

Appendix 3C

Analysis of Relationship Between Seawater Intrusion,
Groundwater Elevations, and Extraction

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The seawater intrusion in the 180/400-Foot Aquifer Subbasin (Subbasin) is driven by groundwater use and the presence of a pathway in the subsurface that enables its advancement. The effect of groundwater use on seawater intrusion can be difficult to quantify. However, seawater intrusion contours, groundwater elevations, and pumping data can be used to illustrate the relationship between seawater intrusion and groundwater use. This assessment is based on data collected by MCWRA. Figure 1 and Figure 2 show the seawater intrusion contours up to 2022, annual 2022 groundwater extraction, and change in August groundwater elevations from 2021 to 2022 for the 180-Foot and 400-Foot Aquifers, respectively. August groundwater elevations are used because MCWRA conducts water quality sampling for the seawater intrusion monitoring wells during the summer.

The extraction data shown on these figures are collected by MCWRA through the Groundwater Extraction Management System (GEMS). The aquifer designations used to categorize the GEMS data by aquifer were determined by MCWRA using well construction information in well completion reports or well permits if well completion reports are unavailable. Of the wells that reported extraction to GEMS in 2022, 84% had a flowmeter, 16% had an electrical meter, and less than 1% had an hour meter (MCWRA, 2023).

Seawater intruded acreage has increased annually during the evaluation period (Water Year 2019 to 2023) in the 400-Foot Aquifer and is the focus of this assessment. Figure 2 highlights the increase in seawater intruded acreage that occurred from 2021 to 2022 in red. These areas are surrounded by pumping wells as shown by the pink bubbles. Note that most pumping in the Subbasin occurs during the summer, so the annual extraction shown on Figure 2 is likely a good representation of pumping distributions near the seawater intrusion front. Although more limited than at the pumping wells, August groundwater elevations decreased from 2021 to 2022 at many groundwater elevation monitoring wells along the new seawater intrusion areas that occurred in 2022. This suggests that pumping in these areas increased and likely contributed to additional seawater intrusion.

Similarly, Figure 1 illustrates a decrease in August groundwater elevations along portions of the 180-Foot Aquifer seawater intrusion front that indicates an increase in pumping. Despite the decrease in groundwater elevations, there was no seawater intrusion advancement from 2021 to 2022 in the 180-Foot Aquifer. This could be due to a lack of a potential pathway in the subsurface in the areas near decreasing groundwater elevations.

The advancement of seawater intrusion is not always directly related to changes in groundwater elevations and pumping. There is a density difference between the freshwater within the inland groundwater system and the saline water within the ocean and seaward groundwater system. This density difference is sufficient to influence groundwater flow and can induce seawater intrusion even without change in groundwater elevations due to pumping. However, seawater intrusion due to lowered groundwater elevations from pumping is predominant over density-dependent intrusion in Salinas Valley.

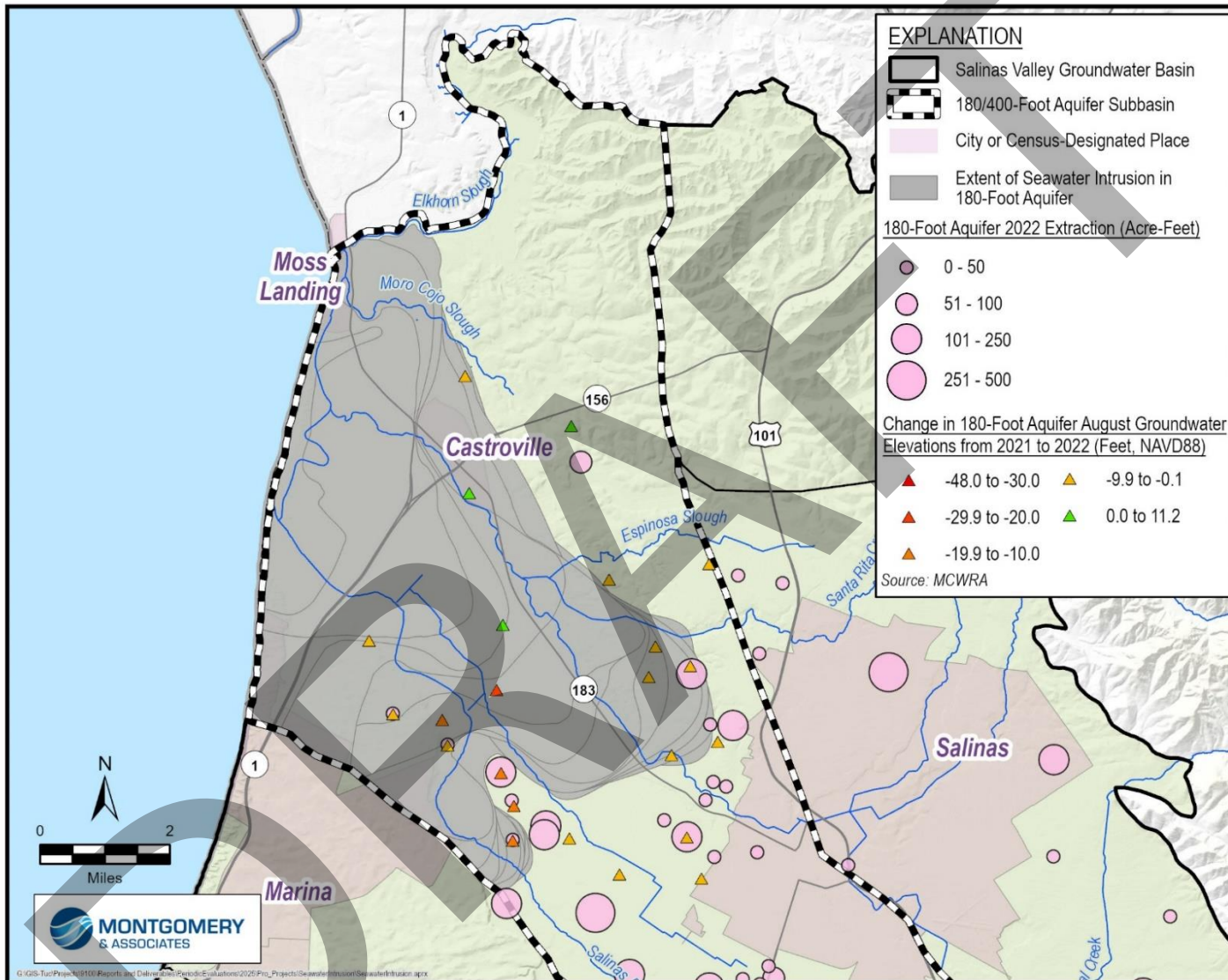


Figure 1. Seawater Intrusion Contours up to 2022 with Annual 2022 Extraction and Change in August Groundwater Elevations from 2021 to 2022 in the 180-Foot Aquifer

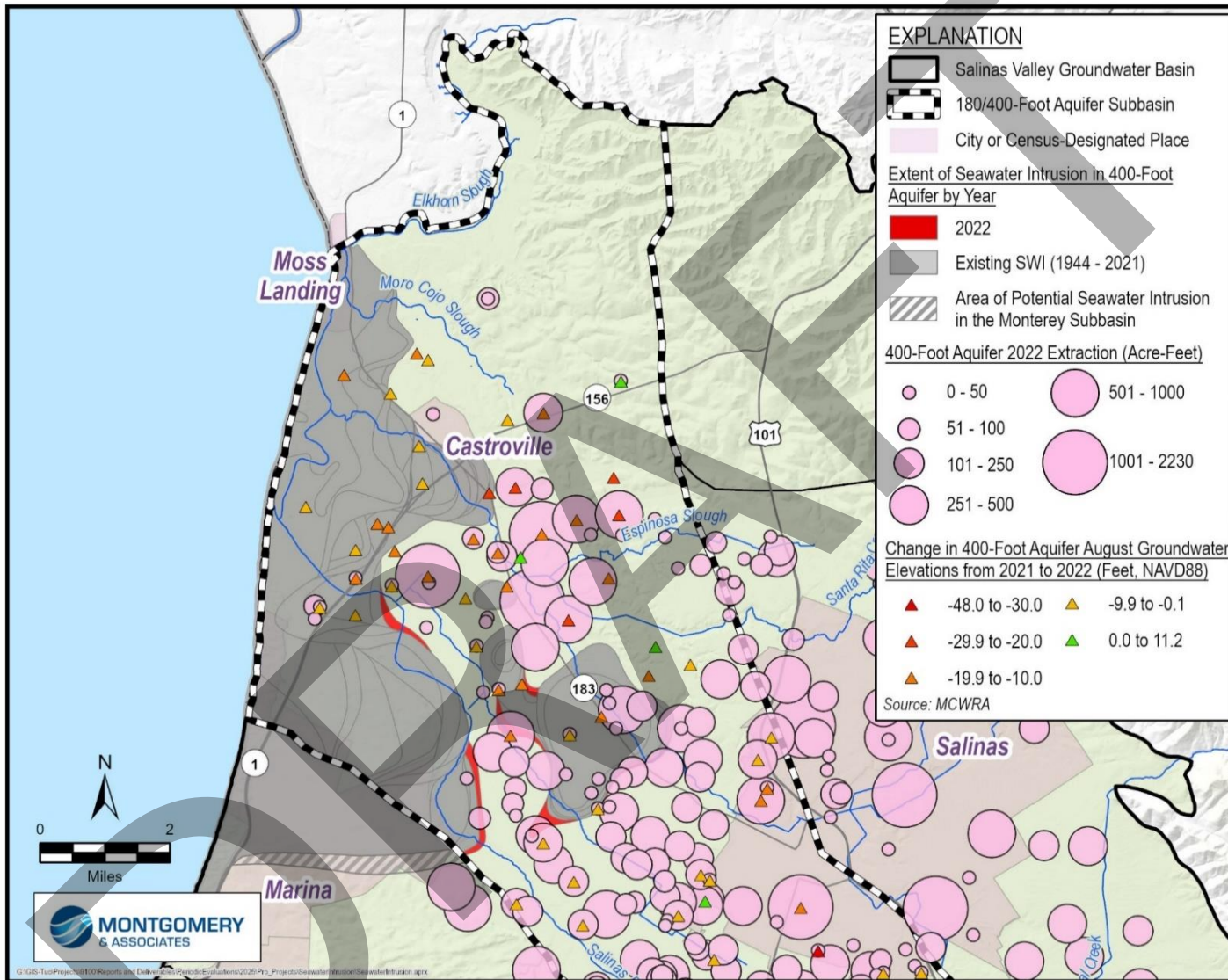


Figure 2. Seawater Intrusion Contours up to 2022 with Annual 2022 Extraction and Change in August Groundwater Elevations from 2021 to 2022 in the 400-Foot Aquifer

References

MCWRA (Monterey County Water Resources Agency). 2023. 2022 Groundwater Extraction Summary Report. <https://www.countyofmonterey.gov/home/showdocument?id=125881&t=638308124679234895>.

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