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TECHNICAL MEMORANDUM

DATE: March 20, 2026 **PROJECT #:** 9100.99

TO: Sarah Hardgrave, Salinas Valley Basin GSA

FROM: Derrik Williams P.G., C.Hg., and Hanni Blair

REVIEWER: Abby Ostovar, Ph.D.

PROJECT: Brackish Groundwater Restoration Project

SUBJECT: No Action Alternative Modeling

INTRODUCTION

The No Action Alternative (NAA) characterizes the projected economic and hydrogeologic conditions that would occur if no new measures were implemented to halt seawater intrusion. An NAA is required by the U.S. Bureau of Reclamation (USBR) for any project that might receive grant funding for planning or implementation. By regulation, the NAA must (1) comply with all applicable laws and regulations and (2) exclude any new structural or infrastructure projects.

Because the NAA cannot violate any laws, this alternative must avoid SGMA undesirable results in the 180/400-Foot Aquifer (180/400) Subbasin by 2040. Therefore, the 500 milligrams per liter (mg/L) chloride isocontour that defines the seawater intrusion must be at, or coastal of, its minimum threshold line by 2040. Additionally, undesirable results must be avoided through management actions—not projects—because the NAA cannot build any new infrastructure. Specifically, seawater intrusion must be stopped and reversed by 2040 using only demand management.

The NAA does not estimate future seawater intrusion if no project is built; instead, it estimates the financial impacts to the Salinas Valley if the State of California enforces demand management to stop and reverse intrusion. The NAA assumes the State will reduce any and all groundwater pumping necessary to control seawater intrusion, whether or not this pumping is in the 180/400 Subbasin. Reducing groundwater pumping outside of the 180/400 Subbasin might be the State's only way of controlling seawater intrusion, meeting the requirements of SGMA, and not violating the law.

MODELING APPROACH

Montgomery & Associates (M&A) estimated the amount of demand management needed to control seawater intrusion using both the Salinas Valley Operational Model (SVOM) (version 1; M&A, 2025a, 2026a) and the Seawater Intrusion Model (SWIM) (version 3; M&A, 2023b, 2025b). The extent of the 2 models is shown on Figure 1. The extent of the SVOM is outlined in orange, and the extent of the SVIM is outlined in red on this figure.

The SVOM simulates conditions in the entire Salinas Valley. Based on the historical Salinas Valley Integrated Hydrologic Model (SVIHM, M&A, 2025a), it projects both future groundwater levels and future reservoir operations. The SVOM can address the influence of reducing pumping in one subbasin on groundwater conditions in adjacent or nearby subbasins.

The SWIM is a variable density regional groundwater flow and solute transport model that simulates chloride concentration changes (M&A, 2023a, 2023b, 2024, and 2025b). It simulates groundwater conditions on a regional scale and may not reflect specific conditions in any particular location. The SWIM also simulates potential seawater intrusion from Water Year (WY) 2023 through WY 2072.

The SWIM projects seawater intrusion rates and directions in the coastal portion of the Salinas Valley. It does not simulate groundwater conditions throughout the Salinas Valley. Groundwater level and groundwater flow information from the SVOM is supplied to the SWIM to incorporate Valley-wide pumping reductions and then evaluate the effect on coastal seawater intrusion and groundwater levels.

The SVOM and the SWIM are used in sequence to model each NAA scenario. Valley-wide hydrologic conditions simulated by the SVOM are passed as model inputs to the SWIM, which in turn simulates the seawater intrusion in the coastal region. Data passed from the SVOM to the SWIM for each simulation include the following:

- Simulated monthly pumping rates at individual agricultural wells
- Simulated monthly groundwater recharge rates averaged by water balance subregion as defined in SVIHM
- Simulated groundwater heads at the upgradient SWIM boundary near Chualar averaged by reach
- Simulated Salinas River flows at Chualar, with corrections to better match observed flows
- Simulated Salinas River Diversion Facility (SRDF) diversions

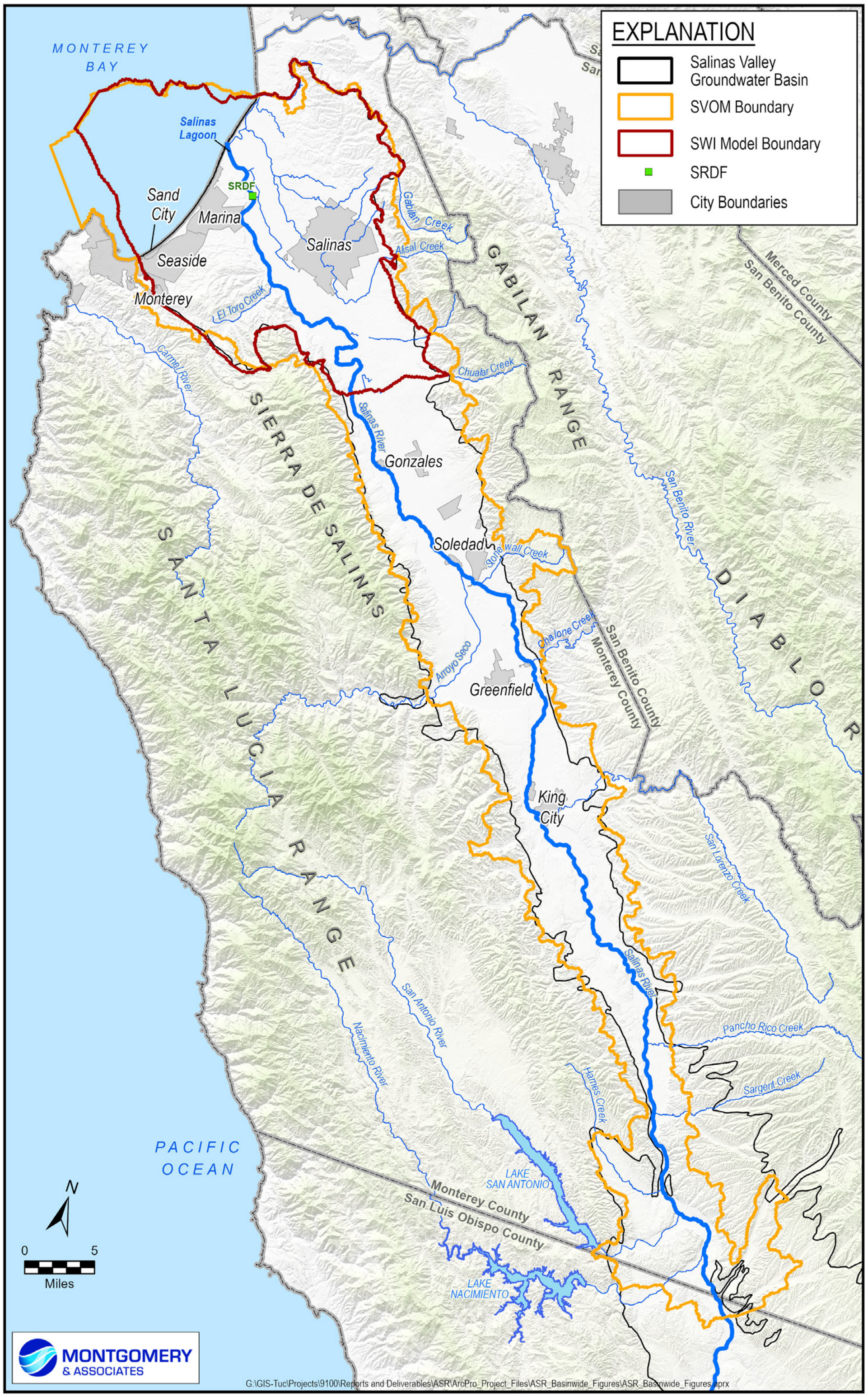

Figure 1. SVOM and SWIM Boundaries

MODELING ASSUMPTIONS

The following assumptions were implemented in both SVOM and SWIM.

- Agricultural pumping cutbacks are implemented in 2030. This assumes the following:
  - The SVBGSA Board of Directors takes no action to advance a preferred suite of projects in 2026.
  - The Department of Water Resources (DWR) finds that with no preferred suite of projects and management actions, it is unlikely the 180/400 Subbasin will achieve sustainability and gives SVBGSA 180 days to remedy the Groundwater Sustainability Plan (GSP).
  - SVBGSA fails to remedy GSP inadequacies in 180 days, and oversight of the 180/400 Subbasin is transferred to the State Water Resource Control Board (SWRCB) in 2027.
  - After a 90-day public notice, the 180/400 Subbasin is put on probation by the SWRCB in late 2027 or early 2028.
  - SWRCB gives the SVBGSA 1 year to remedy the GSP inadequacies and resubmit a GSP that will achieve sustainability by 2040 that includes a preferred suite of projects.
  - SVBGSA fails to remedy GSP inadequacies in 1 year, and SWRCB staff develop an interim GSP for the subbasin, released in 2029. This interim GSP relies on demand management in the form of pumping reductions to control seawater intrusion.
- Reductions in agricultural pumping are achieved through land fallowing. Agriculture is not provided an alternative water supply because that would require new infrastructure and a new project, which is not allowed for the NAA.
- Municipal pumping is reduced to 42 gallons per capita per day (gpcd) This is the post-2030 residential indoor water use standard established under Senate Bill 1157. No outdoor residential water use is allowed. This applies to all water suppliers of 4 or more connections.
- No water is pumped for industrial water use.
- Domestic pumping is not reduced. M&A assumed SWRCB will find all domestic pumpers to be *de minimis* and not subject to pumping reductions.

- Reservoir releases for the Salinas Valley Water Project (SVWP) continue. These releases do not deplete groundwater needed for reversing seawater intrusion. Agricultural land in the Castroville Seawater Intrusion Project (CSIP) area remains cropped to the extent that it can be served by recycled and surface water.
- The Clark Colony Water Company Diversion remains active. Agriculture served by the Clark Colony Water Company Diversion remains cropped to the extent that it can be served solely by diverted surface water.
- Additional surface water stored in the Nacimiento and San Antonio reservoirs, as well as additional flood flows in the Salinas River, are not captured for beneficial use. Capturing these flows would require new infrastructure and a new project, which is not allowed for the NAA.

MODEL SIMULATION DESCRIPTONS

M&A completed 5 NAA simulations; each simulation turned off agricultural pumping in various parts of the Salinas Valley. Each simulation consisted of an SVOM simulation followed by a SWIM simulation. The 5 simulations are compared to a Baseline Scenario that simulates continued current pumping and recharge practices.

Baseline Scenario Description

The Baseline Scenario simulates continued current pumping practices and includes the following assumptions:

- Water inflows and outflows such as precipitation, potential evapotranspiration, and stream inflows along the valley margins were derived from a historical 25-year climate cycle. This 25-year climate cycle was selected to be representative of recent historical climate.
- Land use remained constant. The land use in the SVOM is identical to the 2022 land use used in the SVIHM.
- Agricultural pumping rates and irrigation return flows to groundwater were estimated by the SVOM and copied into the SWIM.
- Groundwater recharge from precipitation was estimated by the SVOM and copied into the SWIM.
- Salinas River inflows at Chualar were estimated by the SVOM and copied into the SWIM. These river inflows include projected reservoir operations.

- Municipal pumping was based on Association of Monterey Bay Area Governments (AMBAG) population estimates and growth projections.
- Sea level was estimated to rise 1.2 feet between 2022 and 2072, based on the intermediate scenario in the State of California Sea Level Rise Guidance (California Ocean Protection Council, *et al.*, 2024).

A detailed summary of the SWIM Baseline Scenario is in the Seawater Intrusion Model Version 3 Projected Baseline Scenario (M&A, 2026b). A detailed summary of the SVOM Baseline is in the Salinas Valley Operational Model Update and Projected Baseline Scenario (M&A 2026a).

No Action Alternative Scenario Descriptions

The NAA scenarios were developed by modifying the Baseline Scenario. Each scenario fallowed land in different parts of the Salinas Valley. The SVOM simulated land fallowing by deactivating agricultural supply wells starting in October 2030. Deactivating agricultural supply wells prevents the model from applying any irrigation above natural precipitation. Table 1 summarizes the 5 NAA scenarios and Table 2 shows the total amount of agricultural pumping simulated in each subbasin for each NAA scenario.

In the fourth scenario, agricultural pumping is reduced in just the northern portion of the Eastside Subbasin. This scenario attempted to differentiate between Eastside Subbasin agricultural pumping that significantly affects seawater intrusion and Eastside Subbasin agricultural pumping that has only a minor effect on seawater intrusion. The solid green area on Figure 2 shows the extent of the northern Eastside Subbasin where agricultural land was fallowed. Red dots on this figure show which agricultural wells were turned off. Blue dots on this figure show the municipal wells in the fallowed land area that continued to pump. The municipal wells within the City of Salinas pump at the reduced rate that provides the 42 gpcd supply.

Table 1. No Action Alternative Scenarios Description

Scenario Number	Scenario Name	Subbasins with 100 % Reduction in Agricultural Pumping	Subbasins with Continued Agricultural Pumping
1	No agricultural pumping in all subbasins	180/400, Eastside, Monterey, Langley, Forebay, Upper Valley	None
2	No agricultural pumping in 180/400, Eastside, Monterey, Langley, and Forebay Subbasins	180/400, Eastside, Monterey, Langley, Forebay	Upper Valley
3	No agricultural pumping in 180/400, Eastside, Monterey, and Langley Subbasins	180/400, Eastside, Monterey, Langley	Upper Valley, Forebay
4	No agricultural pumping in 180/400, Northern Eastside, and Monterey Subbasins	180/400, Northern portion of Eastside, Monterey, Langley	Upper Valley, Forebay, Langley, southern portion of Eastside
5	No agricultural pumping in 180/400 and Monterey Subbasins	180/400, Monterey	Upper Valley, Forebay, Langley, Eastside

Note: No groundwater irrigated agriculture is simulated in the Seaside Subbasin.

Table 2. Agricultural Pumping by Subbasin for NAA Scenarios (AF/WY)*

Subbasin	Baseline	No agricultural pumping in all subbasins	No agricultural pumping in 180/400, Eastside, Monterey, Langley, and Forebay Subbasins	No agricultural pumping in 180/400, Eastside, Monterey, and Langley Subbasins	No agricultural pumping in 180/400, Northern Eastside, and Monterey Subbasins	No agricultural pumping in 180/400 and Monterey Subbasins
Upper Valley	92,400	0	92,300	92,300	92,300	92,300
Forebay	131,700	0	0	130,400	130,900	131,000
Eastside	69,900	0	0	0	55,600	69,800
180/400	97,800	0	0	0	0	0
Monterey	200	0	0	0	0	0
Langley	1,500	0	0	0	1,500	1,500

*Rounded to nearest 100 AF

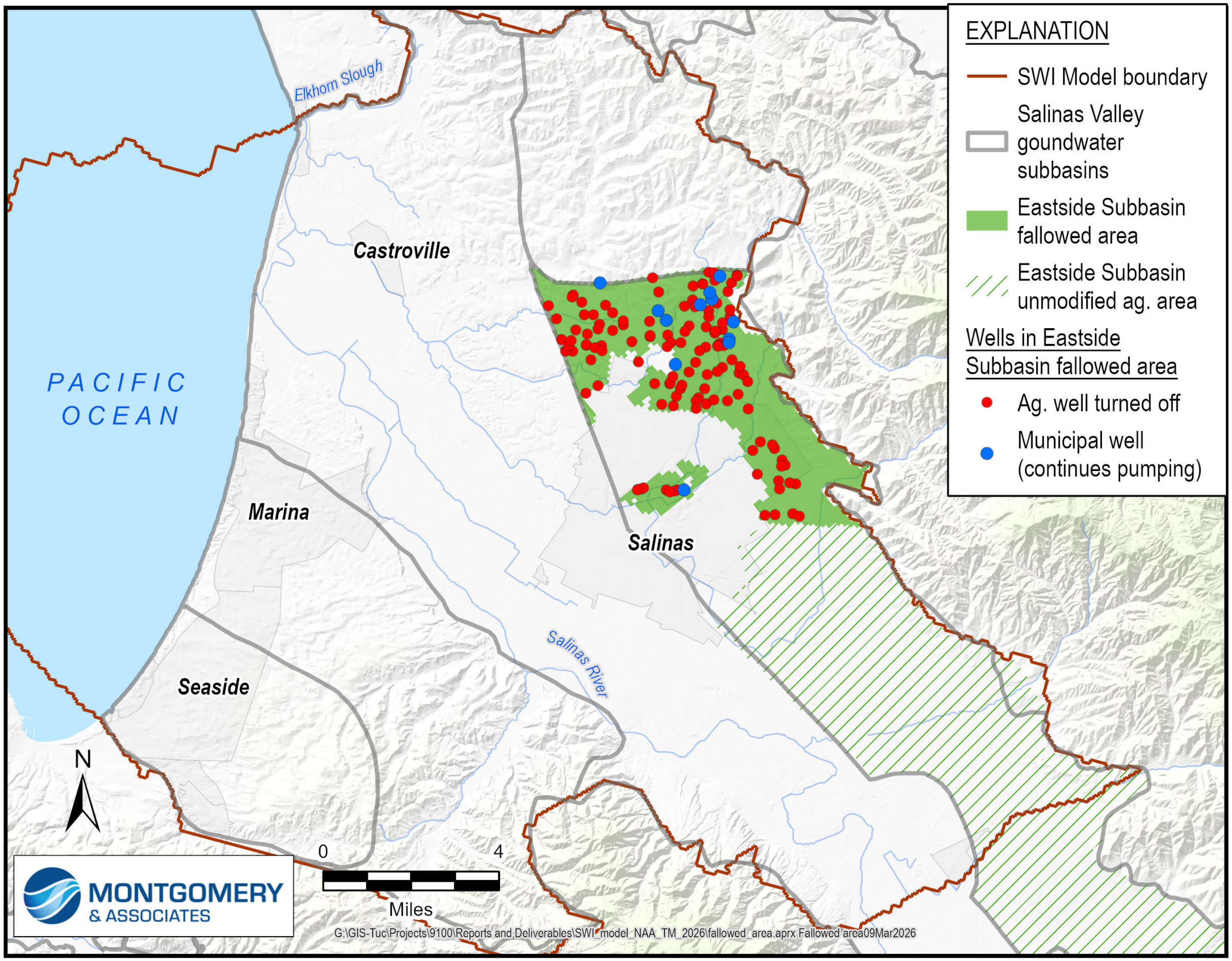

Figure 2. Location of Northern and Southern Eastside Subbasin Areas

MODEL SIMULATION RESULTS

The 5 model simulations are compared to each other and the Baseline Scenario in the following figures. More detailed results for each of the individual 5 model simulations are presented in Attachment 1.

Extent of Seawater Intrusion

Figure 3 and Figure 4 compare the locations of the 500 mg/L chloride isocontours for the 5 NAA simulations in 2040, for both the 180-Foot Aquifer and the 400-Foot Aquifer and their respective stratigraphic equivalents. The black line on both figures represents the minimum threshold: the line to which the 500 mg/L chloride isocontour must be moved by 2040 to achieve sustainability. The red dashed line on both these figures represents the location of the 500 mg/L chloride isocontour under the Baseline Scenario.

Figure 3 shows that none of the 5 NAA scenarios move the 500 mg/L chloride isocontour to the 180-Foot Aquifer's minimum threshold line by 2040. At the eastern tip of the 500 mg/L isocontours near the City of Salinas, 4 of the 5 scenarios show almost identical results to the Baseline Scenario. In Scenario 5 (No agricultural pumping in the 180/400 and Monterey Subbasins), land fallowing results in more seawater intrusion near the City of Salinas by 2040 in the 180-Foot Aquifer. Figure 3 shows that all 5 NAA scenarios push the 500 mg/L chloride isocontour toward the ocean compared to the Baseline Scenario in the area southwest of the City of Salinas.

Figure 4 shows similar results for the 500 mg/L chloride isocontour in the 400-Foot Aquifer. Most simulation results are nearly identical on this figure and cannot be differentiated. The results for most scenarios are hidden beneath the blue line representing the scenario simulating no agricultural pumping anywhere in the Salinas Valley. Near the City of Salinas, seawater intrusion in all 5 NAA scenarios continues to advance farther eastward than in the Baseline Scenario. Closer to the Pacific Ocean, however, seawater intrusion in all 5 NAA scenarios retreat toward the ocean compared to the Baseline Scenario.

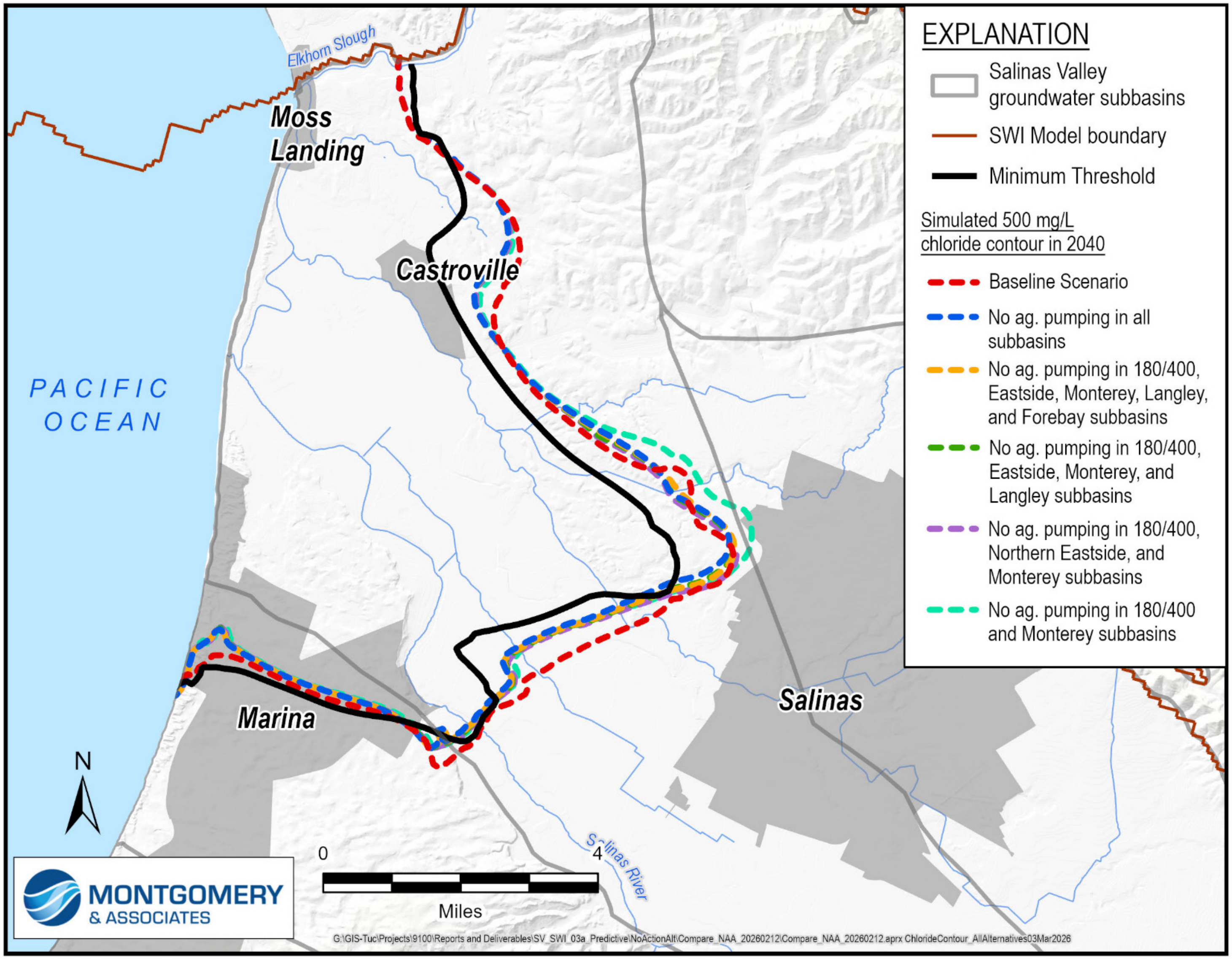

Figure 3. Comparison of the 2040 500 mg/L Isocontour for the 5 NAA Simulations in the 180-Foot Aquifer

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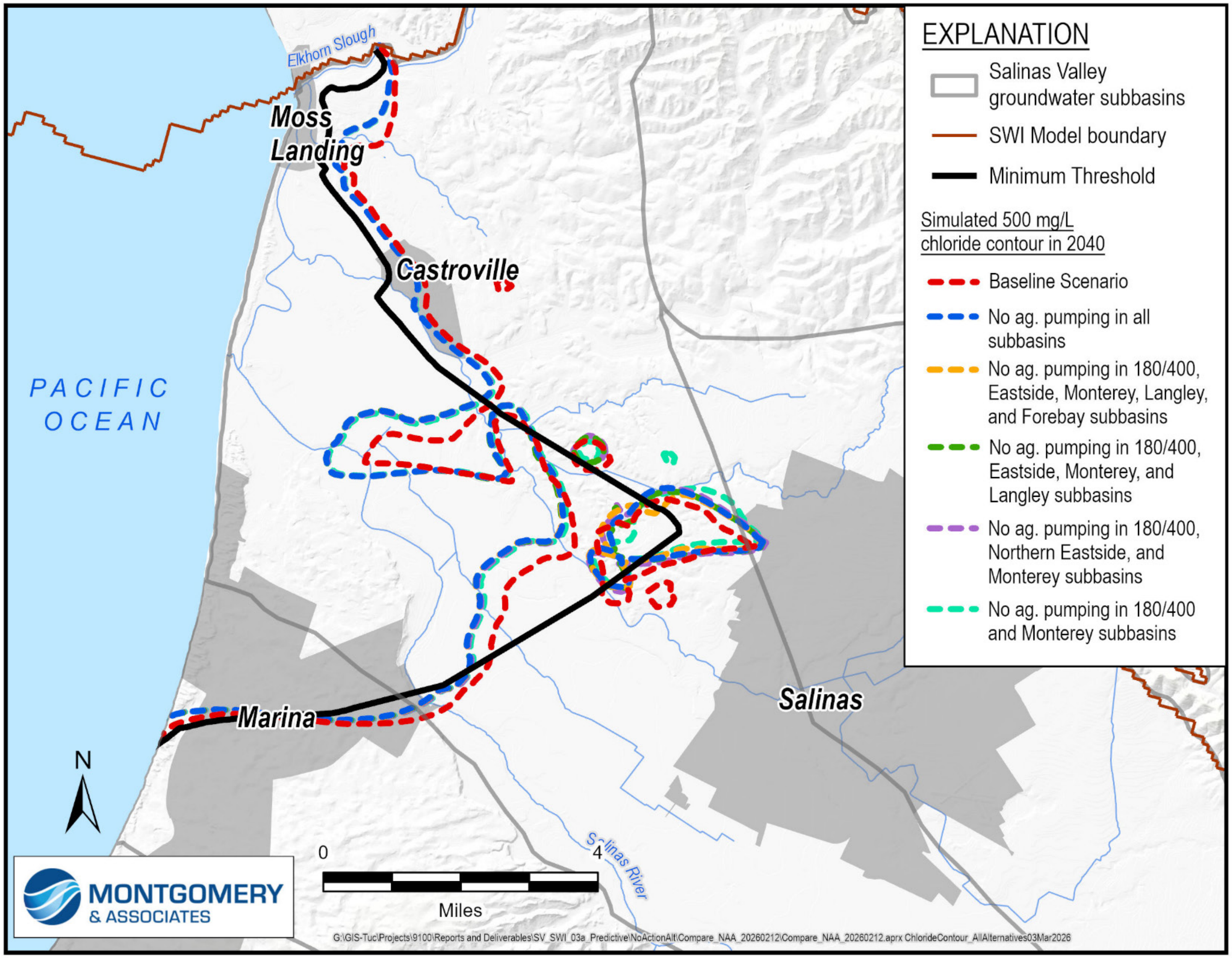

Figure 4. Comparison of the 2040 500 mg/L Isocontour for the 5 NAA Simulations in the 400-Foot Aquifer

Although the NAA scenarios do not significantly improve the 2040 extent of seawater intrusion compared to the Baseline Scenario, the scenarios do move the 500 mg/L chloride isocontour toward the coast over time. Figure 5 and Figure 6 compare the 500 mg/L chloride isocontours for the 5 simulations in 2070 for the 180-Foot Aquifer and 400-Foot Aquifer, respectively.

Figure 5 shows that in the 180-Foot Aquifer, all but 1 of the 5 NAA scenarios have less seawater intrusion than the Baseline Scenario by 2070. The scenario that does not show notable improvement compared to the Baseline Scenario is the No Agricultural Pumping in 180/400 and Monterey Subbasins Scenario simulation, which allows continued pumping throughout the Eastside Subbasin. This continued pumping keeps groundwater levels low in the Eastside Subbasin, driving seawater intrusion eastward. This figure shows that land fallowing and demand reduction can help halt and reverse seawater intrusion; however, reversing seawater intrusion this way is a slow process. This figure additionally demonstrates that pumping in each subbasin has some effect on the rate of seawater intrusion, although pumping in subbasins closer to the coast have the greatest effects.

Figure 6 shows similar results for the 500 mg/L chloride isocontour in the 400-Foot Aquifer. The 500 mg/L chloride isocontour in all but 1 of the NAA simulations have less seawater intrusion than the Baseline Scenario. However, the 500 mg/L chloride isocontours have not achieved the minimum threshold lines in either the 180-Foot or 400-Foot Aquifers.

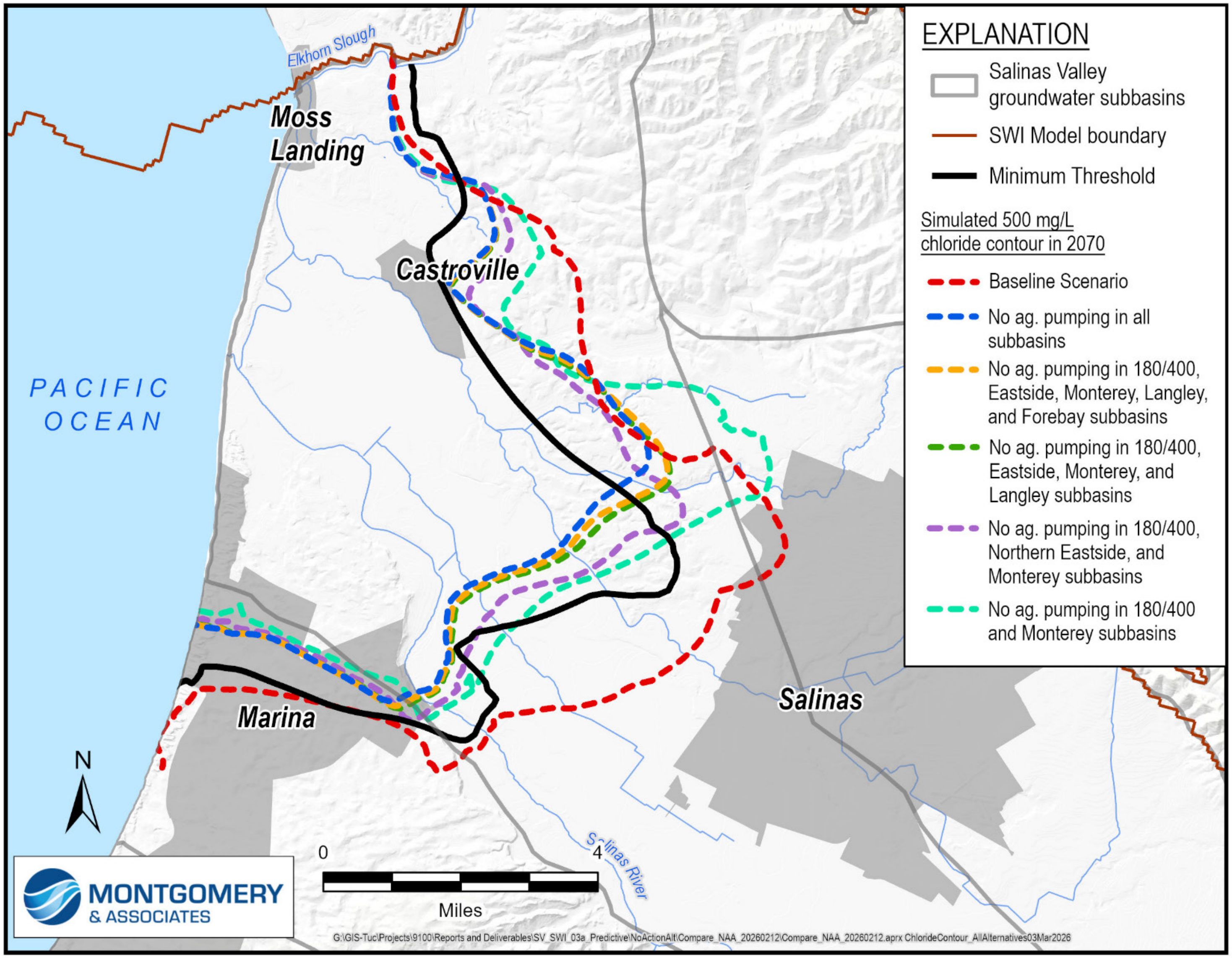

Figure 5. Comparison of the 2070 500 mg/L Isocontour for the 5 NAA Simulations in the 180-Foot Aquifer

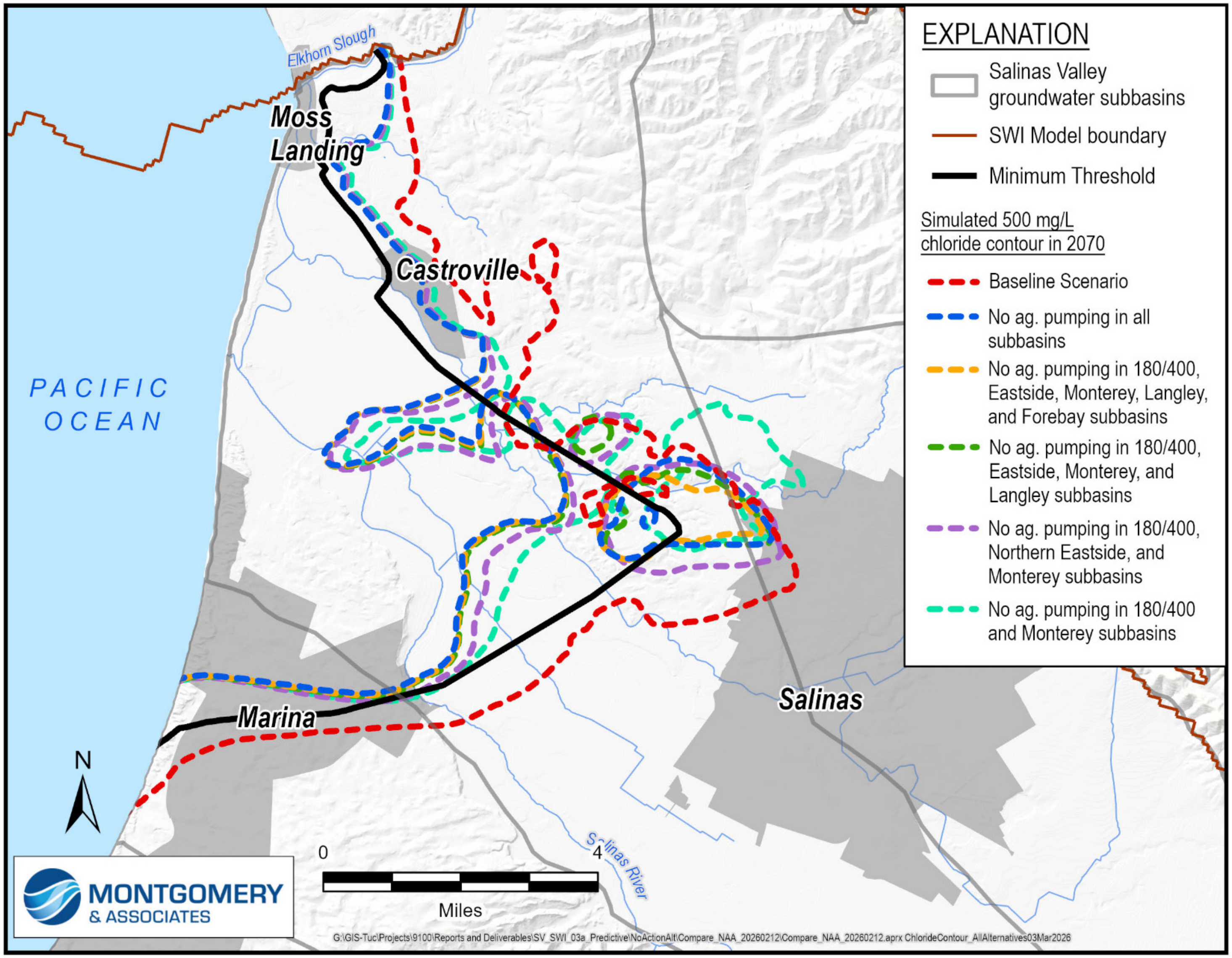

Figure 6. Comparison of the 2070 500 mg/L Isocontour for the 5 NAA Simulations in the 400-Foot Aquifer

Changes in Salinity

Figure 7 shows the 2040 chloride concentrations in both the 180-Foot Aquifer and 400-Foot Aquifer for the No Agricultural Pumping in All Subbasins Scenario simulation. Without a barrier to prevent further seawater intrusion at the coast, areas seaward of the 500 mg/L isocontour show increasing chloride concentrations through 2040. This could lead to existing wells becoming unusable, resulting in either a loss of agricultural production or more wells being drilled into the Deep Aquifers.

Figure 8 shows the 2070 chloride concentrations in both the 180-Foot Aquifer and 400-Foot Aquifer for the No Agricultural Pumping in All Subbasins Scenario. Comparing this figure with Figure 7 shows that chloride concentrations decrease between 2040 and 2070, most notably in the 180-Foot Aquifer. This is due to the groundwater gradients that develop over time to push the 500 mg/L chloride isocontour and all existing seawater intrusion toward the coast.

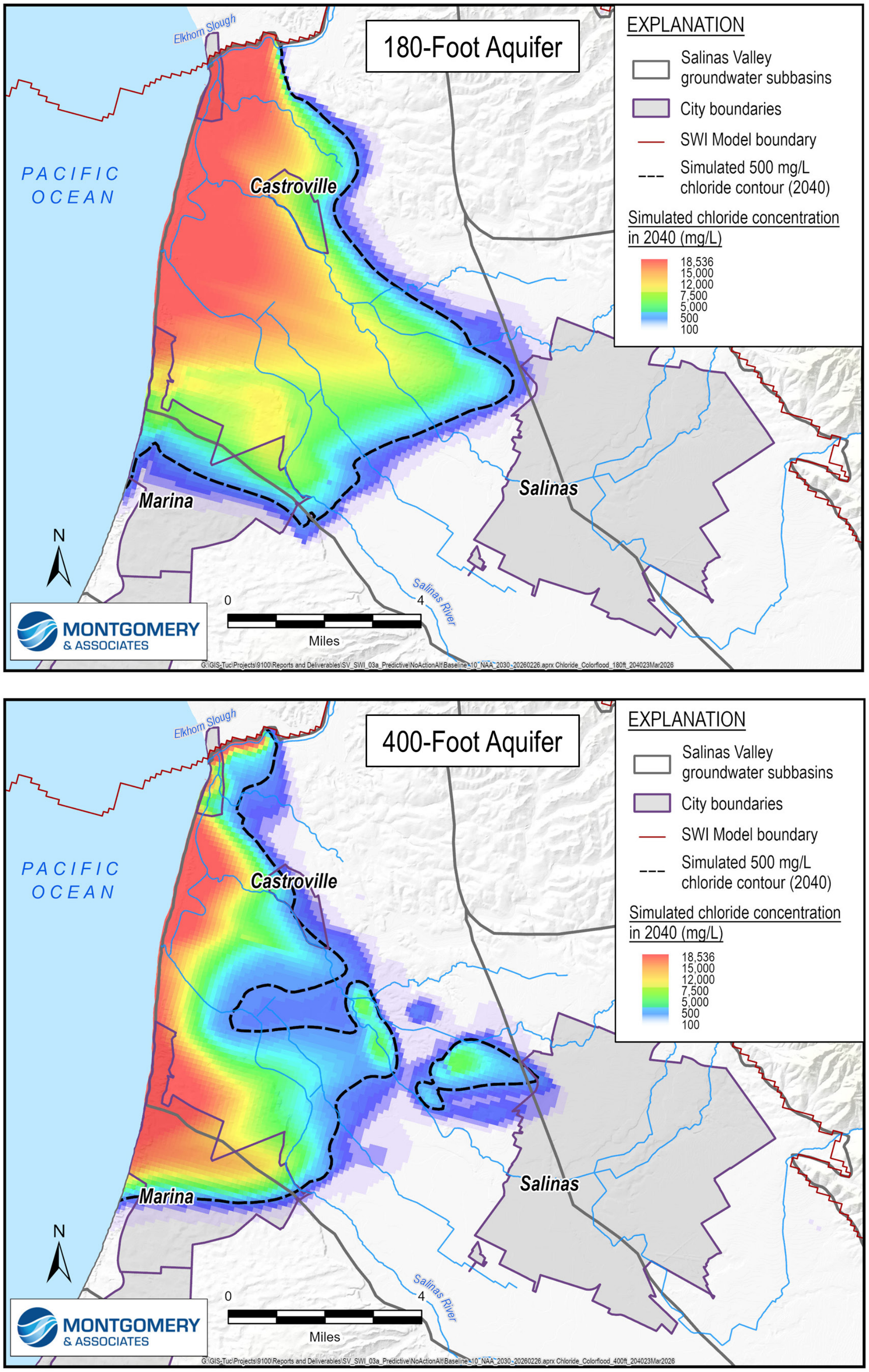

Figure 7. 2040 Chloride Concentrations in the 180-Foot and 400-Foot Aquifers from the No Agricultural Pumping in All Subbasins Scenario Simulation

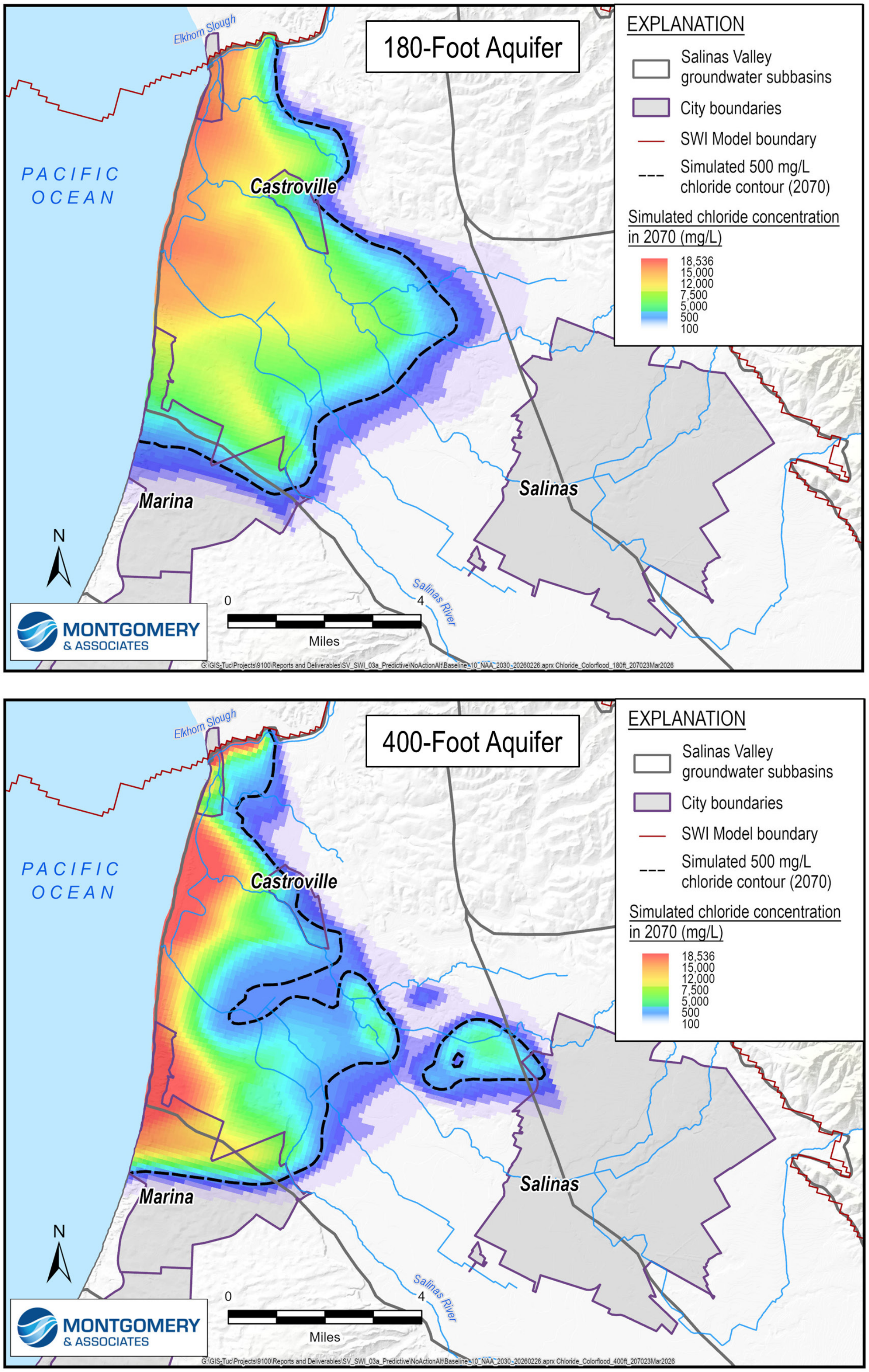

Figure 8. 2070 Chloride Concentrations in the 180-Foot and 400-Foot Aquifers from the No Agricultural Pumping in All Subbasins Scenario Simulation

Groundwater Levels and Gradients

Changes to groundwater gradients explain why land fallowing increases seawater intrusion near the eastern edge of the 500 mg/L isocontour but pushes more western areas of seawater intrusion bask toward the coast. Simulated groundwater levels from the No Agricultural Pumping in 180/400, Eastside, Monterey, and Langley Subbasins Scenario are used to illustrate the gradient changes. Similar groundwater gradient changes occur in all other NAA scenarios.

Figure 9 shows the simulated change in groundwater elevations between 2023 and 2040 in the 180-Foot Aquifer. Darker green areas are greater groundwater level increases. This figure shows that groundwater levels rise throughout the 180/400 Subbasin, and in most but not all the surrounding subbasins.

Figure 10 shows the simulated 2040 groundwater level contours in the 180-Foot Aquifer. A groundwater divide is inferred from groundwater contours and is sketched on Figure 10 with a red dashed line. The blue arrows show the inferred flow directions from this groundwater divide. This figure illustrates how the 2040 flow field drives parts of the seawater intruded area toward the coast, and other parts toward the Eastside Subbasin.

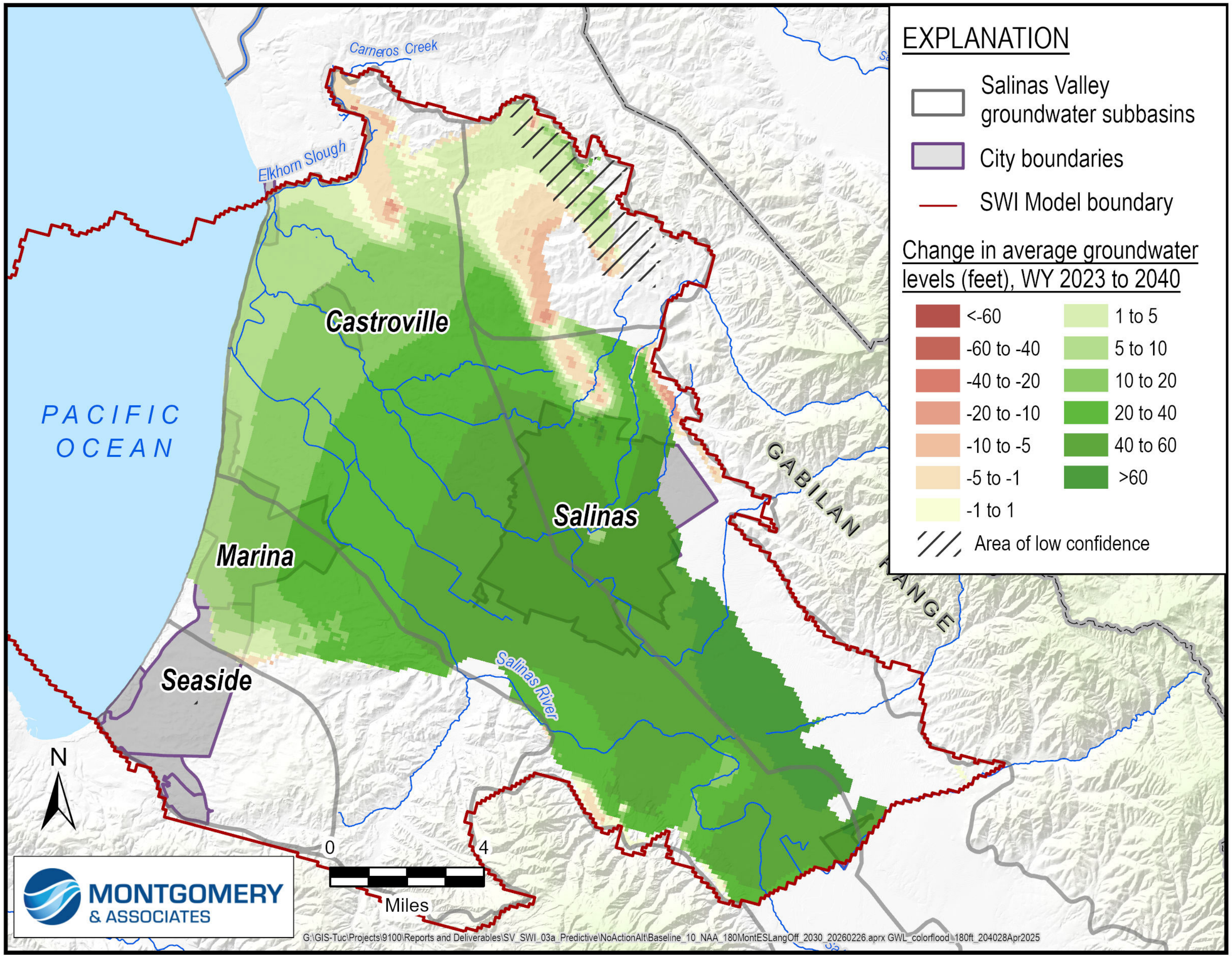

Figure 9. Simulated Groundwater Level Rise by 2040 in the No Agricultural Pumping in 180/400, Eastside, Monterey, and Langley Subbasins Scenario Simulation

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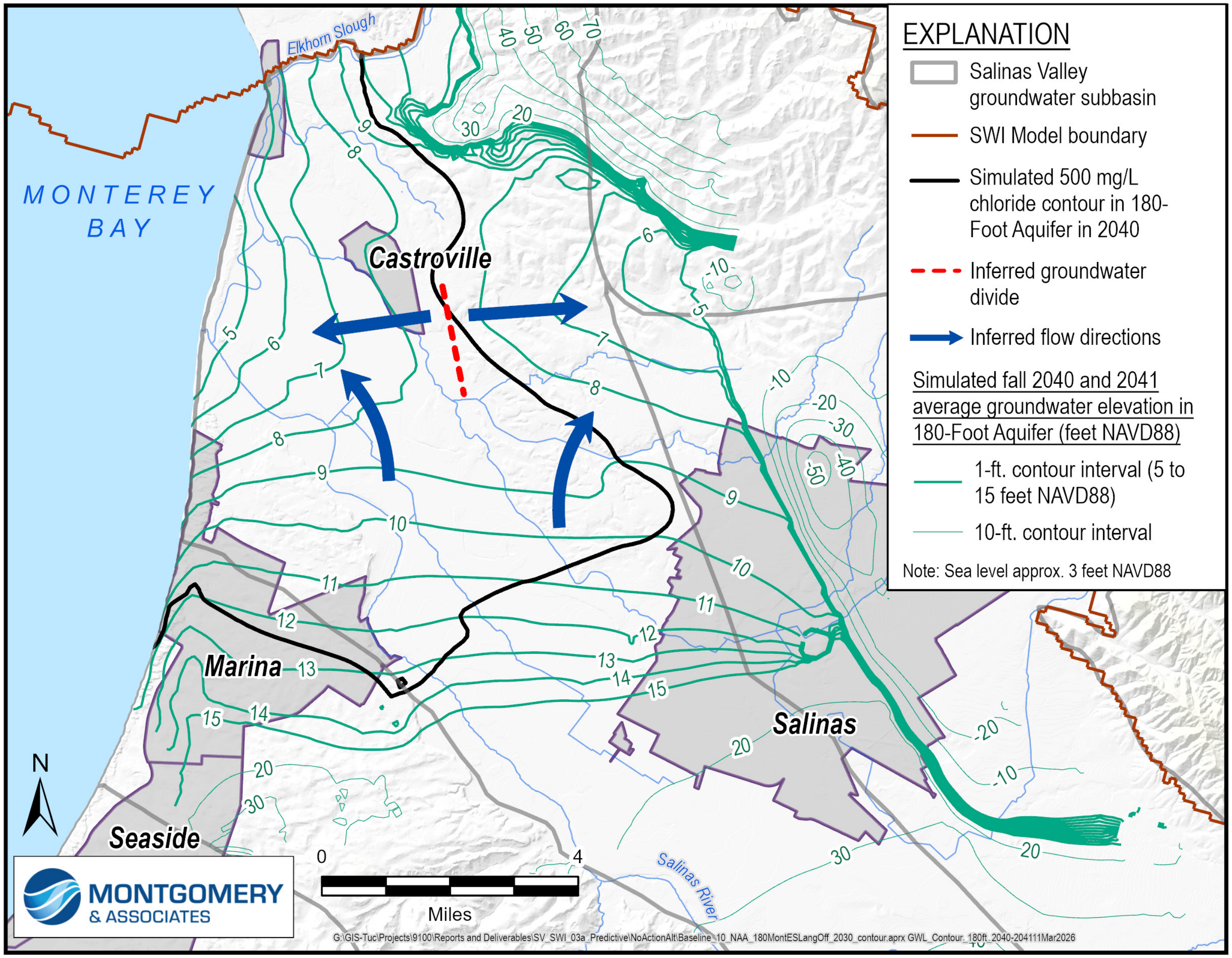

Figure 10. Simulated 2040 Groundwater Levels in the No Agricultural Pumping in 180/400, Eastside, Monterey, and Langley Subbasins Scenario Simulation Showing an Inferred Groundwater Divide (Red Dashed Line)

Surface Water Flows and Diversions

SVOM incorporates the Surface Water Operations (SWO) module which estimates future reservoir releases based on current operating rules. Reservoir releases to the Salinas River and the SRDF diversions vary among the Baseline Scenario and the NAA scenarios in response to changes in groundwater elevations and the associated river seepage. Table 3 shows how leakage from all modeled streams varies among the NAA scenarios. This table shows that fallowing all land in the 180/400, Forebay, and Upper Valley Subbasins reduced river depletions by 40% to 50%. This results in less water being released from the 2 reservoirs to meet downstream needs.

Table 3. Average Annual Stream Leakage (AF/WY*)

Scenario	180/400	Eastside	Forebay	Upper Valley	Monterey	Seaside	Langley
Baseline	55,400	7,100	118,600	95,300	4,500	1,000	1,900
No agricultural pumping in all subbasins	-6,800	4,900	42,100	32,500	1,200	800	1,000
No agricultural pumping in 180/400, Eastside, Monterey, Langley, and Forebay Subbasins	-8,000	5,000	43,200	85,200	1,200	800	1,000
No agricultural pumping in 180/400, Eastside, Monterey, and Langley Subbasins	-4,800	5,500	101,100	95,100	1,200	800	1,000
No agricultural pumping in 180/400, Northern Eastside, and Monterey Subbasins	16,400	6,100	110,300	95,600	2,000	800	1,300
No agricultural pumping in 180/400 and Monterey Subbasins	19,600	6,400	109,200	94,900	2,400	800	1,700

Note: Positive number indicates net streamflow loss to groundwater and negative indicates net groundwater discharge to stream.
*Rounded to nearest 100 AF/WY

Two permitted river diversions continued to operate in the 5 NAA simulations: the Clark Colony diversion on the Arroyo Seco, and the SRDF on the Salinas River. Table 4 shows the total amount of irrigation water available to Clark Colony in the Baseline Scenario and the 5 NAA simulations. Diversions from the Arroyo Seco are relatively constant because they are not controlled by varying reservoir releases. Groundwater pumping by Clark Colony is restricted in 2 of the 5 simulations.

Table 4. Clark Colony Water Availability (AF/WY*)

Scenario	Arroyo Seco Diversion	Groundwater Pumping	Total Irrigation
Baseline	3,700	8,000	11,700
No agricultural pumping in all subbasins	3,700	0	3,700
No agricultural pumping in 180/400, Eastside, Monterey, Langley, and Forebay Subbasins	3,700	0	3,700
No agricultural pumping in 180/400, Eastside, Monterey, and Langley Subbasins	3,700	8,000	11,700
No agricultural pumping in 180/400, Northern Eastside, and Monterey Subbasins	3,700	8,000	11,700
No agricultural pumping in 180/400 and Monterey Subbasins	3,700	8,000	11,700

*Rounded to nearest 100 AF

Table 5 shows the average annual total irrigation water available to the Castroville Seawater Intrusion Project (CSIP). The data in Table 5 are 25-year averages, representing WY 2040 through WY 2064. CSIP receives water from 3 sources: recycled water, SRDF, and supplemental groundwater pumping. Recycled water use is fairly constant across all NAA scenarios. Diversions from the SRDF increase when less groundwater is pumped from the Valley, such as in the No Agricultural Pumping in All Subbasins and No Agricultural Pumping in 180/400, Eastside, Monterey, Langley, and Forebay Subbasins scenarios. This is due to the reduced stream depletion resulting from higher groundwater levels. Supplemental groundwater pumping is only allowed in the Baseline Scenario. More water is diverted from the SRDF than is supplied to CSIP in these simulations. The SRDF diversions are the maximum amount that can be diverted at 36 cubic feet per second (cfs) in the scenario. The CSIP delivery from SRDF is calculated based on agricultural demand.

Table 5. CSIP Water Use (AF/WY)*

Scenario	SRDF Diversions	CSIP from SRDF	Recycled Water	Groundwater pumping	Total irrigation
Baseline	8,500	5,100	9,400	4,900	19,400
No agricultural pumping in all subbasins	14,700	8,300	9,200	0	17,500
No agricultural pumping in 180/400, Eastside, Monterey, Langley, and Forebay Subbasins	14,400	7,900	9,200	0	17,100
No agricultural pumping in 180/400, Eastside, Monterey, and Langley Subbasins	12,600	6,900	9,200	0	16,100
No agricultural pumping in 180/400, Northern Eastside, and Monterey Subbasins	11,700	6,600	9,200	0	15,800
No agricultural pumping in 180/400 and Monterey Subbasins	10,500	5,900	9,300	0	15,200

*Rounded to nearest 100 AF

CONCLUSIONS

M&A simulated various groundwater management scenarios to estimate the economic impact if no action is taken by the SVBGSA to arrest seawater intrusion. The scenarios were designed to assess the financial impact of fallowing agricultural land to meet the SGMA seawater intrusion minimum threshold. Five scenarios were simulated, each with a different amount of land fallowing initiated in 2030.

The 5 scenarios demonstrated that agricultural land fallowing by itself is inadequate to meet the SGMA seawater intrusion minimum threshold. This is due to the slow process of natural recharge resulting from land fallowing, combined with the required 2040 deadline for meeting the SGMA seawater intrusion minimum threshold. However, given adequate time, land fallowing does move the 500 mg/L chloride isocontour toward the coast and to the north.

Fallowing agricultural lands in the 180/400, Monterey, and northern portion of the Eastside Subbasins have the most significant effect on the progression of the 500 mg/L chloride isocontour. Fallowing agricultural lands in the Forebay, Upper Valley, and southern portion of the Eastside Subbasins have lesser, although measurable, effects on the progression of the 500 mg/L chloride isocontour. This study did not specifically address the relative effect of fallowing the limited agricultural lands in the Langley Subbasin.

Chloride concentrations in the 180-Foot and 400-Foot Aquifers increase through 2040 in all simulations. Chloride concentrations in the 180-Foot and 400-Foot Aquifers slowly decrease after 2040, as natural recharge eventually creates groundwater gradients that push the 500 mg/L chloride isocontour and all existing seawater intrusion toward the coast.

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Attachment 1

Individual Model Simulation Results

INDIVIDUAL MODEL SIMULATION RESULTS

Results from each of the 5 NAA model simulations are described in the sections below.

No agricultural pumping in all subbasins simulation

In this simulation, all agricultural pumping in the Monterey County portion of the Salinas Valley was turned off in 2030. This is the most extensive fallowing of all the simulations.

Figure A-1 shows the progression of the 500 milligrams per liter (mg/L) chloride isocontour in the 180-Foot and 400-Foot Aquifers for the No Agricultural Pumping Scenario simulation. In the 180-Foot Aquifer, the 500 mg/L chloride isocontour moves toward the east until approximately 2040, when groundwater levels rise high enough to start pushing the isocontour back to the northwest. In the 400-Foot Aquifer the 500 mg/L chloride isocontour moves inland for until approximately 2040, then the isocontour appears to slow down and remain in place.

Figure A-2 compares the 2040 location of the 500 mg/L chloride isocontour in blue, with the minimum threshold line in black and the baseline simulation in red. This figure demonstrates that eliminating all agricultural pumping in the Salinas Valley starting in 2030 is insufficient for moving the 500 mg/L isocontour line to the minimum threshold. Figure A-3 compares the 2070 location of the 500 mg/L chloride isocontour in blue, with the minimum threshold line in black and the baseline simulation in red. This figure demonstrates that eliminating all agricultural pumping in the Salinas Valley starting in 2030 can significantly move the 500 mg/L isocontour given adequate time. The only area where eliminating all agricultural pumping has inadequate influence is near the City of Salinas in the 400-Foot aquifer. The easternmost 500 mg/L isocontour in the 400-Foot Aquifer continues to migrate toward the City of Salinas, likely in response to continued municipal pumping. Additionally, areas in the 180-Foot Aquifer between the City of Salinas and Castroville continue to exceed the minimum threshold line through 2070 because the natural recharge pushes existing seawater intrusion to the northwest, not directly toward the ocean.

Figure A-4 shows the 2040 chloride concentrations in the 180-Foot and 400-Foot Aquifers. Because there is no barrier to prevent seawater intrusion at the coast, the aquifers continue to become more saline within the seawater intruded area. This could lead to additional wells being removed from service, loss of agricultural production, increased water treatment costs, or additional wells being drilled into the Deep Aquifers.

Figure A-5 shows the change in groundwater elevations between 2023 and 2040 in the 180-Foot and 400-Foot Aquifers. Figure A-6 shows the average 2040 to 2041 groundwater elevations in each aquifer. These figures show that although reducing pumping results in significant groundwater level increases, groundwater levels remain below sea level in the Eastside Subbasin.

These low groundwater levels in the Eastside Subbasin result in a groundwater divide; groundwater west of the divide flows toward the coast while groundwater east of the divide flows toward the Eastside Subbasin. This explains why the western areas of seawater intrusion in the 400-Foot Aquifer retreat toward the coast while the eastern areas of seawater intrusion migrate toward the City of Salinas.

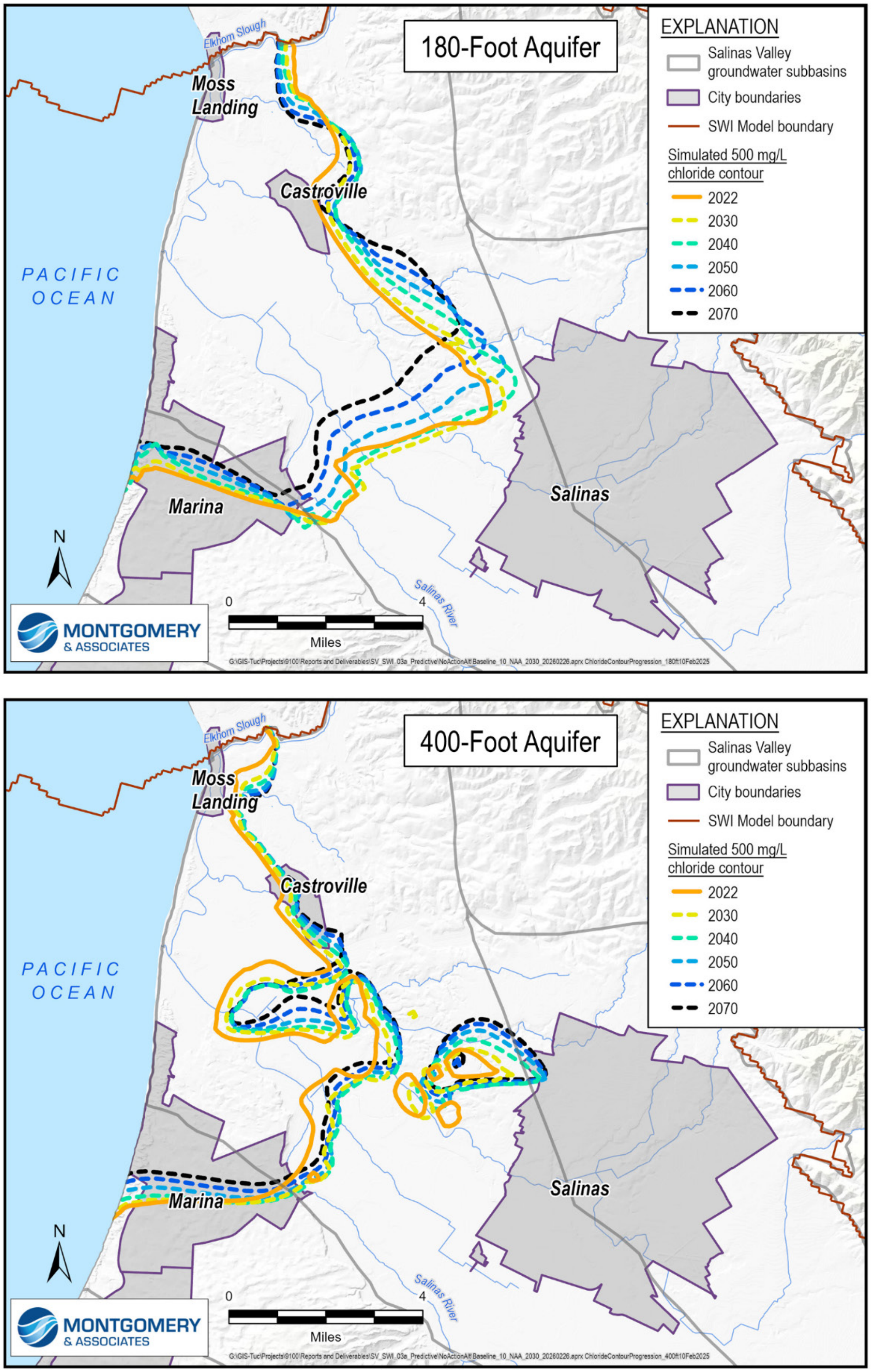


Figure A-1. Progression of 500 mg/L Chloride Isocontour for the No Agricultural Pumping in All Subbasins Scenario Simulation

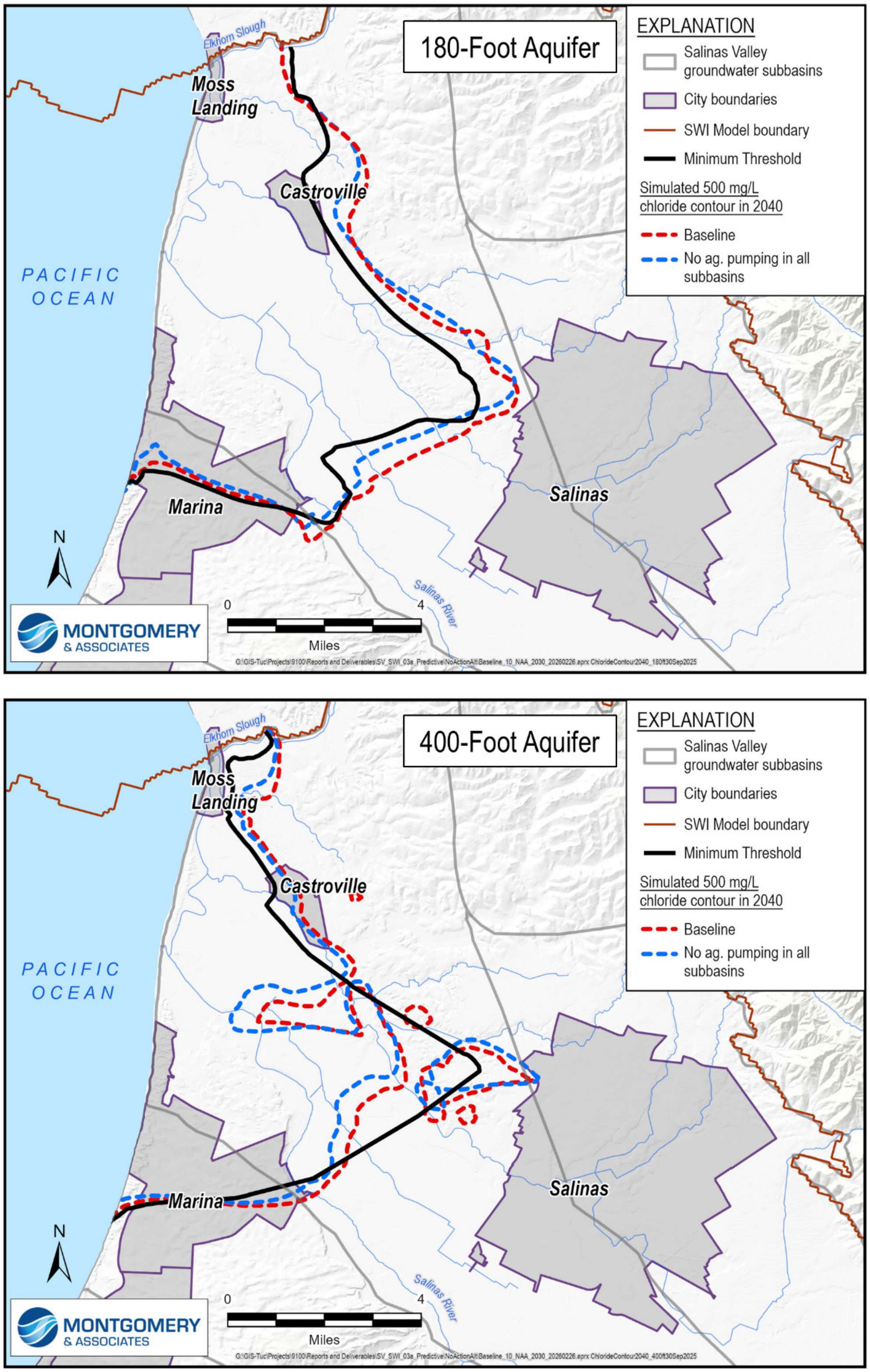


Figure A-2. Location of the 500 mg/L Isocontour in 2040 for the No Agricultural Pumping in All Subbasins Scenario Simulation

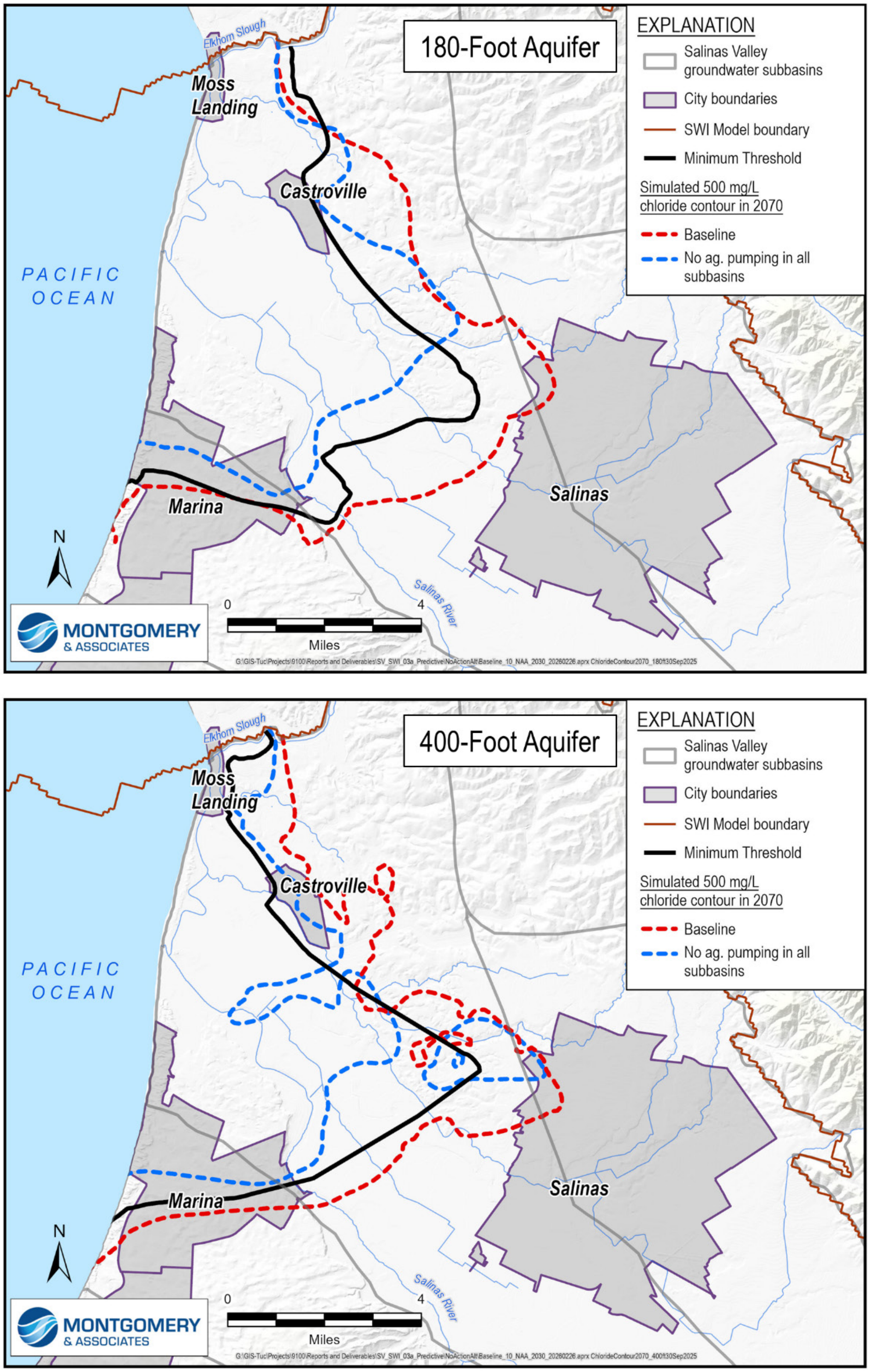
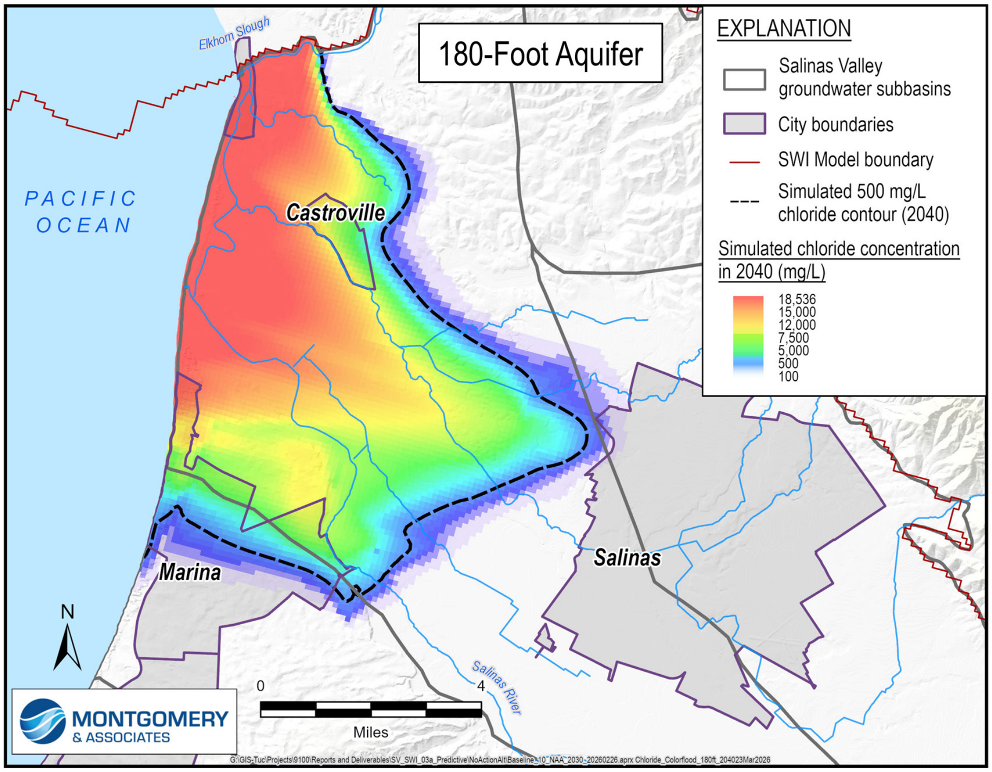


Figure A-3. Location of the 500 mg/L Isocontour in 2070 for the No Agricultural Pumping in All Subbasins Simulation Simulation



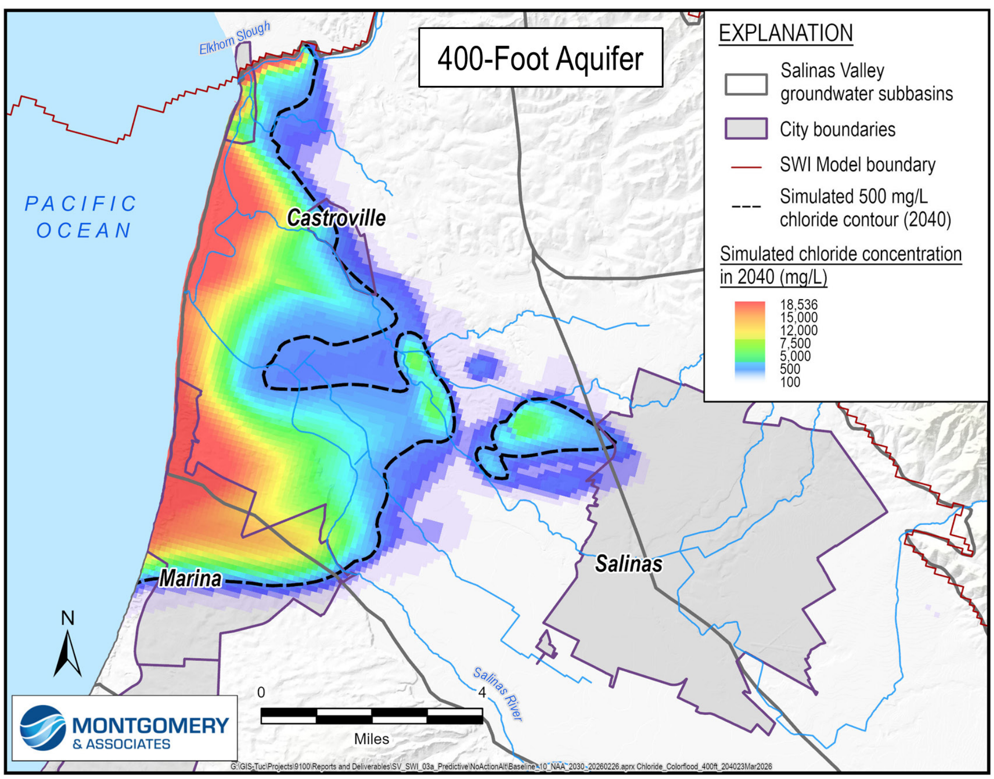


Figure A-4. Chloride Concentrations in 2040 for the No Agricultural Pumping in All Subbasins Scenario Simulation

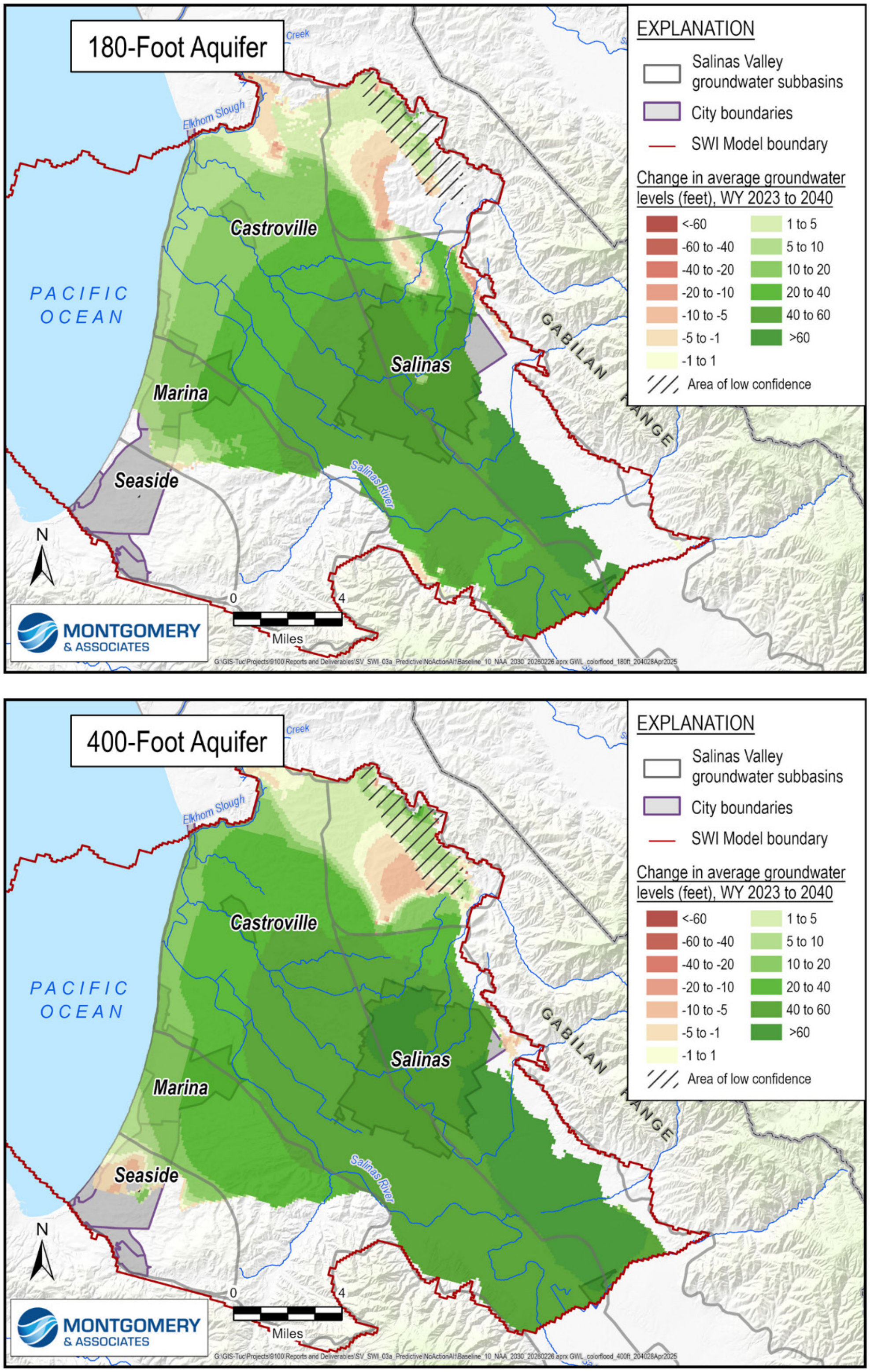
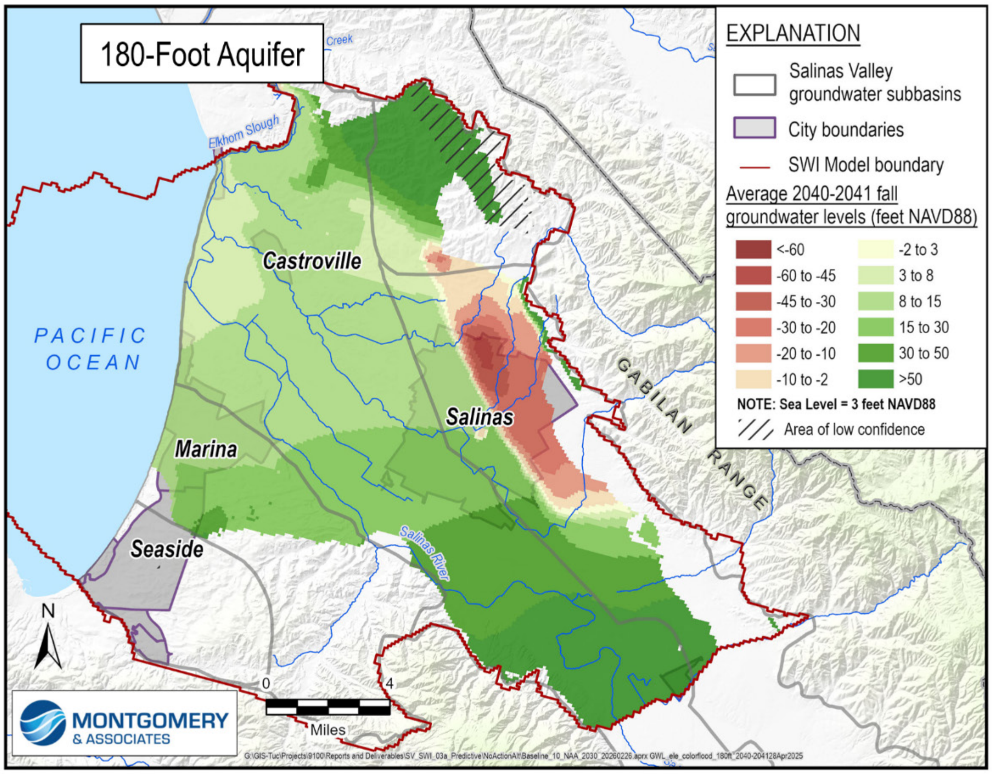


Figure A-5. Change in Groundwater Levels by 2040 for the No Agricultural Pumping in All Subbasins Scenario Simulation



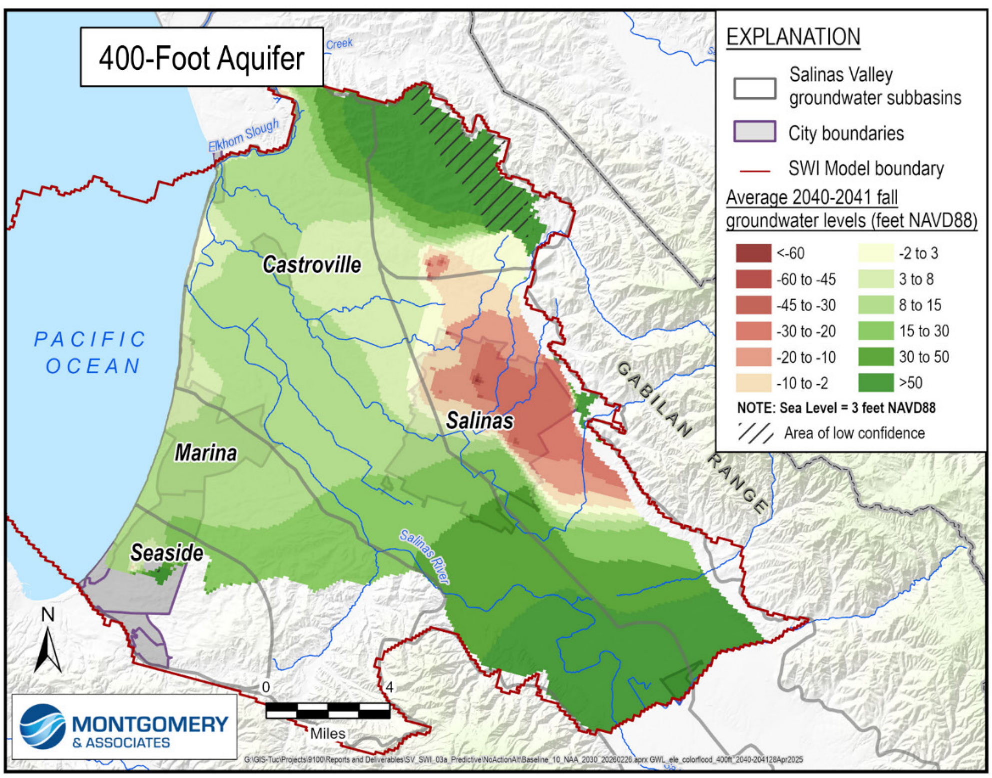


Figure A-6. Average 2040 to 2041 Groundwater Levels for the No Agricultural Pumping in All Subbasins Scenario Simulation

No agricultural pumping in 180/400, Eastside, Monterey, Langley, and Forebay Subbasins simulation

In this simulation, agricultural pumping is only allowed in the Upper Valley Subbasin. No agricultural pumping is allowed after 2030 in the 180/400, Monterey, Eastside, Langley, or Forebay Subbasins.

Figure A-7 shows the progression of the 500 mg/L chloride isocontour in the 180-Foot and 400-Foot Aquifers for this scenario's simulation. In the 180-Foot Aquifer, the 500 mg/L chloride isocontour moves toward the east until approximately 2040, when groundwater levels rise high enough to start pushing the isocontour back to the northwest. In the 400-Foot Aquifer the 500 mg/L chloride isocontour moves inland until approximately 2040, then the isocontour appears to slow down and remain in place.

Figure A-8 compares the 2040 location of the 500 mg/L chloride isocontour in blue, with the minimum threshold line in black and the baseline simulation in red. The pumping reductions in this simulation are insufficient for moving the 500 mg/L isocontour line to the minimum threshold line. Figure A-9 compares the 2070 location of the 500 mg/L chloride isocontour in blue, with the minimum threshold line in black and the baseline simulation in red. This figure demonstrates that eliminating all agricultural pumping in the 180/400, Monterey, Eastside, Langley, and Forebay Subbasins starting in 2030 can significantly move the 500 mg/L isocontour given adequate time. The only area where eliminating this amount of pumping has inadequate influence is near the City of Salinas in the 400-Foot aquifer. The easternmost 500 mg/L isocontour in the 400-Foot Aquifer continues to migrate toward the City of Salinas, likely in response to continued municipal pumping. Additionally, areas in the 180-Foot Aquifer between the City of Salinas and Castroville continue to exceed the minimum threshold line through 2070 because the natural recharge pushes existing seawater intrusion to the northwest, not directly toward the ocean.

Figure A-10 shows the 2040 chloride concentrations in the 180-Foot and 400-Foot Aquifers. Because there is no barrier to prevent seawater intrusion at the coast, the aquifers continue to become more saline within the seawater intruded area. This could lead to additional wells being removed from service, loss of agricultural production, increased water treatment costs, or additional wells being drilled into the Deep Aquifers. Removal of wells is not simulated in this scenario.

Figure A-11 shows the change in groundwater elevations between 2023 and 2040 in the 180-Foot and 400-Foot Aquifers. Figure A-12 shows the average 2040 to 2041 groundwater elevations in each aquifer. These figures show that, although reducing pumping results in significant groundwater level increases, groundwater levels remain below sea level in the Eastside Subbasin. These low groundwater levels in the Eastside Subbasin result in a groundwater divide near the community of Castroville; groundwater west of the divide flows toward the coast while groundwater east of the divide flows toward the Eastside Subbasin. This explains why the western areas of seawater intrusion in the 400-Foot Aquifer retreat toward the coast while the eastern areas of seawater intrusion migrate toward the City of Salinas.

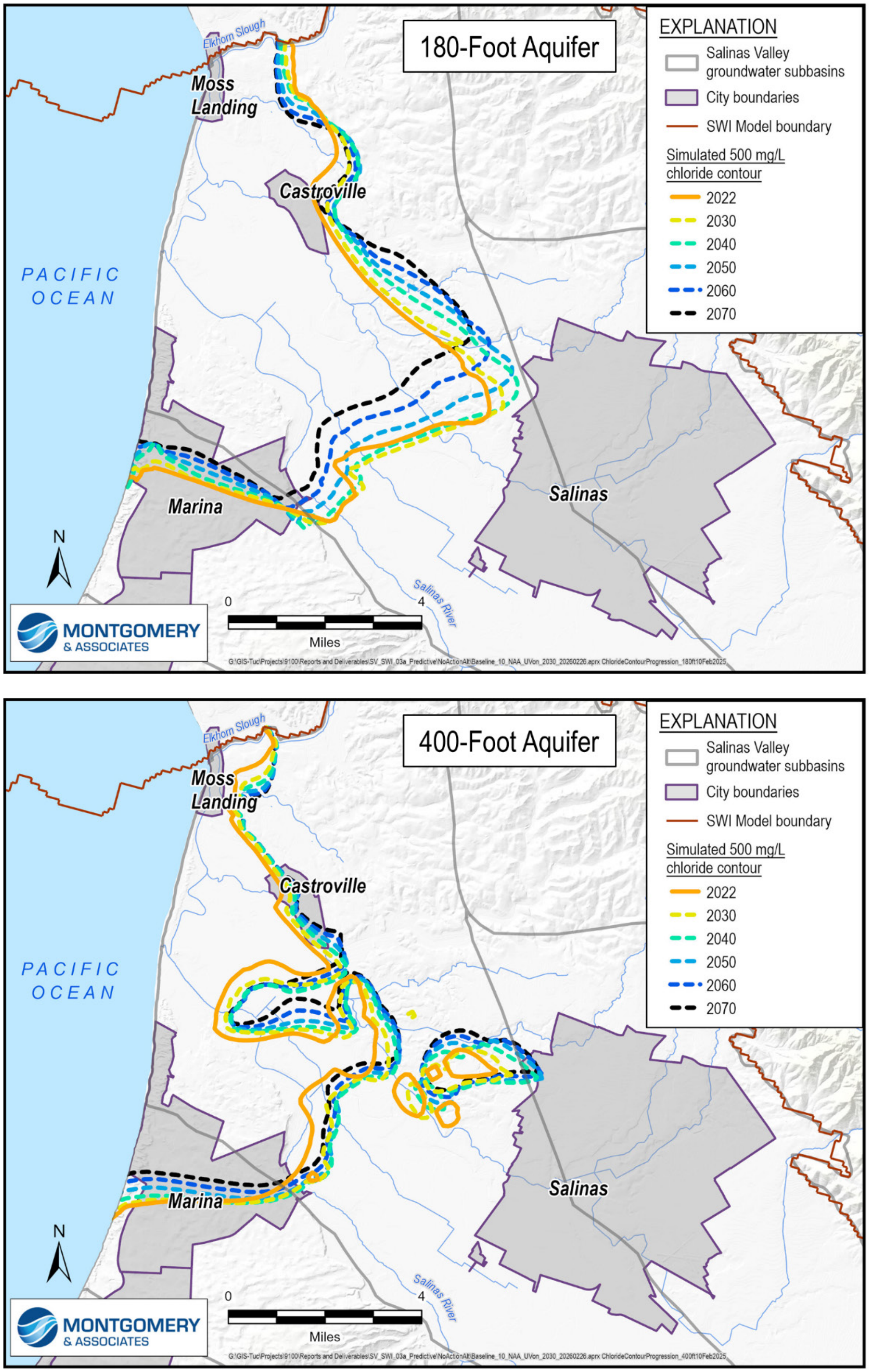


Figure A-7. Progression of 500 mg/L Chloride Isocontour for the No Agricultural Pumping in 180/400, Eastside, Monterey, Langley, and Forebay Subbasins Scenario Simulation

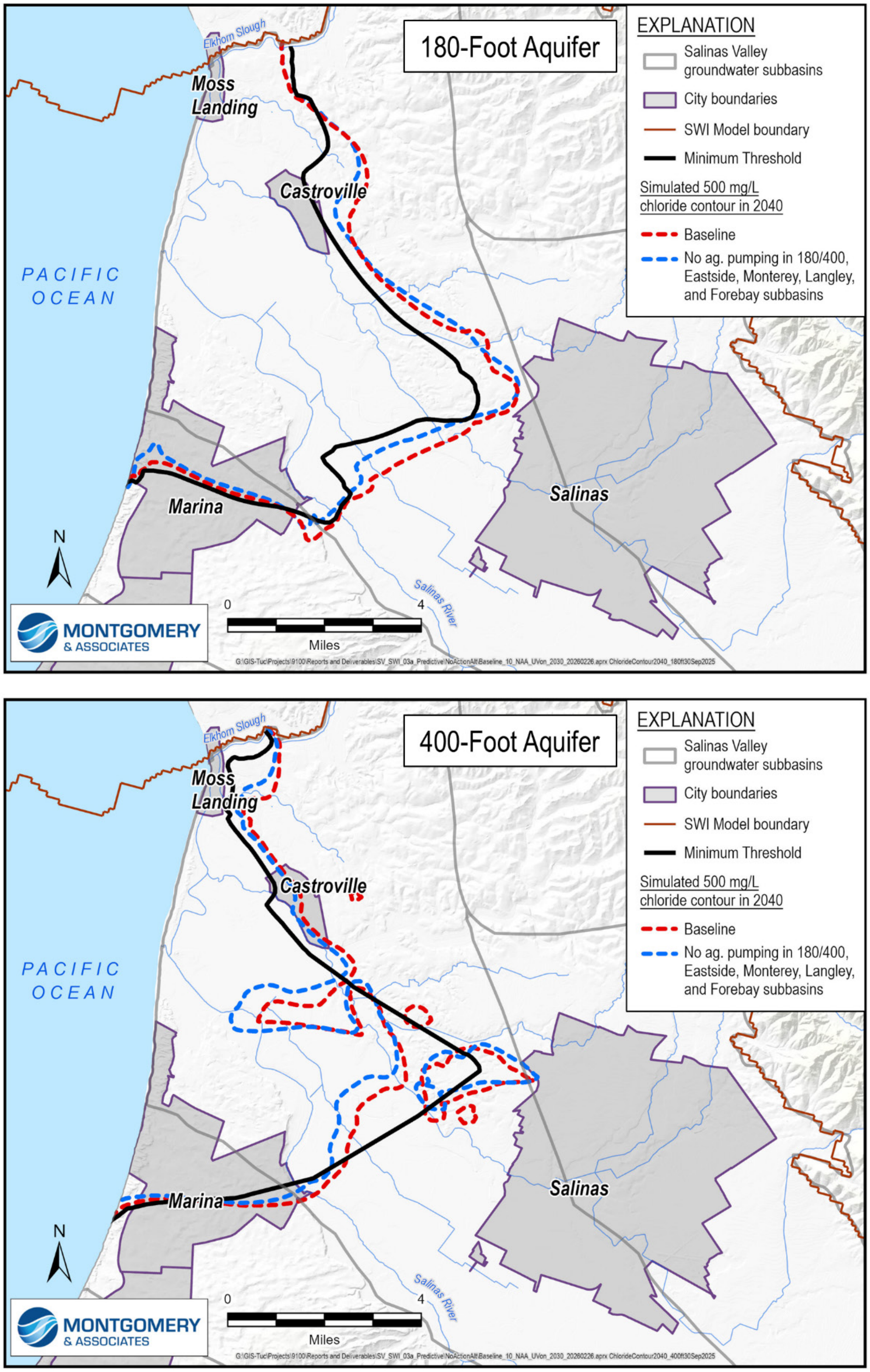
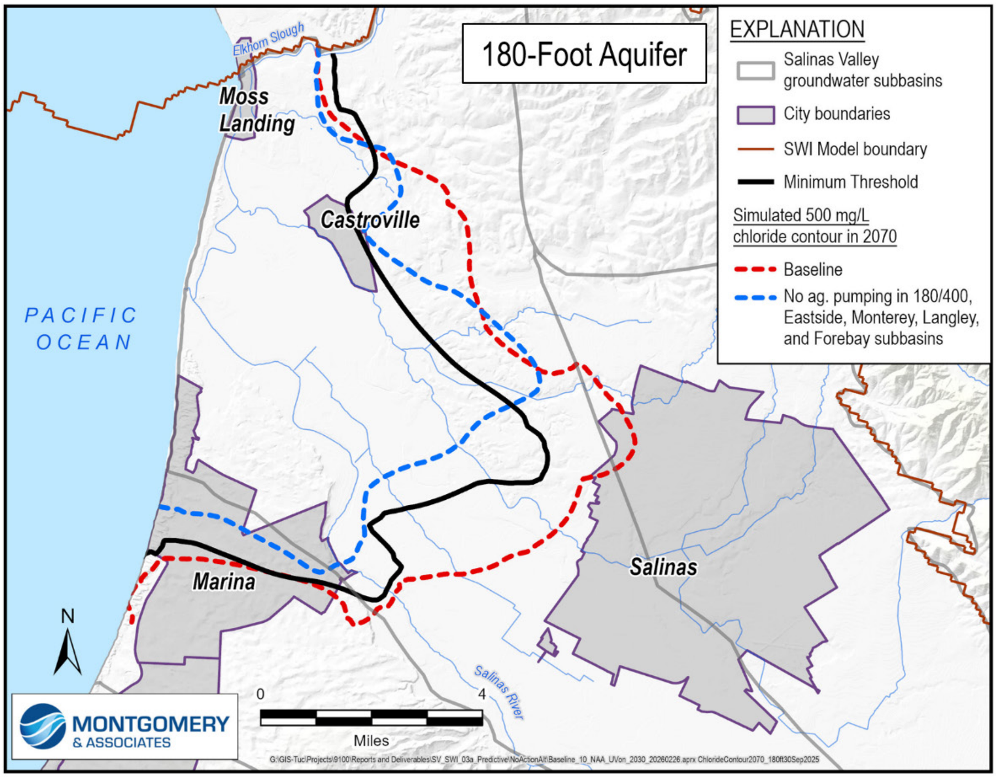


Figure A-8. Location of the 500 mg/L Isocontour in 2040 for the No Agricultural Pumping in 180/400, Eastside, Monterey, Langley, and Forebay Subbasins Scenario Simulation



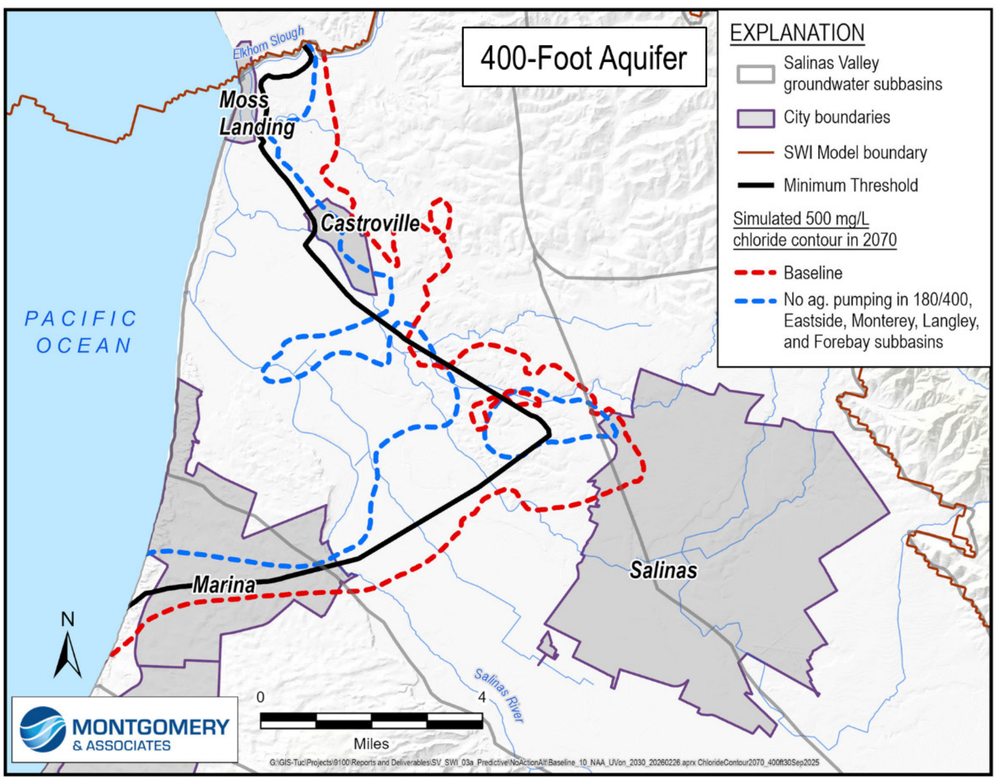


Figure A-9. Location of the 500 mg/L Isocontour in 2070 for the No Agricultural Pumping in 180/400, Eastside, Monterey, Langley, and Forebay Subbasins Scenario Simulation

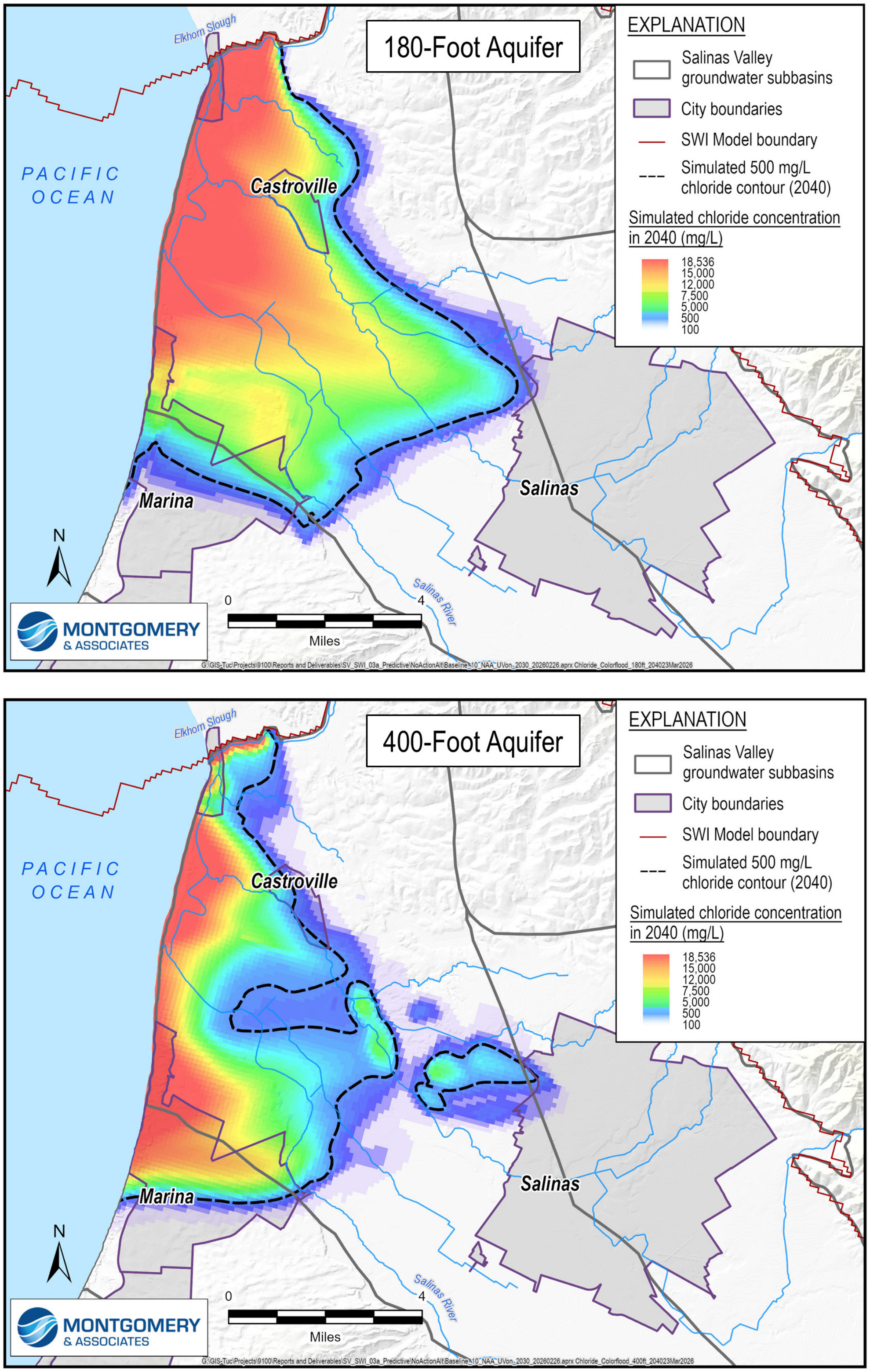
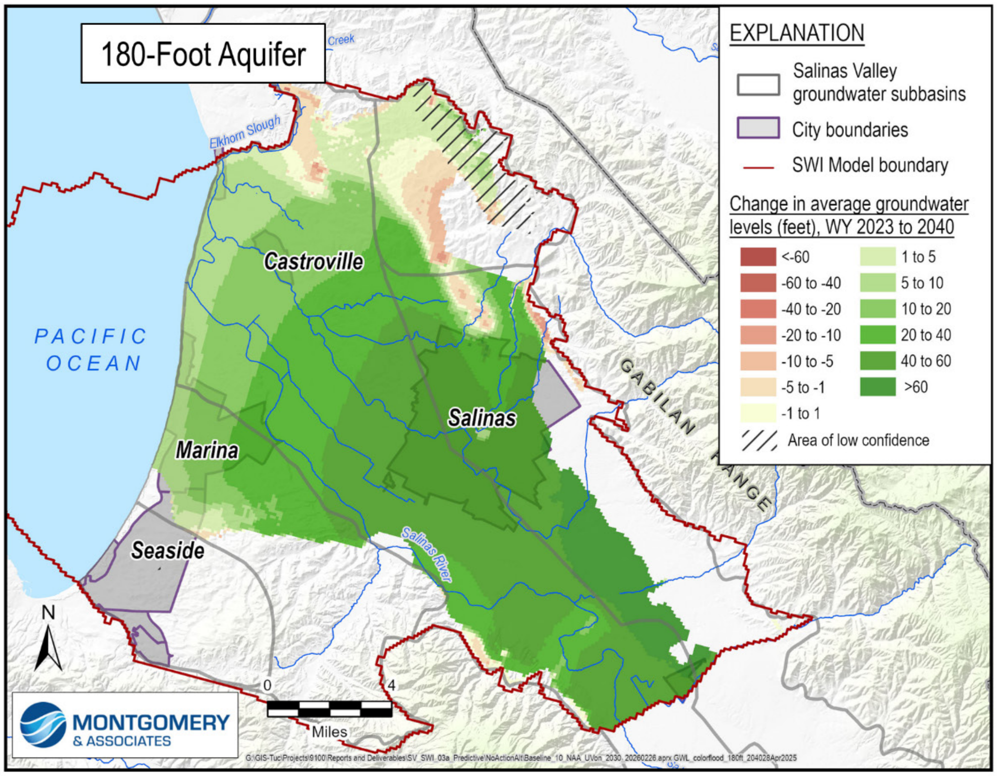


Figure A-10. Chloride Concentrations in 2040 for the No Agricultural Pumping in 180/400, Eastside, Monterey, Langley, and Forebay Subbasins Scenario Simulation



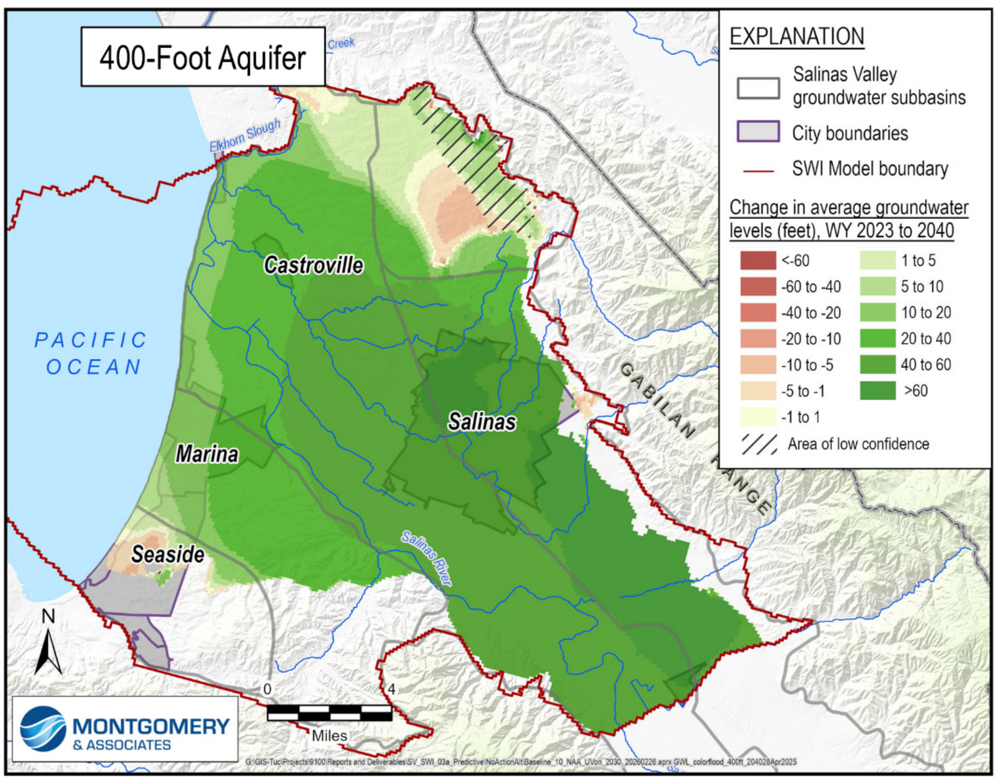
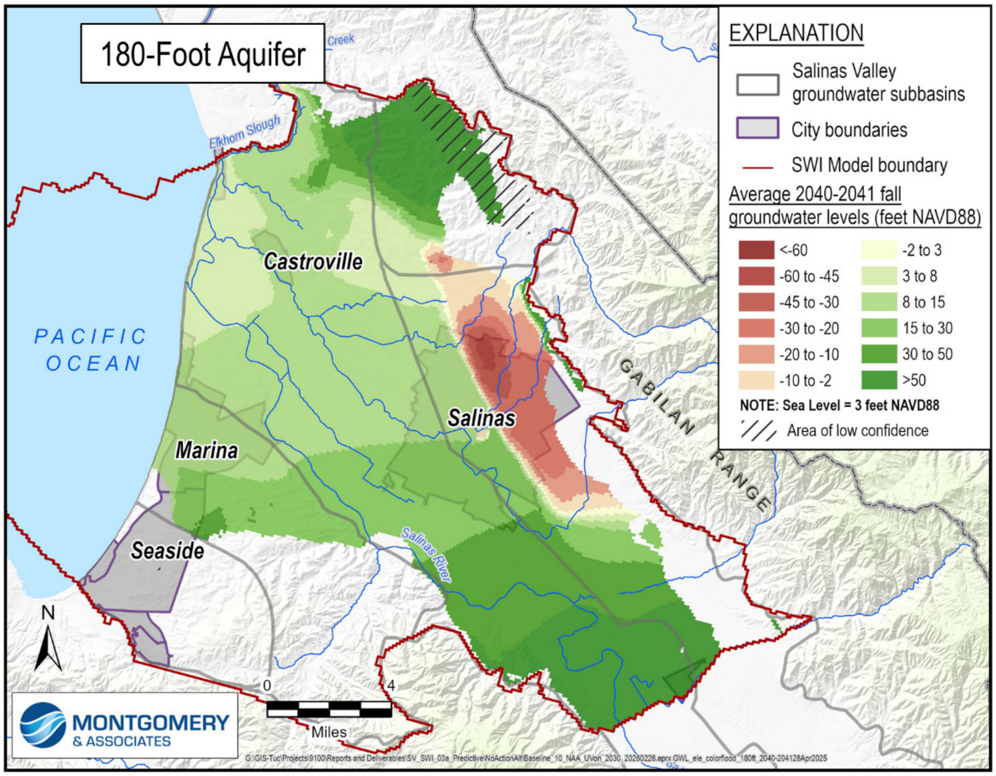


Figure A-11. Change in Groundwater Levels by 2040 for the No Agricultural Pumping in 180/400, Eastside, Monterey, Langley, and Forebay Subbasins Scenario Simulation



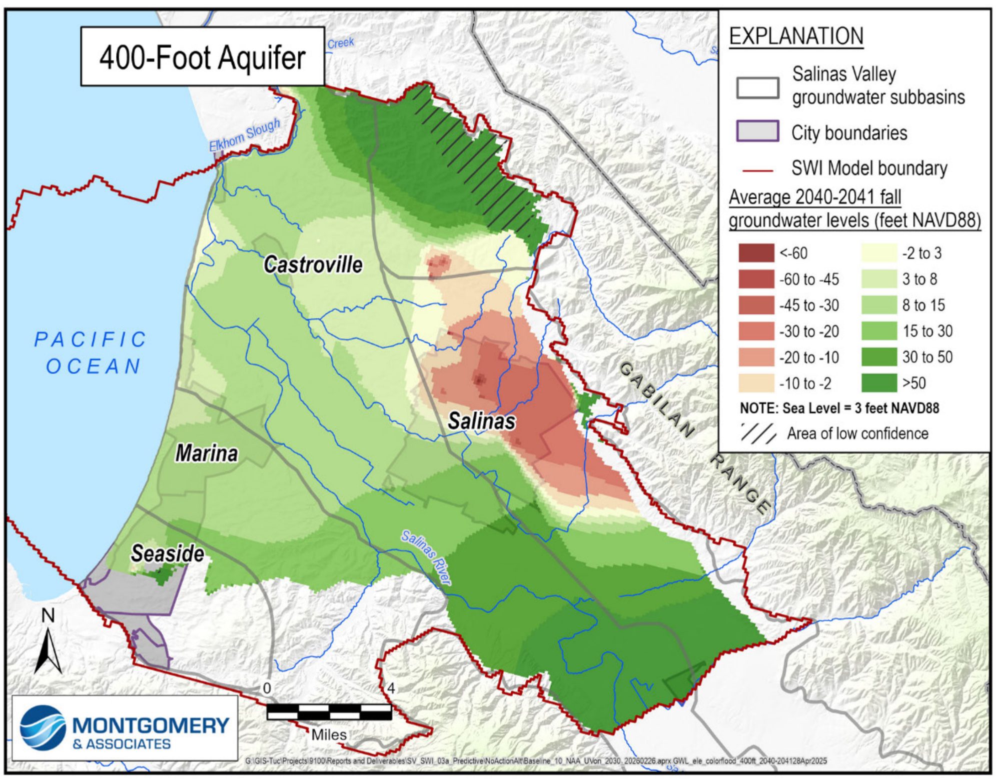


Figure A-12. Average 2040 to 2041 Groundwater Levels for the No Agricultural Pumping in 180/400, Eastside, Monterey, Langley, and Forebay Subbasins Scenario Simulation

No agricultural pumping in 180/400, Eastside, Monterey, and Langley Subbasins simulation

In this simulation, agricultural pumping is allowed in the Upper Valley and Forebay Subbasins. No agricultural pumping is allowed after 2030 in the 180/400, Monterey, Eastside, or Langley Subbasins.

Figure A-13 shows the progression of the 500 mg/L chloride isocontour in the 180-Foot and 400-Foot Aquifers for this scenario's simulation. In the 180-Foot Aquifer, the 500 mg/L chloride isocontour moves toward the east until approximately 2040, when groundwater levels rise high enough to start pushing the isocontour back to the northwest. In the 400-Foot Aquifer the 500 mg/L chloride isocontour moves inland until approximately 2040, then the isocontour appears to slow down and remain in place.

Figure A-14 compares the 2040 location of the 500 mg/L chloride isocontour in blue, with the minimum threshold line in black and the baseline simulation in red. The pumping reductions in this simulation are insufficient for moving the 500 mg/L isocontour line to the minimum threshold line. Figure A-15 compares the 2070 location of the 500 mg/L chloride isocontour in blue, with the minimum threshold line in black and the baseline simulation in red. This figure demonstrates that eliminating all agricultural pumping in the 180/400, Eastside, Monterey, and Langley Subbasins starting in 2030 can significantly move the 500 mg/L isocontour given adequate time. The only area where eliminating this amount of pumping has inadequate influence is near the City of Salinas in the 400-Foot aquifer. The easternmost 500 mg/L isocontour in the 400-Foot Aquifer continues to migrate toward the City of Salinas, likely in response to continued municipal pumping. Additionally, areas in the 180-Foot Aquifer between the City of Salinas and Castroville continue to be inland of the minimum threshold line through 2070 because the natural recharge pushes existing seawater intrusion to the northwest, not directly toward the ocean.

Figure A-16 shows the 2040 chloride concentrations in the 180-Foot and 400-Foot Aquifers. Because there is no barrier to prevent seawater intrusion at the coast, the aquifers continue to become more saline within the seawater intruded area. This could lead to additional wells being removed from service, loss of agricultural production, increased water treatment costs, or additional wells being drilled into the Deep Aquifers.

Figure A-17 shows the change in groundwater elevations between 2023 and 2040 in the 180-Foot and 400-Foot Aquifers. Figure A-18 shows the average 2040 to 2041 groundwater elevations in each aquifer. These figures show that although reducing pumping results in significant groundwater level increases, groundwater levels remain below sea level in the Eastside Subbasin. These low groundwater levels in the Eastside Subbasin result in a groundwater divide near the community of Castroville; groundwater west of the divide flows toward the coast while groundwater east of the divide flows toward the Eastside Subbasin. This explains why the western areas of seawater intrusion in the 400-Foot Aquifer retreat toward the coast while the eastern areas of seawater intrusion migrate toward the City of Salinas.

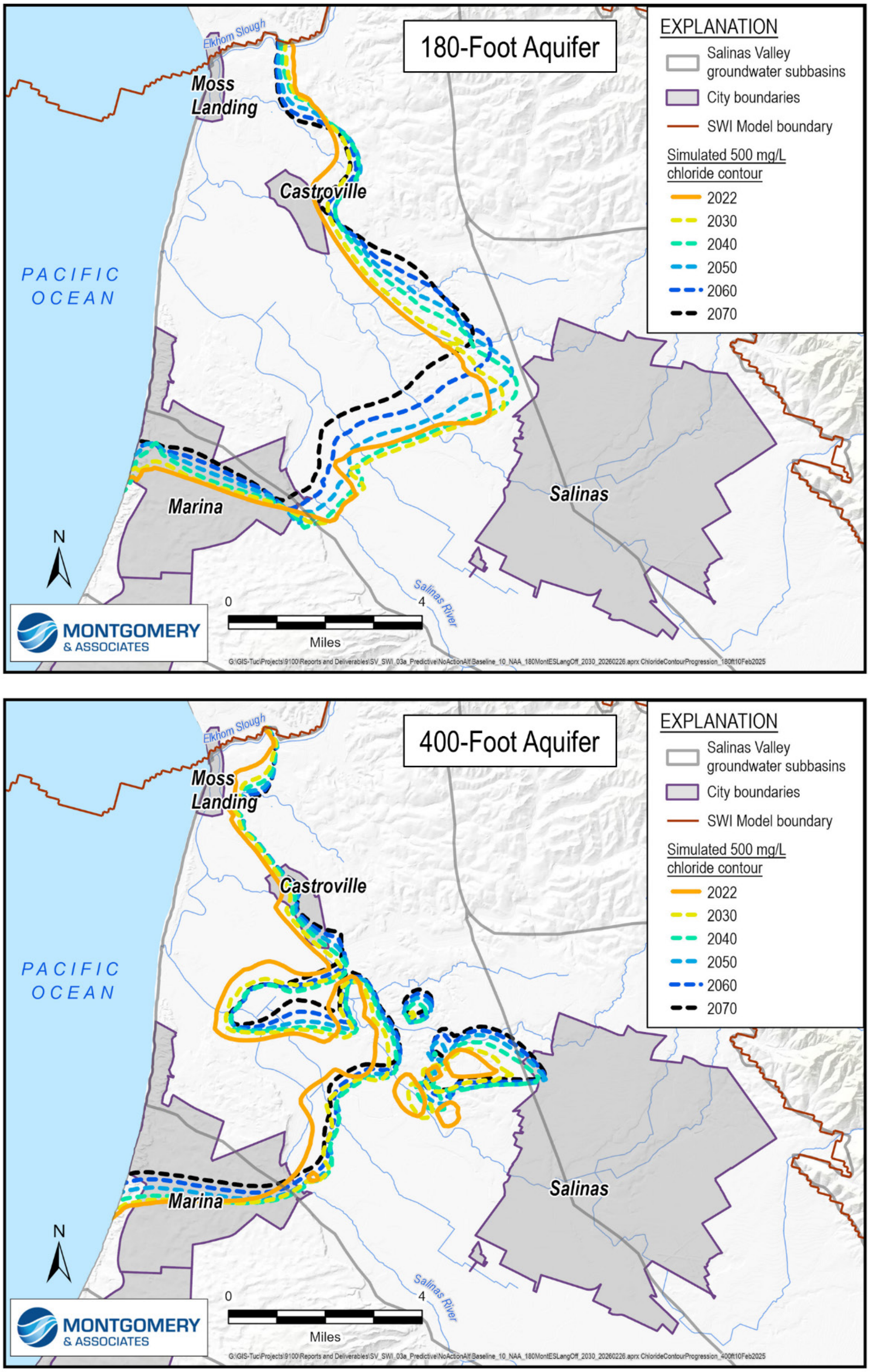


Figure A-13. Progression of 500 mg/L Chloride Isocontour for the No Agricultural Pumping in 180/400, Eastside, Monterey, and Langley Subbasins Scenario Simulation

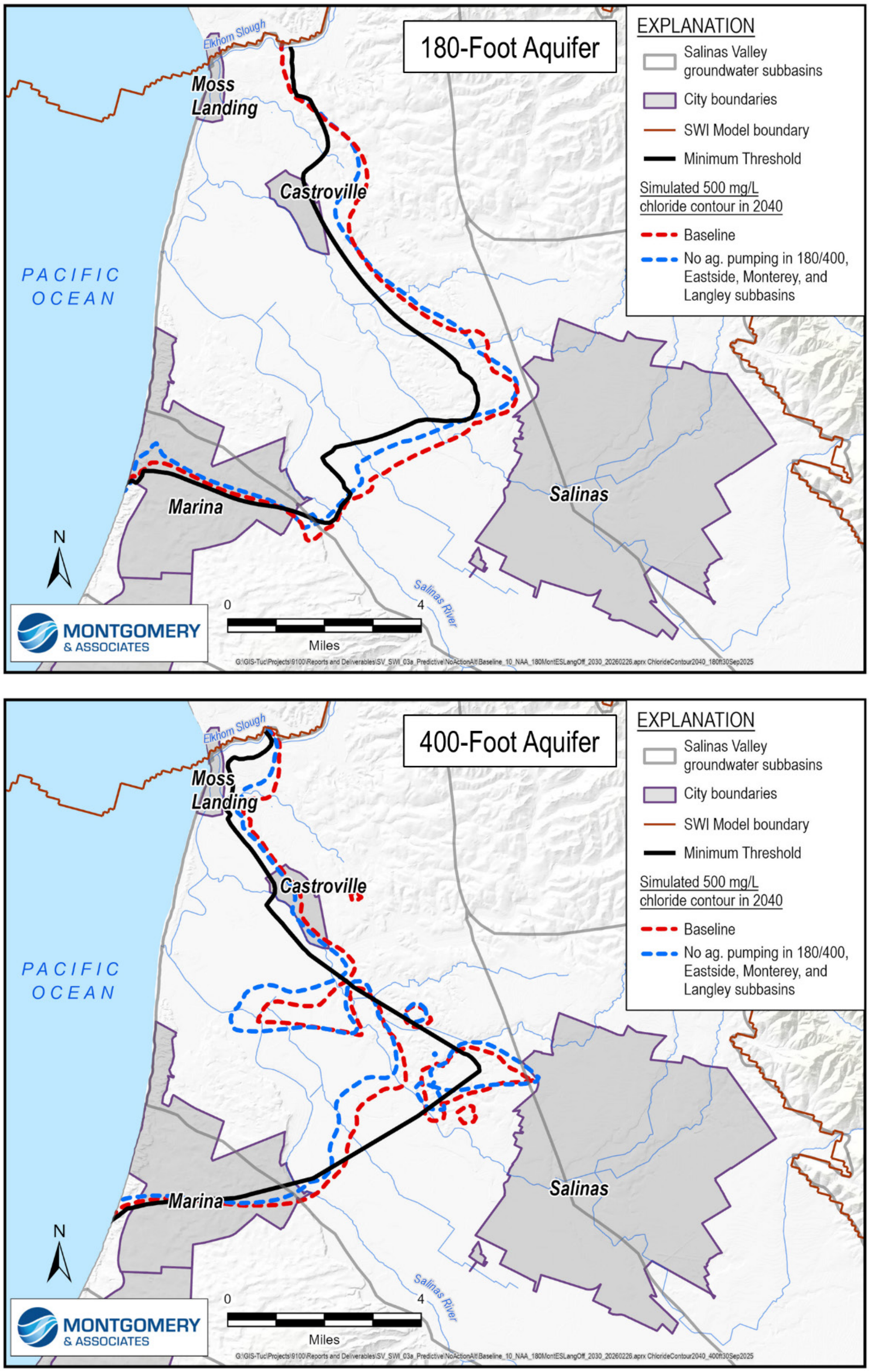
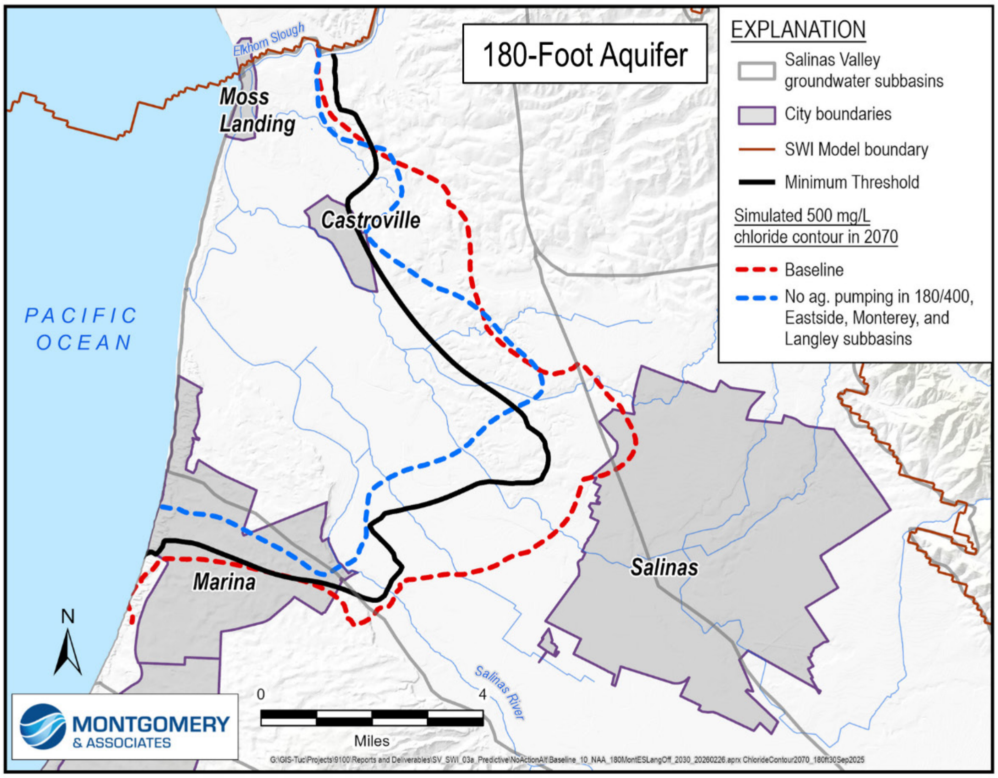


Figure A-14. Location of the 500 mg/L Isocontour in 2040 for the No Agricultural Pumping in 180/400, Eastside, Monterey, and Langley Subbasins Scenario Simulation



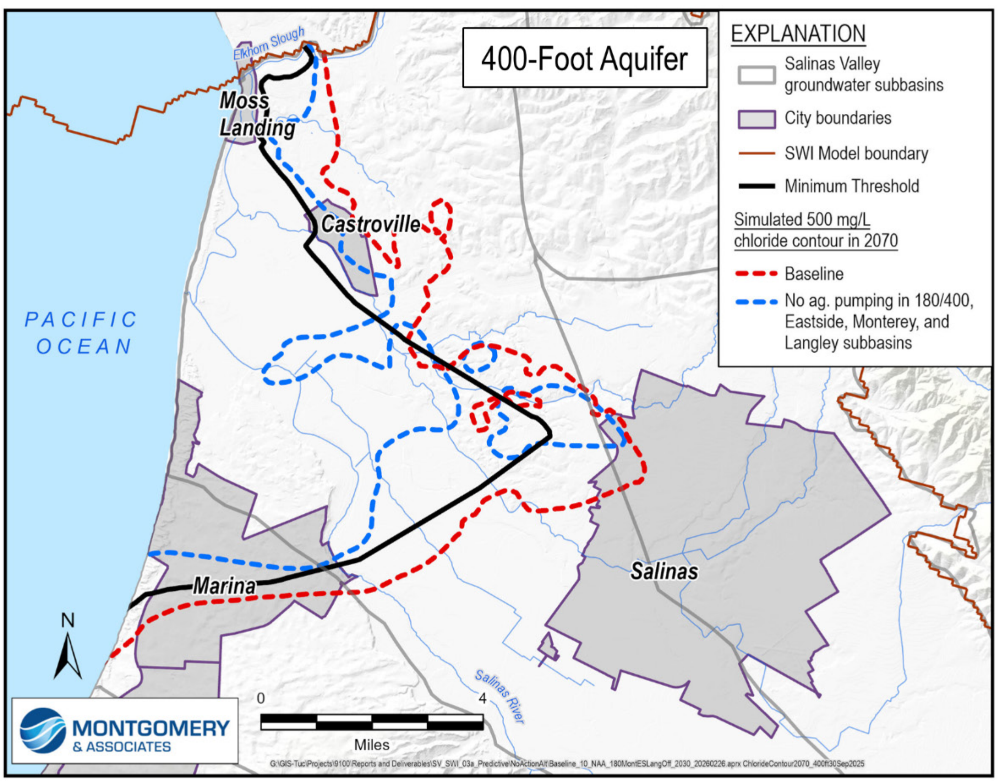
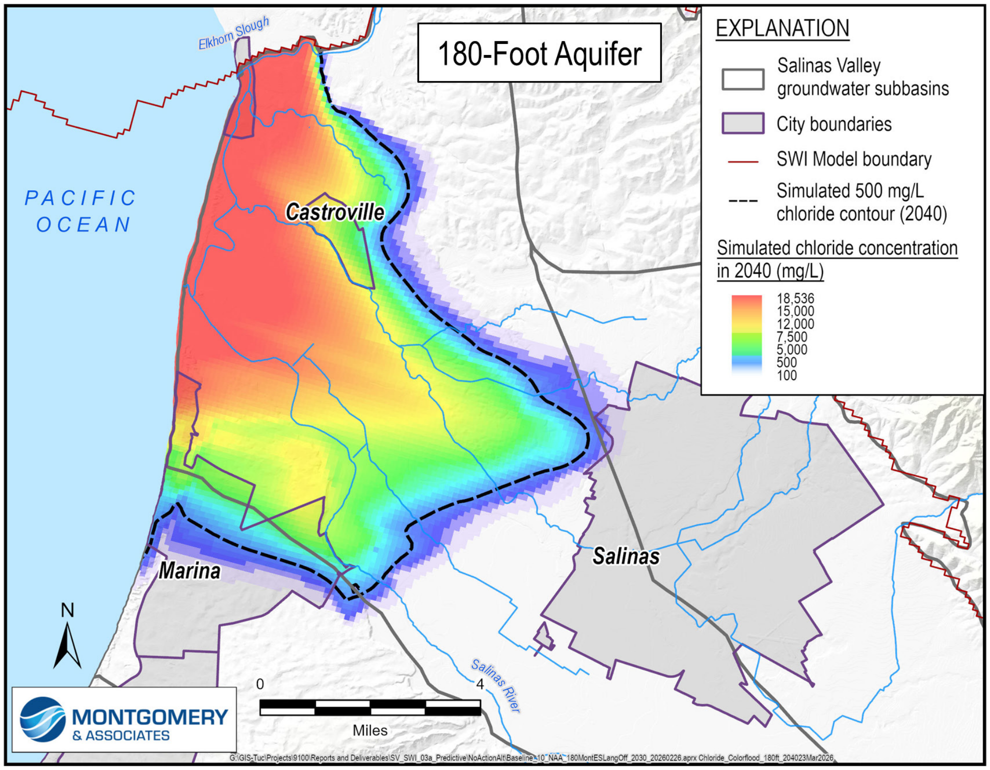


Figure A-15. Location of the 500 mg/L Isocontour in 2070 for the No Agricultural Pumping in 180/400, Eastside, Monterey, and Langley Subbasins Scenario Simulation



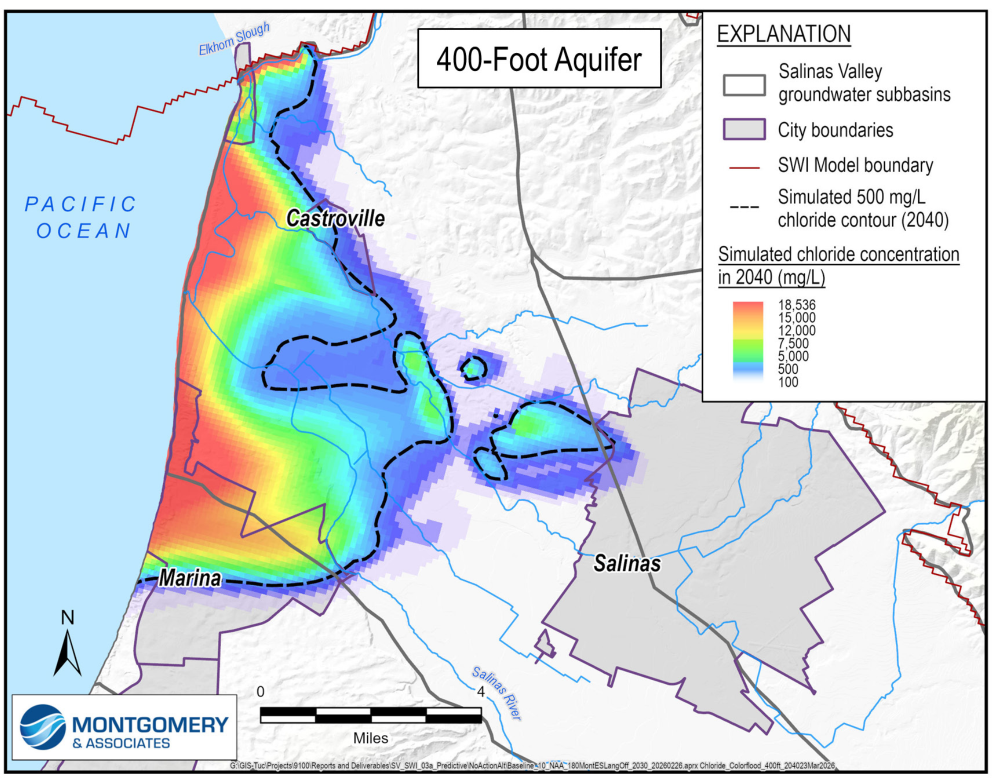


Figure A-16. Chloride Concentrations in 2040 for the No Agricultural Pumping in 180/400, Eastside, Monterey, and Langley Subbasins Scenario Simulation

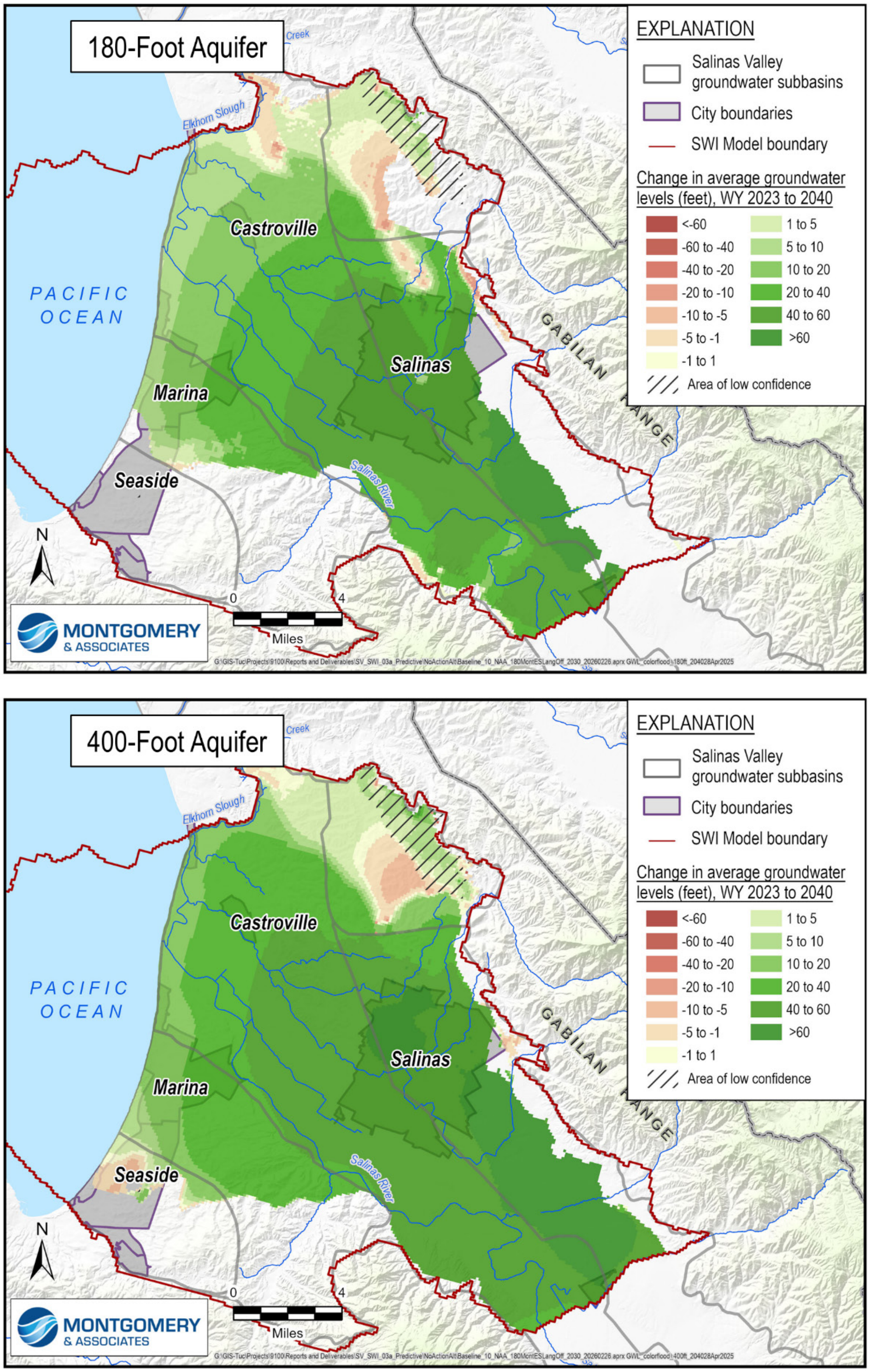
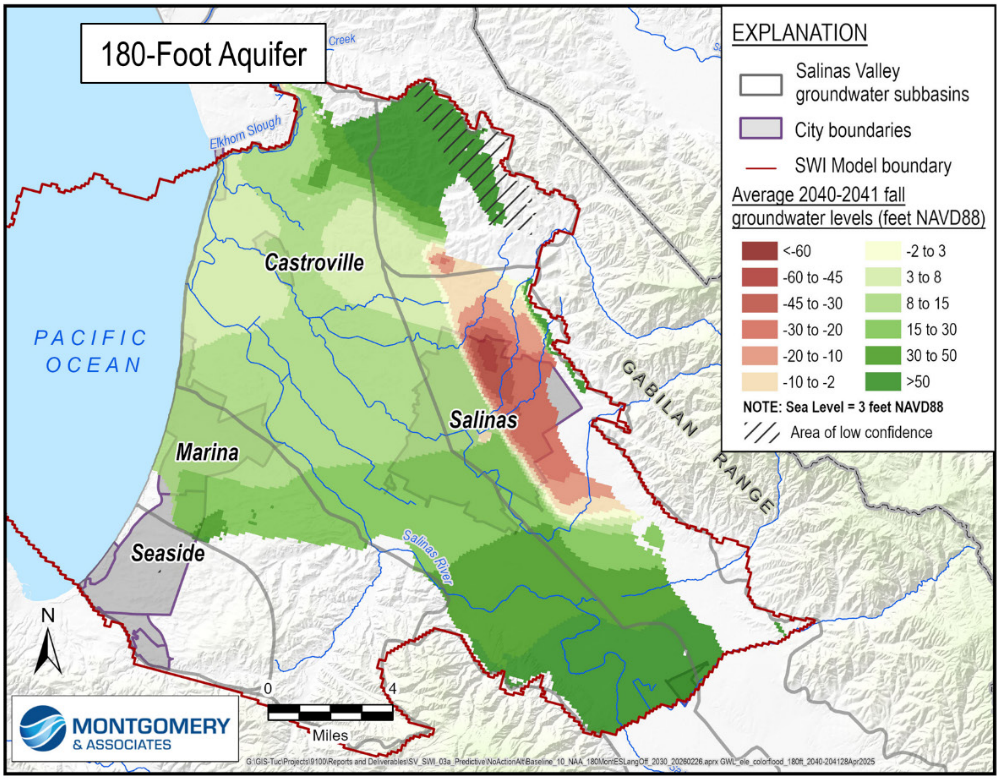


Figure A-17. Change in Groundwater Levels by 2040 for the No Agricultural Pumping in 180/400, Eastside, Monterey, and Langley Subbasins Scenario Simulation



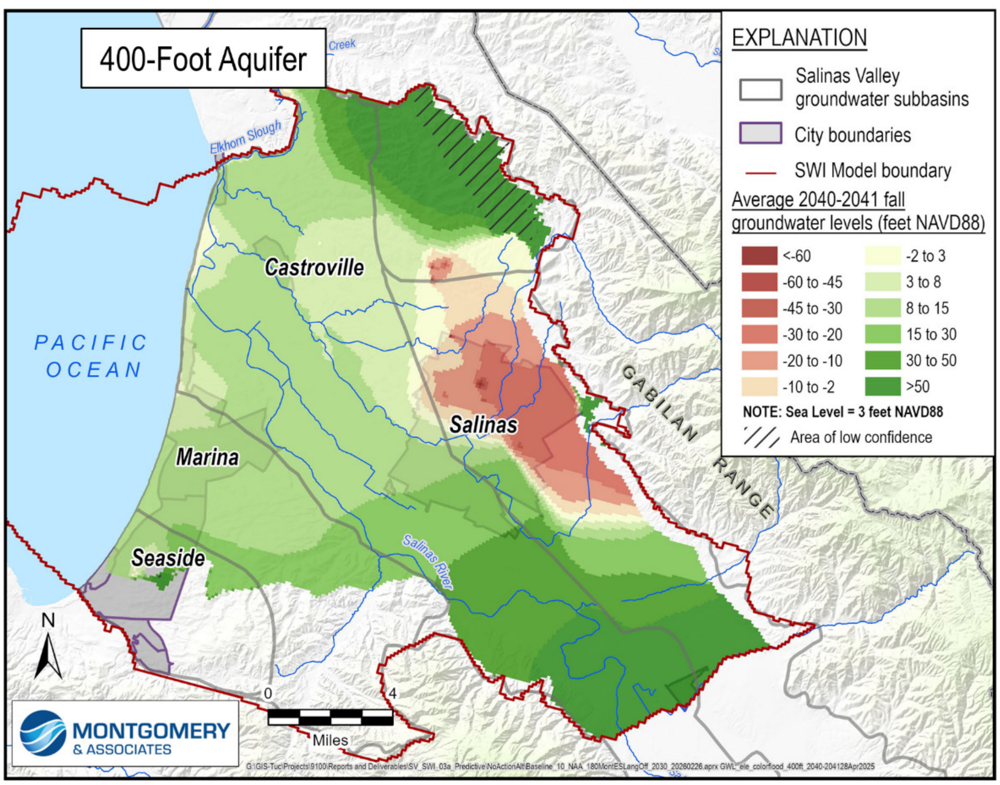


Figure A-18. Average 2040 to 2041 Groundwater Levels for the No Agricultural Pumping in 180/400, Eastside, Monterey, and Langley Subbasins Scenario Simulation

No agricultural pumping in 180/400, Northern Eastside, and Monterey Subbasins simulation

In this simulation, agricultural pumping is allowed in the Upper Valley, Forebay, Langley, and southern Eastside Subbasins. No agricultural pumping is allowed after 2030 in the 180/400, Monterey, or norther Eastside Subbasins.

Figure A-19 shows the progression of the 500 mg/L chloride isocontour in the 180-Foot and 400-Foot Aquifers for this scenario's simulation. In the 180-Foot Aquifer, the 500 mg/L chloride isocontour moves toward the east until approximately 2040, when groundwater levels rise high enough to start pushing the isocontour back to the northwest. In the 400-Foot Aquifer the 500 mg/L chloride isocontour moves inland for until approximately 2040, then the isocontour appears to slow down and remain in place.

Figure A-20 compares the 2040 location of the 500 mg/L chloride isocontour in blue, with the minimum threshold line in black and the baseline simulation in red. The pumping reductions in this simulation are insufficient for moving the 500 mg/L isocontour line to the minimum threshold line. Figure A-21 compares the 2070 location of the 500 mg/L chloride isocontour in blue, with the minimum threshold line in black and the baseline simulation in red. This figure demonstrates that eliminating all agricultural pumping in the 180/400, Northern Eastside, and Monterey Subbasins starting in 2030 can significantly move the 500 mg/L isocontour given adequate time. The only area where eliminating this amount of pumping has inadequate influence is near the City of Salinas in the 400-Foot Aquifer. The easternmost 500 mg/L isocontour in the 400-Foot Aquifer continues to migrate toward the City of Salinas, likely in response to continued municipal pumping. Additionally, areas in the 180-Foot Aquifer between the City of Salinas and Castroville continue to exceed the minimum threshold line through 2070 because the natural recharge pushes existing seawater intrusion to the northwest, not directly toward the ocean.

Figure A-22 shows the 2040 chloride concentrations in the 180-Foot and 400-Foot Aquifers. Because there is no barrier to prevent seawater intrusion at the coast, the aquifers continue to become more saline within the seawater intruded area. This could lead to additional wells being removed from service, loss of agricultural production, increased water treatment costs, or additional wells being drilled into the Deep Aquifers.

Figure A-23 shows the change in groundwater elevations between 2023 and 2040 in the 180-Foot and 400-Foot Aquifers. Figure A24 shows the average 2040 to 2041 groundwater elevations in each aquifer. These figures show that although reducing pumping results in significant groundwater level increases, groundwater levels remain below sea level in the Eastside Subbasin. These low groundwater levels in the Eastside Subbasin result in relatively flat groundwater gradients near the community of Castroville.

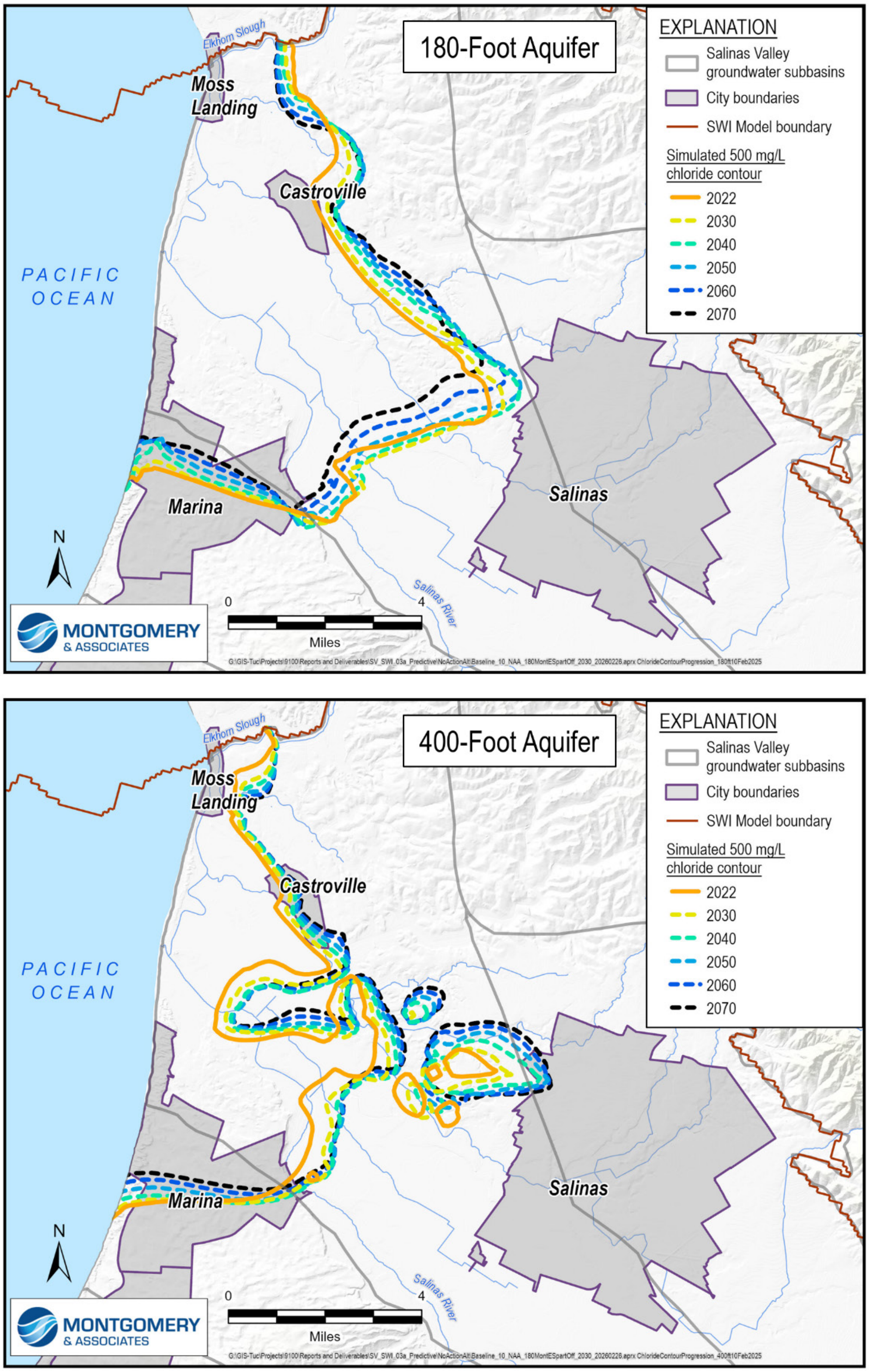


Figure A-19. Progression of 500 mg/L Chloride Isocontour for the No Agricultural Pumping in 180/400, Northern Eastside, and Monterey Subbasins Scenario Simulation

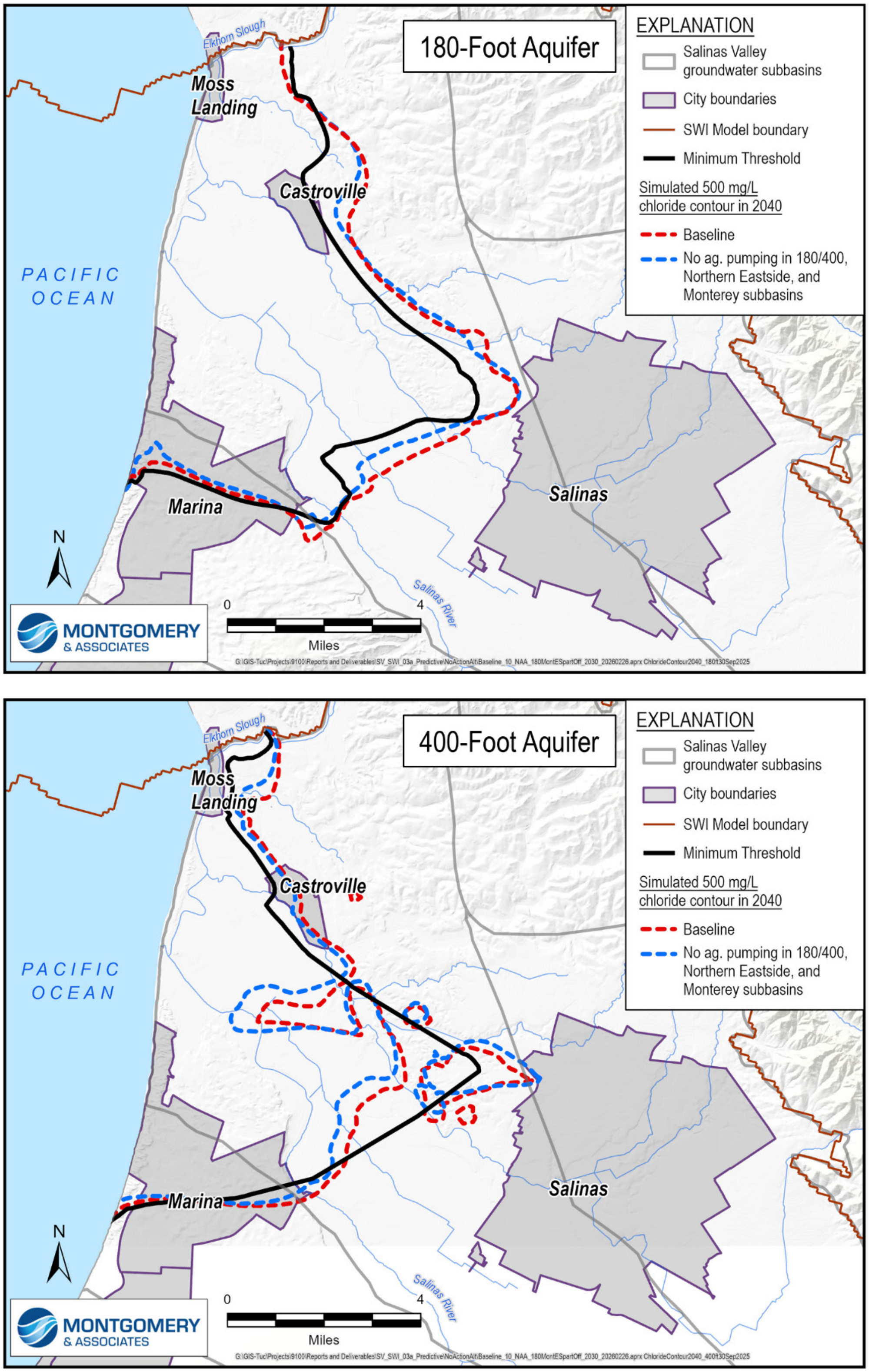
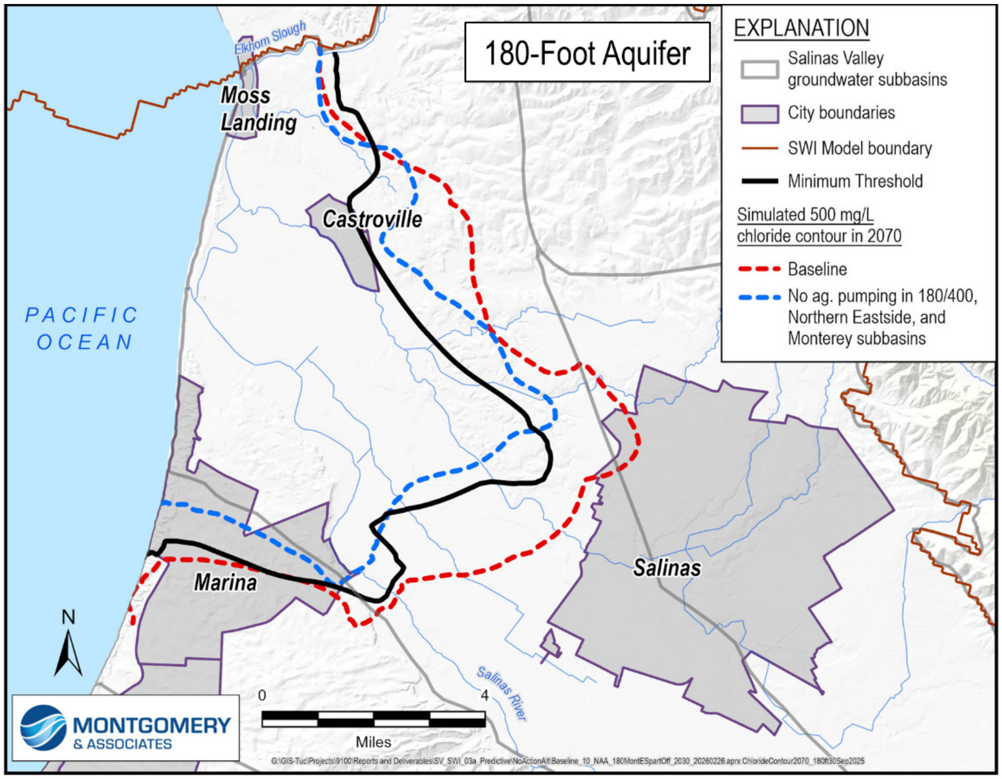


Figure A-20. Location of the 500 mg/L Isocontour in 2040 for the No Agricultural Pumping in 180/400, Northern Eastside, and Monterey Subbasins Scenario Simulation



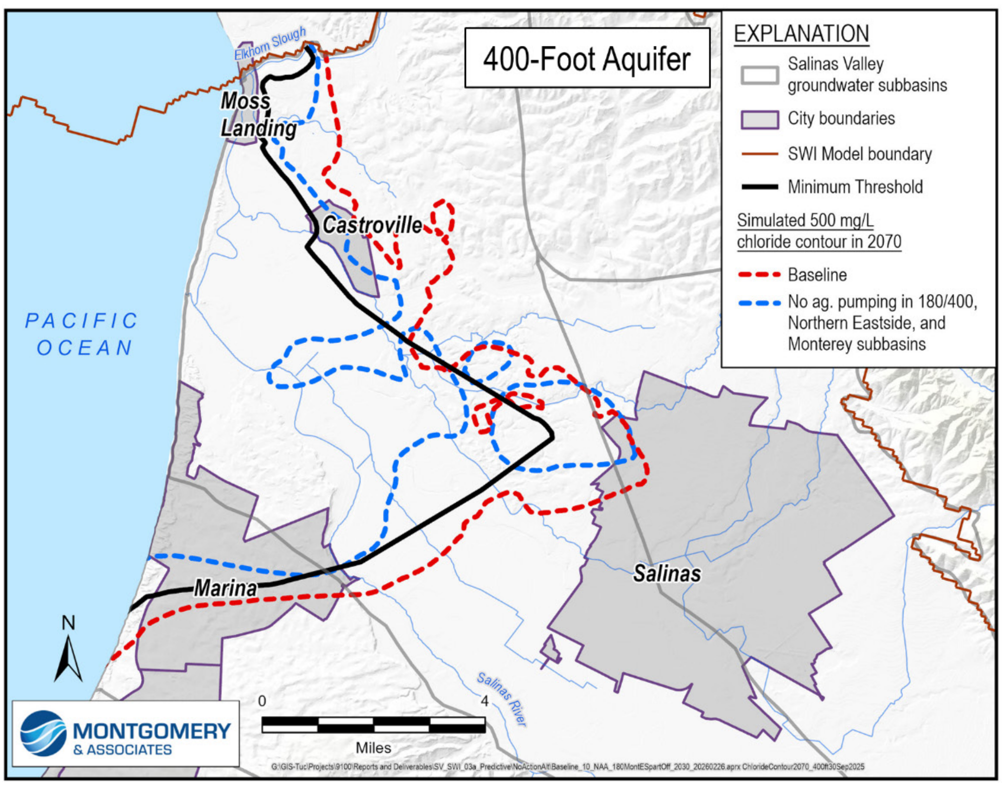


Figure A-21. Location of the 500 mg/L Isocontour in 2070 for the No Agricultural Pumping in 180/400, Northern Eastside, and Monterey Subbasins Scenario Simulation

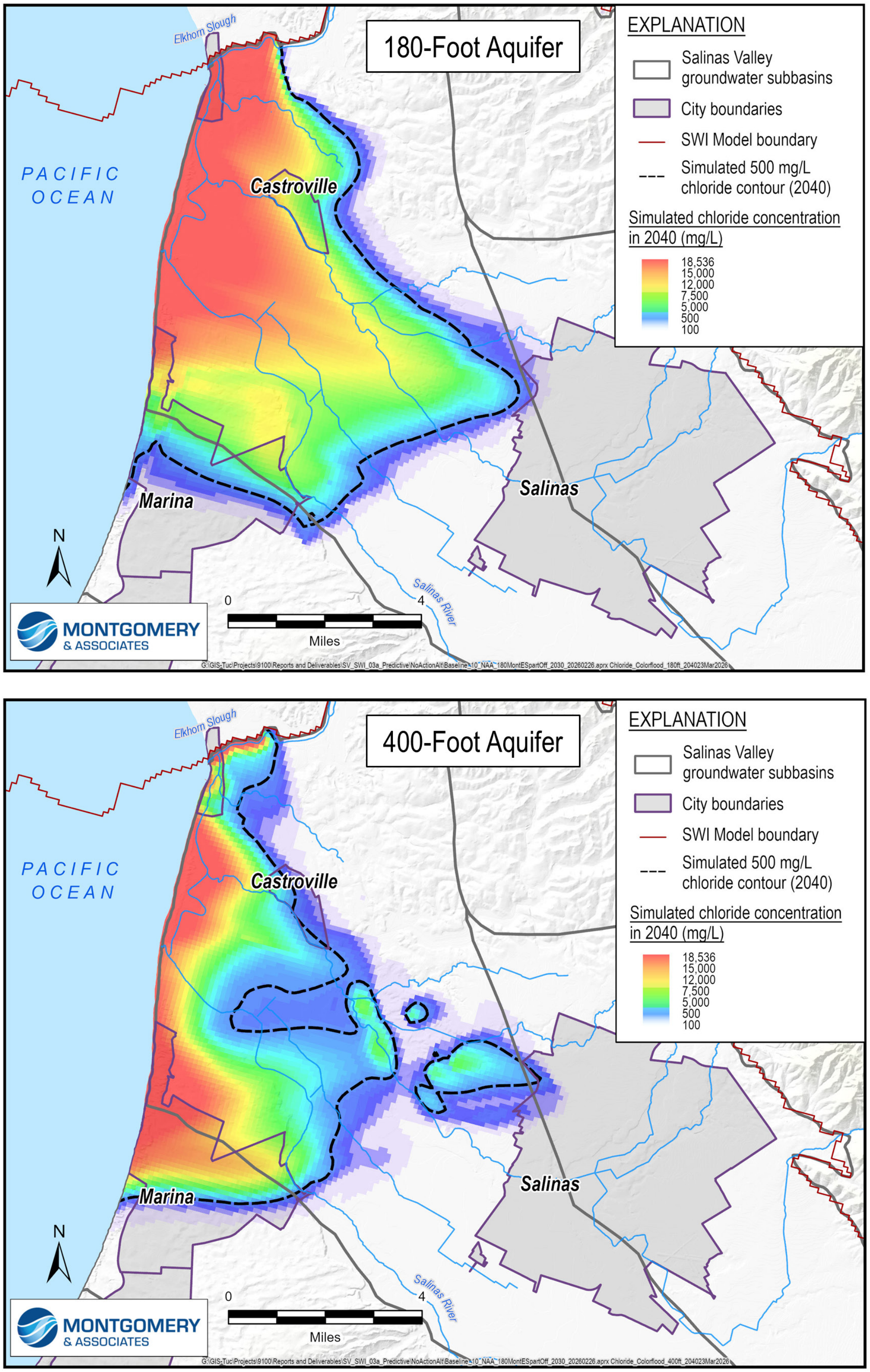
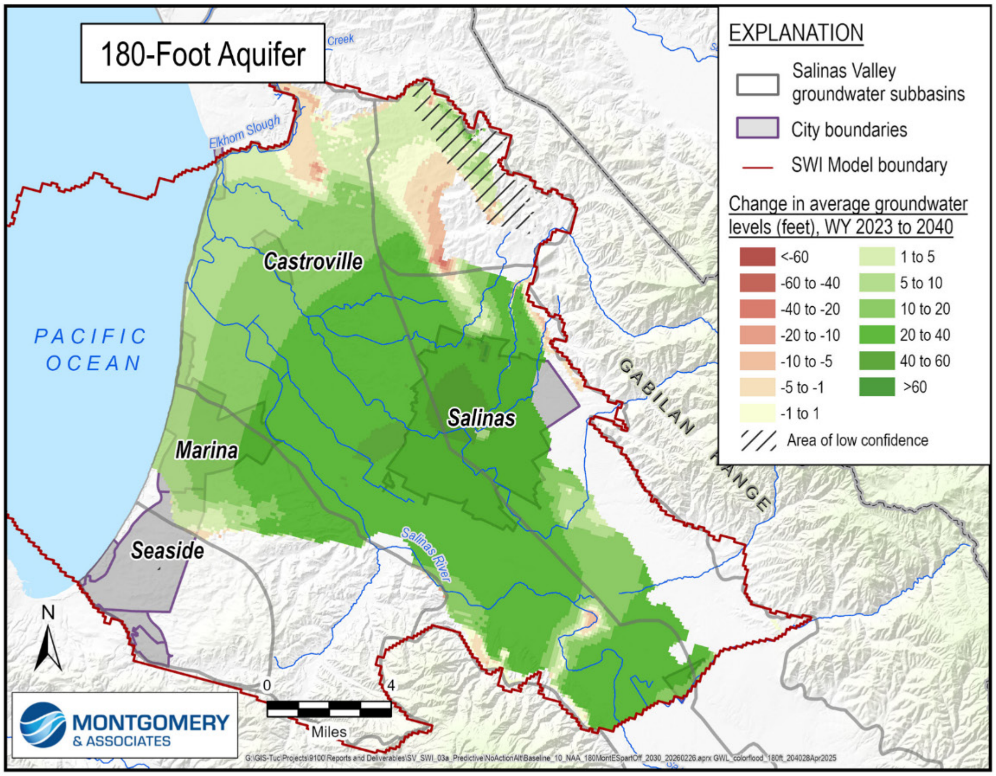


Figure A-22. Chloride Concentrations in 2040 for the No Agricultural Pumping in 180/400, Northern Eastside, and Monterey Subbasins Scenario Simulation



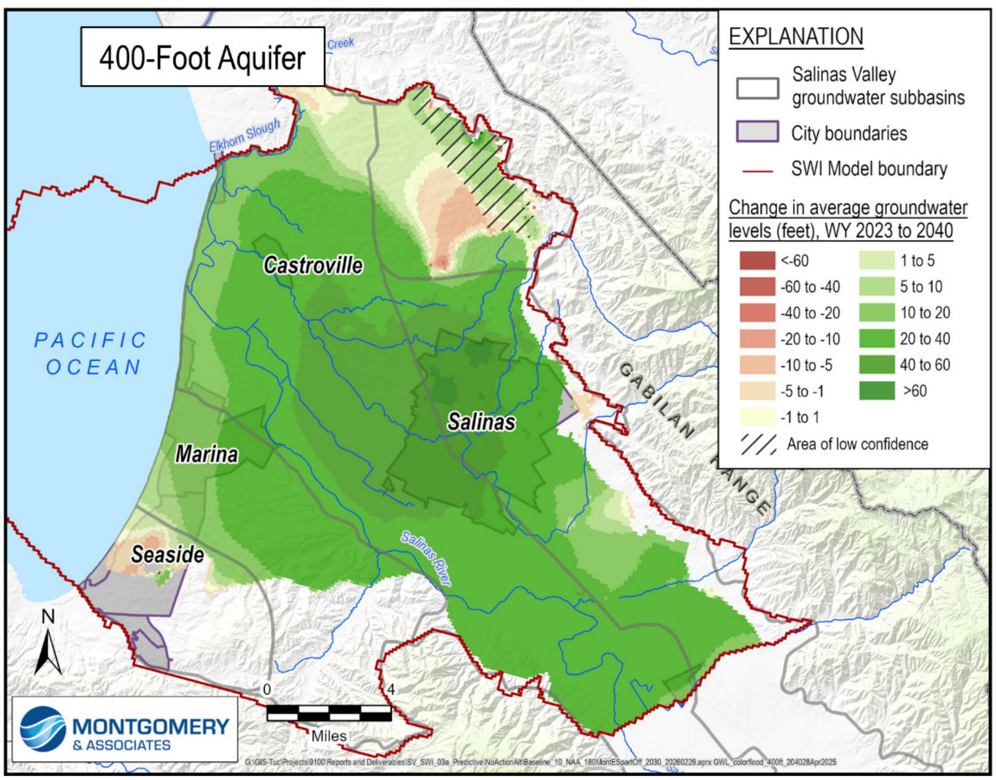
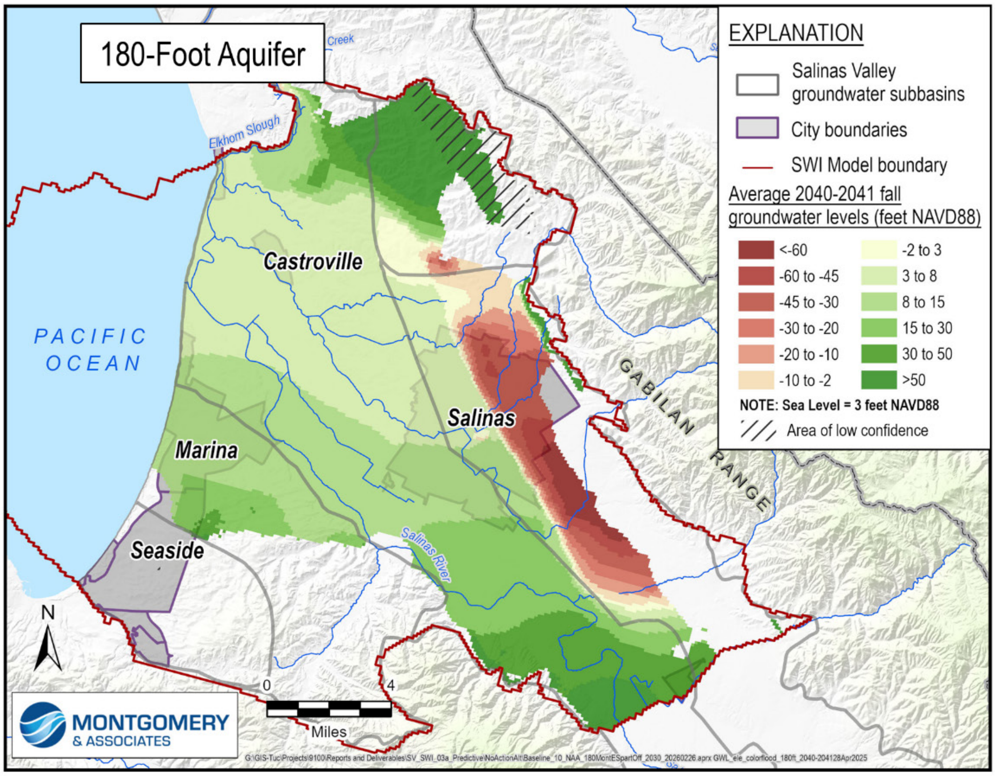


Figure A-23. Change in Groundwater Levels by 2040 for the No Agricultural Pumping in 180/400, Northern Eastside, and Monterey Subbasins Scenario Simulation



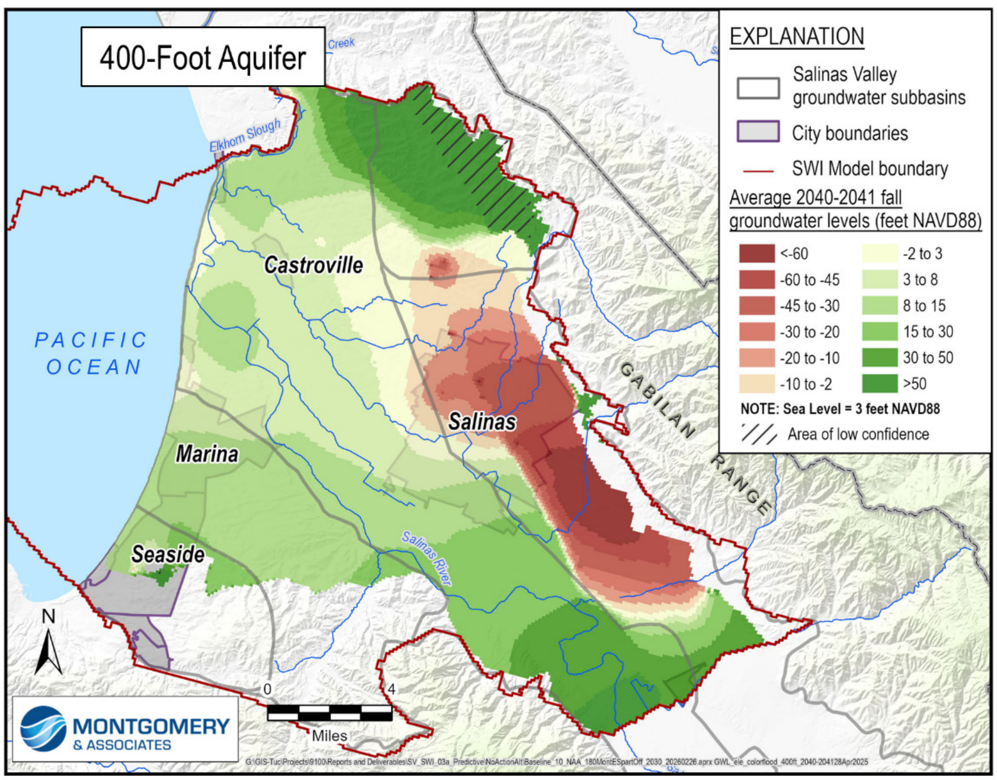


Figure A-24. Average 2040 to 2041 Groundwater Levels for the No Agricultural Pumping in 180/400, Northern Eastside, and Monterey Subbasins Scenario Simulation

No agricultural pumping in 180/400 and Monterey Subbasins simulation

In this simulation, agricultural pumping is allowed in the Upper Valley, Forebay, Langley, and Eastside Subbasins. No agricultural pumping is allowed after 2030 in the 180/400 or Monterey Subbasins.

Figure A-25 shows the progression of the 500 mg/L chloride isocontour in the 180-Foot and 400-Foot Aquifers for this scenario's simulation. In the 180-Foot Aquifer, the 500 mg/L chloride isocontour moves toward the east until approximately 2040, when groundwater levels rise high enough to start pushing the isocontour back to the northwest. In the 400-Foot Aquifer the 500 mg/L chloride isocontour moves inland until approximately 2040, then the isocontour appears to slow down and remain in place.

Figure A-26 compares the 2040 location of the 500 mg/L chloride isocontour in blue, with the minimum threshold line in black and the baseline simulation in red. The pumping reductions in this simulation are insufficient for moving the 500 mg/L isocontour line to the minimum threshold line. Figure A-27 compares the 2070 location of the 500 mg/L chloride isocontour in blue, with the minimum threshold line in black and the baseline simulation in red. This figure demonstrates that eliminating all agricultural pumping in the 180/400 and Monterey Subbasins starting in 2030 can significantly move the 500 mg/L isocontour given adequate time. The only area where eliminating this amount of pumping has inadequate influence is near the City of Salinas in the 400-Foot Aquifer. The easternmost 500 mg/L isocontour in the 400-Foot Aquifer continues to migrate toward the City of Salinas, likely in response to continued municipal pumping. Additionally, areas in the 180-Foot Aquifer between the City of Salinas and Castroville continue to exceed the minimum threshold line through 2070 because the natural recharge pushes existing seawater intrusion to the northwest, not directly toward the ocean.

Figure A-28 shows the 2040 chloride concentrations in the 180-Foot and 400-Foot Aquifers. Because there is no barrier to prevent seawater intrusion at the coast, the aquifers continue to become more saline within the seawater intruded area. This could lead to additional wells being removed from service, loss of agricultural production, increased water treatment costs, or additional wells being drilled into the Deep Aquifers.

Figure A-29 shows the change in groundwater elevations between 2023 and 2040 in the 180-Foot and 400-Foot Aquifers. Figure A-30 shows the average 2040 to 2041 groundwater elevations in each aquifer. These figures show that although reducing pumping results in significant groundwater level increases, groundwater levels remain below sea level in the Eastside Subbasin. These low groundwater levels in the Eastside Subbasin result in a groundwater divide between the community of Castroville and the coast; groundwater west of the divide flows toward the coast while groundwater east of the divide flows toward the Eastside Subbasin. Because this groundwater divide is near the coast, a significant amount of existing seawater intrusion continues to migrate toward the Eastside Subbasin.

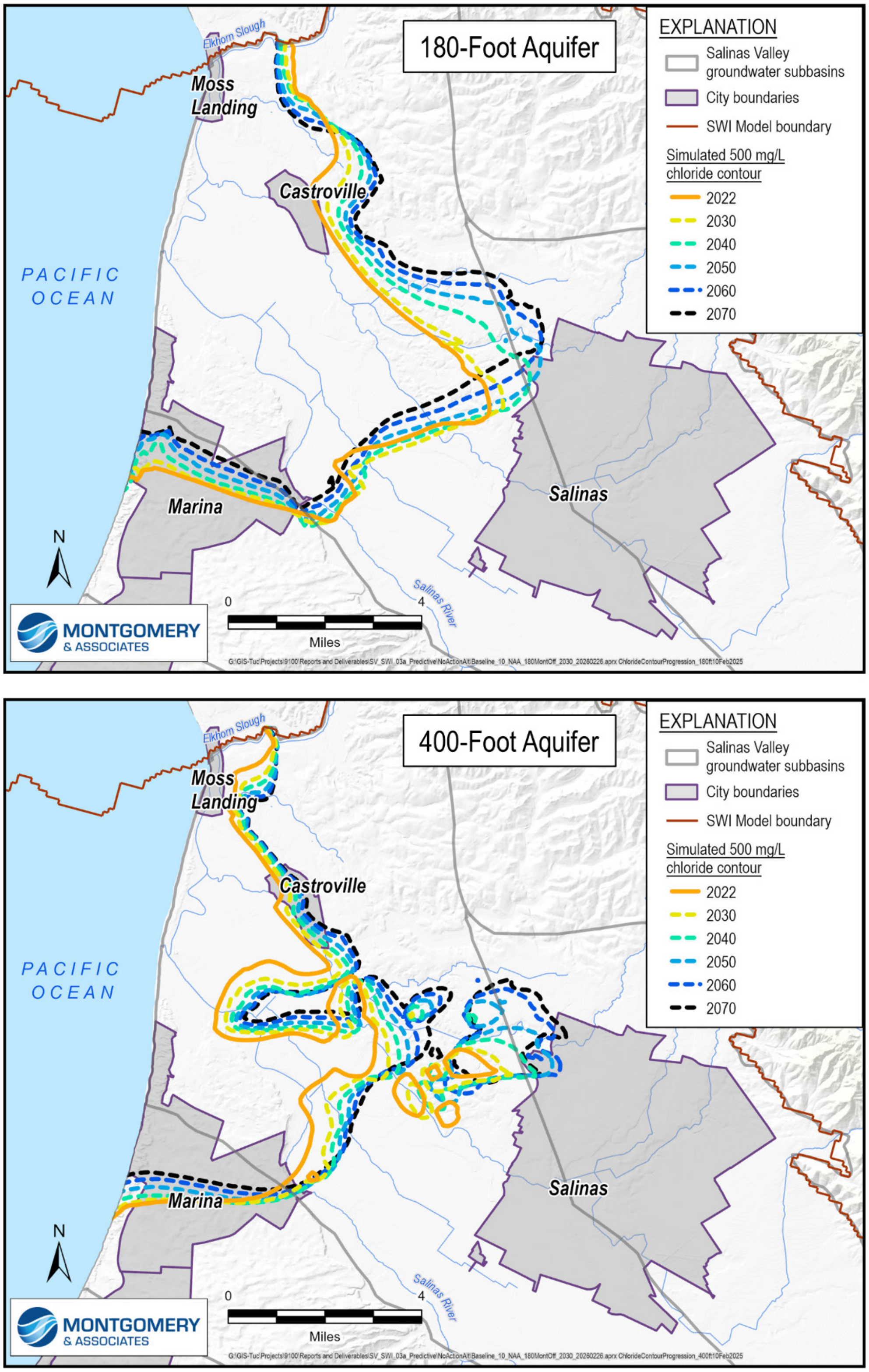


Figure A-25. Progression of 500 mg/L Chloride Isocontour for the No Agricultural Pumping in 180/400 and Monterey Subbasins Scenario Simulation

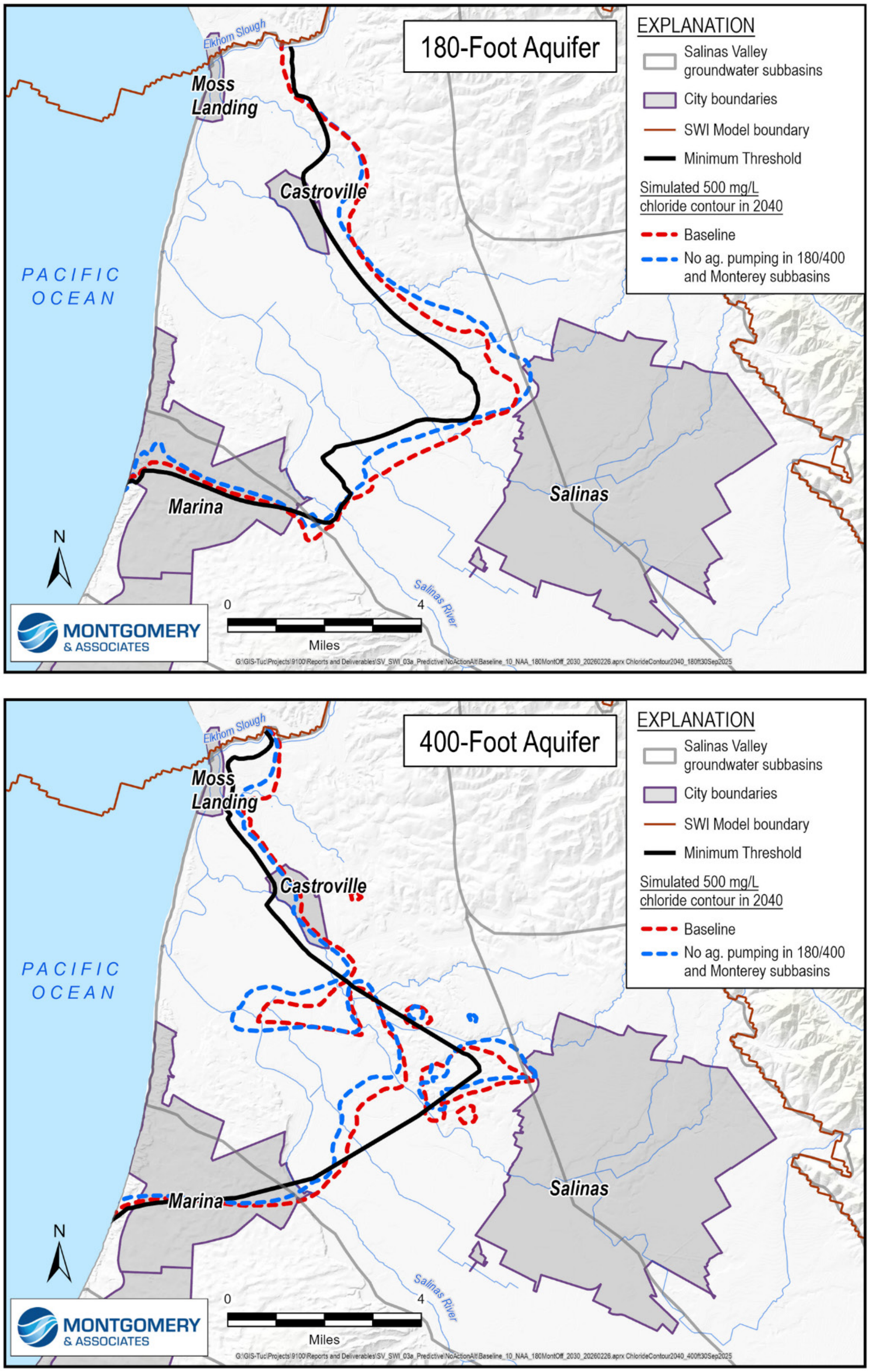


Figure A-26. Location of the 500 mg/L Isocontour in 2040 for the No Agricultural Pumping in 180/400 and Monterey Subbasins Scenario Simulation

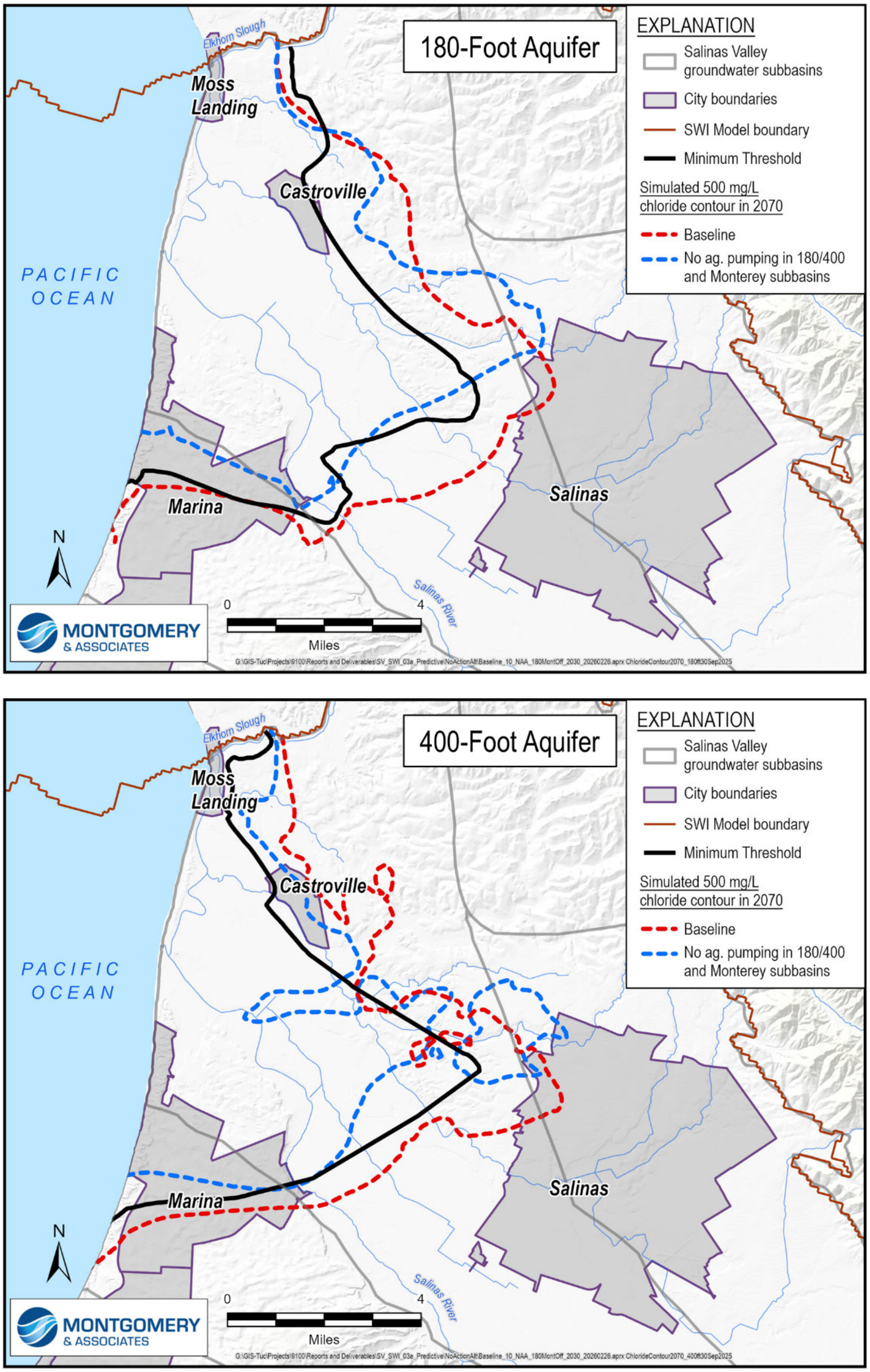
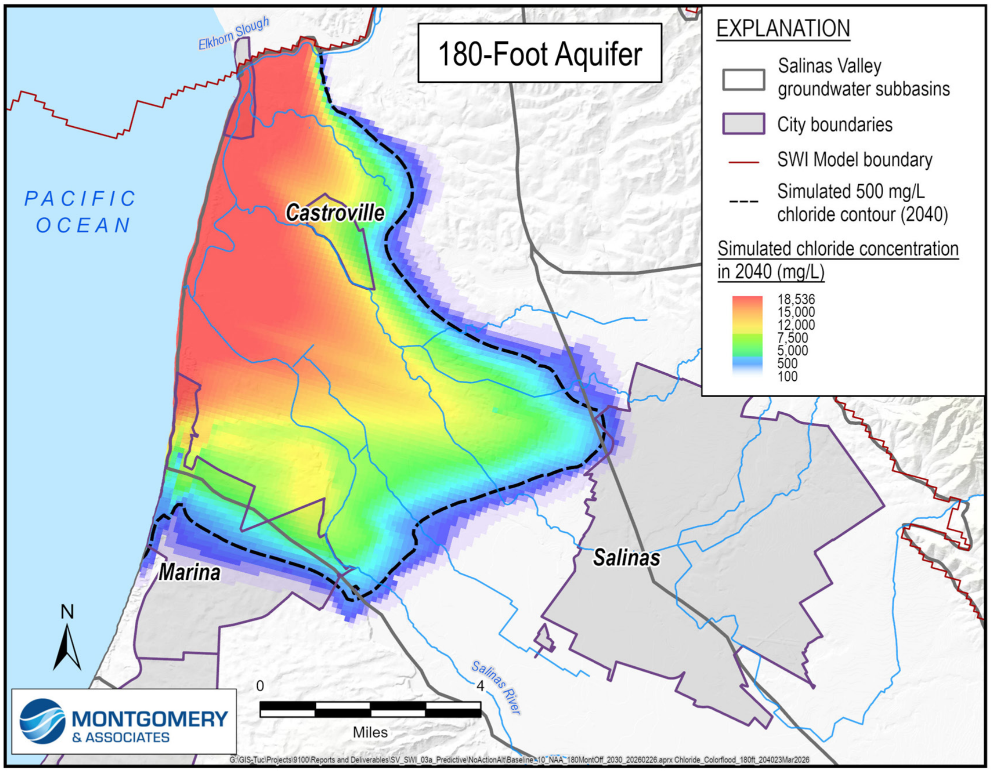


Figure A-27. Location of the 500 mg/L Isocontour in 2070 for the No Agricultural Pumping in 180/400 and Monterey Subbasins Scenario Simulation



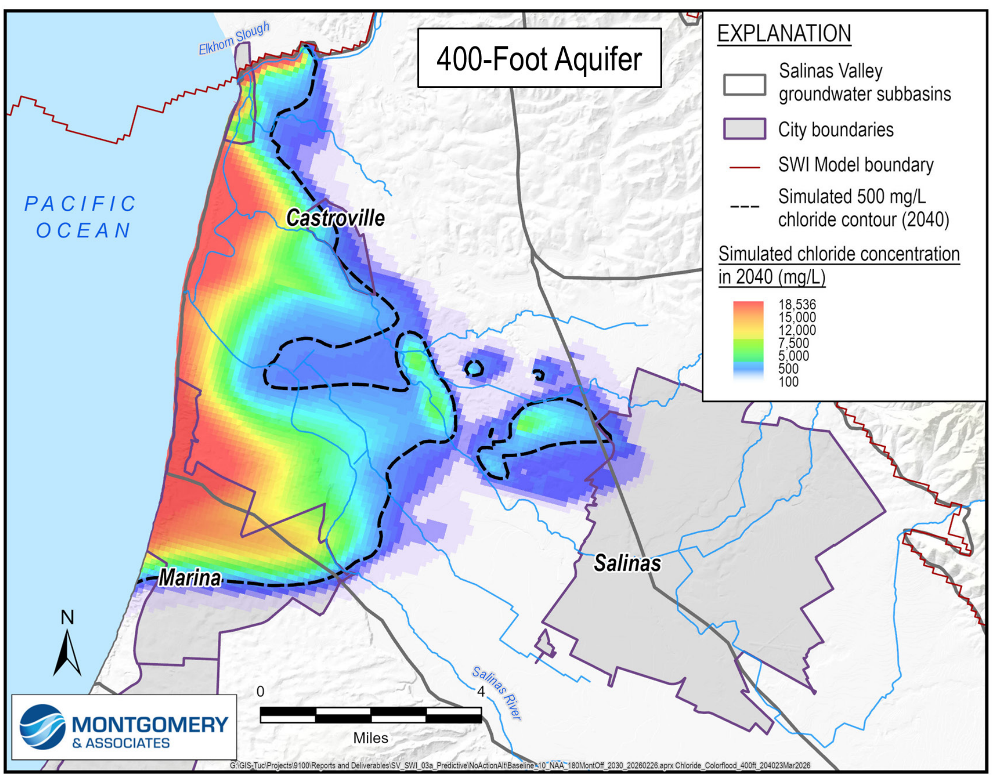


Figure A-28. Chloride Concentrations in 2040 for the No Agricultural Pumping in 180/400 and Monterey Subbasins Scenario Simulation

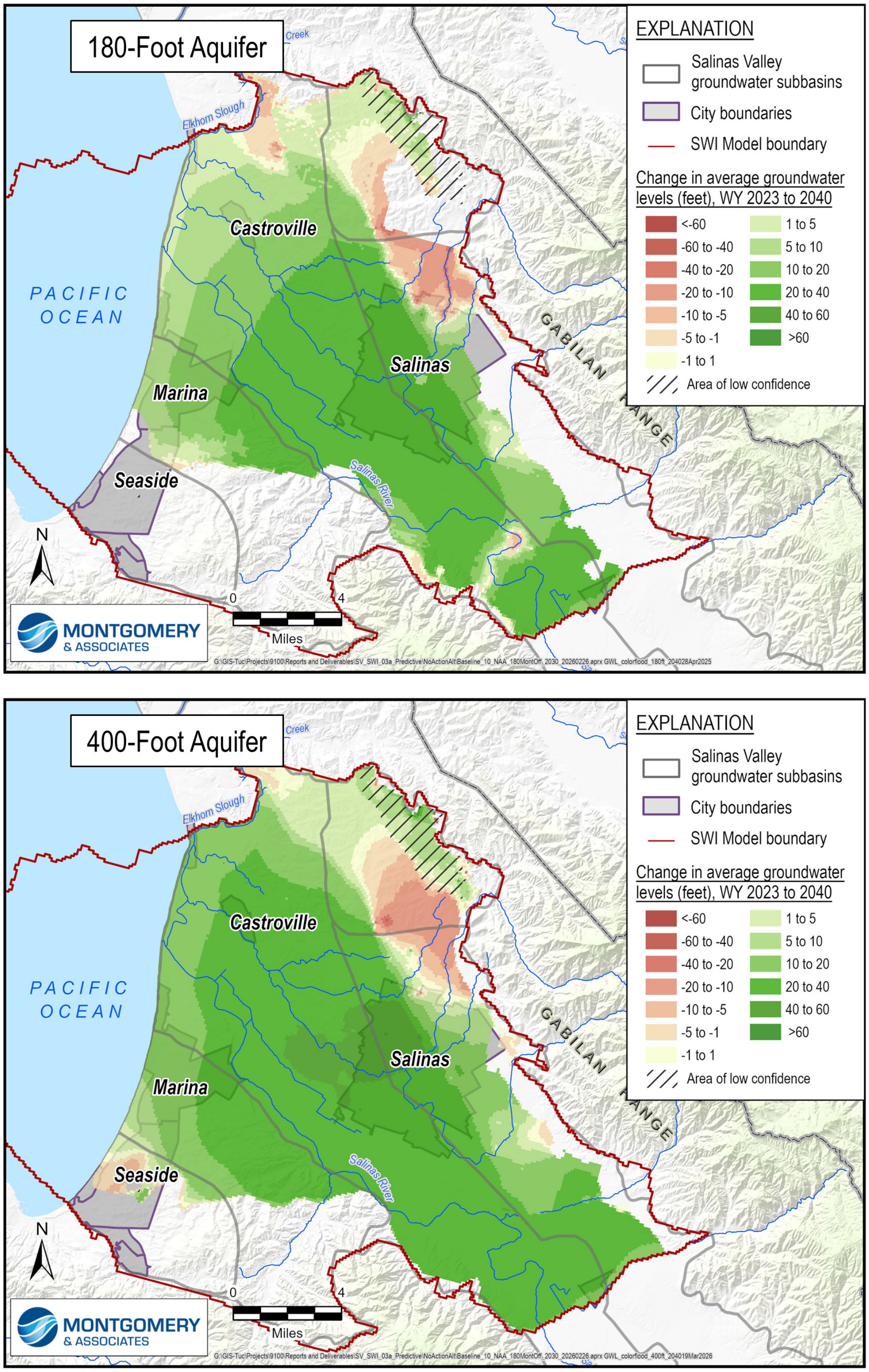


Figure A-29. Change in Groundwater Levels by 2040 for the No Agricultural Pumping in 180/400 and Monterey Subbasins Scenario Simulation

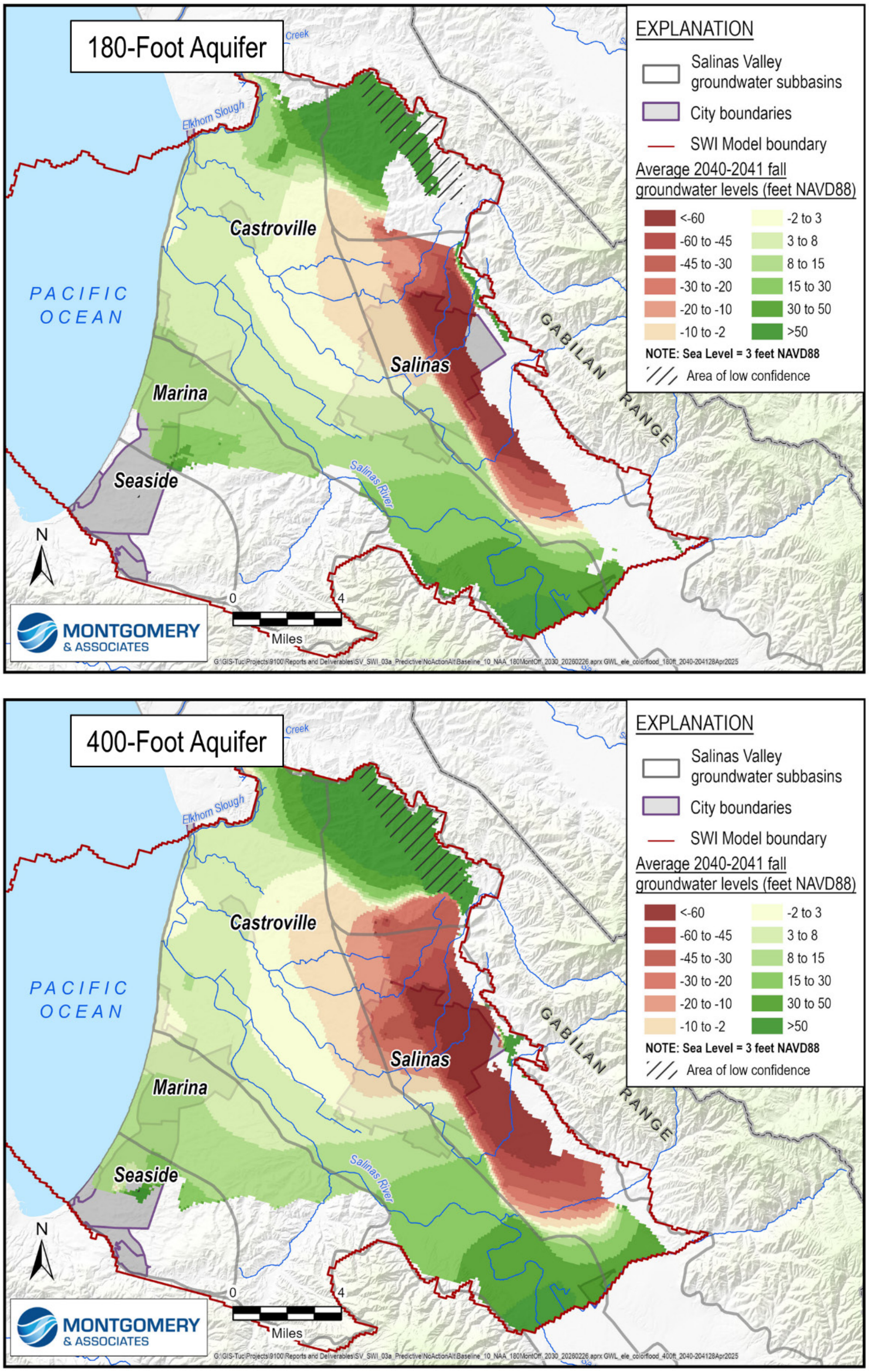


Figure A-30. Average 2040 to 2041 Groundwater Levels for the No Agricultural Pumping in 180/400 and Monterey Subbasins Scenario Simulation