MONTGOMERY & ASSOCIATES

TECHNICAL MEMORANDUM

DATE: November 10, 2020 **PROJECT #:** 9100

TO: SWIG

FROM: Derrik Williams and Victoria Hermosilla.

SUBJECT: SWIG TAC Recommendations for Deep Aquifers Study

INTRODUCTION AND BACKGROUND

The Seawater Intrusion Group (SWIG) Technical Advisory Committee (TAC) discussed the current state of knowledge surrounding the Deep Aquifers of the Salinas Valley Groundwater Basin at its October 2, 2020 and November 9, 2020 meetings. The discussion included a review of existing data, a presentation by Marina Coast Water District's consultant, a presentation by MCWRA staff, and a discussion of what should be included in the proposed Deep Aquifers study.

This memo summarizes the existing wells in the Deep Aquifers, and presents the SWIG TAC recommendations for the Deep Aquifers Study.

EXISTING DEEP AQUIFERS WELLS

The Deep Aquifers refer to all the water-bearing sediments beneath the 400-Foot Aquifer in the 180/400-Foot Aquifer Subbasin, or their equivalent in neighboring subbasins: the Monterey, Forebay, Langley, and Eastside (Hanson, 2002). Most wells drilled into the Deep Aquifers are near the coast.

Wells in the Deep Aquifers include agricultural, municipal, industrial, monitoring, and even domestic wells (MCWRA, 2017). Available hydrogeologic data on the Deep Aquifers have been obtained through well drilling activities and related well or aquifer testing rather than through an intentional aquifer-wide study (MCWRA, 2017).

MCWRA has designated certain wells as completed in the Deep Aquifers. All MCWRA-designated Deep Aquifer wells fall within the 180/400-Foot Aquifer and Monterey Subbasins. However, because the extent of the Deep Aquifer is unknown wells that are deeper than 800 ft in adjacent subbasins could also potentially be drawing water from the Deep Aquifers. Figure 1

shows both the MCWRA designated Deep Aquifers wells (purple), and wells completed at least 800 feet below ground surface (bgs) (green). Table 1 shows the total number of deep wells and average well depth of deep wells in each subbasin. On average, the Monterey and 180/400-Foot Aquifer Subbasins have the deepest wells with average depths of 1269 ft bgs and 1250 ft bgs, respectively.

Table 2 lists the annual average groundwater elevations in the deep wells in each subbasin from 2015 to 2019. Table 3 shows the sum of annual extraction from deep wells from 2015 to 2018. After 2015, the 180/400-Foot Aquifer had the highest extraction rates among all the other subbasins.

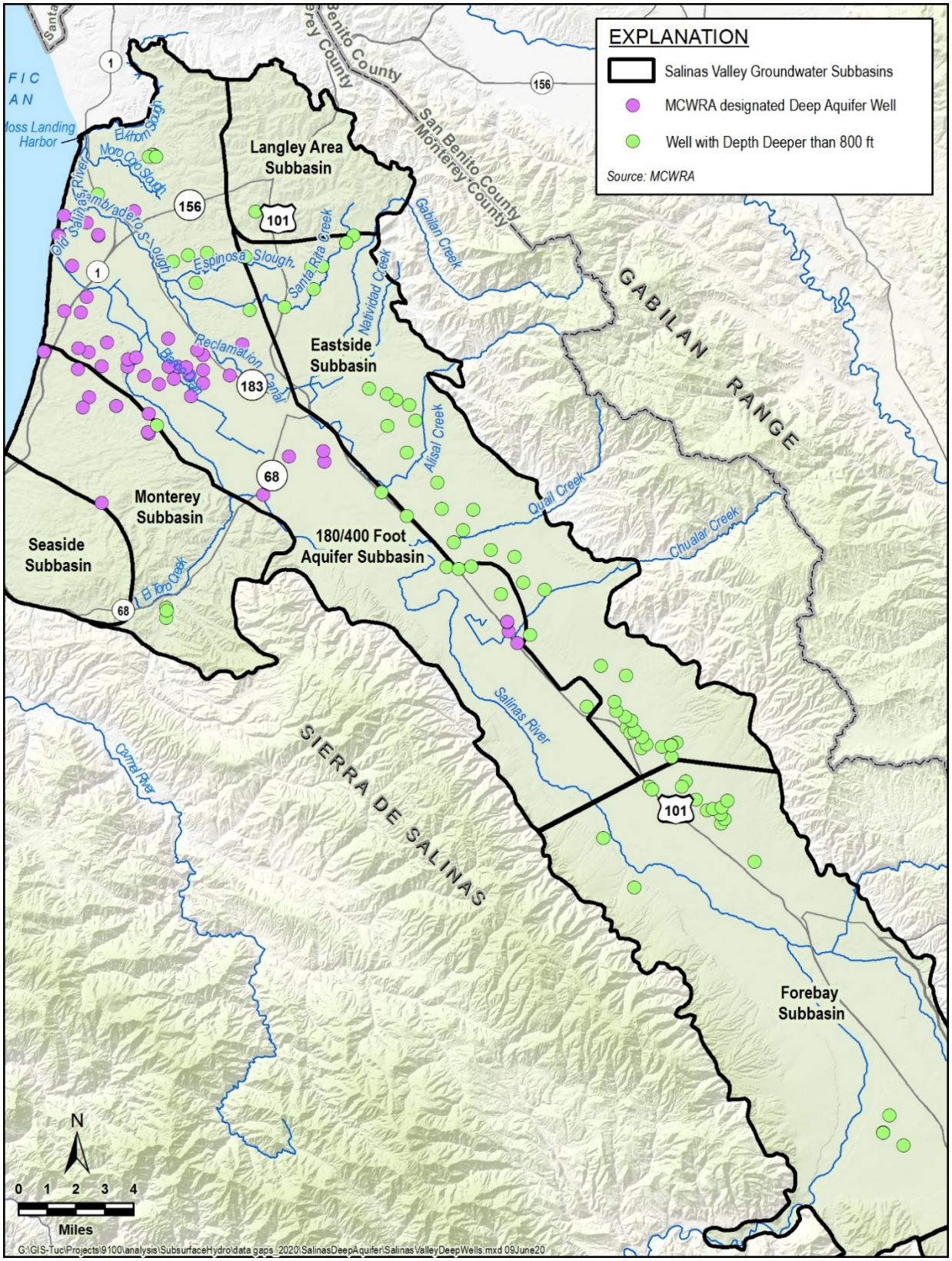

Figure 1. Deep Wells in the Salinas Valley

Table 1. Total Number and Average Well Depth of Deep Wells per Subbasin

DWR Subbasin	Number of Deep Wells	Average Well Depth [ft]
180/400-ft. Aquifer	60	1,250
Eastside Aquifer	42	899
Forebay Aquifer	20	913
Langley Area	1	900
Monterey	16	1,269
Total	**139**	**1,088**

Table 2. Average Annual Groundwater Elevations in Deep Wells per Subbasin

Average Groundwater Elevation (ft NADV88)	2015	2016	2017	2018	2019
180/400-ft. Aquifer	-9	-12	-15	-25	-22
Eastside Aquifer	6	12	13	11	3
Forebay Aquifer	92	76	97	100	100
Monterey	-24	-24	-24	-18	-23
Total	**-19**	**-19**	**-22**	**-12**	**-12**

Table 3. Sum of Annual Extracted Volume from Deep Wells per Subbasin

Sum of Annual Extracted Volume (acre-feet)	2015	2016	2017	2018
180/400-ft. Aquifer	5,739	10,637	10,055	10,811
Eastside Aquifer	7,834	10,105	9,023	8,283
Forebay Aquifer	4,156	5,165	4,340	5,290
Langley Area	285	83	155	93
Monterey	1,250	1,949	2,207	2,576
Total	**19,264**	**27,939**	**25,779**	**27,053**

DEEP AQUIFERS STUDY SCOPE

The TAC has agreed to the following general approach and scope items for the Deep Aquifers study.

Data Availability

To ensure that the proposals are well-informed, the RFP should include a list of available data sources for the Deep Aquifers. Additionally, the RFP should include information about existing wells and other infrastructure that may be relevant to the study.

Phasing

The TAC suggests that the selected consultant phase their approach to provide interim information early in the process. The selected consultant should not hold all results until the final project report. Some results, such as groundwater sampling results, well induction results, or estimates of localized overdraft should be released in memoranda as they become available. However, the phased development and release of information should not constrain the selected consultant's scope or focus. The selected consultant must address the entire extent of the Deep Aquifers.

Methodologies

Consultants should be encouraged to the provide information about methodologies they will employ to gather data and review existing studies. For example, consultants may sample existing wells to broaden the groundwater quality data set; run induction logs on deep wells to investigate the extent of seawater intrusion, or re-analyze electric logs to refine the hydrogeologic conceptual model of the Deep Aquifers.

Deep Aquifer Study Activities

The range of items that the SWIG TAC believes could be included in the Deep Aquifers study include the following.

Describe the Geology, Hydrogeology, and Extents of the Deep Aquifers.

- Provide the geologic structure of the Deep Aquifers and state which geologic formations or depths should be included in the Deep Aquifers. For example, is the Santa Margarita Formation in the Toro/Highway 68 area part of the Deep Aquifers, or is it a separate area?
- Provide information on how the geologic formations that constitute the Deep Aquifers change with location.
- Assess whether existing groundwater quality data can be used to differentiate the Deep Aquifers from other aquifers.
- Describe the lateral extents of the Deep Aquifers, geologically and hydrogeologically. The Deep Aquifers may extend well beyond the boundaries of the Salinas Valley. This description should provide context for subsequent discussions about managing the Deep Aquifers within the Salinas Valley

- Assess the extent of the Deep Aquifers in the Salinas Valley. The study should, at a minimum, assess the existence of the Deep Aquifers in 180/400 Foot Aquifer Subbasin, the Monterey Subbasin, the Forebay Subbasin and the Langley Subbasin.
- Assess whether the Deep Aquifers have effective physical boundaries such as the Reliz Fault or the Ord Terrace Fault.
- Identify where the Deep Aquifers outcrop, if at all.
- Summarize the hydrogeologic properties of the 400-Foot/Deep aquitard.
- Summarize the heterogeneity of the 400-Foot/Deep aquitard. Identify where there may be significant gaps in the aquitard, if possible.
- Identify and map locations where the 400-Foot/Deep aquitard pinches out in the Salinas Valley.
- Identify data gaps that, if addressed, would refine and improve the hydrogeological understanding of the Deep Aquifers

Deep Aquifers' Water Budgets

- Estimate a complete water budget for the Deep Aquifers.
- Include in the water budget a discussion of the impact from pumping water in the Deep Aquifers.
    - Assess the extent to which pumping the Deep Aquifers draws water from overlying aquifers.
    - Assess whether, and where, inducing leakage in overlying aquifers promotes additional seawater intrusion in the overlying aquifers.
    - Identify specific areas where pumping the Deep Aquifers draws water from recharge zones other than the overlying aquifers.
- Quantify, to the degree available, any overdraft in the Deep Aquifers. If the overdraft is localized, quantify both the localized and Valley-wide overdraft. Describe the history of overdraft based on existing data, if possible.
- If possible, estimate impacts of climate change on the Deep Aquifer water budget, including effects of likely sea level rise.

Address the Economic and Administrative Constraints on Extracting from the Deep

Aquifers

- Based on the capacities of Deep Aquifers wells, water quality of the Deep Aquifers, and the cost of installing Deep Aquifers wells, assess who the existing and likely beneficial uses and users are for the aquifers.

- Identify existing agreements, such as between the MCWRA and MCWD, that may promote or limit Deep Aquifers groundwater use by some parties.

Provide Guidance on the Practical Aspects of Managing the Deep Aquifers within the Salinas Valley.

- Describe what potential management activities or extractions outside the Salinas Valley may occur, and how they may influence successful management of the Deep Aquifers.
- Describe the benefits and drawbacks of managing the Deep Aquifers only within the boundaries of the Salinas Valley.

Propose and Initiate a Deep Aquifers Monitoring Program

- Outline a robust monitoring program for the Deep Aquifers with a clear purpose for monitoring. The monitoring program should address uncertainty and possibly manage risk. The monitoring program should include monitoring improvements at existing wells. The monitoring plan should be implemented during the study using existing wells, to the degree possible.

- (Optional Task) Install one deep aquifer well. After assessing data availability and data needs; site, design and install one well in the deep aquifer to fill identified data gaps.

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