional model work to adequately address the court's questions, and preparation of the draft report of referee. These discussions occurred during the hearing days on December 14, December 15, January 31, February 2, March 1, and March 16, 2023. (See Section 4.2 for additional discussion of the collaborative modeling effort.)

Phase 2 of the hearing addressed the collaborative modeling efforts of the parties to address the court's questions, except for exhibits and testimony about solute transport model analysis and dual-density or variable density model analysis – which subjects were addressed in Phase 3. (2023-06-30 Status Conference Order; Notice of Hearing p. 2.) The AHO conducted Phase 2 of the hearing on July 17, and July 19 through 21, 2023.

Phase 3 of the hearing addressed the description, analyses and modeling results of the solute transport model and dual-density or variable density model, and four additional issues described in the July 26, 2023, Post-Hearing Order the AHO issued after the completion of Phase 2. (2023-07-26 Post-Hearing Order, pp. 1–3.) The AHO conducted Phase 3 of the hearing on September 11 through 15, and 26, and October 12, 2023.

Summary of Hearing Dates and Witness Testimony:

Phase 1		
Date	***Witness & Relevant Exhibits***	***General Subject***
October 26 to October 28, 2022	*Cal-Am, Vice President of Engineering:* Ian Crooks (Exhs. Cal-Am-1 & 2) *Cal-Am, Expert Witnesses:* Timothy Durbin (Exhs. Cal-Am-70 to 77) Peter Leffler (Exhs. Cal-Am-3 to 33, 78 to 87, & 104)	General information about the proposed project. Hydrogeologic and groundwater modeling, and potential impacts from proposed project.

	Johnson Yeh (Exhs. Cal-Am-56 to 58 & 88)	
October 31, & November 1, 2022	*MCWD, General Manager:* Remleh Scherzinger (Exhs. MCWD-1, 5, 89, & 100) *MCWD, Expert Witness:* Theodore Asch (Exhs. MCWD-4, 27 to 30, 77, 91, 101, 102, & 108)	MCWD operations, water sources, groundwater management, and water rights. Airborne electromagnetic surveys.
November 3, 2022	*Marina, City Manager:* Layne Long (Exhs. Marina-1, 25, 32, & 33)	Marina's water sources, wells, water rights. Annexation Agreement, vernal ponds, groundwater use, and impacts of proposed project.
December 7 to December 9, 2022	*MCWD, Expert Witnesses:* Vera Nelson (Exhs. MCWD-2, 9, 10, 92, 93, 113, & 117) Todd Kincaid (Exhs. MCWD-3, 17, 90, 114, 115, 118 to 120, & 122)	Hydrology at site of proposed slant wells and effects of the proposed project. Evaluation of modeling related to proposed project.
December 12, 2022	*Marina, Expert Witness:* Mark Trudell (Exhs. Marina-2 to 4, 28, 29, & 39 to 41)	Hydrogeology, groundwater, and related subjects.
December 14 & December 15, 2022	None	Hearing officer questions to expert witnesses.
January 31, February 2, March 1, & March 16, 2023	None	Discussion among experts, parties, and hearing officer about development of model improvements and procedural issues.

<table>
<tr><th colspan="3">Phase 2</th></tr>
<tr><th>Date</th><th>Witness & Relevant Exhibits</th><th>General Subject</th></tr>
<tr><td>July 17 &
July 19, 2023</td><td>Cal-Am, Expert Witnesses:

Tim Durbin
(Exhs. Cal-Am-134 to 137, 152, & 160 to 163)

Johnson Yeh
(Exhs. Cal-Am-138 to 141, 157, 158, & 168)

Peter Leffler
(Exhs. Cal-Am-143 to 145, 153 to 156, & 167)</td><td>Regional model (SVSM) inputs used by Cal-Am and MCWD.

Water level, water quality, and seawater intrusion model results using Cal-Am WBSSM^{2023}. Expert opinions on scenarios.

Results of Phase 2 modeling using MCWD WBSSM^{2023} and Cal-Am WBSSM^{2023}.</td></tr>
<tr><td>July 20, 2023</td><td>MCWD, Expert Witnesses:

Vera Nelson
(Exhs. MCWD-126, 128 to 131, 150, 152, 153, & 155 to 160)

Todd Kincaid
(Exhs. MCWD-127, 149, 151, & 161)</td><td>Similarities and differences between MCWD WBSSM^{2023} and Cal-Am WBSSM^{2023}, modeling scenarios, and results.

Model results in relation to Court's questions, details and results of MCWD WBSSM^{2023}, and differences between the models.</td></tr>
<tr><td>July 21, 2023</td><td>Marina, Expert Witness:

Mark Trudell
(Exhs. Marina-43 to 46, & 54 to 56)</td><td>Model representation of hydrogeologic characteristics, model calibration, modeling results.</td></tr>
</table>

Phase 3		
Date	***Witness & Relevant Exhibit***	***General Subject***
September 11, 2023	None	Discussion of procedural and evidentiary issues.
September 12 & September 13, 2023	*Cal-Am, Expert Witnesses:* Tim Durbin (Exhs. Cal-Am-176, 179, 185 to 187, 189, 192) Johnson Yeh (Exhs. Cal-Am-174, 177, 183, 187, 190) Peter Leffler (Exhs. Cal-Am-175, 177, 178, 180, 184, 187, 191)	Hydrogeology, water level profiles, effects on protective heads (water levels), and resulting effects on salinity. Solute transport modeling, effects of project on TDS, aquifer storage, freshwater availability, seawater intrusion.
September 14, September 15, & September 26, 2023	*Marina, Expert Witnesses:* Mark Trudell (Exhs. Marina-58 to 61, & 67) Michael Tietze (Exhs. Marina-62, 63, 65, & 68) *MCWD, Expert Witnesses:* Vera Nelson (Exhs. MCWD-163, 165, 166, 168, & 175) Todd Kincaid (Exhs. MCWD-164, 167, 169, & 176)	Solute transport model development and results, seawater and freshwater flows, and groundwater storage. Modeling approach used by Cal-Am. Cal-Am and MCWD flow and transport modeling, changes in TDS and protective heads, seawater movement, and groundwater storage. Effects of flow modeling on results of modeled seawater movement, particle tracking results.
October 12, 2023	None	Procedural issues regarding admission of exhibits.

3.3 Significant Procedural Rulings

On July 11, 2022, Hearing Officer Lilly issued a ruling on a June 22 joint motion in limine filed by Marina and MCWD to exclude testimony of Dave Owen submitted by Cal-Am. The hearing officer excluded the testimony because it lacked evidentiary value and consisted solely of legal argument regarding legal issues in the proceeding. (2022-7-11 Ruling on City of Marina Motion in Limine, p. 3.)

On August 31, 2022, Hearing Officer Lilly issued a ruling on Cal-Am's August 9 motion in limine to exclude, among other evidence, Marina's proposed written testimony and related exhibits regarding wetlands and vernal pools, and the potential effects of Cal-Am's proposed project on them. (2022-08-31 AHO Ruling on Cal-Am Mtn. in Limine, p. 5.) The hearing officer excluded the exhibits because they "[did] not concern any potential water rights of Marina or [M]CWD," and therefore were not relevant to the hearing issues. (*Id.* at p. 6.)

On December 21, 2022, after reviewing the written testimony and cross-examination of the parties' witnesses, the hearing officer directed the parties to work collaboratively to conduct additional modeling work. (2022-12-21 Post-Hearing Order and Notice of Additional Hearing Dates, pp. 2–3; see also Section 4.2, *infra*.) The hearing officer also directed the parties to prepare technical memoranda and to report areas of agreement and disagreement about the collaborative modeling effort in a joint status report. (*Id.* at pp. 4–5.) This collaborative modeling effort is described in more detail in Section 4.2.

On February 6, 2023, the hearing officer circulated a draft outline for the report of referee and asked the parties to prepare proposed text for some of those sections, to coordinate "consensus text" for as many sections and answers as possible, and to submit this text to the AHO by March 20, 2023. (2023-02-06 Post-Hearing Order, pp. 4–5.)

On March 7, 2023, the hearing officer directed the parties' technical experts to run designated model scenarios. (2023-03-07 Post-Hearing Order, p. 2.) The hearing officer also updated his questions to these experts in the December 21, 2022, Post-Hearing Order about model assumptions, model calibration, and other analyses, and updated the list of exhibits to be submitted to the AHO. (*Id.* at pp. 3–6; see also 2023-03-20 Post-Hearing Order, pp. 3–4 [modifying March 7, 2023, text regarding model scenarios and comparisons of results].) The hearing officer later postponed the deadlines for submittal of the requested technical memoranda, written testimony, and related exhibits at the request of the parties. (2023-04-25 Status Conference Order, p. 2; 2023-05-03 Status Conf. Order; Notice of New Status Conf., p. 2; 2023-05-30 Status Conf. Order; Notice of Hrg., pp. 2–3.)

On June 30, 2023, the AHO issued a status conference order clarifying that Phase 2 of the proceeding would not address solute transport model analyses and dual-density model analyses, and that these issues would be addressed in Phase 3. (2023-06-30 Status Conference Order; Notice of Hearing p. 2.)

After conducting Phase 2 of the hearing in July 2023, the hearing officer issued a July 26 Post-Hearing Order. This procedural ruling identified the issues to be addressed in Phase 3 of the hearing, directed the submission of specific exhibits, and set deadlines for submission of exhibits, proposed text for all sections of the draft report of referee, and closing briefs. (2023-07-26 Post-Hrg. Order.) The hearing officer directed the parties to address in their closing briefs the questions of whether a physical solution as described in *City of Lodi v. East Bay Mun. Util. Dist.* (1936) 7 Cal.2d 316, 339–341 and subsequent reported court decisions might be appropriate. (*Id.* at p. 3.) Finally, the order stated that, effective August 1, 2023, Nicole Kuenzi, the newly-appointed Presiding Hearing Officer of the AHO, would become the assigned hearing officer for the proceeding.[21]

The AHO held Phase 3 of the hearing from September 11 to 15 and an additional hearing day on September 26, 2023. (2023-09-21 Procedural Ruling & Notice of Additional Hearing Day, p. 2.) The hearing officer also extended the parties' deadline to prepare closing briefs and proposed text for all remaining sections to October 31, 2023. (*Ibid.*) The hearing officer later extended this deadline to November 13, 2023. (2023-10-17 N. Kuenzi email to Service List.) The AHO held an additional procedural hearing day on October 12, 2023, to address evidentiary matters. (2023-10-04 Procedural Ruling & Notice of Additional Hearing Day, p. 2.)

3.4 Proposed Text for Report of Referee and Closing Briefs

The hearing officer directed the parties to submit proposed text for the State Water Board's report of referee. Part 1 of the draft text submitted by the parties was to address parts of the February 6, 2023, hearing officer's outline and some of the court's questions. Part 2 of the draft text submitted by the parties was to address the remaining sections of the draft outline and the remaining questions from the court.

On March 27, 2023, the parties filed Part 1 of their proposed text for the report of referee. Cal-Am filed a Proposed Draft Report of Referee (Part 1 of 2) and Marina and MCWD jointly filed "Draft Referee Report Sections to AHO," along with a separate single-page file titled "3/27/2023 AHO Draft Referee Report – Q.6, A.1."[22]

[21] This re-assignment of hearing officers occurred because of Hearing Officer Lilly's retirement from the State Water Resources Control Board.
[22] The draft reports of referee sections submitted in March 2023 are in the Communications and Transmittals subfolder, while the draft reports submitted in November 2023 are in the Closing Briefs subfolder within the Hearing Documents folder in the administrative record for this proceeding.

On November 13, 2023, the parties filed Part 2 of their proposed text for the report of referee. Cal-Am filed a 2023-11-13 Cal-Am's Proposed Draft Referee's Report. Marina and MCWD jointly filed a 2023-11-13 City of Marina Joint Draft Referee Report Sections 11–13.

Cal-Am, Marina, and MCWD each filed a closing brief on November 13, 2023. (2023-11-13 Cal-Am's Closing Brief; 2023-11-13 MCWD's Closing Brief; 2023-11-13 City of Marina's Closing Brief.)[23]

3.5 Preparation of Report of Referee and Approval by the Executive Director

On May 22, 2024, the AHO circulated a partial draft report of referee to the parties for comment. The partial draft included relevant background sections and addressed the court's Questions 1 through 5. On June 25, 2024, the parties submitted comments on the partial draft report of referee. (2024-06-25 Cal-Am Initial Objections to Draft Report of Referee Part 1; 2024-06-25 MCWD Comments on 5-22-24 AHO Partial Draft Report; 2024-06-25 Marina Comments on 5-22-24 Draft Report.)[24]

On December 31, 2024, the AHO, on behalf of the State Water Board, transmitted by e-mail a complete Draft Report of Referee to the parties' representatives pursuant to Water Code section 2013. The AHO received objections from the parties by the deadline of January 31, 2025. (2025-01-31 Cal-Am's Objections to Report of Referee; 2025-01-31 MCWD's Objections and Comments to Draft Report; 2025-01-31 City of Marina's Comments on 2024-12-31 Draft Report.) The AHO responded to the objections, which are in Appendices B, C, and D of this Final Report, and revised th Final Report accordingly.

In June 2025, the AHO submitted the Final Report of Referee to the Executive Director of the Board for his consideration. (2025-06-20 Memo to E. Oppenheimer Re Marina.) The Executive Director approved this Final Report pursuant to the Board's delegation of authority to the Executive Director of the Board in Resolution No. 2023-0036, and directed the AHO to file the Final Report and the underlying administrative record with the court. (See Wat. Code, § 2016.) The AHO filed the Final Report on behalf of the Board by United States Mail with the clerk of the court on June 25, 2025, and transmitted a copy of the Final Report to the representatives of the parties by e-mail.

[23] The documents identified in this section are in the "Hearing Documents" folder, in the subfolder for "Closing Briefs."
[24] These documents are also in the "Hearing Documents" folder, in the subfolder for "Closing Briefs."

3.6 Administrative Record and Evidentiary Record

The administrative record for this proceeding includes the evidentiary record; all recordings and transcripts of proceedings; documents from this proceeding such as recordings from the site visit, closing briefs and procedural rulings; Court documents; and any other documents the Board considered in preparing this report. The State Water Board has made the administrative record associated with this proceeding available to the parties and the public on the Board's FTP site. The State Water Board is transmitting the administrative record to the court on a digital storage device with the Final Report of Referee. (As described below, model files are part of the administrative record and are available upon request.)

The evidentiary record is a subset of the administrative record, which includes all exhibits admitted into evidence and oral testimony made under oath during the hearing. The evidentiary record is the basis for the Board's factual findings in the Final Report of Referee.

Functioning model files received by the AHO from the parties were accepted into the evidentiary record for this proceeding. The Board did not rely directly on the functioning model files for any finding of fact, however, but rather relied on the technical reports and model results the parties provided. Because of the very large digital size of the model files and because the Board did not directly rely on the files to reach any conclusion, the Board has not included the model files in the administrative record submitted on the digital storage device with this report. We can provide the functioning model files upon request.

4 GROUNDWATER MODELING

Mathematical modeling is an important element of decision-making for virtually all complex groundwater management matters. Computer models are used as tools to simulate groundwater flow systems for educational, investigatory, management, and legal purposes. There are inherent uncertainties in mathematical groundwater modeling, as it relies on a series of assumptions and extrapolations from limited known data. However, groundwater modeling results are an important source of information on which decision-makers may rely to understand these complex systems.

4.1 Groundwater Models in the Salinas Valley Groundwater Basin

During the development and environmental review of the MPWSP, Cal-Am and the CPUC used several iterations of groundwater models to analyze the potential impacts of the proposed project on the groundwater basin.

In 2008, Dr. Johnson Yeh, of Geoscience Support Services, Inc. (Geoscience), developed a transient groundwater and solute transport model,[25] called the North Marina Groundwater Model (NMGWM), to evaluate the potential groundwater impacts from various coastal water supply projects. (Exh. Cal-Am-56, p. 4, ¶14.) Dr. Yeh constructed the model by integrating the Salinas Valley Integrated Ground and Surface Water Model (SVIGSM) aquifer parameters, recharge and discharge terms, and boundary conditions. (*Ibid.)*

Between 2013 and 2015, Dr. Yeh and Geoscience updated and recalibrated the NMGWM to include two additional model layers to represent the Dune Sand Aquifer and Salinas Valley Aquitard, incorporate the updated and recalibrated SVIGSM, and extend the model calibration period. (Exhs. Cal-Am-60, p. 17 & Cal-Am-56, p. 4, ¶ 15.) Dr. Yeh used predictive model runs to simulate changes in water level, the seawater intrusion front, and Ocean Water Percentages (OWP) drawn from the proposed project wells. (See Exh. Cal-Am-60.) The CPUC relied on these model runs in the 2015 Draft EIR for the proposed project. (See Exh. MCWD-22.)

After the CPUC publicly released the 2015 Draft EIR, the CPUC retained HydroFocus, Inc. (HydroFocus) to review and update the model. HydroFocus developed the $NMGWM^{2016}$ and converted it to a superposition model to conduct the analysis presented in the 2018 revision to the Draft EIR. (Exh. Cal-Am-8, p. 35 [DEIR p. 8.2-29]; Exh. MCWD-23.)

In 2020, Weiss Associates (Weiss) conducted additional modeling using the $NMGWM^{2016}$ for predictive model scenarios. (Exh. Cal-Am-48.) Weiss' modeling focused on capture zones of the proposed wells, OWP of water drawn from the proposed wells, and drawdown cause by operation of the proposed wells. (*Ibid.*)

4.2 Groundwater Modeling for this Proceeding

The expert witnesses based many of their opinions addressing the court's questions on results from groundwater modeling conducted specifically for this proceeding. The groundwater models on which the experts relied were developed from existing models for the SVGB that the experts modified and refined through the proceeding before the AHO to address some of the criticisms of the existing models and to respond to the court's questions.

$NMGWM^{2022}$

In 2022, Dr. Yeh and Geoscience updated the $NMGWM^{2016}$ model to produce the model known as $NMGWM^{2022}$. (Exh. Cal-Am-89.) The 2022 update added a new model layer,

[25] Definitions of groundwater modeling terms are found in the Glossary in Section 8.

extended the calibration period, and incorporated recharge and discharge terms and boundary conditions from the 2022 SVSM model developed by Tim Durbin. (Exh. Cal-Am-56, pp. 5–6, ¶ 17.) Cal-Am submitted testimony in Phase 1 of this proceeding based on modeling results from $NMGWM^{2022}$. (See Exh. Cal-Am-89.)

MCWD's expert, Dr. Todd Kincaid of Shannon & Wilson, Inc., evaluated $NMGWM^{2022}$ and ran predictive model scenarios with a steady-state version of the model that he developed. (See Exh. MCWD-115.) MCWD submitted testimony by its experts in Phase 1 of this proceeding that addressed the disagreements and concerns their experts had with the modeling and model results Cal-Am submitted. These opinions are presented in MCWD experts' written direct, rebuttal, and sur-rebuttal testimony for Phase 1 of this proceeding. (See Exhs. MCWD-2, 3, 90, 92, 113, & 114.) In Phase 1, MCWD's experts also presented some limited model results based on Dr. Kincaid's steady-state version of $NMGWM^{2022}$. (*Ibid.)*

Collaborative Modeling Effort

Following Phase 1, the AHO hearing team determined that the evidence in the record was insufficient to address the court's questions. In lieu of inviting Cal-Am to directly respond to the criticisms of $NMGWM^{2022}$ and prior models presented by MCWD and Marina in Phase 1,[26] the hearing officer directed the parties to undertake a cooperative effort to develop a joint model that addressed the concerns and disagreements of MCWD's experts with the construction and results derived from $NMGWM^{2022}$ and prior models, and to present results from this model in supplemental hearing days. (See Combined Hearing Transcript, pp. 1960:1–1964:21; 2022-12-21 Post-Hearing Order and Notice of Additional Hearing Dates.)

The parties' technical experts met several times in December 2022 and January 2023 but were unable to resolve their disagreements sufficiently to develop one joint model for Phases 2 and 3 of this proceeding. The hearing officer directed the parties to develop separate models referred to as the Cal-Am and MCWD Water Board Steady-State Models (Cal-Am $WBSSM^{2023}$ and MCWD $WBSSM^{2023}$) and to continue to collaborate on the models as much as possible. (2023-03-07 Post-Hearing Order.)

The parties continued to develop their models in parallel and presented results from their flow models in Phase 2 of the hearing and results from their solute transport models in Phase 3 of the hearing.

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[26] The hearing officer did not invite Cal-Am to respond to MCWD and Marina experts' criticisms of $NMGWM^{2022}$ and prior models presented in Phase 1 of this proceeding, and we do not evaluate those criticisms because the evidence was superseded by the testimony and other evidence submitted in Phases 2 and 3.

Water Board Steady-State Models

The Cal-Am WBSSM[2023] and MCWD WBSSM[2023] are steady-state flow models and solute transport models developed from the NMGWM[2022] presented in Phase 1 of this proceeding. The models are similar because the parties' technical experts were able to agree on most of the models' construction, calibration, and parameters. The technical experts did not reach agreement on several issues, however, and these disagreements resulted in some differences in the model results presented the parties presented.

The areas of agreement and disagreement between the parties' technical experts, as well as their more general concerns with the applicability of the modeling techniques used in Phases 2 and 3, are identified and discussed in the technical memoranda the parties' experts submitted. (See, e.g., Exhs. Cal-Am-141 & MCWD-128 [flow models]; Cal-Am-177 & MCWD-165 [transport models].)

We acknowledge these concerns and disagreements between the parties' technical experts. However, we conclude that the Cal-Am WBSSM[2023] and MCWD WBSSM[2023] represent the technical experts' best efforts to simulate the potential effects of the proposed project based on the available information and time to develop these models. We rely on the results of these models in our responses to the court's questions and generally consider the results from the two models to be reliable evidence of a range of possible outcomes from operation of the proposed project.

Model Scenarios

The AHO hearing officer directed the parties to run 12 model scenarios using the parties' respective models. The hearing officer also directed the parties to present model results comparing scenarios with project pumping to scenarios with no project pumping. (2023-03-07 Post-Hearing Order.) The scenarios include three project pumping configurations:

1. No project pumping;
2. 11.6 mgd project pumping; and
3. 15.5 mgd project pumping.

For each pumping configuration, the scenarios consider four calibration and potential SGMA implementation options, which are identified as Options A, B, C, and D. Figure 3 shows a matrix of the 12 scenarios identified by numbers for the pumping configurations and letters for the calibration and SGMA implementation options.

Cal-Am MPWSP Slant Well Pumping Rate	Calibration and SGMA Implementation Scenarios			
	Option A	Option B	Option C	Option D
	WY 2019-2021 Calibration, No SGMA Implementation	WY 2009-2021 Base Period, No SGMA Implementation	WY 2009-2021 Base Period, Cal-Am SGMA Implementation	WY 2009-2021 Base Period, MCWD/Marina SGMA Implementation
None	A1	B1	C1	D1
11.6 MGD Slant Well Pumping (for 4.8 MGD Production)	A2	B2	C2	D2
15.5 MGD Slant Well Pumping (for 6.4 MGD Production)	A3	B3	C3	D3

Figure 3 – WBSSM Predictive Model Scenarios (adapted from 2023-03-07 Post-Hearing Order, p. 3.)

Option A, the "Calibration Scenario," assesses the impacts of project pumping configurations if climate conditions and groundwater elevations remain consistent with those observed during water years 2019 to 2021 and future conditions in the groundwater basin do not change due to SGMA implementation projects.

Option B assesses the impacts of project pumping configurations if climate conditions remain consistent with those observed during water years 2009 to 2021 and future conditions in the groundwater basin do not change due to SGMA implementation projects.

Option C assesses the impacts of project pumping configurations if climate conditions remain consistent with those observed during water years 2009 to 2021 and future conditions in the groundwater basin include a regional extraction barrier. A regional extraction barrier is a series of extraction wells intended to form a barrier to seawater intrusion and is one of nine potential priority projects identified in the 180/400 Subbasin GSP. (SVBGSA Combined GSP 2020-0123, p. 345.)

Option D assesses the impacts of project pumping configurations if climate conditions remain consistent with those observed during water years 2009 to 2021 and future conditions in the groundwater basin include significant reductions in annual groundwater extraction by groundwater users within the 180/400 Subbasin. As noted by MCWD in its objection to the Draft Report, Scenario D could serve as a proxy for a SGMA-compliance scenario that relies on a combination of reduction in extractions and groundwater recharge. (2025-01-25 MCWD Objections and Comments to Draft Report, p. 15.)

The inclusion of both Option A and Option B arose from a disagreement between the parties' experts regarding the appropriate data set for recharge values for the predictive model scenarios. During the March 1, 2023 Status Conference, the parties' experts discussed this issue but were not able to reach agreement (See 2023-03-01 City of Marina v. RMC Lonestar Hearing Transcript (Morning), pp. 98–112.) The hearing officer directed the parties to present model results for both the 2019 to 2021 dataset (as Option A) and the 2009 to 2021 dataset (as Option B).

The analysis in this report of model results is nearly all from only Option B scenarios. During Phases 2 and 3 of this proceeding, the parties' experts generally focused their presentations of model results comparing changes in groundwater elevations and TDS concentrations on Option B scenarios. (See Exhs. MCWD-161; MCWD-165; Cal-Am-143 & Cal-Am-175.) In addition, the model results from Options A and B are not substantially different, and the differences in elevation or TDS concentration changes between the options would not change our conclusions in our responses to the court's questions.

Options C and D are included in the model scenarios to assess the effects that future groundwater management actions or projects, intended to help achieve sustainability in the 180/400 Subbasin, might have on the model-simulated effects of the proposed project. However, model results for these options are more speculative than results for options without potential SGMA implementation actions. This is because we cannot predict, based on the evidence in the record, the likelihood, extent, or timeline for implementation of an extraction barrier project or a reduction in groundwater pumping. Because of the high degree of uncertainty, we do not evaluate the results from Option C and D scenarios in our responses to the court's questions that rely on groundwater modeling results. Furthermore, Options C and D assume actions that mitigate the impacts of overdraft on groundwater conditions in the subbasins.

Analyzing the potential impact of the project absent other mitigating actions should produce a "worst case" scenario to assess the potential impacts of the proposed draw. The overall magnitude of the impact of Cal-Am's proposed draw may vary depending on future SGMA compliance actions and resulting conditions in the basin, but overall conditions in the basin under Option C and D scenarios should be improved as compared to the no-mitigation alternative of the Option B scenario. These improved conditions would reduce the likelihood that the proposed draw by Cal-Am may injure other legal users or result in unreasonable harm.

5 LEGAL DISCUSSION

5.1 Rights to Groundwater

In California, rights to groundwater are generally categorized as overlying, appropriative, or prescriptive. (*Antelope Valley Groundwater Cases* (2021) 62 Cal.App.5th 992, 1023.)

5.1.1 Overlying Rights

An overlying right attaches to land overlying a groundwater basin and consists of an equitable share of the sustainable yield of the basin, correlative to the rights of other overlying users, for use on overlying lands. (*Katz v. Walkinshaw* (1903) 141 Cal. 116, 118, 135–136.)[27] An overlying user can pump as much water as the user can apply to reasonable and beneficial use on the overlying parcel so long as other overlying users are not injured. (*City of Barstow v. Mojave Water Agency* (2000) 23 Cal.4th 1224, 1240.) In times of shortage, pumping must be curtailed correlatively, to provide each overlying user with a reasonable share of the available supply. (*Id.* at p. 1241.) Overlying rights generally take priority over appropriative rights and are not lost through non-use. (*Antelope Valley Groundwater Cases*, *supra,* 62 Cal.App.5th at pp. 1022–1023.) Extractions under overlying rights are not subject to the water right permit and license system administered by the State Water Board. (See Wat. Code, §§ 1201, 1202.)

5.1.2 Appropriative Rights

Appropriative rights to groundwater authorize the pumping and use of groundwater that is surplus to the needs of overlying users but within the sustainable yield of the basin. (*Antelope Valley Groundwater Cases*, *supra*, 62 Cal.App.5th at p. 1023.) An appropriator is "limited to taking *only* the remainder (or surplus) of the basin's 'safe yield.'" (*Id*. at p. 1024.) Once the needs of overlying water users are fully satisfied, appropriative rights to any surplus are governed by the principle of first in time, first in right. (*City of Santa Maria v. Adam* (2012) 211 Cal.App.4th 266, 279.)

Water extracted under an appropriative water right is not limited to use on overlying lands and may be exported for use outside of the basin. The extraction of groundwater for public use such as a municipal water supply, where not applied to a city's own property, is an appropriative use of water rather than an overlying use. (*City of San Bernardino v. City of Riverside* (1921) 186 Cal. 7, 24–25.)

Groundwater appropriations are not subject to the water permit and license systems unless the appropriations are from subterranean streams in known and definite

[27] In relevant precedential decisions, courts have used the terms "sustainable yield" and "safe yield" essentially interchangeably. These terms are discussed in more detail in Section 5.1.4.

channels, a narrow class of groundwater not at issue in this proceeding. (See Wat. Code, § 1201.) As against those with an existing right, a proposed new appropriator has the "burden of proving the existence of a surplus from which it can extract the quantity it desires … without injury to the uses and requirements of those who have prior rights." (*Tulare Irr. Dist. v. Lindsay-Strathmore Irr. Dist*. (1935) 3 Cal.2d 489, 535; see also *Peabody v. City of Vallejo* (1935) 2 Cal.2d 351, 381.) A valid appropriation of groundwater includes the following elements: "(1) [t]he intent to appropriate water and apply it to a beneficial use; (2) the actual . . . extraction from a ground-water basin; and (3) the application of water to a beneficial use within a reasonable time." (*Turlock Irrigation District v. Zanker* (2006) 140 Cal. App. 4th 1047, 1055; see also Hutchins, The California Law of Water Rights (1956) p. 108.)

5.1.3 Prescriptive Rights

A prescriptive right to groundwater is a right acquired by taking water to which someone else has a superior claim. This may be accomplished by the extraction and use of water that exceeds the basin's sustainable yield. "An appropriative taking of water which is not surplus is wrongful and may ripen into a prescriptive right where the use is actual, open and notorious, hostile and adverse to the original owner, continuous and uninterrupted for the statutory period of five years, and under claim of right." (*City of Santa Maria*, *supra*, 211 Cal.App.4th at p. 279; *California Water Service Co. v. Edward Sidebotham & Son* (1964) 224 Cal.App.2d 715, 726.)

5.1.4 Sustainable Yield of a Groundwater Basin

"'Safe yield' is defined as 'the maximum quantity of water which can be withdrawn annually from a ground water supply under a given set of conditions without causing an undesirable result[,]' i.e. a gradual lowering of the groundwater levels." (*Cent. & W. Basin Water Replenishment Dist. v. S. California Water Co.* (2003) 109 Cal.App.4th 891, 899, fn. 4 [as modified on denial of reh'g (July 9, 2003)] [quoting *City of Los Angeles v. City of San Fernando* (1975) 14 Cal.3d 199, 278].) "The phrase 'undesirable result' is understood to refer to," among other possible harms to the basin, "a gradual lowering of the ground water levels resulting eventually in depletion of the supply." (*City of Los Angeles v. City of San Fernando* (1975) 14 Cal.3d 199, 278 [citing *City of Pasadena v. City of Alhambra* 33 Cal.2d at p. 929] [disapproved on other grounds by *City of Barstow v. Mojave Water Agency* (2000) 23 Cal.4th 1224].) SGMA defines "sustainable yield" as "the maximum quantity of water, calculated over a base period representative of long-term conditions in the basin and including any temporary surplus, that can be withdrawn annually from a groundwater supply without causing an undesirable result." (Wat. Code, § 10721, subd. (w).)

Although a decrease in the amount of groundwater stored in the basin from pumping in excess of replenishment may be immaterial when considered on an annual basis, over time, the cumulative overdraft may injure existing uses and users or cause unreasonable harm. “Each taking of water in excess of the safe yield . . . was wrongful and was an injury to the then existing owners of water rights, because the overdraft, from its very beginning, operated progressively to reduce the total available supply.” (*City of Pasadena, supra,* 33 Cal.2d at p. 929; *City of Santa Maria, supra*, 211 Cal.App.4th at p. 292.)

A quantification of the sustainable yield of a groundwater basin should include all parts of the basin with significant hydrological connection to one another such that withdrawal of groundwater from one part of the basin affects groundwater conditions in the other hydrologically connected parts. The interconnected groundwater within the basin is a common source from which legal users may draw in accordance with the priority of their rights. (See, e.g., *City of Barstow v. Mojave Water Agency* (2000) 23 Cal.4th 1224, 1234 [describing the five hydrologic subareas of Alto, Centro, Baja, Oeste, and Este Basin within the Mojave River Basin as “a single interrelated source” because the [ ] “basins are interconnected”]; *Antelope Valley Groundwater Cases* (2020) 59 Cal.App.5th 241, 251 & 255, fn. 8 [considering hydraulic connectivity to determine whether portions of the Butte Subbasin should be treated as a separate basin]; *City of Los Angeles v. City of San Fernando* (Super. Ct. L.A. County, 1979, No. 650079 pp. 18–19 [describing the groundwater basins as “separate underground reservoirs” with impediments to inter-basin groundwater flow such that “the extractions of water in the respective basins … do not significantly or materially affect the groundwater levels in any of the other basins”]; see also *O.W.L. Foundation v. City of Rohnert Park* (2008) 168 Cal.App.4th 568, 587 [quoting DWR, California’s Groundwater: Bulletin 118-Update 2003 (Oct. 2003) at p. 88 (“A groundwater basin is defined as an ‘alluvial aquifer or a stacked series of alluvial aquifers within reasonably well-defined boundaries in a lateral direction and a definable bottom’”)]; but see (Cal. Code Regs., tit. 23, § 341, subd. (g)(2) [subbasins as defined by Bulletin 118 “refer generally to any subdivision of a basin based on geologic and hydrologic barriers or institutional boundaries ….”].)

5.1.5 Prohibition on Wasteful or Unreasonable Use or Method of Diversion of Water

Under article X, section 2 of the California Constitution and section 100 of the Water Code, the exercise of all water rights, regardless of the basis under which the right is held, are constrained by the rule of reasonableness. (*Peabody v. Vallejo* (1935) 2 Cal.2d 351, 366-367; *California Farm Bureau Federation v. State Water Resources Control Bd.* (2011) 51 Cal.4th 421, 429, *as modified* (Apr. 20, 2011); *Modesto Properties Co. v. State Water Rights Bd.* (1960) 179 Cal.App.2d 856, 862.)

Article X, section 2 provides in relevant part:

> It is hereby declared that because of the conditions prevailing in this State the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented …. The right to water or to the use or flow of water in or from any natural stream or water course in this State is and shall be limited to such water as shall be reasonably required for the beneficial use to be served, and such right does not and shall not extend to the waste or unreasonable use or unreasonable method of use or unreasonable method of diversion of water.

The rule that water diversions and use must be reasonable is "the overriding principle governing the use of water in California." (*People ex rel. State Water Resources Control Board v. Forni* (1976) 54 Cal.App.3d 743, 750; *Environmental Defense Fund, Inc. v. East Bay Mun. Utility Dist.* (1980) 26 Cal.3d 183, 198–199.) "What is a reasonable use or method of use of water is a question of fact to be determined according to the circumstances in each particular case ... Such an inquiry cannot be resolved *in vacuo* isolated from statewide considerations of transcendent importance." (*Joslin v. Marin Mun. Water Dist.* (1967) 67 Cal.2d 132, 139–140.)

5.1.6 Developed or Salvaged Water

An appropriator may claim a superior right to water that the right holder has developed or salvaged, which superior claim applies against all other right holders. The principles of "salvaged" water and "developed" water are similar, the terms often used interchangeably, and "[t]he general rules governing rights to the use of salvaged and developed water are the same, viz., that the person who by his own efforts makes such waters available is entitled to use them, provided that in doing so he is not infringing on the prior rights of others." (Hutchins, The Law of California Water Rights, *supra*, at p. 383.) The technical difference between the two is that salvaged water refers to water that is saved from the supply, "water that is saved from waste," and developed water refers to new water that is added to the supply. (*Ibid*.; *City of Santa Maria, supra*, 211 Cal.App.4th at pp. 266, 299, 304–305 [recognizing a superior right to water in the groundwater basin that was stored as surface water and released at a rate to allow infiltration into the basin rather than flowing downstream to the ocean].)

"[A] priority right to salvaged water belongs to the one who made it available." (*Id.* at p. 304; see also *Pomona Land & Water Co. v. San Antonio Water Co.* (1908) 152 Cal. 618, 624–625 [finding appropriator had superior right to water made available by construction of a pipeline to avoid losses by seepage, percolation, and evaporation]; *Wiggins v. Muscupiabe Land & Water Co.* (1896) 113 Cal.182, 196 [finding that the defendant was entitled to salvaged water that would have been lost by absorption and evaporation absent salvage efforts]; *Cohen v. La Canada Land & Water Co.* (1907) 151 Cal. 680, 691–693 [holding that an upstream water user could take water that otherwise would have been lost to the earth and would never have reached downstream users].) As with the development of any other appropriative right, however, the burden is on the appropriator to demonstrate that its diversion and use of developed or salvaged water will not injure other legal users.

5.1.7 Replacement Water

Replacement water is another means by which a junior water user may acquire a right to divert or extract water even when water would not otherwise be available for appropriation. (See generally, MacDonnell, *Out-of-Priority Water Use: Adding Flexibility to the Water Appropriation System*, (2004) 83 Neb. L. Rev. 485.) A right holder may supply replacement water to senior users to prevent injury caused by a more junior diversion. In the context of rights to groundwater, replacement water may offset extractions that would otherwise exceed the sustainable yield of the basin or otherwise cause injury to other right holders, or result in unreasonable harm that would violate the rule of reasonableness.

Replacement water is a common element of settlement agreements or physical solutions in California groundwater adjudications, in which users who extract more than their apportioned share must either provide replacement water or pay a fee for the purchase of replacement water to prevent undesirable results in the basin. (See, e.g., *Antelope Valley Groundwater Cases*, Judgment and Physical Solution, Judicial Council Coordinated Proceeding No. 4408, Santa Clara County Case No. 1-05-CV-049053 (Dec. 23, 2015); *City of Barstow v. Mojave Water Agency*, Judgment, Riverside County Case No. 208568 (Jan. 10, 1996); *California Water Service v. City of Compton*, Amended Judgment, Los Angeles County Case No. C 506 806 (Dec. 5, 2014); *Upper San Gabriel Valley Municipal Water Dist. v. City of Alhambra*, Amended Judgment, Los Angeles County Case No. 924128 (June 21, 2012); *Southern California Water Co. v. City of La Verne*, Judgment, Los Angeles County Case No. KC029152 (Dec. 18, 1998); *California American Water v. City of Seaside*, Amended Decision, Monterey County Case No. M66346 (Feb. 9, 2007) (using the term “replenishment water”). Like California, several other western states authorize out-of-priority diversions with the provision of replacement water to prevent injury to senior users in observance of the priority system and to maximize beneficial use of the states’ waters.[28]

[28] “Commonly, an augmentation plan authorizes out of priority diversions for beneficial use to the extent that a replacement supply of water is made available to substitute for the otherwise diminished amount of water available to supply other water rights. This

5.2 Injury to Water Rights

The proprietary interest in water includes the right to divert and use water of a quantity and quality necessary for the use. Injury to a water right is a material and unreasonable interference with the exercise of the right, whether by interference with physical availability, water quality, method of diversion, or other types of harms. For example, injury may occur from diversion of water that causes water to be physically unavailable to a user with senior priority. Or injury may occur from interference in the senior user's access to water that causes the senior user to sustain material costs to divert and use the quantity of water to which the user has a right. Possible remedies to address injury to a water right include curtailment of the junior user's diversion, payment of damages,

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allows the junior diversion to operate without injury to senior vested water rights. Augmentation plans allow for flexibility and maximum utilization of water while protecting senior rights…." Colorado Division of Water Resources, Department of Natural Resources, https://dwr.colorado.gov/services/water-administration/augmentation-plans (last visited June 19, 2025.) "Augmentation plans implement the Colorado doctrine of optimum use and priority administration, which favors management of Colorado's water resource to extend its benefit for multiple beneficial purposes. Out-of-priority diversions can occur only when a replacement supply of water, suitable in quantity and quality, is made available to substitute for the otherwise diminished amount of water available to supply other water rights exercising their priorities." (*Williams v. Midway Ranches Property Owners Assn.* (Colo. 1997) 938 P.2d 515, 522; see also *Dry Gulch Ditch Co. v. Hutton* (Or. 1943) 133 P.2d 601, 675 ["A subsequent appropriator may assert the right to take the waters of the stream from which the prior appropriation has been made and give the prior appropriator in return therefor other water from a different source, but of like quantity and quality delivered at such a place that the prior appropriator can make full use thereof without being injured in any way"]; Wyo. Stat. Ann. § 41-3-106, subd. (a) & (d) [(a) "Any appropriator owning a valid water right in and to the use of the ground, surface or reservoir waters of the state, where the source of the appropriation is at times insufficient to fully satisfy such appropriation, or better conservation and utilization of the state's water can be accomplished, or the appropriator can develop appropriable water but cannot economically convey it to its point of use, may petition the state engineer for an order allowing an exchange and the use of stored, direct flow, or ground water from another source or from another appropriation from the same source … (d) It is the policy of the state to encourage exchanges. The state engineer shall not issue an exchange order if the rights of other appropriators will be injuriously affected thereby, or if the proposed exchange would, in the opinion of the state engineer, be too difficult to administer or would be adverse to the public interest"]; *Pima Farms Co. v. Proctor* (Ariz. 1926) 245 P. 369 ([authorizing junior appropriator to provide replacement water to avoid injury to senior right holder from lowering groundwater levels]; MacDonnell, *supra,* 83 Neb. L. Rev. at p. 522 [discussing similar examples].)

or a physical solution, such as the provision of replacement water to the senior user to make up for the losses from a junior's use.

5.2.1 Material and Significant Impacts

Not every interference with the exercise of a water right constitutes injury. Injury occurs if the interference is material and significant, and the cost to the senior right holder of avoiding the harm is unreasonable. "An injury occurs when the change materially diminishes the quantity of water or deteriorates the quality for the intended uses." (State Water Board Order WR 79-22, p. 7; see *Hudson v. Dailey* (1909) 156 Cal. 617, 630 [to make a case for an injunction against another water user, the plaintiff must "show substantial injury"]; *Waterford Irr. Dist. v. Turlock Irr. Dist.* (1920) 50 Cal.App. 213, 221 ["There must be a substantial as distinguished from a mere technical or abstract [injury]"]*; Phoenix Water Co. v. Fletcher* (1863) 23 Cal. 481, 487 ["A mere temporary or trivial irregularity in the flow of water, such as does not cause actual injury to the proprietor below, will not amount to an actionable injury"].)

A senior right holder may be required to incur some reasonable expense to allow another to beneficially use available water. "The mere inconvenience, or even the matter of extra expense, *within limits which are not unreasonable*, to which a prior user may be subjected, will not avail to prevent a subsequent appropriator from utilizing his right." (*Peabody v. Vallejo* (1935) 2 Cal.2d 351, 376 [emphasis in original] [quoting *Waterford Irr. Dist., supra,* 50 Cal.App. at p. 221]); see also State Water Board Decision 421 (1938) at p. 9; *Rancho Santa Margarita v. Vail* (1938) 11 Cal.2d 501, 561 ["[I]t would be an unreasonable use to require the flow of the surface stream if such cattle can reasonably be watered at reasonable expense by some artificial means"].) This principle accords with the mandate in article X, section 2 of the California Constitution, which requires that the state's water resources be "put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented."

5.2.2 Impairment of Water Quality

An impairment of water quality may infringe upon a water right even if an adequate quantity of water is available. (*Joerger v. Pacific Gas & Electric Co.* (1929) 207 Cal. 8, 25–26 [upholding cause of action for temperature pollution of waters from power generation resulting in water quality not suited for stock or domestic use]; *Phoenix Water Co. v. Fletcher* (1863) 23 Cal. 481, 487 [finding that a right holder is "clearly entitled to protection against acts which materially … deteriorate [the water's] quality for the uses to which he wishes to apply it"].) "[U]nder the law of this state, an appropriator of water from a stream for domestic and similar uses has the right to enjoin the pollution of the stream above him, so that the water may flow down to his place of diversion in a condition as suitable for those uses as it was in at the time he acquired his right to take it." (*Town of Antioch v. Williams Irr. Dist.* (1922) 188 Cal. 451, 459.)

Like impairments to physical access to water, impairments to water quality constitute injury only if the impacts to the senior right holder are significant and unreasonable. For example, in *Hill v. Smith*, (1865) 27 Cal. 476, the court held that junior appropriators of water for mining purposes whose claims were located upstream of other more senior mining diversions had no right to run their mining tailings in such a manner as either to obstruct the flow of water into the lower ditch or to so deteriorate the quality of the water so as to render it unfit for mining purposes. "[B]ut the mere fact that their mining operations muddy the water, rendering it less valuable, though not unfit for mining purposes, or deposit sediment in the ditch to only such an extent as may easily be removed, without great cost, does not render them liable…." (*Id.* at p. 478.)

In the context of water quality impacts from seawater intrusion, courts have considered the rule of reasonableness and the interest in maximizing the beneficial use of the water resources of the state to allow junior right holders to divert and use water even though the resulting seawater intrusion injured a senior user. A significant amount of water is generally required to flow to the ocean to hold back the advancement of saltwater. "[W]hile common law clearly affords water rights holders relief from pollution, it is debatable whether such protection include the right to require upstream subsequent appropriators to curtail their use of water solely to permit a sufficient flow to resist natural saltwater intrusion." (*United States v. State Water Resources Control Bd.* (1986) 182 Cal.App.3d 82, 117, citing *Town of Antioch v. Williams Irr. Dist.* (1922) 188 Cal. 451, 460.)

In *Town of Antioch v. Williams Irrigation District*, the court relied on the public interest in maximizing the beneficial use of the state's limited water resources to conclude that there was no injury to a senior right holder from seawater intrusion that was exacerbated by upstream diversions by junior users. (*Town of Antioch v. Williams Irr. Dist.* (1922) 188 Cal. 451.) The Town of Antioch was a senior diverter of fresh water from the Sacramento-San Joaquin Delta for domestic and municipal uses. Antioch's intakes were located near the point within the Delta where freshwater and seawater intermingled, the location of which fluctuated depending on the tides and flows in the Sacramento and San Joaquin Rivers. Antioch filed suit against diverters of water from the Sacramento River upstream, alleging that their diversions diminished flows to an extent that allowed saltwater that was unsuitable for domestic purposes to reach the location of Antioch's intakes.

The court concluded that Antioch did not have a right to prevent upstream diversions of water to maintain the saltwater line from incoming tides below Antioch's intake. The court held that to allow Antioch to prevent the amount of upstream diversions as would be necessary to hold back the saltwater tides below its intake would “under the circumstances existing in this state, would be extremely unreasonable and unjust to the inhabitants of the valleys above, and highly detrimental to the public interests besides.” (*Id*. at p. 465.) To hold otherwise would have allowed a single downstream appropriator to “keep more than 300,000 acres of fertile land in the valley above dry and unproductive… [The appropriator] would, in effect, appropriate all the water flowing in both of these large rivers. It would be hard to conceive of a greater waste for so small a benefit.” (*Id.* at p. 461.)

In contrast, in *Allen v. California Water & Telephone* (1946) 29 Cal.2d 466, the Supreme Court upheld the determination of the trial court to enjoin the holder of a junior appropriative groundwater right from pumping and exporting groundwater. The trial court found that the defendant’s continued pumping was “an existing hazard to all overlying owners” because of the threat of “permanent injury through mineralization and salt water intrusion.” (*Id.* at pp. 482, 485.) The defendant also presented a physical solution to the trial court that would have limited extractions based on the impact of pumping on a series of test wells, and included an agreement to pay for the deepening of plaintiffs’ wells. The court rejected the proposal as “unworkable.” (*Id.* at p. 487.) The Supreme Court upheld the trial court’s finding that the junior user’s pumping exceeded the safe yield (or sustainable yield) of the basin, but allowed pumping by the junior exporter at times when there were surface flows in the Tijuana River, which flowed through and replenished the basin. The court retained jurisdiction to modify the decree based on evidence of additional available supplies from the operation of a new upstream project that might increase groundwater recharge and therefore the sustainable yield of the basin. (*Id.* at p. 488.)

5.2.3 Injury to Groundwater Rights

In a groundwater basin, injury to other legal users of water may be more difficult to identify than in a surface stream. Extractions in excess of the safe or sustainable yield of a basin may lower groundwater levels but generally will not eliminate the supply. Groundwater is still available but may be more expensive to extract or have impaired water quality, or the extractions may cause significant and unreasonable results in the basin such as reduced groundwater supplies, land subsidence, seawater intrusion, or unreasonable impacts to public trust or other beneficial uses of surface waters.

Injury to a senior groundwater right holder may result from substantial lowering of groundwater levels caused by a junior right holder’s extractions, particularly where the senior right holder must deepen its wells to continue to access the supply. (See, e.g., *Burr v. Maclay Rancho Water Co.* (1908) 154 Cal. 428, 432-433, 437-438 [defendant’s groundwater pumping permanently lowered groundwater levels as much as seven feet over an 18-month period and the plaintiff was unable to operate his pumps while defendant was pumping]; *Lodi v. East Bay Municipal Utility Dist.* (1936) 7 Cal.2d 316, 331, 334, 339 [defendant's diversions would cause a progressive decline in water levels of at least one foot per year and the plaintiff would be required to continually lower its wells to access water]; *Corona Foothill Lemon Co. v. Lillibridge* (1937) 8 Cal.2d 522, 524–525 [defendant's groundwater pumping was materially lowering groundwater levels in the basin and would eventually "exhaust the water therein"]; *Smith v. Wheeler* (1951) 107 Cal.App.2d 451, 455–456 [defendant's pumping would lower water levels to such an extent that the plaintiffs' wells could not operate]; *Monolith Portland Cement Co. v. Mojave Public Utilities Dist*. (1957) 154 Cal.App.2d 487, 493–494 [defendant's groundwater pumping would lower groundwater levels to such an extent that other pumpers had to lower their wells to continue pumping].)

Injury may also occur when lowering of the groundwater table results in impairment of water quality, often in the form of seawater intrusion. (See *Allen v. California Water & Tel. Co.* (1946) 29 Cal.2d 466, 485–486 [finding that where there is a threat of salt water intrusion, overlying owners are entitled to protection "against any exportation of the water that would unduly increase their costs or lower the groundwater level below the danger point"]; *City of Lodi v. East Bay Municipal Dist.* (1936) 7 Cal.2d 316, 345 (*Lodi v. EBMUD)* [holding that the city has a right to maintenance of groundwater levels above the "danger level" to protect its municipal supply].)

Groundwater extractions in excess of the sustainable yield of the basin may be injurious even if there is no immediate harm to other users. In *City of Pasadena v. City of Alhambra*, the court described the injury as not "an immediate disability to obtain water, but, rather … the continual lowering of the level and gradual reducing of the total amount of stored water, the accumulated effect of which, after a period of years, would be to render the supply insufficient to meet the needs of the rightful owners." (*City of Pasadena v. City of Alhambra* (1949) 33 Cal.2d 908, 929; see also *Lodi, supra,* 7 Cal.2d at p. 339.) "Each taking of water in excess of the safe yield … was wrongful and was in injury to the then existing owners of water rights, because the overdraft, from its very beginning, operated progressively to reduce the total available supply." (*City of Pasadena, supra*, 33 Cal.2d at p. 929.)

5.3 Physical Solution

"The phrase 'physical solution' describes an agreed upon or judicially imposed resolution of conflicting claims to water in a manner that advances the constitutional rule of reasonable and beneficial use of the state's water supply." (*City of Santa Maria*, *supra*, 211 Cal. App. 4th at p. 287 [cited by *Antelope Valley Groundwater Cases*, *supra,* 62 Cal. App. 5th at p. 1025].) Because article X, section 2 of California's Constitution mandates that "the water resources of the State be put to beneficial use to the fullest extent of which they are capable," a court must consider in cases involving disputes over water rights, whether a physical solution is available to allow the further development of the state's water resources while protecting existing right holders from injury. (See State Water Board Decision 1631, § 2.5 at p. 10 ["Adoption of a physical solution is consistent with the constitutional goal of promoting maximum beneficial use of the State's water resources"].) "[I]t is not only within the power, but it is also the duty of the trial court to admit evidence relating to possible physical solutions, and if none is satisfactory to it to suggest on its own motion such physical solution. The court possesses the power to enforce such solution regardless of whether the parties agree." (*Lodi v. EBMUD* 7 Cal.2d at p. 341; see also *California American Water v. City of Seaside* (2010) 183 Cal.App.4th 471, 480; *Central Basin Municipal Water Dist. v. Fossette* (1965) 235 Cal.App.2d 689, 699–700; *Montecito Valley Water Co. v. City of Santa Barbara* (1904) 144 Cal. 578, 591–592.)

In *Lodi v. EBMUD*, the City of Lodi brought an action against the East Bay Municipal Utility District (EBMUD) seeking, among other relief, to restrain EBMUD from diverting and storing water from the Mokelumne River in a manner that reduced the supply of groundwater available to the city. The Mokelumne River was (and remains) a significant source of recharge to the groundwater basin from which Lodi pumped water for its municipal supply. Lodi asserted that EBMUD's upstream diversions reduced the amount of water that infiltrated into the groundwater basin, particularly in wet years when flood flows would otherwise recharge groundwater levels, causing lowering groundwater levels over time and injury to Lodi's senior appropriative groundwater right. The trial court concluded that to maintain the level of groundwater recharge necessary to avoid injury to Lodi's right to pump up to 3,600 afy, EBMUD must release 120,000 to 360,000 acre-feet of surface water from storage annually.

The appellate court held that article X, section 2 of the California Constitution "compels the trial court … to ascertain whether there exists a physical solution of the problem presented that will avoid the waste, and that will at the same time not unreasonably and adversely affect the prior appropriator's vested property right." (*Lodi v. EBMUD*, *supra*, at pp. 339–340.) The appellate court remanded the matter to the trial court to take evidence as to the elevation to which groundwater levels could be lowered in the basin, with an appropriate margin of safety, without affecting the city's water supply. If water levels dropped below the threshold designated by the court, EBMUD must supply water to the city or artificially raise the groundwater levels or be limited in the amount of water EBMUD could store under its rights to maintain the amount of recharge that would occur naturally. (*Id.* at p. 343.) "Such a decree would adequately meet the requirements of the Constitution by preventing an unreasonable waste of the waters of the stream, and at the same time would adequately protect the prior rights of the city of Lodi." *(Id*. at p. 344.)

In *Rancho Santa Margarita v. Vail*, the plaintiff sued for a declaration of its riparian rights to the waters of the Santa Margarita River and an injunction preventing the defendants from using more than a reasonable share of the available water pursuant to their riparian rights. (*Rancho Santa Margarita, supra,* 11 Cal.2d at pp. 508–509.) The plaintiff contended that absent the defendants' upstream diversions, the Santa Margarita River was a perennial surface stream through the plaintiff's property, but due to the defendant's diversion, the river consisted of only subsurface flow during the dry portions of the year. As a result, the plaintiff was required to "scrap[e] out shallow water holes about 50 feet square in the bed of the stream" to water its cattle. (*Id.* at p. 554.)

The appellate court held that neither the plaintiff nor the defendant was entitled to satisfy their need for water from the surface stream if those demands could be economically met through a physical solution. (*Id.* at pp. 556–559.) The court noted that there may be reservoir sites available to the defendants, and that by diversion and storage of high winter flows, the defendants' water demands could be fully met during the dry months with minimal additional diversions. (*Id.* at p. 560.) The court further noted that, in the alternative, there may be reservoir sites available on the plaintiff's property for storage of high winter flows for use during the summer for livestock watering. Based on the available evidence, the court concluded that there appeared to be "a strong possibility of working out some physical solution, at a reasonable cost, that may be of benefit to both parties." (*Ibid*.) "[I]f the facts warrant it, [the trial court] can grant an injunction in favor of [the plaintiff] unless [the defendants] agree to bear a fair proportion of the expense necessary to construct the required improvements on respondent's ranch. This would appear to be a fair, just and equitable rule." *(Id.* at p. 561.)

The courts have also imposed physical solutions, even over the objection of some of the parties, in comprehensive groundwater adjudications. These physical solutions can include approaches to groundwater management that are not otherwise explicitly authorized under the common law, such as the transfer of overlying rights and carryover of un-pumped rights, management by a water master, requirements for artificial groundwater replenishment, varying requirements depending on wet or dry conditions, and other equitable provisions. (McGlothlin & Acos, *The Golden Rule of Water Management*, (2015) 9 Golden Gate U. Envtl. L.J. 109, 120, fn. 57 [citing *Tulare Irrigation Dist*. *v. Lindsay–Strathmore Dist.* (1935) 3 Cal.2d 489]; fn. 58 [citing *California American Water v. City of Seaside* (2010) 183 Cal.App.th 471, 474–476] & fn. 59 [citing *City of Pasadena v. City of Alhambra* (1949) 33 Cal. 2d 908)].) This proceeding and the underlying lawsuit is not, however, a comprehensive groundwater adjudication. A comprehensive groundwater adjudication requires notice to all claimants of a right to extract and use water from the basin or subbasin and is subject to specific statutory procedures.

Ultimately, “[e]ach case must turn on its own facts, and the power of the court extends to working out a fair and just solution, if one can be worked out, of those facts.” (*Rancho Santa Margarita, supra,* at pp. 560–561 [cited in *Antelope Valley Groundwater Cases*, *supra,* 62 Cal. App. 5th at p. 1026].) The solution must not unreasonably or adversely affect the existing legal rights and respective priorities of the parties (cf. *City of Barstow v. Mojave Water Agency* (2000) 23 Cal.4th 1224, 1243–1244, 1250–1251), but “[n]o injunction should be granted if its effect will be to waste water than can be used.” (*Rancho Santa Margarita, supra,* 11 Cal. 2d at pp. 558–559.) “[I]n this type of case the trial court is sitting as a court of equity, and as such, possesses broad powers to see that justice is done in the case. The state has a definite interest in seeing that none of the valuable waters from any of the streams of the state should go to waste…” (*Id.* at pp. 560–561.) “[O]ur Supreme Court has encouraged the trial courts to be creative in devising physical solutions to complex water problems to ensure a fair result consistent with the constitution's reasonable-use mandate.” (*City of Santa Maria, supra,* 211 Cal. App. 4th at p. 288 [citing *Tulare Irrigation Dist., supra,* 3 Cal.2d at p. 574].)

Courts are authorized to refer the development of a physical solution to the State Water Board (or its predecessor, the State Water Commission) pursuant to Water Code section 2000 et seq. (See *Tulare Irr. Dist., supra,* 3 Cal. 2d at p. 575; *City of Lodi, supra,* 7 Cal.2d at p. 341; State Water Board Resolution No. 88-78 (June 16, 1988) Lower American River Court Reference, *Environmental Defense Fund, Inc. v. East Bay Municipal Utility District*, Alameda County Superior Court Case No. 425955 [non-precedential resolution under Gov. Code, § 11425.60].)

6 THE COURT'S QUESTIONS

6.1 Question 1

Where are the subsurface drawing source points (including capture zones) for each of the currently proposed Cal-Am wells located in relation to:

a. *seawater in the ocean itself;*
b. *drawing source points for the Marina Coast Water District ("MCWD") production wells;*
c. *the Subbasin Interface Zone;*
d. *the 180/400-foot Aquifer Subbasin;*
e. *the Monterey Subbasin;*
f. *the Cemex property;*
g. *the MCWD wells.*

Graphic depictions, if available, would be helpful.

6.1.1 Locations of Subsurface Drawing Source Points

The locations of the subsurface drawing source points for the proposed slant wells are the locations of the screened intervals of the wells. Slant Well 1 (which is also the Test Slant Well) is constructed, and the dimensions of the screened sections of the well are known and described below. Slant Wells 2 through 7 have not been constructed and the proposed depths and lengths of the screened sections of these wells are not in the evidentiary record, except that the wells "would be screened for approximately 400 to 800 linear feet at depths corresponding to both the Dune Sand Aquifer and the underlying 180-Foot Aquifer." (Exh. Cal-Am-38(b), p. 3-18.)

6.1.2 Screened Intervals of the Test Slant Well

The Test Slant Well head is located in the southern portion of the CEMEX Property (the state plane coordinates are northing 2,154,702.56 and easting 5,739,561.92). (Exh. Cal-Am-38(c), p. 53.) The well shaft is drilled toward the ocean at an angle of 19 degrees below horizontal, extending to a total length of 724 feet. (Exh. Cal-Am-38(c), p. 38.)[29] The well casing extends 720 feet and is screened from 140 to 245 feet in the Dune Sand Aquifer, and 400 to 710 feet in the 180-Foot Aquifer. (*Ibid.*) The end of the well

[29] There is a discrepancy between dimensions of the Test Slant Well in Table 3-2 of the EIR/EIS and in Appendix E3, Part 1 of the EIR/EIS. (Exhs. Cal-Am-38(b) & Cal-Am-38(c).) Table 3-2 lists proposed offshore, onshore, and total lengths of casings for Slant Wells 1 through 10. Appendix E3, Part 1 describes the dimensions of the Test Slant Well as constructed. We assume that the description of the dimensions as constructed in Appendix E3, Part 1 is the more accurate.

casing interval is approximately 170 feet horizontally offshore,[30] at a vertical depth of 235 feet below the well head, which is -200 feet NAVD88. (*Ibid.*)

From these dimensions, we calculate that the end of the well casing interval is approximately 180 feet offshore along the well shaft,[31] the length of the well casing located offshore that is not screened is 10 feet,[32] and the length of the screened interval located offshore is 170 feet.[33] The proportion of the well casing located offshore that is screened is approximately 94 percent.[34] The total length of the screened intervals is 415 feet,[35] of which approximately 41 percent is located offshore.[36]

6.1.3 Screened Intervals of Proposed Slant Wells 2 through 7

Proposed Slant Wells 2 through 7 will be drilled at approximately 14 degrees below horizontal to extend between 63 to 225 feet offshore. (Exh. Cal-Am-38(b), Tbl. 3-2, p. 3-19.) The well heads of Slant Wells 2 and 3 would be located at well Site 2 about 600 feet south of the Test Slant Well head at Site 1. (Exh. Cal-Am-38(b), pp. 3–18 & 3–19.) The remaining well heads would be located at Sites 3, 4, and 5, which would be spaced approximately 250 feet apart southward from Site 2. (Exh. Cal-Am-38(b), pp. 3–18 & 3–19.)

Figure 4 shows the approximate locations and layout of the proposed slant wells.

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[30] There is potentially conflicting evidence in the record regarding the location of the Test Slant Well head relative to the MHW line. The well completion report for the Test Slant Well depicts the well head to be located 800 feet from the "Pacific Ocean." (Exh. MCWD-68, p. 2.) If the Test Slant Well is located 800 feet from the MHW line, the 724-foot Test Slant Well could not have any portion located beneath the ocean. However, based on the testimony of the parties' expert witnesses during the hearing, we rely on the description of the dimensions in Appendix E3, Part 1 for our analysis in this report.
[31] Cos(19 degrees) = 0.945; (170 feet / 0.945) = 179.9 feet.
[32] (720 feet – 710 feet) = 10 feet.
[33] (180 feet – 10 feet) = 170 feet.
[34] (170 feet / 180 feet) = 0.944, approximately 94 percent.
[35] Screened interval in Dune Sand Aquifer is (245 feet – 140 feet) = 105 feet. Screened interval in the 180-Foot Aquifer is (710 feet – 400 feet) = 310 feet. Total screened interval is (105 feet + 310 feet) = 415 feet.
[36] (170 feet / 415 feet) = 0.409, approximately 41 percent.

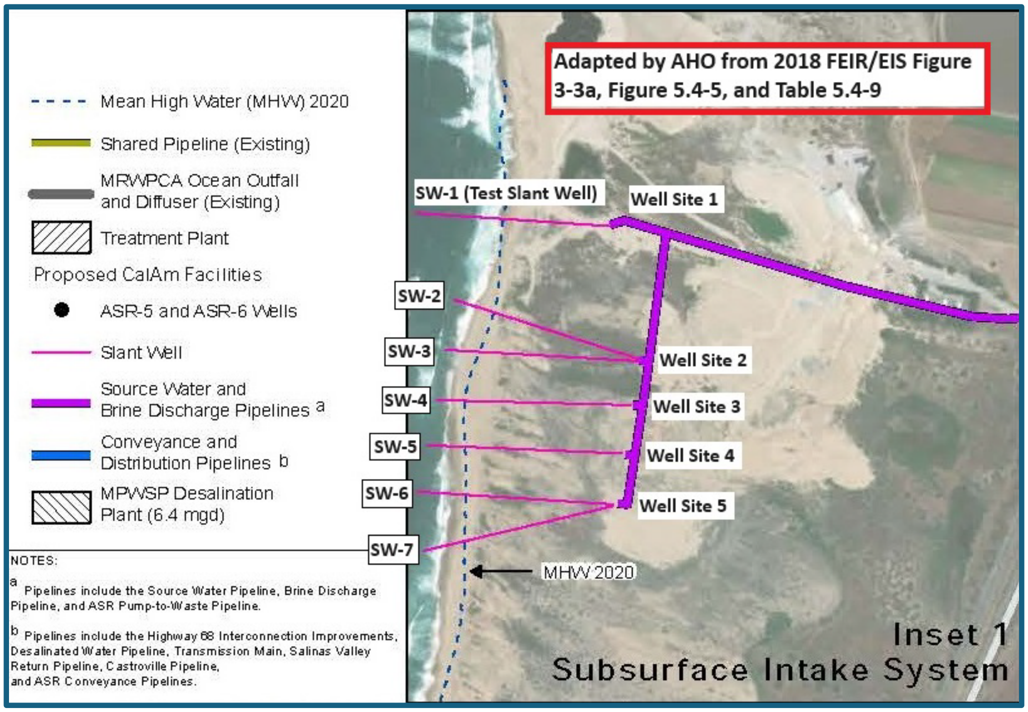

Figure 4 – Approximate locations of proposed slant wells

Figure 5 lists the proposed well casing dimensions, adapted from Table 3-2 of the EIR/EIS. (Exh. Cal-Am-38(b), Tbl. 3-2, p. 3-19.)

Adapted by AHO From Draft EIR/EIS, Table 3-2, p. 3-19

LENGTH OF PERMANENT SLANT WELLS SEAWARD OF MEAN HIGH WATER LINE

Well	Total Length	2020		2040		2060	
		Offshore	Onshore	Offshore	Onshore	Offshore	Onshore
Test Slant Well, SW-1	685	166	519	290	395	423	262
SW-2	970	63	907	219	751	385	585
SW-3	966	202	764	325	641	455	511
SW-4	961	162	799	292	669	431	530
SW-5	961	130	831	254	707	385	576
SW-6	961	174	787	298	663	428	533
SW-7	957	225	732	347	610	479	478

NOTES:

All lengths in feet.
MHW = Mean high water - A tidal datum. The average of all the high water heights observed over the National Tidal Datum Epoch. The 2020 MHW at the Monterey Tide Gauge NOAA#9413450 equals 1.53 m (5.02 ft) NAVD88, considering a high sea level rise scenario of 8.1 cm (3.2 in) by 2020 (5.46 ft by 2100). See also Appendices C1 and C2.

The lengths provided in this table indicate the total length of the well casing extending seaward of the MHW line. Because the slant wells would be drilled at an approximately 14-degree angle, the total horizontal distance seaward of the MHW line would be slightly shorter than the length of the well casing. The total horizontal distance seaward of the MHW line can be determined by dividing the length by 1.03.

SOURCE: Geoscience, 2017

Figure 5 – Proposed slant well casing dimensions

In the absence of precise dimensions, we can approximate the offshore and onshore lengths and proportions of the screened intervals for Slant Wells 2 through 7 using screened interval lengths of 400 and 800 feet as a range. We use the well casing dimensions listed in Table 3-2 of the EIR/EIS and assume that the proportion of the proposed slant well casing length offshore that is screened is 94 percent, similar to the proportion of the Test Slant Well casing offshore as described in the EIR/EIS. Figure 6 summarizes the offshore and onshore slant well screened interval dimensions based on our calculations for the Test Slant Well and approximations for proposed Slant Wells 2 through 7.

Well	Well Casing Interval Lengths[2] (feet)			Length of Screened Interval Offshore[3] (feet)	Offshore and Onshore Well Screen Lenths (feet) and Proportions for 400 ft. Total Well Screen Length				Offshore and Onshore Well Screen Lenths (feet) and Proportions for 800 ft. Total Well Screen Length			
	Total Length	Offshore	Onshore		Total Length[4]	Proportion Offshore	Onshore Length[5]	Proportion Onshore	Total Length[4]	Proportion Offshore	Onshore Length[5]	Proportion Onshore
SW-2	970	63	907	59	400	15%	341	85%	800	7%	741	93%
SW-3	966	202	764	190	400	47%	210	53%	800	24%	610	76%
SW-4	961	162	799	152	400	38%	248	62%	800	19%	648	81%
SW-5	961	130	831	122	400	31%	278	69%	800	15%	678	85%
SW-6	961	174	787	164	400	41%	236	59%	800	20%	636	80%
SW-7	957	225	732	212	400	53%	189	47%	800	26%	589	74%
Average	963	159	803	150	400	37%	250	63%	800	19%	650	81%
Test Slant Well[1]	720	180	540	170	415	41%	245	59%				

[1] The dimensions of the well casing intervals for the Test Slant Well are decribed in Appendix E3 part 1 of the EIR/EIS.
[2] The dimensions of the well casing intervals for Slant Wells 2 through 7 are listed in Table 3-2 of the EIR/EIS.
[3] The lengths of the screened intervals located offshore is calculated as the offshore lengths of well casings multuplied by 0.94.
[4] The total length range of screened intervals for Slant Wells 2 through 7 from EIR/EIS p. 3-18 for Slant Wells 2 through 7.
[5] The length of well screen intervals located onshore is calculated as the length of the well screen interval located offshore subtracted from the total length of the screened intervals.

Figure 6 – Offshore and onshore lengths and proportions of screened intervals for Slant Wells 2 through 7 and Test Slant Well

Cal-Am objects to this analysis of the likely locations and dimensions of Slant Wells 2 through 7 based on the descriptions of the proposed slant wells in the EIR/EIS because Special Condition 11 of the California Coastal Commission's approval of the project requires Cal-Am to "install the Project's slant wells to extend at least 1,000 feet seaward of the proposed well head locations and shall screen the wells so they extract water as far seaward as is feasible and without penetrating the 400-Foot Aquifer." (Exh. MCWD-125, p. 29; see also 2025-01-31 Cal-Am's Objections to Report of Referee, pp. 20-21.) This requirement will likely require some changes in the final design of the slant wells as described in the EIR/EIS but Cal-Am did not submit evidence about specific modifications to address Special Condition 11. This report's approximation of offshore and onshore lengths and proportions of screened intervals for Slant Wells 2 through 7 relies on the available evidence.

The Pacific Ocean is the western boundary of the CEMEX Property (Exh. MCWD-2, p. 7), the Subbasin Interface Zone (Exh. MCWD-9, p. 22), and the Monterey and 180/400

Subbasins (Exh. MCWD-2, p. 7.) The screened intervals of the proposed slant wells located onshore would be located beneath the CEMEX Property and the Subbasin Interface Zone, within the 180/400 Subbasin, approximately 0.5 to 0.75 miles north of the boundary between the Monterey and 180/400 Subbasins. (See Exh. MCWD-9, Figs. 3-1 & 3-4, pp. 17 & 24.) The screened intervals of the proposed slant wells located offshore would not be beneath the CEMEX Property or the Subbasin Interface Zone, and not within either the Monterey or 180/400 Subbasin. Figure 7, adapted from Figure 3-1 of Exhibit MCWD-9, shows the location of the proposed slant wells in relation to the MCWD production wells, 180/400 Subbasin, Monterey Subbasin, and CEMEX Property.

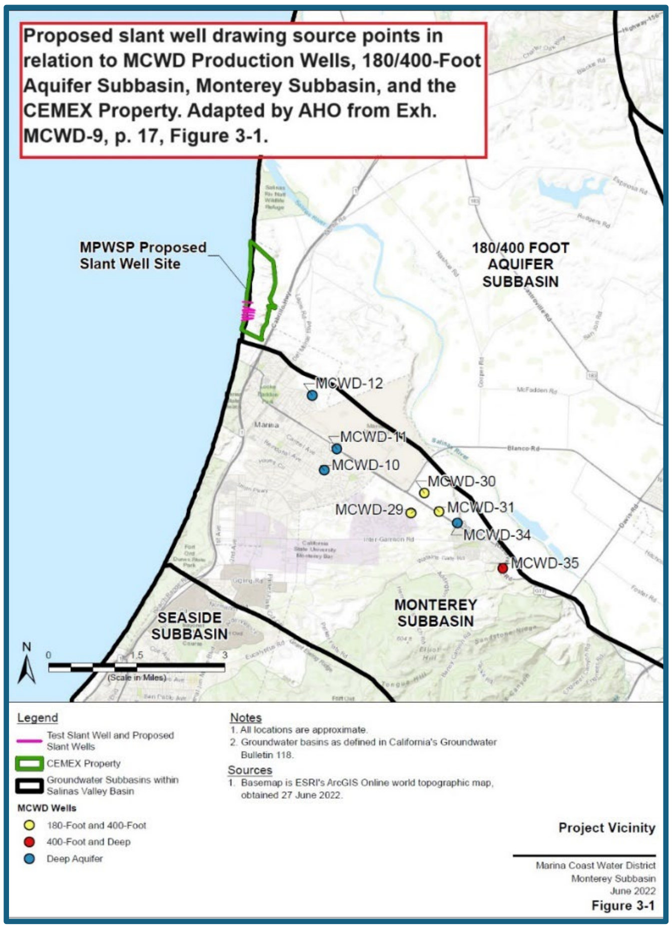

Figure 7 – Location of the proposed slant wells in relation to the MCWD production wells, 180/400-Foot Aquifer Subbasin, Monterey Subbasin, and CEMEX Property

We estimate the location of the drawing source points of the proposed slant wells in relation to the drawing source points for the eight MCWD production wells using a GIS analysis of the surface locations of the Test Slant Well head and MCWD production well heads collected by AHO staff during the site visit. The locations of the Test Slant Well head and the MCWD production well heads are appropriate approximations for the locations of the subsurface drawing points because the distances between the Test

Slant Well head and the proposed slant well casings are negligible compared to the distances between the Test Slant Well head and the MCWD production well heads. The drawing source points for the MCWD production wells are also directly below the well heads.

The approximate distance between the Test Slant Well head and MCWD Wells 10, 11, and 12, which are screened only in the Deep Aquifer, is between 1.9 to 3.1 miles. The approximate distance between the Test Slant Well head and MCWD Wells 29, 30, and 31, which are screened in the 180-Foot and 400-Foot Aquifers, is between 4.4 to 4.8 miles. The approximate distances between the Test Slant Well head and MCWD Well 34, which is screened only in the Deep Aquifer, and MCWD Well 35, which is screened in the 400-Foot and Deep Aquifers, are 5.1 and 6.2 miles respectively. Figure 8 summarizes the distances between the Test Slant Well head and MCWD production wells.

MCWD Well Number	Screened Aquifers	Distance to Test Slant Well (miles)
10	Deep	3.1
11	Deep	2.9
12	Deep	1.9
29	180-Foot/400-Foot	4.5
30	180-Foot/400-Foot	4.4
31	180-Foot/400-Foot	4.8
34	Deep	5.1
35	400-Foot/Deep	6.2

Figure 8 – Table showing distances between the Test Slant Well and MCWD production wells

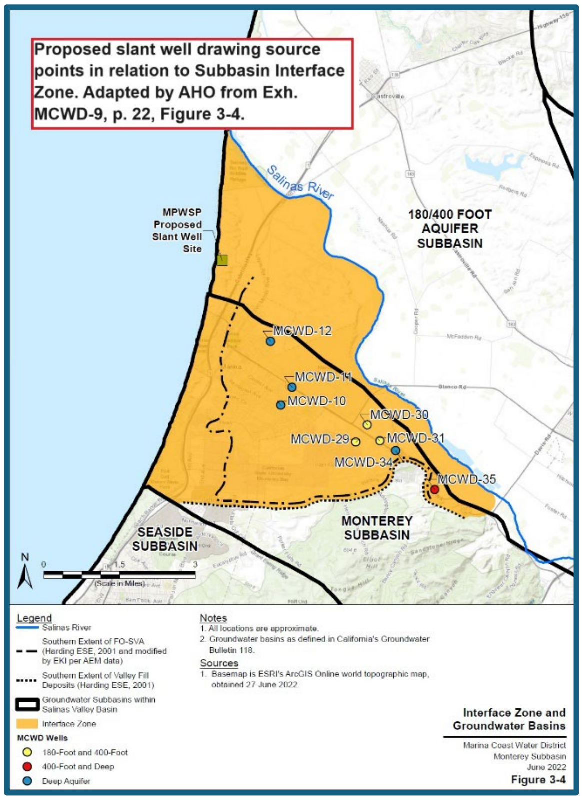

Figure 9 – Proposed slant wells in relation to the Subbasin Interface Zone

6.1.4 Capture Zones

A capture zone for a well is the "area from which subsurface water flows toward and is captured by the slant wells' screened openings." (Exh. Cal-Am-3, p. 2:19-20.) The capture zone is the three-dimensional spatial extent within an aquifer containing water that will eventually be drawn into the well. (See USEPA, A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems Final Project Report (Jan. 29, 2008) p. 10.)

In a simple groundwater system with a uniform flow field, the capture zone generally extends in the upgradient direction from the well. The capture zone of a well can be modeled using reverse particle tracking to estimate the spatial extent within each aquifer that a particle originating from the slant well field will travel when a flow model is run in reverse. (Testimony of Dr. Kincaid, Combined Hearing Transcript, p. 2541:12-18.)

Near the proposed slant wells, however, the groundwater conditions are relatively complex, and the capture zones for a groundwater system with a uniform flow field do not reflect these conditions. The proposed slant wells would draw water from two hydrologically connected aquifers with opposite groundwater gradient directions (the Dune Sand Aquifer with a seaward gradient and the 180-Foot Aquifer with a landward gradient) and no confining layers between them in the area of the proposed draw (see Section 6.3). (Testimony of Vera Nelson, Combined Hearing Transcript, p. 1357:17-1358:24.)

This complexity resulted in disagreements between the parties' experts about the extent of the capture zone for the proposed slant wells and the significance of the concept of a capture zone in relation to the court's question.

6.1.5 Discussion

Cal-Am's experts contend that "the definition of capture zones is based on a uniform flow field with a hydraulic gradient in one direction." (Exh. Cal-Am-78, p. 5:3-5.) Given this definition, they argue the term "capture zone" is "no longer relevant" in this proceeding because there are mixed seaward and landward gradients. (*Id*. at 5:1-2.) Instead, Cal-Am applies the concept of a mixing zone to demonstrate how water will be extracted by the proposed slant wells. A mixing zone, as Cal-Am uses the term, is the region where the flow paths of source water to the proposed slant wells come from the ocean. (Testimony of Peter Leffler, Combined Hearing Transcript, p. 494:16-24.) Therefore, by definition, the mixing zone delineated by Cal-Am does not encompass areas where water may be drawn into the wells from inland sources.

Cal-Am submitted figures showing the extent of the mixing zone in the area around the proposed slant wells. (Exh. Cal-Am-141, p. 144.) These figures depict the flow lines of seawater traveling through the onshore portions of the aquifers that are drawn into the slant wells and depict a blue bar to represent the area where inland aquifer water mixes with the seawater. Notably, the figures do not show flowlines for water from the inland aquifers that crosses the blue bar into the mixing zone. If marked, the area east of the blue bar would depict the extent of the capture zone inland from the proposed slant wells. The figures also do not show the flowlines of seawater drawn into the wells that does not cross the Mean High Water (MHW) line before being captured.

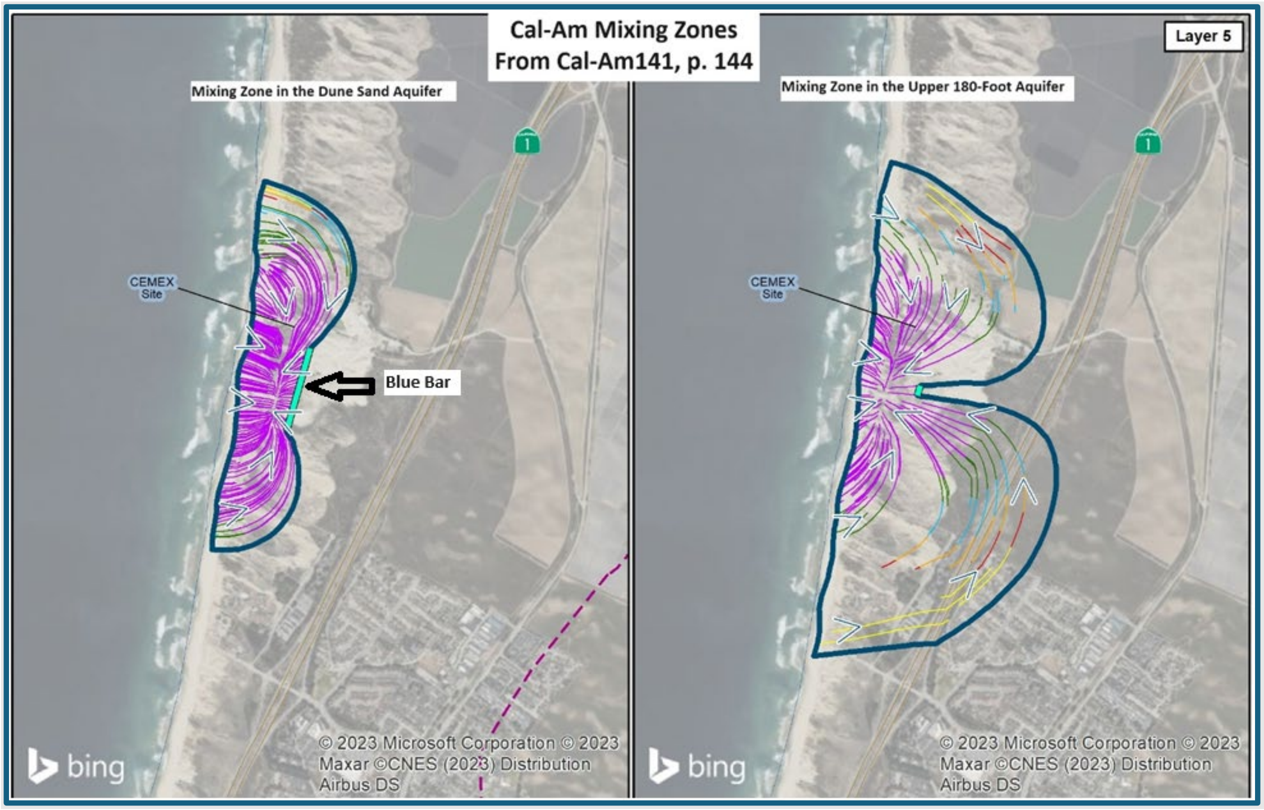

Figure 10 – Mixing zones in the Dune Sand and 180-Foot Aquifers submitted by Cal-Am. (Exh. Cal-Am-141, p.144.)

MCWD asserts that mixing zones are not equivalent to capture zones, and that estimates of mixing zones are not responsive to the court's question. (Exh. MCWD-92, p. 12.) MCWD submitted figures showing the extent of the capture zones for the proposed slant wells in the Dune Sand, 180-Foot, and 400-Foot Aquifers based on their model results, and the Dune Sand Aquifer based on Cal-Am's model results.[37] (Exh. MCWD-161, p. 2.) The figures depict the capture zones in the 180-Foot and 400-Foot Aquifers extending seaward to the portions of those aquifers under the ocean floor, and

[37] Cal-Am objects to the Board's use of Figure 11 (Exh. MCWD-161, p. 2) to depict the capture zones of the proposed slant wells. Cal-Am asserts that the timeframe MCWD used for the particle tracking analysis is "far too long and speculative to have any practical predictive value," (2024-06-25 Cal-Am Initial Objections to Draft Report of Referee Part 1, p. 17) and could "mislead the Court into drawing erroneous inferences of imminent harm." (*Id.* at p. 7.) Cal-Am technical expert Peter Leffler testified that a water molecule located in the Dune Sand Aquifer in the vicinity of MCWD's wells would travel for approximately 700 years before reaching a location where it could be captured by the slant wells. (Exh. Cal-Am-167, Slide 42.) We note that none of MCWD's production wells located in the vicinity of the capture zones depicted in this figure are screened in the Dune Sand Aquifer, and we do not rely on this particle tracking analysis in our consideration of potential harm caused by the proposed project.

inland toward MCWD's production wells in the Dune Sand Aquifer. Although it appears that the capture zone in the Dune Sand Aquifer is relatively close to MCWD's production wells in the aerial view, none of these wells are screened in the Dune Sand Aquifer, and the capture zone in the Dune Sand Aquifer in this area is vertically separated from the drawing source points for the MCWD production wells in the 180-Foot and 400-Foot Aquifers by the Fort Ord-Salinas Valley Aquitard. (See Section 6.3.1.)

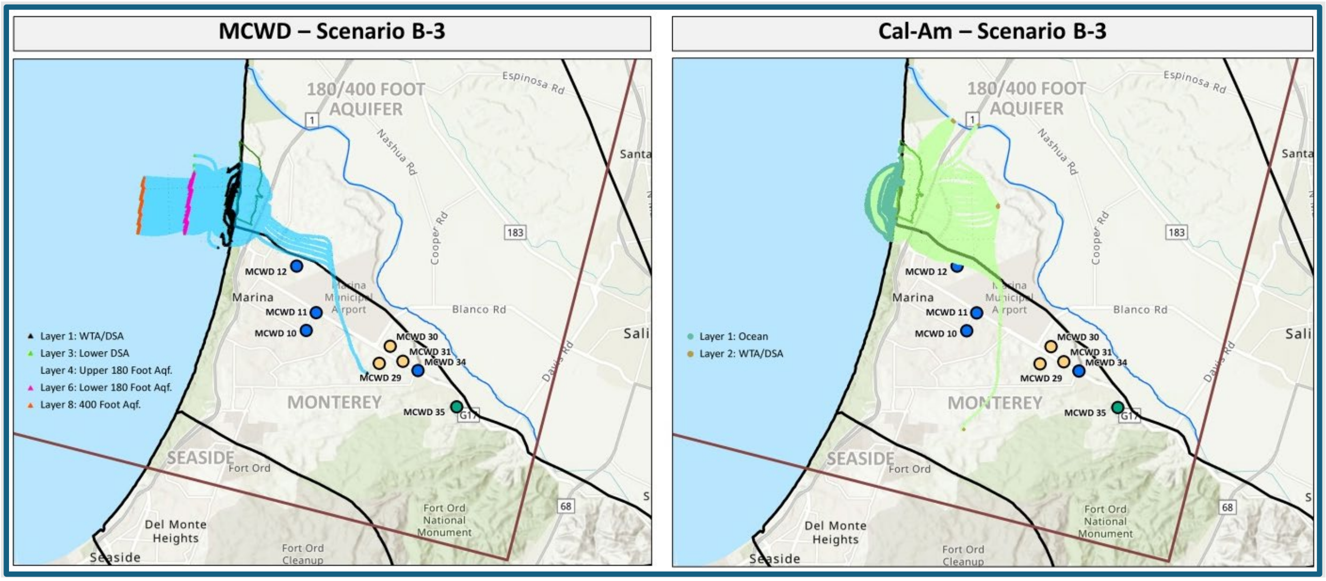

Figure 11 – Capture zones in the Dune Sand, 180-Foot, and 400-Foot Aquifers submitted by MCWD (Exh. MCWD-161, p. 2.)

6.1.6 Analysis

MCWD's depiction of the capture zones in Figure 11 above addresses the court's question about the locations of the capture zones in relation to the features and locations the court identified. Generally, the capture zones extend from the drawing source points toward the direction of higher groundwater elevations within each aquifer in and around the CEMEX Property, within the Subbasin Interface Zone, and in the Monterey and 180/400 Subbasins near the boundary between the subbasins.

In the Lower 180-Foot and 400-Foot Aquifers, most of the area of the capture zones extends west underneath the ocean beyond the MHW line, and so are not within the boundaries of the groundwater basin or subbasins, beneath the CEMEX Property, or within the Subbasin Interface Zone.

In the Dune Sand Aquifer, the capture zone extends inland in the area surrounding the CEMEX Property in the 180/400 and Monterey Subbasins.

While the court did not ask about the location and extent of a mixing zone, Cal-Am's description of a mixing zone is a useful tool to estimate the boundary for the area where seawater migrating inland because of pumping by the proposed slant wells will be drawn into the wells. Seawater migrating inland because of pumping by the proposed slant wells outside of this mixing zone is not drawn into the proposed slant wells.

6.2 Question 2

Would water drawn by any of the currently proposed Cal-Am wells come from any source other than seawater from directly beneath the Ocean?

a. *If so, from which sources? And which if any of these sources lie in whole or in part beneath the Cemex property?*
b. *If so, can one approximate with reasonable certainty in what quantities the water would be drawn from each source? Can this be expressed in percentages?*
c. *If so, do the relative amounts drawn from each source vary depending upon amounts drawn by the slant wells?*
d. *If so, can it be said with reasonable certainty that the amount drawn by the Cal-Am wells will not exceed 500 acre-feet per year ("afy") from any water source beneath the Cemex property?*

There is some ambiguity in the definition of the term "source" as the term is used in the court's question. The source of water may be described by the *location where water is drawn* within physical features, such as aquifers, or within administrative areas, such as groundwater basins and subbasins or property boundaries. Alternatively, the source of water may be described by the *location of the origin of the water* rather than the location where it is drawn.

Both interpretations may be relevant to this proceeding. Therefore, we discuss the source of water as it relates to locations of the screened intervals of the proposed slant wells within the Dune Sand and 180-Foot Aquifers, the CEMEX Property, and the 180/400 Subbasin in the SVGB. We also discuss the source as the portion of the water drawn by the proposed slant wells that will originate from the ocean and sources other than the ocean.

6.2.1 Locations of the Slant Well Screens

The source of the water drawn by the proposed slant wells can be described by the locations of the drawing source points in relation to the MHW line. The drawing source points are the screened intervals of the proposed slant wells within the Dune Sand and 180-Foot Aquifers. We refer to locations within aquifers and along the proposed slant well shafts that are landward of the vertical plane of the MHW line as "onshore" and locations seaward of the MHW Line as "offshore." Onshore sources of water are the screened intervals located beneath the CEMEX Property and within the boundaries of the 180/400 Subbasin in the SVGB. Offshore sources of water are the screened intervals located beneath the ocean and are not within the boundaries of any groundwater basin or subbasin.

MCWD and Marina assert that the location where water would be extracted by Cal-Am's proposed slant wells is relevant to issues related to the 1996 Annexation Agreement. (MCWD-Marina Proposed Report Part 2, p. 76.) They assert that approximately 83 percent of the slant well screens, by distance, would be in the Dune Sand and 180-Foot Aquifers beneath the CEMEX Property, and approximately 17 percent of the well screens would be seaward of the MHW Line. (*Id.* at p. 78.)

MCWD and Marina also argue that if the court is "simply asking whether the water that Cal-Am will extract will come from a groundwater basin or from the ocean … all of the water extracted by the Project will be groundwater from the 180/400 Subbasin and the Monterey Subbasin, which are both within the Basin referenced by the Annexation/Groundwater Framework Agreement." (MCWD-Marina Proposed Report Part 2, pp. 76–77.)

6.2.2 Sources of the Slant Wells

The water drawn by the proposed slant wells will come from locations within the Dune Sand and 180-Foot Aquifers both onshore and offshore. The screened portions of the slant wells would be located in part beneath the ocean and not within the boundaries of any groundwater basin or subbasin, and in part onshore, beneath the CEMEX Property and within the boundaries of the 180/400 Subbasin in the SVGB. (See Section 6.1.)

The Dune Sand and 180-Foot Aquifers each lie, in part, beneath the CEMEX Property. They extend inland, from the west beneath the ocean floor, to the east beyond the CEMEX Property, and along the coastline from areas to the north and south of the CEMEX Property. (See depictions of the aquifers in Exh. Cal-Am-40, p. 97 and the capture zones in Exh. MCWD-161, p. 2.) The portions of the screened intervals of the proposed slant wells located onshore would be wholly beneath the CEMEX Property. (See Section 6.1.1.)

6.2.3 Quantities of Water from Onshore and Offshore Sources

The quantities of water that would be drawn from onshore and offshore sources depend on several factors, including the proportions of the screened intervals located offshore and onshore, the hydraulic conductivity of the areas around the screened intervals, and the total quantity of water pumped.

Marina's expert, Dr. Mark Trudell, estimated that an average of 17.4 percent of the screened intervals of the proposed slant wells will extend offshore based on data from Table 1 of his written testimony. (Exh. Marina-2, p. 7:17-19; Figure 12 below; Exh. Marina-2, p. 8.) Dr. Trudell assumed that the length of the screened interval located offshore would be equal to the length of the well casing located offshore, then estimated the average proportion of the screened intervals located offshore for Slant Wells 1 through 7 as the sum of the lengths of the slant well casings located offshore divided by the sum of the total lengths of the slant well casings (160 / 923 = 0.174). (Exh. Marina-2, p. 8, Notes 1 & 2.)

Source: Exh. Marina 2, Table 1, p. 8.

Table 1 - Length of Permanent Slant Wells Seaward of Mean High-Water Line

Well	Total Length (ft)	2020 Offshore (ft)	2020 Onshore (ft)	% Screen Offshore
Test Slant Well, SW-1	685	166	519	24%
SW-2	970	63	907	6%
SW-3	966	202	764	21%
SW-4	961	162	799	17%
SW-5	961	130	831	14%
SW-6	961	174	787	18%
SW-7	957	225	732	24%
SW-8	955	257	698	27%
SW-9	970	228	742	24%
SW-10	970	0	970	0%

Modified from Geoscience (2017) and EIR (2018).
1. "% Screen Offshore" indicates the % of the well screen, as a % of total length, that is offshore, seaward of the mean high tide water line.
2. The lengths provided in this table indicate the total length of the well casing extending seaward of the MHW line. Because the slant wells would be drilled at an approximately 14-degree angle, the total horizontal distance seaward of the MHW line would be slightly shorter than the length of the well casing. The total horizontal distance seaward of the MHW line can be determined by dividing the length by 1.03.

Figure 12 – Proposed slant well dimensions - Exh. Marina-2, Tbl. 1, p. 8

Dr. Trudell then estimated that the amount of water drawn in the screened intervals located onshore beneath the CEMEX Property "would be approximately 83% of the total amount of water extracted because that is the percentage of well screening for the slant wells that is under the land." (Exh. Marina-2, p. 22:19-21.)

As discussed in Section 6.1.1, we calculated the proportion of the screened interval located offshore and onshore for the Test Slant Well and estimated this proportion for Slant Wells 2 through 7, as the offshore and onshore lengths of the screened intervals divided by the total length of the screened intervals. For each slant well, the total length of the slant well casing is larger than the total length of the screened interval, and Dr. Trudell's estimate of the average proportion of the screened intervals located onshore (83 percent) is larger than the proportion we calculated for the Test Slant Well (59 percent) and estimated for Slant Wells 2 through 7 (between 63 and 81 percent).

Dr. Trudell also assumes that the proportion of the water extracted from screened intervals located onshore is equal to the proportion of the screened intervals located onshore. This assumption is not supported by the evidence in the record.

MCWD expert Dr. Todd Kincaid discussed in his testimony that pumping proportions depend in part on the hydraulic conductivities of the substrate in the areas where the screened intervals are located. Discussing how he would assign pumping proportions to different model layers, Dr. Kincaid stated, "[t]he correct way to do this…is essentially based on the distribution of thicknesses in the layers from which the pumping will occur…so to most accurately reflect what each model would say about the impacts of pumping, [the pumping proportions] should be defined on the basis of how those respective models define those layer thicknesses and hydraulic conductivities." (Testimony of Dr. Kincaid, Combined Hearing Transcript, p. 2537:9-18.)

The parties did not attempt to estimate the impact that hydraulic connectivity might have on the proportion of water drawn from the portions of the screened intervals of a well located onshore as opposed to offshore, and, therefore, we cannot calculate with any reasonable certainty the quantities of water drawn from screened intervals located onshore versus offshore based on the evidence in the record.

6.2.4 Quantities of Water from the Dune Sand Aquifer beneath the CEMEX Property

The parties did consider hydraulic conductivity to assign relative percentages of water pumped from the Dune Sand and 180-Foot Aquifers for their Phase 2 and 3 modeling. Using the relative percentages approximated by MCWD and Cal-Am for modeling purposes, we approximated a range of quantities of water that would be drawn from the Dune Sand Aquifer.

For their Phase 2 and 3 modeling, MCWD experts initially assigned 19 percent of the pumping to draw from the Dune Sand Aquifer and 81 percent to draw from the 180-Foot Aquifer based on hydrostratigraphic unit thickness and hydraulic conductivities.[38] (Testimony of Dr. Kincaid, Combined Hearing Transcript, pp. 2536:17–2538:19.) Cal-Am experts assigned 44 percent to draw from the Dune Sand Aquifer and 56 percent to draw from the 180-Foot Aquifer based in part on the Test Slant Well's orientation and layout within their model grid (Exh. Cal-Am-141, p. 30) and in part because the HydroFocus model $NMGWM^{2016}$, on which the Cal-Am flow model is based, used these percentages. (Testimony of Dr. Yeh, Combined Hearing Transcript, p. 2398:2-5.) Dr. Yeh

[38] MCWD later assigned 44 percent to the Dune Sand Aquifer to match the proportion assigned by Cal-Am experts, as directed by the hearing officer, to facilitate a more direct comparison between models.

added that using those percentages resulted in “very good calibration for the drawdown Test Slant Well pumping.” (*Id*. at p. 2399:1.)

We acknowledge that the parties’ experts did not approximate these relative pumping percentages with the intent of directly addressing this question from the court. Nevertheless, we consider these percentages to represent the technical experts’ opinions of reasonable percentages to simulate the effects of the proposed project. Based on these relative percentage assignments, we can approximate that the proportion of total project pumping that will draw from the Dune Sand Aquifer ranges between 19 and 44 percent.

Under the 15.5 mgd project alternative, the proposed project will pump a total of 17,362 afy.[39] Of that, applying the pumping percentages used by the parties’ modelers, approximately 3,300 to 7,600 afy will be drawn by the wells from the Dune Sand Aquifer.[40] Under the 11.6 mgd project alternative, the proposed project will pump a total of 12,993 afy,[41] of which approximately 2,500 to 5,700 afy will be drawn from the Dune Sand Aquifer.[42]

Any water drawn from the Dune Sand Aquifer can be assumed to have been drawn from screened intervals of the wells located onshore. We reach this conclusion based on the maximum depth of the aquifer beneath the CEMEX Property and the geometries of the Test Slant Well and proposed Slant Wells 2 through 7. The Dune Sand Aquifer extends to depths up to 110 feet below the ground surface beneath the CEMEX Property, or -75 feet NAVD88. (Exh. Cal-Am-38(a), p. 8.) Any screened intervals located above 110 feet below ground surface are screened within the Dune Sand Aquifer.

The locations and dimensions of the screened intervals of the Test Slant Well are described in Appendix E3 part 1 of the EIR/EIS. The Test Slant Well is screened from 140 to 245 feet along the well shaft in the Dune Sand Aquifer. (Exh. Cal-Am-38(c), p. 38.) This interval along the well shaft corresponds to depths of 46 to 80 feet below ground surface at the well head.[43] Of the proposed Slant Wells 2 through 7, Slant Well 7 has the shortest length of well casing onshore, and as a result, also has the shallowest depth below ground surface at the well head when it passes through the vertical plane of the MHW line. The well casing for proposed Slant Well 7 will be drilled toward the ocean at an angle 14 degrees below horizontal and will extend 957 feet from the well head, 732 feet of which will be located onshore. (Exh. Cal-Am-38(b), Tbl. 3-2, p. 3-19.)

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[39] 15.5 mgd x (1/892.7) afy/mgd = 17,362 afy.
[40] 17,632 x 0.19 = 3,299 afy; 17,632 x 0.44 = 7,639 afy.
[41] 11.6 mgd x (1/892.7) afy/mgd = 12,993 afy.
[42] 12,993 x 0.19 = 2,469 afy; 12,993 x 0.44 = 5,717 afy.
[43] Sin(19 degrees) = 0.325; (0.325) x (140) = 46 feet; and (0.325) x (245) = 80 feet.

The depth where the well shaft will pass through the vertical plane of the MHW line is 177 feet below ground surface at the well head.[44] Consequently, the well shafts for the proposed Slant Wells 2 through 7 will each pass through the vertical plane of the MHW line at depths greater than or equal to 177 feet from the ground surface, or 67 feet below the maximum depth of the Dune Sand Aquifer, and any water drawn from the Dune Sand Aquifer by these wells must come from screened intervals located onshore.

6.2.5 Relative Amounts Drawn for Project Alternatives

The relative amounts of total project pumping drawn from the Dune Sand Aquifer beneath the CEMEX Property do not vary depending on the total project pumping amounts in this analysis because the percentage of water pumped from the Dune Sand Aquifer, as assigned by the parties, does not vary depending on the amounts of water drawn by the slant wells.

6.2.6 Quantities from beneath the CEMEX Property

We cannot say with reasonable certainty that the amount drawn by the Cal-Am wells *will not exceed* 500 afy from any source beneath the CEMEX Property. To the contrary, the evidence strongly supports the conclusion that the amount drawn by the proposed slant wells will significantly exceed 500 afy from beneath the CEMEX Property.

Five hundred afy represents approximately 3 percent[45] of total project pumping for the 15.5 mgd alternative and approximately 4 percent[46] for the 11.6 mgd alternative. As we discuss above, the range of the parties' approximations for pumping from the Dune Sand Aquifer is 19 to 44 percent, which is significantly higher than 3 or 4 percent. We approximate the amounts drawn by the proposed slant wells from beneath the CEMEX Property will be at least approximately 2,500 afy for the 11.6 mgd alternative, and 3,300 afy for the 15.5 mgd alternative, each significantly more than 500 afy.

The quantities of water drawn from the 180-Foot Aquifer would be the total quantities of water drawn by the proposed project minus the quantities of water drawn from the Dune Sand Aquifer. We cannot approximate with reasonable certainty the amounts of water drawn from the 180-Foot Aquifer from beneath the CEMEX Property because, unlike the Dune Sand Aquifer, we cannot assume the relative proportion of water drawn from screened intervals located onshore versus offshore. Regardless, the screened intervals for the Test Slant Well and proposed Slant Wells 2 through 7 include a portion screened onshore in the 180-Foot Aquifer, and some quantity of water in addition to the quantity of water drawn from the Dune Sand Aquifer will be drawn from the 180-Foot Aquifer

[44] Sin(14 degrees) = 0.242; (0.242) x (732) = 177 feet.
[45] 500 afy / 17,362 afy = 0.029.
[46] 500 afy / 12,993 afy = 0.038.

beneath the CEMEX Property and within the boundaries of the 180/400 Subbasin in the SVGB.

6.2.7 Origin of the Water

The source of water drawn by the proposed slant wells can also be described by the location of the origin of the water, following an initial transitional period in which the groundwater system's response to project pumping stabilizes. The water either originates from the ocean or from sources other than the ocean. The proportion of the water drawn by the proposed slant wells that originates from the ocean is the Ocean Water Percentage (OWP). The OWP can be estimated by measuring the TDS concentration of water drawn from the well and comparing the TDS concentration of the water drawn by the proposed slant wells to the TDS concentration of seawater (assumed to be 33,500 mg/L) and the TDS concentration of groundwater in the basin (assumed to be 500 mg/L).

6.2.8 Sources Other Than Ocean Water

Initially, the water drawn by the proposed slant wells when pumping commences will be water in the Dune Sand and 180-Foot Aquifers in the offshore and onshore areas immediately surrounding the screened intervals. Over time, the water pumped from these areas will be replaced by ocean water drawn through the ocean floor and non-ocean water drawn through the aquifers from inland areas. (Combined Hearing Transcript, p. 564:6-12.; MCWD-Marina Proposed Report Part 2, p. 78.)

6.2.9 Extent of Sources beneath the CEMEX Property

The water drawn by the proposed slant wells from sources other than the ocean is drawn from the capture zones in the Dune Sand and 180-Foot Aquifers. The capture zones extend from the west beneath the ocean floor to the east beyond the CEMEX Property, and along the coastline from areas to the north and south of the CEMEX Property including, in part, the area beneath the CEMEX Property. (See Section 6.1.2.)

6.2.10 Quantities of Ocean Water and Non-Ocean Water

Cal-Am discusses several analyses used to approximate the percentage of water drawn into the slant wells that would originate from the ocean, including analytical calculations, steady state modeling, and transient modeling. (Cal-Am Proposed Report Part 2, pp. 97–99.) Cal-Am asserts that all these analyses show that at least 90 percent of the water captured by the proposed slant wells will originate directly from the ocean. (*Id.* at p. 97) The remaining 10 percent or less of water drawn into the proposed slant wells will originate from a non-ocean source consisting of "unusable, brackish to saline water drawn from the zone of seawater intrusion inland of the shoreline that is both beneath and outside the CEMEX boundaries." (*Id.* at p. 99.)

MCWD argues that it is not possible to approximate with reasonable certainty the relative quantities of water that would be drawn either from the ocean or from the inland portions of the aquifers. MCWD asserts that "[t]here are inherent uncertainties in the type of modeling conducted in this proceeding, as it relies on a series of assumptions and extrapolations from limited known data to project the likely impact of the Project on a highly complex underground system of aquifers." (MCWD-Marina Proposed Report Part 2, p. 82.) However, MCWD and Marina also state that "the parties have conducted modeling based upon the best available data, and the State Board can provide a range of likely outcomes with respect to how much water may be drawn from each source." (*Ibid.*) MCWD and Marina's experts estimate that the OWP range is between 87.5 and 92 percent, assuming a background concentration in the SVGB of 500 mg/L of TDS. (*Id.* at p. 87.)[47]

Cal-Am objects that MCWD and Marina inappropriately assumed a TDS concentration of 29,800 mg/L in its analysis, rather than 33,500 mg/L for ocean inflow from the constant head ocean boundary flowing through the Dune Sand Aquifer. (2025-01-31 Cal-Am's Objections to Report of Referee, p. 6.) Cal-Am asserts that a change in the assumed ocean water concentration would change MCWD and Marina's model results to estimate an OWP of 96 percent for Scenario 3B (well pumping of 15.5 mgd). (*Ibid.*; Exh. Cal-Am-187, p. 25.) The Board does not make any finding of fact as to whether MCWD and Marina's use of 29,800 mg/L rather than 33,500 mg/L as a TDS concentration for ocean water in the OWP calculation was appropriate. Because Cal-Am estimates an OWP greater than 90 percent, Cal-Am's proposed correction to MCWD and Marina's calculation would not change the lower range of the estimate of OWP included in this report.

In comments on the May 22, 2024 partial draft report of referee, Marina objects to the method used by Cal-Am and its own experts to calculate the percentage and amount of water originating from the groundwater basin "primarily relat[ing] to the total dissolved solids (TDS) benchmark that is utilized to identify water that is suitable or usable for drinking water and other beneficial use purposes." (Marina Comments on 5-22-24 Draft Report, pp. 32–33.) As we understand, however, the assumed concentration of TDS used in the formula to calculate OWP is to identify the source and not the utility of the water. The concentration of TDS in water from the non-ocean sources is eliminated from both sides of the equation to reflect that not all the TDS in water drawn from the wells is from the ocean. The selection of 500 mg/L of TDS should reflect the background

[47] The equation used by the parties to calculate OWP is: OWP = 100 x (C_{pw} – 500)/(C_s – 500) where C_{pw} = Salinity (TDS in mg/L) concentration from project wells, C_s = Salinity (TDS in mg/L) concentration of ocean water, and 500 = Assumed Fresh Water TDS in mg/L. (Exh. Cal-Am-42, p. 2.)

concentration of TDS in groundwater in the basin to obtain an accurate OWP. (See DWR Bulletin 118, 180-400 Foot Aquifer Subbasin Description, p. 3 [describing average values of TDS of 478 mg/L and 556 mg/L].) During cross-examination, Mr. Leffler stated, "my understanding of this formula when it was developed is that [500 mg/L of TDS] was intended to be the background TDS value… [T]hat's the value that was, you know, assumed in this formula to be representative of the background level of the TDS…." (Combined Hearing Transcript, pp. 421:21-24–422:2-6.) Marina does not raise any argument or evidence that 500 mg/L is an inaccurate estimate of the background concentration of TDS in the basin. Marina also did not object to the use of 500 mg/L of TDS concentration as a background concentration when its experts estimated an OWP range between 87.5 and 92 percent. (MCWD-Marina Proposed Report Part 2, p. 87.)

The ranges for OWP estimated by the parties (87.5 to 92 percent by MCWD and Marina and greater than 90 percent by Cal-Am) overlap, and we conclude that 90 to 92 percent represents a reasonable approximation of the range of the parties' estimates.

Applying this range of OWP to the quantities of water pumped for the 11.6 mgd and 15.5 mgd project alternatives, we estimate that the 11.6 mgd project will pump approximately 11,694 to 11,953[48] afy of water originating from the ocean, and 1,039 to 1,299[49] afy of water originating from sources other than the ocean. We estimate that the 15.5 mgd project will pump approximately 15,626 to 15,973[50] afy of water originating from the ocean, and 1,389 to 1,736[51] afy of water originating from sources other than the ocean.

6.2.11 Relative Amounts Drawn for Project Alternatives

The parties agree, and the modeling results presented in Phase 3 of OWP estimates for the 11.6 and 15.5 mgd scenarios support the conclusion that the relative amounts of water drawn from each source do not vary depending on the amounts drawn by the proposed slant wells. (MCWD-Marina Proposed Report Part 2, p. 91; Cal-Am Proposed Report Part 2, p. 100.)

6.2.12 Quantities Exceed 500 afy from Non-Ocean Water

At any given time, there is a certain amount of water located in the Dune Sand and 180-Foot Aquifers in the three-dimensional space directly beneath the CEMEX Property. This amount of water is determined by the volume of the space within the aquifers and the physical properties of the aquifer materials. Cal-Am technical expert Mr. Leffler estimated that this space would yield approximately 11,100 acre-feet of water

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[48] 12,993 afy x 0.90 = 11,694 afy; 12,993 afy x 0.92 = 11,953 afy.
[49] 12,993 afy – 11,953 afy = 1,039 afy; 12,993 afy – 11,694 afy = 1,299 afy.
[50] 17,362 afy x 0.90 = 15,626 afy; 17,362 afy x 0.92 = 15,973 afy.
[51] 17,362 afy – 15,973 afy = 1,389 afy; 17,362 afy – 15,626 afy = 1,736 afy.

(Combined Hearing Transcript, p. 563:6-10), and that most of that water would likely be extracted after roughly a year of project pumping during the transitional period in which the groundwater system's response to project pumping stabilizes. (*Id.* at p.563:11-564:5.) After this initial transition, the water in the aquifers beneath the CEMEX Property drawn by the proposed project will be replaced by water drawn into the aquifers from the ocean and sources other than the ocean. (*Ibid.* & MCWD-Marina Proposed Report Part 2, p. 78.)

The parties' estimated OWPs represent the percentage of water originating from offshore sources as opposed to onshore sources after this initial transitional period. We approximate the amounts drawn by the proposed slant wells from sources other than the ocean, based on the higher-end approximation of OWP of 92 percent, to be approximately 1,039 afy for the 11.6 mgd alternative and 1,389 afy for the 15.5 mgd alternative. Both results are significantly more than 500 afy. After the initial transition period, some of this water would be drawn from screened portions of the slant wells located beneath the CEMEX Property although the water would have originated from portions of the aquifers outside of the CEMEX Property boundary and migrated within the CEMEX Property boundary because of the draw of the wells.

6.3 Question 3

What is the hydrogeological connectivity, if any, between the areas from which Cal-Am proposes to draw water and the areas from which MCWD extracts water?

The parties adopted different approaches to respond to this question and applied the term "area" in different ways. Cal-Am focused on the connectivity between the aquifers from which the slant wells and MCWD's wells draw, while Marina and MCWD focused on connectivity between the groundwater subbasins from which the slant wells and MCWD's wells draw.

Cal-Am contends there is "no physical hydrogeologic connectivity between the areas from which Cal-Am slant wells will draw water and some of the MCWD production wells, and there is no functional hydrogeologic connectivity between the areas from which Cal-Am slant wells will draw water and certain other MCWD production wells."[52] (Cal-Am Proposed Report Part 2, p.102.)

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[52] We take Cal-Am's contention that there is no functional connectivity to mean that although there may be physical connectivity between areas where Cal-Am's proposed slant wells will draw water and where MCWD's productions wells draw water, the proposed draw will not substantially affect groundwater conditions at the MCWD production wells. We address physical connectivity in this section. We address any

Marina and MCWD contend that some of MCWD's production wells are screened in the same aquifer as the proposed slant wells so there is connectivity between the two areas. (MCWD-Marina Proposed Report Part 1, p. 55.) Although the proposed slant wells and MCWD's production wells are screened in different groundwater subbasins, there are no hydraulic barriers between the Monterey Subbasin and the 180/400 Subbasin and groundwater flows freely between these subbasins. (Exh. MCWD-9, p. 20.)

We address the court's question about hydrogeologic connectivity[53] both (1) as it relates to the connectivity between the specific areas of the Dune Sand Aquifer and 180-Foot Aquifer where the proposed slant wells will be screened and the areas in the 180-Foot, 400-Foot, and Deep Aquifers where the MCWD production wells are screened, and (2) as it relates to flow of groundwater across the boundary between the Monterey and 180/400-Foot Groundwater Subbasins.

6.3.1 Connectivity Between the Aquifers

The proposed slant wells will be screened within the Dune Sand and 180-Foot Aquifers beneath the CEMEX Property and under the ocean floor to the west of the CEMEX Property. For purposes of analyzing connectivity with the areas from which MCWD extracts water, we consider the proposed slant well field to be a single area because the screened intervals of the slant wells are all hydrologically connected and the distances between each of the slant wells are negligible compared to their distances from the MCWD production wells.

6.3.2 Dune Sand and 180-Foot Aquifers

The parties do not dispute that the Fort Ord-Salinas Valley Aquitard separates the Dune Sand Aquifer and the 180-Foot Aquifer in the area of MCWD Wells 29, 30, and 31, preventing the Dune Sand Aquifer and the 180-Foot Aquifer from being connected in this area. (See Exhs. Cal-Am-13, Cal-Am-89 p. 42 & MCWD-161, slide 38.) In the area where the proposed slant wells will draw water, however, the Dune Sand Aquifer and the 180-Foot Aquifer are connected, and there is no evidence in the record to suggest there is any barrier preventing horizontal flow within the 180-Foot Aquifer between this area and MCWD Wells 29, 30, and 31. (Exh. Cal-Am-89, p. 42.)

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effect on groundwater conditions in the vicinity of MCWD's wells from the proposed draw in our responses to Questions 4 and 5.

[53] The court's question asks about hydrogeologic connectivity; however, the parties also address this question in terms of hydraulic and hydrologic connectivity. We address the question in terms of hydrogeologic connectivity, which we understand to include both hydraulic and hydrologic connectivity.

Cal-Am argues that even if there is physical connectivity between these areas, there is no functional connectivity between the areas where the slant wells and MCWD wells draw water because the seawater intrusion front within the 180-Foot Aquifer extends within 0.2 miles of MCWD Wells 29, 30, and 31, (Cal-Am Proposed Report Part 2, p. 102) and "[p]umping of MCWD-Wells #29, 30, and 31 will draw in pre-existing high salinity water within the present seawater intrusion, currently located between the proposed slant wells and these three MCWD wells, long before there is any potential for interaction…between MCWD-Wells #29, 30, and 31, and the proposed slant wells." (Cal-Am Proposed Report Part 2, p. 104.) To the contrary, however, the existence of seawater intrusion so close to MCWD's wells supports MCWD's argument that there is no barrier preventing horizontal flow within the 180-Foot Aquifer. The movement of highly saline water from the ocean near the proposed slant wells, inland to MCWD's wells, demonstrates that these areas are hydrologically connected. Additionally, results from both parties' groundwater models show drawdown of approximately half a foot to one foot in the 180-Foot Aquifer in the area of MCWD Wells 29, 30, and 31 from operation of the slant wells, again, demonstrating that the two areas are hydrologically connected. (See Section 6.5.)

6.3.3 400-Foot Aquifer

The parties' experts disagree about the extent to which the 180/400-Foot Aquitard prevents vertical flow between the 180-Foot and 400-Foot Aquifers in the area of MCWD Wells 29, 30, and 31. Cal-Am asserts that the 180/400-Foot Aquitard physically separates the 400-Foot Aquifer from the 180-Foot Aquifer so there is no connectivity between the proposed slant wells and the MCWD wells screened in the 400-Foot Aquifer. (Exh. Cal-Am-3, p. 4: 21.) MCWD asserts that there are gaps in the 180/400-Foot Aquitard allowing some vertical flow of groundwater between the aquifers. (Exh. Marina-56, slide 19 & Combined Hearing Transcript, pp. 2847:21–2848:3.)

The parties' opposing positions arise in part from different interpretations of the limited hydrogeologic data for the hydrostratigraphic units in the area. MCWD and Marina considered airborne electromagnetic method (AEM) and field data in reaching their conclusions. AEM is an exploratory geophysical surveying technology commonly used by groundwater managers to map and evaluate subsurface groundwater resources. (Exh. MCWD-35, p. 2.) In 2016, MCWD retained a consultant to collaborate with the Department of Geophysics at Stanford University to collect, process, and interpret AEM data, in conjunction with other available background information and data, to develop a 3D hydrogeologic framework of MCWD's service area. (Exh. MCWD-29, p. 3.) These efforts culminated in the publication of a report authored by Ian Gottschalk and Rosemary Knight of Stanford, and Ted Asch, Jared Abraham, and Jim Cannia of Aqua Geo Frameworks, LLC (AGF). (Exh. Marina-22.) In 2019, MCWD retained AGF to perform a second AEM investigation of selected areas within MCWD's service area that had been previously surveyed in May 2017 as part of the Stanford/AGF 2018 AEM Report. (Exh. MCWD-29, p. 18.) Cal-Am's experts dispute MCWD's interpretation of the AEM data and the relevance of some of the field data. We do not address these disagreements because resolution would not alter the responses to the court's questions in this report.

Despite its stated position, Cal-Am submitted geologic cross-sections used to construct their WBSSM which depict a gap in the 180/400-Foot Aquitard in the area adjacent to MCWD Wells 29, 30, and 31. (Exh. Cal-Am-141, p. 82.) And although the proposed slant wells would not be screened in the 400-Foot Aquifer, results from both parties' groundwater models show drawdown of half a foot to one foot in the 400-Foot Aquifer at MCWD Wells 29, 30, and 31 because of project pumping. We therefore conclude that there is hydrologic connectivity between the proposed slant wells and the MCWD wells in the 400-Foot Aquifer, but that this connectivity is less than the connectivity between the proposed slant wells and the MCWD wells in the 180-Foot Aquifer.

6.3.4 Deep Aquifers

None of the parties assert that there is connectivity between the proposed slant wells and the MCWD production wells screened in the Deep Aquifer.

6.3.5 Between Bulletin 118 Groundwater Subbasins

The proposed slant wells would be located in the 180/400 Subbasin and MCWD's wells are in the Monterey Subbasin. Because we conclude there is connectivity between the area where the proposed slant wells would draw water and the area where MCWD production wells draw water in the 180-Foot Aquifer, and to a lesser extent, in the 400-Foot Aquifer, we also conclude that there is connectivity in these aquifers between the area in the 180/400 Subbasin where the proposed slant wells would draw water and the area in the Monterey Subbasin where MCWD's production wells draw water.

6.4 Question 4

Is it likely that any of the proposed draw for the Cal-Am wells would (a.) result in or (b.) increase any seawater intrusion into the Subbasin Interface Zone, the 180/400 [F]oot Aquifer or the Monterey Aquifer,[54] *or any source for the MCWD production wells? If so, what is the likely extent of the intrusion?*

Cal-Am asserts that operation of the proposed slant wells would not increase the extent of seawater intrusion in either the 180/400 Subbasin or the Monterey Subbasin and

[54] We presume the court is referring to the 180/400 Subbasin and the Monterey Subbasin.

would not impact any sources of water for any active MCWD production wells. (Cal-Am Proposed Report of Referee, p. 113.)

MCWD asserts that the proposed slant well pumping would cause additional ocean inflows and widespread increases in TDS concentrations north and south of the CEMEX Property in the 180/400 Subbasin and Monterey Subbasin, including areas of the subbasins that are not currently considered seawater intruded. (2023-11-13 City of Marina, Joint Draft Referee Report Sections 11–13, p. 93.)

6.4.1 Definition of Seawater Intrusion

The Monterey and 180/400 Subbasin Groundwater Sustainability Plans each define seawater intruded areas as those areas with chloride concentrations above 500 mg/L. (Exh. MCWD-60, p. 357, Tbl. 8-1, pp. 396–397; SVBGSA Combined GSP 2020-0123, pp. 285 [8-31], 291 [8-37]). MCWRA also utilizes an isocontour of 500 mg/L of chloride to track and identify seawater intrusion. (See, e.g., Exhs. Cal-Am-83; Cal-Am-84; MCWD-136, pp. 22–29; Monterey Subbasin GSP, p. 213 [referencing MCWRA's definition of the seawater intrusion threshold as 500 mg/L of chloride].)

The United States Environmental Protection Agency (USEPA) sets secondary maximum contaminant levels (MCL) for chloride and TDS in drinking water. These secondary MCLs are non-mandatory water quality standards established as guidelines to assist public water systems in managing drinking water for aesthetic considerations, such as taste, color, and odor. Contaminants at these levels do not present a risk to human health. (Exh. Cal-Am-91, p. 1.)

California has adopted regulations consistent with USEPA's secondary MCLs for chloride and TDS to set secondary maximum contaminant levels for these constituents in water supplied by drinking water systems in the following concentration range:

	Recommended	**Upper**	**Short Term**
Chloride	250 mg/L	500 mg/L	600 mg/L
TDS	500 mg/L	1,000 mg/L	1,500 mg/L

(Cal. Code Regs., tit. 22, § 64449, subd. (a).)

Section 64449 states that constituent concentrations lower than the recommended contaminant level are desirable for a higher degree of consumer acceptance; constituent concentrations ranging to the upper contaminant level are acceptable if it is neither reasonable nor feasible to provide more suitable waters; and constituent concentrations ranging to the short term contaminant level are acceptable only for existing community water systems on a temporary basis pending construction of treatment facilities or development of acceptable new water sources. (Cal. Code Regs., tit. 22, § 64449, subd. (d).)

For Phase 3 of this proceeding, the parties agreed to use TDS concentrations, rather than chloride concentrations, as an indicator of seawater intrusion. (See 2023-07-26 Post-Hrg. Order, p. 4, [hearing officer directing the parties to meet and confer to decide whether to use TDS or chloride concentrations for tables and figures in Phase 3].) The parties utilized the isocontour of 1,500 mg/L of TDS to depict the boundary of seawater intrusion. (See Cal-Am-177, p. 10; MCWD-165, p. 13.) The chloride to TDS concentration conversion factor is site-specific, and in the area relevant to this proceeding, a TDS concentration of 1,500 mg/L is equal to a chloride concentration of approximately 650 mg/L. (Exh. Cal-Am-178, p. 2.)

To respond to the court's question, we consider model results relative to the 1,500 mg/L TDS isocontour and do not specifically analyze other changes in TDS concentrations. A landward progression of the TDS isocontour is, however, a proxy to indicate associated increases in TDS concentration in the vicinity, both landward and seaward, of the 1,500 mg/L TDS isocontour. Changes in TDS concentrations at MCWD's wells from operation of the proposed project as indicated by the model results are addressed in response to the court's Question 7 (see Section 6.7).

6.4.2 Model Results

In Phase 3 of this proceeding, the parties presented model results of simulated TDS concentrations for model layers corresponding to the Dune Sand, 180-Foot, and 400-Foot Aquifers. These results show changes in TDS between the no project and with project scenarios within each aquifer in the Monterey and 180/400 Subbasins. The parties evaluated seawater intrusion to include areas with TDS concentrations above 1,500 mg/L and estimated the changes to the extent of seawater intrusion caused by the proposed draw by comparing the 1,500 mg/L TDS isocontour between no-project and with-project scenarios.

We evaluate changes to seawater intrusion caused by the proposed draw in each aquifer in four relevant areas, described in the following paragraphs, by considering the prevailing direction of movement (seaward, landward, or no change) and the maximum approximate magnitude of the movement, in miles, of the 1,500 mg/L TDS isocontour. The prevailing direction is the direction we consider to best represent the direction of movement of the isocontour in a relevant area.

For each aquifer, we consider four areas within the groundwater subbasins that we defined for purposes of this analysis. In each of these four areas we identify whether any changes to seawater intrusion are predicted to occur because of project pumping. The areas from north to south are: (1) Central and Northern portions of the 1,500 mg/L isocontour in the 180/400 Subbasin; (2) Southern portion of the isocontour in the 180/400 Subbasin near the subbasin boundary; (3) Northern portion of the isocontour in the Monterey Subbasin near the subbasin boundary; and (4) Central and Southern portions of the isocontour in the Monterey Subbasin.

As depicted in Figures 10 through 17, the inland extents and shapes of the 1,500 mg/L isocontours vary between aquifers and between models. We define and identify the areas used for our analysis of changes in seawater intrusion as light blue ovals overlayed on the figures submitted by the parties for each aquifer in each model.

6.4.3 Dune Sand Aquifer

The predicted TDS concentration changes in the Dune Sand Aquifer for each model are depicted below in Figures 13 and 14.

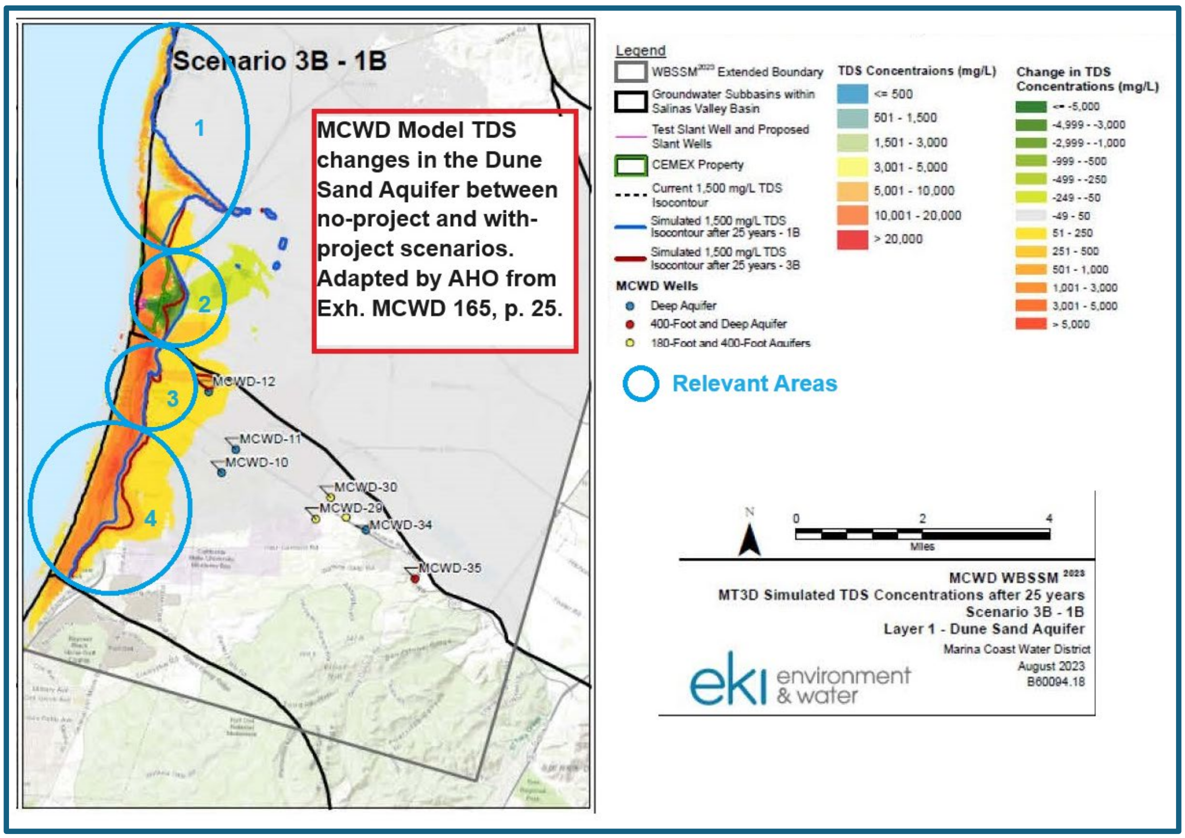

Figure 13 – MCWD model predicted TDS changes between no project and with project scenarios in the Dune Sand Aquifer

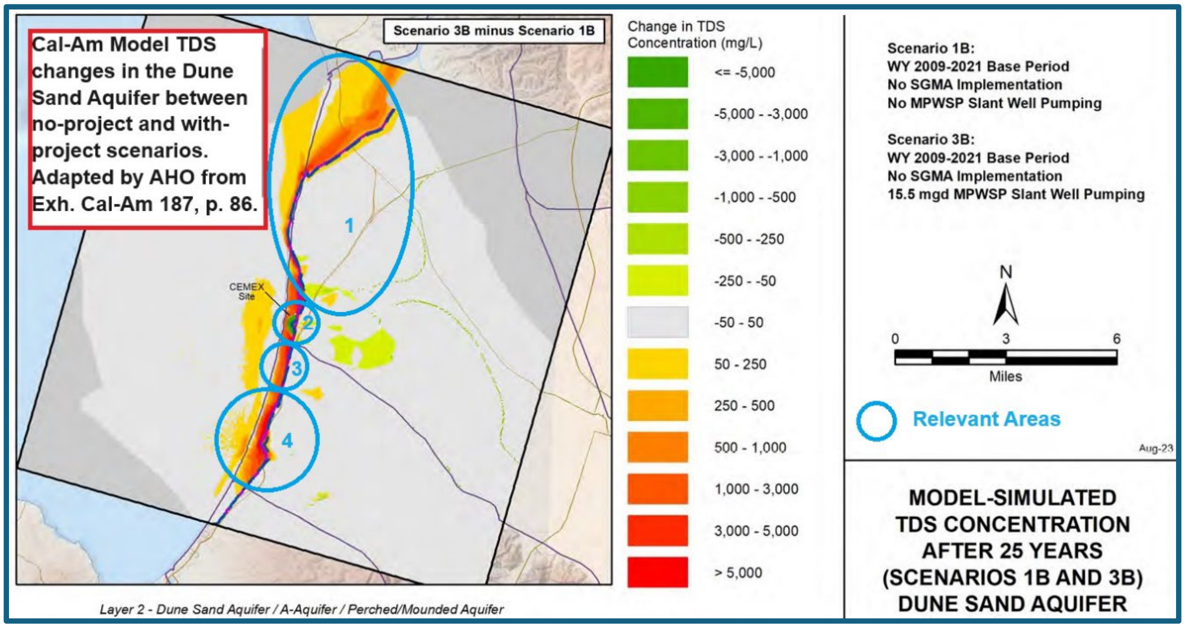

Figure 14 – Cal-Am model predicted TDS changes between no project and with project scenarios in the Dune Sand Aquifer

6.4.4 180-Foot Aquifer

Both models use two model layers to represent the 180-Foot Aquifer. The aquifer is sometimes considered as two separate aquifers identified as the Upper 180-Foot Aquifer and the Lower 180-Foot Aquifer. The parties presented model results for both the Upper and Lower 180-Foot Aquifers, and we evaluate them separately in this section.

6.4.5 Upper 180-Foot Aquifer

The predicted TDS concentration changes in the Upper 180-Foot Aquifer for each model are depicted below in Figures 15 and 16.

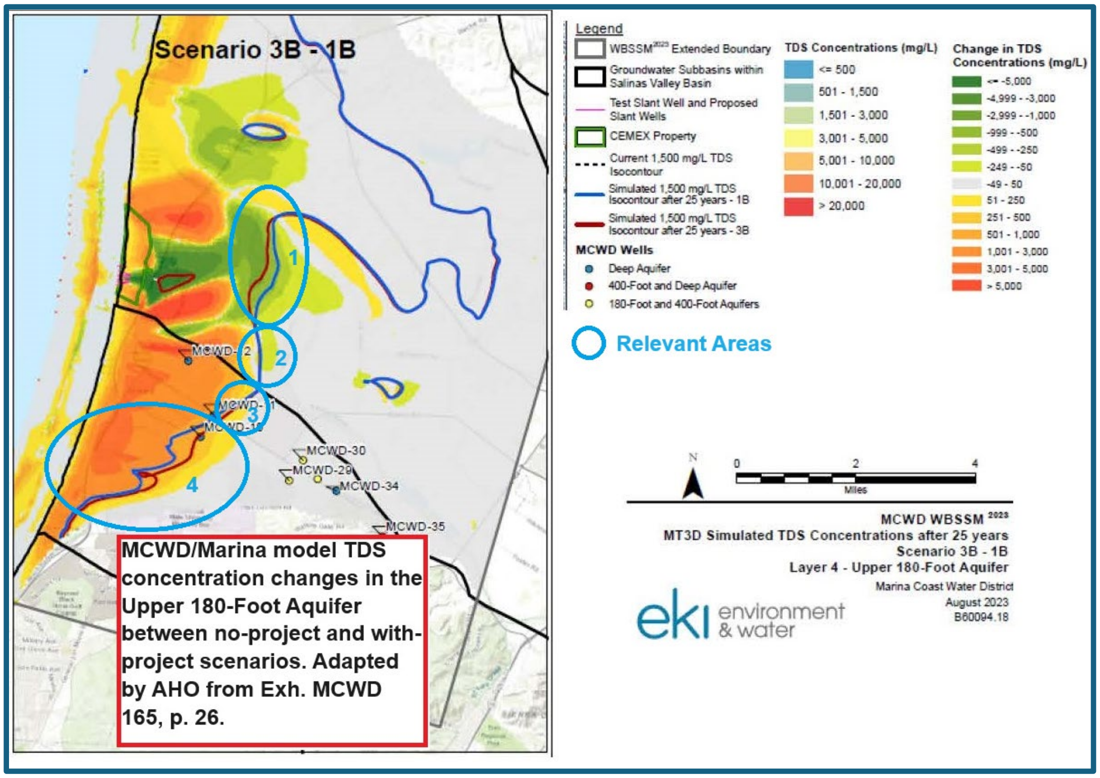

Figure 15 – MCWD model predicted TDS changes between no project and with project scenarios in the Upper 180-Foot Aquifer

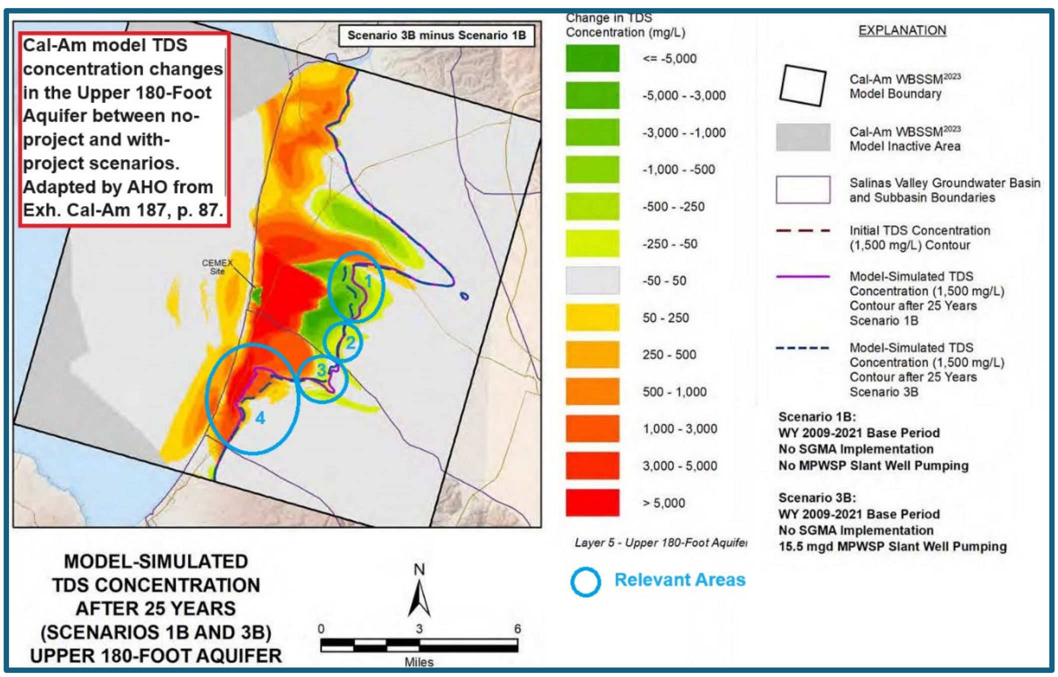

Figure 16 – Cal-Am model predicted TDS changes between no project and with project scenarios in the Upper 180-Foot Aquifer

6.4.6 Lower 180-Foot Aquifer

The predicted TDS concentration changes in the Lower 180-Foot Aquifer for each model are depicted below in Figures 17 and 18.

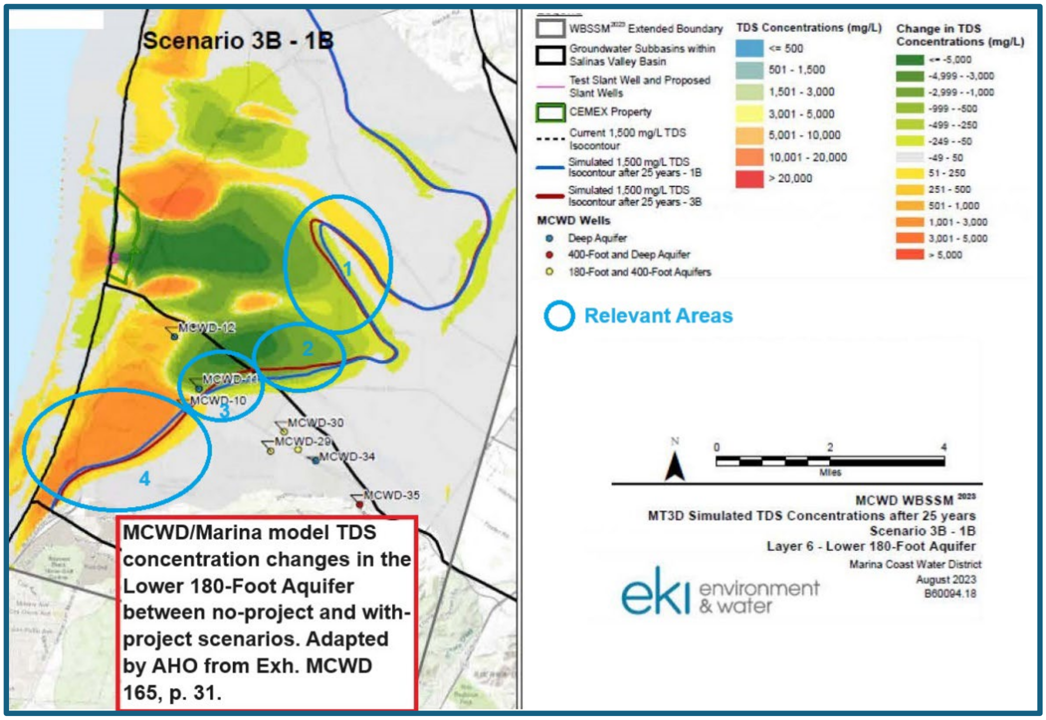

Figure 17 – MCWD model predicted TDS changes between no project and with project scenarios in the Lower 180-Foot Aquifer

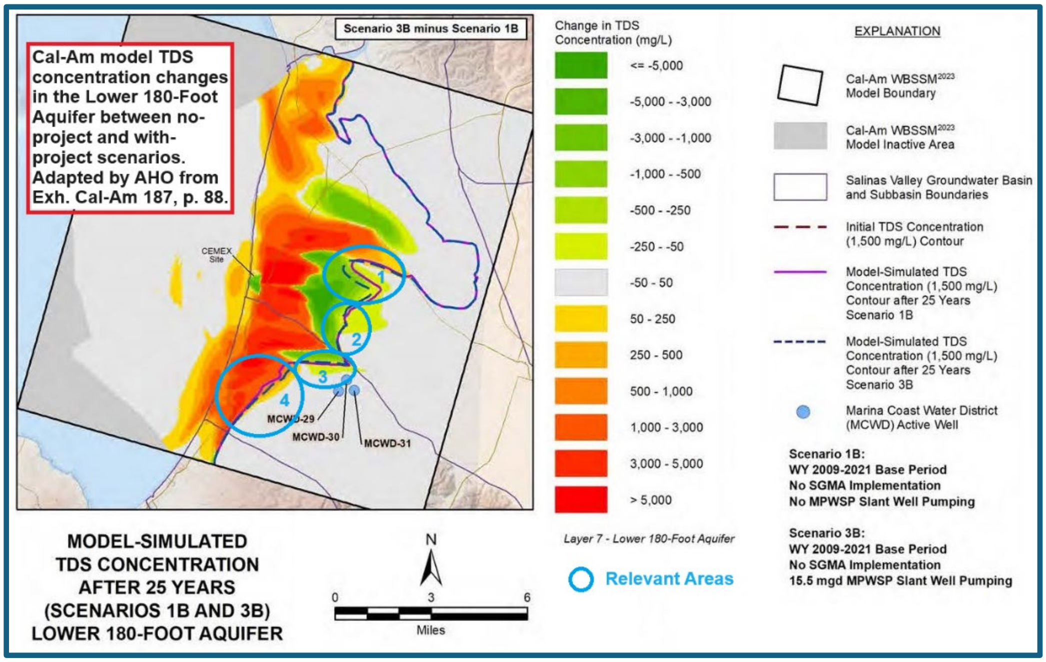

Figure 18 – Cal-Am model predicted TDS changes between no project and with project scenarios in the Lower 180-Foot Aquifer

6.4.7 400-Foot Aquifer

The predicted TDS concentration changes in the 400-Foot Aquifer for each model are depicted below in Figures 19 and 20.

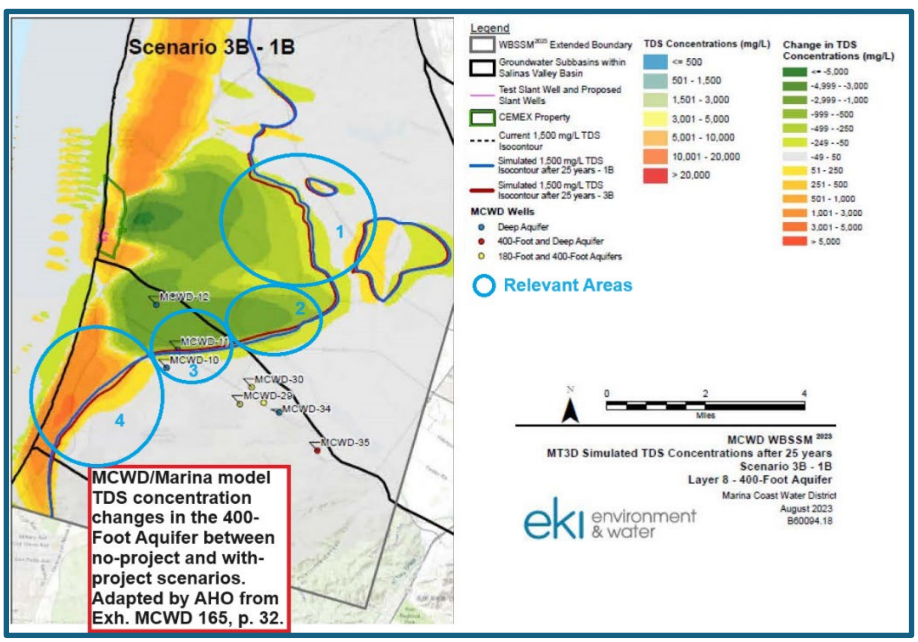

Figure 19 – MCWD model predicted TDS changes between no project and with project scenarios in the 400-Foot Aquifer

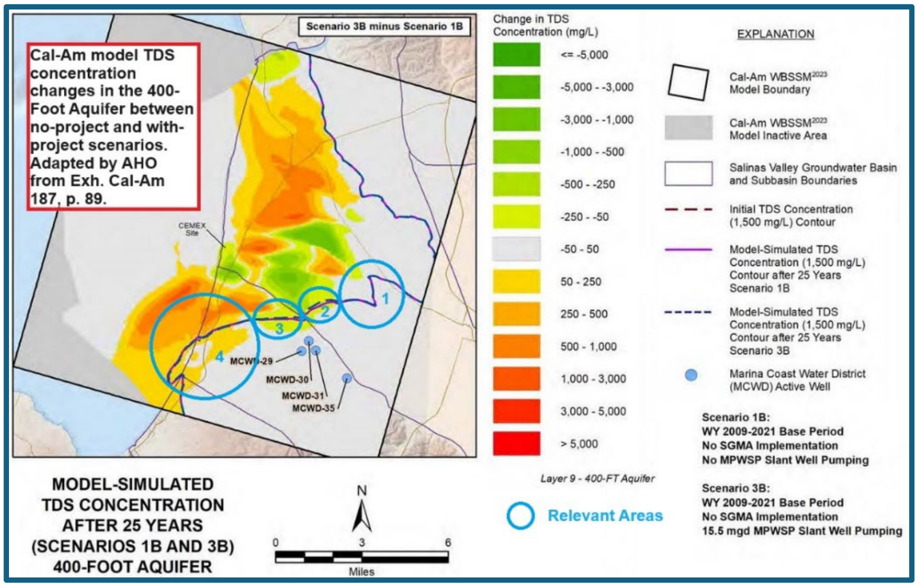

Figure 20 – Cal-Am model predicted TDS changes between no project and with project scenarios in the 400-Foot Aquifer

6.4.8 Deep Aquifer

The parties did not present model results or assert that the draw from the proposed slant wells will result in or increase seawater intrusion in the Deep Aquifer.

6.4.9 Analysis

Figure 21 summarizes the prevailing direction of movement of the 1,500 mg/L TDS isocontour predicted by each model for each of the four areas, as measured in miles, in each aquifer considered in this section.

	Aquifer	Dune Sand		Upper 180-Foot		Lower 180-Foot		400-Foot	
	Model	MCWD/ Marina	Cal-Am	MCWD/ Marina	Cal-Am	MCWD/ Marina	Cal-Am	MCWD/ Marina	Cal-Am
	Section of the 1,500 mg/L isocontour	Prevailing Movement of the 1,500 mg/L Isocontour (miles)							
180/400-Foot Aquifer Subbasin	(1) - Northern and central	No Change	No change	0.5 Seaward	0.5 Seaward	0.5 Seaward	0.5 Seaward	0.25 Seaward	No change
	(2) - Southern near the subbasin boundary	0.5 Seaward	0.5 Seaward	No change	No change	0.5 Seaward	No change	0.25 Seaward	0.25 Seaward
Monterey Subbasin	(3) - Northern near the subbasin boundary	No change	No change	0.25 Landward	0.5 Seaward	0.5 Seaward	No change	0.25 Seaward	No change
	(4) - Southern and central	0.5 Landward	No change	0.75 Landward	0.75 Landward	0.25 Landward	0.25 Landward	0.25 Landward	No change

Figure 21 – Summary of prevailing directions of model predicted movements of 1,500 mg/L isocontours

Although the shapes and magnitudes of movement of the 1,500 mg/L isocontours differ among the models, the model results agree on the question of whether the proposed draw will result in or increase seawater intrusion in 13 of the 16 relevant areas we considered.

In the 180/400 Subbasin, the models predict either no movement or seaward movement of the 1,500 mg/L TDS concentration isocontour in areas (1) and (2) in each aquifer. These results suggest that it is not likely the proposed draw will result in seawater intrusion or inland movement of the seawater intrusion front in the 180/400 Subbasin in areas (1) and (2) in any aquifer.

In the Monterey Subbasin area (3), the models predict either no movement or seaward movement in the Dune Sand, Lower 180-Foot, and 400-Foot Aquifers. In the Upper 180-Foot Aquifer in area (3), the model results disagree on the question of whether the proposed draw would increase seawater intrusion.

In the Monterey Subbasin area (4), the models predict landward movement of approximately 0.75 miles in the Upper 180-Foot Aquifer and approximately 0.25 miles in the Lower 180-Foot Aquifer. The model results disagree on whether the proposed draw would result in increased seawater intrusion in the Dune Sand and 400-Foot Aquifer.

These results suggest that it is not likely that the proposed draw will result in seawater intrusion or inland movement of the seawater intrusion front in the Monterey Subbasin in area (3) in the Dune Sand, Lower 180-Foot, and 400-Foot Aquifers, while it is likely that the proposed draw will result in seawater intrusion and inland movement of the seawater intrusion front in area (4) up to 0.75 miles in the Upper 180-Foot Aquifer and 0.25 miles in the Lower 180-Foot Aquifer.

6.4.10 Area 3 in the Upper 180-Foot Aquifer

In area (3) in the Upper 180-Foot Aquifer, the MCWD model predicts landward movement up to 0.25 miles for the 1,500 mg/L TDS concentration isocontour, while the Cal-Am model predicts seaward movement of 0.5 miles. Unlike the other two areas where the models disagree, the range of results of the two models in this area include both landward and seaward movement of the 1,500 mg/L isocontour. In addition to the different directions and magnitudes of movement, the shape of the 1,500 mg/L isocontours in this area differs notably between models.

The MCWD model predicts the isocontour for the no-project scenario, seen as the blue line within area (3) in Figure 15, will be generally straight and oriented in a southwest to northwest direction across the area. The isocontour for the with-project scenario, seen as the red line within area (3) in Figure 15, is inland from and generally tracks the shape and orientation of the no-project isocontour. The Cal-Am model predicts the isocontour for the no-project scenario, seen as the purple line in area (3) in Figure 16. This isocontour will have a similar southwest to northwest orientation across the area, but rather than a generally straight line, the isocontour protrudes inland in two locations in the direction of MCWD Wells 29, 30, and 31 (the wells are not depicted on Exhibit Cal-Am-187 p. 87 or Figure 16). The isocontour for the with-project scenario, seen as the dashed blue line in area (3) in Figure 16, generally tracks but does not protrude inland as far as the no-project isocontour.

These results are inconclusive as to whether the 1,500 mg/L TDS concentration isocontour will move inland or seaward because of the proposed draw in area (3) in the Upper 180-Foot Aquifer. Either result does not affect our conclusions with respect to potential impact or injury to MCWD's water rights (see Questions 7 and 8), although any landward change in the 1,500 mg/L TDS concentration isocontour could affect any conclusion as to whether the proposed draw will cause unreasonable harm (see Question 8).

6.4.11 Area 4 in the Dune Sand Aquifer

In area (4) in the Dune Sand Aquifer, the MCWD model predicts landward movement up to 0.5 miles for the 1,500 mg/L TDS concentration isocontour, while the Cal-Am model predicts that there will be no movement of the isocontour. These results suggest that it is likely that the proposed draw will result in some seawater intrusion and inland movement of the seawater intrusion front in area (4) between 0 and 0.5 miles in the Dune Sand Aquifer.

6.4.12 Area 4 in the 400-Foot Aquifer

In area (4) in the 400-Foot Aquifer, the MCWD model predicts landward movement up to 0.25 miles for the 1,500 mg/L TDS concentration isocontour, while the Cal-Am model predicts that there will be no movement of the isocontour. These results suggest that it is likely that the proposed draw will result in some seawater intrusion and inland movement of the seawater intrusion front in area (4) between 0 and 0.25 miles in the 400-Foot Aquifer.

6.4.13 Conclusion

Based on the model results presented by the parties in Phase 3 of this proceeding, we conclude that it is likely the proposed draw will result in seawater intrusion in the central and southern sections of the Monterey Subbasin in the following aquifers and magnitudes: between 0 and 0.5 miles in the Dune Sand Aquifer; up to 0.75 miles in the Upper 180-Foot Aquifer; up to 0.25 miles in the Lower 180-Foot Aquifer; and between 0 and 0.25 miles in the 400-Foot Aquifer.

We also conclude that it is not likely that the proposed draw will result in or increase seawater intrusion in any aquifer in any portion of the 180/400 Subbasin, or in any aquifer in the northern portion of the Monterey Aquifer Subbasin. Figure 22 summarizes our conclusions based on the model results for each area in each aquifer considered in this section.

	Aquifer	Dune Sand	Upper 180-Foot	Lower 180-Foot	400-Foot
	Section of the 1,500 mg/L isocontour	Range or Maximum Inland Movement of Seawater Intrusion Front (miles)			
180/400-Foot Aquifer Subbasin	(1) - Northern and central	None	None	None	None
	(2) - Southern near the subbasin boundary	None	None	None	None
Monterey Subbasin	(3) - Northern near the subbasin boundary	None	Inconclusive	None	None
	(4) - Southern and central	Between 0 and 0.5	Up to 0.75	Up to 0.25	Between 0 and 0.25

Figure 22 – Summary of Seawater Intrusion Conclusions

6.5 Question 5

Is it likely that any of the proposed draw will (a) lower the groundwater table or
(b) reduce the storage space in any source other than seawater, and if so, can the extent be approximated?

6.5.1 Groundwater Table

This section addresses whether the proposed draw by the slant wells is likely to lower the groundwater table in any source other than seawater.

6.5.2 Model Results

The parties presented model results of simulated drawdown for model layers corresponding to the Dune Sand, 180-Foot, and 400-Foot Aquifers. These results show changes in hydraulic head between the no project and with project scenarios within each aquifer in the Monterey and 180/400 Subbasins.

Hydraulic head in an aquifer refers to the total energy possessed by a unit volume of groundwater at a specific point. It considers two key components of groundwater energy: Elevation head and pressure head. Elevation head represents the potential energy due to the height of the water table or the groundwater level relative to a reference point, often sea level. Pressure head represents the energy due to the pressure exerted by the water itself.

A water table is a term used to describe the depth at which groundwater pressure head is equal to atmospheric pressure. The elevation of the water table is the elevation of the water surface of an unconfined aquifer, such as the Dune Sand Aquifer.

A potentiometric surface is a reference water surface defined by the hydraulic head of groundwater throughout an aquifer. It is primarily used to describe the virtual elevation of the water surface, which may be higher than the actual surface due to pressure head in confined aquifers, such as the 180-Foot and 400-Foot Aquifers.

We use the term "drawdown" to describe both lowering of the elevation of groundwater table in an unconfined aquifer and lowering the potentiometric surface in a confined aquifer caused by groundwater pumping.

We evaluate drawdown caused by the proposed draw in each aquifer in six general locations chosen to facilitate analysis of any predicted changes to groundwater table elevations, and whether any such changes will occur close enough to the MCWD production wells to impact the quantity of water available for extraction by MCWD. The areas from west to east include: 1) the immediate vicinity of the proposed slant wells; 2) west of Highway 1 near the proposed slant wells; 3) between Highway 1 and MCWD Well 12; 4) between MCWD Well 12 and MCWD Well 30; 5) between MCWD Well 30 and MCWD Well 34; and 6) near MCWD Well 35.

MCWD submitted figures comparing drawdowns predicted by both the MCWD and Cal-Am model in the Dune Sand, Upper and Lower 180-Foot, and 400-Foot Aquifers due to project pumping for the 15.5 mgd project (Exh. MCWD-161, pp. 11–14), which we analyze with respect to each of the six above-described areas.

6.5.3 Dune Sand Aquifer

Figure 23 shows the model predicted drawdowns in the Dune Sand Aquifer.

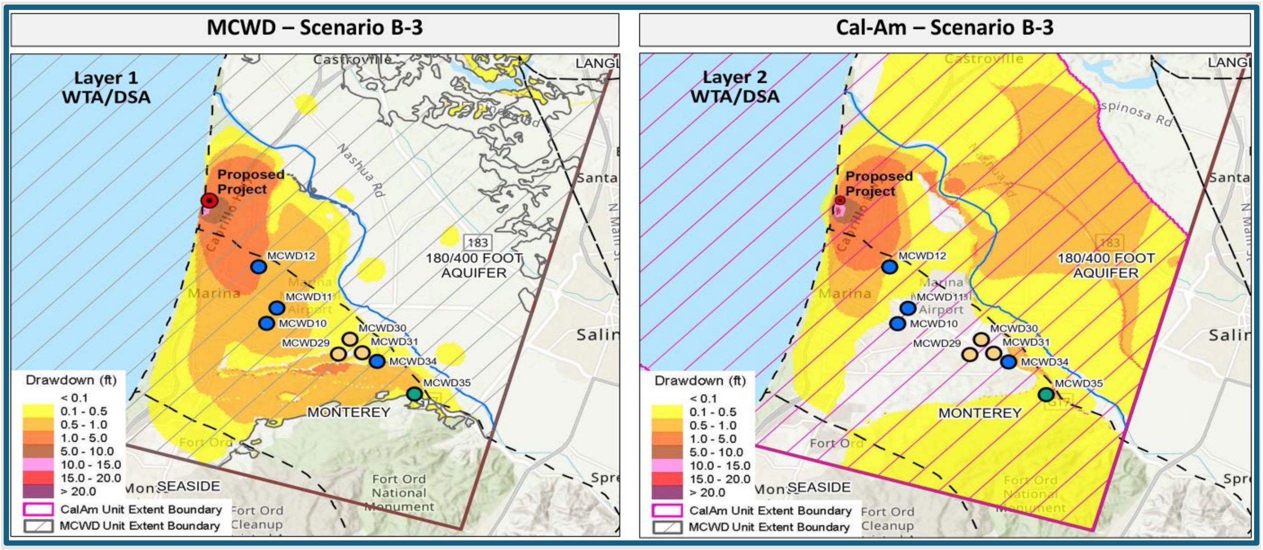

Figure 23 – Model predicted drawdowns in the Dune Sand Aquifer

6.5.4 180-Foot Aquifer

Figure 24 shows the model predicted drawdowns in the Upper 180-Foot Aquifer.

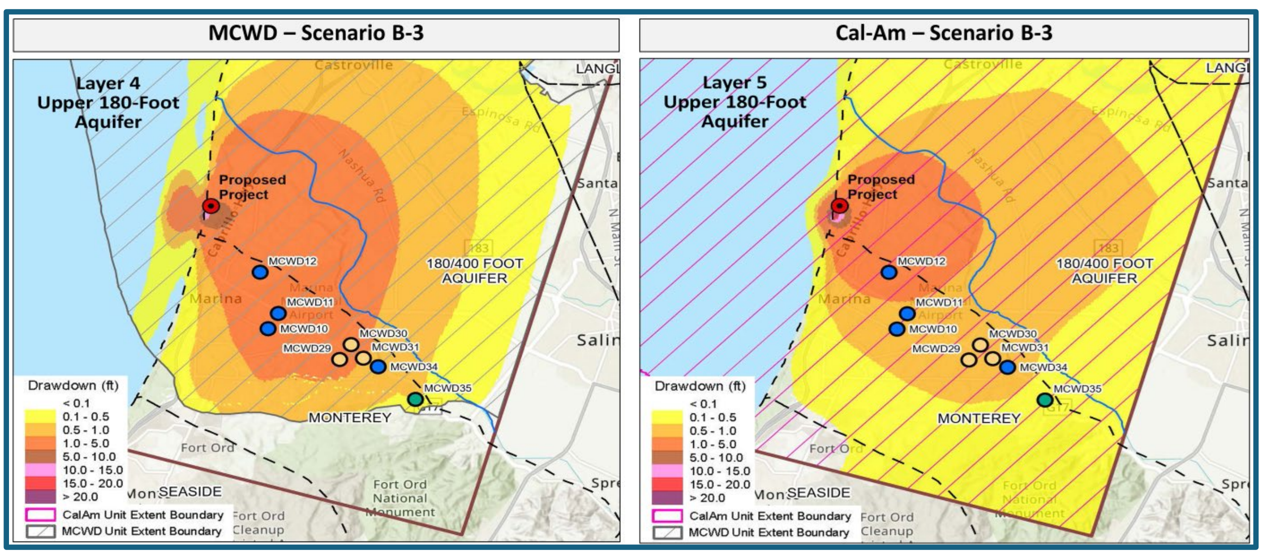

Figure 24 – Model predicted drawdowns in the Upper 180-Foot Aquifer

Figure 25 shows the model predicted drawdowns in the Lower 180-Foot Aquifer.

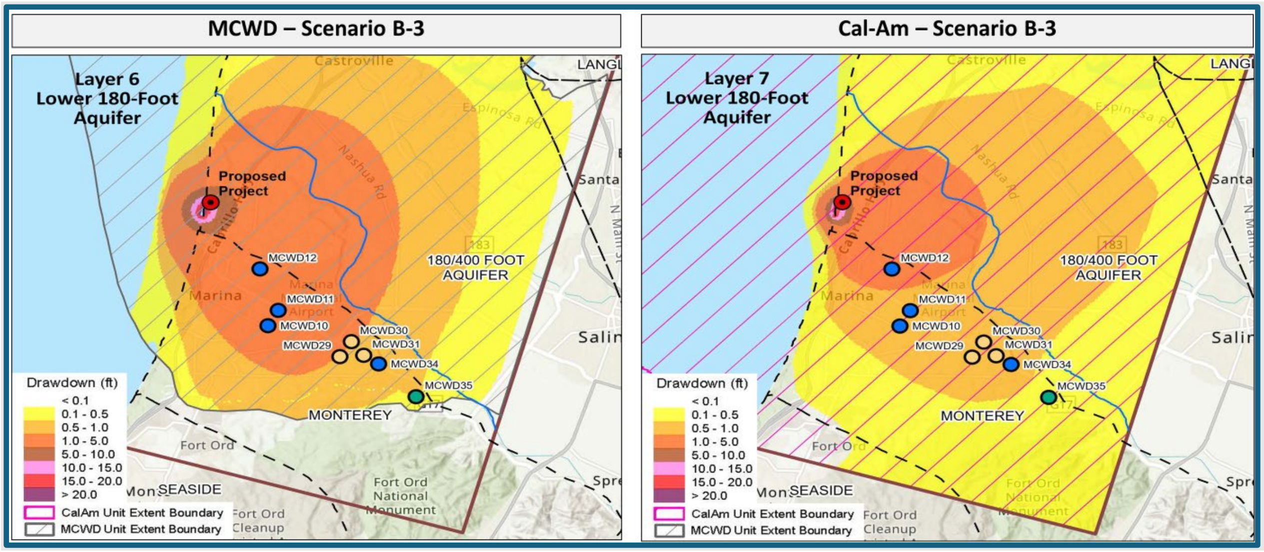

Figure 25 – Model predicted drawdowns in the 180-Foot Aquifer

6.5.5 400-Foot Aquifer

Figure 26 shows the model predicted drawdowns in the 400-Foot Aquifer.

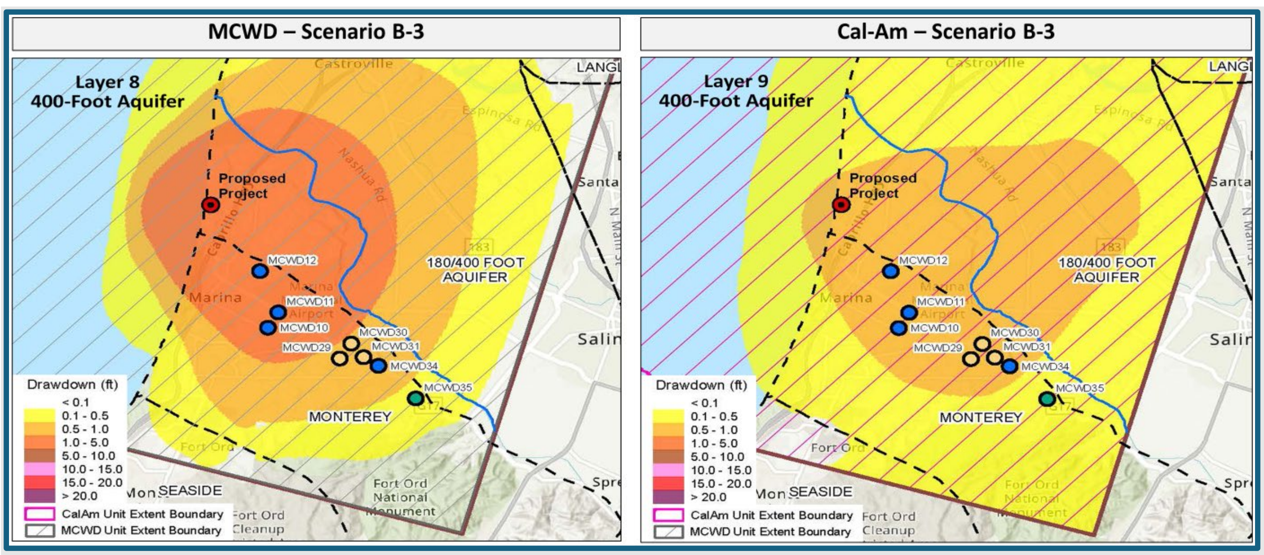

Figure 26 – Model predicted drawdowns in the 400-Foot Aquifer

Figure 27 summarizes the drawdown predicted by each model for each of the areas defined by our analysis, in each aquifer.

Aquifer	Dune Sand		180-Foot		400-Foot	
Model	MCWD/Marina	Cal-Am	MCWD/Marina	Cal-Am	MCWD/Marina	Cal-Am
Location	Drawdown Range (Feet)					
Immediate vicinity of the proposed slant wells	10 to 20	10 to 20	10 to 20	10 to 20	1 to 5	0.5 to 1
West of Highway 1 near the proposed slant wells	5 to 10	5 to 10	5 to 10	5 to 10	1 to 5	0.5 to 1
Between Highway 1 and MCWD Well 12	1 to 5	1 to 5	1 to 5	1 to 5	1 to 5	0.5 to 1
Between MCWD Well 12 and MCWD Well 30	0.5 to 1	Less than 0.1	1 to 5	0.5 to 1	1 to 5	0.5 to 1
Between MCWD Well 30 and MCWD Well 34	0.1 to 0.5	Less than 0.1	0.5 to 1	0.5 to 1	0.5 to 1	0.5 to 1
Near MCWD Well 35	0.1 to 0.5	0.1 to 0.5	0.1 to 0.5	0.1 to 0.5	0.1 to 0.5	0.1 to 0.5

Figure 27 – Model predicted drawdown summary

6.5.6 Conclusion

Based on the model results the parties presented, we conclude that the draw of the proposed slant wells will lower the groundwater table or potentiometric surface in sources other than seawater. The drawdown in each aquifer is largest near the proposed slant wells and generally declines across the area between the proposed slant wells and MCWD Well 35. In the Dune Sand and 180-Foot Aquifers, drawdown ranges from a maximum of 10 to 20 feet in the immediate vicinity of the proposed slant wells, to a minimum of less than half a foot near MCWD Well 35. In the 400-Foot Aquifer, the drawdown ranges from a maximum of 1 to 5 feet in the immediate vicinity of the proposed slant wells, to a minimum of less than half a foot near MCWD Well 35.

6.5.7 Storage Space

There is some ambiguity in the definition of the term “storage space” as the term is used in the court’s question. The term might either describe (1) the space in which water can be stored in an aquifer, or (2) the amount of water stored in the aquifer.

The space in which water can be stored in an aquifer can be reduced if the proposed draw causes subsidence in confined aquifers or if the proposed draw causes seawater intrusion to displace storage of water of a quality that is suitable for use. MCWD asserts that an “increase in seawater intrusion will reduce water quality in the [Monterey] Subbasin, reduce storage space in the Subbasin, and jeopardize the ability of MCWD to rely on its production wells.” (2023-11-13 MCWD’s Closing Brief, p. 25.) Cal-Am responds that the portions of aquifers that are already seawater intruded are not usable for fresh groundwater storage, and any increase in TDS concentrations in these portions of the aquifers from the operation of the slant wells is not a loss of usable storage space. (Exh. Cal-Am-183, ¶ 12.) None of the parties submitted evidence of storage loss from subsidence or attempted to quantify any loss in storage space from displacement by seawater intrusion. Such a calculation would require a judgment as to the TDS or chloride concentration that constitutes a “loss” of storage space, delineation of the change in the isocontour for that concentration, and quantification of the depth of the aquifer. The information necessary to make such an estimate is not in the evidentiary record so we do not further address this type of loss in storage space.

Alternatively, storage space may describe the amount of groundwater stored in an unconfined or semi-confined aquifer. The amount of water stored in an unconfined or semi-confined aquifer is reduced by an amount proportional to the drawdown. Because there is information in the record to estimate this type of potential loss in storage space, we focus our response to the court’s question on evidence of a reduction in storage space from a reduction in the amount of water stored in the unconfined or semi-confined aquifers based on model-predicted drawdown.

6.5.8 Groundwater Stored in the Dune Sand Aquifer

MCWD asserts that both models demonstrate that project pumping would reduce groundwater storage in the Dune Sand Aquifer within the Monterey and 180/400 Subbasins from drawdowns in groundwater elevation. (MCWD-Marina Proposed Report Part 2, p. 98.) Cal-Am does not dispute this assertion but argues that the seawater intruded portions of aquifers are not usable for fresh groundwater storage, and any increase in TDS concentrations in such aquifers resulting from the operation of the slant wells does not constitute the loss of fresh groundwater storage space. (Exh. Cal-Am 183, ¶ 12.)

Storage loss in an unconfined aquifer can be roughly estimated by calculating the volume of the unsaturated space created by the model predicted drawdown over the area in which the drawdown occurs and multiplying that volume by the specific yield of the aquifer.[55] The specific yield is the ratio of the volume of water the saturated space

[55] This storage loss estimate is based on differences in groundwater elevations between with-project and no-project scenarios in the stead-state models. As such, it represents an overall loss resulting from project pumping, and not a “per year” loss.

will yield by gravity to the total volume of the space. The parties submitted model results for losses in groundwater storage in the Dune Sand Aquifer across the entire model domain and for the area south of the Salinas River. The Salinas River is the northern boundary of the Subbasin Interface Zone as defined by MCWD.

Within the Dune Sand Aquifer, the MCWD model results predict a storage loss of 1,531 acre-feet for the 11.6 mgd project alternative, and 2,046 acre-feet for the 15.5 mgd project alternative (Exh. MCWD-128, p. 71). MCWD also presented modeling results from the Cal-Am model, which predicts a storage loss of 3,681 acre-feet for the 11.6 mgd project alternative, and 5,993 acre-feet for the 15.5 mgd project alternative. (Exh. MCDW-175, p. 26.)

For the area south of the Salinas River, the MCWD model predicts a storage loss of 1,284 acre-feet for the 11.6 mgd project alternative, and 1,715 acre-feet for the 15.5 mgd project alternative. The Cal-Am model predicts a storage loss of 1,409 acre-feet for the 11.6 mgd project alternative, and 1,783 acre-feet for the 15.5 mgd project alternative.

Cal-Am calculates the loss of "usable storage space," which discounts impacts to areas of existing seawater intrusion by excluding storage losses in areas with (1) existing TDS concentrations greater than 1,000 mg/L (the upper (long-term) secondary MCL for drinking water) and (2) predicted drawdown of less than 0.2 ft. (Exh. Cal-Am-177, p. 32.) Cal-Am calculates "usable storage loss" in the Dune Sand Aquifer to range from 1,463 acre-feet for the 11.6 mgd project alternative to 2,055 acre-feet for the 15.5 mgd project alternative. (Exh. Cal-Am-177, p. 33.)

6.5.9 Analysis

Both models predict that the proposed draw will lower the groundwater table in the Dune Sand Aquifer and correspondingly predict a reduction in the amount of water stored in the aquifer. Figure 28 summarizes the model predicted losses in water stored in the Dune Sand Aquifer.

Storage Losses in the Dune Sand Aquifer (AF)			
Project Alternative (mgd)	MCWD Response (Exh. MCDW-175, p. 26.)		Cal-Am Response (Exh. Cal-Am-177 p. 33.)
	MCWD Model	Cal-Am Model	
11.6	1,531	3,681	1,463
15.5	2,046	5,993	2,055

Figure 28 – Storage losses in the Dune Sand Aquifer

6.5.10 Conclusion

We conclude that it is likely that the proposed draw will reduce the groundwater storage in the Dune Sand Aquifer. Based on the model results, the reduction in storage will range from 2,046 to 2,055 acre-feet. (Exh. MCWD-128, p. 71, Exh. Cal-Am-177, Tbl. 3-10, p. 33.)[56]

We do not directly analyze changes in groundwater storage in the remaining aquifers because the technical experts did not report model-calculated groundwater storage fluctuations in confined aquifers. Aquifers in the vicinity of the proposed project other than the Dune Sand Aquifer are generally confined and declines in the potentiometric head in these aquifers do not directly correspond to changes in actual groundwater storage. (Exh. MCWD-128, p. 70.)

6.5.11 Subbasin Cross-Boundary Flows

After Phase 2 of this proceeding, the AHO hearing officer asked the parties to address whether the projected Cal-Am slant well pumping will result in losses in groundwater storage or sustainable yield in the Monterey Subbasin due to increased flows from the Monterey Subbasin into the 180/400 Subbasin. (2023-07-26 Post-Hrg. Order, p. 2.) We refer to flows from the Monterey Subbasin to the 180/400 Subbasin as cross-boundary flows.

6.5.12 Parties' Positions

MCWD and Marina assert that the proposed draw would result in an increase in subbasin cross-boundary flow from the Monterey Subbasin to the 180/400 Subbasin between 1,605 and 2,103 afy, and of these increased flows, between 666 and 1,164 afy will occur in the Dune Sand and 180-Foot Aquifers. (Exh. MCWD-165, at pp. 50–54.) They assert that the subbasin cross-boundary flows will reduce the volume of groundwater in the Monterey Subbasin absent replacement of the water from other sources, and the Monterey Subbasin's sustainable yield will be correspondingly reduced. (Exh. MCWD-168, p. 22:1-3, 18-23.) MCWD also asserts that the increase in cross-boundary flows will cause harm by impacting MCWD's ability to meet SGMA requirements by reducing the groundwater supply that is legally available for extraction under the groundwater sustainability plan. (*Id.* at p. 22:17-19.)

Cal-Am does not contest that cross-boundary flows into the 180/400 Subbasin from the Monterey Subbasin will increase because of the proposed draw. Cal-Am asserts that the change in cross-boundary flows is small, and the effects caused by these increased

[56] We note that although the parties' responses to this question appear to be similar, these results are not an "apples to apples" comparison. MCWD's results include losses within the entire model domain, while Cal-Am's results do not include losses from areas of the Dune Sand Aquifer they contend are not usable.

cross-boundary flows will not injure MCWD or Marina. (Exh. Cal-Am-177, pp. 35–36; Cal-Am Closing Brief, pp. 34:24–35:3.)

6.5.13 Analysis – Changes in Cross-Boundary Flows

MCWD estimated cross-boundary flows with a zone budget analysis for all layers using each model, but did not report changes to inflows from other sources such as the ocean or Seaside Subbasin. (Exh. MCWD-165, pp. 50–54.) MCWD considered two reaches along the subbasin boundary within the model domain to quantify cross-boundary flow. The first reach, which we refer to as the capture zone reach, extends from the ocean to the boundary of the capture zone (or mixing zone). The second reach, which MCWD calls Reach A, extends from the boundary of the capture zone to the boundary of the model domain. Figure 30 shows the capture zone reach (yellow line), the capture zone (blue shaded area), and Reach A (light green line). (Exh. MCWD-165 p. 52, Figure 6-1.)

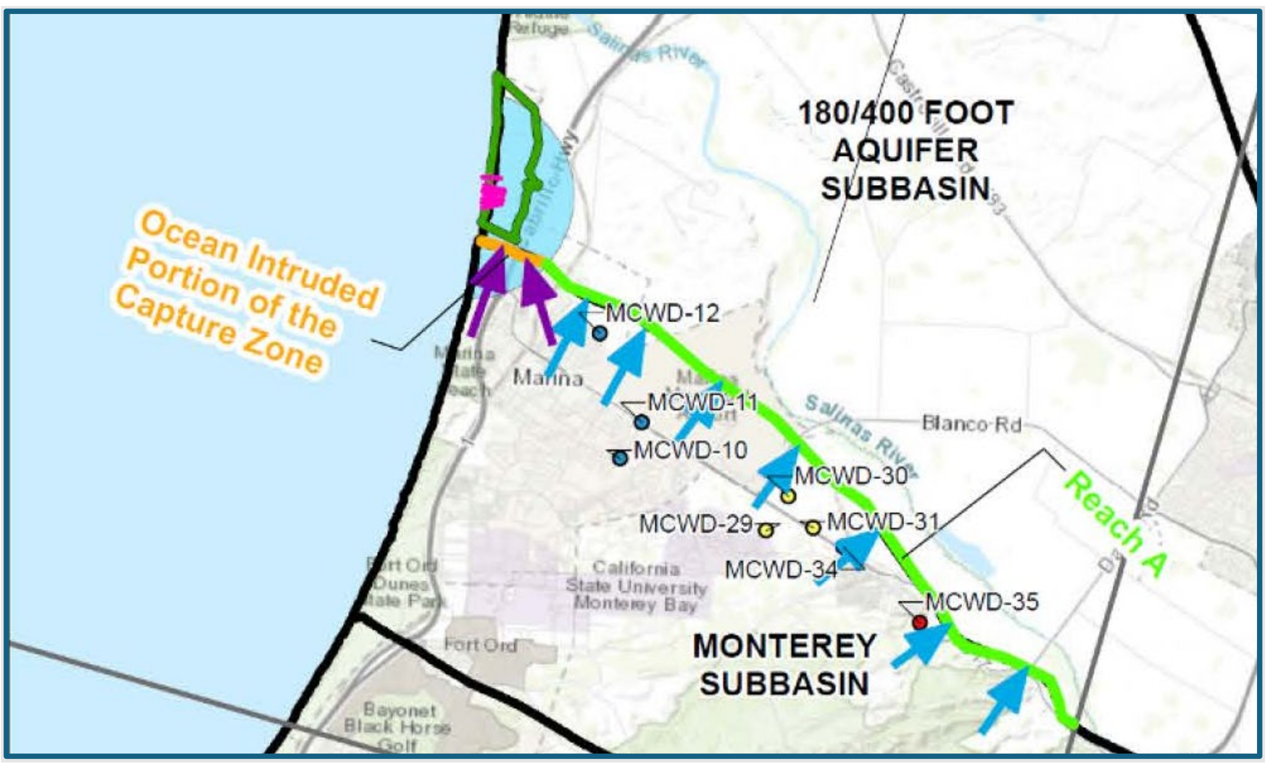

Figure 29 – Subbasin cross-boundary flow reaches submitted by MCWD

Using its own model, MCWD calculates that 15.5 mgd of slant well pumping (Scenario B3) will cause a total increase in cross-boundary flow for all model layers of 2,103 afy,[57] consisting of 833 afy in Reach A and 1,270 afy in the capture zone reach. (Exh. MCWD-

[57] This value is based on the amounts provided in Table 4. The amount is reported as 2,102 afy on page 50 of Exh. MCWD-165. The difference in amounts is assumed to be due to a rounding error.

165, pp. 50, 127 [Tbl. 4].) For the model layers that include only the Dune Sand Aquifer and Upper 180-Foot Aquifer, MCWD calculates an increase in cross-boundary flow of 228 afy in Reach A and 438 afy in the capture zone reach, totaling 666 afy across both reaches. (*Id.* at p. 53, Tbl. 6-1.) Using the Cal-Am model, MCWD calculates an increase in cross-boundary flow for all model layers of 749 afy in Reach A and 856 afy in the capture zone reach, totaling 1,605 afy across both reaches. (*Id.* at pp. 135 [Tbl. 12], 50.)

MCWD asserts that the increase in cross-boundary outflows along Reach A in freshwater aquifers represents a loss in the sustainable yield of the Monterey Subbasin, and that the increase in cross-boundary flows along the capture zone reach includes a mix of freshwater originating from inland sources and seawater. MCWD asserts that the portion of these cross-boundary flows originating from freshwater inland sources represent an additional loss in sustainable yield to the Monterey Subbasin. (Exh. MCWD-165, at p. 50.)

Cal-Am estimated subbasin cross-boundary flows with a zone budget analysis using their model and reported inflows from the ocean and other subbasins as well as flows across the subbasin boundary (1) within the capture zone; (2) within the seawater intrusion front (but outside the capture zone); and (3) outside the seawater intrusion front. Figure 30 shows the reaches considered by Cal-Am and the calculated flows. (Exh. MCWD-165, at pp. 131–132, Figs. 83 & 84.)

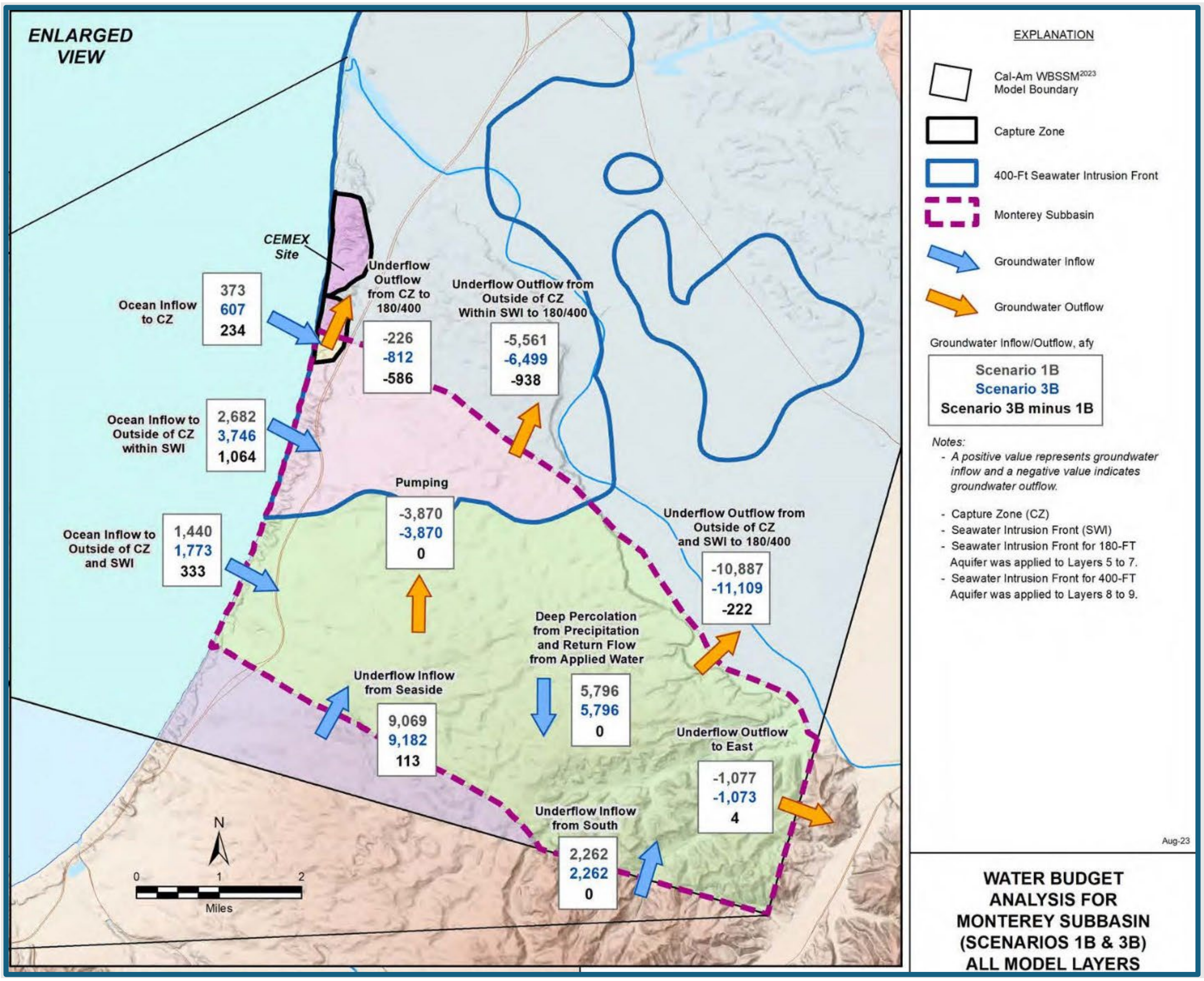

Figure 30 – Subbasin cross-boundary flow reaches submitted by Cal-Am

Cal-Am calculates increases in cross-boundary flows from the Monterey Subbasin to the 180/400-Foot Subbasin of 586 afy in the capture zone, 938 afy within the seawater intrusion front (but outside the capture zone), and 222 afy outside the seawater intrusion front, totaling 1,746 afy across the entire boundary within the model domain. Cal-Am did not submit more specific information about cross-boundary flow, such as volume of flow by individual model layer or aquifer.

Cal-Am also calculated the expected increase of inflows into the Monterey Subbasin. Cal-Am calculated increased inflows from the ocean of 234 afy in the capture zone, 1,064 afy within the seawater intrusion front (but outside the capture zone), and 333 afy outside the seawater intrusion front, and 113 afy from the Seaside Subbasin, totaling 1,744 afy.

Cal-Am experts concluded that the change in inflows from the ocean of 1,064 afy to the zone of seawater intrusion within Monterey Subbasin (and outside of the proposed slant well capture zone) are approximately equal to the change in outflows of 938 afy from Monterey Subbasin to the 180/400 Subbasin within the zone of seawater intrusion (but outside the proposed slant well capture zone), resulting in no net loss to the Monterey Subbasin. They estimated the increase in outflows from Monterey Subbasin to the 180/400 Subbasin outside the zone of seawater intrusion would result in a net loss of 222 afy. (Exh. Cal-Am-177, p. 35.)

6.5.14 Analysis – Water Budget/Sustainable Yield

Both parties estimate that cross-boundary flows will increase with the proposed project, and their calculation of the volume of increase are consistent. MCWD used both its own model and Cal-Am's model to calculate a cross-boundary flow range from 1,605 afy to 2,103 afy. Cal-Am used the Cal-Am model to estimate a total cross-boundary flow of 1,746 afy. Cal-Am's analysis indicates that the total cross-boundary flow increases from the Monterey Subbasin to the 180/400 Subbasin (1,746 afy) are approximately balanced by inflows to the Monterey Subbasin from the ocean and the Seaside Subbasin (1,744 afy). In contrast, MCWD's analysis is incomplete because MCWD does not consider water movement across other boundaries of the basin. MCWD does not provide sufficient information about changes in inflows to the subbasin to conclude whether their model results show a loss in groundwater storage to the subbasin overall.[58] Therefore, MCWD's analysis does not directly address impacts from changes in cross-boundary flow on storage or sustainable yield in the Monterey Subbasin. We rely on Cal-Am's model results to conclude that operation of the proposed project will not directly impact groundwater storage within the Monterey Subbasin because increased inflows to the subbasin will offset increased outflows to the 180/400 Subbasin.

The parties differ in their characterization of the salinity of cross-boundary flows, which could result in a loss of useable "fresh" groundwater storage even if the amount of groundwater in storage remains constant. We conclude, however, that changes in the salinity of groundwater in the subbasins from operation of the proposed project is better

[58] MCWD's methodology is also inconsistent with the water budget calculation in the GSP for the subbasin. The water budget for the Monterey Subbasin includes recharge, well pumping, net inter-basin flows (freshwater and seawater), and net surface water exchange. (Monterey Subbasin GSP, Table ES-1, p. 37.) The freshwater net inter-basin flows in the GSP include inflow from the Seaside Subbasin and outflows to the 180/400 Subbasin. The seawater net inter-basin flows include inflow from the ocean and outflow to the 180/400 Subbasin. (*Ibid*.)

characterized by the subbasin-wide water quality model results addressed in Section 6.4, rather than by a more limited analysis of the salinity of cross-boundary flows.

6.6 Question 6

Has MCWD been pumping water from the Subbasin Interface Zone and, if so, for approximately what period?

All of MCWD's production wells are located within the areal extent of the Subbasin Interface Zone. (Exh. MCWD-9, p. 22 [Fig. 3-4].) MCWD General Manager Remleh Scherzinger testified that the district has been pumping groundwater since it was formed in 1960 (Exh. MCWD-1, p. 6), and Ms. Vera Nelson testified that the district has used groundwater from the Subbasin Interface Zone since that time. (Exh. MCWD-2, p. 63.)

MCWD provided pumping records for calendar years 2006 through 2020 by well, subbasin location, screening depth, and volume in Exhibit MCWD-8. Cal-Am did not dispute this testimony about MCWD's pumping or the pumping information listed in Exhibit MCWD-8.

6.7 Question 7

What effect, if any, would the proposed draw by Cal-Am slant wells have upon any primary or paramount water right of Marina or MCWD?

What impact on quantity and quality of the water sourced by MCWD wells is likely?

6.7.1 Marina's Water Rights

Marina does not claim or present any evidence of an appropriative right to extract groundwater from the SVGB. Marina does not own or operate any wells in the basin. The residents of Marina are customers of MCWD and receive water from MCWD. (See Exhs. MCWD-1, p. 4:13-18; Marina-1, p. 4:2-4.) Marina claims to own property overlying the basin, and as an overlying owner, Marina likely has overlying rights to groundwater for use on those properties. We conclude that Marina does not have any appropriative right to extract groundwater from the basin that would be paramount to the proposed draw by Cal-Am but may have unexercised overlying rights.

Marina asserts that as an overlying landowner, it has overlying rights to groundwater for use on its properties. (2025-01-31 City of Marina's Comments, p. 60.) Marina does not identify any evidence in the record for this proceeding as to the extent of its overlying landholdings, but we assume that Marina owns some property overlying the basin to which an overlying right may attach. (*Ibid.)* Even so, an overlying groundwater right is a usufructuary right. The overlying owner has a right to protect its reasonable and beneficial use of water from injury. "[O]verlying owners and appropriators are entitled to the protection of the courts against any substantial infringement of their rights in water which they reasonably and beneficially need.” (*City of Pasadena v. City of Alhambra* (1949) 33 Cal. 2d 908, 926 [citing *Peabody v. City of Vallejo* (1935) 2 Cal.2d 351, 368–369, 374].) “[T]he rights of the riparian and overlying landowners were limited to the amount of their actual or prospective reasonable beneficial use of the water.” (*Corona Foothill Lemon Co. v. Lillibridge* (1937) 8 Cal. 2d 522, 530.)

To the extent that Marina has a current or prospective reasonable beneficial use of groundwater on its overlying property, significant and unreasonable impacts to the quantity or quality of groundwater available for extraction and beneficial use at the overlying property caused by Cal-Am’s proposed draw may injure the exercise of Marina’s overlying right. It is not possible to assess any such risk of injury, however, while Marina’s intent to extract water remains speculative and without more information about the location of Marina’s overlying property, the location of any proposed wells, the type of proposed beneficial use to be made, and when the proposed extraction and use would occur. Furthermore, the doctrine of reasonableness would apply to any prospective overlying use by Marina to prohibit unreasonable interference with maximum beneficial use of the state's water resources. (See *Town of Antioch, supra,* 188 Cal. 451; Cal. Const., art. X, § 2.) A physical solution might address any injury to Marina’s exercise of its claimed overlying rights when and if Marina seeks to exercise those rights.

Marina also argues that Cal-Am’s proposed project will “cause irreparable harm to the City’s beneficial uses of the vernal ponds,” and that this “is a water rights issue that the State Water Board must consider in this proceeding.” (2022-08-22 City of Marina Opposition to Motion in Limine, p. 13:4-8.) Marina does not cite any legal authorities to support its argument that it has water rights for the *in situ* uses of water in vernal pools or wetlands within its boundaries. Marina presents no evidence that it owns any lands that have overlying or riparian rights associated with vernal pools or wetlands. And appropriative water rights do not extend to *in situ* uses in the absence of pumping, diversion, or another method of capture or control of water from the natural source. (See *Fullerton v. State Water Resources Control Bd.* (1979) 90 Cal.App.3d 590, 604; *California Trout, Inc. v. State Water Resources Control Bd.* (1979) 90 Cal.App.3d 816, 820.) Marina therefore has not demonstrated any “primary or paramount water right,” as those terms are used in Question 7, to water in vernal pools or wetlands within its boundaries. (2022-08-31 AHO ruling on Cal-Am mtn. in limine, pp. 5–6.)

6.7.2 MCWD’s Water Rights

MCWD has been pumping groundwater from the SVGB since the district was formed in 1960. (Exh. MCWD-1, p. 4.) MCWD now serves approximately 35,000 people in Marina, Seaside, the Ord Military Community, and neighboring areas. (*Ibid*.) MCWD submitted pumping records for calendar years 2006 through 2020 by well, subbasin location, screening depth, and volume in Exhibit MCWD-8. Figure 31, prepared by AHO staff, summarizes the information in Exhibit MCWD-8 to show the total amount of groundwater that MCWD pumped from the basin and from each aquifer in each calendar year from 2006 to 2020.

Summary of MCWD Groundwater Pumping between 2006 and 2020 from Exh. MCWD-8 (Acre-Feet per Year)												
Year	MCWD Production Wells								Aquifers			Total
	Deep			180-Foot and 400-Foot			Deep	-Foot and D	Deep	180-Foot and 400-Foot	400-Foot and Deep	
	10	11	12	29	30	31	34	35/WG				
2006		1,278	508	504	883	1,122			1,786	2,509	0	4,295
2007		1,164	458	520	1,155	1,266			1,622	2,941	0	4,563
2008	650	875	308	462	896	911			1,833	2,269	0	4,102
2009	841	869	251	394	892	791			1,961	2,077	0	4,038
2010	687	845	213	555	882	953			1,745	2,390	0	4,135
2011	699	864	136	554	898	896			1,699	2,348	0	4,047
2012	893	909	12	549	530	1,216	15	1	1,829	2,295	1	4,125
2013	830	621	16	671		740	543	1,009	2,010	1,411	1,009	4,430
2014	717	894	8	390		411	750	856	2,369	801	856	4,026
2015	544	869	7	159		461	550	638	1,970	620	638	3,228
2016	593	710	0	185	73	328	528	609	1,831	586	609	3,026
2017	721	866		165	404	330	492	260	2,079	899	260	3,238
2018	769	974		233	357	508	532	32	2,275	1,098	32	3,405
2019	663	763		221	272	351	351	569	1,777	844	569	3,190
2020	594	622		205	310	416	448	698	1,664	931	698	3,293

Figure 31 – Summary of MCWD Groundwater Pumping between 2006 and 2020 from Exh. MCWD-8 (Acre-Feet per Year)

Cal-Am does not dispute the pumping information listed in Exhibit MCWD-8. Because there is no dispute that MCWD has been continuously pumping for municipal uses, MCWD appears to have perfected either an appropriative or prescriptive right to groundwater in the SVGB. This appropriative or prescriptive right would be senior in priority to any appropriative right developed by Cal-Am to extract groundwater from the basin.

The maximum annual amount of groundwater to which MCWD may have perfected a right cannot exceed the maximum amount of its historical extraction and beneficial use in any one year. MCWD's maximum annual extraction based on the available evidence occurred in 2007 and was 4,563 afy from the SVGB and 2,941 afy from the aquifers that would be affected by the proposed project. It is not necessary to precisely quantify the amount of MCWD's water right to determine whether the right may be affected or injured by operation of the proposed slant wells. The evidence does not show that the operation of the slant wells is likely to materially impact MCWD's ability to extract the amount of water per year up to the historical maximum to which it may be entitled.

It is possible that MCWD could, in the future, perfect a right to extract and use more water than the volume of its historical maximum use with a priority date senior to any right acquired by Cal-Am. To demonstrate a prior right to this additional volume of water, MCWD must show an intent to appropriate the additional amount as of the date of the claimed priority and show that, since that time, MCWD pursued extraction and beneficial use with reasonable diligence. (See, e.g., *State of Arizona v. State of California*, (1936) 298 U.S. 558 ["The appropriator first in time is prior in right over others upon the same stream, and the right, when perfected by use, is deemed effective from the time the purpose to make the appropriation is definitely formed and actual work upon the project is begun, or from the time statutory requirements of notice of the proposed appropriation are complied with, provided the work is carried to completion and the water is applied to a beneficial use with reasonable diligence"].) To demonstrate potential injury to such a future-perfected right, MCWD must identify the amount of water claimed, the aquifer from which the additional water would be drawn, the location of the wells, and the use of the water. There is no such evidence in the record in this proceeding.

6.7.3 Injury to MCWD's Water Rights

Because the draw of the slant wells is not hydrologically connected to the Deep Aquifer (see Section 6.3.1), there would be no effect of the proposed draw on MCWD's water rights associated with wells that are screened solely in the Deep Aquifer (MCWD Wells 10, 11, 12, and 34).

In contrast to the Deep Aquifer, the 180-Foot and 400-Foot Aquifers are hydrologically connected to sources for the proposed slant wells (see Section 6.3.1). As a result, the proposed draw could affect MCWD's water rights associated with wells screened in those aquifers. MCWD Well 35 is screened in part in the 400-Foot Aquifer, and MCWD Wells 29, 30, and 31 are screened in the 180-Foot and 400-Foot Aquifers. As discussed in further detail below, the parties' modeling results and other evidence show that although the proposed draw may have some impact on groundwater conditions at MCWD Wells 29, 30, 31, and 35, the impacts would most likely be insignificant and not rise to the level of an injury to MCWD's senior rights.

6.7.4 Impacts to Quantity of Groundwater

The proposed draw of Cal-Am's slant wells will not affect the amount of water physically available to MCWD for extraction under its water rights, nor will it result in any significant increase in pumping or other costs for MCWD to exercise its right.

Even with the proposed draw from Cal-Am's slant wells, the steady state model results show that there will be sufficient water within the aquifers to meet MCWD's documented historic maximum use of 4,563 afy, which is the greatest amount of water for which MCWD has demonstrated entitlement under its senior water rights. (See Section 6.7.2.) Although operation of the project will result in some drawdown of water levels, the models predict drawdown ranges of half a foot to one foot (Cal-Am) and one to five feet (MCWD) near MCWD's wells screened in the 180-Foot and 400-Foot Aquifers. (See Section 6.5.1 & Figure 27.)

Cal-Am objects that the one to five feet predicted drawdown range for the MCWD model "are misleading as the value is much closer to 1 than 5." (2025-01-31 Cal-Am Objections to Report of Referee, pp. 50–51.) Regardless, MCWD did not present any evidence that this relatively small amount of drawdown would require MCWD to increase the depth of its well casings or well screens to access groundwater, significantly increase the cost of operating its pumps, or otherwise materially impact MCWD's ability to extract groundwater. (See Exh. Cal-Am-157, ¶ 52(d).)

As discussed in Section 5.2.1, not every interference with the exercise of a water right constitutes injury. Injury occurs if the interference is material and significant, and the cost to the senior right holder of avoiding the harm is unreasonable. Those cases in which courts have found injury to senior groundwater rights from drawdown of groundwater levels involved significant declines in groundwater levels or continuous and cumulative declines over time that were collectively significant. (See *Burr v. Maclay Rancho Water Co.* (1908) 154 Cal. 428, 432–433, 437–438 [defendant's groundwater pumping prevented plaintiff from operating his pumps and permanently lowered groundwater levels as much as seven feet over an 18-month period]; *City of Lodi, supra,* 7 Cal.2d at pp. 331, 334, 339 [defendant's diversions would cause a progressive decline in water levels of at least one foot per year and plaintiff would be required to continually lower its wells to access water]; *Corona Foothill Lemon Co. v. Lillibridge* (1937) 8 Cal.2d 522, 524-525 [defendant's groundwater pumping was materially lowering groundwater levels in the basin and would eventually "exhaust the water therein"]; *Smith v. Wheeler* (1951) 107 Cal.App.2d 451, 455–456 [defendant's pumping would lower water levels to such an extent that the plaintiffs' wells could not operate]; *Monolith Portland Cement Co. v. Mojave Public Utilities Dist.* (1957) 154 Cal.App.2d 487, 493–494 [defendant's groundwater pumping would lower groundwater levels to such an extent that other pumpers had to lower their wells to continue pumping].)

Based on the evidence presented in this proceeding, the proposed draw would not injure MCWD's water rights by materially or unreasonably affecting the amount of water available to MCWD at its existing wells, either now or over time, or the cost of extracting and using that water.

6.7.5 Impacts to Quality of Groundwater

Based on the parties' model results, the proposed draw of Cal-Am's slant wells is unlikely to cause significant or unreasonable impacts to the quality of water drawn from MCWD's Wells 29, 30, 31, or 35, and the quality of water drawn from those wells will remain suitable for municipal use.

Cal-Am's model results showed no expected change in TDS at MCWD Wells 29, 30, 31, or 35. (Exh. Cal-Am-183, ¶ 16.) MCWD's modeling as depicted in Figures 15, 17, and 19 of this report, shows that operation of the proposed slant wells would not, after 25 years of operation, cause the quality of water in the 180-Foot or 400-Foot Aquifers to increase in TDS concentration more than 50 mg/L at MCWD Wells 29, 30, 31, or 35. Because MCWD did not offer a more refined quantitative analysis of the change in TDS, it is possible that the model results showed no change in TDS concentration. MCWD also did not present any evidence that, if an increase in TDS of up to 50 mg/L did occur, the change would significantly or unreasonably increase the cost to MCWD of treating and delivering water for municipal use.

Instead, MCWD argues that the proposed draw from the slant wells will result in harm because of the "significant increases in TDS levels (decreases in water quality) in portions of both the Monterey Subbasin and the 180/400 Foot-Aquifer Subbasin," and eastward advancement of the seawater intrusion front in some areas. (Exh. MCWD-164, at pp. 5–6; see Marina and MCWD Proposed Report Part 2, pp. 102–03.) These arguments are not specific to MCWD's wells. MCWD presents no evidence that MCWD would be injured by impacts to the quality of water available at its wells. We address in further detail in response to Question 8 (see Section 6.8) whether operation of the proposed slant wells may injure other legal users of water or cause unreasonable harm.

6.7.6 Conclusion

Based on the model results, the proposed draw by the slant wells will not injure or infringe upon any water rights held by MCWD or Marina. Marina has not demonstrated that it has any rights to groundwater in the basin that could be injured. The declines in groundwater levels and water quality at the location of MCWD's wells that may result from the proposed draw would not prevent MCWD from extracting the volume of water to which it has a right, increase the cost of pumping or treatment, or otherwise cause significant and material impacts to MCWD's exercise of its rights.

6.8 Question 8

Does SWRCB have an opinion as to whether:

a) *there is any legal theory upon which Cal-Am may rely to extract the proposed draw; and*

b) *the proposed Cal-Am extraction would infringe upon MCWD's appropriative rights to groundwater?*

[Question 8(b) is addressed in part in the Board's response to Question 7, above.]

The proposed draw from Cal-Am's wells would primarily consist of water originating from the ocean but would include some amount of water originating from the SVGB. As addressed in Section 6.2.2, Cal-Am's proposed 15.5 mgd project would pump 17,362 afy in total, of which approximately 1,389 to 1,736 afy (8 percent to 10 percent) will be water from sources other than the ocean (i.e., water from the SVGB). We conclude that Cal-Am may lawfully extract this ocean water. We also conclude that Cal-Am may extract groundwater from the SVGB if the extraction neither (1) injures other legal users of water nor (2) causes unreasonable harm. To avoid injury or harm, Cal-Am may be required to provide replacement water to offset impacts from the proposed extraction.

6.8.1 Extraction of Ocean Water

To our knowledge, there is no decision by a California court or a court of any other state or federal jurisdiction, or any precedential decision by the State Water Board, that limits the diversion or beneficial use of ocean water or requires a water right to divert and use ocean water. Marina and MCWD do not challenge Cal-Am's right to draw water from the ocean for treatment and beneficial use. State Water Board staff concluded in its 2013 Report to the CPUC, "Cal-Am needs no groundwater right or other water right to extract seawater from Monterey Bay." (Exh. Cal-Am-93, p. 39.) We agree that Cal-Am either needs no water right to draw ocean water or may obtain such a right by diverting and using the water, and that Cal-Am may lawfully draw the proposed amount of ocean water for desalination and service to its customers.

MCWD objects that Cal-Am is not proposing to extract ocean water because the water will be captured through screened portions of the wells located in the Dune Sand and 180-Foot Aquifers and not the Monterey Bay. (MCWD Closing Brief, p. 27.) We disagree that water drawn from the aquifers cannot be ocean water. Although the slant wells will capture water within the Dune Sand and 180-Foot Aquifers, and much of the water captured will enter the wells landward of the MHW line, the originating source of approximately 90 to 92 percent of the water will be from the Pacific Ocean. (See Section 6.2.2.) The water would move from the ocean, through the ocean floor, and into the Dune Sand and 180-Foot Aquifers, where it would be captured by the slant wells. This water is ocean water, not water originating from the SVGB.

6.8.2 Extraction of Groundwater

As described in Section 5.1, rights to extract and use groundwater are generally of three types: overlying, prescriptive, or appropriative. Of these three, Cal-Am may be able to rely on an appropriative right to extract and use the portion of the slant-wells' draw that would originate from the SVGB and not the ocean.

Cal-Am cannot purchase or develop an overlying groundwater right that would authorize its proposed extraction and use. Cal-Am intends to serve the water that it draws from the slant wells to customers located outside of the boundaries of the SVGB for municipal use. Because the uses will be on lands that do not overlie the basin, and because the use will be municipal, an overlying groundwater right cannot authorize Cal-Am's proposed extraction and use.

A prescriptive right to groundwater is developed by adverse use over time. Cal-Am cannot claim a prescriptive right unless it extracts and uses groundwater over the prescriptive period of five years, adverse to the rights of others. Furthermore, private parties such as Cal-Am cannot obtain prescriptive rights against public entities. (Cal. Civ. Code, § 1007; *City of Los Angeles v. City of San Fernando* (1975) 14 Cal.3d 199, 292.)

Cal-Am might develop an appropriative right to extract groundwater from the basin if surplus water is available or Cal-Am otherwise prevents injury to existing users and unreasonable harm that might be caused by the extraction. The rule of priority applies to appropriations of groundwater. In general, a new appropriator must avoid injury to existing senior rights by pumping and beneficially using only that amount of groundwater that is surplus to the rights of overlying users and within the sustainable yield of the basin.[59] (See Section 5.1.2; *City of Los Angeles v. City of San Fernando* (1975) 14 Cal.3d 199, 277 [defining "safe yield" (or sustainable yield) as "the maximum quantity of water which can be withdrawn annually from a ground water supply under a given set of conditions without causing an undesirable result"] [disapproved on other grounds by *City of Barstow v. Mojave Water Agency* (2000) 23 Cal.4th 1224].) A proposed new appropriator has the "burden of proving the existence of a surplus from which it can extract the quantity it desires …without injury to the uses and requirements of those who have prior rights." (*Tulare Irr. Dist., supra,* 3 Cal.2d at p. 535; *Allen v. California Water & Tel. Co.*, *supra,* 29 Cal.2d at p. 481; *City of Los Angeles, supra,*14 Cal.3d at p. 214.) If no surplus water is available in the basin, Cal-Am could make an out-of-priority appropriation by implementing a physical solution that would prevent injury to senior right holders and any other unreasonable harm.

[59] Cal-Am is not required to obtain a water right permit from the State Water Board before extracting and using groundwater from the Salinas Valley Groundwater Basin. As explained in Section 5.1.2, the State Water Board's water right permitting authority does not extend to the appropriation of percolating groundwater.

Rather than developing a new right, Cal-Am could obtain an appropriative right to extract groundwater through purchase or lease of an existing right. The exercise of any transferred right to extract groundwater would, however, be similarly conditioned on avoidance of injury to other legal users of water and unreasonable harm resulting from the transfer. (See *City of San Bernardino v. City of Riverside* (1921) 186 Cal. 7, 28–29 [appropriator may "change the place of use thereof, or the character of the use, without affecting his right to take it" and "may change the place from whence the water is taken out of the source, provided others are not injured by such change"].)

In summary, Cal-Am might lawfully draw water from the SVGB if the extraction will neither injure other legal users of water nor cause unreasonable harm. Cal-Am may avoid injury to other legal users and prevent unreasonable harm by: (1) demonstrating that the proposed draw would extract only water that is surplus to the rights of overlying users and within the sustainable yield of the basin, if any such surplus water is available, or (2) implementing a physical solution, such as the provision of replacement water, to prevent any injury to legal users and unreasonable harm that might otherwise result.

6.8.3 Availability of Surplus Water

MCWD asserts that there is no surplus water available for appropriation by Cal-Am in the 180/400 or Monterey Subbasins. (2023-11-13 MCWD's Closing Brief, p. 21.) MCWD relies on current conditions of overdraft in the subbasins and alleged increases in cross-boundary flows from the Monterey to the 180/400 Subbasin caused by the proposed project, to support its assertion. (*Ibid.*) We conclude that the overdrafted conditions of the subbasins is prima facie evidence that no surplus water is available for extraction, but this evidence must be considered with any other available evidence to determine whether the project Cal-Am proposes would injure existing users or cause unreasonable harm.

Where outflows from a groundwater system exceed inflows, the system is deficient. Groundwater basins with chronic groundwater deficits are commonly referred to as overdrafted. Chronic overdraft is evidence that extractions from the basin are exceeding the sustainable yield of the basin and that no surplus water is available for appropriation.

The 180/400 and the Monterey Subbasins are overdrafted subbasins, in which historic pumping levels have caused lowering of groundwater elevations, decreases in groundwater storage, and seawater intrusion. (SVBGSA Combined GSP 2020-0123, pp. 45 [1-1], 212 [6.8.5]; MCWD-60, p. 280 [Tbl. 6-4].) Because these are coastal subbasins, extractions of groundwater in excess of groundwater recharge generally cause ocean water to flow into hydrologically connected portions of the basin. (See, e.g., California's Groundwater Update 2020 (Bull. 118), p. 333 ["Seawater intrusion is the process of the natural seawater-freshwater interface migrating landward within a groundwater basin because of changes in the hydraulic gradient in the basin caused by groundwater extraction"].) The current conditions of overdraft in the 180/400 and Monterey Subbasins is general evidence that an additional draw from the subbasins, absent the implementation of some physical solution, would injure existing users or cause unreasonable harm. This evidence should be considered with other available project-specific evidence to determine whether injury to legal users or unreasonable harm will result from Cal-Am's proposed draw.

Cal-Am asserts that the relatively small amount of brackish groundwater that the proposed project will extract from the SVGB is "salvaged" water not of a quality suitable for any of the existing uses or users in the basin, and therefore, "surplus" water available for appropriation. (Cal-Am's Proposed Report of Referee, p. 139.) Cal-Am seems to take the position that this water should not be considered in the subbasin water budget to determine overdraft or sustainability because it is not suitable for use unless desalinated. But regardless of whether the brackish water is characterized as "salvaged" water and whether it is properly considered in the basin's water budget, Cal-Am concurs that the water is only "available for use by Cal-Am if such use can be made without injuring the Basin or other water rights holders." (Cal-Am Proposed Report Part 2, p. 141.)

MCWD relies on changes in cross-boundary flow from the Monterey to the 180/400 Subbasin, in addition to the general conditions of overdraft in these subbasins, to show that no surplus water is available for appropriation by Cal-Am. (2023-11-13 MCWD's Closing Brief, p. 21.) As addressed in Section 6.5.3, MCWD's analysis of changes in cross-boundary flow from the Monterey to the 180/400 Subbasin does not necessarily show an increase in net groundwater deficit to the Monterey Subbasin because MCWD did not consider corresponding changes in inflow to the subbasin. Therefore, MCWD's analysis does not directly address impacts from cross-boundary flow on the amount of surplus water or sustainable yield in the Monterey Subbasin.

6.8.4 Avoidance of Injury to Existing Uses and Users

Marina and MCWD allege that the proposed draw will injure MCWD's water rights and the water rights of other users of groundwater from wells in the 180/400 and Monterey Subbasins. (2023-11-13 MCWD's Closing Brief, pp. 28–29; MCWD-Marina Proposed Report Part 2, p. 109.)

As addressed in our response to Question 7, the proposed draw by Cal-Am is unlikely to cause a material or significant impact to the quantity or quality of water extracted by MCWD from its wells and is therefore not likely to injure MCWD in the exercise of its groundwater rights.

The evidentiary record does not address injury to any other legal users of water that may be affected by the proposed draw.[60] Although the evidence the parties submitted includes some general information about the existence of other wells, the record does not include sufficient information to determine whether injury may occur. (See 2013-07-31 SWRCB review of Cal-Am Monterey Peninsula Water Supply Project, p. 33 [approximately 14 wells are identified in the State Water Board's Groundwater Ambient Monitoring and Assessment Database within two miles of the proposed location of the slant wells, but "it is not clear how many other wells are located in this area, or at what depths the wells are screened"]; Exh. MCWD-150, pp. 7–8 [depicting modeled production wells, of which six wells in the 180-Foot Aquifer and approximately 50 wells in the 400-Foot Aquifer appear to be closer to the location of the proposed slant wells than MCWD's Wells 29, 30, and 31].) Such a determination would depend upon where any such wells are located, the aquifers from which the wells draw, the type and amount of the water right associated with the wells, the quantity and quality of water drawn from the wells, and the beneficial uses to which the extracted water is applied. Based on the model results, it is possible that Cal-Am's proposed extraction could impact groundwater conditions in the basin in proximity to the slant wells and injure the rights of other groundwater users. Absent more specific information about the location and nature of the alleged senior water right holders' extractions and use, we cannot offer more definitive conclusions about the risk of injury.

Cal-Am may, however, avoid injury to any such users of water — if there are legal users that might be injured by its proposed extraction – by reaching an agreement with the right holder or by providing replacement water of an appropriate quantity, quality, and location to offset the injury, in accordance with a physical solution.

6.8.5 Avoidance of Unreasonable Harm

MCWD and Marina assert that Cal-Am's proposed extraction will cause unreasonable harm to the 180/400 and Monterey Subbasins by causing further drawdown of groundwater levels, increases in TDS concentrations, and inland progression of the seawater intrusion front.[61] (2023-11-13 MCWD's Closing Brief, pp. 28–29.) Further, MCWD asserts that an inland progression of the seawater intrusion front beyond the "minimum threshold" identified in MCWD's groundwater sustainability plan makes Cal-Am's proposed extraction per se unreasonable under article X, section 2, of the

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[60] No such legal users (persons or entities other than MCWD who have groundwater rights in the SVGB) are parties to this proceeding.

[61] Marina also argues for the first time in comments on the Draft Report that Cal-Am's proposed extraction will cause unreasonable harm to the 180/400 Subbasin by causing significant and unreasonable impacts on beneficial uses supported by vernal pools and wetlands located within the City of Marina. (2025-01-31 City of Marina Comments on 12-31-24 Draft Report, pp. 61–62.)

California Constitution. (2025-01-31 MCWD's Objections and Comments to Draft Report, pp. 11–13.)

The groundwater sustainability plans for the 180/400 and Monterey Subbasins identify any landward advancement of the seawater intrusion contour, defined as an isoconcentration of 500 mg/L of chloride, as a significant and unreasonable impact. (Exh. MCWD-60, p. 357, Tbl. 8-1, pp. 396–397; SVBGSA Combined GSP 2020-0123, pp. 285 [8-31], 291 [8-37].) The model results show that there would likely be some advancement of the seawater intrusion front in the Monterey Subbasin caused by the proposed draw, absent remedial measures. Other modeled impacts, such as lowering of groundwater elevations in portions of the subbasins near the proposed slant wells, may also exceed quantitative thresholds for significant and unreasonable declines in groundwater elevations set in the subbasins' groundwater sustainability plans.

The quantitative thresholds for undesirable results set in the groundwater sustainability plans for the 180/400 and Monterey Subbasins are based on evidence compiled in the plans and the groundwater sustainability agencies'[62] understanding of local basin conditions. We consider the agencies' conclusions in these plans, which DWR has approved, to have significant persuasive value in identifying thresholds for unreasonable harm to the subbasin and these conclusions should be afforded deference. SGMA does not, however, contain any language establishing that every determination in a GSP is entitled to absolute judicial deference. Rather, SGMA requires that the judgment in a comprehensive adjudication must not "substantially impair" the ability of the GSA to achieve sustainable management. (Wat. Code, §10737.8; see also Code Civ. Proc., § 850, subd. (b).) And this proceeding is not a groundwater adjudication (see Section 2.6.3.) Accordingly, while some deference is appropriate, there is no basis for treating any deviation from the GSA's determinations as unreasonable per se.

To determine whether the impacts caused by the proposed draw would be unreasonable requires balancing of the benefits of the project, which would make ocean water available for beneficial use, against the potential injury to legal users of groundwater and the risk and significance of harm to the basin. (See *United States v. State Water Resources Control Bd.* (1986) 182 Cal.App.3d 82, 130 [describing the determination of an unreasonable method of use as "essentially a policy judgment requiring a balancing of the competing public interests"].) Such a balancing of factors was not directly addressed by the parties and would likely require a more expansive evidentiary record than was developed in this proceeding.

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[62] Marina Coast Water District Groundwater Sustainability Agency and the SVBGSA are the GSAs for the Monterey Subbasin.

Cal-Am defends that the brackish water that it will extract from the basin is salvaged water, and that this salvaged water is surplus to the demands of other users because it is not of a quality suitable for use. (Cal-Am's Proposed Report of Referee, p. 139.) The calculation of an OWP in Cal-Am's proposed draw that presumes a background concentration of 500 mg/L of TDS for non-ocean water, suggests that such water would be available to other users absent the proposed draw. This assumption supports the conclusion that the extracted water is neither salvaged nor developed. Salvaged or developed water is water made available through some intentional effort, and absent that effort, would not be available for beneficial use. (See Section 5.1.6.) For this reason, the person who makes such water available for use is entitled to a prior right to that water. If, absent Cal-Am's extraction, this relatively high quality groundwater would have been available to other legal users in the basin for beneficial use, it is not developed or salvaged by Cal-Am.

In the alternative, Cal-Am argues that its proposed draw will not harm the basin because Cal-Am will provide replacement water to the SVGB in the amount it extracts pursuant to the Return Water Settlement Agreement (see Section 2.4.3.) (2023-11-13 Cal-Am's Proposed Report of Referee, p. 149.) Cal-Am submitted two model scenarios that incorporate the Return Water Settlement Agreement (RWSA) with project operations, which assume 6 percent and 9 percent of the water extracted from the slant wells would be returned to the basin in the Castroville area. (Exh. Cal-Am-177, pp. 156–159, 169, 170.) These model runs show some difference in groundwater elevations but do not address changes in water quality, and these results do not change the conclusion in this report that the record is not adequate to determine whether the proposed draw will cause unreasonable harm.

The model results show that Cal-Am's proposed draw will cause some lowering of groundwater elevations, declines in groundwater quality, and further progression of seawater intrusion in portions of the 180/400 and Monterey Subbasins, as discussed in our responses to the court's Questions 4 and 5. These model results are evidence tending to show that the proposed project may cause unreasonable harm to the basin absent the provision of replacement water or another type of physical solution.[63] Cal-Am may be able to prevent any unreasonable harm to the subbasins that results from operation of the slant wells by providing replacement water in an appropriate quantity, quality, and location to offset the expected impacts, as discussed in the following

[63] The model results also show, however, that in some areas within the 180/400 Subbasin, operation of the project may cause the seawater intrusion isocontour to move seaward, benefitting conditions in the basin. This benefit should be considered in determining whether the impacts are, overall, unreasonable.

section. The details of any such physical solution necessary to avoid unreasonable harm would, however, require additional evidence.

6.8.6 Physical Solution

Cal-Am may be able to demonstrate that its project would not injure existing users or cause unreasonable harm to the basin by providing replacement water to potentially affected users in the basin, which might include MCWD, in conjunction with ongoing monitoring to ensure that the replacement water is supplied in an adequate quantity, quality, and location. The provision of replacement water is a physical solution that could allow Cal-Am to lawfully make the proposed draw, even if the proposed extraction would otherwise cause injury or unreasonable harm. (See Section 5.3.) The State Water Board's 2013 final staff report similarly concluded that "[a] physical solution could be implemented to ensure all rights are protected while maximizing the beneficial uses of the Basin's waters." (2013-07-31 SWRCB review of Cal-Am Monterey Peninsula Water Supply Project, pp. 49–50.) "Adoption of a physical solution is consistent with the constitutional goal of promoting maximum beneficial use of the State's water resources." (State Water Board Decision 1631, § 2.5 at p. 10.)

The hearing officer directed the parties to address the applicability of the physical solution doctrine to the operation of Cal-Am's proposed project in their draft reports of referee. MCWD argued only that "no physical solution has been proposed or discussed that would mitigate the harm that the Project will cause MCWD and other users in the Monterey Subbasin," not that a physical solution could not adequately address the alleged injury to water users and harm to the basin. (2023-11-13 MCWD's Closing Brief, p. 33.) Marina similarly asserts that "Cal-Am has never proposed a physical solution to MCWD or the City of Marina." (Marina Closing Brief, p. 110.)

Cal-Am asserts that certain "protective measures" already incorporated into its project would "prevent and address any potential, *unforeseen*, detrimental impacts," and would operate "analogous to the water law concept of a 'physical solution.'" (2023-11-13 Cal-Am's Proposed Draft Referee's Report, p. 149.) These protective measures include the Return Water Settlement Agreement, pursuant to which Cal-Am will provide replacement "fresh" water to the basin, a Mitigation, Monitoring, and Reporting Program required by the CPUC, and a similar monitoring and mitigation program imposed by the California Coastal Commission. The mitigation and monitoring programs require ongoing monitoring and remedial actions by Cal-Am if monitoring demonstrates injury to other groundwater users from operation of the proposed slant wells or exceedance of certain groundwater quality thresholds.

Under the Return Water Settlement Agreement, Cal-Am will supply water to the Castroville Community Services District and agricultural water to the Castroville Seawater Intrusion Project. Both recipients are in the northern portion of the 180/400

Subbasin. Cal-Am will supply water in an amount equal to the percentage of water of a quality of less than 500 mg/L of TDS ("fresh" water) that would effectively be extracted from the basin by the slant wells, based on the calculation methodology included in the agreement. (2018-09-20 CPUC Dec. 18-09-017, pp. 2, 111, 161, 207 & 215; Exh. Cal-Am-67.) The return water agreement offsets this "fresh" water drawn from the basin by providing usable water in lieu of pumping by other groundwater users. As described by Cal-Am, the return water would "put the [SVGB] in a 'no net loss' position in terms of fresh water quantity." (2023-11-13 Cal-Am's Proposed Draft Referee's Report, p. 150 [citing the FEIR/EIS, p. 4.4-70].) Cal-Am submitted model results that show that with implementation of the Return Water Settlement Agreement the change in groundwater elevation in the 180-Foot Aquifer in the vicinity of the MCWD supply wells would be less than half a foot. (Exh. Cal-Am-177, p. 159.)

Marina objects that even if the Return Water Agreement results in "no net loss" to the basin, the water provided from the project under the Agreement would not address alleged impacts to the Monterey Subbasin because the return water will be provided to users in the northern 180/400 Subbasin. (2023-11-13 City of Marina's Closing Brief, p. 110.) Marina's objection is likely valid. Even if the amount of replacement water provided by Cal-Am is sufficient to maintain the balance of water stored in the basin overall, the location where Cal-Am will deliver any replacement water is relevant to whether the water will offset potential injury to water users or localized harm to the basin. Based on the evidentiary record in this proceeding and the areas of modeled potential impact, replacement water provided by Cal-Am to locations within the Monterey Subbasin or the southern portion of the 180/400 Subbasin may be necessary to offset some of the effects of the proposed draw. For example, Cal-Am might deliver replacement water to MCWD in lieu of pumping from its own wells to mitigate impacts to the basin.

Marina also argues that the amount of return water to be provided under the agreement is insufficient because the calculation methodology fails to address extraction of water from the basin that exceeds 500 mg/L in TDS, and the potential beneficial uses of that water. (2023-11-13 City of Marina's Closing Brief, p. 112.) Marina does not appear to consider that the water Cal-Am would provide under the Return Water Settlement Agreement will be of a quality of 500 mg/L or less of TDS. This relatively high-quality water could be mixed with brackish water to produce a larger amount of lower-quality water. The evidentiary record before us is not, however, adequate to reach any definitive conclusions about the details of a physical solution, such as the amount, quality, and location of replacement water necessary to avoid injury to existing users or unreasonable harm to the basin or monitoring necessary to ensure that the solution is effective.

6.8.7 Monitoring and Adaptive Management

The conclusions reached in this report rely heavily on the results of the highly complex and sophisticated modeling the parties conducted. There are inherent uncertainties in this type of modeling, as the models rely on a series of assumptions and extrapolations from limited known data to project the likely impact of the proposed project on a highly complex underground system of aquifers. Furthermore, the models were developed with limited time and resources, and likely could be improved in future iterations. Yet, we conclude that the methodologies employed in developing these models meet scientific standards and the model results are the most reliable information the parties offered about the expected impacts of the project.

There is a reasonable likelihood that the actual impacts of the project will be either greater or less than the modeled range. Not only are the models themselves imperfect, but there are numerous other future conditions that were not incorporated into the models that could affect groundwater within the basin during the operation of the project. Monitoring and incremental management actions based on monitoring results, often called adaptive management, might address this uncertainty to prevent injury to MCWD's water rights or other those of other legal users, and unreasonable harm to the basin.

The concept of adaptive management arises from the recognition that natural resources are generally complex systems of which our knowledge is inherently uncertain. Adaptive management approaches are intended to "mitigate the difficulty of predicting the outcome of decisions that must be made based on currently available but incomplete information ... [by] provid[ing] policymakers with some assurance that they will have the flexibility to respond if their initial assumptions and projections about future resource conditions were misinformed or they were incapable of foreseeing the flow of future events." (Glicksman & Page, *Adaptive Management and NEPA: How to Reconcile Predictive Assessment in the Face of Uncertainty with Natural Resource Management Flexibility and Success* (2022) 46 Harv. Env't L. Rev. 121, 125.)

Although the model results the parties submitted in this proceeding show that the proposed draw from the slant wells is unlikely to injure MCWD's water rights, contingent actions triggered by observed conditions could provide further assurance that the proposed draw will not injure MCWD's or other legal users' water rights or cause unreasonable harm. Monitoring and reporting of the effects of pumping by Cal-Am's proposed wells at key locations could show whether the range of impacts predicted by the models are reflected in actual conditions. If the empirical data collected through monitoring shows changes in groundwater conditions that differ from those predicted by the models, additional management actions, such as restrictions on pumping from the slant wells, may be necessary to prevent injury or other unreasonable results.

An adaptive management plan would also likely be necessary to ensure that any physical solution will prevent, in application, injury to legal users and unreasonable harm. The amount, quality, and location of any replacement water supplied by Cal-Am would likely need to be re-evaluated over time, first to ensure that the replacement water is effectively addressing impacts that might otherwise result, and secondly, to address changing conditions that may affect the impacts of the proposed draw on the basin.

6.8.8 Conclusion

To make the proposed extraction, Cal-Am may be able to develop a new appropriative water right or obtain an existing appropriative water right. In either circumstance, Cal-Am bears the burden of demonstrating that its proposed draw will not injure other existing users or cause unreasonable harm. Although Cal-Am has demonstrated through modeling that the proposed draw will not injure MCWD's water rights, and Marina has not exercised any claimed rights to groundwater, the potential impacts to other users in the basin are not fully addressed in the record for this proceeding. Secondly, the modeling results show that Cal-Am's proposed draw may cause unreasonable harm in portions of the 180/400 and Monterey Subbasins. Cal-Am's Return Water Agreement might not be sufficient to offset these potential impacts.

Both the injury to unknown existing users and any unreasonable harm to the basin might be addressed with a physical solution. It is possible that provision of an appropriate quantity and quality of replacement water to relevant locations would prevent injury to other legal users and avoid unreasonable harm. A monitoring and adaptive management program, similar to that already required by the CPUC and California Coastal Commission, could help determine whether the replacement water is remedying any injury to legal users and unreasonable harm that might otherwise be caused by the proposed draw. Such a program could also verify whether the results of the groundwater models presented in this proceeding captured the range of impacts to the basin caused by operation of the slant wells.

7 CONCLUSION

<u>Question 1:</u> Where are the subsurface drawing source points (including capture zones) for each of the currently proposed Cal-Am wells located in relation to:

a. seawater in the ocean itself;

The locations of the subsurface drawing source points for the proposed slant wells are the locations of the screened intervals of the wells. Figure 6, reproduced below, depicts the Board's estimate of offshore and onshore lengths and proportions of screened intervals for Slant Wells 2 through 7 and the Test Slant Well.

Well	Well Casing Interval Lengths[2] (feet)			Length of Screened Interval Offshore[3] (feet)	Offshore and Onshore Well Screen Lenths (feet) and Proportions for 400 ft. Total Well Screen Length				Offshore and Onshore Well Screen Lenths (feet) and Proportions for 800 ft. Total Well Screen Length			
	Total Length	Offshore	Onshore		Total Length[4]	Proportion Offshore	Onshore Length[5]	Proportion Onshore	Total Length[4]	Proportion Offshore	Onshore Length[5]	Proportion Onshore
SW-2	970	63	907	59	400	15%	341	85%	800	7%	741	93%
SW-3	966	202	764	190	400	47%	210	53%	800	24%	610	76%
SW-4	961	162	799	152	400	38%	248	62%	800	19%	648	81%
SW-5	961	130	831	122	400	31%	278	69%	800	15%	678	85%
SW-6	961	174	787	164	400	41%	236	59%	800	20%	636	80%
SW-7	957	225	732	212	400	53%	189	47%	800	26%	589	74%
Average	963	159	803	150	400	37%	250	63%	800	19%	650	81%
Test Slant Well[1]	720	180	540	170	415	41%	245	59%				

[1] The dimensions of the well casing intervals for the Test Slant Well are decribed in Appendix E3 part 1 of the EIR/EIS.
[2] The dimensions of the well casing intervals for Slant Wells 2 through 7 are listed in Table 3-2 of the EIR/EIS.
[3] The lengths of the screened intervals located offshore is calculated as the offshore lengths of well casings multuplied by 0.94.
[4] The total length range of screened intervals for Slant Wells 2 through 7 from EIR/EIS p. 3-18 for Slant Wells 2 through 7.
[5] The length of well screen intervals located onshore is calculated as the length of the well screen interval located offshore subtracted from the total length of the screened intervals.

Figure 6 - Offshore and onshore lengths and proportions of screened intervals for Slant Wells 2 through 7 and Test Slant Well

MCWD's depiction of the capture zones in Figure 11, reproduced below, addresses the court's question about the locations of the capture zones in relation to the features and locations the court identified. Generally, the capture zones extend from the drawing source points toward the direction of higher groundwater elevations within each aquifer in and around the CEMEX Property, within the Subbasin Interface Zone, and in the Monterey and 180/400 Subbasins near the boundary between the subbasins. In the Lower 180-Foot and 400-Foot Aquifers, most of the area of the capture zones extends west underneath the ocean beyond the MHW Line, and so are not within the boundaries of the groundwater basin or subbasins, beneath the CEMEX Property, or within the Subbasin Interface Zone. In the Dune Sand Aquifer, the capture zone extends inland in the area surrounding the CEMEX Property in the 180/400 and Monterey Subbasins.

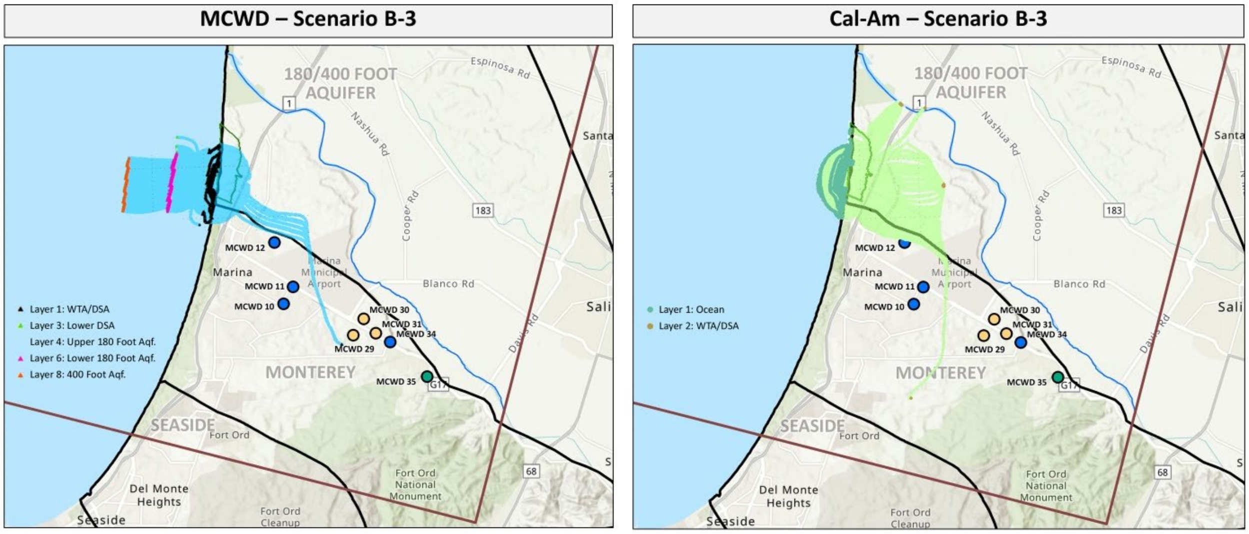

Figure 11 - Capture zones in the Dune Sand, 180-Foot, and 400-Foot Aquifers submitted by MCWD. (Exh. MCWD-161, p. 2.)

b. *drawing source points for the Marina Coast Water District ("MCWD") production wells;*

See Figure 6 and Figure 11, reproduced above.

c. *the Subbasin Interface Zone;*

Figure 9, reproduced below, depicts the location of the proposed slant wells in relation to the Subbasin Interface Zone (depicted in yellow).

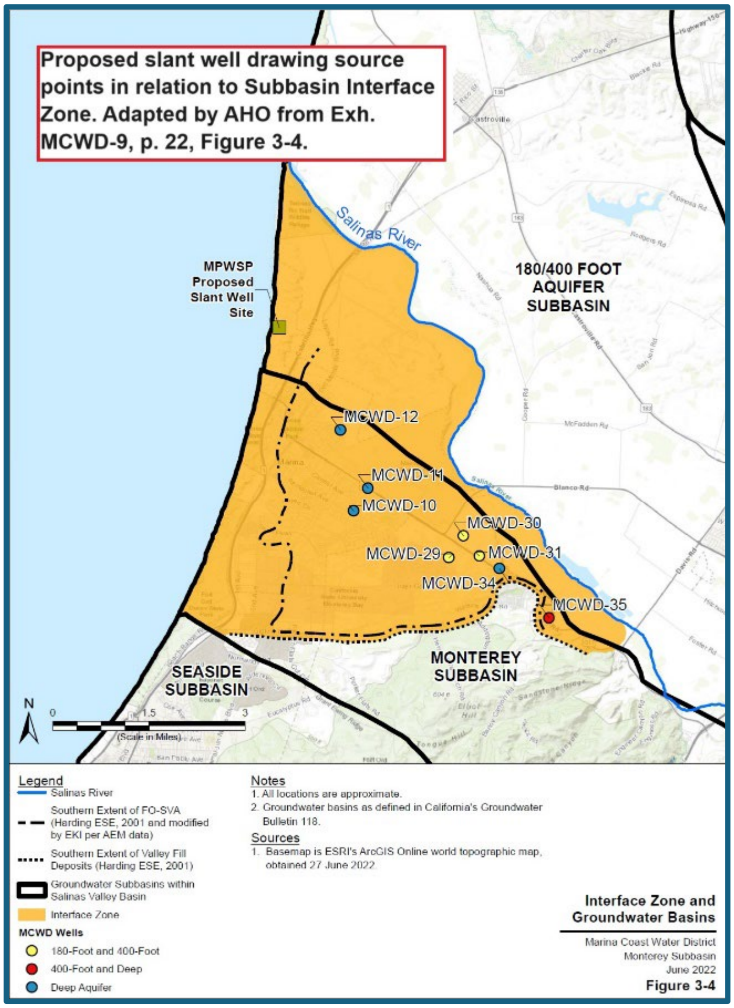

Figure 9 - Proposed slant wells in relation to the Subbasin Interface Zone

d. the 180/400-foot Aquifer Subbasin;

See Figure 6 and Figure 11, reproduced above.

e. the Monterey Subbasin;

See Figure 6 and Figure 11, reproduced above.

f. the Cemex property;

See Figure 6 and Figure 11, reproduced above.

g. the MCWD wells.

See Figure 6 and Figure 11, reproduced above.

<u>Question 2:</u> ***Would water drawn by any of the currently proposed Cal-Am wells come from any source other than seawater from directly beneath the Ocean?***

Yes.

If so, from which sources? And which if any of these sources lie in whole or in part beneath the Cemex property?

The sources of water can be described by the locations within the aquifers from which the proposed slant wells would draw water. The water drawn by the proposed slant wells will come from locations within the Dune Sand and 180-Foot Aquifers both onshore (beneath the CEMEX Property) and offshore (beneath the ocean).

The sources of water drawn by the proposed slant wells can also be described by the location of the origin of the water. The water either originates from the ocean or from sources other than the ocean.

If so, can one approximate with reasonable certainty in what quantities the water would be drawn from each source? Can this be expressed in percentages?

We cannot calculate with any reasonable certainty the quantities of water drawn from screened intervals located onshore versus offshore based on the evidence in the record.

We can approximate a range of quantities of water that would be drawn from the Dune Sand Aquifer, which we consider to be a minimum amount of water drawn from screened intervals located beneath the CEMEX Property. Under the 15.5 mgd project alternative, approximately 3,300 to 7,600 afy will be drawn by the wells from the Dune Sand Aquifer. Under the 11.6 mgd project alternative, the proposed project will pump a total of 12,993 afy, of which approximately 2,500 to 5,700 afy will be drawn from the Dune Sand Aquifer.

We estimate that approximately 90 to 92 percent of the water drawn by the proposed project will originate from the ocean. Under the 15.5 mgd project alternative, approximately 15,625 to 15,973 afy of water will originate from the ocean, and 1,389 to 1,736 afy of water will originate from sources other than the ocean. Under the 11.6 mgd project alternative, approximately 11,693 to 11,953 afy of water will originate from the ocean, and 1,039 to 1,299 afy of water will originate from sources other than the ocean.

If so, do the relative amounts drawn from each source vary depending upon amounts drawn by the slant wells?

The relative amounts of total project pumping drawn from the Dune Sand Aquifer beneath the CEMEX Property, or from the ocean versus non-ocean sources, do not vary depending on the total project pumping amounts.

If so, can it be said with reasonable certainty that the amount drawn by the Cal-Am wells will not exceed 500 acre-feet per year ("afy") from any water source beneath the Cemex property?

We cannot say with reasonable certainty that the amount drawn by the Cal-Am wells *will not exceed* 500 afy from any source beneath the CEMEX Property. To the contrary, the evidence strongly supports the conclusion that the amount drawn by the proposed slant wells will significantly exceed 500 afy from beneath the CEMEX Property.

<u>**Question 3:**</u> ***What is the hydrogeological connectivity, if any, between the areas from which Cal-Am proposes to draw water and the areas from which MCWD extracts water?***

In the area where the proposed slant wells will draw water, the Dune Sand Aquifer and the 180-Foot Aquifer are connected. There is no evidence of any barrier preventing horizontal flow within the 180-Foot Aquifer between this area and the MCWD Wells in the 180-Foot Aquifer. There is also hydrologic connectivity between the proposed slant wells and the MCWD wells in the 400-Foot Aquifer, but this connectivity is less than the connectivity between the proposed slant wells and the MCWD wells in the 180-Foot Aquifer. None of the parties assert that there is connectivity between the proposed slant wells and the MCWD production wells screened in the Deep Aquifer.

The proposed slant wells would be located in the 180/400 Subbasin and MCWD's wells are in the Monterey Subbasin. There is connectivity in these aquifers between the area in the 180/400 Subbasin where the proposed slant wells would draw water and the area in the Monterey Subbasin where MCWD's production wells draw water.

<u>**Question 4:**</u> ***Is it likely that any of the proposed draw for the Cal-Am wells would (a.) result in or (b.) increase any seawater intrusion into the Subbasin Interface Zone, the 180/400 Foot Aquifer or the Monterey Aquifer, or any source for the MCWD production wells? If so, what is the likely extent of the intrusion?***

It is likely the proposed draw will result in seawater intrusion in the central and southern sections of the Monterey Subbasin in the following aquifers and magnitudes: between 0 and 0.5 miles in the Dune Sand Aquifer; up to 0.75 miles in the Upper 180-Foot Aquifer; up to 0.25 miles in the Lower 180-Foot Aquifer; and between 0 and 0.25 miles in the 400-Foot Aquifer. We also conclude that it is not likely that the proposed draw will result in or increase seawater intrusion in any aquifer in any portion of the 180/400 Subbasin, or in any aquifer in the northern portion of the Monterey Aquifer Subbasin.

Figure 22, reproduced below, summarizes our conclusions based on the model results for each area in each aquifer considered in this section.

	Aquifer	Dune Sand	Upper 180-Foot	Lower 180-Foot	400-Foot
	Section of the 1,500 mg/L isocontour	Range or Maximum Inland Movement of Seawater Intrusion Front (miles)			
180/400-Foot Aquifer Subbasin	(1) - Northern and central	None	None	None	None
	(2) - Southern near the subbasin boundary	None	None	None	None
Monterey Subbasin	(3) - Northern near the subbasin boundary	None	Inconclusive	None	None
	(4) - Southern and central	Between 0 and 0.5	Up to 0.75	Up to 0.25	Between 0 and 0.25

Figure 22 - Summary of Seawater Intrusion Conclusions

<u>Question 5:</u> *Is it likely that any of the proposed draw will (a) lower the groundwater table or (b) reduce the storage space in any source other than seawater, and if so, can the extent be approximated?*

Figure 27, reproduced below, summarizes the drawdown predicted by each model for each of the areas defined by our analysis, in each aquifer.

Aquifer	Dune Sand		180-Foot		400-Foot	
Model	MCWD/Marina	Cal-Am	MCWD/Marina	Cal-Am	MCWD/Marina	Cal-Am
Location	Drawdown Range (Feet)					
Immediate vicinity of the proposed slant wells	10 to 20	10 to 20	10 to 20	10 to 20	1 to 5	0.5 to 1
West of Highway 1 near the proposed slant wells	5 to 10	5 to 10	5 to 10	5 to 10	1 to 5	0.5 to 1
Between Highway 1 and MCWD Well 12	1 to 5	1 to 5	1 to 5	1 to 5	1 to 5	0.5 to 1
Between MCWD Well 12 and MCWD Well 30	0.5 to 1	Less than 0.1	1 to 5	0.5 to 1	1 to 5	0.5 to 1
Between MCWD Well 30 and MCWD Well 34	0.1 to 0.5	Less than 0.1	0.5 to 1	0.5 to 1	0.5 to 1	0.5 to 1
Near MCWD Well 35	0.1 to 0.5	0.1 to 0.5	0.1 to 0.5	0.1 to 0.5	0.1 to 0.5	0.1 to 0.5

Figure 27 - Model predicted drawdown summary.

Based on the model results the parties presented, we conclude that the draw of the proposed slant wells will lower the groundwater table or potentiometric surface in sources other than seawater. The drawdown in each aquifer is largest near the proposed slant wells and generally declines across the area between the proposed slant wells and MCWD Well 35. In the Dune Sand and 180-Foot Aquifers, drawdown ranges from a maximum of 10 to 20 feet in the immediate vicinity of the proposed slant wells, to a minimum of less than half a foot near MCWD Well 35. In the 400-Foot Aquifer, the drawdown ranges from a maximum of one to five feet in the immediate vicinity of the proposed slant wells, to a minimum of less than half a foot near MCWD Well 35.

Question 6: ***Has MCWD been pumping water from the Subbasin Interface Zone and, if so, for approximately what period of time?***

All of MCWD's production wells are located within the areal extent of the Subbasin Interface Zone. The district has been pumping groundwater since it was formed in 1960 and has used groundwater from the Subbasin Interface Zone since that time. MCWD provided pumping records for calendar years 2006 through 2020 by well, subbasin location, screening depth, and volume in Exhibit MCWD-8.

Question 7: ***What effect, if any, would the proposed draw by Cal-Am slant wells have upon any primary or paramount water right of Marina or MCWD? What impact on quantity and quality of the water sourced by MCWD wells is likely?***

Based on the model results and the evidentiary record, the proposed draw by the slant wells will not injure or infringe upon any water rights held by MCWD or Marina. The declines in groundwater level and water quality at the location of MCWD's wells that may result from the proposed draw would not prevent MCWD from extracting the volume of water to which it has a right, increase the cost of pumping or treatment, or otherwise cause significant and material impacts to MCWD's exercise of its rights. Marina has not demonstrated that it is exercising any rights to groundwater in the basin that could be injured.

Question 8: ***Does SWRCB have an opinion as to whether: there is any legal theory upon which Cal-Am may rely to extract the proposed draw; and whether the proposed Cal-Am extraction would infringe upon MCWD's appropriative rights to groundwater?***

The proposed draw from Cal-Am's wells would primarily consist of water originating from the Pacific Ocean but would include some amount of water originating from the SVGB. Cal-Am's proposed 15.5 mgd project would pump 17,362 afy in total, of which approximately 1,389 to 1,736 afy (8 percent to 10 percent) will be water from sources other than the ocean (i.e., water from the SVGB). We conclude that Cal-Am may lawfully extract this ocean water as proposed. We also conclude that Cal-Am may extract groundwater from the SVGB if the extraction neither (1) injures other legal users of water nor (2) causes unreasonable harm to the basin, but there is insufficient evidence in the record to conclude whether the proposed draw is likely to injure legal users of water who are not parties to this proceeding or cause unreasonable harm. To avoid injury or harm, Cal-Am could be required by the court to provide replacement water or take other action pursuant to a physical solution to offset impacts from the proposed extraction.

8 GLOSSARY – TECHNICAL CONCEPTS AND TERMS

In this report we discuss technical concepts and terms related to hydrogeology, groundwater pumping, and groundwater modeling. While we do not intend this report to be a technical reference, we describe in this section the concepts and terms necessary for our analysis of the testimony of the parties' technical experts and our responses to the court's questions.

8.1 Hydrogeology Terms

Hydrogeology is the study of groundwater that exists beneath the Earth's surface in saturated soil or rock formations. The terms below are commonly used in hydrogeology.

Aquifer

An aquifer is an underground layer of rock or sediment that can be saturated or partially saturated with water. Aquifers are typically made of porous materials and are permeable, which means that water can flow relatively easily through them.

Aquitard

An aquitard, also known as a confining layer, is an underground layer of rock or sediment that is less permeable than an aquifer.

Aquifer, Confined

A confined aquifer is a fully saturated aquifer with confining layers above and below it. Because the upper boundary is confined, water in the aquifer is pressurized and a reduction in pressure does not necessarily lower the elevation of the upper boundary.

Aquifer, Unconfined

An unconfined aquifer is an aquifer without a confining layer above it. The groundwater table is the upper boundary and can be raised or lowered depending on recharge and withdrawal of water.

Capture Zones

A capture zone for a well, as we use the term in this report, is the three-dimensional spatial extent within an aquifer containing water that will eventually be drawn into the well. The extent of a capture zone can be approximated by modeling using a method known as reverse particle tracking.

The simplest example of a capture zone is a single vertical well extracting water from an aquifer with a uniform groundwater flow direction. In this example, the capture zone extends from the area near the well toward higher groundwater elevations (see figure below, adapted by AHO from 2008-01-29 USEPA - 2008 - Capture Zones.)

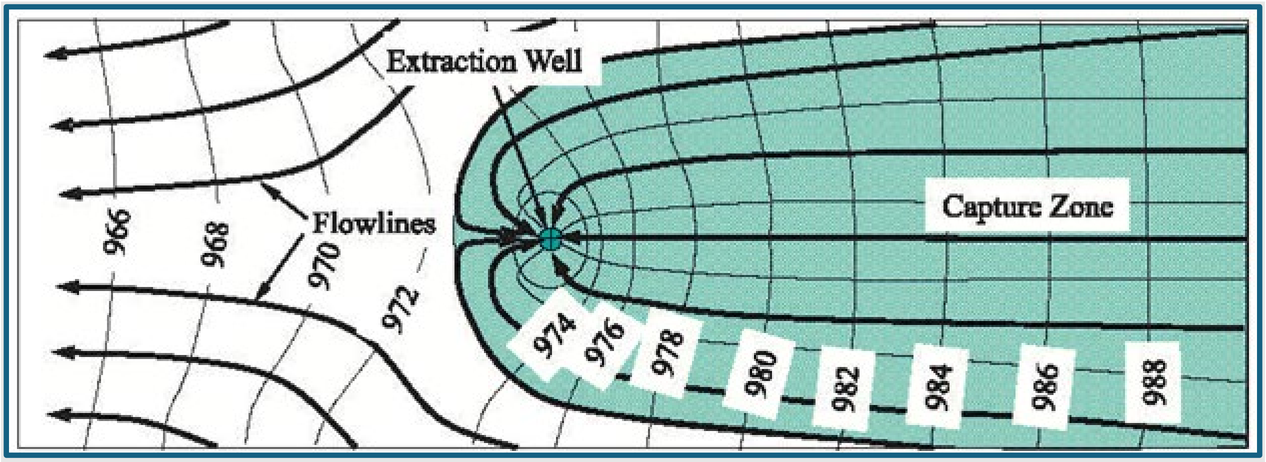

Illustration of a map view of a capture zone with a uniform groundwater flow direction

The flow conditions in the area where the proposed slant wells will extract water, however, are more complex. The proposed slant wells will draw water from more than one aquifer with different hydraulic gradients and flow directions, which requires a more sophisticated analysis to identify the anticipated capture zone. We discuss the capture zones for the proposed slant wells in our response to the court's Question 1 in Section 6.1.2.

Connectivity

Connectivity in a groundwater system is a broad term that encompasses how well water and solutes can move and interact within the system. In this report, we discuss three related and sometimes overlapping types of connectivity for aquifers: hydrologic, hydraulic, and hydrogeologic connectivity.

Drawdown

We use the term "drawdown" to describe both lowering of the elevation of the groundwater table in an unconfined aquifer and lowering the potentiometric surface in a confined aquifer caused by groundwater pumping.

Hydraulic Connectivity

Hydraulic connectivity in an aquifer refers to the ability of water to move within the aquifer, that is, how well different parts of the aquifer are connected for water flow.

Hydrologic Connectivity

Hydrologic connectivity in an aquifer refers to how well an aquifer is connected to other water bodies, including surface water, or parts of the hydrologic cycle.

Hydrogeologic Connectivity

Hydrogeologic connectivity is similar to hydrologic connectivity but specifically focuses on the connections between groundwater and other geologic features within a groundwater system. It describes how well water and solutes can move and interact between different parts of the groundwater system.

Hydraulic Gradient

Hydraulic gradient is the rate of change of hydraulic head over a distance. It is commonly estimated as the slope of the water table in unconfined aquifers or the slope of the potentiometric surface in confined aquifers. Groundwater naturally flows along the hydraulic gradient from areas with higher hydraulic head to areas with lower hydraulic head.

Hydraulic Head

Hydraulic head in an aquifer refers to the total energy possessed by a unit volume of groundwater at a specific point. It considers two key components of groundwater energy: elevation head and pressure head. Elevation head represents the potential energy due to the height of the water table or the groundwater level relative to a reference point, often sea level. Pressure head represents the energy due to the pressure exerted by the water itself.

Potentiometric Surface

A potentiometric surface is a reference water surface defined by the hydraulic head of groundwater throughout an aquifer. It is primarily used to describe the virtual elevation of the water surface in confined aquifers, which may be higher than the actual surface due to pressure head.

Seawater Intrusion

Seawater intrusion is a general term for the movement of saline oceanic water into freshwater aquifers. In this proceeding, we consider seawater intrusion to be present in areas within an aquifer if the chloride concentration is greater than 500 mg/L, as defined in the Groundwater Sustainability Plans for the Monterey and 180/400 Subbasins. (Exh. MCWD-44, p.16.)

Water Table

A water table is a term used to describe the depth at which groundwater pressure head is equal to atmospheric pressure. The elevation of the water table is the elevation of the water surface of an unconfined aquifer.

8.2 Groundwater Modeling Terms

In this section, we identify some fundamental groundwater modeling concepts and terms necessary for our analysis.

Boundary Conditions

Boundary conditions are the model inputs representing the exchange of flow between the model and the external system. These conditions can be imported from other models, estimated from field data, or defined by the modeler.

Density-Dependent Flow Model

A density-dependent flow model is a type of solute transport model that accounts for different densities of groundwater and how dissolved chemical concentrations influence the density of groundwater, which in turn, affect the hydraulic gradient and groundwater flow. For example, density of a dependent flow model can account for the higher density of seawater versus freshwater and is commonly used to model seawater intrusion into coastal groundwater basins.

Groundwater Flow Model

A groundwater flow model simulates groundwater movement and hydraulic head in a groundwater system and can be used to estimate changes in groundwater flow and head caused by pumping.

Hydrogeologic Conceptual Model

A hydrogeologic conceptual model is a generalized representation of the major properties and processes at work in a groundwater system. It is informed by available data and expert knowledge about hydrologic processes. This preliminary representation helps modelers estimate and predict the characteristics of the groundwater system.

Model Calibration

Model calibration is a standard procedure where a model is run for a historical period and model outputs are compared to actual historical data from the groundwater system of interest. The aim of calibration is to refine estimates of model inputs that cannot be measured directly, or for which direct measurements are relatively uncertain.

Model Domain

A model domain is the geographic area simulated by a model. It defines the boundaries within which the model considers the movement and behavior of groundwater.

Model Inputs

Model inputs are the values of the parameters used by the model to simulate groundwater conditions. Input parameters include geologic and hydrogeologic properties, boundary conditions, and operational inputs which represent human-made influences on the aquifer, such as pumping or recharge activities.

Particle Tracking and Reverse Particle Tracking

The extent of a capture zone for a well can be approximated by modeling using a method known as reverse particle tracking. This method runs the model in reverse and tracks the paths of particles from the point of capture at the well to their location at the start of the model run.

Steady-State Model

A steady-state groundwater model simulates long-term average conditions at infinite time with constant recharge and discharge values. It does not account for seasonal, year-to-year, or long-term climate fluctuations or changes in recharge or discharge.

A steady-state model is generally less complex and resource intensive to develop than a transient model and is appropriate when the objectives of the investigation do not require information about the time it takes for the system to respond to new stresses or how the system responds between periods of relative equilibrium.

Solute Transport Model

A solute transport model builds on a flow model to simulate movement of dissolved chemical constituents, such as salinity, in a groundwater system and can be used to estimate movement of seawater intrusion.

Superposition Model

A superposition model simulates a groundwater system response due only to the stresses imposed by a proposed project by holding all boundary conditions, recharge, and other discharge values to zero. They do not calculate absolute values for groundwater levels, but only the changes in these values.

Transient Model

A transient groundwater model simulates conditions at defined time-steps over a defined time with variable recharge and discharge values. They can account for seasonal, year-to-year, and long-term climate fluctuations or changes in recharge or discharge.

A transient model is generally more complex and resource intensive to develop than a steady state model and is appropriate when the objectives of the investigation require information about the time it takes for the system to respond to new stresses or how the system responds between periods of relative equilibrium.

Zone Budget Analysis

A zone budget analysis is a technique to quantify the flow of water into or out of defined regions or zones in a model domain. The boundaries of each zone can be further split into reaches to account for flows across each reach.

9 APPENDIX A – FIGURES

Appendix A - Figures

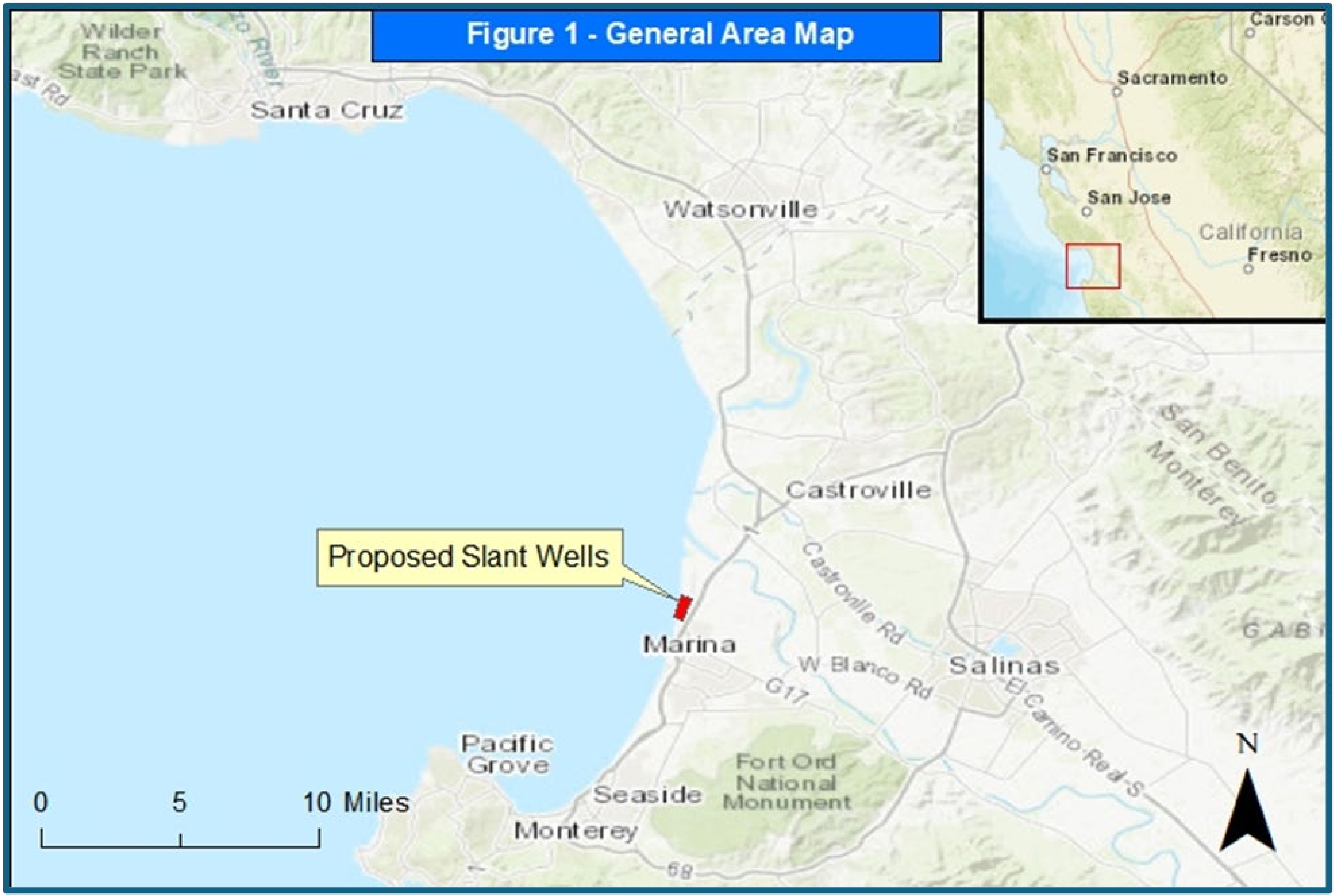

Figure 1 – General Area Map

Appendix A - Figures

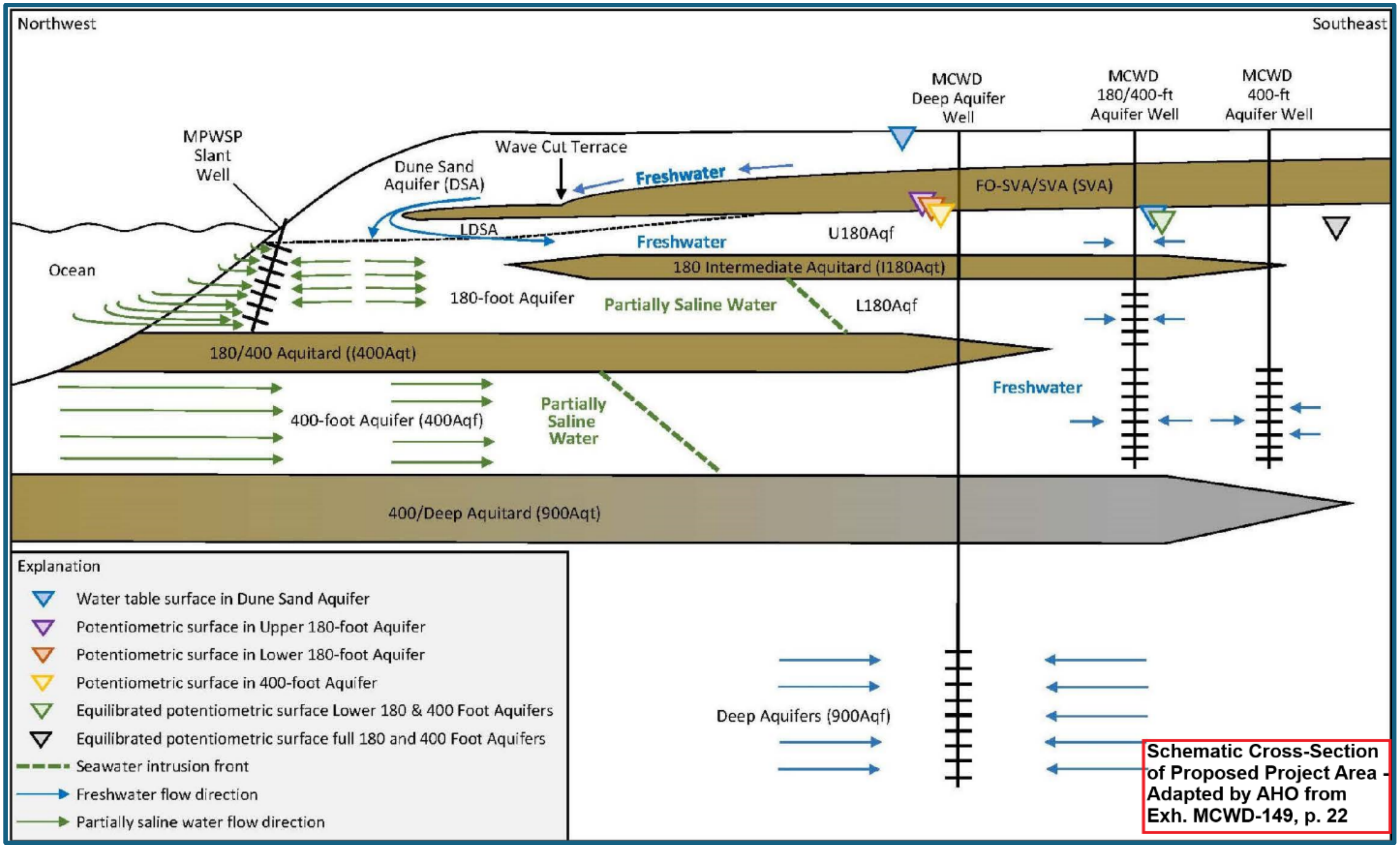

Figure 2 – Schematic cross-section showing hydrogeologic features in the area of the proposed project

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Cal-Am MPWSP Slant Well Pumping Rate	Calibration and SGMA Implementation Scenarios			
	Option A	Option B	Option C	Option D
	WY 2019-2021 Calibration, No SGMA Implementation	WY 2009-2021 Base Period, No SGMA Implementation	WY 2009-2021 Base Period, Cal-Am SGMA Implementation	WY 2009-2021 Base Period, MCWD/Marina SGMA Implementation
None	A1	B1	C1	D1
11.6 MGD Slant Well Pumping (for 4.8 MGD Production)	A2	B2	C2	D2
15.5 MGD Slant Well Pumping (for 6.4 MGD Production)	A3	B3	C3	D3

Figure 3 – WBSSM Predictive Model Scenarios (adapted from 2023-03-07 Post-Hearing Order, p. 3.)

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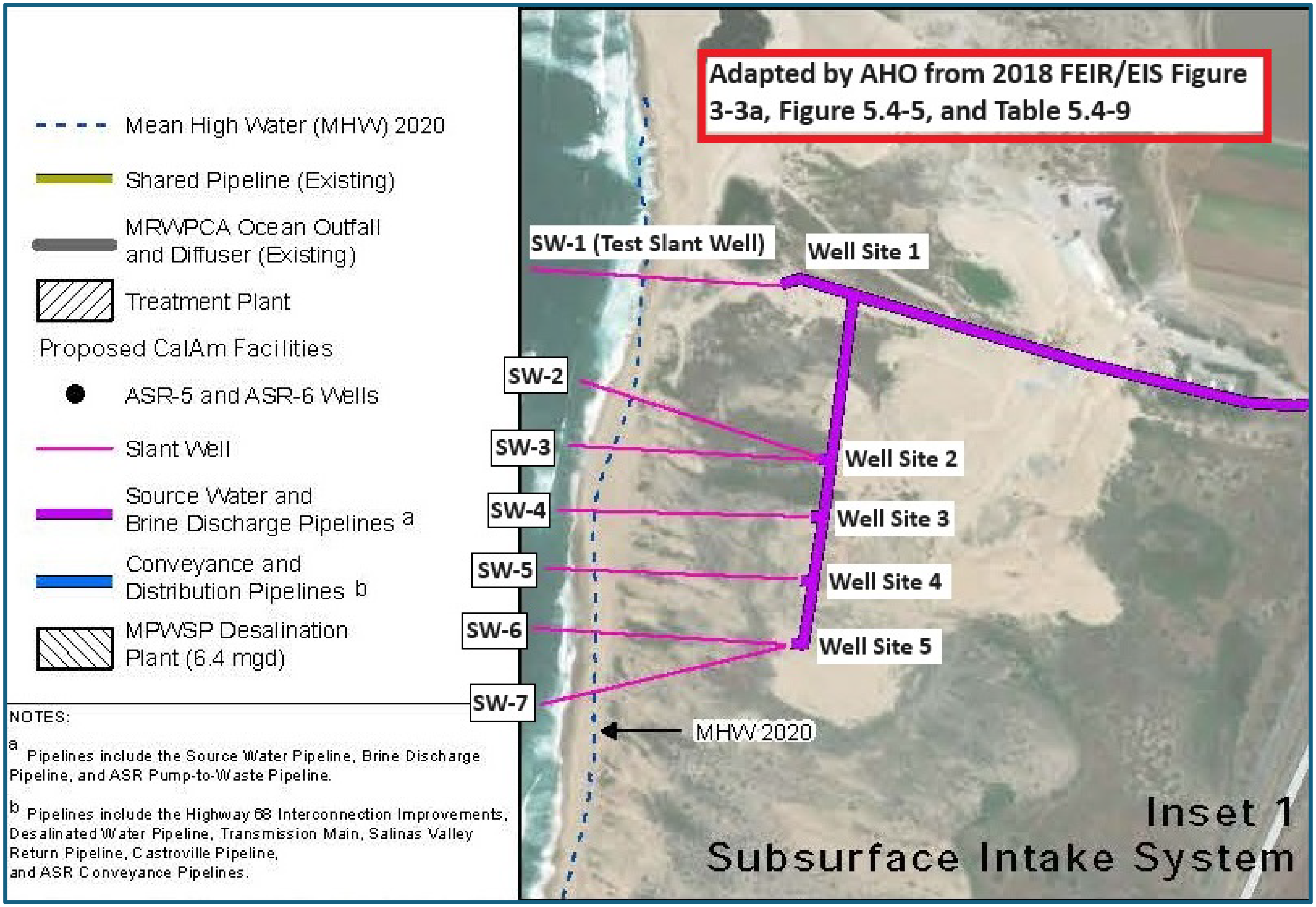

Figure 4 – Approximate locations of proposed slant wells

Appendix A - Figures

Adapted by AHO From Draft EIR/EIS, Table 3-2, p. 3-19

LENGTH OF PERMANENT SLANT WELLS SEAWARD OF MEAN HIGH WATER LINE

Well	Total Length	2020		2040		2060	
		Offshore	Onshore	Offshore	Onshore	Offshore	Onshore
Test Slant Well, SW-1	685	166	519	290	395	423	262
SW-2	970	63	907	219	751	385	585
SW-3	966	202	764	325	641	455	511
SW-4	961	162	799	292	669	431	530
SW-5	961	130	831	254	707	385	576
SW-6	961	174	787	298	663	428	533
SW-7	957	225	732	347	610	479	478

NOTES:

All lengths in feet.
MHW = Mean high water - A tidal datum. The average of all the high water heights observed over the National Tidal Datum Epoch. The 2020 MHW at the Monterey Tide Gauge NOAA#9413450 equals 1.53 m (5.02 ft) NAVD88, considering a high sea level rise scenario of 8.1 cm (3.2 in) by 2020 (5.46 ft by 2100). See also Appendices C1 and C2.

The lengths provided in this table indicate the total length of the well casing extending seaward of the MHW line. Because the slant wells would be drilled at an approximately 14-degree angle, the total horizontal distance seaward of the MHW line would be slightly shorter than the length of the well casing. The total horizontal distance seaward of the MHW line can be determined by dividing the length by 1.03.

SOURCE: Geoscience, 2017

Figure 5 – Proposed slant well casing dimensions

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Well	Well Casing Interval Lengths[2] (feet)			Length of Screened Interval Offshore[3] (feet)	Offshore and Onshore Well Screen Lenths (feet) and Proportions for 400 ft. Total Well Screen Length				Offshore and Onshore Well Screen Lenths (feet) and Proportions for 800 ft. Total Well Screen Length			
	Total Length	Offshore	Onshore		Total Length[4]	Proportion Offshore	Onshore Length[5]	Proportion Onshore	Total Length[4]	Proportion Offshore	Onshore Length[5]	Proportion Onshore
SW-2	970	63	907	59	400	15%	341	85%	800	7%	741	93%
SW-3	966	202	764	190	400	47%	210	53%	800	24%	610	76%
SW-4	961	162	799	152	400	38%	248	62%	800	19%	648	81%
SW-5	961	130	831	122	400	31%	278	69%	800	15%	678	85%
SW-6	961	174	787	164	400	41%	236	59%	800	20%	636	80%
SW-7	957	225	732	212	400	53%	189	47%	800	26%	589	74%
Average	963	159	803	150	400	37%	250	63%	800	19%	650	81%
Test Slant Well[1]	720	180	540	170	415	41%	245	59%				

[1] The dimensions of the well casing intervals for the Test Slant Well are decribed in Appendix E3 part 1 of the EIR/EIS.

[2] The dimensions of the well casing intervals for Slant Wells 2 through 7 are listed in Table 3-2 of the EIR/EIS.

[3] The lengths of the screened intervals located offshore is calculated as the offshore lengths of well casings multuplied by 0.94.

[4] The total length range of screened intervals for Slant Wells 2 through 7 from EIR/EIS p. 3-18 for Slant Wells 2 through 7.

[5] The length of well screen intervals located onshore is calculated as the length of the well screen interval located offshore subtracted from the total length of the screened intervals.

Figure 6 – Offshore and onshore lengths and proportions of screened intervals for Slant Wells 2 through 7 and Test Slant Well

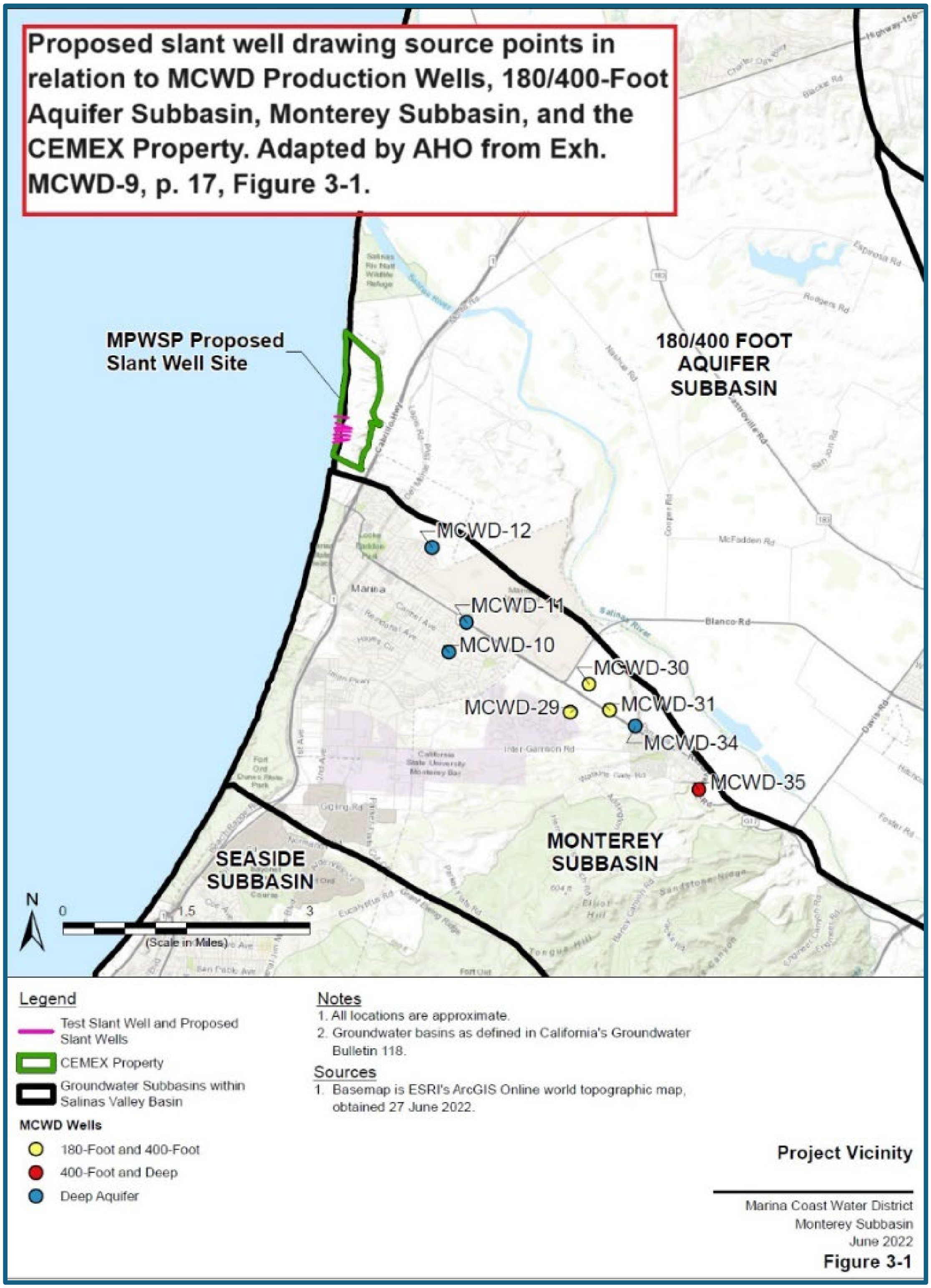

Figure 7 – Location of the proposed slant wells in relation to the MCWD production wells, 180/400-Foot Aquifer Subbasin, Monterey Subbasin, and CEMEX Property

MCWD Well Number	Screened Aquifers	Distance to Test Slant Well (miles)
10	Deep	3.1
11	Deep	2.9
12	Deep	1.9
29	180-Foot/400-Foot	4.5
30	180-Foot/400-Foot	4.4
31	180-Foot/400-Foot	4.8
34	Deep	5.1
35	400-Foot/Deep	6.2

Figure 8 – Table showing distances between the Test Slant Well and MCWD production wells

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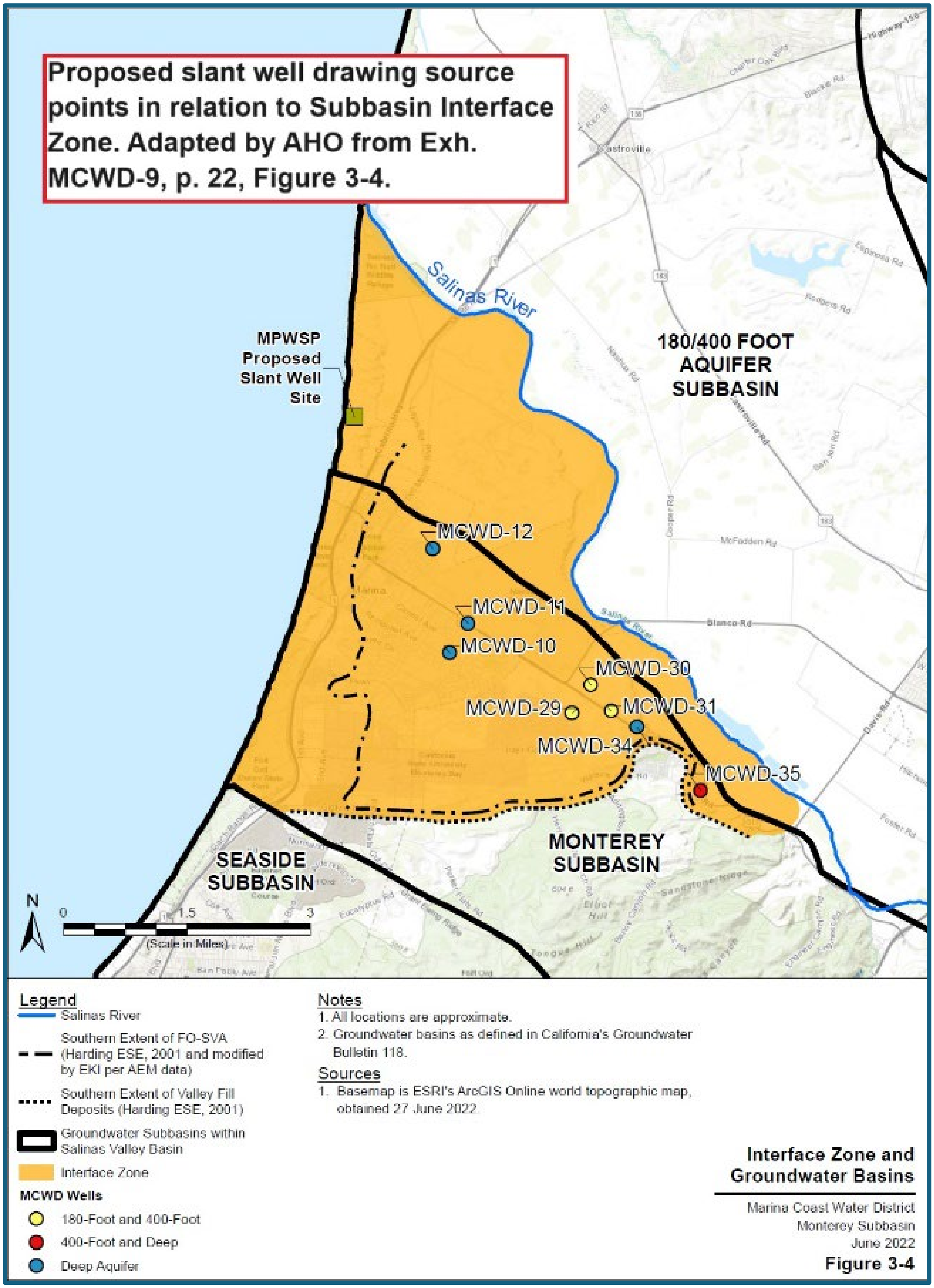

Figure 9 – Proposed slant wells in relation to the Subbasin Interface Zone

Appendix A - Figures

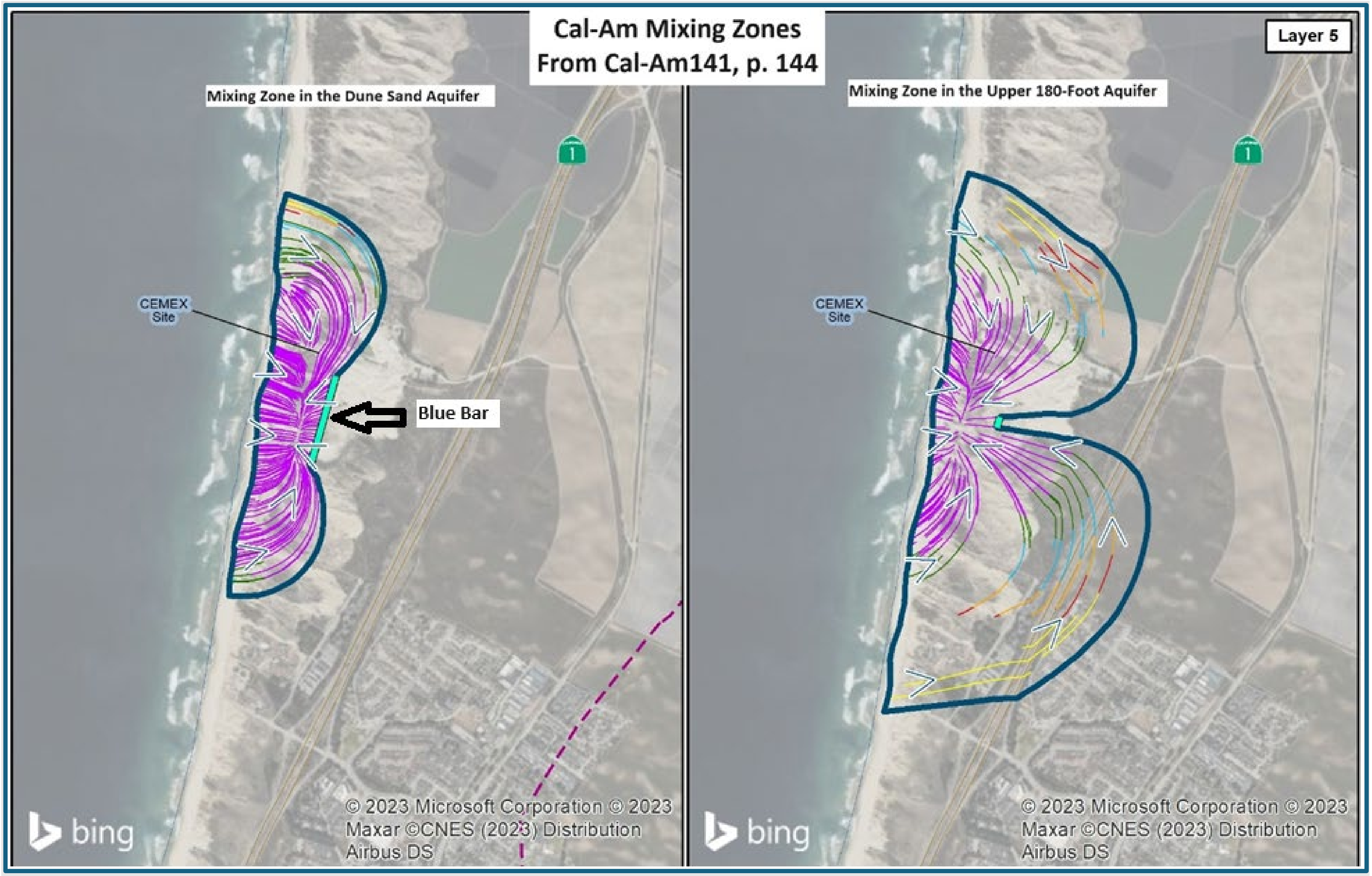

Figure 10 – Mixing zones in the Dune Sand and 180-Foot Aquifers submitted by Cal-Am (Exh. Cal-Am-141, p.144)

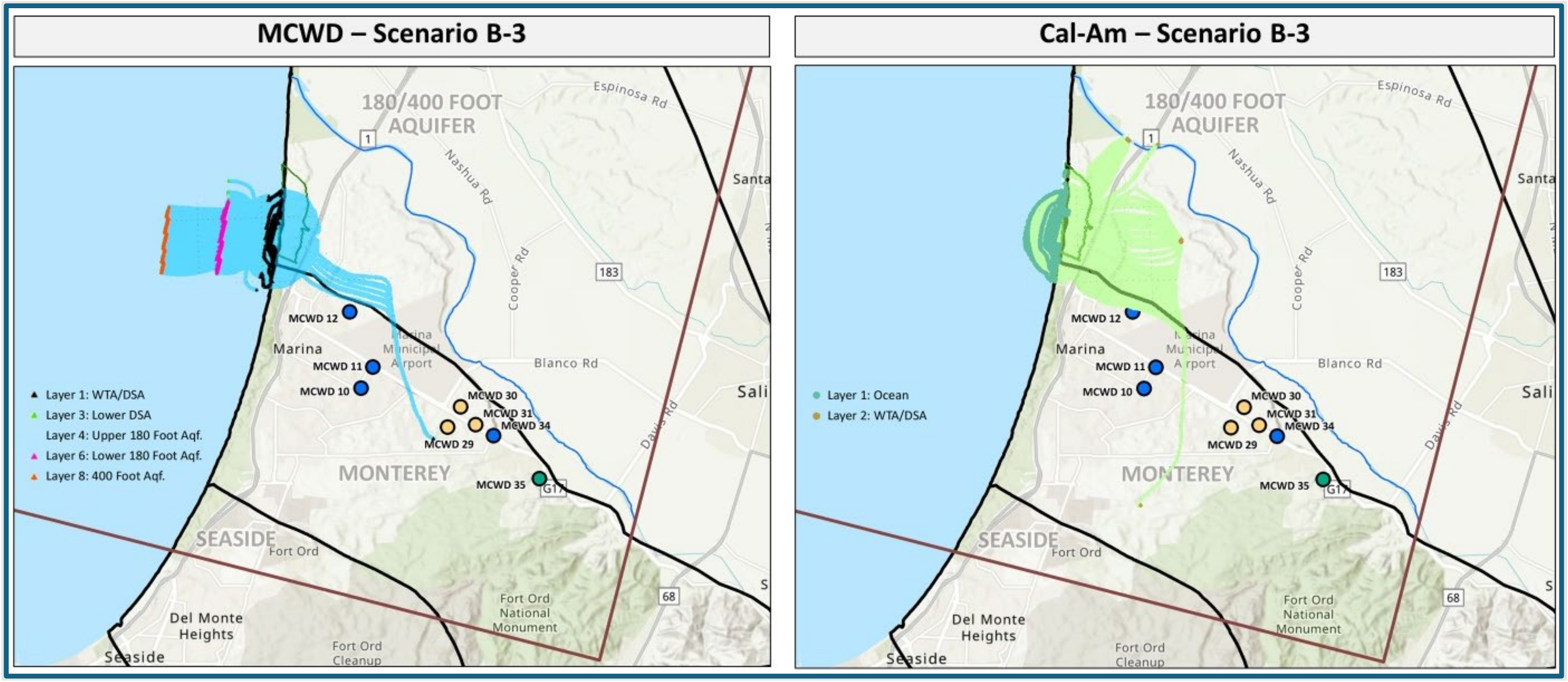

Figure 11 – Capture zones in the Dune Sand, 180-Foot, and 400-Foot Aquifers submitted by MCWD (Exh. MCWD-161, p. 2)

Source: Exh. Marina 2, Table 1, p. 8.

Table 1 - Length of Permanent Slant Wells Seaward of Mean High-Water Line

Well	Total Length (ft)	2020 Offshore (ft)	2020 Onshore (ft)	% Screen Offshore
Test Slant Well, SW-1	685	166	519	24%
SW-2	970	63	907	6%
SW-3	966	202	764	21%
SW-4	961	162	799	17%
SW-5	961	130	831	14%
SW-6	961	174	787	18%
SW-7	957	225	732	24%
SW-8	955	257	698	27%
SW-9	970	228	742	24%
SW-10	970	0	970	0%

Modified from Geoscience (2017) and EIR (2018).
1. "% Screen Offshore" indicates the % of the well screen, as a % of total length, that is offshore, seaward of the mean high tide water line.
2. The lengths provided in this table indicate the total length of the well casing extending seaward of the MHW line. Because the slant wells would be drilled at an approximately 14-degree angle, the total horizontal distance seaward of the MHW line would be slightly shorter than the length of the well casing. The total horizontal distance seaward of the MHW line can be determined by dividing the length by 1.03.

Figure 12 – Proposed slant well dimensions - (Exh. Marina-2, Tbl. 1, p. 8)

Appendix A - Figures

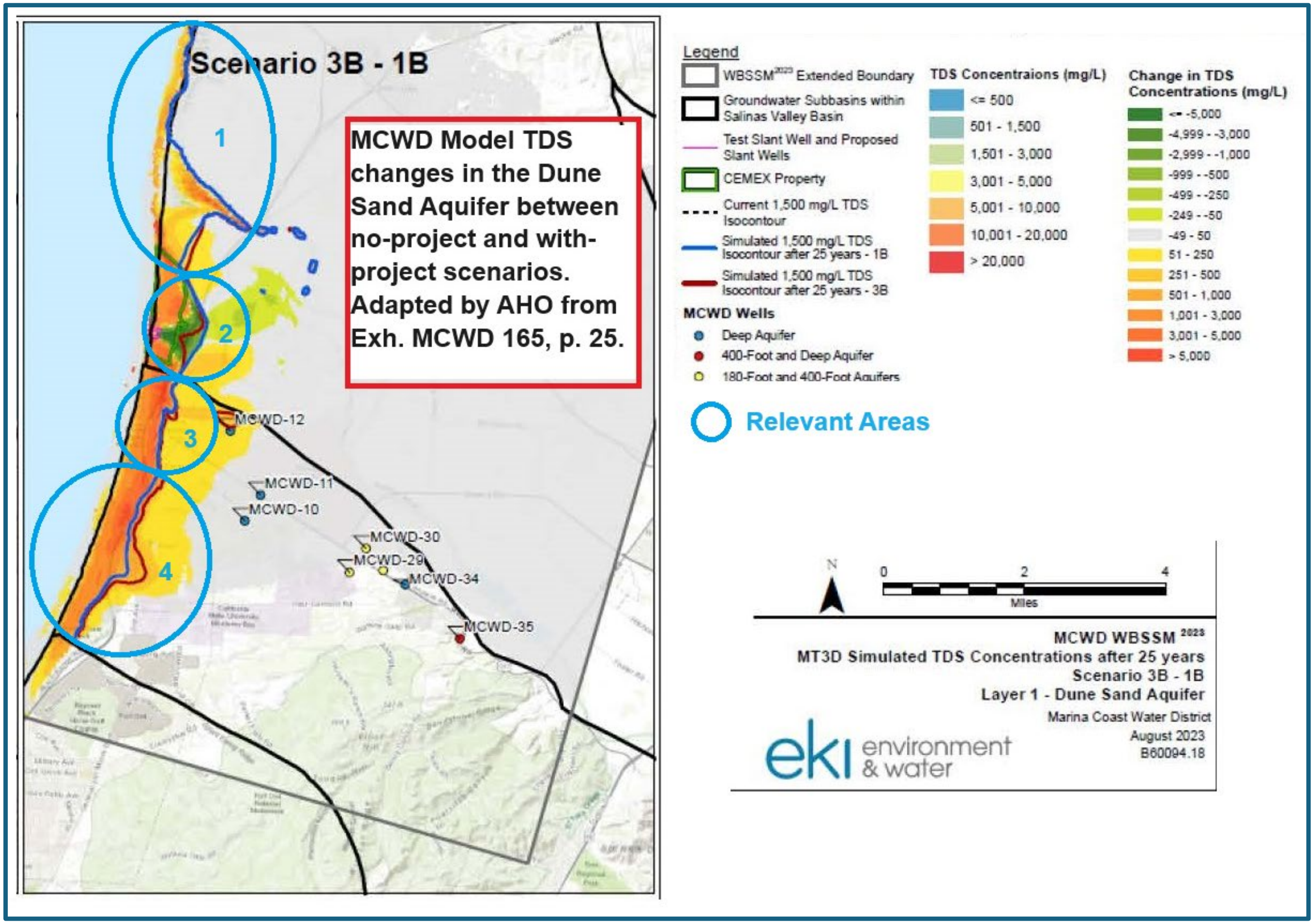

Figure 13 – MCWD model predicted TDS changes between no project and with project scenarios in the Dune Sand Aquifer

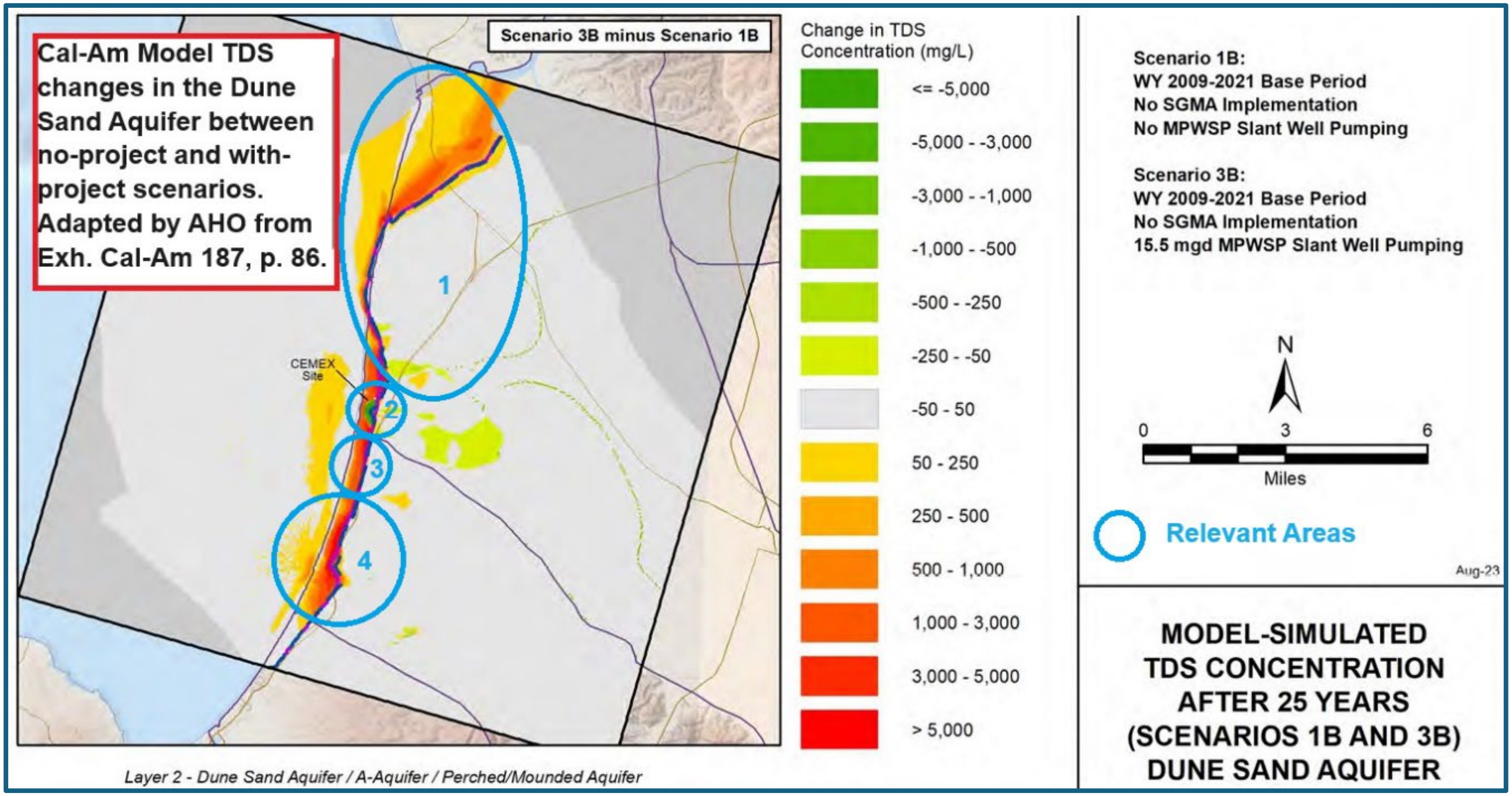

Figure 14 – Cal-Am model predicted TDS changes between no project and with project scenarios in the Dune Sand Aquifer

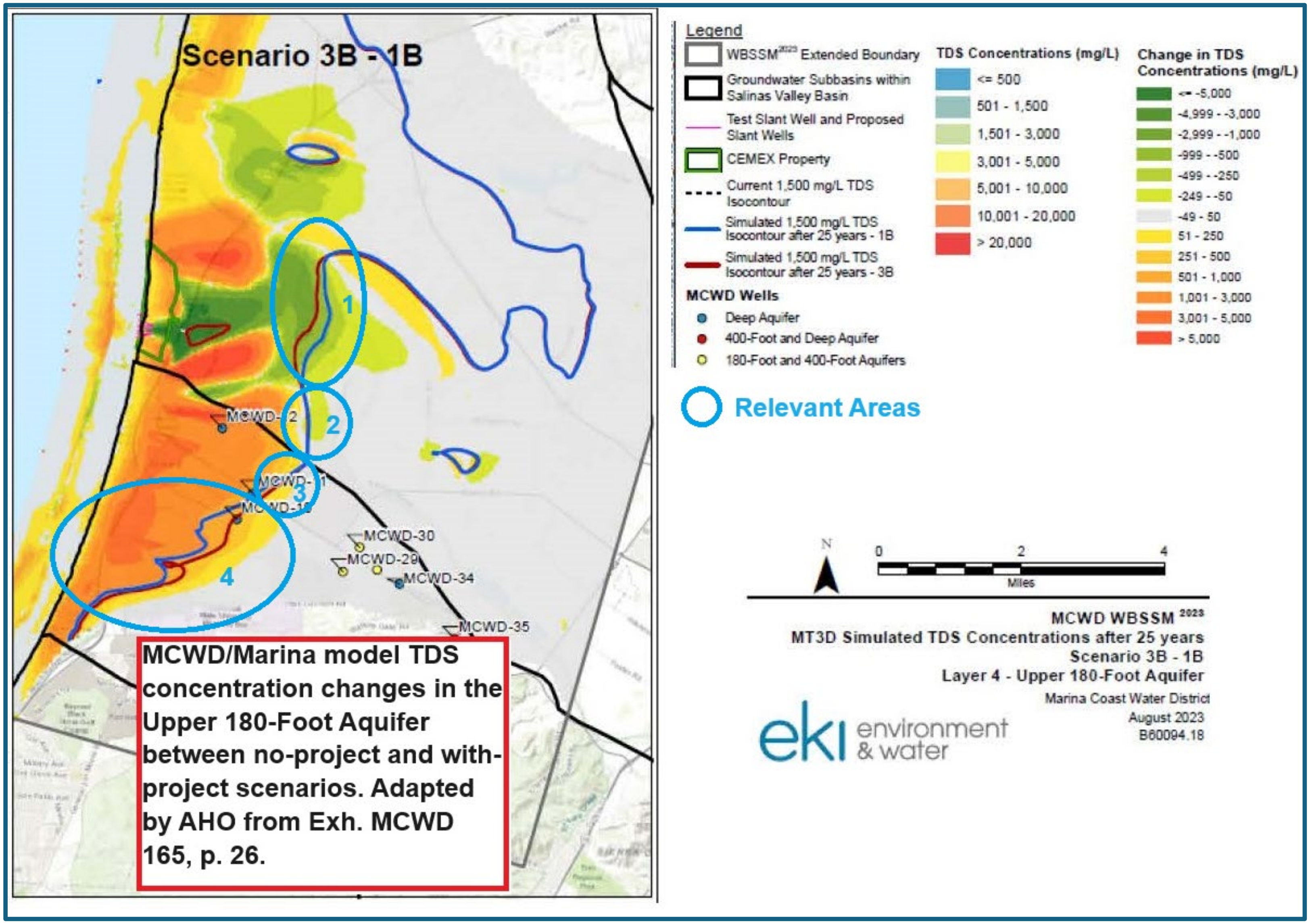

Figure 15 – MCWD model predicted TDS changes between no project and with project scenarios in the Upper 180-Foot Aquifer

Appendix A - Figures

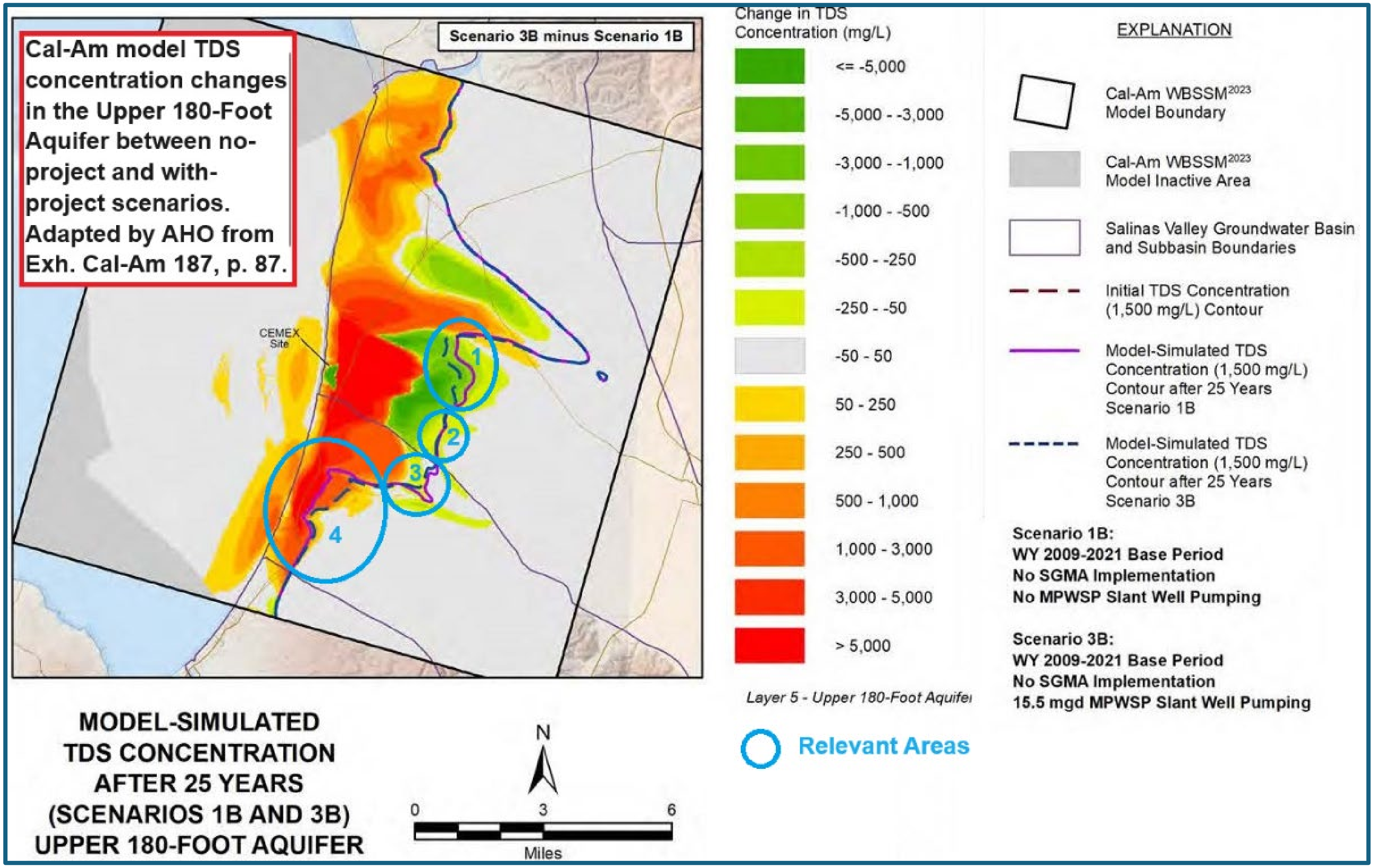

Figure 16 – Cal-Am model predicted TDS changes between no project and with project scenarios in the Upper 180-Foot Aquifer

Appendix A - Figures

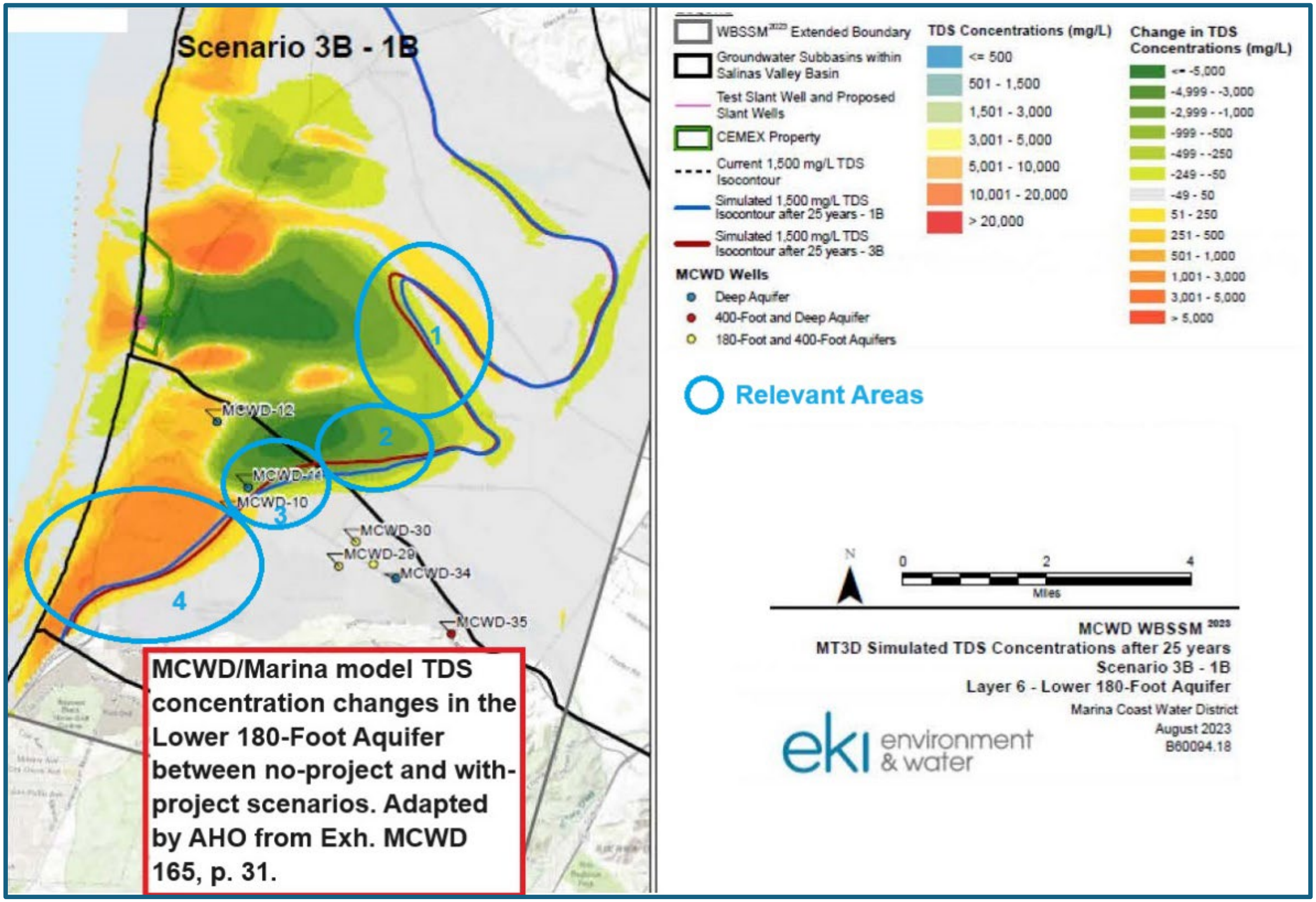

Figure 17 – MCWD model predicted TDS changes between no project and with project scenarios in the Lower 180-Foot Aquifer

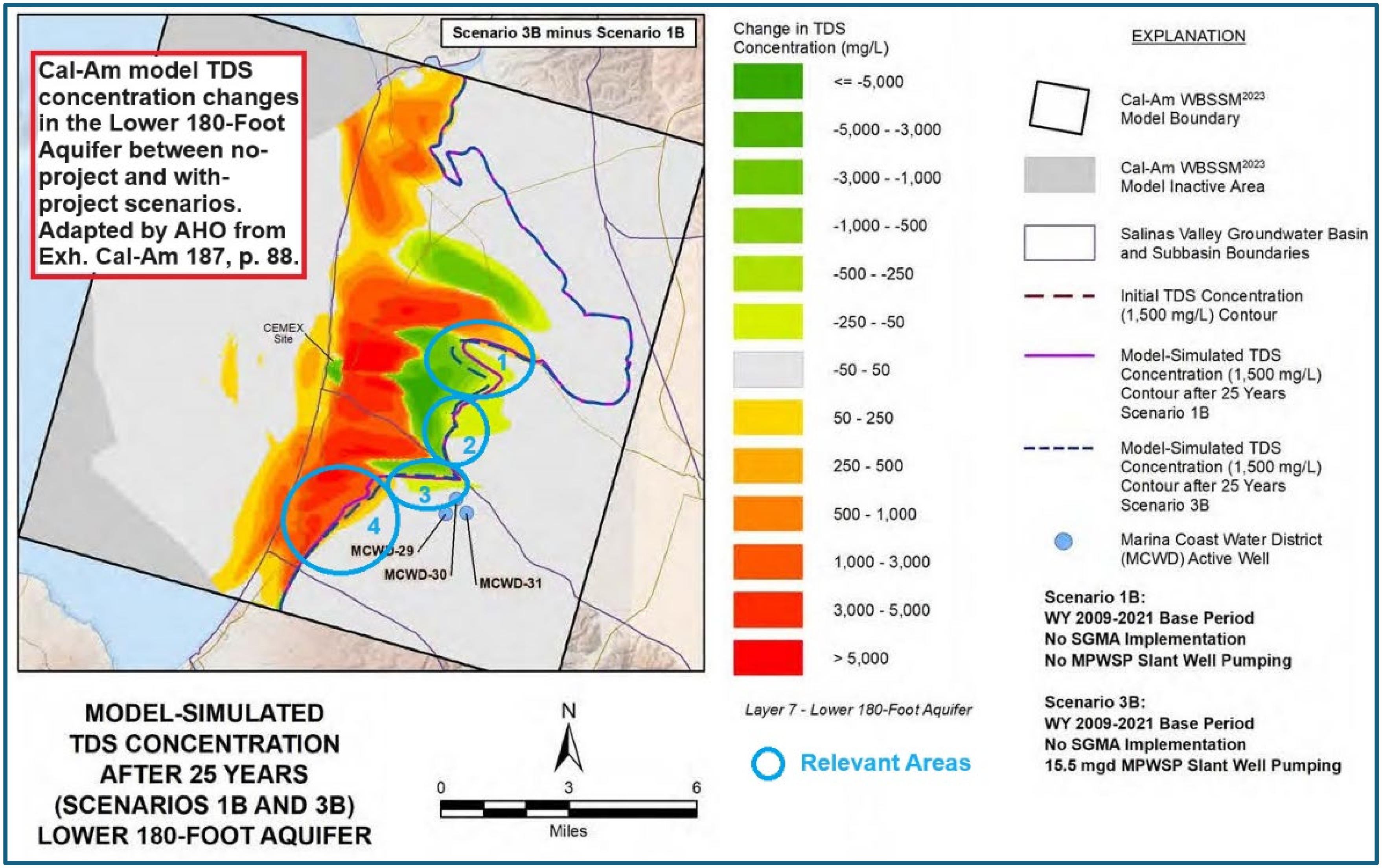

Figure 18 – Cal-Am model predicted TDS changes between no project and with project scenarios in the Lower 180-Foot Aquifer

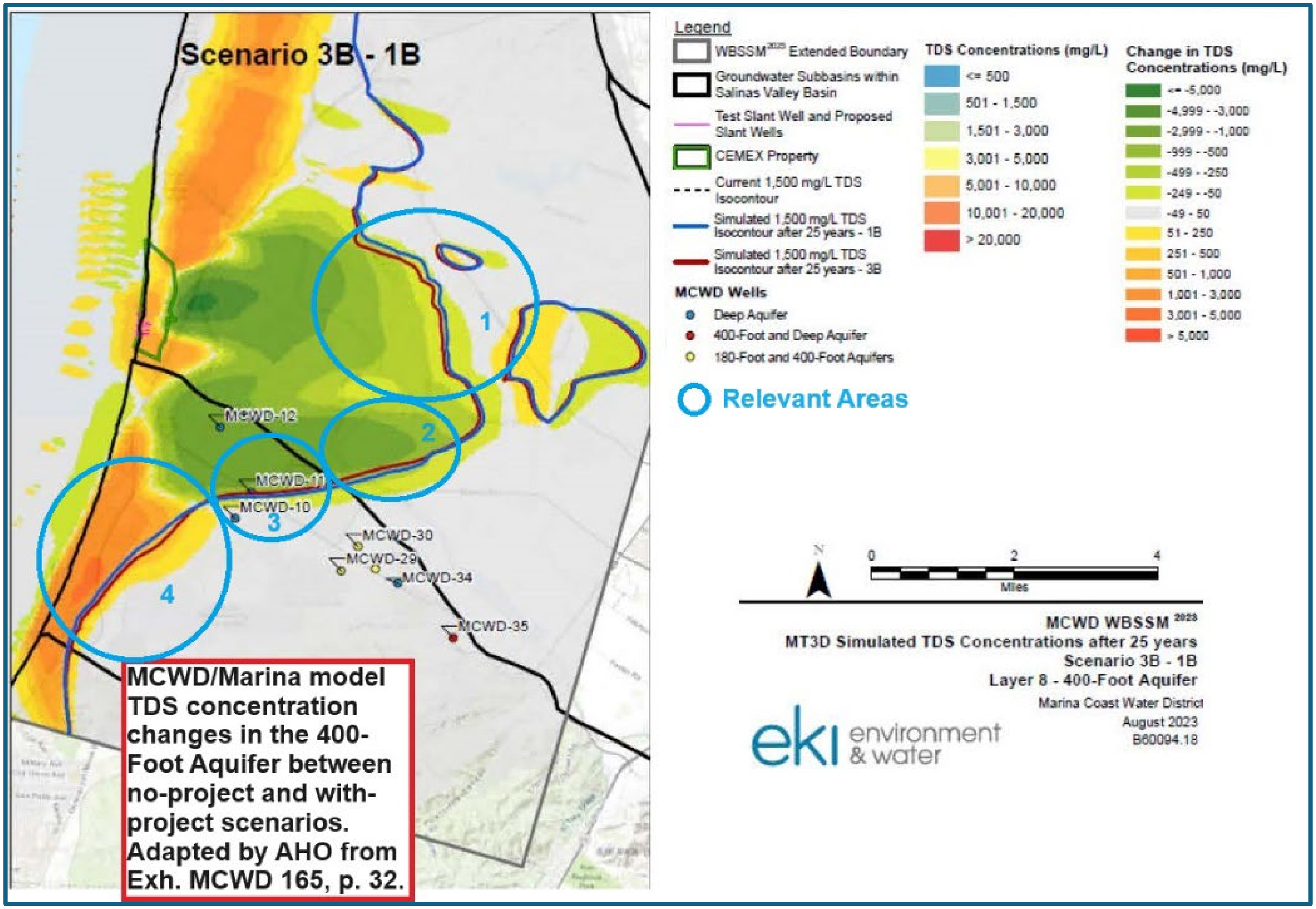

Figure 19 – MCWD model predicted TDS changes between no project and with project scenarios in the 400-Foot Aquifer

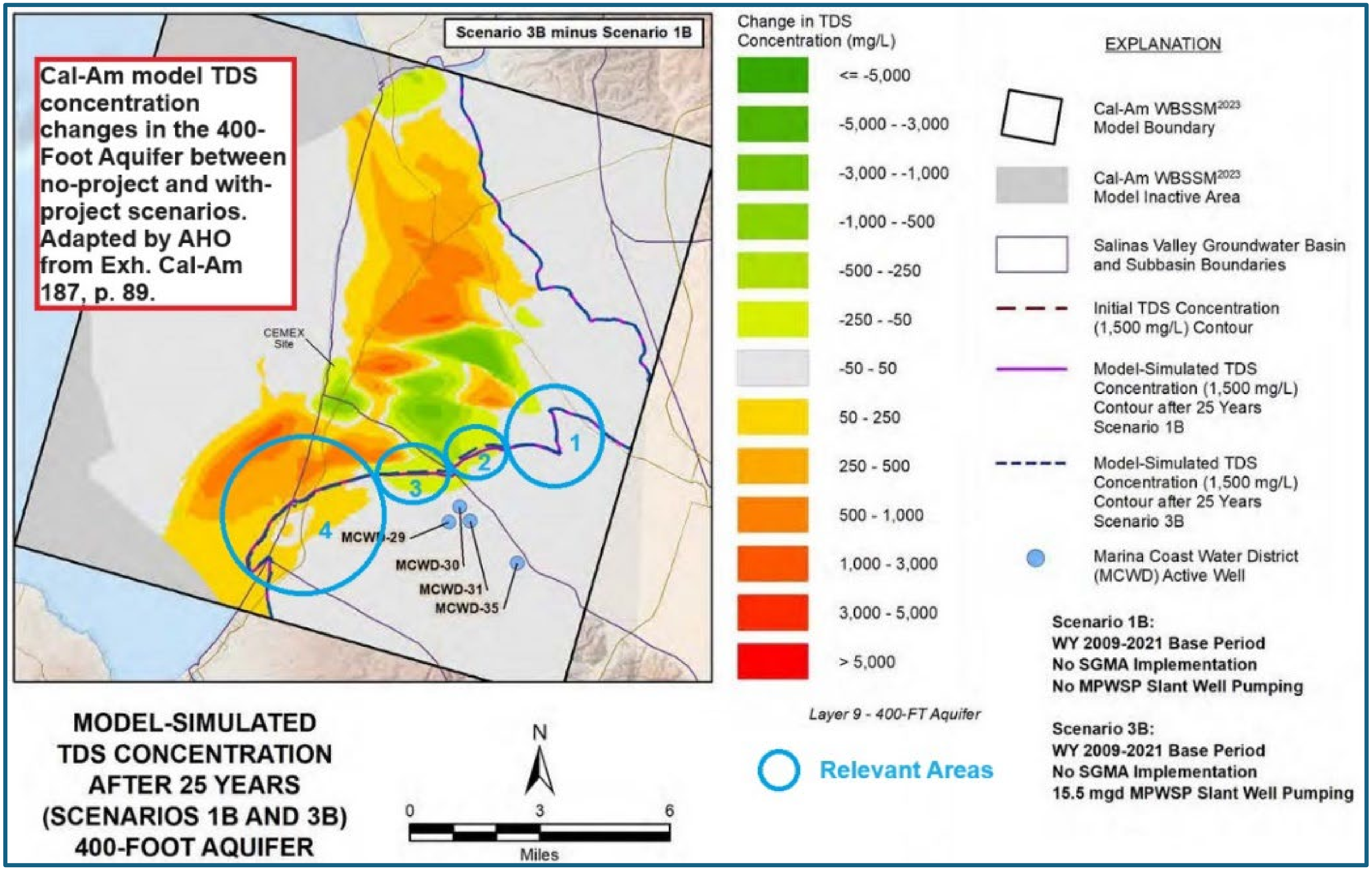

Figure 20 – Cal-Am model predicted TDS changes between no project and with project scenarios in the 400-Foot Aquifer

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	Aquifer	Dune Sand		Upper 180-Foot		Lower 180-Foot		400-Foot	
	Model	MCWD/ Marina	Cal-Am	MCWD/ Marina	Cal-Am	MCWD/ Marina	Cal-Am	MCWD/ Marina	Cal-Am
	Section of the 1,500 mg/L isocontour	Prevailing Movement of the 1,500 mg/L Isocontour (miles)							
180/400-Foot Aquifer Subbasin	(1) - Northern and central	No Change	No change	0.5 Seaward	0.5 Seaward	0.5 Seaward	0.5 Seaward	0.25 Seaward	No change
	(2) - Southern near the subbasin boundary	0.5 Seaward	0.5 Seaward	No change	No change	0.5 Seaward	No change	0.25 Seaward	0.25 Seaward
Monterey Subbasin	(3) - Northern near the subbasin boundary	No change	No change	0.25 Landward	0.5 Seaward	0.5 Seaward	No change	0.25 Seaward	No change
	(4) - Southern and central	0.5 Landward	No change	0.75 Landward	0.75 Landward	0.25 Landward	0.25 Landward	0.25 Landward	No change

Figure 21 – Summary of prevailing directions of model predicted movements of 1,500 mg/L isocontours

	Aquifer	Dune Sand	Upper 180-Foot	Lower 180-Foot	400-Foot
	Section of the 1,500 mg/L isocontour	Range or Maximum Inland Movement of Seawater Intrusion Front (miles)			
180/400-Foot Aquifer Subbasin	(1) - Northern and central	None	None	None	None
	(2) - Southern near the subbasin boundary	None	None	None	None
Monterey Subbasin	(3) - Northern near the subbasin boundary	None	Inconclusive	None	None
	(4) - Southern and central	Between 0 and 0.5	Up to 0.75	Up to 0.25	Between 0 and 0.25

Figure 22 – Summary of Seawater Intrusion Conclusions

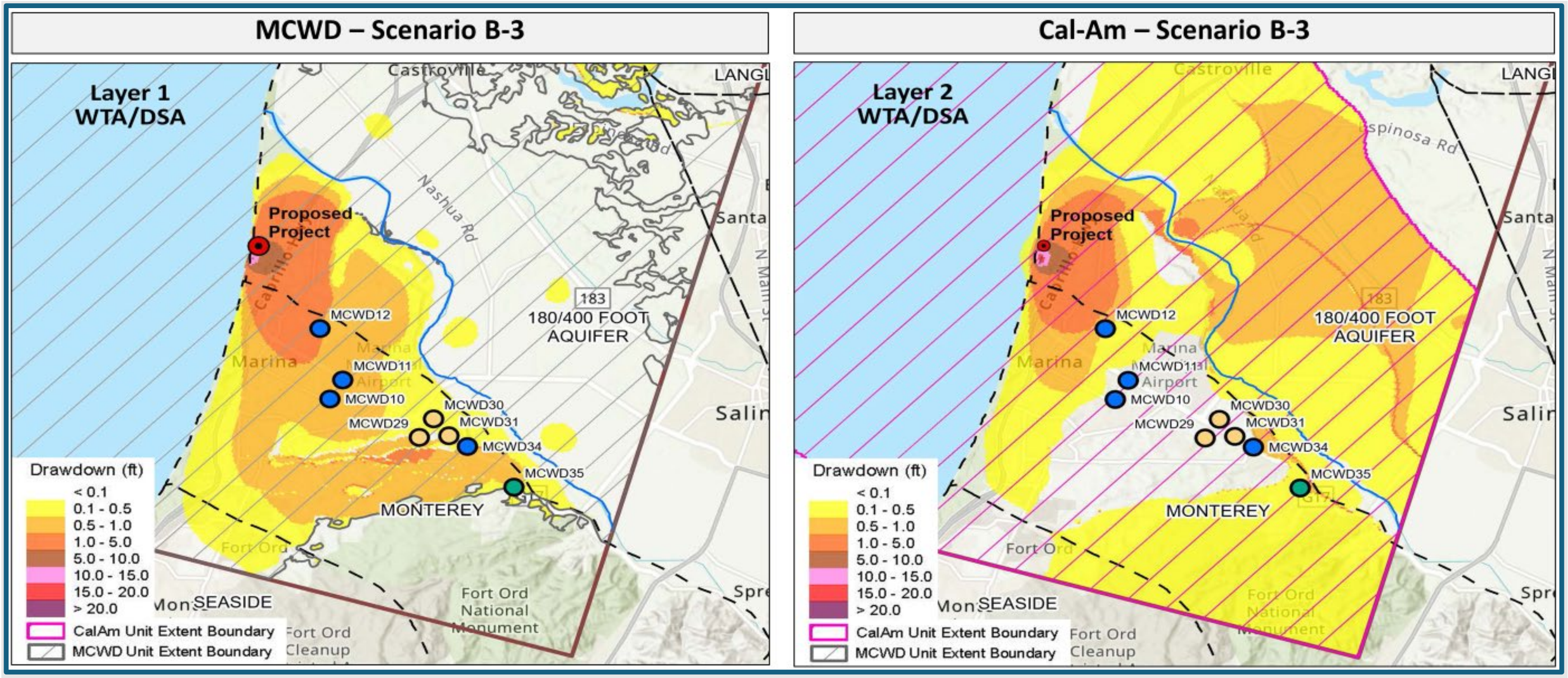

Figure 23 – Model predicted drawdowns in the Dune Sand Aquifer

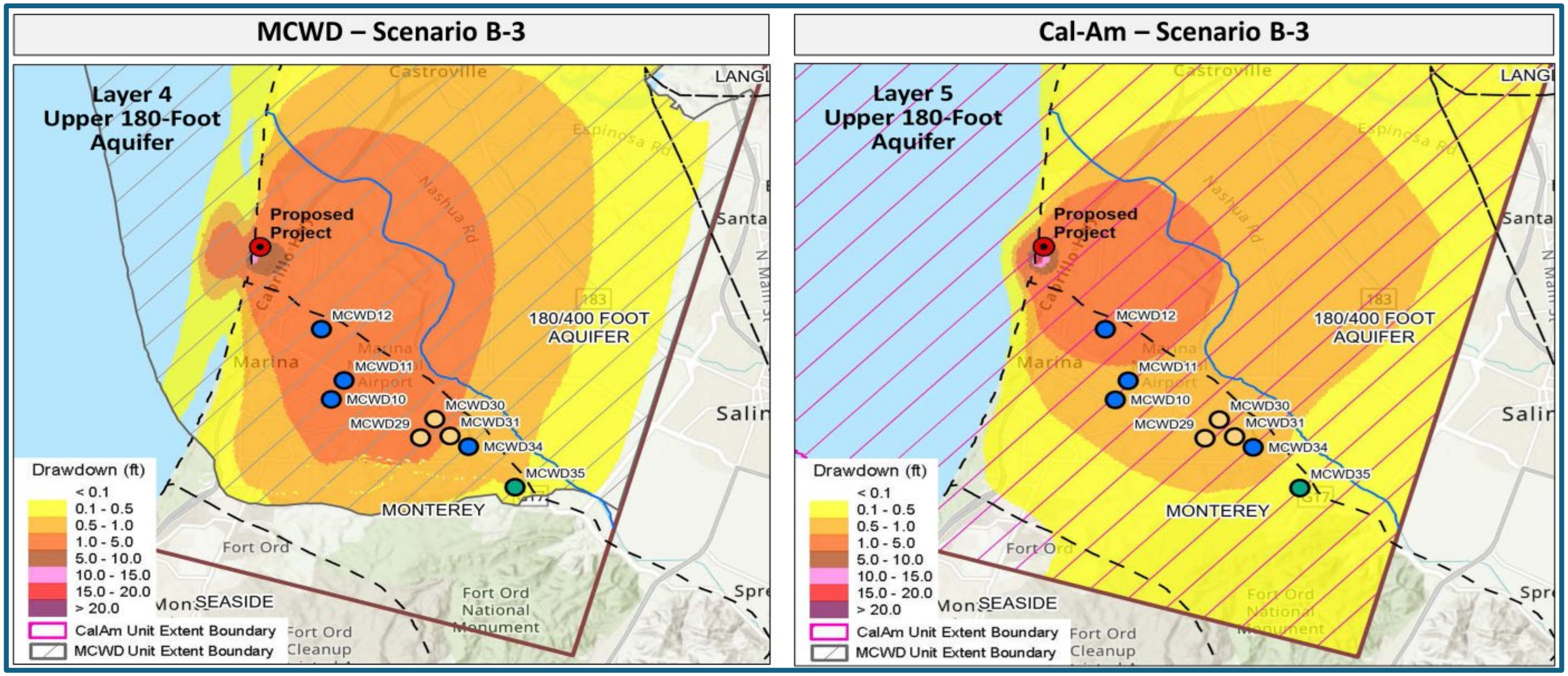

Figure 24 – Model predicted drawdowns in the Upper 180-Foot Aquifer

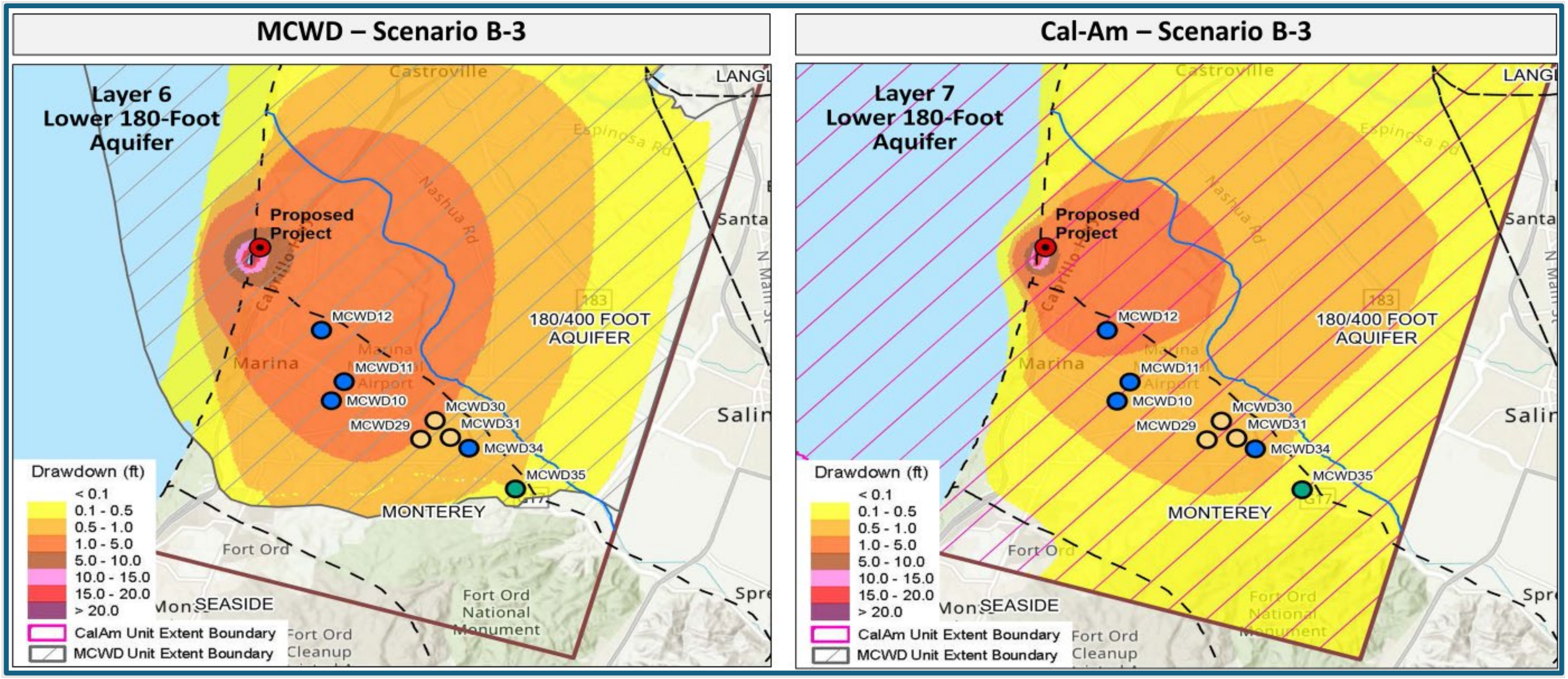

Figure 25 – Model predicted drawdowns in the 180-Foot Aquifer

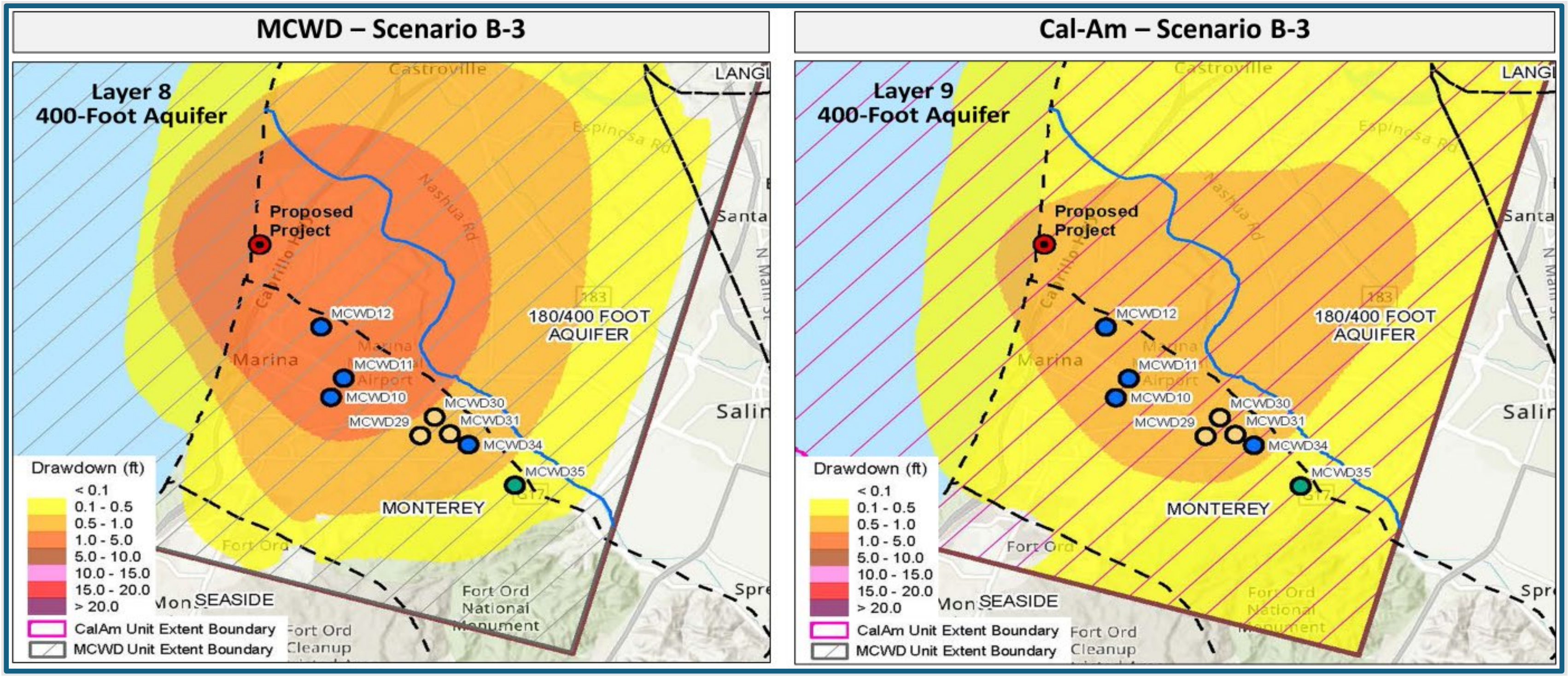

Figure 26 – Model predicted drawdowns in the 400-Foot Aquifer

Aquifer	Dune Sand		180-Foot		400-Foot	
Model	MCWD/Marina	Cal-Am	MCWD/Marina	Cal-Am	MCWD/Marina	Cal-Am
Location	Drawdown Range (Feet)					
Immediate vicinity of the proposed slant wells	10 to 20	10 to 20	10 to 20	10 to 20	1 to 5	0.5 to 1
West of Highway 1 near the proposed slant wells	5 to 10	5 to 10	5 to 10	5 to 10	1 to 5	0.5 to 1
Between Highway 1 and MCWD Well 12	1 to 5	1 to 5	1 to 5	1 to 5	1 to 5	0.5 to 1
Between MCWD Well 12 and MCWD Well 30	0.5 to 1	Less than 0.1	1 to 5	0.5 to 1	1 to 5	0.5 to 1
Between MCWD Well 30 and MCWD Well 34	0.1 to 0.5	Less than 0.1	0.5 to 1	0.5 to 1	0.5 to 1	0.5 to 1
Near MCWD Well 35	0.1 to 0.5	0.1 to 0.5	0.1 to 0.5	0.1 to 0.5	0.1 to 0.5	0.1 to 0.5

Figure 27 – Model predicted drawdown summary

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Storage Losses in the Dune Sand Aquifer (AF)			
Project Alternative (mgd)	MCWD Response (Exh. MCDW-175, p. 26.)		Cal-Am Response (Exh. Cal-Am-177 p. 33.)
	MCWD Model	Cal-Am Model	
11.6	1,531	3,681	1,463
15.5	2,046	5,993	2,055

Figure 28 – Storage losses in the Dune Sand Aquifer

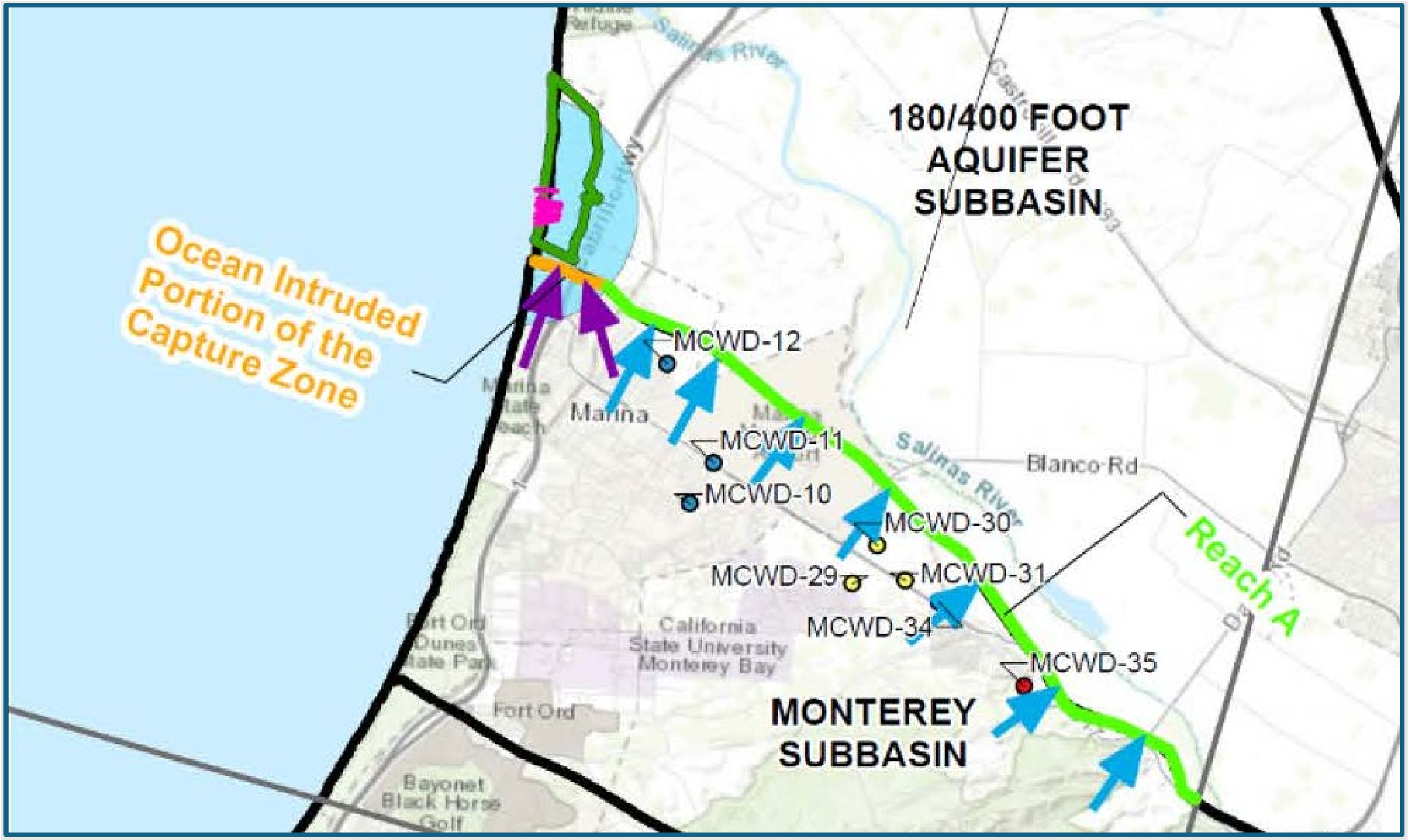

Figure 29 – Subbasin cross-boundary flow reaches submitted by MCWD

Appendix A - Figures

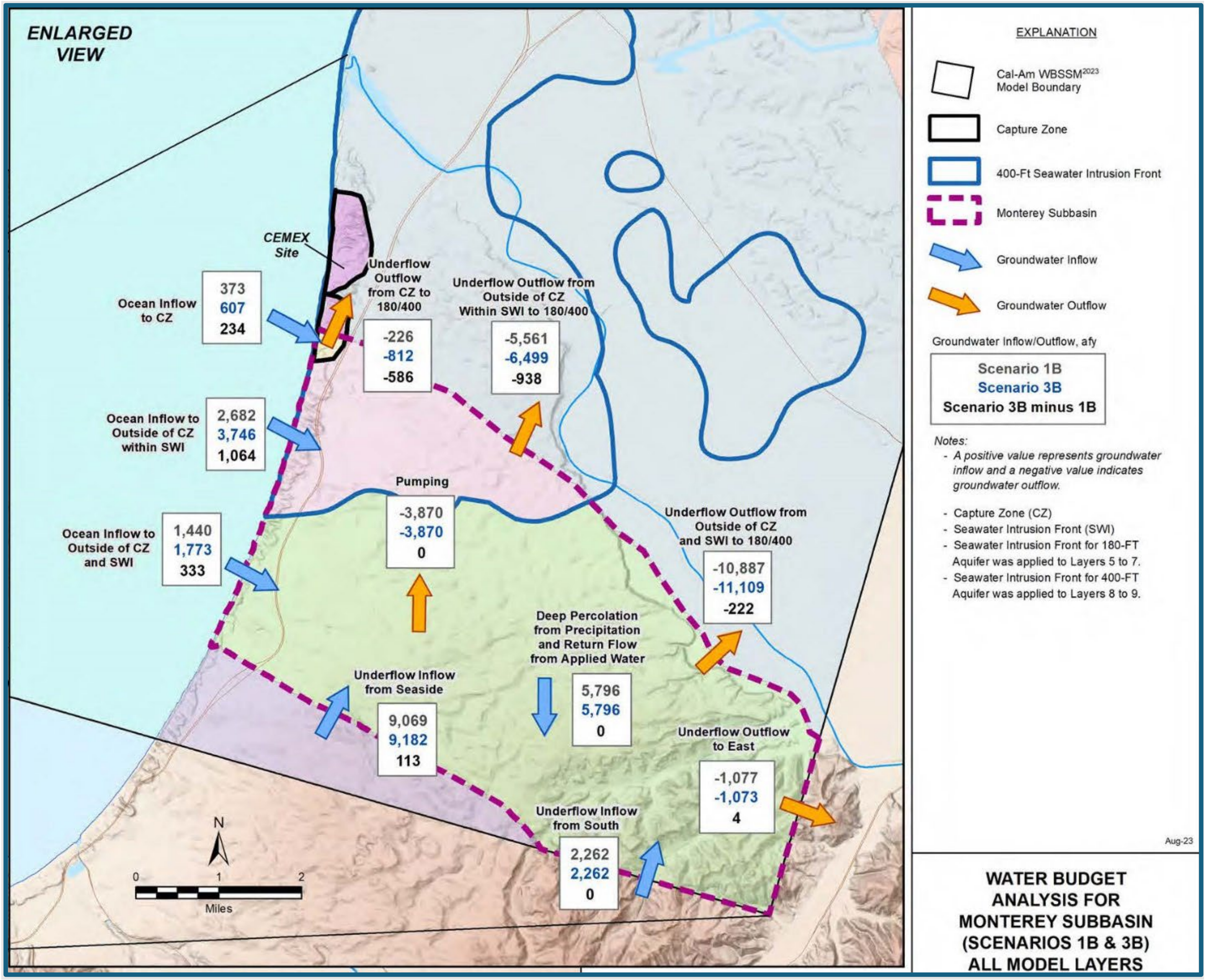

Figure 30 – Subbasin cross-boundary flow reaches submitted by Cal-Am

Appendix A - Figures

Summary of MCWD Groundwater Pumping between 2006 and 2020 from Exh. MCWD-8 (Acre-Feet per Year)												
Year	MCWD Production Wells								Aquifers			Total
	Deep			180-Foot and 400-Foot			Deep	-Foot and D	Deep	180-Foot and 400-Foot	400-Foot and Deep	
	10	11	12	29	30	31	34	35/WG				
2006		1,278	508	504	883	1,122			1,786	2,509	0	4,295
2007		1,164	458	520	1,155	1,266			1,622	2,941	0	4,563
2008	650	875	308	462	896	911			1,833	2,269	0	4,102
2009	841	869	251	394	892	791			1,961	2,077	0	4,038
2010	687	845	213	555	882	953			1,745	2,390	0	4,135
2011	699	864	136	554	898	896			1,699	2,348	0	4,047
2012	893	909	12	549	530	1,216	15	1	1,829	2,295	1	4,125
2013	830	621	16	671		740	543	1,009	2,010	1,411	1,009	4,430
2014	717	894	8	390		411	750	856	2,369	801	856	4,026
2015	544	869	7	159		461	550	638	1,970	620	638	3,228
2016	593	710	0	185	73	328	528	609	1,831	586	609	3,026
2017	721	866		165	404	330	492	260	2,079	899	260	3,238
2018	769	974		233	357	508	532	32	2,275	1,098	32	3,405
2019	663	763		221	272	351	351	569	1,777	844	569	3,190
2020	594	622		205	310	416	448	698	1,664	931	698	3,293

Figure 31 – Summary of MCWD Groundwater Pumping between 2006 and 2020 from Exh. MCWD-8 (Acre-Feet per Year)

10 APPENDIX B – CAL-AM OBJECTIONS RESPONSE TABLE

Cal-Am's Primary Objections to the AHO's December 31, 2024, Draft Report of Referee:

No.[1]	**Section/Page of Text in Draft Report**	**PDF page of Cal-Am's Objection**[2]	**Board's Response or Ruling**
1	Section 6.2.2 (Origin of the Water), pp. 67-70 [63-66][3]	6-7	In reaching an estimate of ocean water percentage (OWP) in the draw from the proposed wells, the Board considered the range of OWP calculated by each of the parties. The Board concludes that the overlap in this range provides a general estimate sufficient to respond to the court's questions. Cal-Am's proposed change in the total dissolved solids (TDS) concentration utilized by MCWD and Marina to calculate the OWP would result in an overlapping range in the parties' estimates of 90 to 96 percent rather than 90 to 92 percent, which does not affect the lower range of the estimate. (See Exh. Cal-Am-187, p. 25; MCWD-Marina Proposed Report Part 2, p. 87.) Therefore, the Board declines to make a finding of fact as to whether MCWD's use of a TDS concentration of 29,800 mg/L rather than 33,500 mg/L was appropriate. The Board revised the report to note Cal-Am's objection.
2	Section 6.8.2.4 (Physical Solution), pp. 106-108 [102-104]	7-9	Cal-Am submitted two model scenarios that incorporate the Return Water Settlement Agreement (RWSA) with project operations and assume 6 percent and 9 percent return water. (Exh. Cal-Am-177, p. 156.) A reference to this information is now included in the Report of Referee. (Final Report, p. 109.) These model runs show some difference in groundwater elevations but do not address changes in water quality. These model results do not change any of the conclusions in the report.

[1] For ease of reference, we have added numbering to the text describing the objections.
[2] All references to objections are to Cal-Am's January 31, 2025, objections, saved in the Hearing Documents folder and in the Communications and Transmittals subfolder as "2025-01-31 Cal-Am's Objections to Report of Referee".
[3] Unless otherwise indicated, citations to page numbers of documents and exhibits are to the pages of the PDF files. These page numbers often are different from the text page numbers in the documents or exhibits. We have also provided the printed page numbers in brackets, following the PDF page numbers.

			Any mitigation of impacts from the RWSA should be considered when determining whether the potential harmful impacts shown in the model results are unreasonable. The RWSA is one form of a physical solution, however, as stated in the Final Report, "[b]ased on the evidentiary record in this proceeding and the areas of modeled potential impact, replacement water provided by Cal-Am to locations within the Monterey Subbasin or the southern portion of the 180/400 Subbasin may be necessary to offset some of the effects of the proposed draw." (Final Report, p. 111.) The RWSA may be insufficient as a physical solution without additional measures, to avoid injury to legal users and unreasonable harm.
3	Section 6.8.2 (Physical Solution), pp. 106-108 [102-104]; Section 6.8.3 (Monitoring and Adaptive Management), pp. 108-110 [104-106]	9-16	The groundwater monitoring programs required by the California Public Utilities Commission (and California Coastal Commission may be appropriate monitoring and adaptive management programs to prevent injury to other legal users of groundwater. Because these users are not parties to this proceeding, however, these right holders had no notice or opportunity to provide information for the Board's consideration about their extractions and uses of groundwater and how those uses might be impacted by operation of the slant wells. The Final Report also concludes that there is insufficient information in the record to determine whether the draw from the proposed slant wells will cause unreasonable harm – for the same reasons, the Board cannot determine whether the existing monitoring and adaptive management plans would address any unreasonable harm. The State Water Board therefore does not reach any conclusion as to the adequacy of the programs to prevent injury and unreasonable harm.
4	Section 6.8.2.2 (Avoidance of Injury to Existing Uses and Users), pp. 104-105 [100-101]	16-18	This court proceeding does not include, as parties, legal users of water other than MCWD. Therefore, the Final Report does not address whether the proposed project would or would not injure the rights of any of these legal users, as they have had no notice or opportunity to present evidence. The Board also does not reach the question of the relative burden of proof for a party to demonstrate the absence of injury to other legal users of water when no other user presents evidence to support a claim of right.

5	Section 6.4 (Question 4, generally), pp. 69-80 [73-84]; Section 6.5 (Question 5, generally), pp. 80-91 [84-95]	18-19	Special Condition 2 in the California Coastal Commission approval provides conditional approval of the 6.4 mgd project. (Exh. MCWD-125, p. 14.) The Report of Referee primarily evaluates groundwater conditions resulting from the 6.4 mgd project because the modeled effects of slant well pumping are greater for the larger project as compared to the reduced pumping 4.8 mgd project.
6	Section 6.1.1 (Locations of Subsurface Drawing Points), p. 51 [47]; Section 6.2.1 (Location of Slant Well Screens), p. 65 [61]; Section 7 (Conclusion), p. 110 [106]	20-21	The Special Conditions included in the California Coastal Commission approval may influence the final design of the slant wells. (Exh. MCWD-125, pp. 12-40.) However, the record does not include evidence describing specific changes to the proposed slant well design in the FEIR/EIS, that would address Special Condition 11. The Report relies on the available evidence.
7	Section 6.8.2.3 (Avoidance of Unreasonable Harm), p. 105 [101]	21-25	The Final Report does not reach any conclusion as to whether the extent of seawater intrusion predicted by the modeling would be unreasonable, and the Board declines to describe the model results as “insignificant” or “unreasonable” without adequate evidence in the record to balance the expected benefits and harms of the project. Cal-Am does not dispute that such a conclusion would require balancing of benefits of the proposed project, including any reduction in seawater intrusion in portions of the basin, against any harm. (See 2025-01-31 Cal-Am's Objections to Report, p. 21.) The Board has revised the Final Report is revised to state that the further progression of seawater intrusion is evidence tending to show that the effect of the slant well pumping may be unreasonable.

8	Section 7 (Conclusion), p. 113 [109]	25-28	Objection noted.
9	Section 4.2 (Groundwater Modeling for this Proceeding), p. 35 [31]	28-29	Objection noted.

Cal-Am's Specific Objections to the AHO's December 31, 2024, Draft Report of Referee:

No.	**Page of Text in Draft Report**	**PDF page of Cal-Am's Objection**	**Board's Response or Ruling**
1	Section 2.3.2 (Hydrogeologic Features), p. 7 [11], 1st paragraph	29	Objection noted.
2	Section 2.3.2 (Hydrogeologic Features), p. 7 [11], 1st paragraph	30	Objection noted.
3	Section 2.3.2 (Hydrogeologic Features), p. 9 [13], 1st full paragraph	31	Objection noted.
4	Section 2.3.2 (Hydrogeologic Features), p. 9 [13], 1st paragraph under "180-Foot Aquifer"	31	Objection noted.
5	Section 2.3.3 (Subbasin Interface Zone), p. 9 [13],	31	Objection noted.

	1st paragraph under “400-Foot Aquifer”		
6	Section 2.3.3 (Subbasin Interface Zone), p. 10 [14], paragraph 4	32	Objection noted.
7	Section 2.4.1 (California Public Utilities Commission Permit), p. 11 [15], 2nd paragraph	32	Objection noted.
8	Section 2.4.3 (Return Water Settlement Agreement), pp. 12-13 [16]	32	The potential effects of the RWSA on modeled groundwater conditions, as described in Exh. Cal-Am-177, do not change the legal analysis in our responses to the court’s Questions 7 and 8.
9	n/a		There is no comment 9.
10	Section 3.2.2 (Hearing Phases 1, 2, and 3), p. 24 [28]	32	Objection noted.
11	Section 3.2.2 (Hearing Phases 1, 2, and 3), p. 25 [29]	32	Objection noted.
12	Section 4 (Groundwater Modeling), p. 29 [33], 1st full paragraph	33	Objection noted.
13	Section 4.2 (Groundwater Modeling for this Proceeding), p. 30 [34], 1st full paragraph	33	Objection addressed in modified Footnote 26.
14	Section 4.2 (Groundwater Modeling for this Proceeding), p. 30 [34], 2nd paragraph under “NMGWM2022”	33	Objection addressed in modified Footnote 26.
15	Section 4.2 (Groundwater Modeling for this	34	Objection noted.

	Proceeding), p. 30 [34], last paragraph and Footnote 24		
16	Section 6.1.2 (Capture Zones), pp. 53-56 [57-59]	35	Objection noted.
17	Section 6.1.2 (Capture Zones), p. 54 [58], Figure 10	35	Objection noted.
18	Section 6.1.2 (Capture Zones), p. 56 [60], last paragraph	36	Objection noted.
19	Section 6.2 (Question 2), pp. 57-66 [61-70]	36	Objection noted.
20	Section 6.2.1 (Locations of the Slant Well Screens), p. 58 [62], 2nd paragraph	38	Objection noted.
21	Section 6.2.1 (Locations of the Slant Well Screens), p. 58 [62], 2nd paragraph under “Sources of the Slant Wells”	38	Objection noted.
22	Section 6.2.1 (Locations of the Slant Well Screens), p. 61 [65], 2nd paragraph	38	Objection noted.
23	Section 6.2.2 (Origin of the Water), p. 63-64 [67-68]	39	Added assumed concentrations of seawater and groundwater.
24	Section 6.2.2 (Origin of the Water), Section 6.2.2 (Origin of the Water), pp. 64-65 [68-69]	39	Objection noted.
25	Section 6.2.2 (Origin of the Water), p. 65 [69], last paragraph	41	Objection noted.

26	Section 6.3.1 (Connectivity Between the Aquifers), p. 68 [72], 3rd full paragraph	41	Edited the paragraph.
27	Section 6.3.1 (Connectivity Between the Aquifers), p. 68 [72], last paragraph before "Deep Aquifers"	43	Objection noted and edited to change "gaps" to "a gap".
28	Section 6.4.2 (Model Results), p. 71 [75], 1st full paragraph	44	Objection noted.
29	Section 6.4.3 (Analysis), pp. 77-80 [81-84]	46	Objection noted.
30	Section 6.4.3 (Analysis), p. 78 [82], 1st paragraph	47	Objection noted.
31	Section 6.4.3 (Analysis), p. 80 [84], Figure 22	48	Objection noted.
32	Section 6.5.1 (Groundwater Table), p. 8 [87]3, Figure 27	50	Objection noted and edited figure to correct value in lower left cell.
33	Section 6.5.1 (Groundwater Table), p. 84 [88], 1st paragraph	52	Objection noted.
34	Section 6.5.2 (Storage Space), p. 86 [90], 1st paragraph under "Conclusion"	53	Objection noted.
35	Section 6.5.2 (Storage Space), p. 86 [90], last paragraph before Section 6.5.3	53	Edited the paragraph.
36	Section 6.5.3 (Subbasin Cross-Boundary Flows), p. 91 [95], 1st paragraph	53	Objection noted.

37	Section 6.7.2 (MCWD's Water Rights), p. 93 [97], 2nd paragraph	54	The Board modified this sentence to include the year of recorded maximum historical use (2007). The Board did not modify the sentence to include the word "potentially," as suggested by Cal-Am. The prior sections of the report document impacts to the 180-Foot and 400-Foot Aquifers predicted by the model results from operation of the proposed project, though these impacts are not predicted to be material or significant at the locations where MCWD's wells draw groundwater.
38	Section 6.7.3 (Injury to MCWD's Water Rights), p. 93 [97], last 2 lines	54	No change. The referenced Section 6.3.1 describes the conflicting positions of the parties about the extent of hydrologic continuity between the 180-Foot and 400-Foot Aquifers and the basis for the Board's conclusion "that there is hydrologic connectivity between the proposed slant wells and the MCWD wells in the 400-Foot Aquifer, but that this connectivity is less than the connectivity between the proposed slant wells and the MCWD wells in the 180-Foot Aquifer." (Final Report, p. 74.)
39	Section 6.7.3 (Injury to MCWD's Water Rights), p. 94 [98], 1st paragraph	55	No change. As described in Section 6.7.3.2, MCWD did not present its water quality model results in sufficient detail to identify whether no change or up to a 50 mg/L increase in TDS concentrations is predicted by its model to occur at Wells 29, 30, 31, or 35. The Report acknowledges that the model results may show that some impact to water quality is predicted to occur at these wells, but concludes that these impacts would not be significant.
40	Section 6.7.3.2 (Impacts to Quality of Groundwater), p. 95 [99], 2nd paragraph of section	56	See above response to Objection 39.
41	Section 6.8 (Question 8), p. 96 [100], last paragraph before Section 6.8.1	56	No change. The statement is not limited to potential impacts to water quality but includes other potential impacts such as declines in groundwater levels. In addition, as noted in the Final Report, the evidentiary record does not include detailed information about other existing production wells in the area so the Board cannot reach a conclusion as to the potential for injury to these other legal users, if there are any such users.

42	Section 6.8.2.2 (Avoidance of Injury to Existing Uses and Users), pp. 100-101 [104-105]	57	See above response to Objection 41.
43	Section 6.8.2.3 (Avoidance of Unreasonable Harm), p. 101 [105], 1st paragraph of section	57	Objection noted.
44	Section 6.8.2.3 (Avoidance of Unreasonable Harm), p. 101 [105], 3rd paragraph of section	58	Sentence edited to replace “will” with “may.” As described in the following paragraphs in this section, the Groundwater Sustainability Plans for the 180/400 and Monterey Subbasins define any inland advancement of the 500 mg/L isocontour for chloride in the subbasins to be significant and unreasonable. This per se analysis does not acknowledge potential benefits of the project, as described by Cal-Am, which may offset harms resulting from further seawater intrusion in some portions of the subbasins. “[T]o determine whether these impacts are unreasonable also requires balancing of the benefits of the project, which would make significant quantities of ocean water available for beneficial use, against the potential injury to legal users of groundwater and the risk and significance of harm to the basin … Such a balancing of factors was not directly addressed by the parties and would likely require a more expansive evidentiary record than was developed in this proceeding.” (Final Report, p. 108.)
45	Section 6.8.2.3 (Avoidance of Unreasonable Harm), p. 101 [105], last paragraph	59	Objection noted.
46	Section 6.8.2.3 (Avoidance of Unreasonable Harm), pp. 101-102 [105-106]	59	The recent mapping referenced by Cal-Am is not part of the evidentiary record on which the Report is based and Cal-Am cites no evidence in the record of ongoing advancement of the seawater intrusion front. A physical solution, as described in the Final Report, should offset any unreasonable impacts or injury that may be caused by the proposed project. Although a physical solution would not generally require

			mitigation of existing conditions or impacts from extractions by other users, existing conditions in the Monterey and 180/400-Foot Subbasins and extractions by existing users may affect the extent of impacts caused by Cal-Am's proposed draw. In addition, any water right Cal-Am developed to extract groundwater from the basin would be junior in priority to the rights of existing legal users. The relative priority of water rights may be relevant to ascribing responsibility for cumulative impacts to groundwater conditions in the basin.
47	Section 6.8.2.3 (Avoidance of Unreasonable Harm), p. 102 [106], 1st full paragraph	60	Objection noted. The court explicitly asked for the Board's opinion as to whether the proposed draw from the Cal-Am wells would result in or increase any seawater intrusion into the Monterey or 180/400-Foot Subbasins and the likely extent of any intrusion. The Board's response to the court's Question 4 quantifies the model results as to both the landward and seaward movement of the seawater intrusion isocontour. The statement in the Report referenced by Cal-Am in its objection is intended to include the relative benefits and harms of these changes in the seawater intrusion isocontour.
48	Section 6.8.2.3 (Avoidance of Unreasonable Harm), p. 102 [106], last paragraph of section	60	See above responses to the General Objections.
49	Section 7 (Conclusion), p. 113 [117], 1st full paragraph	61	No change. The Final Report clarifies in the preceding sentence the different ways to describe the "source" of the water drawn by the proposed wells. The sentence referenced by Cal-Am describes the "locations within the aquifers from which the proposed slant wells would draw water," in other words, the point of capture by the slant wells. (Final Report, p. 117.) This point of capture of water are "locations within the Dune Sand and 180-Foot Aquifers both onshore (beneath the CEMEX property) and offshore (beneath the ocean)." (*Ibid.)*

11 APPENDIX C – CITY OF MARINA RESPONSE TABLE

City of Marina's Objections to the AHO's December 31, 2024, Draft Report of Referee:

No.[1]	Section/Page of Text in Draft Report	PDF page of Marina's Objection[2]	Board's Response or Ruling
1	Section 2.1 (Proposed Project), p. 15 [11][3]	6	Report revised to include requested text.
2	Section 2.3.2 Generally, pp. 11-14 [7-10]	6	Objection noted.
3	Section 2.3.2 (Dune Sand Aquifer), p. 13 [9]	8	Objection noted.
4	Section 2.3.2 - Proposed New Subsection (FO-SVA), p. 13 [9]	9	Objection noted. Declined to add new section.
5	Section 2.3.2 (180-Foot Aquifer), p. 13 [9]	10	Objection noted.
6	Section 2.3.2 (180/400-Foot	11	Objection noted. Declined to add new section.

[1] For ease of reference, we have added numbering to the text describing the objections.
[2] All references to objections are to the City of Marina's January 31, 2025, objections, saved in the Hearing Documents folder and in the Communications and Transmittals subfolder as "2025-01-31 City of Marina's Comments on 12-31-24 Draft Report."
[3] Unless otherwise indicated, citations to page numbers of documents and exhibits are to the pages of the PDF files. These page numbers often are different from the text page numbers in the documents or exhibits. We have also provided the printed page numbers in brackets, following the PDF page numbers.

	Aquitard), p. 13 [9]		
7	Section 2.3.2 (400-Foot Aquifer), p. 13 [9]	11	Objection noted.
8	Section 2.4.1 (California Public Utilities Commission Permit), p. 14 [11]	12	Report revised to include requested text.
9	Section 2.4.2 (Environmental Review and Findings), p. 14 [11]	12	Report revised.
10	Section 2.4.3 (Return Water Settlement Agreement), pp. 16-17 [12-13]	13	Report revised.
11	Section 2.4.5 (Test Slant Well), p. 18 [14]	13	Objection noted.
12	Section 2.5.1 (State Water Board Orders), pp. 18-20 [14-16]	13	No change. This section focuses on the State Water Board's orders and does not discuss specific water supply projects.
13	Section 2.6.1 (Annexation/Groundwater Framework Agreement), p. 21 [17]	14	Report revised.

14	Section 2.6.2 (Cal-Am Easement to Occupy CEMEX Property), pp. 21-22 [17-18]	14	Report revised.
15	Section 2.6.3 (Sustainable Groundwater Management Act), pp. 22-23 [18-19]	15	The Board does not agree in full with the proposed edits. Exceedance of the quantitative threshold set by a groundwater sustainability agency in a groundwater sustainability plan does not necessarily result in injury to other water users in the basin. Injury occurs when there is an actual or threatened significant and material interference with the extraction of water by a legal user for a beneficial use. The model results in the evidentiary record do not show that such an interference with the exercise of MCWD's water rights is likely to occur because of the proposed draw, even over time. There is insufficient evidence in the record to conclude whether such an interference might occur with respect to any other legal user of groundwater in the basin. The Board has partially revised the report to remove citations to statutory sections relevant to comprehensive groundwater adjudications. This proceeding is not a comprehensive adjudication of groundwater and provisions in the Water Code that govern groundwater adjudications do not apply. The Board declines to add additional text about required basin management actions under Sustainable Groundwater Management Act (SGMA) because these summaries appear to address potentially disputed questions of law that are not directly presented by the Court's questions. Marina asserts that 3,000 mg/L of Total Dissolved Solids (TDS) is an appropriate standard to define the extent of fresh water in the groundwater basin. (2025-01-31 City of Marina Objections to Draft Report, p. 43.) The Final Report uses the seawater isocontour of 1,500 mg/L of TDS to depict the boundary of seawater intrusion because the parties selected this

			threshold and did not explicitly depict other isocontours in their model results. An increase in TDS concentration of water in the aquifers of a quality between 1,500 mg/L and 3,000 mg/L of TDS may constitute harm. The Final Report does not reach any conclusion as to whether such an increase would be unreasonable. This determination would require a more comprehensive evidentiary record than developed in these proceedings and may implicate the legal interests of other groundwater users who are not parties to this proceeding. The Board disagrees with Marina and MCWD's assertion that an extraction of water that causes an "undesirable result" as defined by the applicable groundwater sustainability plan is per se unreasonable and binding on any court conducting a judicial determination of water rights. No court has reached such a conclusion. The Department of Justice did not make this assertion in the joint letter submitted on behalf of the California Department of Water Resources and the State Water Resources Control Board in *Indian Wells Valley Groundwater Authority v. Superior Court*, Court of Appeal of the State of California, Fourth Appellate District, Division Three, Case No. G064757. In that letter, the agencies expressed concern that a court might conduct a "*de novo* trial on a basin's safe yield" rather than affording deference to the determinations in the groundwater sustainability plan. (2025-01-31 MCWD's Objections to Draft Report, p. 75 (Attachment 1, Letter from Department of Justice to Presiding Justice and Associate Justices regarding Case No. G064757, Oct. 17, 2024, p. 4.) The State Water Board expresses a consistent position here, concluding that "the agencies' conclusions in these plans, which plans have also been approved by DWR, [] have significant persuasive value in identifying thresholds for unreasonable harm to the subbasin." (2024-12-31 Draft Report, p. 105.) SGMA does not alter the law governing rights to groundwater or surface water. "Nothing in this part or in any groundwater management plan …determines or alters surface water rights or groundwater rights under common law or any provision of law that determines or grants surface water

			rights." (Wat. Code, §10720.5, subd (b).) "Nothing in this part shall be construed as authorizing a local agency to make a binding determination of the water rights of any person or entity …." (*Id.* at §10726.8, subd. (b).) To allow local groundwater sustainability agencies to determine the sustainable yield of a basin and set quantitative thresholds for undesirable results in a manner that is absolute and unreviewable by a court in a subsequent determination that affects groundwater rights, would effectively authorize these local agencies to alter and determine groundwater rights. The Board agrees, however, that the determinations of groundwater sustainability agencies in groundwater sustainability plans that set thresholds for undesirable results should be afforded substantial deference. Groundwater sustainability agencies' determinations are based on comprehensive technical evidence and policy considerations, with input from the public as required by SGMA. These plans have also been approved by the Department of Water Resources as consistent with SGMA and the Department's regulations governing the development and adequacy of groundwater sustainability plans.
16	Proposed New Section 2.7 (California Coastal Commission Proceedings), p. 23 [19]	18	Report revised.

17	Section 3.1.1 (Assignment to the Administrative Office), p. 23 [19]	19	In this context, the term “adjudicative hearing” means “an evidentiary hearing for determination of facts pursuant to which an agency formulates and issues a decision.” (Gov. Code, § 11405.20.) The State Water Board’s Administrative Hearings Office (AHO) is explicitly authorized by statute to conduct these types of proceedings, and the Board’s Executive Director referred the matter to the AHO to conduct an adjudicative hearing. The Board relied on the evidence compiled through the AHO’s hearing process, conducted in accordance with the Administrative Procedure Act, to reach the factual determinations included in the Report of Referee.
18	Section 3.2.2 (Hearing Phases 1, 2 and 3), pp. 26-29 [22-25]	19	Report revised.
19	Section 3.3 (Significant Procedural Rulings), pp. 30-31 [26-27]	23	Report revised.
20	Section 3.4 (Proposed Text for Report of Referee and Closing Briefs), p. 31 [27]	25	Report revised.
21	Section 4.1 (Groundwater Models in the Salinas Valley Groundwater Basin), pp. 33-34 [29-30]	25	The requested text is included in the Final Report.
22	Section 4.1 (Groundwater	26	Objection noted.

	Models in the Salinas Valley Groundwater Basin), pp. 33-34 [29-30]		
23	Section 4.2 (Water Board Steady-State Models), p. 35 [31]	26	Objection noted.
22	Section 4.2 (Model Scenarios), pp. 35-36 [31-32]	27	Objection noted.
25	Section 4.2 (Model Scenarios), pp. 35-36 [31-32]	27	Objection noted. See response to MCWD General Objection No. 1 (Appendix D).
26	Section 4.2 (Model Scenarios), p. 37 [33]	27	The table referenced by Marina in the Draft and Final Report is a general summary of the topics of witness testimony and identifies Peter Leffler's testimony about the referenced variable density groundwater model. The Board did not rely on this testimony in responding to the court's questions and therefore does not cite the testimony or underlying report in its discussion of the model at issue here, in the Final Report. (Exhs. Cal-Am-175 & 178.) The Board did not reach any conclusion as to the veracity or adequacy of the model assumptions, methodology, or results.
27	Section 4.2 (Groundwater Modeling For This Proceeding), p. 37 [33]	29	The Board has revised the report to reflect that in addition to representing a scenario with significantly reduced groundwater extractions, Scenario D could also be considered as a proxy for a scenario that includes a combination of reductions in extraction and groundwater recharge. The Final Report of Referee concludes that the specific SGMA-compliance scenarios considered in the modeling of Scenarios C and D are speculative

			as compared to an assumption that existing levels of extraction and recharge will continue. Scenarios C and D assume actions that mitigate the impacts of overdraft on groundwater conditions in the subbasins such as progressive seawater intrusion and lowering of groundwater elevations. The Final Report's analysis of the potential impact of the project absent other mitigating actions provides a "worst case" assessment of the potential impacts of the proposed draw. The overall magnitude of the impact of Cal-Am's proposed draw may vary depending on future SGMA compliance actions and resulting conditions in the basin. However, conditions in the basin under Scenarios C and D would be improved as compared to the no-mitigation alternative of Scenario B. These improved conditions would reduce the likelihood that the proposed draw by Cal-Am may injure other legal users or result in unreasonable harm. Because the Board does not consider the amount of replacement water that may be necessary to avoid injury to other legal users or unreasonable harm to the basin, the Board does not consider the use of Scenario D model results for this purpose.
28	Section 5.1.6 (Developed Or Salvaged Water), pp. 41-42 [37-38]	30	The calculation of an ocean water percentage in Cal-Am's proposed draw assumes a background concentration of 500 mg/L of TDS of non-ocean water that originates from the groundwater basin, and seems to presume that such "fresh" groundwater would be available to other users in the basin absent the proposed draw. This extracted "fresh" water from the basin would neither be salvaged nor developed water. Salvaged or developed water is water made available through some intentional effort, and absent that effort, would not be available for beneficial use. (See Section 5.1.6.) The person who makes such water available for use is entitled to a prior right to that water. The Board agrees that if, absent Cal-Am's extraction, this high-quality groundwater would have been available to other legal users in the basin for beneficial use, it is not developed or salvaged by Cal-Am. The Board added these conclusions to the Report.
29	Section 5.1.7 (Replacement	32	The Final Report provides several California examples of groundwater adjudications in which pumpers are authorized to take water in excess of the

	Water Objection), p. 42 [38]		amount allocated under their water right and the safe yield of the basin (an "out-of-priority" diversion), by providing replacement water or compensating the basin's water master for the purchase of replacement water. In addition, the State Water Board allows new appropriations of surface water even when water is otherwise unavailable (out-of-priority diversions), with the provision of replacement water. Water Right Order 91-07 identifies stream systems in California that are fully appropriated, and in which no unappropriated water is available. Order 91-07 states that the Board may issue a water right permit for a new appropriation even in these fully appropriated systems if a water transfer or water exchange provides replacement water to avoid injury to existing right holders. (WR Order 91-07, p. 25, section 5.1.) Such rights are appropriative water rights. The same legal theory should apply analogously to the appropriation of groundwater, as it does in other western states. For example, pursuant to this provision of Order 91-07, the State Water Board authorized appropriation of water from the fully-appropriated Tuolumne River system with the following permit term: "Diversion of water under this permit during the period from June 16 through October 31 of each year is subject to maintenance of the Water Exchange Agreement executed on December 12, 1992, between the permittee and the Modesto and Turlock Irrigation Districts. Pursuant to the Agreement, permittee shall provide replacement water to New Don Pedro Reservoir for all water diverted under this permit during the period from June 16 to October 31 of each year. The source, amount, and location at New Don Pedro Reservoir of replacement water discharged to the reservoir shall be reported to the State Water Resources Control Board with the annual Progress Report by Permittee." (Water Right Permit 20784 (March 23, 1995), Term 19.) Marina correctly notes that the elements of a physical solution presented by Cal-Am are the Return Water Settlement Agreement (Exh. Cal-Am-67), the Mitigation, Monitoring, and Reporting Program (Exh. Cal-Am-98), and the

			groundwater monitoring plan required by California Coastal Commission Special Condition 12 (Exh. MCWD-125 at pp. 29-31.) Cal-Am submitted two model scenarios that incorporate the Return Water Settlement Agreement (RWSA) with project operations and assumes 6 percent and 9 percent return water. (Exh. Cal-Am-177, p. 156.)
30	Section 5.2.2 (Impairment of Water Quality), p. 44 [40]	34	See response above to Objection 14.
31	Section 5.2.2 (Impairment of Water Quality), pp. 44-46 [40-42]	36	In the case of *Town of Antioch v. Williams Irrigation District* (1922) 188 Cal. 451 ("*Antioch*"), the court articulates the standard for injury to a legal user of water and applies the common law doctrine of reasonableness (the case was decided before amendment of the California Constitution to include article X, section 2). Although the court in *Antioch* may not have anticipated that similar facts might arise in any case "except one arising upon these two rivers concerning a similar claim of some prior appropriator near the outlets thereof," (*id.* at p. 464), the facts in this proceeding present some similarities. Here, Cal-Am proposes to extract a combination of ocean and groundwater that would constitute, in part, a new supply to the basin (the 15.5 million gpd project would produce an estimated 7,167 afy of water of a quality suitable for municipal use). (CPUC Dec.18-09-017, p. 178.) These potential benefits should be considered in determining reasonableness of the proposed draw, just as the benefits of the upstream junior diversions were considered by the court in *Antioch* in determining whether those diversions should be enjoined to protect a senior right holder. In addition, the court considered the availability of a physical solution that could prevent the claimed harm to Antioch, finding that "by moving its pump a few miles up the river it could obtain water free from saline solution. It is not altogether improbable that if it had devoted the same amount of energy and expenditure to a change of its place of diversion as it has to the present litigation, it would have had the water uncontaminated by salt with less delay than had already occurred and at no more expense." (*Antioch*, *supra*, at p. 465.)

			Any physical solution in this proceeding would likely be significantly more complex than the relocation of a single point of diversion, if any such solution is feasible. But the *Antioch* case presents a relevant application of the rules of injury and reasonableness in the context of seawater intrusion. *Allen v. California Water and Telephone* (1946) 29 Cal.2d 466, is also relevant precedent identified by MCWD and Marina in which the Supreme Court enjoined the holder of a junior appropriative groundwater right from pumping and exporting groundwater except at times when there were surface flows in the Tijuana River. The trial court found that the defendant's continued pumping was "an existing hazard to all overlying owners" because of the threat of "permanent injury through mineralization and salt water intrusion." (*Id.* at pp. 482, 485.) The defendant presented a physical solution to the trial court, which imposed limitations on extractions based on the impact to a series of test wells, and included an agreement to pay for the deepening of plaintiffs' wells. The court rejected the proposal as "unworkable." (*Id.* at p. 487.) The Supreme Court upheld the trial court's determination that except at times when surface flows were in the river, the junior user's pumping exceeded the safe yield (or sustainable yield) of the basin. The court retained jurisdiction to modify the decree based on evidence of additional available supplies from the operation of a new upstream project located in Mexico that may have increased the sustainable yield of the basin. The evidentiary record in this proceeding does not include sufficient evidence to determine whether the proposed draw by Cal-Am is likely to injure existing right holders other than MCWD. In the *Allen* case, the defendant "put in issue the right of all overlying owners," through its pleadings and cross-complaint. (*Id.* at p. 484.) As a result, all overlying users in the basin who sought to participate in the proceeding had the opportunity to present evidence as to the threat of injury to their overlying uses and the potential harm from the extractions. There has been no similar opportunity in this proceeding. The Final Report declines to address the questions of injury

			to other legal users or the reasonableness of the proposed draw because of the limits of the evidentiary record. The Supreme Court noted in *Allen* the "[d]ifficulties in the formulation of a decree which will protect the supply and at the same time prevent the waste of surplus water …." (*Id*. at p. 486.) Similar difficulties are presented by this case, particularly because not all of the right holders in the basin are represented.
32	Section 5.2.3 (Injury To Groundwater Rights), p. 46 [42]	37	See Response to MCWD General Objection No. 1 (Appendix D).
33	Section 5.3 (Physical Solution), pp. 47-51 [43-47]	38	See Response to MCWD Specific Objection No. 13 (Appendix D).
34	Section 6.1.1 (Court's Question 1 -- Locations of Subsurface Drawing Source Points), pp. 51-56 [47-52]	39	There is ambiguous and potentially conflicting information in the evidentiary record about the distance between the test slant well and the MHW line. The Final Report relies on the information about the test slant well in the FEIR, which provides the precise location of the test slant well head by state plane coordinates and describes the end of the well casing as located "approximately 170 ft seaward of the mean high water line." (Exh. Cal-Am-38(c), p. 38.) The well completion report for the Test Slant Well depicts the well head to be located 800 feet from the "Pacific Ocean." (Exh. MCWD-68, p. 2.) There is no other information in the record about the distance between the test slant well head and the MHW water line. The information in the well completion report is ambiguous, because there is no information about the method and precision of measurement of the distance between the well head and the Pacific Ocean and the relationship of the boundary depicted as the Pacific Ocean and the MHW water line. If the boundary of the Pacific Ocean is estimated based on the approximate water line at the time of observation, then this boundary will fluctuate depending on the tide and the season. The Final Report relies on the

			information in the FEIR because it is specific as to the relationship between the well casing and the MHW line although there is no further information about the basis of the statement. The accuracy of the information in the FEIR could be verified and documented through the submission of additional evidence to the court.
35	Section 6.1.2 (Court's Question 1 -- Capture Zones), pp. 57-60 [53-56]	40	Objection noted.
36	Section 6.2.1 (Court's Question 2 -- Quantities from Beneath the CEMEX Property), p. 66 [62]	41	Objection noted.
37	Section 6.2.2 Generally (Origin of the Water), pp. 63-66	41	Objection noted.
38	Section 6.2.2 (Court's Question 2 -- Origin of the Water), pp. 67-69 [63-65]	43	Objection noted.
39	Section 6.4 (Court's Question 4), p. 73 [69]	47	Objection noted.

40	Section 6.5.2 (Storage Space), pp. 88-90 [84-86]	58	Objection noted.
41	Section 6.5.3 (Subbasin Cross-Boundary Flows), pp. 90-95 [86-91]	59	Objection noted.
42	Section 6.7.1 (Marina's Water Rights), pp. 95-96 [91-92]	60	The Board revised the draft order to reflect that Marina may have unexercised overlying rights to groundwater for use on any overlying property Marina owns. The remainder of this objection does not allege injury to a water right holder. The hearing officer excluded evidence about the vernal ponds and wetlands because it was unrelated to any alleged injury to Marina or MCWD's water rights. Marina now asserts that the proposed draw would result in unreasonable harm by causing significant and unreasonable impacts on beneficial uses of surface water in the form of impacts to these vernal ponds and wetlands. It is unclear whether such an allegation is within the scope of the court's Question 8, although the potential for significant and unreasonable impacts to beneficial uses of surface water is relevant to determining whether Cal-Am's proposed draw is reasonable. The Monterey Subbasin groundwater sustainability plan identifies the vernal pools as groundwater-dependent ecosystems that are a beneficial use of water. (Exh. MCWD-60, p. 247.) Because admission of the evidence offered about potential impacts to vernal pools would likely necessitate the opportunity for additional hearing days at this late stage in the proceeding, and given that Marina did not previously raise this argument, the Board will not re-open the evidentiary record to accept additional evidence on this issue. The Board might address this issue in more detail, with the submission of additional evidence, if directed to do so by the court.

43	Section 6.7.2 & 6.7.3 (MCWD's Water Rights & Injury to MCWD's Water Rights), pp. 96-98 [92-94]	63	Marina objects that the Draft Report "limits its analysis of harm to MCWD's water rights to a narrow view of well interference." (2025-01-31 City of Marina Objections to Draft Report, p. 63.) The Final Report conducts an analysis of the potential for the proposed draw to cause legal injury to MCWD's water rights under the Water Code and the common law. Absent interference with the quantity or quality of water available to MCWD at its historical points of diversion and purposes of use, there is no injury to its rights. Pursuant to this analysis, the evidence in the record supports the conclusion that MCWD's appropriative water rights are not likely to be injured. Although Marina points to evidence of increased seawater intrusion and alleges that there may be a loss of protective heads that prevents further intrusion, the model results do not support a conclusion that groundwater quality at MCWD's wells would be significantly affected. Marina asserts that the Board should consider "whether the aggregated pumping of all water rights holders can be pumped without damaging the basin, particularly in terms of seawater intrusion, but also in terms of chronically exceeding the basin safe yield." (2025-01-31 City of Marina Objections to Draft Report, p. 68.) The Board agrees that determining whether a proposed extraction is reasonable, as distinguished from causing injury to a particular legal user, depends in part on the harm that may result. Although the Board has concluded based on the model results that some harm is likely to result from the proposed draw, including additional seawater intrusion and lowering of groundwater elevations in certain portions of the subbasins, there was insufficient evidence for the Board to conduct a complete balancing of the benefits of the proposed project against the potential harms to the basin. Therefore, the Board cannot conclude whether the proposed draw would be reasonable or whether a physical solution could reduce or prevent the potential impacts. Marina also alleges that the operation of the proposed slant wells will require additional management actions to achieve sustainability of the basin under SGMA, which may include additional restrictions on pumping from MCWD's

			wells. SGMA authorizes groundwater sustainability agencies to regulate groundwater pumping to achieve sustainability. Limitations imposed on the exercise of a groundwater right, that are properly adopted by a groundwater sustainability agency as authorized by SGMA, do not result in legal injury to the rights. Finally, the Final Report does not address whether cessation of Cal-Am's proposed draw may injure MCWD's water rights. That issue is not directly identified in the court's questions and any estimate of the timing of such an occurrence and future conditions when pumping may cease, would be speculative.
44	Section 6.7.3.1 (Impacts to Quantity of Groundwater), pp. 98-99 [94-95]	68	As addressed above, the Board agrees that the court should consider whether the added draw by Cal-Am's proposed slant wells would, when taken in the aggregate with other extractions of water, cause unreasonable harm to the basin. This consideration is relevant to determine whether Cal-Am's proposed extraction would be a wasteful or unreasonable diversion or use of water. (Cal. Const., art. X, § 2.) Exceedance of the "safe yield" of the basin, defined as an aggregate quantity of water that may be extracted from the basin on an average annual basis without causing unreasonable harm, is prima facie evidence that there is no surplus water available in the basin for appropriation. The Board concluded based on the model results that some harm to the basin is likely to result from the proposed draw, including additional seawater intrusion and lowering of groundwater elevations in certain portions of the subbasins. There was, however, insufficient evidence for the Board to conduct a complete balancing of the benefits of the proposed project against the potential harm. A physical solution might address potential impacts of the project to prevent any unreasonable harm. Such a solution may also support the objectives of SGMA by preventing the project from causing undesirable results as those results are defined in the applicable groundwater sustainability plans.

45	Section 6.7.3.2 (Impacts to Quality of Groundwater), p. 99 [95]	68	The groundwater sustainability agency for the 180/400 Aquifer Subbasin has the authority to regulate Cal-Am's extraction of groundwater from the subbasin to achieve sustainable groundwater management. Cal-Am's extraction would be junior to overlying and senior appropriative groundwater users. The groundwater sustainability agencies would have the authority to reduce Cal-Am's pumping before regulating pumping by other more senior right holders.
46	Section 6.8, 6.8.1 and 6.8.2 (Court Question 8, Extraction of Ocean Water, Extraction of Groundwater), pp. 100-102 [96-98]	69	The Board maintains its conclusion that water that originates from the ocean but that migrates towards and is captured by the slant wells landward of the MHW line, is ocean water and not groundwater under applicable law. Such a characterization accurately reflects that the proposed draw of ocean water is of water that would not be located within the groundwater basin absent operation of the wells. Section 5.1.7 describes and identifies relevant case law that discusses the doctrines of replacement or augmentation water, pursuant to which a junior appropriator may take water out of priority (in other words, divert or extract water when water would not otherwise be available for appropriation) by providing a suitable quantity and quality of replacement water to satisfy other legal users and prevent unreasonable harm. This doctrine is distinct from the doctrines of salvaged or developed water.
47	Section 6.8.2.2 (Avoidance Of Injury To Existing Uses and Users) pp. 104-105 [100-101]	72	The statement in the report quoted and objected to by Marina was intended to reflect that some amount of replacement water, of a suitable quality and delivered to a suitable location, could ensure that other legal users are not injured by the proposed draw. That conclusion is not speculative — it is a statement of law. Whether such injury would actually occur, and the amount and quality of replacement water and the location of delivery of that replacement water that would be necessary to prevent injury, is not addressed because the evidentiary record before the Board is not adequate to resolve that issue. Marina asserts that the Board had a duty to conduct an independent investigation to identify legal users other than MCWD and Marina that might

			be injured by the proposed project. The Board did not understand the reference from the court and the court's questions to include any direction to conduct an independent investigation. The Board assigned the matter to the Administrative Hearings Office based on its understanding that the parties to the proceeding would submit relevant evidence through an administrative hearing process on which the Board would base its Final Report.
48	Section 6.8.2.4 (Physical Solution), pp. 106-110 [102-104]	75	The Board has not taken a position regarding the burden of proof as between the parties on legal or factual issues presented in the court's questions. Based on the record before the Board, Cal-Am has not demonstrated that its proposed draw would avoid injury to other legal users of water and unreasonable harm to the basin. Marina and MCWD have not demonstrated that the implementation of an appropriate physical solution, such as the provision of replacement water, could not address any injury to other legal users of water or unreasonable harm to the basin that might otherwise result from the proposed draw. Marina objects that a physical solution and the use of replacement water cannot be relied upon to prevent injury or harm from a new appropriation. Marina cites no support for this assertion, and it is the Board's conclusion that the physical solution doctrine can apply in such a manner to allow a new appropriation. The use of replacement water to prevent injury or unreasonable harm is similar to an exchange or augmentation plan as described in Footnote 28 (Final Report, p. 43). The Final Report addresses the bases for utilizing a background concentration of 500 mg/L of TDS to calculate the ocean water percentage in the proposed draw, and Marina raises no new arguments in its objection. (Final Report, p. 68.) If the ocean water percentage is used to determine the amount of replacement water that Cal-Am is to provide, then this same background concentration of TDS should be the maximum background concentration of TDS in any replacement water. If the ocean water percentage is calculated using a higher assumed background concentration of TDS, which is then utilized to calculate the quantity and quality of

			replacement water, then Cal-Am will be required to provide a higher quantity of lower quality replacement water. The Board revised the December 31, 2024 Draft Report to address the ambiguities identified by Marina on page 102 of the draft. The court asked the Board whether it has “an opinion as to whether there is any legal theory on which Cal-Am may rely to extract the proposed draw.” (Final Report, pp. 5, 102, 120.) The Board’s answer is yes; Cal-Am may be able to rely on the physical solution doctrine to make the proposed extraction. The Board cannot determine, based on the record before it, the specific elements of such a physical solution that would prevent injury to other legal users and unreasonable harm.
49	Section 7 (Conclusion), pp. 110-117 [106-113]	78	Objections noted.

12 APPENDIX D – MCWD OBJECTIONS RESPONSE TABLE

MCWD's General Objections to the AHO's December 31, 2024, Draft Report of Referee:

No.[1]	Section/Page of Text in Draft Report	PDF page of MCWD's Objection[2]	Board's Response or Ruling
1	(1) Section 6.8.2.3 (Avoidance of Unreasonable Harm), pp. 105-106 [101-102][3] (2) Section 4.2 (Groundwater Modeling for this Proceeding), p. 37 [33]	7	Marina Coast Water District (MCWD) argues that an extraction of water that causes an "undesirable result" as defined by the applicable groundwater sustainability plan (GSP) is per se unreasonable and that this determination is binding on any court conducting a judicial determination of water rights. No court has reached such a conclusion. The Department of Justice did not make this assertion in the joint letter submitted on behalf of the California Department of Water Resources and the State Water Resources Control Board in *Indian Wells Valley Groundwater Authority v. Superior Court*, Court of Appeal of the State of California, Fourth Appellate District, Division Three, Case No. G064757. In that letter, the agencies expressed concern that a court might conduct a "*de novo* trial on a basin's safe yield" rather than affording deference to the determinations in the groundwater sustainability plan. (2025-01-31 MCWD's Objections to Draft Report, p. 75 (Attachment 1, Letter from Department of Justice to Presiding Justice and Associate Justices regarding Case No. G064757, Oct. 17, 2024, p. 4).) The State Water Board expresses a consistent position here, concluding that "the agencies' conclusions in these plans, which DWR has approved,

[1] For ease of reference, we have added numbering to the text describing the objections.
[2] All references to objections are to MCWD's January 31, 2025, objections, saved in the record as "2025-01-31 MCWD's Objections and Comments to Draft Report."
[3] Unless otherwise indicated, citations to page numbers of documents and exhibits are to the pages of the PDF files. These page numbers often are different from the text page numbers in the documents or exhibits. We have also provided the printed page numbers in brackets, following the PDF page numbers.

			to have significant persuasive value in identifying thresholds for unreasonable harm to the subbasin." (2024-12-31 Draft Report, p. 105.) To add clarity, the Board has amended the Final Report to include that the agencies' conclusions "should be afforded deference." (Final Report, p. 108.) Contrary to MCWD's assertion (2025-01-31 MCWD's Objections and Comments to Draft Report, p. 12), the Sustainable Groundwater Management Act (SGMA) does not authorize groundwater sustainability agencies to define per se unreasonable uses of water under article X, section 2 of the California Constitution. The State Water Board, in contrast, has been granted such authority by the Legislature in Water Code section 275: "The department and board shall take all appropriate proceedings or actions before executive, legislative, or judicial agencies to prevent waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of water in this state." The Legislature has made no similar grant of authority to groundwater sustainability agencies. Even if we agreed with MCWD's arguments as to the per se and binding effect of the definition of undesirable results in a GSP, however, the Final Report's ultimate response to the court's question remains the same. In the Board's opinion, there is a legal theory upon which Cal-Am may rely to extract the proposed groundwater. Cal-Am may be able to rely upon a physical solution to avoid injury to legal users and unreasonable harm from the proposed draw. The Board has revised the Final Report to reflect that in addition to representing a scenario with significantly reduced groundwater extractions, Scenario D could also be considered as a proxy for a scenario that includes a combination of reductions in extraction

			and groundwater recharge. The Final Report concludes that the specific SGMA-compliance scenarios considered in the modeling are speculative as compared to an assumption that existing levels of extraction and recharge will continue to occur. In addition, Scenarios C and D assume actions that mitigate the impacts of overdraft on groundwater conditions in the subbasins such as seawater intrusion and groundwater elevations. Analyzing the potential impact of the project absent other mitigating actions provides a “worst case” scenario to assess the potential impacts of the proposed draw. The overall magnitude of the impact of Cal-Am’s proposed draw may vary depending on future SGMA compliance actions and resulting conditions in the basin. However, conditions in the basin under Scenarios C and D would be improved as compared to the no-mitigation alternative of Scenario B. These improved conditions would reduce the likelihood that the proposed draw by Cal-Am may injure other legal users or result in unreasonable harm. Because the Board does not consider the amount of replacement water that may be necessary to avoid injury to other legal users or unreasonable harm to the basin, the Board does not consider the use of Scenario D model results for this purpose.

2	Section 6.8.2 (Extraction of Groundwater), p. 102 [97]	17	Surplus water may be available on a localized or time-limited basis even if extractions from a basin exceed the safe yield of the basin considered as a whole or on average. The overdrafted conditions of the subbasins is prima facie evidence, however, that no surplus water is available for extraction. (Final Report, p. 105.) This evidence must be considered with any other available evidence to determine whether the project proposed by Cal-Am would cause unreasonable harm. The calculation of an ocean water percentage in Cal-Am's proposed draw that presumes a background concentration of 500 mg/L of TDS for non-ocean water, suggests that such water would be available to other users absent the proposed draw. This assumption supports the conclusion that the extracted water is neither salvaged nor developed. Salvaged or developed water is water made available through some intentional effort, and absent that effort, would not be available for beneficial use. (See Section 5.1.6.) The person who makes such water available for use is entitled to a prior right to that water. The Board agrees that if, absent Cal-Am's extraction, this relatively high-quality groundwater would have been available to other legal users in the basin for beneficial use, it is not developed or salvaged by Cal-Am. The Board added these conclusions to the Final Report. The Board updated the Final Report to clarify the lack of information about other wells in the proximity of the proposed slant well location, and the types of information that would be necessary for the Board to determine whether there is a risk of injury to these other legal users from the proposed draw by Cal-Am. (Final Report, p. 107.)

			The Board updated the Final Report to address the use of the word "or" in a manner that was unclear to MCWD. The report now states, "Cal-Am may extract groundwater from the SVGB if the extraction **neither** (1) injure**s** other legal users of water **n**or (2) cause**s** unreasonable harm." (Final Report, p. 103.)
3	Section 6.4.1 (Definition of Seawater Intrusion), pp. 73-74 [69-70]	20	To respond to the court's question about the likelihood and extent of seawater intrusion, the Final Report considers the seawater isocontour of 1,500 mg/L of TDS to depict the boundary of seawater intrusion. The parties selected this threshold and did not explicitly depict other isocontours in their model results. A landward progression of the TDS isocontour is, however, a proxy to indicate associated increases in TDS concentration in the vicinity, both landward and seaward, of the 1,500 mg/L TDS isocontour. An increase in TDS concentration of water in the aquifers may constitute harm. The Final Report does not reach any conclusion as to whether such an increase might be unreasonable. This determination would require a more comprehensive evidentiary record than developed in these proceedings and may implicate the legal interests of other groundwater users who are not parties to this proceeding.

4	Section 6.7.3 (Injury to MCWD's Water Rights), pp. 97-100, 117 [93-95, 113]	22	MCWD objects that the Draft Report limits its analysis of harm to MCWD's water rights to potential trespass or direct well interference. (2025-01-31 MCWD's Objections to Draft Report, p. 22.) The Final Report conducts an analysis of the potential for legal injury to MCWD's water rights under the Water Code and applicable case law. Absent interference with the quantity or quality of water available to MCWD at its historical points of diversion and for its purposes of use, there is no injury to its rights. Pursuant to this analysis, the evidence in the record supports the conclusion that the proposed draw is not likely to injure MCWD's appropriative water rights. Although MCWD points to evidence of increased seawater intrusion seaward of MCWD's wells and alleges losses of seawater protective heads, the evidence does not support a conclusion that groundwater quality at MCWD's wells would be significantly affected. MCWD suggests that it may extract groundwater from different locations in the basin at a future time. To the extent that MCWD changes an element of its appropriative right, such as relocating its wells, MCWD may not interfere with the extractions of a junior user. "A junior appropriator is entitled as against the senior to continuance of the conditions that existed when the junior appropriation was made." (Hutchins, The California Law of Water Rights (1956), p. 157; *Nevada Water Co. v. Powell* (1867) 34 Cal. 109, 119.) MCWD asserts that "the Project will have an impact on MCWD's ability to comply with SGMA, and by extension the [enjoyment] of its primary and paramount water right." (2025-01-31 MCWD Objections to Draft Report, p. 22.) MCWD alleges that the operation of the proposed slant wells will cause additional management actions to be necessary to achieve sustainability of

			the subbasin under SGMA, which actions may include restrictions on pumping from MCWD's wells. SGMA authorizes groundwater sustainability agencies (GSAs) to regulate groundwater pumping to achieve sustainability. (Wat. Code § 10725.2.) Limitations imposed on groundwater extractions by the GSA, within the scope of its authority, are not an injury to or impairment of water rights caused by the junior user. GSAs are authorized to regulate groundwater pumping to achieve sustainability and the exercise of this authority does not create a cause of action against any other user of water. To the extent that a senior user claims an infringement of its water rights because of pumping restrictions, any such claim would lie against the GSA. SGMA does not, however, require that restrictions on pumping imposed by the GSA to achieve sustainability strictly comply with water right priorities. Groundwater management by a GSA for the 180/400 Subbasin may not "impede[] achievement of sustainability goals in an adjacent basin." (Wat. Code, § 10733.) This provision must be considered by a GSA in developing its GSP and by the Department of Water Resources when considering whether to approve the GSP. This provision does not create a private cause of action as against individual groundwater pumpers. Although the evidence does not show a likelihood of injury to MCWD, the model results show that additional seawater intrusion and lowering of groundwater elevations in certain portions of the subbasins will likely occur, which MCWD describes as "harm." (2025-01-31 MCWD Objections to Draft Report, p. 22.) The evidence in the record does not, however, include sufficient information about current or reasonably anticipated uses of groundwater from the basin in proximity to the slant wells, other

			than MCWD's existing wells, to conclude whether any such extractions and uses may be materially impaired by the proposed draw. Absent a substantial effect on beneficial uses of water, the proposed draw would not be unreasonable. Finally, the Final Report does not address whether cessation of Cal-Am's proposed draw may injure MCWD's water rights. That issue is not directly identified in the court's questions and any estimate of the timing of such an occurrence and future conditions at that time would be highly speculative.
5	Section 6.8 (Question 8 Generally), pp. 101, 102, 106 [98, 102]	24	The Board agrees that Cal-Am has no existing right to extract groundwater from the Salinas Valley Groundwater Basin. The Board understood the court to ask whether there is any *legal theory* upon which Cal-Am might rely to obtain such a right and make the proposed extraction of groundwater. The Board's response to this question is yes, there is such a legal theory. First, Cal-Am may be able to demonstrate that its proposed draw would not injure other legal users or cause unreasonable harm, although the evidence in the record before the Board is insufficient to reach a conclusion. Second, Cal-Am may be able to demonstrate that a physical solution, such as the provision of replacement water, would be sufficient to prevent injury to other legal users and avoid unreasonable harm. Again, the evidence in the record before the Board on this point is inadequate to reach a conclusion. The Board did not understand that the court was seeking a definitive answer to these broader questions about the potential for injury to other legal users and unreasonable harm, which extend well beyond the court's more focused questions relevant to the threat of injury to MCWD's water rights (or any water rights Marina holds). The Board can conduct such an investigation, but

			such an undertaking would be complex and may require notice to all potentially affected groundwater users in the basin.

MCWD's Specific Objections to the AHO's December 31, 2024, Draft Report of Referee:

No.	Section/Page of Text in Draft Report	PDF Page of MCWD's Objection	Board's Response or Ruling
1	Section 2.3.2 (Hydrogeologic Features), p. 13 [9]	26	Deleted sentence about the Dune Sand Aquifer.
2	Section 3.1.1 (Assignment to the Administrative Hearings Office), pp. 23-24 [19-20]	28	The statement accurately describes the assignment of the matter by the Executive Director of the State Water Board to the Board's Administrative Hearings Office (AHO). The AHO is explicitly authorized by statute to conduct adjudicative hearings. (Wat. Code, § 1112, subd. (c).)
3	Section 3.1.2 (Statutory Procedure for Court References), p. 24 [20]	28	Changed sentence to match the statute.
4	Section 4 (Groundwater Modeling), Section 6.7.3.2 (Impacts to Quality of Groundwater), pp. 33, 100 [29, 96]	29	Noted.
5	Section 4.2 (Groundwater Modeling for this Proceeding), p. 37 [33]	29	Noted.
6	Section 4.2 (Groundwater Modeling for this Proceeding), p. 37 [33]	30	See Response to General Objection No. 1.

7	Section 5.1.4 (Sustainable Yield of a Groundwater Basin), p. 39 [35]	31	The bench book, *Adjudicating Groundwater: A Judge's Guide to Understanding Groundwater and Modeling, Dividing the Waters, The National Judicial College (2018),* was published by the Dividing the Waters Program at the National Judicial College. Dividing the Waters is a program intended for federal and state judges who are adjudicating water matters, to provide education and resources about water law and science. The bench book was developed to build judicial understanding of the science of groundwater. The Board, and the court, may consider the bench book as a learned treatise. The Final Report does not reference the bench book, however. The references in the Draft Report were helpful but not necessary to define the concept of sustainable yield.
8	Section 5.1.7 (Replacement Water), p. 42 [38]	32	MCWD erroneously asserts that "[u]nlike other jurisdictions, California law does not authorize out-of-priority diversions with provisions for replacement water." (2025-01-31 MCWD's Objections to the Draft Report, p.34.) The Final Report provides several California examples of groundwater adjudications in which pumpers are authorized to take water in excess of the amount allocated under their water right and the safe yield of the basin (an "out-of-priority" diversion), by providing replacement water or compensating the basin water master for the purchase of replacement water. In addition, the State Water Board allows new appropriations of surface water even when water is otherwise unavailable (out-of-priority diversions), with the provision of replacement water. Water Right Order 91-07 identifies stream systems in California that are fully appropriated, and in which no unappropriated water is available. Order 91-07 states that the Board may issue a water right permit for a new appropriation even in these fully appropriated systems if a water transfer or water exchange provides replacement water to avoid injury to existing right holders. (WR

			Order 91-07, p. 25, section 5.1.) Such rights are appropriative water rights. The same legal theory applies analogously to the appropriation of groundwater, as it does in other western states. For example, pursuant to this provision of Order 91-07, the State Water Board authorized appropriation of water from the fully-appropriated Tuolumne River system with the following permit term: "Diversion of water under this permit during the period from June 16 through October 31 of each year is subject to maintenance of the Water Exchange Agreement executed on December 12, 1992, between the permittee and the Modesto and Turlock Irrigation Districts. Pursuant to the Agreement, permittee shall provide replacement water to New Don Pedro Reservoir for all water diverted under this permit during the period from June 16 to October 31 of each year. The source, amount, and location at New Don Pedro Reservoir of replacement water discharged to the reservoir shall be reported to the State Water Resources Control Board with the annual Progress Report by Permittee." (Water Right Permit 20784 (March 23, 1995), Term 19.) See also C*ity of Lodi v. East Bay Mun. Util. Dist.* (1936) 7 Cal.2d 316, discussed in response to Objection No. 36, for an example of a new appropriation authorized by implementation of a physical solution to prevent interference with senior water rights.
9	Section 5.2.2. (Impairment of Water Quality), p. 45 [41]	35	*Town of Antioch v. Williams Irrigation District* (1922) 188 Cal. 451 (*Antioch*) applies the standard for injury to a legal user and the common law doctrine of reasonableness prior to constitutional incorporation of the doctrine through article X, section 2, enacted in 1928. Although the court in *Antioch* may not have anticipated that similar facts might arise in any case "except one arising upon these two rivers concerning a similar claim of some prior appropriator near the outlets thereof," (*id.* at p. 464), the facts in this proceeding present some similarities. If the court in this proceeding enjoins the

			proposed draw by Cal-Am because it concludes that the impact to MCWD's water rights constitutes injury or that the effects of the proposed draw will cause unreasonable harm, Cal-Am will be prevented from extracting and desalinating ocean water that would constitute a new supply to the basin (the 15.5 million gallons per day project would produce an estimated 7,167 afy of water of a quality suitable for municipal use). (CPUC Dec.18-09-017, p. 178.) These potential benefits should be considered in determining reasonableness of the proposed draw, just as the benefits of the upstream junior diversions were considered by the court in *Antioch* in determining whether those diversions should be enjoined to protect a senior right holder. In addition, the court considered the availability of a physical solution that could prevent the claimed harm to Antioch, finding that "by moving its pump a few miles up the river it could obtain water free from saline solution. It is not altogether improbable that if it had devoted the same amount of energy and expenditure to a change of its place of diversion as it has to the present litigation, it would have had the water uncontaminated by salt with less delay than had already occurred and at no more expense." (*Antioch, supra,* at p. 465.) Any physical solution in this proceeding would likely be significantly more complex than the relocation of a single point of diversion, if any such solution is feasible. But the *Antioch* case presents a potentially helpful application of the rules of injury and reasonableness in the context of seawater intrusion.
10	Section 5.2.3 (Injury to Groundwater Rights), p. 46 [42]	36	This statement reflects that lowering groundwater elevations may cause injury to other legal users, even if the injured right holders can, for a period of time, continue to access and extract the water to which they are entitled. As referenced by MCWD in its objection, such lowering of groundwater levels will tend to result in interference with the exercise of legal users' rights over time. (2025-01-31 MCWD's Objections to the Draft Report, p. 37.)

			Groundwater users are not required to wait until lowered groundwater levels interfere with the ability to extract the quantity and quality of water to which the right holder is entitled to demonstrate injury. (*City of Pasadena v. City of Alhambra* (1949) 33 Cal.2d 908, 929.) In this proceeding, however, the model results support the conclusion that there will be no interference with the exercise of MCWD's water rights from the proposed draw, even over time.
16	Section 5.3 (Physical Solution), p. 47 [43]	37	A physical solution in which Cal-Am provided sufficient replacement water to prevent any injury to senior right holders, such that these right holders would remain whole, is consistent with the rule of priority. In *City of Barstow v. Mojave Water Agenc*y (2000) 23 Cal.4th 1224, the California Supreme Court affirmed that the trial court erred by imposing a physical solution that relied upon the equitable apportionment doctrine rather than the rule of priority to allocate groundwater among competing users.
17	Section 6.1.1 (Location of Subsurface Drawing Source Points), pp. 51-52 [47-48]	38	Objection noted, see Footnote 30.
18	Section 6.1.1 (Location of Subsurface Drawing Source Points), p. 54 [50]	38	Adjusted sentence to reflect that the assumed proportion relates to the description of the Test Slant Well in the EIR/EIS.
19	Section 6.1.1 (Location of Subsurface Drawing Source Points), p. 54 [50]	39	Objection noted.
20	Section 6.1.1 (Location of Subsurface Drawing Source Points), p. 54 [50]	39	Objection noted.
21	Section 6.1.2 (Capture Zones), p. 60 [56]	40	Objection noted.
22	Section 6.1.2 (Capture Zones), pp. 61 [57]; 62 [58]	40	Objection noted.

23	Section 6.4.1 (Definition of Seawater Intrusion), p. 74 [70]	41	Objection noted.
24	Section 6.4.3 (Analysis), p. 81 [77]	42	Objection noted.
25	Section 6.4.3 (Analysis), p. 81 [77]	43	Objection noted.
26	Section 6.5.2 (Storage Space), p. 83 [79]	43	Objection noted.
27	Section 6.5.2 (Storage Space), p. 88 [84]	44	Objection noted.
28	Section 6.5.2 (Storage Space), p. 90 [86]	45	Amended language to address objection.
29	Section 6.5.3 (Subbasin Cross-Boundary Flows), pp. 90-94 [86-90]	46	Objection noted.
30	Section 6.7.3 (Injury to MCWD's Water Rights), p. 97 [93]	48	The type of indirect harm described by MCWD, even if it were to occur, would not constitute legal injury to its water rights.
31	Section 6.7.3 (Injury to MCWD's Water Rights), p. 97 [93]	49	See response to General Objection No. 4.
32	Section 6.7.3 (Injury to MCWD's Water Rights), p. 98 [94]	49	The model results show that there will be sufficient groundwater physically available for extraction from MCWD's wells to meet historical demands even with operation of the proposed project over time. (See also, response to General Objection No. 4.)
33	Section 6.7.3 (Impacts to Quantity and Quality of Groundwater), p. 98 [94]	50	Harm is not sufficient to demonstrate legal injury to a water right. The standard for legal injury is significant and material interference with the exercise of the right. The model results support the conclusion that the proposed draw from the slant wells would not significantly and materially interfere with the extraction of water from MCWD's wells.

			Cal-Am cannot, however, develop a right to extract water in a manner that would cause unreasonable harm. The Final Report of Referee concludes that there is insufficient evidence in the record to conduct the type of balancing necessary to determine whether Cal-Am's extraction would be unreasonable, although exceedance of the GSP's quantitative standards for undesirable results is persuasive evidence that the proposed draw would be unreasonable absent mitigation of those impacts. Such mitigation might include a physical solution that requires Cal-Am to provide replacement water. For example, Cal-Am might provide replacement water to MCWD in lieu of pumping from their wells, to offset impacts to the Monterey Subbasin.
34	Section 6.7.3 (Impacts to Quantity and Quality of Groundwater), p. 99 [95]	50	See responses to Objections 31-33. The court's questions referred to the State Water Board did not explicitly include consideration of potential impacts to legal users of water at a future time if the project ceases to operate. Therefore, this question is not addressed in the Final Report of Referee.
35	Section 6.7.3.2 (Impacts to Quality of Groundwater), p. 100 [96]	51	Cal-Am cannot develop a right to extract water in a manner that would cause unreasonable harm. The Final Report concludes that there is insufficient evidence in the record to conduct the type of balancing necessary to determine whether Cal-Am's extraction would be unreasonable, although exceedance of the GSP's quantitative standards for undesirable results is persuasive evidence that the proposed draw would be unreasonable absent mitigation of those impacts. Such mitigation might include a physical solution that requires Cal-Am to provide replacement water.
36	Section 6.8 (Question 8), p. 100 [96]	51	The cited text is revised to strike "as proposed."
37	Section 6.8.2 (Extraction of Groundwater), p. 101 [97]	52	See responses to General Objections.

38	Section 6.8.2 (Extraction of Groundwater), p. 101 [97]	52	See responses to General Objections.
39	Section 6.8.2 (Extraction of Groundwater), p. 102 [98]	52	See responses to General Objections.
40	Section 6.8.2 (Extraction of Groundwater), p. 102 [98]	53	A physical solution in which Cal-Am provided sufficient replacement water to prevent any injury to senior right holders, such that these right holders would remain whole, is consistent with the rule of priority. In *City of Barstow, supra,*, the California Supreme Court affirmed that the trial court erred by imposing a physical solution that relied upon the equitable apportionment doctrine rather than the rule of priority to allocate groundwater among competing users. In the case of C*ity of Lodi, supra*, the court applied the physical solution doctrine to require that upon lowering of groundwater below an elevation found by the trial court to affect the city's water supply with an appropriate margin of safety, EBMUD must supply water to the city, artificially raise the groundwater levels, or be limited in the amount of water EBMUD could store under its rights to maintain the amount of recharge that would occur naturally. (*Id.* at p. 344.) In *City of Lodi*, the court determined that a new appropriation could be supported by a physical solution to prevent injury to prior right holders. EBMUD held water right permits, but had not yet constructed the reservoirs necessary to divert and beneficially use water. EBMUD was allowed to proceed with its appropriation conditioned upon implementation of the physical solution to be established by the court.
41	Section 6.8.2 (Extraction of Groundwater), p. 102 [98]	53	The point of diversion, place of use, and purpose of use of a valid appropriative right, including an appropriative groundwater right, may be changed if the change does not injure other legal users. (*City of San Bernardino v. City of Riverside* (1921) 186 Cal. 7, 28-29.) It is theoretically possible that Cal-Am could purchase an existing appropriative right to groundwater in the Salinas Valley Groundwater Basin, and extract water pursuant to that right from the proposed slant wells. The evidentiary record does not reflect

			whether any such appropriative rights to groundwater might be purchased and whether any such change in the rights to allow extraction and use by Cal-Am, might injure other legal users or cause unreasonable harm.
42	Section 6.8.2 (Extraction of Groundwater), p. 102 [98]	54	See response to General Objection No. 2.
43	Section 6.8.2.1 (Availability of Surplus Water), pp. 102-103 [98-99]	54	See response to General Objection No. 1.
44	Section 6.8.2.1 (Availability of Surplus Water), p. 103 [99]	55	This statement in the Final Report is intended to note that, in certain limited circumstances, a basin or subbasin may be in overdraft as assessed at a general or average level, even though some surplus water may be available for appropriation in certain seasons, hydrological conditions, or areas. The relevance to the operation of the proposed slant wells and the 180/400 and Monterey Subbasins is not clear, however, so the sentence is not included in the Final Report of Referee.
45	Section 6.8.2.1 (Availability of Surplus Water), p. 104 [100]	55	See response to Objection No. 29.
46	Section 6.8.2.2 (Avoidance of Injury to Existing Uses and Users), p. 104 [100]	56	See responses to Objections Nos. 1, 3, 4, 9, 30, 32, and 34.
47	Section 6.8.2.2 (Avoidance of Injury to Existing Uses and Users), p. 104 [100]	56	See responses to Objection Nos. 3 and 23.
48	Section 6.8.2.2 (Avoidance of Injury to Existing Uses and Users), p. 105 [101]	56	See response to General Objection No. 5.
49	Section 6.8.2.3 (Avoidance of Unreasonable Harm), p. 105 [101]	57	See response to General Objections Nos. 1 and 5.

50	Section 6.8.2.3 (Avoidance of Unreasonable Harm), p. 105 [101]	57	See response to General Objection No. 1.
51	Section 6.8.2.3 (Avoidance of Unreasonable Harm), p. 106 [102]	57	Application of the rule of reasonableness is, in general, a balancing test that incorporates a variety of factors on a case-by-case basis in determining whether a particular use or method of diversion of water is reasonable based on the particular circumstances and conditions. The doctrine incorporates evolving standards and principles and recognizes that a use that is reasonable at one time or in one location may be unreasonable at a future time or in other circumstances. (See *Joslin v. Marin Mun. Water Dist.* (1967) 67 Cal.2d 132, 140; *Environmental Defense Fund, Inc. v. East Bay Mun. Utility Dist.* (1980) 26 Cal.3d 183, 194.) The Board's Water Right Decision 1600 (*Imperial Irrigation District Alleged Waste and Unreasonable Use of Water*) (1984), identifies seven factors to be considered in determining the reasonableness of a particular use of water: (1) other potential beneficial uses, (2) whether water is wasted or otherwise put to some beneficial use, (3) benefits of water savings, (4) amount of water reasonably required for current use, (5) amount and reasonableness of the cost of saving water, (6) whether methods of saving water are conventional reasonable rather than extraordinary, and (7) whether a physical solution might meet the needs of competing users. A similar suite of factors would apply to an assessment of the reasonableness of Cal-Am's proposed draw, which would make previously unusable ocean water available for beneficial use but would also cause some amount of draw on and impacts to the groundwater basin. The State Water Board understood the court's questions to focus on the potential for injury to water rights held by MCWD or Marina from Cal-Am's proposed extraction from the slant wells. In addition, the parties' evidence focused on these questions and did not address the more general and complex question of whether the

			proposed draw might cause unreasonable harm independent from any interference with MCWD's water rights. The Board could address this question upon direction from the court, but doing so would likely require significant additional evidence. MCWD also asserts that the Board had a duty to conduct an independent investigation to identify legal users other than MCWD and Marina that might be injured by the proposed project. The Board did not understand the reference from the court and the court's questions to include any direction for the Board to conduct an independent investigation. The Board assigned the matter to the Administrative Hearings Office based on its understanding that the parties to the proceeding would submit the relevant evidence through an administrative hearing, on which the Board would base its report.
52	Section 6.8.2.3 (Avoidance of Unreasonable Harm), p. 106 [102]	62	The Final Report does not reach any conclusion about the quantity of return water that might be necessary to prevent any unreasonable harm, in the form of seawater intrusion, lowered groundwater elevations, or other effects of the proposed draw, and whether a physical solution is feasible. The Final Report also does not address whether the Scenario D model runs may be relevant to estimating the amount of replacement water that may be necessary to prevent any progression of seawater intrusion in the 180/400 Aquifer caused by the proposed draw.
53	Section 6.8.2.4 (Physical Solution), p. 106 [102]	63	Objection noted.
54	Section 6.8.2.4 (Physical Solution), p. 108 [104]	64	The Final Report of Referee does not include the referenced text.
55	Section 6.8.3 (Monitoring and Adaptive Management), p. 108 [104]	64	The referenced sentence is amended in the Final Report.

56	Section 6.8.3 (Monitoring and Adaptive Management), p. 109 [105]	67	See responses to Objection Nos. 1, 3, 4, 23, 32, 34, 54, and 55.
57	Section 6.8.3 (Monitoring and Adaptive Management), p. 109 [105]	67	See responses to Objection Nos. 1, 4, 11, 31, and 52
58	Section 6.8.3 (Monitoring and Adaptive Management), p. 109 [105]	68	See responses to Objection Nos. 1, 3, 4, 32, and 34.
59	Section 6.8.3 (Monitoring and Adaptive Management), pp. 109-110 [105-106]	69	See responses to Objection Nos. 1, 4, 11, 31, and 52.
60	Section 7 (Conclusion), p. 113 [109]	69	See responses to Objection Nos. 1, 3, 4, 32, and 34.
61	Section 7 (Conclusion), p. 114 [110]	69	See response to Objection No. 22.
62	Section 7 (Conclusion), p. 117 [113]	70	Objection noted.
63	Section 7 (Conclusion), p. 117 [113]	70	Objection noted.