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CALFED WQTG Meeting

Via e-mail

August 2, 1997

Richard Woodard
CALFED Bay-Delta Program
Water Quality Technical Group
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Dear Rick:

Please find presented below some comments on the July 15, 1997 memo you sent regarding the August 6, 1997 Water Quality Technical Group meeting. Upon receipt of this memo, I faxed the request for the Water Quality Component Report that you indicated should be available on about July 23rd. As of today, I have not yet received this report and, therefore, cannot respond to your request for comments on the "Component Report."

I have submitted three proposals to CALFED to work with CALFED and others in helping to develop a technically valid, cost effective approach for managing excessive mercury bioaccumulation in Delta and North Bay fish, managing the pollution-actual use impairment of receiving waters caused by urban area and industrial stormwater runoff associated constituents, and in formulating an approach for developing a program that would allow the use of some contaminated dredged sediments for beneficial uses in the Delta for levee enhancement and shallow water habitat development. Basically, I am proposing to expand my occasional volunteer commenting on documents and issues to one of becoming an active participant and facilitator in helping to develop and implement programs that CALFED will ultimately need to develop if it is going to address all of the major water quality problems of concern to the Delta in a technically valid, cost effective manner.

I would assume that the mercury and stormwater runoff water quality programs would be part of the Water Quality Technical Group activities. It is unclear to me where the contaminated dredged sediment activity fits in the CALFED program. It is a water quality

issue, although it interfaces with both levee stability enhancement and shallow water habitat development.

If you review these proposals and have questions or comments on them, please contact me.

**Comments on the Draft Framework for the CALFED Bay-Delta Program
Comprehensive Monitoring, Assessment, and Research Plan**

From an overall point of view, I am happy to see that CALFED is beginning to address the issue of properly evaluating the impact of implementing various CALFED programs on Delta water quality and aquatic resources. Far too many times in my over 37 year professional career, I have seen large amounts of funds spent conducting studies and developing programs to manage water quality problems without any follow-up to determine whether the approaches implemented were effective. Often the agencies responsible for implementation of the programs lose interest once implementation has been initiated and either do not have or do not make available the funds needed to determine whether the approach adopted was effective.

As I have discussed in previous correspondence, it is extremely important that the CALFED WQTG focus on assessing impacts of actions on water quality characteristics of concern to people. Far too often those conducting such programs focus on changes in the concentrations in a chemical, such as a heavy metal, as a result of some type of control activity but fail to understand that, with few exceptions, there is a poor coupling between the concentration of the chemical in a water and its impact on the issues of concern to people. For aquatic life related issues, the numbers, types and characteristics of desirable forms of aquatic life must be the focus of the evaluation program. The CALFED CMARP must, if it is to be a reliable program, focus on aquatic organism issues and not chemicals unless it is well established that measuring a chemical concentration is directly translatable to an organism population impact.

On page 1 of the Draft Framework, the first bulleted item mentions Phase I. Phase I is not defined. It should be.

On page 1, first bulleted item under "Principles" states that the CMARP will be implemented through the efforts of others, presumably those responsible for developing and implementing a particular action. This can lead to unreliable assessments since those who develop control programs will have a vested interest in "proving" that their program is effective. CALFED WQTG will need to establish a rigorous quality control of program effectiveness through independent assessment of programs. If there is interest and support, I would be willing to serve as a member of a panel who would help CALFED develop the independent quality control for its WQTG projects outside of the areas I have already proposed to address in my three proposals.

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Belt

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Phase I

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Principles

The second bulleted item under "Principles" states that CMARP is to be devoted to "data evaluation and use." It is my experience that there are few individuals who work in some aspect of the water quality field who have the necessary expertise and experience to properly evaluate and use water quality data. CALFED WQTG cannot rely on the various investigators/implementors of proposed actions to properly evaluate and use the water quality data that will be generated from a CMARP activity. Again, there will be need for independent, high quality peer review of CMARP proposed programs and the results of the control activities as they become available. CALFED WQTG cannot rely on a technical review of the reports developed after the work is done but, instead, must be involved from day one through independent peer review of all components of the work/project.

On the second page of the Draft Framework, the first bulleted item mentions "zero base framework." This should have been defined.

The third bulleted item on the second page mentions a "standardization" of methods, equipment, etc. It is important for CALFED not to fall into the trap of assuming that standardization of equipment, methods, etc. leads to comparable results over time or between locations at the same time. I have a strong analytical chemistry background and for 30 years taught graduate level environmental engineering and environmental sciences water and wastewater analyses courses. I also taught courses on the use of water quality data in the development of water quality management programs. I have also served on various "standard methods" committees for over 35 years. As I published in the late 1960's, there is a "standard methods" syndrome that exists among those who are not familiar with analytical methods and the impact of interferences in these methods that leads to the incorrect conclusion that standardization yields comparable results. This is only true if the amount of interference in the method is exactly the same in all cases. That situation never occurs.

It is my experience that "standard methods" tends to cause investigators to fail to properly evaluate the reliability of the analytical methods being used for the waters being examined. This type of situation is one of the primary reasons why much of the analytical data generated in water quality management programs is of limited reliability. Several years ago, Dr. Jones-Lee and I developed guidance on conducting water quality studies, "Guidance for Conducting Water Quality Studies for Developing Control Programs for Toxic Contaminants in Wastewaters and Stormwater Runoff." This guidance provides additional information on some of the pitfalls of improperly developed and implemented standardized approaches for gathering water quality data. CALFED must be careful not to force standardization for the sake of standardization at the expense of high quality reliable results. Again, I can help with this if there is interest.

Comments on CALFED Water Quality Technical Group - Parameter Assessment Team Recommendations for Ecosystem and Urban Water Quality Targets

Under "Water Column" it states that the National Toxics Rule will soon provide

reference targets for various parameters, including ammonia, DO, and turbidity. It is my understanding that ammonia will not be part of the National Toxics Rule. I doubt that DO and turbidity will be covered by it as well. I have recently been asked to serve as an advisor to the US EPA in reviewing the soon to be released revised draft water quality criteria for ammonia. I was a member of the US EPA peer review panel that reviewed the original ammonia criteria document in the early 1980's. I am, therefore, familiar with ammonia issues and can be of assistance to CALFED in this area.

I am concerned about the statements under "Water Column" regarding target values since the focus seems to be on chemical concentrations rather than chemical impacts. The CALFED program should focus on target values that control the impacts of chemicals on beneficial uses of the Delta and its resources not on the concentrations of chemicals. It is well known that, for most chemicals, there is a poor relationship between concentrations as measured by various standard analytical procedures and impacts. CALFED should not perpetuate the technically invalid approaches that are often used in developing water quality management programs which ignore the basic science that has been available for over 25 years, such as focusing on the toxicity of a chemical rather than on the concentration of the chemical. This was the approach that the National Academies of Science and Engineering recommended in 1972 in their development of the "Blue Book" of water quality criteria. The US EPA initially adopted this approach for heavy metals and then backed off to a bureaucratically simpler but technically invalid approach based on total heavy metal concentrations. The Agency is finally beginning to correct the error that was made in the early 1980's in regulating constituents in water where it is beginning to change from focusing on chemicals to focusing on chemical impacts.

The target values for diazinon and chlorpyrifos should not be chemical concentrations as implied, but should be on the control of aquatic life toxicity that is significantly detrimental to the beneficial uses of the Delta and its tributaries. There is increasing evidence that, in some cases, substantial parts of diazinon and especially chlorpyrifos which are measured in typical analytical procedures are in non-toxic forms. Further, there is considerable justification for questioning the water quality significance of toxicity to a limited number of types of organisms such as *Ceriodaphnia*-like organisms to overall ecosystem health and water quality. These are issues for which CALFED will have to provide support that will need to be addressed as part of its control of organophosphorus pesticide toxicity in Delta tributary waters and within the Delta.

Under "Fish Tissue" it is stated, "in general, it was recommended that NAS guidance numbers be used." This is a significant error and should not be accepted by CALFED. As I have discussed in detail in previous correspondence, the so-called NAS guidance numbers have no technical credibility today. I was involved as a peer reviewer for the National Academies of Science and Engineering "Blue Book" of water quality criteria that was released in 1972. I am highly familiar with how the NAS guidance numbers were developed. They were never intended to be used as the state of California is using them. Unfortunately, someone in the

State Water Resources Control Board did not take the time to find out how these numbers were developed and how they should be used when they adopted them as part of the Toxics Substances Monitoring Program. The US EPA, no other state, the National Academies of Science and Engineering, nor, to my knowledge, anyone else uses the so-called NAS values for critical concentrations of chemical constituents in aquatic life tissue.

A couple of years ago when this issue surfaced again, as part of the Water Resources Control Board Bay Protection and Toxic Cleanup Program (BPTCP), where the State Board staff persisted with using these values even though the error that was made in their adoption was pointed out to them, I contacted Carlos Fetterolf who headed the NAS "Blue Book" development effort. Mr. Fetterolf has now retired. He was Chief Pollution Control Biologist for the state of Michigan. Further, he was the Executive Director for the Great Lakes Fisheries Commission for many years. Mr. Fetterolf was shocked to learn that California had adopted and is still using today the so-called NAS values as reliable, critical concentrations of chemical constituents in aquatic organism tissue. If there is doubt about this situation, I can put you in touch with Mr. Fetterolf. While the State Board staff appears to be locked in to technically invalid approaches for assessing excessive concentrations of constituents in aquatic organism tissue, CALFED should not perpetuate this error.

CALFED should adopt the approach that was used by the San Francisco Regional Water Quality Control Board in assessing excessive concentrations of hazardous chemicals in San Francisco Bay fish which is based on the most recent US EPA guideline values. The US EPA has a large program devoted to hazardous chemical bioaccumulation issues. The Agency has developed a number of guidance manuals for assessing excessive bioaccumulation in aquatic organism tissue. The Agency's current guideline values incorporate current thinking on what is known with reliability today about critical concentrations of potentially hazardous chemicals in aquatic life tissue. As a person who has been actively involved in this area for many years, I strongly recommend that CALFED not accept the recommendation of using NAS values which were developed somewhat off-the-cuff in the early 1970's but instead use the current US EPA guidance for critical concentrations of chemicals in aquatic life tissue. Further, CALFED should not adopt the approach of using an NAS value if the US EPA has not developed a value. This situation almost certainly means that there is not agreement on what the value should be within the US EPA. If there was, a value would be proposed.

Under "Sediment" it is stated, "It was suggested that sediment information collected from the Great Lakes and in San Francisco Bay might be useful in screening for potential problems in the Delta." I am familiar with both the Great Lakes and San Francisco Bay sediment quality data and know that neither have developed standards or guidelines that have applicability to their waterbodies, much less the Delta. I have worked on sediment quality issues for over 35 years and have done over \$2 million in research on this topic. There are no chemically-based, reliable sediment quality criteria. There will never be such criteria that can be used for regulatory purposes because of the complexity of aquatic sediments. I have

published extensively on this topic. Further information on it is available from the papers on my web site (<http://members.aol.com/gfredlee/gfl.htm>).

The approach that CALFED should use for evaluating excessive concentrations of chemical constituents in sediments is the approach that was originally developed and adopted in the 1970's by the US Army Corps of Engineers and the US EPA for regulating open water disposal of contaminated dredged sediments. Based on the Corps of Engineers' \$35 million, five year Dredged Material Research Program results and subsequent work by the US EPA, it was concluded that chemically-based regulatory approaches were technically invalid. The Corps and US EPA instead adopted biological effects based approaches. For example, instead of measuring heavy metals or some other constituent in sediments and then trying to extrapolate to whether the constituent is toxic, the Corps and the US EPA adopted the approach of measuring toxicity directly through the use of toxicity tests. This approach has been used successfully for 20 years. There are standard manuals available that describe how to conduct these tests. I have published several reviews on the issue of regulating contaminated dredged sediments. The following are available as downloadable files from my web site: "Water Quality Aspects of Dredging and Dredged Sediment Disposal," and "Contaminated Dredged Sediment Disposal Criteria."

An area that needs attention is how to interpret the results of the sediment toxicity tests with respect to water quality impacts. Last fall I presented an invited paper at the Water Environment Federation's national meeting that was held in Dallas on this topic, in which I discussed some of the issues that need to be considered in sediment toxicity test results interpretation. This paper, "Evaluation of the Water Quality Significance of the Chemical Constituents in Aquatic Sediments: Coupling Sediment Quality Evaluation Results to Significant Water Quality Impacts," was published in the proceedings of the WEF National Conference and is available as a downloadable file from my web site.

There is need for CALFED to provide leadership and support for developing guidance on how to interpret Delta sediment toxicity test results with respect to their implications for water quality management within the Delta. The basic problem, as discussed in my review of this topic, is that many sediments have natural toxicity arising from low DO, ammonia and hydrogen sulphide that cause the sediments to be toxic to some forms of aquatic life. Waterbodies with highly toxic sediments, however, can also have what are considered by the public to be outstanding fisheries resources. This occurs in virtually every eutrophic lake. Again, I could help CALFED address this issue and formulate a policy for determining what represents ecological or water quality significant sediment toxicity.

The section entitled "Unknown Toxicity" states, "Narrative statements in the Basin Plans should be used. They both essentially say that toxics shall not be present in toxic amounts." While I agree with this approach that all toxicity should be controlled, there are significant problems with implementing toxicity control programs to achieve this objective. The current situation with respect to the organophosphorus pesticides points to the need for

CALFED to assemble a panel of experts to work with CALFED management in developing guidance on what constitutes excessive aquatic life toxicity to warrant development of a control program. I have recently developed a set of notes ("Diazinon and Chlorpyrifos as Urban Stormwater Runoff Associated Pollutants") that review the key issues that CALFED needs to consider in formulating a policy in the control of both known and unknown water column toxicity. These notes are available from my web site.

The Urban Water Quality Target Subcommittee presented a table which for bromide pathogens, salinity, TOC and turbidity is in my opinion appropriate. The section on "nutrients" (nitrate) needs further work. As you know from previous correspondence, I have been working on nutrients as they impact domestic water supply water quality for over 35 years. I am past Chairman of the American Water Works Association national committee for Quality Control in Reservoirs. Under my leadership, this Committee developed several guidance manuals that were designed to assist water utilities in evaluating the sources of aquatic plant nutrients within the water supply watershed that could be causing adverse impacts on the water utilities raw water quality. When I first moved back to California in 1989, this issue in the Delta was one of my major areas of activity. Many water utilities that use Delta water as a raw water source experienced severe water quality problems which are directly traceable to excessive fertilization of the Delta. These problems include taste and odors, shortened filter runs, and, in some instances, increased THM precursors. At that time, I could find no one who was interested in funding the types of studies that needed to be done to evaluate the potential benefits of controlling nitrogen and/or phosphorus inputs to the Delta as they may impact the use of Delta waters for domestic water supply purposes.

The recommendation made by the urban Water Quality Target Subcommittee to decrease phosphorus levels as being desirable is, in my opinion, not based on a adequate, critical evaluation of this issue. It appears to me to be an off-the-cuff comment. As I published some years ago in a U.C. Water Resources Center Conference paper, "Managing Delta Algal Related Drinking Water Quality: Tastes and Odors and THM Precursors," it would be possible to significantly reduce the phosphorus input to the Delta by providing for phosphorus removal in the domestic wastewater discharges to Delta tributaries. There are about 100 million people in the world today that have phosphorus removed from their domestic wastewaters before discharged to the environment. The cost of such removal is about \$0.03 per person per day for the population served.

From my review of Delta data, it appears that at times the Delta produces planktonic algae at the export pumps proportional to the phosphorus load to the Delta. At other times the amount of planktonic algae is far less than predicted based on the results of studying 750 waterbodies located in various parts of the world as part of the international OECD eutrophication studies and post-OECD studies that have been carried out by Dr. Jones-Lee and myself. At one time I had hoped to obtain funds to examine the nutrient load eutrophication response relationships for the various water supply reservoirs that store Delta water prior to use. I never undertook this work because of a lack of funding. This is an area that needs to

be addressed before CALFED formulates a policy on nutrient control as it may impact domestic water supplies water quality. Properly conducted studies in this area could show that phosphorus removal from domestic wastewaters entering Delta tributaries would limit algal growth in down-Delta reservoirs.

The issue of nitrogen fixation is raised as a reason for not controlling nitrate inputs to the Delta by the Urban Water Quality Target Subcommittee. The statement is made, "This is a problem with respect to the growth of blue-green algae, which can fix their own nitrogen." I had a student do her PhD dissertation on nitrogen fixation by blue-green algae in eutrophic waters. Further, I am highly familiar with the literature on this topic. I have found that there are considerable misconceptions about this issue. Before anyone could conclude that nitrogen fixation is an important phenomenon in the Delta and/or down-Delta reservoirs, they would need considerable information beyond that which I know is available today on the factors that influence nitrogen fixation by those blue-green algae that, at certain times, can fix nitrogen. Not all blue-green algae are nitrogen fixers. Further, even those that fix nitrogen only do so under certain conditions, which is not necessarily related to the amount of nitrogen in the water in which they are located. If there is interest, I would be happy to work with CALFED in formulating a program to address this issue. It is one I have worked on at many different locations throughout the world. It is also one in which I am becoming involved in Orange County, California as it relates to nitrogen inputs for Upper Newport Bay.

If you or others have questions about these comments or wish further information on any aspect of them, please contact me. If you wish to explore developing specific CALFED programs in the areas I have indicated that I could be of assistance, please let me know.

Sincerely yours,



G. Fred Lee, PhD, DEE,

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GFL:jw
Enclosure

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