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

TECHNICAL ADVISORY COMMITTEE OF THE SEASIDE BASIN WATER MASTER

DATE: Wednesday, March 11, 2015
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 (712) 432-1212. 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 will be ended.

OFFICERS
Chairperson: Roger Hulbert, California American Water Company
Vice-Chairperson: Joe Oliver, 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

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SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 11, 2015
AGENDA ITEM:	2.A
AGENDA TITLE:	Approve Minutes from the February 11, 2015 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.

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

D-R-A-F-T
MINUTES

Seaside Groundwater Basin Watermaster
Technical Advisory Committee Meeting
February 11, 2015

Attendees: TAC Members

City of Seaside – Scott Ottmar
California American Water – Roger Hulbert
City of Monterey – No Representative
Laguna Seca Property Owners – Bob Costa
MPWMD – Joe Oliver
MCWRA – Howard Franklin
City of Del Rey Oaks – No Representative
City of Sand City – Leon Gomez
Coastal Subarea Landowners – No Representative

Watermaster
Technical Program Manager - Robert Jaques

Consultants

Others
Bishop, McIntosh & McIntosh – Leonard McIntosh

The meeting was convened at 1:38 p.m. after a quorum had arrived.

1. Public Comments
There were no public comments.

2. Administrative Matters:

A. Approve Minutes from the November 12, 2014 Meeting
On a motion by Mr. Gomez, seconded by Mr. Oliver, the Minutes were unanimously approved as presented.

B. Backup Desalination Projects
Mr. Jaques summarized the agenda packet materials for this item. There were no questions on this material.

C. Progress Report on Peer Review of Modeling Data
Mr. Jaques summarized the agenda packet materials for this item. He reported that he had received a letter dated February 9, 2015 from the attorney representing Bishop, McIntosh & McIntosh pertaining to the peer review and TAC discussions at the November 12, 2014 meeting. However, the letter had been received after the agenda packet for today's meeting had already been sent out, so it could not be included in today's packet. Mr. Jaques said he would include the letter in the agenda packet for the TAC's March meeting, so there can be TAC discussion on its contents.

There was a brief discussion by TAC members regarding the peer review.

9. Update on Work Pertaining to Calibration of Water Meters
Mr. Jaques and Mr. Oliver summarized the agenda packet materials for this item.

Following a brief discussion by TAC members, on a motion by Mr. Oliver, seconded by Mr. Gomez, the TAC unanimously agreed that no further action needs to be taken at this time with regard to meter calibration issues. Should future well production or other data indicate that metering accuracy is in question, this matter will be revisited.

10. Application from Cal Am to Increase Storage Quantity and Number of Storage/Recovery Sites

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

Mr. Hulbert commented that with regard to Question No. 2 on page 22 of the agenda packet, it is generally possible to specify the water quality characteristics of the water that will be produced by a reverse osmosis plant. Mr. Oliver suggested that the anticipated water quality from Cal Am's planned desalination plant is probably already known by the designers, and Mr. Hulbert added that he could probably obtain the missing data from the design documents.

Mr. Franklin asked Mr. Hulbert if there was any planned priority of what water will be injected into the groundwater basin, e.g. desalinated water, Carmel River water, ASR water, or reclaimed water. No one present knew of any priority that had been established with regard to this question.

Mr. Oliver questioned whether the proposed additional quantity of water to be stored included both desalinated water as well as ASR Phase 2 water. He noted that the ASR Phase 1 project is permitted for up to 2,426 AFY and the Phase 2 project is permitted for an additional 2,900 AFY, bringing the total permitted ASR water quantity to 5,326 AFY. Mr. Jaques commented that Mr. Sabolsice had indicated to him that the full quantity of additional water would be provided by the desalination plant.

There was some discussion regarding the implementation schedule for the groundwater replenishment project (GWRP). Mr. Oliver said that the latest projected startup date for the GWRP was late 2017.

Mr. Oliver and Mr. Franklin asked for clarification on the exact makeup of the additional water to be stored, and that there be continued discussion of this topic at the next TAC meeting. Mr. Oliver asked that the following information be provided for further discussion: (1) the additional water quality data so that all of the water quality parameters contained in Cal Am's original Storage Agreement would be included with this new application (Mr. Jaques listed the missing water quality parameters as nitrate, sulfate, potassium, magnesium, and calcium), (2) the breakdown of the sources of water to be stored, and (3) whether there should be separate applications for each source of water to be stored.

Mr. Franklin asked if it was time critical to get the additional injection/recovery sites approved. Mr. Oliver and Mr. Jaques commented that the sites are already in use, so it would be appropriate to have them formally approved at this time.

Mr. Hulbert offered to better define the volumes of water from the Phase 1 and Phase 2 ASR projects that would be included in the Storage Application at this time, and that it may be acceptable to delay applying for storage of the desalinated water until the volume of desalinated water to be stored is better known. He said he would need to discuss this with Mr. Sabolsice before making that determination.

There was agreement to continue discussion of this topic at the next TAC meeting.

11. Schedule

Mr. Jaques briefly summarized certain of the items in the schedule. There was not other discussion on this topic.

12. Other Business

There was no Other Business.

13. Set Next Meeting Date
The next regular meeting will be held on Wednesday March 11, 2015 at 1:30 p.m. at the MRWPCA Board Room.

The meeting adjourned at 2:26 p.m.

SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 11, 2015
AGENDA ITEM:	3.A
AGENDA TITLE:	Presentation of Draft Peer Review Technical Memorandum
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

The contract issued to Todd Groundwater in December 2014 to perform a Peer Review of the recent modeling work performed by HydroMetrics contains the following Tasks:

Task 1. Review Reports and Memoranda
Task 2. First Meeting with HydroMetrics WRI
Task 3. Sensitivity Testing of Groundwater Model
Task 4. Second Meeting with Hydrometrics WRI
Task 5. Prepare Peer Review Memorandum

Tasks 1 through 4 have now been completed. At today's TAC meeting Mr. Gus Yates of Todd Groundwater will make a presentation on the Task 5 Draft Peer Review Technical Memorandum and will be available to respond to questions from the TAC on that document. Depending on the questions and comments he receives from the TAC Mr. Yates may edit the Draft prior to presenting it to the Board at its April 1, 2015 meeting.

Attached is a copy of the Draft Peer Review Technical Memorandum.

Once he has received all input/questions from both the TAC and the Board he will prepare a final version of the Technical Memorandum addressing that input and those questions.

ATTACHMENTS:	Draft Peer Review Technical Memorandum
RECOMMENDED ACTION:	Provide comments to Mr. Yates to clarify any ambiguities in the Draft Peer Review Technical Memorandum

TODD GROUNDWATER

6 March 2015

MEMORANDUM

To: Bob Jaques, Seaside Basin Watermaster Technical Program Manager

From: Gus Yates, Senior Hydrologist, Todd Groundwater

Re: Peer Review of Seaside Basin Groundwater Modeling Studies—TAC REVIEW DRAFT

INTRODUCTION

HydroMetrics Water Resources, Inc. (HMWRI) has completed several groundwater modeling studies of the Seaside Basin in recent years to support decision-making by the Seaside Basin Watermaster. These include the original model documentation report (HMWRI 2009), the 2014 model update report (HMWRI 2014a) and a safe yield analysis of the Laguna Seca subarea (HMWRI 2014b). The last of these raised fundamental questions about basin boundaries and yield, which prompted the Watermaster to request a technical peer review of the groundwater model, simulation results and conclusions drawn from those results. I have completed the peer review, and this memorandum summarizes my findings.

The review process was structured to include extraction of additional information from previous model simulations and additional testing of the model. These steps were beyond the typical scope of a peer review and added substantial additional value to the outcome. Instead of simply retroactively identifying weaknesses and speculating about their causes, I was able to investigate hypotheses and test potential model improvements. HMWRI staff facilitated these steps by running the model and its pre- and post-processing programs per my instructions. As a result of this hands-on approach, this memorandum presents more technical information—results not included in prior reports—than is commonly included in peer reviews.

APPROACH

The primary purpose of the groundwater model since its inception has been to address questions related to the yield of the basin and its subareas. The ability of the model to correctly represent existing and future water balances is central to its reliability for estimating yield. Water balances are linked to simulated water levels, and an error in one is often associated with an error in the other. The focus of the technical review consisted of applying this linkage to two apparent model weaknesses to see whether they might result in incorrect yield estimates. One apparent weakness is the discrepancy between simulated and measured historical water levels evident for several wells in the Northern Coastal Subarea.

The second potential weakness is that the estimate of Laguna Seca Subarea safe yield is much lower than estimates in previous studies. These possible weaknesses are described below, followed by the results of three model sensitivity tests designed to investigate causes and implications of the weaknesses.

Other questions regarding technical details of the model arose during the peer review. These are of secondary importance. However, the questions and the additional information provided by HMWRI in response to the questions are potentially valuable for others involved in basin modeling and management. Accordingly, they are included in Appendix A.

The adjudication judgment includes the term "natural safe yield", which is a legal concept that conflicts with physical processes that actually occur in the Seaside Basin. Consequently, the term is of little practical value for basin management. A discussion of the limitations of the natural safe yield concept is presented in Appendix B.

Simulated Northern Coastal Water Levels and Water Balances

The model was calibrated to observed groundwater conditions during 1987-2013. The Paralta Well at the eastern edge of the Northern Coastal Subarea commenced operation in 1995 and immediately became one of the two largest producers in that subarea. Total groundwater production also increased at that time as a result of State Water Resources Control Board (SWRCB) Decision 95-10, which forced the largest retail water supplier in the region (California American Water Company, or Cal-Am) to shift much of its production from wells in the Carmel Valley to wells in the Seaside Basin. Measured water levels at many Northern Coastal wells began steadily declining in response to the increase in pumping. However, simulated water levels at many of those wells do not exhibit a long-term declining trend. **Figure 1** shows annual production from Northern Coastal Subarea wells during 1987-2013. The increase in total production of about 1,500 AFY and the onset of Paralta Well pumping in 1995 are clear. **Figure 2** shows hydrographs for four of the wells where the discrepancy between measured and simulated water-level trends can be seen. Other wells do not exhibit the discrepancy, such as the ones shown in **Figure 3**.

The discrepancies as of the end of 2013 were plotted on a map, and they formed a pattern consistent with failure of the model to develop a pumping trough in either the Santa Margarita aquifer (model layer 5) or the Paso Robles aquifer (model layers 1-4). A map of water level residuals in the two aquifers is shown in **Figure 4**, along with the location of average annual pumping stress during 2009-2013. Unfortunately, the number of points in each aquifer is not sufficient to completely define the pumping troughs. The data appear to indicate that the Santa Margarita trough is centered near the eastern edge of the subbasin and extends to near the coastline. The Paso Robles trough appears to be slightly more localized and centered farther west.

A possible explanation for the discrepancy is that formation of a pumping trough (local storage depletion) is prevented by too much simulated groundwater inflow. In addition to the storage response, the Santa Margarita aquifer in the Northern Coastal Subarea has five other head-dependent flow boundaries: net inflows from the Northern Inland Subarea, Fort

Ord, the ocean, the Southern Coastal Subarea, and the overlying Paso Robles aquifer. Simulated annual net inflows across each boundary during 1987-2013 are shown in **Figure 5**. Each of those boundary flows will respond to a change in pumping. The sensitivity tests described below were designed to test the relative magnitudes of the boundary responses to determine whether one or more of them was primarily responsible for preventing the development of a pumping trough.

Simulated Laguna Seca Water Balances

Yates and others (2002) estimated that average annual groundwater pumping in the Laguna Seca Subarea during 2000-2002 was approximately 1,000 AFY, and the safe yield was about 400 AFY. The original (2009) HMWRI groundwater model included the same estimate of average annual production during 2003-2007. Shortly thereafter, groundwater withdrawals began to decrease as a result of basin adjudication. The adjudication proceedings assumed a safe yield of 608 AFY for the Laguna Seca subarea, although no derivation of that estimate was presented (HMWRI 2014b). In the 2014 Laguna Seca yield analysis, HMWRI applied the equation for natural safe yield to obtain a yield estimate of 240 AFY. Future baseline pumping was projected to be 524 AFY, which in spite of being only half as much as historical pumping was still double the estimated natural safe yield.

Head-dependent flows in the Laguna Seca Subarea water balance are storage change, net inflow from the El Toro Subarea, net outflow to the Northern Inland Subarea and net outflow to the Southern Coastal Subarea. **Figure 6** shows annual inflows and outflows for the Laguna Seca Subarea in the groundwater model during 1995-2013. Inflows from El Toro and outflows to El Toro are both fairly large in the groundwater model, whereas the flow is almost exclusively outflow at the other two boundaries. For clarity El Toro inflows and outflows are shown separately in the graph. Recharge is also shown to put the magnitudes of the other inflows into context.

The Laguna Seca water balance in the groundwater model differs substantially from the most recent previous estimates. Yates and others (2002 and 2005) estimated that the subarea receives an average of 810 AFY of internal recharge (from rainfall, irrigation return flow and septic system percolation) and 180 AFY of inflow from the El Toro Subarea, which together total 990 AFY. Their estimate of safe yield was 400 AFY, or 40 percent of total inflow. The HMWRI groundwater model includes 1,050 AFY of internal recharge and 760 AFY of inflow from El Toro, for a total of 1,810 AFY of inflow—almost double the prior estimate. However, the natural safe yield was estimated to be 240 AFY, which is only about half of the prior estimate and only 13 percent of total inflows. In other words, the model incorporates a large amount of groundwater flow through the Laguna Seca Subarea, a relatively small fraction of which can be extracted within the subarea without causing long-term water-level declines.

The additional through-flow of groundwater is essentially northward, entering across the southern subarea boundary (from the area near the Bay Ridge and Robley wells) and exiting across the northern boundary (crossing the Laguna Seca Anticline and into the Northern Inland Subarea). Although geologic evidence could support the the possibility of northward

flow out of the Laguna Seca Anticline, overestimating that flow could result in underestimating groundwater yield within the subarea. Furthermore, excess outflow to the Northern Inland Subarea could conceivably supply excess flow from the Northern Inland to the Northern Coastal Subarea. This means that the two possible weaknesses in the groundwater model could share a common cause. The inter-subarea flows were adjusted in the sensitivity simulations to explore this possibility.

Simulated Water Levels at Laguna Seca-El Toro Boundary

A third possible weakness in the groundwater is smaller and more localized but could impact yield calculations because of its location. HMWRI found that even when Laguna Seca pumping was reduced to zero in the groundwater model, water levels in the eastern part of the subarea continued to decline as a result of pumping in the adjacent El Toro Subarea. On the one hand, this is physically plausible because the Laguna Seca-El Toro boundary is simply a flow divide, not a true barrier to groundwater flow. Pumping on one side of the boundary would be expected to affect water levels on the opposite side.

On the other hand, part of the simulated decline in water levels might be due to a localized calibration error. In the calibration simulation, the model over-simulated the amount of historical water-level decline at three wells near the Laguna Seca-El Toro boundary. Simulated and measured water-level hydrographs for those wells are shown in **Figure 7**. At the scale of the entire basin, this discrepancy is not particularly large, but it is centered on a particularly controversial boundary segment. If whatever caused the discrepancy in the historical calibration simulation also applied to future simulations, it would tend to over-simulate water level declines, which would reduce the estimate of operational safe yield in the Laguna Seca Subarea.

Model Sensitivity Tests and Results

Three simulations were completed to explore the sensitivity of model results to changes in inputs that affect east-to-west flow between basin subareas. The objective of the tests was not to achieve fully-calibrated alternative models, but simply to test whether substantial changes in parameters that affect east-to-west flow could produce qualitatively different results. Specifically, results were examined to see whether alternative parameters resulted in a more pronounced pumping trough in the Northern Coastal Subarea or in a more gradual rate of water-level decline in the Laguna Seca Subarea. The three test simulations were:

- **Sensitivity Alternative 1a: Decreased hydraulic conductivity along Laguna Seca Anticline.** The anticline follows the northern edge of the Laguna Seca Subarea and continues east and north a couple of miles along the western edge of the El Toro Creek Valley. Hydraulic conductivity in all model layers was decreased to a relatively low value of 0.5 ft/day along a swath of model cells tracing the anticline. The location of the adjustment is shown in **Figure 8**. This alternative is consistent with previous conceptual models in which the anticline was viewed as a barrier to groundwater flow.

- **Sensitivity Alternative 1b: Uniform, low hydraulic conductivity in Northern Inland subarea.** The automated calibration routine used by HMWRI resulted in quite variable hydraulic conductivity throughout the Northern Inland Subarea. This could have resulted in "preferred flow paths" along connected areas of high conductivity. This alternative eliminated the possibility of high flow along preferred pathways by substituting a uniform zone of moderately low conductivity (5 ft/d) throughout the eastern two-thirds of the Northern Inland Subarea (all layers). The purpose was the same as for Alternative 1a, which was to diminish east-to-west flow across the Northern Inland Subarea.

- **Sensitivity Alternative 2: Steady-state water levels as initial water levels.** Simulated water levels climb steeply toward the southeastern corner of the El Toro Subarea. This region of high water levels could represent a large volume of stored groundwater. If that volume were incorrectly specified at the start of the simulation, it could slowly drain out during the course of the simulation and supply an excessive amount of east-to-west flow across the basin. Alternative 2 sought to eliminate this type of initial disequilibrium by first running the model in steady-state and then using the resulting water levels as initial heads for the transient calibration simulation.

Results of the three sensitivity simulations were plotted as hydrographs, water-level contour maps and water-balance pie charts, and then compared with output from the calibration simulation.

Northern Coastal Subarea Results

Hydrographs of selected wells are shown in **Figure 9** for the calibration simulation and the three sensitivity alternatives. The results for Alternatives 1a and 1b are slightly offset from the calibration hydrograph, but have the same slope. The long-term slope of the hydrograph is the principal indicator of basin yield. Because the slopes remained unchanged, the estimate of yield would not change. The hydrographs for Alternative 2 exhibit a different type of response. Initial water levels at the start of the simulation were much higher than the initial water levels in the calibration simulation. Over a period of about 20 years, they converged with the calibration hydrograph. This is the result of head-dependent boundary responses, which counteract perturbations that are inconsistent with inflows, outflows and aquifer parameters. Thus, the different hydrograph slope for Alternative 2 does not necessarily indicate a different estimate of subarea yield.

Contours of simulated water levels in December 2008 throughout the basin are shown in **Figure 10** for the calibration simulation (20-foot contour interval) and in **Figures 11, 12 and 13** for Alternatives 1a, 1b and 2, respectively (10-foot contour interval).

Decreasing horizontal hydraulic conductivity along the Laguna Seca Anticline (Alternative 1a) produced a stair-step in the regional east-to-west water-level gradient (Figure 11). Water levels were elevated on the east side of the anticline and lowered on the west side. However, the effect diminished with distance downgradient such that water levels in the

Northern Coastal subarea were nearly the same as in the calibration simulation. Imposing a uniform and relatively low hydraulic conductivity of 5 ft/d throughout the eastern two-thirds of the Northern Inland subarea (Alternative 1b) produced a uniform gradient in that area, but the direction of flow was more northerly (Figure 12). Furthermore, a stair-step in the regional gradient appeared at the western edge of the low-conductivity zone, such that downgradient water levels in the Northern Coastal subarea were nearly the same as in the calibration simulation. As mentioned above, the different set of initial water levels implemented in Alternative 2 gradually converged toward the calibration water levels in the Northern Coastal subarea, so that by December 2008 the two sets of contours were quite similar (Figures 10 and 13).

Subarea water balances were extracted from simulation results to identify how head-dependent boundaries responded to the changes in parameters and water levels. For the Northern Coastal subarea, the key question is why the calibrated model did not simulate the development of a pumping trough in layer 5 when pumping increased in 1995. Too little of the new pumping stress was absorbed by storage depletion, and too much was absorbed by other head-dependent boundary flows, which in this case include lateral net inflow from all four directions (Northern Inland, Fort Ord, Southern Coastal and the ocean) and downward flow from the Paso Robles Formation (model layers 1-4). **Figure 14** shows pie charts of average annual net inflows to model layer 5 in the Northern Coastal subarea during 1995-2013. In the sensitivity tests, the perturbation was not an increase in pumping but a decrease in inflow from the Northern Inland Subarea resulting from decreased hydraulic conductivity to the east.

The pie charts show that storage depletion was a small percentage of the Northern Coastal water balance and contributed little of the response to changes in initial water levels or inflow from the Northern Inland Subarea. In Alternative 1B, for example, Northern Inland inflow was 321 AFY less than in the calibration simulation, but the concurrent change in storage depletion was only 3 AFY.

Basically the change in one boundary inflow interacted more with the other boundary inflows than with the storage change. This implies that excessive inflow from the Northern Inland Subarea was not the primary factor hindering the model from simulating a localized pumping trough. To develop a trough, the internal pumping stress might need to be buffered from all of the head-dependent boundaries by means of locally lower hydraulic conductivity and storativity. Although this concept was not tested, it does not necessarily imply a different water balance and yield for the Northern Coastal Subarea. It could simply allow the development of a pumping trough with the same magnitude of boundary inflows.

Laguna Seca Subarea Results

Hydrographs of sensitivity test results in the Laguna Seca Subarea are shown for four wells in **Figure 15**. The responses to the alternative simulations were similar at all Laguna Seca wells. Alternatives 1a and 1b both raised groundwater elevations in the Laguna Seca Subarea by restricting outflow into the Northern Inland Subarea, as expected. The alternative hydrographs gradually departed from the calibration hydrograph, but the effect

was only a small percentage of the overall declining trend. In other words, the effect was not large enough to substantially alter the overall slope of the hydrograph and hence would not result in a substantially different yield estimate. Alternative 2 commenced with initial water levels tens of feet lower than in the calibration simulation. Given the absence of nearby head-dependent boundaries such as the ocean, water levels remained lower throughout the simulation. In spite of these very different initial conditions, the overall slope of the hydrograph was the same as for the other alternatives and the calibration simulation. Because yield is indicated primarily by long-term water-level trends, none of the alternative sensitivity tests appeared to justify a revision of the yield estimate.

Pie charts showing average annual Laguna Seca water balances during 1995-2013 are shown in **Figure 16**. In this subarea, flow at two of the head-dependent boundaries (adjoining the Southern Coastal and Northern Inland Subareas) is predominantly outflow, so the net flows appear as negative numbers. The El Toro boundary includes an inflow segment and an outflow segment, with inflows exceeding outflows by a modest amount. The change in outflow to the Northern Inland Subarea can viewed as the perturbation of the water balance, and the changes in storage depletion and flows across the other two head-dependent boundaries can be evaluated as responses to that perturbation. For example, the largest change in outflow to the Northern Inland Subarea was a decrease of 438 AFY under Alternative 1b. Storage depletion within Laguna Seca was smaller by 129 AFY, or 30 percent of the perturbation. Thus, storage was a larger part of the response than in the Northern Coastal Subarea, but not big enough to greatly alter the slopes of simulated water-level hydrographs.

In the simulation of Alternative 2, net inflow from the El Toro Subarea was almost zero. This can be attributed to eliminating the high water levels in the southeastern corner of the El Toro Subarea, which apparently was the source of net inflow in the calibration and other alternative simulations. However, even the substantial change in inflow and initial water levels in Alternative 2 did not cause a tremendous change in the long-term rate of storage depletion (which decreased by 85 AFY, or 29 percent of the change in outflow to the Northern Inland Subarea). Like the other tests, Alternative 2 did not reveal an obvious error in the HMWRI estimate of Laguna Seca yield.

Technical Conclusions and Recommendations

Northern Coastal Subarea

- Decreasing the rate of east-to-west flow across the Northern Inland Subarea did not result in simulation of a pumping trough in the Northern Coastal Subarea. Hydrographs in the Northern Coastal Subarea were shifted up or down slightly but had the same slopes as in the calibration simulation.
- In the Northern Coastal Subarea, the storage response in model layer 5 to decreased inflow from the east was the smallest of the five head-dependent boundary responses.

- A plausible alternative hypothesis is that a combination of lower hydraulic conductivity and storativity within the Northern Coastal Subarea might enable the model to simulate more of a trough. These are factors within the subarea that might not affect boundary flows and hence might not affect the subarea yield estimate.
- An incorrect assignment of pumping stresses to model layers could theoretically contribute to the lack of a simulated pumping trough in layer 5. However, this mechanism seems unlikely because the model also under-simulated the pumping trough in layers 1-4.
- The hydrographs for sensitivity Alternative 2 gradually converged with the calibration hydrographs over the first 20 years of the simulation. This is the expected response in a flow system with multiple head-dependent flow boundaries. Because the alternative initial water levels were much higher or lower than measured historical water levels (that is, incorrect), this pattern does not support a revised estimate of safe yield.
- Changes in simulated flow across the ocean boundary flow also accounted for a small fraction of the total response to decreased inflow from the Northern Inland Subarea (10-12 percent). This provides reassurance that large amounts of seawater intrusion are not the reason the model fails to create a pumping trough.

Laguna Seca Subarea

- The hydrographs for Alternatives 1a and 1b departed gradually from the calibration hydrographs at most wells, but only by a small amount. The alternative long-term declining trends were not sufficiently different from the calibration trends to justify a revised estimate of operational safe yield.
- Alternative 2 water levels in the southeastern corner of the El Toro Subarea were as much as 120 feet lower than in the calibration simulation. The absence of this large body of stored groundwater substantially decreased simulated groundwater inflow to the Laguna Seca Subarea, but it decreased outflow to the Northern Inland Subarea by a similar amount, so the net effect within Laguna Seca was relatively small.
- The relatively low estimate of Laguna Seca Subarea yield reported by HMWRI does not appear to be entirely the result of excessive amounts of groundwater "draining" out to the Northern Inland Subarea. If this had been the case, then Alternative 1a or 1b would have produced a much smaller declining trend in simulated hydrographs.
- The large difference between the Laguna Seca Subarea water balance in the groundwater model and previous estimates of the water balance illustrate the problem of "non-unique" model calibrations. The current model and the previous model (Yates and others, 2002) both simulated measured water levels reasonably well, but with substantially different aquifer parameters and water balances. On the basis of water levels alone, it is not possible to determine whether one water balance is more accurate than the other.

This discussion of management conclusions and recommendations focuses on the Laguna Seca Subarea. The coastal subareas will benefit from two water importation projects. The Seaside Basin Groundwater Replenishment Project (GWR Project) will import highly-treated recycled water from various sources primarily in the Salinas area and inject the water into the Seaside Basin near the eastern border of the Northern Coastal Subarea. The Monterey Peninsula Water Supply Project (MPWSP) would import water from a seawater desalination facility to be constructed near Marina. The water would be introduced directly into water distribution systems operated by California American Water Company (Cal-Am). Both projects are in active stages of design, permitting and environmental compliance. Together, the projects are expected to balance groundwater supply and use in the coastal subbasins. Neither project, however, would supply additional water to the eastern half of the Laguna Seca Subarea, where chronically declining water levels are a problem. Although Cal-Am plans to discontinue producing groundwater from the Laguna Seca Subarea, simulations by HMWRI (2104b) indicate that pumping by the remaining users ("alternative producers") would still exceed the operational yield.

Possible solutions to groundwater overdraft in the Laguna Seca Subarea are described below at a conceptual level, along with potential obstacles to their implementation.

Management Measures within Laguna Seca

Management Option: Redistribute Pumping

Because of head-dependent boundary responses, decreased groundwater pumping by Cal-Am and/or other users will increase the rates of groundwater outflow to the Southern Coastal, Northern Inland and El Toro Subareas. Given that the adjudication and now the Watermaster are managing the Seaside Basin on a subarea basis, Laguna Seca could retain some of its local yield by installing recovery wells near the three outflow boundaries to intercept any increases in outflow. Pipelines would need to be installed to convey that water back to the locations where pumping was decreased.

This concept would involve installing new municipal wells in up to three locations and constructing pipelines several miles in length from each location back to the east-central part of the subarea. It might be possible to use the Ryan Ranch water system to convey water from the Southern Coastal outflow boundary part of the way toward the eastern half of the Laguna Seca Subarea.

This approach would not eliminate the problem of water-level declines at the eastern end of the Laguna Seca Subarea caused by pumping in nearby wells in the El Toro Subarea. Without recovery wells, outflow to El Toro would increase. Outflow would remain the same if the water-level gradient across the boundary remains the same. If El Toro water levels decline in the future, then Laguna Seca water levels near the boundary would have to decline at the same rate to maintain a constant gradient. However, this would require pumping at a

recovery well on the Laguna Seca side of the boundary, which would increase the total rate of water-level decline near the boundary.

Management Option: Continue Pumping from Ryan Ranch Wells

Cal-Am reportedly plans to discontinue pumping from its wells in the Ryan Ranch development in the western half of the Laguna Seca Subarea. Groundwater levels are stable in that area, and groundwater flow is toward the Southern Coastal Subarea. Eliminating production from the Ryan Ranch wells would simply increase the rate of outflow while doing little to alleviate overdraft in the eastern half of the Laguna Seca Subarea. Therefore, it would be desirable to continue using the Ryan Ranch wells and to convey the produced water to the eastern part of the subarea. Depending on how Cal-Am plans to deliver water from other sources to Ryan Ranch customers, this management option might require additional pipelines all the way from the wells to the eastern part of Laguna Seca. Alternatively, the two sources could simply be exchanged on paper, which could ppotentially decrease the amount of new pipeline required.

Management Option: Reduce Water Demand

Given the high cost of conveying water within Laguna Seca—much less obtaining it from external sources—reducing water demand in the eastern part of the subarea is worth a hard look. Much of the consumptive use is for golf course irrigation. A package plant reportedly converts nearly all locally-produced wastewater into recycled water that is used on the golf courses. However, the recycled water supply is less than the golf course irrigation demand. Therefore, the principal variable that can easily be managed is the irrigation requirement of the golf courses. This might be accomplished, for example, by reducing the irrigated width of the fairways, or omitting or reducing irrigation on parts of the fairways where golf balls rarely land (for example, areas near the tees that the balls generally cross in the air). Turf in those areas could be replaced with other types of vegetation that require little or no irrigation.

Decreasing the amount of irrigated turf at the golf courses would obviously change the aesthetic, but with some creativity would not necessarily make the visual experience worse.

Management Measures beyond the Basin

Management Option: Change the Laguna Seca-El Toro Boundary Location

The problem of trans-boundary pumping effects could be solved by shifting the boundary location inward or outward to fully exclude or include the effects of the external pumpers, which in this case are primarily the Toro and Corral de Tierra municipal wells. If the boundary were moved outward to include those wells, they would fall under the jurisdiction of the adjudication and Watermaster and would be subject to the same phased pumping reductions as other Seaside Basin users. This would theoretically halt long-term water-level declines near the current boundary location.

From a practical standpoint, there are two major problems with this approach:

- It would require reopening the adjudication and forcing or persuading El Toro pumpers to join the Seaside Basin and its management program. This could prove to be risky, slow and expensive.
- It would not permanently eliminate the fundamental problem of basin boundaries defined by flow divides. Future changes in pumping near the new basin boundaries would be likely to create similar problems of trans-boundary flow.

Management Option: Import Water to the Laguna Seca Subarea

Cal-Am reportedly intends to size the combined capacities of the GWR Project and the MPWSP such that they replace only the amount of Cal-Am's former Carmel River supply that was eliminated by State Water Resources Control Board Decision 95-10. The capacity of either project could conceivably be increased to obtain a new increment of supply for Laguna Seca. This would require that water users in the eastern part of the Laguna Seca Subarea—and possibly also El Toro—join with Cal-Am to jointly construct an expanded version of one of the projects. Additional pipelines would also be needed to convey the water from the Cal-Am system to the eastern part of Laguna Seca.

The cost of the water under this option would likely be quite high. Also, the GWR Project and the MPWSP are both already at advanced stages of environmental analysis. Changing the size of the project would delay the schedule for completion.

Management Option: Use SGMA as a Means of Managing Areas outside the Basin

The Sustainable Groundwater Management Act (SGMA) was adopted by the California Legislature and Governor in late 2014 and became effective on January 1, 2015. It profoundly changes statewide groundwater management and requires that all groundwater basins be sustainably managed, which means that overdraft is eliminated. SGMA represents a new vehicle for managing groundwater in adjacent parts of the Salinas Valley Groundwater Basin, or more specifically, to prevent external pumpers from adversely affecting groundwater levels within the Seaside Basin. Application of SGMA to the situation in Seaside is complicated by two factors: adjudication and basin boundaries.

Implications of Adjudication

Seaside Basin is adjudicated, and SGMA defers to existing management programs in basins or parts of basins that have already been adjudicated, including the Seaside Basin (Water Code Section 10720.8(a)). The Watermaster is thus equivalent to the Sustainable Groundwater Agency that in other basins must be selected from among local agencies or created by a group of agencies acting under a memorandum of agreement or as a joint powers authority. Collaboration with other agencies to manage groundwater close to its borders is obviously desirable for the Watermaster, but it might not be feasible to become a member of a joint powers authority. That would bring the Seaside Basin under the authority of the Sustainable Groundwater Agency, which could conflict with current legal authority of the court.

SGMA does allow parts of basins to be managed by separate Groundwater Sustainability Agencies under separate Groundwater Sustainability Plans, but it requires the agencies to develop "coordination agreements" that ensure consistency among the plans (Water Code

Sections 10727(b)(3), 10727.6 and 10723.4). Coordination agreements must demonstrate that all of the Groundwater Sustainability Plans within a basin together achieve the objective of sustainability throughout the basin. The coordination agreement is a means by which the Watermaster could engage in managing adjacent parts of the basin without subverting or reopening the adjudication.

Basin Boundaries

SGMA requires that basin and subbasin boundaries be consistent with the boundaries in California Department of Water Resources (DWR) Bulletin 118. The boundaries of the Seaside Basin used by the court for the purpose of adjudication do not conform at all to the Bulletin 118 boundaries, as shown in **Figure 17**. The adjudicated area straddles two Bulletin 118 subbasins of the Salinas Valley Groundwater Basin: the Seaside Area Subbasin and the Corral de Tierra Area Subbasin. The boundary between these Bulletin 118 subbasins is the inland extent of windblown dune deposits, which are unsaturated and have no bearing on the underlying groundwater flow system. However, the adjudication boundaries are equally problematic because the northern and eastern boundaries are the approximate locations of groundwater flow divides that could easily shift in response to future changes in pumping.

SGMA includes a provision for requesting changes in basin or subbasin boundaries. By January 1, 2016, DWR must adopt regulations stating the procedures for requesting boundary revisions. Several general criteria are listed in SGMA (Water Code Section 10722). The triennial update of Bulletin 118 is due to be completed by January 1, 2017, and that version is to be the basis for creating Groundwater Sustainability Agencies and Plans (Water Code Section 10720.7). This would appear to create a one-year window—calendar year 2017—to apply for basin boundary adjustments.

Sub-Option A: Do Nothing

If the Watermaster takes no proactive steps to accelerate management of groundwater in adjacent parts of the Salinas Valley Basin, management will still occur pursuant to SGMA. Whichever entity becomes the Sustainable Groundwater Agency will need to submit a Groundwater Sustainability Plan by January 31, 2022 and have achieved sustainability by January 31, 2042.

The drawbacks to this sub-option are that the Watermaster would have no input into strategies and programs developed for managing groundwater in adjoining areas, and Seaside Basin interests might not be fully taken into account. Also, it might take 27 years to achieve sustainability.

Sub-Option B: Actively Participate in External Groundwater Management

Monterey County Water Resources Agency (MCWRA) is the most obvious candidate to become the Groundwater Sustainability Agency for areas adjoining the Seaside Basin. At a minimum, it would certainly be a member and key player in a multi-party Groundwater Sustainability Agency. The Watermaster could approach MCWRA in the near future to initiate a collaborative effort to manage the Seaside part of the Salinas Valley Basin under SGMA. The problems with the Bulletin 118 and adjudication boundaries would impact the external Groundwater Sustainability Agency as much as they would impact the

Watermaster. A joint petition to DWR for subbasin boundary adjustments could be a useful near-term objective.

RECOMMENDATIONS

Several of the possible management options listed above seem promising in terms of feasibility and cost-effectiveness. Recommended next steps to further explore those options are as follows:

- **Quantify the costs and benefits of continued operation of Ryan Ranch wells.** The groundwater model should be used to simulate Laguna Seca water balances with and without Ryan Ranch pumping, with particular attention paid to changes in outflow to the Southern Coastal Subarea. Cal-Am should be approached to discuss options for transferring the wells to a different owner, swapping water on paper, and conveying water toward the eastern part of the Laguna Seca Subarea. The approximate cost of additional pipelines should be estimated. These items should be integrated into a feasibility and cost-benefit analysis of continued operation of the wells.
- **Quantify the costs and benefits of recovery wells to intercept increased subsurface outflow from the Laguna Seca Subarea.** The groundwater model should be used to simulate the increases in outflow at the Southern Coastal, Northern Inland and El Toro boundaries and the ability of hypothetical recovery wells to capture any increases in outflow resulting from decreased pumping in the eastern part of the Laguna Seca Subarea. The cost of the wells and of pipelines needed to return the captured outflow to the central part of the Subarea should be estimated. These items should be integrated into a feasibility and cost-benefit analysis of outflow recovery wells.
- **Initiate sustainable groundwater management in areas adjacent to the Seaside Basin.** The Watermaster should meet soon with MCWRA to discuss implementation of SGMA in areas adjacent to the Seaside Basin. Issues to be discussed include:
    - whether to petition DWR for subbasin boundary revisions, and if so, what the alternative boundaries should be for the purposes of implementing SGMA;
    - which agency or agencies should become the Sustainable Groundwater Agency for the adjacent areas;
    - the elements of a coordination agreement linking water management in the Seaside Basin with the Sustainable Groundwater Plan for adjacent areas.

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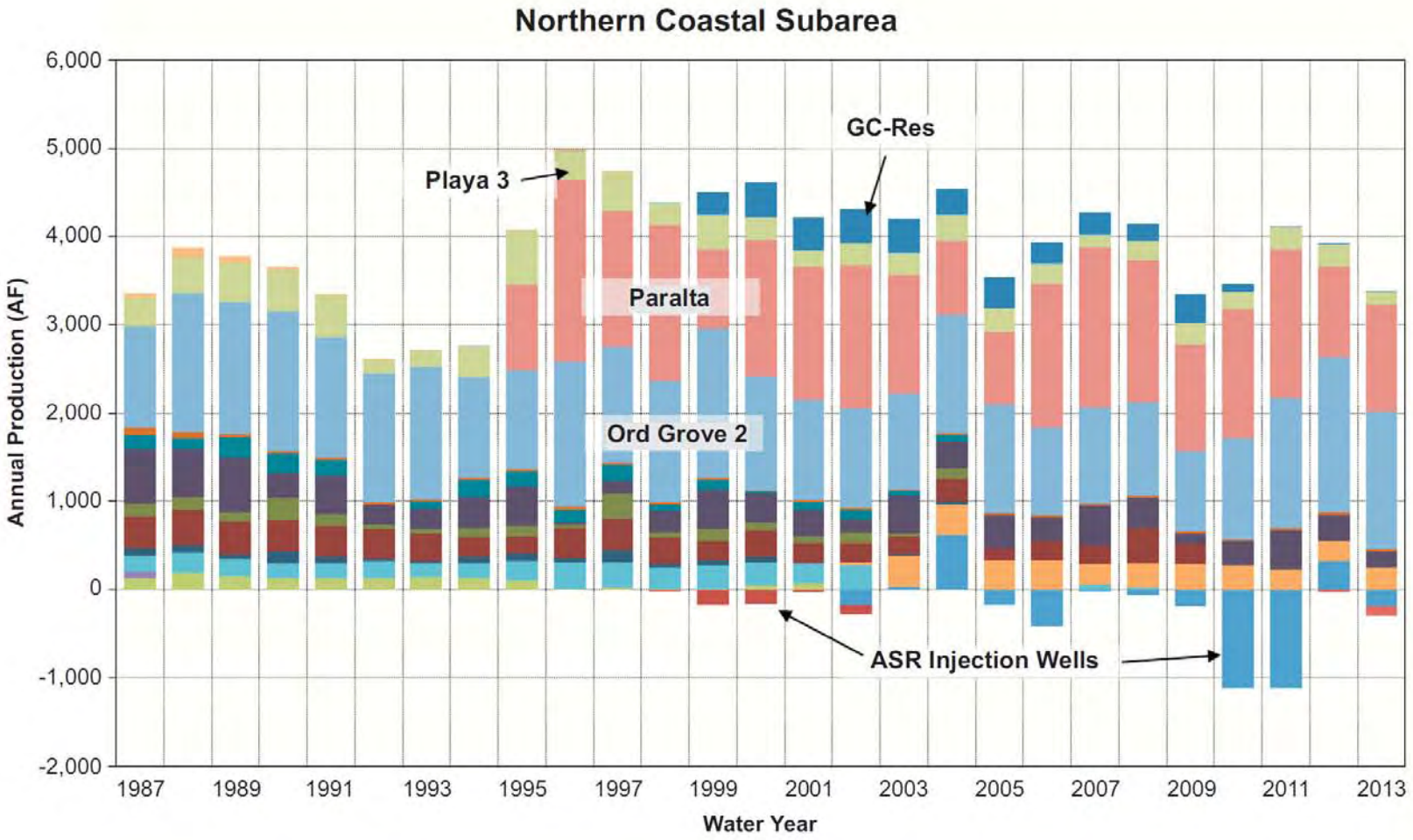

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Figure 1
Annual Groundwater Pumping in the Northern Coastal Subarea

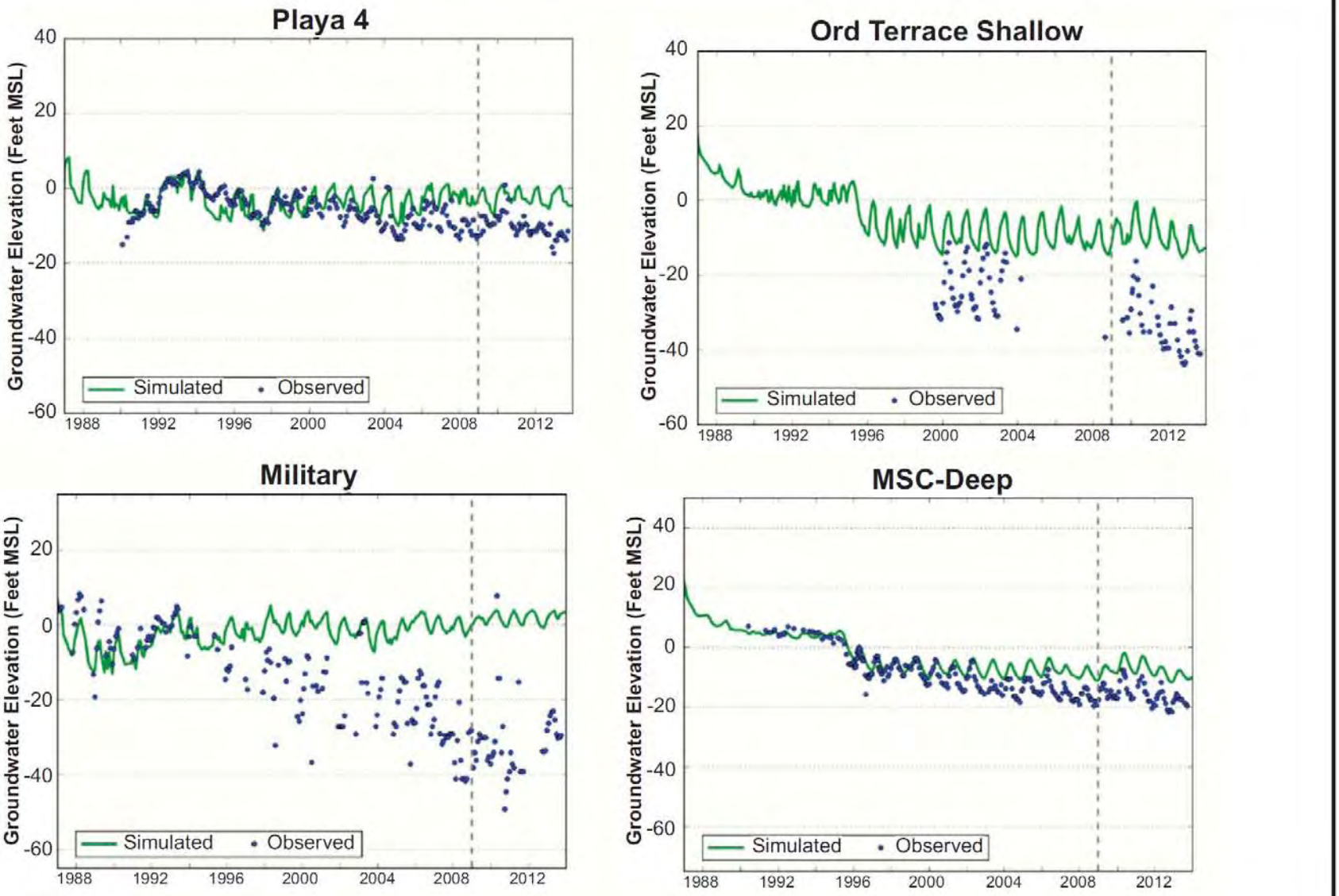
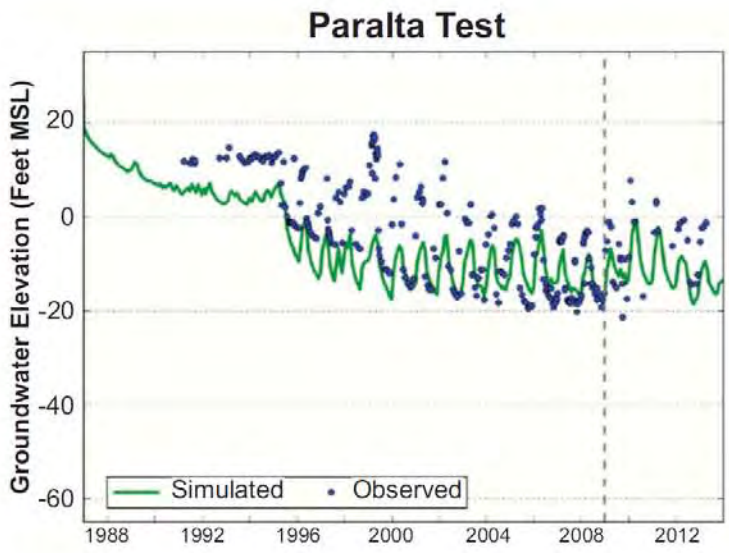
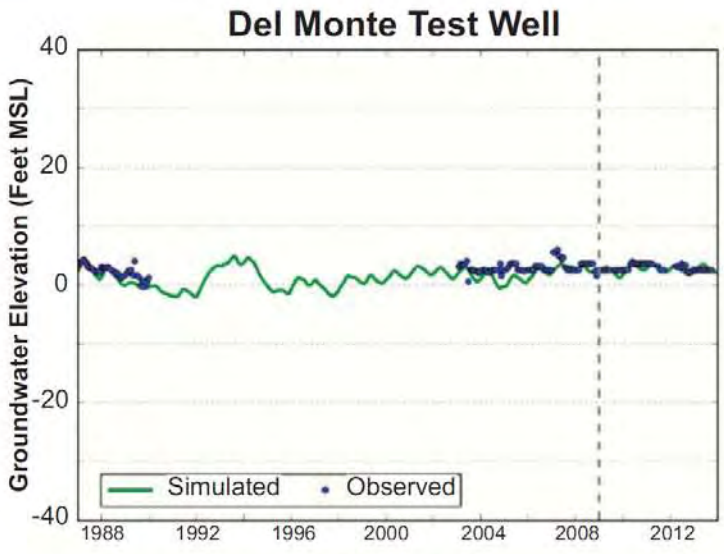
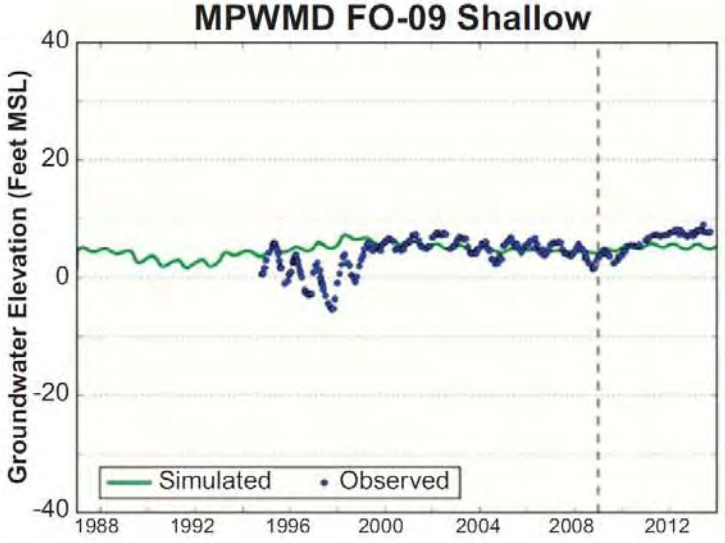


Figure 2
Northern Coastal Calibration Hydrographs with Discrepancies







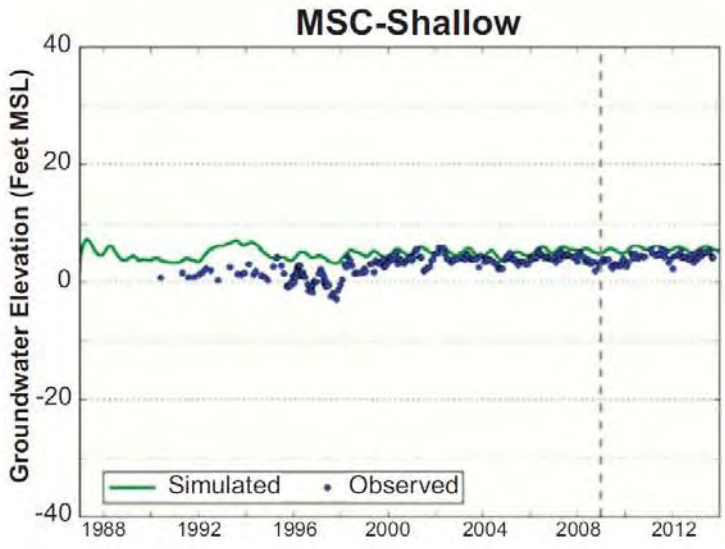


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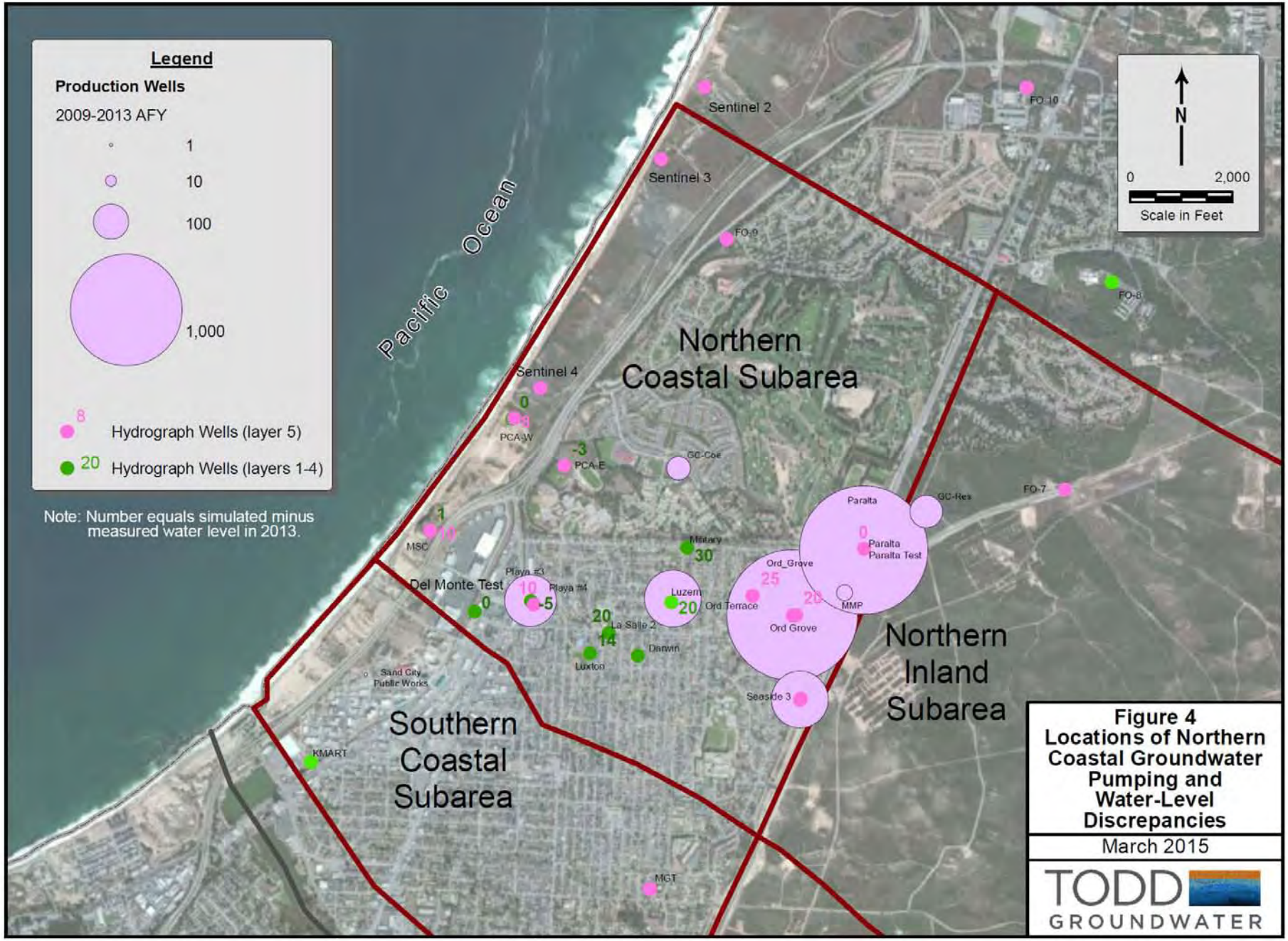
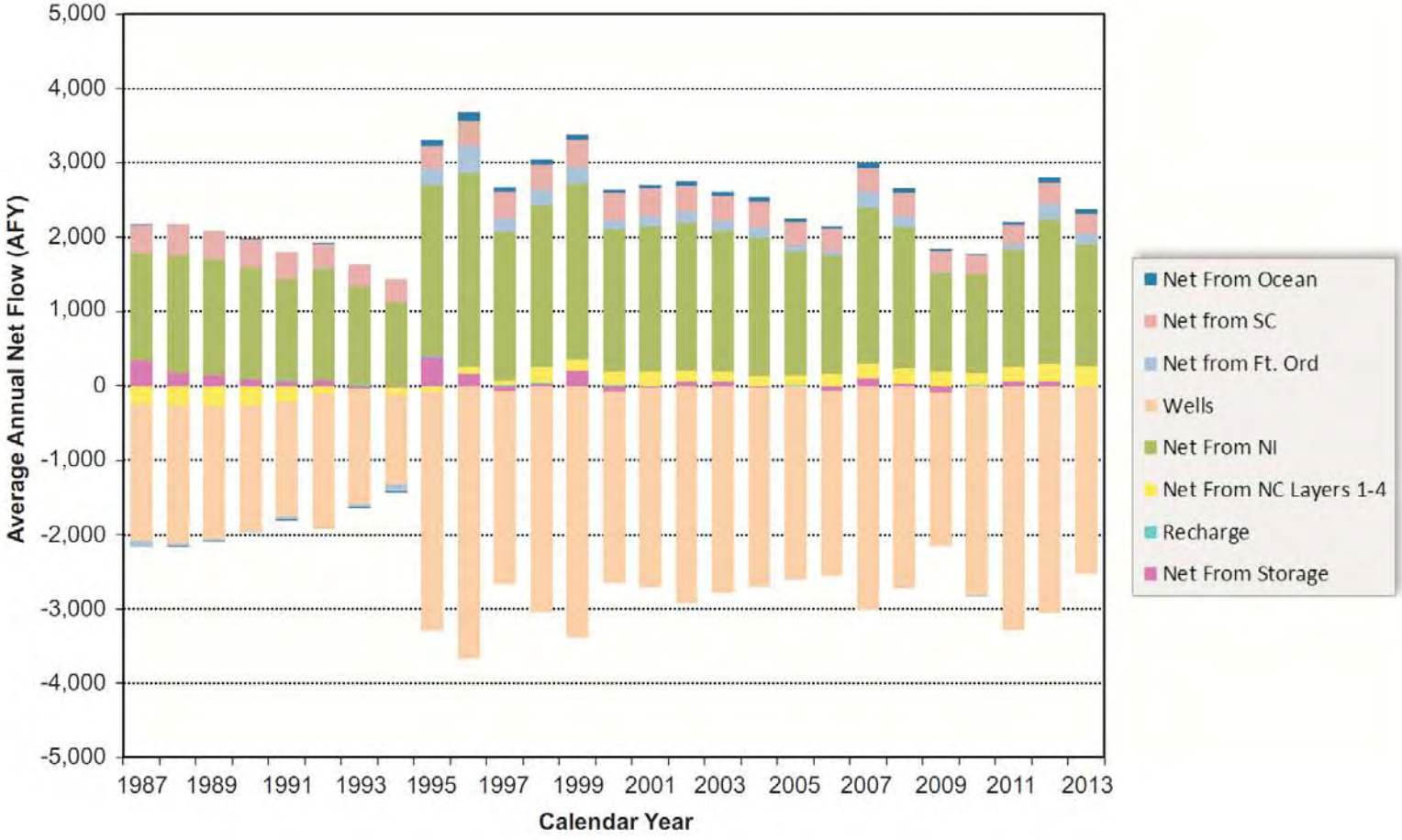
Figure 3
Northern Coastal Calibration Hydrographs without Discrepancies


Legend
Production Wells
2009-2013 AFY
1
10
100
1,000
8
Hydrograph Wells (layer 5)
20
Hydrograph Wells (layers 1-4)
Note: Number equals simulated minus measured water level in 2013.
N
0
2,000
Scale in Feet
Pacific Ocean
Northern Coastal Subarea
Northern Inland Subarea
Southern Coastal Subarea
Sentinel 2
Sentinel 3
Sentinel 4
FO-10
FO-9
FO-8
FO-7
PCA-W
PCA-E
GC-Coe
GC-Res
Paralta
Paralta
Paralta Test
MMP
Military
Ord_Grove
Ord Terrace
Ord Grove
Luzern
Playa #3
Playa #4
Del Monte Test
La Salle 2
Dawn
Luxton
Seaside 3
MSC
Sand City Public Works
KMART
MGT
Figure 4
Locations of Northern Coastal Groundwater Pumping and Water-Level Discrepancies
March 2015
TODD GROUNDWATER



Note: SC = Southern Coastal; NI = Northern Inland; NC = Northern Coastal

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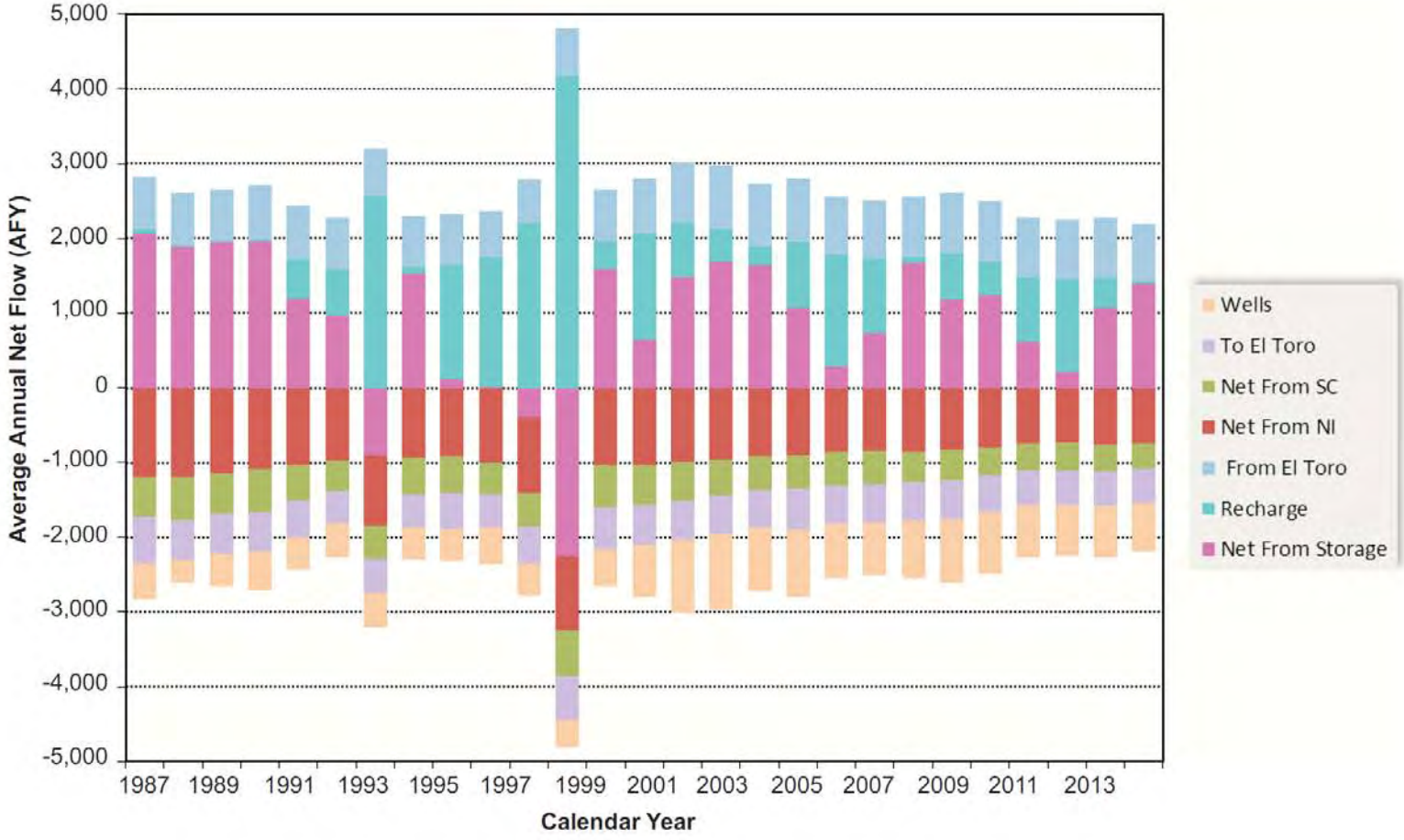
Figure 5
Annual Northern Coastal Layer 5 Inflows and Outflows, 1987-2013



Note: SC = Southern Coastal; NI = Northern Inland

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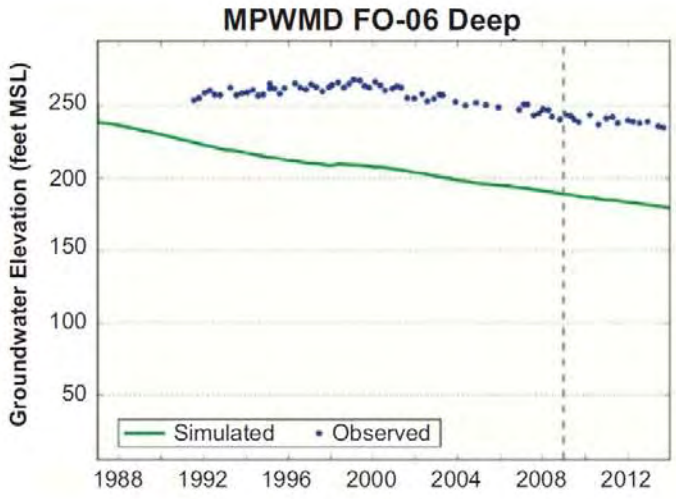
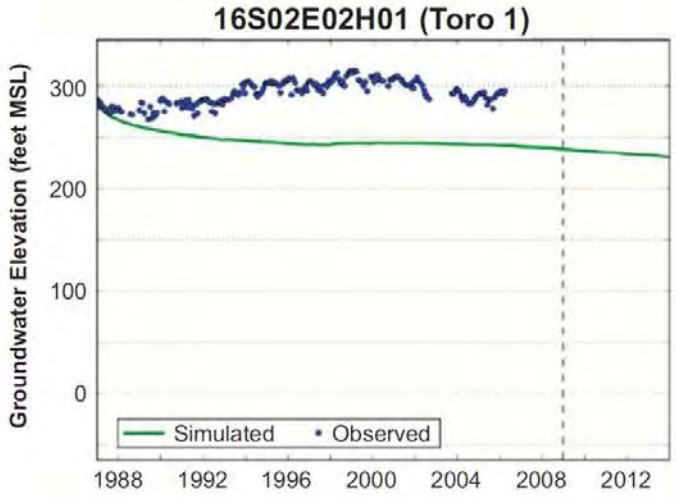
Figure 6
Annual Laguna Seca Inflows and Outflows, 1987-2013





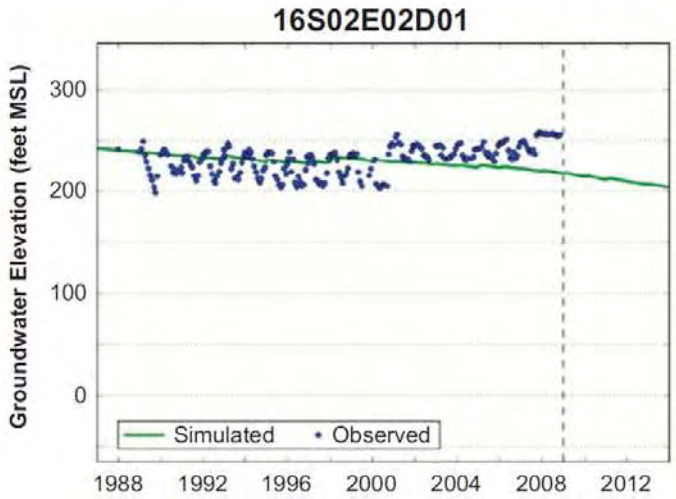


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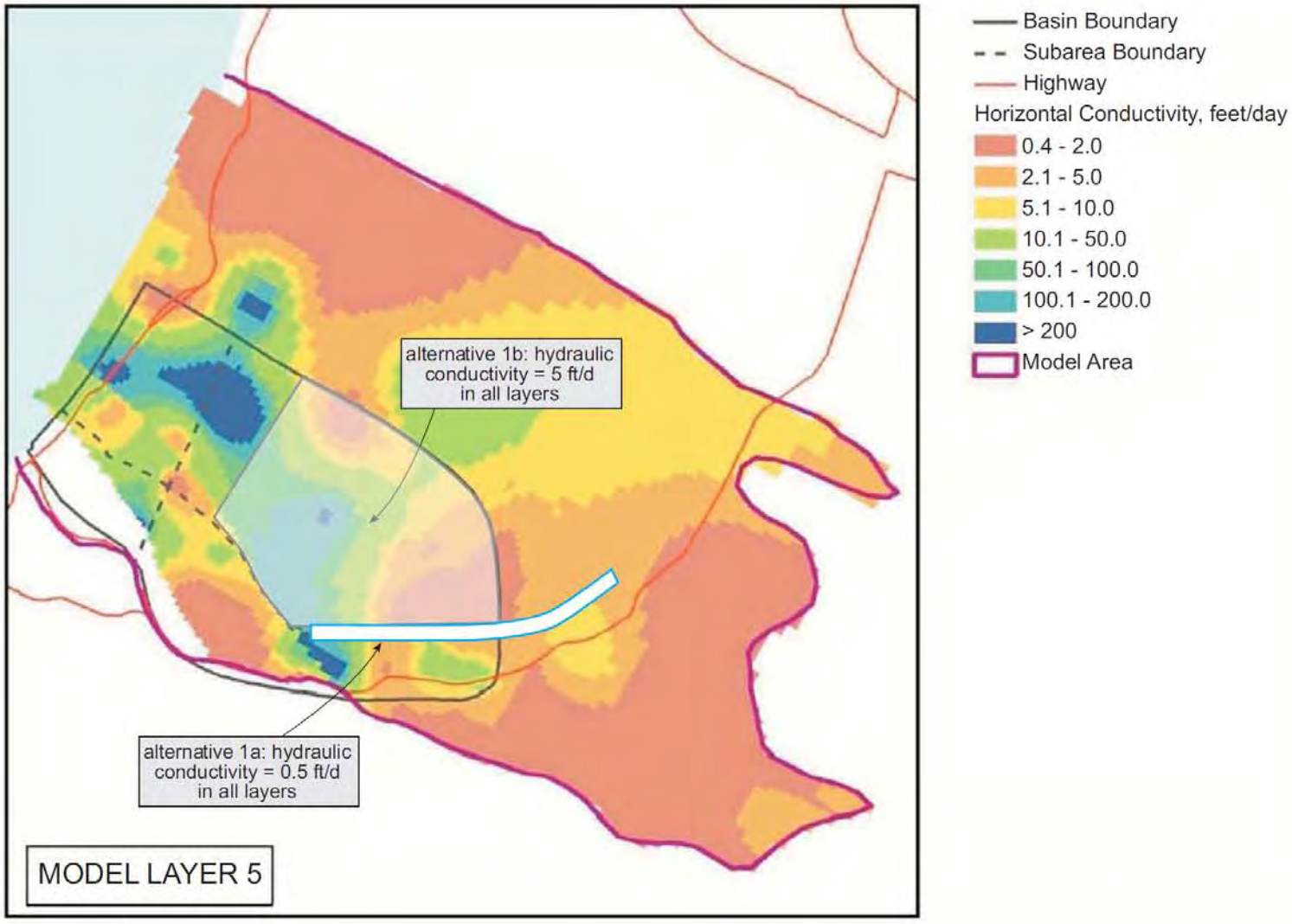
Figure 7
Localized Calibration Discrepencies near the Laguna Seca - El Toro Boundary



Source: HydroMetrics WRI (2009)

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Figure 8
Locations of Sensitivity Test Adjustments

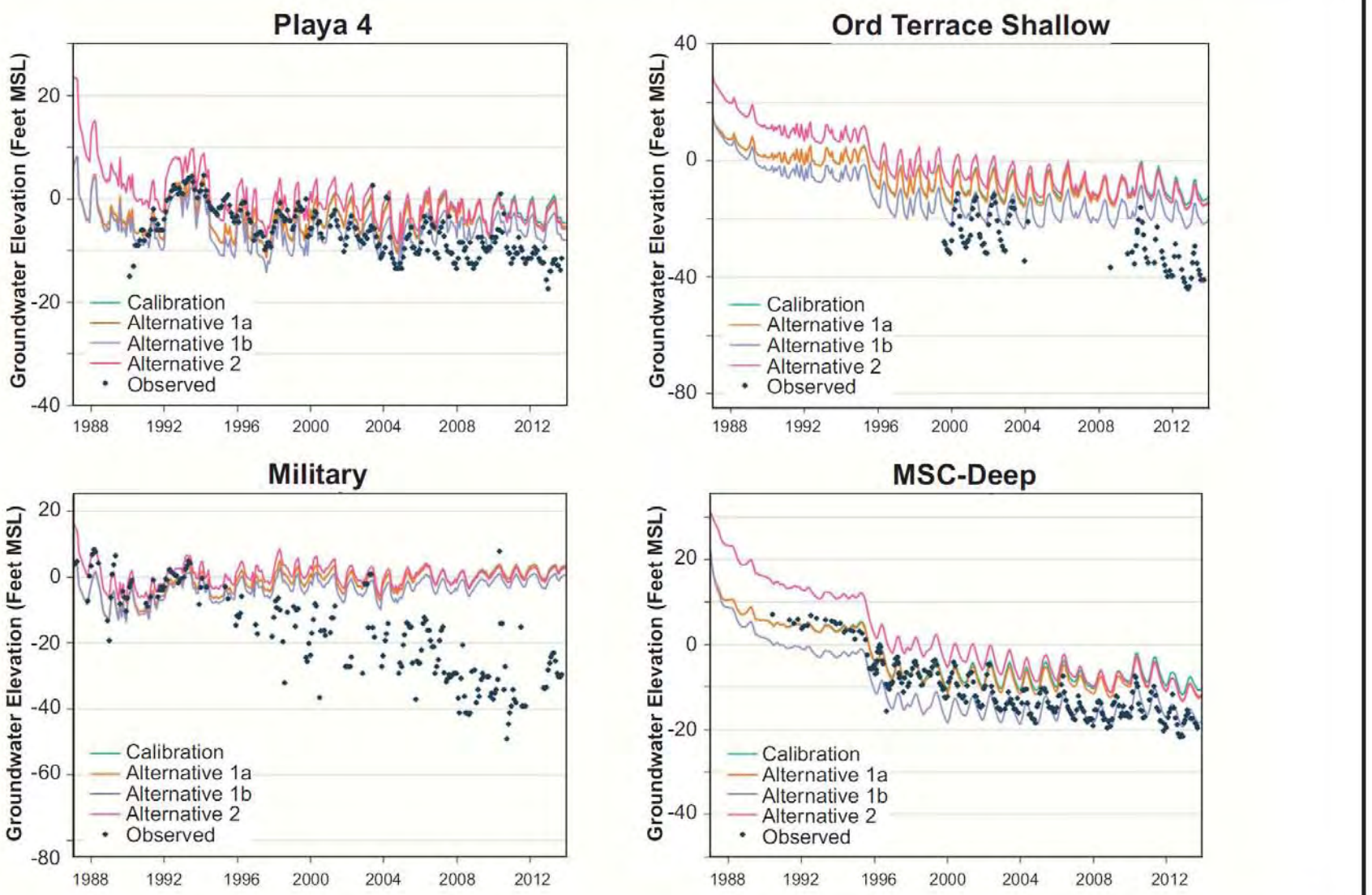

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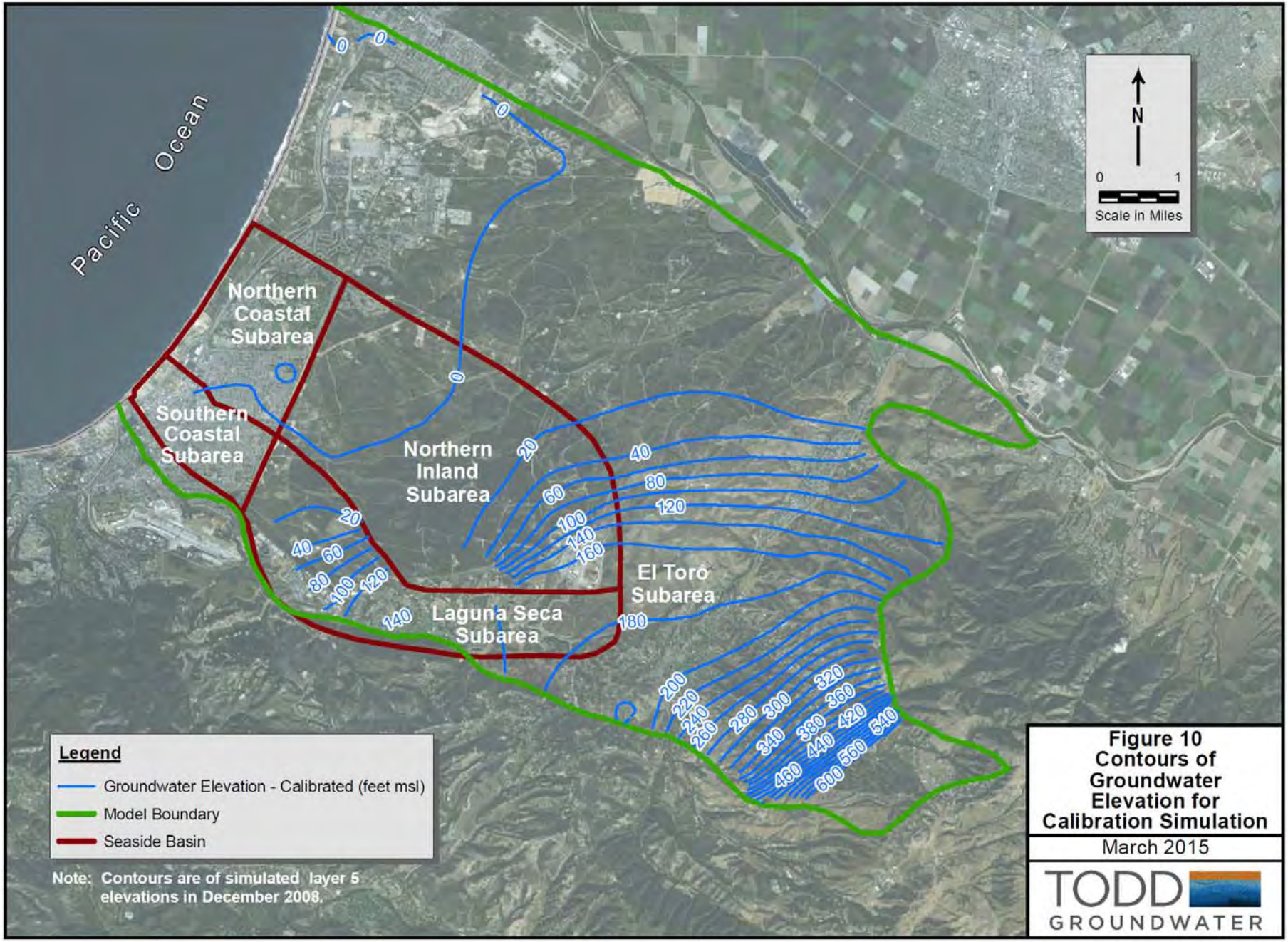
Figure 9
Hydrographs of Sensitivity Results, Northern Coastal Subarea


Pacific Ocean
Northern Coastal Subarea
Southern Coastal Subarea
Northern Inland Subarea
El Toro Subarea
Laguna Seca Subarea
N
0
1
Scale in Miles
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
540
560
580
600
Legend
Groundwater Elevation - Calibrated (feet msl)
Model Boundary
Seaside Basin
Note: Contours are of simulated layer 5 elevations in December 2008.
Figure 10
Contours of Groundwater Elevation for Calibration Simulation
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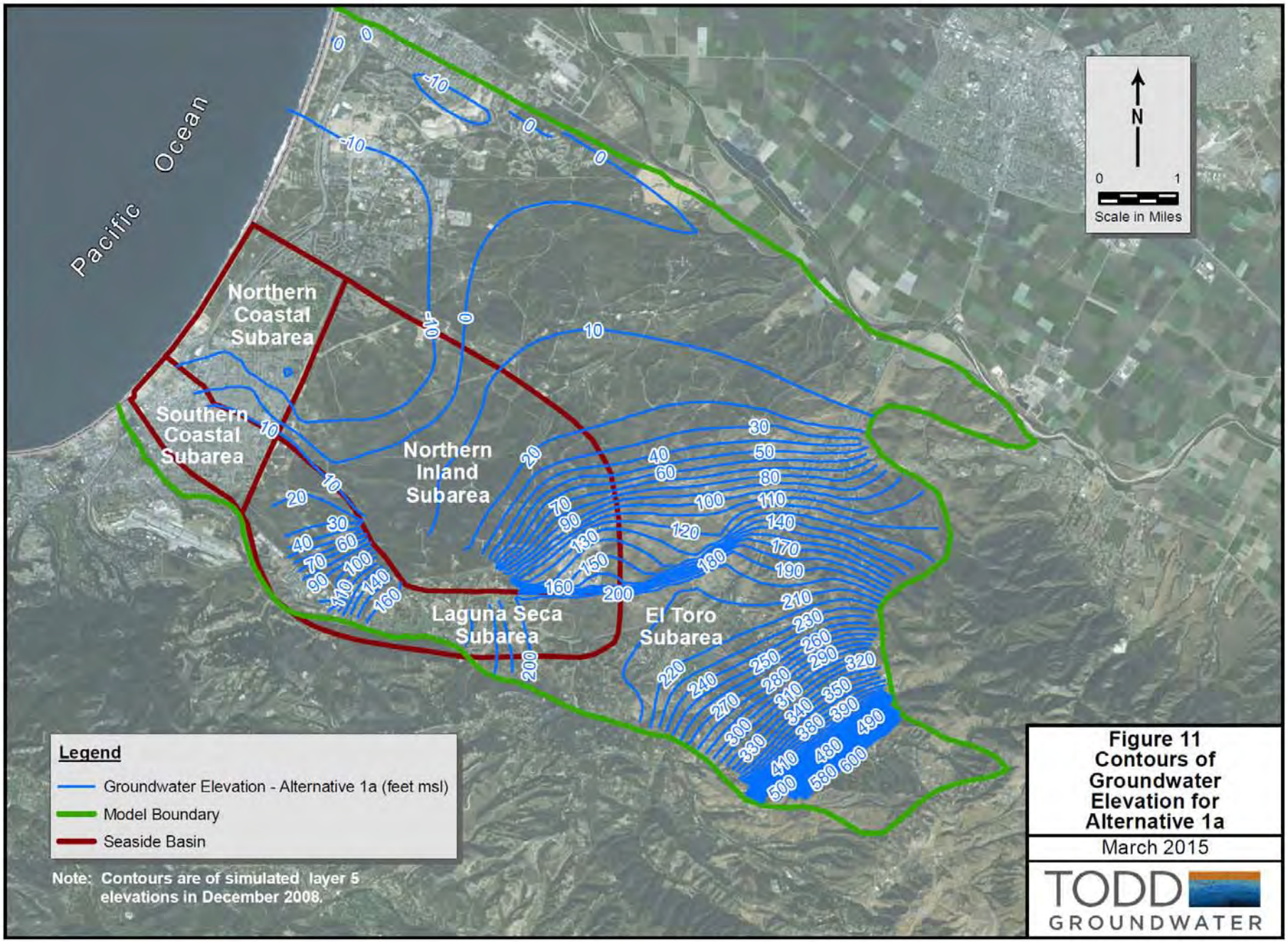
Pacific Ocean
Northern Coastal Subarea
Southern Coastal Subarea
Northern Inland Subarea
Laguna Seca Subarea
El Toro Subarea
N
0
1
Scale in Miles
Legend
Groundwater Elevation - Alternative 1a (feet msl)
Model Boundary
Seaside Basin
Note: Contours are of simulated layer 5 elevations in December 2008.
Figure 11
Contours of Groundwater Elevation for Alternative 1a
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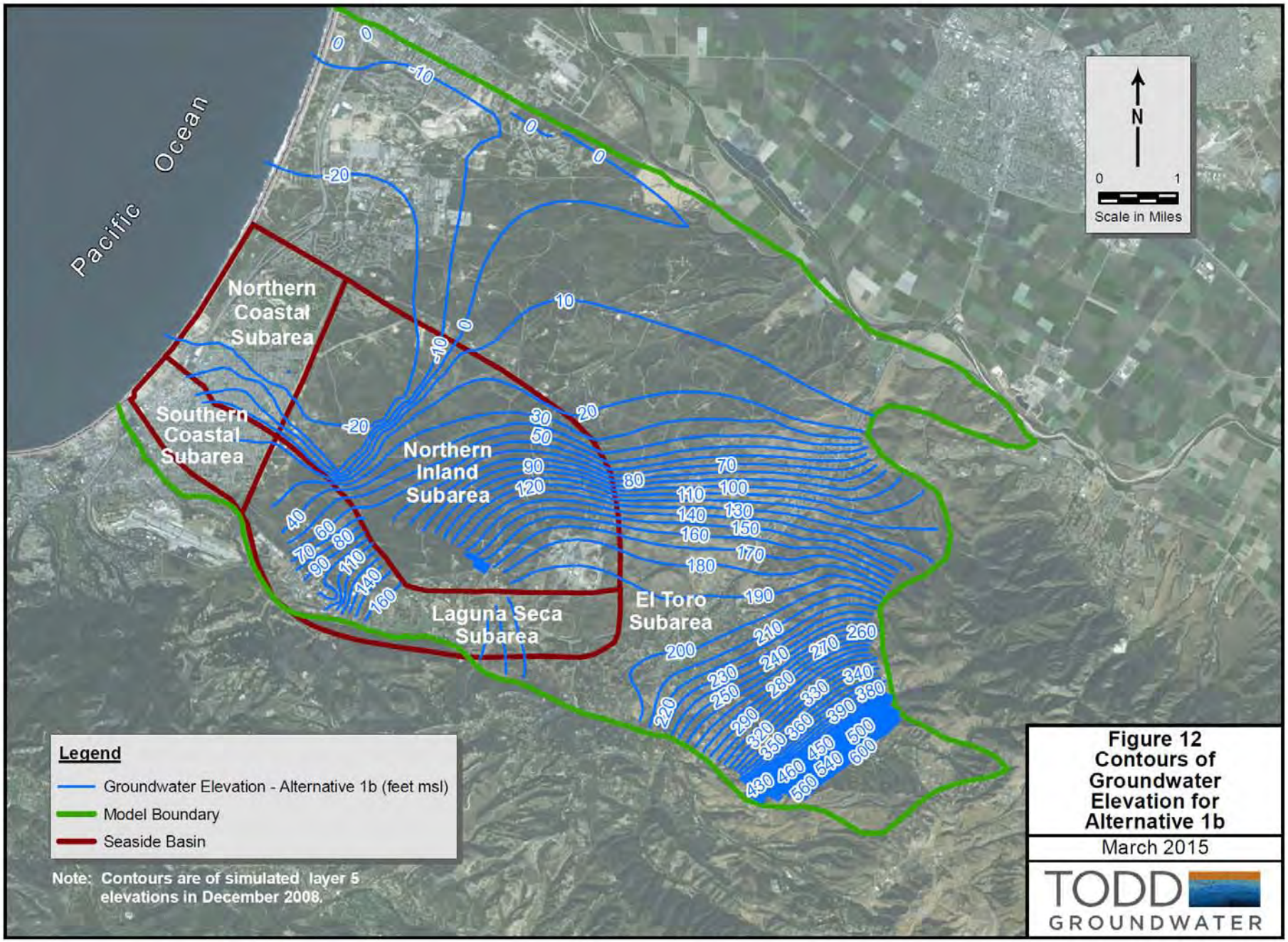
Pacific Ocean
Northern Coastal Subarea
Southern Coastal Subarea
Northern Inland Subarea
Laguna Seca Subarea
El Toro Subarea
N
0
1
Scale in Miles
Legend
Groundwater Elevation - Alternative 1b (feet msl)
Model Boundary
Seaside Basin
Note: Contours are of simulated layer 5 elevations in December 2008.
Figure 12
Contours of Groundwater Elevation for Alternative 1b
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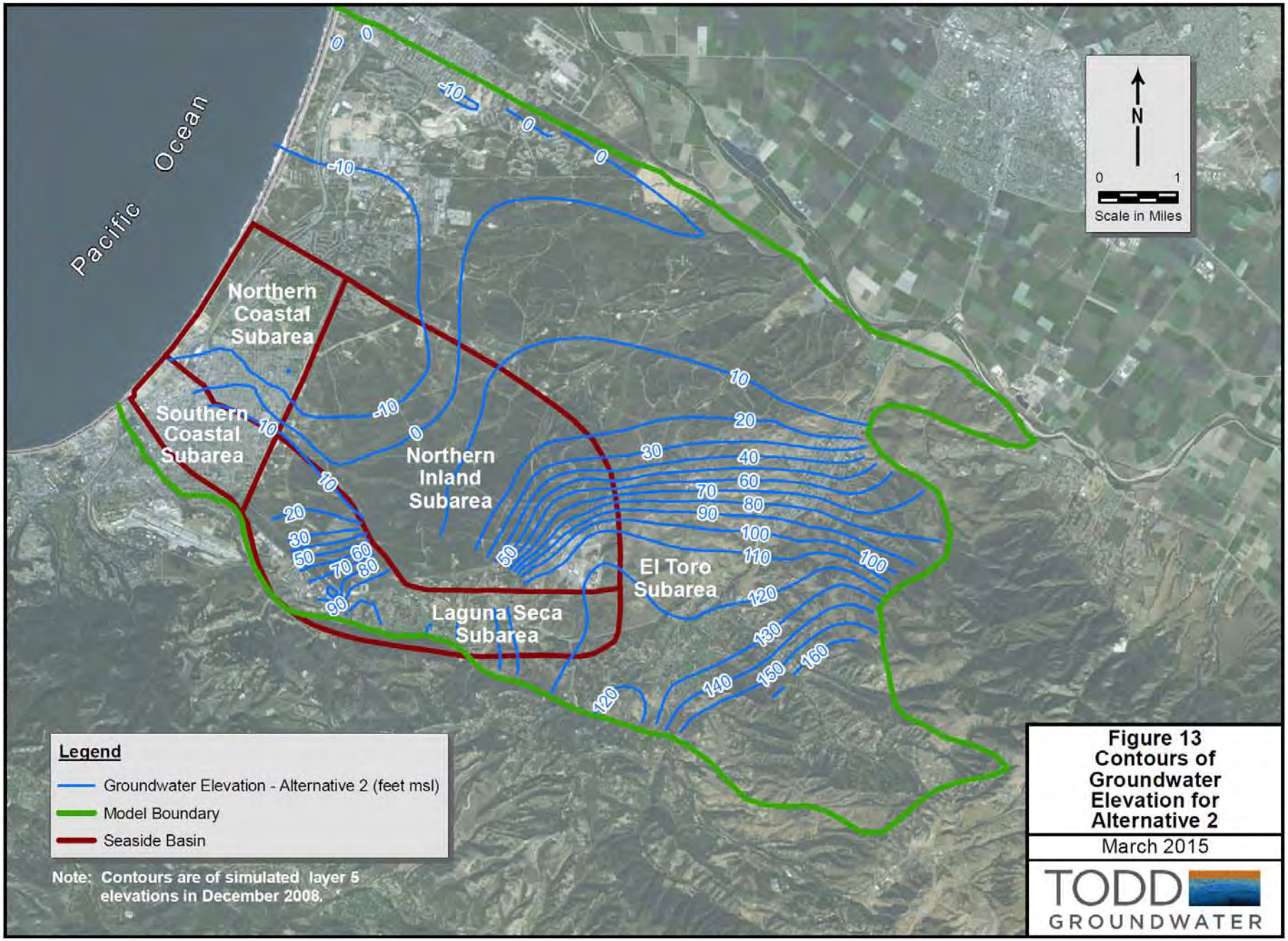
Pacific Ocean
Northern Coastal Subarea
Southern Coastal Subarea
Northern Inland Subarea
El Toro Subarea
Laguna Seca Subarea
N
0
1
Scale in Miles
Legend
Groundwater Elevation - Alternative 2 (feet msl)
Model Boundary
Seaside Basin
Note: Contours are of simulated layer 5 elevations in December 2008.
Figure 13
Contours of Groundwater Elevation for Alternative 2
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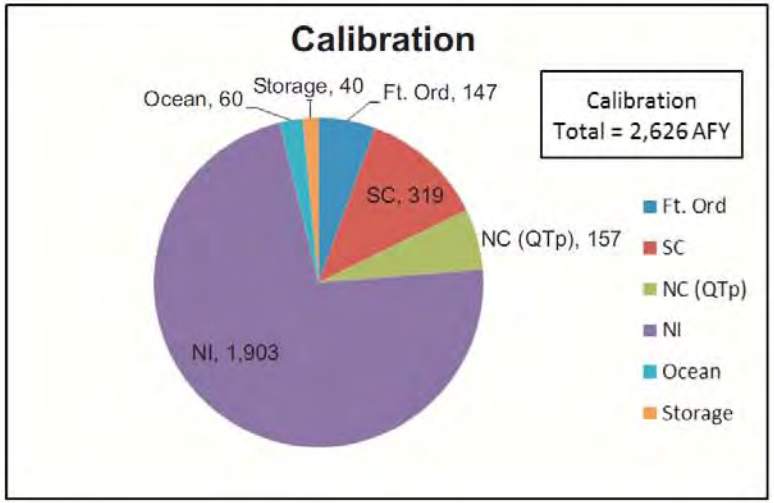

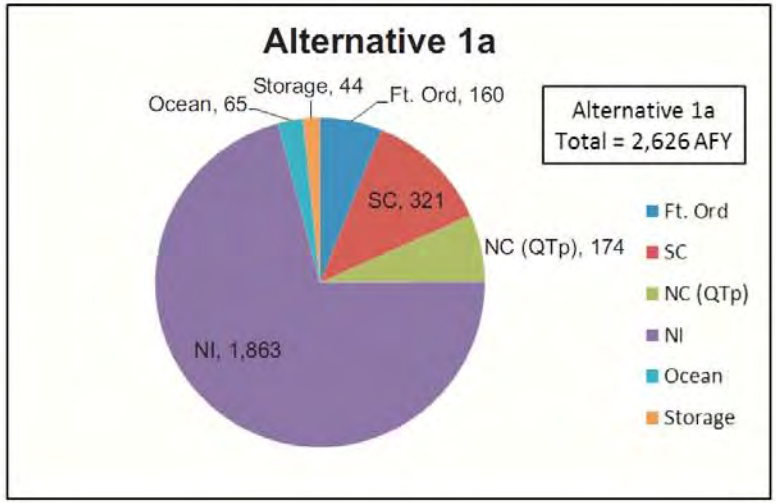

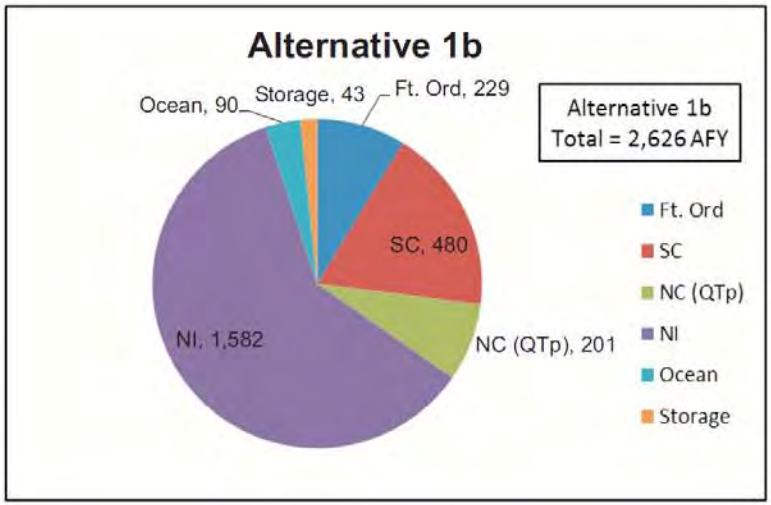

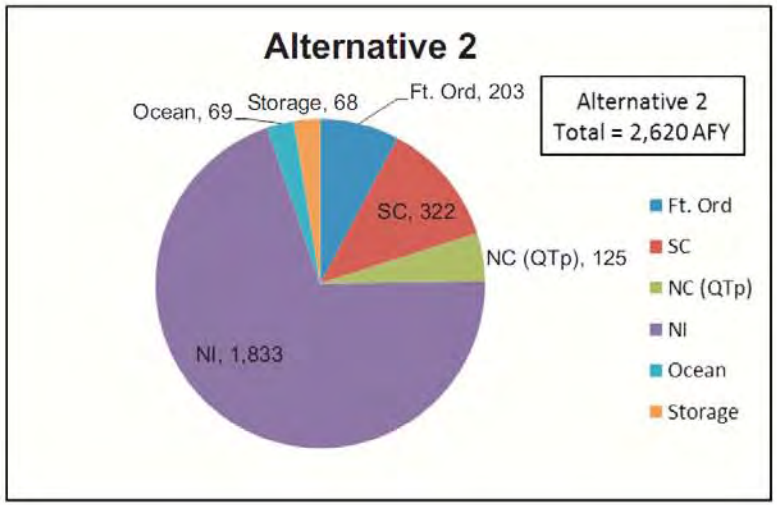

Notes: SC = Southern Coastal; NC (QTp) = Northern Coastal layers 1-4; NI = Northern Inland
Results are shown for Northern Coastal model layer 5 (Santa Margarita)
Wedges are labeled with average annual pumping during 1995-2013.
Values shown are net inflowto the subarea.

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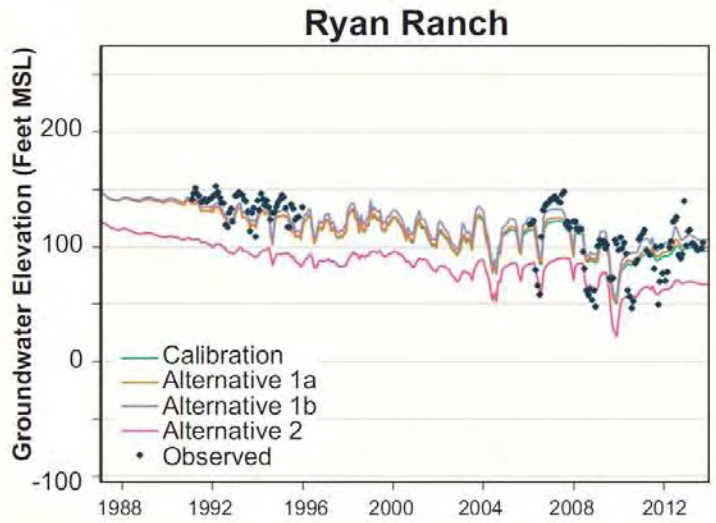
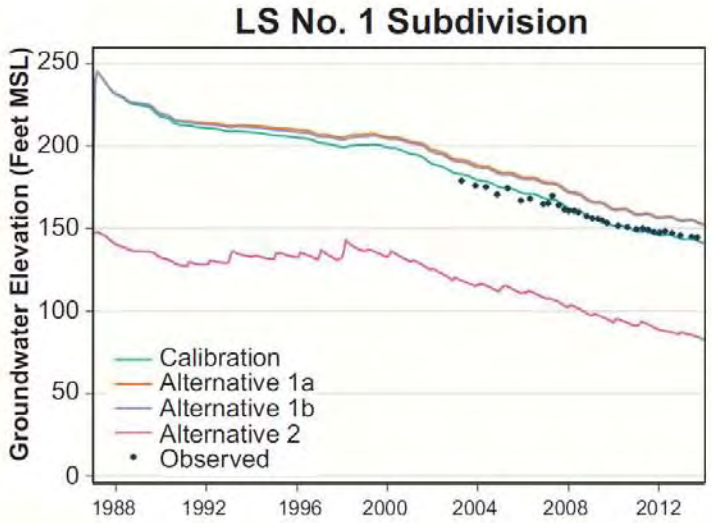
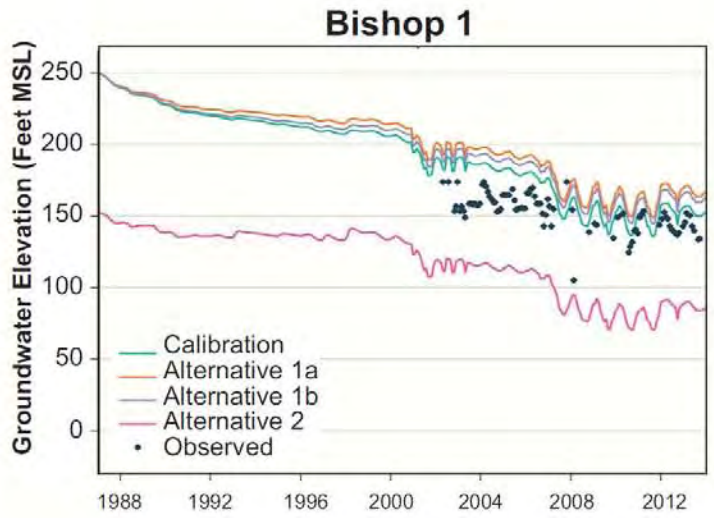
Figure 14
Comparison of Northern Coastal Water Balances







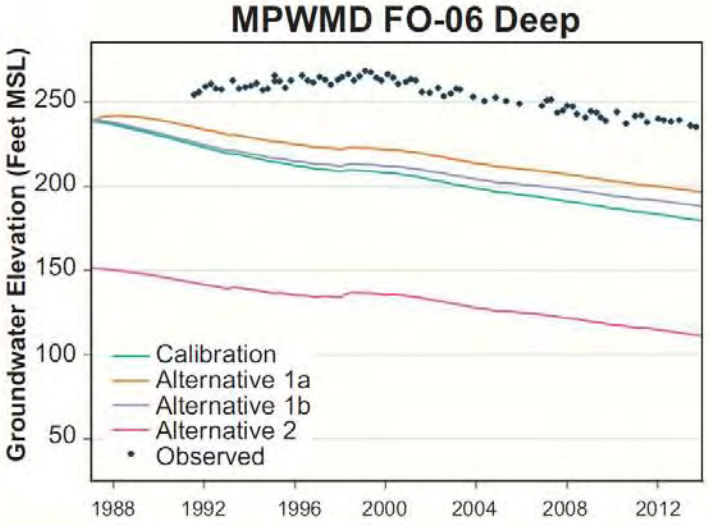


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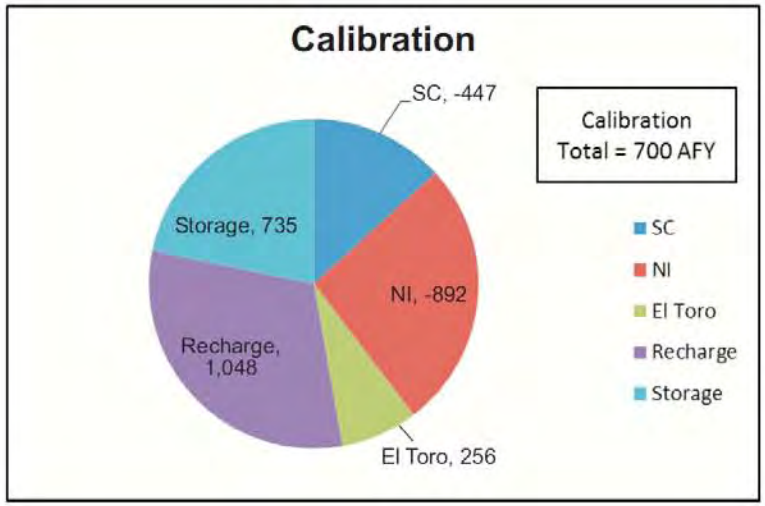
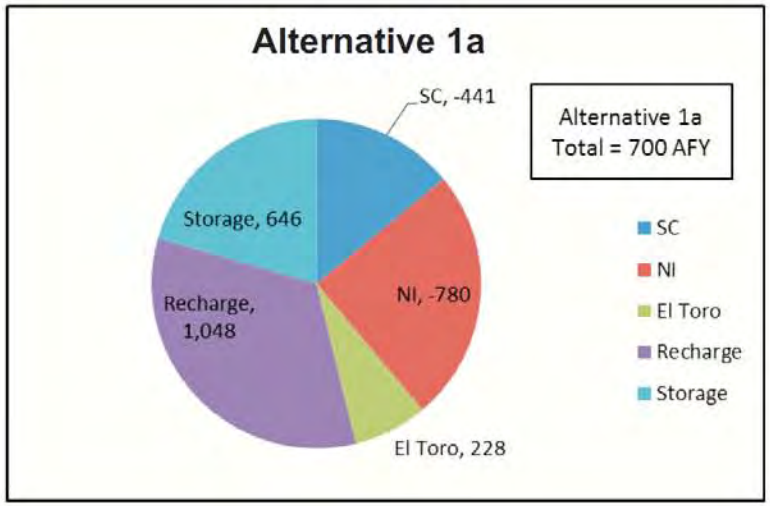
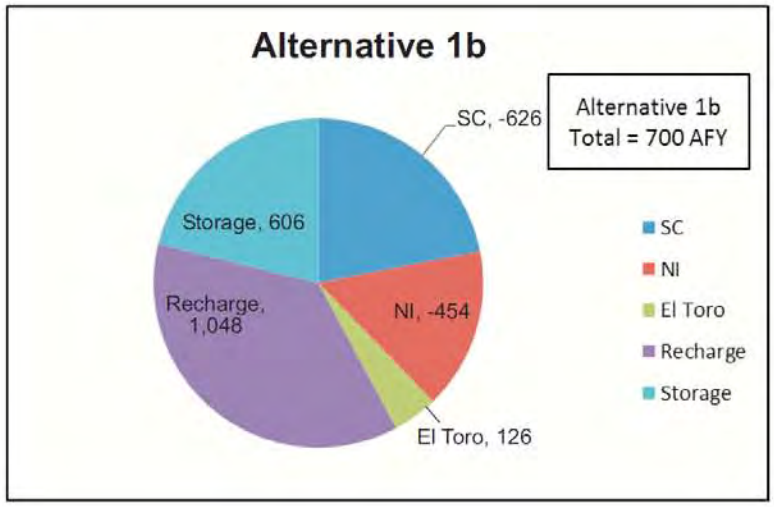
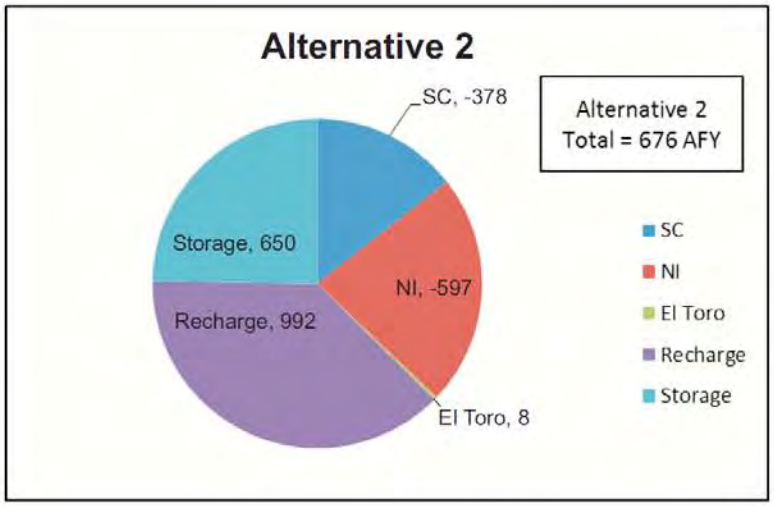
Figure 15
Hydrographs of Sensitivity Results, Laguna Seca Subarea









Notes: SC = Southern Coastal; NC (QTp) = Northern Coastal layers 1-4;
Wedges are labeled with average annual pumping during 1995-2013.
Values shown are net inflow; negative values indicate that net flow is outward.

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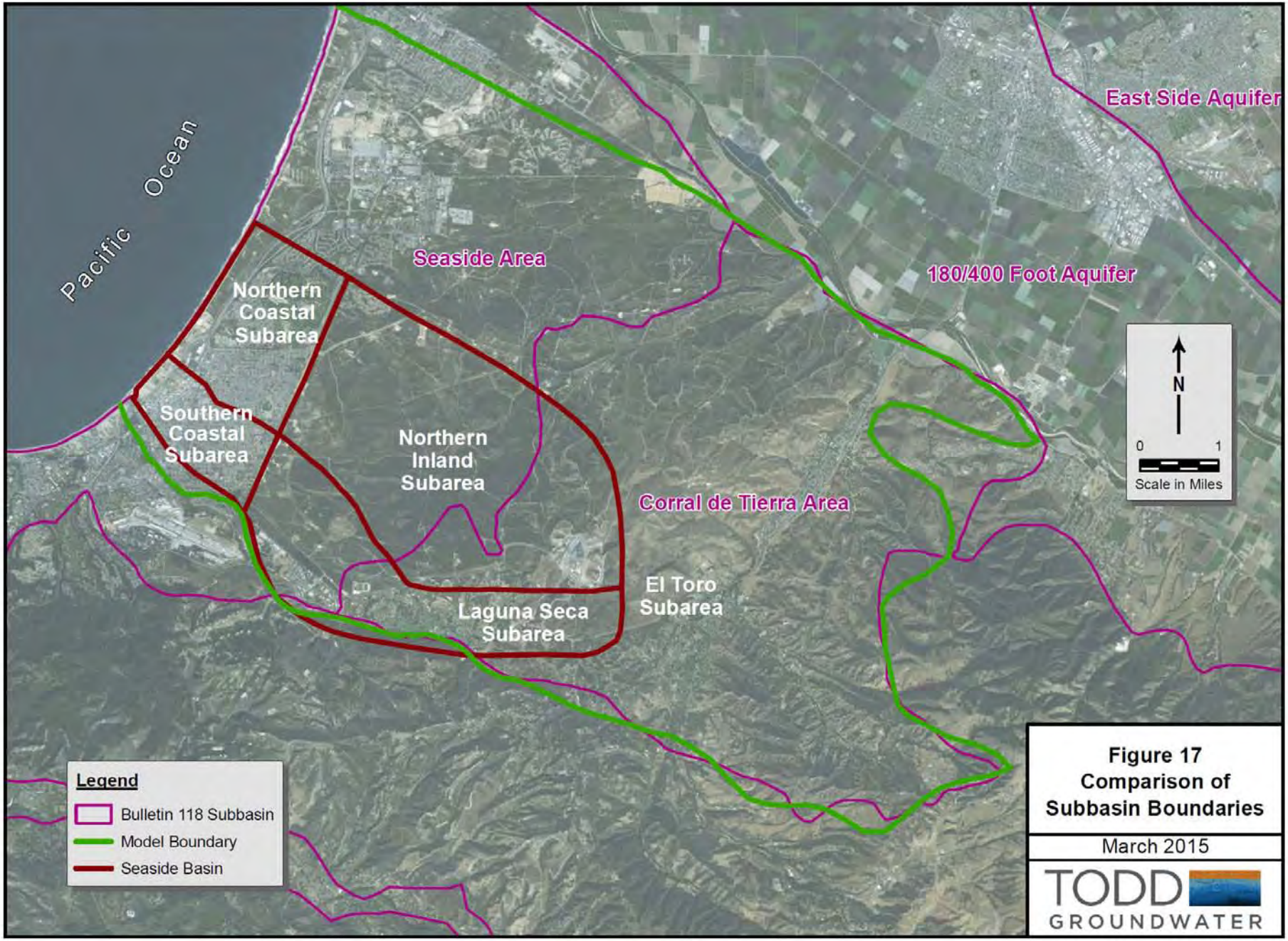
Figure 16
Comparison of Laguna Seca Water Balances


Pacific Ocean
East Side Aquifer
Seaside Area
180/400 Foot Aquifer
Northern Coastal Subarea
Southern Coastal Subarea
Northern Inland Subarea
Corral de Tierra Area
El Toro Subarea
Laguna Seca Subarea
N
0
1
Scale in Miles
Legend
Bulletin 118 Subbasin
Model Boundary
Seaside Basin
Figure 17
Comparison of Subbasin Boundaries
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TODD GROUNDWATER

APPENDIX A. ADDITIONAL REVIEW COMMENTS

Discussions during meetings with HMWRI staff produced the following additional information about the groundwater model:

- The local variability in horizontal hydraulic conductivity in the model (visible in Figure 8) was produced by the PEST automated calibration routine. There are very few wells in the Northern Inland Subarea, and none with aquifer test data. Thus, actual hydraulic conductivity throughout this large subarea is unknown.
- Variations in hydraulic conductivity also reflect variations in layer thickness. Geologic data supporting layer thicknesses was good in the Laguna Seca and coastal subareas but poor in the El Toro Subarea.
- PEST can result in localized high or low values of hydraulic conductivity around wells with anomalous water levels or incorrectly specified pumping. Examples of these "bullseyes" can be seen around the Toro 1 well (in layer 2) and Toro 3 well (in layer 3).
- In the future baseline simulation, flow across the Laguna Seca-El Toro boundary reverses from westward to eastward within the first 10 years of the simulation. This results primarily from the baseline assumption that Cal-Am will discontinue pumping its Laguna Seca wells. This in turn causes Laguna Seca water levels to decline more slowly than El Toro water levels, eventually reversing the gradient at the boundary.
- In the baseline scenario, the standard producer's pumping was eliminated by 2017. In the natural safe yield scenario the standard producers pumping is eliminated immediately, and the alternative producers are cut back to meet the "natural safe yield" estimated to be 240 AFY.
- In Subtask 1.5 of the Laguna Seca analysis (HMWRI 2014b), the "wells south and east of the LSSA" are the ones listed in Table 3 of the memo, including the Toro wells.
- Declining water levels in the eastern part of the Laguna Seca Subarea and presence of the Northern Coastal pumping trough both raise the issue of the geographic scale over which overdraft is calculated. A pumping trough could develop in a basin with a balanced overall water budget. There inevitably ensues an argument among local stakeholders over who is "we" when it comes time to pay for a solution to the problem. Should all pumpers in the basin be cut back uniformly, when local wells in the trough itself have a much greater effect? This is analogous to the Salinas Valley, where Forebay and Upper Valley subarea pumpers have stable water levels and don't want to pay to solve the seawater intrusion problem at the northern end of the basin. There typically are tradeoffs between the amount of cutback and the area

over which cutbacks are applied. You could eliminate all Alternative Producer pumping within Laguna Seca and leave El Toro pumping unchanged, or you could achieve a similar result with partial reductions in both areas. As a third alternative, you could vary the percent reduction by distance from the center of the trough (or the location of maximum decline).

- Laguna Seca Subarea groundwater pumping has decreased from the 1,000 AFY estimated by Yates and others (2002 and 2005) to a current amount of about 770 AFY. Cal-Am pumping accounts for 246 AFY of the current total and is expected to drop to zero as triennial pumping reductions continue to be imposed. This would leave approximately 524 AFY of pumping by "alternative" producers.
- The low apparent yield of the Laguna Seca Subarea could also be partly due to the presence of a shallow groundwater system that intercepts rainfall and stream recharge before it reaches the underlying regional groundwater system. A shallow groundwater system could explain the presence of wetlands, riparian vegetation and base flow along Arroyo del Rey in areas where regional water levels are far below the ground surface. The shallow groundwater system was discussed in Yates and others (2002).

APPENDIX B. NATURAL SAFE YIELD

The term "natural safe yield" is a legal term that reflects a simplistic concept of groundwater basin water balances. The term appears in California Water Code sections relating to replenishment districts and municipal water districts (Sections 60350 et seq. and 71689.7). Unfortunately, the concept does not reflect reality in most California groundwater basins. In that respect, it is analogous to the artificial distinction in water rights law between "underflow" and "percolating groundwater". The flaws in the natural safe yield concept are as follows:

- Recharge is not "natural" in developed basins; it is influenced by human activities.
- The natural safe yield equation includes only part of the water balance: pumping and storage change are excluded.
- The concept ignores the role of head-dependent boundaries. This problem is exacerbated when natural safe yield is applied at the subarea level.
- By omitting storage change, the equation implicitly assumes that storage change is zero and that pumping will vary each year to maintain zero storage change. This is not how basins are operated.

Each of these problems is elaborated below.

Recharge is Not Natural

Groundwater recharge, inflow and outflow occurred under natural, predevelopment conditions, and those water balance items had long-term average values. However, recharge is altered by land and water use activities when lands overlying the basin are developed. For example, impervious surfaces alter rainfall runoff and infiltration patterns; replacement of natural vegetation with crops or irrigated urban landscaping changes root depths and soil moisture conditions during the wet season, which alter the amount of rainfall recharge; water and sewer pipes leak; stormwater and wastewater are collected and percolated into the basin through ponds and septic systems; groundwater pumping changes water levels, which alters the rates of stream percolation and groundwater inflow and outflow. Most of these changes increase the amount of recharge relative to pre-development conditions. That increase becomes part of the yield that can be pumped from the basin without inducing long-term water-level declines or other undesirable effects. Thus, the pre-development water balance is not relevant to contemporary yield.

Pumping and Storage Change are Omitted

The natural safe yield equation is as follows:

$$\text{Natural Safe Yield} = \text{Recharge} + \text{GW Inflow} - \text{GW Outflow}$$

This is a partial water balance that omits pumping and storage change. Under pre-development conditions, pumping would have been zero and natural safe yield over a large

number of years would also have been zero, because recharge plus groundwater inflow equal groundwater outflow under a condition of zero storage change. In fact, all undeveloped groundwater basins would have a natural safe yield of zero, which implies that there was no opportunity for groundwater development anywhere. The pre-development conditions is illustrated in Figure 1, which shows a water balance diagram.

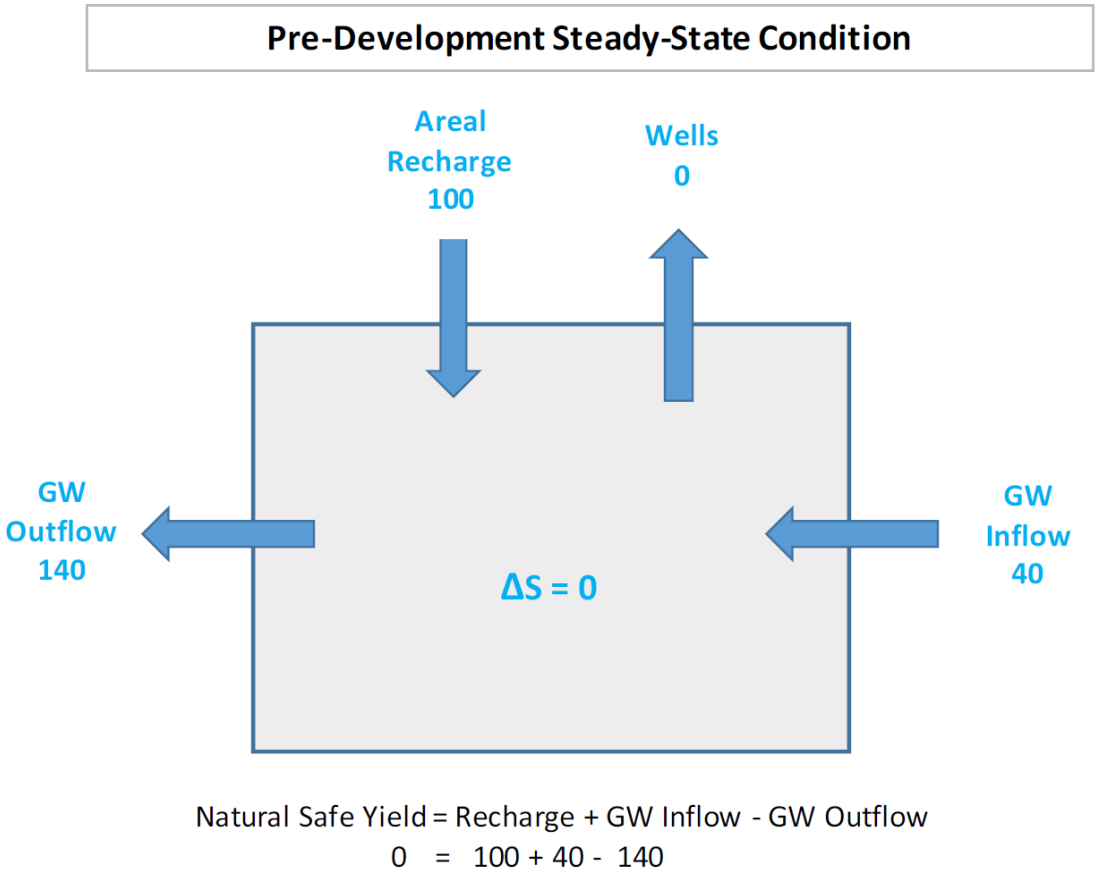

Figure 1. Basin Water Balance under Pre-Development Conditions

Following development, pumping changes the water balance, leading to an "unnatural" safe yield. This could also be a steady-state condition, where pumping is balanced by increased recharge, increased groundwater inflow and decreased groundwater outflow. This case is shown in **Figure 2**.

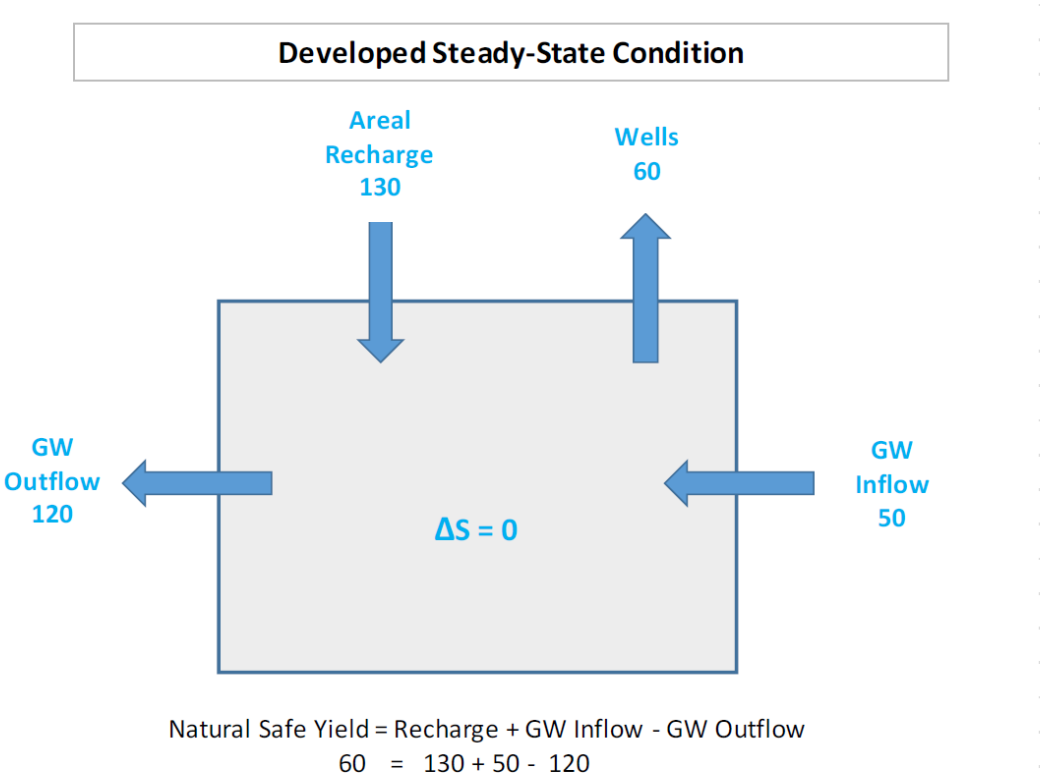

Figure 2. Water Balance for Developed Basin

Notice that the yield exactly equals the amount of pumping. This is the result of increased recharge under developed conditions combined with head-dependent boundary responses to pumping (see below). Up to a point, the more you pump, the more you get.

Head-Dependent Boundary Effects are Ignored

The natural safe yield concept ignores the existence of head-dependent boundaries, which are boundaries where the rate of flow is affected by the water-level gradient across the boundary. Pumping inside the basin changes the water levels, which changes the rates of inflow and outflow. In the above diagrams, groundwater inflow and outflow are treated as head-dependent boundaries. Other common head-dependent boundaries are streams, rivers, the ocean, and leakage from overlying aquifers.

Storage change is closely linked to head-dependent boundaries. In order for pumping to affect the head-dependent boundaries, water levels must decline, which represents a decrease in groundwater storage. In some cases, water levels stabilize once the change in boundary flow balances the increase in pumping. The system equilibrates at a lower set of water levels, and storage change returns to zero. In other cases—where boundary flows are not capable of balancing the increased pumping—storage depletion continues indefinitely and becomes part of the well yield. The natural safe yield equation implicitly enforces zero long-term change in storage, but it ignores the head-dependent boundaries and the one-time change in storage associated with changing the boundary flows.

An increase in pumping simultaneously decreases storage and changes each of the head-dependent boundary flows. The distribution of the overall response among each of these depends on the location of pumping relative to the boundaries and hydrogeologic characteristics unique to the basin. This means that storage depletion cannot be eliminated without increasing net groundwater outflow. In the case of the Laguna Seca subarea, for example, pumping currently exceeds the HMWRI estimate of natural safe yield by 530 AFY (770 AFY pumping – 240 AFY natural safe yield = 530 AFY overdraft). However, decreasing pumping by 530 AFY would not eliminate storage depletion, because some of the decrease in pumping would be absorbed by the head dependent boundaries. That is, groundwater inflow would decrease and groundwater outflow would decrease. This is one of the reasons why simulated water levels still declined in the central and eastern parts of the Laguna Seca subarea in the "Natural Safe Yield Scenario" (HMWRI 2014b, Figure 16).

Applying the concept of natural safe yield at the scale of subareas exacerbates the problem of head-dependent boundaries, because flows between subareas are head-dependent. For example, the Santa Margarita aquifer in the Northern Coastal Subarea is surrounded by five head-dependent boundaries. The water balance and amount of overdraft in each subarea is thus dependent upon pumping and overdraft in adjacent subareas. The Laguna Seca subarea would be "subsidizing" overdraft in the El Toro and Northern Coastal subareas if it were forced to eliminate its internal storage depletion. This is because groundwater flow from Laguna Seca to those other areas would increase.

Conversely, calculating a lumped water balance for the entire basin can fail to reveal areas of local overdraft and chronic water-level declines. This problem is compounded in the Seaside Basin because the adjudicated basin boundary does not include the entire groundwater flow system. Groundwater in the El Toro area (officially outside the basin) is actually hydraulically coupled to the Laguna Seca subarea, so that external pumping affects internal water levels.

Calculated Annual Yield Assumes Zero Storage Change

When applied annually, the natural safe yield equation produces yields that are sometimes positive and sometimes negative, because groundwater storage is assumed to remain constant. It is difficult to grasp the physical or practical meaning of a negative safe yield value. Are groundwater users supposed to stop pumping, or even to pay the aquifer back? In practice, pumping from a basin typically remains relatively constant from year to year while recharge and storage changes fluctuate more widely. This simply demonstrates the value of groundwater basins as large storage reservoirs that moderate the effects of variable climate on water supply. The more common definitions of safe yield assume constant pumping and fluctuating storage, which is more consistent with actual operation of groundwater basins in California. When averaged over many years, both approaches should theoretically produce the same estimate of safe yield.

SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 11, 2015
AGENDA ITEM:	3.B
AGENDA TITLE:	Discussion of Letter from Bishop, McIntosh & McIntosh
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY: At the February 11, 2015 TAC meeting I briefly described a letter dated February 9, 2015 from Mr. Eric Robinson whose law firm represents Bishop, McIntosh & McIntosh. Bishop, McIntosh & McIntosh holds the water rights to, and is the landowner and leaseholder of, the Laguna Seca Golf Resort which is operated by Laguna Seca Golf Resort. Mr. Robinson's letter pertained to the modeling work performed by HydroMetrics on the Laguna Seca Subarea and to the Peer Review on that work being performed by Todd Groundwater. Unfortunately, the letter was not received until after the February 11 TAC agenda packet had been sent out, so it was not included in that packet. I agreed to include the letter in today's agenda packet for TAC discussion, and it is attached.

The November 12, 2014 letter, which is an attachment to the February 9, 2015 letter, was received too late to be included in the TAC's November 12, 2014 agenda packet, but it was provided to the Board in the agenda packet for the Board's December 3, 2014 meeting. The following is an excerpt from the Board's agenda packet pertaining to the November 12 letter:

> *"Subsequent to the November 12 TAC meeting an additional letter was received from Mr. Robinson. A copy of that letter dated November 12 is attached. Due to its arrival after the TAC meeting the letter could not be presented to the TAC for its review or discussion. The letter largely clarifies that there is little dispute between Mr. Robinson's client, Bishop McIntosh & McIntosh, and HydroMetrics on the points covered in Mr. Robinson's September 30, 2014 letter, and also provides suggested revisions to the Preliminary Draft 2014 Annual Report. It is my [Technical Program Manager's] opinion that it would be premature to make the revisions to the Annual Report suggested by Mr. Robinson in his November 12 letter. I believe that it would be better to leave the language in the Annual Report unchanged in order to allow time for the peer review of HydroMetrics' modeling work to be completed, and for the Board to discuss the findings of the peer review and to then determine what actions should be taken on this matter. Consequently, the attached body of the Draft 2014 Annual Report does not contain the revisions Mr. Robinson has proposed."*

The Board concurred with this recommendation.

The February 9, 2015 letter reiterates some of the points made in the earlier letters from Bishop, McIntosh & McIntosh on this matter, namely that "…the Watermaster should not focus on reducing the LSSA natural safe yield based on a groundwater model that predicts pumping by California American Water Company ("Cal-Am ') and others in the El Toro area will deplete the natural safe yield of groundwater in the immediately adjacent LSSA even if all LSSA pumping were eliminated. Instead, the Watermaster should protect the LSSA's natural safe yield by working with Cal-Am and other El Toro pumpers to investigate options for solving the El Toro pumping problem." The letter further urges that "Rather than changing the groundwater model to protect unsustainable Cal-Am pumping located just outside the LSSA boundary, the Watermaster should be working on a physical solution to stop that pumping problem from harming groundwater conditions in the LSSA," and states Bishop, McIntosh &

McIntosh's agreement that "…the most significant finding of the LSSA modeling is that pumping to the east of the LSSA Decision-created boundary is contributing to the continued lowering of groundwater levels in the LSSA." The letter goes on to ask the Watermaster to "1. Confirm and disclose how much groundwater Cal-Am and others are extracting from wells in the El Toro area; 2. Assess and disclose how those extractions reduce groundwater elevations in the LSSA; and 3. Assess and disclose how reducing or eliminating El Toro area groundwater extractions would benefit groundwater elevations and protect the natural safe yield of the LSSA," and goes on to recommend that "Such tasks should be completed and shared with LSSA alternative producers before the TAC or Watermaster makes any recommendations or decisions about whether to recalculate the natural safe yield of the LSSA."

Regarding the first point raised by Mr. Robinson in the paragraph above, I believe the Watermaster is not focusing on reducing the NSY of the LSSA, but is viewing it as one tool among many that may be required to arrest dropping groundwater levels in the LSSA. Regarding the 3 requests listed at the end of the paragraph above, I believe all 3 of these items are discussed and described in the HydroMetrics Technical Memorandum dated July 30, 2014 titled "Results of Laguna Seca Safe Yield Analysis (Revised)." Specifically, the amounts of groundwater that Cal-Am and others are extracting from wells in the El Toro area is shown in Table 3 of that Tech Memo, as shown below:

Table 3: Baseline Scenario Pumping Rates Outside of the Laguna Seca Subarea, but Near its Eastern Boundary

Well	Average Annual Pumping (AF)
Ambler_4	2
Ambler_5	185
Bay_Ridge	24
Corral_de_Tierra_CC_No_1	64
Corral_de_Tierra_CC_No_2	64
Corral_de_Tierra_CC_No_3	64
Corral_de_Tlerra_CC	64
Tierra_Meadows_No_1	105
Tierra_Meadows_No_2	105
Toro-1	128
Toro-2&3	101
Vista_El_Encanto_No_1	105
Vista_El_Encanto_No_2	105
All Eastern Boundary Wells	1,117
All Laguna Seca Wells	526

While these are not all of the wells in the El Toro area, they are the wells closest to the eastern boundary of the LSSA and thus the ones that likely have the greatest impact on the LSSA.

How pumping from these wells outside the boundary of the LSSA impact groundwater elevations within the LSSA, and how reducing pumping from those wells would benefit groundwater elevations within the LSSA, is discussed in Subtask 1.5 of the Tech Memo which is excerpted below. The Tech Memo summarizes these impacts in its *Conclusions* where it states *"As expected, well pumping outside of the LSSA has a significant impact on groundwater levels in the eastern portion of the LSSA (Figure 27)."*

AGENDA ITEM:	3.B (Continued)

SUBTASK 1.5 – GROUNDWATER LEVEL IMPACTS IN LAGUNA SECA SUBAREA FROM WELLS OUTSIDE THE SUBAREA

This additional task was added after the Watermaster Board had been presented with the results of the first three subtasks in April 2014. The Board asked what the impact on groundwater levels in the LSSA is from pumping outside the eastern and southeastern boundaries of the subarea. To evaluate impacts from outside wells, four scenarios were developed and run, and results compared against each other. The scenarios all included pumping in LSSA at current rates. Each of the scenarios included a different assumption about well pumping outside the LSSA. Figure 18 shows the location of the wells outside the LSSA that were varied in each scenario. The scenario differences in the outside pumping were:

1. *Maintain existing pumping rates for wells south and east of the LSSA.*
2. *Eliminate all pumping from the three Toro wells.*
3. *Reduce by half the existing pumping for wells south and east of the LSSA.*
4. *Eliminate all pumping from wells south and east of the LSSA.*

Hydrographs for the same wells used in Subtask 1.4 were used to show the relative impacts of the four scenarios on different portions of the LSSA. Figure 25 through Figure 27 show the hydrographs for each well with separate lines for each of the four predicted groundwater levels.

Figure 25 shows that reducing pumping south and east of the LSSA has only a minor impact on monitoring well FO-04 Deep. This monitoring well is the farthest from the outside pumping wells, and is expected to have the least impact from the simulated pumping changes. Similar to the results in Subtask 1.4, groundwater elevations in monitoring well FO-04 Deep do not appear to exceed a certain elevation, regardless of the pumping scenario.

Figure 26 shows that reducing pumping south and east of the LSSA has a small but discernible impact on the Laguna Seca Driving Rage well in the central LSSA. None of the four scenarios run for this subtask had enough effect on the Laguna Seca Driving Range well to completely eliminate long-term water level declines. The impact in this area from reducing pumping south and east of the LSSA was notably less than the impact from reducing Alternative producer pumping.

As expected, reducing well pumping south and east of the LSSA has a significant impact on groundwater levels in the eastern portion of the LSSA. This is shown in the hydrograph of monitoring well FO-06 Shallow on Figure 27. In this portion of the subarea, reducing outside pumping or eliminating Toro well pumping has a similar impact. However, to completely eliminate declining water levels in this area, all pumping from wells south and east of the LSSA must be eliminated.

Figures 25 through 27 are contained in Attachment 2 at the end of this Agenda Transmittal.

In summary I concur that the issues raised in the Bishop, McIntosh & McIntosh letter are issues of concern to the Watermaster, but that they are properly evaluated through the modeling work HydroMetrics has already performed, or additional modeling work that the Watermaster may have HydroMetrics perform. I believe that the purpose of the peer review is to evaluate HydroMetrics' model

SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

AGENDA ITEM:	3.B (Continued)

itself to determine its accuracy and validity, but not to generate data or to evaluate additional scenarios.

Therefore, I do not recommend modifying the scope of the peer review to respond to the issues raised in the Bishop, McIntosh & McIntosh letter.

ATTACHMENTS:	1. February 9, 2015 letter from Bishop, McIntosh & McIntosh 2. Figures 25-27 from the HydroMetrics Technical Memorandum
RECOMMENDED ACTION:	Provide direction to the Technical Program Manager on any actions to be taken or recommendations to be made to the Board in response to the Bishop, McIntosh & McIntosh letter

KRONICK MOSKOVITZ TIEDEMANN & GIRARD
A PROFESSIONAL CORPORATION

Eric N. Robinson

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February 9, 2015

VIA ELECTRONIC MAIL

Dewey Evans, Chief Executive Officer
Robert Jaques, Technical Program Manager
Seaside Groundwater Basin Watermaster
2600 Garden Road, Suite 228
Monterey, CA 93940

Re: The Watermaster Should Protect Laguna Seca Subarea Natural Safe Yield From The El Toro Pumping Problem

Dear Messrs. Evans and Jaques:

This letter is submitted by Bishop, McIntosh & McIntosh ("Bishop"), which holds an Alternative Production Allocation in the Laguna Seca Subarea ("LSSA") of the Seaside Basin, and responds to certain materials addressing El Toro area groundwater pumping and LSSA natural safe yield in the Agenda Packet for the February 11, 2015, meeting of the Watermaster's Technical Advisory Committee ("TAC").

As explained in our letter dated November 12, 2014, the Watermaster should not focus on reducing the LSSA natural safe yield based on a groundwater model that predicts pumping by California American Water Company ("Cal-Am") and others in the El Toro area will deplete the natural safe yield of groundwater in the immediately adjacent LSSA—even if all LSSA pumping were eliminated. Instead, the Watermaster should protect the LSSA's natural safe yield by working with Cal-Am and other El Toro pumpers to investigate options for solving the El Toro pumping problem.

TAC Agenda Packet (February 11, 2015)

Agenda item 2.A concerns the minutes approved from the November 12, 2014, TAC meeting. With respect to "Issue 1" under item 4 ("Discussion of Letter from Attorney Regarding Laguna Seca Groundwater Modeling"), the characterization of our September 30, 2014, letter as raising a point involving LSSA outflow that is "refuted" by Hydrometrics' October 12, 2014, letter is inaccurate and misleading. Our September letter and Hydrometrics' October response speak for themselves.

As detailed in our November 12, 2014, letter—which is not addressed in the TAC meeting minutes—a key issue is *how the LSSA outflow estimate is used* in making future decisions about how to manage groundwater elevations in the LSSA.

Item 4.A of the November 12, 2014, minutes summarizes comments of consultant Gus Yates, whom the Watermaster has retained to perform a "peer review" of the Seaside Groundwater Basin model. According to the minutes, Mr. Yates said he would comment on the Adjudication Decision's Natural Safe Yield figure for the LSSA, if he found it "to be significantly incorrect, but would not be making his own calculations."

Bishop requests that any peer-review comments distinguish between the accuracy of the model's estimate of LSSA outflow versus the question whether that outflow estimate (which is caused in significant part by the El Toro pumping problem) should be used as a model "assumption" to guide the Watermaster's basin management decisions. Such an assumption would be improper, because the El Toro area pumping appears unsustainable, and no Court has determined that any El Toro groundwater pumpers have a prior right to groundwater originating from the Laguna Seca Subarea.

Converting such an outflow estimate into a model assumption treats excessive pumping in the El Toro area as a fixed condition that will continue unabated. In turn, that would focus attention solely on what measures could be undertaken within the LSSA to stabilize groundwater elevations—*while maintaining the artificially high groundwater outflow induced by the ongoing El Toro pumping problem.* One example is the ill-conceived proposal to use the high groundwater outflow induced by excessive El Toro pumping as the basis for cutting the LSSA's natural safe yield.

Rather than changing the groundwater model to protect unsustainable Cal-Am pumping located just outside the LSSA boundary, the Watermaster should be working on a physical solution to stop that pumping problem from harming groundwater conditions in the LSSA. The November 12, 2014, TAC meeting minutes state "[t]he most significant finding of the LSSA modeling is that pumping to the east of the LSSA Decision-created boundary is contributing to the continued lowering of groundwater levels in the LSSA." Bishop agrees.

Bishop does not agree, however, that "[t]he significance of this is that the Decision does not provide authority to the Watermaster to regulate that pumping." Just because the Seaside Groundwater Basin adjudication Judgment does not encompass the El Toro area right now does not mean the Watermaster lacks standing to negotiate with Cal-Am or others for an agreement to solve the El Toro pumping problem.

If the Watermaster's groundwater model shows over-pumping in the El Toro area is inducing greater groundwater outflow from the LSSA into the El Toro area, the Watermaster should be investigating El Toro pumping and negotiating with Cal-Am and, perhaps, others, about measures to protect the LSSA's natural safe yield from the El Toro pumping problem. As explained in our November 12, 2014, letter, the Court's Amended Decision authorizes and,

indeed, obligates the Watermaster to do so:

- "The **Watermaster will monitor and perform** or obtain engineering, hydrogeologic, and scientific **studies concerning** all characteristics and workings of the Seaside Basin, and all natural and **human-induced influences on the Seaside Basin, as they may affect the quantity and quality of Water available for Extraction**, that are reasonably required for the purposes of achieving prudent management of the Seaside Basin . . . ." (Amended Decision, § III(L)(3)(j)(xxi) at 39 [emphasis added].)

- "The **Watermaster may** act jointly or **cooperate with any public or private entity** to the end that the purposes of the Physical Solution may be fully and economically carried out." (Amended Decision, § III(L)(3)(j)(xviii) at 38 [emphasis added].)

The Court's Amended Decision further directs that:

- **"California American shall undertake all reasonable best efforts** to promptly and diligently pursue, and if necessary collaborate with other entities, to obtain and develop sufficient long-term supplemental Water supplies **to augment the Water supply available for its service territory within Monterey County."** (Amended Decision, § III(M)(1)(a) at 41 [emphasis added].)

If Cal-Am's use of groundwater from the Seaside Basin and El Toro area were replaced with water from an alternative source (e.g., Cal-Am's Monterey Peninsula Water Supply Project, and the Groundwater Replenishment Project of the Monterey Peninsula Water Management District and Monterey Regional Water Pollution Control Agency), ongoing implementation of the Judgment would bring LSSA groundwater production within the LSSA's natural safe yield. If a concentration of LSSA groundwater production in one particular area prevented stabilization of local groundwater elevations in that area, redistribution of that production could stop or reverse the decline by optimizing "operational yield" in order to maximize use of the LSSA's natural safe yield.

The Agenda Transmittal Form for Agenda Item 2.C at the February 11, 2015, TAC meeting outlines five tasks to be completed in connection with the groundwater model peer review by Mr. Yates. Before Mr. Yates completes those tasks and produces any technical memorandum presenting his comments, Bishop respectfully requests that the TAC and Watermaster:

1. Confirm and disclose how much groundwater Cal-Am and others are extracting from wells in the El Toro area;

2. Assess and disclose how those extractions reduce groundwater elevations in the LSSA; and

3. Assess and disclose how reducing or eliminating El Toro area groundwater extractions would benefit groundwater elevations and protect the natural safe yield of the LSSA.

Such tasks should be completed and shared with LSSA alternative producers before the TAC or Watermaster makes any recommendations or decisions about whether to recalculate the natural safe yield of the LSSA.

Bishop also respectfully requests that the TAC and Watermaster start talking to Cal-Am now about developing measures to reduce El Toro groundwater pumping (*e.g.*, by providing substitute water supplies). Such measures might not require an expansion of the Seaside Basin Groundwater Adjudication Judgment boundary to encompass the El Toro area pumping. For example, if Cal-Am made an enforceable commitment to eliminate El Toro groundwater pumping by providing an alternative source of water supply, the Watermaster might conclude that the LSSA is protected and that the Judgment boundary need not be expanded to encompass the El Toro area.

If Cal-Am were unwilling to make such a commitment voluntarily, then perhaps the Watermaster should move the Court to expand the Judgment to encompass the El Toro area, so that the LSSA natural safe yield and production allocations would be protected by managing the El Toro pumping problem under a Judgment mandating a solution.

Conclusion

We look forward to continuing to work with the TAC and Watermaster on a strategy to stabilize groundwater levels over the long term throughout the Basin, while protecting the natural safe yield of the Laguna Seca Subarea.

Sincerely,

KRONICK, MOSKOVITZ, TIEDEMANN & GIRARD
A Professional Corporation

Eric N. Robinson

ENR/tw

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Attachments: November 12, 2014, Bishop letter (without attachments)

cc: Laguna Seca Resort
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November 12, 2014

VIA ELECTRONIC MAIL

Dewey Evans, Chief Executive Officer
Robert Jaques, Technical Program Manager
Seaside Groundwater Basin Watermaster
2600 Garden Road, Suite 228
Monterey, CA 93940

Re: *The Watermaster Should Protect Laguna Seca Subarea Natural Safe Yield From The El Toro Pumping Problem*

Dear Messrs. Evans and Jaques:

This letter is submitted by Bishop, McIntosh & McIntosh, which holds an Alternative Production Allocation in the Laguna Seca Subarea ("LSSA") of the Seaside Basin.

This letter responds to certain materials addressing El Toro area groundwater pumping and LSSA natural safe yield in the Agenda Packet for the November 12, 2014, meeting of the Watermaster's Technical Advisory Committee ("TAC"). This letter also responds to the discussion of El Toro area pumping and LSSA natural safe yield in the November 6, 2014, "Preliminary Draft Annual Report – 2014."

Our main point is that the Watermaster should not rush to cut the LSSA natural safe yield and production allocations based on a groundwater model that predicts pumping by California American Water Company ("Cal-Am") and others in the El Toro area will deplete the natural safe yield of groundwater in the immediately adjacent LSSA—even if all LSSA pumping were eliminated.

Instead, the Watermaster should protect the LSSA's natural safe yield by working with Cal-Am and other El Toro pumpers to investigate options for solving the El Toro pumping problem.

TAC Agenda Packet

The "Agenda Transmittal Form" for TAC Agenda Item No. 4 spends three pages characterizing our letter dated September 30, 2014, ("Bishop Letter") and the October 13, 2014, response letter from the Watermaster's principal groundwater engineering expert, HydroMetrics Water Resources Inc., ("HydroMetrics Response"). Unfortunately, those characterizations create a false sense of dispute that distracts from our main point.

Bishop and HydroMetrics Agree: Any notion that the HydroMetrics Response "reputes" the Bishop Letter is mistaken and belied by the following points of agreement:

- Bishop and HydroMetrics agree on the formula providing that: "*Natural Safe Yield = Aerial Recharge + Subsurface Inflow - Subsurface Outflow*"[1]
- Bishop and HydroMetrics agree that: "Under the current formula, any change in the values assumed for Aerial Recharge, Subsurface Inflow or Subsurface Outflow would cause the natural safe yield value to change."[2]
- Bishop and HydroMetrics agree that: "The Draft Memo's assumption that subsurface outflow is 1,556 AFY is not based on an immutable fact."[3]
- Bishop and HydroMetrics agree that: The assumption that LSSA subsurface outflow is 1,556 AFY is a groundwater model "**estimate** of how much groundwater is flowing out of the LSSA, on an annual average, based on our modeling results."[4]
- Bishop and HydroMetrics agree that: "The amount of groundwater flowing out the eastern end of the Laguna Seca Subarea has increased due to pumping by Cal-Am and others in the El Toro area" and that "[a]s El Toro pumping drives groundwater elevations lower, the Subsurface Outflow gradient becomes steeper, and the Laguna Seca Subarea loses more Subsurface Outflow."[5]
- Bishop and HydroMetrics agree that: The Watermaster's groundwater model projects that "eliminating all pumping from the subarea does not completely halt the predicted decline in groundwater elevations," which "suggests that pumping from wells outside of

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1 HydroMetrics Response at 1.
2 *Id.*
3 *Id.*
4 *Id.* (emphasis added).
5 *See id.* at 2-3 (citing "number of items" Bishop Letter quotes from HydroMetrics memo[5] and stating "We have no disagreement with this point"); *see* August 6, 2014, Draft Technical Memorandum from HydroMetrics to the Watermaster's Technical Director, Bob Jacques re Results of Laguna Seca Safe Yield Analysis (Revised) (stating: "The flow out of the subarea along the eastern boundary, for example, is driven by the groundwater levels in the LSSA being higher than water levels to the east. As groundwater levels in the LSSA rise [i.e., due to pumping reductions on adjudicated rights holders], the gradient from the LSSA to the east increases and drives more water out of the subarea.").

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the LSSA prevents the subarea from achieving stable groundwater elevations" "due to the amount of pumping from wells located outside of the LSSA."[6]

- Bishop and HydroMetrics agree that: "The wells just outside and east of the LSSA . . . pump roughly twice as much as all of the wells within the LSSA," and "either the original boundary in this portion of the Seaside Basin was incorrectly drawn, or the boundary has shifted to the east due to changes in pumping practices."[7]

- Bishop and HydroMetrics agree that the preceding boundary issue: ". . . highlights the difficulty that can arise when trying to manage only a subset of an aquifer system when that subset is fully integrated with the system surrounding it. In the case of the LSSA, the surrounding system contains several wells that appear to have a direct influence on the conditions that exist within the subarea. This influence is beyond the control of the Watermaster and draws into question the ability of establishing an operational safe yield for the LSSA . . . ."[8]

- Bishop and HydroMetrics agree that despite the adverse impact of Cal-Am and other pumping in the El Toro area east and south of the LSSA: "groundwater levels in the Southern Coastal Subarea . . . remain more than sufficient to prevent seawater intrusion" and that "LSSA pumping has negligible influence on seawater intrusion."[9]

Based on the actual content of the Bishop Letter and the HydroMetrics Response, there is no real disagreement between Bishop and the Watermaster's principal groundwater engineering expert, HydroMetrics. The suggestion that HydroMetrics "reputes" anything is misleading and distracts from the Bishop Letter's main point.

Watermaster Should Protect The LSSA's Safe Yield From The El Toro Pumping Problem: The main point is that the Watermaster should not rush to cut the LSSA natural safe yield based on a model that predicts pumping by Cal-Am and others in the El Toro area will deplete LSSA groundwater supplies—even if all LSSA pumping were eliminated.

If LSSA groundwater is flowing outside the Judgment boundary at an accelerating rate to fill a growing hole created by unregulated over-pumping in the immediately adjacent El Toro area, the

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6 *Id.*

7 *Id.; see* HydroMetrics Draft Memo (original source of quoted statements).

8 *Id.*; *see* HydroMetrics Draft Memo (original source of quoted statements).

9 *Id.* at 3; *see* Water Year 2013 Seawater Intrusion Analysis Report, Seaside Basin, Monterey County California [December 2013] at pp. 45-51 (groundwater elevations have always been above sea level and have continued to remain stable over time")

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Watermaster's first response should not be to use that outflow estimate to lock in a modeling assumption that sets the stage to cut the LSSA natural safe yield.

The problem with that approach is not the "accuracy" of the groundwater model's prediction that El Toro pumping prevents stabilization of LSSA groundwater levels even if all pumping inside the LSSA stops today (although confirming the model's accuracy through a "peer review" seems like a fine idea).

The main problem is that the TAC and Watermaster are proposing to convert today's "estimate" of LSSA outflow induced by the El Toro pumping problem into a model "assumption" that will guide the Watermaster's basin management decisions. That problem is significant, because the El Toro area pumping has not been shown to be sustainable, and no Court has determined that any El Toro groundwater pumpers have a prior right to groundwater originating from the Laguna Seca Subarea.

That is not a technical groundwater model "accuracy" problem that can be addressed through "peer review." A final decision to use the El Toro-induced LSSA outflow estimate as a model assumption that guides the Watermaster's Basin management decisions poses a legal problem that threatens the adjudicated natural safe yield and groundwater rights of Bishop and others in the LSSA.

The Watermaster Should Be Investigating The El Toro Pumping Problem And Negotiating A Solution With Cal-Am: Just because the Seaside Groundwater Basin adjudication Judgment does not encompass the El Toro area right now does not mean the Watermaster lacks standing to negotiate with Cal-Am or others for an enforceable agreement to solve the El Toro pumping problem.

If the Watermaster's groundwater model correctly estimates increasing LSSA outflow caused by over-pumping in the El Toro area, the Watermaster should be investigating El Toro pumping and negotiating with Cal-Am and, perhaps, others, about measures to protect the LSSA's natural safe yield from the El Toro pumping problem. The Court's Amended Decision authorizes and, indeed, obligates the Watermaster to do so:

- "The **Watermaster will monitor and perform** or obtain engineering, hydrogeologic, and scientific **studies concerning** all characteristics and workings of the Seaside Basin, and all natural and **human-induced influences on the Seaside Basin, as they may affect the quantity and quality of Water available for Extraction**, that are reasonably required for the purposes of achieving prudent management of the Seaside Basin . . . ." (Amended Decision, § III(L)(3)(j)(xxi) at 39 [emphasis added].)

- "The **Watermaster may** act jointly or **cooperate with any public or private entity** to the end that the purposes of the Physical Solution may be fully and economically carried out." (Amended Decision, § III(L)(3)(j)(xviii) at 38 [emphasis added].)

The Court's Amended Decision further directs that:

- "**California American shall undertake all reasonable best efforts** to promptly and diligently pursue, and if necessary collaborate with other entities, to obtain and develop sufficient long-term supplemental Water supplies **to augment the Water supply available for its service territory within Monterey County.**" (Amended Decision, § III(M)(1)(a) at 41 [emphasis added].)

If Cal-Am's use of groundwater from the Seaside Basin and El Toro area were replaced with water from an alternative source (e.g., Cal-Am's Monterey Peninsula Water Supply Project, and the Groundwater Replenishment Project of the Monterey Peninsula Water Management District and Monterey Regional Water Pollution Control Agency), ongoing implementation of the Judgment would bring LSSA groundwater production within the LSSA's natural safe yield. If a concentration of LSSA groundwater production in one particular area prevented stabilization of local groundwater elevations in that area, redistribution of that production could stop or reverse the decline by optimizing "operational yield" in order to maximize use of the LSSA's natural safe yield.

The beneficial effect of such measures on the LSSA and the rest of the Seaside Basin should be analyzed with the Watermaster's groundwater model. Since the Watermaster is proposing to spend $25,420 (out of a $40,000 line item in the 2015 budget for "additional consulting") to have a second groundwater engineering consultant "peer review" its groundwater model, funding should be available to model the beneficial effects of solving the El Toro pumping problem.

Bishop respectfully requests that the TAC and Watermaster:

1. Confirm and disclose how much groundwater Cal-Am and others are extracting from wells in the El Toro area;

2. Assess and disclose how those extractions reduce groundwater elevations in the LSSA; and

3. Assess and disclose how reducing or eliminating El Toro area groundwater extractions would benefit groundwater elevations and protect the natural safe yield of the LSSA.

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Bishop also respectfully requests that the TAC and Watermaster negotiate with Cal-Am to develop measures to reduce El Toro groundwater pumping (*e.g.*, by providing substitute water supplies). Such measures might not require an expansion of the Seaside Basin Groundwater Adjudication Judgment boundary to encompass the El Toro area pumping. For example, if Cal-Am made an enforceable commitment to eliminate El Toro groundwater pumping by providing an alternative source of water supply, the Watermaster might conclude that the LSSA is protected and that the Judgment boundary need not be expanded to encompass the El Toro area.

If Cal-Am were unwilling to make such a commitment voluntarily, then perhaps the Watermaster should move the Court to expand the Judgment to encompass the El Toro area, so that the LSSA natural safe yield and production allocations would be protected by managing the El Toro pumping problem under a Judgment mandating a solution.

Preliminary Draft Annual Report – 2014

The "Preliminary Draft Annual Report – 2014" discusses the Watermaster's groundwater model and LSSA natural safe yield. That discussion suffers from some of the same problems that we address above. Attached as Exhibit A to this letter are excerpts from the Preliminary Draft Annual Report addressing the groundwater model and LSSA natural safe yield. Those excerpts use redline to show changes we propose to make the Watermaster's Annual Report accurate, complete and objective.

We respectfully request that the TAC and Watermaster incorporate the redline changes in the Annual Report submitted to the Court. If the TAC and Watermaster decline to incorporate the attached redline changes, we respectfully request that the Annual Report submitted to the Court include copies of:

- This letter and its Exhibit A;
- Our September 30, 2014, letter to Watermaster Chief Executive Officer Dewey Evans; and
- The August 6, 2014, Draft Technical Memorandum from HydroMetrics to the Watermaster's Technical Director, Bob Jacques re Results of Laguna Seca Safe Yield Analysis (Revised).

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Conclusion

We look forward to continuing to work with the TAC and Watermaster on a strategy to stabilize groundwater levels over the long term throughout the Basin, while protecting the natural safe yield of the Laguna Seca Subarea.

Sincerely,

KRONICK, MOSKOVITZ, TIEDEMANN & GIRARD
A Professional Corporation

ERIC N. ROBINSON

ENR/tw

Attachments: Exhibit A;
September 30, 2014, Bishop letter; and
August 6, 2014, "Draft Technical Memorandum from HydroMetrics to the Watermaster's Technical Director, Bob Jacques re Results of Laguna Seca Safe Yield Analysis (Revised)"

cc: Laguna Seca Resort
Pasadera Country Club
York School

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Attachment 2

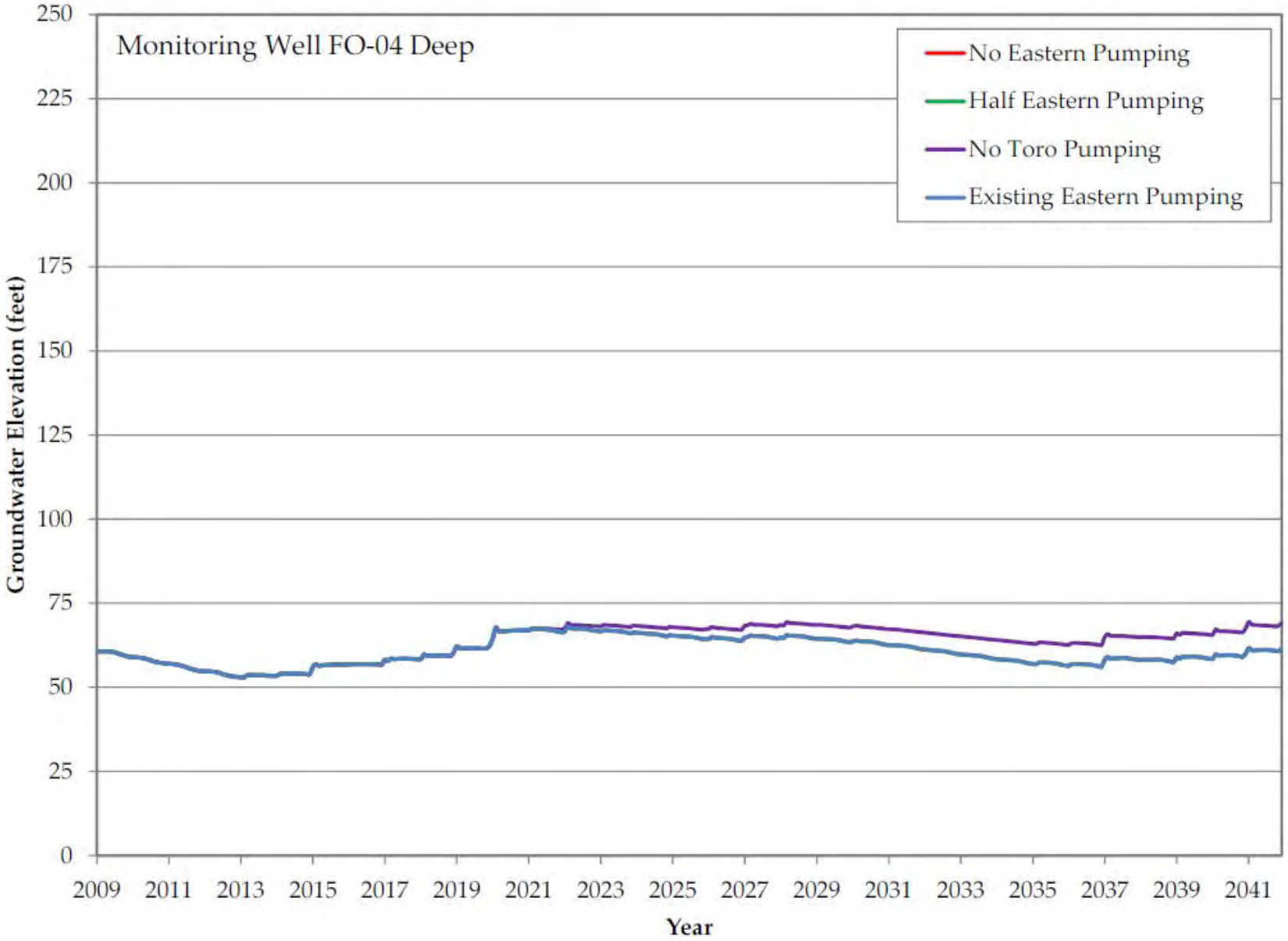


Figure 25: Western LSSA Impacts from Changes in Outside Pumping – Monitoring Well FO-04 Deep

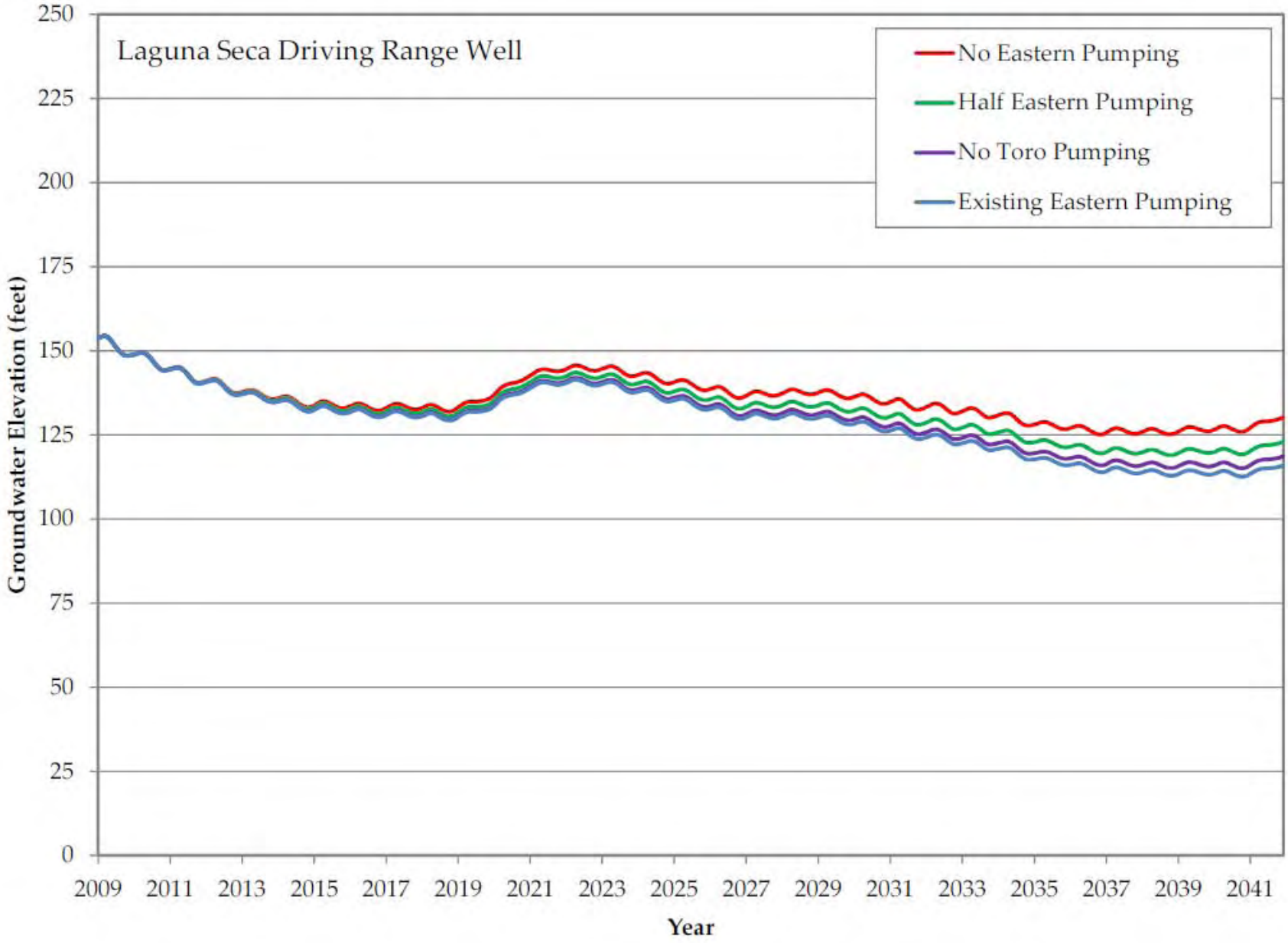


Figure 26: Central LSSA Impacts from Changes in Outside Pumping – Laguna Seca Driving Range Well

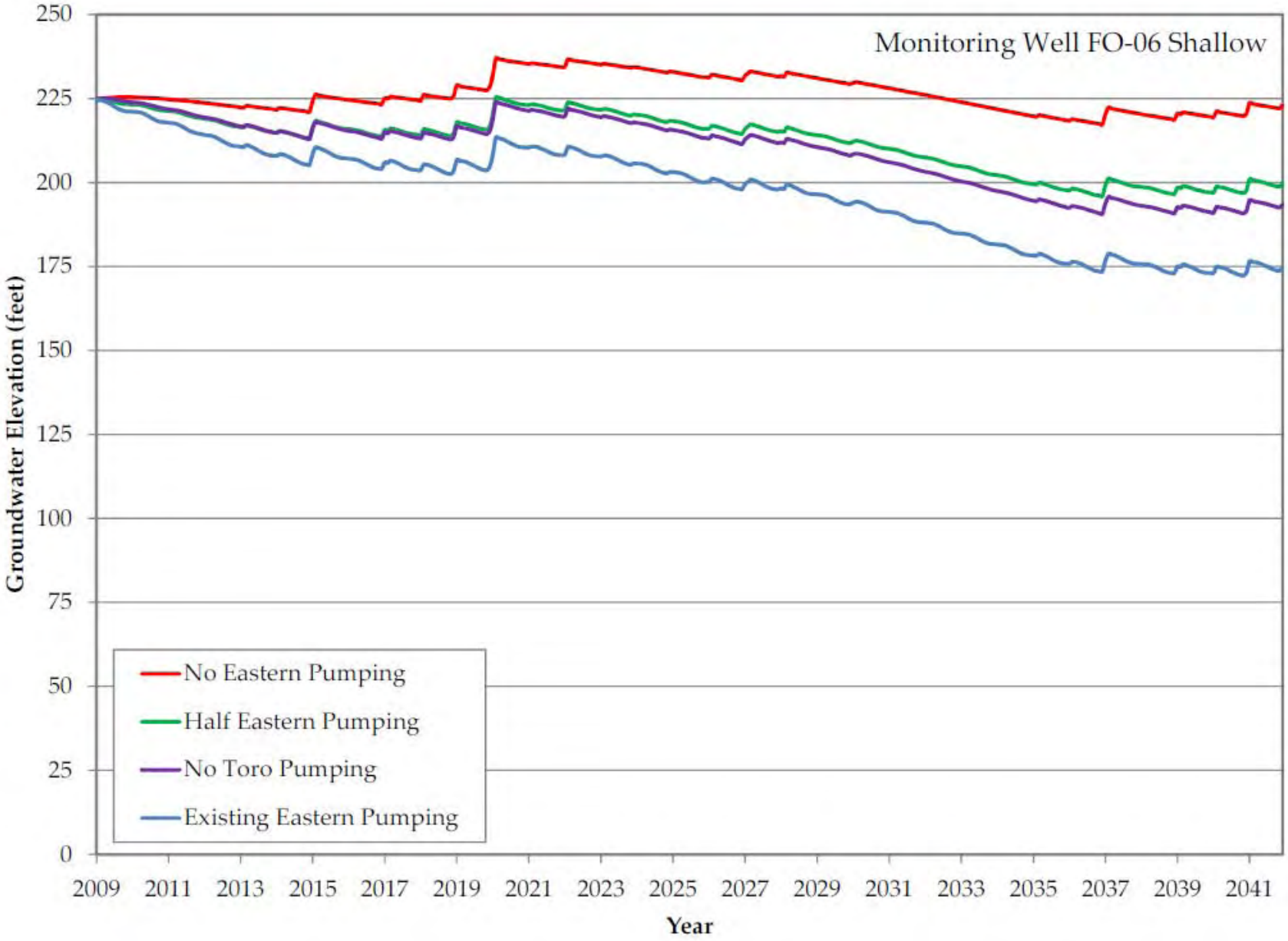


Figure 27: Eastern LSSA Impacts from Changes in Outside Pumping – Monitoring Well FO-06 Shallow

SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 11, 2015
AGENDA ITEM:	3.C
AGENDA TITLE:	Develop TAC Recommendations to be Made to the Board
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

The Board will want to know what the TAC's recommendations are with regard to the Draft Peer Review Technical Memorandum when Mr. Yates presents it to the Board at its April 1, 2015 meeting.

Under this Agenda item the TAC is asked to develop its recommendations and provide direction to the Technical Program Manager on presenting those recommendations to the Board.

ATTACHMENTS:	
RECOMMENDED ACTION:	Provide direction to Technical Program Manager regarding TAC recommendations to be made to the Board regarding the Peer Review

SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 11, 2015
AGENDA ITEM:	4
AGENDA TITLE:	Preliminary Discussion of Work Plan to Address Findings of Laguna Seca Modeling Work
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY: The Board is considering retaining an attorney to prepare documents to file with the Court regarding several issues: (1) requesting a stay of the 2015 through 2018 Operating Yield reduction, (2) updating the Court concerning recent regional water supply developments pertinent to the Seaside Basin, and (3) updating the Court concerning the recent modeling results and findings concerning the Laguna Seca Subarea (LSSA) and the Watermaster's intended work plan to address long-term water reliability for the subbasin.

With regard to the 3rd of the 3 items listed above, if the Board moves forward with this work I anticipate that they will seek input from the TAC on development of the work plan. I also think it is likely that the work plan would at some point include reaching out to the pumpers in the Toro area to seek a joint means of resolving the problems associated with falling water levels in the LSSA.

In order to begin the process of developing a set of technical issues that the Board may wish to address in its work plan, below is a preliminary list of some issues that I would appreciate getting initial TAC input and direction on. This discussion can also serve as a starting point for soliciting other issues from TAC members so they can be further discussed at future TAC meetings.

Issue 1: The LSSA Natural Safe Yield (NSY) values that are reported in the Yates 2002 and CH2M 2004 reports (referred to on page 18 of the LSSA Modeling Tech Memo of July 28, 2014) were as follows:

Yates 2002 Report: Estimated the LSSA NSY to be 400 AFY. However, that estimate included an assumed pumping level of 1,000 AFY from the LSSA. The WY 2007 Production Report showed that only 961 AF was pumped from the LSSA in that year. The WY 2013 and 2014 Production Reports show that only 912 and 920 AF, respectively, was pumped from the LSSA in those years. The continuing decline in water levels with even these lower pumping levels than were assumed in the Yates 2002 Report suggest that the NSY may be less than was estimated when that Report was prepared.

CH2M 2004 Report: This Report did not break out the individual subarea NSYs, and only provided a total-Basin NSY of 3,400 to 3,500 AFY. No estimate of the LSSA NSY was provided in that Report. However, if the area of the LSSA as a fraction of the area of the total-Basin was used to approximate the portion of the total-Basin NSY attributable to the LSSA, the estimated LSSA NSY would be approximately 600 AFY. Again, that Report did not contain that calculation and did not provide an estimate of the LSSA NSY.

Question: With differing NSY estimates contained in prior reports, the Decision itself (which uses 3,000 AFY for the Basin as a whole with no breakout for the LSSA), and the more recent work by HydroMetrics, what approach should be taken to reach consensus with all affected parties on what the best estimate of the LSSA NSY is?

Issue 2: While stopping all pumping from the LSSA is unrealistic, if all LSSA pumping were stopped by 2018 (one of the Scenarios evaluated in the Tech Memo) only the eastern LSSA wells FO-6 Shallow and Deep continue to experience falling water levels. Both of these wells are monitoring wells not production

AGENDA ITEM:	4 (Continued)

wells.
Question: Should the work plan address issues pertaining to monitoring wells as well as production wells, or should it only address issues pertaining to production wells?

Issue 3: With no CAW pumping from the LSSA once the regional desalination project goes online, the rate of decline in LSSA groundwater levels will decrease considerably.
Question: Would it be useful to run the Model further out into the future (beyond 2014 where it currently ends) for the Baseline scenario with no CAW LSSA pumping to see if all the other LSSA production wells will finally achieve stabilized groundwater levels at their projected pumping rates?

Issue 4: If the answer to Issue 3 is "yes", the stabilized groundwater levels may or may not be within the water-bearing thickness of the aquifer from which these wells are pumping.
Question: Would it be useful to determine the depth of the bottom of the aquifer at the location of each LSSA production well in order to determine if it would be feasible to lower the pump and/or casing perforations to enable the wells to continue to serve as operational production wells to meet the water needs of these producers?

Issue 5: The Board at some point may conclude that the southeastern boundary of the Seaside Groundwater Basin is incorrectly shown in the Decision, and that the boundary in fact is either further to the east or further to the west.
Question: What would be the best way of determining more accurately the southeastern boundary of the Seaside Groundwater Basin? What additional information would be needed to be able to do this?

ATTACHMENTS:	None
RECOMMENDED ACTION:	Provide direction to Technical Program Manager regarding further topics for TAC discussion on this issue

SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 11, 2015
AGENDA ITEM:	5
AGENDA TITLE:	Continued Discussion of Application from Cal Am to Increase Storage Quantity and Number of Storage/Recovery Sites
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY: At the TAC's February 11, 2015 meeting there was initial discussion of Cal Am's draft Application to amend its Storage and Recovery Agreement with the Watermaster (executed in October 2011) to include the Seaside Middle School injection and recovery wells and to increase the non-native water storage amount. The following questions and requested clarifications were raised by TAC members during that discussion:

1. Is it appropriate to process an application to increase the storage amount this far in advance of when the additional water for storage will become available, and while the final quantity of desalinated water to be stored is still being determined?
2. Should the Application be processed for approval without first having the required permits and approvals in hand?
3. What are the sources and quantities of the additional water to be stored?
4. Provide the additional water quality data so that all of the water quality parameters contained in Cal Am's original Storage Agreement will be included with this new application. The additional parameters are nitrate, sulfate, potassium, magnesium, and calcium.
5. Should there be separate applications for each source of water to be stored?
6. Would it be better to process an application to add the two new storage and recovery well-sites now, and to have a subsequent amendment(s) covering the additional storage/recovery amounts when decisions about the quantities of desalinated water and reclaimed water, and their respective water qualities, have been made and the necessary permits and approvals have been obtained?

In response to these items Eric Sabolsice of Cal Am provided the following information for further discussion at today's meeting:

Thinking through your questions, I believe we need to develop a plan for this updated storage agreement that is focused on the integrity of the basin. We would want to finalize the agreement as soon as possible so that we are ready when the time comes to store water under a signed agreement. The basin needs to be protected, with that in mind the following are critical in my opinion -

- *Water quality should meet Title 22 standards as they relate to drinking water. If there are certain additional parameters like Boron, SDI, Chlorine residual, etc. that are of specific concern we can address those individually. The TAC could provide input on what parameters should be monitored.*
- *Parties to the Agreement, in this case Cal Am and Watermaster*
- *Sources - Carmel River, Seaside Basin, Sand City Desal, Water Supply Project*
- *The location water will be injected and recovered.*
- *The volume of water to be stored in total.*

Question 1 - It is appropriate to process now to allow storage of 8,000 AF.

SEASIDE BASIN WATER MASTER TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

AGENDA ITEM:	5 (Continued)

Question 2 - No, the permits provide nothing regarding protection of the basin. We operate a potable water system that is currently permitted by DDW and that condition will continue. When the permits are received, we would provide them but I don't see a need to wait.
Question 3 -Carmel River, Seaside Basin, Sand City Desal, Water Supply Project. GWR would be covered under a separate agreement.
Question 4 - Title 22 standards. The Watermaster and Cal Am could set limits for Nitrate, Sulfate, Potassium, Magnesium, and Calcium suitable to protect the basin.
Question 5 - No reason for separate agreements (exception is GWR due to regulatory requirements)
Question 6 - No reason to wait on ASR or the Water Supply Project. The volumes produced by any project have no relationship to protection of the basin - what's important is how much can be injected, stored, and then recovered. We can estimate and set volumetric limits in the agreement and modify if/when conditions change.

Following further TAC discussion and direction on Cal Am's application at today's meeting, I will either ask them to (1) further revise the application to address issues still of concern to the TAC, or (2) will process it as-is if the TAC has no further issues of concern and recommends approval. This could then lead to preparing an Amended Storage and Recovery Agreement for presentation to the Board at a future meeting.

ATTACHMENTS:	Draft Amendment Application from Cal Am (same as provided in the February 11, 2015 TAC agenda packet for this item)
RECOMMENDED ACTION:	Provide direction to the Technical Program Manager regarding approval or further modification of the Revised Amended Application

APPLICATION TO STORE AND RECOVER NON-NATIVE WATER FROM THE SEASIDE GROUNDWATER BASIN

NOTE: This Application is to amend the applicant's original Agreement for Storage and Recovery of Non-native Water from the Seaside Groundwater Basin dated October 21, 2011 (hereinafter referred to as the "Original Agreement")

INSTRUCTIONS: This Application form is for use by Standard Producers in the Seaside Groundwater Basin (Seaside Basin) for the purpose of obtaining approval from the Seaside Basin Watermaster (Watermaster) to store non-native water in, and to subsequently recover that stored water from, the Seaside Basin. The application process is as described in Section III.L.3.j.xx of the Amended Decision of the Monterey County Superior Court, Case No. M66343, filed February 9, 2007.

California-American Water Company

Name of Standard Producer (Applicant)

Contact Information for Applicant:

Contact Person: Eric Sabolsice

Address: 511 Forest Lodge Rd. Ste 100, Pacific Grove, CA 93950

Telephone: 831-646-3291

Proposed quantity of non-native water Applicant seeks to store through spreading or direct injection into the Seaside Basin (acre-feet per year):

Additional quantity to be stored: 5574
Total quantity to be stored (as amended): 8,000

Proposed location(s) where the spreading or direct injection of non-native water into the Seaside Basin will occur. If injection will be performed using one or more injection wells, provide identifying information for those wells including the aquifer(s) into which the injection will occur. If spreading will be performed, provide coordinate location information, as well as any physical street address information for the proposed location.

Locations listed in the Original Agreement:
ASR-1 injection and recovery well located at the Santa Margarita ASR site located at 1910 General Jim Moore Blvd., Seaside, CA 93955 (Santa Margarita)

ASR-2 injection and recovery well located at the Santa Margarita ASR site located at 1910 General Jim Moore Blvd., Seaside, CA 93955 (Santa Margarita)

Additional locations to be added to the Amended Agreement:
ASR-3 injection and recovery well located at Seaside Middle School, 999 Coe Ave., Seaside, CA 93955 (Santa Margarita)

ASR-4 injection and recovery well located at Seaside Middle School, 999 Coe Ave., Seaside, CA 93955 (Santa Margarita)

Proposed location(s) where the stored water may be recovered. Provide identifying information for each well from which the stored water will be recovered, including the aquifer(s) from which recovery will occur.

Locations listed in the Original Agreement:
Santa Margarita Well #1, 1910 General Jim Moore Blvd., Seaside, CA 93955 (Santa Margarita)
Santa Margarita Well #2, 1910 General Jim Moore Blvd., Seaside, CA 93955 (Santa Margarita)
Ord Grove Well #2, 1987 Park Ct., Seaside, CA 93955 (Santa Margarita)
Paralta Well, 2014 Paralta Ave., Seaside, CA 93955 (Santa Margarita)
Luzern Well #2, 1984 Luzern St., Seaside, CA 93955 (Paso Robles)
Playa Well #3, 1237 Playa Ave., Seaside, CA 93955 (Paso Robles)
Plumas Well #4, 1453 Plumas Ln., Seaside, CA 93955 (Paso Robles)

Additional locations to be added to the Amended Agreement:
Seaside Middle School Well #3, 999 Coe Ave., Seaside, CA 93955 (Santa Margarita)
Seaside Middle School Well #4, 999 Coe Ave., Seaside, CA 93955 (Santa Margarita)

Water quality characteristics of the non-native water proposed for spreading or direct injection into the Seaside Basin. Provide sufficient physical, chemical, and microbiological information about the water being proposed for storage, so that the Watermaster can determine whether or not storing such water will have any adverse water quality impacts to the Seaside Basin. Provide this information in the form of analytical results from a properly certified water testing laboratory, attached to this Application.

Also provide sufficient information to demonstrate to the Watermaster that the water quality characteristics of the water being proposed for storage will meet all of the requirements imposed on the Applicant by permits and/or approvals issued to the Applicant by the regulatory agency or agencies with jurisdiction.

Attachment A contains projected water quality characteristics of the additional water to be stored under this amended Application. This additional water will be provided by applicant's planned desalination plant.

Permits and approvals from regulatory agencies. Attach copies of all permits and approvals the applicant has received from regulatory agencies, which relate to the storage of water in the Seaside Basin. Such agencies will likely include some or all of the following:

- California Regional Water Quality Control Board
- California Department of Public Health
- County of Monterey Department of Health
- State Water Resources Control Board

Copies of permits will be provided prior to initial injection of desalinated water.

ATTACHMENT A

(Excerpted from planning and design documents for applicant's desalination plant)

APPENDIX 2 – ATTACHMENT 3

FINISHED WATER QUALITY BASIS OF DESIGN STANDARDS AND WATER QUALITY ACCEPTANCE STANDARDS AND REQUIREMENTS

Finished Water quality standards and requirements and Acceptance Standards and Requirements that will be used as the basis of design and Acceptance Testing are shown in Table 2C-1, for the pretreatment effluent (RO feed stream), the combined RO permeate, and the Finished Water after stabilization for corrosion control and disinfection with chlorine. The Design-Builder shall design the facility to meet the water quality standards and requirements shown in Table 2C-1. Acceptance Test Standards and Requirements are discussed in Appendix 7 of the draft Design-Build Agreement. During Acceptance Testing, all treatment systems will be monitored in accordance with the requirements of Appendix 7 to demonstrate continuous successful treatment as stipulated by the treated water Acceptance Standards and Requirements shown in Table 2C-1 below. Acceptance Testing of the RO system shall also be based on computer model projected future performance after 5 years, for both average and maximum raw water design concentrations (refer to Appendix 2, Attachment 2), taking into account increased salt passage over time as the membranes age.

Table 2C-1 – Treated Water Basis of Design Standards and Acceptance Standards and Requirements [10]

Parameter	Units	Pretreatment Effluent		Combined RO Permeate		Finished Water After Stabilization	
		Maximum Average Concentration [1, 2]	Not to Exceed Concentration [3]	Maximum Average Concentration [1, 2]	Not to Exceed Concentration [3]	Maximum Average Concentration [1, 2]	Not to Exceed Concentration [3]
General and Inorganic							
Total Dissolved Solids (TDS)	mg/L						300
Turbidity	NTU	0.15 [4]	1.0	0.1 [4]	0.5	0.5 [4]	1.0
Silt Density Index (SDI)	min^{-1}	3 [4]	4 [5]				
Boron [12]	mg/L			0.5	0.7	0.5	0.7
Chloride [12]	mg/L			60	100	60	100
Bromide [12]	mg/L			0.3	0.5	0.3	0.5
Sodium [12]	mg/L			35	60	35	60
Iron, total	mg/L	0.06	0.10				
Manganese, total	mg/L	0.03	0.05				
Product Water Stabilization [6]							
Hardness, total [7]	mg/L as $CaCO_3$					40 to 100 [11]	–

Parameter	Units	Pretreatment Effluent Maximum Average Concen-tration [1, 2]	Pretreatment Effluent Not to Exceed Concen-tration [3]	Combined RO Permeate Maximum Average Concen-tration [1, 2]	Combined RO Permeate Not to Exceed Concen-tration [3]	Finished Water After Stabilization Maximum Average Concen-tration [1, 2]	Finished Water After Stabilization Not to Exceed Concen-tration [3]
pH [7]	pH units					7.7 to 8.7[11]	–
Alkalinity, total [7]	mg/L as $CaCO_3$					40 to 100[11]	–
Orthophosphate [7]	mg/L as PO_4					Set by Owner within the range of 1.0 to 3.5 mg/L[11]	3.5
Disinfection and Disinfection Byproducts (DBPs)							
Total Chlorine Residual[7]	mg/L as Cl_2					Set by Owner for a target of 2 mg/L, within the range of 1.5 to 2.5 mg/L[11]	3.5 mg/L
Trihalomethanes, total (TTHM) [8]	µg/L					40	64
Haloacetic Acids, total of 5 (HAA5) [8]	µg/L					30	48
Total Nitrosamines [8, 9]	ng/L					5	8
Bromate	µg/L					5	8

[1] The **average** of the measured concentrations shall be below the Maximum Average Concentration at all times (see remaining footnotes). This footnote does not apply to (a) turbidity or SDI, or (b) finished water calcium hardness, pH, alkalinity, chlorine residual or phosphate; separate footnotes apply to these parameters.

[2] Maximum Average Concentration cannot be exceeded during the applicable period, which shall be (i) daily for continuous recording with results reported every 15 minutes (pH, chlorine residual and turbidity); (ii) annual running average for monthly samples of DBPs (TTHM, HAA5, Total nitrosamines, and bromate); and (iii) annual running average for weekly samples of the remaining parameters.

[3] No measurement shall exceed this value, at any time.

[4] Measured values must be less than the ~~m~~aximum average" concentration 95% of the time.

[5] The maximum SDI limit applies unless more stringent requirements apply based on the SWRO membrane supplier warranty.

[6] The Owner will set the conditions for product water stabilization to minimize corrosion in the existing distribution system.

[7] Finished Water shall be within the ~~ta~~rget range" at all times, where the target range is the target concentration set by the Owner, plus or minus the allowed variance shown in Appendix 7.

[8] TTHM, HAA5, and total nitrosamine concentrations shall be determined using the Simulated Distribution (SDS) test method in Standard Methods (Method 5710C). Samples of the finished water where it enters the distribution system shall be collected, with no adjustment of chlorine residual or pH, and held at the temperature of the finished water at the time of collection (±2°C) for a 48-hour holding time.

[9] Total Nitrosamines includes the 6 nitrosamine compounds on the EPA's UCMR2-List 2; NDEA, NDMA, NDBA, NDPA, NMEA and NPYR.

[10] These basis of design standards are also the Additional Finished Water Quality Acceptance Standards and requirements set forth in Appendix 7 (Table A7-7 for Finished Water, Table A7-11 for Pretreatment Filtration and Table 7-13 for Combined RO Permeate) except that the applicable periods for the Acceptance Testing are defined in Appendix 7.

[11] Compliance with ~~ta~~rget range" for calcium hardness, pH, alkalinity, chlorine residual, and phosphate shall be based on the median, rather than the average, of samples taken during the applicable monitoring period.

[12] For the Combined RO Permeate concentrations of boron, chloride, bromide and sodium, the Maximum Average and Not-to Exceed concentrations shall be met under the Average Design value and Design Maximum value shown in Table 1 of Appendix 2 Attachment 2, respectively.

SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 11, 2015
AGENDA ITEM:	5
AGENDA TITLE:	Schedule
PREPARED BY:	Robert Jaques, Technical Program Manager

SUMMARY:

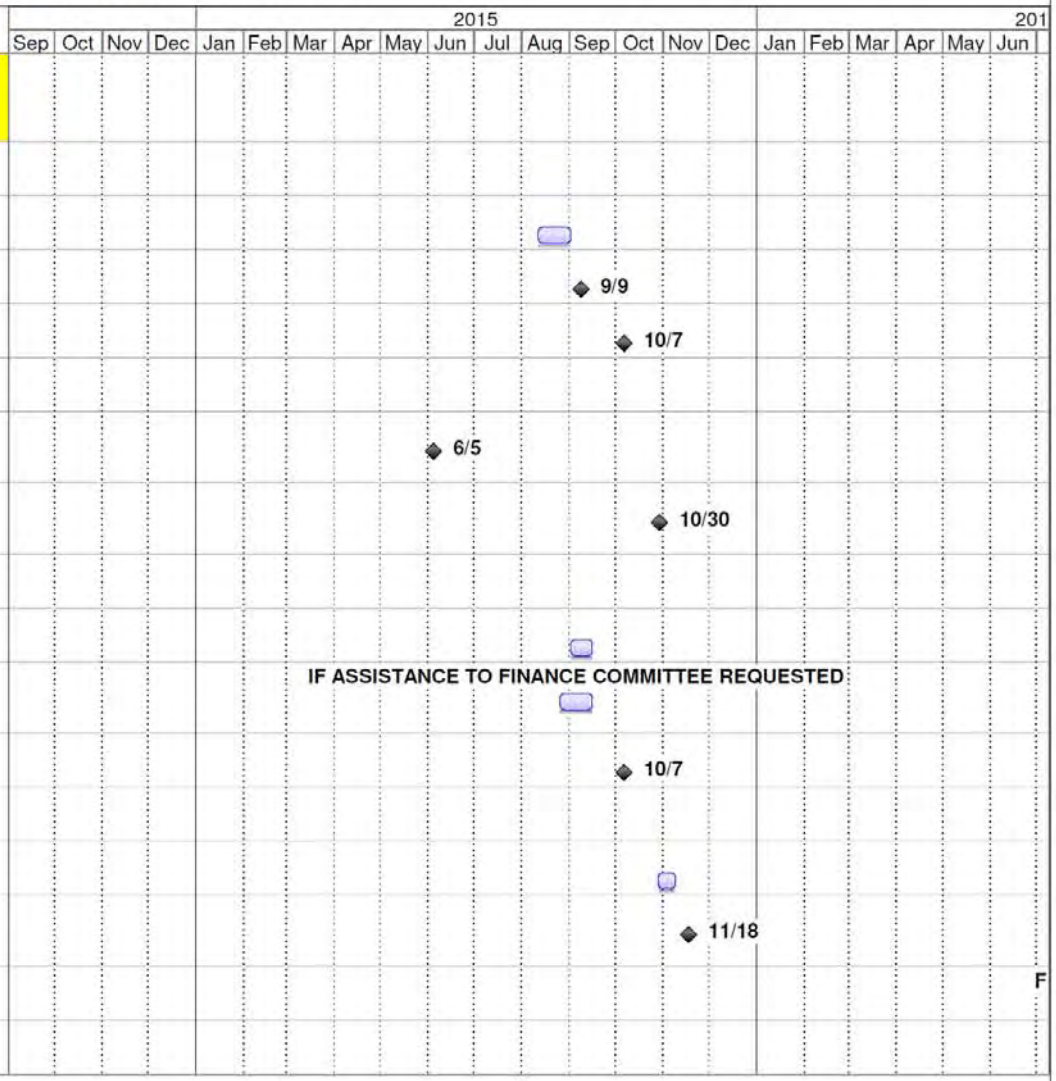
As a regular part of each monthly TAC meeting, I will provide the TAC with an updated Schedule of the activities being performed by the Watermaster, its consultants, and the public entity, MPWMD, which is performing certain portions of the work.

Attached is the most recent update of the Work Schedule for FY 2015.

ATTACHMENTS:	Schedule of Work Activities for FY 2015
RECOMMENDED ACTION:	Provide Input to Technical Program Manager Regarding Any Corrections or Additions to the Schedule

Seaside Basin Watermaster
Monitoring and Management Program
2015 Work Schedule

ID	Task Name
1	***CRITICAL PROJECT MILESTONES ASSOCIATED WITH TAC, BOARD, AND/OR CONSULTANT WORK***
2	**2016 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 Prepares Combined Quarterly Water Production, Water Level, and Water Quality Reports for 1st & 2nd Quarters (Same as Task 41)
8	Watermaster Prepares Annual Water Production, Water Level, and Water Quality Report for 2015 (Same as Task 42)
9	**Replenishment Assessment Unit Costs for Water Year 2016**
10	B&F Committee Develops Replenishment Assessment Unit Cost for 2016 Water Year
11	If Requested, TAC Provides Assistance to B&F Committee in Development of 2016 Water Year Replenishment Assessment Unit Cost
12	Board Adopts and Declares 2016 Water Year Replenishment Assessment Unit Cost
13	**Replenishment Assessments for Water Year 2015**
14	Watermaster Prepares Replenishment Assessments for Water Year 2015
15	Watermaster Board Approves Replenishment Assessments for Water Year 2015 (At November Meeting)
16	Watermaster Levies Replenishment Assessment for 2014
17	**Monitoring & Management Program (M&MP) Budgets for 2015 and 2016**



Seaside Basin Watermaster
Monitoring and Management Program
2015 Work Schedule

Seaside Basin Watermaster
Monitoring and Management Program
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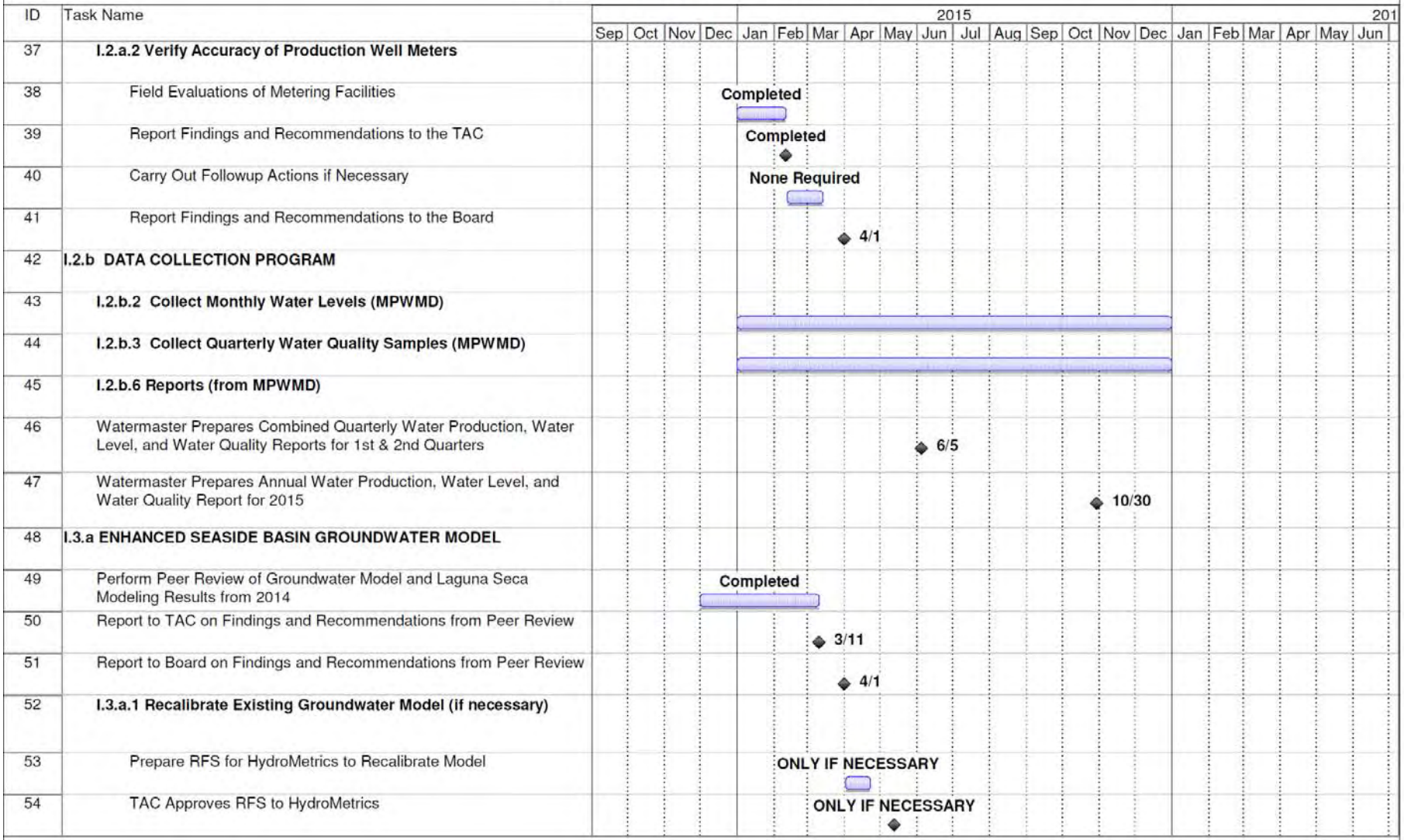
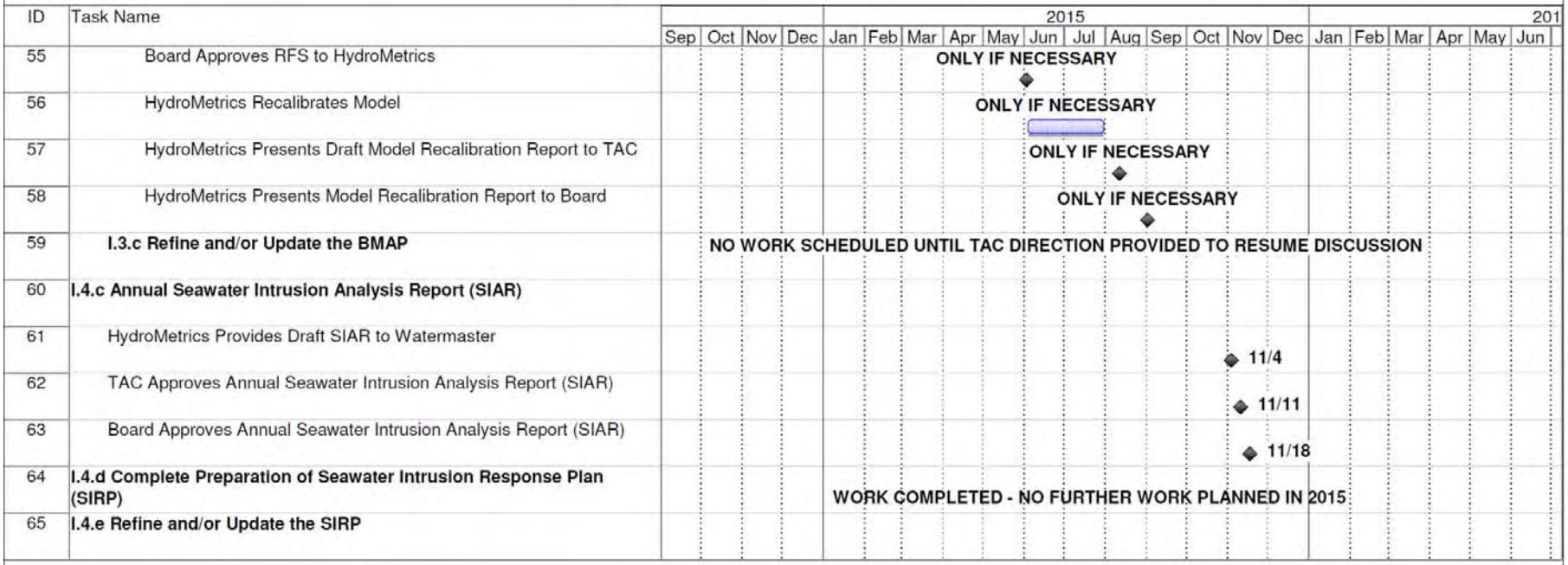


Seaside Basin Watermaster
Monitoring and Management Program
2015 Work Schedule



SEASIDE BASIN WATER MASTER
TECHNICAL ADVISORY COMMITTEE

** * * AGENDA TRANSMITTAL FORM * * **

MEETING DATE:	March 11, 2015
AGENDA ITEM:	6
AGENDA TITLE:	Other Business
PREPARED BY:	Robert Jaques, Technical Program Manager

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

ATTACHMENTS:	None
RECOMMENDED ACTION:	None required – information only