# MEETING NOTICE AND AGENDA

## *TECHNICAL ADVISORY COMMITTEE OF THE SEASIDE BASIN WATER MASTER*

**DATE: Wednesday, July 11, 2018**
**MEETING TIME: 1:30 p.m.**
**Monterey Regional Water Pollution Control Agency Offices**
**5 Harris Court, Building D (Ryan Ranch)**
**Monterey, CA 93940**

***If you wish to participate in the meeting from a remote location, please call in on the Watermaster Conference Line by dialing (515) 739-1015. Use the Meeting ID 355890617. Please note that if no telephone attendees have joined the meeting by 10 minutes after its start, the conference call may be ended.***

**OFFICERS**
**Chairperson: Nina Miller, California American Water Company**
**Vice-Chairperson: Jon Lear, MPWMD**

**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**



**The next regular meeting will be held on Wednesday August 15, 2018 at 1:30 p.m. at the MRWPCA Board Room. (Note: This will be the third Wednesday in August, not the usual second Wednesday of the month)**

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## *SEASIDE BASIN WATER MASTER*
## *TECHNICAL ADVISORY COMMITTEE*

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

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| **MEETING DATE:** | July 11, 2018 |
| **AGENDA ITEM:** | 2.A |
| **AGENDA TITLE:** | Approve Minutes from the June 13, 2018 Meeting |
| **PREPARED BY:** | Robert Jaques, Technical Program Manager |

**SUMMARY:**

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

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| **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 13, 2018**

**Attendees: TAC Members**

City of Seaside –Rick Riedl
California American Water – Nina Miller
City of Monterey – Laurie Williamson (via telephone)
Laguna Seca Property Owners – Bob Costa
MPWMD – Tom Lindberg
MCWRA – Howard Franklin
City of Del Rey Oaks – No Representative
City of Sand City – Leon Gomez (via telephone)
Coastal Subarea Landowners – No Representative

**Watermaster**
Technical Program Manager - Robert Jaques

**Consultants**
HydroMetrics – Georgina King (via telephone)
Martin Feeney – Martin Feeney (via telephone)

**Others**
MCWD – Patrick Breen

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The meeting was convened at 1:35 p.m. after a quorum had been established. The meeting was moved from the Board Room to the Conference Room in an effort to improve the performance of the telephone conference call-in line.

**1. Public Comments**
There were no public comments.

**2. Administrative Matters:**

**A. Approve Minutes from the March 14, 2018 Meeting**
On a motion by Mr. Riedl, seconded by Mr. Franklin, the minutes from this meeting were unanimously approved as presented, with Ms. Williamson abstaining.

**B. Sustainable Groundwater Management Act (SGMA) Items**
Mr. Jaques summarized the agenda packet materials for this item.

Ms. Miller asked for an explanation of the "Area of Impact" to which the moratorium on new wells discussed on page 8 of the agenda packet applied. Mr. Franklin clarified that the Area of Impact means the area within which seawater intrusion is being detected. He went on to explain that the Area of Impact needs to be better defined for the deep aquifer by performing additional analyses, but that the Areas of Impact for the 180' and 400' aquifers have already been defined.

Mr. Riedl asked how often the TAC to work with HydroMetrics on development of the SVBGSA's GSP will meet. Mr. Jaques replied that this TAC has not yet been formed and no meeting schedule for it has been promulgated.

**C. Progress Report on Geotechnical Modeling Work**

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

Mr. Riedl asked if the core samples referred to on page 20 of the agenda packet, which MPWMD will be collecting, will come from a bore that will subsequently be used as a monitoring well. Mr. Lindberg responded that he believed the core sample would probably be from an injection well. He said several wells will be drilled and some will be for injection and some will be for monitoring.

**2. Results from Martin Feeney's March Induction Logging of the Sentinel Wells**

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

Mr. Feeney noted that he had modified how the plots display the data to make the plots more readable. He briefly explained that there is some separation of data from year-to-year caused by different tools being used in the induction logging process and the amounts of natural recharge that occurred, but there are no trends to indicate seawater intrusion is occurring.

He went on to point out that the conductivities over much of the depth of the Sentinel Wells is in the 300 to 400 microsiemens range, whereas seawater is typically about 50,000 microsiemens. The shallow Aromas Sands are seawater intruded, and that is why their conductivity is so high

He also commented that a 5 to 8% change in chloride levels is necessary to see an appreciable change in conductivity.

**3. Discuss Technical Memorandum from HydroMetrics on Updating and Recalibrating the Seaside Basin Groundwater Model**

Mr. Jaques introduced this topic, and Ms. King made a presentation on the Technical Memorandum. Copies of her presentation slides are attached.

She noted in her presentation that the 1997 groundwater level data from the Salinas Valley Basin model were used in 2009 when the Seaside Basin model was developed, but in the 2018 update 2010 data from the Salinas Valley Basin model was initially used. The 2010 data showed greater differences between observed and simulated values at the boundary between the Seaside Groundwater Basin and the Salinas Valley Basin, along the northeasterly boundary of the Seaside Basin. Consequently, HydroMetrics reverted back to using the 1997 Salinas Valley Basin model results, in which the observed and simulated groundwater levels matched much more closely than the results from the 2010 modeling.

Mr. Jaques asked if she knew why there would be these differences between the 1997 data and the 2010 data. Mr. Franklin responded that the boundary area in question was not an area of high interest to the County when the 2010 Salinas Valley Basin model runs were performed. He reported that the more recent USGS model is based on 1967 through 2014 data and should be ready to review soon. He felt that it would be more accurate in that location.

Mr. Feeney said that since 1997 more work has been done, and it is now clear that the water levels predicted by the Salinas Valley Basin model at the location of the blue arrow on the "Model Boundary with Salinas Valley" slide in Ms. King's presentation are much too high.

Mr. Franklin noted that the USGS model will be available in 2019 and could then be used by Hydro Metrics if desired.

Ms. King said HydroMetrics recommends that this issue be looked at again at the boundary between the Seaside Basin model and the Salinas Valley Basin model when the Salinas Basin model data becomes available in 2019. The purpose of that would be to see how well the predicted groundwater levels between the two models match at this boundary.

The wells that are perforated in multiple aquifers do not correlate well between observed versus simulated levels, because HydroMetrics had to make assumptions on how much water was being pumped from each aquifer. Since other nearby wells that were screened in only one aquifer correlated very well, it indicates that the model is accurate in these locations.

Statistical analysis indicates that the model does not show any significant bias as indicated in the first "Calibration Results" slide, and also that calibration is good as shown in the second "calibration results" slide.

The conclusions from the Technical Memo were:

- Changing the northern boundary heads had the greatest impact on calibration of the model
- When the new Salinas Valley model has been completed by the USGS, assess if that new model does a good job on northern boundary and if so add those heads when the Seaside Basin model is next updated
- Recalibration, primarily by changing the northern boundary heads, resulted in a better calibration than the original 2009 model
- The model should be updated at least every five years and its calibration reevaluated

In response to a question by Mr. Riedl, Mr. Franklin and Mr. Feeney explained that there have been Salinas Valley Basin model updates, and currently the USGS is developing the new model. Mr. Franklin went on to say that the USGS was provided the Seaside Basin model as information available to them in conjunction with developing the new Salinas Basin model, but that no data for the Seaside Basin will be provided in the USGS model.

Mr. Franklin, Mr. Feeney, and Ms. King all expressed the opinion that the updated and recalibrated Seaside Basin model is fine for use in managing the Seaside Basin.

Mr. Jaques, Mr. Franklin, and Mr. Breen all agreed that it will be important for the various entities involved in developing groundwater sustainability plans and selecting groundwater management actions at interfaces between basins to be in agreement with the modeling results.

Mr. Jaques asked TAC members if they felt there would be value in having Gus Yates of Todd Groundwater review the Technical Memorandum and provide any comments or concerns that he feels should be addressed. Mr. Costa said he felt this would be a good idea. Following further discussion there was consensus by TAC members that such a review would be beneficial. The review would not be done at a "high-level", i.e. not too detailed and therefore not too costly. Mr. Jaques said there was already an open on-call services agreement with Todd Groundwater that could cover these costs, and that he would contact Mr. Yates and ask him to perform this review.

Mr. Franklin said there were a few "editorial" comments on page 18 in the second paragraph of the Technical Memorandum that he felt should be deleted. Ms. King said she would gladly make those revisions.

There was consensus that this agenda item be carried over to the next TAC meeting, in order to receive the comments from Mr. Yates before taking any further action on the Technical Memorandum.

**4. RFS to HydroMetrics WRI to Update the Basin Management Action Plan**

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

The TAC determined to defer taking action on this agenda item until the next TAC meeting after it has received Mr. Yates comments on the Technical Memorandum discussed in the preceding agenda item.

**5. Schedule**

Mr. Jaques highlighted a few changes to dates in the schedule for the Basin Management Action Plan update.

Mr. Riedl requested that Mr. Jaques ask the Budget and Finance Committee if it will be wanting the TAC to provide any assistance as it develops the Replenishment Assessment Unit Cost for 2019. Mr. Jaques said he would make that contact and report back.

**6. Other Business**

Ms. Miller reported that Eric Sabolsice is leaving California American Water to go to work with a consulting firm. Ms. Miller will take over as the California American Water Board representative and will have Mr. Sabolsice notify Ms. Dadiw of this change.

The meeting adjourned at 2:55 p.m.

# Seaside Groundwater Basin Model

## Update and Recalibration

Presented to the Seaside Basin Technical Advisory Committee

June 13, 2018

## Background

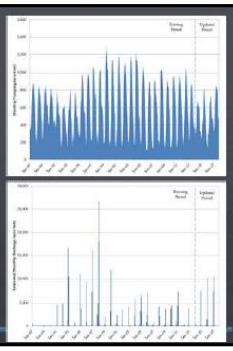
- Over nine years since the Basin Management Plan (BMAP) was last updated, includes estimates of:
  - Groundwater Storage
  - Safe Yield
- BMAP update this year will benefit from use of updated model to assist in determining storage and safe yield, and in developing short and long-term management strategies

## Model History

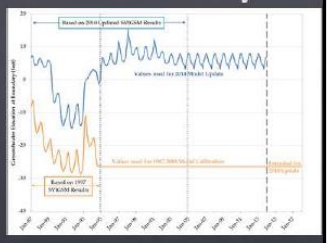
- 2009: original model developed and calibrated from 1987 through 2008
- 2010: new Salinas Valley model data used to update northern boundary when modeling Coastal Water Project scenarios
- 2014: update model input data from 2009 – 2013, worsening calibration
- **2018: update model input data from 2014 – 2017 and recalibrate**

## Data Input

- Groundwater Pumping
  - MPWMD
  - Cal Water Service
  - Marina Coast Water District
- Deep Groundwater Recharge
  - Precipitation data
  - Evapotranspiration data
- Groundwater Level Data



## Model Boundary with Salinas Valley



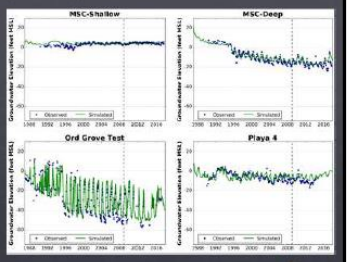
- Sensitivity analysis found that the northeastern boundary impacts wells in the Northern Coastal subarea
- Changing boundary heads based on 1997 SVIGSM results improved calibration

## Model Calibration Approach

1. Conducted sensitivity analysis to assess if incremental changes in applied recharge had an influence on simulated groundwater levels
   - ► northern boundary had a much greater impact on groundwater levels – recalibration focused on this aspect
2. Use model calibration software to vary aquifer parameters, such as hydraulic conductivity to see if this would improve calibr
   - ► no significant overall improvements in calibration. Some wells would improve while others would worsen.

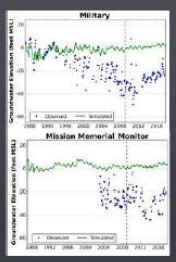
## Well Hydrographs

- Northern Coastal subarea monitoring wells and some production wells are simulated well
- These wells are generally screened in one aquifer which makes it easier to model

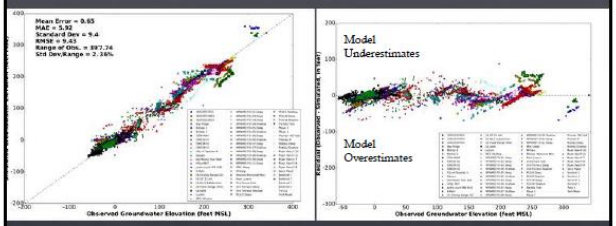



## Well Hydrographs

- Northern Coastal subarea production wells do not match well because they are screened across multiple aquifers/model layers and often have levels influenced by pumping
- Other observed groundwater levels in the area better match simulated levels
- No locational bias



## Calibration Results




## Calibration Results

| Statistical Measure | 2009 Calibration | 2018 Recalibration |
|---|---|---|
| Mean Error | 2.18 | 0.65 |
| Mean Absolute Error (MAE) | 7.4 | 5.9 |
| Standard Deviation | 12.9 | 9.4 |
| Root Mean Squared Error (RMSE) | 12.9 | 9.4 |
| Standard Deviation/Range | 2.9% | 2.4% |

Below 10% is industry standard

## Conclusions

- Changing the northern boundary heads had the greatest impact on calibration of the model
  - When the new Salinas Valley model has been completed by the USGS, assess if that new model does a good job on northern boundary and if so add those heads when the Seaside Basin model is next updated
- Recalibration, primarily by changing the northern boundary heads, resulted in a better calibration than the original 2009 model
- The model should be updated at least every five years and its calibration reevaluated

## Questions?

## *SEASIDE BASIN WATER MASTER*
## *TECHNICAL ADVISORY COMMITTEE*

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

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|---|---|
| **MEETING DATE:** | July 11, 2018 |
| **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, I have not received any new materials from the State that would impact the Watermaster.

**At the Monterey County level:**
Since my last update there have not been any meetings of the SVBGSA's Advisory Committee, and their TAC to work with HydroMetrics on preparation of their GSP has not yet convened.

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| **ATTACHMENTS:** | None |
| **RECOMMENDED ACTION** | None required – information only |

## *SEASIDE BASIN WATER MASTER*
## *TECHNICAL ADVISORY COMMITTEE*

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

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| **MEETING DATE:** | July 11, 2018 |
| **AGENDA ITEM:** | 2.C |
| **AGENDA TITLE:** | Progress Report on Geochemical Modeling Work |
| **PREPARED BY:** | Robert Jaques, Technical Program Manager |

SUMMARY:

Following TAC and Board approval earlier this year, work was started by MPWMD's consultant Pueblo Water Resources to perform geochemical modeling in the Seaside Groundwater Basin to assess the geochemical interaction effects of introducing non-native water from the storage and recovery projects proposed by MPWMD (expanded ASR project), M1W (Pure Water Monterey Project), and CAW (desalination project) into the native water in the Basin. A progress report on this work was contained in the June TAC agenda packet.

Mr. Jon Lear of MPWMD will provide an oral update at today's meeting.

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| **ATTACHMENTS:** | None |
| **RECOMMENDED ACTION:** | None required – information only |

## *SEASIDE BASIN WATER MASTER*
## *TECHNICAL ADVISORY COMMITTEE*

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

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| **MEETING DATE:** | July 11, 2018 |
| **AGENDA ITEM:** | 2.D |
| **AGENDA TITLE:** | Discuss Making Changes in the Use of the Teleconference Line for Participation in Future TAC Meetings |
| **PREPARED BY:** | Robert Jaques, Technical Program Manager |

**SUMMARY:**

The Chair and other members of the TAC have noticed that many of the TAC members that participate in TAC meetings via the teleconference line have few, if any, comments to make or questions to ask during the course of discussion of the Agenda items. This may be due in part to distractions or interruptions occurring at the location of the member(s) participating via the teleconference line.

There are also occasional difficulties for TAC members in being able to participate via the teleconference line if they are trying to participate via cell phone.

There have also been comments from members participating via the teleconference line that they sometimes have difficulty hearing the discussions going on at the meetings, both by those TAC members who are physically present at the meetings and others who are participating via the teleconference line. In an effort to address this problem the TAC meetings are now being held in the Monterey One Water Conference Room when that room is available, rather than the Board Room. The Conference Room is much smaller than the Board Room which enables those TAC members who are physically present to sit closer to the speaker-phone and thus be more easily heard by those members who are using the teleconference line. However, in spite of making this change members using the teleconference line still report experiencing difficulty in hearing some of the discussion going on at the meetings.

In order that the TAC meetings be more productive, and to encourage more active participation by all TAC members, it is proposed that future use of the teleconference line be limited to participation by consultants or others who are located out of the Monterey Bay area, e.g. HydroMetrics, Martin Feeney, Todd Groundwater, etc. and not by TAC members themselves who are located in the Monterey Bay area.

At today's meeting the TAC is invited to discuss making changes in how the teleconference line is used.

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| **ATTACHMENTS:** | None |
| **RECOMMENDED ACTION:** | Determine whether or not to make changes to how the teleconference line is used for future TAC meetings. |

## *SEASIDE BASIN WATER MASTER*
## *TECHNICAL ADVISORY COMMITTEE*

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

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| **MEETING DATE:** | July 11, 2018 |
| **AGENDA ITEM:** | 2.E |
| **AGENDA TITLE:** | Change in Ownership of HydroMetrics |
| **PREPARED BY:** | Robert Jaques, Technical Program Manager |

**SUMMARY:**

In late June I was informed by Derrik Williams of HydroMetrics that HydroMetrics will be acquired by Errol L. Montgomery & Associates of Tucson, Arizona effective July 1, 2018. He said that as of that date HydroMetrics will no longer be an entity, and that HydroMetrics' staff members will become employees of Montgomery and Associates. Mr. Williams said that since HydroMetrics will not be an entity as of July 1, that is the best date to assign their contracts to Montgomery and Associates.

I responded to Mr. Williams asking him to give me some background on what brought this on and what the near and long-term future outlook will be, i.e. will HydroMetrics continue to exist pretty much unchanged in terms of size, staff members, fees, capabilities, etc.; will he and Georgina King continue to be the staff we will normally interact with?

Mr. Williams provided this explanation regarding the organizational change:

*Mr. Williams and Ms. King will definitely remain as our points of contact and they will be the two people we will see regularly. There may be additional modelers or graphic artists on the invoices, but the public face of the company will not change. He is committed to providing us the same attention and service that HydroMetrics always has. With more company resources, however, the service should be even better.*

*This has been in the works for a couple years. With the new SGMA law, there are simply not enough groundwater hydrologists in the state to cover all the work that is coming up. HydroMetrics wanted to grow into new clients but could not do it with its existing staff because they are committed to their existing clients. Therefore, he was looking for a way to grow his staff with hydrogeologists who are not committed to other California clients. He was approached by a number of companies who were hoping to grow their groundwater staff. Montgomery & Associates was attractive to him for a number of reasons. One is that he has known many of the principles of Montgomery and Associates for over 30 years. He has found them to be a great group of people who have the same technical expertise and commitment to both clients and employees that HydroMetrics currently has. Another is that they are a groundwater focused company. He did not want to simply become a small arm of a large engineering firm, he wanted to remain a groundwater focused firm.*

*For the Watermaster, Mr. Williams feels there are only upsides. We will still work with Mr. Williams and Ms. King. Montgomery and Associates will occupy HydroMetrics' former Oakland office and will have the same personnel locally and the same financial structure. However, the staff there will be supported by a much larger group of hydrogeologists who can be more responsive to our questions.*

*He went on to say that he is working with Montgomery & Associates staff on the Paso Robles GSP, and will start work with them soon on the Salinas Valley GSP.*

## *SEASIDE BASIN WATER MASTER*
## *TECHNICAL ADVISORY COMMITTEE*

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

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| **AGENDA ITEM:** | 2.E (Continued) |

With Mr. Williams explanation and assurances, I am comfortable with the change in ownership. Mr. Riedl has suggested that as part of contracting with Montgomery & Associates, we include language to the effect that:

> *Because of the personal nature of the services to be rendered pursuant to this Agreement, Derrik Williams shall oversee the services described in this Agreement. Derrik Williams may use assistants under his supervision to perform services under this Agreement. Consultant shall provide Watermaster fourteen (14) days' notice prior to the departure of from Consultant's employ. Should he leave Consultant's employ, the Watermaster shall have the option to immediately terminate this Agreement, within three (3) days of the close of said notice period. Upon termination of this Agreement, Consultant's sole compensation shall be payment for actual services performed up to, and including, the date of termination or as may be otherwise agreed to in writing between the Watermaster and the Consultant.*

After discussing this language with Mr. Williams, he suggested that, since Ms. King performs much of the work for the Watermaster, instead of just listing his name in this language we add Ms. King's name as well. I concur with making this minor wording change.

In terms of ongoing work with HydroMetrics, there currently are two HydroMetrics Requests for Service (RFS) with remaining work to be done on them. One is to prepare the 2018 Seawater Intrusion Analysis Report, and one is to provide on-call/as-needed consulting services.

With the TAC's approval, I will:

1. Incorporate Mr. Riedl's recommended language (with Ms. King's name added) into a new Professional Services Agreement (PSA) to be executed between Montgomery and Associates and the Watermaster. This new PSA would replace the existing PSA with HydroMetrics.

2. Cancel both of the existing ongoing RFSs with HydroMetrics, and re-issue them to Montgomery and Associates with the same terms and conditions as the existing ones.

3. Take these actions to the Board for their approval at its next meeting.

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

## *SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE*

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

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| **MEETING DATE:** | July 11, 2018 |
| **AGENDA ITEM:** | 2.F |
| **AGENDA TITLE:** | Update on Monterey Regional Stormwater Resources Plan |
| **PREPARED BY:** | Robert Jaques, Technical Program Manager |

**SUMMARY:**

Monterey One Water, formerly the Monterey Regional Water Pollution Control Agency (MRWPCA), was the lead entity in the development of a Stormwater Resource Plan (SWRP) for the Monterey Peninsula, Carmel Bay, and South Monterey Bay (Monterey Peninsula) Integrated Regional Water Management (IRWM) Planning Area. A Consultant Project Team consisting of Geosyntec Consultants, Inc. (Geosyntec), EOA, Inc. (EOA), and Denise Duffy & Associates, Inc. (DD&A) prepared the SWRP and conducted associated analyses. Preparation of the Monterey Peninsula SWRP was funded by a Proposition 1 Planning Grant and local match funds, including the locally funded Monterey Peninsula Water Recovery Study Report, the results of which are integrated into the SWRP.

The purpose of the SWRP is to identify stormwater capture project opportunities that could be utilized as new water supply sources for the Monterey Peninsula and provide additional water quality and environmental benefits. The purpose of the Monterey Peninsula Water Recovery Study, which was conducted as part of the development of this Monterey Peninsula Region SWRP, was to examine the feasibility of establishing a Peninsula-wide water recovery and reclamation system, including identifying and evaluating potential projects that could capture sources of wet and dry weather runoff within the Monterey Peninsula IRWM Planning Area for water recovery and use. The water recovery projects were specifically identified based on their potential to reduce the Peninsula's dependence on the Carmel River, Carmel Valley Alluvial Aquifer, and adjudicated Seaside Groundwater Basin. The study considered how to store, treat, and transport potential sources of runoff prior to entering existing water and wastewater infrastructure for use, but did not identify projects that expand existing water distribution and wastewater storage, treatment, and conveyance system capacities, or determine if this will be needed.

Seven projects were selected for conceptual design in the SWRP. Some of these have the potential of augmenting wastewater flows to the Monterey One Water reclamation facilities and could thus help enable the PWM project to produce more water for use in recharging, or reducing pumping from, the Seaside Groundwater Basin. Since these projects are in the early planning stages and are not currently funded or otherwise being pursued by project sponsors, they are considered only to be potential sources of water that M1W could use to increase the capacity of its PWM project. Thus, no specific quantities of water that would be used for the benefit of the Seaside Groundwater Basin can be identified for these projects.

Six of the seven projects would have the potential to increase flows to the M1W reclamation facilities, and thus have the potential to increase the capacity of the PWM Project. The seventh project lies within the watershed of the City of Carmel-by-the-Sea and would not be of benefit to the Seaside Basin. These six projects are described in the attachment to this Agenda item.

## *SEASIDE BASIN WATER MASTER*
## *TECHNICAL ADVISORY COMMITTEE*

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

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| **AGENDA ITEM:** | 2.F (Continued) |

I will include this information in the Section I am writing for the updated Basin Management Action Plan that the Watermaster will have prepared later this year. I will include a statement that any direct or indirect recharge of the Seaside Basin would require regulatory agency approval to ensure there would be no harmful water quality or other impacts on the Basin.

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| **ATTACHMENTS:** | Description of Projects Being Considered for Recharge of the Seaside Groundwater Basin |
| **RECOMMENDED ACTION:** | None required – information only |

## Description of Projects Being Considered for Recharge of the Seaside Groundwater Basin

Hartnell Gulch Restoration and Stormwater Diversion

The Hartnell Gulch Restoration and Stormwater Diversion project, a proposed diversion to sanitary sewer and creek restoration project, is in the City of Monterey. The project would install a pump to divert underground seepage and dry weather flows into the sanitary sewer. The restoration component would consist of removal of invasive plants, erosion control, and revegetation of native plants. The tributary drainage area for this project is approximately 1,100-acres. The project is estimated to achieve between 20 to 100 ac-ft/yr of water supply.

Lake El Estero Diversion to Sanitary Sewer

The Lake El Estero Diversion to Sanitary Sewer project is in the City of Monterey. This is a lake project that would augment water supply via a diversion to sanitary sewer and remove urban stormwater and dry weather flows that are currently discharged to Monterey Bay, thereby partially restoring natural drainage patterns and removing any urban pollutants that are associated with the diverted flows. The project would install a diversion valve from the box culvert on the north side of the lake to divert flows into the sanitary sewer system, instead of discharging into Monterey Bay. The project is estimated to achieve over 100 ac-ft/yr of water supply from the approximately 3,670-acre tributary drainage area.

Monterey Tunnel Stormwater Diversion

The Monterey Tunnel Stormwater Diversion project is in the City of Monterey. The project would divert flows from the downtown Tunnel and Oliver Street storm drain gravity pipe to the sanitary sewer instead of discharging it into Monterey Bay. This would remove dry weather flows that are currently discharged to Monterey Bay, thereby partially restoring natural drainage patterns and removing any urban pollutants that are associated with the diverted flows. The project is estimated to achieve from 10 to 20 ac-ft/yr of water supply from the approximately 150-acre tributary drainage area.

Pacific Grove-Monterey ASBS Watershed – David Avenue Stormwater Storage and Diversion

The Pacific Grove-Monterey ASBS Watershed – David Avenue Stormwater Storage and Diversion project is in the City of Pacific Grove. This project would store wet weather and dry weather flows for diversion to the Pacific Grove storm drain network instead of discharging runoff into Monterey Bay and the Pacific Grove ASBS region, thereby partially restoring natural drainage patterns in this tributary area and removing any urban pollutants that are associated with the diverted flows. This project is estimated to achieve from 10 to 20 ac-ft/yr of water supply from its approximately 100-acre tributary drainage area.

Del Monte Manor Park Infiltration

The Del Monte Manor Park Infiltration Project in the City of Seaside is a regional infiltration project. The project includes open space park improvements and flood management to infiltrate runoff from the surrounding ROW. This would remove urban stormwater and dry weather flows that are currently discharged to the Pacific Ocean, thereby partially restoring natural drainage patterns and removing any urban pollutants that are associated with the diverted flows. The project will provide indirect benefits of infiltrating 5 to 10 ac-ft/yr of urban runoff above a potable water supply aquifer from its approximately 25-acre tributary drainage area.

Drywell Aquifer Recharge Program

The Drywell Aquifer Recharge Program in the City of Seaside, with support from regional partners, would focus on using drywells to recharge urban runoff to a primary water supply aquifer. The program would recommend potential locations where flows could be diverted from surface ditches or within the storm drain network to a water quality pretreatment system that will discharge to a drywell above the domestic supply aquifers in the Seaside Groundwater Basin. This would remove urban stormwater and

dry weather flows that are currently discharged to the Pacific Ocean, thereby partially restoring natural drainage patterns and removing any urban pollutants that are associated with the diverted flows. The project is estimated to achieve between 20 to 100 ac-ft/yr of water supply.

## *SEASIDE BASIN WATER MASTER*
## *TECHNICAL ADVISORY COMMITTEE*

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

| | |
|---|---|
| **MEETING DATE:** | July 11, 2018 |
| **AGENDA ITEM:** | 3 |
| **AGENDA TITLE:** | Continued Discussion of Technical Memorandum from HydroMetrics on Updating and Recalibrating the Seaside Basin Groundwater Model |
| **PREPARED BY:** | Robert Jaques, Technical Program Manager |

HydroMetrics has completed work on recalibrating and updating the Seaside Basin Groundwater Model under its RFS No. 2018-03.

A draft copy of their Technical Memorandum describing this work was discussed at the TAC's June 13, 2018 meeting, and an updated copy of that document (reflecting deletion of a few editorial comments as requested by Howard Franklin at the June 13 meeting) is attached. A copy of the PowerPoint presentation slides which Ms. King of HydroMetrics used in her June 13 TAC meeting presentation is included with the Minutes from that meeting on pages 7-9 of this Agenda packet.

At the June 13 meeting the TAC determined that it would be worthwhile to have Gus Yates of Todd Groundwater review the Technical Memorandum to see if he had any comments or concerns that he felt should be addressed before the updated model is used. I asked Mr. Yates to perform this review, and a copy of the letter containing his findings and recommendations is attached.

Mr. Yates' review Memo is attached. He concurs with the HydroMetrics Technical Memorandum. In his email he said the review was easy, that it was good to see that additional testing improved model results, and that he thinks the model is fine for continued use.

Ms. Georgina King of HydroMetrics will be available via telephone during today's meeting to respond to any other questions from the TAC.

| | |
|---|---|
| **ATTACHMENTS:** | 1. Updated Draft Technical Memorandum from HydroMetrics on Updating and Recalibrating the Seaside Basin Groundwater Model<br>2. Letter from Gus Yates Containing His Findings and Recommendations Based on His Review of the Draft Technical Memorandum |
| **RECOMMENDED ACTION:** | Approve the Updated Draft Technical Memorandum and Forward the TAC's Findings to the Board |

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

# TECHNICAL MEMORANDUM

To: Seaside Groundwater Basin Watermaster
Technical Advisory Committee

From: Pascual Benito, Georgina King, and Derrik Williams

Date: June 8, 2018

Subject: 2018 Seaside Groundwater Model Update



## Background and Scope

The Watermaster's first Basin Management Action Plan (BMAP) was completed in February 2009 (HydroMetrics LLC, 2009a). The BMAP constitutes the basic plan for managing the Seaside Groundwater Basin. The BMAP identifies both short-term actions and long-term strategies intended to protect the groundwater resource while maximizing the beneficial use of groundwater in the basin. It provides the Seaside Basin Watermaster (Watermaster) a logical set of actions that can be undertaken to manage the basin to its Safe Yield. Over the nine years since the BMAP was completed, the Watermaster has collected much groundwater level and quality data, and conducted various studies to improve the understanding of the basin.

At the time the 2009 BMAP was prepared, a groundwater model had not yet been developed for the basin, and the analysis contained in the BMAP was completed using analytical methods. Following the BMAP recommendation that a groundwater model be constructed to assist with groundwater management decisions, a calibrated model was completed in November 2009 (HydroMetrics LLC, 2009b). The model simulated groundwater conditions in the basin between January 1987 and December 2008. In 2014, the model was updated with data through September 2013 (HydroMetrics WRI, 2014) but not recalibrated because its accuracy was still acceptable. The 2014 update found that the uncalibrated portion of the model (January 2009 – September 2013) tended to simulate higher groundwater levels than measured levels. Periodic recalibration of the model is

necessary to ensure the model simulates groundwater levels within an acceptable industry standard accuracy. When simulated groundwater levels are not accurate this reduces the accuracy of all output from the model such as groundwater storage and water budget.

This technical memorandum documents (1) the update of the Seaside Basin groundwater model that extends the model simulation period through 2017, and (2) recalibration of the model using all the groundwater level data that has been added to the model since 2008. In extending the model timeframe, new pumping and recharge input data for the extended period, and new groundwater level data used to measure model calibration were added to the model.

## Data Collection and Input to Model

### PUMPING

Updated monthly records of groundwater pumping from wells in the model area were provided by Monterey Peninsula Water Management District (MPWMD), Cal Water Service, and Marina Coast Water District (MCWD) for the period between 2014 and 2017.

Figure 1 shows the total monthly pumping for the entire model period of 1987-2017. The pumping pattern of the updated period between 2014 and 2017 is similar to the lower pumping that was observed in the 1992/93 drought. No new wells were added to the model for the updated period as no new municipal production wells were drilled and put into production between 2014 and 2017.

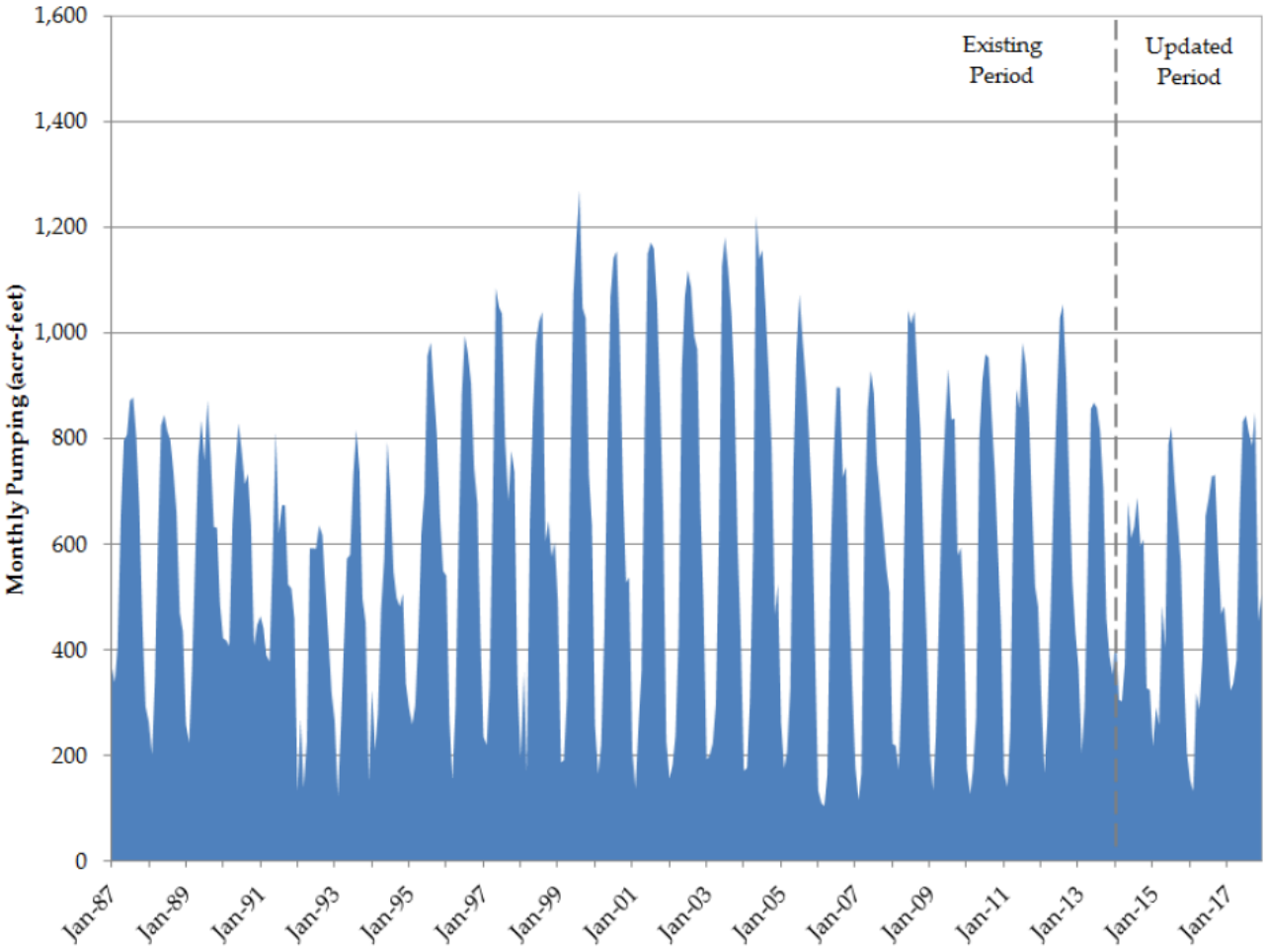


*Figure 1: Total Monthly Pumping*

## DEEP GROUNDWATER RECHARGE

The amount of deep groundwater recharge added to the model each month is estimated by a soil moisture balance model. The documentation of this model can be found in the Seaside Basin Modeling and Protective Groundwater Elevations Report (HydroMetrics, 2009a). The inputs to the soil moisture balance model include:

- Water system deliveries
- Precipitation
- Evapotranspiration
- Land use
- Soil types
- Recharge pond and septic information

The soil moisture balance model was updated by supplying updated input data to extend the model period through the end of 2017. System loss data were obtained from MPWMD for Cal-Am water delivered to customers. Precipitation data were downloaded from the Utah Climate Center to extend the Monterey (Coop No. 45795) and Salinas (Coop No. 47668) station data. Monthly evapotranspiration data were downloaded for the Castroville CIMIS station.

As the soil moisture balance model uses average monthly evapotranspiration rates, 2009-2017 evapotranspiration data for the Castroville CIMIS station was evaluated to determine if it varied from average monthly rates used previously in the model. It was found that average monthly evapotranspiration for the updated period was similar to previous years and thus, average monthly evapotranspiration rates for the updated model were assumed to be the same as for the 1987-2008 original model calibration period.

The number of septic tanks in use and the land use throughout the model domain were assumed to be the same because land use has not changed substantially from the General Plan land use used in the original model. The amount of runoff percolation occurring in the recharge ponds is estimated in the soil moisture balance model as a proportion of precipitation.

Figure 2 shows the estimated total monthly deep groundwater recharge that is input into the model for every month between 1987 and 2017. The greatest recharge takes place during winter months when deep percolation of rainfall occurs. Less recharge takes place during the dry portion of the year when recharge

is dependent upon system losses and irrigation return flow. This seasonal pattern is consistent throughout the entire simulation period, including the updated model period.

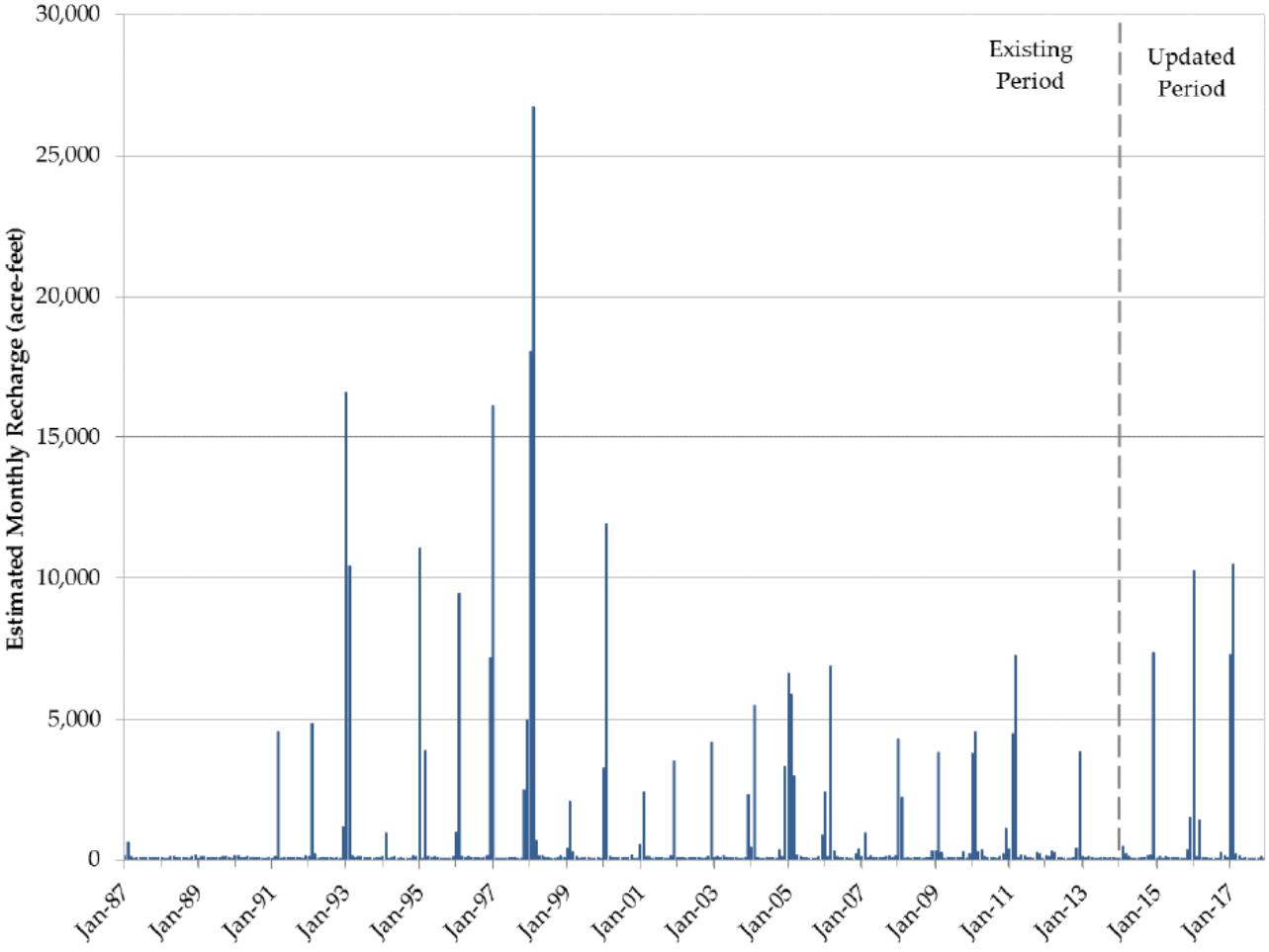


*Figure 2: Estimated Monthly Recharge*

## GROUNDWATER LEVEL OBSERVATIONS

An updated set of groundwater level observations from wells in the Seaside Basin were provided by MPWMD, MCWD, and the Monterey County Water Resources Agency (MCWRA). The dataset covers the updated model period of 2014-2017. Observations collected from wells that were pumping at the time of measurement (pumping temporarily lowers the groundwater level at the well location) and other questionable values were removed from the dataset.

The updated groundwater level data were used to assess the performance of the updated groundwater model. Performance of the model was evaluated by comparing the model's simulated groundwater elevations to the observed groundwater elevations that were provided. This process is described in greater detail in the Model Recalibration section below.

## MODEL BOUNDARY WITH SALINAS VALLEY

Groundwater flows freely into and out of the Salinas Valley along the model's northeastern boundary. The boundary with Salinas Valley was simulated as a specified head boundary condition with the MODFLOW Constant Head (CHD) package. This option assigns a set of specified (or known) groundwater elevation heads to each model cell along the northwestern boundary. The specified groundwater elevations vary spatially along the boundary and can also be made to vary with time according to changing conditions. If simulated groundwater elevations in the model are higher than the assigned boundary elevations, water will flow out of the model towards the Salinas Valley. If simulated groundwater elevations in the model are lower than the assigned boundary elevations, water will flow from the Salinas Valley into the model.

For the original model calibration in 2009 (HydroMetrics LLC, 2009b), the groundwater elevations assigned to the model cells along the northeastern boundary were derived from results of the Salinas Valley Integrated Groundwater Surface Water Model (SVIGSM) (Montgomery Watson, 1997). WRIME Inc., the consultant updating the SVIGSM for Monterey County Water Resources Agency, provided estimated groundwater elevations from a number of the SVIGSM nodes that were near the regional model boundary and these were interpolated onto the regional model boundary cells ("the 1997 SVIGSM results"). In 2009, the SVIGSM calibrated results were available only through model year 1994, so the SVIGSM groundwater heads from the last month of 1994 were repeated through the end of the calibration model period, 2008, for each boundary cell.

In 2010, WRIME, Inc. provided updated SVIGSM results ("2010 SVIGSM Results") that covered a longer time period extending to 2004, and these new results were used to update the specified heads along the northeastern boundary as part of a modeling study looking at the impacts from the Regional Project as described in the Final Environmental Impact Report (EIR) for the Coastal Water Project (HydroMetrics Water Resources Inc., 2010).

In the Seaside Basin model's 2014 update, the Seaside Basin model was updated to extend through years 2005-2013. SVIGSM model results were not available for these years, so to approximate the groundwater elevations along the northeastern boundary for this period, the final 12 months of available 2010 SVIGSM results (from year 2004) were applied to each of the remaining years from January 2005 through December 2013. This is illustrated in graph form on Figure 3 as the higher elevation blue line.

At the time of the 2014 Seaside Basin model update, no sensitivity analysis had yet been performed for the northeastern boundary condition to evaluate if and how changes to the specified heads along this boundary might impact model results. Given that the boundary is over four miles away from the nearest Seaside Basin production wells located in the central portion of the Northern Coastal subarea, it was thought that impacts from the boundary would be greatest in areas adjacent to the boundary, and would have less impact on areas further away.

In preparation for the model recalibration described in this Technical Memorandum, a limited sensitivity analysis of the northeastern boundary condition was carried out by applying consecutive changes in specified groundwater heads along the boundary for different durations of time, and assessing how this impacted groundwater levels in different areas of the model. It was found that changes in specified boundary heads of more than 10-20 feet over multi-year periods resulted in changes to groundwater levels and regional gradients in large areas of the model including areas not directly adjacent to the boundary, such as the Northern Coastal subarea. Because of the length and large cross-sectional area of the northeastern boundary, large changes in the specified heads over sustained periods of time can change the regional groundwater levels and gradients, the location of the groundwater divide, and also the spatial and temporal distribution of wet and dry cells in the model.

With this understanding, the original 1997 SVIGSM model and the newer 2010 SVIGSM model head values along the northeastern boundary were compared against one another, as shown for an example model boundary cell in Figure 3. For the same time periods, the newer updated 2010 SVIGSM head values that were used to update the model in 2014 were significantly higher than the earlier 1997 SVGISM model head values, by as much as 35 feet during some periods.

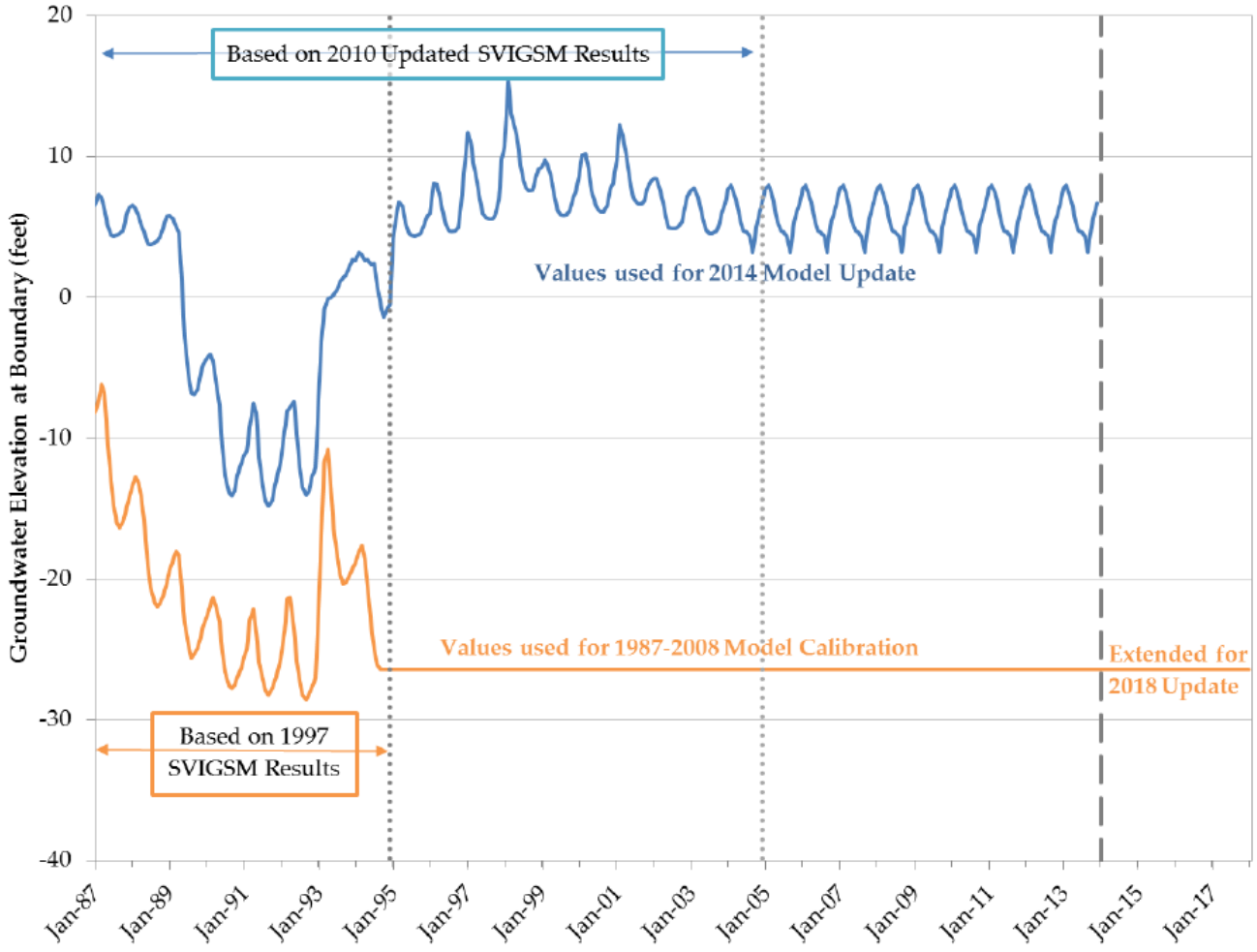


*Figure 3: Groundwater Elevations at an Example Northeastern Boundary Cell*

The two SVIGSM model results (1997 and 2010) were compared against measured groundwater levels in wells located along and adjacent to the northeastern boundary. Historical and current groundwater level data for these wells were compiled from a number of sources, including the Fort Ord environmental remediation monitoring wells, the California Department of Water Resources CASGEM program, and Marina Coast Water District's production wells.

The comparison of the two SVIGSM model results along the boundary showed that the heads from the earlier 1997 SVIGSM model results used for the original 2009 Seaside Basin model calibration much more closely match observed groundwater levels along the boundary over the extended model period through

2017. Using the 2010 SVIGSM heads did not allow for improvement in model calibration and for this reason, the much higher 2010 SVIGSM heads, used in the groundwater model since 2010, were replaced with the original 1997 SVIGSM heads. The head value for the last month of 1994 in the 1997 SVIGSM model were applied to all subsequent months through December 2017, as shown in Figure 3. Even without the annual seasonal variation in the extended period from 1994 through 2017, it was found matching the overall average head elevations along the boundary was critical to recalibrating the model.

## Model Recalibration

### CALIBRATION APPROACH

Calibrating the groundwater flow model involved successive attempts to match model output to measured data from the calibration period. Relatively uncertain and sensitive parameters such as horizontal and vertical hydraulic conductivities, were varied over a reasonable range of values. Simulated hydraulic heads were compared against available observed groundwater elevations. The model was considered calibrated when simulated groundwater levels matched the measured groundwater levels within an industry standard acceptable measure of accuracy, and when successive calibration attempts did not notably improve the calibration statistics. Acceptable measures of model accuracy are described on pages 15 and 16.

Prior to varying the 2009 calibrated model parameters such as hydraulic conductivity and storage coefficients, a limited sensitivity analysis was carried out on two model inputs that had not previously undergone calibration, 1) the specified head boundary with the Salinas Valley (as described in the previous section), and 2) the deep groundwater recharge estimated using a soil moisture balance model.

The sensitivity of the groundwater model to changes in applied recharge was evaluated by making incremental changes to the soil properties in the soil moisture balance model. Both the rooting depth and the soil runoff curve numbers (CN) are soil parameters that influence the percentage of rainfall that runs off or infiltrates to become recharge. Rooting depth is the typical depth of the root zone and the soil runoff curve number is a coefficient that reduces precipitation to runoff. The soil balance model was run with a range of soil rooting depth (between 12-80 inches) and a range of CN parameter values to create different groundwater recharge input data sets for the groundwater model, and the sensitivity of the

changes on simulated groundwater levels was evaluated. It was found that in general the model was much more sensitive to long-term average groundwater elevations along the Salinas Valley boundary than to changes in the soil runoff properties, and as such, recalibration efforts were focused first on recalibrating the Salinas Valley boundary as described in the previous section.

## CALIBRATION RESULTS

After updating the Salinas Valley boundary conditions as described above, the updated groundwater model was re-run and the calibration results improved to the same level of calibration as the original 1987-2008 calibration period. This indicates that the revision of the northern boundary condition provides for better simulation of groundwater levels than the model was able to achieve with the higher 2010 SVIGSM heads. Many of the simulated groundwater levels that had been diverging from the observed values in the 2014 model update better matched observed values. At this stage, a calibration tool called Parameter Estimation (PEST) (Watermark Numerical Computing, 2004) was used to determine if further significant improvements could be made by adjusting model parameters.

### MODEL PARAMETER MODIFICATIONS

Model hydraulic parameters are adjusted during model calibration to improve the model's ability to simulate known conditions. Calibration runs of the model with PEST consisted of modifying the distribution and magnitude of horizontal hydraulic conductivity, vertical hydraulic conductivity, and specific storage values. This process was conducted in the 2009 model calibration.

For this 2018 recalibration of the model, hydraulic parameter modifications resulted in measureable, but not significant, improvements in the calibration statistics. In some cases, small improvements were gained in matching groundwater levels of some wells, while other wells showed decreases in accuracy. It was determined that the existing calibrated parameters should be kept and that the recalibration of groundwater elevations at the Salinas Valley boundary was sufficient to return the model to its original performance and accuracy, without the need to modify hydraulic parameters.

### GROUNDWATER ELEVATION CALIBRATION

Groundwater flow model calibration is evaluated by comparing simulated groundwater elevations with observed groundwater elevations from monitoring and production wells. Hydrographs of simulated groundwater elevations should

generally match the trends and fluctuations observed in measured hydrographs. Furthermore, the average errors between observed and simulated groundwater elevations should be relatively small and unbiased. Unbiased means that simulated groundwater levels should not be either all higher or all lower than the observed values. For wells screened over multiple model layers, simulated groundwater levels in each of the layers were weighted by layer transmissivity and averaged before comparing with measured data.

Example hydrographs showing both observed and simulated groundwater elevations are shown in Figure 4 through Figure 7. These example hydrographs were selected to demonstrate the model's accuracy in various parts of the Seaside Groundwater Basin. The hydrographs show that the updated model accurately simulates both the magnitude of groundwater fluctuations and trends observed in monitoring well data throughout the basin. A complete set of hydrographs showing both observed and simulated groundwater elevations are included in Appendix A.

Various graphical and statistical methods can be used to demonstrate the magnitude and potential bias of the calibration errors. Figure 8 shows all simulated groundwater elevations plotted against observed groundwater elevations for each month in the updated calibration period. Results from an unbiased model will scatter around a dashed line with a slope of 45° on Figure 8. If the model has a bias such as consistently exaggerating or underestimating groundwater level differences, the results will diverge from this line. The dashed line drawn on Figure 8 demonstrates that the results suggest that in general the model results are not biased towards overestimating or underestimating average groundwater level differences.

The four statistical measures used to evaluate calibration are the mean error (ME), the mean absolute error (MAE), the standard deviation of the errors (STD), and the root mean squared error (RMSE). These statistical measures are included on Figure 8. These statistical measures take into consideration all wells in the model with groundwater level data.

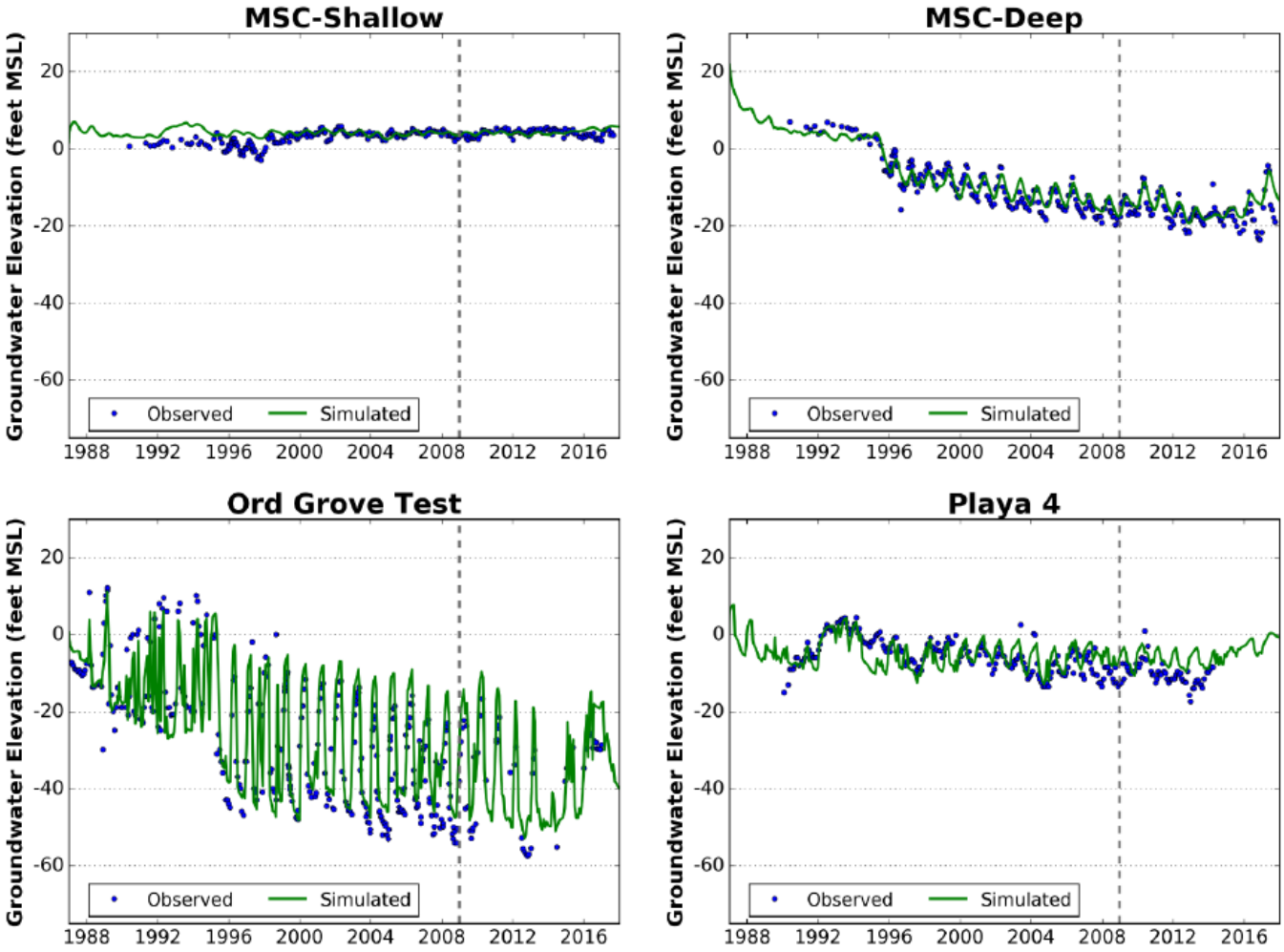


*Figure 4: Hydrographs – Northern Coastal Subarea*

Right of the dashed line represents the model period added as part of this model update

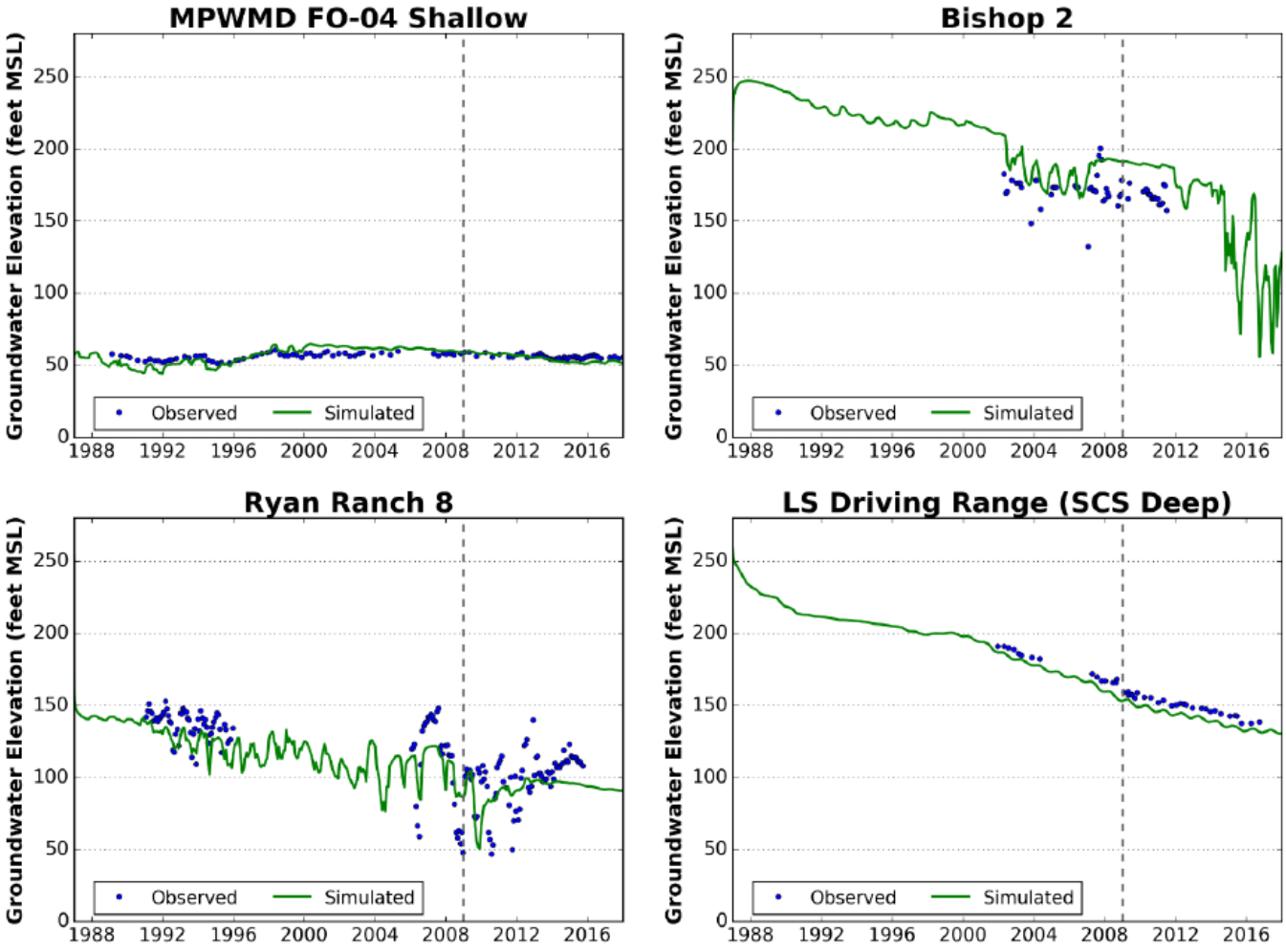


*Figure 5: Hydrographs – Laguna Seca Subarea*

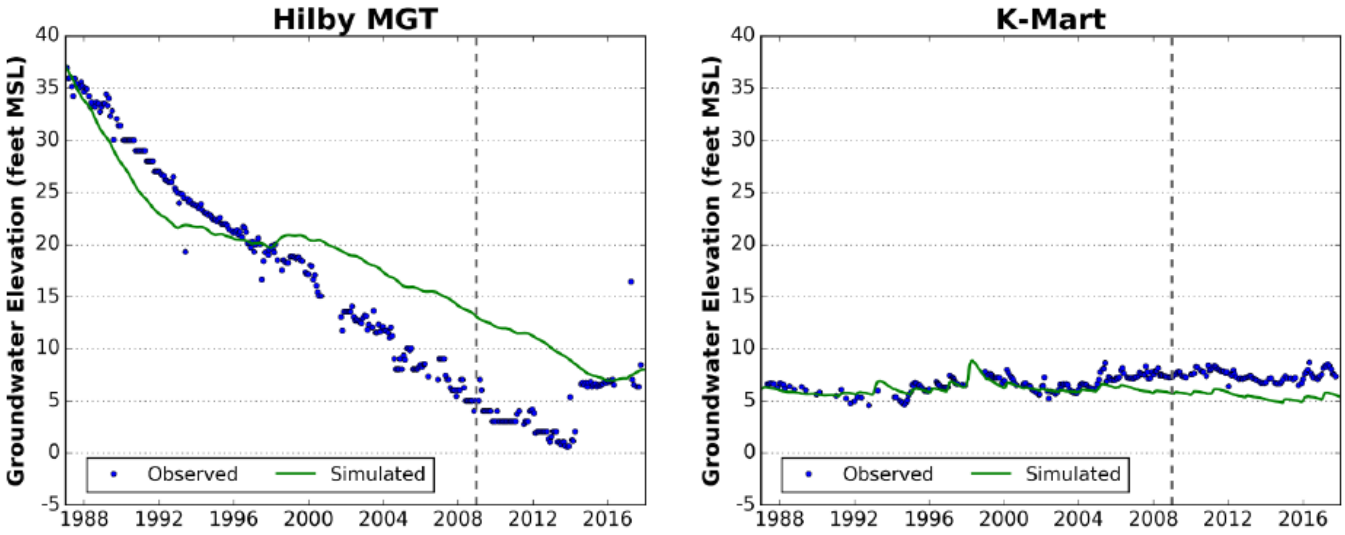


*Figure 6: Hydrographs – Southern Coastal Subarea*

Right of the dashed line represents the model period added as part of this model update

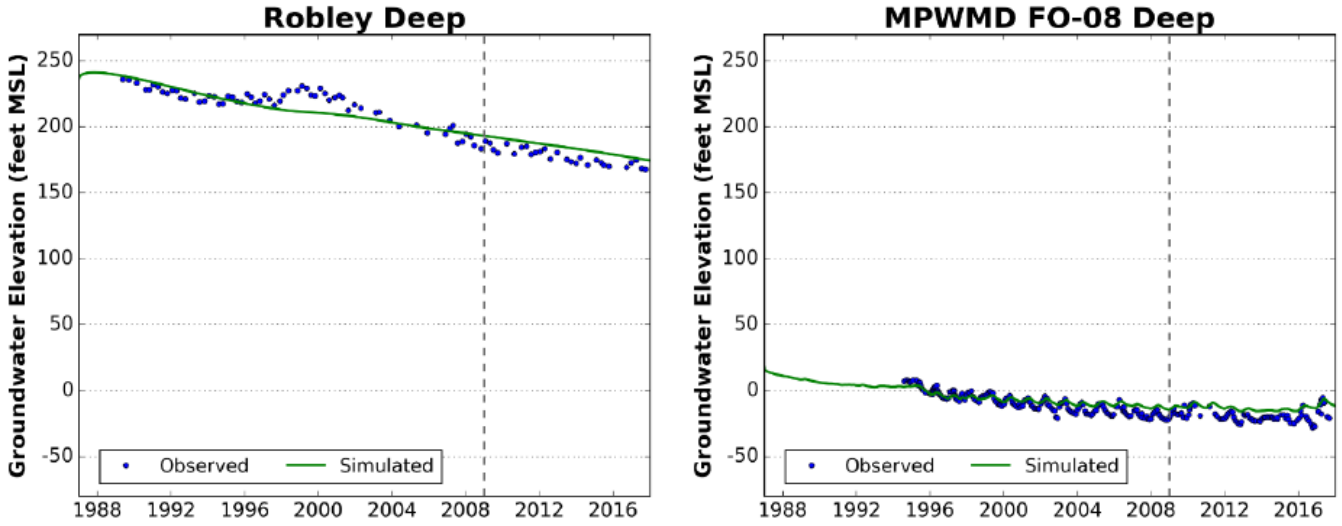


*Figure 7: Hydrographs – Outside Seaside Groundwater Basin*

Right of the dashed line represents the model period added as part of this model update

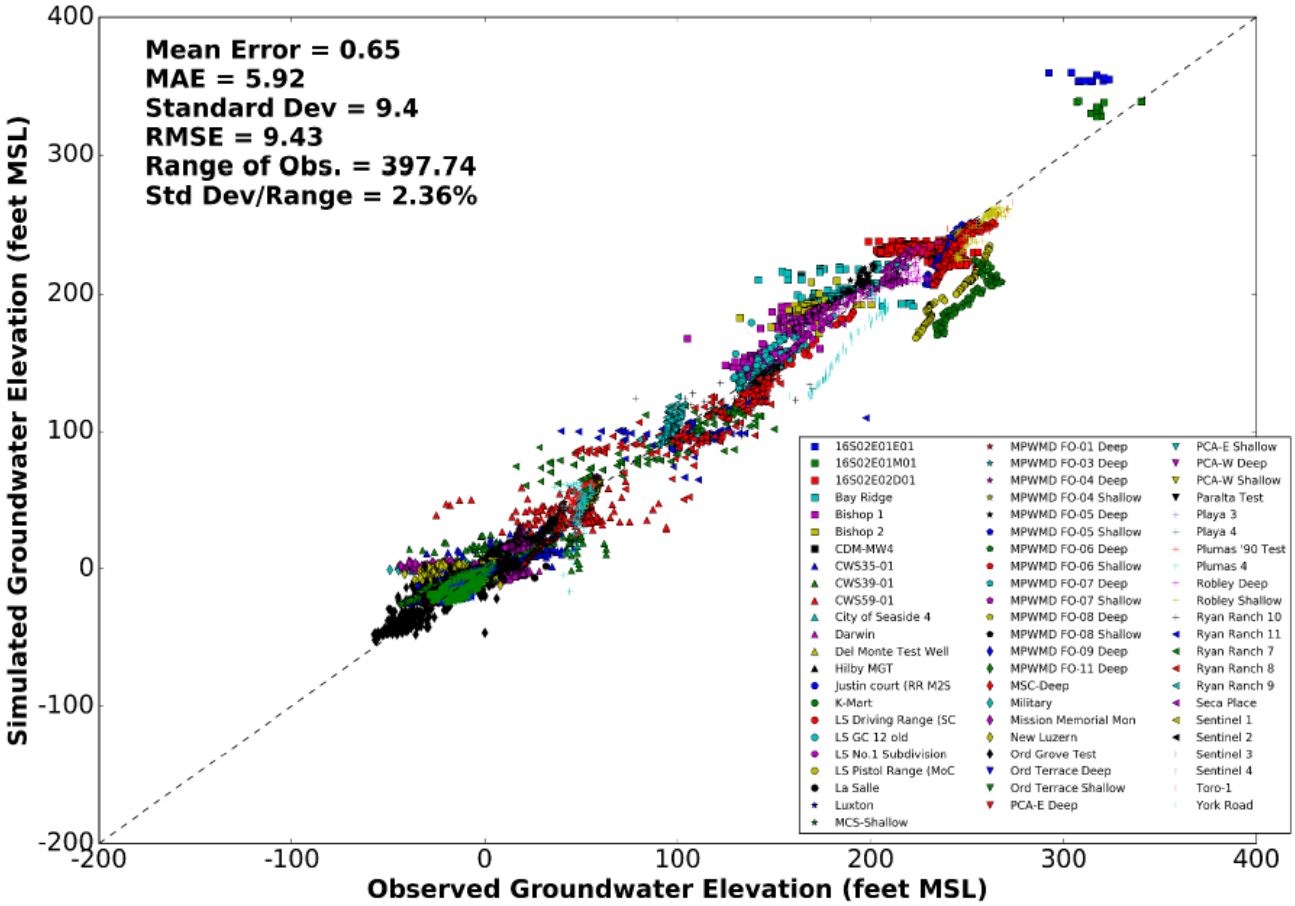


*Figure 8: Simulated Versus Observed Groundwater Elevations - All Data (1987–2017)*

The mean error is the average error between measured and simulated groundwater elevations for data on Figure 8 through **Error! Reference source not found.**.

$$ME = \frac{1}{n}\sum_{i=1}^{n}(h_m - h_s)_i$$

Where $h_m$ is the measured groundwater elevation, $h_s$ is the simulated groundwater elevation, and n is the number of observations.

The mean absolute error is the average of the absolute differences between measured and simulated groundwater elevations.

$$MAE = \frac{1}{n}\sum_{i=1}^{n}|h_m - h_s|_i$$

The standard deviation of the errors is one measure of the spread of the errors around the 45º line on Figure 8 through **Error! Reference source not found.**. The population standard deviation is used for these calculations.

$$STD = \sqrt{\frac{n\sum_{i=1}^{n}(h_m - h_s)_i^2 - \left(\sum_{i=1}^{n}(h_m - h_s)\right)_i^2}{n^2}}$$

The RMSE is similar to the standard deviation of the error. It also measures the spread of the errors around the 45º line on Figure 8 through **Error! Reference source not found.**, and is calculated as the square root of the average squared errors.

$$RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(h_m - h_s)_i^2}$$

As a measure of successful model calibration, Anderson and Woessner (1992) state that the ratio of the spread of the errors to the total head range in the system should be small to ensure that the errors are only a small part of the overall model response. As a general rule, the RMSE should be less than 10% of the total head range in the model.

The RMSE for the entire simulation period is 9.4 feet. This is approximately 2.4% of the total range of observed groundwater elevations of 397.7 feet. Table 1 provides a comparison of calibration statistics for both the original 2009 model and the 2018 recalibrated model. The table shows that overall, the 2018 updated and recalibrated model simulates groundwater levels better than the 2009 model.

*Table 1: Comparison of 2009 Model Calibration and 2018 Recalibration Statistics*

| **Statistical Measure** | **2009 Calibration** | **2018 Recalibration** |
|---|---|---|
| Mean Error | 2.18 | 0.65 |
| Mean Absolute Error (MAE) | 7.4 | 5.9 |
| Standard Deviation | 12.9 | 9.4 |
| Root Mean Squared Error (RMSE) | 12.9 | 9.4 |
| Standard Deviation/Range | 2.9% | 2.4% |

A second general rule that is occasionally used is that the absolute value of the mean error should be less than 5% of the total head range in the model. The mean error for the entire simulation period is 0.65 feet. This is approximately 0.2% of the range of observed groundwater elevations. These results indicate that the model is in good calibration after the model update and recalibration of the Salinas Valley boundary condition.

A second graph type used to evaluate bias in model results is shown on Figure 9. This figure shows observed groundwater elevations versus model residual (observed elevation minus simulated elevation) for the entire model period. A residual value of zero would indicate the model exactly simulating the observed groundwater elevation. Residual values greater than zero indicate that the model has underestimated observed groundwater levels, and residuals less than zero indicate the model has overestimated the observed groundwater level. Results from a non-biased simulation will appear as a cloud of residual points evenly distributed both above and below zero model residual line. Results that do not cluster around the zero residual line show potential model bias. Results that display a trend instead of a random cloud of points may suggest additional model bias.

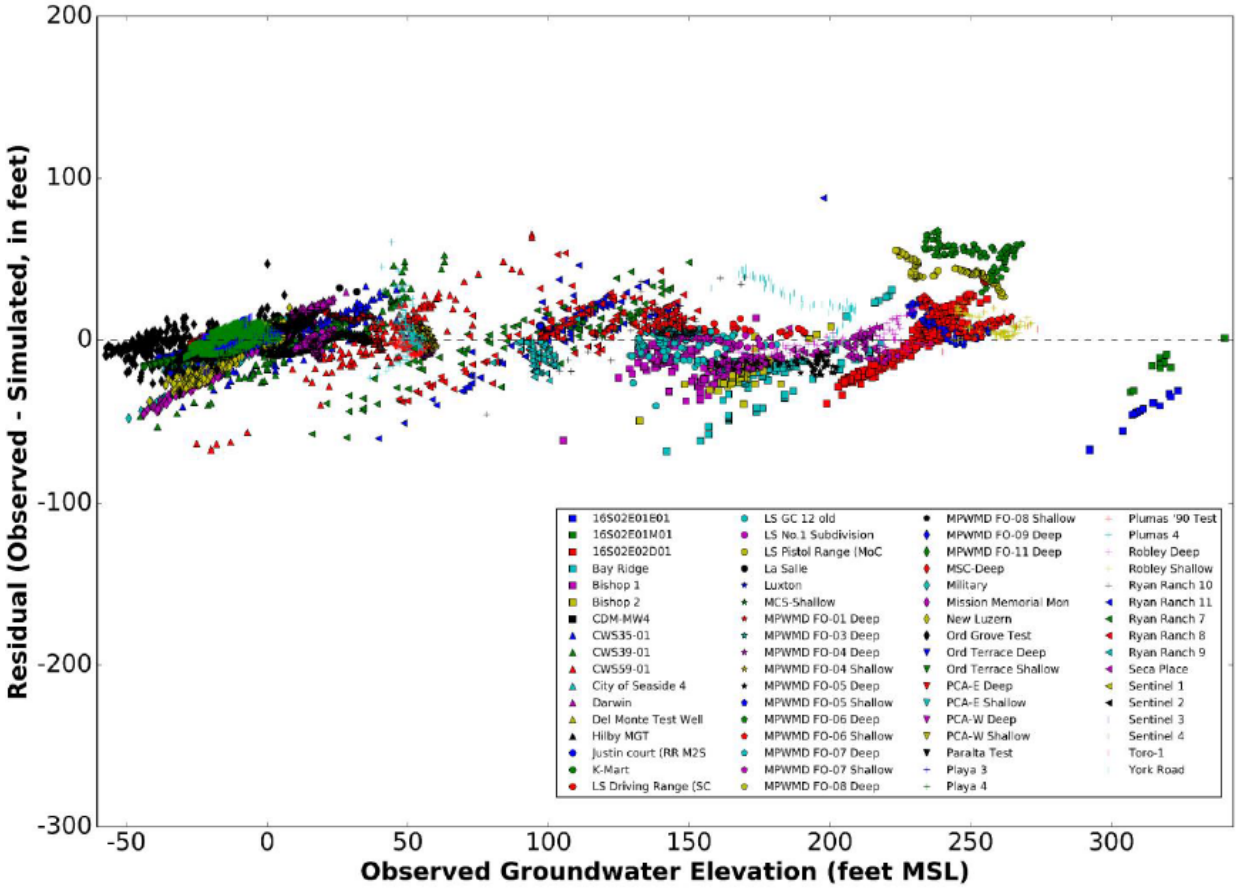


*Figure 9: Observed Groundwater Elevations Versus Model Residual - All Data (1987–2013)*

The residuals plotted on Figure 9 show that overall the calibrated model is not strongly biased to either overestimating or underestimating observed groundwater levels. There are however, some individual wells that show bias towards overestimation or underestimation, as well as some wells that show trends that may indicate other types of model bias. There are a number of individual well hydrographs in Appendix A with simulated groundwater levels that do not correspond well with observed levels. Generally, these are production wells that are screened in multiple aquifers/model layers, e.g., Northern Coastal Subarea wells: Military, Mission Memorial Monitor (former production well), and City of Seaside 3. Without field spinner (flow) testing to determine how much groundwater each aquifer is contributing to the well, only an estimate of each aquifer's contribution can be simulated by the model. The difference in modeled levels and observed levels can be attributed to this estimate not being correct and/or the model layers in this area requiring refinement. For example, , some production wells, such as City of Seaside 3 and City of Seaside 4, are located in the same model cell, and as such because of the model grid resolution, the model cannot accurately resolve the different groundwater level behavior at both wells.

As there is a mix of well simulated and less well simulated wells in the same area, there is confidence that the model is simulating groundwater levels acceptably in those areas, and that there no locational bias. Monitoring wells such as MSC-Shallow, MSC-Deep, Ord Grove Test, Del Monte Test, show much better correlation between simulated and observed groundwater levels. These wells are screened in a single aquifer/model layer which provides much more certainty in assigning it to a model layer.

Appendix A includes hydrographs for all wells so that it is clear that some wells are less well calibrated than others. It is impossible to simulate every well accurately, and thus the statistical measures described above have ranges of statistics that are considered acceptable. Statistical ranges such as the RMSE should be less than 10% of the total head range in the model, and the absolute value of the mean error should be less than 5% of the total head range in the model acknowledge that some wells will be less well calibrated than others.

## Conclusions

1. Simulated groundwater levels are sensitive to the specified heads along the northeastern boundary with the Salinas Valley. The behavior of the boundary was found to impact the calibration of areas of the model at some distance from the boundary. It was found that in the absence of the most recent Salinas Valley Integrated Hydraulic Model (SVIHM), currently being developed by the USGS, assigning boundary head elevations that match the general observed average groundwater levels along the boundary is more important than capturing smaller scale seasonal fluctuations along the boundary. It is recommended that when the SVIHM has been completed, an assessment of how well it simulates historical groundwater conditions in the Seaside Basin be conducted. If it is concluded that the new data improves simulation of groundwater level in the Seaside Basin, the boundary condition can be revised using parts of the SVIHM that improve model calibration of the Seaside Basin model.

2. The model recalibration improved calibration statistics over the original 2009 model calibration. As a result, simulated groundwater levels throughout the model, as a whole, better match observed groundwater levels.

3. The groundwater model should be updated in a maximum of five years and its calibration reevaluated at that time. However, if groundwater related projects are implemented in the basin before that time, the update and calibration reevaluation may need to be performed sooner.

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## *APPENDIX A: HYDROGRAPHS*

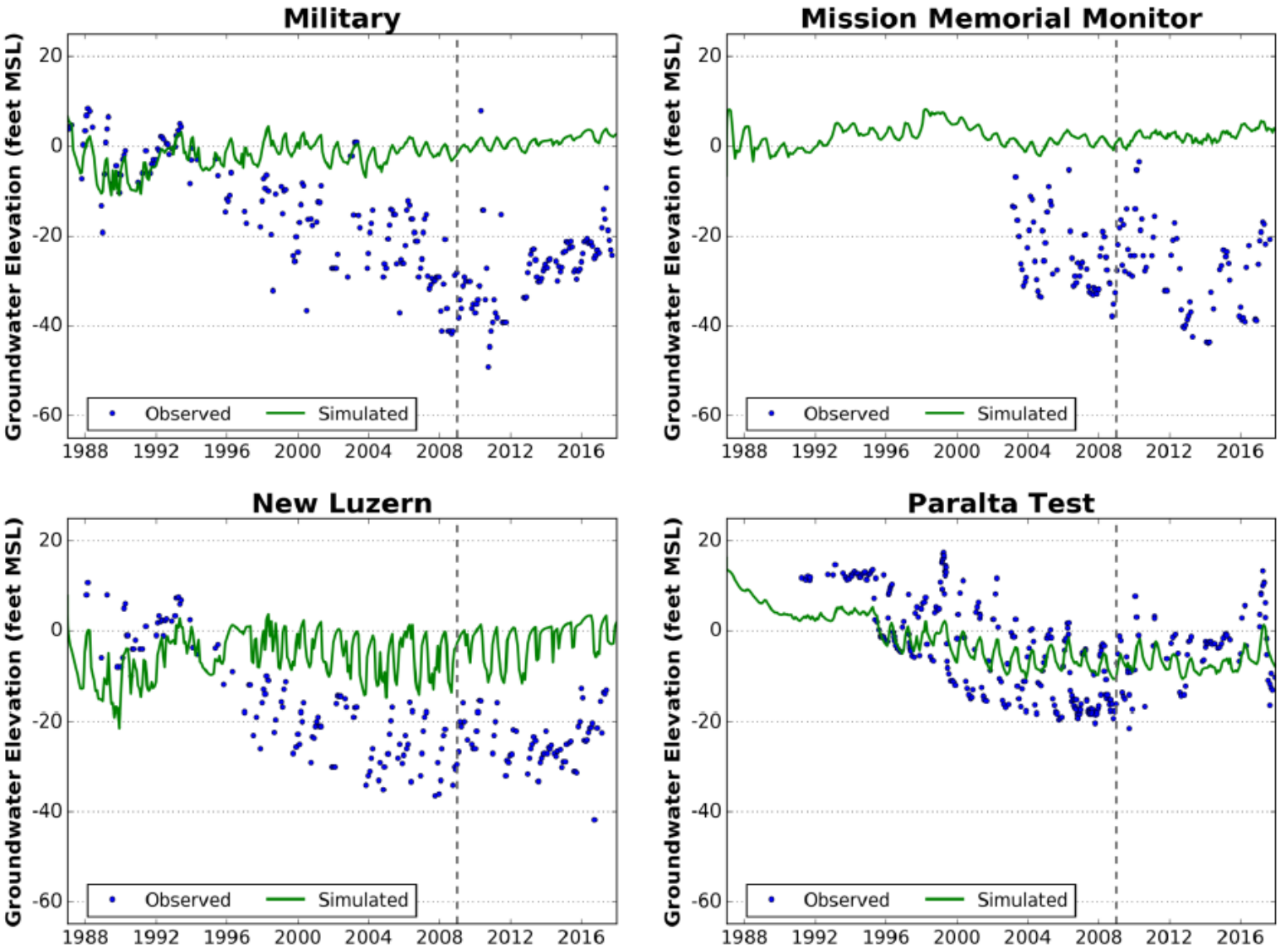



*Figure A1: Northern Coastal Subarea Hydrographs*

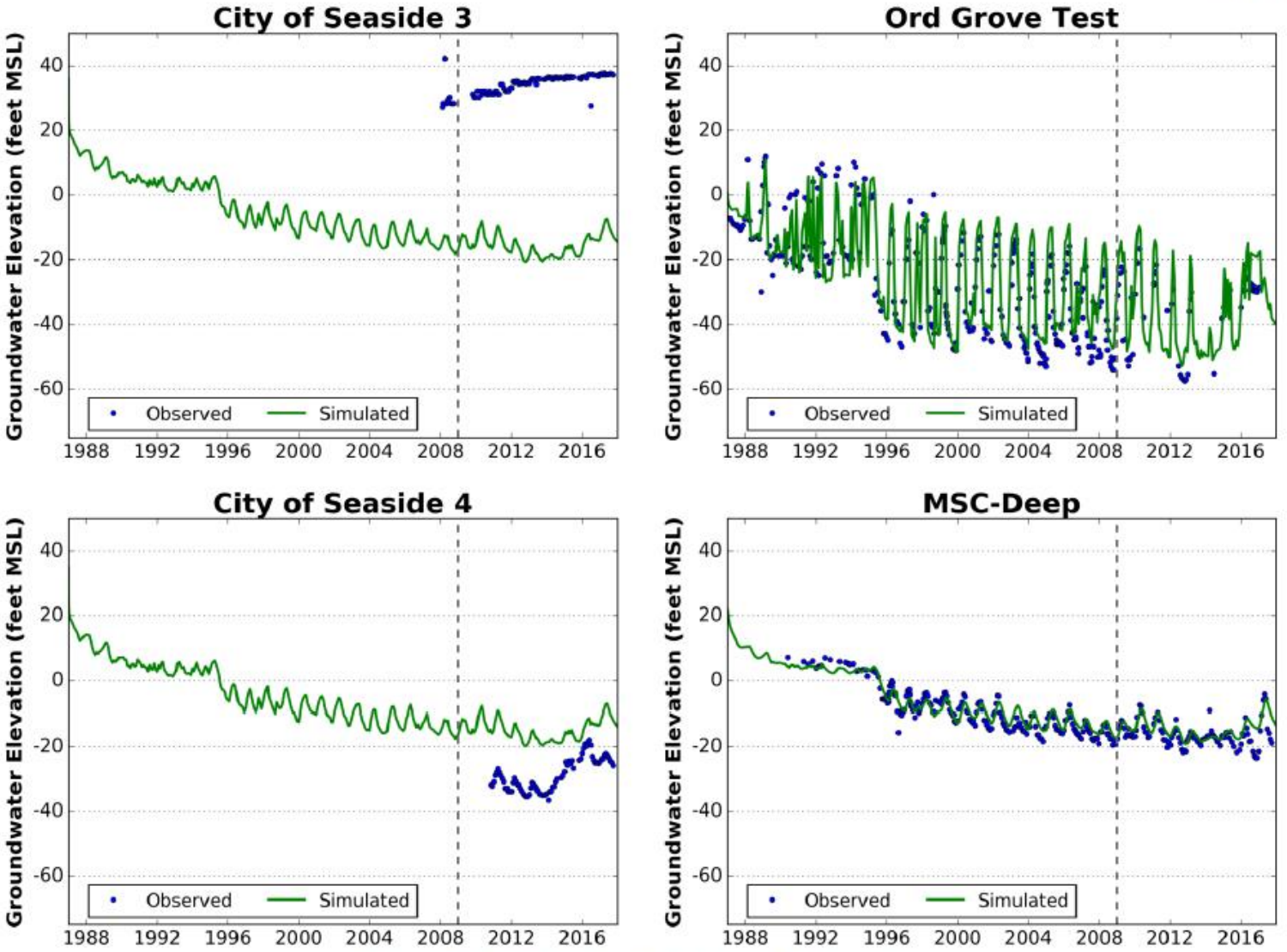



*Figure A2: Northern Coastal Subarea Hydrographs*

*HydroMetrics Water Resources Inc. • 1814 Franklin Street, Suite 501 • Oakland, CA 94612*
*(510) 903-0458 • (510) 903-0468 (fax)*

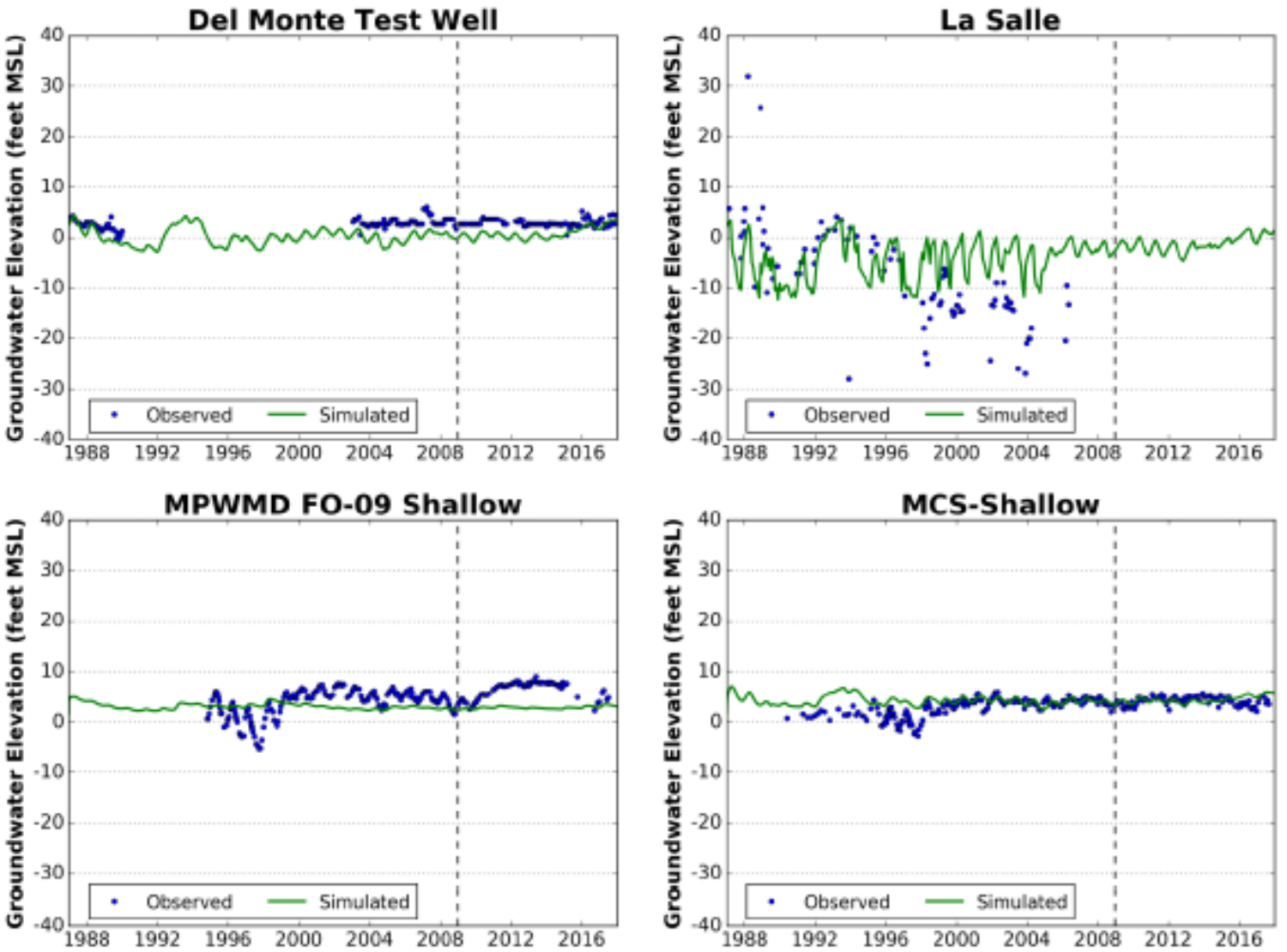



*Figure A3: Northern Coastal Subarea Hydrographs*

*HydroMetrics Water Resources Inc. • 1814 Franklin Street, Suite 501 • Oakland, CA 94612*
*(510) 903-0458 • (510) 903-0468 (fax)*

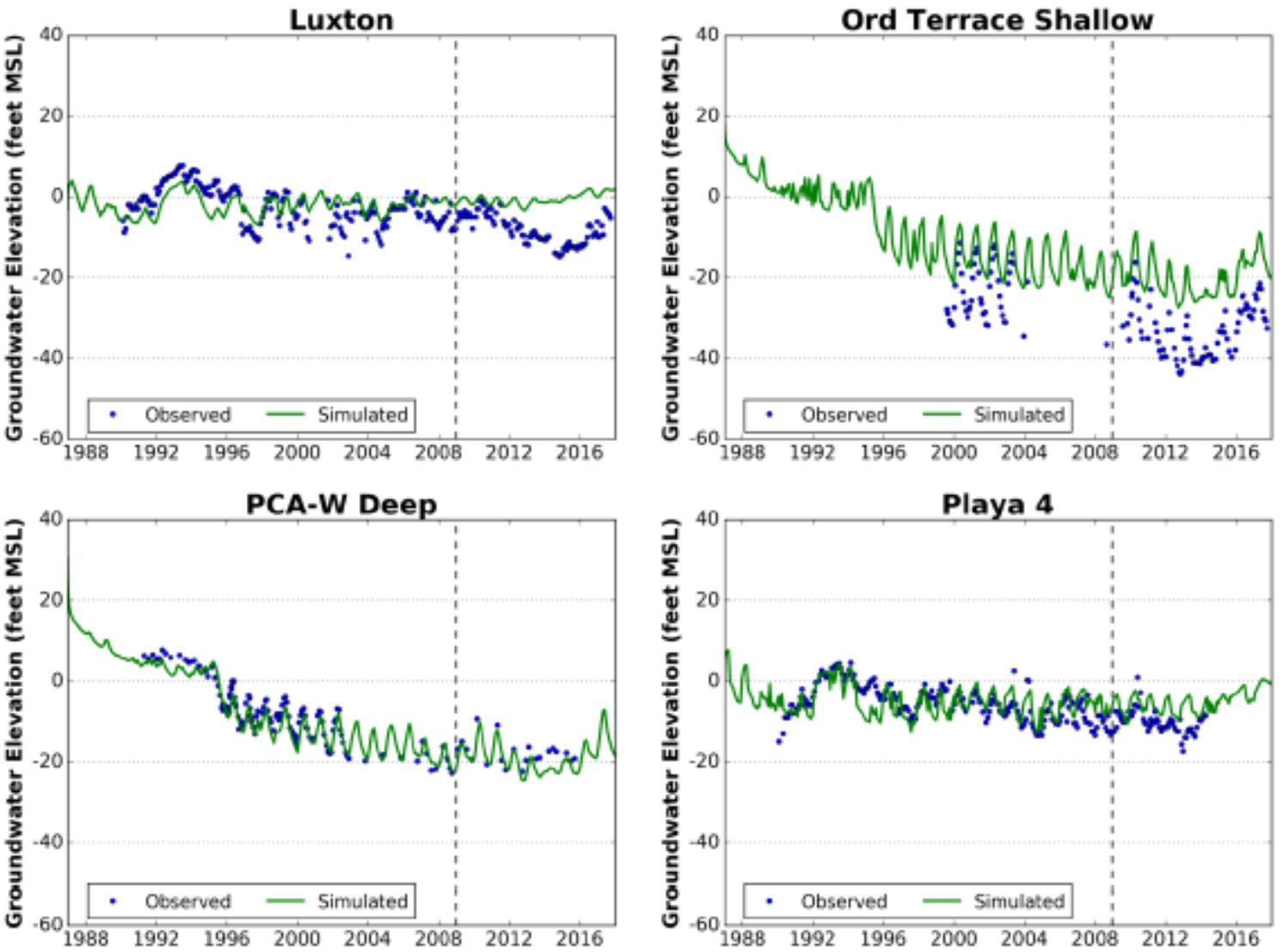
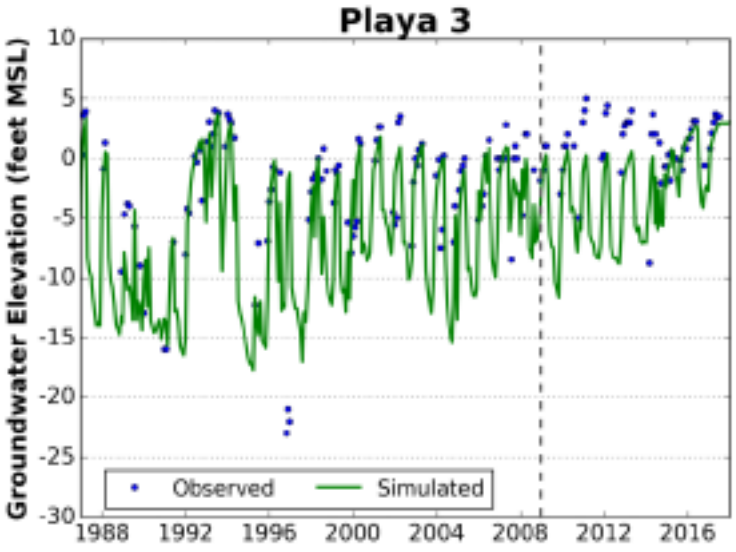
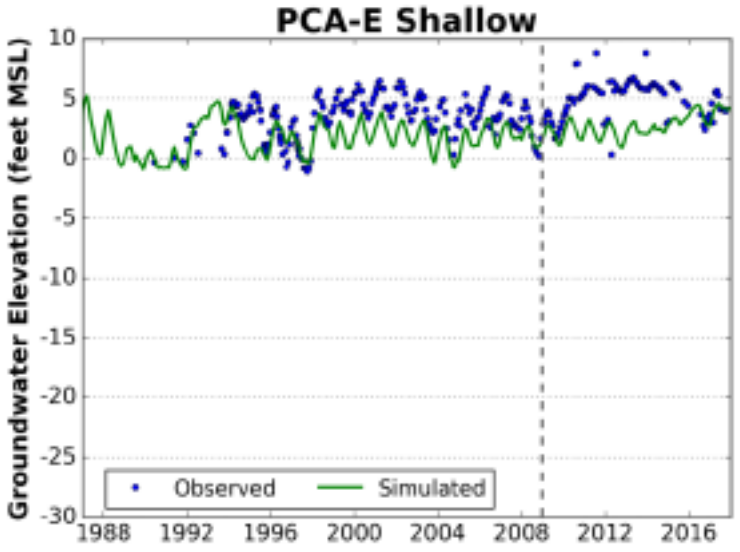



*Figure A4: Northern Coastal Subarea Hydrographs*



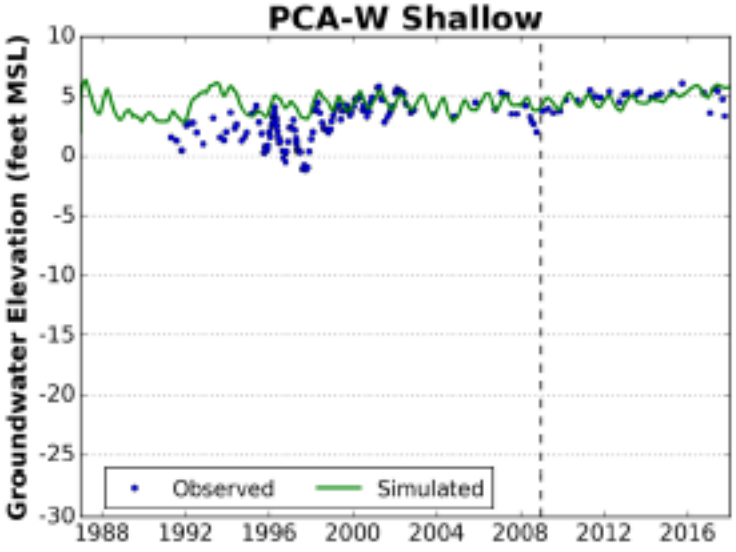




*Figure A5: Northern Coastal Subarea Hydrographs*

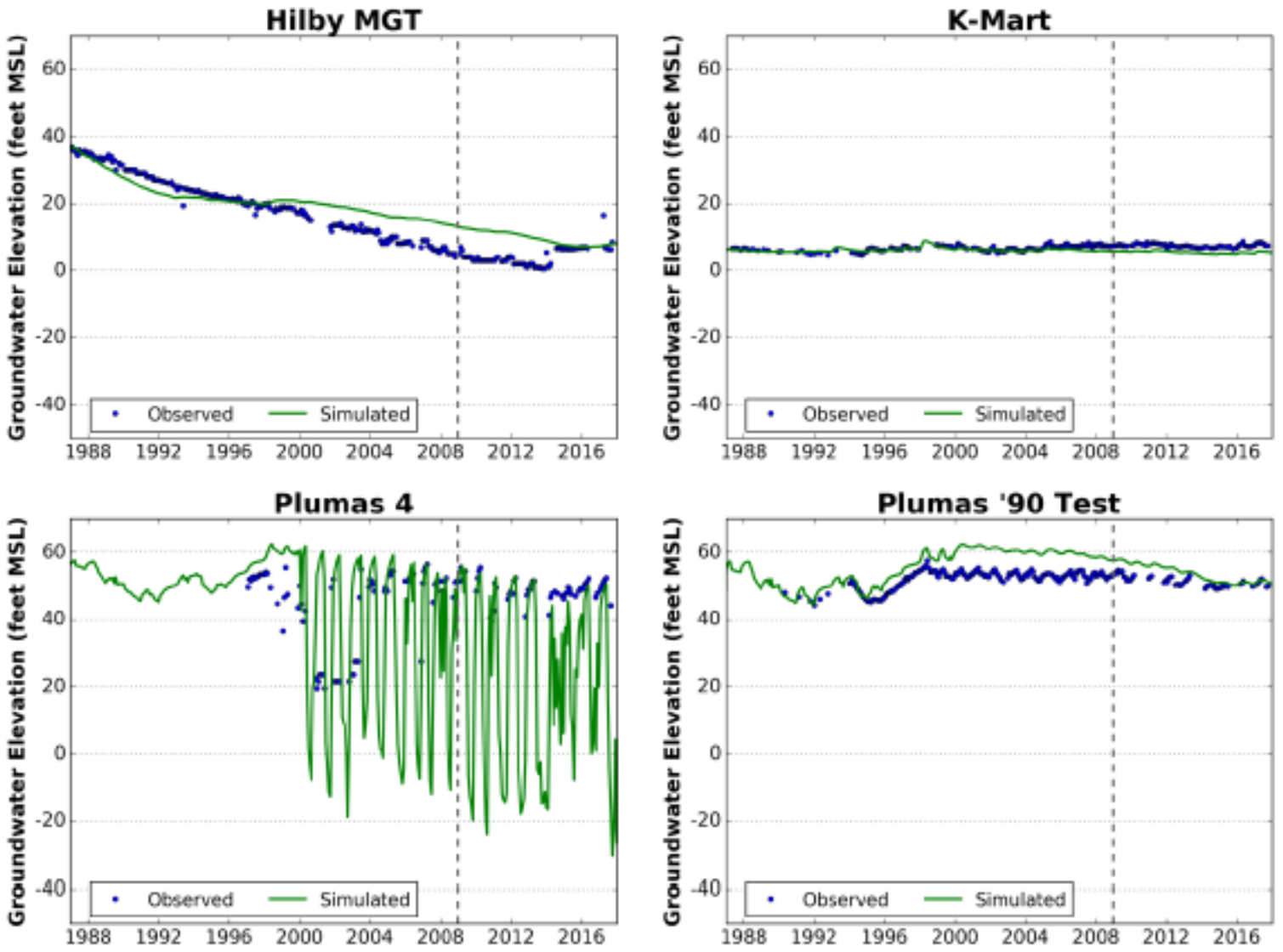



*Figure A6: Southern Coastal Subarea Hydrographs*

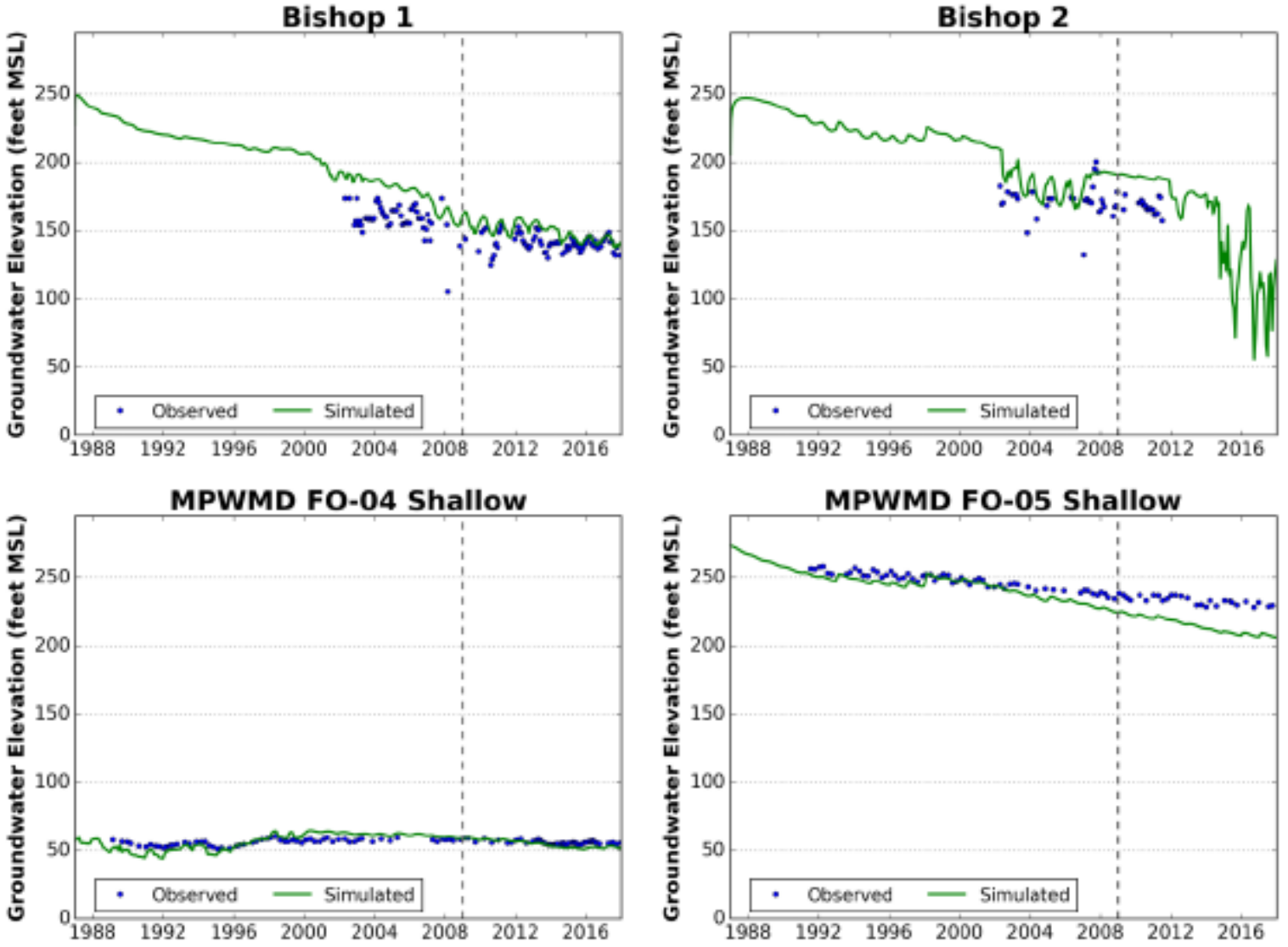



*Figure A7: Southern Coastal Subarea Hydrographs*

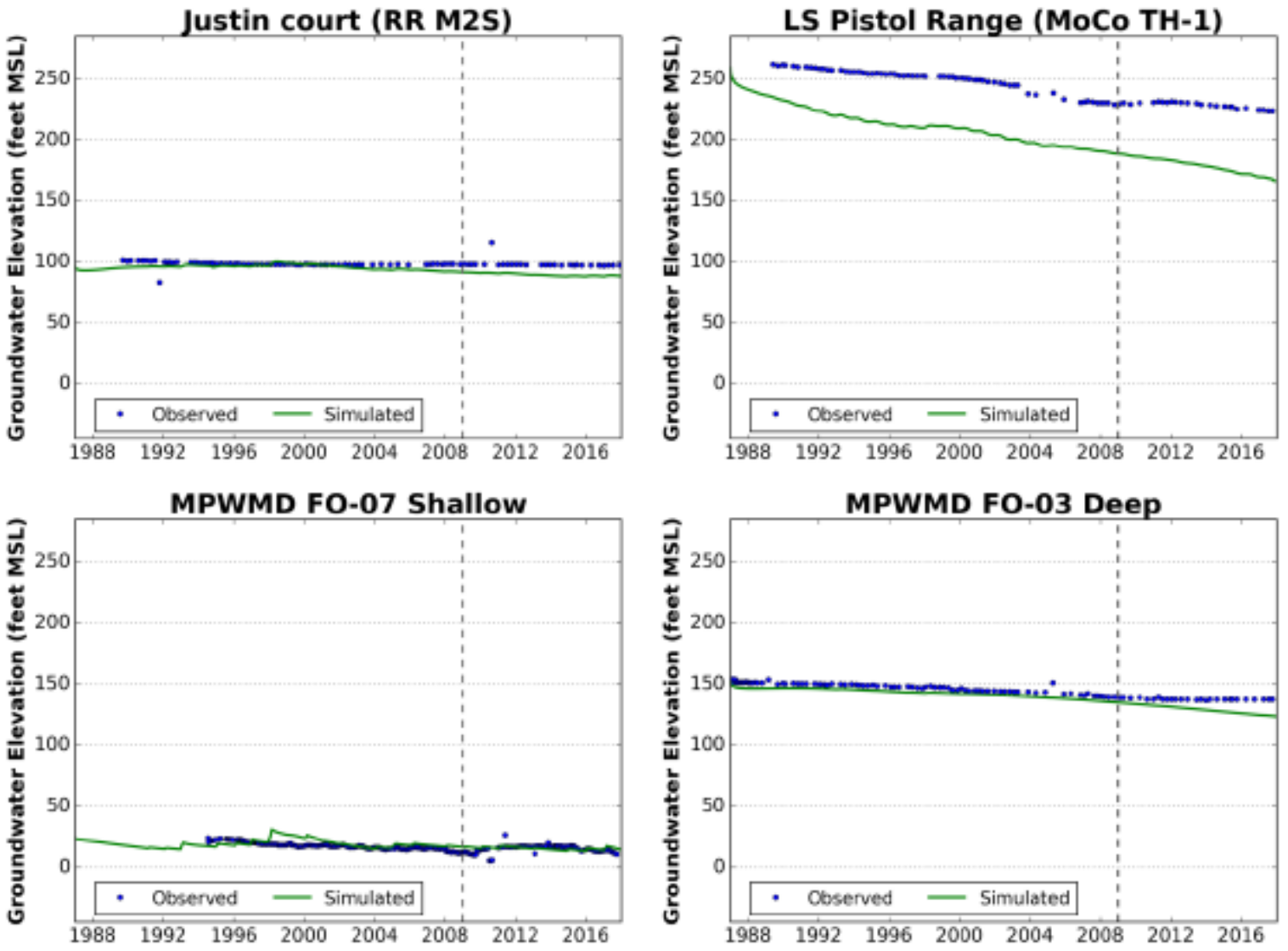



*Figure A8: Laguna Seca Subarea Hydrographs*

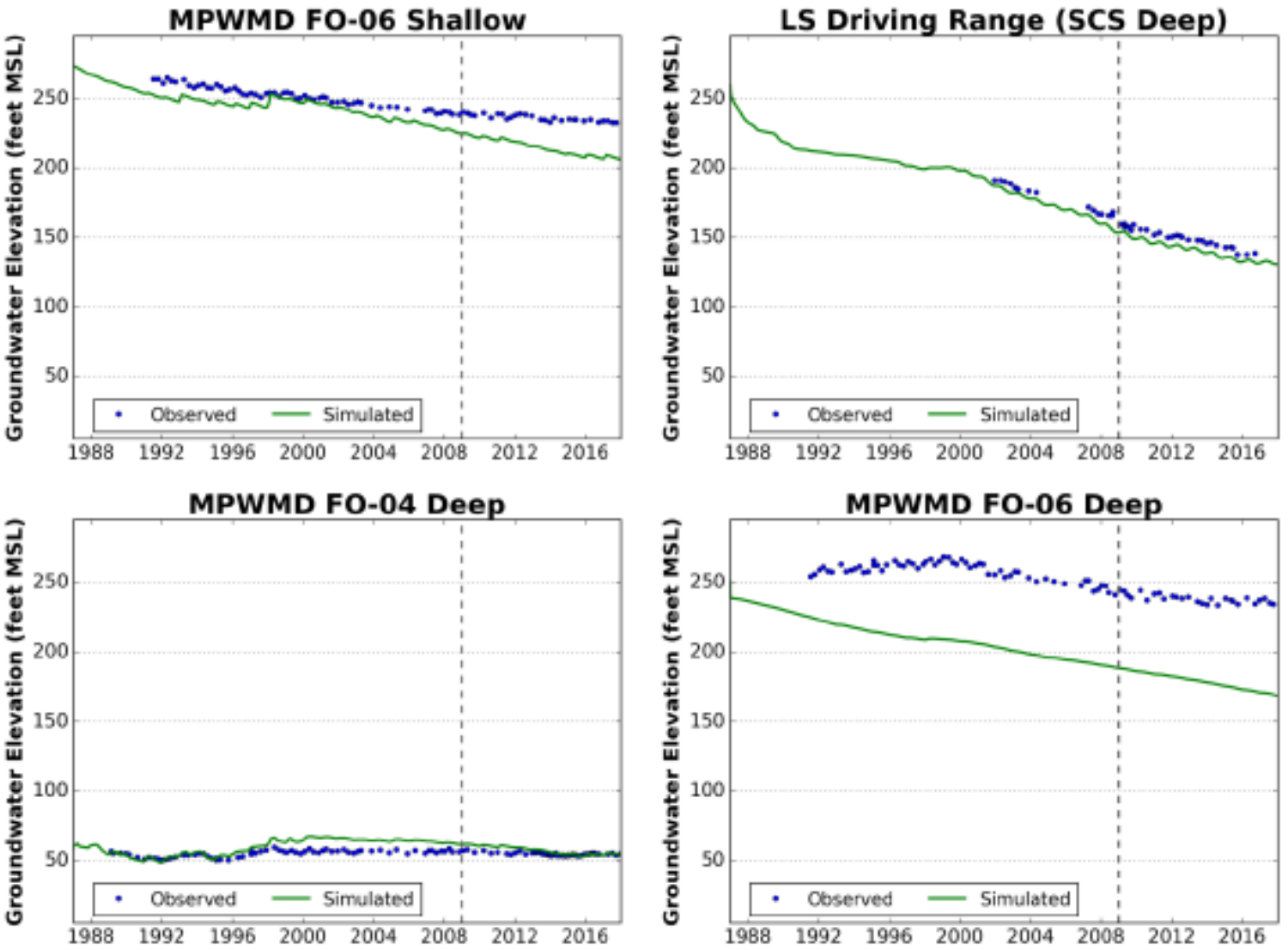



*Figure A9: Laguna Seca Subarea Hydrographs*

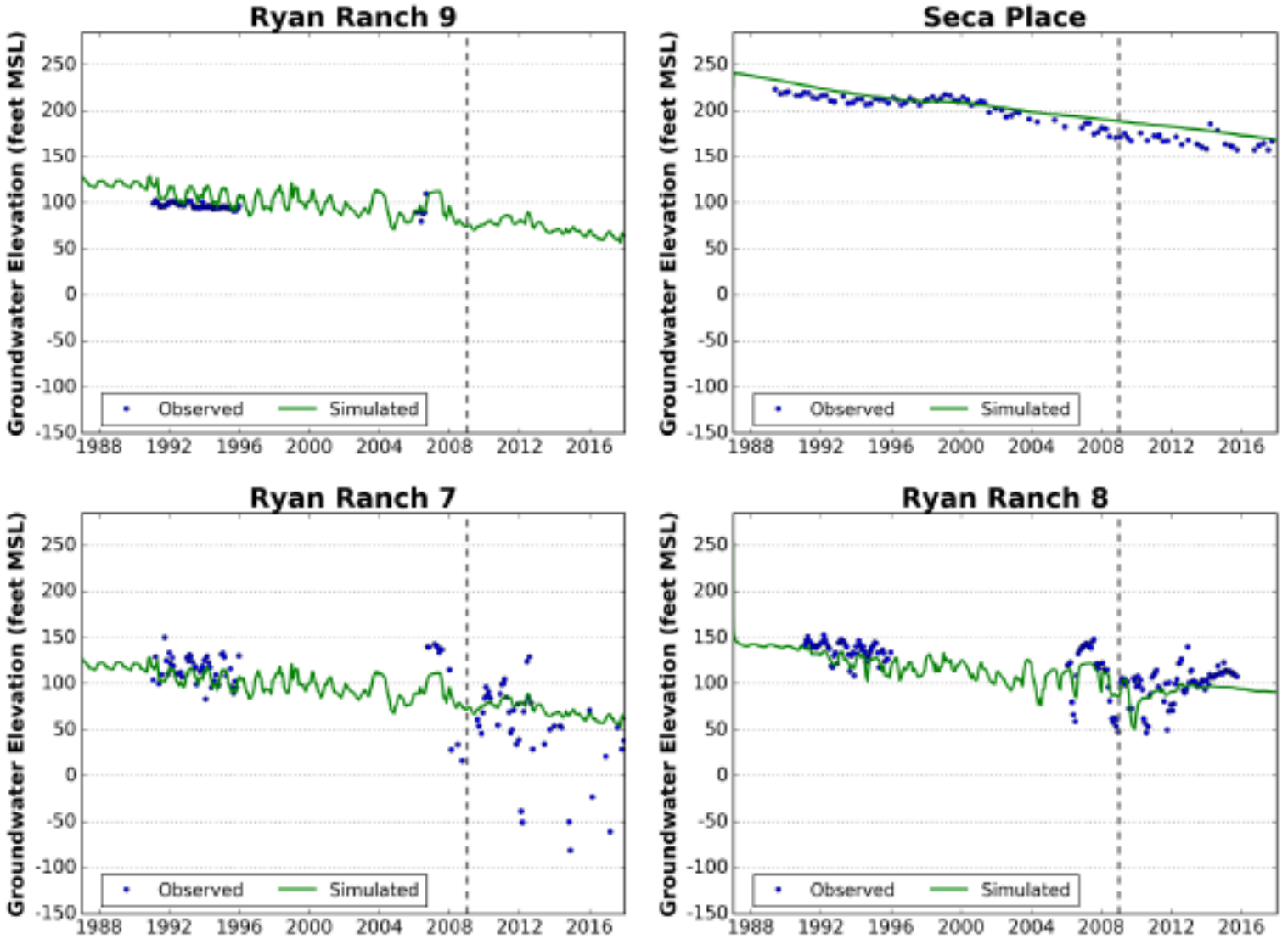



*Figure A10: Laguna Seca Subarea Hydrographs*

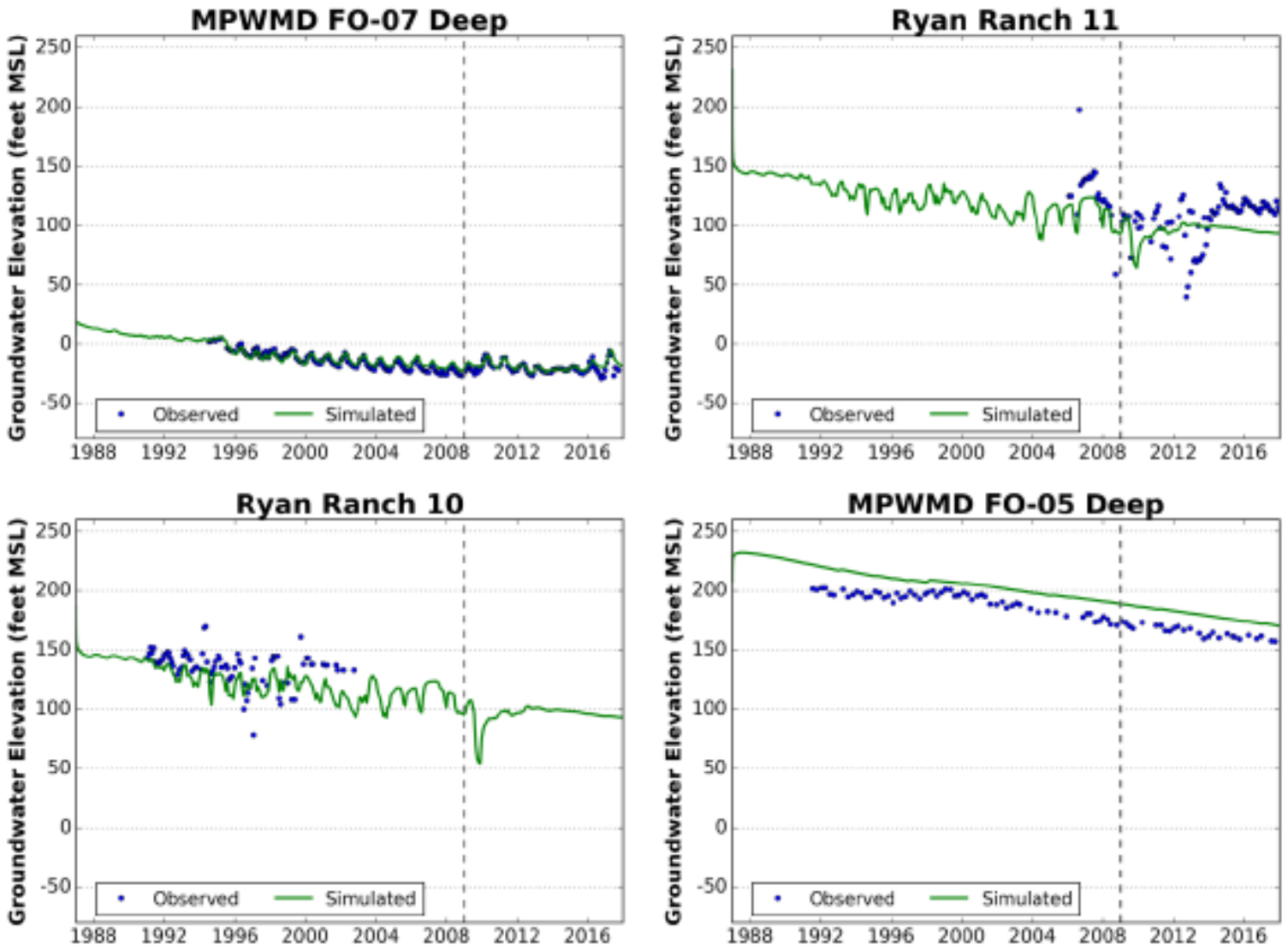



*Figure A11: Laguna Seca Subarea Hydrographs*

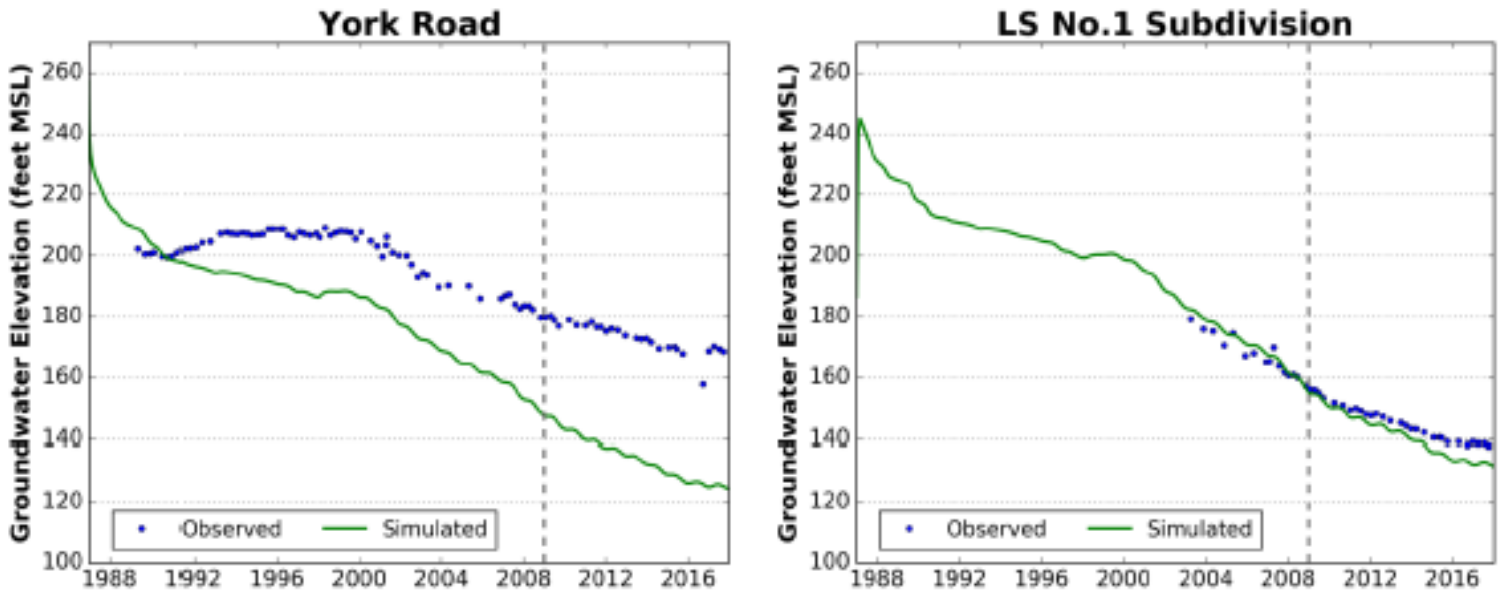



*Figure A12: Laguna Seca Subarea Hydrographs*

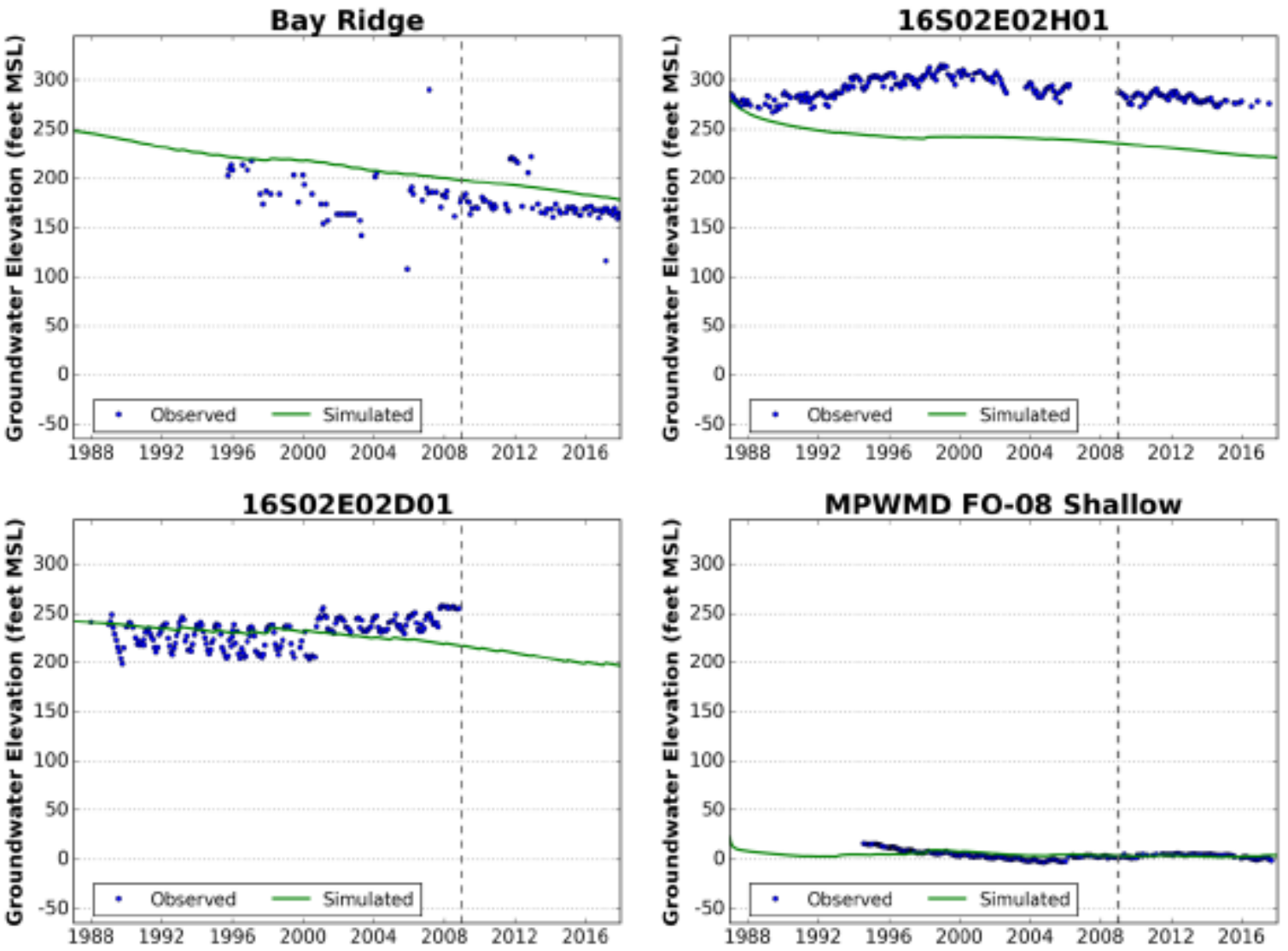



*Figure A13: Hydrographs from Wells Outside of the Seaside Groundwater Basin*

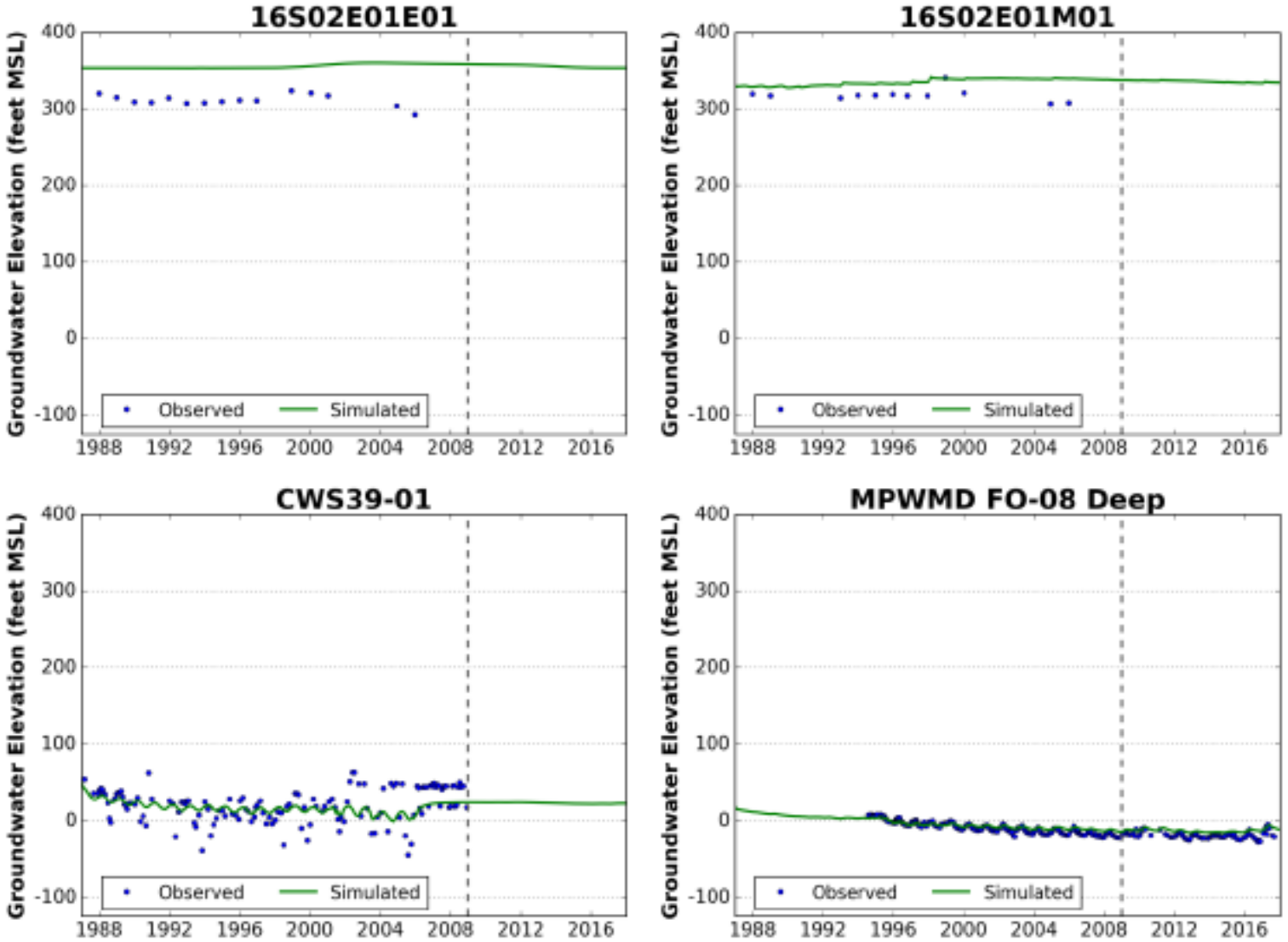



*Figure A14: Hydrographs from Wells Outside of the Seaside Groundwater Basin*

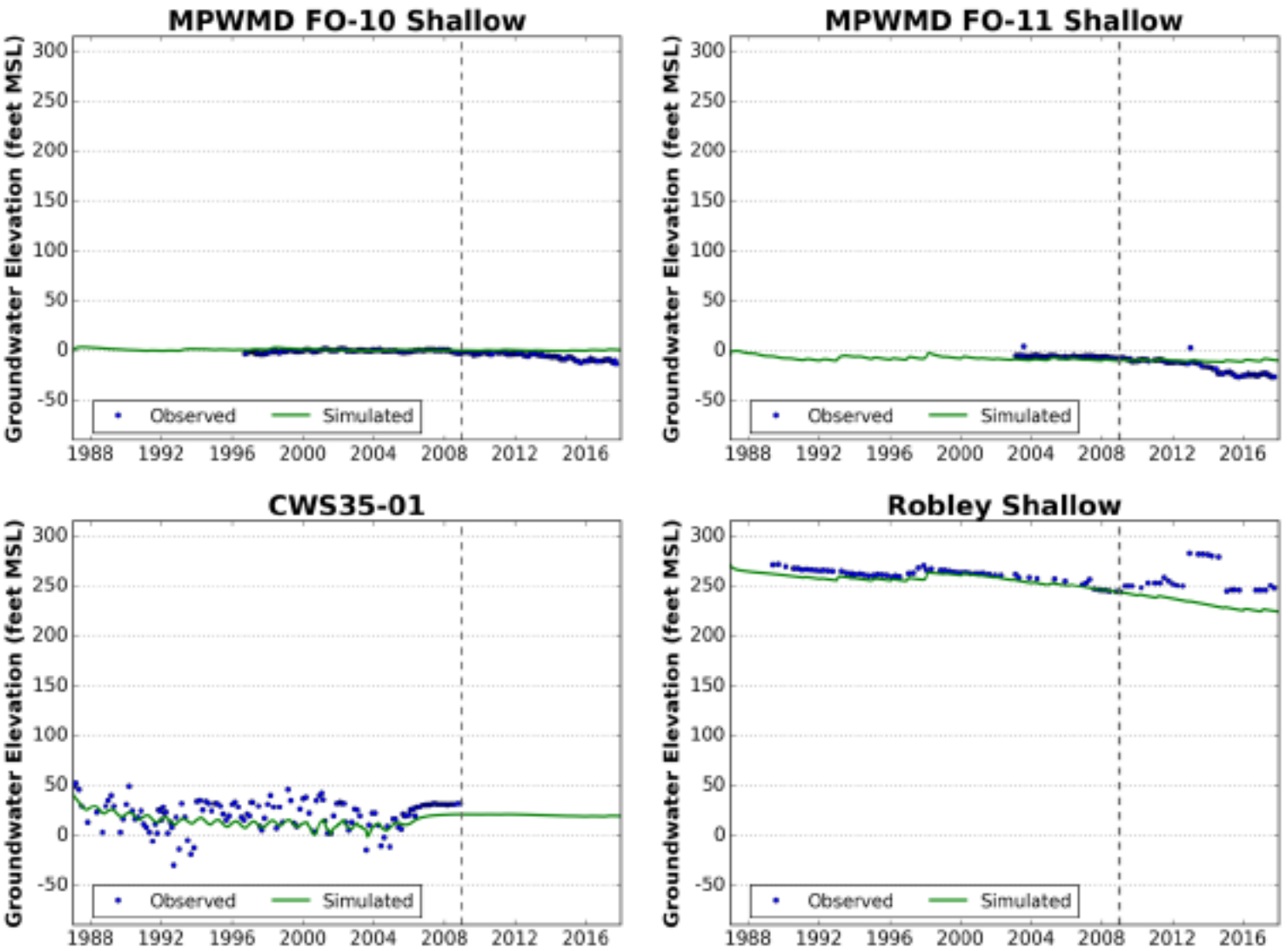
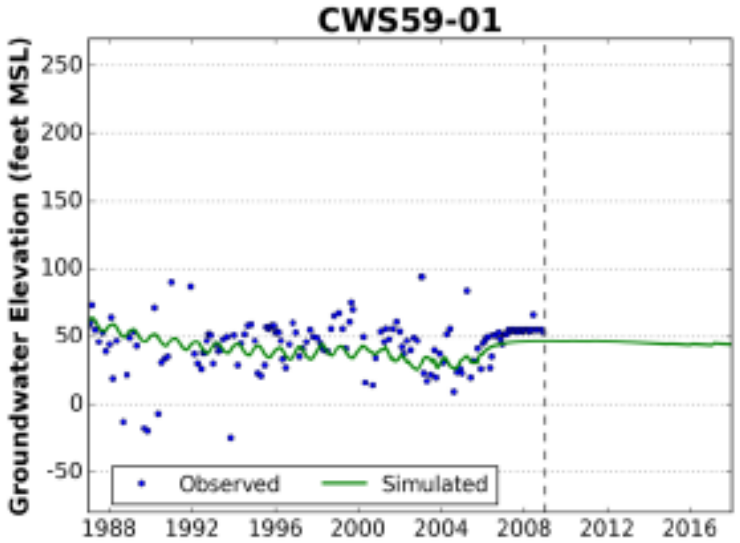
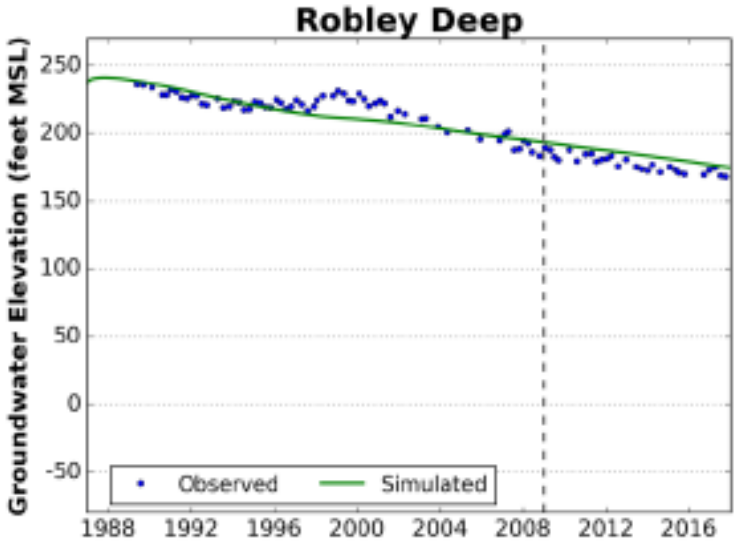



*Figure A15: Hydrographs from Wells Outside of the Seaside Groundwater Basin*



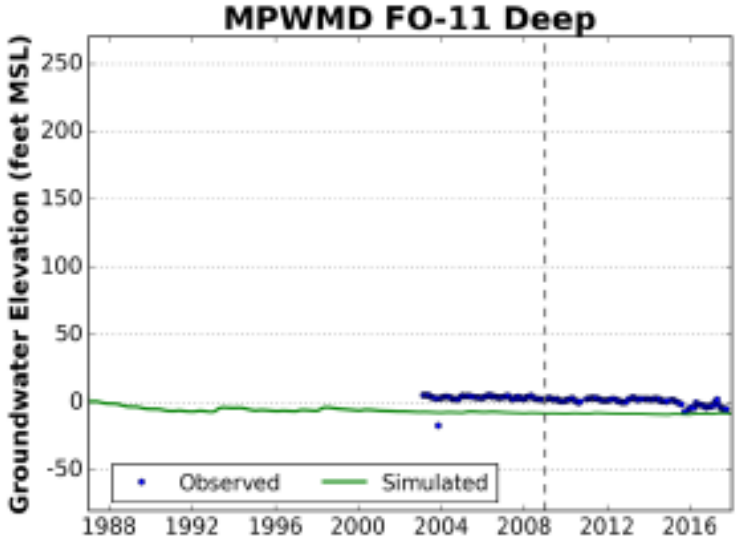




*Figure A16: Hydrographs from Wells Outside of the Seaside Groundwater Basin*

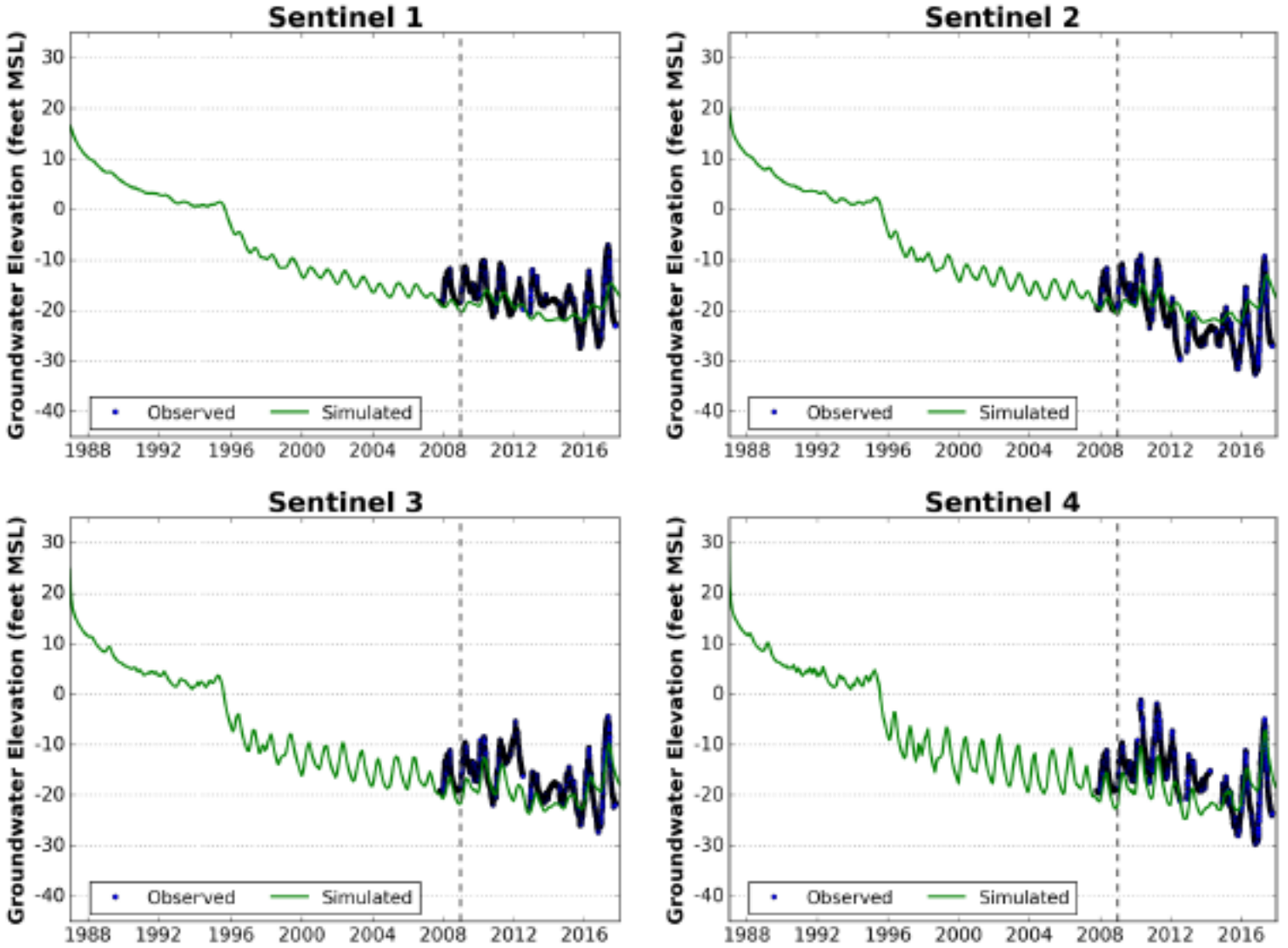



*Figure A17: Hydrographs for Sentinel Wells*

TODD GROUNDWATER

5 July 2018

## MEMORANDUM

**To:** Bob Jaques, Seaside Basin Watermaster Technical Program Manager

**From:** Gus Yates, Senior Hydrologist

**Re:** Peer Review of Seaside Basin Groundwater Model Update

I have reviewed the technical memorandum dated June 8, 2018 titled "Seaside Basin Groundwater Model Update" by HydroMetrics WRI. I was pleased to see that new sensitivity tests were performed and that those led to substantial improvements in model calibration. In particular, revision of the constant head levels used to represent the boundary with the Salinas Valley Basin improved the match between simulated and measured historical water levels at 12 wells, while the match became only slightly worse at four wells (City of seaside 3, Del Monte Test, PCA-E Shallow and Justin Court (RR M2S)). Hydrographs at the remaining 25 calibration wells remained about the same as before. The residuals statistics all improved noticeably since the previous model update in 2014.

I was mildly surprised that the model was not very sensitive to the rate of distributed rainfall recharge. It would have been helpful to state the magnitude of change in average annual recharge that was implemented in the test. If the change was small, then simulated water levels would not be expected to change much either. The inability of the PEST automated calibration software to improve the estimates of hydraulic conductivity and storativity is reassuring and instructive. It demonstrates that manual calibration can be reliable and that automated methods might not discover the variables that need adjusting, which in this case turned out to be the northeastern boundary heads.

I agree with the conclusions stated in the model update memorandum, which are that the model performs well (actually better than before), that boundary heads from the new USGS model of the Salinas Valley should be evaluated for use along the northeastern boundary of the Seaside model, and that updating the model and checking its calibration every 5 years or so is advisable.

## *SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE*

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

| | |
|---|---|
| **MEETING DATE:** | July 11, 2018 |
| **AGENDA ITEM:** | 4 |
| **AGENDA TITLE:** | RFS to Update the Seaside Groundwater Basin Basin Management Action Plan |
| **PREPARED BY:** | Robert Jaques, Technical Program Manager |

**SUMMARY:**

In the approved Monitoring and Management Program (M&MP) for 2018, and in its associated approved budget, there is a task to update the Basin Management Action Plan (BMAP).

Attached is an RFS to be issued to the new owner of HydroMetrics, Montgomery and Associates, to perform that work. The Scope of Work and cost in the RFS were taken directly from the scope and cost proposal the TAC reviewed at its August 9, 2017 meeting. At that same meeting the TAC recommended going ahead with updating the BMAP.

This item was originally on the TAC's June 13, 2018 meeting Agenda for action. However, it was deferred to today's meeting in order to give the TAC the opportunity to review Gus Yates' comments and recommendations, as presented in the preceding agenda item, before taking action on this RFS.

This RFS would be the third one to be issued to Montgomery and Associates. The first two would be to replace the two ongoing ones with HydroMetrics (Seawater Intrusion Analysis Report and on-going/as-needed consulting services). Therefore, this would be RFS No. 2018-03 to Montgomery and Associates.

| | |
|---|---|
| **ATTACHMENTS:** | Montgomery and Associates RFS No. 2018-03 to update the Basin Management Action Plan |
| **RECOMMENDED ACTION:** | Approve or edit the RFS |

SEASIDE BASIN WATERMASTER
REQUEST FOR SERVICE

**DATE:** _____ **RFS NO.** 2018-03
(To be filled in by WATERMASTER)

**TO:** Derrik Williams
Montgomery and Associates
PROFESSIONAL

**FROM:** Robert Jaques
WATERMASTER

**Services Needed and Purpose:** Update the Seaside Groundwater Basin Basin Management Action Plan. This work will be comprised of Task 2 (including all Subtasks under Task 2) as described in the Scope of Work in Attachment 1.

**Completion Date:** All work of this RFS shall be completed not later than November 30, 2018, and shall be performed in accordance with the Schedule described in Attachment 1.

**Method of Compensation:** Time and Materials (As defined in Section V of Agreement.)

**Total Price** Authorized by this RFS: $ 45,260.00 (Cost is authorized only when evidenced by signature below.) (See Table 1 in Attachment 1 for Detailed Breakdown of Estimated Costs for Task 2).

**Total Price** may not be exceeded without prior written authorization by WATERMASTER in accordance with Section V. COMPENSATION.

**Requested by:** _____ Date:_____.
WATERMASTER Technical Program Manager

**Agreed to by:** _____ Date:_____.
PROFESSIONAL

# ATTACHMENT 1

HydroMetrics WRI

1814 Franklin St., Suite 501
Oakland, CA 94612

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

August 4, 2017

Subject: Revised Scope and Cost to Update the Seaside Basin Management Action Plan

Mr. Jaques:

Thank you for the opportunity to provide you with this scope and cost to update the Seaside Groundwater Basin's Basin Management Action Plan (BMAP). The scope we have put together addresses the BMAP items that were presented at the February 2017 Technical Advisory Committee meeting, and includes some of the recommendations made by Gus Yates of Todd Groundwater.

The Watermaster's first BMAP was completed in February 2009 (HydroMetrics LLC, 2009a). The BMAP constitutes the basic plan for managing the Seaside Groundwater Basin. The BMAP identifies both short-term actions and long-term strategies intended to protect the groundwater resource while maximizing the beneficial use of groundwater in the basin. It provides the Watermaster a logical set of actions that can be undertaken to manage the basin to its Safe Yield. Over the eight years since the BMAP was completed, the Watermaster has collected much groundwater level and quality data, and conducted various studies to improve the understanding of the basin. This improved understanding should be incorporated into an updated BMAP to facilitate ongoing responsible management of the groundwater resource.

At the time the 2009 BMAP was prepared, a groundwater model had not yet been developed for the basin, and the analysis contained in the BMAP was completed using analytical methods. Following the BMAP recommendation that a groundwater model be

constructed to assist with groundwater management decisions, a calibrated model was completed in November 2009 (HydroMetrics LLC, 2009b). The model simulated groundwater conditions in the basin between January 1987 and December 2008. In 2014, the model was updated with data through September 2013 (HydroMetrics WRI, 2014) but not recalibrated because its accuracy was still acceptable. The 2014 update found that the uncalibrated portion of the model (January 2009 – September 2013) tended to simulate higher groundwater levels than measured levels. Periodic recalibration of the model is necessary to ensure the model simulates groundwater levels within an acceptable industry standard accuracy. If simulated groundwater levels are not accurate this reduces the accuracy of all output from the model such as groundwater storage and water budget.

The scope of work provided below assumes the model will be used to develop estimates of groundwater storage, water budget, and safe yield; and to test impacts of potential management actions. The groundwater model was developed to assist in making basin management decisions, and for providing the simulated results that are required for analysis in the BMAP. As the model currently only includes input data through September 2013, groundwater storage, water budget, and safe yield estimates can only reliably be obtained from the model up through Water Year 2013. The model needs to be updated through Water Year 2016 to be used for current estimates. It is likely recalibration of the model will be required so that it more accurately simulates the historic low groundwater levels currently occurring in the basin.

The scope outlined below starts with an update and recalibration of the groundwater model, and then generally updates each of the main sections of the BMAP.

**Task 1: Update Seaside Basin Groundwater Flow Model.**

***Subtask 1.1. Update Model Input Data.***

Groundwater production, groundwater levels, injected water, and precipitation data will be sourced and compiled for input into the groundwater model. In addition to precipitation, estimates of storm water percolation, septic tank leakage, and system losses are also needed as they all contribute to the recharge of the basin. Most data are already available from MPWMD or Watermaster, but some other pumpers such as Cal Water Service and Marina Coast Water District, which do not fall under the Watermaster will be contacted for their data.

The updated model input data will be incorporated into the groundwater model. Once the model has been updated and is successfully running, hydrographs comparing measured and simulated groundwater levels will be prepared. The hydrographs produced will be the same ones used in the 2009 model report.

***Subtask 1.2. Model Recalibration.***
Model calibration is a process that involves varying relatively uncertain and sensitive parameters such as horizontal and vertical hydraulic conductivities, over a reasonable range of values. Per Mr. Yates's recommendation, we will jointly calibrate recharge and aquifer parameters. This is a change from our previous calibration approach of only calibrating aquifer parameters. Calibration will be completed when simulated results match the measured data within an acceptable measure of accuracy, and when successive calibration attempts do not notably improve the calibration statistics. Parameter Estimation (PEST) software will be used as a tool to improve calibration.

Estimating the effort involved in model calibration is difficult because there is no defined set of steps that can be followed. The costs provided with this scope reflect our best estimate, but additional costs may be necessary to complete calibration successfully.

***Subtask 1.3. Model Update Technical Memorandum.***
A Draft Technical Memorandum will be prepared documenting the model update and calibration results. After presenting the Tech Memo to the TAC and receiving comments, a Final Tech Memo will be prepared for submission to the Board. For purposes of the cost estimate, we have assumed HydroMetrics WRI will present the findings to the TAC and to the Board. One presentation will be in-person and one will be by telephone.

**Task 2: Update BMAP Section 2 - State of the Seaside Groundwater Basin.**

***Subtask 2.1. Update Basin Conceptual Model.*** Since the 2009 BMAP was completed, a significant amount of modeling has been undertaken that has assisted in improving our hydrogeologic understanding of the basin. Additionally, a few new wells have been drilled that may improve our understanding of basin geometry. Below is a list of recent developments that will be used to update our conceptual understanding of the basin:

- Modeling work we completed related to the locations of flow divides in the eastern part of the Laguna Seca subarea and how pumping outside of the basin affects groundwater within the basin.
- The concept of the Laguna Seca Anticline as only a partial barrier to groundwater flow is relatively recent. We will present data and implications related to that reconceptualization.
- New wells, such as the Pure Water Monterey ASR wells and the MPWMD ASR wells, may provide new data related to aquifer depths and bottom of the basin that could improve the conceptual understanding of the basin.
- Groundwater levels collected over the past eight years may provide an undated definition of the basin's northeastern flow-divide boundary.

***Subtask 2.2. Analyze Groundwater Levels Trends.*** Since 2009, eight years of groundwater level data have been collected, some of it using data loggers that record groundwater levels multiple times a day. This has allowed us to vastly improve our understanding of both seasonal and long-term trends. The basin has also experienced a recent drought and Court-mandated pumping reductions. How groundwater levels have responded to these changes has also improved our understanding of the basin. Furthermore, protective groundwater elevations developed after the 2009 BMAP should be included and discussed in an updated BMAP.

***Subtask 2.3. Update Estimates of Groundwater Storage.*** The updated BMAP will include updates of estimated total stored groundwater, usable storage space, and total useable storage space. The Watermaster is required under the Decision to recalculate Total Usable Storage Space and adjust the allocation as needed.

The groundwater model and protective groundwater elevations should be used to quantify these storage estimates for the Seaside Basin. The 2009 BMAP did not have the benefit of site specific protective elevations and thus used Ghyben-Herzberg generated elevations. This updated BMAP will instead use protective elevations developed using groundwater models that estimate onshore groundwater elevations that keeps the productive onshore aquifers fresh (HydroMetrics LLC, 2009b).

***Subtask 2.4. Update Groundwater Budget.*** A long-term and current groundwater budget will be developed to enhance our understanding of the groundwater system, and how the basin has responded during the recent drought. Similar to Subtask 2.3, the groundwater budget can be readily generated from groundwater model output. However, the groundwater model needs to be updated through September 2016 and recalibrated for it be used reliably to evaluate the current and historical water budget.

***Subtask 2.5. Review Natural Safe Yield Estimates.*** The State of California has experienced a recent drought which has impacted natural aquifer recharge more than was anticipated in the 2009 BMAP. Also, even though pumping in recent years has been below the amounts required under the Decision, groundwater levels have continued to fall. This suggests that the Natural Safe Yield of 3,000 AFY in the Decision may be too high.

The reevaluated Safe Yield will be compared against other Safe Yield estimates that were included in the 2009 BMAP. If appropriate, a revised Safe Yield to replace the Decision-established Natural Safe Yield of 3,000 AFY will be provided for basin management purposes.

**Task 3: Update Section 3 – Supplemental Water Supplies.**
This section will be primarily completed by Watermaster staff, and will be edited and integrated into the BMAP update by HydroMetrics WRI. Watermaster staff will update the old BMAP Section 3 with current information on projects being considered to meet the long-term water needs in the Seaside Basin. Included will be MRWPCA's Pure Water Monterey groundwater replenishment project and Cal Am's Monterey Peninsula Water Supply Project (MPWSP). Recent Environmental Impact Reports will be used to update the information. If any other projects are in early planning stage, they will also be included in the update.

In the revised cost estimate (Table 1), the number of hours has been reduced from our previous cost estimate in March to reflect that Watermaster staff will be responsible for the majority of this task.

**Task 4: Update Section 4 – Groundwater Management Actions.**
This section will be updated to reflect actions and interim water supplies that have already been implemented, eliminate actions that are no longer viable, and add potential future actions and interim water supplies that could be implemented to address basin imbalances in the short-term before the long-term supply projects in Section 3 of the BMAP can be permitted, built and operated.

An example of a local management action would be to identify optimal extraction well locations such that those wells can make more efficient use of useable stored groundwater. The groundwater model is the most appropriate tool for this as it is able to simulate cumulative impacts by taking into account long-term projects and any other short-term projects while optimizing well locations.

It is beyond the scope of the BMAP update to prepare preliminary costs for potential future actions and interim water supplies. However, as cost is an important factor in deciding which actions to pursue, the Watermaster may need to engage a financial expert to provide preliminary cost estimates for those actions that do not already have cost estimates associated with them.

**Task 5: Update Section 5 – Recommended Management Strategies.**
After developing the groundwater management actions, we will present the results to the TAC with the purpose of soliciting input that will allow each action to be ranked in order of preference. The top actions will become recommended management strategies that the Watermaster should consider going forward.

**Task 6: Prepare Draft, Final Draft and Final Updated BMAP.**

A Draft Updated BMAP will be prepared that follows the format of the 2009 BMAP. After the TAC has reviewed the Draft Updated BMAP, comments received will be incorporated into a Final Draft Updated BMAP that will be presented to the Board. If comments are received from the Board, these will be included in a Final Updated BMAP. Up to 15 bound hardcopies will be provided to the Watermaster. We assume that HydroMetrics WRI will attend one TAC and one Board meeting in person to present the Updated BMAP.

**Estimated Budget**

The total cost to update and recalibrate the groundwater model through September 2016, and to update the BMAP is provided in Table 1.

**Schedule**

We expect it will take two months to update and recalibrate the groundwater model. An updated BMAP draft can be completed in approximately six weeks after the model update.

**References**

HydroMetrics LLC. 2009a. Basin Management Action Plan. Seaside Groundwater Basin, Monterey County, California, prepared for Seaside Groundwater Basin Watermaster. February.

HydroMetrics LLC. 2009b. Seaside Groundwater Basin Modeling and Protective Groundwater Elevations, prepared for Seaside Groundwater Basin Watermaster. November.

HydroMetrics WRI. 2014. Technical Memorandum – 2014 Seaside Groundwater Model Update, prepared for Seaside Groundwater Basin Watermaster. July 31.

Please call if you have any questions.

Sincerely,

Georgina King
Principal Hydrogeologist
HydroMetrics Water Resources Inc.

## Table 1: Cost Estimate for Basin Management Action Plan Update

| Tasks | HydroMetrics WRI Labor | | | Labor Total | | Other Direct Costs | TOTALS |
|---|---|---|---|---|---|---|---|
| | Derrik Williams | Georgina King | Hanieh Haeri | | | | |
| | President | Principal Hydrogeologist | Hydrologist | | | | |
| **Rates** | $220 | $195 | $130 | **Hours** | **($)** | **($)** | **($)** |
| **Task 1: Update Groundwater Model & Recalibrate** | | | | | | | |
| Subtask 1.1. Update Model Input Data | 8 | 24 | 40 | 72 | $ 11,640 | $ - | $ 11,640 |
| Subtask 1.2. Model Recalibration | 46 | 10 | 140 | 196 | $ 30,270 | $ - | $ 30,270 |
| Subtask 1.3. Model Update and Recalibration Technical Memorandum | 12 | 28 | 32 | 72 | $ 12,260 | $ 200 | $ 12,460 |
| ***Subtotal Task 1*** | ***66*** | ***62*** | ***212*** | ***340*** | ***$ 54,170*** | ***$ 200*** | ***$ 54,370*** |
| **Task 2: Update BMAP Section 2 - State of the Seaside Groundwater Basin** | | | | | | | |
| Subtask 2.1. Update Basin Conceptual Model | 2 | 16 | 4 | 22 | $ 4,080 | $ - | $ 4,080 |
| Subtask 2.2. Analyze Groundwater Levels Trends | 1 | 16 | 4 | 21 | $ 3,860 | $ - | $ 3,860 |
| Subtask 2.3. Update Estimates of Groundwater Storage | 5 | 10 | 16 | 31 | $ 5,130 | $ - | $ 5,130 |
| Subtask 2.4. Update Groundwater Budget | 4 | 8 | 20 | 32 | $ 5,040 | $ - | $ 5,040 |
| Subtask 2.5. Review of Natural Safe Yield Estimates | 3 | 8 | 12 | 23 | $ 3,780 | $ - | $ 3,780 |
| ***Subtotal Task 2*** | ***15*** | ***58*** | ***56*** | ***129*** | ***$ 21,890*** | ***$ -*** | ***$ 21,890*** |
| **Task 3: Update BMAP Section 3 – Supplemental Water Supplies** | ***1*** | ***4*** | ***0*** | ***5*** | ***$ 1,000*** | ***$ -*** | ***$ 1,000*** |
| **Task 4: Update BMAP Section 4 – Groundwater Management Actions** | ***8*** | ***20*** | ***12*** | ***40*** | ***$ 7,220*** | ***$ -*** | ***$ 7,220*** |
| **Task 5: Update BMAP Section 5 – Recommended Management Strategies** | ***4*** | ***10*** | ***0*** | ***14*** | ***$ 2,830*** | ***$ -*** | ***$ 2,830*** |
| **Task 6: Prepare Draft, Final Draft and Final BMAP** | ***6*** | ***40*** | ***20*** | ***66*** | ***$ 11,720*** | ***$ 600*** | ***$ 12,320*** |
| | | | | | | | |
| **TOTAL for GROUNDWATER MODEL UPDATE** | **66** | **62** | **212** | **340** | **$ 54,170** | **$ 200** | **$ 54,370** |
| **TOTAL for BMAP UPDATE** | **34** | **132** | **88** | **254** | **$ 44,660** | **$ 600** | **$ 45,260** |
| ***TOTAL*** | ***100*** | ***194*** | ***300*** | ***594*** | ***$ 98,830*** | ***$ 800*** | ***$ 99,630*** |

**Notes**

Other direct costs include travel expenses, office supplies, photocopies, postage, and equipment rental

## *SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE*

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

| | |
|---|---|
| **MEETING DATE:** | August 9, 2017 |
| **AGENDA ITEM:** | 5 |
| **AGENDA TITLE:** | Initial Discussion Regarding Scope of Work for Monitoring and Management Program (M&MP) for FY 2019 |
| **PREPARED BY:** | Robert Jaques |

The Schedule calls for the TAC to approve an FY 2019 Work Plan and Budget for the 2019 Management and Monitoring Program (M&MP) at its August 2018 meeting. This will then go on to the Board for approval at its October 2018 meeting.

In order to obtain TAC input and direction regarding these items, I have reviewed the FY 2018 M&MP and have edited it to reflect those work items that I anticipate being performed in FY 2019. A copy of this Proposed Work Plan is attached.

Items highlighted in yellow are costs and/or descriptions 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 2018 to 2019 (which I have done), all other proposed changes from the 2018 M&MP are shown in Track-Change format (deletions in ~~red~~ strikeout and additions in blue underlines) for the TAC to consider in preparing the 2019 M&MP. Most of the proposed revisions are relatively minor. I do not anticipate any new tasks to add to the M&MP for 2019.

If there are other revisions the TAC would like to make to prepare the M&MP for 2019 they can be brought up at today's meeting. The final M&MP for 2019, which will reflect any revisions or additions/deletions that come up at today's meeting, will be on the TAC's August 15, 2018 Agenda for approval.

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| **ATTACHMENTS:** | Seaside Groundwater Basin Monitoring and Management Program – Preliminary Proposed FY 2019 Work Plan |
| **RECOMMENDED ACTION:** | Approve the Proposed Work Plan or Recommend Edits to It |

# Seaside Groundwater Basin Monitoring and Management Program
# FY 2019 Work Plan

The tasks outlined below are those that are anticipated to be performed during 2019. Some Tasks listed below are specific to 2019, while other Tasks recur throughout the program, such as data collection and database entry, and Program Administration Tasks.

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

## *M.1 Program Administration*

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| **M. 1. a**<br>**Project Budget and Controls**<br>**($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**<br>**Assist with Board and TAC Agendas**<br>**($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**<br>**Preparation for and Attendance at Meetings**<br>**($11,500)** | The Consultants' work will require internal meetings and possibly meetings with outside governmental agencies and the public. For meetings with outside agencies, other Consultants, or any other parties which are necessary for the conduct of the work of their contracts, the Consultants will set up the meetings and prepare agendas and meeting minutes to facilitate the meetings. These may include planning and review meetings with Watermaster staff. The costs for these meetings will be included in their contracts, under the specific Tasks and/or subtasks to which the meetings relate. The only meeting costs that will be incurred under Tasks M.1.c and M.1.d will be:<br>• 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.<br>• 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.<br>Appropriate Consultant representatives will attend TAC meetings when requested to do so by Watermaster Staff (either in person or by teleconference connection), but will not be asked to prepare agendas or meeting minutes. As necessary, Consultants may provide oral updates to their progress reports (prepared under Task M.1.d) at the TAC meetings. |
| **M. 1. e**<br>**Peer Review of Documents and Reports**<br>**($7,500)** | When requested by the Watermaster staff, Consultants may be asked to assist the TAC and the Watermaster staff with peer reviews of documents and reports prepared by various other Watermaster Consultants and/or entities. |
| **M. 1. f**<br>**QA/QC**<br>**($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. |

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

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

### I. 2. a. Database Management

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| **I. 2. a. 1**<br>**Conduct Ongoing Data Entry and Database Maintenance/ Enhancement**<br>**($17,004)** | The database will be maintained by a Consultant (MPWMD) performing this work for the Watermaster. MPWMD will enter new data into the consolidated database, including water production volumes, water quality and water level data, and such other data as may be appropriate. Another Consultant will periodically post database information to the Watermaster's website, so it will be accessible to the public and other interested parties. No enhancements to the database are anticipated during 2019. |
| **I. 2. a. 2**<br>**Verify Accuracy of Production Well Meters**<br>**($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 2019. |

### I. 2. b. Data Collection Program

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| **I. 2. b. 1**<br>**Site Representation and Selection**<br>**($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 2019. |
| **I. 2 b. 2**<br>**Collect Monthly Manual Water Levels**<br>**($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.<br><br>This Task includes the purchase of one datalogger and parts for the datalogger to keep in inventory as a spare if needed. |

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| **I. 2. b. 3**<br>**Collect Water Quality Samples.**<br>**($51,128)** | Water quality data will be collected quarterly from certain of the monitoring wells, but ~~beginning in WY 2018~~ will no longer be collected from the four coastal Sentinel Wells. Discontinuing water quality sampling in those wells is the result of the finding 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 2019.<br><br>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 2019, but will no longer be performed on the Watermaster's coastal Sentinel Wells ~~beginning in 2018,~~ as discussed above.<br><br>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.<br><br>Under this Task in 2013 retrofitting to use the low-flow purge approach for getting water quality samples was completed on all of the wells that are sampled. This sampling equipment sits in the water column and may periodically need to be replaced or repaired. Accordingly, an allowance to perform maintenance on previously installed equipment has been included in this Task. Also, in the event a sampling pump is found to be no longer adequate due to declining groundwater levels, or if a sampling pump needs to be installed on a Sentinel Well, an allowance to purchase a replacement sampling pump has been included in this Task.<br><br>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 2019. |
| **I. 2. b. 4**<br>**Update Program Schedule and Standard Operating Procedures.**<br>**($0)** | All recommendations from prior reviews of the data collection program have been implemented. No additional work of this type is anticipated in 2019. |
| **I. 2. b. 5**<br>**Monitor Well Construction**<br>**($0)** | An additional monitoring well was installed in 2009. No further work of this type is anticipated in 2019. |

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| **I. 2. b. 6 Reports ($3,576)** | The groundwater level and water quality monitoring will be conducted on a monthly, quarterly, semi-annual or annual basis, as described in the Consultant's Scope of Work. Reports summarizing data collected and analyzed will be submitted to the Watermaster on a schedule to be established during the year, and will consist of:<br><br>1. A review of the water quality and water level data at the end of each quarter of the Water Year, including tabularized data summaries of the WQ/WL data twice per year, once for the Q1 and Q2 period and once for the Q3 and Q4 period, so this data can be posted to WATERMASTER's website. No reporting on a quarterly basis is required but the Consultant will promptly notify the Watermaster of any missing data or data collection irregularities that were encountered during the quarterly reporting period.<br><br>2. An annual report summarizing the water quality and water level data for the Water Year, and containing tables of this data for the complete Water Year. The report will include a brief cover letter describing any missing data or data collection irregularities that were encountered during the reporting period, and any recommendations for changes to be made to the data collection program. |
| **I.2.b.7 CASGEM Data Submittal ($2,384)** | On the Watermaster's behalf MPWMD will c~~C~~ompile 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. |

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| **I.3.a.1**<br>**Update the Existing Model**<br>**($~~54,370~~0)** | The ~~existing~~ Model, described in the report titled "Groundwater Flow and Transport Model" dated October 1, 2007, was updated in 2009 in order to develop protective water levels, and to evaluate replenishment scenarios and develop answers to Basin management questions ~~(Tasks I.3.a.2 and I.3.a.3)~~. The ~~scope and budget~~Model was again updated in 2014~~. for again updating the Model included the following:~~<br>~~Step1: Update the model and check its accuracy - $10,000~~<br>~~Step 2: Recalibrate the model - $15,000~~<br>~~Step 3: Prepare report describing the work that was done - $5,000~~<br><br>~~Step 1 was completed in 2014 by incorporating recent pumping data, groundwater level data, and rainfall data, and then checking to see if the recently simulated groundwater levels match the recently measured groundwater levels. These are the principle findings and conclusions of this Step 1 work:~~<br>~~• The model still provides reliable results in the Laguna Seca Subarea.~~<br>~~• Although the performance of the model during the updated period is worsening, the calibration of the model remains within acceptable standards.~~<br>~~• The northern boundary condition needs to be updated to reflect real groundwater elevation variations for the model period of 2005-2013. The behavior of the northern boundary will impact flows and the ability to calibrate the model for the area of the model that is adjacent to the northern boundary. An alternative method for defining this boundary condition will have to be developed that does not rely upon simulations from the Salinas Valley Integrated Groundwater Surface Water Model (SVIGSM).~~<br>~~• The groundwater model should be updated in a maximum of five years and its calibration reevaluated at that time. However, if groundwater related projects are implemented in the Basin before that time, the update and calibration reevaluation may need to be performed sooner.~~<br><br>~~Modeling of the Laguna Seca Subarea was performed in 2014 and a peer review of that work was performed in 2015. The peer review concluded that the model is a reasonable representation of the Seaside Basin groundwater flow system. No major errors in assumptions, data or results were identified during this peer review, and the simulated water levels generally matched observed water levels for the historical calibration simulation. The peer review recommended some aspects of the model should be explored to try to determine some differences between field-measured conditions and model-predicted conditions in some parts of the Basin, but stated that the model should be used for estimating the operational safe yield of the basin and subareas, and for simulating the effects of possible management measures. It also recommended that some additional simulations should be completed for management measures likely to be implemented.~~<br><br>In 2018 ~~Step 1 (updating the Model) will be performed again, along with Steps 2 (recalibrating) and 3 (reporting on this work).~~the Model was recalibrated and updated. No further work of this type is anticipated in 2019. |
| **I. 3. a. 2**<br>**Develop Protective Water Levels**<br>**($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. |

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| **I. 3. a. 3**<br>**Evaluate Replenishment Scenarios and Develop Answers to Basin Management Questions**<br>**($20,000)** | In 2009 the updated Model was used to evaluate different scenarios to determine such things as the most effective methods of using supplemental water sources to replenish the Basin and/or to assess the impacts of pumping redistribution. This work is described in HydroMetrics' "Seaside Groundwater Basin Groundwater Model Report." In 2010, and again in 2013, HydroMetrics used the updated Model to develop answers to some questions associated with Basin management. Modeling performed in 2014, 2015, and 2016 led to the conclusion that groundwater levels in parts of the Laguna Seca Subarea will continue to fall even if all pumping within that subarea is discontinued, because of the influence of pumping from areas near to, but outside of, the Basin boundary. Additional modeling work may be performed in 2019 to further examine this situation. |
| **I. 3. b.**<br>**Complete Preparation of Basin Management Action Plan**<br>**($0)** | The Watermaster's Consultant completed preparation of the Basin Management Action Plan (BMAP) in February 2009. The BMAP serves as the Watermaster's long-term seawater intrusion prevention plan. The Sections that are included in the BMAP are:<br>Executive Summary<br>Section 1 – Background and Purpose<br>Section 2 – State of the Seaside Groundwater Basin<br>Section 3 – Supplemental Water Supplies<br>Section 4 –Groundwater Management Actions<br>Section 5 – Recommended Management Strategies<br>Section 6 – References<br>~~The only work which may be performed on the BMAP in 2018 is discussed under Task I. 3. c.~~ |
| **I. 3. c.**<br>**Refine and/or Update the Basin Management Action Plan**<br>**($~~45,260~~0)** | During 2018 the BMAP ~~will be~~was updated based on new data and knowledge that has been gained since it was prepared in 2009.<br><br>No further work of this type is anticipated in 2019. |
| **I. 3. d.**<br>**Evaluate Coastal Wells for Cross-Aquifer Contamination Potential**<br>**($0)** | If seawater intrusion were to reach any of the coastal wells in any aquifer, and if a well was constructed without proper seals to prevent cross-aquifer communication, or if deterioration of the well had compromised these seals, it would be possible for the intrusion to flow from one aquifer to another. An evaluation of this was completed in 2012 and is described in MPWMD's Memorandum titled "Summary of Seaside Groundwater Basin Cross-Aquifer Contamination Wells Investigation Process and Conclusions" dated August 8, 2012. This Memorandum did not recommend performing any further work on this matter at this time, other than to incorporate into the Watermaster's Database data from wells that were newly identified by the work performed in 2012. That data has now been incorporated into the Database, and no further work by the Watermaster on this matter is anticipated. In late 2017 a request was made to MPWMD to destroy one of its no-longer-used monitoring wells that is perforated in multiple aquifers (Well PCA-East Multiple). ~~It is anticipated that MPWMD will perform that~~MPWMD performed this work in 2018.<br><br>No further work of this type is anticipated in 2019. |

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| **I. 3. e.**<br>**Seaside Basin Geochemical Model**<br>**($~~50,000~~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.<br><br>In order to predict whether there will be groundwater quality changes that will result from the introduction of desalinated water and additional ASR water (under the Monterey Peninsula Water Supply Project) and advance-treated wastewater (under the Pure Water Monterey Project) a geochemical model ~~should be~~ was developed in 2018 and is being used~~for use~~ in the areas of the Basin where injection of these new water sources will occur. ~~This can be most cost-efficiently accomplished in the following manner:~~<br><br>~~Step 1: MPWMD's consultant would use the water quality and water delivery schedule data provided by each of the project proponents to develop and run the geochemical model. If the geochemical modeling indicated there would be no water chemistry problems then there would be no need perform Step 2.~~<br><br>~~Step 2 (if needed):~~ If the geochemical modeling ~~in Step 1~~ indicates the potential for problems to occur, then HydroMetrics may use the Watermaster's ~~existing~~ 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 to have HydroMetrics perform such modeling, if necessary.<br><br>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)*

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

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| **I. 4. c.**<br>**Annual Report- Seawater Intrusion Analysis**<br>**($22,082)** | At the end of each water year, a Consultant will reanalyze all water quality data. Semi-annual chloride concentration maps will be produced for each aquifer in the basin. Time series graphs, trilinear graphs, and stiff diagram comparisons will be updated with new data. The annual EM logs will be analyzed to identify changes in seawater wedge locations. All analyses will be incorporated into an annual report that follows the format of the initial, historical data report. Potential seawater intrusion will be highlighted in the report, and if necessary, recommendations will be included. The annual report will be submitted for review by the TAC and the Board. Modifications to the report will be incorporated based on input from these bodies, as well as Watermaster staff. |
| **I. 4. d**<br>**Complete Preparation of Seawater Intrusion Response Plan**<br>**($0)** | The Watermaster's Consultant (HydroMetrics) completed preparation of the long-tem Seawater Intrusion Response Plans (SIRP) in February 2009. The Sections that are included in the SIRP are:<br>Section 1 – Background and Purpose<br>Section 2 – Consistency with Other Documents<br>Section 3 – Seawater Intrusion Indicators and Triggers<br>Section 4 –Seawater Intrusion Contingency Actions<br>Section 5 - References<br>No further work on the SIRP is anticipated in 2019. |
| **I. 4. e.**<br>**Refine and/or Update the Seawater Intrusion Response Plan**<br>**($0)** | At the beginning of 2009 it was thought that it might be beneficial or necessary to perform work to refine the SIRP and/or to update it based on new data or knowledge that was gained subsequent to the preparation of the SIRP. However, this did not prove to be necessary, and no further work of this type is anticipated in 2019. |
| **I. 4. f.**<br>**If Seawater Intrusion is Determined to be Occurring, Implement Contingency Response Plan**<br>**($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 * * **

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| **MEETING DATE:** | July 11, 2018 |
| **AGENDA ITEM:** | 6 |
| **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 is performing certain portions of the work.

Attached is the Work Schedule for FY 2018. The attached version:

- Reflects the change from HydroMetrics to Montgomery and Associates
- A longer duration for the performance of the geochemical modeling

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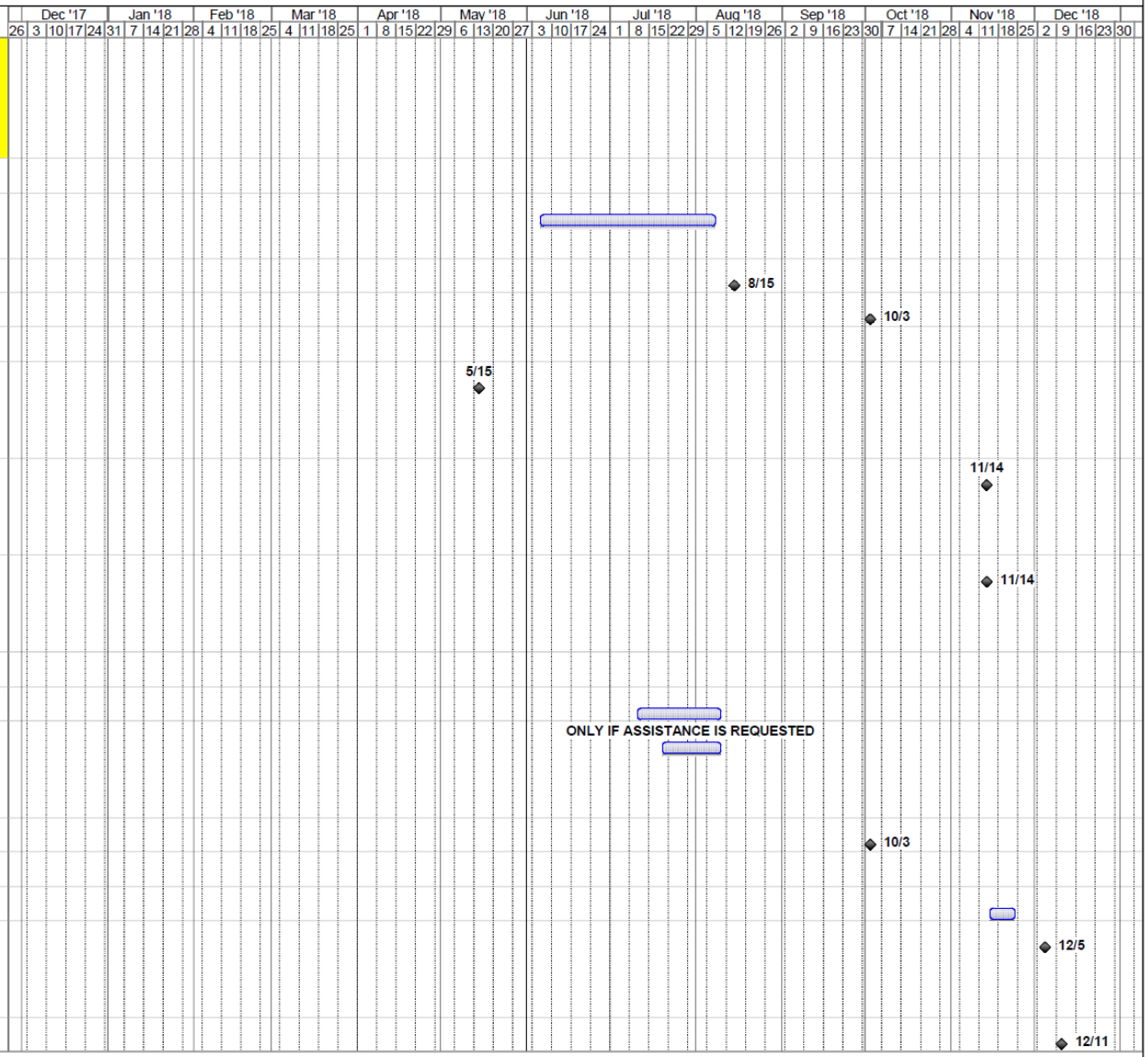
| **ATTACHMENTS:** | Schedule of Work Activities for FY 2018 |
| **RECOMMENDED ACTION:** | Provide Input to Technical Program Manager Regarding Any Corrections or Additions to the Schedule |

# Seaside Basin Watermaster
# Monitoring and Management Program
# 2018 Work Schedule




| ID | Task Name |
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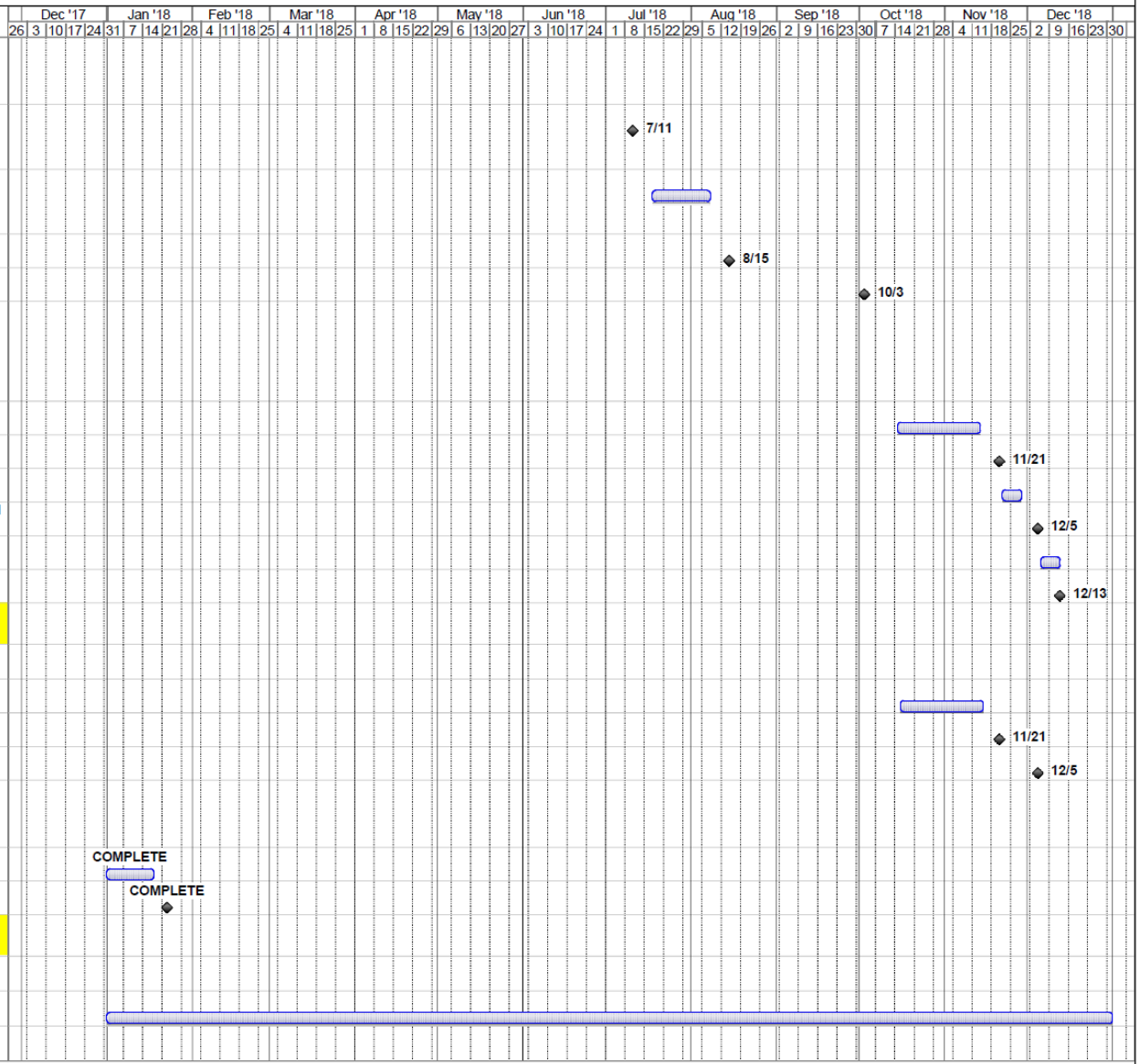
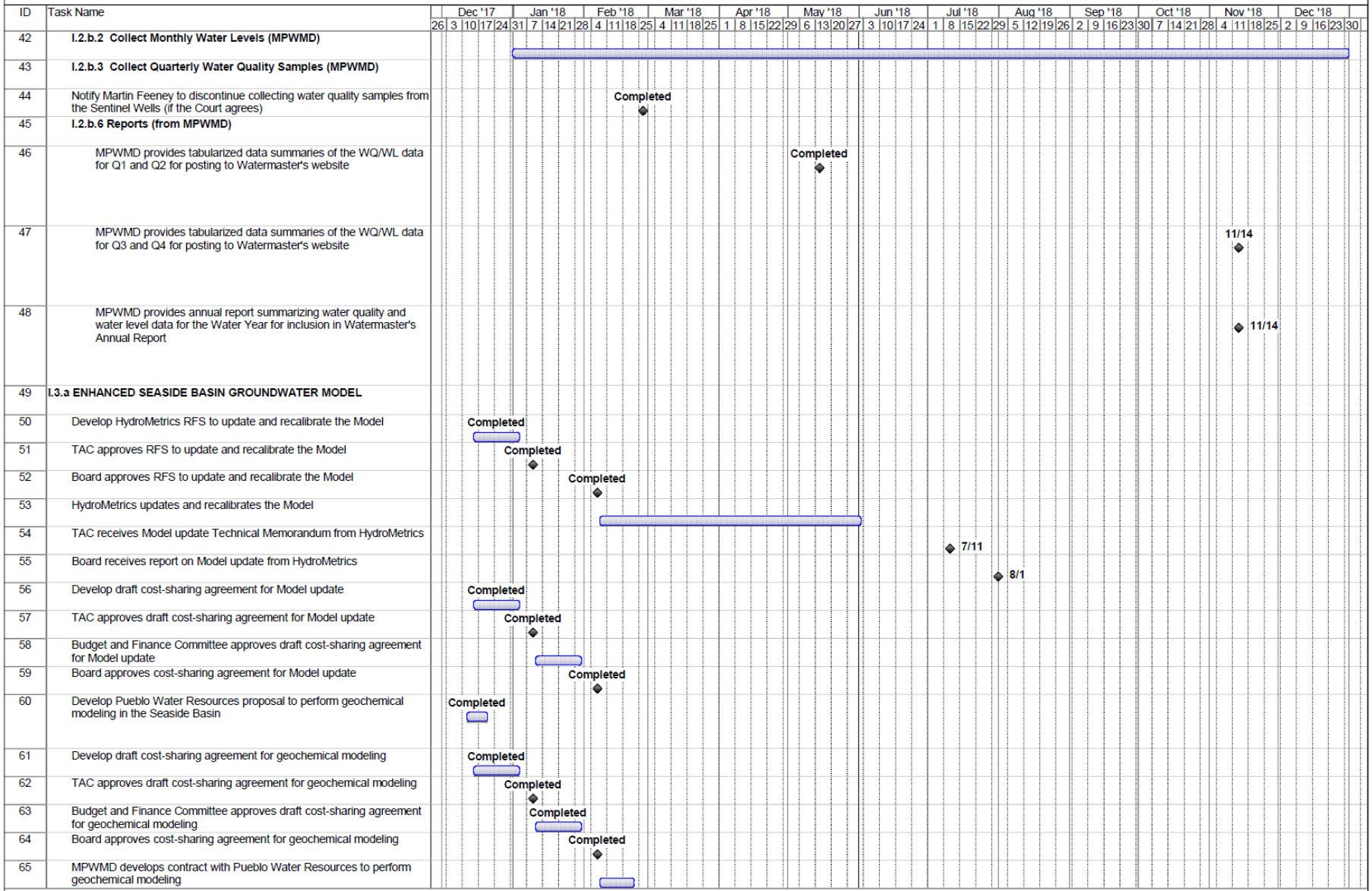
| 1 | ***CRITICAL PROJECT MILESTONES ASSOCIATED WITH TAC, BOARD, AND/OR CONSULTANT WORK*** |
| 2 | **2019 Administration, Operations and Replenishment Budgets** |
| 3 | Prepare M&MP Draft Budgets (Same as Task 19) |
| 4 | TAC Approves M&MP Budgets (Same as Task 20) |
| 5 | Board Approves M&MP Budgets (Same as Task 21) |
| 6 | **Watermaster Prepares Quarterly Water Production, Water Level, and Water Quality Reports** |
| 7 | Watermaster posts tabularized data summaries of the WQ/WL data for Q1 and Q2 on Watermaster's website (See Task 47) |
| 8 | Watermaster posts tabularized data summaries of the WQ/WL data for Q3 and Q4 on Watermaster's website (See Task 48) |
| 9 | Watermaster Prepares Annual Water Production Report for 2018 |
| 10 | **Replenishment Assessment Unit Costs for Water Year 2019** |
| 11 | B&F Committee Develops Replenishment Assessment Unit Cost for 2019 Water Year |
| 12 | If Requested, TAC Provides Assistance to B&F Committee in Development of 2019 Water Year Replenishment Assessment Unit Cost |
| 13 | Board Adopts and Declares 2019 Water Year Replenishment Assessment Unit Cost |
| 14 | **Replenishment Assessments for Water Year 2018** |
| 15 | Watermaster Prepares Replenishment Assessments for Water Year 2018 |
| 16 | Watermaster Board Approves Replenishment Assessments for Water Year 2018 (At December Meeting) |
| 17 | Watermaster Levies Replenishment Assessment for 2018 |

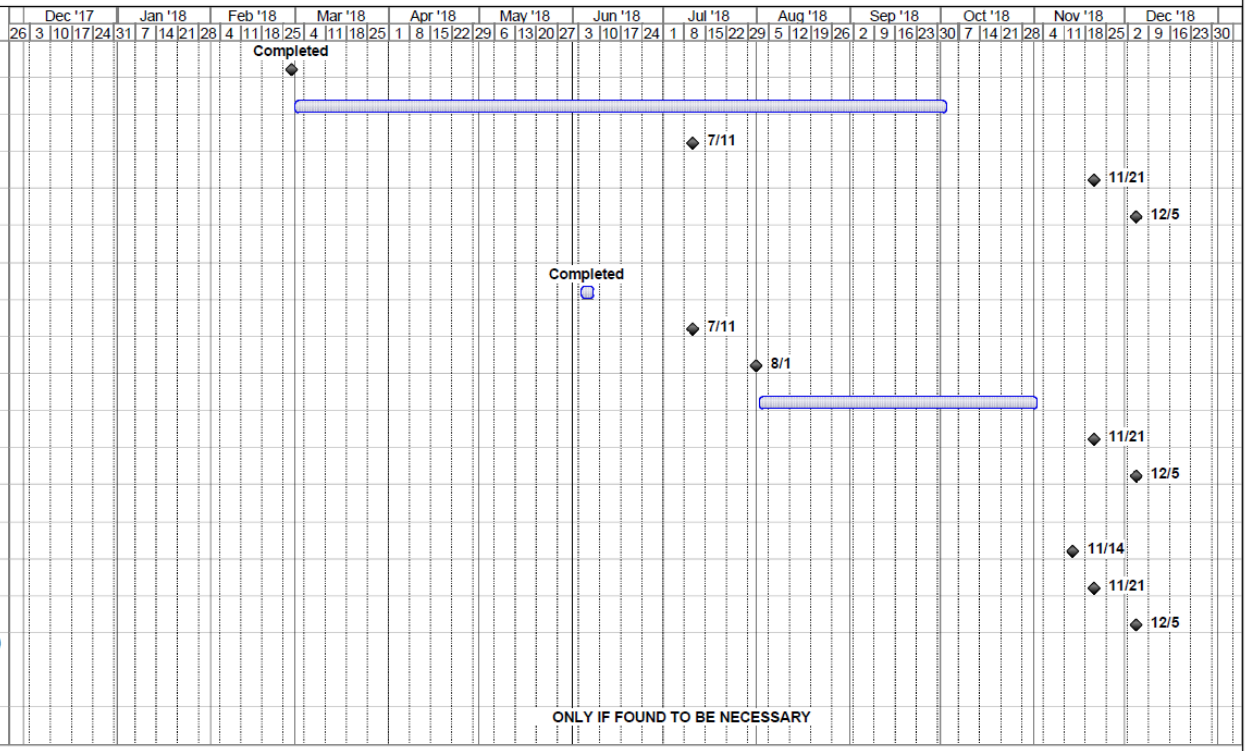
# Seaside Basin Watermaster
# Monitoring and Management Program
# 2018 Work Schedule



# Seaside Basin Watermaster
# Monitoring and Management Program
# 2018 Work Schedule



# Seaside Basin Watermaster
# Monitoring and Management Program
# 2018 Work Schedule




| ID | Task Name |
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| 66 | MPWMD issues contract to Pueblo Water Resources to perform geochemical modeling |
| 67 | Pueblo Water Resources performs geochemical modeling |
| 68 | TAC receives progress report regarding geochemical modeling work |
| 69 | TAC receives report from Pueblo Water Resources containing the findings of the geochemical modeling |
| 70 | Board receives report from Pueblo Water Resources containing the findings of the geochemical modeling |
| 71 | **I.3.c Refine and/or Update the BMAP** |
| 72 | Develop RFS to update the BMAP |
| 73 | TAC approves RFS to update the BMAP |
| 74 | Board approves RFS to update the BMAP |
| 75 | Montgomery and Associates updates the BMAP |
| 76 | TAC receives updated BMAP from Montgomery and Associates |
| 77 | Board receives report on BMAP update from Montgomery and Associates |
| 78 | **I.4.c Annual Seawater Intrusion Analysis Report (SIAR)** |
| 79 | Montgomery and Associates Provides Draft SIAR to Watermaster |
| 80 | TAC Approves Annual Seawater Intrusion Analysis Report (SIAR) |
| 81 | Board Approves Annual Seawater Intrusion Analysis Report (SIAR) |
| 82 | **I.4.d Complete Preparation of Seawater Intrusion Response Plan (SIRP)** |
| 83 | **I.4.e Refine and/or Update the SIRP** |

## *SEASIDE BASIN WATER MASTER*
## *TECHNICAL ADVISORY COMMITTEE*

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

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|---|---|
| **MEETING DATE:** | July 11, 2018 |
| **AGENDA ITEM:** | 7 |
| **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.

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| **ATTACHMENTS:** | None |
| **RECOMMENDED ACTION:** | None required – information only |