STATE OF CALIFORNIA EDMUND G. BROWN JR., *Governor*

PUBLIC UTILITIES COMMISSION
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February 14, 2013 File No.: A.12-04-019

Michael Buckman
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State Water Resources Control Board
P.O. Box 100
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RE: Response to Draft Review by State Water Resource Control Board Staff of the Monterey Peninsula Water Supply Project proposed in Application 12-04-019 by California-American Water Company (Cal-Am)

Dear Mr. Buckman:

Thank you for the SWRCB Staff Draft Review (Draft Review) sent to this Commission via the December 21, 2012 cover memorandum. In the cover memorandum you invited questions or comments that might arise from the Commission's reading of the Draft Review. The following are our questions and comments, including some new and additional information we would like you to consider in finalizing the Draft Review.

1. Recent Changes to the Monterey Peninsula Water Supply Project

On January 11, 2013, Richard Svindland of Cal-Am provided to the Commission supplemental testimony that addressed certain changes in the proposed configuration and design of the Monterey Peninsula Water Supply Project (MPWSP). Enclosed as Attachment A are the portions of the testimony and attachments reflecting recent changes to the MPWSP. The Commission requests that the SWRCB consider this information in finalizing the Draft Review, so that it includes a discussion of the current design and configuration of the MPWSP.

Based on the latest information that the Commission has received, Cal-Am is no longer intending to use pumping wells. Instead, the MPWSP slant wells would be designed as gravity wells that would passively receive seawater and convey it to a wet well installed below sea level on the inland side of the coastal dunes.

Enclosed as Attachment B is a description of this aspect of the project, drafted by our environmental consultants. The Commission requests that the SWRCB consider revising the Draft Review to include a discussion of the updated configuration and location of the slant wells.

2. Information Relating to the Nature of the 180 Foot Aquifer

As noted throughout the SWRCB Draft Review, an important inquiry is whether the aquifer from which the supply wells for the MPWSP will draw is a confined or an unconfined aquifer. Enclosed as Attachment C is a technical memorandum prepared by Geoscience, the firm working with the Commission to conduct the groundwater modeling for the MPWSP. The memo from Geoscience summarizes and analyzes the studies and literature concerning the current understanding of the existence, location and configuration of the Salinas Valley Aquitard, and the nature of the aquifer at the MPWSP well location. The Commission requests that the SWRCB consider the Geoscience memo and the sources it cites in finalizing the Draft Review.

3. Definition of Surplus Water

In the SWRCB Draft Review at 19, the term "surplus water" appears to be defined alternately as: (1) water that is "surplus to all existing uses;" and (2) water that is surplus to "all present and potential reasonable beneficial uses." The Commission requests that the SWRCB provide clarification as to the definition of surplus water.

4. Definition of Unusable Water

In the SWRCB Draft Review at 20, reference is made to "unusable water." If the term unusable water can be quantitatively or qualitatively described by reference to a particular chemical content, chloride content or salinity, the Commission requests that SWRCB provide that description in the final SWRCB Review.

5. Physical Solution Issue

The physical solution discussion in the SWRCB Draft Review at page 24 includes the statement that:

> Cal-Am may be allowed to pump a mixture of seawater and fresh water, export the desalinated water to non-overlying parcels, and be required to return its freshwater component to the [Salinas] Basin in such a way that existing users are not harmed and foreseeable uses of the Basin are protected.

The Draft Review states that the particular method for returning such a "freshwater component" would need further examination.

Under this approach, would the Basin need to be first charged with water ("put") from an entirely non-basin source before there is a withdrawal or use ("take")? Or could there be an initial, first-step "take" if any harm to existing users would be only temporary, ending with the subsequent "put" of desalinated water? The Commission would appreciate clarification of this issue in the final SWRCB Review.

6. Public Comment Process

The Commission would support a SWRCB process that provides an opportunity for public comment (whether by hearing, written comments, or other means) prior to action by the SWRCB itself on this issue. Because of the schedule of the Commission proceeding, it would be optimal if the document finalizing the SWRCB's review of the MPWSP was available by June 1, 2013.

Again, the Commission greatly appreciates the assistance provided by the SWRCB in this matter, and also appreciates the opportunity to submit these comments on the Draft Review in advance of its release for public comment.

Please do not hesitate to contact me, or Peter Allen of the Legal Division at (415) 703-2195, or Andrew Barnsdale of the Energy Division CEQA Unit at (415) 703-3221, with any further questions or to discuss the issues addressed in this letter.

Thank you for your continued assistance in this matter.

Sincerely,

/s/ PAUL CLANON

Paul Clanon
Executive Director

cc: Thomas Howard, Executive Director, SWRCB
Michael A.M. Lauffer, Chief Counsel, SWRCB
President Peevey
ALJ Weatherford
A.12-04-019 Service List

ATTACHMENT A

BEFORE THE PUBLIC UTILITIES COMMISSION

OF THE STATE OF CALIFORNIA

In the Matter of the Application of California-American Water Company (U 210 W) for a Certificate of Public Convenience and Necessity to Construct and Operate its Monterey Water Supply Project to Resolve the Long-Term Water Supply Deficit in its Monterey District and to Recover All Present and Future Costs in Connection Therewith in Rates	Application No. 12-04-019 (Filed April 23, 2012)

SUPPLEMENTAL TESTIMONY OF RICHARD C. SVINDLAND

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January 11, 2013

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BEFORE THE PUBLIC UTILITIES COMMISSION

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SUPPLEMENTAL TESTIMONY OF RICHARD C. SVINDLAND

I. WITNESS QUALIFICATIONS

Q1. Please provide your name, position and business address.

A1. My name is Richard C. Svindland. I am the Vice President of Engineering for California American Water (CAW). My business address is 4701 Beloit Drive, Sacramento, CA 95838.

Q2. Have you provided testimony in this proceeding and what are your qualifications?

A2. Yes, I provided testimony for this project as part of CAW's original application. My qualifications, prior testimony experience and prior water and wastewater experiences are included with my original testimony.

II. PURPOSE OF TESTIMONY

Q3. What is the purpose of your supplemental testimony?

A3. The purpose of this supplemental testimony is to:

(i) discuss the status and major milestones on the project since CAW's application was filed;

(ii) discuss changes to the project since CAW's application was filed and provide an updated Project Description;

(iii) discuss any updates on the facilities and their location, design, construction, the anticipated capital cost and the anticipated operation and maintenance costs;

(iv) discuss the current project schedule;

(v) discuss the status of water rights for the project;

(vi) discuss various aspects of the public governance proposals by various agencies;

(vii) discuss several small projects that have emerged since CAW's filing;

(viii) provide additional information on CAW's Contingency Plan that was filed on November 1, 2012, and

(ix) Lastly, to address other miscellaneous items identified in the ALJ's ruling on December 26, 2012.

III. PROJECT STATUS SINCE APPLICATION FILING

Q4. What is the status of the slant test well?

A4. CAW has been actively working on the slant test well since its filing in April of 2012 and since the approval to track the costs of the test well in CAW's existing memorandum account. CAW's slant test well work has been focused in two major areas, namely: land acquisition and environmental permitting. Currently the test slant well is scheduled to be constructed in the fall / winter of 2013-2014.

CAW has revised the schedule for the slant test well due to the potential impact to a state and federal threatened bird (snowy plover) that frequents the beach in the area of the slant well that was originally proposed by CAW in its application. There are several stakeholders whom have had different opinions on the location of the slant well and this has affected the schedule. CAW and its project team have met with these stakeholders,

who include California Department of Fish and Game (CDFG), US Fish and Wildlife Service (USFWS), Monterey Bay National Marine Sanctuary, California Coastal Commission, California State Lands Commission, Monterey Peninsula Regional Parks District (MPRPD), the property owner (Cemex) and the City of Marina. Based on these meetings CAW has modified our approach to the slant test well and ultimately to the slant intake well system proposed for the project in order to accommodate the needs of the various agencies.

Q5. What were some of the differing opinions and how have they been addressed?

A5. The City of Marina wanted the slant wells located at the Cemex's north property line so as to avoid impact to recreational beach users who access the beach at the northern end of MPRPD's property which is adjacent to the southern end of Cemex's property. CDFG and USFWS wanted the slant wells to be completely south of the Cemex's property so as to avoid snowy plover habitat. Ultimately, as described in the revised project description attached to this supplemental testimony, we have proposed moving the wells into the wet part of the beach so as to avoid critical snowy plover habitat and we have changed to an all gravity intake system in lieu of the pump system so as to reduce the future need to travel up and down the beach.

Q6. What is the status of land acquisition(s) on the project?

A6. In early December 2012, CAW closed on approximately 46 acres of land located off Charles Benson Road just west of the land fill and the Monterey Regional Water Pollution Control Agency's wastewater treatment plant that will be used for its desalination plant facilities. This land is the tract that was identified in CAW's original application.

Since filing its application, CAW has been and continues to be in active negotiations with Cemex, the property owner that owns 376 acres and 7,000 feet of ocean front property due

west of the desalination plant site. These negotiations have resulted in allowing access to the site on two occasions so environmental work could proceed and most recently we have been working to finalize our permit application to the City of Marina for the slant test well Coastal Development Permit. This permit requires acknowledgment from the property owner. Cemex is currently reviewing the revisions to the project description in light of the recent changes due to snowy plover. Based on these active negotiations, CAW believes it will be able to obtain land rights for its intake system by the fall of 2013.

Q7. Are there any changes to customer demands or supplies?

A7. As part of its application, CAW indicated it needed new supplies of 9,006 acre foot per year (AFY) in order to meet an annual estimated demand of 15,250 AFY. This estimated demand was derived from the last Environmental Impact Report ("EIR") and was the amount agreed upon by the parties in the settlement adopted in decision ("D.") 10-12-016. Since we filed our application, a couple of items have been brought to our attention that merits an adjustment to the estimated annual demand. These changes are as follows:

- A payback schedule for the Seaside Groundwater Basin was set at 25 years. Essentially, this reduces the available supply from the Seaside Basin from 1,474 AFY to 774 AFY.
- The tourism industry pointed to recent reductions in their occupancy rates that will come back and since they are existing customers, the use of a 5 year historical average may not reflect their true demand. We have reviewed past water use by commercial class users and have allocated 500 AFY for this updated demand return.
- With recycle water improvements made by the Pebble Beach Company in the last 5 year period, we have an additional 325 AFY of potable water demand that needs to be included in future demands.

In its application, CAW provided the estimated demands for the Lots of Records (LOR) (1,181 AFY) and the General Plan Buildout (GPBO) (4,545 AFY). During the Technical and Cost Workshops we showed different demand scenarios and how these demands could be met with the facilities sized to meet the 15,250 AFY. As part of this supplemental testimony, we have re-evaluated the plant size to accommodate the above listed supply and demand changes and to accommodate LOR with the assumption that current demands remain equal to the 5 year historical average which is approximately 13,290 AFY.

Summed up, the revised demands are 15,296 AFY, however, due to the reduction in the Seaside Basin supply, the desal plant needs to be sized larger by approximately 700 AFY or 0.6 million gallons per day (MGD) to account for the reduction in supply. Please refer to Attachment 1 which is a plant sizing memorandum from RBF Consulting dated January 7, 2013 that discuses the updated sizing of the desal plant with and without the Groundwater Replenishment (GWR) project.

Q8. How will CAW factor in the City of Pacific Grove's three small projects?

A8. CAW has met with the City of Pacific Grove officials on several occasions with the most recent meeting occurring on January 2, 2013, to discuss the three small projects it has proposed as part of this application. CAW has stated in filings as part of this proceeding that it supports these projects so long as they do not impact existing customers in terms of costs and so long as these three small projects do not detract from CAW's resources needed to implement the MPWSP. With that said, CAW will assist the City and is currently working on a Memorandum of Understanding with the City to provide a framework for how these projects may be factored in to CAW's water supply portfolio. Because these projects are in the development stage, it is speculative to include them in

the sizing of the desal plant; however, if and when they occur we would reduce the operating level of the desal plant, thereby increasing plant reliability.

Q9. Is there an update to the project schedule?

A9. Yes, an updated schedule is attached as Attachment 2. This schedule reflects recent changes to the slant test well, incorporates the CPUC's revised procedural schedule and replaces Appendix B of CAW's original Application.

Q10. Will the revised schedule allow CAW to meet the Cease and Desist Order (CDO) deadline?

A10. No. Based on this revised schedule, the desal plant is not expected to be on-line until December of 2017, a full 11 months past the CDO deadline.

Q11. What is the current status on water rights?

A11. On December 21, 2012, the State Water Resources Control Board issued its report to the Commission on water rights for the MPWSP. In general, this report confirmed the validity of the legal positions that CAW set forth in its water rights brief submitted to the Commission. Some of the important points made by the State Water Resources Control Board include: (1) that no water right is needed to pump and use seawater for the MPWSP; (2) that consistent with California law and the California Constitution, the MPWSP may appropriate brackish water from the Salinas Groundwater Basin, as "developed" or "surplus" water, so long as CAW's pumping does not cause legal injury to Basin users; and (3) that such appropriation would be consistent with the physical solution doctrine.

Moreover, the technical record for the North Marina Alternative of the Regional Project – which is based on the most recent and best available scientific and technical information –

fully supports the position that the MPWSP will not result in legal injury to Salinas Basin groundwater users. CAW expects that the proposed test slant well will reconfirm these conclusions.

Finally, CAW understands that there is controversy as to whether the 180-foot aquifer is a confined or unconfined aquifer, and the attendant effects of MPWSP pumping in light of those conditions. As of yet, CAW has not had an independent hydrogeologist evaluate those claims and has not decided if it will hire its own expert. CAW understands that the Commission may address that controversy in its EIR. CAW has reason to believe, however, that reports claiming the 180-foot aquifer is a fully confined aquifer are based on outdated information.

Q12. How does the Settlement Agreement between CAW, the County of Monterey County, and the Monterey County Water Resources Agency, executed December 4, 2012, ("Monterey County Settlement") impact the project?

A12. Although the Monterey County Settlement is subject to Commission approval and will be considered in a separate proceeding, the settlement spells out requirements for a Groundwater Monitoring Plan. The purpose of the Groundwater Monitoring Plan is to protect water in the Salinas River Groundwater Basin and prevents its export, in furtherance of the Monterey County Water Resources Agency Act. Although not specifically called out in a budget line item, the costs of implementing this Groundwater Monitoring Plan are included in the capital costs and O&M costs for the project.

IV. PROJECT COSTS

Q13. Are there updated costs of components for the project?

A13. Yes. As previously discussed, we have considered a larger desal plant to accommodate the changes in demand and supply. With this larger desal plant, the costs (both capital and O&M) have been updated to reflect the changes needed to build a slightly larger facility.

Please see the Cost Memorandum from RBF Consulting dated January 9, 2013, included as Attachment 3. Furthermore, the Financial Model, recently made available to parties to the service list on January 3, 2013, has been updated to include these updated capital and O&M costs.

Q14. Do you have any concerns using a Net Present Value (NPV) analysis to compare projects?

A14. Yes, as part of the Cost workshop held on December 11-12, 2012, the CPUC staff requested CAW to include a NPV calculation in its Financial Model so as to be able to compare alternative projects and so that parties could compare different projects. Although NPV calculations can be made, incorrect assumptions will lead to an unfair comparison of projects. It is important to note that future capital replacement expenditures can have a large effect on the results of this analysis. Another caution when using this analysis is the comparison of two projects that compare two different elements, one of which may not be permittable. As an example, take the comparison of the Open Ocean Intake versus a series of slant wells. The Open Ocean intake would likely have a lower capital cost and replacement cost than the series of slant wells, but given the fact that the legal and permitting issues associated with this intake could take 2 to 10 years, how would one interpret the results? The supplemental testimony of Mr. David Stephenson addresses a number of concerns regarding the use of NPV analysis to compare different financing and operating scenarios of its proposed project. .

Q15. Have there been any developments with respect to the cost of electricity?

A15. As indicated in the cost memorandum, RBF Consulting assisted CAW in estimating electrical power rates in its April 2012, application using rate estimates developed in 2009 for the Coastal Water Project (CWP) in Application ("A") 04-09-019 and applying an escalation factor to reflect estimated 2012 costs. Power rates presented in that proceeding were developed using applicable tariff or rate schedules from PG&E for each facility.

These estimated power rates were based on using the E-20 Primary voltage schedule for the desalination plant, and using PG&E's E-19 Primary voltage schedule for the desalinated water conveyance and ASR facilities.

As part of this supplemental testimony CAW has updated the assumed average power rates that will be applied to energy consumption at the desalination plant and the intake facilities. CAW worked directly with PG&E representatives to develop a rate analysis based on their December 2012, E-20 rate schedule. Using a monthly electrical load based on an CAW estimated water demand, PG&E developed an estimated average summer and winter rate in dollars per kilowatt-hours ($/kWh) for the three service types on the E-20 rate schedule; E-20 Secondary voltage, E-20 Primary voltage, and E-20 Transmission voltage. Secondary voltage is served from PG&E distribution lines. Primary voltage is also served from distribution lines but without a service transformer. Transmission voltage is served from transmission lines without a service transformer. The analysis showed a reduction in the average summer and winter power rates as compared to those presented in our April 2012 application. For example, on the 9.0 MGD plant the E-20 Transmission voltage schedule for summer usage yielded an average rate of $0.0964/kWh, and for winter yielded an average rate of $0.0764/kWh, which equates to a blended average rate of approximately $0.0867/kWh. For the 9.6 MGD plant the E-20 Transmission voltage schedule for summer usage yielded an average rate of $0.1003/kWh, and for winter yielded an average rate of $0.0771/kWh, which equates to a blended average rate of approximately $0.0888/kWh.

As part of the updated Financial Model, we have included the blended electrical rate for each of the three electric service types based on CAW's interaction with PG&E. The model also reflects the rates estimated by RBF Consulting in their cost memorandums. Attachment 4 to this supplemental testimony includes the analysis prepared by PG&E for

the 9.6 MGD facility. The PG&E analysis was performed for the various plant size scenarios based on the power requirements. The PG&E rates were included in the revenue requirement modeling as reflected in the supplemental testimony of Mr. Jeffrey T. Linam.

Q16. What other actions has CAW taken to try to lower the power costs for customers?

A16. In addition to consulting with PG&E representatives, CAW has explored other Commission approved programs that could result in lower power costs to customers. Those programs include Direct Access (DA) and Community Choice Aggregation (CCA), which are alternative procurement options under PG&E's tariffs. DA would allow CAW to purchase electric power from Energy Service Providers while CCA would require cities, counties or any group of cities and counties to aggregate the electric load of utility end-use customers within their service areas for the purpose of acquiring and providing their electric power needs. CAW continues to explore these options as a way to further lower the power prices to the project and ultimately customers.

Q17. Are you changing any of the contingency factors used in the cost estimates?

A17. No. While we have learned several items since our filing, such as the amount of the land purchase for the desal plant, we have yet to fully permit and design any of the facilities. As such it is premature to reduce any of the contingency factors that we have used to estimate the cost of this project.

Q18. Are there any impacts of the project capacity?

A18. Yes, as previously discussed the size of the plant has increased to account for the Seaside Groundwater Basin payback, tourism bounce back, Pebble Beach and LOR. Please refer to the RBF Consulting Sizing Memorandum in Attachment 1.

Q19. Can you summarize the changes CAW is seeking in this supplemental testimony?

A19. Yes, specifically, CAW is seeking to make the desal plant slightly larger to accommodate the changes in demand and supply. Additionally, much like it did in its application, should the GWR project come on line in time, CAW would also be seeking to make the smaller desal plant slightly larger as well. The slightly large plant is now estimated at 9.6 MGD and the smaller plant accounting for GWR is now estimated at 6.4 MGD. The 9.6 MGD plant would need to deliver 9,752 AFY and the 6.4 MGD plant would need to deliver 6,252 AFY.

V. COST IMPACT OF CONTINGENCIES

Q20. Can you clarify mitigation costs?

A20. The mitigation cost in our capital cost estimate is a line item used to cover various items that are likely to arise during the permitting process of the project. An example would be the cost to pay into a wetland bank for any disturbed wetlands along the project corridor or the additional monitoring that may be required when working around threatened species. Following the discussion of the mitigation cost for the project at the December 11-12, 2012 cost workshops, I confirmed that the mitigation costs for the larger desal plant project is estimated at 1%. For the smaller desal plant project; however, the mitigations cost was kept at the same value as the larger project because it is believed that the smaller amount of capital at the desal plant site would not reduce the overall mitigation cost for the entire project corridor since the project corridor remains essentially unchanged. Thus the mitigation cost is slightly higher than 1% but is less than 2% for the smaller project.

Q21. What is the useful life of the intake/outfall at the Moss Landing Power Plant and the other Moss Landing items used in the Contingency Plan?

A21. We believe the Moss Landing Power Plant was initially constructed in 1950, and it is assumed that the discharge tunnel was constructed at that time as well. Absent any type of

condition survey report or physical inspection report, the useful life of the buried infrastructure (discharge conduit) is unknown at this time; however, based on CAW's experience and from a rate making depreciation standpoint, structures of this type have been known to last 80 - 100 years or more, even in seawater. It is unknown if this conduit was damaged in the Loma Prieta quake or any other previous seismic event and as such a condition assessment is recommended before proceeding with any option that involves use of this conduit.

In a quick survey of available records, we could find no information about when the intake structures for the original plant were constructed, but we can assume that the original intake structures were constructed at the current location of the intakes for Power Generation Units Nos. 1 and 2, so portions of that intake structure may be more than 60 years old.

It appears that Power Generation Units No. 1 and 2 were repowered in 2002, and the Disengaging Basin (a reinforced concrete structure that receives the spent cooling water from Units No. 1 and 2) and associated tail works was also built at that time. An aerial photograph taken in June of 1993 clearly shows that the Disengaging Basin was not there at that time. We can conclude that this structure is between 10 and 20 years old. From personal observation, it appears to be in good condition.

From a strictly ratemaking perspective and based on what we have learned to date, we would estimate that the discharge conduit probably has 40 years of useful life, the concrete structure portion of the Unit Nos. 1 and 2 probably has less than 20 years of useful life, and the Disengaging Basin probably has 50 or more years of useful life. All of these assume that use of once through cooling water continues. If the facilities are not in use, we would expect them to degrade much more rapidly.

As-built drawings of the National Refractories outfall are dated as 1971. The seafloor and the marine environment are very corrosive and it is assumed that the useful life of outfall facilities is 50 years. However, the outfall was visually inspected, as presented in the "Evaluation of Seawater Desalination Projects Proposed for the Monterey Peninsula" by MPWMD dated February 20, 2008, earthquakes have caused joint separation on the National Refractories Outfall and damaged the outfall significantly. We have assumed that the outfall will require rehabilitation and modifications for using either as an intake or an outfall. The contingency plan assumes approximately $3,000,000[1] would be required to convert the outfall into an intake and $4,000,000[2] would be required to modify the outfall for discharge to meet the Ocean Plan requirements. Upon completion of these improvements the useful life of these assets would be expected to be greater than 50 years.

The existing intake at National Refractories site is approximately the same age (40 years), and we expect it is in poor condition, since it has not been used for years. In the contingency plan, we estimated $1,000,000[3] to rehabilitate the structure and install new screens at this facility. Even with rehabilitation of the structure; however, we would not count on a useful life of more than 20 years for this facility without the need to replace or repair the reinforced concrete pier components.

Q22. What are the timelines, permitting issues, cost impacts and financial impacts of the items in your Contingency Plan?

A22. We have spent considerable time since the Cost workshops focusing on timelines and permitting risks for all the options that were presented in our Contingency Plan. In the Contingency Plan we reviewed eight intake options, four discharge options and eight options for plant siting. Looking at different combinations of these options, we conducted

[1] This cost does not include potential litigation costs that may arise during the permitting of these improvements.
[2] This cost does not include potential litigation costs that may arise during the permitting of these improvements.
[3] This cost does not include potential litigation costs that may arise during the permitting of these improvements.

a schedule and permitting risk assessment for twenty three combinations of projects. The results were that twelve would still meet a December 2017 completion date, that seven would not be complete until April 2018 and that four would not be complete until July of 2018, all assuming no length legal challenges. Please refer to Attachment 5 which is a memorandum from RBF Consulting dated January 9, 2013, for the timelines and permitting issues associated with the Contingency Plan filed by CAW on November 1, 2012. The cost impacts of each of these Contingency Plan items was summarized in the November 1, 2012 filing, however, included as Attachment 6 are further details for the costs impacts on the project for each of the items in the Contingency Plan. In terms of financial impacts for each of the items in the Contingency Plan CAW is not easily able to determine this based on the uncertainty and complexity of the issue.

Q23. What are the O&M costs for the various items in your contingency plan?

A23. We have also spent considerable time since the Cost workshops working on the expected O&M costs for all the options that were presented in our Contingency Plan. These O&M costs included changes to items such as: pumping costs, replacement and repair costs, membrane replacement costs, pretreatment costs, etc. As discussed above, in the Contingency Plan we reviewed eight intake options, four discharge options and eight options for plant siting. Of these, six options that had no change in annual O&M costs, five options that had increase O&M costs of less than $1M per year and nine that had increase O&M costs between $1M and $1.4M per year. Please refer to Attachment 7 which is a memorandum from RBF Consulting dated January 9, 2013, for the additional O&M costs associated with each option in the Contingency Plan filed by CAW on November 1, 2012. Additionally, Attachment 8, is a print out of the detailed spreadsheets used to compute the additional O&M per option.

Q24. Can you reduce the pipeline length in your contingency plans?

A24. No. At the cost workshops, I indicated that the routes we selected to run pipelines to and from our Charles Benson Road desal plant site and the various options at Moss Landing did not necessarily follow the shortest route which I indentified as being State Hwy 1. Although CAW acknowledges that the shortest possible, permittable route should be the desired route, we did not follow the State Hwy 1 route based on our experience with Caltrans that they prefer not to have utilities located within their right of way on major state roads. Starting at the intersection of Charles Benson Road and Del Monte Blvd and ending at the intersection of Hwy 1 and Dolan Rd, this route is approximately 6.6 miles long (34,800 feet). The alternate route that we included for all the Contingency Options using Moss Landing area components was to run east along Dolan Rd, south along Castroville Road, west along Hwy 156 and then parallel Hwy 1 for the remaining distance to Charles Benson Road and Del Monte Blvd which is located just south of Hwy 1. This route is 7.9 miles in length (41,700 feet); however, if we were to locate the desal plant at the formerly approved FEIR site along Dolan Road, the length of finished water pipeline from this site to the intersection of Charles Benson Road and Del Monte Blvd is 6.6 miles, since the Dolan road site is 1.3 miles east of the intersection of Hwy 1 and Dolan Road. Thus, depending on the Contingency Plan item being contemplated the routes are identical in length.

Q25. Are there any updates to the cost in the Contingency Plan filed on November 1, 2012?

A25. Yes, based on the updated costs done for this supplemental testimony we have gone back and readjusted the cost of each option. Please see Attachment 9 which is an updated memorandum from RBF Consulting dated January 9, 2013 that contains the updated costs. To make the changes easier to see, we have included updated tables with the “as-filed” number and the “revised numbers”.

Q26. Please discuss the status of permits?

A26. Please see Attachment 10, a memorandum from RBF Consulting dated January 9, 2013, which discusses the various permits and the status of the many permits needed for a project of this complexity. It is important to note that until the EIR is certified for this project very limited permit processing can occur. Thus the only active permitting items for the project currently relate to the test slant well.

Q27. Please discuss whether the parallel processing of permits will save time?

A27. CAW acknowledges the benefit in certain circumstance of the parallel processing of permits to save time, and in fact for most of, if not all of our capital projects across the state we do apply for multiple permits at one time that all relate to the same project. It is important; however, to note that there are some regulatory agencies that will only finalize their permit after all other agencies have granted their permit. Thus, we will not be able to have a parallel process for all the permits on this project. Lastly, we want to point out that it is not advisable to process different parallel permits for different designs on the same project because the reviewing regulatory body is likely to not review the permits in a timely manner due to differing stakeholder perspectives.

Q28. Please explain the reason why CAW would like the Hwy 68 corridor water main covered in the environmental review?

A28. The Highway 68 main is necessary to address the effects of the Seaside Basin Adjudication on sources of supply to the Ryan Ranch, Bishop, and Hidden Hills water distribution systems. Under the Adjudication, in 2021, the entire Natural Safe Yield of the Laguna Seca subarea of the Seaside Basin will be allocated to "alternative producers"[4] and

[4] Under California groundwater law, overlying groundwater rights are superior to appropriative groundwater rights. The parties to the adjudication having "alternative production allocations" all have overlying groundwater rights. The total of all alternative production allocations (which are not subject to the "rampdown" provisions of the judgment) in the Laguna Seca subarea exceed the Natural Safe Yield of the Laguna Seca subarea.

there will be no water to allocate to "standard producers"[5] such as CAW. Accordingly, CAW needs the flexibility to deliver MPWSP product water to the Ryan Ranch, Bishop and Hidden Hills distribution systems via the Highway 68 main. CAW has included water demanded by customers in those systems in its demand estimates for the MPWSP.

Having water available to meet that demand is not enough for CAW to address all of the effects of the Adjudication on the Laguna Seca Subarea. The Adjudication also includes "anti-portability" clauses. The anti-portability provisions are found in Section III.M.3.c. of the Judgment. Under the anti-portability provisions, a Producer such as CAW may physically pump water from the Coastal Subbasin and then export it for use in the Laguna Seca subarea, but water may not be physically pumped from the Laguna Seca subarea and accounted for against a right to produce water in the Coastal subarea. Thus, barring an amendment to the judgment, when the Operating Yield becomes equal to the Natural Safe Yield, CAW will no longer have the right to produce groundwater in the Laguna Seca subarea. Accordingly, CAW will need to supply its customers that overly the Laguna Seca subarea, specifically customers served by the Ryan Ranch, Bishop and Hidden Hills distribution systems, with water produced elsewhere and then pumped into those distribution systems. Although CAW is not requesting the Commission to approve these pipelines as part of this Application, CAW has suggested that the Commission include the environmental impacts of such pipelines in the EIR to ensure the Commission is fully informed of the environmental impacts related to distributing MPWSP product water within CAW's service area.

[5] The parties to the adjudication having "standard production allocations" (including CAW) all have appropriative groundwater rights.

Q29. How does CAW intend to work with the Public Agencies whom have requested a governance role in the project?

A29. CAW is continuing to negotiate with the Monterey Peninsula Regional Water Authority, the Monterey Peninsula Water Management District, and the County of Monterey (collectively, the "Public Agencies") regarding a potential acceptable compromise pertaining to the governance and financing of the Project. CAW most recently met with the Public Agencies on January 10, 2013. The parties discussed a proposal by the Public Agencies for partial public financing of the Project, as well as proposed revision to the governance proposals previously exchanged between the parties. CAW believes the meeting was very productive. Another meeting with the Public Agencies has been set for January 17, 2013. If an agreement is reached between CAW and the Public Agencies, the proposal would then be submitted to the CPUC for its consideration.

Q30. Do you have a revised Project Description and Project Figures?

A30. Yes, please see Attachment 11, which is a revised Project Description based on the changes provided as part of this supplemental testimony. This revised project description was prepared by RBF Consultants dated January 9, 2013 is in a memorandum format and replaces Appendix H of CAW's Application. Also included as Attachment 12 are revised figures that replace Appendix C of CAW's Application.

Q31. Does this conclude your supplemental testimony?

A31. Yes, it does.

NOTICE OF AVAILABILITY

Attachments 1-12 in support of California American Water's *Supplemental Testimony of Richard C. Svindland* exceed 50 pages in length and 3.5 megabytes in size. Therefore, pursuant to Rules 1.9(d)(1)-(2), California American Water hereby provides this Notice of Availability of Attachments 1-8. Beginning on January 11, 2013, California American Water will make Attachments 1-12 available at the following website: http://www.watersupplyproject.org/downloads.

If a party, on whom this Notice of Availability is served, is unable to access the attachments via the website, California American Water will provide a copy of Attachments 1-12 upon written request to:

Margaret Bailes
Paralegal – Legal, Regulatory
California American Water
333 Hayes Street, Suite 202
San Francisco, CA 94102
Phone: (415) 863-2470
Fax: (415) 863-0615
Email: margaret.bailes@amwater.com

Attachments to the *Supplemental Testimony of Richard C. Svindland*

Attachment 1 – Desalination Plant Sizing Memo, Jan. 7, 2013.

Attachment 2 – Revised Schedule for the Monterey Peninsula Water Supply Project ("MPWSP").

Attachment 3 – MPWSP Capital and O&M Cost Estimate Update, Jan. 9, 2013.

Attachment 4 – PG&E Electric Rate Analysis

Attachment 5 – MPWSP Project Implementation Schedule Analysis, Jan. 9, 2013.

Attachment 6 – Contingency Capital Costs Details.

Attachment 7 – O&M Cost Comparison for the Contingency Options, Jan. 9, 2013.

Attachment 8 – Contingency O&M Comparison.

Attachment 9 – Contingency Planning for Planning for the MPWSP *(Update of Nov. 1, 2012 TM)*, Jan. 9, 2013.

Attachment 10 – Permitting Status Update, Jan. 9, 2013.

Attachment 11 – MPWSP Project Description Update, Jan. 9, 2013.

Attachment 12 – Revised Project Figures.

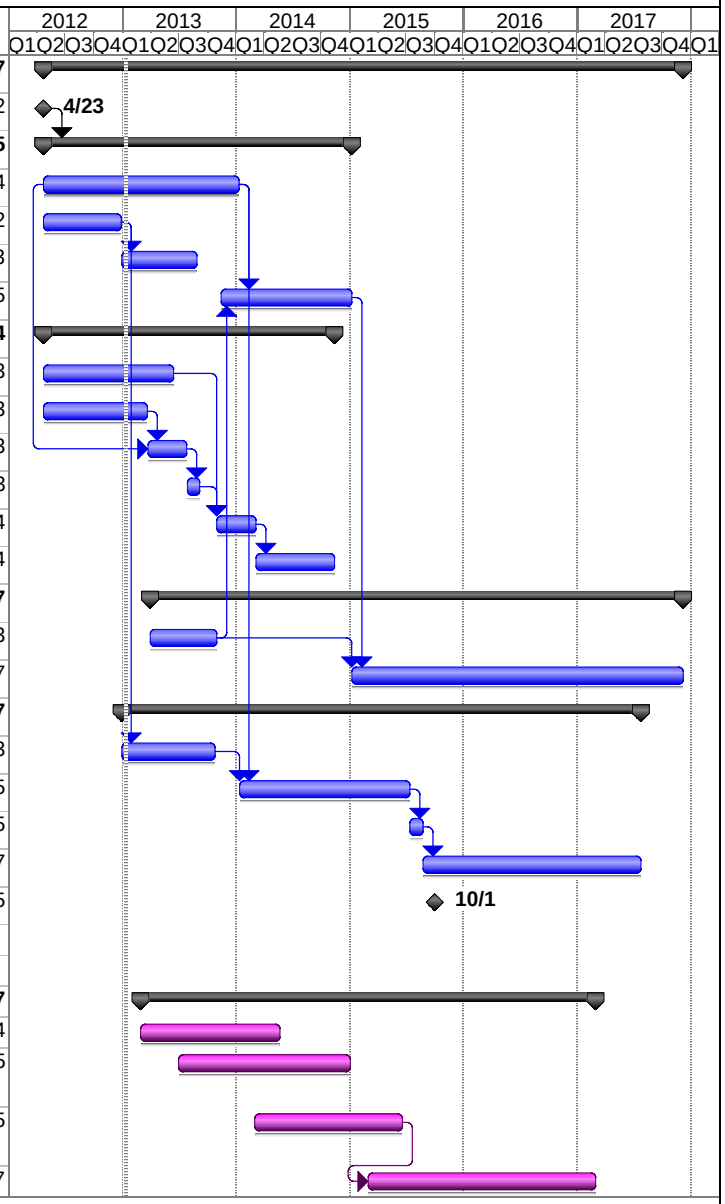
Dated: January 11, 2013

By: Margaret Bailes
Margaret Bailes

Attachment 2

Revised Schedule for MPWSP

ID	Task Name	Duration	Start	Finish
1	**CAW Project**	**1469 days?**	**Mon 4/23/12**	**Thu 12/7/17**
2	**File with CPUC**	0 days	Mon 4/23/12	Mon 4/23/12
3	**Permitting**	**709 days?**	**Mon 4/23/12**	**Thu 1/8/15**
4	CPUC Approval	450 days	Mon 4/23/12	Fri 1/10/14
5	Pre-Application Activities	180 days?	Mon 4/23/12	Fri 12/28/12
6	Application Preparation and Submittal	173 days?	Mon 12/31/12	Wed 8/28/13
7	Permit Processing	300 days	Fri 11/15/13	Thu 1/8/15
8	**Feedwater Test Well**	**669 days**	**Mon 4/23/12**	**Thu 11/13/14**
9	Permitting	300 days	Mon 4/23/12	Fri 6/14/13
10	Site Acquisition	240 days	Mon 4/23/12	Fri 3/22/13
11	Design	90 days	Mon 3/25/13	Fri 7/26/13
12	Driller Procurement	30 days	Mon 7/29/13	Fri 9/6/13
13	Construction	90 days	Fri 11/1/13	Thu 3/6/14
14	Operation	180 days	Fri 3/7/14	Thu 11/13/14
15	**DB Delivered Items**	**1224 days**	**Mon 4/1/13**	**Thu 12/7/17**
16	DB Contract Procurement	154 days	Mon 4/1/13	Thu 10/31/13
17	Design / Construction / Startup	760 days	Fri 1/9/15	Thu 12/7/17
18	**DBB Delivered Items**	**1191 days?**	**Mon 12/31/12**	**Mon 7/24/17**
19	Design Contract Procurement	215 days?	Mon 12/31/12	Fri 10/25/13
20	Design	391 days?	Mon 1/13/14	Mon 7/13/15
21	Bid	30 days	Tue 7/14/15	Mon 8/24/15
22	Construction / Startup	500 days	Tue 8/25/15	Mon 7/24/17
23	Decision on GWR	0 days	Thu 10/1/15	Thu 10/1/15
24				
25				
26	**GWR Project**	**1044 days**	**Fri 3/1/13**	**Wed 3/1/17**
27	Environmental Permitting	320 days	Fri 3/1/13	Thu 5/22/14
28	Pilot Plant Testing & Develop Final Design	395 days	Mon 7/1/13	Fri 1/2/15
29	Final Design	340 days	Mon 3/3/14	Fri 6/19/15
30	Construction	523 days	Mon 3/2/15	Wed 3/1/17



Project: MPWSP Project High Level pe
Date: Thu 1/10/13

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

Attachment 9

M E M O R A N D U M

REGISTERED PROFESSIONAL ENGINEER
No. 26189
Exp. 3-31-2014
PAUL L. FINDLEY
STATE OF CALIFORNIA
9 January 2013

To: Richard Svindland, California American Water
From: Paul Findley, RBF Consulting
Date: January 9, 2013
Subject: Contingency Planning for the MPWSP *(Update of November 1, 2012 TM)*

On November 1, 2012, RBF produced the original Technical Memorandum (TM) on this subject and provided descriptions and cost estimates of intake and discharge facilities for the proposed project and various contingency options. Since that time, as a result of discussions with Federal and State regulatory agencies, the size of the desalination plant and location and construction method for the proposed slant intake wells on the beach sites at CEMEX has changed significantly, and the Project's conceptual design, cost estimate, and schedule have been updated (see RBF Consulting TMs dated July 7, 2013 and July 9, 2013 on these subjects). In some cases, the description of the contingency option has also been refined, based on information developed since the date of the original TM. This has resulted in changes in the estimates of incremental capital costs for the contingency options, and these changes are presented in this update. This update also provides the incremental cost impacts for the site contingency options, which were not provided in the original memorandum but are provided here at the request of CPUC.

In this update, additions or changes to the original TM are shown in bold italics.

As requested, this technical memorandum presents contingency planning options to consider in the event that the Monterey Peninsula Water Supply Project cannot be implemented as currently proposed. The project proposed in the original application envisions a ***9.6*** mgd or ***6.4*** mgd desalination plant located at a site on Charles Benson Road (CBR) near the Monterey Regional Water Pollution Control Plant. This desalination plant would receive water from ***7 to 9*** slant wells located on the beach on sites that would be acquired from CEMEX ***and/or the State of California***. These wells were originally conceived as drawing water from under the ocean floor from the 180-foot aquifer. However, in order to minimize impacts on the 180-aquifer, the currently proposed concept is for these wells to draw water from under the ocean floor from either the surface formation (aquifer) known as the Sand Dunes Formation or the deeper 180-foot aquifer, or from both. Concentrate from the RO process, also known as brine, will be discharged through a pipe connection to the ocean outfall of the Monterey Regional Water Pollution Control Plant.

We believe that this project concept for intake, plant site, and brine discharge is the most cost-effective of the options that have been reviewed in the last year. However, this technical memorandum considers contingency plans in the event the proposed intake method or site is not feasible; in the event the proposed method of brine disposal is not feasible, or in the event a change in the desalination plant site is required.

Implementation Schedules for the Proposed (Base) Project and each Contingency Option have been prepared and are provided in a separate RBF Consulting Memorandum dated January 7, 2013.

The above dates do not include time for potential litigation which could range from 2 to 10 years for certain options such as open ocean intakes.

PROPOSED PROJECT: Shallow slant wells at CEMEX that extract seawater from the Sand Dunes and/or 180- foot formations.

The slant test well at north CEMEX site is currently planned to have screens that test both the 180-foot and Sand Dunes formation, with the objective of testing to determine if the Sand Dunes and/or 180-foot formations are sufficiently productive to meet project requirements with 10 or fewer wells. For purposes of illustration, it is assumed that ***9*** wells (two four-well clusters ***plus the test well converted to a production well***) would be required to extract ***23*** mgd of water from the Sand Dunes and/or 180-foot formations in order to support a **9.6** mgd desalination plant.

The slant wells would be configured ***as gravity wells*** in order to minimize access and maintenance requirements associated with submersible well pumps. The final selection will be made on the basis of the test well program results. All wells would be connected by a ***900 LF 36***-inch diameter beach pipeline that would connect to a **2,500 LF** 36-inch diameter carrier pipe that would convey the seawater under the dunes to ***a 23 mgd intake pump station which would be installed at the eastern edge of the dunes***. ***The beach pipeline and beach access tunnel would be installed by trenchless construction. An 8,300 LF 36-inch diameter pipeline would convey the water from the eastern edge of the dunes to the desalination plant. The*** pipeline crossing under Highway 1 would be installed with trenchless construction.

The brine generated from the desalination plant would be conveyed to the MRWPCA wastewater treatment facility and discharged into the existing outfall.

The configuration of intake and discharge facilities for the proposed project is presented in Figure 1.

The estimated capital costs (2012) of the intake and brine discharge costs are presented below.

	November, 1, 2012	***January 9, 2013***
Slant Intake Wells (wells, pipelines, land):	***$ 36,000,000***	***$ 50,300,000***
Tunnel under Coastal Dunes:	***$ 8,900,000***	***$ 8,200,000***
Intake Pump Station:	***$ 5,900,000***	***$ 6,400,000***
Intake Pipeline :	***$ 5,000,000***	***$ 4,700,000***
Brine Discharge Pipeline:	***$ 1,000,000***	***$ 5,100,000***
Outfall Connection Fee:	***$ 3,100,000***	***Included above***
CSIP Return	***Not Included***	***$ 1,100,000***
Total Capital Costs (2012)	***$ 59,900,000***	***$ 75,700,000***

Note that cost analysis presented in the remainder of this memo is presented on the basis of incremental cost difference (i.e., net change) to the above January 9 cost estimate.

INTAKE CONTINGENCY OPTIONS

If a slant well intake system at CEMEX as proposed in the application is not possible, then:

Intake Contingency Option 1: Ranney collectors at CEMEX property that extract seawater from the Sand Dunes formation.

This contingency option would also be considered if the proposed extraction from the 180-foot aquifer is not possible, and slant well test results indicate that the Sand Dunes formation is sufficiently productive for a design

based on Ranney collectors. Each Ranney collector would consist of a 10- to 20-foot diameter buried caisson, extending to a depth of approximately 50 feet below the beach surface, with 100 to 300 foot long horizontal collector wells extending radially in a semi-circle pattern. Although portions of the horizontal well screens would be under the ocean floor, portions would be under the beach. For purposes of illustration, it is assumed that four Ranney collectors would be required for this contingency option in order to extract ***23*** mgd of feedwater for a **9.6** mgd desalination plant. ***The Ranney collectors would be configured as a gravity system draining to a pump station on the east side of the dunes.***

The collectors would be connected by an 1,800 LF 36-inch diameter beach pipeline that would connect to a 2,500 LF 36-inch diameter carrier pipe that would convey the seawater under the dunes to a 23 mgd intake pump station which would be installed at the eastern edge of the dunes. The beach pipeline and beach access tunnel would be installed by trenchless construction. An 8,300 LF 36-inch diameter pipeline would convey the water from the eastern edge of the dunes to the desalination plant. The pipeline crossing under Highway 1 would be installed with trenchless construction.

The brine generated from the desalination plant would be conveyed to MRWPCA wastewater treatment facility and discharged into the existing outfall.

This contingency option is presented in Figure 2.

Estimated Capital Cost Impacts

		November, 1, 2012	***January 9, 2013***
4 Ranney Collectors (Excl. Land):		***$ 35,000,000***	***$ 40,000,000***
Additional 600-ft of Beach Pipeline:		***$ 900,000***	***$ 1,400,000***
Avoided Costs of Slant Wells (Excl. Land)	***:***	***($35,000,000)***	***($ 39,800,000)***
Net Capital Cost Increase (2012 dollars):		***$ 900,000***	***$ 1,600,000***

Pros

- Ranney collectors are proven technology and have been used in numerous projects
- This intake contingency option would not have any advantages with respect to the proposed project, although it would allow project to move forward on the current site if slant wells become infeasible.

Cons

- Construction of each Ranney collector might not be completed in a 5-month Snowy Plover non-breeding season. Deep and large diameter collector shaft construction could increase the costs and increase permitting risks.
- Higher average use and pumping costs due to potentially greater drawdown compared to the slant wells
- Ranney collectors are difficult to test at a demonstration scale.
- Confined space below ground entry is required for maintenance.
- Possible length limitation on horizontal collectors could result in significantly less well screen directly below the ocean floor.

Intake Contingency Option 2: Open ocean intake offshore from CEMEX property.

This contingency option involves construction of a new wedge-wire passive screen intake which would be installed on the ocean floor at a depth of approximately 40 feet of water approximately 2,400 feet offshore from

the CEMEX property. The intake screen would be mounted on a vertical shaft that that would be connected to a 5,000-foot long 36-inch diameter pipeline that would terminate at a 23 mgd pump station on the eastern edge of the dunes. This pipeline would be installed with trenchless technology under the ocean floor, the beach and the dunes. From the pump station, ***an 8,300*** LF 36-inch diameter pressure pipeline would convey the water to the desalination plant. The pipeline crossing under Highway 1 would be installed with trenchless construction.

A membrane or media filtration system would be required for this alternative to provide adequate removal of algae and suspended and colloidal solids prior to reverse osmosis, and to provide pathogen log-removal credits as required by the Safe Drinking Water Act.

The brine generated from the desalination plant would be conveyed to the MRWPCA wastewater treatment facility and discharged into the existing outfall.

This contingency option is presented in Figure 3.

Estimated Capital Cost Impact

	November, 1, 2012	***January 9, 2013***
Longer Tunnel:	***$ 10,500,000***	***$ 9,200,000***
Terminal Structure:	***$ 3,000,000***	***$ 3,400,000***
Wedge-wire Screens:	***$ 300,000***	***$ 300,000***
Pretreatment:	***$ 30,000,000***	***$ 33,300,000***
Avoided Cost of Slant Wells:	***($ 36,000,000)***	***($ 42,600,000)***
Net Capital Cost Increase (2012 dollars):	***$ 7,800,000***	***$ 3,600,000***

Pros

- No impact on groundwater
- No construction on the beach
- Virtually unlimited supply
- Faster to construct
- No seasonal construction restrictions
- No initial tests required

Cons

- Increased construction risk
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown feasibility of acquiring a construction permit in the marine sanctuary
- Increased pretreatment requirements
- Intake screens are exposed to ocean hazards
- Unknown additional impingement and entrainment mitigation costs

Intake Contingency Option 3: Slant well intake system at Portrero Road with feedwater pumped to Desalination Plant at CBR site.

For this contingency option, slant wells would be installed at the parking lot on the west end of the Portrero Road and along the roadway that parallels the beach north of the parking lot. For purposes of illustration, it is

assumed ***that 9 pumped*** wells would be required to extract 23 mgd of water from the Sand Dunes formation at this location. The intake wells would pump water into a ***1,600 LF 36-inch diameter connector pipeline that would convey the flow to a 23 mgd intake pump station. The intake pump station would pump into a 34,000 LF*** 36-inch diameter pressure pipeline to the desalination plant at the CBR site. The route of this pipeline from the slant wells would be along Portrero Road to Highway-1, on private easements parallel to Highway 1, and then along Molero Road to Artichoke Road. Trenchless construction would be used to install the pipeline under Highway 1 and the Salinas River from the south end of the Artichoke Road to a private easement on the east side of Highway 1 and south of the river. The pipeline would then follow the TAMC right-of-way from this location south to Charles Benson road and to the desalination plant.

The brine generated from the desalination plant would be conveyed to MRWPCA wastewater treatment facility and discharged into the existing outfall.

This contingency option is presented in Figure 4.

Estimated Capital Cost Impact

	November, 1, 2012	***January 9, 2013***
34,000 LF of Intake pipeline from Portrero Road to CBR:	***$19,400,000***	***$ 21,300,000***
Increased Pump Horsepower (500hp):	***$ 1,000,000***	***$ 700,000***
Avoided Feedwater Pipeline between Clusters	***Not Included***	***($ 2,200,000)***
Avoided Temporary Sheet Piling and Wave Protection	***Not Included***	***($ 7,100,000)***
Avoided Tunnel Cost:	***($8,900,000)***	***($ 8,100,000)***
Avoided Cost of 3,500 LF of intake pipeline for pump station to CBR from Dunes Tunnel to CBR :	***($3,000,000)***	***($ 2,400,000)***
Net Capital Cost Increase (2012 dollars):	***$ 8,500,000***	***$ 2,200,000***

Pros

- No tunneling under the dunes
- No beach construction
- Improved access to well pumps
- No seasonal construction restrictions

Cons

- Unknown geological conditions
- Wells located in restricted pumping area
- Site acquisition for slant wells and pump station in state-owned land (not included in cost estimate)
- Right-of-way acquisition requirements along Highway-1
- Higher energy requirements for conveyance
- Old Salinas River crossing
- Salinas River and Highway-1 crossings

Intake Contingency Option 4: Direct intake of water from Moss Landing Harbor, using existing Marine Refractory intake infrastructure, with feedwater pumped to a desalination plant at the CBR site.

For this contingency option, existing intake infrastructure at the Marine Refractory site in Moss Landing Harbor would be utilized to supply 23 mgd of feedwater to a desalination plant at the CBR site. It is assumed that this

existing intake would require modifications to comply with current and proposed modifications of the State Ocean Plan. A 23 mgd pump station, installed near the intake, would deliver the feedwater into a ***43,500 LF*** 36 –inch diameter pipeline to the desalination plant. This pipeline would be routed along Dolan Road; south in private easements on the west side of the railroad right-of-way; west in Benson Road and then crossing Hwy 156 using trenchless construction; west in private easements on the south side of Hwy 156; east on Nashua Road to the TAMC railroad right-of-way; south on the TAMC right-of-way to the Salinas River, crossing the Salinas River either with trenchless construction or with a pipe bridge constructed on the Del Monte Boulevard Bridge; south

[1] Horsepower provided to show relative increase over proposed project. The cost does not include additional annual operating cost. This note applies to all horsepower estimates provided in this memo.

on Del Monte Boulevard to CBR; and then east on CBR to the desalination plant at the CBR site. Trenchless construction or pipe bridges would be required for crossing Moro Cojo Slough and Tembladero Slough.

A membrane or media filtration system would be required for this alternative to provide adequate removal of algae and suspended and colloidal solids prior to reverse osmosis, and to provide pathogen log-removal credits as required by the Safe Drinking Water Act.

The brine generated from the desalination plant would be conveyed to MRWPCA wastewater treatment facility and discharged into the existing outfall.

This contingency option is presented in Figure 5.

Estimated Capital Cost Impact

	November, 1, 2012	***January 9, 2013***
43,500 LF of intake pipe from Marine refractory site to CBR:	***$26,800,000***	***$ 29,100,000***
Increased Pump Capacity (650hp):	***$ 1,300,000***	***$ 1,100,000***
Pretreatment:	***$30,000,000***	***$ 33,300,000***
Intake & Screen Modifications:	***$ 1,000,000***	***$ 1,100,000***
Avoided Dunes Tunnel Cost:	***($ 8,900,000)***	***($ 8,100,000)***
Avoided Cost of 3,500 LF of intake pipeline from pump station to CBF:	***($ 3,000,000)***	***($ 2,500,000)***
Avoided Cost of Slant Wells (including Land):	***($36,000,000)***	***($ 42,700,000)***
Net Capital Cost Increase (2012 dollars):	***$ 11,200,000***	***$ 11,300,000***

Pros

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions

Cons

- Unknown surge protection requirements
- Higher energy costs for conveyance
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156.
- Private property acquisition and facility use agreements (not included in cost estimate) at Marine Refractory site.

- Right-of-way acquisition requirements along highways (not included in cost estimate)
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs

Intake Contingency Option 5: Use of spent cooling water from the Moss Landing Power Plant, with feedwater pumped to a desalination plant at the CBR site.

Similar to the intake proposed as part of the Moss Landing Alternative in the Coastal Water Project EIR, this contingency option would use a diversion facility at the disengaging basin of the Moss Landing Power Plant (MLPP) to supply water to the desalination plant. The disengaging basin receives spent cooling water from Units 1 and 2 and directs this water to the MLPP outfall. The source of cooling water for Units 1 and 2 is water drawn from Moss Landing Harbor. This alternative assumes that the power plant circulates a minimum amount of seawater (23 mgd or more) even if the plant is not generating any power. The diversion from the disengaging basin would be by vacuum-actuated siphons with the feedwater flowing by gravity in a 48-inch diameter pipeline to a site along Dolan Road approximately 7,000 feet east of the disengaging basin (as described previously for the Coastal Water Project Moss Landing Alternative). A 23 mgd intake pump station at this site would deliver feedwater to a desalination plant at the CBR site via a 36-inch diameter pressure pipeline.

The feedwater pipeline from the intake pump station to the desalination plant would be constructed along the same pipeline route as described for Intake Contingency Option 4. Additional pretreatment requirements and brine disposal would also be as described for Intake Contingency Option 4.

This contingency option is presented in Figure 6.

Estimated Capital Cost Impact

	November, 1, 2012	***January 9, 2013***
43,500 LF of Intake pipeline from disengaging basin to CBR:	***$ 26,800,000***	***$ 27,600,000***
Increased Pump Horsepower (650hp):	***$ 1,300,000***	***$ 1,100,000***
Pretreatment:	***$ 30,000,000***	***$ 34,300,000***
Intake Connection at Disengaging Basin:	***$ 500,000***	***$ 800,000***
Avoided Dunes Tunnel Cost:	***($ 8,900,000)***	***($ 8,100,000)***
Avoided Cost of 3,500 LF of intake pipeline from pump station to CBR:	***($ 3,000,000)***	***($ 2,500,000)***
Avoided Cost of Slant Wells (Including Land):	***($ 36,000,000)***	***($ 42,700,000)***
Net Capital Cost Increase (2012 dollars)	***$ 10,700,000***	***$ 10,500,000***

Pros

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions
- Warmer feedwater from the spent cooling water potentially reduces desalination costs
- No intake permit required

Cons

- Warmer feedwater from the spent cooling water potentially increases second pass requirements
- Unknown surge protection requirements

- Higher energy costs for conveyance
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River and Highway 156
- Private property acquisition and facility use agreements at MLPP
- Right-of-way acquisition requirements along highways
- Use of power plant cooling water makes permitting relatively more challenging and diminishes NGO support
- Intake operations dependent on power plant operation

Intake Contingency Option 6: Use of water diverted from the Moss Landing Power Plant cooling water intake facilities, with feedwater pumped to a desalination plant at the CBR site.

This contingency option would utilize the MLPP cooling system intake screens to screen desalination plant feedwater. New diversion pumps for pumping seawater to the desalination plant would be installed behind the existing MLPP intake screens and the desalination plant intake system would be independent of the cooling operations at the MLPP. For purposes of illustration, it is assumed that a 23 mgd feedwater pump station would be installed at or near the MLPP intake for Units 6 and 7, but it would also be capable of receiving flow from a pipeline connection to the MLPP intake for Units 1 and 2.

The feedwater pipeline, additional pretreatment requirements, and brine disposal would be identical to that described for Intake Contingency Option 4.

This contingency option is presented in Figure 7.

Estimated Capital Cost Impact

	November, 1, 2012	January 9, 2013
43,500 LF of Intake Pipeline from disengaging basin to CBR:	***$26,800,000***	***$ 29,100,000***
Increased Pump Horsepower (650hp):	***$ 1,300,000***	***$ 1,500,000***
Pretreatment:	***$30,000,000***	***$ 33,300,000***
Intake and screen modifications:	***$ 1,000,000***	***$ 1,100,000***
Avoided Dunes Tunnel Cost:	***($ 8,900,000)***	***($ 8,100,000)***
Avoided Cost of 3,500 LF of intake pipeline from Tunnel to CBR:	***($ 3,000,000)***	***($ 2,500,000)***
Avoided Cost of Slant Wells (including land):	***($ 36,000,000)***	***($ 42,700,000)***
Net Capital Cost Increase (2012 dollars)	***$ 11,200,000***	***$ 11,700,000***

Pros

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions

Cons

- Unknown surge protection requirements
- Higher energy costs for conveyance
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Private property acquisition and facility use agreements at MLPP
- Right-of-way acquisition requirements along highways
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support

- Unknown additional impingement and entrainment mitigation costs

Intake Contingency Option 7: Convert existing Marine Refractory outfall into an open ocean intake, with feedwater pumped to a desalination plant at the CBR site.

This contingency option involves installing a new wedge-wire passive screen intake on the ocean end of the existing outfall at the Marine Refractory site and using the existing outfall piping to draw seawater into a 23 mgd pumping station located on or near the existing headworks of the existing outfall. This pump station would deliver feedwater to a desalination plant at the CBR site via a pipeline identical to the feedwater pipeline described in Intake Contingency Option 4. Additional pretreatment requirements and brine disposal would be identical to that described for Intake Contingency Option 4.

This contingency option is presented in Figure 8.

Estimated Capital Cost Impacts

	November, 1, 2012	***January 9, 2013***
43,500 LF of Intake pipeline from disengaging basin to CBR:	***$ 26,800,000***	***$ 27,600,000***
Increased Pump Horsepower (650hp):	***$ 1,300,000***	***$ 1,500,000***
Pretreatment:	***$ 30,000,000***	***$ 33,300,000***
Outfall modifications:	***$ 1,000,000***	***$ 1,100,000***
Screens:	***$ 2,000,000***	***$ 2,200,000***
Avoided Tunnel Cost:	***($ 8,900,000)***	***($ 8,100,000)***
Avoided Cost of 3,500 LF of Pipeline:	***($ 3,000,000)***	***($ 2,500,000)***
Avoided Cost of Slant Wells (including land):	***($ 36,000,000)***	***($ 42,700,000)***
Net Capital Cost Increase (2012 dollars):	***$ 13,200,000***	***$ 12,400,000***

Pros

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions

Cons

- Unknown surge protection requirements
- Higher energy costs
- Special construction required to cross Tembladero Slough, Moro Cojo Slough and Salinas River
- Additional private property acquisition and facility use agreements
- Right-of-way acquisition requirements along highways
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs
- Unknown outfall condition
- Unknown feasibility of acquiring a construction permit in the marine sanctuary
- Screens are exposed to ocean hazards

Intake Contingency Option 8: Construct a new open ocean intake near Moss Landing, with feedwater pumped to a desalination plant at the CBR site.

This contingency option involves construction of a new wedge-wire passive screen intake which would be installed on the ocean floor at a depth of approximately 40 feet of water approximately 2,400 feet offshore from the coastline near the parking lot at the end of Portrero Road. The intake screen would be mounted on a vertical shaft that would be connected to a 3,100-foot long 36-inch diameter pipeline that would terminate at a 23 mgd pump station in or near the parking lot. This pipeline would be installed with trenchless technology under the ocean floor and the beach. From the pump station, a ***34,000*** LF 36-inch diameter pressure pipeline would convey the water to the desalination plant along the same pipeline route as described previously for ***Intake Contingency Option 3.*** Additional pretreatment requirements and brine disposal would be identical to that described for ***Intake Contingency Option 4.***

This contingency option is presented in Figure 9.

Estimated Capital Cost Impacts

	November, 1, 2012	***January 9, 2013***
34,000 LF of pipe	***$ 19,400,000***	***$ 18,600,000***
Pretreatment	***$ 30,000,000***	***$ 33,300,000***
2,700 ft of Intake Tunnel	***$ 5,600,000***	***$ 9,200,000***
Intake Structure and Screens	***$ 3,300,000***	***$ 3,700,000***
Increased Pump Capacity (500hp)	***$ 1,000,000***	***$ 700,000***
Avoided Dunes Tunnel Cost:	***($ 8,900,000)***	***($ 8,100,000)***
Avoided Cost of 3,500 LF of Pipeline from Tunnel to CBR:	***($ 3,000,000)***	***($ 2,500,000)***
Avoided Cost of Slant Wells (including land):	***($ 36,000,000)***	***($ 42,700,000)***
Net Capital Cost Increase (2012 dollars):	***$11,400,000***	***$ 12,200,000***

Pros

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions
- Reduced construction costs

Cons

- Unknown surge protection requirements
- Higher energy costs
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Additional private property acquisition and facility use agreements
- Right-of-way acquisition requirements along highways
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs
- Unknown feasibility of acquiring a construction permit in the marine sanctuary
- Old Salinas River crossing
- Salinas River and highways crossing
- Additional site acquisition for the pump station

DISCHARGE CONTINGENCY OPTIONS

If discharge of brine from CBR site desalination plant to an unmodified MRWPCA outfall is not possible, then:

Discharge Contingency Option 1: Modify outfall by inserting separate pipe for brine discharge, and adding dedicated brine diffusers at the end of the outfall.

This contingency option involves inserting a brine discharge pipeline inside the existing outfall pipeline. The annular space between the outer wall of the inserted pipeline and the inner wall of the outfall would continue to be used for effluent flow. At an offshore location, an exit structure would be constructed on the existing pipeline, and a separate brine diffuser would be constructed for brine discharge. This pipe-in-pipe arrangement would be configured with a new pump station that would be used during wet weather periods, when effluent flows are high, to pump a mixture of brine and effluent through the inserted pipe and the new diffusers. For purposes of illustration , it is assumed that 13,500 ft of 20-inch brine pipeline would be inserted in the MRWPCA outfall starting at the outfall headworks and extending to the first off-shore bend in the outfall. At this point, approximately 3,500 ft off-shore, the exit structure would be constructed, and a 500-foot long brine diffuser section would be constructed on the ocean floor.

This contingency option is presented in Figure 10.

Estimated Capital Cost Impact

	November, 1, 2012	***January 9, 2013***
Slip Lining:	***$ 4,000,000***	***$ 4,100,000***
Exit Structure from Existing Outfall:	***$ 2,000,000***	***$ 2,000,000***
New Diffusers:	***$ 500,000***	***$ 500,000***
Brine Pump Station :	***$ 1,200,000***	***$ 3,500,000***
Avoided Cost of Brine Discharge Facilities	***Not Included***	***($ 600,000)***
Net Capital Cost Increase (2012 dollars):	***$ 7,700,000***	***$ 9,500,000***

Pros

- Allows MRWPCA to use the outfall to maximum capacity at all times
- Discharge operations are independent of MRWPCA discharge
- ***Eliminates brine storage requirement at desalination plant***

Cons

- New discharge permit required for brine
- Higher energy requirements when brine pump station is operating
- Additional maintenance requirements for the brine pump station

Discharge Contingency Option 2: Install new outfall off-shore of CEMEX property.

For this contingency option, brine would be discharged from the desalination plant at the CBR site through a 13,000 LF 24-inch diameter brine pipeline to brine diffusers that would be located approximately 2,500 LF off-shore of the CEMEX property near the slant well intake system. Approximately 5,400 LF of the brine pipeline would be constructed under the ocean floor, beach and dunes using a tunnel boring machine. The diffusers would be designed to meet anticipated requirements of the modified State Ocean Plan.

This contingency option is presented in Figure 11.

Estimated Capital Cost Impact

	November, 1, 2012	***January 9, 2013***
Brine Pipeline from Desalination Plant to Tunnel:	***$ 3,500,000***	***$ 4,500,000***
Outfall Tunnel:	***$ 13,000,000***	***$ 8,200,000***
Terminal Structure and diffusers:	***$ 3,000,000***	***$ 3,000,000***
Avoided Cost of Brine Discharge Facilities	***Not Included***	***($ 5,700,000)***
Net Capital Cost Increase (2012 dollars):	***$ 19,500,000***	***$ 10,000,000***

Pros

- Allows MRWPCA to use the outfall to maximum capacity at all times
- Discharge operations are independent of MRWPCA discharge
- ***Eliminates brine storage requirement at desalination plant***

Cons

- New discharge permit required
- Higher energy requirements
- Additional maintenance costs associated with the pump station

Discharge Contingency Option 3: Construct brine pipeline to Moss Landing, and discharge to the MLPP cooling water outfall.

For this contingency option, a brine pumping station would be constructed at the desalination plant at the CBR site, for discharging brine into a 47,000 LF long 24-inch diameter brine pipeline to Moss Landing for discharge to the MLPP cooling water outfall (using a connection to the MLPP Disengaging Basin). This contingency option would possibly be limited during those periods when cooling water flow in the MLPP outfall is insufficient to provide adequate dilution of the brine discharge.

This contingency option is presented in Figure 12.

Estimated Capital Cost Impact

	November, 1, 2012	***January 9, 2013***
Brine Pipeline from Desalination Plant to MLPP:	***$ 16,200,000***	***$ 20,000,000***
Brine Pump Station:	***$ 2,000,000***	***$ 4,200,000***
Disengaging Basin Connection:	***$ 300,000***	***$ 300,000***
Avoided Cost of Brine Discharge Facilities	***Not included***	***($ 5,700,000)***
Net Capital Cost Increase (2012 dollars):	***$ 18,500,000***	***$ 18,800,000***

Pros

- Allows MRWPCA to use the outfall to maximum capacity at all times
- Discharge operations are independent of MRWPCA discharge
- ***Eliminates brine storage requirement at desalination plant***

Cons

- Additional right-of-way acquisition required
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Hwy 156
- Additional private property acquisition and facility use agreements
- Right-of-way acquisition requirements along highways
- Facility use agreements required at MLPP.

Discharge Contingency Option 4: Construct brine pipeline to Moss Landing, and discharge to the existing Marine Refractory outfall, with modifications.

This contingency option is similar to Discharge Contingency Option 3, except that the brine would be discharged through the existing Marine Refractory outfall, with modifications to meet the State Ocean Plan requirements. A brine pumping station would be constructed at the desalination plant at the CBR site, for discharging brine into a 47,000 LF 24-inch diameter brine pipeline to the Marine Refractory outfall. This contingency plan would require brine-only discharge permitting through the Marine Refractory outfall as it is assumed that no dilution water would be available.

This contingency option is presented in Figure 13.

Estimated Capital Cost Impact

	November, 1, 2012	***January 9, 2013***
Brine Pipeline from Desalination Plant to MLPP:	***$ 16,200,000***	***$ 19,500,000***
Brine Pump Station	***$ 2,000,000***	***$ 4,200,000***
Outfall Modification	***$ 4,000,000***	***$ 4,100,000***
New Diffusers	***$ 500,000***	***$ 500,000***
Avoided Cost of Brine Discharge Facilities	***Not Included***	***($ 5,700,000)***
Net Capital Cost Increase (2012 dollars)	***$ 22,700,000***	***$ 22,600,000***

Pros

- Allows MRWPCA to use the outfall to maximum capacity at all times
- Discharge operations are independent of MRWPCA discharge
- ***Eliminates brine storage requirement at desalination plant***

Cons

- New discharge permit required
- Additional right-of-way acquisition required
- Unknown feasibility of acquiring a construction permit in the marine sanctuary
- Unknown surge protection requirements
- Higher energy costs
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Additional private property acquisition and facility use agreements
- Right-of-way acquisition requirements along highways

DESALINATION PLANT SITE CONTINGENCY OPTIONS

If slant well intake at CEMEX is not possible and it is not possible to use the existing or modified MRWPCA outfall, then the desalination plant would be moved to Moss Landing, as described below. Cost impact for each of the plant site contingency options was not estimated.

Desalination Plant Site Contingency Option 1: Desalination plant at Marine Refractory site

For this contingency plan, the desalination plant would be located at the Marine Refractory Site. Feedwater would be supplied by the existing intake infrastructure, with modifications as described in Intake Contingency Option 4. Product water from the desalination plant would be conveyed to Monterey Peninsula using the alignment previously described for the intake pipeline in Intake Contingency Option 4 down to CBR, and from there using the product water pipeline route described in the application. The brine from the desalination would be discharged through the existing Marine Refractory outfall, with modifications to meet State Ocean Plan requirements. This contingency plan would require brine-only discharge permitting through the Marine Refractory outfall as no dilution water would be available.

This contingency option is presented in Figure 14.

	January 9, 2013
Intake Pump Station	***$ 3,800,000***
Pretreatment	***$ 33,300,000***
Intake and Screen Modifications	***$ 1,100,000***
Product Water Pump Station (Net)	***$ 2,200,000***
Product Water Pipeline, 39,000 LF	***$ 27,300,000***
Avoided Dunes Tunnel Cost:	***($ 8,100,000)***
Avoided Cost of 3,500 LF of Pipeline from Tunnel to CBR:	***($ 2,500,000)***
Avoided Intake Pump Station	***($ 6,400,000)***
Avoided Brine Discharge Facilities	***($ 5,700,000)***
Avoided Cost of Slant Wells (including land):	***($ 42,700,000)***
Net Capital Cost Increase (2012 dollars):	***$ 2,300,000***

Pros

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions
- ***Eliminates brine storage requirement at desalination plant***

Cons

- Unknown surge protection requirements
- Higher energy costs for conveyance
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156.
- Private property acquisition and facility use agreements at Marine Refractory site.
- Right-of-way acquisition requirements along highways
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs

- Additional pipeline construction to Moss Landing
- Discharge Permit required

Desalination Plant Site Contingency Option 2: Desalination plant at Capurro Ranch site

For this contingency option, the desalination plant would be located at Capurro Ranch, north of Elkhorn Slough. Feedwater would be provided by an open ocean intake located near the terminus of the former Sandholdt Pier. From Moss Landing Harbor, the seawater pipeline would be routed along Highway 1 north to the desalination plant at Capurro Ranch. The product water would be conveyed south from the desalination plant on Highway 1 to Dolan Road, then east on Dolan Road to the alignment previously described for the intake pipeline in Intake Contingency Option 4. The brine from the desalination plant would be conveyed to the MLPP outfall for final discharge.

This contingency option is presented in Figure 15.

	January 9, 2013
Intake Pump Station	***$ 3,800,000***
Pretreatment	***$ 33,300,000***
Intake and Screen Modifications	***$ 1,000,000***
Product Water Pump Station (Net)	***$ 2,200,000***
Brine Discharge Pipeline, 7,100 LF	***$ 2,600,000***
Product Water Pipeline, 46,100 LF	***$ 39,100,000***
Avoided Dunes Tunnel Cost:	***($ 8,100,000)***
Avoided Cost of 3,500 LF of Pipeline from Tunnel to CBR:	***($ 2,500,000)***
Avoided Intake Pump Station	***($ 6,400,000)***
Avoided Brine Discharge Facilities	***($ 5,700,000)***
Avoided Cost of Slant Wells (including land):	***($ 42,700,000)***
Net Capital Cost Increase (2012 dollars):	***$ 16,600,000***

Pros

- No tunneling under the dunes
- No beach construction
- No seasonal construction restrictions
- ***Eliminates brine storage requirement at desalination plant***

Cons

- Discharge Permit required
- Project requires two pipeline crossings of Elkhorn Slough
- Long product water pipeline from Moss Landing to California American Water service area
- Unknown surge protection requirements
- Higher energy costs for conveyance
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Private property acquisition
- Right-of-way acquisition requirements along highways
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs

Desalination Plant Site Contingency Option 3: FEIR proposed project at Moss Landing Desalination Plant site

For this contingency option, the desalination plant would be located at the eastern MLPP property as proposed in the FEIR. MLPP cooling water would be utilized for both intake and discharge of brine. Intake system would be connected to the Disengaging Basin and divert water east to the desalination plant. The product water from the desalination plant would be conveyed south to Monterey Peninsula as described in the FEIR and the brine would be conveyed west to the disengaging basin and connect to the basin downstream of the intake location.

	January 9, 2013
Intake Pump Station	***$ 2,900,000***
Pretreatment	***$ 34,300,000***
Intake Connection to Disengaging Basin	***$ 500,000***
Product Water Pump Station (Net)	***$ 2,200,000***
Brine Discharge Pipeline, 6,300 LF	***$ 2,400,000***
Product Water Pipeline, 32,000 LF	***$ 23,700,000***
Avoided Dunes Tunnel Cost:	***($ 8,100,000)***
Avoided Cost of 3,500 LF of Pipeline from Tunnel to CBR:	***($ 2,500,000)***
Avoided Intake Pump Station	***($ 6,400,000)***
Avoided Brine Discharge Facilities	***($ 5,700,000)***
Avoided Cost of Slant Wells (including land):	***($ 42,700,000)***
Net Capital Cost Increase (2012 dollars):	***$ 600,000***

The pros and cons of this contingency option are the same as listed for the Intake Contingency Option 5 and Discharge Contingency Option 3.

This contingency option is presented in Figure 16.

Desalination Plant Site Contingency Option 4: Slant intake wells at Portrero Road and FEIR proposed desalination plant site with brine discharge to MLPP outfall

For this contingency option, the desalination plant would be located at the eastern MLPP property as proposed in the FEIR. Slant wells would be installed at the parking lot on the west end of the Portrero Road and along the roadway that parallels the beach north of the parking lot. For purposes of illustration, it is assumed that 10 pumped wells would be required to extract 22 mgd of water from the Sand Dunes formation at this location. The intake wells would pump water into a 15,000 LF 36-inch diameter pressure pipeline to the desalination plant at a desalination plant on Dolan Road east of the MLPP. Brine from the desalination plant would be returned to Moss Landing for discharge to the MLPP cooling water outfall (using a connection to the MLPP Disengaging Basin). The product water from the desalination plant would be conveyed south to Monterey Peninsula as described in the FEIR.

	January 9, 2013
Intake Pipeline, 15,000 LF	***$ 16,400,000***
Product Water Pump Station (Net)	***$ 2,200,000***
Brine Discharge Pipeline, 6,300 LF	***$ 2,400,000***
Product Water Pipeline, 32,000 LF	***$ 23,700,000***
Avoided Dunes Tunnel Cost:	***($ 8,100,000)***
Avoided Cost of 3,500 LF of Pipeline from Tunnel to CBR:	***($ 2,500,000)***
Avoided Sheet Piling and Wave Protection	***($ 7,100,000)***
Avoided Brine Discharge Facilities	***($ 5,700,000)***
Net Capital Cost Increase (2012 dollars):	***$ 21,300,000***

Pros

- No tunneling under the dunes
- No beach construction
- Improved access to well pumps
- No seasonal construction restrictions
- ***Eliminates brine storage requirement at desalination plant***

Cons

- Discharge may not be possible during periods of MLPP shutdown
- Difficult pipeline construction in Hwy 1 at Moro Cojo Slough crossing
- Unknown geological conditions
- Wells located in restricted pumping area
- Site acquisition for slant wells and pump station in state-owned land
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Higher energy costs for conveyance
- Private property acquisition and facility use agreements at MLPP
- Right-of-way acquisition requirements along highways

This contingency option is presented in Figure 17.

Desalination Plant Site Contingency Option 5: Slant intake wells at Portrero Road and FEIR proposed desalination plant site with brine discharge to Marine Refractory outfall

For this contingency option, the desalination plant would be located at the eastern MLPP property as proposed in the FEIR. Slant wells would be installed at the parking lot on the west end of the Portrero Road and along the roadway that parallels the beach north of the parking lot. For purposes of illustration, it is assumed that 10 pumped wells would be required to extract 22 mgd of water from the Sand Dunes formation at this location. The intake wells would pump water into a 15,000 LF 36-inch diameter pressure pipeline to the desalination plant on Dolan Road east of the MLPP. Brine from the desalination plant would be discharged to the existing Marine Refractory outfall, with modifications. The product water from the desalination plant would be conveyed south to Monterey Peninsula as described in the FEIR.

	January 9, 2013
Intake Pipeline, 15,000 LF	***$ 16,400,000***
Product Water Pump Station (Net)	***$ 2,200,000***
Brine Discharge Pipeline, 6,300 LF	***$ 2,400,000***
Product Water Pipeline, 32,000 LF	***$ 23,700,000***
Avoided Dunes Tunnel Cost:	***($ 8,100,000)***
Avoided Cost of 3,500 LF of Pipeline from Tunnel to CBR:	***($ 2,500,000)***
Avoided Sheet Piling and Wave Protection	***($ 7,100,000)***
Avoided Brine Discharge Facilities	***($ 5,700,000)***
Net Capital Cost Increase (2012 dollars):	***$ 21,300,000***

Pros

- No tunneling under the dunes
- No beach construction
- Improved access to well pumps
- No seasonal construction restrictions
- ***Eliminates brine storage requirement at desalination plant***

Cons

- New discharge permit required
- Property acquisition and facility use agreements required at Marine Refractory Site
- Difficult pipeline construction in Hwy 1 at Moro Cojo Slough crossing
- Unknown geological conditions
- Wells located in restricted pumping area
- Site acquisition for slant wells and pump station in state-owned land
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Higher energy costs for conveyance
- Private property acquisition and facility use agreements at MLPP
- Right-of-way acquisition requirements along highways

This contingency option is presented in Figure 18.

Desalination Plant Site Contingency Option 6: Slant intake wells at Portrero Road and FEIR proposed desalination plant site with brine discharge to a new outfall

For this contingency option, the desalination plant would be located at the eastern MLPP property as proposed in the FEIR. Slant wells would be installed at the parking lot on the west end of the Portrero Road and along the roadway that parallels the beach north of the parking lot. For purposes of illustration, it is assumed that 10 pumped wells would be required to extract 22 mgd of water from the Sand Dunes formation at this location. The intake wells would pump water into a 15,000 LF 36-inch diameter pressure pipeline to the desalination plant along Dolan Road, east of the MLPP. Brine from the desalination plant would be discharged to a new outfall that would be constructed at the parking lot on the west end of the Portrero Road. The outfall diffusers would be located approximately 3,000 LF off-shore. The product water from the desalination plant would be conveyed south to Monterey Peninsula as described in the FEIR.

	January 9, 2013
Intake Pipeline, 15,000 LF	***$ 16,400,000***
Product Water Pump Station (Net)	***$ 2,200,000***
Brine Discharge Pipeline, 15,000 LF	***$ 5,000,000***
Outfall Tunnel, 2,700 LF	***$ 8,200,000***
Terminal Structure and Diffusers	***$ 3,000,000***
Product Water Pipeline, 32,000 LF	***$ 23,700,000***
Avoided Dunes Tunnel Cost:	***($ 8,100,000)***
Avoided Cost of 3,500 LF of Pipeline from Tunnel to CBR:	***($ 2,500,000)***
Avoided Sheet Piling and Wave Protection	***($ 7,100,000)***
Avoided Brine Discharge Facilities	***($ 5,700,000)***
Net Capital Cost Increase (2012 dollars):	***$ 35,100,000***

Pros

- No tunneling under the dunes
- No beach construction
- Improved access to well pumps
- No seasonal construction restrictions
- ***Eliminates brine storage requirement at desalination plant***

Cons

- New discharge permit required
- Property acquisition and facility use agreements required at Marine Refractory Site
- Difficult pipeline construction in Hwy 1 at Moro Cojo Slough crossing for brine and feedwater pipeline
- Unknown geological conditions
- Wells located in restricted pumping area
- Site acquisition for slant wells and pump station in state-owned land
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Higher energy costs for conveyance
- Right-of-way acquisition requirements along highways

This contingency option is presented in Figure 19.

Desalination Plant Site Contingency Option 7: Marine Refractory open ocean intake and FEIR proposed desalination plant site with brine discharge to a MLPP outfall

For this contingency option, the desalination plant would be located along Dolan Road east of the MLPP, as proposed in the Coastal Water Project FEIR. Existing intake infrastructure at the Marine Refractory site in Moss Landing Harbor would be utilized to supply 23 mgd of feedwater to a desalination plant at a site located along Dolan Road, approximately 7000 LF from Highway 1. It is assumed that this existing intake would require modifications to comply with current and proposed modifications of the State Ocean Plan. A 23 mgd pump station, installed near the intake, would deliver the feedwater into a 6,300 LF 36 –inch diameter pipeline to the desalination plant. Brine from the desalination plant would be discharged conveyed to Moss Landing for discharge to the MLPP cooling water outfall (using a connection to the MLPP Disengaging Basin). The product water from the desalination plant would be conveyed south to Monterey Peninsula as described in the FEIR.

	January 9, 2013
Intake Pump Station	***$ 2,900,000***
Pretreatment	***$ 33,300,000***
Intake and Screen Modifications	***$ 1,100,000***
Product Water Pump Station (Net)	***$ 2,200,000***
Brine Discharge Pipeline, 6,300 LF	***$ 2,400,000***
Product Water Pipeline, 32,000 LF	***$ 23,700,000***
Avoided Dunes Tunnel Cost:	***($ 8,100,000)***
Avoided Cost of 3,500 LF of Pipeline from Tunnel to CBR:	***($ 2,500,000)***
Avoided Intake Pump Station	***($ 6,400,000)***
Avoided Brine Discharge Facilities	***($ 5,700,000)***
Avoided Cost of Slant Wells (including land):	***($ 42,700,000)***
Net Capital Cost Increase (2012 dollars):	***$ 200,000***

Pros

- No tunneling under the dunes
- No beach construction
- Improved access to well pumps
- No seasonal construction restrictions
- ***Eliminates brine storage requirement at desalination plant***

Cons

- Property acquisition and facility use agreements required for both the Marine Refractory Site and MLPP
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River, and Highway 156
- Right-of-way acquisition requirements along highways
- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs
- Higher energy costs for conveyance

This contingency option is presented in Figure 20.

Desalination Plant Site Contingency Option 8: Marine Refractory open ocean intake and FEIR proposed desalination plant site with brine discharge to a new outfall

For this contingency option, the desalination plant would be located along Dolan Road East of the MLPP property as proposed in the FEIR. Existing intake infrastructure at the Marine Refractory site in Moss Landing Harbor would be utilized to supply 23 mgd of feedwater to a desalination plant at a site located along Dolan Road, approximately 7000 LF from Highway 1. It is assumed that this existing intake would require modifications to comply with current and proposed modifications of the State Ocean Plan. A 23 mgd pump station, installed near the intake, would deliver the feedwater into a 6,300 LF 36–inch diameter pipeline to the desalination plant. Brine from the desalination plant would be discharged into a new ocean outfall. The brine would be conveyed west in Dolan Road, south on Highway 1 and west on Moss Landing Road to Sandholdt Road. From a location to be determined on Sandholdt Road, the outfall would convey brine to approximately 1,000 LF off-shore for disposal. The product water from the desalination plant would be conveyed south to Monterey Peninsula as described in the FEIR.

	January 9, 2013
Intake Pump Station	***$ 2,900,000***
Pretreatment	***$ 33,300,000***
Intake Connection	***$ 500,000***
Product Water Pump Station (Net)	***$ 2,200,000***
Brine Discharge Pipeline, 20,000 LF	***$ 6,500,000***
Outfall Tunnel, 2,700 LF	***$ 8,200,000***
Terminal Structure and Diffusers	***$ 3,000,000***
Product Water Pipeline, 32,000 LF	***$ 23,700,000***
Avoided Dunes Tunnel Cost:	***($ 8,100,000)***
Avoided Cost of 3,500 LF of Pipeline from Tunnel to CBR:	***($ 2,500,000)***
Avoided Intake Pump Station	***($ 6,400,000)***
Avoided Brine Discharge Facilities	***($ 5,700,000)***
Avoided Cost of Slant Wells (including land):	***($ 42,700,000)***
Net Capital Cost Increase (2012 dollars):	***$ 14,900,000***

Pros

- No tunneling under the dunes
- No beach construction
- Improved access to well pumps
- No seasonal construction restrictions
- ***Eliminates brine storage requirement at desalination plant***

Cons

- Impingement and entrainment concerns make permitting relatively more challenging and diminishes NGO support
- Unknown additional impingement and entrainment mitigation costs
- New Discharge Permit required
- Higher energy costs for conveyance
- Special construction required to cross Tembladero Slough, Moro Cojo Slough, Salinas River and Highway 156
- Private property acquisition and facility use agreements at MLPP
- Right-of-way acquisition requirements along highways

This contingency option is presented in Figure 21.

SLANT INTAKE WELL LOCATIONS – CONTINGENCY PLANS NOT PURSUED

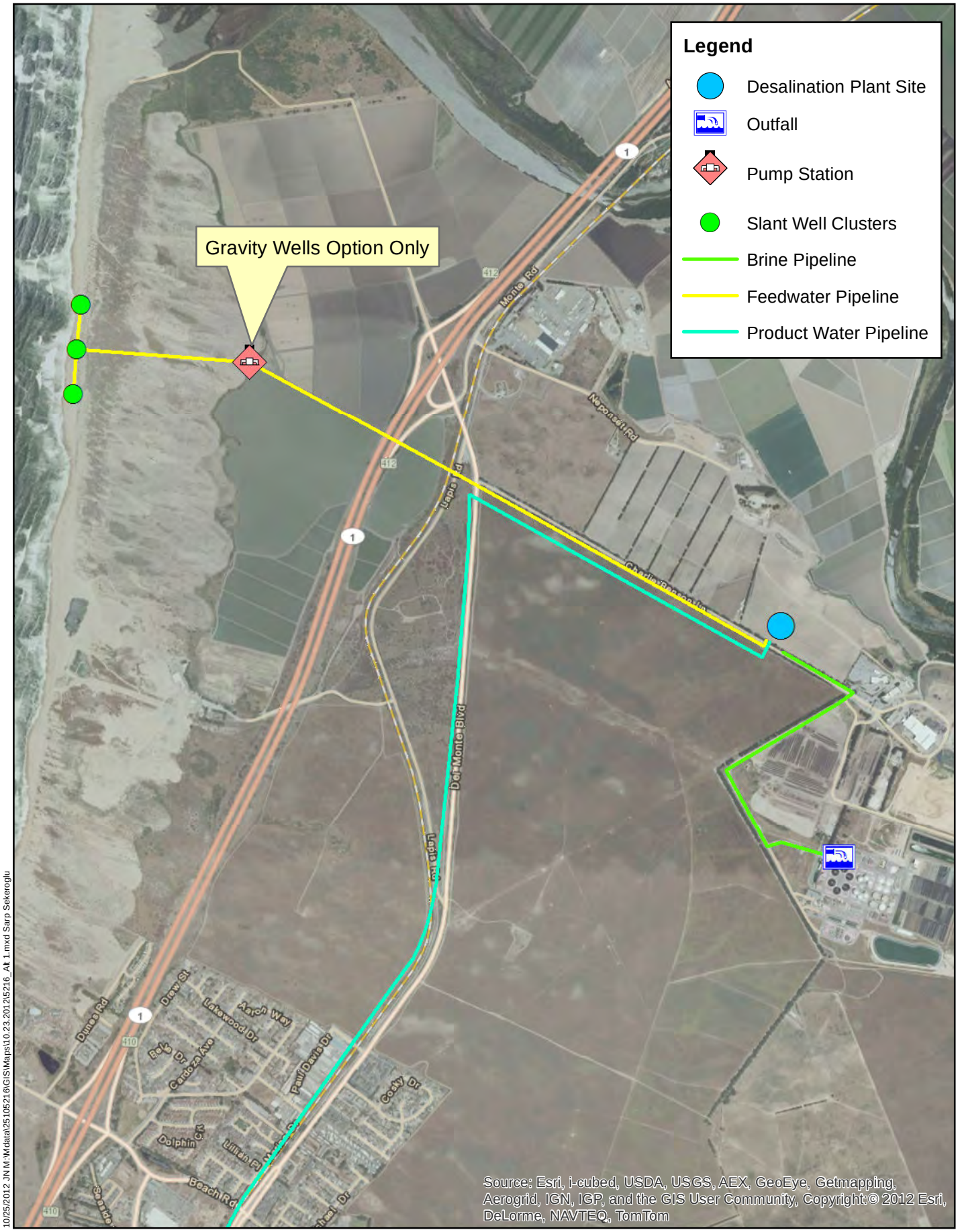
Slant Intake Wells at Seaside – Not Pursued:

The geology along the shoreline of Seaside has been recently studied in detail (CDM and Feeney). It has been concluded by these studies that the existing geological conditions would not be supportive to install productive slant wells in the area. Therefore this contingency plan has not been pursued.

Slant Intake Wells at Carmel River – Not Pursued:

For this contingency plan, slant intake wells would be constructed around the Carmel River mouth. The existing geology at the Carmel River has not been studied in detail; however, it is suspected that the geology would not

support construction of productive slant wells. Additionally, the intake wells would be too far (over 17 miles) from any feasible desalination plant site.



10/25/2012 JN M:\Mdata\25\05216\GIS\Maps\10.23.2012\5216_Alt 1.mxd Sarp Sekeroglu

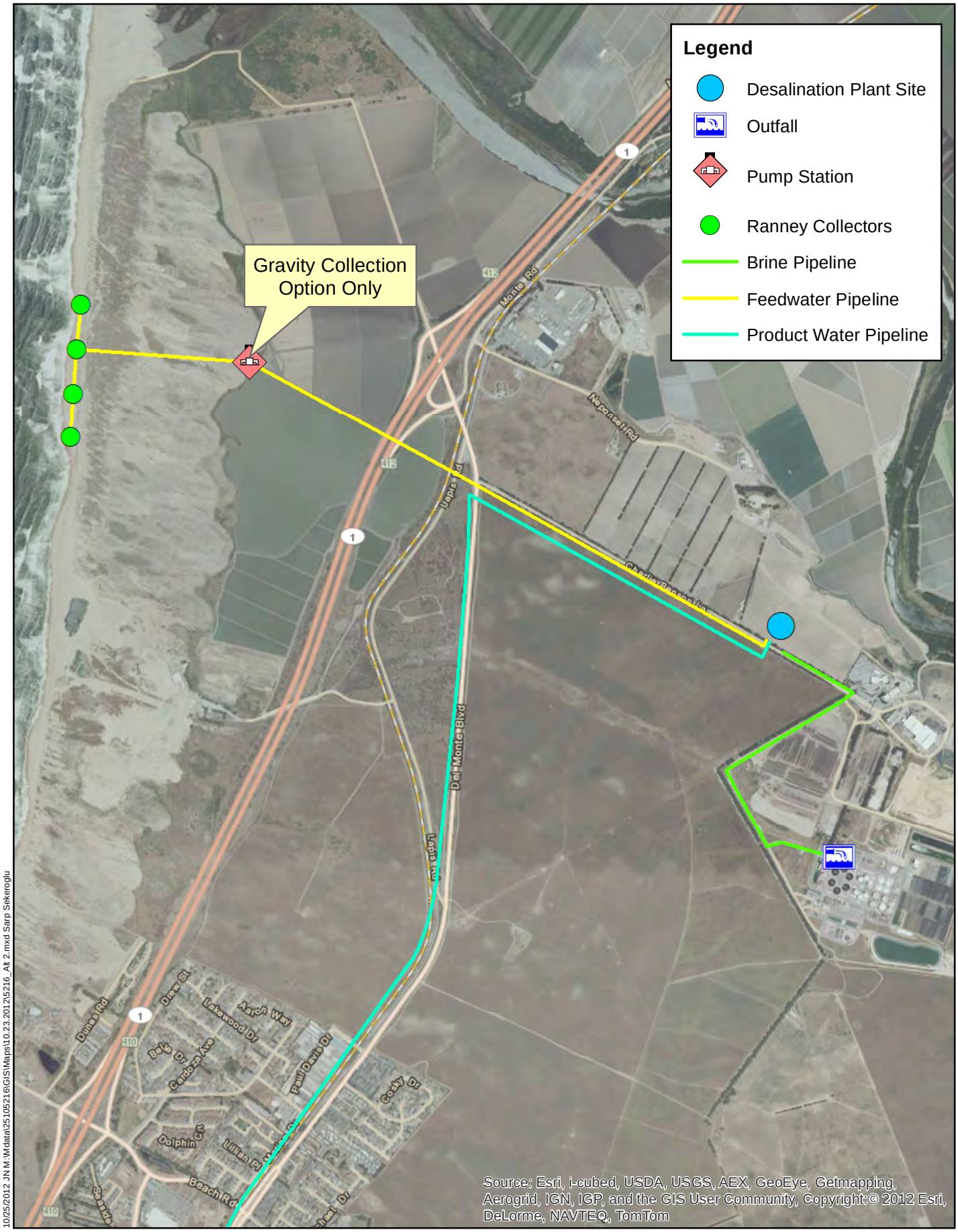
CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure 1 - Proposed Intake System



10/25/2012 JN M:\Mdata\25\05216\GIS\Maps\10.23.2012\5216_Alt 2.mxd Sarp Sekeroglu

CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure 2 - Intake Contingency Option 1

10/25/2012 JN M:\Mdata\25\05216\GIS\Maps\10.23.2012\5216_Alt 3.mxd Sarp Sekeroglu

CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure 3 - Intake Contingency Option 2

10/25/2012 JN M:\Mdata\25105216\GIS\Maps\10.23.2012\5216_Alt 4.mxd Sarp Sekeroglu

CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure - 4 Intake Contingency Option 3

10/25/2012 JN M:\Mdata\25\05216\GIS\Maps\10.23.2012\5216_Alt 5ai.mxd Rick Hendrickson

CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula
Water Supply Project

Figure 5 - Intake Contingency Option 4

10/25/2012 JN M:\Mdata\25\05216\GIS\Maps\10.23.2012\5216_Alt 5aii.mxd Rick Hendrickson

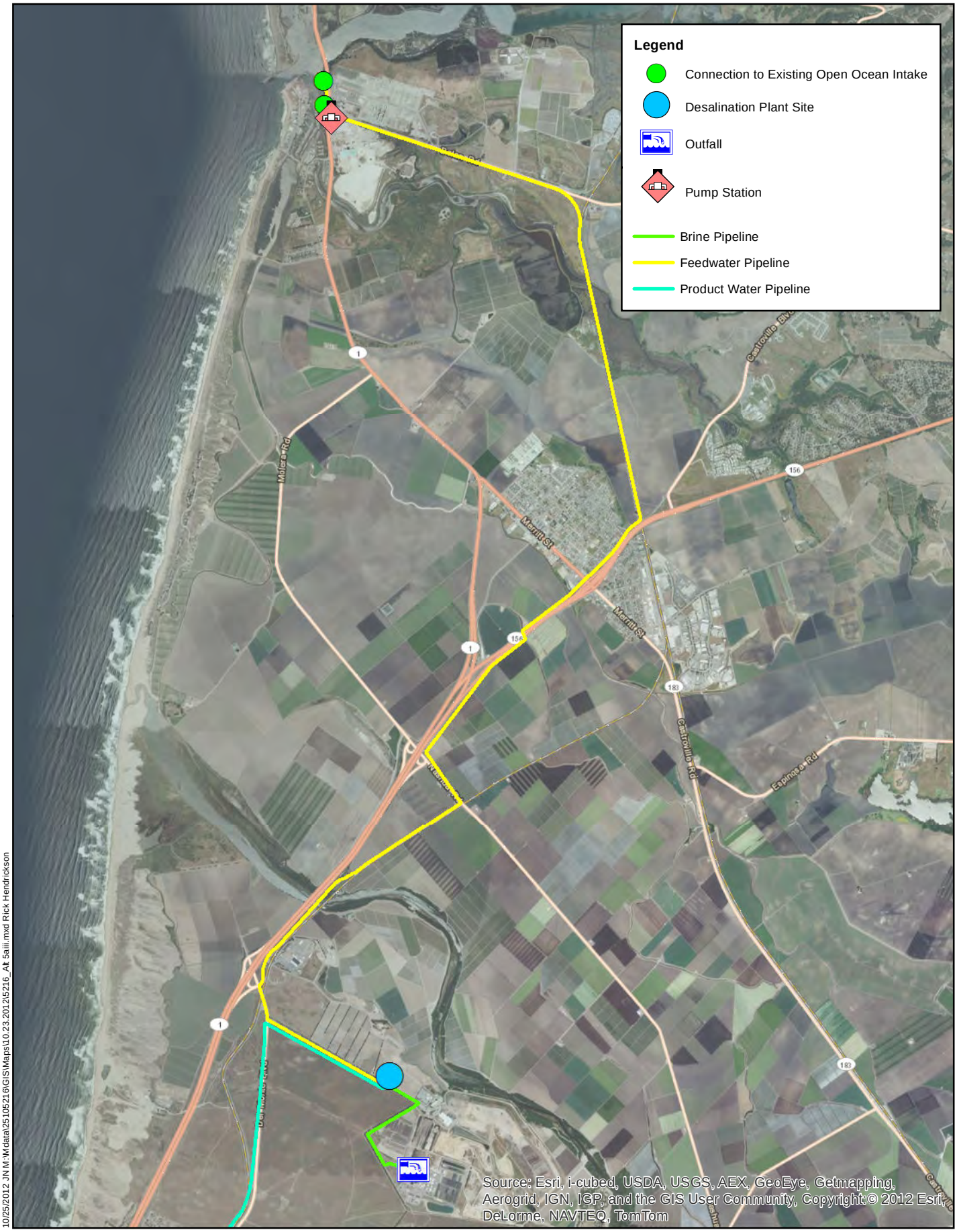
CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure 6 - Intake Contingency Option 5



10/25/2012 JN M:\Mdata\25\05216\GIS\Maps\10.23.2012\5216_Alt 5aiii.mxd Rick Hendrickson

CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula
Water Supply Project

Figure 7 - Intake Contingency Option 6

10/25/2012 JN M:\Mdata\25105216\GIS\Maps\10.23.2012\5216_Alt 5bi.mxd Rick Hendrickson

CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula
Water Supply Project

Figure 8 - Intake Contingency Option 7

10/25/2012 JN M:\Mdata\25\05216\GIS\Maps\10.23.2012\5216_Alt 5bii.mxd Rick Hendrickson

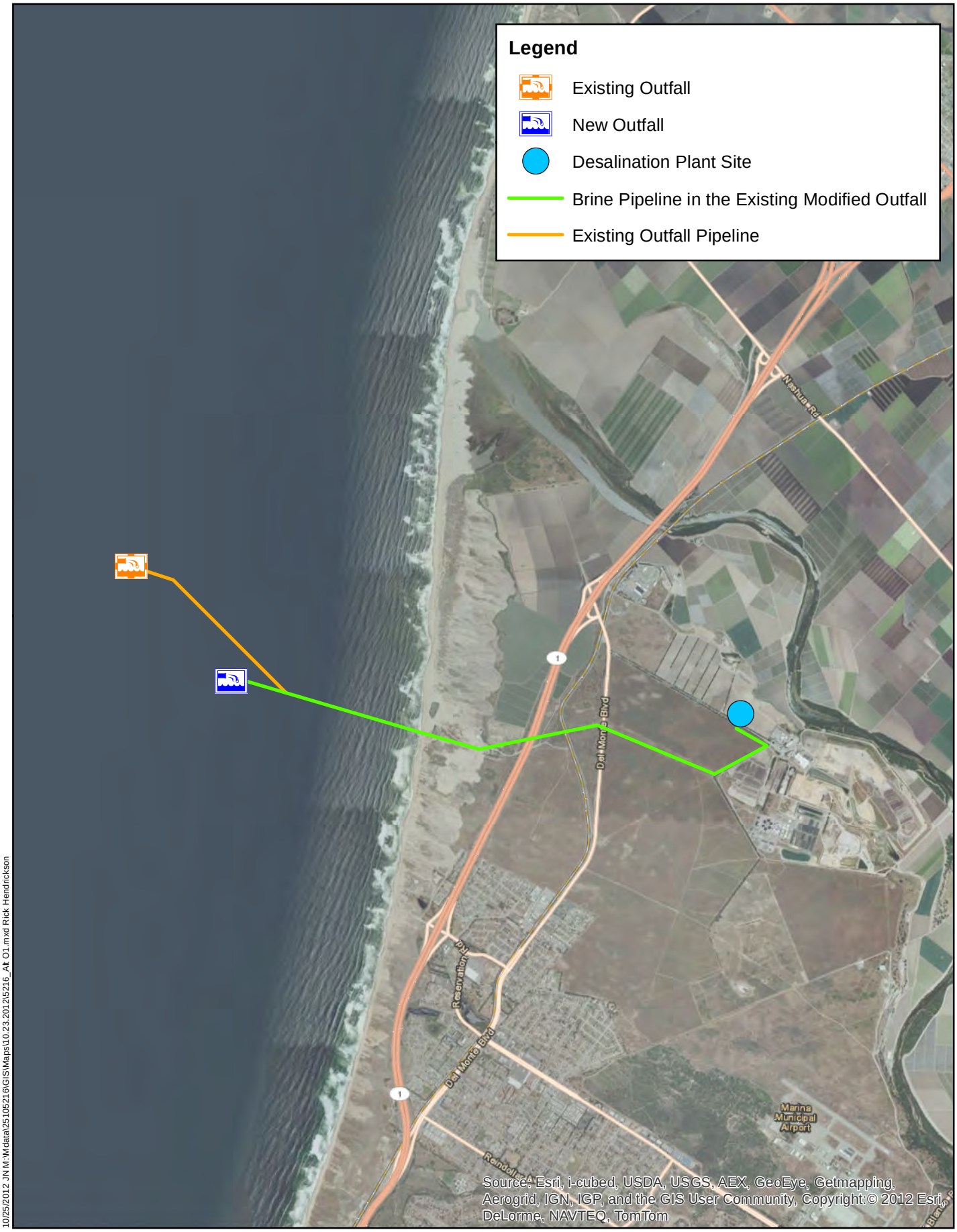
CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula
Water Supply Project

Figure 9 - Intake Contingency Option 8



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CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula
Water Supply Project

Figure 10 - Discharge Contingency Option 1

10/25/2012 JN M:\Mdata\25\05216\GIS\Maps\10.23.2012\5216_Alt O2.mxd Rick Hendrickson

CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure 11 - Discharge Contingency Option 2

10/25/2012 JN M:\Mdata\25\05216\GIS\Maps\10.23.2012\5216_Alt O3a.mxd Rick Hendrickson

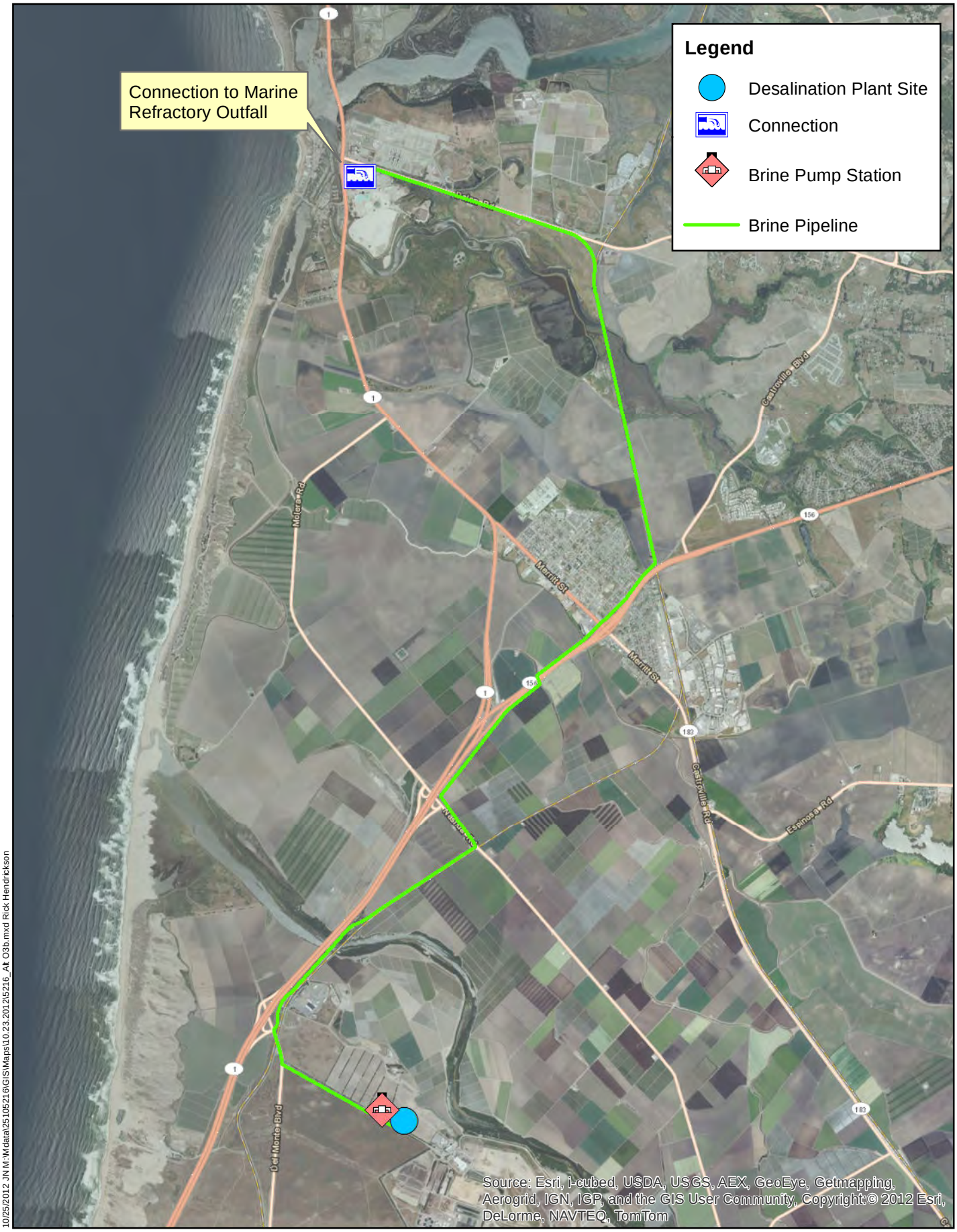
CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure 12 - Discharge Contingency Option 3



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CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure 13 - Discharge Contingency Option 4

10/25/2012 JN M:\Mdata\25105216\GIS\Maps\10.23.2012\5216_Alt S1.mxd Rick Hendrickson

CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula
Water Supply Project

Figure 14 - Desalination Plant Site Contingency Option 1

10/25/2012 JN M:\Mdata\25\05216\GIS\Maps\10.23.2012\5216_Alt S2.mxd Rick Hendrickson

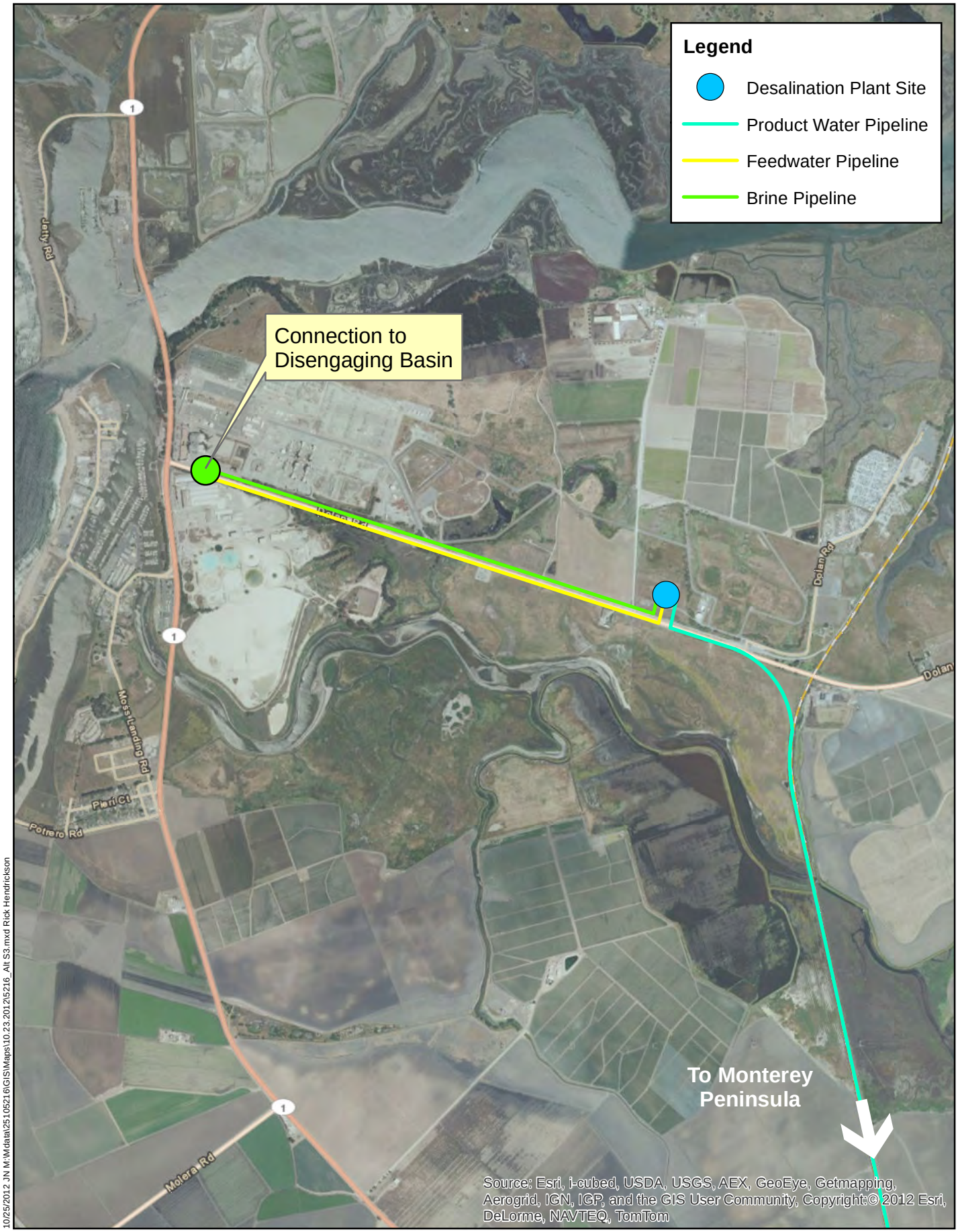
CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure 15 - Desalination Plant Site Contingency Option 2



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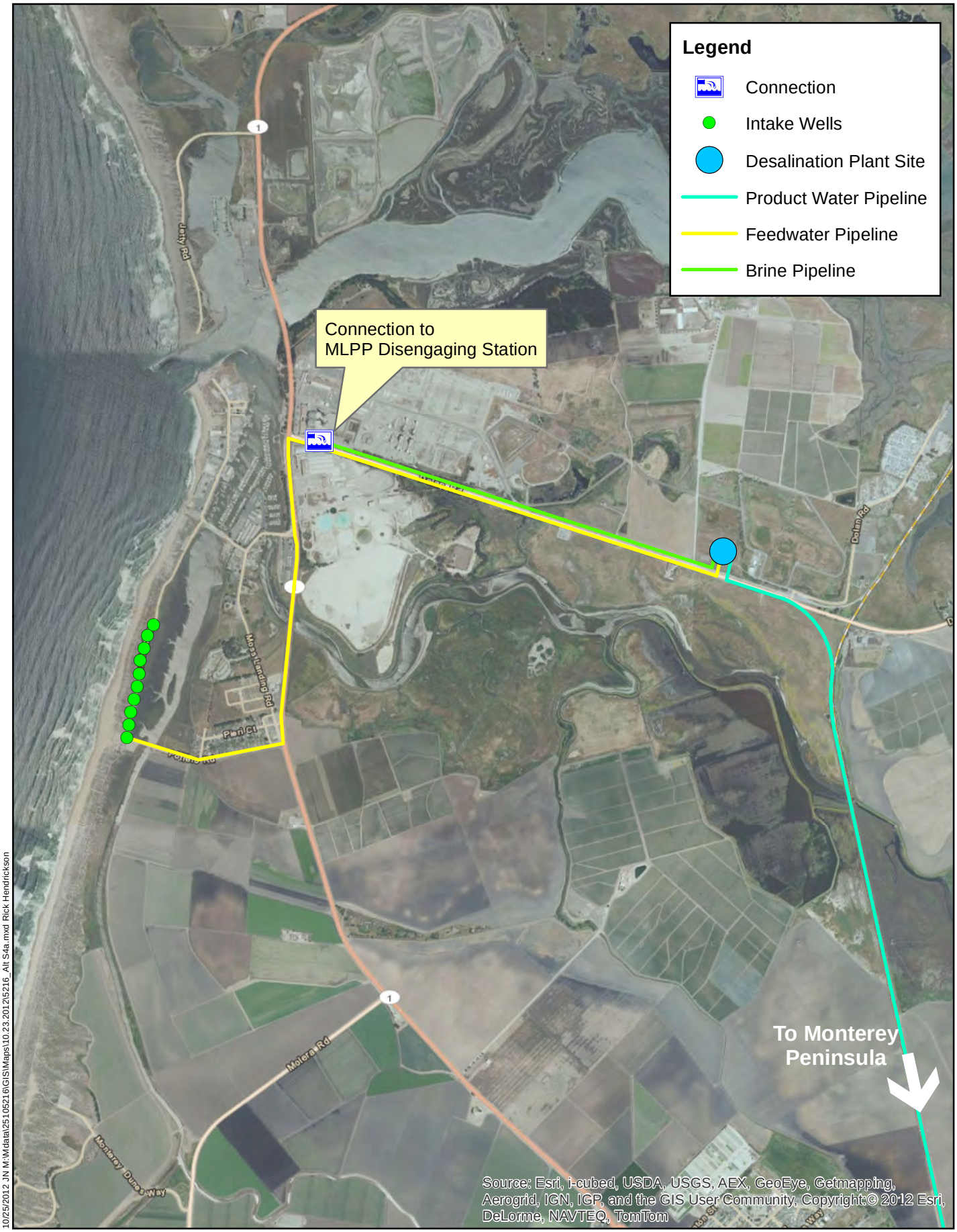
CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure 16 - Desalination Plant Site Contingency Option 3



10/25/2012 JN M:\Mdata\25105216\GIS\Maps\10.23.2012\5216_Alt S4a.mxd Rick Hendrickson

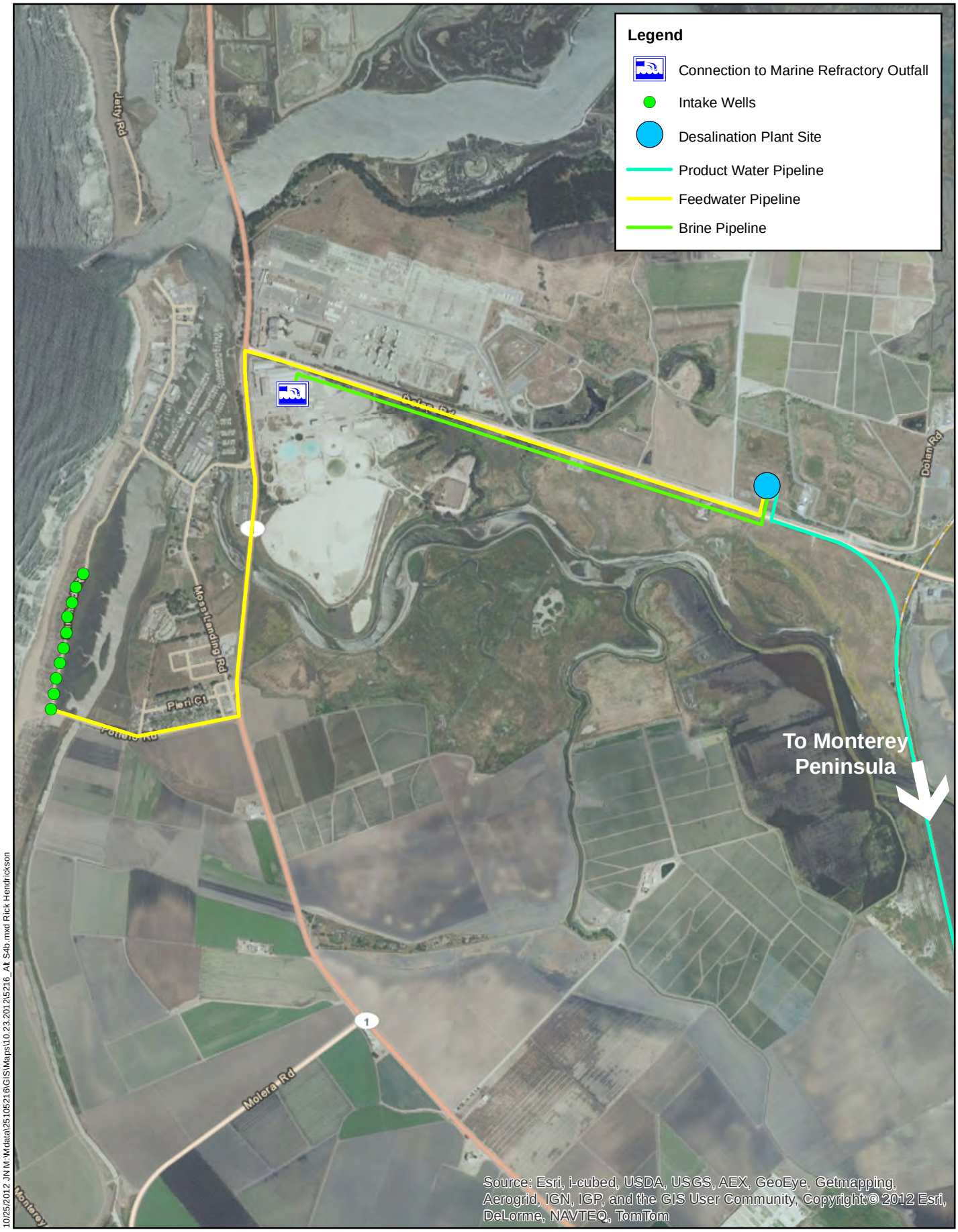
CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula
Water Supply Project

Figure 17 - Desalination Plant Site Contingency Option 4



10/25/2012 JN M:\Mdata\25\05216\GIS\Maps\10.23.2012\5216_Alt S4b.mxd Rick Hendrickson

CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure 18 - Desalination Plant Site Contingency option 5

11/1/2012 JN M:\Mdata\25105216\GIS\Maps\10.23.2012\5216_Alt S4c.mxd Rick Hendrickson

CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure 19 - Desalination Plant Site Contingency Option 6

10/25/2012 JN M:\Mdata\25\05216\GIS\Maps\10.23.2012\5216_Alt S5a.mxd Rick Hendrickson

CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure 20 - Desalination Plant Site Contingency Option 7

10/25/2012 JN M:\Mdata\25105216\GIS\Maps\10.23.2012\5216_Alt S5b.mxd Rick Hendrickson

CALIFORNIA AMERICAN WATER

0 0.25 0.5 1 Miles

Source:

Monterey Peninsula Water Supply Project

Figure 21 - Desalination Plant Site Contingency Option 8

Attachment 11

M E M O R A N D U M

REGISTERED PROFESSIONAL ENGINEER
No. 26189
Exp. 3-31-2014
PAUL L. FINDLEY
STATE OF CALIFORNIA
9 January 2013

To: Richard Svindland, California American Water

From: Paul Findley/Kevin Thomas/Sarp Sekeroglu, RBF Consulting

Date: January 9, 2013

Subject: Monterey Peninsula Water Supply Project (MPWSP) Project Description Update

INTRODUCTION

The Monterey Peninsula Water Supply Project (MPWSP) includes the following facilities: a subsurface beach well intake system; a seawater desalination plant north of the City of Marina at a site west of the Monterey Regional Water Pollution Control Agency (PCA) wastewater treatment facility; open-water discharge of brine through the PCA outfall; desalinated water conveyance and storage infrastructure, including approximately 25 miles of pipeline; and Aquifer Storage and Recovery (ASR) facilities. The following MPWSP description is intended for use by CPUC and its environmental consultant in preparation of necessary documentation for compliance with the California Environmental Quality Act (CEQA).

MPWSP SUPPLY CAPACITY

CAW plans to meet a projected demand condition of 15,290 acre-feet per year (AFY) with 11,046 AFY of supply from the MPWSP, and 4,244 AFY from existing sources (774 AFY of supply from the Seaside Groundwater Basin (SGWB), 3,376 AFY from the Carmel River, and 94 AFY from the Sand City Desalination Plant (SCDP)). The intended operation of the MPWSP includes operation of the existing Seaside groundwater wells at a long term average of 774 AFY, which is 700 AFY below the safe yield of the basin, effectively achieving 700 AFY of in-lieu replenishment water to the Seaside Groundwater Basin.

CAW is considering implementation of the MPWSP under two different possible scenarios. In both scenarios, available Carmel River would be injected in the Seaside Groundwater Basin (SGWB) during the wet season, and this stored water would then be extracted and used as supply during the dry season. In one scenario, the MPWSP would provide a long term average of up to 3,000 AFY of Carmel River water and 1200 AFY of desalinated water to the GWR Project, and this water would be combined with up to 3,500 AFY of highly treated GWR Project water and injected in the Seaside Groundwater Basin using wells provided by the GWR Project. This supply would then be extracted using the proposed ASR wells. The remaining supply increment of 7,590 AFY would be met with Carmel River Water direct to the system (1,670 AFY), desalinated water from the MPWSP desalination plant (5052 AFY), existing Seaside wells (774 AFY), and the existing SCDP (94 AFY). In this scenario, the MPWSP desalination plant would have a rated capacity of 6.4 million gallons per day (MGD); therefore, this scenario is referred to as the “6.4 MGD desalination option.”

In the other scenario, which provides for a possible delay of GWR project implementation, the entire supply increment of 11,046 AFY would be met with supply from the ASR system and the desalination plant. The MPWSP would provide a long term average of up to 1,300 AFY of Carmel River water for injection in the SGWB during the wet season, and this stored water would then be extracted and used as supply during the dry season. The remaining supply

increment of 9,746 AFY would be met with desalinated water from the MPWSP desalination plant. The MPWSP desalination plant would have rated capacity of 9.6 MGD; therefore, this scenario is referred to as the "9.6 MGD desalination option."

The Sand City Desalination Plant was analyzed in the Sand City Water Supply Project EIR (Sand City, 2004). It is not included in this current project description, because it has been constructed (by Sand City) and is now in operation.

PROJECT OBJECTIVES

The primary objectives of the Monterey Peninsula Water Supply Project are to:

- Satisfy CAW's obligations to meet the requirements of SWRCB Order 95-10;
- Diversify and create a reliable drought-proof water supply;
- Protect the Seaside Groundwater Basin for long-term reliability;
- Protect the local economy from the effects of an uncertain water supply;
- Minimize water rate increases by creating a diversified water supply portfolio;
- Minimize energy requirements and greenhouse gas (GHG) emissions per unit of water delivered to the extent possible;
- Provide facilities that can accommodate sea level changes;
- Explore opportunities for regional partnerships; and
- Provide flexibility to incorporate alternative water supply sources, such as GWR

SEASIDE GROUNDWATER BASIN REPLENISHMENT PROJECT (GWR)

The GWR is a separate project, which CAW does not control. Given the urgency of the SWRCB's Cease and Desist Order, CAW is proceeding with a full-scale project that includes a 9.6 mgd desalination plant. However, CAW remains committed to exploring incorporation of alternative water supplies into the overall Monterey Peninsula water supply solution. CAW has been in discussion with PCA, CPUC and other stakeholders regarding incorporating PCA's GWR project into the overall water supply solution. As such, CAW has developed the proposed Project to be flexible, allowing for incorporating GWR water into the water supply portfolio. Therefore, this Project Description includes a scenario whereby approximately 3,500 AFY of recycled water would be contributed by the GWR Project under the "with GWR" scenario, based on information provided to CAW by PCA.

The GWR project would provide a year-round source of supply to the Seaside Groundwater Basin. As described in Section 5.3.6 of the FEIR, the GWR Project would include replenishment of the Seaside Groundwater Basin with advanced treated recycled water from PCA's Regional Treatment Plant (RTP). All groundwater replenishment water would be treated through a proposed advanced water treatment plant (AWTP). The GWR Project would contribute up to 3,500 AFY of recycled water to the MPWSP over an 8-month period (September through April). The GWR Project would have injection wells located at inland locations in the Seaside Basin. Treated water from the AWTP would be conveyed to the Seaside Basin through a pipeline to be constructed as part of the Regional Urban Water Augmentation Project (RUWAP). If the RUWAP pipeline is not constructed or feasible for their use, PCA would explore other approaches to transmit the recycled water to the Seaside Basin.

MPWSP FACILITIES

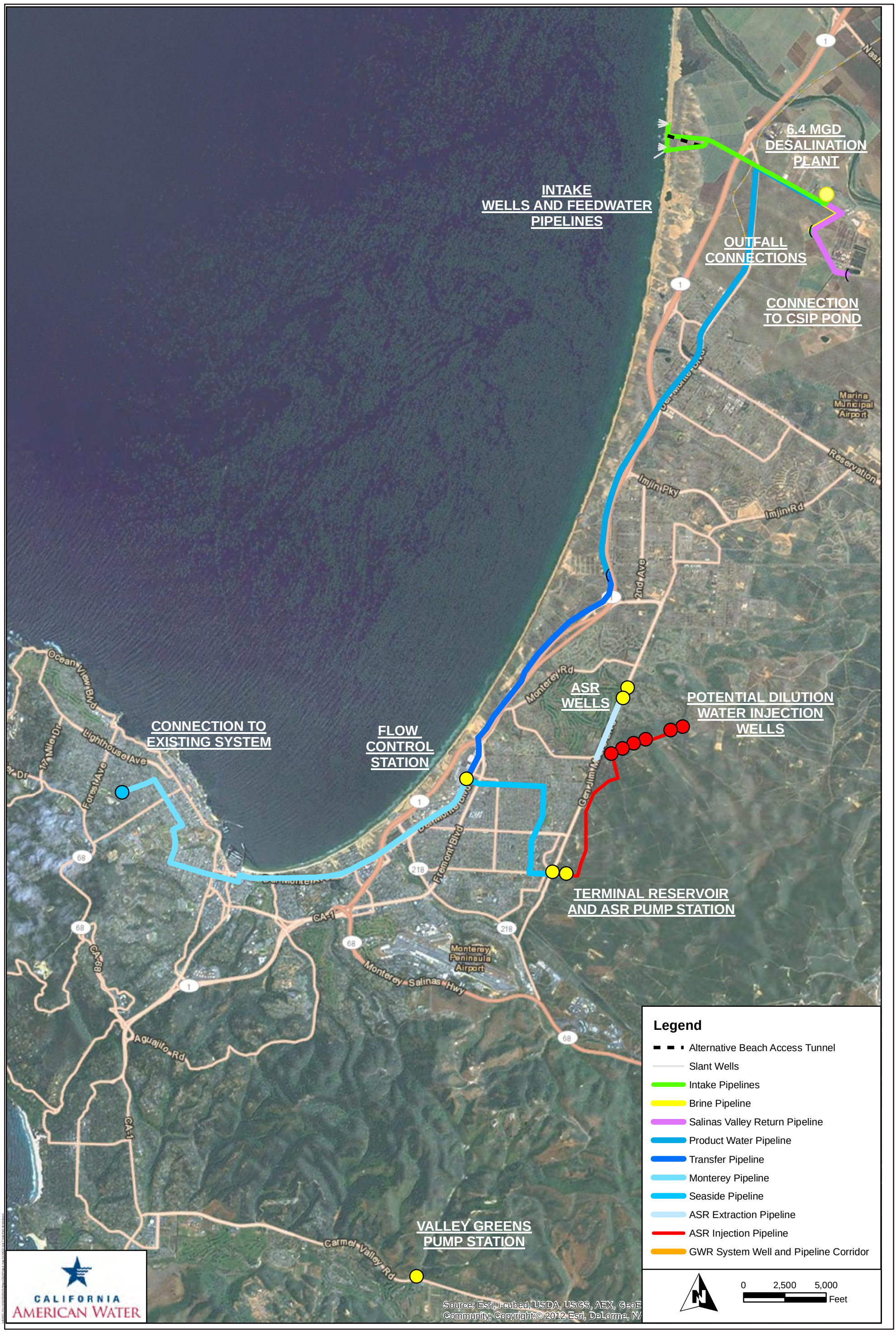
The MPWSP's facilities include a feedwater intake and conveyance system, a 6.4 or 9.6 MGD desalination plant, a brine discharge system, and a variety of conveyance and storage facilities, including an ASR system, as shown on **Figures 1 and 2**. **Tables 1 and 2** provide a summary

Monterey Peninsula Water Supply Project

9.6 MGD Desalination Plant (without GWR)

Source: ESRI
25105216\Images\Exhibits\Well Cluster\5216Exhibits 2013-01-09.indd

Figure 1



Monterey Peninsula Water Supply Project

6.4 MGD Desalination Plant (with GWR)

Source: ESRI
25105216\Images\Exhibits\Well Cluster\5216Exhibits 2013-01-09.indd

Figure 2

description for each component of the MPWSP with and without implementation of the Seaside Groundwater Basin Replenishment (GWR) Project by PCA. Some of these facilities have not changed from what is described in the FEIR; these facilities are marked with a "P" in Tables 1 and 2. Other facilities were described in the FEIR but have been modified for this Project Description; these facilities are marked with an "M" in Tables 1 and 2. Finally, some facilities in this Project Description have not been previously described and these facilities are marked with an "N" in Tables 1 and 2.

Table 1
MPWSP FACILITIES SUMMARY WITH GWR

Facility	Quantity	Size and Characteristics	M/N/P[1]	FEIR Reference
Northern Facilities				
Subsurface Intake:				
Intake Wells	2 clusters of 3 plus 1 test well	Gravity wells; Angle from horizontal TBD by test well; -190 to -210 MSL depth; 580 ft average length, average capacity 1500 gpm each	M	Chapter 3.3.1
Beach Collector Pipeline	1600 LF	36-inch diameter trenchless construction under beach	N	Not described in FEIR
Gravity Intake Tunnel Pipeline	2,500 LF	72-inch diameter tunnel constructed under dunes	N	Not described in FEIR
Feedwater Pump Station	1	15 MGD; 150 ft TDH; 600 HP (VFD) installed	N	Not described in FEIR
Feedwater Pipeline	8,300 LF	36-inch diameter, includes trenchless 500 LF under Hwy 1	M	Chapter 3.3.1
Desalination Plant:			M	Chapter 3.3.2
Feedwater Receiving Tanks	2	0.5 MG each		
Pretreatment System	1	15 MGD, multimedia sand filters		
Backwash Supply System	1	0.2 MG elev. tank, 1,500 gpm fill pumping system		
Backwash Waste Handling	1	0.5 acre, 6 ft deep, lined open basin with decant system		
Desalination Process	1	6.4 MGD SWRO system, 40-50% second pass		
Post-Treatment System	1	Calcite, carbon dioxide, NaOH, and sodium hypochlorite		
Brine Storage Basin	1	3.0 MG lined open basin, 8 ft deep		
Clearwell Pump Station	1	6.4 MGD, 40 ft TDH, 90 HP installed		
Desalinated Water Storage	2	1.0 MG each, steel or concrete above ground tanks		
Desalinated Water Pumping (to CAW)	1	6.4 MGD, 280 ft TDH 600 HP (VFD) installed		
Desalinated Water Pumping (to SV)	1	1000 gpm, 20 HP installed		
Brine Conveyance/Disposal:			M	Chapter 3.3.3
Brine Pipeline	5,000 LF	24-inch diameter		
PCA Outfall Pipeline (Existing)	11,260 LF	80 MGD capacity (existing); 60-inch diameter		
PCA Outfall Diffuser (Existing)	1,368 LF	60-inch and 48-inch diameter pipes; 120 to 170 diffuser ports; 2-inch diameter ports; -95 to -109 ft MSL; 3.5 ft above seafloor		
Desalinated Water Conveyance:			M	Chapter 3.3.4.3
Product Water Pipeline	32,000 LF	36-inch diameter		
Desalinated Water Pipeline to SV	6,200 LF	12-inch diameter		
Previous "CAW Only" Facilities (addressed in certified Final EIR)				
Conveyance and Storage:			P	Chapter 3.2.5 & 3.2.6
Transfer Pipeline	15,700 LF	36-inch diameter		
Monterey Pipeline	28,400 LF	36-inch diameter		
Terminal Reservoir	2 tanks	3 MG each		
Valley Greens Pump Station	1	3.0 MGD; 110 ft TDH; 100 HP (VSD) installed		
ASR:			M	Chapter 3.2.6
ASR Extraction (only) Wells	2	1000-foot depth, 4.3 MGD extraction		
ASR Pump Station	1	14 MGD, 150 ft TDH, 500 HP installed		
ASR Pipeline	13,000 LF	30-inch diameter north of Coe Avenue to ASR Wells;		
ASR Pump-to-Waste Conveyance	5,800 LF pipeline	16-inch diameter pipeline		
ASR Pump-to-Waste Treatment	1 settling basin	2,500 square-foot by 12-foot deep basin		

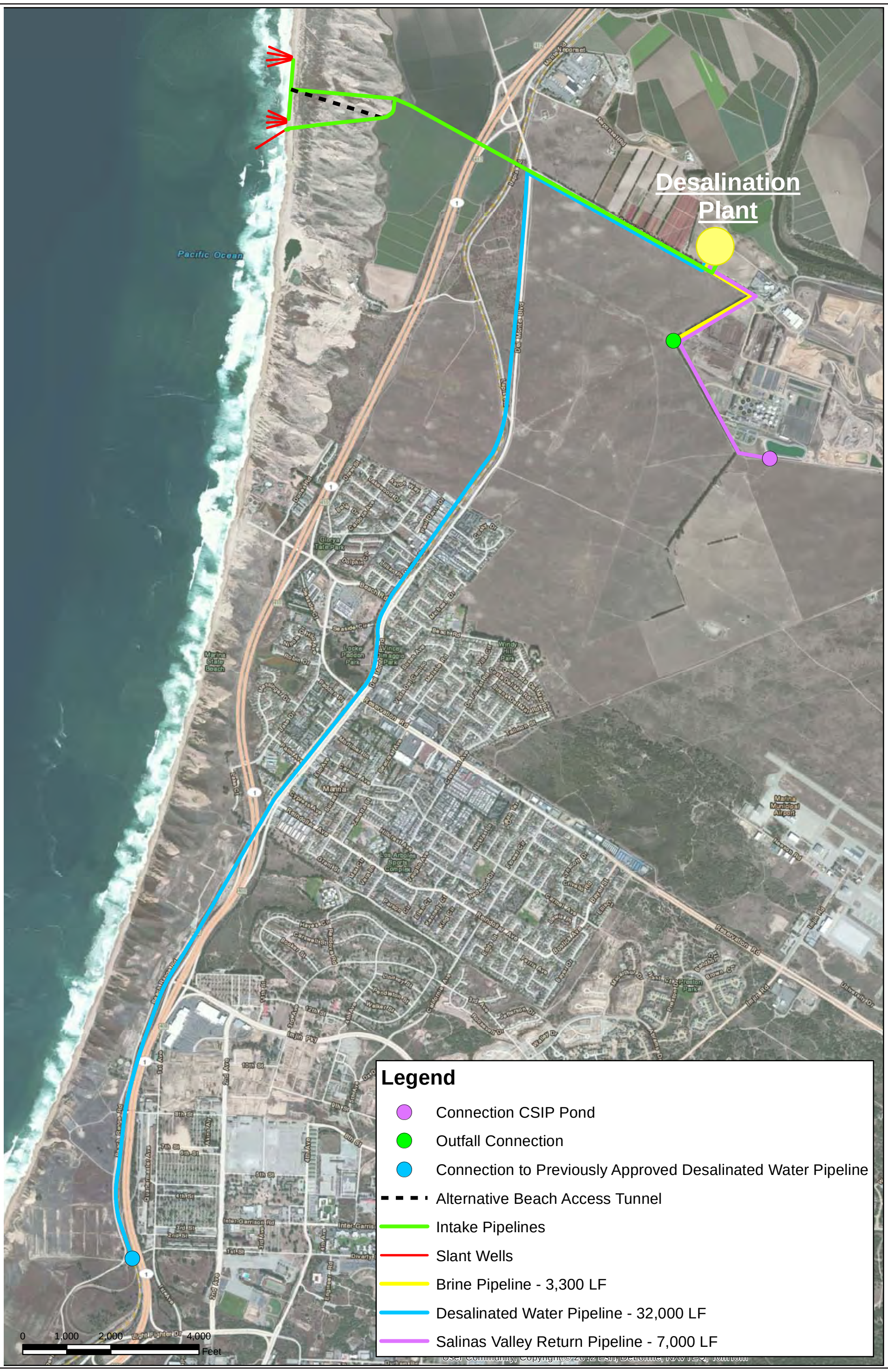
Notes **1. N: New, M: Previously described in the FEIR but modified in this Project Description, P: Previously described in the FEIR**

Table 2
MPWSP FACILITIES SUMMARY WITHOUT GWR

Facility	Quantity	Size and Characteristics	M/N/P[1]	FEIR Reference
Northern Facilities				
Subsurface Intake:				
Intake Wells	2 clusters of 4 plus 1 test well	Gravity wells; Angle from horizontal TBD by test well; -190 to -210 MSL depth; 580 ft average length, average capacity 1780 gpm each	M	Chapter 3.3.1
Beach Collector Pipeline	900LF to 1,600 LF (Depending on Selected Sites)	36-inch diameter trenchless construction under beach	N	Not described in FEIR
Gravity Intake Tunnel Pipeline	2,500 LF	72-inch diameter tunnel constructed under dunes	N	Not described in FEIR
Feedwater Pump Station	1	23 MGD; 150 ft TDH; 1000 HP (VFD) installed	N	Not described in FEIR
Feedwater Pipeline	8,300 LF	42-inch diameter, includes trenchless 500 LF under Hwy 1	M	Chapter 3.3.1
Desalination Plant:			M	Chapter 3.3.2
Feedwater Receiving Tanks	2	0.5 MG each		
Pretreatment System	1	23 MGD, multimedia sand filters		
Backwash Supply System	1	0.2 MG elev. tank, 1,500 gpm fill pumping system		
Backwash Waste Handling	1	0.5 acre, 6 ft deep, lined open basin with decant system		
Desalination Process	1	9.6 MGD SWRO system, 40-50% second pass		
Post-Treatment System	1	Calcite, carbon dioxide, NaOH, and sodium hypochlorite		
Brine Storage Basin	1	3.0 MG lined open basin, 8 ft deep		
Clearwell Pump Station	1	9.6 MGD, 120 HP installed		
Desalinated Water Storage	2	1.0 MG each, steel or concrete above ground tanks		
Desalinated Water Pumping (to CAW)	1	9.6 MGD, 800 HP (VFD) installed		
Desalinated Water Pumping (to SV)	1	1000 gpm, 20 HP installed		
Brine Conveyance/Disposal:			M	Chapter 3.3.3
Brine Pipeline	5,000 LF	24-inch diameter		
PCA Outfall Pipeline (Existing)	11,260 LF	80 MGD capacity (existing); 60-inch diameter		
PCA Outfall Diffuser (Existing)	1,368 LF	60-inch and 48-inch diameter pipes; 120 to 170 diffuser ports; 2-inch diameter ports; -95 to 109 ft MSL; 3.5 ft above seafloor		
Desalinated Water Conveyance:			M	Chapter 3.3.4.3
Product Water Pipeline	32,000 LF	36-inch diameter		
Desalinated Water Pipeline to SV	6,200 LF	12-inch diameter		
Previous "CAW Only" Facilities (addressed in certified Final EIR)				
Conveyance and Storage:			P	Chapter 3.2.5 & 3.2.6
Transfer Pipeline	15,700 LF	36-inch diameter		
Monterey Pipeline	28,400 LF	36-inch diameter		
Terminal Reservoir	2 tanks	3 MG each		
Valley Greens Pump Station	1	3.0 MGD; 110 ft TDH; 100 HP (VSD) installed		
ASR:			M	Chapter 3.2.6
ASR Injection/Extraction Wells	2	1000-foot depth, 2.2 MGD injection/4.3 MGD extraction		
ASR Pump Station	1	8.4 MGD, 100 ft TDH, 300 HP installed		
ASR Pipeline	13,000 LF	30-inch diameter north of Coe Avenue to ASR Wells;		
ASR Pump-to-Waste Conveyance	5,800 LF pipeline	16-inch diameter pipeline		
ASR Pump-to-Waste Treatment	1 settling basin	2,500 square-foot by 12-foot deep basin		

Notes 1. **N: New, M: Previously described in the FEIR but modified in this Project Description, P: Previously described in the FEIR**

The ASR system and the major portion of the conveyance and storage facilities are as described for the North Marina Alternative in Chapter 3 of the Coastal Water Project FEIR (with the exception of a required increase in the installed horsepower of the ASR Pump Station for the 6.4 MGD desalination option). However, the intake wells and supply/return pipelines, the desalination plant, and the desalinated water conveyance pipelines of the MPWSP are different than those described for the North Marina Alternative, and are described here. Proposed Northern MPWSP facilities are shown on **Figure 3**.



CALIFORNIA AMERICAN WATER

Source: Esri
25105216\Images\Exhibits\Well Cluster\5216Exhibits 2013-01-09.indd

Monterey Peninsula Water Supply Project

Northern Facilities

Figure 3

It is important to note that the following facility descriptions are preliminary, and are subject to modification through the CEQA process and subsequent final design and construction. Facility sizing, location and quantities are best estimates at this time. It is CAW's intent to seek CPUC approval for a "project" addressed in the Subsequent EIR that will allow CAW adequate flexibility in project implementation. Therefore, wherever possible, facility siting, alignment and sizing should be understood and addressed as conceptual in nature, with "study areas" and "pipeline alignment corridors" addressed in the EIR. More detailed facility information will be developed as the project moves through the regulatory permitting and design process.

NORTHERN PROJECT FACILITIES

As shown on Figure 3, the MPWSP northern project facilities involve a feedwater intake system, a desalination plant (6.4 MGD or 9.6 MGD), a brine conveyance and disposal system, and a desalinated water conveyance system.

Intake System

This section describes the location, size, and configuration of feedwater intake wells, feedwater intake pump station, and feedwater intake pipelines in the MPWSP. Proposed MPWSP intake facilities are shown on **Figure 4**.

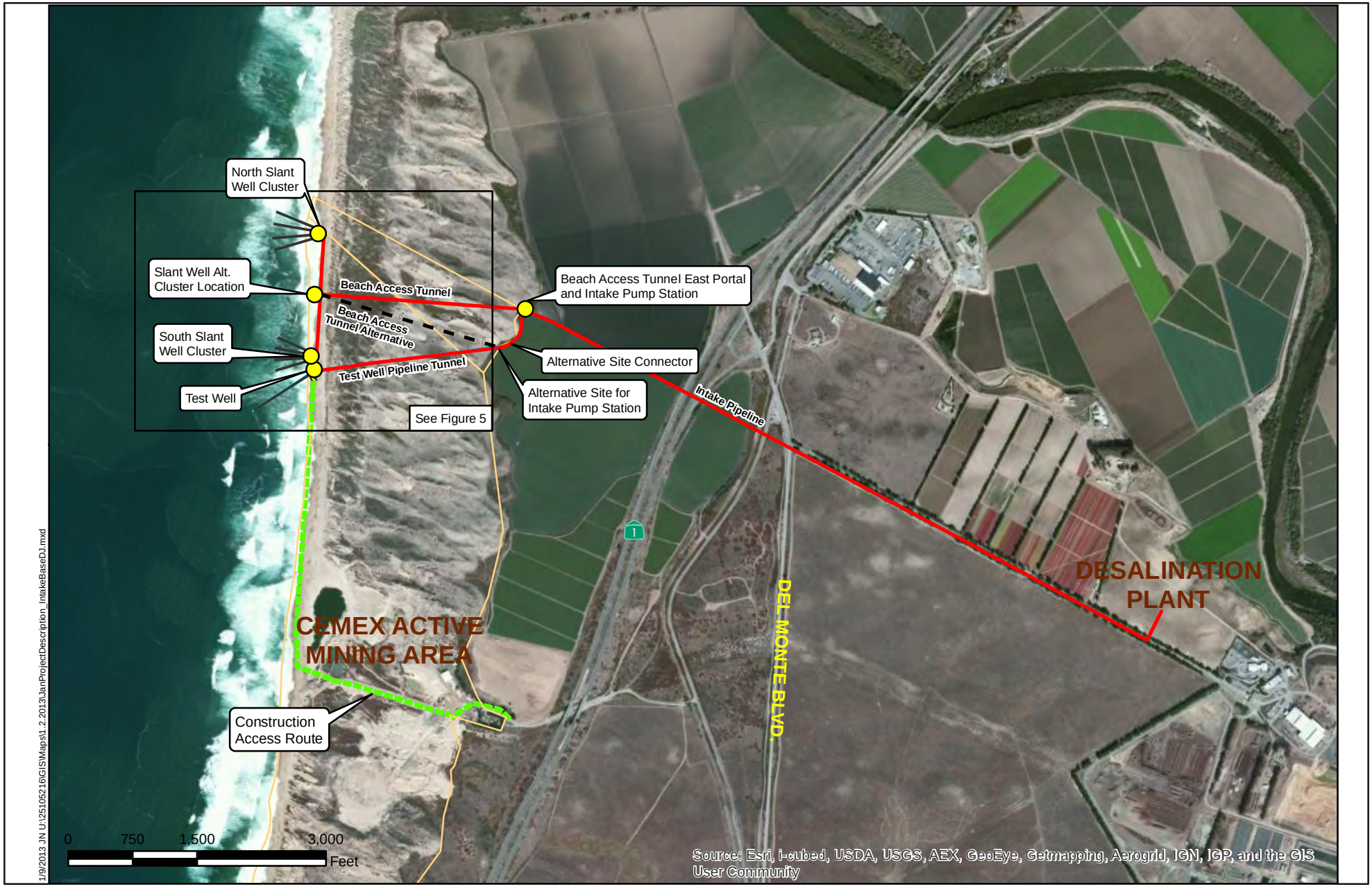
Intake Wells

Feedwater for the MPWSP desalination plant would be extracted from subsurface slant wells that would draw seawater from beneath the shoreline. A slant well is a well that is drilled at an angle using modified vertical well construction methods. This allows construction of wells that extract water from as close to the coastline as possible, in order to extract water with higher salinity than can be obtained with conventional vertical wells. Angled drilling is beneficial because it results in a substantially increased screen length in the targeted water-bearing formations.

For the 9.6 MGD desalination option, the total well capacity required is approximately 23 MGD to meet the feedwater requirement for a 9.6 MGD desalination plant operating at an overall recovery of 42 percent. Nine wells operating at 1,800 gpm can meet this requirement. For the 6.4 MGD desalination option, the total well capacity required is approximately 15 MGD which can be met by seven wells operating at 1,500 gpm per well.

The preferred site (APN Number: 203 011 019 000) for construction of the slant wells is adjacent to a 376-acre parcel of land owned by the CEMEX corporation located due west of the proposed desal plant site and west of Highway 1. This property borders the Pacific Ocean and includes disturbed and undisturbed areas and approximately 7,000 feet of ocean shoreline. The wells would be constructed in two clusters along a 2000-foot stretch of this shoreline, at two of the three candidate cluster locations shown on Figure 4 and **Figure 5**. Most, if not all, of the facilities in the well clusters will actually be constructed on land owned by the State of California, under the authority of the California State Lands Commission.

One of the clusters would be constructed near the test well site, which is being separately permitted as a test facility, and the expectation is that the test well facility would be connected to this southern cluster, allowing the test well to be converted to a permanent facility. Four wells would be constructed at each cluster for the 9.6 MGD desalination option and three wells would be constructed at each cluster for the 5.4 MGD option. A preliminary layout and profile view of the well cluster is shown on **Figures 6 and 7.**



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Source: Esri Esri
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Monterey Peninsula Water Supply Project

Intake Facilities

Figure 4

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Source: Esri
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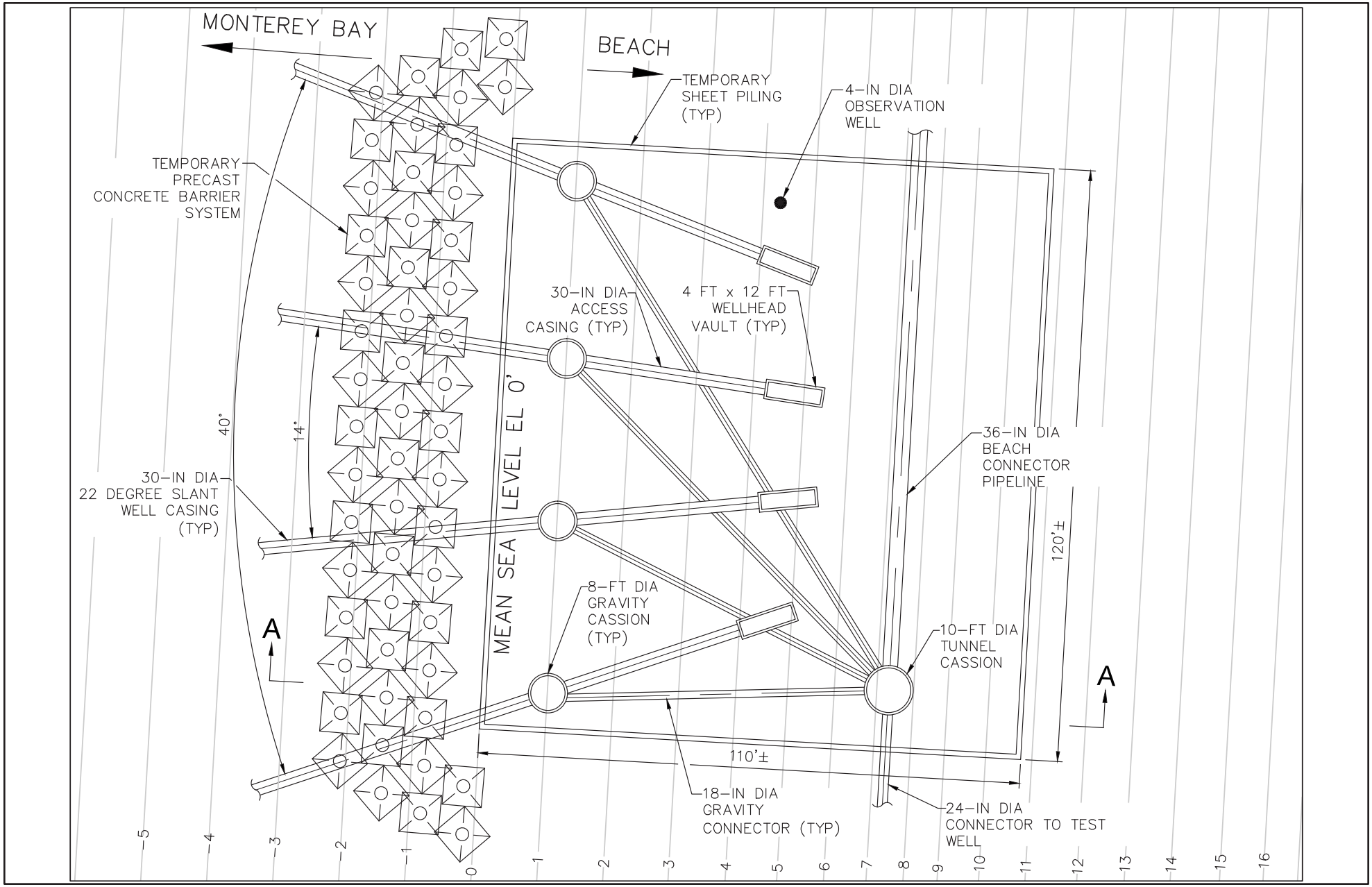
Monterey Peninsula Water Supply Project

Intake Wells

Figure 5



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Monterey Peninsula Water Supply Project

Southern Intake Well Cluster

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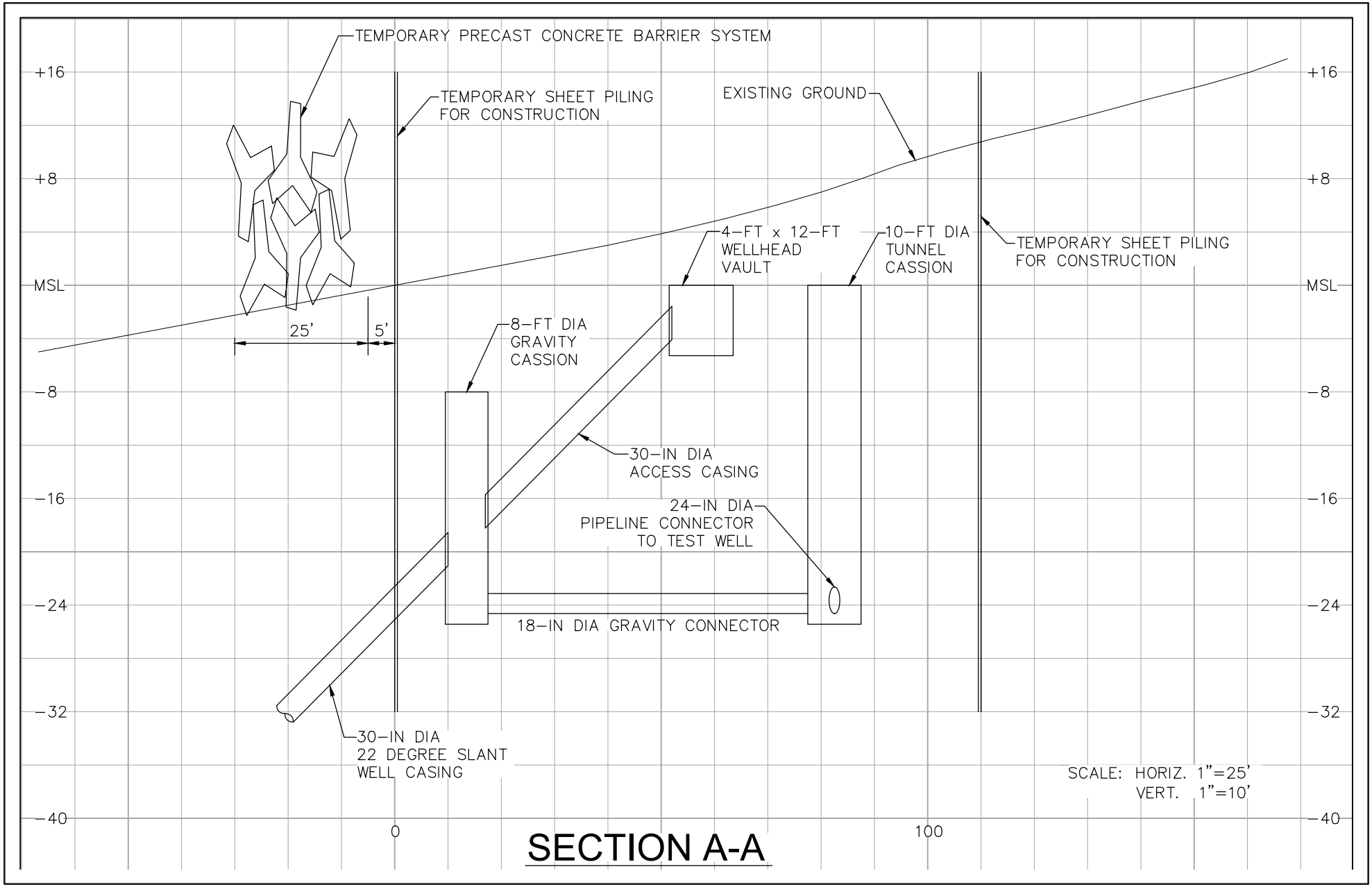
Figure 6



Monterey Peninsula Water Supply Project

Profile A-A of Southern Intake Well Cluster

Figure 7

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Slant Wells. Subject to verification in the test well program, each slant well would be drilled at a 22 degree angle from horizontal to the bottom of the surface aquifer, which is referred to as the Sand Dunes Aquifer (SDA). In the proposed locations, the length of the wells is expected to range from 530 LF to 630 LF, measured from ground surface, and the length of the well screens is expected to range from 370 LF to 470 LF. The wells will be designed as gravity wells such that they will not require submersible well pumps or electrical power.

In order to protect the wellheads from wave damage, to eliminate any visual profile after construction, and to eliminate impacts on Snowy Plover nesting habitat, the wellheads will be completely buried below the beach surface in the area known as the "swash zone", which is the portion of the beach that lies within the run-up of waves at normal high tide. In order to eliminate any possibility that the wellheads or any associated structures will be exposed by the combined effects of coastal erosion and sea level rise, they will be capped at or below mean sea level.

Construction of the intake wells in the swash zone will require a temporary barrier and sheet piling to protect equipment and personnel during construction. Further, the construction will need to be accomplished within the five-month (October through February) non-nesting season for the Snowy Plover, and the temporary barrier and sheet piling must be removed prior to March 1.

Access to the well facilities during construction will be obtained by two methods: (1) construction personnel and some of the construction equipment would travel to the shoreline through the active CEMEX mining area and travel north along the shoreline below the high water mark, as shown in Figure 4; and (2) barges would be used to deliver some construction equipment and most of the construction materials directly to the well sites. Once the slant test well is constructed, routine operational access to the slant test well site would not be necessary other than once every 5 to 10 years, for one to two weeks per well, during which time the well head would be excavated and uncovered, and well cleaning operations would be performed.

Test Well. CAW intends to construct a test slant well to collect data to facilitate overall intake and desalination plant design, operational and maintenance methods. The slant well will be permitted separately from the full-scale project, and would be located near the proposed southern well cluster, as shown on Figure 5. The test well is planned to be a pumped well, but it will be designed such that it could be converted to a gravity well, if desired. It is anticipated that the test well will be operated for twelve months, but this operational period may be longer as determined appropriate by CAW and applicable regulatory agencies.

Intake Pump Station and Pipelines

The hydraulic design of the intake wells, beach connector pipelines, beach access tunnel, and intake pump station would induce gravity flow in the intake slant wells. The intake pump station would pump feedwater from the beach access tunnel into the intake pipeline for conveyance to the desalination plant.

Beach Connector Pipelines. The two well clusters would be connected to the west portal of the beach access tunnel with 36-inch diameter pipe tunnels, which would be installed using trenchless construction technology such as jack-and-bore or drill-and-burst. The connector pipes would be launched from the west portal of the beach access tunnel to the tunnel caissons located at each well cluster. (The tunnel caissons at each well cluster would be connected to the gravity wells via gravity connectors.) Material excavated during the trenchless technology construction would be conveyed in the pipe tunnels back to the beach access tunnel west portal

and from there conveyed in the beach access tunnel back to the east portal of the beach access tunnel.

Beach Access Tunnel. The beach access tunnel would be approximately 2,500 LF in length. Based on hydraulics, the minimum diameter of the tunnel would be 48-inches, however the final diameter and construction method of the tunnel will be determined based on constructability criteria and the requirement to remove spoils from beach trenchless technology construction operations.

Intake Pump Station. The intake pump station would be located on the east side of the coastal dunes at the east portal of the beach access tunnel, as shown on Figure 4. The intake pump station would have a capacity of approximately 23 MGD for the 9.6 MGD desalination option, and approximately 15 MGD for the 6.4 MGD option. The intake pumps (4 pumps at 150 HP each for 6.4 MGD desalination option or 4 pumps at 250 HP each for the 9.6 MGD desalination option) would be variable speed, vertical turbines mounted on vertical "pump cans", enclosed in an above-ground 3,000 square-foot building.

Intake Pipeline. As shown in Figure 4, the 8,300 LF 36-inch diameter intake pipeline would convey pumped flow east from the intake pump station along an existing unpaved road between two agricultural fields, under Highway 1, then across the TAMC right-of-way to the intersection of Charles Benson Road and Del Monte Boulevard intersection. From there the pipeline would continue southeast on Charles Benson Road to the desalination plant. The crossing of Highway 1 would be constructed using trenchless technology.

Brine Conveyance Pipeline

The desalination plant will generate a brine stream (with a salinity of approximately 55,000 to 60,000 mg/L or approximately 70 to 80 percent higher than seawater) at a flow rate equal to 120 to 140 percent of the plant's production rate, and possibly another 0.4 MGD of decanted waste backwash (at seawater salinity). These combined streams will flow by gravity from the RO process through approximately 3,300 LF of 24-inch diameter pipeline to the headworks of the Monterey Regional Pollution Control Authority's (PCA) outfall, where it will mix with effluent from PCA's Regional Treatment Plant (RTP) and be discharged to the ocean through the existing outfall diffusers. The amount of RTP effluent available for blending with the brine is expected to be highly variable throughout the year and may be zero for extended periods during the summer months when all of the RTP's effluent is reclaimed for agricultural irrigation.

Salinas Valley Desalinated Water Return Pipeline

Groundwater modeling results indicate that, over the long term, feedwater pumped from the slant wells would include a small amount of intruded groundwater from the Salinas Valley Groundwater Basin (SVGB). The MPWSP desalination plant would be operated such that, on an annual average basis, the plant would return desalinated water to the SVGB in an amount equal to the freshwater amount in the water extracted from the slant wells. Geosciences Support Services, Inc. (GSSI) prepared a study for CAW titled *North Marina Groundwater Model Evaluation of Potential Projects*, dated September 26, 2008. This study looked at a CAW slant well only scenario to be located at MCWD Reservation Road property. The study predicted:

'The predicted TDS concentration of 33,000 mg/L for the feedwater extracted by the six slant wells is approximately 94 to 97 percent of the TDS concentration of seawater (34,000 to 35,000 mg/l). As the modeled layout represents a worse-case scenario (due to the steeper well angles), the most recent layout (six 700 ft wells with a 20 degree angle proposed by RBF, 2008) would most likely result in an even higher percentage of seawater in the extracted water."

For the purposes of this project description, the assumed percentage of seawater in the feedwater is approximately 97 percent. Therefore, freshwater in the feedwater, which would be returned to Salinas Valley, is approximately three percent. Considering plant recovery, the amount of water to be returned to Salinas Valley is assumed to be eight percent of the desalinated water production and is calculated as follows:

Return Amount = ((Delivery to CAW)/0.92) - (Delivery to CAW)

Using the above formula, the calculated return amounts for the 9.6 MGD desalination option and the 6.4 MGD desalination option are 850 AFY and 540 AFY, respectively.

The proposed method to return the excess desalinated water to the SVGB is to deliver the water to the Castroville Seawater Intrusion Project (CSIP) 80-acre foot (AF) storage pond located on the PCA's RTP property. During the irrigation season, the desalinated water would be blended with tertiary treated recycled water and delivered to farms connected to the CSIP. Desalinated water would be pumped from the clear well of the desalination plant into a 12-inch diameter PVC pipe which would convey the water approximately 7,000 LF to the CSIP irrigation storage pond.

Desalination Plant

The MPWSP desalination plant would be constructed on approximately 46 acres of currently vacant and disturbed land west of the RTP, adjacent to Charles Benson Road (see Figure 3). For most of the site, ground elevations range from elevations 90 feet to 114 feet. Structures and facilities at the site, as shown in **Figure 8**, would consist of the following: feedwater receiving tanks; pre-treatment process; filter backwash supply system; waste washwater storage and settling basin; desalination process; post-treatment process and chemical systems; brine storage tanks; desalinated water storage tanks and pumping station; and non-process facilities.

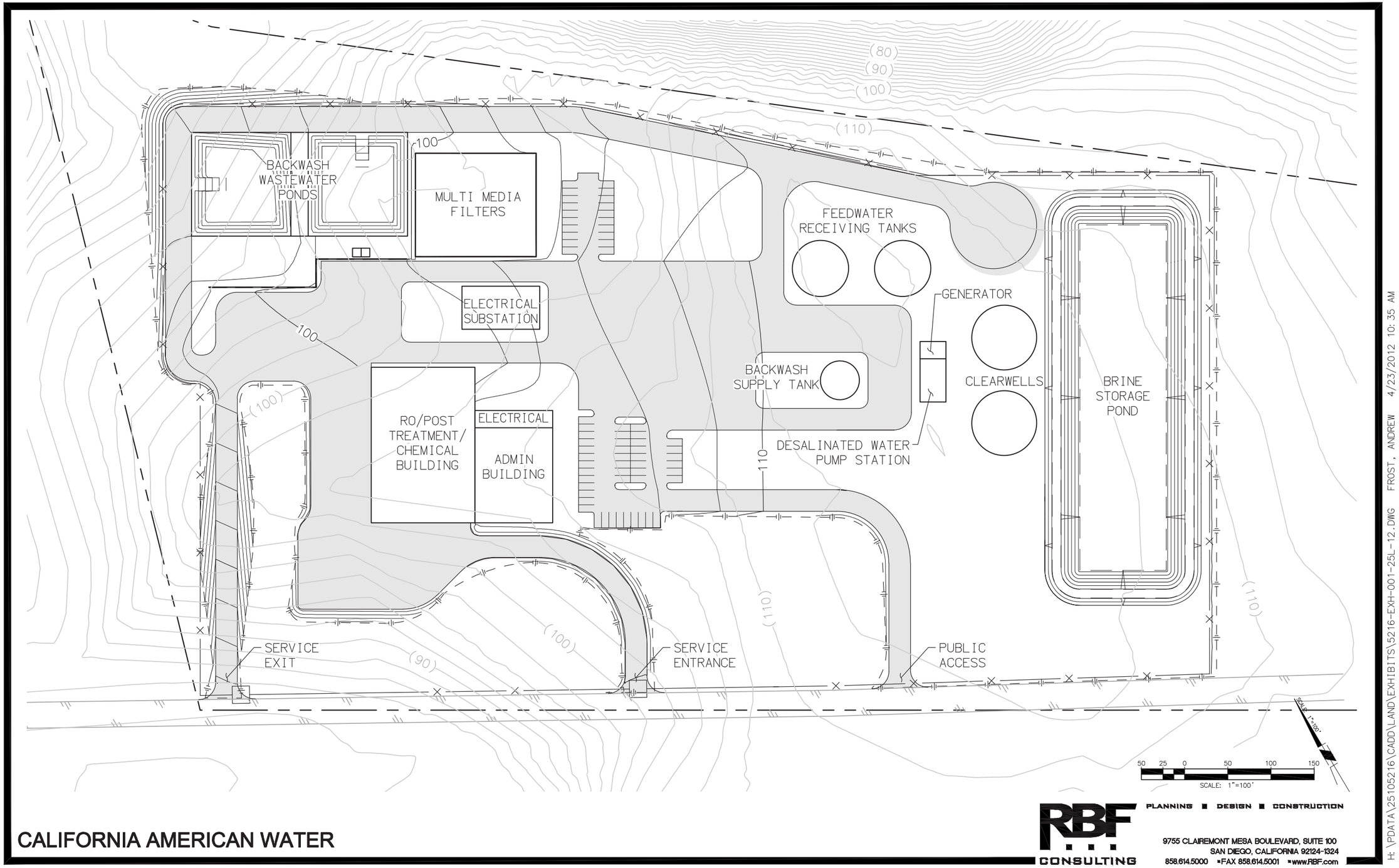
The following sections describe each of these facilities.

Feedwater Receiving Tanks

Feedwater will be pumped from the feedwater intake wells directly to two above-ground feedwater receiving tanks at the desalination plant site. The two tanks will be each have a volume of approximately 0.5 million gallons, and will be either glass-lined steel or cast-in-place concrete construction. The tanks will be sized to receive the variable flow from the various combinations of constant speed well pumps, and produce an equalized flow rate to the pretreatment process. The tanks will be located on the plant site at approximately elevation 110 feet in order to provide a water surface in the tanks ranging from elevation 115 feet to 130 feet in order to deliver flow by gravity through the pretreatment filters.

Pretreatment

Feedwater from the feedwater receiving tanks will be piped directly to pressure or gravity multimedia sand filters for removal of small particles that could otherwise foul the downstream cartridge filters and/or RO membranes. These filters may also play an important role in providing pathogen removal credit during initial plant operations during which time the feedwater supply may be considered to be groundwater under the influence of surface water, and therefore subject to the Surface Water Treatment Rule. Also, a low dosage of chlorine may be added to the feedwater as an oxidant in order to precipitate any dissolved iron and manganese,



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Monterey Peninsula Water Supply Project

Desalination Plant Layout

Figure 8

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and the resulting precipitate will be removed by the filters. If pressure filters are used, they would be multiple parallel fiberglass or lined-steel tank units installed in a large walled open pit area which has a floor elevation that is 5 to 15 feet below grade. If gravity filters are used, they would be installed in below-grade multi-cell concrete structures.

Filter Backwash Supply System

The filters will be backwashed periodically (approximately once per day) using process filtrate as backwash supply. The backwash supply may be chlorinated in order to control biological growth on the filters. The backwash supply, which must be provided at a relatively high flow rate for a short duration (10 minutes per backwash), will be from a 200,000 gallon backwash supply tank that will be located on the plant site high enough to provide gravity flow to the filters. The backwash supply tank will be filled by a process filtrate pump which will operate a relatively low rate between backwash cycles.

Waste Backwash Storage/Settling Basin

Waste from the backwashing process will flow from the filters by gravity to a 0.5-acre 6-foot deep basin. The basin will be open, but will be equipped with an impermeable liner to prevent leakage of the water (seawater salinity) into the ground. Suspended solids in the waste wash water will settle to the bottom of the basin and the clarified water will be decanted. The decanted water will then be pumped to the brine discharge pipeline for blending with RO brine and ultimate disposal in the PCA outfall. Alternatively, it may be possible to pump the decanted water at a low rate to the feedwater receiving tank for blending with feedwater and subsequent retreatment through the pretreatment and RO process.

The basin will be equipped with ramps and divider walls to allow periodic draining and manual removal of accumulated solids of one half of the facility while the other half remains in service. Sodium hypochlorite may be added to the basin periodically or continuously for algae control.

Desalination Process

Reverse osmosis (RO) is a molecular separation process that uses semi-permeable membranes to remove salts in saltwater and produce desalinated water (which is also called product water or permeate). Pretreated seawater is forced at very high pressures through the membranes, and the water molecules, smaller than almost all impurities, including salts, are selectively able to pass through the membranes. The remaining impurities and residual water are discharged as concentrate, which is commonly called “brine”.

A schematic drawing of the proposed RO process is shown in Figure 3-12 of the Coastal Water Project FEIR. The assumed and proposed RO process would consist of a first pass with a partial (40 to 50 percent) second-pass. The partial second pass is required to provide additional removal of three constituents of concern, specifically boron, chloride and sodium. Variable-speed low-pressure pumps would “forward” filtered flow from the pretreatment process to constant-speed high-pressure first-pass RO feed pumps. The high pressure RO feed pumps would deliver flow to the first pass membrane arrays. Low pressure variable speed pumps would be used to pump 40 to 50 percent of the first-pass permeate to the second-pass membrane arrays. The second-pass permeate would then be blended with the by-passed portion of first-pass permeate. The overall recovery of the RO process is expected to be in the approximately 42 percent; thus, approximately 23 MGD of filtered feedwater is required to produce 9.6 MGD of desalinated water, and approximately 15 MGD of filtered feedwater is required to produce 6.4 MGD of desalinated water. The RO process will include energy recovery from the high-pressure brine stream using pressure exchanger technology.

The RO process will be modularized, with each module producing 1.6 MGD of permeate. Each module would include arrays that have 80 to 110 24-foot long by 10-inch O.D. pressure vessels (including both first-pass and second-pass vessels) mounted horizontally on a single rack, with each rack being approximately 16 feet wide by 24 feet long by 15 to 18 feet high.

For the 9.6 MGD desalination plant, the RO process will be housed in a 19,200 SF building with an interior ceiling height of approximately 26 feet. (For the 6.4 MGD desalination plant, the building may be reduced to approximately 12,800 SF.) This building will also house a clean-in-place (CIP) system for periodic cleaning of the RO membranes; the post-treatment facilities (see discussion below); and chemical storage/handling systems.

The RO process will produce a concentrate, or brine, which will flow continuously by gravity to the PCA outfall, at 120 to 140 percent of the plant's water production rate. As previously discussed, this brine stream will be conveyed by a gravity pipeline that will discharge into the PCA outfall. Spent cleaning solutions from the CIP process, which will occur two or three times per year, will be collected and neutralized and then either pumped or trucked to an appropriate disposal site.

Post-Treatment and Chemical Systems

Hardness, alkalinity, and pH of the product water would be adjusted after the RO process to protect piping and plumbing materials and to make the water more compatible with the other sources of supply in the CAW system. Facilities will be included at the desalination plant to add carbon dioxide (to adjust alkalinity), followed by filtration through calcite beds (to adjust hardness), and addition of sodium hydroxide (to adjust pH).

Sodium hypochlorite will also be added for disinfection. Even though the feedwater to the desalination plant will be coming from wells, disinfection requirements for initial operation of the desalination plant may be established according to pathogen removal/inactivation standards of the Surface Water Treatment Rule. Following the installation and startup of the feedwater wells, a testing program may be required to demonstrate that the bacteriological water quality of the extracted from the wells is not being influenced by surface water. If the desalination plant must be placed in operation before this determination is made (by the California Department of Public Health), and if it is determined that the pretreatment filters, reverse osmosis process, and chlorination process do not provide sufficient pathogen removal credits, a temporary UV disinfection system may be required for disinfection.

Various chemicals to be used during treatment would be stored and processed onsite. The estimated use, dosage (in units of milligrams per liter [mg/l]), and annual consumption (in units of pounds per year [lbs/yr]) of each chemical are summarized in **Table 3**. Bulk storage will be located in the Desalination/Post-Treatment/Chemical building. The design of this building will incorporate the regulatory requirements for hazardous materials storage, such as spill containment features that exceed the capacity of the tanks; segregation of individual chemicals to prevent mixing in the case of accidental spillage; and appropriate alarm and fire sprinklers. Chemicals that have specific reactivity risks with one another will be stored at opposite ends of the storage area to reduce the risk of mixing.

Table 3 Desalination Plant Chemicals				
Chemical	Application	Dosage (mg/l)	Annual Usage (lbs)	
			6.4 MGD	9.6 MGD
Sodium Hypochlorite	Raw Feedwater	1.3	59,000	85,000
Sodium Bisulfite	Filtered Feedwater	1.3	59,000	85,000
Carbon Dioxide	RO permeate	15	280,000	420,000
Calcite	RO Permeate	35	660,000	960,000
Sodium Hydroxide	RO Permeate	2	38,000	55,000
Sodium Hypochlorite	Post-Treated Water	2	38,000	55,000
CIP Chemicals (Various)	Membrane Cleaning	Varies	Negligible	Negligible

Brine Storage Basin

In the event of an interruption of this discharge, brine would be diverted to a 3 million-gallon lined open basin, on the desalination plant site. This storage will provide time for the plant to remain in operation for a short period to allow plant personnel to adjust or cease production and for system personnel to increase production from other sources (ASR wells, Seaside wells, BIRP).

Desalinated Water Storage Tanks and Pumping Stations

Following post-treatment, desalinated water would flow by gravity to on-site storage tanks, called clearwells. Two 85-foot diameter clearwells will provide a total storage volume of 2 million gallons. The clearwells would be covered, steel or concrete, and constructed above-grade with a floor elevation of approximately 110 feet. A clearwell pump station, located in the desalination building, will deliver flow from the post-treatment process to the clearwells. Desalinated water pumps would pump desalinated water from the clearwells into the Desalinated Water Pipeline for conveyance to CAW's service area. A second set of pumps would pump desalinated water from the clearwells into the Salinas Valley Return Pipeline (SVRP). Both sets of pumps would be housed in the Desalinated Water Pump Station (DWPS), located near the clearwells. Surge control tanks (hydrodynamic) would be required and would be installed outside and next to the DWPS.

Non-Process Facilities

A 10,000 to 12,000 sq-ft single story building would be constructed on-site. The building would house visitor reception, offices, restrooms, locker rooms, break rooms, conference rooms, control room, laboratory, equipment storage and maintenance area, and electrical service equipment for the adjacent Desalination/Post-Treatment/Chemical Building.

Power Supply

Power to the MPWSP intake wells and desalination plant would be supplied by the existing power grid and no new power plant or other industrial emissions sources would be constructed. The total energy usage for the proposed intake wells, desalination plant, and desalinated water pump station would be approximately 49 million kwhrs/yr with the desalination plant producing 10,600 AFY(9.5 MGD average), and approximately 32 million kwhrs/yr with the desalination plant producing 6,850 AFY(6.1 MGD average). Energy use for each project component can be found in the MPWSP Capital and O&M Cost Estimate Update Memorandum dated January 2013. CAW is also investigating obtaining power from other sources, such as combinations of on-site solar, and/or use of power generated from landfill gas from the Monterey County Regional Solid Waste Management Agency.

Desalinated Water Conveyance

CAW Supply

Desalinated water will be pumped by the Desalinated Water Pump Station at the desalination plant into the 32,000 LF, 36-inch diameter Product Water Pipeline, which will connect to the 15,700 LF Transfer Pipeline. The alignment of the Product Water Pipeline heads west from the desalination plant on Charles Benson Road, and then south on Del Monte Boulevard, and then south in the TAMC right-of way to the intersection of Beach Range Road and 1st Street, at which point it will connect to the Transfer Pipeline.

Salinas Valley Return

Desalinated water will be pumped by the Salinas Valley Return Pump Station at the desalination plant into a 6,200 LF, 12-inch diameter pipeline which will discharge into the Castroville Seawater Intrusion Program's irrigation water storage pond on PCA's property.

PROJECT IMPLEMENTATION SCHEDULE

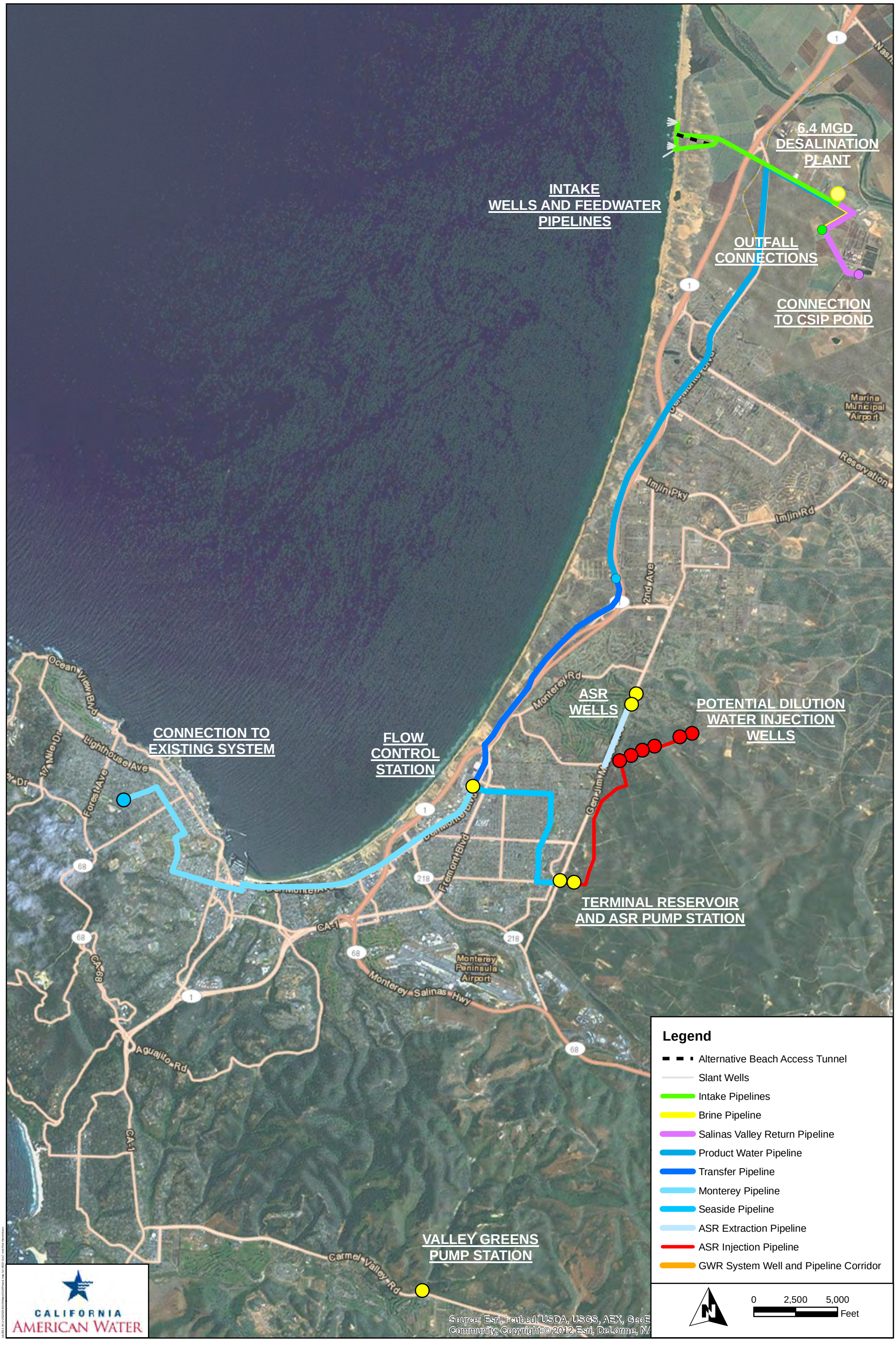
A preliminary implementation schedule for the proposed MPWSP is provided in **Table 4.** As shown, the Project is currently programmed to be on line by December of 2017, or more than one year beyond the Cease and Desist Order's targeted date of October 1, 2016 at which time dramatic reductions are required in diversions from the Carmel River. Key permitting milestones include CPUC's completion of the CEQA Subsequent EIR in November of 2013, CPUC's approval of the CPCN in January of 2014, and completion of a number of regulatory permit approvals leading to approval of the Coastal Development Permit (by the California Coastal Commission) in August of 2014. No construction of facilities in the Coastal Zone can occur prior to the Coastal Commission's approval of the CDP.

Table 4 - Implementation Schedule for Proposed MPWSP

Implementation Activity	Start (month)	Finish (month)
CEQA Subsequent EIR	In Progress	Nov 2013
CPCN Reapplication and Approval	In Progress	Jan 2014
Coastal Development Permit Reapplication and Approval	In Progress	Aug 2014
Desalination Plant and Intake Wells Site Acquisitions	In Progress	Jan 2014
Desalination Plant Intake System Design	Feb 2014	May 2015
Desalination Plant Intake System Bidding and Construction	June 2015	Feb 2017
Pipeline ROW Acquisition	Feb 2014	Nov 2014
Conveyance Pipeline Design	Feb 2014	June 2015
Conveyance Pipeline Bidding and Construction	July 2015	July 2017
Terminal Reservoir/ASRPS Site Acquisition	In Progress	Jan 2014
Terminal Reservoir/ASRPS Design	Feb 2014	July 2015
Terminal Reservoir/ASRPS Bidding and Construction	July 2015	July 2017
ASR Well Design and Construction	Feb 2014	Sept 2015
ASR Well-Head Facilities Design	June 2015	Oct 2015
ASR Well-Head Facilities Bidding and Construction	Oct 2015	July 2017
GWR Decision	In Progress	Oct 2015
Desalination Plant Preliminary Design and D/B Contractor Procurement	June 2013	Oct 2013
Desalination Plant Design/Construction	Jan 2015	Dec 2017
Desalination Plant Start-up	July 2017	Dec 2017

Attachment 12

9.6 MGD DESALINATION PLANT
INTAKE WELLS AND FEEDWATER PIPELINES
OUTFALL CONNECTIONS
CONNECTION TO CSIP POND
Marina Municipal Airport
Reservation
Imjin Pky
Imjin Rd
2nd Ave
ASR WELLS
Monterey Rd
CONNECTION TO EXISTING SYSTEM
FLOW CONTROL STATION
Ocean View Blvd
Lighthouse Ave
Forest Ave
Fremont Blvd
Gen Jim M
TERMINAL RESERVOIR AND ASR PUMP STATION
CA-1
CA-68
Monterey Peninsula Airport
Monterey-Salinas Hwy
Aguajito Rd
VALLEY GREENS PUMP STATION
Carmel Valley Rd
Legend
Alternative Beach Access Tunnel
Slant Wells
Intake Pipelines
Brine Pipeline
Salinas Valley Return Pipeline
Product Water Pipeline
Transfer Pipeline
Monterey Pipeline
Seaside Pipeline
ASR Pipeline
0 2,500 5,000 Feet
CALIFORNIA AMERICAN WATER
Source: Esri, i-cubed, USDA, USGS, AEX, GeoEye, Getm
Community, Copyright:© 2012 Esri, DeLorme, NAVTEQ,


6.4 MGD DESALINATION PLANT
INTAKE WELLS AND FEEDWATER PIPELINES
OUTFALL CONNECTIONS
CONNECTION TO CSIP POND
Marina Municipal Airport
Reservation
Imjin Pky
Imjin Rd
2nd Ave
Monterey Rd
ASR WELLS
POTENTIAL DILUTION WATER INJECTION WELLS
CONNECTION TO EXISTING SYSTEM
FLOW CONTROL STATION
Ocean View Blvd
Lighthouse Ave
Forest Ave
Fremont Blvd
TERMINAL RESERVOIR AND ASR PUMP STATION
CA-1
CA-68
Monterey Peninsula Airport
Monterey Salinas Hwy
Aguajito Rd
Carmel Valley Rd
VALLEY GREENS PUMP STATION
Legend
Alternative Beach Access Tunnel
Slant Wells
Intake Pipelines
Brine Pipeline
Salinas Valley Return Pipeline
Product Water Pipeline
Transfer Pipeline
Monterey Pipeline
Seaside Pipeline
ASR Extraction Pipeline
ASR Injection Pipeline
GWR System Well and Pipeline Corridor
0 2,500 5,000 Feet
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(END OF ATTACHEMENT A)

ATTACHMENT B

Monterey Peninsula Water Supply Project
Proposed Seawater Intake System

The proposed seawater intake system for the Monterey Peninsula Water Supply Project (MPWSP) would include nine subsurface slant wells (eight active and one standby) along the coastline that would draw seawater from beneath the ocean floor for use as source water for the proposed MPWSP desalination plant. Slant wells allow for a substantially increased screen length in the target water source, resulting in higher production rates when compared to vertical wells in the same water source. The subsurface slant wells are proposed on a 376-acre coastal property located in the city of Marina, just north of a CEMEX sand mining facility and approximately 1.7 mile south of the Salinas River (see **Figure 1**).

The slant wells would be designed as gravity wells that would passively receive seawater and convey it to an Intake Pump Station located on the inland side of the dunes that would have pump suction lines below sea level. The elevation difference between the ocean surface and the pump inlets would create the differential pressure (i.e., hydraulic head) needed to convey seawater through a collector pipeline and intake tunnel into the pump suction lines via gravity. The intake pump station would then pump seawater through the source water pipeline to the proposed desalination plant. Because the slant wells would use differential pressure to collect seawater, the wellheads would not be equipped with pumps.

As part of the project design process, a test slant well will be constructed at the proposed slant well site and operated and monitored for approximately eight months as part of a pilot program. The test slant well and carrier pipe would ultimately be converted into permanent facilities and utilized as part of the proposed project's seawater intake system. The test slant well will be screened at depths corresponding to both the shallow Dune Sand Aquifer and the deeper 180-Foot-Aquifer of the Salinas Valley Groundwater Basin. A 2,800-foot-long 18-inch-diameter carrier pipe will be constructed west-to-east between the wellhead of the test slant well to a point on the east side of the dunes. During the pilot program, the carrier pipe will be used as a conduit for electrical cable and 2-inch-diameter tubing for water quality sampling. The pilot program will confirm the geologic, hydrogeologic and water quality characteristics of the underlying formations, and inform the final design of the proposed slant wells.

As part of the proposed project, the test slant well would be converted into a permanent seawater intake well and eight additional slant wells would be constructed. If the results of the pilot program indicate the Dune Sand Aquifer can reliably provide source water at a sufficient rate and volume for the proposed desalination plant, the eight new slant wells would be designed to draw water from the Dune Sand Aquifer. Alternately, if it is determined that only the 180-Foot Aquifer can provide adequate source water supplies, the eight new slant wells would be designed to draw water from the 180-Foot Aquifer. Also as part of the proposed project, the carrier pipe would be converted into a permanent intake tunnel to convey seawater from the converted test slant well to a new intake pump station on the inland side of the dunes.

If screened in the Dune Sand Aquifer, the eight new slant wells would be drilled below mean high tide,[1] extending at an angle of 22 degrees below horizontal offshore to a depth of 190 to 210 feet below mean sea level (msl). The slant wells would be completed using 30-inch-diameter casing. Measured from the wellhead, the length of each well would range from 530 to 630 feet and would be screened for

[1] Mean high tide is the average of all high tide elevations observed over a 19-year period.

approximately 370 to 470 feet in the shallow Dune Sand Aquifer. The test slant well that was constructed as part of the pilot program would be converted into a permanent well by blocking off the lower screening interval such that the well would only draw water from the shallower Dune Sand Aquifer.

The eight new slant wells would be grouped in two clusters, with four wells in each cluster. The two clusters and the converted test slant well would be sited along a 2,000-foot stretch of shoreline. Each wellhead would be encased in a concrete vault and completely buried beneath the ground surface in the area known as the "swash zone", which is the portion of the beach that lies within the run-up of waves at mean high tide.

If screened in the 180-Foot Aquifer, the eight new slant wells would extend at an angle of 23 degrees below horizontal offshore to an approximate depth of 400 feet below msl. The slant wells would be completed using 30-inch-diameter casing. Measured from the wellhead, each well would have a length of approximately 920 feet, and would be screened for approximately 190 linear feet in the 180-Foot Aquifer. The test slant well would be converted into a permanent well by blocking off the upper screening interval such that the well would only draw water from the deeper 180-Foot Aquifer.

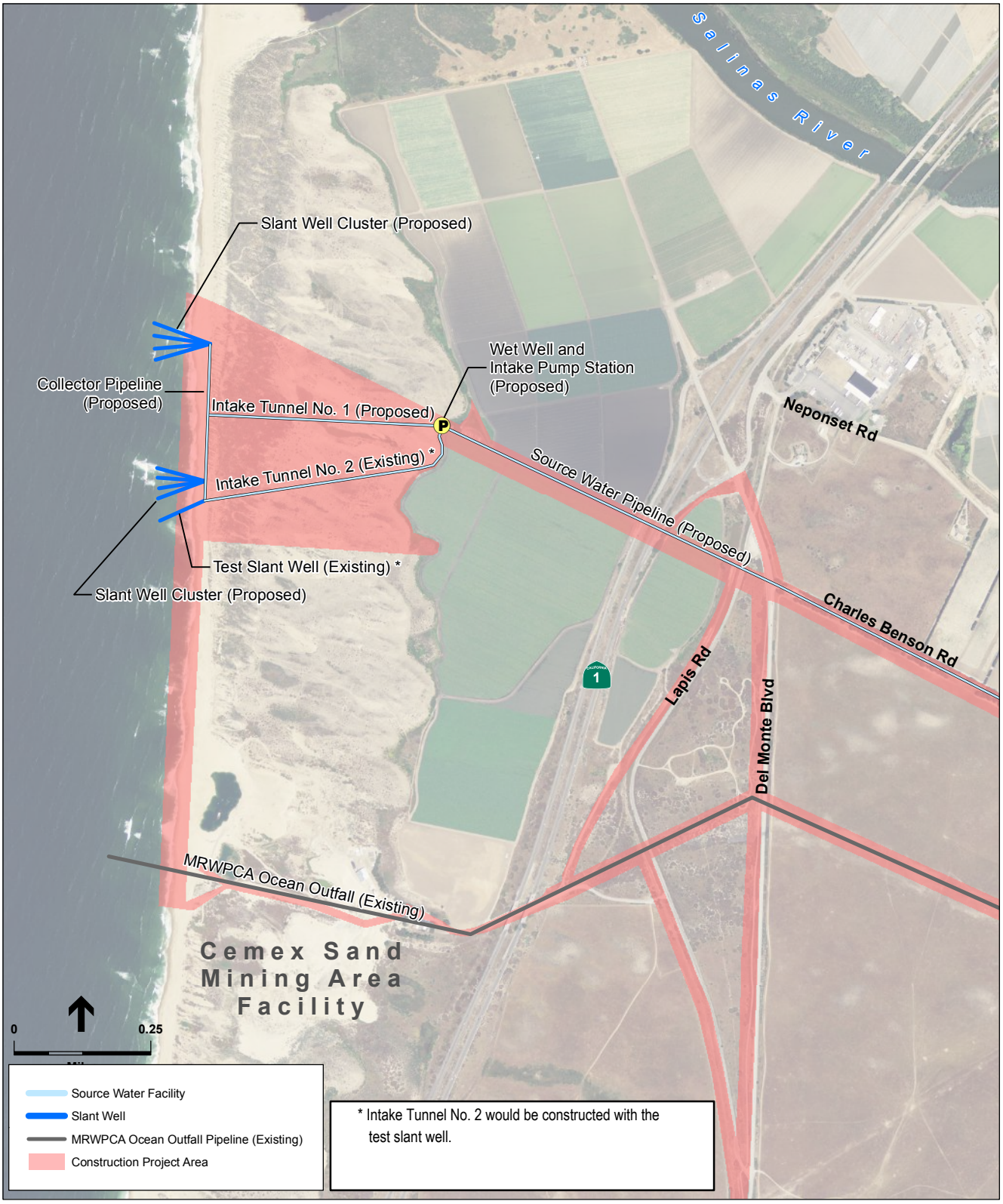
The configuration of the slant wells and the wellhead design would be the same as described above for the Dune Sand Aquifer screening scenario.

The two well clusters and converted test slant well would be interconnected with a 36-inch-diameter collector pipeline oriented parallel to the beach. Depending on the distances between the well clusters and the converted test slant well (distances to be determined during final design), the total length of the collector pipeline would be between 0.2 and 0.3 miles long.

A 36-inch-diameter intake tunnel (Intake Tunnel No. 1) would be constructed west-to-east between the collector pipeline located along the shoreline and the intake pump station located on the inland side of the dunes. Intake Tunnel No. 1 would convey source water by gravity from the collector pipeline to the intake pump station. In addition, the 18-inch-diameter carrier pipe previously constructed for the test slant well would be converted into a permanent intake tunnel (Intake Tunnel No. 2) and would be used as part of the permanent seawater intake system. Valves would be installed in both intake tunnels to allow for the isolation of flows in either tunnel. It is anticipated that Intake Tunnel No. 1 would be used during normal project operations, with Intake Tunnel No. 2 on standby. Intake Tunnel No. 2 would provide operational flexibility and facilitate maintenance activities.

The intake pump station would be constructed above the intake tunnels on the inland side of the dunes and would be used to pump water through the source water pipeline to the desalination plant. The intake tunnels would terminate at the intake pump station. The pump intake lines would receive water from the intake tunnels and provide a transition to the overlying intake pump station. The pump station would be approximately 20 feet by 50 feet in size and be between 25 and 50 feet deep.

The pump station would include four 250-horsepower vertical pumps, valves, a surge suppression system, and electrical controls. The pump station would be enclosed in a sand-colored, concrete building. The pumps would be variable-frequency to allow facility operators to adjust the overall pumping rate based on varying demand as well as other conditions (such as water quality and acceptance capacity at the desalination plant).



SOURCE: CalAm, 2012

Monterey Peninsula Water Supply Project

Figure 1

Subsurface Seawater Intake System

(END OF ATTACHMENT B)

ATTACHMENT C

Technical Memorandum

To:	Mr. Michael Burns Senior Geologist ESA 1425 North McDowell Blvd Ste 200 Petaluma, CA 94954
From:	Dennis E. Williams, Ph.D. President GEOSCIENCE Support Services, Inc.
Date:	February 6, 2013
Subject:	**Review and Comments to the December 3, 2012, Technical Memorandum Prepared by Mr. Timothy Durbin *"California-American Water Company – Comments on proposal to pump groundwater from the Salinas Valley groundwater basin"***

1.0 EXECUTIVE SUMMARY

The purpose of this technical memorandum is to respond to the December 3, 2012, technical memorandum prepared by Mr. Timothy Durbin entitled *California-American Water Company – Comments on proposal to pump groundwater from the Salinas Valley groundwater basin.*

The California-American Water Company (CalAm) is proposing the Monterey Peninsula Water Supply Project (MPWSP or proposed project) for the purpose of developing additional water supplies for CalAm's Monterey District service area. The purpose of the MPWSP is to replace existing CalAm supplies that have been constrained by legal decisions affecting diversions from the Carmel River and pumping from the Seaside Groundwater Basin. The proposed project would construct a subsurface seawater intake system and a desalination plant to produce desalinated water supplies, along with other system improvements. A system of slant wells would provide this feedwater by pumping saline water from the shallow Dune Sand Aquifer or, as an alternative, from the deeper 180-Foot Aquifer in an area just offshore and about 1.7 miles south of the mouth of the Salinas River.

To evaluate the response of the aquifers to pumping from the slant wells, GEOSCIENCE Support Services, Inc. (GEOSCIENCE) and Luhdorff and Scalmanini (L&S), consultants for the California Public Utilities Commission, are updating the existing Salinas Valley Integrated Groundwater-Surface Water Model (SVIGSM) and adding additional modeling through the use of SEAWAT, a three-dimensional, variable-density groundwater flow model coupled with multi-species solute and heat transport. The combined modeling effort will simulate the response of the aquifers under various pumping scenarios. The output will simulate groundwater flow patterns in order to determine the project's effect on the existing basin overdraft and seawater intrusion.

Mr. Durbin has provided comments on the proposed project, with his focus on the SVIGSM. However, his analyses are based on outdated information. The conceptual model of the geology and hydrology has been refined with recent work that Mr. Durbin does not cite or use. Specifically, recent investigations, along with Mr. Durbin's own 1978 report, indicate that the Salinas Valley Aquitard[1] (SVA) is not present above the location of slant wells and would therefore not prevent the migration of seawater through the seabed vertically downward to the slant wells. The Project Description for the MPWSP has also been refined and Mr. Durbin appears to be using a previous version of the proposed project. Finally, Mr. Durbin based some of his comments on the version of the SVIGSM that was run in 2008. The project consultants have been updating the model with recent and new information. As a consequence of using outdated information, the comments Mr. Durbin provides are also outdated, in error, or not relevant to the currently proposed project, as discussed in this response to his comments.

The following sections provide general and detailed responses to Mr. Durbin's comments.

[1] An aquitard is a geologic unit that restricts the flow of groundwater from one aquifer to another. Aquitards comprise layers of either clay or non-porous rock with low hydraulic conductivity.

2.0 GENERAL RESPONSE TO DURBIN'S COMMENTS

Durbin Comment 1—Extent of the Salinas Valley Aquitard:

Durbin disputes the validity of predictive modeling work conducted by GEOSCIENCE based on his opinion that the extent of the SVA in the project area is not properly simulated by the ground water model.

GEOSCIENCE General Response 1

As discussed further below, this technical memorandum provides the information that clearly shows that the SVA does not extend offshore to above the location of the slant wells. For example, Figure 6 reproduces a map from Durbin's own report (Durbin, 1978), wherein the SVA is represented by the shaded area. Durbin's map shows that the location of the proposed slant wells is clearly southwest of the southwestern-most extent of the SVA. With no SVA present at this location, slant wells constructed within the sandy materials of the Dune Sand Aquifer and/or the 180-Foot Aquifer would be in hydraulic continuity[2] with the sea floor. The schematic diagram of the GEOSCIENCE conceptual model presented in Figure 18 is in conformance with this interpretation.

Durbin offers a broad and general interpretation of the hydrogeologic conditions in the project area based primarily on data collected and published in the 1970s, and only alludes briefly to recent work. Consequently, Durbin assumes no hydraulic continuity of the slant wells with the ocean. As noted above, this is simply incorrect and not supported by his own work, as well as the more recent work of others. In reality, the ocean floor has a semi-pervious layer[3] generally existing in the benthic zone[4] on the ocean floor. A slant well pumping water from a subsea aquifer behaves exactly like a well in an infinite leaky aquifer[5] with a constant head source[6], in this case, the ocean. Therefore, the majority of recharge to the slant wells will occur from induced infiltration through the sea floor caused by pumping through the slant wells, as illustrated on Figures 19 and 20.

GEOSCIENCE certainly agrees that the distribution and thickness of the SVA in the project area is important since the flow regimes in the underlying Dune Sand Aquifer and 180-Foot Aquifer in which project pumping may take place will be directly impacted by the extent and thickness of an aquitard, if present. In the development of groundwater projects, additional studies serve to refine the understanding of the hydrogeology, and in this case, the mapped extent of hydrostratigraphic units,

---

2 Hydraulic continuity is the interconnection between groundwater (aquifers) and surface water sources.

3 A semi-pervious layer is partly open to the flow of water.

4 The benthic zone is the ecological region at the lowest level of a body of water such as an ocean or a lake, and includes the sediment surface and some sub-surface layers.

5 A leaky aquifer loses or gains water through adjacent less permeable layers, in this case, the benthic zone.

6 A constant head source is the origin of the pressure that maintains a constant water level. In this case, the overlying ocean is providing a constant pressure or constant head source though its overlying weight.

including the SVA. A considerable amount of new information has been developed by various investigators, including the United States Geologic Survey (USGS), since the work completed by Durbin and referenced by Durbin in his technical memorandum. Further below, this technical memorandum provides a historical synopsis of studies and their implication with regard to the distribution of the SVA.

GEOSCIENCE has been careful to consider all of the more recent work in developing a current understanding of the hydrostratigraphic units in the project area. The GEOSCIENCE groundwater model was based on the SVIGSM, and the studies cited within this technical memorandum were reviewed to confirm that the hydrogeologic conceptual model used in the previous studies is accurate for the intended planning purpose. It is the standard of practice to construct a groundwater model from the most current available data to be used for evaluation of project impacts in the feasibility phase and to further refine the groundwater model and/or project details as additional data is collected in subsequent phases during the project planning and development process. Additional proposed project studies include exploratory test drilling, test wells, geophysical surveying and long-term aquifer testing. Results from these studies and testing will be evaluated and used to further refine the project details, such as the final well locations and well construction details for the current proposed MPWSP.

Durbin Comment 2—Degradation of Groundwater Supplies:

Durbin postulates that groundwater pumping will induce extrusion of connate water[7] from the SVA which will further degrade the groundwater aquifer.

GEOSCIENCE General Response 2

Durbin appears to be referring to the process of extrusion, by which seawater entrained within aquitard materials (i.e., clays) when the layer was originally deposited is released from the clays due to pressure changes, in this case, pumping of the aquifers. Data is not provided in the Durbin technical memorandum to provide any support for this opinion. The volume of connate water potentially released from the SVA relative to the volume of water in the aquifers would be very small, if any. However, since lowering of the piezometric surface[8] in the 180-Foot Aquifer has been documented since the 1930s, extrusion of water from the SVA, where possible, would have already occurred historically. As such, initially, the feedwater to the slant wells will come from vertical leakage through the ocean floor as well as from horizontal flow from the subsea aquifer system. With time, source water for the feedwater supply will come primarily from seafloor leakage. A recent isotope tracer study for the Orange County Ocean Desalination Project documented this process of sea floor leakage (Coastal

[7] Water that has remained trapped in a sedimentary rock since the original sediments were laid down in that water.

[8] The piezometric or potentiometric surface is the level to which water rises in a well completed in that unit. In an unconfined aquifer the surface is the water table. In a confined or semi-confined unit under pressure, the water level may be above the unit.

Groundwater Consulting, 2012). In addition, although continuous clay layers have not been documented above the slant well locations, any seawater entrained in clay materials, if present, and then released from the clay materials by the pumping of the slant wells would also be routed to the desalinization facility, the salts removed, and the resultant treated water added to the public water supply.

Durbin Comment 3—Modeling Scenarios:

Durbin disputes the validity of the operational scenarios simulated by the groundwater modeling, stating that the modeling includes projects that are not in consideration. Specifically, in the first paragraph of page 6, Durbin states:

> *"No current plans exist for the expansion of CSIP facilities, service area, or water supply. Nevertheless, the Geosciences modeling assumes a baseline condition with a greatly expanded CSIP service area and a corresponding significant additional reduction in agricultural pumping within the coastal area of the Salinas Valley groundwater basin (a project anticipated at one time as SVWP Phase 2)."*

GEOSCIENCE General Response 3

As also stated by Mr. Durbin, "*the historical agricultural pumping within the coastal region has been reduced by the implementation of the Castroville Seawater Intrusion Project (CSIP) and the Salinas Valley Water Project (SVWP). The purpose of the CSIP and SVWP is to reduce seawater intrusion by reducing groundwater pumping."*

Although seawater intrusion has been reduced through the implementation of the CSIP and SVWP operation practices, additional seawater intrusion protection and basin overdraft measures should and will be implemented, and ostensibly may include further reductions in agricultural pumping and additional water supplies to the CSIP (and other areas—e.g., SVWP Phase II). Even though the specific combination of projects may be further refined and/or other projects may be added to the overall program, from the perspective of the SVIGSM, additional pumping reductions will be required to mitigate seawater intrusion on a long-term basis. Therefore, including the SVWP Phase II as a reasonably foreseeable project in the predictive scenarios is appropriate. Furthermore, the current modeling analysis considers a number of scenarios, including scenarios both with and without additional water from the SVWP Phase II, thus fully addressing any concerns raised by Mr. Durbin on this topic.

3.0 DETAILED RESPONSES TO DURBIN'S COMMENTS

Durbin Comment 1—Extent of the Salinas Valley Aquitard:

The first critique put forth by Durbin in the technical memorandum dated December 3, 2012, is that the simulation of the SVA used in the GEOSCIENCE model is not representative of the actual hydrogeologic conditions. The critique is summarized by the following Durbin statements:

The first paragraph under the heading "Hydrogeology"

> *"The 180-foot aquifer is overlain by an aquitard that is as much as 100 feet in thickness at the bayshore (Durbin , 1978), and that aquitard extends offshore."*

The third paragraph of page 4

> *"The Geosciences model construction assumes a direct connection between the offshore extension of the 180-foot aquifer and Monterey Bay, which occurs in the model because of the high leakance (hydraulic conductivity divided by thickness) assigned to the material overlying the 180-foot aquifer. That does not represent the actual hydrogeologic setting. As described above, <u>both onshore and offshore parts of the 180-foot aquifer are overlain by an aquitard</u> which causes the actual groundwater system to respond much differently than simulated by the groundwater model"… . <u>That reality is contrary to the Geoscience modeling result</u> that wells near the shore would draw almost entirely seawater. Therefore, the model construction and simulation results <u>are so different from reality that the model has no predictive value</u> with respect to the proposed CalAm project.*

<u>Durbin assumes:</u>

1) The SVA extends offshore as far as the outcrops of the 180-Foot Aquifer shown by Greene (1970), and

2) The thickness of the SVA near the mouth of the Salinas River is the same approaching and outside the boundaries of the Salinas Valley Pressure Area.

To support his assumptions, Durbin prepared several figures for his technical memorandum including the offshore geology as mapped by Greene (1970) and a geologic cross-section prepared by Durbin. The portion of the geologic map showing the project area is reproduced below as Figure 1 and the geologic cross-section is reproduced below as Figure 2. The onshore portion of the geologic cross-section is located along the approximate axis of the Salinas Valley and the offshore portion extends west to include the locations where the 180-Foot and 400-Foot Aquifers are interpreted to be at the surface of the ocean floor. The cross-section is illustrative and not based on actual data. Offshore, the cross-

section trends seaward, nearly perpendicular to the shoreline. We have added the approximate location of the project site shown by a yellow circle on Figure 1 below.

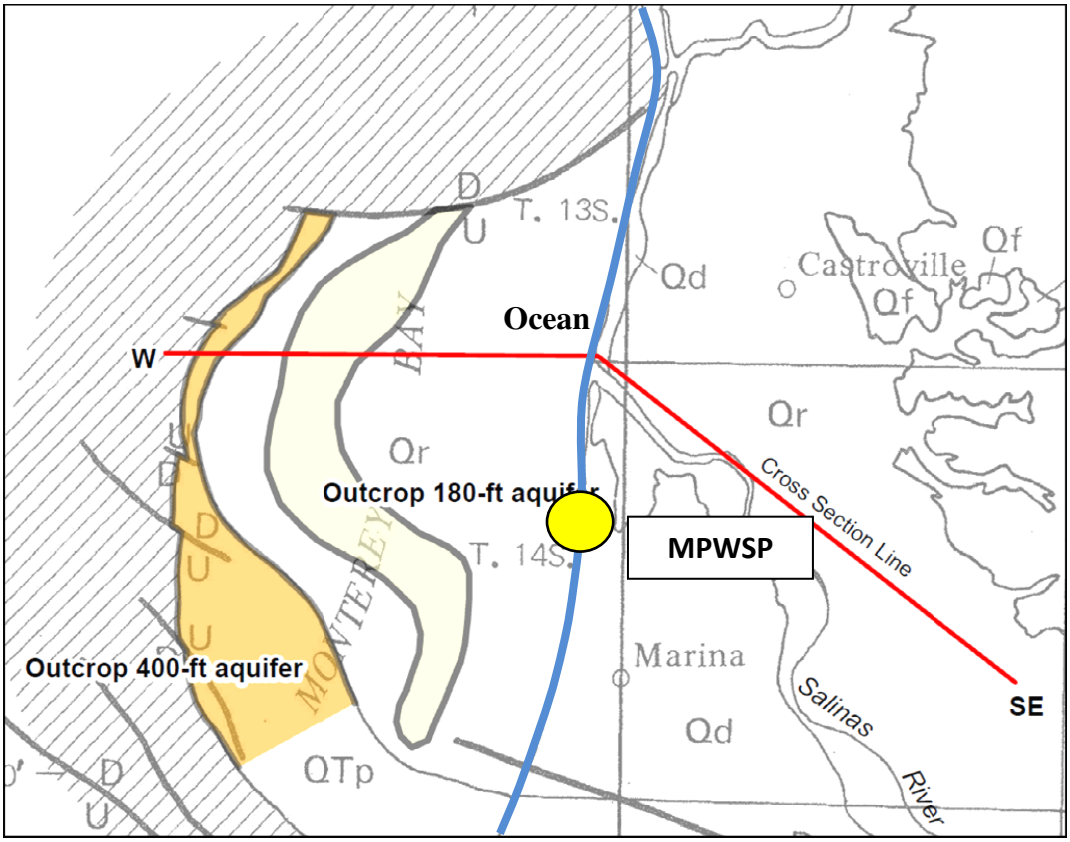


Figure 1. MPWSP Site (modified from Figure 2, Durbin [2012])

The geologic cross-section (see Figure 2) presented below is from the Durbin (2012) technical memorandum and depicts the SVA as extending offshore over 3 miles from the mouth of the Salinas River. The cross-section is illustrative; however, <u>there are no data points to validate the offshore portion of aquitards depicted in the cross-section</u>. The figure assumes and depicts the SVA to be approximately 150 feet thick at the shoreline and extending as a continuous unit several miles offshore. However, this is not supported even by Durbin's own data.

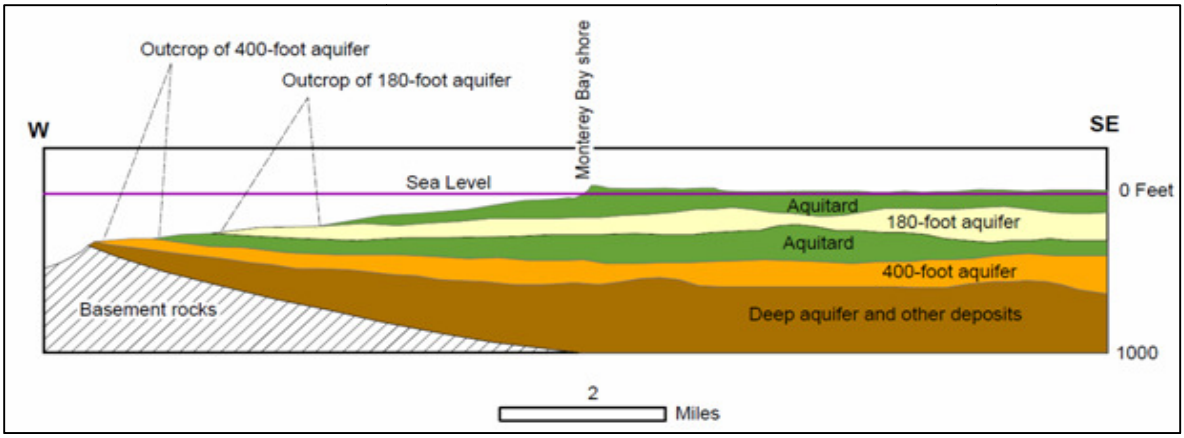


Figure 2. (Reproduced from Figure 3 of Durbin technical memorandum [2012])

Consequently, there is no direct evidence that the SVA extends offshore to this distance or that continuous, thick fine-grained deposits are present in the deltaic deposits mapped by Greene. Bear in mind that the location of the proposed slant wells are about 1.7 miles south of where the SVA would be expected to be present of the mouth of the Salinas River. In addition, data from borehole logs used to prepare geologic cross-sections by Harding Lawson Associates (HLA, 1994, 2001) and Kennedy-Jenks (2004), both discussed further below, clearly show that the Durbin geologic cross-section incorrectly depicts the subsurface geologic conditions in the areas to the south in the project area, both onshore and offshore, and, in fact, contradicts previous work completed by Durbin as previously discussed and discussed further below. Durbin's opinions and critique of the GEOSCIENCE model is predicated on a conceptual model of the hydrostratigraphy that is incorrect for the project area. The following sections below provide a detailed response to Durbin's critique.

3.1 Consideration of the Distribution of SVA from 1970 Greene Study

With regard to Durbin's first assumption, there is no data or clear evidence that the SVA extends offshore, covering the offshore extent of the 180-Foot Aquifer. With respect to Durbin's second assumption, numerous studies confirm that the SVA decreases in thickness and pinches out south of the Salinas River. The following observations are based on historical studies and strongly indicate that the SVA is limited in areal extent, both onshore and offshore.

Observation 3.1.1

The 1970 Greene study (Greene, 1970 – USGS Open File report 70-141) cited by Durbin used seismic surveys to evaluate the subsea distribution of geologic units in the Monterey Bay area. The purpose of the study was to evaluate potential subsea entry points for seawater into the offshore extension of the landward potable aquifers. Greene's work was able to distinguish the geophysical expression of deltaic

deposits and the offshore extension of valley fill deposits containing the 180-Foot Aquifer from the underlying Pleistocene Aromas/Paso Robles Formation containing the 400-Foot Aquifer. Figure 3 below is from the Greene report and reproduces Greene's cross-section. The figure illustrates the relationship of offshore deltaic deposits containing the 180-Foot Aquifer underlying deeper units. The yellow-colored circle highlights the offshore extent of deltaic deposits which contain the 180-Foot Aquifer. The right side of the cross-section at **8'** is located in the vicinity of the project site. The cross-section line extends in the offshore area in a northwesterly direction to the Monterey Canyon. There are no continuous fine-grained units distinguishable in the cross-section, nor does Greene postulate this condition within the deltaic deposits.

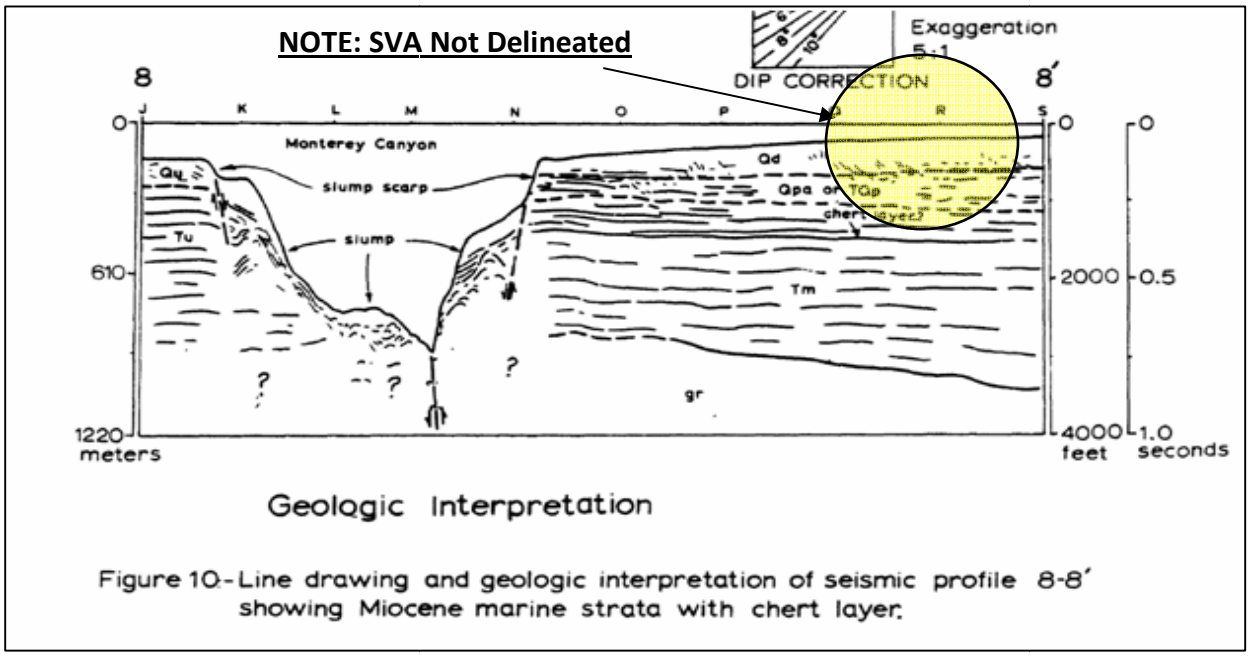


Figure 3. (From Figure 10 of Greene [1970])

Observation 3.1.2

The inset below in Figure 4 shows a portion of Greene's illustration of the subsea expression of the deltaic deposits and Aromas Sand/Paso Robles Formation (Greene, 1970). The deltaic deposits are expressed by the lobate form extending from the mouth of the Salinas River.

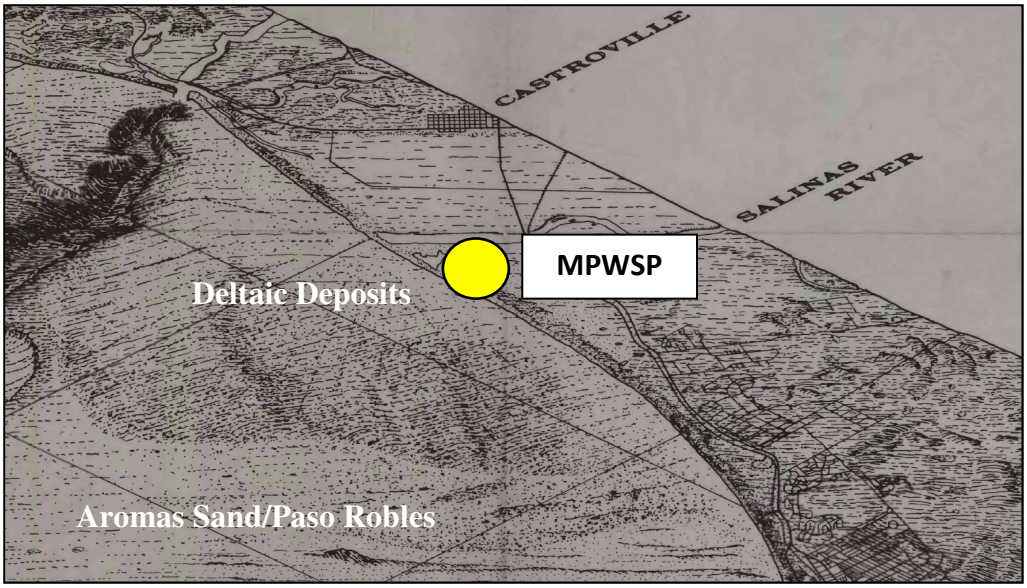


Figure 4. (Portion of Plate 5 from Greene [1970])

Greene was unable to distinguish specific units within the Deltaic deposits, such as the 180-Foot Aquifer or the SVA, nor the contact between the Aromas Sand and Paso Robles Formation. The SVA is considered an estuarine[9] deposit, being thickest under the axis of the Salinas Valley. The depositional environment that formed the ancient delta would not yield extensive continuous clay deposits, but rather would be composed of discontinuous lenticular gravel, sand, silt, and clay layers deposited by the various delta depositional environments. *It is extremely unlikely that the thick SVA deposit depicted by Durbin on Figure 3 of his technical memorandum would extend offshore as Durbin postulates or would be present offshore in the lateral portion of the deltaic deposit in the vicinity of the project site.* This is because the energy carrying the sediments in the river is lost once it meets the ocean and thus drops its sediments in the immediate vicinity of the estuary.

3.2 Distribution of the SVA from 1978 Durbin report

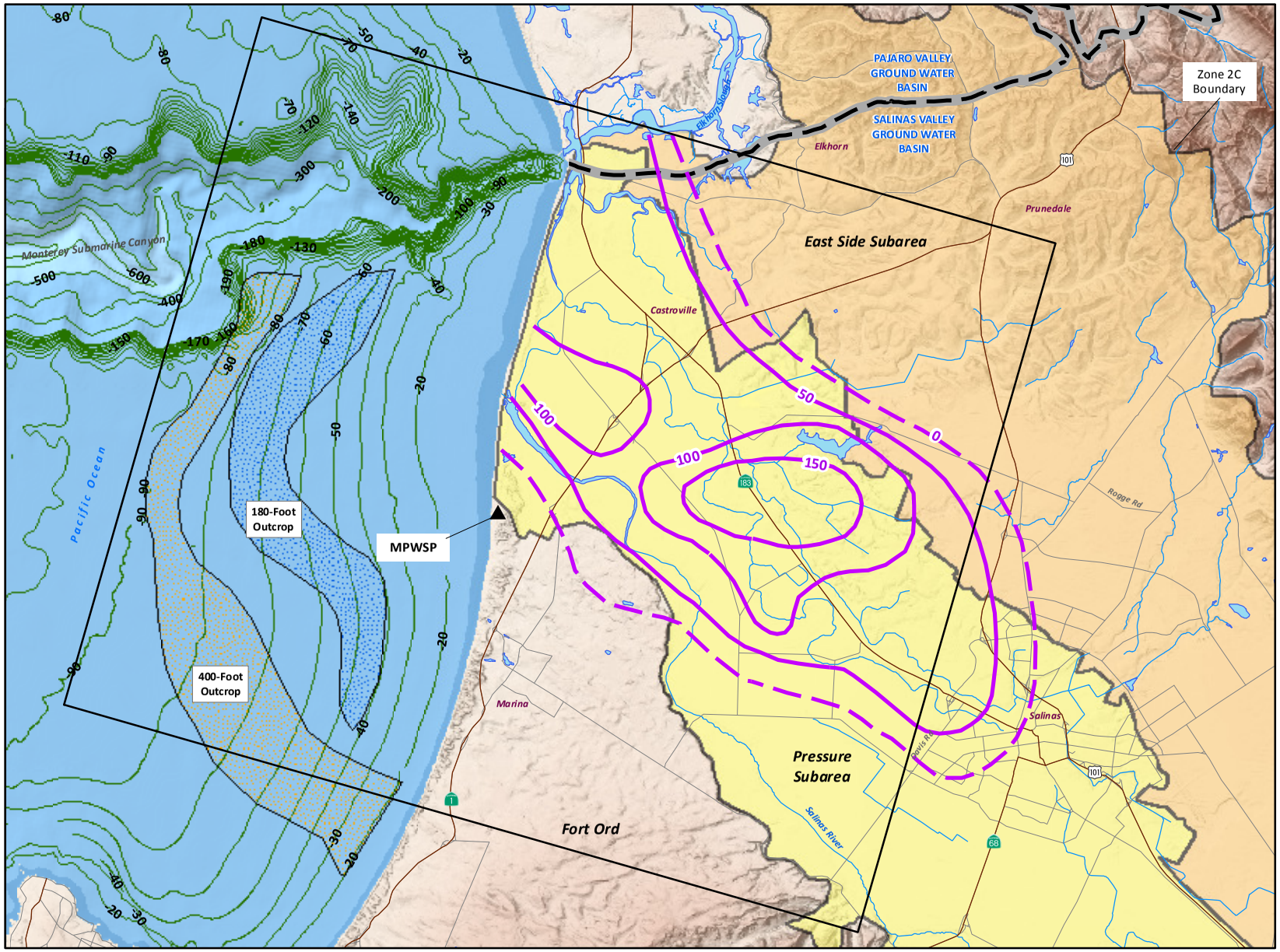
The 1978 Durbin report is entitled "Two-dimensional and three-dimensional digital models for the Salinas Valley groundwater basin, California" (USGS Water Resources Investigation 78-113). Figure 8 in Durbin's 1978 report (cited by Durbin in his technical memorandum and of which he was the primary author) clearly shows the thickest portion of the SVA to be located beneath the axis of the Salinas Valley. Figure 5 reproduces Durbin's figure. The approximate location of Durbin's 2012 geologic cross-section line is shown (black line) for reference on the 1978 figure below (Figure 6).

[9] An estuary is the area where a river meets the ocean.

ESA

RESPONSES TO THE DECEMBER 3, 2012 TECHNICAL MEMORANDUM PREPARED BY TIMOTHY DURBIN - CALIFORNIA-AMERICAN WATER COMPANY COMMENTS ON PROPOSAL TO PUMP GROUNDWATER FROM THE SALINAS VALLEY GROUNDWATER BASIN

THICKNESS AND EXTENT OF SALINAS VALLEY AQUITARD



6-Feb-13

Prepared by: DWB. Map Projection: State Plane 1983, Zone IV.

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NORTH

0 2 4 Miles

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www.gssiwater.com

Figure 5

GIS_proj/esa_durbin_response_1-13/0_Fig_5_aquitard_thickness_8x11_2-13.mxd

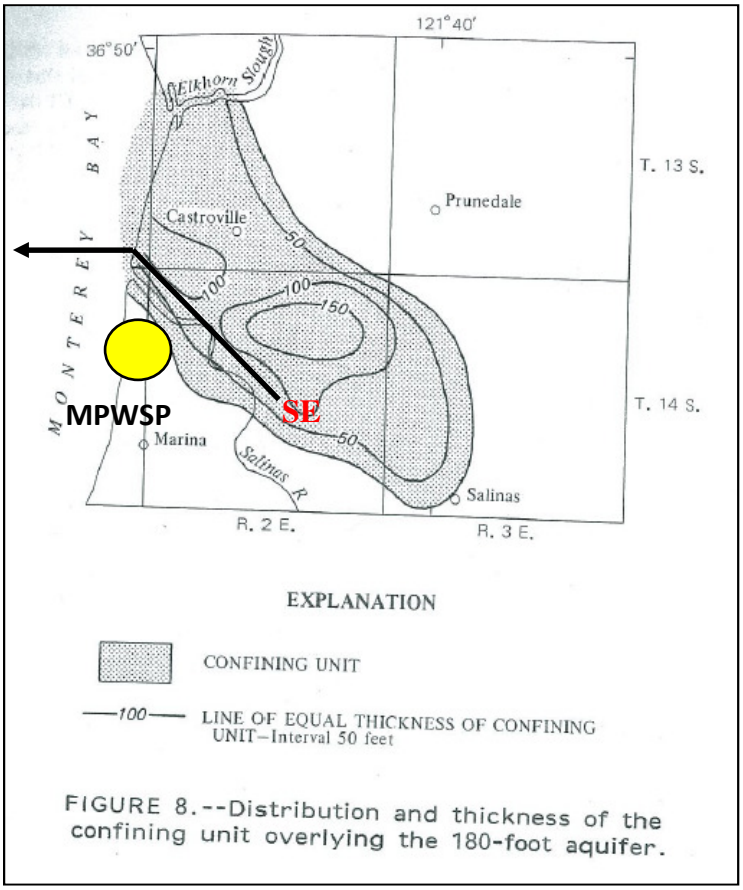


Figure 6. Salinas Valley Aquitard (modified from Figure 8 Durbin [1978])

Observation 3.2.1

The Durbin figure showing the SVA (Figure 6 above) also clearly indicates that the SVA is limited in extent. The "zero" thickness contour shown (but not labeled) is located approximately 1.2 miles to the northeast of the project site (yellow circled area on inset), suggesting that the Dune Sand Aquifer rests directly above the 180-Foot Aquifer at the coast. Based on Durbin's reference to his own work, the SVA is not present in the project area, which is the opposite of (i.e. contradicts) Durbin's assertion.

Observation 3.2.2

With reference to the SVA, page 21 of the 1978 Durbin report states that "the thickness (of the SVA) is variable and in general decreases towards the margins of the body." This statement is correct, based on available data, and would be anticipated based on the depositional environment of the underlying hydrostratigraphic units in the region. This statement is also consistent with subsequent studies, as will be shown below.

Observation 3.2.3

Figure 7 shows the most recent seafloor mapping (Eittriem, 2002 and Chin, 1988). The geologic map indicates that a wedge of Holocene[10] sediments is present offshore from the mouth of the Salinas River. The Holocene material is the result of deposition from the Salinas River. Eittreim postulates that the wedge will continue to migrate seaward on the continental shelf. The Holocene wedge represents deltaic sediments that overlie an erosional unconformity underlain by Pleistocene[11] sediments. According to Eittreim, the Pleistocene material is likely composed of the Pleistocene Aromas Sand. Figure 7 shows the Holocene wedge in relation to the project site and to offshore outcrops of geologic units. Offshore from the project area, the Holocene wedge reaches a maximum thickness of approximately 25 meters (approximately 80-85 feet). This condition would suggest that the Valley Fill deposits are thinner at the southern lateral edge of the delta and that the Dune Sand Aquifer and 180-Foot Aquifer may be merged a short distance offshore.

3.3 Distribution of the SVA from Previous Studies

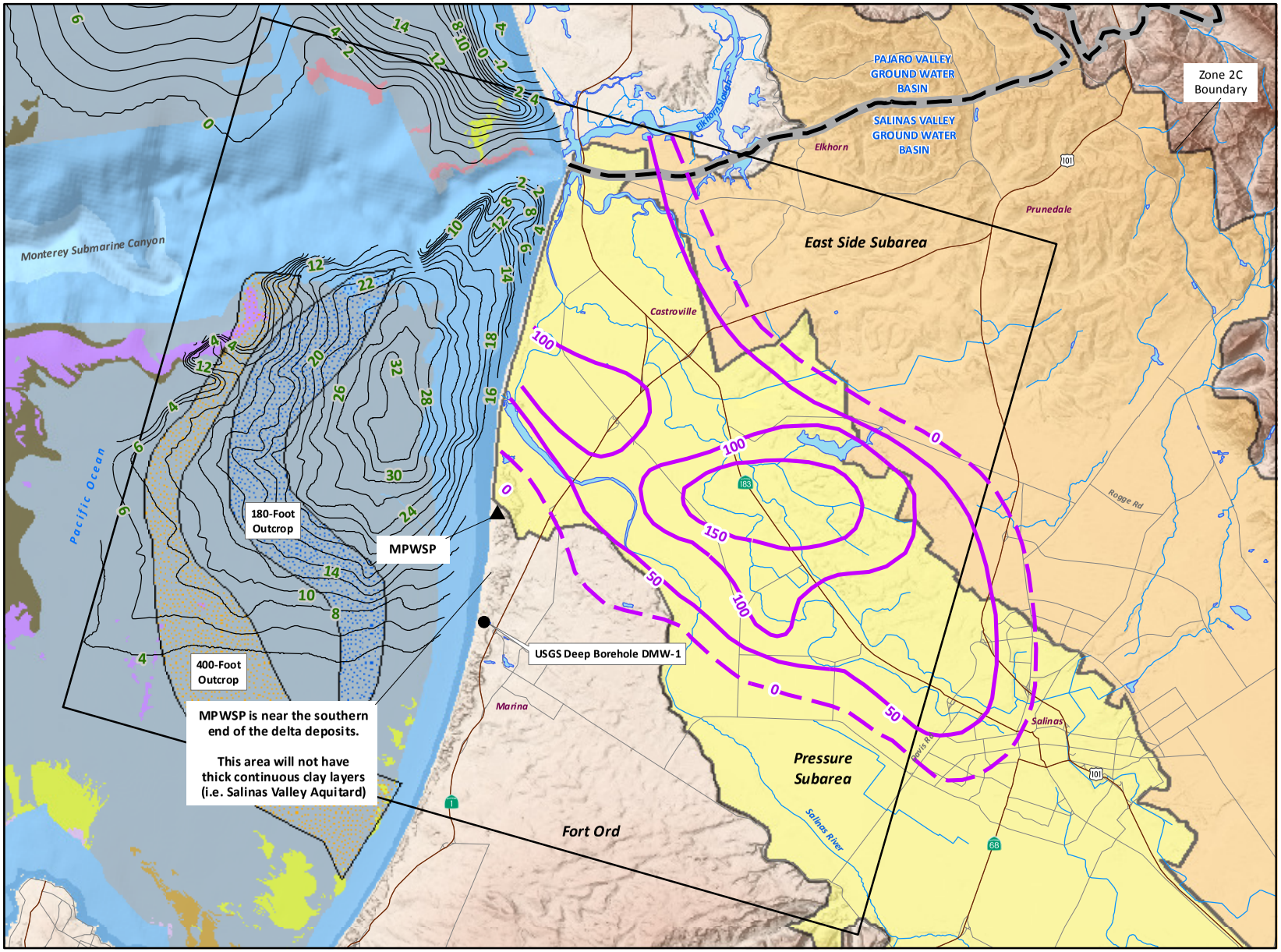
Figure 8 shows the locations of wells—including wells with available lithologic logs—in the vicinity of the project area from the Salinas Valley on the north, to the community of Marina and Fort Ord on the south. Note that a considerable amount of subsurface data has been generated since the 1978 Durbin report.

The GEOSCIENCE model was based on the SVIGSM. Previous studies were reviewed to confirm the model layers with respect to the hydrogeology. These studies include work completed by the state Department of Water Resources (DWR, 1973), Harding Lawson Associates (HLA, 1994), Fugro West Inc. (Fugro, 1996), HLA Mactec (2001), the United States Geological Survey (USGS, 2002), and Kennedy-Jenks (Kennedy-Jenks, 2004).

[10] Holocene time is from 11,000 years ago to the present.

[11] Pleistocene time is from 1.6 million to 11,000 years ago.

GEOLOGIC MAP SHOWING OFFSHORE DEPOSITS



EXPLANATION

Salinas Valley Aquitard Isopachs (Durbin, 1978), feet

- dashed (0 contour)
- GEOSCIENCE Ground Water Model Boundary
- California American Water Company Monterey Peninsula Water Supply Project (MPWSP)
- Ground Water Basin Boundary (DWR, 2003)

Offshore Aquifer Outcrop (Green, 1970; DWR, 1973)

- 180-Foot Aquifer
- 400-Foot Aquifer
- – -10 – Isopachs of Holocene Sediment Thickness, meters (Wong, F.L. and Eittreim, S.E., 2001)

Seafloor Surficial Geology (USGS MF-2345)

- Qa - Aromas sand
- Qgv - relict gravels
- Qmud - mud
- Qsd - coarse sands
- Tp - Purisima Formation
- Tm - Monterey Formation
- Kgr - granite

6-Feb-13

Prepared by: DWB. Map Projection: State Plane 1983, Zone IV.

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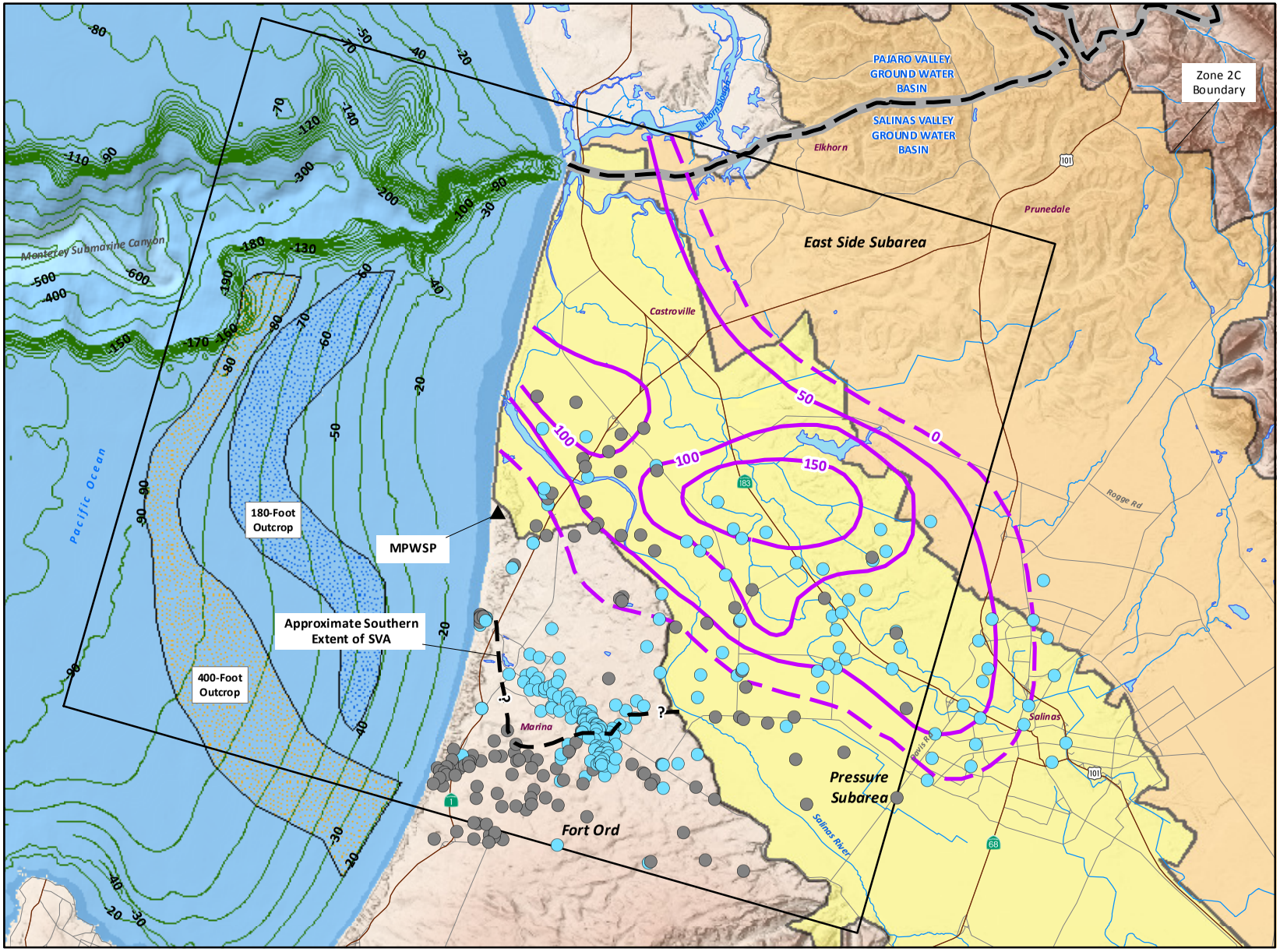
Figure 7

WELL LOCATIONS AND WELLS WITH LITHOLOGIC DATA



EXPLANATION

- Well Location with Lithologic Log
- Other Well Locations
- Approximate Southern Extent of Salinas Valley Aquitard (HLA, 1994)

Salinas Valley Aquitard Isopachs (Durbin, 1978), ft

- dashed (0 contour)
- GEOSCIENCE Ground Water Model Boundary
- California American Water Company Monterey Peninsula Water Supply Project (MPWSP)
- Ground Water Basin Boundary (DWR, 2003)

Offshore Aquifer Outcrop (Green, 1970; DWR, 1973)

- 180-Foot Aquifer
- 400-Foot Aquifer
- -10 Elevation of Sea Floor, meters (Wong, F.L. and Eittreim, S.L., 2001)

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Figure 8

Observation 3.3.1

Geologic cross-section A-A' published by DWR (1973) is drawn approximately parallel to the shoreline from the community of Seaside in the south to a well north of Moss Landing. A portion of the cross-section between Reservation Road at Marina and the Salinas River is shown in Figure 9 below. The line of the cross-section parallels the coast and is located approximately 1.5 miles inland from the project site. The cross-section depicts the lenticular nature of the SVA, consisting of several tabular bodies that pinch out at the margins of the units. The fine-grained units (shown as non-patterned areas) below the project area may represent a part of the SVA.

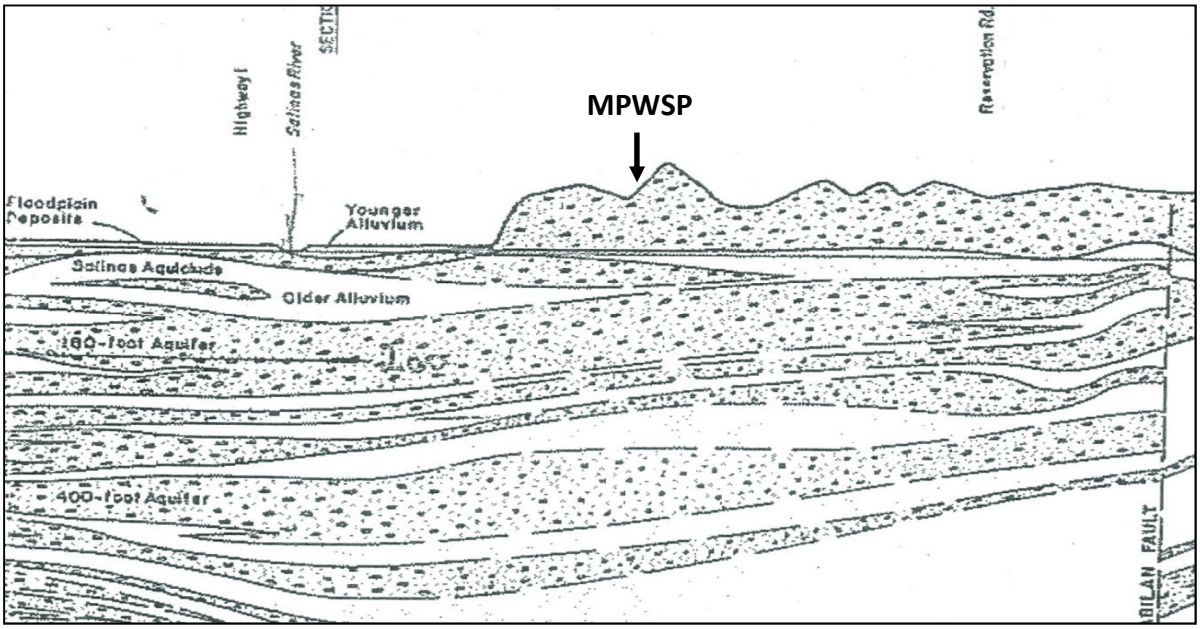


Figure 9. Geologic Cross-Section Parallel to Coast (Portion of Cross-Section A-A' from DWR, 1973)

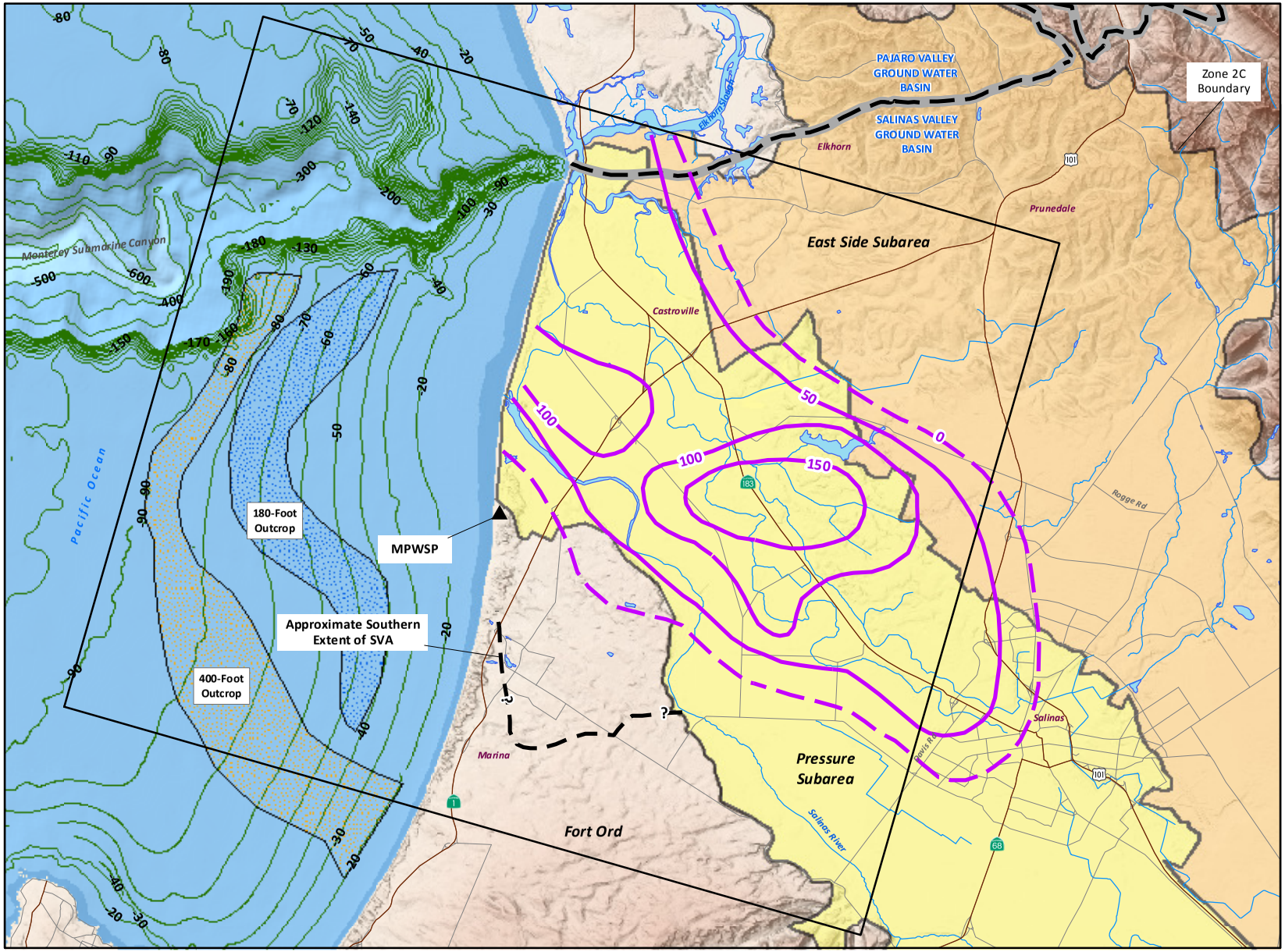
The fine-grained unit is shown to be approximately 20-feet thick in the cross-section. The lenticular configuration suggests that that the units will decrease in thickness and pinch out seaward in a manner consistent with that shown in Figure 13 below.

Observation 3.3.2

Figure D5 of a groundwater modeling report for Fort Ord prepared by HLA (1994) maps the southerly extent of the SVA approximately 0.75 miles east of the shoreline at a point about one mile south of the community of Marina. Figure 10 below shows the approximate southern extent of the SVA as interpreted by HLA.

ESA

RESPONSES TO THE DECEMBER 3, 2012 TECHNICAL MEMORANDUM PREPARED BY TIMOTHY DURBIN - CALIFORNIA-AMERICAN WATER COMPANY
COMMENTS ON PROPOSAL TO PUMP GROUNDWATER FROM THE SALINAS VALLEY GROUNDWATER BASIN



EXTENT AND THICKNESS OF SALINAS VALLEY AQUITARD SHOWING SOUTHERN EXTENT (HLA, 1994)

EXPLANATION

- Approximate Southern Extent of Salinas Valley Aquitard (HLA, 1994)
- Salinas Valley Aquitard Isopachs (Durbin, 1978), ft
  - dashed (0 contour)
- GEOSCIENCE Ground Water Model Boundary
- California American Water Company Monterey Peninsula Water Supply Project (MPWSP)
- Ground Water Basin Boundary (DWR, 2003)
- Offshore Aquifer Outcrop (Green, 1970; DWR, 1973)
  - 180-Foot Aquifer
  - 400-Foot Aquifer
- -10 Elevation of Sea Floor, meters (Wong, F.L. and Eittreim, S.L., 2001)

6-Feb-13

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Figure 10

GIS_proj/esa_durbin_response_1-13/0_Fig_10_HLA_aquitard_loc_2-13.mxd

Observation 3.3.3

Fugro West, Inc. (Fugro, 1996) completed studies for Marina Coast Water District at the Marina Coast Water District facility located immediately north of Marina State Beach. For the study, four monitoring wells were installed. The Marina Coast Water District facility is located over one mile south of the project area. Two monitoring wells were completed and screened in the Dune Sand Aquifer and two monitoring wells were completed and screened only in the 180-Foot Aquifer. The monitoring wells were used to evaluate groundwater level responses to tidal changes in the two aquifers, and to evaluate groundwater quality in both aquifers and changes in groundwater quality due to tidal changes. The Fugro study demonstrated that the Dune Sand Aquifer is unconfined to semi-confined, while the 180-Foot Aquifer is confined. The logs of the borings for the monitoring wells indicate an approximately 25-foot-thick clay layer at a depth of 170 feet bgs (-110 feet above mean sea level [amsl]). Well screens in the deeper observation wells were placed below this lower clay layer, suggesting that the 180-Foot Aquifer was interpreted to be at a depth of approximately 170 feet at this location. The report does not note whether the clay unit used to distinguish the Dune Sand Aquifer above from the 180-Foot Aquifer below represented the SVA or a fine-grained unit of a different origin. Work by the USGS at the same location discussed below did not interpret this clay layer to represent the SVA. In any case, due to its thickness (25 feet), it likely pinches out within a short distance offshore. This would support that the 180-Foot Aquifer would be semi-confined to unconfined offshore.

Observation 3.3.4

Geologic cross-section A-A' prepared by HLA (2001) interprets the Dune Sand Aquifer to directly overlie the upper portion of the 180-Foot Aquifer in the vicinity of Marina, California. The inset below provides the southerly portion of the cross-section in the vicinity of the project area. The slant wells would be located about 1,300 feet seaward from the view of the cross-section.

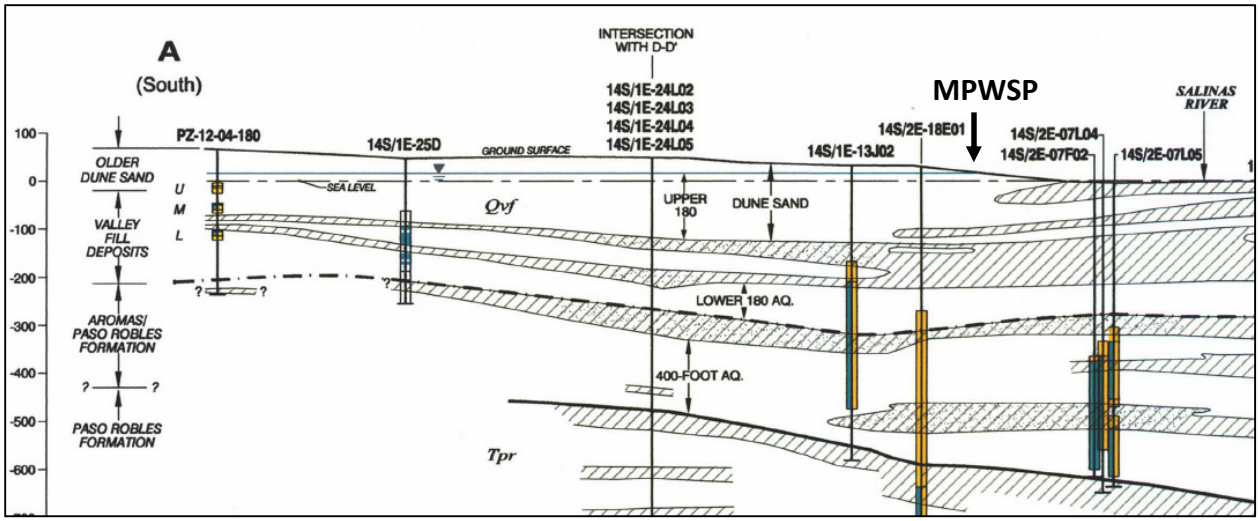

Figure 11. Geologic Cross-Section Parallel to Coast (Portion of Plate 3 HLA [2001])

The cross-section interprets the 180-Foot Aquifer as consisting of two units. The upper unit is unconfined and is merged with the overlying Dune Sand Aquifer. The lower unit is confined and is overlain and divided by thin units of the SVA. The SVA increases in thickness towards the Salinas River. The approximate project location is shown by the black arrow. In this interpretation, the slant wells would be pumping from either the Dune Sand Aquifer or the Upper 180-Foot Aquifer, both of which would be <u>above</u> the SVA, assuming the SVA is even thinly present.

The location of cross-section A-A' and the extent of the SVA in the vicinity of the project as interpreted by HLA are shown on Plate 2 of their report. A portion of Plate 2 is shown below. The approximate location of the project is shown by the yellow circle. The seaward extent of the SVA is indicated by the black arrows. In the vicinity of the proposed slant well site, the extent of the SVA is queried, indicating that exact extent of the SVA is unknown. However, the queried line represents the approximate distal portion of the SVA if present. The cross-section above suggests that the queried extent of the SVA should be further inland from the project site.

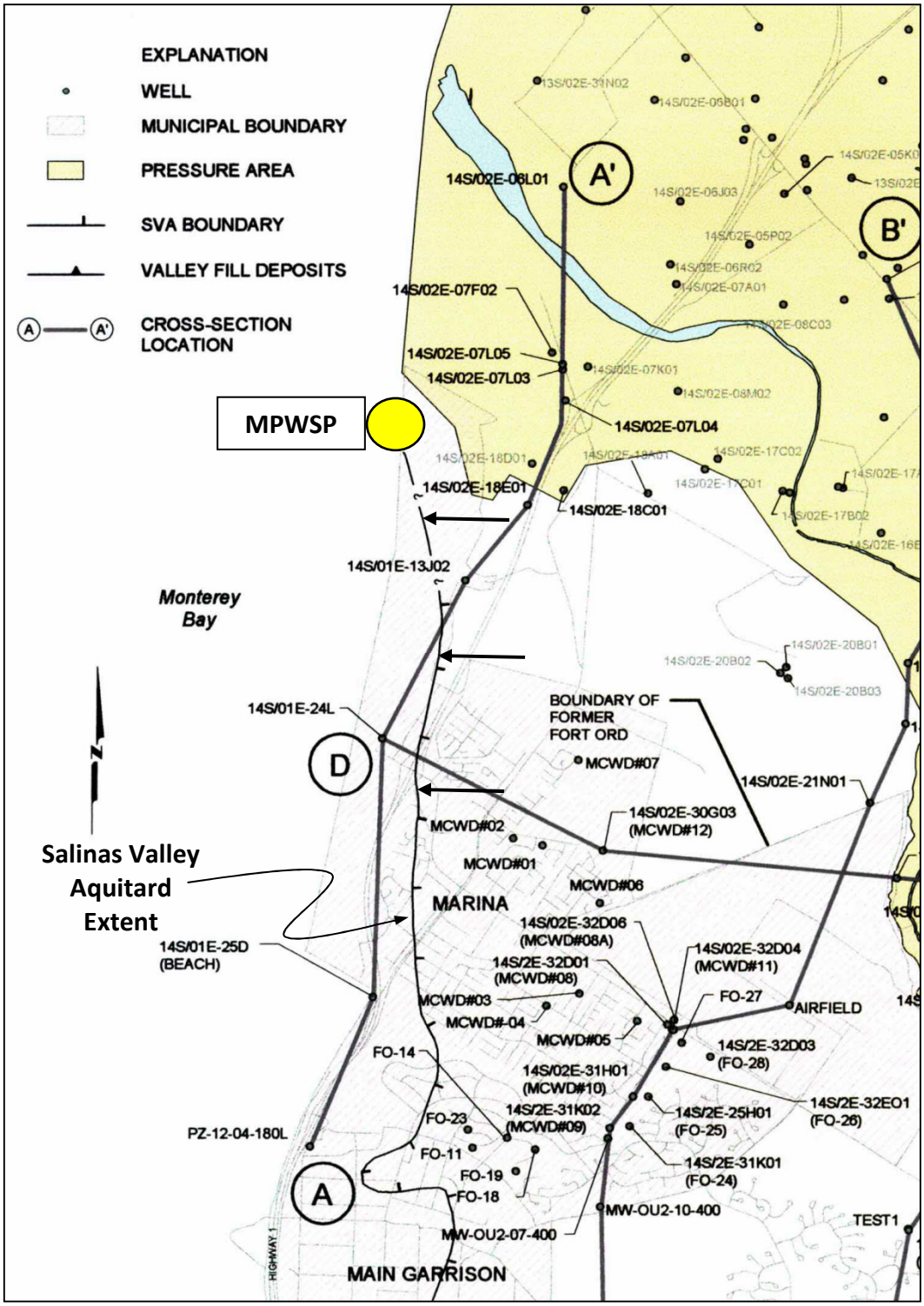

Figure 12. Extent of Salinas Valley Aquitard (Portion of Plate 2 from HLA, 2001)

Observation 3.3.5

HLA cross-section D-D' of the 2001 HLA report depicts the SVA to pinch out in a seaward direction, at a point approximately one-half mile east of the shoreline (inland) at Marina State Beach. This results in the Dune Sand Aquifer directly overlying the upper portion of the 180-Foot Aquifer in the vicinity of Marina, California. The inset below shows the westerly portion of the cross-section in the vicinity of the project area. The location of the cross-section is shown on Figure 12 above. A portion of the cross-section is reproduced below. The approximate project area is projected onto the cross-section approximately 1.7 miles (shown by yellow circle).

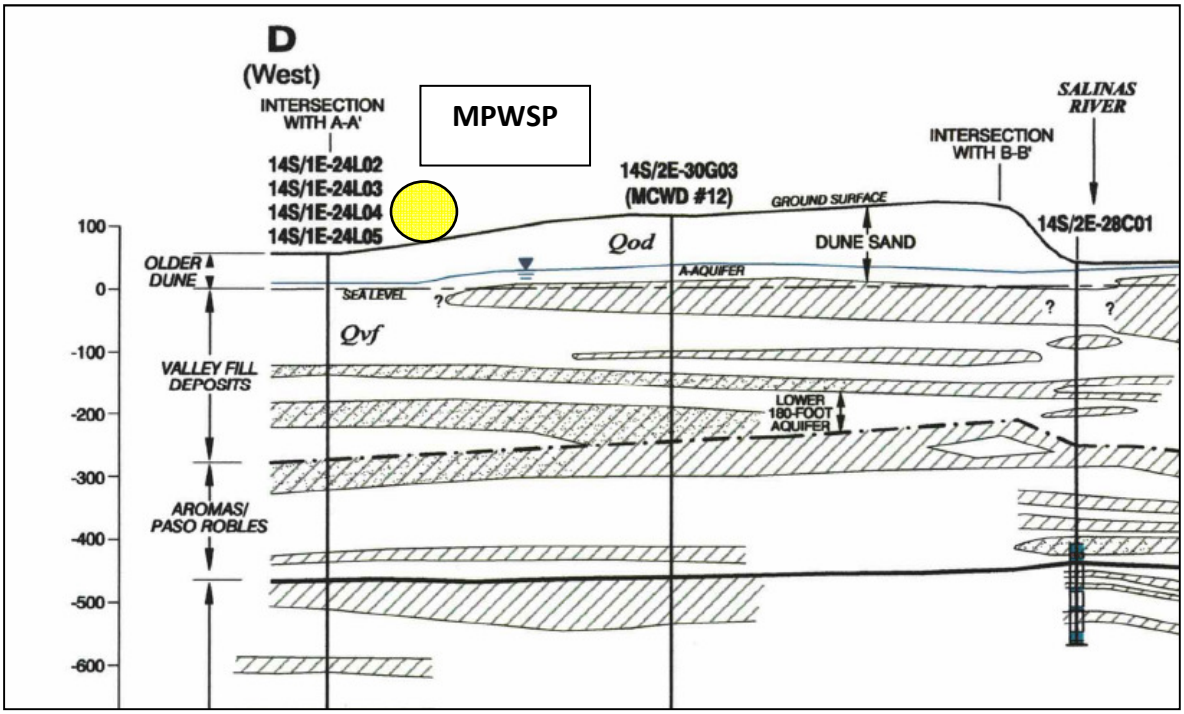

Figure 13. Geologic Cross-Section (Portion of Plate 6 from HLA, 2001)

Observation 3.3.6

Figure 3 of the 2002 USGS Water Resources Investigation 02-4003 provides the lithologic log of the deep boring (DMW-1) drilled at the Marina Coast Water District Facility located at the coast near Marina, California. Well DMW-1 is located about one mile south from the slant wells. The upper portion of the lithologic log is reproduced below as Figure 14. Figure 3 of the USGS publication also provides the construction details for deep monitoring wells and the lithologic log of deep well #12, located approximately 1.2 miles inland from USGS Well DMW-1. *Page 20 of the report describes the upper aquifer system at this location as consisting of the Dune Sand Aquifer resting directly over the 180-Foot*

Aquifer. This interpretation is consistent with delineation of the SVA shown on Figures 11, 12, and 13 above.

The approximately 60 feet thick blue clay noted on the lithologic log for Well #12 at a depth of 100 feet bgs (see blue arrow on the inset below) is likely an expression of the SVA located inland. However, the 25–foot-thick sandy, silty clay shown at a depth of 80 feet bgs on the lithologic log of DMW-1 (black arrow) likely represents a series of paleosols or terrace deposits resting immediately beneath the Dune Sand.

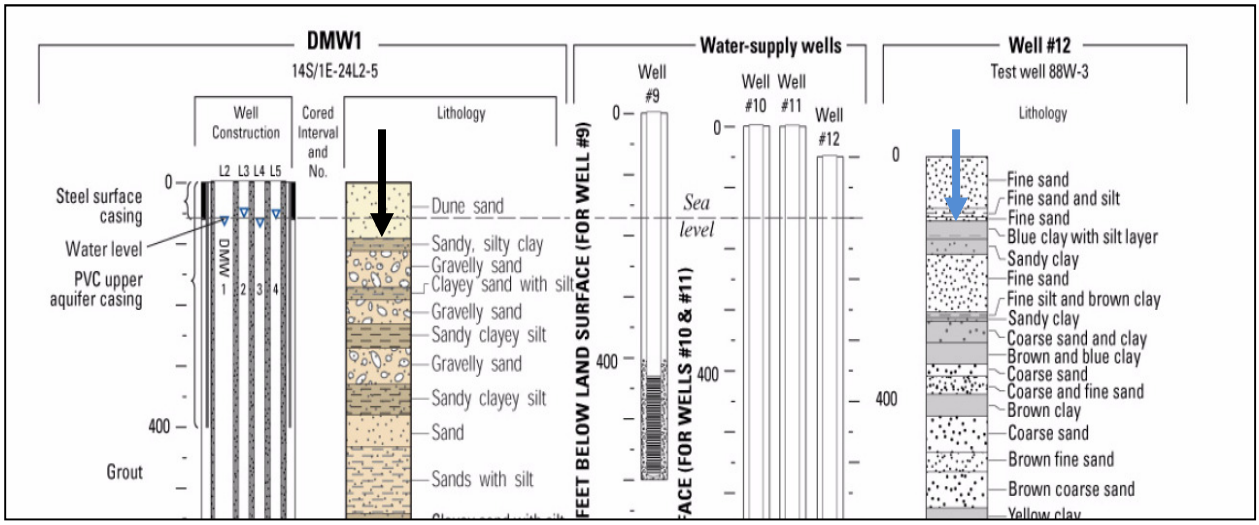

Figure 14. Portion of Figure 3 of USGS Water Resources Investigation 02-4003

Observation 3.3.7

Cross-section B-B' prepared by Kennedy-Jenks (2004) depicts the SVA as discontinuous, interfingering, westward-thinning lenses of clay in the subsurface near the shoreline near Marina. The southerly portion of the cross-section is reproduced below. The Kennedy-Jenks interpretation of the distribution of hydrostratigraphic units differs from the 2001 HLA report, discussed above, in that the Dune Sand Aquifer extends to a depth of approximately 170 feet below the project area. Kennedy-Jenks does not divide the 180-Foot Aquifer into an upper and lower unit. However, in both interpretations, approximately 100 to 200 feet of aquifer is exposed to the seafloor. The SVA is decreasing in thickness and into thinner units southward. The approximate slant well location is as indicated, although the slant well will be located approximately 0.9 miles seaward of the location of the cross-section. The light blue unit that separates the Dune Sand Aquifer from the 180-Foot Aquifer is logged as sandy clay unit and may be a leaky confining layer.

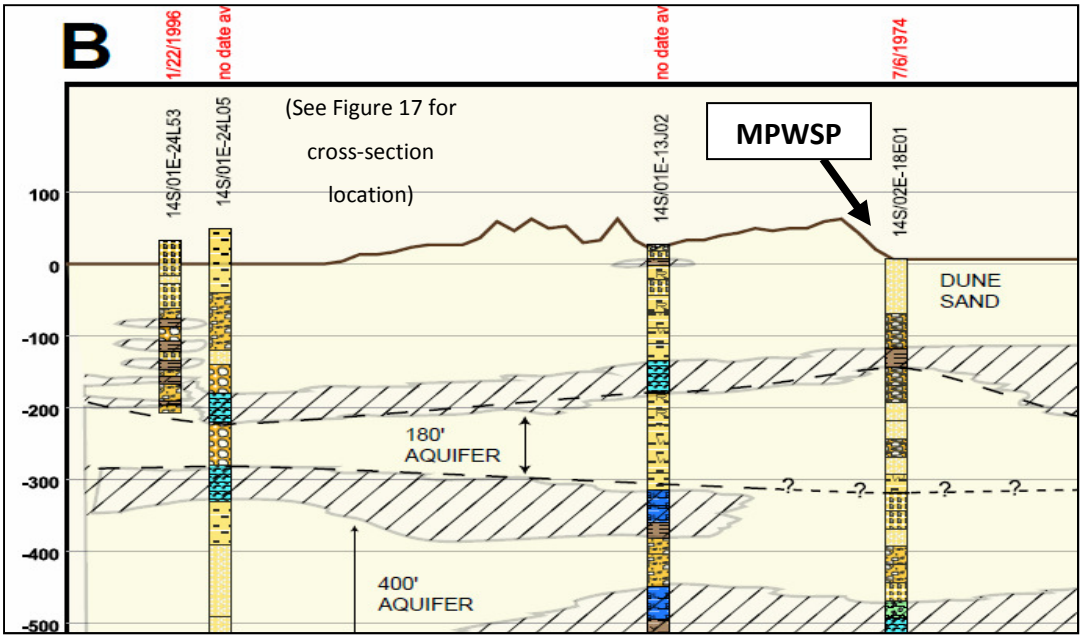

Figure 15. Portion of Figure 4 from Kennedy-Jenks (2004)

Observation 3.3.8

Cross-section C-C' (Figure 16) prepared by Kennedy-Jenks (2004) depicts the SVA as two clay units separated by a sand unit. Note that the SVA quickly thins away from the axis of the Salinas River. The upper clay unit pinches out in a southwestward direction at a point about 1.5 miles east of Marina (at Well 14S/2E-28C1). The lower clay unit is approximately 15 to 20 feet thick.

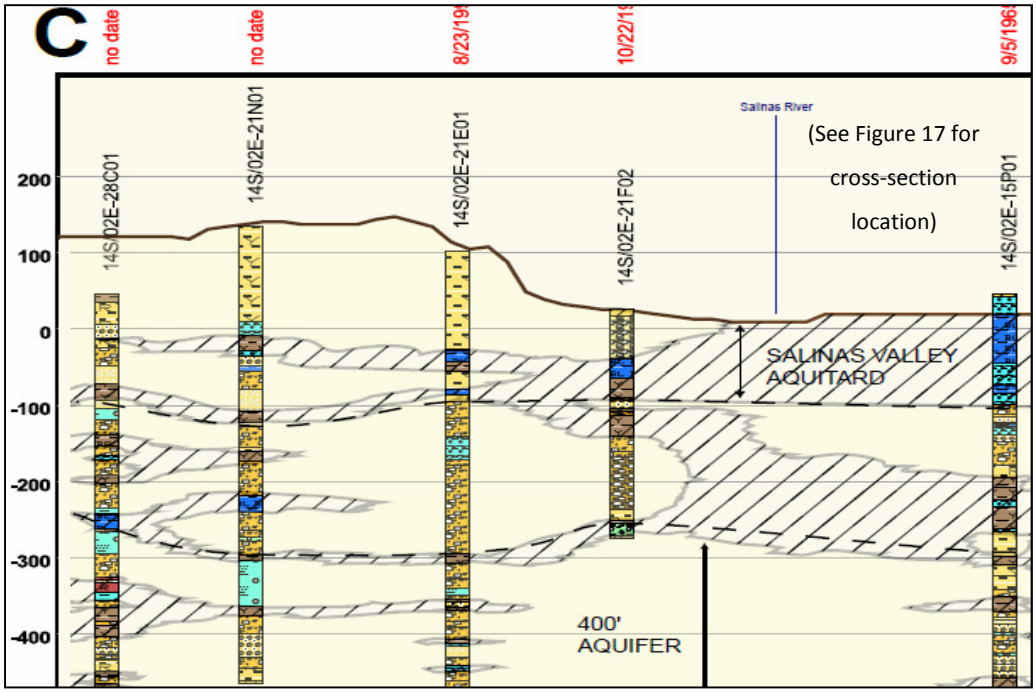

Figure 16. Portion of Figure 5 from Kennedy-Jenks (2004)

The location of the project area in relation to Kennedy-Jenks cross-sections B-B' and C-C' is shown on the inset below. The slant well locations would be about 0.9 miles west of the cross-section B-B' and 3.3 miles west of cross-section C-C'. Any expressions of the SVA would be expected to be even thinner toward the ocean.

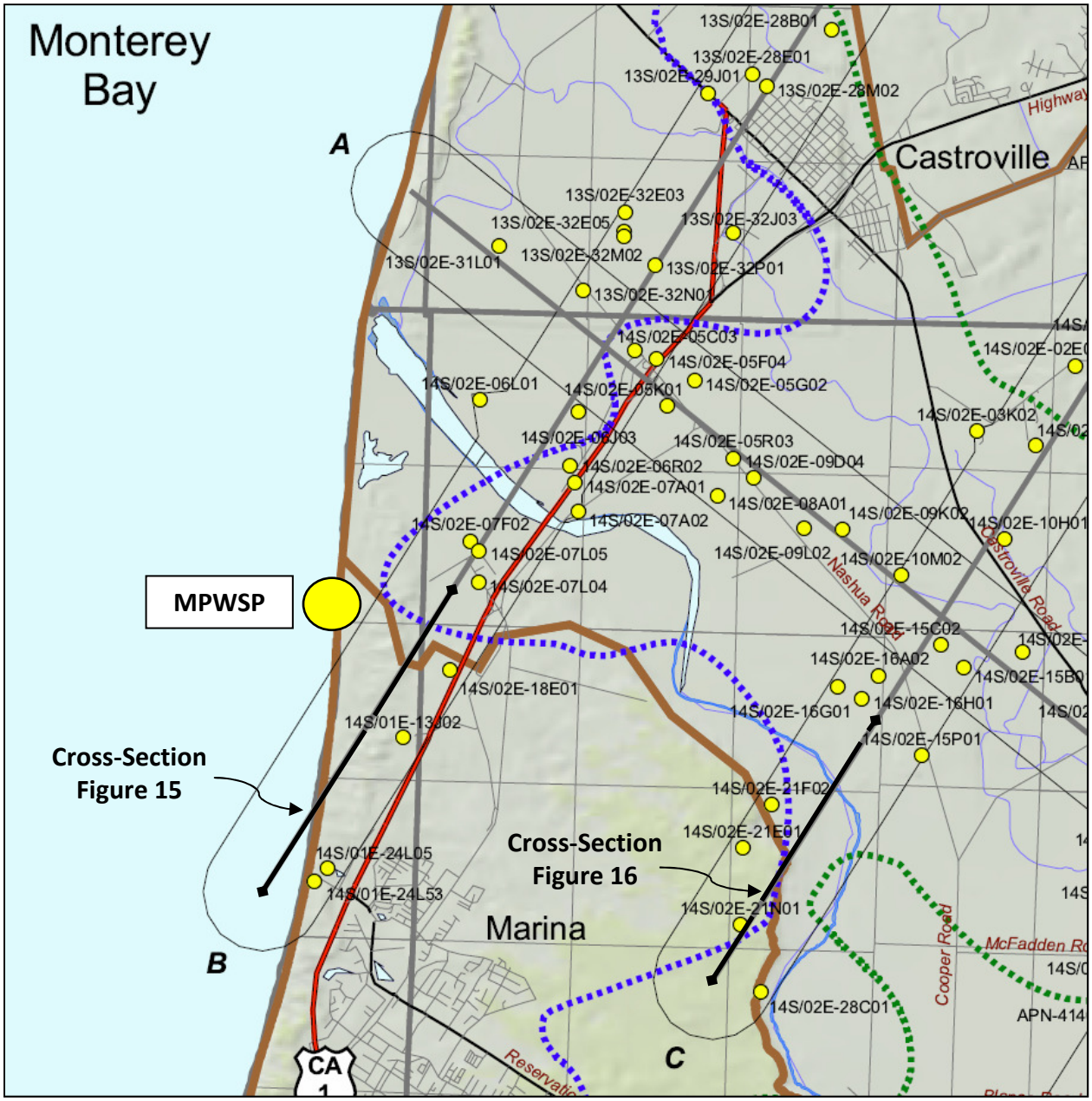

Figure 17. Portion of Figure 2 from Kennedy-Jenks (2004)

4.0 GEOSCIENCE GROUNDWATER MODEL

The 2008 GEOSCIENCE groundwater model relied primarily on the existing model layers prepared for the SVIGSM. Subsequent review of the studies noted above (HLA, 1994; HLA, 2001; USGS, 2002; Kennedy-Jenks, 2004) confirmed the validity of the relationship of the subsea aquifers in relation to the seafloor.

The schematic diagram illustrating the relationship of the aquifers with the seafloor from Page 13 of the GEOSCIENCE 2008 report is reproduced below as Figure 18. The depiction of the aquifer relationships is consistent with the 1994 HLA work, 2001 HLA report, and the 2002 USGS report. Although the 2004 Kennedy-Jenks report selected to interpret upper sediments as Dune Sand and Older Dune Sand to depths of 170 feet bgs in the project area, the schematic diagram is consistent in concept in that extraction wells placed underneath the shallow sea floor will induce and extract leakage from the sea above.

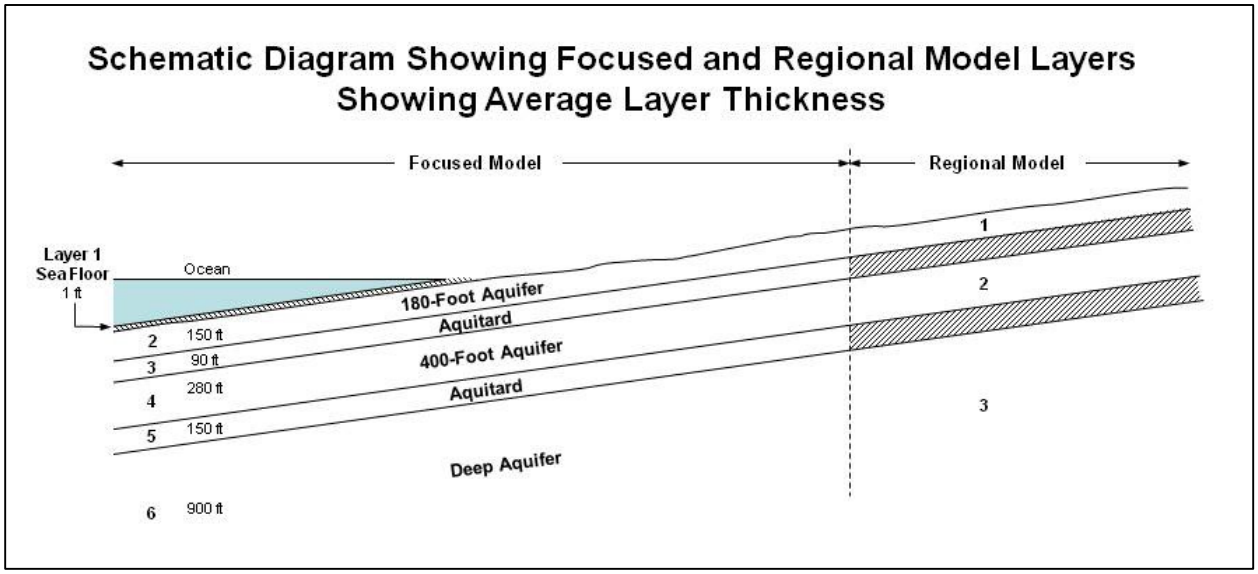

Figure 18. GEOSCIENCE (2008)

The inset below (Figure 19) provides an illustration of potential project pumping conditions at the project site, based on the information obtained from the well completion report of the existing well (Well 14S/2E-18E1). The well completion report indicates that the Dune Sand Aquifer at the project site is underlain by an approximately 50-foot thick, fine-grained unit at an approximate elevation of -150 feet amsl. This fine-grained unit in turn is underlain by the 180-Foot Aquifer. Additional exploratory work will be necessary to evaluate the lateral extent of the fine-grained unit. A slant well constructed and pumping in the Dune Sand Aquifer would induce leakage through the sea floor; the 50-foot fine-grained unit would be located below the Dune Sand Aquifer and would therefore not restrict the vertical flow of seawater from the overlying sea floor. A slant well constructed and pumping from the 180-Foot

Aquifer would still induce leakage through the seafloor so long as the 50-foot fine-grained unit is similar to the SVA and is not extensive or continuous away from the Salinas River.

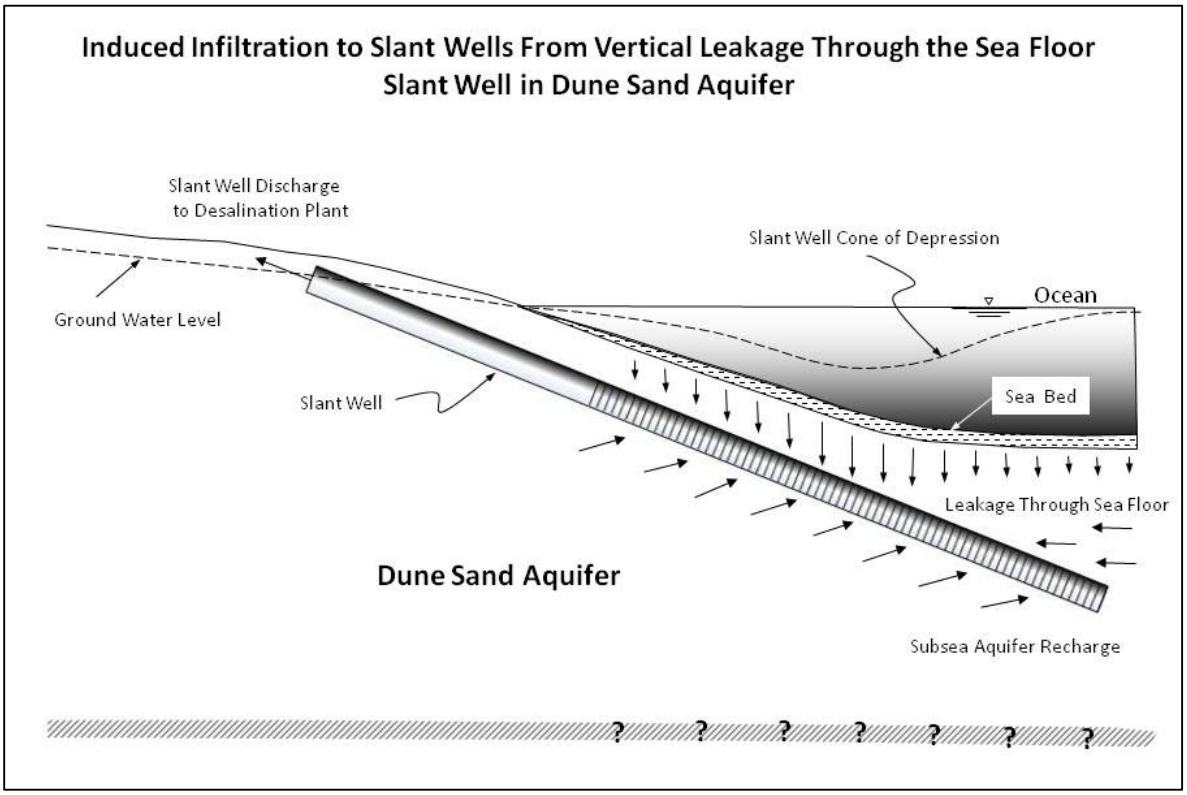

Figure 19. Sources of recharge to a slant well producing from the Dune Sand Aquifer showing a high percentage of recharge to the slant well system comes from induced infiltration through the sea floor as well as offshore subsea aquifers

Subsequent data collection through drilling exploratory borings and test wells may determine that a 50-foot thick, fine-grained unit present beneath the Dune Sand Aquifer may extend a limited distance offshore. In this condition, the Dune Sand Aquifer may merge with the 180-Foot Aquifer, as shown by previous workers and as noted earlier in this document. The inset below illustrates the hydrostratigraphic condition where the Dune Sand Aquifer is merged with the 180-Foot Aquifer. In this case, the screened portions of the slant wells would be constructed in either the Dune Sand Aquifer or the 180-Foot Aquifer or both. Any of the three well construction configurations would still result in inducing seawater leakage through the ocean floor.

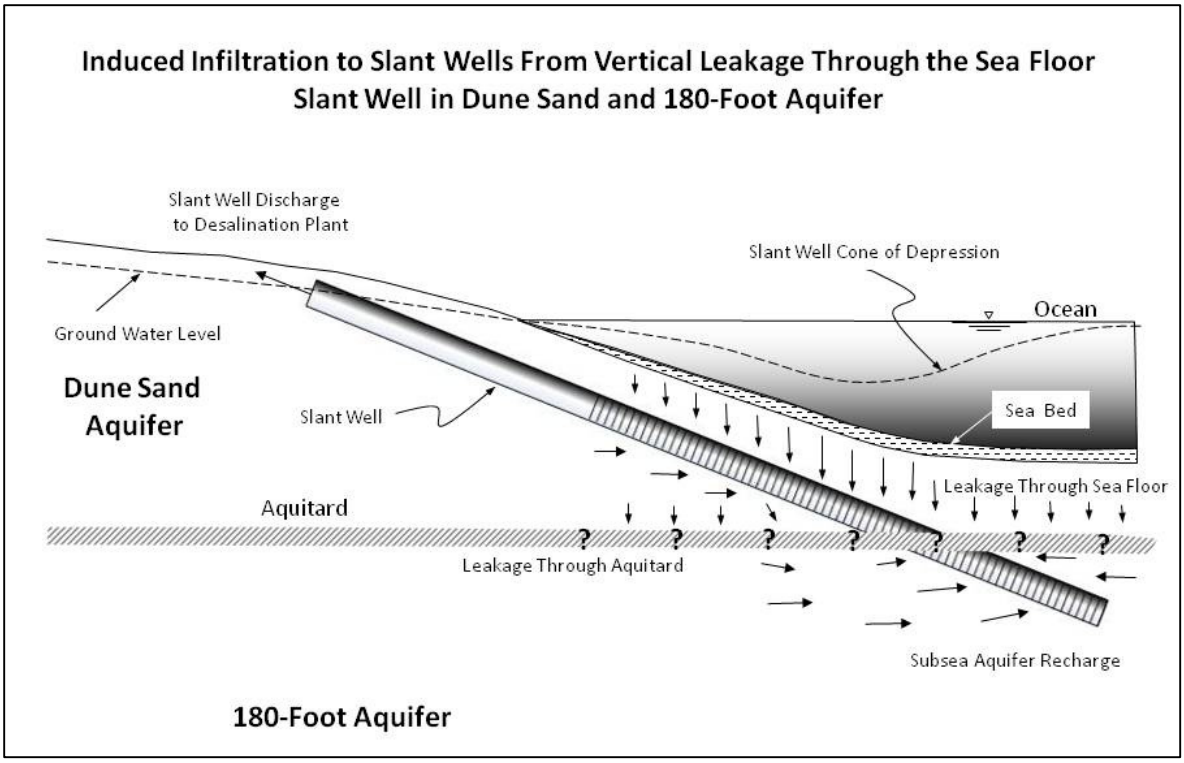

Figure 20. Sources of recharge to a slant well producing from the Dune Sand and 180-Foot Aquifers showing a high percentage of recharge to the slant well system ocean sources

5.0 DURBIN RECOMMENDATIONS

The recommendations provided in the Durbin technical memorandum summarize his opinions, as well as present his proposal for additional work. The table below reproduces the recommendations and provides a brief response and commentary to those recommendations.

	Durbin Recommendations	GEOSCIENCE Comments
1	The understanding of the hydrologic setting along Monterey Bay must be refined. Previous investigations have established the general hydrologic setting, but additional work is needed to define the thickness and extent of the 180-foot aquifer, overlying aquitard, and dune deposits. Especially important are identifying the onshore and offshore extent, thickness, and continuity of the aquitard overlying the 180-foot aquifer and defining the hydraulic connections among the 180-foot aquifer, overlying aquitard, and dune deposits. The hydrogeologic investigation will require the compilation and analysis of existing hydrogeologic information, the construction of new boreholes, and perhaps conducting geophysical surveys. Whether the proposed pumping from the 180-foot aquifer or the dune deposits will have adverse impacts will depend largely on the details of the actual hydrogeologic setting.	As discussed above, the understanding of the hydrogeology in the project area and region has been refined continuously through the 1980s, 1990s, and 2000s, but is not displayed in the comments nor considered in the opinions prepared by Durbin. As an example: the cross-section (Figure 2 above showing Durbin's cross-section) provided in the Durbin technical memorandum does not correctly depict the subsurface geologic conditions in the areas to the south of the Salinas River, both onshore and offshore. The cross-section is misleading. Therefore, the opinions that are based on Durbin's cross-section and subsequent figures in his technical memorandum <u>are incorrect</u>. Since Durbin's hydrostratigraphic conceptual model is incorrect, Durbin's statement: "actual groundwater system will respond much differently than simulated by the groundwater model" (third paragraph of page 4 in his technical memorandum) <u>is also incorrect</u>. The opinions concerning the response of the 180-Foot Aquifer to the project are predicated on an incorrect conceptual model of the SVA, as extensively discussed above. As is standard protocol for hydrogeologic studies, the groundwater model is prepared using the most recent available data. Model revisions are

		conducted and prediction scenarios refined as additional studies provide the data to inform the model.
2	An understanding of the seawater-intrusion mechanisms must be developed. Historical seawater intrusion has occurred by some combination of the mobilization of naturally occurring seawater within the groundwater system, pumping-induced vertical leakage from Monterey Bay into the groundwater system, extrusion of naturally occurring seawater within the aquitards deposited as lagoonal sediments, and other mechanisms. The collection and analysis of geochemical and other information will be required to identify seawater-intrusion pumping details of the seawater-intrusion processes. Whether the proposed pumping from the 180-foot aquifer or the dune deposits will have adverse impacts may depend significantly on the actual processes that will be activated by the proposed pumping.	Durbin does not fully understand the groundwater hydraulics of the proposed slant wells. They are purposely designed to induce vertical infiltration through the sea floor, thus providing a high percentage of the recharge from both offshore ocean sources, as illustrated on Figures 19 and 20. Although Durbin's text is unclear, Durbin postulates that degradation of groundwater can or will occur if "leakage" is induced from the overlying SVA from lowering of piezometric pressures in the underlying 180-Foot Aquifer. It may be that Durbin is actually referring to "extrusion" (he mixes his terminology in his text); the process previously discussed where water buried with fine-grained materials (e.g., clays) is released by changes in pressure in the adjacent aquifer. Durbin, without providing any data, assumes: 1) extrusion from the SVA will produce a sufficient volume of water to impact the water quality; 2) <u>this condition has not already occurred, even though seawater intrusion induced by lowering piezometric pressures has been documented since the 1940s;</u> and, 3) the cone of depression from the pumping of the slant wells would be confined mainly to subsea aquifers and would not significantly influence onshore resources. Data is not provided in the Durbin technical memorandum to provide any support for his opinion. If poor quality water is present in the SVA, then extrusion would have

		occurred during the historical lowering of ground water levels in 180-Foot Aquifer and mixing of SVA groundwater would be represented in the historical water quality underlying the SVA.
3	Large-scale aquifer tests will be needed to supplement the hydrogeologic and seawater-intrusion investigations. Separate tests must be conducted with pumping from the 180-foot aquifer and the dune deposits. The tests need to include monitoring wells within the 180-foot aquifer, the overlying aquitard, and the dune deposits. The pumping rates and test durations must be sufficient to identify processes that will be activated by the full implementation of the proposed water-supply pumping.	Large-scale aquifer tests have already been proposed for the next phases of the project to further refine the project design details, such as well locations, configurations, and construction details.
4	A local groundwater model must be developed that represents the essential elements of the groundwater system onshore and offshore along Monterey Bay. The model must simulate both groundwater flow and solute transport. The model must represent the hydrologic setting, including the thickness and extents of the dune deposits, 180-foot aquifer, 400-foot aquifer, and deep aquifer, and the intervening aquitards. The model must represent the hydraulic characteristics of the groundwater system, and it must represent the seawater-intrusion process active within the groundwater system. The development of an adequate model may require simulating the effects of water density on the hydrodynamics of the groundwater system. The boundary and initial conditions for the local model should be derived from SVIGSM. However, the simulation run on the SVIGSM must represent a realistic representation of baseline conditions. The appropriate baseline condition is for the continued operation of the CSIP project	As previously discussed, the current groundwater model includes the most recent geologic and hydrogeologic data collected in the project area, whereas, the opinions offered in the Durbin technical memorandum do not. As stated in the previous response, it is normal and a standard of practice to construct a groundwater model from the most current available data to be used for evaluation of project impacts in the feasibility phase. In addition, as previously discussed, seawater intrusion and basin overdraft must and will be addressed through the construction and implementation of a combination of various projects. While the final combination of projects continues to be evaluated and may be different from the individual projects assumed in the SVIGSM, the requirement that some combination of projects be implemented is a certainty. We note that Durbin specifically objects to the inclusion of

	without additional acreage. An expansion of CSIP is not in place or envisioned at this time, and it is not an appropriate or realistic depiction of baseline conditions for analyzing the potential impacts of the CalAm proposal. The proposed CalAm pumping must be simulated for a finite period, and an extended post-project period must be simulated.	the SVWP – Phase II. As previously discussed, the SVIGSM includes scenarios both with and without the SVWP – Phase II component.
5	The modeling results for both the primary and contingency proposal must be subjected to a thorough sensitivity analysis. The modeling results will unavoidably always contain uncertainty, even though the objective of the modeling exercise and supporting investigations described above will be to minimize the uncertainty. The sensitivity analysis will quantify how the modeling results might change with different assumptions about the hydrogeologic setting, seawater intrusion processes, and the hydraulic characterization of groundwater system.	The SVIGSM includes a sensitivity analysis by considering different scenarios. The scenarios include differences such as pumping from the Dune Sand Aquifer versus the 180-Foot Aquifer, varying the volume of water pumped from the slant wells, considering different land use projections, and, as previously noted, including or excluding the SVWP – Phase II component.
Final Note	The groundwater modeling work and supporting investigations should be conducted with continuing input from a technical advisory committee. The committee would provide advice on study plans and review study results. The committee would include representatives of the stakeholders and other experts.	Groundwater studies have been conducted by numerous investigators historically with each study adding to the understanding of the groundwater basins. Currently, reputable firms abreast of previous studies are working in the area and collaborating on the technical issues. For this project, the groundwater modeling team consists of two groundwater modeling consultants working on different parts of the model and providing input and comments on each other's work.

6.0 SUMMARY AND GENERAL OBSERVATIONS

As discussed above, the conceptual model used in the original and current modeling work is valid as supported by the detailed description of the aquifer and aquitard descriptions summarized in this technical memorandum. The discussions above also validate and support the input and assumptions for the GEOSCIENCE groundwater model. In regards to Mr. Durbin's December 3, 2012, technical memorandum, the following summarizes our responses:

- The SVA reaches a maximum thickness below Salinas Valley.
- The SVA thins and divides into several thin clay units that are divided by a sand unit.
- From its maximum thickness beneath the Salinas Valley, the SVA thins and pinches out southwestward.
- The SVA decreases in thickness and pinches out in the area immediately south of the community of Marina.
- The SVA may extend offshore from the mouth of the Salinas River, but rapidly pinches out south of the Salinas Valley.
- The SVA isopachs provided in the 1978 Durbin report and work completed by HLA (1994) conclude that the SVA is not present at the location of the proposed slant wells.
- The cross-section provided in the Durbin technical memorandum does not correctly depict the subsurface geologic conditions in the areas to the south of the Salinas River at the MPWSP, both onshore and offshore, and thus is misleading in relation to evaluation of the MPWSP.
- Durbin's opinion that the "actual groundwater system will respond much differently than simulated by the groundwater model" is incorrect since it is based upon an incorrect conceptual model of the hydrostratigraphy in the project area.
- The opinions concerning the response of the 180-Foot Aquifer to the project are predicated on Durbin's incorrect SVA conceptual model, as noted above, and are not reliable.
- The hydrostratigraphy simulated by the groundwater model more closely follows the most current available subsurface data than that noted by the reviewer.
- Pumping of the slant wells drilled in the Dune Sand Aquifer at the project site will induce leakage of seawater into the subsea portion of the Dune Sand Aquifer. The percentage of recharge from offshore sources will be high. Vertical leakage from the ocean as well as horizontal recharge from subsea aquifers will provide the source of waster for the feedwater supply.
- Pumping of the slant wells drilled in the 180-Foot Aquifer at the project site will also induce leakage of seawater into the subsea portion of the Dune Sand Aquifer and the 180-Foot Aquifer.

7.0 REFERENCES

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(END OF ATTACHMENT C)