Comments on
Interim Draft
Advance Notice of Proposed Rulemaking
US EPA 40CFR Part 131 (FRL-OW- ?]
Water Quality Standards Regulation

Submitted by

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Presented below are comments on the Interim Draft Advance Notice of Proposed Rulemaking (ANPRM). Appended to these comments is a set of professional papers and reports that provide additional information on the issues discussed below.

Since the early 1990's I have been highly involved in working with the California Stormwater Quality Task Force. This Task Force is made up of representatives of regulatory agencies such as the State Water Resources Control Board, Regional Water Quality Control Boards, the regulated community such as the urban NPDES permitted dischargers, industry and other interested parties. There are about 100 individuals actively participating in this task force. One of the primary objectives of this task force is to develop regulatory approaches for chemical constituents and pathogenic organisms present in urban area and highway stormwater runoff that will protect and, where necessary, enhance the designated beneficial uses of a waterbody receiving the stormwater runoff without significant unnecessary expenditures for chemical constituent control.

It has become clear through this task force's activities that there is a highly significant problem in trying to use the regulatory approach that the US EPA developed in the early 1980's for regulating chemical constituents in point source discharges for regulating urban area and highway stormwater runoff. The management of water quality associated with urban and highway stormwater runoff provides the impetus to correct the significant errors that were made by the Agency in the early 1980's in the implementation of US EPA water quality criteria into state standards and NPDES discharge permits. At this time, if the current regulatory approach persists for regulating potentially toxic chemicals in stormwater runoff and municipal and industrial wastewater discharges, it will result in massive wastes of public and private funds through the construction of treatment works that will provide little to no improvement in the

designated beneficial uses of the receiving waters for the discharges over that which could be achieved if a more technically valid, cost-effective approach were adopted.

While the Agency has, to some extent, been able to force industry and municipalities to spend the funds necessary to control "toxics" in the wastewater discharges, with respect to stormwater discharges from urban areas, the amount of funds needed to treat these discharges in a manner similar to that which is used in true point source discharges is so massive that the urban community has joined together to force the Agency to begin to adopt a more technically valid, cost-effective approach in regulating potentially toxic chemicals. A discussion of suggested approaches for addressing the over-regulation that is occurring today for urban area and highway stormwater runoff is presented below. While the focus of this discussion is urban area stormwater runoff, it is equally applicable to rural stormwater runoff and NPDES-permitted POTW and industrial discharges.

Independent Applicability

The US EPA's Independent Applicability Policy is highly inappropriate, technically invalid and is rapidly leading to a massive waste of public and private funds in addressing administrative exceedances of overly-restrictive water quality standards that evolved from US EPA criteria. This problem is becoming especially acute in stormwater quality evaluation and management. As discussed in the enclosed papers, it is very important that aquatic life toxicity, as measured by toxicity tests using a suite of sensitive organisms, be the determining factor of whether a chemical is, in fact, toxic in the receiving waters. To attempt to estimate toxicity based on grossly over-protective US EPA water quality criteria is technically invalid.

An example of the gross over-regulation that is occurring today is copper in San Francisco Bay. To continue to follow the approach that has been adopted for managing copper in San Francisco Bay (wasteload allocation and TMDL's) will require that ultimately over $1 billion will have to be spent to control copper inputs to San Francisco Bay from urban stormwater runoff sources because the ambient waters routinely exceed the water quality criteria-standard based on both total and dissolved copper. These exceedances, however, are administrative exceedances relating to the inability of the US EPA's regulatory approach to regulate copper without wasting large amounts of public and private funds in its control.

Toxicity testing of Bay waters using the same test organism and tests as were used to develop the copper criterion by the US EPA shows no toxicity and clearly demonstrates the fallacy of the US EPA's Independent Applicability Policy. It was adopted without proper public review and must be abandoned. The approach mentioned the US EPA's San Antonio Multi-Regional Meeting on Water Quality Standards/Criteria and Related Programs held last September for modification of the Independent Applicability Policy is not adequate and should not be adopted. Properly conducted toxicity measurements for a constituent should be able to over-ride estimates of potential toxicity in determining whether an excessive concentration of a chemical constituent exists in a waterbody or an input to it.

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This should not require that a several $100,000 study be conducted to demonstrate what is obvious based on toxicity measurements in receiving waters that namely the copper in San Francisco Bay from all sources today is in non-toxic, non-available forms, even though it exceeds the national and site-specific criterion by factors of two to three. There is no need to implement further controls of copper for San Francisco Bay based on its water quality impacts on the beneficial uses of the Bay. The only reason that a TMDL approach has been implemented is the need to satisfy the Independent Applicability Policy of controlling potentially toxic chemicals to meet the water quality standard, even though appropriately conducted toxicity tests show that the constituent of concern, i.e. copper, is non-toxic in Bay waters.

Focus on Toxic Forms

With few exceptions, the heavy metals, many of the organics and other potentially toxic chemicals exist in a variety of chemical forms, only some of which are toxic. While this was recognized in the early 1970's in the National Academies of Science and Engineering's "Bluebook" of Water Quality Criteria, beginning in the early 1980's, the Agency chose to largely ignore aquatic chemistry in implementation of water quality criteria into standards. This approach has now led to the crisis situation that exists in implementing water quality criteria into discharge limits for urban and highway stormwater runoff.

It is essential that the US EPA start to incorporate cost-effectiveness in criteria implementation and stop forcing states to adopt overly-protective standards. The dissolved metal adjustment recommended in October 1993 and adopted in May 1995 does not correct this problem. In most situations dissolved metals will also be highly over-protected due to the formation of non-toxic soluble complexes and colloidal forms that are measured as dissolved.

Further, all the other US EPA contaminant criteria are based on total concentrations while it has been known for over 20 years that that approach is technically invalid. The other criteria should also be implemented based on dissolved forms where the exceedance of a dissolved form of a potentially toxic or bioaccumulatable chemical is a trigger that allows the discharger to determine whether adverse impacts on the beneficial uses of the receiving water are occurring because of the exceedance of the dissolved form criteria-standard. If a discharger does not conduct appropriate studies, then the discharger should be required to control discharges so that they meet the US EPA's water quality criterion.

Site Specific Criteria

The Agency's current over-regulation arising from maintaining independent applicability of the chemical criteria over biological effects-based criteria-measurements cannot be corrected by the development of site-specific criteria-standards as the Agency claims. The 1994 US EPA draft guidance for developing site-specific water quality criteria and standards through the use of the water effects ratio fails to reliably consider the aqueous environmental chemistry of contaminants in aquatic systems that affect their toxicity and availability. The Agency should stop trying to contrive approaches that would allow the Agency to continue its misguided efforts

of focusing its regulatory program on the control of chemical constituents rather than on the impairment of water quality. The Agency should use chemical criteria as an indication of potential problems-triggers and build its regulatory program around assessment of water quality use impairments, i.e. typically biological effects-based approaches. This will lead to far more technically valid, cost-effective management of true pollutants in the nation's waters than is occurring today.

Use of Algae as a Test Organism

As discussed in the enclosed paper on the use of planktonic algae for toxicity testing, algae are not valid test organisms and will in some instances greatly overestimate ambient water toxicity that is of concern to the public in protecting the designated beneficial uses of waterbodies. The ambient water toxicity testing should be based on responses associated with sensitive forms of fish, shellfish and zooplankton.

Wet Weather Standards-Adjustment of Use Attainability for Urban Area and Highway Stormwater Runoff

In order to implement the US EPA's urban stormwater runoff water quality management program, it will be necessary to develop an implementation approach for US EPA criteria to address wet weather flow conditions that properly consider the toxicity of available-toxic forms of contaminants in urban and highway stormwater runoff as well as the duration of exposure that aquatic organisms can receive from such runoff events.

The Independent Applicability approach being used by the US EPA in which an administrative exceedance of a water quality criterion-standard for a potentially toxic chemical carries equal weight to appropriately conducted toxicity tests that leads to an administrative exceedance of a water quality standard is obviously inappropriate. This results in an operationally-defined impaired use of a waterbody which causes significant distortion of technically valid, cost-effective US water pollution control programs. This approach also misinforms the US Congress and others about the relative water quality significance of contaminants derived from various sources, such as urban area and highway runoff. Every two years since the late-1980's, the US EPA has been unreliably reporting on the current status of the nation's surface waters through the National Water Quality Inventory.

The way the Inventory is set up by the US EPA, states are required to indicate as impaired waterbodies those waterbodies that have exceedances of state water quality standards. The US EPA criteria are based on worst-case or near-worst-case evaluations and do not reflect the average conditions that are encountered with respect to the forms of contaminants in waterbodies that are being regulated. The National Water Quality Inventory lists urban stormwater runoff as the second or third most important cause of water quality deterioration in the nation's waters. This listing, however, is based on administrative exceedances, not real water quality impairment which for aquatic life should be defined based on an alteration of the numbers, types and characteristics of desirable forms of aquatic life in the receiving waters for

the runoff. A discussion of the significant deficiencies in the US EPA's current approach for developing its National Water Quality Inventory is enclosed. These issues need to be addressed as part of the ANPRM.

Recently, a draft US EPA statement was made available at the California Stormwater Task Force meeting which indicates that the Agency is adopting a policy which states that urban stormwater and highway runoff cannot cause exceedances in water quality standards in the receiving waters for the runoff. However, this policy states that causing exceedances of these standards does not represent a violation of the NPDES permit. This approach appears to have been developed by an attorney who wants to ensure job security. Such an approach will lend itself to common-place litigation to challenge it.

A far more rational approach to addressing the wet weather standards exceedance problem is the one set forth in the Interim Draft ANPRM in which temporary variances from use attainability will be allowed associated with stormwater runoff events. The Agency should immediately pursue the development of this approach to avoid future litigation filed by environmental groups of the type that has occurred which was causing stormwater dischargers to waste large amounts of money in implementing unnecessary chemical constituent control programs associated with stormwater runoff.

Sediment Quality Criteria Development

The ANPRM provides no information on the Agency's current thinking on revising its approaches on developing sediment quality criteria and standards. As discussed in the enclosed materials, the approach being used by the US EPA to develop sediment quality criteria based on equilibrium partitioning is obviously technically invalid. Virtually every new study that is reported shows that equilibrium partitioning as the US EPA has developed it, is not a reliable method of estimating the dissolved-available-toxic forms of contaminants in sediment interstitial waters. Again, rather than trying to force the regulatory program to use a chemically-based approach, the Agency should abandon this approach in favor of biological effects-based approaches. For example, rather than trying to estimate toxicity of a chemical in sediments, it is far more reliable to measure the toxicity directly using a suite of sensitive organisms. This is the approach that the Agency should adopt.

While the Agency claims that the chemical approach can be used as a screening tool, as discussed in the enclosed papers that approach fails to recognize the real world where sediment quality criteria will be used. As discussed, sediment quality screening tools can be no less reliable than regulatory approaches. Further, the Agency's claim that exempting certain types of contaminated sediments, such as dredged sediments, from being regulated by the Agency's chemically-based sediment quality criteria will eliminate the need for those concerned with continued use of technically valid biological effects-based approaches to be opposed to the implementation of the chemically-based sediment quality criteria is, at best, naive on the part of the Agency. While the Agency may issue a directive that states that the chemically-based sediment quality criteria should not be used to regulate dredged sediments, such a directive will

be ignored at the state and local levels with the result that the chemically-based sediment quality criteria will become widely used regulatory tools that could readily replace the biological effects-based criteria that are currently being used as the primary regulatory tool for contaminated sediment management associated with maintaining the navigable depth of the nation's waterways. The development of sediment-based quality criteria as now proposed by the Agency will result in massive waste of public and private funds associated with the over-regulation of chemical constituents in sediments. This approach should be abandoned in favor of biological effects-based criteria. Additional information on this issue is provided in the enclosed papers.

Also of concern is the unreliability of the co-occurrence-based approaches which while not being developed by the US EPA, parts of the US EPA such as the E-MAP program, the National Water Quality Inventory, the National Sediment Inventory and other programs are using Long and Morgan ER-L and ER-M values. Those values are based on total contaminant concentration in a sediment and the presumption that what happens in one sediment at some location will happen in all sediments at other locations. Further, this approach assumes that there is a causal relationship between some impact on organisms, etc. in a sediment and the concentrations of all of the constituents present in a sediment. This is obviously flawed and makes co-occurrence-based approaches technically invalid for even screening sediments for water quality impacts. A discussion of the lack of validity of co-occurrence-based approaches is enclosed.

Recently, co-occurrence-based sediment quality evaluations have caused those conducting the Santa Monica Bay Restoration Project to recommend a $42 million, five-year stormwater quality contaminant control program for runoff from the Santa Monica Bay-Los Angeles area streets because of the presence of persistent chemicals, such as copper, in the runoff. The copper was of concern because it accumulates in sediments. There was no measurement, however, of whether the copper that accumulates in sediments is toxic; it was present at greater than the Long and Morgan co-occurrence-based values for alleged impact. It is very important that the Agency stop using co-occurrence-based values for any purpose and develop an unequivocal statement about the lack of validity of using this approach for any purpose associated with sediment quality evaluation.

Regulation of Mercury

A special problem is developing with the regulation of mercury in point source discharges. POTW's are finding that regulatory agencies are restricting the discharge of mercury in the effluent to no more than the US EPA "Gold Book" criterion. This criterion (12 ppb) is based on the bioaccumulation of mercury in fish tissue. The bioaccumulation process is now well-understood to be related to methylmercury. It is also becoming fairly well-understood that not all forms of mercury discharged to a POTW contribute mercury in the effluent which, in turn, contributes to methylmercury formation and excessive bioaccumulation in aquatic organism tissue.

There are a number of situations around the country where POTW discharges of mercury above the "Gold Book" criterion are not causing excessive bioaccumulation in fish tissue in the receiving waters for the discharge. Further, it is clear that certain forms of mercury, such as dental amalgam, are not likely significant contributors to mercury in receiving water sediments that cause excessive bioaccumulation through methylation. The regulation of chemicals such as mercury should be through the regulation of methylmercury that leads to excessive bioaccumulation in a waterbody. Those sources of mercury, independent of whether they are derived from former mining activities, POTW's, etc., that lead to a significant excessive bioaccumulation should be regulated. This is the technically valid, cost-effective approach. It should replace the current regulatory approach for mercury.

Interpretation of Sediment Bioassay Results

A significant problem is occurring in the approach being used to interpret sediment bioassay results where it is being assumed that anthropogenically-derived Priority Pollutants that cause statistically significant toxicity relative to a reference location should be remediated and sources of those constituents be controlled through modified NPDES permitted loadings. This approach assumes that toxicity due to a heavy metal or organic is different to an aquatic organism such as oyster or fish larvae than the toxicity due to naturally-occurring toxicants such as low dissolved oxygen, ammonia and hydrogen sulfide. Further, the current approach does not attempt to regulate anthropogenically-derived constituents (nitrogen and phosphorus compounds) that stimulate algal growth in a waterbody which, in turn, causes low DO in sediments that leads to increased ammonia and hydrogen sulfide toxicity in the sediments. To an oyster larvae, it does not matter whether it was killed by ammonia or a Priority Pollutant organic; the effect to the oyster population is the same. The Agency needs to address this highly inconsistent approach of only regulating toxicity associated with the Priority Pollutant toxicants and ignoring toxicity associated with other constituents such as ammonia, H_2S and the large number of unregulated toxicants that can be present in sediments.

Another factor that the Agency needs to immediately address is the inappropriateness of assuming that any statistically significant toxicity relative to a reference sediment is of water quality significance. It is well-known that many waterbody sediments such as lakes and reservoirs are highly toxic yet have high-quality recreational fisheries. There is an urgent need for the Agency to conduct research that properly defines the water quality significance of sediment-associated toxicity. Such questions as whether there is a difference between the toxicity to various forms of aquatic life, such as amphipods, oyster larvae, etc., and the impairment of the beneficial uses of a waterbody in which the toxic sediments are located that is of concern to the public must be addressed.

There is also need to better understand the relationship between a certain percent kill or other adverse impact in a bioassay test and the impairment of the designated beneficial uses of the waterbody. Certainly, toxicity in excess of statistically significant amounts can occur in sediments without significantly impairing the designated beneficial uses of waterbodies. The coupling between sediment bioassay results and water quality use impairment must be better

understood. For now, the Agency should formulate guidance on how state and local regulatory agencies should proceed to address this issue as part of implementing control programs for sediment toxicity.

Regulation of Bioaccumulatable Chemicals

The US EPA's current approach for regulating bioaccumulatable chemicals is not technically valid. Rather than artificially contriving a chemical-specific national water quality criterion and a state standard, a far more reliable approach is to measure the concentrations of the bioaccumulatable chemicals in aquatic organism tissue that are important sources of food for humans and/or could be adverse to wildlife. Measurement of tissue residues directly assesses the excess concentrations. The contrived chemical criterion/standard and a derived bioaccumulation factor can, at best, only estimate excess concentrations. Bioaccumulation factors are site-specific. Applying the worst-case bioaccumulation factor to all sites, as is now done, is technically invalid and leads to massive over-regulation of some chemicals.

Eutrophication

The US EPA criteria and standards staff at a December 1994 multi-regional meeting held in Chicago indicated that the Agency was going to consider the development of water quality criteria for phosphorus and possibly nitrogen as they may impact the excessive fertilization of waterbodies. This is certainly justified since eutrophication is one of the major causes of real water quality use impairments in the nation's waters. Until the mid-1970's, the Agency had a very strong effective program devoted to eutrophication evaluation and management. The Agency's administration at that time, however, terminated this activity and shifted research funds to the Priority Pollutants. There has been about a 20-year period where one of the most important causes of water quality deterioration in the country (eutrophication) has been neglected by the Agency.

It is important that the Agency start to develop programs in eutrophication evaluation and management. It is also very important that these programs properly consider the large amount of work that was done in the 1960's and 1970's under the sponsorship of the Agency or its predecessor organization on this topic. Of particular concern is the work of the OECD eutrophication studies that was supported by the US EPA-Corvallis laboratory. Through this work in the US and in western Europe an overall approach was developed which provides a technical base for developing valid phosphorus limits for lakes, reservoirs and, in some cases, estuaries.

Enclosed is a summary paper covering the results of the US OECD studies and post-OECD studies that Dr. Jones-Lee and I conducted. Also enclosed are several reports on the use of these results in assessing and managing the trophic state of waterbodies. These papers provide information on an approach that can be used to determine excessive concentrations of phosphorus in waterbodies as it may impact the growth of planktonic algae. It is important to understand that it is not possible to develop a national water quality criterion for phosphorus in

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a similar way as has occurred for potentially toxic chemicals. From the OECD eutrophication study results, it is possible to develop a site-specific regulatory approach that can be used to determine the amounts of phosphorus that may be added to a waterbody in order to avoid excessive growth of planktonic algae. Additional information on these issues is provided in the enclosed papers.

Regulation of the Unregulated Toxic Chemicals

In some parts of the US, such as northern California, organophosphorus pesticides such as diazinon cause widespread significant aquatic life toxicity to *Cerodiaphnia.* The diazinon is derived primarily from agricultural use, although some of it is derived from urban use. The level of toxicity is such that if a NPDES point source discharger caused that amount of toxicity in the receiving waters for the discharge, the owner of the treatment works and the operator would be fined and possibly incarcerated.

Since there are no water quality criteria for diazinon and many of the other organophosphorus pesticides, the states and the US EPA representatives believe that they cannot regulate diazinon in the stormwater runoff from agricultural fields and in runoff from other areas where diazinon has been carried by airborne transport. The US EPA developed the information necessary to promulgate a diazinon water quality criteria several years ago. It appears that the reason this was not promulgated was that agricultural interests were able to prevent it through political pressure on the Agency.

It is essential that if the US EPA toxics control program is to have any credibility, the Agency must immediately develop an approach to control aquatic life toxicity due to all chemicals independent of their source that are found, as diazinon has been, to cause significant widespread toxicity in receiving waters for stormwater runoff. The requirements of no toxicity in ambient waters should not just be restricted to NPDES dischargers. It should apply to all sources of toxic chemicals including agricultural sources. The Agency should immediately continue the development of organophosphorus pesticide water quality criteria.

The Agency also needs to develop a more effective approach for regulating unregulated toxics in ambient waters. The finding of widespread toxicity using appropriate tests, such as the short-term chronic test developed by the Agency using larval fish, shellfish and zooplankton, should serve as a basis for regulatory action without having to develop water quality criteria and standards. Ambient water toxicity testing coupled with TIE's and source investigation should become the backbone of the US EPA's control program for toxic chemicals. This will lead to a far more technically valid, cost-effective control of toxics than is occurring under the Agency's current regulatory program.

Watershed Management Approach

The Agency is pursuing the watershed management approach for implementation of its water quality control programs. This is an appropriate approach to follow. However, unless

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agricultural interests and other unregulated activities can be brought under regulatory control, the watershed management approach as proposed will fail.

As discussed in the enclosed papers, it is important that the watershed management approach appropriately incorporate aquatic chemistry and toxicology in developing watershed-based chemical constituent control programs. Under no circumstances should the technically invalid approach of assuming that all constituents of a type, such as copper, derived from various components of the watershed have equal adverse impacts at all locations within the watershed. This is the approach that is being used in the San Francisco Bay copper situation by the state of California Regional Water Quality Control Board with the support of US EPA Region 9. As discussed above, it is obviously technically flawed since this approach failed to define a real water quality use impairment in San Francisco Bay before adopting this approach.

Further, even if such an impairment had been found that could be attributed to copper, the approach considered that all sources of copper were equally responsible for the water quality use impairment. This approach totally ignores what has been well-known for over 20 years--that chemical constituents, such as copper, exist in aquatic systems and their sources in a variety of chemical forms, only some of which are toxic - available. Further, the copper forms in a particular source do not necessarily equilibrate (chemical sense) in the receiving waters. Technically valid approaches require that the watershed approach consider the site-specific causes of both near-field (near the source) and far-field (away from the source) real water quality impacts on the beneficial uses of the waterbody or parts thereof. Further, any pollutant trading programs that are adopted must incorporate sufficient science in developing the trade so that real pollutants are traded, rather than a mixture of pollutants and chemical constituents. These issues are discussed in the enclosed papers.

Overall Regulatory Approach

There is urgent need to have those responsible in the US EPA for developing water quality management policy to focus on effects-based impact evaluation and not try to use chemically-based evaluations to regulate contaminants. Those who understand aquatic chemistry and aquatic toxicology as they relate to real water quality impacts have known for many years that chemically-based approaches are not valid and can lead to massive waste of public and private funds in over-regulating contaminants. Chemically-based approaches, if they are used at all, can only be used to indicate potential problems and not as an absolute standard.

During the past year, I have spent considerable time formulating a different approach for water quality management than is typically being used today. This approach focuses on using the monitoring funds available to determine the water quality use impairments that are occurring in a waterbody. We call the approach "evaluation monitoring." A description of this approach as it is applied to highway stormwater runoff is enclosed. The approach is applicable to any type of discharge or runoff.

While there is growing recognition that compliance monitoring as it is typically practiced provides little in the way of useful information on the impacts of the residual constituents in permitted discharges and runoff, there is a reluctance on the part of dischargers to conduct additional monitoring to define water quality impacts of the constituents in the discharge. This reluctance stems from the shortage of funds available to expand monitoring programs beyond the compliance monitoring that is now required.

The US EPA, as part of the ANPRM, should encourage dischargers and regulatory agencies to pool their financial resources where they focus on determining what real water quality use impairments are occurring in receiving waters, determine the cause of these impairments and the source of the constituents causing the impairments. This approach can readily lead to an appropriate implementation of the watershed management approach and a technically valid, cost-effective management of water quality.

It is very important that the Agency adopt a prioritized approach that can be implemented at the state and local level for addressing the most important water quality problems first. As these problems are solved, then more subtle problems can be addressed. A discussion of these issues is enclosed in the copy of the poster items from the paper presented at the national SETAC conference held in Vancouver, British Columbia in November, 1995.

Qualifications of G. Fred Lee and Anne Jones-Lee

Dr. G. Fred Lee is president and Dr. Anne Jones-Lee is vice president of G. Fred Lee & Associates, an environmental consulting firm located in El Macero, California. For 30 years, Dr. G. Fred Lee held university graduate level teaching and research positions at several major US universities, including a Distinguished Professorship of Civil and Environmental Engineering at the New Jersey Institute of Technology. Dr. Anne Jones-Lee taught university graduate-level environmental engineering and environmental sciences courses and conducted research for 11 years. She held an Associate Professorship in Civil and Environmental Engineering at the New Jersey Institute of Technology. In 1989, Dr. G. Fred Lee and Dr. Jones-Lee assumed full-time consulting activities through G. Fred Lee & Associates.

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

Dr. Anne Jones-Lee holds a bachelors degree from Southern Methodist University and a masters and PhD degree in Environmental Sciences from the University of Texas at Dallas. She has published over 200 professional papers and reports.

Dr. Lee's academic background and expertise in environmental engineering, aquatic chemistry, public health and water quality and Dr. Jones-Lee's academic background and expertise in aquatic biology, aquatic toxicology and water quality, coupled with their extensive

backgrounds in serving as advisors to governmental agencies, industry and others on water quality evaluation and management issues provide them with expertise and experience to provide guidance on how to address the significant water quality problems associated with the current regulatory approaches for the control of toxic and other chemicals in point and non-point source discharges.

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

Dr. G. Fred Lee and Dr. Anne Jones-Lee have extensive experience in developing approaches that work toward protection of water quality without significant unnecessary expenditures for chemical constituent control. They have been active in developing technically-valid, cost-effective approaches for the evaluation and management of chemical constituents in domestic and industrial wastewater discharges, contaminated sediments and urban and highway stormwater runoff since the 1960's.

Further information on their experience and expertise in water quality evaluation and management is available upon request.

List of Enclosures

Toxic Chemical Water Quality Criteria and Standards Development and Implementation

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Qualifications of G. Fred Lee

Recent Publications of G. Fred Lee and Anne Jones-Lee

G. Fred Lee and Anne Jones-Lee Summary of Experience & Activities

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

A copy of these enclosures is available upon request.