POSEIDON WATER

Appendix A
Compliance with Ocean Plan Amendments

Renewal of NPDES CA0109223
Carlsbad Desalination Project

Appendix A

Expanded Carlsbad Desalination Project

Compliance with the Amendment to the Water Quality Control Plan for Ocean Waters of California Addressing Desalination Facility Intakes and Brine Discharges

September 2015

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Appendix A Expanded Carlsbad Desalination Project Compliance with the Amendment to the Water Quality Control Plan for Ocean Waters of California Addressing Desalination Facility Intakes and Brine Discharges			
Ocean Plan Section	**Applicable**	**Key Recommendations, Conclusions, and Findings**	**RCF Ref**
III. M. Implementation Provisions for Desalination Facilities			
1 Applicability and General Provisions			
a. Chapter III.M applies to desalination facilities using seawater. Chapter III.M.2 does not apply to desalination facilities operated by a federal agency. Chapter III.M.2, M.3, and M.4 do not apply to portable desalination facilities that withdraw less than 0.10 million gallons per day (mgd) of seawater and are operated by a governmental agency. These standards do not alter or limit in any way the authority of any public agency to implement its statutory obligations. The Executive Director of the State Water Board may temporarily waive the application of chapter III.M to desalination facilities that are operating to serve as a critical short term water supply during a state of emergency as declared by the Governor.	Yes	The Carlsbad Desalination Project (the "CDP") is a privately owned desalination facility using seawater. Poseidon Resources (Channelside) LP ("Poseidon") is the owner and operator of the CDP, and applicant for purposes of compliance with Chapter III.M.	RCF 1
b. Definitions of New, Expanded, and Existing Facilities:			RCF 2
(1) For purposes of chapter III.M, "existing facilities" means desalination facilities that have been issued an NPDES permit and all building permits and other governmental approvals necessary to commence construction for which the owner or operator has relied in good faith on those previously-issued permits and approvals and commenced construction of the facility beyond site grading prior to [effective date of this Plan].	Yes	The CDP is currently an Existing Facility. The CDP is currently permitted to produce up to 54 million gallons per day ("mgd") of desalinated water while operating in conjunction with the Encina Power Station (the "EPS") by using the power plant's cooling water discharge as its source water.	RCF 3
(2) For purposes of chapter III.M, "expanded facilities" means existing facilities for which, after [effective date of the Plan], the owner or operator does either of the following in a manner that could increase intake or mortality of all forms of marine life beyond that which was originally approved in any NPDES permit or Water Code section 13142.5, subdivision (b) (hereafter Water Code section 13142.5(b)) determination: 1) increases the amount of seawater used either exclusively by the facility or used by the facility in conjunction with other facilities or uses, or 2) changes the design or operation of the facility. To the extent that the desalination facility is co-located with another facility that withdraws water for a different purpose and that other facility reduces the volume of water withdrawn to a level less than the desalination facility's volume of water withdrawn,	Yes	Poseidon proposes to transition the CDP to an Expanded Facility (the "Expanded CDP"). There are two elements to this expansion: 1. The planned retirement of the EPS at the end of 2017 will result in the need to retrofit the CDP for a transition to long-term stand-alone operation. At such time, the CDP will be considered an "Expanded Facility" and will be subject to the provisions of Chapter III.M of the Water Quality Control Plan, Ocean Waters of California. 2. Poseidon seeks to increase the rated capacity of the CDP to realize the improvements in reverse osmosis membrane production capabilities since the original CDP approvals. The membrane technology advances enable the CDP to increase potable water output from a production rate of up to 54 mgd to a production rate of up to 60 mgd with minimal improvements to the plant. Therefore, Poseidon's amended Report of Waste Discharge (the "ROWD"), and the analysis contained herein assume a production rate of 60 mgd across all of the stand-alone options evaluated.	RCF 4

the desalination facility is considered to be an expanded facility.			
(3) For purposes of chapter III.M, "new facilities" means desalination facilities that are not existing facilities or expanded facilities.	No		
c. Chapter III.M.2 (Water Code §13142.5(b) Determinations for New and Expanded Facilities: Site, Design, Technology, and Mitigation Measures) applies to new and expanded desalination facilities withdrawing seawater.	Yes	The Expanded CDP is subject to a 13142.5(b) determination.	RCF 5
d. Chapter III.M.3 (Receiving Water Limitation for Salinity) applies to all desalination facilities that discharge into ocean waters and wastewater facilities that receive brine from seawater desalination facilities and discharge into ocean waters.	Yes	The CDP discharges into the ocean waters, therefore the Receiving Water Limitation for Salinity are applicable.	RCF 6
e. Chapter III.M.4 (Monitoring and Reporting Programs) applies to all desalination facilities that discharge into ocean waters. Chapter III.M.4 shall not apply to a wastewater facility that receives brine from a seawater desalination facility and discharges a positively buoyant commingled effluent through an existing wastewater outfall that is covered under an existing NPDES permit as long as the owner or operator monitors for compliance with the receiving water limitation set forth in chapter III.M.3. For the purposes of chapter III.M.4, a positively buoyant commingled effluent shall mean that the commingled plume rises when it enters the receiving water body due to salinity levels in the commingled discharge being lower than the natural background salinity.	Yes	The CDP discharges into the ocean waters, therefore the Monitoring and Reporting Programs are applicable.	RCF 7
f. References to the regional water board include the regional water board acting under delegated authority. For provisions that require consultation between regional water board and State Water Board staff, the regional water board shall notify and consult with the State Water Board staff prior to making a final determination on the item requiring consultation.	Yes	Noted.	RCF 8
g. All desalination facilities must comply with all other applicable sections of the Ocean Plan.	Yes	Order R9-2006-0065 (as amended) addresses all other applicable sections of the Ocean Plan for the existing CDP. Poseidon's ROWD for the Expanded CDP will address all applicable sections of the Ocean Plan, including Chapter III.M.	RCF 9
2 Water Code section 13142.5(b) Determinations for New and Expanded Facilities: Site, Design, Technology, and Mitigation Measures Feasibility Considerations			
a. **General Considerations**			
(1) The owner or operator shall submit a request for a Water Code section 13142.5(b) determination to the appropriate regional water board as early as practicable. This request shall include sufficient information for the regional water board to conduct the analyses described below. The regional water board in consultation with the State Water Board staff may require an owner or operator to provide additional studies or information if needed, including any information necessary to identify and assess other potential sources of mortality to all forms of marine life. All studies and models are subject to the approval of the regional water board in consultation with State Water Board staff. The regional water board may require an owner or	Yes	Poseidon requests the San Diego Regional Water Quality Control Board (the "Regional Water Board") conduct a Water Code section 13142.5(b) determination for the Expanded CDP. This Ocean Plan Chapter III.M. Analysis for the Expanded CDP includes sufficient information to allow the Regional Water Board and State Water Resources Control Board (the "State Water Board") to conduct the analysis, including but not limited to a feasibility study prepared by Alden Research Laboratory Inc. (Alden) to determine the best available site, design, technology, and mitigation feasible to minimize intake and mortality of all forms of marine life while transitioning the CDP to long-term stand-alone operation and increasing plant production to 60 mgd. A copy of the Expanded CDP Intake/Discharge Feasibility Report is included in Appendix B.	RCF 10

	operator to hire a neutral third party entity to review studies and models and make recommendations to the regional water board.			
(2)	The regional water board shall conduct a Water Code section 13142.5(b) analysis of all new and expanded desalination facilities. A Water Code section 13142.5(b) analysis may include future expansions at the facility. The regional water board shall first analyze separately as independent considerations a range of feasible alternatives for the best available site, the best available design, the best available technology, and the best available mitigation measures to minimize intake and mortality of all forms of marine life. Then, the regional water board shall consider all four factors collectively and determine the best combination of feasible alternatives to minimize intake and mortality of all forms of marine life. The best combination of alternatives may not always include the best alternative under each individual factor because some alternatives may be mutually exclusive, redundant, or not feasible in combination.	Yes	Noted.	RCF 11
(3)	The regional water board's Water Code section 13142.5(b) analysis for expanded facilities may be limited to those expansions or other changes that result in the increased intake or mortality of all forms of marine life, unless the regional water board determines that additional measures that minimize intake and mortality of all forms of marine life are feasible for the existing portions of the facility.	Yes	Poseidon requests the Regional Water Board so limit its analysis.	RCF 12
(4)	In conducting the Water Code section 13142.5(b) determination, the regional water boards shall consult with other state agencies involved in the permitting of that facility, including, but not limited to: California Coastal Commission, California State Lands Commission, and California Department of Fish and Wildlife. The regional water board shall consider project-specific decisions made by other state agencies; however, the regional water board is not limited to project-specific requirements set forth by other agencies and may include additional requirements in a Water Code section 13142.5(b) determination.	Yes	Poseidon requests that the Regional Water Board consider the project-specific decision made by the California Coastal Commission (the "Commission") included in Appendix R. Specifically, the Commission's approval of the Marine Life Mitigation Plan for CDP stand-alone operations. As noted in Appendix R (page 15) the Commission found that 55.4 acres of estuarine wetland restoration subject to the conditions provided in the Marine Life Mitigation Plan provides a sufficient degree of certainty that the CDP's entrainment impacts will be mitigated for flows of up to 304 mgd through an open intake in Agua Hedionda Lagoon that is assumed to cause 100% mortality of all forms of marine life.	RCF 13
(5)	A regional water board may expressly condition a Water Code section 13142.5(b) determination based on the expectation of the occurrence of a future event. Such future events may include, but are not limited to, the permanent shutdown of a co-located power plant with intake structures shared with the desalination facility or a reduction in the volume of wastewater available for the dilution of brine. The regional water board must make a new Water Code section 13142.5(b) determination if the foreseeable future event occurs.	Yes	Permanent shutdown of the co-located Encina Power Station with shared intake and outfall structures is currently contemplated, and Poseidon requests that the Regional Water Board make a new Water Code section 13142.5(b) determination now for long term stand-alone operation of the Expanded CDP.	RCF 14

a. The owner or operator shall provide notice to the regional water board as soon as it becomes aware that the expected future event will occur, and shall submit a new request for a Water Code section 13142.5(b) determination to the regional water board at least one year prior to the event occurring. If the owner or operator does not become aware that the event will occur at least one year prior to the event occurring, the owner or operator shall submit the request as soon as possible.	Yes	On May 22, 2014, Poseidon notified the Regional Water Board of the owner of the EPS, Cabrillo Power I LLC ("Cabrillo"), intent to discontinue the operation of once-through-cooling pumps serving the EPS and CDP as early as June 1, 2017. Retirement of the existing once-through-cooling system and transition of the CDP to long-term stand-alone operation represents a change in the permit conditions. Poseidon is requesting the Regional Water Board conduct a Water Code section 13142.5(b) for the Expanded CDP that is limited to those expansions or other changes that result in the increased intake and mortality of all forms of marine life.	RCF 15
b. The regional water board may allow up to five years from the date of the event for the owner or operator to make modifications to the facility required by a new Water Code section 13142.5(b) determination, provided that the regional water board finds that 1) any water supply interruption resulting from the facility modifications requires additional time for water users to obtain a temporary replacement supply or 2) such a compliance period is otherwise in the public interest and reasonably required for modification of the facility to comply with the determination.	Yes	Poseidon's preference is to complete the 13142.5(b) determination and construct as much of the improvements needed for the transition to long-term stand-alone operation in advance of the retirement of the EPS so to minimize the interruption in the output from the CDP.	RCF 16
c. If the regional water board makes a Water Code section 13142.5(b) determination for a desalination facility that will be co-located with a power plant, the regional water board shall condition its determination on the power plant remaining in compliance with the Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling.	No	The Expanded CDP will not be co-located with a power plant.	RCF 17
b. **Site**			
Site is the general onshore and offshore location of a new or expanded facility. There may be multiple potential facility design configurations within any given site. For each potential site, in order to determine whether a proposed facility site is the best available site feasible to minimize intake and mortality of all forms of marine life, the regional water board shall require the owner or operator to:	Yes	The Regional Water Board conducted a 13142.5(b) determination for the co-located and temporary standalone CDP operations in 2009. Order R9-2009-0038 (Appendix O) Includes the following finding: *If EPS permanently ceases operations and the Discharger proposes to independently operate the existing EPS seawater intake and outfall for the benefit of the CDP ("stand-alone operation"), it will be necessary to evaluate whether, under those conditions, the CDP complies with the requirements of Water Code section 13142.5(b). Additional review will be necessary in part because under stand-alone operations, the Discharger will have more flexibility in how it operates the intake structure and outfall and additional and/or better design and technology features will be feasible.* This finding confirms that the 13142.5(b) siting determination for the Expanded CDP is limited how the CDP operates the intake structure and outfall and additional and/or better design and technology features will be feasible.to minimize the intake and mortality to all forms of marine life.	RCF 18
(1) Consider whether subsurface intakes are feasible.	Yes	The feasibility of various intake configurations (beach wells, slant wells, horizontal wells, offshore subsurface infiltration galleries, and the existing EPS intake) was extensively studied in the Regional Water Board's 2009 Water Code 13142.5(b) determination for the Carlsbad Desalination Project (see Appendix O, Order R9-2009-0038 and Appendix P, Carlsbad Desalination Project Flow, Entrainment, and Impingement Minimization Plan); City of Carlsbad's Final Environmental Impact Report for the Carlsbad Desalination Project (see Appendix Q, City of Carlsbad EIR 03-05); and California Coastal Commission's Coastal Development Permit (see Appendix R, California Coastal Commission CDP E-06-013) review phases of the CDP. A thorough review of the site-specific applicability of subsurface intake technology supported by a comprehensive hydrogeological study of the subsurface conditions in the vicinity of the CDP concluded that the subsurface intakes studied at that time were not feasible due to limited production capacity of the subsurface geological	RCF 19

formation, poor water quality of collected source water, excessive cost, and environmental considerations (i.e., construction impacts, operational impacts, and aesthetics).

The conditions that led to the City of Carlsbad and the Coastal Commission to find that beach wells, slant wells, horizontal wells, and offshore seafloor infiltration galleries were not feasible for the CDP have not changed. The Appendix B includes a feasibility assessment of two additional subsurface intake alternatives for the Expanded CDP: (1) a seafloor infiltration gallery (SIG) located in Agua Hedionda Lagoon coupled with an ocean outfall with a diffuser; and (2) a lagoon based SIG coupled with flow augmentation using the existing EPS intake and an outfall with a diffuser. This analysis is included in Appendix B and summarized below.

Both of the SIG alternatives have impacts that must be considered in the Regional Water Board's feasibility determination. These impacts are described below.

Feasibility assessment criteria. For purposes of Chapter III.M., Feasible means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors.

Both of the SIG alternatives have impacts that must be considered in the Regional Water Board's feasibility determination. These impacts are described below.

Site and Project Description. As shown in Figure 1, the Agua Hedionda Lagoon complex is divided into three bodies of water herein referred to as the "west lagoon", "middle lagoon", and "east lagoon".

Figure 1. Agua Hedionda Lagoon.

The design requirements for the SIG alternatives are shown in Table 1.

Table 1.
SIG Design Requirements

Basis of Design	SIG with Multiport Diffuser	SIG with Flow Augmentation
Intake Flow (mgd)	128	299
Required footprint (Acres)	32	72
Excavation of sand and mud from bottom of Lagoon (CY)	758,000	1,742,000
12” installation of collector pipe (LF)	72,000	165,000
Installation of 20” conveyance pipe (LF)	82,000	394,000
Placement of sand and gravel (CY)	1,360,000	3,084,000
72” Outfall with multiport diffuser (LF)	6,000	NA
Shore based seawater collection pumps (2500 GPM each)	36	83
Design and construction cost	$545,126,147	$792,540,433
Permitting duration (Years)	3.0	3.0
Construction duration (Years)	3.8	7.2

The foot print of the SIG would overlay most of the west and middle lagoon, and in the case of the flow augmentation alternative, the footprint would also extend over a significant portion of the eastern cell lagoon. Seawater would be withdrawn from the lagoon via the infiltration gallery and conveyed to an Intermediate Pump Station located adjacent to the existing SWRO Pump Station. Under both the multiport diffuser and the flow augmentation discharge alternatives, 128 mgd of seawater collected from the SIG would be pumped from the Intermediate Pump Station to the existing SWRO Pump station for conveyance to the desalination plant. The layout for the SIG that is sized for the Expanded CDP intake needs in conjunction with brine disposal via a multiport diffuser is shown in Figure 2.

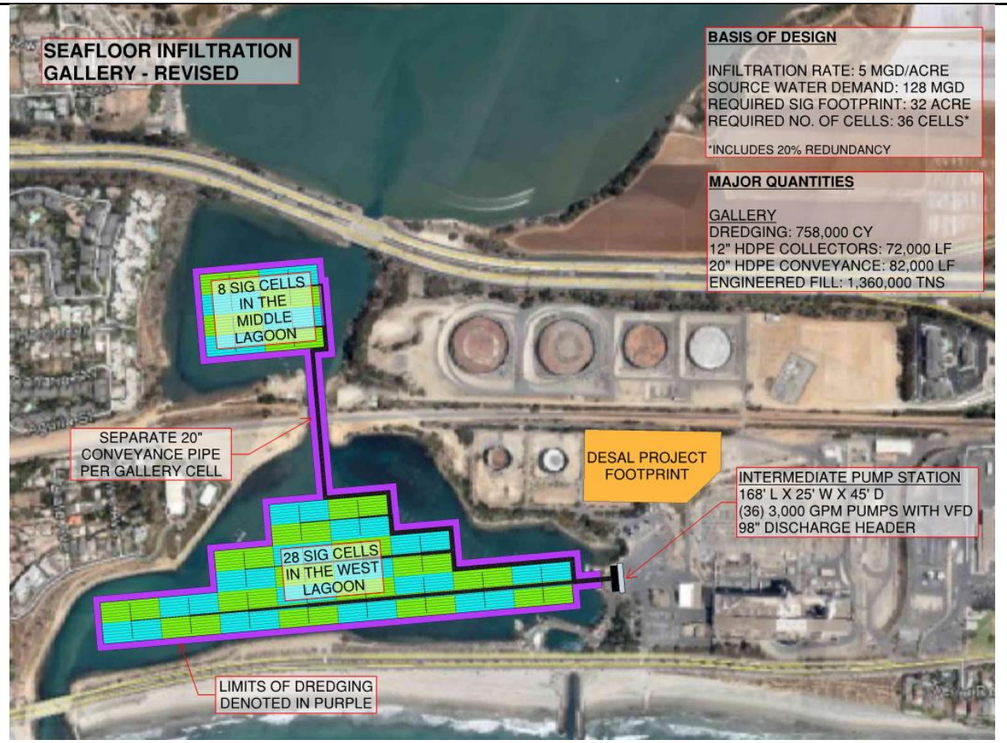


Figure 2. SIG Design for Discharge Diffuser.

In the case of the flow augmentation discharge alternative, 171 mgd of seawater collected from the SIG would also be pumped from the intermediate pump station to the discharge channel. The layout for the SIG that is sized for the desalination plant intake needs in conjunction with brine disposal via flow augmentation is shown in Figure 3.

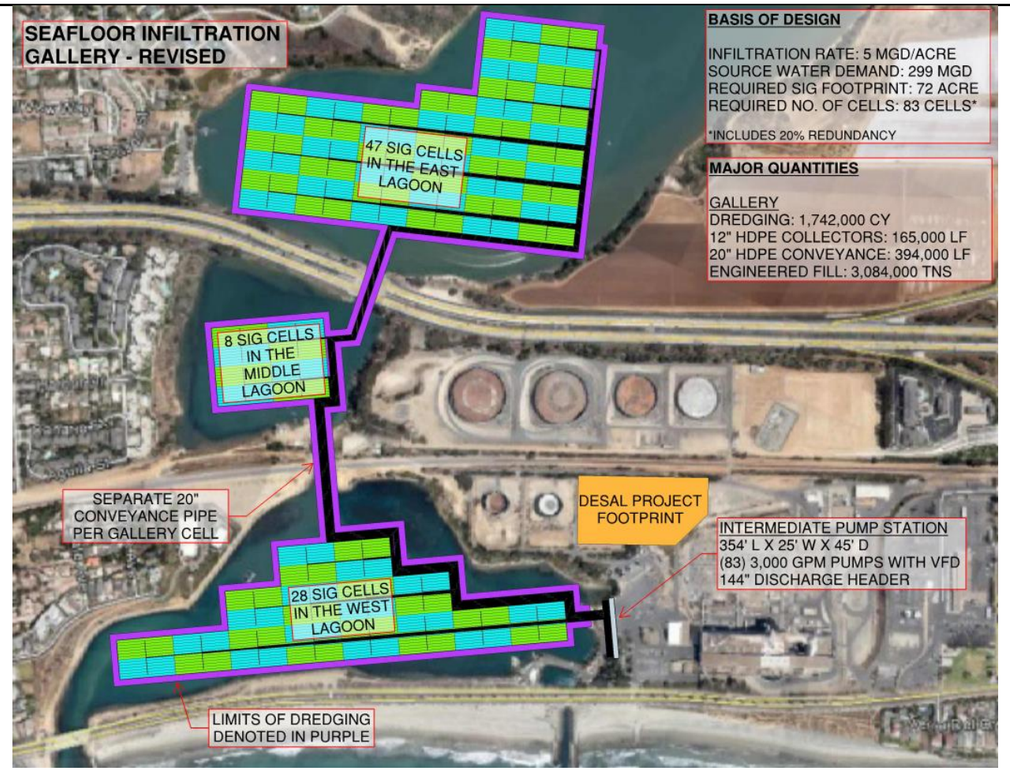


Figure 3. SIG Design for Discharge Flow Augmentation.

Environmental factors. Heavy construction would be required along the lagoon shoreline for placement of the Intermediate Pump Station and associated piping. Similarly, heavy construction in the lagoon complex associated with construction of the infiltration gallery will result in temporary loss of the lagoon for recreational, permanent loss of aquaculture use, and conversion of 32 to 72 acres of subtidal habitat to engineered fill.

A recognized advantage of a SIG is its ability to withdraw seawater without impinging or entraining marine life. However, in this instance, construction and operation of the SIG would replace a significant portion of the habitat of the most abundant larval fish species identified in the CDP entrainment study. Over ninety percent of the fish larvae that are expected be entrained by the Expanded CDP using a surface intake are CIQ goby, combtooth blennies and Garibaldi (see Appendix K, Carlsbad Desalination Facility Discharge Options Entrainment Analysis, MBC, July 27, 2015). These species' habitats include 49 acres of mudflat/tidal channel, 253 acres of open water, and the rocky areas adjacent to the power plant intake. Depending on which SIG alternative is selected, construction and operation of the subsurface (SIG) intake in Agua Hedionda Lagoon would effectively eliminate a substantial portion of the CIQ goby habitat on the floor of the lagoon and replace it with engineered fill. The combtooth blennies live primarily in the shell fish racks in the west lagoon. The aquaculture operation would not be compatible with construction and operational maintenance required for the SIG. Therefore, both SIG alternatives would require removal of the combtooth blennie habitat in the lagoon. Garibaldi live in the rocks adjacent to the power plant intake structure. Garibaldi are found in greater numbers at this location than comparable habitat in the pristine environments of Coronado, San Clemente, and Santa Catalina Islands. The reason for the high concentrations is that the power plant intake operations provide a source of food for the Garibaldi. If the intake were to be permanently decommissioned, the Garibaldi would likely abandon this area of the lagoon.

In summary, the construction and operation of both SIG alternatives have environmental effects on the marine ecology that must be considered by the Regional Water Board in assessing the feasibility of subsurface intakes. The expected impacts to the CIQ goby are similar to those of the open intake, whereas the SIG is expected to have a greater impact on the combtooth blennie and Garibaldi populations than the Expanded CDP using an open intake.

Social Factors. Depending on the alternative selected, the SIG alternatives are expected to take three years to permit, and four two seven years to construct. The expected temporary and permanent impacts during the construction and operation of the SIG alternatives include the following:

- **Desalination Plant Operations.** Starting Fall 2015, the Carlsbad Desalination Project will provide the San Diego region with up to 10% of its water supply. As noted above, Cabrillo intends to discontinue the operation of once-through-cooling pumps serving the EPS and CDP as early as June 1, 2017. The improvements needed for the transition to long-term stand-alone operation need to be in place in advance of the retirement of the EPS so to minimize the interruption in the output from the CDP. If the SIG alternative were to be selected, the CDP could be out of service for five to eight years waiting for the SIG to be completed. During this period, the San Diego County Water Authority's (the "SDCWA") would need to find an alternative water supply, and the owner of the CDP would be unable to make debt service payments on the CDP construction bonds.
- **Carlsbad Aquafarm.** The lagoon is home to the thriving Carlsbad Aquafarm where mussels and oysters are harvested and sold to seafood vendors and restaurants. The Aquafarm has 20 employees and helps reduce the toll that over-fishing takes on the ocean by providing high-quality farmed seafood. Aquafarm operations would not be compatible with construction and operation of either of the SIG alternatives because construction of the SIG, and ongoing maintenance dredging associated with SIG operations, would require unobstructed access to the entire west lagoon. Therefore, the Aquafarm would be closed if either SIG alternative was selected. The surface intake alternatives would not impact Aquafarm operations.
- **YMCA Camp H2O**. Located in the middle lagoon, Camp H2O is a summer camp that offers seven to 12-year olds affordable day camp activities, including swimming, kayaking, paddleboards, rowboats and fishing. The camp plays an important role in educating youth about the precious marine environment and the need to preserve the lagoon for future generations. These activities would not be compatible with construction of either of the SIG alternatives. Depending on the alternative selected, Camp H2O would be closed for four to seven years. The surface intake alternatives would not impact Aquafarm operations.
- **Recreational Boating.** Recreational boating is allowed in the east lagoon and is one of the most popular lagoon activities for residents and visitors. California Water Sports offers boating lessons and rents a variety of boats, jet skis, paddle board, kayaks, canoes, and peddle craft to the general public. California Water Sports operations would not be compatible with construction of the larger SIG alternative because construction of the SIG would require exclusive access to the area of the east lagoon designated for use by the water craft. Therefore, if the SIG with flow augmentation alternative is selected, California Water Sports would be closed for seven years. The surface intake alternatives would not impact Aquafarm operations.
- **Warm Water Jetties Surf Break.** The EPS discharge acts as a manmade river mouth that delivers sand to the end of the jetties that form the discharge channel, creating a man-made sandbar. The result is a popular surfing break. Should the SIG with the multiport diffuser be selected, the Expanded CDP discharge would be relocated offshore, thereby eliminating a significant source of sand replenishment for the sandbar. Additionally, per the terms of the CDP's State Lands Commission Lease, the jetties must be removed if the existing discharge channel is decommissioned. Thus, if the SIG with the multiport diffuser is selected, an important recreational asset would be lost. The surface intake alternative with a multiport diffuser would have the same result, whereas the surface intake with flow augmentation would allow the jetties to remain in place with continued discharge, albeit at a reduced flow rate compared to that of the EPS.

In summary, the construction and operation of either SIG alternative would have impacts on local businesses and the general public that must be considered by the Regional Water Board in assessing the feasibility of subsurface intakes. The expected impacts would last from four to seven years, affecting coastal recreation, and the income of lagoon based businesses. Additionally, the San Diego region would lose access to the CDP output for a period of five to eight years.

Economic Factors. In August of 2014, Poseidon evaluated the cost of implementing a SIG intake with flow augmentation discharge and presented the evaluation to the State Water Board as part of its comments on the proposed Ocean Plan Amendment for desalination facilities. Since August of 2014, Poseidon has been engaged with the California Coastal Commission in the evaluation of

the alternative intakes for the proposed Huntington Beach Desalination Facility (the "HBDF") (see Appendix U, Phase 1 and Phase 2 Technical Feasibility of Subsurface Intake Designs for the Proposed Poseidon Water Desalination Facility at Huntington Beach, California, Independent Scientific Technical Advisory Panel, October 9, 2014 and August 17, 2015, respectively). As a result of the HBDF intake evaluation, updates have been made to the design and layout of the SIG alternatives. Specifically, the updated design now includes individual collector pipes and a shore based source seawater collection pump for each of the 36 to 83 cells required to ensure a relatively uniform flow and velocity of seawater flowing through each of the individual cells to produce the combined volume of seawater needed. The addition of the collector pipes and seawater collection pumps resulted in additional costs compared to the design from August 2014. Since the previous cost estimate prepared in August 2014 resulted in a 58% to 100% increase in the cost of water produced by the CDP (Appendix N), and the updated design would only increase cost of the SIG alternatives, the cost estimate has not been re-evaluated. Rather, the $545,126,147 to $792,540,443 construction cost estimate from August 2014 included in Appendix X is considered to be conservative for the purposes of this feasibility assessment.

The life cycle cost analysis presented in Appendix N and summarized below (RCF 33b) provides a relative comparison of the net incremental cost and savings of each of the alternatives. The findings of this analysis indicate that $73,885,146 would need to be added to the annual operating budget of the CDP to pay for the capital and operating costs associated with SIG with the multiport diffuser alternative and $127,571,675 would need to be added to the annual operating budget of the CDP to pay for the capital and operating costs associated with the SIG with flow augmentation alternative.

Chapter III.M provides the following guidance for assessing the feasibility of subsurface intakes:

> *Subsurface intakes shall not be determined to be economically infeasible solely because subsurface intakes may be more expensive than surface intakes. Subsurface intakes may be determined to be economically infeasible if the additional costs or lost profitability associated with subsurface intakes, as compared to surface intakes, would render the desalination facility not economically viable.*

Thus, the Regional Water Board's determination of the economic feasibility of the SIG alternatives turns on the basis of whether the additional costs or lost profitability associated with these alternatives would render the desalination facility not economically viable. One measure of economic viability is whether the anticipated plant revenues would cover cost of one or both of the SIG alternatives.

The SDCWA entered into a 30-year Water Purchase Agreement (the "WPA") with Poseidon. Under the terms of the WPA, all of the output of the CDP is to be made available to the SDCWA at a predetermined price. Thus, one consideration for determining feasibility is whether the amount the SDCWA is obligated to pay for the water would be adequate to cover additional cost of the SIG alternatives.

The WPA pricing terms provide for recovery of a predetermined dollar amount for intake retrofit capital and operating costs incurred due to the retirement of the EPS. The incremental annual life-cycle costs presented in RCF 33b exceed the maximum allowance provided under the WPA by $69,131,344 to $122,677,866 depending on which SIG alternative selected. Therefore, absent a source of additional revenue, the SIG alternatives are not economically viable. See RCF 33b below and Appendix N for a comparison of the life-cycle costs for each of the alternatives under consideration.

Technical Factors. The physical placement of a SIG is governed by the required design acreage and the geometry of the Agua Hedionda Lagoon complex. The Agua Hedionda Lagoon complex is divided into three bodies of water herein referred to as the "west lagoon", "middle lagoon", and east lagoon". The required design acreage surpasses that available in any one of the three lagoon sections, thereby requiring the placement of SIG cells in all three lagoon sections for implementation of a SIG intake with discharge flow augmentation and two of the three lagoon cells for implementation of the SIG intake with the discharge via a multiport diffuser. Although all three sections of the lagoon are hydraulically connected, it is expected that variations in water quality and sediment transport across the three lagoon sections will create variations in cell fouling and maintenance.

The placement of SIG cells in all three sections of the lagoon complex also creates engineering and construction challenges. From an engineering perspective, cells placed in the west lagoon are significantly closer to the Intermediate Pump Station as compared to cells in the east lagoon. Specifically, the cell located furthest away from the Intermediate Pump Station is located up to 7,000 linear feet

		away while the closest cell is located about 500 linear feet away. Although each of these two cells would be hydraulically managed by stand-alone pump, this difference in length of conveyance piping creates a large difference in expected head losses between the two cells. The depth and inlet elevations for the Intermediate pump station will ultimately be governed by the head losses of the cells located the furthest distance away. From a construction perspective, the placement of conveyance piping spanning the east lagoon to the Intermediate Pump Station requires the placement of conveyance piping underneath the rail road and, in the case of the SIG with flow augmentation, under the I-5 freeway overpasses. Placement of conveyance piping through these overpass sections must not undermine or otherwise cause adverse effects to the overpass footings. Similarly, construction easements / approvals must be obtained as required for the construction of conveyance piping under these overpasses as required. The Intermediate Pump Station required for implementation of the SIG with discharge flow augmentation measures 354 feet long by 25 feet long by 45 feet deep. The discharge piping associated with this pump station would be approx. 144-in diameter. The Intermediate Pump Station required for implementation of a SIG with a multiport diffuser measures 168 feet long by 25 feet long by 45 feet deep. The discharge piping associated with this pump station would be approx. 98-in diameter. Obtaining the required land for this pump station from the land owner, Cabrillo, may not be feasible. However, if feasible, significant construction would take place at and near the lagoon shoreline.	
(2) Consider whether the identified need for desalinated water is consistent with an applicable adopted urban water management plan prepared in accordance with Water Code section 10631, or if no urban water management plan is available, other water planning documents such as a county general plan or integrated regional water management plan.	Yes	The proposed output from the Expanded CDP is consistent with the need for desalinated water identified in the SDCWA's 2003 Regional Water Facilities Master Plan and the 2013 Update of the Regional Water Facilities Master Plan: 2003 Regional Water Facilities Master Plan and 2013 Update Identify Seawater Desalination as Future Water Supply. (Appendix W) In November 2003, the SDCWA Board of Directors certified a Program Environmental Impact Report ("PEIR") for the SDCWA's Regional Water Facilities Master Plan Project and approved Alternative 2 – Conveyance of Supplies from the West, or Regional Seawater Desalination, as the new supply for development. In the 2003 PEIR, as part of the preferred alternative Project Description (Section 2.9.1.5 New Conveyance and Supply), it describes Phase I as the Seawater Desalination Project at Encina, with an initial capacity of 50 mgd. The 2003 PEIR Project Description also considered a Phase II, where "…seawater desalination development would include expansion of seawater desalination capacity between 30 and 50 mgd, up to a total of 100 mgd, at the existing Seawater Desalination Plant at Encina, or construction of a new seawater desalination plant at a location other than the Encina Power Station by 2015." The 2003 PEIR also looked at a third phase, where seawater desalination development would include expansion of capacity between 50 and 70 mgd, up to a total of 150 mgd, again either at Encina or at another location by 2020. One of the Project Objectives of the 2003 Master Plan, and the recently approved 2013 Regional Water Facilities Optimization and Master Plan Update (Appendix W) and certified Supplemental Program EIR, is to have the ability to adjust facility location, size and timing to meet changes in future demands. Inherent in the Master Plan is a built-in flexibility designed to allow the SDCWA to respond to slowed or accelerated local supply development and/or population growth and associated water demand within the region. The SDCWA can adjust the implementation schedule for appropriate Master Plan elements (projects) consistent with future revisions of the San Diego Association of Government's (SANDAG) regional growth forecasts (RGF) and/or the SDCWA's Urban Water Management Plan (UWMP) updates. As such, consideration of additional capacity expansion at the CDP to 60 mgd falls within the capacity ranges already considered and analyzed as part of the 2003 PEIR Alternative 2 Project Description. 2010 Urban Water Management Plan ("UWMP") Identifies Increased Desalination Capacity to Help Manage Drought Scenario The SDCWA's 2010 UWMP (Appendix W) contains a water supply reliability assessment that identified the verifiable mix of water resources to meet the region's existing and future demands. In addition, the plan incorporates a traditional scenario planning process to assess the reliability of the region's future resource mix and provide options to address potential supply uncertainties. The planning process evaluated the reliability of future potential supplies while considering uncertainties such as climate change, droughts, and regulatory restrictions. The scenario planning process also identified the potential strategies, or alternative supply sources, to help manage uncertainties that resulted in any gaps between demands and supplies.	RCF 20

		One of the scenarios (Scenario 2) included in the 2010 UWMP is a severe multi-year drought situation, where imported supplies from the Metropolitan Water District of Southern California ("MWD") are limited. A potential supply gap of approximately 55,000 acre-feet in 2030 was identified, where alternative sources would be needed to help meet demands. This drought scenario is currently occurring, as California enters its fourth consecutive year of drought, MWD storage supplies have been drastically reduced and there is a high likelihood of a MWD supply shortage for the San Diego region in 2015. In addition, the frequency and severity of drought scenarios could increase due to climate change and/or increased regulatory restrictions. Recent research links California's drought conditions with human-induced climate change. The NOAA Drought Task Force released an assessment report on California's current drought in December 2014 that stated: "California's temperatures have been rising and record high temperatures during the drought were likely made more extreme due to human-induced climate change." Stanford scientists published research in September 2014 concluding that the extreme atmospheric conditions associated with California's crippling drought are far more likely to occur under today's global warming conditions than in the climate that existed before humans emitted large amounts of greenhouse gases. These findings and research indicate that the San Diego region must plan for the potential of continued drought scenarios and implement strategies to mitigate this supply risk. The 2010 UWMP scenario planning process identified the potential strategies or alternative supply sources that can assist in managing drought scenarios by helping fill the supply gap and reduce the risk of shortages. The strategies are listed in Table 10-4 of the 2010 UWMP and include a combination of member agency and SDCWA local projects. One of the SDCWA's potential strategies is to increase regional seawater desalination capacity within the region. The potential long-term project is the proposed MCB Camp Pendleton seawater desalination project, which is currently in the feasibility stage. The proposed increase in capacity at the CDP would serve as an incremental supply strategy to help manage the current and likely water supply shortages identified in the 2010 UWMP.	
(3) Analyze the feasibility of placing intake, discharge, and other facility infrastructure in a location that avoid impacts to sensitive habitats and sensitive species.	Yes	**Environmental Setting – Surface Intake.** The screened surface intake under consideration would be located adjacent to the Agua Hedionda Lagoon. Feedwater for the Expanded CDP, and brine dilution water (in the case of the flow augmentation alternatives), would be withdrawn through the existing EPS intake structure located in the south west corner of Agua Hedionda Lagoon. There would be no change in the source waterbody, and no significant construction in the lagoon. The habitats potentially impacted by the surface water intake include those areas occupied by the three most commonly entrained lagoon fish larvae (90% of the fish larvae that would be entrained by the Expanded CDP using a surface intake are CIQ goby, combtooth blennies and Garibaldi). These habitats include 49 acres of mudflat/tidal channel and 253 acres of open water. The continued use of the EPS intake would avoid impacts to pelagic fishes commonly reported in the nearshore water-column habitat, including some species important to the commercial and sport fishing industries. **Environmental Setting – Subsurface Intake.** The SIG alternatives under consideration would be located in the lagoon. All other subsurface intake alternatives have been found to be infeasible. RO feedwater and flow augmentation water for the SIG alternatives would be withdrawn beneath the floor of the lagoon. The lagoon based SIG would avoid impacts to sensitive habitats and sensitive species. See Section 2.b.(1) above for further discussion of the environmental effects of the SIG alternatives. **Environmental Setting – Discharge.** The areas of the offshore environment that have the potential to be impacted by the Expanded CDP discharge alternatives vary depending on which discharge method (flow augmentation or multiport diffuser) is selected. Flow augmentation has the potential to affect a 15.5 acre semi-circular area of the near shore environment that extends 200 m (650 ft) seaward of the existing discharge structure. In this area the ocean bottom is sandy with scattered low- lying rocky outcroppings. This area is well mixed by wave action and longshore transport. The multiport diffuser has the potential to affect an offshore area of approximately 14.4 acres of the offshore environment. This area is defined by rocky outcroppings. Kelp beds are located shoreward of the multiport diffusers approximately 3,280 ft. to the southeast of the proposed discharge location. As noted in the FEIR for the CDP (Appendix Q), the Kelp beds are ecologically important because they provide refuge for a diverse assemblage of species. The pelagic fishes commonly reported in the nearshore water-column habitat also include some species important to the commercial and sport fishing industries. .	RCF 21
(4) Analyze the direct and indirect effects on all forms of marine life resulting from facility construction and operation, individually	Yes	The direct and indirect effects on all forms of marine life resulting from various alternatives under consideration for the Expanded CDP are summarized in Table 2.	RCF 22

and in combination with potential anthropogenic effects on all forms of marine life resulting from other past, present, and reasonably foreseeable future activities within the area affected by the facility.

Table 2.
Carlsbad Desalination Project Intake and Discharge Alternatives
Comparison of Environmental, Schedule and Cost Impacts

Alternative	1	2	3	4
Intake/Discharge Configuration	Surface Screened Intake with Flow Augmentation	Surface Screened Intake with Multiport Diffuser	Subsurface Intake with Flow Augmentation	Subsurface Intake with Multiport Diffuser
Intake Water Potentially Exposed to 100% Mortality	128 mgd	128 mgd	0 mgd	0 mgd
Flow Augmentation Water Potentially Exposed to 100% Mortality	171 mgd	0 mgd	0 mgd	0 mgd
Diffuser Water Potentially Exposed to 23% Mortality	0 mgd	217 mgd	0 mgd	217 mgd
Total Water Potentially Exposed to Mortality	299 mgd	345 mgd	0 mgd	217 mgd
Area of Production Foregone	84 Acres[1]	103 Acres[1]	0 Acres	67 Acres[1]
Brine Mixing Zone @ 35.5 ppt	15.5 Acres[2]	14.4 Acres[2]	15.5 Acres[2]	14.4 Acres[2]
Permanent Construction Impacts to Marine Environment	0 Acres	1 Acre	72 Acres	33 Acres
Total Area Impacted Entrainment, Brine Mixing Zone and Construction	99.5 Acres	118.4 Acres	87.5 Acres	114.4 Acres
Permitting Schedule	1.5 Years	3.0 Years	3.0 Years	3.0 Years
Construction Schedule	2.0 Years	3.0 Years	7.2 Years	3.8 Years

		<table><tr><td>**Total Duration**</td><td>3.5 Years[3]</td><td>6.0 Years[3]</td><td>10.2 Years[3]</td><td>6.8 Years[3]</td></tr><tr><td>**Total Project Cost**</td><td>$47,108,597[4]</td><td>$425,024,742[4]</td><td>$1,308,495,009[4]</td><td>$745,549,704[4]</td></tr></table> 1. Area of Production Foregone is calculated as described in Appendix E of the Staff Report for Amendment to the Water Quality Control Plan for Ocean Waters of California Addressing Desalination Facility Intakes, Brine Discharges, and the Incorporation of other Non-substantive Changes (hereafter, "Appendix E of the Staff Report"). See Appendix K, Carlsbad Desalination Facility Entrainment Analysis for Dilution and Discharge Options Entrainment Analysis, MBC, July 27, 2015. 2. Brine Mixing Zone is calculated as described in Appendix B. 3. See Appendix Y for project schedule. 4. See Appendix N and Appendix X for detailed cost estimate.	
(5) Analyze oceanographic geologic, hydrogeologic, and seafloor topographic conditions at the site, so that the siting of a facility, including the intakes and discharges, minimizes the intake and mortality of all forms of marine life.	Yes	The feasibility of various intake configurations (beach wells, slant wells, horizontal wells, offshore subsurface infiltration galleries, and the existing EPS intake) was extensively studied in the Regional Water Board's 2009 Water Code 13142.5(b) determination for the Carlsbad Desalination Project (see Appendix O, Order R9-2009-0038 and Appendix P, Carlsbad Desalination Project Flow, Entrainment, and Impingement Minimization Plan); City of Carlsbad's Final Environmental Impact Report for the Carlsbad Desalination Project (see Appendix Q, City of Carlsbad EIR 03-05); and California Coastal Commission's Coastal Development Permit (see Appendix R, California Coastal Commission CDP E-06-013) review phases of the CDP. A thorough review of the site-specific applicability of subsurface intake technology supported by a comprehensive oceanographic, geological and hydrogeological studies of the subsurface conditions in the vicinity of the CDP concluded that the subsurface intakes studied at that time were not feasible due to limited production capacity of the subsurface geological formation, poor water quality of collected source water, excessive cost, and environmental considerations (see Appendices O, P, Q, and R). **Intake Studies.** In addition to the references cited in the previous paragraph, the following studies analyze the oceanographic, geological and hydrogeological conditions in Agua Hedionda Lagoon: 1. Appendix B, CDP Intake/Discharge Feasibility Analysis, Alden, August 27, 2015. 2. Appendix D, Coastal Processes Effects of Reduced Intake Flows at Agua Hedionda Lagoon, Jenkins December 13, 2006. 3. Appendix F, Biological Considerations of Water Recirculation in Agua Hedionda Lagoon Under Long Term Standalone Operations for the Carlsbad Desalination Project, September 4, 2015. 4. Appendix S Drought-Proofing Through Desalting the San Diego Gas and Electric Approach, Boyle 1995. 5. Appendix T, Hydrogeologic Investigation SDG&E Encina Power Plant Carlsbad, California, Boyle 1994. **Discharge Studies.** In addition to the references cited at the beginning of this section, oceanographic, geological and hydrogeological studies affecting the proposed near-shore and offshore Brine Mixing Zones are included in the following exhibits: 1. Appendix B, CDP Intake/Discharge Feasibility Analysis, Alden, August 27, 2015. 2. Appendix C, Hydrodynamic Dilution Analysis for the Carlsbad Desalination Project Operating at Sixty Million Gallons Per Day Production Rate, Jenkins, September 3,, 2015. 3. Appendix G, Acute Toxicity Study Results, Nautilus, September 3, 2015 4. Appendix H, Results of Chronic Salinity Tolerance Tests, Nautilus, August 26,2015 5. Appendix I, Brine Dilution Salinity Tolerance Study, Nautilus, July 24, 2015 6. Appendix K, Carlsbad Desalination Facility Entrainment Analysis for Dilution and Discharge Options Entrainment Analysis, MBC, July 27, 2015. 7. Appendix L, CFD Modeling of Flow Augmentation System, Alden August 27, 2015	RCF 23
(6) Analyze the presence of existing discharge infrastructure, and the availability of wastewater to dilute the facility's brine discharge.	Yes	The CDP's brine discharge pipeline is connected to the existing EPS discharge infrastructure. This infrastructure is available for the Expanded CDP discharge. However, Cabrillo has notified Poseidon of its intent to discontinue the operation of once-through-cooling pumps serving the EPS and CDP as early as June 1, 2017. Following retirement of the existing once-through-cooling system EPS wastewater will no longer be available to dilute the Expanded CDP discharge.	RCF 24

		After the EPS, the closest source of treated wastewater is the Encina Water Pollution Control Facility (EWPCF). The EWPCF is located approximately two miles south of the CDP. The current average daily flow at the EWPCF, 20 mgd, does not provide adequate dilution to ensure salinity of the commingled discharge will reliably meet the receiving water limitation for salinity. The next closest source of treated wastewater is the outfall serving the San Luis Rey Wastewater Treatment Plant, the Las Salina Wastewater Treatment Plant, the Fallbrook Public Utility District Wastewater Treatment Plant, Camp Pendleton and the Oceanside brackish water reverse osmosis facility. The Oceanside outfall is located approximately ten miles north of the CDP. The current daily flow in the outfall is approximately 20 mgd, which does not provide adequate dilution to ensure salinity of the commingled discharge will reliably meet the receiving water limitation for salinity. Further limiting the availability of treated wastewater for brine dilution from EWPCF and SLRWTP is that both facilities are considering opportunities for expanding their water recycling programs. Therefore, wastewater is unavailable to dilute the Expanded CDP's brine discharge.	
(7) Ensure that the intake and discharge structures are not located within a MPA or SWQPA with the exception of intake structures that do not have marine life mortality associated with the construction, operation, and maintenance of the intake structures (e.g. slant wells). Discharges shall be sited at a sufficient distance from a MPA or SWQPA so that the salinity within the boundaries of a MPA or SWQPA does not exceed natural background salinity. To the extent feasible, surface intakes shall be sited so as to maximize the distance from a MPA or SWQPA.	Yes	The intake and discharge structures analyzed are not located within a MPA or SWQPA. The nearest MPA or SWQPA is located in Batiquitos Lagoon, approximately five miles south of the CDP. As noted in Appendix C, the discharge would be sited at a sufficient distance from a MPA or SWQPA so that the salinity within the boundaries of a MPA or SWQPA does not exceed natural background salinity.	RCF 25
c. **Design**			
Design is the size, layout, form, and function of a facility, including the intake capacity and the configuration and type of infrastructure, including intake and outfall structures. The regional water board shall require that the owner or operator perform the following in determining whether a proposed facility design is the best available design feasible to minimize intake and mortality of all forms of marine life:	Yes		RCF 26
(1) For each potential site, analyze the potential design configurations of the intake, discharge, and other facility infrastructure to avoid impacts to sensitive habitats and sensitive species.	Yes	See RCFs 19, 22, 23, and 25 above	RCF 27
(2) If the regional water board determines that subsurface intakes are not feasible and surface water intakes are proposed instead, analyze potential designs for those intakes in order to minimize the intake and mortality of all forms of marine life.	Yes	An analysis of relevant geotechnical data, hydrogeology, benthic topography, oceanographic conditions, presence of sensitive habitats and presence of sensitive species, energy use for the entire facility, design constraints, and project life cycle costs demonstrates that various subsurface intake alternatives are not feasible for the Expanded CDP. Poseidon proposes to retrofit the existing EPS intake to address the seawater intake and brine dilution requirements for the Expanded CDP. Poseidon has analyzed the following surface intake designs to minimize the intake and mortality of all forms of marine life: (1) a surface intake with flow augmentation; and (2) a surface intake with a multiport diffuser. Both intake designs are described below. **Screened Intake with Flow Augmentation.** The surface intake considered for the Expanded CDP would be designed to minimize impacts to all forms of marine life. Intake water would be withdrawn directly from the EPS intake tunnels on Agua Hedionda Lagoon rather than from the CDP's existing intake connection to the EPS discharge tunnel. Two pump stations would be connected to the intake tunnels: (1) the existing intake pump station which provides feedwater to the Expanded CDP's seawater reverse osmosis process (the "SWRO Pump Station"); and (2) a new pump station that would provide seawater for initial dilution of the brine discharge from the Expanded CDP (the "Flow Augmentation Pump Station"). The intake screening technologies that have been evaluated for the pump stations are considered state-of-the art for protecting marine life and were selected to fit within the small footprint available at the existing EPS. Through-screen velocities were designed to meet the 0.5-ft/sec criterion to minimize	RCF 28

impingement, the 1.0-mm screen mesh size was selected to minimize impingement and entrainment of marine organisms in the SWRO Pump Station, and a combination of screening technology and fish-friendly pumps were selected to minimize impingement and entrainment mortality in the Flow Augmentation Pump Station. A general schematic layout is provided in Figure 4.

Figure 4. General schematic of the layout of the Expanded CDP with a screened intake and discharge flow augmentation.

Approximately 299 mgd of seawater would be withdrawn from the Lagoon -- 127 mgd for processing by the Expanded CDP, 171 mgd for brine dilution, and approximately 1 mgd for screen wash and fish return. Approximately 60 mgd of the diverted seawater is converted to fresh water which is piped to the San Diego County SDCWA delivery system in the City of San Marcos. The remaining flow (67 mgd) is returned to the EPS discharge tunnel for blending with seawater prior to discharge to the Pacific Ocean. The discharge consists of brine produced by the reverse osmosis process (60 mgd) and treated backwash water from the pretreatment filters (7 mgd). The salinity of the discharge prior to dilution is approximately 65 parts per thousand ("ppt") (67 ppt with no backwash water included), whereas the average salinity of the seawater in the vicinity of the discharge channel is 33.5 ppt.

Chapter III.M.3.d provides that a facility which has received a conditional Water Code section 13142.5(b) determination and is over 80 percent constructed by [the effective date of the Desalination Amendments] shall not exceed a daily maximum of 2.0 parts per thousand (ppt) above natural background salinity measured at the edge of the brine mixing zone 200 meters (656 ft.) away from the points of discharge. Poseidon is proposing an initial dilution of the brine to 42 ppt prior to discharge. This is accomplished by mixing the Expanded CDP discharge with 171 mgd of the seawater withdrawn from Agua Hedionda Lagoon. The combined Expanded CDP discharge and dilution water flow rate is 238 mgd. The discharge shall not exceed a daily maximum of 2.0 parts per thousand (ppt) above natural background salinity measured at the edge of the brine mixing zone. Over the last 20 years, the natural background salinity at the closest reference site (Scripps Pier) has measured a minimum salinity of 30.4 ppt, maximum salinity of 34.2 ppt and an average salinity of 33.5 ppt. Therefore, under average conditions, the discharge shall not exceed a daily maximum of 35.5 ppt at the edge of the brine mixing zone 200 meters (656 ft.). Final dilution to comply with the receiving water limitation for salinity would be accomplished through natural mixing in the surf zone.

		The portion of the screening structure devoted to the process water flow would be screened by four (three plus one redundant) Bilfinger Water Technologies (BWT) center-flow traveling water screens (or equal) with 1.0-mm mesh. The one redundant screen will be shared between the process water flow and the flow augmentation portion. The screens would be modified with fish protection features (fish lifting buckets on each screen basket, low pressure spraywash, and fish return system). The process water intake is designed for a through-screen velocity of less than 0.5 ft/sec with only three screens in service and 15% fouling. If all four screens are in service, the through-screen velocity is well below 0.5 ft/sec. Each screen bay includes upstream and downstream stoplog slots to allow each bay to be dewatered and each screen isolated. All fish and debris collected in the traveling screen fish buckets would be returned to Agua Hedionda Lagoon at a location that minimizes the potential for recirculation. See Appendix B for a detailed discussion of the fish-friendly screen and pump design. The portion of the screening structure devoted to the augmentation flow would be screened by four BWT center-flow traveling water screens (or equal) with 1.0-mm mesh. As with the process water screens, the augmentation flow screens would be equipped with fish protection features. The flow augmentation intake is designed for a through-screen velocity of less than 0.5 ft/sec with four screens in service and 15% fouling. The flow augmentation screen bays also include stoplogs to allow each bay to be dewatered and each screen isolated. As with the process water intake, all fish and debris collected in the traveling screen fish buckets would be returned to Agua Hedionda Lagoon at a location that minimizes the potential for recirculation. Flow distributors are included upstream and downstream of the screens to create a more uniform flow through the screens and approaching the flow augmentation pump bell intakes. The flow augmentation system would pump flow using four fish-friendly, axial flow pumps (Bedford submersible or equal). This augmentation flow would be conveyed to a junction and be discharged through a common vault into the existing EPS discharge tunnel. The combined brine and augmentation flow would mix in transit to the existing EPS discharge pond and then to the ocean. Figure 5 provides a plan view of the new screening/fish-friendly pumping structure.	

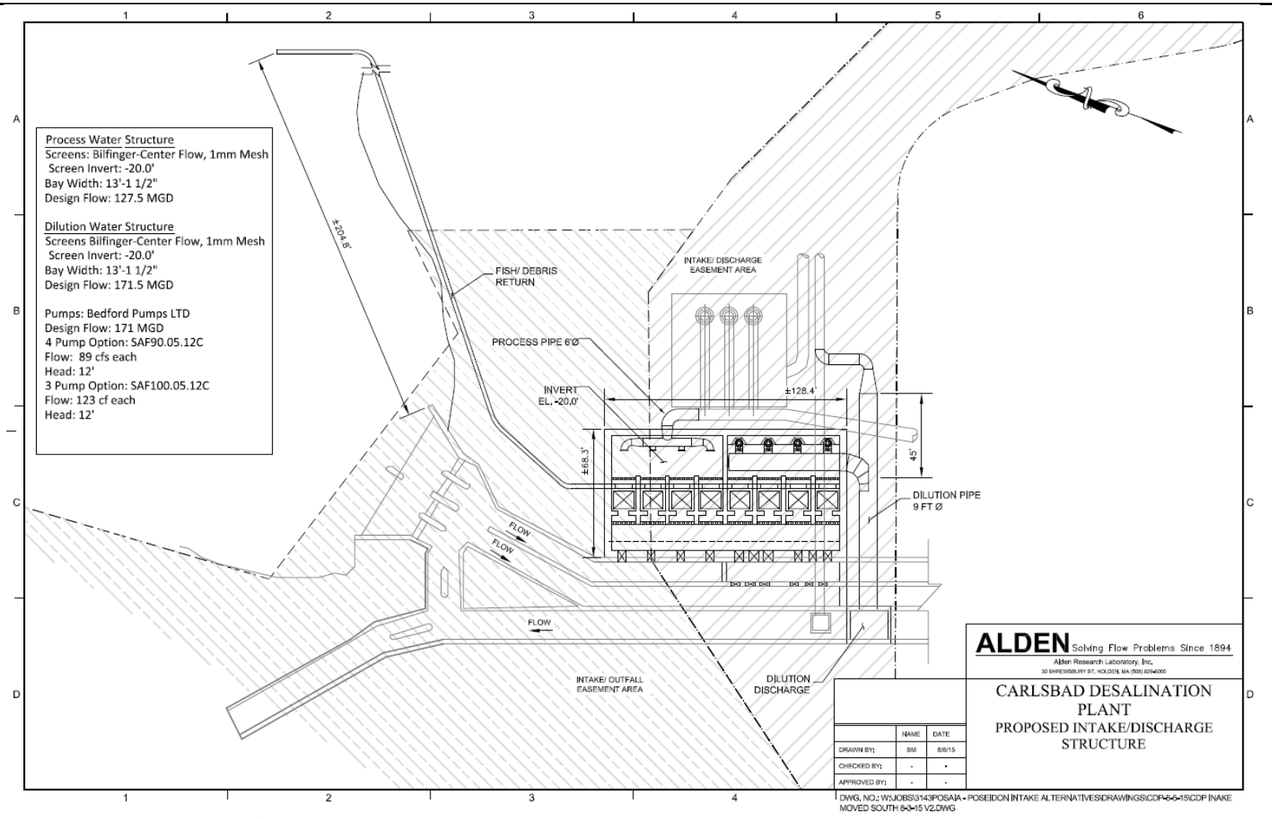


Figure 5. Screened intake/discharge structure, plan view.

Screened Intake with Multiport Diffuser. Similar to the surface intake with flow augmentation, the surface intake coupled with a multiport diffuser would be designed to minimize impacts to all forms of marine life. Intake water would be withdrawn directly from the EPS intake tunnels on Agua Hedionda Lagoon rather than from the CDP's existing intake connection to the EPS discharge tunnel. The SWRP Pump Station would be connected to the intake tunnel. The intake screens were designed to meet the 0.5-ft/sec criterion to minimize impingement. Feedwater for the Expanded CDP would be withdrawn through the existing EPS trash rack structure in the Lagoon. There would be no change in the source waterbody nor would the new screening structure require any heavy shoreline construction in the lagoon. A new multiport diffuser system would be located approximately4,000 ft. offshore, 3,280 ft. northwest of kelp beds. The diffuser system would be designed to maximize dilution, minimize the size of the brine mixing zone, minimize the suspension of benthic sediments, and minimize marine life mortality in accordance with the provisions of the Ocean Plan. A general schematic of the layout is provided in Figure 6.

Figure 6. General schematic of the layout of the Expanded CDP with a screened intake and discharge diffuser.

Approximately 127.5 mgd of seawater would be withdrawn from the Lagoon -- 127 mgd for processing by the Expanded CDP and approximately 0.5 mgd for screen wash and fish return. Approximately 60 mgd of the diverted seawater is converted to fresh water which is piped to the San Diego County SDCWA delivery system in the City of San Marcos. The remaining flow (67 mgd) leaving the SWRO building is discharged into a multiport diffuser system and discharge to the Pacific Ocean. The discharge would consists of brine produced by the reverse osmosis process (60 mgd) and treated backwash water from the pretreatment filters (7 mgd). The salinity of the discharge prior to dilution is approximately 65 ppt (67 ppt with no backwash water included), whereas the average salinity of the seawater in the vicinity of the discharge channel is 33.5 ppt.

The Desalination Amendment provides that the discharge shall not exceed a daily maximum of 2.0 parts per thousand (ppt) above natural background salinity measured at the edge of the brine mixing zone 100 meters (328 ft.) away from the points of discharge Over the last 20 years, the natural background salinity at the closest reference site (Scripps Pier) has measured a minimum salinity of 30.4 ppt, maximum salinity of 34.2 ppt and an average salinity of 33.5 ppt. Therefore, under average conditions, the discharge shall not exceed a daily maximum of 35.5 ppt 100 meters from the diffuser ports.

The new intake screening structure would be screened by four (three plus one redundant) Bilfinger Water Technologies (BWT) center-flow traveling water screens with 1.0-mm mesh. The screens would be modified with fish protection features (fish lifting buckets on each screen basket, low pressure spraywash, and fish return system). The intake is designed for a through-screen velocity of less than 0.5 ft/sec with only three screens in service and 15% fouling. If all four screens are in service, the through-screen velocity is well below 0.5 ft/sec. Each screen bay includes upstream and downstream stoplog slots to allow each bay to be dewatered and each screen isolated. All fish and debriscollected in the traveling screen fish buckets would be returned to Agua Hedionda Lagoon at a location that minimizes the potential recirculation. See Appendix B for a detailed discussion of the fish-friendly screen design. A 72” outfall pipeline extending approximately 4,000 feet offshore would convey the brine discharge from the SWRO building to the multiport diffuser system where four duck-bill diffuser ports would eject the brine into the water column at a high velocity to promote rapid diffusion and dispersion. Figure 7 provides a plan view of the new screening structure.

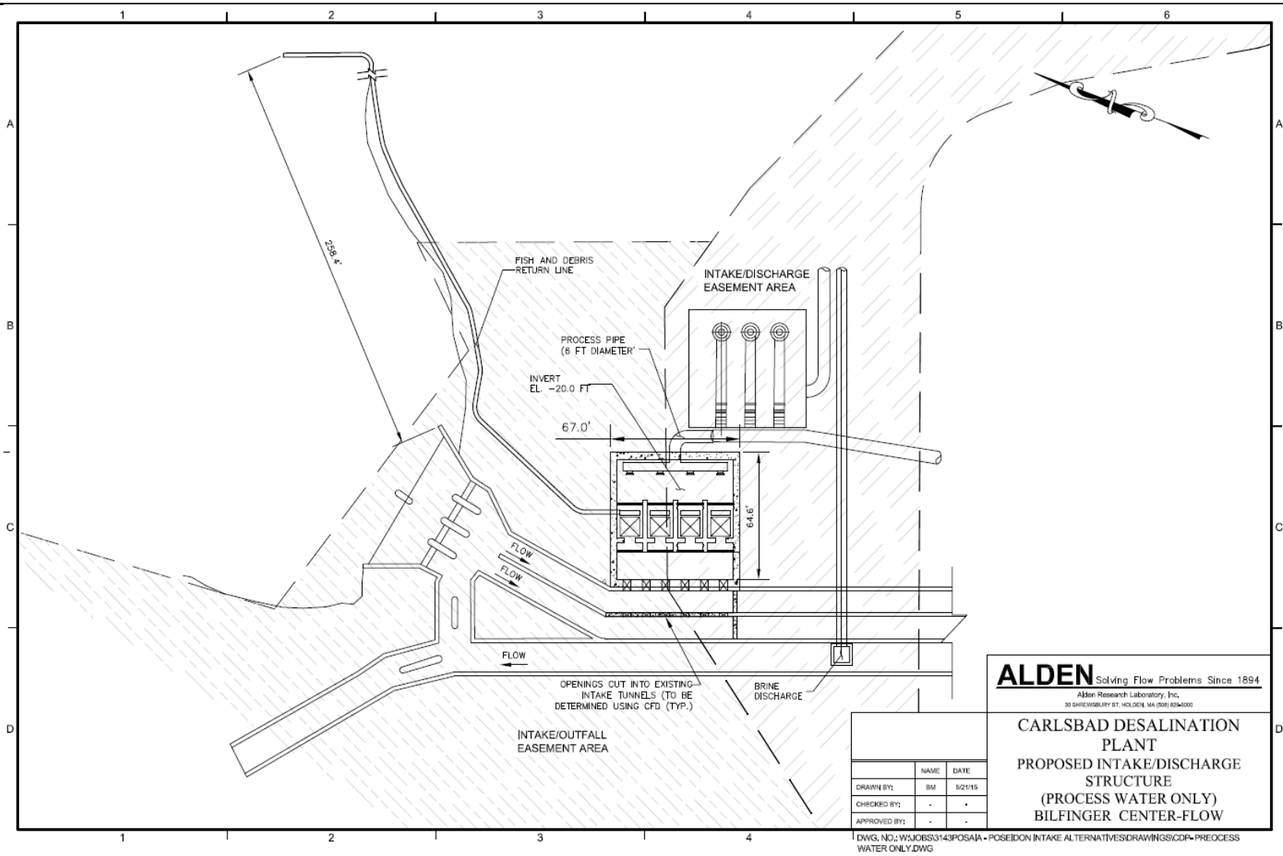


Figure 7. Screened intake structure, plan view.

(3)	Design the outfall so that the brine mixing zone does not encompass or otherwise adversely affect existing sensitive habitat.	Yes	See RCF 19 through RCF 26 above	RCF 29
(4)	Design the outfall so that discharges do not result in dense, negatively buoyant plumes that result in adverse effects due to elevated salinity or hypoxic conditions occurring outside the brine mixing zone. An owner or operator must demonstrate that the outfall meets this requirement through plume modeling and/or field studies. Modeling and field studies shall be approved by the regional water board in consultation with State Water Board staff.	Yes	**Multiport Diffuser.** A 72" outfall pipeline extending approximately 4,000 feet offshore would convey the brine discharge from the SWRO building to the multiport diffuser system where four duck-bill diffuser ports would eject the brine into the water column at a high velocity to promote rapid diffusion and dispersion (Figure 6). The diffusers would be designed to promote rapid mixing so to prevent the formation of dense, negatively buoyant plumes that could result in adverse effects due to elevated salinity or hypoxic conditions occurring outside the brine mixing zone, which would be verified through receiving water monitoring. The brine mixing zone is a circle with a radius of 100 meters (328 ft.) originating from the discharge diffuser ports in the ocean. The discharge diffuser system will be comprised of four duckbill diffuser spaced approximately 100 ft. apart. Outside of the brine mixing zone, salinity would not exceed 2 ppt over ambient background salinity. Within the brine mixing zone, entrained organisms will experience elevated salinity. The benthic area encompassed by the brine mixing zone would be approximately 14.4 acres. **Flow Augmentation**. The flow augmentation system would initially dilute the brine to 42 ppt prior to discharge. This is accomplished by mixing the Expanded CDP discharge with 171 mgd of the seawater withdrawn from Agua Hedionda Lagoon. The combined Expanded CDP discharge and dilution water flow rate is 238 mgd. Final dilution to comply with the receiving water limitation for salinity would be accomplished through natural mixing in the surf zone. As noted in Appendix C, hydrodynamic modeling of the	RCF 30

		discharge was calculated using 20 year records of waves, currents, winds, ocean salinity and temperature to produce 7,523 modeled outcomes for brine dispersion and dilution evaluated on the boundaries of the 200 meter brine mixing zone. The minimum brine salinity at the brine mixing zone boundary that was calculated from the 7,523 dilution simulations is 32.8 ppt. The median dilution result throughout the 20.5 year period of record gives an average brine salinity of 35.0 ppt at the edge of the brine mixing zone. Altogether, 98% of the 7,523 modeled outcomes produced discharge salinity that was less than or equal to 2 ppt above the natural background salinity at the edge of the brine mixing zone. Outcomes where discharge salinity exceeded 2 ppt above daily ambient ocean salinity are extremely rare and never persistent, accounting for only 2% of the potential discharge cases over a 20.5 year period. The flow augmentations system would be designed to promote rapid mixing and prevent the formation of dense, negatively buoyant plumes that could result in adverse effects due to elevated salinity or hypoxic conditions occurring outside the brine mixing zone, which would be verified through the receiving water monitoring program described below (RCF 97 and RCF 98). The brine mixing zone is a semicircle with a radius of 200 meters (656 ft.) originating from the end of the discharge channel. The benthic area encompassed by the brine mixing zone would be approximately 15.5 acres. See Appendix C, Hydrodynamic Dilution Analysis for the Carlsbad Desalination Project Operating at Sixty Million Gallons Per Day Production Rate, Jenkins, July 31, 2015.	
(5) Design outfall structures to minimize the suspension of benthic sediments.	Yes	Poseidon has designed the brine discharge alternatives to minimize the suspension of benthic sediments. **Flow Augmentation Alternatives.** As shown in Figure 8, the flow augmentation discharge would flow by gravity into the existing EPS discharge channel following in-plant dilution to 42 ppt. Final dilution to comply with the receiving water limitation for salinity would be accomplished through natural mixing in the surf zone, thereby minimizing project related suspension of benthic sediments.  **Figure 8. General schematic of the layout of the Expanded CDP with a screened intake and discharge flow augmentation.** **Multiport Diffuser Alternative.** A new multiport diffuser system would be located approximately 4,000 feet offshore, 3,280 feet northwest of kelp beds. The diffuser system would be elevated off the seafloor and oriented so to minimize the suspension of benthic sediments in accordance with the provisions of the Ocean Plan.	RCF 31

A 72” outfall pipeline extending approximately 4,000 feet offshore would convey the brine discharge from the SWRO building to the multiport diffuser system where four duck-bill diffuser ports located 100 feet apart would eject the brine into the water column at a high velocity to promote rapid diffusion and dispersion. The Brine Mixing Zone would extend 100 meter (328 ft.) out from each of the four discharge points with the combined area inside the Brine mixing Zone covering 14.4 acres.

A general schematic of the layout is provided in Figure 9.

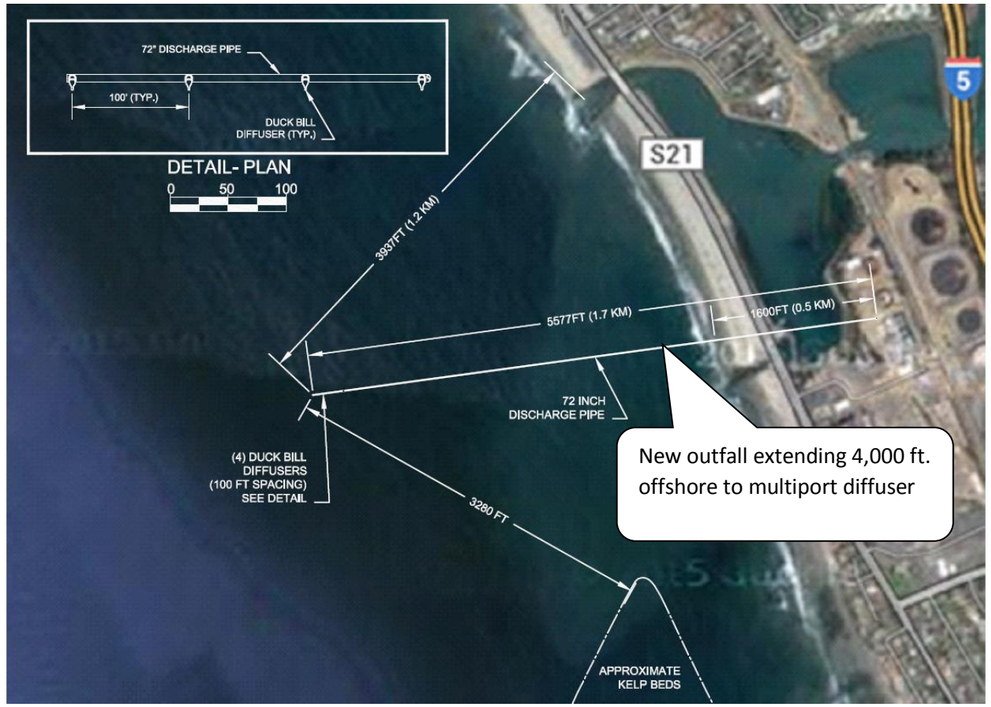


Figure 9. General schematic of new outfall extending 4,000 feet offshore to a multiport diffuser.

Installation of the outfall pipeline will require tunneling and pipeline placement under the existing EPS site, Carlsbad Boulevard, and approximately 4,000 linear feet of seafloor. The spacing, number, and orientation of the four diffuser heads has been designed to maximize brine mixing.

d. Technology

Technology is the type of equipment, materials, and methods that are used to construct and operate the design components of the desalination facility. The regional water board shall apply the following considerations in determining whether a proposed

RCF 32

technology is the best available technology feasible to minimize intake and mortality of all forms of marine life:			
(1) Considerations for Intake Technology:		Poseidon requests the Regional Water Board find that subsurface intakes are not feasible.	
(a) Subject to Section chapter L M.2.a.(2), the regional water board in consultation with State Water Board staff shall require subsurface intakes unless it determines that subsurface intakes are not feasible based upon a comparative analysis of the factors listed below for surface and subsurface intakes. A design capacity in excess of the need for desalinated water as identified in chapter III.M.2.b.(2) shall not be used by itself to declare subsurface intakes as not feasible.			RCF 33a
i. The regional water board shall consider the following factors in determining feasibility of subsurface intakes: geotechnical data, hydrogeology, benthic topography, oceanographic conditions, presence of sensitive habitats, presence of sensitive species, energy use for the entire facility; design constraints (engineering, constructability), and project life cycle cost. Project life cycle cost shall be determined by evaluating the total cost of planning, design, land acquisition, construction, operations, maintenance, mitigation, equipment replacement and disposal over the lifetime of the facility, in addition to the cost of decommissioning the facility. Subsurface intakes shall not be determined to be economically infeasible solely because subsurface intakes may be more expensive than surface intakes. Subsurface intakes may be determined to be economically infeasible if the additional costs or lost profitability associated with subsurface intakes, as compared to surface intakes, would render the desalination facility not economically viable. In addition, the regional water board may evaluate other site- and facility-specific factors.	Yes	See RCFs 19, 22, 23, and 25 above for a review of the geotechnical data, hydrogeology, benthic topography, oceanographic conditions, presence of sensitive habitats, presence of sensitive species, design constraints (engineering, constructability) associated with the SIG alternatives. A detailed analysis of the life-cycle cost for the Expanded CDP subsurface intake/discharge alternatives is presented in Appendix N. The findings of this analysis are summarized in Table 3. The life cycle costs provide a relative comparison of the net incremental cost and savings of each of the alternatives. Costs considered include permitting, design, land acquisition, financing, construction, operations, maintenance, mitigation, equipment replacement, insurance, taxes, management, and energy consumption over the lifetime of the facility. Savings considered include construction and operating allowances provided for in the WPA that are applicable to each of the alternatives and operational savings due reduced chemical consumption, extended membrane life, and reduced membrane cleaning frequency that is applicable to the subsurface intake alternatives. **Table 3.** **Expanded CDP Subsurface Intake/Discharge Alternatives** **Net Incremental Annual Life-Cycle Cost/ (Savings) ($/year)** **Annual Cost** / **Surface Intake with Flow Augmentation** / **Surface Intake with Multiport Diffuser** / **Subsurface Intake with Flow Augmentation** / **Subsurface Intake with Multiport Diffuser** Capital Charge: $ 3,806,058 / $ 34,314,716 / $ 107,982,781 / $ 60,209,040 O&M Charge: $ 2,897,960 / $ 1,690,000 / $ 8,868,050 / $ 5,477,125 Other Charges: $ 391,997 / $ 4,880,500 / $ 10,720,844 / $ 8,198,981 Total Annual Cost: $ 7,096,016 / $ 40,642,836 / $ 127,571,675 / $ 73,885,146 WPA O&M Offset: $ (2,759,512) / $ (2,759,512) / $ (2,759,512) / $ (2,759,512) WPA Capital Offset: $ (1,897,879) / $ (1,968,003) / $ (2,134,297) / $ (1,994,291) Net Annual Cost: $ 2,438,626 / $ 35,915,322 / $ 122,677,866 / $ 69,131,344 The findings of this analysis indicate that $73,885,146 would need to be added to the annual operating budget of the CDP to pay for the capital and operating costs associated with SIG with the multiport diffuser alternative and $127,571,675 would need to be added to the annual operating budget of the CDP to pay for the capital and operating costs associated with the SIG with flow augmentation alternative.	RCF 33b

		Chapter III.M provides the following guidance for assessing the feasibility of subsurface intakes: *Subsurface intakes shall not be determined to be economically infeasible solely because subsurface intakes may be more expensive than surface intakes. Subsurface intakes may be determined to be economically infeasible if the additional costs or lost profitability associated with subsurface intakes, as compared to surface intakes, would render the desalination facility not economically viable.* Thus, the Regional Water Board's determination of the economic feasibility of the SIG alternatives turns on the basis of whether the additional costs or lost profitability associated with these alternatives would render the desalination facility not economically viable. One measure of economic viability is whether the anticipated plant revenues would cover cost of one or both of the SIG alternatives. The SDCWA entered into a 30-year Water Purchase Agreement (the "WPA") with Poseidon. Under the terms of the WPA, all of the output of the CDP is to be made available to the SDCWA at a predetermined price. Thus, one consideration for determining the feasibility of the SIG alternatives is whether the amount the SDCWA is obligated to pay for the water would be adequate to cover additional cost of the SIG alternatives for the duration of the 30-year operating life of the project when the SIG is put into operation. The WPA pricing terms provide for recovery of a predetermined dollar amount for intake retrofit capital and operating costs incurred due to the retirement of the EPS. The net annual costs of $69 million per year for the subsurface intake with a multiport diffuser and $123 million per year for the subsurface intake with flow augmentation are net of the maximum allowance provided under the WPA. Therefore, absent an additional source of revenue, the SIG alternatives are economically infeasible.	
ii. If the regional water board determines that subsurface intakes are not feasible for the proposed intake design capacity, it shall determine whether subsurface intakes are feasible for a reasonable range of alternative intake design capacities. The regional water board may find that a combination of subsurface and surface intakes is the best feasible alternative to minimize intake and mortality of marine life and meet the identified need for desalinated water as described in chapter III.M.2.b.(2).		The life-cycle analysis presented in RCF 33b supports the conclusion that subsurface intakes are not feasible for a reasonable range of intake alternatives.	RCF 33c
b. Installation and maintenance of a subsurface intake shall avoid, to the maximum extent feasible, the disturbance of sensitive habitats and sensitive species.	Yes	See RCF 21 for a description of habitat disturbance associated with the SIG alternatives.	RCF 34
c. If subsurface intakes are not feasible, the regional water board may approve a surface water intake subject to the following conditions:	Yes	An analysis of relevant geotechnical data, hydrogeology, benthic topography, oceanographic conditions, presence of sensitive habitats, and presence of sensitive species, energy use for the entire facility, design constraints, and project life cycle costs demonstrates that various subsurface intake alternatives are not feasible for the Expanded CDP. Poseidon proposes to retrofit the existing EPS intake to address the seawater intake and brine dilution requirements for the Expanded CDP. Poseidon has analyzed potential intake designs to minimize the intake and mortality of all forms of marine life. The description of the surface intake alternatives is summarized in RCF 28, as well as in RCF 21 through RCF 25.	RCF 35
i. The regional water board shall require that surface water intakes be screened. Screens must be functional while the facility is withdrawing seawater.	Yes	The Expanded CDP will be equipped with functioning screens while withdrawing seawater. The screen design is described in RCF 28 and Appendix B.	RCF 36
ii. In order to reduce entrainment, all surface water intakes must be screened with a 1.0 mm (0.04 in) or smaller slot size screen when the desalination facility is withdrawing seawater.	Yes	The portion of the screening structure devoted to the process water flow would be screened by four (three plus one redundant) Bilfinger Water Technologies (BWT) center-flow traveling water screens (or equal) with 1.0-mm mesh. The one redundant screen will be shared between the process water flow screening structure and the flow augmentation screening structure.	RCF 37

iii. An owner or operator may use an alternative method of preventing entrainment so long as the alternative method results in intake and mortality of eggs, larvae, and juvenile organisms that is less than or equivalent to a 1.0 mm (0.04 in) slot size screen. The owner or operator must demonstrate the effectiveness of the alternative method to the regional water board. The owner or operator must conduct a study to demonstrate the effectiveness of the alternative method, and use an Empirical Transport Model (ETM)/ Area of Production Forgone (APF) approach to estimate entrainment. The study period shall be at least 12 consecutive months. Sampling for environmental studies shall be designed to account for variation in oceanographic or hydrologic conditions and larval abundance and diversity such that abundance estimates are reasonably accurate. Samples must be collected using a mesh size no larger than 335 microns and individuals collected shall be identified to the lowest taxonomical level practicable. The ETM/APF analysis shall evaluate entrainment for a broad range of species, species morphologies, and sizes under the environmental and operational conditions that are representative of the entrained species and the conditions at the full-scale desalination facility. At their discretion, the regional water boards may permit the use of existing entrainment data to meet this requirement.	Yes	The portion of the screening structure devoted to the augmentation flow would be screened by four BWT center-flow traveling water screens (or equal) with 1.0-mm mesh. The flow augmentation system would pump flow to the existing EPS discharge tunnel using four fish-friendly, axial flow pumps (Bedford submersible or equal). This augmentation flow would be conveyed to a junction and be discharged through a common vault into the existing EPS discharge tunnel. The combined brine and augmentation flow would mix in transit to the existing EPS discharge pond and then to the ocean.	RCF 38
iv. In order to minimize impingement, through-screen velocity at the surface water intake shall not exceed 0.15 meters per second (0.5 feet per second).	Yes	The process water intake is designed for a through-screen velocity of less than 0.5 ft/sec with only three screens in service and 15% fouling. If all four screens are in service, the through-screen velocity is well below 0.5 ft/sec. Each screen bay includes upstream and downstream stoplog slots to allow each bay to be dewatered and each screen isolated. All fish and debris collected in the traveling screen fish buckets would be returned to Agua Hedionda Lagoon at a location that minimizes the potential for recirculation. The portion of the screening structure devoted to the augmentation flow would also be screened by four BWT center-flow traveling water screens (or equal) with 1.0-mm mesh. As with the process water screens, the augmentation flow screens would be equipped with fish protection features. The flow augmentation intake is designed for a through-screen velocity of less than 0.5 ft/sec with four screens in service and 15% fouling. See Appendix B for a detailed discussion of the fish-friendly screen design.	RCF 39
(2) Considerations for Brine Discharge Technology:			RCF 40
(a) The preferred technology for minimizing intake and mortality of all forms of marine life resulting from brine discharge disposal is to commingle brine with wastewater (e.g., agricultural, municipal, industrial, power plant cooling water, etc.) that would otherwise be discharged to the ocean. The wastewater must provide adequate dilution to ensure salinity of the commingled discharge meets the receiving water limitation for salinity in chapter III.M.3. Nothing in this section shall preclude future recycling of the wastewater.	Yes	Wastewater is unavailable to dilute the Expanded CDP's brine discharge (see RCF 24). The CDP's brine discharge pipeline is connected to the existing EPS discharge infrastructure. This infrastructure is available for the Expanded CDP discharge. However, Cabrillo has notified Poseidon of its intent to discontinue the operation of once-through-cooling pumps serving the EPS and CDP as early as June 1, 2017. Following retirement of the existing once-through-cooling system EPS wastewater will no longer be available to dilute the Expanded CDP discharge. After the EPS, the closest source of treated wastewater is the Encina Water Pollution Control Facility (EWPCF). The EWPCF is located approximately two miles south of the CDP. The current average daily flow at the EWPCF, 21.6 mgd, does not provide adequate dilution to ensure salinity of the commingled discharge will reliably meet the receiving water limitation for salinity.	RCF 41

		The next closest source of treated wastewater is the outfall serving San Luis Rey Wastewater Treatment Plant, the Las Salina Wastewater Treatment Plant, the Fallbrook Public Utility District Wastewater Treatment Plant, Camp Pendleton and the Oceanside brackish water reverse osmosis facility. The Oceanside outfall is located approximately ten miles northeast of the CDP. The current daily flow in the outfall is approximately 20 mgd, which does not provide adequate dilution to ensure salinity of the commingled discharge will reliably meet the receiving water limitation. Further limiting the availability of treated wastewater for brine dilution from EWPCF and SLRWTP is that both facilities are considering opportunities for expanding their water recycling programs.	
(b) Multiport diffusers are the next best method for disposing of brine when the brine cannot be diluted by wastewater and when there are no live organisms in the discharge. Multiport diffusers shall be engineered to maximize dilution, minimize the size of the brine mixing zone, minimize the suspension of benthic sediments, and minimize mortality of all forms of marine life.	Yes	As noted in Section RCF 28 through RCF 31, Poseidon evaluated a new multiport diffuser system would be located approximately offshore, 3,280 feet northwest of kelp beds. The diffuser system evaluated was engineered to maximize dilution, minimize the size of the brine mixing zone, minimize the suspension of benthic sediments, and minimize marine life mortality in accordance with the provisions of the Ocean Plan.	RCF 42
(c) Brine discharge disposal technologies other than wastewater dilution and multiport diffusers, such as flow augmentation, may be used if an owner or operator can demonstrate to the regional water board that the technology provides a comparable level of intake and mortality of all forms of marine life as wastewater dilution if wastewater is available, or multiport diffusers if wastewater is unavailable. The owner or operator must evaluate all of the individual and cumulative effects of the proposed alternative discharge method on the intake and mortality of all forms of marine life, including (where applicable); intake-related entrainment, osmotic stress, turbulence that occurs during water conveyance and mixing, and shearing stress at the point of discharge. When determining the intake and mortality associated with a brine discharge disposal technology or combination of technologies, the regional water board shall require the owner or operator to use empirical studies or modeling to:	Yes	**Analysis of Intake and Mortality of All Forms of Marine Life Due to Operation of Multiport Diffuser and Flow Augmentation Brine Disposal Technology.** **Multiport Diffuser.** Since wastewater is unavailable to dilute the Expanded CDP's brine discharge, Poseidon evaluated the individual and cumulative effects of multiport diffuser and flow augmentation on the intake and mortality of all forms of marine life, including (where applicable); intake-related entrainment, osmotic stress, turbulence that occurs during water conveyance and mixing, and shearing stress at the point of discharge. The results of this evaluation are summarized below. **Evaluation of Entrainment Effects.** Chapter III.M. requires a detailed entrainment study for estimating operational mortality related to intakes and diffusers. Section III.M.2.e.(1)(a) provides that the Regional Water Boards may permit the use of existing entrainment data from the facility to meet this requirement. Poseidon commissioned MBC Applied Environmental Sciences (“MBC”) to evaluate the entrainment effects of each brine discharge alternatives under consideration for the Expanded CDP (see Appendix K). MBC evaluated the intake and mortality of each alternative by calculating the Area of Production Foregone (the “APF”) and comparing these results to determine which discharge alternative will result in the lowest intake and mortality of all forms of marine life (see Appendix K). Similar to the prior entrainment assessment of the CDP approved by the Regional Water Board, MBC’s analysis relies on Tenera Environmental 2008 EPS Impingement Mortality and Entrainment Characterization Study (the “CDP Entrainment Study”) as the primary larval-entrainment data source. The CDP Entrainment Study, and others produced in support of Poseidon’s CDP permitting applications, was reviewed by Dr. Peter Raimondi, an independent scientist with extensive experience evaluating entrainment studies on behalf of California State Agencies, including the Commission and the San Diego Regional Water Board in support of its the 2009 Water Code 13142.5 determination for the CDP. The Commission retained Dr. Raimondi to advise the Commission on the development of the CDP Marine Life Mitigation Plan. In April 2008, Dr. Raimondi determined the entrainment study was consistent with the best available science with minor suggestions for improvement. He concluded that the study provided adequate data to determine the types and numbers of organisms that would be subject to entrainment (see Appendix K). Multiport Diffuser Entrainment, Turbulence and Shear Stress. The multiport diffuser alternatives would discharge brine through a 72” outfall pipeline extending approximately 4,000 feet offshore would convey the brine discharge from the SWRO building to the multiport diffuser system where four duck-bill diffuser ports would eject the brine into the water column at a high velocity to promote rapid diffusion and dispersion. Under the diffuser alternatives, the Expanded CDP would discharge 60 mgd of brine, which would entrain 943 mgd of the surrounding water as it is discharged. This volume equals the volume of ambient seawater required to dilute the brine to within 2 ppt of the natural background salinity of 33.5 ppt: ((60 mgd x 67 ppt) + (945 mgd x 33.5 ppt))/(60 mgd + 945 mgd) = 35.5 ppt .	RCF 43

The Staff Report and Substitute Environmental Documentation for Amendment to the Water Quality Control Plan for Ocean Waters of California Addressing Desalination Facility Intakes, Brine Discharges, and the Incorporation of other Non-substantive Changes approved by the State Water Board in conjunction with the adoption of Chapter III.M. of the Ocean Plan provides the following with respect to the turbulence and shearing stress associated with the operation of a multiport diffuser: "until additional data is available, [the State Water Board] assume[s] that larvae in 23 percent of the total entrained volume of diffuser dilution water are killed by exposure to lethal turbulence." (SED Section 8.5.1.2). Thus, 23% of the entrained receiving water volume, or 217 mgd, represents the volume of water, and associated ichtyoplankton, subject to 100% mortality.

Potential diffuser-induced entrainment estimates were calculated using data from stations near the proposed diffuser site 4,000 feet offshore of the CDP. The calculated APF associated with the operation of the multiport diffuser is 67 acres using the methodology set forth in Appendix E of the Staff Report. The methodology for calculating the APF is described in Appendix K.

Flow Augmentation Entrainment. Flow augmentation is expected to require 171 mgd of seawater for brine dilution purposes. This additional seawater withdrawal would be used to dilute the brine in the discharge channel prior to discharging to the receiving water. As described in RCF 28, the flow augmentation system would pump flow to the existing EPS discharge channel using four low turbulence axial flow or screw centrifugal pumps and an associated conveyance system. The fish-friendly design elements of the flow augmentation system are designed and expected to reduce entrainment mortality. This expectation is based on the following information:

Entrainment. The magnitude of entrainment losses for any species from flow augmentation is a function of the number or proportion of the organisms entrained and the subsequent mortality of those organisms as they pass through the screens, pumps, channels, and conveyance system. The proposed flow augmentation system would be equipped with screens with 1.0-mm mesh that would potentially reduce entrainment in flow augmentation intake/discharge structure. If we assume no reduction in entrainment losses from the screens, and we also assume 100% mortality of all organisms entrained in the flow augmentation system, the calculated area of production foregone ("APF") as a function of the potentially affected habitat for the 171 mgd flowing through the flow augmentation system is 48 acres (Appendix K). The actual entrainment mortality is expected to be less.

Pump Passage. Flow augmentation at the CDP would be accomplished by pumping additional flow from the intake tunnels to mix with the brine flow generated by the SWRO process. Poseidon has committed to using fish-friendly flow augmentation pumps to minimize entrainment mortality. As noted in Appendix J, Fish-friendly pumps were originally designed for transferring fish in the aquaculture industry. Such pumps have demonstrated the capacity to transfer fish with little or no injury. Since their inception, fish-friendly pumps have been used in fish passage and protection facilities to convey fish to a safe release location. There are several types of fish-friendly pumps available, each designed with the common goal of safely transferring live fish. Each fish-friendly pump type employs certain fundamental principles that reduce the potential injury and mortality to fish. To varying degrees, fish-friendly pump designs limit fish exposure to stressors, such as pressure, shear, and impeller blade strike. More specifically, fish-friendly pumps limit fish exposure to the stresses associated with pump passage, including pressure changes, blade strike, and shear. The low lift pumps specified for the CDP flow augmentation system would be fish-friendly axial flow Bedford pumps. The low head design of the pumps (approximately 5 psi) should minimize the potential for pressure-related injuries. These pumps have been designed and used to safely pass live fish for pumping applications worldwide. The pump specified for the CDP has been tested with juvenile and adult fish at a full scale for fish-friendliness (Appendix J). A total of 373 fish were passed through the pump operating at 330 rpm discharging 1.3m3/sec (46 ft3/sec) and survival was 100%.

Conveyance System Turbulence and Shear Stress. The entrained organisms are also exposed to shear and turbulence forces during mixing of the brine and dilution flows in the flow augmentation conveyance system. The location of entrained organisms when the dilution and brine flows are mixed would affect whether they would be exposed to areas of high shear in the discharge tunnel. The mixing point is being designed to minimize the creation of high shear zones while still promoting efficient mixing of the two flows.

CFD and Hydrodynamic modeling was conducted by Alden Research Laboratory (Appendix L) and Dr. Scott Jenkins (Appendix C) to determine the duration of larval exposure to elevated salinity. Table 4 presents the matrix of durations based on varying flows at

the CDP during average ocean conditions. These exposure durations formed the basis of the biological assays conducted during Nautilus' salinity tolerance testing discussed below.

Table 4.
Ichthyoplankton Exposure Durations

Total Discharge Flow Rate	Total Discharge Salinity Level	Time Exposure for Salinity in Discharge Tunnel	Time Exposure for Salinity from Discharge Tunnel to BMZ (35.5 ppt)	Time Exposure for Salinity from BMZ (35.5 ppt) to Average Ambient Ocean (33.5 ppt)
184 mgd	44 ppt	2.8 min	30.0 min + Pond[1]	26.7 min
238 mgd	42 ppt	2.2 min	26.9 min +Pond[1]	24.5 min
254 mgd	40 ppt	1.7 min	24.3 min +Pond[1]	22.2 min

1. Residence time in the discharge pond ranges from less than one minute to ten minutes, with a median residence time of 5.5 minutes

The CDP flow augmentation system has been designed to minimize shear and turbulence by specifying fish-friendly equipment and designing the new discharge conveyance system to minimize hydraulic disturbances that can contribute to excessive turbulence and shear. The system has been designed for the dual purposes of efficiently mixing the brine and dilution flows and for minimizing the potential for injury and mortality of entrained organisms. The following lists the features of the flow augmentation system that have been designed to ensure compliance with the requirements to minimize shear and turbulence.

- Fish-friendly axial flow pumps
- Hydraulically-optimized discharge from pumps to flow conveyance piping to reduce the risk of shear
- Long-radius bends to minimize turbulence and shear at junctions
- Gradual expansions and contractions in flow conveyances to gradually increase/decrease flow velocity to reduce the risk of shear
- Flow conveyances sized to minimize in-pipe velocity which reduces the risk of shear

Therefore, pending results of ongoing modeling efforts (Appendix L), we expect that shear will not be a major contributor to injury and mortality in the flow augmentation system.

Osmotic Stress Poseidon contracted with Nautilus Environmental (Nautilus) to assess the potential effects of varying salinity levels on sensitive larval-stage marine organisms. The study design was focused on potential effects due to salinity fluctuations on organisms travelling into the intake from ambient seawater salinity in the receiving environment, through the brine dilution systems of the Carlsbad desalination plant, and then being discharged back into the receiving water. Species and endpoints evaluated for this study included red abalone (Haliotis rufescens) development and purple sea urchin (Strongylocentrotus purpuratus) development. These species were identified as two of the most sensitive to elevated salinity levels relative to other accepted monitoring species in the Ocean Plan, based on previous studies using standard EPA whole effluent toxicity (WET) tests (Philips et al., 2012).

The goal of this study was to determine the salinity- induced adverse effects to these organisms as they travel through the brine dilution system. The study was designed to assess several potential operating scenarios involving differing salinity levels and residence times that were within the plant's operational capabilities. Procedures were established to simulate the salinity fluctuations an organism might experience as it moves through the brine dilution system, encountering elevated salinity as the brine discharge is mixed with seawater from the flow augmentation system then a reduction in salinity to 35.5 ppt as it travels through the discharge system to the edge of the brine mixing (BMZ), and finally a reduction from 35.5 ppt to ambient salinity.

Using these procedures, the report included in Appendix I and summarized below describes the methods and results of this study, including an operating scenario that is expected to result in no salinity-related adverse effects to organisms passing through the system.

There were three distinct phases common to each exposure scenario; only the salinity at the end of phase 1 (e.g., 42 ppt), and duration of each phase were varied:

- Phase 1 simulated the initial mixing of brine with seawater from the flow augmentation system. The salinity of the dilution water was raised from ambient seawater (33.5 ppt) by adding 67 ppt brine at a rate calculated to reach 42 ppt salinity within approximately one minute, and then held there for a specified amount of time (1.7 to 2.8 minutes depending on the scenario being tested).
- Phase 2 simulated the dilution that occurs in the mixing pond and out to the edge of the brine mixing zone. This simulation involved the continuous addition of ambient seawater at a rate calculated to reach 35.5 ppt within a specified period (34 to 39 minutes depending on the scenario being tested).
- Phase 3 simulated the dilution that occurs in the brine mixing zone. This simulation involved the continuous addition of ambient seawater at a rate calculated to reach 33.5 ppt in 30 minutes.

All scenarios assumed that transitions between salinity levels were linear. The tests were conducted in a step-wise manner, starting with the lowest salinity and duration, and then testing at increased salinity and duration if no effects were observed. The various scenarios tested, as well as species tested and test dates, are described in Table 4.

Table 5.
Exposure Scenarios and Test Dates for the Pump/Brine Dilution Study

Exposure Scenario	Species; Test Date	Phase 1	Phase 2	Phase 3
1	Abalone; 02/06/15 Urchin; 02/17/15	33.5 to 44 ppt in one minute, hold for 2.8 minutes	44 to 35.5 ppt in 39 minutes	35.5 to 33.5 ppt in 30 minutes
2	Abalone; 01/30/15	33.5 to 42 ppt in one minute, hold for 2.2 minutes	42 to 35.5 ppt in 36 minutes	35.5 to 33.5 ppt in 30 minutes
3	Abalone; 01/22/15	33.5 to 40 ppt in one minute, hold for 1.7 minutes	40 to 35.5 ppt in 34 minutes	35.5 to 33.5 ppt in 30 minutes

.
A summary of the results indicates normal development at the end of Phase 3 for all Exposure Scenarios and species is shown in Figure 11. Results for all species and exposure scenarios are presented in Table 5. Full test results, including all water quality measurements and summary tables, are presented in Appendix I0.

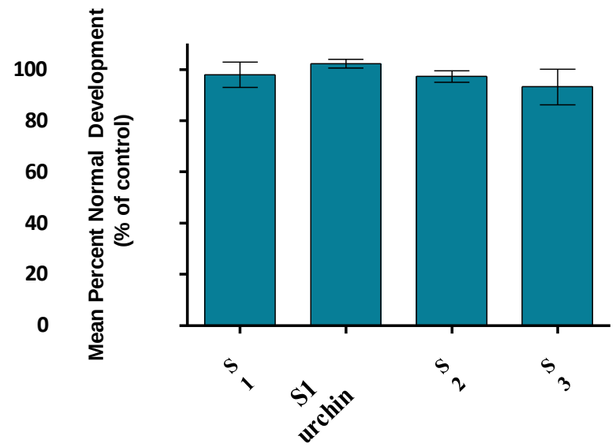


Figure 11. Mean Normal Development after Completion of Phase 3 for all four Scenarios (S1-S3). Scenario #1: P1 44 ppt for 2.8 min, P2: 39 min, P3: 30 min; Scenario #2: P1 42 ppt for 2.2 min, P2: 36 min, P3: 30 min; Scenario #3: P1 40 ppt for 1.7 min, P2: 34 min, P3: 30 min.

None of the three scenarios described in this report resulted in statistically significant effects after Phase 3 compared to the control exposure ($p<0.05$). In all exposure scenarios, replicates were terminated after each of the phases. There was one statistically significant effect ($p<0.05$) that was detected in Phase 1 of Exposure Scenario #2. However, the effect was small (8.5 percent compared to the Phase 1 control results), and there were no statistically significant effects observed in Phase 2 or 3 of this exposure compared to the controls. Therefore, Nautilus concluded that this finding was not due to the treatment itself.

Although urchins were tested only with Scenario #1, the similarity of results to those obtained for abalone suggests that the abalone results should be predictive of those obtained with echinoderms.

Table 6.
Summary of Results for Bench-top Exposure Scenarios

Scenario #	Scenario Description	Test date	Species Tested	Mean Normal Development			
				Sample	Phase 1	Phase 2	Phase 3
1	P1: 44 ppt for 2.8 minutes; P2: 39 min.; P3: 30 min.	2/6/15	Abalone Development	Control	83.8	77.7	80.5
				Brine Exposure	76.7*	79.1	78.8
1	P1: 44 ppt for 2.8 min.; P2: 39 min.; P3: 30 min	2/17/15	Urchin Development	Control	93.7	92.0	89.3
				Brine Exposure	91.3	90.3	91.3
2	P1: 42 ppt for 2.2 min.; P2: 36 min.; P3: 30 min.	1/30/15	Abalone Development	Control	94.0	93.7	94.3
				Brine Exposure	95.7	92.7	91.7
3	P1: 40 ppt for 1.7 min.; P2: 34 min.; P3: 30 min.	1/22/15	Abalone Development[a]	Control[a]	66.0	61.0	67.3
				Brine Exposure	68.5	67.0	60.3

P1, P2, P3 = Phase 1, 2, and 3
* An asterisk indicates a statistically significant decrease compared to the control ($p < 0.05$)
[a] The abalone test Scenario #3 conducted on January 22 did not meet the 80% test acceptability criterion for normal development in the control.

In summary, the brine dilution toxicity study focused on the species that is most sensitive to elevated salinity and concluded that these species experienced no significant toxic effects after being exposed elevated salinity conditions similar those that would exist during transit through proposed flow augmentation system offshore to the location where the salinity of the discharge would be match the surrounding seawater.

Notwithstanding the expected high rate of survival of all forms of marine life exposed to the cumulative effects of the flow augmentation system, for the purposes of demonstrating to the Regional Water Board that this technology provides a comparable level of intake and mortality of all forms of marine life to that of the multiport diffusers, Poseidon has conservatively assumed the worst case outcome -- 100% mortality of all organisms passing through the flow augmentation system. Flow augmentation is expected to require 171 mgd of seawater for brine dilution purposes. Therefore, 171 mgd, represents the volume of water, and associated ichtyoplankton, Poseidon has assumed would be subject to 100% mortality. The calculated APF associated with the operation of the flow augmentation system is 48 acres using the methodology set forth in Appendix E of the Staff Report. The methodology for calculating the APF is described in Appendix K.

i. Estimate intake entrainment impacts using an ETM/APF approach.	Yes	Using the methodology set forth in Appendix E of the Staff Report, the calculated APF associated with the operation of the multiport diffuser is 67 acres, and the calculated APF associated with the operation of flow augmentation system is 48 acres. The methodology for calculating the APF is described in Appendix K.	RCF 44

ii.	Estimate degradation of all forms of marine life from elevated salinity within the brine mixing zone, including osmotic stresses, the size of impacted area, and the duration that all forms of marine life are exposed to the toxic conditions. Considerations shall be given to the most sensitive species, and community structure and function.	Yes	See RCF 43.	RCF 45
iii.	Estimate the intake and mortality of all forms of marine life that occurs as a result of water conveyance, in-plant turbulence or mixing, and waste discharge.	Yes	See RCF 43.	RCF 46
iv.	Within 18 months of beginning operation, submit to the regional water board an empirical study that evaluates intake and mortality of all forms of marine life associated with flow augmentation the alternative brine discharge technology. The study must evaluate impacts caused by any augmented intake volume, intake and pump technology, water conveyance, waste brine mixing, and effluent discharge. Unless demonstrated otherwise, organisms entrained by flow augmentation the alternative brine discharge technology are assumed to have a mortality rate of 100 percent. The study period shall be at least 12 consecutive months. If the regional water board requires a study period longer than 12 months, the final report must be submitted to the regional water board within 6 months of the completion of the empirical study.	No	The flow augmentation discharge technology is assumed to have a mortality rate of 100%, therefore no empirical study is required.	RCF 47
v.	If the empirical study shows that flow augmentation the alternative brine discharge disposal technology results in more intake and mortality of all forms of marine life than a facility using wastewater dilution or multiport diffusers, then the facility must either (1) cease using flow augmentation the alternative brine discharge technology and install and use wastewater dilution or multiport diffusers to discharge brine waste, or (2) re-design the flow augmentation the alternative brine discharge technology system to minimize intake and mortality of all forms of marine life to a level that is comparable with wastewater dilution if wastewater is available, or multiport diffusers if wastewater is unavailable, subject to regional water board approval.		Noted.	RCF 48
d.	Flow augmentation as an alternative brine discharge technology is prohibited with the following exceptions:			RCF 49
i.	At facilities that use subsurface intakes to supply augmented flow water for dilution. Facilities that use subsurface intakes to supply augmented flow water for dilution are exempt from the requirements of chapter III.M.2.d.(2)(c) if the facility	No		RCF 50

meets the receiving water limitation for salinity in chapter III.M.3.			
ii. At a facility that has received a conditional Water Code section 13142.5(b) determination and is over 80 percent constructed by [the effective date of this plan]. If the An owner or operator of the facility proposes proposing to use flow augmentation as an alternative brine discharge technology, the facility must: Use low turbulence intakes (e.g., screw centrifugal pumps or axial flow pumps) and conveyance pipes.; convey and mix dilution water in a manner that limits thermal stress, osmotic stress, turbulent shear stress, and other factors that could cause intake and mortality of all forms of marine life; Facilities proposing to using flow augmentation must comply with chapter III.M.2.d.(1); facilities proposing to using flow augmentation through surface intakes are prohibited from and not discharging through multiport diffusers.	Yes	The CDP has received a conditional Water Code section 13142.5(b) determination for co-located and temporary standalone operations (see Order R9-2006-0065 as amended) and is over 80% constructed. Poseidon proposes to use flow augmentation as an alternative brine discharge technology for the Expanded CDP. As noted in RCF 28 and RCF 43, Poseidon proposes to retrofit the Expanded CDP use low turbulence intakes (e.g., screw centrifugal pumps or axial flow pumps) and conveyance pipes.; convey and mix dilution water in a manner that limits thermal stress, osmotic stress, turbulent shear stress, and other factors that could cause intake and mortality of all forms of marine life and will comply with chapter III.M.2.d.(1).	RCF 51
e. Mitigation			
Mitigation for the purposes of this section is the replacement of all forms of marine life or habitat that is lost due to the construction and operation of a desalination facility after minimizing intake and mortality of all forms of marine life through best available site, design, and technology. The regional water board shall ensure an owner or operator fully mitigates for the operational lifetime of the facility and uses the best available mitigation measures feasible to minimize intake and mortality of all forms of marine life. The owner or operator may choose whether to satisfy a facility's mitigation measures pursuant to chapter III.M.2.e.(3), or if available, M.2.e.(4), or a combination of the two.	Yes	The Marine Life Mitigation Plan (the "MLMP") approved by the Regional Water Board pursuant to Order R9-2009-0038 satisfies the Expanded CDP's mitigation needs pursuant to chapter III.M.2.e.(3) and III.M.2.e.(7). A copy of the MLMP is included in Appendix R.	RCF 52
(1) Marine Life Mortality Report. The owner or operator of a facility shall submit a report to the regional water board estimating the marine life mortality resulting from construction and operation of the facility after implementation of the facility's required site, design, and technology measures.	Yes	The direct and indirect effects on all forms of marine life resulting from various alternatives under consideration for the Expanded CDP are summarized in Table 2.	RCF 53
(a) For operational mortality related to intakes, the report shall include a detailed entrainment study. The entrainment study period shall be at least 12 consecutive months and sampling shall be designed to account for variation in oceanographic or hydrologic conditions and larval abundance and diversity such that abundance estimates are reasonably accurate. At their discretion, the regional water boards may permit the use of existing entrainment data from the facility to meet this requirement. Samples must be collected using a mesh size no larger than 335 microns and individuals collected shall be identified to the lowest taxonomical level practicable. The ETM/APF analysis shall be representative of the entrained species collected using the 335 micron net. The APF shall be calculated using a one-sided, upper	Yes	The CDP Entrainment study included in Appendices K and P addresses the requirement set forth in Section III.M.2.(e)(1)(a). The CDP Entrainment Study, and others produced in support of Poseidon's CDP permitting applications, was reviewed by Dr. Peter Raimondi, an independent scientist with extensive experience evaluating entrainment studies on behalf of California State Agencies, including the Commission and the San Diego Regional Water Board in support of its the 2009 Water Code 13142.5 determination for the CDP. The Commission retained Dr. Raimondi to advise the Commission on the development of the CDP Marine Life Mitigation Plan. Dr. Raimondi reported his findings that the EPS Entrainment Study in April 2008. He reported that the EPS Entrainment Study, and Poseidon's use of the entrainment data for the CDP was consistent with the best available science (see Appendix K). Dr. Raimondi concluded that the study provided adequate data to determine the types and numbers of organisms that would be subject to entrainment.	RCF 54

	95 percent confidence bound for the 95th percentile of the APF distribution. [NOTE: This language is optional additional language for the board members to consider at the May 6, 2015 board meeting: An owner or operator may use an alternative mitigation assessment method if the method assesses intake and mortality of all forms of marine life and can be used to determine the number of mitigation acres needed to fully mitigate for the impacts. The method must be peer reviewed by a neutral third party expert review panel and then approved by the regional water board in consultation with the State Water Board staff.] An owner or operator with subsurface intakes is not required to do an ETM/APF analysis for their intakes and is not required to mitigate for intake-related operational mortality. The regional water board may apply a one percent reduction to the APF acreage calculated in the Marine Life Mortality Report to account for the reduction in entrainment of all forms of marine life when using a 1.0 mm slot size screen.			
(b)	For operational mortality related to discharges, the report shall estimate the area in which salinity exceeds 2.0 parts per thousand above natural background salinity or a facility-specific alternative receiving water limitation (see §L chapter III.M.3). The area in excess of the receiving water limitation for salinity shall be determined by modeling and confirmed with monitoring. The report shall use any acceptable approach approved by the regional water board for evaluating mortality that occurs due to shearing stress resulting from the facility's discharge, including any incremental increase in mortality resulting from a commingled discharge.	Yes	The area in which the brine discharge from the two flow augmentation alternatives exceeds 2.0 ppt above the natural background salinity is a 15.5 acre semicircle extending 200 meters (656 ft.) from the end of the discharge channel. The size of the area has been determined through a hydrodynamic modeling study that is included in Appendix C and will be confirmed with monitoring. The area in which the brine discharge from the two multiport diffuser alternatives exceeds 2.0 ppt above the natural background salinity is 4,000 feet offshore where four duck-bill diffuser ports located 100 feet apart would eject the brine into the water column at a high velocity to promote rapid diffusion and dispersion. The Brine Mixing Zone would extend 100 meters (328 ft.) out from each of the four discharge points with the combined area inside the Brine mixing Zone covering 14.4 acres Mortality caused by shear stress is expected to be low based on the design of the flow augmentation system. Design efforts have focused on minimizing potential high shear zones by including the features described above. In addition, the flow augmentation system will be screened by 1-mm center-flow traveling water screens, so only small organisms that could entrain through 1-mm mesh could be exposed to any shear present in the system. The area of the greatest shear in the flow augmentation system is likely to be at the pump impellor; however, Poseidon proposes to use the fish-friendly axial flow pumps described in Appendix B to minimize pump induced shear stress.. Downstream of pumps, the remainder of the flow conveyance system is not likely to present a risk to organisms in the form of high shear. Therefore, pending results of ongoing modeling efforts (Appendix L), we expect that shear will not be a major contributor to injury and mortality in the flow augmentation system.	RCF 55
(c)	For construction-related mortality, the report shall use any acceptable approach approved by the regional water board for evaluating the mortality that occurs within the area disturbed by the facility's construction. The regional water board may determine that the construction-related disturbance does not require mitigation because the disturbance is temporary and the habitat is naturally restored.	No	The proposed surface intake with flow augmentation alternative would not require any construction in the marine environment. The surface intake with multiport diffuser alternative would impact four acres in the marine environment during construction, with one acre of permanent impacts remaining after construction. The subsurface intake with flow augmentation alternative would impact approximately 100 acres in the marine environment during construction, with 32 acres of permanent impacts remaining after construction. The subsurface intake with the multiport diffuser alternative would impact approximately 54 acres in the marine environment during construction, with 33 acres of permanent impacts remaining after construction.	RCF 56
(d)	Upon approval of the report by the regional water board in consultation with State Water Board staff, the calculated marine life mortality shall form the basis for the mitigation provided pursuant to this section.	Yes	The direct and indirect effects on all forms of marine life resulting from various alternatives under consideration for the Expanded CDP are summarized in Table 2.	RCF 57
(2)	The owner or operator shall mitigate for the mortality of all forms of marine life determined in the report above by	Yes	The Marine Life Mitigation Plan (the "MLMP") approved by the Regional Water Board pursuant to Order R9-2009-0038 satisfies the Expanded CDP's mitigation needs pursuant to chapter III.M.2.e.(3) and III.M.2.e.(7). A copy of the MLMP is included in Appendix R.	RCF 58

choosing to either complete a mitigation project as described in chapter III.M.2.e.(3) or, if an appropriate fee-based mitigation program is available, provide funding for the program as described in chapter III.M.2.e.(4). The mitigation project or the use of a fee-based mitigation program and the amount of the fee that the owner or operator must pay is subject to regional water board approval.			
(3) Mitigation Option 1: Complete a Mitigation Project. The mitigation project must satisfy the following provisions:	Yes	The Marine Life Mitigation Plan (the "MLMP") for the CDP was approved by the Regional Water Board pursuant to Order R9-2009-0038, which included the following findings: 41. The MLMP sets forth a plan for mitigation and monitoring for impacts due to entrainment from the CDP as a means of complying with Water Code 13142.5(b). It was developed by the Discharger in consultation with multiple resource agencies including the Regional Board, and was approved by the California Coastal Commission (Commission) on August 6, 2008. Coastal Commission staff worked with the Discharger and the final language for the MLMP was approved by the Coastal Commission on December 10, 2008. The MLMP was written for long term stand-alone operation, and proposes phased implementation of up to 55.4 acres of wetland mitigation with the Southern California Bight. Phase I requires creation of 37 acres, and Phase II requires an additional 18.4 acres which the Discharger my propose to eliminate or reduce if it proposes alternative mitigation, such as new entrainment reduction technology or mitigation credits for dredging (emphasis added). 50. Although the CDP will rely on EPS discharge water for its source water to the extent it is available, the mitigation provided for in the Minimization Plan, incorporating the MLMP, as conditioned below is expected to fully offset the projected entrainment and impingement losses for up to 304 mgd of source water withdrawn directly from the Agua Hedionda Lagoon under conditions of co-located operation. With these modifications to the March 27, 2009 Minimization Plan, the Regional Board finds that the proposed mitigation for the CDP is the best available mitigation feasible for the CDP (emphasis added). Subsequent to approval of the MLMP by the Regional Water Board, Poseidon voluntarily agreed to increase the size of the mitigation project to 66.4 acres to remove any doubt that the mitigation project was capable of addressing both the projected impingement and entrainment impacts associated with the CDP. In September 2010, Poseidon entered into an MOU with the US Fish and Wildlife Service (the "USFWS") to locate the wetlands restoration project in the San Diego National Wildlife Restoration Complex at the south end of San Diego Bay (Appendix V). Since 2010, Poseidon, USFWS, Regional Water Board, and the Commission's Science Advisory Panel have been working to advance the planning, permitting and design of the wetlands restoration project. On March 9, 2011, the Regional Water Board adopted Resolution R9-2011-0028 approving the preliminary wetlands restoration plan and selection of the Otay River Floodplain Wetland Mitigation Site to Mitigate for entrainment and impingement impacts of the Carlsbad Desalination Project. A copy of the signed resolution is included in Appendix E. The MLMP satisfies the requirements of this section III.M.2.e.(3) and section III.M.2.e.(7). A copy of the MLMP is included in Appendix R.	RCF 59
(a) The owner or operator shall submit a Mitigation Plan. Mitigation Plans shall include: project objectives, site selection, site protection instrument (the legal arrangement or instrument that will be used to ensure the long-term protection of the compensatory mitigation project site), baseline site conditions, a mitigation work plan, a maintenance plan, a long-term management plan, an adaptive management plan, performance standards and success criteria, monitoring requirements, and financial assurances.		The MLMP included in Appendix R addresses these requirements.	

(b) The mitigation project must meet the following requirements:			
i. Mitigation shall be accomplished through expansion, restoration or creation of one or more of the following: kelp beds, estuaries, coastal wetlands, natural reefs, MPAs, or other projects approved by the regional water board that will mitigate for intake and mortality of all forms of marine life associated with the facility.	Yes	The MLMP included in Appendix R addresses these requirements.	RCF 60
ii. The owner or operator shall demonstrate that the project fully mitigates for intake-related marine life mortality by including expansion, restoration, or creation of habitat based on the APF acreage calculated in the Marine Life Mortality Report above. The owner or operator using surface water intakes shall do modeling to evaluate the areal extent of the mitigation project's production area to confirm that it overlaps the facility's source water body. Impacts on the mitigation project due to entrainment by the facility must be offset by adding compensatory acreage to the mitigation project.	Yes	The MLMP fully mitigates for intake-related marine life mortality by including restoration and creation of habitat based on the APF acreage calculated for the Expanded CDP. The mitigation project's production area does not overlap the facility's source water body.	RCF 61
iii. The owner or operator shall demonstrate that the project also fully mitigates for the discharge-related marine life mortality projected in the Marine Life Mortality Report above.	Yes	The MLMP fully mitigates for discharge-related marine life mortality by including restoration and creation of habitat based on the APF acreage calculated for the CDP.	RCF 62
iv. The owner or operator shall demonstrate that the project also fully mitigates for the construction-related marine life mortality identified in the Marine Life Mortality Report above.	No	Retrofitting the Expanded CPD with the proposed surface intake with flow augmentation does not require any construction in the marine environment. Therefore, there the Expanded CDP would not cause construction-related marine life mortality.	RCF 63
v. The regional water board may permit out-of-kind mitigation for mitigation of open water or soft-bottom species. In-kind mitigation shall be done for all other species whenever feasible.	Yes	As noted in the Commission Findings (Appendix R, page 13), the acreage requirements set forth in the MLMP approved by the Regional Water Board are based on out-of-kind mitigation for mitigation of open water or soft-bottom species and in-kind mitigation for all other species.	RCF 64
vi. For out-of-kind mitigation, an owner or operator shall evaluate the biological productivity of the impacted open water or soft-bottom habitat calculated in the Marine Life Mortality Report and the proposed mitigation habitat. If the mitigation habitat is a more biologically productive habitat (e.g. wetlands, estuaries, rocky reefs, kelp beds, eelgrass beds, surfgrass beds), the regional water boards may apply a mitigation ratio based on the relative biological productivity of the impacted open water or soft-bottom habitat and the mitigation habitat. The mitigation ratio shall not be less than one acre of mitigation habitat for every ten acres of impacted open water or soft-bottom habitat.	Yes	As noted in the Commission Findings (Appendix R, page 13), the acreage requirements set forth in the MLMP approved by the Regional Water Board are based on a mitigation ratio derived from the relative biological productivity of the impacted open water or soft-bottom habitat and the inter-tidal mitigation habitat to be provided by Poseidon. The mitigation ratio is one acre of mitigation habitat for every ten acres of impacted open water or soft-bottom habitat.	RCF 65

vii. For in-kind mitigation, the mitigation ratio shall not be less than one acre of mitigation habitat for every one acre of impacted habitat.	Yes	As noted in the Commission Findings (Appendix R, page 13, the acreage requirements set forth in the MLMP approved by the Commission and the Regional Water Board are based on a mitigation ratio for estuarine species is one acre of mitigation habitat for every acre of impacted estuarine habitat.	RCF 66
viii. For both in-kind and out-of-kind mitigation, the regional water boards may increase the required mitigation ratio for any species and impacted natural habitat calculated in the Marine Life Mortality Report when appropriate to account for imprecisions associated with mitigation, including but not limited to, the likelihood of success, temporal delays in productivity, and the difficulty of restoring or establishing the desired productivity functions.	Yes	As noted in the Commission Findings (Appendix R, page 13), the requirements set forth in the MLMP approved by the Commission and the Regional Water Board account for imprecisions associated with mitigation, including but not limited to, the likelihood of success, temporal delays in productivity, and the difficulty of restoring or establishing the desired productivity functions.	RCF 67
ix. The rationale for the mitigation ratios must be documented in the administrative record for the permit action.	Yes	The rationale for the mitigation ratios is documented in Appendix R, page 13.	RCF 68
(c) The Mitigation Plan is subject to approval by the regional water board in consultation with State Water Board staff and with other agencies having authority to condition approval of the project and require mitigation.	Yes	The Marine Life Mitigation Plan (the "MLMP") approved by the Commission and the Regional Water Board pursuant to Order R9-2009-0038 satisfies the Expanded CDP's mitigation needs pursuant to chapter III.M.2.e.(3) and III.M.2.e.(7). A copy of the MLMP is included in Appendix P. Poseidon respectfully requests Regional Board approval, in consultation with State Board staff, of the MLMP for purposes of this Report of Waste Discharge.	RCF 69
(4) Mitigation Option 2: Fee-based Mitigation Program. If the regional water board determines that an appropriate fee-based mitigation program has been established by a public agency, and that payment of a fee to the mitigation program will result in the creation and ongoing implementation of a mitigation project that meets the requirements of section chapter L M.2.e.(3), the owner or operator may pay a fee to the mitigation program in lieu of completing a mitigation project.	No		RCF 70
(a) The agency that manages the fee-based mitigation program must have legal and budgetary authority to accept and spend mitigation funds, a history of successful mitigation projects documented by having set and met performance standards for past projects, and stable financial backing in order to manage mitigation sites for the operational life of the facility.	No		RCF 71
(b) The amount of the fee shall be based on the cost of the mitigation project, or if the project is designed to mitigate cumulative impacts from multiple desalination facilities or other development projects, the amount of the fee shall be based on the desalination facility's fair share of the cost of the mitigation project.	No		RCF 72
(c) The manager of the fee-based mitigation program must consult with the California Department of Fish and Wildlife, Ocean Protection Council, Coastal Commission, State Lands Commission, and State and regional water boards to develop mitigation projects that will best compensate for intake and mortality of all forms of marine life caused by the desalination facility. Mitigation projects that increase or enhance the	No		RCF 73

<table>
<tr><td>viability and sustainability of all forms of marine life in Marine Protected Areas are preferred, if feasible.</td><td></td><td></td><td></td></tr>
<tr><td>(5) California Department of Fish and Wildlife, the regional water board, and State Water Board may perform audits or site inspections of any mitigation project.</td><td>Yes</td><td>The MLMP approved by the Regional Water Board places the Regional Water Board and its Executive Officer on equal footing with the Commission and its Executive Director with respect to implementation of the MLMP, including audits and site inspections of the mitigation project (see Finding 11, Order R9-2009-0038).</td><td>RCF 74</td></tr>
<tr><td>(6) An owner or operator, or a manager of a fee-based mitigation program, must submit a mitigation project performance report to the regional water board 180 days prior to the expiration date of their NPDES permit.</td><td>No</td><td></td><td>RCF 75</td></tr>
<tr><td>(7) For conditionally permitted facilities or expanded facilities, the regional water boards may:</td><td></td><td></td><td>RCF 76</td></tr>
<tr><td>(a) Account for previously-approved mitigation projects associated with a facility when making a new Water Code section 13142.5(b) determination.</td><td>Yes</td><td>Poseidon respectfully requests the Regional Water Board account for and accept the previously approved mitigation associated with the CDP when making its Water Code 13142.5(b) determination for the Expanded CDP. Poseidon requests that the Regional Water Board consider the Marine Life Mitigation Plan included in Appendix P that was approved by Commission for long-term stand-alone operations, and by the Regional Water Board for temporary stand-alone operations (see Appendices E, O, and P). As noted in Appendix R (page 15) the Commission found that 55.4 acres of estuarine wetland restoration subject to the conditions provided in the Marine Life Mitigation Plan provides a sufficient degree of certainty that the CDP's entrainment impacts will be mitigated for flows of up to 304 mgd through an open intake that is assumed to cause 100% mortality of all forms of marine life.</td><td>RCF 77</td></tr>
<tr><td>(b) Require additional mitigation when making a new Water Code section 13142.5(b) determination for any additional mortality of all forms of marine life resulting from the occurrence of the conditional event or the expansion of the facility. The additional mitigation must be to compensate for any additional construction, discharge, or other increases in intake or impacts or an increase in intake and mortality of all forms of marine life.</td><td>Yes</td><td>The impacted area of the marine environment and mitigation requirements for the existing CDP are shown in Table 6. The impacted area of the marine environment and mitigation requirements for the Expanded CDP with an assumed 100% mortality are shown in Table 7. As noted in Tables 6 and 7, the expansion of the CDP does not result in any additional mortality of all forms of marine life. The previously approved mitigation is adequate for both exiting and expanded CDP.

Table 7.
Existing CDP Impacted Area and Mitigation Requirements
<table><tr><th>Impact</th><th>Impacted Area</th><th>Mitigation Required</th><th>Confidence Limit</th><th>Reference</th></tr><tr><td>100% mortality of all form of marine life entrained by 304 mgd intake</td><td>113 acres[1]</td><td>55.4 acres[2]</td><td>80%</td><td>Page 20 of Appendix 2 of Appendix K</td></tr><tr><td>4.5 kg/day of impingement</td><td>11 acres</td><td>11 acres</td><td>NA</td><td></td></tr><tr><td>Zone of Initial Dilution semicircle extending 1,000 feet off the discharge structure</td><td>36 acres`</td><td>0 acres</td><td>NA</td><td></td></tr><tr><td>Total</td><td>160 acres</td><td>66.4 acres</td><td></td><td></td></tr></table>1. See Appendix R, page 11.
2. See Appendix R, page 14.</td><td>RCF 78</td></tr>
</table>

		Table 8. **Expanded CDP Impacted Area and Mitigation Requirements Assuming 100% Mortality** **Impact** / **Impacted Area** / **Mitigation Required** / **Confidence Limit** / **Reference** **100% mortality of all form of marine life entrained by 299 mgd intake** / 84 acres[1] / 65.1 acres / 95% / Page 8 of Appendix K **0 kg/day of impingement** / 0 acres / 0 acres / NA / 0.5 fps through-screen velocity coupled with fish return system is considered best available technology for impingement control. **Brine Mixing Zone semicircle extending 656 feet off the discharge structure** / 15.5 acres / 15.5 acres / NA / **Total** / **99.5 acres** / **80.6 acres** / / 1. See Appendix K, page 8.	
3 Receiving Water Limitation for Salinity			
(a) Chapter III.M.3 is applicable to all desalination facilities discharging brine into ocean waters, including facilities that commingle brine and wastewater.	Yes	Poseidon acknowledges that Chapter III.M.3 is applicable to the CDP.	RCF 79
(b) The receiving water limitation for salinity shall be established as described below:			RCF 80
(1) Discharges shall not exceed a daily maximum of 2.0 parts per thousand (ppt) above natural background salinity measured no further than 100 meters (328 ft) horizontally from the each discharge point. There is no vertical limit to this zone.	Yes	In conjunction with the renewal and update of Order R9-2006-065, Poseidon is requesting the Regional Water Board consider the following receiving water limitation for salinity for the Expanded CDP: ▪ Increase daily maximum salinity limit in discharge pond from 40 ppt to 42 ppt ▪ Establish an initial salinity limit of 2 ppt over Natural Background Salinity at edge of brine mixing zone located 200 meters (656 ft.) from end of discharge structure pursuant to III.M.3.d.; and ▪ Consider adoption of a facility-specific alternative receiving water limitation pursuant to III.M.3.c. if: (i) Poseidon has addressed the requirements of section III.M.3.c to the satisfaction of the Regional Water Board; and (ii) the Regional Water Board determines the facility-specific alternative receiving water limitation is adequately protective of beneficial uses. As noted in Appendix C, the 20.5 year record for the natural mixing conditions offshore the discharge structure (wave height, tidal exchange, wind, currents, etc.) indicate that when the natural mixing conditions are at minimum levels, the Expanded CDP will not be able to run at full capacity and simultaneously meet a salinity limit of 2 ppt over Natural Background Salinity within the 200 meter (656 ft.) brine mixing zone. The frequency of recurrence of the minimal mixing conditions is about 2%, or approximately seven days per year. The chronic toxicity test results contained in Appendix H, suggest that the CDP may qualify for a facility-specific alternative receiving water limitation that would allow the facility to operate at full capacity across the entire range of natural mixing conditions in the historical record.	RCF 81
(2) In determining an effluent limit necessary to meet this receiving water limitation, permit writers shall use the formula in chapter III.C.4 that has been modified for brine discharges as follows: Equation 1: Ce= Co + Dm(2.0 ppt) Ce= (2.0 ppt + Cs) + Dm(2.0 ppt) Where: Ce= the effluent concentration limit, ppt Co= the salinity concentration to be met at the completion of initial dilution= 2.0 ppt + Cs Cs= the natural background salinity, ppt Dm= minimum probable initial dilution expressed as parts seawater per part brine discharge	Yes		RCF 82

(a) The fixed distance referenced in the initial dilution definition shall be no more than 100 meters (328 feet).		As noted above, Poseidon is requesting the Regional Water Board establish an initial salinity limit at 2 ppt over Natural Background Salinity at edge of brine mixing zone located 200 meters from end of discharge structure pursuant to III.M.3.d., and consider adoption of a facility-specific alternative receiving water limitation pursuant to III.M.3.c. if the Regional Water Board determines the facility-specific alternative receiving water limitation is adequately protective of beneficial uses, and Poseidon has addressed the requirements of section III.M.3.c to the satisfaction of the Regional Water Board.	RCF 83
(b) In addition, the owner or operator shall develop a dilution factor (Dm) based on the distance of 100 meters (328 feet) or initial dilution, whichever is smaller. The dilution factor (Dm) shall be developed within the brine mixing zone using applicable water quality models that have been approved by the regional water boards in consultation with State Water Board staff.		**Minimum Month Initial Dilution** **Determination of Minimum Month Initial Dilution.** The Ocean Plan establishes receiving water concentration standards that are to be achieved upon completion of initial dilution. Provision III.C.4.d of the Ocean Plan states: *For the purpose of this Plan, minimum initial dilution is the lowest average initial dilution within any single month of the year. Dilution estimates shall be based on observed waste characteristics, observed receiving water density structure, and the assumption that no currents, of sufficient strength to influence the initial dilution process, flow across the discharge structure.* Provision III.M.3.b of the 2015 Ocean Plan amendments requires owners or operators of desalination facilities to develop a dilution factor (Dm) for application to the BMZ: *The dilution factor (Dm) shall be developed within the Brine Mixing Zone using applicable water quality models that have been approved by the regional water boards in consultation with State Water Board staff.* Worst case initial dilution for the CDP surface discharge would occur during periods when receiving water salinity and temperature are highest at the same time that wind, waves, currents, and ocean water levels are minimal. For purposes of identifying minimum month initial dilution within the 200-meter CDP brine mixing zone (BMZ), the SEDXPORT surfzone dilution model was used to superimpose the 60 mgd CDP discharge on a 20.5 year record of hydrodynamic drivers, including: wave, wind, current, ocean water levels, temperature. Based on the 20.5 year hydrodynamic record, worst case month initial dilution conditions were identified as having occurred in August 1992 (cf. Figures 7 & 8). The August 1992 conditions meet the criteria (worst case monthly dilution out of a 20.5 year record and minimal to near-zero ocean currents) established in Ocean Plan Provisions III.C.4.d for the determination of minimum initial dilution within the BMZ. Figure 12 presents a probability histogram of computed initial dilution achieved at a 200 meter distance from the discharge jetty (e.g. the edge of the BMZ) for a 60 mgd CDP discharge under permanent stand-alone operation during the August 1992 worst case hydrodynamic conditions. These initial dilution results are evaluated at the seabed where the salinity of the partially diluted dense brine discharge is greatest. Initial dilutions during this worse case month (computed using six-hour time increments during the 31-day period) ranged from a low of 9.1:1 to a high of 17.3:1. Mean monthly dilution during this worst case month was 10.4:1. While instantaneous initial dilutions at any given point and any given time along the BMZ edge continuously vary with the instantaneous breaking wave heights, (whereby the surf zone mixing creates a natural diffuser), the 10.4:1 mean initial dilution at the 200 meter distance during August 1992 worst case conditions (probability of occurrence of 0.4 percent) represents the most conservative characterization of Ocean Plan-defined lowest initial dilution within any single month of the year to serve as the minimum initial dilution for the CDP discharge.	RCF 84

Implications on Receiving Water Compliance. Equation 1 of the 2015 Ocean Plan amendments establishes how the minimum month initial dilution is applied for purposes of determining effluent concentration standards required to implement the Ocean Plan receiving water salinity standard:

$$Ce = (2.0\ ppt + Cs) + Dm \times 2.0\ ppt$$ (Equation 1 of California Ocean Plan Amendment)

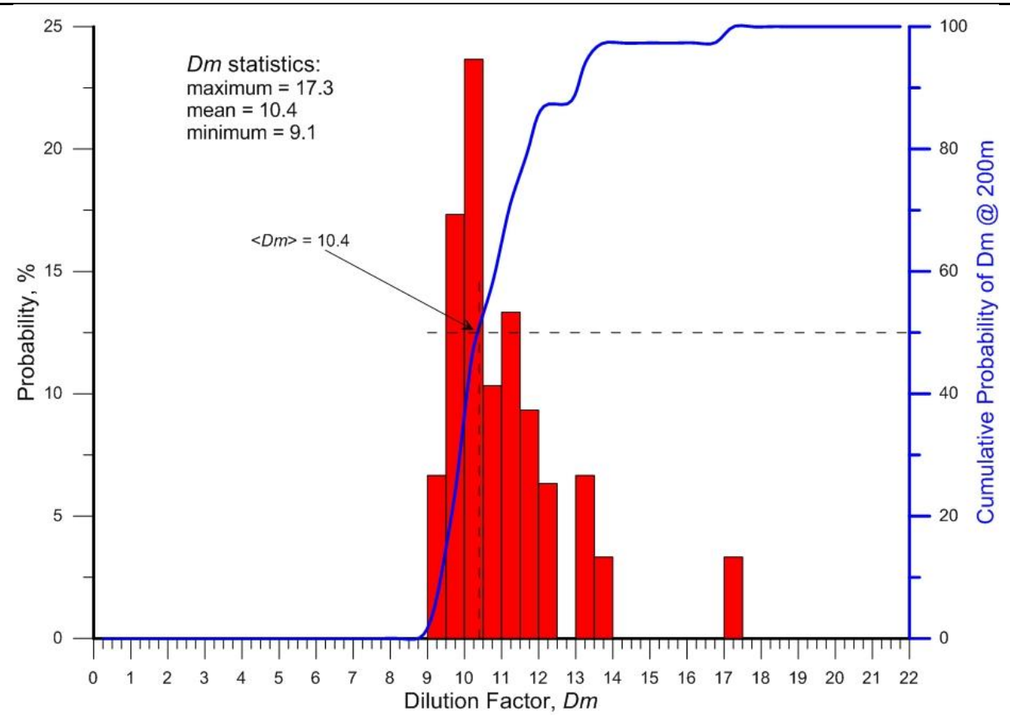
where: *Ce* = the effluent concentration limit required to implement the Ocean Plan standard that receiving water salinity not exceed 2 ppt above ambient beyond the BMZ,

Cs = the natural background salinity, and

Dm = the minimum probable initial dilution expressed as parts of seawater per part brine discharge at the edge of the BMZ.

Applying a natural background salinity (Cs) of 33.5 ppt and a minimum initial dilution (Dm) of 10.4 to Equation 1, an effluent concentration standard (Ce) at M-002 as high a 56.3 ppt would satisfy compliance with the 2 ppt above ambient standard at the edge of the BMZ. Stated another way, a minimum month initial dilution (Dm) of only 3.25:1 would be required to ensure that a 42 ppt effluent concentration (Ce) at M-002 complies with the Ocean Plan receiving water standard that salinity not exceed 2 ppt above ambient beyond the BMZ.

Since the minimum month initial dilution is projected to significantly exceed 3.25:1 for the 60 mgd CDP discharge, it can be seen that the proposed 42 ppt effluent concentration salinity standard (Ce) proposed by Poseidon Water LLC will achieve compliance with the 2 ppt above ambient Ocean Plan standard by a significant margin under minimum month conditions. Thus, while hydrodynamic modeling of the CDP discharge (see Figures 13, 15, and 16) shows a small probability (up to 2 percent) that the 2 ppt above ambient standard may be exceeded under short-term (6-hour or daily) periods, compliance with the Ocean Plan receiving water standard under minimum month conditions is assured.

		 Figure 12. Computed initial dilution at a 200 meter discharge from the CDP discharge jetty under August 1992 hydrodynamic conditions for a 60 mgd CDP discharge under permanent stand-alone operations. Initial dilutions computed using six-hour time increments over the 31-day worst case month period. Average ambient receiving water salinity during the worst case month was 33.49, approximately the same as the long-term average.	
(c) The value 2.0 ppt in Equation 1 is the maximum incremental increase above natural background salinity (Cs) allowed at the edge of the brine mixing zone. A regional water board may substitute an alternative numeric value for 2.0 ppt in Equation 1 based upon the results of a facility-specific alternative salinity receiving water limitation study, as described in chapter III.M.3.c below.		As noted above, Poseidon has requested the Regional Water Board consider adoption of a facility-specific alternative receiving water limitation pursuant to III.M.3.c. if the Regional Water Board determines the facility-specific alternative receiving water limitation is adequately protective of beneficial uses, and Poseidon has addressed the requirements of section III.M.3.c to the satisfaction of the Regional Water Board.	RCF 85
c. An owner or operator may submit a proposal to the regional water board for approval of an alternative (other than 2 ppt) salinity receiving water limitation to be met no further than 100 meters horizontally from the discharge. There is no vertical limit to this zone.	Yes	As noted above, Poseidon is requesting the Regional Water Board establish an initial salinity limit at 2 ppt over Natural Background Salinity at edge of brine mixing zone located 200 meters (656 ft.) from end of discharge structure pursuant to III.M.3.d. Additionally, Poseidon has requested the Regional Water Board consider adoption of a facility-specific alternative receiving water limitation pursuant to III.M.3.c. if the Regional Water Board determines the facility-specific alternative receiving water limitation is adequately protective of beneficial uses, and Poseidon has addressed the requirements of section III.M.3.c to the satisfaction of the Regional Water Board.	RCF 86
(1) To determine whether a proposed facility-specific alternative receiving water limitation is adequately protective of beneficial uses, an owner or operator shall:			RCF 87

(a) Establish baseline biological conditions at the discharge location and at reference locations over a 12-month period prior to commencing brine discharge. The biologic surveys must characterize the ecologic composition of habitat and marine life using measures established by the regional water board. At their discretion, the regional water boards may permit the use of existing data to meet this requirement.		Poseidon requests guidance from the Regional Water Board on the biologic surveys required to establish facility-specific alternative receiving water limitation, characterize the ecologic composition of habitat and marine life, and establish baseline biological conditions at the discharge location and at reference locations.	
(b) Conduct at least the following chronic toxicity Whole Effluent Toxicity (WET) tests: • germination and growth for giant kelp (Macrocystis pyrifera); • development for red abalone (Haliotis refescens); • development and fertilization for purple urchin (Strongleocentrotus purpuratus); development and fertilization for sand dollar (Dendraster excentricus); • larval growth rate for topsmelt (Atherniops affinis). WET tests shall be performed by an Environmental Laboratory Accreditation Program (ELAP)certified laboratory.	Yes	Poseidon has conducted the following chronic toxicity WET tests required to determine whether a proposed facility-specific alternative receiving water limitation is adequately protective of beneficial uses: • germination and growth for giant kelp (Macrocystis pyrifera); • development for red abalone (Haliotis refescens); • development and fertilization for purple urchin (Strongleocentrotus purpuratus); • development and fertilization for sand dollar (Dendraster excentricus); • larval growth rate for topsmelt (Atherniops affinis). Wet testing was performed by Nautilus Environmental, an ELAP laboratory. See Appendix H for a copy of the WET test report.	
(c) The regional water board in consultation with State Water Board staff may require an owner or operator to do additional toxicity studies if needed.			
(2) The regional water board in consultation with the State Water Board staff may require an owner or operator to provide additional studies or information in order to approve a facility-specific alternative receiving water limitation for salinity.			RCF 88
(3) The facility-specific alternative receiving water limitation shall be based on the lowest observed effect concentration (LOEC) for the most sensitive species and toxicity endpoint as determined in the chronic toxicity studies. The regional water board in consultation with State Water Board staff has discretion to approve the proposed facility specific alternative receiving water limitation for salinity.	Yes	The chronic toxicity testing described in Appendix H found that the LOEC for the most sensitive species, red abalone, is 36.5 ppt.	RCF 89
(4) The regional water board shall review a facility's monitoring data, the studies as required in chapter III.M.4 below, or any other information that the regional water board deems to be relevant to periodically assess whether the facility-specific alternative receiving water limitation or salinity is adequately protective of beneficial uses. The regional water board may eliminate or revise a facility-specific alternative receiving water limitation for salinity based on its assessment of the data.			RCF 90
d. The owner or operator of a facility that has received a conditional Water Code section 13142.5(b) determination and is over 80 percent constructed by [the effective date of this plan] that proposes flow augmentation using a surface water intake may submit a proposal to	Yes	Poseidon has received a conditional Water Code section 13142.5 (b) determination and the CDP is over 90% complete with construction. Poseidon proposes flow augmentation using a surface water intake and is requesting the Regional Water Board in consultation with the State Water Board staff approve of an alternative brine mixing zone not to exceed 200 meters (656 ft.) laterally from the discharge point and throughout the water column. Poseidon has demonstrated in accordance with chapter III.M.2.d.(2)(c),	RCF 91

the regional water board in consultation with the State Water Board staff for approval of an alternative brine mixing zone not to exceed 200 meters laterally from the discharge point and throughout the water column. The owner or operator of such a facility must demonstrate, in accordance with chapter III.M.2.d.(2)(c), that the combination of the alternative brine mixing zone and flow augmentation using a surface water intake provide a comparable level of intake and mortality of all forms of marine life as the combination of the standard brine mixing zone and wastewater dilution if wastewater is available, or multiport diffusers if wastewater is unavailable. In addition to the analysis of the effects required by chapter III.M.2.d.(2)(c), the owner or operator must also evaluate the individual and cumulative effects of the alternative brine mixing zone on the intake and mortality of all forms of marine life. In no case may the discharge result in hypoxic conditions outside of the alternative brine mixing zone. If an alternative brine mixing zone is approved, the alternative distance and the areal extent of the alternative brine mixing zone shall be used in lieu of the standard brine mixing zone for all purposes, including establishing an effluent limitation and a receiving water limitation for salinity, in chapter III.M.		that wastewater dilution is not available, and that the combination of the alternative brine mixing zone and flow augmentation using a surface water intake provide a comparable level of intake and mortality of all forms of marine life as the combination of the standard brine mixing zone with a multiport diffusers. In addition to the analysis of the effects required by chapter III.M.2.d.(2)(c), Poseidon also evaluated the individual and cumulative effects of the alternative brine mixing zone on the intake and mortality of all forms of marine life. The evaluations indicate that the proposed discharge would result in hypoxic conditions outside of the alternative brine mixing zone. Poseidon understands that if an alternative brine mixing zone is approved by the Regional Water Board, the alternative distance and the areal extent of the alternative brine mixing zone shall be used in lieu of the standard brine mixing zone for all purposes, including establishing an effluent limitation and a receiving water limitation for salinity, in chapter III.M.	
e. Existing facilities that do not meet the receiving water limitation at the edge of the brine mixing zone and throughout the water column by [the effective date of this plan] must either: 1) establish a facility-specific alternative receiving water limitation for salinity as described in chapter III.M.3.c; or, 2) upgrade the facility's brine discharge method in order to meet the receiving water limitation in chapter III.M.3.b in accordance with the State Water Board's Compliance Schedule Policy, as set forth in (e) below. An owner or operator that chooses to upgrade the facility's method of brine discharge disposal:	Yes	Poseidon requests the Regional Board grant a compliance schedule deferring the application of the receiving water limitation for salinity to the CDP pending the renewal and update of Order R9-2006-0065 in accordance with the State Water Board's Compliance Schedule Policy.	RCF 92
(1) Must demonstrate to the regional water board that the brine discharge does not negatively impact sensitive habitats, sensitive species, MPAs, or SWQPAs.	Yes	The proposed intake and discharge structures are not located within a MPA or SWQPA. The nearest MPA or SWQPA is located in Batiquitos Lagoon, approximately five miles south of the CDP. As noted in Appendix C, the discharge would be sited at a sufficient distance from a MPA or SWQPA so that the salinity within the boundaries of a MPA or SWQPA does not exceed natural background salinity.	RCF 93
(2) Is subject to the Considerations for Brine Discharge Technology described in chapter III.M.2.d.(2).	Yes	Poseidon has demonstrated in accordance with chapter III.M.2.d.(2), that wastewater dilution is not available, and that the combination of the alternative brine mixing zone and flow augmentation using a surface water intake provide a comparable level of intake and mortality of all forms of marine life as the combination of the standard brine mixing zone with a multiport diffusers.	RCF 94
f. The regional water board may grant compliance schedules for the requirements for brine waste discharges for desalination facilities. All compliance schedules shall be in accordance with the State Water Board's Compliance Schedule Policy, except that the salinity receiving water limitation set forth in chapters III.M.3.b and III.M.3.c. shall be considered to be a "new water quality objective" as used in the Compliance Schedule Policy.		Poseidon requests the Regional Water Board grant a compliance schedule deferring the application of the receiving water limitation for salinity to the CDP pending the renewal and update of Order R9-2006-0065 in accordance with the State Water Board's Compliance Schedule Policy.	RCF 95
g. The regional water board in consultation with the State Water Board staff may require an owner or operator to provide additional studies or information if needed. All studies and models are subject to the approval of the regional water board in consultation with State Water Board staff. The regional water board may require an owner or operator to hire a neutral third party entity to			RCF 96

review studies and models and make recommendations to the regional water board.			
4 Monitoring and Reporting Programs			
a. The owner or operator of a desalination facility must submit a Monitoring and Reporting Plan to the regional water board for approval. The Monitoring and Reporting Plan shall include monitoring of effluent and receiving water characteristics and impacts to all forms of marine life. The Monitoring and Reporting Plan shall, at a minimum, include monitoring for benthic community health, aquatic life toxicity, hypoxia, and receiving water characteristics consistent with Appendix III of this Plan and for compliance with the receiving water limitation in chapter III.M.3. Receiving water monitoring for salinity shall be conducted at times when the monitoring locations are most likely affected by the discharge. For new or expanded facilities the following additional requirements apply:	Yes	**Proposed Monitoring and Reporting Plan** **Existing and Proposed CDP Operations**. Regional Water Board Order No. R9-2006-0065 (as amended) establishes monitoring requirements for the CDP within Attachment E - Monitoring and Reporting Program. Order No. R9-2006-0065 establishes requirements for CDP discharge operations at an annual potable water production rate of 50 million gallons per day (gpd) under: • co-located operating conditions where CDP discharge flows would be blended with heated cooling water from the Encina Power Station (EPS) prior to discharge to the EPS effluent pond (Monitoring Location M-002) and discharge channel. • temporary stand-alone conditions when EPS cooling water flows are insufficient and EPS intake pumps would be operated for the benefit of providing unheated dilution water for the benefit of CDP. Construction of CDP facilities is nearing completion, initial CDP process testing has been initiated. Proposed co-located seawater desalination operations are scheduled to begin later in 2015 which will utilize EPS cooling water as intake flow and utilize EPS pumps and effluent discharge facilities. When the Encina Power Station discharge is terminated (scheduled for 2017), CDP will convert to permanent stand-alone operations where bypassed CDP intake flow will be blended with CDP process flow (reverse osmosis concentrate and filter backwash) prior to discharge to the ocean via the existing discharge pond (Monitoring Location M-002) and discharge channel. Under such permanent stand-alone operations, Poseidon proposes to operate the CDP at a potable water production capacity of 60 mgd. The Amended Report of Waste Discharge seeks NPDES requirements for the CDP discharge under both existing co-located/temporary stand-alone operations and permanent stand-alone operations. Accordingly, the Monitoring and Reporting Plan presented in Appendix Z addresses monitoring needs for both operational scenarios. **Focus on Brine Mixing Zone.** The 2015 Ocean Plan amendments require that receiving water salinity not exceed 2 parts per thousand (ppt) above ambient beyond a designated brine mixing zone. Provision III.M.3.d of the Ocean Plan establishes requirements under which a brine mixing zone may be established at a 200 meter (656-feet) distance from the discharge point. The CDP qualifies for designation of a 200-meter brine mixing zone, and Poseidon's Amended Report of Waste Discharge requests that such a 200-meter BMZ be established for the CDP discharge. Existing monitoring provisions of Order No. R9-2006-0065 do not provide for assessment of conditions along and within the brine mixing zone boundaries established within the 2015 Ocean Plan amendments. Accordingly, receiving water monitoring proposed in Appendix Z focuses on water quality effects at the brine mixing zone boundary as well as outlying waters. **Characterization of Conditions:** Existing Permitted Operations. As part of the proposed Monitoring and Reporting Plan (Appendix Z), the existing monitoring requirements of Order No. R9-2006-0065 for CDP co-located/temporary stand-alone conditions are reviewed, and supplemental monitoring is proposed to: • adequately assess compliance of existing permitted co-located and stand-alone operations with Ocean Plan salinity and toxicity requirements, • ensure that existing permitted operations are consistent with protecting beneficial uses, including aquatic and benthic habitat, and • assess receiving water and benthic conditions within and beyond the brine mixing zone. **Characterization of Conditions: Permanent Stand-Alone Operations.** When EPS once-through cooling water operations are terminated in 2017, CDP will transition to permanent stand-alone mode. As part of these permanent stand-alone operations, new dedicated CDP intake facilities will be placed in operation and CDP will assume control of the existing discharge pond and effluent channel facilities. Monitoring proposed to support and address proposed permanent stand-alone operations focuses on:	RCF 97

		• identifying baseline conditions prior to initiation of the permanent stand-alone operations, • identifying and characterizing any changes in influent, effluent, or receiving water quality that occur as a result of implementation of permanent stand-alone operations, • assessing compliance of permanent stand-alone operations with Ocean Plan salinity and toxicity requirements, and • ensuring that permanent stand-alone operations are consistent with protecting beneficial uses, including aquatic and benthic habitat.	
(1) An owner or operator must perform facility-specific monitoring to demonstrate compliance with the receiving water limitation for salinity, and evaluate the potential effects of the discharge within the water column, bottom sediments, and the benthic communities. Facility specific monitoring is required until the regional water board determines that a regional monitoring program is adequate to ensure compliance with the receiving water limitation. The monitoring and reporting plan shall be reviewed, and revised if necessary, upon NPDES permit renewal.	Yes	See the Monitoring and Reporting Plan presented in Appendix Z for the proposed facility-specific monitoring to demonstrate compliance with the receiving water limitation for salinity, and evaluate the potential effects of the discharge within the water column, bottom sediments, and the benthic communities.	
(2) Baseline biological conditions shall be established at the discharge location and at a reference location prior to commencement of construction. The owner or operator is required to conduct biological surveys (e.g., Before-After Control-Impact study), that will evaluate the differences between biological communities at a reference site and at the discharge location before and after the discharge commences. The regional water board will use the data and results from the surveys and any other applicable data for evaluating and renewing the requirements set forth in a facility's NPDES permit.	Yes	See the Monitoring and Reporting Plan presented in Appendix Z for the proposed facility-specific monitoring to identify baseline conditions prior to initiation of the permanent stand-alone operations.	RCF 98