twb Environmental Research and Consulting

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Re: Technical Memorandum: Response to Phil Roberts July 26, 2017 Comment Letter on the CA State Lands Commission Draft Supplemental Environmental Impact Report for the Huntington Beach Desalination Plant

Dear Scott,

I am pleased to submit this memo responding to the comment letter submitted by Dr. Phil Roberts on July 26, 2017 during the public comment period for the Draft Supplemental Environmental Impact Report for the Seawater Desalination Project at Huntington Beach: Outfall/Intake Modifications and General Lease– Industrial Use (PRC1980.1) Amendment (Lease Modification Project) prepared by the California State Land Commission.

One of two original memoranda (memos) referenced in his letter was prepared jointly by TWB Environmental Research and Consulting (Tim Hogan) and Michael Baker International (Dr. Scott Jenkins); the other was prepared by HDR (Eric Miller). The authors of these memos have relevant expertise in fish protection at industrial facilities, surface water entrainment assessment, biology and ecology of California's marine fishes, diffuser hydraulics, marine oceanography, and the application of the Ocean Plan Amendment to seawater desalination projects in CA.

The following are the principal conclusions:

- Dr. Roberts employs a fundamentally different calculation approach from that which was provided as regulatory guidance by the SWRCB in the SED (i.e., the 23% approach). We believe that the 23% approach remains a valid method for estimating shear-related mortality at the HBDP.
- The angle of the diffuser is not an explicit assumption in the SED's general guidance language on the topic of shear-related mortality at the diffuser. In addition, since the diffuser angle is immaterial to the 23% calculation approach, we believe that the 23% approach remains a valid method for estimating shear-related mortality at the HBDP. Poseidon's diffuser ports are angled at 47º to account for the higher elevation of the diffuser above the seafloor. This angle is intended to prevent a surface boil.
- The SLC's analysis in the DSEIR correctly relied on the 23% approach to be conservative. Though Dr. Roberts calculation approach for the CalAm project assumes 100% of the entrained dilution water is subject to lethal shear, other

assumptions in his model used to derive the mortality estimate are decidedly less conservative.

- Dr. Raimondi (who was retained by the SLC to review information submitted by Poseidon relative to the operational effects of the Huntington Beach Desalination Plant on marine life) also relied on the 23% approach to reach a conclusion that shear-related mortality "*would not lead to populations falling below self-sustaining levels*" even when using the most conservative assumption of 100% mortality in 100% of the dilution water entrained.

Sincerely,

Timothy W. Hogan
TWB Environmental Research and Consulting, Inc.

Introduction

Poseidon has proposed to construct the Huntington Beach Desalination Plant (HBDP) discharge by installing a multiport diffuser on the existing offshore discharge riser of the Huntington Beach Generating Station (HBGS). The Amendment to the Water Quality Control Plan For Ocean Waters of California (Ocean Plan Amendment or OPA), at Chapter III.M.2.e.1.b, requires that the discharger estimate mortality that occurs due to shearing stress resulting from the facility's discharge. The Final Staff Report Including the Final Substitute Environmental Documentation (SED) provides guidance on how to estimate the shear-related mortality at the diffuser based on the total entrained volume of dilution water required to dilute the brine to the receiving water limitation (i.e., to within 2 ppt of ambient background salinity).

The California State Lands Commission (SLC) has prepared a Draft Supplemental Environmental Impact Report (DSEIR) on the HBDP Lease Modification Project. During preparation of the DSEIR, Dr. Peter Raimondi was retained by the SLC to review information submitted by Poseidon relative to the operational effects of the HBDP on marine life. Based on Dr. Raimondi's April 24 memorandum (memo) (Raimondi 2017a), the SLC requested (in an April 26 email from Cy Oggins) that Poseidon recalculate shear-related mortality based on an alternative approach described in a report prepared by Dr. Philip Roberts for the proposed CalAm Monterey Peninsula Water Supply Project (MPWSP). The alternative calculation approach is described in Appendix D1 (Roberts 2016) of the MPWSP Draft Environmental Impact Report/Environmental Impact Statement (DEIR/EIS) prepared by Environmental Science Associates.

Poseidon submitted a memo authored by TWB Environmental Research and Consulting and Michael Baker International (TWB and MBI 2017) on May 9, 2017 in response to the request from the SLC and a subsequent memo authored by HDR was submitted on June 7, 2017 (HDR 2017). After these memos were submitted, Dr. Raimondi prepared another memo under contract to the SLC (Raimondi 2017b), that recommended using the 23% approach for estimating shear-related mortality at the HBDP diffuser. During the public review comment period for the DSEIR, Dr. Roberts (2017) submitted a comment letter to rebut the two memos submitted by Poseidon. The objective of this memo is to provide responses to the comments provided in Roberts (2017).

Comment Themes

Calculation Approach

Poseidon and Dr. Roberts take fundamentally different approaches to estimating shear-related mortality at the diffuser. Prior to addressing the more technical comments in Dr.

Roberts' comment letter (Roberts 2017), describing the differences between the two approaches is warranted.

For the past two years, Poseidon's OPA compliance approach for the HBDP has relied on the language provided in the both the OPA and/or the SED. In cases where the OPA does not explicitly address certain issues (e.g., the accepted approach for estimating shear-related mortality at the discharge), we have taken guidance from the SED (final staff report) since these are interrelated and dependent upon each other, as described in the following excerpt from the SED: "*The purpose of this document is to present the Desalination Amendment as well as the basis for and rationale applied in the development and analysis of the amendment*…" The SED also served as a document required by the California Environmental Quality Act evaluating the potential environmental effects of the proposed OPA, including the potential for environmental effects that might result from the OPA's proposed requirement for use of diffuser technology. Poseidon's compliance and calculation approach for estimating shear-related mortality at the diffuser was first documented about a year and a half ago in March 2016 in *Appendix T – Huntington Beach Desalination Facility: Diffuser Discharge Analysis, March 1, 2016* (MBC 2016). Subsequent submittals also reiterated the calculation approach being used. More recently, the rationale for adopting the 23% approach outlined in the SED was provided in additional memos submitted to the Santa Ana Regional Water Quality Control Board (RWQCB):

- May 9, 2017 Memo from TWB Environmental Research and Consulting - Response to SLC Request for Additional Turbulence Mortality Calculation (TWB and MBI 2017)
- June 7, 2017 Memo from HDR - Ocean Plan Desalination Amendment Shearing Mortality Guidelines Represents the Best Available Science (HDR 2017)

Rather than relying on the calculation approach described in the SED (which Dr. Roberts was involved in developing as part of the SED process), Dr. Roberts employed a tailored, site- and design-specific approach for the shear-related analysis conducted for CalAm's MPWSP. Dr. Roberts' methodology, developed for a different project in a different receiving waterbody, is not portable (i.e., it is site-specific) to the HBDP in light of the significant differences in the sites and designs of the two projects.

The calculation approach used by Poseidon has been well-documented in their submittals and is based on the guidance provided in the SED. As stated in section 8.5.1.2 of the SED, the 23% approach represents the upper bound of mortality expected: "*To date, there is no empirical data showing the level of mortality caused by multiport diffusers. Foster et al. (2013) hypothesized that the actual level of mortality associated with multiport diffusers was very low, in part because the exposure time to organisms was very low. However, until additional data is available, we assume that larvae in 23 percent of the total entrained volume of diffuser dilution water are killed by exposure to lethal turbulence.*"

In addition, as addressed in a previous submittals to the RWQCB, the language on page 115-116 of the SED leaves it to the discretion of the owner or operator to propose the calculation approach: "***An owner or operator could use*** *[emphasis added] existing shearing data (see discussion in section 8.5.1.2 above) that has been approved by the regional water board or alternately, could* ***elect*** *[emphasis added] to do their own diffuser entrainment modeling under the guidance and approval of the regional water board. Empirical studies of diffuser-related mortality are technically feasible and encouraged, but may be cost prohibitive."* Poseidon has chosen to use the SED approach (i.e., 23% approach) described in section 8.5.1.2 of the SED.

Although using a different calculation approach is allowed by the OPA, the approach used by Dr. Roberts for CalAm's MPWSP is inherently site- and project-specific (refer to TWB and MBI 2017 for more information on the site-specificity of the method use by Dr. Roberts). As such, its application to the HBDP is not appropriate.

Dr. Roberts also rejected the notion that the SED's shear-related mortality calculation approach was well vetted in the peer review process, noting that only one reviewer commented on this component, and he agreed that "*the 23% level is probably a conservative upper bound*". Adding the parenthetical "*for 60º jets*" in Dr. Roberts' comment letter is misleading as this was not part of the original reviewer comment from the SED process. The intent of the original comment from TWB and MBI (2017) was to illustrate that the guidance provided in the SED by the SWRCB staff has been through a transparent review process where multiple experts and the public have had the opportunity to vet the approach. This stands in stark contrast to Dr. Roberts' proposed methodology, which he conceded was only reviewed by one expert.

Diffuser Angle

In his July 26, DSEIR comment letter, Dr. Roberts notes more than once that the assumption of 23% of the entrained dilution water being subject to lethal shear is based on a diffuser designed with 60º port angles. This point is overstated since nowhere in the SED or the OPA is there a requirement that the 23% estimate only be used for a specified port angle. If the 23% approach was intended to be a design-specific calculation approach, such a caveat would have been stated. Instead, the language in the SED is worded much more generally and does not differentiate among different diffuser designs. Furthermore, an explicit calculation example is given on how to derive the total entrained dilution water volume and the 23% that would be subject to lethal shear. As a matter of record, Poseidon's overall OPA compliance approach, including the shear-related mortality calculation approach, has been clearly documented for nearly the last year and half; though Dr. Roberts' seemingly critical point about the diffuser angle was never raised by Regional or State Board staff.

Dr. Roberts questions why the HBDP diffuser angle is 47º. Since the HBDP diffuser is being retrofitted to the existing discharge infrastructure of the HBGS, the diffuser ports will sit approximately 13.2 ft above seafloor. The 47º angle was selected to avoid the potential for creating a surface boil. Creating a boil on the surface would reduce the plume's access to dilution water on its upper boundary and could create an undesirable recreational and commercial navigation obstacle. Alden Research Laboratory (Alden 2017) described the design logic behind the 47º angle: "*To help prevent the brine from sinking immediately after discharge, the check valves are inclined upward at 47 degrees. This provides a longer arched flow path and more dilution prior to the brine interacting with the bottom where dilution is limited to the upper side of the plume. The longer flow path also results in greater dissipation of velocity. Discharging at a much steeper angle (e.g., 60 degrees) would force the brine to interact with the water surface due to the relatively shallow submergence, where dilution is again limited to one surface of the plume. Discharging at steeper angles will also result in higher surface velocities and a visible "boil".*" The dilution analyses conducted by MBI evaluated diffuser angles (among other variables) and determined that the 47º inclination was best to reduce the potential surface boil while also optimizing the performance of the diffuser.

Implications for CEQA Analysis

Dr. Roberts states, in his comment letter: "*The mechanistic relationships between turbulence and organism damage are speculative at this point so conservative assumptions are warranted. It is important, however, not to be overly conservative.*" Here, the SLC and Dr. Raimondi (2017b) have correctly used very conservative assumptions in assessing shear-related mortality from diffuser entrainment. Beyond representing a conservative approach yielding what would be considered the upper bound impact estimate, the SLC must rely on the only guidance provided by the SWRCB in the SED as it represents the only regulatory language available on this topic.

Dr. Raimondi prepared a memo (Raimondi 2017b) for the SLC that reviewed the operational effects of the HBDP. This memo also used the 23% calculation approach. As a CEQA-responsible agency, the SLC relied on Dr. Raimondi's analysis to ensure that the potential marine life impacts estimated were conservative and that the estimate was based on guidance provided by the SWRCB in the SED. Dr. Raimondi's analysis evaluated 100% mortality for a range of total entrained dilution water from 23 to 100%. Dr. Raimondi (2017b) concluded "…*in my opinion, while entrainment would be an adverse ecological impact, this impact would not lead to populations falling below self-sustaining levels.*" Dr. Raimondi's conclusion, therefore, confirms that the threshold for CEQA significance ("…*has the potential to substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels…*") is not exceeded under even the most

conservative calculation assumptions (100% mortality in 100% of the dilution water entrained).

Is The Roberts Approach Conservative?

Regarding the fraction of entrained water subject to potentially damaging shear stress, Dr. Roberts states that he "*used the most conservative assumption of 100%*". Although Dr. Roberts (2016) used 100% of the entrained water in his calculation, his estimate should not be considered conservative for the following reasons:

- Mortality for organisms 1 mm and greater is assumed to be zero: "*We assume no incremental mortality for organisms larger than 1 mm*." By contrast, the 23% approach assumes 100% mortality for all organisms (including organisms 1mm and greater) captured by a 335-micron mesh plankton net, meaning more organisms are estimated to be lost due to shear.
- Mortality for organisms less than 1 mm is assumed to be 50%: "…*we assume the conservative upper limit of 50%*." By contrast, the 23% approach assumes that mortality for all organisms captured by a 335-micron mesh plankton net is 100%, meaning more organisms are estimated to be lost due to shear.

As described in the section above, for a CEQA analysis of potential impacts, capturing the upper bound is important. The 23% approach described in the SED is the more conservative of the two calculation approaches and captures this upper bound. For the purposes of CEQA, SLC should be confident that impacts are not likely to be higher than what has already been estimated using the 23% approach as described in the DSEIR.

Conclusions

We agree with Dr. Roberts that the science surrounding the topic of shear-related mortality at the diffuser is an emerging one. While we accept that other calculation approaches may be appropriate for other projects in other locations, we note that use of the 23% calculation approach is warranted at the HBDP to capture the upper bound of the potential impacts. Moreover, since the 23% approach is offered as guidance in the SED and was subsequently used by Dr. Raimondi (2017b) to assess shear-related mortality at the HBDP, we are confident that SLC's use of the 23% approach is appropriate and fulfills its CEQA-related responsibilities relative to the DSEIR.

References

Alden Research Laboratory (Alden). 2017. Huntington Beach Desalination Facility Discharge Diffuser Design. Prepared for Poseidon, February 23, 2017.

MBC Applied Environmental Sciences (MBC). 2016. Huntington Beach Desalination Facility: Diffuser Discharge Analysis. Prepared for Poseidon Water, Huntington Beach, CA.

HDR. 2017. Ocean Plan Desalination Amendment Shearing Mortality Guidelines Represents the Best Available Science. Prepared for Poseidon, June 7, 2017.

Raimondi, P. 2017a. Procedure for Calculating Discharge Entrainment Volume Having Turbulent Intensity Sufficient to Cause Planktonic Mortality. Prepared for CA State Lands Commission.

Raimondi, P. 2017b. Project Memorandum Huntington Beach Desalination Plant – Proposed Modifications. Prepared for California State Lands Commission, May 24, 2017.

Roberts, P.J.W. 2017. Response to Memoranda from TWB Environmental and HDR concerning Huntington Beach desalination plant. Submitted to Alexandra Borack, July 26, 2017.

Roberts, P.J.W. 2016. Modeling Brine Disposal into Monterey Bay. Prepared for ESA Environmental Science Associates, San Francisco, CA. July 6, 2016. 62 pp.

TWB Environmental Research and Consulting and Michael Baker International (TWB and MBI). 2017. Technical Memorandum: Response to SLC Request for Additional Turbulence Mortality Calculation. Prepared for Poseidon, May 9, 2017.