

EXHIBIT 16-A

DRAFT

**Evaluation of Seawater
Desalination Projects Proposed
for the Monterey Peninsula**

Submitted to:
Monterey Peninsula Water Management District

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Executive Summary

Bookman-Edmonston (B-E), a Division of GEI Consultants, Inc., along with sub-consultants Malcolm Pirnie, Inc. and Separation Processes, Inc., is providing engineering support to the Monterey Peninsula Water Management District (MPWMD) to review and evaluate four seawater desalination projects that have been proposed for the Monterey Peninsula. In 2006, B-E and its sub-consultants prepared a report evaluating three of these projects. A report titled “Seawater Desalination Projects Evaluation” and dated June 26, 2006 was provided to MPWMD. Comments on the report and questions regarding the project were submitted by project proponents, MPWMD Board members, and members of the public. B-E was retained to respond to these comments and questions, and to add an evaluation of a fourth project, the Seawater Desalination Vessel concept proposed by Water Standard Company. The four projects evaluated in the current report and their respective sponsors are:

1. California American Water (CAW) – Coastal Water Project (CWP). The proposed project includes a 10 million gallons per day (mgd) desalination plant combined with an aquifer storage and recovery (ASR) component in the Seaside Groundwater Basin providing an additional 1,300 acre-feet per year.
2. Pajaro/Sunny Mesa Community Services District (P/SMCSD) in cooperation with Poseidon Resources Corporation (Poseidon) – 20 mgd Monterey Bay Regional Seawater Desalination Project (MBRSDP).

Proponent	Proposed Project
CAW California American Water	CWP Coastal Water Project
P/SMCSD Pajaro/Sunny Mesa Community Services District	MBRSDP Monterey Regional Seawater Desalination Project
MPWMD Monterey Peninsula Water Management District	SCDP Sand City Desalination Project
WSC Water Standard Company	SDV Seawater Desalination Vessel

3. Monterey Peninsula Water Management District (MPWMD) – 7.5 mgd Sand City Desalination Project (SCDP)
4. Water Standard Company – 10 to 20 mgd Seawater Desalination Vessel (SDV).

Project Summaries

The four projects are in the conceptual or preliminary stage of development and all four have as their objective to assist the affected Monterey Peninsula communities to comply with the State Water Resources Control Board (SWRCB) Order No. 95-10, with some expandable capacity to meet regional needs. Brief summaries of the projects follow.

Project name:	<u>Coastal Water Project (CWP)</u>
Proponent(s):	California American Water (CAW)
Location:	Moss Landing Power Plant (MLPP), Moss Landing
Purpose:	<p>Primarily (Basic Coastal Water Project), to comply with State of California Water Resources Control Board Order No. 95-10 by replacing the Carmel River shortfall, and to offset a portion of the Seaside Groundwater Basin overdraft.</p> <p>Alternatively (Regional Coastal Water Project), as a regional water supply project to meet the Monterey Peninsula build-out water demands; the water needs of the Marina Coast Water District; and the water needs of Moss Landing, Castroville, and Northern Monterey County.</p> <p>The project is currently progressing as the Basic Coastal Water Project.</p>
Production volume:	<p>Basic Coastal Water Project: 11,730 ac-ft per year (includes 1,300 ac-ft per year from Seaside Basin ASR)</p> <p>Regional Coastal Water Project: 20,272 ac-ft per year (includes 1,300 ac-ft per year from Seaside Basin ASR)</p>

Project name:	<u>Monterey Bay Regional Seawater Desalination Project (MBRSDP)</u>
Proponent(s):	Pajaro/Sunny Mesa Community Services District in cooperation with Poseidon Resources Corporation
Location:	The former National Refractories plant site, Moss Landing
Purpose:	To replace and augment existing water supplies serving the Monterey Peninsula, certain areas of northern Monterey County, the service area of the Pajaro/Sunny Mesa Community Services District and portions of the Pajaro Valley Water Management Agency service area.
Production volume:	20 mgd (22,400 ac-ft per year capacity) (20,930 ac-ft per year demand identified)

Project name:	<u>Sand City Desalination Project (SCDP)</u>
Proponent(s):	Monterey Peninsula Water Management District
Location:	The desalination plant would be constructed at one of three potential sites within the City of Sand City. Seawater collection wells would be in the City of Sand City and on the property of the former Fort Ord. Brine disposal would be through the Monterey Regional Water Pollution Control Agency outfall north of Marina.
Purpose:	To assist CAW in developing a legal water supply to meet the provisions of the State Water Resources Control Board Order No. 95-10, and to offset a portion of the Seaside Groundwater Basin overdraft.
Production volume:	7.5 mgd (8,400 ac-ft per year)

Project name:	<u>Seawater Desalination Vessel (SDV)</u>
Proponent(s):	Water Standard Company
Location:	The seawater desalination vessel would be permanently anchored in Monterey Bay, likely less than five miles from shore. Seawater would be treated on the vessel and delivered to CAW, and potentially to other customers as well. Brine disposal would be made at the vessel.
Purpose:	To provide water to satisfy a range of potable water demands in the Monterey Peninsula area and Northern Monterey County.
Production volume:	10 to 20 mgd (11,200 to 22,400 ac-ft per year) expandable up to 85,000 ac-ft per year

Project Function

A primary purpose of all four projects is to resolve the issues associated with SWRCB Order No. 95-10 and the overdraft of the Seaside Groundwater Basin. In addition to resolving these two issues, the Regional CWP and the MBRSDP would provide solutions to regional water supply issues.

Each of the projects has primarily identified customers within CAW's service area due to the implications of SWRCB Order No. 95-10. In addition, the Regional CWP and the MBRSDP have identified potential customers to the north. The only commitment by these northern customers would be for the MBRSDP in the P/SMCSD service area.

The proposed technology for the seawater intake and brine discharge for the four projects varies. The primary difference is the proposal to use wells for feed water at the SCDP compared to ocean intakes for the CWP and the MBRSDP. Wells may avoid significant pretreatment and its associated cost. A great deal of information on the appropriate seawater desalination technology will be obtained during the proposed pilot plant testing for the CWP and the MBRSDP. Water intake for the SDV would be below the level that light penetrates (i.e., below the photic zone) to minimize impact to organisms.

Brine discharge for the CWP would be via the MLPP outfall. For the MBRSDP, the primary option for brine discharge is the National Refractories and Minerals Corporation (National Refractories) outfall, with the MLPP outfall as an alternative. Technically, either of these discharge options may be possible; however, additional studies are needed to determine the National Refractories outfall's structural integrity and the fate of the brine if discharged at this location. Brine discharge for the SCDP would be via horizontal directionally drilled (HDD) wells along the coastline north of Sand City in former Fort Ord, or via the Monterey Regional Water Pollution Control Agency (MRWPCA) outfall as an alternative. Additional technical studies would be needed to determine if brine discharge to HDD wells is feasible and if seasonal storage is needed if the outfall is utilized. The SDV would discharge brine through diffusers into the open ocean.

The biggest issues with the waste stream fate are institutional constraints. There are long-term issues associated with one-pass power plant discharges to the ocean (also known as once-through cooling) and the impact of concentrated seawater brine discharge to the ocean. These issues will need to be resolved for any project that moves forward.

CWP proponents have produced the most comprehensive supporting documentation of the four projects. The CWP is the only project for which an environmental document beyond the draft level has been completed. A document known as the Proponents Environmental Assessment (PEA) was completed for the CWP in accordance with California Public Utilities Commission (CPUC) regulations. An administrative Draft Environmental Impact Report has been prepared for the SCDP in accordance with the California Environmental Quality Act (CEQA), and the CPUC is currently preparing a Draft EIR for the CWP. CEQA documents have not been initiated for either the MBRSDP or the SDV. The CWP has a number of site-specific studies that appear to have been useful in the preparation of its supporting construction cost information and provide a solid foundation for any future design work.

The CWP and the MBRSDP have the most comprehensive information for pilot plant work. Permits are in place for the CWP pilot plant, and plant construction has begun at the Moss Landing Power Plant. The MBRSDP project proponents are in the process of obtaining the necessary permits to construct and operate the pilot plant at the former National Refractories site. The MBRSDP is the only one of the three land-based projects for which an agreement or rights to the land have been secured for their proposed full-scale treatment plant.

The SCDP has been developed conceptually but has not yet concluded on the location of the desalination plant facility or determined a treated water pipeline alignment. Additional technical work on the use of the MRWPCA outfall is also needed to determine an appropriate seawater intake method and to quantify seasonal storage requirements.

The SDV is a completely self-contained seawater desalination treatment plant installed on a ship. Electrical energy and propulsion will be provided by gas turbine engines fueled with bunker fuel or biodiesel. A seabed intake or outfall are not needed for the alternative. A seabed pipeline is proposed to bring product water to the shore. Alternately, water produced on the ship will be shuttled to shore via barges. Facilities required for distribution of the water to customers on shore need to be developed but it is assumed that they would be similar to other alternatives.

Projected Performance

Several potential water quality issues were identified for the CWP in its Conceptual Design Report (CDR)¹. One issue is the formation of significant chlorinated disinfection by-products (DBPs). DBPs could result from the reaction of total organic carbon (TOC) in the

¹ RBF Consulting, September 16, 2005

MLPP Units 6 & 7 intake with the proposed amount of free chlorine and a combined 21 minutes of contact time in the coagulation and flocculation processes.

Other concerns are the allocation of the physical pathogen removal credits, identification of a target for total dissolved solids (TDS), and the possible presence of synthetic organic chemicals (SOCs) in Moss Landing Harbor. The CWP CDR does not specify how the physical pathogen removal credits for *Giardia*, *Cryptosporidium*, and viruses will be allocated throughout the treatment process by the State of California Department of Health Services (CDHS) nor does it identify a target for TDS. All of these issues warrant more detailed planning as the CWP enters the pilot stage.

Areas of concern for the MBRSDP are the information gaps provided by the MBRSDP CDR² regarding the allocation of physical pathogen removal credits, pesticides and agricultural runoff, and the use of chloramines to comply with CDHS disinfection requirements. However, the CDR does note that formation of DBPs would not be a concern due to the low TOC levels compared with CWP TOC levels.

In addition to the information gaps, the most significant water quality concerns associated with the MBRSDP involve the diverse systems owned by the Pajaro/Sunny Mesa Community Services District (P/SMCSD). The MBRSDP CDR indicates that the water produced by the plant is compatible with the water in the P/SMCSD's distribution system. With customers not yet identified and a variety of disparate water qualities among the systems owned by the P/SMCSD, however, this claim cannot be substantiated. If the water quality is moderately different, it may be infeasible to treat the desalinated water to match that of the receiving water of each system. Moreover, additional pipe loop and/or coupon testing³ may need to be conducted for the piping in each receiving system.

A major area of concern for the SCDP is the occasional non-point source pollution, which could potentially cause the beach wells to become infiltrated with enteric viruses, SOCs, pharmaceutical residuals, and/or endocrine disruptors. Because there are no test wells constructed at this stage of project development, the potential for such contamination cannot be accurately assessed. However, the acknowledgement and awareness of this possible contamination is important at this early stage of project development.

No water quality concerns were identified by the SDV project proponents. The proponents assert that the impacts on marine life are minimized because the multiple depth intake system takes water beneath the primary plankton and phytoplankton habitat. Brine is mixed with

² P/SMCSD in cooperation with Poseidon Resources Corporation, April 2006

³ Pipe loop and coupon testing are used to determine the corrosion potential of the material by exposing a sample of the pipe or pipe material to the potentially corrosive water.

seawater in chambers on board the vessel to cool the brine and dilute the salinity. The brine is discharged through diffusers near the water surface.

Economics

The four projects are in various stages of development. The CWP and the SCDP are at a conceptual or preliminary level, but the CWP is more developed. More work on resolving site-specific technical issues for the CWP has been performed; therefore, a more complete assessment of the associated construction costs has been made. Construction costs for the SCDP were estimated based on potential alignments due to the fact that the SCDP does not have a preferred treatment plant site or preferred pipeline alignment. The MBRSDP estimate is at a screening level of development. Construction cost estimates are apparently developed from projects of similar nature. The SDV proposal claims use of proven off-the-shelf technologies, and includes construction bids for some of the principal components. No comparable ship-based desalination facilities of this size have been constructed, so full-scale construction and life-cycle costs have not been established. The breakdowns of costs for the four projects are provided in Section 5.

Assumptions for connecting into the CAW distribution system are inconsistent. In particular, the need for storage or additional supplies to meet peak day demands is absent from the proposals except for CWP options that include an ASR component. Without regulatory storage, either peak day demands will not be met or the full annual capacity will not be achieved. Lack of a specific provision for regulatory storage may overstate the annual yield of an alternative and thus understate its unit cost.

The estimated capital cost for the CWP, without the aquifer storage and recovery (ASR) component, is \$186M (2007 dollars) and the total operation and maintenance (O&M) cost with membrane replacement is \$8.19 M/year. Including the ASR component, the estimated capital cost is \$210M and the total O&M cost is \$8.84 M/year. Long-term financing for the capital investment required to implement the CWP has not been secured by CAW, but it is clear that the company has an avenue to secure such financing when required. The California Public Utilities Commission has approved interim rates to enable recovery of certain CAW pre-construction costs for the CWP.

Poseidon Resources Corporation estimates indicate that the total capital cost for the MBRSDP is \$165M (2007 dollars) and the total O&M cost is \$16.9M/year. The desalination component values used for the estimate were derived from quotes received on other projects with substantially similar equipment, albeit different size. Poseidon can potentially become the lead entity responsible for the project financing. It is a United States corporation whose largest shareholder is Warburg Pincus, an international investment firm. With Warburg Pincus, it appears that Poseidon has extensive private equity financing resources if obligated to obtain private financing for the proposed MBRSDP in-lieu of the P/SMCSD not pursuing municipal bond financing.

The report titled “Monterey Peninsula Water Supply Project, Phase 2 Technical Memorandum, Project Facilities Alternatives for the Sand City Desalination Project, 7.5 million gallons/day (8,400 acre-feet/year)⁴ provides a desalination plant cost component of \$29M (2007 dollars). This cost is a reasonable value for the SCDP and 25% contingency is appropriate, considering the level of estimate provided. Total capital costs range from \$185M to \$200M. A financing plan for the SCDP by the MPWMD has not been developed. However, two prior water supply projects proposed by MPWMD provide examples of likely financing avenues to be taken if the SCDP is formalized.

The SDV proponent has provided information indicating that capital cost of the SDV, completely fitted for operation, and two water barges would be \$189M. A seabed pipeline alternative was estimated at \$131M. Implementation and project-scale contingency costs are low or were excluded from proponent’s estimates. The seabed pipeline alternative capital cost would total an estimated \$176M when appropriate implementation and contingency costs are added. O&M costs were \$11.1 M/year based on a subsidized biodiesel fuel cost of \$0.048/KWh⁵; however, the fuel costs could range up to \$0.093/KWh. Proponent’s conceptual cost estimate for an 18 mgd⁶ seabed pipeline and connection to the CAW system is \$45,370,000. Partial financing may be available from the project proponents.

For the land-based desalination projects, the capital cost estimates were based on preliminary level design, which warrants a larger contingency than employed in the CWP and MBRSDP estimates. A 10 to 15 percent greater contingency is recommended on those projects. The O&M cost estimates of these projects were generally considered reasonable, with the exception of SCDP, which indicated substantially higher energy consumption for the reverse osmosis (RO) process than currently anticipated for high-efficiency designs.

The following table summarizes the projects’ current cost status. The costs have been refined by the B-E team to make them more comparable (2007 cost levels, overheads, contingencies, etc.). Of particular note is the cost per acre-ft for the CWP Regional Project and MBRSDP being within 25 percent of each other. Given some of the unknown cost elements as described in Section 5, the 25 percent represents a very small difference⁷. The CWP Basic Project’s per acre-ft costs would be expected to be higher due to the economies of scale.

⁴ Camp Dresser & McKee Inc., June 23, 2004

⁵ Other documents provided by proponents show a minimum cost of \$0.052/KWh

⁶ Though earlier proponent documents describe a proposed 20 mgd ship-based desalination project, the more recent estimates to bring the product water to shore describe an 18 mgd system.

⁷ Costs for elements of both the MBRSDP and the SDV appear to be underestimated by approximately 10 percent

Table ES-1 – Summary of Desalination Project Capacities and Estimated Costs
2007 Costs for Desalination Projects
 with standard overhead and contingency allowance, excluding land and pilot testing
 (millions of 2007 dollars)

	Coastal Water Project				Monterey Bay Regional Seawater Desalination Project ¹	Sand City Desalination Project		Seawater Conversion Vessel ²	
	Desal Only		Desal + ASR			Low range	High Range	Subsidized Fuel	Un-Subsidized Fuel
	Proposed Project	Regional Project	Proposed Project	Regional Project					
RO Capacity (mgd)	10	18	10	18	18	7.5	7.5	18	18
<i>(total af/yr)</i>	10,430	18,970	11,730	18,970	20,180	8,410	8,410	20,180	20,180
Desalination Facilities	\$90.29	\$120.29	\$90.29	\$120.29	\$108.47	\$71.05	\$79.95	\$82.80	\$82.80
<i>(\$/mgd)</i>	\$9.03	\$6.68	\$9.03	\$6.68	\$6.03	\$9.47	\$10.66	\$4.60	\$4.60
Seawater feed and brine disposal (incl. SCV ship cost)	\$6.67	\$6.21	\$6.67	\$6.21		\$41.71	\$50.61	\$30.16	\$30.16
Residuals handling and treatment	\$1.30	\$1.39	\$1.30	\$1.39		\$0.00	\$0.00		
Desalination process	\$82.31	\$112.68	\$82.31	\$112.68		\$29.34	\$29.34	\$52.64	\$52.64
Finished water storage & pumping facilities						\$0.00	\$0.00		
Desalinated Water Pipelines	\$24.20	\$35.66	\$24.20	\$35.66	\$28.28	\$13.18	\$13.18	\$30.63	\$30.63
Electrical Transmission Upgrades						\$1.04	\$1.04		
Terminal Reservoir and ASR Pump Station	\$5.76	\$8.92	\$5.76	\$8.92					
Segunda/ ASR System			\$15.06	\$9.54					
Field Office Overhead (8%)						\$6.82	\$7.53		
Contractor Mark-Ups (16.25%)						\$14.96	\$16.53		
Total Construction Costs	\$120.25	\$164.86	\$135.30	\$174.39	\$136.75	\$107.05	\$118.23	\$113.43	\$113.43
Engineering, Overhead, Legal	\$28.86	\$39.57	\$32.47	\$41.85	\$32.82	\$40.14	\$44.34	\$27.22	\$27.22
	24.0%	24.0%	24.0%	24.0%	24.0%	30.0%	30.0%	24.0%	24.0%
Contingency	\$37.28	\$51.11	\$41.94	\$54.06	\$42.39	\$26.76	\$29.56	\$35.16	\$35.16
	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Total Capital Costs	\$186.38	\$255.53	\$209.72	\$270.31	\$211.97	\$173.96	\$192.12	\$175.82	\$175.82
Operations and Maintenance	<i>(\$/M/yr)</i>								
Desalination Facilities/Power	\$6.25	\$10.12	\$6.25	\$10.12		\$5.90	\$5.90		
Desalination Water Conveyance	\$0.42	\$0.95	\$0.42	\$0.95		\$1.54	\$1.89		
Terminal Reservoir/ASR Pump Station	\$0.07	\$0.33	\$0.07	\$0.33					
Segunda/ ASR System	\$0.00	\$0.00	\$0.65	\$0.13					
Subtotal O&M Costs	\$6.74	\$11.40	\$7.39	\$11.53		\$7.44	\$7.79		
Repairs and Replacements	\$1.45	\$0.00	\$1.45	\$0.00		\$1.30	\$1.30		
Total O&M	\$8.19	\$11.40	\$8.84	\$11.53	\$16.90	\$8.74	\$9.09	\$11.14	\$15.73
<i>(\$/af)</i>	\$730	\$560	\$790	\$570	\$840	\$1,040	\$1,080	\$550	\$780
Total Annualized Cost (7%, 30 yrs)	\$23.21	\$31.99	\$25.74	\$33.31	\$33.98	\$22.76	\$24.57	\$25.31	\$29.90
Unit Cost	<i>(\$/af)</i>	\$2,230	\$1,690	\$2,190	\$1,760	\$2,710	\$2,920	\$1,250	\$1,480

Notes:

¹ MBRSDP is currently described as a 20 mgd facility, but costs provided are for 18 mgd facility. Cost detail is subject to a confidentiality agreement.

² 20 mgd is proposed for SCV, but proponents provided conveyance for 18 mgd. 24% overhead used -- proponents estimate 5.1%. 25% contingency used -- proponents estimate 12%. Cost detail is subject to a confidentiality agreement.

Regional Water Supply Considerations

The CWP is proposed to serve the CAW territories on the Monterey Peninsula (formally known as CAW's "Monterey District") and adjacent areas. It would provide enough desalinated water to comply with SWRCB Order No. 95-10 and to offset 1,000 ac-ft per year of the overdraft of the Seaside Groundwater Basin. An option is under consideration to upsize to the Regional CWP to allow for future increased deliveries to the Monterey Peninsula and to supply water to the Marina Coast Water District, Moss Landing, Castroville, and Northern Monterey County.

The MBRSDP is proposed to serve the Monterey Peninsula, Northern Monterey County, P/SMCSD service areas, and portions of the Pajaro Valley Water Management Agency. Contemplated major distribution system serving areas north, east, and west of the National Refractories treatment plant site could be added incrementally in the future.

The SCDP is intended to serve only the CAW Monterey District territories and may only partially offset SWRCB Order No. 95-10 reductions and the overdraft of the Seaside Groundwater Basin. The project should be capable of expansion, provided additional planning is performed.

The SDV is intended to serve the Monterey Peninsula. However, the SDV can be outfitted to produce up to 85,000 ac-ft/year and provide water throughout the region.

Implementability

Mitigating impingement and entrainment impacts from seawater intake is a major issue for the CWP and the MBRSDP. The proposed CWP desalination plant would not have a separate direct ocean water intake. It would instead receive raw seawater from the MLPP once-through cooling (OTC) water return system. Water withdrawn from MLPP would not alter the operations of the MLPP nor would it change the volume and velocity of water entering the MLPP intakes. Also, the implementation of the desalination facility would not alter the potential impacts associated with operation of the MLPP. Therefore, as long as the MLPP is permitted to continue to operate with OTC technology, the CWP would not have any adverse impacts on the aquatic resources of the associated marine environment.

The proposed water intake for the MBRSDP would be from one of two sources: (1) direct pumping from the Monterey Bay via the existing National Refractories intake, and/or (2) the cooling water from Units 6 and 7 at the MLPP. For the full-scale MBRSDP facility, the heated water from the MLPP is the preferred source. No evidence was found to indicate that the cooling water system operations would result in an adverse impact on the populations of fish and invertebrates inhabiting Moss Landing Harbor, Elkhorn Slough, and Monterey Bay. Assessment of potential impacts of operating the National Refractories outfall could not be conducted due to damage to the outfall.

The SCDP would include either an array of horizontal directionally drilled or radial collector wells for seawater collection located along the coastal beachfront of Sand City. Because the intake for the seawater is below the sea floor, it is assumed that no potential impacts from impingement or entrainment would result from seawater withdrawal. However, additional studies are needed to determine the technical feasibility of such a system.

Marine vessels operate under unique regulations and legislation that require direct knowledge of international maritime organizations. Conducting business in the maritime environment would require the SDV project operator to have expertise so that exposure to unforeseen risks, such as vessel operation, safety failures, and fuel spills, can be minimized. Purchasing of vessels, classification, and maintenance of ocean structures require specialized experience.

Schedules for the MBRSDP, and SDV are similar, with the target of delivering water by 2010. Recent information from CAW indicates a project completion date of 2012. The SCDP currently does not have an updated schedule.

All three terrestrially based projects would have similar permitting requirements. Little activity has been done in this area. Primarily, permitting activities for the CWP and MBRSDP have focused on their respective pilot plants. P/SMCSD has obtained a permit for the MBRSDP pilot plant from Monterey County but to date has not obtained a permit from the Coastal Commission. CAW has secured all necessary permits for the CWP pilot plant, and construction of the pilot plant is currently underway on the Moss Landing Power Plant site.