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Subject: Comments on California Coastkeeper Alliance 5 May 2020 "Supplemental Documentation" which includes the HydroFocus 10 March 2020 "Assessment of Effects of Varying Water-Level Elevations in the Seawater Intrusion Barrier Wells on Sources of Groundwater to Slant Wells," Huntington Beach Seawater Desalination Project

Dear Mr. Maloni:

This letter provides comments on the 5 May 2020 submittal by the California Coastkeeper Alliance (CCKA) to the Santa Ana Regional Water Quality Control Board (RWQCB). The CCKA cover letter is titled "Supplemental Documentation", and it includes two attachments:

1. "Assessment of Effects of Varying Water-Level Elevations in the Seawater Intrusion Barrier Wells on Sources of Groundwater to Slant Wells" by HydroFocus (10 March 2020), herein referred to as the *HydroFocus 2020 Report*, and
2. "Subsidence of Organic Soils and Salinity Barrier Design in Coastal Orange County, California" by Fairchild and Weibe, Orange County Water District (OCWD) and James M Montgomery Consulting Engineers (December 1976), herein referred to as the *1976 Subsidence Study*.

A summary of the contents of the CCKA "Supplemental Documentation" and Geosyntec's corresponding comments is presented below and is followed by more detailed discussion and comments.

SUMMARY

The CCKA cover letter and the HydroFocus 2020 Report make two main claims regarding the Huntington Beach Desalination Project (the Project):

1. The "Regional Water [Quality Control] Board must require calibration of the Geosyntec modeling to improve certainty of the modeling results for the proposed project."
2. The "analysis of freshwater withdrawn in [hypothetical] slant wells [at the coastal margin] must consider lowering the" [groundwater] "elevation" [at OCWD's Talbert injection barrier] "reducing the volume of freshwater injected into the barrier."

Both of these claims are fundamentally incorrect and based on a series of misconceptions:

1. The Huntington Beach subsurface seawater intake (HB SSI) models are tools for evaluation of feasibility of subsurface seawater intakes (SSIs). The Department of Water Resources (DWR) Sustainable Groundwater Management Act (SGMA) groundwater modeling guidelines for Groundwater Sustainability Plans (GSPs) are neither applicable to, nor appropriate for, the HB SSI models.

2. Calibration is neither necessary nor applicable for many groundwater modeling applications, such as feasibility evaluations and screening level evaluation of engineering design alternatives.

3. The injection rate at the Talbert Barrier is based on modeling and monitoring by OCWD, not by Poseidon Resources (Poseidon). Injection of water at the barrier is critical for aquifer replenishment as well as to help mitigate sea water intrusion of aquifers. OCWD also refers to the Talbert Barrier as a Groundwater Replenishment System, and their management of the groundwater basin and sustainable groundwater production is dependent on the aquifer replenishment.

4. Twelve model simulations presented by HydroFocus with reduced slant well pumping rates and reduced groundwater elevations at the injection barrier (and thus less aquifer replenishment) all indicate inland groundwater contribution to the hypothetical slant well pumping that exceeds the maximum acceptable threshold of 1,000 acre-feet per year (AFY) stipulated by OCWD.

DISCUSSION

1. The DWR SGMA Guidelines Are Not Applicable to the HB SSI Modeling

The claim by CCKA that the RWQCB must require the HB SSI modeling to be conducted in accordance with DWR SGMA guidelines for GSPs apparently is incorrect and based on at least three misconceptions:

1. The HB SSI modeling is not a component of a groundwater management plan or GSP.

2. The HB SSI modeling is not subject to the DWR guidelines for GSPs required by the (SGMA).

3. The DWR, not the RWQCB, oversees GSPs required for the SGMA.

The HB SSI groundwater models were developed as tools to help evaluate the feasibility of SSIs, including slant wells, for the proposed Project in accordance with the California Ocean Plan (SWRCB, 2015). The design of the HB SSI models and assigned hydraulic properties are based on data from both onshore and offshore investigations at Huntington Beach, the regional OCWD groundwater model, and publications on geologic and hydrogeologic characteristics of the Orange County coastal margin.

Documentation of design and findings of numerous versions and refinements of the HB SSI models and sensitivity analyses have been provided to, and discussed with, the California Coastal Commission (CCC), the Santa Ana RWQCB, and State Water Resources Control Board (SWRCB). In addition, Geosyntec has made numerous refinements to and produced different versions of the HB SSI model based on reviews, comments, and discussions with an Independent Technical Advisory Committee convened by the CCC, an independent technical review by Dr. Detwiler (2015, a civil and environmental engineering professor at UC Irvine), the RWQCB, the SWRCB, and OCWD.

None of the many versions of the HB SSI model are intended to be used for developing a groundwater management plan or as an operational management tool. As such, the HB SSI models are certainly not subject to the DWR requirements or SGMA guidelines. Rather, OCWD uses their regional groundwater model for groundwater management.

2. Formal Calibration Is Not A Prerequisite for a Groundwater Model to be a Useful Tool

Geosyntec has repeatedly documented and explained that the numerous versions of the HB SSI model are not formally calibrated, but were designed as conservative screening tools with variations in design and properties that serve as sensitivity analyses. The refinements to evaluate the potential for flow from nearby wetlands to the hypothetical Project slant wells led to some calibration of the model in order to better replicate current condition groundwater levels reported by OCWD near the coastal margin of the Talbert Gap.

However, as discussed in a United States Geological Survey (USGS) guidance document for evaluating groundwater models (Reilly and Harbaugh, 2004), not all applications of groundwater models require calibration. Further, as discussed in an ASTM (1998) standard guidance for groundwater modeling: (1) formal calibration is not applicable to screening models that are used with "conservative" or "worst case" input parameters for gross differentiation or elimination of alternatives, and (2) calibration may not be necessary, or even applicable, for groundwater models used for engineering calculation applications to predict the response of the hydrogeologic system to specified hypothetical changes in boundary conditions or hydrologic stresses (such as a series of slant wells along the coastal margin).

Thus, it is not necessary for groundwater models to be calibrated to serve as useful screening tools for feasibility studies (e.g. Michigan DEQ, 2002; Anderson et al., 2015), which is the purpose of the HB SSI models.

3. The Claim That OCWD Should Decrease the Injection Rate at the Talbert Barrier is Inappropriate and Misconceived

The assertion that Poseidon should fund more groundwater modeling to optimize operation of the Talbert Barrier is nonsensical. The operation of the barrier and management of groundwater resources in most of Orange County is based on modeling and monitoring by OCWD, which is widely recognized as a technical leader among water districts in California and the United States. If CCKA and HydroFocus have suggestions for optimization of the operation of the Talbert Barrier, their suggestions and requests for consideration should be addressed to OCWD, not to the RWQCB or Poseidon.

The evaluation of reduced injection rates at the barrier by HydroFocus seems to be based on a key misconception that the purpose of the injection barrier is to only mitigate sea water intrusion. In reality, a further critical function of the injection barrier is also to replenish the deeper aquifers.

The operational groundwater levels at the Talbert Barrier reflect the pressures associated with injection rates that OCWD has determined are appropriate to replenish the deeper aquifers—the barrier is not solely intended to provide a groundwater mound to mitigate sea water intrusion. The aquifer replenishment provided by the injection is a necessary component of OCWD's sustainable management of regional groundwater resources.

The discussion about decreasing the injection rate to lessen the groundwater mounding and adding extraction wells near the coast is interesting, as is the 1976 publication provided as the second attachment to the CCKA submittal of "supplementary documentation," but both have little, if any, relevance to the current operation of the injection barrier or to the RWQCB's proceedings on the Project. OCWD is not operating a line of extraction wells, and the main topic addressed by the 1976 report is potential subsidence associated with pumping.

4. HydroFocus Model Simulations with Lower Pumping Rates for the Hypothetical Slant Wells and Lower Injection Rates at the Talbert Barrier Show Unacceptable Inland Groundwater Flow to Slant Wells

As described in the HydroFocus 2020 Report, HydroFocus obtained the HB SSI MODFLOW files and ran Geosyntec model V6 for which the specified groundwater elevation at the injection barrier ranges from 6 to 10 ft msl, based on monitoring data from OCWD reports, and the total Project slant well pumping is 126.7 MGD. HydroFocus then ran twelve alternative model simulations with three reduced slant well pumping rates (100, 50, and 25 MGD), and three lower values of groundwater elevation specified at the barrier (5, 2, and 0 ft msl).

Table 1, which is attached hereto, is adapted from Table 2 from the HydroFocus 2020 Report. The table provides a summary of the results of HydroFocus model simulations with the range of slant well pumping rates and lower elevations at the injection barrier. For purposes of this response, Geosyntec added two columns to the table presenting the inland groundwater contribution to the hypothetical Project slant wells in units of MGD and AFY, instead of simply displaying a percentage of the slant well pumping.[1] The results of the HydroFocus model summarized by **Table 1**, supports that less mounding of groundwater at the injection barrier

[1] HydroFocus also presents several figures that shows model "particle tracks" which illustrate groundwater flow paths. In addition to presenting the portioning of flow to the hypothetical slant wells based on zone-budget calculations with MODFLOW, HydroFocus also presents portions of ocean and inland flow based on the numbers of particle tracks that flow to the slant wells from the ocean compared to number of particle tracks that flow to the slant wells from inland. However, this method provides only an approximate indication of the water balance. The zone-budget water balance accounting presented in Table 2 of HydroFocus Report and Table 1 to this letter is the correct approach.

would reduce the hydraulic gradient toward the coast and result in a smaller contribution of inland groundwater to the water pumped from the hypothetical Project slant wells. **However, the inland portion of flow to the hypothetical slant wells still exceeds OCWD's (2018) acceptable threshold of 1,000 AFY (~0.9 MGD)** ***for all 12 of the alternative model simulations run by HydroFocus***.

Moreover, lower groundwater elevations at the injection barrier would require lower injection rates, which would not achieve the aquifer replenishment that is a critical element of groundwater management measures implemented by OCWD to sustain groundwater production. The necessity for groundwater replenishment at the injection barrier is the reason that OCWD specified the maximum acceptable threshold of 1,000 AFY for the take of inland groundwater by potential pumping from SSIs, such as slant wells, along the coastal margin of the Talbert Gap. Also, to accommodate lower injection rate, OCWD would likely require a corresponding lower acceptable threshold of inland groundwater flow to SSIs along the coastal margin.

Numerous refinements of the HB SSI model by Geosyntec and sensitivity runs with conservative model design assumptions, and a range of hydraulic properties, SSI locations, and pumping rates, consistently indicated that the Project design pumping rate from slant wells along the coast would draw over 1,000 AFY of inland groundwater under any pumping scenario. The additional model runs by HydroFocus indicate that even with reduction in the slant well pumping rates and a reduction of the injection rates at OCWD injection barrier, pumping from hypothetical Project slant wells would still result in exceedance of 1,000 AFY, which is the acceptable threshold specified by OCWD for inland groundwater flow to the subsurface intakes.

CONCLUSION

CCKA's May 8, 2020 "Supplemental Documentation" offers no new information regarding the hypothetical use of slant wells for the Project. CCKA mistakenly argues that the DWR SGMA groundwater modeling guidelines should be applied to the HB SSI models, and they inappropriately question OCWD's management of the groundwater basin.

Further, the additional HyrdoFocus modeling runs are superfluous and do not change the outcome of the hydrogeologic analysis for the Project—pumping from hypothetical slant wells would still result in exceedance of 1,000 AFY, which is the acceptable threshold specified by OCWD for inland groundwater flow to any SSIs. The RWQCB has correctly concluded that slant wells at even a small-scale capacity (i.e., 3.8 MGD of source water) would impact the adjacent restored Magnolia Wetlands and that the slant wells would need to be constructed on Huntington State

Beach, subjecting the wells and infrastructure to climate-change induced coastal erosion and flooding from sea level rise.

Moreover, CCKA's "Supplemental Documentation" only addresses groundwater modeling for the Project and OCWD's operation of the Talbert Injection Barrier, ignoring the findings in the RWQCB's Tentative Order that ***subsurface intakes are infeasible for all reasonable Project intake design capacities*** (RWQCB TO G-45 Finding 20) due to social, economic and environmental considerations.

Sincerely,

Gordon Thrupp, PhD, PG, CHG
Principal Hydrogeologist

Attachments:

Table 1. Summary of Results of Model Simulations with a Range of Slant Well Pumping Rates and Lower Elevations at the Seawater Intrusion Barrier (adapted from Table 2, HydroFocus, 2020).

References

Copies by email to

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Table 1. Summary of Results of Model Simulations with a Range of Slant Well Pumping Rates and Lower Elevations at the Seawater Intrusion Barrier (adapted from Table 2, Hydrofocus, 2020)

Model Runs[1]	Project Pumping with Slant Wells (MGD)	Project Pumping with Slant Wells (AFY)	Length of Slant Well (ft)	Seawater Intrusion Protective Elevation at the Talbert Gap, (ft msl)	Flow Contributed to Slant Well, %				Inland Portion[2]	
					Ocean	Wetlands	Aereal Recharge	Inland Groundwater	(MGD) OCWD Threshold is 0.9 MGD[3]	(AFY) OCWD Threshold is 1000 AFY[3]
Geosyntec Run V6*	126.7	141900	425	~7	87%	2%	1%	10%	12.7	14,193
Run 100_Ori	100.0	112000	425	~ 7	87%	2%	1%	10%	10	11,202
Run 100_5ft	100.0	112000	425	~ 5	87%	2%	1%	10%	10	11,202
Run 100_2ft	100.0	112000	425	~ 2	88%	2%	1%	9%	9	10,082
Run 100_D	100.0	112000	425	0	90%	2%	1%	7%	7	7,842
Run 50_Ori	50.0	56000	425	~ 7	84%	2%	2%	12%	6	6,721
Run 50_5ft	50.0	56000	425	~ 5	85%	2%	2%	11%	5.5	6,161
Run 50_2ft	50.0	56000	425	~ 2	87%	2%	2%	9%	4.5	5,041
Run 50_D	50.0	56000	425	0	90%	2%	2%	6%	3	3,361
Run 25_Ori	25.0	28000	425	~ 7	77%	2%	4%	17%	4.3	4,761
Run 25_5ft	25.0	28000	425	~ 5	80%	2%	4%	14%	3.5	3,921
Run 25_2ft	25.0	28000	425	~ 2	84%	2%	4%	10%	2.5	2,801
Run 25_D	25.0	28000	425	0	89%	2%	4%	4%	1	1,120

Notes:

[1] **Hydrofocus obtained the MODFLOW files and ran the Geosyntec model Run V6 for which the groundwater elevation at the injection barrier ranges from 6 to 10 ft msl based on monitoring data from OCWD reports, and the total slant well pumping is 126.7 MGD. They then ran 12 alternative model simulations with three reduced slant well pumping rates (100, 50, and 25 MGD), and three lower values of groundwater elevation specified at the barrier (5 ft msl, 2 ft msl, and Sea Level).**

[2] **Geosyntec added the two columns with inland groundwater contribution to the slant wells in units of MGD and AFY.**

[3] **1000 AFY (~0.9 mgd) is the maximum acceptable inland impact of the slant well pumping specified by OCWD (2018).**
The inland portion of flow to the hypothetical slant wells exceeds the OCWD acceptable threshold of 1000 AFY (~0.9 MGD) for all 12 of the alternative model simulations run by Hydrofocus.

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