G. Fred Lee & Associates

27298 E. El Macero Dr.
El Macero, California 95618-1005
Tel. (530) 753-9630 • Fax (530) 753-9956
e-mail gfredlee@aol.com
web site: http://members.aol.com/gfredlee/gfl.htm
Please note the new area code for telephone and fax has been changed to 530

Comments on Upper Newport Bay Nutrient TMDLs

January 1998

Hope Smythe
Environmental Specialist IV
Calif Regional Water Quality Ctrl Board
Santa Ana Region
3737 Main Street, Suite 500
Riverside, CA 92501-3339

Dear Hope:

Please find enclosed a set of comments that I have prepared on the Santa Ana Regional Water Quality Control Board's proposed nutrient TMDL for Upper Newport Bay. I find significant technical problems with the approach that has been used to determine the appropriate amounts of nitrogen and phosphorous that can enter Upper Newport Bay in order to manage the excessive fertility problems of the Bay in a technically valid, cost-effective manner. I have worked on nutrient load eutrophication response relationships in many waterbodies located throughout the US and other countries. I find that this nutrient TMDL largely ignores the substantial literature that exists on the aqueous environmental chemistry of nutrients (nitrogen and phosphorus) as they impact the growth of aquatic plants that in turn impact the beneficial uses of waterbodies. Basically the problem seems to be that the Santa Ana Regional Board entered into a consent decree for developing a nutrient TMDL that does not allow adequate time and resources to establish a proper technical base of information needed to manage the excessive fertility of Upper Newport Bay in a technically valid, cost-effective manner.

When I discussed this matter with you, about a month ago, you indicated that there were differences of opinion with regard to the need to focus on some of the key issues that others and I have raised, namely, available forms of nutrients rather than total nutrient concentrations and loads, as well as the nutrient loads that control the excessive fertility problems during the summer vs. annual loads. As I have indicated, based on my experience, having addressed problems of this type in many parts of the world over the past 37 years, I have found that there are individuals who have limited understanding of aquatic chemistry, physical limnology and oceanography and aquatic plant growth who make claims that total nitrogen to phosphorus ratios, or total annual loads are an appropriate basis for regulating excessive fertility in a waterbody such as Upper Newport Bay, which has a short hydraulic residence time. However, when examined from a basic aquatic chemistry, algal physiology, Bay mixing and transport processes, it is found that such claims are based on an inadequate review of key issues. There are also individuals who ignore the fact that nutrients added to a waterbody with a short hydraulic residence time, such as Upper Newport Bay, during the late fall, winter and early spring, are flushed through the waterbody and do not significantly contribute to the excessive fertility

problems of the following summer. Further, the algal available limiting nutrients within the Bay have been unreliably assessed. Total nitrogen and total phosphorus ratios is not a valid basis for assessing nutrient limitation.

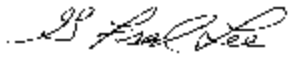
One of the most significant problems of the current TMDL is that it ignores the fact that much of the phosphorus entering the Bay is in particulate forms which is likely to be largely unavailable to support algal growth. As discussed in the attached report, the importance of focusing phosphorus control on available phosphorus loads is a topic area that I and a number of others have addressed. through extensive research and field studies. Based on work in many other locations, the total phosphorus loads under conditions such as exist in Upper Newport Bay, where much of the phosphorus is added in a particulate sediment form, is not available to support algal growth.

I have discussed these and other technical problems in separate correspondence with you on these issues as well as in the attached report. It is my experience that in situations of this type, adoption of technically invalid approaches can result in massive waste of public and private funds in controlling nutrient input, and have little or no impact on the beneficial uses of the water body.

Under conditions where there is controversy on technical issues, the approach that should be followed is to conduct independent peer review of the technical merits of the areas of dispute by an expert panel knowledgeable in the topic area, who operate in a full public arena where any claims about the technical position on the issue must be backed by reliable science, engineering, and to the extent possible, appropriate literature. I am confident that if the issues I have raised, concerning the inappropriateness of using total annual loads of nutrients, the unreliable procedures that are being used to assess limiting nutrients, and the failure to assess available forms of nutrients are peer reviewed by an expert panel of individuals knowledgeable in the topic area, that the conclusion would be that the Santa Ana Regional Board's proposed TMDL would be found in several key respects to be technically invalid. It is important that the Santa Ana Regional Board not allow an inappropriate timetable arising from a consent decree associated with the nutrient TMDL development to prevent proper peer review of issues and the development of a technically valid approach that will address the excessive fertilization problems of Upper Newport Bay in a cost effective manner.

I have incorporated comments on the December 9 staff report on the December 5 TMDL workshop as part of these comments. I have also enclosed a copy of the comments I developed based on the IRWD Upper Newport Bay meeting summary As discussed, these comments cover some of the significant technical problems that exist in properly investigating and managing excessive fertilization problems in Upper Newport Bay.

If you, members of the Board staff, or members of the Board have questions about these comments, please contact me. If there is any way that I can be of help in incorporating more appropriate science and engineering into the Upper Newport Bay nutrient TMDL process, please let me know.



Sincerely yours,

G. Fred Lee, PhD, DEE

Comments on
"California Regional Water Quality Control Board Santa Ana Region Staff Report on the Nutrient Total Maximum Daily Loads for the Newport Bay/San Diego Creek Watershed and Response to Comments Received during the September 12, 1997 Public Workshop"

Dated December 5, 1997

Submitted by

G. Fred Lee, PhD, DEE
G. Fred Lee & Associates
El Macero, CA 95618
PH: (530) 753-9630
FX: (530) 753-9956
e-mail: gfredlee@aol.com
http://members.aol.com/gfredlee/gfl.htm

January 3, 1998

The December 5, 1997 Santa Ana Regional Water Quality Control Board (SARWQCB) nutrient TMDLs for Upper Newport Bay report presents the proposed nutrient (N and P) TMDLs for Upper Newport Bay and San Diego Creek watersheds. Presented below are comments on some of the technical problems with the proposed approach for developing N and P TMDLs for Upper Newport Bay.

Overall Assessment

From the information available, it appears that the Santa Ana Regional Water Quality Control Board staff are trapped, through a consent decree, into a crash program for developing nutrient TMDLs for Upper Newport Bay that does not allow adequate time and resources to formulate technically valid, cost-effective approaches for managing the excessive fertilization problems of Upper Newport Bay. The approach being followed for developing nitrogen and phosphorus TMDLs for Upper Newport Bay does not reflect the substantial literature that exists on how nitrogen and phosphorus compounds impact the growth of algae and other aquatic plants, as well as the impacts of the aquatic plants on the beneficial uses of waterbodies such as Upper Newport Bay. The currently proposed TMDLs for nitrogen and phosphorus have highly significant technical problems that could result in substantial public and private

expenditures for nutrient control, without significantly impacting the excessive fertilization problems of Upper Newport Bay.

There is an urgent need to revise the consent decree deadlines for promulgation of the Phase I TMDL to allow adequate time to do the site-specific investigations that are needed to incorporate the science and engineering associated with managing excessive fertility problems in waterbodies located throughout the world into the development of an approach for managing excessive fertilization of Upper Newport Bay. Specific comments on significant deficiencies on the proposed TMDLs are provided herein.

Specific Comments

Page 2, "DISCUSSION," first paragraph states,

> *"The Regional Board has identified San Diego Creek, Reaches 1 and 2, and Upper and Lower Newport Bay as water quality limited due to excessive nutrients. These nutrients are found in elevated levels in the water column and, to a lesser degree, in the sediments of both San Diego Creek and Newport Bay."*

Based on my review of the water quality characteristics of Upper Newport Bay, I agree that the water quality of the Bay is being limited by excessive growth of algae and that the excessive algal growth is caused by the introduction of excessive amounts of aquatic plant nutrients (nitrogen and phosphorus). Therefore, there is need to investigate the feasibility of controlling the excessive nutrient input to Upper Newport Bay as a possible way to improve water quality in the Bay due to excessive fertility.

Contrary to the implications of the above-quoted statement, there is no way to reliably evaluate the concentrations of nutrients in sediments with respect to causing excessive fertility problems. This is a topic area that I have intensively researched for many years. While sediments do, under certain conditions, contribute nutrients to the water column, in general, sediments are a sink for nutrients as a result of the fact the nutrients in sediments are in general in non-algal available forms.

Far too much emphasis is being placed on nutrients in sediments as a cause of excessive fertility problems in Upper Newport Bay. The nutrients that are driving excessive fertility in Upper Newport Bay are most likely those that are added in late spring and during the summer periods when excessive fertility water quality problems typically occur. The sediments derived from the watershed likely play a minor role in contributing nutrients to the excessive growth of algae that occur in the Bay and its tributaries.

Page 2, "DISCUSSION," first paragraph, states,

> *"The excessive levels of nutrients, combined with the relatively warm water of the Creek and Bay and the mild Mediterranean climate of Southern California, cause the growth of*

green and brown algae in San Diego Creek and blooms of green algae in Upper Newport Bay."

It is the nutrients that are causing the growth. The mild climate and warm waters are not factors. Temperature, while influencing, to a minor degree, the rate of growth of algae, is not a factor that influences the overall eutrophication-related water quality of waterbodies. Some of the coldest waters in the oceans (Arctic and Antarctic) are nutrient rich and produce prolific growths of algae, while some of the warmest waters of the world (the tropics) are nutrient poor and do not grow excessive algae. Tropical waters are noted for their clarity due to a lack of algal growth. Temperature is not an important factor in controlling water quality problems associated with nutrients. The above quoted statement should be modified to focus on nutrients and eliminate the inference that temperature and the mild Mediterranean climate have anything to do with the excessive fertility of Upper Newport Bay.

Page 2, last paragraph, discusses the use of a phased approach for establishing nutrient TMDLs for Upper Newport Bay. While I agree that there is not sufficient information at this time to understand the relationship between nutrient loads to the Bay and the excessive fertility problem, and therefore, in accord with regulatory requirements, a phased approach should be used, it is important that this phased approach for Phase I be accompanied by a detailed, properly developed modeling effort that attempts to relate nutrient loads to excessive fertility. This modeling effort should be followed closely for about five years after new nutrient loads to the Bay are achieved in order to determine how well the predicted nutrient reductions impact the beneficial uses of the Bay as measured by excessive fertility (algal biomass and not nutrient concentrations). Funds should be available to ensure that the models can be adjusted at the end of five years and then again on an on-going basis, such as 7.5 and 10 years, to improve the reliability of predicting nutrient loads on excessive fertility within the Bay. Through a phased approach on nutrient reduction and modeling, it should be possible to eventually develop a nutrient load response model that will, in fact, have some predictive capability for estimating the impact of altering nutrient loads to the Bay on the excessive fertility related water quality problems of the Bay. At this time, there is a poor understanding of these relationships for Upper Newport Bay.

On page 3, "MODELING," second paragraph, the statement is made that the GLEAMS model was used to predict nutrient export from agricultural lands. This type of model predicts annual nutrient export which is appropriate for waterbodies with long hydraulic residence times. However, it is not appropriate for Upper Newport Bay. The primary nutrients of concern in driving the excessive fertility of Upper Newport Bay are the nitrogen and phosphorus added to the Bay in late spring and during the summer. These nutrients are not provided to any significant extent by stormwater runoff; they are associated with the base flow of San Diego Creek which appears to be primarily derived from groundwater sources and irrigation return water.

A key issue that must be incorporated in any valid modeling effort of nutrients derived from various types of land use is the amounts of algal available nutrients derived from a particular land use that are added to Upper Newport Bay during the time that they could stimulate algal growth within the Bay. While the

nitrate and ammonia derived from agricultural and other lands are likely available to support algal growth as they enter Upper Newport Bay, only a small part of the total phosphorus that enters the Bay via San Diego Creek from agricultural sources and, for that matter, other sources such as urban runoff, will be in an algal available form. Proper modeling of nutrients, and especially phosphorus, loads and impacts requires that algal available phosphorus be assessed and used in the model. While phosphorus as an algal nutrient available form issues are well presented in the literature, there seems to have been no incorporation of this information into the Upper Newport Bay phosphorus TMDL. This is a significant technical deficiency that should be corrected.

The bottom of page 4, last paragraph, discusses the limitations of the Tetra Tech modeling found by the staff. From the statements made, it appears that the Tetra Tech modeling was, as expected, found to be unreliable. From the information provided, it appears that the modeling effort that has been conducted is likely to be of limited reliability in developing the information needed to formulate technically valid cost-effective nutrient TMDLs for Upper Newport Bay.

The statement is made on the bottom of page three, last sentence, "*No modeling was conducted of in-bay processes for Newport Bay.*" The fact that the modeling did not consider that most of the nutrients added during late fall, winter and early spring pass through the Bay into the ocean and are not available to support algal growth during the late spring and early summer is a significant deficiency in the current modeling effort. The current nutrient load modeling has no predictive capability in determining the impact of altering nutrient loads on the beneficial uses of Upper Newport Bay.

Page 4, "NUTRIENT TMDL TARGETS," second paragraph, states that the selected goals for nutrient reduction of nitrogen and phosphorus are a five-year goal of 30% reduction and a 10-year goal of 50% reduction in the average annual loads of total N and total P to Upper Newport Bay. The average annual loads of total N and total P are not a reliable basis for formulating TMDLs for managing excessive fertilization of Upper Newport Bay. At least with respect to phosphorus, much of the phosphorus that enters Upper Newport Bay on an annual basis is in a particulate form associated with transport of erosional materials. Most of this phosphorus will not become available to support algal growth in the Bay.

The second problem with this approach is the fact that it is based on total annual loads of N and P. Total annual loads are not appropriate reduction goals. To develop a meaningful TMDL for Upper Newport Bay, it is necessary to focus on reduction of the loads that lead to excessive fertility water quality problems. These are the late spring and summer loads, and do not include most of the stormwater runoff loads derived from fall, winter and early spring since they are flushed through Upper Newport Bay to the ocean and do not contribute to the excessive fertilization problems of Upper Newport Bay.

The statement is made on page 4, fourth paragraph, "*The proposed goal is a 50% reduction in sediment loading over a ten year period.*" This statement reflects a lack of familiarity with the literature on the relationship between particulate nutrients, especially phosphorus, and their impacts on excessive fertility. There is substantial literature on this topic that is not being adequately considered in formulating

the proposed load reductions. This makes the current proposed nutrient load reductions technically invalid and unreliable.

Page 5, first paragraph, states,

> *"The model results indicate that a 70% reduction in loading from the nurseries and the headwaters is necessary to meet the 5 mg/L Total Inorganic Nitrogen (TIN) water quality objective for San Diego,* [Creek] *Reach 2."*

On page 5, the first two paragraphs confirm that the modeling effort by Tetra Tech was of limited value. With respect to the nursery loads, unless the nurseries are a significant contributor to late spring and summer nitrogen and phosphorus loads to San Diego Creek, then they are not significant contributors to excessive fertility of Upper Newport Bay. What must be done is to break down the nutrient load to the Bay from individual sources during the April, May, June, July and August period. If detailed data on various sources are not available for this period, then they must be obtained before a technically valid nutrient TMDL can begin to be formulated for Upper Newport Bay.

Page 5, third paragraph, states, *"The lack of historic data on algal distribution made developing targets difficult."* The issue is not solely the lack of algal distribution data; an equally, if not more, important factor is that the algae of concern are not planktonic algae, but are relatively immobile - attached algae. There are no reliable models that can predict the relationship between nutrient loads or nutrient concentrations in the vicinity of algae of the type that are developing in Upper Newport Bay and excessive fertility water quality problems. The models that are available have applicability only to planktonic algae.

Page 5, last paragraph, mentions a number of limitations related to conservative elements where mention is made of "rising groundwater." It is unclear what is meant by "rising groundwater." The issue is groundwater inputs to San Diego Creek which are high in nitrate. This source is likely to be one of the primary driving forces for excessive fertilization of the Bay during the summer months.

Page 6, under "SOURCES," first paragraph, mentions that the GLEAMS modeling, combined with the literature, has led to a prediction on the amount of nitrogen derived from various types of sources. From the information provided, it is almost certain that this prediction has little or no validity with respect to predicting the amount of nitrogen entering Upper Newport Bay that leads to excessive fertility of the Bay of concern to the public because of its impairment of the beneficial uses of the Bay.

Page 6, under "ALLOCATIONS," the load allocations for nitrogen and phosphorus that have been developed have little technical validity. They appear to be based on technically invalid approaches for assessing nutrient loads on the excessive fertility problem in Upper Newport Bay. They do not properly consider the nitrogen loads that drive the excessive fertility problem that is of concern to the public. They

ignore the well-established facts that significant parts of the total phosphorus associated with particulate inputs are not available to support algal growth.

Page 7, Tables 1 and 2, contain total nitrogen loads from various types of land use. As discussed herein, these values have little reliability in estimating nitrogen loads that are of importance to growing algae in Upper Newport Bay that impairs water quality.

Page 8, Table 3, lists nitrogen loads from various sources and the projected allocations. The nitrogen loads and the projected allocations are not based on a proper evaluation of the nitrogen sources and their significance in causing excessive fertility in Upper Newport Bay. Of particular concern is the urban runoff total nitrogen load in which a significant reduction in the total nitrogen load and stormwater runoff from urban areas must be achieved as part of the TMDL process. The projected nitrogen loads that are derived from urban runoff and those that are allocated for future loads have been developed without properly evaluating the nitrogen loads to the Bay that lead to excessive fertilization that cause the water quality problems of the Bay.

The same problem applies to the agricultural discharges of nitrogen listed in Table 3. The values listed are largely based on inappropriate assessments of nitrogen from agricultural sources that are of importance to the Bay. Basically, the problem is that the nitrogen loads to the Bay that need to be calculated and allocated are those loads that drive the excessive fertility. This approach has not been incorporated into Table 3.

There are no values listed for "rising groundwater" in Table 3. There can be little doubt that groundwater inputs of nitrogen during the summer months is one of the key factors in stimulating excessive growths of algae in Upper Newport Bay. Before any allocations are made, it is important to understand how much nitrogen is contributed to San Diego Creek from point sources, such as nurseries, vs. groundwater inputs and irrigation return waters during late spring, summer and early fall. If these data are not readily available, they should be collected before any attempts to allocate nitrogen loads to control excessive fertilization are undertaken.

Page 9, item 2, "Establish New Waste Discharge Requirements," focuses on the nurseries. From the information provided, it is not possible to reliably estimate the significance of the nurseries as a source of nitrogen that drives the excessive fertility problem of Upper Newport Bay. While this information may be available, it has not been adequately and reliably presented. The proposed approach could result in significant over-estimation of nursery nitrogen input significance which could cause the expenditures of large amounts of money that will have little or no impact on the excessive fertility of Upper Newport Bay during the critical periods of the year when the excessive fertility is of importance to the majority of the public.

Before any decisions are made, as set forth on page 9 under item 3, "Revisions of Existing Waste Discharge Requirements," on the amount of nitrogen that can be discharged, such as 3 mg/L total nitrogen or 1 mg/L total nitrogen, as set forth in items a, b and c, a much better understanding of the significance of

various sources of nitrogen as they contribute to the excessive fertility problems should be achieved. Basically, the Regional Board is developing waste load allocations well in advance of the basic science and engineering that is needed to properly develop a TMDL for nutrient loads to Upper Newport Bay.

Page 9, item 4, "Actions Recommended for Implementation by Other Entities," discusses that the stormwater dischargers from urban areas will be required to submit nutrient management plans for those discharges that have concentrations of nitrogen in excess of 1 mg/L total inorganic nitrogen. This approach could result in large expenditures for nitrogen control programs that have little or nothing to do with the excessive fertility of the Bay. There is no need to spend public or private funds controlling nitrogen inputs to the Bay for those inputs that are flushed through the Bay without contributing to the excessive fertility - water quality use impairment of the Bay when there is little or no stormwater input to the Bay and, most importantly, the previous year's stormwater input of nutrients has been flushed to the ocean.

Page 10, item b, mentions that the Orange County Areawide Urban Stormwater Permit shall be required to submit for approval a BMP for implementation of nitrogen control associated with stormwater runoff. Such an approach could readily result in massive public expenditures for inorganic nitrogen control in stormwater runoff that have little or no impact on the beneficial uses of Upper Newport Bay.

Page 11, Table 4, presents a time schedule for implementation of the proposed TMDL. The schedule is too advanced for the current state of knowledge. It needs to be relaxed by several years while adequate information is obtained on nutrient sources that drive the Bay's excessive fertility water quality problems.

Page 12, under the second paragraph, "Alternative 3," states,

> *"While a longer schedule would allow the collection of further monitoring data and the continued refinement of loading rates and in-stream and in-bay relationships, this does not compensate for the continued impairment of beneficial uses and violation of water quality standards."*

The issue that should have been discussed in this section is the lack of an adequate technical base of information to formulate TMDLs and an appropriate implementation schedule which would ensure that funds spent for nutrient control address real water quality use impairments in Upper Newport Bay. The current program could result in massive waste of public and private funds with little or no improvement in the Bay water quality. There is such an inadequate database on significant nutrient sources during critical periods, as well as the nutrient load eutrophication response relationship that exists for the Bay, that it is not possible to develop technically valid, cost-effective TMDLs for nutrient inputs to the Bay. At least three to possibly five years of properly conducted studies need to be carried out in order to proceed with the development of a technically valid, cost-effective nutrient control program for Upper Newport Bay.

Appended to this report is "Attachment A--Tentative Resolution No. 98-9." On page 2 of this Attachment is a discussion of nutrient targets. As discussed above, these targets are not based on a technically valid assessment of nutrient loads and their impacts on the beneficial uses of Upper Newport Bay.

Similar problems exist with respect to "Attachment to Resolution No. 98-9," page 2, item 2, "Establish New Waste Discharge Requirements." There is an inadequate database at this time to formulate technically valid, cost-effective waste discharge requirements for nutrients entering Upper Newport Bay tributaries from NPDES regulated sources.

Table 5-11 has the same deficiencies as Table 3, discussed above.

One of the significant deficiencies of this Staff Report is the failure to provide detailed information on the monitoring program that will be implemented as part of the Phase I evaluation of the reliability of this approach in addressing the excessive fertility of Upper Newport Bay. In order to begin to support the proposed approach, it is necessary to provide detailed information on this program, since without it, it cannot be certain that Phase II, which could be implemented in five years, will have an improved technical database upon which to formulate nutrient input reduction programs.

Page 3 lists the *Estimated costs of agricultural water quality control programs and potential sources of financing*. No discussion is presented however on the reliability for any of these so called BMP's in effectively controlling available forms of nutrients in runoff waters from various types of land use. While these various approaches claimed to be effective in controlling nutrients, they are primarily effective against particulate forms of nutrients, much of which is in non-algal available forms. Before anyone undertakes control of nutrients through one of these procedures they should be certain that they will in fact be effective in controlling the available nutrient loads that influence the excessive fertility problems of Upper Newport Bay.

Attachment A presents Tentative Resolution No 98-9. Item 4 states,

> *Section 303(d) also requires the allocation of the TMDL among sources of nutrients, together with an implementation plan and schedule that will ensure the TMDL is met and compliance with water quality standards is achieved.*
>
> *Section 5 The adoption of the Basin Plan amendment attached to this resolution is intended to meet the requirements of Section 303(d) of the Clean Water Act through the implementation of measures to control sources of nutrients that provides a reasonable assurance that water quality standards will be met.*

The above quoted sections present an overly optimistic view of being able to achieve a significantly improved eutrophication related water quality in Upper Newport Bay. This Bay may be, like many other waterbodies in the world, where it is not possible to control the nutrient inputs to the Bay sufficiently to significantly change the excessive fertility related water quality of the Bay. Before any TMDL based program is implemented which would lead the public to believing that the expenditure of funds for nutrient control will lead to an improvement of water quality in the Bay, a much better understanding of nutrient load eutrophication response relationships needs to be achieved. Based on the poor understanding that exists now, the situation could be that 10 to 15 years from now after several phased nutrient reductions are implemented, it is concluded that the Bay is still excessively fertile and there's no possibility of controlling the residual nutrients added to the Bay with the financial resources available to achieve the desired eutrophication related water quality. For waterbodies such as Upper Newport Bay which are inherently

naturally fertile, the phased approach could readily lead the public down a path of spending large amounts of money and achieving very little in the way of improved water quality in Upper Newport Bay.

The Board should postpone consideration of tentative Resolution No 98-9 until an adequate database exists upon which to formulate technically valid cost effective TMDL's for control of nutrients entering Upper Newport Bay.

Attachment to Resolution No 98-9.

Page 1, 4th paragraph mentions various types of "models" where it is stated that they will be, "*...used in the future to further refine the algae and nutrient relationships in the Bay*." Great caution must be exercised in relying on models of the type being developed to reliably predict the impact of altering nutrient loads on the eutrophication related water quality of Upper Newport Bay. I have been involved in eutrophication modeling efforts for over 30 years for a wide variety of types of waterbodies in many parts of the world. The Upper Newport Bay eutrophication situation has never been modeled successfully in the past and will not likely be modeled successfully in the future. For a model to be successful, it must have high degrees of predictive reliability for estimating the impact of altered nutrient loads to the waterbody on the eutrophication related water quality. Upper Newport Bay is one of the most difficult systems to reliably model its nutrient load-eutrophication related water quality response relationship. While models can be developed, such models have no predictive capabilities and are little more than computer games.

The information needs for Upper Newport Bay will not be met by modeling. There is a basic need to understand the available nutrient load-eutrophication response relationship that exists in the Bay. This understanding will be achieved through appropriately conducted site specific studies, not modeling. Models can only be used to formulate the results of such studies, they are not a substitute for them.

Page 2 presents the annual loading targets for nitrogen and phosphorus for 2002 and 2007. As discussed herein, these target loads are based on technically invalid approaches. The same situation applies to Table 5-9b. While seasonal target loads are presented in this table there is no adjustment of these loads for the fact that the winter loads do not cause excessive fertilization of the Bay.

Table 5-9b lists the current urban runoff total nitrogen load as 277,131 lbs/yr. The 2002 target urban runoff nitrogen load is about 208,000 lbs/yr. This means that the communities in the Upper Newport Bay watershed will have to remove about 70,000 lbs/yr total nitrogen from the stormwater runoff within 5 years. Further, by 2007, they will have to remove over 117,000 lbs/yr of total nitrogen. As an individual who has done extensive work on nutrient transport from urban areas, I can unequivocally state that achieving that magnitude of nutrient reduction could cause the public to have to spend large amounts of money for treating urban stormwater runoff. Before such a program is adopted by the Board for implementation, there should be reasonable expectation that treating urban stormwater runoff for nutrient control will have a significant beneficial impact on the eutrophication related water quality in Upper Newport Bay. As discussed herein, some of the nutrients present in urban stormwater runoff are in non-

algal available forms and most importantly, are present in stormwater runoff that occurs when their addition to the Bay does not stimulate algal growth. Table 5-9b needs to be redeveloped after several years of appropriately conducted studies to develop the information needed to properly formulate this table.

Page 4, Section 3 ,devoted to Revision of Existing Waste Discharge Requirements, establishes nutrient reductions for NPDES permitted discharges which fails to incorporate the information available on the seasonal differences in the water quality significance of nutrients added to Upper Newport Bay

Page 4 under item 4, Agricultural Activities, requires that agricultural interests which contribute TIN above 1 mg/L to a tributary of Upper Newport Bay shall submit nutrient management plans by January 1, 1999. Page 5, item 5, states that "Urban Stormwater" dischargers must develop BMP's to control nutrient inputs to achieve the targeted loads by January 1, 1999. One year is too short a period to develop credible nutrient management plans for urban and agricultural stormwater runoff. The Board should require that both urban and agricultural interests fund the necessary studies over the next 3 years to define what role , if any, stormwater runoff derived nutrients play in causing excessive fertilization of Upper Newport Bay. Once this is known , then if the stormwater derived nutrients are significant factors in causing excessive fertilization of the Bay, then nutrient control programs can be explored as a means of controlling the available forms of nutrients derived from urban and agricultural sources that lead to excessive fertilization of the Bay.

Page 5, Item 6, Phosphorus states,

> *"The primary reduction of phosphorus loading is expected to be achieved by the implementation of the total maximum daily load for sediment in the Newport Bay/San Diego Creek watershed. The sediment TMDL is incorporated into the nutrient TMDL for the Newport Bay/San Diego Creek watershed by reference. Limits on phosphorus discharges shall be incorporated into the new and revised Waste Discharge Requirements previously listed, as necessary."*

As discussed herein, this approach is technically invalid where it ignores the substantial research that has been done which demonstrates that particulate phosphate associated with erosional material is largely in a non-algal available form. Several years ago, at the request of the International Joint Commission for the Great Lakes, my associates and I presented a review paper titled "Availability of Phosphorus to Phytoplankton and Its Implication for Phosphorus Management Strategies" that was published in "Phosphorus Management Strategies for Lakes", Ann Arbor Press, Ann Arbor, MI, pp 259-308 (1980). This paper presented a review of the work that had been done by various investigators including my students and myself devoted to assessing algal available phosphorus and its significance in eutrophication management. Since completing that review, my associates and I have conducted studies in other locations where we have continued to demonstrate that the total phosphorus load for phosphorus limited waterbodies is a poor predictor of planktonic algal biomass. When the phosphorus loads are corrected however, for

the non-algal available P associated with a high sediment load, reliable predictions are made for the algae present based on the available P load.

Page 5 establishes a regional monitoring program as part of the nutrient TMDL. Such a program is urgently needed. However, it should be implemented and be active for at least 3 to 5 years before target loads are established. Many of the issues that will be addressed listed on the bottom of page 5 and top of page 6 should be addressed before target loads are established. It is important that this monitoring program be based on the vast experience that exists in the world literature, most of which was developed prior to the mid 1980's on eutrophication management.

Page 6 presents a schedule to achieve water quality objectives where the Board will review progress every 3 years. Further, Table 5-9c presents a schedule for achieving the eutrophication related water quality objectives. The timetables that have been established for achieving objectives, etc., are far too accelerated compared to those that will be needed to properly implement the nutrient TMDL's. I have been concerned for many years about how rapidly waterbodies respond to nutrient load changes and have published on this topic. Typically it takes from 3 to 5 years for an entity, once it has received a regulatory requirement (order) to control nutrients to a certain degree, to design, construct and begin to operate the nutrient control facilities/program. Further, typically it takes at least 3 and possibly 5 years of post load reduction monitoring to examine the impact of implementing the reduced loads on the eutrophication related water quality of a waterbody. This period of time is even needed for waterbodies with short hydraulic and nutrient residence times such as Upper Newport Bay because of the year-to-year variation in nutrient loads and algal response to the loads. Therefore, optimistically, Phase II of the Upper Newport Bay TMDL cannot be expected to begin to be formulated earlier than about 15 years from now, where 5 years will be needed to formulate appropriate Phase I nutrient TMDL's.

Page 6 lists the agricultural water quality control costs as being on the order of $0.69 to $4.73 million/year. No information is provided on the cost to urban communities as well as the technical base for the cost to the agricultural interests. Both of these are significant shortcomings in this report that need to be addressed. Further, the public should be informed what they can expect to experience in the way of improved water quality in Upper Newport Bay for these expenditures. The current approach of throwing money at nutrient control and seeing what happens is a technically invalid approach for developing a TMDL for Upper Newport Bay excessive fertilization control.

Attachment B.

Page 2, under Item A, Staff Response, indicates that it is proposed to regulate groundwater dewatering projects based on total annual nitrogen load. This is another of the invalid approaches that prevails through this TMDL report. The limitation on groundwater dewatering associated construction projects should be based on limiting the nitrogen input to tributaries of Upper Newport Bay that can cause excessive fertilization of the Bay. There should be no limitation on groundwater dewatering associated with

construction projects that do not contribute to the excessive fertilization of Upper Newport Bay or cause other water quality problems in Bay tributaries or the Bay itself.

Page 3, under Numeric Targets where it is stated under Item A, "*Concern was expressed that there is not adequate justification for the proposed nutrient numeric targets.*" The staff response is that several investigators have provided anecdotal reports on the amounts of algae that have been present in Upper Newport Bay over the years. The staff further states that the 10 year target nutrient TMDL of a 50% reduction from current annual loadings would reduce the annual load to approximately 1973 levels. Based on my experience, such an approach is not a valid basis for selecting a target load. I have conducted a review of historical as well as current water quality data on Upper Newport Bay where I have found that there is an inadequate database to evaluate 1973 eutrophication related water quality within the Bay as well as nutrient loads to the Bay. Since 1973 there have been substantial land use changes within the Upper Newport Bay watershed which impact nutrient transport and eutrophication response within the Bay. Changes in land use will affect the amounts and delivery rate and delivery times of algal available nutrients added to the Bay. Further, the characteristics of Upper Newport Bay have changed significantly since 1973.

Page 6, 1st paragraph, The Staff Response to comments about the "simplistic" TMDL approach for nitrogen loadings states,

> "*There is a widespread notion that all winter storm flows and related nutrient loadings 'pass through' the Bay and are discharged to the ocean with no net nutrient loading occurring in the Bay. The large winter storms that occasionally occur in Southern California do generally conform to this notion. The Bay does becomes* [sic] *stratified with the freshwater from the watershed 'riding' over the saltwater. It is currently unknown how long after the storm events the flows stay in a stratified pattern and at what discharge rate stratification occurs. The extent to which these flows do or do not provide a net loading of nutrients to the Bay is unknown. Typically during a winter storm season there are also a number of smaller storms that do not produce stratification in the Bay due to their discharge.*"

The above quoted statement fails to recognize the inherently short flushing time that has been reported by the Corps of Engineers in their reports on Upper Newport Bay hydrodynamics. It is not possible for dissolved nutrients to stay within Upper Newport Bay in either a stratified or unstratified condition as implied by the staff comments for extended periods of time where late fall, winter or early spring nutrients could contribute to the excessive fertilization problems found in the Bay the following summer.

Impact of Nutrient Reduction on Aquatic Life Resources of Upper Newport Bay

One of the issues that has not been addressed in these discussions of developing a nutrient TMDL for Upper Newport Bay is that reducing the nutrient load to the Bay could significantly adversely impact the aquatic life productivity of the Bay. There is a well-known conflict between overall aquatic life

productivity in a waterbody and its eutrophication related water quality. Several years ago, my associates and I developed a review paper on this topic. This paper "Effects of Eutrophication on Fisheries," published in *Reviews in Aquatic Sciences*, volume 5, pages 287-305, CRC Press, Boca Raton, Florida (1991), relates the phosphorus load to waterbodies to their eutrophication related water quality and fish biomass. As expected, they are inversely related. The coastal bays of Southern California are important nursery grounds and aquatic life resources for the associated open water-pacific ocean marine resources of the area. Significantly improving the algal related water quality of Upper Newport Bay will be detrimental to the overall productivity of the Bay as a fisheries and other aquatic life resource.

Overall

The December 9, 1997 Staff Report on the December 5 workshop fails to address many of the key issues that must be addressed if a technically valid, cost-effective approach is developed for nutrient control that will significantly impact the excessive fertilization water quality of Upper Newport Bay.

Qualifications to Undertake Review

Dr. G. Fred Lee is president of G. Fred Lee & Associates, an environmental consulting firm located in El Macero, California.

For 30 years, Dr. Lee held university graduate level teaching and research positions at several major US universities, including a Distinguished Professorship of Civil and Environmental Engineering at the New Jersey Institute of Technology. In 1989, Dr. Lee assumed full-time consulting activities through G. Fred Lee & Associates.

Dr. Lee holds a PhD degree from Harvard University in Environmental Engineering and Environmental Sciences and a Master of Science in Public Health degree from the University of North Carolina. He obtained a bachelors degree from San Jose State University.

Dr..Lee has conducted over $5 million in research on various aspects of water quality and solid and hazardous waste management. He has published over 650 papers and reports on this work. He has served as an advisor to numerous governmental agencies and industries in the US and other countries on water quality and solid and hazardous waste management issues.

Dr. Lee has extensive experience in developing approaches that work toward protection of water quality without significant unnecessary expenditures for chemical constituent control. He has been active in developing technically-valid, cost-effective approaches for the evaluation and management of chemical constituents in rivers, lakes, impoundments, estuaries, nearshore marine waters, and groundwaters, domestic and industrial wastewater discharges, contaminated sediments, urban stormwater runoff, solid and hazardous waste, and hazardous chemicals since the 1960s.

One of the primary areas of Dr. Lee's work has been devoted to the management of eutrophication in fresh and marine waters. He has conducted extensive research on this topic and has published over 100 professional papers and reports on this work. A listing of some of his publications in this work is appended to these comments. He has been frequently invited to present lectures and short courses on this work throughout the US and in many other countries. His work on eutrophication management includes serving as the US EPA contractor for developing the US part of the OECD eutrophication studies. He was also an advisor to the international OECD studies. These studies represented a $50 million, five-year effort involving 200 waterbodies in 22 countries in Western Europe, North America, Japan and Australia. Since completing the OECD studies in 1978, he and Dr. Jones-Lee have expanded the OECD database relating nutrient load to eutrophication response relationships to over 750 waterbodies located throughout the world. In addition to serving as a consultant to numerous government agencies on eutrophication management problems within the US, Dr. Lee has served as a consultant to Argentina, Canada, Columbia, Dominican Republic, India, Israel, Italy, Japan, Jordan, The Netherlands, Norway, South Africa, Spain, Tunisia and the USSR.

Further information on his experience and expertise in eutrophication related water quality evaluation and management is available on his web site (http://members.aol.com/gfredlee/gfl.htm) or from him upon request.