California Regional Water Quality Control Board
Santa Ana Region

May 15, 2020

Item: 3

SUBJECT: Second Workshop for the Permit Renewal for Poseidon Resources' Proposed Huntington Beach Desalination Facility

BACKGROUND

On November 22, 2019, Santa Ana Water Board staff issued the Tentative National Pollutant Discharge Elimination System (NPDES) Number CA8000403, Waste Discharge Requirements and draft California Water Code section 13142.5(b) determination for the Poseidon Resources' (Surfside) L.L.C. (Poseidon Water or Discharger) proposed Huntington Beach Desalination Facility (Facility) (Tentative Order). The Facility will be located at 21730 Newland Street, Huntington Beach on twelve acres at the AES Huntington Beach Generating Station (AES HBGS). The Discharger proposes to modify and operate the AES HBGS intake and discharge systems for its desalination operations. The Facility will produce an average annual volume of 50 million gallons per day (MGD) of potable water through a reverse osmosis (RO) process. The treatment process requires an intake of seawater averaging 106.7 MGD; discharge of concentrated brine will average 56.59 MGD.

On December 6, 2019, the Santa Ana Water Board held a public workshop to discuss details of the proposed Facility, to discuss the details of the draft tentative NPDES permit and draft Water Code 13142.5(b) determination, and to receive comments from interested parties. Topics summarized in the December 6, 2019 staff report and at the workshop included:

- Identified need for the desalinated water;
- Facility onshore location;
- Intake considerations (including subsurface and surface intake systems);
- Concentrated brine discharge considerations;
- Calculation of the marine life mortality impacts; and
- Determination of the best feasible mitigation project available.

At the December workshop, the Santa Ana Water Board had several inquiries and information requests for staff to address at a subsequent meeting. The inquires related to the identified need for the desalinated water, the marine life mitigation requirements, a more detailed cost comparison for intake system alternative sites, and performance of the Carlsbad seawater desalination facility.

Due to the complexity of this project, Santa Ana Water Board staff recommended that a second workshop be conducted on May 15, 2020 specifically to focus on the identified need for the desalinated water and the marine life mitigation requirements. The cost comparison of the intake system alternative sites, and performance of the Carlsbad seawater desalination facility are discussed later in this staff report.

PROJECT DESCRIPTION

As a reminder, the Discharger proposes to construct and operate the proposed Facility on a 12-acre parcel adjacent to the AES HBGS site. Once constructed, the Facility will discharge wastewater to the Pacific Ocean, a water of the United States.

The proposed Facility is designed to produce potable water for delivery into the water distribution and/or groundwater recharge systems within Orange County. The Discharger will receive its source water directly from the AES HBGS's intake system. Pursuant to the Water Quality Control Plan for Ocean Waters of California (Ocean Plan) requirements, the intake system will be equipped with a screening system consisting of four 1.0-mm slot wedgewire screens with a through-screen velocity of 0.5 feet per second or less. The wedgewire screen must have screens composed of stainless steel and include a rotating brush-cleaning system. The Discharger may use a boat-based or onshore air burst system or deploy divers to remove debris that accumulates on the screens.

The desalination process will consist of source water screening, coagulation, filtration, pH control, chlorination, de-chlorination, RO membrane separation, and product water chlorination and chemical conditioning. The RO system will use high-rejection seawater membranes. The proposed Facility will produce a 12-month average of 50 MGD of potable water and discharge an annual average of 56.59 MGD of concentrated wastewater and process water (e.g., backwash water, RO cleaning solutions) that will be discharged to the ocean through the existing AES HBGS outfall structure. At the discharge tower, the Discharger will install a multiport diffuser consisting of 14 ports equipped with Tideflex diamond shaped-nozzles (or similar) with an open area of 1.28 square feet.

WATER CODE SECTION 13142.5(B) DETERMINATION

Water Code section 13142.5(b) states “for each new or expanded coastal powerplant 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 intake and mortality of all forms of marine life.”

To provide direction to regional water quality control boards for evaluating seawater desalination facilities pursuant to California Water Code section 13142.5(b) and to ensure a consistent statewide approach for minimizing the intake and mortality of all forms of marine life, in May 2015, the State Water Resources Control Board (State Water Board) adopted an amendment that added chapter III.M. to the Ocean Plan to

address environmental impacts associated with the construction and operation of seawater desalination facilities. The amendment was subsequently approved by the Office of Administrative Law and the United States Environmental Protection Agency. These provisions provide a consistent statewide approach based on best available science for minimizing intake and mortality of all forms of marine life, in addition to protecting water quality and related beneficial uses of ocean waters.

The focus of the Ocean Plan desalination provisions is to minimize the intake and mortality of all forms of marine life resulting from the construction and operation of desalination facilities. To achieve this, the Ocean Plan specifies requirements which aim to reduce the entrainment and impingement of marine life. Entrainment occurs when organisms are drawn in through the intake and perish when exposed to high pressure and heat inside the desalination system. Typically, entrainment affects smaller organisms, such as plankton, algae, larvae, and fish eggs; studies have shown that organisms typically do not survive entrainment. Impingement occurs when organisms get trapped against intake screens and cannot escape the suction power of the surface intake. To address entrainment and impingement effects, the Ocean Plan requires the use of subsurface intake facilities. Subsurface intakes withdraw water from under the seafloor and thus have no entrainment or impingement of marine life. If the regional water board determines subsurface intakes are not feasible, the Ocean Plan requires the use of screened intake (slot size $\leq$ 1 millimeter) and the reduction of the intake flow velocity ($\leq$ 0.5 ft/s).

In addition to marine life mortality associated with a screened, open ocean intake, there is also mortality associated with the discharge of concentrated brine. Mortality to planktonic organisms near the discharge port can be caused by shear stress as the organisms become entrained in the turbulent jet. Further, the brine is twice the salinity of ocean waters[1]. Concentrated brine behaves differently than traditional wastewater effluent plumes because of its greater density. The increased density can cause the brine plume to sink and spread on the seafloor instead of mixing with the surrounding water thus impacting bottom-dwelling (benthic) organisms from the concentrated brine and any pollutants in the brine discharge. To minimize the mortality associated with the brine discharge, the Ocean Plan's preferred method of brine discharge is to commingle the brine with wastewater. If wastewater is not available, the next best preferred method is to utilize multiport diffusers to achieve rapid mixing of the brine discharge.

[1] State Water Resources Control Board, "Final Staff Report Including the Final Substitute Environmental Documentation, Amendment to the Water Quality Control Plan for Ocean Waters of California Addressing Desalination Facility Intakes, Brine Discharges, and the Incorporation of Other Non-Substantive Changes," May 6, 2015

The Ocean Plan also requires that marine life impacts resulting from the construction and operation of a desalination facility be mitigated via an acceptable and approved Marine Life Mitigation Plan (MLMP).

IDENTIFIED NEED FOR DESALINATED WATER

The Ocean Plan, chapter III.M.b.(2) requires that "the identified need for desalinated water" be "consistent with" an applicable urban water management plan (UWMP) prepared in accordance with Water Code section 10631, or other water planning documents if an UWMP is not available. The Ocean Plan does not define "need" or elaborate on what it means to be "consistent with" water planning documents. As such, the Board has discretion in its interpretation of these terms. Staff's proposed interpretation of the terms is included in Attachment G.2 to the Tentative Order and briefly discussed here.

The term "need" has been construed differently by various stakeholders. Environmental groups argue that there is no "need" for desalinated water if there are other sources of water that can meet regional water demands; on the other hand, water supply agencies and other similarly situated stakeholder groups view need as a more flexible concept that considers a range of factors that affect water supply reliability as well as water planning policies and priorities. The administrative record for the Desalination Amendment appears to indicate that the State Water Board intended a more flexible construction of "need' consistent with the latter view — a concept that allows for multiple considerations, including uncertainty of current supplies, competing demands, and the inherent risk of unforeseen circumstances. Further, to be "consistent with" water planning documents does not appear to require that water planning documents specifically identify a project and the specific volume of desalinated water as a source that is absolutely required to meet water demand. Based on guidance from interpretations of "consistent with" in other statutory contexts, staff interpreted "consistent with" water planning documents to require only that a proposed project be "in agreement or harmony with the terms of the applicable plan, not in rigid conformity with every detail thereof." However, these terms are ambiguous and, as noted above, the Board may disagree with staff's interpretation and direct staff to revise their analysis.

As was discussed at the December 6, 2019 workshop, the Municipal Water District of Orange County (MWDOC) and other municipalities have UWMPs that specifically identify the proposed Facility as an opportunity to develop a water supply and this represents support for the need for desalinated seawater. The MWDOC UWMP explains that the desalinated water would offset imported water demands and could be used to augment recycled water supplies used in the Talbert Seawater Barrier to prevent seawater intrusion. The MWDOC UWMP also lists the 56,000 acre-feet/year, or 50 MGD, of desalinated water produced by the proposed Facility as a way to improve water supply and system reliability in Orange County. In addition to the UWMPs, the

Orange County Water District (OCWD) has also prepared a Groundwater Management Plan and a Long-term Facilities Plan. The identified need for desalinated water appears to be consistent with the MWDOC and OCWD management plans.

MWDOC recently released its 2018 reliability study that projects water supply and demand in Orange County through the year 2050 and compares local projects that can meet the forecasted water demands. The proposed Poseidon Water project is among the local projects that were compared, and the proposed Facility ranked last based on system reliability and supply reliability metrics. The purpose of the study, however, was not to determine which projects should be implemented; rather, it was intended to provide information to local decisionmakers charged with choosing local projects. While there may be more cost-effective projects to meet water supply needs in Orange County, the proposed Project is among the potential projects that local suppliers can choose to pursue to meet water demand.

In order to obtain clarification from Poseidon Water on the identified need for desalinated water, on January 8, 2020, Santa Ana Water Board staff requested additional information. Poseidon Water and OCWD submitted responses to Board staff inquiries. These documents have been provided to the Santa Ana Water Board. The May 15, 2020 workshop will be an opportunity for the Santa Ana Water Board to hear directly from the relevant water planning agencies on the identified need for the desalinated water.

DETERMINATION OF THE BEST AVAILABLE MITIGATION MEASURES FEASIBLE

Water Code section 13142.5(b) requires that the best available mitigation measures feasible be used to minimize the intake and mortality of all forms of marine life. Chapter III.M.2.e of the Ocean Plan sets forth requirements to implement mitigation measures in compliance with Water Code section 13142.5(b).

The Ocean Plan requires a specific type of mitigation to offset the desalination facility impacts. Chapter III.M.2.e.(3)(b)i requires:

> "Mitigation shall be accomplished through expansion, restoration or creation of one or more of the following: kelp beds, estuaries, coastal wetlands, natural reefs, MPAs, 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".

As discussed in the Tentative Order and at the December workshop, Santa Ana Water Board staff estimate that 89.47 acres are needed to mitigate for impacts related to the proposed Facility's construction and stand-alone operations. After consideration of comments received from staff from other resource agencies (specifically, NOAA's National Marine Fisheries Service [NMFS]), however, the acreage needed for mitigation has been increased to 109.5 acres. The reasoning behind Staffs' decision to revise the

required mitigation acreage will be described in the Response to Comments currently being finalized as well as revisions to Attachment G.4 of the Tentative Order which is also being revised.

To fulfill the required mitigation acreage, the Discharger proposed in their Marine Life Mitigation Plan (MLMP) to conduct maintenance dredging of the ocean inlet at Bolsa Chica to support the Bolsa Chica Lowlands Restoration Project in order to maintain full tidal flow within the Bolsa Chica wetlands. The inlet channel has historically shoaled and filled with sand limiting tidal exchange between the ocean and the wetlands. Maintenance dredging of the inlet will provide essential tidal connectivity between the wetlands and the Pacific Ocean. In addition, dredging will help maintain the existing wetland system as well as support restoration and enhancement activities. The maintenance dredging of the ocean inlet will be done for the lifetime of the Project as needed to meet performance standards specified in the MLMP.

Santa Ana Water Board staff determined that the inlet maintenance dredging would be considered a “preservation” form of mitigation, not “expansion,” “restoration” or “creation” as is required by the Ocean Plan. The proposed maintenance dredging alone would only preserve the already existing habitat at Bolsa Chica.

Therefore, to be in compliance with the Ocean Plan, Santa Ana Water Board staff have worked extensively with the Discharger to ensure that the best available mitigation project feasible includes compliant restoration components. There are several areas within Bolsa Chica where the Discharger has proposed restoration activities. The major areas are within the Fieldstone Property (Cell 46, and Cell 42 of the Bolsa Chica Lowlands Restoration Project). The Fieldstone property consists of approximately 12 acres of dry, barren salt pans, with marsh and subtidal habitat. Within this property, the discharger proposes to restore approximately 4.5 acres of subtidal and tidal wetlands in addition to upland restoration. At several sites within Cell 46 and 42, oil pads and roads will be removed, and the areas restored to upland habitat. The individual sites for these activities are scattered throughout Cells 46 and 42 but will result, in total, in approximately 1.2 acres of additional restoration.

For these restoration projects to succeed, the Discharger must make improvements to the water circulation within the Muted Tidal Basins in Bolsa Chica. The circulation improvements constitute enhancement activities and, based on input from other resource agency staff (NMFS, the Coastal Commission, and the State Lands Commission), these improvements are required for the restoration projects to be fully successful.

The Discharger has not fully developed detailed descriptions of the restoration components of their proposed mitigation plan in the MLMP that has been submitted. The full development of the restoration components requires additional analyses and information that are not currently available. Therefore, Santa Ana Water Board staff

recommends that the Water Code section 13142.5(b) determination be conditioned on the Board's approval of supplemental plans submitted by the Discharger in accordance with the Marine Life Mitigation Plan Schedule included in Attachment K to the Tentative Order. Provided that the Discharger satisfies the requirements of Attachment K, the mitigation at the Bolsa Chica Lowlands Restoration Project would provide the mitigation acreage identified below.

Total Bolsa Chica Mitigation Acreage

Preservation of the Full Tidal Basin via inlet maintenance dredging	108.0 acres
Restoration of the Fieldstone property to subtidal habitat	4.5 acres
Restoration of the Oil Pads to subtidal habitat	1.2 acres
Enhancement of water circulation within the Muted Tidal Basins	15.0 acres
Total	**128.7 acres**

It is Santa Ana Water Board staff's position that if Poseidon Water successfully implements the above components, they will have adequately mitigated for the construction and operation of the Facility over the 50-plus year life span of the Facility. The approval of all mitigation acreage is contingent upon:

a. Completion of all tasks in the Marine Life Mitigation Plan Schedule (Attachment K to the tentative Order)
b. Successful implementation of all four mitigation components in the above table (as determined by performance standards)

Previous Inlet Dredging Mitigation Projects

While the Bolsa Chica ocean inlet dredging maintenance was originally funded by the Ports of Los Angeles and Long Beach as a Coastal Commission mitigation project for activities within the ports, the mitigation effort was based on a finite expenditure rather than funds necessary to maintain the mitigation efforts over a pre-determined amount of time. The funds identified for the Ports mitigation efforts have run out and it has been difficult to acquire the additional funding from the State or other sources necessary to continue those mitigation efforts. Dredging of the inlet would help preserve the wetlands and allow them to continue to function as designed.

Conditional Mitigation Requirements

Because Poseidon Water's proposal to mitigate for the marine life impacts associated with the construction and operation of the Facility at the Bolsa Chica Lowlands

Restoration Project requires additional information to flesh out the final details of their plan, the Tentative Order specifies that the Water Code section 13142.5(b) determination be made conditional on Poseidon Water's submission of a Coordination and Communication Plan, a Final Restoration Plan for the Fieldstone Property (this deliverable also requires submittal of an Enhancement Plan to Improve Water Circulation for the Muted Tidal Basins), a Final Restoration Plan for the Oil Pads and Road, and a Final Adaptive Management Plan in accordance with the schedule established in the Marine Life Mitigation Plan Schedule included in Attachment K.

The Tentative Order requires that Poseidon Water's final MLMP be brought back to the Santa Ana Water Board for consideration and approval.

Prohibitions on Discharge and Intake

Related to the outstanding mitigation requirements, the Tentative Order prohibits the discharge of waste and the intake of seawater unless and until (1) the Discharger has submitted the supplemental plans required under the MLMP Schedule (Attachment K), including the Final MLMP; (2) the Santa Ana Water Board has approved the Discharger's supplemental plans; (3) the Discharger has obtained all permits and other governmental approvals necessary to implement all components of the approved mitigation project (including the components included in supplemental plans required under the MLMP Schedule (Attachment K)); and (4) the Discharger has begun dredging of the Bolsa Chica inlet in accordance with the current MLMP (Appendix TT3). Staff included the prohibition provisions in the Tentative Order to avoid a situation where Discharger would be operating and impacting marine life without mitigating for these impacts.

PERFORMANCE OF THE CARLSBAD SEAWATER DESALINATION FACILITY:

The Discharger has maintained compliance with requirements and provisions specified in Order R9-2019-0003, issued by the San Diego Water Board on May 8, 2019, with two exceptions discussed below. There have been two exceedances of the receiving water pH limit, which requires that pH shall not be changed more than 0.2 standard units from the receiving water. The receiving water pH limit was exceeded during the August 29, 2019 quarterly monitoring event (3rd Quarter of 2019) at two surf zone monitoring locations out of a total of 21 monitoring locations sampled (two pH measurements out of a total of 72 taken during the quarterly monitoring event). These two pH results were deemed as erroneous measurements by the Discharger, as these results were not confirmed by additional pH monitoring conducted at the two monitoring locations during the August 29, 2019 monitoring event and the pH of the plant discharge measured in the discharge pond prior to mixing with the receiving water was measured at 0.2 units below the pH of the receiving water. No exceedances of the receiving water pH limit were reported for the monitoring conducted by the Discharger during the 4th Quarter of 2019. Also, during the 3rd Quarter of 2019 the Discharger failed to

collect a final effluent sample for TCDD Equivalents determination[2] and to sample one receiving water monitoring location. No other violations of the current 2019 permit have been reported by the Discharger to date.

Notwithstanding Poseidon's operational and violation history at their Carlsbad facility, if the Discharger violates any Santa Ana Water Board permit requirement, Board staff will take appropriate action.

COST COMPARISON OF ALTERNATIVE INTAKE SYSTEM SITES:

As part of the feasibility analysis, the Discharger developed the cost comparison for equipping the existing intake (Station E) to installing a new intake at one of two locations (Station D2/U2). Station D2/U2 are equidistance from the existing facility; one is located two kilometers up-coast and the other is located two kilometers down-coast. The estimated costs associated with a new intake at either Station D2 or U2 are assumed to be equal. The Santa Ana Water Board requested more cost information related to the alternative analysis regarding the construction costs and the operating and maintenance costs. These costs are show in Tables 1 and 2 below.

Table 1 shows the detailed construction cost comparisons for the alternatives provided by Poseidon in their Appendix RRRRR. Table 1 shows that the main differences in the alternative costs are related to the additional pipeline requiring a trestle for construction for Station D2/U2, four-year variance in the start of construction, and 39-month difference in the construction periods. Table 1 also indicates that costs for the alternative intake location has significant additional costs related to financing debt issuance costs, capitalized interest, and financing fees.

A second question was asked about the costs for each alternative without including the financial costs. These costs can be calculated by removing the estimated costs listed in Table 1 for 'Capitalized Interest During Construction' and 'Financing Fees and Reserves.' The total estimated construction costs without including the financial costs would be: $70.8 million for Station E, and $289.5 million for Station D2/U2.

[2] TCDD Equivalents is the sum of the concentrations of chlorinated dibenzodioxins (2,3,7,8-CDDs) and chlorinated dibenzofurans (2,3,7,8-CDFs) multiplied by their respective toxicity factors.

Table 1. Comparative Construction Costs

Comparison of Proposed Intake to Alternative Intake Cost Estimate ($000s)		
Intake:	**Proposed Intake (E)**	**Alternative Intake (U2/D2)**
Construction Period (Months) (1)	**39**	**72**
Financial Close Pricing Year	**2020**	**2024**
Direct Capital Costs		
Pipeline and Associated Infrastructure	-	26,312
Trestle and Associated Infrastructure	-	31,541
Intake Screen and Related Costs	22,135	22,135
Other Project Costs (Unallocated)	2,178	2,178
Indirect, Insurance and Overhead Costs	13,372	45,192
Subtotal	**37,685**	**127,358**
Engineering (15%)	5,653	19,104
Contingency (40%)	15,074	50,943
Direct Capital Cost (2018$)	**58,412**	**197,405**
Direct Capital Cost Escalation (to Year of Financial Close)	2,957	38,736
Direct Capital Cost ($ in Year of Financial Close)	**61,369**	**236,140**
Development and Construction Costs (2)	9,438	53,367
Capitalized Interest During Construction (3)	12,816	151,540
Financing Fees and Reserves (4)(5)	8,996	32,811
Total Intake Cost Estimate (6)	**92,618**	**473,858**
Total Intake Cost Estimate - Rounded	**93,000**	**474,000**
% Increase over E		*409.7%*

Note: Direct Capital Costs reflect 12-foot Pipeline Diameter

(1) Construction Schedule for U2/D2 assumes new Intake construction commences prior to Plant Construction

(2) Costs include Property Taxes, Title Insurance, Construction Management and Permitting, and Development Costs

(3) Includes a 6 Month Capitalized Interest Contingency

(4) Reserves include Debt Service, Working Capital and Project O&M

(5) Financing Fees include Conduit, Rating Agency, Underwriting, Equity and Advisory Fees

(6) *Proposed Intake (E) Total Intake Cost Estimate is in 2020$ and Alternative Intake (U2/D2) is in 2024$ (both the respective year of Financial Close)*

The Santa Ana Water Board also asked the following questions related to operation and maintenance: what would be the major maintenance schedules for each alternative intake location and the associated costs, and what would be the anticipated annual

operating costs for both alternatives excluding debt costs and fees for the life of the project? Poseidon provided the following information in response to these questions. The routine cleaning, maintenance, and inspections are expected to include:

- Offshore inspection and cleaning of the intake systems 4-6 times per year with a 4-person dive team, potentially including boat-based air burst
- Periodic inspection and cleaning of the intake pipeline, including pigging as needed to avoid biomass accumulation (especially in the intake pipeline)
- Intermittent replacement of the wedge wire screens as needed
- Maintenance and replacement of the rotating brushes and motors as needed
- Regular monitoring in the ocean as required

Given the limited number of installations that use active stainless steel wedgewire screen intake manifolds on this scale, the exact cleaning and maintenance schedule will need to be refined during the first year of commercial operations. The incremental costs associated with Stations D2/U2 as compared to Station E are primarily attributable to the longer length of intake piping that includes a 90-degree bend for pipes at Stations D2/U2. This will increase the required energy output and normal wear and tear at the intake pump station due to frictional losses, and it will also take longer and be more costly to inspect and clean the longer length of intake piping.

In Table 2, the annual operating costs provided are an average and assumed to be only subject to inflation. Therefore, the total operating cost for the intake configurations over a 50-year period excluding debt repayment and fees are as follows:

Table 2. Operating and Maintenance (O&M) Costs for Alternative Intake Locations

	STATION E	STATION (D2/U2)
First Year of Operation (FYO)	2025	2031
Total Operating Cost Over 50 Years (Constant $FYO)	$180 Million	$330 Million
Total Operating Cost Over 50 Years, Subject to 2.0% Annual Inflation (Nominal $)	$304.5 Million	$558.2 Million

PUBLIC COMMENTS

Following the November 22, 2019 release of the Tentative Order determination, the 60-day public comment period closed on January 21, 2020. Santa Ana Water Board staff received 217 unique comment letters that include comments from concerned citizens, environmental groups, elected officials, water agencies, business organizations, federal, state and local agencies and the Discharger. All comment letters have been made available to the public through the State Board's FTP site.

Santa Ana Water Board staff is in the process of responding to all of these comments and, where appropriate, revising the Tentative Order and Water Code section 13142.5(b) determination.

RECOMMENDATION

Provide feedback to staff on the Tentative Order and direct staff to continue to prepare written responses to comments received and bring an appropriately revised Order and Water Code determination back to the Santa Ana Water Board for consideration at the July 31, 2020 public hearing.