Comments on "Draft Functional Equivalent Document Water Quality Control Policy for Guidance on the Development of Regional Toxic Hot Spot Cleanup Plans" Developed by Division of Water Quality State Water Resources Control Board dated March 1998

# G. Fred Lee & Associates

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May 10, 1998

John Caffrey, Chairman State Water Resources Control Board Sacramento, CA 95812

Dear Chairman and Members of the Board:

Please find enclosed my comments on the significant technical deficiencies on the Draft Functional Equivalent Document for the Water Quality Control Policy for Guidance on the Development of Regional Toxic Hot Spot Cleanup Plans. As I have indicated in previous correspondence to the Board, the BPTCP was inappropriately implemented and administered by the State Board staff with a result that if the Board adopts this Policy in its current form, it could readily cause substantial misdesignation and ranking of toxic hot spots and unnecessary economic burden to California. There is need for the State Board to adopt a BPTCP Policy which includes developing technically valid toxic hot spot designation and ranking criteria focusing on assessing real significant water quality use impairments caused by potentially toxic chemicals that lead to significant aquatic life toxicity or excessive bioaccumulation of hazardous chemicals that represent public health threats to those that use the organisms as food.

I would be pleased to answer questions that the members of the Board may have on these comments. I continue to be willing to work with the Board in developing technically valid approaches for designating, ranking and remediation of toxic hot spots within the State's waters. These comments as with my previous comments over the past seven years on the technical deficiencies in the BPTCP are unsponsored. They are presented for the purpose of trying to improve the quality of science and engineering in managing some of the State's water quality problems. I am providing one set of enclosures with the copy provided to W. Pettit. Additional enclosures are available on request. They are also available from my website at http://members.aol.com/gfredlee/gfl.htm.

Sincerely yours,

G. Fred Lee

G. Fred Lee, PhD, DEE

copy to: W. Pettit C. Wilson

GFL:cab Enclosures



Comments on "Draft Functional Equivalent Document Water Quality Control Policy for Guidance on the Development of Regional Toxic Hot Spot Cleanup Plans" Developed by Division of Water Quality State Water Resources Control Board dated March 1998

Submitted by

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In March 1998 the State Water Resources Control Board Division of Water Quality released a draft "Water Quality Control Policy presenting proposed Guidance on the

Development of Regional Toxic Hot Spot Cleanup Plans." Presented herein are comments on the technical deficiencies in the proposed Policy.

# **Overall Assessment**

From an overall perspective, the proposed Policy contains numerous significant technical deficiencies that can readily cause state of California public and private interests to fund contaminated sediment remediation programs which will have little or no impact on the designated beneficial uses of the waters in which the sediments are located. Further adoption of this Policy as proposed can readily cause public and private wastewater and stormwater NPDES permit holders to significantly increase the cost of treatment of the wastewater before discharge because of alleged contributions to toxic hot spots where such treatment will have little or no impact on the designated beneficial uses of the wastewater discharge and stormwater runoff. There is need for a toxic hot spot management program in the state. The proposed Policy falls far short of meeting this need in a technically valid, cost-effective manner.

The draft Policy is an outgrowth of the Bay Protection and Toxic Cleanup Program (BPTCP) that was initiated in 1989 and administered by State Water Resources Control Board staff. The State Board staff responsible for the BPTCP have created a program that is leading to a Policy that is strongly contrary to the public's interests. As I have discussed in the past, there are water quality problems with certain contaminants in aquatic sediments that are adverse to the beneficial uses of the waterbodies associated with the sediments. Unfortunately, the BPTCP State Board staff have chosen to ignore what has been known in the literature for years of how to identify these problems and begin to control them in a technically valid, cost-effective manner. The BPTCP was inappropriately developed and executed. Even though several million dollars per year of fee-based funding were spent since 1989 in program administration and data collection, there is still an inadequate, unreliable database upon which to properly designate and rank toxic hot spots in the state.

Further, to the extent that it has been possible based on information released by the State Board staff, I have followed closely the development and implementation of the BPTCP. I have provided extensive comments on the significant technical deficiencies in this Program. With the development of the BPTCP Advisory Committee, I provided this Committee with extensive comments on the significant technical deficiencies in the proposed approaches that the State Board staff presented for designating and ranking toxic hot spots. The comments presented herein are summaries of key issues that need to be addressed by the State Board before adoption of this Policy. Additional information on these issues has been provided in previous comments. I request that my previous comments to the State Board and to the BPTCP Advisory Committee become part of the administrative record for these comments on the proposed BPTCP Policy.

# Recommendation

Because of the significant misapplication of public and private funds in toxic hot spot clean-up and prevention that will result if the proposed designation and ranking criteria are adopted, it is essential that the State Water Resources Control Board conduct a detailed economic analysis of the cost to California associated with the use of the unreliable approaches for designating and ranking toxic hot spots.

The State Board should adopt a BPTCP Policy that will enable the appointment of an independent expert panel that will develop reliable toxic hot spot designation and ranking criteria. The criteria should focus on reliably assessing real water quality use impairments of significance to the public in the state's waters and their associated sediments that are caused by toxic chemicals. When these criteria have been developed, then any potential toxic hot spot should be examined by a panel of experts who have the ability to reliably determine whether there is sufficient data to designate a site as a toxic hot spot that requires remediation and/or chemical constituent input control to a waterbody.

# **Background to these Comments**

This proposed Policy focuses primarily on contaminated sediment issues as they may impact the designated beneficial uses of the state's waters that are covered under the BPTCP regulations. As summarized in the enclosed Statement of Qualifications, my academic background in environmental sciences, public health and environmental engineering which includes a bachelor's degree from San Jose State University, a master's degree from the University of North Carolina and a PhD from Harvard University, coupled with 30 years of university graduate-level teaching and research during which I conducted over \$5 million in research and published over 500 professional papers and reports, enables me to comment with considerable expertise and experience on the significant technical deficiencies in the proposed BPTCP Cleanup Plan Policy. Over \$2 million of my \$5 million university research effort has been devoted to evaluating the water quality significance of constituents in contaminated sediments and their management.

I have published extensively on contaminated sediment issues. A number of these publications discuss specific deficiencies with the approach that the State Board staff have used in designating and ranking toxic hot spots. Of particular concern is the approach that has been used to incorporate chemical information into the sediment quality triad. In my previous comments on the BPTCP, I have repeatedly pointed out, as has been extensively discussed in the literature, that the approaches that the State Board staff adopted early in the BPTCP and have persisted with, using co-occurrence-based approaches for incorporating chemical information into assessing the water quality significance of chemicals as they may impact the beneficial use of waterbodies, are obviously technically invalid. The co-occurrence-based approach utilizes total concentrations of constituents in sediments, rather than toxic - available forms. For most constituents in sediments, only a small part of the total concentration is available to adversely affect aquatic life or to bioaccumulate in aquatic organisms. It has been well documented since the late 1960s that there is no relationship between the total

concentration of constituents in sediments and their impact on aquatic life or their availability for bioaccumulation. A list of my papers and reports pertinent to these issues is appended to these comments. Copies of these papers and reports are available from my website (http://home.pacbell.net/gfredlee/index.html) as downloadable files. These should be incorporated into the administrative record for review of this Policy.

# **Specific Comments**

Page xiii, under "Introduction," third paragraph, states

"The RWQCBs shall prepare their regional toxic hot spot cleanup plans in accordance with this Policy. Any site-specific variance from the Policy shall be approved by the SWRCB Executive Director."

This should be changed so that the public has the opportunity to critically review any proposed change in the Policy before adoption by the State Board Executive Director. There have been repeated, significant problems with the State Board staff not following technically valid approaches in the development and implementation of the BPTCP. These problems were brought to the attention of the Executive Director, but were not corrected. Under this proposed arrangement, this type of technically invalid approach could persist in the future where the public would not have the opportunity to comment on the adequacy of the proposed variance from the Policy.

Page xiv, under "Monitoring Approach," states

"The BPTCP has used effects-based measurements of impacts using the sediment quality triad (sediment toxicity, benthic community structure and measures of chemical concentrations in sediments) to identify toxic hot spots in California enclosed bays and estuaries."

That is a gross over-statement of what has actually been accomplished by the BPTCP. The database developed by the BPTCP for designating and ranking toxic hot spots falls far short of providing the adequate and reliable database for designating and ranking toxic hot spots in many areas of the state which can then be used as a basis for developing clean-up plans. As has been discussed extensively in my previous comments, chemical concentration of constituents in sediments is not a proper measure of the chemical component of a sediment quality triad. The chemical concentration information in which total concentrations of a constituent are used to designate and rank toxic hot spots has been known since the 1960s to be a technically invalid measure of potential impacts of chemicals in sediments. There is no relationship between the total concentration of a constituent in sediments and its impact on aquatic life or other beneficial uses. As discussed in the enclosed papers, chemicals in sediments have been known since the 1960s to impact aquatic life through toxic - available forms. The toxic - available forms of constituents in sediments is not proportional to the total concentration of the chemical, but is dependent on the concentration of constituents in the sediments that detoxify the chemical constituents. At no place in the BPTCP has

there been a proper incorporation of the toxic - available forms of constituents. This can only be done through a proper, sediment-based toxicity investigation evaluation (sediment TIE). The BPTCP was set up inappropriately with respect to measuring constituents in sediments that can impact the toxicity of many of the key chemical constituents that can cause a sediment to be listed and ranked as a toxic hot spot.

It is important to note that the State Board staff have persisted with the technically invalid approach of using co-occurrence-based values based on Long and Morgan's values. While these are sometimes characterized inappropriately as NOAA values, NOAA has made it clear that these are not NOAA values, but Long and Morgan, two NOAA staff, derived values and do not have the endorsement of NOAA. As discussed in the enclosed papers, other NOAA staff have shown that the Long and Morgan co-occurrence values which the State Board staff proposed to use in the BPTCP toxic hot spot designation and ranking are less reliable than flipping a coin in predicting whether sediments are toxic. The regional and State Board staff can, by flipping a coin, be more correct in estimating whether a sediment is toxic than by using the State Board staff's recommended approach utilizing co-occurrence-based values.

In that same paragraph, the statement is also made *"The first step is to screen sites using toxicity tests, benthic community structure, or measures of chemicals in sediments or tissues."* Once again, this is a significant over-statement of what was done with respect to measurement of chemicals in tissue. The State Board staff in setting up the BPTCP ignored what should have been and based on a recent legislative hearing has now been recognized as the most important issue associated with potential impacts of constituents in sediments, namely their bioaccumulation to excessive levels that render fish or other edible aquatic organisms unusable as human food. This deficiency in the staff's BPTCP was pointed out early in the Program, yet the State Board staff did not correct this deficiency. It was only because of the San Francisco Regional Water Quality Control Board, as the result of threat of litigation by environmental groups, was a consideration of tissue residues of hazardous chemicals as they might be derived from sediments included as a key issue in the BPTCP toxic hot spot designation and ranking for the San Francisco Bay area.

There was no work done in the BPTCP to develop a key area with respect to bioaccumulation of hazardous chemicals, namely how Regional Boards, the public and others can determine whether chemical constituents in sediments are in an available form for bioaccumulation in higher trophic-level organisms. As discussed in my previous comments to the BPTCP Advisory Committee, I pointed out that the BPTCP staff was making a significant error in their comments to the Committee about how the State Board would proceed to evaluate the significance of the constituents in sediments that tend to bioaccumulate where the State Board staff would use total concentrations of constituents in sediments as a measure of the forms that are potentially bioaccumulated. It has been known since the 1960s that such an approach is technically invalid. A discussion of these issues is provided in a 1978 report (Lee *et al*, 1978 and Jones and Lee , 1978), as well as more recent update and review of this topic (Lee and Jones-Lee, 1993; 1996).

In 1991 during one of the few times that there was opportunity for the public to formally provide comments to the Board on the significant technical deficiencies with the BPTCP as it was being developed and implemented, Dr. Jones-Lee (my wife) and I provided detailed comments (Lee and Jones, 1991) on the potential significant problems with the State Board staff's proposed approaches. One of the key issues at the time was that the BPTCP was being conducted without the opportunity for public input or review. Then Chairman Maughan of the Board assured those present at this State Board meeting that in the future the BPTCP would be conducted with full public review. In fact, it was not; the State Board staff continued to be able to spend several million dollars per year with no accountability on how the money was spent and without having to develop any reports covering these expenditures. Year after year, comments were submitted to the State Board with respect to the continued funding that there is need for accountability. No action was taken by these State Boards or their senior staff in correcting these problems. These problems have now come home to demonstrate the significant deficiencies that were discussed as would occur if this Program were not corrected.

Page xiv, "Monitoring Approach," second paragraph, states "*The description of the monitoring approach shall be presented in the cleanup plan.*" The Regional Boards should be required also to discuss as part of this presentation the significant deficiencies in this monitoring approach in properly designating and ranking toxic hot spots where the Regional Board staff delineate the database that is needed to properly determine whether chemical constituents present in sediments which are being considered as toxic hot spots are, in fact, causing a significant adverse impact on the beneficial uses of the waters associated with the sediments that require the expenditure of public and/or private funds for their remediation.

Page xiv, section 5, first paragraph, states "A priority ranking of all THS (including a description of each THS included a characterization of the pollutants present at the site)." The Regional Board staff, with few exceptions, do not have the data from the BPTCP or other sources to carry out the guidance provided in the proposed Policy to properly characterize a Porter-Cologne pollutant. The Porter-Cologne Act defines a pollutant as a constituent that impairs the beneficial use. Because of the inappropriate approach that was used by the State Board staff in developing the BPTCP, the focus was not on pollutants, but on chemical constituents. The staff did not incorporate into the BPTCP the kinds of studies that are needed to couple true pollutants, i.e. those constituents which impair use, in sediments to an impairment of beneficial uses.

Page xiv, section 5, second paragraph, states "*The RWQCBs shall use the definition of a candidate and known toxic hot spot listed in this Policy to identify toxic hot spots.*" As discussed herein, the proposed approach for identification of toxic hot spots is technically invalid and can readily lead to an inappropriate designation. The ranking of toxic hot spots will almost certainly be done incorrectly because of the inappropriate approach that has been presented for ranking toxic hot spots by the State Board staff.

Page xv, item D, "Reason for Listing." The Regional Board staff should be required not only to present the reasons for the site or station being listed as a toxic hot spot, but also present a discussion of the technical validity of this listing based on what is known about how chemical constituents impact the designated beneficial uses of a waterbody. The public who ultimately has to pay for the contaminated sediment remediation is entitled to know how reliable the designation of toxic hot spots is for each site.

Page xv, item E, "Pollutants present at the site." The State Board staff in developing this write up is using the term "pollutant" as synonymous with "chemical constituent" and has ignored the Porter-Cologne definition of a pollutant, i.e. a constituent that impairs use. The term "pollutant" should only be used in accord with the Porter-Cologne definition where there has been adequate work done to ensure that a chemical constituent present in sediments is, in fact, in a toxic - available form and not, as commonly occurs, in an inert form.

Beginning on the bottom of page xv and continuing through xviii is a listing of the information that the RWQCBs show compiled for "high priority" ranking of toxic hot spots. On page xvi, section A, "An assessment of the areal extent of the toxic hot spots," The assessment of an areal extent should be based on toxicity and organisms assemblage alteration. It should not be based on chemical concentrations unless the chemical concentration data are tied to a TIE investigation that focuses on defining the toxic - available forms of the constituents responsible for the toxicity or release of bioavailable forms of constituents which result in excessive concentrations in aquatic life tissue.

Page xvi, item B, "An assessment of the most likely sources of pollutants (potential dischargers)." Again, from the information available, regional water quality control boards will not be in a position to designate sources of pollutants, i.e. constituents that are impairing use. The best that they can do is to indicate that based on the chemical measurements made, some elevated concentration of a constituent or group of constituents may be responsible, some of which may not have been identified in the studies conducted. In order for the Regional Boards to carry out item B, there will be need to conduct extensive studies at each site to properly define what is the real pollutant(s) responsible for the toxicity. It would be inappropriate to use the cooccurrence-based values, i.e. total concentration-based issues to estimate the true pollutant concentrations responsible for toxicity, i.e. use impairment which is causing the designation of a toxic hot spot. In order for the Regional Boards to carry out this requirement, there will have to be conducted fairly detailed appropriate aquatic chemistry studies, i.e. fate, transport and transformation studies, which relate the chemical forms in a particular discharge to the concentrations of constituents in a particular sediment that are responsible for toxicity. There is no way to relate these two based on total concentrations of constituents in a discharge, or even particular forms of constituents in a discharge, to those that accumulate in sediments in a particular location that would cause aquatic life toxicity - excessive bioaccumulation. This draft Policy approach, as proposed, will lead to extensive litigation by potential PRPs since

the guidance provided in the proposed Policy is obviously inadequate to properly designate Responsible Parties for a toxic hot spot in most situations.

When this issue was raised at a BPTCP Advisory Committee meeting, the State Board staff responsible for shepherding the BPTCP indicated that the approach that should be used is to base this on total concentrations of constituents in a discharge. As was pointed out in my comments, that approach, while bureaucratically simple to administer, is obviously technically invalid and reflects a 1960s level of understanding of aquatic chemistry as it relates to chemical constituents in sediments impacting beneficial uses of waterbodies.

Page xvi, item C, states "A summary of actions that have been initiated by the RWQCBs to reduce the accumulation of pollutants at existing THSs and to prevent the creation of new THSs." Once again, the State Board staff in proposing this approach have ignored the Porter-Cologne definition of pollutant and have erroneously assumed that there is some way to relate the total concentrations of a constituent in a discharge and/or in a sediment to water quality impacts. The Regional Boards will not have the information based on the BPTCP database to reliably identify a source of real pollutants that accumulates in sediments that are adverse to the designated beneficial use of a waterbody and therefore they will not be able to carry out this requirement in a reliable manner. This will put virtually every BPTCP cleanup plan involving a designation of Responsible Parties into the courts based on the fact that the guidance that the State Board staff are providing to the State Board for this Policy is inadequate.

Page xvii, item D, "Preliminary assessment of actions required to remedy or restore a THS to an unpolluted condition including recommendations for remedial actions." In order for the State Board staff as part of their draft guidance referred to a National Academies overview review of the kinds of approaches that are used for remediation of contaminated sediments. Those familiar with this area, however, understand that the NAS review falls far short of providing the Regional Board staff with the site-specific information they need to develop a credible assessment of the required

actions to remedy and restore to an unpolluted condition at a toxic hot spot as required under item D. This is another example of how the State Board staff have failed to provide proper guidance to the Regional Board staff on remediation issues. Those familiar with this topic area know that this requires extensive appropriate engineering evaluations which cannot be adequately derived from an appendix of a guidance document as proposed by the State Board staff.

Page xiv, item E, instructs the Regional Boards to provide cost estimates in the cleanup Plan. Again, as with section D, any cost estimates based on the information provided by the State Board in the draft guidance would be of little or no value in properly defining the true costs of remediation of a toxic hot spot. The State Board staff are significantly deficient in the engineering expertise necessary to provide guidance in this topic area. Page xvii, item F, instructs that the Regional Board make an estimate of recoverable costs from potential dischargers. The State Board staff through this proposed Policy are creating an "aquafund" where potential Responsible Parties can legitimately take these matters to the courts and likely show that the designation and ranking of toxic hot spots under this proposed guidance has little or no technical merit. The net result is that any attempts to recover costs from a PRP clean-up of a site at most sites will likely cost the public and the state considerable funds in support of litigation.

Page xvii, from Items D through G, is the State Board staff's "aquafund" which will have even greater problems in implementation than the US EPA's Superfund. The public will be the losers because massive amounts of public funds will be spent unnecessarily because of the inappropriate approaches recommended in the Policy for designating and ranking toxic hot spots as well as designating PRPs.

At one of the BPTCP Advisory Committee meetings, questions were raised about whether there was need for this Policy and why the issues raised could not be handled as part of normal Basin Plan requirements. This is an issue that the State Board needs to carefully consider. As it stands now, the State Board staff are recommending to the State Board a massive Aquafund program in which attorneys and their consultants will become rich at the public's expense because of the inadequate approaches used by the State Board staff in developing, implementing and now recommending the Policy covering toxic hot spot designation, ranking and clean-up plans. One of the most significant consequences of this inadequately proposed, implemented and developed Policy is that the Regional Boards who are already seriously short on staff to meaningfully address real water quality issues will be forced because of the inadequacies of the proposed Policy to have staff time and resources devoted to litigation-related issues as opposed to water pollution control programs.

Basically, the State Board needs to start over with respect to designating and ranking toxic hot spots where a full public peer review process is used to develop a consensus among all stakeholders on how to designate and rank toxic hot spots to protect the beneficial uses of the state's waters without significant, unnecessary expenditures for chemical constituent control. This starting over should not be done through the current State Board staff. They have been shown to be incapable of properly recognizing and addressing key fundamental technical issues that must be incorporated in this Policy.

Page xviii presents a definition of toxic hot spots. Under "Candidate Toxic Hot Spot," item 1, it is stated,

"The site exceeds water or sediment quality objectives for toxic pollutants that are contained in appropriate water quality control plans or exceeds water quality criteria promulgated by the U.S. Environmental Protection Agency (U.S. EPA)."

The exceedance of a water quality or sediment quality objective for toxic pollutants is not an appropriate criterion for designating a toxic hot spot. There has been general agreement at BPTCP Advisory Committee meetings that the original legislation establishing the BPTCP, which included the exceedance of a sediment or water quality objective as a parameter for designating toxic hot spots, was in error. This issue has been discussed for a number of years, yet the State Board staff, staff management and the Board have not taken action to have the legislature correct this error. Those familiar with the most elementary aspects of water quality criteria and sediment quality objectives development know that these criteria or objectives are based on worst-case assumptions and that there can readily be and usually is exceedance of the criterion/objective without adverse impact. This designation parameter needs to be changed to focus on exceedance of water quality or sediment quality objectives for potentially toxic or bioaccumulatable pollutants which are in forms that have a significant potential to be adverse to the beneficial uses of the water body in which the sediments are located.

# Page xviii, item 1, second paragraph, states

# "This finding requires chemical measurement of water or sediment, or measurement of toxicity using tests and objectives stipulated in water quality control plans."

One of the most significant deficiencies with this guidance is that there is no requirement that appropriate aquatic chemistry - toxicology information be developed through TIEs to determine whether the exceedance of a worst-case water quality criterion/objective for water or sediments, in fact, results in an impairment of the beneficial uses of a waterbody that should cause the public or private entities to spend funds to control the constituent input and/or to remediate the sediments in which the constituents have accumulated.

#### Page xviii, item 2, states

# "The water or sediment exhibits toxicity associated with toxic pollutants that is significantly different from the toxicity observed at reference sites..."

The State Board staff have persisted with this "associated-with approach" in their development of the BPTCP and the proposed Policy. Those with an elementary understanding of aquatic chemistry and how chemical constituents in water and/or sediments impact the beneficial uses of a waterbody know that the association/co-occurrence approach is not a valid approach for assessing whether a chemical constituent is the cause of toxicity at a particular location. There is a substantial literature which shows that the State Board staff's proposed approach for this Policy of associating the concentrations of chemical constituents with toxicity is technically invalid and can readily result in massive waste of public and/or private funds in remediating sites because of this association where the real cause of the toxicity is due to other constituents. A 1960s level understanding of aquatic chemistry and toxicology should not, as proposed in the State Board staff's Functional Equivalent Document for the Policy, be the basis for designating toxic hot spots.

#### Page xix, first paragraph, states

# "Toxic pollutants should be present in the media at concentrations sufficient to cause or contribute to toxic responses in order to satisfy this condition."

This is an attempt by the State Board staff to justify the use of Long and Morgan or MacDonald co-occurrence-based values which have been repeatedly proven to be less reliable than flipping a coin for estimating toxicity. If the State Board accepts this approach, it will find itself in justified litigation where every potential PRP can take this matter to the courts through the Regional Board and State Board appeal process and potentially, if it receives appropriate judicial review, be determined to be inappropriate. Rather than using an obviously technically invalid approach as recommended in the above-quoted sentence, what should be done is to conduct the studies necessary to demonstrate whether the constituents of potential concern are, in fact, in a toxic available form at sufficient concentrations and for sufficient duration to be significantly adverse to the beneficial uses of a waterbody in which the constituents are located.

# Page xix, item 3, states

"The tissue toxic pollutant levels of organisms collected from the site exceed levels established by the United States Food and Drug Administration (FDA) for the protection of human health, or the National Academy of Science (NAS) for the protection of human health or wildlife."

This is another of the significant technical deficiencies of the State Board staff that has been discussed in detail in previous comments provided to the BPTCP Advisory Committee and the State Board. First, the FDA values are not necessarily protective of human health in accord with what is known about the potential impacts of hazardous chemical constituents bioaccumulating in edible aquatic organisms. The US EPA Region 9 has developed guidance values which, in general, are more protective. These were, in fact, used as part of the BPTCP by the San Francisco Regional Water Quality Control Board.

On the other hand, the so-called National Academy of Science (NAS) values are not valid values for making such assessments. I have provided detailed discussions of this issue to the State Board, their staff management and to the BPTCP Advisory Committee. As I have discussed in previous correspondence, I was part of the National Academies of Science and Engineering 1972 "Blue Book" review of water quality criteria where I was asked to be a peer reviewer of the then draft criterion document. I understand how the various criterion values were developed. I was shocked when I returned to California in 1989 and found that the State Water Resources Control Board and various Regional Boards were using so-called NAS values for excessive bioaccumulation.

I pointed out the NAS/NAE values, which is the proper terminology since both academies were involved, were not values that should be used today or even in the early 1970s as critical concentrations upon which regulatory programs are based; these values were best guesses in the early 1970s of what was known about potential

concentrations of concern. The State Water Resources Control Board staff, who were not involved in the NAS/NAE review, assumed that the "Blue Book" values had far greater significance and reliability than they deserved. While I pointed out the significant error being made by the State Board and Regional Board staff with respect to these values, the State Board staff have persisted with their use, even though they are without technical validity. When I saw that this situation was occurring, I contacted the National Academies panel currently responsible for bioaccumulation of constituents in fish tissue and asked them if they recognized the 1972 NAS/NAE critical concentrations of constituents as reliable guidelines. The staff and the person responsible for this panel indicated that they had never heard of the NAS/NAE 1972 critical concentrations. They are not recognized by the US EPA, the National Academies or, for that matter, any other state as being reliable values.

I understand that the State Board staff responsible for the Toxic Substances Monitoring program contacted a US EPA staff member regarding my comments on this situation, and this staff member who was obviously not involved in these issues, indicated that if the State of California wanted to use these values, the US EPA Region 9 had no problems with their use. Obviously they have no problems since they are at least as strict as the FDA values.

Those familiar with the modern water quality literature know that the US EPA as part of its Great Lakes Initiative made extensive efforts to try to develop critical concentrations of chemicals in fish as they may impact higher trophic level wildlife. Except for PCBs, they were unable to do so. It is important to note, however that they did not select the NAS/NAE values as values that should be used for this purpose. The US EPA understood that these values are not reliable for this purpose.

As I have discussed previously, I contacted Carlos Fetterolf who was the NAS/NAE coordinator for the "Blue Book" review. He is former head of water pollution biology for the state of Michigan and was for many years Executive Director of the Great Lakes Fisheries Commission. He has now retired from these positions. Several years ago when I discussed this situation with him of the State of California Water Resources Control Board using so-called NAS values for judging excessive concentrations of chemical constituents in fish tissue, he was shocked that the State of California was following this approach. I reported this to the BPTCP Advisory Committee indicating that Mr. Fetterolf had offered to discuss this matter with anyone interested. Rather than following a technically valid approach of correcting errors that had been made by the State Board staff in trying to use so-called NAS values, the State Board staff have, in this draft Policy, incorporated these values as regulatory tools for implementation of the Policy. This is yet another example of the obvious lack of technical validity of the foundations for the proposed Policy.

In Table 1 which lists the NAS, FDA and US EPA limits relevant to the BPTCP, the column "NAS Recommended Guideline (Whole Fish)" should be deleted. It is not valid and the values presented have no place in assessing toxic hot spots.

The State Board must put a stop to its staff persisting with this obviously technically invalid approach where so-called NAS values are used for any purpose. Those who contrive this approach were obviously not involved in the original NAS/NAE review that took place in the early 1970s. They and those who continue to use them have never taken the time to critically review how these values were established relative to what is known today.

Page xix, section 3, second paragraph states, "Acceptable tissue concentrations are measured either as muscle tissue (preferred) or whole body residues." Again, the State Board staff are off-base with respect to making appropriate recommendations. The only reliable values available for excessive concentrations of bioaccumulatable chemicals are the edible tissue values. While there may be wildlife effects which would be based on total concentrations in the whole body residues, there is insufficient information to make this assessment, except for PCBs which were developed in the US EPA Great Lakes Initiative (GLI). For the State Board staff, to assert that the State Board should adopt a Policy that states that if there are no edible tissue residues, that it is appropriate to use whole organism residues, is another of the significantly technically invalid approaches that are proposed by the staff.

With respect to deployed organisms vs. resident species discussed in the next sentence, a former NOAA employee responsible for the Musselwatch Program, (Salazar, et al.1995) has pointed out that there are significant problems with trying to use Musselwatch data for regulatory purposes. This is associated with the fact that minor changes in the characteristics of the organisms deployed can have a significant impact on the tissue residues. This makes any tissue residue that is even close to a critical value subject to justified questioning as to whether the concentrations in the deployed organisms were, in fact, above a critical value or were the result of how the deployment of the organism took place. Basically, Musselwatch data is not, as is currently being collected, reliable for regulatory purposes. It can be used as an indication of a potential problem. Site-specific resident species measurements should be made to determine whether or not there is, in fact, excessive bioaccumulation of hazardous chemicals in edible organisms that are being consumed or potentially consumed by the public.

Page xx, "Fin-fish," states "*A minimum of three replicates is necessary*." The guidance provided is not adequate to reliably determine whether excessive tissue residues are present. OEHHA guidance should be used for this purpose.

Page xx, Item 4 states, "Impairment measured in the environment is associated with toxic pollutants found in resident individuals." This is another of the deficient, technically invalid approaches proposed by the State Board staff. Those with an elementary understanding of how chemical constituents impact organisms in which a tissue residue exists or higher trophic-level organisms that use the organisms with elevated tissue residues as food know that it is not technically valid to "associate" toxic pollutants found in resident individuals with water quality impacts.

Again, this significant error was pointed out to the State Board staff in comments on earlier documents developed as part of the BPTCP. The State Board staff have, without responding to these comments, persisted with an obviously technically invalid approach. As discussed above, association with toxic pollutants is not a valid approach. Highly competent individuals have been trying for years to associate tissue residues within organisms to organism impacts without success. An independent peer review by qualified experts would show that the situation today is that we cannot associate tissue residue concentrations to impact on the organism in which the residues are present. The State Board staff are trying to create a pseudo-science association where abnormal development, reduction of the reproductive capacity, reduction in growth or histopathological abnormalities are tied to specific chemical constituents measured in an organism tissue. This section of the proposed Policy must be deleted since it is based on technically invalid approaches.

It is important to note that the staff appear to be confusing toxic available forms of constituents in water with aquatic organism tissue residues where they state in item 4, *"Impairment measured in the environment is associated with toxic pollutants found in resident individuals."* [emphasis added] There is virtually no reliable data of this type. Further, there are substantial data which show that there is no relationship between what is in the tissue of an organism to adverse impacts.

Under some of the subsequently listed parameters, such as reproductive measures which includes a discussion of water concentrations, however item 4 focuses on what is known about impacts of chemicals in resident organisms. This section needs to be rewritten to eliminate the confusion about tissue residues and water concentrations.

Page xx, item 5, states "Significant degradation in biological populations and/or communities associated with the presence of elevated levels of toxic pollutants." Again, the State Board staff have persisted with technically invalid approaches of assuming that because a particular concentration of a constituent measured in a sediment and/or water is at an elevated level, this particular constituent is responsible for the demise of the populations of aquatic organisms in the area. The so-called co-occurrence approach of having elevated concentrations associated with some impact is not a valid approach for developing a regulatory program. Those responsible for developing such approaches, such as Ed Long of Long and Morgan, make it clear that what the State Board staff are now doing where they are relying on such associations to implement a regulatory program is inappropriate. This section must be revised to require that appropriate cause and effect relationship studies be conducted to investigate whether the so-called association with adverse impacts on communities with an elevated concentration of a constituent is a likely cause of this adverse impact. It is readily possible to conduct these studies. Just because the BPTCP was set up incorrectly with respect to developing this kind of information does not mean that the Policy that evolves out of the BPTCP should continue to ignore readily available science in its implementation into clean-up plans.

Page xxi, mid-page, first paragraph, starts a discussion of ranking criteria which states:

"The RWQCB shall create a matrix of the scores of the ranking criteria. The RWQCB shall determine which sites are 'High' priority based on the six general criteria (below) keeping in mind the value of the water body."

The first of the ranking criteria, "Human Health Impacts," indicates that a Human Health Advisory issued for the consumption of non-migratory aquatic life shall be assigned a "high" ranking. It further states that *"Tissues residues in aquatic organisms exceed FDA/DHS action level or U.S. EPA screening levels ('Moderate')." should be designated as "moderate."* Unfortunately, there are a lot of politics associated with designating a waterbody as having a human health advisory. It would seem appropriate that exceeding DHS, OEHHA or US EPA guidance values are appropriate criteria for high ranking of an area as a potential toxic hot spot. However, this applies to a waterbody or substantial part of the waterbody since, in general, edible organisms have sufficient mobility to acquire their excessive body burdens which cause or could cause a health advisory through a substantial area of a waterbody.

# Page xxi, last paragraph, states

"For aquatic life, site ranking shall be based on analysis of the preponderance of information available (i.e., weight-of-evidence). The measures that shall be considered are the sediment quality triad (sediment chemistry, toxicity, and benthic community analysis), water toxicity, toxicity identification evaluations (TIES), and bioaccumulation."

As discussed above, the State Board staff have persisted throughout the BPTCP with confusing "sediment chemistry" with "sediment chemical composition." The two are not the same. One is a characteristic of a sediment with respect to its chemical content; while chemistry involves an evaluation of the chemical reactions that occur that determine the composition. It is these chemical reactions that govern the actual chemical species present which, in turn, govern the impact of the chemical on aquatic life through toxicity or lead to excessive bioaccumulation of constituents. The TIE mentioned is an integral part of the chemistry into the sediment quality triad. Several members of the Scientific Planning and Review Committee (SPARC) advisory panel informed the State Board staff of this issue at the SPARC meeting that was held two years ago where these issues were reviewed. The staff, however, have continued to ignore the guidance of SPARC and others on this issue, as well as basic principles of aquatic chemistry/toxicology and common sense.

Page xxii, first paragraph, states "A hit in one of the measures associated with high chemistry is assigned 'moderate'. and high sediment or water chemistry only shall be assigned 'low'." This approach is inappropriate and is without technical foundation and merit. First, it is not the concentration of total constituents as measured that determines impacts. There is no relationship between the total concentration of constituents and impacts. As long as the State Board staff persist with this approach, the BPTCP will not be a technically valid program.

Page xxii, under "Water Quality Objectives," states "Any chemistry data used for ranking under this section shall be no more than 10 years old..." Such an approach reflects a lack of understanding of basic analytical chemistry. Some of the best work done on trace element composition, especially as it relates to impacts was done in the 1960s. To throw out high-quality data as is done here is inappropriate. Data should be reviewed with respect to the approach that was used for collection and analysis of the samples, irrespective of whether the data were collected within the past month or 30 years ago. Thirty-year-old data can be much more reliable than much of the data that are being collected today.

The statement that a water quality objective or water quality criterion exceedance is used to rank a site as "high," "moderate," or "low" is another example of the technically invalid approach that can readily cause inappropriate ranking. Those familiar with how water quality criteria are developed and implemented today know that they represent worst-case assessments of the potential impacts of chemical constituents. There will be few situations in California where such a worst-case assessment is appropriate for determining the impacts of constituents. Basically, the staff have proposed to use a technically invalid approach for ranking toxic hot spots based on exceedance of water quality standards. Exceedance of water quality standards should not be used for ranking; it should only be used as an indication of an area that needs further study to determine there is real significant aquatic life-related beneficial use impairment in a waterbody or excessive bioaccumulation that causes a human health advisory. Previously I brought to the attention of the BPTCP Advisory Committee an invited 1995 paper published by Dr. Jones-Lee and myself, "Appropriate Use of Numeric Chemical Concentration-Based Water Quality Criteria," (Lee and Jones-Lee, 1995) which discusses how exceedance of water quality criteria should be used in a regulatory program. A copy of this paper is appended to these comments.

Page xxii, "Areal Extent of Toxic Hot Spot," is based on an arbitrary greater than 10 acres, between one to 10 acres and less than one acre for ranking the toxic hot spot as "high," "moderate," or "low." This approach is without technical merit. Toxic hot spots should be ranked not based on the arbitrary type of criteria that the State Board staff have proposed, but based on the magnitude of the real water quality use impairment associated with the hot spot. The reason that there is concern is the impairment of beneficial uses. The ranking criteria must be based on direct assessment of these impairments.

Page xxii, "Pollutant Source," is listed as a ranking criteria. This is without merit and it, along with other arbitrarily developed approaches for ranking, should be abandoned. Whether there is an identified pollutant source should not be part of ranking the significance of a toxic hot spot.

Page xxii lists "Natural Remediation Potential" as also a parameter for ranking. This, like pollutant source, is another parameter that should not be listed in the ranking criteria. First, there will be few situations where the Regional Boards will have sufficient information to be able to assess with an adequate degree of reliability whether

the constituents that are present in sediments that are causing toxicity to aquatic life will be naturally remediated.

Page xxiv, "Sediment Cleanup Methods," is a superficial treatment of a complex topic that requires considerable engineering expertise and experience to develop properly. To provide the Regional Boards with the National Research Council's 1997 "Contaminated Sediment in Ports and Waterways: Cleanup Strategies and Technologies" under conditions where the Regional Boards staff have little or no experience in these topic areas is like having a teenager to read a book about driving a car and then issue their license without any experience and guidance by qualified drivers.

The same issues apply to sediment clean-up costs beginning on page xl. This is a topic that cannot be addressed through someone with limited expertise and experience developing costs based on the NRC manual overview discussion of these issues.

On page xlii, "Prevention of Toxic Hot Spots," the discussion does not provide guidance that the Regional Boards need to implement this Policy in a technically valid, cost-effective manner. The key to developing a proper toxic hot spot prevention program is defining the sources of the constituents that have led to or could lead to a toxic spot. TIEs should be the base for determining the constituents responsible for the toxicity at a toxic hot spot. Once this information is available, then through a combination of forensic studies based on toxicity and chemical measurements, including TIEs, it would be possible to trace back the source of the constituents specifically responsible for the toxic hot spot. It is important, as discussed herein, not to make the assumption that the State Board staff have stated would be the approach used, of assuming that the total concentration of constituents from any source that is in some ill-conceived way related to - associated with a toxic hot spot, is responsible for the toxic hot spot. This is early 1960s level aquatic chemistry. There is far better science and engineering available that can be used to determine the cause of toxicity, the source of excessive bioaccumulation and the potential significance of a particular source(s) as a contributor to the toxic hot spot.

For new sources, the approach should be that of developing a site-specific risk assessment in which appropriate aquatic chemistry transport, fate and toxicology serve as the basis for determining whether constituents discharged from a particular source could likely be responsible for a toxic hot spot. Again, the basis for the evaluation cannot be total concentrations of dissolved or particulate forms in a discharge, but must be based on those components of the discharges that do, in fact, cause aquatic life toxicity or excessive bioaccumulation.

Pages xlv, and xli provide a template for toxic hot spot cleanup plan development. This template guidance falls far short of appropriately developing the information needed to develop credible toxic hot spot designation and ranking and associated clean-up plans.

Beginning on page 1, is a "Functional Equivalent Document Water Quality Control Policy for Guidance on the Development of Regional Toxic Hot Spot Cleanup Plans."

"Introduction," Item 1, states "The SWRCB will adopt a policy outlining the toxic hot spot definition, ranking criteria and other factors needed for the consistent development of the BPTCP cleanup plans" The State Board will be making a serious error if it adopts the proposed Policy with its toxic hot spot designation and ranking approaches and criteria. The State Board should basically start over, only this time follow the approach that was recommended early in the development of the Program to a previous State Board of full public involvement in formulating and implementing the Program. The key approach that needs to be implemented is the appointment of a technical advisory panel consisting of stakeholders. This panel would have the responsibility of working with all stakeholders in formulating a technically valid approach for designating and ranking toxic hot spots that considers mid-1990s level aquatic chemistry, aquatic toxicology and water quality issues. If the State Board ignores this recommendation, it will find that it will perpetuate a series of significant errors that have been made by past State Boards associated with BPTCP development and implementation. This will ultimately result in the BPTCP becoming recognized as one of the most expensive, least effective programs managed by the State Water Board.

Page 6 under "Toxic Hot Spot Identification," lists the original water code definition of toxic hot spots which includes 1) pose hazard to aquatic wildlife, fisheries, or human health, or 2) may impact beneficial uses, or 3) exceed SWRCB or RWQCB-adopted water quality or sediment quality objectives. One of the fundamental problems with the BPTCP is that those who advised the legislature in setting up this program failed to inform the legislature that exceedance of a water quality or sediment quality objective is not a valid basis for defining a toxic hot spot. Toxic hot spots by name and common sense should be sites where there is toxicity. Those with even the most elementary knowledge of water quality criteria developed by the US EPA know that water quality criteria for potentially toxic constituents are not developed to precisely measured toxicity. They are based on a worst-case estimate of the critical concentrations of constituents that when exceeded may be toxic. There are few constituents for which concentrations well above the criterion value cannot occur for extended periods of time without being toxic to aquatic life. This relates to the fact that water quality criteria assume that the constituents in the 100% toxic available forms for sufficient time to be adverse to aquatic life. As discussed in a number of papers that we and others referenced in our papers have developed, such as Lee, et al. (1982) "Water Quality Standards and Water Quality," Lee and Jones-Lee (1995b) "Independent Applicability of Chemical and Biological Criteria/Standards and Effluent Toxicity Testing,"and Lee and Jones-Lee (1995a), the only reliable way to assess aquatic life toxicity is to directly measure toxicity. It cannot be estimated based on chemical concentrations.

The fundamental problem of including exceedance of a water quality or sediment quality objective with the legislative definition of toxic hot spots was pointed out to the State Board staff and to the State Board early in the program. Unfortunately, no action was taken. Now the people of California are saddled with a fundamentally flawed program involving designating toxic hot spots which are based on exceedance of water quality standards where the exceedance of the standard may not cause toxicity. The BPTCP regulations need to be changed so the first two definitions in the original legislation based on a hazard to aquatic life wildlife fisheries or human health and impacting beneficial uses of a waterbody, including the resources derived from the waterbody, such as bioaccumulation of hazardous chemicals in fish tissue are the appropriate approaches for designating a toxic hot spot. The exceedance of a water quality standard should be used only as a trigger to indicate the need for more studies to define whether the exceedance is, in fact, associated with toxicity of sufficient magnitude and duration or excessive bioaccumulation to be significantly adverse to the beneficial uses of a waterbody. This is the technically valid approach for designating toxic hot spots.

With respect to exceedance of a sediment quality objective, there are no sediment quality objectives. The State Board staff started out with a ill-conceived approach for developing sediment quality objectives. I testified at a 1991 State Board hearing on the inappropriate approaches being used by the State Board staff in proposing to develop sediment quality objectives. After spending several million dollars, the State Board staff finally admitted that their proposed approach for trying to establish sediment quality objectives could not be achieved. While they blamed this on not collecting sufficient amounts of funds as part of the BPTCP, the facts are that even if they had ten times the amount of money than that anticipated in the original establishment of the program, the sediment quality objective approach that the State Board staff had proposed would have still failed.

Even the US EPA who has spent many millions of dollars trying to develop; chemically-based sediment quality criteria that could be used as stand-alone regulatory criteria, abandoned this effort and are now finally recognizing that the only way to judge whether the constituents in sediments are toxic is to measure toxicity. The Agency is now in the process of releasing sediment quality indices which have to be backed by toxicity tests. The Agency was informed of this by a Pellston Workshop expert panel in the mid-1980s (In: Fate and Effects of Sediment-Bound Chemicals in Aquatic Sediments, Pergamon Press, 1987). The Agency ignored the recommendations of this panel and spent millions of taxpayers' funds trying to develop chemically-based sediment quality objectives only to, as predicted, fail to achieve this objective.

Page 6 under "Toxic Hot Spot Identification, second paragraph, last sentence, states *"The BPTCP efforts continue this work by focusing on measures of effects (such as toxicity) with the associated pollutants."* As discussed herein, the BPTCP staff approach of "association" with toxicity is fundamentally flawed and technically invalid. Those with an elementary understanding of aquatic chemistry and toxicity issues know that it is not possible to make the "associations" that the staff are trying to use based on total concentrations. Even normalized concentrations of chemical constituents such as for certain organics based on total organic carbon content or for certain heavy metals, acid-volatile sulfide content, is not a reliable predictor of toxicity. While it has been known since the late 1960s that total concentrations of metals and other constituents cannot be used to estimate toxicity, availability or water quality impacts, those with limited understanding and appreciation of aquatic chemistry, aquatic toxicology and water quality issues persist with attempting to develop a over-simplified approach

involving fundamentally flawed concepts trying to relate toxicity to chemical concentrations. There is no need for the BPTCP to involve having to base regulatory programs on chemical concentrations in water or sediments; the program can be carried out based on excessive bioaccumulation and toxicity measurement with appropriate use of TIEs to determine the cause of the toxic or the source of the bioaccumulatable chemicals.

### Page 8, first full paragraph, states

"Within 120 days from the ranking of a toxic hot spot in the consolidated cleanup plan, each RWQCB is required to begin reevaluating waste discharge requirements for dischargers who have contributed any or all of the pollutants which have caused the toxic hot spot."

This is a dangerous approach and will certainly result in inappropriate changes in waste discharge requirements where the discharger will be placed under significant additional financial burden that is not related to adverse impacts to the beneficial uses of the waterbody receiving the wastewater discharge or stormwater runoff. Again, as discussed elsewhere in these comments, to identify the source of pollutants that causes a real, significant toxic hot spot will, in general, require a substantial effort in field studies to properly define whether a source of a type of chemical constituent such as copper is a contributor of copper to a waterbody that ultimately results in a toxic hot spot. The State Board staff's approach, as iterated at a BPTCP Advisory Committee meeting in response to a question that I asked, of assuming that all copper from any source was in a form that contributes to a toxic hot spot, reflects a lack of understanding of basic aquatic chemistry and is obviously technically invalid.

Page 8, under "Program Organization," Item 1, mentions the Monitoring and Surveillance Task Force. Unfortunately, this Task Force operated without public review and input. Significant errors were made in establishing the BPTCP monitoring program in developing the data base needed to achieve the legislatively mandated objectives of the program. A properly conducted BPTCP would have, in 1989 and 1990, involved this Task Force proposing monitoring and surveillance approaches which would have been reviewed by the public to assess whether they were appropriate for meeting the objectives of the program. Further, rather than carrying out the program for almost 10 years with only limited release of monitoring data, periodic (no less frequent than every two years) data report and their interpretation would have been made available for public review during the course of the program. This is a normal approach for developing a program of this type. If it had been followed, the significant errors that were made in establishing and implementing this program would have been eliminated or at least significantly reduced.

With respect to page 8, Item 2, SPARC, SPARC was brought into this review process as an afterthought after much of the program had already been planned and implemented. SPARC and other technical review panels should have been involved in helping to plan the program, not to review the program, after it had been essentially completed. This is another example of the mismanagement of the program by the State Board staff.

Page 8, Item 3, BPTCP Advisory Committee, was organized as the result of the fact that the State Board staff, contrary to State Board Chairman Maughan's 1991 instructions, continued to operate the BPTCP without public review and input. It became clear to some who had been attempting to follow this program, that the only way to stop this mode of operation was to have the legislature incorporate a mandatory public advisory committee as part of the reauthorization of the BPTCP. Once the BPTCP Advisory Committee became established, it found in its general review of the approaches that the State Board staff had proposed for designating and ranking toxic hot spots, were in some instances, technically invalid. It was agreed that these approaches should not be used. The State Board staff accepted the recommendations and adopted the approach of not attempting to designate and rank toxic hot spots but instead would devote the remainder of the program to data collection. However Governor Wilson's requirement set forth in the fall of 1997 that the Regional Boards must, by December 31, 1997, develop toxic hot spot designation and ranking with existing information even though recognized as inadequate, have led to the State Board staff proposing a BPTCP Policy that incorporates the designation and ranking criteria that had been previously judged to be invalid and that, in fact, had been abandoned by the State Board staff.

While the BPTCP Advisory Committee did address some of the most obvious significant deficiencies with the State Board staff's approach for designation and ranking toxic hot spots, it did not address many of the technical deficiencies that ultimately have to be addressed in developing a credible BPTCP. One of the significant deficiencies with the BPTCP Advisory Committee is that it did not appoint a technical advisory panel to advise the Committee and the State Board on some of the more detailed technical issues that needed to be addressed in terms of designating and ranking toxic hot spots. The net result is that a technically invalid program has been formulated and implemented.

Page 27, first paragraph, states,

# "In order to implement this approach it is necessary for the toxic hot spot definition to include assessment of biological response as well as analysis of the chemical contamination of various media."

That statement is a distortion of the facts. It is readily possible to establish a toxic hot spot definition based on toxicity and organism assemblage information. There is no need to incorporate total concentrations of constituents to define a toxic hot spot; in fact, it is this incorporation that causes the State Board staff's proposed approach to be technically invalid. The proper incorporation of chemistry into the triad weight-of-evidence is through defining the toxic components, not determining their presence as is now recommended by the State Board staff.

Page 27, third paragraph, states "*The SPARC considered the monitoring activities scientifically defensible.*" SPARC did not conduct a detailed public peer review discussion of issues that would support such a claim. There are significant problems with the monitoring approach that was used in the BPTCP which cause major problems now in trying to develop appropriate clean-up plans.

Page 28, Table 2, presents an independently developed "Prioritization of Criteria Recommended for a Sediment Quality Assessment Strategy." A review of these criteria provides strong support for the comments made herein. At no place in the highest priority is any listing of the total concentrations of chemical contstituents, however there is significant inclusion of the issues of concern, such as consideration of bioavailability, identifying agents causing toxicity, identifying and quantifying potentially toxic agents, etc. These are all based on appropriate incorporation of chemistry, not chemical analyses, into the assessment. If the State Board staff had properly incorporated this information into the development and implementation of the BPTCP, this program would, with the funds available, have achieved many if not all of its original goals.

Beginning on the bottom of page 27 is a listing of so-called programmatic and regulatory elements that need to be considered in the development of a specific toxic hot spot definition. Item 3, page 29, states *"The definition should be usable with existing monitoring information as well as with any new monitoring information that may become available."* The definition of a toxic hot spot should not be tied to the existing monitoring information. A properly developed toxic hot spot definition should be developed, and then the monitoring data needed to determine compliance with the definition developed. The staff have reversed the approach in trying to bend definition of toxic hot spot to utilize data that was developed for other purposes that is not in any way related to toxicity issues.

Page 29, item 5, states "Biological response should be associated with the presence of non-naturally-occurring toxic pollutants..." The greatest cause of toxicity in aquatic sediments is low-dissolved oxygen, not anthropogenically derived chemical constituents. The low DO leads to the production of a variety of chemicals, such as ammonia and hydrogen sulfide which cause toxicity to many forms of aquatic life. It is inappropriate to ignore this situation as is being done in this definition. In light of the fact that there are toxic sediment associated with low DO conditions could cause a situation where many millions to hundreds of millions of dollars are spent cleaning up toxic hot spots due to anthropogenic target constituents, such as heavy metals, yet the sediments are still toxic to aquatic life due to natural or sources of constituents which leads to increased algal production in a waterbody that leads to increased hydrogen sulfide and ammonia in the sediments. These issues have been discussed in enclosed the paper, "Evaluation of the Water Quality Significance of the Chemical Constituents in Aquatic Sediments: Coupling Sediment Quality Evaluation Results to Significant Water Quality Impacts." This issue has been largely ignored by the State Board staff. It has to be a key component of any appropriately developed clean-up plan. The public/regulated community should be assured that if funds are spent for cleaning up

toxic hot spots that significant benefits in terms of improved designated beneficial uses will be achieved.

Page ;29, item 6, "The actual loss of beneficial use is not necessary to designate a site as a toxic hot spot (i.e., indicators of pollutant effects are sufficient for the designation)." This is a dangerous approach, especially in the hands of those who wish to prove a point. There are lots of responses by so-called indicators which are not, in fact, related to actual use impairment. Several years ago the American Society of Testing and Materials organized a symposium devoted to biomarkers and risk assessment. Many of the experts in the field met and discussed the validity of "indicators" (biomarkers) as a measure of the impacts on an organism or group of organisms. The results of the symposium were published as Bengtson and Henshel, editors, (1996), in <u>Biomarkers and Risk Assessment.</u>

Many of the so-called indicators that the State Board staff proposed to use are classified as biomarkers. The consensus of the ASTM biomarker symposium was that the field is years away from being able to use biomarkers in regulatory programs. Biomarkers are interesting. They indicate exposure to chemicals. However, the relationship to the impact on the organism, group of organisms, or the beneficial use of a waterbody in which the organisms are located, is unknown. They are not reliable tools for designating and ranking toxic hot spots. The purpose of the BPTCP is to protect the designated beneficial uses of importance to the public. The responses that are of concern are those responses which are associated with use impairment that the public can recognize. With few exceptions, these cannot be reliably assessed by so-called indicators.

Page 38, mid-page, begins a discussion of so-called "Chemical Measures" where it is stated

"The statutory definition of a toxic hot spot requires that the SWRCB and RWQCB focus on the effects of toxic pollutants...For a site to be designated a toxic hot spot, a determination of association of biological effect with measured chemistry that may contribute to the observed biological effect(s) must be made."

This is part of the technically invalid approach that the State Board staff are trying to foster on the people of California where they have ignored basic principles of aquatic chemistry in favor of a technically invalid association approach. There are readily available procedures that can be used to determine whether the toxicity is caused by, not associated with. "Association with" is a dangerous, obviously technically invalid approach that has no place in designating and ranking toxic hot spots.

Page 38, last paragraph, states "*The EqP approach assumes that pollutants are generally in a state of thermodynamic equilibrium..."* The statement is incorrect; it assumes that chemical constituents in sediments are in equilibrium. Many of the components of the chemical constituents are not pollutants, i.e. substances that impair uses, based on either federal or the Porter-Cologne definition.

The statement on the top of page 39, "*The protection of sediment ingesting organisms is not addressed in this approach.*" is not correct. The equilibrium partitioning predicted toxic form, i.e. dissolved form, and the actual impacts on organisms is not understood. Some component of this is associated with ingestion of sediment particles by some forms of aquatic life.

Page 39, bottom of first paragraph, states "EPA has recently published...draft SQC that could be used for this purpose." and then gives references to 1993 publications. Five years ago is not considered recent. Further if the staff had reliably reported on these issues, they would have indicated that the sediment quality criteria that the US EPA published have been found by various organizations to be unreliable as regulatory tools. It is my understanding that the US EPA has decided to abandon trying to develop sediment quality criteria.

Page 39, Item 2, first paragraph, claims that it is the National Oceanic Atmospheric Administration (NOAA) that is responsible for the Long and Morgan values. This is more of the distorted information that is being fostered on the public by the State Board staff. NOAA is not responsible; in fact, NOAA has informed Ed Long that he is to stop claiming that these are NOAA values. Other NOAA staff have shown that the Long and Morgan values referred to here are not valid for estimating the effects of chemical constituents on aquatic life. The same can be said about the MacDonald values. In the enclosed review, "'Co-Occurrence' in Sediment Quality Assessment", the Long and Morgan and MacDonald co-occurrence-based values are obviously technically invalid and should not be used for any purpose. As discussed herein, flipping a coin is more reliable for estimating the toxicity of sediments than using Long and Morgan and MacDonald values.

Page 40, Item 3 "Apparent Effects Thresholds (AET)," suffers from the same kinds of problems as the Long and Morgan and MacDonald values. Neither of these approaches provide the cause and effect relationship necessary to properly define the cause of toxicity. The fundamental problem with co-occurrence-based values such as Long and Morgan, MacDonald and AETs is that they are based on total concentrations of constituents. There is no relationship between the total concentration of a constituent in sediments and its impact on aquatic organisms.

Page 41, Item 4, "Correlations," states "Correlations between toxicity or benthic community effects and chemical concentration can be used to show the relationship between these factors." This is a dangerous approach that can easily lead to inappropriate assessment of the importance of a chemical constituent in causing toxicity. It should not be used.

The same applies to Page 41, Item 5 "Multivariate Analysis." Such approaches are statistical tools for manipulation of data. They are not reliable for determining cause and effect and can easily lead to inappropriate assessment of the real cause of toxicity or sources of bioaccumulatable chemicals.

Page 41, Item 6, "Sediment Toxicity Identification Evaluation," states "Sediment toxicity identification evaluation (TIE) methods can be used to make a better estimate of the cause-and-effect relationship between chemicals and toxicity." This statement is inappropriate; TIEs are the only procedures that can be used to reliably determine whether a chemical constituent is, in fact, the cause of toxicity. All the other co-occurrence procedures such as those advocated by the State Board staff in the draft Policy are invalid for this purpose.

The statement, "Standard procedures for TIES are unavailable." does not limit the use of TIEs in identifying the cause of toxic hot spots or the source of constituents responsible for toxic hot spots. TIEs are not cook-book type procedures. They must be carried out by individuals who understand the behavior (aquatic chemistry and toxicology) of sediment associated constituents. It is probably better not to have standard procedures which can be mechanically performed by individuals who do not understand the complexity of the systems and how to properly conduct an evaluation of the cause of toxicity.

Page 41, Item 7 "Weight-of-Evidence," correctly state that a proper weight of evidence is an appropriate approach for assessing a toxic hot spot. The problem, however, is how the State Board staff have implemented the weight-of-evidence with respect to the chemical component.

Page 42, first full paragraph, states "*The BPTCP has used individual measures such as the PEL or ERM, ERM and PEL quotients (cf. Fairey et al., 1996; Anderson et al., 1997) as the values to make determination of association between chemicals and toxicity.*" This approach has caused the reports generated in the BPTCP to have limited reliability in terms of identifying the chemicals responsible in determining the cause of the toxicity. Many of the BPTCP reports for specific waterbodies contain large amounts of misleading and unreliable information which limit their utility in developing credible toxic hot spot definition and ranking. Basically many of these reports need to be rewritten by individuals knowledgeable in how chemicals and sediments impact water quality where the reliable data generated is presented and discussed.

In the fall of 1996, I provided the State Board with comments on the inappropriate approaches which were then proposed by the BPTCP staff based on the draft report that the staff had generated in which I pointed out that the co-occurrence-based approaches that the staff were using would provide unreliable information on assessing the significance of chemical constituents in causing aquatic life toxicity. A group of BPTCP laboratory staff members who were under contract with the State Board to conduct the BPTCP sampling and analyses responded that it was inappropriate for me to comment about the inappropriate approaches since the final approach that would be used for incorporating chemical information into assessing toxic hot spots had not yet been defined. I pointed out in a letter to the State Board on this issue that the laboratory directors who had responded did not provide information on what they planned to do with respect to the incorporation of chemical information into the analysis of the cause of sediment toxicity and that the draft report on the BPTCP San Diego studies used the co-occurrence-based values for incorporating chemical information.

Subsequently, the final reports for many of the various BPTCP study areas have been released and as noted on page 42 of the draft Policy, first full paragraph, the co-occurrence-based values have been used as the basis for indicating the chemicals responsible for the toxicity. This approach is technically invalid and inappropriate. Unfortunately my predictions about the inappropriate approach being used for incorporating chemical information have been fully borne out. Significant amounts of public funds have been wasted in generating unreliable reports on the relationship between the presence of chemicals and sediments and the cause of toxicity found in the sediments.

It is stated in the next paragraph,

"By not specifying the precise values to use the SWRCB is allowing the RWQCBs to exercise their discretion in making the determination if observed biological effects are associated with toxic pollutants."

This is gobbledygook. The State Board staff should have developed guidance on how to determine a proper association, not rely on the co-occurrence values, as they have done.

Page 42, under "Water and Sediment Quality Objectives," states "By definition, water quality or sediment quality objectives are established for the reasonable protection of beneficial uses." That statement is not in accord with how water quality objectives are developed. They are based on worst-case approaches which do not properly reflect the fact that many constituents exist in a variety of chemical forms, only some of which are toxic. There is no way to reliably relate an exceedance of a water quality or sediment quality objective to a real use impairment that should cause a designation and/or remediation of a toxic hot spot.

The statement is made in the same paragraph, "*If the California Toxics Rule is promulgated, the EPA criteria applicable to California Bays and Estuaries will apply.*" A critical review of the US EPA criteria proposed in the California Toxics Rule shows that they are worst-case based criteria that can in most situations over-estimate the toxicity associated with the exceedance of a criterion value.

Page 43, under "Staff Recommendation," to adopt Alternative 2 which is the one that contains the technically invalid approach for incorporating chemistry into a weight-of-evidence approach. Why did not the State Board present an alternative that involves proper incorporation of chemistry into this evaluation? This is the alternative that should have been presented, discussed and recommended to the State Board.

A key component of any new regulations promulgated by the State Water Resources Control Board is a proper economic analysis of the potential cost of these regulations to California. The State Board will be significantly deficient if it adopts these regulations without requiring the State Board staff to conduct a proper analysis of the significant errors that could occur in designating and ranking toxic hot spots associated with the use of co-occurrence-based values for incorporating chemical information into the weight-of-evidence.

# Page 44, "Issue Description" states

"The site ranking criteria proposals were first discussed at the January 8, 1993 SWRCB Workshop. At that workshop, the SWRCB directed the staff to conduct a staff workshop to solicit public comment. These workshops were held on January 26 and 28, 1993."

The staff in writing these comments did not discuss the fact that the State Board received a large number of comments pointing out that the staff's proposed approach for ranking toxic hot spots was technically invalid. The State Board never adopted the ranking approach, presumably because there was so much justified opposition to the approach that the staff had proposed. The State Board also did not require that its staff specifically answer the comments that were made by highly qualified individuals and organizations on the technical deficiencies with the staff's approach. The staff have now continued these technically invalid approaches without ever having to be held accountable for their lack of technical validity. The State Board should make available for full public review all of the comments that were received in connection with the January 1993 workshop. These comments should be incorporated into the administrative record for the review of this FED.

Page 45, bottom of page, lists the assumptions associated with the ranking criteria where Item 2 states

"Ranking should be based on existing information at the time of ranking; additional studies should not be required for the purpose of setting priorities on candidate or known toxic hot spots."

This is an inappropriate assumption. It is possible to designate a toxic hot spot based on toxicity issues and then conduct additional studies to determine its significance and therefore its rank.

Page 45, Item 3 under "Assumptions" states that the cost associated with clean-up of a site influences the ranking. That approach is invalid. The ranking should be based on impact on beneficial uses, not the cost to clean up.

Page 49, first full paragraph states that the Superfund risk assessment approach in which there is a clearly defined impact associated with the presence of chemical constituents and water, soils and sediments is inappropriate for BPTCP. The statement, "The level of details required to complete an HRS evaluation does not seem justified for BPTCP purposes." BPTCP is an aquatic "superfund" (aquafund) program. It should be subjected to the same degree of rigor as the land-based "Superfund" program. The

State Board staff's attempts to short-cut good science in designating and ranking sites and establishing the requirements for clean-up are strongly contrary to the interests of the public.

Beginning on the bottom of page 49 is a "Weighted Numerical Ranking Criteria" section for ranking toxic hot spots. The approach presented has been found to be technically invalid, however the staff are persisting with an obviously fundamentally flawed ranking approach where arbitrary scores are assigned to various factors to establish a ranking. The approach advocated by the staff is without technical validity and should be rejected by the State Board in favor of a best professional judgement, non-numeric ranking in which a panel of experts would advise each of the Regional Boards on the adequacy of the database for designating and ranking toxic hot spots. This panel would also prescribe the data needed to properly designate and rank a toxic hot spot once an area is considered to be a potential hot spot.

Page 51, under "Chemical Measures" contains essentially all of the technically invalid issues that have been discussed herein, such as under (i) the use of NAS guidelines and elevated data level values.

Under (ii), the exceedance of a water quality criterion on a regular basis causes a different rank than less regular or infrequent exceedance. Again, those familiar with the elements of water quality know that it is not the frequency of exceedance, but the magnitude of the concentration of available form duration of exposure relationships that influence how a chemical constituent impacts aquatic organisms.

Under (iii), the inappropriately labeled sediment weight of evidence guidelines recommended for the state of Florida by MacDonald should not be used for any purpose, certainly not ranking toxic hot spots.

Page 52, the incorporation of pollutant source, remediation potential, etc. are inappropriate parameters for ranking toxic hot spots. A toxic hot spot should be ranked based its water quality-use impairment significance, not who is available to pay for its clean up.

Page 53, under "Rationale for Weighted Numerical Criteria," indicates that MTRL values were being used. MTRL values are not valid assessments of potential water quality problems. They should not be used, even for low ranking such as no relationship between the value and water quality problems.

Page 53, bottom of page, indicates that rare, threatened or endangered species could cause a toxic hot spot to have a highest value ranking. This should only be true if there is reason to believe that rare, threatened or endangered species are being affected by the toxic hot spot.

Page 54, "Chemical Measures," establishes an arbitrary approach toward ranking toxic hot spots where if two chemicals are suspected to be responsible, the ranking is

multiplied by 2. This has no technical validity and is more of the arbitrary approach that the State Board staff are using in trying to develop ranking criteria.

Page 54, last paragraph, the discussion about the NAS values is inappropriate and should be deleted; as discussed herein, it is not a valid approach.

Page 55, third paragraph, states that since the California Enclosed Bays and Estuaries Plan and the Inland Surface Waters Plan were nullified, the objectives in these Plans are not used in toxic hot spot ranking. This is another example of an inappropriate approach. The reason the Plans were nullified were not because of the lack of validity of the US EPA criteria and standards based on these criteria as worst-case estimates of potential problems; it was because the State Board failed to follow Porter-Cologne requirements for incorporating economic analysis in promulgating the Plans. The US EPA criteria when appropriately used, are far more reliable than most of the parameters that the State Board staff propose for ranking toxic hot spots.

Page 57, Table 3 presents the co-occurrence values based on Long and Morgan and MacDonald. These are labeled "State of Florida" and "NOAA." These are inappropriate and misleading labels. NOAA has never adopted these values; in fact, NOAA management has recently informed Ed Long to stop asserting in any way that these are NOAA values. This table should be deleted as it provides unreliable information which will be inappropriately used to assess the significance of chemical constituents in sediments.

Page 56, "Sediment Values," is more of the distorted information on the use of socalled NOAA values and the State of Florida values for incorporating chemical issues into assessing toxic hot spots.

Page 56, "Areal Extent of Toxic Hot Spot," should be based on actual impacts on aquatic organisms or as a source of bioavailable forms, not on total concentrations of constituents in sediments.

Page 56, "Pollutant Source and Remediation Potential," as discussed earlier, these are not appropriate ranking criteria.

Pages 58 and 59 provide the arbitrary approach developed by the staff in establishing numeric scores for the various parameters. The scores have no meaning and should not be used.

Table 4 lists the NAS recommended guidelines. As discussed, there are no NAS recommended guidelines that are applicable today. This column should be deleted from the table.

Page 61, "Aquatic Life Impacts," includes a number of the parameters commented on elsewhere, such as NAS values, various correlation techniques, etc., that are not reliable for the purposes of identifying and ranking toxic hot spots.

The same problems discussed earlier occur on page 62, "Water Quality Objectives," "Areal Extent of Toxic Hot Spot," and "Pollutant Source and Remediation Potential."

The staff recommendation on page 63 for Alternative 4 is based on a fundamentally flawed analysis of the basic parameters that need to be used in properly ranking toxic hot spots.

On page 65, the staff recommends alternative 2, which is to adopt guidance on each of the required sections in the clean-up plans. Basically, a third alternative should have been included which indicates "start over" with properly developing toxic hot spot designating and ranking, data collection, etc. where the control of the program is put in the hands of a public advisory panel, not left for control by the State Board staff.

Beginning on page 66 and continuing on for several pages is essentially copying from a summary report developed by the National Academy of Sciences. As discussed earlier, this kind of information, while useful for those who have limited understanding of the issues, is not an adequate base for developing clean-up plan remediation approaches and costs. These are complex engineering issues where having Regional Board staff limited expertise and experience using this kind of information as the basis for establishing remediation approaches and costs could readily produce erroneous information.

Page 97, "Total Maximum Daily Loads." The TMDLs that are being developed for the control of toxics generally ignore fundamental principles of water chemistry, water quality and toxicity impacts and control. It is important that if TMDLs are used in the BPTCP program that they, in fact, focus on controlling the toxic forms of constituents responsible for a toxic hot spot.

The appropriate approach for developing TMDLs for potentially toxic constituents is discussed in Lee and Jones-Lee (1997).

Beginning on page 102 is a discussion of "Environmental Effects of the Proposed Policy." This discussion is significantly deficient since it does not address the fact that the arbitrary approaches proposed by the State Board staff in designating and ranking toxic hot spots and establishing clean-up plans could result in large amounts of public and private funds being wasted through misdirected efforts. This, in turn, will cause the public to become cynical about the ability of the Water Resources Control Board and the Regional Boards to meaningfully administer water pollution control regulations within the state. The net result is that ultimately, rather than the BPTCP being a significant asset to helping to control water pollution in the state, it could turn out to be significantly detrimental to pollution control arising out of its inappropriate development, formulation and now proposed implementation.

The State Board must address the potential cost to the people of the state associated with the inappropriate designation and ranking of toxic hot spots. As it stands now, because of the unreliable information and the inadequate discussion of economic issues,

the Office of Administrative Law has adequate grounds to reject this proposed Policy as being inadequately developed.

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# **List of Enclosures**

Summary Biographical Information, Drs. G. Fred Lee and Anne Jones-Lee.

Water Quality and Solid Hazardous Waste Landfills Evaluation and Management website information.

Selected Papers, Reports and Other Publications Devoted to Water Quality Impacts of Sediment-and Soil-Associated Contaminants, Water Quality Impacts of Dredging and Dredged Sediment Disposal.

Lee, G.F. and Jones-Lee, A., "Can Chemically Based Sediment Quality Criteria Be Used as Reliable Screening Tools for Water Quality Impacts"

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Lee, G.F. and Jones-Lee, A., "Evaluation of the Water Quality Significance of the Chemical Constituents in Aquatic Sediments: Coupling Sediment Quality Evaluation Results to Significant Water Quality Impacts"

Copies of this information is available from Drs. G. Fred Lee and Anne Jones-Lee at http://members.aol.com/gfredlee/gfl.htm.



Reference as: "Lee, G.F., 'Comments on "Draft Functional Equivalent Document Water Quality Control Policy for Guidance on the Development of Regional Toxic Hot Spot Cleanup Plans" Developed by Division of Water Quality State Water Resources Control Board dated March 1998",' submitted to J. Caffrey, State Water Resources Control Board, Sacramento, CA, May (1998)."

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