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MEMORANDUM

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Michael Wegley, P.E., Marina Coast Water District

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Subject: Comments Regarding California America Water Monterey Peninsula Water Supply Project Draft Environmental Impact Report/Environmental Impact Statement, Released 13 January 2017
Marina Coast Water District, California
(EKI B60094.01)

On behalf of the Marina Coast Water District ("MCWD" or "District"), Erler & Kalinowski, Inc. ("EKI") has reviewed and prepared comments on the California America Water ("CalAm") Monterey Peninsula Water Supply Project ("MPWSP" or "Project") Draft Environmental Impact Report/Environmental Impact Statement, released 13 January 2017 ("DEIR/EIS"). The DEIR/EIS was prepared on behalf of the California Public Utilities Commission ("CPUC") and the Monterey Bay National Marine Sanctuary ("MBNMS"). The DEIR/EIS analyzes the potential environmental impacts of the proposed CalAm Project which includes an intake system consisting of 10 subsurface slant wells at the CEMEX sand mining site near the City of Marina; a desalination plant; a brine discharge system; product water conveyance pipelines; one pump station; storage facilities; and improvements to the existing Seaside Groundwater Basin's aquifer storage and recovery ("ASR") system. The proposed intake system lies immediately northwest of MCWD's Service Area, which includes the Central Marina Service Area, the MCWD Sphere of Influence ("SOI"), and the Ord Community Service Area, see Figure 1 (Shaaf & Wheeler, 2016).

A central issue addressed in the DEIR/EIS relates to CalAm's legal right to extract source water for the Project from offshore aquifers of the Salinas Valley Groundwater Basin ("SVGB"). This issue is addressed by the State Water Resources Control Board ("SWRCB") in its 2013 letter included in Appendix B2 of the DEIR/EIS, which states that in order for CalAm to appropriate groundwater from the SVGB, the DEIR/EIS must demonstrate that the proposed Project "*will not*

harm or cause injury to other basin users". The SWRCB (2013) makes specific recommendations regarding additional studies and analyses required to make such a demonstration.

EKI's comments on the DEIR/EIS evaluate: (1) the adequacy of information presented in the DEIR/EIS to meet the SWRCB's requirement that the proposed Project "*will not harm or cause injury to other basin users*", and (2) whether the Project specifically has the potential to harm or cause injury to MCWD interests in the local subbasins. Where information is found to be inadequate, additional studies, demonstrations, and/or mitigation measures are identified. Specific issues discussed in this comment letter are summarized below.

- **The DEIR/EIS does not incorporate water quality from the Dune Sand Aquifer and 180-Foot Aquifer from nearby Fort Ord where over 300 monitoring wells have been installed.** The omission of these data leads to an incomplete understanding of hydrogeologic conditions and the importance of the Dune Sand Aquifer in limiting saltwater intrusion and providing fresh water recharge to the 180-Foot Aquifer within MCWD's service area. Fort Ord water quality data and water quality data collected from Cal Am monitoring wells show that fresh water exists in both the Dune Sand Aquifer and the upper 180-Foot Aquifer outside of the immediate area of the CEMEX site. This information is critical to the evaluation of the Project which will influence groundwater flow in these zones and disrupt the current system equilibrium.

- **The DEIR/EIS dismisses the potential beneficial use of groundwater within the Dune Sand and 180-Foot Aquifers.** Their characterization is based on assumed "poor water quality" and the current absence of groundwater production wells. This characterization is inconsistent with available monitoring well data, the Water Quality Control Plan for the Central Coastal Basin "Basin Plan" (RWQCB, 2016), and the remedial action objectives applied to these aquifer zones at Fort Ord, where millions of dollars have been spent restoring groundwater to drinking water standards. The DEIR/EIS also fails to consider the Project's impact on potential beneficial use of these aquifer zones for storage or augmentation of groundwater supplies through applied recharge. Multiple studies and field investigations have been conducted by MCWD since 2008 to assess such groundwater recharge options at the nearby Armstrong Ranch, many of which would be precluded by the Project.

- **The DEIR/EIS provides inadequate documentation of groundwater modeling inputs and outputs to facilitate transparency, public review, and future verification of results**. The DEIR/EIS does not include figures identifying assumed baseline water levels

in each aquifer zone so hydraulic gradients can be verified. This issue is of particular concern for the Dune Sand Aquifer where model calibration results for Fort Ord wells are extremely poor. The DEIR/EIS also does not identify groundwater flow paths prior to and after Project implementation so changes to salt water migration patterns can be assessed and effects of boundary conditions can be evaluated. The use of superposition also precludes verification of modeling results through future monitoring. Most importantly, the modeling does not assess potential water quality changes to the Dune Sand Aquifer and the upper 180-Foot Aquifer that will occur as a result of reduced recharge from the Dune Sand Aquifer and induced saltwater migration inland of the Project's slant wells.

- **Groundwater modeling presented in the DEIR/EIS predicts that extraction from the slant wells will create significant water level declines within in the Dune Sand and 180-Foot Aquifers.** Although it is impossible to accurately assess the impacts of the Project on groundwater levels within MCWD's service area, given the poor model calibration for the Dune Sand and 180-Foot Aquifers south of the Salinas River, the model does predict that drawdowns will extend between 1.5 and 4.5 miles inland into MCWD's service area. Nonetheless, the DEIR/EIS does not acknowledge that any negative impacts to water quality will occur as a result. Cal Am proposes to replace groundwater withdrawn from these aquifer zones by in-lieu recharge in the 400-Foot Aquifer outside of MCWD's service area. This proposed in-lieu recharge, however, will not mitigate the Project's adverse impacts to Dune Sand and 180-Foot Aquifers or avoid harm to MCWD water rights. Nor does it recognize that the Project will preclude MCWD from utilizing the Dune Sand Aquifer for storage and/or augmentation of groundwater supplies through surface water recharge at Armstrong Ranch.

Further information in support each of these comments is provided below.

1. THE PROJECT DOES NOT DEMONSTRATE COMPLIANCE WITH SWRCB REQUIREMENTS FOR APPROPRIATION OF GROUNDWATER FROM THE SVGB

The SWRCB 2013 letter included in Appendix B2 of the DEIR/EIS (SWRCB, 2013) states:

> *To appropriate groundwater from the Basin, the burden is on Cal-Am to show their project will not cause injury to other users… The groundwater quality in the Basin will be a key factor in determining the effects of extraction on groundwater users in the Basin, assessing*

> *any potential injury that may occur, and measures that would be necessary to compensate for it…*
>
> *Additional information is needed to accurately determine MPWSP impacts on current and future conditions of the Basin regardless of whether the extraction occurs from pumped or gravity wells. First, specific information is needed on the depth of the wells and aquifer conditions. Studies are needed to determine the extent of the Dune Sand Aquifer, the water quality and water quantity of the Dune Sand Aquifer, the extent and thickness of the Salinas Valley Aquitard, and the extent of the 180-Foot Aquifer.*

As described in detail in the following comments, the DEIR/EIS does not meet the SWRCB criteria for demonstrating that the Project *will not cause injury*. In particular, through omission of publicly available data, the DEIR/EIS does not accurately characterize water quality and hydrogeologic conditions within the Dune Sand Aquifer and 180-Foot Aquifer in the vicinity of Project which includes the northern portion of MCWD's Service Area (i.e., including the Ford Ord portion of the Monterey Subbasin) (see Figure 2). As shown in Figures 3 and 4, water quality data, specifically Total Dissolved Solids ("TDS") and chloride data, have been collected over the years in the vicinity of the Project and south into Fort Ord. These data show that groundwater with TDS concentrations of less than 3,000 milligrams per liter ("mg/L"), which is the SWRCB Resolution No. 88-63 criteria *potentially suitable, for municipal or domestic water supply*[1] standard for drinking water, is present in the Dune Sand Aquifer and the 180-Foot Aquifer in the vicinity of the Project site and south into Fort Ord. These data show that the Dune Sand Aquifer and upper 180-Foot Aquifer are an important source of water in the region. As a result of this failure, the DEIR/EIS fails to analyze or disclose that increased groundwater extraction from Project wells

[1] SWRCB Resolution No. 88-63 states:

All surface and ground waters of the state are considered to be suitable, or potentially suitable, for municipal or domestic water supply and should be designated by the Regional Boards with the exception of surface and ground waters where:

a. *The total dissolved solids (TDS) exceed 3,000 mg/L (5,000 us/cm, electrical conductivity) and it is not reasonably expected by Regional Boards to supply a public water system, or*
b. *there is contamination, either by natural processes or by human activity (unrelated to a specific pollution incident), that cannot reasonably be treated for domestic use using either Best Management Practices or best economically achievable treatment practices, or*
c. *The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day.*

would impact the equilibrium of that system and the local and regional groundwater quality. Therefore, the DEIR/EIS does not demonstrate compliance with the SWRCB requirements for appropriation of groundwater from the SVGB

2. PROJECTED IMPACTS FROM THE PROJECT ARE INCONSISTENT WITH THE BASIN PLAN

Potential degradation of groundwater water quality in the Dune Sand Aquifer and the 180-Foot Aquifer by the Project violates the Water Quality Control Plan for the Central Coastal Basin "Basin Plan" (RWQCB, 2016), which designates all groundwater within the SVGB as potential drinking water source[2]. As shown in Figures 3 and 4, groundwater in the Dune Sand Aquifer and upper 180-Foot Aquifer inland of the Project site meets the SWRCB Resolution No. 88-63 criteria for *potentially suitable, for municipal or domestic water supply*. This beneficial use designation within the Basin Plan is articulated as an applicable or relevant and appropriate requirement ("ARAR") within the Fort Ord Basin Wide Record of Decision (U.S. Department of the Army, 1997). As such, national and state primary drinking water standards are identified as ARARs and established as remedial action objectives for groundwater in the Dune Sand Aquifer and 180-Foot Aquifer at chemically impacted sites at Fort Ord. Millions of dollars have been, and continue to be spent, to remediate groundwater to meet these remedial action objectives within these aquifer zones. Therefore, statements made within the DEIR/EIS that imply that these aquifer zones have poor water quality and therefore have limited or no beneficial use, are inconsistent with the Basin Plan and any potential degradation of groundwater within these aquifers must be addressed within the DEIR/EIS.

The Basin Plan further states that:

> *Controllable water quality shall conform to the water quality objectives contained herein. When other conditions cause degradation of water quality beyond the levels or limits established as water quality objectives, controllable conditions shall not cause further degradation of water quality*[3].

Therefore, further degradation of existing water quality even within brackish areas of the aquifers is also precluded under the Basin Plan.

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[2] Basin Plan *Chapter 2.I. Present and Potential Beneficial Uses.* States: "Ground water throughout the Central Coastal Basin, except for that found in the Soda Lake Sub-basin, is suitable for agricultural water supply, municipal and domestic water supply, and industrial use."

[3] RWQCB,2016. Chapter 3. Section II Water Quality Objectives. Page 3-1

3. HYDROGEOLOGIC CONDITIONS AND WATER QUALITY IN DUNE SAND AQUIFER AND UPPER 180-FOOT AQUIFER ARE INCOMPLETELY CHARACTERIZED IN THE DEIR/EIS

The Project slant wells at the CEMEX Site will be screened through the Dune Sand Aquifer and into the 180-Foot Aquifer. These wells will draw groundwater from these zones and potentially underlying aquifer zones. Therefore, characterization of groundwater quality and flow conditions within these aquifer zones is critical to understanding Project impacts. Cal Am recently installed eight groundwater monitoring well clusters (MW-1, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, and MW-9) to further assess baseline groundwater conditions and monitor the response to extraction at the test slant well installed at the CEMEX Site. When information from these wells is combined with data from Fort Ord, a basic understanding of groundwater flow and quality conditions in the Project vicinity and within the northern portion of MCWD's Service Area can be inferred with reasonable confidence; such work or understanding is not reflected in the DEIR/EIS.

Specifically, the baseline water level data and water quality information presented in the DEIR/EIS for the adjacent MCWD Service Area is incomplete. No water level maps for the Dune Sand Aquifer are included, although, as described below, water level data have been collected from local and CalAm monitoring wells that, when plotted, show a Bay-ward gradient and an apparent connection between the Dune Sand Aquifer and the 180-Foot Aquifer in the vicinity of the Project site. In addition, publicly-available water quality data from Fort Ord, where over 300 monitoring wells in the Dune Sand Aquifer and 180-Foot Aquifer have been installed, are not presented or analyzed.

Further, although the DEIR/EIS estimates projected drawdown within the Dune Sand Aquifer and 180-Foot Aquifer, the DEIR/EIS does not address the impacts of the Project on freshwater recharge from the Dune Sand Aquifer into the 180-Foot Aquifer. It is apparent that the modeling does not accurately characterize baseline water level conditions in these aquifer zones based on the limited information included in the DEIR/EIS for this area and extremely poor model calibration results are reported for the Dune Sand Aquifer (i.e., the root mean square error between modeled and observed water levels for the Dune Sand Aquifer is 30.2 feet).

3.1 The DEIR/EIS Does Not Adequately Characterize or Address Project Impacts to Groundwater Flow Within and Between the Dune Sand and 180-Foot Aquifers

The DEIR/EIS provides limited information regarding groundwater levels and hydraulic gradients in the Dune Sand Aquifer and 180-Foot Aquifer in the northern portion of MCWD's Service Area although over 300 monitoring wells have been installed at Fort Ord in these aquifer zones. For example, DEIR/EIS Figures 4.4-5 and 4.4-7 only present baseline water level data for the 180-Foot Aquifer in the 180/400 Foot Subbasin north of the Salinas River and in the Seaside Subbasin, respectively – no data are presented for the Monterey Subbasin, which lies between those two subbasins and includes the MCWD Service Area. Selected Fort Ord wells have been incorporated into the numerical model, however calibration results for the Dune Sand Aquifer are poor and do not accurately reflect baseline conditions[4]. The DEIR/EIS's failure to adequately characterize baseline conditions in the Dune Sand Aquifer is exemplified in its statement:

> *The groundwater flow patterns within the Dune Sand Aquifer are not known but, based on the aquifer depth and geologic structure, it is reasonable to expect that they would be tidally controlled, with little to no net horizontal flow in any particular direction*[5].

Draft Technical Memorandum No.2 ("TM2") referenced in the DEIR/EIS (Geosciences, 2016), includes water level maps for the Dune Sand Aquifer and 180-Foot Aquifer[6]. However, these maps further complicate and obscure the continuity of groundwater flow within the Dune Sand Aquifer, by separating this aquifer into a "perched zone" and "-2 foot aquifer zone", and incorrectly imply that groundwater flow is discontinuous between Fort Ord and the northern portion of MCWD service area in both the Dune Sand and 180-Foot Aquifers. Copies of these maps are presented in Appendix B hereto.

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[4] The root mean square error between modeled and observed water levels for the Dune Sand Aquifer was 30.2 feet.
[5] DEIR/EIS Section 4.4.1.3 Groundwater Flow and Occurrence; Groundwater Elevations and Flow Directions page 4.4-14
[6] TM2 Figure 9- Groundwater Elevations – "Perched Aquifer" (Using Fort Ord "A" Aquifer Wells, MCPCA 35-Foot Aquifer Wells, and MPWSP MW-5S) Fall 2015; Figure 10 - Groundwater Elevations – "Dune Sand Aquifer" (Using MCPCA -2-Foot Aquifer Wells, and MPWSP Shallow Completions and showing Fort Ord "A" Aquifer Monitoring Wells) Fall 2015; Figure 11- Groundwater Elevations – "180-FTE/180-Foot Aquifer" (Using Fort Ord Upper 180-Foot Aquifer Wells and MPWSP Middle Completions) Fall 2015

In contrast to this finding, EKI used water level data collected from CalAm[7] and Fort Ord wells to map hydraulic gradients in the Dune Sand Aquifer and 180-Foot Aquifer in the northern portion of MCWD's Service Area. These maps are presented on Figures 5 and 6, respectively, and present water level data measured in:

(a) Cal Am monitoring wells on 3 May 2016, immediately prior to the restart of extraction from the slant well[8], and
(b) Fort Ord wells in early June 2016, as part of the self-monitoring program conducted by the Army.

As shown on Figure 5, groundwater in the Dune Sand Aquifer in the northern portion of MCWDs Service Area is significantly above sea level and flows west towards Monterey Bay. In contrast, as shown in Figure 6, groundwater in the 180-Foot Aquifer flows eastward towards a regional pumping center in the interior of the Salinas Valley. Based on the head differences between these aquifers it is apparent that the Dune Sand Aquifer is "perched" on the Salinas Valley Aquitard in inland areas but has some degree of connection with the 180-Foot Aquifer as one moves west towards the Bay (i.e., the head difference between the two aquifer systems lessens near the Project Site).

These water level data in combination with water quality data obtained from Fort Ord indicate that fresh water from the Dune Sand Aquifer seeps down into the upper portion of the 180-Foot Aquifer upgradient of coast and the Project site and then "U-turns" and flows back into the basin. The exact location and volume of groundwater that seeps from the Dune Sand Aquifer into the upper 180-Foot Aquifer and makes this "U-Turn" has not been quantified. However, data from Fort Ord indicates that seepage from the Dune Sand Aquifer near Monterey Bay (where water levels are above sea level) into the underlying 180-Foot Aquifer (where water levels are below sea level) has effectively stopped salt water intrusion in the upper 180-Foot Aquifer in that area. This natural mounding has maintained freshwater in the upper portion of the 180-Foot Aquifer under much of Fort Ord (see Figures 3 and 4). This natural barrier appears to have been undermined north of Fort

[7] Cal Am installed 8 well clusters (MW-1 and MW-3 through MW-9) in the northern portion of MCWD's Service Area in 2015. These wells were installed pursuant to the requirements of Coastal Development Permit and a request by the Monterey County Water Resource Agency ("MCWRA").

[8] Water level data from MRWPCA-1 collected during the baseline period ending on 11 April 2015, indicates that the potentiometric head elevation was -5 ft MSL. Although the transducer in this well apparently failed after the baseline period, review of water level data from nearby Cal Am 180-Foot Aquifer monitoring wells (MW-7M, MW-5M) indicates that water levels measured in 2015 are generally consistent with those measured in 2016, outside of the direct influence of the slant well and that water levels declined approximately 2 to 4 feet between April and May in the 180-Foot Aquifer in 2015 and 2016. Therefore, an estimated water level of -7 ft MSL has been included on Figure 6 for MRWPCA-1, for general reference. Replacement of the transducer in this well is recommended along with hand measurements to verify hydraulic gradients in this area.

Ord through groundwater extraction and/or salt water discharges into the Dune Sand Aquifer at the CEMEX Plant, and would likely be further disturbed by the Project.

3.2 The DEIR/EIS Does Not Adequately Characterize Water Quality Conditions in the Dune Sand Aquifer and 180-Foot Aquifer

The water quality data included in the DEIR/EIS for the Dune Sand Aquifer and the 180-Foot Aquifer is limited to the immediate vicinity of the CEMEX facility where salt water intrusion has occurred and does not accurately characterize water quality as more broadly observed in these aquifer zones. For example, statements made in the DEIR/EIS indicate that groundwater within Dune Sand Aquifer and the 180-Foot Aquifer are directly and widely impacted by sea water[9,10]. However, the absence of inclusion of data from Fort Ord leads to an incomplete understanding of hydrogeologic conditions and the importance of the Dune Sand Aquifer in actually limiting saltwater intrusion and providing fresh water recharge to the 180-Foot Aquifer within the northern portion of MCWD's Service Area and inland of the Project site. Contrary to statements made in the DEIR/EIS, water level and water quality data obtained at Cal Am's recently installed monitoring well clusters MW-5, MW-6, MW-7 and Monterey Regional Water Pollution Control Agency ("MRWPCA") wells 1 and 2, indicate that chloride and TDS concentrations in the Dune Sand Aquifer and upper portion of the 180-Foot Aquifer meet SWRCB Resolution No. 88-63 criteria as a potential drinking water source and California Secondary Drinking Water Standards for these constituents[11]. Maps depicting TDS and chloride concentrations detected in groundwater samples most recently collected from Fort Ord and CalAm wells screened in these zones over the last 10 years (i.e., 2006 through 2016) are presented on Figures 3 and 4. These figures show that, outside of the immediate area of the CEMEX Site, groundwater in these aquifer zones is <u>not brackish</u> as characterized in the DEIR/EIS.

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[9] On page 4.4-6 and 4.4-8 the DEIR/EIS states *Water quality of the Perched A Aquifer and Dune Sand Aquifer is directly influenced and controlled by seawater. Because of the aquifer's proximity to the ocean, most of the water in the Dune Sand Aquifer has been intruded by seawater and is considered saline to brackish (Kennedy/Jenks, 2004). This influence decreases inland where the infiltration of precipitation and applied agricultural water has more of an influence.*

[10] On page 4.4-11the DEIR/EIS states *Based on the recent groundwater testing data discussed in the Groundwater Quality subsection below, the quality of water in the 180-FTE Aquifer is directly influenced by seawater; this influence extends for miles inland, as discussed below in the Seawater Intrusion section. The lower portion of the proposed slant wells at the CEMEX site would have well screens installed across and would draw water from these deposits*

[11] The recommended and upper secondary maximum contaminant levels for chloride are 250 mg/L and 500 mg/L. The recommended and upper secondary maximum contaminant level for total dissolved solids (TDS) is 500 mg/L and 1000 mg/L, respectively. (California Code of Regulations, Title 22. Division 4 Environmental Health, Chapter 15. Domestic Water Quality and Monitoring Regulations, Article 16, dated 27 September 2006.

The information presented in Figures 3 and 4 is consistent with data collected at Fort Ord in the late 1990's which was presented in Harding ESE's, *Final Report Hydrogeologic Investigation of the Salinas Valley Basin in the Vicinity of Fort Ord and Marina Salinas Valley, California*, prepared for MCWRA dated 12 April 2001. (Harding, 2001). A copy of selected figures which depict water quality information from the upper 180-Foot Aquifer zone are included in Appendix A, hereto.

Geologic, water level, and water quality information from Fort Ord indicates that there are multiple clay zones within the 180-Foot Aquifer. As one moves deeper within this aquifer the salinity increases. A north-south transect that extends from Fort Ord into the area inland of the CEMEX facility was constructed (Figure 7). The transect identifies well screen depths and TDS and chloride measurements in wells screened in the 180-Foot Aquifer (Figure 8). These figures show that wells at Fort Ord that are screened in the upper 180-Foot Aquifer contain fresh water, but that salinity likely increases with depth. This is particularly apparent at well MCWD#05[12], which has a long screened interval that extends across the upper and lower portions of the aquifer[13]. Vertical profiling conducted in 1991 during groundwater extraction indicated:

- TDS concentrations of <1,000 mg/L in the upper portion of the screen interval (i.e., elevations above -155 ft MSL); and
- TDS concentrations of approximately 5,000 mg/L at bottom of screen interval (i.e., elevations between -195 ft MSL to -235 ft MSL) (Stalle, Gardner & Dunne, Inc., 1991).

These data provide insight regarding TDS concentrations detected in wells with long screened intervals, such as those constructed by CalAm, which likely reflect a mix of lower salinity (fresh) water from the upper portions of the 180-Foot Aquifer and more saline water from the deeper portion of the aquifer. Therefore, data from these wells is difficult to interpret and inadequate for characterizing salinity within the upper portions of the 180-Foot Aquifer. It is likely that the well known saltwater intrusion maps prepared by MCRA and cited in the DEIR/EIS are based on wells screened in the lower portion of the 180-Foot Aquifer[14].

[12] Well MCWD#05 is screened in the 180 Foot Aquifer and was shut down in 1983 due to elevated TDS concentrations (i.e., up to 4,000 mg/L).
[13] The screen at well MCWD#05 extends from approximately 216 ft below ground surface ("bgs") to 370 ft bgs; corresponding to an elevation of -91 feet mean sea level ("ft MSL") to -245 ft MSL
[14] In locations where wells screen across both fresh water and saline water and vertical gradients exist between zones TDS concentrations measured in the well bore may only reflect the salinity of groundwater from the zone at higher hydraulic head, as groundwater flows down the well bore from the zone with higher head to lower head, and therefore samples collected are not reflective of water quality in both zones. Such conditions were observed at MCWD#05, where vertical profiles of EC measurements during pre-pumping static conditions were all 500 micro

Arguments have been made that extraction from the upper 180-Foot Aquifer would inevitably draw water from deeper zones. However, numerous groundwater extraction wells have been operating within the upper 180-Foot Aquifer at Fort Ord to facilitate remediation of volatile organic compounds. These wells have maintained low salinity levels, demonstrating the significant vertical stratification of salinity within higher permeability sediments within the 180-Foot Aquifer. These conditions confirm the aquifer's beneficial use designation within the Basin Plan and substantiate remedial action objectives established at Fort Ord, which are reviewed by the U.S. Environmental Protection Agency every five years, and continue to drive remedial efforts at Fort Ord to bring groundwater back to drinking water standards. As such, statements made in the DEIR/EIS that dismiss the beneficial use and conditions of the local groundwater system are inconsistent with the data and minimize the potential impact that the Project will have on degrading groundwater quality.

4. THE PROJECT WILL IMPACT GROUNDWATER CONDITIONS AND MCWD'S ABILITY TO IMPLEMENT GROUNDWATER RECHARGE AUGMENTATION AT ARMSTRONG RANCH

4.1 Impacts of the Project on Groundwater Conditions

Construction and operation of the Project as proposed will (a) limit recharge of fresh water from the Dune Sand Aquifer into the upper 180-Foot Aquifer, (b) influence this natural hydraulic barrier and (c) decrease the existing freshwater zone within a portion of MCWD's service area. The estimated area of impact from the Project's proposed intake system on the Dune Sand and 180-Foot Aquifer is presented on Figures 9 and 10. This figure shows that the zone of influence extends anywhere from 1.5 miles to 4.5 miles inland based on modeled results[15]. As shown in these figures, withdrawal of groundwater from the proposed slant wells will draw fresh water from Dune Sand Aquifer, which in turn will decrease recharge of such water into to the 180-Foot Aquifer. The full extent of these impacts is unknown and must be evaluated prior to Project approval.

Further, water within both the Dune Sand Aquifer and upper 180-Foot Aquifer will be fully saline within the zone of capture of the slant wells, as ocean water will be drawn into these areas by the slant wells. The predicted lateral extents of these capture zones based on groundwater modeling

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siemens (i.e., 270 mg/L TDS). These conditions could explain, low salinity levels measured in samples collected in Some Cal Am wells and MRWPCA wells 1 and 2, which are screened at the base of this aquifer zone.

[15] Figure E3 of Appendix E2 of DEIR EIS

results are depicted on Figure 5.6 of Appendix E2 of the DEIR/EIS and have been included on Figures 11 and 12, herein. No current water quality data exists in the southern portion of these capture zones which may extend into areas where non-saline water currently exists. Further characterization of water quality in these areas is needed prior to Project approval to verify that degradation of the beneficial uses of groundwater will not occur at these locations. In addition, it is anticipated that the salinity of groundwater within the Dune Sand Aquifer and 180-Foot Aquifer will increase immediately inland of these capture zones as saline water is drawn into these areas to backfill groundwater that is withdrawn. The DEIR/EIS discounts such impacts as it erroneously characterizes all water within the area as salt water intruded and does not recognize its designated beneficial use. The modeling in the DEIR/EIS must estimate changes in salinity within MCWD's Service Area.

4.2 Impacts of MPWSP on MCWD's Ability to Implement Groundwater Recharge Augmentation at Armstrong Ranch

The Project will also affect MCWD's ability to utilize the Dune Sand Aquifer for storage and/or groundwater recharge augmentation at Armstrong Ranch. Armstrong Ranch is a 230 acre property located with MCWD's sphere of influence and owned by MCWD (Figures 1 and 2). MCWD has conducted multiple studies to evaluate the potential for groundwater recharge augmentation at Armstrong Ranch. These studies include:

- Todd Engineers, 2008. *Phase I Investigation Armstrong Ranch Groundwater Storage Project.* Marina Coast Water District, Marina;
- RMC, 23 May 2008. *Preliminary Draft Technical Memorandum, Armstrong Ranch: Seasonal Subsurface Storage of Recycled Water, Modeling TM;*
- RMC, 2 October 2008. *Draft Technical Memorandum, Marina Coast Water District – Water Augmentation Project; and*
- EKI, 16 January 2017. *Technical Memorandum, Preliminary Feasibility Assessment – Potential to Conduct Augmented Groundwater Recharge at the Armstrong Ranch Property*

These studies evaluate the potential for infiltrating and or/storing surplus Salinas River storm flows and/or tertiary treated recycled water from MRWPCA in the Dune Sand Aquifer and potentially extract stored water from the Dune Sand or 180-Foot Aquifers. The studies include:

(a) Compilation/evaluation of historic water levels from (3) existing Dune Sand Aquifer monitoring wells located on Armstrong Ranch, completion of four (4) borings and four cone penetrometer testing ("CPT") sites to assess geologic conditions in the Dune Sand Aquifer at Armstrong Ranch, (Todd, 2008);
(b) Numerical groundwater monitoring to estimate the volume of water that could be stored in the Dune Sand Aquifer through infiltration, (RMC, 2008a);
(c) Conceptual plans and cost estimates for storage of Salinas River winter storm flows that exceed National Oceanic and Atmospheric Administration National Marine Fisheries ("NOAA") instream requirements within the Dune Sand Aquifer (RMC, 2008b);
(d) A feasibility study assessing the viability and potential costs for increasing MCWD's water supplies through augmented groundwater recharge at the Armstrong Ranch Property (EKI, 2017).

The studies conclude that local hydrogeologic conditions would support enhanced groundwater recharge at Armstrong Ranch. One of the simplest and most cost effective options evaluated as part of the EKI's (2017) feasibility study focuses on direct infiltration of surplus Salinas River storm flows and/or tertiary treated recycled water from MRWPCA into the Dune Sand Aquifer for later extraction from the 180-Foot Aquifer at Armstrong Ranch[16]. Further description of this option is illustrated on Figure 13.

Implementation of such an option could be used to augment MCWD groundwater supplies by approximately 1,500 acre-feet per year ("AFY") to 3,000 AFY, and could aid in limiting salt water intrusion within the 180-Foot Aquifer. The Project as proposed, however, would preclude MCWD from utilizing the Dune Sand Aquifer for storage and/or groundwater recharge augmentation at Armstrong Ranch, because groundwater within the Dune Sand Aquifer downgradient of Armstrong Ranch would be drawn into the Project's slant wells and not return to the groundwater system within MCWD's service area.

5. THERE ARE SIGNIFICANT DEFICIENCIES IN THE GROUNDWATER MODELING APPROACH AND PRESENTATION

The DEIR/EIS provides inadequate documentation of groundwater modeling inputs and outputs to facilitate transparency and public review of results. For example, the DEIR/EIS does not include

[16] Salinas River storm flows could be augmented by tertiary treated wastewater flows, if it were demonstrated that waste water flows had at least one (1) year of residence time within the aquifer.

figures identifying assumed and calibrated baseline water levels in each aquifer zone so hydraulic gradients can be verified. This issue is of particular concern south of the Salinas River for the 180-Foot Aquifer and the Dune Sand Aquifer where model calibration results for Fort Ord wells are extremely poor and water quality conditions are mischaracterized in statements made in the DEIR/EIS (see Section 3.1 herein). The DEIR/EIS also does not identify groundwater flow paths prior to and after Project implementation so changes to salt water migration patterns can be assessed and effects of boundary conditions can be evaluated. The use of a superposition model, also precludes verification of modeling results through future monitoring and obscures potential model deficiencies. Most importantly, the modeling does not assess potential water quality changes to the Dune Sand Aquifer and the upper 180-Foot Aquifer that will occur as a result of reduced recharge from the Dune Sand Aquifer and induced saltwater migration inland of the Projects slant wells. In order to evaluate potential impacts of the Project on salt water intrusion and water quality, a well calibrated density dependent fate and transport model must be used.
The absence of this information does not meet the requirements specified by the SWRCB in its 2013 letter, discussed in Section 1 herein, and does not address the extent of the project's potential degradation of groundwater which would be in direct violation of the Basin Plan.

6. IN-LIEU RECHARGE DOES NOT ADDRESS PROJECT IMPACTS ON MCWD'S SERVICE AREA

The DEIR/EIS states that slant wells will draw water and create water level declines within in the Dune Sand Aquifer and 180-Foot Aquifer approximately 1.5 to 4.5 miles inland of the slant wells within MCWD's service area, but does not acknowledge that any negative impacts to water quality will occur as a result of such withdrawals as it dismisses potential beneficial use of groundwater within these aquifer zones. Cal Am proposes to replace groundwater withdrawn from these aquifer zones by in-lieu recharge of the 400-foot aquifer within other areas of the SVGB. This replacement water does not mitigate impacts or avoid harm to MCWD water rights, nor does it recognize that the Project will preclude MCWD from utilizing the Dune Sand Aquifer for storage and/or augmentation of groundwater supplies through surface water recharge at Armstrong Ranch.

7. CONCLUSIONS

The DEIR/EIS does not demonstrate the proposed Project "*will not harm or cause injury to other basin users*" as required by the SWRCB for CalAm to appropriate groundwater from the SVGB, (SWRCB, 2013). These comments demonstrate that prior to Project approval Cal Am must at a minimum:

(a) Further characterize baseline hydrogeologic and salinity conditions in the Dune Sand and 180 Foot Aquifers in MCWD's Service Area, including installation of additional groundwater monitoring wells to establish baseline water quality conditions and facilitate future monitoring of groundwater within the Dune Sand Aquifer and upper and lower portions of the 180-Foot Aquifer within the predicted capture zone of the slant wells

(b) Expand/modify groundwater modeling and use a well calibrated density dependent fate and transport model to assess changes in salinity within each aquifer, including the upper 180-Foot Aquifer zone, to demonstrate that the Project will not degrade groundwater quality in MCWD's Service Area and not preclude MCWD's options for groundwater augmentation at Armstrong Ranch.

(c) Commit to future long-term monitoring of water levels and water quality within MCWD's Service Area if the Project is implemented to demonstrate that the Project does not degrade groundwater conditions within MCWD's service area and provide a mitigation plan to address any degradation in water quality that is observed. Such monitoring and mitigation should be conducted under the oversight of the RWQCB, to verify that the Project does not violate the provisions of the Basin Plan.

ACRONYMS

ASR	Aquifer storage and recovery
Basin Plan	Water Quality Control Plan for the Central Coastal Basin
CalAm	California American Water
CPUC	California Public Utilities Commission
DEIR/EIS	Draft Environmental Report/Environmental Impact Statement
EKI	Erler & Kalinowski, Inc.
MBNMS	Monterey Bay National Marine Sanctuary
MCL	Maximum Contaminant Level
MCWD Service Area	Collectively refers to the Central Marina service area, MCWD sphere of influence ("SOI"), and Ord Community Service Area
MCWD:	Marina Coast Water District or District
MCWRA	Monterey County Water Resources Agency
MCWRA	Monterey County Water Resources Agency
MPWSP	Monterey Peninsula Water Supply Project
MRWPCA	Monterey Regional Water Pollution Control Agency
NOAA	National Oceanic and Atmospheric Administration National Marine Fisheries
RWQCB	Central Coast Regional Water Quality Control Board
SOI	Sphere of influence
SRDF	Salinas River Diversion Facility
SVGB	Salinas Valley Groundwater Basin
SVIGSM	Salinas Valley Integrated Groundwater Surface Model
SVWP	Salinas Valley water project
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TM2	Geosciences Draft Technical Memorandum No. 2

FIGURES

Figure 1. MCWD Service Area

Figure 2. Northern portion of MCWD's Service Area

Figure 3. Groundwater Quality, TDS and Chloride – Dune Sand Aquifer

Figure 4. Groundwater Quality, TDS and Chloride – 180 Foot Aquifer

Figure 5. Groundwater Elevations – Dune Sand Aquifer

Figure 6. Groundwater Elevations –180 Foot Aquifer

Figure 7. Well Screen Transect A – A' Location – 180 Foot Aquifer

Figure 8. Well Screen Transect A – A'

Figure 9. Predicted Lateral Extent of Drawdown TDS/Chloride Concentrations (2006 – 2016) – Dune Sand Aquifer

Figure 10. Predicted Lateral Extent of Drawdown TDS/Chloride Concentrations (2006 – 2016) – (upper) 180 Foot Aquifer

Figure 11. Predicted Ocean Capture Zone and TDS/Chloride Concentrations (2006 – 2016) – Dune Sand Aquifer

Figure 12. Predicted Lateral Extent of Drawdown TDS/Chloride Concentrations (2006 – 2016) – (upper) 180 Foot Aquifer

Figure 13. Conceptual Map Groundwater Augmentation at Armstrong Ranch – Option 1

APENDICIES

Appendix A: Selected figures from Harding ESE, *Final Report Hydrogeologic Investigation of the Salinas Valley Basin in the Vicinity of Fort Ord and Marina Salinas Valley, California*, prepared for Monterey County Water Resources Agency, dated 12 April 2001

Appendix B: Selected figures from Geoscience Monterey Peninsula Water Supply Project Hydrogeologic Investigation-TM2 Monitoring Well Completion Report. Released July 2016

REFERENCES

Alta, 2016. Final Operable Unit Carbon Tetrachloride Plume Second Quarter 2016 Groundwater Monitoring Report, Former Fort Ord, California, dated 29 August 2016

California Coastal Commission, 2014. Coastal Development Permit #A-3-MRA-14-0050 issued to Cal Am dated 8-Dec-14

EKI, 16 January 2017. Technical Memorandum, Preliminary Feasibility Assessment – Potential to Conduct Augmented Groundwater Recharge at the Armstrong Ranch Property, dated 16 January 2017

Cal Am Monterey Peninsula Water Supply Project Test Slant Well Long Term Pumping—Monitoring Report No. 55, released 24-May 2016.

Guo & Langevin, 2002. User's Guide to SEAWAT, U.S. Geological Survey Techniques of Water Resources Investigations 6-A7, released 2002.

Geosciences, 2014. Monterey Peninsula Water Supply Project Hydrogeologic Investigation Technical Memorandum (TM1) Summary of Results – Exploratory Boreholes, dated 8 July 2014.

Geoscience, 2015. Cal Am Monterey Peninsula Water Supply Project Baseline Water and Total Dissolved Solids Levels-- Test Slant Well Area, released 20-April 2015.

Geoscience, 2016. Monterey Peninsula Water Supply Project Hydrogeologic Investigation-TM2 Monitoring Well Completion Report. released July 2016

SWRCB, 2017. State Water Resources Control Board GeoTracker database, accessed 13 February 2017

Harding ESE, 2001. Final Report Hydrogeologic Investigation of the Salinas Valley Basin in the Vicinity of Fort Ord and Marina Salinas Valley, California, prepared for Monterey County Water Resources Agency, dated 12 April 2001

RMC,2008a. Preliminary Draft Technical Memorandum, Armstrong Ranch: Seasonal Subsurface Storage of Recycled Water, Modeling TM, dated 23 May 2008;

RMC, 2008b. Draft Technical Memorandum to Marina Coast Water District- Water Augmentation Project, Subject Water Supply Evaluation Date 2 October 2008.

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RWQCB, 2016. Water Quality Control Plan for the Central Coast Basin, Regional Water Quality Control Board Central Coast Region, State Water Resources control Board, California Environmental protection Agency, March 2016 Edition

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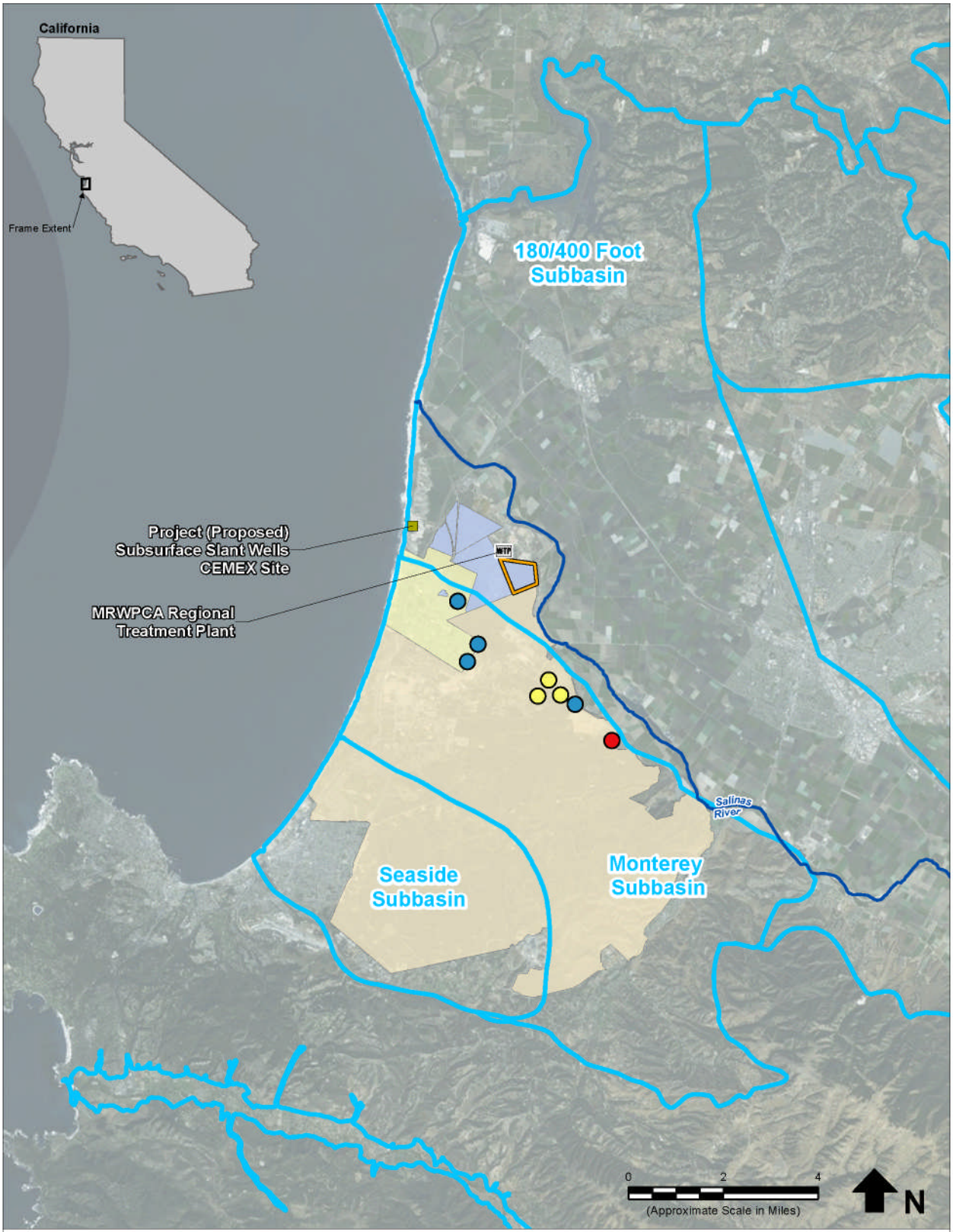
Stalle, Gardner & Dunne, Inc., 1991. Ground Water Quality Assessment-District Well No. 5., released July 3 1991

Todd Engineers, 2008. Phase I Investigation Armstrong Ranch Groundwater Storage Project. Marina Coast Water District, Marina;

U.S. Department of the Army, 1997. Record of Decision Basinwide Remedial Investigation Sites, Fort Ord, California



Legend

- DWR Groundwater Basin
- MCWD's Service Area - Ord Community
- MCWD's Service Area - Central Marina
- MCWD's Sphere of Influence
- Armstrong Ranch

MCWD Wells by Aquifer

- 180-Foot and 400-Foot
- 400-Foot
- Deep

Abbreviations

DWR = Department of Water Resources
MCWD = Marina Coast Water District
MRWPCA = Monterey Regional Water Pollution Control Agency

Notes

1. All locations are approximate.

Sources

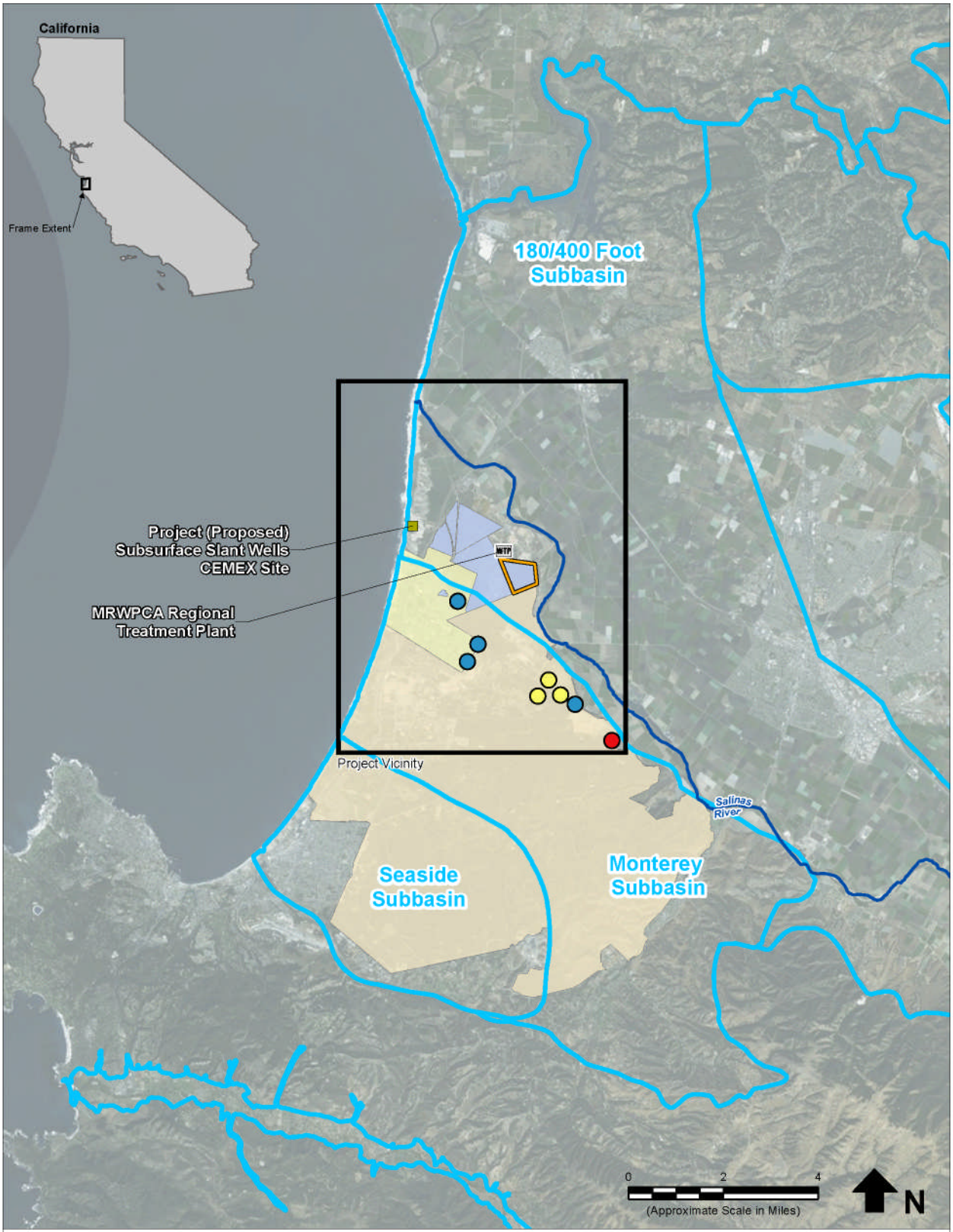
1. Aerial photograph provided by ESRI's ArcGIS Online, Obtained 22 March 2017.

Path: X:\B60094\Maps\20170224\Fig1_MCWD_ServiceArea.mxd

Erler & Kalinowski, Inc.

MCWD Service Area

Marina Coast Water District
Marina, CA
February 2017
EKI B60094.01
Figure 1



Legend

- DWR Groundwater Basin
- MCWD's Service Area - Ord Community
- MCWD's Service Area - Central Marina
- MCWD's Sphere of Influence
- Armstrong Ranch

MCWD Wells by Aquifer

- 180-Foot and 400-Foot
- 400-Foot
- Deep

Abbreviations

DWR = Department of Water Resources
MCWD = Marina Coast Water District
MRWPCA = Monterey Regional Water Pollution Control Agency

Notes

1. All locations are approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, Obtained 22 March 2017.

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Erler & Kalinowski, Inc.

Project Vicinity

Marina Coast Water District
Marina, CA
February 2017
EKI B60094.01
Figure 2

Legend

- MCWD's Service Area
- DWR Groundwater Basin
- Armstrong Ranch
- TDS Isoconcentration, 3,000 mg/L
- Well with Data

Concentration

- TDS >3,000 mg/L
- TDS ≤ 3,000 mg/L

Sample Labeling

MW-8S — Well ID
1,214/251 — TDS/Chloride Concentration (mg/L)
(6/23/2015) — Sample Date

Abbreviations

DWR	= Department of Water Resources	NA	= not analyzed
MCWD	= Marina Coast Water District	TDS	= total dissolved solids
mg/L	= milligrams per liter		

Notes

1. All locations are approximate.
2. TDS Isoconcentration line is dashed when approximated off sparse data.

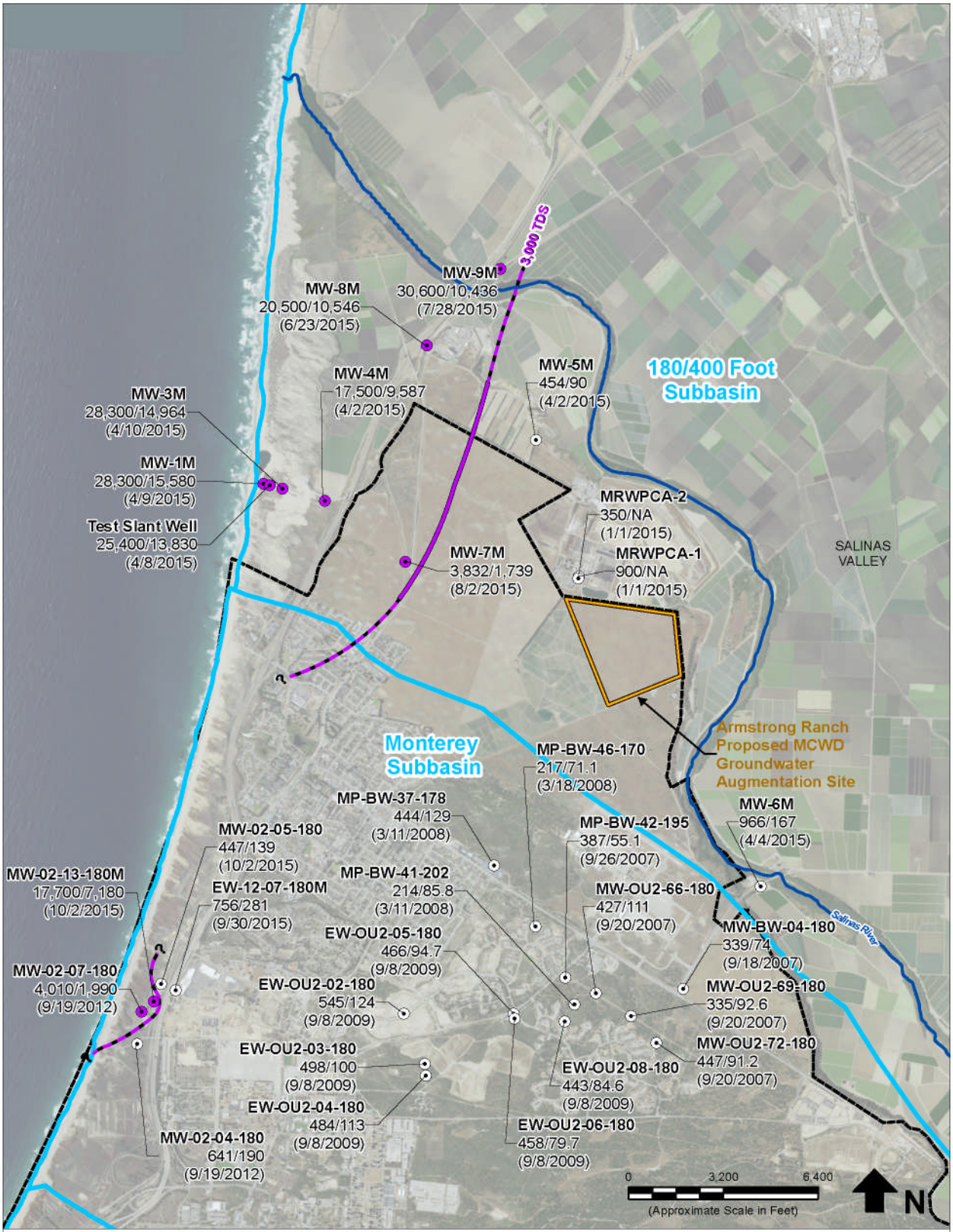
Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 21 February 2017.
2. Cal Am Monterey Peninsula Water Supply Project Baseline Water and Total Dissolved Solids Levels-- Test Slant Well Area, released 20-April 2015.
3. State Water Resources Control Board GeoTracker database.

Erler & Kalinowski, Inc.

Groundwater Quality, TDS and Chloride - Dune Sand Aquifer (2006-2016)
Marina Coast Water District
Marina, CA
February 2017
EKI B60094.01
Figure 3

Path: X:\B60094\Maps\20170202\Fig3_TDS_CL_DuneSandAquifer.mxd



Legend

- MCWD's Service Area
- DWR Groundwater Basin
- Armstrong Ranch
- TDS Isoconcentration, 3,000 mg/L
- Well with Data

Concentration

- TDS >3,000 mg/L
- TDS ≤ 3,000 mg/L

Sample Labeling

MW-8M (Well ID)
20,500/10,546 (6/23/2015) (TDS/Chloride Concentration (mg/L) / Sample Date)

Abbreviations

DWR	= Department of Water Resources	NA	= not analyzed
MCWD	= Marina Coast Water District	TDS	= total dissolved solids
mg/L	= milligrams per liter		

Notes

1. All locations are approximate.
2. TDS Isoconcentration line is dashed when approximated off sparse data.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 21 February 2017.
2. Cal Am Monterey Peninsula Water Supply Project Baseline Water and Total Dissolved Solids Levels-- Test Slant Well Area, released 20-April 2015.
3. State Water Resources Control Board GeoTracker database.

Erler & Kalinowski, Inc.

Groundwater Quality TDS and Chloride - Upper 180 Foot Aquifer (2006-2016)
Marina Coast Water District
Marina, CA
February 2017
EKI B60094.01
Figure 4

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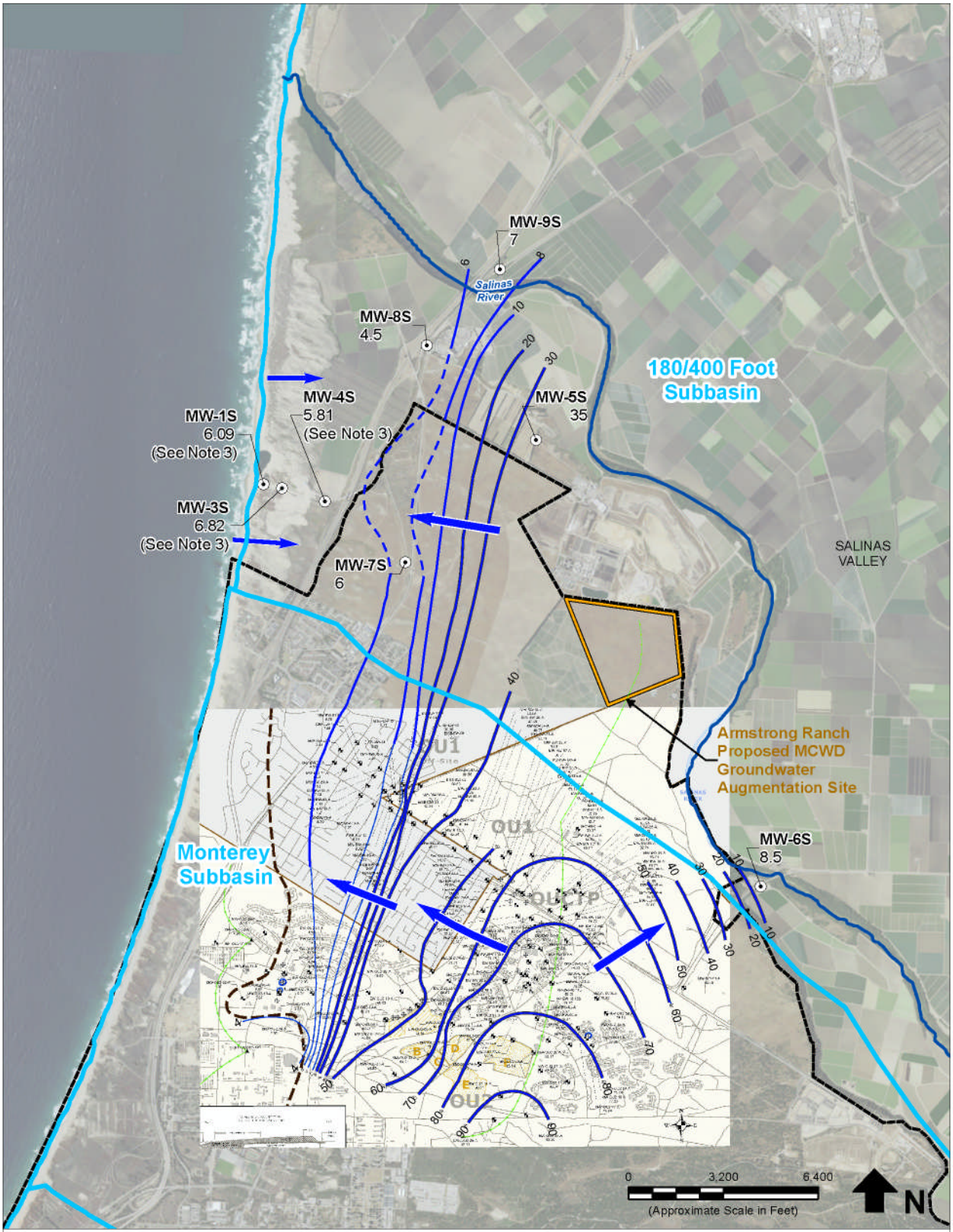

Legend

- MCWD's Service Area
- DWR Groundwater Basin
- Armstrong Ranch
- Groundwater Divide
- Edge of Fort Ord-Salinas Valley Aquitard
- Groundwater Elevation Contour (2' Interval)
- Groundwater Elevation Contour (10' Interval)
- Cal Am Monitoring Well
- Fort Ord Monitoring Well

Well Labeling

MW-5S
35
Well ID
Groundwater Elevation (ft MSL)

Abbreviations

Cal Am = California American Water
DWR = Department of Water Resources
ft MSL = feet mean sea level
MCWD = Marina Coast Water District
mg/L = milligram per liter
TDS = total dissolved solids

Notes

1. All locations are approximate.
2. Groundwater levels obtained from Reference 2 are measured in May 2016. Groundwater levels at Fort Ord are measured during June 2016 (Ahta, 2016. Final Operable Unit Carbon Tetrachloride Plume Second Quarter 2016 Groundwater Monitoring Report, Former Fort Ord, California, dated 29 August 2016). All groundwater levels are approximate.
3. Groundwater levels have been correlated for density, where TDS > 10,000 mg/L (see Reference 3).
4. Groundwater elevation contour dashed where approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 21 February 2017.
2. Cal Am Monterey Peninsula Water Supply Project Test Slant Well Long Term Pumping—Monitoring Report No. 55, released 24-May-2016.
3. Guo & Langevin, 2002. User's Guide to SEAWAT, U.S. Geological Survey Techniques of Water Resources Investigations 6-A7, released 2002.

Erler & Kalinowski, Inc.

Groundwater Elevations
Dune Sand Aquifer

Marina Coast Water District
Marina, CA
February 2017
EKI B60094.01
Figure 5

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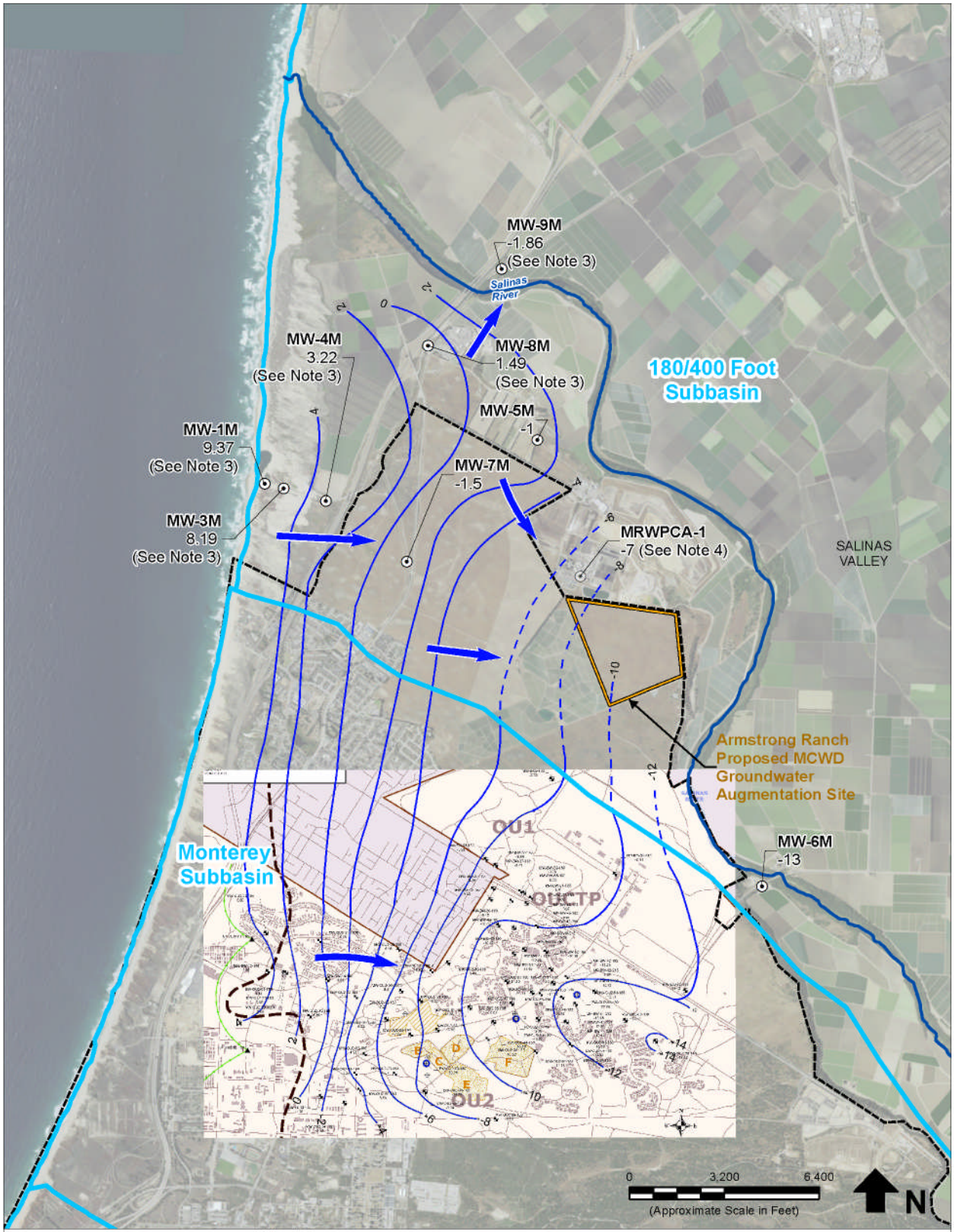

Legend

- MCWD's Service Area
- DWR Groundwater Basin
- Armstrong Ranch
- Groundwater Divide
- Edge of Fort Ord-Salinas Valley Aquitard
- Groundwater Elevation Contour (2' Interval)
- Cal Am Monitoring Well
- Fort Ord Monitoring Well

Well Labeling

MW-5M (Well ID)
-1 (Groundwater Elevation (ft MSL))

Abbreviations

Cal Am	= California American Water	MCWD	= Marina Coast Water District
DWR	= Department of Water Resources	mg/L	= milligram per liter
ft MSL	= feet mean sea level	TDS	= total dissolved solids

Notes

1. All locations are approximate.
2. Groundwater levels obtained from Reference 2 are measured in May 2016. Groundwater levels at Fort Ord are measured during June 2016 (Ahta, 2016. Final Operable Unit Carbon Tetrachloride Plume Second Quarter 2016 Groundwater Monitoring Report, Former Fort Ord, California, dated 29 August 2016). All groundwater levels are approximate.
3. Groundwater levels have been correlated for density, where TDS > 10,000 mg/L (see Reference 3).
4. Water level at MRWPCA-1 estimated based on baseline water level measurements from April 2015 and changes observed in water levels at other nearby Cal Am 180 Foot wells between April 2015 and May 2016.
5. Groundwater elevation contour dashed where approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 21 February 2017.
2. Cal Am Monterey Peninsula Water Supply Project Test Slant Well Long Term Pumping—Monitoring Report No. 55, released 24-May-2016.
3. Guo & Langevin, 2002. User's Guide to SEAWAT, U.S. Geological Survey Techniques of Water Resources Investigations 6-A7, released 2002.

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Groundwater Elevations
180 Foot Aquifer

Marina Coast Water District
Marina, CA
February 2017
EKI B60094.01
Figure 6

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Legend

- MCWD's Service Area
- DWR Groundwater Basin
- Armstrong Ranch
- Transect A-A'
- Well with Data

Concentration

- TDS >3,000 mg/L
- TDS ≤ 3,000 mg/L

Sample Labeling

Well ID
MW-8M
20,500/10,546 TDS/Chloride Concentration (mg/L)
(6/23/2015)
Sample Date

Abbreviations

DWR = Department of Water Resources
MCWD = Marina Coast Water District
mg/L = milligrams per liter
TDS = total dissolved solids

Notes

1. All locations are approximate.
2. Water Quality Assessment conducted by MCWD in 1991 indicates TDS <1000 ug/L in upper portion of screen interval (i.e., elevations above -155 ft MSL) and approximately 5,000 mg/L at bottom of screen interval (i.e., elevations between -195 ft MSL to -235 ft MSL).

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 21 February 2017.
2. Cal Am Monterey Peninsula Water Supply Project Baseline Water and Total Dissolved Solids Levels-- Test Slant Well Area, released 20-April 2015.
3. State Water Resources Control Board GeoTracker database.

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Well Screen Transect A-A' Location
180 Foot Aquifer

Marina Coast Water District
Marina, CA
February 2017
EKI B60094.01
Figure 7

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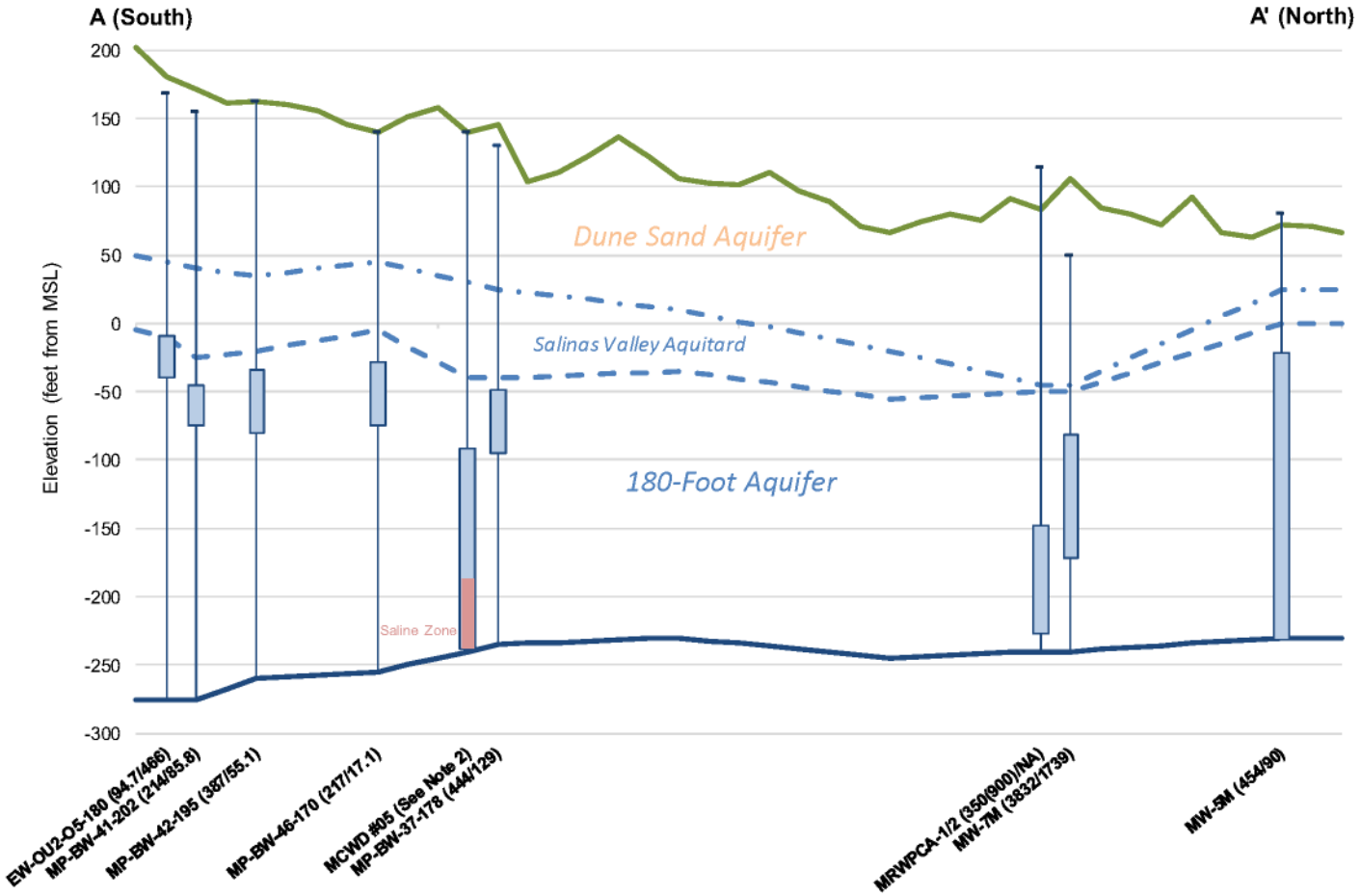

N

0 0.5 1

(Approximate Scale in Miles)

Legend

- Ground Surface Elevation (feet)
- Top of Salinas Valley Aquitard
- Bottom of Salinas Valley Aquitard
- Top of 180/400 Aquitard
- Well Screen Interval
- **MW-5M (454/90)** —— TDS/Chloride Concentration (mg/L)
  - Well ID

Abbreviations

ft. = feet
MSL = mean sea level
NA = not analyzed
TDS = total dissolved solids

Notes

1. Wells MRWPCA-1/2, MW-5M, and MW=7M were sampled in 2015. Well EW-OU2-05-180 was sampled in 2009. Wells MP-BW-41-202, MP-BW-46-170, and MP-BW-37-178 were sampled in 2008. Well MP-BW-42-195 was sampled in 2007. Well MCWD #05 was sampled in 1991.
2. Water Quality Assessment conducted at MCWD #05 in 1991 indicates TDS less than 1000 mg/L in upper portion of screen interval (i.e. elevations above -155 ft MSL) and approximately 5,000 mg/L at bottom of screen interval (i.e. elevations between -195 ft. MSL to -235 ft MSL)

Sources

1. Geoscience, 2016. Monterey Peninsula Water Supply Project Hydrogeologic Investigation-TM2 Monitoring Well Completion Report. released July 2016
2. State Water Resources Control Board GeoTracker database, accessed 13 February 2017
3. Stalle, Gardner and Dunne, Inc., 1991. Ground Water Quality Assessment: District Well No. 5., released July 3 1991

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Well Screen Intervals
Transect A-A'

Marina Coast Water District
Marina, CA
February 2017
B60094.01
Figure 8

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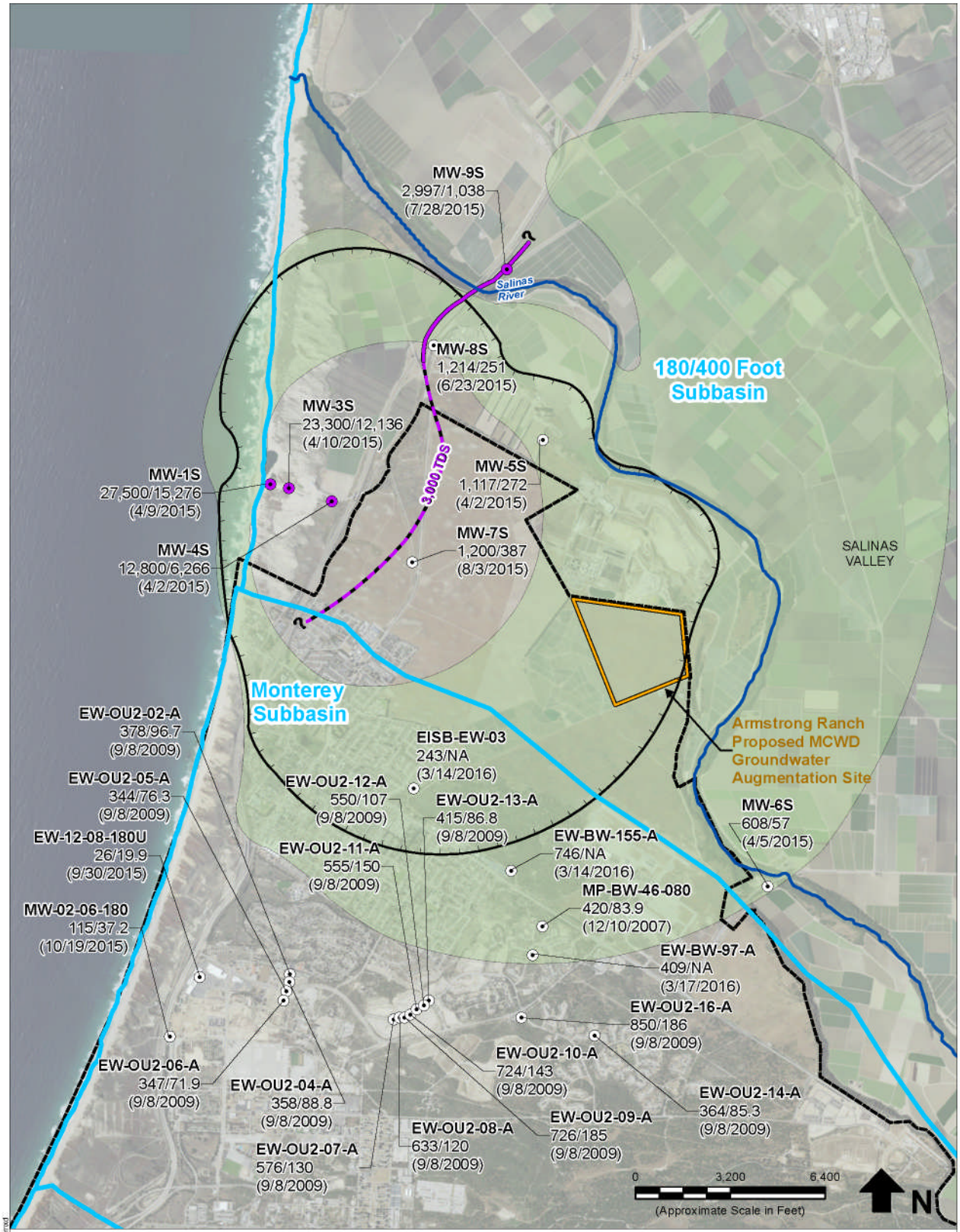

Legend

- MCWD's Service Area
- DWR Groundwater Basin
- Armstrong Ranch
- TDS Isoconcentration, 3,000 mg/L
- Groundwater Level Decrease (Drawdown) Contour 1'
- Possible Extent of 1' Drawdown (Based on Sensitivity Tests)
- Well with Data

Concentration

- TDS >3,000 mg/L
- TDS ≤ 3,000 mg/L

Sample Labeling

MW-8S — Well ID
1,214/251 — TDS/Chloride Concentration (mg/L)
(6/23/2015) — Sample Date

Abbreviations

DWR = Department of Water Resources
MCWD = Marina Coast Water District
mg/L = milligrams per liter
NA = not analyzed
TDS = total dissolved solids

Notes

1. All locations are approximate.
2. TDS Isoconcentration line is dashed when approximated off sparse data.
3. Drawdowns based on extraction of 24.1 MGD at CEMEX Site 2012 sea level, no return water.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 21 February 2017.
2. Cal Am Monterey Peninsula Water Supply Project Baseline Water and Total Dissolved Solids Levels-- Test Slant Well Area, released 20-April 2015.
3. State Water Resources Control Board GeoTracker database.
4. Appendix E2 of CalAm Monterey Peninsula Water Supply Project Draft Environmental Impact Report/Environmental Impact Statement, Released 13 January 2017.

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Predicted Lateral Extent of Drawdown
TDS/Chloride Concentrations
(2006-2016) - Dune Sand Aquifer
Marina Coast Water District
Marina, CA
February 2017
EKI B60094.01
Figure 9

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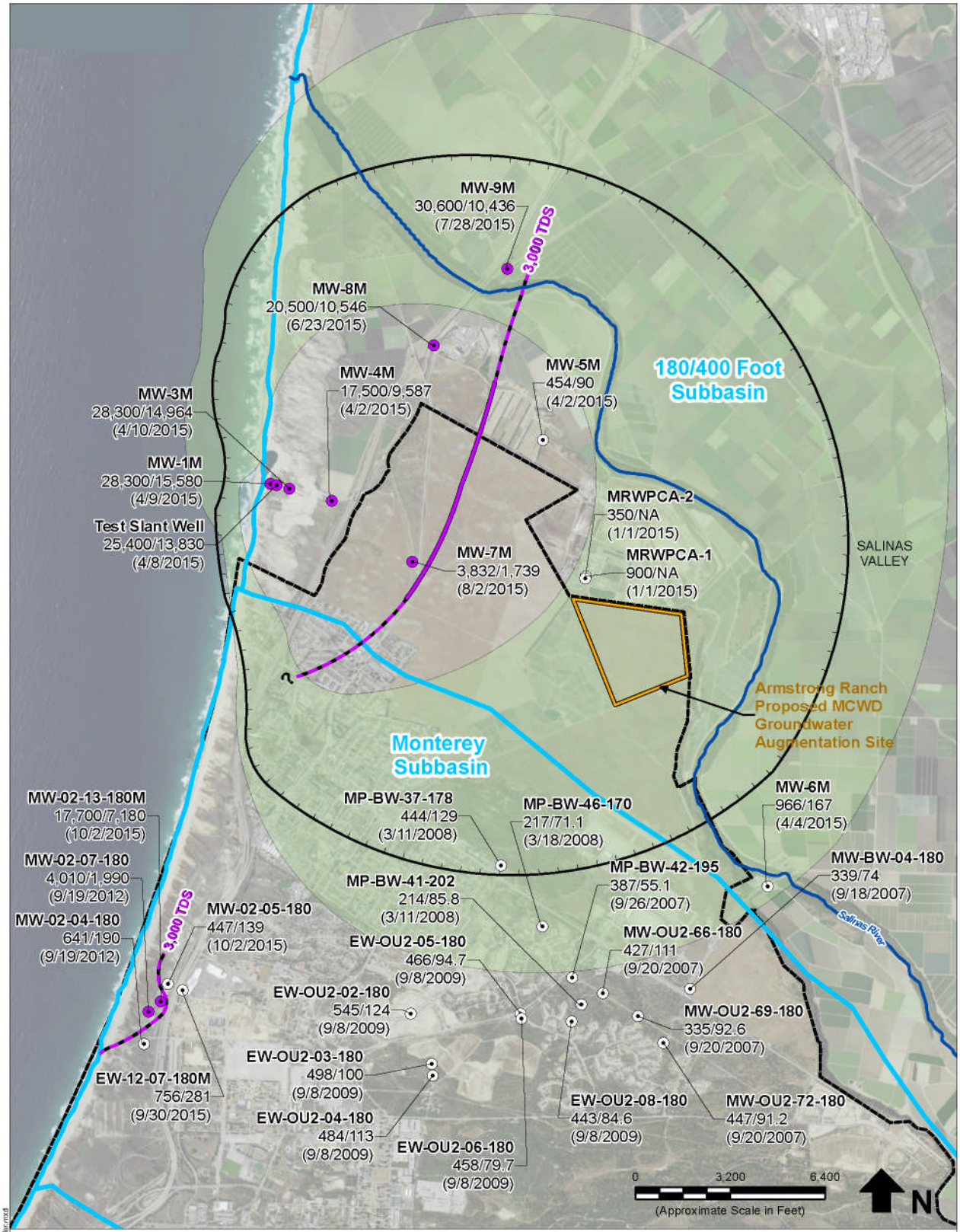

Legend

- MCWD's Service Area
- DWR Groundwater Basin
- Armstrong Ranch
- TDS Isoconcentration, 3,000 mg/L
- Groundwater Level Decrease (Drawdown) Contour 1'
- Possible Extent of 1' Drawdown (Based on Sensitivity Tests)
- Well with Data

Concentration

- TDS >3,000 mg/L
- TDS ≤ 3,000 mg/L

Sample Labeling

- MW-8M — Well ID
- 20,500/10,546 — TDS/Chloride Concentration (mg/L)
- (6/23/2015) — Sample Date

Abbreviations

DWR	= Department of Water Resources	NA	= not analyzed
MCWD	= Marina Coast Water District	TDS	= total dissolved solids
mg/L	= milligrams per liter		

Notes

1. All locations are approximate.
2. TDS Isoconcentration line is dashed when approximated off sparse data.
3. Drawdowns based on extraction of 24.1 MGD at CEMEX Site 2012 sea level, no return water.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 21 February 2017.
2. Cal Am Monterey Peninsula Water Supply Project Baseline Water and Total Dissolved Solids Levels-- Test Slant Well Area, released 20-April 2015.
3. State Water Resources Control Board GeoTracker database.
4. Harding, 2001. Hydrogeologic Investigation of the Salinas Valley Basin in the Vicinity of Fort Ord and Marina Salinas Valley, dated 12 April 2001.

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Predicted Lateral Extent of Drawdown
TDS/Chloride Concentrations (2006-2016)
(Upper) 180 Foot Aquifer
Marina Coast Water District
Marina, CA
February 2017
EKI B60094.01
Figure 10

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Legend

- MCWD's Service Area
- DWR Groundwater Basin
- Armstrong Ranch
- TDS Isoconcentration, 3,000 mg/L
- Ocean Capture Zone (0.0004, 0.0007, 0.0011)
- Well with Data

Concentration

- TDS >3,000 mg/L
- TDS ≤ 3,000 mg/L

Sample Labeling

MW-8S — Well ID
1,214/251 — TDS/Chloride Concentration (mg/L)
(6/23/2015) — Sample Date

Abbreviations

avg	= average	mg/L	= milligrams per liter
DWR	= Department of Water Resources	NA	= not analyzed
MCWD	= Marina Coast Water District	TDS	= total dissolved solids

Notes

1. All locations are approximate.
2. Ocean Capture Zone, porosity = 0.1, average gradient between 0.0004 and 0.0011.
3. TDS Isoconcentration line is dashed when approximated off sparse data.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 21 February 2017.
2. Cal Am Monterey Peninsula Water Supply Project Baseline Water and Total Dissolved Solids Levels-- Test Slant Well Area, released 20-April 2015.
3. State Water Resources Control Board GeoTracker database.
4. Appendix E2 of CalAm Monterey Peninsula Water Supply Project Draft Environmental Impact Report/Environmental Impact Statement, Released 13 January 2017.

Erler & Kalinowski, Inc.

Predicted Ocean Capture Zone and TDS/Chloride Concentrations (2006-2016) - Dune Sand Aquifer

Marina Coast Water District
Marina, CA
February 2017
EKI B60094.01
Figure 11

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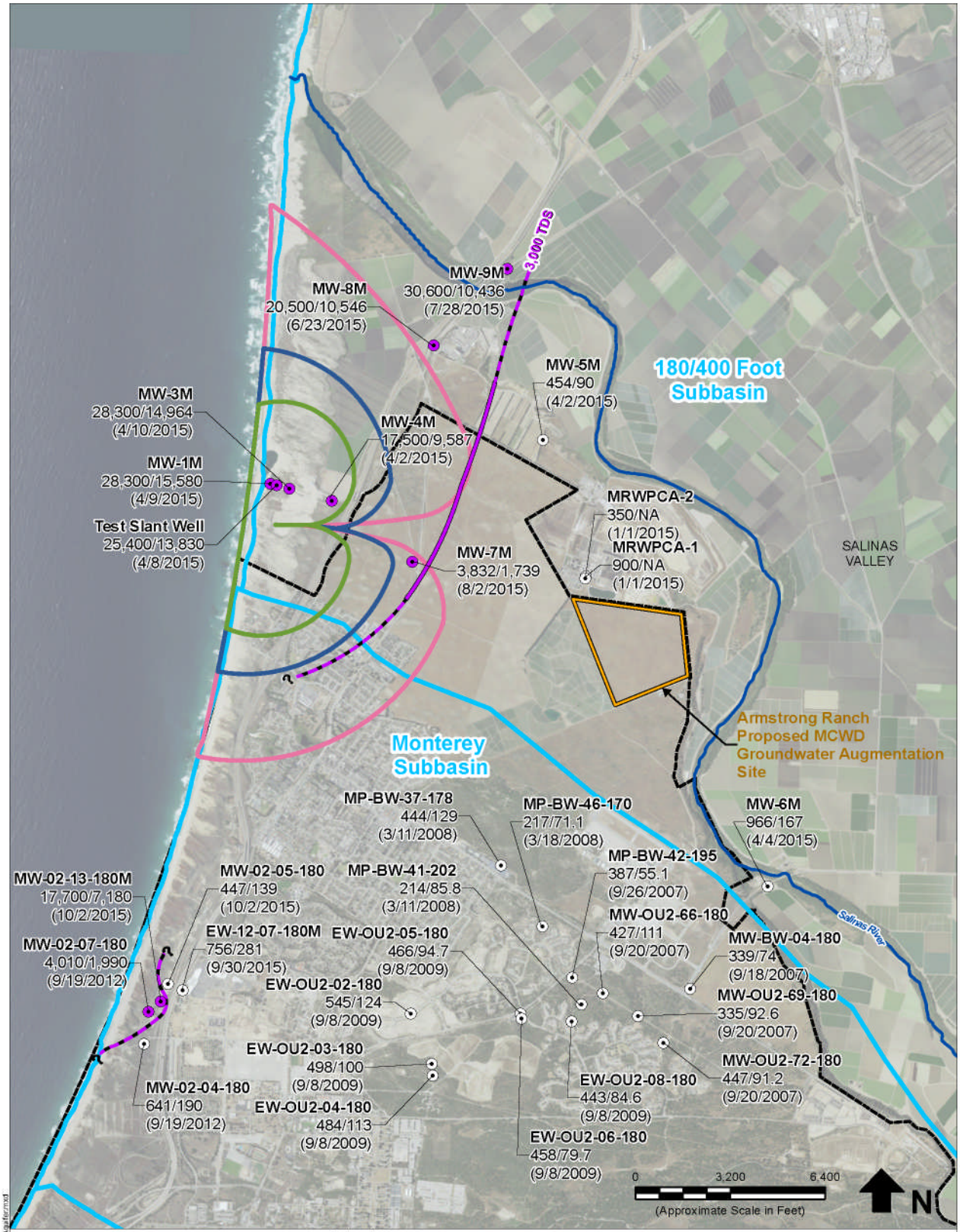


Legend

- MCWD's Service Area
- DWR Groundwater Basin
- Armstrong Ranch
- TDS Isoconcentration, 3,000 mg/L
- Ocean Capture Zone (0.004, 0.001, 0.0011)
- Well with Data

Concentration

- TDS >3,000 mg/L
- TDS ≤ 3,000 mg/L

Sample Labeling

MW-8M — Well ID
20,500/10,546 — TDS/Chloride Concentration (mg/L)
(6/23/2015) — Sample Date

Abbreviations

avg	= average	mg/L	= milligrams per liter
DWR	= Department of Water Resources	NA	= not analyzed
MCWD	= Marina Coast Water District	TDS	= total dissolved solids

Notes

1. All locations are approximate.
2. Ocean Capture Zone, porosity = 0.1, average gradient between 0.0004 and 0.0011.
3. TDS Isoconcentration line is dashed when approximated off sparse data.

Sources

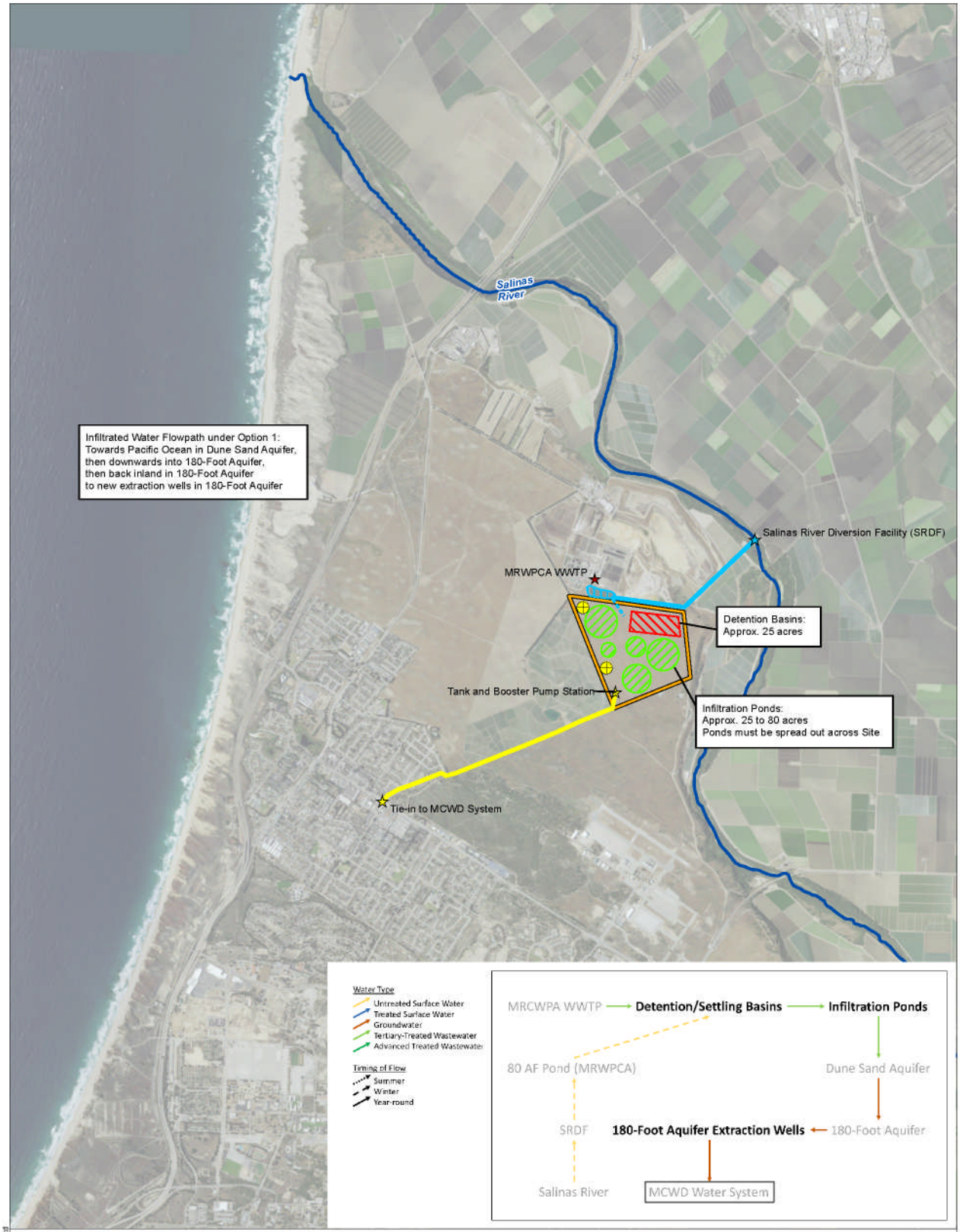
1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 21 February 2017.
2. Cal Am Monterey Peninsula Water Supply Project Baseline Water and Total Dissolved Solids Levels-- Test Slant Well Area, released 20-April 2015.
3. State Water Resources Control Board GeoTracker database.
4. Appendix E2 of CalAm Monterey Peninsula Water Supply Project Draft Environmental Impact Report/Environmental Impact Statement, Released 13 January 2017.

Erler & Kalinowski, Inc.

Predicted Ocean Capture Zone and TDS/Chloride Concentrations (2006-2016) - (Upper 180 Foot Aquifer)

Marina Coast Water District
Marina, CA
February 2017
EKI B60094.01
Figure 12

Path: X:\B60094\Maps\20170202\Fig12_TDS_CL_WithOceanCapture_180ftAquifer.mxd



Legend

- Armstrong Ranch
- Detention/Settling Basin
- Infiltration Pond
- 80 AF Pond (MRWPCA)
- Pipeline to Armstrong Ranch
- SRDF Surface Water Intake Pipeline
- Pipeline to MCWD System
- 180-Foot Aquifer Extraction Well

Abbreviations

MCWD = Marina Coast Water District
MRWPCA = Monterey Regional Water Pollution Control Agency
SRDF = Salinas River Diversion Facility

Notes

1. All locations are approximate.

Sources

1. Aerial photograph provided by ESRI's ArcGIS Online, obtained 21 February 2017.

0 3,200 6,400
(Approximate Scale in Feet)

N

Erler & Kalinowski, Inc.

Conceptual Map
Groundwater Augmentation at
Armstrong Ranch – Option 1
Marina Coast Water District
Marina, CA
February 2017
EKI B60094.00
Figure 13

Path: X:\B60094\Maps\20170224Fig13_ConceptualGrndWatrAugOption1.mxd

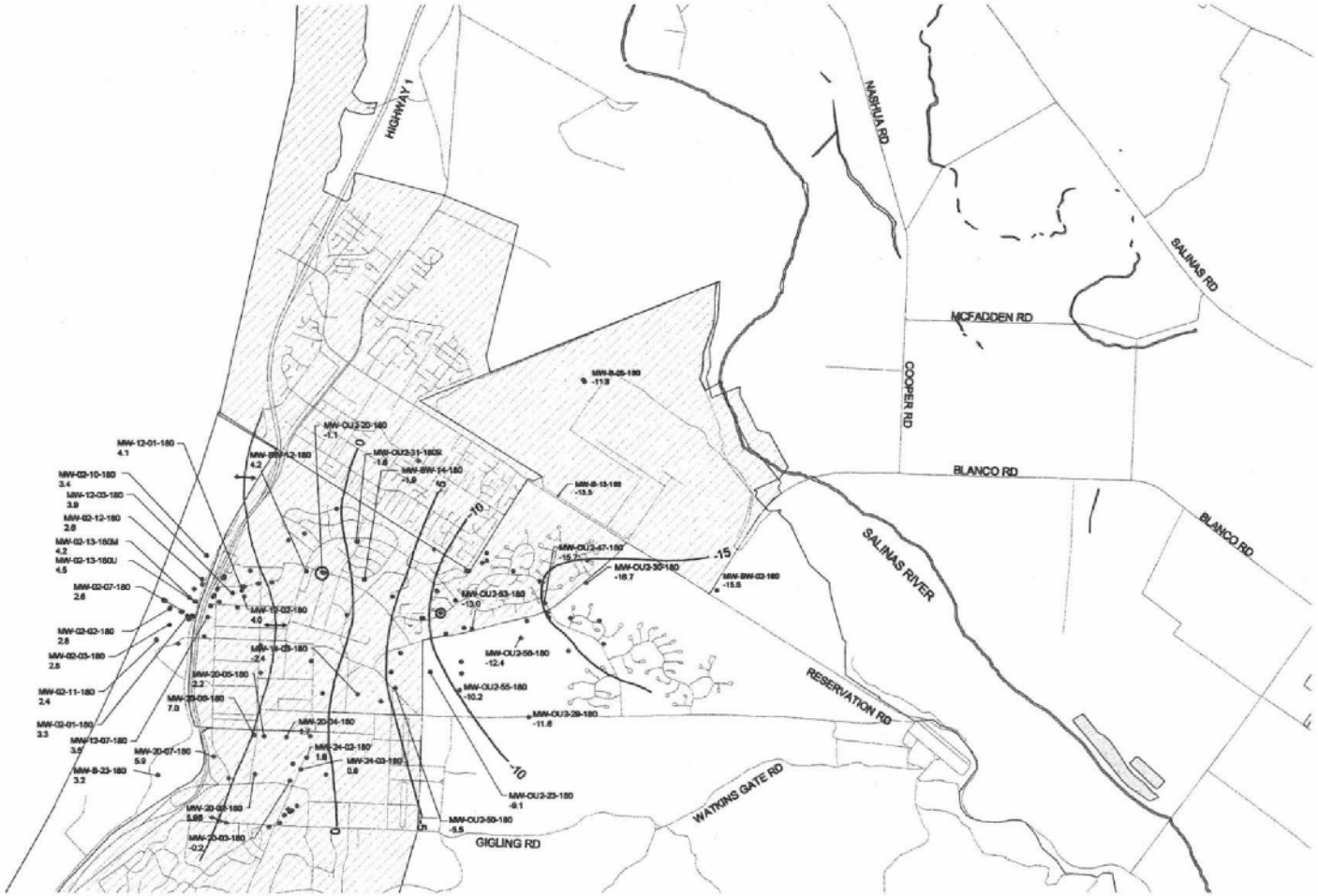
Appendix A

Selected figures from Harding ESE, *Final Report Hydrogeologic Investigation of the Salinas Valley Basin in the Vicinity of Fort Ord and Marina Salinas Valley, California*, prepared for Monterey County Water Resources Agency, dated 12 April 2001

W.Q. Section

Final Report
Hydrogeologic Investigation of the Salinas Valley Basin in the Vicinity of Fort Ord and Marina
Salinas Valley, California

Harding ESE
A MACTEC COMPANY



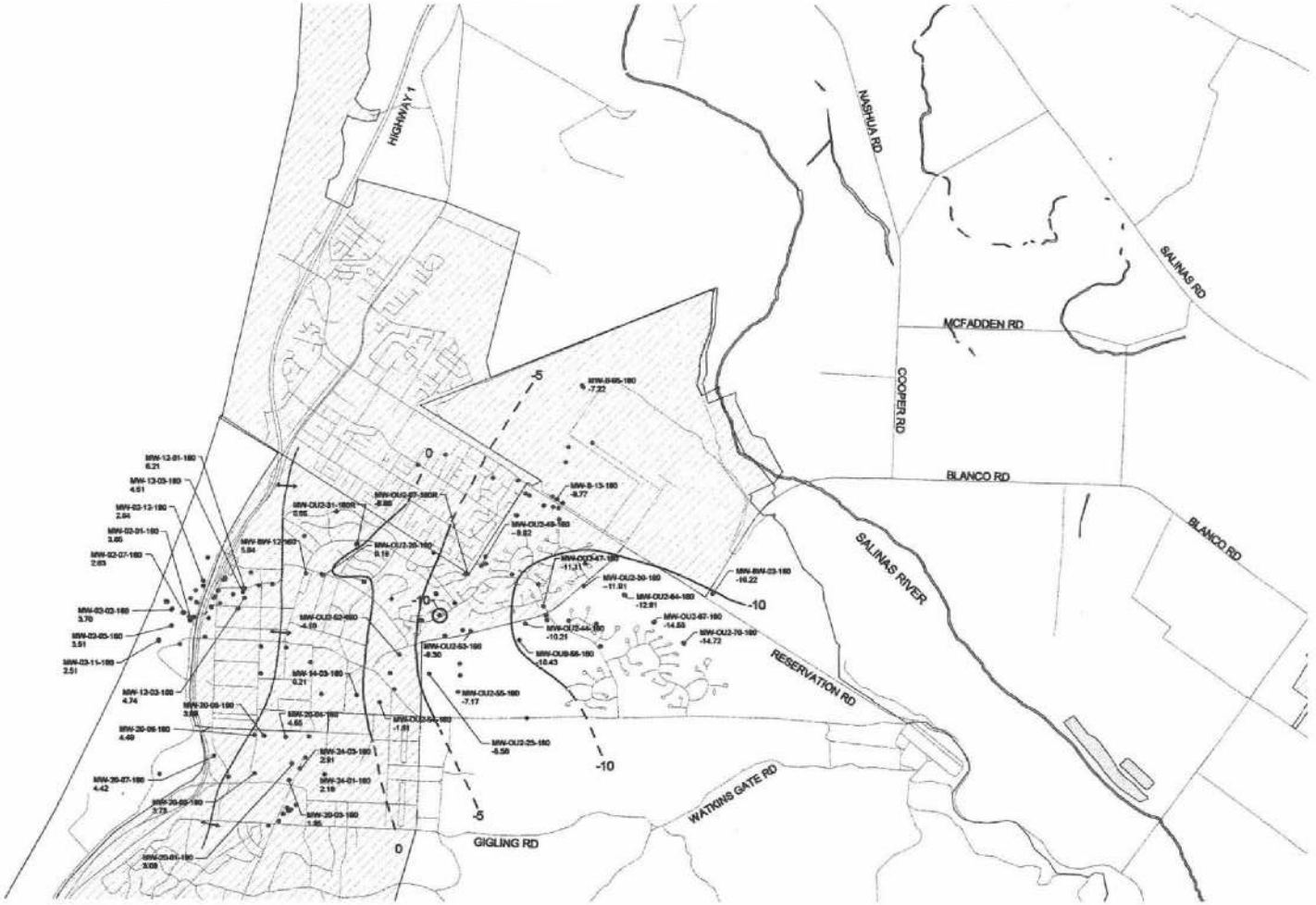
Harding ESE
A MACTEC COMPANY

Upper-180-foot Aquifer
Ground Water Elevations (feet MSL), 1997
Hydrogeologic Investigation of the Salinas Valley Basin
in the Vicinity of Fort Ord and Marina
Monterey County Water Resources Agency
Salinas Valley, California

PLATE 7

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
TJH	51750 007	MTDT	4/01	

mcwrawl2.apr - wl-U180-97 - 4/10/01



EXPLANATION

- WELL LOCATION
- WATER-LEVEL ELEVATION CONTOUR (Feet MSL)
- GROUND WATER DIVIDE

N

4000 0 4000 Feet

Harding ESE
A MACTEC COMPANY

Upper-180-foot Aquifer
Ground Water Elevations (feet MSL), 1999
Hydrogeologic Investigation of the Salinas Valley Basin
in the Vicinity of Fort Ord and Marina
Monterey County Water Resources Agency
Salinas Valley, California

PLATE 8

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
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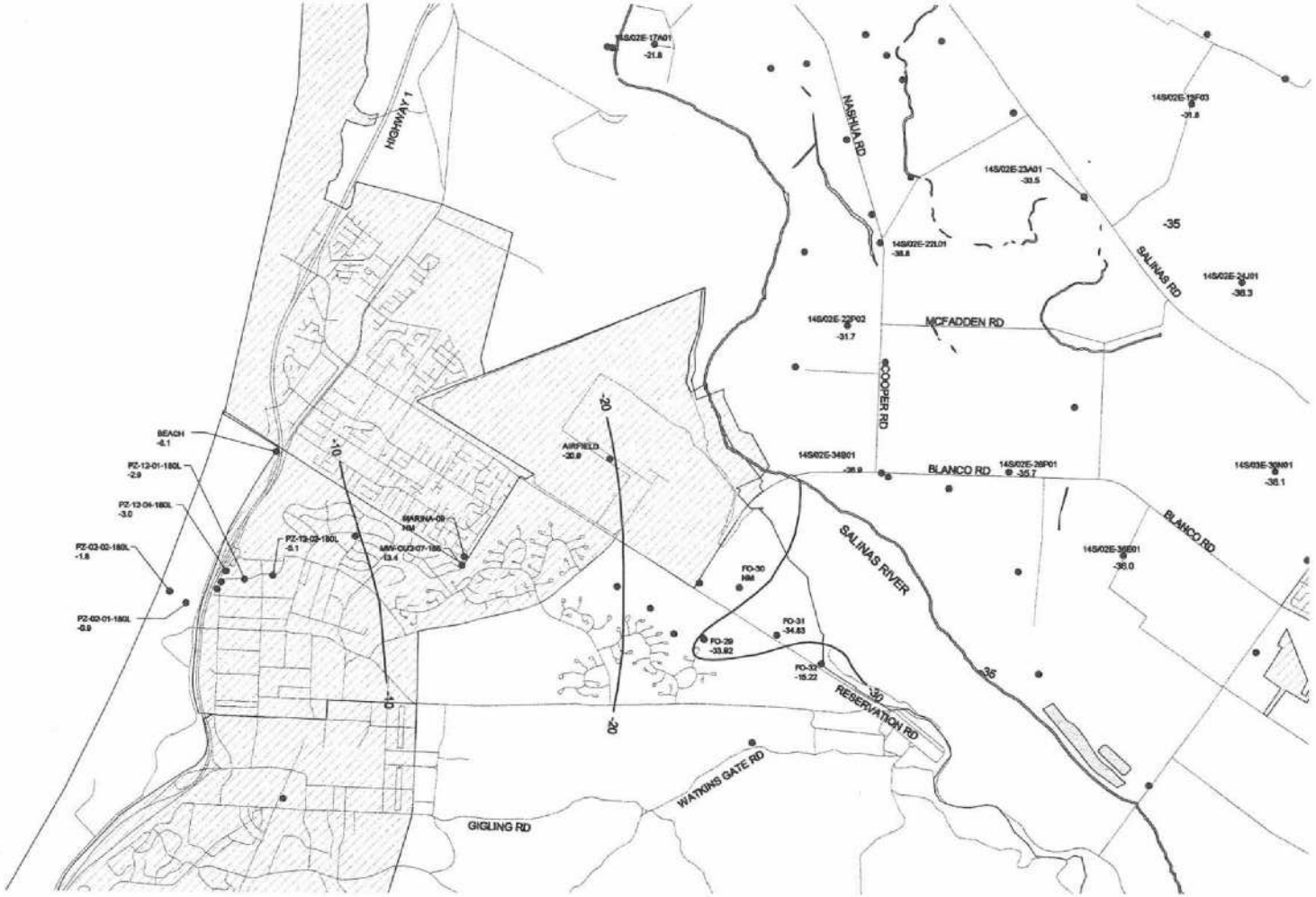

Harding ESE
A MACTEC COMPANY

180-Foot Aquifer
Ground Water Elevations (feet MSL), 1997
Hydrogeologic Investigation of the Salinas Valley Basin
in the Vicinity of Fort Ord and Marina
Monterey County Water Resources Agency
Salinas Valley, California

PLATE 9

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
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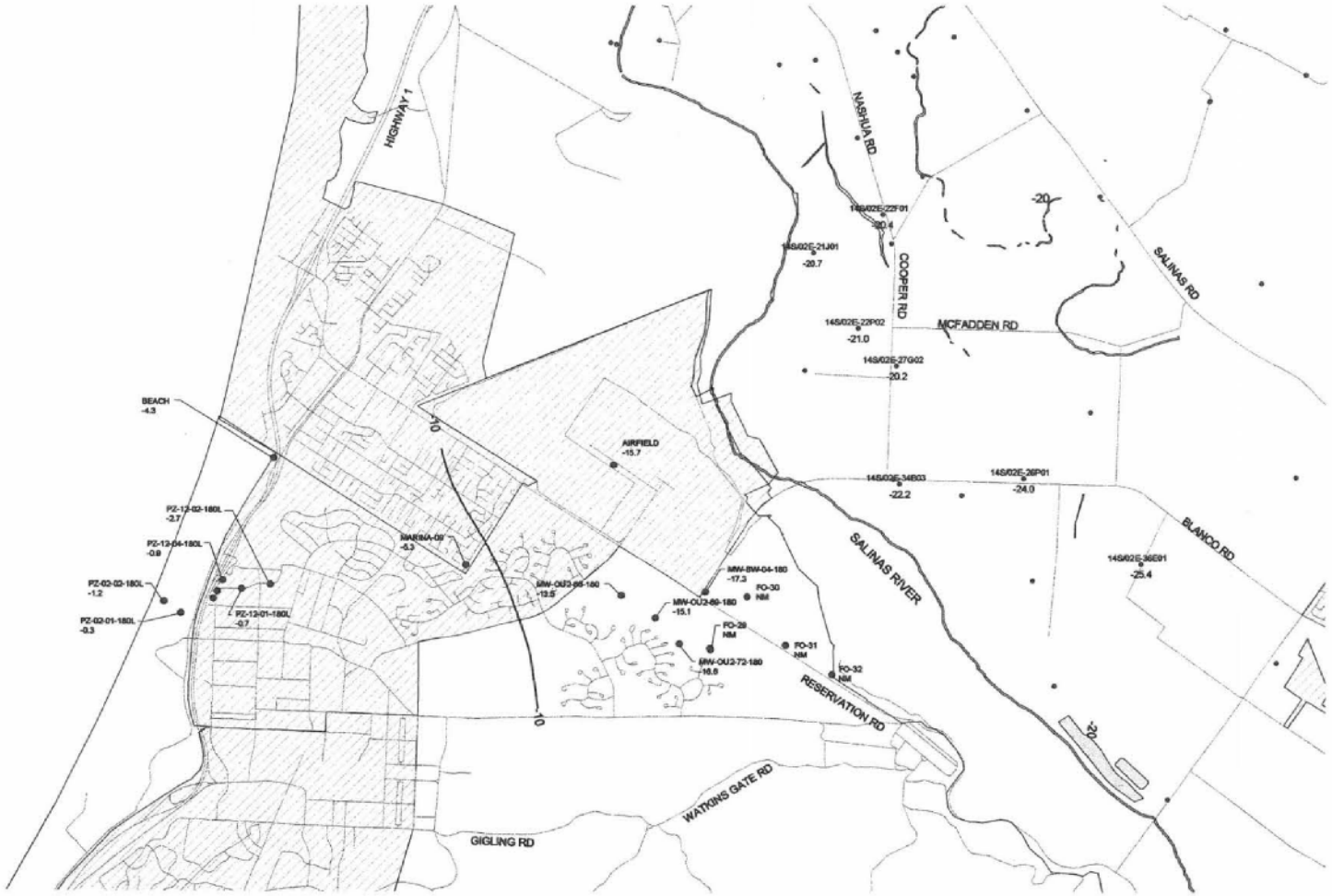
mowraw2.spr - wl.180-97 - 4/10/01



EXPLANATION

- WELL LOCATION
- WATER-LEVEL ELEVATION CONTOUR (Feet MSL)

N

4000 0 4000 Feet

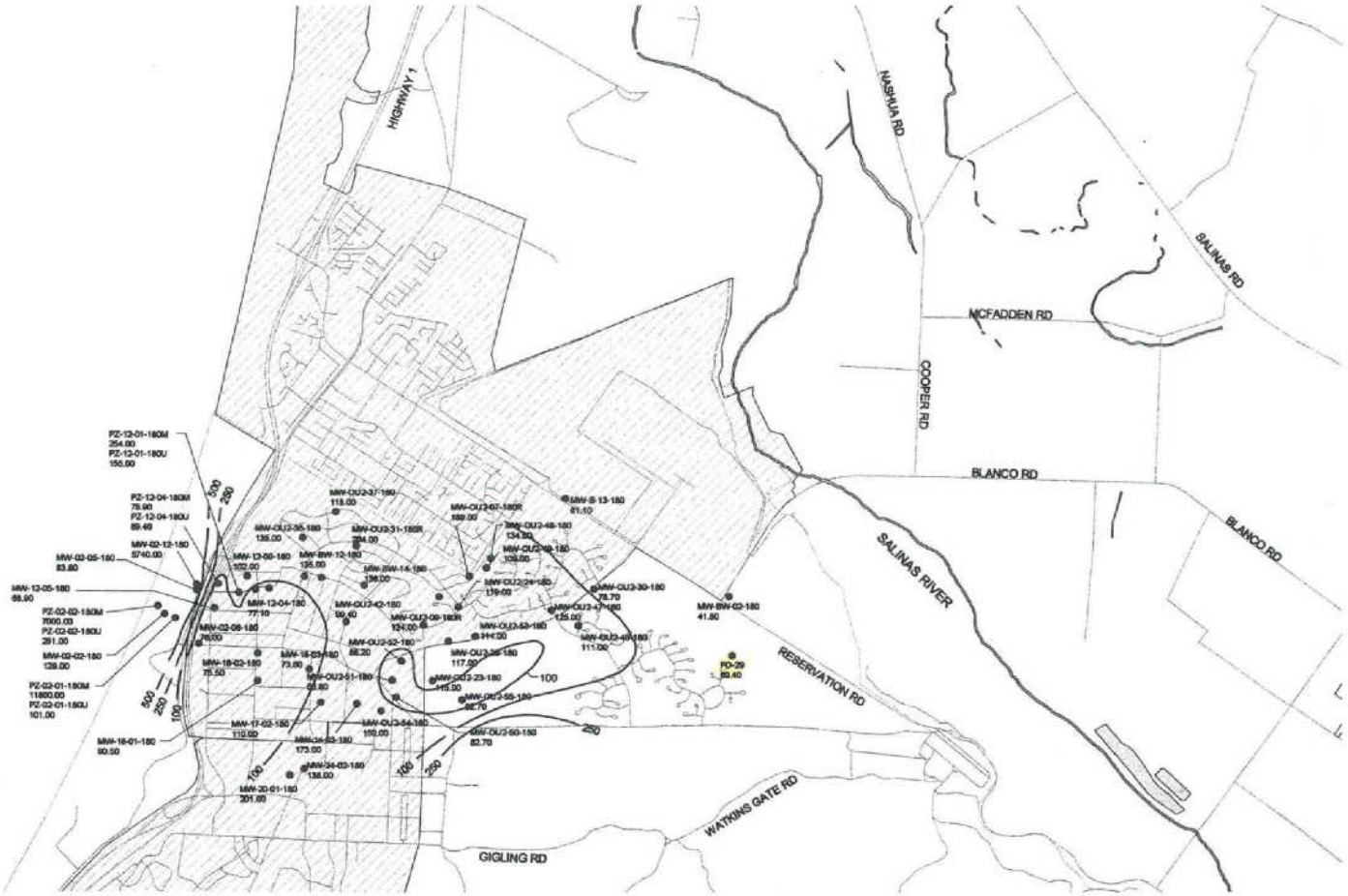
Harding ESE
A MACTEC COMPANY

180-Foot Aquifer
Ground Water Elevations (feet MSL), 1999
Hydrogeologic Investigation of the Salinas Valley Basin
in the Vicinity of Fort Ord and Marina
Monterey County Water Resources Agency
Salinas Valley, California

PLATE
10

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
TJH	51750 007	MDT	4/01	

mcwrawl2.spr - wl_180-99 - 4/10/01



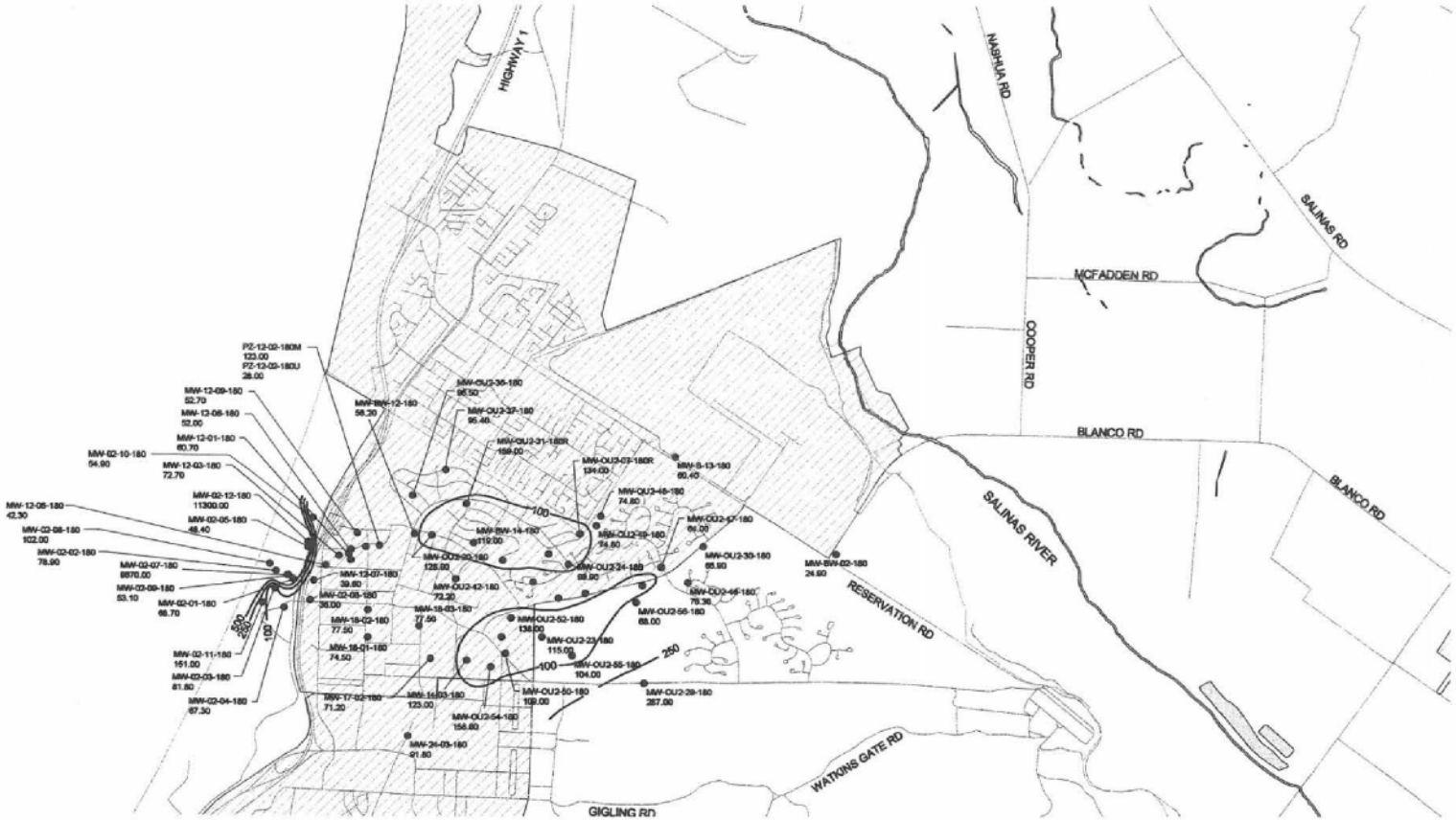
Harding ESE
A MACTEC COMPANY

Upper 180-foot Aquifer
Chloride Concentrations, 1997
Hydrogeologic Investigation of the Salinas Valley Basin
in the Vicinity of Fort Ord and Marina
Monterey County Water Resources Agency
Salinas Valley, California

PLATE 13

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
TJH	51750 007	NDT	4/01	

mcwra3.apr - Chloride-180-97 - 4/10/01



EXPLANATION

CHLORIDE CONCENTRATION CONTOUR (mg/L)

WELL LOCATION

N

4000 0 4000 Feet

Harding ESE
A MACTEC COMPANY

Upper 180-foot Aquifer
Chloride Concentrations, 1999
Hydrogeologic Investigation of the Salinas Valley Basin
in the Vicinity of Fort Ord and Marina
Monterey County Water Resources Agency
Salinas Valley, California

PLATE 14

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
TJH	51750 007	MDT	4/01	

mcwra3.apr - Chloride-180-99 - 4/10/01

4000 0 4000 Feet

Harding ESE
A MACTEC COMPANY

Seawater Intrusion Map
180-foot Aquifer, 1997
Hydrogeologic Investigation of the Salinas Valley Basin
in the Vicinity of Fort Ord and Marina
Monterey County Water Resources Agency
Salinas Valley, California

PLATE 15

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
TJH	51750 007	MDT	4/01	

mowre3.apr - Chloride-180-97 - 4/10/01

EXPLANATION

100 —— 1999 CHLORIDE
250 —— CONCENTRATION
500 —— CONTOURS (mg/L)

- - - 1997 CHLORIDE CONCENTRATION CONTOUR (500 mg/L)

—— 1985 CHLORIDE CONCENTRATION CONTOUR (500 mg/L)

-·-·- 1975 CHLORIDE CONCENTRATION CONTOUR (500 mg/L)

4000 0 4000 Feet

Harding ESE
A MACTEC COMPANY

Seawater Intrusion
180-foot Aquifer, 1999
Hydrogeologic Investigation of the Salinas Valley Basin
in the Vicinity of Fort Ord and Marina
Monterey County Water Resources Agency
Salinas Valley, California

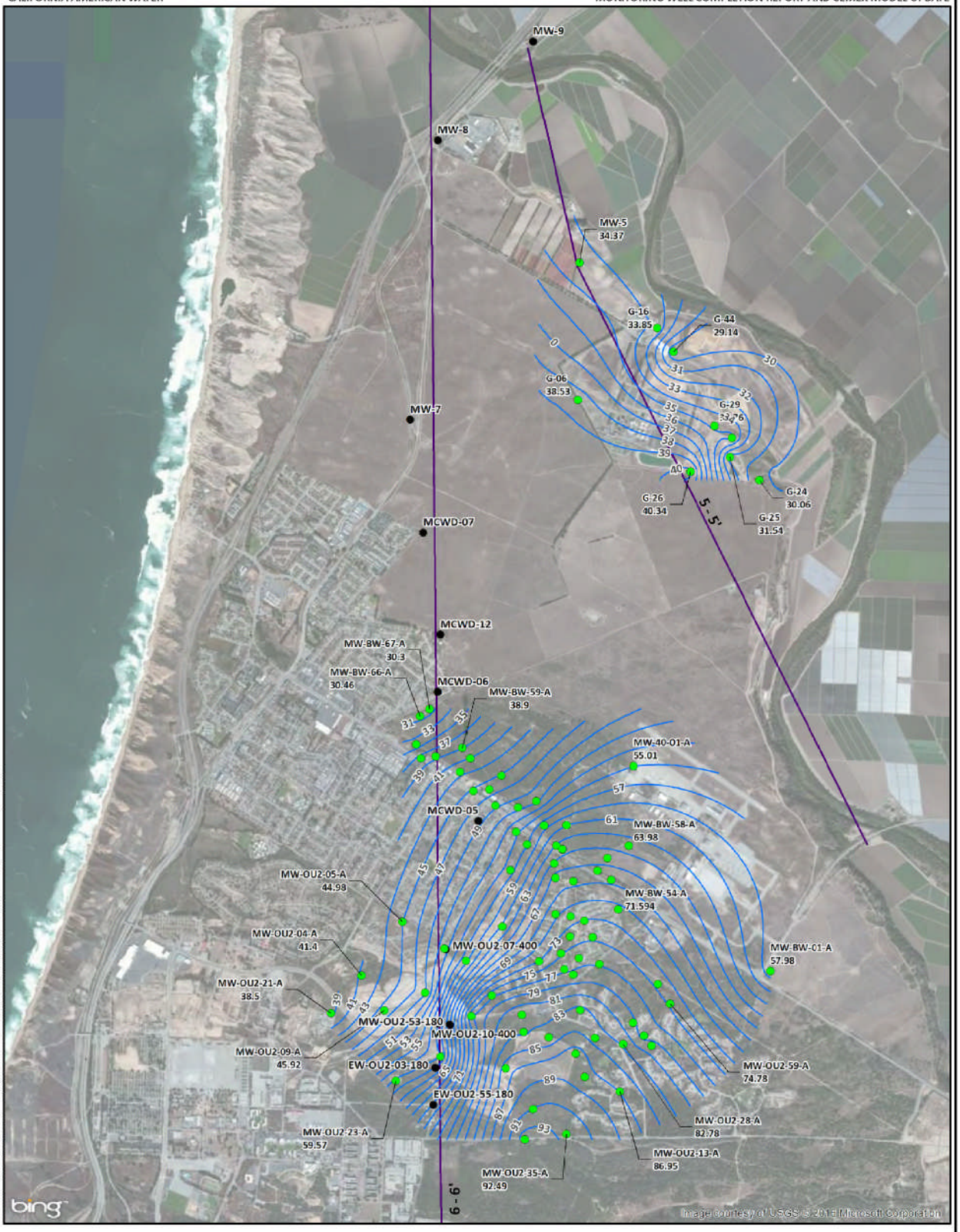
PLATE 16

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED DATE
TJH	51750 007	MDT	4/01	

mcwrs3.apr - Chloride-L180-99 - 4/10/01

Appendix B

Selected figures from Geoscience Monterey Peninsula Water Supply Project Hydrogeologic Investigation-TM2 Monitoring Well Completion Report. Released July 2016



Monitoring Wells

-40- Groundwater Elevations (ft msl)

Cross-Section Location

GROUNDWATER ELEVATIONS - "PERCHED AQUIFER" (USING FORT ORD "A" AQUIFER WELLS, MCPCA 35-FOOT AQUIFER WELLS, AND MPWSP MW-5S) FALL 2015

15-Jul-16

Prepared by: HL Map Projection: State Plane 1983, Zone V.

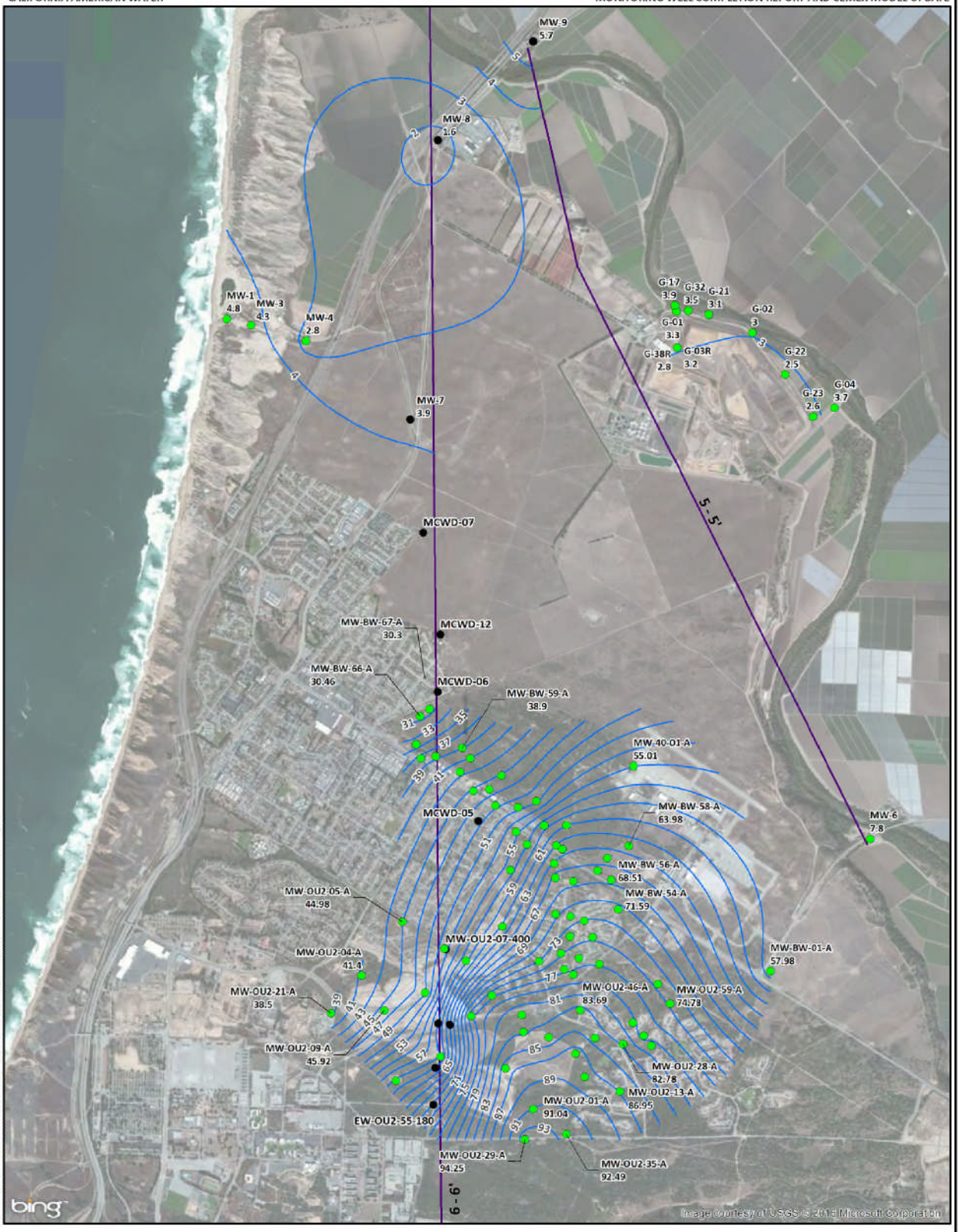
NORTH

0 2,000 4,000 Feet

GEOSCIENCE
GEOSCIENCE Support Services, Inc.
P.O. Box 220, Claremont, CA 91711
Tel: (909) 451-6650 Fax: (909) 451-6638
www.geoinc.com

DRAFT

Figure 9



W:\GIS_proj\mcwap_cal_am\cal-am_CEMEX_model\Model_Calibration\4_Fig_10_Fort_Ord_A_MWs_2ft_Aquifer_7-16.mxd

Monitoring Wells

-40- Groundwater Elevations (ft msl)

Cross-Section Location

GROUNDWATER ELEVATIONS - "DUNE SAND AQUIFER" (USING MCPCA -2-FOOT AQUIFER WELLS, AND MPWSP SHALLOW COMPLETIONS AND SHOWING FORT ORD PERCHED "A" MONITORING WELLS) FALL 2015

15-Jul-16

Prepared by: HL Map Projection: State Plane 1983, Zone V.

NORTH

0 2,000 4,000 Feet

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GEOSCIENCE Support Services, Inc.
P.O. Box 220, Claremont, CA 91711
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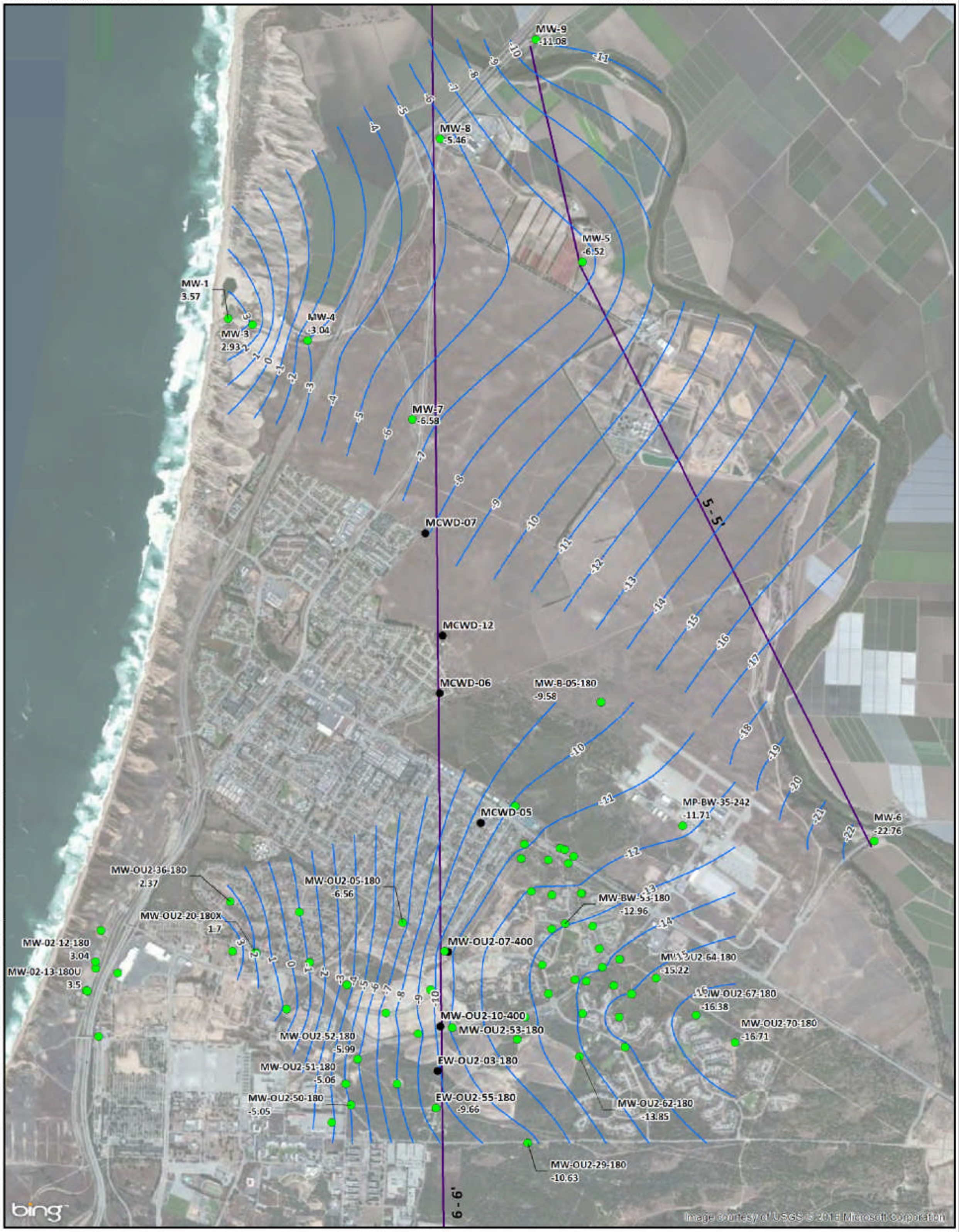
www.geoinc.com

DRAFT

Figure 10



● Monitoring Wells

-40- Groundwater Elevations (ft msl)

— Cross-Section Location

GROUNDWATER ELEVATIONS - "180-FTE/180-FOOT AQUIFER" (USING FORT ORD UPPER 180-FOOT AQUIFER WELLS AND MPWSP MIDDLE MIDDLE COMPLETIONS) FALL 2015

15-Jul-16

Prepared by: HL Map Projection: State Plane 1983, Zone V.

NORTH

0 2,000 4,000 Feet

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Figure 11