

Questions concerning impingement, and Fish Return System (FRS) at Carlsbad Desalination Plant. These all relate to the following questions to the independent review panel shown below.

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).*

Questions for Tim Hogan

The following questions relate to questions 1 and 2 (above).

- A. The estimated loss of larger organisms associated with the operation of the FRS is <1 lb per day (depending on alternative) relative to the previously estimated loss due to impingement of ~10 lbs per day. In Appendix ZZ the reduction (10.36 to < 1 lb per day) appears to be due to the following
 - a. Page 20, #1 and 2, the adult organisms at risk are shown as 15.5 lbs per day based on EPS flows (657 MGD). Following this is step 3 also on page 20 where the impingement is reduced to 7.06 lbs per day as a result of decreased flow under CDP operations (299MGD). This latter step is reasonable. However the approach yielding the starting value (15.5 lbs per day) , while argued for in Appendix P is not

consistent with the compensatory mitigation acreage (11 acres based on 10.36 lbs per day = 4.7 kg per day) that is part of the CCC requirement and is also part of the assessment of impingement related compensatory mitigation requested for co-located operations. In addition subsequent calculations in appendix ZZ rely on 10.36 lbs per day. Can we assume that Poseidon accepts 10.36 lbs per day as the *average* base estimate (299 MGD) for losses due to impingement based on co-located operations?

- b. Assuming 10.36 lbs per day is the average base estimate for impingement loss based on co-located operations, the next set of questions are related to factors that diminish the losses.
 - i. It appears that the underlying assumption of step 4 is that the individual fish having prolonged swimming speed (based on size) sufficient to swim against the mean velocity in the intake tunnels all do so and escape. Is there any evidence that this actually occurs? The key question here is less about capability and more about behavior. This is important given that this assumption (those that can escape do escape) has a marked impact on reduction of individuals potentially using the FRS. Also an important word is missing from the last sentence in step 4 that affects the interpretation of the sentence (I think a word or phrase is missing after the word “potentially”
“The quantity of juvenile and adult organisms that are potentially after accounting for the organisms that can conservatively overcome the tunnel velocity associated with Alternatives 1 is 6.19 lbs/day, and for Alternative 15 is 5.61 lbs/day.”
 - ii. There are two parts to understanding the utility of a FRS. First is the fraction of organisms that could be impinged that get into the FRS (best as a function of mass) and second is the percent of the mass that does get into the FRS that survives. Note the use of mass instead of individual survivorship because of the currency of importance: conversion of mass to acres. As the authors note there is scant information about the efficacy of FRS in general and no information about the proposed one. The value used for post FRS survival (85%) is based on a very different system. We will come back to this point later but there is considerable uncertainty in all these estimates which is a compelling reason to produce estimates based on confidence intervals – this also is requested in question 1 above.

Based on potential to escape (swimming speed) and FRS survivorship the net impingement mortality can be estimated (see appendix P) as ~ estimated impingement in the absence of FRS – (mass that survives FRS + mass that can escape). Here Poseidon uses a value different from 10.36 lbs per day as the estimated impingement in the absence of FRS. That value appears to be 7.06 lbs per day. This difference appears to be based on an

approach that weights sample values by assumed probability of occurrence. Here the net effect is to down-weight large values. There are many ways to incorporate uncertainty and this should be a discussion point in the phone call.

- iii. Finally – and related to discussion above, in order to be consistent with the Water Board request there needs to be an approach that utilizes a 95% confidence level approach. This was done for entrainment effects but not yet for effects related to impingement/FRS. This should also be a discussion item also.