

San Joaquin River Dissolved Oxygen Total Maximum Daily Load Technical Working Group (TWG) Meeting Notes

Thursday, October 21, 2010
9:30 a.m. – 12:00 p.m.

ICF International
630 K Street, 2nd Floor
Sacramento, CA 95814

Attendees

Name	Agency
Ameri, Khalid	CA Department of Water Resources
Atkins, Carol	CA Department of Fish and Game
Brown, Russ	ICF
Centerwall, Steve	ICF
Fong, Stephanie	Central Valley Regional Water Quality Control Board
Gleason, Alex	U.S. Fish and Wildlife Service
Huggins, Dania	Central Valley Regional Water Quality Control Board
Hulkower, Bonnie	U.S. Army Corps of Engineers
Joab, Christine	Central Valley Regional Water Quality Control Board
Kamei, Gary	U.S. Army Corps of Engineers
Kan, Alex	U.S. Army Corps of Engineers
Kendall, Carol	USGS
Lee, Petra	CA Department of Water Resources
Litton, Gary	UOP
Loschke, Carrie	Modesto Irrigation District
Lyster, Stefanie (notetaker)	ICF
McGahan, Joe	Summers Engineering

McLaughlin, Bill	CA Department of Water Resources
Oros, Daniel	DSC
Parlin, Larry	City of Stockton
Pedlar, Bob	CA Department of Water Resources
Petruzzeli, Ken	San Joaquin River Group
Pulupa, Patrick	Central Valley Regional Water Quality Control Board
Reeves, Ryan	CA Department of Water Resources
Stringfellow, William	University of Pacific
Wilson, Danielle (facilitator)	ICF
Wingfield, Mike	ICF
Zweig, Leanna	U.S. Fish and Wildlife Service

Introductions and Agenda Review

Danielle Wilson opened the meeting with a round of introductions and an agenda review. No one had any suggested changes to the agenda.

Updates and Announcements

Central Valley Regional Water Quality Control Board update from April Roundtable Discussion (Christine Joab)

Christine Joab introduced Carol Atkins of the CA Department of Fish and Game. Carol is the contract manager for the proposed downstream studies that are trying to get funded using Proposition 13 bonds. Carol took over the position from Mary Menconi. When Christine has more information about funding, she will share it with Danielle so it gets passed on to the TWG.

Christine provided an update on the TMDL. The Regional Board is considering various options to address the prohibition, such as a cease/desist order or a basin plan amendment.

Dr. Lee asked Carol and Christine what was meant by an “implementation project” that would qualify for funding. Carol responded that they are working with the Regional Board and are looking at ways to keep moving ahead so things stay on track. Ken Petruzzelli asked Carol what would make these proposed downstream studies an “implementation project”. Carol responded that she will get back to group with an answer.

Stockton DWSC Demonstration Dissolved Oxygen Aeration Facility (Bill McLaughlin)

Bill McLaughlin informed the group that staff is in the process of writing a final report on the additional testing since the 2008 operations report. Since 2008, additional operational testing has been done to finish the Aeration Facility study. Russ Brown will give an update on the testing at today's meeting. The final report should be completed in early December. It will discuss the overall study including the additional testing that was conducted, cost information, and recommendations for improving the facility. Those interested can review the 2008 Operations Report on the TWG website (<http://www.sjrdotmdl.org/>) and DWR's aeration website.

Bill also mentioned that researchers at the U.C. Davis Bodega Marine Lab conducted a fish study to investigate concerns that NMFS had. Bill and staff from DWR have reviewed and provided comments on the draft report. It should be finalized by late November/early December. The study looked at possible stress in juvenile salmon from chemical oxidants resulting from high DO concentrations. No adverse effects were found by the researchers. When the study is available, it will be posted on the TWG website (<http://www.sjrdotmdl.org/>) and Danielle will send an email to the TWG to inform them it has been posted for review.

Will Stringfellow asked for some more detail about the fish study and its impacts. Bill responded that the report was very scientific and technical and he would share information as soon as he had it. He reiterated that he had been told that the studies indicated there were no adverse effects on fish. He told the TWG that Jeff Stewart of NMFS reviewed the study and provided comments and seemed comfortable with the report's findings.

San Joaquin River Water Quality Management Group

No updates were provided.

Additional Topics

1. Christine Joab reported that today's presentation will also be given, either partially or in its entirety, at the December 2010 or February 2011 Regional Board meeting, so if participants aren't able to catch it all today they can hear it again at an upcoming Regional Board Meeting.
2. Danielle indicated there will be one more meeting of the TWG in December. Russ Brown will give another presentation on the final report and other related topics.
3. Christine Joab provided an update on the feasibility report that the S.F. District of the U.S. Army Corps of Engineers is working on as part of the S.F. to Stockton deepening project. Bonnie Hulkower of the U.S. Army Corps of Engineers was not present during the update session so Christine mentioned that once the report is posted by the Corps

an email would be sent out to the TWG so members can review the report before the next meeting.

Presentation

Possibilities for Long-Term Operations of the Aeration Facility as part of the SJR DO TMDL Implementation Plan (Russ Brown)

Russ Brown began his presentation by noting that it had two parts: one part was the discussion of the aeration facility and the second part was a discussion of how the facility could be used to solve the low DO problem in the DWSC, which he refers to as TMDL implementation. Russ said the overall question before the group was: “What would raise oxygen in the ship channel up to the objective level and how could we make this happen on a continuous basis into the future?” He noted the group could finish with this discussion at the December TWG meeting in the hopes of finalizing the issue and determining how to create an operational strategy and the monitoring needed to demonstrate compliance with the DWSC DO objective.

Russ then went through his presentation slides (available on the TWG website) and discussed the following topics:

- The demonstration Aeration Facility and objectives for the testing program
- Information about the three years of testing done at the Aeration Facility to determine the oxygen transfer efficiency and effectiveness for increasing DO in the DWSC
- The costs of running the pumps and supplying oxygen and the cost per pound of oxygen delivered to the DWSC.
- The distribution of the added oxygen in the ship channel
- Tidal movement and net flows in the DWSC
- Different studies by DWR (DO monitoring stations and San Carlos boat surveys), the City of Stockton (RWCF effluent and river sampling), and the University of the Pacific (water quality measurements)
- Calculations of how much of the added oxygen increments remains in the river downstream with time (the added DO increments decrease because natural reaeration is reduced)
- Recommendations for monitoring, operational strategies, and improvements to the Aeration Facility
- Possible DOTMDL accounting procedures for estimating effects of the major factors that influence the DWSC DO concentrations

Questions/Responses/Comments by others

Question: How is the oxygen transfer efficiency curve measured?

Response: The change in DO is measured at the exit from the U-tube. The tube is a double-well design tube that goes down 200 feet to get high pressure. At five percent gas/water ratio, you get a DO increment of 40 mg/l, which is half of what you

might have gotten with 100% of the gas dissolved. For instance, if you pay for 10,000 pounds of oxygen, you would get 5,000 pounds dissolved and going out into ship channel. If operated at six percent gas/water ratio, you can get 10,000 pound of oxygen per day, which was the design goal of the demonstration facility.

Question: Can you please explain the single versus double tube operation?

Response: A single tube has a flow of 25 cfs. If you are running both pumps, they share the 1,000-foot discharge pipe to the diffuser. You lose 15 more feet of head loss and put pressure on the pumps so they can't each pump 25 cfs. Two pumps can discharge 45 cfs (22.5 cfs each). The gas transfer efficiency is the same, but the capacity with both pumps is about 80% more than with 1 pump.

Question: The capacity numbers are the effective oxygen pounds that went out of the diffuser, minus what was wasted?

Response: Yes. The oxygen transfer efficiency is the ratio.

Question: What was the tidal flow reliability at Rough & Ready for earlier studies?

Response: The 2000/2001 studies had some measurement difficulties. With upgraded equipment, the tidal flow data are now more reliable, but the net flow is still uncertain. Dr. Brown indicated he prefers the Garwood or Lathrop stations because at those stations it is easier to resolve the net flow. He doesn't know the actual net flow because there are three locations to measure the same net flow.

Question: For the studies, where is oxygen injected?

Response: The diffuser is 1,000 feet upstream of RRI station at River Mile (RM) 38.

Question: Where does the San Joaquin River enter the ship channel?

Response: At RM 39.5

Question: Did you look at reverse flow or zero flow and the effects of sodium?

Response: No. What would be the effects of zero flow? What would happen to oxygen if there was just tidal flow and no net flow of oxygen? There would still be an added DO wedge in the tidal mixing zone and the DO wedge can be estimated. In the ship channel, there can only be four days of added oxygen at any one time. Under zero flow, a triangle wedge of DO forms and only moves with tidal flow. If there is a reverse flow of -250 cfs, relatively high DO water from downstream would flow through the DWSC so there shouldn't be a need to operate the Aeration Facility. However, if the aerator is operating, the wedge of DO would be pushed upstream.

Question: Did you take a statistical approach to study the effects of the diffuser when it was on versus when it was off?

Response: No, we have not. The patterns of DO increments seem more complicated because of the tidal movement in the DWSC.

Question: As part of the review of the State Water Board and DFG flow objectives for the Delta, there is talk about flow to minimize DO problems. You could eliminate DO problems if you had a certain amount of flow at Garwood in the early 2000s. What would flows need to be now, with current oxygen demands, algae and the city's nitrification process? Is there a chance to require this minimum flow with regulations? Can we incorporate this?

Response: (Russ) was not the right person to answer this; it is a regulatory question. How would the RWQCB like to see this TMDL factor (flow) controlled? They have to resolve that issue. Russ agreed that a daily minimum flow in the DWSC would provide dilution and downstream movement and might eliminate low DO conditions.

Comment: There has also been an argument over where DO is measured and if a mid-column measurement was used, would that be a reasonable measurement?

Response: If the Rough & Ready surface monitor is being used, it will have a high variability. Russ prefers using an early morning value (fully mixed during night) to measure DO compliance. He suggests measurements below the surface layer (with stratification and algae photosynthesis) such as the 10-foot depth that was used for the DWR monitoring stations.

Question: How close to the DO objective does some minimum flow get us? Does aeration get us there to meet the objective or do we need flow management.

Comment: With respect to the DO objective, the 2003 Synthesis report discussed this. Low DO may slow the rate of growth, but will not kill anything. If you average over time, you will not have a major impact. Fall-run Chinook salmon adults may have been inhibited in going thru the channel because of low DO, and this started the studies. Oxygen is higher now, so fish migration studies need to be done again to see if this is still an issue.

Comment: Part of the solution for an averaging period for the DO objective is to have it included in the Basin Plan so you can evaluate the scientific underpinning. You need to put a compliance determination in the basin plan amendment.

Comment: Back in 2003, a basin plan amendment with an averaging period was recommended but it was not incorporated.

Question: Since 6.0 mg per liter (for September-November) is included in the Bay Delta water quality control plan, would the State Water Board have to amend their plan for the Bay Delta?

Comment: Yes, possibly. There are issues regarding how programs are funded and it is difficult to secure funding, go thru the peer-review process, and move ahead. This is exactly what would be needed. The compliance determination in the DWSC is still a question.

Comment: There was an effort to push the State Water Board into the next periodic review of the Bay Delta plan, but it seems the Board wants to stick with the work plan and this issue is not in the work plan, so stakeholders should tell the Board to look at this issue if they feel strongly about it.

Question/
Comment: How does this issue relate to discharge requirements? If this whole process is reopened, there should be a meeting to discuss it.

Question: In terms of controlling optimization when the aeration device is on and off, is that being considered? Are there thoughts about having two monitoring stations that could serve as stations for monitoring the aerator?

Response: Yes, part of the Final Report will discuss long-term operations and monitoring requirements.

Comment: Look at the issue of plankton chlorophyll load and if it can be controlled. What load is allowable so the aerator can be operated at an economically feasible level? What are upstream flow and algae effects? When you can determine what depletions are from sources, I would be anxious to see that data.

Response: The upstream algae pattern at Mossdale is somewhat predictable. We are not trying to track upstream. The entire upstream area is contributing algae. We are not tracking back to the sub-basins, just what algae load is entering the DWSC. The TMDL accounting tool could show how much of the BOD was from RWCF effluent and upstream river algae, and how to determine responsibilities.

Question: Is there a winter mismatch, because you are not getting algae loads coming in from the river?

Response: The low DO concentrations previously observed in the fall and winter were usually from high ammonia going into very low flow. There was a very low dilution of very high ammonia. These ammonia discharges have been eliminated with the City of Stockton nitrification facility since 2007.

Comment: Everything is in transition, especially Old River flows because of the BDCP. We don't have any idea where we are headed with SJR flows and exports, but that will affect DWSC flows and what comes out of this TMDL.

- Response: Yes, the flows are in transition but the TMDL implementation still needs to happen. The Regional Board or stakeholders need to create accounting procedures and determine how the Aeration Facility should be used.
- Comment: Unless there is a barrier at the Head of Old River, no amount of upstream flow will make a difference (according to the TMDL staff report). This means the flow split is too large for delta inflow to make a difference in the DWSC. Without a barrier at Old River, you can't get enough flow at Vernalis to make notable improvements in DO.
- Response: The flow data can be used to demonstrate the effects of pumping on the flow split. Additional flow at Vernalis will increase the flow in the DWSC. The DWSC flows are about 50% of Vernalis flow minus about 5% of the combined export pumping. The DWSC flows are very low when Vernalis flow is less than 1,500 cfs. A gate or barrier at the head of Old River can also be used to manage the flows in the DWSC.
- Comment: I would want to see data to show this. If we know what flow would change the effects in the DWSC and could verify a method to get approved by the State Board for the next amendment, this could be a framework.
- Comment: Overall, this issue needs to be developed and supported by the Regional Board and the Regional Board needs to determine the flow management.
- Question: If this model works, what does it tell you about the operational costs of the aerator? Have you looked at outcomes?
- Response: We can estimate how much we would operate in the future using the historical conditions. We can compare the RRI DO data with the DO objective and estimate when we would turn the aerator on. We would need to decide if we operate one or two pumps and at what capacity. There is a cost range of \$1,000 to \$3,000 per day (for 2,500 pounds to 10,000 pounds). We would know how much the aerator can increase the DO. We could integrate the two other aerators at Dock 13.
- Question: Did you look at substituting air for oxygen and how much you could get at a less cost?
- Response: We did this previously to decide what type of aerator to use. Using air would reduce the capacity to about 20% of the capacity with oxygen.
- Question: Did you look at efficiency of the diffusers over time and the wear, tear and maintenance?
- Response: We are not too concerned about the diffuser. It is working relatively well. We could make improvements to it, like getting rid of the excess bubbles in the diffuser that cause the high DO discharge water to rise towards the surface. The

diffuser is definitely an important part of the system to get oxygen in the channel. It probably will not require a lot of maintenance.

Comment: This accounting tool sounds interesting but it needs funding and contributors to validate Russ Brown's spreadsheet accounting tool. He needs funding and peer reviewed validation in order for his proposal to move forward.

Identify Next Steps

Danielle said the next TWG meeting is proposed for December 14. It will likely be the last of the TWG meetings unless there are contract changes. At that meeting, there will be a presentation by the U.S. Army Corps of Engineers as well as a presentation of the final report on the performance of the aerator. If participants would like to discuss additional topics, let Danielle know.

Christine Joab commented that the TWG would be coming to a close because of the funding of the DWR contract. If stakeholders feel the TWG is important, they need to find a way to keep it moving forward. If stakeholders are interested in funding a portion of the TWG, they should email Bill McLaughlin. He could provide information on the costs to fund the group and see if other stakeholders could contribute.