TOPICS FOR NEUTRAL THIRD PARTY REVIEW IN SUPPORT OF THE REISSUANCE OF THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR THE CARLSBAD DESALINATION PLANT

Chapter III.M.2.a.(1) of the Water Quality Control Plan for the Ocean Waters of California (Ocean Plan) provides that the California Regional Water Quality Control Board, San Diego Region (San Diego Water Board) may require an owner or operator of a seawater desalination facility to hire a neutral third party to review studies and models and make recommendations. In this instance, the San Diego Water Board is requiring that Poseidon Resources (Channelside), LP (Poseidon) hire a neutral third party to determine whether the information, analyses, and conclusions provided by Poseidon in their report of waste discharge (ROWD) and California Water Code section 13142.5(b) determination to reissue the NPDES permit for the Carlsbad Desalination Plant (Facility) are based upon sound scientific knowledge, methods, and practices and meet the relevant technical requirements of the Ocean Plan.

The San Diego Water Board requests that the third party reviewers review the proposed scientific conclusions and supporting information analyses below; respond to the proposed conclusions and questions herein; and make their recommendations to the San Diego Water Board. Reviewers are not limited to the documents provided and may include additional relevant scientific literature with corresponding citations. If the reviewers think that the existing information is inadequate for addressing the proposed conclusions, the San Diego Water Board requests that the reviewers identify what specific information is necessary to enable the reviewer(s) to address the conclusion(s) and provide recommendations to the San Diego Water Board.

In addition to what is listed under "Documents to Review," the San Diego Water Board staff refers reviewers to the *Final Staff Report Including the Final Substitute Environmental Documentation for the Amendment to the Ocean Plan Addressing Desalination Facility Intakes, Brine Discharges, and the Incorporation of Other Non-Substantive Changes* (Staff Report / SED) with attachments as a background reference to provide additional context for this review.

Topic 1: Removing the biological performance standard for mitigation

Chapter III.M.2.e.(2) of the Ocean Plan requires that:

> *The regional water board shall ensure an owner or operator fully mitigates for the operational lifetime of the facility and uses the best available mitigation measure feasible to minimize intake and mortality of all forms of marine life.*

On May 13, 2009, the San Diego Water Board adopted Order No. R9-2009-0038, NPDES No. CA0109223 (2009 Order) and approved the March 27, 2009 Flow, Entrainment, and Impingement Minimization Plan (2009 Minimization Plan) for the Facility. The 2009 Minimization Plan includes the Marine Life Mitigation Plan, which sets forth a plan for up to 55.4 acres of wetland mitigation within the Southern California Bight. To ensure that the mitigation fully compensates for impacts to marine life caused by the Facility operating while co-located with the Encina Power Station (EPS), the San Diego Water Board amended the 2009 Minimization Plan to establish a biological performance standard for fish productivity of 1,715.5 kilograms (kg) of fish productivity per year, with required fish productivity monitoring to demonstrate that Poseidon meets this performance standard.

Proposed conclusion 1.1: Because Poseidon proposes to provide an additional 11 acres of mitigation habitat for a total of 66.4 acres, the biological performance standard and

associated fish productivity monitoring are no longer necessary to compensate for impingement from the Facility during co-located operations with EPS.

Appendix ZZ to the ROWD requests that the San Diego Water Board remove the biological performance standard and associated fish productivity monitoring. The ROWD states that the additional 11 acres of mitigation habitat fully offsets the impingement impacts to marine life from the Facility during co-located operations with EPS.

Proposed conclusion 1.2: The methodology for fish productivity monitoring (Allen 1982) required by the 2009 Order is destructive to wetlands habitat and organisms and would otherwise adversely affect the mitigation's restoration efforts.

Appendix ZZ states that the methodology for fish productivity monitoring required by the 2009 Order would result in adverse impacts to wetland habitats and organisms and would affect fish populations and the salt marsh habitat of the restored site. These effects would contradict the goals of the Marine Life Mitigation Plan.

Reviewers are asked to address the proposed conclusions presented above and are asked to contemplate the following questions:

1. If the mitigation acreage is increased by 11 acres, are the biological performance standard and associated fish productivity monitoring necessary to verify that the mitigation adequately compensates for impingement from the Facility during co-located operations?
2. Would the methodology for fish productivity monitoring in Allen 1982 undermine the mitigation's restoration efforts? If yes, is there an alternative, less destructive methodology to monitor fish productivity that would still verify that the biological performance standard has been met?

Documents for review for Topic 1:

- Appendix ZZ: Marine Life Mortality Report and Mitigation Calculation (Revision 1 April 5, 2017)
- San Diego Water Board Order No. R9-2009-0038 (2009 Order)
- Appendix P: 2009 Flow, Entrainment and Impingement Minimization Plan – Attachment 7 Nordby Biological Consulting – Mitigation Computation Based on Impingement Assessment (2009 Minimization Plan)

Topic 2: Mitigating for mortality to all forms of marine life

Regarding mitigation, Chapter III.M.2.e of the Ocean Plan requires the following:

> *The regional water board shall ensure an owner or operator fully mitigates for the operational lifetime of the facility and uses the best available mitigation measure feasible to minimize intake and mortality of all forms of marine life.*
>
> *Marine Life Mortality Report. The owner or operator of a facility shall submit a report to the regional water board estimating the marine life mortality resulting from construction and operation of the facility after implementation of the facility's required site, design, and technology measures.*
>
> *For operational mortality related to intakes, the report shall include a detailed entrainment study. The entrainment study period shall be at least 12 consecutive months and sampling shall be designed to account for variation in oceanographic or hydrologic*

conditions and larval abundance and diversity such that abundance estimates are reasonably accurate. At their discretion, the regional water boards may permit the use of existing entrainment data from the facility to meet this requirement. Samples must be collected using a mesh size no larger than 335 microns and individuals collected shall be identified to the lowest taxonomical level practicable. The Empirical Transport Model (ETM)/ Area of Production Forgone (APF) analysis shall be representative of the entrained species collected using the 335 micron net. The APF shall be calculated using a one-sided, upper 95 percent confidence bound for the 95th percentile of the APF distribution.

For operational mortality related to discharges, the report shall estimate the area in which salinity exceeds 2.0 parts per thousand above natural background salinity or a facility-specific alternative receiving water limitation (see chapter III.M.3). The area in excess of the receiving water limitation for salinity shall be determined by modeling and confirmed with monitoring. The report shall use any acceptable approach approved by the regional water board for evaluating mortality that occurs due to shearing stress resulting from the facility's discharge, including any incremental increase in mortality resulting from a commingled discharge.

Additionally, Chapter III.M.2.e.(3)(b) of the Ocean Plan provides the following requirements for mitigation:

Mitigation shall be accomplished through expansion, restoration or creation of one or more of the following: kelp beds, estuaries, coastal wetlands, natural reefs, MPAs [Marine Life Protection Areas], *or other projects approved by the regional water board that will mitigate for intake and mortality of all forms of marine life associated with the facility.*

The owner or operator shall demonstrate that the project fully mitigates for intake-related marine life mortality by including expansion, restoration, or creation of habitat based on the APF acreage calculated in the Marine Life Mortality Report above. The owner or operator using surface water intakes shall do modeling to evaluate the areal extent of the mitigation project's production area to confirm that it overlaps the facility's source water body. Impacts on the mitigation project due to entrainment by the facility must be offset by adding compensatory acreage to the mitigation project.

The owner or operator shall demonstrate that the project also fully mitigates for the discharge-related marine life mortality projected in the Marine Life Mortality Report above.

The regional water board may permit out-of-kind mitigation for mitigation of open water or soft-bottom species. In-kind mitigation shall be done for all other species whenever feasible.

For out-of-kind mitigation, an owner or operator shall evaluate the biological productivity of the impacted open water or soft-bottom habitat calculated in the Marine Life Mortality Report and the proposed mitigation habitat. If the mitigation habitat is a more biologically productive habitat (e.g. wetlands, estuaries, rocky reefs, kelp beds, eelgrass beds, surfgrass beds), the regional water boards may apply a mitigation ratio based on the relative biological productivity of the impacted open water or soft-bottom habitat and the mitigation habitat. The mitigation ratio shall not be less than one acre of mitigation habitat for every ten acres of impacted open water or soft-bottom habitat.

For in-kind mitigation, the mitigation ratio shall not be less than one acre of mitigation habitat for every one acre of impacted habitat.

> *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.*

San Diego Water Board staff is evaluating the proposed mitigation acreage and proposed mitigation for the Facility to determine the best available mitigation measures feasible to minimize intake and mortality of all forms of marine life. The following proposed conclusions and questions pertain to the proposed mitigation for the Facility.

Proposed conclusion 2.1: For intake-related impacts, the Empirical Transport Model (ETM)/ Area of Production Forgone (APF) analysis was done adequately to account for impacts to all forms of marine life that may be affected by the intake under stand-alone operations. Also, the APF was calculated in accordance with Ocean Plan requirements, including the one-sided, upper 95 percent confidence bound and one percent mitigation credit.

Appendix K includes ETM/APF estimates for impacts due to the intake of process water and dilution water under stand-alone operations.

Proposed conclusion 2.2: The proposed mitigation of 67.83 acres mitigates for mortality to all forms of marine life resulting from the operation and construction of the Facility under stand-alone operations.

Appendix ZZ estimates the loss of all forms of marine life from operation and construction of the Facility's intake and discharge under stand-alone operations.

Reviewers are asked to address the proposed conclusions presented above and are asked to contemplate the following questions:

1. Were the ETM/APF analyses provided by Poseidon done adequately to account for impacts to all forms of marine life that may be affected by the intake of seawater during stand-alone operations, including but not limited to potential impacts from a fish return system and entrapment in the intake channel? 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?
2. Does Poseidon's proposed mitigation of 67.83 acres compensate for the intake and mortality to all forms of marine life resulting from the stand-alone operation of the Facility, including but not limited to potential impacts from a fish return system and entrapment in the intake channel?
3. Do the ETM/APF analyses in Appendix K include species that are representative of a full range of life histories, habitats, and future productivity that may be subject to intake and mortality by construction and operation of the Facility? If not, please identify which additional species should be included in the ETM/APF analyses and explain the basis for including those species.
4. Did Poseidon and their consultants appropriately use and apply the information and data from Tenera Environmental's 2008 report, *Encina Power Station Clean Water Act Section 316(b) Impingement Mortality and Entrainment Characterization Study,* for calculating the mitigation acreage required for stand-alone operation and to adequately account for all impacts to all forms of marine life from the Facility during stand-alone

operation, including but not limited to impacts from entrapment and a fish return system? If not, please cite the reasons for such.

5. Were species that were included in the ETM/APF analyses in Appendix K appropriately classified by habitat? If not, please identify and explain what type of classification(s) would be appropriate to use. Where available, please provide references to peer-reviewed literature supporting any specific conclusion(s).

Documents to review for topic 2:

- ROWD Appendix K – Intake/discharge entrainment analysis
- ROWD Appendix TT – CDP Fish Return Discharge Alternatives Analysis
- ROWD Appendix YY – Marine Life Mortality Comparison between Proposed Screening Location and Lagoon Shoreline Location
- ROWD Appendix ZZ – Marine Life Mortality Report and Mitigation Calculation.
- Order No. R9-2009-0038
- Tenera Environmental, 2008, Encina Power Station Clean Water Act Section 316(b) Impingement Mortality and Entrainment Characterization Study
- E-06-013 Condition Compliance for Special Condition 8 Poseidon Resources Corporation, Marine Life Mitigation Plan (see pages 10 and 11 for the Science Advisory Panel's previous findings regarding the 2008 Impingement and Entrainment study and the ETM/APF analyses for the CDP)

Topic 3: Comparing intake and mortality of all forms of marine life associated with different intake screen locations

Chapter III.M.2.d.(1)(c) of the Ocean Plan requires the San Diego Water Board to apply the following considerations in determining whether a proposed technology is the best available technology feasible to minimize intake and mortality of all forms of marine life:

> *If subsurface intakes are not feasible, the regional water board may approve a surface water intake, subject to the following conditions:*
>
> *i. The regional water board shall require that surface water intakes be screened. Screens must be functional while the facility is withdrawing seawater. In order to reduce entrainment, all surface water intakes must be screened with a 1.0 mm (0.04 in) or smaller slot size screen when the desalination facility is withdrawing seawater. …*
>
> *iv. … In order to minimize impingement, through-screen velocity at the surface water intake shall not exceed 0.15 meters per second (0.5 feet per second).*

Poseidon is proposing an alternative intake design that would use a surface intake with onshore center-flow traveling screens with 1 mm pore size, 0.5 feet per second through-screen velocity, and a fish return system (intake alternatives 1 or 15 discussed in Appendices B and BBB to the ROWD). These screens would be located downstream of the intake structure, approximately 100 feet from Agua Hedionda Lagoon, rather than at the onset of the intake structure in the lagoon (such as intake alternatives 9 or 21 as discussed in Appendices II and DDD to the ROWD). Under the proposed intake screen location, seawater with marine life travels through an initial trash/bar rack at the lagoon with 3.5" spacing, and then the water travels approximately

100 feet through a pipeline, at velocities greater than 0.5 feet per second, before reaching the traveling screens.

Proposed conclusion 3.1: Installing intake screens at the proposed onshore location would result in an incremental increase in operational intake and mortality of marine life of 0.497 kg of fish/day, in comparison to installing intake screens at the onset of the intake structure in the lagoon.

Appendix YY compares the operational and construction-related impacts on marine life mortality between the two locations for the screens: (1) onshore location that is downstream of the intake structure and (2) lagoon-based location at the onset of the intake structure. The proposed onshore location also would include installation of a fish return system.

Proposed conclusion 3.2: An intake tunnel velocity of 2.6 ft/sec and the use of 1-mm screens at the proposed onshore location with a fish return system precludes the possibility of entrapment of marine life in the intake channel of the Facility.

Appendices HH and YY address the potential for entrapment of marine life in the intake channels if the screens are constructed at the proposed onshore location. Both appendices conclude that the mean velocity in the intake tunnel of 2.6 ft/sec will allow some fish to escape (i.e. those capable of sustaining a swim speed higher than the mean tunnel velocity) the intake channel and that the use of 1-mm screens with a fish return system will provide a means of egress for fish that are unwilling or unable to swim out of the intake channel.

Proposed conclusion 3.3: The operational impacts of the fish return system associated with the onshore intake for the Facility can be adequately assessed using survival data from the fish return system at the San Onofre Nuclear Generating Station (SONGS).

With the proposed onshore intake screens, a low-pressure spray would rinse organisms off the screen face into a fish trough, and these troughs would empty into a discharge pipe that returns marine life back to Agua Hedionda Lagoon (Appendix AAA). The fish return system at SONGS diverts fish from a bypass basin in front of the screens. As an elevator basket ascends, it collects fish in the basin, and then the elevator basket empties into a channel, which discharges fish into a pipe that empties about 400 m offshore (Love 1989). Appendix YY describes how the survival data from the fish return system was used to assess operational impacts of the fish return system associated with the onshore screen for the Facility.

Proposed conclusion 3.4: Using kg of fish/day is an appropriate metric for quantifying marine life impacts for the intake and mortality of all forms of marine life for the different intake screen locations.

Appendix CCC quantifies incremental operational impacts of the onshore intake screen location as 0.386 kg of juvenile and adult fish/day. Poseidon assumed 100% mortality for all egg and larval life stages. This metric is appropriate to evaluate the intake and mortality of all forms of marine life that could occur at the different intake screen locations.

Reviewers are asked to address the proposed conclusions presented above and are asked to contemplate the following questions:

1. Were operational impacts to marine life that could result in the intake and mortality of all forms of marine life (e.g., entrainment, impingement, entrapment) from the onshore screen location adequately evaluated in Appendices HH and YY? If not, identify specific reasons for such conclusion and, where available, provide references to peer-reviewed literature supporting any specific conclusion(s). Is entrapment an additional source of impacts to marine life for the onshore screen location?

2. Is it scientifically sound and reasonable to use the marine life survival data from a different fish return system design at SONGS to evaluate operational impacts of the fish return system for the onshore screen intake option for the Facility? If not, please identify specific reasons for such conclusion and, where available, provide references to peer-reviewed literature supporting any specific conclusion(s), and identify whether there are other readily available data that can be used for this purpose?
3. Is it scientifically sound and reasonable to use total marine life mortality as measured in kg of fish/day for purposes of quantifying operational impacts of the onshore intake screen option that could result in additional intake and mortality of all forms of marine life? If not, please identify specific reasons for such conclusion and, where available, provide references to peer-reviewed literature supporting any specific conclusion(s). Please also describe the limitations to this approach of quantifying operational impacts and suggest more appropriate metric(s) for quantifying these impacts, if they exist.

Documents for review for topic 3:

- Appendix B – Intake/Discharge Feasibility Report
- Appendix HH – Technical memorandum assessing the potential for entrapment of fish and organisms in the proposed intake/discharge modifications (8/10/16)
- Appendix II – Addendum to Intake Discharge Feasibility Report
- Appendix YY – Marine Life Mortality Comparison between Proposed Screening Location and Lagoon Shoreline Location
- Appendix AAA – Fish return discharge antidegradation analysis (April 2017)
- Appendix CCC – Evaluation of Alternatives 1, 11-14
- Appendix DDD – Feasibility Assessment of Carlsbad Desalination Plant Intake and Discharge Alternative 21
- Love et al. 1989 – Analysis of fish diversion efficiency and survivorship in the fish return system at SONGS