November 1, 2019

City of Marina Groundwater Sustainability Agency
211 Hillcrest Avenue
Marina, CA 93933
Attn: Brian McMinn, Public Works Director/City Engineer
publicworksengineeringdept@cityofmarina.org

SUBJECT: HWG COMMENTS ON CITY OF MARINA DRAFT GROUNDWATER SUSTAINABILITY PLAN FOR THE MARINA GSA AREA OF THE 180/400 FOOT AQUIFER SUBBASIN DATED OCTOBER 2019

Dear Mr. McMinn:

This letter provides the comments of the Hydrogeologic Working Group (HWG) on the City of Marina's Draft Groundwater Sustainability Plan (GSP) for the proposed City of Marina (Marina) Groundwater Sustainability Agency (GSA) Plan Area of the 180/400 Foot Aquifer Subbasin. Marina developed this Draft GSP for a very small area (400 acres) already covered by the Salinas Valley Basin (SVB) GSA Groundwater Sustainability Plan, thereby creating many current and potential future conflicts for meeting the requirements of the Sustainable Groundwater Management Act (SGMA). The Marina GSP develops a monitoring network with Representative Monitoring Sites (RMS) and sets sustainable management criteria (SMC) for locations largely outside of its Plan Area. Regardless of the conflicts it creates, the City of Marina Draft GSP is based on a faulty Basin Setting, unjustified sustainable management criteria, and makes no attempt to address the only viable aquifer within its boundaries (the Deep Aquifer). This letter provides both an Executive Summary highlighting some of our main comments, and a Detailed Comments section. It should be noted that the Executive Summary and Detailed Comments provided in this letter are not comprehensive (due in part to the size of the draft GSP and limited time for HWG members to review), and our lack of comment on a specific point or issue in the draft GSP should not be taken as HWG concurrence on or acceptance of that specific point or issue.

EXECUTIVE SUMMARY

The City of Marina Draft GSP made available for public review in October 2019 has several major fatal flaws that can generally be categorized as follows: flawed Basin Setting analyses, inappropriate and unjustified application of sustainable management criteria, a flawed monitoring program, lack of its own projects and legitimate management actions, and major conflicts with the SVB GSP. An overall comment is that the entire document is based on the questionable premise that the groundwater resources within MGSA can be used beneficially and that groundwater extraction within MGSA (from the Dune Sand Aquifer, 180-FTE Aquifer, or 400-Foot Aquifer) does harm to that resource. Our high-level summary comments on the key Draft GSP chapters are provided below, with a detailed comments section following this Executive Summary.

HWG 1

HWG 2

HWG summary comments on the flawed Basin Setting analyses (Chapter 3) are:

- The GSP presents a flawed hydrogeologic conceptual model (HCM) based on incorrect and invalid hydrogeologic interpretations of the aerial electromagnetics (AEM) surface geophysics and other data that is not in agreement with available field data including boring logs, aquifer test, groundwater level, and groundwater quality data;
- The Marina GSA made no attempt to enlist the support and expertise of the Hydrogeologic Working Group (HWG) members (or utilize the most up-to-date hydrogeologic conceptual model for the area in the HWG Technical Report) in understanding the hydrogeology of the area even the though the HWG has recently provided oversight on the most recent and an extensive investigation of the hydrogeology specific to the MGSA area;
- Groundwater levels/quality and aquifer/aquitard continuity are mischaracterized both outside and especially within the MGSA Plan Area;
- The flawed Basin Setting analyses create many conflicts with the Salinas Valley Basin GSP;
- The nature of seawater intrusion and the resulting impacts to potential beneficial uses is grossly mischaracterized;
- The extremely flawed Basin Setting analyses lead to flawed and improper setting of sustainable management criteria.

HWG 3

HWG comments on the sustainable management criteria presented in the Marina GSP (Chapter 4) are:

- The GSP attempts to set SMC for areas outside of its Plan Area are unjustified and outside of its jurisdiction, and an attempt to usurp authority that belongs to the SVBGSA;
- The GSP sets strict SMC based on inappropriate and flawed interpretations of technical data and analyses;
- The GSP SMC inside and outside of the MGSA Plan Area present many conflicts to the SVBGSA GSP and interfere with key projects and management actions listed in the SVB GSP.

HWG 4

HWG comments on the monitoring program presented and adopted in the Marina GSP (Chapter 5) are:

- Without approval and development of the Monterey Peninsula Water Supply Project (MPWSP), the monitoring program described in the GSP will not be funded, installed, or monitoring initiated;
- The monitoring program is composed of representative monitoring sites located primarily outside of the MGSA Plan Area, which is not appropriate or within the jurisdiction of Marina GSA and in direct conflict with the SVB GSP.

HWG 5

HWG comments on the projects and management actions included in the Marina GSP (Chapter 6) include:

- The Marina GSP presents no projects or legitimate management actions of its own;
- The Marina GSP selectively agrees with certain SVBGSP projects and management actions and then sets SMC to prevent implementation of other SVB GSP projects and management actions it disagrees with, which presents a clear conflict with SVB GSP;
- From the beginning of the document and all throughout the chapters, the MGSA GSP speaks about the MPWSP as a project, providing numerous opinions about its potential negative impacts without formally including the MPWSP as a potential project, consistent with the recommendations of the SVBGSP;

HWG 6

HWG comments on the conflicts of the Marina GSP with the Salinas Valley Basin GSP include:

- The Marina GSP attempts to set SMC in areas under the sole jurisdiction of SVB GSP;
- The Marina GSP attempts to apply SVB GSP SMC to locations not included in the SVB GSP, which is a conflict that would have the effect of preventing implementation of certain SVB GSP projects and management actions;
- The Marina GSP designates the Dune Sand Aquifer (DSA) as a principal aquifer for which minimum thresholds (MTs) and measurable objectives (MOs) are assigned; thereby creating a clear conflict with the SVB GSP that specifically declined to designate the Dune Sand Aquifer as a principal aquifer even though MCWD consultants specifically brought it to the attention of SVB GSA and requested it be designated a principal aquifer in the SVB GSP;
- The Marina GSP sets SMC that would prevent implementation of certain key SVB GSP projects/management actions

More specific and detailed comments on City of Marina's Draft GSP are provided below.

DETAILED COMMENTS

Chapter 1 - Introduction

HWG 7

1.The GSP states, "A locally-focused GSP is needed in the MGSA Area to address the hydrogeologic conditions and management needs unique to this portion of the Subbasin." (Section 1.1, page 1-3)

HWG Comment: *The MGSP does not provide the hydrogeologic foundation and justification to support the need for a locally-focused GSP.*

HWG 8

2. The GSP states, "Near the shore, where the highest groundwater salinities have been documented, an interface between a seawater intrusion wedge and a zone of higher quality groundwater (the low total dissolved solids [TDS] zone) that is locally recharged through the highly permeable Dune Sand Aquifer extends downward into the 180-Foot Aquifer. (Section 1.1, page 1-3)

HWG Comment: *There is no technical support for this statement. Additional comments related to this statement are provided in subsequent sections of this letter.*

HWG 9

3. The GSP states, "A state of equilibrium exists between a more saline, dense seawater intrusion wedge that tends to flow landwards, and an over-riding, less dense and higher quality groundwater zone that tends to flow shoreward." (Section 1.1, pages 1-3 and 1-4)

HWG Comment: *This description is too simplistic for a complex system, where there are multiple saline wedges that have intruded inland several miles over several decades. The GSP provides no technical drawings to support this statement nor does it reference actual physical data.*

HWG 10

4. The GSP states, "The freshwater that potentially flows from the Dune Sand Aquifer to the upper 180-Foot Aquifer may also contribute to maintaining this high quality groundwater zone." (Section 1.1, page 1-4)

HWG Comment: *There is no technical support provided for this statement that also uses the words "potentially" and "may" (further demonstrating the uncertainty of the statement).*

HWG 11

5. The GSP states that MCWRA, "…prohibited the expansion of groundwater extraction in the Deep Aquifers. As such, a key objective of the MGSA GSP is to protect the existing high quality of waters in the Deep Aquifers underlying the MGSA Area."

HWG Comment: *While the GSP states here that protection of the Deep Aquifer beneath he MGSA is critical, the GSP actually allows for dramatic increases in Deep Aquifer pumping by MCWD and sets no SMC for groundwater levels in the Deep Aquifer.*

HWG 12

6. The GSP states, "Based on the data discussed in Chapter 3 (Basin Setting), maintaining the groundwater elevations and thickness of the higher quality groundwater zone (low TDS zone) needed to protect against seawater intrusion will largely prevent undesirable results from occurring for all six sustainability indicators in the MGSA Area, and will support the sustainability goals of the neighboring GSAs." (Section 1.2, page 1-6).

HWG Comment: *There is no data to support this statement; and, in fact, available data support a conclusion opposite to this statement.*

Chapter 2 – Plan Area

HWG 13

1. The GSP states, "Figure 2-9, Figure 2-10, and Figure 2-11 show the density of domestic, municipal, and production wells per square mile in the vicinity of the MGSA Area, as available from the DWR Well Completion Report Map Application (DWR 2019a)." (Section 2.1.3, pages 2-8 to 2-9)

HWG Comment: *DWR Completion reports do not note whether wells are active or abandoned.*

HWG 14

2. The GSP states, "CEMEX has two production wells at the CEMEX Lapis Plant sand mine site (one active and one inactive)."

HWG Comment: *This is Incorrect information, the second CEMEX well has collapsed casing and cannot be used again without re-drilling.*

HWG 15

3.The GSP states, "Groundwater in the MGSA Area is currently used for industrial supply at the CEMEX Lapis Plant sand mine site, and groundwater containing less than 3,000 mg/L TDS has a designated potential beneficial use as a source of domestic and municipal supply." (Section 2.2.7.3, page 2-18)

HWG Comment: *The CEMEX wells produce water with approximately 19,000 mg/L TDS for industrial uses (washing sand). A TDS concentration of 3,000 mg/L requires treatment for municipal and domestic uses.*

HWG 16

4.The GSP states, "The slant wells would extract a combined volume of approximately 17,400 AFY of groundwater consisting of a combination of saline groundwater (some of which originated in the ocean) and low total dissolved solids (TDS) groundwater from the Dune Sand and 180-Foot Aquifers within the Subbasin (HWG 2017)." (Section 2.3.2, page 2-26)

HWG Comment: *This is an incorrect and unsupported statement. The vast majority of extracted water will be sourced from the ocean, and Dune Sand Aquifer water quality is near seawater quality at the coast and brackish water quality inland. Few localized areas of lower TDS water are present. It is a misrepresentation to attribute this statement to the HWG 2017 and not clear why this statement is attributed to HWG 2017.*

HWG 17

5.The GSP states, "If the proposed MPWSP is fully approved and implemented, or if well extractions by others are proposed, such extractions of groundwater potentially may cause exceedances of measurable objectives established for the MGSA Area and trigger the need for management actions." (Section 2.3.2, page 2-26)

HWG Comment: *There is no supporting data for this opinion/assumption, which appears to be placed in this section just get this opinion in the GSP. Furthermore, measurable objectives ae meant to represent average basin conditions after sustainability is achieved, with seasonal and year to year fluctuations around the MO. The MO is not meant to be a trigger level.*

Chapter 3 – Basin Setting

HWG 18

1. The GSP states, "…the aquifers above a depth of approximately 700 feet are seawater intruded…" (Section 3.1.2.2, page 3-3).

HWG Comment: *Just to clarify and provide more detail, the seawater intruded aquifers in the MGSA Plan Area include the Dune Sand Aquifer, the 180-FTE Aquifer, and the 400-Foot Aquifer. These aquifers extend to a depth ranging from about 575 to 700 feet in the Marina GSP Plan Area and surrounding region; thus, the vertical extent of seawater intrusion ranges from 575 to 700 feet below ground surface (bgs). The uppermost Deep Aquifer occurs at a depth of 900 feet bgs, and there is 200 to 300 feet of clay between the base of the 400-Foot Aquifer and the top of the uppermost Deep Aquifer. In addition, water level information from the area documents an approximate 60 foot differential in water levels between the 400-ft and Deep Aquifers – documenting the limited connection of these systems.*

HWG 19

2. The GSP states that the vertical boundary of the MGSA Plan Area is 2,000 feet bgs (Section 3.1.2.2, page 3-3).

HWG Comment: *This text description of the vertical boundary is in conflict with Figure 3-3, which appears to show a vertical boundary of 800 to 1,200 feet bgs.*

3. The GSP relies on old geologic cross-sections (Section 3.1.6, page 3-10).

HWG 20

HWG Comment: *The cited geologic cross-section references and (Figures 3-6 and 3-11 to 3-13 do not utilize best available science and most recent borehole and geophysical logs for wells drilled within MGSA and nearby, nor do they utilize the most recent geologic cross-sections developed based on these data (see HWG, November 2017). This results in gross misrepresentation of hydrogeologic conditions for the MGSA Plan Area. Furthermore, the geologic cross-sections provided in the GSP (Figures 3-6, 3-11, 3-12, and 3-13) are not even located within the MGSA Plan Area and therefore to not meet the GSP requirements. Geologic cross-sections that use the latest available data and occur within the MGSA are provided in the HWG Final Technical Report (HWG, November 2017).*

4. The GSP relies on Gottschalk (2018) for discussion/description of geologic units (Section 3.1.6, page 3-11).

HWG 21

HWG Comment: *Mr. Gottschalk is not a geologist and relied primarily on surface geophysics in the cited report. The HWG has previously demonstrated the flaws and incorrect hydrostratigraphic interpretations based on the surface geophysics data (e.g., HWG, April 12, 2019). A detailed description of the geology within and adjacent to the MGSA Plan Area based on latest available data and best available science is provided in the HWG Final Technical Report (HWG, November 2017).*

5.The GSP repeatedly refers to "low-TDS groundwater" throughout the document (e.g., Section 3.1.6.1, page 3-11, Section 3.2.2, page 3-35).

HWG 22

HWG Comment: *The GSP applies the term "low-TDS groundwater" to groundwater with TDS up to 3,000 mg/L as inferred by surface geophysics. Notwithstanding all the uncertainty inherent in attempts to quantify both TDS and lithology from surface geophysics data discussed in numerous previous documents by the HWG (e.g., November 2017, January 2018, August 2018, January 2019, March 2019, April 2019), it has been demonstrated that groundwater with TDS greater than 1,000 mg/L has chloride levels exceeding MCLs such that it cannot be used for municipal or agricultural use without desalination. Furthermore, it has been shown that groundwater in the region with TDS greater than 1,500 mg/L has chloride exceeding the 500 mg/L standard used by MCWRA in mapping seawater intrusion. The surface geophysics study referenced in the GSP (Gottschalk, 2018) made no attempt to distinguish and map occurrence of groundwater TDS greater than 1,000 or 1,500 mg/L. Thus, references in the GSP to "low-TDS groundwater" includes primarily areas with groundwater having chloride greater than 500 mg/L that are included by MCWRA in mapping the seawater intruded area of the groundwater basin.*

6.The GSP mischaracterizes the Dune Sand Aquifer in multiple instances in the GSP. One example is the attempt to label the Dune Sand Aquifer as a "principal aquifer" (Section 3.1.6.1, page 3-11).

HWG 23

HWG Comment: *The Dune Sand Aquifer is not a principal aquifer in the subbasin, as is essentially acknowledged in the GSP where it states, "…it is not commonly used for drinking water or agricultural irrigation". The MCWRA, which has studied and characterized the groundwater basin for many decades,*

does not consider the Dune Sand Aquifer as a principal aquifer. The Salinas Valley Basin (SVB) GSP also does not treat the Dune Sand Aquifer as a principal aquifer. This is one example of the many conflicts that the MGSA GSP creates with the SVB GSP that already covers the MGSA GSP Plan Area.

7.The GSP does not distinguish and describe the differences between the Salinas Valley Aquitard (SVA) and Fort-Ord Salinas Valley Aquitard (FO-SVA) and its significance to the perched/mounded aquifer (underlain by FO-SVA) versus the Dune Sand Aquifer and its equivalents (not underlain by FO-SVA in many places in the document (Section 3.1.6.1, page 3-11).

HWG 24

HWG Comment: *It should be noted that the SVA and FO-SVA are not the same aquitard and FO-SVA occurs at a much higher elevation; therefore, they should not be referred to as the same aquitard. Of primary significance regarding characterization of the shallow aquifer system is that pumping from the proposed MPWSP will have no impact on the perched-mounded aquifer, which is the primary area of the claimed low-TDS groundwater (3,000 mg/L TDS or less; chloride up to 1,000 mg/L or greater). Also, the western edge of this area lies well outside the MGSA Plan Area approximately 0.5 miles or further to the east near MW-7 (HWG, 2017).*

8.The GSP states, "The thinning of the SVA is coincident with a drop in the hydraulic head in the Dune Sand Aquifer (Section 3.1.6.1, page 3-11).

HWG 25

HWG Comment: *The GSP reference to SVA should be FO-SVA. Also, the reference to "thinning" of the aquitard is really a pinching out of the aquitard. The area where the FO-SVA pinches out is the demarcation between the Perched/Mounded Aquifer and the Dune Sand Aquifer (oceanward of this point). Future pumping from the MPWSP would not affect the hydraulically separate Perched/Mounded Aquifer, which is where most of the referenced "low-TDS water" is located.*

9.The GSP states, "In the MGSA Area, the Dune Sand Aquifer is seawater intruded; however, high recharge rates have resulted in a large zone of groundwater containing lower concentrations of TDS immediately east of, and extending into the eastern portion of, the MGSA area." (Section 3.1.6.1, page 3-11).

HWG 26

HWG Comment: *We agree that the Dune Sand Aquifer is seawater intruded in the MGSA area; this is fully documented by TDS concentrations from MW-1S, 3S, and 4S that extend from about 400 feet east of the western edge of MGSA to the eastern boundary of MGSA (actually MW-4 is slightly east of most of the eastern boundary of MGSA). These concentrations range from 34,400 mg/L TDS in the western portion of MGSA to 7,700 mg/L TDS at the eastern boundary of MGSA. Thus, it is clear from field data that no so-called "low-TDS water" (which is really brackish water with chlorides exceeding 1,000 mg/L) exists within the MGSA. As stated above, the purported "low-TDS" zone is not immediately adjacent to the eastern boundary of the MGSA Plan Area.*

10. The following sentence in the GSP states, "The seaward discharge of low TDS groundwater from this area, and the flow of groundwater from the Dune Sand Aquifer to the Upper 180-Foot Aquifer, appears to mound groundwater in the Dune Sand and Upper 180-Foot Aquifers near the coast, creating a local groundwater barrier against encroaching seawater intrusion." ((Section 3.1.6.1, page 3-11).

HWG 27

HWG Comment: *As explained above, there is no "low TDS groundwater" in the MGSA Plan Area, so there can be no seaward discharge of such water. Furthermore, groundwater flows over the edge of the FO-SVA (where is pinches out) from the Perched/Mounded aquifer (not the Dune Sand Aquifer) into the underlying 180-FTE Aquifer approximately 0.75 mile inland of the eastern edge of the MGSA Plan Area (not near the coast), and there is no indication any significant mound is created from this small amount of groundwater flow that clearly is not impeding seawater intrusion.*

11. The GSP states, "…near the MGSA Area, the Dune Sand Aquifer is hydraulically connected to, and supports, local groundwater-dependent ecosystems (GDEs), including palustrine and emergent wetlands which support protected species." (Section 3.1.6.1, page 3-12). The Marina GSP references GDEs in several places throughout the document (e.g., pages 3-16, 3-19, 3-24, 3-42, 3-60, 3-72, 4-6, 4-10, 4-12)

HWG 28

HWG Comment: *It is most important to note that no GDEs occur within the MGSA Plan Area, and the MGSA GSP has no jurisdiction to set sustainable management criteria (SMC) for GDEs that occur within only the SVB GSA Plan Area. This is a clear and problematic conflict with the SVB GSP. Furthermore, it is important to note that these nearby areas were not fully evaluated to determine if potential GDEs obtained from TNC mapping are actual GDEs (despite claims to the contrary in the MGSA GSP). The role of surface water in supporting these GDEs, as opposed to groundwater, was not evaluated. In addition, it is clear from MPWSP monitoring well data that the shallow aquifer beneath the GDEs nearest to MGSA is highly saline and would not support (and actually would be detrimental to) most types of vegetation.*

12. The GSP states, "The 180-Foot Aquifer underlies the SVA and is the uppermost regional aquifer that has historically been used as a groundwater supply. Near the MGSA area, it is seawater intruded…"

HWG 29

HWG Comment: *We agree that the 180-FTE Aquifer (referred to in GSP as 180-Foot Aquifer) is the shallowest aquifer historically used for groundwater supply and is seawater intruded in the MGSA area.*

13. The GSP states in reference to the 180/400-Foot Aquitard, "Geophysical studies reported by Gottschalk et. al. (2018) have confirmed this aquitard is discontinuous in and near the MGSA Area, and its hydraulic connection to the overlying 180-Foot Aquifer in the vicinity of the MGSA area is substantiated by available hydrographs (Section 3.2.1.3)." (Section 3.1.6.4, page 3-12).

HWG 30

HWG Comment: *Previous studies (e.g., MCWRA, 2017) cited in various places in the GSP regarding potential gaps in the 180/400-Foot Aquitard did not have the MPWSP borings available to incorporate. These recent data (documented in HWG, 2017) show presence of the 180/400-Foot Aquitard where gaps were previously suggested. In addition, the HWG (April 2019) previously demonstrated that purported gap(s) claimed in the AEM study (Gottschalk, et. al., 2018) were incorrectly interpreted and the gap(s) in fact do not exist. Finally, review of boring logs and water level data (head differences and different patterns of fluctuation in different depth zones/aquifers) in the MPWSP monitoring wells or other data demonstrate no gaps are present in the 180/400-Foot Aquitard beneath and near MGSA. Even if there were a gap somewhere in the aquitard, there are significant differences in vertical hydraulic conductivity (much lower) compared to horizontal hydraulic conductivity within aquifers that create a degree of*

confinement and resistance to vertical flow, and reduced heads in the 180-FTW Aquifer from proposed MPWSP slant well pumping would reduce the rate of vertical migration to the 400-Foot Aquifer.

HWG 31

14. The GSP states, "…saline groundwater in the 180-Foot Aquifer, which has been recorded farther inland than in the 400-Foot Aquifer, has been documented to migrate vertically into the 400-Foot Aquifer, deteriorating water quality in the 400-Foot Aquifer…" (Section 3.1.6.5, page 3-13)

HWG Comment: *While this is true, vertical migration to the 400-Foot Aquifer has only been documented to occur several miles inland of the coast and has not been documented in or near the MGSA. In addition, the vertical migration of contamination has been linked primarily to cross connected wells as opposed to aquitard gaps.*

HWG 32

15. The GSP appears to question the integrity of the 400-Foot/Deep Aquitard stating, "More variable lithology has been interpreted from other deep well geophysical logs in the area…", and "…regional continuity and competence are not well understood." (Section 3.1.6.6, page 3-13).

HWG Comment: *Borehole lithologic and geophysical logs for the nearby USGS Deep Aquifer monitoring well and MCWD water supply wells 10, 11, and 12 show 200 to 300 feet of fine-grained clay and silt deposits comprising the 400-Foot/Deep Aquifer Aquitard. The lack of seawater intrusion in the Deep Aquifer, which has groundwater levels on the order of 100 feet below sea level in the MGSA area and a strong vertically downward gradient from the 400-Foot Aquifer, with high salinity in the 400-Foot Aquifer beneath and surrounding the MGSA also shows the strong integrity of the aquitard between the 400-Foot Aquifer and Deep Aquifer.* Again, the large difference in water levels between the 400-Foot Aquifer and Deep Aquifers provides evidence of a thick/tight aquitard separating these aquifer zones.

HWG 33

16. The GSP states that typical specific yield values range from 10 to 30 percent. The GSP also states that specific storage values, which the GSP states are equivalent to storage coefficient values, typically range from 10^{-3} to 10^{-5}.

HWG Comment: *Typical specific yield values actually range from 3% (for clay) to 30% (for gravel). Specific storage values are not the same as storage coefficient values; specific storage values must be multiplied by aquifer thickness to obtain storage coefficient values. The range of 10^{-3} to 10^{-5} cited in the GSP is typical for storage coefficient, while specific storage values are typically 10^{-5} to 10^{-6} per foot.*

HWG 34

17. The aquifer parameter values cited in the GSP for near the MGSA Plan Area are stated to be derived from the CEMEX model (3.1.7.2, page 3-15).

HWG Comment: *The calibrated CEMEX Model parameters do not match the values stated in the GSP. It is important to note there is a large difference in hydraulic conductivity values between the Dune Sand Aquifer (which occurs within 1 to 1.5 miles of the coast) and the Perched/Mounded Aquifer further inland, which is the aquifer containing the purported low-TDS water east of the MGSA area. As indicated in the more regional groundwater model used in the FEIR (CPUC, 2018), the Perched/Mounded Aquifer has much lower K values ranging from 2 to 4 feet/day compared to the much higher values cited in the GSP.*

18. The GSP states, "The Dune Sand Aquifer is not currently used as a water supply, but does support surface water systems and does yield water to GDEs in the immediate vicinity of the MGSA Area…" (Section 3.1.8, page 3-16).

HWG 35

HWG Comment: *We agree that the Dune Sand Aquifer is not used as a water supply. There are no GDEs within the MGSA area, and the Marina GSP has no jurisdiction over setting SMC for GDEs. Furthermore, the GSP assumes nearby mapped Potential GDEs are Actual GDEs without evaluating the more likely contribution of surface water in maintaining vegetation in these areas and without considering the fact that shallow groundwater is saline in the mapped Potential GDE areas near MGSA.*

19. With regard to pumping from the CEMEX well in the MGSA Area, the GSP states, "The amount of groundwater produced from the lower TDS zone in the upper 180-Foot Aquifer vs. saline groundwater from the deeper portions of the 180-Foot Aquifer and the underlying 400-Foot Aquifer is not known." (Section 3.1.8, page 3-16).

HWG 36

HWG Comment: *Available data clearly demonstrate that there is no lower TDS water within the MGSA area in the 180-Foot and 400-Foot Aquifers.*

20. With regard to the potential MPWSP slant wells, the GSP states, "The wells would extract water radially from the DSA and 180-Foot Aquifer near the coast. Groundwater captured by the wells would include saline groundwater originating outside the western (seaward) Subbasin boundary, saline groundwater from aquifers within the Subbasin, and low-TDS groundwater from aquifers within the Subbasin." (Section 3.1.8, page 3-17; Section 3.3.8.1, page 3-58).

HWG 37

HWG Comment: *There are several corrections and clarifications that need to be made to this text. First, the wells would not extract water in a radial pattern, rather most of the water flowing to the wells would be derived from the ocean side of the wells. Second, the wells would capture saline water seeping through the seabed and migrating a short distance through the Dune Sand Aquifer and 180-Foot Aquifer to the slant well screens, as opposed to the referenced, "saline groundwater" from west of the Subbasin boundary. Third, is that the slant wells will capture a small amount of brackish water (as opposed to low-TDS groundwater) from the Subbasin aquifers.*

21. The GSP states the following with regard to pumping from Marina Coast Water District Deep Aquifer wells, "The combined extraction from these wells was approximately 1,823 AFY in 2015, and is forecast to increase to 3,905 AFY by 2035…" (Section 3.1.8, page 3-17).

HWG 38

HWG Comment: *While the Marina GSP states its support for prohibition against pumping from new Deep Aquifer wells, it is silent on the issue of increased pumping from existing Deep Aquifer wells. The cited MCWD Deep Aquifer pumping numbers represent a greater than doubling of the amount of current pumping from the Deep Aquifer, a pumping amount that already results in Deep Aquifer water levels east of the GSP boundary on the order of 60-100 feet below sea level. Also, whereas, as stated above, it is inappropriate for the GSP to proscribe SMC outside of its jurisdiction, the combined pumpage of the existing agricultural deep aquifer wells just east of the GSP boundary is approximately 5,000 acre-feet/year (AFY). Such increased pumping from the Deep Aquifer by MCWD and others is likely not*

sustainable, but the Marina GSP provides no SMC for Deep Aquifer groundwater levels or storage even though it is the only viable and potable aquifer within its boundaries.

HWG 39

22. The GSP references Figure 3-15 as being from a report for the Central Coast Groundwater Coalition (Section 3.1.9, page 3-17).

HWG Comment: *On Figure 3-15 the cited reference is MCWRA, 2017.*

HWG 40

23. The GSP discusses the need to protect groundwater with TDS of 3,000 mg/L and states, "…a prominent zone of higher quality groundwater extends approximately from the eastern portion of the MGSA Area eastward through the area underlain by the Dune Sand Aquifer, and extends vertically downward into the 180-Foot Aquifer (Gottschalk et.al., 2018)." (Section 3.1.9, Pages 3-18 to 3-19).

HWG Comment: *As stated previously in this document and described in the HWG Final Report (November 2017), there is no groundwater less than 3,000 mg/L within the MGSA Plan Area, so the statement in the text about such water extending from the eastern portion of the MGSA Area is incorrect. Well MW-4 on the eastern boundary of the MGSA area has no groundwater less than 7,500 mg/L TDS. Furthermore, it is important to note that groundwater to the east of the MGSA area that is 3,000 mg/L TDS has chloride concentrations exceeding 1,000 mg/L, which is approximately twice the highest MCL for chloride and therefore a non-potable source of water for domestic, municipal, and agricultural uses.*

HWG 41

24. The GSP states, "These GDEs utilize shallow groundwater from the Dune Sand Aquifer to meet a significant portion of their water demand." (Section 3.1.11.2, page 3-19).

HWG Comment: *The presence of Actual GDEs as opposed to a Potential GDEs has not been fully evaluated in the Marina GSP. We note that any GDE near the MGSA boundary is subject to being underlain by saline shallow groundwater, and the contribution of fresh surface water sources has not been evaluated.*

HWG 42

25. The GSP states, "Potentiometric surface maps prepared for the vicinity of the MGSA Area indicate the groundwater flow direction in the Dune San Aquifer is toward the coast." (Section 3.1.11, page 3-20).

HWG Comment: *The only shallow monitoring wells within the MGSA are MW-1S, MW-3S, and MW-4S. Data from these monitoring wells (under static conditions without the test slant well pumping) show the Dune Sand Aquifer groundwater flow directions within MGSA that vary from inland to relatively flat depending on the season and year being evaluated (see HWG, 2017). Water quality data for these monitoring wells also demonstrates significant seawater intrusion has occurred throughout the MGSA in the Dune Sand Aquifer. Thus, the GSP mischaracterizes shallow groundwater flow within the MGSA Plan Area.*

26. The GSP states, "…there is an upward gradient between the 180-Foot Aquifer and the Dune Sand Aquifer at the monitoring well cluster that is nearest to the coast…" (Section 3.1.11, page 3-20).

HWG 43

HWG Comment: *There is an overall downward gradient between MW-1S and MW-1M under static conditions (without the test slant well pumping). The GSP mischaracterizes the vertical gradient and uses this mischaracterization to argue for a hydrogeologic conceptual model (seaward discharge of groundwater from the Dune Sand Aquifer and upper 180-Foot Aquifer) that is not present beneath MGSA.*

27. The GSP describes the chloride islands found in a study by MCWRA that are located approximately 3.5 to 4.5 miles inland of the MGSA, presents a potential aquitard gap map in Figure 3-20, and generally implies this issue is relevant in the MGSA Plan Area. (Section 3.1.12, page 3-20). The chloride island issue is discussed in other places in the GSP as well (e.g., Section 3.2.3.2, page 3-37).

HWG 44

HWG Comment: *This issue of possible aquitard gaps and chloride islands was documented at locations far inland and not relevant to the Marina GSP. In addition, detailed work by MCWRA was able assign these chloride islands to being caused by poorly constructed wells. The cited study by MCWRA did not have MPWSP monitoring well boring logs available to incorporate in their study. The locations of the MPWSP borings relative to the purported aquitard gaps (GSP Figure 3-20) is displayed in the attached* ***Figure 1****. MPWSP MW-8 has a major clay zone present from approximately 225 to 295 feet bgs and MW-9 has a major clay zone present from approximately 225 to 350 feet bgs (aquitard intervals in other boreholes include: MW-1: 210-275; MW-3: 215-285; MW-4: 260-300; MW-5: 305-395 (higher ground elevation); and MW-7: 225-270).*

28. The GSP goes into a detailed description of the surface geophysics (AEM) study conducted by Marina Coast Water District's consultants. A statement made in the GSP in this section is, "The 180/400-Foot Aquitard is discontinuous and notably absent beneath a portion of the MGSA Area and in a large area located just east of the MGSA Area. This occurs in the vicinity of an area where the aquitard was previously judged to be thin or absent by MCWRA (see Figure 3-20)." (Section 3.1.12, page 3-21)

HWG 45

HWG Comment: *The HWG has previously provided extensive documentation of erroneous hydrogeologic interpretations of the AEM data (HWG, November 2017, January 2018, August 2018, January 2019, March 2019, and April 2019). The HWG April 2019 document clearly demonstrates with field data that the hydrogeologic interpretation of aquitard gaps from the AEM study is invalid. Furthermore, as described above, MPWSP monitoring well borehole logs demonstrate that areas of uncertain aquitard continuity areas identified by MCWRA (who did not have MPWSP monitoring well borehole data available to them at the time of their study) near MGSA are no longer uncertain and clearly have significant aquitard material present. Furthermore, review of water level and water quality data for the MPWSP clearly demonstrate the presence and continuity of the 180/400-Foot Aquitard beneath MGSA and surrounding MGSA.*

HWG 46

29. The GSP states, "The 400-Foot Aquitard is uneven, and the Deep Aquifer occurs at some locations as shallow as depths of approximately 650 feet below the ground surface." (Section 3.1.12, page 3-21 and 3-22).

HWG Comment: *The GSP provides no basis or reference for this description of the 400 Foot/Deep Aquifer Aquitard and the depth to the top of the Deep Aquifer, but it clearly does not apply to the MGSA or vicinity as noted above in Comment 15 for Chapter 3.*

30. The GSP states, "The water quality data show a prominent saline groundwater wedge (>10,000 mg/L TDS) which dives downward from the coast through the Dune Sand and 180-Foot Aquifers, and extends downward into the 400-Foot Aquifer through a large gap in the 180/400 Foot Aquitard." (Section 3.1.12, page 3-22).

HWG 47

HWG Comment: *This characterization of a large gap in the 180/400 Foot Aquitard is based solely on surface geophysics AEM data (not water quality data as stated in GSP text), and was clearly demonstrated to be wrong and contrary to water quality field data in a previous HWG letter (April 2019). This is one major example of invalid hydrogeologic interpretations generated by MCWD consultants from the surface geophysics AEM data. The AEM data hydrogeologic interpretations were not ground-truthed with actual field data that included borehole lithologic logs, borehole geophysical logs, water level data, and water quality data. In fact, many of the surface geophysics AEM data hydrogeologic interpretations are in direct opposition to the readily available field data.*

31. The GSP states, "A correlation between groundwater elevations and GDE stress or habitat quality has not been established." (Section 3.1.13, page 3-24).

HWG 48

HWG Comment: *While we agree this statement is true, the Marina GSP subsequently establishes an unjustified and very stringent minimum threshold for GDEs, the locations of which are not even within MGSA's Plan Area and jurisdiction.*

32. The GSP states, "Before a substantial groundwater extraction is implemented in the MGSA Area, there would be a need for a locally refined groundwater flow model this is able to simulate solute transport and density-driven flow…" (Section 3.1.13, page 3-24).

HWG 49

HWG Comment: *This issue was addressed in the Final Environmental Impact Report (FEIR) for the MPWSP, which essentially concluded such a model was not necessary (section 8.2.12, CPUC, 2018).*

33. The GSP describes the MPWSP nested monitoring well network as having installed one well in each aquifer (Dune Sand Aquifer, 180-Foot Aquifer, and 400-Foot Aquifer) at each of the eight sites. (Section 3.1.13, page 3-26).

HWG 50

HWG Comment: *It should be noted that at site MW-5, the shallow monitoring well is screened in the Perched/Mounded Aquifer and not the Dune Sand Aquifer equivalent at that location; and at the MW-6 site the middle and deep monitoring wells are both screened within the 180-Foot Aquifer.*

34. The GSP provides selected groundwater contour maps for the various aquifers along with discussion of groundwater levels, gradients, and implications thereof (Section 3.2.1.2, pages 3-27 to 3-30, Figures 3-25 to 3-33).

***HWG Comment**: There are several important points to note in this GSP discussion: 1) The GSP only presents groundwater elevations and contour maps for March and April at the peak (highest seasonal) groundwater levels whereas MCWRA focus their analysis of groundwater levels/contours on the Summer and Fall months that are critical to understanding seawater intrusion; 2) the entire GSP analysis of groundwater levels/contours is biased and unrepresentative because it ignores groundwater levels/contour during the majority of the year that drive local and regional seawater intrusion (see HWG 2017 for a more balanced discussion of Spring and Fall groundwater contour maps); 3) presenting a local contour map for March 2015 is not useful because the majority of the MPWSP monitoring well network had not yet been installed; there were plenty of opportunities to prepare and show groundwater contour maps representative of static conditions due to interruptions in test slant well pumping (e.g., June to October 2015; March to May, 2016); 4) the Dune Sand Aquifer groundwater contour map mixes wells from different aquifers (Perched/Mounded Aquifer and Dune Sand Aquifer), which results in mischaracterization of shallow groundwater flow; 5) the March 12, 2017 groundwater contour map either does not show static groundwater level conditions (i.e., the map is misdated), or it mixes groundwater levels for MW-1S and MW-3S for two different times (i.e., test slant well is pumping for the MW-1S reading and not pumping for the MW-3S reading); 6) the April 2018 groundwater contour map indicates groundwater flow from MW-1S, 3S, 4S, and 7S towards MW-8S and the Monterey Landfill monitoring wells, but this is not indicated on Figure 3-27; 7) the March 2017 and April 2018 groundwater contour maps for the 180-FTE Aquifer show steep inland gradients towards MW-6 that are not reflected on the maps (Figure 3-29 and Figure 3-30); 8) all the hydraulic gradient calculations are misleading in terms of magnitude (and in some cases direction) due to use of only Spring groundwater level measurements (see HWG 2017 or a more balanced discussion of magnitude and direction of hydraulic gradients).*

HWG 51

35. The GSP states, "At the landfill, groundwater elevations in the landfill area may be affected by local shallow French drains for landfill hydraulic containment and leachate collection systems…and are lower than expected." (Section 3.2.1.1, page 3-28).

HWG 52

***HWG Comment:** The French drains only impact the uppermost perched zone at the landfill, and do not impact the -2 Foot Aquifer (Dune Sand Aquifer equivalent) well measurements (e.g., Wells G-1, G-2, C-34, and others) shown on the GSP maps.*

36. The GSP terminates groundwater level contours south of the Salinas River to avoid, "…conjecture about the effect of river seepage on groundwater elevations in this area…" (Section 3.2.1.1, page 3-28)

HWG 53

***HWG Comment:** If the GSP had focused on Fall groundwater level measurements and contours as it should have, there would be no need to worry about conjecture regarding river seepage.*

37. The GSP states, "Near the coast in wells MW-1S…groundwater elevations increased by approximately 7 feet…between March 2017 and April 2018." (Section 3.2.1.1, page 3-29)

HWG 54

***HWG Comment:** The GSP is clearly mixing test slant well pumping and non-pumping water level measurements at MW-1S in this statement and on its maps for these two time periods.*

HWG 55

38. The GSP compares September 2018 groundwater elevations to 30-year averages and states it indicates "average stable to somewhat recovering conditions" for the 180-Foot Aquifer (Section 3.2.1.3, page 3-31).

HWG Comment: *The discussion in this section of the GSP is very misleading and compares a single snapshot in time to 30-year averages, and is not indicative of recent or overall conditions in the subbasin that very substantially from year to year.*

HWG 56

39. The GSP discusses MPWSP MW-6M and MW-6M(L) and suggests groundwater levels may indicate, "…an area where the 180-Foot and 400-Foot Aquifers are in direct communication." (Section 3.2.1.3, page 3-33).

HWG Comment: *As is clear from review of the borehole lithologic and geophysical logs, and related discussion by HWG in the Technical Report (November 2017), the 180/400=Foot Aquitard is quite substantial at this location, and the 180-Foot and 400-Foot Aquifers are clearly not in "direct communication."*

HWG 57

40. The GSP states, "In well clusters MW-7, MW-8 and MW-9, there is less separation between the hydrographs for the middle (M) lower (D) wells than in well clusters MW-1, MW-3, and MW-4, indicating the 180/400-Foot Aquitard may be less competent or absent in this area, as also documented by the AEM surveys in this area…" (Section 3.2.1.3, page 3-33)

HWG Comment: *Examination of all available data for the MPWSP monitoring wells (borehole lithologic logs, geophysical logs, groundwater level data, groundwater quality data, pumping test data) consistently demonstrate the presence of substantial hydraulic separation between the 180-FTE and 400-Foot Aquifers in the MPWSP monitoring well network area. In addition, the HWG have demonstrated the hydrogeologic misinterpretation of AEM data with regard to aquitard gaps and other misleading and/or incorrect conclusions from AEM data interpretation (e.g., HWG, April 2019).*

HWG 58

41. The GSP acknowledges that, "There is a cyclical pattern of high groundwater elevations in the winter/spring and low elevations in the summer/fall." (Section 3.2.1.3, page 3-33)

HWG Comment: *While the GSP acknowledges this key fact here, it fails to present or describe groundwater levels, contours, and gradients during the key summer and fall months that drive seawater intrusion in the MGSA and SVBGSA Plan areas.*

42. The GSP states that groundwater levels during the test slant well pumping test declined by "…approximately 8 feet in MW-1S and MW-1M, and by 3 feet in MW-3S and MW-3M…" and that "pumping-related drawdown was too gradual to be readily distinguishable…" in other MPWSP monitoring wells. The GSP goes on to state, "…groundwater elevations in most of these wells appeared to show a sudden recovery (or rebound) when pumping was temporarily discontinued in the spring of 2016." (Section 3.2.1.3, page 3-34).

HWG 59

HWG Comment: *The HWG previously documented (e.g., HWG, July 2015) in detail that drawdowns from pumping the test slant well were approximately 8 feet in MW-1S, 2 feet in MW-3S, negligible in MW-4S, 6 feet in MW-1M, 2 feet in MW-3M, negligible in MW-4M, and 0 in all other MPWSP monitoring wells. The purported "recovery" in spring 2016 had nothing to do with operation of the test slant well, but rather represented regional pumping fluctuations tied to variation in climatic conditions as is apparent by the fact that the recovery started prior to the test slant well being turned off and occurred in aquifers and well locations completely unaffected by test slant well pumping. Furthermore, if such a notable recovery occurred at these well locations upon turning the test slant well off, it would have consistently been observed (but was not) when the test slant well was temporarily turned off on numerous occasions.*

43. The GSP states in reference to monitoring well drawdown during test slant well pumping, "Drawdown in the deep wells illustrates a strong hydraulic connection between the 180-Foot and 400-Foot Aquifer in this area, consistent with a thin or absent 180/400-Foot Aquitard in much of the area." (Section 3.2.1.3, page 3-34).

HWG 60

HWG Comment: *As described above and elsewhere in this comment letter, and in other HWG documents, the cited drawdown in the 400-Foot Aquifer from pumping of the test slant well does not exist and this conclusion is completely erroneous. This erroneous conclusion is further illustrated by the GSP claim that drawdown from test slant well pumping resulted in the greatest drawdown and most rapid response in the 400-Foot Aquifer, which is an aquifer that is not even screened and pumped from in the test slant well.*

44. The GSP states, "In 2017, storage recovered by approximately 24,000 AF, indicating that, as had occurred on several past occasions during the period of record, that significant storage recovery is possible within a relatively short period of time." (Section 3.2.2, page 3-34)

HWG 61

HWG Comment: *It should be noted here that 2016-2017 was a record rainfall year, which is a rare occurrence and would be expected to result in some recovery. It should also be recognized that basin "recovery" can occur in part via seawater intrusion.*

45. In referring to MCWD consultant hydrogeologic interpretation of surface geophysics work the GSP states, "This includes low TDS groundwater identified within the MGSA Area…" (Section 3.2.2, page 3-35)

HWG 62

HWG Comment: *This statement clearly illustrates again the erroneous hydrogeologic interpretation of AEM data presented by MCWD/Marina consultants and in this GSP. While field groundwater level and quality data clearly demonstrate that TDS in the Dune Sand Aquifer, 180-FTE Aquifer, and 400-Foot Aquifer within MGSA exceeds 7,500 mg/L, Marina/MCWD consultants and the MGSA GSP keep stating that such water exists within the MGSA Plan area based on the AEM data. This clearly demonstrates either flawed AEM data or (more likely) a flawed interpretation of the AEM data.*

46. The GSP states, "…it is entirely possible that in an aquifer where seawater intrusion has occurred at 500 mg/L chloride, that there will be large groundwater areas within the 500 mg/L impacted area that have higher quality groundwater than at the leading edge." The GSP also states that groundwater

quality in the seawater intruded area, "…may well be sufficient for many beneficial uses." (Section 3.2.3.1, page 3-36)

HWG 63

HWG Comment: *There is no evidence to support these statements. The so-called "low-TDS" groundwater claimed to be found by interpretation of AEM data has chloride concentrations exceeding the maximum chloride MCL (600 mg/L) and up to 1,000 mg/L or more. Furthermore, this so-called "higher quality groundwater" is not sufficient for domestic, municipal, or agricultural beneficial uses without treatment. Lastly, any attempt to develop any actual better quality groundwater zones (if they were to exist) within the seawater intruded soon will result in rapid salinization of such pumping wells.*

HWG 64

47. The GSP states, "…the seawater intrusion front defined using the 500 mg/L chloride threshold…does not mean that the groundwater within the affected region is no longer suitable for current or potential beneficial uses." (Section 3.2.3.1, page 3-36)

HWG Comment: *Again, the GSP presents no evidence to support this statement.*

HWG 65

48. The GSP states that it "augmented" the MCWRA seawater intrusion maps to show zones of low TDS groundwater "…identified during the AEM survey…" (Section 3.2.3.2, page 3-37).

HWG Comment: *It is not clear why the MCWRA seawater intrusion maps (which show areas of groundwater with chloride exceeding 500 mg/L) need to be "augmented" by "low TDS" zones that have chloride concentrations exceeding 500 mg/L and up to as much as 1,000 mg/L or more. The "augmented" maps really don't display any information of value.*

HWG 66

49. The GSP states, "Geophysical data collected in 2017 indicate that groundwater elevations in the Dune Sand Aquifer are close to the river stage elevation, and decline away from the river, suggesting a losing condition…" (Section 3.2.6.1.1, page 3-41)

HWG Comment: *The surface geophysical data do not provide groundwater elevation data.*

HWG 67

50. The GSP states, "No potential GDEs are mapped in the MGSA Area, but several potential GDEs are located nearby. Potential GDEs near the MGSA Area include riverine wetlands and riparian habitat along the banks of the Salinas River, and Palustrine and emergent wetland areas that are seasonally flooded in depressions a short distance east of the MGSA Area, north in the Salinas River National Wildlife Refuge, and south in the City of Marina." Additional discussion of these potential GDEs located outside of the MGSA Plan Area (and within the undisputed area of SVB GSA GSP) occurs in subsequent paragraphs of the GSP. (Section 3.2.6.1.2, page 3-42 to 3-44.)

HWG Comment: *The fact that no GDEs are located with the Marina GSP Plan Area means that the SVB GSA and GSP (and not City of Maria GSA and GSP) has jurisdiction over that evaluation of (to determine if potential GDEs are considered actual GDEs) and setting of SMC for these GDEs if deemed necessary. We note that Salinas River GDEs are located two miles or further from potential MPWSP slant wells within MGSA. In addition, the fact that nearby GDEs are seasonally flooded and have a seasonal nature to them (and are associated with "a lens of less pervious soil") suggests a surface water source is most likely sustaining vegetation in these areas. The GSP evaluation to determine if potential GDEs are actual*

GDEs did not consider that shallow groundwater in these nearby potential GDE areas is saline or the likelihood that fresh surface water is the primary sustaining factor for these areas and (which means they are not GDEs).

HWG 68

51. The GSP states, "Hydrographs for well MW-4S indicate that the seasonal fluctuation in groundwater elevations in this well was approximately 2 feet, and suggest that pumping-induced drawdown was approximately 1 foot. The above ET analysis demonstrates the correlation between groundwater levels and ET from this wetland, and illustrates its sensitivity to groundwater level declines." (Section 3.2.6.1.2, page 3-44).

HWG Comment: *Previous HWG documents demonstrate negligible drawdown at MW-4S (e.g., HWG, 2015). Available data make clear that there was no drawdown from test slant well pumping at potential GDE locations that are outside the MGSA Plan Area. Any claimed changes in ET (assuming there are any given the wide ranges in ET cited) from the wetland areas is related to other (likely climatic) factors.*

HWG 69

52. The GSP states, "…it is not possible to determine the extent to which the drawdown induced during the test slant well pumping test resulted in significant and unreasonable impacts to the GDE, or whether the results were temporary and reversible." (Section 3.2.6.1.2, page 3-44).

HWG Comment: *As stated above, it is clear from available data that there was no drawdown from test slant well pumping at the referenced potential GDE locations. Thus, the claimed impacts at potential GDE locations (assuming such impacts even occurred) are due to other factors and illustrate the uncertainty of such an analysis. Most importantly, this is a clear and significant conflict with the SVG GSA GSP, which has sole jurisdiction and authority to evaluate potential GDEs within its Plan Area and to determine if SMC need to be set.*

HWG 70

53. The GSP states that since monitoring wells were only installed within MGSA Plan area as of 2015, "…there is little data for development of a local historical water budget prior to 2015."

HWG Comment: *The majority of the water budget is not dependent on well data, which is only needed for evaluation of surface inflow and outflow. The vertical components of the water budget (e.g., recharge from precipitation, surface water, irrigation, and discharge from wells) do not require well data and can be calculated for historic conditions.*

HWG 71

54. The GSP states, "…density-driven convection of saline groundwater in the intruding wedge underlying the MGSA Area likely results in the mixing of saline and low-TDS groundwater in the upper portion of the intruding wedge, which discharges seaward." (Section 3.3.2, page 3-47).

HWG Comment: *This discussion and previous/subsequent discussion in the GSP relative to the Ghyben-Herzberg approximation (e.g., Section 3.3.8.1, page 3-59) are based on there being one continuous seawater wedge in the area. This discussion is fundamentally flawed because each aquifer (Dune Sand Aquifer, 180-FTE Aquifer, and 400-Foot Aquifer) has its own distinct seawater intrusion wedge (and given the stratification within a given aquifer, there are likely multiple "mini-wedges" depending on the distribution of hydraulic conductivity and water levels). Beneath the MGSA, the wedge interfaces with*

"low-TDS groundwater" are inland of the MGSA Plan area for all three aquifers, as demonstrated by lack of any aquifer TDS being less than approximately 7,500 mg/L.

HWG 72

55. Table 3-7 shows groundwater levels and vertical gradients for late March and early April at MPWSP monitoring wells, and Figures 3-25 through 3-33 also show only March/April groundwater level and contours. (Section 3.3.3, pages 3-51 through 3-53).

HWG Comment: *The GSP only shows groundwater levels for the various aquifers at their peak (highest) elevations, and does not provide overall representative groundwater levels, groundwater contours, or vertical gradients. Groundwater levels are considerably lower with steeper inland gradients during other times of year (i.e., before March and after April), but these conditions are not displayed in the GSP (see HWG 2017 for more representative description of groundwater levels and gradients).*

HWG 73

56. The GSP calculates purported subsurface inflow in the Dune Sand Aquifer from the east in the MGSA based on March 2017 groundwater levels. (Section 3.3.7.1, pages 3-56 and 3-57).

HWG Comment: *The GSP uses groundwater levels/gradients from a record wet rainfall year and peak seasonal month for groundwater levels. This calculation should utilize average groundwater levels across a given year and range of climatic conditions across several years. Such a calculation would likely result in no net subsurface inflow from the east, which is evident from the saline groundwater conditions within the Dune Sand Aquifer within the MGSA.*

HWG 74

57. The GSP provides a discussion of the ocean water percentage extracted by the test slant well, and suggests it is unknown but expected to be larger than 10 percent; thus, a value of 30% is used for subsequent water balance calculations. (Section 3.3.8.1, page 3-59)

HWG Comment: *The GSP ignores the weekly water quality data collected from the test slant in discussing the ocean water percentage. This field data was reported in weekly/monthly monitoring reports, and demonstrates that the ocean water percentage averaged 10% over the long term (including record wet year conditions). Thus, the use of a 30% value for ocean water percentage is clearly erroneous as demonstrated by field data.*

HWG 75

58. The GSP states, "Discharge from the Dune Sand Aquifer to the Pacific Ocean is approximately 435 AFY (seaward direction out of the western MGSA boundary)." (Section 3.3.8.1, page 3-59).

HWG Comment: *This statement/calculation is clearly erroneous, and the basis for the calculation is not explained. Again, the only groundwater level data even presented in the GSP is for March/April (the peak/highest groundwater levels in a given year), which are not representative of the average annual condition needed for this calculation.*

HWG 76

59. The GSP states, "…the 400-Foot Aquifer did experience drawdown during test slant well pumping…" (Section 3.3.8.2, page 3-60).

HWG Comment: *This statement/conclusion is clearly erroneous and not supported by the abundant available field data during the three years of test slant well pumping, including several episodes of the*

test slant well being turned off and on, during which drawdown (and recovery) would be demonstrated if it occurred.

HWG 77

60. The GSP states, "…groundwater storage beneath the MGSA Area does not appear to be decreasing at the present. This implies that conditions at the seaward edge of the saline intrusion front in the Subbasin are relatively stable; however significant changes in groundwater pumping in this area could upset this equilibrium and have both local and inland implications for future seawater intrusion." (Section 3.3.9, page 3-61).

HWG Comment: *Stable groundwater storage conditions does not mean there is not continuing seawater intrusion; it just means the inland gradient is relatively constant on an average annual basis. Pumping from the proposed MPWSP within MGSA would serve to help mitigate future inland seawater intrusion as was demonstrated in the MPWSP FEIR.*

HWG 78

61. The GSP makes several assumptions and statements in its discussion of Current Groundwater Budget Supplement (Section 3.3.10.2, pages 3-64 and 3-65).

HWG Comment: *Many of these assumptions/statements are incorrect or not valid, e.g., all test slant well extraction assigned to DSA; much of the inflow into the DSA from the landward side of MGSA Area was captured by the test slant well; the amount of infiltrating seawater cannot be evaluated without a model.*

HWG 79

62. The GSP states, "The proposed pumping of 17,400 AFY of feed water for the MPWSP, if permitted and implemented, would extract primarily saline groundwater from beneath the ocean and saline as well as low TDS groundwater from the Dune Sand and 180-Foot Aquifers in the Subbasin." (Section 3.3.10.4, page 3-69).

HWG Comment: *This sentence is more accurately written as, "The proposed pumping of 17,400 AFY of feed water for the MPWSP, if permitted and implemented, would extract primarily saline water from the ocean and small amounts of saline to brackish groundwater from the Dune Sand and 180-Foot Aquifers in the Subbasin from within the MPWSP slant well capture zone."*

HWG 80

63. The GSP states, "In the Monterey Subbasin, groundwater demand from the Deep Aquifer by MCWD to supply the City of Marina is expected to increase….however, the increase is projected to be within MCWD's allocated pumping rights." (Section 3.3.10.4, page 3-69).

HWG Comment: *Regardless of allocated pumping rights, it remains unclear if the proposed MCWD increase in pumping from the Deep Aquifer is sustainable. In addition, the increased pumping from the Deep Aquifer to the east to support agricultural expansion is based on overlying rights, not allocated (paper water) pumping rights, and are thereby superior to MCWD.*

64. The GSP references in several places the need for modeling of density-driven groundwater flow (e.g., Section 3.3.10.4, page 3-69; Section 3.3.11, page 3-71).

HWG 81

HWG Comment: *Somewhat ironically, if the MGSA Plan area is impacted to the point of needing to consider use of density-dependent groundwater flow software, the groundwater in MGSA is impacted well beyond the point of any undesirable results thresholds (i.e., any reasonable MTs and MOs were exceed long ago by a substantial amount and further degradation by seawater intrusion would have no impact on potential uses of groundwater within MGSA). Regardless, this issue is addressed in Comment 32 for Chapter 3.*

HWG 82

65. The GSP references in multiples places the need to assure that sustainability goals are met. (Section 3.3.10.4, page 3-69).

HWG Comment: *It is not clear what existing groundwater beneath MGSA needs to be sustained given TDS concentrations exceeding 7,500 mg/L in all aquifers other than in the Deep Aquifer, and Deep Aquifer sustainability is not defined and addressed in the GSP.*

HWG 83

66. The GSP states, "The MPWSP monitoring well east of the MGSA Area…did not show a direct response to Slant Well pumping…" (Section 3.3.10.5, page 3-70).

HWG Comment: *While this statement is true, there were also several wells within MGSA GSP Plan Area that showed no response to test slant well pumping including: MW-1D, MW-3D, MW-4S, MW-4M, and MW-4D. The only MPWSP monitoring wells that showed a measurable response to test slant well pumping were MW-1S, MW-1M, MW-3S, and MW-3M.*

HWG 84

67. The GSP states, "Groundwater gradients in the Dune Sand Aquifer remained generally similar throughout the period of record." (Section 3.3.10.5, page 3-70).

HWG Comment: *This statement is incorrect. Groundwater levels were generally lower and had a steeper inland gradient in 2015 and 2016, which were slightly below average to slightly above average rainfall years, compared to subsequent years that showed generally higher groundwater levels due to the record wet year in 2017.*

HWG 85

68. The GSP includes a paragraph on slant well pumping in Section 3.3.11 on page 3-71.

HWG Comment: *The paragraph should be edited as follows: "The amount of landward saline and brackish groundwater from the Subbasin aquifers captured by test slant well pumping was approximately 10% of the amount pumped. A large portion of the groundwater pumped by the test slant well was saline groundwater originating from the ocean outside the western boundary of the Subbasin. The MPWSP test slant well salinity data and groundwater elevations in the DSA indicate that a small amount of groundwater was derived from saline and brackish groundwater in the Dune Sand and 180-Foot Aquifer. Conceptual water budgets are provided assuming 10 percent of the test slant well groundwater was captured Subbasin groundwater, as demonstrated by field data collected during test slant well testing that showed the actual percentage of Subbasin groundwater extracted from the Subbasin by the test slant well."*

HWG 86

69. The GSP includes a paragraph on the potential use of a density-driven flow model in Section 3.3.11 on page 3-71.

HWG Comment: *See Comment 32 for Chapter 3.*

HWG 87

70. The GSP states MGSA will support, "…projects and management actions that will be implemented by SVBGSA under its regional GSP…"(Section 3.3.12, page 3-72).

HWG Comment: *While this statement is made here and in several other places in the MGSA GSP, it also attempts to set SMC that will not allow one of SVBGSA's main projects – a groundwater extraction barrier to mitigate seawater intrusion.*

HWG 88

71. With regard to test slant well pumping, the GSP states, "The groundwater quality and level monitoring data indicates that some groundwater from the low-TDS zone in the DSA and 180-Foot Aquifer was drawn into the test slant well from the east; however, the data are insufficient to determine whether there was a significant and unreasonable impact to these resources during the test time period, and whether the saline groundwater intrusion wedge advanced inland or thickened as a result." (Section 3.3.12, page 3-72).

HWG Comment: *This GSP statement is incorrect; and the field data show primarily ocean water and a small amount of brackish water extracted by the test slant well. Furthermore, the test slant well pumping created a capture zone that helped reduce inland seawater intrusion.*

HWG 89

72. The GSP states, "The proposed implementation of the MPWSP…has the potential to…contribute to regional overdraft conditions." (Section 3.3.12, page 3-72).

HWG Comment: *The reality is that the MPWSP has the potential to be part of the solution to regional overdraft and historical/current seawater intrusion problems. Extractions at the coast are a major component of the SVB GSP to mitigate seawater intrusion.*

HWG 90

73. The GSP states, "The sustainable management criteria, monitoring program and management actions described in chapters 4, 5, and 6 are intended to identify and address any overdraft in the MGSA area (from any cause) before it results in significant and unreasonable impacts." (Section 3.3.12, pages 3-72 and 3-73). A similar statement is made in Section 4.2 on page 4-4.

HWG Comment: *It is not clear how significant and unreasonable impacts in the MGSA area can be defined when groundwater TDS concentrations already exceeds 7,500 mg/L.*

HWG 91

74. The GSP defines sustainable yield for the MGSA Area as "the amount of groundwater that can be withdrawn annually over a period of time without causing undesirable results within or near the MGSA Area." The GSP goes on to identify four areas of potential undesirable results for significant and unreasonable impacts beyond a 2015 baseline condition: 1) chronic groundwater level decline in the DSA that adversely affects GDEs; 2) reduction in "low-TDS" groundwater storage; 3) seawater intrusion; and 4) degradation of "low TDS" groundwater zone. (Section 3.3.13, page 3-73; Section 4.2, pages 4-4 and 4-5).

HWG Comment: *It is not clear why these four items are all stated to be applicable to the DSA, 180-Foot Aquifer, and 400-Foot Aquifer, but only the seawater intrusion item is considered to be applicable to the Deep Aquifer; this suggests chronic groundwater level decline, reduction in groundwater storage, and degradation of the only actual "low-TDS" groundwater within MGSA is allowable within the Deep Aquifer beneath MGSA. Also, given that significant and undesirable conditions for groundwater level decline, reduction in low-TDS groundwater storage, seawater intrusion, and degradation of low TDS groundwater zone have already occurred in MGSA as of 2015 (actually, long before 2015), it is not clear how or why future significant and unreasonable conditions can be defined. Essentially, sustainable yield is not*

applicable to MGSA, except possibly for the Deep Aquifer. It is also important to note that GDEs and "low TDS" groundwater do not occur within the MGSA area in the Dune Sand, 180-Foot Aquifer, and 400-Foot Aquifer, and that these three aquifers have been thoroughly seawater intruded as of 2015; thus, it is unclear what are the undesirable results that could occur within MGSA relative to the 2015 baseline condition.

Chapter 4 – Sustainable Management Criteria

HWG 92

1. The GSP states, "Chronic declines in inland groundwater levels have led to a reversal in the groundwater gradients in the 180-Foot and 400-Foot Aquifers from shoreward to landward, causing water affected by seawater intrusion to flow inland for a distance of up to approximately 7 miles." (Section 4.2, page 4-3).

HWG Comment: *We agree.*

HWG 93

2. The GSP states that MGSA's sustainability goal is, "… to manage groundwater resources in the MGSA Area in a way that ensures all beneficial uses and users in, or affected by, groundwater management in the MGSA Area are protected from undesirable results, and have access to a safe and reliable groundwater supply that meets current and future demand. This goal will support SVBGSA's sustainability goal by addressing undesirable results at a local level and protecting local resources from further degradation, while coordinating with MCWRA, SVBGSA and MCWD GSA to support regional groundwater management, including groundwater level and seawater intrusion monitoring, and mitigation projects and management actions that will contain and reverse the conditions resulting from regional overdraft." (Section 4.2, page 4-5)

HWG Comment: *It is not clear who/what are the beneficial users/uses within MGSA for groundwater that exceeds 7,500 mg/L TDS (the entirety of the Dune Sand Aquifer, 180-FTE Aquifer, and 400-Foot Aquifer within MGSA). Even if there were beneficial uses of groundwater exceeding 7,500 mg/L TDS, it is not clear how such beneficial use would be impacted by a modest increase in TDS from the existing very elevated and non-potable concentration. The Marina GSP does not coordinate well with or support the SVBGSA GSP – many of the sustainable management criteria are in conflict with the SVB GSA's jurisdiction and/or SVB GSP sustainable management criteria, projects, and management actions.*

HWG 94

3. The GSP states that implementation objectives in support of the MGSA sustainability goal include ensuring that, "…groundwater is available for beneficial and potential beneficial uses, including all of the diverse municipal, domestic, agricultural, industrial, and environmental uses potentially affected by management actions within the MGSA…" (Section 4.2, pages 4-5 and 4-6).

HWG Comment: *There are no demonstrated municipal, domestic, agricultural, or environmental uses of groundwater within or even near the MGSA in the Dune Sand Aquifer, 180-FTE Aquifer, and 400-Foot Aquifer due to extremely high salinity levels in groundwater. CEMEX represents an Industrial use of highly brackish water.*

HWG 95

4. The GSP makes several references to protecting groundwater containing less than 3,000 mg/L TDS as having a potential beneficial use as a domestic or municipal drinking water supply per SWRCB Resolution No. 88-63 (e.g., Section 4a-2, page 4-6).

HWG Comment: *The HWG has previously demonstrated (HWG, August 2018) that groundwater with TDS of 3,000 mg/L in the MGSA vicinity has chlorides exceeding 1,000 mg/L, which far exceeds chloride*

MCLs and represents a chloride concentration greater than chloride levels at which numerous agricultural, municipal, and domestic water supply wells have been abandoned. These chloride levels are not suitable for municipal or domestic beneficial uses and would need to be treated to be useable for beneficial use.

HWG 96

5. The GSP states, "The consistency of the locally-defined criteria with criteria developed by SVBGSA in their GSP was evaluated, so that the sustainable management criteria in this GSP would address local conditions while remaining regionally compatible." (Section 4.3, page 4-6)

HWG Comment: *The sustainable management criteria in the Marina GSP are clearly in conflict with and not compatible with the SVBGSA GSP, as demonstrated with many of our comments.*

HWG 97

6. With reference to the approach for evaluating sustainable management criteria in the Marina GSA Plan area, the GSP states, "The assessment was conducted based upon the hydrogeologic conceptual model and water budget information summarized in Chapter 3." (Section 4.3, page 4-6).

HWG Comment: *As demonstrated in our preceding comments on Chapter 3, the Basin Setting discussion of the hydrogeologic conceptual model, groundwater conditions, and water budget contains has many flaws, incorrect statements, and invalid assumptions, and provides a poor and unrealistic basis for assessment of sustainable management criteria. This has resulted in inappropriate and unjustified minimum thresholds and measurable objectives in Chapter 4.*

HWG 98

7. The GSP notes that, "…SVBGSA has not designated any monitoring well near the MGSA Area, so there is no possibility that groundwater extraction in this area would create an undesirable result detected under their Regional GSP." (Section 4.4.1, page 4-9).

HWG Comment: *There is likely good reason that SVBGSA specifically did not establish monitoring compliance points adjacent to the coast in the MGSA and other areas. For example, water level near the coast are not the key to mitigating seawater intrusion; rather, water levels further inland are the key to halting seawater intrusion. Furthermore, lower groundwater levels near the coast may be key in helping mitigate seawater intrusion such as through use of an extraction barrier, which is a key potential project for the SVBGSA.*

HWG 99

8. The GSP states, "With respect to potential future groundwater extraction in the MGSA area, potential adverse impacts to beneficial users and uses from groundwater level decline include development or worsening of gradients that promote seawater intrusion…" (Section 4.4.1, page 4-9).

HWG Comment: *Gradients that promote seawater intrusion have been occurring historically and currently exist in the MGSA Plan Area. Pumping within the MGSA Plan Area will actually help mitigate seawater intrusion, as demonstrated in the MPWSP FEIR.*

HWG 100

9.The GSP uses a local definition (based on SVB GSP assessment of 180-Foot and 400-Foot Aquifers) for significant and unreasonable groundwater level decline as 1 foot above low groundwater levels measured in 2015 (Section 4.4.1, page 4-10).

HWG Comment: *While this definition may make sense for the 180-Foot and 400-Foot Aquifers further inland, the MGSA GSP does not provide an adequate basis or justification for requiring such a stringent definition in/near MGSA for these two Principal Aquifers or for application to the Dune Sand Aquifer, which is not a Principal Aquifer for the SVB GSP.*

HWG 101

10.The GSP states, "…undesirable results, minimum thresholds, and measurable objectives for chromic groundwater level decline are not adopted for the Deep Aquifer in this GSP." (Section 4.4.1, page 4-11)

HWG Comment: *This is perplexing given that the Deep Aquifer contains the only groundwater worthy of setting MTs and MOs for within the MGSA.*

HWG 102

11.The GSP states that drawdown from test slant well pumping "…decreased with distance from the MGSA Area." (Section 4.4.1, page 4-11).

HWG Comment: *There was no drawdown from test slant well pumping at the eastern boundary and outside the MGSA Plan Area.*

HWG 103

12.The GSP states, "The minimum threshold for groundwater elevation drawdown in the Dune Sand Aquifer is established as a drawdown attributable to groundwater extraction in the MGSA Area of 1 foot above the 2015 low groundwater levels recorded in monitoring wells near GDEs in the vicinity of the MGSA Area." (Section 4.4.2.1, page 4-12).

HWG Comment: *The Marina GSP has no authority to set minimum thresholds outside its Plan Area and in fact presents a major conflict with the SVB GSP. Even if it were allowed to set this MT, the basis and justification for the selected MT in the Marina GSP is woefully inadequate. Furthermore, setting MTs for the Dune Sand Aquifer is a conflict with the SVB GSP, which does not recognize the Dune Sand Aquifer as a principal aquifer for which to establish SMC. It is also noteworthy that drawdown beyond the stated MT is apparently allowed for pumping outside of the MGSA Plan Area.*

HWG 104

13.The GSP states, "…wetlands such as the vernal ponds that occur east of the MGSA Area are likely to be more highly groundwater dependent and contain sensitive communities that could be adversely affected by drawdown." (Section 4.4.2.1, page 4-12).

HWG Comment: *The Marina GSP neither establishes the dependence on groundwater (which is saline in the referenced GDE areas) as opposed to surface water, nor establishes the link to vegetative stress from drawdown (there was no drawdown at the referenced GDEs from test slant well pumping). As stated previously, the Marina GSP has no jurisdiction to set MTs for GDEs located "east of the MGSA Area", which causes a major conflict with SVB GSP.*

HWG 105

14.The Marina GSP adopts the SVB GSP definition of groundwater level MTs in the 180-Foot and 400-Foot Aquifers for the area within MGSA: 1 foot above historical low groundwater elevations measured in 2015 in 15% or more of the monitoring wells (Section 4.4.2.2, page 4-14).

HWG Comment: *The rationale and justification for adopting the regional-scale MTs at the monitoring well locations shown in the SVB GSP are not applicable or appropriate to the location and local-scale area of the MGSA Plan Area.*

HWG 106

15.The Marina GSP states, "…the thickness and water quality of the low-TDS zone must also be maintained." (Section 4.4.2.3, page 4-15)

HWG Comment: *The "low-TDS" zone referred to here is brackish non-potable water. It is not clear why this brackish water zone must be maintained. It does nothing to stop seawater intrusion, which has continued unabated for the last several decades, and cannot be used for municipal, domestic, or agricultural water supply without extensive treatment for TDS, nitrate, and other constituents. In fact, implementation of the MPWSP would actually help mitigate the inland seawater intrusion that has and is occurring through the MGSA Plan Area and vicinity.*

16.The Marina GSP states, "A significant and unreasonable condition for degraded water quality is a statistically-significant increase in the chloride or TDS concentration of groundwater in the low-TDS groundwater zone." (Section 4.4.2.3, page 4-15). Later in the GSP, a "statistically significant" increasing trend in TDS or chloride concentrations is used to set SMC (Section 4.6.3, page 4-33; Section 4.7.1, page 4-34) and triggers (Section 6.2.1.1, page 6-4).

HWG 107

HWG Comment: *We have several comments, many already stated previously: 1) The "low-TDS" zone is a non-potable brackish water zone; 2) It is not clear why this brackish water zone needs to be protected since it cannot be used for potable water supply and does nothing to prevent seawater intrusion; 3) The cited brackish water zone is outside of the MGSA Plan Area, and the Marina GSP has no jurisdiction/authority to set MTs/MOs for this area; 4) The approach to set MTs here sounds like a contaminant/environmental hydrogeology approach, and has no relevance to protecting groundwater in terms of chloride and TDS concentrations – particularly when the TDS and chloride concentrations already exceed all applicable MCL thresholds.*

17.The Marina GSP states, "MGSA's local sustainable management criteria for the Dune Sand Aquifer are compatible with the SVBGSA's management strategy for the underlying regional aquifers." (Section 4.4.2.4, page 4-16)

HWG 108

HWG Comment: *As stated previously in this letter, MGSA's SMC for the DSA are specifically not compatible with the SMBGSA's management strategy that does not recognize the DSA as a primary aquifer and sets no MTs/MOs for the DSA.*

18.The Marina GSP refers to setting MTs to protect "…beneficial users of groundwater for domestic irrigation, and small non-transient supply systems near the MGSA Area…" (Section 4.4.2.5, page 4-17)

HWG 109

HWG Comment: *The Marina GSP does not identify the locations of any beneficial users of groundwater for domestic, irrigation, or small supply systems near the MGSA Plan Area. As stated elsewhere in this letter, the MGSP is trying to establish SMC for locations outside of its Plan Area for which it has no authority/jurisdiction to do so, and presents a clear conflict with the SVBGSP that covers these areas.*

19.The Marina GSP states, "…measurable objectives for groundwater level decline are intended to serve as triggers for management actions…" (Section 4.4.3, page 4-18)

HWG 110

HWG Comment: *The purpose of measurable objectives (MO) is not to serve as a trigger for management actions. The MO is intended to represent the anticipated average condition (in this case, groundwater levels) after sustainability is achieved after 2040.*

20.The Marina GSP states, "Interim milestones will only be established if corrective actions are implemented…" (Section 4.4.3, page 4-18)

HWG 111

HWG Comment: *Interim milestones are required to be established in the GSP.*

21. The Marina GSP states, "The MGSA area is located at the western edge of a substantial zone of low-TDS groundwater (TDS<3,000 mg/L) extending vertically from the DSA into the 180-Foot Aquifer and the 400-Foot Aquifer…" (Section 4.5.1, page 4-19)

HWG 112

HWG Comment: *We have several comments: 1) The "low-TDS" zone consists of non-potable brackish water with chlorides, TDS and commonly nitrate far in excess of all MCL thresholds; 2) The brackish water with TDS less than 3,000 mg/L does not exist at the eastern edge of the MGSA Plan Area, but*

rather is located east of the MGSA Plan Area; 3) There is not one zone of continuous brackish water through the three aquifers, a conclusion that was based on faulty interpretation of AEM data as described in the HWG April 2019 letter, but rather there are separate seawater intrusion wedges in each aquifer; 4) The Marina GSP is trying to set SMC for locations outside of its Plan Area for which it has no authority/jurisdiction to do so.

HWG 113

21.The Marina GSP states, "Short-term groundwater extraction during the test slant well pumping test may have depleted the low-TDS zone in the Dune Sand and 180-Foot Aquifers…" (Section 4.5.1, page 4-20)

HWG Comment: *This conclusion is incorrect – the test slant well pumping test had no drawdown impacts from MW-4 and beyond, which is well to the west of the claimed "low-TDS" non-potable brackish water zone.*

HWG 114

22.The Marina GSP states, "SVBGSA's GSP does not present sustainable management criteria for the Dune Sand Aquifer because its GSP is more regionally focused." (Section 4.5.2.2, page 4-24; *Section 4.7.2.2, page 4-38*)

HWG Comment: *The SVBGSA specifically choose not to designate the Dune Sand Aquifer as a principal aquifer and specifically choose not to set SMC for the Dune Sand Aquifer. The Marina GSP's attempt to set SMC for the DSA is a major conflict with the SVBGSA, a conflict made even greater by attempts to set SMC for the DSA outside of the MGSA Plan Area.*

HWG 115

24. The Marina GSP claims that its groundwater storage minimum threshold would help to control seawater intrusion and benefit municipal and irrigation groundwater uses/users (Section 4.5.2.3, page 4-24)

HWG Comment: *The Marina GSP MTs would actually prevent implementation of a primary tool identified in the SVBGSP to control seawater intrusion – a groundwater extraction barrier. Thus, the Marina GSP presents major conflicts with the SVB GSP.*

HWG 116

25. The Marina GSP states that SVBGSA's definition of seawater intrusion (chloride > 500 mg/L) does not recognize areas of "…better quality groundwater in the aquifers seaward of the seawater intrusion line…" (Section 4.6.1, page 4-26).

HWG Comment: *The claimed "better quality groundwater" is comprised of groundwater with TDS up to 3,000 mg/L, which has chlorides exceeding 1,000 mg/L and nitrates exceeds MCLs in many areas. The chloride level of the 3,000 mg/L TDS groundwater is far in excess of the 500 mg/L chloride definition used to define seawater intrusion and far in excess of chloride MCLs. Thus, it is not "better quality groundwater" as claimed by the Marina GSP.*

HWG 117

26. The Marina GSP states, "Groundwater extraction in the MGSA Area has the potential to affect the dynamic equilibrium of this nearshore groundwater system and cause seawater intrusion through the migration of the of the saline water wedge, which could in turn lead to deeper seawater intrusion into the currently unintruded Deep Aquifer, or promote the lateral migration or persistence of seawater intrusion…further inland." (Section 4.6.1, page 4-26). This claim is repeated in Section 6.2.1.1 on page 6-3.

HWG Comment: *Groundwater extraction from the DSA and 180-FTE Aquifer in the MGSA area poses no risk of seawater intrusion in the Deep Aquifer. The risk to seawater intrusion in the Deep Aquifer is solely*

from overpumping of wells screened within the Deep Aquifer, which is likely already occurring. In addition, pumping from the currently intruded aquifers from wells within MGSA will help to mitigate further seawater intrusion to inland locations.

HWG 118

27. The Marina GSP states, "…the Dune Sand, 180-Foot and 400-Foot Aquifers are currently seawater intruded and therefore experiencing undesirable results…" (Section 4.6.1, page 4-27).

HWG Comment: *These three aquifers are certainly well beyond the threshold of experiencing undesirable results with TDS concentrations exceeding 7,500 mg/L. It is not clear how a GSP can have a definition for undesirable results within its Plan Area for groundwater that is already experiencing undesirable results and has TDS exceeding 7,500 mg/L. It would seem that the existing groundwater would need to not be experiencing undesirable results in order to set thresholds and have a definition of achieving undesirable results in the future.*

HWG 119

28. The GSP states, "Regionally, SVBGSA has adopted the line defined by Highway 1 as the seawater intrusion minimum threshold for the Deep Aquifer; In this local GSP MGSA has adopted a position that any detectable seawater intrusion into the currently unintruded Deep Aquifer represents a significant and unreasonable impact and would exceed the minimum threshold for seawater intrusion into this important local aquifer." (Section 4.6.2, page 4-28)

HWG Comment: *The MGSP adopts a minimum threshold for seawater intrusion in the Deep Aquifer (which is not used within the MGSA) that is a clear conflict with the SVBGSP. The MGSP later attempts to justify the conflicting MTs by saying the two are not in conflict since there are no Deep Aquifer production wells west of Highway 1 (page 4-31); however, this justification for conflicting MTs is not valid because seawater intrusion could easily occur between the ocean and Highway 1 but not east of Highway 1 if Deep Aquifer seawater intrusion is sourced from beneath ocean or the submarine canyon Deep Aquifer outcrop. Furthermore, while the MGSP adopts a conflicting seawater intrusion MT, it adopts no groundwater level MT and specifically allows for greatly increased pumping in the Deep Aquifer from Marina Coast Water District Deep Aquifer wells that present a high risk for seawater intrusion as Deep Aquifer groundwater levels decline further.*

HWG 120

29. The GSP establishes concentration limits of 1,000 mg/L for TDS and 500 mg/L for chloride defining seawater intrusion in the Deep Aquifer. (Section 4.6.2, page 4-28).

HWG Comment: *The GSP adopts a double standard by saying seawater intrusion has occurred when TDS exceeds 1,000 mg/L or chloride exceeds 500 mg/L in the Deep Aquifer, yet concentrations of 3,000 mg/L TDS and over 1,000 mg/L chloride represent low-TDS groundwater in the shallower aquifers that have beneficial uses and must be protected.*

HWG 121

30. The GSP states, "The groundwater level and quality monitoring will be conducted in accordance with the monitoring plan outlined in Chapter 5." (Section 4.6.2.5, page 4-32).

HWG Comment: *It is very important to note here that the groundwater level and monitoring program described in the Marina GSP will not be constructed and implemented if the MPWSP does not move forward. The MGSA will have to design, construct, and implement its own completely different monitoring network if the MPWSP does not go forward, and this alternative monitoring program is not described in the MGSP.*

HWG 122

31. The GSP describes the sustainability goal for the MGSP as managing groundwater resources in the MGSA Plan Area in a way to ensure all beneficial uses/users are protected from undesirable results and have access to a safe and reliable groundwater supply. (Section 4.6.3, page 4-32).

HWG Comment: *Aside from the Deep Aquifer, which is specifically not protected in the MGSP, the groundwater in the MGSA Plan Area already far exceeds any reasonable definition of undesirable results and contains only unusable and non-potable groundwater supplies. Essentially, there are no beneficial users/uses to be protected within MGSA Plan Area.*

HWG 123

32. The GSP defines undesirable results for groundwater quality as concentrations exceeding MCLs and reduced crop production (Section 4.7.1, pages 4-33 to 4-34)

HWG Comment: *Both of these undesirable result conditions already exist in MGSA and have existed within MGSA for the last several decades.*

HWG 124

33. The GSP attempts to set MTs for contaminant plumes (Section 4.7.2, Page 4-36).

HWG Comment: *There are no contaminant plumes within the MGSA Plan Area. Any attempt to set MTs for contaminant plumes outside the MGSA area is a clear conflict with the SVBGSP.*

HWG 125

34. The GSP sets minimum thresholds and measurable objectives for land subsidence using groundwater levels as a proxy. The minimum threshold requires groundwater levels remain above 2015 levels (Section 4.8.2, page 4-42).

HWG Comment: *There is no rationale, evidence, or justification for the minimum threshold and measurable objective set for land subsidence.*

HWG 126

35. GSP Figure 4-1 states, "Approximately 1-Foot Recovery When Pumping Stopped" in reference to test slant well pumping.

HWG Comment: *This statement is incorrect. The arrows pointing to purported recovery when test slant well pumping stopped are clearly related to seasonal increases in groundwater levels.*

Chapter 5 – Monitoring Network

HWG 127

1. With regard to the Dune Sand Aquifer, the GSP states, "The uppermost aquifer, which is of local importance due to its interaction with local groundwater-dependent ecosystems (GDEs), substantial storage of groundwater with designated potential beneficial use as a municipal or domestic supply, and importance in maintaining nearshore seawater intrusion dynamics…" (Section 5.1, page 5-1).

HWG Comment: *While it remains unclear if the Dune Sand Aquifer plays any role in supporting GDEs, it is clear there are no GDEs within the MGSA Plan Area and the Marina GSP should not be addressing GDEs outside of its jurisdiction. There is no groundwater with potential beneficial uses within the MGSA Plan Area. The historic and current nearshore seawater intrusion dynamics have allowed for historic and ongoing seawater intrusion.*

2.With regard to the 180-Foot Aquifer, the GSP states the seawater intruded area, "…includes significant zones of groundwater with a designated beneficial use as a domestic and municipal supply in the vicinity…" (Section 5.1, page 5-1).

HWG 128

HWG Comment: *There is no groundwater in the Dune Sand Aquifer, 180-FTE Aquifer, or 400-Foot Aquifer with designated beneficial use as a domestic and municipal supply in the MGSA Plan Area. In addition, there are no significant areas with designated domestic or municipal supply beneficial use in the MGSA vicinity.*

3.The GSP states, "…the MGSA GSP will rely primarily on data collected from a local monitoring network adopted in and around the MGSA Area under the Mitigation, Monitoring and Reporting program (MMRP) for the proposed Monterey Peninsula Water Supply Project (MPWSP)…" (Section 5.1.2, page 5-3).

HWG 129

HWG Comment: *The MGSA GSP is relying primarily on a local monitoring network that will not be implemented if the MPWSP does not move forward. The sustainable management criteria proposed in the MGSA GSP preclude development of the MPWSP. Thus, if the MGSA GSP is approved, adopted, and enforced for the MGSA Plan Area, the MPWSP will not be able move forward and the local monitoring network will not be implemented. Therefore, the proposed MGSA GSP does not have a viable monitoring network.*

4.The GSP describes a monitoring network and representative monitoring sites comprised of locations primarily outside of the MGSA Plan Area (Section 5.1.4, pages 5-4 to 5-5).

HWG 130

HWG Comment: *The MGSA has no jurisdiction to establish a monitoring network and RMS sites outside of its Plan Area, which presents major conflicts with the SVB GSA that has jurisdiction of these areas.*

5.The GSP describes minimum thresholds and measurable objectives for groundwater levels for principal aquifers encompassed by its monitoring network (Section 5.2.1, pages 5-6 and 5-7).

HWG 131

HWG Comment: *This section presents many conflicts with the SVB GSA GSP, many of which are described elsewhere in this letter. Another conflict is that the MGSA attempts to assign SVB GSA GSP minimum thresholds and measurable objectives for the 180-Foot Aquifer to RMS locations near the coast that are not included in the SVB GSA GSP. It is likely that the SVB GSA GSP RMS locations were carefully selected to be compatible with proposed projects and management actions that allow maximum potential to achieve subbasin sustainability. The MGSA RMS locations present major conflicts to SVB GSA, and would likely impede SVB GSA attempts to reach sustainability.*

6.The GSP states, "Because groundwater is not currently extracted from the Deep Aquifer in the MGSA Area, minimum thresholds and measurable objectives were not established for the Chronic Lowering of Groundwater Levels sustainability indicator in the aquifer…" (Section 5.2.1, page 5-7).

HWG 132

HWG Comment: *Groundwater is not currently extracted from the Dune Sand Aquifer in the MGSA Area; therefore, under this rationale there should be not minimum thresholds and measurable objectives established for the Dune Sand Aquifer.*

7.The GSP states, "MCWRA will conduct monitoring of seven other Deep Aquifer wells as part of the MMRP. Locations of these wells are shown on Figure 5-2, and well construction and monitoring information is presented in Table 5-4." (Section 5.2.1, page 5-7)

HWG 133

HWG Comment: *It is not clear why data from these wells were not included in the analysis; especially since the introduction states the Deep Aquifer is a primary source of freshwater to the City of Marina. As stated above, it is also very important to note that the MMRP will not be implemented if the MPWSP does not move forward.*

8. The GSP states, "The MPWSP wells were installed to monitor the effects pumping the test slant well." (Section 5.2.2, page 5-7)

HWG 134

HWG Comments: *The purposes of installing the MPWSP monitoring wells extended far beyond monitoring effects of pumping the test slant well. These monitoring wells are intended to provide background water level and water quality data well beyond the influence of test slant well pumping, provide borehole lithologic and geophysical logs to improve characterization of aquifers/aquitards within and well beyond the CEMEX area, allow for long-term monitoring of water levels and water quality after implementation of the MPWSP both within and outside the influence of proposed intake slant wells, and for other uses.*

HWG 135

9. The adequacy and density of the monitoring network is described in Section 5.2.2 and 5.2.3 (pages 5-8 to 5-10).

HWG Comment: *The adequacy and density of the monitoring network should be focused on the MGSA Plan Area, and not encroach on the authority and jurisdiction of other GSAs/GSPs.*

HWG 136

10. In the section entitled, "Groundwater elevation and quality data in the MGSA Area", the GSP states that groundwater elevation and quality data in the MGSA Area are limited and that five additional monitoring well clusters will be installed to address data gaps (Section 5.2.7, page 5-13).

HWG Comment: *We note that none of the five proposed new monitoring well clusters are located within the MGSA Plan Area.*

HWG 137

11. The GSP states, "This definition of seawater intrusion adopts a concentration that is aligned with potential impacts to municipal and agricultural beneficial uses; however, it includes water with existing actual and potential beneficial uses." (Section 5.4.1, pages 5-19 to 5-20)

HWG Comment: *Groundwater in the MGSA cannot be used as a potable source without treatment. The only current use of groundwater in the MGSA Plan area is the CEMEX well for industrial wash water. The MCWRA 500 mg/l chloride concentration is an appropriate threshold for monitoring and definition of seawater intrusion (some may even argue for a lower threshold definition such as 250 mg/L chloride, which the MCWRA also used for contouring as the level that the growers were concerned about). The reference to potential beneficial uses refers to SWRCB resolution regarding TDS up to 3,000 mg/L; however, such water is non-potable and has chlorides exceeding 1,000 mg/L placing it appropriately within the zone of seawater intrusion.*

HWG 138

12. The GSP states, "Groundwater extraction in the MGSA Area has the potential to affect the dynamic equilibrium of this nearshore groundwater system and cause seawater intrusion through the migration of the saline groundwater wedge…" (Section 5.4.1, page 5-20).

HWG Comment: *This statement is incorrect; properly located groundwater extraction at the coast will serve to induce or maintain a seaward gradient, thus inhibiting seawater intrusion to inland locations.*

HWG 139

13. The GSP states, "…groundwater extraction from the upper aquifer system could cause further seawater intrusion by expansion or migration of the saline groundwater wedge that underlies this area. Such an expansion or migration would put the Deep Aquifer at greater risk of seawater intrusion." (Section 5.4.1, page 5-20)

HWG Comment: *This statement is incorrect. Pumping from the DSA and 180-FT Aquifer at the coast will have little impact on the 400-Foot Aquifer due to the presence of 180-/400-Foot Aquitard. The 400-Foot aquifer is already highly intruded at the coast and inland. If the 400-Foot aquifer is the source of recharge for the Deep Aquifer, the already extremely high salinity in the 400-Foot Aquifer has not yet been demonstrated to impact the Deep Aquifer wells.*

HWG 140

14. In reference to setting MTs for seawater intrusion the GSP references, "…Lateral migration of the saline water intrusion wedge beyond the limits established by the 2017 AEM survey…" (Section 5.4.1, page 5-21)

HWG Comment: *The AEM data must first be validated through physical water quality data before it can be used as a reference point, and previous HWG letters have demonstrated this has not been done (HWG, April 2019). These previous HWG letters also demonstrate the many flaws and uncertainties in the hydrogeologic interpretations of the AEM data presented by MCWD and City of Marina consultants.*

HWG 141

15. The GSP states, "Groundwater extraction in the MGSA Area potentially could disturb the equilibrium that exists between the saline water intrusion wedge and overlying low-TDS groundwater zone, cause mixing of low-TDS and saline groundwater or otherwise lead to the capture and migration of saline groundwater, potentially impacting the low-TDS groundwater zone or existing supply wells in the area." (Section 5.5.1, page 5-25)

HWG Comment: *This statement is incorrect. There is no evidence to support this statement. Any existing equilibrium is with pumping induced seawater intrusion. Pumping at the coast would serve to mitigate at least a portion of the inland movement of seawater intrusion, and partially reverse SWI in the area inland of the pumping at the coast.*

Chapter 6 – Projects and Management Actions

HWG 142

1. The GSP states, "MGSA has not identified any feasible projects within the MGSA Area…"; and "MGSA will coordinate with and support SVBGSA in the implementation of projects and management actions it has determined to be locally and regionally beneficial…" (Section 6.1, page 6-2)

HWG Comment: *The MGSA has developed no projects of its own, and has developed SMC specifically designed to stop selected SVBGSA projects from being implemented.*

HWG 143

2. Chapter 6 of the GSP presents a confusing array of triggers and additional studies labeled as management actions (Section 6.2, pages 6-2 to 6-11).

HWG Comment: *The use of "triggers" and "management actions" presented in Chapter 6 do not align with SGMA and GSP requirements, and present many conflicts with the SVBGSP.*

HWG 144

3. The GSP lists the SVBGSP projects and management actions that it supports (Section 6.5, pages 6-12 to 6-17).

HWG Comment: *The GSP specifically does not support and sets SMC to prevent implementation of the groundwater extraction barrier, which is a primary and critical project in the SVBGSP. This is a clear conflict with the SVBGSP.*

4. The GSP states that groundwater extraction could substantially deplete the low-TDS groundwater

HWG 145

storage, thereby "…substantially depleting this resource for inland water rights holders." (Section 6.2.1.1, page 6-3)

HWG Comment: *Groundwater pumping at the coast would actually help mitigate seawater intrusion and improve availability of low TDS groundwater for inland pumpers.*

HWG 146

5. The GSP states that the seawater intrusion measurable objective would, "...prevent or reverse seawater intrusion advancement into the Deep Aquifer." (Section 6.2.1.2, page 6-6)

HWG Comment: *Setting seawater intrusion MO/MT for the DSA, 180-FTE, and 400-Foot Aquifers in MGSA does nothing to prevent seawater intrusion in the Deep Aquifer. Reducing pumping in the Deep Aquifer is the only way to control/prevent seawater intrusion in the Deep Aquifer.*

HWG 147

6. In discussing potential management actions for GDEs, the GSP states, "The triggers are equal to the measurable objectives…" (Section 6.2.2.1, page 6-7)

HWG Comment: *The DWR draft BMP for Sustainable Management Criteria defines the measurable objective as, "quantitative goals that reflect the basin's desired groundwater conditions…", and should be set to allow,"…a reasonable margin of flexibility…that will accommodate droughts, climate change, conjunctive use operations…" The BMP does not refer to using measurable objectives as triggers; rather they represent the anticipated/desired basin condition after sustainability is achieved.*

HWG 148

7. The GSP essentially bases its GDE MT/MO on 2015 groundwater levels, and states that a baseline biological assessment of GDEs will be done in the future to allow for comparison of future GDE biologic conditions to its baseline (Sections 6.2.2 and 6.2.3, pages 6-7 to 6-12).

HWG Comment: *While the GDE MT/MO are based on 2015 groundwater levels, there is no corresponding baseline biological assessment to utilize as described in the GSP. The baseline biological assessment yet to be conducted will not be representative of 2015 groundwater, surface water, and climatic conditions.*

HWG 149

8. The GSP claims legal authority to, "…conduct investigations to determine the need for groundwater management, and to monitor compliance and enforcement of a GSP." (Section 6.3, page 6-11)

HWG Comment: *A key question to be answered here is does a GSA have this legal authority for lands outside of its Plan Area?*

HWG 150

9. In discussing CSIP in-lieu recharge projects (including reduction/avoidance of pumping of groundwater from wells in the CSIP area), the GSP states in several places, "This is beneficial to MGSA because of its proximity to the CSIP service area and because pumping reductions in these areas support measurable objectives related to groundwater elevation, groundwater storage and seawater intrusion." (Section 6.5.1, pages 6-13 to 6-15)

HWG Comment: *The GSP does not describe the MPWSP return water agreement, which provides the same benefits described here in the GSP text.*

Sincerely,

The Hydrogeologic Working Group (Dennis Williams, Tim Durbin, Martin Feeney, Peter Leffler)

Dennis Williams

Tim Durbin

Martin Feeney

Peter Leffler

Attachments:

Figure 1 Locations of MPWSP Boreholes Relative to GSP Potential Aquitard Gap Areas

REFERENCES

California Public Utilities Commission (CPUC), CalAm Monterey Peninsula Water Supply Project Environmental Impact Report/Environmental Impact Statement, SCH#2006101004, March 2018.

The Hydrogeologic Working Group (HWG), *Monterey Peninsula Water Supply Project – Test Slant Well Long Term Pumping Test and Coastal Development Permit #A-3-MRA-14-0050*, letter addressed to California Coastal Commission, July 23, 2015.

HWG, *HWG Hydrogeologic Investigation Technical Report*, November 6, 2017.

HWG, *Memorandum Responding to Comments on HWG Hydrogeologic Investigation Technical Report*, January 4, 2018.

HWG, *HWG Comments on Technical Appendices/Attachments to Letters Submitted by MCWD and City of Marina to the CPUC and MBNMS on April 19, 2018, Letter to John Forsythe/CPUC and Paul Michel/MBNMS*, August 15, 2018.

HWG, *HWG Comments on Technical Presentations and Letters/Memorandum Prepared by HGC, EKI, and MCWD for City of Marina Public Workshop on MPWSP Coastal Development Permit Held on January 8, 2019*, January 25, 2019.

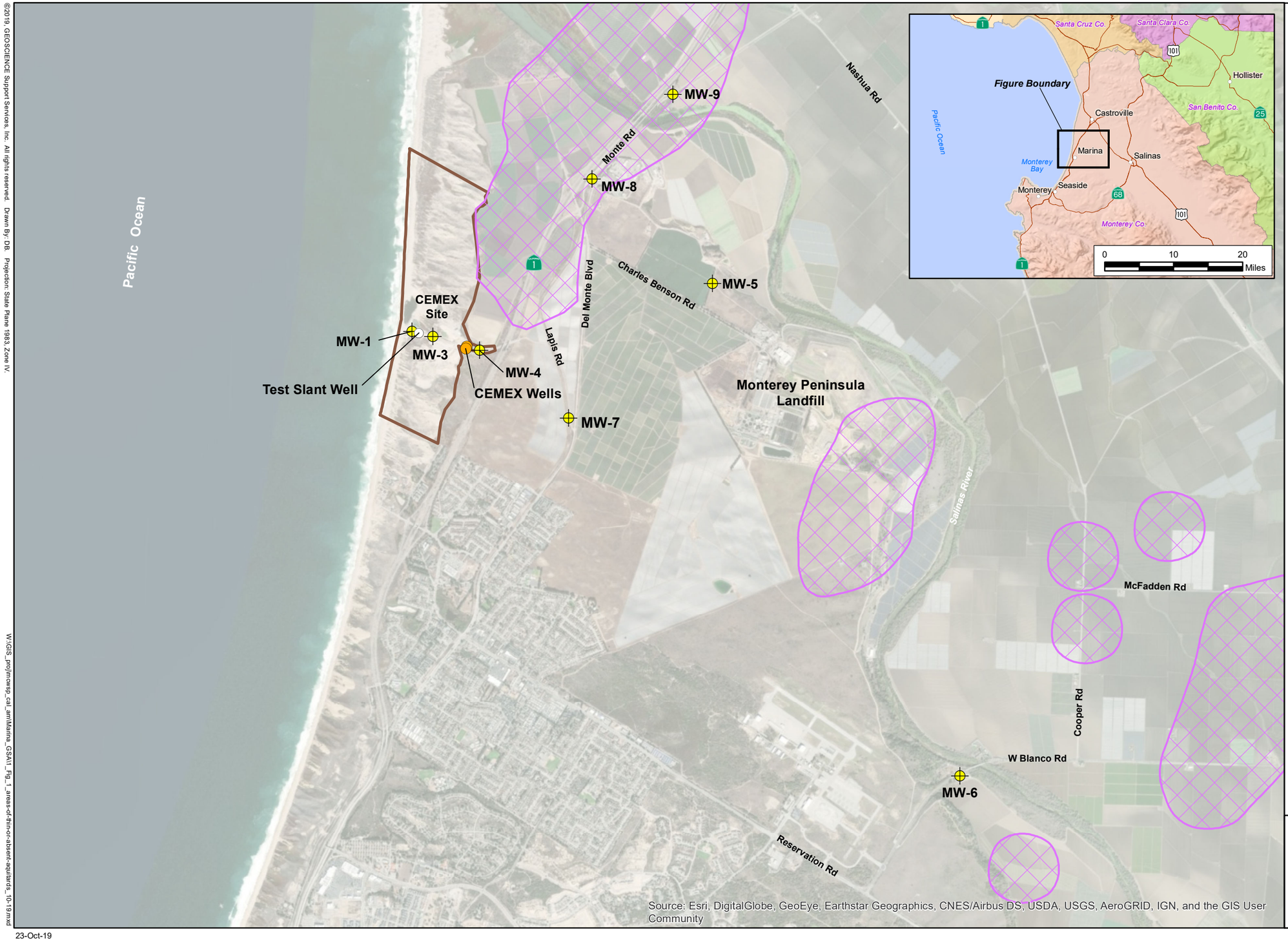
HWG, *HWG Responses to Dr. Knight Letter Addressed to HWG and Submitted During City of Marina Planning Commission Hearing on MPWSP Coastal Development Permit Held on February 14, 2019*, March 6, 2019.

HWG, *HWG Comments on Remy Moose Manley Letter Attachments Prepared by HGC, EKI, and AGF for City of Marina Planning Commission Hearing Agenda Item #6A on MPWSP Coastal Development Permit Held on February 14*, 2019, April 12, 2019.

LIST OF ACRONYMS & ABBREVIATIONS

AEM	Aerial Electromagnetics
bgs	below ground surface
Cal Am or CalAm	California American Water Company
CPUC	California Public Utilities Commission
DSA	Dune Sand Aquifer
EIR	Environmental Impact Report
FEIR	Final Environmental Impact Report
FO-SVA	Ford Ord Salinas Valley Aquitard
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HCM	Hydrogeologic Conceptual Model
HWG	Hydrologic Working Group
MCWD	Marina Coast Water District
MCWRA	Monterey County Water Resources Agency
mg/L	Milligrams per Liter
MGSA	Marina Groundwater Sustainability Agency
MGSP	Marina Groundwater Sustainability Plan
MO	Measurable Objective
MPWSP	Monterey Peninsula Water Supply Project
MT	Minimum Threshold
MW	Monitoring Well
RMS	Representative Monitoring Site
SGMA	Sustainable Groundwater Management Act
SMC	Sustainable Management Criteria
SVB	Salinas Valley Basin
TDS	Total Dissolved Solids
TSW	test slant well
USGS	United States Geological Survey
180-FTE Aquifer	180-Foot Equivalent Aquifer

Figures



EXPLANATION

- City of Marina GSA Boundary
- Areas of Thin or Absent Aquitards (Source: Marina GSA, Fig 3-20, dated 10-1-19)
- Monitoring Well Cluster
- CEMEX Well
- Test Slant Well

N

0 3,000 6,000

Feet

LOCATIONS OF MPWSP BOREHOLES RELATIVE TO GSP POTENTIAL AQUITARD GAP AREAS

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23-Oct-19

CALIFORNIA AMERICAN WATER

MONTEREY PENINSULA WATER SUPPLY PROJECT

FIGURE 1

GEOSCIENCE