

Technical Memorandum

October 29, 2017

To: Rebecca Fitzgerald, State Water Resources Control Board
From: Peter Raimondi, UC Santa Cruz
Subject: Encina Power Station Draft Determination

This memorandum is in response to a request from the State Water Resources Control Board to (1) Calculate the Habitat Production Forgone (HPF) for Encina Power Station (EPS), including converting coastal to estuarine mitigation and, (2) Convert HPF to entrainment cost per acre, including updating mitigation project costing using current mitigation project estimates.

1) Calculate the HPF for Encina Power Station (converting coastal to estuarine mitigation)

The basis for the estimation of HPF for EPS is the assessment done for the Carlsbad Poseidon Desalination Project (CPDP), which uses the same intake as EPS (CCC, Condition Compliance for CDP No. E-06-013, Special Condition 8, January 27, 2011). The assessment for CPDP, with respect to HPF, was carried out using the ETM/HPF model (ETM = Empirical Transport Model) and was based on an intake volume of 304 MGD. This approach has been used as the model to determine impacts related to intake entrainment resulting from once through use of water for nearly 20 years. Generally there is a single Habitat (in HPF) that is primarily affected by entrainment of larvae and other propagules, hence the conversion of Proportional Mortality (Pm) that comes from the ETM to acres in HPF is straight-forward. This was not the case for CPDP and is also not the case for EPS. Here impacts occurred to both wetland (estuarine) and open coast soft bottom habitat species and there were separate estimates for HPF for each. Because wetland habitat in southern California has been so impacted, and because mitigation opportunities for soft bottom habitat would not be clearly compensatory, parties agreed to convert HPF estimates for soft bottom habitat to acres of wetland that could be combined with the HPF estimates for wetland species. This was done using a 10-1 ratio (ten acres of soft bottom habitat = 1 acre wetland habitat), based on productivity differences between the two habitats. The Marine Life Mitigation Plan, as originally approved by the Commission, required 55.4 acres of mitigation. This was based on 49 estuarine (wetland) acres and 6.4 added wetland acres to account for impacts to open coast soft bottom species (HPF = 64 acres x 0.1 conversion ratio = 6.4 acres). In September 2009, based on re-evaluation of the project's likely impingement impacts due to the intake, Poseidon voluntarily agreed to provide 11 additional acres. Hence the combined HPF was 66.4 acres (CCC, Condition Compliance for CDP No. E-06-013, Special Condition 8, January 27, 2011).

I have been asked to calculate the HPF for EPS assuming 863.5 MGD, the permitted facility design flow. This can be done using the information provided above as follows:

$$HPF_{863.5} = (863.5 \text{ MGD} \times 66.4 \text{ acres}) / 304 \text{ MGD} = 188.61 \text{ acres}$$

The calculated acreage, 188.61, if substantially restored or created would be considered to be compensatory for impacts to both wetland and shallow soft-bottom open coast species.

1. Based on Information from Hany Elwany, Founder and President, Coastal Environments, part of team responsible for wetland creation and restoration in San Dieguito lagoon (<http://www.coastalenvironments.com/>)

2) Convert HPF to entrainment cost per acre, including updating mitigation project costing using current mitigation project estimates

The conversion of HPF to cost per acre must include an estimate of the current cost per acre for wetland (estuarine) restoration for a similar project in a similar location that was either completed recently or where values come from prevailing costs.

The most similar project that was completed in the general area in the last ten years is the restoration at San Dieguito Lagoon, done by Southern California Edison. This was a wetland creation and restoration project that led to 165 acres of tidal marsh, subtidal habitat and mudflats. This project was completed in 2011 at a cost of 23 million dollars¹. Using an annual cost escalator of 3% per year (as used in the MGD fee calculator), the estimated cost (not including any funding for maintenance and monitoring) can be calculated as:

Cost = $(\$23,000,000 \times 1.03^6 \times 188.61 \text{ acres}) / 165 \text{ acres} = \$31,391,563$ or \$172,852 per acre, where 1.03⁶ is the cost escalator.

Expert estimate currently is that simple wetland restoration costs \$300,000 per acre¹. This yields a cost estimate of

188.61 acres x \$300,000/acre = \$56,583,000

The difference between the two estimates likely reflects two things: (1) cost of restoration increasing more rapidly than 3% per year. (2) The relative simplicity of the restoration at San Dieguito relative to most restoration sites.

Calculation of the cost for wetland restoration for impacts related to entrainment at EPS for an intake volume of 863.5 MGD also provides an approach to calculate a fee per MGD of intake water. This is:

Cost of mitigation / (863.5 MGD x (365 days/year) x 30 years compliance period)

Doing this yields two estimates: (1) \$3.32 per MG based on San Dieguito Wetland restoration, (2) \$5.98 per MG based expert opinion of prevailing costs.

Because no site has been identified for a mitigation project, it is reasonable to assume that the two estimates bracket the likely cost (2017 dollars) for simple wetland restoration, not accounting for monitoring and maintenance costs. Simple here means that there are no major costs not directly associated with habitat restoration. Such costs could include moved or new bridges or roads, remediation of toxic soils or movement or modernization of public utilities. Hence, in the absence of any site specific information and consistent with the approach approved for estimating fees for once through use of water (Expert Review Panel (ERP II)), I think that that the average of the two estimates, \$4.65 per MG, is the most supportable estimate of the cost per MG, while noting that site specific constraints could increase the cost substantially.

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