SEASIDE BASIN WATERMASTER

ANNUAL REPORT – 2017

December 8, 2017

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Integral to the Superior Court Decision (Decision) rendered by Judge Roger D. Randall on March 27, 2006 is the requirement to file an Annual Report. This 2017 Annual Report is being filed on or before December 15, 2017, consistent with the provisions of the Decision, as amended by the Annual Report Review and Order dated January 7, 2011. This Annual Report addresses the specific Watermaster functions set forth in Section III. L. 3. x. of the Decision. In addition this Annual Report includes a section pertaining to Water Quality Monitoring and Basin Management.

A. Groundwater Extractions

The schedule summarizing the Water Year 2017 (WY 2017) groundwater production from all the producers allocated a Production Allocation in the Seaside Groundwater Basin is provided in Attachment 1, "Seaside Groundwater Basin Watermaster, Reported Quarterly and Annual Water Production from the Seaside Groundwater Basin for all Producers Included in the Seaside Basin Adjudication During Water Year 2017." For the purposes of this Annual Report Water Year 2017 is defined as beginning October 1, 2016 and ending on September 30, 2017.

B. Groundwater Storage

Monterey Peninsula Water Management District (MPWMD), in cooperation with California American Water (CAW), operates the Seaside Basin Aquifer Storage and Recovery (ASR) program. Under the ASR program, CAW diverts water from its Carmel River sources during periods of flow in excess of NOAA-Fisheries' bypass flow requirements, and transports the water through the existing CAW distribution system for injection and storage in the Seaside Basin at the MPWMD's Santa Margarita ASR site and CAW's Seaside Middle School ASR site. During WY 2017, 2,345 AF was diverted and stored in the Seaside Basin under the ASR program. Rainfall in the area was about 152% of normal, Carmel River flow was 292% of normal. WY 2017 was classified as "Extremely Wet" by MPWMD.

Based upon production reported for WY 2017, the following Standard Producers are entitled to Free and Not-Free Carryover Credits to 2018 in accordance with the Decision, Section III. H. 5:

Producer	Free Carryover Credit (Acre-feet)	Not-Free Carryover Credit (Acre-feet)
Granite Rock	166.32	86.45
DBO Development	315.46	166.30
	(2.31assigned to CAW against Free Carryover)	
Calabrese (Cypress)	10.87	1.85
CAW	00.00	708.80 (assigned from DBO)
City of Seaside Muni	00.00	00.00

C. Amount of Artificial Replenishment, If Any, Performed by Watermaster
Per the Decision, "Artificial Replenishment" means the act of the Watermaster, directly or indirectly, engaging in contracting for Non-Native Water to be added to the Groundwater supply of the Seaside Basin through Spreading or Direct Injection to offset the cumulative Over-Production from the Seaside Basin in any particular Water Year pursuant to Section III.L.3.j.iii. It also includes programs in which Producers agree to refrain, in whole or in part, from exercising their right to produce their full Production Allocation where the intent is to cause the replenishment of the Seaside Basin through forbearance in lieu of the injection or spreading of Non-Native Water (referred to herein as "In-lieu Replenishment").

During Water Year 2017 the Watermaster did not indirectly engage in In-lieu Replenishment of the Basin. No non-native water was made available to the Basin during Water Year 2017 under the Memorandum of Understanding and Agreement entered into by Watermaster with the City of Seaside for its golf course irrigation program creating in-lieu replenishment water.

D. Leases or Sales of Production Allocation and Administrative Actions
On April 7, 2017, D.B.O Development No. 30 transferred/assigned 0.16 acre-feet (AF) of its Standard Production Allocation within the Seaside Groundwater Basin to California American Water for the Water Year ending 2017 applied to Water Year 2017. This transfer of water allocation was the first assignment of water pursuant to MPWMD Ordinance No. 166 and the Front-Loading Agreement between D.B.O and California American Water. A copy of this document is contained in Attachment 10.

On June 15, 2017, D.B.O Development No. 30 transferred/assigned 2.15 acre-feet (AF) of its Standard Production Allocation within the Seaside Groundwater Basin to California American Water for the Water Year ending 2017 applied to Water Year 2017. This transfer of water allocation was the second assignment of water pursuant to MPWMD Ordinance No. 166 and the Front-Loading Agreement between D.B.O and California American Water. A copy of this document is contained in Attachment 10.

A Status Conference with the Court was held on March 17, 2017. The transcript of the Status Conference Hearing is available for viewing on the Watermaster web site at http://www.seasidebasinwatermaster.org/ under Postings and Records on the March 17, 2017 date line in the Court Docs column.

During WY 2017 the Watermaster Board did not make any revisions to its *Rules and Regulations*. However, the mailing address for the Watermaster changed to: Seaside Basin Watermaster, P.O. Box 51502, Pacific Grove, CA 93950.

During WY 2017 the Watermaster Board was comprised of the following Members and Alternates:

MEMBER	ALTERNATE	REPRESENTING
Director Paul Bruno	N/A	Coastal Subarea Landowner
Eric Sabolsice	Nina Miller	California American Water
Director Bob Costa	N/A	Laguna Seca Subarea Landowner
Director Jeanne Byrne	Andrew Clarke	MPWMD
Mayor Maryann Carbone	Todd Bodem	City of Sand City
Supervisor Mary Adams	Jane Parker	Monterey County (MCWRA)
Mayor Jerry Edelen	Kristin Clark	City of Del Rey Oaks
Councilmember Dan Albert	Mayor Clyde Roberson	City of Monterey
Mayor Ralph Rubio	Dennis Alexander	City of Seaside

E. Use of Imported, Reclaimed, or Desalinated Water as a Source of Water for Storage or as a Water Supply for Lands Overlying the Seaside Basin

The CAW/MPWMD ASR Program operated in WY 2017 and accordingly 2,345.19 acre-feet of water was injected into the Basin as Stored Water Credits and 1,501.33 acre-feet was extracted.

F. Violations of the Decision and Any Corrective Actions Taken

Section III. D. of the Decision enjoins all Producers from any Over-Production beyond the Operating Yield in any Water Year in which the Watermaster declares that Artificial Replenishment is not available or possible. Section III. L. 3. j. iii. requires that the Watermaster declare the unavailability of Artificial Replenishment in December of each year, so that the Producers are informed of the prohibition against pumping in excess of the Operating Yield.

The Watermaster made a declaration regarding the availability of Artificial Replenishment for WY 2018 at its Board meeting of December 6, 2017. A copy of this declaration is contained in Attachment 2. In WY 2017 the Watermaster continued the previously implemented 10% water production reductions required under Section III.B.2 of the Decision. No additional water production reductions were implemented in WY 2017.

Total pumping for WY 2017 did not exceed the Operating Yield (OY) of the Basin and exceeded the Natural Safe Yield (NSY) of the Basin by 49.34 acre-feet.

California American Water reported annual pumping quantities that exceeded their Standard Production NSY allocation by 64.40 acre-feet, and reported annual pumping quantities that did not exceed their Operating Yield allocation. The Watermaster will assess California American Water a Replenishment Assessment for this over production, as further described in Section H, below.

The City of Seaside reported annual pumping quantities that exceeded their Standard Production NSY allocation by 30.47 acre-feet, and reported annual pumping quantities that exceeded their Operating Yield allocation by 3.35 acre-feet. The City of Seaside did not exceed its Alternative Production NSY. The Watermaster will assess the City of Seaside a Replenishment Assessment for these over productions, as further described in Section H, below.

G. Watermaster Administrative Costs

The total estimated Administrative costs through the end of Fiscal Year 2017 amounted to $82,000 including a $25,000 dedicated reserve. Costs include the Administrative Officer salary and legal counsel fees. The "Fiscal Year 2017 Administrative Fund Report" and "Fiscal Year 2017 Operations Fund Report" are provided as Attachment 3.

H. Replenishment Assessments

At its meeting of October 4, 2017 the Watermaster Board determined that the Replenishment Assessment unit cost of $2,872 per acre-foot should remain the same as the previous year for WY 2018

Alternative and Standard Producers report their production amounts from the Basin to the Watermaster on a quarterly basis. Based upon the reported production for WY 2017, California American Water's Replenishment Assessment for Overproduction in excess of its share of the Natural Safe Yield is $184,957.11, and no overproduction in excess of its share of the Operating Yield.

The City of Seaside's Replenishment Assessment for its Municipal System for Overproduction in excess of its share of the Natural Safe Yield is $87,511.62, and for overproduction in excess of its share of the Operating Yield is $2,408.69. The City of Seaside did not exceed its Alternative Production Allocation for its Golf Course System production. A summary of the calculations for Replenishment Assessments for WY 2017 is contained in Attachment 5.

I. All Components of the Watermaster Budget

The Watermaster budget has four separate funds: Administrative Fund; Monitoring & Management–Operations; Monitoring and Management–Capital Fund and; Replenishment Fund. Copies of the budgets for Fiscal Year 2018 are contained in Attachment 6.

The Watermaster Board is provided monthly financial status reports on all financial activities for each month with year-to-date totals.

J. Water Quality Monitoring and Basin Management

Water Quality Analytical Results

Groundwater quality data continued to be collected and analyzed on a quarterly basis during WY 2017 from the enhanced network of monitoring wells. The low-flow sampling method implemented in 2009 continued to be used in 2017 and is expected to continue to be used in the future to improve the efficiency of sample collection. As discussed in the 2013 Annual Report, the Watermaster reduced the frequency of water quality sampling at SBWM-MW5 to once every 3 years.

No modifications to the quarterly data collection frequency from the enhanced network of monitoring wells were made during WY 2017.

Up until WY 2010 quarterly geophysical (induction) logging was performed at the four coastal Watermaster Sentinel wells that were installed in 2007. The induction logging results showed very little variations and trends were steady since that monitoring began, indicating that the coastal water quality conditions were not changing at this sample frequency. Therefore, beginning in WY 2010 the Court approved reducing the induction logging frequency to semi-annually at these wells. Water samples from these wells continued to be collected on an annual basis during WY 2017.

The expanded water quality analyses begun in WY 2012 were continued in WY 2017. The Sentinel Wells will continue to be induction logged twice a year in WY 2018. However, beginning in WY 2018 water quality sampling will be discontinued in the Watermaster's Sentinel Wells located along the coast (wells SBWM-1, SBWM-2, SBWM-3, and SBWM-4). This is because these wells were constructed for induction logging, not for water quality sampling. Water quality samples have been collected from them in the past based on the expectation that those samples would be representative of the water quality in the aquifers in which these wells were completed. However, that water quality data has been found not to be useful because it is not representative of the water quality in the aquifers in which these wells were completed. The depth of the wells and the small (3-inch) diameter of the wells limit sampling techniques that can be applied cost-effectively to extract a representative sample. Information that led to this conclusion, and which justifies discontinuing water quality sampling in these wells, is contained in Attachment 13. Water quality sampling will be continued for the 3 most coastal MPWMD monitoring wells (MSC, PCA, and FO-09).

Copies of the sampling results are contained in the report in Attachment 7.

Management and Monitoring Program Work Plan

The Monitoring and Management Program (M&MP) 2018 Work Plan contained in Attachment 9 includes the types of basin management activities conducted in prior years as well as revisions approved by the Board at its October 4, 2017 meeting.

The major changes from the 2017 M&MP Work Plan are:

Tasks M.1.c, d, and e (Preparation for and Attendance at Meetings and Peer Review of Documents and Reports): Portions of the Requests for Service (RFSs) for general

hydrogeologic consulting services have been allocated between these three tasks in the amounts anticipated to potentially be requested of HydroMetrics, Todd Groundwater (Gus Yates) and Martin Feeney for assistance. It is anticipated, with Technical Advisory Committee (TAC) and Board approval, to issue RFSs to each of these firms for general on-call/as-needed hydrogeologic consulting services in 2018 as follows:

HydroMetrics: $11,000
Todd Groundwater: $4,000
Martin Feeney: $4,000
Total: $19,000

These amounts are based on prior experience with these firms and what is believed likely to be a growing need for these types of services, especially as interface with the Groundwater Sustainability Agency for the Salinas Valley Basin begins.

In 2017 the amount budgeted for these three tasks was $14,376. For 2018 the proposed amount is $19,000. Mr. Yates and/or Mr. Feeney would only be called upon when an issue arises that the TAC or Board feels would benefit from their review or input.

Task I.2.a.1 (Conduct Ongoing Data Entry/ Database Maintenance/Enhancement): In 2017 the amount budgeted for this Task was $13,452. The proposed scope of work for this task is unchanged from 2017, but the hourly rate for the MPWMD staff involved in performing their portion of this task has risen from $112/hour to $149/hour, so the amount proposed for 2018 is increased by $3,552 to $17,004. There was no increase in cost for the outside consultant that manages the Watermaster's website (where data from this task is posted), and that cost remained at $200/month.

Task I.2.b.2 (Collect Monthly Water Levels): In 2017 the amount budgeted for this Task was $7,192. The proposed scope of work for this task is unchanged from 2017, but the hourly rate for the MPWMD staff involved in performing this task has dropped from $89/hour to $62/hour, so the amount proposed for 2018 is reduced by $3,466 to $3,726.

Task I.2.b.3 (Collect Quarterly Water Quality Samples): In 2017 the total amount budgeted for this Task was $55,520, comprised of $29,834 for MPWMD and $25,686 for Martin Feeney. The proposed scope of work for MPWMD for this task is unchanged from 2017, but the hourly rate for the MPWMD staff involved in performing their portion of this task has dropped from $89/hour to $62/hour, so the amount proposed for their portion of this work for 2018 is reduced by $5,292 to $24,542. The amount proposed for Martin Feeney's portion of this work in 2018 was increased by the $900 additional lab cost of adding field blanks and duplicates to the Sentinel Well water quality sampling program, so the amount proposed for his portion of this work for 2018 was increased by $900 to $26,586. Therefore, the amount budgeted for 2018 was reduced by $4,392 to $51,128. This amount, and the associated scopes of work, were included in the Board-approved M&MP Operations Budget when it was approved in October 2017. However, the subsequent decision to discontinue water quality sampling in the coastal Sentinel Wells under this Task beginning in WY 2018 (as discussed above) means that that portion of the work under this Task will not be performed, and the costs associated therewith will not be incurred.

Task I.2.b.6 (Reports): In 2017 the amount budgeted for this Task was $2,688. The proposed scope of work for this task is unchanged from 2017, but the hourly rate for the MPWMD staff involved in performing their portion of this task has risen from $112/hour to $149/hour, so the amount proposed for 2018 is increased by $888 to $3,576.

Task I.2.b.7 (CASGEM Data Submittal for Watermaster's Voluntary Wells): In 2017 the amount budgeted for this Task was $1,792. The proposed scope of work for this task is unchanged from 2017, but the hourly rate for the MPWMD staff involved in performing their portion of this task has risen from $112/hour to $149/hour, so the amount proposed for 2018 is increased by $592 to $2,384.

Task I.3.a.1 (Update the Existing Model): HydroMetrics proposed cost to update the existing Seaside Basin groundwater model is $54,370, and this is the amount budgeted for this task in 2018. This amount reflects an increase in cost to address the items recommended in Gus Yate's peer review of HydroMetrics' proposal. Copies of documents with detailed background information on this Task were included in the agenda packet for the Budget and Finance Committee's September 19, 2017 meeting which is posted on the Watermaster's website at this link:

http://www.seasidebasinwatermaster.org/Agenda.pdf/17%200919%20WM%20Budget%20&%20Finance%20Com%20mtg%20Agenda%20pkt.pdf.

It is anticipated that the Watermaster will be reimbursed for 50% of the costs to perform this Task by MPWMD and Monterey One Water (formerly MRWPCA) whose projects intend to inject new sources of water into the Basin. Therefore, the net cost to the Watermaster for the work of this Task should only be $27,185. No amount for this task was budgeted in 2017.

Task I.3.a.3 (Evaluate Replenishment Scenarios & Develop Answers to Basin Management Questions): In 2017 the amount budgeted for this Task was $40,000. That was a placeholder amount in case the Board decided it wished to perform work of this type. Since the Model and BMAP will be updated under Tasks I.3.a.1 and I.3.c respectively, this Task would only be used if there were other issues the Board wished to evaluate, and which were not covered in the updated BMAP. For this reason in 2018 it is proposed that this amount be reduced by $20,000 to $20,000.

Task I.3.c (Refine and/or Update the Basin Management Action Plan): In 2017 the amount budgeted for this Task was $25,000. That was a placeholder amount in case the Board decided to perform this work. HydroMetrics' proposed cost to update the existing Basin Management Action Plan is $45,260, and this is the amount proposed for this task in 2018. This amount includes the cost to address the items recommended in Gus Yate's peer review of HydroMetrics' groundwater model updating proposal referred to in Task I. 3.a.1. This is an increase of $20,260 over the 2017 budget amount.

Task I.3.e (Seaside Basin Geochemical Model): This is a proposed new Task for 2018. There was no such task in the 2017 Work Plan. The Task would be performed by MPWMD's Consultant, Pueblo Water Resource, Inc. If necessary, HydroMetrics may

also work on this task after the initial modeling results have been prepared and analyzed. A preliminary estimate of Pueblo Water Resource's cost for their portion of the work is $50,000. A preliminary estimate of HydroMetrics' cost for their portion of the work, if that work is found to be necessary, is $20,000 to $40,000 depending on how many scenarios need to be run. The proposed budget amount to perform this Task is $50,000, based on only performing the Pueblo Water Resources portion of the work. If the Board determines that the HydroMetrics portion of the work is necessary, the Board could fund that work from the Contingency line-item or in some other manner. It is anticipated that the Watermaster will be reimbursed for all of the costs to perform this Task by the three proponents of the projects that intend to inject new sources of water into the Basin. These are California American Water, MPWMD, and Monterey One Water (formerly MRWPCA). Therefore, there should be no net cost to the Watermaster for the work of this Task.

Task I.4.c (Annual Report- Seawater Intrusion Analysis): In 2017 the total amount budgeted for this Task was $21,786, comprised of $896 for MPWMD and $20,890 for HydroMetrics. The proposed scope of MPWMD's portion of this task is unchanged from 2017, but the hourly rate for the MPWMD staff involved in performing their portion of this task has risen from $112/hour to $149/hour, so the amount proposed for 2018 is increased by $296 to $1,192. HydroMetrics' proposed cost to perform their portion of this Task is $20,890. This does not include a new task proposed by HydroMetrics, which would be to perform statistical trend analyses of data from certain of the wells. If that task were included HydroMetrics' cost would be $26,110. The TAC felt that a decision on whether or not to perform trend analyses should be made only if monitoring anomalies are encountered in 2018. If a decision was made to perform that work, it could be funded from the Contingency line-item. Therefore, the proposed budget shows no change in the cost for performing HydroMetrics' portion of this Task. Thus, overall there is an increase of only $296 for this Task in 2018.

The proposed amount for the line-item titled "Contingency (not including Technical Program Manager)" is 10%, the same percentage that has been used in preceding years. The line item for the Technical Program Manager has been reduced by $10,000, based on actual expenditures for this line-item in recent years.

The adopted Budget is $113,636 higher than the 2017 Budget. It should be noted that the Watermaster's actual expenditures will be considerably less if there is cost-sharing with other entities for the work of Tasks I.3.a.1 and I.3.e.

No new monitoring wells are planned for installation in 2018. Consequently, no monies are budgeted in the M&MP Capital Budget for 2018.

Basin Management Database

Pertinent groundwater resource data obtained from a number of sources has been consolidated into the Watermaster's database to allow more efficient organization and data retrieval. No modifications or enhancements to the database are planned in FY 2018.

Enhanced Monitoring Well Network

The Seaside Basin M&MP uses an Enhanced Monitoring Well Network to fill in data gaps in the previous monitoring well network used by the Monterey Peninsula Water Management District (MPWMD), and others, in order to improve the Basin management capabilities of the Watermaster. The Enhanced Monitoring Well Network has been described in detail in previous Watermaster Annual Reports. It continues to be used to obtain additional data that is useful to the Watermaster in managing the Basin.

Basin Management Action Plan (BMAP)

HydroMetrics LLC was hired by the Watermaster to prepare the BMAP which contains these Sections:

- Executive Summary
- The Background and Purpose of the Plan
- The State of the Basin
- Supplemental Water Supplies (long-term water supply solutions)
- Groundwater Management Actions (to be taken as interim measures while long-term supplies are being developed)
- Recommended Management Strategies
- References

The Final BMAP was approved by the Watermaster Board at its February 2009 meeting, and the Executive Summary from the BMAP was contained in Attachment 9 of the 2009 Annual Report. The complete document may be viewed and downloaded from the Watermaster's website at: http://www.seasidebasinwatermaster.org/.

Considerable additional data (8 years' worth) on groundwater quality and groundwater levels throughout the Basin have been collected since the BMAP was prepared. Drought conditions have also been experienced over the past four years, which has impacted aquifer recharge more than anticipated in 2009. Also, even though pumping in recent years has been below the required amounts required under the Decision, groundwater levels have continued to fall. This suggests that the Natural Safe Yield of 3,000 AFY in the Decision may be too high.

Integrating this new information into an updated BMAP will be beneficial and will provide a more complete understanding of the state of the basin. This information could also be used to refine the earlier findings, conclusions, and recommendations contained in the 2009 BMAP. An updated BMAP will provide improved knowledge of:

- The useable quantities of groundwater stored in the basin.
- The annual loss of storage in the basin due to overpumping. (The BMAP estimated this to be between 1,300 and 1,430 AFY).
- The Natural Safe Yield of the basin. (This is the quantity of water than can be extracted through pumping while achieving the first of the two objectives listed above. The Decision set this at an assumed value of 3,000 AFY).

Therefore, updating of the BMAP will be performed in FY 2018, as described above under Task I.3.c of the M&MP.

Seawater Intrusion Response Plan

HydroMetrics LLC was hired by the Watermaster to prepare a long-term Seawater Intrusion Response Plan (SIRP), as required in the M&MP.

The Final SIRP was approved by the Watermaster Board in 2009 and a summary of the Seawater Intrusion Contingency Actions from the SIRP were contained in Attachment 10 of the 2009 Annual Report. The complete document may be viewed and downloaded from the Watermaster's website at: http://www.seasidebasinwatermaster.org/. No modifications to the SIRP are planned in 2018.

Seawater Intrusion Analysis Report

The SIAR examines the "health" of the Basin with regard to whether or not there are any indications that seawater intrusion is either occurring or is imminent. Previous SIARs have stated that depressed groundwater levels, continued pumping in excess of recharge and fresh water inflows, and ongoing seawater intrusion in the nearby Salinas Valley all suggest that seawater intrusion could occur in the Seaside Groundwater Basin. However, as reported in the 2016 Annual Report, in 2016 for the first time there was conflicting data from two of the Watermaster's Sentinel Wells. Some of the data were suggestive of the possible initial onset of seawater intrusion, while other data indicated seawater intrusion was not occurring. At the time of submittal of the 2016 Annual Report, because of the conflicting data no conclusions with regard to the initial onset of seawater intrusion could be drawn.

Verification resampling, one of the recommendations contained in the 2016 SIAR, was undertaken in order to reach a conclusion. Specifically, the recommendation was to perform verification water quality sampling and analysis for Sentinel Well SBWM-2, Sentinel Well SBWM-4, and the Ord Terrace Shallow Monitoring Well. This work was performed in December 2016. A Technical Memorandum prepared by HydroMetrics describing the work and containing an analysis of the data is contained in Attachment 11. The principle conclusion from the analysis was that none of the samples definitively indicated incipient seawater intrusion. However, variations in groundwater quality from samples collected during 2016 from wells SBWM-1 and SBWM-4 necessitate continued vigilance regarding potential changes to the Basin's groundwater quality. The Technical Memorandum contained seven recommendations, all of which were carried out in 2017.

One of these recommendations was to prepare a Work Plan to try to identify the source of fluctuating chloride concentrations. A proposed Work Plan was prepared by HydroMetrics, and is contained in Attachment 12. After due consideration the Technical Advisory Committee and the Board of Directors determined that it would be appropriate to wait until the data from the late-2017 Sentinel Well induction logging, water quality sampling, and fluid resistivity logging events had been analyzed before making a decision on whether to proceed with the activities described in the Work Plan.

A Technical Memorandum prepared by Martin Feeney, one of the Watermaster's

hydrogeologic consultants, describes the late-2017 Sentinel Well fluid resistivity logging event and is contained in Attachment 13. None of the data obtained from this logging indicated that seawater intrusion was occurring. The logging confirmed that the depth-specific water quality samples that are routinely collected during the sampling events are representative of the water in the casing at the specified depths. However, the quality of the water in the casing was found not be representative of the quality of the water in the aquifers in which these wells had been completed.

The Watermaster retained HydroMetrics LLC to prepare the WY 2017 Seawater Intrusion Analysis Report (SIAR) required by the M&MP. The WY 2017 SIAR provides an analysis of data collected during this Water Year.

The 2017 SIAR notes that although changes in chloride concentrations were found at some depths in some of the Sentinel Wells, the evaluation of the data from the sampling and monitoring program continues to indicate that seawater intrusion is not occurring. Because the water quality data being collected in the coastal Sentinel Wells has been found to not be representative of the water quality in the aquifers in which those wells are completed, the SIAR recommends that water quality sampling in those wells be discontinued, and that they be used only for induction logging, as was the original intent when those wells were constructed.

The SIAR is lengthy, but the full *Executive Summary Section* from it is provided in Attachment 8. A complete copy of the document is posted for viewing and downloading from the Watermaster's website at: http://www.seasidebasinwatermaster.org/. All recommendations contained in the SIAR are being or will be carried out and are included in the budgeted activities contained in Attachment 6 and described in Attachment 9.

The Watermaster continues to analyze the data that is being gathered at the various monitoring sites in order to keep a close watch on the conditions within the Basin, as discussed under the "Enhanced Monitoring Well Network" heading above. Because none of the data indicates the presence of seawater intrusion, the Watermaster does not at this time plan to move forward with the Work Plan described in Attachment 12. However, should future data warrant it, the Watermaster may reconsider undertaking the initial phase of the Work Plan.

Groundwater Modeling

During FY 2009 the previous Groundwater Model of the Basin was updated, and a separate Groundwater Model was developed to determine protective water levels within the Basin. The modeling work was performed by HydroMetrics LLC. This Model development work was described in the 2009 Annual Report.

Updating and Evaluating the Accuracy of the Groundwater Model

Evaluating the accuracy of the Groundwater Model was performed in 2015 and is reported on in the 2015 Annual Report. The Model was updated by incorporating more recent data several years ago, but at that time it was not recalibrated because it was felt that the groundwater levels predicted by the Model satisfactorily corresponded to field measured groundwater levels. However, in some parts of the Basin it was found that he Model results were beginning to diverge from the field measured results, and therefore

recalibration would be desirable. Further, even though pumping in recent years has been close to or even below the Natural Safe Yield (NSY) amount of 3,000 AFY authorized in the Decision, groundwater levels have continued to fall. This suggests that the NSY in the Decision may be too high. An updated value for NSY is needed in order to make proper Basin management decisions to prevent seawater intrusion and continued declines in water levels from occurring. An updated Model would be needed to develop an updated NSY value.

Also, in late 2017 the Watermaster began interacting with the new Salinas Valley Basin Groundwater Sustainability Agency (SVBGSA) by being selected for membership on its Advisory Committee. Once the SVBGSA has advanced to the point of hiring their consultants to start developing their Groundwater Sustainability Plan (GSP), the Watermaster will need to have up-to-date documents in order to work with the SVBGSA to jointly resolve the problem of declining water levels in the Laguna Seca and Corral de Tierra subareas.

Therefore, updating of the model will be performed in 2018, as described above under Task I.3.a.1 of the M&MP.

Coordination of Watermaster's Seaside Groundwater Model with Salinas River Basin Model

As reported in the 2015 Annual Report, in May 2015 the Monterey County Resource Management Agency convened a Technical Advisory Committee (TAC) to develop a new Salinas River Basin model, and asked the Watermaster to join their TAC for this work. The County asked for information regarding the Watermaster's model of the Seaside Basin to ensure that the Salinas River Basin model coordinates properly with the Watermaster's model, and the Watermaster provided its model to the County.

During 2017 Monterey County Water Resources performed the following activities on development of the new Salinas River Basin model, termed the Salinas Valley Integrated Hydraulic Model (SVIHM):

- Refined the approach for representing land use and crop rotational patterns within the model. This included discussion with stakeholders and agricultural experts in March. Efforts at refinement and review of possible supplemental land use data sources are ongoing.
- The Technical Advisory Committee met on March 14, 2017. Further meetings of the TAC have not been specified but may coincide with future SVIHM updates.
- Calibration of the historical SVIHM (SVIHM-2014), which covers the time period 1967 to 2014, was finalized in 2017. Initial results from the calibrated model were presented to the public at a joint meeting of the Board of Supervisors of Monterey County; Board of Supervisors of the Monterey County Water Resources Agency; and Board of Directors of the Monterey County Water Resources Agency on July 11, 2017.
- Began with initial steps for completing the 2015 and 2016 updates to the SVIHM.
- The USGS initiated, and is continuing, refinements to the Surface Water Operations module of MODFLOW-OWHM which – upon completion – will be

incorporated into the SVIHM to allow for an operational version of the model. The operational, as opposed to historical, version of the SVIHM will be used to complete the future trends analysis that will be part of the final Basin Investigation report (estimated release in late 2019).

The Watermaster will continue to participate in the Technical Advisory Committee meetings for the development of the SVIHM in order to ensure that the SVIHM coordinates well with the Watermaster's Seaside Basin model.

Sustainable Groundwater Management Act

As reported in the 2015 Annual Report the Watermaster Board determined that the Watermaster should monitor the development of the Salinas Valley Basin Groundwater Sustainability Agency and the State Department of Water Resources' (DWR) development of regulations pertaining to requesting boundary revisions, with the intent to collaborate with these entities as appropriate.

At the State Level

In late 2016 DWR released the final 2016 modifications to California's groundwater basin boundaries. Of the 54 requests for changes to basin boundaries, DWR approved 39, denied 12, and three were deemed incomplete. Most of the modifications were made to basins in the Central Valley and included refinements reflecting waterways, county lines and geologic information. The boundary modification request submitted by the Monterey Peninsula Water Management District (MPWMD) to remove some areas near Monterey from the Salinas Valley Groundwater Basin, and to recognize the boundaries of the Adjudicated Seaside Basin, was approved. These modifications are reflected in the basin boundary map that is now posted on the DWR website.

DWR has included new basin boundaries in its interim update of Bulletin 118, which came out in 2017. It includes the boundary of the Adjudicated Seaside Basin, as requested in the boundary modification request submitted in 2016 by the Monterey Peninsula Water Management District (MPWMD).

At the Monterey County level:

The County met the June 2017 DWR deadline for the establishment of GSAs by filing its Notification with DWR to become the GSA for all of the portions of the Salinas Valley Basin that do not lie within the Arbitrated Seaside Basin. However, Marina Coast Water District (MCWD) also filed a Notification with DWR that it wished to serve as the GSA for the portion of the Salinas Valley Groundwater Basin that lies within their service area, and which does not lie within the Adjudicated Seaside Basin. Two other agencies in southern Monterey County also filed Notifications seeking to be the GSA for their portions of the Salinas Valley Basin. As of the date of preparation of this 2017 Annual Report those entities were still discussing how to resolve these conflicts. However, in spite of these as-yet unresolved conflicts, the County created the SVBGSA and is moving ahead with development of a GSP.

As noted above the SVBGSA approved the Watermaster's application for membership on its Advisory Committee. This will ensure that there is close coordination between that agency and the Watermaster on matters of mutual interest.

K. Updates to the Court

This is a new Section added to the Annual Report beginning with the 2017 Annual Report, to provide a section to respond to the Court on issues it has requested being updated upon, and to raise issues the Watermaster wishes the Court to be aware of that do not readily fit into any of the other sections.

November 26, 2017 email from Judge (Ret) Leslie C. Nichols to Russell McGlothlin

With regard to the questions that were responded to in the Watermaster's response to the Court dated March 13, 2017, Judge Nichols asked for updates if there have been any further developments which are more current in response to those questions.

The following are updates to certain of the issues addressed in the March 13 response:

1. **Water Conservation.** From a water conservation standpoint customers of Cal-Am are doing an exceptional job. California American Water's Monterey system has one of the highest levels of voluntary conservation in the state. There has essentially been no back-off in conservation following the end of mandatory conservation that occurred after the wet winter of 2016-2017.

2. **Storm Water and Recycled Water.** Storm water and recycled water are both components of the Pure Water Monterey (PWM) project that is being implemented by Monterey One Water (formerly Monterey Regional Water Pollution Control Agency). Cal-Am has already contracted to receive 3,500 AFY of PWM recycled water for injection into, and recovery from, the Seaside Basin by Cal-Am. Monterey One Water, in coordination with others, is looking at potential to expand the delivery capacity of the PWM project by using additional sources of recycled water and storm water.

3. **Sustainable Groundwater Management Act.** Coordination between the Watermaster and the Salinas Valley Groundwater Basin Sustainability Agency is ongoing and is discussed in more detail under Section J of this Annual Report. That coordination will aid in groundwater management of the Laguna Seca and Corral de Tierra subareas.

4. **Climate Change.** Higher seawater levels could exacerbate seawater intrusion concerns, which punctuates the importance of monitoring and long-term management to avoid seawater intrusion. From a water supply perspective, reliance on groundwater with sustainable management is ideal because the resource is a reservoir and therefore not subject to sharp fluctuations in availability resulting from year-to-year precipitation amounts as is the case with surface water supplies. Updating of the Watermaster's Groundwater Model and Basin Management Action Plan in 2018 (discussed in Section J) will incorporate impacts from climate change and sea level rise.

Other Topics

1. **Seaside Basin Groundwater Levels and Seawater Intrusion Monitoring.** Changes in groundwater levels in the Coastal and Laguna Seca Subareas are discussed in the Seawater Intrusion Analysis Report (Section J and Attachment 8). Seawater intrusion monitoring is also described in Section J and Attachment 8.

2. **Rampdown in Pumping and Compliance with the Judgement.** This is discussed in Sections A and F of this Annual Report.

3. **Status of the Monterey Peninsula Water Supply Project (MPWSP).** Implementation of the MPWSP is being vigorously pursued by California American Water, and much progress has been made since the March 13 response. Work has commenced on Monterey One Water's (MOW) PWM recycled water project in Marina that is scheduled to come online in 2019. This project will produce approximately 3,500 AFY of advanced treated recycled water that will be delivered to the Seaside Basin for injection into the Basin and subsequent recovery and service to California American Water customers. MOW has also recently executed an agreement with Marina Coast Water District (MCWD) to use a MCWD pipeline that will convey the water from PWM treatment plan to the Seaside Basin.

   Efforts to obtain approval from the California Public Utilities Commission (CPUC) and other responsible agencies to construct the desalination project are also continuing. A final EIR/EIS for the project is expected to be released in March 2018 and the CPUC is scheduled to complete its action on the application for the desalination project in June 2018. California American Water will then seek approvals from the California Coastal Commission and other permitting agencies. Parties to the CPUC proceeding are also engaged in ongoing settlement efforts to seek to resolve conflicts relating to the desalination project. Meanwhile, construction work for a major piece of related infrastructure, the Monterey Pipeline and Pump Station, is progressing steadily. The pipeline will carry recovered PWM water, desalination water, and expanded Aquifer Storage and Recovery (ASR) water between the northern portions of the California American Water system overlying the Seaside Basin to southern portions of the system. The pipeline extends about 7 miles from the City of Seaside to the City of Pacific Grove and is expected to be operational in 2018. The PWM component of the MPWSP is currently projected to become operational in 2019, and the desalination and expanded ASR components are currently projected to become operational in 2021. Detailed quarterly update reports on the MPWSP are posted on the MPWSP website at https://www.watersupplyproject.org.

4. **Potential Replenishment of the Basin with Water Purchased from Marina Coast Water District (MCWD).** In late 2017 the Watermaster received a letter from MCWD proposing to sell water to the Watermaster for purposes of replenishing the Seaside Basin. The Watermaster Board and its Technical Advisory Committee are studying the proposal. An update on this will be provided in the March 2018 Status Conference with the Court.

5. **Articles from the *Standford News* on Technical Issues Potentially of Interest to the Watermaster.** Watermaster staff reviewed the articles Judge Nichols cited in his November 26, 2017 email to Mr. McGlothlin. The applicable technical issues discussed in those articles are being addressed and/or incorporated into the design of the MRSWP, and in the Watermaster's studies and modeling.

Request to Change Due Date for Annual Reports

Again this year (as has been the case every year since water quality monitoring was begun under the Monitoring and Management Program), as of the date of preparation of this Draft 2017 Annual Report the Watermaster's consultants were still waiting for some of the water quality data from the laboratory. This problem became exacerbated in 2017 as a result of changing the second set of annual sampling dates from July to September, as recommended in the HydroMetrics report contained in Attachment 11. As a result, the consultants cannot finalize their reports in time to have them presented in final form to the Watermaster's Technical Advisory Committee (TAC) and Board of Directors in time to meet the current deadline of December 15 to submit the annual report.

The Watermaster requests that the Court revise the deadline for submittal to January 15, to allow sufficient time for the consultants to finalize their reports and have them reviewed by the TAC and Board prior to finalizing and submitting the annual report.

L. Conclusions and Recommendations

The Seaside Basin Watermaster Board has worked diligently to meet all of the Court's established deadline dates. All of the Phase 1 Scope of Work activities, which are described in the "Implementation Plan for the Seaside Basin Monitoring and Management Program" dated March 7, 2007, have been completed. At the Watermaster Board meeting held on October 4, 2017 the Board adopted the FY 2018 budgets contained in Attachment 6, which support carrying out all elements of the "Seaside Groundwater Basin Monitoring and Management Program 2018 Work Plan." That Work Plan describes the M&MP activities that will be conducted during Fiscal Year 2018. A copy of this Work Plan is contained in Attachment 9.

As described in Section J above, information from the Enhanced Monitoring Well Network is being utilized to detect any seawater intrusion. The response actions described in the Watermaster's Seawater Intrusion Response Plan, which was contained in the 2009 Annual Report, will be implemented if seawater intrusion is detected within the Basin.

Because it is not possible to obtain all of the water quality and water level data from the September monitoring event in time to prepare a complete Annual Report in time to submit it to the Board for its approval at its December meeting, the Watermaster proposes to submit its Annual Reports not later than January 15 of each year following the end of each Water Year. This will ensure that all monitoring data can be included and accounted for in the annual SIAR and other reports that comprise part of these Annual Reports.

The Watermaster has scheduled another status conference with the Court on March 30, 2018 to provide an update on certain of the Watermaster's activities.

LISTING OF ACRONYMS USED IN THIS ANNUAL REPORT

AF - acre-feet
ASR - Seaside Basin Aquifer Storage and Recovery program
BLM - Bureau of Land Management
BMAP - Basin Management Action Plan
CASGEM - California Statewide Groundwater Elevation Monitoring
CAW - California American Water
Decision - Superior Court Decision rendered by Judge Roger D. Randall on March 27, 2006
DWR - California State Department of Water Resources
GSA - Groundwater Sustainability Agency
GSP - Groundwater Sustainability Plan
LSSA - Laguna Seca Subarea
MCWD - Marina Coast Water District
MPWMD - Monterey Peninsula Water Management District
M&MP - Monitoring and Management Program
NSY - Natural Safe Yield
SGMA - Sustainable Groundwater Management Act
SIAR - Seawater Intrusion Analysis Report
SIRP - Seawater Intrusion Response
SVBGSA - Salinas Valley Basin Groundwater Sustainability Agency
TAC - Technical Advisory Committee
USGS - United States Geological Survey
WY - Water Year

ATTACHMENT 1

GROUNDWATER EXTRACTIONS

SEASIDE GROUNDWATER BASIN WATERMASTER

Reported Quarterly and Annual Water Production From the Seaside Groundwater Basin
For All Producers Included in the Seaside Basin Adjudication -- Water Year 2017

(All Values in Acre-Feet [AF])

	Type	Oct	Nov	Dec	Oct-Dec 16	Jan	Feb	Mar	Jan-Mar 17	Apr	May	Jun	Apr-Jun 17	Jul	Aug	Sep	Jul-Sep 17	Reported Total	Yield Allocation	from WY 2016	for WY 2017
Coastal Subareas																					
CAW - Coastal Subareas	SPA	242.09	158.00	282.71	**682.80**	209.26	141.81	137.75	**488.82**	127.71	184.33	51.29	**363.33**	78.44	57.62	59.42	**195.48**	**1,730.43**	2,254.40	430.99	2,685.39
City of Seaside (Municipal)	SPA	16.03	16.47	17.47	**49.98**	15.41	12.20	13.37	**40.98**	14.29	16.66	15.65	**46.59**	17.28	17.54	15.93	**50.76**	**188.31**	184.96	0.00	184.96
Granite Rock Company	SPA	---	---	---	**0.00**	---	---	---	**0.00**	---	---	---	**0.00**	---	---	---	**0.00**	**0.00**	17.45	235.32	252.77
DBO Development No. 30	SPA	---	---	---	**0.00**	---	---	---	**0.00**	---	---	---	**0.00**	---	---	---	**0.00**	**0.00**	31.66	454.72	486.38
Calabrese (Cypress Pacific Inv.)	SPA	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	**0.00**	4.24	8.48	12.72
City of Seaside (Golf Courses)	APA	18.59	0.53	0.29	**19.42**	0.42	0.33	12.84	**13.59**	29.64	75.76	84.06	**189.46**	85.45	66.85	64.59	**216.90**	**439.36**	540.00		540.00
Sand City	APA	0.04	0.03	0.00	**0.07**	0.00	0.00	0.02	**0.02**	0.01	0.01	0.01	**0.03**	0.03	0.02	0.02	**0.06**	**0.19**	9.00		9.00
SNG (Security National Guaranty)	APA	---	---	---		---	---	---		---	---	---		---	---	---	**0.00**	**0.00**	149.00		149.00
Calabrese (Cypress Pacific Inv.)	APA	0.00	0.00	0.00	**0.00**	0.01	0.00	0.00	**0.01**	0.01	0.00	0.00	**0.01**	0.01	0.00	0.00	**0.01**	**0.03**	6.00		6.00
Mission Memorial (Alderwoods)	APA	1.46	0.09	0.07	**1.62**	0.00	0.00	0.21	**0.21**	0.49	2.33	3.34	**6.15**	2.07	2.01	1.67	**5.76**	**13.74**	31.00		31.00
Coastal Subareas Totals					**753.88**				**543.63**				**605.58**				**468.97**	**2,372.06**	**3,227.70**	**1,129.51**	**4,357.21**
Laguna Seca Subarea																					
CAW - Laguna Seca Subarea	SPA	28.59	18.63	18.69	**65.91**	18.14	16.16	20.12	**52.42**	20.34	29.50	31.80	**81.64**	36.95	36.22	25.94	**99.11**	**298.08**	48.30		48.30
Ryan Ranch Unit		5.18	3.88	3.36	12.42	3.13	2.90	4.58	10.61	4.26	5.35	5.16	**14.77**	5.10	4.83	5.91	15.84	53.64			
Hidden Hills Unit		11.62	7.08	7.91	26.61	6.81	6.63	8.58	22.02	7.88	11.29	13.23	**32.40**	16.51	16.53	6.68	39.72	120.75			
Bishop Unit		11.79	7.67	7.42	26.88	8.20	6.63	6.96	19.79	8.20	12.86	13.41	**34.47**	15.34	14.86	13.35	43.55	124.69			
Nicklaus Club Monterey	APA	17.00	0.00	0.00	**17.00**	2.00	0.00	0.00	**2.00**	0.00	18.00	30.00	**48.00**	25.00	40.00	23.00	**88.00**	**155.00**	251.00		251.00
Laguna Seca Golf Resort (Bishop)	APA	10.71	0.00	0.00	**10.71**	2.07	4.48	0.00	**6.55**	4.73	33.37	38.94	**77.04**	37.82	27.79	25.58	**91.15**	**193.46**	320.00		320.00
York School	APA	0.87	0.02	0.01	**0.90**	0.00	0.00	0.00	**0.00**	0.65	3.20	1.91	**5.77**	2.70	2.16	2.00	**6.85**	**13.52**	32.00		32.00
Laguna Seca County Park	APA	0.00	0.00	0.00	**0.00**	0.00	0.00	6.24	**6.24**	0.00	2.76	2.71	**5.47**	1.04	1.78	1.69	**4.51**	**16.22**	41.00		41.00
Laguna Seca Subarea Totals					**100.52**				**67.21**				**219.92**				**289.62**	**677.28**	**692.30**	**0.00**	**692.30**
Total Production by WM Producers					**854.40**				**610.85**				**825.50**				**758.59**	**3,049.34**	**3,920.00**	**1,129.51**	**5,049.51**
									Annual Production from APA Producers									831.52	1,370.00		
									Annual Production from SPA Producers									2,217.82	3,670.51		

City of Seaside Golf Courses In-Lieu (MCWD source water)																					
MCWD delivery	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	**0.00**				
CAW / MPWMD ASR (Carmel River Basin source water)																					
Injection	0.00	0.00	112.08	**112.08**	438.40	404.07	557.41	**1307.88**	496.85	338.38	0.00	**835.23**	0.00	0.00	0.00	0.00	**2345.19**				
(Recovery)	-155.00	-149.92	0.00	**-304.92**	0.00	0.00	0.00	**0.00**	0.00	0.00	-286.56	**-286.56**	-310.00	-301.05	-298.80	-909.85	**-1501.33**				
Net ASR	-155.00	-149.92	112.08	**-192.84**	438.40	404.07	557.41	**1307.88**	496.85	338.38	-286.56	**548.67**	-310.00	-301.05	-298.80	-909.85	**843.86**				

Notes:

1. The Water Year (WY) begins October 1 and ends September 30 of the following calendar year. For example, WY 2017 begins on October 1, 2016 and ends on September 30, 2017.
2. "Type" refers to water right as described in Seaside Basin Adjudication decision as amended, signed February 9, 2007 (Monterey County Superior Court Case No. M66343).
3. Values shown in the table are based on reports to the Watermaster received by July 15, 2017.
4. All values are rounded to the nearest hundredth of an acre-foot. Where required, reported data were converted to acre-feet utilizing the relationships: 325,851 gallons = 43,560 cubic feet = 1 acre-foot.
5. "Base Operating Yield Allocation" values are based on Seaside Basin Adjudication decision. These values are consistent with the *Watermaster Produce Allocations Water Year 2017* (see Item IX B in 12/7/2016 Board packet).
6. Any minor discrepancies in totals are attributable to rounding.
7. APA = Alternative Producer Allocation; SPA = Standard Producer Allocation; CAW = California American Water.
8. It should be noted that CAW/MPWMD ASR "Injection" and "Recovery" amounts are not expected to "balance" within each Water Year. This is due to the injection recovery "rules" that are part of SWRCB water rights permits and/or separate agreements with state and federal resources agencies that are associated with the water rights permits.

ATTACHMENT 2

WATERMASTER DECLARATION
OF
NON-AVAILABILITY
OF
ARTIFICIAL REPLENISHMENT WATER

NOTICE TO ALL SEASIDE GROUNDWATER PRODUCERS:

Case No. M66343 Amended Decision Section III.B.2.

Commencing with the fourth Water Year, and triennially thereafter, the Operating Yield for both Subareas will be decreased by ten percent (10%) until Operating Yield is the equivalent of the Natural Safe Yield unless:

a. *The Watermaster has secured and is adding an equivalent amount of Non-Native water to the Basin on an annual basis; or*
b. *The Watermaster has secured reclaimed water in an equivalent amount and has contracted with one or more of the Producers to utilize said water in lieu of their Production Allocation, with the Producer agreeing to forego their right to claim a Stored Water Credit for such forbearance; or*
c. *Any combination of a and b above which results in the decrease in Production of Native Water required by this Decision; or*
d. *The Watermaster has determined that Groundwater levels within the Santa Margarita and Paso Robles aquifers are at sufficient levels to ensure a positive offshore gradient to prevent seawater intrusion.*

The Watermaster has determined that the conditions necessary to avoid the ten percent Operating Yield reduction have not been met as follows:

1. Watermaster has not secured water for adding an equivalent amount of Non-Native water to the Basin on an annual basis. Watermaster received an offer dated September 27, 2017 from Marina Coast Water District to sell a portion of its existing potable groundwater as replenishment water; if and when associated agreements mature to the point where water is available to Watermaster, a new Declaration will be made.
2. The Watermaster has not secured reclaimed water in an equivalent amount.
3. The Watermaster has not secured Non-Native water or reclaimed water which results in the decrease in Production of Native Water required by the Decision.
4. The firm contracted by Watermaster for technical analyses continued to report in 2017 that Groundwater levels within the Santa Margarita and Paso Robles aquifers are not at sufficient levels to ensure a positive offshore gradient to prevent seawater intrusion, so the requirement for this item continues to not be met.

Section III.L.3.j.iii: Watermaster declares that for Water Year 2018 Artificial Replenishment Water is not available to offset Operating Yield Over-Production and producers are limited in production to the following quantities of water:

Coastal Subarea Alternative Producers:	
Seaside (Golf)	540.00 acre-feet
SNG	149.00 acre-feet
Cypress (Calabrese)	6.00 acre-feet
Mission Memorial (Alderwood)	31.00 acre-feet
Sand City	9.00 acre-feet

Laguna Seca Subarea Alternative Producers:

Nicklaus Club Monterey	251.00 acre-feet
Bishop	320.00 acre-feet
York School	32.00 acre-feet
Laguna Seca County Park	41.00 acre-feet

Coastal Subarea Standard Producers:

California American Water.....	2,546.17 acre-feet*
Seaside (Municipal)	150.74 acre-feet**
Granite Rock	266.99 acre-feet***
D.B.O. Development 30	507.56 acre-feet****
Cypress (Calabrese).....	16.17 acre-feet*****

Laguna Seca Subarea Standard Producers:

California American Water.....	0.0 acre-feet

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* Total is the 2018 base allocation of 1,837.38 acre-feet plus 706.49 not free carryover plus 0.16 acre-feet and 2.15 acre-feet assigned from D.B.O. No. 30.
California American Water has a positive balance of 824.01 acre-feet of stored water credit at WY-end 2017 from Basin extractions exceeding injections since WY 2010 under the CAW/MPWMD ASR Program, formalized through a Storage Agreement in 2012.

** Total is the 2018 base allocation of 150.74 acre-feet.

*** Total includes 166.32 acre-feet of "free" carryover and 86.45 acre-feet of "not-free" carryover credit from previous water years, plus the 2018 base allocation of 14.22 acre-feet.

**** Total includes 317.77 acre-feet of "free" carryover minus 0.16 acre-feet and 2.15 acre-feet assigned to California American Water, and 166.30 acre-feet of "not-free" carryover credit from previous water years, plus the 2018 base allocation of 25.80 acre-feet.

***** Cypress (Calabrese) converted 8 acre-feet of APA to SPA in January 2015; total includes 10.87 acre-feet of "free" carryover and 1.85 acre-feet of "not-free" carryover credit from water year 2017, plus the 2018 base allocation of 3.45 acre-feet.

ATTACHMENT 3

WATERMASTER ADMINISTRATIVE AND OPERATIONS COSTS

Seaside Groundwater Basin Watermaster

Budget vs. Actual Administrative Fund

Fiscal Year (January 1 - December 31, 2017)

Balance through November 30, 2017

	2017 Adopted Budget Revised July 5, 2017	Contract Amount	Year to Date Revenue / Expenses
Available Balances & Assessments			
Dedicated Reserve	-		-
FY (Rollover)	47,000.00		41,619.33
Admin Assessments	52,000.00		52,000.00
Available	**99,000.00**		**93,619.33**
Expenses			
Contract Staff	60,000.00	60,000.00	36,600.00
Legal Advisor	24,000.00	24,000.00	21,233.39
Total Expenses	**84,000.00**	**84,000.00**	**57,833.39**
Total Available	15,000.00		
Dedicated Reserve	15,000.00		25,000.00
Net Available	-		**10,785.94**

Seaside Groundwater Basin Watermaster

Budget vs. Actual Monitoring & Management - Operatio

Fiscal Year (January 1 - December 31, 2017)

Balance through November 30, 2017

	2017 Adopted Amended Budget	Contract Encumbrance	Year to Date Revenue/Expenses
Available Balances & Assessments			
Operations Fund Assessment	$ 100,000.00	$ -	$ 100,000.00
Pass Through 2017	-	4,788.00	2,664.00
FY 2016 Rollover	270,965.98	-	270,965.98
Total Available	**$ 370,965.98**	**$ 4,788.00**	**$ 373,629.98**
Appropriations & Expenses			
GENERAL			
Technical Project Manager	$ 60,000.00	$ 60,000.00	$ 37,300.00
Contingency @ 20% (not including TPM)	12,091.00	$ -	-
Total General	**$ 72,091.00**	**$ 60,000.00**	**$ 37,300.00**
CONSULTANTS (Hydrometrics; Todd Groundwater; Web Site Database)			
Program Administration	$ 26,276.00		
Production/Lvl/Qlty Monitoring	2,400.00	$ 23,800.00	$ 19,658.46
Basin Management Action Plan	48,881.76		
Seawater Intrusion Analysis Report	20,890.00	20,890.00	17,893.75
Total Consultants	**$ 98,447.76**	**$ 44,690.00**	**$ 37,552.21**
MPWMD			
Production/Lvl/Qlty Monitoring	$ 52,558.00	53,454.00	16,495.00
Pass Through 2017	-	4,788.00	2,310.00
Basin Management	-		-
Seawater Intrusion	896.00	-	-
Direct Costs	-	-	-
Total MPWMD	**$ 53,454.00**	**$ 58,242.00**	**$ 18,805.00**
CONTRACTOR (Martin Feeney)			
Production/Lvl/Qlty Monitoring	$ 36,203.80	$ 36,203.80	35,660.58
Reserve			-
Transfer Out to Capital Fund			-
Total Appropriations & Expenses	**$ 260,196.56**	**$ 199,135.80**	**$ 129,317.79**
Total Available	**110,769.42**		**244,312.19**

ATTACHMENT 4

REPLENISHMENT ASSESSMENT UNIT COST DETERMINATION FOR WATER YEAR 2018

SEASIDE GROUNDWATER BASIN WATERMASTER

TO: Board of Directors

FROM: Laura Dadiw, Administrative Officer

DATE: October 4, 2017

SUBJECT: Unit Cost for Water Year 2017/18 Over Production Replenishment Assessment Amounts

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RECOMMENDATION:
It is recommended that the Board approve a Proposed Replenishment Assessment Unit Cost of $2,872 for Operating Yield Overproduction and $718 (25% of $2,872) for Natural Safe Yield Over Production for Water Year 2018 (October 1, 2017 - September 30, 2018).

SUMMARY:
The Replenishment Assessment Unit Cost is used to calculate the Replenishment Assessments that are charged to any Standard Producer that exceeds its allocations (both Operating Yield and Natural Safe Yield allocations) during the Water Year.

Per page 33 of the Decision, *"The per acre-foot amount of the Replenishment Assessments shall be determined and declared by Watermaster in October of each Water Year in order to provide Parties with advance knowledge of the cost of Over-Production in that Water Year."* Thus, the per acre-foot amount determined by the Board in or before October of 2017 will be used to calculate Replenishment Assessments for pumping that occurs during the Water Year which begins on October 1, 2017 and ends on September 30, 2018.

BACKGROUND:
For each of the past three Water Years 2014, 2015, and 2016, the Board adopted a unit cost of $2,702/AF. This unit cost was developed starting with Water Year 2014 by taking the average of the Base Unit Cost ($/AF) listed in Table 1 for each project [$3,507+$1,800+$2,000+$3,500)/4], as the Replenishment Assessment Unit Cost. The Water Year 2014 unit cost was carried over to the two subsequent Water Years because no updated cost data was available for the projects listed in Table 1, and no other viable projects could be identified. For last Water Year (2016/17) the Budget and Finance Committee updated the basis from which the annual calculation of the Unit Cost of replenishment water is established, a blended cost of a reduced size desalination plant for the Monterey Peninsula Water Supply Project and groundwater replenishment provided by the Pure Water Monterey Project [($4,591+$2,025+$2,000)/3] = $2,872 (see Table 2).

DISCUSSION:
Due to the lack of more supportable data the recommendation by the Budget and Finance Committee at its September 19th meeting is to continue using $2,872, the average of the Base Unit Cost ($/AF) listed in Table 2 for each project [($4,591+$2,025+$2,000)/3] as the Operating Yield Over Production Replenishment Assessment Unit Cost for the Water Year 2017/2018. The Natural Safe Yield Replenishment Assessment Unit Cost is 25% of that amount, or $718.

ATTACHMENTS:
Table 1: Water Year 2017 Unit Cost Calculation Data
Table 2: Updated Unit Cost Data

WATER YEAR 2014 (October 1, 2013-September 30, 2014)

ANTICIPATED UNIT COSTS OF REPLENISHMENT WATER FOR THE SEASIDE BASIN

POTENTIAL SOURCE OF REPLENISHMENT WATER	POTENTIAL DATE REPLENISH-MENT WATER COULD BECOME AVAILABLE	POTENTIAL VOLUME OF WATER THAT COULD BE SUPPLIED BY THE PROJECT (AFY) [1]	LEVEL OF PROJECT DEVELOP-MENT	CONTINGENCY INCLUDED IN BASE UNIT COST [2] (%)	BASE UNIT COST ($/AF)	BASE UNIT COST YEAR	ADDITIONAL CONTINGENCY ADDED TO REFLECT LEVEL OF PROJECT DEVELOPMENT [3] (%)	UNIT COST INCLUDING ADDITIONAL CONTINGENCY ($/AF)	UNIT COST INFLATED @ 3% FROM COST BASIS YEAR TO YEAR REPLENISH-MENT WATER COULD BECOME AVAILABLE ($/AF)	VOLUME-WEIGHTED AVG %
Monterey Peninsula Water Supply Project (Regional Desalination) [4]	2018	9,752	Project Report	30%	$3,507	2012	0%	$3,507	$4,188	56.53%
Seaside Basin ASR Expansion [5]	2015	1,000	Conceptual	11%	$1,800	2012	39%	$2,502	$2,734	5.80%
Regional Urban Water Augmentation Project [6]	2017	3,000	Design	5%	$2,000	2013	10%	$2,200	$2,476	17.39%
Groundwater Replenishment Project (GWRP) [7]	2017	3,500	Conceptual	50%	$3,500	2017	0%	$3,500	$3,500	20.29%
Total Quantity of Replenishment Water (AFY) the Listed Projects Could Cumulatively Potentially be Able to Produce Within the Next 10 Years [8] =										**17,252**

FOOTNOTES:

(1) For the Monterey Peninsula Water Supply Project this is the total amount of water from this source which could potentially come to the CAW distribution system. Only a portion of this amount might be available as initially unused capacity that could be used to help replenish the Seaside Basin. For the RUWAP this is the total amount of water from this source. Only a portion of this amount might be used for in-lieu replenishment of the Seaside Basin. For the ASR Expansion Project this is the additional amount of water that could potentially be provided by this project (see footnote 5). For the RUWAP this is the total amount of water that this project is expected to produce. Only a portion of this amount might be used as in-lieu replenishment of the Seaside Basin. For the GWRP this is the quantity of water that is being considered at this time by CAW for inclusion in its Monterey Peninsula Water Supply Project.

(2)(3) The following Contingency percentages were considered reasonable for the indicated levels of project development: Conceptual Level - 50%, Project Report Level - 30%, and Design Level - 15%. The sum of the values in the columns titled "Contingency Included in Base Unit Cost" and "Additional Contingency Added to Reflect Level of Project Development" equals the Contingency appropriate for the project's level of development.

(4) Project data based on documents provided by Cal Am and MPWMD.

(5) Project data provided by MPWMD. The 1,000 AFY of potential water that this project could supply would be in addition to the 1,300 AFY included as part of the Monterey Peninsula Water Supply Project, and would be an annual average taking into account river flow and hydrologic conditions that change from year to year.

(6) Project data provided by MCWD.

(7) Project data provided by MRWPCA. MRWPCA reported that the GWRP quantity being used in the current CEQA documentation is 3,500 AFY, but that the project could potentially supply 6,500 AFY or more. The unit cost would be lower if a quantity larger than 3,500 AFY were produced.

(8) This value is the cumulative production capacity of all of the Potential Sources of Replenishment Water that listed in this table, and is used only to determine the "Volume-Weighted Average." It is not the amount of water that is expected to be available to the Seaside Basin.

WATER YEAR 2017 (October 1, 2016-September 30, 2017)

ANTICIPATED UNIT COSTS OF WATER COULD POTENTIALLY BE USED FOR REPLENISHMENT OF THE SEASIDE BASIN

POTENTIAL SOURCE OF REPLENISHMENT WATER	POTENTIAL DATE REPLENISH-MENT WATER COULD BECOME AVAILABLE	POTENTIAL VOLUME OF WATER THAT COULD BE SUPPLIED BY THE PROJECT (AFY) [1]	BASE UNIT COST ($/AF)	BASE UNIT COST YEAR
Regional Desalination[2]	2020	6,250	$6,147	2019
Groundwater Replenishment Project (Pure Water Monterey)[2]	2018	3,500	$1,811	2018
Monterey Peninsula Water Supply Project (Combined Regional Desalination with Groundwater Replenishment Project)	GWRP in 2018 Regional Desalination in 2020	9,750	$4,591	
Seaside Basin ASR Expansion[3]	2020	1,000	$2,025	2016
Regional Urban Water Augmentation Project[4]	2018	1,400-1,700	$2,000	2018

FOOTNOTES:

(1) For the Regional Desalination Project this is the total amount of water from this source which could potentially come to the CAW distribution system, based on the desalination plant having a 6.4 MGD capacity which is equivalent to 7,169 AFY. Only a portion of this amount might be available as initially unused capacity that could be used to help replenish the Seaside Basin. For the RUWAP this is the total amount of non-potable water from this source. Only a portion of this amount might be used for in-lieu replenishment of the Seaside Basin. For the ASR Expansion Project this is the additional amount of water that could potentially be provided by this project (see footnote 3). For the GWRP this is the quantity of water that is being planned at this time by CAW for inclusion in its Monterey Peninsula Water Supply Project.

(2) Base unit cost data based on PUC filing documents and provided by Dave Stoldt of MPWMD .

(3) Base unit cost data provided by MPWMD. The 1,000 AFY of potential water that this project could supply would be in addition to the 1,300 AFY included as part of the Monterey Peninsula Water Supply Project, and would be an annual average taking into account river flow and hydrologic conditions that change from year to year.

(4) Project data provided by MCWD.

ATTACHMENT 5

REPLENISHMENT ASSESSMENT CALCULATIONS FOR WY 2017

WATERMASTER PRODUCER ALLOCATIONS WATER YEAR 2017 IN ACRE-FEET (AF)
INCLUDING A 10% TRIENNIEL REDUCTION FOR 100% OF THIS WATER YEAR

Initial Basin-Wide Operating Yield[1]	3920.00	Coastal Operating Yield[1]	3227.70
Natural Safe Yield (NSY)[2]	3000.00	Laguna Seca Operating Yield[1]	692.30

ALTERNATIVE PRODUCER ALLOCATIONS

Coastal Subarea[3]	AF	Laguna Seca Subarea[3]	AF
Seaside (Golf)	540.00	Nicklaus Club Monterey	251.00
SNG	149.00	Bishop	320.00
Calabrese	6.00	York School	32.00
Mission Memorial (Alderwood)	31.00	Laguna Seca County Park	41.00
Sand City	9.00		
Total[1]	735.00	Total[1]	644.00

ALTERNATIVE PRODUCER AMOUNT PUMPED WY 2017

Coastal Subarea[3]	AF	Laguna Seca Subarea[3]	AF	Total Alternative Produce Production
Seaside (Golf)	439.36	Nicklaus Club Monterey	155.00	
SNG	0.00	Bishop	193.46	
Calabrese	0.03	York School	13.52	
Mission Memorial (Alderwood)	13.74	Laguna Seca County Park	16.22	
Sand City	0.19			
Total[1]	453.32	Total[1]	378.20	831.52

STANDARD PRODUCER ALLOCATIONS

Coastal Operating Yield Available to Standard Producers (AF)			2492.70	Laguna Seca Operating Yield Available to Standard Producers (AF)			48.30
	Standard Producer Allocations				Standard Producer Allocations		
Coastal Subarea	Base Water Right %[4]	Weighted %[5]	AF Available to This Producer	Laguna Seca Subarea	Base Water Right %[4]	Weighted %[5]	AF Available to This Producer
California American Water (CAW)	77.55%	90.44%	2254.40	CAW	45.13%	100.00%	48.30
Seaside (Municipal)	6.36%	7.42%	184.96				
Granite Rock	0.60%	0.70%	17.45				
D.B.O. Development No. 30	1.09%	1.27%	31.66				
Calabrese (Cypress Pacific Investors LLC)	0.15%	0.17%	4.24				
Total	85.75%	100.0%	2492.70	Total	45.13%	100.0%	48.30

Allocation of Available Operating Yield Among Standard Producers	Base Water Right Available to this Producer (AF)	% NSY to SPA (Base Water Right / Total Water Right)	NSY Available to Producers (AF) Current Water Year	Free Carryover Credits from Prior Water Year	Not-Free Carryover Credits from Prior Water Year	Water Rights Transferred / Sold DBO to CAW 710 Amador	Water Rights Transferred / Sold DBO to CAW 2 Upper Ragsdale	Total Producer NSY (AF) (NSY Available + Free Carryover Credits)	Total Authorized Production Current WY (Base Water Right Plus All Carryover)[6]	Actual AF Pumped by Producer in WY 2017	Free Carry over Credits to WY 2018	Not-Free Carry over Credits to WY 2018
		NSY 3000 - 921.52 AF =	WY 2017 APA Pumped 831.52 AF 2168.48									
California American Water	2302.70	90.62%	1965.11	0.00	43C99	0.16	2.15	1967.42	2736.00	2029.51	0.00	706.49
Seaside (Municipal)	184.96	7.28%	157.84	0.00	0.00	0.00	0.00	157.84	184.96	188.31	0.00	0.00
Granite Rock	17.45	0.69%	14.89	151.43	83.89	0.00	0.00	166.32	252.77	0.00	166.32	86.45
D.B.O. Development No. 30	31.66	1.25%	27.02	293.06	161.66	(0.16)	(2.15)	317.77	484.07	0.00	317.77	166.30
Calabrese (Cypress Pacific Investors LLC)	4.24	0.17%	3.62	7.26	1.72	0.00	0.00	10.87	12.72	0.00	10.87	1.85
Total	2541.01	100.00%	2168.48	451.75	677.75	0.00	0.00	2620.23	3670.51	2217.82	494.97	961.07

Footnotes:
(1) From page 17 of Exhibit A (Amended Decision)of Court Order filed February 9, 2007.
(2) From page 14 of Exhibit A (Amended Decision)of Court Order filed February 9, 2007.
(3) From page 21 of Exhibit A (Amended Decision)of Court Order filed February 9, 2007.
(4) From Table 1 on page 19 of Exhibit A (Amended Decision) of Court Order filed February 9, 2007.
(5) Calculated from the Base Water Right percentages in the adjacent column.
(6) Base Water Right plus Free and Not Free Carryover Credit = 2017 Production Allocation (see 2017 Declaration from 12/6/2017 Watermaster board meeting)
Note: Calabrese (Cypress Pacific Investors LLC) opted to convert 8AF of its 14AF Alternative Production Allocation to Standard Production Allocation on January 22, 2015 (notice filed by Cypress with Superior Court).

CALCULATION OF REPLENISHMENT ASSESSMENTS WATER YEAR 2017

Using the Basin-wide methodology approved by the Court on January 12, 2007, and as shown in detail on the spreadsheet contained in this attachement, Watermaster calculated the Water Year (WY) (October 1st through September 30th) 2017 Replenisment Assessments as follows:

2017 Replenishment Assessment NSYO Unit Charge =	$2,872.00	
2017 Replenishment Assessment OSYO Unit Charge =	$718.00	
2017 Natural Safe Yield (NSY) Available to Standard Producers =	2,168.48	AF (3,000 AF NSY - 831.52 Alternative Producers 2017 Production)

Standard Producers	WY 2017 Production (AF)	% of NSY Available	Volume of NSY Available (AF)	NSY Overproduction (AF)	NSY Overproduction Assessment	Operating Yield Available (AF)	Operating Yield Overproduction (AF)	Operating Yield Overproduction Assessment	Total Assessment
California American Water	2,029.51	90.62%	1,965.11	64.40	$ 184,957.11	2,736.00	-	$ -	$ 184,957.11
Seaside (Municipal)	188.31	7.28%	157.84	30.47	87,511.62	184.96	3.35	2,408.69	89,920.31
Granite Rock	-	0.69%	14.89	-	-	252.77	-	-	-
D.B.O. Development No. 30	-	1.25%	27.02	-	-	484.07	-	-	-
Calabrese (Cypress Pacific Inv.)	-	0.17%	3.62	-	-	12.72	-	-	-
Total Production	**2,217.82**	**100.00%**	2,168.48	**94.87**	**$ 272,468.72**	**3,670.51**	**3.35**	**$ 2,408.69**	**$ 274,877.41**

Alternative Producers	WY 2017 Production (AF)	% of NSY Available	Volume of NSY Available (AF)	NSY Overproduction (AF)	NSY Overproduction Assessment	Operating Yield Available (AF)	Operating Yield Overproduction (AF)	Operating Yield Overproduction Assessment	Total Assessment
City of Seaside (Golf Courses)	439.36	N/A	540.00	0.00	$ -	540.00	0.00	$ -	$0
Security National Guaranty	-	N/A	149.00	0.00	-	149.00	0.00	-	-
Calabrese (Cypress Pacific Inv.)	0.03	N/A	6.00	0.00	-	6.00	0.00	-	-
Mission Memorial (Alderwoods)	13.74	N/A	31.00	0.00	-	31.00	0.00	-	-
City of Sand City	0.19	N/A	9.00	0.00	-	9.00	0.00	-	-
Nicklaus Club Monterey	155.00	N/A	251.00	0.00	-	251.00	0.00	-	-
Laguna Seca Golf Resort (Bishop)	193.46	N/A	320.00	0.00	-	320.00	0.00	-	-
York School	13.52	N/A	32.00	0.00	-	32.00	0.00	-	-
Laguna Seca County Park	16.22	N/A	41.00	0.00	-	41.00	0.00	-	-
Total Production	**831.52**	**N/A**	**1,379.00**	**0.00**	**$ -**	**1,379.00**	**0.00**	**$ -**	**$0**

ATTACHMENT 6

WATERMASTER BUDGETS FOR 2018

Seaside Groundwater Basin Watermaster
Fiscal Year 2018 Administrative Fund Budget

	2017 Adopted Revised Budget	2017 Estimated Total	2018 Budget et
Assessment Income			
Reserve/Rollover*	$ 47,000	$ 37,000	$ 42,000
Administrative Assessment	52,000	52,000	40,000
Totals	99,000	89,000	82,000
Expenditures			
Contractual Services - Administrativ	60,000	50,000	50,000
Legal Services**	24,000	24,000	7,000
Total Expenses	84,000	74,000	57,000
Total Available	15,000	15,000	25,000
Less Reserve	15,000	15,000	25,000
Net Available	$ -	$ -	$ -

** Note: The reserve/rolloer balance of $42,000 was determined upon completion by Watermaster staff of a detailed reconciliation from 2006 through July 2017 of the Administrative Fund financial records held at the Watermaster office against the Administrative Fund financial records held by the City of Seaside - the Watermaster fiscal agent.*

*** July 5, 2017 board action to amend 2017 Administrative Fund Budget to include $10,000 additional for legal services for 3/17/17 Case Management Conference unanticipated expenses.*

Seaside Groundwater Basin Watermaster
Fiscal Year 2018 Monitoring & Management Plan
Operations Budget

Monitoring and Management Plan Operations Budget For Tasks to be Undertaken in 2018							
Task	**Subtask**	**Sub-Subtask**	**Cost Description**	**CONSULTANTS & CONTRACTORS[3]**			**Total**
				MPWMD	**Private Consultants**	**Contractors**	
			Labor				
			Technical Project Manager	$0	$50,000	$0	$50,000
M.1 Program Administration							
	M.1.a		Project Budget and Controls	$0	$0	$0	$0
	M.1.b		Assist with Board and TAC Agendas	$0	$0	$0	$0
	M.1.c & M.1.d		Preparation for and Attendance at Meetings[8]	$0	$11,500	$0	$11,500
	M.1.e		Peer Review of Documents and Reports[8]	$0	$7,500	$0	$7,500
	M.1.f		QA/QC	$0	$0	$0	$0
	M.1.g		SGMA Documentation Preparation	$0	$1,900	$0	$1,900
I.1 Initial Phase 1 Monitoring Well Construction (Task Completed in Phase 1)							
I.2 Production, Water Level and Quality Monitoring							
	I. 2. a.		Database Management				
		I. 2. a. 1.	Conduct Ongoing Data Entry/ Database Maintenance/Enhancement	$14,604	$2,400	$0	$17,004
		I. 2. a. 2.	Verify Accuracy of Production Well Meters	$0	$0	$0	$0
	I. 2. b.		Data Collection Program				
		I. 2. b. 1.	Site Representation and Selection[7]	$0	$0	$0	$0
		I. 2. b. 2.	Collect Monthly Water Levels[6]	$3,726	$0	$0	$3,726
		I. 2. b. 3.	Collect Quarterly Water Quality Samples[1][5][6]	$24,542	$0	$26,586	$51,128
		I. 2. b. 4.	Update Program Schedule and Standard Operating Procedures.	$0	$0	$0	$0
		I. 2. b. 5.	Monitor Well Construction[7]	$0	$0	$0	$0
		I. 2. b. 6.	Reports	$3,576	$0	$0	$3,576
		I. 2. b. 7.	CASGEM Data Submittal for Watermaster's Voluntary Wells	$2,384	$0	$0	$2,384
I.3 Basin Management							
	I. 3. a.		Enhanced Seaside Basin Groundwater Model	(Costs Shown in Subtasks Below)			
		I. 3. a. 1	Update the Existing Model[11]	$0	$54,370	$0	$54,370
		I. 3. a. 2	Develop Protective Water Levels[12]	$0	$0	$0	$0
		I. 3. a. 3	Evaluate Replenishment Scenarios and Develop Answers to Basin Management Questions[10]	$0	$20,000	$0	$20,000
	I. 3. b.		Complete Preparation of Basin Management Action Plan	$0	$0	$0	$0
	I. 3. c.		Refine and/or Update the Basin Management Action Plan	$0	$45,260	$0	$45,260
	I. 3. d		Evaluate Coastal Wells for Cross-Aquifer Contamination Potential	$0	$0	$0	$0
	I. 3. e		Seaside Basin Geochemical Model[13][14]	$0	$50,000	$0	$50,000
I.4 Seawater Intrusion Contingency Plan							
	I. 4. a.		Oversight of Seawater Intrusion Detection and Tracking	$0	$0	$0	$0
	I. 4. b.		Provide focused area hydrogeologic investigation for Sand City Public Works	$0	$0	$0	$0
	I. 4. c.		Annual Report- Seawater Intrusion Analysis	$1,192	$20,890	$0	$22,082
	I. 4. d.		Complete Preparation of Seawater Intrusion Response Plan[2]	$0	$0	$0	$0
	I. 4. e.		Refine and/or Update the Seawater Intrusion Response Plan[2][9]	$0	$0	$0	$0
	I. 4. f.		If Seawater Intrusion is Determined to be Occurring, Implement Contingency Response Plan[2]	(No Costs are Included for This Task, as This Task Will Likely Not be Necessary During 2018. If it Does Become Necessary, Use of Contingency Funds or a Budget Modification Will Likely be Necessary)			
		TOTALS CONSULTANTS & CONTRACTORS		**$50,024**	**$263,820**	**$26,586**	
						SUBTOTAL not including Technical Program Manager =	$290,430
						Contingency (not including Technical Program Manager) @ 10%[4] =	$29,043
						Technical Program Manager =	$50,000
						TOTAL=	**$369,473**

Footnotes:

(1) Under this Subtask the Watermaster will directly contract with an outside contractor to perform the Sentinel Well induction logging work, and to also collect and analyze water quality samples in conjunction with doing the induction logging. MPWMD will perform the other portions of the work of this Subtask.

(2) The response plan would only be implemented in the event sea water intrusion is determined to be occurring.

(3) Within the context of this document the term "Consultant" refers either to a Private Consultant providing professional engineering or other types of technical services, or to the Monterey Peninsula Water Management District (MPWMD). The term "Contractor" refers to a firm providing construction or field services such as well drilling, induction logging, or meter calibration.

(4) Due to the uncertainties of the exact scopes of some of the larger Tasks listed above at the time of preparation of this Budget, e.g. Tasks I.3.a.1, I.3.c, and I.3.e, it is recommended that a Contingency of approximately 10% be included in the Budget.

(5) Includes $1,000 to maintain equipment previously installed for this purpose. Also includes lab costs to analyze for barium and iodide ions in certain of these wells as was done in preceding years beginning in 2012.

(6) Does not include costs for MPWMD to collect water level data or water quality samples from wells other than those that are part of the basic monitoring well network, i.e. for private well owners who have requested that the Watermaster obtain this data for them. Costs to obtain that data are to be reimbursed to the Watermaster by those well owners, so there should be no net cost to the Watermaster for that portion of the work under these Tasks. Includes the purchase and installation of four new and/or replacement dataloggers at a price of $680, plus $50 for installation parts, for each datalogger.

(7) No additional monitoring well is expected to be constructed in 2018.

(8) For HydroMetrics and Todd Groundwater to provide hydrogeologic consulting assistance to the Watermaster, beyond that associated with performing other specified Tasks, when requested to do so by the Technical Program Manager. This work may include participation in conference calls and reviewing documents prepared by others.

(9) If work under this Task is found to be necessary, it will be funded through the Contingency line item in this Budget.

(10) Since the Model and BMAP will be updated under Tasks I.3.a.1 and I.3.c respectively, this Task would only be used if there were other issues the Board wished to evaluate and which were not covered in the updated BMAP.

(11) It is anticipated that the costs to perform this Task will be shared by the Watermaster, MPWMD, and One Water Monterey (formerly MRWPCA). It is expected that the Watermaster's share of these costs will be 50% and that the other 50% will be funded by those other entities.

(12) If new protective water levels are warranted, that work will be included in Task I.3.a.1.

(13) This is a new Task proposed for 2018. It is anticipated that the Watermaster will be reimbursed for the costs to perform this work by the three proponents of the projects that intend to inject new sources of water into the Basin. These are California American Water, MPWMD, and One Water Monterey (formerly MRWPCA). Therefore, there should be no net cost to the Watermaster for the work of this Task.

(14) The work for this Task is described in the M&MP as consisting of two Steps. The dollar amount shown in this budget only covers the estimated cost of Step 1. After Step 1 is completed, if the Board determines to pursue Step 2, funding for that work will likely be provided by the Contingency line-item, or from other tasks that have unused funds.

Seaside Groundwater Basin Watermaster
Fiscal Year 2018 Monitoring & Management Plan
Capital Fund Budget

No Capital projects are anticipated to be undertaken in 2018, so this budget is $0.

ATTACHMENT 7

WATER QUALITY ANALYTICAL RESULTS

[Note: In this Preliminary Draft Annual Report some of the data in this Attachment are incomplete because the laboratory data had not all been received as of the date of preparation of this document. In the Final version all of the data will be included.]

were excessive (>50 NTU), pumping was halted and the well was allowed to rest for another 1-2 hours before initiating pumping again. Water levels were monitored during sampling to insure excessive drawdowns were not occurring to verify the sample volume was being collected from the aquifer and not the water stored in the casing. The devices used are capable of measuring water

levels to 0.01-foot precision.

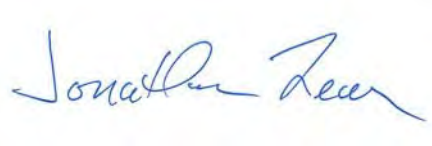
Static, non-pumping, water-level measurements were taken for basin monitor wells and basin producer active and inactive wells during WY 2017 and are also included in this data transmittal. Static water levels are collected so these measurements will more closely approximate ambient groundwater-level conditions, and facilitate the plotting and trend analysis of well water-level hydrographs. Occasionally, water-level measurements have been collected and reported while the well was in operation. In some cases, this may be due to the fact that the well cannot be taken offline in order to collect a static water-level measurement because of pumping demand requirements. These occurrences have been recorded in the comments section the data transmittal. These water-level data were collected primarily with manual water-level sounding devices by producers or by the MPWMD on behalf of the Watermaster. Some monitor wells are equipped with continuous water level recording transducers. In these cases the transducer files were downloaded and provided to Hydrometrics, LLC for inclusion in their Seawater Intrusion Analysis Report for WY 2017.

All data transmitted in this letter have been through the QA/QC process and entered into the Watermaster's database according the protocols outlined in the RFS between the District and the Watermaster. The enclosed data are an export from the Watermaster database.

In WY 2017, water quality data was not collected from FO09 Deep in the second quarter because the well was obstructed and was fixed for all other quarters. All lab results submitted to the Watermaster are included in this data transfer. Please note that fourth quarter water quality results for PCA West, MSC, and FO09 have not been received from the lab and will be entered into the database upon receipt.

Please accept this letter and enclosure as a summary and transfer of data collected by MPWMD and Watermaster Producers for WY 2017. The District will also forward an electronic version of this report so that it can be posted to the Watermaster website.

Sincerely,



Jonathan Lear PG, CHg
Senior Hydrogeologist

Enclosures: WY 2017 Water Quality and Water Level Data

Seaside Basin Monitoring and Management Plan
Water Level Data for WY 2017

ASR - 1 (Watermaster No. 188) — **Northern Inland**

Owner: MPWMD

Well Type: Monitor

Aquifer Unit: Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/27/2016	474.3	337.23	-137.07	on
11/23/2016	369.6	337.23	-32.37	off
12/29/2016	319.65	337.23	17.58	off
01/26/2017	280.3	337.23	56.93	off
02/23/2017	241.9	337.23	95.33	off
03/30/2017	332.9	337.23	4.33	off
04/27/2017	332.4	337.23	4.83	off
05/25/2017	342.9	337.23	-5.67	off
06/29/2017	356.9	337.23	-19.67	off
07/27/2017	365	337.23	-27.77	off
08/31/2017		337.23		Well Rehab

ASR - 2 (Watermaster No. 256) — **Northern Inland**

Owner: MPWMD

Well Type: Monitor

Aquifer Unit: Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/27/20	395.5	354.	-40.	off
11/23/2016	388	354.66	-33.34	off
12/29/2016	297.81	354.66	56.85	off

01/26/2017	226.2	354.66	128.46	off
02/23/2017	259.6	354.66	95.	off
03/30/2017	258.2	354.66	96.	off

04/27/2017	308.5	354.66	46.16	off
05/25/2017	333.4	354.66	21.26	off
06/29/2017	374.7	354.66	-20.04	off
07/27/2017	382.3	354.66	-27.64	off
08/31/2017	383.9	354.66	-29.24	off

Bay Ridge (Watermaster No. 226)

Southern Inland

Owner: California American Water

Well Type: Producer

Aquifer Unit: QTc/Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/26/2016	386	545.	159.	off
10/27/2016	378	545.92	167.92	off
11/23/2016	380	545.92	165.92	off
12/29/2016	379	545.92	166.92	off
01/26/2017	376	545.92	169.92	off
02/23/2017	430	545.92	115.92	off
03/30/2017	376	545.92	169.92	off
04/27/2017	380	545.92	165.92	off
05/25/2017	379	545.92	166.92	off
06/29/2017	435	545.92	110.92	on
07/27/2017	383	545.92	162.92	off
08/31/2017	376	545.92	169.92	off
09/28/2017	380	545.92	165.92	

Bishop #3 (Watermaster No. 262)

Southern Inland

Owner: CAW

Aquifer Unit:

Well Type: Producer

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/26/20	368	420	52.58	on

10/27/2016	274	420.58	146.58	off
11/23/2016	275	420.58	145.58	off
12/29/2016	278	420.58	142.58	off
01/26/2017	267	420.58	153.58	off
02/23/2017	358	420.58	62.58	off
03/30/2017	266	420.58	154.58	off
04/27/2017	360	420.58	60.58	on
05/25/2017	275	420.58	145.58	off
06/29/2017	368	420.58	52.58	on
07/27/2017	275	420.58	145.58	off
08/31/2017	275	420.58	145.58	off
09/28/2017	276	420.58	144.58	off

Blue Larkspur-East End (Watermaster No. 143)

Southern Inland

Owner: Laguna Seca Resorts

Well Type: Monitor

Aquifer Unit:

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/20	115.55	253.	137.	
12/28/2016	113.90	253.29	139.39	
03/31/2017	115.15	253.29	138.14	
07/13/2017	115.02	253.29	138.27	
10/03/2017	115.18	253.29	138.11	

CalAm Granite Construction (Watermaster No. 242)

Southern Inland

Owner: California American Water

Aquifer Unit:
Tsm

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/05/20	135.15	226.	91.	
12/27/2016	135.38	226.43	91.	

04/03/2017	135.17	226.43	91.26
07/13/2017	135.32	226.43	91.11
10/03/2017	135.24	226.43	91.19

CDM MW#4 (Watermaster No. 238)

Southern Coastal

Owner:
MPWMD Well
Type: Monitor

Aquifer Unit: Qod

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/20	15.13	18.	3.5 6	
10/04/2016	15.30	18.69	3.3	
11/04/2016	15.05	18.69	3.6	
11/21/2016	14.89	18.69	3.8	
01/26/2017	13.38	18.69	5.3	
02/28/2017	13.91	18.69	4.7	
03/30/2017	13.97	18.69	4.7	
04/27/2017	13.27	18.69	5.4	
05/27/2017	14.22	18.69	4.4	
06/29/2017	15.27	18.69	3.4	
07/31/2017	15.19	18.69	3.5	
08/30/2017	15.37	18.69	3.3	
09/26/2017	15.17	18.69	3.5	

CDM MW-1 (Watermaster No. 251)

Northern Coastal

Owner: MPWMD
Well Type: Monitor

Aquifer Unit: Qod/Qar

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments

09/06/2016	90.36	93.53	3.17
10/04/2016	90.65	93.53	2.88
11/02/2016	89.08	93.53	4.45

11/22/2016	88.73	93.53	4.80
12/29/2016	89.12	93.53	4.41
01/27/2017	88.48	93.53	5.05
02/28/2017	87.92	93.53	5.61
03/30/2017	88.17	93.53	5.36
04/28/2017	88.92	93.53	4.61
05/26/2017	89.10	93.53	4.43
07/03/2017	89.98	95.53	5.55
07/31/2017	90.13	95.53	5.40
08/31/2017	90.1	95.53	5.43
09/25/2017	89.8	95.53	5.73

CDM MW-2 (Watermaster No. 252) **Northern Coastal**

Owner: MPWMD

Aquifer Unit: Qod/Qar

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/04/20	61.39	68.8	7.44	
11/02/2016	59.93	68.83	8.90	
11/22/2016	58.79	68.83	10.04	
12/29/2016	59.29	68.83	9.54	
01/27/2017	57.71	68.83	11.12	
02/28/2017	57.32	68.83	11.51	
03/30/2017	57.91	68.83	10.92	
04/28/2017	59.36	68.83	9.47	
05/26/2017	59.12	68.83	9.71	
07/03/2017	60.57	68.83	8.26	
07/31/2017	60.97	68.83	7.86	

08/31/2017	61.03	68.83	7.80
09/25/2017	60.79	68.83	8.04

CDM MW-3 (Watermaster No. 239)

Southern Coastal

Owner: MPWMD

Well Type: Monitor

Aquifer Unit: Qod/Qar

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/20	32.35	33.	1.46	
10/04/2016	32.49	33.81	1.32	
11/04/2016	32.24	33.81	1.57	
11/21/2016	30.62	33.81	3.19	
12/29/2016	30.58	33.81	3.23	
01/26/2017	29.51	33.81	4.30	
02/28/2017	30.23	33.81	3.58	
03/30/2017	30.30	33.81	3.51	
04/27/2017	31.95	33.81	1.86	
05/26/2017	32.21	33.81	1.60	
06/29/2017	32.77	33.81	1.04	
07/31/2017	32.61	33.81	1.20	
08/30/2017	32.92	33.81	0.89	
09/26/2017	32.32	33.81	1.49	

Cypress Pacific Production (Watermaster No. 150)

Southern Coastal

Owner: Paul Bruno

Well Type: Producer

Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/20	47.14	50.	3.09	
10/04/2016	47.19	50.23	3.04	

11/04/2016	46.77	50.23	3.46
11/21/2016	46.62	50.23	3.61
12/29/2016	46.68	50.23	3.55

01/26/2017	45.92	50.23	4.31
02/28/2017	45.42	50.23	4.81
03/30/2017	45.70	50.23	4.53
04/28/2017	45.81	50.23	4.42
05/26/2017	45.94	50.23	4.29
06/29/2017	46.42	50.23	3.81
07/31/2017	46.62	50.23	3.61
08/30/2017	46.84	50.23	3.39
09/26/2017	46.97	50.23	3.26

Del Monte Test (Watermaster No. 231) **Northern Coastal**

Owner: California American Water

Well Type: Monitor

Aquifer Unit:

QTc All Values in

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/26/2016	30.8	32.	1.82	off
10/27/2016	29.6	32.62	3.02	off
11/23/2016	30	32.62	2.62	off
12/29/2016	29.5	32.62	3.12	off
01/26/2017	29	32.62	3.62	off
02/23/2017	28.8	32.62	3.82	off
03/30/2017	30.8	32.62	1.82	off
04/27/2017	30.1	32.62	2.52	off
05/25/2017	30	32.62	2.62	off
06/29/2017	30.5	32.62	2.12	off
07/27/2017	28.2	32.62	4.42	off
08/31/2017	30.1	32.62	2.52	off
09/28/2017	28	32.62	4.62	off

Design Ctr. (Watermaster No. 167)

Southern Coastal

Owner: City of Sand City

quifer Unit: Qod/Qar/QTc Well Type: Producer

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
11/03/2016	13.69	21.	7.65	
11/04/2016	13.41	21.34	7.93	
11/23/2016	13.33	21.34	8.01	
12/29/2016	13.73	21.34	7.61	
01/26/2017	13.30	21.34	8.04	
02/28/2017	12.92	21.34	8.42	
03/30/2017	13.04	21.34	8.30	
04/27/2017	13.95	21.34	7.39	
05/26/2017	12.82	21.34	8.52	
06/29/2017	13.18	21.34	8.16	
07/31/2017	13.14	21.34	8.20	
08/30/2017	13.53	21.34	7.81	
09/26/2017	13.59	21.34	7.75	

FO-01-Deep (Watermaster No. 116)

Northern Inland

Owner: MPWMD

Aquifer Unit: Tm

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/20	341.80	362.	20.	
12/27/2016	341.92	362.57	20.	
03/31/2017	341.41	362.57	21.	
07/13/2017	341.99	362.57	20.	

FO-01-Shallow (Watermaster No. 115)

Northern Inland

Owner: MPWMD

Well Type: Monitor

Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/20	203.30	362.	159.	
12/27/2016	203.39	362.61	159.22	
03/31/2017	203.42	362.62	159.20	
07/13/2017	203.59	362.62	159.03	
10/02/2017	203.64	362.62	158.98	

FO-03-Deep (Watermaster No. 127)

Southern Inland

Owner: MPWMD

Well Type: Monitor

Aquifer Unit: Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/06/20	637.44	774.	137.	
04/03/2017	637.28	774.74	137.46	
07/26/2017	637.34	774.74	137.40	
10/03/2017	637.33	774.74	137.41	

FO-04-Deep (W) (Watermaster No. 130)

Southern Inland

Owner: MPWMD

Well Type: Monitor

Aquifer Unit: Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/05/2016	113.16	167.44	54.	
11/21/2016	113.59	167.44	53.85	
12/28/2016	113.43	167.44	54.	

01/30/2017	113.03	167.44	54.
03/01/2017	112.79	167.44	54.

04/01/2017	113.12	167.44	54.32
04/04/2017	112.30	167.44	55.14
04/28/2017	112.11	167.44	55.33
05/26/2017	111.83	167.44	55.61
07/03/2017	112.42	167.44	55.02
09/26/2017	113.62	167.44	53.82
12/31/2017	112.93	167.44	54.51

FO-04-Shallow (E) **(Watermaster No. 129)** **Southern Inland**

Well Type: Monitor

Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/05/2016	113.4	168.23	54.	
11/21/2016	112.59	168.23	55.64	
12/02/2016	112.9	168.23	55.	
01/30/2017	112.0	168.23	56.	
03/01/2017	111.9	168.23	56.	
04/01/2017	112.9	168.23	55.	
04/04/2017	111.1	168.23	57.	
04/28/2017	110.9	168.23	57.	
05/26/2017	110.7	168.23	57.	
07/03/2017	112.2	168.23	55.	
09/26/2017	113.4	168.23	54.	
12/31/2017	112.8	168.23	55.	

FO-05-Deep (Watermaster No. 132) **Southern Inland**

Owner: MPWMD

Well Type: Monitor

Aquifer Unit: Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments

09/21/2016	320.03	479.29	159.26
12/27/2016	317.63	479.29	161.66
07/14/2017	321.84	479.29	157.45
09/28/2017	322.13	479.29	157.16

FO-05-Shallow (Watermaster No. 131)

Southern Inland

Owner: MPWMD

Aquifer Unit: QTc

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/20	250.92	478.	228.	
12/27/2016	247.28	478.97	231.69	
07/14/2017	250.07	478.97	228.90	
09/28/2017	249.46	478.97	229.51	

FO-06-Deep (Watermaster No. 134)

Southern Inland

Owner: MPWMD

Aquifer Unit: Tsm

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/20	236.33	470.	234.	
12/27/2016	233.51	470.62	237.11	
04/03/2017	232.27	470.62	238.35	
07/14/2017	235.64	470.62	234.98	
09/28/2017	236.39	470.62	234.23	

FO-06-Shallow (Watermaster No. 133)

Southern Inland

Owner: MPWMD

Aquifer Unit: QTc

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/2016	237.67	470.13	232.46	

FO-07-Shallow (Watermaster No. 18)

Date Me	Depth To Wate	Ref Point	Water Elev	Co en
10/03	499	470	-29.	
11/04	497	470	-27.	
11/22	498	470	-27.	
12/28	492	470	-22.	
01/26	485	470	-15.	
02/27	479	470	-9.7	
03/29	475	470	-5.6	
04/27				ch
05/25	479	470	-8.9	
06/29	497	470	-26.	
07/27	490	470	-19.	
08/29	491	470	-21.	
09/25	492	470	-22.	

Well Type: Monitor

All Values

Northern Inland

12/27/2016	236.57	470.13	233.56
04/03/2017	236.42	470.13	233.71
07/14/2017	237.91	470.13	232.22
09/28/2017	237.98	470.13	232.15

FO-07- (Watermaster 119)

Owner: MPWMD

Owner: MPWMD

Aquifer Unit: QTc

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/2016	457.27	470	12.92	

FO-08- (Watermaster 121)

Owner: MPWMD

10/03/2016	457.58	470.19	12.61	
11/04/2016	457.09	470.19	13.10	
11/22/2016	457.07	470.19	13.12	
12/28/2016	456.93	470.19	13.26	
01/26/2017	456.78	470.19	13.41	
02/27/2017	456.17	470.19	14.02	
03/29/2017	456.32	470.19	13.87	
04/27/2017				check data
05/25/2017	457.03	470.19	13.16	
06/29/2017	458.03	470.19	12.16	
07/27/2017	458.52	470.19	11.67	
08/29/2017	458.99	470.18	11.19	
09/25/2017	459.72	470.18	10.46	

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/20	403.53	378.	-25.	
10/04/2016	405.9	378.1	-27.	
11/04/2016	404.48	378.1	-26.	
11/22/2016	405.18	378.1	-27.	
12/28/2016	400.32	378.1	-22.	datalogger fell to
01/27/2017	394.08	378.1	-15.	
03/01/2017	388.69	378.1	-10.	
03/28/2017	395.73	378.1	-17.	

03/29/2017	384.92	378.1	-6.8
04/27/2017	383.17	378.1	-5.0
05/25/2017	387.20	378.1	-9.1

07/27/2017	397.73	378.1	-19.63
08/29/2017	398.97	378.1	-20.87

FO-08-Shallow (Watermaster No. 120) **Northern Inland**

Owner: MPWMD

Aquifer Unit: QTc

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/20	377.79	378.	0.2	
10/04/2016	378.40	378.04	-0.36	
11/04/2016	378.46	378.04	-0.4	
11/22/2016	378.23	378.04	-0.1	
12/28/2016	377.97	378.04	0.0	
01/27/2017	377.49	378.04	0.5	
03/01/2017	376.73	378.04	1.3	
03/29/2017	376.27	378.04	1.7	
04/27/2017	375.92	378.04	2.1	
05/25/2017	376.21	378.04	1.8	
06/28/2017	377.39	378.04	0.6	
07/27/2017	378.12	378.04	-0.08	
08/29/2017	379.01	378.04	-0.97	

FO-09-Shallow (Watermaster No. 111) **Northern Coastal**

Owner: MPWMD

Aquifer Unit: QTc/Tp

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/28/2016	116.67	118.89	2.22	
11/28/2016	115.11	118.89	3.78	
12/29/2016	114.96	118.89	3.93	
02/27/2017	113.10	118.89	5.79	

03/30/2017	112.59	118.89	6.30
06/01/2017	114.50	118.89	4.39
07/05/2017	114.07	118.89	4.82

FO-10-Deep (Watermaster No. 114) **Northern Coastal**

Owner: MPWMD
Well Type: Monitor

Aquifer Unit: Tp

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/20	211.7	201.03	-10.67	
11/02/2016	211.40	201.03	-10.37	end of Sept?
11/22/2016	211.95	201.03	-10.92	
12/28/2016	210.40	201.03	-9.37	
01/27/2017	209.15	201.03	-8.12	
03/01/2017	208.56	201.03	-7.53	
03/30/2017	208.05	201.03	-7.02	
04/28/2017	207.24	201.03	-6.21	
05/24/2017	209.02	201.03	-7.99	
07/03/2017	211.27	201.03	-10.24	
07/27/2017	212.70	201.03	-11.67	
08/29/2017	212.97	201.03	-11.94	
09/25/2017	213.66	201.03	-12.63	

FO-10-Shallow (Watermaster No. 113) **Northern Coastal**

Owner: MPWMD

Aquifer Unit: QTc

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/2016	211.45	200.	-10.	
11/02/2016	211.25	200.84	-10.	
12/28/2016	210.75	200.84	-9.9	

01/27/2017	209.96	200.84	-9.12
03/01/2017	209.85	200.84	-9.01
03/30/2017	209.97	200.84	-9.13
04/28/2017	209.63	200.84	-8.79
05/25/2017	210.82	200.84	-9.98
07/03/2017	211.95	200.84	-11.11
07/27/2017	213.29	200.84	-12.45
08/29/2017	211.04	200.84	-10.20
09/25/2017	214.02	200.84	-13.18

FO-11-Deep (Watermaster No. 123) **Northern Inland**

Owner: MPWMD
Well Type: Monitor

Aquifer Unit: Tp

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/20	335.7	332.96	-2.74	
10/04/2016	336.46	332.96	-3.50	
11/02/2016	335.25	332.96	-2.29	
11/22/2016	335.89	332.96	-2.93	
12/28/2016	335.74	332.96	-2.78	
01/27/2017	335.24	332.96	-2.28	
03/01/2017	332.69	332.96	0.27	
03/30/2017	331.55	332.96	1.41	
04/28/2017	330.87	332.96	2.09	
05/24/2017	334.82	332.96	-1.86	
07/03/2017	336.77	332.96	-3.81	
07/27/2017	337.26	332.96	-4.30	
08/30/2017	337.40	332.96	-4.44	

09/25/2017	337.74	332.96	-4.78

FO-11-Shallow (Watermaster No. 122)

Northern Inland

Owner: MPWMD

Well Type: Monitor

Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/20	357.6	332.	-24.	
10/04/2016	358.8	332.93	-25.	
11/02/2016	358.30	332.93	-25.	
11/22/2016	358.11	332.93	-25.	
12/28/2016	356.94	332.93	-24.	
01/27/2017	356.53	332.93	-23.	
03/01/2017	356.22	332.93	-23.	
03/30/2017	356.30	332.93	-23.	
04/28/2017	356.01	332.93	-23.	
05/24/2017	357.77	332.93	-24.	
07/03/2017	358.44	332.93	-25.	
07/27/2017	359.56	332.93	-26.	
08/30/2017	359.64	332.93	-26.	
09/25/2017	359.88	332.93	-26.	

Hilby MGT (Watermaster No. 244)

Southern Coastal

Owner: California American Water

Well Type: Monitor

Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/26/2016		248.		blocked
10/27/2016		248.04		blocked

11/23/2016	248.04	blocked
12/29/2016	248.04	blocked
01/26/2017	248.04	blocked

02/23/2017		248.04		blocked
03/30/2017	231.6	248.04	16.44	off
04/27/2017	241	248.04	7.04	off
05/25/2017	241.5	248.04	6.54	off
06/29/2017		248.04		no reading
07/27/2017	241.7	248.04	6.34	off
08/31/2017	241.7	248.04	6.34	off
09/28/2017	239.6	248.04	8.44	off

Justin Court (Watermaster No. 135)

Southern Inland

Owner: California American Water

Well Type: Monitor

Aquifer Unit:

QTc All Values

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/20	143.29	240.28	96.	
12/27/2016	143.48	240.28	96.	
04/03/2017	143.20	240.28	97.	
07/13/2017	143.38	240.28	96.	
12/03/2017	143.24	240.28	97.	

K-Mart (Watermaster No. 125)

Southern Coastal

Owner: MPWMD

Well Type: Monitor

Aquifer Unit: Qod/Qar

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/2016	23.5	30.65	7.15	
10/03/2016	23.57	30.65	7.08	

11/04/2016	23.33	30.65	7.32
11/21/2016	23.24	30.65	7.41
12/29/2016	23.11	30.65	7.54
01/26/2017	22.52	30.65	8.13

02/28/2017	22.30	30.65	8.35
03/30/2017	22.40	30.65	8.25
04/27/2017	22.12	30.65	8.53
05/27/2017	22.31	30.65	8.34
06/29/2017	22.62	30.65	8.03
07/31/2017	23.08	30.65	7.57
08/30/2017	23.13	30.65	7.52
09/26/2017	23.30	30.65	7.35

LS Golf Old #12 (Watermaster No. 144)

Southern Inland

Owner: Laguna Seca Resorts

Well Type: Producer

Aquifer Unit: QTc/Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/01/20	233.0	368.	135.	
11/01/2016	225.7	368.02	142.32	
12/01/2016	228.5	368.02	139.52	
02/01/2017	228.3	368.02	139.72	
04/01/2017	224.1	368.02	143.92	
05/01/2017	238.4	368.02	129.62	
06/01/2017	234.67	368.02	133.35	
07/01/2017	235.17	368.02	132.85	
08/01/2017	235.67	368.02	132.35	
09/01/2017	236.08	368.02	131.94	

LS No. 1 Subdivision (Watermaster No. 142)

Southern Inland

Owner: Laguna Seca Resorts

Aquifer Unit: Tsm

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/2016	138.72	277.13	138.41	

12/28/2016	137.8	277.13	139.33
03/31/2017	138.21	277.13	138.92
07/13/2017	138.19	277.13	138.94
10/03/2017	139.06	277.13	138.07

LS Pistol Range (Watermaster No. 136)

Southern Inland

Owner: County of Monterey
Well Type: Monitor

Aquifer Unit: Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/27/2016		514.39		Access Blocked
12/27/2016	290.23	514.39	224.16	
03/31/2017	289.98	514.39	224.41	
07/13/2017	290.68	514.39	223.71	
09/27/2017	291.02	514.39	223.37	

LSRA #2 (Watermaster No. 196)

Southern Inland

Owner: Monterey County Parks Department
Well Type: Producer
Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
04/01/2017	197	390.9	193.90	
05/01/2017	177	390.9	213.00	
06/01/2017	180	390.9	210.00	
07/01/2017	180	390.9	210.00	
08/01/2017	186	390.9	204.00	
09/01/2017	179	390.9	211.9	

Luxton (Watermaster No. 243)

Northern Coastal

Owner: California American Water Well Type: Monitor
Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/26/2016	98.8	89.12	-9.68	off
10/27/2016	98.7	89.12	-9.58	off
11/23/2016	98	89.12	-8.88	off
12/29/2016	95.3	89.12	-6.18	off
01/26/2017	99.1	89.12	-9.98	off
02/23/2017	98.8	89.12	-9.68	off
03/30/2017	96.3	89.12	-7.18	off
04/27/2017	98.5	89.12	-9.38	off
05/25/2017	91.9	89.12	-2.78	off
06/29/2017	92.6	89.12	-3.48	off
07/27/2017	93	89.12	-3.88	off
08/31/2017	93.5	89.12	-4.38	off
09/28/2017	94.3.	89.12		off

Luzern #2 (Watermaster No. 159)

Northern Coastal

Owner: California American Water Well Type: Producer
Aquifer Unit: QTc/Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/26/20	198.7	156.	-41.	off
10/27/2016	199	156.99	-42.01	on
11/23/2016	178.3	156.99	-21.01	off
12/29/2016	197	156.99	-40.01	on

01/26/2017	172.7	156.99	-15.	off
02/23/2017	179.4	156.99	-22.	off

03/30/2017	170.7	156.99	-13.71	off
04/27/2017	170.9	156.99	-13.91	off
05/25/2017	170.2	156.99	-13.21	off
06/29/2017	190	156.99	-33.01	on
07/27/2017	190.6	156.99	-33.61	on
08/31/2017	194	156.99	-37.01	on
09/28/2017	195	156.99	-38.01	on

Military (Watermaster No. 151) **Northern Coastal**

Owner: California American Water Well Type: Producer

Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/26/2016	160.8	135.8	-25.00	off
10/27/2016	160.2	135.8	-24.40	off
11/23/2016	159	135.8	-23.20	off
12/29/2016	159.7	135.8	-23.90	off
01/26/2017		135.8		no reading
02/23/2017	154	135.8	-18.20	off
03/30/2017	149.8	135.8	-14.00	off
04/27/2017	152	135.8	-16.20	off
05/25/2017	145.1	135.8	-9.30	off
06/29/2017	154.5	135.8	-18.70	off
07/27/2017	156.8	135.8	-21.00	off
08/31/2017	159	135.8	-23.20	off
09/28/2017	160.2	135.8	-24.40	off

MMP monitor (Watermaster No. 154)

Northern Coastal

Owner: Mission Memorial Park

Well Type: Monitor

Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/2016	349.42	315.42	-34.00	on
10/03/2016	353.99	315.42	-38.57	on
11/01/2016	354.01	315.42	-38.59	
11/21/2016	354.20	315.42	-38.78	
12/29/2016	341.70	315.42	-26.28	
01/27/2017	336.49	315.42	-21.07	
02/28/2017	334.61	315.42	-19.19	
03/31/2017	332.40	315.42	-16.98	
04/28/2017	332.90	315.42	-17.48	
05/26/2017	337.25	315.42	-21.83	
07/03/2017	336.29	315.42	-20.87	on
07/28/2017	336.94	315.42	-21.52	on
08/30/2017	336.13	315.42	-20.71	
09/26/2017	341.06	315.42	-25.64	on

MSC Shallow (Watermaster No. 101)

Northern Coastal

Owner: MPWMD

Well Type: Monitor

Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
	77.57			
09/06/2016		80.	2.5	
10/04/2016	77.29	80.	2.8	
11/01/2016	77.67	80.	2.4	

11/21/2016	77.22	80.	2.8
12/29/2016	77.99	80.1	2.11

01/26/2017	76.25	80.1	3.85
02/28/2017	75.18	80.1	4.92
03/30/2017	75.12	80.1	4.98
04/28/2017	75.05	80.1	5.05
05/26/2017	75.18	80.1	4.92
06/29/2017	76.42	80.1	3.68
07/28/2017	75.89	80.1	4.21
08/30/2017	76.6	80.1	3.50
09/26/2017	76.91	80.	3.19

MSC-Deep (Watermaster No. 102)

Northern Coastal

Owner: MPWMD

Well Type: Monitor

Aquifer Unit: Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/20	101.78	80.29	-21.	
10/04/2016	103.21	80.29	-22.	
11/01/2016	103.83	80.29	-23.	
11/21/2016	103.74	80.29	-23.	
12/29/2016	101.87	80.29	-21.	
01/26/2017	95.42	80.29	-15.	
02/28/2017	90.87	80.29	-10.	
03/30/2017	86.23	80.29	-5.94	
04/28/2017	84.55	80.29	-4.26	
05/26/2017	85.91	80.29	-5.62	
06/29/2017	94.87	80.29	-14.	
07/28/2017	96.03	80.29	-15.	
08/30/2017	98.01	80.29	-17.	
09/26/2017	99.2	80.29	-18.91	

MW-BW-08-A (Watermaster No. 240)

Southern Coastal

Owner: U.S.A. Fort Ord

Aquifer Unit: Qod/Qar

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/20	61.06	205.	144.	
12/28/2016	60.47	205.18	144.71	
03/28/2017	60.44	205.18	144.74	
07/14/2017	59.77	205.18	145.41	
10/02/2017	59.79	205.18	145.39	

MW-BW-09-180 (Watermaster No. 241)

Southern Coastal

Owner: U.S.A. Fort Ord

Aquifer Unit: QTc

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/20	211.44	206.	-5.2	
12/28/2016	211.59	206.22	-5.3	
03/28/2017	211.71	206.22	-5.4	
07/14/2017	211.62	206.22	-5.4	
10/02/2017	211.23	206.22	-5.0	

Ord Grove #2 (Watermaster No. 153)

Northern Coastal

Owner: California American Water

Well Type: Producer

Aquifer Unit: QTc/Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments

09/26/2016	309.2	292.39	-16.81	off
10/27/2016	308	292.39	-15.61	off
11/23/2016	307.9	292.39	-15.51	off
12/29/2016	307.2	292.39	-14.81	off

01/26/2017	319.6	292.39	-27.21	off
02/23/2017	319.3	292.39	-26.91	off
03/30/2017	344.4	292.39	-52.01	off
04/27/2017	346.3	292.39	-53.91	on
05/25/2017	344.7	292.39	-52.31	on
06/29/2017	340	292.39	-47.61	on
07/27/2017	366.6	292.39	-74.21	on
08/31/2017	366	292.39	-73.61	on
09/28/2017	370	232.39	-137.61	on

Ord Grove Test (Watermaster No. 107) **Northern Coastal**

Owner: California American Water Well Type: Monitor

Aquifer Unit: QTc/Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/20	322.02	294.	-28.0	
10/03/2016	323.57	294.00	-29.5	
11/01/2016	323.56	294.00	-29.5	
11/26/2016	323.86	294.00	-29.8	
12/29/2016	322.58	294.00	-28.5	
01/30/2017	329.03	294.00	-35.0	prod well on
02/28/2017	335.81	294.00	-41.8	on
03/31/2017	333.10	294.00	-39.1	on
04/28/2017	332.32	294.00	-38.3	on
05/26/2017	333.31	294.00	-39.3	on
07/03/2017	337.80	294	-43.	on
07/28/2017	338.82	294.00	-44.8	on
09/26/2017	341.42	294	-47.	on

Ord Terrace-Shallow (Watermaster No. 109)

Northern Coastal

Owner: MPWMD

Aquifer Unit: Tsm (upper)

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/20	256.18	228.	-27.5	
10/03/2016	258.11	228.68	-29.	
11/01/2016	258.41	228.68	-29.7	
11/21/2016	258.82	228.68	-30.1	
12/29/2016	256.78	228.68	-28.1	
01/30/2017	252.92	228.68	-24.2	
02/28/2017	254.03	228.68	-25.3	
03/31/2017	251.28	228.68	-22.6	
04/28/2017	250.06	228.68	-21.3	
05/26/2017	251.46	228.68	-22.7	
07/03/2017	257.02	228.68	-28.3	
07/28/2017	258.82	228.68	-30.1	
08/30/2017	259.37	228.68	-30.6	
09/26/2017	261.19	228.68	-32.5	

Paralta (Watermaster No. 169)

Northern Coastal

Owner: California American Water

Well Type: Producer

Aquifer Unit: QTc/Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/26/20	377.9	324.49	-53.	on
10/27/2016	377.3	324.49	-52.	on

11/23/2016	371.4	324.49	-46.	on
12/29/2016	364.2	324.49	-39.	on
01/26/2017	345.8	324.49	-21.	on

02/23/2017	311	324.49	13.49	off
03/30/2017	320	324.49	4.49	off
04/27/2017	315	324.49	9.49	off
05/25/2017	330.7	324.49	-6.21	off
06/29/2017	323.8	324.49	0.69	off
07/27/2017	361.2	324.49	-36.71	on
08/31/2017	362	324.49	-37.51	on
09/28/2017	304.0	324.49	20.49	on

Paralta Test Well (Watermaster No. 108) **Northern Coastal**

Owner: MPWMD

Well Type: Monitor

Aquifer Unit: QTc/Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/2016	350.64	330.72	-19.92	on
10/03/2016	352.18	330.72	-21.46	on
11/01/2016	348.83	330.72	-18.11	on
11/23/2016	348.25	330.72	-17.53	on
12/28/2016	342.48	330.72	-11.76	on
01/30/2017	326.98	330.72	3.74	
02/28/2017	322.60	330.72	8.12	
03/29/2017	320.57	330.72	10.15	
04/28/2017	319.98	330.72	10.74	
05/25/2017	327.69	330.72	3.03	
06/29/2017	336.05	330.72	-5.33	off
07/27/2017	346.33	330.72	-15.61	on
08/29/2017	347.29	330.72	-16.57	
09/26/2017	340.21	330.72	-9.49	

Pasadera Golf - Main Gate (Watermaster No. 208)

Southern Inland

Owner: Pasadera Country Club, LLC Well Type: Producer
Aquifer Unit: Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/01/20	222.6	345.	122.	
11/01/2016	216.5	345.42	128.92	
12/01/2016	212.3	345.42	133.12	
01/01/2017	210.5	345.42	134.92	
02/01/2017	NR	345.42		
03/01/2017	212.5	345.42	132.92	
04/01/2017	210.5	345.42	134.92	
05/01/2017	209.9	345.42	135.52	
06/01/2017	217.3	345.42	128.12	
07/01/2017	213.5	345.42	131.92	
08/01/2017	214.2	345.42	131.22	
09/01/2017	224	345.42	121.42	
10/01/2017	226.5	345.42	118.92	

Pasadera Golf - Paddock (Watermaster No. 204)

Southern Inland

Owner: Pasadera Country Club, LLC Well Type: Producer
Aquifer Unit: QTc/Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/01/20	239.9	359.	119.7	
11/01/2016	225.7	359.69	133.99	
12/01/2016	218.6	359.69	141.09	
01/01/2017	215.9	359.69	143.79	

03/01/2017	207	359.69	152.69
04/01/2017	204.25	359.69	155.44

05/01/2017	204.25	359.69	155.44
06/01/2017	225.83	359.69	133.86
07/01/2017	218.25	359.69	141.44
08/01/2017	227.17	359.69	132.52
09/01/2017	232.75	359.69	126.94

PCA Production (Watermaster No. 171)

Northern Coastal

Owner: Security National Guaranty Inc Well Type: Producer
Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/25/20	67.25	72.6	5.38	
11/27/2016	67.2	72.63	5.43	
12/21/2016	67.62	72.63	5.01	
01/23/2017	65.8	72.63	6.83	
02/22/2017	66.5	72.63	6.13	
03/27/2017	66.15	72.63	6.48	
05/26/2017	67.2	72.63	5.43	
06/26/2017	68.0	72.63	4.63	
07/25/2017	68.2	72.63	4.43	

Playa #3 (Watermaster No. 162)

Northern Coastal

Owner: California American Water Well Type: Producer
Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/26/2016	145.2	53.02	-92.18	on
10/27/2016	53.6	53.	-0.58	off

11/23/2016	108.8	53.02	-55.78	on
12/29/2016	104.8	53.	-51.78	on
01/26/2017	52.2	53.	0.82	off

02/23/2017	50.9	53.02	2.12	off
03/30/2017	50	53.02	3.02	off
04/27/2017	49.3	53.02	3.72	off
05/25/2017	49.6	53.02	3.42	off
06/29/2017	49.5	53.02	3.52	off
07/27/2017		53.02		Well Rehab
08/31/2017		53.02		Well Rehab
09/28/2017	NA	53.02		No Reading

Plumas #4 (Watermaster No. 177) **Southern Coastal**

Owner: California American Water
Well Type: Producer

Aquifer Unit:
Tsm All Values in

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/26/20	219.4	161.48	-57.	on
10/27/2016	114.9	161.48	46.	off
11/23/2016	113.7	161.48	47.78	off
12/29/2016	212.8	161.48	-51.	on
01/26/2017	112.5	161.48	48.	off
02/23/2017	111.3	161.48	50.	off
03/30/2017	110.2	161.48	51.	off
04/27/2017	109.6	161.48	51.	off
05/25/2017	109.1	161.48	52.	off
06/29/2017	250.8	161.48	-89.	on
07/27/2017	253	161.48	-91.	on
08/31/2017	117.3	161.48	44.	off
09/28/2017	254.8	161.48	-93.	on

Plumas Test 1990 **(Watermaster No. 124)** **Southern Coastal**

Aquifer Unit: Tsm

Well Type: Monitor

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/06/2016	107.37	157.83	50.46	on
10/03/2016	107.70	157.83	50.13	on
11/04/2016	107.50	157.83	50.33	prod well on
11/21/2016	107.90	157.83	49.93	
12/29/2016	108.11	157.83	49.72	on
01/26/2017	107.47	157.83	50.37	
03/01/2017	107.22	157.83	50.61	
03/31/2017	106.59	157.83	51.24	
04/27/2017	105.90	157.83	51.93	
05/25/2017	105.73	157.83	52.10	
06/29/2017	106.78	157.83	51.05	on
07/31/2017	106.88	157.83	50.95	on
08/30/2017	108.02	157.83	49.81	
09/26/2017	108.00	157.83	49.83	

Robley Deep (South) (Watermaster No. 140) **Southern Inland**

Owner: County of Monterey

Well Type: Monitor

Aquifer Unit: Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/20	397.19	566.	169.	
12/27/2016	393.6	566.44	172.84	
04/03/2017	391.50	566.44	174.94	

07/13/2017	398.02	566.44	168.42
09/28/2017	398.71	566.44	167.73

Robley Shallow (North) (Watermaster No. 139)

Southern Inland

Owner: County of Monterey

Well Type: Monitor

Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/2016	321.14	566.54	245.40	
12/27/2016	321.23	566.54	245.31	
04/03/2017	321.00	566.54	245.54	
07/13/2017	316.40	566.54	250.14	
09/28/2017	319.12	566.54	247.42	

Ryan Ranch #11 (Watermaster No. 215)

Southern Inland

Owner: California American Water

Well Type: Producer

Aquifer Unit: Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/26/20	195	307.	112.5	off
10/27/2016	196	307.59	111.5	off
11/23/2016	197	307.59	110.59	off
12/29/2016	193	307.59	114.59	off
01/26/2017	188	307.59	119.59	off
02/23/2017	188	307.59	119.59	off
03/30/2017	192	307.59	115.59	off
04/27/2017	190	307.59	117.59	off
05/25/2017	192	307.59	115.59	off
06/29/2017	195	307.59	112.59	off
07/27/2017	195	307.59	112.59	off
08/31/2017	196	307.59	111.5	off

09/28/2017	198	307.59	109.59	off

Well Type: Producer

Ryan Ranch #7 (Watermaster No. 213)

Southern Inland

All Values

Date Measured	Depth To Water	Ref Point	Water Elev	Comments
10/27/2016	391	294	-97.00	on
11/23/2016	273	294	21.00	off
12/29/2016	379	294	-85.00	on

Ryan Ranch #8 (Watermaster No. 362)

Date Measured	Depth To Water	Ref Point	Water Elev	Comments
01/26/2017	368	294	-74.00	on
02/23/2017	355	294	-61.00	off
03/30/2017	380	294	-86.00	on
04/27/2017	384	294	-90.00	on
05/25/2017	390	294	-96.00	on
06/29/2017	399	294	-105.00	on
07/27/2017	242	294	52.00	off
08/31/2017	400	294	-106.00	on
09/28/2017	400	294	-106.00	on

Southern Inland

Owner: California American Water

Well Type: Producer

Aquifer Unit:

Tsm All Values in

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/26/20	200	306.	106.	off
10/27/2016	197	306.86	109.86	off
11/23/2016	198	306.86	108.86	off
12/29/2016	194	306.86	112.86	off
01/26/2017	190	306.86	116.86	off
02/23/2017	190	306.86	116.86	off

03/30/2017	195	306.86	111.86	off
04/27/2017	192	306.86	114.86	off
05/25/2017	195	306.86	111.86	off
06/29/2017	198	306.86	108.86	off
07/27/2017	197	306.86	109.86	off
08/31/2017	199	306.86	107.86	off
09/28/2017	200	306.89	106.89	off

Sand City Corp Yard (Watermaster No. 165)

Southern Coastal

Owner: City of Sand City

quifer Unit: Qod/Qar/QTc Well Type: Producer

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/03/20	42.26	47.2	4.99	1900 us/cm
11/04/2016	41.95	47.25	5.3	1957 us/cm
11/23/2016	41.92	47.25	5.3	1428 us/cm
12/29/2016	41.76	47.25	5.49	1649 us/cm
01/27/2017	41.12	47.25	6.13	1790 us/cm
02/28/2017	41.03	47.25	6.22	851 us/cm
03/30/2017	41.20	47.25	6.05	885 us/cm
04/27/2017	42.01	47.25	5.24	509 us/cm
05/26/2017	41.56	47.25	5.69	
06/29/2017	42.16	47.25	5.09	829 us/cm
07/31/2017	42.10	47.25	5.15	737 us/cm
08/30/2017	42.14	47.25	5.11	381 us/cm
09/26/2017	42.49	47.25	4.76	339 us/cm

Seaside Golf - Coe (Watermaster No. 189)

Northern Coastal

Owner: City of Seaside

Well Type: Producer

Aquifer Unit: QTc

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
11/01/2016	107.09	110.15	3.06	off
12/01/2016	105.30	110.15	4.85	off
01/01/2017	120.65	110.15	-10.50	off
02/01/2017	104.16	110.15	5.99	off
03/01/2017	104.14	110.15	6.01	off
04/01/2017	104.69	110.15	5.46	off
05/02/2017	104.15	110.15	6.00	off
06/01/2017	106.96	110.15	3.19	off
07/01/2017	107.34	110.15	2.81	off
08/01/2017	106.7	110.15	3.45	off
09/01/2017	104.96	110.15	5.19	off
10/01/2017	105.64	110.15	4.51	off

Seaside Golf - Reservoir (Watermaster No. 187)

Northern Coastal

Owner: City of Seaside

Well Type: Producer

Aquifer Unit: Qc, Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/01/2016	445.02	417.	-27.	Well shut off for 35 min
11/01/2016	403.85	417.44	13.59	off
12/01/2016	401.99	417.44	15.	off
01/01/2017	400.5	417.44	16.	off

02/01/2017	399.57	417.44	17.	off
03/01/2017	399.5	417.44	17.	off
04/01/2017	399.2	417.44	18.	off

05/02/2017	418.66	417.44	-1.22	off
06/01/2017	412.59	417.44	4.85	off
07/01/2017	420.78	417.44	-3.34	off
08/01/2017	415.19	417.44	2.25	off
09/01/2017	446.35	417.44	-28.91	off
10/01/2017	417.49	417.44	-0.05	off

Seaside Muni #3 (Watermaster No. 174) **Northern Coastal**

Owner: City of Seaside

Aquifer Unit: QTc, Tsm

Well Type: Producer

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
11/01/2016	270.12	307.19	37.07	off
12/01/2016	270.47	307.19	36.	off
01/01/2017	269.76	307.19	37.	off
02/01/2017	269.65	307.19	37.	off
03/01/2017	269.99	307.19	37.	off
04/01/2017	269.45	307.19	37.	off
05/02/2017	270.02	307.19	37.	off
06/01/2017	269.83	307.19	37.	off
07/01/2017	269.95	307.19	37.	off
08/01/2017	269.65	307.19	37.	off
09/01/2017	269.76	307.19	37.	off
10/01/2017	269.97	307.19	37.	off

Seaside Muni #4 (Watermaster No. 173) **Northern Coastal**

Owner: City of Seaside

Aquifer Unit: QTc, Tsm

Well Type: Producer

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/01/2016	337.08	312.12	-24.9	off

11/01/2016	337	312.12	-24.88	off
12/01/2016	337.2	312.12	-25.08	off
01/01/2017	336.7	312.12	-24.58	off
02/01/2017	335.8	312.12	-23.68	off
03/01/2017	335.8	312.12	-23.68	off
04/01/2017	334.7	312.12	-22.58	off
05/01/2017	334.3	312.12	-22.18	off
06/01/2017	334.9	312.12	-22.78	off
07/01/2017	335.6	312.12	-23.48	off
08/01/2017	336.6	312.12	-24.48	off
09/01/2017	337.0	312.12	-24.88	off
10/01/2017	337.9	312.12	-25.78	off

Seca Place (Watermaster No. 138) — **Southern Inland**

Owner: County of Monterey Well Type: Monitor

Aquifer Unit: Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/20	270.03	427.	157.	
12/27/2016	265.33	427.59	162.26	
04/03/2017	262.97	427.59	164.62	
07/13/2017	270.03	427.59	157.56	
09/28/2017	261.13	427.59	166.46	

Target Well (Watermaster No. 152) — **Northern Coastal**

Owner: DBO Development

Well Type: Producer

Aquifer Unit: QTc/Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/04/2016	58.55	44.42	-14.13	
11/04/2016	58.25	44.42	-13.	

11/23/2016	58.17	44.42	-13.75
12/30/2016	58.66	44.	-14.24
01/26/2017	58.63	44.	-14.21
02/28/2017	58.30	44.	-13.88
03/30/2017	58.01	44.	-13.59
04/28/2017	58.27	44.	-13.85
05/30/2017	59.33	44.	-14.91
06/29/2017	60.04	44.	-15.62
07/31/2017	60.21	44.	-15.79
08/30/2017	60.31	44.	-15.89
09/26/2017	60.38	44.	-15.96

Toro #3 (Watermaster No. 303) **Southern Inland**

Owner: Cal-Am

Aquifer Unit: QTc

Well Type: Producer

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/26/2016	205	499	294.00	off
10/27/2016	205	499	294.00	off
11/23/2016	205	499	294.00	off
12/29/2016	205	499	294.00	off
01/26/2017	204	499	295.00	off
02/23/2017	205	499	294.00	off
03/30/2017	206	499	293.00	off
04/27/2017	206	499	293.00	off
05/25/2017	206	499	293.00	off
06/29/2017	206	499	293.00	off
07/27/2017	205	499	294.00	off

08/31/2017	206	499	293.00	off

York Rd-West (Watermaster No. 137)

Southern Inland

Owner: County of Monterey

Well Type: Monitor

Aquifer Unit: Tsm

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
09/21/2016	332.41	490.28	157.87	
12/28/2016	321.63	490.28	168.65	
03/31/2017	320.05	490.28	170.23	
07/13/2017	320.92	490.28	169.36	
09/27/2017	321.72	490.28	168.56	

York School 2001 (Watermaster No. 212)

Southern Inland

Owner: York School

Aquifer Unit: QTc/Tsm

Well Type: Producer

All Values in Feet

Date Measured	Depth To Water	Ref Point	Water Elevation	Comments
10/05/20	227.10	384.	157.	
11/01/2016	225.69	384.3	158.61	
11/21/2016	220.75	384.3	163.55	
12/28/2016	220.78	384.3	163.52	
01/27/2017	220.35	384.3	163.95	
02/28/2017	220.19	384.3	164.11	
03/31/2017	219.50	384.3	164.80	
04/27/2017	221.69	384.3	162.61	
06/06/2017	222.88	384.3	161.42	
06/28/2017	223.99	384.3	160.31	off
07/31/2017	228.68	384.3	155.62	off
08/28/2017	249.95	384.3	134.35	on
09/27/2017	270.87	384.3	113.43	on

ATTACHMENT 8

EXECUTIVE SUMMARY
FROM THE
WY 2017 SEAWATER INTRUSION ANALYSIS REPORT

EXECUTIVE SUMMARY

This report fulfills part of the annual reporting requirements contained in the Seaside Groundwater Basin Adjudication (California American Water v. City of Seaside, Monterey County Superior Court, Case Number M66343). The annual report addresses the potential for, and extent of, seawater intrusion in the Seaside Groundwater Basin.

Seawater intrusion may occur in basic hydrogeologic conditions as a wedge beneath fresh groundwater, or in more complex hydrogeology with various intrusion interfaces among the different aquifers. Continued pumping in excess of recharge and fresh water inflows, coastal groundwater levels well below sea level, and ongoing seawater intrusion in the nearby Salinas Valley all suggest that seawater intrusion could occur in the Seaside Groundwater Basin.

Seawater intrusion is typically identified through regular chemical analyses of groundwater which can identify geochemical changes in response to seawater intrusion. No single analysis definitively identifies seawater intrusion, however by looking at various analyses we can ascertain when fresh groundwater mixes with seawater. At low chloride concentrations, it is often difficult to identify incipient seawater intrusion. This is due to the natural variation in fresh water chemistry at chloride concentrations below 1,000 milligrams per liter (mg/L). Mixing trends between groundwater and seawater are more easily defined when chloride concentrations exceed 1,000 mg/L. Common geochemical indicators of seawater intrusion are cation and anion ratios, chloride trends, sodium/chloride ratios, and electric induction logging.

Based on an evaluation of geochemical indicators for Water Year 2017 and prior, no seawater intrusion has historically been or is currently observed in existing monitoring and production wells in the Seaside Groundwater Basin. It should be noted that although seawater intrusion has not been observed in the hydrogeologic data collected, there have been some chloride anomalies observed over the past two water years in some of the Sentinel Wells.

In September 2017, Sentinel Well SBWM-2's deep sample at 1,470 feet had a chloride concentration of 292 mg/L, which is the highest chloride measured in any of the coastal wells. Verification sampling is not necessary as the concentration was effectively verified using downhole electrical conductivity profiling, which uses an instrument to measure the conductivity of the water within the well casing. The September 2017 chloride concentration is a 226 mg/L increase from the December 2016 concentration of 66 mg/L. The previous 4th quarter sample was also elevated at 178 mg/L. These past three results indicate that chloride concentrations are fluctuating over 100 mg/L within each of the past two water years. After last year's concentration fluctuation possible sources of the salinity contributing to the observed increases were postulated to include natural groundwater quality variations, upwelling or upconing of underlying saline formation water from the Monterey Formation in response to declining groundwater levels, or very early seawater intrusion (HydroMetrics WRI, 2017). However, from evaluation of the downhole electrical conductivity profiling of all four Sentinel Wells (Feeney, 2017) and their long-term electric induction logs, it appears the groundwater samples collected using the low flow sampler appear to be sampling water within the well casing and not the groundwater from the aquifer surrounding the well. The groundwater quality data collected in the Sentinel Wells is therefore not considered representative of the aquifer and should not be used in seawater intrusion analysis.

Data which indicate that seawater intrusion is not occurring are described in the bulleted items below:

- Maps of chloride concentrations for the shallow aquifer do not show chlorides increasing towards the coast.
- Induction logging data at the coastal Sentinel Wells do not show large changes over time that are indicative of seawater intrusion in the deep aquifer.
- None of the Stiff diagrams for monitoring and production wells show the characteristic chloride spike that typically indicates seawater intrusion in Stiff diagrams.
- None of the Piper diagrams for monitoring and production wells show the typical evolution of water chemistry from freshwater to seawater.

The following groundwater level and production data suggest that conditions in the basin continue to provide a potential for seawater intrusion:

- Even though Water Year 2017 was an above average rainfall year with increased groundwater elevations, and basin pumping was very slightly above the current safe yield of 3,000 acre-feet per year, Northern Coastal subarea groundwater levels in the deep aquifer remain below sea level (Figure 30 and Figure 32). The 4th quarter deep aquifer groundwater levels along the coast, in most locations, are at elevations greater than 20 feet below sea level.
- Groundwater levels remain below protective elevations in all deep monitoring wells used for protective groundwater elevation monitoring (MSC deep, PCA-W deep, and Sentinel Well SBWM-3). Two of the three shallow wells' groundwater levels are above protective elevations: PCA-W shallow and CDM-MW4. The MSC shallow well remains below protective elevations.

Due to its far distance from the coast, seawater intrusion is not an issue of concern in the Laguna Seca subarea. However, groundwater levels in the eastern Laguna Seca subarea have historically been declining at rates of 0.6 feet per year in the shallow aquifers, and between two and three feet per year in the deep aquifers. These declines have occurred since 2001, despite triennial reductions in allowable pumping. The cause of this decline is due in part to the safe yield of the subarea being incorrect and in part due to the influence of wells to the east of the groundwater basin. The rate of decline in groundwater levels in the western portion of the subarea is between one and two feet per year. There is an indication, however, from 2016 and 2017 groundwater levels that the rate in decline has stabilized over the past couple years.

Based on the findings of this report, the following recommendations should be implemented to monitor and track potential seawater intrusion.

1. **Continue to Analyze and Report on Water Quality Annually**

   Seawater intrusion is a threat, and data must be analyzed regularly to identify incipient intrusion. Maps, graphs, and analyses similar to what are found in this report should continue to be developed every year.

2. **Discontinue Sampling the Four Sentinel Wells but Continue Induction Logging Twice a Year**

   Due to the finding that the water quality samples being extracted from the Sentinel Wells are not representative of the aquifer, it is recommended that sampling the wells with the low flow sampler is

discontinued. The depth of the wells and the small 3-inch diameter of the wells limit sampling techniques that can be applied cost-effectively to extract a representative sample. The Sentinel Wells were designed for the purpose of electric induction logging, and therefore should continue to be induction logged twice a year.

ATTACHMENT 9

SEASIDE GROUNDWATER BASIN
MONITORING AND MANAGEMENT PROGRAM
2018 WORK PLAN

Seaside Groundwater Basin Monitoring and Management Program
FY 2018 Work Plan

The tasks outlined below are those that are anticipated to be performed during 2018. Some Tasks listed below are specific to 2018, while other Tasks recur throughout the program, such as data collection and database entry, and Program Administration Tasks.

Within the context of this document the term "Consultant" refers either to a firm providing professional engineering or other types of technical services, or to the Monterey Peninsula Water Management District (MPWMD). The term "Contractor" refers to a firm providing construction or field services such as well drilling, induction logging, or meter calibration.

M.1 Program Administration

M. 1. a **Project Budget and Controls** **($0)**	Consultants will provide monthly or bimonthly invoices to the Watermaster for work performed under their contracts with the Watermaster. Consultants will perform maintenance of their internal budgets and schedules, and management of their subconsultants. The Watermaster will perform management of its Consultants.
M. 1. b **Assist with Board and TAC Agendas** **($0)**	Watermaster staff will prepare Board and TAC meeting agenda materials. No assistance from Consultants is expected to be necessary to accomplish this Task.
M. 1. c. & M. 1. d **Preparation for and Attendance at Meetings** **($11,500)**	The Consultants' work will require internal meetings and possibly meetings with outside governmental agencies and the public. For meetings with outside agencies, other Consultants, or any other parties which are necessary for the conduct of the work of their contracts, the Consultants will set up the meetings and prepare agendas and meeting minutes to facilitate the meetings. These may include planning and review meetings with Watermaster staff. The costs for these meetings will be included in their contracts, under the specific Tasks and/or subtasks to which the meetings relate. The only meeting costs that will be incurred under Tasks M.1.c and M.1.d will be: • Those associated with attendance at TAC meetings (either in person or by teleconference connection), including providing periodic progress reports to the Watermaster for inclusion in the agenda packets for the TAC meetings, when requested by the Watermaster to do so. These progress reports will typically include project progress that has been made, problem identification and resolution, and planned upcoming work. • From time-to-time when Watermaster staff asks Consultants to make special presentations to the Watermaster Board and/or the TAC, and which are not included in the Consultant's contracts for other tasks. Appropriate Consultant representatives will attend TAC meetings when requested to do so by Watermaster Staff (either in person or by teleconference connection), but will not be asked to prepare agendas or meeting minutes. As necessary, Consultants may provide oral updates to their progress reports (prepared under Task M.1.d) at the TAC meetings.
M. 1. e **Peer Review of Documents and Reports** **($7,500)**	When requested by the Watermaster staff, Consultants may be asked to assist the TAC and the Watermaster staff with peer reviews of documents and reports prepared by various other Watermaster Consultants and/or entities.
M. 1. f **QA/QC** **($0)**	A Consultant (MPWMD) will provide general QA/QC support over the Seaside Basin Monitoring and Management Program. These costs are included in the other tasks.

M.1.g Prepare Documents for SGMA Reporting ($1,900)	Section 10720.8 of the Sustainable Groundwater Management Act (SGMA) requires adjudicated basins to submit annual reports. Most of the documentation that needs to be reported is already generated by the Watermaster in conjunction with preparing its own Annual Reports. However, some information such as changes in basin storage is not currently generated and will require consultant assistance to do so. This task will be used to obtain this consultant assistance, as needed.

I. 2 Comprehensive Basin Production, Water Level and Water Quality Monitoring Program

I. 2. a. Database Management

I. 2. a. 1 Conduct Ongoing Data Entry and Database Maintenance/ Enhancement ($17,004)	The database will be maintained by a Consultant (MPWMD) performing this work for the Watermaster. MPWMD will enter new data into the consolidated database, including water production volumes, water quality and water level data, and such other data as may be appropriate. Another Consultant will periodically post database information to the Watermaster's website, so it will be accessible to the public and other interested parties. No enhancements to the database are anticipated during 2018.
I. 2. a. 2 Verify Accuracy of Production Well Meters ($0)	To ensure that water production data is accurate, the well meters of the major producers were verified for accuracy during 2009 and again during 2015. No additional work of this type is anticipated during 2018.

I. 2. b. Data Collection Program

I. 2. b. 1 Site Representation and Selection ($0)	The monitoring well network review that was started in 2008 has been completed, and sites have been identified where future monitoring well(s) could be installed, if it is deemed necessary to do so in order to fill in data gaps. No further work of this type is anticipated in 2018.
I. 2 b. 2 Collect Monthly Manual Water Levels ($3,726)	Each of the monitoring wells will be visited on a regular basis. Water levels will be determined by either taking manual water levels using an electric sounder, or by dataloggers. The wells where the use of dataloggers is feasible or appropriate have been equipped with dataloggers. This Task includes the purchase of one datalogger and parts for the datalogger to keep in inventory as a spare if needed. All of the other wells will be manually measured.

I. 2. b. 3 **Collect Water Quality Samples.** **($51,128)**	Water quality data will be collected quarterly from certain of the monitoring wells, but beginning in WY 2018 will no longer be collected from the four coastal Sentinel Wells. Discontinuing water quality sampling in those wells is the result of the finding that the water quality samples being extracted from those wells are not representative of the aquifer. Those wells were designed for the purpose of electric induction logging, and will therefore continue to be induction logged twice a year in WY 2018. In 2012 water quality analyses were expanded to include barium and iodide ions, to determine the potential benefit of performing these additional analyses. These two parameters have been useful in analyzing seawater intrusion potential in other vulnerable coastal groundwater basins, and are briefly mentioned in the Watermaster's annual Seawater Intrusion Analysis Reports. These parameters were added to the annual water quality sampling list for the four Watermaster Sentinel wells (SBWM-1, SBWM-2, SBWM-3, and SBWM-4), and also for the 3 most coastal MPWMD monitoring wells (MSC, PCA, and FO-09). Barium and iodide analyses will continue being performed on the 3 most coastal MPWMD monitoring wells in 2018, but will no longer be performed on the Watermaster's coastal Sentinel Wells beginning in 2018, as discussed above. Water quality data may come from water quality samples that are taken from these wells and submitted to a State Certified analytic laboratory for general mineral and physical suite of analyses, or the data may come from induction logging of these wells and/or other data gathering techniques. The Consultant or Contractor selected to perform this work will make this judgment based on consideration of costs and other factors. Under this Task in 2013 retrofitting to use the low-flow purge approach for getting water quality samples was completed on all of the wells that are sampled. This sampling equipment sits in the water column and may periodically need to be replaced or repaired. Accordingly, an allowance to perform maintenance on previously installed equipment has been included in this Task. Also, in the event a sampling pump is found to be no longer adequate due to declining groundwater levels, or if a sampling pump needs to be installed on a Sentinel Well, an allowance to purchase a replacement sampling pump has been included in this Task. Improvements to the QA/QC program for the water quality sampling work were adopted in mid-2017 and will be included in this work in 2018.
I. 2. b. 4 **Update Program Schedule and Standard Operating Procedures.** **($0)**	All recommendations from prior reviews of the data collection program have been implemented. No additional work of this type is anticipated in 2018.
I. 2. b. 5 **Monitor Well Construction** **($0)**	An additional monitoring well was installed in 2009. No further work of this type is anticipated in 2018.

I. 2. b. 6 Reports ($3,576)	The groundwater level and water quality monitoring will be conducted on a monthly, quarterly, semi-annual or annual basis, as described in the Consultant's Scope of Work. Reports summarizing data collected and analyzed will be submitted to the Watermaster on a schedule to be established during the year, and will consist of: 1. A review of the water quality and water level data at the end of each quarter of the Water Year, including tabularized data summaries of the WQ/WL data twice per year, once for the Q1 and Q2 period and once for the Q3 and Q4 period, so this data can be posted to WATERMASTER's website. No reporting on a quarterly basis is required but the Consultant will promptly notify the Watermaster of any missing data or data collection irregularities that were encountered during the quarterly reporting period. 2. An annual report summarizing the water quality and water level data for the Water Year, and containing tables of this data for the complete Water Year. The report will include a brief cover letter describing any missing data or data collection irregularities that were encountered during the reporting period, and any recommendations for changes to be made to the data collection program.
I.2.b.7 CASGEM Data Submittal ($2,384)	Compile and submit data on the Watermaster's "Voluntary Wells" into the State's CASGEM groundwater management database. The term "Voluntary Well" refers to a well that is not currently having its data reported into the CASGEM system, but for which the Watermaster obtains data. This will be done in the format and on the schedule required by the Department of Water Resources under the Sustainable Groundwater Management Act.
	I. 3 Basin Management
I. 3. a. Enhanced Seaside Basin Groundwater Model (Costs listed in subtasks below)	The Watermaster and its consultants use a Groundwater Model for basin management purposes.

I.3.a.1 **Update the Existing Model** **($54,370)**	The existing Model, described in the report titled "Groundwater Flow and Transport Model" dated October 1, 2007, was updated in 2009 in order to develop protective water levels, and to evaluate replenishment scenarios and develop answers to Basin management questions (Tasks I.3.a.2 and I.3.a.3). The scope and budget in 2014 for again updating the Model included the following: Step1: Update the model and check its accuracy - $10,000 Step 2: Recalibrate the model - $15,000 Step 3: Prepare report describing the work that was done - $5,000 Step 1 was completed in 2014 by incorporating recent pumping data, groundwater level data, and rainfall data, and then checking to see if the recently simulated groundwater levels match the recently measured groundwater levels. These are the principle findings and conclusions of this Step 1 work: • The model still provides reliable results in the Laguna Seca Subarea. • Although the performance of the model during the updated period is worsening, the calibration of the model remains within acceptable standards. • The northern boundary condition needs to be updated to reflect real groundwater elevation variations for the model period of 2005-2013. The behavior of the northern boundary will impact flows and the ability to calibrate the model for the area of the model that is adjacent to the northern boundary. An alternative method for defining this boundary condition will have to be developed that does not rely upon simulations from the Salinas Valley Integrated Groundwater Surface Water Model (SVIGSM). • The groundwater model should be updated in a maximum of five years and its calibration reevaluated at that time. However, if groundwater related projects are implemented in the Basin before that time, the update and calibration reevaluation may need to be performed sooner. Modeling of the Laguna Seca Subarea was performed in 2014 and a peer review of that work was performed in 2015. The peer review concluded that the model is a reasonable representation of the Seaside Basin groundwater flow system. No major errors in assumptions, data or results were identified during this peer review, and the simulated water levels generally matched observed water levels for the historical calibration simulation. The peer review recommended some aspects of the model should be explored to try to determine some differences between field-measured conditions and model-predicted conditions in some parts of the Basin, but stated that the model should be used for estimating the operational safe yield of the basin and subareas, and for simulating the effects of possible management measures. It also recommended that some additional simulations should be completed for management measures likely to be implemented. In 2018 Step 1 (updating the Model) will be performed again, along with Steps 2 (recalibrating) and 3 (reporting on this work).
I. 3. a. 2 **Develop Protective Water Levels** **($0)**	A series of cross-sectional models was created in 2009 in order to develop protective water levels for selected production wells, as well as for the Basin as a whole. This work is discussed in Hydrometrics' "Seaside Groundwater Basin Protective Water Elevations Technical Memorandum." In 2013 further work was started to refine these protective water levels, but it was found that the previously developed protective water levels were reasonable. Protective water levels will be updated, if appropriate, as part of the work of Task I.3.c.

I. 3. a. 3 **Evaluate Replenishment Scenarios and Develop Answers to Basin Management Questions ($20,000)**	In 2009 the updated Model was used to evaluate different scenarios to determine such things as the most effective methods of using supplemental water sources to replenish the Basin and/or to assess the impacts of pumping redistribution. This work is described in HydroMetrics' "Seaside Groundwater Basin Groundwater Model Report." In 2010, and again in 2013, HydroMetrics used the updated Model to develop answers to some questions associated with Basin management. Modeling performed in 2014, 2015, and 2016 led to the conclusion that groundwater levels in parts of the Laguna Seca Subarea will continue to fall even if all pumping within that subarea is discontinued, because of the influence of pumping from areas near to, but outside of, the Basin boundary. Additional modeling work may be performed in 2018 to further examine this situation.
I. 3. b. **Complete Preparation of Basin Management Action Plan ($0)**	The Watermaster's Consultant completed preparation of the Basin Management Action Plan (BMAP) in February 2009. The BMAP serves as the Watermaster's long-term seawater intrusion prevention plan. The Sections that are included in the BMAP are: Executive Summary Section 1 – Background and Purpose Section 2 – State of the Seaside Groundwater Basin Section 3 – Supplemental Water Supplies Section 4 –Groundwater Management Actions Section 5 – Recommended Management Strategies Section 6 – References The only work which may be performed on the BMAP in 2018 is discussed under Task I. 3. c.
I. 3. c. **Refine and/or Update the Basin Management Action Plan ($45,260)**	During 2018 the BMAP will be updated based on new data and knowledge that has been gained since it was prepared in 2009.
I. 3. d. **Evaluate Coastal Wells for Cross-Aquifer Contamination Potential ($0)**	If seawater intrusion were to reach any of the coastal wells in any aquifer, and if a well was constructed without proper seals to prevent cross-aquifer communication, or if deterioration of the well had compromised these seals, it would be possible for the intrusion to flow from one aquifer to another. An evaluation of this was completed in 2012 and is described in MPWMD's Memorandum titled "Summary of Seaside Groundwater Basin Cross-Aquifer Contamination Wells Investigation Process and Conclusions" dated August 8, 2012. This Memorandum did not recommend performing any further work on this matter at this time, other than to incorporate into the Watermaster's Database data from wells that were newly identified by the work performed in 2012. That data has now been incorporated into the Database, and no further work by the Watermaster on this matter is anticipated. In late 2017 a request was made to MPWMD to destroy one of its no-longer-used monitoring wells that is perforated in multiple aquifers (Well PCA-East Multiple). It is anticipated that MPWMD will perform that work in 2018.

I. 3. e. **Seaside Basin Geochemical Model** **($50,000)**	When new sources of water are introduced into an aquifer, with each source having its own unique water quality, there can be chemical reactions that may have the potential to release minerals which have previously been attached to soil particles, such as arsenic or mercury, into solution and thus into the water itself. This has been experienced in some other locations where changes occurred in the quality of the water being injected into an aquifer. MPWMD's consultants have been using geochemical modeling to predict the effects of injecting Carmel River water into the Seaside Groundwater Basin under the ASR program. In order to predict whether there will be groundwater quality changes that will result from the introduction of desalinated water and additional ASR water (under the Monterey Peninsula Water Supply Project) and advance-treated wastewater (under the Pure Water Monterey Project) a geochemical model should be developed for use in the areas of the Basin where injection of these new water sources will occur. This can be most cost-efficiently accomplished in the following manner: Step 1: MPWMD's consultant would use the water quality and water delivery schedule data provided by each of the project proponents to develop and run the geochemical model. If the geochemical modeling indicated there would be no water chemistry problems then there would be no need perform Step 2. Step 2 (if needed): If the geochemical modeling in Step 1 indicates the potential for problems to occur, then HydroMetrics may use the Watermaster's existing groundwater model, and information about injection locations and quantities, injection scheduling, etc. provided by MPWMD for each of these projects, to develop model scenarios to see if the problem(s) can be averted by changing delivery schedules and delivery quantities. If the modeling predicts that there may be adverse impacts from introducing these new sources of water, measures to mitigate those impacts will be developed under a separate task that will be created for that purpose when and if necessary.

I. 4 Seawater Intrusion Response Plan (formerly referred to as the Seawater Intrusion Contingency Plan)

I. 4. a. **Oversight of Seawater Intrusion Detection and Tracking** **($0)**	Consultants will provide general oversight over the Seawater Intrusion detection program under the other Tasks in this Work Plan.
I. 4. b. **Focused Hydrogeologic Evaluation** **($0)**	MPWMD attempted to compile historical and current water quality data in the coastal area to provide more in-depth evaluation of conditions in the shallow Dune Sand/Aromas Sand aquifer in the vicinity of the Sand City Public Works well, where unique water quality conditions and variability have recently been observed as discussed at TAC meetings. However, it was found that no historical water quality data from Cal Am's now-abandoned wells existed, and consequently it was not possible to answer the question of why water quality in the Sand City Public Works well differs from water quality in other wells in the Basin. The Sand City desalination plant could be affecting water quality in this area, but without the prior water quality data from now-abandoned wells, this could not be determined. The results of this work were summarized in 2013 in a brief Technical Memorandum prepared by MPWMD with conclusions and recommendations, and no further work on this matter is planned.

I. 4. c. **Annual Report- Seawater Intrusion Analysis** **($22,082)**	At the end of each water year, a Consultant will reanalyze all water quality data. Semi-annual chloride concentration maps will be produced for each aquifer in the basin. Time series graphs, trilinear graphs, and stiff diagram comparisons will be updated with new data. The annual EM logs will be analyzed to identify changes in seawater wedge locations. All analyses will be incorporated into an annual report that follows the format of the initial, historical data report. Potential seawater intrusion will be highlighted in the report, and if necessary, recommendations will be included. The annual report will be submitted for review by the TAC and the Board. Modifications to the report will be incorporated based on input from these bodies, as well as Watermaster staff.
I. 4. d **Complete Preparation of Seawater Intrusion Response Plan** **($0)**	The Watermaster's Consultant (HydroMetrics) completed preparation of the long-tem Seawater Intrusion Response Plans (SIRP) in February 2009. The Sections that are included in the SIRP are: Section 1 – Background and Purpose Section 2 – Consistency with Other Documents Section 3 – Seawater Intrusion Indicators and Triggers Section 4 –Seawater Intrusion Contingency Actions Section 5 - References No further work on the SIRP is anticipated in 2018.
I. 4. e. **Refine and/or Update the Seawater Intrusion Response Plan** **($0)**	At the beginning of 2009 it was thought that it might be beneficial or necessary to perform work to refine the SIRP and/or to update it based on new data or knowledge that was gained subsequent to the preparation of the SIRP. However, this did not prove to be necessary, and no further work of this type is anticipated in 2018.
I. 4. f. **If Seawater Intrusion is Determined to be Occurring, Implement Contingency Response Plan** **($0)**	The SIRP will be implemented if seawater intrusion, as defined in the Plan, is determined by the Watermaster to be occurring.

ATTACHMENT 10

WATER ALLOCATION TRANSFER DOCUMENTS

FENTON & KELLER
A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW
2801 MONTEREY-SALINAS HIGHWAY
POST OFFICE BOX 791
MONTEREY, CALIFORNIA 93942-0791
TELEPHONE (831) 373-1241
FACSIMILE (831) 373-7219
www.fentonkeller.com

April 11, 2017

DSweigert@FentonKeller.com
ext. 202

VIA E-MAIL (watermasterlaura@sbcglobal.net)

Laura Dadiw
Seaside Groundwater Basin Watermaster
P.O. Box 51502
Pacific Grove, CA 93950

Re: Assignment of Entitlement to 710 Amador
Our File: 30646.27923

Dear Ms. Dadiw:

Enclosed for your records and for appropriate processing is a copy of the executed Assignment of a Portion of Monterey Peninsula Water Management District ("MPWMD") Ordinance No. 166 Water Entitlement ("Assignment") from D.B.O. Development No. 30 ("D.B.O.") to Jerry Zack, owner of 710 Amador St. in Seaside ("Benefited Property"). The Assignment was recorded on April 7, 2017 in the office of the Monterey County Recorder as Document No. 2017018673. This constitutes the first assignment of water pursuant to MPWMD Ordinance No. 166 and the Front Loading Agreement between D.B.O. and California American Water Company ("Cal-Am").

The transactions contemplated in the Front Loading Agreement and authorized by Ordinance No. 166, including the transfer under the Assignment and all future D.B.O. entitlement transfers under Ordinance No. 166, were subject to the process required by Rule 9.0 of the Rules and Regulations of the Seaside Groundwater Basin Watermaster ("Watermaster"). The Rule 9.0 process was initiated by my February 9, 2016, letter to the Watermaster. The Watermaster circulated notice of the proposed transfer pursuant to Rule 9.0 on March 23, 2016. On May 10, 2016, the Watermaster reported that no comments or objections were received. Therefore, no further process is required under Rule 9 for the Assignment.

Pursuant to Ordinance No. 166, the Assignment, and the Front Loading Agreement, D.B.O. hereby requests the Watermaster to transfer 0.16 AF of D.B.O.'s annual production right to Cal-Am to allow it to serve the Benefited Property. This amount consists of 0.15 AF in metered deliveries to the Benefited Property pursuant to the Assignment, plus 0.01 AF (7% of

0.15 AF) for anticipated system loss as required by MPWMD. (For purposes of MPWMD accounting under Ordinance No. 166, 0.15 AF should be debited against the total of 13.95 AF of allowable metered deliveries and 0.16 AF should be debited against the total of 15.0 AF of allowable production. There have been no prior transfers of D.B.O. entitlements. Therefore, under Ordinance No. 166, this transfer pursuant to the Assignment leaves a D.B.O. entitlement balance of 13.80 AF of metered deliveries, or 14.84 of total production.)

As set forth in my February 9, 2016, letter to the Watermaster, D.B.O. hereby requests that the Watermaster debit this 0.16 AF production amount annually to D.B.O.'s Watermaster account first against D.B.O.'s "free" Carryover Credits unless and until all of D.B.O.'s "free" Carryover Credits have been exhausted. If and when D.B.O.'s "free" Carryover Credits have been exhausted, this amount should then be debited against D.B.O.'s annual share of the Natural Safe Yield. The Watermaster should track the 0.16 AF Assignment amount separately both as an increase in Cal-Am's annual production limit and a decrease in D.B.O.'s annual production limit. Cal-Am will report annual production pursuant to the Assignment.

While the Assignment was recorded on April 7, 2017, the full increment of 0.16 AF in production should be transferred to Cal-Am in the current 2017 Water Year. Under no circumstances shall production of this amount by Cal-Am for use on the Benefited Property be deducted from, or be allowed to reduce, Cal-Am's existing production rights under the Court's Amended Decision in the case of *California American Water Company v. City of Seaside et al.* (Monterey Superior Court Case No. GNM66343.)

Thank you for your attention to this matter. Please let me know if you have any questions or comments, if you need any further information from us, or if there is anything we can do to assist Watermaster staff in implementing the accounting related to the Assignment.

Very truly yours,

FENTON & KELLER
A Professional Corporation

David C. Sweigert

DCS:kmc
Enclosure
cc: (with enclosure)
David Stoldt (MPWMD)
Eric Sabolsice (Cal-Am)
Ted Lim (DBO)

{DCS-00825678}

072301395 3

Recording requested by and when recorded, mail to:

Jerry Zack
c/o Anthony Pietragallio
Resource Real Estate-Loans
654 Cass Street
Monterey, CA 93940

CONFORMED COPY
Recorded 4-7-17
Serial # 2017018673
Monterey County Records
NOT COMPARED

THIS SPACE FOR RECORDER'S USE ONLY

ASSIGNMENT OF A PORTION OF MONTEREY PENINSULA WATER MANAGEMENT DISTRICT ORDINANCE NO. 166 WATER ENTITLEMENT

Pursuant to and in accordance with the rights and authority of Monterey Peninsula Water Management District Ordinance No. 166, the related agreements entered into with respect thereto, and the Rules and Regulations of the Monterey Peninsula Water Management District ("MPWMD") applicable thereto (all of which are incorporated by reference in this Assignment, with the capitalized terms used in this Assignment having the meanings defined therein), D.B.O. DEVELOPMENT NO. 30 , a California limited liability company ("DBO"), for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, hereby GRANTS, ASSIGNS, TRANSFERS, and CONVEYS to JERRY ZACK, an unmarried individual ("Owner"), a Water Entitlement of fifteen hundredths (0.15) acre feet per year dedicated to the real property located in Seaside, California, more particularly described in **Exhibit A attached hereto and incorporated herein by this reference** (Monterey County Assessor's parcel number 011-325-002-000), and comprising the Benefited Property to which Owner is the holder (of record) of fee title, for use on such Benefited Property.

By signing this Assignment, Owner acknowledges and agrees that Owner accepts the assignment of the Water Entitlement and all of the rights, preferences, privileges, and limitations related to Owner's ownership and use of the Water Entitlement conveyed by this Assignment, as set forth in MPWMD Ordinance No. 166 and Ordinance No. 109, the related agreements entered into with respect thereto, and the Rules and Regulations of MPWMD applicable thereto. Except for the limited right to receive water pursuant to the Water Entitlement upon Owner's compliance with any and all applicable MPWMD Rules and Regulations, this Assignment document is not intended nor shall it be construed to assign, transfer, convey, or delegate any other rights or obligations of DBO under the Amended Decision in *California American Water v. City of Seaside, et al.*, (Monterey County Superior Court, Case No. M66343) filed on February 9, 2007, as such Amended Decision has been or may be amended from time to time,

By signing this Assignment, Owner further acknowledges and agrees to all of the following: (1) that Owner has confirmed that the Benefited Property Benefited Property lies within the boundaries of the Seaside Groundwater Basin and within the service area of California American Water Company ("CAW"); 2) that upon recordation of this Assignment, the Water Entitlement shall become appurtenant to the Benefited Property, shall not be conveyed separately from the Benefited Property, and shall automatically be conveyed with the Benefited Property when the

Benefited Property is sold, transferred, or otherwise conveyed to any other person or entity; (3) that, except to the extent authorized by MPWMD in the event of a lot line adjustment involving the Benefited Property, the use of all or any portion of the Water Entitlement on any property other than the Benefited Property shall be prohibited; (4) that Owner shall be solely responsible for the payment of all fees, costs, and expenses of any nature whatsoever accruing or arising at any time after the recordation of this Assignment in connection with the ownership or use of the Water Entitlement, including, but not limited to, any connection or other fees that must be paid to MPWMD and any rates, fees, or charges that must be paid to CAW or its successor, in connection with water service under the Water Entitlement; (5) that prior to using any water on the Benefited Property pursuant to the Water Entitlement, Owner shall also first obtain and comply with any required approval from the local jurisdiction in which the Benefited Property is located; (6) Owner, at Owner's sole cost, shall comply with all applicable MPWMD Rules and Regulations, including, but not limited to, any rules applicable to CAW customers related to new connections, intensification of water use, and water conservation for the type of use (e.g., commercial, hotel, residential, landscape); (7) that Owner, at Owner's sole cost, shall obtain any additional approvals necessary to allow delivery of water to and use of water on the Benefited Property pursuant to the Water Entitlement, including, but not limited to, any amendment to any CAW water system permit required by MPWMD if the Benefited Property is located in Ryan Ranch or any other of CAW's "satellite system"; (8) that, if use of non-CAW wells on the Benefited Property is contemplated, Owner, in consultation with CAW, shall take appropriate action to prevent contamination of the CAW system, such as by installing a back-flow protection device; (9) that Owner authorizes CAW or its successor to provide to DBO and MPWMD any and all meter data regarding the amounts of water that CAW has delivered or will deliver to the Benefited Property pursuant to the Water Entitlement; and (6) agrees that all provisions of this Assignment Document will be binding on Owner's successors and assigns and shall run with the land.

This Assignment document may be executed in one or more counterparts, each of which will be deemed an original and all, taken together, will constitute one and the same instrument.

DBO:
D.B.O. DEVELOPMENT NO. 30,
A California limited liability company

By: THE OROSCO FAMILY TRUST
dated June 28, 1977, as amended, Member

By: _____ Date: 1/12/17
Donald B. Orosco, Co-Trustee

_____ Date: 1/12/17
Mary Kay Orosco, Co-Trustee

By: LYLES DIVERSIFIED, INC.,
a California corporation, Member

By: _____ Date: January 16, 2017
Gerald V. Lyles, Senior Vice President

[Signatures continued on the following page]

OWNER:
JERRY ZACK, an unmarried individual

By: Jerry Zack
Jerry Zack, an unmarried individual

Date: 1-31-17

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF MONTEREY

On JANUARY 31, 2017 before me, SHERRY PEVERINI, a Notary Public, personally appeared JERRY ZACK, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~), and that by his/~~her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Notary Public

SHERRY PEVERINI
Commission # 2108529
Notary Public - California
Monterey County
My Comm. Expires May 22, 2019

My Commission Expires: MAY 22, 2019

Commission Number: 2108529

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF MONTEREY

On JANUARY 12, 2017, before me, Sherry Peverini, a Notary Public, personally appeared DONALD B. OROSCO, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~), and that by his/~~her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Notary Public

SHERRY PEVERINI
Commission # 2108529
Notary Public - California
Monterey County
My Comm. Expires May 22, 2019

My Commission Expires: May 22, 2019

Commission Number: 2108529

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF MONTEREY

On JANUARY 12, 2017, before me, SHERRY PEVERINI, a Notary Public, personally appeared MARY KAY OROSCO, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that ~~he/she/they~~ executed the same in ~~his/her/their~~ authorized capacity(~~ies~~), and that by ~~his/her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Notary Public

SHERRY PEVERINI
Commission # 2108529
Notary Public - California
Monterey County
My Comm. Expires May 22, 2019

My Commission Expires: May 22, 2019

Commission Number: 2108529

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF FRESNO

On January 16, 2017, before me, Joyce Neale, a Notary Public, personally appeared GERALD V. LYLES, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~), and that by his/~~her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Joyce Neale
Notary Public

My Commission Expires: March 9, 2017

Commission Number: 2010834

JOYCE NEALE
Commission # 2010834
Notary Public - California
Fresno County
My Comm. Expires Mar 9, 2017

JOYCE NEALE
Commission # 2010834
Notary Public - California
Fresno County
My Comm. Expires Mar 9, 2017

ORDER NO. : 0723008864

EXHIBIT A

The land referred to is situated in the County of Monterey, City of Seaside, State of California, and is described as follows:

Lot 3, in Block 30, as shown on the map entitled, "Map of Vista Del Rey Tract, Monterey County, California", filed January 30, 1905 in the office of the County Recorder of Monterey, State of California, and now on file in said office in Map Book 1, Cities and Towns, at Page 7 therein.

APN: 011-325-002

FENTON & KELLER
A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW
2801 MONTEREY-SALINAS HIGHWAY
POST OFFICE BOX 791
MONTEREY, CALIFORNIA 93942-0791
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MARK A. CAMERON
JOHN S. BRIDGES
DENNIS G. MCCARTHY
CHRISTOPHER E. PANETTA
DAVID C. SWEIGERT
SARA B. BOYNS
BRIAN D. CALL
TROY A. KINGSHAVEN
JOHN E. KESECKER
ELIZABETH R. LEITZINGER
SHARILYN B. PAYNE
CAROL S. HILBURN
CHRISTINA J. BAGGETT
ELIAS E. SALAMEH
KENNETH S. KLEINKOPF
DERRIC G. OLIVER
ROXANA E. KHAN
LAURA L. FRANKLIN
EVAN J. ALLEN
ANDREW B. KREEFT

LEWIS L. FENTON
1925-2005

OF COUNSEL
CHARLES R. KELLER
THOMAS H. JAMISON

June 16, 2017

DAVID C. SWEIGERT

DSweigert@FentonKeller.com
ext. 202

VIA E-MAIL (watermasterlaura@sbcglobal.net)

Laura Dadiw
Seaside Groundwater Basin Watermaster
P.O. Box 51502
Pacific Grove, CA 93950

Re: Assignment of Entitlement to Montage Health (Community Hospital Properties)
Our File: 30646.33397

Dear Ms. Dadiw:

Enclosed for your records and for appropriate processing is a copy of the executed Assignment of a Portion of Monterey Peninsula Water Management District ("MPWMD") Ordinance No. 166 Water Entitlement ("Assignment") from D.B.O. Development No. 30 ("D.B.O.") to Community Hospital Properties, owner of 2 Upper Ragsdale Drive in Monterey ("Benefited Property"). The Assignment was recorded on June 15, 2017, in the office of the Monterey County Recorder as Document No. 2017031712. This constitutes the second assignment of water pursuant to MPWMD Ordinance No. 166 and the Front Loading Agreement between D.B.O. and California American Water Company ("Cal-Am").

The transactions contemplated in the Front Loading Agreement and authorized by Ordinance No. 166, including the transfer under the Assignment and all future D.B.O. entitlement transfers under Ordinance No. 166, were subject to the process required by Rule 9.0 of the Rules and Regulations of the Seaside Groundwater Basin Watermaster ("Watermaster"). The Rule 9.0 process was initiated by my February 9, 2016, letter to the Watermaster. The Watermaster circulated notice of the proposed transfer pursuant to Rule 9.0 on March 23, 2016. On May 10, 2016, the Watermaster reported that no comments or objections were received. Therefore, no further process is required under Rule 9.0 for the Assignment.

Pursuant to Ordinance No. 166, the Assignment, and the Front Loading Agreement, D.B.O. hereby requests the Watermaster to transfer 2.15 AF of D.B.O.'s annual production right to Cal-Am to allow it to serve the Benefited Property. This amount consists of 2.00 AF in

metered deliveries to the Benefited Property pursuant to the Assignment, plus 0.15 AF (7% of 2.15 AF) for anticipated system loss as required by MPWMD.

Note that, for purposes of MPWMD tracking accounting under Ordinance No. 166, 2.00 AF should be debited against the remaining total of 13.85 AF of allowable metered deliveries and 2.15 AF should be debited against the total of 15.0 AF of allowable production. There has been a single prior transfer of D.B.O. entitlements of 0.15 AF in metered deliveries, or 0.16 AF in production. Therefore, under Ordinance No. 166, the transfer pursuant to this Assignment leaves a D.B.O. entitlement balance of 11.80 AF of metered deliveries, or 12.69 of total production. The table below shows this transfer, all previous transfers, and current production and metered sales balances of the D.B.O. entitlement.

		PRODUCTION	METERED SALES
BEGINNING ENTITLEMENT BALANCE→		15.00	13.95
ASSIGNMENT	**DATE ASSIGNMENT RECORDED**		
710 Amador	4/7/2027	-0.16	-0.15
Montage	6/15/2017	-2.15	-2.00
CURRENT BALANCE (AFTER ALL PRIOR TRANSFERS)→		12.69	11.80

As set forth in my February 9, 2016, letter to the Watermaster, D.B.O. hereby requests that the Watermaster debit this 2.15 AF production amount annually to D.B.O.'s Watermaster account first against D.B.O.'s "free" Carryover Credits unless and until all of D.B.O.'s "free" Carryover Credits have been exhausted. If and when D.B.O.'s "free" Carryover Credits have been exhausted, this amount should then be debited against D.B.O.'s annual share of the Natural Safe Yield. The Watermaster should track the 2.15 AF Assignment amount separately both as an increase in Cal-Am's annual production limit and a decrease in D.B.O.'s annual production limit. Cal-Am will report annual production pursuant to the Assignment.

While the Assignment was recorded on June 15, 2017, the full increment of 2.15 AF in production should be transferred to Cal-Am in the current 2017 Water Year. Under no circumstances shall production of this amount by Cal-Am for use on the Benefited Property be deducted from, or be allowed to reduce, Cal-Am's existing production rights under the Court's Amended Decision in the case of *California American Water Company v. City of Seaside, et al.* (Monterey Superior Court Case No. M66343.)

Thank you for your attention to this matter. Please let me know if you have any questions or comments, if you need any further information from us, or if there is anything we can do to assist Watermaster staff in implementing the accounting related to the Assignment.

Very truly yours,

FENTON & KELLER
A Professional Corporation

David C. Sweigert

DCS:kmc
Enclosure
cc: (with enclosure)
David Stoldt (MPWMD)
Eric Sabolsice (Cal-Am)
Ted Lim (DBO)

{DCS-00656632}

Stephen L. Vagnini
Monterey County Recorder
Recorded at the request of
Filer

CRLUPE
6/15/2017
13:43:39

DOCUMENT: **2017031712**

Titles: 1/ Pages: 7
Fees... 39.00
Taxes
Other... 14.00
AMT PAID $53.00

Recording requested by and when recorded, mail to:

Community Hospital Properties
Attn: Tim Nylen
Post Office Box HH
Monterey, CA 93940

THIS SPACE FOR RECORDER'S USE ONLY

The undersigned grantor(s) declare(s): County Tax is $0.00.
The Documentary Transfer Tax is $0.00 on the basis that this assignment does not involve the transfer of real property. R&T Section 6353.

ASSIGNMENT OF A PORTION OF
MONTEREY PENINSULA WATER MANAGEMENT DISTRICT
ORDINANCE NO. 166 WATER ENTITLEMENT
DBO DEVELOPMENT NO. 30

Pursuant to and in accordance with the rights and authority of Monterey Peninsula Water Management District Ordinance No. 166, the related agreements entered into with respect thereto, and the Rules and Regulations of the Monterey Peninsula Water Management District ("MPWMD") applicable thereto (all of which are incorporated by reference in this Assignment, with the capitalized terms used in this Assignment having the meanings defined therein), D.B.O. DEVELOPMENT NO. 30 , a California limited liability company ("DBO"), for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, hereby GRANTS, ASSIGNS, TRANSFERS, and CONVEYS to COMMUNITY HOSPITAL PROPERTIES, a California corporation ("Owner"), a Water Entitlement of two (2.0) acre feet per year dedicated to the real property located in Monterey, California, more particularly described in **Exhibit A** attached hereto and incorporated herein by this reference (Monterey County Assessor's Parcel Number 259-221-004), and comprising the Benefited Property to which Owner is the holder (of record) of fee title, for use on such Benefited Property for Non-Residential use.

By signing this Assignment, Owner acknowledges and agrees that Owner accepts the assignment of the Water Entitlement and all of the rights, preferences, privileges, and limitations related to Owner's ownership and use of the Water Entitlement conveyed by this Assignment, as set forth in MPWMD Ordinance No. 166, the related agreements entered into with respect thereto, and the Rules and Regulations of MPWMD applicable thereto. Except for the limited right to receive water pursuant to the Water Entitlement upon Owner's compliance with any and all applicable MPWMD Rules and Regulations, this Assignment Document is not intended nor shall it be construed to assign, transfer, convey, or delegate any other rights or obligations of DBO under the Amended Decision in *California American Water v. City of Seaside, et al.*, (Monterey County Superior Court, Case No. M66343) filed on February 9, 2007, as such Amended Decision has been or may be amended from time to time.

By signing this Assignment, Owner further acknowledges and agrees to all of the following: (1) that Owner has confirmed that the Benefited Property lies within the boundaries of the Seaside Groundwater Basin and within the service area of California American Water Company ("CAW"); (2) that upon recordation of this Assignment, the Water Entitlement shall become appurtenant to the Benefited Property, shall not be conveyed separately from the Benefited Property, and shall automatically be conveyed with the Benefited Property when the Benefited Property is sold, transferred, or otherwise conveyed to any other person or entity; (3) that, except to the extent authorized by MPWMD in the event of a lot line adjustment involving the Benefited Property, the use of all or any portion of the Water Entitlement on any property other than the Benefited Property shall be prohibited; (4) that Owner shall be solely responsible for the payment of all fees, costs, and expenses of any nature whatsoever accruing or arising at any time after the recordation of this Assignment in connection with the ownership or use of the

Water Entitlement, including, but not limited to, any connection or other fees that must be paid to MPWMD and any rates, fees, or charges that must be paid to CAW or its successor, in connection with water service under the Water Entitlement; (5) that prior to using any water on the Benefited Property pursuant to the Water Entitlement, Owner shall also first obtain and comply with any required approval from the local jurisdiction in which the Benefited Property is located; (6) Owner, at Owner's sole cost, shall comply with all applicable MPWMD Rules and Regulations, including, but not limited to, any rules applicable to CAW customers related to new connections, intensification of water use, and water conservation for the type of use (e.g., commercial, hotel, residential, landscape); (7) that Owner, at Owner's sole cost, shall obtain any additional approvals necessary to allow delivery of water to and use of water on the Benefited Property pursuant to the Water Entitlement, including, but not limited to, any amendment to any CAW water system permit required by MPWMD if the Benefited Property is located in Ryan Ranch or any other of CAW's "satellite system"; (8) that, if use of non-CAW wells on the Benefited Property is allowed, Owner, in consultation with CAW, shall take appropriate action to prevent contamination of the CAW system, such as by installing a back-flow protection device; (9) that Owner authorizes CAW or its successor to provide to DBO and MPWMD any and all meter data regarding the amounts of water that CAW has delivered or will deliver to the Benefited Property pursuant to the Water Entitlement; and (10) agrees that all provisions of this Assignment Document will be binding on Owner's successors and assigns and shall run with the land.

This Assignment Document may be executed in one or more counterparts, each of which will be deemed an original and all, taken together, will constitute one and the same instrument.

DBO:

D.B.O. DEVELOPMENT NO. 30,
A California limited liability company

By: THE OROSCO FAMILY TRUST
dated June 28, 1977, as amended, Member

By: _____ Date: 6/3/17
Donald B. Orosco, Co-Trustee

_____ Date: 6/8/17
Mary Kay Orosco, Co-Trustee

By: LYLES DIVERSIFIED, INC.,
a California corporation, Member

By: _____ Date: _____
Gerald V. Lyles, Senior Vice President

[Signatures continued on the following page]

Water Entitlement, including, but not limited to, any connection or other fees that must be paid to MPWMD and any rates, fees, or charges that must be paid to CAW or its successor, in connection with water service under the Water Entitlement; (5) that prior to using any water on the Benefited Property pursuant to the Water Entitlement, Owner shall also first obtain and comply with any required approval from the local jurisdiction in which the Benefited Property is located; (6) Owner, at Owner's sole cost, shall comply with all applicable MPWMD Rules and Regulations, including, but not limited to, any rules applicable to CAW customers related to new connections, intensification of water use, and water conservation for the type of use (e.g., commercial, hotel, residential, landscape); (7) that Owner, at Owner's sole cost, shall obtain any additional approvals necessary to allow delivery of water to and use of water on the Benefited Property pursuant to the Water Entitlement, including, but not limited to, any amendment to any CAW water system permit required by MPWMD if the Benefited Property is located in Ryan Ranch or any other of CAW's "satellite system"; (8) that, if use of non-CAW wells on the Benefited Property is allowed, Owner, in consultation with CAW, shall take appropriate action to prevent contamination of the CAW system, such as by installing a back-flow protection device; (9) that Owner authorizes CAW or its successor to provide to DBO and MPWMD any and all meter data regarding the amounts of water that CAW has delivered or will deliver to the Benefited Property pursuant to the Water Entitlement; and (10) agrees that all provisions of this Assignment Document will be binding on Owner's successors and assigns and shall run with the land.

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D.B.O. DEVELOPMENT NO. 30,
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By: THE OROSCO FAMILY TRUST
dated June 28, 1977, as amended, Member

By: _____ Date: _____
Donald B. Orosco, Co-Trustee

_____ Date: _____
Mary Kay Orosco, Co-Trustee

By: LYLES DIVERSIFIED, INC.,
a California corporation, Member

By: Gerald V. Lyles Date: June 8, 2017
Gerald V. Lyles, Senior Vice President

[Signatures continued on the following page]

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA)
COUNTY OF MONTEREY)

On June 8, 2017, before me, Sherry Peverini, a Notary Public, personally appeared DONALD B. OROSCO, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~), and that by his/~~her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Notary Public

SHERRY PEVERINI
Commission # 2108529
Notary Public - California
Monterey County
My Comm. Expires May 22, 2019

My Commission Expires: May 22, 2019

Commission Number: 2108529

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA)
COUNTY OF MONTEREY)

On June 8, 2017, before me, Sherry Peverini, a Notary Public, personally appeared MARY KAY OROSCO, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that ~~he/she/they~~ executed the same in ~~his/her/their~~ authorized capacity(~~ies~~), and that by ~~his/her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Notary Public

SHERRY PEVERINI
Commission # 2108529
Notary Public - California
Monterey County
My Comm. Expires May 22, 2019

My Commission Expires: May 22, 2019

Commission Number: 2108529

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF FRESNO

On June 8, 2017, before me, Joyce Neale, a Notary Public, personally appeared GERALD V. LYLES, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~), and that by his/~~her/their~~ signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Joyce Neale
Notary Public

My Commission Expires: March 9, 2021

Commission Number: 2182728

JOYCE NEALE
Notary Public – California
Fresno County
Commission # 2182728
My Comm. Expires Mar 9, 2021

OWNER:

COMMUNITY HOSPITAL PROPERTIES,
a California corporation

By: _____ Date: 2.22.17

Tim Nylen AKA Timothy R. Nylen
(PRINTED NAME)

Vice President
(TITLE)

ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA
COUNTY OF Monterey

On 2/22/17, before me, Sandra Vázquez, a Notary Public, personally appeared Timothy R. Nylen, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Sandra Vázquez
Notary Public

My Commission Expires: 4/13/19

Commission Number: 2106855

SANDRA VAZQUEZ
Commission # 2106855
Notary Public - California
Monterey County
My Comm. Expires Apr 13, 2019

EXHIBIT A

LEGAL DESCRIPTION
BENEFITED PROPERTY

THAT CERTAIN REAL PROPERTY SITUATED IN THE CITY OF MONTEREY, COUNTY OF MONTEREY, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

Parcel 4, as shown on that certain map entitled, "Tract No. 1428, Community Hospital Ryan Ranch Outpatient Campus, a Planned Unit Development" filed November 1, 2004, in Volume 22, "Cities and Towns", at Page 65, Monterey County Records.

(APN259-221-004)

ATTACHMENT 11

TECHNICAL ANALYSIS OF DATA FROM SENTINEL WELLS SAMPLED IN DECEMBER 2016

Hydro Metrics WRI

1814 Franklin St, Suite 501

Oakland, CA 94612

TECHNICAL MEMORANDUM

To: Bob Jaques, Seaside Watermaster Program Manager

From: Georgina King and Derrik Williams

Date: February 21, 2017

Subject: Seaside Groundwater Basin Analysis of Wells Sampled in December 2016

1. Executive Summary

Three Sentinel Wells and one monitoring well were sampled in December 2016. Each Sentinel Well was sampled at two depths and the Ord Terrace Well was sampled at only one depth. Three of these wells (Sentinel Well #2 (SBWM-2) at the 1,470 foot depth, Sentinel Well #4 (SBWM-4) at the 900 foot depth, and Ord Terrace Shallow well) were being resampled to verify anomalous results from samples collected in July 2016. Sentinel Well #1 was included in the sampling event to complete the suite of wells that are normally sampled in January. The December sampling event effectively replaced the normal January event.

Of the seven groundwater quality samples analyzed, SBWM-1 (1,140 ft), SBWM-2 (1,000 ft), and SBWM-4 (715 ft) results were within the range of normal historical values. Results from samples with observed anomalies in either the July 2016 or December 2016 samples are summarized below.

- Well SBWM-1 (1,390 ft): Based on the well's piper diagram, and shape of its stiff diagram, the increased chloride concentration in December 2016 is not indicative of incipient seawater intrusion This well has experienced fluctuating chloride concentrations since 2014 with higher chloride concentrations being observed in winter samples and lower concentrations in summer samples. Prior to 2014, its chloride concentrations were fairly stable. The induction log at the deeper depths of well SBWM-1 show no clear evidence of increased salinity over time.

- Well SBWM-2 (1,470 ft): The chloride concentration in December 2016 returned to within the range of historical concentrations. The well's piper and stiff diagrams both indicate that the anions and cations from the December 2016 sample returned to within their pre-July 2016 range. The high chlorides and anomalous sodium/chloride ratios observed in the July 2016 sample may have been due to seasonal fluctuations, similar to what is observed in well SBWM-1 (1,390 ft). The induction logs for this well shows increased conductivity in the July 2016 log at the 1,470 foot depth which corroborates the higher chloride concentration on that date and rules out sampling/laboratory error for this sample.

- Well SBWM-4 (900 ft): The chloride concentration in December 2016 is higher than historical concentrations, with the exception of the July 2016 sample. The well's piper and stiff diagrams show that its anions and cations have returned to within the range of pre-July 2016 conditions. The anomalous anion and cation distribution observed in July 2016 may have been due to seasonal fluctuations, similar to what is observed in well SBWM-1 (1,390 ft). This well has the highest chloride elevations of all the coastal monitoring wells and appears to have an increasing

chloride trend. The electrical conductivity logs for this well are very similar over time, indicating there has been no major increase in salinity in the aquifer at the 900 foot depth

- Ord Terrace Shallow well chloride concentrations have declined to within the range of historical concentrations. Its piper and stiff diagrams, and inland location do not suggest a seawater source.

None of the samples definitively indicate incipient seawater intrusion. However, variations in groundwater quality from samples collected over the last year from wells SBWM-1 and SBWM-4 warrant increased vigilance regarding potential changes to the Basin's groundwater quality in the vicinity of the Sentinel Wells. There may be some seasonal changes in groundwater quality in the deepest portions of the aquifer that could be related to seasonal groundwater elevation changes. If this is true and groundwater elevations continue to decline, larger fluctuations might be seen in the fall when groundwater levels are at their lowest.

The sources of increasing and fluctuating chlorides in wells SBWM-1 and SBWM-4 are unclear. Potential sources may include natural groundwater quality variations, upwelling or upconing of saline water in wells in response to declining groundwater levels, seawater intrusion, or downward leakage of shallow, poor quality groundwater.
Regardless of the source, the coincidence of record low groundwater elevations in the basin with increasing and fluctuating chlorides may indicate that the chronically low groundwater elevations have triggered the fluctuations being observed.

Recommendations on future work and monitoring include:

1. Continue to sample SBWM-1 and SBWM-4 twice a year.
2. SBWM-2 should be resampled at the end of summer in 2017 and based on those results a decision should be made as to whether it should be sampled twice a year on an ongoing basis.
3. To determine if groundwater quality samples reflect the influence of fluctuating groundwater elevations, it is recommended that samples in the future be collected in the last week of September for the 4th quarter samples and in the first week of March for the 2nd quarter samples.
4. Prepare a work plan that will direct an effort towards identifying the source of fluctuating chloride concentrations. The work plan should outline the types of analyses and data to be used in identifying the chloride source. If the source of fluctuating chlorides is understood, it will help in developing management actions to prevent the higher concentrations increasing to the point that they cause groundwater degradation.
5. Conduct downhole conductivity and temperature profiles within each of the Sentinel Wells during the next sampling event. This tool measures the conductivity within the well, as opposed to induction logging which measures conductivity within the adjacent sediments. This technique may help identify if upwelling is occurring.
6. Continue the process that has recently been implemented to review water quality results as soon as they are received, rather than waiting until they are used to prepare the annual Seawater Intrusion Analysis Report. This will enable action to be taken, including reanalysis of samples, if appropriate, immediately instead of at the end of the year when the data have historically been analyzed.
7. Continue conducting all groundwater quality sampling and analysis conducted in accordance with standard quality assurance and quality control procedures. This includes submitting field blanks and duplicates samples to the laboratory once every couple of years.

2. Background

The 2016 Seawater Intrusion Analysis Report (SIAR) reported on groundwater samples obtained during July 2016 that contained several anomalous chloride concentrations and other anion and cations concentrations. These anomalous results triggered resampling of those wells with the anomalies. The wells with the increased chlorides were:

- Sentinel Well #2 (SBWM-2) at the 1,470 ft depth,
- Sentinel Well #4 (SBWM-4) at the 900 ft depth, and
- Ord Terrace Shallow well.

The Technical Advisory Committee (TAC) approved the SIAR recommendation to resample those wells as soon as possible to verify the water quality. The Ord Terrace Shallow well was resampled on December 5, 2016 by Monterey Peninsula Water Management District; and the sentinel wells were resampled by Martin Feeney on December 14, 2016.

The December samples effectively replace the samples that were scheduled to be collected in January 2017. Samples were analyzed by Monterey Bay Analytical Services (MBAS), which is the laboratory that has historically analyzed the Seaside Basin groundwater samples. Duplicate samples of the sentinel wells were sent to the Monterey County laboratory for general minerals analysis. Samples were not collected for Sentinel Well 3 (SBWM-3) which is only sampled in July of each year. No duplicate samples for the Ord Terrace Shallow well were analyzed.

3. Laboratory Results

Table 1 summarizes the results obtained from both MBAS and Monterey County laboratories. The analyses in the following section of this memorandum are based on the MBAS results to maintain consistency with previous years' reports.

With one exception, the results from duplicate samples analyzed by Monterey County were close to those results from MBAS; and there were no results that would indicate MBAS laboratory error. Some differences in the cations and anions are to be expected, but overall the results were similar. The exception is the SBWM-1 (1,390 ft) duplicate sample from the Monterey County laboratory which has higher chloride, sodium, specific conductivity than the MBAS sample. The concentrations of these constituents collected at the well's 1,140 foot depth did not have as great a difference.

Table 1: Summary of Laboratory Results

Well	Constituent	MBAS Result	Monterey County Result	Units
SBWM 1 at 1,140 ft Sampled 12/14/2016	Calcium	12	9.1	mg/L
	Chloride	74	72	mg/L
	Fluoride	0.2	-	mg/L
	Hardness (as CaCO3)	34	-	mg/L
	Bicarbonate (as HCO3-)	89	-	mg/L
	Potassium	3.3	2.5	mg/L
	Langlier Index, 60°C	0.56	-	
	Magnesium	1.0	0.3	mg/L
	Manganese, Total	21	-	µg/L
	Sodium	73	80	mg/L
	Nitrate as NO3	ND	ND	mg/L
	pH (Laboratory)	8.5	7.9	pH (H)
	Specific Conductance (E.C)	457	443	µmhos/cm
	Total Diss. Solids	254	-	mg/L
	Sulfate	22	25	mg/L
	QC Anion-Cation Balance	-1	-	%
	QC Ratio TDS/SEC	0.56	-	
	o-Phosphate-P, Dissolved	ND	-	mg/L
	Langlier Index, 15°C	-0.04	-	
	Alkalinity, Total (as CaCO3)	73	75	mg/L
	Iron	1359	-	µg/L
	Nitrite as NO2-N	0.1	-	mg/L
	QC Anion Sum x 100	88%	-	%
	QC Cation Sum x 100	86%	-	%
	Hydroxide	ND	-	mg/L
	Carbonate as CaCO3	ND	-	mg/L
	Bromide	0.2	-	mg/L
	Barium, Total	26	-	µg/L
	Iron, Dissolved	ND	-	µg/L
	Manganese, Dissolved	ND	-	µg/L
	Boron	0.09	-	mg/L
	Iodide	28	-	µg/L

ND = Not Detected

Well	Constituent	MBAS Result	Monterey County Result	Units
SBWM 1 at 1,390 ft Sampled 12/14/2016	Calcium	29	27	mg/L
	Chloride	152	201	mg/L
	Fluoride	0.2	-	mg/L
	Hardness (as CaCO3)	81	-	mg/L
	Bicarbonate (as HCO3-)	83	-	mg/L
	Potassium	5.3	4.2	mg/L
	Langlier Index, 60°C	0.97	-	
	Magnesium	2.0	0.3	mg/L
	Manganese, Total	58		µg/L
	Sodium	109	149	mg/L
	Nitrate as NO3	ND	ND	mg/L
	pH (Laboratory)	8.6	7.6	pH (H)
	Specific Conductance (E.C)	706	889	µmhos/cm
	Total Diss. Solids	383	-	mg/L
	Sulfate	29	35	mg/L
	QC Anion-Cation Balance	2	-	%
	QC Ratio TDS/SEC	0.54	-	
	o-Phosphate-P, Dissolved	ND	-	mg/L
	Langlier Index, 15°C	0.38	-	
	Alkalinity, Total (as CaCO3)	68	74	mg/L
	Iron	6400	-	µg/L
	Nitrite as NO2-N	ND	-	mg/L
	QC Anion Sum x 100	89%	-	%
	QC Cation Sum x 100	92%	-	%
	Hydroxide	ND	-	mg/L
	Carbonate as CaCO3	ND	-	mg/L
	Bromide	0.4	-	mg/L
	Barium, Total	72	-	µg/L
	Iron, Dissolved	40	-	µg/L
	Manganese, Dissolved	ND	-	µg/L
	Boron	0.09	-	mg/L
	Iodide	30	-	µg/L

ND = Not Detected

Well	Constituent	MBAS Result	Monterey County Result	Units
SBWM 2 at 1,000 ft Sampled 12/14/2016	Calcium	16	14	mg/L
	Chloride	67	66	mg/L
	Fluoride	0.2	-	mg/L
	Hardness (as CaCO3)	48	-	mg/L
	Bicarbonate (as HCO3-)	99	-	mg/L
	Potassium	3.3	2.8	mg/L
	Langlier Index, 60°C	0.64	-	
	Magnesium	2.0	0.7	mg/L
	Manganese, Total	36	-	µg/L
	Sodium	61	69	mg/L
	Nitrate as NO3	ND	ND	mg/L
	pH (Laboratory)	8.4	8.2	pH (H)
	Specific Conductance (E.C)	432	417	µmhos/cm
	Total Diss. Solids	234	-	mg/L
	Sulfate	17	19	mg/L
	QC Anion-Cation Balance	-2	-2	%
	QC Ratio TDS/SEC	0.54	-	
	o-Phosphate-P, Dissolved	ND	-	mg/L
	Langlier Index, 15°C	0.04	-	
	Alkalinity, Total (as CaCO3)	81	86	mg/L
	Iron	6585	-	µg/L
	Nitrite as NO2-N	0.2	-	mg/L
	QC Anion Sum x 100	89%	-	%
	QC Cation Sum x 100	86%	-	%
	Hydroxide	ND	-	mg/L
	Carbonate as CaCO3	ND	-	mg/L
	Bromide	0.2	-	mg/L
	Barium, Total	40	-	µg/L
	Iron, Dissolved	34	-	µg/L
	Manganese, Dissolved	ND	-	µg/L
	Boron	0.08	-	mg/L
	Iodide	32	-	µg/L

ND = Not Detected

Well	Constituent	MBAS Result	Monterey County Result	Units
SBWM 2 at 1,470 ft Sampled 12/14/2016	Calcium	18	18	mg/L
	Chloride	66	65	mg/L
	Fluoride	0.2	-	mg/L
	Hardness (as CaCO3)	53	-	mg/L
	Bicarbonate (as HCO3-)	100	-	mg/L
	Potassium	3.4	3.0	mg/L
	Langlier Index, 60°C	0.69	-	
	Magnesium	2.0	1.0	mg/L
	Manganese, Total	47	-	µg/L
	Sodium	60	69	mg/L
	Nitrate as NO3	ND	ND	mg/L
	pH (Laboratory)	8.4	7.9	pH (H)
	Specific Conductance (E.C)	431	419	µmhos/cm
	Total Diss. Solids	234	-	mg/L
	Sulfate	18	18	mg/L
	QC Anion-Cation Balance	-2	1	%
	QC Ratio TDS/SEC	0.54	-	
	o-Phosphate-P, Dissolved	ND	-	mg/L
	Langlier Index, 15°C	0.10	-	
	Alkalinity, Total (as CaCO3)	82	89	mg/L
	Iron	5448	-	µg/L
	Nitrite as NO2-N	0.2	-	mg/L
	QC Anion Sum x 100	90%	-	%
	QC Cation Sum x 100	87%	-	%
	Hydroxide	ND	-	mg/L
	Carbonate as CaCO3	ND	-	mg/L
	Bromide	0.2	-	mg/L
	Barium, Total	50	-	µg/L
	Iron, Dissolved	77	-	µg/L
	Manganese, Dissolved	ND	-	µg/L
	Boron	0.08	-	mg/L
	Iodide	34	-	µg/L

ND = Not Detected

Well	Constituent	MBAS Result	Monterey County Result	Units
SBWM 4 at 715 ft Sampled 12/14/2016	Calcium	78	69	mg/L
	Chloride	139	135	mg/L
	Fluoride	0.2	-	mg/L
	Hardness (as CaCO3)	232	-	mg/L
	Bicarbonate (as HCO3-)	224	-	mg/L
	Potassium	8.5	7.5	mg/L
	Langlier Index, 60°C	0.62	-	
	Magnesium	9.0	9.4	mg/L
	Manganese, Total	133	-	µg/L
	Sodium	91	103	mg/L
	Nitrate as NO3	ND	ND	mg/L
	pH (Laboratory)	7.4	7.5	pH (H)
	Specific Conductance (E.C)	866	866	µmhos/cm
	Total Diss. Solids	503	-	mg/L
	Sulfate	37	36	mg/L
	QC Anion-Cation Balance	3	2	%
	QC Ratio TDS/SEC	0.58	-	
	o-Phosphate-P, Dissolved	ND	-	mg/L
	Langlier Index, 15°C	0.02	-	
	Alkalinity, Total (as CaCO3)	184	195	mg/L
	Iron	12,985	-	µg/L
	Nitrite as NO2-N	0.2	-	mg/L
	QC Anion Sum x 100	97%	-	%
	QC Cation Sum x 100	102%	-	%
	Hydroxide	ND	-	mg/L
	Carbonate as CaCO3	ND	-	mg/L
	Bromide	0.4	-	mg/L
	Barium, Total	133	-	µg/L
	Iron, Dissolved	29	-	µg/L
	Manganese, Dissolved	27	-	µg/L
	Boron	0.10	-	mg/L
	Iodide	50	-	µg/L

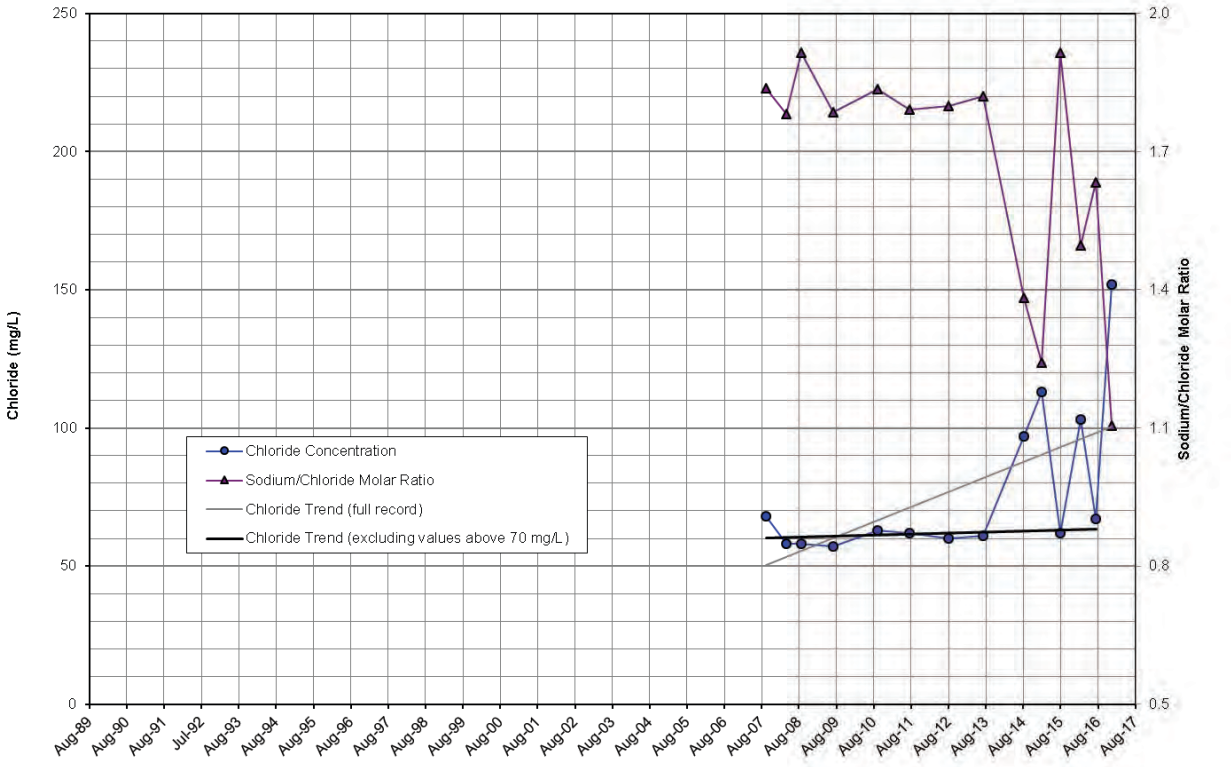
ND = Not Detected

Well	Constituent	MBAS Result	Monterey County Result	Units
SBWM 4 at 900 ft Sampled 12/14/2016	Calcium	86	83	mg/L
	Chloride	274	259	mg/L
	Fluoride	0.2	-	mg/L
	Hardness (as CaCO3)	297	-	mg/L
	Bicarbonate (as HCO3-)	340	-	mg/L
	Potassium	8.6	8.1	mg/L
	Langlier Index, 60°C	0.79	-	
	Magnesium	20	18	mg/L
	Manganese, Total	140	-	µg/L
	Sodium	172	189	mg/L
	Nitrate as NO3	ND	ND	mg/L
	pH (Laboratory)	7.4	7.6	pH (H)
	Specific Conductance (E.C)	1,427	1,430	µmhos/cm
	Total Diss. Solids	806	-	mg/L
	Sulfate	40	50	mg/L
	QC Anion-Cation Balance	-2	0	%
	QC Ratio TDS/SEC	0.56	-	
	o-Phosphate-P, Dissolved	ND	-	mg/L
	Langlier Index, 15°C	0.20	-	
	Alkalinity, Total (as CaCO3)	279	284	mg/L
	Iron	4215	-	µg/L
	Nitrite as NO2-N	0.2	-	mg/L
	QC Anion Sum x 100	99%	-	%
	QC Cation Sum x 100	96%	-	%
	Hydroxide	ND	-	mg/L
	Carbonate as CaCO3	ND	-	mg/L
	Bromide	0.8	-	mg/L
	Barium, Total	347	-	µg/L
	Iron, Dissolved	37	-	µg/L
	Manganese, Dissolved	72	-	µg/L
	Boron	0.31	-	mg/L
	Iodide	65	-	µg/L

ND = Not Detected

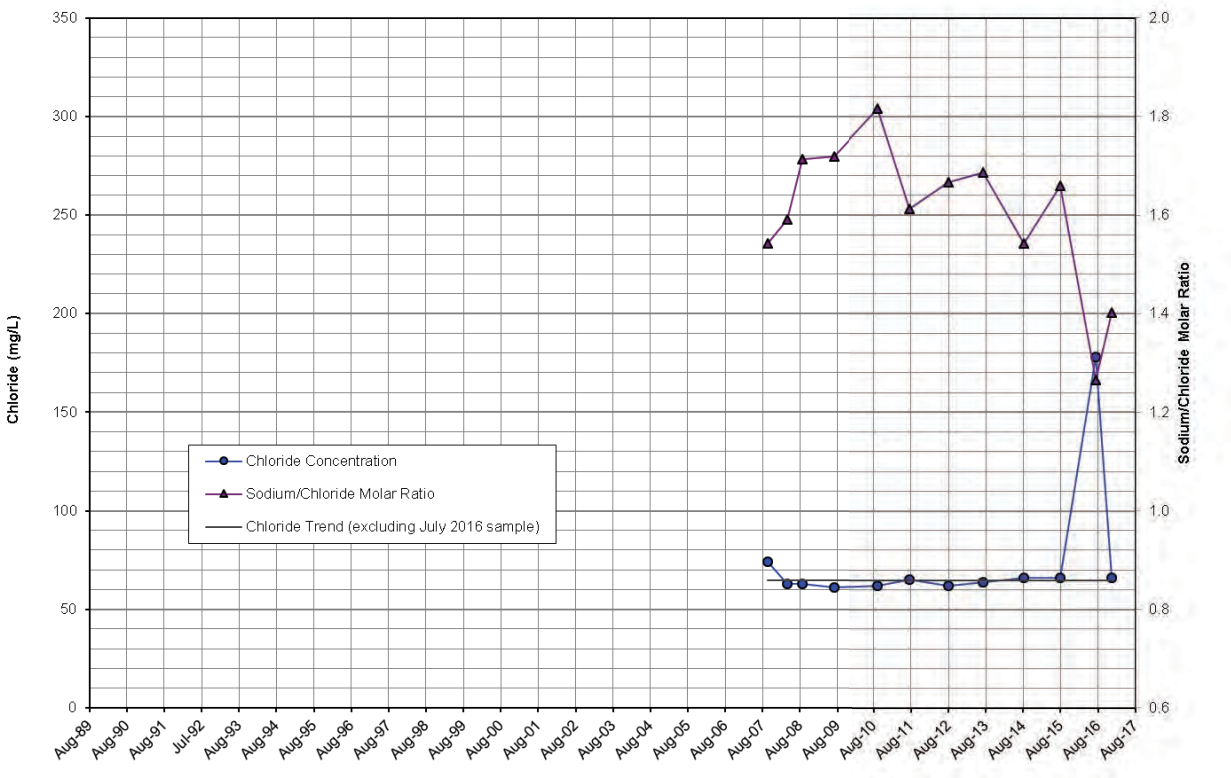
Well	Constituent	MBAS Result	Units
Ord Terrace Shallow Sampled 12/14/2016	Calcium	64	mg/L
	Chloride	114	mg/L
	Fluoride	0.2	mg/L
	Hardness (as CaCO3)	217	mg/L
	Bicarbonate (as HCO3-)	249	mg/L
	Potassium	3.7	mg/L
	Langlier Index, 60°C	--	
	Magnesium	14	mg/L
	Manganese, Total	87	µg/L
	Sodium	66	mg/L
	Nitrate as NO3	6	mg/L
	pH (Laboratory)	7.6	pH (H)
	Specific Conductance (E.C)	868	µmhos/cm
	Total Diss. Solids	506	mg/L
	Sulfate	43	mg/L
	QC Anion-Cation Balance	-6	%
	QC Ratio TDS/SEC	0.58	
	o-Phosphate-P, Dissolved	ND	mg/L
	Langlier Index, 15°C	--	
	Alkalinity, Total (as CaCO3)	204	mg/L
	Iron	106	µg/L
	Nitrite as NO2-N	0.2	mg/L
	QC Anion Sum x 100	95%	%
	QC Cation Sum x 100	84%	%
	Hydroxide	--	mg/L
	Carbonate as CaCO3	ND	mg/L
	Bromide	0.3	mg/L
	Barium, Total	51	µg/L
	Iron, Dissolved	ND	µg/L
	Manganese, Dissolved	ND	µg/L
	Boron	0.07	mg/L

ND = Not Detected

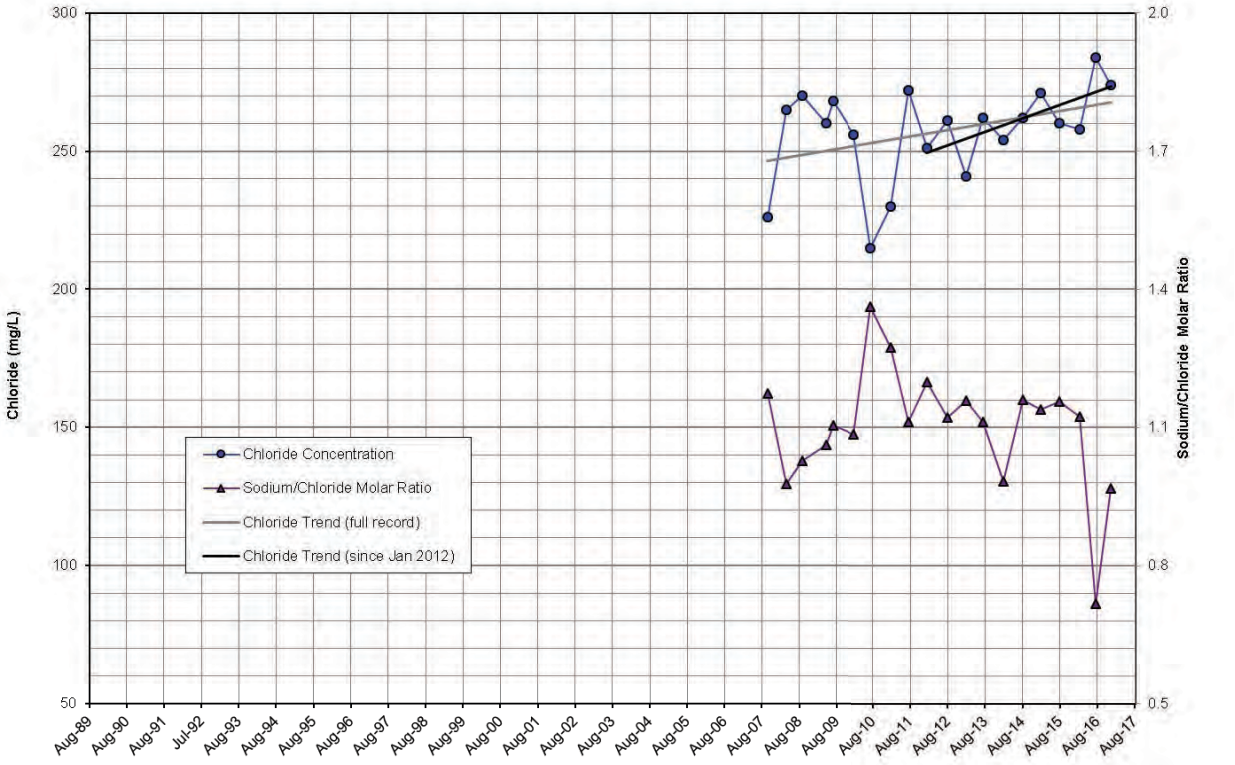


4. Water Quality Analysis

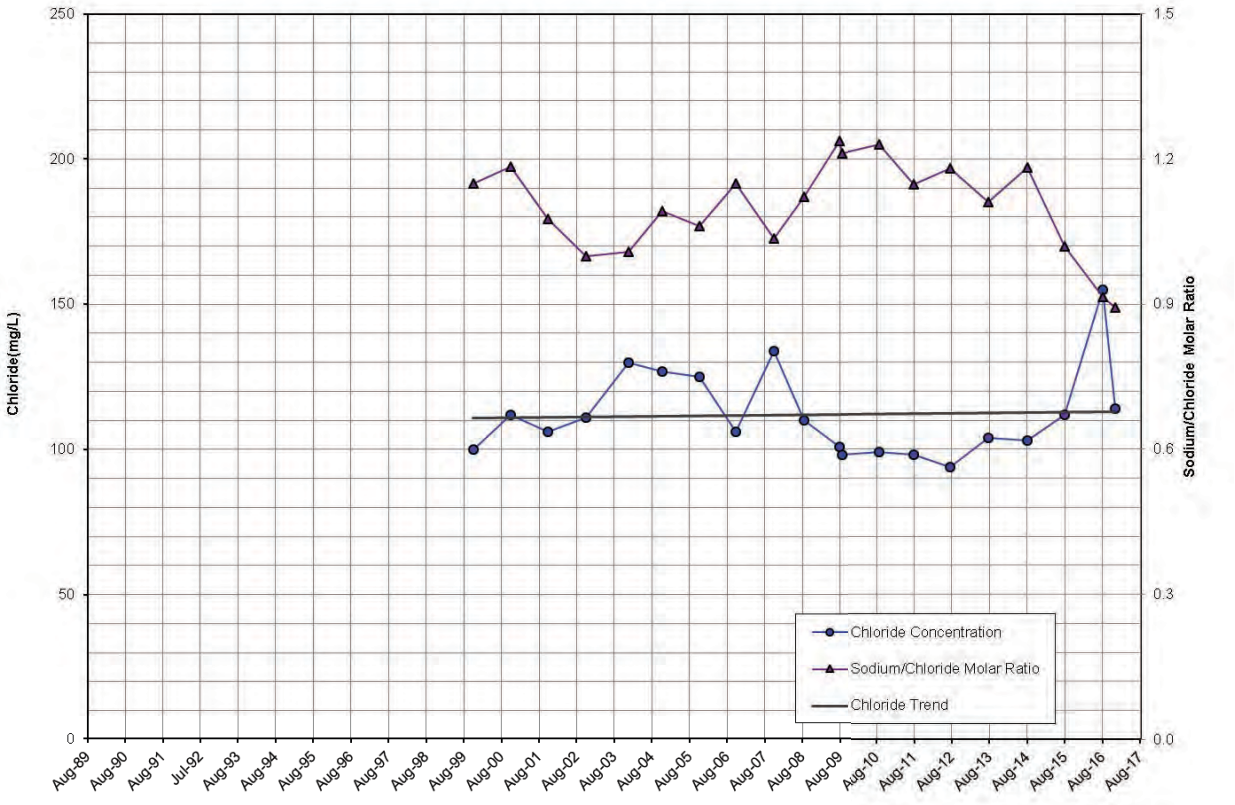
The analyses used to examine the water quality data collected in December 2016 are the same as those used in the SIAR: chloride concentrations over time, sodium/chloride ratios, and piper and stiff diagrams.



Groundwater quality results for the following wells were within the range of normal historical values, and are therefore not discussed further in this memorandum:



- Well SBWM-1 (1,140 ft),
- Well SBWM-2 (1,000 ft), and
- Well SBWM-4 (715 ft).



The analysis in this memorandum focuses on those wells with observed anomalies in either the July 2016 or December 2016 samples:

- Well SBWM-1 (1,390 ft),
- Well SBWM-2 (1,470 ft),
- Well SBWM-4 (900 ft), and
- Ord Terrace Shallow.

4.1.Chloride Concentrations and Sodium/Chloride Ratios

Figures 1 through 4 update the chloride concentration and sodium/chloride ratio charts from the 2016 SIAR with the December 2016 sample results, and include chloride trend lines. In summary, the charts show:

- Well SBWM-1 (1,390 ft) had an 85 mg/L chloride increase since July 2016 and its overall chloride concentrations are increasing. The increasing chloride trend (grey trend line) observed in this well is more pronounced because of seasonal fluctuations where the winter concentrations tend to be higher than summer concentrations. There is a slight, but inconsequential, increasing trend if the high winter concentrations are excluded (> 70 mg/L, black trend line). The sodium/chloride ratio is well above the ratio of 0.86, below which other investigators have proposed as an indicator of seawater intrusion.
- Well SBWM-2 (1,470 ft) chloride concentrations declined in December to less than 70 mg/L, back to within the range of historical concentrations. The overall chloride trend is virtually flat if the July 2016 sample is excluded. The sodium/chloride ratio is well above the ratio of 0.86, below which other investigators have proposed as an indicator of seawater intrusion.
- Well SBWM-4 (900 ft) chloride concentrations are slightly less than in July 2016 but still higher than historical values. The overall chloride trend at this depth in the well is increasing over the period of record and increasing at a higher rate since January 2012. The sodium/chloride ratio has increased from less than 0.86 in July 2016 to above 1 in December 2016.
- Ord Terrace Shallow well chloride concentrations have declined to 114 mg/L, which is within the range of historical concentrations. There is a very slight increasing chloride trend over the period of record. The sodium/chloride ratio is between 0.86 and 0.9.

Figure 1: SBWM-1 (1,390 ft) Chloride Concentrations and Sodium/Chloride Ratios

Figure 2: SBWM-2 (1,470 ft) Chloride Concentrations and Sodium/Chloride Ratios

Figure 3: SBWM-4 (900 ft) Chloride Concentrations and Sodium/Chloride Ratios

Figure 4: Ord Terrace Shallow Chloride Concentrations and Sodium/Chloride Ratios

4.2.Anion and Cation Analyses

4.2.1.Piper Diagrams

Piper diagrams for the four wells with anomalous data are shown on Figures 5 through 8. In summary the Piper diagrams show:

- Well SBWM-1 (1,390 ft)'s groundwater quality is generally of a sodium-chloride-bicarbonate type (Figure 5). The sample for December 2016, shown with the green solid triangle, has slightly increased calcium cations compared to the majority of the data points. Chloride anions increased such that the water type can be classified as more strongly sodium-chloride in character. The data points on the piper diagram show no consistent trend over time but rather appear to exhibit fluctuations.

- Well SBWM-2 (1,470 ft)'s groundwater quality is generally of a sodium-chloride-bicarbonate type (Figure 6). The sample for December 2016, shown with the green open triangle, plots within its historical cluster of data points. This is in contrast with the July 2016 sample, shown with the open circle, which had no apparent change in cations compared to historical values but a large increase in chloride anions with correspond decrease in bicarbonate anions. The data points on the piper diagram show no consistent trend over time but rather appear to exhibit fluctuations.

- Well SBWM-4 (900 ft)'s groundwater quality is generally of a sodium-chloride type (Figure 7). The sample for December 2016, shown with the green solid star, plots within its historical cluster of data points. This is in contrast with the July 2016 sample, shown with the open star symbol, which exhibits a more strongly sodium-chloride character than usual. The data points on the piper diagram show no consistent trend over time but rather appear to exhibit fluctuations.

- Ord Terrace Shallow well's groundwater quality is generally of a calcium-bicarbonate type (Figure 8). The sample for December 2016, shown with the green open triangle, plots within its historical cluster of data points. The data points on the piper diagram show no trend over time.

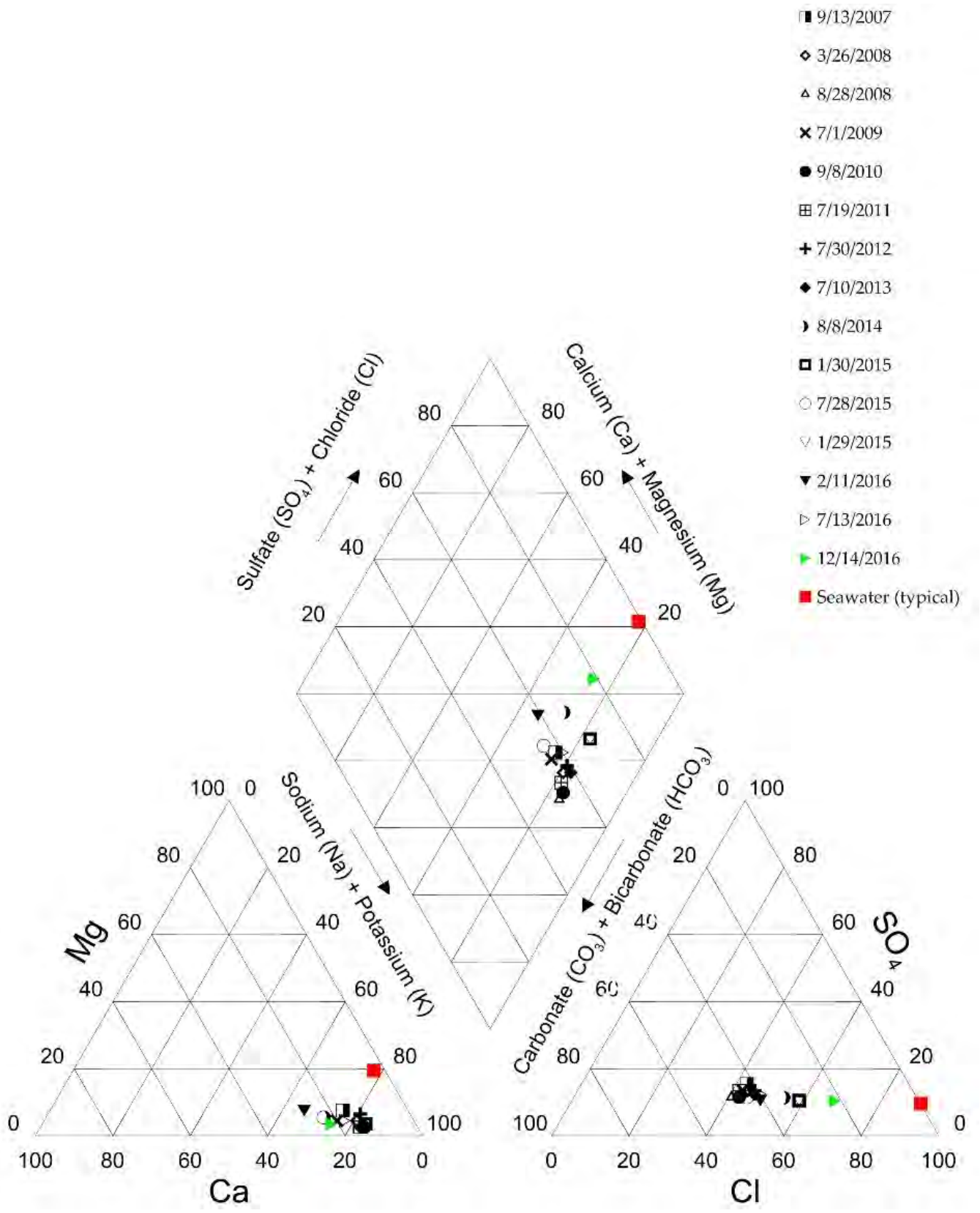


Figure 5: Piper Diagram for SBWM-1 (1,390 ft)

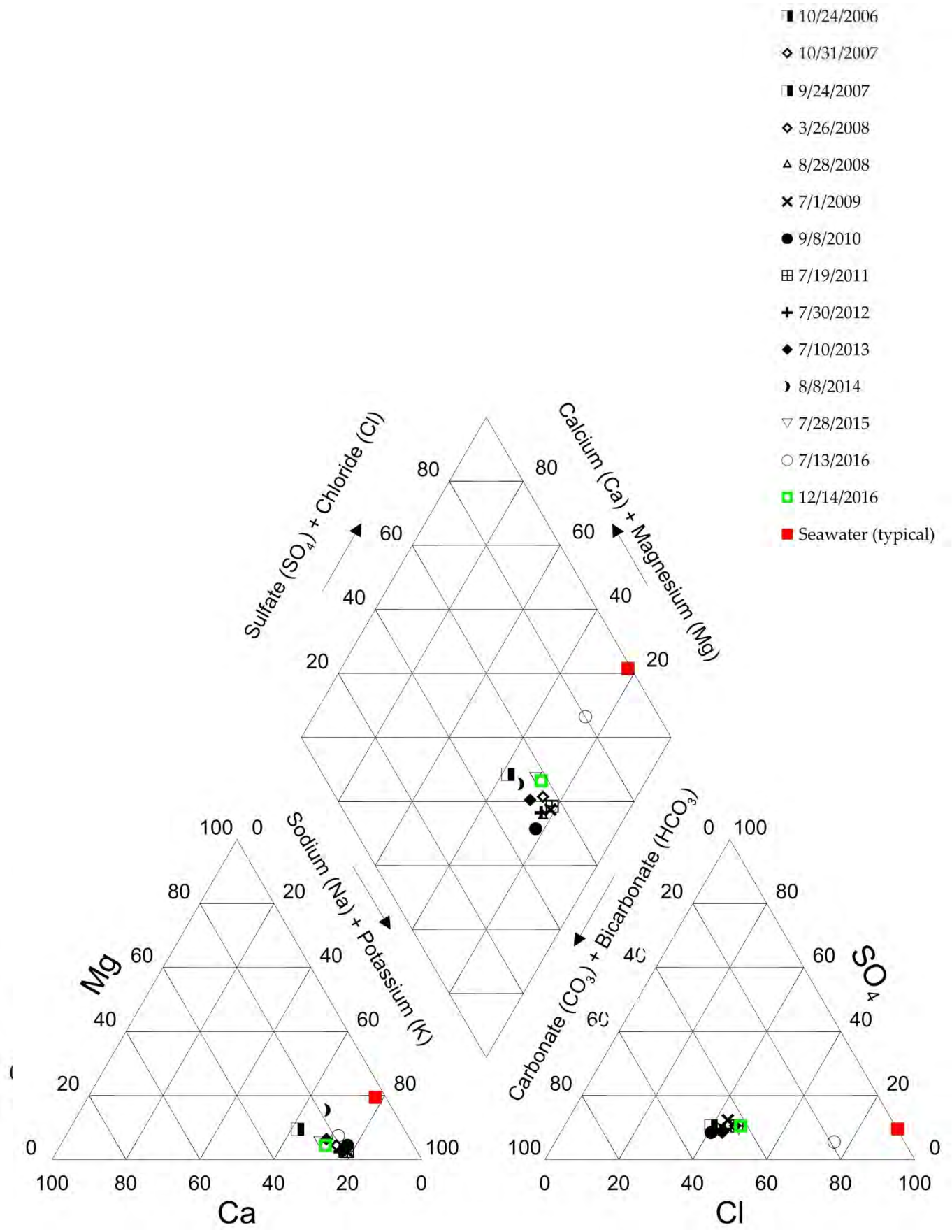


Figure 6: Piper Diagram for SBWM-2 (1,470 ft)

Figure 7: Piper Diagram for SBWM-4 (900 ft)

Figure 8: Piper Diagram for Ord Terrace Shallow

In the Pajaro Valley to the north, the evolution of groundwater quality from fresh to seawater intruded followed the paths indicated with red arrows on the piper diagram shown on Figure 9. In the Pajaro Valley, unintruded groundwater was of a calcium-bicarbonate type. During the initial phase of seawater intrusion in the Pajaro Valley, the dominant chemical change in groundwater was an increase in chloride concentrations, as evidenced by the plotted samples moving up towards the peak of the diamond in Figure 9. The expected increase in sodium concentrations only occurs later, as evidenced by the later samples moving down and to the right of the diamond in Figure 9. Groundwater samples from the Pajaro Valley did not exhibit an immediate sodium increase during the initial phase of seawater intrusion because of an ion exchange reaction in which sodium in the groundwater replaces the calcium on the clays; effectively taking sodium out of the groundwater and replacing it with calcium.

The groundwater quality evolution shown in Figure 9 is what we expect to see for any groundwater that is initially of a calcium-bicarbonate type. For wells starting off as a sodium-bicarbonate or sodium-chloride-bicarbonate water type, including wells SBWM-1, SBWM-2 and SBWM-4, it is unclear what the expected chemical evolution of groundwater will look like as seawater advances. To date, we have found no other examples of clearly documented seawater intrusion in these types of groundwater from which to examine whether calcium enrichment occurs or not in sodium-rich waters.

Sentinel Wells SBWM 1, 2 and 3 are completed in the Purisima Formation and have chloride concentrations that are typical of groundwater from that formation (Feeney, 2007). They also share a similar sodium-chloride-bicarbonate chemical character. Sentinel Well SBWM-4 is completed in the Santa Margarita Sandstone and has a different groundwater quality than the three sentinel wells completed in the Purisima Formation. Well SBWM4 has higher chloride concentrations and a stronger sodium-chloride character, which is consistent with wells completed in the Santa Margarita Sandstone (Feeney, 2007).

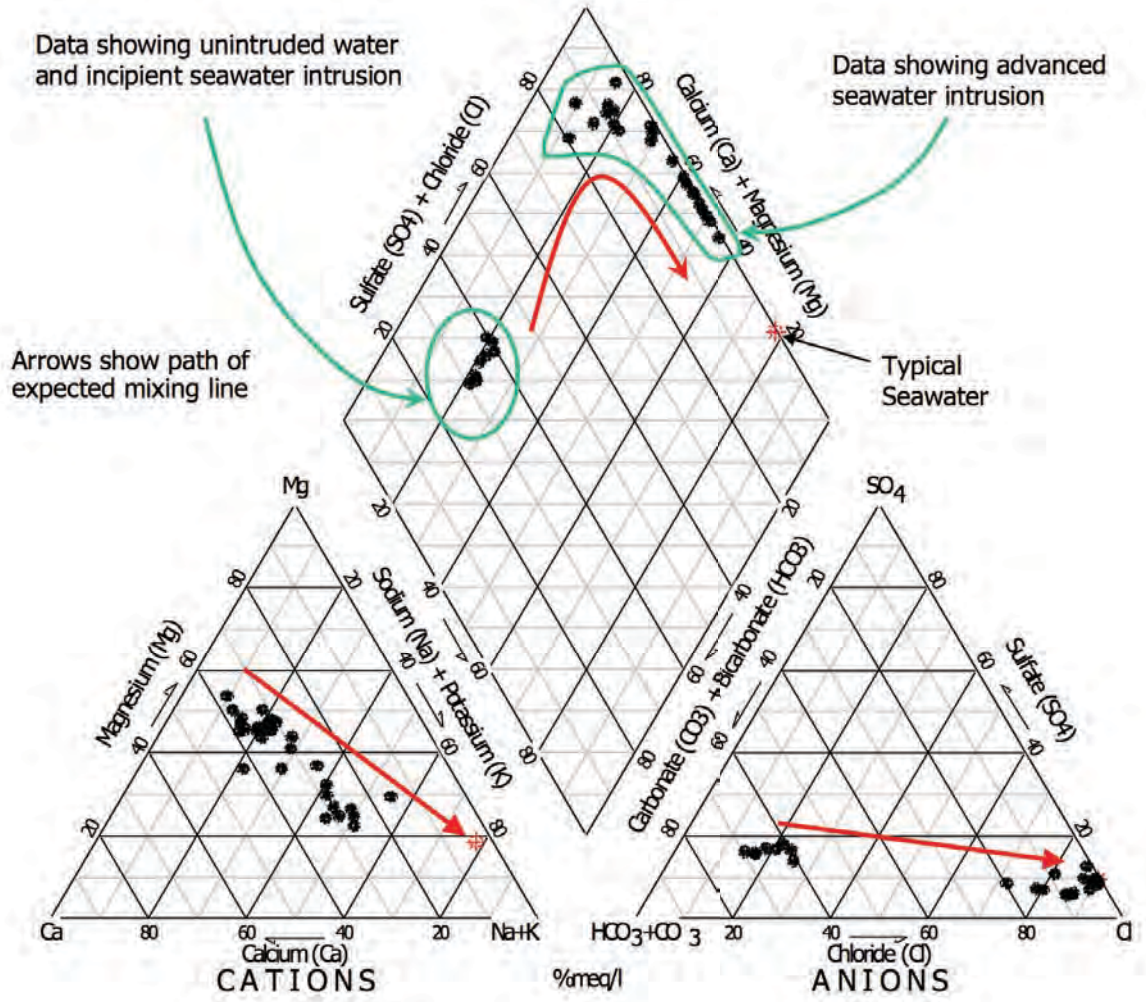


Figure 9: Piper Diagram for Groundwater in Pajaro Valley
(Data source: PVWMA)

4.2.2.Stiff Diagrams

Stiff diagrams for SBWM-1 (1,470ft), SBWM-2 (1,390 ft), SBWM-4 (900 ft), and Ord Terrace Shallow are shown on Figures 10 and 11. Stiff diagrams for 2015 and 2016 are included to provide context, and show change over a two-year period. All of the well's stiff diagrams for the December 2016 sample, except well SBWM-1 (1,390 ft)'s, are similar to historical diagrams before July 2016. Sentinel well SBWM-1 (1,390 ft)'s stiff diagram has a slightly different shape from previous years, but the shapes of the stiff diagrams have varied over time for this well.

The stiff diagrams demonstrating what a seawater intruded sample might look like are provided on Figure 12. Comparing the stiff diagrams on Figure 10 and Figure 11 with Figure 12 reveals that none of the December sample's stiff diagrams are indicative of seawater intrusion, which is characterized on the stiff diagram as having calcium enrichment and a chloride spike. The stiff diagrams in Figure 12 came from locations where the native, unintruded groundwater was a calcium-bicarbonate type. It is unclear what the stiff diagrams of incipient seawater intrusion look like for areas where the native groundwater is of sodium-chloride or sodium-chloride-bicarbonate types.

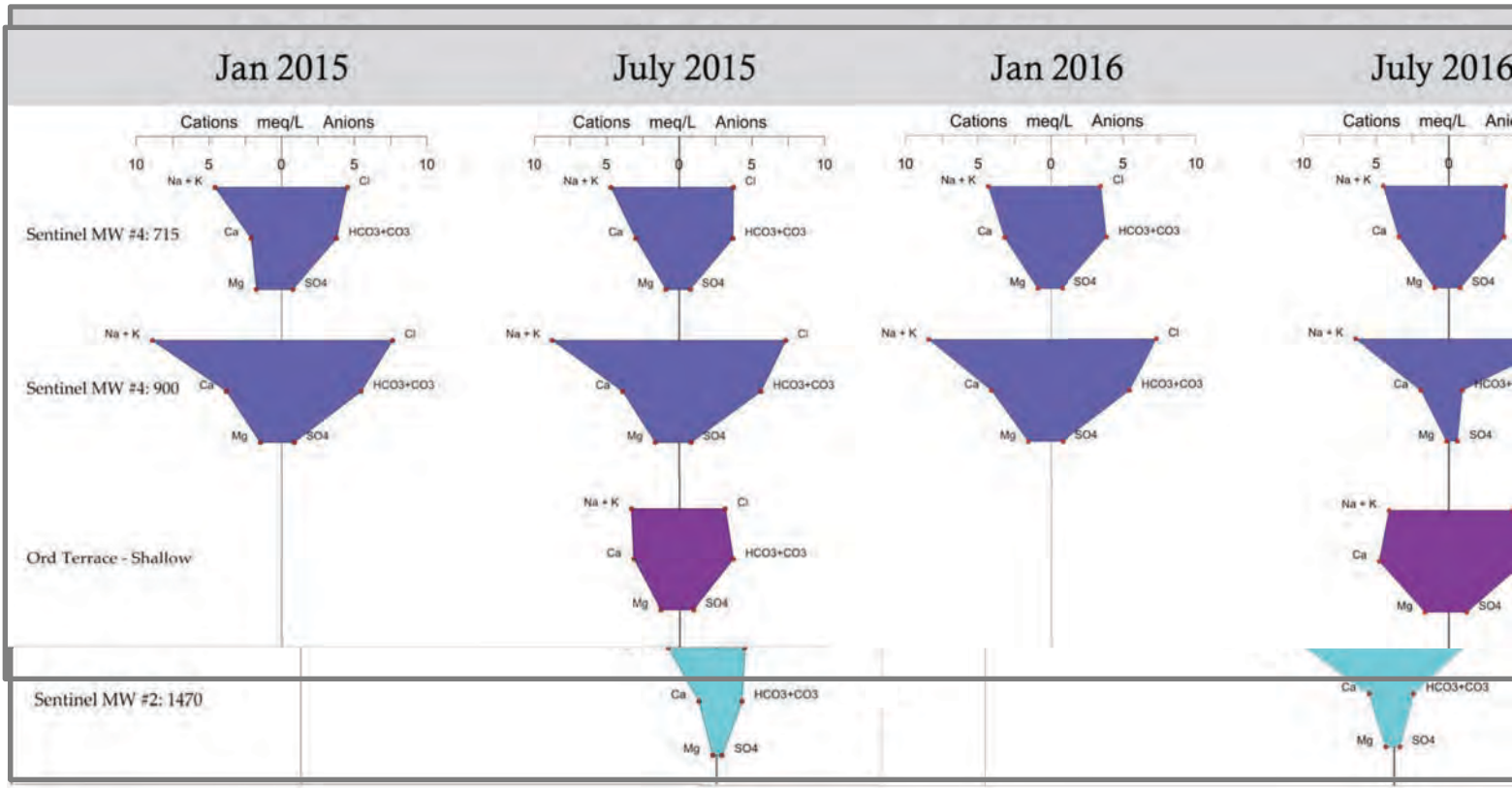


Figure 10: Stiff Diagram for SBWM-1 and SBWM-2

Figure 11: Stiff Diagram for SBWM-4 and Ord Terrace Shallow

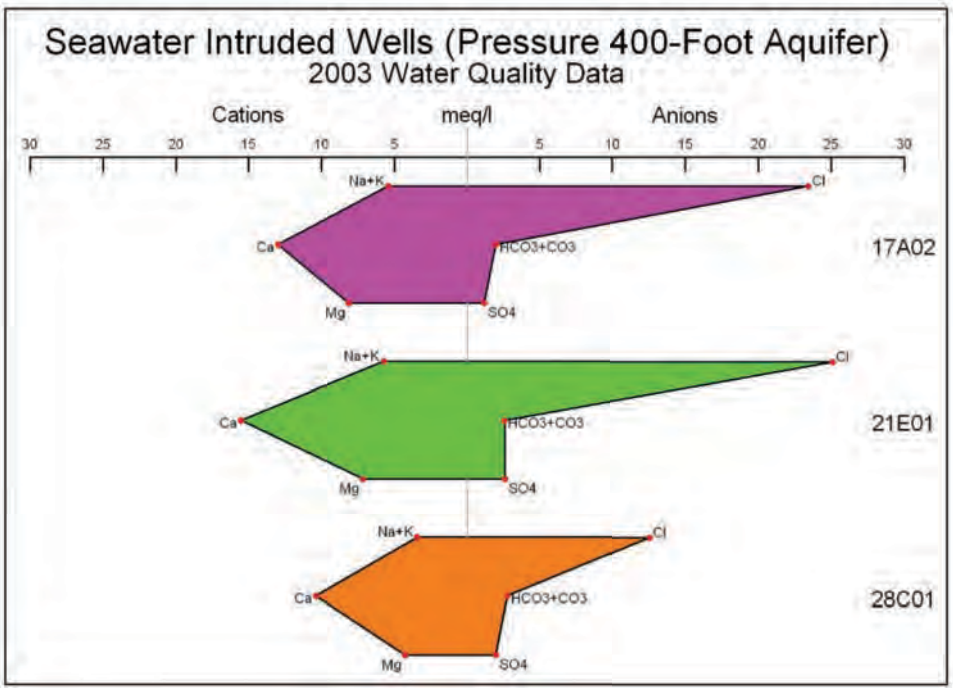


Figure 12: Stiff Diagrams from Salinas Valley Wells with Seawater Intrusion (Source: MWCRA)

5. Discussion of Results

5.1.Well SBWM-1 (1,390 ft)

Based on the piper diagram (Figure 6), and shape of the stiff diagram (Figure 10), the increased chloride concentration in the December 2016 sample is not clearly indicative of incipient seawater intrusion This well has experienced fluctuating chloride concentrations since 2014 (Figure 1) with higher chloride concentrations being observed in winter and lower concentrations in summer. Prior to 2014, its chloride concentrations were fairly stable. It is possible the observed chloride fluctuations are being controlled by seasonal groundwater elevation fluctuations, and that may or may not be attributable to seawater intrusion. This is discussed in more detail in Section 5.5. However, the increasing trend of chloride and significant drop in sodium/chloride ratios that indicated seawater intrusion was occurring in the nearby Salinas and Pajaro valley are not apparent.

5.2.Well SBWM-2 (1,470 ft)

The December 2016 sample, the chloride concentration in SBWM-2 (1,470 ft) returned to within the range of historical concentrations of less than 70 mg/L, following a reading of over 150 mg/L in the July 2016 sample. The piper (Figure 6) and stiff diagrams (Figure 10) both indicate that the anions and cations from the December 2016 sample returned to within their pre-July 2016 range. The high chlorides and anomalous sodium/chloride ratios observed in the July 2016

sample may have been due to seasonal fluctuations, similar to what is observed in SBWM-1; or may have been the result of sampling/laboratory error. Continued monitoring of this well will determine whether seasonal fluctuations are responsible for the elevated chloride concentration observed in July 2016.

5.3.Well SBWM-4 (900 ft)

The 274 mg/L chloride concentration in SBWM-4 (900 ft) from December 2016 is above historical concentrations prior to July 2016 concentrations, but slightly lower than the July 2016 concentration of 284 mg/L (Figure 3). The piper (Figure 7) and stiff (Figure 11) diagrams for this well show that the anions and cations have returned to within the range of pre-July 2016 conditions. The anomalous anion and cation distribution observed in the July 2016 sample may have been due to seasonal fluctuations, similar to what is observed in well SBWM-1. This well has the highest chloride elevations of all the coastal monitoring wells and appears to have an increasing chloride trend (Figure 3).

5.4.Ord Terrace Shallow Well

The chloride concentration measured in the Ord Terrace Shallow well in December 2016, returned to within its historical range of concentrations of less than 120 mg/L. In the 2016 SIAR, this well was ruled out as being potentially impacted by seawater because of its inland location, and because its piper and stiff diagrams did not indicate a seawater source of its anions and cations. The piper and stiff diagrams on Figure 7 and Figure 11, respectively, support this observation.

5.5.Trends and Fluctuations

The Seaside Basin Watermaster Seawater Intrusion Response Plan (SIRP) (HydroMetrics WRI, 2009) points out that:

> *Unusually high or steadily increasing chloride concentrations are one of the most commonly used indicators of seawater intrusion. At low chloride concentrations, trends are often as important as absolute concentrations because of natural variations in groundwater chemistry. While chloride concentrations are strongly indicative of seawater intrusion, it often takes time for the increasing chloride trend to be recognizable due to the long-term and relatively slow increase in chlorides during seawater intrusion.*

Most of the coastal wells have low chloride concentrations and trends are difficult to identify at those low concentrations because the trends can be masked by natural variations in groundwater quality. However, we are starting to see an increasing trend in the well with the highest coastal chloride concentrations: SBWM-4.

The chloride fluctuations observed more recently in well SBWM-1 (1,390 ft) appear to be seasonal, with samples collected in January/February having higher concentrations than samples collected in July/August. It is apparent from groundwater level hydrographs of the coastal monitoring wells (An increasing chloride trend may underlie the seasonal fluctuations as evidenced by the slight increasing chloride trend even when the seasonal high concentrations are excluded from the trend line (Figure 1). If water quality is changing in response to seasonal groundwater elevation fluctuations, larger groundwater quality impacts may be seen in future fall months as groundwater levels continue to decline in the basin.

The types of analyses for the annual SIAR and this memorandum do not identify the source of the increased salinity or fluctuations. Potential sources of salinity may include natural groundwater quality variations, upwelling or upconing of saline water in wells in response to declining groundwater levels, seawater intrusion, or downward leakage of shallow, poor quality groundwater.
Figure 13) that the current sampling periods do not correspond with seasonal low and high groundwater levels. Both sampling periods occur midway between the seasonal fluctuation in groundwater levels that occurs in response to groundwater pumping. It may be possible to identify the relationship between chloride concentrations and seasonal changes in groundwater elevations if samples were collected when the extreme low and high groundwater levels were occurring. However, this relationship likely results from a complex interplay of hydrogeologic structure and stratigraphy, pumping location, and seawater interface location.
An increasing chloride trend may underlie the seasonal fluctuations as evidenced by the slight increasing chloride trend even when the seasonal high concentrations are excluded from the trend line (Figure 1). If water quality is changing in response to seasonal groundwater elevation fluctuations, larger groundwater quality impacts may be seen in future fall months as groundwater levels continue to decline in the basin.

The types of analyses for the annual SIAR and this memorandum do not identify the source of the increased salinity or fluctuations. Potential sources of salinity may include natural groundwater quality variations, upwelling or upconing of saline water in wells in response to declining groundwater levels, seawater intrusion, or downward leakage of shallow, poor quality groundwater.

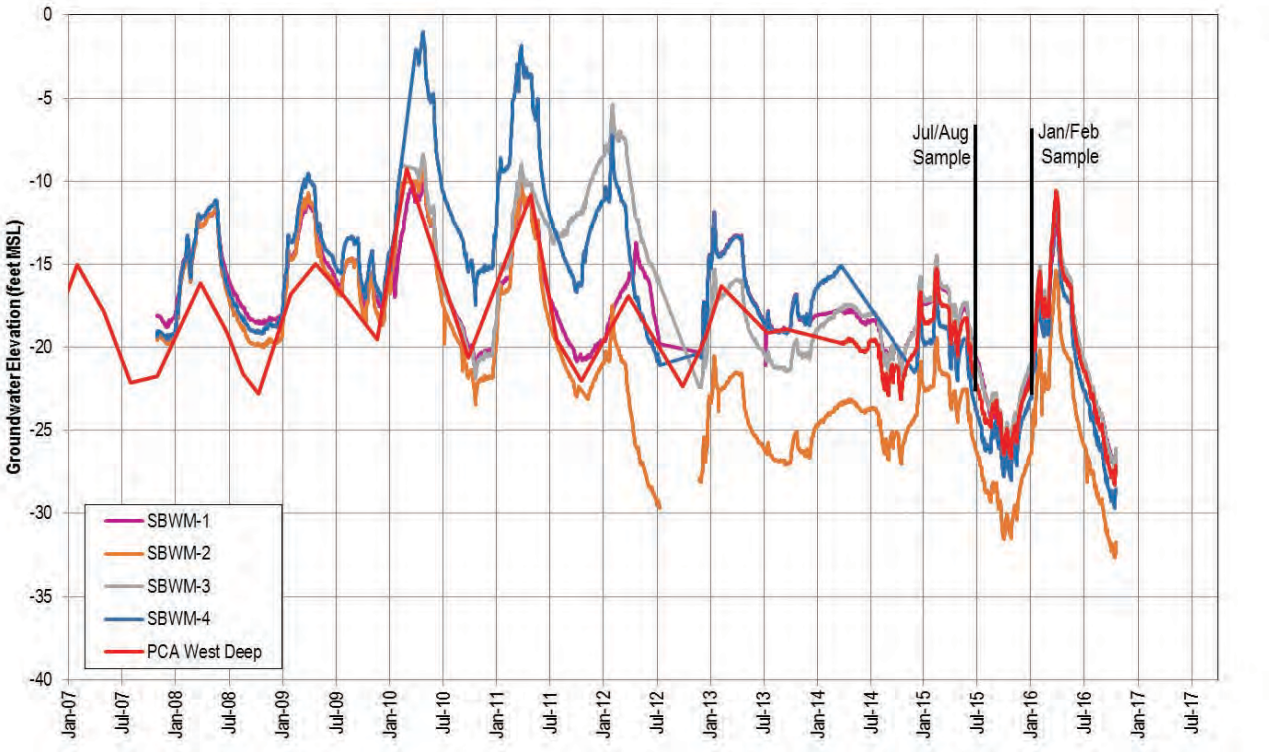


Figure 13: Hydrograph for Sentinel Wells and Monitoring Well PCA West Deep

In the Seaside Basin, declining groundwater levels may be causing upwelling of saline water from the Monterey Formation which underlies the Santa Margarita Formation. This saline water, known as connate water, was trapped in the sediment pore spaces at the time of deposition and is known to cause increased salinity. For example, groundwater in the Laguna Seca subarea is more saline than the rest of the Seaside Basin due to the Monterey Formation.

Poorer quality water from shallow depths, migrating down the outside of the well casing is not likely a source of higher chloride concentrations in the sentinel wells because they are constructed with concrete/bentonite seals in the annular space between the formation and well casing that extend from the surface to at least 620 feet down. Mixing of poorer quality water within the well is also not considered a source of higher chlorides. Each sentinel well is sampled at two different depths. The samples taken from shallower depths do not have the same high chloride concentrations as those taken from deeper depths; so there is no apparent water mixing within the well.

The source of fluctuating chloride concentrations at the deeper depths of the sentinel wells should be investigated so that management options to protect the basin can be appropriately developed. For example, managing salinity from upwelling may require lower protective groundwater elevations than incipient seawater intrusion will require.

6. Electric Induction Logging

Induction logging measures the fluid conductivity up to a distance of three feet away from the well, within the formation adjacent to the well being logged. If conductivity increases relative to a baseline value over time, it indicates increased salinity. A limitation of this method is that it does not provide concentrations of chloride or other ions that contribute to salinity. Therefore, the use of electric induction logs can only be used qualitatively.

Induction logs are run in the sentinel wells because they are deep wells screened at select depths. The induction logs provide qualitative salinity information throughout the entire well depth, including unscreened areas of the well. The groundwater grab samples taken within the screened intervals only provide groundwater quality at that particular screened depth.

Figure 14 through Figure 16 shows the initial induction logs for the entire length of wells SBWM-1, SBWM-2 and SBWM-4 when they were installed (blue), and for all induction logs run by Pacific Surveys since 2014. Welenco performed the logging between 2007 and 2013 but due to a different tool used by Pacific Survey, a new baseline was established in August 2014. To improve readability of the lower portion of the wells, Figure 17 and Figure 18 provide a zoomed in view with the logs overlain on one another.

The induction logs for well SBWM-1 shows there has been an increase in the shallow seawater intrusion zone above 450 feet depth since the well was constructed in 2007 (Figure 14). This intrusion was evident at the time SBWM-1 was constructed (HydroMetrics WRI, 2016). The deeper depths of well SBWM-1 show no clear evidence of increased salinity over time, although seasonal fluctuations are observed in the clays (zones with lower resistivity); summer conductivities (July 2015 and July 2016) plot close together and the conductivities in winter are more varied (Figure 17).

The induction logs for well SBWM-2 shows that there has been an increase in the shallow seawater intrusion zone above 300 feet depth since the well was constructed in 2007 (Figure 15). The logs show seasonal fluctuations in the clays (zones with lower resistivity), with similar conductivities in January 2015 and February 2016, and increased conductivities in summer (August 2014, July 2015 and July 2016) (Figure 17). At a depth of 1,470 feet within the screened sandy part of the aquifer (higher resistivity), the July 2016 conductivity is higher than all previous conductivities, except the initial log in 2007 (Figure 17). This might corroborate the higher chloride concentration observed in the July 2016 sample and rule out sampling/laboratory error for this sample.

At the 900-foot depth in well SBWM-4, it is difficult to see changes in conductivity because most of the logs plot too close together (Figure 18). These similar conductivities indicate that there has been no major increase in salinity at this depth. The seasonal fluctuations observed in SBWM-1 and SBWM-2 are not obvious in this well.

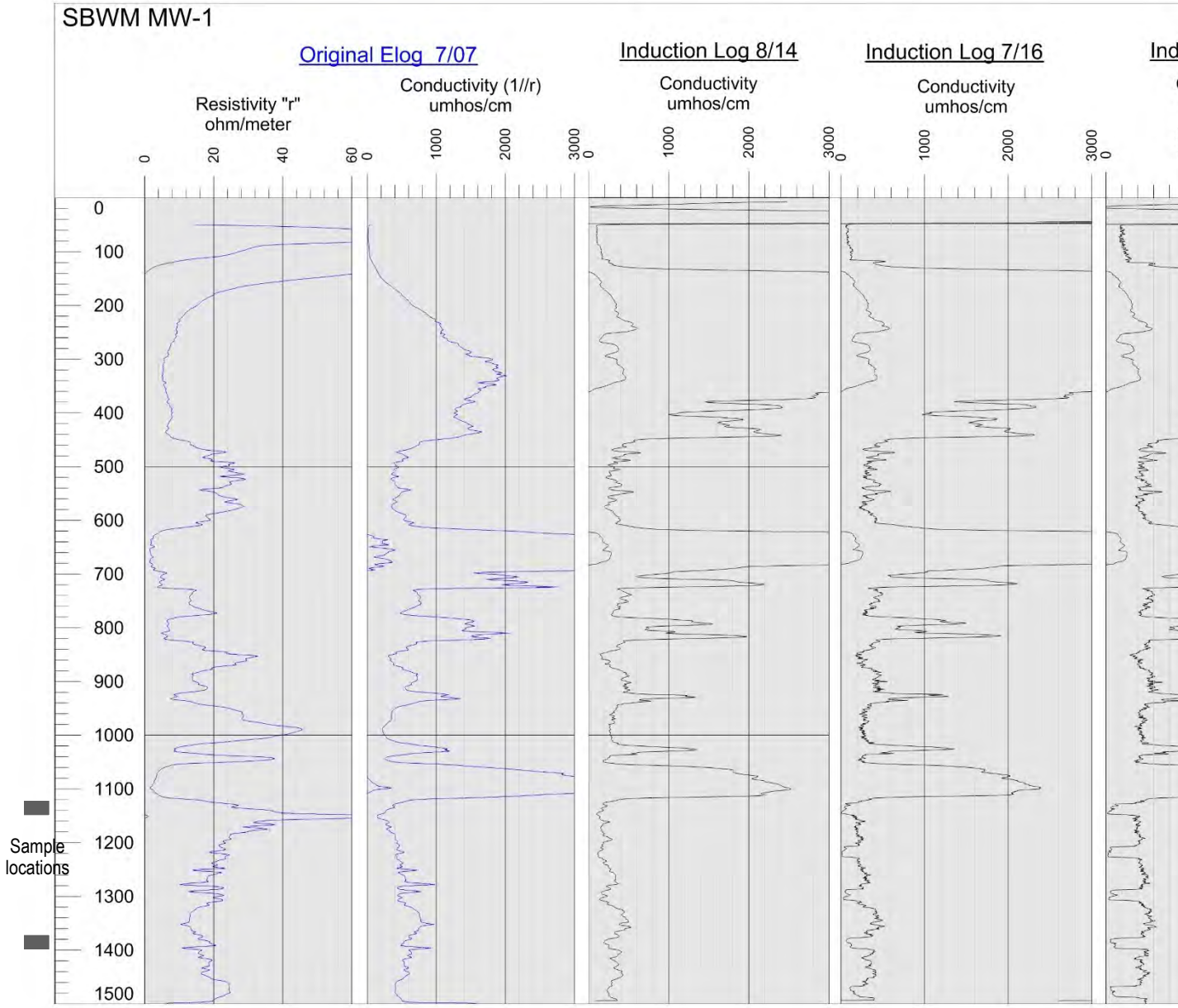
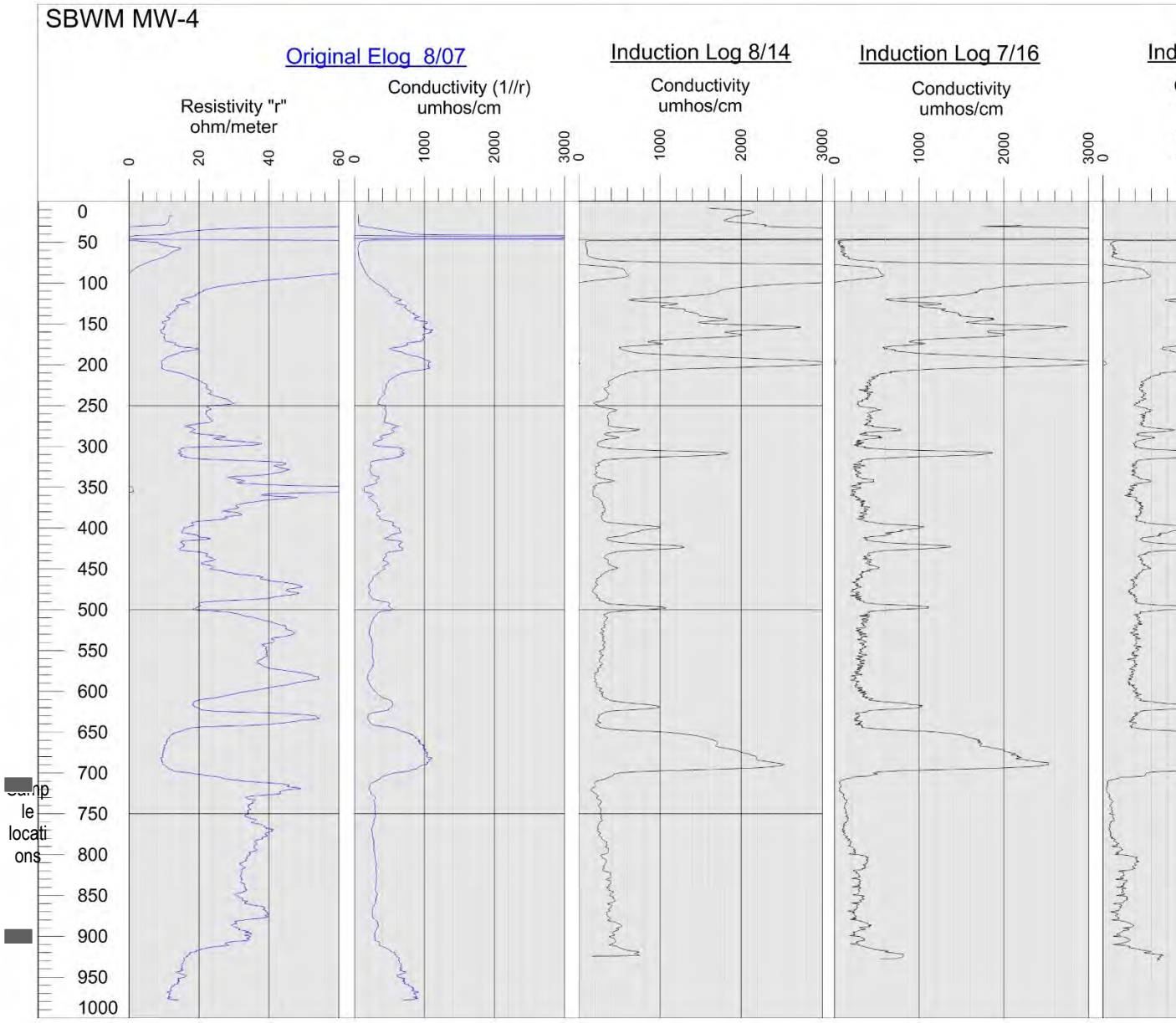


Figure 14: Sentinel Well 1 Induction Logs


SBWM MW-4
Original Elog 8/07
Induction Log 8/14
Induction Log 7/16
Resistivity "r"
ohm/meter
Conductivity (1//r)
umhos/cm
Conductivity
umhos/cm
Conductivity
umhos/cm
0
20
40
60
0
1000
2000
3000
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1000
2000
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1000
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3000
0
50
100
150
200
250
300
350
400
450
500
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600
650
700
750
800
850
900
950
1000
Sample locations

Figure 16: Sentinel Well 4 Induction Logs

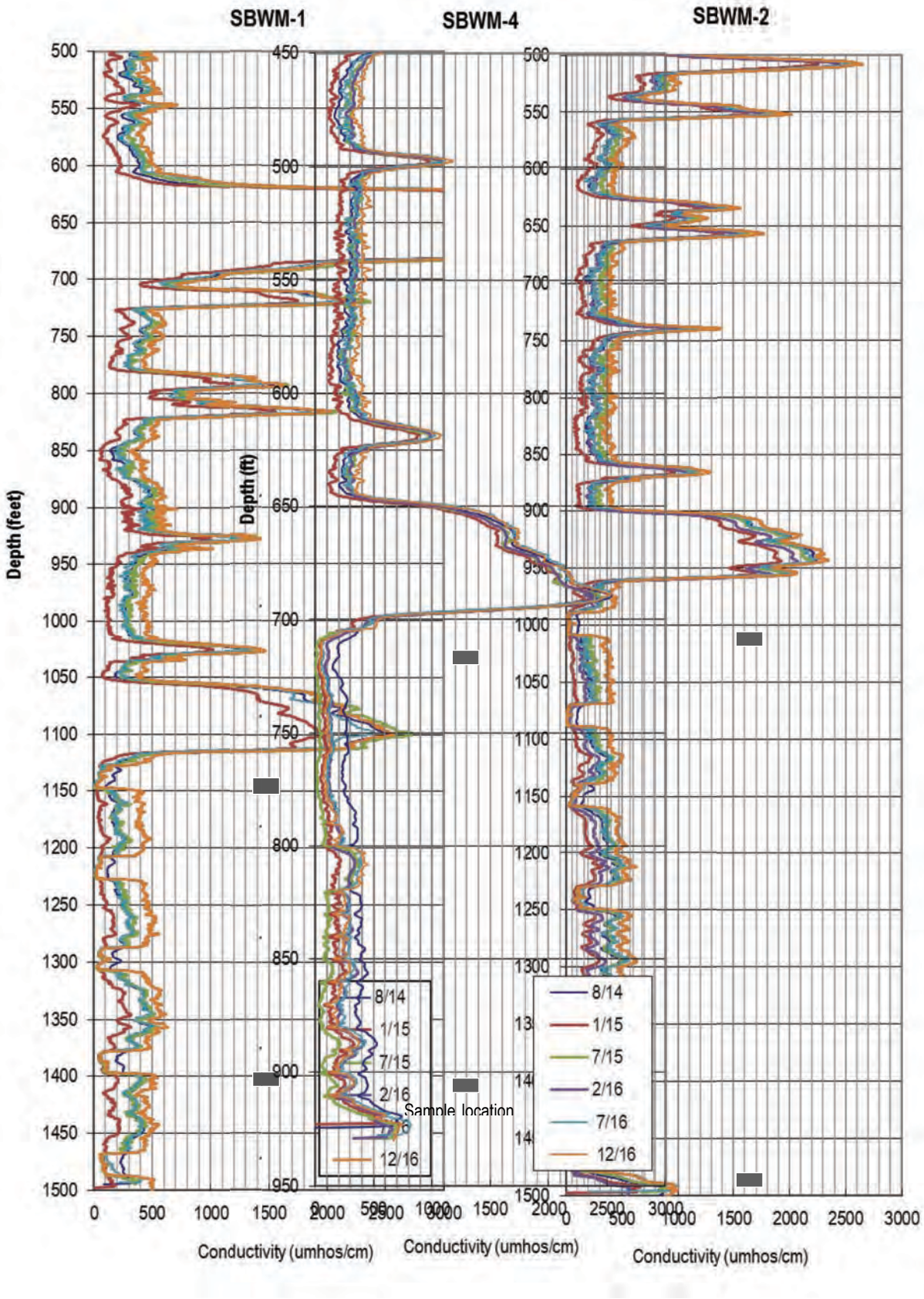

Figure 17: Induction Logs of Lowest 500 feet of Sentinel Wells 1 and 2

Figure 18: Induction Logs of Lowest 500 feet of Sentinel Well 4

7. Conclusions

1. None of the samples definitively indicate incipient seawater intrusion. However, variations in groundwater quality from samples collected over the last year from wells SBWM-1 and SBWM-4 necessitate continued vigilance and caution regarding potential changes to the Basin's groundwater quality.
2. Chloride concentrations at well SBWM-1 (1,390 ft) increased in December 2016 but the stiff diagram does not indicate that the anions and cations are much different from previous years. There is a very slight increasing chloride trend in this well.
3. Water quality at both well SBWM-2 (1,470 ft) and well SBWM-4 (900 ft) returned to within the range of historical groundwater quality observed in previous years.
4. Sentinel well SBWM- 4 (900 ft) has the highest coastal chloride concentrations and does appear to show an increasing chloride trend of approximately 5 mg/L per year since 2012. Although, this rate of increase is not significant, any increasing trend should continue to be monitored.
5. Monitoring well Ord Terrance Shallow chloride concentrations returned to the historic range. Its anions and cations both currently and historically do not indicate seawater chemistry.
6. There could possibly be some seasonal effects on groundwater quality in the deepest portions of the aquifer that may be related to seasonal groundwater elevation changes. If this is true and groundwater elevations continue to decline, larger impacts might be seen in the fall when groundwater levels are at their lowest.
7. The sources of increasing and fluctuating chlorides in wells SBWM-1 and SBWM-4 are unclear. Further investigation may provide evidence for the chloride source. Regardless of the source, the increasing and fluctuating chlorides likely result from chronically low groundwater levels.
8. Poorer quality water from shallow depths, migrating down the outside of the well casing is not likely a source of higher chloride concentrations in the sentinel wells because they are constructed with deep concrete/bentonite seals. Mixing of poorer quality water within the well is also not considered a source of higher chlorides at the deeper sample depths of the sentinel wells because the samples taken above the deepest samples do not have the same higher chloride concentrations.
9. While there is no evidence that errors occurred in the July 2016 sampling event, errors in collection, labeling, handling, and/or laboratory analyses of water quality samples is always a possibility in complex sampling events such as these. Consequently, the possibly of such errors cannot be ruled out. Reanalysis of samples, and resampling as soon as possible when anomalous results are obtained will verify such concentrations.

8. Recommendations

1. Continue to sample SBWM-1 and SBWM-4 twice a year.
2. SBWM-2 should be resampled at the end of summer in 2017 and based on those results a decision should be made as to whether it should be sampled twice a year on an ongoing basis.

3. To determine if groundwater quality samples reflect the influence of fluctuating groundwater elevations, it is recommended that samples in the future be collected in the last week of September for the 4th quarter samples and in the first week of March for the 2nd quarter samples.
4. Prepare a work plan that will direct an effort towards identifying the source of fluctuating chloride concentrations. The work plan should outline the types of analyses and data to be used in identifying the chloride source. If the source of fluctuating chlorides is understood, it will help in developing management actions to prevent the higher concentrations increasing to the point that they cause groundwater degradation.
5. Conduct downhole conductivity and temperature profiles within each of the Sentinel Wells during the next sampling event. This tool measures the conductivity within the well, as opposed to induction logging which measures conductivity within the adjacent sediments. This technique may help identify if upwelling is occurring.
6. Continue the process that has recently been implemented to review water quality results as soon as they are received, rather than waiting until they are used to prepare the annual Seawater Intrusion Analysis Report. This will enable action to be taken, including reanalysis of samples, if appropriate, immediately instead of at the end of the year when the data have historically been analyzed.
7. Continue conducting all groundwater quality sampling and analysis conducted in accordance with standard quality assurance and quality control procedures. This includes submitting field blanks and duplicates samples to the laboratory once every couple of years.

9. References

Feeney, M.B., 2007. *Seaside Groundwater Basin Watermaster - Seawater sentinel wells project, summary of operations*, prepared for the Seaside Groundwater Basin Watermaster, October 2007.

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ATTACHMENT 12

TECHNICAL PROPOSED WORK PLAN TO INVESTIGATE SOURCES OF FLUCTUATING CHLORIDES IN THE SENTINEL WELLS

HydroMetrics WRI
1814 Franklin St., Suite 501
Oakland, CA 94612

Mr. Robert S. Jaques
Seaside Groundwater Basin Watermaster
83 Via Encanto
Monterey, CA 93940

February 2, 2017

Subject: Proposed Work Plan to Investigate Sources of Fluctuating Chlorides in the Sentinel Wells

Mr. Jaques:

This letter outlines a proposed Work Plan to investigate sources of fluctuating chloride in some of the Seaside Basin's coastal sentinel wells. Preparation of the Work Plan was approved at the Technical Advisory Committee's January 11, 2017 meeting.

The Work Plan objectives are:

1. Investigate the source(s) of elevated chlorides.
2. Determine the mechanism causing the chloride fluctuations observed in recent groundwater samples.

Objective 1 – Investigate the Source of Elevated Chlorides

No single water quality analysis, or ratio between water quality constituents, can definitively differentiate between potential sources of chloride. This is partially because the source of the elevated chlorides may be from similar sources, e.g. ocean water. Figure 1 shows a number of potential salinization mechanisms, with three mechanisms highlighted are potential mechanisms introducing higher chloride water to the groundwater basin. Upwelling is not shown on Figure 1. The source of any potential upwelling water is the underlying Monterey Shale, which is a marine sediment containing connate water (seawater trapped at the time of sedimentation) that reflects its marine origin. The differences in the water chemistry of the various sources reflect

the amount of time the saline water has been separated from the ocean, and the amount of time the saline water has interacted with sediments. The proposed analyses can assess whether the chlorides are from recent seawater, or seawater that has been in contact with sediments for an extended period of time. Seawater intrusion, however, could occur through sediments that have had seawater in them for an extended period of time (bottom arrow on Figure 1), and that are geochemically similar to connate water. For this reason, the analyses may not definitively identify the source of the chlorides.

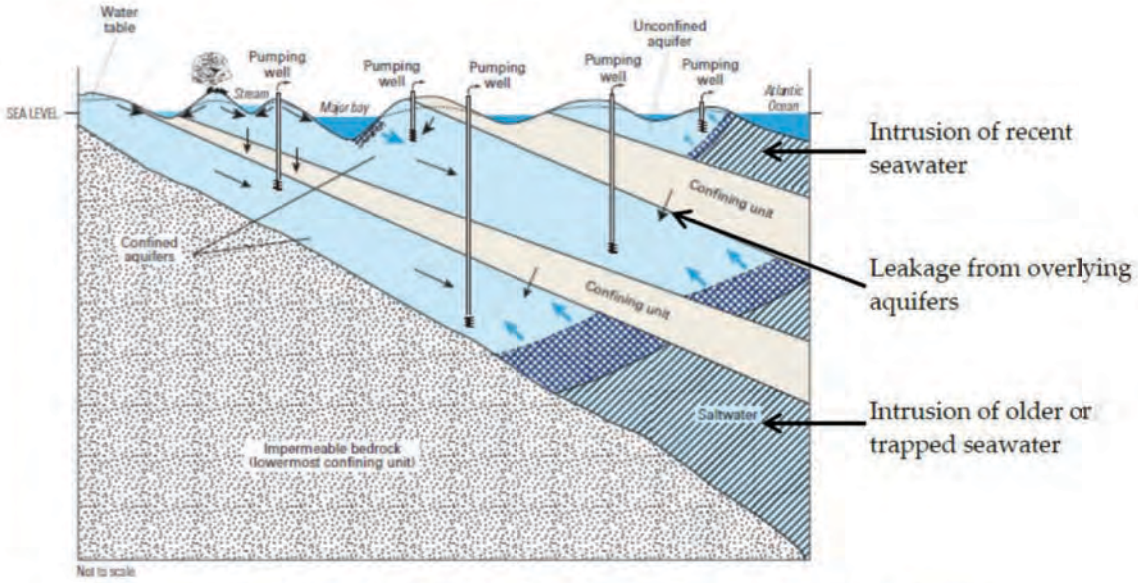

Figure 1: Potential Salinization Mechanisms (from Barlow, 2003)

As described above, comparing results from a number of analyses can suggest the source of elevated chlorides, although not always definitively. Typically, all or a combination of the following analyses are undertaken to investigate chloride sources (Izbicki et al., 2005; Martin, 1984; Klassen et al., 2014):

- Physical properties (temperature, pH, specific conductivity);
- Major-ion composition (piper and stiff diagrams; Na/Cl, Ca/Mg, Ca/(HCO_3 and SO_4), and Cl/EC plots);
- Selected minor ion and trace-element concentrations: boron, iodide, bromide, and barium;
- Minor ion ratio vs. chloride plots, e.g., Cl/Br vs. Cl, Cl/I vs. Cl, Cl/Ba vs. Cl, Cl/B vs. Cl); and
- Isotopic composition of groundwater using the stable isotopes of deuterium in hydrogen, oxygen-18 in oxygen, sulfur-34 in sulfur, and carbon-13 in inorganic carbon.

To control the costs of differentiating between differing chloride sources, we have divided the chloride source assessment into two phases.

Phase I

Phase I will compare the groundwater quality from the Northern Coastal Subarea with (1) seawater and (2) the groundwater quality in selected Laguna Seca wells or other nearby wells that are influenced by connate water in the underlying Monterey Shale. Most of the analyses on major ions are already included in the annual SIARs, but they do not provide an indication of the source(s) of the elevated chloride levels in the Sentinel Wells.

For Phase I, we recommend focusing analyses on the minor ions of boron, iodide, bromide, and barium, and including some additional major ion analyses as listed in the bullets below. The minor ion analyses were also recommended in the 2016 SIAR and have been used together with other indicators in similar studies to determine chloride sources in Santa Barbara and Oxnard (Martin, 1984 and Izbicki et al., 2005, respectively). The Watermaster has been analyzing samples from selected coastal monitoring and production wells for iodide, bromide, boron, and barium since 2012. Figure 2 shows the location of wells with minor ion data.

The Phase I work will consist of:

- Compare chloride to iodide ratios. Iodide is strongly depleted in seawater as a result of biological sequestration by marine organisms, such as kelp. Enriched iodide in groundwater indicates long residence time where iodide has had the opportunity to leach out of the sediments and may build up in groundwater (Kim et al., 2002). Changes in the chloride to iodide ratio in high-chloride water are often diagnostic of the source of high-chloride water in coastal aquifers (Kim et al., 2002).
- Compare barium concentrations. High barium concentrations are presumptive (but not conclusive) evidence that the source of high chloride in groundwater might be from the underlying Monterey Shale and not seawater. Barium is a reactive chemical constituent. Its concentrations may provide a means of determining whether ocean water or water from the Monterey Shale is the source of increasing chloride levels in the groundwater. The concentration of barium in seawater is typically less than 100 µg/L, whereas its concentration in groundwater from connate water sources is generally greater.

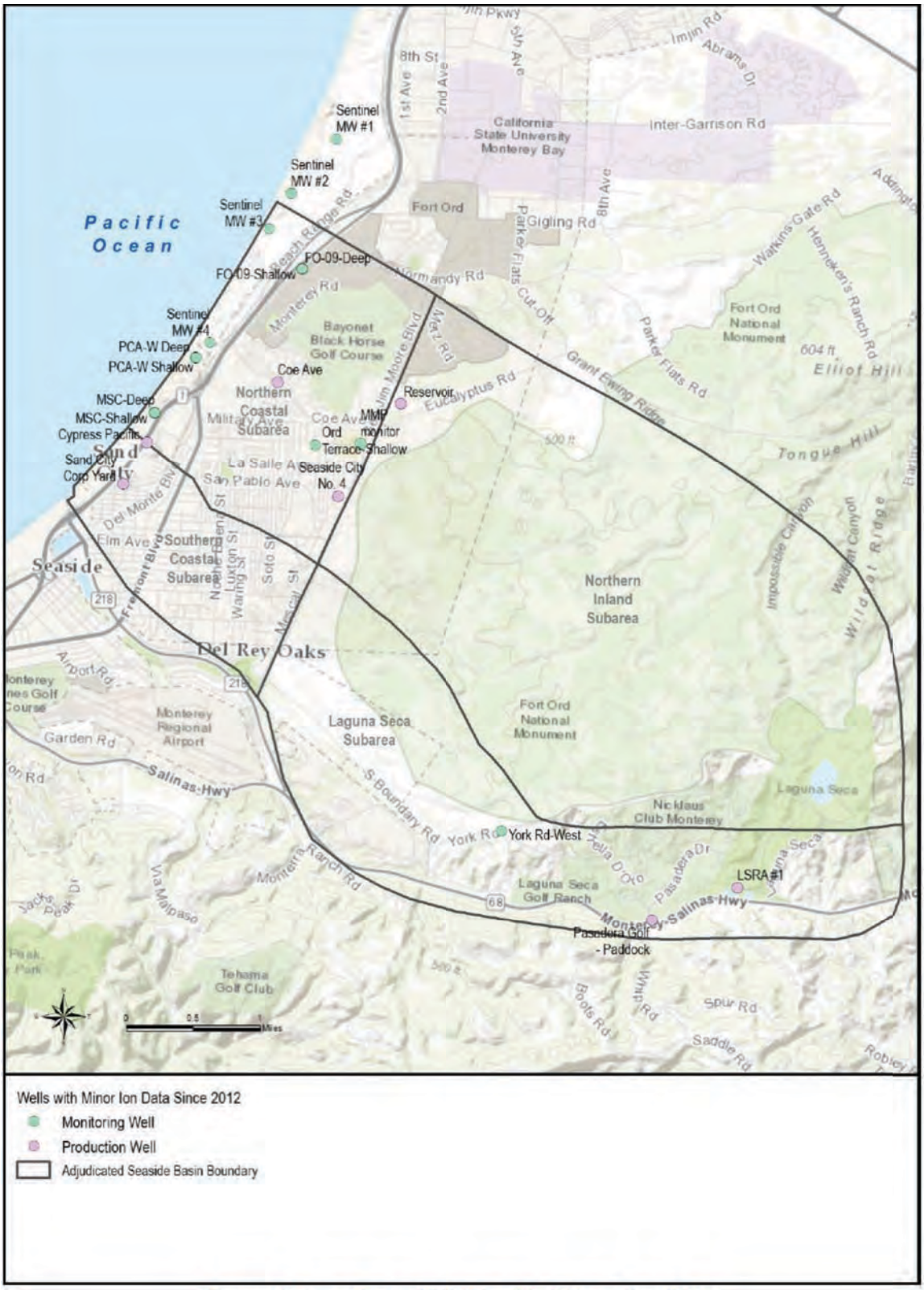

Figure 2: Location of Wells with Minor Ion Data

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- Compare chloride to boron ratios. Chloride-to-boron ratios in the higher-chloride groundwater samples in the Sentinel Wells that are substantially less than the ratio for seawater is presumptive evidence that the source of the increased chloride levels is groundwater from the underlying Monterey Shale.
- Compare chloride to bromide ratios. Bromide is a generally nonreactive dissolved species, and like chloride, it behaves conservatively in groundwater environments (i.e., it does not take part in significant ion exchange reactions, nor are adsorbed onto mineral surfaces). Seawater typically has a bromide concentration of about 67 mg/L. Chloride-to-bromide ratios plotting along the native freshwater/seawater mixing line (blue line on Figure 2) may indicate evidence of groundwater mixing with seawater.

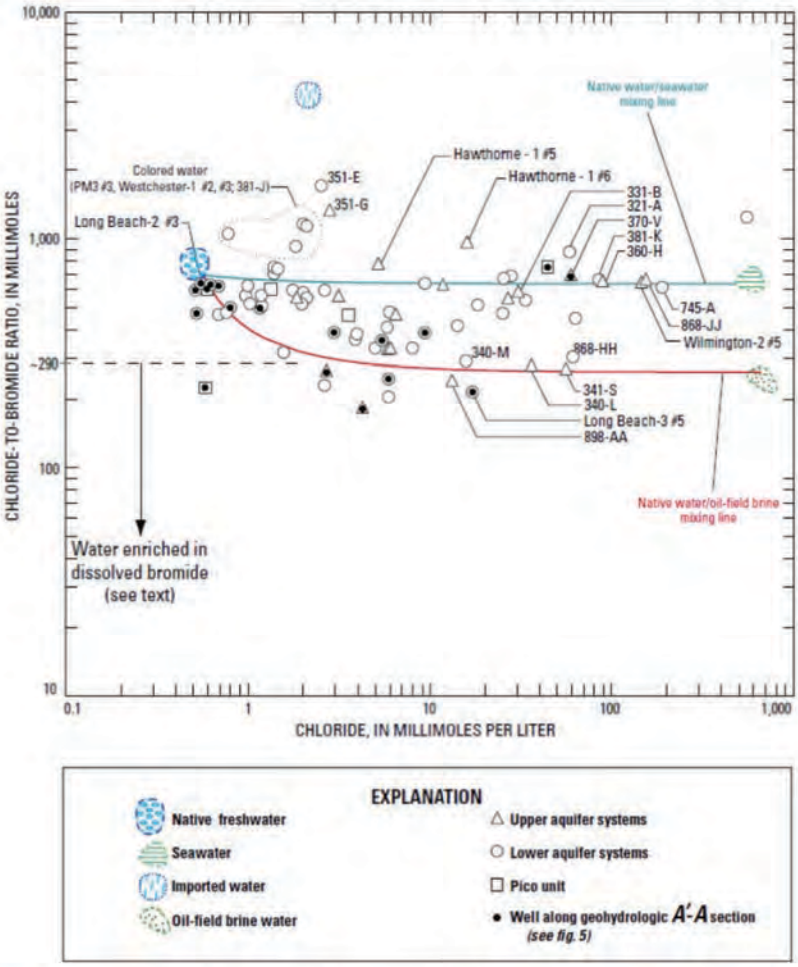

Figure 3: Example Chloride-to-Bromide Ratio of a Function of Chloride (from Land et al., 2004)

- Investigate whether calcium enrichment has occurred in any coastal monitoring wells. Evaluate whether calcium enrichment is taking place by plotting ratios of Ca/Mg and Ca/(HCO_3 and SO_4). Calcium enrichment may be occurring if Ca/Mg > 1 and Ca/(HCO_3 and SO_4) > 1. If it calcium enrichment is taking place, it may indicate incipient seawater intrusion.
- Profiling conductivity and temperature within each of the Sentinel Wells when they are next sampled in September/October 2017 may indicate whether upwelling is occurring within the wells.

Phase II

If determination of the source of elevated chloride levels in the Sentinel Wells from Phase I is inconclusive, it may be necessary to evaluate the isotopic composition of the coastal groundwater as a second phase of study. Isotopic analysis may be used to distinguish between waters of similar chemical character and to understand the source and movement of groundwater near the coast. Typically, the stable isotopes of deuterium in hydrogen and oxygen-18 in oxygen are the only isotopes analyzed. However, in Oxnard, Izbicki et al. (2005) included analysis of the stable isotopic composition in sulfur and inorganic carbon to evaluate the source of these dissolved constituents and to evaluate geochemical processes that may have altered their concentration and isotopic composition over time. If this phase is necessary, laboratory analyses will be needed from either Lawrence Livermore Laboratory, U.C Santa Cruz, University of Arizona or the USGS. If Phase II is required, a detailed work plan will be developed for TAC and Board approval.

Objective 2 – Mechanism for Fluctuating Chloride Concentrations

To determine a mechanism for the fluctuations in chloride concentrations in the Sentinel Wells, we will first need to identify the likely source of chloride (Objective 1) and also examine groundwater quality results from the October 2017 sampling event. These data are key to establishing a relationship between groundwater levels and chloride fluctuations.

As part of the analysis of fluctuating chloride concentrations, we propose to use a specialized diagram that can be used to categorize the hydrochemical environment of water types, also known as a hydrochemical facies evolution diagram (Figure 3) that has been used to track the onshore (intrusion) and offshore (freshening) movement of seawater in aquifers (Giménez-Forcada, 2010). Using the percentage content of principal major ions, the multi-rectangular diagram classifies groundwater by hydrochemical environment.

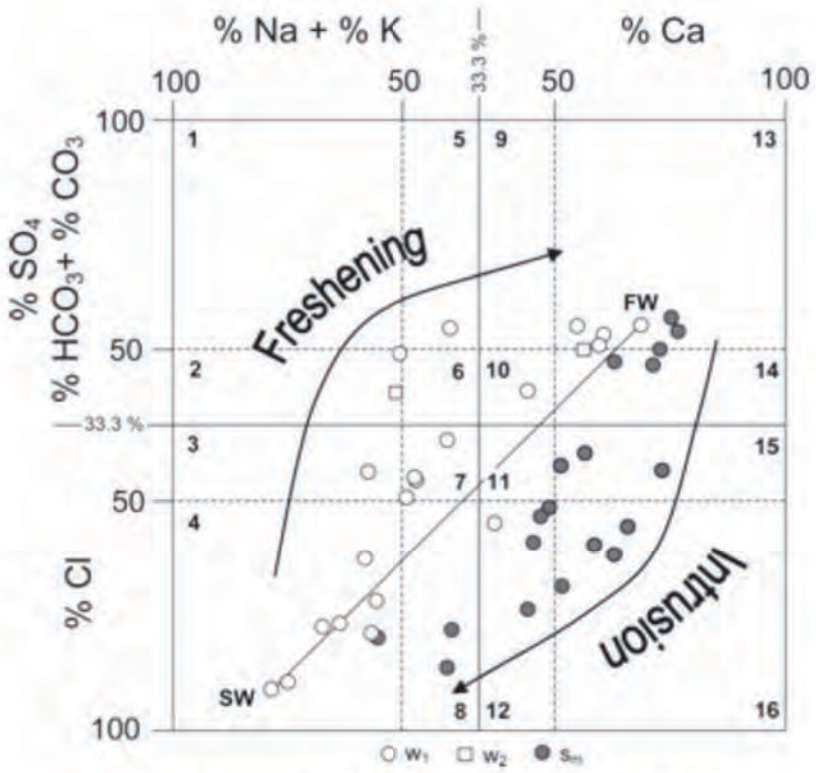

Figure 4: Example Hydrochemical Facies Diagram

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Estimated cost for Phase I

The estimated cost for Phase I (Objectives 1 and 2) are included in Table 1 at the end of this Work Plan. Work to investigate the source of elevated chlorides can be completed within six weeks from receiving a notice to proceed. However, work on determining the mechanism causing the chloride fluctuations can only be completed in November 2017 once the 4th quarter samples have been analyzed and conductivity and temperature profiling has been completed.

It is assumed that HydroMetrics WRI will prepare for and attend two TAC meetings by phone to present the results. The cost estimate includes time for Derrik Williams to present study results in-person at up to two Board meetings, if needed.

Please call if you have any questions.

Sincerely,

Georgina King, Principal Hydrogeologist
HydroMetrics Water Resources Inc.

Table 1: Cost Estimate for Phase I

Phase I Tasks	HydroMetrics WRI Labor				Other Direct Costs	TOTALS
	Derrik Williams	Georgina King	Labor Total			
	President	Principal Hydrogeologist				
Rates	$220	$195	Hours	($)	($)	($)
Task 1. Characterize Monterey Shale Groundwater Chemistry	2	12	14	$ 2,780	$ -	$ 2,780
Task 2. Analyze Major Ions	1	8	9	$ 1,780	$ -	$ 1,780
Task 3. Analyze Minor Ions	2	16	18	$ 3,560	$ -	$ 3,560
Task 4: Analyze Conductivity and Temperature Profiling Data	2	8	10	$ 2,000	$ -	$ 2,000
Task 5: Prepare Technical Memorandum with Charts and Maps	6	32	38	$ 7,560	$ -	$ 7,560
Task 6: Prepare for and Present Results by Phone to TAC (assume 2 meetings)	4	8	12	$ 2,440	$ -	$ 2,440
Task 7: Prepare for and Present Results in Person to Board (assume 2 meetings)	16	8	24	$ 5,080	$ 400	$ 5,480
TOTAL			*125*	*$ 25,200*	*$ 400*	*$ 25,600*

Notes

Cost estimate does not include field work related to conductivity and temperature profiling in Sentinel Wells

Other direct costs include per diem, transportation, office supplies, photocopies, postage, and equipment rental

Per diem rate is $150 per day, mileage is at current IRS rate

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ATTACHMENT 13

TECHNICAL MEMORANDUM DESCRIBING THE 2017 SENTINEL WELLS FLUID RESISTIVITY LOGGING EVENT

Martin B. Feeney *P.G. 4634*
Consulting Hydrogeologist *C.E.G. 1454*
C.Hg 145

TECHNICAL MEMORANDUM

To:	Seaside Basin Watermaster	Date:	November 7, 2017
From:	Martin Feeney, PG, CEG, CHg	Project No:	
Subject:	Sentinel Wells Fluid Resistivity		

Introduction

Presented in this Technical Memorandum are the results from the fluid resistivity logging of the 4 monitoring wells on Fort Ord State Beach (Sentinel Wells). The Sentinel Wells were constructed in 2008 to allow periodic induction logging to capture changes in pore-fluid conductivity, throughout the entire thickness of the aquifer system, that would occur if seawater was intruding into the aquifer system. In addition, depth-specific downhole water quality samples within the perforated interval have been collected for laboratory analysis. Water level data are also collected. Induction logging has been performed semi- annually since 2008 and no significant change in pore-fluid conductivity has been detected in the lower aquifer system. Seasonal changes in conductivity have been captured in the shallower portion of the wells; the strata where seawater intrusion is known to exist.

Recently, there has been some divergence between the induction logging conductivity values and the laboratory conductivity values of the depth-specific samples in several of the wells; the conductivity values in the samples being higher than the induction logging values. This has raised questions as to the source of the high conductivity water in the samples, which conductance value to honor (induction or laboratory) and to the validity of the sampling methods. In response to these questions, it was proposed that the conductance of the water in the wells be measured to help answer these questions. This technical memorandum presents the findings of this work.

Methodology

The fluid resistivity logging was performed by Newman Well Logging in October 2017. The fluid resistivity tool was manufactured by Mount Sopris Geophysical and the tool lowered into the well on a wireline. The tool measures raw resistivity and temperature. The raw resistivity values can be corrected to specific conductance with the temperature data. Unlike induction logging which measures the aggregate conductance of the all materials in an approximate 6-foot diameter sphere surrounding the tool, down-hole fluid resistivity (inverse of conductance) measures the conductivity of the fluid in the casing. Whereas, induction logging "sees" through the water in the well, the

casing, the gravel pack out into the formation, the fluid resistivity tool measures the resistivity of the fluid across a narrow gap in the tool within the 3-inch casing[1]. Given the differences in scale (1-inch to 6 feet), the induction tool is relatively insensitive to the conductance of the fluid in the casing. The result of the fluid resistivity logging reveals much about the nature of the water in the casing, although this information is not necessarily reflective of conditions in the aquifer in the 6-foot diameter surrounding the casing.

[1] In practice the spacing of the electrodes in the tool are spaced about a 1-inch apart.

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The results of the fluid resistivity logging are presented in Figures 1 through 5. Presented on the figures are the construction of each well, the corrected fluid conductivity values, the temperature values, the laboratory values for the depth-specific samples and the most recent induction logging conductivity. The reader is advised that all the data presented on the graphic were not collected at the same time. The induction logging and depth-specific sampling were performed in late August, and the fluid resistivity logging in early October. Also, some of the graphs of the data are presented in a 10X wrap mode. That is, when the trace goes off the right axis, it returns at 10 times the value from the left axis.

Each of the Figures is discussed in more detail below.

Results

SBWM#1 – Figure 1

The fluid conductivity, presented as Specific Conductance, is presented in the left-center panel with the blue trace. There is no fluid in the well until a depth of about 110 feet (water table). Below this depth, water conductivity is relatively high (1,500 to 2,000 uS) to the top of the perforations, where it sharply falls to about 400 uS. At the bottom, below 1480, there is water with a conductivity above 1,200 uS. The depth-specific laboratory water quality data, which was collected a month earlier than the fluid resistivity logging, are also shown in green. The upper water quality sample compares well with the fluid resistivity trace. The lower samples are significantly higher. It might be speculated that the conductivity kick at the bottom may move up seasonally[2] or that the act of sampling resulted in mixing. Water temperature in the well goes from about 16C degrees to about 38C degrees at the bottom of the well.

SBWM#2 – Figure 2

Again, fluid conductivity is in the left-center panel with the blue trace. The water table is at about 100 feet below ground surface. The conductivity of the water below the water surface is around 1000 uS to about 280 feet and steadily declines to the top of the perforations. Between the perforations 1150 and 1250 feet, the conductivity again increases to about 1000 uS. Again, there is poorer quality water in the bottom interval with a conductivity of about 2,500 uS. Depth-Specific samples match fairly well (the blue trace is wrapped; the green bar is not – labeled). Water temperature in the well goes from about 16C degrees to about 38C degrees at the bottom of the well.

SBWM#3 – Figure 3

Conductivity data documents the water table at a depth of approximately 80 feet. Below this depth the water is very fresh, averaging 100 uS to about the top of the perforations where it increases to approximately 400 uS. This fresh water above the perforations is interpreted as rainwater that entered the well during periods when the well head was flooded[3]. The increase in conductivity in the perforated interval is indicative that water is moving through the perforations. Both the conductivity values of both the depth-specific water quality samples compare well with the conductivity trace. Water temperature in the well goes from about 16C degrees to about 35C degrees at the bottom of the well.

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2. Either through the inland movement of a wedge of saline water or the upconing of saline water from the underlying Monterey Shale.

3. It was observed that after sufficient rain, the paved area where SBWM#3 was located was flooded to the extent that there was as much as 6 inches of water above the well vault. It was also observed in the data logger record that the temperature would decline in the water column suggesting that water was entering casing. After this problem was discovered, a drain was installed in the low point of the paved area which has eliminated this problem. Also, the well seals/caps have been improved.

SBWM#4 – Figure 4 and 5

Two separate fluid resistivity logs were performed on SBWM#4, one following induction logging and sampling in August, the other as part of the logging of all the wells in October. Both runs of induction logging on SBWM#4 were performed with the same tool.

Figure 4 - Conductivity logging reveals water level in the well to be about 80 feet below surface. Below this depth fluid conductivity is about 850 uS slowly declining to the top of the perforations where it is around 750 uS. At 800 feet, the conductivity sharply increases to about 1000 uS to the bottom of the well. Because the well is shallower, the range in water temperature is lower. Water temperature in the well goes from about 18C degrees to about 32C degrees at the bottom of the well.

Figure 5 - This figure presents a comparison of the two fluid resistivity logs of SBWM#4; the one from August and the one performed in October. The curves are relativity similar; however, the mixing of the water in the upper perforations with the water in the lower perforation can be seen in the smoother transition between the two zones in the curve on the right. The trace on the right was performed after the sampling tool had been down the well twice and the induction tool had been to bottom. The depth- specific samples are presented on the contemporaneous fluid resistivity log. The laboratory values for conductivity compare well with the conductivity values from the fluid resistivity logging.

Conclusions

- Fluid resistivity logging has confirmed that the depth-specific samples are representative of the water in the casing at the specified depth.

- Fluid resistivity logging has documented the presence of high conductivity (high TDS) water at the bottom of the casing of SBWM#1 and SBWM#2 – wells with samples that have been elevated in specific conductance and chlorides. The source of this water remains unknown.

- The fluid resistivity logging has confirmed the very different water quality between the two aquifer zones (Purisima on top, underlain by Santa Margarita) in SBWM#4 that has always been reflected in the downhole samples.

- There has been entry of surface water into Sentinel Well SBWM#3. However, in the perforated intervals, the fluid conductivity values document that water is moving through the casing and that the depth-specific samples are consistent with the values from the well prior to the entry of surface water.

- The activities of sampling and logging disturb stratification of water quality in the wells. However, this disturbance does not appear to affect the validity of the samples from the zones sampled.

Figure 1

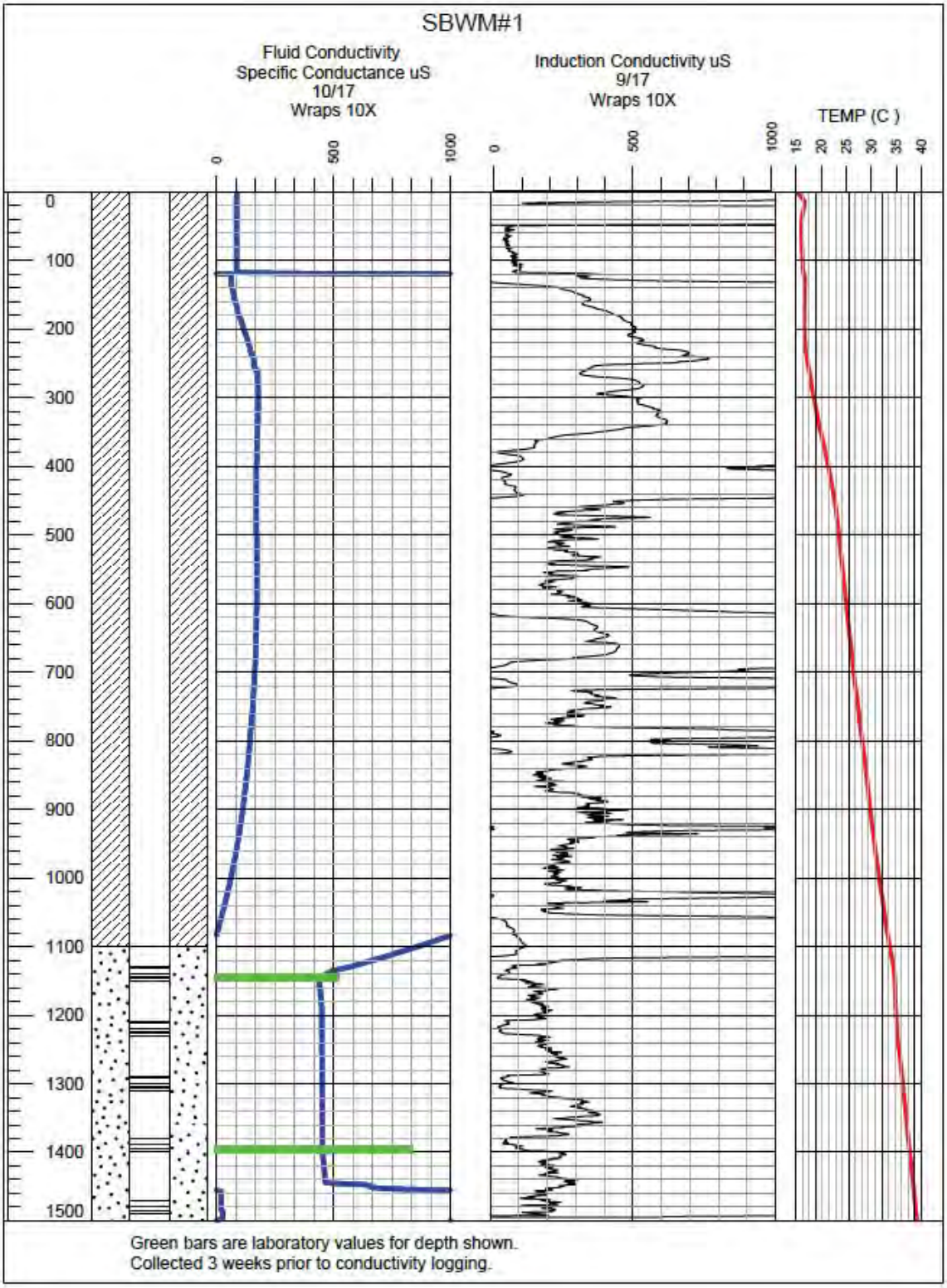

SBWM#1
Fluid Conductivity
Specific Conductance uS
10/17
Wraps 10X
Induction Conductivity uS
9/17
Wraps 10X
TEMP (C)
0
500
1000
15
20
25
30
35
40
100
200
300
400
500
600
700
800
900
1100
1200
1300
1400
1500
Green bars are laboratory values for depth shown.
Collected 3 weeks prior to conductivity logging.

Figure 2

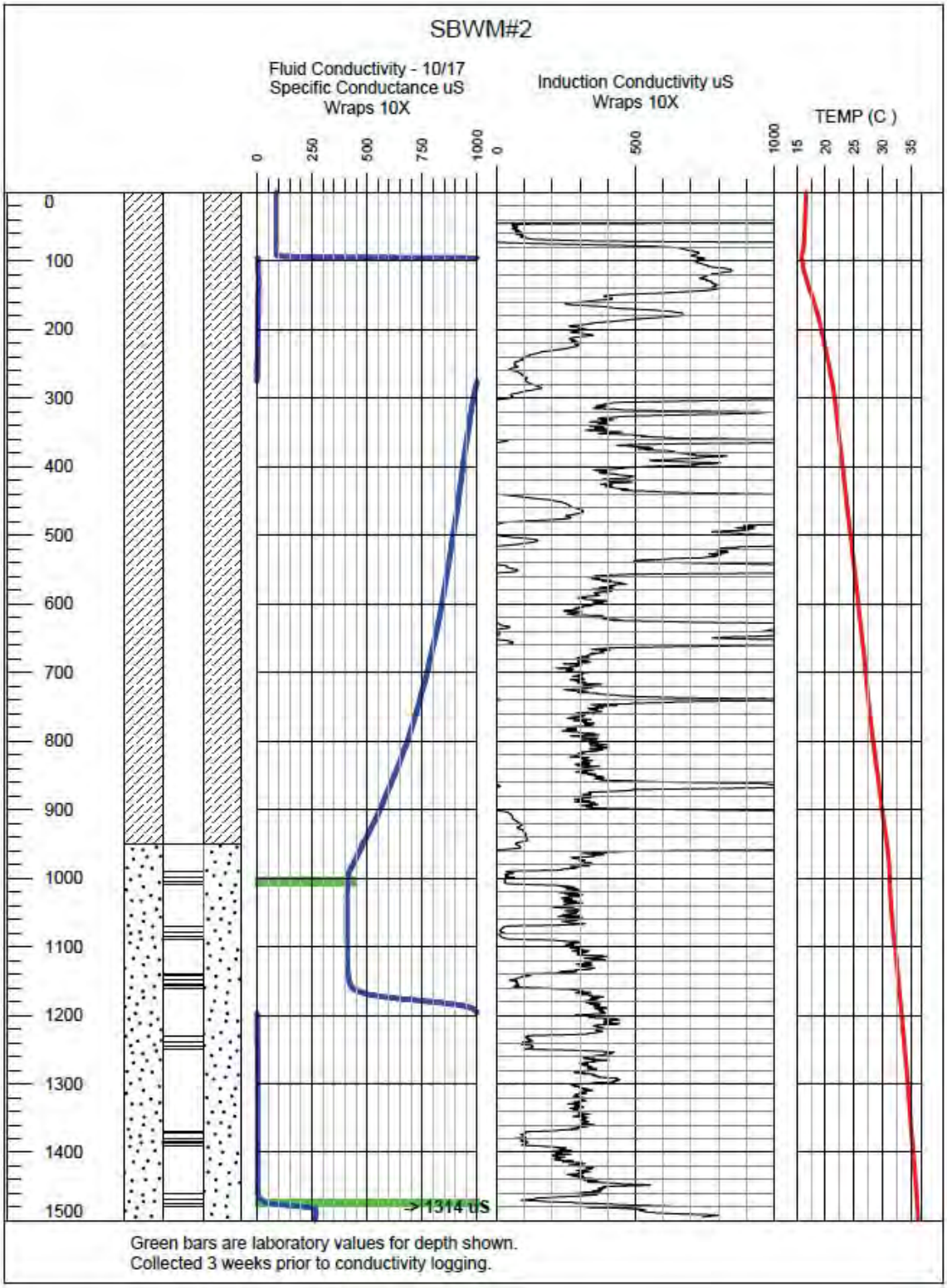

SBWM#2
Fluid Conductivity - 10/17
Specific Conductance uS
Wraps 10X
Induction Conductivity uS
Wraps 10X
TEMP (C)
0
250
500
750
1000
0
500
1000
15
20
25
30
35
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1314 uS
Green bars are laboratory values for depth shown.
Collected 3 weeks prior to conductivity logging.

Figure 3

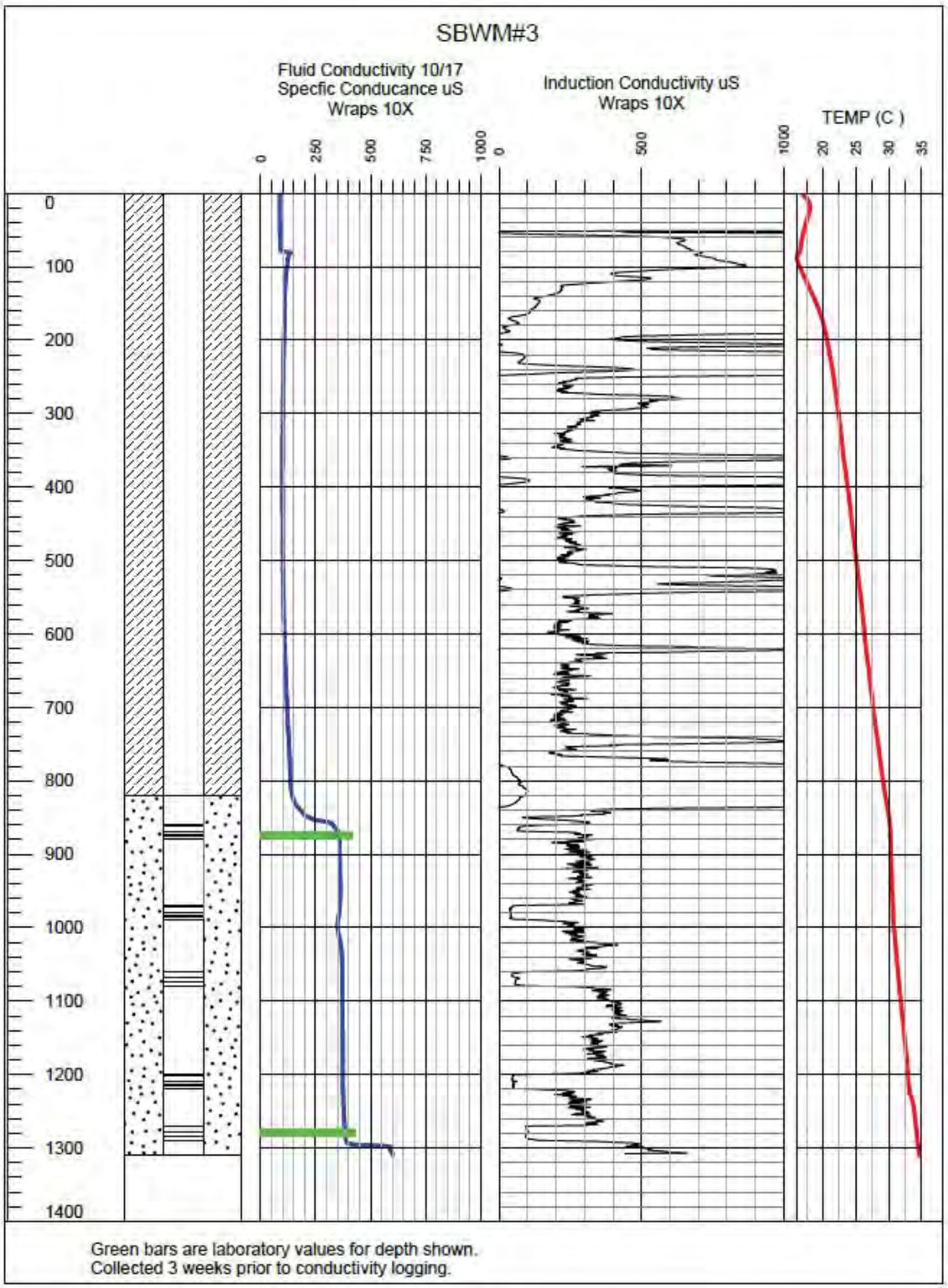
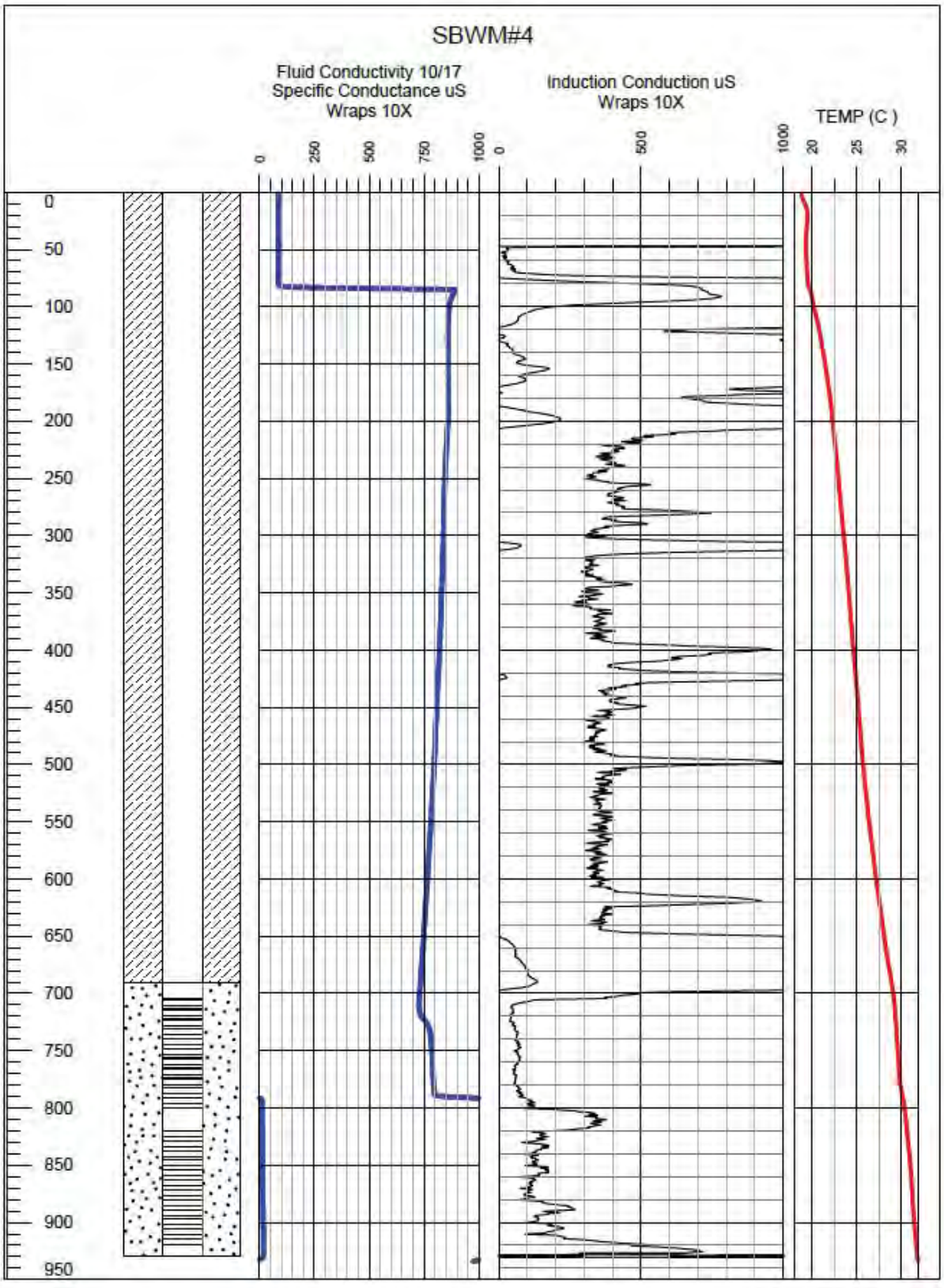

SBWM#3
Fluid Conductivity 10/17
Specfic Conducance uS
Wraps 10X
Induction Conductivity uS
Wraps 10X
TEMP (C)
0
250
500
750
1000
0
500
1000
20
25
30
35
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
Green bars are laboratory values for depth shown.
Collected 3 weeks prior to conductivity logging.

Figure 4


SBWM#4
Fluid Conductivity 10/17
Specific Conductance uS
Wraps 10X
Induction Conduction uS
Wraps 10X
TEMP (C)
0
250
500
750
1000
0
500
1000
20
25
30
0
50
100
150
200
250
300
350
400
450
500
550
600
650
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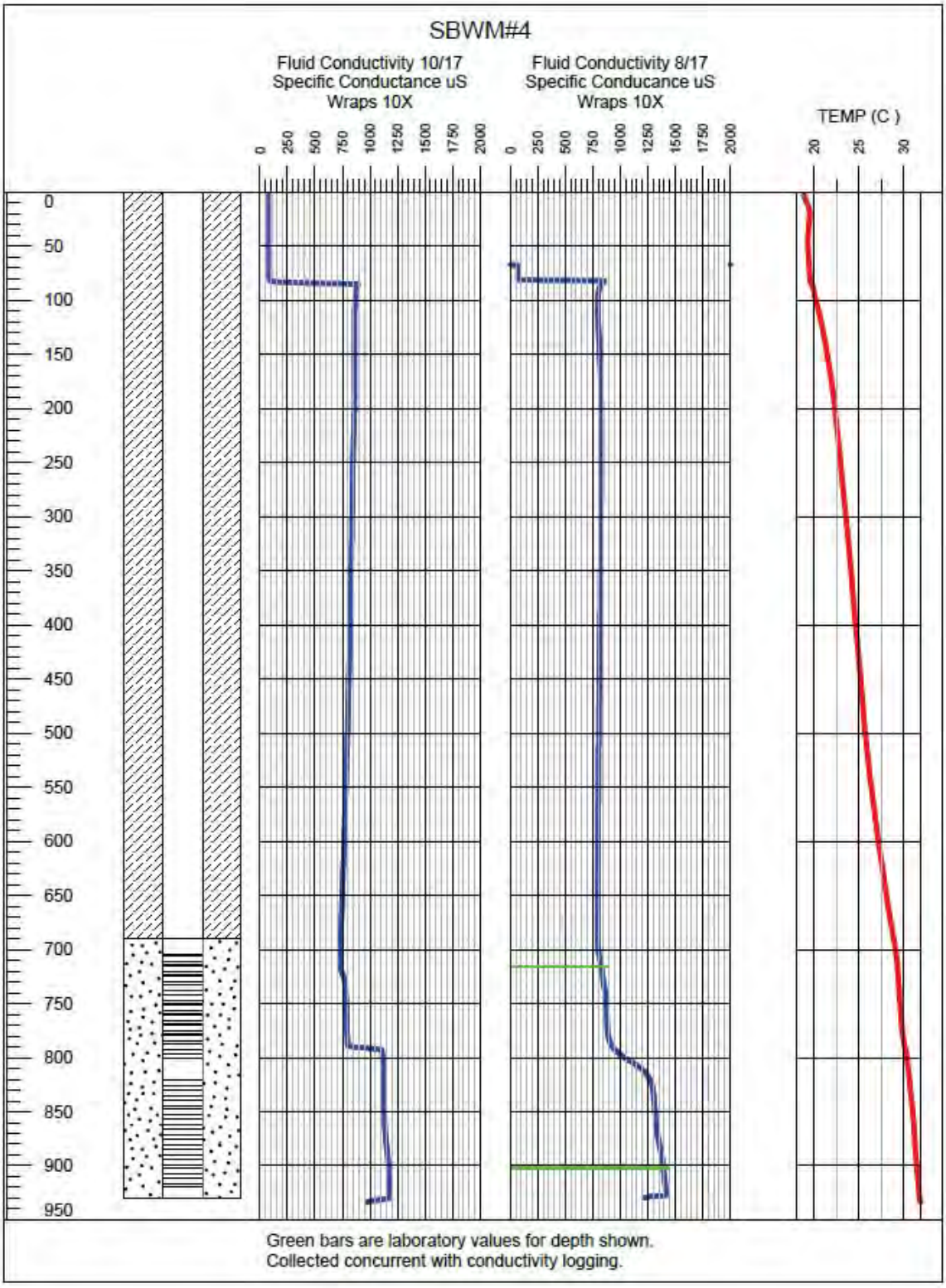
750
800
850
900
950

Figure 5


SBWM#4
Fluid Conductivity 10/17
Specific Conductance uS
Wraps 10X
Fluid Conductivity 8/17
Specific Conducance uS
Wraps 10X
TEMP (C)
0 250 500 750 1000 1250 1500 1750 2000
20 25 30
0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950
Green bars are laboratory values for depth shown.
Collected concurrent with conductivity logging.