California Regional Water Quality Control Board
San Diego Region

Response to Comments Report

Tentative Order No. R9 2019-0003

Waste Discharge Requirements
For the Poseidon Resources (Channelside) LP
Claude "Bud" Lewis Carlsbad Desalination Plant
Discharge to the Pacific Ocean including Water Code Section 13142.5(b) Determination

May 8, 2019

Response to Comments Report
Tentative Order No. R9 2019-0003

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
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San Diego Region
(San Diego Water Board)

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Response to Comments Report
Tentative Order No. R9 2019-0003

Introduction

This report contains the San Diego Water Board responses to written comments received on Tentative Order No. R9 2019-0003, *Waste Discharge Requirements for the Poseidon Resources (Channelside) LP Claude "Bud" Lewis Carlsbad Desalination Plant Discharge to the Pacific Ocean* (Tentative Order). The San Diego Water Board provided public notice of the release of the Tentative Order on December 21, 2018 and provided a period of 38 days for public review and comment. The public comment period ended on January 28, 2019.

Comments and Responses

The summarized written comments and San Diego Water Board responses are set forth in Table 2 below. The responses include a description of any actions taken to revise the Tentative Order in response to the comment. Proposed revisions to the Tentative Order in red-underline for added text and ~~red strikeout~~ for deleted text.

Table 1: Acronyms

Abbreviation	Definition
AAEL	Average Annual Effluent Limitation
APF	Area Production Foregone
BMZ	Brine Mixing Zone
CDP	Carlsbad Desalination Plant
CEQA	California Environmental Quality Act
CTD	Conductivity, Temperature, and Depth
Discharger	Poseidon Resources (Channelside) LP
Dm	Initial Dilution
EIR	Environmental Impact Report
Empirical Study	Brine Discharge Technology Empirical Study
EOO	Encina Ocean Outfall
EPS	Encina Power Station
ETM	Empirical Transport Model
IWC	Instream Waste Concentration
MDEL	Maximum Daily Effluent Limitation
MGD	Million Gallons per Day
MRP	Monitoring and Reporting Program
MWD	Metropolitan Water District
MDA	Multiport Diffuser Analysis
NPDES	National Pollutant Discharge Elimination System
Ocean Plan	California Ocean Plan, Water Quality Control Plan Ocean Waters of California
Once-Through Cooling Policy	State Water Resources Control Board Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling
OPA	Amendment to the Ocean Plan Addressing Desalination Facility Intakes, Brine Discharges, and to Incorporate Other Nonsubstantive Changes
PMP	Productivity Monitoring Program
ppt	Parts per thousand
RO	Reverse Osmosis
ROWD	Report of Waste Discharge
SDCWA	San Diego County Water Authority
San Diego Water Board	California Regional Water Quality Control Board, San Diego Region
SAP	Science Advisory Panel
SED	Final Staff Report Including the Final Substitute Environmental Documentation
State Water Board	State Water Resources Control Board
Tentative Determination	California Water Code section 13142.5(b) determination
Tentative Order	Tentative Order No. R9-2019-0003
TIE	Toxicity Identification Evaluation
TRE	Toxicity Reduction Evaluation
TST	Test of Significant Toxicity
U.S. EPA	United Stated Environmental Protection Agency
U.S.	United States
UWMP	Urban Water Management Plan
Water Code	California Water Code

Table 2: Response to Comments

No.	Comment	Response	Action Taken
Peter M. MacLaggan, Senior Vice President, Poseidon Resources (Channelside) LP (Poseidon or Discharger)			
1	**Permitted Discharge Flows (Tentative Order page 5, Table 4; and page F-3, Table F-1)** **Issue Presented.** The Amended Report of Waste Discharge (ROWD) contemplates that the Carlsbad Desalination Plant (Facility or CDP) would operate at a production rate of 60 MGD with average annual reverse osmosis (RO) concentrate discharge of up to 60 million gallons per day (MGD) and backwash flows of up to 7 MGD, for combined waste streams totaling 67 MGD. Table 4 of the Tentative Order, on the other hand, limits the RO concentrate discharge to an average daily flow of 60 MGD. The discharge of RO concentrate flow in excess of 60 MGD in a 24-hour period is prohibited. The use of an average daily RO concentrate flow limit of 60 MGD instead of an average annual RO concentrate flow limit of 60 MGD would significantly constrain CDP operations. Under routine operating conditions described below, an average daily flow limit would reduce CDP output by up to 5 MGD (8 percent reduction in plant capacity) without providing any improvement in the quantity or quality of the combined discharge contemplated under the Tentative Order. This permitting limitation, particularly during times when other regional water supplies are constrained or limited, could impact the San Diego County Water Authority's (SDCWA) ability to sustain regional water supply reliability. **Requested Modifications of Tentative Order.** The Tentative Order acknowledges that the Discharger requested an average annual RO concentrate discharge of 60 MGD (Attachment F, page F-6), yet the permitted RO concentrate flow shown in Table 4 is restricted to a maximum daily flow rate of 60 MGD. For the reasons stated in the comment letter,	The San Diego Water Board agrees that modifying the flow limitations for RO concentrate and filter backwash in the Tentative Order to allow additional operational flexibility is unlikely to result in a decrease in receiving water quality. Modifying the flow limitations will account for the interim operations of the Facility until new pumps are installed and operational. The revision to the flow limitations in the Tentative Order provided below are designed to ensure that the discharge will not exceed the worst-case scenarios modeled and analyzed in the ROWD. The San Diego Water Board has modified the Tentative Order as follows: Section III.D, Table 4[1] **Table 4. Permitted Discharge Flows[1] at Monitoring Location M-001** Wastewater: Media Filtration Backwash — Maximum Daily Flowrate (MGD): ~~7~~ -- — Annual Average Flowrate (MGD): 7 Wastewater: Reverse Osmosis Concentrate — Maximum Daily Flowrate (MGD): ~~60~~ -- — Annual Average Flowrate (MGD): 60 Wastewater: Combined Discharge of Media Filtration Backwash and Reverse Osmosis Concentrate — Maximum Daily Flowrate (MGD): 67 — Annual Average Flowrate (MGD): -- Section VII.C (added) **C. Compliance with Annual Average Effluent Limitation (AAEL)** If the average of daily discharge monitoring results over a calendar year exceeds the AAEL for a given parameter, an alleged violation will be flagged, and the Discharger is out of compliance for each day of that year for that parameter (e.g., resulting in 365 days of noncompliance in a 365-day year). The average of daily discharge monitoring results over the calendar year that exceeds the AAEL for a parameter will be considered	The Tentative Order has been revised as described in the response at section III.D Table 4; section VII.C; Attachment A; Attachment E, Table E-3, footnote 4; Attachment F, section I, Table F-1.

[1] Monitoring Location M-001 is defined in Table E-1 of Attachment E to the Tentative Order as "a location downstream of all contributing flows to the Facility effluent, prior to combining with Encina Power Station effluent or augmentation flow.

<table>
<tr><th>No.</th><th>Comment</th><th>Response</th><th>Action Taken</th></tr>
<tr><td></td><td>Poseidon respectfully requests that the San Diego Water Board modify Table 4 (and make conforming changes to Table F-4) of the Tentative Order as shown below to reflect the plant operations described on page F-6 of the Tentative Order and in the Amended ROWD. These modifications would provide the plant operator flexibility to adjust the allocation of flow between the individual waste streams internal to the CDP operations, without causing any change in the quantity or quality of the combined discharge contemplated under the Tentative Order. These modifications would also eliminate an unnecessary permitting constraint that would curtail production at the CDP, potentially hindering the SDCWA's ability to sustain regional water supply reliability.

Table 4
Permitted Discharge Flows at Monitoring Location M-001
<table>
<tr><th>Wastewater</th><th>Maximum ~~Daily~~ Flowrate (MGD)</th></tr>
<tr><td>Media Filtration Backwash (Daily Average)</td><td>7</td></tr>
<tr><td>Reverse Osmosis Concentrate (Annual Average)</td><td>60</td></tr>
<tr><td>Total Flow (Daily Average)</td><td>67</td></tr>
</table>
Note. Poseidon's comment letter contains an analysis with supporting data and calculations. The comment letter is posted on the San Diego Water Board website at https://www.waterboards.ca.gov/sandiego/water_issues/programs/regulatory/docs/FINAL_PW_Comment_-_Tentative_Order_R9-2019-0003_012819.pdf</td><td>out of compliance for that year only. If only a single sample is taken during the calendar year and the analytical result for that sample exceeds the AAEL, the Discharger is out of compliance for that calendar year. For any one calendar year during which no sample is taken, no compliance determination in regard to the AAEL can be made for that calendar year.

Attachment A – Abbreviations and Glossary, Part 1 – Abbreviations

AAEL – Average Annual Effluent Limitation

Attachment A – Abbreviations and Glossary, Part 2 – Glossary of Common Terms

Average Annual Effluent Limitation
The highest allowable average of daily discharges over a calendar year, calculated as the sum of all daily discharges measured during a calendar year divided by the number of daily discharges measured during that month.

Attachment E – Monitoring and Reporting Program (MRP), Table E-3, footnote 4

During interim operations while using the existing pumps, the flowrate for flow augmentation dilution water shall be calculated based on the rated flow of pumps in service. Flowrates at M-001 shall be separately monitored and reported for the reverse osmosis concentrate, media filtration backwash, and total flow.

Attachment F - Fact Sheet, Table F-1</td><td></td></tr>
</table>

<table>
<tr><th>No.</th><th>Comment</th><th>Response</th><th>Action Taken</th></tr>
<tr><td></td><td></td><td>
Table F-1. Facility Information
<table>
<tr><td>WDID</td><td colspan="3">9 000001429</td></tr>
<tr><td>Discharger</td><td colspan="3">Poseidon Resources (Channelside) LP</td></tr>
<tr><td>Name of Facility</td><td colspan="3">Claude "Bud" Lewis Carlsbad Desalination Plant</td></tr>
<tr><td>Facility Address</td><td colspan="3">4590 Carlsbad Boulevard
Carlsbad, CA 92008
San Diego County</td></tr>
<tr><td>Facility Contact, Title and Phone</td><td colspan="3">Peter M. MacLaggan, Vice President, (760) 655-3900</td></tr>
<tr><td>Authorized Person to Sign and Submit Reports</td><td colspan="3">Same as above</td></tr>
<tr><td>Mailing Address</td><td colspan="3">5780 Fleet Street, Suite 140
Carlsbad, CA 92008</td></tr>
<tr><td>Billing Address</td><td colspan="3">Same as mailing address</td></tr>
<tr><td>Type of Facility</td><td colspan="3">Water Supply (Desalination Plant)</td></tr>
<tr><td>Major or Minor Facility</td><td colspan="3">Major</td></tr>
<tr><td>Threat to Water Quality</td><td colspan="3">2[1]</td></tr>
<tr><td>Complexity</td><td colspan="3">B[2]</td></tr>
<tr><td rowspan="4">Facility Permitted Flow at Monitoring Location M-001</td><td>Wastewater</td><td>Maximum Daily Flowrate (MGD)[3]</td><td>Annual Average Flowrate (MGD)</td></tr>
<tr><td>Media Filtration Backwash</td><td>~~7~~ –</td><td>7</td></tr>
<tr><td>Reverse Osmosis Concentrate</td><td>~~60~~ –</td><td>60</td></tr>
<tr><td>Combined Discharge of Media Filtration Backwash and Reverse Osmosis Concentrate</td><td>67</td><td>–</td></tr>
<tr><td>Facility Permitted/Design Flow at Monitoring Location M-002</td><td colspan="3">330 MGD with existing intake pumps; 299 MGD with new intake pumps</td></tr>
<tr><td>Watershed</td><td colspan="3">Pacific Ocean</td></tr>
<tr><td>Receiving Water</td><td colspan="3">Pacific Ocean</td></tr>
<tr><td>Receiving Water Type</td><td colspan="3">Ocean waters</td></tr>
</table>
</td><td></td></tr>
<tr><td>2</td><td>Brine Discharge Technology Empirical Study (Tentative Order pages 17-18, F-40-42, Appendix H-1 Finding 31, Appendix GGG)

a. Analysis of Multiport Diffuser Brine Discharge Technology

Finding 31 of Appendix H-1 of the Tentative Order states that the San Diego Water Board staff has determined that flow augmentation[2] is the best available discharge technology feasible.</td><td>The San Diego Water Board concluded in Finding 31 of the Tentative Determination that flow augmentation is the best available feasible brine discharge technology based on a consideration of the estimated intake and mortality of all forms of marine life (marine life impacts) from flow augmentation and from a theoretical multiport diffuser.[3] The Tentative Determination also requires collection of additional scientific data through the Brine Discharge Technology Empirical Study described in section VI.C.2.a. of the Tentative Order (section VI.C.2.b. as modified). The Brine Discharge Technology Empirical Study is expected to</td><td>The Tentative Order was revised as described in the response at sections II.D; VI.A.6; VI.C.2.a; VI.C.2.b.iii; Attachment F, section I.M; Attachment F,</td></tr>
</table>

[2] Flow augmentation is a defined term in the Ocean Plan and refers to a type of in-plant dilution and occurs when a desalination facility withdraws additional source water for the specific purpose of diluting brine prior to discharge. The term is defined consistent with the Ocean Plan definition in Attachment A of the Tentative Order.

[3] The Tentative Determination separately concludes that wastewater dilution as a brine discharge technology is not available at this time. Because the Tentative Determination concludes that wastewater dilution is not available at this time (see Finding 14 of Attachment H.1 of the Tentative Order) the comparison required in Ocean Plan chapter III.M.2.d.(2)(c) does not consider marine life impacts from wastewater dilution.

No.	Comment	Response	Action Taken
	Poseidon agrees with the San Diego Water Board's Tentative California Water Code (Water Code) section 13142.5(b) determination (Tentative Determination) that flow augmentation is the best available discharge technology, Poseidon objects to the San Diego Water Board's plan to revisit the multiport diffuser impacts as part of the Brine Discharge Technology Empirical Study, and disagrees with the methodology the San Diego Water Board used to arrive at the Tentative Determination that flow augmentation is the best available discharge technology. Chapter III.M.2.d.(2)(c) of the Ocean Plan provides guidance for determining whether or not flow augmentation is the best available discharge technology. The San Diego Water Board has determined that wastewater dilution is unavailable. Therefore, the analysis shifts to whether the flow augmentation brine discharge technology provides a comparable level of intake and mortality of all forms of marine life as a multiport diffuser. However, rather than assess the entrainment impacts of the two brine discharge technologies using the Empirical Transport Model[4]/Acres of Production Foregone[5] (ETM/APF) approach as required by the Ocean Plan, the San Diego Water Board arrived at its Tentative Determination that the intake and mortality associated with the flow augmentation brine discharge technology was comparable to a multiport diffuser on the basis that the volume of water exposed to shearing-related mortality is comparable for both discharge technologies.	provide additional scientifically appropriate data to allow comparison of actual intake and mortality from flow augmentation to estimates of intake and mortality from use of a theoretical multiport diffuser, as the Ocean Plan requires (see chapter III.M.2.d.(2)(c)v), once the new intake and discharge structures are completed and operational. The Tentative Order requires that data for the ETM/APF analysis for establishing the intake and mortality of marine life for a theoretical multiport diffuser be collected concurrently with the flow augmentation aspect of the Brine Discharge Technology Empirical Study. Poseidon comments (1) that additional data collection for the ETM/AFP analysis for a multiport diffuser is unnecessary and that adequate data already exist in the record to establish the intake and mortality of marine life levels for a theoretical multiport diffuser and (2) the Tentative Determination should establish the existing estimates as the basis, or benchmark, for comparison to the results of the post-construction flow augmentation empirical study portion of the Brine Discharge Technology Empirical Study. Poseidon objects to "revisiting" multiport diffuser intake and marine life mortality levels after the Tentative Determination is adopted. Poseidon cites substantial financial risk if the benchmark levels of intake and marine life mortality from a theoretical multiport diffuser are not established finally in the Tentative Determination. The San Diego Water Board recognizes Poseidon's desire for certainty in establishing the benchmark intake and	section III.A; Attachment F, section III.E; Attachment F, section VI.B.2.a; Attachment F, section VI.G, Attachment H, footnote 7; Attachment H.1, Finding 5; Attachment H.1, Finding 7; Attachment H.1, Finding 30; Attachment H.1, Finding 31 Attachment H.1, Finding 32; Attachment H.1, Finding 33; Attachment H.1, Finding 34; and Attachment H.1, Finding 36.

[4] Empirical Transport Model is a methodology for determining the spatial area known as the source water body that contains the source water population, which are the organisms that are at risk of entrainment as determined by factors that may include but are not limited to biological, hydrodynamic, and oceanographic data. ETM can also be used to estimate proportional mortality.

[5] Area Production Foregone (APF) also known as habitat production foregone, is an estimate of the area that is required to produce (replace) the same amount of larvae or propagules that are removed via entrainment at a desalination facilities intakes. APF is calculated by multiplying the proportional mortality by the source water body, which are both determined using an empirical transport model.

No.	Comment	Response	Action Taken
	Poseidon evaluated entrainment effects of the brine discharge alternatives using the ETM/APF approach required by the Ocean Plan and submitted the results of the evaluation in Appendix K of the 2015 ROWD, on September 4, 2015. The analysis in Appendix K determined that the flow augmentation brine discharge technology provides a "comparable level of intake and mortality of all forms of marine life" as a multiport diffuser. Poseidon subsequently submitted updated ETM/APF calculations to reflect the guidance provided by the Science Advisory Panel (SAP) and submitted the results to the San Diego Water Board on December 14, 2018 and a revision on December 18, 2018 in Appendix GGG of the ROWD, *Revised Entrainment Analysis for Brine Discharge Options* (Appendix GGG). The analysis presented in Appendix GGG reaffirmed that the flow augmentation brine discharge technology provides a "comparable level of intake and mortality of all forms of marine life" as a multiport diffuser. Appendix GGG provides an estimate of the ETM/APF of a multiport diffuser analyzed in accordance with the *Final Staff Report Including the Final Substitute Environmental Documentation* (SED)[6] guidance for a multiport diffuser with an intake of 943 MGD and a deleterious shear volume of 217 MGD. The San Diego Water Board and State Water Board met with Poseidon January 7, 2019 to review Appendix GGG. That meeting led to a request for further revisions to Appendix GGG, which were incorporated in Revision 2 to Appendix GGG included as Attachment 2 to Poseidon's January 28, 2019 comment letter.[7]	marine life mortality levels for later comparison to the flow augmentation empirical study. However, as explained further below, the San Diego Water Board disagrees that adequate scientific ETM/APF data are available today to appropriately estimate the intake and marine life mortality levels from a multiport diffuser for purposes of establishing the benchmark for future post-operational comparison to the empirical study of flow augmentation intake and marine life mortality levels. To address Poseidon's concerns, in part, the Tentative Order and Tentative Determination are modified to: 1. Require collection of scientifically appropriate data to more accurately estimate intake and marine life mortality levels for a theoretical multiport diffuser; 2. Require collection of these data in a Multiport Diffuser Analysis special study to be completed within the first two years after the Tentative Order's effective date instead of as part of the post-operational Brine Discharge Technology Empirical Study; 3. Recognize that the results of the Multiport Diffuser Analysis establish the benchmark for later comparison to the flow augmentation data collection required in the Brine Discharge Technology Empirical Study; and 4. Consistent with Ocean Plan chapter III.M.2.a.(5), condition the Tentative Determination in limited part on the Multiport Diffuser Analysis confirming the conclusion required by Ocean Plan chapter III.M.2.d.(2)(c) that flow augmentation provides comparable intake and mortality of all forms of marine life as a multiport diffuser. If the Multiport Diffuser	

[6] The Final Staff Report Including the Final Substitute Environmental Documentation is available at: https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2015/rs2015_0033_sr_apx.pdf

[7] Poseidon's January 28, 2019 comment letter included a revised Appendix GGG. The revised Appendix GGG is accepted as part of the Poseidon's comments but it is untimely to be considered part of or an amendment to Poseidon's ROWD.

<table>
<tr><th>No.</th><th>Comment</th><th>Response</th><th>Action Taken</th></tr>
<tr><td></td><td>Poseidon asserts that Roberts' diffuser analysis does not conform to the State Water Board SED guidance because: (i) it is based on a model, so by definition, it does not reflect additional "data"; (ii) the model used by Dr. Roberts is not approved by the State Water Board or the U.S. Environmental Protection Agency (U.S. EPA) and has not been peer reviewed; (iii) unlike the guidance in the SED developed by the State Water Board's Brine Discharge Panel (Foster et al.), Roberts diffuser impact assessment has not been through public review and a formal rule making process; and (iv) the Ocean Plan has not been updated to reflect this modified approach for analyzing diffuser impacts. Poseidon understands that State Water Board staff has a different view regarding the applicability of Roberts diffuser design, so the revised entrainment analysis for brine discharge options presented in Revision 1 to Appendix GGG includes ETM/ APF calculations following both the SED guidance and Roberts approach. The results of the brine discharge technology entrainment analysis presented in Revision 1 to Appendix GGG is summarized in Table 4.

Table 4
Brine Discharge Technology Entrainment Analysis
Area of Production Foregone (acres)
<table>
<tr><th>Taxa Category</th><th>Flow Augmentation (171 MGD)</th><th>Flow Augmentation (196 MGD)</th><th>Roberts Diffuser (170 MGD)</th><th>SED Guidance Diffuser (217 MGD)</th></tr>
<tr><td>Estuarine</td><td>36</td><td>40.9</td><td>17.6</td><td>22.2</td></tr>
<tr><td>Coastal Ocean</td><td>39.8</td><td>47.5</td><td>441.0</td><td>562.5</td></tr>
<tr><td>Total</td><td>75.8</td><td>88.4</td><td>458.6</td><td>584.7</td></tr>
</table>
The San Diego Water Board’s Tentative Determination concludes that flow augmentation is the best available brine discharge technology. Such a determination requires Poseidon to conduct an empirical study that evaluates the intake and mortality of all forms of marine life associated with the flow augmentation brine discharge technology in accordance with chapter III.M.2.d.(2)(c) of the Ocean Plan.

The Brine Discharge Technology Empirical Study requirements are described in section VI.C.2.a. of the Tentative Order. Section VI.C.2.a.(iii) states that the San</td><td>Analysis fails to confirm the conclusion in the Tentative Determination that the two brine discharge technologies provide comparable levels of intake and mortality of all forms of marine life, a new limited Water Code section 13142.5(b) determination to select an appropriate brine discharge technology is required. This comparison, based on the Multiport Diffuser Analysis, reduces the financial risk to Poseidon because the benchmark will be understood within the first two years after the Order’s effective date, while Poseidon is conducting its intake technology pilot study and during the design phase, prior to incurring substantial construction costs for the flow augmentation brine discharge technology structures.

The rationale to support these revisions to the Tentative Order is set forth below.

<u>Ocean Plan Requirements Applicable to Use of Alternative Brine Discharge Technologies</u>

The Ocean Plan establishes wastewater dilution, if available, followed by multiport diffusers, as the preferred brine discharge technologies for desalination facilities. (See Ocean Plan chapter III.M.2.d.(2)(c).) Use of flow augmentation is allowed only for this Facility (and in other limited circumstances with a subsurface intake), subject to the demonstration that flow augmentation provides a comparable level of intake and mortality of all forms of marine life to wastewater dilution, if available, or multiport diffusers if wastewater dilution is unavailable.

When an alternative brine discharge technology is approved for a facility based on this initial comparability demonstration, the Ocean Plan still requires that a post-construction and operation empirical study verify that flow augmentation, as an alternative brine discharge technology, results in less intake and mortality of all forms</td><td></td></tr>
</table>

No.	Comment	Response	Action Taken
	Diego Water Board will reassess and reconsider the analysis of projected marine life impacts caused by brine discharged through multiport diffusers using the Roberts Report and possibly other yet to be determined methodologies after the flow augmentation system is placed in service. According to the Tentative Order, if a yet to be determined analysis finds that the marine life impacts caused by brine discharged through multiport diffusers are lower than previously projected such that the impacts are no longer comparable to flow augmentation, Poseidon is required to cease using flow augmentation and install and use a multiport diffuser. Poseidon acknowledges its obligation to conduct the post-construction assessment of the intake and mortality of all forms of marine life associated with the flow augmentation technology. Poseidon has no objection to conducting such a study and living with the results because Poseidon selects the technology and its performance is within Poseidon's control. On the other hand, Poseidon strongly objects to the requirement in the Tentative Order that would revisit the assessment of the intake and mortality of all forms of marine life associated with the multiport diffuser technology based on some yet to be determined criteria that is beyond its control. Leaving open the determination of the ETM/ APF calculation for the hypothetical multiport diffuser until after the flow augmentation discharge technology is constructed and operating places an $80 million investment in intake and discharge improvements at risk of having to be replaced shortly after being placed in service. It is unreasonable for the San Diego Water Board to require Poseidon, and ultimately SDCWA ratepayers, to proceed with this investment in the face of such uncertainty. The Tentative Determination is being made now, not in several years when the new intake technology is put into service. A second look at that Tentative Determination	of marine life than a multiport diffuser. (Ocean Plan, Chapter III.M.2.d.(2)(c)v.) In accordance with this Ocean Plan provision, if the flow augmentation empirical study demonstrates that flow augmentation results in more intake and mortality of marine life than would be expected using multiport diffusers, then Poseidon must either (1) cease using the alternative brine discharge technology and install and use wastewater dilution or multiport diffusers to discharge brine waste, or (2) redesign 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 or multiport diffusers. No subsequent verification of intake and marine life mortality through an empirical study would be required had Poseidon elected to construct a multiport diffuser as the brine discharge technology for the Facility. <u>Need for Additional Scientifically Appropriate Data to Estimate Intake and Mortality of All Forms of Marine Life from a Multiport Diffuser</u> In Finding 31 of Attachment H.1 of the Tentative Determination, the San Diego Water Board finds that flow augmentation is the best available discharge technology feasible for the Facility using currently available data to compare the marine life impacts from Poseidon's proposed flow augmentation discharge technology to the intake and marine life mortality caused by a theoretical multiport diffuser. The Tentative Order recognized the need to collect additional data for purposes of the later post-construction comparison of flow augmentation discharge technology to a multiport diffuser. With an operational flow augmentation discharge technology, the empirical study will establish intake and marine life mortality levels. However, for purposes of comparison to a multiport diffuser, it is necessary to estimate intake and marine life mortality of a theoretical multiport diffuser. The San Diego Water Board is aware of two scientific models for	

No.	Comment	Response	Action Taken
	through an open-ended study is an unreasonable burden on the applicant. **Requested Modifications to the Tentative Order.** Poseidon's comment letter requests modifications of the Tentative Order at sections VI.C.2.a.i(c), VI.C.2.a.iii, Attachment F section VI.B.2.a, and Attachment H-1 Finding 31 to state: • The Tentative Determination that flow augmentation provides a comparable level of intake and mortality of all forms of marine life as a multiport diffuser is based on an ETM/APF approach as required by Ocean Plan. • The ETM/APF calculation for the multiport diffusers is a one-time determination that is made at the time of the Tentative Determination and is not subject to reconsideration.	estimating the marine life impacts. The first model is based on a study by Foster et al[8] (Foster Method) referenced in the May 2015 Substitute Environmental Document for the Desalination Amendment to the Ocean Plan (SED) and the second model is based on a study by Dr. Philip Roberts[9] (Roberts Method) published in April of 2018. Each model has limitations: • In a letter to the State Lands Commission dated July 26, 2017, Dr. Roberts clarified that the Foster Method, which Dr. Roberts co-authored, was based on a specific multiport diffuser design with 60o nozzle angles and would not apply to all diffuser designs. • The Roberts Method has not been peer reviewed nor has it been approved by the State Water Board. However, the Roberts Method is the best available method for estimating marine life impacts from shear forces that the San Diego Water Board is aware of. The Roberts Method accounts for multiple designs of multiport diffusers to determine the design that results in the least impacts to water quality and marine life. The Foster Method is based on one specific design of a multiport diffuser. • The science of estimating marine life impacts due to shear forces is an emerging field.	

[8] Desalination Plant Entrainment Impacts and Mitigation. Expert Review Panel III, Foster et al, 2013 (Foster report) available at: https://www.waterboards.ca.gov/water_issues/programs/ocean/desalination/docs/erp_final.pdf

[9] Brine Diffusers and Shear Mortality, Philip J.W. Roberts, (Roberts Report) April 18, 2018 is available at the California Regional Water Quality Control Board – Santa Ana Region (Santa Ana Water Board) website: https://www.waterboards.ca.gov/santaana/water_issues/programs/Wastewater/Poseidon/2018/4-18-18_Diffuser_Analysis_Method.pdf

No.	Comment	Response	Action Taken
		The SED emphasizes on page 85 that there are few studies that estimate shearing-related mortality at brine multiport diffusers and other discharges. Multiport diffusers entrain ambient water to mix with the discharge, thus diluting the brine discharge. This entrained volume is subjected to high turbulence intensities and shear stresses. Foster et al. (2013) modeled shearing stress from multiport diffusers and reported that larvae in 23 percent of the total entrained volume of dilution water may be exposed to lethal turbulence for 10 to 50 seconds. The total entrained volume of dilution water is the amount of ambient water that mixes with a discharge to dilute the brine to the salinity receiving water limitation. The Ocean Plan in chapter III.M.2.d.(2)(c) requires that when determining the intake and mortality associated with a brine discharge technology or combination of technologies, the regional water board shall require the discharger to use empirical studies or modeling to simulate intake entrainment impacts using an ETM/APF approach. The ETM/APF approach relies on data from marine life studies. Three key types of marine life data are needed to calculate an ETM/APF: • Larval concentrations • Larval lengths • Oceanographic currents In Appendix K to the ROWD, Poseidon provided an analysis of the marine life impacts from a theoretical multiport diffuser using the Foster Method referenced in the SED and described above. In Appendix GGG to the ROWD, Poseidon provided an analysis of the marine life impacts from a theoretical multiport diffuser using the Roberts Method. Poseidon asserts that the results in the Appendix GGG submittal reflect the guidance provided by the Scientific Advisory Panel (SAP) to account for the intake of marine life species from multiple source water bodies rather than a single source water body. However, the SAP were requested by the San Diego Water Board to	

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		review the ETM/APF calculations for flow augmentation and not the multiport diffuser calculations provided in Appendix K or Appendix GGG. The SAP did not review the multiport diffuser calculations provided in Appendix GGG. However, on March 5, 2019, Dr. Raimondi, who is a member of the SAP for the Facility, provided to the Santa Ana Water Board in connection with the proposed Huntington Beach Desalination Facility a memorandum titled: *Approaches for the Assessment of Potential Intake Locations with Respect to Entrainment, Proposed Huntington Beach Desalination Plant*. In that assessment (see Attachment 1 to this Response to Comments Document), Dr. Raimondi stated that to assess impact potential using ETM/APF, "site specific measurements of concentration of larvae entrained" is needed. Dr. Raimondi's assessment would also be applicable to the calculation of ETM/APF for the Facility. Appendix GGG to the ROWD does not include site-specific measurement of concentration of larvae entrained at the location of a theoretical multiport diffuser for the Facility. In addition, no site specific data for the concentration of larvae entrained is available at the location of a theoretical multiport diffuser for the Facility. The San Diego Water Board concludes that the ETM/APF calculations for a multiport diffuser in Appendix GGG are inaccurate and based on incomplete data for the proposed purpose because no larval length data were collected at the location in the Pacific Ocean where a theoretical multiport diffuser would be located. Dr. Raimondi's assessment, although prepared for a different desalination facility, is persuasive and supports these conclusions. For this reason, the ETM/APF calculations for a multiport diffuser in Appendix GGG are inaccurate for the proposed purpose because no larval length data were collected at the location in the Pacific Ocean where a theoretical multiport diffuser would be located. In both Appendix K and Appendix GGG to the ROWD, Poseidon performed the ETM/APF analyses using the existing marine life entrainment data in the 2008 *Cabrillo*	

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		Power I LLC, Encina Power Station (EPS) Clean Water Act Section 316(b) Impingement Mortality and Entrainment Characterization Study[10] (2008 EPS study). However, the larval length data in the 2008 EPS study were only from Agua Hedionda Lagoon and not from the open ocean coastal area where a theoretical multiport diffuser would be located. Without larval length data from the open ocean coastal area, an ETM/APF analysis from a multiport diffuser cannot be performed in a scientifically sound manner. In Appendix GGG to the ROWD, the ETM/APF analysis for a multiport diffuser was performed inappropriately based on the false assumption that the larval lengths in the open ocean coastal area are the same as in Agua Hedionda Lagoon. The analysis inappropriately used the larval length data from Agua Hedionda Lagoon with larval concentrations and oceanographic currents from the open ocean coastal area. Poseidon submitted Appendix GGG to the ROWD on December 18, 2018. San Diego Water Board staff had limited time to consider the information it set forth but are confident in their conclusion that additional scientifically appropriate data required in the Multiport Diffuser Analysis are necessary to perform a scientifically sound ETM/APF calculation to establish the benchmark for comparison to the flow augmentation empirical study. Since the Multiport Diffuser Analysis will be completed within the first two years of the Permit's effective date, it is also appropriate to consider the results to confirm the comparison required in Ocean Plan chapter III.M.2.d.(2)(c). Assuming the results of the Multiport Diffuser Analysis confirm this comparison, they will also establish the benchmark for the post-construction and operational comparison in Chapter III.M.2.d.(2)(c)v. If the Multiport Diffuser Analysis fails to	

[10] The 2008 EPS Study, *Cabrillo Power I LLC, Encina Power Station, Clean Water Act Section 316(b) Impingement Mortality and Entrainment Characterization Study, Effects on the Biological Resources of Agua Hedionda Lagoon and the Nearshore Ocean Environment*, January 2008, Tenera Environmental, is available on the State Water Board website at: https://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/powerplants/encina/docs/eps_ip2011att1_imec.pdf

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		confirm that intake and marine life mortality from a multiport diffuser are comparable to flow augmentation, then it is appropriate to require a limited new Water Code section 13142.5(b) determination to select an appropriate brine discharge technology that complies with the Ocean Plan requirements implementing Water Code section 13142.5(b) to minimize the intake and mortality of all forms of marine life. With these revisions to the Tentative Order and Tentative Determination to implement these modifications, the San Diego Water Board anticipates that the estimated level of intake and mortality of all forms of marine life from a theoretical multiport diffuser will be based on scientifically defensible, location-appropriate data, to support the conclusion that flow augmentation and multiport diffuser brine discharge technologies are comparable in intake and marine life mortality. At the same time, the ETM/APF calculations for the theoretical multiport diffuser will be established much earlier in the process, thereby addressing, at least in part, Poseidon's objections that the intake and mortality associated with a theoretical multiport diffuser will be "revisited" only after the flow augmentation discharge technology is constructed and operational. Only if the results of the Multiport Diffuser Analysis fail to confirm comparability in intake and mortality of marine life from the two technologies will a limited new Water Code section 13142.5(b) determination be required. The Tentative Order has been revised as follows: Section II.D **Water Code Section 13142.5(b) Determination.** Water Code section 13142.5(b) requires that for each new or expanded coastal power plant or other industrial installation using seawater for cooling, heating, or industrial processing, the best available site, design, technology, and mitigation measures feasible shall be used to minimize the intake and mortality of all forms of	

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		marine life. Chapter III.M of the Water Quality Control Plan for Ocean Waters of California, California Ocean Plan (Ocean Plan) provides the implementation provisions for desalination facilities to comply with Water Code section 13142.5(b). This Order Implements the Water Code section 13142.5(b) determination described in Attachments H.1 and H.2 (which may also be collectively referred to as Attachment H or Water Code section 13142.5 Determination) of this Order for Facility stand-alone operations in accordance with Ocean Plan requirements. In making this Determination the San Diego Water Board evaluated a range of alternatives proposed by the Discharger for the best available site, design, technology, and mitigation measures to minimize intake and mortality of all forms of marine life and then determined the best combination of feasible alternatives to minimize intake and mortality of all forms of marine life. ~~Any potential future expansion, including any design change or operational change to the Facility that could increase the intake or mortality of all forms of marine life beyond that which is approved under this Order will require a Water Code 13142.5(b) determination in accordance with the Ocean Plan requirements.~~ This Water Code section 13142.5(b) Determination is based upon available information. The Determination is conditional in limited part on the results of the Multiport Diffuser Analysis (in section VI.C.2.a of the Order) which the San Diego Water Board expects will confirm the conclusion that flow augmentation provides a comparable level of intake and mortality of all forms of marine life to a multiport diffuser (see Ocean Plan chapter III.M.2.d.(2)(c)). As discussed in Attachment H, the Multiport Diffuser Analysis will obtain additional appropriate scientific data to establish a benchmark regarding the intake and mortality of all forms of marine life associated with a multiport diffuser. If, as expected,	

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		the Multiport Diffuser Analysis confirms this Order's conclusion that flow augmentation is comparable to a multiport diffuser in intake and mortality of all forms of marine life, then the condition will have no further effect. In this case, the results of the Multiport Diffuser Analysis will establish the level of intake and mortality of all forms of marine life for a multiport diffuser as the benchmark for comparison to the results of the flow augmentation empirical study as required by Ocean Plan chapter III.M.2.d.(2)(c)v. If instead, the condition does not occur and the results of the Multiport Diffuser Analysis fail to confirm that flow augmentation provides a comparable level of intake and mortality of all forms of marine life as a multiport diffuser, a new Water Code section 13142.5(b) determination will be required, consistent with Ocean Plan chapter III.M.2.a.(5) to select an appropriate brine discharge technology for the Facility. In addition, any potential future expansion, including any design change or operational change to the Facility that could increase the intake or mortality of all forms of marine life beyond that which is approved under this Order will require a new Water Code section 13142.5(b) determination in accordance with the Ocean Plan requirements. Section VI.A.6 The Water Code section 13142.5(b) ~~d~~Determination described in attachment H of this Order does not expire and shall remain in effect unless: (1) the Multiport Diffuser Analysis described in section VI.C.2.a. of this Order fails to confirm that flow augmentation and multiport diffuser brine discharge technologies are comparable in intake and mortality to all forms of marine life and a new Water Code section 13142.5(b) determination is required consistent with Ocean Plan chapter III.M.2.a.(5); or (2) the Discharger proposes a change in design or operation of the Facility in a manner that could increase intake or mortality of all	

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		forms of marine life, consistent with the Ocean Plan definition of an expanded facility. Such a proposed change will require a new Water Code section 13142.5(b) determination for an expanded facility as required by the Ocean Plan chapter III.M.1.b.(3). New section VI.C.2.a and subsequent sections renumbered **a. Multiport Diffuser Analysis (MDA).** i. In accordance with chapter III.M.2.d.(2)(c) of the Ocean Plan, within 180 days following the adoption of this Order, the Discharger shall submit a work plan (MDA Work Plan) for a study and subsequently a final report designed to: (a) Confirm the Water Code section 13142.5(b) Determination that the level of intake and mortality of all forms of marine life estimated by using flow augmentation discharge technology is comparable to the intake and mortality of all forms of marine life caused by a theoretical multiport diffuser in the Pacific Ocean; and (b) Establish the benchmark to compare intake and mortality of all forms of marine life for a theoretical multiport diffuser for purposes of the comparison to flow augmentation in the *Brine Discharge Technology Empirical Study* described in section VI.C.2.b of this Order. ii. The MDA Work Plan shall provide for an analysis of the intake and mortality to all forms of marine life caused by brine discharged through theoretical multiport diffusers at the proposed location station N4 (described in the Tenera 2008 study) in the Pacific Ocean. Collection of data at multiple potential diffuser locations in the Pacific Ocean shall also be considered. The MDA Work Plan shall provide for using the approach contained in the scientific report *Brine*	

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		Diffusers and Shear Mortality, Philip J.W. Roberts April 18, 2018, referenced as the Roberts Report in Finding 31 of Attachment H.1 of this Order. The MDA Work Plan may also provide for conducting the analysis using an additional approach, in addition to using the Roberts Report approach. iii. Pursuant to Ocean Plan Chapter III.M.2.e.(1)(a), the MDA Work Plan shall include, but not be limited to: (a) A study period of at least 12 consecutive months; (b) A sampling program designed to account for variation in oceanographic or hydrologic conditions; (c) Sample collection using a mesh size no larger than 335 microns; (d) Samples identified to the lowest taxonomical level practicable; and (e) A schedule for completion of all activities and submission of the MDA Final Report. iv. The MDA Work Plan shall provide for consistency with the methodology described in Attachment E of the *Final Staff Report Including the Final Substitute Environmental Documentation for the Desalination Amendment to the Ocean Plan* including but not limited to larval length data, and deployment of an acoustic Doppler current profiler at each sampling location for the 12-month duration of the study. v. The Discharger shall modify the MDA Work Plan as requested by the San Diego Water Board after consultation with other State agencies involved in the permitting of the Facility including but not limited to the State Water Board, the California Coastal Commission, the California State Lands Commission, and the California Department of Fish and Wildlife. vi. Following the San Diego Water Board's review of the MDA Work Plan, the Discharger shall implement the	

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		MDA Work Plan in compliance with any conditions set by the San Diego Water Board in consultation with other State agencies involved in the permitting of the Facility including but not limited to the State Water Board, the California Coastal Commission, the California State Lands Commission, and the California Department of Fish and Wildlife. vii. The MDA Final Report must be completed and submitted to the San Diego Board within two years of the effective date of this Order, unless otherwise specified by the San Diego Water Board. The MDA Final Report shall include an in-depth discussion, evaluation, interpretation, and tabulation of the data supporting the interpretations and conclusions reached. The San Diego Water Board will review and comment, as needed, on the MDA Final Report in consultation with other State agencies involved in the permitting of the Facility including but not limited to the State Water Board, the California Coastal Commission, the California State Lands Commission, and the California Department of Fish and Wildlife. If the MDA Final Report confirms the comparability of flow augmentation and multiport diffusor brine discharge technologies, the condition on the Water Code section 13142.5(b) Determination will be of no further effect. In this case, the results of the MDA Final Report will establish the level of intake and mortality of all forms of marine life for a multiport diffuser as the benchmark for comparison to the results of the flow augmentation empirical study as required by Ocean Plan chapter III.M.2.d.(2)(c)v. If instead, the MDA Final Report fails to confirm the San Diego Water Board's conclusion of comparability under Ocean Plan chapter III.M.2.d.(2)(c), a new Water Code section 13142.5(b) determination will be required to select an appropriate brine discharge technology for the Facility.	

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		Section VI.C.2.b.iii iii. **Brine Discharge Technology Empirical Study Final Report** Within six months of completing the Brine Discharge Technology Empirical Study in accordance with the Work Plan, the Discharger shall submit a Brine Discharge Technology Empirical Study Final Report (Final Report) to the San Diego Water Board for review in consultation with other State agencies involved in the permitting of the Facility including but not limited to the the State Water Board, the California Coastal Commission, the California State Lands Commission, and the California Department of Fish and Wildlife. The Final Report shall include the results of the Multiport Diffuser A~~a~~nalysis of projected marine life impacts caused by brine discharged through multiport diffusers using the Roberts Report and any other methodology described in the Work Plan. The Final Report shall include the results of the flow augmentation study. The Final Report shall also include an in-depth discussion, evaluation, interpretation, and tabulation of the data supporting the interpretations and conclusions reached. If the Final Report shows that the flow augmentation choice for brine discharge technology results in more intake and mortality of marine life than if the Facility used ~~wastewater dilution~~ or multiport diffusers as described in Finding 31 of Attachment H.1. of this Order, then the Discharger must also submit with the Final Report a proposed schedule to either: … Attachment F – Fact Sheet, section I.M **Stand-Alone Operations (2019 Determination)** - The San Diego Water Board has analyzed separately as independent considerations, and in combination, a range of intake design alternatives and brine discharge	

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		alternatives and has determined that the Facility will use the best available combination of site, design, technology, and mitigation measures feasible to minimize the intake and mortality of all forms of marine life. This Dd~~d~~etermination is limited to stand-alone operation of the Facility, with a compliance schedule and interim measures to minimize mortality to all forms of marine life. Attachments H.1 and H.2 to this Order (collectively referred to as Attachment H) summarizes the San Diego Water Board's findings in support of its Water Code section 13142.5(b) Dd~~d~~etermination. This Water Code section 13142.5(b) Determination is based upon available information. The Determination is conditional in limited part on the results of the Multiport Diffuser Analysis (required in section VI.C.2.a of this Order). The Multiport Diffuser Analysis is required to be completed within two years of the effective date of this Order confirming the San Diego Water Board's conclusion that flow augmentation is comparable to a multiport diffuser in intake and mortality of all forms of marine life at this Facility. If the Multiport Diffuser Analysis confirms the comparability of the two discharge technologies, the condition will be of no further effect. In this case, the results of the Multiport Diffuser Analysis will establish the level of intake and mortality of all forms of marine life for a multiport diffuser as the benchmark for comparison to the results of the flow augmentation empirical study as required by Ocean Plan chapter III.M.2.d.(2)(c)v. If instead, the Multiport Diffuser Analysis fails to confirm the San Diego Water Board's conclusion of comparability under Ocean Plan chapter III.M.2.d.(2)(c), a new Water Code section 13142.5(b) determination will be required to select an appropriate brine discharge technology for the Facility. Attachment F – Fact Sheet, section III.A **Legal Authorities.** This Order serves as WDRs pursuant to article 4, chapter 4, division 7 of the Water	

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		Code (commencing with section 13260). This Order is also issued pursuant to section 402 of the federal Clean Water Act (CWA) and implementing regulations adopted by the U.S. Environmental Protection Agency (U.S. EPA) and chapter 5.5, division 7 of the Water Code (commencing with section 13370). It shall serve as an NPDES permit for point source discharges from this Facility to surface waters of the U.S. at the discharge location described in Table 2 of the Order, subject to the WDRs in this Order. This Order also includes the San Diego Water Board's Water Code section 13142.5(b) ~~d~~Determination. Attachment F – Fact Sheet, section III.E … The San Diego Water Board has analyzed separately as independent considerations, and in combination, a range of intake design alternatives proposed by the Discharger and has determined that the Facility will use the best available site, design, technology, and mitigation measures feasible to minimize the intake and mortality of all forms of marine life. Attachment H to this Order summarize the considerations and basis for this Water Code section 13142.5(b) ~~d~~Determination. Section VI.C.10.a of the Order includes a compliance schedule in Table 7, pursuant to chapter III.M.2.a(5)(b) of the Ocean Plan. This compliance schedule provides the Discharger the minimum time necessary to design, construct, and operate a new intake structure in compliance with the Ocean Plan, Water Code section 13142.5(b), and the requirements of this Order. The compliance schedule is expected to allow the Discharger to complete the Multiport Diffuser Analysis in the early design phases of the new intake structure. Until a new intake structure is constructed, the Discharger is required to implement interim measures under Provision section VI.C.7.c of this Order to minimize the intake and mortality of all forms of marine life.	

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		The Ocean Plan at chapter III.M.2.a.(5) authorizes a regional water board to expressly condition a Water Code section 13142.5(b) determination on the expectation of the occurrence of a future event. This Order at section VI.C.2.a requires the Discharger to complete the Multiport Diffuser Analysis. The Multiport Diffuser Analysis is required to be completed within two years of the Order's effective date and will provide additional scientific data to establish a benchmark regarding the intake and mortality of all forms of marine life associated with a multiport diffuser. If the Multiport Diffuser Analysis confirms the San Diego Water Board's conclusion that flow augmentation and a multiport diffuser provide a comparable level of intake and mortality of all forms of marine life for purposes of Ocean Plan chapter III.M.2.d.(2)(c), the condition will have no further effect. With the condition removed, the results of the Multiport Diffuser Analysis will establish the level of intake and mortality of all forms of marine life for a multiport diffuser for purposes of the comparison to the flow augmentation empirical study as required in Ocean Plan chapter III.M.2.d.(2)(c)v. If instead, the Multiport Diffuser Analysis fails to confirm the conclusion that the two technologies are comparable in intake and mortality of all forms of marine life, a new Water Code section 13142.5(b) determination to select an appropriate brine discharge technology will be required. Attachment F - Fact Sheet, section VI.B.2.a … The Discharger ~~evaluated~~ estimated entrainment effects ~~of each~~ for the flow augmentation brine discharge alternative, consistent with chapter III.M.2.d.(2)(c)i through iii of the Ocean Plan, in Appendix A and K of the 2015 ROWD on the 2008 EPS Impingement Mortality and Entrainment Characterization Study performed by Tenera Environmental. The Discharger revised the entrainment effects calculations from using flow augmentation discharge technology as	

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		recommended by the SAP and provided the results as Appendices FFF ~~and GGG~~ to the ROWD. The Discharger revised the entrainment effects calculations from using a multiport diffuser in Appendix GGG, however the multiport diffuser calculations are limited in that marine life data from Pacific Ocean was not available and marine life data from Agua Hedionda Lagoon was used in the calculations. The analysis determined that flow augmentation is at least equivalent when compared to the model multiport diffuser for marine life mortality, based on available information. The Water Code 13142.5(b) Determination in this Order is made conditional on the results of the Multiport Diffuser Analysis that the Discharger is required to conduct in section VI.C.2.a of this Order. The Multiport Diffuser Analysis will seek to confirm the San Diego Water Board's conclusion that the intake and mortality of all forms of marine life from flow augmentation and from a multiport diffuser are comparable as required in Ocean Plan chapter III.M.2.d.(2)(c). As explained in Attachment H, the entrainment calculations for a multiport diffuser performed by Tenera Environmental and provided in Appendix GGG do not include the necessary marine life larval length data from the open ocean coastal location where a hypothetical multiport diffuser would be located. As such, the entrainment calculations for a multiport diffuser in the Pacific Ocean inappropriately used marine life data from Agua Hedionda Lagoon rather than from the Pacific Ocean. The Discharger is required to conduct the Multiport Diffuser Analysis to confirm the San Diego Water Board's conclusion that the intake and mortality of all forms of marine life from flow augmentation and a multiport diffuser are comparable. If the Multiport Diffuser Analysis confirms this Order's conclusion that the two discharge technologies are comparable for purposes of Ocean Plan chapter III.M.2.d.(2)(c)v, then the condition will have no further effect. In this case, the results of the Multiport Diffuser Analysis will establish	

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		the level of intake and mortality of all forms of marine life for a multiport diffuser as the benchmark for comparison to the results of the flow augmentation empirical study as required by Ocean Plan chapter III.M.2.d.(2)(c)v. If instead, the results of the Multiport Diffuser Analysis fails to confirm that flow augmentation provides a comparable level of intake and mortality of all forms of marine life as a multiport diffuser, a new Water Code section 13142.5(b) determination will be required to select an appropriate brine discharge technology for the Facility. Irrespective of the conclusions of the Discharger's ROWD and Attachment H of this Order, chapter III.M.2.d(2)(c)iv of the Ocean Plan requires that if an alternative brine discharge technology other than wastewater dilution and multiport diffusers (e.g. flow augmentation) is approved and implemented under this Order, an empirical study that evaluates intake and mortality of all forms of marine life associated with the alternative brine discharge technology must be submitted within a designated ~~time frame~~ 18 months of beginning operation of the alternative brine discharge technology. The requirements for submittal of a Brine Discharge Technology Empirical Study Final Report established in section VI.C.2.b.III~~a~~ of this Order are in conformance with the requirements mandated by chapter III.M.2.d.(2)~~.~~(c)~~.~~iv of the Ocean Plan. If the Final Report shows that the brine discharge technology results in more intake and mortality of marine life than if the Facility used ~~wastewater dilution or~~ multiport diffusers as described in Finding 31 of Appendix H, then the Discharger must also submit with the Final Report a proposed schedule to either: **i.** Cease using the alternative brine discharge technology and install and use wastewater dilution or multiport diffusers to discharge brine waste; or	

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		ii. Re-design 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 San Diego Water Board approval. ~~At the time of this Order's adoption with the Water Code section 13142.5(b) determination, the San Diego Water Board is aware of a study by Dr. Philip Roberts, Brine Diffusers and Shear Mortality April 2018 (Roberts report), that estimates the marine life mortality from a brine discharge through a multiport diffuser. As such, the Discharger's Brine Discharge Technology Empirical Study should include an analysis of the marine life impacts caused by brine discharged through multiport diffusers using the Roberts study. Poseidon may choose to include additional information for the San Diego Water Boards review, as warranted, in addition to an analysis using the Roberts study. The results of such analyses are subject to further review by the San Diego Water Board following Poseidon's submittal.~~ Attachment F – Fact Sheet, section VI.G … The San Diego Water Board has concluded that a compliance schedule is in the public interest and reasonably required for design and modification of the Facility's intake structure to comply with Water Code section 13142.5(b) and the requirements of this Order. A compliance schedule is in the public interest, considering the technological, operational, economic, and permitting factors that affect the design, construction and implementation of the modified intake structure and the need to avoid Facility shut down and interruption of public drinking water supply during that period. Without this Facility supplying drinking water to the region, the long-term water supply plans and forecasts would require change and uncertainty exists if a replacement water supply can be secured during a	

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		potential five-year shutdown of the Facility. The compliance schedule is expected to provide sufficient time for the Discharger to complete the Multiport Diffuser Analysis required in section VI.C.2.a of the Order prior to initiating construction of the intake structure to provide the flow augmentation dilution water for discharge. Based on these considerations a compliance schedule is provided in section IV.C.7.a, Table 7 of this Order to construct and make operational the required modifications of the Facility's intake structure. Attachment H.1, Footnote 7 [7] The Water Code section 13142.5(b) Determination is conditional on completion of the Multiport Diffuser Analysis described in Section VI.C.2.a of this Order requiring the collection of additional data to confirm the conclusion that flow augmentation and a multiport diffuser have a comparable level of intake and mortality of all forms of marine life. See section VI.C.2.a of this Order and Finding 31, below, for discussion of the conditional determination. Attachment H.1, Finding 5 … The Water Code section 13142.5(b) determination in this Order is conditional on the expectation that the Multiport Diffuser Analysis (see Order, section VI.C.2.a) will confirm the San Diego Water Board's conclusion that flow augmentation and a theoretical multiport diffuser have a comparable level of intake and mortality of all forms of marine life. If the San Diego Water Board's conclusion is confirmed, then the condition will have no further effect. If, instead, the results of the study fail to confirm the conclusion that the two discharge technologies have a comparable level of intake and mortality of all forms of marine life, a new Water Code section 13142.5(b) determination will be required. (See Ocean Plan, chapter III.M.2.a(5).)	

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		Attachment H.1, Finding 7 In accordance with chapter III.M.2.(a)(5)(b) of the Ocean Plan, the Order includes a compliance schedule at section VI.C.9 which provides Poseidon up to five years from the date EPS permanently ceased power generating operations to secure permits, complete design, and construct a new intake structure that supports stand-alone operation of the Facility while maintaining compliance with the Ocean Plan. This compliance period to modify the intake technology as required by this Water Code section 13142.5(b) determination is in the public interest to maintain Facility operations and continue drinking water production at the Facility during that time when the EPS has permanently ceased power generating operations prior to the construction of a new intake structure, according to the schedule provided by Poseidon on September 13, 2018. The approximately 4.5 ~~five-~~year compliance schedule reflects a realistic assessment of the time needed to design, obtain necessary permits for, construct and put into operation a new intake structure within the waters of Agua Hedionda Lagoon. If a new Water Code section 13142.5(b) determination for this Facility is required, Ocean Plan chapter III.M.2.a.(5)(b) authorizes the Board to allow up to five years from the date of the event for modifications to the facility to be made to comply with the determination provided certain findings are made. Attachment H.1, Finding 30 Poseidon projects that the total project cost for a multiport diffuser with a surface water intake is up to $458,639,220 in Appendix OO to the ROWD, Table 1, Surface Screened Intake with Multiport Diffuser. While the San Diego Water Board considered this cost projection, the conditional determination that flow augmentation is the best available feasible brine	

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		discharge technology is not based on the projected cost of a multiport diffuser but ~~B~~based ~~on this projection, the San Diego Water Board finds that multiport diffusers are not feasible at this time~~ on available information that supports the conclusion that use of flow augmentation as an alternative brine discharge technology and a theoretical multiport diffuser will provide comparable intake and mortality of all forms of marine life pursuant to chapter III.M.2.d(2)(c). Attachment H.1, Finding 31 To allow use of flow augmentation as an alternative brine discharge technology, the San Diego Water Board must consider whether the Discharger has demonstrated that flow augmentation provides a comparable level of intake and mortality of all forms of marine life as a multiport diffuser. The San Diego Water Board analyzed the information provided by Poseidon for intake and marine life mortality due to flow augmentation and the information provided by Poseidon for intake and marine life mortality due to a discharge from a theoretical multiport diffuser by calculating the required volume of water to dilute the discharge to meet the salinity receiving water limit. This volume was then multiplied by 0.23 (23%) to estimate the volume of water where shearing-related mortality occurs, as was reported by Foster et al[1] and referenced in the Final Staff Report Including the Final Substitute Environmental Documentation (SED)[3]. Finally, an estimate of the size of the Brine Mixing Zone was calculated using modeling and a theoretical diffuser. This area is 12.3 acres according to Appendix A to the ROWD. This analysis shows that the flow augmentation discharge technology provides a comparable level of intake and mortality of all forms of marine life as the theoretical multiport diffuser. See Appendices A, K, WW, ZZ, FFF, and GGG to the ROWD.	

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		A recent scientific report~~1~~2 by Dr. Philip Roberts has refined the methods to calculate marine life mortality caused by a brine discharge through a diffuser. These refined methods include a process to systematically determine the best available diffuser design to minimize mortality and the size of the brine mixing zone (BMZ). The San Diego Water Board ~~staff~~ analyzed potential diffuser designs using the methods in the most recent scientific report by Dr. Roberts and has estimated that the shearing-related mortality from the best available diffuser design is comparable to Poseidon's estimate of the additional intake-related mortality from the flow augmentation discharge technology. Specifically, a theoretical diffuser could be designed that would result in a volume of approximately 170 MGD exposed to shearing-related mortality and a potential BMZ that might be as low as 1 acre. Poseidon's estimate of mortality from using flow augmentation discharge technology includes a 171 to 196 MGD volume of intake ~~related mortality~~ with an APF of 76 to 88 acres and a BMZ of approximately 18.5 acres. The comparison of brine discharge technologies was conducted considering a "worst-case" scenario of the maximum brine discharge of 60 MGD. "Worst case" is the plant operating conditions that would most likely result in the highest threat to water quality. For a brine discharge of 60 MGD, a theoretical multiport diffuser would result in approximately 170 MGD of seawater compared to 171 MGD of seawater needed from flow augmentation to dilute 60 MGD of brine. Due to the Order's intake specification limiting the total intake of seawater to 299 MGD, if the flow augmentation was increased to 196 MGD, the plant could only produce approximately 48 MGD of brine which is less of a threat to water quality than the discharge of 60 MGD of brine. Therefore, the comparison of brine discharge	

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		technologies was done for a discharge of 60 MGD of brine. Poseidon conducted an ETM/APF ~~similar~~ analysis in Appendix GGG to the ROWD that concluded a diffuser could be designed that would result in approximately 170 MGD of shearing related mortality. However, the Appendix GGG ETM/APF calculation for a diffuser inappropriately relied on larval length data from Agua Hedionda Lagoon rather than larval length data from the open ocean coastal area where a diffuser would be located. Due to a lack of larval length data from the open ocean coastal area to calculate an ETM/APF value for a diffuser, the Order requires the collection of entrainment data at the location of the hypothetical multiport diffuser and an ETM/APF analysis based on those data within two years of this Order's effective date. While available information supports the conclusion that flow augmentation is the best available brine discharge technology feasible, greater confidence in the scientific determination that underlays the comparison of intake and mortality levels from multiport diffusers and flow augmentation can be provided through implementation of the Multiport Diffuser Analysis required in Section VI.C.2.a of the Order. See also Finding 36, below for further information on how the data will be used for subsequent comparison to the outcome of the flow augmentation discharge technology empirical study required in the Order, section VI.C.2.b. In Appendix N to the ROWD, Poseidon estimated the cost to construct a multiport diffuser with a surface water intake to be approximately $425 million. In Appendix EEE to the ROWD, Poseidon estimated the cost to construct Design Alternative 21, a surface water intake with WWS using flow augmentation discharge technology, to be $53 million. Poseidon's September 13, 2018 cost update for Alternative 21 put the expected cost of this alternative between $66.2 to $82.8 million.	

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		Based on these considerations with the information available ~~discussion above~~, the San Diego Water Board has conditionally determined that flow augmentation is the best available discharge technology feasible. [See discussion in Finding II.D of the Order explaining that this Water Code section 13142.5(b) determination is made conditional on the results of the Multiport Diffuser Analysis confirming the San Diego Water Board's conclusion that use of an alternative brine discharge technology pursuant to section III.M.2.d.(2)(c) of the Ocean Plan is permissible. If the study fails to confirm the comparability of intake and mortality of all forms of marine life from the two discharge technologies, then the Ocean Plan requires the San Diego Water Board to make a new Water Code section 13142.5(b) determination.] Due to uncertainties in estimating the marine life mortality through modeling and as required by the Ocean Plan, Section VI.C.2.b~~a.v.~~ of the Tentative Order requires a special study ~~to~~ consistent with the requirements in Ocean Plan chapter III.M.2.d.(2)(c)(iv) to further evaluate intake and mortality of all forms of marine life associated with the discharge technology for permanent stand-alone operations. This study will evaluate the marine life mortality from a flow augmentation discharge with empirical observation data for direct comparison to the marine life mortality from a diffuser as required by chapter III.M.2.d.(2)(c)(v) of the Ocean Plan ~~as outlined above~~. If the study ~~shows~~ demonstrates that the flow augmentation discharge 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 submit a proposed schedule to either:	

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		1. Cease using the flow augmentation brine discharge technology and install and use wastewater dilution or multiport diffusers to discharge brine waste; or 2. Re-design the alternative flow augmentation 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 San Diego Water Board approval. [1]Desalination Plant Entrainment Impacts and Mitigation. Expert Review Panel III, Foster et al, 2013 available at: https://www.waterboards.ca.gov/water_issues/programs/ocean/desalination/docs/erp_final.pdf (as of June 25, 2018) [2]Brine Diffusers and Shear Mortality, Philip J.W. Roberts, (Roberts' Report) April 18, 2018 is available at the Santa Ana Water Board's website: https://www.waterboards.ca.gov/santaana/water_issues/programs/Wastewater/Poseidon/2018/4-18-18_Diffuser_Analysis_Method.pdf (as of June 25, 2018) [3]The Final Staff Report Including the Final Substitute Environmental Documentation is available at: https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2015/rs2015_0033_sr_apx.pdf ~~(Roberts' Report)~~ Attachment H.1, Finding 32 Poseidon estimated the intake entrainment impacts from flow augmentation using an ETM/APF approach based on Appendix E to the Desalination Amendment Staff Report. The SAP reviewed Poseidon's APF and ETM calculations for flow augmentation and recommended that the ETM calculations be consistent with the calculations conducted for the 2008 EPS Study, to	

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		account for the intake of marine life species from multiple source water bodies (i.e. Agua Hedionda Lagoon and the Pacific Ocean) rather than a single source water body (i.e. only Pacific Ocean). Poseidon revised the ETM calculations for flow augmentation as recommended by the SAP and provided the results as Appendix FFF to the ROWD. See Finding 31 and Appendices K, P, WW, FFF, and GGG to the ROWD. The San Diego Water Board evaluated this information in reaching its conclusion that the intake and mortality of all forms of marine life from flow augmentation and multiport diffusers are comparable ~~is the best available discharge technology feasible~~. This conclusion is conditional on the outcome of the Multiport Diffuser Analysis, as described in Finding II.D of the Order. Attachment H.1, Finding 33 Poseidon analyzed the potential for degradation to marine life due to elevated salinity within the BMZ. See Appendices C, G, H, I, L, BB, DD, QQ, UU, WW, XX and ZZ to the ROWD. The San Diego Water Board evaluated this information in reaching its conclusion that the intake and mortality of all forms of marine life from flow augmentation and multiport diffusers are comparable ~~is the best available discharge technology feasible at this time~~. This conclusion is conditional on the outcome of the Multiport Diffuser Analysis as described in Finding II.D of the Order. This Order's Monitoring Reporting Program in Attachment E requires salinity monitoring within the BMZ to assess impacts and evaluate adverse changes in the environment due to elevated salinity. Attachment H.1, Finding 34 Poseidon estimated the intake and mortality of all forms of marine life that occurs as a result of water conveyance assuming 100 percent mortality of marine life entrained in the intake water. See Findings 31 and	

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		32 and Appendices B, C, F, K, I, J, L, BB, DD, GG, HH, QQ, UU, WW, XX YY, and ZZ to the ROWD. The San Diego Water Board evaluated this information in reaching its conclusion ~~and concluded~~ that the intake and mortality of all forms of marine life from flow augmentation and multiport diffusers are comparable ~~is the best available discharge technology feasible at this time~~. This conclusion is conditional on the outcome of the Multiport Diffuser Analysis, as described in Finding II.D of the Order. Attachment H.1, Finding 36 Section VI.C.2.b~~a~~ of this Order requires an empirical study to evaluate intake and mortality of all forms of marine life associated with the flow augmentation discharge. If the study shows that flow augmentation results in more intake and mortality than multiport diffusers, the Discharger will be required to either (1) cease using flow augmentation as an alternative brine discharge technology and install and use wastewater dilution or multiport diffusers to discharge brine waste or (2) re-design the flow augmentation 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 available, or multiport diffusers if wastewater dilution is unavailable. Such modifications or redesign are subject to San Diego Water Board approval in consultation with appropriate state agencies. Poseidon may request a time schedule to comply with these requirements including but not limited to cease or redesign the discharge technology. See Finding 31 for more information on the special study.	

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3	**b. Availability of Wastewater to Dilute CDP Brine Discharge (TO page 18, Appendix H-1 Findings 14 and 29).** The Tentative Order states that the San Diego Water Board finds that wastewater is unavailable to dilute the CDP discharge brine discharge, and flow augmentation is the best available brine discharge technology feasible. (Appendix H-1, Findings 14, 29, and 31). However, section VI.C.2.a.(iii) of the Tentative Order requires that the San Diego Water Board reconsider its finding that wastewater is unavailable following completion of the new intake structure. If wastewater dilution is found to be available at that time, Poseidon is required to cease using the alternative brine discharge technology and install and use wastewater dilution. Similar to our concerns related to the multiport diffuser, leaving open the Tentative Determination whether wastewater is available until after the flow augmentation discharge technology is constructed and operating, places an $80 million investment in intake and discharge improvements at risk of having to be replaced shortly after being placed in service. It is unreasonable for the San Diego Water Board to require Poseidon, and ultimately the region's ratepayers, to proceed with this investment in the face of such uncertainty that is outside our control. **Requested Modifications to the Tentative Order.** Poseidon requests the San Diego Water Board revise the Tentative Order to clarify that: • The finding that wastewater is unavailable is a one-time determination that is made at the time of the Tentative Determination and is not subject to reconsideration. Poseidon respectfully requests the San Diego Water Board modify the section VI.C.2, pages F-40 through F-42, and Finding 31 of Attachment H-1 of the Tentative Order.	The San Diego Water Board agrees in part with Poseidon's requested modifications to the Tentative Order to remove references to the availability of wastewater dilution in regard to the Tentative Determination. However, if a new Water Code section 13142.5(b) determination is required pursuant to the Ocean Plan, then Poseidon will be required to evaluate the availability of wastewater dilution as a brine discharge technology. As stated by Poseidon, the San Diego Water Board finds in the Tentative Determination that wastewater is unavailable to dilute the CDP discharge brine discharge, and flow augmentation is the best available brine discharge technology feasible. (Appendix H-1, Findings 14, 29, and 31). The San Diego Water Board based this finding on the Encina Wastewater Authority's feasibility assessment for commingling the brine waste from the Facility with wastewater through the Encina Ocean Outfall (EOO) (see Appendix CC of the ROWD). To accomplish this, the Encina Wastewater Authority concluded that 1) an additional pipeline would need to be constructed from the Facility to the EOO, approximately two miles south of the Facility; 2) the EOO is currently near full capacity during storm events and would not have capacity for a brine discharge at such times requiring the Facility to have an alternative discharge technology during storm events; and 3) future efforts to recycle wastewater for reuse would diminish the availability of wastewater for dilution of the Facility's brine through the EOO. As required by chapter III.M.2.d(2)(c) of the Ocean Plan, the Tentative Order requires Poseidon to conduct a Multiport Diffuser Analysis (MDA) to confirm that the flow augmentation discharge technology provides a comparable level of intake and mortality of all forms of marine life as a multiport diffuser since wastewater dilution is unavailable. If the Brine Discharge Technology Empirical Study shows that the flow augmentation discharge technology results in	The Tentative Order was revised as described in the response at section VI.C.2.b.iii; Attachment F section VI.B.2.a; and Attachment H.1, Finding 31.

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		more intake and mortality of all forms of marine life than using a multiport diffuser, then Poseidon is required to either 1) cease using flow augmentation discharge technology and install and use wastewater dilution or multiport diffusers, or 2) re-design the flow augmentation discharge technology system to minimize intake and mortality of all forms of marine life to a level that is comparable with that of wastewater dilution, if available, or multiport diffusers. In that event, the Ocean Plan does not limit the Discharger's consideration of the availability of the Ocean Plan's preferred technologies (wastewater dilution if available, and multiport diffusers) or the consideration of other potential alternative brine discharge technologies. Although the Tentative Determination concludes that wastewater dilution is unavailable based on current information, circumstances will possibly have changed, making wastewater dilution a more feasible alternative for brine discharge after the post-construction Brine Discharge Technology Empirical Study is completed comparing the intake and mortality of all forms of marine life from flow augmentation and a theoretical multiport diffuser. References to wastewater dilution regarding the Tentative Determination or for the Brine Discharge Technology Empirical Study's comparison to flow augmentation discharge have been removed from the Tentative Order. However, the feasibility of wastewater dilution for consideration among brine discharge technologies pursuant to Ocean Plan chapter III.M.2.d.(2)(c)v following the results of the Brine Discharge Technology Empirical Study have been retained in the Tentative Order. The Tentative Order has been modified as follows: <u>Section VI.C.2.b.iii</u> **iii. Brine Discharge Technology Empirical Study Final Report** Within six months of completing the Brine Discharge Technology Empirical Study in accordance with the	

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		Work Plan, the Discharger shall submit a Brine Discharge Technology Empirical Study Final Report (Final Report) to the San Diego Water Board for review in consultation with other State agencies involved in the permitting of the Facility including but not limited to the State Water Board, the California Coastal Commission, the California State Lands Commission, and the California Department of Fish and Wildlife. The Final Report shall include the results of the Multiport Diffuser ~~a~~Analysis of projected marine life impacts caused by brine discharged through theoretical multiport diffusers using the Roberts Report and any other methodology described in the Work Plan. The Final Report shall include the results of the flow augmentation study. The Final Report shall also include an in-depth discussion, evaluation, interpretation, and tabulation of the data supporting the interpretations and conclusions reached. If the Final Report shows that the flow augmentation choice for brine discharge technology results in more intake and mortality of marine life than if the Facility used ~~wastewater dilution or~~ multiport diffusers as described in Finding 31 of Attachment H-1 to this Order, then the Discharger must also submit with the Final Report a proposed schedule to either: (a) Cease using the alternative brine discharge technology and install and use wastewater dilution or multiport diffusers to discharge brine waste; or (b) Re-design 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 San Diego Water Board approval. Attachment F- Fact Sheet, section VI.B.2.a	

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		…Irrespective of the conclusions of the Discharger's ROWD and Attachment H of this Order, chapter III.M.2.d(2)(c)iv of the Ocean Plan requires that if an alternative brine discharge technology other than wastewater dilution and multiport diffusers (e.g. flow augmentation) is approved and implemented under this Order, an empirical study that evaluates intake and mortality of all forms of marine life associated with the alternative brine discharge technology must be submitted within ~~a designated time frame~~ 18 months of beginning operation of the alternative brine discharge technology. The requirements for submittal of a Brine Discharge Technology Empirical Study Final Report established in section VI.C.2.b.iii~~a~~ of this Order are in conformance with the requirements mandated by chapter III.M.2.d.(2).(c).iv of the Ocean Plan. If the Final Report shows that the brine discharge technology results in more intake and mortality of marine life than if the Facility used ~~wastewater dilution or~~ multiport diffusers as described in Finding 31 of Appendix H, then the Discharger must also submit with the Final Report a proposed schedule to either: i. Cease using the alternative brine discharge technology and install and use wastewater dilution or multiport diffusers to discharge brine waste; or ii. Re-design 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 San Diego Water Board approval. … Attachment H.1, Finding 31 … If the study ~~shows~~ demonstrates that the flow augmentation discharge technology results in more intake and mortality of all forms of marine life than a Facility using ~~wastewater dilution or~~ multiport diffusers,	

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		then, as required by Ocean Plan chapter III.M.2.d.(2)(c)(v), the Facility must submit a proposed schedule to either: 1. Cease using the flow augmentation brine discharge technology and install and use wastewater dilution or multiport diffusers to discharge brine waste; or 2. Re-design the alternative flow augmentation 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 San Diego Water Board approval.	
4	**Intake Specifications (Tentative Order page 12).** Please revise paragraph 7 as shown in red below to clarify that the in-plant recycling requirement is "to the maximum extent practical": 7. To the maximum extent practical, ~~In~~in-plant recycling of waste streams shall be maximized before intaking additional seawater;	The San Diego Water Board agrees with the comment. The Facility is designed to recycle some, not all, of the internal waste streams. The Tentative Order has been modified as follows: Section IV.C.7 7. To the maximum extent practicable, i~~I~~n-plant recycling of waste streams shall be maximized before intaking additional seawater;	The Tentative Order was revised as described in the response at section IV.C.7.
5	**Interim Operations Requirements (Tentative Order page 23).** Please revise the Interim Operations Requirements set forth in section VI.C.7.c of the Tentative Order the reflect the ongoing operations and maintenance requirements during interim operations shown in red below: **a. Interim Operations Requirements** Until the new intake structure is constructed and operational, the Discharger is required to implement the following measures to minimize the intake and mortality of all forms of marine life:	The San Diego Water Board does not agree with the requested changes to the Tentative Order. Section VI.C.7.c of the Tentative Order prescribes the measures Poseidon must take to minimize the intake and mortality of all forms of marine life. That section of the Tentative Order does not describe the operation and maintenance of the existing intake pumps and screens. The operation and maintenance of the existing intake pumps and screens are regulated under Order No. R9-2006-0043, *Waste Discharge Requirements for Cabrillo Power I LLC Encina Power Plant San Diego County*. Poseidon will need to request an amendment to their	None.

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	i. Surface water intakes must be screened using the existing intake screens, and the screens must be functional while the Facility is withdrawing seawater, screen wash water and organic debris removed from the screens are discharged to the discharge channel; **ii.** The intake of seawater must not exceed a flowrate of 330 MGD with the existing intake pumps; and 299 MGD with the new intake pumps. An existing hypochlorite generator runs intermittently when the existing pumps are in operation. Seawater used to cool the DC rectifier and existing pumps is discharged to the discharge channel.	permit for these waste streams to be covered under the Tentative Order. For these reasons, the Tentative Order has not been modified.	
6	**Effluent Monitoring at M-001 when not Discharging Brine (Tentative Order page E-8).** Please revise the paragraph preceding Table E-4 as shown in red below to clarify the monitoring requirements at Monitoring Location M-001 when the Facility is not discharging: "At times including but not limited to plant start-up, during or after plant maintenance, or other times when the Facility is not delivering product water to the regional water system, the Facility may temporarily discharge flows without the concentrated reverse osmosis brine. During such ~~times~~ temporary periods when the Facility is not discharging brine, monitoring is required to ensure compliance with permit provisions. The Discharger shall monitor the effluent at monitoring location M-001 when not discharging brine as follows:"	The San Diego Water Board has modified the Tentative Order as requested by Poseidon: Attachment E – MRP, section III.B At times including but not limited to plant start-up, during or after plant maintenance, or other times when the Facility is not delivering product water to the regional water system, the Facility may temporarily discharge flows without the concentrated reverse osmosis brine. During such ~~times~~ temporary periods when the Facility is not discharging brine, monitoring is required to ensure compliance with permit provisions. The Discharger shall monitor the effluent at monitoring location M-001 when not discharging brine as follows:	The Tentative Order was revised as described in the response at Attachment E, section III.B.
7	**Table E-8 Offshore Monitoring Requirements (Tentative Order page E-17).** Please revise footnote 2 to Table E-8 to clarify that the depth profile measurements are to be "evaluated at a minimum of one-foot intervals": "Temperature, depth, salinity, dissolved oxygen, light transmittance, and pH profile data shall be measured throughout the entire water column using a conductivity, temperature, and depth (CTD) profiler during the quarterly	The San Diego Water Board agrees with the request to clarify the depth profile measurements for the offshore monitoring stations. Continuous monitoring data from a CTD profiler is difficult to report. Reporting and evaluating the data at one-foot intervals is reasonable to provide sufficient data to assess the water column profile. The phrase "at a minimum" was unclear if the one-foot interval was the greatest or least interval length to evaluate the depth profile measurements. As such, the San Diego	The Tentative Order was revised as described in the response at Attachment E, section IV.B, Table E-8, footnote 2.

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	sampling events. Depth profile measurements shall be obtained using multiple sensors to measure parameters through the entire water column (from the surface to as close to the bottom as practicable), evaluated at a minimum of one-foot intervals."	Water Board accepted the commenter's requested change except for the phrase "at a minimum". The Tentative Order has been revised as follows: Attachment E – MRP, section IV.B, Table E-8, footnote 2 Temperature, depth, salinity, dissolved oxygen, light transmittance, and pH profile data shall be measured throughout the entire water column using a conductivity, temperature, and depth (CTD) profiler during the quarterly sampling events. Depth profile measurements shall be obtained using multiple sensors to measure parameters through the entire water column (from the surface to as close to the bottom as practicable) evaluated at one-foot intervals.	
8	**Facility Description (Tentative Order page F-6).** Please revise the third paragraph of the Facility Description as shown in red below to reflect the correct flow rate during interim operations: "Startup maintenance flows, product water, and off-spec water may be temporarily discharged in the Pacific Ocean during initial plant start-up, during or after plant maintenance, or other times when the Facility is not delivering potable water to the regional water system. To the maximum extent practicable, these flows must be recycled to the Facility headworks for potable water production. During such temporary periods, the total maximum allowable discharge flowrate shall not exceed 330 MGD with the existing intake pumps and 299 MGD with the new intake pumps, the maximum allowable intake flowrate. Temporarily discharging such water to the Pacific Ocean does not constitute a "bypass" as defined in Attachments A and D of this Order. All limits and requirements, including monitoring, specified in this Order remain applicable during these temporary discharges."	The San Diego Water Board agrees that the Facility Description should be corrected to reflect interim operations. The Tentative Order has been modified as follows: Attachment F – Fact Sheet, section II.A … Startup maintenance flows, product water, and off-spec water may be temporarily discharged in the Pacific Ocean during initial plant start-up, during or after plant maintenance, or other times when the Facility is not delivering potable water to the regional water system. To the maximum extent practicable, these flows must be recycled to the Facility headworks for potable water production. During such temporary periods, the total maximum allowable discharge flowrate shall not exceed 330 MGD with the existing intake pumps and 299 MGD with the new intake pumps, the maximum allowable intake flowrate. Temporarily discharging such water to the Pacific Ocean does not constitute a "bypass" as defined in Attachments A and D of this Order. All limits and requirements, including monitoring, specified in this	The Tentative Order was revised as described in the response at Attachment F, section II.A.

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		Order remain applicable during these temporary discharges.…	
9	**Reopener Provision (Tentative Order page F-40).** Please revise the second paragraph of the description of the Reopener Provision on page F-40 of the Fact Sheet (Attachment F) as shown in red below to acknowledge that a potential reason the Discharger may request to modify provisions governing compliance with Water Code section 13142.5(b) and the Ocean Plan is that the Discharger's pilot test failed to confirm the expected performance and reliability of the wedgewire screens as the intake screening technology for the Facility. **1. Reopener Provisions** This Order may be reopened to modify provisions governing compliance with Water Code section 13142.5(b) and the Ocean Plan if the Discharger proposes a change in design or operation of the Facility in a manner that could increase intake or mortality of all forms of marine life, consistent with the Ocean Plan definition of an expanded facility, beyond that which is approved in this Water Code determination. Causes for modifications include, but are not limited to, the Discharger's pilot scale intake project to assess debris management and intake maintenance requirements fails to confirm the expected performance and reliability of the wedgewire screens in the Lagoon. This Order may be reopened at any time for modification of provisions governing compliance with the receiving water limitation for salinity as set forth in Ocean Plan chapter III.M.3.	The San Diego Water Board does not agree with the comment or requested revision. Section VI.C1.a of the Tentative Order provides in relevant part that the Tentative Order may be reopened to modify provisions governing compliance with Water Code section 13142.5(b) and the Ocean Plan if the Discharger proposes a change in design or operation of the Facility in a manner that could increase intake or mortality of all forms of marine life, consistent with the Ocean Plan definition of an expanded facility, beyond that which is approved in this Tentative Determination. This reopener provision describes the circumstances under which the San Diego Water Board may reopen the Tentative Order, not the Tentative Determination. Water Code section 13142.5(b) and the implementation provisions in chapter III.M of the Ocean Plan do not provide for reopening a Water Code determination after that determination has been made except under specific circumstances. However, the Ocean Plan does authorize the San Diego Water Board to conduct a new Water Code section 13142.5(b) determination if Poseidon proposes a change to its Facility design or operation that could increase the intake or mortality of all forms of marine life beyond that which is approved in this Order. Such a change is considered a facility expansion. (See Ocean Plan, chapter III.M.1.b.(2).) Chapter III.M.2.a.(3) of the Ocean Plan allows a regional water board's analysis under a new Water Code section 13142.5(b) determination for a facility expansion to be limited to the expansions or other changes to the design or operation of the Facility that result in the increased intake or mortality of all forms of marine life. The current wording of the reopener provision of the Tentative Order at section VI.C.1.a and the basis of the reopener	The Tentative Order was revised as described in the response at section C.1.a.; and Attachment F, section VI.B.1.

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		provision described in Attachment F section VI.B.1 are broadly written and consistent with the intent of the Ocean Plan and would allow Poseidon to seek a new Water Code section 13142.5(b) determination if, based upon the results of its pilot scale intake project, Poseidon proposes a change to the Facility design or operation that could increase intake or mortality of all forms of marine life beyond that approved in this Tentative Order and Tentative Determination. The Tentative Order has been modified as follows: Section VI.C.1.a. This Order may be reopened to modify provisions governing compliance with Water Code section 13142.5(b) and the Ocean Plan if a new Water Code section 13142.5(b) determination is required by the terms of this Order or if the Discharger proposes a change in design or operation of the Facility in a manner that could increase intake or mortality of all forms of marine life, consistent with the Ocean Plan definition of an expanded facility, beyond that which is approved in this Water Code section 13142.5(b) ~~d~~Determination. This Order may be reopened at any time for modification of provisions governing compliance with the receiving water limitation for salinity as set forth in Ocean Plan section III.M.3. Attachment F – Fact Sheet, section VI.B.1 … This Order may be reopened to modify provisions governing compliance with Water Code section 13142.5(b) and the Ocean Plan if the Discharger proposes a change in design or operation of the Facility in a manner that could increase intake or mortality of all forms of marine life, consistent with the Ocean Plan definition of an expanded facility, beyond that which is approved in this Water Code section 13142.5(b) ~~d~~Determination. Causes for modifications to the Facility operations that are expected to result in an increased	

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		intake or mortality of all forms of marine life will require a new Water Code section 13142.5(b) determination by the San Diego Water Board. This Order may also be reopened to modify provisions governing compliance with Water Code section 13142.5(b) and the Ocean Plan if the future event described in the Order at section VI.C.2.a and in Attachment H occurs requiring a new Water Code section 13142.5(b) determination pursuant to Ocean Plan chapter III.M.2.a.(5). This Order may be reopened at any time for modification of provisions governing compliance with the receiving water limitation for salinity as set forth in Ocean Plan chapter III.M.3.	
10	**Finding 68 (Appendix H-1**). Suggested correction to Finding 68 of Appendix H-1: Poseidon initially requested a facility-specific alternative receiving water limitation for salinity (see Appendix A of the ROWD) but did not ~~provide~~ pursue this request in the development of the ROWD. Consequently, the ROWD does not include adequate technical supporting information to demonstrate that an alternative receiving water limitation would be protective of water quality standards.	The San Diego Water Board has modified the Tentative Order as requested by Poseidon: Attachment H.1, Finding 68 Poseidon initially requested a facility-specific alternative receiving water limitation for salinity (see Appendix A of the ROWD) but did not ~~provide~~ pursue this request in the development of the ROWD. Consequently, the ROWD does not include adequate technical supporting information to demonstrate that an alternative receiving water limitation would be protective of water quality standards.	The Tentative Order was revised as described in the response at Attachment H.1, Finding 68.
Maureen Stapleton, General Manager, SDCWA			
11	The SDCWA concurs with the statements and requested modifications to the Tentative Order that are contained in Poseidon's Comment Letter, submitted to you under separate cover on January 28, 2019.	The San Diego Water Board acknowledges the comment. See Response to Comments No. 1 through 10.	None.
12	**California Environmental Quality Act (Section II.F, Attachment F, III.B)** The SDCWA is currently working on the Sixth Addendum to the Final EIR and anticipates finalizing the document in February 2019. Please revise the language in the Tentative Order, as shown in red below, to reflect the current status:	The San Diego Water Board has modified the Tentative Order as follows as requested by the SDCWA: Section II.F F. California Environmental Quality Act (CEQA). The action to adopt an NPDES permit is exempt from the provisions of the California Environmental Quality Act	The Tentative Order was revised as described in the response at section II.F; and

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	"The action to adopt an National Pollutant Discharge Elimination System (NPDES) permit is exempt from the provisions of the California Environmental Quality Act (Public Resources Code Section 21100, et seq.) in accordance with section 13389 of the Water Code. The Water Code section 13142.5(b) determination set forth in Attachments H-1 and H-2 to this Order is issued under state law authority only and is a discretionary approval subject to compliance with CEQA. In August 2016, the SDCWA certified the Final Supplement to the Precise Development Plan and Desalination Plant Project Final Environmental Impact Report (EIR 03-05, State Clearinghouse No. 2004041081)(Final EIR). ~~In January 2019, the SDCWA approved the Sixth Addendum to the Final EIR.~~ In February 2019, the SDCWA finalized the *Sixth Addendum to the Final EIR*. The San Diego Water Board independently considered the environmental effects of the project as described in the 2006 EIR, the 2016 Supplemental EIR, and addendums. Details of CEQA compliance are set forth in the Fact Sheet (Attachment F)."	(Public Resources Code Section 21100, et seq.) in accordance with section 13389 of the Water Code. The Water Code determination set forth in Attachments H-1 and H-2 to this Order is issued under state law authority only and is a discretionary approval subject to compliance with CEQA. In August 2016, the SDCWA certified the Final Supplement to the Precise Development Plan and Desalination Plant Project Final Environmental Impact Report (EIR 03-05; State Clearinghouse No. 2004041081) (Final EIR). ~~In January 2019, the SDCWA approved the Sixth Addendum to the Final EIR.~~ Since certification of the FSEIR, the SDCWA finalized the *Sixth Addendum to the Final EIRI* in February 2019. The San Diego Water Board independently considered the environmental effects of the project as described in the 2006 EIR, the 2016 Supplemental EIR, and addendums. Details of CEQA compliance are set forth in the Fact Sheet (Attachment F). Attachment F, section III.B Under Water Code section 13389, this action to adopt an NPDES permit is exempt from the provisions of chapter 3 of the CEQA, (commencing with section 21100, et. seq.) of division 13 of the Public Resources Code. However, compliance with CEQA is required for those provisions in this Order that are based on State law only. This Order's determination that the Facility complies with Water Code section 13142.5(b) is a determination based on consideration of State law only and is subject to CEQA compliance. In August 2016, the SDCWA certified the Final Supplement to the Precise Development Plan and Desalination Plant Project Final Environmental Impact Report (EIR 03-05, State Clearinghouse No. 2004041081) (Final SEIR). ~~In January 2019, the SDCWA approved the Sixth Addendum to the Final EIR.~~ Following certification of the Final SEIR, the SDCWA finalized the *Sixth Addendum*	Attachment F, section III.B.

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		to the Final EIR in February 2019. The San Diego Water Board independently considered the environmental effects of the project as described in the 2006 EIR, the 2016 Supplemental EIR, and addendums.	
Tom Luster, Senior Environmental Scientist, California Coastal Commission (Commission)			
13	**Climate Change Action Plan.** We appreciate that the Tentative Order, at section VI.C.2.d (page 20), requires Poseidon to prepare a Climate Change Action Plan that shows compliance with similar plans required by other agencies, including the Commission. We have informed Poseidon that its current *Energy Minimization and Greenhouse Gas Reduction Plan* (Plan), which the Commission required as part of its initial 2007 approval of Poseidon's Facility, is not consistent with the Commission's requirements. Due to new information and changes that have occurred since the Commission's original approval of that 3Plan, we have asked Poseidon to seek an amendment from the Commission to modify that Plan.	The San Diego Water Board acknowledges the comment. The Climate Change Action Plan at section VI.C.2.e of the Tentative Order implements Resolution No. R9-2019-0051, *Addressing Threats to Beneficial Uses from Climate Change,* adopted by the San Diego Water Board on June 20, 2018. The Tentative Order provides three years from the effective date of the Tentative Order for Poseidon to submit the Climate Change Action Plan and must be in conformity with plans and requirements of other agencies such as the Commission.	None.
14	**Brine Discharge Study.** The Tentative Order (at Section C.2, pages 17-18) requires Poseidon to conduct a Brine Discharge Technology Empirical Study to compare the entrainment effects that result from flow augmentation versus those that would result from a multiport diffuser. Our current understanding of the effects resulting from these different intake and discharge technologies is that the Facility is likely to cause less total entrainment when using a multiport diffuser rather than flow augmentation. The Tentative Order also requires that Poseidon complete this Brine Discharge Technology Empirical Study before it installs the newly-required screened intake to ensure that the installed intake system is properly sized to accommodate the discharge system selected as a result of the Brine Discharge Technology Empirical Study.	The San Diego Water Board agrees that the Commission may review the Brine Discharge Technology Empirical Study Work Plan and Final Report before the San Diego Water Board approves the Brine Discharge Technology Empirical Study Work Plan and Final Report. The Ocean Plan at chapter III.M.2.a.(4) requires the San Diego Water Board to consult with other State agencies, including the Commission, involved in the permitting of the Facility. As such, the Commission's review and comment on the Brine Discharge Technology Empirical Study Work Plan and Final Report is appropriate. The Tentative Order has been modified as follows: Section VI.C.2.b.i.(e) (e)The Discharger shall modify the Work Plan as requested by the San Diego Water Board after consultation with other State agencies involved in the	The Tentative Order was revised as described in the response at sections VI.C.2.b.i.(e), VI.C.2.b.ii, and VI.C.2.b.iii.

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	We request that the San Diego Water Board allow for Commission staff review and comment on two main components of this Brine Discharge Technology Empirical Study - i.e., the Work Plan and the Final Report - prior to the San Diego Water Board's final consideration and possible approval of those components. We expect that the Commission will be relying in part on the adequacy of this Work Plan and Final Report during its review of the coastal development permit applications that Poseidon will be submitting to implement any intake and discharge design changes that result from the Brine Discharge Technology Empirical Study.	permitting of the Facility including but not limited to the State Water Board, the California Coastal Commission, the California State Lands Commission, and the California Department of Fish and Wildlife. Section VI.C.2.b.ii The Discharger shall implement the Work Plan no later than 60 days following startup of the new intake structure, unless otherwise directed by the San Diego Water Board after consultation with other State agencies involved in the permitting of the Facility including but not limited to the State Water Board, the California Coastal Commission, the California State Lands Commission, and the California Department of Fish and Wildlife. Before implementing the Work Plan, the Discharger shall: (a) Notify the San Diego Water Board for consultation with other State agencies involved in the permitting of the Facility including but not limited to the State Water Board, the California Coastal Commission, California State Lands Commission, and the California Department of Fish and Wildlife of the intent to initiate the proposed actions included in the Work Plan; and (b) Comply with any conditions set by the San Diego Water Board after consultation with other State agencies involved in the permitting of the Facility including but not limited to the San Diego Water Board, the California Coastal Commission, the California State Lands Commission, and the California Department of Fish and Wildlife. Section VI.C.2.b.iii Within six months of completing the Brine Discharge Technology Empirical Study in accordance with the Work Plan, the Discharger shall submit a Brine Discharge Technology Empirical Study Final Report (Final Report) to the San Diego Water Board for for	

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		review in consultation with other State agencies involved in the permitting of the Facility including but not limited to the State Water Board, the California Coastal Commission, the California State Lands Commission, and the California Department of Fish and Wildlife. ~~The Final Report shall include the analysis of projected marine life impacts caused by brine discharged through multiport diffusers using the Roberts Report and any other methodology described in the Work Plan.~~ The Final Report shall also include an in-depth discussion, evaluation, interpretation, and tabulation of the data supporting the interpretations and conclusions reached.	
15	**Modify the Tentative Order to address unmitigated adverse entrainment and impingement impacts.** The Tentative Order, at section IV.C - Intake Specifications (page 12), states that the Facility's intake of seawater must not exceed 330 MGD with the existing intake pumps and 299 MGD with the new intake pumps. However, the remainder of the Tentative Order evaluates project effects and establishes standards, limitations, and mitigation requirements based on just the 299 MGD volume. We understand that the existing intake pumps (which remain from the prior power plant operations) cannot operate to provide less than 330 MGD for Poseidon's stand-alone operations. However, that volume is more than Poseidon's Facility requires to produce its expected water supply and is more than the Tentative Order has used to identify the Facility's adverse impacts to marine life and as the basis for the Facility's mitigation requirements. Although these existing pumps are scheduled to be replaced within a year or two, the 31 MGD difference between the 330 and 299 MGD flows represents a significant additional adverse impact to marine life for which no mitigation has been proposed. We recommend the Tentative Order be modified to require mitigation that addresses this impact. Because the adverse impacts expected from this additional 31 MGD are expected	The San Diego Water Board agrees the Tentative Order should be modified to address the mitigation requirements associated with interim operations. The Tentative Order in Attachment H-1, Finding 42 specifies a total mitigation of 68.3 acres of wetland habitat to compensate for the Facility's impacts to marine life based on an intake flowrate of 299 MGD. Until Poseidon constructs and operates new pumps, Poseidon relies on the existing EPS pumps that have a minimum flowrate capacity of 330 MGD. Poseidon is expected to rely on the existing pumps for up to 506 days from the day that the EPS ceased power generating operations during the period December 11, 2018 through April 30, 2020. The additional 31 MGD was not contemplated in the mitigation calculation provided in Attachment H-1, Finding 42. Pursuant to the provisions of the Ocean Plan in chapter III.M.2.e, Poseidon must provide additional mitigation habitat through a mitigation project or payment to an in-lieu fee-based mitigation program to compensate for the additional impacts to marine life from the intake of 31 MGD of seawater. The Tentative Order has been revised as follows: Section VI.C.2.d.i.(f) (added)	The Tentative Order was revised as described in the response at section VI.C.2.d.i.(f) and Attachment H.1, Finding 53.

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	to be short-term (one or two years until the pumps are replaced), and because the impacts would be similar to those that occur during the transition of coastal power plants away from once through cooling systems (for example, as described in the May 4, 2010 *State Water Resources Control Board Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling* (Once-Through Cooling Policy)), we recommend the San Diego Water Board include a mitigation requirement similar to the interim mitigation in-lieu fee implemented as part of that Once-Through Cooling Policy. Based on the State Water Board's most recent available determination of that mitigation fee for the Encina Power Station (EPS), the fee, if applied to Poseidon's 31 MGD "overage" would be approximately $66,000 per year. The San Diego Water Board could then direct that mitigation fee towards projects that benefit the marine environment, similar to the projects eligible to receive the mitigation fee collected under the Once-Through Cooling Policy. Not only would imposing this fee address a currently unmitigated project impact, it appears to be a feasible way to provide mitigation, as it would add only slightly more than $1.00 per acre-foot to Poseidon's costs to produce its water.	(f) A demonstration that the updated Marine Life Mitigation Plan provides for full mitigation for the interim operations of the intake pumps at a flowrate of 330 MGD from December 11, 2018 to April 30, 2020, i.e. the period extending from the date that the Encina Power Station ceased power generating activities to the date that the new intake pumps are operational. Attachment H.1, Finding 53 In the interim time between the EPS cessation of power generating activities and the operation of the new intake pumps, the Facility will be intaking up to 330 MGD of seawater, which is 31 MGD more than the 299 MGD contemplated in Finding 43. The Order at section VI.C.2.d.i.(f) requires Poseidon to mitigate for the additional impacts from the additional intake of seawater during the interim period.	
16	**Modify Tentative Order to address unmitigated ocean acidification impacts**. Discharges from desalination facilities are generally more acidic (i.e., have lower pH values) than ocean water. Recent monitoring reports show that Poseidon's discharge averaged about 7.8 pH units, whereas the ocean waters off of San Diego tend to have a higher average pH, ranging from about 8.1 to 8.2 units. California has identified a number of concerns about the increasing acidification of ocean waters that is resulting from climate change. For example, the State has identified acidification as causing adverse impacts to mussels, crabs, oysters, sea urchins, market squid, several rockfish species, and other marine biological resources, many of which have valuable ecosystem and economic values. The State is	While the San Diego Water Board agrees that ocean acidification presents a number of challenges for the State, NPDES permitting rules prevent the San Diego Water Board from modifying water quality standards through permitting actions. Modification of the water quality standards in the Ocean Plan is addressed through a separate amendment process administered by the State Water Board. Triennial reviews of the Ocean Plan water quality standards are conducted by the State Water Board every three years in accordance with Clean Water Act section 303(c)(1) and Title 40 of the Code of Federal Regulations, section 131.20. The State Water Board currently plans to host three public scoping meetings to discuss the 2019 triennial review and solicit informal comments on potential projects or amendments to	The Tentative Order was revised as described in the response at Attachment E – MRP, section III.B, Table E-3.

<table>
<tr><th>No.</th><th>Comment</th><th>Response</th><th>Action Taken</th></tr>
<tr><td></td><td>represented on an Ocean Acidification and Hypoxia Science Task Force that has recommended the State take action to "reduce local pollutant inputs that exacerbate ocean acidification." The State has also developed an Ocean Acidification Action Plan, which includes "reduce the pollution that causes ocean acidification" as one of its strategies.

As currently proposed, the Tentative Order cites the State's standard effluent limitations for a discharge pH - i.e., that the discharge must be between 6.0 and 9.0 units and be no more than 0.2 units from that which occurs naturally. We recommend that the San Diego Water Board consider modifying the Tentative Order to require that Poseidon's discharge have a pH of no less than that of the receiving waters. It appears that this more stringent protection can be required using the San Diego Water Board's existing authority - for example, through the biological requirements of the water quality standards, or through other available legal mechanisms. This more protective pH standard also appears to be feasible to implement. Poseidon's treatment process already involves adjusting its source water pH upwards and downward – to improve efficiency, to better remove certain constituents, to prepare water for the distribution system, etc. - and this standard would presumably require adding just one more pH adjustment before the discharge leaves the Facility.</td><td>update the Ocean Plan. Additional information on the triennial review and Ocean Plan can be found at the State Water Board’s web site at: https://www.waterboards.ca.gov/water_issues/programs/ocean

The Tentative Order implements the water quality standards prescribed in the Ocean Plan for pH as technology-based effluent limitations and receiving water limitations.

The San Diego Water Board has modified the Tentative Order as follows to require pH sampling before and after dilution so that the data is representative of the effluent and the diluted effluent that is discharged to the Pacific Ocean.

Attachment E – MRP, section III.B, Table E-3
<table><tr><th>Parameter[1]</th><th>Monitoring Location</th></tr><tr><td>pH</td><td>M-001 & M-002</td></tr></table></td><td></td></tr>
<tr><td colspan="4">Livia Borak Beaudin, Coastal Environmental Rights Foundation (CERF)</td></tr>
<tr><td>17</td><td>The impingement and entrainment data, as well as the SAP’s comments, are all based on outdated data and studies. The 2008 EPS Study was done over a decade ago. Because EPS has operated at a reduced capacity for a much longer period than anticipated during the original NPDES permit process, this data is of questionable value. In fact, the entrainment data was subjected to a scaling factor based on assumed changes in flow between EPS and Poseidon. Now that EPS has ceased operations, there is no reason to use this outdated information or rely on scaling assumptions. Poseidon should provide actual, current data on the species present and impingement and entrainment rates. Poseidon’s outdated</td><td>The 2008 EPS Study is the most current comprehensive dataset available, and the San Diego Water Board’s reliance on this data for making its Tentative Determination is legally and scientifically sound.

The Ocean Plan in chapter III.M.2.d.(1).(c).iii expressly provides the San Diego Water Board the discretion to allow Poseidon to use existing entrainment data to evaluate marine life impacts. Prior to deciding whether or not to use the 2008 EPS Study, the San Diego Water Board required Poseidon to hire a neutral third party to provide an independent scientific assessment and recommendations</td><td>None.</td></tr>
</table>

No.	Comment	Response	Action Taken
	analysis also fails to comply with the Ocean Plan study requirements. In light of the fact that the proposed Tentative Order requires empirical observation data for the discharge technology and diffuser comparison (Brine Discharge Technology Empirical Study), similar analysis should be required for the intake.	to the San Diego Water Board regarding Poseidon's analysis of intake and marine life mortality caused by the Facility and pursuant to chapter III.M.2.a.(1) of the Ocean Plan. Poseidon funded a previously-convened, independent SAP to review several mutually agreed upon topics and questions. In particular, one of the questions posed to the SAP was whether or not Poseidon appropriately used and applied the information and data from the 2008 EPS Study. The SAP found that "the original approach provided by Poseidon for the calculation of entrainment impacts was inconsistent with the approach used in the 2008 EPS Study." The SAP's final report is available on the San Diego Water Board website at: https://www.waterboards.ca.gov/sandiego/water_issues/programs/regulatory/docs/SAP/Poseidon_Carlsbad_SAP_report.pdf. Ultimately, Poseidon provided a revised entrainment calculation (Appendix FFF of the ROWD) to address the SAP's recommendations. The San Diego Water Board agrees with CERF that Poseidon should conduct an empirical observational study for the intake. Because the Facility will intake additional seawater to dilute the brine prior to discharging, the Brine Discharge Technology Empirical Study required by section VI.C.2.b of the Tentative Order will collect empirical data to analyze the marine life mortality resulting from the intake of seawater for flow augmentation dilution.	
18	Poseidon continues to focus on impacts to taxa that support a fishery (commercial or recreational) in all of its impact studies/analysis. However, Water Code section 13142.5(b) (section 13142.5(b)) contains no such qualification. In fact, section 13142.5(b) requires the "best available site, design,	As discussed in the response to Comment No. 17, the 2008 EPS Study is the most current comprehensive dataset available at this time, and the San Diego Water Board's reliance on this data at this time for making its Tentative Determination is legally and scientifically sound.	None.

No.	Comment	Response	Action Taken
	technology, and mitigation measures feasible shall be used to minimize the intake and mortality of **all forms of marine life**." (emphasis added).	Because of the complexity and cost of analyzing the intake and mortality of hundreds of species of marine life potentially impacted at various life stages by the Facility's intake of seawater and discharge of brine, the accepted scientific practice is to analyze representative samples of marine life and to extrapolate from those representative samples the expected intake and mortality of all forms of marine life. The SAP was asked to review Poseidon's approach, and their finding was that Poseidon's analyses do include species that are representative of a full range of life histories, habitats, and future productivity. As explained in the response to Comment No. 17, the SAP recommended a modified analysis and calculation of the entrainment impacts resulting in Poseidon's submittal of Appendix FFF of the ROWD. Based on the SAP's findings and recommendations, the San Diego Water Board concluded that the selection of species for the analyses was appropriately representative of the marine life expected to be impacted by the operations of the Facility.	
19	In light of the fact that 2/3 of the intake volume is necessary solely to dilute the saline byproduct, additional consideration should be given to the energy-intensity and greenhouse gas impacts of the volume augmentation alternative to brine diffusers. The Tentative Order touches on the Facility's greenhouse gas impacts and requires a Climate Change Action Plan. However, this study is disjointed from the Brine Discharge Technology Empirical Study. The greenhouse gas impacts of all options should be included in the latter study.	The San Diego Water Board disagrees that the Brine Discharge Technology Empirical Study should evaluate greenhouse gas impacts. The Brine Discharge Technology Empirical Study is required by the Tentative Order to implement Ocean Plan chapter III.M.2.d(2)(c) to determine the intake and mortality associated with the flow augmentation brine discharge technology. Greenhouse gas impacts were analyzed in other required reports and plans such as the Facility's Environmental Impact Report (EIR) and the Energy Minimization and Greenhouse Gas Reduction Plan required by the California Coastal Commission. The Tentative Order section VI.C.2.e requires Poseidon to develop a Climate Change Action Plan. As described in response to Comment No. 13, the Climate Change Action	None.

No.	Comment	Response	Action Taken
		Plan is required to be in conformity with plans and requirements from other agencies including the California Coastal Commission.	
20	Both Poseidon and the SDCWA have an incentive to maximize output (and therefore intake and discharge) at the Facility in order to maximize profit and reduce reliance on Metropolitan Water District (MWD) water. However, as additional technologies are implemented – such as indirect and direct potable reuse throughout the County of San Diego – the justification for operation of the Facility at full capacity will only decrease. Therefore, a reopener or qualification regarding the section 13142.5(b) analysis should be included in the Tentative Order which clarifies that the section 13142.5(b) analysis conducted to date was constrained by Poseidon's self-imposed output requirements of 50 MGD of potable water. In the event 50 MGD is no longer necessary or some portion of Poseidon's water ends up in storage (as already seems to be the case), the permit should require an updated feasibility analysis for subsurface or other intakes at a reduced capacity. In the event 200 MGD of seawater intake is no longer required simply for dilution, the viability of a reduced intake alternative would increase even more.	As discussed in the Response to Comment No. 9, the San Diego Water Board may not reopen its Tentative Determination. Ocean Plan chapter III.M.1.b.(2) and III.M.a.(2) describe the circumstances that would trigger the need for a Water Code determination such as an expansion of the Facility that would increase the intake or mortality of all forms of marine life beyond that which was originally approved. The Ocean Plan does not require nor allow a new Water Code determination due to a decrease in the Facility's potable production alone. Poseidon seeks the flexibility to 'maximize' or at least increase output through production of up to 60 MGD of potable water. Poseidon's proposal is not expected to result in a greater level of intake and marine life mortality, as explained in the Supplemental Response to Comment No. S4. Ocean Plan chapter III.M.2.b(2) requires the Tentative Determination to consider whether the identified need for desalinated water is consistent with an urban water management plan (UWMP). The SDCWA's 2015 UWMP projects the San Diego region will need the desalinated water from the Facility through the year 2040. As wastewater is increasingly reused for potable and non-potable water supply, the region's reliance on imported water supplies will correspondingly decrease prior to decreasing the need for existing local desalinated water supplies. Decreasing the region's reliance on imported water supply could have ancillary benefits to the water quality in other regions of the State, such as an increased potential for decreasing water exports, and the associated water quality and marine life impacts to the Sacramento Delta and Colorado River ecosystems.	None.

No.	Comment	Response	Action Taken
		Although the SDCWA's water supply projections identify the continued need for the existing desalinated water supply from the Facility, the SDCWA has currently put on hold plans for future desalination plants in the region partly due to the forecasted increase in water supplies from indirect potable reuse and the future potential for direct potable reuse. Poseidon requested flexibility to increase production of potable water if needed. The increased production of potable water would not result in an increased intake volume of seawater; or an increased volume of brine discharge beyond what is permitted in the Tentative Order. As such, the increased production of potable water is unlikely to result in an increased level of intake or marine life mortality.	
Mandy Sackett, California Policy Coordinator, Surfrider Foundation; and Raymond Hiemstra, Associate Director, Orange County Coastkeeper			
21	**Flow augmentation Impacts** Flow augmentation is one of the least effective technologies that currently exists to minimize impacts to marine life from seawater desalination brine discharge. As such, all future ocean desalination facilities – besides the Facility – are prohibited from using flow augmentation. According to the Tentative Order, "Flow augmentation provides a dilution of 1-part undiluted effluent (60 MGD) to 2.97 parts flow augmentation dilution water (178 MGD), resulting in a total of 3.97 parts water." Hence, as a result of using flow augmentation, the Facility intakes approximately three times the amount of sea water when compared to discharge alternatives such as comingling brine with wastewater streams or multiport diffusers.	The San Diego Water Board acknowledges the comment. The Ocean Plan at chapter III.M.2.d.(2) establishes the order of preference for brine discharge technologies for minimizing the intake and mortality of all forms of marine life as 1) commingling brine with wastewater; 2) use of multiport diffusers; and 3) other brine discharge technologies if the owner or operator can demonstrate that the alternative technology provides a comparable level of intake and mortality of all forms of marine life as wastewater, if available, or multiport diffusers if wastewater is unavailable. Chapter III.M.2.d(2)(d) of the Ocean Plan expressly prohibits using flow augmentation as an alternative brine discharge technology with the exception of a facility that has received a conditional Water Code determination and is over 80 percent constructed by January 28, 2016 and for other purposes not relevant to this Facility or Tentative Determination.	None.

No.	Comment	Response	Action Taken
		Therefore, this Facility is the only desalination plant in the State of California that meets the Ocean Plan's exception criteria to implement the flow augmentation brine discharge technology. Use of the exception is not automatic but is subject to the demonstration requirement, above, and subject to the requirement that the facility employ specific types of technologies (e.g., use of low turbulence intakes and conveyance pipes) as provided in chapter III.M.2.d.(2)(d)ii of the Ocean Plan. The Tentative Order sets forth the San Diego Water Board's conclusion that the requirements allowing the Discharger to use flow augmentation as an alternative brine discharge technology are met but this conclusion is made conditional on the outcome of the Multiport Diffuser Analysis in section VI.C.2.a of the revised Tentative Order confirming that flow augmentation is at least as protective as a multiport diffuser in intake and mortality of all forms of marine life. See Response to Comments 2, 22, and 23.	
22	**Facility Flow augmentation Exemption** Under the *Amendment to the Ocean Plan Addressing Desalination Facility Intakes, Brine Discharges, and to Incorporate Other Nonsubstantive Changes* (OPA), flow augmentation as an alternative brine discharge technology is generally prohibited. However, the Facility, which was far along in the permitting process before passage of the OPA, received a special condition for their original temporary permit co-located with the EPS stating, "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; comply with chapter III.M.2.d.(1); and not discharge through multiport diffusers." However, with the decommissioning of the EPS, the Facility must now operate under a ***new*** NPDES permit as a stand-alone operation. This new permit must be in full	The San Diego Water Board disagrees with the commenters' interpretation of the Ocean Plan chapter III.M.2.d(2)(d). The Tentative Order along with the Tentative Determination in Attachment H complies with and is intended to implement the Ocean Plan for this Facility. The referenced chapter of the Ocean Plan is referring to a Water Code section 13142.5(b) determination and not to a new NPDES permit. The Ocean Plan's exception to allow this Facility to use flow augmentation brine discharge technology, based on a demonstration of comparable intake and mortality of a multiport diffuser does not expire or become void with a new NPDES permit or with a new Water Code section 13142.5(b) determination.	None.

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	compliance with the OPA and the above-mentioned exemption is now void.		
23	**Flow Augmentation Prohibited** As stated, flow augmentation as an alternative brine discharge technology is generally prohibited in the OPA. In order for Poseidon to use flow augmentation and simultaneously comply with the OPA, the application must, "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." Poseidon has yet to effectively demonstrate that the proposed flow augmentation will comply with this exception. Given the unlikelihood of Poseidon's proposed flow augmentation to meet this standard based on the impacts described above, the Facility will be operating out of compliance with the OPA in the interim period from adoption of the Final Order and when stand-alone operation construction and the Brine Discharge Empirical Study is completed. Also, an additional period of noncompliance is anticipated in the Tentative Order through the suggestion that a Time Schedule Order may have to be issued as a mechanism to bring the Facility into compliance if the Brine Discharge Technology Empirical Study shows noncompliance with OPA. Poseidon did provide an analysis to compare flow augmentation impacts with that of a multiport diffuser to the San Diego Water Board using the preferred Roberts methodology and submitted it in late 2018. However, the analysis is inadequate and has not yet been accepted by San Diego Water Board staff for consideration in the Tentative Order. It appears that the study Poseidon submitted found that diffusers would entrain 170 MGD. See Tentative Order at Attachment H1 Finding 33. Based on that finding, combining the approximate entrainment from an approximate 100 MGD intake and 170 MGD diffuser, the comparison clearly shows intake and mortality would be minimized by 10% compared to a 300 MGD intake flow. And as Attachment A points out,	See the response to Comment No. 2, 21, and 22 for additional information. Poseidon provided a comparative analysis of the estimated marine life impacts from using flow augmentation discharge technology and a theoretical multiport diffuser as described in Tentative Order Attachment H.1, Finding 31. The volume of water potentially exposed to shearing related mortality of marine life is comparable at 170 MGD for a multiport diffuser and as low as 171 MGD for flow augmentation. The comparison did not include a comparison to marine life impacts from using wastewater dilution for the discharge technology because dilution with wastewater was determined to be unavailable as described in Tentative Order Attachment H.1, Finding 14. The San Diego Water Board analyzed the estimation of intake and mortality of all forms of marine life from the different brine discharge technologies. The comparative analysis of marine life impacts was based on modeling. The San Diego Water Board evaluated Poseidon's analysis in Appendix GGG of the ROWD (submitted December 18, 2019), of marine life impacts from a multiport diffuser using the Roberts methodology. Using the entrainment flowrate is appropriate to assess that the intake and marine life mortality will be comparable between the discharge technologies in the absence of empirical data. Evaluation of Appendix GGG's analysis lends support to the San Diego Water Board's conclusion that, based on available information, the discharger demonstrated that the intake and mortality of all forms of marine life from the two brine discharge technologies are comparable. Ocean Plan chapter III.M.2.d.(2)(c) and Tentative Order section VI.C.2.b require Poseidon to develop and submit a Multiport Diffuser Analysis Final Report to confirm the San Diego Water Board's conclusion that the intake and	None.

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	rough estimates suggest an even more disparate impact is likely. Arguably there is enough evidence for the Final Order to require Poseidon to build a 100 MGD intake that minimizes intake and mortality, and a properly sited and designed diffuser. But at a minimum, the Organizations [Surfrider Foundation and Orange County Coastkeeper] request this analysis be reviewed and verified before issuance of a Final Order and NPDES permit. The Roberts methodology represents the best available science for estimating the impact of multiport diffusers. The Organizations strongly urge the San Diego Water Board to require an acceptable analysis using the *Brine Diffusers and Shear Mortality* report by Philip J.W. Roberts, April 18, 2018, referenced as the Roberts Report in Finding 31 of Attachment H.1 of the Tentative Order, prior to issuance of the Final Order.	mortality of all forms of marine life from flow augmentation and a multiport diffuser are comparable. See response to comments 2, 21, and 22. The Tentative Order has been revised to make this conclusion, and the Tentative Water Code section 13142.5(b) determination (Tentative Determination) conditional on the results of the Multiport Diffuser Analysis confirming that the two discharge technologies are comparable. The Tentative Order is revised to accelerate the timing of the Multiport Diffuser Analysis so that it is completed within the first two years from the effective date of the Order. If the results of the Multiport Diffuser Analysis Report fail to confirm the San Diego Water Board's conclusion of comparability under Ocean Plan chapter III.M.2.d.(2)(c), a new Water Code section 13142.5(b) determination will be required to select an appropriate brine discharge technology for the Facility. The San Diego Water Board disagrees with the comment that the Facility will be operating out of compliance with the Ocean Plan during the interim period until the new intake structure is constructed. Ocean Plan section III.M.2.a.(5)(b) provides the San Diego Water Board the discretion to allow up to five years from the date of the EPS permanent shutdown for the Facility to construct the new intake structure required by the Tentative Determination. Tentative Order section VI.C.7 contains a compliance schedule with specific tasks and compliance dates for the Facility to construct the new intake structure. Making the Tentative Determination conditional on completion of the Multiport Diffuser Analysis within the first two years from the permit effective date is expected to confirm that the two technologies are comparable in intake and mortality of all forms of marine life and accelerates collection of scientific data to provide greater confidence in the conclusion. Once the empirical study of flow augmentation as a brine discharge technology is completed following construction of the new intake structure, the results of the empirical study will be compared to the level of intake and mortality from a multiport diffuser determined through the Multiport	

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		Diffuser Analysis, as required in Ocean Plan chapter III.M.2.d.(2)(c)v. If the empirical study demonstrates that the alternative brine discharge technology (i.e., flow augmentation) results in more intake and mortality of marine life than using multiport diffusers, then Poseidon must either (1) cease using the alternative brine discharge technology and install and use wastewater dilution if available and multiport diffusers to discharge brine waste, or (2) redesign 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.	
24	**Brine Discharge Empirical Study and Final Report** Despite the OPA special conditions, the Tentative Order for Poseidon's Facility allows for the continued use of flow augmentation in order to dilute concentrated brine prior to discharge. In an attempt to comply with the OPA, the Tentative Order's Special Provisions 2a, requires Poseidon to submit a Brine Discharge Technology Empirical Study Final Report. This report will be conducted over 12 consecutive months following initial operation of the new intake structure and finalized within six months. However, the time table provided in the Tentative Order, allows Poseidon up to five years to complete construction of the intake infrastructure. Five years is the maximum amount of time allowable under the OPA; however, the San Diego Water Board is not obligated to allow the maximum. Indeed, five years is unreasonably long given that the entire Facility was constructed in two years and the shutdown of the EPS was a clearly foreseeable event before construction was completed. In the Tentative Order as drafted, the Facility will potentially be able to continue with interim operations for up to five years. After construction is complete, the trigger for the 18-month Empirical Study and Final Report will begin. Thus,	As described in the response to Comment No. 2, the San Diego Water Board has made a Tentative Determination using the best available science and models that are available at this time. The Multiport Diffuser Analysis will either confirm or fail to confirm the San Diego Water Board's determination that flow augmentation discharge provides a comparable level of intake and mortality of marine life as a multiport diffuser. Ocean Plan chapter III.M.2.a.(5)(b) provides the San Diego Water Board the discretion to allow up to five years from the date of the EPS shutdown to build the new intake structure. Poseidon requested that the time schedule be five years to provide sufficient time for capital financing, permitting, final design, contract bidding, construction, and initial startup. Poseidon is concerned about the use of a wedgewire screened intakes in an estuarine environment. Design factors regarding the amount of screen clogging debris and maintenance requirements to clean the screens need to be refined prior to final design. Poseidon intends to conduct a pilot study as part of the design phase to verify the	None.

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	the new intake structures may be constructed and operating for 6.5 years before compliance with the OPA is verified. This is unacceptable and unreasonable. Even worse, the Tentative Order suggests a Time Schedule Order may be needed after noncompliance with the OPA is confirmed by the Brine Discharge Technology Empirical Study and Final Report, potentially adding five or more years of noncompliance. Further, the OPA requires, "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 the alternative brine discharge technology." (emphasis added) The OPA requires the Brine Discharge Technology Empirical Study to begin with 18 months of beginning operation. The Facility operations and use of flow augmentation are ongoing and technically begin at the date of issuance of the Final Order issuance. Arguably, the Brine Discharge Technology Empirical Study and Final Report should be completed within 18 months and certainly not 6.5 years post issuance. Nonetheless, the Organizations strongly recommend that the San Diego Water Board require construction of the new intake infrastructure to be completed within two years with finalization of the Brine Discharge Technology Empirical Study and Final Report. Further, given the likelihood the Brine Discharge Empirical Study will show that minimizing intake volume combined with a properly sited and designed diffuser would be a superior alternative (i.e., not favorably "comparable"), the Final Order should include enforcement provisions – as discussed below.	feasibility and refine the design of wedgewire screens in the estuarine environment. During the time Poseidon is conducting its pilot study as part of the design phase, the Tentative Order, as revised, will require Poseidon to complete the Multiport Diffuser Analysis. Use of flow augmentation discharge technology will be conditional on the outcome of this study confirming that the two discharge technologies are comparable in intake and mortality of all forms of marine life. See Response to Comments No. 2 and 21 through 23. Ocean Plan chapter III.M.2.d.(2)(c) requires the Brine Discharge Technology Empirical Study to begin within 18 months of the Facility beginning permanent stand-alone operations with the new pumps and the new intake structure, not as of the shutdown of the EPS or the date the Tentative Order is adopted by the San Diego Water Board. The purpose of the study is to verify the capabilities of the new pump and new intake structure at minimizing the intake and mortality of marine life based on empirical data from their actual operation over a twelve-month period.	
25	**Compliance with OPA** Finally, and most importantly, the San Diego Water Board must provide stronger assurance that the Facility will not be allowed to operate for prolonged periods of non-compliance with the OPA in the Final Order. This is especially prudent given the high likelihood that flow augmentation will not be found to have a comparable level of intake and mortality as	The San Diego Water Board disagrees that the language at Tentative Order section VI.C.2.b.iii should be revised to clarify the Board's expectations if the Brine Discharge Technology Empirical Study determines that flow augmentation results in more intake and mortality than multiport diffusers.	None.

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	wastewater dilution or multiport diffusers. The Tentative Order includes the following language in an attempt to ensure compliance: "If the Final Report shows that the flow augmentation choice for brine discharge technology results in more intake and mortality of marine life than if the Facility used wastewater dilution or multiport diffusers, then the Discharger must also submit with the Final Report a proposed schedule to either: (a) Cease using the alternative brine discharge technology and install and use wastewater dilution or multiport diffusers to discharge brine waste; *or* (b) Re-design 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 San Diego Water Board approval." Further, similar to the enforcement provisions in Attachment D section 1.B. of the Tentative Order ["Need to Halt or Reduce Activity Not a Defense"], the provisions for the Brine Discharge Empirical Study should make perfectly clear that if the Brine Discharge Empirical Study Report shows augmented intake flow results in greater intake and mortality than minimized flow and diffusers, the plant must cease operations and modify the intake and construct the diffuser, and that an additional noncompliance period through a Time Schedule Order is not an option. The Organizations support statements made in sections (a) and (b) and urge the San Diego Water Board to further clarify and strengthen these requirements. The Final Orders should state: "If the Brine Discharge Empirical Study and Report shows that mortality with ~100 MGD intake and use of multiport diffusers is less than the mortality from the augmented	Tentative Order section VI.C.2.b.iii provides two options for Poseidon to pursue if the Brine Discharge Technology Empirical Study determines that flow augmentation results in more intake and mortality than multiport diffusers. These two options are identical to Ocean Plan chapter III.M.2.d(2)(c)v. Option (a) would require Poseidon to cease using the flow augmentation discharge technology and instead use wastewater dilution or multiport diffusers to discharge brine. Option (a) may require the Facility to stop producing potable water for an extended period while wastewater dilution or a multiport diffuser are designed, permitted, and constructed. Option (b) would not require Poseidon to cease using the flow augmentation discharge technology. Option (b) would require Poseidon to re-design the Facility such that the intake and mortality is comparable to that of a multiport diffuser until the flow augmentation discharge technology can be redesigned. The Ocean Plan provides the Discharger the discretion to choose either option to pursue, subject to the San Diego Water Board's satisfaction and approval. The Tentative Order is consistent with the requirement of the Ocean Plan and was not modified in response to this comment. In response to the comment regarding the financial liability for complying with State laws and regulations, the San Diego Water Board does not have the authority to specify who will pay the cost for constructing the new intake structure nor does it have the authority to absolve Poseidon from any potential liability for non-compliance with State laws and regulations. The San Diego Water Board retains all authorities to enforce non-compliance with permit provisions and applicable Water Code provisions.	

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	flow intake at ~299MGD, Poseidon must cease operations and change the technology. Poseidon assumes all financial responsibility for proceeding with the proposed flow augmentation design option and may not rely on a financial infeasibility claim (for a design change) upon non-compliance with the OPA. Poseidon will be expected to change technology and/or discontinue operations immediately. This Order is final." This clarification will ensure that the Facility will not be given an unjustified exception to the OPA and that Poseidon is expected to comply with State laws and regulations. The Organizations strongly recommend the San Diego Water Board include additional language to clarify and strengthen the requirement for compliance with the OPA. According to the Tentative Order, construction costs for the Facility's stand-alone operations will be up to $84 million. This is a considerable amount of financial resources. Poseidon must assume all financial liability for the extremely risky decision to proceed. Indeed, the court ruling in *Surfrider Foundation v. California Regional Water Quality Control Board, San Diego Region and Poseidon Resources (Channelside) LLC, et.al.* (Super. Ct. No. 37-2010-90436-CUWM-OTL), found that the Facility did not violate section 13142.5(b) of California Water Code while co-located with the EPS. However, the findings state that, "Poseidon will be required to reapply to the San Diego Water Board for authorization to operate in a stand-alone mode, and the San Diego Water Board, in that instance, will review whether additional measures are necessary for compliance with section 13142.5(b)" – indicating that Poseidon remains subject to liability and additional compliance verification with State laws and regulations in their stand-alone permit.	The San Diego Water Board has modified the Tentative Order as follows at section VI.C2.b.iii.(b)	
26	**Chronic Toxicity** The Facility began delivering water to San Diego County in December 2015 and is the nation's largest seawater desalination plant. Unfortunately, the Facility has continuously	The San Diego Water Board agrees that it is appropriate for Poseidon to monitor chronic toxicity at Monitoring Location M-001. However, the San Diego Water Board has	The Tentative Order was revised as described in the response to

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	violated the San Diego Water Board's discharge permit and has done so since operations began in 2015. In April 2016, the San Diego Water Board issued a Notice of Violation finding that the Facility had failed to comply with several provisions of its discharge permit, including failures to comply with discharge prohibitions, receiving water limitations, and effluent limitations, and failure to monitor in accordance with discharge provisions. Later, in December 2016, the San Diego Water Board issued a Staff Enforcement Letter describing 19 occasions on which Poseidon had exceeded daily maximum toxicity limits. In its annual discharge permit monitoring report for 2016, Poseidon stated that it had exceeded chronic toxicity limits in 30% of tests. In 2017, the San Diego Water Board cited for exceeding chronic toxicity violations in 36 out of 90 total toxicity tests as well as 11 deficient monitoring and 2 reporting violations. In 2018, Poseidon has been cited for 11 chronic toxicity violations, 1 deficient monitoring violation and 1 Category one pollutant violation for exceeding total suspended solids effluent limitations. Since opening, Poseidon has been unable or unwilling to resolve this toxicity issue. The testing limits established for chronic toxicity at location M-001 (pre-dilution) are listed as enforceable in the existing NPDES permit. In the new stand-alone operations permit and Tentative Order, chronic toxicity is listed as enforceable only at location M-002, after the brine is diluted and no longer at M-001. The Tentative Order cites Poseidon's explanation of the toxicity without any further justification for changing the testing requirements. The Tentative Order states that: "Additionally, between December 2015 through January 2018, the Discharger reported 61 exceedances of the chronic toxicity maximum daily effluent limitation of 16.5 TUc at monitoring location M-001 of the undiluted brine. In response to the effluent limitation exceedances for chronic toxicity, ***the Discharger reported that the violations are an artifact of the chronic toxicity effluent limitation in Order No. R9-2006-0065 not***	retained the compliance location for the chronic toxicity effluent limitation at Monitoring Location M-002. Monitoring Location M-001 is located downstream of all contributing flows to the Facility effluent and prior to combining with EPS effluent or augmentation flows. Monitoring Location M-002 is in the pond that contains effluent from the Facility, effluent from EPS, and flow augmentation seawater for dilution. Monitoring Location M-002 provides a representative sample of the discharge prior to discharging to the Pacific Ocean. Even though the EPS is no longer generating power, the EPS will continue to have miscellaneous discharges during decommissioning. Chronic toxicity monitoring at Monitoring Location M-001 will provide Poseidon with a sample of effluent that has not been affected by discharges from the EPS to better determine if the Facility's brine discharge is the source of chronic toxicity if a sample at Monitoring Location M-002 exceeds the effluent limitation. Order No. R9-2006-0065 required monitoring for chronic toxicity at Monitoring Location M-001 prior to combining with EPS effluent or augmentation flow. At this location, the brine is not diluted by either wastewater from EPS or additional flow augmentation seawater. In Order No. R9-2006-0065, the effluent limitation for chronic toxicity at M-001 accounted for dilution in the ocean but did not account for dilution from EPS water or from additional flow augmentation seawater. This method of calculating the effluent limitation was representative of a scenario where the brine was discharged directly to the Pacific Ocean without dilution water. As noted in the comment, the Facility's effluent exceeded the chronic toxicity effluent limitation in Order No. R9-2006-0065 numerous times. Poseidon conducted an extensive Toxicity Reduction Evaluation and Toxicity Identification Evaluation (TRE/TIE) but was unable to identify the source of toxicity. In April 2018, Poseidon submitted a TRE Report	comment at section VII.L, Attachment E – MRP, section III.C.1, Attachment E – MRP, section III.C.7, Attachment E – MRP, section III.C.8, Attachment E – MRP, section III.C.8.d, and Attachment F – MRP, section IV.C.6.c.

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	accounting for the flow augmentation dilution water provided by the EPS. Monitoring samples that account for the flow augmentation dilution water provided by the EPS did meet the chronic toxicity effluent limitation prior to discharging to the Pacific Ocean, and also passed the Test of Significant Toxicity (TST) statistical approach for determining compliance with chronic toxicity monitoring included in this Order. ***Nevertheless, the Discharger conducted an extensive Toxicity Identification Evaluation (TIE), and the results were inconclusive as to the source and cause of toxicity***" (emphasis added). Poseidon's explanation for the violations is that the brine is undiluted. However, this is precisely the point of the enforceable testing location M-001 in the existing NPDES permit. The pre-dilution limitation was set according to acceptable chronic toxicity limitations in concentrated brine. Testing location M-001 is crucial to understanding the Facility's discharge and must remain enforceable for chronic toxicity. There is an acceptable limit of chronic toxicity – no matter how much the brine is diluted. This is because the discharge is released into the nearshore environment in which marine life, ocean users, beach goers and recreational users rely. According to toxicologists, there is a potential for accumulation of elements of the chronic toxicity in the nearshore environment, despite dilution. Poseidon's statement that the violations at M-001 are an artifact of the chronic toxicity effluent limitation in Order No. R9-2006-0065 not accounting for the flow augmentation dilution water provided by the EPS are not relevant to the continuing need to identify the source of toxicity of the brine and need to be removed from the Tentative Order. As mentioned in the Tentative Order, Poseidon completed a series of toxicity evaluations to determine the cause of the chronic toxicity and released the Final Toxicity Reduction Evaluation (TRE) Report in April 2018. The TRE Report rules out several potential direct causes such as salinity and	that summarized the results of the investigation as being inconclusive as to the source of the chronic toxicity exceedances. The Tentative Order has been revised as follows: Section VII.L, and footnote 3 … The MDEL for chronic toxicity is exceeded and a violation will be flagged when a chronic toxicity test, analyzed using the TST statistical approach, results in "Fail" at M-002. The MDEL for chronic toxicity is set at the IWC for the discharge (17.4% effluent at M-002, and expressed in terms of the TST statistical approach ("Pass" or "Fail"). Monitoring for chronic toxicity at M-001 will be conducted as specified in the MRP, Attachment E and compared to the MDEL for informational purposes only using an IWC of 4.38% effluent for the discharge at that location. All monitoring for the chronic toxicity MDEL shall be reported using the 17.4% effluent concentration at M-002, 4.38% effluent concentration at M-001, and negative control, expressed in terms of the TST. The TST hypothesis (Ho) (see above) is statistically analyzed using the IWC and a negative control. Effluent toxicity tests shall be run using Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to West Coast Marine Estuarine Organisms (EPA/600/R-95/136, 1995). … [3]At M-001, IWC = 1/minimum initial dilution factor (Dm) = 1/22.83 = 0.0438 = 4.38%. At M-002, IWC = 1/~~minimum initial dilution factor~~ (Dm) = 1/5.75 = 0.174 = 17.4%. Because chronic toxicity ~~is~~ sampled at M-002 is following dilution from the flow augmentation water, the only remaining dilution available is from the ocean. Therefore, the IWC for chronic toxicity at M-002 is calculated only using dilution from the ocean, 5.75 parts	

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	harmful algal blooms. The TRE Report also finds that certain chemical and polymer additives could contribute to the toxicity findings at higher concentrations. And though the evaluation did not test the actual concentration of polymer additives in the final effluent, the report states that the effluent is "suspected" to have low enough additive concentration levels that polymers would not have a significant effect. The TRE Report speculates that a confluence of polymer and chemical additives may be at fault, however. In light of the Facility's past and ongoing discharge permit violations and the inconclusive results of the Poseidon's toxicity evaluations, the Organizations strongly urge the final order to include chronic toxicity as an enforceable limitation at Monitoring Location M-001.	water (i.e. dilution ratio of 1:4.75) and not the total dilution of 22.83 parts water, (i.e. dilution ratio of 1:21.83). For further information regarding the calculation of the dilution factor, please see section II.B. of the Fact Sheet. Attachment E – MRP, Section III.C.1 The Discharger shall conduct chronic toxicity testing on effluent samples collected at Monitoring Locations M-001 and M-002 in accordance with the following schedule and requirements: … … The chronic instream waste concentration (IWC) is calculated by dividing 100 percent by the dilution ratio. At Monitoring Location M-001, the IWC = 1/minimum initial dilution factor (Dm) = 1/22.83 = 0.0438 = 4.38%. Because chronic toxicity ~~is~~ sampled at M-002 ~~which~~ is following dilution from the flow augmentation water, the only remaining dilution available is from the ocean. Therefore, the IWC for chronic toxicity at M-002 is calculated only using dilution from the ocean, 5.75, and not the total dilution, 22.83. For further information regarding the calculation of the dilution factor, please see section II.B. of the Fact Sheet. IWC = 1/minimum initial dilution factor (Dm) = 1/5.75 = 0.174 = 17.4%. The "in-stream" waste concentration (IWC) for this discharge is 17.4 percent effluent at M-002. Attachment E, MRP, Section III.C.7 During accelerated monitoring schedules, only TST results ("Pass" or "Fail") for chronic toxicity tests shall be reported as effluent compliance monitoring and effluent informational monitoring results for the chronic toxicity MDEL. Attachment E, MRP, Section III.C.8 During the TRE Process, monthly effluent monitoring shall resume and TST results ("Pass" or "Fail" and "Percent Effect") for chronic toxicity tests shall be	

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		reported as effluent compliance monitoring results at M-002 and effluent informational monitoring results at M-001 for the chronic toxicity MDEL. Attachment E, MRP, Section III.C.8.d The Discharger shall continue to conduct routine effluent monitoring for compliance determination purposes at M-002 and informational purposes at M-001 while the TRE and/or TIE process is taking place. Additional accelerated monitoring and TRE Work Plans are not required once a TRE is begun, Attachment F, Section IV.C.6.c. Using the RPA procedures outlined in the Ocean Plan, the effluent demonstrated reasonable potential to cause an exceedance of the narrative water quality objective for chronic toxicity (i.e., Endpoint 1). Therefore, this Order retains effluent limitations and monitoring for chronic toxicity. Monitoring for chronic toxicity at M-001 will be conducted as specified in the MRP, Attachment E and compared to the MDEL for informational purposes only using an IWC of 4.38% effluent for the discharge at that location. Monitoring for chronic toxicity at M-002 will be conducted as specified in the MRP, Attachment E for effluent compliance purposes with the MDEL for chronic toxicity using an IWC of 17.4% effluent for the discharge at that location.	
27	**Sediment Assessment for Physical and Chemical Properties** The Tentative Order requires Poseidon to conduct a Sediment Assessment for Physical and Chemical Properties (Sediment Assessment) as part of the Benthic Monitoring Work Plan described in Attachment E. According to the Tentative Order, "Sediments can accumulate these particles over the years until the point where sediment quality is degraded and beneficial uses are impaired. Benthic organisms are strongly affected by sediment contaminant exposure because these	The San Diego Water Board acknowledges the comment. Tentative Order section IV.C requires benthic monitoring in the near shore zone affected by the discharge. The benthic monitoring consists of the measurement and integration of three lines of evidence: 1) sediment assessment for physical and chemical properties, 2) sediment toxicity, and 3) benthic community condition. The benthic monitoring is intended to assess the potential accumulation of pollutants in the seafloor sediments and assess impacts on the condition of the benthic community.	The Tentative Order was revised as described in the response to comment at Attachment E, section IV.C.1, and Attachment

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	organisms often live in continual direct contact with sediment/pore water, and many species ingest significant quantities of sediment as a source of nutrition." Given the potential for serious impacts as stated, along with ongoing chronic toxicity violations at the Facility, the Organizations strongly support the Sediment Assessment. The chronic toxicity violations highlight the urgent need for sediment sampling, especially given the inconclusive nature of the cause of the violations. As previously stated, according to local toxicologists, there is a potential for accumulation of elements of the choric toxicity in the nearshore environment, despite dilution. And given the results of the TRE were inconclusive, sampling to understand the potential impact is especially prudent. The sampling for the Sediment Assessment is required on a biannual basis in the Tentative Order. The Organizations strongly urge the final order to require sediment sampling to be conducted twice per year, rather than every other year. This will provide a much more representative sample given the dynamic nature of sediment in the marine environment and seasonal fluctuations.	The Ocean Plan Appendix III section 8 recommends that benthic community assessment be sampled once per permit cycle, unless the discharge is greater than 100 MGD then the minimum frequency is at least twice per permit cycle which is five years. The Tentative Order requires benthic community assessment once every two years which is more frequent than the recommended twice per permit cycle, i.e. once every two and a half years. The Ocean Plan Appendix III section 6 recommends that sediment monitoring for chemical pollutants be sampled annually rather than once every two years. The Tentative Order has been revised as follows to require sediment chemistry and physical properties be sampled every year consistent with Ocean Plan guidance: Attachment E – MRP, section IV.C.1.a a. Sediment Sampling Stations and Monitoring Frequency. The sediment monitoring program is designed to assess spatial and temporal trends in sediment quality and to assess benthic habitat condition in terms of physical and chemical composition (e.g., grain-size distribution, sediment chemistry). Sediment samples for assessment of sediment chemistry shall be collected on an ~~bi~~annual basis at the monitoring stations specified in the Benthic Monitoring Work Plan required in section IV.C.4 below. Attachment E – MRP, section IV.C.1.d, Table E-9 Sampling Frequency for all parameters is modified to be "1 / Year ~~1 / Two Years~~"	E, section IV.C.1.d.
George L. Piantka, Sr. Director Environmental, NRG - Cabrillo Power I LLC (Cabrillo)			
28	Cabrillo wants to ensure that the San Diego Water Board accurately captures the existing non-contact cooling water system and associated waste flows at EPS that operate for the Facility and should therefore be included in the Facility's Tentative Order.	The San Diego Water Board disagrees that the Tentative Order should discuss in detail the discharges from the EPS. As explained in the Response to Comment No. 5, Poseidon will need to request an amendment to the	None.

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	Cabrillo would like the San Diego Water Board to transfer the EPS Order No. R9-2006-0043 Fact Sheet sections A.1.a, c, d, and e, as they relate to the non-contact cooling water system. These sub-systems are namely "Cooling Water Pump Lubrication and Seal Water Pretreatment Backwash," "Traveling Screen Backwash Water," "Tunnel and Forebay Cleaning," and "Hypochlorinator DC Rectifier Cooling Water." These systems will continue to be in service as long as the Facility uses Cabrillo's non-contact cooling water system on an interim basis.	Tentative Order to have these wastewater streams covered by the Tentative Order.	
Supplemental Late Comments Received on February 20, 2019 from Mandy Sackett, California Policy Coordinator, Surfrider Foundation; and Raymond Hiemstra, Associate Director, Orange County Coastkeeper			
S1	**Expanded Facilities** Chapter III.M.1.b.(2) of the Ocean Plan defines "expanded facilities" as: *For purposes of chapter III.M, "expanded facilities" means existing facilities for which, after January 28, 2016, 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, the desalination facility is considered to be an expanded facility.* [emphasis added]	The San Diego Water Board agrees that the Facility is an "expanded facility." However, the San Diego Water Board disagrees with the commenters about the basis for considering the Facility an "expanded facility." The San Diego Water Board's determination in Finding 2 of the Tentative Determination that the Facility is an "expanded facility" that requires a Water Code section 13142.5(b) determination is based on the last sentence of chapter III.M.1.b.(2) of the Ocean Plan which provides that: *"…..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, the desalination facility is considered to be an expanded facility."* Operation of the Facility began in December 2015. The Facility was designed to withdraw source water from Agua Hedionda Lagoon through the existing EPS intake structure. Under this arrangement EPS served as the host site and shared its intake and discharge infrastructure with the co-located Facility. The EPS terminated power generation operations on December 11, 2018 and since	None

No.	Comment	Response	Action Taken
	The proposed Facility meets this definition for two reasons - and we believe the distinction is important. The proposed Facility significantly changes "the design or operation of the Facility" by increasing the production capacity by 20 percent (from 50 MGD to 60 MGD) and modifying the discharge dilution by increasing the volume of brine discharged and decreasing the volume of seawater used for in-plant dilution. The 2009 Determination describes the Facility that withdraws 107 MGD as source water for the production plant, creating 50 MGD of potable water and 57 MGD of brine to be mixed with 197 MGD of dilution water. See the 2009 Determination, [Order No. R9-2009-0038]. The current Tentative Order, at page H-1, describes an expanded plant as: *Under the current stand-alone operations as regulated under this Order, CDP intakes source seawater from Agua Hedionda lagoon at a flowrate of 299 MGD. 127 MGD of the source water will be used to produce up to 60 MGD of potable water. The remaining water that is not used for potable water production will be used to dilute the brine wastewater and other wastewater flows for Poseidon to meet the discharge salinity requirements of this Order. The discharge flow rate will vary in accordance with CDP operations. For example, at 50 MGD of potable water production, the discharge flow rate is 249 MGD (54 MGD of wastewater with 195 MGD of dilution water). At 60 MGD of potable water production, the discharge flow rate is 239 MGD (67 MGD of wastewater and 172 MGD of dilution water) into the Pacific Ocean.*	that time has continued to operate its circulating water pumps exclusively to supply source water to the Facility for both potable water production and brine dilution. The EPS is no longer withdrawing any source water from the Lagoon for power plant operations. These facts provide the basis to now classify the Facility as an expanded facility pursuant to chapter III.M.1.b.(2) of the Ocean Plan. The Ocean Plan at chapter III.M.2.a.(2) requires the regional water boards to conduct a Water Code section 13142.5 analysis all new and expanded desalination facilities. This basis used for classifying the Facility as an "expanded facility" pursuant to chapter III.M.1.b.(2) of the Ocean Plan is significant because that triggers the need for a new Water Code section 13142.5(b) determination. In addition, in its Water Code determination in Order No. R9-2009-0038 (2009 Determination), the San Diego Water Board specified that upon permanent stand-alone operations, the Discharger was required to seek review of the Water Code section 13142.5(b) determination (Order No. R9-2009-0038, directive 3, modifying Order No. R9-2006-0065, Section VI.C.2.f.). As the commenters point out, the Ocean Plan at chapter III.M.2.a.(3) provides the San Diego Water Board with the discretion to limit the section 13142.5(b) analysis to those expansions or other changes that result in the increased intake or mortality of all forms of marine life. The San Diego Water Board did not limit the Tentative Determination to only those expansions or changes that result in the increased intake or mortality of all forms of marine life because the Facility is seeking a determination for stand-alone operations following the cessation of power generating activities at EPS. The Facility is no longer able to rely upon the EPS effluent to supply seawater for potable water production and brine dilution. The San Diego Water Board evaluated the Facility's "worst-case"[11]	

[11]"Worst-case" scenario is where plant operations have the highest threat to water quality and would cause the maximum marine life mortality from the intake of seawater and the discharge of brine.

No.	Comment	Response	Action Taken
	The change of design and operation requires different considerations and alternatives analyses than the simpler analysis of an updated conditional approved facility. Chapter III.M.2.a.(3) of the Ocean Plan states: *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**. [emphasis added] In brief, the current Tentative Order requires analyses of the applicability of the OPA to the "expanded" portion of the proposed facility, unless the Regional Board determines that additional modifications to the "existing" portion are feasible. It is not adequate to analyze the proposed facility as a whole – the analyses must include a 13142.5(b) determination for the expansion in isolation of the conditionally approved facility.	discharge scenario for marine life impacts when discharging the full volume of brine and filter backwash water (a maximum of 67 MGD); with the minimum amount of additional seawater for flow augmentation dilution water modeled to meet the salinity receiving water limitation at 200 meters (171 MGD).	
S2	**Intake Alternatives** Water Code section 13142.5(b) requires analyses of the best available site, design, technology and mitigation feasible – both as individual components and in combination – to minimize intake and mortality of marine life. In brief, the OPA implementation regulations require the use of subsurface intakes unless they are proven not feasible. The production capacity is not allowed as a factor in the feasibility determination unless the applicant shows a "need" in an Urban Water Management Plan (UWMP). First, the Tentative Order, Attachment H.1, page 15 at Finding 10 states:	The San Diego Water Board evaluated the feasibility of subsurface intakes for the project and determined that subsurface intakes are infeasible based on technical, economic, and social factors. See Finding 9 of the Tentative Determination for more information. The San Diego Water Board also evaluated the feasibility of subsurface intakes in combination with surface intakes and also determined that the combination of intakes is infeasible based on technical and economic considerations. See Finding 22 of the Tentative Determination for more information. The San Diego Water Board disagrees that the Tentative Determination should be modified to more thoroughly	None

No.	Comment	Response	Action Taken
	The UWMP describes the additional annual average potable water output potentially resulting from the proposed CDP modifications as an adaptive management supply that could be used to meet projected regional growth and water demands. The language doesn't satisfy the requirement to identify a "need" in an UWMP sufficient to allow an exemption from the requirement to use subsurface intakes for the expanded capacity. Even if the UWMP were adequate proof of "need" for the additional product water, the Tentative Order must be revised to include analyses of whether subsurface intakes would be feasible for the expanded production capacity expansion in isolation from the previous conditionally approved 50mgd capacity as required in III.M.2.a.(3). The Tentative Order must answer the question: "can a subsurface intake feasibly supply water to a 10 MGD production expansion?".	discuss the need for desalinated water or to evaluate the SDCWA's 2015 UWMP. The Ocean Plan at chapter III.M.2.b(2) states: *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.* The need for desalinated water is consistent with the UWMP, as discussed in Finding 10 of the Tentative Determination. The San Diego Water Board reviewed the SDCWA's 2015 UWMP and determined that it appropriately identified the need for desalinated water as a water supply source for the region. The UWMP supports the need for desalinated water and the UWMP was adopted and prepared in accordance with Water Code section 10631.	
S3	**Brine Discharge Alternatives** Chapter III.M.2.d.(2)(c) of the Ocean Plan allows for "alternative" types of discharge technologies, including the requirement to do a "comparable marine life mortality" analysis. And chapter III.M.3.d of the Ocean Plan describes how that works. Chapter III.M.2.d.(2)(c) of the Ocean Plan follows several other chapters that define dilution with wastewater as "best" and diffusers as "second best" where wastewater isn't available. <u>But that chapter on "alternative discharge technologies" was only intended to allow future technologies that weren't available when the OPA was adopted. Augmented flows are NOT an "alternative technology."</u>	The San Diego Water Board disagrees with the assertion that the Ocean Plan prohibits the Facility from using flow augmentation as a brine discharge technology. Ocean Plan chapter III.M.2.d.(2)(d)ii allows the use of flow augmentation as a brine discharge technology for desalination facilities that meet specific criteria including: *At a facility that has received a conditional Water Code section 13142.5(b) determination and is over 80 percent constructed by January 28, 2016. If the owner or operator of the facility proposes 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*	None

No.	Comment	Response	Action Taken
	The very next chapter, III.M.2.d.(2)(d), makes it clear that augmented flow for dilution is prohibited (i.e., NOT an "alternative technology") except in two circumstances: • For facilities with a "conditional permit and 80 percent built" before the OPA was adopted; or, • For facilities using subsurface intakes to supply the augmented flow. But Poseidon is proposing expanding the production capacity – which increases the volume of wastewater and decreases the volume of dilution water. With the expansion, Poseidon no longer has a "conditional permit" for the new design. It is an "expanded facility" as described in chapter III.M.1.b.(2) of the Ocean Plan. Poseidon can continue using flow augmentation for the Facility as it was conditionally approved in 2009. But they cannot use flow augmentation for an expanded facility – flow augmentation is not an allowed "alternative technology" for expanded facilities. And if they propose to use flow augmentation for the conditionally approved facility (i.e. 50 MGD production), they have to dilute the brine within a MAXIMUM of a 200-meter BMZ. **See III.M.3.d** below. The OPA definitions include: **Brine mixing zone (BMZ)** *The area where salinity may exceed 2.0 parts per thousand above natural background salinity, or the concentration of salinity approved as part of an alternative receiving water limitation. The standard brine mixing zone shall not exceed 100 meters (328 feet) laterally from the point(s) of discharge and throughout the water column.* **An alternative brine mixing zone***, if approved as described in the Ocean Plan chapter III.M.3.d,* **shall not exceed 200 meters** *(656 feet) laterally from the point(s) of discharge and throughout the water column. The brine mixing zone is an allocated impact zone where there may be toxic effects on marine life due to elevated salinity.* [emphasis added]	*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; comply with chapter III.M.2.d.(1); and not discharge through multiport diffusers.* Consistent with chapter III.M.2.d.(2)(d)ii of the Ocean Plan, the Facility had received a conditional Water Code section 13142.5(b) determination at the time the Ocean Plan Amendment was adopted, and the Facility was over 80 percent constructed by January 28, 2016. The Ocean Plan neither prohibits a facility with a conditional determination from using the flow augmentation technology for future expansions when the expansion requires a separate Water Code 13142.5(b) determination beyond the existing conditional determination nor does the Ocean Plan prohibit an "expanded facility" from meeting the exception criteria to use the flow augmentation discharge technology. In fact, chapter III.M.2.d.(2)(d)ii of the Ocean Plan requires such a desalination facility to make operational changes that might require another separate Water Code determination: *… 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; comply with chapter III.M.2.d.(1); and not discharge through multiport diffusers.* To implement the requirements of chapter III.M.2.d.(2)(d)ii, the Facility would undergo changes that could require a new Water Code determination. Chapter III.M.3.d of the Ocean Plan also allows for an alternative brine mixing zone of 200 meters: *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*	

No.	Comment	Response	Action Taken
	Further, the Regional Board should be aware that the 100-meter BMZ was determined by analyzing the "near field" of brine dilution exiting a properly designed diffuser. The concern at the time was that improperly diluted brine could accumulate on the seafloor outside the BMZ (the "far field") and create ever-growing areas of hypoxic conditions. Therefore, chapter III.M.3.(d) of the Ocean Plan states: *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 January 28, 2016 that proposes flow augmentation using a surface water intake may submit a proposal to 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.* [emphasis added]	*January 28, 2016 that proposes flow augmentation using a surface water intake may submit a proposal to 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.* As discussed in Finding 64 of the Tentative Determination, modeling of the brine discharge demonstrates that the salinity is expected to meet the Ocean Plan's receiving water limitation of a daily maximum of 2.0 ppt above natural background salinity at 200 meters from the point of discharge and beyond. The model used a worst-case scenario with conservative assumptions not accounting for any currents or wave action in the ocean that would also promote mixing. The model predicted that while the discharge meets the receiving water limitation at 200 meters, the discharge would continue to be diluted beyond 200 meters and at 1,851 meters from the discharge point the discharge salinity would be indistinguishable, less than 1 percent difference, from natural ocean salinity.	

No.	Comment	Response	Action Taken
	The description of the brine flow in the Tentative Order states: *[Based] on the model, the effluent discharge plume will be negatively buoyant (denser than seawater) and will flow along the ocean bottom downslope and offshore towards the west-northwest. When the brine plume becomes stationary, at a distance of approximately* **1,851 meters** *from Discharge Point No. 001, the model predicts a difference in the salinity of the plume and the ambient ocean water to be less than 1 percent….* See Tentative Order at Attachment F-8. This description of the brine plume sinking to the seafloor at the point of discharge and migrating offshore to 1851 meters and still not reaching ambient salinity is, ironically, the description of brine behavior that provided the rationale for requiring wastewater dilution or diffusers. The brine migrates to depressions where it is no longer exposed to currents and other mixing mechanisms and accumulates into ever greater hypoxic zones inside and outside the BMZ. The proposed facility is an "expanded facility" and is no longer a "conditionally approved facility with 80 percent construction completed" before adoption of the OPA. As such, the facility now must use wastewater for dilution, diffusers, or any alternative that meets the requirements in the OPA. But augmented flows for expanded facilities is strictly prohibited under chapter III.M.2.(d)(2) of the Ocean Plan.		
S4	**Mitigation Alternatives** Poseidon's conditional permit Marine Life Mitigation Plan (MLMP) used an ETM/APF calculation based on an 80 percent statistical confidence. After quite a bit of debate during the drafting process for the OPA, the required confidence level was increased to 95 percent. See chapter III.M.2.e(1)(a) of the Ocean Plan:	The San Diego Water Board disagrees that the Tentative Determination should be modified to include additional analyses of the MLMP. As discussed further in the response to Comment No. 17, the San Diego Water Board required Poseidon to hire a neutral third-party expert to review the ETM/APF calculations used as the basis for the mitigation calculation. Poseidon funded a previously-convened independent SAP to review several mutually agreed upon topics and	None

No.	Comment	Response	Action Taken
	[The] APF shall be calculated using a one-sided, upper 95 percent confidence bound for the 95th percentile of the APF distribution… Regardless of whether the proposed Facility is considered an "expanded facility" or an update of the 2009 conditional permit, the Tentative Order must analyze the mitigation provisions in the OPA. It is our understanding, in a very general way, that this change in statistical confidence would approximately double the acreage that was required in the 2009 conditional permit. There are a number of other new considerations for mitigation in the OPA. It doesn't appear like the Tentative Order has adequately analyzed those new mitigation requirements and incorporated them into an updated MLMP. Chapter III.M.2.e.(3)(b)(viii) of the Ocean Plan states: *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.* For example: first, the MLMP must compensate for all area affected by brine above 2 ppt. See chapter III.M.3.e.(1)(b) of the Ocean Plan. This additional area should include reasonably foreseeable brine accumulation spreading on the seafloor for the Facility's operating life – as briefly mentioned above. Second, it is our understanding that no restoration has begun. This delay must be calculated into the new MLMP. See M.3.e.(3)(b)(viii).	questions. Among the questions posed to the SAP was this question: *Were the ETM/APF analyses calculated in accordance with the Ocean Plan Requirements, including the one-sided, upper 95 percent confidence bound, and one percent mitigation credit?* The SAP recalculated the ETM/APF with a 95 percent confidence limit and those calculations are contained in Table 2 of the SAP's final report. Based upon the SAP's report, Poseidon provided a revised entrainment calculation in Appendix FFF to the ROWD that addresses the SAPs recommendations and those calculations are the basis for the mitigation requirements for the Tentative Determination. The SAP's final report is available on the San Diego Water Board website at: https://www.waterboards.ca.gov/sandiego/water_issues/programs/regulatory/docs/SAP/Poseidon_Carlsbad_SAP_report.pdf. The San Diego Water Board's previous Water Code section 13142.5 determination for co-located operations in Order No. R9-2009-0038 required 55.4 acres of wetland mitigation based on an 80 percent confidence interval. The Tentative Determination requires 68.3 acres of wetland mitigation based on a 95 percent confidence interval. There are several differences between the 2009 Determination (which applied to co-located operations) and the Tentative Determination (which applies to permanent stand-alone operations) that influence the marine life impacts and consequently the required mitigation: • An intake flow rate of 299 MGD for permanent stand-alone operations instead of 304 MGD for co-located operations. • The use of 1-mm WWS at the onset of seawater withdrawal from the Agua Hedionda Lagoon for permanent stand-alone operations as required by chapter III.M.2.d.(1)(c)ii of the Ocean Plan instead	

No.	Comment	Response	Action Taken
	These are just two examples of additional analyses of the MLMP that must be included before final adoption. The full requirements are found in III.M.	of the existing 3/8-inch and 5/8-inch onshore screens which screen marine life travels through an intake tunnel for co-located operations. • A through-screen velocity of 0.5 ft/second under permanent stand-alone operations as required by chapter III.M.2.d.(1)(c)iv of the Ocean Plan. • A 10 to 1 mitigation ratio for impacted open water or soft-bottom habitat as provided by Ocean Plan chapter III.M.2.e.(3)(b)vi. • The use of low turbulence intake pumps under stand-alone operations to limit thermal stress, osmotic stress, turbulent shear stress and other factors that could cause intake and mortality of all forms of marine life as required by chapter III.M.2.d.(2)(d)ii. of the Ocean Plan. The Tentative Order also requires Poseidon to account for the temporal loss of marine life and habitat productivity during the period extending from the commencement of Facility operations that result in marine life impacts until the mitigation project meets performance standards. The commenter is correct that construction of Poseidon's mitigation project, the Otay River Estuary Restoration Project, has not yet begun construction. The project is still seeking the necessary permits to begin construction. The Tentative Order at section VI.C.2.d.i.(e) requires Poseidon to update the MLMP to provide for full mitigation for the operational lifetime of the Facility to account for the temporal loss of marine life and habitat productivity during the period extending from the commencement of Facility operations that results in marine life impacts until the mitigation project meets performance standards.	
Supplemental Late Comments Received on March 21, 2019 from Sandy Kerl, Acting General Manager of the San Diego County Water Authority			

No.	Comment	Response	Action Taken
S5	Please confirm the methodology staff used to arrive at the Finding in the Water Code determination that flow augmentation results in a comparable marine life impact as the multiport diffuser for purposes of the Tentative Determination.	Finding 31 of the Tentative Determination describes how the San Diego Water Board analyzed the information provided by Poseidon to determine that flow augmentation discharge technology provides a comparable level of intake and mortality of all forms of marine life as a theoretical multiport diffuser. The San Diego Water Board analyzed two different models to approximate the marine life mortality from a multiport diffuser; i.e. the Foster Model and the Roberts Model referenced in Finding 31 of the Tentative Determination. The San Diego Water Board recognizes that both models were limited by not having marine life data from the specific location of the theoretical multiport diffuser in the Pacific Ocean and relied on marine life data from Agua Hedionda Lagoon to estimate the marine life impacts from a multiport diffuser. Nevertheless, the marine life data from Agua Hedionda Lagoon was the best available data at this time to determine that flow augmentation results in a comparable marine life impact as a multiport diffuser. Both models demonstrated that the marine life intake and mortality from a multiport diffuser is comparable with the marine life mortality from using the flow augmentation discharge technology. See Appendix GGG to the ROWD. Also as described in Finding 31 of the Tentative Determination, the volume of seawater potentially entrained by a multiport diffuser at 170 MGD is comparable to the intake volume of additional seawater to implement the flow augmentation discharge at 171 MGD.	None
S6	Please confirm that the volume of water where shearing-related mortality occurs for purposes of determining the marine life mortality associated with the multiport diffuser will be set forth in the Tentative Determination and is not subject to reconsideration at a future date.	Finding 31 of the Tentative Determination specifies that the Roberts Model calculated the volume of seawater where shearing related mortality occurs from a multiport diffuser is 170 MGD. This volume of seawater entrainment was part of the information analyzed by the San Diego Water Board in making the Tentative Determination and is not being reconsidered for this determination at this time. If future changes at the Facility require a separate Water Code section 13142.5(b) determination, then this volume of	None

No.	Comment	Response	Action Taken
		seawater could be subject to reconsideration by the San Diego Water Board.	
S7	Please confirm that when determining the intake and mortality associated with the multiport diffuser and flow augmentation brine discharge technologies pursuant to the Brine Discharge Technology Empirical Study, the San Diego Water Board will require Poseidon estimate the impact using the ETM/APF approach pursuant to chapter III.M.2.d.(2)(c)i of the Ocean Plan.	The commenter is correct that chapter III.M.2.d.(2)(c)i Ocean Plan requires the Discharger to estimate the intake entrainment impacts using an ETM/APF approach. However, the Ocean Plan does not require the San Diego Water Board to limit the comparison of impacts to only using the ETM/APF approach. The San Diego Water Board used all available information to compare the marine life impacts from a multiport diffuser to flow augmentation, including the volume of seawater potentially entrained, the mitigation acreage required, and the ETM/APF calculations.	None
S8	Please confirm that the finding in the Water Code determination that wastewater is unavailable is a one-time determination that is made at the time of the Water Code determination and is not subject to reconsideration.	The San Diego Water Board addressed this comment in Response to Comment No. 3.	None
S9	Please confirm that staff intends to extend the April 30, 2020 compliance date to complete construction and begin operation of the new dilution water intake pumps to reflect delays associated with adoption of the Tentative Order.	If the Tentative Order proceedings extend beyond the May 8, 2019 Board meeting, the San Diego Water Board will consider extending the April 30, 2020 compliance date to complete construction and begin operation of the new dilution water intake pumps.	None

TO: Hope Smythe, Executive Officer
Santa Ana Regional Water Quality Control Board

FROM: Professor Pete Raimondi, University of California, Santa Cruz

DATE: March 5, 2019

SUBJECT: APPROACHES FOR THE ASSESSMENT OF POTENTIAL INTAKE LOCATIONS WITH RESPECT TO ENTRAINMENT, PROPOSED HUNTINGTON BEACH DESALINATION PLANT

This memo is to give some context and guidance to the assessment of potential intake sites for the Huntington Beach Desalination Plant (HBDP). There are 6 alternative sites being evaluated, in addition to the proposed intake site (station E). These are sampling locations that were used to assess the concentration of larvae in the Sample and Total Source Water Bodies during earlier evaluations to determine the impact of once-through use of water for power generation and desalination. The early evaluations were focused only on the entrainment effects of the intake located at station E. Though all the stations were used to characterize the source water body, and much of the data were collected using identical methods at all seven stations, data for some stations were much more limited than that collected for station E. In particular, there were very limited larval length data collected at any station other than station E. This has major implications for the primary approach used to assess impacts relating to entrainment (Empirical Transport Model/Area of Production Foregone, ETM/APF) as discussed below. Because this previous ETM/APF analysis was not conducted to compare entrainment at different sampling stations within the study, and therefore the data at the 6 alternative sites is limited, we are developing a novel approach that relies on multiple lines of evidence to provide a method to compare entrainment effects among alternative stations. First, I will provide a quick review of the problems associated with the use of ETM/APF for the purpose of station comparison that is unique to this assessment, then I will describe the proposed hybrid approach.

Background on ETM/APF

ETM/APF has been the primary tool for the evaluation of entrainment impacts in California for almost two decades. Over that period there has been an evolution of some of the model elements, but the core equations have remained the same. The details of the approach have been laid out and reviewed elsewhere; however, I will review the basic ideas for the model and indicate why the use of it is problematic in this specific case.

The general idea of the model is to evaluate risk to a population of a species due to mortality caused by some source. Here, we are talking about entrainment. Risk is defined as the proportion of the vulnerable population (Pm) that is killed as a result of entrainment. Calculating Pm across species representative of the local community leads to the ability to assess

community-wide risk and also, through APF, to convert that risk into a measure of compensatory mitigation. It is a robust approach in that it should allow for community-wide assessment of direct and indirect impacts related to entrainment. As such, it should be an appropriate approach for the comparison of ecological impacts at potential intake locations.

What is needed, in a general sense, in order to use the ETM/APF approach to assess impact potential is: (1) Site specific measurements of concentration of larvae entrained, (2) Site specific estimates of age frequency distributions for representative species and (3) Site specific information concerning hindcast probabilities of larval delivery from locations in the source water body to the station (typically based on current information). These three factors in combination allow for a more complete characterization of the source water body population (i.e. the population at risk to entrainment). Age of larvae is based on size of the larvae (usually determined by the length of the larvae). Generation of age frequency relies on a sufficient number of larvae being measured for length. For the evaluations available for HBDP, there are scant measurements of larval length (age) for any station other than station E, which limits ETM/APF calculations at other stations. These components can be mathematically assembled to provide both Pm and APF values. If a study was designed to compare stations, estimates for # 1, 2, and 3 above would be needed for all potential sites.

For HBDP, an attempt has been made to use data collected in 2003-2004 as part of the California Energy Commission (CEC) impingement and entrainment study for the AES Huntington Beach Generating Station (HBGS) Retool Project (MBC and Tenera, 2005). Seven stations were selected as larval sampling sites to characterize the source water body for the generating station's intake, which is located near station E. This study provided good characterization of site-specific larvae concentrations (# 1), but no site specific information about larvae delivery (#3), and very little information concerning age frequencies (#2). In addition, the oceanographic instrument that could have provided simultaneous ocean current speed data for the general area failed (#3) and therefore, ocean current information for a different time period (1999-2000) were used.

Based on these deficiencies, it was clear that we should not rely solely on ETM/APF to make the station comparison. Instead, an approach was adopted to look at other "lines of evidence" that together might inform the comparison. The ones discussed below are all quantitative; another set is largely qualitative and will not be discussed here.

The three quantitative approaches are: (1) using ETM/APF with an understanding of the limitations in this particular case, (2) looking at raw estimates of station-specific larval loss, which is estimated as the mean larval concentration at each station, and (3) standardized species-specific loss. Approach #2 provides a way to assess station-specific comparison of total larval loss irrespective of species. Here, species contribute to the estimated loss in proportion to their abundances. In Approach #3, each species' concentrations are standardized across stations such that all species count equally, whether they were common or rare in the samples.

APF: here are many issues with this approach given the available data. First, there are limitations with respect to species that can be assessed because of the deficiency in larval length data (in the form of size frequency data) for all stations other than station E. For station E, 12 species are available for use, including the 9 species sufficient to assess impact in the 2005 HBGS impingement and entrainment study. For all other stations, there are no more than 4 species that are common to all seven stations. This number of species would likely not be sufficient for a stand-alone impact determination. Moreover, my initial review suggests that the overall APF at station E decreases with increasing sample size. This means that a comparison among stations should rely on these common 4 species (meaning that the calculation for station E should also be based on the common 4 species and not 12).

The second issue concerns current measurements. Normally, the larval delivery function (#3 above) is calculated using ocean current speed data collected during the larval sampling period. In this case, we have 2 types of current speed data. The first is based on a single estimate for all stations in each of two time periods (1999-2000 and 2007-2008), which are both outside the time period when the larval population was sampled (2003-2004). Although neither time period is likely to match the current regime that occurred during the 2003-2004 larval sampling, both estimates were used as representative speeds for the nearshore area. The second set of estimates is site specific and is based on Regional Ocean Modeling System (ROMS) output for the appropriate time period. These are values modeled in a grid of spatial cells. However, there is concern about modeling at nearshore stations as they are located outside the nearest modeled cells. Here, ROMS estimates were projected from nearby cells. These values should also be used to provide APF estimates.

Finally, there are two estimates for estuarine species (CIQ gobies and Diamond Turbot) larval concentrations: one set collected from Agua Hedionda Lagoon (AHL) and the other from Alamitos Bay (AB).

Because the ETM/APF evaluation for station comparison is based upon sampling designs implemented for other reasons– i.e., to determine entrainment risk at a single location rather than to compare entrainment risks among several locations – an approach for combining all values is preferred. The key is to provide a single reconciled set of APF estimates--one for each station. My recommendations for this approach are:

1) Produce one set of values (APF) for the ROMS-based current measurements and another set for current measurements based on area estimates (from single point current measurements from the two sample periods, 1999-2000 and 2007-2008).
    a. The area values for the area estimates can be derived as the average of the two sets representing the two periods.
2) For species with estuarine populations (CIQ gobies and diamond turbot), the calculation of Pm is based on two source water populations – the nearshore open coast (as for the

other species) and also estuarine subtidal habitat adjacent to nearshore source water bodies. Concentration of larvae for these species in the nearshore can be estimated based on sampling done at stations during the 2003-2004 evaluation. However, there was no directed sampling of estuarine populations in the HBGS impingement and entrainment study and hence other information must be used to estimate likely estuarine concentrations. There are two sources of such information, as previously noted. Measurements of larval concentrations of CIQ gobies and Diamond Turbot from both AHL and AB can be used to estimate estuarine source water concentrations for these two species.

3) Combining #1 and # 2 entails:
    a. For each species and station - calculating APF values using AB and AHL larval concentrations for the three current estimates (ROMS, 1999-2000, 2007-2008)
    b. Given a, for each species and station – calculating the average APF across the two non-ROMS models (1999-2000 and 2007-2008).
    c. Given a and b, for each station and species – calculating the average APF of the non-ROMS (b) and ROMS model. This will result in a single estimate of APF per station and species--the "joint estimate" (Equation 2, below).

ETM/APF has been the modeling approach used in almost all recent evaluations for estimating entrainment loss from once-through cooling use of seawater in California for power generation stations. Its key advantage is that it provides simultaneous estimation of species vulnerability (i.e. risk) and a currency relevant to mitigation (area of production foregone = area of habitat which, if restored or created, would provide compensatory mitigation). The utility of this approach relates directly to the adequacy of the data collected, particularly with respect to representation of species (and species life histories) likely to be affected. When ETM/APF approaches are planned in advance of a potential study, data adequacy is integrated into the sampling design. Here, ETM/APF is being used for stations (all but E) that were not envisioned as potential intake locations; hence, there are severe constraints on the species for which the approach can be used. This compromises the utility of this approach because we are limited to 4 species for which there is minimally sufficient information for the core calculations. However, if the purpose of the study had been to compare potential entrainment among all of the larval sampling stations, the ETM/APF approach with adequate sampling at each station would have been the preferred option.

Mean Larval Concentration (MLC): This is a very simple approach (this is one of its attributes). The goal is to get an estimate of the larval loss by station. Given that the intake volume is constant (meaning that whatever the actual volume, it will be the same at all stations), what is needed is the mean larval concentration over the entire sampling period for each station. These overall MLC estimates should not be species specific. As an example, there are species-specific estimates of larval concentration for each station over 12 surveys. Within each survey there are 4 cycles of sampling and 2 replicates in each cycle. This means that there are 8 estimates of larval concentration (# per cubic meter) for each survey / station combination. It is important to

note that the datasets are not populated with zeros, so zeros need to integrated back into the data. The mean concentration per station can be attained by summing concentrations across species (but maintaining Station, Survey, Cycle and Replicate as strata), then calculating the mean for each station.

The core idea that is the basis of the use of MLC is that one aspect of determining ecological impact is simply to calculate the total larval loss per proposed intake station. The station with the lowest projected total entrainment, if species-specific risk is assumed to be not important, could be considered the station having the lowest ecological impact with respect to entrainment. Here we are using this as one of three approaches and note that the other two approaches both are based on species specific risk.

Standardized Larval Concentration (SLC): As noted above, this approach is based on station and species-specific larval concentrations. However, the values are then standardized such that all species count equally irrespective of whether the species was common or uncommon in the samples. In previous discussions, we discussed the use of Z-scores which are distributed as a normal deviate (typically ranging between -3 and 3) based on the following equation: Z=(measurement-mean)/standard deviation. This will be done for each species and the replicates are stations. The key here is to define the constraints on the values. For example, this could be done for each sampling period. As an example, the mean and standard deviations for goby concentrations for sample period 1 could be calculated across stations and used to calculate species-, sample-, and station-specific Z values. One underlying assumption of doing this is that the pattern of larval abundance over time is unimportant. This is because a period with low concentrations would count equally to one with high concentrations. This is not the intent of the transformation. Instead, and more simply, the idea is that each species should count equally but that the standardized dataset should be based on the station and species-specific (but not survey, cycle or replicate) mean concentrations of larvae over all sample periods. It is important to note that, as with the MLC approach, the datasets are not populated with zeros, so zeros need to integrated back into the data. The species-specific standardized concentration per station can be attained by averaging the concentrations of each species across Survey, Cycle and Replicate. These values can then be standardized as discussed above.

SLC is a modification of MLC that mathematically equalizes all species. This means that each species counts the same toward an overall estimate of impact. The reason for this is to provide an evaluation of risk, in the absences of a sufficient ETM/APF assessment. It is recognition that uncommon species, which minimally contribute to the MLC, may actually be more at risk to ongoing or new sources of mortality than are common species which drive MLC estimates.

Linking the three approaches: The decision on how or whether to link and weight APF, MLC, and SLC is a policy decision. The argument for linking and perhaps differentially weighting each estimate is based on the idea that all provide independent, or at least semi-independent, estimations of impact. Therefore, linking the estimates provides a more comprehensive

evaluation. Alternatively, if all are essentially designed to evaluate ecological risk, then linking better and worse methods may diminish the accuracy of the evaluation. The key decisions that must be made are 1) whether or not to link, and 2) if not, which metric to use.

If metrics are to be linked, here are some possible approaches:

1) Ranking stations in each approach and then using the mean of the ranks as a final assessment for stations. This assumes all approaches are equally valuable and that ranks (more than measurements) are better indicators of relative value. For example, stations A, B, and C with values 10, 12, and 25 respectively, would be ranked 1, 2, and 3 but the difference among stations is progressive by 2 and 13, meaning station C (25) is much more different from Station B (13) than B is from A (2). Yet, the difference in ranks is the same.

2) Making units comparable but maintaining measurement differences. As one example, all attributes could be converted to a relative scalar using the equation:

$$\frac{y_i - min}{max - min} \qquad (1)$$

where y_i is the value for station i and *min* and *max* are the minimum and maximum values across stations for the metric of interest. This results in all metrics have a range of 0 -1. This approach ensures no inadvertent weighting of the attributes (because all are scaled 0-1).

3) Some combination of either 1 or 2 but with weighting that represents relative importance in the metrics.

Assessment of potential intake locations with respect to entrainment

I have reviewed submissions by both Poseidon and the CCC. Both contained estimates of potential station-specific entrainment impact based on APF, MLC and SLC. In addition, other metrics (quantitative and qualitative) were provided by both, but primarily by Poseidon. This review does not cover any assessment other than as described above for APF, MLC and SLC. My initial review was an interactive process with both groups to ensure that there was consistency in terms of data (e.g. repopulation of zeros), analytic approaches, and simple QA/QC activities, such that the results from both parties for the core metrics are similar. This means that the values and the approaches taken to get to the values are not different and are consistent with agreed upon approaches and, also, with the values I calculated. Hence, the key issue relates to interpretation of the values. Below I present the final values for both groups along derived metrics (i.e. ranks and scaled values) that can be used in assessing potential entrainment impact at all stations.

Group	Station	Joint APF	MLC	SLC
CCC	D2	146.5948	0.5697	-0.1835
CCC	D4	137.8344	0.8226	-0.2260
CCC	E	215.7184	0.6782	-0.2585
CCC	O2	279.6908	0.4451	0.2172
CCC	O4	202.1039	0.6042	0.6616
CCC	U2	199.4776	0.5415	-0.1483
CCC	U4	168.7313	0.9051	-0.0625
Poseidon	D2	146.5948	0.5697	-0.1989
Poseidon	D4	137.8344	0.8226	-0.2336
Poseidon	E	215.7184	0.6782	-0.2392
Poseidon	O2	279.6908	0.4451	0.2010
Poseidon	O4	202.1039	0.6042	0.7242
Poseidon	U2	199.4776	0.5420	-0.1698
Poseidon	U4	168.7313	0.9051	-0.0839

Table 1: Final estimates by Groups for Joint APF (across all species), Mean Larval Concentration (MLC) and Standardized Larval Concentration (SLC). APF is based on 95% confidence interval.

Table 1 shows the final estimates for Joint APF, Mean Larval Concentration and Standardized Larval Concentration for all species. The calculation for 'Joint APF' was based on the weighting given to each of the three estimates of larval transport. They were weighted using the following equation, which yielded an estimate giving equal weight to the period and ROMS estimates:

$$Joint\ APF = \frac{\left[\left(\frac{APF_{P1}+APF_{P2}}{2}\right)+APF_{ROMS}\right]}{2} \qquad (2)$$

where P1 and P2 are period 1 (1999-2000) and period 2 (2007-2008). I also calculated habitat-

specific APF's for estuarine (CIQ gobies and diamond turbot) and open coast species (white croaker and northern anchovy), shown in Table 2. Here, the idea was to determine if the potential station-specific impact differed as a function of habitat. This could be caused by a number of things, but the most likely is distance from an estuary.

Note that MLC and SLC values are the same in Tables 1 and 2. This is because MLC and SLC calculations were not done separately for open coast and estuarine species.

Group	Station	APF Estuarine Species	APF Open coast Species	MLC	SLC
CCC	D2	12.4740	233.2160	0.5697	-0.1835
CCC	D4	24.3426	186.1041	0.8226	-0.2260
CCC	E	7.1829	361.2893	0.6782	-0.2585
CCC	O2	6.0515	358.5923	0.4451	0.2172
CCC	O4	0.1744	281.1617	0.6042	0.6616
CCC	U2	12.2946	343.6112	0.5415	-0.1483
CCC	U4	9.5539	226.2715	0.9051	-0.0625
Poseidon	D2	12.4740	233.2160	0.5697	-0.1989
Poseidon	D4	24.3426	186.1041	0.8226	-0.2336
Poseidon	E	7.1829	361.2893	0.6782	-0.2392
Poseidon	O2	6.0515	358.5923	0.4451	0.2010
Poseidon	O4	0.1744	281.1617	0.6042	0.7242
Poseidon	U2	12.2946	343.6112	0.5420	-0.1698
Poseidon	U4	9.5539	226.2715	0.9051	-0.0839

Table 2: Final estimates by Groups for Joint APF (across all species) for both estuarine and open coast species, Mean Larval Concentration (MLC) and Standardized Larval Concentration (SLC). APF is based on 95% confidence interval.

Station-specific values for Tables 1 and 2 were related to each other as described above, using ranks and scaling (scaling as shown in equation 1). These are shown in tables 3-6.

Group	Station	Joint APF	MLC	SLC
CCC	D2	2	3	3
CCC	D4	1	6	2
CCC	E	6	5	1
CCC	O2	7	1	6
CCC	O4	5	4	7
CCC	U2	4	2	4
CCC	U4	3	7	5
Poseidon	D2	2	3	3
Poseidon	D4	1	6	2
Poseidon	E	6	5	1
Poseidon	O2	7	1	6
Poseidon	O4	5	4	7
Poseidon	U2	4	2	4
Poseidon	U4	3	7	5

Table 3: Ranks for APF, MLC, SLC for both groups. A rank of 1 indicates the lowest estimated impact for the metric of interest. These ranks are based on the values shown in Table 1.

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Group	Station	Joint APF	MLC	SLC
CCC	D2	0.0618	0.2709	0.0816
CCC	D4	0.0000	0.8207	0.0353
CCC	E	0.5490	0.5067	0.0000
CCC	O2	1.0000	0.0000	0.5170
CCC	O4	0.4531	0.3459	1.0000
CCC	U2	0.4345	0.2096	0.1198
CCC	U4	0.2178	1.0000	0.2130
Poseidon	D2	0.0618	0.2710	0.0418
Poseidon	D4	0.0000	0.8205	0.0058
Poseidon	E	0.5490	0.5067	0.0000
Poseidon	O2	1.0000	0.0000	0.4569
Poseidon	O4	0.4531	0.3458	1.0000
Poseidon	U2	0.4345	0.2107	0.0720
Poseidon	U4	0.2178	1.0000	0.1612

Table 4: Proportional scaling for APF, MLC, SLC for both groups. Values of 0 and 1 indicate the minimum and maximum estimated impact for the metric of interest, respectively. These values are based on those shown in Table 1.

In tables 5 and 6, values for combined APF are shown. For Table 5, these are the ranks of the average of APFS for estuarine and open coast species. For estuarine species these are the average of the scalar values for estuarine and open coast species.

Group	Station	APF Estuarine Species	APF Open coast Species	MLC	SLC	Combined APF
CCC	D2	6	3	3	3	5
CCC	D4	7	1	6	2	3
CCC	E	3	7	5	1	6
CCC	O2	2	6	1	6	3
CCC	O4	1	4	4	7	1
CCC	U2	5	5	2	4	6
CCC	U4	4	2	7	5	2
Poseidon	D2	6	3	3	3	5
Poseidon	D4	7	1	6	2	3
Poseidon	E	3	7	5	1	6
Poseidon	O2	2	6	1	6	3
Poseidon	O4	1	4	4	7	1
Poseidon	U2	5	5	2	4	6
Poseidon	U4	4	2	7	5	2

Table 5: Ranks for APF, MLC, SLC for both groups. APF ranks for estuarine, open coast and combined ranks across both habitats are shown. A rank of 1 indicates the lowest estimated impact for the metric of interest. These ranks are based on the values shown in Table 2.

Group	Station	APF Estuarine Species	APF Open coast Species	MLC	SLC	Combined APF
CCC	D2	0.5089	0.2689	0.2709	0.0816	0.2742
CCC	D4	1.0000	0.0000	0.8207	0.0353	0.5331
CCC	E	0.2900	1.0000	0.5067	0.0000	0.8711
CCC	O2	0.2432	0.9846	0.0000	0.5170	0.7986
CCC	O4	0.0000	0.5426	0.3459	1.0000	0.0000
CCC	U2	0.5015	0.8991	0.2096	0.1198	1.0000
CCC	U4	0.3881	0.2293	1.0000	0.2130	0.0871
Poseidon	D2	0.5089	0.2689	0.2710	0.0418	0.2742
Poseidon	D4	1.0000	0.0000	0.8205	0.0058	0.5331
Poseidon	E	0.2900	1.0000	0.5067	0.0000	0.8711
Poseidon	O2	0.2432	0.9846	0.0000	0.4569	0.7986
Poseidon	O4	0.0000	0.5426	0.3458	1.0000	0.0000
Poseidon	U2	0.5015	0.8991	0.2107	0.0720	1.0000
Poseidon	U4	0.3881	0.2293	1.0000	0.1612	0.0871

Table 6: Proportional scaling for APF, MLC, SLC for both groups. APF values for estuarine, open coast and combined scalar across both habitats are shown. Values of 0 and 1 indicate the minimum and maximum estimated impact for the metric of interest, respectively. These values are based on those shown in Table 2.

Examination of the results of these multiple metrics and multiple approaches to evaluate the metrics leads to no clear indication of which station would result in the lowest impact due to entrainment. Depending on the metric and whether habitats are evaluated separately or together for APF, four stations have the lowest estimated entrainment impact: D4 for Joint APF (Tables 3, 4), E for SLC (Tables 3, 4 and 5, 6), O2 for MLC (Tables 3,4 and 5,6) and O4 for Combined APF (Tables 5, 6). Importantly, no station has the lowest value for more than one metric. As noted earlier, MLC and SLC estimates are the same in Tables 3 and 5 and also in Tables 4 and 6. Later in the report, I will discuss my assessment of the relative importance of the metrics for the comparison of stations, given the data at hand, but before doing this I'll show the results of a synthetic approach that combines all metrics. These results are based on the ranked and the (0-1) scaled approach and were done for both joint APF and habitat-specific APF.

Table 7 shows the summary values for all combination of approaches for both groups. Here the average value across all metrics is shown. For example, values shown in the cells below:

1. *Ranking 1* are the means of the ranks for APF, MLC and SLC from Table 3.
2. *Ranking 2* are the means of the ranks for APF, MLC and SLC from Table 5, where APF is the combined rank for estuarine and open coast habitats.
3. Scalar 1 are means of the scalar values APF, MLC and SLC from Table 4.
4. Scalar 2 are means of the scalar values for APF, MLC and SLC from Table 6, where APF is the combined rank for estuarine and open coast habitats.

Group	Station	Ranking 1	Ranking 2	Scalar 1	Scalar 2
CCC	D2	2.6667	3.6667	0.1381	0.2089
CCC	D4	3.0000	3.6667	0.2853	0.4630
CCC	E	4.0000	4.0000	0.3519	0.4593
CCC	O2	4.6667	3.3333	0.5057	0.4385
CCC	O4	5.3333	4.0000	0.5996	0.4486
CCC	U2	3.3333	4.0000	0.2547	0.4431
CCC	U4	5.0000	4.6667	0.4769	0.4334
Poseidon	D2	2.6667	3.6667	0.1248	0.1957
Poseidon	D4	3.0000	3.6667	0.2755	0.4532
Poseidon	E	4.0000	4.0000	0.3519	0.4593
Poseidon	O2	4.6667	3.3333	0.4856	0.4185
Poseidon	O4	5.3333	4.0000	0.5996	0.4486
Poseidon	U2	3.3333	4.0000	0.2391	0.4276
Poseidon	U4	5.0000	4.6667	0.4597	0.4161

Table 7: Synthetic (across all metrics) values for ranked and scalar (0-1) approaches. Ranking 1 and Scalar 1 refer to use of a Single calculated (per station) APF value in the calculation (e.g. Tables 3 and 4). Ranking 2 and Scalar 2 refer to use of habitat based APF to produce a combined APF per station (e.g. Tables 5 and 6).

Table 8 uses the data in Table 7 and each value in the each of the response columns (Ranking 1, Ranking 2, Scalar 1 and Scalar 2). This yields a table of ranks that allows comparison of synthetic metrics (e.g. across APF, MLC, SLC).

Group	Station	Ranking 1	Ranking 2	Scalar 1	Scalar 2
CCC	D2	1	2.5	1	1
CCC	D4	2	2.5	3	7
CCC	E	4	5	4	6
CCC	O2	5	1	6	3
CCC	O4	7	5	7	5
CCC	U2	3	5	2	4
CCC	U4	6	7	5	2
Poseidon	D2	1	2.5	1	1
Poseidon	D4	2	2.5	3	6
Poseidon	E	4	5	4	7
Poseidon	O2	5	1	6	3
Poseidon	O4	7	5	7	5
Poseidon	U2	3	5	2	4
Poseidon	U4	6	7	5	2

Table 8: Ranks for all response columns in Table 7. Ranking 1 and Scalar 1 refer to use of a Single calculated (per station) APF value in the calculation (e.g. Tables 3 and 4. Ranking 2 and Scalar 2 refer to use of habitat based APF to produce a combined APF per station (e.g. Tables 5 and 6).

Consideration of the metrics

This analysis has relied on three metrics, APF, MLC and SLC as a basis for assessing the potential entrainment impact for each station. Of the three metrics (APF, MLC and SLC), the most appropriate approach in theory is APF because it reflects risk to entrained species and risk is, ecologically, the most appropriate assessment of impact. Assessment of risk is complicated because loss needs to be expressed in term of entrainment mortality calibrated to population vulnerability. APF can provide species-specific risk but in terms of an overall assessment that is relevant to the array of species entrained, it relies on estimation across multiple species representative of the entrained species assemblage. It is also, by nature of the need to determine population vulnerability, a very data-hungry calculation. At a minimum, it requires data on: (1) species-specific entrainment over a period representative of temporal patterns of larval abundance, (2) species-specific concentration in the source water, (3) species-specific demographic information for entrained individuals (e.g. age structure and length data), (4) oceanographic transport to establish species-specific source water bodies, and (5) information for enough species to be representative for the purpose of statistical evaluation (e.g., to produce a confidence interval for APF that would be representative of all species). If all 5 criteria were available for each proposed intake station, APF would be the clear best choice. In theory, such a study could have been designed for a station assessment, but here we are trying to use historic

data (not always matched in time) for a study where station comparison was not part of the monitoring design. These considerable constraints limit the utility of the APF approach for the question at hand – leading to the use of other metrics: MLC and SLC.

APF, MLC and SLC can all be used individually, but because of limitations of all approaches, as described above, there was consideration of taking a "multiple lines of evidence" (MLE) approach in the hope that there would be more clarity as to station-specific impact. This led to ideas about how to combine APF, MLC and SLC to produce a simple and combined ranking. The two used here (rank based and scalar based) represent ends of a spectrum. The mean rank approach (taking the means of station ranks for all metrics) implicitly assumes that actual difference in a metric between stations is best considered a step rather than a measurable increment. For example, assume there are three stations (A, B and C) with three values for APF (10, 100, 110). These would be ranked in order of lowest to highest impact: 1, 2, 3, even though pairwise differences (AB, AC and BC) are quite different (90, 100, 10). The key advantage for ranks over some other approach is that the units for APF, MLC and SLC are all the same and stations can be ranked from 1-7 for all three metrics.

The other approach used here, the one based on relative scalars, also produces the same units (0-1) for all metrics. Here, however, the differences between stations are maintained in the scalar. The key issue with this approach is the underlying assumption that the range between lowest and highest station for any metric represents a range from low to high impact (this is also true for ranks) rather than, say, a gradient within the low impact range. This assumption is one that we have informed but it is generally a policy decision. Fortunately, results are similar for the two approaches.

Conclusion of independent reviewer

The discussion presented in the previous section aligns with discussion among the groups leading up to this report. Here, I am presenting my personal assessment. First, I do not think that the use of APF is appropriate, given the design-imposed limitations for comparison of stations as discussed above. Second, MLC and SLC are robust to the issues associated (for this study) with APF. Third, MLC and SLC provide different types of information concerning risk, discussed briefly below. Fourth, I do not think that formal inferential statistics are likely to be useful for the comparisons of interest, especially given the use of two metrics and the goal of producing a joint estimate. If there is a need for inferential statistics, the basis should not be the individual metrics but rather the joint MLC/SLC metric. I am providing an example of this below.

MLC is a very simple metric that allows estimation of likely larval loss due to entrainment at each station. Here, lower values unambiguously indicate lower overall larval mortality than higher numbers. It is a metric very sensitive to the most common species. MLC does not provide any way to estimate risk to individual species or across species.

SLC is a metric that addresses the issue of disproportionate contribution of species that are common in samples by standardizing the measurements of each species using Z transformation. This yields a means (across stations) for each species =0 with standard deviation =1. Hence, all species count the same in the SLC assessment.

Both MLC an SLC are indicators of impact and now the question is how to use both to provide a joint calculation of potential impact. Below I take a somewhat different approach than was discussed above. This is based on the assumption that in the absence of any policy guidelines, MLC and SLC should count the same. There should be some reflection on this assumption because it leads to a complicated analytical approach and potentially different answers than analyses based on a single metric.

Assuming that both metrics should be used, I based the approach (and this differs from the joint methods discussed above) on the idea that given equal weighting of metrics, the station with the lowest impact is that one that is the closest to the minimum values (e.g. rank =1 or scalar =0) for both metrics. This might lead one to conclude that this is best represented as the arithmetic mean, but in fact it is not. Instead, it is best represented by the Euclidean mean, which here is simply the Euclidean solution: $A^2+B^2=C^2$**.** This is shown graphically below. Here, the rank for each station for MLC and SLC is plotted in x, y space. In place of the typical rectangular grid, there is a set of arcs that are of distances 1-7 from the origin (0, 0). Dots are stations and, assuming that impact is equally related to MLC and SLC, decreasing impact is toward the origin and increasing impact is further from it. As an example, consider two stations A and B. For MLC and SLC, station A ranks are 3 and 3 (lower ranks are better). B ranks are 1 and 5. The arithmetic means are 3 for both stations. The Euclidean solution for station A = sqrt (MLC^2 + SLC^2) = sqrt (9+9) = 4.24 and that for B = sqrt (1 + 25) = 5.09. Using arithmetic means, both stations would be considered to have the same impact whereas using the Euclidean solution station A would be considered less impactful than B. The results for the actual stations using ranks are shown in Figure 1.

Figure 1: Use of Euclidean distances to assess joint metrics of impact. Arcs indicate distance from origin.

Figures 2a and 2b shows the Euclidean values for the joint metrics MLC and SLC for both ranks (EDR; Table 3) and scalar distances (EDS; Table 4) for all stations. Qualitatively these results indicate that for the two metrics assessed, the estimated entrainment impacts ranked from worst to best station:

- ranks: U4>O4>D4>O2>E>U2>D2
- scalar: O4>U4>D4>E~O2>D2>U2

Note these rankings are based solely on estimated entrainment effects based on MLC and SLC and do not incorporate the other qualitative or quantitative considerations included in either the Poseidon or CCC reports.

If the use of inferential statistics (e.g. hypothesis testing with confidence intervals) is important, then the statistics have to be based on the synthetic values (e.g. EDR, EDS). The complication of such calculations is not the measure of central tendency (e.g. mean or median). Instead it is modeling the variance structure of values derived from two variables each with their own variance structure. This can be done analytically making assumptions about covariance and the shape of distributions or it can be done using a resampling process. This is what was done here. As a test of the procedure I used only MLC and SLC scalars for each station. These were resampled (bootstrapped) 2500 times for each station for MLC and SLC producing 2500 means for

both for each station. For each of the iterations at each station I then calculated the EDS yielding 2500 estimates of the mean EDS for each station. From these distributions the most supported value (the most commonly found value, which is also the median) and the confidence interval of the median can be directly calculated. Here I used both the 95% and the 50% confidence intervals to give an indication of how sensitive the comparisons are to the critical p-value. These data are presented in Figure 3. For pairwise comparisons, if the confidence interval of a station overlaps with the median of another station, they are not significantly different at the P=0.05 (95% CI) or the P=0.50 (50% CI) level. Note that such analyses are based on confidence intervals that are somewhat arbitrary. I use the word arbitrary because the selection of the confidence interval was done in the absence of consideration of type 2 error (concluding that there is no difference between stations when there actually is one). Also the confidence interval is assumed to be based on 2 tailed considerations. If one was only concerned with identifying if a station was lower than another station the depicted confidence intervals (one tailed) would be 90% (instead of 95%) and 75% (instead of the depicted 50%). Using the 95% confidence interval (or 90% if one tailed) all stations are lower than O4 but not any other station. Using the 50% confidence interval (or 75% if one tailed) there are many more patterns; for example, D2, E and U2 are all lower than D4, O2, O4 and U4. The difference between the results using the two confidence intervals is due to variability within stations being high relative to between stations.

Finally, I want to state that I believe an ETM/APF approach that was designed to compare entrainment impact among proposed intake stations might have produced better separation of results (e.g. APF values) among stations and separation that was clearly based on ecological risk (ETM/APF) rather than proxies for elements of risk (MLC, SLC).

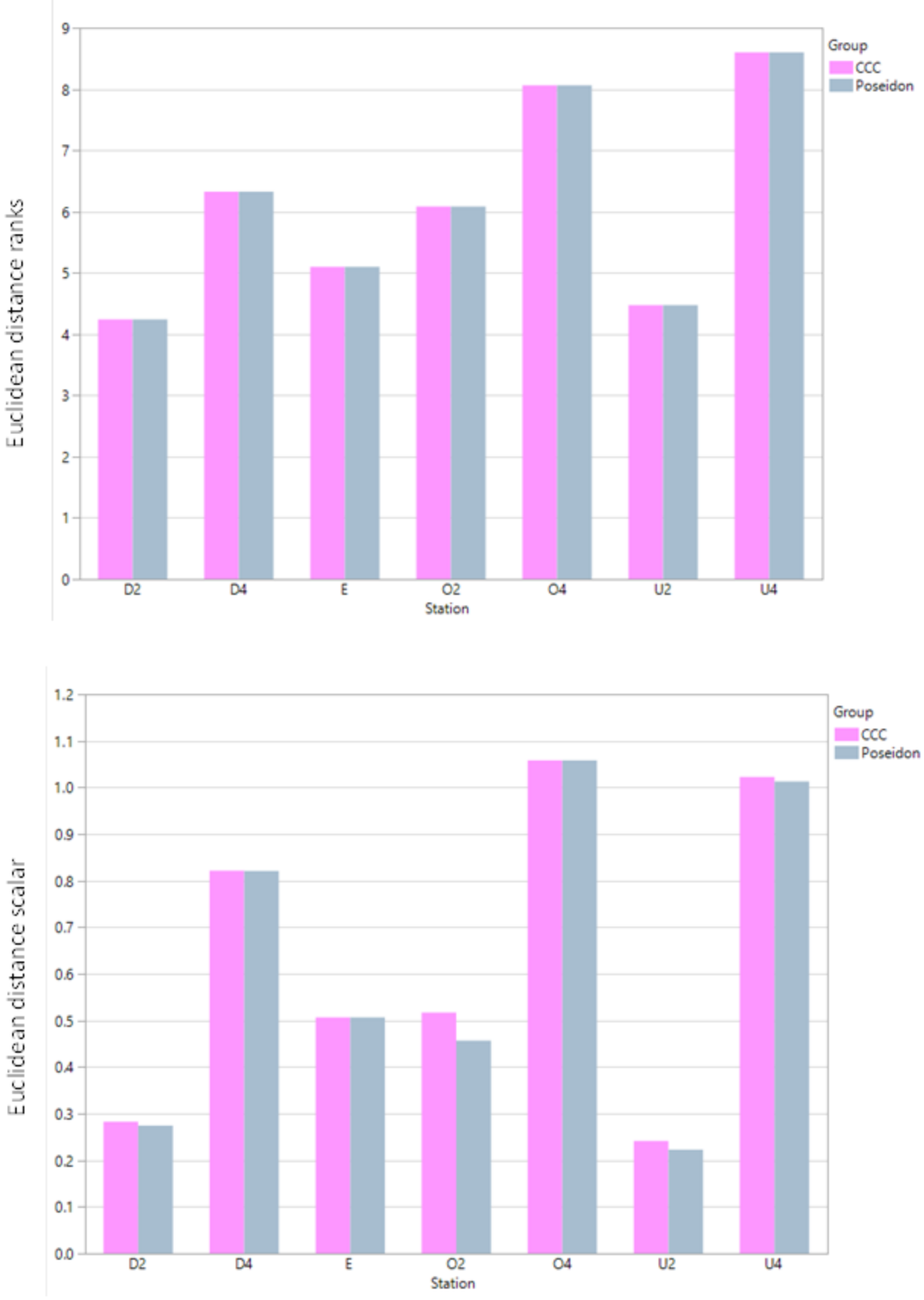

Figure 2: 2a: the relationship between Euclidean distances of ranks (EDR) and station. 2b: the relationship between Euclidean distances of scalar distances (EDS) and station.

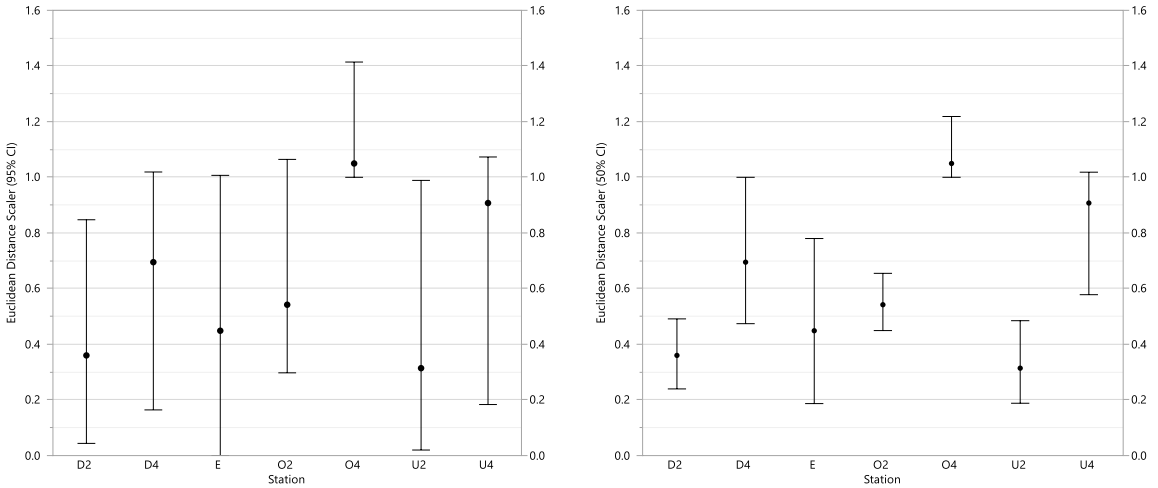

Figure 3: Results of resampling model for the Euclidean Distance Scalar (EDS). Shown are the means +- the 95 percent confidence level of the median (left) and +- 50 percent confidence level of the median (right).

Mitigation APF Estimate for Station E

Poseidon and CCC staff separately estimated APFs for intake-related entrainment at Station E based on: 1) a proposed intake volume of 106 MGD; 2) the same suite of 12 taxa; 3) the same larval concentration data collected in 2003-2004 at each of the six source water stations and Station E; 4) larval durations representing the time period over which larvae are susceptible to entrainment, calculated as the difference between the 1st and 99th length percentiles for larval lengths collected at Station E and converted to days based on the documented relationship between larval length and growth rate for each taxa; 5) ocean current measurements recorded using acoustic doppler current profilers in the study area during two 12-month deployments (1999-2000 and 2007-2008); and 6) the estimated estuarine larval source water concentrations for estuarine taxa collected in Alamitos Bay and Agua Hedionda Lagoon. The calculation methodology was included using the standard ETM for all coastal taxa and a modified ETM for those estuarine taxa entrained at an open coastal site. The ETM and APF calculations for the coastal and estuarine taxa were done separately to allow for separate mitigation scaling for each; however, any scaling will be done later and is not part of my review. Both Poseidon and CCC staff calculated two APFs, one for each ocean current measurement, and then averaged these estimates.

Habitat assignments were based on the agreed-upon source water locations (i.e., estuarine or open coast) for each taxon (CIQ Goby and Diamond Turbot were classified as estuarine while the remaining taxa were classified as open coast). Procedurally, for each of the two habitat groups, the 95% confidence interval was calculated using standard practice for an APF determination, which includes calculating: 1) the mean APF for each habitat group; 2) the standard error across taxa for each habitat group; and 3) the 95% confidence interval, using the MS-Excel NORM.INV function but substituting standard error for standard deviation in the application of this function. The final estimated APF represents the sum of the two habitat groups' 95% confidence interval APFs. Initially, intake entrainment ETM/APF was calculated by Poseidon and CCC staff separately, with those results presented in Table 9 below. The resulting APFs were calculated using an intake volume of 106 MGD as an input to the model. The final APF represents the average of the APFs derived for each ocean current measurement.

Table 9 includes the APFs calculated by Poseidon and CCC staff for intake-related mortality. Differences are likely primarily due to rounding errors. One substantive difference stems from the difference in larval duration values used in calculating ETM for mole crab, *Emerita spp.,* the most abundant species entrained. Poseidon used a value of three days, while CCC staff used a value of five days.

It is important to note that the APF estimates reported for station E in Table 9 are not the same as those shown in Tables 1 and 2. This is because we limited the taxa assessed for the calculations reported in Tables 1 and 2 to those for which there were sufficient data for the calculation of APF at all stations. Using all 12 taxa provides additional data for the calculation of the mean and 95% confidence interval.

Review of the total APF for the proposed project (i.e., intake and diffuser) is not within the scope of my report. However, to calculate a total APF, the intake APF should be added to the discharge

APF. To calculate the discharge APF, the APF for the intake should be proportionally scaled. The discharge scaling factor is calculated based on the volume of water exposed to shearing-related mortality and the intake volume. For example, if the shearing-related mortality volume were 200 MGD, and the intake volume 106 MGD, then the ratio would 200/106 = 1.887. As such, each taxon-specific APF from the intake would be multiplied by 1.887. The discharge scaling factor should be applied to each taxon ***before*** the 95% CI is calculated. After adjusting the taxon-specific APFs, the new 95% APF is calculated. This is the discharge APF. The total APF will then be a sum of the intake and discharge APFs. Please remember that other sources of mortality from construction or operation may occur from the proposed project, which are not discussed in this report.

			Poseidon APF Estimates (ac)			CCC APF Estimates (ac)		
Estuarine Taxa	**Pm**	**SWA (acres)**	**1999-00**	**2007-08**	**Mean**	**1999-00**	**2007-08**	**Mean**
CIQ	0.341%	2278.63	7.8	5.7	6.8	7.3	5.4	6.3
Diamond Turbot	0.119%	2278.63	2.7	2.0	2.4	2.6	1.9	2.3
Mean			5.2	3.9	4.6	4.9	3.7	4.3
Std Err			2.5	1.9	2.2	2.3	1.8	2.0
95% CI			9.4	6.9	8.2	8.7	6.6	7.6
Coastal Taxa								
Black Croaker	0.041%	57290.06	23.4	23.5	23.5	23.3	23.3	23.3
California halibut	0.057%	55750.59	31.9	31.9	31.9	31.7	31.7	31.7
combtooth blennies	0.111%	18583.53	20.6	20.6	20.6	20.6	20.6	20.6
Jacksmelt	0.230%	16824.14	38.7	38.7	38.7	38.8	38.8	38.8
mole crab	0.540%	5827.97	31.5	31.6	31.5	50.0	50.1	50.1
Queenfish	0.189%	85330.30	161.5	160.9	161.2	161.1	161.1	161.1
rock crab	0.303%	87419.57	265.0	265.8	265.4	265.7	265.8	265.7
Spotfin Croaker	0.097%	14075.10	13.6	13.6	13.6	13.7	13.7	13.7
Northern Anchovy	0.297%	100614.98	298.5	297.8	298.2	298.8	298.9	298.8
White Croaker	0.148%	68726.08	101.4	101.4	101.4	101.1	101.2	101.1
Mean			98.6	98.6	98.6	100.5	100.5	100.5
Std Err			33.9	33.8	33.8	33.5	33.6	33.5
95% CI			154.3	154.2	154.3	155.6	155.7	155.7
Total Est + Coastal APF			163.7	161.2	162.4	164.4	162.3	163.3

Table 9. Area of production foregone (APF) estimates for each ocean current speed and the mean APF across both ocean current speeds derived by Poseidon and the CCC. Taxa are split into two habitat groups: estuarine taxa and coastal taxa.