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SCDA-35

Attorney for Protestants Save the California Delta Alliance, et al.

BEFORE THE CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

IN RE CALIFORNIA WATERFIX CALIFORNIA DEPARTMENT OF WATER RESOURCES AND U.S. BUREAU OF RECLAMATION PETITION FOR CHANGES IN WATER RIGHTS, POINTS OF DIVERSION/RE-DIVERSION	**TESTIMONY OF TOM BURKE**

I Thomas Burke, submit this written testimony. The matters contained herein are true and correct and based upon my personal knowledge. If called upon to testify to them, I would and could do so. I do hereby declare:

Introduction

My name is Thomas Burke and I am a Principal at Hydrologic Systems. I received a Bachelor's of Science in Civil Engineering in 1980 from the University of Florida, and a Master's of Science in Civil Engineering with a specialty in Water Resources Engineering from Colorado State University in 1992. I am the owner and Principal Engineer at Hydrologic Systems, a company that I started in 1998. Prior to starting Hydrologic Systems, I worked as a Senior Water Resources Engineer at Phillip Williams and Associates, Western Regional Director of Water Resources at EA Engineering Science and Technology, and Hydraulic Engineer at the US Army Corps of Engineers. I have over 30 years of experience in hydrologic modeling of aquatic systems, including both surface water and groundwater. I am familiar with the CALSIM II and DSM2 models that were used to evaluate the different operational scenarios of the California Water Fix Project (CWF).
I have assessed the potential impacts from the CWF scenarios on the waters in and around the Discovery Bay development. My testimony is submitted to provide a summary of the analyses that I conducted on the different scenarios and results that I have developed from those analyses. A detailed report of my analyses has been submitted as Exhibit SDWA-47.

The CWF Project

The CWF is a joint project developed by the California Department of Water Resources (DWR) and the Bureau of Reclamation (BOR) (Petitioners). They have applied to the SWRCB for a water right change petition to move their diversion point to a new location on the Sacramento River. To operate the State Water Project (SWP) and Central Valley Project (CVP) (Projects) utilizing this new diversion point, the Petitioners have proposed four scenarios that define the range of operations that might be implemented for operating the two projects.

Presently, the Projects divert water at the southern end of the Delta, and export the water to areas south of the Delta. Much of this diverted water is from the Sacramento River and flows north to south through the Delta, and is picked up by the southern export pumps.

The Petitioners have requested that a new point of diversion be established at the north end of the Delta to capture water from the Sacramento River before it gets a chance to flow through the Delta. The diverted water will then be conveyed to the southern export pumps through twin tunnels that will completely bypass the Delta. Diverting the Sacramento River water through the twin tunnels rather than allowing it to flow through the Delta removes a significant source of fresh water from the Delta.

Under the current operating scenario, without the CWF, high quality Sacramento River water must flow through the Delta before reaching the export pumps. The concentration of nutrients in Sacramento River water in the vicinity of the proposed NDD is typically lower than the concentration of nutrients in the central Delta. When Sacramento River water flows through the Delta on the way to the export pumps it generally dilutes the nutrient load in the central and south Delta.

If diversions are shifted to the proposed NDD, this dilution effect will be reduced or eliminated. This will result in a higher nutrient loads for waters in and around Discovery Bay. All things being equal, higher nutrient loads can lead to algal blooms which reduce dissolved oxygen and lead to degradation of water quality. This is a qualitative analysis

Exhibit SCDA-56 is a chart I prepared comparing model results with actual historical conditions. I am aware that DWR cautions that their models do not accurately replicate historical conditions.

However, the chart indicates that the models are likely not useful for comparative purposes either. The model results under-report salinity. If the model results consistently under-reported salinity but accurately captured trends, they might be useful for comparative purposes. However, the model results are also erratically inaccurate in capturing trends as well. The model reports periods of sharply decreasing salinity at times when salinity was actually sharply increasing. In my opinion, failure to accurately track the direction of trends makes it unlikely that model errors are consistent across scenarios and I would not rely on the modeling to provide useful comparisons of scenarios. The Petitioners may have offered modeling that purports to show that the reduction in the amount of Sacramento River water entering the Delta will not adversely affect water quality. However, their own testimony establishes that because of the technical limitations of the models, they cannot reliably predict specific outcomes. (DWR-71 page 13). As described above, using the models on a comparative basis is unreliable when the model is not capable of tracking actual water quality trends in the Delta. Given that the DSM2 model has issues both as a predictive and comparative tool for water quality, it cannot be reliable used to assess the impacts from the CWF scenarios.

Analysis of the Changes to Delta Salinity from The CWF Scenarios

The Petitioners analyzed and developed the four operating scenarios using the CALSIM II operations model and the DSM2 hydrodynamic model. Both of these models, representing each of the four scenarios, have been uploaded to the State Water Resources Control Board's Water Right Change Petition web site. There were 5 DSM2 models that represented the 4 CWF scenarios that have been proposed by DWR and a No Action Alternative (NAA). These scenarios, labeled B1, H3, H4, B2 and NAA consist of different sets of operational constraints that each scenario would conform to. The scenarios as listed go incrementally from a high export scenario, B1 to a low export scenario, B2, with H3 and H4 falling in between these two upper and lower boundaries.

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I performed an analysis to determine the effect that the CWF scenarios would have on the salinity in the Delta. To perform that analysis, I used the DSM2 models that were provided by the Petitioners. They were downloaded from the State Water Resources Control Board (SWRCB) FTP site. There were five separate DSM2 models. Four of the models represented the four operational scenarios of the CWF project. The fifth model represented the No Action Alternative (NAA). The input to the DSM2 model was generated by the CALSIM II operations model for the Central Valley Project (CVP) and State Water Project (SWP). The CALSIM II model was set up by the Petitioners for an 82 year period of Record (Water Years 1922-2003). The DSM2 model was set up to run for a 16 period Water Years 1976-1991). Given that the CALSIM II model produces the input data for the DSM2 model, it is unclear why two separate time frames were used. The shorter timeframe for the DSM2 model can present problems when making extrapolations to low or high water years.

To perform the salinity analysis, I identified 6 locations in the vicinity of Discovery Bay. A list of the sites and a site map are provided in Exhibit SCDA-36. I ran each of the five DSM2 models and evaluated the output from the models at each of those 6 locations. The 15-minute DSM2 output was used to create a daily average. The daily average salinity is provided in tables within Exhibit SCDA-36. The change in salinity was conducted by comparing the salinity from the output of each of the model that represented the CWF scenarios to the output from the model that represented the NAA. The DSM2 model analyzes flow through the Delta on a 15-minute time step. This allows for a very detailed comparison of the results from the different scenarios.

I plotted the DSM2 salinity model results from each of the different scenarios and the NAA alternative over the full time period that had been developed for the DSM2 models. Those plots are provided in Exhibit SCDA-36. The 15-minute data was averaged into a daily period for each scenario and the NAA. The difference between the salinity for each scenario and the NAA alternative were evaluated and plotted to see the change resulting from each CWF scenario. Those plots are provided in Exhibit SCDA-36. As can be seen in the plots, the CWF scenarios resulted in some very large increases in salinity as compared to the NAA. For the Indian Slough at Discovery

Bay site, there were multiple instances where the difference in salinity was over 500µS/cm, and one period where the salinity was 750µS/cm greater than the NAA. These numbers represent a large increase in salinity.

The Petitioners exhibits did not show a change this large due to the way that they averaged the results of the DSM2 model. By developing a mean monthly average for salinity, they effectively averaged the 15-minute data into daily data then averaged the daily data into monthly data, then averaged the monthly data into mean monthly data which was averaged over the 16 year model period. The result of all that averaging is that the actual change in salinity from the CWF scenarios is masked.

A further comparison of the model results revealed that the salinity for each of the CWF scenarios, is greater than the NAA roughly 50% of the time. Detailed plots for the time that the salinity for the CWF scenarios exceeded the NAA are provided in Exhibit SCDA-36.

Based on the results of the DSM2 models, the CWF will result in frequent and sometimes very high increases in salinity at Discovery Bay. The magnitude of that increase varies by the scenario that the Petitioners may implement, but since they are proposing all scenarios at this time, the worst case scenario must be evaluated. These salinity increases are consistent with general observation that the removal of Sacramento River water from the Delta will reduce the dilution effect that the relatively high quality Sacramento River water provides. The reduction of Sacramento River inflow to the Delta will contribute to degrading the already impacted water quality of the Delta.

These salinity increases will also impact agricultural diverters in the vicinity of Discovery Bay.

Delta Hydrodynamics and D-1641

I am familiar with D-1641 and the location of D-1641 compliance stations in the Delta. Current Delta hydrodynamics are such that a particular D-1641 standard might be met at a specific D-1641 compliance point but other areas in the Delta might have higher or lower levels of the same metric at the same time. In other words, compliance at all D-1641 compliance points does not mean that some areas between compliance points do not have significantly degraded water quality in comparison to the compliance points.

The Submitted BA (SWRCB-104) and the Aquatic Science Peer Review (SCDA-1) both confirm that CWF will radically alter the hydrodynamics of the entire Delta. To the extent that the locations of D-1641 compliance stations and metrics were chosen to capture a picture of water quality trends throughout the Delta, in my opinion CWF could change the validity of the chosen locations for that purpose. In my opinion, it would be unreasonable to assume that meeting D-1641 protocols before and after CWF translates to providing similar water quality overall in the Delta before and after CWF.

Executed this 1st day of September in Sacramento, California.

Thomas K. Burke

THOMAS K BURKE, P.E.

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