M E E T I N G N O T I C E AND A G E N D A

TECHNICAL ADVISORY COMMITTEE OF THE SEASIDE BASIN WATER MASTER

DATE: Wednesday, July 14, 2021
MEETING TIME: 1:30 p.m.

IN KEEPING WITH GOVERNOR NEWSOMS EXECUTIVE ORDERS N-29-20 AND N-35-20, THE TECHNICAL ADVISORY COMMITTEE MEETING WILL BE CONDUCTED BY TELECONFERENCE AND WILL NOT BE HELD IN THE MONTEREY ONE WATER OFFICES.

YOU MAY ATTEND AND PARTICIPATE IN THE MEETING AS FOLLOWS:
JOIN FROM A PC, MAC, IPAD, IPHONE OR ANDROID DEVICE (NOTE: ZOOM APP MAY NEED TO BE DOWNLOADED FOR SAFARI OR OTHER BROWSERS PRIOR TO LINKING) BY GOING TO THIS WEB ADDRESS:
https://us02web.zoom.us/j/88505028991?pwd=M2M1WmJZbVVxbmV4ZTN6K0ZqdDk5QT09
If joining the meeting by phone, dial either of these numbers:
+1 408 638 0968 US (San Jose)
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Meeting ID: 885 0502 8991
Passcode: 089329

OFFICERS
Chairperson: Jon Lear, MPWMD
Vice-Chairperson: Tamara Voss, MCWRA

MEMBERS
California American Water Company **City of Del Rey Oaks** **City of Monterey** **City of Sand City** **City of Seaside**
Coastal Subarea Landowners
Laguna Seca Property Owners **Monterey County Water Resources Agency** **Monterey Peninsula Water Management District**

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The next regular meeting is tentatively planned for Wednesday August 11, 2021 at 1:30 p.m.	

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SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	July 14, 2021
AGENDA ITEM:	2.A
AGENDA TITLE:	Approve Minutes from the June 9, 2021 Meeting
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

Draft Minutes from this meeting were emailed to all TAC members. Any changes requested by TAC members have been included in the attached version.

ATTACHMENTS:	Minutes from this meeting
RECOMMENDED ACTION:	Approve the minutes

D-R-A-F-T
MINUTES

Seaside Groundwater Basin Watermaster
Technical Advisory Committee Meeting
June 9, 2021
(Meeting Held Using Zoom Conferencing)

Attendees: TAC Members

City of Seaside – Scott Ottmar
California American Water – Tim O'Halloran
City of Monterey – Cody Hennings
Laguna Seca Property Owners – Wes Leith
MPWMD – Jon Lear
MCWRA – Tamara Voss
City of Del Rey Oaks – John Gaglioti
City of Sand City – Leon Gomez
Coastal Subarea Landowners – No Representative

Watermaster
Technical Program Manager - Robert Jaques
Administrative Officer – Laura Paxton

Consultants
Montgomery & Associates – Pascual Benito

Others
None

The meeting was convened at 1:32 p.m.

1. **Public Comments**

There were no public comments.

2. **Administrative Matters:**

A. Approve Minutes from the May 12, 2021 Meeting

On a motion by Mr. O'Halloran seconded by Mr. Gaglioti, the minutes were unanimously approved as presented.

B. Sustainable Groundwater Management Act (SGMA) Update

Mr. Jaques highlighted several items materials for this item.

Mr. Gaglioti asked whether the Watermaster should seek to have the Seaside Basin included in the seawater intrusion model being developed for the Monterey Subbasin GSP. Mr. Jaques reported that the Seaside Basin groundwater model is available to the Marina Coast Water District GSA's consultant, EKI, who is developing the seawater intrusion model. Ms. Voss said that all though she does not have expertise in modeling, she did not feel the

Watermaster needed to get further involved with this work. Mr. Lear said that the proposed seawater intrusion model is intended to focus on the movement of intruded seawater using the Salinas Valley Integrated Hydrogeologic Model and a new groundwater model being developed for the Monterey Subbasin GSP by EKI. Mr. Benito added that the Salinas Valley Integrated Hydrogeologic Model did not cover the Monterey Subbasin or the Seaside Subbasin areas very well, so EKI is developing a Monterey Subbasin model of its own. That model doesn't focus on seawater intrusion, whereas the seawater intrusion model will focus on that issue.

C. Results from March 2021 Induction Logging of Sentinel Wells

Mr. Jaques briefly summarized the agenda packet materials for this item and there was no other discussion.

3. Update on Water Quality Issues at Monitoring Wells FO-9 and FO-10

Mr. Jaques summarized the agenda packet materials for this item.

Mr. Gaglioti said he accepted the input from the experts, as summarized in the agenda packet. Ms. Voss said she concurred with their conclusions with regard to Well FO-9 Shallow. She was interested in understanding what is causing the conductivity and induction logging results to differ from the water quality samples and the original E-log from construction of Well FO-10. Mr. Jaques reported that he had forwarded Mr. Feeney's report on the induction logging and conductivity profiling of these wells to Marina Coast Water District, and they said they would investigate Well FO-10 Shallow as they develop the GSP.

Mr. Gaglioti if there had been any progress on developing a cost-sharing agreement to install a replacement monitoring well for FO-9 Shallow. Mr. Jaques reported that a letter had been sent from the watermaster to MPWMD and MCWD seeking a cost sharing agreement for this work. MCWD said they were receptive to cost-sharing for a replacement well. MPWMD is currently processing this internally. Ms. Voss suggested tabling this issue for now, but providing an update on the replacement well next year. Mr. Gaglioti said he concurred with this approach.

A motion was made by Mr. Gaglioti, seconded by Ms. Voss to accept the conclusions from the experts as presented in the agenda packet and to get an update in a year regarding construction of a replacement well for FO-9 Shallow. The motion passed unanimously.

4. Proposed Scopes and Costs for Board Consideration in Response to Concerns about Possible Detection of Seawater Intrusion in Monitoring Wells FO-9 and FO-10 Shallow

Mr. Jaques summarized the agenda packet materials for this item.

Mr. Ottmar asked if performing this work was covered in the current year's budget. Mr. Jaques said that this work could be funded under Task I.3.a.3 of the approved Monitoring and Management Program budget for 2021, titled "Evaluate Replenishment Scenarios and Develop Answers to Basin Management Questions."

A motion was made by a Ms. Voss, seconded by Mr. Gaglioti, to approve RFS No. 2021-01 Amendment No. 1 for Montgomery and Associates to develop flow direction and flow velocity maps. The motion passed unanimously.

5. Continued Discussion of 2012 Cross-Aquifer Contamination Study and Development of Recommendations

Mr. Jaques summarized the agenda packet materials for this item.

Ms. Voss said that doing the proposed conductivity profiling could potentially provide useful information at modest cost and suggested doing it in the current year. Mr. Lear asked if this was being proposed as just a one-time event or whether it would be something that would be repeated on a periodic basis. Mr. Jaques said he envisioned it as a one-time event, unless findings from the first event indicated it would be beneficial to perform repeat profiling in the future. Ms. Voss said that doing it as a one-time event would provide a baseline for possible future comparisons.

Mr. Lear said it would be necessary to see if the wells that are proposed for profiling have equipment in them which would have to be removed and if so, that would add to the cost of the work. Mr. Jaques said he did not know which wells were the ones shown on Figure 6 and asked Mr. Lear if he could provide the names and identification of those wells. Mr. Lear said that he would provide that information. Mr. Ottmar thought that two of the wells might be the Coe Avenue and the Reservoir Well which are used for the golf courses. Mr. Lear said that two of them may be Seaside municipal production wells.

Ms. Voss noted that getting the identification of the wells be the first step to assess the feasibility of doing this work. Mr. Lear said he would send the information Mr. Jaques who will investigate and report back to the TAC at a future meeting.

6. Information Regarding AEM Surveys

Mr. Jaques summarized the agenda packet materials for this item.

Mr. Lear reported that he is on a technical advisory committee for Santa Cruz County's Mid-Basin GSP. They are doing AEM offshore surveys. The surveys have to be repeated on a regular basis in order to detect changes which could indicate movement of seawater intruded water.

Mr. Gaglioti and Ms. Voss felt they would need to have a better understanding of what data would be acquired by this process, what it would cost, and how it might be beneficial the Watermaster.

Ms. Voss went on to report that the DWR AEM survey of the inland portions of the Salinas Valley Basin will start in July, but that work won't get to the coastal area until a later time.

Mr. Jaques offered to get more information from Rosemary Knight and provide it to the TAC for further discussion at a future meeting.

7. Schedule

Mr. Jaques reported that consistent with the determination that seawater intrusion is not occurring in monitoring Well FO-9 Shallow, he had closed out the task pertaining to implementation of the Seawater Intrusion Response Plan. There was no other discussion.

8. Other Business

There was no other business.

The meeting adjourned at 2:36 PM.

SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	July 14, 2021
AGENDA ITEM:	2.B
AGENDA TITLE:	Sustainable Groundwater Management Act (SGMA) Update
PREPARED BY:	Robert Jaques, Technical Program Manager

At the State level:
Since my last update, DWR has released its tentative schedule for conducting the AEM surveys that were reported upon at the last TAC meeting. Here it is:

Basin	Subbasin	Tentative survey dates
Salinas Valley	180/400 (partial)	Mid-July, 2021
	East Side (partial)	
	Forebay	
	Upper Valley	
Paso Robles	Paso Robles	
Cuyama	Cuyama	August , 2021

At the Monterey County level:
Attached are summaries of meetings held in June 2021.

ATTACHMENTS:	Meeting Summaries
RECOMMENDED ACTION:	None required – information only

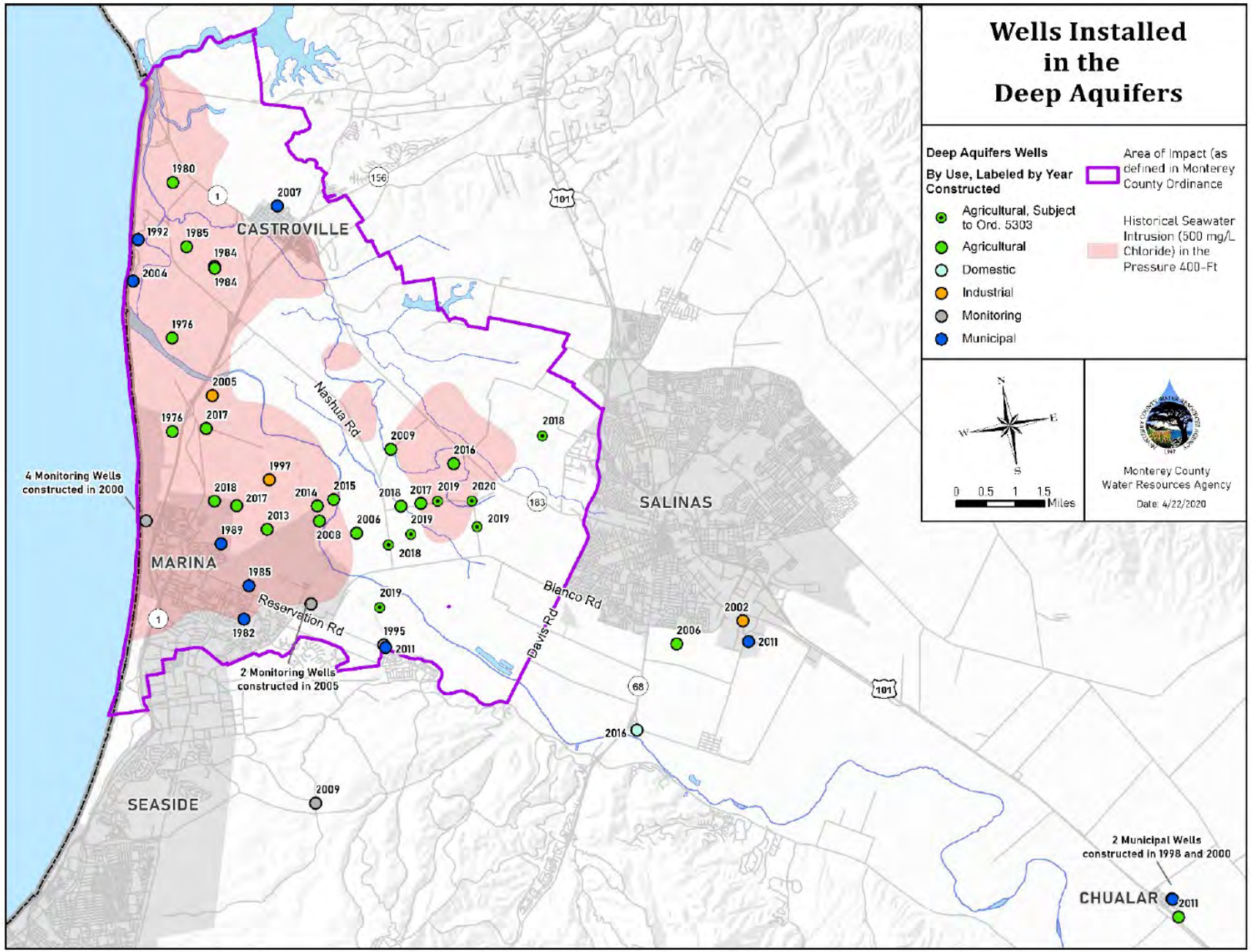
SUMMARY OF PURE WATER MONTEREY, SALINAS VALLEY GROUNDWATER SUSTAINABILITY, AND MARINA COAST WATER DISTRICT GROUNDWATER SUSTAINABILITY ZOOM MEETINGS IN JUNE 2021

Note: This is a synopsis of information from these meetings that may be of interest to the Seaside Basin Watermaster

SVBGSA Advisory Committee Meeting, June 17, 2021

This meeting was attended by Laura Paxton. Topics discussed included:

- As allowable by SGMA, various private parties came forward willing to fund the $155,000 irrigated agriculture portion of the Deep Aquifer Study $1 million funding partnership. The largest non-ag contributor is MCWRA at $400,000. There are 16 Deep Aquifer wells in the Monterey Subbasin at an average depth of 1,269 extracting a total of 2,576 acre-feet in 2018 with an average water level of 24 feet below sea level. A committee member urged Subbasin to Subbasin interactivity be part of the two-year study planned to commence in early 2022.
- In DWR's approval of the 180/400' Aquifer GSP they listed 5 corrections to be made to the approved GSP in 5 years, all but one of which Montgomery and Associates is correcting to submit to DWR in 2022.
- Mr. Farrow of Land Watch submitted a letter to the committee stating that, *"In May 2020, Monterey County permitted its moratorium on Deep Aquifer wells to expire, but the SVGBGSA failed to impose pumping restrictions, despite its authority to do so under Water Code Section 10726.4(a)(2). Since then, Monterey County has resumed issuing permits for Deep Aquifer wells. In 2020, 5 additional high capacity Deep Aquifer wells were constructed, and as of May 3, 2021, there were at least two additional permit applications pending. Pumping from the Deep Aquifers is now more than two and a half times the level that was projected to induce seawater intrusion in the upper aquifers and potentially intrude contaminated groundwater into the Deep Aquifers themselves."*
- Committee Member Bean moved to recommend to the SVBGSA Board that it place a moratorium on extractions from the Deep Aquifers until the Deep Aquifer Study is conducted, with case-by-case consideration for the City of Marina and Castroville. However the motion could not be carried through until a future meeting when such an item for action is placed on the agenda. The figure below shows the locations and types of use of wells that are in the Deep Aquifers. Further information on the Deep Aquifers can be found at: https://www.co.monterey.ca.us/home/showpublisheddocument/90578/637255787124030000
- General Manager Meyers and Legal Counsel Girard had meeting conflicts at 4:00pm so the meeting ended. Presentations on the draft chapter items that weren't covered in the meeting (not for the Monterey Subbasin) were emailed to committee members for review and comment in lieu of holding a special meeting to accept.


Wells Installed in the Deep Aquifers
Deep Aquifers Wells
By Use, Labeled by Year Constructed
Agricultural, Subject to Ord. 5303
Agricultural
Domestic
Industrial
Monitoring
Municipal
Area of Impact (as defined in Monterey County Ordinance
Historical Seawater Intrusion (500 mg/L Chloride) in the Pressure 400-Ft
0 0.5 1 1.5 Miles
Monterey County Water Resources Agency
Date: 4/22/2020
CASTROVILLE
SALINAS
MARINA
SEASIDE
CHUALAR
Nashua Rd
Blanco Rd
Davis Rd
Reservation Rd
4 Monitoring Wells constructed in 2000
2 Monitoring Wells constructed in 2005
2 Municipal Wells constructed in 1998 and 2000

SVBGSA Seawater Intrusion Work Group (SWIG) meeting, June 28, 2021

Topics discussed included:

- For the Deep Aquifer Study a cooperative funding agreement is being formed to generate the needed funds for this work. Included in the agreement are MCWRA, Monterey County, the SVBGSA, City of Salinas, MCWD, Cal Water, Castroville CSD, Alco, and the agricultural community. Collectively these parties intend to provide $1M to help fund this work.
- The GSP for the 180'/400' Subbasin has been approved by DWR with only a few revisions being requested.
- With regard to seawater intrusion, a survey of SWIG members was conducted to get their input on what needs to be monitored, what data should be reported, how seawater intrusion can be managed, where monitoring should be performed, etc.
- Representatives of MCWRA provided a PowerPoint presentation on drought conditions in Monterey County, and the State. Monterey County is experiencing "extreme drought conditions." If these continue in future years, MCWRA anticipates that the areas affected by SWI will continue to grow in size and that groundwater levels will continue to fall as more pumping occurs.
- The Castroville Seawater Intrusion Program (CSIP) has greatly reduced the size of the SWI area in the lower Salinas Valley, but SWI is going around the CSIP area and more downward migration of shallow intruded water is being detected. Drought conditions will cause MCWRA to ask growers to modify irrigation procedures to reduce pumping.
- The next SWIG meeting is scheduled for July 25.

SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	July 14, 2021
AGENDA ITEM:	3
AGENDA TITLE:	Update on Water Quality Issues at Monitoring Well FO-9 Shallow
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

As discussed at prior TAC and Board meetings, Monitoring Well FO-9 Shallow has been determined to have a leaking casing and will need to be destroyed. Martin Feeney reports that he has had the destruction plan approved by the County, and that he is working on the special provisions of the specifications package that he will be providing the MPWMD. It is expected that MPWMD will assemble a bid package and put the destruction work out to bid, with the work to potentially be performed in August.

Mr. Lear had nothing substantial to report regarding cost-sharing for installation of a replacement well. He said the item still needs to go through MPWMD Committees.

ATTACHMENTS:	None
RECOMMENDED ACTION:	None required – information only

SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	July 14, 2021
AGENDA ITEM:	4
AGENDA TITLE:	Continued Discussion of 2012 Cross-Aquifer Contamination Study and Development of Recommendations
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

At its June 9, 2021 meeting the TAC discussed the 2012 Cross-Aquifer Contamination Study. The TAC wanted to continue discussion of the topic of conductivity profiling the four yellow-colored and the one orange-colored well in Figure 6 of that Study (attached) that are nearest the coast and are geographically far enough apart to potentially provide useful information at a modest cost.

Jon Lear of MPWMD provided the following background and well identification information about these wells. The purpose of the Study was to identify wells through multiple datasets that if still existed could be potential cross-contamination threats if contamination was discovered. Figure 6 indicates the wells identified by data requests from multiple sources for field inspection, not knowing if they even existed at the time of the 2012 study. Not all of the wells on this map were found when conducting the field inspections, but evidence of a well was found in the data analysis so the status of some of the wells remains unknown.

The Southernmost yellow well is a cathode protection well owned by PGE, it was flagged because the construction of the seal in not known and it is shallow, so it could be a conduit if contamination were identified in this area. It was located in the south sidewalk of Contra Costa St.

The next yellow well north is identified as the Seaside Sanitary District and was identified as being drilled at the end of Contra Costa St. in Seaside. The well was not located in the area between Contra Costa St. and HWY1.

The next yellow well north and a little inland is named GJ No 1. It was not clear from the well log the exact location of the well, but there appears to be an old well in the Luzern Yard where CalAm has their current Luzern well.

The northern most yellow well is named MW-B-32-180 and it was an Army monitoring well. If it still exists it is in the field west of the Coe Ave well owned by Seaside. In 2012 MPWMD staff swept the field with a metal detector and did not find the well. It could have been destroyed by the Army when they destroyed a good portion of their BW well network in the late 2000's.

The Orange well is either FO test Hole B or C drilled by the Army in 1941 and 1964 respectively. They were flagged due to the age and steel casing and were not located with a metal detector in the area North of the Reservoir well owned by Seaside.

SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

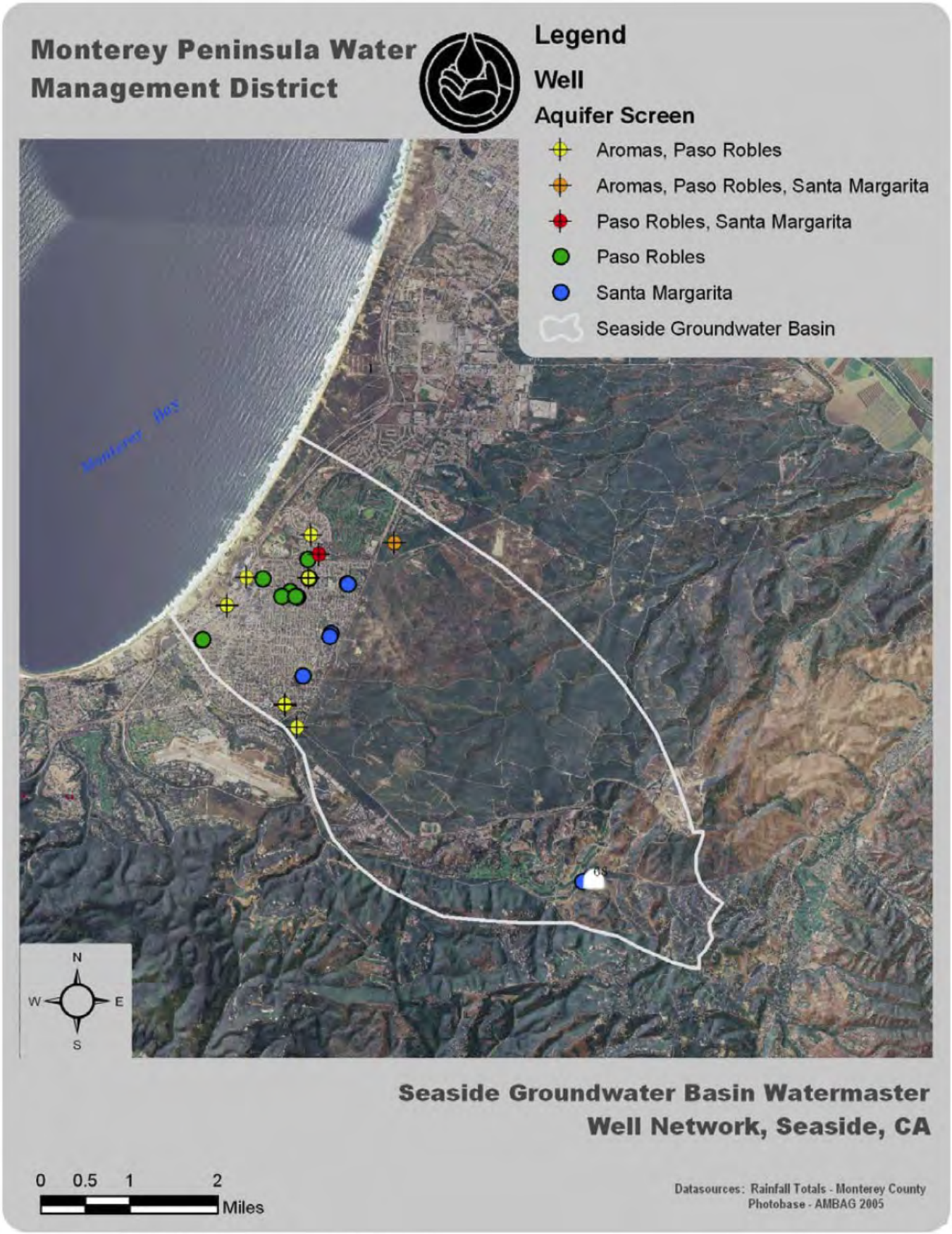
**** * * AGENDA TRANSMITTAL FORM * * ****

AGENDA ITEM:	4 (Continued)

From this information it does not appear that it would be feasible to pursue conducting conductivity profiling in any of these wells.

ATTACHMENTS:	Figure 6 from the 2012 Cross-Aquifer Contamination Study
RECOMMENDED ACTION:	Provide direction to the Technical Program Manager about performing conductivity profiling of these wells

FIGURE 6: WELLS FIELD INSPECTED BY MPWMD



SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	July 14, 2021
AGENDA ITEM:	5
AGENDA TITLE:	Discuss Pros/Cons of Preparing a Sustainable Yield Analysis
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

Over the past several years the TAC and Board have discussed the pros and cons of changing the management approach for the Seaside Basin from the Natural Safe Yield (NSY) approach that was used in the Adjudication Decision to a Sustainable Yield (SY) approach. Attached is background information on this topic, as previously presented to the TAC and Board.

Attachment 1 contains the Proposal received from Montgomery & Associates in 2019 to perform an SY analysis. As is evident from the Proposal, conducting an SY analysis would be a very expensive undertaking. Attachment 2 contains a summary of pertinent information gained from previous groundwater modeling work. From this modeling work it seems apparent that the Basin cannot sustain pumping at any level without the injection of a new source of water (replenishment water) to raise groundwater levels to protective elevations. Attachment 3 contains a discussion of potential Pros and Cons of developing and using the SY approach.

Based on the information provided in these Attachments, the TAC's prior discussion of these topics at its February and March 2019 meetings, and input from the Producers at their March 21 meeting (discussed in the preceding Agenda item) it is my recommendation that:

1. An SY analysis not be performed at this time.
2. That the concept of using the SY approach to replace the NSY approach be revisited after the Groundwater Sustainability Plan for the Monterey Subbasin of the Salinas Valley Groundwater Basin has been completed, and its impacts on the Seaside Groundwater Basin have been determined.

In thinking further about this, it seems to me that there would be little current value in performing such an analysis, for at least two reasons:

1. Modeling performed in 2013 (HydroMetrics April 5, 2013 Tech Memo titled *"Groundwater Modeling Results of Replenishment Repayment in the Seaside Basin")* concluded that in order to achieve protective groundwater elevations it would be necessary to discontinue all pumping from the Basin for a period of approximately 25 years. In the Decision, one condition that constitutes "Material Injury" is seawater intrusion. To me this means that the sustainable yield will be zero acre-feet per year Basinwide until protective elevations are achieved.

Based on this modeling work, and because of the historical overpumping from the Basin, regardless of the approach that is used for Basin management, be it NSY or SY, continued pumping in the Basin, even at the reduced NSY pumping levels recommended in the Updated Basin Management Action Plan, will not achieve protective groundwater levels. The Basin would continue to be at risk of seawater intrusion. Therefore, in order for the Basin to be sustainable, it will need to have protective groundwater levels achieved. The only practical way of doing this will be to gain access to an additional source(s) of water that can be injected into the Basin to raise groundwater levels (replenishment water), and to maintain them at protective water levels.

For this reason it does not appear to me that there would be any benefit to be gained by performing an SY analysis until protective elevations are first achieved, or at least until a plan and time schedule to achieve

AGENDA ITEM:	5 (Continued)

protective elevations has been developed.

2. The Groundwater Sustainability Plans (GSPs) for the adjacent subareas (Marina-Ord and Toro/Corral de Tierra) of the Monterey Subbasin have not yet been completed. The projects identified in those GSPs in order for those subareas to become groundwater sustainable have not yet been finalized. Since those projects might have an impact on groundwater conditions in the Seaside Basin, it would be better to hold off on performing a Sustainable Yield analysis until those GSPs have been completed and the impact of their projects can be assessed.

I polled Georgina King, Gus Yates, and Derrik Williams for their input and opinions on this topic and their responses are contained in Attachment 3. At Mr. Williams' suggestion, I held a subsequent teleconference with him June 24 during which he elaborated on his input.

This is a complicated topic. Mr. Yate's thoughts about it being unlikely that seawater intrusion will come directly (horizontally) into the Santa Margarita aquifer, or if it does that it will be a slow process, would support performing an SY analysis. The purpose of that analysis would be to determine what pumping reductions would be necessary to stabilize groundwater levels, even if they are below sea level in some parts of the Basin. However, as he notes there is no geologic data to confirm that horizontal intrusion will not occur in that aquifer at some point in time if groundwater levels are below protective elevations, as they currently are in that aquifer.

Mr. Yates concurs with Mr. Williams and Ms. King that downward vertical migration of SWI from the Dune Sands into the Paso Robles aquifer is a concern. Mr. Williams has pointed out in the past that SWI reaching the Paso Robles can eventually itself migrate downward into the Santa Margarita, thus posing a risk to that aquifer as well.

I have invited Mr. Yates and Ms. King to join us in discussing this at today's meeting (Mr. Williams is unavailable for today's meeting), so the TAC can ask questions and seek to reach a determination on whether or not to recommend to the Board that an SY analysis be performed now, or at some point in the future.

ATTACHMENTS:	1. Proposal from Montgomery & Associates to Perform a Sustainable Yield Analysis of the Seaside Basin 2. Summary of pertinent information from previous groundwater modeling work 3. Input from consultants 4. Discussion of potential Pros and Cons of staying with the NSY approach vs. developing and using the SY approach
RECOMMENDED ACTION:	Provide direction to Technical Program Manager regarding performing a Sustainable Yield analysis

Attachment 1

MONTGOMERY & ASSOCIATES
Water Resource Consultants

www.elmontgomery.com
1814 Franklin Street, Ste. 501
Oakland, CA 94612
510.903.0458

February 1, 2019

Mr. Bob Jaques
Seaside Watermaster Technical Program Manager
83 Via Encanto
Monterey, CA 93940

SUBJECT: COST PROPOSAL FOR SEASIDE BASIN SUSTAINABLE YIELD ANALYSIS

Dear Mr. Jaques:

Montgomery & Associates (M&A) appreciates the opportunity to present this scope of work and cost for estimating the Sustainable Yield of the Seaside Basin (Basin).

As described in the recent BMAP Update, the simplified method used to estimate Natural Safe Yield is now recognized as not being complete enough to take into account the complexities of inflows and outflows that are occurring in the Basin, and which ultimately affect the amount of groundwater that can be sustainably pumped from the Basin without causing negative effects. A more complete approach to managing the Basin is to use the Seaside Basin Watermaster model (model) to optimize the amount of pumping that can be sustained (Natural Sustainable Yield) at existing and/or new wells. This Natural Sustainable Yield acknowledges management targets such as stopping declining groundwater levels or meeting protective groundwater elevations. The model is the appropriate tool for integrating the effects of various pumping rates with operating or planned projects in the Basin. It is important that the Technical Advisory Committee (TAC) provide input for determining all the operational parameters and management targets to include in the analysis of Sustainable Yield.

This scope of work outlines tasks to estimate the Natural Sustainable Yield. Tasks include developing management targets and updating the predictive portion of the model. Additional tasks include simulating and optimizing a combination of management actions and supplemental water supply projects to estimate the Natural Sustainable Yield.

The tasks described below may be more than the TAC would like to include in the modeling for the Natural Sustainable Yield analysis, and therefore some tasks are identified as optional tasks in the task heading.

TASK 1. DEVELOP OPERATIONAL PARAMETERS & MANAGEMENT TARGETS

M&A will support the TAC in developing basin-wide operational parameters and management targets to be used in the Natural Sustainable Yield optimization modeling runs. Examples of potential management targets would include managing the Basin's groundwater levels to meet the protective groundwater elevations at the coast, or setting a groundwater elevation target at Laguna Seca wells to halt declining groundwater levels at a level acceptable to the groundwater users.

We anticipate attending and participating in up two TAC meetings in person for this task. The costs for TAC meetings are included in Task 7.

TASK 2. EXTEND PREDICTIVE MODEL CLIMATE

The analysis of Natural Sustainable Yield relies entirely on the predictive portion of the model. There are a number of aspects and underlying assumptions of the predictive model that need to be updated for the model to be comparable to groundwater models being used in the larger Salinas Valley. These updates were not part of the recent model update as that effort was purely to update and calibrate the historical Model.

When the model was developed in 2009, the TAC provided substantial input on assumptions related to how long the predictive period was to be, what future climate to use, and what future pumping to include over the predictive period. We acknowledge that some of these are impossible to forecast exactly, but it is important to use assumptions that reflect current science and Basin understanding and therefore some updates are necessary.

TASK 2.1. EXTEND HISTORICAL HYDROLOGY BASELINE SCENARIO

Since 2009, all predictive simulations using the model have been based on repeating the historical hydrology from the 22-year model calibration period of 1987 – 2008. The current predictive simulation runs from 2009 through 2042. While maintaining this approach allows for direct comparison between new simulations and previous simulations, it does not take advantage of the additional nine years of hydrologic and climatic data that have been incorporated into the historical model. The historical model was updated in 2014 and 2018, and now includes a continuous 31 year hydrologic record from 1987 through 2017. Significantly, this 31-year hydrologic record includes the recent 2012-2015 drought. We propose that this full 31-year historical hydrology and climate dataset be used as basis for all predictive modeling, as this incorporates a broader range of potential climate variability.

There are two options for extending the hydrology for the historical predictive baseline:

1. Simply repeat the 31-year hydrology from 1987 – 2017, so that the baseline scenario is extended out 31-years from 2018 to 2048.

2. Extend the predictive model, based on repeating the new extended historical climate record out to 2070, which is more consistent with the long-term planning horizon that will be used in neighboring basins under SGMA compliance.

From the perspective of the Natural Sustainable Yield analysis, there is a strong benefit to having a longer extended predictive simulation period (e.g. out to 2070 instead of 2048). As will be further discussed below in Task 5, the analysis consists of first identifying a shorter-term Basin yield which allows groundwater levels to reach their management targets within a defined time-frame, and then estimating an increased longer-term Natural Sustainable Yield that keeps levels at these targets into the future. Having a longer extended simulation period allows for more flexibility on selecting a reasonable time-frame over which management targets can be met without having to ramp production down too quickly, and it also provides a longer period over which to evaluate the longer-term Natural Sustainable Yield, taking into account historical variability in hydrology and climate.

The updated and extended baseline model will be run and processed to produce a baseline water budget and hydrographs to be used for comparison against subsequent simulations.

TASK 2.2. CONVERT HISTORICAL CLIMATE BASELINE SCENARIO MODEL TO FUTURE CLIMATE CONDITION MODEL (OPTIONAL)

Previous predictive model simulations for the basin have not taken the effects of likely climate change into account: including projected changes in precipitation, temperature, and evapotranspiration. These are projected future conditions that would impact the magnitude and timing of both natural groundwater recharge and surface water deliveries to the Basin. If the TAC feels that management of the Basin should take into account climate change, we propose modifying the baseline predictive simulation model with projected future climate conditions.

For this task we will leverage new California-specific climate change datasets, data preparation tools, and guidance that have been developed by DWR in support of SGMA Groundwater Sustainability Plan development (DWR, 2018). DWR provides basin-specific climate change factors that allow historical hydrology and climatological data to be converted into datasets representative of projected near-future climate conditions in 2030, and late-future climate conditions in 2070. Depending on the degree of climate change uncertainty to be considered, datasets can be chosen that represent three different climate scenarios including Central Tendency, Drier with Extreme Warming, and Wetter with Moderate Warming. A single climate change scenario will be selected in consultation with the TAC, and the DWR climate change factors will be applied to inputs of the historical climate model to represent future climate conditions and hydrology.

TASK 3. INCORPORATE SEA LEVEL RISE AT OCEAN BOUNDARIES (OPTIONAL)

In this task we will incorporate estimates of projected sea level rise over the next century into the predictive model simulation by adjusting the head boundary conditions specified along the ocean boundary. Generally speaking, sea level rise is expected to increase seawater intrusion and/or the risk of sea water intrusion in coastal aquifers, though the magnitude of the effects due to sea level rise alone are highly dependent on local conditions. The sea level rise estimates will be based on the projected levels for Monterey Bay from the 2018 update of the State of California Sea-Level Rise Guidance document recently released by the California Ocean Protection Council (OPC, 2018). It should be noted that adjustments to the sea level elevations will also entail simple equivalent adjustments to the protective head elevations as they are tied to sea level.

TASK 4. INCORPORATE ALL EXISTING AND APPROVED/PLANNED SUPPLEMENTAL SUPPLY PROJECTS INTO BASELINE MODEL

We will update the predictive model to include various supplemental supply projects likely to be, or are in the process of being, constructed, as described in the 2019 BMAP Update. TAC involvement will be crucial to developing a predictive model that incorporates all of the projects envisioned over the predictive period, such as the Monterey Peninsula Water Supply Project (MPWSP), the Regional Urban Water Augmentation Project (RUWAP), Carmel River water ASR, and potentially other projects such as stormwater recharge projects. M&A will work with the TAC to finalize a list of projects and their planned implementation schedule. For costing purposes we have assumed incorporating up to three new projects not previously modeled and extending previously modeled projects.

The Pure Water Monterey project and existing phases of the Carmel River water ASR have already been modeled through 2041 but operational assumptions will need to be extended through the end of the predictive model period if it is extended, and other operational changes may be incorporated, such as increasing recharge if additional water sources such as RUWAP are included. We assume we will receive technical support from MPWMD who will provide recharge volumes based on climate, similar to what they have provided us before.

TASK 5. OPTIMIZATION SCENARIO SIMULATIONS

TASK 5.1. PREPARE SCENARIO INPUTS AND SETUP SUSTAINABLE OPTIMIZATION MODEL

M&A will work with the TAC to identify production wells that will be used in optimization. This may include only the Standard Producers, or a combination of Standard and Alternate Producers. There are other potential management actions such as installing new wells in either the Southern Coastal Subarea or the Northern Inland Subarea, or shifting a portion of production to these new wells, but this will likely require development of a separate scenario and therefore additional budget. Costs for development of additional scenarios are provided as an optional line item in the budget.

Given the management targets from Task 1 and wells identified for use in optimization, the USGS MODFLOW Groundwater Management Optimization process (GWM) will be configured to optimize average production rates at a predetermined set of wells such that the defined management targets at specific locations (e.g. groundwater levels) are met within a specified time frame and then maintained at those levels in the future. There will be two different Basin yields estimated. The first will be the yield that allows the Basin to achieve its management targets, and the second will be the Natural Sustainable Yield. Reaching management targets will require pumping less than the Natural Sustainable Yield until targets are achieved, thereafter, the Basin yield can be increased to the Natural Safe Yield that keeps groundwater levels at Basin management targets.

For costing purposes, we assume that a single set of management targets to be met within a single defined time frame will be used for the scenario, and that if multiple scenarios are developed, they will be based on the same baseline climate model (e.g. either Historical Climate or Climate Change Baseline).

TASK 5.2. RUN AND PROCESS OPTIMIZATION SCENARIO

In this task we will run the optimization model and process the model results, and document the scenario and the results with hydrographs and maps, along with a brief text summary.

TASK 6. PREPARE TECHNICAL MEMORANDUM

We will prepare a technical memorandum which documents Task 1 through 5, with a synthesis of the model optimization results and water budgets and Natural Sustainable Yield analysis for the Basin based on the identified management targets. For costing purposes we assume preparing one draft, responding to and addressing one round of review comments, and one final version of the report. The report will be provided in MSWord and PDF formats.

TASK 7. ATTEND TAC AND BOARD MEETINGS

In support of Tasks 1 – 5, to get input and direction from the TAC, and to report on progress and findings, we will prepare presentations and attend those monthly TAC meetings at which this work will be discussed. For costing purposes we assume preparing for and attending up to five TAC meetings. One in-person Board meeting is also included to present the findings of the analysis. Should the number of meetings be more than those assumed above, additional budget will be required to prepare for and attend those meetings.

MODELING CONTINGENCY

Modeling the long-term optimization of integrated groundwater management at a basin-wide scale is a complex process with several technical challenges that can arise and can lead to additional effort not originally scoped out. For this reason we have allocated a contingency budget corresponding to 40 additional hours of modeling effort (11% of the lead modeling effort for Tasks 2- 5) to address unexpected model integration or optimization issues that may arise during the modeling components of the project. This contingency task budget will not be used without prior consultation and approval from the client.

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PROJECT BUDGET AND SCHEDULE

We anticipate that this work can be completed within an eight month period, though the timing may depend on the scheduling of TAC and Board meetings. We can begin work on this immediately following notice to proceed.

The total estimate costs for these tasks is $133,035 as detailed in the attached cost table. As mentioned previously, there are a few optional tasks that we have included which may need to be discussed at the Technical Advisory Committee level.

Please feel free to contact us with any questions about the proposed scope of work and budget.

Sincerely,

Derrik Williams

Derrik Williams, Principal Hydrogeologist
E.L. MONTGOMERY & ASSOCIATES

Georgina King, Senior Hydrogeologist
E.L. MONTGOMERY & ASSOCIATES

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Cost Estimate for Seaside Basin Watermaster Sustainable Yield Modeling Analysis									
		Montgomery & Associates Labor						Other Direct Costs	TOTALS
		Scientist VIII	Scientist VI	Scientist V	Scientist III	Labor Total			
		D. Williams	G. King	P. Benito	N. Byler				
Task	Hourly Rates	$225	$200	$185	$145	Hours	($)	($)	
1.0	**Develop Operational Parameters & Management Targets**								
	Support TAC in developing Operational Parameters & Management Targets	8	32	36	0	76	$14,860	$0	$14,860
	Task 1 Subtotal	*8*	*32*	*36*	*0*	*76*	*$14,860*	*$0*	*$14,860*
2.0	**Extend Predictive Model Climate**								
2.1	Option 1: Extend Historical Hydrology Baseline Scenario to 2048	0	2	24	0	26	$4,840	$0	$4,840
	Option 2: Extend Historical Hydrologic Baseline Scenario to 2070	0	2	32	0	34	$6,320	$0	$6,320
	Run and Process Model Results	0	0	12	0	12	$2,220	$0	$2,220
	Document Results and Water Budget	1	1	12	4	18	$3,225	$0	$3,225
2.2	Convert Historical Climate Baseline Model to Future Climate Condition Model (Optional)	2	4	60	0	66	$12,350	$0	$12,350
	Run and Process Model Results	0	0	12	0	12	$2,220	$0	$2,220
	Document Results and Water Budget	1	1	12	4	18	$3,225	$0	$3,225
	Task 2 Subtotal (with Option 2 for Task 2.1)	*4*	*8*	*140*	*8*	*160*	*$29,560*	*$0*	*$29,560*
3.0	**Incorporate Sea Level Rise at Ocean Boundaries (Optional)**								
	Adjust General Head Boundaries to account for predicted sea level rise rate over model period	2	4	16	0	22	$4,210	$0	$4,210
	Optional Task 3 Subtotal	*2*	*4*	*16*	*0*	*22*	*$4,210*	*$0*	*$4,210*
4.0	**Incorporate All Existing and Approved/Planned Supplemental Supply Projects Into Baseline Predictive Model**								
	Set up modified input files including projects	2	4	32	4	42	$7,750	$0	$7,750
	Run and Process Model Results	0	0	12	0	12	$2,220	$0	$2,220
	Document Results and Water Budget	1	1	12	4	18	$3,225	$0	$3,225
	Task 4 Subtotal	*3*	*5*	*56*	*8*	*72*	*$13,195*	*$0*	*$13,195*
5.0	**Optimization Scenario Simulations**								
5.1	Prepare Scenario Inputs and Setup Sustainable Optimization Model	2	8	40	0	50	$9,450	$0	$9,450
5.2	Run and Process Optimization Scenario								
	Run and Process Model Results	0	1	12	0	13	$2,420	$0	$2,420
	Document Results and Water Budget	2	2	12	4	20	$3,650	$0	$3,650
	Task 5 Subtotal	*4*	*11*	*64*	*4*	*83*	*$15,520*	*$0*	*$15,520*
6.0	**Prepare Technical Memorandum**								
	Synthesize Simulation Results and Develop Sustainable Yield	8	30	40	32	110	$19,840	$0	$19,840
	Task 6 Subtotal	*8*	*30*	*40*	*32*	*110*	*$19,840*	*$0*	*$19,840*

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		Montgomery & Associates Labor						Other Direct Costs	TOTALS
		Scientist VIII	Scientist VI	Scientist V	Scientist III	Labor Total			
		D. Williams	G. King	P. Benito	N. Byler				
Task	Hourly Rates	$225	$200	$185	$145	Hours	($)	($)	
7.0	**TAC and Board Meetings**								
	Prepare for and attend up to five onsite TAC meetings and one Board meeting	16	80	16	0	112	$22,560	$1,050	$23,610
	Task 7 Subtotal	*16*	*80*	*16*	*0*	*112*	*$22,560*	*$1,050*	*$23,610*
	Modeling Contingency (11%)								
	Contingency for Modeling Tasks 2-5	0	0	40	0	40	$7,400	$0	$7,400
	Task 9 Subtotal	*0*	*0*	*0*	*0*	*40*	*$7,400*	*$0*	*$7,400*
	Total (with Option 2 for Task 2.1)	**45**	**172**	**392**	**52**	**701**	**$131,985**	**$1,050**	**$133,035**
	Total without Optional Task 2.2. and 3	**40**	**163**	**292**	**48**	**583**	**$109,980**	**$1,050**	**$111,030**

Additional Optimization Scenarios								
Prepare for and Setup Optimization Model	2	8	32	0	42	$7,970	$0	$7,970
Run and Process Optimization Scenario								
Run and Process Model Results	0	1	12	0	13	$2,420	$0	$2,420
Document Results and Water Budget	2	2	12	4	20	$3,650	$0	$3,650
Additional Optimization Scenario Total	*4*	*11*	*56*	*4*	*75*	*$14,040*	*$0*	*$14,040*

Attachment 2

Summary of Pertinent Information from Previous Groundwater Modeling Work

The information provided below comes from modeling reports prepared for the Watermaster by HydroMetrics.

Report Title: *Seaside Groundwater Basin Modeling and Protective Groundwater Elevations*
Report Date: November 2009
Pertinent Findings/Conclusions:

1. The Decision-required triennial pumping reductions will result in a slow increase in most groundwater elevations. They will decrease, but not eliminate, inflow from the ocean into the Basin.
2. The "Physical Solution" required in the Decision, consisting of triennial pumping reductions until pumping has been reduced to a Natural Safe Yield of 3,000 AFY, by itself will not achieve protective groundwater level elevations.
3. Significant injection of water that is left in storage and not taken out through pumping is the most successful means of raising groundwater elevations to protective water level elevations.
4. It will take a long time for the Santa Margarita aquifer to achieve protective water levels without artificial recharge. This is because the Santa Margarita aquifer is highly confined and does not receive significant deep percolation recharge near the coastline.
5. The amount of water in storage is highly dependent on rainfall. Artificial recharge will increase the amount of groundwater in storage.
6. New wells in the Paso Robles aquifer will be required in order to recover much of the stored groundwater.
7. Moving California American Water's major production wells inland has little benefit and is therefore a not a good option to pursue.
8. The quantity of groundwater flowing into and out of the Seaside Basin, from or to the Salinas Valley Basin, is highly dependent on groundwater elevations in the Salinas Valley Basin.

Report Title: *Groundwater Modeling Results of Temporary Suspension of Triennial Pumping Reductions*
Report Date: September 2012
Pertinent Findings/Conclusions:

1. Skipping one triennial pumping reduction for a three-year period from 2011 to 2014 would have a negligible effect on the rate of advance of seawater intrusion (less than 0.001 feet per day of change).
2. Groundwater levels would reach the same levels by 2031 as they would if the pumping reduction had not been skipped.

Report Title: *Groundwater Modeling Results of Replenishment Repayment in the Seaside Basin*
Report Date: April 2013
Pertinent Findings/Conclusions:

1. The protective water level elevations developed in 2009 remain reasonable targets for groundwater management and should not be lowered.
2. California American Water's 25-year, 700 AFY, replenishment payback plan raises shallow aquifer groundwater levels by about 1 to 1.5 feet, and deep aquifer groundwater levels by about 3 feet, but does not achieve protective water level elevations in any of the six protective water level wells, except PCA-West-Shallow, which is already above its protective water level elevation.

3. Stopping all Standard and Alternative Production pumping beginning in 2017 (which would reduce Basinwide pumping by approximately 2,000 AFY) would finally achieve protective water level elevations in all six of the protective water level wells by 2041 (the assumed end of the 25 year payback used for this scenario.)
4. Assuming the 25-year, 700 AFY, repayment plan began in 2017, and 1,000 AFY of water was injected at the four ASR wells near General Jim Moore Boulevard and left stored in the Basin and not pumped back out, protective water levels would be achieved in all six of the protective water level wells by 2041.

Report Title: *Groundwater Modeling Results of Coastal Injection in the Seaside Basin*
Report Date: July 2013
Pertinent Findings/Conclusions:

1. All of the findings and conclusions listed below are based on the assumption that Cal Am's replenishment repayment program of forgoing 700 AFY of pumping for a period of 25 years is being carried out.
2. Coastal groundwater levels in the Santa Margarita aquifer reach protective groundwater level elevations one to ten years faster, and with less injected water, if injection is performed near the coast rather than inland at the General Jim Moore Boulevard ASR well locations.
3. Coastal groundwater levels in the Paso Robles aquifer reach protective water level elevations at similar times with injection at either the coastal or General Jim Moore Boulevard locations.
4. In order to achieve protective water level elevations in all six of the coastal wells for which protective water levels were developed, over a 25-year injection period only 850 AFY of injection is required using coastal injection wells compared to 1,000 AFY required at the General Jim Moore Boulevard ASR well locations.
5. Injection rates higher than those mentioned in item 3 above would shorten the time needed to achieve protective water level elevations.
6. After coastal protective water level elevations are achieved, injection of 850 AFY would need to be continued indefinitely at coastal injection wells in order to keep groundwater levels above protective water level elevations.

Report Title: *Results of Laguna Seca Safe Yield Analysis (Revised)*
Report Date: July 2014
Pertinent Findings/Conclusions:

1. The Laguna Seca Subarea Natural Safe Yield was estimated to be 240 AFY. The Decision used 608 AFY with no explanation of the basis for that value.
2. Stopping all California American Water Laguna Seca Subarea pumping stabilizes groundwater level elevations in the western portion of the subarea, but they continue to decline in the central and eastern portions of the subarea.
3. Stopping all Laguna Seca Subarea pumping (pumping by California American Water and all Alternative Producers) results in stable or rising groundwater levels in the western and central portions of the subarea, but groundwater level declines continue in the eastern portion of the subarea.
4. There is significantly more pumping just east of the Laguna Seca Subarea (within the Salinas Valley Basin and outside of the Seaside Basin boundary) than the total pumping that occurs within the Laguna Seca Subarea itself.
5. Groundwater levels in the eastern portion of the Laguna Seca Subarea are heavily influenced by pumping from outside of the Seaside Basin.

Report Title: *Groundwater Flow Divides Within and East of the Laguna Seca Subarea*
Report Date: January 2016

Pertinent Findings/Conclusions:

1. Under anticipated future pumping conditions, groundwater elevations in the Laguna Seca Subarea will continue to decline. The eastern portion of the Laguna Seca Subarea will suffer the greatest and most persistent declines.
2. Pumping by wells located to the east of the Laguna Seca Subarea, outside of the Seaside Basin boundary and in the Salinas Valley Basin, affect groundwater levels in the Laguna Seca Subarea by diverting groundwater which would otherwise flow into, and thus recharge, the Laguna Seca Subarea. This diversion results in lowering groundwater levels in the Laguna Seca Subarea.
3. Flow currently goes into the Laguna Seca Subarea from the southeast (from the adjacent portion of the Salinas Valley Basin outside of the Seaside Basin boundary), and flows through the Laguna Seca Subarea to the west into the Southern Coastal Subarea and to the northeast into the Northern Inland Subarea.
4. With reduced pumping in the Laguna Seca Subarea in the future, groundwater levels will rise within this subarea and the flow divide between this subarea and the adjacent Salinas Valley Basin will move west.
5. Because of this flow divide movement, reduced pumping in the Laguna Seca Subarea in the future will result in some flow leaving the Laguna Seca subarea and flowing into the Corral de Tierra subbasin of the Salinas Valley Basin.

Attachment 3

Input from Consultants

The following request for opinion/input was sent to three of the Watermaster's hydrogeologic consultants (Derrik Williams, Georgina King, and Guy Yates):

Over the past several years the Watermaster TAC and Board have discussed the pros and cons of changing the management approach for the Seaside Basin from the Natural Safe Yield (NSY) approach that was used in the Adjudication Decision to a Sustainable Yield (SY) approach. This topic has recently come up for discussion again as a result of the recent scare that seawater intrusion might have been detected in Monitoring Well FO-9 Shallow (subsequently determined not to be occurring with increasing chloride levels attributed to a leaking casing in that well).

Modeling performed in 2013 (HydroMetrics April 5, 2013 Tech Memo titled "Groundwater Modeling Results of Replenishment Repayment in the Seaside Basin") concluded that in order to achieve protective groundwater elevations it would be necessary to discontinue all pumping from the Basin for a period of approximately 25 years. In the Decision, one condition that constitutes "Material Injury" is seawater intrusion. To me this means that the sustainable yield will be zero acre-feet per year Basinwide until protective elevations are achieved.

Based on this modeling work, and because of the historical overpumping from the Basin, regardless of the approach that is used for Basin management, be it NSY or SY, continued pumping in the Basin, even at the reduced NSY pumping levels recommended in the Updated Basin Management Action Plan, will not achieve protective groundwater levels. The Basin would continue to be at risk of seawater intrusion. Therefore, in order for the Basin to be sustainable, it will need to have protective groundwater levels achieved. The only practical way of doing this will be to gain access to an additional source(s) of water that can be injected into the Basin to raise groundwater levels (replenishment water), and to maintain them at protective water levels.

With this background, and if my understanding is correct, there does not appear to be any benefit that would be gained by performing an SY analysis until protective elevations are first achieved.

I want to put this topic back before the TAC for further discussion at its July 14th meeting, and would greatly appreciate your respective input and opinions on this topic. Particularly whether you agree that there would be no benefit to performing an SY analysis until protective elevations have been achieved, or at least until a plan and time schedule to achieve protective elevations has been developed.

Their responses were as follows:

Gus Yates:

I am not a fan of the concept of Natural Safe Yield. It is static. It implies that a basin has some natural, fixed endowment of water that is an intrinsic part of the basin. In reality, yield is very much influenced by land use and water use, which change over time. In my opinion, sustainable yield is conceptually a more realistic basis for managing a basin.

I do not necessarily equate sustainability with raising all groundwater levels to protective elevations above sea level, for a couple of reasons. First, we have empirical evidence that the connection between the deeper aquifers and the ocean is weak or slow. This is evidenced by the fact that intrusion has not appeared after decades of water levels below sea level. In basins with physical barriers between onshore aquifers and the ocean, operating with water levels below sea level might be sustainable for a very long time. In San Bruno, for example, water levels at municipal wells located 1-2 miles from San Francisco Bay have been about 200 ft below sea level since at least the 1980s. In that case, a buried bedrock ridge

combined with extensive Bay Mud deposits provide a physical barrier that prevents or impedes intrusion. In the Seaside case, we can't prove the existence of such a barrier other than the fact that intrusion has been slow to arrive. In contrast, intrusion was detected in the adjacent Salinas Valley by the 1930s, only 1-2 decades after the introduction of high-capacity turbine well pumps.

Second, water levels can be below sea level in inland pumping troughs as long as they are above sea level between the trough and the coast. This has long been true in the Paso Robles aquifer in Seaside, for example. Alternatively, intrusion barriers can be created by a line of injection wells between the trough and the coast. This strategy has worked successfully in the West Basin in Los Angeles for 60 years. Or the Santa Margarita pumping trough could be moved farther inland to allow water levels closer to the coast to rise.

If horizontal intrusion does arrive, I expect it to do so gradually. And I have already listed two actions that could address it. I am more inclined to define sustainability as the absence of intrusion rather than the achievement of protective water levels throughout the basin. This provides more flexibility for management while avoiding undesirable results.

Finally, I concur with Derrik and Georgina that intrusion by downward movement of shallow saline groundwater should be given as much attention as the more traditional intrusion by horizontal movement of a saltwater-freshwater interface.

I don't know of a straightforward way to monitor downward movement of saline water, except possibly by water quality fingerprinting. Vertical flow is across layering and is typically even more localized than horizontal flow. That rules out "sentry" shallow wells, which would almost certainly miss the locations where vertical flow is occurring. If saline water does arrive at a deeper well, a post-facto study like the one Martin did with FO-9 and FO-10 might help determine whether the water arrived vertically or horizontally.

If saline water in shallow depth intervals picks up some kind of unique water quality signature (e.g. from the Aromas Sand), that might allow vertical movement to be differentiated from horizontal movement.

For horizontal flow, sentry wells won't intercept the intrusion with 100% certainty; again, due to preferential flow paths. This happened in Los Osos, for example, where intrusion bypassed a coastal monitoring well and arrived at a municipal supply well farther inland. Don't get me wrong: sentry wells are a good idea. It's just that they are not 100% reliable.

Short answer: no easy solution.

Derrik Williams:

Before I answer your questions about natural safe yield and sustainable yield, I would make one clarification to your statement about recently observed chloride increases. I don't think it's quite accurate to say no seawater intrusion has been observed. I think it is more accurate to say that we believe the mechanism for seawater intrusion is vertical leakage from shallow sediments: either through preferred vertical hydrogeologic pathways, or (more likely) through leaking wells. Although a seemingly minor change, you will see how it is important for my discussion of sustainable yields.

You bring up some good points about the natural safe yield and the sustainable yield. You are correct that we would estimate the sustainable yield by calculating how much pumping can be obtained from existing wells in order to stabilize groundwater elevations. However, many of the groundwater elevations will be stabilized below sea level; resulting in an ongoing threat of seawater intrusion.

While horizontal migration of seawater in the deep aquifers may be slow, stabilizing such low groundwater elevations in the deep aquifers could result in vertical migration of seawater similar to what was seen in monitoring wells F-09 and F-10. Highly saline water could migrate downward through preferred vertical hydrogeologic pathways, or through leaky wells. My feeling is that vertical leakage of saline water would be viewed as material injury in the same way as horizontal migration of saline water.

Gus is correct that monitoring vertical movement is difficult. Preventing vertical movement is the same as preventing any movement of seawater intrusion: either prevent it from entering the shallow sediments in the first place, or eliminate the downward gradients that drive the vertical movement (raise deep groundwater elevations).

I agree that achieving and maintaining protective groundwater elevations is an important part of long-term basin management. We might consider combining the sustainable yield and protective elevation studies into one study. I would suggest we don't view them as independent questions, but rather as a single management question: "How do we achieve and maintain protective groundwater elevations while maximizing the use of the Seaside groundwater basin?" Or something along those lines.

Georgina King:

When I read Bob's email, my thought was just like Derrik's. The protective elevations and SY need to be related to each other. As part of the BMAP, we did a model run to see how much we would need to reduce pumping to achieve protective elevations at the coast taking into account our understanding of PWM at that time (2018). From pages 43 and 44 of the BMAP:

> *Surfaces [groundwater elevation contours that are at protective elevations at the coast] for both shallow and deep aquifers were generated using the groundwater model that was updated in early 2018 to determine what the groundwater elevations would look like if groundwater pumping was reduced to the point that protective groundwater elevations were met. CAWC's Ord Grove 2 and Paralta production wells, which are screened mostly in the deep aquifer, were used to reduce pumping. Their adjusted annual pumping was reduced by 50% and 83% of projected pumping, respectively, which resulted in an average annual reduction of 1,800 acre-feet per year.*

So this already gives us an idea of what it would take to achieve protective elevations: groundwater replenishment or supplemental supply of 1,800 AFY. The sustainable yield is strongly linked to how the basin is operated as opposed to natural safe yield which is just based on how much natural recharge is happening. In order for the basin to be sustainable, there are a set of criteria that guide how the Sustainable Yield calculation is done. For the GSPs we [Montgomery & Associates]work on (two have been approved by DWR), we have said that the sustainable yield is the amount of water that can be pumped without causing undesirable results for the other sustainability indicators, of which seawater intrusion is one of the 6.

[Note from Mr. Jaques. Here is additional text from page 45 of the 2018 BMAP Update to amplify the text cited by Ms. King above:

> *The predictive runs also used projected injections and extractions simulated for the Pure Water Monterey project (described in Section 4.2.1) EIR. This surface would look very different if other projects were included. Note that this revised contour surface is less of a hypothetical surface than the Ghyben-Herzberg surface because it represents a surface that can actually be achieved and results from predicted pumping and injection, whereas the previous protective level surface did not. If new production wells are constructed and pumped, they may impact coastal groundwater elevations and require redistribution or reduction in pumping so that protective groundwater*

elevations can be met. The purpose of the contours is to produce a groundwater surface that could be used to estimate useable stored groundwater.

Attachment 4

Discussion Paper of Potential Pros and Cons of Using the Sustainable Yield Approach in Place of Using Natural Safe Yield for Basin Management

Natural Safe Yield Approach

Discussion. The Adjudication Decision ("Decision") uses the Natural Safe Yield (NSY) approach to establish the total quantity of water that producers may pump from the Seaside Basin, and to allocate that quantity amongst the various producers. Under the NSY approach used in the Decision, Alternative Producers have first rights to the NSY, and Standard Producers share in the amount of NSY remaining after the Alternative Producer allocations have been made. The Decision established an initial Basin-wide NSY at 3,000 AFY, and allocated 1,387 AFY of this NSY to Alternative Producers. That left 3,000 – 1,387 = 1,613 AFY to be divided among the Standard Producers. Subsequent to the date of the Decision, one of the Alternative Producers converted part of its allocation to a Standard Producer allocation, which had the effect of increasing the 1,613 AFY figure to 1,621 AFY. If the lower NSY of 2,370 AFY reported in the Updated BMAP were to replace the Decision's initial NSY of 3,000 AFY, the Standard Producers would need to reduce their collective annual pumping to 2,370 – 1,379 = 991 AFY. This means the Standard Producers would have to reduce their pumping by an additional 630 AFY.

It would likely be very difficult if not impossible for some of the Standard Producers, particularly Cal Am and the Seaside Municipal system, to accomplish making these additional pumping reductions while still supplying the water demands of their customers.

Pros and Cons of Continuing to Use the NSY Approach for Basin Management.

PROS	CONS
1. This is the approach prescribed by the Decision, so no change from the current approach would be required.	1. There are some oversights in the numbers included in the Decision which slightly complicate the calculation of Producers' water rights after the pumping ramp-downs are all completed. However, this should be fairly easy to work through.
2. If the 3,000 AFY NSY figure in the Decision continues to be used, no action will be required.	2. The Watermaster's hydrogeologic consultants report that using the NSY approach in the Decision is no longer appropriate for estimating yield. The NSY figure in the Decision was developed in 2005 based on a simplified water balance equation that accounted for some, but not all, flows in the groundwater system. It has now become apparent that there are significant flows across the Basin's boundaries that were not accounted for in the 2005 analysis. Unless those flows are also accounted for, the relationship between pumping, intrusion and storage identified in 2005 will be incorrect.

PROS	CONS
3. If the lower NSY figure of 2,370 AFY is used, the recalculation of water rights to each Producer will be relatively straightforward by following the same calculation approach set forth in the Decision. As noted in Con No. 1, however, there are some oversights in the Decision which will need to be resolved.	3. The Watermaster's hydrogeologic consultants recommend that Basin management use a "sustainable" or "operational" yield approach that takes advantage of the Seaside Basin groundwater model. This would allow the maximum pumping rate to reflect all of the system boundaries as well as the locations of wells and the introduction of new sources of recharge (injection, stormwater percolation, etc.). They feel that making this change from using the NSY approach is essential to linking long-term Basin management to reality.
	4. Given the modeling done to date, and evidenced by continuing declining groundwater levels even in years where pumping has been close to 3,000 AFY, Material Damage is more likely to occur if the 3,000 AFY NSY continues to be used rather than using the lower NSY of 2,370 AFY.

Sustainable Yield Approach

Discussion. As described in the recent BMAP Update, the simplified method used in the Adjudication Decision to estimate Natural Safe Yield is now recognized as not being complete enough to take into account the complexities of inflows and outflows that are occurring in the Basin. These ultimately affect the amount of groundwater that can be sustainably pumped from the Basin without causing negative effects (Material Damage). A more complete approach to managing the Basin would be to use the Seaside Basin groundwater model to optimize the amount of pumping that can be sustained (the Sustainable Yield) at existing and/or new wells. The Sustainable Yield would take into account management targets such as stopping declining groundwater levels or meeting protective groundwater elevations.

The SY analysis would involve making numerous assumptions and evaluations. These could include such things as alternative pumping scenarios and redistribution of pumping locations and quantities. The SY for the entire Basin would be the sum of the production quantities that each well could produce and still prevent Material Damage from occurring.

Pros and Cons of Changing to Using the Sustainable Yield Approach for Basin Management.

PROS	CONS
1. This approach would more realistically reflect the characteristics of the Basin and more accurately predict how much pumping could be sustainably supported without causing Material Damage in the Basin.	1. Performing an SY analysis would be costly. The cost proposal from Montgomery & Associates to do this work is well over $100,000. The proposal notes that modeling the long-term optimization of integrated groundwater management at a basin-wide scale is a complex process with several technical challenges that could arise and could lead to additional effort (and cost) not anticipated in the cost proposal.
	2. Changing from the NSY approach to the SY approach would first have to be approved by the Court. Documentation justifying making this change would have to be prepared and submitted to the Court. This would involve considerable staff, consultant, and legal counsel time and effort.
	3. The SY analysis would then need to be prepared and submitted to the Court for its review and approval before it could be used to replace the NSY approach used in the Decision. If the Court approved the SY analysis, then the Decision would need to be amended to reflect this. All of this would involve considerable staff and legal counsel time and effort.
	4. If SY were used instead of NSY, a new method of allocating pumping rights to each producer would have to be developed. This could be a contentious and time-consuming undertaking.
	5. It is very likely that greater pumping reductions will be required of many of the Producers if the Sustainable Yield approach is used in place of the NSY approach. It may be difficult if not impossible for some Producers to make these additional pumping reductions while still supplying the water demands of their customers.

PROS	CONS
	6. Because of the historical overpumping from the Basin, regardless of the approach that is used for Basin management, be it NSY or SY, it is very likely that even the reduced NSY pumping levels recommended in the Updated Basin Management Action Plan will not achieve protective groundwater levels. The Basin would therefore still be at risk of seawater intrusion at some time in the future. An additional source(s) of water that can be injected into the Basin to raise groundwater levels, and to maintain them at protective water levels, will be necessary regardless of which approach is used for Basin management. Therefore, the expense and complexity of changing to the SY approach may not be justified.

SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	July 14, 2021
AGENDA ITEM:	6
AGENDA TITLE:	Discuss Background and Scope of Work for Replenishment Water Modeling
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

I had initially planned to have a draft contract with Montgomery & Associates on today's agenda to perform replenishment water modeling. However, I realized after discussing this with Georgina King that it would be better to first discuss with the TAC the background on this topic, and the proposed scope of work and assumptions related to that, and then bring the draft contract to the TAC for its approval in August.

Background

In April 2013, HydroMetrics Water Resources Inc. (now acquired by Montgomery & Associates) completed a groundwater modeling study that evaluated 3 scenarios:

- Scenario 1: A 25-year groundwater overpumping replenishment program proposed by California American Water (Cal-Am) which replenishes their overpumping by in-lieu recharge through reducing pumping from their Seaside Basin wells production wells.

- Scenario 2: A set of pumping reductions by Standard and Alternative Producers to achieve protective groundwater levels over a 25-year period

- Scenario 3: Cal-Am's replenishment plan coupled with additional injection into the Santa Margarita aquifer to achieve protective elevations in 25 years.

Under Scenario 2, a pumping reduction by Standard and Alternative Producers of just over 2,000 AFY (including Cal Am's 700 AFY reduction) was needed to achieve protective water levels. The results of Scenario 3 show that when combined with Cal-Am's 25-year repayment schedule of 700 acre-feet per year, protective elevations can be achieved by injecting an additional 1,000 acre-feet per year of water into existing ASR wells. Recharged water is left in the basin, and not pumped by Standard or Alternative producers. This approach requires less water to implement than the pumping reduction approach for Scenario 2.

As part of the Basin Management Action Plan (BMAP) update in 2018, an iterative simulation was run to determine what groundwater elevations throughout the basin would look like once protective groundwater elevations are achieved. To reach protective elevations, pumping in Cal-Am's two main producing wells was reduced by a total of 1,800 AFY. Interestingly, this number is close to the 1,700 AFY of replenishment that Scenario 3 from the 2013 modeling effort simulated it would take to achieve protective elevations by 2041.

The predictive simulation for the 2013 scenarios only took into account historical Carmel River ASR by MPWMD and not Pure Water Monterey (PWM), since in early 2013 PWM was only in the very early planning stages.

AGENDA ITEM:	6 (Continued)

Proposed Scope of Work

The 2013 simulated replenishment volumes needed to achieve coastal protective groundwater elevations need to be updated using current operational plans for PWM and current Carmel River ASR.

Scenarios

A baseline scenario that includes:

1. PWM injection of 3,500 AFY – need to also simulate an amount being extracted each year.

2. Carmel River ASR current planned operations based on hydrology used in simulation.

3. Cal-Am's 700 AFY reduction in pumping as part of its 25-year groundwater overpumping replenishment program (part of Task 4 of the sustainable yield scope).

The baseline scenario essentially replaces Scenario 1 of the 2013 modeling and is covered under part of Task 4 of the sustainable yield scope. Also, we will need to extend the hydrology if we need to model beyond 2041 (Task 2.1 of the sustainable yield scope).

Scenario 2 is not practical as Standard and Alternative producers do not have access to supplemental sources of water.

Scenario 3 is an iterative scenario where the amount of additional replenishment water injection in the model is adjusted until protective groundwater elevations are met at the coast within a specific time period.

The previous modeling effort assumed protective elevations must be reached in 25 years from the time supplemental water is available to offset pumping (assumed in the 2013 modeling to be 2016) thereby resulting in protective elevations being reached in 2041.

Questions for the TAC

For the updating of these simulations should we simulate the scenarios based on 25 years from 2021 (or a different date corresponding to the projected start-up of either of the potential replenishment projects), or instead use 20 years from 2021 which would have the same target date of 2041 as the previous scenarios had? This is likely dependent on Cal-Am's planned timing on their 700 AFY payback replenishment program.

Also, should we run simulations with replenishment water being supplied by the PWM Expansion Project and the Cal Am Desalination Plant to see when/if these sources of replenishment water would be able to achieve protective elevations within the desired time period?

ATTACHMENTS:	None
RECOMMENDED ACTION:	Provide input so the scope of work can be finalized and a cost estimate for it can be prepared

SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	July 14, 2021
AGENDA ITEM:	7
AGENDA TITLE:	Initial Discussion Regarding Scope of Work for Monitoring and Management Program (M&MP) for FY 2022
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

The Schedule calls for the TAC to approve a FY 2022 Work Plan and Budget for the 2022 Management and Monitoring Program (M&MP) at its August 2021 meeting. This will then go on to the Board for approval at its October 2021 meeting.

In order to obtain TAC input and direction regarding these items, I have reviewed the FY 2021 M&MP and have edited it to reflect those work items that I anticipate being performed in FY 2022. A copy of this Proposed Work Plan is contained in Attachment 1.

Items highlighted in yellow are costs or other items for the various tasks that I will evaluate and update as necessary, based on the TAC's input at today's meeting and discussions with our consultants.

Other than the obvious need to change the dates in the M&MP from 2021 to 2022 (which I have done), all other proposed changes from the 2021 M&MP are shown in Track-Change format (deletions in ~~red~~ strikeout and additions in blue) for the TAC to consider in preparing the 2022 M&MP. Most of the proposed revisions are relatively minor, but:

- I have included in Task I.3.a.3 work to update the modeling performed in 2013 pertaining to injection of water to raise groundwater levels. The Board approved moving forward with at its May 5, 2021 meeting. This work would focus on determining the additional amount of water, above and beyond that which would be injected by the desalination plant or the PWM Expansion Project (depending on which of these moves forward to construction), that would need to be injected and not extracted in order to raise groundwater levels to protective elevations Basinwide.
- I am proposing to reduce the frequency of water quality sampling of SBWM-MW5 Shallow and Deep, which are known as the Camp Huffman wells that are located in the Northern Inland Subarea of the Basin. As discussed in the 2013 Annual Report, the Watermaster reduced the frequency of water quality sampling at these wells to once every 3 years beginning in WY 2014. This was based on the January 2010 well construction report in which the well installation hydrogeologic consultant (Martin Feeney) recommended doing initial sampling annually for several years, then reducing the frequency of sampling once it was felt that the water chemistry had been established. Mr. Feeney suggested going to once every five years after initial water quality had been established. Starting with WY 2014 the Watermaster elected to go to once every three years as a more conservative approach. The results from water quality sampling that has performed to date on these wells is depicted in the Piper Diagrams in the 2020 Seawater Intrusion Analysis Report, and copies of these are contained in Attachment 1. As these diagrams show there has been little change in water quality at these wells. I therefore recommend that we reduce the water quality sampling frequency to once every five years as recommended by Mr. Feeney,

SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

AGENDA ITEM:	6 (Continued)

starting in 2022. The wells are scheduled to be sampled for water quality in 2021 (the current year), so this would result in the next scheduled sampling being done in 2026.

If there are other revisions the TAC would like to make to prepare the M&MP for 2022, they can be brought up at today's meeting. The final M&MP for 2021, which will reflect any revisions or additions/deletions that come up at today's meeting, will be on the TAC's August 12, 2020 Agenda for approval.

ATTACHMENTS:	1. Piper diagrams of Camp Huffman wells 2. Preliminary Proposed FY 2022 Seaside Groundwater Basin M&MP
RECOMMENDED ACTION:	Provide Input to Technical Program Manager Regarding Any Corrections or Additions to the Preliminary Proposed FY 2022 M&MP

Attachment 1

MONTGOMERY & ASSOCIATES

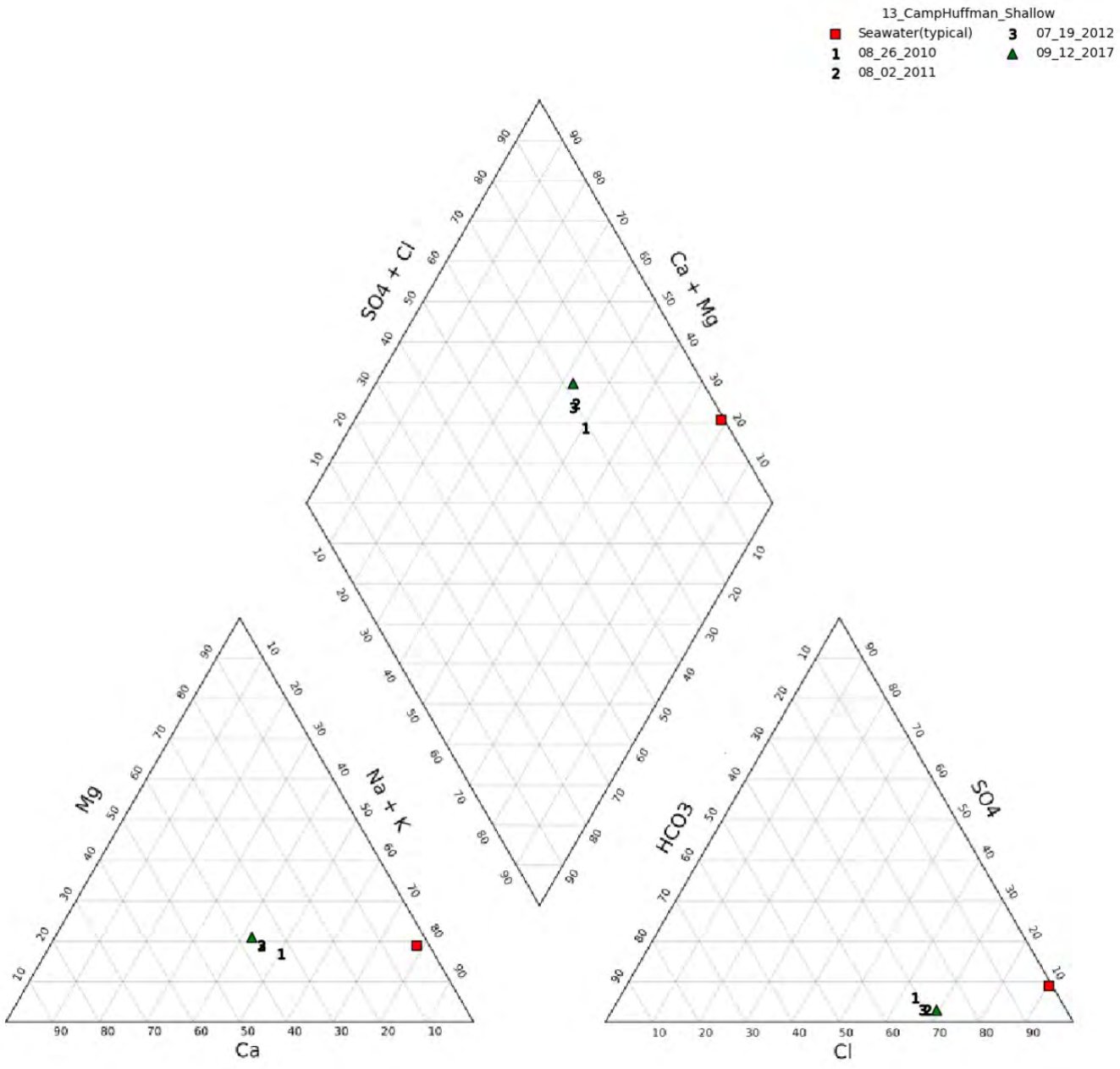


Figure C-13. Piper Diagram of Camp Huffman Shallow Well

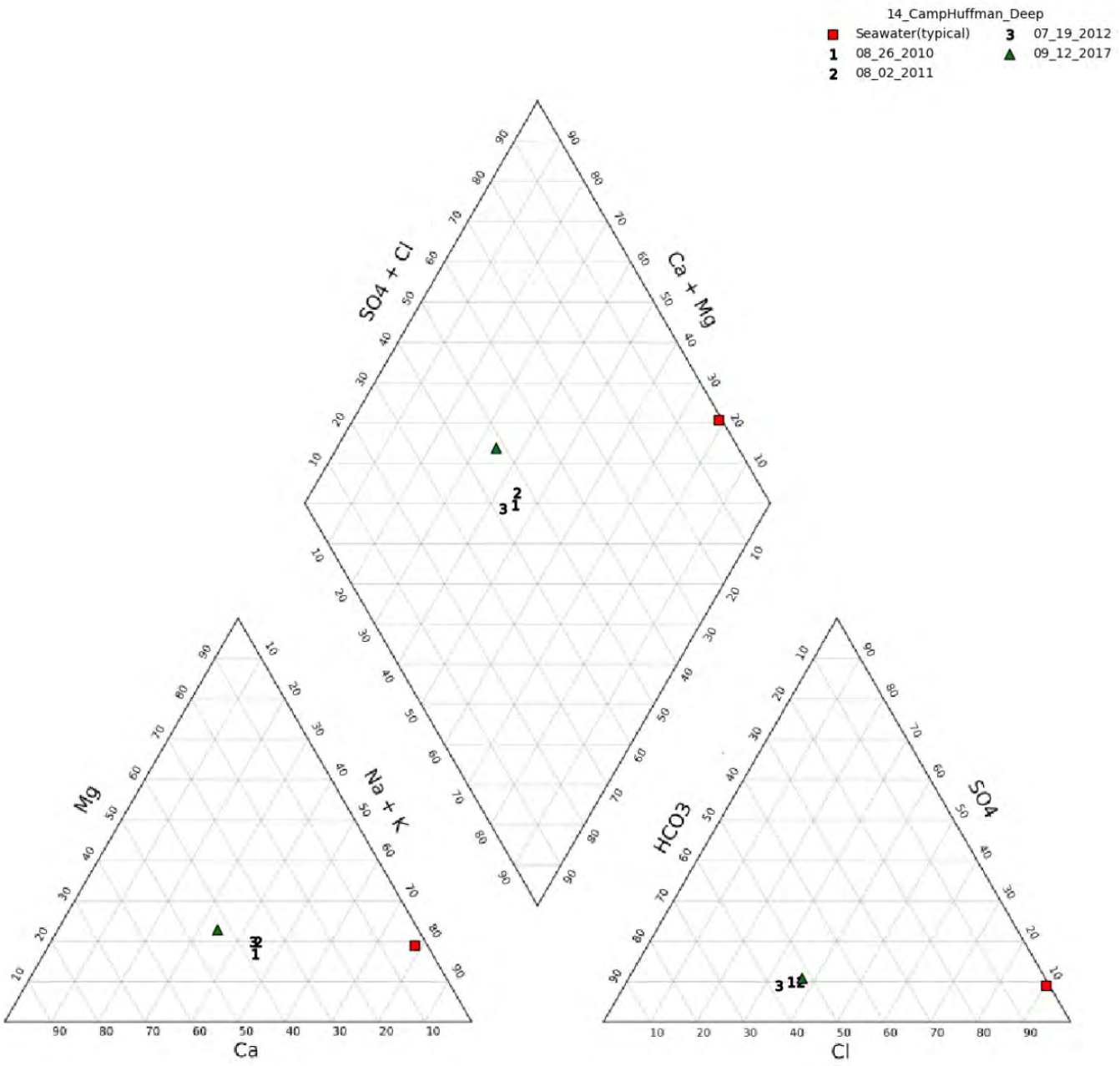


Figure C-14. Piper Diagram of Camp Huffman Deep Well

Attachment 2

Seaside Groundwater Basin
2022 Monitoring and Management Program

The tasks outlined below are those that are anticipated to be performed during 2022. Some Tasks listed below are specific to 2022, while other Tasks are recurring such as data collection, 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, & M.1.e Preparation for and Attendance at Meetings, and Peer Review of Documents and Reports ($23,000)	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, M.1.d, and M.1.e 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 (either in person or by teleconference connection) when requested to do so by Watermaster Staff, 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. 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 ($2,320)	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. Other than an annual reporting of data to another Watermaster Consultant at the end of the Water Year, as mentioned in Task I.4.c below, no reporting of water level or water quality data during the Water Year is required. However, MPWMD will promptly notify the Watermaster of any missing data or data collection irregularities that were encountered. At the end of the Water Year MPWMD will prepare an annual water production, water level, and water quality tabulation in Access format and will provide the tabulation to another Watermaster Consultant who will use that data in the preparation of the SIAR under Task No. I.4.c of the Monitoring and Management Program. No enhancements to the database are anticipated during 2022.
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 2022.
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 2022.
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. All of the other wells will be manually measured. This Task includes the purchase of one datalogger and parts for the datalogger to keep in inventory as a spare if needed.

I. 2. b. 3
Collect Water Quality Samples.
($42,101)

Water quality data will be collected quarterly from certain of the monitoring wells, but will no longer be collected from the four coastal Sentinel Wells. Discontinuing water quality sampling in those wells is the result of the finding made in 2018 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 2022.

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 2022, but will no longer be performed on the Watermaster's coastal Sentinel Wells as discussed above.

As discussed in the 2013 Annual Report, the Watermaster reduced the frequency of water quality sampling at monitoring well SBWM-5 (the Camp Huffman well) to once every 3 years beginning in WY 2014. This was based on the January 2010 well construction report in which the well installation hydrogeologic consultant (Martin Feeney) recommended doing initial sampling annually for several years, then reducing the frequency of sampling once it was felt that the water chemistry had been established. Mr. Feeney suggested going to once every five years after initial water quality had been established. Starting with WY 2014 the Watermaster elected to go to once every three years as a more conservative approach. The results from water quality sampling that has performed to date on these wells shows there has been little change in water quality at these wells. Therefore, the sampling frequency has been reduced to once every five years beginning in 2022.

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 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 2022.
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 2022.
I. 2. b. 5 Monitor Well Construction ($66,667~~0~~)	An additional monitoring well was installed in 2009. ~~No further work of this type is anticipated in 2022.~~ A well to replace Monitoring Well FO-9 Shallow, which in 2021 was found to have a leaking casing, is expected to be installed in 2022. An agreement to share in the cost of this well will be sought between the Watermaster, MPWMD, and Marina Coast Water District. MPWMD estimated the cost of a replacement well with a depth of 600 feet would be approximately $114K, based on an estimated per-foot cost of $140 and a construction supervision cost of $30K. Mr. Feeney estimated it would cost about $280 per-foot, which would increase the MPWMD estimated cost to $198K. The amount budgeted for this Task is based on a 3-way share of an estimated cost of $200K.
I. 2. b. 6 Reports ($2,086)	This task was essentially eliminated starting in 2020 by having the data collected by MPWMD under tasks I.2.b.1, I.2.b.2, and I.2.b.3 reported in the SIAR under Task I.4.c. The work remaining under this task is for MPWMD to prepare and provide the data appendix to the Consultant that prepares the SIAR. No formalized reporting on a quarterly basis is required. However, MPWMD will promptly notify the Watermaster and the Consultant that prepares the SIAR of any missing data or data collection irregularities in the water quality and water level data collected under Tasks I.2.b.2 and I.2.b.3.
I.2.b.7 CASGEM Data Submittal ($5,960)	On the Watermaster's behalf MPWMD will 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** **($0)**	The 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. The Model was again updated in 2014. In 2018 the Model was recalibrated and updated. No further work of this type is anticipated in 2022.
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 ($70,000)

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 to date indicates that the solution to the problem of water levels in the Seaside Basin being below Protective Water Levels will be to inject water. ~~In the not-too-distant future there might be the ability of Monterey Peninsula Water Supply Project's (MPWSP) desalination plant (if it gets built) to provide additional water for Basin injection on an interim basis until California American Water's demand level reaches the desalination plant's design capacity. There is some growth built into that plant's capacity for such things as lots of record and economy bounce back, which will likely not all be needed for some years into the future.~~

~~Also, if the Pure Water Monterey (PWM) Project were to be expanded this could be another source of water, at least some of which could be injected and left in the Basin to bring up water levels.~~

Within the next few years there may be the ability of either of two projects to provide additional water for Basin replenishment. One of these is the Monterey Peninsula Water Supply Project's (MPWSP) desalination plant. The other is the Pure Water Monterey (PWM) Expansion Project. Growth is built into each of these projects' plant capacity and the full capacity of these plants will likely not all be needed for some years into the future. During the time period that these projects would have excess capacity, they could potentially provide was for Basin replenishment.

Montgomery & Associates agrees that injection is the quickest way to bring groundwater levels up in the Seaside Basin. The original 3,500 AFY PWM Project is already in operation, and construction of either the MPWSP desalination plant or the PWM Expansion Project is expected to begin ~~in 2021~~within the next few years. Modeling to determine the additional amount of replenishment water needed to achieve protective groundwater level elevations throughout the Basin, after those projects are constructed, could be performed to aid the Watermaster in pursuing approaches to obtain that additional water for Basin replenishment.

Based on the costs of previous modeling, it is expected to cost approximately $14,000 to model each scenario. Montgomery & Associates anticipates that it would take a minimum of 3 scenarios to perform an initial assessment of the most cost-effective method of using additional injected water to raise groundwater levels to protective elevations. This Task includes a $50,000 allowance to perform this modeling, if so directed by the Watermaster Board.

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 2022 after the Groundwater Sustainability Plan for the Monterey Subbasin (being jointly prepared by the Salinas Valley Basin and the Marina Coast Water District Groundwater Sustainability Agencies) to further examine this situation. This Task provides a $20,000 allowance to perform modeling or other work to develop answers to basin management questions, if so directed by the Watermaster Board.
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
I. 3. c. **Refine and/or Update the Basin Management Action Plan** **($0)**	In 2019 the BMAP was updated based on new data and knowledge that has been gained since it was prepared in 2009. No further work of this type is anticipated in 2022. However, after the Groundwater Sustainability Plan (GSP) for the adjacent Monterey Subbasin of the Salinas Valley Groundwater Basin is completed, it may be appropriate to further update the BMAP to reflect the impacts of implementing that GSP. That GSP is scheduled to be completed by early 2022.

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~~led to casing leakage, 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, 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 2021 the Watermaster TAC examined the feasibility of performing conductivity profiling of certain of the near-coastal wells that were evaluated in the 2012 Memorandum, as a method of determining if any of those wells was allowing downward migration of intruded water from the shallow dunes aquifer to enter the Paso Robles aquifer. However, it was concluded that conditions in those wells would make it infeasible to perform such work. 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). MPWMD performed this work in 2018. No further work of this type is anticipated in 2022.

I.3. e. **Seaside Basin Geochemical Model** **($10,000)**	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 water (under the Pure Water Monterey Project) geochemical evaluations, and potentially modeling, will be performed in the areas of the Basin where injection of these new water sources will occur. In 2019 a geochemical evaluation of introducing advance-treated water from the Pure Water Monterey Project was performed. That evaluation concluded that there would be no adverse geochemical impacts as a result of introducing that water into the Basin. A similar evaluation of the impact of introducing ASR water also concluded that there would be no adverse geochemical impacts. An evaluation of introducing desalinated water will be performed if the Monterey Peninsula Water Supply Project's desalination plant proceeds into the construction phase. If any of the geochemical evaluations indicate the potential for problems to occur, then Montgomery and Associates may use the Watermaster's updated 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. This Task includes an allowance of $10,000 to have Montgomery and Associates perform such modeling, if necessary. 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. c. **Annual Report- Seawater Intrusion Analysis** **($27,502)**	At the end of each water year, a Consultant will reanalyze all water quality data. Water level and water quality data will be provided to the Consultant in MS Access format. The Consultant will put this data into a report format and will include it as an attachment to the Seawater Intrusion Analysis Report. If possible, ~~S~~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. e. **Refine and/or Update the Seawater Intrusion Response Plan** **($0)**	At the beginning of 2009, and again in 2021, 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 2022.
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.

SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	July 14, 2021
AGENDA ITEM:	8
AGENDA TITLE:	Update on Marine Electromagnetic Surveying in Monterey Bay
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

At the June 9, 2021 TAC meeting an informational item regarding Marine Electromagnetic surveying of Monterey Bay was discussed. The TAC sought more information about what work was being planned, how it might be of benefit to the Watermaster, and whether it would be something to which the Watermaster might wish to contribute.

Georgina King reached out to Rosemary Knight of Stanford University, who is proposing this work, to obtain additional information. Ms. Knight provided a link to a scientific journal article that describes the type of work they are proposing, and it is contained in Attachment 1.

Ms. Knight also provided the following information about the work she is proposing to perform in Monterey Bay:

Her group met recently to start better defining the plan. Attachment 2 contains a slide, the right half of which shows roughly where we will be acquiring data - basically everywhere in Monterey Bay where the water depth is less than ~100-200 m. - so the brightly colored area. And this should extend further out in the north end of the bay. What we want to do is map out the freshwater/saltwater interface in the offshore extent of the aquifers of interest to water agencies along the coast. For those aquifers not yet seeing saltwater intrusion on shore, the key question is - how far offshore is the freshwater/saltwater interface?

We now need to build a rough conceptual 3D model of the geology in the area of interest, so that we can determine which aquifer units we are likely to be able to "see" with the geophysics. We are meeting soon with Sam Johnson, who used to work with USGS and is familiar with this area. Is there anyone you know who could provide such a model? or input to such a model? We know a lot about what is happening on land, not much offshore it seems. Once we have the model, it will be easy for various groups to determine whether the results should be of interest to them. So at that point, we were going to contact people all along the coast.

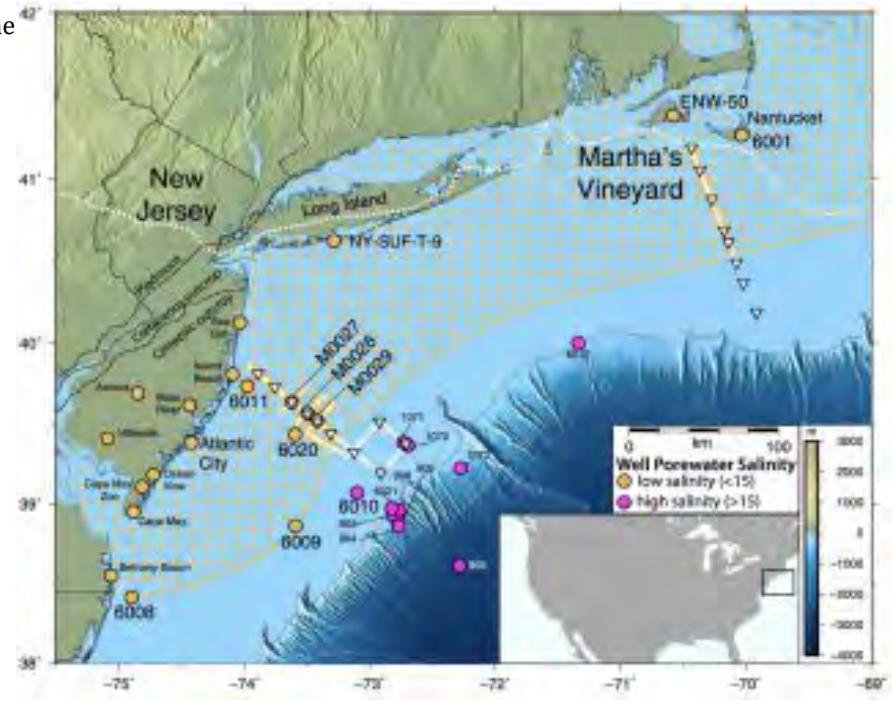
Presumably there will be more refinement on what work they would like to do at some future date, and that will be provided to the TAC when it becomes available.

ATTACHMENTS:	1. News article about Marine EM work 2. PowerPoint slide pertaining to the proposed Marine EM work
RECOMMENDED ACTION:	None required – information only

ATTACHMENT 1

A Massive Freshwater Sea Is Buried Beneath the Atlantic Ocean

By Laura Geggel June



The yellow hatched area shows where the giant aquifer is hiding under the Atlantic Ocean. (Image credit: Gustafson et al., 2019; CC BY 4.0)

A gigantic freshwater aquifer is hiding under the salty Atlantic Ocean, just off the northeastern coast of the United States, a new study finds.

While the aquifer's exact size is still a mystery, it may be the largest of its kind, taking up a region stretching from at least Massachusetts to southern New Jersey, or nearly 220 miles (350 kilometers). The area includes the coastlines of New York, Connecticut and Rhode Island. This aquifer may contain about 670 cubic miles (2,800 cubic kilometers) of slightly salty water (we'll explain its slight saltiness later).

This water isn't young, either. The researchers said they suspect that much of it is from the last ice age. [Photos: Artistic Views of Earth from Above]

Scientists got the first hints that an aquifer was hanging out under the ocean in the 1970s, when companies drilling off the coast for oil sometimes hit freshwater instead. But it wasn't clear whether these freshwater water deposits were isolated pockets or whether they covered a larger expanse.

About 20 years ago, study co-researcher Kerry Key, now a geophysicist at the Lamont-Doherty Earth Observatory at Columbia University in New York, began helping oil companies pinpoint oil hotspots by using electromagnetic imaging on the subseafloor. Much like an X-ray can image a person's bones, electromagnetic imaging uses electromagnetic waves (from static to microwaves and other high frequencies) to detect objects hidden from view.

More recently, in an effort to find freshwater deposits, Key decided to see if tweaking this technology could help him find aquifers, which are underground pools of fresh water. So, in 2015 he and study co-researcher Rob Evans, a senior scientist of geology and geophysics at the Woods Hole Oceanographic Institution in Massachusetts, spent 10 days at sea, taking measurements off the coast of southern New Jersey and Martha's Vineyard in Massachusetts. The researchers chose these spots because oil companies had reported finding fresh water there.

"We knew there was fresh water down there in isolated places, but we did not know the extent or geometry," lead author Chloe Gustafson, a doctoral candidate of marine geology and geophysics at Lamont-Doherty Earth Observatory, said in a statement.

To investigate these areas, the researchers dropped instruments to the seafloor to measure the electromagnetic fields below. In addition, a tool towed behind the ship emitted artificial electromagnetic pulses and measured the reactions from the subseafloor. The two methods rely on a similar science: Salt water conducts electromagnetic waves better than fresh water does, so any pools of fresh water would stand out as bands of low conductance, the researchers said.

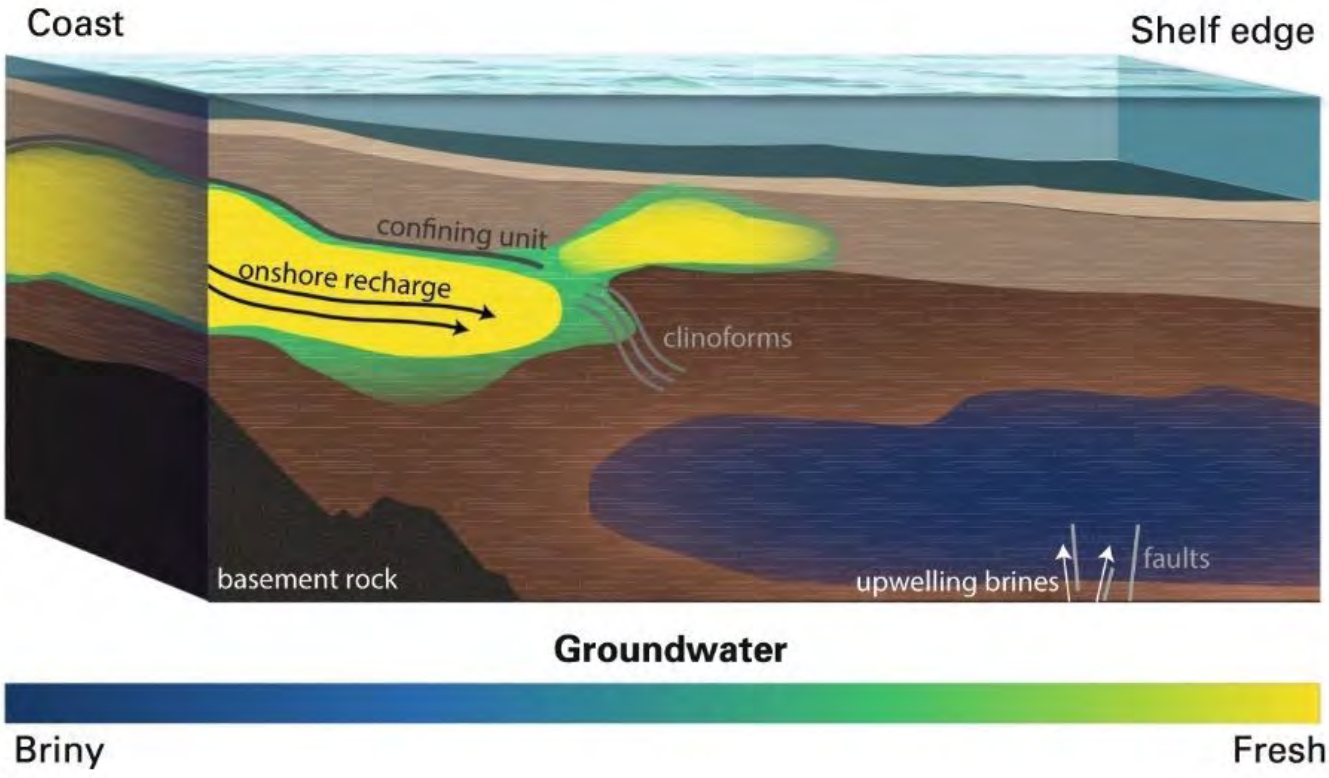
An analysis found that the fresh water wasn't scattered here and there, but was instead continuous, starting at the shoreline and extending out on the continental shelf. In some places, the aquifer stretched as far as 75 miles (120 km) offshore.

The feature also ran deep, starting at about 600 feet (182 meters) below the ocean's floor and ending at about 1,200 feet (365 m) below the seafloor. If later research shows that the aquifer is larger, it could rival the Ogallala Aquifer, a huge freshwater pool that supplies groundwater to eight Great Plains states, from South Dakota to Texas. [Dry and Dying: Images of Drought]

How did the water get under the ocean?

The aquifer likely came into being at the end of the last ice age, the researchers said. About 20,000 to 15,000 years ago, much of the world's water was locked up in glaciers, making sea levels lower than they are now. As temperatures rose and the ice covering the U.S. Northeast melted, water washed away huge quantities of sediments, which formed river deltas on the still-exposed continental shelf. Large pockets of fresh water from the melted glaciers then got stuck in these sediment traps. Later, sea levels rose, trapping the sediment and fresh water under the ocean.

These days, it appears that the aquifer isn't stagnant. Rather, it's likely fed by subterranean runoff from the land, the researchers said. This water is then likely pumped seaward by the rising and falling pressure of the tides, Key said.



This conceptual model shows how offshore groundwater feeds the aquifer. (Image credit: Gustafson et al., 2019; CC BY 4.0)

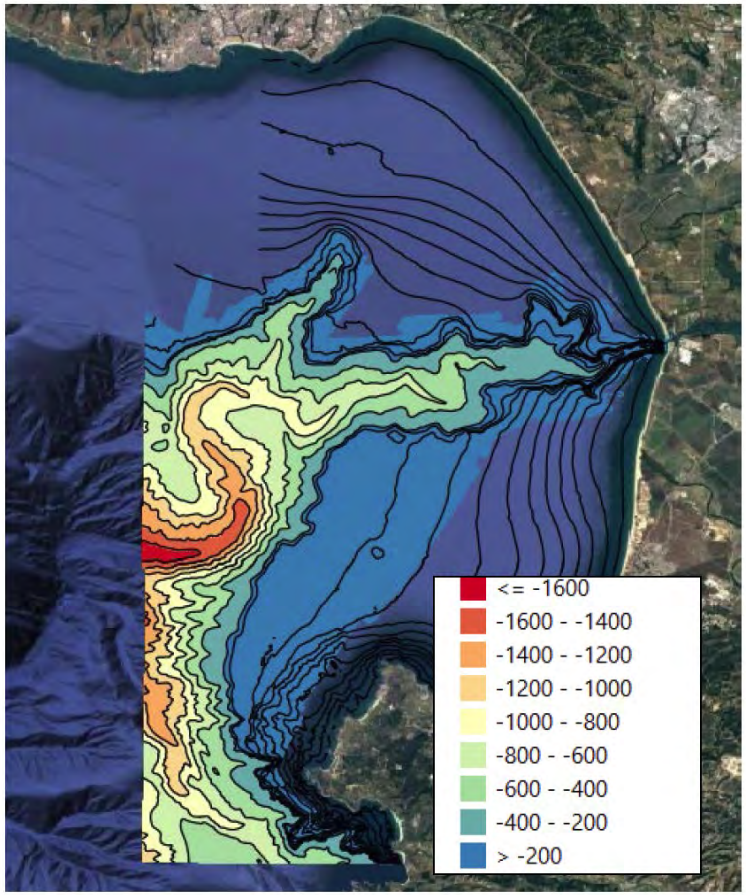
He added that the aquifer is freshest close to shore and gets saltier farther out, indicating that it slowly mixes with seawater over time. The freshwater near land is about 1-part-per-thousand salt, much like other terrestrial fresh water, he said. In contrast, by the aquifer's outer edges, it's about 15 parts per thousand, which is still lower than typical seawater's level of 35 parts per thousand.

In other words, this water would have to be desalinated before people could use it, but it would still be cheaper to process than regular salt water, Key said.
"We probably don't need to do that in this region, but if we can show there are large aquifers in other regions, that might potentially represent a resource" in dry places such as Southern California, Australia, the Mideast or Saharan Africa, he said in the statement.

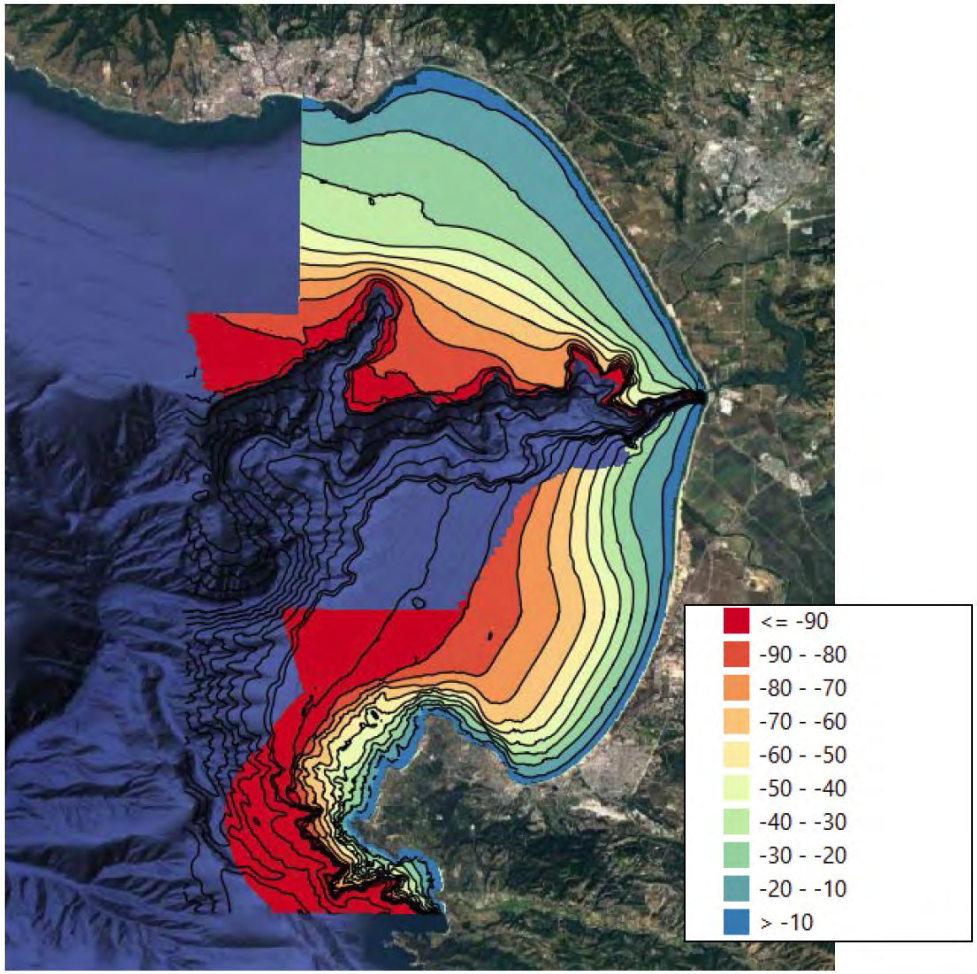
The study was published online June 18 in the journal Scientific Reports.

ATTACHMENT 2

5 m resolution



2 m resolution



SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	July 14, 2021
AGENDA ITEM:	9
AGENDA TITLE:	Schedule
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

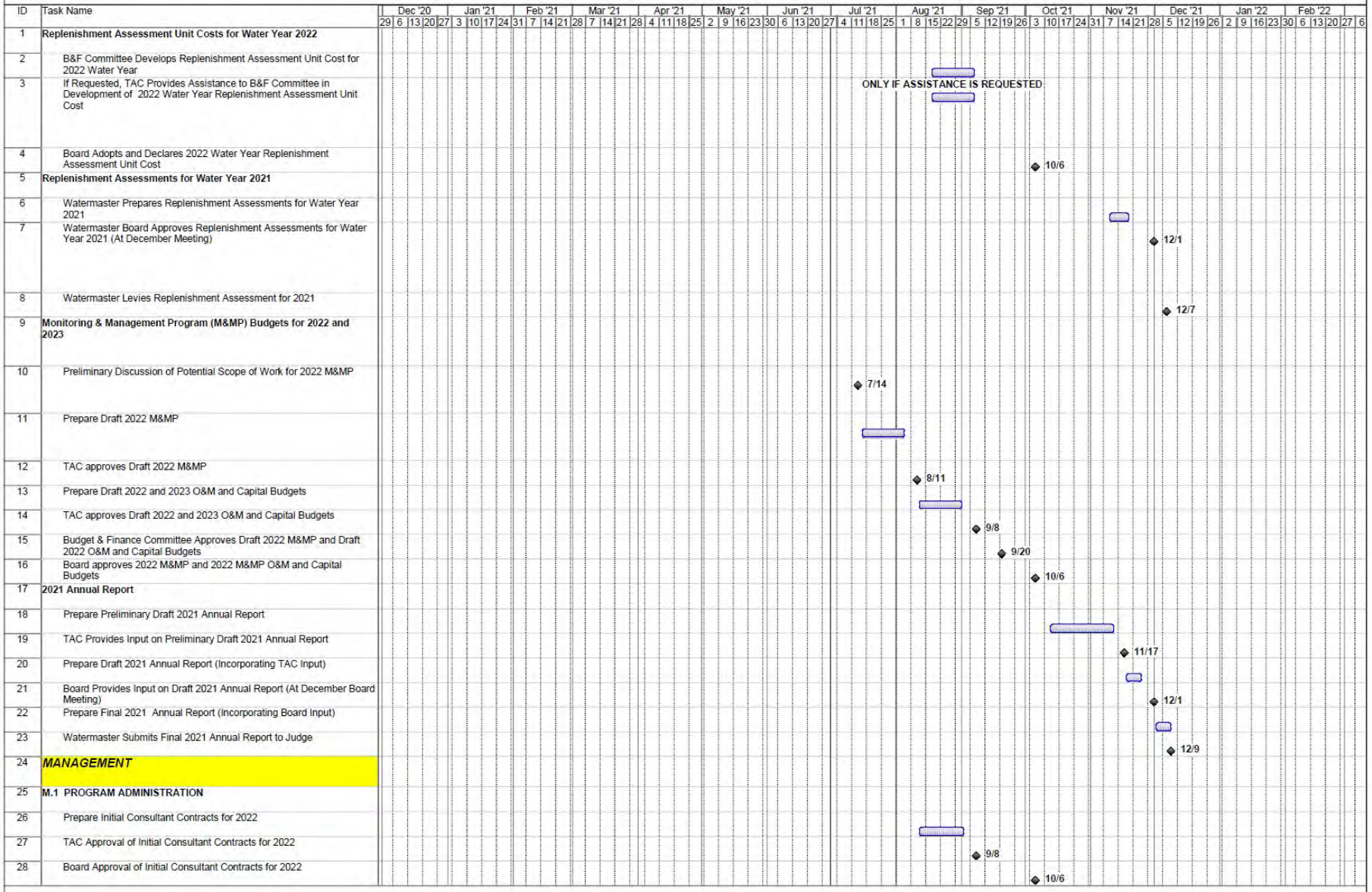
As a regular part of each monthly TAC meeting, I will provide the TAC with an updated Schedule of the activities being performed by the Watermaster, its consultants, and the public entity (MPWMD) which are performing certain portions of the work.

Attached is the updated schedule for 2021 activities.

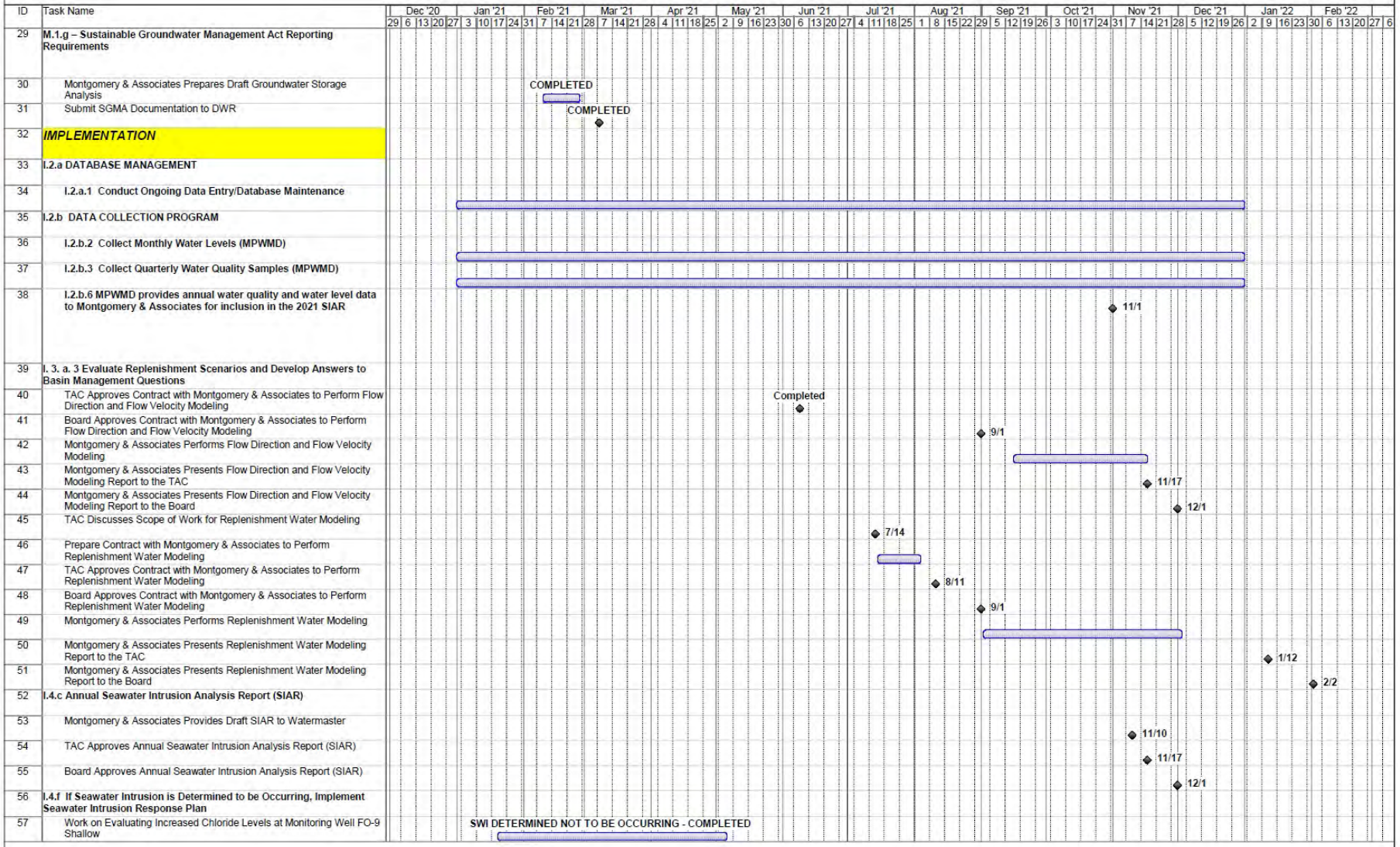
This schedule shows the flow velocity/flow direction modeling and the replenishment water modeling both starting this fall. Completion of the flow velocity/flow direction modeling is projected to occur in time for a report on this work to be made to both the TAC and the Board in late 2021. The replenishment water modeling report is not shown to be made to the TAC and Board until early 2022.

ATTACHMENTS:	Schedule of Work Activities for FY 2021
RECOMMENDED ACTION:	Provide Input to Technical Program Manager Regarding Any Corrections or Additions to the Schedules

Seaside Basin Watermaster
2021 Monitoring and Management Program
Work Schedule



Seaside Basin Watermaster
2021 Monitoring and Management Program
Work Schedule



SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	July 14, 2021
AGENDA ITEM:	10
AGENDA TITLE:	Other Business
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:
The "Other Business" agenda item is intended to provide an opportunity for TAC members or others present at the meeting to discuss items not on the agenda that may be of interest to the TAC.

ATTACHMENTS:	None
RECOMMENDED ACTION:	None required – information only