APPENDIX E

Comment Letters

There were two opportunities for public comment on the PCBs TMDL for San Francisco Bay. The first public comment period was June 22, 2007 through August 20, 2007. The second comment period was December 3, 2007 through January 22, 2008. All of the comment letters received during the first comment period are presented first, followed by the letters received during the second comment period. Peer review comment letters are presented at the end of this Appendix.

This Page Left Intentionally Blank

COMMENT LETTERS
PUBLIC COMMENT PERIOD ONE
JUNE 22, 2007 to AUGUST 20, 2007

Comment Letters Received:

U.S. Environmental Protection Agency, Region IX

California Department of Transportation

Bay Area Stormwater Management Agencies Association

Bay Area Clean Water Agencies

San Francisco Public Utilities Commission

City of San José, Environmental Services Department

Baykeeper, Clean Water Action, and Communities for a Better Environment

Associated General Contractors of California, et. al.

Bay Planning Coalition

Roger James

Mirant Delta, LLC.

Pacific Gas and Electric

California Chamber of Commerce and General Electric Company, submitted by Latham & Watkins LLP

Additional comment letters submitted on behalf of the California Chamber of Commerce and General Electric Company:

Quantitative Environmental Analysis

Natalie Wilson, BBL, Inc.

Russell E. Keenan Ph.D., AMEC Earth & Environmental, Inc.

Jay B. Silkworth, GE Global Research Center

Kenneth D. Jenkins

Anchor Environmental CA, L.P.

Dr. David Sunding, Berkeley Economic Consulting, Inc.

Evan K. Nyer, Donald F. Sauda, ARCADIS U.S., Inc.

This Page Left Intentionally Blank

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

August 20, 2007

Naomi Feger
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street
Oakland, CA 94612

Dear Ms. Feger:

Thank you for the opportunity to review and comment on the proposed Basin Plan Amendment and Staff Report for the Total Maximum Daily Load for PCBs in San Francisco Bay, dated June 22, 2007. We appreciate the hard work to develop this proposed TMDL and its implementation provisions. Below are comments on two issues of particular concern; attached are additional staff comments.

We have reviewed the proposed load and wasteload allocations. Before approving a TMDL in which some of the load reductions are allocated to nonpoint sources in lieu of additional load reductions allocated to point sources, there must be specific reasonable assurances that the nonpoint source reductions will in fact occur. Therefore, it is necessary for the Regional Board to explain in greater detail in this TMDL, with specific reasonable assurances, how the Central Valley load reduction from 42 kg/yr to 5 kg/yr will be achieved, and how the Urban Stormwater Runoff load reduction from 40 kg/yr to 2 kg/yr will be achieved, in order to allocate mass-based loads to point sources based on current concentrations and flows.

The draft Basin Plan language provides only a brief discussion concerning implementation of the PCB TMDL through NPDES permitting for wastewater and industrial sources. It is unclear how Water Board staff intends to calculate water quality-based effluent limits that are consistent with the wasteload allocations for NPDES dischargers, and whether the NPDES permits will require any reductions from these sources. Please explain further how these waste load allocations will be implemented. We look forward to working with you on this issue.

Our comments in this letter and its attachment do not constitute an approval, disapproval or determination by EPA under Clean Water Act section 303(d). We will act upon any TMDL submittal following State adoption and submittal to EPA.

In closing, we are pleased to see the proposed TMDL package for PCBs, and believe it will enhance the Board's ability to protect human health and the environment. If you have any questions, please call me at (415) 972-3452, or refer staff to Diane Fleck at (415) 972-3480; for permitting issues, please contact Nancy Yoshikawa at (415) 972-3535.

Sincerely,

(original signed by)

Janet Hashimoto
Chief, Monitoring and Assessment Office

cc: Fred Hetzel

Attachment

US EPA Region 9 Comments on Proposed Basin Plan Amendment and Staff Report for the Total Maximum Daily Load for PCBs in San Francisco Bay

1. Page 1of Staff Report: Introduction: Second Paragraph: This paragraph says that the Basin Plan delineates the water quality standards for PCBs in San Francisco Bay. While the Basin Plan contains the beneficial uses, the California Toxics Rule contains the numeric water quality criteria for PCBs in San Francisco Bay. Similarly, on page 3 of the Staff Report, under Project Definition, the third paragraph states that the PCB objective of 0.00017 ug/l total PCBs in water is not attained. The 0.00017 ug/l total PCBs value in water is the CTR *criterion*.

2. Page 23 of Staff Report: Fish Tissue Studies: This section calculates a screening value using a risk level of 10(-5), defined as the maximum acceptable risk level, which is later used as the numeric target for the TMDL. However, the CTR promulgated PCB human health criteria at a 10(-6) risk level (10 times more stringent). This section uses a fish consumption rate of 32 g/day, while the CTR uses a fish consumption rate of 6.5 g/day. The resulting CTR water column value is 170 pg/l (in 2002, EPA updated its recommended fish consumption rate to 17.5 g/day, resulting in a revised Clean Water Act section 304(a) criterion of 65 pg/l). The calculation in this section results in a screening value of 10 ng/g, while using the CTR values, the calculation results in a screening value of 5.3 ng/g. (This 5.3 ng/g value is used as the numeric target in the Calleguas Creek TMDL, dated June 20, 2005.) On page 20, it states that the CTR criterion was developed to protect the general population from an increased risk of no more than one in one million, but that sub-populations that consume greater quantities of fish may be less protected. However, it is not clear that the general population is sufficiently protected at a 10(-6) risk level consistent with the CTR which reflects a screening value of 5.3 ng/g, since the screening value used as the numeric target for this TMDL is 10 ng/g.

On page 51 of the Staff Report, in Section 8.1, Fish Tissue Target, the report states that the fish tissue numeric target is consistent with the CTR criterion of 170 pg/l, and that the CTR criteria will be attained when the fish tissue target for white croaker is attained. This is based on a calculation of actual bioaccumulation factors (BAFs) for the Bay, which are listed in Table 21 on page 52. Please include the fish tissue and water column data, from which the BAFs were calculated, and whether the data are spatially and temporally consistent.

We note that the report used an appropriate cancer slope factor of 2 in Section 6.2 to calculate the screening value/numeric target, but Section 8.1 states that a slope factor of 1 was used. It appears Section 8.1 needs to be corrected.

3. Page 23 of Staff Report: Fish Tissue Studies: At the bottom of the page, the report states that the calculated screening level of 10 ng/g wet-weight is equivalent to a sediment PCBs concentration of 1 ng/g, as discussed in Section 7.2. However, this discussion appears to be in Section 9.1, not Section 7.2. Section 9.1 discusses the SFEI food web model and references the Gobas and Arnot 2005 Final Technical Report as the source of the Figure 26, Conceptual Model of PCBs Movement and Fate in San Francisco Bay. Please clearly include the reference to the report that shows the relationship (how it was calculated) between the fish tissue value of 10 ng/g and sediment concentration of 1 ng/g.

4. Page 24 of Staff Report: Fish Tissue Studies: At the top of the page, the report states that the screening level of 10 ng/g wet-weight is protective of wildlife beneficial uses because it equates to a sediment concentration of 1 ng/g, and an EPA document calculated a screening level for the protection of wildlife of 160 ng/g of PCBs in sediment. (This is also noted at page 55, Section 9.1.) However, it is not clear that the 10 ng/g fish tissue value is appropriate for and protective of wildlife in San Francisco Bay. More discussion is needed. If you have not already done so, we request you discuss whether the projected target for the protection of human health will also protect wildlife in the San Francisco Bay with the Sacramento U.S. Fish and Wildlife Service.

5. Page 56-57 of Staff Report: Section 9.2 Mass Budget Model: The report discusses the SFEI simple mass budget model for PCBs and that the model predicts that reduction of external loads to 10 kg/yr is needed to attain a PCBs mass in the Bay of 160 kg, which is equivalent to the sediment goal of 1 ug/kg. Therefore, the report concludes that the assimilative capacity of the Bay is 10 kg/yr from external sources. Figure 28 reflects this model and the time line to achieve different reduction scenarios. It appears that the chosen scenario will take about 100 years to achieve, although this is not mentioned. More discussion of the model and the length of time necessary to achieve water quality standards in the Bay based on this model should be included.

Similarly, in section 11.2 Internal Sources, it states that the clean-up of PCB hot spots will "help accelerate the recovery of the Bay from its current impairment" but there is no attempt to quantify their affect or how their clean-up would affect the length of time necessary to achieve water quality standards. This important discussion should be more detailed.

6. Page 59 of Staff Report: Section 10.1 Total Maximum Daily Load: This section expresses the TMDL as an average annual load. As discussed in EPA's guidance memorandum dated November 15, 2006, EPA recommends that TMDLs and associated load allocations and wasteload allocations be expressed in terms of daily time increments. TMDLs and allocations may also be expressed in terms of both daily and non-daily time increments to help facilitate implementation of the applicable water quality standards.

7. Page 61 of Staff Report: Section 10.3 Wasteload Allocations/Urban Stormwater Runoff: Although this section in the Staff Report does not say how long stormwater agencies will have to achieve their individual wasteload allocations, the Draft Basin Plan Amendment at page A-9 states that "Urban stormwater runoff wasteload allocations shall be achieved within 20 years and shall be implemented through the NPDES stormwater permits issued to urban stormwater runoff management agencies and the California Department of Transportation (Caltrans)." If the schedule is to be implemented through compliance schedules in NPDES permits, and if its terms would not be covered by a compliance schedule-authorizing provision already in existence, the State will need to submit to EPA, and EPA will need to approve, a compliance schedule-authorizing provision under Clean Water Act section 303(c). The provision will need to be approved before the State can allow dischargers to exceed water quality-based effluent limitations (WQBELs) based on final WLAs in permits. The provision will need to include the State's rationale to allow for compliance schedules of up to 20 years to achieve final WLAs. Any authorizing compliance schedule provision must be consistent with EPA regulations at 40 CFR 122.47, which require that the compliance schedule be appropriate, require compliance as soon as possible, and include interim requirements at specified time intervals. When the State submits the compliance-schedule authorizing provision to EPA, it should clearly indicate how

these requirements have been satisfied, or how they will be satisfied during the permit process.

8. Page 64 of Staff Report: Section 10.4 Load Allocations: The report indicates that the Central Valley Watershed allocation is 5 kg/yr, down from a present loading of 42 kg/yr. In Section 11.1, Implementation/External Sources, the report states that sediments entering from the Central Valley have lower PCBs concentrations than in-bay sediments, and that major PCBs mass loading events that occur during episodic high flow events mostly flow directly out of the Bay through the Golden Gate. The report further states "[t]he allocation will be attained through anticipated natural attenuation of PCBs in the Central Valley watershed." Please reference the information or basis used to make this assumption, and the time necessary to achieve this. As noted previously, please explain in more detail how the Central Valley allocation will be achieved.

9. Page 64 of Staff Report: Section 10.5 Margin of Safety: The report indicates that the Margin of Safety is implicit because of several conservative assumptions, one of which is the conservative approach used to derive the fish tissue target. However, the TMDL uses a 10(-5) risk level, thus the target is 10 times less conservative than the risk level used in the CTR to protect the general population. Using a higher fish consumption rate of 32 g/day for the target in the TMDL, as opposed to the 6.5 g/day used in the CTR, does not offset the 10 fold difference in the risk level, as discussed in comment 3 above.

10. Page 73 of Staff Report: Section 11.5 Adaptive Implementation/Periodic Review: This section states that the Water Board will review new information periodically, but does not say how often it will review this information and consider amendments to the TMDL. We suggest the Board consider a more definite timeframe for review of technical information and consideration of amendments to update the TMDL.

DEPARTMENT OF TRANSPORTATION
DIVISION OF ENVIRONMENTAL ANALYSIS, MS 27
1120 N STREET
P. O. BOX 942874
SACRAMENTO, CA 94274-0001
PHONE (916) 653-7507
FAX (916) 653-7757
TTY (916) 653-4086

Flex your power!
Be energy efficient!

August 20, 2007

Mr. Fred Hetzel
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612
By: email - fhetzel@waterboards.ca.gov

SUBJECT: Total Maximum Daily Load (TMDL) for polychlorinated biphenyls (PCBs) for San Francisco Bay

Dear Mr. Hetzel:

The California Department of Transportation (Department) appreciates the opportunity to comment on the proposed Basin Plan Amendment and supporting staff report incorporating a TMDL for PCBs for San Francisco Bay. This TMDL proposes substantial reductions in the loadings of PCBs carried by stormwater and therefore could potentially impact the Department's runoff control program in the Bay area. Approximately 27 square miles of Department right-of-way within Region 2 drains to the San Francisco Bay. This area represents 0.7% of the total watershed (4,000 square miles).

We support the Regional Board's efforts to improve water quality in the Bay but have concerns regarding the viability of the proposed strategy.

Comment #1 With respect to the Department, the proposed Basin Plan Amendment (Appendix A) includes the following statement:

Urban stormwater runoff wasteload allocations shall be achieved within 20 years and shall be implemented through the NPDES stormwater permits issued to urban stormwater runoff management agencies and the Department. The urban stormwater runoff wasteload allocations implicitly include all current and future permitted discharges, not otherwise addressed by another allocation, and unpermitted discharges within the geographic boundaries of urban runoff management agencies including, but not limited to, Caltrans roadway and non-roadway facilities and rights-of-way, atmospheric deposition, public facilities, properties proximate to stream banks, industrial facilities, and construction sites. [*Page A-9*]

It would be premature to develop strategy for corrective actions or effectively control when the sources are largely unknown. While some hot spots have been identified, there is little information demonstrating that those and other hot spots are responsible for the majority of

PCBs contributed by urban runoff. We believe that additional research is needed to identify the sources. We are concerned that the strategy of focusing on hotspots will not achieve the high reductions (95%) required of urban watersheds. As a result, structural controls for runoff may be the only option for meeting the allocation. However, structural BMPs are not considered viable for controlling PCBs in urban runoff. Therefore, the report should clearly demonstrate how the hotspot strategy will achieve those reductions or thoroughly discuss the use of structural BMPs, including their costs, impacts, siting and other feasibility issues.

Comment #2: The Staff Report proposes routing urban stormwater runoff through municipal wastewater treatment facilities as an efficient means of reducing PCBs and other particle-associated contaminant loads to the Bay. The TMDL includes an additional allocation for PCBs (0.9 kg/yr) for the stormwater flows directed to POTWs. Routing of stormwater flows to POTWs could be beneficial. However, the following potential constraints and regulatory issues should addressed in the TMDL:

- Stormwater pollutants could cause POTWs to exceed their water quality-based effluent limits (WQBEL) or worsen current exceedances. Recent permits issued (or proposed to be issued) to POTWs include enforcement orders due to exceedance of WQBELs for dioxin, mercury, and other constituents. Dioxin, in particular, is present generally due to infiltration or inflow of stormwater into sewer systems. Monitoring by the Board has found high levels of dioxin in stormwater runoff.[i] Dioxins in runoff can be as much as two orders of magnitude higher than water quality criteria (objectives). POTWs will be unlikely to accept urban runoff—with its heavy load of dioxins—that is certain to exacerbate permit compliance.
- During larger storms, POTW capacity is typically exceeded to the extent that all flows do not receive full secondary treatment. Increasingly, regulatory pressure is being applied to POTWs to improve their treatment levels during wet weather. As a result, POTWs are going to be reluctant to accept stormwater flows that may put them at risk of not providing full treatment to all flows.

Comment #3: It is not clear how the TMDL can make an appropriate and substantiated allocation to external sources (stormwater runoff, etc.) until the contribution of internal sources has been better quantified. The Staff Report notes that *bed erosion* and in-*bay contaminated sediment* have not been quantified. Nevertheless, the modeling done for the TMDL concludes that attaining the desired Bay sediment concentration of one ug/kg will require a reduction in external loadings to 10 kg/yr.

---

[i] Online at: http://www.swrcb.ca.gov/rwqcb2/download/DioxinStormwaterSurvey1997.pdf

Comment #4: The Basin Plan Amendment specifies that:

Requirements in each NPDES permit issued or reissued [including the Caltrans permit], shall be based on an updated assessment of best management practices and control measures intended to reduce PCBs in urban runoff. Control measures implemented by urban runoff management agencies and other entities (except construction and industrial sites) shall reduce PCBs in urban runoff to the maximum extent practicable. [*Page A-9*]

It then identifies the measures that "demonstrate progress toward attainment," which include:

- Selection of one of three options for quantifying PCB loading in the permittee's drainage.
- Development and implementation of a "monitoring system to quantify PCBs urban runoff loads and the load reductions achieved through treatment, source control and other actions..."
- Support for "actions to reduce the health risks of people who consume PCBs-contaminated San Francisco Bay fish..."
- Conducting or causing "to be conducted monitoring, and studies to fill critical data needs identified in the adaptive implementation section."

Who completes the updated assessment for permitting purposes? Specifically what BMPs or other control measures will the Department need to implement? This vague requirement places no bounds on information collection efforts. In addition, we are not convinced that permittees will have a responsibility to take direct actions, other than reducing pollutant discharges that reduce health risks for those consuming contaminated Bay fish. It is not clear what the Board is proposing. Does it include educational messages or providing alternative food sources? These proposed actions should be further developed to include information on purpose, scope, and costs, before it is possible to evaluate whether they are appropriate.

The Department will work in cooperation with other urban dischargers and the Board to find equitable ways to implement the TMDL. However, we strongly encourage the Board to address the issues raised above prior to adopting the Basin Plan Amendment.

We hope these comments are helpful. If you have any questions, please call Keith Jones of my office at (916) 653-4947.

Sincerely,

for Mike Rogers

G. SCOTT McGOWEN
Chief Environmental Engineer

"Caltrans improves mobility across California"

Alameda Countywide Clean Water Program

Contra Costa Clean Water Program

Fairfield-Suisun Urban Runoff Management Program

Marin County Stormwater Pollution Prevention Program

San Mateo Countywide Stormwater Pollution Prevention Program

Santa Clara Valley Urban Runoff Pollution Prevention Program

Vallejo Sanitation and Flood Control District

B A S M A A

August 20, 2007

Fred Hetzel
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

Subject: PCBs Total Maximum Daily Load (TMDL) in San Francisco Bay
Proposed Basin Plan Amendment and Staff Report, June 22, 2007

Dear Fred:

This letter is submitted on behalf of the Bay Area Stormwater Management Agencies Association (BASMAA) in response to the invitation to submit comments on the document entitled *Total Maximum Daily Load for PCBs in San Francisco Bay, Proposed Basin Plan Amendment and Staff Report*, dated June 22, 2007 (hereinafter referred to as the "PCB Report/BPA"). The PCB Report/BPA was prepared by staff of the California Regional Water Quality Control Board, San Francisco Bay Region (Water Board) and, in addition to providing details on the development of the Bay PCBs TMDL, includes a plan to implement the TMDL.

BASMAA member agencies appreciate the opportunity to comment on the PCB Report/BPA and commend Water Board staff on the hard work put into this challenging project. Release of the PCB Report/BPA is an important milestone. We would also like to recognize the staff and participants of the San Francisco Estuary Regional Monitoring Program (RMP) for their important contributions to the project.

BASMAA is committed to addressing urban runoff-related impairments to beneficial uses of San Francisco Bay. We agree that reducing impairment of the Bay's beneficial uses by PCBs should be a high priority to all Bay Area public agencies and citizens. As public agencies we recognize the importance of this task, and therefore seek a fair, objective and transparent PCBs TMDL. A TMDL development process based on the best available information, sound science, feasibility, and cost-effectiveness will help establish the legitimacy and legality of the TMDL and inspire the public's confidence. Furthermore, the implementation plan must be one that can reasonably and realistically achieve the TMDL goals and wasteload allocations.

The PCB Report/BPA updates and expands upon a Water Board staff report entitled *PCBs in San Francisco Bay Total Maximum Daily Load (TMDL) Project Report,* dated January 8, 2004. BASMAA submitted comments on the January 2004 report in a letter dated February 20, 2004. Most of these comments have not been adequately addressed but remain highly pertinent; they are therefore reiterated below as appropriate. With regard to the Water Board process for adoption of this TMDL, BASMAA's February 2004 letter requested sufficient time for a meaningful official public comment process and dialogue with staff once a proposed Basin Plan amendment is released. Our letter stated as follows:

Bay Area
Stormwater Management
Agencies Association
1515 Clay Street
Suite 1400
Oakland, CA 94612
510.622.2326
www.basmaa.org

"Because of the significant implications of such an amendment, the demands it will impose, and the amount of time and public resources it will likely consume, we would like to emphasize that our current exchange of information will be no substitute for providing adequate time (in our estimation at least six to nine months) for meaningful peer review of and public comment on a proposed Basin Plan amendment. We also request, as was done with the Bay mercury TMDL, the opportunity to review, comment on and discuss with Water Board staff and yourself an early draft version (i.e., before public release) of the sections of the PCBs Basin Plan amendment and related PCB actions relevant to urban runoff."

Rather than the requested six to nine months for review and comment, Water Board staff is providing the minimum public comment period of 45 days, a period of time that is inadequate. In addition, Water Board staff did not provide BASMAA with an early draft version of the urban runoff-related sections of the proposed Basin Plan amendment, despite promising to do so in a December 22, 2006 e-mail.[1] Further, the comment period occurs during the summer time period when many public agency staff and councils are on vacation. Thus the comments in this letter should be considered preliminary and may be revised or expanded in the future. In addition, although we are communicating with the large number (about 90) of Bay Area co-permittees covered under municipal stormwater NPDES permits, the 45-day public comment period precludes their meaningful involvement in preparing these comments. Thus, these comments do not necessarily represent the views of all the municipal stormwater co-permittees, and they may choose to provide their own comments within or after the 45-day public comment period.

It should also be noted that while the adoption of a TMDL containing wasteload allocations and load allocations may be a federally mandated requirement, the Water Board's discretionary determination to assign load reductions and implementation plan responsibilities to municipal stormwater agencies is not required by the Clean Water Act (CWA) and hence, represents a new State-imposed program and/or level of service increase which is subject to the subvention requirements of Article XIII B, section 6 of the California Constitution. (See County of Los Angeles v. Comm'n on State Mandates, Cal. App. 4th (Cal. Ct. App., May 10, 2007).).

Our goal is to work cooperatively with Water Board staff to reach common ground in establishing this important TMDL and the related implementation plan. The preliminary comments in this letter are intended to be constructive; as such, specific suggested improvements are provided in relation to each issue discussed. We request that Water Board staff incorporates our suggested comments and improvements into a revised PCB Report/BPA. We believe that our recommended changes are significant enough in breadth and scope to warrant revision of this document. Our principal comments and recommendations are summarized below; the attachment contains a more detailed discussion of each comment and provides references to specific sections and pages of the PCB Report/BPA.

Summary of BASMAA's Comments

- There is substantial anecdotal evidence that PCB-containing oils were historically used for dust control, resulting in direct releases of PCBs to the environment. In addition, the use of hydraulic fluids containing PCBs had significant potential to result in releases to the environment, since hydraulic systems were designed to leak slowly to provide lubrication.

[1]Prior to release of the PCB Report/BPA, BASMAA did have the opportunity to discuss with Water Board staff short-term aspects of the implementation plan relating to the ongoing Municipal Regional Permit development process. This, however, is not a substitute for more comprehensive discussions of the TMDL itself.

The PCB Report/BPA should be revised to discuss these uses and their relatively high potential to result in releases to the environment.

- Bay Area equipment that may continue to contain PCBs includes PG&E electrical equipment with dielectric fluids, such as substation transformers. The PCB Report/BPA should be revised to include a discussion of PG&E's historic and current use of PCBs. Furthermore, the PCB Report/BPA should acknowledge the need for additional documentation of the status of PG&E's efforts to remove PCBs from their equipment, the fate and management of such removed equipment, and the past, current, and future potential for PG&E equipment (removed and in-service) to release PCBs to the environment. This is an important potential source of PCBs that require further documentation and investigation.

- The PCB Report/BPA incorporates an estimate of PCB loading from urban runoff into the Bay of 40 kg/year. This very preliminary and highly uncertain estimate was developed by the Joint Stormwater Agency Project and was calculated using concentrations of PCBs in bedded sediments from stormwater conveyances. As such it should not be incorporated into regulatory criteria or actions such as the PCB TMDL. The PCB Report/BPA should instead be revised to designate the 40 kg/year estimate as preliminary and describe the associated assumptions, uncertainties and limitations of the estimate, per the Joint Stormwater Agency Project report. Furthermore, the PCB Report/BPA should state that the 40 kg/year estimate will be revised in the adaptive management process once sufficient data are available to extrapolate a loading estimate from ongoing RMP and future urban runoff program studies.

- The linkage analysis and calculation of the total TMDL of 10 kg/year rely on a simple one-box pollutant fate model. The PCB Report/BPA should be revised to clearly describe the limitations of this model. For example, it does not account for how processes such as pollutant loading and sediment erosion/deposition vary among different Bay segments. A multi-box fate model that is currently under development will supersede the one-box model and will help address the limitations. The PCB Report/BPA should be revised to clarify that the linkage analysis and TMDL of 10 kg/year are preliminary pending incorporation of the multi-box model. The linkage analysis and calculation should then be revised accordingly. Although the PCB Report/BPA does acknowledge the need for improved fate and transport modeling, the requested revisions are necessary to inform stakeholders and the public about the current uncertainty in our understanding of how the recovery of the Bay would respond to load reductions caused by management actions.

- The explanation of how the proposed total wasteload allocation for urban runoff of 2 kg/year was calculated is inadequate. The PCB Report/BPA should be revised to include a detailed explanation of the calculation, including all assumptions, justified values for all parameters, and the exact mathematical calculation used. This explanation and wasteload allocation is especially important to BASMAA member agencies.

- The proposed urban runoff allocation of 2 kg/year represents a 95% reduction in PCBs loads, based upon the estimated existing urban runoff load of 40 kg/year. Two kg/year is also estimated to be the resulting load when all sediment in urban runoff has a concentration of 1 ug/kg, the sediment PCB concentration goal. <u>Meeting this allocation and sediment target in the proposed 20-year time frame is almost certainly unrealistic, impracticable and infeasible</u>. A thorough technical and economic analysis of the feasibility of using available technologies to achieve the urban runoff wasteload allocation must be developed and included in a revised PCB Report/BPA.

- BASMAA acknowledges that implementing the TMDL may include remediating selected on-land areas with elevated PCBs. However, it would be unfair and legally inappropriate to burden municipalities with cleaning up these sites. Thus, PCB site cleanups should not be pursued through municipal stormwater NPDES permits. Other regulatory programs and funding sources exist (e.g., Proposition 13 and the State Cleanup and Abatement Account), present reliable enforcement mechanisms, have a proven track record of success, and should instead be used by the Water Board. Existing models used to cleanup polluted sites (e.g., CERCLA actions and site cleanup requirements, waste discharge requirements and Section 13267 requests issued by the Water Board under the California Water Code) should be applied, which include identifying the real responsible parties whenever possible. These are the appropriate legal and regulatory mechanisms for implementation of PCB site cleanups, with assistance from municipalities in this effort. Some sites are currently being cleaned up under such programs; the PCB Report/BPA should be revised to discuss the need to establish coordination between these programs and the TMDL.

- The PCB Report/BPA proposes relatively large load reductions for two external sources: the Central Valley watershed and urban runoff. The PCB Report/BPA should include an estimate of the timeframe for the Central Valley watershed to achieve its proposed wasteload allocation and discuss the relationship between that timeframe and the proposed 20-year timeframe for urban runoff in the context of achievement of the overall TMDL.

- Stormwater agencies have generally been supportive of linking implementation planning with TMDL development. However, BASMAA also strongly desires that implementation policies, actions and schedules be developed in a separate but parallel process from development of the TMDL (i.e., calculation of acceptable loading and allocations) and its approval by USEPA. Separating the TMDL per se from related implementation considerations will allow the Water Board to more expeditiously submit the former for approval by USEPA (which is not required to review or approve implementation aspects of TMDLs under the CWA) and, by so doing, will preserve the State's maximum authority and flexibility to work with local governments on addressing the challenges that will be presented. Thus the PCB Report/BPA should be revised to remove the implementation sections; these sections should be presented in a separate report.

- The economic analysis presented in the PCB Report/BPA is inadequate, poorly supported, and presents numerous assumptions without basis or justification. The PCB Report/BPA states that the basis of cost information includes "similar work performed elsewhere." However, no information or examples are provided to support this statement. The PCB Report/BPA should be revised to include a thorough and detailed economic analysis of the costs associated with the implementation and monitoring activities that might result from the proposed Basin Plan Amendment. The analysis should clearly document and justify all assumptions used to develop the costs.

- Based upon the information in the PCB Report/BPA, a gross upper-bound estimate of the anticipated cost to restore the Bay's beneficial uses that are impaired by PCBs (i.e., attain the sediment target of 1 ug/kg and the fish tissue target of 0.01 mg/kg) is 70 years at $500 million per year, or about $35 billion. This equates to an estimated cost of approximately $14.3 million per kg PCBs removed. Such a comparison of the costs and assumed benefits of the proposed implementation actions should be included in the PCB Report/BPA and used to inform a debate among the Water Board, stakeholders and public regarding whether a reasonable relationship exists between the anticipated costs and benefits. Only then can a meaningful dialogue occur with respect to reasonable and affordable implementation actions and load reductions.

- The PCB Report/BPA asserts that the proposed implementation plan schedule provides opportunity to analyze alternative means of compliance and allows time for urban runoff agencies to secure funding. However, potential sources of such funding are not identified. Unfortunately, the BASMAA member agencies that will be required to implement the urban runoff PCB reduction strategies are under severe budget restrictions and furthermore, as we have repeatedly stated, Proposition 218 severely limits the ability of local government to generate additional revenues for urban runoff programs. Thus, the PCB Report/BPA should be revised to discuss the financial constraints on local agencies and the need for the Water Board to provide flexibility to ensure that the targets, allocations and implementation measures are economically attainable and technically feasible.

We hope you find these preliminary comments and suggested improvements to the PCB Report/BPA useful. Please contact me at 925-313-2373, Jon Konnan (BASMAA PCBs representative) at 510-832-2852 x.108, or Geoff Brosseau (BASMAA Executive Director) at 510-622-2326 if you have any questions regarding the comments or suggested revisions.

Sincerely,

Donald P. Freitas
BASMAA Executive Board Chair and CCCWP

cc: Jim Scanlin, ACCWP
Kevin Cullen, FSURMP
Matt Fabry, SMCWPPP
Lance Barnett, VSFCD
Liz Lewis, MCSTOPPP
Adam Olivieri, SCVURPPP
Jon Konnan, BASMAA PCBs Representative
Geoff Brosseau, BASMAA Executive Director
Gary Grimm, Law Office of Gary J. Grimm
Tom Mumley, SFBRWQCB
Bruce Wolfe, SFBRWQCB
Mike Connor, SFEI

ATTACHMENT

This attachment discusses each of BASMAA's comments in detail and provides references to specific sections and pages of the PCB Report/BPA.

4.3. Production and Uses

There is substantial anecdotal evidence that PCB-containing oils were historically used for dust control, resulting in direct releases of PCBs to the environment. In addition, the use of hydraulic fluids containing PCBs had significant potential to result in releases to the environment, since hydraulic systems are designed to leak slowly to provide lubrication (Binational Toxics Strategy. *Draft Options Paper: Virtual Elimination of PCBs.* USEPA Great Lakes National Program Office. October 1998). The PCB Report/BPA should be revised to discuss these uses and their potential to cause releases to the environment. These are important sources of PCBs that require further documentation and investigation.

Equipment in the Bay Area that potentially contains PCBs includes PG&E electrical equipment with dielectric fluids, such as substation transformers. A letter from PG&E to Water Board staff (Doss, R., letter from Pacific Gas and Electric Company to Lawrence B. Kolb, Acting Executive Officer, California Regional Water Quality Control Board, San Francisco Bay Region, September 1, 2000) indicates that the *"vast majority of PCB-filled electrical equipment"* was removed from its system during the mid-1980s. The letter also states*: "Distribution line equipment and all other fluid-filled substation electric equipment contains mineral oil dielectric fluid. ...The over 900,000 mineral oil-filled distribution line pieces of equipment in service are generally not tested for PCBs until fluid is removed at the time of servicing, or in the event of a spill or release of such fluid. PG&E's experience has been that, in general, approximately ten percent of such units contain PCBs at concentrations of 50 parts-per-million (ppm) or greater, and fewer than one percent of these units contain PCBs at concentrations of 500 ppm or greater."* A follow-up letter (Doss, R., letter from Pacific Gas and Electric Company to Loretta K. Barsamiam, Executive Officer, California Regional Water Quality Control Board, San Francisco Bay Region, December 21, 2000) states*: "The declining percentage of oil-filled units which contain PCBs reflects our efforts to remove such units during servicing, as well as the replacement programs PG&E conducted in the mid-1980s."*

The PCB Report/BPA should be revised to include a discussion of PG&E's historic and current use of PCBs. Furthermore, the PCB Report/BPA should acknowledge the need for additional documentation of the current status of PG&E's efforts to remove PCBs from their equipment, the fate and management of such removed equipment, and the past, current, and future potential for PG&E equipment (removed and in-service) to release PCBs to the environment.

7.2. External Sources

The PCB Report/BPA incorporates an estimate of PCB loading into the Bay from urban runoff of 40 kg/year. This estimate is from the Joint Stormwater Agency Project report (Kinnetic Laboratories, Inc. et al. *Final Report, Joint Stormwater Agency Project to Study Urban Sources of Mercury, PCBs, and Organochlorine Pesticides*. April 2002). As explained in this report, the loading estimate was very preliminary, was calculated using concentrations of PCBs in bedded sediments from stormwater conveyances, and is highly uncertain. The associated assumptions and uncertainties are described in the Joint Stormwater Agency Project report, but not in the PCB Report/BPA. Furthermore, San Francisco Estuary Institute staff has commented that it is not possible to determine the bias and error associated with loading estimates based on bedded sediment concentrations. It is inappropriate to incorporate load estimates based on pollutant concentrations in bedded stormwater sediments into regulatory criteria or actions such as the Bay PCBs TMDL. For example, though not clearly documented (see below comment on 10.3. Wasteload Allocations), we understand that the PCB Report/BPA directly used the urban runoff loading estimate in calculating the urban runoff wasteload allocation.

A more appropriate method to estimate total stormwater loads of PCBs into the Bay would be to extrapolate the results of current and planned pollutant loading studies in representative individual Bay Area watersheds. Some of these studies are currently being conducted through the RMP's "Observation Watershed" approach. Load estimates are currently available for the Guadalupe River watershed, a large watershed in the southern portion of the Bay Area with mixed urban and open space land uses. More recently, estimates are being developed for a small, highly urban watershed in the eastern Bay Area referred to as "Zone 4 Line A." The RMP tentatively plans to perform similar loading studies in other representative Bay Area watersheds in the future.

In addition, Bay Area urban runoff programs are proposing to supplement the RMP studies by conducting pollutant loading monitoring in additional selected Bay Area watersheds. The details of this monitoring are being established through the MRP development process.

The PCB Report/BPA should be revised to designate the above load estimate of 40 kg/year as preliminary and describe the associated assumptions and uncertainties in the Joint Stormwater Agency Project report. Furthermore, the PCB Report/BPA should state that through the adaptive management process the 40 kg/year estimate will be replaced once sufficient data are available to extrapolate a loading estimate from the RMP and urban runoff program studies.

9.2. Mass Budget Model

The linkage analysis and calculation of the total TMDL of 10 kg/year rely on a simple one-box mass budget model. Limitations of this model include:

- The model does not account for how processes such as pollutant loading and sediment erosion/deposition vary among different Bay segments. As discussed in the PCB Report/BPA (p.8), recent studies indicate that sediments are eroding in portions of the Bay. Sediments deposited during earlier periods of Bay Area industrialization and high PCB use are now being uncovered in some areas. These sediments may contain relatively high levels of PCBs, resulting in increased availability of PCBs to the Bay food web. Even if all current external PCBs sources to the Bay are eliminated, exposure of historically contaminated sediment may be a significant PCBs source to organisms. Since this process could potentially significantly delay recovery of the Bay despite any new management actions taken to reduce external loads, sediment dynamics needs to be incorporated into the long-term modeling of the fate of PCBs in the Bay.

- Currently there is a significant discrepancy between direct estimates of PCBs loads to the Bay and estimates based on the model, highlighting the current uncertainty in the model's predictions.

- An uncertainty analysis was not conducted during the modeling. Such an analysis would provide more information on how the model's predictions vary with the uncertainty and variability in input parameters.

The PCB Report/BPA should be revised to clearly describe the limitations of the one-box model. A multi-box fate model currently under development will supersede the one-box model and help address the above limitations. The PCB Report/BPA should therefore be revised to clarify that the linkage analysis and TMDL of 10 kg/year are preliminary pending incorporation of the multi-box model. Although the PCB Report/BPA does acknowledge the need for improved fate and transport modeling (p.74), the requested revisions are necessary to inform stakeholders and the public about the current uncertainty in our understanding of how the recovery of the Bay would respond to load reductions caused by management actions.

The above observations are supported by the external scientific peer review (Appendix C of the PCB Report/BPA, p.C-6 through C-8).

10.3. Wasteload Allocations

Basis of Urban Runoff Allocation

The proposed total wasteload allocation for urban runoff is 2 kg/year. The PCB Report/BPA states that it *"reflects the resulting PCBs load when all sediment in urban stormwater runoff has a concentration of 1 µg/kg, the sediment PCBs concentration goal, assuming the sediment loads used to calculate the current PCBs load do not change."* This explanation of how the allocation was calculated is inadequate, and should be replaced by a detailed explanation that includes all assumptions, justified values for all parameters, and the exact mathematical calculations used.

One of the external scientific peer reviewers also stated that the calculation methodologies for urban runoff and other allocations need to be explained (Appendix C of the PCB Report/BPA, p.C-12).

Feasibility

The proposed urban runoff allocation of 2 kg/year represents a 95% reduction in PCBs loads, based upon the estimated existing urban runoff load of 40 kg/year. Two kg/year is also estimated to be the resulting load when all sediment in urban runoff has a concentration of 1 ug/kg, the sediment PCB concentration goal. The feasibility of meeting this allocation and sediment target in the proposed 20-year time frame is highly questionable given:

- the large reservoir of PCBs typically found in urban areas;
- the wide distribution of sources (most of which are unknown);
- the difficulties in obtaining funding to cleanup former and current industrial/military facilities with PCBs;
- the lack of control by urban runoff programs over many sources (e.g., on-land polluted sites); and
- the potentially prohibitive cost of treating runoff from all such sites.

This observation is supported by the external scientific peer review (Appendix C of the PCB Report/BPA, p.C-13). A thorough technical and economic analysis of the feasibility of using available technologies to achieve the wasteload allocation for urban runoff needs to be developed and included in a revised PCB Report/BPA.

Remediation of On-land Areas with Elevated PCBs

BASMAA acknowledges that implementing the TMDL may include remediating selected on-land areas with elevated PCBs. However, it would be unfair and legally inappropriate to burden municipalities with cleaning up these sites. Thus PCB site cleanups should not be pursued through municipal stormwater NPDES permits. Other regulatory programs and funding sources exist (e.g., Proposition 13 and the State Cleanup and Abatement Account), present reliable enforcement mechanisms, have a proven track record of success, and should instead be used by the Water Board. Existing models used to cleanup polluted sites (e.g., CERCLA actions and waste discharge requirements, site cleanup requirements and Section 13267 requests issued by the Water Board under the California Water Code) should be applied, which include identifying the real responsible parties whenever possible. Some sites are currently being cleaned up under such programs; the PCB Report/BPA should be revised to discuss the need to establish coordination between these programs and the TMDL.

One example is the Delta Star site in the City of San Carlos in San Mateo County. Relatively high levels of PCBs were found in a storm drain sediment sample collected by BASMAA agencies downstream of this site. Electrical equipment containing PCBs was formerly manufactured at the Delta Star property and PCBs have been found in soil and groundwater at the site. Thus this site may be a source of PCBs in storm drain sediments. The Water Board is the lead agency overseeing an ongoing site cleanup.

For a few sites that have been identified to date (such as Delta Star), BASMAA agencies have already requested that Water Board staff work with appropriate parties (e.g., PG&E, the Department of Toxic Substances Control and non-TMDL staff within the Water Board) to investigate the possibility that PCBs have entered storm drains. The PCB Report/BPA should acknowledge and distinguish this type of issue from those that are appropriately addressed directly through municipal stormwater program activities, both in the context of current cleanup sites and sites that may be identified in the future.

11. Implementation

Urban runoff wasteload allocations in the PCBs TMDL will be implemented through Bay Area municipal stormwater NPDES permits. Water Board staff is proposing to replace the existing Phase I countywide permits in the Bay Area with a single Municipal Regional Permit (MRP) covering all Bay Area municipalities with existing Phase I coverage. The overarching goal is to standardize urban runoff-related requirements in the region. Water Board staff released an administrative draft of the MRP on May 1, 2007. BASMAA and Water Board staff met several times in June 2007 to discuss the details of the May 1, 2007 administrative draft. We found the discussions informative and constructive and appreciate that Water Board staff is willing to work with us to develop permit provisions aimed at reducing urban runoff pollutant loads to the maximum extent practicable. The revisions to the PCB TMDL-related administrative draft permit provisions preliminarily and tentatively agreed upon at these meetings appear generally consistent with the corresponding *short-term* actions (i.e., over the next five years) described in the implementation plan in the PCB Report/BPA.

The PCB Report/BPA proposes relatively large load reductions for two external sources: the Central Valley watershed and urban runoff. It is proposed that the Central Valley watershed load reduction (and corresponding wasteload allocation) will be attained through "*anticipated natural attenuation.*" Furthermore, although the PCB Report/BPA proposes that the urban runoff load reduction will be achieved within 20 years, a timeframe for achieving the Central Valley watershed load reduction is not discussed. The PCB Report/BPA should include an estimate of this timeframe for the Central Valley watershed to achieve its proposed allocation and discuss the relationship between that timeframe and the urban runoff timeframe in the context of achievement of the overall TMDL.

Stormwater agencies have generally been supportive of linking implementation planning with TMDL development. BASMAA, however, also strongly desires that implementation policies, actions and schedules be developed in a separate but parallel process from development of the TMDL (i.e., calculation of acceptable loading and allocations) and its approval by USEPA. BASMAA also strongly desires that implementation planning, with respect to municipal stormwater, be conducted in a manner consistent with the maximum extent practicable standard set forth in the CWA. (33 U.S.C. § 1342(p)(3)(B).) Separating the TMDL per se from related implementation considerations will allow the Water Board to more expeditiously submit the former for approval by USEPA (which is not required to review or approve implementation aspects of TMDLs under the CWA) and, by so doing, will preserve the State's maximum authority and flexibility to work with local governments on addressing the challenges that will be presented.[2] Thus the PCB Report/BPA should be revised to remove the implementation sections; these sections should be presented in a separate report.

12.6. Economic Considerations Related to Potential Implementation Plan Actions

The economic analysis presented in the PCB Report/BPA is inadequate, poorly supported, and presents several assumptions without bases or justifications. For example, the PCB Report/BPA states (p.98 – 99):

"... the most costly actions will be identified and evaluated through phased pilot and feasibility studies. These assessments need to be completed before the dischargers select which action or combination of actions will be most effective and appropriate to their allocations. Also, as mentioned previously, many of the implementation measures are part of ongoing programs, and will only result in incremental increases to costs of existing programs.

---

[2]The CWA recognizes the authority and sovereignty of the states by distinguishing between the process of establishing TMDLs and the process of implementing TMDLs, and by providing states with flexibility and independence to implement TMDLs. The CWA requires that each TMDL, which includes one or more numerical targets that represent attainment of the applicable standards and the allocation of the target or load among the various sources of the pollutant, be reviewed and approved by USEPA. (33 U.S.C. § 1313(d).) However, the CWA gives states the flexibility to implement TMDLs as they see fit, without requiring that TMDL implementation plans be approved by USEPA. Instead, the implementation of TMDLs is governed by state law, such as section 13242 of the Porter Cologne Act, which requires a program of implementation to achieve water quality objectives.

In order to satisfy its directive under the Porter Cologne Act, the Water Board should separate the process of establishing the PCBs TMDL and other TMDLs from the process of developing implementation plans for TMDLs. The Porter-Cologne Act requires the Water Board to consider factors in addition to the considerations mandated by the CWA. When developing implementation plans for TMDLs, the Water Board must take into account beneficial uses of the impaired waters, environmental characteristics of the hydrographic unit under consideration, reasonable limitations on water quality conditions, economic considerations, the need for developing housing, and the need to develop and use recycled water. (Water Code § 13241.) In contrast, USEPA is not required to consider all these factors. Therefore, to maintain the flexibility and independence to implement the PCBs TMDL and other TMDLs in accordance with the considerations required by the Porter-Cologne Act, the Water Board should separate the process into two stages, developing the TMDL first, subject to USEPA approval, and then developing the TMDL implementation in a separate process.

These factors result in the likelihood that short-term costs will be modest."

Justification is not given as to why pilot and feasibility studies and incremental increases to existing programs would incur only modest costs. Furthermore, while it true that some measures would be incremental expansions of existing programs, other measures would require completely new programs.

The PCB Report/BPA projects that municipal wastewater management costs of approximately $500 million annually provide an upper bound cost for urban stormwater dischargers to implement the TMDL. Justification is not presented for this assumption. Furthermore, if this assumption could be justified, then even the most rudimentary level of analysis should include, in addition to the $500 million annual cost, the capital costs to construct the treatment plants, which was on the order of several billion dollars.[3]

On p.101 the PCB Report/BPA states:

"Additional monitoring will be necessary to sufficiently quantify loads from urban stormwater runoff and the loads reduced from urban stormwater runoff control actions. As with the control measures, this loads monitoring would also address other pollutants of concern such as heavy metals, pesticides, and petroleum hydrocarbons. This additional monitoring could cost $500 thousand to $1 million per year, but it would inform decisions to implement controls that may total upwards of $100 million per year. There are critical data needs to improve our understanding of PCBs fate and transport, particularly PCBs in Bay sediments. Also, a better understanding of the rate of natural attenuation of PCBs in Bay environments is needed to predict with more certainty the recovery time of the Bay, and to inform whether more implementation actions are needed. We estimate these costs, which would be shared by all source category dischargers, urban stormwater dischargers, and dredgers, would total approximately $1 to 3 million, some of which would be accounted for within the existing RMP."

Justifications and bases are not provided for the above costs associated with monitoring.

The PCB Report/BPA should be revised to include a thorough and detailed economic analysis of the costs associated with the implementation methods and monitoring that might result from the proposed Basin Plan Amendment. The analysis should clearly document and justify all assumptions used to develop the costs.

An analysis of whether a reasonable relationship exists between the costs and assumed benefits of the proposed implementation actions is also needed. Although problems with the economic analysis and pollutant fate modeling are described above, we use that information here in a simple cost-benefit analysis, for lack of better information being available at this time. Water Board staff estimate an upper-bound cost of about $500 million per year to implement the TMDL, essentially all of which would be borne by urban runoff dischargers. The PCB Report/BPA describes this as *"a gross estimate of what it might cost to treat urban stormwater."* Annual costs for monitoring, special studies and risk management activities are also estimated by Water Board staff but are small relative to $500 million. Based on the information in the PCB Report/BPA, it is difficult to estimate how long it would take to attain the fish tissue target and therefore restore the beneficial uses in the Bay that are the subject of this TMDL (ocean,

[3]The Water Board has reported that between 1960 and 1985, over three billion dollars had been spent in the Bay Area to upgrade and construct wastewater treatment plants and to move outfalls into deeper water.

commercial and sport fishing and wildlife habitat-related uses). The Basin Plan amendment states that urban stormwater runoff wasteload allocations shall be achieved within 20 years. Assuming that in 20 years the total TMDL of 10 kg/year is attained, the pollutant fate model (p.58, Figure 28) suggests that it would take another approximately 50 years to attain the sediment target of 1 ug/kg, which according to the food web modeling would result in attainment of the fish tissue target of 0.01 mg/kg. (The fish tissue target is based upon standard risk assessment calculations, including a one in 100,000 carcinogenic risk and a highly conservative fish consumption rate based on the 95th percentile upper bound estimate of fish intake reported for all Bay fish-consuming anglers.) The pollutant fate model (p.58, Figure 28) also indicates that the corresponding reduction in mass of PCBs in the Bay would be about 2,440 kg (i.e., from about 2,600 kg to about 160 kg). Thus, based upon the information in the PCB Report/BPA, a gross upper-bound estimate of the anticipated cost to restore the Bay's beneficial uses that are impaired by PCBs is 70 years at $500 million per year, or about $35 billion. This equates to an estimated cost of approximately $14.3 million per kg PCBs removed. Such a comparison of the costs and assumed benefits of the proposed implementation actions should be included in the PCB Report/BPA and used to inform a debate among the Water Board, stakeholders and public regarding whether a reasonable relationship exists between the anticipated costs and benefits.

The PCB Report/BPA also asserts that the proposed implementation plan schedule provides opportunity to analyze alternative means of compliance and allows time for urban runoff agencies to secure funding. However, potential sources of such funding are not identified. Unfortunately, the BASMAA member agencies that will be required to implement the urban runoff PCB reduction strategies are under severe budget restrictions, which have in many cases forced these agencies to cut back on important municipal services. Furthermore, Proposition 218 severely limits the ability of local government to generate additional revenues for urban runoff programs.[4] Thus the PCB Report/BPA should be revised to discuss the financial constraints on local agencies and the need for the Water Board to provide flexibility to ensure that the targets, allocations and implementation measures are economically attainable and technically feasible.

[4]Section 6 of Article XiII D of the California Constitution, a part of Proposition 218, requires that property-related fees or charges shall not be imposed or increased unless such fee or charge is approved by either a majority vote of the owners of the affected properties or, at the option of the agency imposing the fee or charge, by a 2/3 vote of the voters residing in the area affected by the fee or charge.

August 17, 2007

VIA EMAIL AND FACSIMILE (510) 622-2460

Bruce Wolfe,
Executive Officer, San Francisco Bay
Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Re: Establishing a TMDL for the PCBs in the San Francisco Bay and an Implementation Plan to Achieve the TMDL

Dear Mr. Wolfe:

The Bay Area Clean Water Agencies (BACWA) appreciate the opportunity to comment on the proposed TMDL and implementation plan for achieving the TMDL for PCBs. BACWA members own and operate publicly-owned treatment works (POTWs) that discharge to San Francisco Bay and its tributaries. Collectively, BACWA's members serve over 5 million people in the nine-county Bay Area, treating all domestic, commercial and a significant amount of industrial wastewater. BACWA was formed to develop a region-wide understanding of the watershed protection and enhancement needs through reliance on sound technical, scientific, environmental and economic information and to ensure that this understanding leads to long-term stewardship of the San Francisco Bay Estuary. BACWA member agencies are public agencies, governed by elected officials and managed by professionals who are dedicated to protecting our water environment and the public health.

The proposed TMDL indicates that Municipal Wastewater (Clean Water Agencies) discharge a small fraction of the total load of PCBs to the Bay. Our facilities operate every day at a high level of performance under very specific discharge permits. We understand that the wide spread use of PCBs has created a legacy pollution issue that is both land based and water based in our sediments. We also recognize that PCBs are still present in devices that are either still in use, or stored and which leach into the environment.

The members of BACWA have several specific comments on the PCB TMDL, these are:

1. **BACWA strongly recommends that Table A-3 be eliminated from the TMDL**; we clearly understand that the implementation of a TMDL must be through an NPDES permit. We support the allocation of 2 kg/yr for the source category of Municipal Wastewater which will result in individual permit limits for each clean water agency in their NPDES permit. We do not believe that it is necessary for the TMDL to allocate to each clean water agency a portion of the Municipal Wastewater WLA. The source category WLAs, can lead to enforceable requirements that are applied to particular sources in individual permits - as long as those requirements are "consistent with the assumptions and requirements" in a TMDL, 40 C.F.R. 122.44(d)(1)(vii). As the WLA is so small, we suggest that individual allocations be eliminated. Attainment of the TMDL and the WLA would be determined through compliance with the permit numeric effluent limit and the periodic quantification of loads as is already required by the TMDL. Please see Attachment A for more examples of USEPA approved TMDLs that do not include individual WLA for point sources.

2. **BACWA Supports the Fish Tissue Target**; BACWA supports the fish tissue target for this PCB TMDL. BACWA believes that the CTR criterion for water column concentration is not an appropriate basis for a target (and in fact is not the basis for the 303(d) listing). There is no established relationship between the water column and the fish tissue concentrations.

3. **Numeric Effluent Limit of 0.5 ug/L**; we believe that this number has been proposed because it is the lowest level of quantitation. The analysis that must be done to determine if this level is quantitated is done with Gas Chromatography. This analysis can result in multi-peak conditions that can easily be misread. We believe that a numeric effluent limit of **1.0 ug/L** would be more realistic based on the limit of current technology and available methods for measurement of PCBs. The limit you are proposing is so close to the method detection limits that we can anticipate effluent limit excursions due to analytical variability and not real constituent presence.

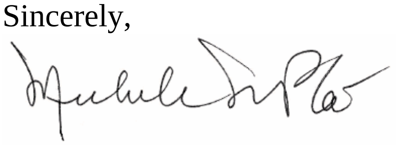
4. **BACWA Fully Supports Adaptive Implementation**; BACWA is supporting the development of a multi-box model so that we can better understand the fate and transport of contaminated sediments. As this information becomes available it is essential that we plan to adjust this TMDL and others. In addition, BACWA and others continue to support studies at SFEI, through our Bay Area Pollution Prevention Group and through WERF and other organizations. The investment in adaptive management studies and analyses must be targeted and focused to ensure that they will indeed further our understanding of the fish tissue target and the sediment target. Our total and joint public funding is limited; we should focus on the largest scientific uncertainties and the most significant controllable sources of the pollutant. We fully anticipate that in 10 years our understanding of issues in the Bay, as well as pollution prevention and remediation will be more advanced than it is now. Our support of this research and investigations is intended to inform policy development. We fully anticipate that this TMDL and others will be adapted as necessary as more information becomes available.

5. **BACWA Supports Risk Management**; BACWA is now engaged with the Water Board and other stakeholders to develop a Risk Reduction Management program for the San Francisco Bay. It is our understanding that this will engage other State agencies, community based organizations and county public health organizations. This is not the core work of BACWA, rather it is the responsibility of county and state public health organizations. We intend to continue to support the development of a sustainable program; we do not anticipate that such a program would ever entail the development and delivery of health care. We also request that the last bullet on page A-11 of the proposed TMDL be changed to state:
    - **Conduct or cause to be conducted special studies needed to support health assessment and risk communication.**
6. **Urban Stormwater Treatment at POTWs;** BACWA fully appreciates the incentives and encouragement that the 0.9 kg/year allocation of PCB represents for agencies that provide redirection of stormwater to POTWs. We fully understand that the proposed WLA does not represent a requirement; rather it is fully and entirely voluntary. We are not aware of any clean water agency that is ready to take advantage of this particular part of the TMDL. As you can imagine, there are many financial and regulatory issues associated with intentional diversion of stormwater to POTWs.

7. **Limited ability to reduce Loading;** BACWA members are extremely limited in their ability to reduce future loading of PCBs. Broad based source control is not effective, it must be extremely well targeted and focused; implementing a water recycling program requires public acceptance and a stable market; and pollution prevention efforts, although important from a public education standpoint, are limited in their impact on the Bay. Going beyond these limited possibilities must be voluntary for BACWA members, not required. BACWA must insist that the State develop a mass offset program which provides credits to any BACWA member (or other discharger) who volunteers to implement more advanced tools such as land based remediation of PCBs, for reducing PCB concentrations in the Bay that originate from sources other than POTWs.

BACWA members do not believe we are part of the problem that created this impairment in San Francisco Bay, but as public stewards to the Bay we want to be part of the solutions that will result in public health protection and improvements in water quality. Thank you for the opportunity to provide these comments. Should you have any questions, please feel free to contact me.

Sincerely,



Michele M Pla,
Executive Director

ATTACHMENT A

EXAMPLES WHERE EPA HAS APPROVED SOURCE CATEGORY WLAs

In developing and approving TMDLs, EPA has consistently indicated that there is some flexibility in the manner in which point source wasteload allocations are expressed. Normally, there will be a specific allocation for each individual source. However, that is not required for all sources. EPA has stated that when there is not sufficient data or information to assign individual allocations, it may be reasonable to assign one allocation to multiple sources. EPA set forth this policy as applied specifically to stormwater discharges in a 2002 guidance document - http://www.epa.gov/npdes/pubs/final-wwtmdl.pdf. Because there is no legal distinction in the TMDL program between stormwater and other sources, there is no reason that this approach cannot be applied to other sources. In fact, EPA itself has used this approach in establishing TMDLs, and in establishing other TMDL guidance. For example:

1. In its 2000 guidance on developing TMDLs, EPA Region 9 stated that “circumstances may arise in which it is appropriate to set wasteload allocations that cover more than one discharge (e.g., discharges covered by a general permit).” http://www.epa.gov/region09/water/tmdl/303d-2002pdfs/caguidefinal.pdf.

2. In the mercury TMDL for the Savannah River in Georgia, issued in 2001, EPA Region 4 set a cumulative wasteload allocation for all point sources. EPA also set individual allocations for some, but not all, of those sources - but even those allocations were not absolutely numeric. EPA gave the state the option of either using individual numeric allocations to set numeric limits, or using allocations equal to “the level of mercury in a point source’s effluent after implementation, when appropriate, of appropriate and cost-effective mercury minimization measures,” which would be used to establish “minimization plan” requirements in individual permits. http://www.epa.gov/owow/tmdl/examples/mercury/ga_savfinal.pdf.

3. In the Newport Bay/San Diego Creek TMDL for toxic pollutants, issued in 2002, EPA Region 9 determined that for several pollutants, “insufficient information was available to support delineation of individual WLAs for each NPDES-permitted discharge.” Therefore, EPA set up a group WLA for a category of “other NPDES permittees.” EPA noted that when the permits for these facilities are issued, the state should include in the fact sheet an explanation of how it has allocated the total WLA among the dischargers, including the specific levels that have been assigned to that particular source.
http://www.epa.gov/region09/water/tmdl/nbay/summary0602.pdf.

4. In the San Gabriel River TMDL for metals and selenium, issued in March 2007, EPA Region 9 provided “grouped” WLAs for dry-weather and wet-weather discharges from MS4s and Caltrans. EPA explained that this was based on insufficient information being available to assign individual WLAs. http://www.epa.gov/region09/water/tmdl/san-gabriel/final_sangabriel_metalstmdl_3-27-07.pdf.

5. In the Little River/Catahoula Lake TMDL for mercury, issued in 2003, EPA Region 6 set a cumulative WLA for all point sources. EPA also set individual WLAs, equal in each case to a concentration equal to the water quality standard (there, 12 ng/l), but stated that

the state permit writer could adjust the individual WLA to reflect a higher value, as long as the sum of all individual WLAs does not exceed the cumulative WLA and the adjusted source-specific WLA reflects levels achievable through a facility-specific mercury minimization program. http://www.epa.gov/waters/tmdldocs/little_cat_hg_f.pdf

6. In the Minnesota statewide TMDL for mercury, issued by the Minnesota Pollution Control Agency and approved by EPA Region 5 in March 2007, the state set two WLAs: one for each of the two regions of the state. The WLA "is by region and is not specific to each source, thereby providing a cap for the region that includes reserve capacity." http://www.pca.state.mn.us/publications/wq-iw4-01b.pdf . EPA, in approving the TMDL, stated that it "agrees that these wasteload allocations are reasonable in light of the significant contribution of mercury from air deposition, which as described in Section 5.1 of the TMDL report, is approximately uniform across the State, and the relatively small contribution of other sources of mercury." As for permitting of these sources, EPA stated that "at the time a permit is issued or renewed for a point source the permitting authority will need to assure that the permit is consistent with the assumptions and conditions that went into development of these wasteload allocations." http://www.pca.state.mn.us/publications/reports/tmdl-mercury-finalreport.pdf .

SFPUC
WATER
HETCH HETCHY WATER & POWER
CLEAN WATER

SAN FRANCISCO PUBLIC UTILITIES COMMISSION
WASTEWATER ENTERPRISE
1155 Market St. 11th Floor, San Francisco, CA 94103 • Tel. (415) 554-3155 • Fax (415) 554-3161

August 20, 2007

Bruce Wolfe
Executive Officer, San Francisco Bay
Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Re: Comments on the Proposed Basin Plan Amendment San Francisco Bay PCBs TMDL

Dear Mr. Wolfe,

The San Francisco Public Utilities Commission (SFPUC) appreciates the opportunity to review and comment on the Proposed Basin Plan Amendment for the PCB Total Maximum Daily Load (TMDL) and implementation strategy for San Francisco Bay. As you know, the City and County of San Francisco (City) has a combined sewer system that discharges both treated stormwater and wastewater into San Francisco Bay. The requirements and methodology of administering the PCB TMDL have a potential effect on the operations of the SFPUC sewers and wastewater treatment facilities.

As a member of the Bay Area Clean Water Agencies (BACWA), San Francisco supports the comments submitted by BACWA. In addition, San Francisco has specific comments pertaining to our unique system.

1. Treatment of Wet Weather Flows

San Francisco has a combined sewer system that collects and treats both wastewater and urban stormwater runoff. Discharges from the system during wet weather are regulated under U.S. EPA's Combined Sewer Overflow (CSO) Control Policy. During wet weather events, treatment of combined flows occurs at the Southeast Plant, the North Point Wet Weather Facility, and within the storage/transport boxes.

The SFPUC appreciates that the efforts San Francisco has put in place to treat stormwater have been considered in the PCB wasteload allocation designated for San Francisco stormwater. However, to be fully accurate, a clarification must be made to reflect the fact that treatment of stormwater flows occurs not just at the

Southeast Plant, but also at the North Point Wet Weather Facility and the storage/transport facilities. Therefore, we recommend the following modification of *Table A-5 County-Based Watershed Wasteload Allocations for Urban Stormwater Runoff*, Footnote C (Page A-8):

> [c] Does not account for treatment provided by San Francisco's combined sewer system. The treatment provided by the City and County of San Francisco's Southeast Plant, North Point Wet Weather Facility, and storage/transport facilities (NPDES permit CA0037664) will be credited toward meeting the allocation and load reduction.

2. Urban Stormwater Runoff Treatment

Like other agencies that are responsible for both stormwater and wastewater management, San Francisco has been given a separate stormwater wasteload allocation from its wastewater wasteload allocation. Unlike all of the other agencies in the San Francisco Bay Region, San Francisco operates a combined sewer system that is designed to direct stormwater to treatment facilities. Therefore by definition, San Francisco is already implementing the "Urban Stormwater Runoff Treatment by POTWs" option. The benefit from implementing stormwater treatment by POTWs that other agencies may receive when they elect to accept stormwater flows to their POTWs, must also be inherently recognized for San Francisco and included as a footnote to *Table A-3 Individual Wasteload Allocations for Municipal Wastewater Dischargers* (Page A-6).

> [c] Does not include a percentage of the "Urban Stormwater Runoff Treatment by POTWs" for the stormwater treatment that is provided by San Francisco's combined sewer system. The San Francisco Southeast Plant allocation will be modified to include a reasonable portion of this allocation.

3. Cumulative Stormwater and Wastewater Waste Load Allocations

As a combined system, the majority of San Francisco's wet weather and sewer flows are collected, treated, and discharged through the same sewer system. Considering this intrinsic design, it would be sensible to allow the stormwater and wastewater wasteload allocations to be met collectively. For example, the stormwater and wastewater mass loadings would be able to collectively meet 0.5 kilograms per year. This value is the combination of the individual municipal wastewater wasteload allocation of 0.3 kilograms per year and the urban stormwater runoff allocation of 0.2 kilograms per year.

The TMDL should explicitly state that the stormwater and wastewater wasteload allocations given to San Francisco may be combined. This may require that a footnote be added to Table A-3 and Table A-5 that states something to the following:

> [c] For San Francisco's combined stormwater and wastewater system, stormwater and wastewater wasteload allocations can be combined and met collectively.

If you have any questions regarding these comments, please contact me at (415) 934-5731.

Sincerely,

Arleen Navarret
Regulatory Manager/Acting Planning Division Manager
San Francisco Public Utilities Wastewater Enterprise

CITY OF
SAN JOSE
CAPITAL OF SILICON VALLEY

Environmental Services Department

August 20, 2007

Fred Hetzel
Environmental Scientist
San Francisco Bay Regional Water Quality Control Board
1515 Clay St., Suite 1400
Phone: (510) 622-2357
Fax: (510) 622-2460
E-mail: FHetzel@waterboards.ca.gov

SUBJECT: City of San Jose comments on Total Maximum Daily Load (TMDL) for PCBs in San Francisco Bay; Proposed Basin Plan Amendment and Staff Report

Dear Mr. Hetzel:

The City of San Jose (City) appreciates the opportunity to submit comments on the TMDL Staff Report (Report) and proposed Basin Plant Amendment (BPA) for PCBs on behalf of the San José/Santa Clara Water Pollution Control Plant (Plant) and the City of San José Urban Runoff Program. The Plant provides wastewater treatment services to the cities of San José and Santa Clara, and other cities and agencies within the tributary area. The tributary service area includes the City of Milpitas, West Valley Sanitary District (Cities of Campbell, Los Gatos, Monte Sereno and Saratoga), Burbank Sanitary District, Cupertino Sanitary District (City of Cupertino), Sunol Sanitary District, and County Sanitation Districts #2 and #3. The service area includes approximately 1.5 million residents and over 16,000 businesses in Silicon Valley.

The City is also a major provider of funding and technical support for studies to identify sources of PCBs as a member of the Santa Clara Valley Urban Runoff Pollution Prevention Program (SCVURPPP), the Regional Monitoring Program (RMP) and the Clean Estuary Partnership. The City strongly supports the San Francisco Bay Regional Water Quality Control Board's (Water Board) adaptive management, phased approach to the PCBs TMDL.

The City's chief concerns with the Report and BPA are that the data limitations and scientific uncertainties make waste load allocations development extremely difficult. Therefore, this TMDL effort necessitates the development of a long-term regional plan to address PCBs and related uncertainties in a cost-effective manner. In particular, implementation actions should be consistent with the standard of "maximum extent practicable."

The following focused comments and concerns are provided:

Linkage Analysis; Sediment Target Uncertainties

- The City agrees that the sediment target will only be achieved after "reduction of external loads, targeted action on internal reservoirs of PCBs, and degradation or burial of PCBs in Bay sediments." (p. 56). However, there is no timeline specified for achievement of the proposed sediment target based on the Food Web Model or single box, Mass Budget Model.

Recommendation: The Report should include a preliminary timeframe that estimates when attainment of the sediment target will occur. This preliminary timeframe should state explicitly that the timeframe could be adjusted as new information becomes available.

Linkage Analysis; Mass Balance Model

- The Mass Balance Model used to calculate the total TMDL of 10 kg/year is a simple one-box fate model. This simple model incorporates major inputs and pathways such as outflow through the Golden Gate, degradation, burial, deposition and re-suspension. However, it does not account for how these processes vary throughout the Bay.

Recommendation: A development of amulti-box fate model is currently under development, which will provide a multi-box sediment budget that would benefit all TMDLs for contaminants associated with sediment. The Report and BPA should clarify that the TMDL of 10 kg/year and all associated load allocations are preliminary until the results of the multi-box model are available.

Central Valley Input

- The Central Valley contributes a large mass of PCBs to the Bay based upon current loading estimates. Although sediment PCB concentrations from the Central Valley are lower than ambient Bay concentrations, they still exceed the sediment PCB target. The BPA calls for load reductions from the Central Valley, but no actions are required to meet this reduction and no information is presented to justify that this reduction is reasonable or expected.

Recommendation: The Report and BPA should include a solid rationale for the reduction from the Central Valley and a preliminary timeline estimating when these reductions are expected. A timeline appropriate for this source category should be specified as it is for other sources (Urban Runoff attainment is expected in 20 years with a review and possible modification of timeline at 10 years).

Sources and Loads – Urban Runoff

- Estimated PCB loads from urban runoff conveyance systems were developed based on studies that only evazluated the concentrations of PCBs in bedded storm drain sediment.

This measure was adequate for comparing differences between land use types as was the original intent of the Joint Storm Water Agency study. However, these studies deliberately searched for the suspected, most contaminated sites, not the average contaminant load from urban runoff systems. These results are therefore inappropriate for estimating loads from Urban Runoff.

Recommendation: The Water Board should qualify the data used to estimate urban runoff loads as highly conservative. Furthermore, the BPA should clearly identify that adaptive management will be used to refine estimates from urban runoff as new information becomes available. The Water Board should not base load reduction activities upon these estimates since the ability to measure success will not be possible given the high level of uncertainty. Until uncertainty levels have been reduced, any urban runoff loading estimates should be classified as preliminary and highly uncertain.

Sources and Loads – Municipal Wastewater Dischargers

- Municipal Wastewater is a "de minimis" contributor of PCBs to San Francisco Bay. The Report estimates PCBs loading from Municipal Wastewater Dischargers at 2.3 kg/year. While this represents a "de minimis" contribution, this loading estimate is based on a paucity of data collected 6 to 8 years ago. No more than 4 data points exist for any single Municipal Wastewater Discharger. There is a high level of uncertainty over current loading estimates for Municipal Wastewater Dischargers, and yet each discharger is to receive a separate waste load allocation. With this level of uncertainty, measuring success again will be technically difficult.

Recommendation: The City recognizes that the available data is the best technical information for estimating Municipal Wastewater Discharger loads. However, these load estimates should be specified as preliminary pending additional monitoring and analysis. Refinement of this estimate should occur through the adaptive management process and the proposed monitoring in the Implementation section of the Report and BPA.

Sources and Loads – Absence of Loss Terms

- Both the Conceptual Model (Figure 25) and the Mass Balance Model (Figure 27) include processes that result in losses of PCBs (Golden Gate outflow and degradation) or of PCBs becoming biologically unavailable (burial). However, it is unclear how, or if, these loss terms are incorporated into calculating the long-term TMDL of 10 kg/year.

Recommendation: Include these losses as separate categories in the TMDL indicating negative loading terms or explicitly state how they contribute over time to attainment of waste load allocations assigned to various Source Categories. For example, what percentage (if any) is the Central Valley Watershed load reduction from 42 kg/year to 5 kg/year expected to come from Golden Gate Outflow over time?

TMDL Implementation – Load and Wasteload Allocation

- Urban Runoff – Prior to requiring any significant load reduction effort, the 2kg/year load allocation for urban runoff must be verified. The level of uncertainty for this load allocation is too great to make the proposed load reductions defensible.

Recommendation: The City recommends that uncertainties be addresses prior to requiring additional load reduction activities and implementation actions be developed consistent with "maximum extent practicable." The Report should indicate load reductions and implementation actions for urban runoff dischargers are preliminary. The City recognizes the net environmental benefit of sediment control measures for PCBs and other particle bound pollutants. However, measuring and demonstrating PCBs load reduction resulting from sediment control actions is not currently practicable or feasible.

TMDL Implementation – Urban Stormwater Runoff Treatment by Municipal Wastewater Dischargers

- The augmentation of 0.9 kg/year Bay-wide for Municipal Wastewater Dischargers that accept Urban Stormwater Runoff may not be sufficient. There does not appear to be a mathematical or scientific justification for this allocation reserve.

Recommendation: A more rigorous and transparent justification for this reserved allocation of 0.9 kg/year is required. An analysis of how this reserved allocation will provide adequate protection for POTWs should be included in the Report and BPA. The City recognizes that targeted diversion of Urban Stormwater for Municipal Wastewater treatment could provide a net environmental benefit. However, since POTWs are expected to maintain current performance with respect to PCBs removal, the City is concerned that the 0.9 kg/year augmentation may not provide sufficient protection for POTWs that accept Urban Stormwater into their system. Given the uncertainty regarding PCBs loads and allocations for Urban Stormwater, it could be possible for POTWs to exceed even the augmented Waste Load Allocation if they accept PCBs loads from Urban Stormwater.

Other Known Uncertainties: South Bay Salt Pond Restoration Project

- The South Bay Salt Pond Restoration Project will cause dramatic changes in hydrology, sediment transport and habitat in the South San Francisco Bay. The restoration project could profoundly impact the time it takes to attain the long-term PCBs sediment target of 1.0 ug/kg. Since the TMDL focuses on sediment transport, changes in the rates and spatial extent of erosion and deposition of Bay sediment could either accelerate or delay recovery of the southern segments of the Bay. Modeling suggests that Bay sediments will most likely be transported into and accumulate in existing salt ponds. This could potentially concentrate contaminated sediments in areas that will be future salt marshes, thus increasing food web exposure and further delaying recovery.

Recommendation: The South Bay Salt Pond Restoration Project should be described as a current and future uncertainty that will be considered in the adaptive management process. While it is impossible to predict the impacts of the restoration project on the recovery of the Bay from PCB impairment, it is known that the restoration is occurring, on-going, and likely to affect sediment bound pollutants in some fashion.

In closing, the City wishes to incorporate by reference comments submitted by the Bay Area Stormwater Management Agencies Association (BASMAA) and the Bay Area Clean Water Agencies (BACWA). If you have any questions or comments on our recommendations please contact David Tucker at 408-945-5316.

Sincerely,

John Stufflebean, Director
Environmental Services Department

BAYKEEPER
Defending Our Waters—from the High Sierra to the Golden Gate

CLEAN WATER ACTION
Our Water, Our Health, Our Future

August 17, 2007

Mr. Fred Hetzel
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Sent via electronic mail to fhetzel@waterboards.ca.gov

RE: Proposed Basin Plan Amendment Establishing a Total Maximum Daily Load for PCBs in the San Francisco Bay

Dear Mr. Hetzel:

On behalf of San Francisco Baykeeper and Clean Water Action, please accept the following comments on the draft Basin Plan Amendment establishing a Total Maximum Daily Load ("TMDL") for Polychlorinated biphenyls ("PCBs") in the San Francisco Bay ("PCBs TMDL") and the implementation plan to achieve that TMDL. Baykeeper and Clean Water Action appreciate the time and energy that Water Board staff has dedicated to developing this TMDL. We commend the Water Board for its efforts and hope that staff will carefully consider and address the issues raised by our comments below.

To put today's comments into context it is important to consider the broad purpose of TMDLs and the characteristics of PCBs. TMDLS are the Clean Water Act's—and the Water Board's—primary tool for cleaning up waters that are too polluted to be safe for basic uses such as fishing and drinking. The assumptions and commitments in the TMDL provide the basis for identifying and prioritizing the actions necessary to improve water quality. As the framework for future action, the TMDL must be as precise and detailed as feasible to ensure that implementation is consistent with and occurs within the timeframe contemplated by the TMDL.

PCBs are an unquestionably challenging environmental problem. Despite an almost thirty year ban on production PCBs are ubiquitous in the environment—from industrialized urban areas to the arctic[1]—and have been found in human cord blood,

[1] Herbert, B.M. *et al.*, "Rapid changes in PCB and OC pesticide concentrations in arctic snow," *Environ. Sci. Technol.* 39(9):2998-3005 (2005 May).

785 Market Street, Suite 850
San Francisco, CA 94103
Tel (415) 856-0444
Fax (415) 856-0443

maternal blood, and mother's milk.[2] Across the country more than 2,000 rivers, lakes, bays, and creeks contain PCBs at levels that prevent attainment of beneficial uses.[3]

PCBs bioaccumulate in the fatty tissue of fish, and therefore pose a significant health threat to top predators and anglers, especially those anglers who relay on Bay fish for subsistence. Research has linked chronic, low level exposure in humans to severe impacts, such as neurological disorders (especially in infants exposed prenatally), liver damage, reproductive harm, immune suppression, endocrine disruption, developmental disorders, stunted intellectual function, and cancer.[4] Other human health impacts include gastrointestinal disease and cardiovascular problems.[5] Impacts to wildlife are also significant and include reproductive and behavioral effects. Disturbingly, PCBs levels in the blood of San Francisco Bay seals has been found to be up to three times higher than the level at which scientists have observed reduced reproductive success and impaired immune function.[6]

Despite the pervasiveness of PCBs in the environment, the major sources of PCBs to the San Francisco Bay appear to be relatively well understood. A remaining question is what level of effort is necessary to reduce PCBs in and around the Bay in order to make regular consumption of Bay fish safe within a reasonable timeframe. While this TMDL makes significant progress towards understanding and reducing PCBs loading, Baykeeper and Clean Water Action believe that room for improvement exists.

A. TMDL Numeric Targets

<u>The fish tissue target in the proposed TMDL is not adequate to protect beneficial uses.</u>

The proposed fish tissue target is unreasonably high in light of information about fish contamination and consumption in the Bay Area. One in ten Bay anglers consumes more fish than considered safe by the Office of Environmental Health Hazard Assessment ("OEHHA").[7] In addition to PCBs, those fish may also contain high levels of other pollutants such as polybrominated diphenylethers ("PBDEs"), DDT and dioxins. Therefore, according to peer reviewer, Dr. David Carpenter, setting a fish tissue target based solely on PCBs is likely to significantly underestimate the risk of Bay fish consumption.

---

[2] Guvenius, D.M. *et al.*, "Human prenatal and postnatal exposure to polybrominated diphenyl ethers, polychlorinated biphenyls, polychlorobiphenylols, and pentachlorophenol". *Environ. Health Perspec.* 111(9):1235-1241 (2003).
[3] USEPA National 303(d) List, http://iaspub.epa.gov/waters/national_rept.control#TPOL.
[4] http://delta-institute.org/publications/HealthImpactFS.pdf.
[5] Johnson *et.al.*, "Public Health Implications of Exposure to Polychlorinated Biphenyls (PCBs)," Agency for Toxic Substances and Disease Registry Public Health Service U.S. Department of Health and Human Services and U.S. Environmental Protection Agency,http://www.atsdr.cdc.gov/DT/pcb007.html.
[6] Young, D., et al., "GC/MS analysis of PCB congeners in blood of the harbor seal Phoca vitulina from San Francisco Bay," *Chemosphere* 37(4):711-33 (August 1998).
[7] San Francisco Estuary Institute "San Francisco Bay Seafood Consumption Study," p. 46 (2000).

Given both the serious health impacts of even low level chronic exposure and the existence of subsistence fishing in the region, Baykeeper and Clean Water Action strongly urge the Water Board to recalculate the fish tissue target using more conservative assumptions, including a risk factor of at least 1 in 1,000,000. A more stringent fish tissue target is necessary to ensure that the TMDL is consistent with the requirement to bring the Bay back into compliance with the beneficial use of fishing.

We further note that a less protective target has significant environmental justice implications. Of the fishermen who eat more than two meals each month of Bay fish—the maximum amount recommended by OEHAA—seventy-five percent (75%) are persons of color with incomes under $45,000 a year.[8] Low income communities and communities of color, therefore, are disproportionately affected by PCBs contamination and will not be adequately protected unless the fish tissue target is recalculated. While risk reduction strategies are to be employed as part of TMDL implementation, the reality is that these many communities will remain at great risk until the Bay's fish are once again safe to eat.

The TMDL should contain a sediment target.

Unlike the PCBs TMDL staff report prepared in 2004,[9] the proposed TMDL lacks a numeric target for bedded sediments. According to the 2004 report, sediments are the largest environmental reservoir of PCBs in the Bay and PCBs uptake by biota from sediment is "likely to be *the* most important pathway for PCBs bioaccumulation in fish."[10] As explained in the 2004 report, a sediment target is necessary because reducing concentrations in Bay sediments is the most effective means of reducing fish tissue PCBs concentration and the TMDL is largely focused on reducing PCBs through reductions in sediment loads and PCBs concentrations in those loads.[11] Considering the previous report's emphasis on a sediment target and the relationship between sediment and fish tissue concentrations, the rationale for removing the sediment target is unclear. Accordingly, the PCBs TMDL should be revised to include a sediment target. Should the Water Board decline to reinsert a sediment target, the TMDL must explain the scientific and policy reasons for removing it.

---

[8] *Id.*
[9] San Francisco Bay Regional Water Quality Control Board, "PCBs San Francisco Bay Total Maximum Daily Load Project Report," p. 47 (January 8, 2004).
[10] *Id.* at 46 (emphasis added). This point is made several times throughout the report. In Section 4.4, Key Points and Issues, the report notes that "[s]ince benthic organisms are the major prey food for the fish species of concern, sediments may be a more important source of PCBs to biota than the water column." *Id.* at 26.
[11] San Francisco Seafood Study, *supra* note 7.

B. Urban Stormwater

More detail is needed about implementation of urban stormwater load reductions.

A TMDL is intended to be a regulatory driver: its provides a basis and rationale for actions to reduce pollutant loading to the extent necessary to achieve water quality standards. The proposed TMDL's implementation description lacks sufficient detail to ensure implementation of urban stormwater load reductions within the specified time. While it states that reductions in urban stormwater loading should occur within twenty years, it fails to state how those reductions will occur or on what timeframe. At a minimum, the TMDL should identify the specific TMDL-related actions in the proposed municipal regional stormwater permit and state a schedule for completion of each. For example, the TMDL should require completion of each of the pilot projects identified by 2010 and require identification, investigation and abatement of land with elevated PCBs concentrations by 2018.

Attainment of Wasteload Allocations for stormwater should be demonstrated using multiple methods.

Urban stormwater is by far the largest Bay Area source of PCBs and is responsible for the greatest reductions in loading. For the TMDL to be successful, therefore, loading from urban stormwater must be dramatically reduced and that reduction must be quantifiable and demonstrable. The draft TMDL, however, allows stormwater permittees to show progress towards wasteload allocations using widely different methods, each of which is based on different assumptions and is likely to produce very different assessments of whether compliance is achieved.

Moreover, the proposed TMDL fails to articulate the basis for selecting these methods and we question whether they will produce meaningful information about actual reductions in loading. For example, PCBs strongly associate with sediments, yet the proposed TMDL would allow permittees to rely only on flow and water column data to estimate reductions. Similarly, the proposed TMDL allows permittees to estimate load reductions resulting from pollution prevention activities and source and treatment controls yet we fail to see how a specific load reduction could be assigned to a pollution prevention activity or other control given all the variables that affect PCBs loading.

Before specifying any methods to quantify reductions in loading, the Water Board must explain the rationale for selecting those methods and the limitations of each. If multiple methods are available, the TMDL should require a "weight of evidence approach" that involves the use of all available methods. The use of multiple methods will provide a better understanding of the limitations of each method and would be a more valid way of evaluating progress toward attaining the TMDL's wasteload allocations. We ask that the Water Board explain the basis for selecting the three methods identified on page A-9 of the draft TMDL and consider requiring permittees to demonstrate progress using all three methods and a weight of evidence approach.

The TMDL and any municipal stormwater permit should require municipalities' stormwater inspection programs to include abandoned sites.

The primary way that the PCBs TMDL will reduce loading is through implementation of the municipal stormwater permit once it is adopted. One significant limitation of the draft permit and current stormwater programs is that they do not require stormwater inspections of industrial facilities that are abandoned or no longer in operation. The TMDL should specify the regulatory actions the Water Board will take to ensure all sites which are potentially significant sources of PCBs (i.e., industrial sites active at any time from the 1940s through the early 1980s) will be identified, investigated, prioritized for sampling and inspection, and followed up with appropriate cleanup action.

Codification of the MEP and BAT standards is inappropriate.

The implementation plan for controlling PCBs inappropriately specifies that all municipal stormwater permits requirements will be based on the maximum extent practicable standard ("MEP") and that pollution from construction and industrial sites shall reduce discharges based on the best available technology economically achievable ("BAT") standard.[12] Not only does this unnecessarily restrict the Water Board's ability to control PCBs in stormwater, it is inconsistent with the intent of the Clean Water Act and the basic goal of TMDLs.

The most basic purpose of a TMDL is to clean up a waterway that cannot support designated beneficial uses. To this end, section 303(d) of the Clean Water Act requires identification of waters for which existing technology-based controls are not stringent enough to ensure achievement of water quality standards.[13] The State must then determine the maximum amount of pollutant that a waterway can accept from each discharger and still achieve water quality standards taking into account neither economic feasibility nor economic consequences. The NPDES permit for each discharger, then, must contain effluent limits based on and consistent with the TMDL's wasteload allocated for that discharger.[14]

The language in the draft PCBs TMDL is inconsistent with the TMDL regime because it restricts permit limits to those based on MEP or BAT for municipal and non-municipal stormwater permittees respectively. Instead, the draft TMDL should state that stormwater permits shall contain requirements based on the applicable standard (MEP for municipalities and BAT for other dischargers) and any more stringent requirements necessary to implement the wasteload allocations in the TMDL. This change will ensure that the Water Board retains its ability to include in permits more stringent requirements should they be necessary to implement the TMDL and achieve water quality standards.

---

[12] PCBs TMDL at A-9.
[13] 33 U.S.C. 1313(d)(1)(a).
[14] 40 C.F.R. § 122.44(d)(vii)(B).

The TMDL should commit the Water Board to ensuring that on-land site cleanup standards are protective of water quality.

One of the comments repeatedly raised during the October 2006 TMDL Roundtable Meeting was that the standards for a cleanup under CERCLA or RCRA are designed to be protective of human health and not water quality. Efforts to reduce PCBs loading in stormwater, therefore, are likely to be frustrated if site cleanups fail to remediate PCBs levels to the extent or in such a way that these sites no longer remain a significant source of PCBs in stormwater. This possibility was explicitly recognized in the Clean Estuary Project's 2006 PCBs TMDL Implementation Plan Development Report, which noted that washoff from remediated sites could be substantial as "annual washoff quantity is usually not a PCB-contaminated site remediation endpoint," and sites that may have undergone remediation may still have significant amounts of PCBs present in soils.[15] The TMDL, therefore, should commit the Water Board to developing clean up standards for on-land sites that may contribute to PCBs loading and to ensuring that those standards become part of all cleanups.

C. In-Bay Contaminated Sites

The TMDL must specify a timeframe for clean up of in-Bay contaminated sites.

Currently, the proposed PCBs TMDL provides a deadline for including specific actions into site cleanup plans but lacks a date by which all clean-ups must be completed. As mentioned above, a TMDL is intended to initiate action to cleanup a waterway. Without sufficient detail regarding implementation, the TMDL's effectiveness is limited. In order to drive cleanups and ensure expeditious completion of those already underway, the TMDL should state a deadline by which the cleanup plans for all in-Bay contaminated sites will be completed.

The TMDL should address the likelihood that erosion may uncover contaminated sediments.

As recognized by Water Board staff, certain sections of the Bay are believed to be eroding and this erosion could uncover contaminated sediments.[16] While the draft TMDL acknowledges that the uncovering of contaminated sources may contribute to loading, it makes no attempt to quantify this source or to address this possibility in terms of the margin of safety or other mechanism.[17] We are deeply concerned that erosion may ultimately increase fish tissue concentrations and request that the TMDL more explicitly address this possibility.

---

[15] Clean Estuary Project, PCBs TMDL Implementation Plan Development, p. 26, prepared by Larry Walker Associations (May 2006).
[16] San Francisco Bay Regional Water Quality Control Board, "PCBs San Francisco Bay Total Maximum Daily Load Project Report," p. 8 (June 22, 2007); 1: Davis, J.A. *et al.*, Polychlorinated biphenyls (PCBs) in San Francisco Bay, *Environ Res.* (April 2007).
[17] PCBs TMDL at A-4.

D. Municipal and Industrial Wastewater

A recent study of PCBs in wastewater undertaken in support of a PCBs TMDL for the Delaware River concluded that wastewater was a more significant source than previously estimated.[18] The study was based on data submitted by all the NPDES permit holders in the watershed as required by their permits and the Delaware River PCBs TMDL. As part of the study, all dischargers analyzed effluent using an analytical method—Method 1668A—to quantify PCB concentrations at picogram per liter concentrations. The study results demonstrated discharges from wastewater were of sufficient magnitude to cause the water quality standards to be exceeded. It also concluded that most of the loading during wet weather was associated with combined sewer overflows.

Many NPDES permits issued by the Water Board currently contain effluent limits for PCBs of 0.5 µg/L, which is the reporting limit for the method used by the dischargers. To our knowledge, no Bay Area dischargers have exceeded this limit in recent memory. Because the limit is equal to the reporting limit, the dischargers report that PCBs were not detected or detected but not quantified. Calculating the annual mass of PCBs discharged by permittees is difficult because the reporting limit and their effluent limits are typically higher than the concentration being emitted. Considering that many of these permittees discharge millions of gallons each day, PCB concentrations less than 0.5 µg/L may equal a substantial mass of PCBs discharged annually.

The TMDL appears to circumvent the reporting limit challenge by calculating loadings from all municipal dischargers based on two sampling events conducted on the effluent of five dischargers using secondary treatment and four sampling events for the four using advanced treatment.[19] Similarly, the loads for refineries were calculated based only on two sampling events, although at all Bay Area refineries. Considering the limited sampling size, the recognized variability in PCB concentrations across municipal wastewater treatment plants, the possibility of temporal variability, and the results of the Delaware River study, we believe that additional monitoring is appropriate. We strongly recommend that the Water Board revise the TMDL to require all NPDES permit holders to use Method 1668A to better determine actual loading from point sources. This data can then provide a basis for revising the TMDL wasteload allocations should loading from wastewater be greater or less than originally estimated.

Finally, we note that studies have clearly shown a relationship between decreased effluent PCBs concentration and increased wastewater treatment. Most, if not all, Bay area publicly-owned treatment works regularly discharge untreated or partially treated wastewater in the form of sewer overflows, combined sewer overflows, and bypassing and blending events. Please clarify whether the load allocations for municipal wastewater takes into account loading from wet weather events.

---

[18] Delaware River Basin Commission, Estuary Toxics Management Program, "Study of the Loadings of Polychlorinated Biphenyls from Tributaries And Point Sources Discharging to the Tidal Delaware River" (June 1998). Available at http://www.state.nj.us/drbc/regs/pcb-new.pdf.
[19] 2007 TMDL Staff Report, *Supra* note 17 at 41.

E. Central Valley Load Allocation and Implementation

According to the draft TMDL, the Central Valley is the largest source of PCBs loading to the San Francisco Bay, contributing an estimated 42 kg/year.[20] The TMDL assigns the Central Valley a final load allocation of 5 kg/yr but neither the TMDL nor the staff report explain how that load allocation will be achieved other than through natural attenuation. Reliance solely on natural attenuation to achieve a 37 kg/year reduction is concerning. In fact, estimates of the degree and time in which other contaminates attenuate, such as some pesticides, have proven to be overly optimistic. We remind the Board that the Clean Water Act contemplates that water quality be brought into compliance within a reasonably quick period of time, with the expectation that specific strategies be carried out to meet those goals. We ask, therefore, that the Water Board identify any and all actions necessary to ensure that the Central Valley load allocation will be achieved within the expected timeframe.

* * *

We trust that the Water Board will carefully consider and respond to all of the issues and questions raised in our comments. In particular, we wish to emphasize the TMDL's need for a more conservative fish tissue target, reinsertion of a sediment target; increased specificity for stormwater implementation, including development of a clean-up standard; and a requirement that all NPDES permit holders better quantify the concentration and variability of PCBs in their effluent.

Thank you for your consideration of these comments.

Sincerely,

Amy Chastain, Staff Attorney
Sejal Choksi, Program Director & Baykeeper
SAN FRANCISCO BAYKEEPER

Andria Ventura, Program Manager
CLEAN WATER ACTION

[20] Draft TMDL at A-4.

AGC CALIFORNIA

BPC BAY PLANNING COALITION

California Alliance for Jobs

California Business Properties Association

California Manufacturers & Technology Association

CSAC

CICC

CICWQ

CELSOC Consulting Engineers and Land Surveyors of California

August 20, 2007

Mr. Fred Hetzel
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Re: Establishing a Total Maximum Daily Load (TMDL) for Polychlorinated Biphenyls in San Francisco Bay and an Implementation Plan to Achieve the TMDL

Dear Mr. Hetzel:

Our organizations appreciate the opportunity to provide comments regarding the proposed amendment to the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) to establish a total maximum daily load (TMDL) for polychlorinated biphenyls (PCBs) in San Francisco Bay, and an implementation plan to achieve the TMDL. (Please see the attached Statement of Interests document briefly describing the signatory organizations)

Our organizations believe we need to work constructively with regulatory agencies in order to develop policies and permits – including the development of TMDLs – that protect the quality of our waters and at the same time enable the State to prosper economically. We support efforts to protect and improve water quality in a meaningful way through attainable implementation measures. We are concerned that the proposed PCBs TMDL and implementation plan is inconsistent with one of our fundamental regulatory rulemaking principals – seeking common-sense and economically reasonable solutions to address water quality problems.

Issues of concern our organizations have with the San Francisco Bay Regional Water Quality Control Board (Board) proposed action include:

- *Stringency* -- We understand that the Board staff previously calculated a fish target of 111 parts per billion ("ppb"), 11 times greater than the current proposal, and, as recently as January 2004, proposed a target that was more than twice as high as the current proposal. The TMDL is 3.4 to 8.9 times as stringent as the California Toxics Rule water-quality criteria set by the U.S. EPA to protect human health. The Board bears a heavy burden to demonstrate why it needs to subject the regulated community to such an extraordinarily stringent target.

- *Benefits to Human Health* -- The ostensible benefits of the TMDL are minimal and speculative, as the TMDL is addressing theoretical risks, and is intended to protect a segment of the sport fishing population that probably does not even exist (hypothetical extreme anglers who eat large quantities of bottom fish loaded with PCBs every week for 70 years).

HOME BUILDERS ASSOCIATION
HBA OF NORTHERN CALIFORNIA
Industrial Environmental Association
naiop National Association of Industrial and Office Properties
The Forum for Commercial Real Estate
Regional Council of Rural Counties
WECA-IEC

Even if the TMDL would result in attainment of the 10 ppb fish-tissue target and even if such hypothetical anglers existed, such anglers would be able to legally buy and consume fish from markets and at restaurants that meet the federal Food and Drug Administration's national tolerance level of 2000 ppb PCBs.

- *Benefits to the Ecosystem* -- The TMDL would result in no material benefits to the ecosystem as current levels of PCBs are not hurting fish or wildlife. Bay waters are in compliance with the California Toxics Rule for the protection of aquatic life. Likewise the vast majority of PCB concentrations in Bay sediment are well below screening levels set by the U.S. EPA for the protection of wildlife.

- *Costs* -- The TMDL calls for a 95 percent reduction of PCBs in stormwater to help meet the TMDL's proposed water column concentration of 19 to 49 parts per quadrillion. BMPs could not be expected to achieve these extremely low concentrations--in fact, there is no technology demonstrated to achieve these levels in stormwater on a wide-scale basis. Nevertheless, the TMDL calls for hundreds of millions of dollars to be spent annually on removal of PCBs from stormwater, without analysis to demonstrate that such removal is necessary or feasible at any particular Bay locations. Additional huge sums would be necessary to physically remove PCBs from sediments in the Bay margin, where the Board calls for mass removal of PCBs through dredging and capping, without regard to any risk reduction benefits that might accrue. Also, the TMDL will place a cloud over port and waterfront businesses and activities, as the TMDL classifies bottom sediments in these areas as contaminated, adding complexity and cost to economic activity along the entire perimeter of the Bay.

- *Balance* -- Given the potentially huge costs of the TMDL, and the very minimal benefits associated with it, the TMDL does not reflect a reasonable balance between costs and benefits. Adoption of the TMDL would violate the economic and business priorities of the Administration, and the reasonable balance called for by the Board's governing statute, the Porter-Cologne Act.

- *Proper Technical Conditions* -- The TMDL has serious errors in its data, modeling, and analysis that leaves the Board without an accurate understanding of PCBs in the Bay. By applying a model that violates basic principles of physics (i.e., conservation of mass, the TMDL significantly understates the ability of the Bay to assimilate PCBs. The TMDL also ignores extensive, reliable data showing that the Bay is recovering from PCBs with half the PCBs dissipating every six to twelve years. External loads from the Central Valley, non-urban runoff, the atmosphere and rainfall are indefinite, and based on inappropriate, incomplete, or the faulty interpretation of data. The TMDL uses an uncalibrated model to calculate stormwater loads and then arbitrarily assigns load reductions to counties based on their populations.

- *Impacts Review* -- Our organizations believe that an analysis of economic and environmental impacts of the Board's proposal must be conducted and that the Board has not yet developed that information. The information that is available shows that implementing the TMDL will have a potentially huge price tag, however, and will cause significant environmental impacts—including destroying healthy benthic communities, emissions of criteria pollutants, consumption of landfill capacity, and emissions of greenhouse gases.

The TMDL is another example of an unsound regulatory proposal that is not supported by science and that likely will impose very significant costs on California in general, and the San Francisco Bay Area regional economy specifically, without commensurate environmental benefit.

Our organizations are interested in working with the Board to find economically-feasible and environmentally-beneficial solutions to address PCBs in the San Francisco Bay. To that end, our organizations request the Board to pursue less costly, more environmentally sensitive alternatives to the proposed TMDL such as monitored natural attenuation with an education and outreach program for subsistence fisherman. In the alternative, if the Board moves forward with the current proposal, we ask the Board to grant us an additional forty-five days to consider and comment on the proposal. The current public comment period, initiated just prior to the Fourth of July holiday, and ending on August 20, does not provide a meaningful opportunity to review the proposed TMDL. In the meantime, we incorporate by reference as if fully set forth herein, comments submitted under separate cover by the California Chamber of Commerce.

Thank you once again for the opportunity to comment on the proposed PCBs TMDL and implementation plan.

Sincerely,

Thomas T. Holsman
Associated General Contractors of California

Ellen Johnck
Bay Planning Coalition

Joseph Cruz
California Alliance for Jobs

Rex S. Hime
California Business Properties Association

Mike Rogge
California Manufacturers and Technology Association

Karen Keene
California State Association of Counties

John Ulrich
Chemical Industry Council of California

Mark Grey
Construction Industry Coalition on Water Quality

Paul Meyer
Consulting Engineers and Land Surveyors of California

Paul Campos
Home Builders Association of Northern California

Patti Krebs
Industrial Environmental Association

James Camp
National Association of Industrial and Office Properties – California Chapters

Kathy Mannion
Regional Council of Rural Counties

Richard Markuson
Western Electrical Contractors Association

Statement of Interests

The organizations signatory to the letter each have an interest in the TMDL as their members include public and/or private entities with business, employment and/or governmental activities in the Bay area that may be affected, and impacted adversely, by the proposed TMDL. The signatory organizations are more particularly described below:

The Associated General Contractors of California (AGC), the voice of the construction industry since 1920, is an organization of responsible construction firms and industry-related companies dedicated to skill, integrity and responsibility in improving our physical environment. AGC of California is comprised of over 1,200 member companies, consisting of general contractors, subcontractors, suppliers and service firms throughout the state of California. Our members build the state's highways, tunnels, utility systems, hospitals and schools and are committed to improving the air within in the state as their employees and families live and work here. We assist our members in labor relations, safety and health, legislative advocacy, and regulatory compliance.

Bay Planning Coalition (BPC) - Founded in 1983, the BPC is a non-profit, membership-based organization representing the maritime industry and related shoreline business, ports and local governments, landowners, recreational users, environmental and business organizations, and professional service firms in engineering, construction, law, planning, and environmental sciences. The mission of the BPC is to advocate for the balanced use and regulation of San Francisco Bay-Delta resources to ensure the economic prosperity and environmental protection of the region.

The California Alliance for Jobs is dedicated to improving the livelihoods of the men and women of the Northern and Central California heavy construction industry. We believe heavy construction is an engine for our state's prosperity and the key to a better quality of life. We also believe that an investment in our infrastructure is an investment in the future. Together, the Alliance and its members are building a better California, today and for generations to come.

California Business Properties Association (CBPA) is the recognized voice of all aspects of the commercial retail industrial real estate industry in California - representing the largest commercial real estate consortium with almost 10,000 industry members. CBPA proudly serves property owners, tenants, developers, retailers, contractors, lawyers, brokers, and other professionals in the industry by representing their interests at the State Capitol and in Washington, D.C., as well as responding to the never-ending regulatory actions of dozens of state and federal agencies.

The California Manufacturers and Technology Association (CMTA) works to improve and preserve a strong business climate for California's 30,000 manufacturers, processors and technology based companies. For more than 85 years, CMTA has worked with state government to develop balanced laws, regulations and policies that stimulate economic growth and create new jobs while safeguarding the state's environmental resources. CMTA represents businesses from the entire manufacturing community - a segment of our economy that contributes more than $250 billion annually and employs more than 1.5 million Californians.

California State Association of Counties - The mission of CSAC is to represent county government before the California Legislature, U.S. Congress, state and federal agencies and other entities, while educating the public about the value and need for county programs and services. CSAC provides a broad range of services to all 58 counties in California through its Finance Corporation activities, public policy development, training, insurance service programs, research and a variety of communication tools, including Internet services. CSAC is committed to assisting California counties in providing a vital and efficient system of public services for the general health, welfare and public safety of every resident. County governments spend in excess of $30 billion a year and comprise a work force of more than 280,000 professionals. Each day county government directly or indirectly touches the lives of every Californian. The magnitude of this human effort demands strong and credible participation in our democratic institutions.

The Chemical Industry Council of California (CICC) is a voluntary trade association comprised of large and small chemical manufacturers and distributors throughout California. CICC represents multiple facilities throughout California, including: forty-three (43) manufacturing plants; five (5) research laboratories; and sixty-seven (67) sales, service, and distribution centers. Our California members account for annual sales in excess of $3,000,000,000 and directly employ more than 5700 workers, with combined annual payroll in excess of $283,000,000. An additional 11,000 indirect jobs are created by CICC member companies with an additional combined annual payroll of some $360,000,000.

The Construction Industry Coalition on Water Quality (CICWQ) is comprised of the four major construction and building industry trade associations in Southern California: the Associated General Contractors of California (AGC), the Building Industry Association of Southern California (BIA/SC), the Engineering Contractors Association (ECA) and the Southern California Contractors Association (SCCA). The membership of CICWQ is comprised of construction contractors, labor unions, landowners, developers, and homebuilders who work collectively to provide the region with housing, commercial buildings and development, institutions, and public works projects.

Consulting Engineers and Land Surveyors of California (CELSOC) is a 50-year-old, nonprofit association of private consulting engineering and land surveying firms. As a statewide organization, we are dedicated to enhancing the consulting engineering and land surveying professions, protecting the general public and promoting use of the private sector in the growth and development of our state. Our members provide services for all phases of planning, designing and constructing projects. Member services include civil, structural, geotechnical, electrical and mechanical engineering and land surveying for all types of public works, residential, commercial and industrial projects.

The Home Builders Association of Northern California (HBANC) is a professional, non-profit association committed to promoting housing for people of all income levels and the production of quality homes. HBANC's membership comprises about 1,000 home builders, trade contractors, suppliers and industry professionals in the Bay Area.

The Industrial Environmental Association promotes environmental responsibility through effective communication and interaction with our members, government, regulatory agencies, business and the community. We use proven technology, scientific methods and common sense to achieve a beneficial relationship between environmental protection, public health and economically sustainable growth.

National Association of Industrial and Office Properties – California Chapters (NAIOP) is the nation's leading trade association for developers, owners, investors, asset managers and other professionals in industrial, office and mixed-use commercial real estate. NAIOP provides communication, networking and business opportunities for all real estate related professionals; provides a forum for continuing education; and promotes effective public policy, through its grassroots network, to create, protect and enhance property values. There are six (6) NAIOP chapters in California - Inland Empire, Sacramento Valley, San Diego, San Francisco Bay, Silicon Valley, and Southern California.

Regional Council of Rural Counties (RCRC) is a non-profit corporation representing the unique interests of its 30 member counties (Alpine, Amador, Butte, Calaveras, Colusa, Del Norte, El Dorado, Glenn, Imperial, Inyo, Lake, Lassen, Madera, Mariposa, Merced, Modoc, Mono, Napa, Nevada, Placer, Plumas, San Benito, San Luis Obispo, Shasta, Sierra, Siskiyou, Sutter, Tehama, Trinity, Tuolumne). RCRC members participate through their respective Boards of Supervisors. RCRC represents the elected general governments of over half of California's counties – local governments with regulatory and public trust responsibilities over lands, surface waters, groundwater, natural resources, fish and wildlife, and overall environmental quality within their respective jurisdictions.

The Western Electrical Contractors Association (WECA-IEC) began 79 years ago, has over 200 members and represents more than 6,000 electrician employees. WECA-IEC contractor members are engaged in the business of electrical construction, maintenance or repair and must have a current C-10 or C-7 license on file with the state Contractors License Board. WECA-IEC offers one of just four currently operating electrical apprenticeship programs approved by the California Apprenticeship Council (CAC). WECA-IEC trains approximately 600 students a year in its classes at its modern training centers in Sacramento and San Diego. WECA-IEC has trained more than 6,000 journeymen in preparation for state certification. All WECA-IEC employers pay their apprentices' wages and apprenticeship program tuition as well as providing major medical insurance for them. WECA-IEC is approved to train and dispatch apprentices state-wide.

BAY PLANNING COALITION
10 Lombard Street, Suite 408
San Francisco, CA 94111-6205
☎415/397.2293 fax: 415/986.0694

August 31, 2007

Mr. Fred Hetzel, Environmental Scientist
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Re: Total Maximum Daily Load for PCBs in San Francisco Bay, Proposed Basin Plan Amendment and Staff Report, June 22, 2007

Dear Mr. Hetzel,

The Bay Planning Coalition (BPC) welcomes the opportunity to submit comments on the above-PCB TMDL Staff Report (PCB Report). This Report represents several years of work (since the first documents in 2003-004) on a very complex scientific and regulatory process, and we applaud your conscientious effort and achievements to date.

This letter identifies specifically the interests and concerns of the maritime community members of BPC and the regulatory impact on the PCB TMDL Basin Plan Amendment on our ability to accomplish necessary dredging and disposal of sediments to support a safe and reliable navigable channel system serving trade and commerce. Below are our comments on the TMDL approach that BPC would like to see incorporated into any finalization of this TMDL, future TMDLs and/or subsequent Basin Plan amendments.

1) **General accounting of sources and losses from dredging and dredged material disposal**

   With the mercury TMDL as your foundation for assessing loading from dredging and sediment disposal, BPC supports your analysis that in-bay dredging and disposal has a net zero loading allocation. Moreover, we support your use of the LTMS implementation plan as a basis on which to identify a -3.3 average annual estimated PCB Mass (kg/yr) loss associated with dredge material disposal. Also we note your agreement with the scientific understanding that the mass of PCBs resuspended by dredging and transported by in-bay disposal are "small" relative to the suspension and deposition assumed for the active layer.

2) **Sediment Dredging, page 72**

   The Report proposes that the "PCB concentration in dredged material disposed of in the Bay not exceed the 99th percentile total PCBs concentration of the previous 10 years of Bay surface sediment samples collected through the RMP". This same requirement was adopted in the mercury TMDL, and it poses a problem for us. This percentile changes frequently--it is a moving target. It increases the threshold being used by the DMMO on which to make permitting decisions. As the 10-year period slides forward in time, the ambient concentration should become lower. This could hurt smaller dredgers in the future who maintain their harbors infrequently, once very 5-10 years. Sediments would be buried after dredging in one year and be consistent with background concentrations, but exceed a future background concentration. We propose a lowering to the 90th percentile which is what we proposed for the mercury TMDL.

3) Linkage Analysis and Food Web Bioaccumulation Modeling.

We believe the assumptions on which the above "modeling" is based are flawed. On page 54-55 the Report indicates that you have chosen sediment rather than biota, as the primary vector causing PCB concentrations and bioaccumulation in fish. Based on this approach, this means that a sediment management strategy will have to be employed to reduce sediment concentrations to the fish tissue level of 10 ppb. As a general approach, this natural recovery will be impossible to achieve. We note that one of your assumptions is that PCBs are really deposited into the Bay from the watershed, and so we believe that a management strategy should be redirected at that assumption.

4) Other Technical Problems

The theoretical bioaccumulation model does not take into account how PCB's can vary dramatically between different ecosystems, due to site specific hydraulic, biological, chemical, and ecological factors that affect bioavailability and bioaccumulation. For instance, there are substantial differences in the toxicity of various PCB congeners, differences in the degree to which such congeners can be sequestered in the sediment such that their bioavailability is reduced, and substantial differences in the process of breakdown of congeners. More analysis is needed to assess the relative distribution of congener patterns relative to fish tissue.

5) Sediments as a sink

The literature on dredging and sediments shows that sediments sequester contaminants and release only a small fraction of constituents. This fact should be reflected in the PCB TMDL.

6) Other relevant studies

Two studies, a US Army Corps of Engineers evaluation of the HARS site in New York and a Willamette River study, were recently completed that indicate that PCBs primary transport mechanism is through the water column, not sediments. This is reflected by the congener pattern.

7) **Implementation actions for sediment and dredge material disposal**

The dredging implementation component of the PCB (and Mercury) TMDL is based on the subscription to the LTMS 40% ocean, 40% upland and beneficial reuse and 20% in-bay disposal plan. The dredging community diligently works towards achieving the LTMS disposal plan and is making good progress. However, the plan is a disposal target, not a regulation. Reaching this target is, in part, dependent on variables beyond the control of dredgers, such as a timely permit process and available funding. Thus, we would like the Regional Board to understand that TMDL implementation cannot strictly rely on the dredging community adherence to the 40-40-20 plan because we can only achieve it if it is financially and practically feasible to do so, and that permits are approved.

Finally, we have one general comment to be considered when developing future TMDLs. As the Bay and watershed is a dynamic ecosystem, individual TMDL criteria and implementation plans must be developed to ensure that the plans are complementary and provide for adaptive environmental management. We look forward to participating in the TMDL program in the future to ensure the integration of sound science and the balancing of economic and environmental policy goals.

Sincerely yours,

Ellen

Ellen Joslin Johnck
Executive Director

Cc: LTC Craig Kiley, San Francisco District Engineer, U. S. Army Corps of Engineers
Alexis Strauss, Director, Water Quality Division, U. S. EPA
William Travis, Executive Director, S. F. BCDC
Ms. Dorothy Rice, Executive Officer, State Water Resources Control Board

Memorandum

To: Fred Hetzel
From: Roger James
Date: August 20, 2007

SUBJECT: PCB TMDL for San Francisco Bay

The following comments are submitted regarding the PCB TMDL and are specific to the Urban Storm Water Runoff implementation measures beginning on page 67.

Application of MEP to TMDLs
The reduction of pollutants to the "maximum extent practicable" is a technology based standard in the Clean Water Act, does not apply to compliance with water quality based standards and should be deleted in the 2nd paragraph on page 68.

Urban Storm Water Treatment by POTWs
While I agree that this should be explored, the feasibility is questioned and reliance on this as a possible solution should be quickly addressed and feasibility determined. The feasibility is questioned because runoff from areas with elevated PCBs in ***soils/ sediments*** will be from pervious areas.

Studies by Pitt and Bozeman, 1982 *Sources of Urban Runoff Pollution and Its Effects on an Urban Creek*, USEPA-600/S2-82-090 have reported on the relative solids and other pollutant loadings from pervious and impervious areas in the San Jose area. They found that total solids loadings from pervious areas were over six times those from impervious areas.

Dry weather nuisance flows from pervious areas will be minimal. Storm event runoff from pervious areas occurs later in a storm event, during larger events and during short-duration periods of high storm intensities when the ground is saturated. POTWs during these periods of rainfall will have minimal additional capacity to treat storm water runoff.
McKee et al 2005 found a seasonal SSC "first flush", but also found that 90% of the annual loads occur during floods and that the maximum PCB concentration coincided with a high stream flows and maximum SSCs.

The ability or willingness of POTWs to accept storm water runoff discharges during periods of high runoff or storm events should be quickly addressed so that the effort to identify effective BMPs can focus on other feasible control measures in the TMDL implementation plan and Regional Storm Water Permit.

Storm Design Criteria
The investigation of strategic runoff treatment retrofits must also include a requirement to develop the storm event volume, duration and short-term (5-15 minute) rainfall intensities that mobilize the sediments and associated PCB concentrations by particle size from the pervious areas with elevated PCBs in ***soils/sediments.*** The current storm event design criteria in the State's BMP manuals and NPDES Permits were not developed considering these criteria. It is highly likely that larger capacity flow thorough treatment BMPs will be required to address PCBs.

Improved System Design Operation and Maintenance

Street sweeping or street washing will not be effective BMPs in controlling runoff from pervious areas with elevated PCBs in ***soils/sediments*** unless those sediments were deposited on streets by wind from adjacent pervious areas with elevated PCBs in ***soils/sediments*** or were deposited on the streets during previous runoff events. Storm drain inlets are not effective in trapping sediments unless they have large sumped catch basins. Street sweeping, street washing and storm drain inlets should be deleted from further consideration because they will not be effective.

Control measures should focus on source control to prevent or abate PCBs in runoff, preventing erosion of soils from pervious areas with elevated PCBs in ***soils/sediments*** and treatment of discharges from the storm drain systems. The fewer options given to municipalities for further study and evaluation will lead to quicker implementation of feasible control measures.

Mirant Delta, LLC
Pittsburg Power Plant
696 West 10th Street, P.O. Box 192, Pittsburg, CA 94565
T 925 427 3500 **F** 925 427 3535 **U** www.mirant.com

August 17, 2007

Mr. Bruce H. Wolfe
Executive Officer
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, California 94612

Attn: Mr. Fred Hetzel

Subject: Comments on Proposed Basin Plan Amendment San Francisco Bay Polychlorinated Biphenyls TMDL

Dear Mr. Wolfe:

Thank you for the opportunity to comment on the proposed polychlorinated biphenyls (PCBs) TMDL for San Francisco Bay. In general, Mirant supports the efforts of the San Francisco Bay Regional Water Quality Control Board (Regional Board) and commends your staff on the development of a well-thought out approach to addressing PCBs in the Bay. Mirant has only a couple of matters it wishes to draw to the Board's attention:

1. The TMDL does not account for Ambient PCBs in Once-Through Cooling Water

PCBs are ubiquitous in Bay sediment and will, from time to time, appear in the water column due to air deposition or stirring up of the bay as a result of wind, storms, tidal action or the actions of others. These suspended PCBs may be drawn into the intake structures of facilities using Bay water as once-through cooling water and may then appear in effluent monitoring for those facilities. A facility is not responsible for ambient PCBs, yet the wasteload allocations for industrial facilities (Table A-4) make no provision for ambient PCBs in once-through cooling water.

This same issue was resolved in the Regional Board's Basin Plan amendment for the San Francisco Bay Mercury TMDL which was recently approved by the State Water Resources Control Board. In the amendments for the Mercury TMDL, the Regional Board added footnote (c) to the individual wasteload allocations for industrial discharges table. That footnote reads:

> **Wasteload allocations for industrial wastewater discharges do not include mass from once-through cooling water. The Water Board will apply intake credits to once-through cooling water as allowed by law.**

See Footnote (c) to Table 4-z of Mercury TMDL for San Francisco Bay, approved by the Regional Water Quality Control Board on August 9, 2006 and approved by the State Water Resources Control Board on July 17, 2007.

Mirant suggests the same language be added as a footnote to Table A-4 of the San Francisco Bay PCBs TMDL.

2. Financial Burdens for Monitoring and Evaluation should not be placed Exclusively on Point Source Dischargers

As the TMDL recognizes, the single most significant source of source of PCBs to fish, equal to all other quantified sources combined, is inflow to the San Francisco Bay from the Central Valley. (Draft PCB TMDL, Table A-1 at Page A-4). Nonetheless, the TMDL proposes to place the entire financial burden of monitoring and evaluation of the TMDL's success on the discharger-funded Regional Monitoring Program (RMP). (Draft PCB TMDL at Page A-11). Point-source dischargers (wastewater and stormwater) should not continue to be the sole source of funding for the monitoring of PCB conditions in the Bay. We would suggest that the Regional Board actively seek additional funding at the local, state, and federal levels. One recommendation to the Regional Board is to make the TMDL expressly contingent on obtaining funding at the state and federal levels, proportionate to the "non-point source" contribution. Since the TMDL must be approved at both the state and federal levels, making the TMDL contingent on appropriate state and federal funding would assure that the costs implementing the TMDL are shared among all the appropriate parties.

Thank you for your consideration of these thoughts and comments. Please call Steve Bauman of my staff at (925) 427-3381 if you have any questions.

Sincerely,

Jeffrey S. Russell
President, Mirant California, LLC

Pacific Gas and Electric Company®

Environmental Services

US Mail:
Mail Code B24A
P. O. Box 770000
San Francisco, CA 94120

Overnight Mail:
77 Beale Street, B24A
San Francisco, CA 94105

415.973.7000
Fax: 415.973.9201

August 20, 2007

Ms. Jodi Bailey
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

RE: PROPOSED BASIN PLAN AMENDMENT FOR PCB TMDL IN SAN FRANCISCO BAY

Dear Ms. Bailey

On behalf of Pacific Gas and Electric Company (PG&E), thank you for the opportunity to provide comments on the proposed basin plan amendments for San Francisco PCB Total Maximum Daily Load (TMDL). In addition to comments on the proposed amendment, PG&E would like to provide information on our voluntary PCB reduction programs.

PG&E is committed to reducing PCBs and has been recognized for its efforts to remove PCBs from its equipment. Since the early 1980's PG&E has completed a number of programs to eliminate PCBs while maintaining reliable energy services and avoiding unnecessary rate increases. PG&E is active in the EPA's Voluntary Accelerated Reduction Program and has been recognized as significantly contributing to the program. A copy of EPA's letter recognizing PG&E is attached.

PG&E's programs represent one of the most extensive PCB removal efforts undertaken by an electric utility. PG&E has removed and safely disposed of the vast majority of the PCBs that previously existed in its electric distribution system. PG&E's programs have been aimed at every major source of PCBs in utility electric equipment, including capacitors, network transformers (underground), and distribution transformers.

<u>PG&E'S PCB ELIMINATION AND ASSESSMENT PROGRAM</u>

<u>Completed Programs</u>

PCBs have not been manufactured since 1979 and for 27 years, PG&E has implemented a number of specific programs to reduce PCB's in its electrical system, including:

- Replacement of PCB capacitors, which are sealed metal containers usually mounted near the top of power poles that help maintain proper voltage on the system;
- Replacement or retrofill of PCB transformers near food or feed facilities;

- Replacement of more than 15,000 capacitors in four major transmission substations connected to the 500 kV line; and
- Replacement of nearly 1,000 underground network transformers.

In the late 1990s, PG&E performed a detailed study that, in part, evaluated the presence of PCBs in hundreds of soil samples from over a dozen substations, which was submitted to the San Francisco Regional Water Quality Control Board (SFRWQCB) and the Department of Toxic Substances Control. It found that PCBs are detected only rarely, and at concentrations well below Toxic Substances Control Act (TSCA) levels.

Current Program

As part of our on-going maintenance program, more than 10,000 transformers are tested annually to determine their PCB content. When a transformer is found to contain 2 ppm PCBs or more, it is drained and refilled with non-PCB mineral oil or replaced with a new non PCB transformer.

Additionally, if a customer is concerned with a distribution transformer PG&E will inspect it; if PG&E determines that it should be removed, it is replaced with a non PCB transformer.

Due to PG&E's PCB removal efforts, the continual replacement of aging equipment, and completion of the series capacitor bank replacement projects, PG&E is confident that the major sources (network transformers and series capacitor banks) of PCBs in PG&E's electric system have been removed and PCBs within the system have been substantially reduced.

COMMENTS ON THE PROPOSED BASIN PLAN AMENDMENT

The following items are PG&E's specific comments to the basin plan amendment:

- PG&E supports the SFRWQCB's efforts to use good science to reduce PCB loading to San Francisco Bay.

- PG&E operates throughout northern and central California and is concerned with consistent implementation of the TMDL. PG&E urges the Board to take the necessary steps to ensure a consistent approach and further, encourage and foster cooperation amongst the various jurisdictions implementing the TMDL program

- The direct allocations for industrial dischargers includes an allocation for Hunters Point Power Plant. Hunters Point Power Plant closed in May 2006 and its NPDES permit was rescinded in June 2006. The plant is being demolished and the area will be remediated to residential standards. All activities at the site are covered by an industrial storm water discharge permit. Sara Everitt of PG&E spoke with Fred Hetzel of the SFRWQCB on August 17, 2007, and it is our understanding that Hunters Point will be removed from the allocation list for industrial dischargers.

PG&E looks forward to continuing to work with the SFRWQCB on this important matter and would be happy to meet with you to explain the reduction programs further or provide any other information.

If you have any questions please contact Sara Everitt at (415) 973-0707.

Sincerely

Korbin D Creek

Korbin Creek
Director of Environmental Services

cc: K Jones
D Harnish
F Flint
A Jackson
A Leung

CalChamber™

August 20, 2007

VIA EMAIL

Fred Hetzel, Ph.D
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612
fhetzel@waterboards.ca.gov

Re: Public Comment on RWQCB's June 22, 2007 Total Maximum Daily Load for PCBs in San Francisco Bay, Proposed Basin Plan Amendment and Staff Report ("Proposed TMDL")

Dear Mr. Hetzel:

The California Chamber of Commerce and its member, General Electric Company, hereby are submitting to the California Regional Water Quality Control Board, San Francisco Bay Region, the enclosed comments and expert report. We also submitted under separate cover dated August 18 an appendix of expert reports and supporting materials. We are submitting today by personal delivery a supplemental appendix and Professor David Sunding will be submitting a report analyzing the economic impacts of the Proposed TMDL under separate cover today on our behalf. Our testimony, if any, at the public hearings on the Proposed TMDL will be based on these materials.

We appreciate the opportunity to provide this public comment. We are available to discuss our comments with the agency at your convenience, and look forward to continued constructive participation in this matter.

Best regards,

Valerie Nera

Valerie Nera, Director
Agriculture and Resources, Water & Privacy

Enclosures

COMMENTS ON CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD'S

TOTAL MAXIMUM DAILY LOAD FOR PCBs IN SAN FRANCISCO BAY

PROPOSED BASIN PLAN AMENDMENT AND STAFF REPORT

JUNE 22, 2007

Submitted by: Date: August 20, 2007

LATHAM & WATKINS LLP
600 West Broadway, Suite 1800
San Diego, California 92101-3375
Tel: (619) 236-1234
Fax: (619) 696-7419
Daniel Brunton, Esq.
Paul N. Singarella, Esq.
Gene Lucero, Esq.

On behalf of the California Chamber of Commerce (the "Chamber") and General Electric Company, we appreciate the opportunity to submit public comment to the California Regional Water Quality Control Board, San Francisco Bay Region ("RWQCB" or "Board"), in response to the Board's issuance on June 22, 2007 of a proposed Basin Plan Amendment (the "proposed BPA") and Total Maximum Daily Load (the "proposed TMDL") for polychlorinated biphenyls ("PCBs") in San Francisco Bay ("SFB" or the "Bay"), and request for public comment on these proposed agency actions.[1] The Chamber and its members including General Electric have a particular interest in this matter, as we believe the proposed TMDL does not strike a reasonable balance among competing objectives including the need to avoid significant economic impact and other adverse consequences that are not warranted by any realistic assessment of potential benefits, and as a different TMDL would have been proposed had the agency been informed by technically sound analysis and modeling. As an association representing business interests in the State, and General Electric as a company with such business interests, we request that the TMDL be revised to avoid undue economic impacts on the business community without commensurate environmental benefit, fostering a climate unfavorable to the growth and competitiveness of the California economy, and to Bay-area businesses.

I. <u>EXECUTIVE SUMMARY</u>.

The TMDL documentation does not provide an adequate technical foundation for RWQCB to make an informed decision regarding the control of PCBs in the Bay. On critical points, the assumptions in the TMDL documentation are based on mistakes in modeling and analysis. On other points, the TMDL documentation is without the underlying data necessary to produce a reliable understanding of PCBs in the Bay. Principal concerns include the following:

- <u>Assimilative Capacity Understated</u> – The model used to calculate the Bay's ability to assimilate PCBs artificially traps PCBs in the Bay that in reality flow out under the Golden Gate Bridge and to the open ocean. This artifact of the TMDL's analytical approach results in an estimate of the Bay's ability to assimilate PCBs that is too low by at least a factor of 2.5, which is very significant especially in light of the small quantities of PCBs allowed under the proposed TMDL.

- <u>Natural Recovery Discounted</u> – The TMDL does not quantify natural recovery or compare its ameliorative effects on PCBs with the TMDL's proposed plan. Mussel, sediment, and water column data show that tidal flushing and other natural processes are reducing PCB levels in the Bay materially, with a half-life

---

1 These comments are based on RWQCB's report entitled, "Total Maximum Daily Load for PCBs in San Francisco Bay, Proposed Basin Plan Amendment and Staff Report" (hereinafter "Staff Report"), and attachments thereto. We respectfully request that these public comments, and related expert reports, appendices, and attachments submitted under separate cover be given appropriate consideration, be placed in the administrative record for the Basin Plan Amendment and the TMDL, and be maintained in the agency's records.

of six to twelve years, a process which shows no evidence of slowing. Even if RWQCB takes no action to reduce external loads, the Bay will reach ambient sediment concentrations much lower than the current concentration of ten parts per billion ("ppb") (as estimated in the TMDL) – and may reach a concentration of five ppb in the next ten years. Natural recovery is a well accepted alternative for sites with residual levels of legacy compounds like PCBs, and should not be marginalized, as does the TMDL, by equating it with a "no project" alternative.

- Arbitrary Stormwater Loadings From An Uncalibrated Model – The TMDL's estimate of current PCBs in stormwater is based on an uncalibrated model that does not account for the spatial and temporal variability of stormwater loads to the Bay. The TMDL proposes to reduce these loads through an arbitrary allocation to each county in proportion to population, such that it is estimated San Francisco County would be allowed to discharge stormwater with a PCB concentration of 8,050 parts per quadrillion ("ppq"), but more rural Napa County must reduce PCBs in stormwater to a concentration of 640 ppq.

- Reduction Of Indefinite Central Valley Loads Not Reasonably Assured – The current load of PCBs from the Central Valley is effectively unknown as the TMDL assumed a rate of freshwater flow from the Central Valley that was seven to ten times too high and used PCB concentration data that were temporally biased and taken from sampling stations that are not representative of freshwater flows. Although attainment of the TMDL is predicated upon dramatic reductions in PCBs from the Central Valley, the TMDL contains no measures to reduce this source of PCBs and does not provide reasonable assurances that this load reduction will occur. This predicted reduction conflicts with the Central Valley RWQCB's analysis showing that the rate of any decline of PCBs in the Central Valley is unclear and cannot be predicted.

- The TMDL Cannot Be Met Without Added Treatment At POTWs – The load of PCBs from publicly owned treatment works ("POTWs") is understated as the TMDL did not use available site-specific data to calculate the load, and did not properly account for future growth. The TMDL's assumption that the POTWs will be able to meet their allocation of two kg/year without additional treatment is not correct, frustrating the potential attainment of the TMDL as such treatment is not part of the TMDL.

- The PCB Load From Atmospheric Deposition Is Essentially Unknown – The rate of atmospheric deposition of PCBs is effectively unknown, but is likely larger than the 0.35 kg/year assumed by the TMDL, which value the TMDL's own peer reviewer does not believe, and which includes no load for PCBs in rainfall. PCB loads to other water bodies can be very significant, and, in a number of cases, have been shown to be greater than 10 kg/yr – the proposed value for the entire TMDL from all sources.

The technical problems in the TMDL are not just sources of uncertainty that RWQCB can address by using "conservative" assumptions. Rather, they are mistakes in the TMDL's data, modeling, and analysis that obscure a true understanding of the processes controlling PCB levels in the Bay, yielding results that are contrary to observed, empirical data. For example, there is no uncertainty that measured PCB concentrations in mussels, the water column, and sediment have been declining, and that natural recovery at meaningful levels is occurring; but the TMDL does not account for these facts.

RWQCB must balance competing environmental and economic objectives when adopting a TMDL. The TMDL documentation does not provide RWQCB adequate information about the costs and benefits of the TMDL to make an informed, balanced decision. But it is evident from the available information that achieving the TMDL is not feasible, and would come at great environmental and economic cost, with little benefit to the environment or human health.

- Stormwater Treatment Infeasibility – Attempting to meet the stormwater load would require capture and treatment of stormwater on a region-wide scale, as Best Management Practices will not meet the TMDL's concentration requirements. The costs for acquiring the land for stormwater capture and treating stormwater with best available technology would be astronomical, even for a typical design storm volume. Even such sophisticated treatment has not been demonstrated to meet the stringent PCB levels called for by the TMDL.

- Dredging And Capping Infeasibility – Dredging and capping are the only implementation measures in the TMDL for contaminated sediments, identified as sediments containing more than 10 ppb PCBs. Given the many millions of cubic yards of sediment that presently exceed 10 ppb, dredging and capping this volume would entail an unprecedented effort, many times greater than any remedial project ever attempted in the United States. Even dredging and capping just the 22 sites identified in the TMDL as being of particular interest would potentially be the largest remedial project undertaken in the United States. The costs would be astronomical, the time to complete years if not decades, and the benefits minimal as technical analysis shows that these particular locations are not driving fish-tissue levels on a regional basis, and as natural recovery is reducing PCB levels at these sites at a rate certainly comparable to the timescale for any such undertaking, if not faster.

- Infeasible PCB Numerical Targets And Goals – The proposed PCB targets and goals are much more aggressive (in some cases by orders of magnitude) than levels generally found to be acceptable at sites assessed under U.S. EPA oversight. While the TMDL states that the one ppb sediment "goal" is not a cleanup standard, it sets the bar so low that even trying to approach it through remedial projects would be extremely onerous and potentially impossible and, as described above, unnecessary. If the TMDL, as it seems to imply, is not meant to affect PCB cleanups, the TMDL needs to be revised to create a clear separation between the TMDL and cleanup programs, lest the PCB targets and goals be used as *de facto* standards, or Applicable or Appropriate and Relevant Requirements ("ARARs").

- Adverse Environmental Impacts Of The TMDL – Implementing the TMDL would cause significant environmental impacts, including destruction of and/or damage to healthy benthic communities, emissions of criteria pollutants and greenhouse gases, consumption of landfill capacity, and land use impacts. Mass removal of PCBs from contaminated sediment sites will result in adverse impacts, as equipment to remove and transport the material likely will generate diesel exhaust, and greenhouse gases, and the act of sediment removal likely will reintroduce into the water column PCBs otherwise sequestered in the sediment.

- Adverse Consequences To Bay Management – The TMDL will make it more difficult and expensive to manage sediment in the Bay, whether that entails removing it from places where it impedes navigation and commerce at ports, handling it as part of waterfront redevelopment, or utilizing it as a resource for habitat restoration or the construction of wetlands. The TMDL may adversely affect maintenance dredging and the ability to keep the region's ports open for business, and the costs of, and options for, disposal of dredged material. The TMDL may adversely affect waterfront development and redevelopment since such economic activity will encounter sediment with levels greater than one ppb. The TMDL may affect adversely, and increase the cost of, projects to restore or reclaim habitat, or construct wetlands, given that such projects typically rely on the availability of sediment that can be used as a resource.

- No Apparent Ecological Benefit – Adopting the TMDL would not appear to have material ecological benefits as the current PCB levels in fish, sediment, and the water column are below levels that are considered protective by U.S. EPA and NOAA. During multiple impairment proceedings over the last decade, data showing that PCBs are impairing the Bay's ecological standards have not been identified; nor does the TMDL show such impairment.

- Health Benefits Theoretical And Speculative – The fish-tissue target is based on such an extreme scenario that adopting the TMDL would not prevent a single case of cancer. Very few, if any, persons eat an average of eight ounces of uncooked white croaker or surf perch from the Bay every week for 70 years – which is the hypothetical population the TMDL is designed to protect. The TMDL's water-column goal of 19 to 49 parts per quadrillion is 3.4 to 8.9 times more stringent than the state-wide standard for PCBs set by U.S. EPA to protect sport fisheries, further underscoring the unrealistic risks on which the TMDL is based.

- No Risk To General Population – The TMDL proposes a safe level for PCBs in fish that is 200 times lower than the national tolerance level for commercial seafood set by the federal Food and Drug Administration. While the TMDL proposes to protect anglers from consuming fish with over 10 ppb of PCBs, those very same anglers can legally be served fish in a Bay-area restaurant or purchase fish at a Bay-area market containing PCBs with up to 2,000 ppb.

- No Consideration Of Epidemiology – The TMDL does not account for the extensive scientific literature showing that PCBs do not cause cancer or non-cancer effects in humans. As no human study has shown that PCBs are a carcinogen, U.S. EPA considers PCBs to be only a probable carcinogen.

- Adoption Of Suspect United Nations' Toxicity Values – The TMDL sets a fish-tissue level for dioxin-like PCBs based on a United Nations approach to comparing the relative toxicities of dioxin with these PCBs, when federal officials including the National Academy of Sciences have called into question the UN approach.

The federal Clean Water Act requires RWQCB to establish proper technical conditions to demonstrate that any particular compound is suitable for development of a TMDL. For the above and other reasons, the proposed TMDL is not supported by proper technical conditions, and is not technically defensible. Adoption of it as proposed would be arbitrary and capricious. California law requires RWQCB to put the TMDL through a thorough review of economic and environmental consequences, to define the project with specificity, and to examine feasible alternatives to it. These requirements are especially important here, as the proposed plan for reduction of PCBs from runoff and mass removal of PCBs from sediments, although not adequately defined, likely will entail the construction of stormwater capture and treatment facilities, large-scale dredging, and the use of diesel-emitting heavy equipment, among other measures. Despite the pressing need for economic and environmental review, however, the TMDL contains no economic analysis that can be recognized as such, and the environmental review of the proposal is not adequate. The proposed TMDL does not conform with a number of other applicable legal requirements, as more particularly described infra, Section IV.

Further underscoring the importance of thorough analysis, feasible alternatives might avoid the environmental and economic costs of the proposed TMDL. For example, monitored natural attenuation coupled with institutional controls would protect those consuming Bay-caught fish from any potential risk to which they might be exposed, without causing the significant environmental impacts that an unprecedented dredging/capping and stormwater treatment program would entail. The TMDL must identify the feasible alternatives to the proposed plan and analyze these alternatives fully, so as to identify the superior environmental alternative, and comply with law.

II. THE PROPOSED TMDL IS TECHNICALLY UNSOUND AND INFEASIBLE, MAY BE IMPOSSIBLE TO ACHIEVE, AND IS BEING PURSUED AT GREAT COST AND RISK OF SERIOUS, ADVERSE ENVIRONMENTAL IMPACT WITHOUT PROMISE OF MATERIAL BENEFIT, WHEN PRUDENT ALTERNATIVES EXIST.

RWQCB is required to strike a reasonable balance among competing objectives when preparing a TMDL, and must establish a technically sound basis in order to inform TMDL implementation measures. As more particularly described below, the proposed TMDL does not meet these basic requirements.

- The TMDL's technical analysis has numerous problems, leaving RWQCB without an adequate understanding of the sources and processes that affect PCB levels in the Bay, and in turn without the requisite technical compass necessary to make rational decisions about whether and how to reduce PCB levels in fish – the TMDL's stated objective.

- The TMDL's fish-tissue target is based on an exaggerated assessment of the risk of eating fish from the Bay containing PCBs, and on hypothetical angler consumption of such fish that is at most an extreme conduct engaged in by only a handful of persons, and which has not been demonstrated to be occurring at all.

- The TMDL's implementation focus on stormwater and contaminated sediments is misplaced, as the TMDL's stormwater analysis is compromised by significant error, the TMDL's stormwater goals are unattainable, and the TMDL's assumption that cleanup of contaminated sediments will accelerate attainment of the fish-tissue target is not correct.

- In addition, it is very difficult to square the TMDL's suggestion that the TMDL will not be the but-for cause of greatly expanded cleanups of contaminated sediments with the TMDL's stringent numerical goals and standards.

- The TMDL will require great public and private expenditures to achieve very little benefit, and also will result in significant adverse environmental impacts that RWQCB has not anticipated or characterized adequately.

- The capacity of the Bay to assimilate and recover from PCBs is much greater than portrayed in the TMDL, and the TMDL materially understates the loss of PCBs from the Bay due to natural recovery processes. As a result, the TMDL analysis has overlooked several reasonable alternatives such as monitored natural recovery and institutional controls – alternatives which RWQCB fully should consider.

Under these circumstances, and as more particularly described below, RWQCB must reformulate the TMDL based on sound science and in accordance with its statutory mandates to craft a reasonable regulation that strikes a proper balance among various objectives, including the objective of achieving the highest water quality that is reasonable, given economics and technical feasibility. Also, RWQCB should incorporate into the TMDL the safeguards necessary to ensure that the TMDL does not supplant typical PCB cleanup levels, which generally are orders of magnitude greater than the PCB values of the TMDL.

A. The Benefits Of The TMDL Are Minimal And Likely Illusory.

The document does not support a claim of ecological benefit from the proposed TMDL. PCB concentrations in Bay waters have been below the aquatic life standard of the California Toxics Rule ("CTR") since 2000. While the TMDL claims that PCBs are preventing the Bay from meeting ecological standards, RWQCB has not made this argument during prior periodic agency proceedings where SWRCB, in cooperation with the State's RWQCBs, compiles a comprehensive state-wide list of all water bodies not meeting standards for particular compounds. RWQCB has made no such showing during these prior proceedings for an ecological impairment of the Bay by PCBs; and RWQCB offers no such showing in the TMDL. RWQCB points to a U.S. EPA sediment screening level of 160 ppb, which U.S. EPA considers protective of wildlife. The overwhelming majority of surficial sediments in the Bay are below this screening value.

The TMDL documentation attempts to make a case for material risk to people from eating fish in the Bay; but the risk scenario is hypothetical, without plausible basis in fact, and is unrelated to any risk to which the general population may be exposed. The overall angler population in the Bay area is on the order of 125,000 persons. Using straightforward probability analysis, it can be shown that very few anglers – fewer than 100 – possibly would be engaging in the conduct assumed by the TMDL. The number may in fact be zero, as the year-long angler intercept survey conducted in the Bay area from July 1998 to June 1999 likely would have found such an angler, if he or she existed. In any event, this tiny group may be exposed to a slight incremental cancer risk, assuming PCB concentrations and toxicology as characterized in the TMDL documentation. The group is so small that not a single additional cancer would be expected to occur from the target exposure, or even much higher exposures.

The minimal benefit is underscored further by the undisputed fact that no epidemiological study has shown PCBs to cause cancer in people. For this reason, U.S. EPA identifies PCBs as a probable human carcinogen. Not one of fifty epidemiologic studies have shown a link between cancer and PCB exposure – in many studies at concentrations well above levels present in the Bay. While one of RWQCB's peer reviewers believes that PCBs can be harmful to people at any levels, and offered that the TMDL is not stringent enough, this expert has been disqualified as an expert in federal court, and has testified under oath that his assumption about PCBs being a threat regardless of threshold is based on faith – not science. RWQCB cannot rely on its peer reviewer's faith-based assumption, especially in light of the substantial empirical information showing an absence of human carcinogenicity.

The benefits of a fish-tissue target of 10 ppb must be considered in light of the national tolerance level for PCBs in commercial seafood set by the federal Food and Drug Administration (the "FDA"). The proposed 10 ppb target of the TMDL is 200 times more stringent than the FDA tolerance level of 2,000 ppb. While the TMDL is designed to protect anglers from fish containing PCBs over 10 ppb, those very same anglers can buy fish in any fish market or restaurant in the Bay area with PCBs of up to 2,000 ppb.

B. The TMDL Is Infeasible, And May Be Impossible, To Achieve.

The stated objective of the TMDL to reduce PCB loads to the Bay to 10 kg/yr cannot be achieved. The plan requires dramatic reductions in PCBs in urban runoff that cannot feasibly be met with Best Management Practices and, as such, would require stormwater capture and treatment. It does not appear possible that the land requirements for stormwater capture on a regional scale could be met, because the land is neither available nor affordable. In addition, no known large-scale stormwater treatment technology has been demonstrated to meet the very low PCB concentrations required to satisfy the allocation for urban runoff; existing treatment technologies are prohibitively expensive on a regional basis, even if only a design-storm volume (not all stormwater) were treated.

Other sources of PCBs not controlled under the proposed plan in combination or alone likely will frustrate the attainment of the TMDL's 10 kg/yr goal. The TMDL has not made the case that Central Valley PCBs will drop dramatically in the years ahead – declines that are fundamental to the 10 kg/yr goal, as RWQCB estimates that the current load from the Central Valley is 42 kg/yr, far greater than the goal. There is no present plan to control this source, as it is under the jurisdiction of a different agency, the Central Valley RWQCB, which has not developed a TMDL for these PCBs, and has found that future declines cannot be assumed or predicted. The SF RWQCB's estimate of this load is technically flawed and unreliable, and RWQCB has not made any independent evaluation upon which it can reasonably assure that its proposed Central Valley allocation (5 kg/yr) will be met.

The TMDL assumes that PCBs in nonurban runoff are minimal (0.1 kg/yr), and will not frustrate its 10 kg/yr objective, when recent studies indicate that this load is at least 2 kg/yr (20 percent of the 10 kg/yr goal), and may be as high as 11 kg/yr (110 percent of the 10 kg/yr goal). RWQCB needs to identify and quantify the magnitude of this source, which it has no plan to control, and which alone could absorb the 10 kg/yr goal, materially or even entirely.

The TMDL's estimate of PCBs entering the Bay from the atmosphere is questioned by RWQCB's peer reviewer, and likely is much higher than the TMDL assumes, providing yet another source beyond RWQCB's control that may frustrate the attainment of the 10 kg/yr goal. RWQCB would need to identify and quantify the magnitude of this source before it could ascertain with confidence that its 10 kg/yr goal can be attained, even if all other implementation measures were achievable.

The TMDL proposes to accelerate attainment of its fish-tissue target through dredging and capping of contaminated sediments, which RWQCB defines as sediments with PCB concentrations greater than 10 ppb. Since dredging cannot achieve levels below the Bay ambient level of 10 ppb, even if all the sediments in the Bay margin were reduced to ambient levels, under the TMDL's logic bottom-feeding fish in the margin would not meet the fish-tissue target of 10 ppb. The TMDL assumes that PCBs in fish are 10 times higher than PCBs in sediment, and that fish derive their PCBs principally from the sediment. Under these assumptions, bottom-feeding fish in the margin would have PCB levels of about 100 ppb, even if sediments in the margin were reduced to ambient levels.

In addition, the particular sites identified in the TMDL for possible remediation represent a very small percentage of the Bay; remediation of all of these sites will not materially promote attainment of the fish-tissue target, showing that the TMDL's focus is misplaced. Roughly 60 percent of the PCBs in the Bay are outside the Bay margin, and will continue to exert a significant influence on regional PCB levels, even if the entire Bay margin were to be remediated.

C. <u>The TMDL's Implementation Plan Calls For Extraordinary Measures, Entailing Potentially Staggering Costs</u>.

The cost information provided in the TMDL does not consider the economic impacts of measures to achieve the TMDL. The TMDL documentation has left the public with no meaningful information on the costs of the proposal. RWQCB must address this deficiency in order to satisfy its disclosure obligations, and balance these costs against potential benefits.

1. Stormwater.

The TMDL's use of current annual wastewater treatment costs to assess the costs of the stormwater proposals is not sound. Wastewater is treated at several Bay-area Publicly Owned Treatment Works ("POTWs") already in existence and designed to treat domestic sewage and industrial wastewater. Treating PCBs in stormwater would deploy different technologies (e.g., granular activated carbon versus activated sludge), has different land requirements (because of the need to capture and store for treatment large stormwater volumes that arrive in pulses), and entails different annual operating and maintenance costs.

Capital costs to build the storage and treatment works for a 25-year storm volume (standard RWQCB design storm) is estimated to be $8 billion. These costs do not include land acquisition or the operation and maintenance of the stormwater treatment system, which would include replacing 700 tons of activated carbon per year and transporting over 8 million square feet of waste sludge to area landfills.

Even this investment, however, will not achieve the TMDL's stormwater allocation, which calls for effluent concentrations that existing technologies have not been demonstrated to meet in the treatment of stormwater. Whatever PCBs exist in stormwater in excess of the design-storm volume will continue to enter the Bay unabated – a fact the TMDL does not acknowledge.

2. Dredging and capping; remediation of industrial sites.

The TMDL's discussion of dredging and capping costs similarly is deficient. If such costs should not be ascribed to the TMDL, as the documentation seems to suggest, RWQCB needs to explain why the TMDL contains these implementation measures, and how the TMDL's PCB goals, which are much more stringent than typical PCB cleanup levels, will have no influence on PCB cleanups.

The TMDL suggests that its PCB goals are not applicable to PCB cleanups. RWQCB should make this point very clear and explicit. Under the ARARs cleanup programs established under federal and California law, the responsible agency can look to nonapplicable standards that may be "relevant and appropriate," or to standards or objectives that fall in the category of "to be considered." Absent very clear language from RWQCB, the PCB goals of the TMDL could be misinterpreted to be legally enforceable cleanup goals regardless of their status in RWQCB's regulatory regime. These concerns are particularly important give that portions of Bay, including Hunter's Point, have been designated as Superfund sites. RWQCB either must revise the TMDL to remove the focus on contaminated sediments and thereby create a clear separation between sediment cleanups and the TMDL, or properly analyze the costs and impacts of dredging and capping.

The only cost contained in the TMDL for dredging is an estimate of the "tipping fees" for disposing of dredged spoils at a landfill ($10 to $100 per cubic yard). Tipping fees are only a single component of the myriad costs of a remedial dredging project. Overall unit costs are more accurately estimated to be in the range of $111 to $1014 per cubic yard.

The TMDL documentation does not address how much dredging will be required. Since the TMDL classifies all sediments with over 10 ppb PCBs as contaminated, dredging of all such sediments is one scenario, although the scale and cost of this scenario plainly is not feasible. Even accelerated dredging at the particular sites identified by RWQCB would involve extraordinary activity and staggering cost.

In light of ongoing natural recovery (which the TMDL discounts without basis) it makes little sense to focus efforts on remediation of sediments where cleanups will take years, if not decades, of study and implementation to effect. An accelerated dredging program is not feasible, as dredging only the particular sites identified in the TMDL could result in one of the largest remedial dredging programs ever undertaken in the United States, requiring a massive commitment of equipment and manpower dredging six days a week for 14 years to complete. By the time such a massive, and probably infeasible, dredging program is completed, PCB levels in the target sites would have declined significantly, due to ongoing natural recovery. This rapid natural recovery undermines any perceived imperative for dredging, and avoids the adverse environmental consequences inherent in dredging.

The TMDL identifies as an implementation measure the remediation of on-land PCB-contaminated soils. But the TMDL omits any discussion regarding the costs of this measure; it does not even contain an inventory of industrial sites along the Bay margin where the TMDL might require such remediation. The costs of remediating on-land sites could be considerable; RWQCB must identify the sites it is targeting for such remediation and quantify the costs.

RWQCB has failed to properly assess the true cost to implement the proposed TMDL. The secondary economic consequences of the TMDL, such as the impacts on jobs, housing and competitiveness, have not been considered at all. RWQCB must undertake an economic analysis that begins with a definition of the actions that will be necessary under the TMDL, who will be responsible for such actions, and what those actions realistically will cost.

D. The Adverse Environmental Consequences Of The TMDL Are Significant.

The plan to reduce PCBs will be disruptive from an environmental standpoint. Not only will the TMDL's implementation measures result in significant adverse impact, its new classification scheme whereby all sediment with over 10 ppb PCBs is classified as contaminated could complicate and potentially frustrate habitat restoration and beneficial reuse opportunities for dredged sediments. Since loss of habitat is a significant environmental threat to the Bay, any impediment to restoration such as the proposed TMDL must be tailored carefully to avoid negatively impacting restoration projects.

The TMDL's classification scheme also could complicate and impede levee reinforcement and maintenance, with life safety, property and economic implications. Private and public economic activity, development and redevelopment may encounter Bay sediments classified as contaminated under the TMDL's scheme, potentially delaying and/or reducing such activity, with potential economic and environmental costs.

The direct impacts of the TMDL's implementation measures also are apparent. The energy needs to construct and operate stormwater treatment plants and to dredge and cap sediments are sizeable, and will produce greenhouse gases, and air pollution, including emissions for which the Bay area is in non-attainment. In addition, dredging the Bay will destroy healthy benthic communities, which typically require four years to re-colonize the impacted area. The habitat modification and turbidity caused by the dredging may impact sensitive species, including juvenile fish. Land uses would be impacted, as stormwater treatment and staging areas for dredging will occupy significant land, and the designation of dredged material as "waste" will impede the beneficial re-use of that material in habitat restoration and redevelopment projects.

E. Prudent Alternatives To The TMDL Exist, And Must Be Considered By RWQCB.

Feasible alternatives to the TMDL have not been considered by RWQCB. The TMDL cannot dismiss natural recovery by equating it with the No Project alternative. When natural recovery is monitored, it represents a viable alternative, typically combined with institutional controls. A realistic assessment of natural recovery in the Bay shows that half of the PCBs are dissipating every six to twelve years. This robust level of recovery is promoted by tidal flushing, which has not been modeled properly in the TMDL.

To satisfy its obligation to consider feasible alternatives, RWQCB must direct that the assessment of natural recovery be corrected and that monitored natural recovery with institutional controls be assessed properly as a stand-alone alternative to the proposed TMDL.

Other feasible alternatives exist. U.S. EPA sponsored a recently released report on TMDLs which describes two alternatives that RWQCB must analyze. The first approach is to require equal-percent reductions across all sources – an approach that has been used in other TMDLs. The equal-reduction approach stands in contrast to the proposed TMDL, which arbitrarily requires each county to meet vastly different stormwater concentrations, and purports to require no reduction of PCBs from POTWs (although this assertion does not seem correct). As an alternative to treating stormwater and wastewater differently, and placing disproportionate burdens on different counties, RWQCB must examine an equal-percent reduction approach, as identified in the EPA-sponsored TMDL report.

The other alternative recommended in the EPA-sponsored report is an allocation that meets the TMDL at the lowest possible cost. This alternative is consistent with the balancing RWQCB must undertake, and the legal requirements to consider the cost of complying with the TMDL. This approach, too, has been used in other TMDLs, and must be evaluated by RWQCB.

Another alternative that RWQCB should evaluate is a TMDL designed to protect against real risk from bioaccumulation as opposed to theoretical effects in a hypothesized but unobserved population. This alternative is consistent with the narrative standard for bioaccumulation, which protects against increasing concentrations of toxic substances that are "detrimental" – rather than theoretical risks from PCB concentrations that are declining.

III. THE TMDL'S TECHNICAL PROBLEMS ARE SIGNIFICANT AND LEAVE RWQCB WITHOUT THE PROPER TECHNICAL CONDITIONS TO ADOPT THE TMDL.

The TMDL materially understates the Loading Capacity of the Bay, and does not provide reasonable estimates of the key sources of PCBs to the Bay. The Loading Capacity incorrectly assesses natural recovery; the fish-tissue target, which drives the TMDL's calculation of Loading Capacity, is too low due to an exaggerated assessment of risk. Current loading estimates for stormwater, the Central Valley, POTWs, and the atmosphere are indefinite and in error for a variety of reasons. Similarly, the load reductions proposed in the TMDL are problematic and either unattainable or unnecessary. These problems leave RWQCB without the proper technical conditions necessary to support adoption of the TMDL as proposed.

A. Natural Recovery In The Bay Is Occurring At A Robust Rate, Promoting The Bay's Ability To Assimilate PCBs, A Linkage The TMDL Misses.

We pointed out the importance of natural recovery in our February 2004 comments, and indicated that RWQCB could not achieve a realistic assessment of natural recovery unless it accounted for the ebb and flow of the tides in the Bay which promote the removal of PCBs from the system. While a tidal component has been added to the model, the model remains inaccurate, in large part because it artificially limits the outflow of PCBs in the Bay, trapping them in the Bay when in reality they flow out under the Golden Gate Bridge. This artifact of the model prevents a reliable characterization of the Bay's ability to recover from and assimilate PCBs.

The TMDL used a scaling factor in the one-box model to account for a drop in PCB concentrations near the seaward boundary of the Bay. But the drop is explained fully by dilution with ocean water, and mixing processes, and is related to transport of PCBs from the Bay on the outgoing tide. Introducing the scaling factor interfered with the model's conservation of mass equations, and misspecified the boundary between the Bay and the ocean. The results are model calculations that retain PCBs in the Bay that actually exit the Bay in the outgoing tide, and false conclusions about natural recovery and assimilation because of a basic failure to conserve mass. Correcting this single error shows that the Loading Capacity of the Bay is at least 2.5 times greater than assumed in the TMDL.

The TMDL continues to rely on the inaccurate application of the one-box model instead of using available empirical information and data that unequivocally demonstrate natural recovery. Available data for mussels, the water column, and sediment uniformly show that PCB concentrations are declining, such that PCB levels are cut in half every six to twelve years. Fish-tissue data has shown a decreasing, long-term trend since the 1950s, although more recent data are insufficient to support a short-term trend analysis. There is no evidence that the rate of recovery is slowing; the natural, ongoing processes at work in the Bay may result in sediments in the Bay reaching an ambient PCB level of five ppb (half the current estimated level) in six to twelve years.

B. The TMDL For Stormwater Is Based On Speculative Loading Values, Assumes Without Basis That The Bay Cannot Assimilate PCBs In Stormwater, Allocates The Load On An Arbitrary Basis, And Is Unachievable With Any Known Technology.

The TMDL's estimate of current PCBs in stormwater is based on an uncalibrated model, the predictive ability of which has not been established, making the proposed use of the estimate suspect. PCB concentrations in storm sewer sediments vary throughout the region, and the majority of the PCB stormwater load enters the Bay during storm events. For example, the average PCB concentrations in sewer sediment samples collected from Alameda and San Mateo Counties are 156 and 1,042 ppb, respectively, reflecting significant variation across the region. Yet, the TMDL relied on an uncalibrated model of rainfall and subsequent stormwater runoff that held PCB concentrations for each land use invariant across the region, and ignored the temporal peaking that is inherent in stormwater loads. The TMDL documentation ignored both the spatial and temporal variability of PCB loads, and did not calibrate the model, which would have enabled the agency to evaluate the influence of the TMDL's assumptions. In the absence of a calibration, and given the assumptions which are not consistent with known conditions, the TMDL's calculations of current stormwater loads are speculative, and not technically defensible.

The TMDL states that PCB levels on sediments in stormwater must be reduced to one ppb in order to achieve the sediment goal and the fish target. This approach assumes that the Bay has no capacity to assimilate PCBs in stormwater as it requires PCBs entering the system in stormwater pipes to be at the same concentration (one ppb) as the sediment goal (one ppb), and is akin to setting a numeric effluent limit for urban runoff of one ppb sediment PCBs. The TMDL documentation offers no study of assimilative capacity to support its implicit conclusion that the Bay cannot assimilate PCBs in stormwater. The TMDL's own analysis inadvertently demonstrates that the Bay can assimilate PCBs in stormwater.

The TMDL proposes to spread the stormwater Waste Load Allocation of two kg/yr among the nine counties which drain to the Bay. Using the TMDL's own information, it can be estimated from these county-by-county allocations what sediment concentrations correspond to each. These concentrations are presented in the QEA report submitted herewith, and are reproduced below:

County	Estimated Current Load (kg/yr)	Load Allocation (kg/yr)	Required % Reduction	Resulting PCB Water Column Concentration (ppq)	Particulate PCB Concentration (ppb)
Alameda	8.86	0.5	94	2,370	19
Contra Costa	6.55	0.3	95	3,250	27
Marin	4.07	0.1	98	890	7
Napa	2.08	0.05	98	640	2
San Francisco	1.08	0.2	81	8,050	79
San Mateo	4.91	0.2	96	1,800	17
Santa Clara	8.94	0.5	94	2,270	18
Solano	1.97	0.1	95	1,530	4
Sonoma	1.55	0.05	97	870	2

As can be seen in the last column above, the proposed TMDL does not require PCBs in stormwater sediment to be reduced to one ppb. In fact, PCBs in stormwater sediment range from a low of two ppb (Napa and Sonoma Counties) to a high of 79 ppb (San Francisco County), with an average of about eleven ppb. The inconsistency between the stormwater allocations and the TMDL's goals relates to an order-of-magnitude error in the translation of the sediment goal of one ppb into these allocations. If corrected, the proposed allocations and the associated concentrations would be reduced by a factor of ten (e.g., the corrected Waste Load Allocation is 0.2 kg/yr). But, by concluding that the fish-tissue target can be met with a two kg/yr load from stormwater and eleven ppb PCB levels in stormwater sediments, the TMDL actually has demonstrated that stormwater need not have sediment PCB levels at one ppb. In other words, the Bay does assimilate PCBs in stormwater at concentrations in excess of the TMDL's goals. Thus, the TMDL documentation erred in implicitly assuming that the Bay has no such assimilative capacity. QEA's independent analysis of assimilative capacity and natural recovery also demonstrates the Bay's ability to achieve recovery with sediment PCBs entering the Bay at concentrations in excess of one ppb.

The county-by-county allocations in the above table are arbitrary, incorrect and unachievable with any known large-scale stormwater treatment technology. The current PCB stormwater loads (column two) were based on an assumed association between land use and PCB levels. In allocating that load among the various Bay-area counties (column three), however, the TMDL departed from this association, and, instead, distributed the assigned load on the basis of county population. This approach was inconsistent with the land-use based approach through which the current loads were calculated, and also arbitrary in that the TMDL documentation provides no rational for why population centers should receive a greater PCB allocation than less populated areas. Thus, while Napa and Solano Counties have estimated current loads that are very similar (about two kg/yr), Napa's allocation is only half as much as Solano's because Napa has a smaller population. San Francisco County can maintain PCB loads at 19 percent of current estimates, while less populated Marin and Napa Counties must achieve future loads that are a mere two percent of current estimates. These results are arbitrary and are not technically defensible, and also place burdens onto the counties disproportionately without plausible basis.

The TMDL's approach results in nondefensible allocations, where some counties will be required to achieve stormwater concentrations that are much lower than concentrations from other counties. The TMDL documentation offers no explanation as to why urban runoff from Napa County must be reduced to PCB levels of 640 ppq, whereas San Francisco County will be allowed discharges at levels more than ten times greater, at 8,050 ppq.

Whether RWQCB persists with the proposed allocation of two kg/yr, or corrects the TMDL documentation's error and adjusts the allocation to 0.2 kg/yr, the allocation is unachievable. While the TMDL documentation makes the good point that Best Management Practices should be used to reduce sediment, and thus PCBs, in stormwater, Best Management Practices do not clean stormwater to the ppq levels in the above table. In fact, not even the best available technology is known to achieve these levels in stormwater. The best systems will produce PCB levels below 1,000,000 ppq, and maybe even below 65,000 ppq, but no one has demonstrated their ability to reach 8,050 ppq, or 640 ppq. With a corrected math error, the proposed TMDL allows only up to 805 ppq in stormwater – below any demonstrated technology for large-scale stormwater treatment.

Further, the TMDL fails to adequately consider PCBs in nonurban stormwater that is not gathered in the region's public storm drain systems subject to the Clean Water Act's NPDES program. The TMDL estimates that the current PCB load from nonurban stormwater is only 0.1 kg/yr; the TMDL does not contain any measures to reduce PCBs from this largely uncontrollable source. More recent studies place the current load from this source in the range of two to eleven kg/year, potentially greater than the entire Loading Capacity of the Bay calculated by the TMDL, and raising questions about attainment. RWQCB needs to better characterize this source before it can demonstrate with confidence that implementation of the proposed TMDL will achieve water quality standards, as RWQCB has interpreted them.

C. The Current Load Estimated For The Central Valley Is Neither Supported Nor Reliable; There Is No Reasonable Basis To Expect A Precipitous Reduction In That Load.

The TMDL did not use the available data correctly when it calculated the existing load of PCBs entering the Bay from the Central Valley. Both the flow data and the PCB concentration data have problems that render the TMDL's estimate of current loading from the Central Valley unreliable and unsupported. The rate of freshwater flow that the TMDL assumed (212,000 cubic feet per second) was too high by a factor of seven to ten. Actual river flow entering the Bay from the Central Valley is in the range of 22,000 to 30,000 cubic feet per second. Using the higher, incorrect value caused the TMDL to ascribe certain measured PCB concentrations to much more freshwater flow than it should have. We believe the problem arose from using flow information from an area affected by the ebb and flow of the tides, and from not isolating the net flow from the Central Valley towards the Bay from the influence of the tides.

The PCB concentration data relied upon by the TMDL also was incorrect as these data were collected with a bias towards the summer dry season, when it is anticipated that the higher PCB loads would be associated with the rainy season. In addition, the data were taken at a point where Bay water and river water were mixed together; thus, the data cannot be assumed to be representative of the freshwater influence of the Central Valley rivers. The combined flow and concentration errors yield an unreliable, unsupported estimate of the PCB load entering the Bay from the Central Valley.

Nor has the TMDL established the case for a dramatic reduction in Central Valley PCBs, which RWQCB predicts will drop from 42 kg/yr to 5 kg/yr without any implementation measures. Not only is the current loading value of 42 kg/yr unreliable, the TMDL did not include an independent evaluation of PCB sources in the Central Valley, an area outside its jurisdiction, to examine the potential for load reduction. The Central Valley RWQCB, however, has investigated the rate of PCB declines in that region, concluding that the rate of decline is unclear and cannot be predicted:

> "[I]n the Central Valley, PCB . . . concentrations appeared to be declining at some sites but did not show apparent trends in others sites. . . . The available data cannot be used to predict future rates of decline since the temporal and spatial variation observed in this study is relatively high, and the number of individual sampling years (and sample size within years) is relatively low. . . . [T]race organic contaminant concentrations [including PCBs] in Central Valley fish may remain relatively stable for the foreseeable future."

B.K. Greenfield, E. Wittner, N. David, S. Shonkoff, and J.A. Davis, Monitoring trace organic contamination in Central Valley fish: current data and future steps, Report to the Central Valley Regional Water Quality Control Board, SFEI Contribution #99 at page 16-18 (available at http://www.sfei.org/rmp/reports/delta_organics/ delta_organics_report.pdf)(2004). RWQCB's own peer reviewer commented: "I do have some question as to whether the anticipated natural attenuation within the Central Valley watershed . . . is realistic. . . ." Staff Report at C-13.

Despite the contrary conclusions of the Central Valley RWQCB's study of PCB sources and potential attenuation in that region, and without its own independent evaluation, the TMDL concludes that Central Valley PCBs will diminish dramatically to achieve the Load Allocation. This conclusion is not technically defensible, especially in light of the errors the TMDL has made in assessing PCB inputs from the upstream Central Valley.

D. Absent New Treatment At Secondary Plants, PCB Discharges From POTWs Will Frustrate Attainment Of The TMDL; The TMDL Arbitrarily Favors Wastewater Over Stormwater.

The effluent PCB levels from Bay-area POTWs vary significantly, even when comparing effluent data from POTWs that use comparable wastewater treatment technology. For example, both the East Bay Municipal Utility District ("EBMUD") POTW and the Central Costa County Sanitary District ("CCCSD") POTW are secondary treatment plants, yet the TMDL reports effluent PCB levels for these plants of 5,700-7,900 ppq and 1,100-1,400 ppq, respectively. Notwithstanding this documented five-fold difference, the TMDL assumed that the effluent concentrations from these two plants, and all other area plants with secondary treatment, were the same.

The total POTW load estimated using the uniform-concentration approach was 2.3 kg/yr, which value supposedly accounted for future growth and anticipated increases in wastewater flows. Had the TMDL used the available site-specific data, and assumed future PCB loads grow proportionately to future increases in wastewater flow (the standard and most reasonable assumption), the overall POTW load would have been 3.1 kg/yr. The 0.8 kg/yr incremental difference between these two values represents eight percent of the Bay's Loading Capacity as calculated by the TMDL documentation.

The TMDL reduced its already-low estimate of 2.3 kg/year of PCBs in POTW effluent by 15 percent to a value of two kg/year. The TMDL documentation explained this reduction as a rounding adjustment. The effect of it, however, is to leave the POTWs with an allocation set at an artificially depressed estimate of current loading. Since the TMDL does not include implementation measures to reduce PCBs in POTW effluent, future discharges will be on the order of 3.1 kg/yr, which will cause the TMDL of 10 kg/yr to be exceeded by 1.1 kg/yr from this source alone, another indication that the TMDL will not be attained. Achieving the POTW Waste Load Allocation of two kg/yr would require a 35 percent reduction in PCBs from POTWs – a reduction that likely could be achieved only through additional treatment at the secondary treatment plants, which is not required by the TMDL.

The TMDL does not explain its disproportionate treatment between wastewater and stormwater. For example, the EBMUD POTW currently discharges sediments with an average PCB concentration of 340 ppb. This value is more than four times greater than the highest PCB concentration allowed on stormwater sediments (79 ppb for San Francisco County; see above table). The TMDL does not explain why PCBs on stormwater sediments must be reduced to the 2-79 ppb range (0.2 to 7.9 ppb if RWQCB corrects the TMDL's math error) while POTW sediments can contain much higher levels, yet warrant no reduction.

The TMDL proposes to allow EBMUD and other POTWs to discharge at concentrations of up to 500,000 ppq, as the TMDL proposes a numeric effluent limit ("NEL") of that value for the POTWs. In comparison, PCBs in county stormwater must be at or below 8,050 ppq (or 805 ppq if RWQCB corrects the TMDL's math error). This disproportionate treatment of these two sources is not explained and appears arbitrary. PCBs in stormwater are not understood to pose any greater threat than PCBs in wastewater effluent, suggesting that similar NEL values should be acceptable.

Moreover, the TMDL does not account for the local effects of discharges by POTWs. For example, the EBMUD plant discharges between 17 to 73 percent of the regional PCB load within the vicinity of its discharge. Because the plant accounts for such a large percentage of the regional PCB load, it is unreasonable to assume that reductions in stormwater loads alone would be beneficial without EBMUD load reductions.

E. The TMDL's Estimate Of Atmospheric Deposition Of PCBs Is Not Believable And Does Not Include PCBs In Rainfall, Which Are Known To Be Material.

The TMDL assumes that more PCBs leave the Bay by volatilizing into the atmosphere than enter the Bay through atmospheric input. But this assumption is based on an estimate that only 0.35 kg/year of PCBs enter the Bay through the atmosphere which, according to RWQCB's own peer reviewer, is "simply not believable." Staff Report at C-11. In contrast, up to 90 percent of the PCB load to Lake Superior is through the atmosphere, and atmospheric inputs into Lakes Ontario, Erie and Michigan are 64, 257, and 3,200 kg/yr, respectively. Given that the Bay is bordered by a largely urbanized area, with industrial centers in the cities of San Francisco, Oakland, and San Jose, and in light of atmospheric loads to other water bodies, the TMDL's loading estimate is suspect.

The 0.35 kg/yr value is not based on site-specific data, which are essential to obtaining accurate loading estimates of atmospheric deposition. The report containing the 0.35 kg/yr value acknowledges that, "[o]btaining comprehensive measurements of site-specific parameters is critical to the accurate estimate of the magnitude as well as direction of the fluxes for . . . PCBs over the Estuary." Critical site-specific data regarding PCB concentrations in the air and wind speed were not used to calculate the 0.35 kg/year value. Measurements of PCB concentrations in air were taken at only one monitoring station, despite the size of the region, and its various microclimates.

The 0.35 kg/yr value is based only on dry deposition of PCBs from the atmosphere. But PCBs are known to enter water bodies in rainfall as well. While the TMDL made no attempt to quantify this source of PCBs, scientific literature indicates that PCB loads in rainfall can be as large as, or greater than, PCB loads during dry periods. PCBs are present in rainfall at meaningful levels (80-520 ppq), in comparison with the TMDL's goal of achieving 19-49 ppq in the Bay. Because the TMDL ignored this source, the amount of PCBs entering the Bay in rainfall remains indefinite. Since available information indicates this source likely is significant, this source must be quantified as part of a proper demonstration that the TMDL, as proposed, could achieve the target water column concentrations and Loading Capacity.

Because the TMDL omitted the load from PCBs in rainfall, did not use site-specific data, and has not convinced its peer reviewer that the loading estimate is plausible, and in light of much larger PCB fluxes to other water bodies from the atmosphere, the true rate of atmospheric deposition to the Bay is unknown, and very likely is larger than the TMDL assumes.

F. PCBs Are Not Causing Violations Of Ecological Standards In The Bay.

Federal Clean Water Act ("CWA") Section 303(d) listing proceedings for the Bay, information on benthic ecology and aquatic life in the Bay, and wildlife screening values all indicate a healthy Bay ecosystem. As the TMDL documentation acknowledges, "current conditions" in the Bay "are protective of aquatic life from chronic toxicity." Since aquatic toxicity could occur only at levels higher than chronic thresholds, aquatic life in the Bay is not at risk from PCBs. Therefore, a TMDL is not necessary to protect aquatic life and the TMDL will not produce benefits to aquatic life.

1. The Bay is not impaired for EST, RARE and WILD.

The TMDL documentation states that the PCBs in the Bay are impairing estuarine and wildlife habitat (the "EST" and "WILD" beneficial uses), and also the preservation of rare and endangered species (the "RARE" beneficial use). The TMDL documentation, however, lacks a presentation of any information that establishes how current levels of PCBs are harming such habitats or species. The only information provided in the Staff Report relating to potential ecological effects is the statement, "evidence that wildlife may be affected by PCBs exists as bird egg PCBs concentrations that have been measured at levels near the effects threshold." This statement does not indicate that bird egg concentrations are greater than a relevant and appropriate effects threshold and, therefore, does not support the contention that birds or any other ecological receptors are being impacted negatively by PCBs.

RWQCB previously has not identified PCBs as impairing the Bay for the EST, RARE and WILD beneficial uses. The TMDL provides no grounds upon which, for the first time, to find the Bay impaired for EST, RARE and WILD. If the Bay were impaired for EST, RARE and WILD, such impairment would have been identified during the semiannual process of updating the CWA Section 303(d) list of impaired waters, which requires RWQCBs to assemble and evaluate all existing and readily available water quality-related data and information to develop the list and to provide documentation for listing or not listing a particular region's waters as impaired. SWRCB, Water Quality Control Policy For Developing California's Clean Water Act Section 303(d) List (2004). Neither the proposed 2006 CWA Section 303(d) list, nor the 2002 and 2004 lists, however, includes such impairment designations.

As neither the current nor prior 303(d) lists include listings for San Francisco Bay for RARE, EST, or WILD designated uses, and as the proposed TMDL does not provide data or analysis consistent with the listing policy, the ecological impairments claimed as a basis for the TMDL are unsupported.

2. Current levels of PCBs in the Bay are not harming aquatic life or the benthic ecosystem.

The proposed TMDL does not make independent findings that the Bay's ecology is being injured by PCBs, nor would such claims be supportable. The TMDL itself recognizes that PCB concentrations in Bay waters generally are below the CTR standard for aquatic life (i.e., 30,000 ppq). The TMDL refers to a U.S. EPA screening level for the protection of wildlife of 160 ppb; average PCB concentrations in Bay sediments are well below this threshold, as are the vast majority of surficial sediments in the Bay.

Concentrations of PCBs in sediment in the Bay are well below thresholds used by U.S. EPA as potential measures of harm. The risk-based sediment concentrations protective of ecological receptors developed for specific locations in San Francisco Bay under U.S. EPA oversight range from 97-24,000 ppb – well above ambient PCB concentrations in the Bay, and two to five orders of magnitude higher than the TMDL's sediment goal of one ppb. The fact that ambient Bay sediments do not exceed these values suggests that U.S. EPA would not find general harm to ecological receptors in the Bay from PCBs.

Concentrations of PCBs in fish tissue are below thresholds U.S. EPA has determined are protective of fish. Since 2000, all tissues from fish collected from the Bay have had PCB concentrations below 760 ppb – the concentration U.S. EPA set to protect the most sensitive fish species. Based on this conservative threshold, it is apparent that current concentrations of PCBs in fish tissues are not causing detrimental effects to fish in the Bay.

Localized pockets of degraded benthic communities have not been linked to PCBs. For example, the benthic community in San Leandro Bay, one of the contaminated sediment locations identified in the Staff Report, is generally healthy and is not considered injured from PCBs. Healthy benthic communities, or ones not harmed by PCBs, are located at other sites listed in the Staff Report.

G. PCBs In Bay Fish Are Not Placing Any Angler Population At Significant Risk.

PCBs in the Bay pose no material risk to the general population. The TMDL is targeted at a hypothetical, small group of anglers that probably does not exist: anglers who (i) eat an average of eight ounces a week; (ii) of raw white croaker and shiner surfperch; (iii) caught in the Bay; (iv) every week for 70 years. Even if the TMDL's assumption that anglers who catch and eat fish in one four-week period will continue to do so for 70 years is correct, the TMDL would at most protect a population of 6,250 to 8,000 persons from a one in 100,000 cancer risk (which is roughly comparable to the one in 280,000 risk of being struck by lightning). But since it is very unlikely that any anglers are so consistent in their consumption of Bay-caught fish, the TMDL likely protects zero anglers from such a risk.

The assumed fish consumption pattern is an unfounded extrapolation of an angler survey conducted by the San Francisco Estuary Institute ("SFEI"). Of 1,331 anglers, interviewed by SFEI, only 537 reported eating fish from the Bay in the prior four-week period. A small group (53 anglers) reported eating at least an average of eight ounces of fish from the Bay for each week in the prior four-week period. The TMDL applies these eating habits, based on the four-week period preceding the interview, to all 910 four-week periods over seventy years. But doing so is inconsistent with the SFEI survey results themselves, as such anglers were not identified. Had they existed, this kind of year-long angler intercept survey very likely would have identified them.

In fact, very few consumers eat fish from the Bay every month for even a single year. Because the SFEI study reports the probability of a consumer of Bay fish eating Bay fish in a four-week period was approximately 50 percent, it follows from basic probability concepts that the probability of a person eating Bay fish in each of the 13 four-week periods in a year would be 0.5^{13} (or less than 1 in 8000) if each period were independent. While each period may not be entirely independent, it is clear that very few, if any, consumers of Bay fish would fall into the extreme, every-month-for-70-years scenario assumed in the TMDL.

The eight-ounce rate, is the 95^{th} percentile consumption rate over only a four-week period. This short-term rate is an overstatement of the true long-term rate. Even if it were applicable to the long term, any 95^{th} percentile is not representative of the population of consumers of Bay fish, but represents an extreme scenario. The San Francisco angler population is estimated to be about 125,000, out of nearly 6.5 million Bay Area residents. Assuming that five percent of the Bay angler population eats at least eight ounces per week of Bay-caught fish, the resultant population is only 6,250 out of 6.5 million. Protecting these persons from excess cancer at a risk level of one in 100,000, as the TMDL proposes to do, will not prevent a single cancer. From a public health perspective, the TMDL provides little, if any, cancer-prevention benefit.

The TMDL documentation adds to its unrealistic assumptions by using white croaker and shiner surfperch as the measure of whether the 10 ppb PCB fish-tissue target is being attained. The SFEI consumption rates, however, were calculated over all species, not just croaker and shiner surfperch. The SFEI data show that only 28 percent of the consumer population is even willing to eat white croaker, and only 7.5 percent of consumers of Bay fish actually ate white croaker in the four-week period prior to their interview. For shiner surfperch, the figure was only 1.7 percent.

The TMDL documentation does not account for the PCBs that are lost when fish are cooked, which reduces PCBs in fish on the order of 40 percent. The SFEI survey results show that eating raw fish is very rare among Bay-area anglers. Fully 99 percent of white croaker consumers never ate raw white croaker. It is unrealistic for the TMDL to assume that consumers are eating large amounts of uncooked fish.

Meeting the TMDL would not reduce the amount of potential risk accepted for consumers of commercial fish in the Bay Area. The FDA enforces a Tolerance Level for PCBs of 2,000 ppb in commercially sold fish. The TMDL fish-tissue target is 200 times lower than the FDA Tolerance Level. More of the SFEI survey respondents (53 percent) reported eating fish from a store or restaurant in the preceding four weeks than reported consuming fish from the Bay (40 percent). Even if the hypothetical population of the TMDL exists, after implementation of the TMDL (assuming it could be achieved), the risk level would be unchanged within the general population, who could continue to eat fish from stores and restaurants containing up to 200 times as much PCBs as fish caught from the Bay.

H. The OEHHA Fish Advisory Does Not Mean That Toxic Levels Of PCBs Are Present In Bay Fish.

As discussed in our 2004 comment letter, RWQCB cannot rely upon the 1994 OEHHA advisory as a basis to claim that the TMDL will provide benefits. The advisory was issued in 1994, according to OEHHA, to "be prudent." It was a precautionary advisory, not based on the establishment of a safe/unsafe threshold but, rather, advising the public as to conservative practices that might be adopted to avoid any risk altogether. OEHHA never has claimed that failure to adopt the recommended practices will expose people to unacceptable risk. In fact, the primary finding made by OEHHA when it issued the advisory was that a "health evaluation and risk assessment" should be conducted in light of the data upon which the advisory was issued. Because no formal risk assessment has been conducted, the conditions and data on which the advisory was based have materially changed, and the advisory was not completed in accordance with current standards of the California Water Code, or then-applicable standards of the Fish & Game Code, the advisory provides no basis upon which RWQCB may conclude rationally that fish PCB levels must be reduced significantly to protect people.

I. Dr. Carpenter's Opinions Regarding The Health Effects Of PCBs Are Not Credible.

Dr. David Carpenter served as one of the peer reviewers for the TMDL. A court recently has held that Dr. Carpenter's opinions regarding PCBs "are not sufficiently reliable and therefore inadmissible . . . ." Allgood v. General Motors Corp., 2006 WL 2669337, at *27 (S.D. Ind. Sept.

18, 2006). In the Allgood case, the court found that, "Dr. Carpenter failed to use reliable methodology" and that his "methodological flaw . . . cannot be overlooked by the court." Id. at *28-29. The Allgood court explained that, under Dr. Carpenter's "approach, one would expect half the world's population of approximately six billion people (everyone with [blood serum] levels above the median) to be entitled to a special medical monitoring program, at least if they could identify the sources of their exposure to PCBs." Id. at *28.

Dr. Carpenter has testified under oath that, on the basis of faith, he assumes that PCBs can be harmful down to any level, no matter how miniscule. He admitted that he makes this assumption without scientific fact to support it, as shown in the following excerpt from his deposition:

> "A. I can't give you any scientific evidence on [sic] factual basis that there are diseases that result from very low concentrations of PCBs. . . . I'm making the assumption these effects [of PCBs] on biological molecules are ultimately the effect of the basis for the human disease.
>
> "Q. That's the faith part?
>
> "A. That's the faith part."

Long v. Monsanto Abernathy, Calhoun County Alabama Circuit Court (Case No. CV 97-767), Deposition of David O. Carpenter, M.D., held on 12/16/1998.

Further, Dr. Carpenter ascribes a whole host of ailments (including memory loss, heart disease, and high blood pressure) to PCB exposure, without scientific basis. Dr. Carpenter even testified under oath that a man's 1978 knee surgery was required because of PCB exposure. Clopton v. Pharmacia Corporation, Federal District Court, N. Dist. of Alabama (Case No. 2:30-CV-3369-UWC), Deposition of David O. Carpenter, M.D. at 56, held on January 31, 2007. As a result of motion practice on the reliability of Dr. Carpenter's opinions, Dr. Carpenter did not testify in Clopton as to the health effects of PCBs in specific individuals.

Given both Dr. Carpenter's unscientific, faith-based opinions about PCBs and his demonstrably flawed methodology, RWQCB lacks a rational basis to rely upon Dr. Carpenter – either as to the health effects of PCBs or to whether the TMDL should be set even lower.

J. The TMDL Ignores Overwhelming Evidence That PCBs Do Not Cause Cancer Or Non-Cancer Effects In People.

There is little (if any) evidence that current exposure to PCBs in the environment causes cancer or neurological effects in humans. The overwhelming scientific literature regarding the potential human health effects of PCBs does not establish a link between PCBs and cancer or any other illness in humans. The TMDL does not account for this publicly available information and concludes, against the weight of scientific evidence, that PCBs cause cancer in humans.

In 2001, a comprehensive review of available scientific literature regarding the human health effects of PCBs was submitted to U.S. EPA. That review included over 40 cancer studies, over 90 studies of non-cancer effects, and over 25 studies regarding neurodevelopmental effects.

The review authors reported no credible evidence that PCBs cause cancer or any other illness in humans. Since 2001, a number of scientists who previously reported an association between PCBs exposure and human health effects published new reports finding no such link.

Additionally, recent studies show that human cells are many times less sensitive to PCBs than rat and monkey cells – significant findings as the current approach to human risk assessment is based on extension of the results from animal studies to humans. The National Academy of Sciences has reviewed the results of some of these studies and concluded that, if the toxic effect of PCBs on human cells is significantly less than the effect on non-human cells, the toxic equivalency factor for PCBs should be revised accordingly. National Research Council, Health Risks from Dioxin and Related Compounds—Evaluation of the EPA Reassessment at 61 (2006).

The TMDL should be advised to take into account the current understanding of PCB toxicity, as reflected above and in the technical reports submitted herewith.

K. The TMDL's Fish Screening Goal For Dioxin-Like PCBs Improperly Relies On Highly Suspect United Nations' Toxicity Values.

The TMDL improperly based its fish screening value for the so-called dioxin-like PCBs on toxicity information from the United Nations World Health Organization ("WHO"). WHO created a scheme whereby it tried to establish a correspondence between the toxicity of dioxin, a known human carcinogen, and certain congeners of PCBs, which apparently bear structural similarities to dioxin. WHO generated Toxicity Equivalency Quotients ("TEQs"), which purported to reflect the toxicity of the PCB congeners as a fraction of dioxin's toxicity. The TMDL used WHO's original TEQs from 1994 to derive the proposed dioxin-like PCBs fish-tissue value of 0.14 parts per trillion.

The proposed TMDL does not reflect any critical evaluation of the WHO TEQ scheme; it adopts it wholesale. This is problematic for several reasons. WHO has updated its TEQ values twice since 1994, yet the TMDL uses the outdated 1994 values without any indication of awareness of the more recent values, or explanation as to why they were not used.

More fundamentally, WHO did not publish the values through any kind of a public process, nor did WHO subject the values to peer review before publication. It has been up to the scientific community to ascertain to what extent WHO's TEQ scheme has any value in predicting and characterizing PCB toxicity. Such value has not been established to date.

The equivalency between PCBs and dioxin which WHO hoped to establish is fraught with assumptions, the truth of which have not been established. For example, the National Toxicology Program ("NTP") of the United States Department of Health and Human Services recently evaluated the chronic toxicity and carcinogenicity of dioxin, "dioxin-like" compounds, structurally similar PCBs, and mixtures of these compounds, in order to address "the lack of data on the adequacy of the TEQ methodology for predicting relative potency for cancer risk." NTP, Technical Report on the Toxicology and Carcinogenesis Studies of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) (CAS No. 1746-01-6) in Female Harlan Sprague-Dawley Rats (Gavage Studies) (NTP TR 521), National Toxicology Program (2006). The stated purpose of NTP's evaluation indicates that the adequacy of the TEQ methodology to predict toxicity has not been established. The National Academy of Science review of U.S. EPA's draft Dioxin Reassessment, stated that "[i]t remains to be determined whether the current WHO TEFs, which were developed to assess the relative toxic potency of a mixture to which an organism is directly exposed by dietary intake, are appropriate for body burden toxic equivalent quotient (TEQ) determinations." National Research Council of the National Academies, Health Risks from Dioxin and Related Compounds: Evaluation of the EPA Reassessment of TCDD and Related Compounds (2006).

Notwithstanding these problems, the TMDL uses the TEQ values without any recognition that they have not been established as a valid or reliable means to characterize PCB toxicity. The WHO TEQs do not provide a technically defensible basis to establish a fish screening value for dioxin-like PCBs.

L. Remediation Of Contaminated Sediment Sites Will Not Accelerate Attainment Of The Fish-Tissue Target.

The presumed effectiveness of dredging sites with elevated PCB concentrations is predicated on the implicit belief that these sites are a major source of PCBs to the Bay. This assumption is not correct; remediation will yield minimal benefits because of the relatively small PCB mass contained in these sites. The TMDL documentation fails to demonstrate that the locations identified as "In-Bay Contaminated Sites" in Table 26 of the Staff Report are important sources of PCBs to the Bay. The maximum sediment PCB concentrations listed in the table are actually buried PCBs found well below the active sediment layer.

QEA used sediment PCB data to evaluate whether the identified PCB contaminated sites are a major external source of PCBs to the Bay, as the TMDL assumes, and concluded is that it is unlikely these sites contain sufficient PCB mass to limit the recovery of the Bay. For example, the bioavailable sediments in San Leandro Bay contain about 12 kg of PCBs, which amounts to merely 0.8 percent of the total 1,500 kg of PCBs in surficial sediments throughout the Bay . QEA concluded that the total PCB mass in San Leandro Bay sediments cannot keep the sediments of SFB contaminated or materially reduce the rate of ongoing natural recovery. Although insufficient data exist to make this type of quantitative assessment for other areas of the Bay, it is unlikely that similar analyses would show that any of the other PCB-contaminated sites are an important source of PCBs to the Bay.

Any attempt to clean up contaminated sediments in the Bay margin would be undermined by recontamination from the main Bay. The identified sediment sites are likely depositional areas that trap particulate matter that enters the Bay with each tidal cycle and storm event. Ambient PCB concentrations in suspended particles exceed the sediment target by as much as an order of magnitude or more. Such particles would settle on remediated areas, re-contaminating them. While the PCB-contaminated sites the TMDL has identified have insufficient PCB mass to keep the Bay contaminated, the Bay has sufficient PCB mass to re-contaminate any such site that is remediated.

The inclusion of remediation of PCB contaminated sites in the implementation plan is inappropriate because no analysis has been done to establish potential benefits of such remediation on PCB levels in water and in fish; remediating such sites will yield minimal benefits because of the relatively small PCB mass contained therein; and recontamination will undercut the goals of any such remediation.

M. Bay-Wide Monitoring Of PCBs At Parts Per Quadrillion Concentrations For TMDL Compliance Is Problematic.

High-volume water sampling and U.S. EPA Method 1668, Revision A, likely will be necessary to show TMDL compliance, as conventional methods cannot detect PCBs in the parts per quadrillion range. Since Method 1668 has not been approved by U.S. EPA, RWQCB independently must develop a program to ensure consistency and accuracy of sampling analyses, based on the use of standardized procedures and periodic assessment of laboratory performance. The TMDL presents no such program, and the reliability of Method 1668 has not been established.

Method 1668 suffers from various technical challenges associated with detecting chemical compounds in the low ppq range. Interlaboratory calibrations and comparisons have been elusive, as results of samples split between laboratories have not been reproducible on a consistent enough basis. Quality assurance and control is a challenge, as high volume water sampling introduces significant opportunity for introduction of ambient and background PCBs, or interferents, into the sample. Simply obtaining samples that are adequate for testing is a time-intensive process that requires either using specialized equipment or collecting and shipping large volumes of water to the testing facility. Even with careful collection of samples, Method 1668 is so sensitive to background contamination that it may not be able to determine consistently whether ambient conditions meet the TMDL's water-quality objectives.

Even if the TMDL could ensure consistency between the results of different laboratories and could avoid quality control issues, sampling to measure compliance with the TMDL will be expensive. The cost for collecting one sample and analyzing it with Method 1668 exceeds $1,000, and can approach $2,000, greatly exceeding typical costs to analyze a sample for total PCBs (about $50 to $100 per sample).

RWQCB is premising measuring attainment with the TMDL on the assumption that the large-scale use of unapproved Method 1668 can yield accurate, reproducible results – an assumption that the TMDL documentation does not support, and one that is highly suspect. The proper technical conditions are not present for the TMDL to rely on Method 1668 for TMDL attainment demonstrations.

N. The Analysis Of The TMDL's Environmental Impacts Does Not Describe The Project's Significant Environmental Impacts.

The TMDL's analysis of project impacts is technically flawed; the TMDL as proposed will have significant environmental impacts that cannot be mitigated.

Because the project is not well-defined, we made certain assumptions in the assessment of the environmental impacts, including with respect to proposed implementation measures for contaminated sediments. We assumed that dredging at the sites identified in the Staff Report would be limited to a depth of four feet, and that the volume of dredging of such sites would be up to 110 million cubic yards. Dredging even just these sites would be a massive dredging operation – comparable to or larger than the largest remedial dredging projects in the country. An operating and processing area necessary to support the dredging project would require many acres of near shore land, which even if it were available, would have its own environmental impacts. Disposing of the dredged material would exhaust the landfill capacity at many existing facilities, and could result in the need for new landfills, which would have its own environmental impacts. Even if the actual area of dredging were substantially less, the conclusions below would still apply (though for some of them – such as air quality – at a different magnitude).

The likely designation of the dredged materials as "waste" would likely render them unfit for beneficial reuse, which is an important part of the San Francisco Bay Long Term Management Strategy. Beneficial reuse opportunities the TMDL would impact include habitat restoration, levee maintenance, and redevelopment.

Dredging "contaminated sites" will result in emissions of criteria pollutants that exceed Bay Area Air Quality Management District significance thresholds – including nitrous oxides, particulate matter, and reactive organic gasses – and significant emissions of greenhouse gases. RWQCB has failed to consider these emissions.

Dredging will damage benthic communities. Once destroyed by dredging or damaged by capping, it can take up to four years for benthic ecosystems to re-colonize. The TMDL does not characterize the health of the benthic communities at the "contaminated sites," but some of them are known to be generally healthy, and localized pockets of degraded benthic communities have not been linked to PCBs.

Dredging "contaminated sites" will cause significant impacts to species. The TMDL did not consider potential impacts to the long list of protected species that live in the Bay. Habitat modification, increased turbidity, and re-suspension of contaminants into the water column could result in significant impacts to some of those species.

The recently proposed organochlorine TMDL for Newport Bay corroborates that a large dredging operation will cause significant environmental impacts. In that TMDL (which includes PCBs), the Santa Ana RWQCB concluded that implementing the TMDL, and dredging in particular, would cause significant impacts to biological resources, air quality, noise, traffic, and landfill capacity. The proposed TMDL for SFB will cause greater impacts than the organochlorine TMDL for Newport Bay since the sediment goal for SFB is lower than the one proposed for Newport Bay, and SFB is larger than Newport Bay. The TMDL must address the significant discrepancies between the proposed Newport Bay TMDL and the proposed TMDL for SFB, and explain why Santa Ana RWQCB recognizes significant impacts despite having a much higher PCB sediment goal.

Further impacts will be caused by the treatment of stormwater, which will entail, among other things, constructing massive storage basins, the size of which is estimated to be up to 28 square miles. RWQCB has not examined the land use, economic, and habit impacts of this aspect of the TMDL.

Due to the incomplete project description, it cannot be ascertained exactly when and where the impacts discussed above will occur, pointing to the need for a better-defined project.

IV. <u>THE TMDL MUST BE REVISED TO CONFORM WITH APPLICABLE LEGAL REQUIREMENTS</u>.

The proposed TMDL must meet various legal requirements of the Porter-Cologne Water Quality Control Act (the "PCA"), the federal Clean Water Act (the "CWA"), the California Environmental Quality Act ("CEQA"), the California Administrative Procedures Act, the California Health & Safety Code (pertaining to peer review), as well as the due process requirements of the federal and state constitutions. The TMDL does not satisfy a number of applicable legal requirements, as discussed below.

A. <u>The TMDL Is Defective As A Matter Of Law As It Cannot Feasibly Be Met</u>.

The PCA, the CWA, RWQCB's Basin Plan interpreting these statutes, and RWQCB's project objectives for the TMDL require RWQCB to adopt a reasonable TMDL that can be implemented feasibly, and accomplished. The proposed TMDL does not meet these standards.

1. <u>The law requires water quality standards, and plans to implement them, to be achievable</u>.

Attainability is a touchstone of the PCA, which incorporates a reasonableness standard specified by the California Legislature. Under the PCA, "activities and factors which may affect the quality of the waters of the state shall be regulated to attain the highest water quality which is reasonable, considering all demands being made and to be made on those waters and the total values involved, beneficial and detrimental, economic and social, tangible and intangible."

Water quality standards are established to provide "reasonable" protection of beneficial uses, and are set in light of "[w]ater quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality" in a particular area. Cal. Water Code § 13241. Economics, the housing needs of the region, and the need to develop and use recycled water each must be considered under PCA when setting water quality objectives. <u>Id.</u> The PCA allows "the quality of water to be changed to some degree without unreasonably affecting beneficial uses." <u>Id.</u> The Chief Counsel's Office of the SWRCB has recognized the importance of attainability in water quality control planning, stating that RWQCBs "should review any available information on receiving water and effluent quality to determine whether the proposed objective is currently being attained or can be attained." Memorandum from William R. Attwater, Chief Counsel, State Water Resources Control Board, to Regional Water Board Executive Officers at 4 (January 4, 1994)("1994 State Board Memo").

RWQCB's narrative standard for bioaccumulative toxic substances incorporates the PCA's requirements that water quality standards be reasonable and feasible: "[c]ontrollable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life" (the TMDL documentation omits the words "concentrations of" when quoting this standard), and "[e]ffects on aquatic organism, wildlife, and human health will be considered" in determining whether this narrative standard is met. Basin Plan at 3-1. "Controllable water quality factors" are defined as "those actions, conditions, or circumstances resulting from human activities that may influence the quality of the waters of the state and that may be reasonably controlled." Id.

Similarly, the CWA requires vigorous protection of water quality where attainable, requiring fishing to be designated as a use "wherever attainable." 33 U.S.C. § 1251(a)(2). States can remove a designated use if it is determined that such use is infeasible. 40 C.F.R. § 131.10(g). Relevant factors when assessing the feasibility of a use include economics, and "[h]uman caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place." Id.; 40 C.F.R. § 131.3(g). The National Research Council recommends analyzing use attainability before adopting a TMDL for water bodies with legacy pollutants, such as PCBs, that cannot be removed without causing environmental damage. National Research Council, Assessing the TMDL Approach to Water Quality Management at 92-3 (2001).

A valid TMDL corresponds to the maximum amount of a pollutant that can be discharged into a water body and still meet water quality standards. City of Arcadia v. State Water Resources Control Bd. (2006) 135 Cal. App. 4th 1392, 1404. In other words, a TMDL must be a reasonable interpretation of a water quality standard – not an ultra-conservative, unreasonable calculation resulting in a value that is far below what is necessary to meet the standard. Since a TMDL implements a water quality standard, and since such standards must be feasible and reasonable, the TMDL itself must be feasible and reasonable. The project objective for the TMDL, which states "[a]void actions that will have unreasonable costs relative to their environmental benefits," is consistent with these principles. The TMDL itself, however, is not.

2. The TMDL is infeasible and invalid on that basis.

As discussed supra, Section III, the TMDL as proposed is infeasible. Although the TMDL's estimates of PCB loads to the Bay are indefinite, the loads from various sources that the TMDL does not propose to reduce (e.g., nonurban runoff, POTWs, the Central Valley, rainfall and the atmosphere) appear to be so significant that even full implementation of the TMDL's control measures would not achieve the 10 kg/yr Loading Capacity. Further, we are aware of no large-scale technology demonstrated to clean stormwater to PCB levels to the target range of 640 to 8,050 ppq (or 64 to 805 ppq if the TMDL's math error is corrected). The land requirements for stormwater collection, even when limited to a 25-year storm, appear to be infeasible to satisfy. Physically removing PCBs from just the 22 "contaminated sites" is infeasible, in any meaningful time frame.

3. The TMDL's references to adaptive implementation do not render the TMDL feasible.

Adaptive implementation, or the present-tense general expression of flexibility in future enforcement, is no substitute for adopting a TMDL that is feasible to achieve in the first instance. Adaptive implementation does not relieve RWQCB of the responsibility to adopt a TMDL that is based on sound data and is feasible.

The California Attorney General recently has asserted that once a regulation (like a TMDL) is in a basin plan, it is an inflexible mandate. "The Basin Plan is a planning document that serves as the basis for the Water Board's implementation of programs to meet water quality standards and their resulting objectives. These standards and objectives do not vary from permit to permit; they remain the same regardless of the mechanism the Water Boards use to implement them." Reply in Supp. of Dem. at 4:10-15, State Water Resources Control Board v. City of Arcadia, Orange County Superior Court Case No. 06CC02974 (2006). Once a water quality based effluent limitation such as a Waste Load Allocation is established, dischargers must comply with it without regard to the limits of practicability. Defenders of Wildlife v. Browner (9th Cir. 1999) 191 F.3d 1159, 1163; 40 C.F.R. § 130.2(h) ("WLAs constitute a type of water quality-based effluent limitation."). "The language of the [CWA] Act does not allow for incremental achievement of water quality standards through successive approval of TMDLs that fall short of the required standard." NRDC v. Fox (S.D.N.Y. 1998) 30 F. Supp. 2d 369.

Adaptive TMDLs must be achievable and must meet the same basic requirements as other TMDLs, including the need for adequate information to support the needed regulatory determinations. In guidance on phased TMDLs, which share certain features with adaptive TMDLs, U.S. EPA has stated that "each phase must be established to attain and maintain the applicable water quality standard." EPA Memorandum from Benita Best-Wong, Director, Watershed Assessment and Protection Division to Water Division Directors, Regions I-X, "Clarification regarding 'Phased' Total Maximum Daily Loads" (Aug. 2, 2006). "Some reasonable minimum amount of reliable data is always needed in TMDL development." Report of the Federal Advisory Committee on the Total Maximum Daily Load (TMDL) Program, EPA-100-R-98-006 at p. G-1 (July 1998).

B. To The Extent The TMDL Is Impossible To Meet, It Is Unlawful.

"The law never requires impossibilities." Cal. Civ. Code § 3531. The conditions called for by the TMDL discussed supra are so extreme, they may well be impossible to attain. Dischargers and other potentially responsible parties ("PRPs") cannot avoid violating the TMDL, as, for example, counties cannot capture and clean stormwater to the TMDL's arbitrary concentration requirements, and PRPs cannot achieve the fish-tissue target or the sediment goals due to ambient PCB concentrations, other sources, and the impossibility of remediating to the TMDL's standards.

Impossible dimensions of the TMDL violate not only the Civil Code, but also state and federal due process protections. It long has been settled that a governmental directive to perform an impossible task violates due process. See, e.g., Consolidated Gas Co. of New York v. Prendergast (S.D.N.Y. 1925) 6 F.2d 243, 277, modified and affirmed, 272 U.S. 576 (1926) (affirming referee report finding state utility law invalid because, *inter alia*, requiring transmission of natural gas at standard of 650 B.T.U. per cubic foot "is commercially and physically impossible for the company to comply with"; "it can be safely found that the enforcement of the 650 B.t.u. standard would be in effect a confiscation of the coal gas plants of the company, and render it impossible to operate them under such standard"). Similarly, the TMDL is invalid to the extent that compliance with its requirements is impossible.

Even strict liability statutes for regulatory offenses – which ordinarily require no showing of fault or mens rea – may not be applied to a defendant who can show that compliance was objectively impossible. United States v. Park (1975) 421 U.S. 658, 673 (sustaining conviction for strict liability offence because the statute did "not require that which is objectively impossible"). The Ninth Circuit has assumed the existence of an "objective impossibility" defense. United States v. Y. Hata & Co., Ltd. (9th Cir. 1976) 535 F.2d 508, 510; United States v. Starr (9th Cir. 1976) 535 F.2d 512, 515-16; see also Laurie L. Levenson, Good Faith Defenses: Reshaping Strict Liability Crimes, 78 Cornell L. Rev. 401, 460 n.299 (1993) ("when it is objectively impossible for a defendant to avoid violating the law, the statute becomes arbitrary and vulnerable to a due process challenge."). For these reasons discussed supra, the objective impossibility defense is satisfied, and the TMDL violates due process.

C. RWQCB Must Disclose The Economic And Non-Economic Costs And Benefits Of The TMDL And Reasonably Balance All Factors Before Adopting The TMDL.

PCA requires RWQCB to consider and balance the economic and environmental benefits and harms associated with the TMDL. The CWA does not prohibit such a balancing; guidance interpreting the CWA encourages the consideration of costs in developing TMDLs.

1. RWQCB is required to consider economics in developing the TMDL.

Water quality targets and allocations must take into consideration that water quality which reasonably is achievable in light of social and economic factors. Cal. Water Code § 13241 (economics must be considered in setting water quality objectives.); 1994 State Board Memo at 7 ("For a TMDL whose goal is to achieve a standard based primarily on nonattainment of a designated beneficial use, for which there are no applicable objectives, a numeric target is established for each pollutant or stressor that interferes with attaining the use. Establishing a numeric target in these instances is analogous to establishing water quality objectives"); id. at 4 (acknowledging that RWQCBs "cannot fulfill this duty [to consider economic impacts] simply by responding to economic information supplied by the regulated community.").

CEQA requires a consideration of costs when an agency establishes a performance standard. Cal. Pub. Res. Code § 21159. SWRCB has acknowledged that TMDL "numeric targets and load allocations would probably fall into the category of performance standards." Memorandum from William R. Attwater, Chief Counsel, Office of Chief Counsel of SWRCB, to Executive Officer of Santa Ana Regional Water Quality Control Board, "Do TMDLs Have to Include Implementation Plans?" at 7 (March 1, 1999). Thus, "[u]nder CEQA, the Regional Water Board would have to identify the reasonably foreseeable methods of compliance with any TMDL provisions that established performance standards or treatment requirements [under Section 21159]."). Id. at 6-7. RWQCB also must analyze the costs of the TMDL under the California Administrative Procedures Act. Cal. Gov't Code § 11346.3.

2. A TMDL must strike a reasonable balance among economic and non-economic factors.

Once RWQCB has characterized and disclosed the various costs, benefits and potential harms of a TMDL, it must proceed to balance these factors before adoption. "The regional boards must balance environmental characteristics, past, present, and future beneficial uses, and economic considerations (both the cost of providing treatment facilities and the economic value of development)." Study Panel Report at 13; see also City of Burbank v. State Water Resources Control Bd. (2005) 35 Cal. 4th 613, 618 (California law allows consideration of economics when imposing pollutant restrictions more stringent than required by CWA).

The CWA does not limit RWQCB's ability to satisfy its statutory mandate under the PCA and engage in substantive balancing when developing the TMDL. TMDL implementation plans are under the purview of state authority as U.S. EPA has no CWA authority to develop and enforce them. 42 U.S.C. § 1313(d) (implementation plan not required as part of TMDL under CWA); Memorandum from William R. Attwater, Chief Counsel, Office of Chief Counsel of SWRCB, to Executive Officer of Santa Ana Regional Water Quality Control Board, "Do TMDLs Have to Include Implementation Plans?" at 7 (March 1, 1999). U.S. EPA has identified several factors that bear on a state's allocation of Loading Capacity, including "technical and engineering feasibility; cost or relative cost; economic impacts/benefits; cost effectiveness; fairness/equity; ability to monitor implementation and effectiveness; assurance and timeliness of attainment of the TMDL and water quality standards; relative source contributions; and/or other appropriate criteria." U.S. EPA Region IX, Guidance for Developing TMDLs in California at 6 (Jan. 7, 2000) (hereinafter "Guidance"). The CWA directs RWQCB to interpret its water quality standards to fulfill Congress's intent to establish maximum Loading Capacity, in part to avoid unreasonable water quality requirements. Economic cost is an appropriate consideration under the CWA, as the values of the water can be taken into account in setting water quality standards. 33 U.S.C. § 1313(c)(2)(A); see also Idaho Mining Ass'n v. Browner (2000) 90 F. Supp. 2d 1078, 1101 (costs may be "an integral component of a [use attainability analysis]").

3. The TMDL does not reflect economics or a reasonable balance among all factors.

The TMDL has not considered economics. Alhough there is a "Discussion of Costs" heading in the TMDL documentation, the report contains no meaningful assessment of the costs of the TMDL, and does not rise to the level of a consideration of economics. The disclosure and analysis of costs is far too thin to inform adequately RWQCB's decision making.

The minimum level of assessment RWQCB must conduct for a meaningful consideration of economics and to satisfy PCA includes: (1) identifying baseline risk levels; (2) listing the benefits to be achieved; (3) identifying alternative strategies to achieve the benefits; (4) estimating the costs of each alternative; (5) assessing uncertainty; (6) comparing the cost effectiveness of each alternative; and (7) identifying the most cost-effective alternative. Absent such an assessment, RWQCB is without the information to balance economic considerations versus other factors, and the public is left without any assurance that RWQCB is proposing a properly balanced regulation.

The proposed TMDL does not strike any reasonable balance between competing economic and environmental factors. The human-health and environmental benefits of the TMDL are minimal and otherwise speculative. In contrast, the economic costs of treating stormwater and dredging contaminated sediments could range from several to many billions of dollars. Attempting the dredging and stormwater treatment measures suggested by the TMDL will have significant adverse environmental impacts, including destruction of healthy benthic communities, emissions of greenhouse gases and criteria pollutants, and various land-use impacts.

D. The Technical Conditions To Support The TMDL Are Not Present.

As discussed supra, and in the technical reports submitted herewith, the foundation for the proposed TMDL is not sound and the TMDL's analysis, modeling and data have significant problems. Because of these technical problems, PCBs in the Bay presently are not suitable to be regulated under the TMDL program, and the proposed TMDL is not technically defensible.

1. PCBs are suitable for calculation of a TMDL only if proper technical conditions are met; those conditions are not present in the instant case.

CWA Section 303(d)(1)(C) provides:

> "Each State shall establish for [impaired waters], the total maximum daily load, for those pollutants which the Administrator identifies under [CWA § 304(a)(2)] as suitable for such calculation." 33 U.S.C. § 1313(d)(1)(C) (emphasis added).

Section 304(a)(2)(D) in turn requires U.S. EPA to develop and publish "information . . . for the purposes of [Section 303] on and the identification of pollutants suitable for maximum daily load measurement correlated with the achievement of water quality objectives." 33 U.S.C. § 1314(a)(2). U.S. EPA complied with this statutory mandate through a "notice" issued in 1978. Total Maximum Daily Loads Under Clean Water Act, 43 Fed. Reg. 60,662 (Dec. 28, 1978); see also 43 Fed. Reg. 42,303 (Sept. 20, 1978) (proposal). In its final notice, U.S. EPA determined that "[a]ll pollutants, under the proper technical conditions, are suitable for the calculation of total maximum daily loads." 43 Fed. Reg. at 60,665.

In other words, states are required to calculate TMDLs for all pollutants where "proper technical conditions" are present. U.S. EPA's 1978 notice explains:

> "'Proper technical conditions' refers to the availability of the analytical methods, modeling techniques and data base necessary to develop a technically defensible TMDL. These elements will vary in their level of sophistication depending on the nature of the pollutant and characteristics of the segment in question. They must be determined on a case-by-case basis. It is impossible to detail the proper technical conditions for all pollutants in all situations. Moreover, EPA does not want to preclude States from developing their own approaches." Id. at 60,662.

U.S. EPA recognizes that, "proper techniques do not exist for all pollutants in all situations; however, proper techniques can be developed for any pollutant given adequate resources. A limited list of specific pollutants [suitable for calculation of TMDLs] would be too restrictive because it might preclude the States from determining TMDLs for other pollutants for which proper techniques can be developed." Id. at 60,662-63.

Specifically, U.S. EPA interprets pollutants to be suitable for calculation of a TMDL only where "proper technical conditions" are met, i.e., where there exist (1) analytical methods;

(2) modeling techniques; and (3) data necessary to develop a "technically defensible" TMDL. These proper technical conditions must be met with regard to each element of the TMDL. In the instant case, no such showing has been made.

a. The TMDL has not established the Bay's Loading Capacity for PCBs.

The principal parameter that an agency must establish to promulgate a proper TMDL is the assimilative capacity of a waterbody with respect to a particular compound. The TMDL itself corresponds to this assimilative capacity, referred to in TMDL terminology as "Loading Capacity." "Loading Capacity" is defined as "the greatest amount of loading [i.e., mass of a particular compound introduced into a receiving water] that a water can receive without violating water quality standards." 40 C.F.R. § 130.2(f). Particularly where narrative (e.g., the COMM beneficial use, and the narrative toxicity standard in this case) standards are used, a TMDL will be "technically defensible" only if the analytical methods, modeling techniques, and data are adequate to establish that a particular amount of loading is the maximum that the water body can receive while still complying with the standards. In the instant case, RWQCB must determine the "greatest amount" of PCBs that the Bay can receive without violating the COMM and bioaccumulation standards. The TMDL has not done so.

In order to determine how much loading a water body can take without violating the applicable water quality standard, it is necessary to understand the water body's capacity to assimilate loading. Where an assimilative capacity study has not been done, or where that study is not supported by "technically defensible" analytical methods, modeling, or data, the proper technical conditions for calculation of a TMDL are not present. "The loading capacity is the critical quantitative link between the applicable water quality standards (as interpreted through numeric targets) and the TMDLs. Thus a maximum allowable pollutant load must be estimated to address the site-specific nature of the impairment. . . ." Guidance at 3.

The TMDL presents no adequate study of assimilative capacity, and mischaracterizes "the critical quantitative link" for a TMDL. It does not account for declining trends in PCBs, which indicate that current PCB inputs are not overwhelming the ability of the Bay to flush PCBs out of the system. Where concentrations of a compound are declining, one would expect assimilative capacity to be much closer to current loads than RWQCB calculates. On the basis of incorrect analysis and modeling, the TMDL miscalculates in concluding that Loading Capacity is 10 kg per year – far below 84 kg per year, its estimate of current loading. Correction of one modeling error alone shows that Loading Capacity is at least 2.5 times greater than estimated in the TMDL.

b. The proposed sediment goal does not reflect a correct translation between fish-tissue PCBs and PCBs in sediment.

The relationship ("translator") between water quality standards and the numeric loading capacity (i.e., the TMDL) must be technically defensible. As U.S. EPA explained in its 2000 TMDL Guidance for California, "[n]umeric water quality target(s) must be identified, and an adequate basis for target(s) as interpretation of water quality standards must be specifically documented in the submittal." Id.

A technical problem with the TMDL's sediment goal is that it is not based on knowledge of the extent to which fish in the Bay obtain PCBs from a food web connected to bottom sediments. The goal assumes that fish derive all (or the vast majority) of their PCBs from sediment, but this assumption is not plausible. Spatial gradients in PCB concentrations in the fish do not support a direct sediment linkage. Whereas sediment concentrations are three times lower in the North Bay than in the South Bay, fish concentrations are not significantly different in these locations. This finding is consistent with evidence concerning fish diets and movement patterns, which indicate that food resources in the water column are of importance to the fish community. PCBs within the water column likely originate from a wide area of the Bay, and thus PCBs in fish, even those near contaminated sediments, likely come from a combination of local and bay-wide sources.

The TMDL is not justified in concluding that fish are getting all of their PCBs from the sediments in the Bay; a one ppb sediment goal is not a proper translation of the COMM and bioaccumulation standards. The TMDL's translation overstates the importance of local sediments as a source of PCBs in fish.

c. <u>RWQCB has not demonstrated that full implementation of the TMDL will attain water quality standards</u>.

Under CWA § 303(d)(1)(C) and U.S. EPA regulations, a TMDL must be "established at a level necessary to implement the applicable water quality standards . . . ." 33 U.S.C. § 1313(d)(1)(C); 40 C.F.R. § 130.7(c)(1). U.S. EPA's 2000 Guidance emphasizes that "[t]he TMDL and associated waste load and load allocations must be set at levels necessary to result in attainment of all applicable water quality standards . . . ." Guidance at 2.

The TMDL and the LAs and WLAs must be calculated such that implementation of the TMDL will attain water quality standards. "Proper technical conditions" may not be present where available methods, models, and data are not adequate to ensure that implementation will lead to attainment. This concern is not directed to the practical feasibility of implementing the TMDL, but rather to whether full implementation of the chosen numeric standards would in fact lead to attainment. Proper technical conditions are not satisfied, for example, where the decision maker has not characterized or to taken account of significant sources – <u>e.g.</u>, aerial deposition, nonurban stormwater runoff, and POTW discharges – such that reductions in other sources in accord with the TMDL may not actually lead to attainment. The proposed TMDL's inadequate accounting for assimilative capacity, spatial arrangement of sources (possibly resulting in "hot spots"), bioavailablity, seasonal variations, and critical weather events present similar problems. The TMDL has set its target so low and relied on such poor data and analysis to characterize existing PCB loads, it has not been established that the proposed implementation actions will achieve the 10 kg/yr Loading Capacity, which RWQCB equates to its standards.

d. <u>RWQCB lacks the necessary reliable, technically defensible data to adopt the TMDL</u>.

The current PCB load of the Bay is unknown because RWQCB lacks the necessary data, including reliable, site-specific data for the PCB load from non-urban runoff, atmospheric deposition, the Central Valley, stormwater, and POTWs.

E. <u>The TMDL Erred In Assigning Half Of The Proposed 10 kg/yr Load To The Central Valley, Improperly Reducing The Loading That Should Be Assigned To Point Sources Such As Stormwater</u>.

The TMDL characterizes PCB loading from the Central Valley as a nonpoint source with a current loading of 42 kg/yr, and specifies a Load Allocation of 5 kg PCBs per year to this incoming, upstream source.

Where, as here, a Load Allocation is specified in the TMDL, the TMDL must include a demonstration that loading reductions to meet the allocation are practicable, technically feasible and reasonably assured of being implemented in a reasonable period of time. Guidance at 4. This demonstration provides "[r]easonable assurances" that "the measures identified will actually obtain the predicted reductions and that the State is able to assure this result." <u>Id.</u>; <u>see</u> <u>also</u> U.S. EPA, Guidance for Water Quality Based Decisions: The TMDL Process, Pub. No. 440/4-91-001 at Chapter 2 (1991)("In order to allocate loads among both nonpoint and point sources, there must be reasonable assurances that nonpoint source reduction will in fact be achieved."). Here, the TMDL assigned 5 kg/yr to the Central Valley without providing reasonable assurances that the Central Valley can meet this Load Allocation.

The TMDL documentation does not explain how or why Central Valley loads will drop by 88 percent. The TMDL documentation speculates that the current Central Valley load is 42 kg per year, when the analysis and data are so suspect that the load is essentially unknown. It may be that the TMDL overestimated the Central Valley load, but without reliable data, it is impossible to determine by how much, or whether the load – even if overestimated – will diminish to a level of 5 kg per year without any controls.

The TMDL documentation assumes the Central Valley Load Allocation will be met through attenuation. The SF RWQCB has no jurisdiction, however, to monitor attenuation in that region and it has done no study of the Central Valley to support its attenuation assumption. The TMDL presents no information as to what sources constitute the current (incorrect) load of 42 kg per year, or how these sources are being addressed, to support its reliance on attenuation for significant future reductions.

Nor does the Central Valley RWQCB have in place, or have planned, a PCBs TMDL for the Central Valley. Had there been a TMDL for PCBs in the Central Valley, and had that TMDL included valid calculations showing reductions in PCBs exiting that region down to 5 kg per year, RWQCB would have been positioned to provide reasonable assurances that the Load Allocation for the Central Valley would be met. But, there is no such upstream PCBs TMDL, nor is there any comparable plan for PCB control in the Central Valley region.

Finally, while the SF RWQCB may claim authority to regulate nonpoint sources, the proposed Load Allocation is unenforceable by it because the allocation is set at or near a political boundary beyond which its jurisdiction does not extend. The SF RWQCB cannot provide reasonable assurances that the proposed Load Allocation will be met in a reasonable period of time.

Where, as is this case here, an agency cannot provide reasonable assurances to support a Load Allocation, the entire load reduction must be assigned to point sources in the form of Waste Load Allocations. Id. In this case, the absence of reasonable assurances with respect to the Central Valley load means that RWQCB must assign the entire Loading Capacity to point sources, such as stormwater.

F. Adoption Of The Proposed TMDL Would Be Arbitrary And Capricious.

At a minimum, the TMDL must satisfy the arbitrary and capricious test of California law, and also cannot be entirely lacking in evidentiary support. Various aspects of the proposed TMDL, alone or in combination, violate these standards. The problems with the TMDL are systemic, rendering any adoption of the TMDL without evidentiary support. Illustrative of the problems with the TMDL are, without limitation, the following:

Infeasibility – An agency action establishing requirements with which compliance is not feasible, or requiring conditions that cannot be achieved, is arbitrary and capricious. An impossible order is "irrational" and may not be enforced: "[t]he condition was unreasonable, because it could not be complied with. [The district court] might as well have asked the plaintiff's attorney to hold his breath [for several hours]. . . . We cannot uphold an irrational ruling." Diehl v. H.J. Heinz Co. (7th Cir.1990) 901 F.2d 73, 75.

Setting Sediment Goals That Invite More Stringent Cleanups – The TMDL's proposed sediment classification scheme, where sediments containing PCBs above 10 ppb are classified as contaminated, invites much more stringent PCB cleanups. If, as the TMDL suggests, the intent is not to make PCB cleanups any more stringent or frequent, the TMDL must be clearly separated from such cleanups, lest the TMDL's stringent PCB values drive cleanups as *de jure* or *de facto* cleanup standards. It would be arbitrary and capricious for RWQCB to invite unnecessary and wasteful cleanups to the levels of the proposed TMDL. It also would be arbitrary and capricious for RWQCB to not create a clear separation between sediment cleanups and the TMDL, especially given the potentially enormous stakes involved, and the dredging and capping implementation measures in the proposed TMDL.

Acting In Contradiction To Stated Principles – It is capricious to identify reasonable principles, and state that the TMDL intends to avoid high costs that are not warranted by environmental threat, but then set a TMDL at levels that are so unnecessarily low that almost any action, no matter how draconian, can be justified under the stated principles.

Unexplained Departure From Precedent – The draft TMDL departs significantly from the January 2004 proposal when RWQCB released a previous draft TMDL that contained a fish-tissue target of 23 ppb and a sediment target of 2.5 ppb. The TMDL documentation provides no adequate explanation why a much more stringent TMDL is needed today than it was in January 2004, and largely has ignored the earlier version of its TMDL, and the many significant differences between it and the current proposal. In addition, the proposed target is 11 times more restrictive than one previously calculated by staff. See 2004 Project Report, comment of Fred Hetzel regarding fish screening values from electronic files produced by RWQCB ("If I use mean for all consumers (6.3 g/day), I get a target of 111 ng/g. With 95%ile number used for mercury, I get 22 ng/g. With 95%ile number for recent consumers (108g/day, I get 6 ng/g.

THIS IS A POLICY ISSUE TO BE DISCUSSED."). "[A]n agency changing its course must supply a reasoned analysis indicating that prior policies and standards are being deliberately changed, not casually ignored, and if an agency glosses over or swerves from prior precedents without discussion it may cross the line from the tolerably terse to the intolerably mute." Greater Boston Television Corp. v. FCC (D.C. Cir. 1971) 444 F.2d 841, 852 (internal citations omitted), cited in California Hotel & Motel Assn. v. Industrial Welfare Commission (1979) 25 Cal. 3d 200, 210 and 219. RWQCB is required to "supply a reasoned analysis indicating that prior" PCBs TMDLs "are being deliberately changed, not casually ignored."

Modeling That Violates Conservation Of Mass Principles – The TMDL's reliance on a model that violates a first principle of physics – conservation of mass – is arbitrary and capricious and renders the TMDL wholly without evidentiary support. The model assumes that PCBs are trapped at the seaward boundary, when in reality they pass through to the open ocean as a correct model would demonstrate. A court generally will defer to an agency as to "the determination of fit between the facts and the model . . . , so that the agency rather than the court may balance marginal losses in accuracy against marginal gains in administrative efficiency and timeliness of decision making." Chemical Mfrs. Ass'n v. EPA (1994) 28 F.3d at 1265. "The more inflexibly the agency intends to apply the model, however, the more searchingly will the court review the agency's response when an affected party presents specific detailed evidence of a poor fit between the agency's model and that party's reality." Id. The conservation-of-mass mistake produces a poor fit; not correcting it would render the TMDL invalid.

Reliance On An Erroneous Calculation Of Loading Capacity – The principal feature of a TMDL is the Loading Capacity, to which the TMDL is equated. Here, Loading Capacity is depressed arbitrarily because modeling errors led the TMDL documentation to assume without rational basis that the capacity is much lower than it is in reality.

Without A Valid Calculation, Dismissing Natural Recovery – The basic flaw in the model causes an error with respect to natural recovery, which occurs much faster than the erroneous model predicts.

Arbitrary Reliance On Modeling Results That Are Contrary To Site-Specific, Empirical Information – Rich data sets of mussel, sediment and water column PCB levels constitute material evidence of natural recovery and the Bay's ability to assimilate PCBs, but are not used to examine recovery and assimilation, or even to calibrate the TMDL's model. Instead, the TMDL uses a model that does not provide a good fit with these data and thus incorrectly predicts that recovery is slowing or minimal. In so doing, the TMDL does not adequately consider all relevant factors. See Sequoia Union High School Dist. v. Aurora Charter High School (2003) 112 Cal. App. 4th 185, 195 ("However, courts must ensure that an agency has adequately considered all relevant factors, and has demonstrated a rational connection between those factors, the choice made, and the purposes of the enabling statute."); Chemical Mfrs. Ass'n v. EPA, supra at 1265.

Numerous Data And Analysis Errors – The errors in the TMDL are such that RWQCB does not have a rational basis to act on the proposed BPA. The TMDL's stormwater values are speculative and based on an uncalibrated model, the current loads from the Central Valley are effectively unknown as they are based on incorrect flow data and biased PCB-concentration data, the estimate of POTW loads is incorrect as it does not use site-specific data, the estimate of the PCB load from atmospheric deposition is flawed and "not believable," PCBs entering the Bay in rainfall are ignored, and the TMDL documentation does not account for data that show the TMDL is not needed to protect human health or the environment.

Stormwater Loads Based On Population Statistics – RWQCB is without rational basis to allocate stormwater loads on a flawed and illogical methodology that allocates PCB loads among the nine affected counties in a manner inversely proportional to county population size.

Arbitrary Allocation Of Loads – The TMDL offers no rationale for its allocation of PCB loads among sources. For example, the TMDL offers no reason for allocating half of the 10 kg/yr load to the Central Valley or for discriminating among counties on the basis of their population density for stormwater allocation. There is no principled reason articulated for any of the allocations in the TMDL.

Arbitrary Preference For Allowing Discharges Of PCBs From POTWs Compared With PCBs In Stormwater – The TMDL offers no rationale as to why it does not propose implementation measures for wastewater and proposes to tolerate PCB discharges from POTWs at concentrations of up to 500,000 ppq, when each county must reduce PCBs in stormwater dramatically to levels no greater than 8,050 ppq, and in many cases far lower.

Reliance On An Unqualified Expert – RWQCB is without a rational basis to rely upon Carpenter's opinions as to the health effects of PCBs, and whether the TMDL should be set even lower.

Noncompliance With Executive Order S-2-03 – Executive Order S-2-03, issued on November 17, 2003, required California agencies to cease processing any "proposed regulatory action," in order to provide time to analyze the proposed regulation's potentially adverse impacts on the economy and business interests. Though the TMDL is covered by the Executive Order, RWQCB arbitrarily has not complied with its requirements.

RWQCB Has Not Articulated Its Rationale Of Decision – RWQCB has not demonstrated a satisfactory rationale for its decision to adopt the TMDL in light of all relevant factors and the statutory purposes of TMDLs. Id. U.S. EPA guidance for the development of TMDLs in California states that "assumptions must be stated and the basis behind the margin of safety must be documented." Guidance at 7. Yet the TMDL documentation does not provide its sources of uncertainty, how large the margin of safety is, or explain why the margin of safety is reasonable.

G. The Narrative Toxicity Standard Is Void For Vagueness And Violates Due Process, As Applied In The TMDL.

California courts consistently have held that due process of law is violated by "a statute which either forbids or requires the doing of an act in terms so vague that men of common intelligence must necessarily guess at its meaning and differ as to its application." Britt v. City of Pomona (1990) 223 Cal. App. 3d 265, 278; Franklin v. Leland Stanford Junior Univ. (1985) 172 Cal. App. 3d 322, 347. Due process requires the prohibition or regulation be clearly defined in order to provide fair notice to the public and to avoid arbitrary and discriminatory application of the standard. Britt, 223 Cal. App. 3d at 347; People v. Townsend (1998) 62 Cal. App. 4th

1390, 1400 ("A statute must be definite enough to provide a standard of conduct for its citizens and guidance for the police to avoid arbitrary and discriminatory enforcement.").

California courts look not only at the face of the regulation, but also consider vagueness challenges to statutes in light of the facts of the case at hand. Arellanes v. Civil Serv. Com'n (1995) 41 Cal. App. 4th 1208, 1217 (as-applied vagueness challenge not limited to where First Amendment freedoms at risk). In determining the sufficiency of fair notice, the challenged statute must be examined in light of the conduct with which the person allegedly violated it. Cranston v. City of Richmond (1985) 40 Cal. 3d 755, 764.

Under these principles, RWQCB's narrative toxicity standard is unconstitutionally vague as applied in the TMDL because it does not provide any notice to the public that it: (1) would be implemented using the various parameters of the hypothetical risk scenario upon which the target was derived, and by which the public will be bound, (2) corresponds to a fish-tissue target for PCBs of 10 ppb and other quantitative proxies, and (3) encompasses theoretical toxicity.[2]

1. The narrative standard does not provide notice that it corresponds to various numerical proxies for PCBs, such as the proposed fish tissue target of 10 ppb.

The narrative standard does not explain how RWQCB equates the standard to various quantitative measures of PCBs, including a fish-tissue target of 10 ppb, a dioxin-like PCBs fish-tissue target of 0.14 parts per trillion, a sediment concentration goal of 1 ppb, a sediment PCBs mass goal of 160 kg for the entire Bay, a water-column goal of 19 to 49 ppq PCBs, and a Loading Capacity for the Bay of 10 kg per year. These numerical proxies for the standard are indiscernible from the standard itself, which provides the public no notice that the standard also stands for these measures of PCBs. One could not have anticipated reasonably that RWQCB would interpret its narrative toxicity standard as it proposes to do in the TMDL.

This TMDL is analogous to the situation in Simpson Tacoma Kraft Co., where the trial court invalidated a narrative toxicity standard that an agency translated without notice into a very low numerical value for dioxin, using a specific, but previously undisclosed, risk level. Simpson Tacoma Kraft Co. v. Dep't of Ecology (Wash. 1992) 835 P.2d 1030 (affirming the trial court's judgment that the agency had not followed proper rule-making procedures and vacating on other grounds the ruling that the administrative rule was unconstitutionally vague). The trial court found that the State Department of Ecology's narrative standard was void for vagueness and violated due process where the agency applied it to create an effluent limit for dioxin of 0.013 ppq using a one in one million risk level. Simpson Tacoma Kraft Co. v. Dep't of Ecology, No.

---

2 The narrative toxicity standard is also not the kind of criterion that can be used as a basis for the PCBs TMDL. When a toxic pollutant "could reasonably be expected to interfere with . . . designated uses," CWA Section 303(c)(1)(B) specifies that numeric criteria or criteria based on biological monitoring or assessment methods consistent with CWA Section 304(a)(8) shall be developed. The narrative toxicity standard is none of these, and the TMDL clearly assumes that PCBs are reasonably expected to interfere with designated uses. As such, RWQCB must develop the type of criteria required by CWA Section 303(c)(1)(B) and base the TMDL on those criteria.

90-2-00398-9, at 6 (Wash. Super. Ct. 1990). Similar to RWQCB's narrative standard, the Ecology narrative standard stated that toxic substances shall not be introduced into a waterbody at levels that may adversely affect public health. See id. Ecology's failure to include in its narrative rule notice to the public that it might be applied in a manner such as the one at issue violated due process. In the instant case, also in violation of due process, RWQCB gave no notice when it promulgated the narrative standard that it might apply it to PCBs to create PCB proxies that correspond to the standard itself.

2. The narrative standard provides no notice to the public that it will be adjudged to be violated on the basis of highly theoretical assumptions as to fish consumption and PCB exposure.

The TMDL documentation determined that 10 ppb in fish must be achieved to meet the standard based on a highly speculative scenario that could not have been anticipated based on empirical fact. See, discussion, supra, Section III.G. But the narrative standard provides no notice that it will be applied this way, combining one assumption upon another and positing unrealistic consumption and exposure.

Rather than providing more definite guidance as to how to apply the narrative standard, which the agency could have done, the TMDL created a scenario – based on multiple assumptions – that is not likely to occur. The application of the standard in the TMDL was highly unpredictable; the narrative standard provides no notice of the human health parameters to be employed by RWQCB.

3. The narrative standard provides no notice to the public that it prohibits potential toxicity, no matter how theoretical.

The theoretical fish consumption and health risk scenario created by the TMDL is vague and also inconsistent with a 1998 RWQCB Staff Report, where the agency explained that "one must observe a toxic effect to consider this a failure of the standard." Staff Report, Ambient Concentrations of Toxic Chemicals in San Francisco Bay Sediments at 4 (May 1998). While it appears that RWQCB may have been referring to a second, related narrative toxicity standard, this expression of policy would make sense for the overall narrative program. RWQCB made clear that "there can, and usually will be, potentially toxic chemicals detected at some concentration," distinguishing the mere presence of toxic chemicals from a violation, where the concentrations are sufficient to present a toxic concern, and respecting the basic principle of toxicology that the dose is what can result in a threat. Id. The public could not have anticipated that RWQCB's narrative toxicity program would be applied to instances of theoretical toxicity, as the agency proposes in the TMDL. RWQCB has given inadequate notice that its narrative standard is intended to cover hypothetical toxicity; it is thus void for vagueness.

Because RWQCB's narrative toxicity standard – as used in the TMDL for hypothetical, unobserved effects on an angler population not known to exist – does not give the public notice of the standards by which it will be regulated, the standard is void for vagueness and violates due process.

H. The COMM Beneficial Use Standing Alone Does Not Provide A Basis For The TMDL.

The TMDL is far more stringent that the CTR value for aquatic life. As discussed supra, Section III, the TMDL is not based on protection of the ecosystem as current levels of PCBs in the Bay are not the cause of any injury to plants and animals, and as the Bay is not impaired for ecological uses. As discussed supra, Section IV.G, the TMDL cannot be supported by the Basin Plan's narrative toxicity standard since that standard, as RWQCB proposes to apply it in this TMDL, violates due process. Nor does the COMM beneficial use provide a basis for the TMDL.

RWQCB cannot equate the COMM standard with a series of proxies for PCBs in fish, sediment, and the water column. The TMDL has used extreme risk parameters and scenarios to conclude, contrary to empirical fact, that sport fishing behavior is placing anglers and others at risk from PCBs in the Bay. The OEHHA Advisory does not provide a basis for impairment of the COMM standard. In fact, in 1995 RWQCB said just the opposite – that the Advisory was not evidence that persons were at risk from eating fish from the Bay. Thus, application of the COMM use to support the TMDL is also inconsistent with due process (see supra, Section IV.G), and is arbitrary and capricious (see supra, Section IV.F).

I. The TMDL's Alternatives Analysis Is Not Adequate.

1. PCA, CEQA, and SWRCB's regulations require RWQCB to analyze alternatives.

RWQCB is required to develop and analyze any feasible alternatives that would result in fewer environmental impacts than the TMDL. This requirement stems in part from CEQA. See, e.g., 14 Cal. Code Regs. § 15126.6. In addition, the balancing the PCA requires can be achieved only with a probing analysis of alternatives. See, e.g., County of Inyo v. City of Los Angeles (1977) 71 Cal. App. 3d 185, 192-193 (accurate project description and alternatives analysis facilitates balancing). California Public Resources Code Section 21159 and SWRCB guidelines also require RWQCB to analyze project alternatives and their environmental impacts. 23 Cal. Code Regs. § 3777(a)(2).

2. The alternatives analysis does not meet minimum standards.

The alternatives discussion consists of one page of the Staff Report (and an additional half page discussing the project itself). The discussion consists of a mere identification of three alternatives (no project, alternative load allocations, and an alternative fish-tissue target). There is no discussion, analysis, or data regarding the potential environmental impacts of these alternatives. Each of the alternatives is rejected summarily as not meeting the project objectives. The description and analysis of alternatives in the TMDL is insufficient to comply with CEQA, and does not give RWQCB or the public adequate information to engage in the balancing required under PCA.

The California Supreme Court has found a very similar approach to alternatives analysis to violate CEQA. In Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal. 3d 376, 403, the Court stated that an adequate alternatives discussion "must contain facts and analysis, not just the agency's bare conclusions or opinions." Id. at 404. The facts and analysis RWQCB includes in the CEQA analysis must consist of a "quantitative, comparative analysis" of the relative environmental impacts of the proposed TMDL and each alternative. Kings County Farm Bureau v. City of Hanford (1990) 221 Cal. App. 3d 692, 735.

CEQA requires a lead agency to chose alternatives that "would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project." 14 Cal. Code Regs. § 15126.6. In contrast, the TMDL documentation analyzed only alternatives that were claimed not to meet the project objectives. If RWQCB still concludes that there is no project alternative that would meet the project objectives after actually analyzing the alternatives, RWQCB has defined the project objectives too narrowly. City of Santee v. County of San Diego (1989) 214 Cal. App. 3d 1438, 1455 (improperly narrow description of project and project objectives resulted in inadequate alternatives analysis).

3. RWQCB must revise the alternatives analysis.

RWQCB must describe both the project and each alternative and their environmental and economic impacts in enough detail to allow a meaningful comparison. RWQCB must quantify the impacts of the project and alternatives with respect to each environmental resource listed on Appendix B of RWQCB's CEQA checklist. To allow balancing under PCA, RWQCB also must quantify the costs of the proposed TMDL and each alternative using the criteria identified supra Section IV.C.

To allow for a meaningful comparison, RWQCB also must describe the benefits of the project and each alternative. This must include a quantitative discussion of the ecological and human health benefits of the TMDL, if any. The analysis must compare the water quality that will be attained in the near and long-term with the project and with the alternatives to the project. If that comparison shows a difference in the water quality endpoints between the project and the alternatives, RWQCB must describe and quantify the human health and ecological benefits, if any, between the water quality conditions attained with the project and those attained with the alternatives.

In addition, RWQCB must broaden the alternatives discussion to include an analysis of alternatives that would meet most of the basic project objectives. At a minimum, RWQCB must analyze the alternatives described below.

a. Monitored natural attenuation with institutional controls.

This alternative would involve adopting a TMDL with an implementation plan that consists of letting PCBs in the Bay naturally attenuate coupled with institutional controls such as an outreach program to educate any subpopulations that RWQCB believes are susceptible to PCBs in fish caught in the Bay. An effective suite of institutional controls should be just as protective as the TMDL, but would avoid the environmental and public health impacts of implementing the TMDL. U.S. EPA has adopted this adopted this alternative in other PCBs TMDLs, including the PCBS TMDLs for the Shenandoah River, the Missouri River, and Lake Worth.

U.S. EPA's Contaminated Sediment Management Strategy specifically recognizes that natural attenuation can be the best strategy in certain circumstances, stating, in pertinent part:

> "In certain circumstances, the best strategy may be to implement pollution prevention measures as well as point and nonpoint source controls to allow natural attenuation."

U.S. EPA, Contaminated Sediment Management Strategy, EPA-823-R-98-001 at 56 (April 1998) ("EPA's Contaminated Sediment Management Strategy"). U.S. EPA reiterated that position most recently in December 2005, when it stated that "each of the three remedy approaches (MNR [monitored natural recovery], in-situ capping, and removal) should be considered at every site at which they might be appropriate . . . ." U.S. EPA, Contaminated Sediment Remediation Guidance for Hazardous Waste Sites, EPA-540-R-05-012 (December 2005) ("Contaminated Sediment Remediation Guidance").

Some of the factors identified in EPA's Contaminated Sediment Remediation Guidance to determine whether natural attenuation is appropriate include:

- Whether "contaminant concentrations are low and cover diffuse areas." Id. at 4-3.
- Whether "natural recovery processes have a reasonable degree of certainty to continue at rates that will contain, destroy or reduce the bioavailability or toxicity of contaminants within an acceptable time frame." Id.
- Whether "contaminant concentrations in biota and in the biologically active zone of sediment are moving towards risk-based goals of their own." Id.

Evidence of the efficacy of natural recovery exist if there are long-term decreasing trends in higher tropic level biota, water column concentrations, sediment core data or surface sediment concentrations. Contaminated Sediment Remediation Guidance at 4-9. Given that PCBs in Bay sediment meet all of the factors above, the cited U.S. EPA guidance strongly suggests that monitored natural attenuation is a feasible alternative for the PCBs TMDL.

This alternative also is consistent with RWQCB policy, and has been adopted by RWQCB as the final remedy for site cleanups in other contexts. See, e.g., San Francisco Regional Water Quality Control Board, ORDER NO. 01-053, WXI/696 Realty LLC and Quebecor World, Inc., 696 East Trimble Road, San Jose, Santa Clara County – Adoption of Final Site Cleanup Requirements (May 22, 2001).

The TMDL documentation dismisses natural attenuation with institutional controls as not meeting project objectives, without first comparing the water quality endpoints between this alternative and the proposed TMDL. As discussed in greater detail in Section III.A, supra, monitored natural attention would be effective in greatly reducing PCB concentrations in fish tissue and in-Bay sediments. This alternative also would have the benefit of letting RWQCB and the public focus on other pollutants that cause more harm. It is anticipated that this alternative would not have the significant environmental impacts that the proposed project would cause.

b. Equal reduction of PCBs across all sources.

The recently-released report, Adaptive Implementation of Water Quality Improvement Plans: Opportunities and Challenges, describes two alternatives that RWQCB must analyze. L. Shabman et al., Adaptive Implementation of Water Quality Improvement Plans: Opportunities and Challenges (2007 draft). The first approach is to require equal-percent reductions across all sources. Id. at 32. This alternative specifically is recommended when an adaptive implementation approach, such as the one the TMDL purports to be applying, is used. Id. This approach has been used in other TMDLs. See, e.g., Florida Department of Environmental Protection, Fecal and Total Coliform TMDLs for the Cedar River (2005) (requiring all source categories to reduce fecal and total coliforms by equal amounts); Pennsylvania Department of Environmental Protection, Little Juniata River Watershed TMDL (2004) (equal reductions across sources in a TMDL that focused entirely on non-point sources); U.S. Environmental Protection Agency, Total Mercury in Fish Tissue Residue TMDL for Savannah River Watershed (2001) (reduction of mercury loads divided proportionally between air deposition (99%) and point sources where air deposition was acknowledged to be responsible for 99% of mercury load).

c. Lowest-cost reduction of PCB loads.

The other alternative recommended in Adaptive Implementation of Water Quality Improvement Plans: Opportunities and Challenges is an allocation "that meets the TMDL at the lowest possible cost." L. Shabman at 32. This alternative is consistent with the balancing in which RWQCB must engage under PCA, the requirements of CEQA Cal. Pub. Res. Code § 21159(c), and the project objective that RWQCB avoid actions that will have unreasonable costs relative to their environmental benefits. This approach, too, has been used in other TMDLs. See, e.g., Idaho Department of Environmental Quality, Snake River – Hells Canyon TMDL at 21 (2004) (TMDL employs "pollutant trading which enables stakeholders to commit limited financial resources to implement the most cost-effective control strategies within watershed(s)").

d. RWQCB should develop an alternative that protects against non-negligible toxicity.

The water quality standard for bioaccumulation indicates that the mere presence of PCBs does not violate the Basin Plan unless it is "detrimental" and causes an "effect." Basin Plan at 3.3.2. Consistent with this, RWQCB should develop an alternative that would protect against non-negligible risk to a sizeable population, rather than theoretical risk to a hypothesized, and unobserved population.

e. Organochlorines alternative.

The Bay is listed as impaired for dioxins, furan, DDT, and PCBs – all of which are organochlorines. RWQCB should develop and analyze an alternative TMDL that addresses all organochlorines in one regulatory action. This sensible alternative would reduce the regulatory burden and avoid overlapping, potentially inconsistent, rules for different classes of organochlorines. It also would prevent a "piece-mealing" CEQA violation by considering related parts of what appears to be a single project – reduction of organochlorines – as a whole.

The Santa Ana RWQCB proposed a similar TMDL for Newport Bay that would replace the currently operative June 2002 TMDL. U.S. EPA issued an organochlorines TMDL for Newport Bay in Orange County in June 2002.

J. The TMDL Does Not Comply With CEQA.

1. The TMDL is not excused from a CEQA analysis because of RWQCB's certified regulatory program or alleged inability to conduct a project-level analysis.

Because the basin planning process by which RWQCB proposes to add the TMDL to the Basin Plan is a "certified regulatory program," certified by the California Secretary of Resources, RWQCB must produce a document that is "functionally equivalent" to an Environmental Impact Report ("EIR") – but not an EIR *per se*. Lead agencies following CEQA under a "certified regulatory program" are exempted only from Chapters 3 and 4 (EIR contents/process), and Section 21167 (time period for CEQA challenges, replaced by Section 21080.5(g) for certified regulatory programs) of CEQA; such lead agencies must comply with all other CEQA provisions. RWQCB cannot limit its CEQA review because it proposes to adopt the TMDL under a certified regulatory program. Envtl. Prot. Info. Ctr. v. Johnson (1985) 170 Cal. App. 3d 604, 618 ("Nothing in section 21080.5 supplies a basis for concluding that the Legislature intended the section to stand as a blanket exemption from CEQA's thorough statutory scheme and its salutary substantive goals.").

The TMDL documentation states that "the Water Board cannot mandate adoption of any specific compliance method, the analysis provided here should be viewed as comparable to a programmatic or Tier 1 environmental impact review." The TMDL documentation appears to base this on California Water Code Section 13360, which prohibits orders of RWQCB from specifying the means of compliance. Cal. Water Code § 13360. By its plain terms, Section 13360 is limited in application, however, to "orders," and not rules and regulations such as the TMDL. Even if Section 13360 applied to the TMDL, it does not purport to limit the scope of the CEQA analysis RWQCB must conduct.

A programmatic-level CEQA analysis is not appropriate here. The TMDL involves a basin plan amendment, and RWQCB must provide a detailed plan to achieve compliance with the TMDL, including a description of actions that must be undertaken to meet the TMDL's requirements, when those actions must be undertaken, and a monitoring plan to determine compliance with the TMDL. See Cal. Water Code § 13242. Though the project is not described with adequate specificity to meet the project objectives and statutory obligations, if it were adequately described, it appears the information would have supported a project-level CEQA review.

But even if a program-level CEQA analysis were appropriate, "tiering is not a device for deferring the identification of significant environmental impacts that the adoption of a specific plan can be expected to cause." Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova (2007) 40 Cal. 4th 412, 429 (citation omitted). Had RWQCB conducted an in-depth analysis of just portions of the implementation plan, it would have found the TMDL would cause significant environmental impacts that must be mitigated.

As a certified regulatory program, RWQCB is required to respond in writing to all significant environmental points raised in public comments. 23 Cal. Code Regs. § 3779; Cal. Pub. Res. Code § 21080.5(d)(2)(D). Failure to provide "reasoned responses" to public comments on a certified regulatory program's environmental analysis is a violation of CEQA. Gallegos v. State Bd. Of Forestry (1978) 76 Cal. App. 3d 945, 954. RWQCB also must summarize the main areas of disagreement between experts and explain its reasons for relying on one expert over another. 14 Cal. Code Regs. § 15151.

Here, RWQCB must provide reasoned, written responses to all of the points raised in these comments. The technical and legal defects of the TMDL all implicate CEQA in that they result in an inaccurate project description and baseline environmental assumptions that compromise the analysis of impacts and the evaluation of alternatives.

2. The project description is inadequate.

Without a detailed, accurate project description, the CEQA process cannot yield accurate, clear results and public review is frustrated. County of Inyo v. City of Los Angeles (1977) 71 Cal. App. 3d 185, 192. The "project" that must be described includes everything needed for implementation of the overall action. 14 Cal. Code Regs. § 15003(h). RWQCB must "[d]escribe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation." CEQA Guidelines, Appendix G.

The TMDL documentation falls short of providing an adequate project description by proposing a TMDL and then not describing in detail the measures "necessary for its implementation." The Staff Report's "TMDL Implementation" section provides only generalizations as to how TMDL allocations will be achieved in each load category.

- The TMDL documentation does not quantify the amount of dredging that the TMDL will require, the boundaries of the dredging, the landing and dewatering sites for the dredged material, the disposal sites for the dredged material, the types and quantities of equipment that are expected to be used, and other critical elements of the dredging portion of the project. It is impossible for the public to tell from reading the TMDL whether it will require dredging of just certain identified "contaminated sites," the entire Bay margin, the entire Bay to ambient conditions, or some other scenario.

- The TMDL documentation states that current maintenance dredging in the Bay is approximately 2,000,000 cubic yards per year, but that this volume is targeted for reduction to approximately 1,000,000 cubic yards per year. RWQCB further states that "sediments disposed of in Bay should have total PCBs concentrations no greater than that in ambient surface sediments in Bay." Yet the TMDL documentation does not quantify the amount of dredged material the TMDL will cause to be unsuitable for in-Bay disposal, or determine the location and environmental suitability of alternate disposal sites.

- The TMDL documentation indicates that project implementation will include the treatment of stormwater runoff. Yet there is no description of the efforts that will be required for stormwater treatment. The TMDL documentation suggests that the TMDL does not require all stormwater to be treated, but does not describe the volume of stormwater that would be treated, or even give a standard that would allow the public to make a reasonably educated estimate of that volume.

- As described infra, Section IV.N, the TMDL appears to include adoption of a sediment quality objective; a 303(d) listing for RARE, EST, and WILD beneficial uses; and incorporation of the CTR and the WHO TEQs into the basin plan. None of these aspects of the TMDL are described as part of the project or analyzed for potential environmental impacts.

3. The description of the environmental baseline is inadequate.

RWQCB is required to analyze potentially significant effects the project may have on the environment. CEQA Guidelines § 15252(b). RWQCB cannot make a meaningful assessment of the potential environmental effects (i.e., any benefits and adverse impacts) of a PCBs TMDL without first characterizing the baseline environment. Save Our Peninsula Committee v. Monterey County Board of Supervisors (2001) 87 Cal. App. 4th 99, 120.

RWQCB must evaluate alternative methodologies for determining baseline conditions rather than simply relying on one approach (i.e., the "one-box model"), while dismissing other approaches that have been brought to its attention during the TMDL process. As one court stated, "[i]f an EIR presents alternative methodologies for determining a baseline condition . . . we believe CEQA requires that each alternative be supported by reasoned analysis and evidence in the record so that the decision of the agency is an informed one." Id. RWQCB's response to these comments must include an analysis of the alternative methods of assessing baseline conditions recommended herein, including the level of natural attenuation, fish consumption rates, and human health risk from PCBs.

The TMDL documentation does not consider adequately the factors affecting the baseline condition of the Bay, and places disproportionate focus on the impacts due to PCBs in sediments. The Bay has been subject to numerous non-contaminant factors contributing to baseline, including a 79 percent loss in tidal marsh habitat during the last 200 years. "[T]he loss of these habitats accounts for most of the decline in ecological function of the tidal marsh . . . . [H]abitat losses have undoubtedly contributed to population decline." San Francisco Bay Area Wetlands Ecosystem Goals Project, Baylands Ecosystem Habitat Goals – A Report of Habitat Recommendations (1999). Moreover, the benthic ecology has been impacted by introduction of exotic species. The TMDL must include a more extensive discussion of the current baseline condition, the factors that are most responsible for contributing to that baseline condition, and the critical factors that will limit or regulate the future enhancement of ecological resources in the Bay.

RWQCB must characterize the environmental baseline for each environmental resource listed in Appendix B of the Staff Report. Among others, RWQCB must analyze the following environmental resources, which the project is likely to significantly impact:

- Quantify current air quality conditions, including an assessment of criteria pollutants for which the San Francisco air basin is in non-attainment.

- Quantify current greenhouse gas emissions to the Bay from the San Francisco region and the globe. Include an assessment of the environmental impact that global climate change is currently having on the Bay region and California.

- Describe and inventory the current land uses surrounding the Bay margin, including recreational, commercial, and institutional uses. The focus must be on uses that could be impacted by the dredging and other implementation actions contemplated in the TMDL.

- Describe the biological resources in the Bay and in the vicinity of the Bay that could be impacted by dredging and other implementation activities. All rare, endangered, and threatened species in the Bay should be identified. Wetlands, eelgrass beds, benthic communities, and other important habitats should be identified and characterized. In order to enable the public to assess the merits of project alternatives, describe any observable, toxic effects on wildlife and habitat caused by current PCBs levels.

- Identify likely disposal sites for dredged materials and their capacity to accommodate the dredge volumes contemplated by the TMDL.

- Describe and quantify the effect of the recently-adopted mercury TMDL on the baseline concentrations of PCBs. Will the management practices required in the mercury TMDL have any effect on future PCBs concentrations?

4. The TMDL does not adequately assess the environmental impact of implementing the TMDL.

The TMDL documentation's assertion that RWQCB "will not require any actions or project to implement the PCBs TMDL that would lead to significant, permanent, negative impacts on the environment" is not relevant to the CEQA analysis, and is unsupported. The project includes both a numeric target for PCBs concentrations in fish tissue and an implementation plan to achieve that target. For purposes of the CEQA analysis, RWQCB and any reviewing court must assume that the entire project will be completed – including all implementation actions necessary to meet the fish-tissue target. Stanislaus Natural Heritage Project v. County of Stanislaus (1996) 48 Cal. App. 4th 182, 206 ("While it might be argued that not building a portion of the project is the ultimate mitigation, it must be borne in mind that the EIR must address the project and assumes the project will be built.").

The TMDL documentation does not adequately characterize the project and the environmental baseline conditions, and that has made a full environmental review of the implementation plan impossible. But even with the limited time and information available, it is believed that the project likely will have significant environmental impacts on environmental resources, including land use, landfill capacity, air quality, global climate change, benthic communities, and species and habitat.

5. The TMDL omits an assessment of cumulative impacts, as required by CEQA.

The full environmental impacts of the TMDL cannot be ascertained until RWQCB conducts a cumulative impacts analysis. Whitman v. Board of Supervisors (1979) 88 Cal. App. 3d 397, 408 ("[An] agency may not . . . [treat] a project as an isolated 'single shot' venture in the face of persuasive evidence that it is but one of several substantially similar operations, each of which will have the same polluting effect in the same area. To ignore the prospective cumulative harm under such circumstances could be to risk ecological disaster.") (citation omitted). The TMDL documentation's discussion of cumulative impacts appears to be limited to a single sentence that reads: "In addition, there are no significant cumulative impacts that are anticipated from actions to implement the PCBs TMDL." This is no analysis at all and does not meet CEQA's requirement to analyze the project's impacts together with those of "closely related past, present, and reasonably foreseeable probable future projects." 14 Cal. Code Regs. § 15355(b).

CEQA requires analysis of cumulative impacts to use either the list approach or the summary-of-projections approach. 14 Cal. Code Regs. § 15130(b)(1). The summary-of-projections approach is appropriate only where an adopted general plan or prior certified environmental document "described or evaluated regional or area wide conditions contributing to the cumulative impact." 14 Cal. Code Regs. § 15130(b)(1)(B). There appears to be no such general plan or prior environmental document analyzing the cumulative impacts of implementing the TMDL. As such, RWQCB must use the list approach. It must begin this exercise by listing all potential dredging projects, development projects on the Bay margin, habitat restoration projects, the recently adopted mercury TMDL, any future dioxins or furan TMDLs, and other projects in the TMDL project area that could affect the environmental resources impacted by the TMDL. 14 Cal. Code Regs. § 15130(b)(1)(B)(2). Once the cumulative project list is identified, RWQCB must analyze the impacts of the TMDL together with those other projects.

K. The Absence Of A Translation Procedure Violates The CWA.

Where a state seeks to regulate the discharge of toxic pollutants into a water quality limited segment based on narrative criteria, as with the proposed PCBs TMDL, federal CWA regulations require the state first to adopt a translator procedure describing how such narrative criteria will be translated in a manner such that the standard can be applied to point source discharges. 40 C.F.R. § 131.11(a)(2) ("Where a State adopts narrative criteria for toxic pollutants to protect designated uses, the State must provide information identifying the method by which the State intends to regulate point source discharges of toxic pollutants on water quality limited segments based on such narrative criteria.").

RWQCB's Basin Plan does not contain a translator procedure for the narrative toxicity standard, which is the basis for the TMDL. Nor did RWQCB identify the method by which it proposed to apply the narrative standard to water quality limited segments listed as impaired under CWA Section 303(d). RWQCB did not provide information that it would apply the narrative standard to PCB compounds, use a method that included a certain risk level, and make assumptions about PCB toxicity and exposure to PCB-containing fish. RWQCB did not explain that it would translate the narrative standard to regulate point source discharges like stormwater by assuming a scenario where anglers were eating PCB-containing fish at a rate of eight ounces per week, every week, for 70 years.

The absence of a translator procedure violates the CWA, and renders the TMDL unlawful, as the translator procedure is a condition precedent to a TMDL in which a narrative standard is applied. This situation is analogous to the case involving the Los Angeles RWQCB's Basin Plan, where the City of Los Angeles challenged the Basin Plan's absence of a translator procedure. See City of Los Angeles v. U.S. EPA, CV 00-08919, Statement of Decision, at 10 (C.D. Cal. 2001) (granting summary judgment and remanding to RWQCB based on absence of translator). In that case, the District Court allowed the City's challenge to the L.A. Basin Plan, stating that the City "may properly challenge the Basin Plan's provisions, or lack thereof, on any legal ground, to the extent . . . [the City's] NPDES permit and/or permit process is affected thereby." Likewise, we may make, and are making, an as-applied challenge to the Basin Plan as the absence of a translator now affects us, through the proposed TMDL.

(To the extent that the 1998 language in which RWQCB interpreted its narrative program as applying to observed – but not potential – toxicity may constitute the requisite translator, the TMDL violates any such translator in that it attempts to extend the narrative standard to theoretical toxicity alleged to be associated with long-term consumption of PCBs by a hypothetical population.)

L. Because The TMDL Adopts Current Treatment Of Municipal And Industrial Wastewater As Stringent Enough, RWQCB Is Without Jurisdiction Under CWA Section 303(d)(1)(A) To Promulgate The Proposed TMDL.

TMDLs are promulgated for a specific class of water bodies, namely "those waters . . . for which the effluent limitations required by section 1311(b)(1)(A) and section 1311(b)(1)(B) . . . are not stringent enough to implement any water quality standard applicable to such waters." The referenced statutory sections set technology-based standards for municipal and industrial point source discharges of wastewater. The proposed TMDL would adopt current performance of PCB removal from such wastewater sources as sufficient treatment to satisfy the narrative toxicity standard. Accepting the TMDL at face value, one must conclude that the CWA Section 301(b)(1)(A) and (B) effluent limitations are stringent enough to implement the narrative standard. If these limitations were "not stringent enough," surely RWQCB would set Waste Load Allocations for these sources that were more stringent than its estimates of current performance.

By setting the TMDL at current performance for municipal and industrial wastewater, RWQCB undermines the basis for it to take jurisdiction under CWA Section 303(d)(1)(A) to prepare a PCBs TMDL for the Bay. The CWA anticipates situations like this and does not leave RWQCB without recourse. RWQCB still could develop an information-only PCBs TMDL under CWA Section 303(d)(3).

M. The TMDL Violates The Applicable Peer Review Statute, Suspending RWQCB's Authority To Adopt The TMDL.

The TMDL violates the statutorily required procedures for scientific peer review and, therefore, RWQCB lacks the authority to take final action on the TMDL. The Health & Safety Code ("HSC") provides: "No board, department, or office within the agency [California EPA] shall take any action to adopt the final version of a rule" unless certain conditions are met. HSC Code § 57004(d).

Those conditions include submitting "the scientific portions of the proposed rule, along with a statement of the scientific findings, conclusions, and assumptions on which the scientific portions of the proposed rule are based and the supporting scientific data, studies, and other appropriate materials, to the external scientific peer review entity for its evaluation." If RWQCB "disagrees with any aspect of the finding of the external scientific peer review entity," it is required to "explain, and include as part of the rulemaking record, its basis for arriving at such a determination in the adoption of the final rule, including the reasons why it has determined that the scientific portions of the proposed rule are based on sound scientific knowledge, methods, and practices." HSC § 57004(d)(2). The TMDL documentation states that the peer reviewers "concluded that the scientific basis of the proposed Basin Plan amendment is based on sound scientific knowledge, methods, and practices." But this statement is at odds with certain specific findings by the peer reviewers.

The peer review conducted by Dr. David Carpenter finds: "With all of the cities and waste cites around the Bay it is simply not believable that only 0.35 kg/yr enter the Bay by atmospheric transport of gas phase PCBs." Staff Report at C-11 and C-12. Dr. Carpenter also expressed doubts regarding the rate of natural attenuation in the Central Valley: "I do have some question as to whether the anticipated natural attenuation within the Central Valley watershed. . . is realistic . . . . " Id. at C-13. Both the rate of atmospheric deposition and the rate of natural attenuation in the Central Valley are key elements of the TMDL, yet the TMDL does not address Dr. Carpenter's critique. In addition, the peer review of Kevin J. Farley identifies a significant miscalculation regarding the net loss of PCBs due to sediment dredging. Id. at C-6.

The TMDL documentation has explained neither why RWQCB disagrees with these aspects of the peer review (assuming it does), nor why it has ignored these points. HSC § 57004(d)(2) requires that RWQCB revise its rule or explain its reasons for disregarding these aspects of the peer review; to date, RWQCB has not met this condition. As stated in the State Board's TMDL Policy, RWQCB must add a new section to the Staff Report containing specific responses to all peer review comments. See supra Appendix A to the TMDL Policy at page A-4. Because RWQCB has not complied with the procedures for scientific peer review, it lacks the authority to take final action on the TMDL.

N. The Proposed Action Improperly Includes A Sediment Quality Objective, Multiple 303(d) Listings, Adoption CTR, And Adoption Of The United Nations' WHO TEQs.

The TMDL appears to include: a sediment quality objective; new 303(d) listings for the RARE, EST, and WILD beneficial uses; and an improper adoption of the CTR and the United Nations' WHO TEQs. RWQCB is without statutory authority to adopt a sediment quality objective under any circumstances, and did not comply with the statutory requirements for the 303(d) listing and adoption of the CTR or the TEQs. RWQCB may not adopt the TMDL as it currently is drafted.

PCA defines a sediment quality objective as "that level of a constituent in sediment which is established with an adequate margin of safety, for the reasonable protection of the beneficial uses of water or the prevention of nuisances." Cal. Water Code § 13391.5. The draft TMDL proposes to establish such an objective for PCBs in Bay sediment. But the PCA mandates detailed procedures for adoption of a sediment quality objective with which RWQCB has not complied. Cal. Water Code §§ 13392.6(a), 13393. Only the SWRCB may adopt a sediment quality objective. Cal. Water Code § 13392.6(a). RWQCB must remove the sediment quality objective from the TDML.

The TMDL documentation also states that PCBs impair the Bay's RARE, EST, and WILD beneficial uses. None of these uses are currently listed as impaired by PCBs. RWQCB has not complied with the requirements for listing the Bay as impaired for RARE, EST, and WILD uses, and may not adopt these portions of the TMDL. 40 C.F.R. § 130.7(b)(5).

The TMDL documentation states that the CTR applies to the Bay, but the CTR has not been made part of the Basin Plan. Unless and until RWQCB adopts the CTR as part of the Basin Plan, and conducts the balancing required by PCA, the CTR is not an applicable water quality objective. Cal. Water Code § 13241. Likewise, the TMDL adopts toxicity values of the United Nations WHO, in that it proposes to set a fish-tissue value for dioxin-like PCBs of 0.14 parts per trillion, on the basis of WHO's TEQs for these compounds. The TEQs and the BPA fish-tissue value set on their basis cannot be adopted without first complying with the PCA.

Finally, for all of the reasons stated in this letter and in our previous submittals to RWQCB, RWQCB's initial 303(d) listing for the COMM use and the narrative standard was arbitrary and capricious and unsupported by the evidence. There is no competent evidence that fishing in the Bay is harmed at the current levels of PCBs.

O. RWQCB Has Not Provided The Documents Upon Which The TMDL Is Based As Required By The APA And CEQA.

RWQCB has not met its burden under CEQA and the California Administrative Procedure Act to disclose and make available for public review materials upon which the TMDL is based.

1. California Administrative Procedure Act.

Certain provisions of the Administrative Procedure Act ("APA") apply to RWQCB's adoption of the TMDL and the BPA. The APA "does not apply to 'the adoption or revision of state policy for water quality control' unless the agency adopts a 'policy, plan, or guideline, or any revision thereof.' (Gov. Code, § 11353, subds. (a), (b)(1).) The Water Boards contend that . . . the Trash TMDL and amendment adding it to the 1994 Basin Plan are policies or plans covered by the APA . . . ." City of Arcadia v. State Water Resources Control Bd. (2006) 135 Cal. App. 4th 1392, 1434-1435. In other words, the State Board and the Los Angeles Regional Water Quality Control Board have acknowledged, as they must, that the rulemaking procedures of the APA apply to the adoption of a TMDL and the amendment of a Basin Plan. A California Court of Appeal interpreted the legislation adding Section 11353 to the Government Code and concluded that the legislation "amends sections of the APA providing, essentially, that any new water quality control programs must comply with the APA . . . ." State Water Resources Control Bd. v. Office of Admin. Law (1993) 12 Cal. App. 4th 697, 707. The court "read the new legislation as rejecting the State Board's proposals to expressly exempt water quality control plans from the APA, and as clarifying existing law as making APA compliance mandatory." Id.

The APA requires that "[e]very agency shall maintain a file of each rulemaking that shall be deemed to be the record for that rulemaking proceeding . . . and during all subsequent periods of time that the file is in the agency's possession, the agency shall make the file available to the public for inspection and copying during regular business hours." Gov Code § 11347.3(a). The "rulemaking file shall include: . . . (6) All data and other factual information, any studies or reports, and written comments submitted to the agency in connection with the adoption, amendment, or repeal of the regulation. (7) All data and other factual information, technical, theoretical, and empirical studies or reports, if any, on which the agency is relying in the adoption, amendment, or repeal of a regulation, including any cost impact estimates as required by Section 11346.3." Cal. Gov Code § 11347.3(b)(6-7). Accordingly, RWQCB must provide the public with all the data, factual information, technical, theoretical, and empirical studies or reports that RWQCB is relying on in the adoption of the TMDL and/or in amending the Basin Plan.

Similarly, the APA requires that a state agency fully explain the rationale for each regulation it proposes to adopt. This rationale must be set forth in the "Initial Statement of Reasons," which must be submitted to the Office of Administrative Law ("OAL") and made available to the public upon request. Gov. Code § 11346.2. The Initial Statement of Reasons must include, *inter alia*: "An identification of each technical, theoretical, and empirical study, report, or similar document, if any, upon which the agency relies in proposing the adoption, amendment, or repeal of a regulation." Gov. Code § 11346.2(b)(2).

Accordingly, RWQCB must provide the public with the Initial Statement of Reasons submitted to the OAL, which hereby is requested pursuant to Government Code Section 11346.2. In this Initial Statement of Reasons, RWQCB is required to identify "each technical, theoretical, and empirical study, report, or similar document, if any, upon which . . . [RWQCB] relies in proposing" the TMDL. Gov. Code § 11346.2(b)(2).

2. CEQA.

The content of administrative records in CEQA proceedings is governed by Public Resources Code Section 21167.6; subdivision (e) specifically enumerates what must be included, but does not exclude materials absent from the subdivision. See County of Orange v. Superior Court (2003) 113 Cal. App. 4th 1, 7. The "actual text of subdivision (e) . . . contemplates that the administrative record will include pretty much everything that ever came near a proposed . . . [project] *or* to the agency's compliance with CEQA in responding to that . . . [project]." Id. at 8. The broad language of Public Resources Code Section 21167.6 encompasses any and all expert reports reviewed by RWQCB, including any and all data underlying those reports.

RWQCB is required to make all documents incorporated into the Staff Report available for public inspection. CEQA Guidelines § 15150(b)("Where part of another document is incorporated by reference, such other document shall be made available to the public for inspection at a public place or public building.") As such, all technical and expert reports incorporated into the TMDL documentation must be disclosed. The adoption of the TMDL under a certified regulatory program does not affect RWQCB's obligation under CEQA to make the technical and expert reports available; the environmental documents of a certified regulatory program must be available for review and comment by the general public. Pub. Res. Code § 21080.5(d)(3)(B); Schoen v. Dep't of Forestry & Fire Prot. (1997) 58 Cal. App. 4th 556, 566.

Similarly, RWQCB's Notice of Filing of a Draft Environmental Document ("Notice") was required to disclose the "address where copies of . . . all documents referenced in the . . . [Environmental Document] will be available for public review." CEQA Guidelines § 15087(c)(5). The June 22, 2007 Notice properly lists a website where "other documentation" will be available online. See Notice (available at http://www.swrcb.ca.gov/rwqcb2/TMDL/SFBayPCBs/pubnoticePCBsTMDL.pdf). To the extent the listed website does not include all of the documents referenced in the Staff Report, RWQCB has not complied with CEQA.

To comply with the APA and CEQA, RWQCB must make available to the public all of the documents and data considered in developing the draft TMDL. For example, we understand RWQCB has documentation regarding the inability of Best Management Practices to reach the TMDL's targets for stormwater – documentation developed with Proposition 13 funds under a RWQCB-led program entitled, "Regional Stormwater Monitoring and Urban BMP Evaluation: A Stakeholder-Driven Partnership to Reduce Contaminant Loadings." This documentation and other documents and data considered by RWQCB in developing the TMDL must be made available to the public.

P. The TMDL Proceedings Must Be Reformed To Reflect Their Quasi-Judicial Character.

Although portions of the TMDL may be characterized as quasi-legislative, portions of the TMDL are directed at a small group of specifically known entities, and must be considered quasi-judicial.

The Staff Report identifies specific "contaminated sites" that are targeted for dredging and remedial action. RWQCB has identified specific parties that it believes are responsible for at least some of the contaminated sites. For example, RWQCB has been focusing on the Oakland Service Shop since 1980, when it issued a Cleanup and Abatement Order for the site. In its Consolidated Cleanup Plan adopted and approved on June 17, 1999, the SWRCB identified a specific Oakland facility when listing the basis for identifying San Leandro Bay as a candidate "hot spot." Thus, portions of the TMDL are focused on determining the rights and obligations of specific entities. This is the essence of a quasi-judicial proceeding. Department of Alcoholic Beverage Control v. Alcoholic Beverage Control Appeals Bd. (1987) 195 Cal. App. 3d 812, 817 ("the determination of specific rights in regard to a specific fact situation" is quasi-judicial conduct); Graves Advice Letter, 1998 WL 473136 at *7 ("The issuance of regulatory letters by the regional board (and subsequent compliance by responsible parties) for the purpose of investigating and remediating UST contamination are properly characterized as quasi-judicial proceedings since the regulatory actions involve specific parties.").

When an agency engages in mixed rule-making and adjudication, it must segregate the proceedings, or adopt the more rigorous procedural protections of a quasi-judicial proceeding for the entire action. See, e.g., L & M Professional Consultants, Inc. v. Ferreira (1983) 146 Cal. App. 3d 1038.

RWQCB must reform the TMDL proceedings to protect the procedural due process rights of the entities whose rights and obligations RWQCB is adjudicating. Specifically, RWQCB must grant parties subject to the quasi-judicial portions of the TMDL a full, fair administrative hearing with the right to discovery, cross-examination of witnesses, and the procedural protections afforded by the California Administrative Procedures Act.

V. CONCLUSION.

For the foregoing reasons, we respectfully request that RWQCB not adopt the TMDL as proposed. Rather, RWQCB should conduct a realistic risk assessment and revise the TMDL on the basis of sound science. RWQCB should adopt a reasonable and achievable TMDL that balances environmental and economic factors. The TMDL that is adopted should not result in more stringent or more frequent cleanups of already-existing PCBs within the Bay, and RWQCB should take steps to ensure that the TMDL does not result in such an outcome. RWQCB should separate the cleanup program from the TMDL, as the TMDL's implementation measures for contaminated sediments will not promote attainment of the TMDL, and are technically and economically unsound and unachievable on a scale anywhere close to the TMDL's proposed goals.

Joshua T. Bledsoe
Direct Dial: 714.755.8049

LATHAM&WATKINS LLP

650 Town Center Drive, 20th Floor
Costa Mesa, California 92626-1925
Tel: +714.540.1235 Fax: +714.755.8290
www.lw.com

FIRM / AFFILIATE OFFICES

Barcelona	New Jersey
Brussels	New York
Chicago	Northern Virginia
Frankfurt	Orange County
Hamburg	Paris
Hong Kong	San Diego
London	San Francisco
Los Angeles	Shanghai
Madrid	Silicon Valley
Milan	Singapore
Moscow	Tokyo
Munich	Washington, D.C.

August 18, 2007

File No. 019304-0008

VIA FEDEX

Fred Hetzel
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612
510.622.2357 (ph.)
510.622.2460 (fax)
fhetzel@waterboards.ca.gov

Re: Appendix to Comments on California Regional Water Quality Control Board's Total Maximum Daily Load for PCBs in San Francisco Bay, Proposed Basin Plan Amendment, and Staff Report, June 22, 2007

Dear Mr. Hetzel:

On behalf of the California Chamber of Commerce (the "Chamber") and General Electric Company, we will be submitting public comment ("Comment Letter") to the California Regional Water Quality Control Board, San Francisco Bay Region ("RWQCB"), in response to the RWQCB's issuance on June 22, 2007 of a proposed Basin Plan Amendment and Total Maximum Daily Load (the "proposed TMDL") for polychlorinated biphenyls ("PCBs") in San Francisco Bay, and request for public comment on these proposed agency actions. The Comment Letter and an additional technical report will arrive, via email, under separate cover on August 20, 2007. Professor David Sunding will also be submitting under separate cover a technical report with supporting materials on behalf of the Chamber and General Electric Company.

You will find enclosed herein the appendix to the Comment Letter. We respectfully request that the enclosed appendix, as well as the Comment Letter and other materials submitted under separate cover, be given appropriate consideration, be placed in the administrative record for the Basin Plan Amendment and the proposed TMDL, and be maintained in RWQCB's records.

OC\907007.1

LATHAM & WATKINS LLP

For your convenience, we have included in the appendix the comment package we prepared on behalf of the Chamber and General Electric Company, and submitted to RWQCB on February 20, 2004, in response to the RWQCB's report dated January 8, 2004 entitled, "PCBs in San Francisco Bay Total Maximum Daily Load Project Report."

Sincerely,

Joshua T. Bledsoe
of LATHAM & WATKINS LLP

Enclosure

QEA
Quantitative Environmental Analysis, LLC
∂c/∂t

MEMORANDUM

TO:	Paul Singarella, Latham & Watkins	**DATE:**	August 17, 2007
FROM:	Jennifer Benaman, Ph.D. John P. Connolly, Ph.D., P.E., D.E.E. Elizabeth M. Lamoureux	**RE:**	Comments on San Francisco Bay Basin Plan Amendment and Related Staff Report
CC:	Files	**JOB#:**	GENfra:130

INTRODUCTION

The San Francisco Bay (Bay) Total Maximum Daily Load (TMDL) for PCBs Staff Report (Staff Report) sets the assimilative capacity of the Bay at an annual loading of 10 kg (San Francisco Bay Regional Water Quality Control Board [SFBRWQCB] 2007). It allocates that load principally among the Central Valley watershed, municipal wastewater dischargers, and urban stormwater. To meet the allocations, the Staff Report indicates that the Central Valley watershed load must be reduced by almost 90% and the urban stormwater load must be reduced by about 95%. It also indicates that remediation of Bay margin sediments with polychlorinated biphenyls (PCB) concentrations above the so called "ambient" concentration of 10 ug/kg will decrease the time necessary for the Bay to meet goals and standards once the load has been reduced to the TMDL. The Staff Report and the Basin Plan Amendment set out an implementation plan that relies on natural recovery for the Central Valley watershed, treatment for stormwater, and although unrecognized in the Staff Report, in order to meet their allocation, treatment will be required for certain municipal wastewater dischargers (SFBRWQCB 2007).

The actions advocated by the Staff Report and the Basin Plan Amendment are misguided because technical deficiencies and errors have yielded an inaccurate understanding of the assimilative capacity of the Bay and the PCB loadings to the Bay. If an accurate scientific assessment is made, different conclusions are supported. Primary among these are the following:

1. natural recovery is ongoing and the Bay will attain ambient sediment concentrations much lower than the current level of 10 ug/kg even if nothing is done to reduce external sources;

305 West Grand Avenue
Suite 300
Montvale, NJ 07645
(201) 930-9890
(201) 930-9805 *fax*

290 Elwood Davis Road
Suite 230
Liverpool, NY 13088
(315) 453-9009
(315) 453-9010 *fax*

80 Glen Street
Suite 2
Glens Falls, NY 12801
(518) 792-3709
(518) 792-3719 *fax*

800 Brazos Street
Suite 308
Austin, TX 78701
(512) 707-0090
(512) 275-0915 *fax*

2. the assimilative capacity of the Bay is much higher than the current estimate of 10 kg/yr because of a fundamental error in the model used to calculate the assimilative capacity and because the risk associated with fish consumption has been overstated;
3. the benefits of loading reduction are unknown because the loading estimates are highly uncertain and site-specific conditions have not been accounted for; and
4. remediation of sediment "hot spots" will be ineffective at accelerating recovery because of the influences of external sources, recontamination, and net sedimentation on PCB levels in these sediments.

These conclusions mean that the only reasonable approach is to institute an adaptive implementation (AI) plan that relies initially on natural recovery and monitoring to better quantify sources and their local and Bay-wide impacts. Sediment remediation should be abandoned and the benefit of reducing external sources should be weighed against the cost.

Natural Recovery

A long-term record of PCB levels in mussels, water, and sediment collected from multiple sites within the Bay shows consistent declines that have been ongoing for the last 20-plus years. The Staff Report fails to consider the extent of improvement that will be ultimately attained even without further control of PCB loadings to the Bay, despite the fact that concentrations are declining such that levels drop by half every 6 to 12 years. Within the next ten years, the "ambient" sediment PCB concentration may reach 5 ug/kg.

Bay Assimilative Capacity

The model used to establish the assimilative capacity of the Bay is flawed because it inappropriately reduced the outflow of PCBs from the Bay (see Specific Comment 2). When this error is corrected, the model indicates that the assimilative capacity of the Bay is 25 kg/yr, rather than the 10 kg/yr in the Staff Report.

The assimilative capacity is the loading estimated to result in a fish tissue PCB concentration of 10 ug/kg, which the Staff Report indicates, is the level that must be achieved to reduce cancer risk to an acceptable level. As discussed in Specific Comment 3, it is likely that no realistic cancer risk exists at this fish tissue concentration and the assimilative capacity of the Bay is greater than the 25 kg/yr calculated by the corrected model.

Benefits of Loading Reduction

The external loads of PCB to the Bay were estimated by simple gross analyses that were fraught with errors (see Specific Comments 5 and 6). As a result, the current loads to the Bay are effectively unknown. More importantly, the locations of those loads have been given no consideration in evaluating the benefits to the Bay of loading reduction (see Specific Comment 4). Thus, there is little understanding of how the load allocation will benefit the Bay. The immense costs associated with the implementation cannot be justified when the benefits are unknown.

Remediation of Sediment "Hot Spots"

The presumed effectiveness of "hot spot" remediation is predicated on the implicit belief that the "hot spots" are a major source of PCBs to the Bay and are inhibiting the recovery of the Bay. No analysis was done to demonstrate that "hot spots" are inhibiting recovery, and it is hard to envision that the Bay could recover faster than it is, as indicated by the trends in mussels, water, and sediment. The majority of the PCB mass is in the main Bay, not the "hot spots." Moreover, it is not known whether external sources are inhibiting the recovery of the "hot spots" themselves (see Specific Comment 7).

Remediation of "hot spots" would have only a limited impact on PCB levels in fish. This is so for three reasons:

1. PCB levels in water would be relatively unaffected and the PCBs in the fish originate, in part, from the water;
2. the fish of concern are not full-time residents of the "hot spots," rather they move around seeking prey and optimal temperature conditions; and
3. the sediments cannot be remediated to a PCB level lower than that of the main Bay; tidal mixing will recontaminate the sediments to this level.

Adaptive Implementation and Alternative Implementations

The proposed implementation plan fails to integrate the AI process, which is justified given the uncertainties in both the loading assessment and the merit of the proposed load reductions. AI is "learning while doing" and is most appropriate when there exists substantial uncertainties in loading assessments or benefits of loading reductions. AI entails significant monitoring in order to first reduce the uncertainty in the external loading quantifications and aid in implementing initial controls, where monitoring indicates they are both warranted and beneficial to Bay recovery. Although some text in the Staff Report mentions adaptive implementation, no specific details on how it will be applied to the Amendment are given. Furthermore, when adaptive implementation is mentioned, the Board indicates they will incorporate new and updated information into the TMDL, as it is available. However, the TMDL as it currently stands is not using up-to-date modeling or data to establish loads or determine the Bay's assimilative capacity. Finally, the proposed implementation plan ignores other feasible alternatives that should have been evaluated.

GENERAL COMMENTS

General Comment 1. The TMDL as presented in the Staff Report is not scientifically defensible due to errors in loading assessments, modeling, and allocation.

As discussed in the Specific Comments, there are numerous inaccuracies in the TMDL presented in the Staff Report. These inaccuracies include a one-box model that violates the basic conservation of mass principle, loading estimates derived from uncalibrated models and unrepresentative data, and loading assessments that ignore site-specific information and localized impacts. In addition, the TMDL failed to consider recent data and ignores the ongoing natural recovery in the Bay, as well as potential changes that may have occurred in the external loads. For these reasons, and others detailed in the specific comments, below, this TMDL is not defensible.

General Comment 2. Proper technical conditions do not exist to support the development of a TMDL.

The Clean Water Act indicates that "proper technical conditions" need to exist in order to adopt a TMDL. These conditions include 1) analytical methods; 2) modeling techniques, and 3) data necessary to develop a technically defensible TMDL. As mentioned in General Comment 1 and in the Specific Comments below, there are insufficient data to properly define the current loads. In particular, the data supporting the loading estimated for the alleged largest sources of PCB (the Central Valley and urban stormwater) are so poor that the loadings are effectively unknown. The Central Valley load was established with non-representative data and the stormwater loads were established with an uncalibrated model that fails to even consider true storm conditions. More data must be collected in order to accurately assess these two loads. Specifically, storm event data on tributaries to the Bay are necessary to calibrate any watershed model that may be used to establish existing non-point sources loads and data representing the PCB concentrations of the freshwater flow from the Central Valley are vital to estimating the impact of this large and somewhat uncontrollable load to the Bay. Without these data, development of a defensible TMDL cannot be supported.

General Comment 3. The complexity of the San Francisco Bay supports the need for more data collection to better define loadings to the Bay and a more complex model to describe the fate and transport of PCBs in the Bay.

San Francisco Bay is a complex estuarine system that includes tidal and land-side influences. The Bay's large watershed is heterogeneous in terms of land use. This characteristic leads to spatial differences in non-point source loadings. In addition, the temporal nature of non-point source storm loadings is complex, with research showing that a majority of stormwater loadings enter bays and lakes usually over a relatively short period of time (Longabucco and Rafferty 1998). Portions of the Bay are depositional, indicating burial of PCBs may be occurring with cleaner sediments. The dilution effect of tides also strongly influences the Central Bay. These tidal and land-side influences result in significant spatial differences in water and sediment residence times within different segments of the Bay. For these reasons, the processes that govern the fate and transport of PCBs in the Bay vary, depending on location in the Bay. Given the complexity of the system, more rigorous modeling is necessary to accurately represent the assimilative capacity of the Bay, as well as the external loading from stormwater and the Central Valley. The use of a simple one-box model to describe PCB fate and a steady-state model to estimate stormwater loads is not supportable, given the complexities and availability of other modeling tools for the system.

SPECIFIC COMMENTS

Specific Comment 1. Natural recovery is occurring and should have been considered in the load allocation in the Basin Plan Amendment.

- **Data are available to evaluate the rate of natural recovery and should be considered.**
- **Natural recovery is occurring and should be a key component of the implementation plan.**
- **Natural recovery should be evaluated consistently in Basin Plan Amendment implementation and alternatives evaluation.**

An accurate assessment of natural recovery is important to understanding the assimilative capacity of San Francisco Bay and thus is essential to the correct development and implementation of the Basin Plan Amendment. The Staff Report identifies the rate of natural PCB attenuation as a critical data need (page 74):

> *A better understanding of local rates of natural attenuation is needed in order to predict with more certainty the recovery time of the Bay from PCBs impairment.*

Yet, the Staff Report does not include an analysis of the rate of natural PCB attenuation despite the availability of long-term PCB monitoring data. The Staff Report contains statements acknowledging recovery from historical PCB levels (page 22):

> *Over time, the frequency of deployed bivalves with tissue PCBs concentrations less than the screening level of 70 nanograms per gram (ng/g) dry-weight...has increased (Figure 5), indicating potential improvement of the Bay relative to PCBs.*

Thus, it is unclear why no attempt has been made to quantify the rate of improvement.

Data available to evaluate natural attenuation include measurements of PCB concentrations in mussels, water, sediments, and fish. Below, we present analyses of these data showing that PCB levels in the Bay are dropping. For these analyses, data have been aggregated into North, Central, and South regions of the Bay (Figure 1).

Transplanted mussels were sampled annually at several locations within San Francisco Bay from the early 1980s to 1991, and sporadically thereafter as part of the California State Mussel Watch Program (SMW). Transplanted mussels have also been sampled by the Regional Monitoring Program (RMP) since 1994. Annual mean total PCB concentrations of the SMW and RMP samples are presented in Figure 2. In all three regions, mussel PCB concentrations decline with half-lives ranging from 6 to 12 years. This range includes declines based on the RMP data only, the SMW data only, and the RMP and SMW data combined. Thus, the rate of decline over the last decade is comparable with the rate measured in the previous decade. Further, the comparable decline rates between programs indicate that the overall rate of decline cannot be discounted "due to changing analytical procedures over time" (Staff Report, page 22).

Dissolved and total PCB water column PCB concentrations have been measured in the Bay through the RMP program since 1993. Annual average water column PCB concentrations based on these data are presented on Figure 3 in units of picograms per liter (pg/L)[1]. As shown, the rate of decline in water column PCB concentrations is similar to that of the mussels, with half-lives ranging from 6 to 12 years.

The RMP program has also collected surface sediment samples in the Bay since 1993. Annual average concentrations are shown on Figure 4. Sediment PCB concentrations in the Central and South regions of the Bay have declined at rates comparable to the declines in mussel and water column concentrations, with half-lives of 8 and 10 years, respectively. The rate of decline in the North region of the Bay is slower, with a half-life on the order of 20 years, possibly reflecting the low PCB concentrations in this region of the Bay and the potential for problems associated with being near the detection limit for the PCB measurement method.

In addition, sediment cores collected within San Leandro Bay show evidence of natural attenuation, with the highest PCB concentrations buried below the surface in 9 of 16 cores (San Francisco Estuary Institute [SFEI] 2000, Figures 5a and b). This provides strong evidence for natural recovery by burial. Because these cores were sliced at 1-foot intervals, the coarseness of the segmentation is expected to mask recovery if burial rates are relatively low. The high-resolution core collected in Richardson Bay illustrates this point (Staff Report, Figure 8). This core exhibits a very clear buried peak, although if it was segmented at 1-foot intervals, the 0-to1-foot and 1- to 2-foot segments would exhibit similar concentrations, masking the extensive recovery that has occurred. Thus, the cores collected from San Leandro Bay and Richardson Bay and a core from San Pablo Bay, cited in the Staff Report, all support the conclusion that recovery is ongoing.

[1] One picogram per liter of PCBs in San Francisco Bay is equivalent to approximately one teaspoon of PCB oil in all of San Francisco Bay.

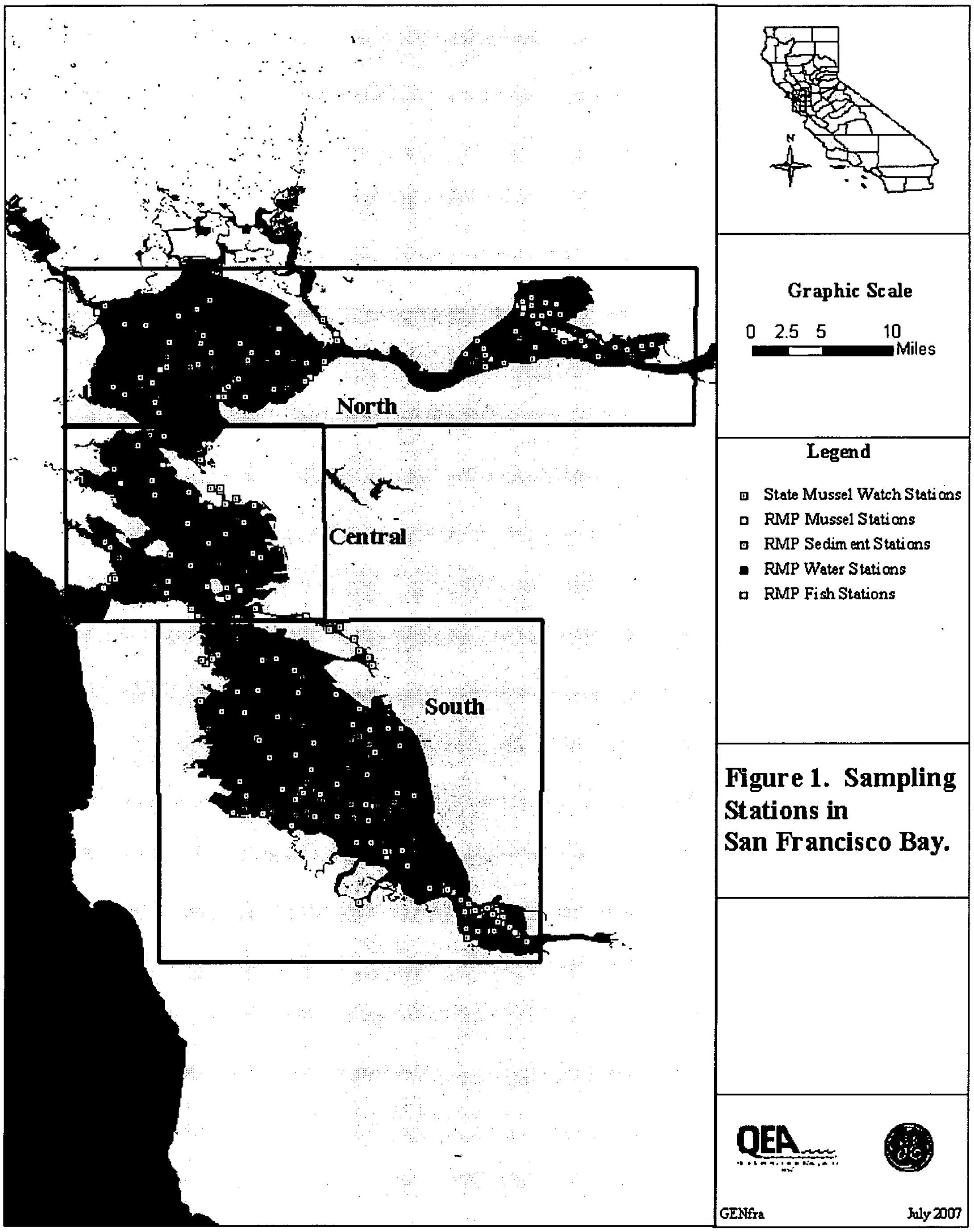


Figure 1. Sampling Stations in San Francisco Bay.

\\Ophion\D_Drive\GENfra\GIS\sampling_stations_TMDL_Comments.mxd

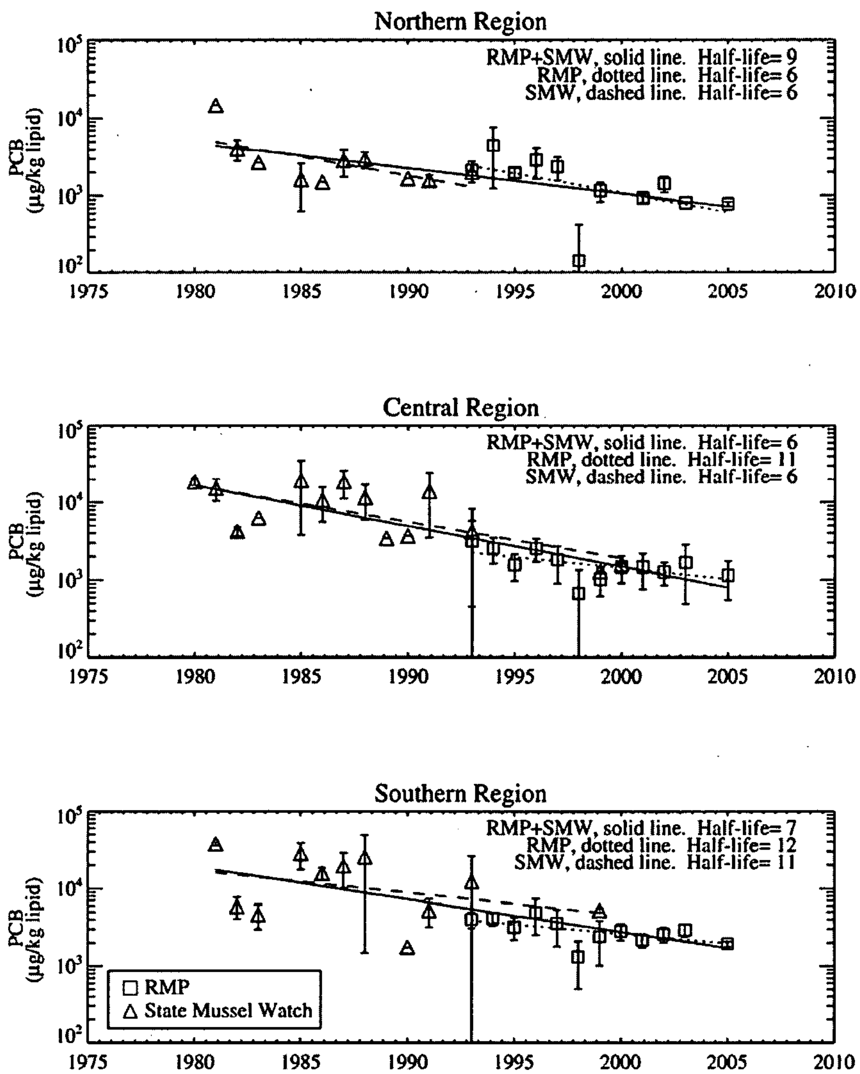


Figure 2. Trends in PCB concentrations in San Francisco Bay: Transplanted mussels.

Data Sources: RMP and State Mussel Watch (7/2007)

SJR - \\ophion\d_drive\GENfra\Analysis\exploreRMP\pcb_temporals_mussels_regression.pro
Thu Aug 16 15:19:33 2007

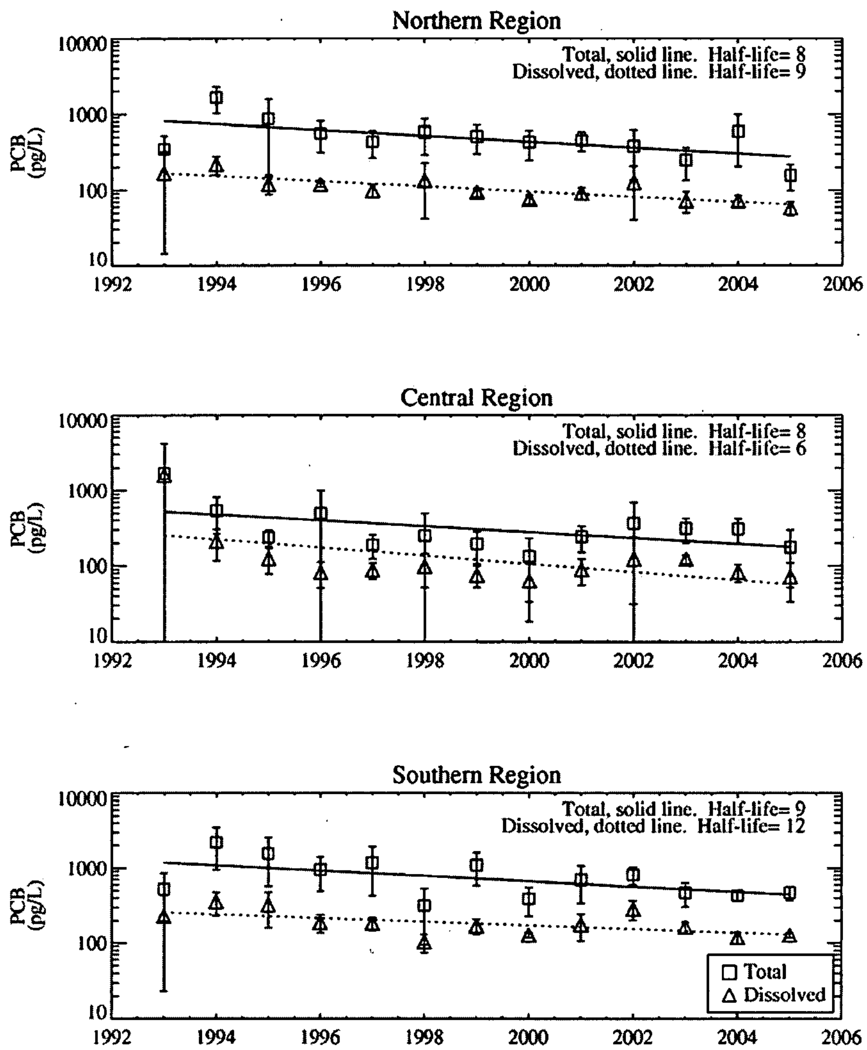


Figure 3. Trends in PCB concentrations in San Francisco Bay: Water.

Data Sources: RMP (7/2007)

SJR - \\ophion\d_drive\GENfra\Analysis\exploreRMP\pcb_temporals_water_regression.pro
Mon Aug 13 16:04:37 2007

The RMP program has also measured PCB concentrations in fish sampled from the Bay since 1994. Total PCB concentrations of individual fish species over time are shown in Figure 6. The data are noisy and the time trends are not consistent among species, but given the natural variability in fish PCB levels due to size differences, changes in diet, movement patterns, etc., the data are too limited for independent trend analysis.

Despite the considerable year-to-year variability in the fish PCB data, there is some evidence that levels have been declining in response to declines in exposure evident in water, sediment, and mussel data. Figure 7 shows the recent trends in shiner surfperch and white croaker in the RMP data. With the exception of shiner surfperch in the southern Bay, the declines in the PCB concentrations of these fish are consistent with the decline rates calculated for the mussels, water, and sediment. Overall, the fish-tissue levels have been declining at rates not inconsistent with those seen in water, mussels, and sediments.

The Staff Report states that "there does not appear to be a decrease in PCBs concentrations [in white sturgeon] over the last 20 years." However, Greenfield et al. (2003) acknowledge that trends may be confounded by interannual variability in PCB exposure, due to variability in fish movement patterns, diet, and the sampled population between years. Thus, because of the limited amount of the data (few samples are available for sturgeon), the unclear interpretation of these data and the presence of confounding factors, these data should not be cited as evidence that natural recovery is not occurring

In summary, the mussel, water, and sediment data show evidence of recovery with half-lives of approximately 6 to 12 years. Sediment cores show clear evidence of attenuation as well. The fish data are too limited for quantitative trend analysis; however rates of decline in some species that are consistent with those measured in other media suggest that trends in fish support the conclusion of ongoing recovery. Thus, the weight of evidence indicates strongly that PCB levels within San Francisco Bay are recovering with half-lives of between 6 and 12 years; that recovery is occurring in the South, Central, and North regions of the Bay; and that the rate of recovery does not appear to be slowing. As a result, using the current estimate of ambient PCB concentration (10 ug/kg), PCB levels may reach 5 ug/kg in the next 6 to 12 years. These data and conclusions are critical to the development of proposed loading reductions and to the development of an effective implementation plan and should be included in the Basin Plan Amendment.

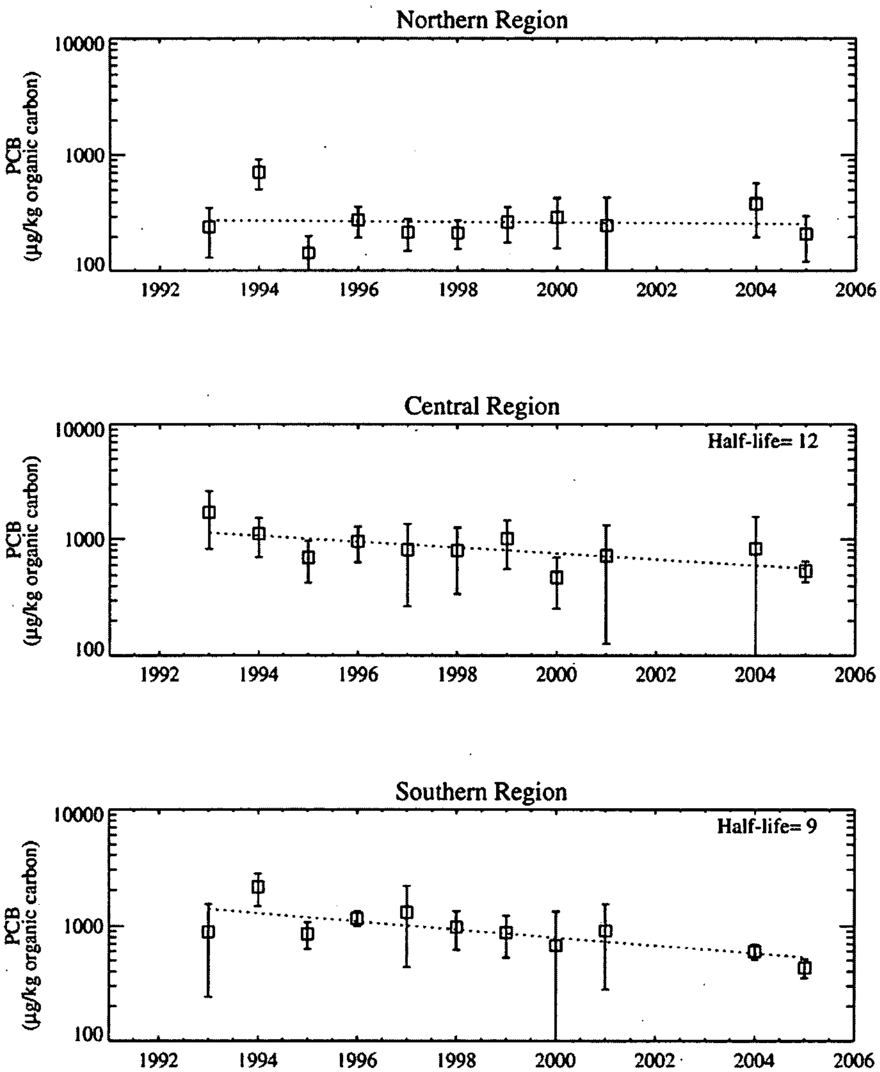


Figure 4. Trends in PCB concentrations in San Francisco Bay: Sediments.

Data Sources: RMP (7/2007)

Nondetects set to the mean detection limit of all PCB congeners. Data from 2002 and 2003 has been excluded.

SJR - \\ophion\d_drive\GENfra\Analysis\exploreRMP\pcb_temporals_sediment_regression.pro
Thu Aug 16 15:22:09 2007

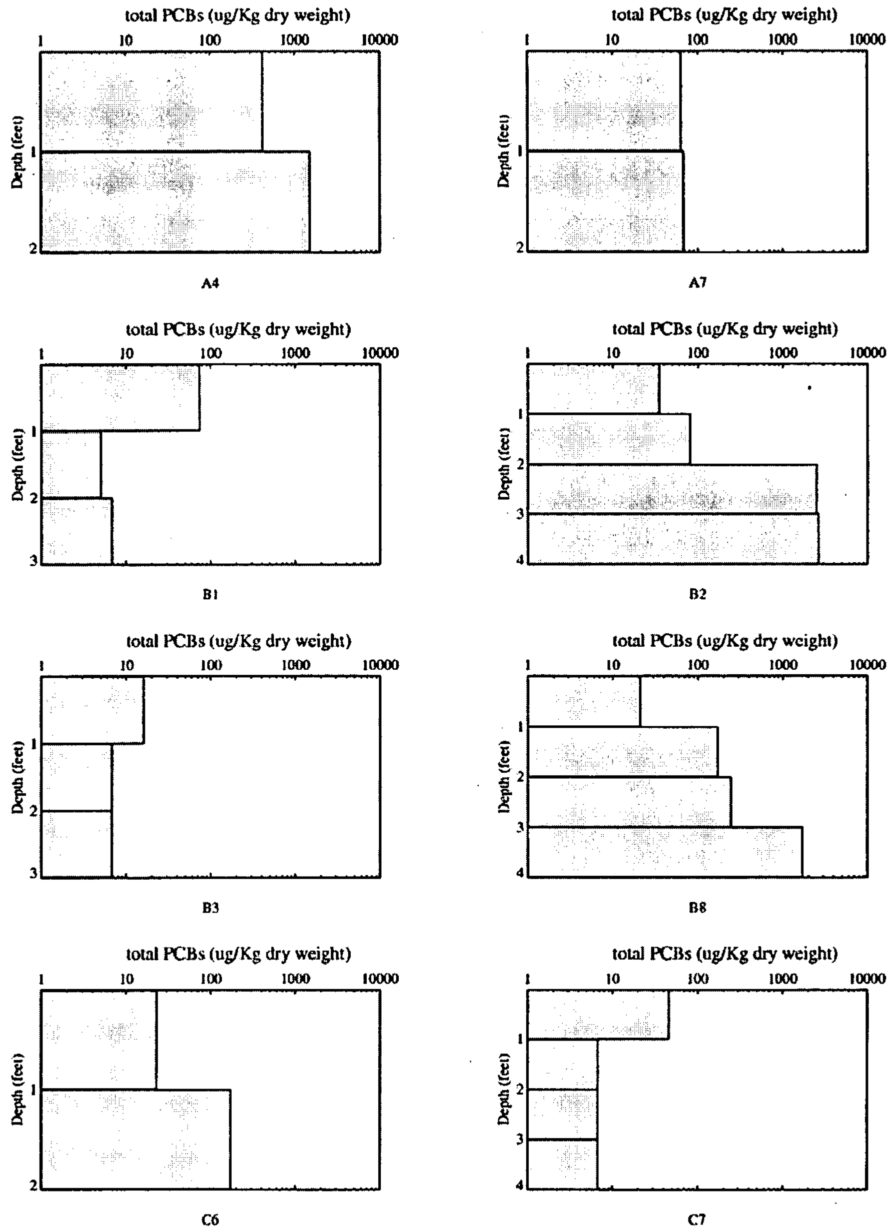


Figure 5a. Sediment Core Profiles from San Leandro Bay.

Data Source: Sediment Contamination in San Leandro Bay, December 2000.
Non-detects were set at 1/2 the average 1998 RMP detection limit.

BL - D:\GENfra\analysis\SanLeandro_cores_log_test.pro
Thu Feb 19 11:06:56 2004

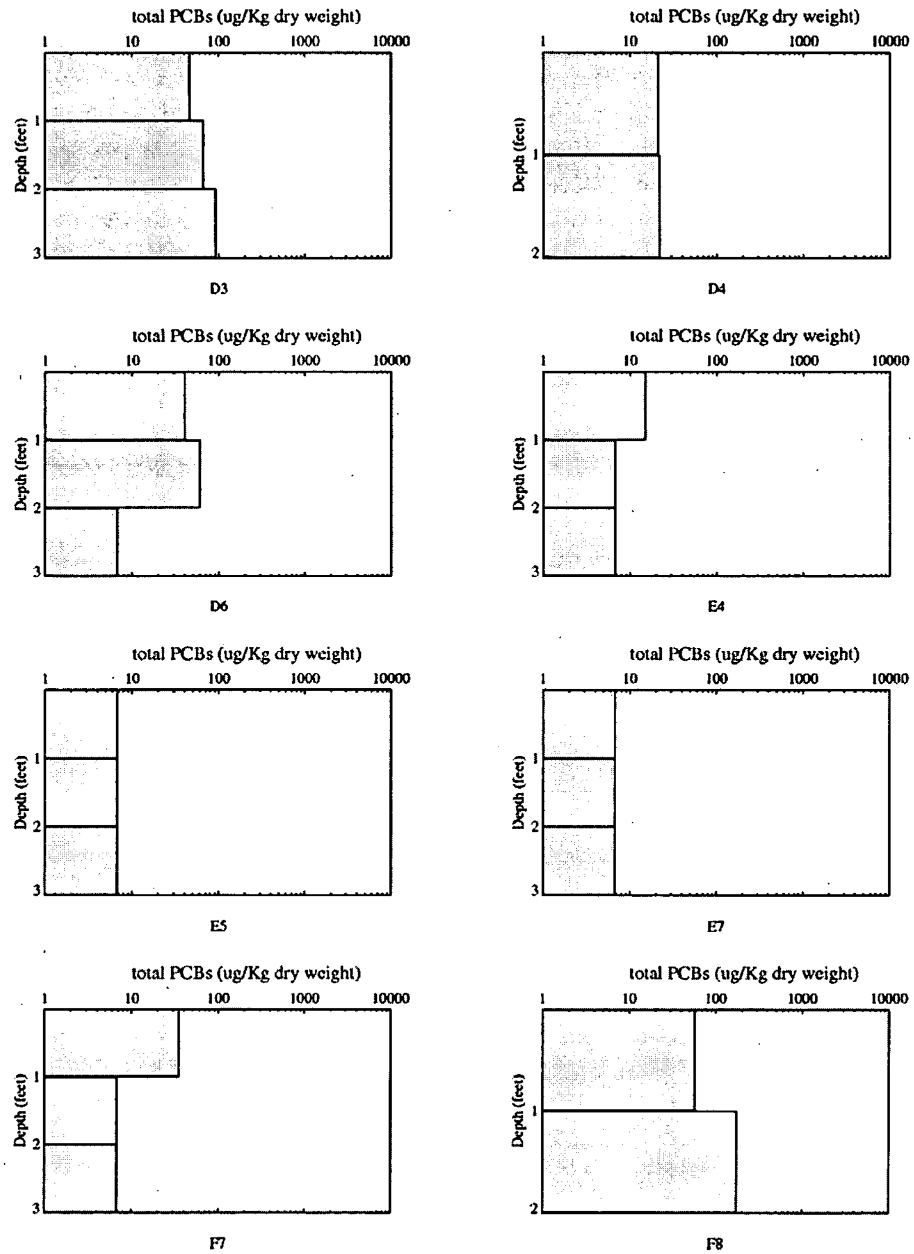


Figure 5b. Sediment Core Profiles from San Leandro Bay.

Data Source: Sediment Contamination in San Leandro Bay, December 2000.
Non-detects were set at 1/2 the average 1998 RMP detection limit.

BL - D:\GENfra\analysis\SanLeandro_cores_log_test.pro
Thu Feb 19 11:06:57 2004

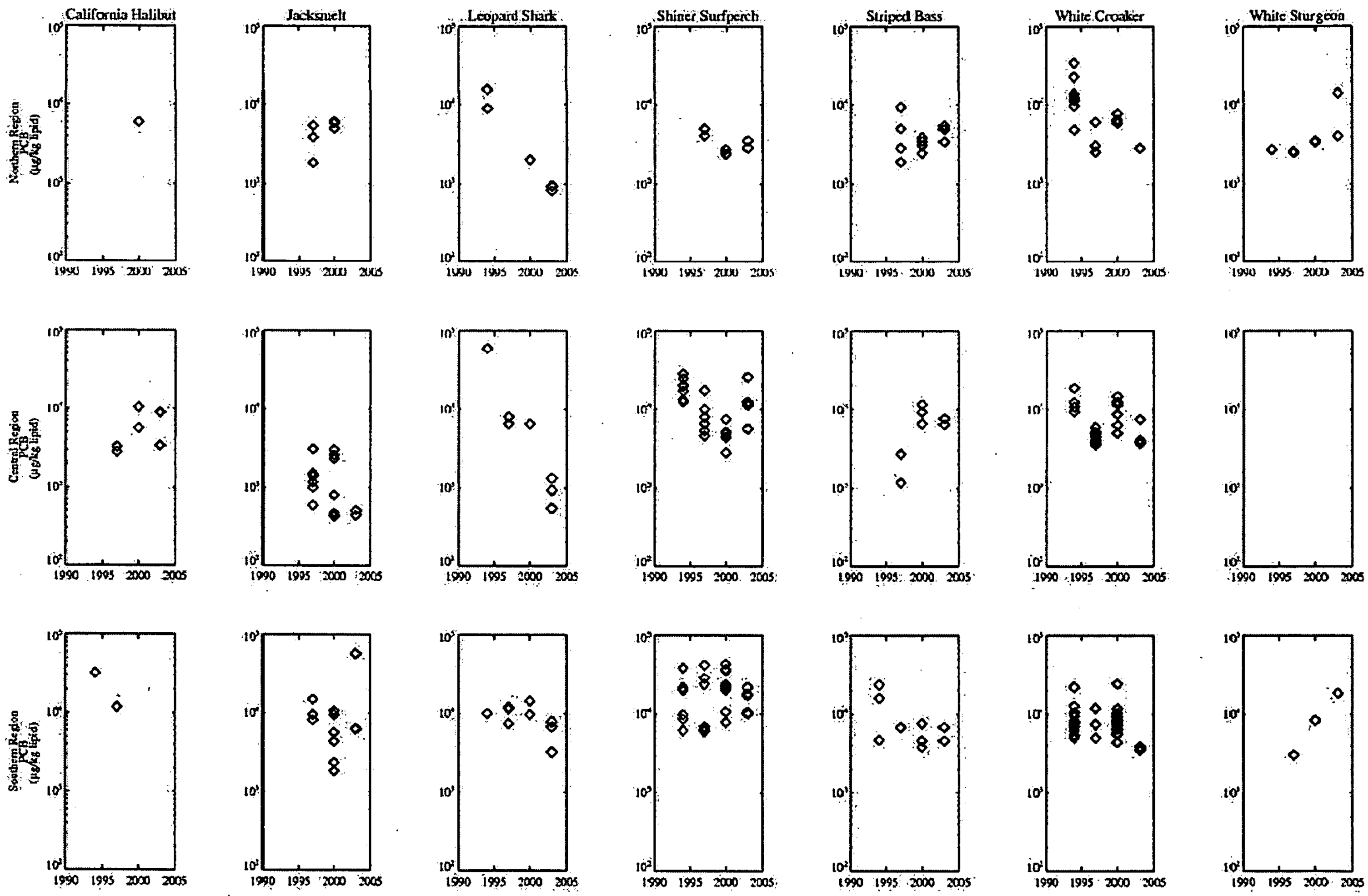


Figure 6. Trends in PCB Concentrations in San Francisco Bay: Fish.

Data Sources: RMP (7/2007)

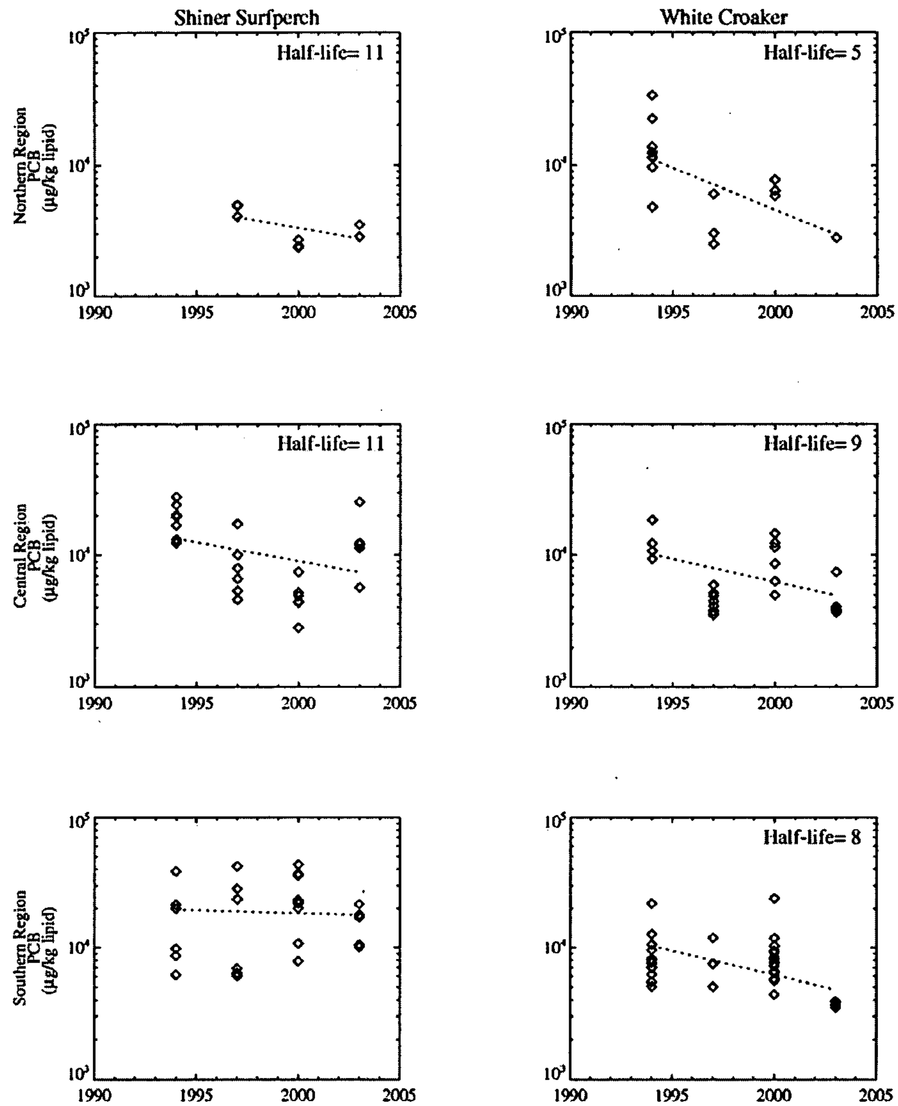


Figure 7. Trends in PCB Concentrations in San Francisco Bay: White croaker and shiner surfperch.

Data Sources: RMP (7/2007)

SJR - \\ophion\d_drive\GENfra\Analysis\exploreRMP\pcb_temporals_fish_SS_WC_regression.pro
Mon Aug 13 17:05:54 2007

The Staff Report is entirely inconsistent in terms of the evaluation of natural recovery. As described above, sufficient data are available to evaluate and quantify natural recovery; yet it is identified as a critical data need (page 74). Then natural recovery is relegated to the No Project Alternative, which is discounted as unacceptable because it "would not achieve the objectives established for the Bay" (page 77). This is contradictory; how can the RWQCB draw this conclusion without consideration of ongoing natural recovery? Further, the implementation plan for the Central Valley load is natural recovery (Staff Report, page 66), despite the significant uncertainty associated with the Central Valley load. The implementation plan for in-Bay contaminated sediments places the burden of quantification of natural attenuation on the responsible party, despite the fact that data are available to be considered in the TMDL. The Basin Plan Amendment should consider natural recovery consistently, and natural recovery should not be discounted as an alternative.

Comment 2: The one-box model used to establish the assimilative capacity of the Bay is flawed, provides inaccurate predictions of the response of the Bay to loading changes, and underestimates the assimilative capacity of the Bay.

- **The model violates the basic principle of mass balance.**
- **The model assumes a level of PCB contamination in the Bay that is at variance with data.**

The assimilative capacity of 10 kg/yr was calculated using the one-box model of the Bay developed by Davis et al. (2006). The components of the model are shown in the figure below:

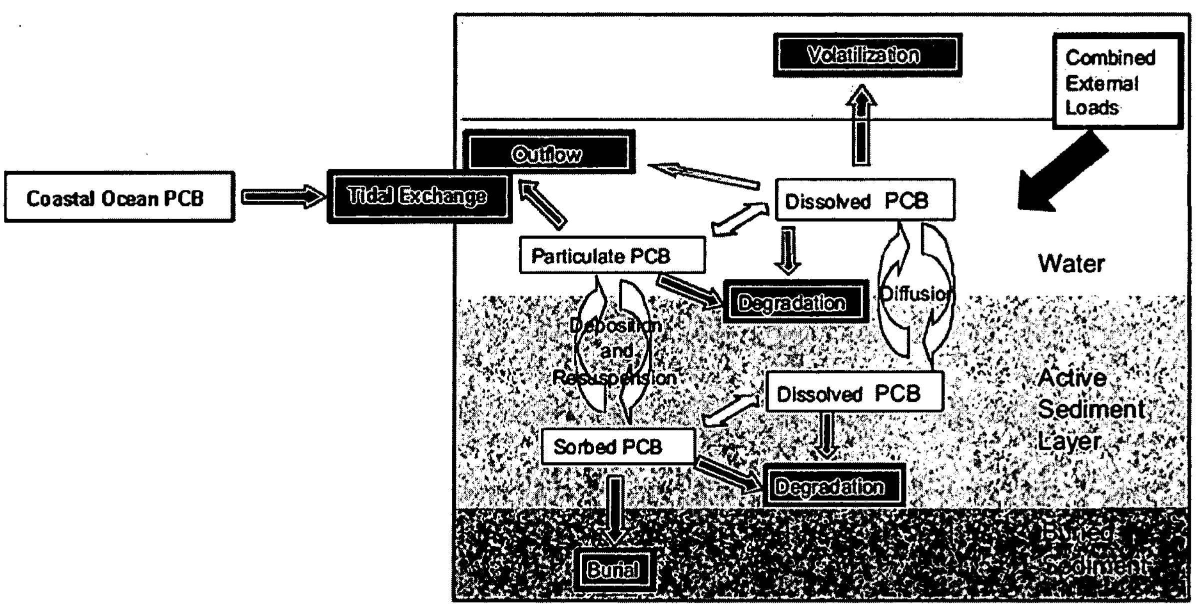


Figure 8. Schematic of the components of the Davis model (Davis et al. 2006).

The model derives from mass balance principles that are described in DiToro and Paquin (1984). However, Davis et al. deviated from these mass balance principles by applying a scale factor to reduce the PCB losses through outflow and tidal exchange "... in recognition of the fact that the water column concentrations near the Golden Gate and available for loss through outflow are lower than the Bay average" (Davis et al. 2006). This scaling is based on flawed logic. From the Bay through the Golden Gate to the ocean, water column PCB concentrations decline as Bay water mixes with ocean water. This mixing is the reason that salinity increases from the Bay through the Golden Gate to the ocean. According to the Davis et al. logic, the decline in PCB concentration results from some mechanism not included in the model that causes PCB load to decline as water moves toward the ocean. However, no mechanism is postulated and dilution is not considered. In fact, dilution is the best explanation for the PCB concentration decline, and dilution reduces concentration but not load, respecting conservation of mass. Thus, it was wrong to scale back the PCB loss from the Bay due to outflow and tidal mixing

Davis et al. rely on the estimate of tidal flow through the Golden Gate made by Connolly et al. (2005). The one-box model of salinity in the Bay used by Connolly et al. is analogous to that developed by Davis et al. but, consistent with mass balance principles, did not scale the salt flux at the Golden Gate, even though the salinity at the Golden Gate differs from the average salinity in the Bay (it is higher). By using the Connolly et al. estimate of tidal flow, Davis et al. were inconsistent in the application of their scaling concept and exacerbated the error it introduced. To be consistent, they would have had to derive a tidal flow estimate from a salinity model that scaled up the outflow to account for the higher than average salinity at the Golden Gate load. This upward scaling of flow would have negated their downward scaling in their PCB model, resulting in a model that correctly had no scaling.

The downward adjustment of outflow load causes the model to miscalculate the rate at which PCBs leave the Bay. This causes the model to miscalculate the assimilative capacity of the Bay. Absent the downward adjustment, the model indicates that the assimilative capacity of the Bay is 25 kg/yr. This fact can be seen in Figure 9, which shows the predictions of the corrected model for external loads of 80 and 25 kg/yr, as well as the trend lines at natural recovery rates with half lives of 6, 8, and 12 years. Note that the trend predicted by the corrected model under current estimated external loading (80 kg/yr) is consistent with the current natural recovery trends, providing validation of the model. At an external load of 25 kg/yr, the model predicts attainment of the active sediment layer PCB mass target of 160 kg, which equates to a PCB concentration of 1 ug/kg.

Another issue with the model in the Staff Report is its assumption that the mass presently in the active sediment layer (top 15 cm) of the Bay sediments is 2,600 kg. Section 7.1 of the Staff Report presents calculations that would yield mass values in the range of 1,600 to 1,800 kg at PCB concentrations of 10 ug/kg to 11 ug/kg. Based on an analysis of the contemporary PCB concentrations measured in the Bay surface sediments, we have estimated that the mass is about

1,500 kg.[2] This error affects the trend predicted by the model. As seen in Figure 9, the correction of this error and the flux scaling error result in a predicted trend that is consistent with the rate of observed natural recovery in the Bay.

The one-box model includes additional flaws that affect the calculation of the Bay's assimilative capacity (i.e., the model neglects burial, which occurs particularly in certain near-shore areas of the Bay). The Staff Report acknowledges the limitations of the one-box model and identifies a more complex model as a critical data need (Staff Report, page 74). Therefore, reliance on the one-box model to evaluate the assimilative capacity of the Bay is premature. A multi-box model would allow for representation of areas of the Bay that have differing characteristics, resulting in a better understanding of the interactions and kinetics that control PCB fate in the Bay. With a system as complex as San Francisco Bay, a multi-box model is justified and has been developed by researchers (Leatherbarrow et al. 2005), yet it is not used in the TMDL.

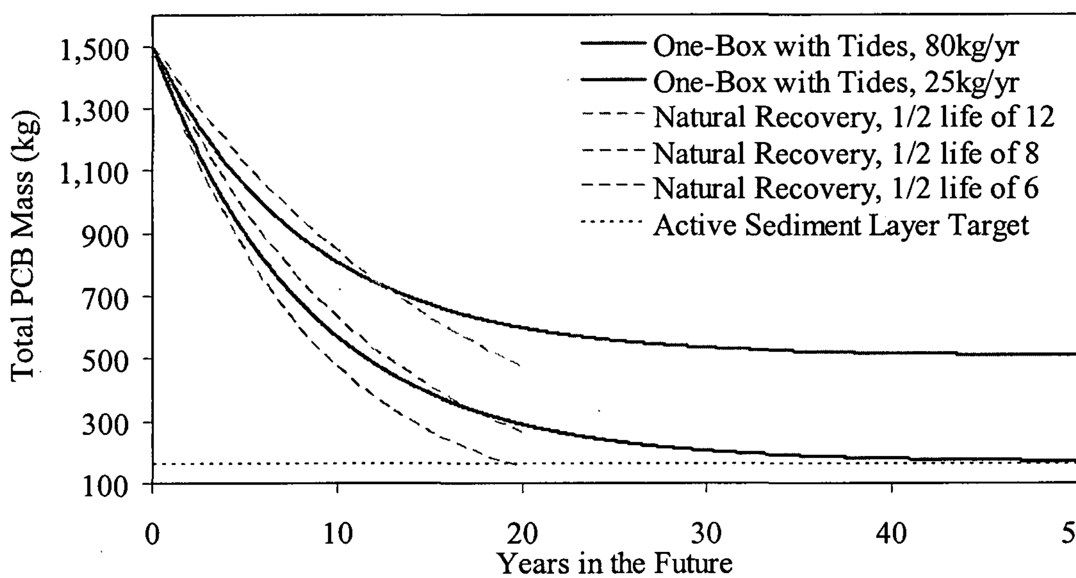


Figure 9. Corrected one-box model prediction of PCB mass in the active sediment later of the Bay under assumed current external loading of 80 kg/yr and a reduced loading of 25 kg/yr. Also shown for comparison is the range of declines estimated from the data-based estimate of ongoing natural recovery.

[2] 2000-2001 NOAA Environmental Monitoring and Assessment Program (EMAP) data and 2000, 2001, 2004, and 2005 RMP data were combined to establish surface sediment locations throughout the Bay. Theissen polygons were developed to set the "area of influence" of each sample for near-shore and open Bay sediments. These areas were used, combined with PCB concentration, a depth of 15 cm, and an estimate of percent solids when percent solids was not directly measured, to determine a mass of PCBs in each Theissen polygon. The delineation of the near-shore area was hand drawn in shallow areas, based on bathymetry data, between near-shore (BPTCP) and open Bay (RMP) sampling locations, and does not represent any statistical analysis of the sediment data.

Comment 3: The fish tissue target is unreasonably conservative and unrealistic and has contributed to an underestimate of the assimilative capacity of the Bay.

- **The fish target is based on multiple levels of conservatism.**
- **The evaluation of the fish target with two species that are consumed infrequently by anglers and cannot be caught year-round introduces yet another level of conservatism.**

The fish PCB target of 10 ng/g is unreasonable because it is based on multiple levels of conservatism which, when combined, results in an unrealistic target not representative of any true risk. First, the fish consumption rate of half a pound per week (32 g/d for 7 days) is extremely conservative, as it is based on the 95th percentile upper-bound estimate of fish-consuming anglers[3]. The Staff Report states that this "conservative estimate constitutes, in effect, a margin of safety for the TMDL" (page 23). However, conservatism is already incorporated several-fold into the screening value calculation; the calculation incorporates an acceptable risk level of 10^{-5}, an upper-bound cancer slope factor that is twice the best estimate (i.e., the best estimate is 1, whereas the upper bound estimate typically used is 2; USEPA 1996), and local fish consumption is assumed year-round. Thus, conservatism is built into every parameter in the calculation, resulting in a value that is practically meaningless in terms of the potential risk from consumption of Bay fish. Taking a simplistic view, we can begin with the general populations' lifetime risk of being diagnosed with invasive cancer from all causes of 40.93% (National Cancer Institute [NCI] 2007). If we look at a group of 200,000 people, about 81,860 (200,000 x 40.93%) would be expected to be diagnosed with cancer during their lifetimes. The fish target has been set such that all 200,000 of these people would have to eat half a pound of San Francisco Bay fish every week for 70 years to expect that one more person in this group would get cancer (using the central tendency cancer slope factor of 1). This simple analysis has ignored the fact that the one additional cancer could occur in an individual already in the group of 81,860, so that the fish consumption might not cause cancer in someone who would otherwise have been cancer free. It has also ignored the fact that the consumption of fish may provide some protection against cancer. In any event, it is likely that much fewer than 200,000 people eat half a pound of San Francisco Bay fish every week for 70 years, and therefore there is little likelihood of any additional diagnoses of cancer if fish PCB concentrations in San Francisco Bay averaged 10, 20, or even higher.

The Staff Report proposes to evaluate attainment of this overly conservative target with white croaker and shiner surfperch. This introduces yet another level of conservatism because these fish are not among the most frequently consumed fish; white croaker was consumed by less than 20% of local anglers and shiner surfperch by less than 5% (SFEI 2001), although they tend to have higher PCB concentrations than other species. Further, both these species migrate

[3] The 95th percentile was particularly biased high in the Seafood Consumption Survey (SFEI 2001) because that the median consumption rate was 0 g/d, given that 53% of the surveyed anglers did not consume any fish.

seasonally and are not available for local consumption year-round (California Department of Fish and Game 2007).

Comment 4: The external loading estimates lack the spatial and temporal variability necessary to set a TMDL or establish an implementation plan.

- **Urban stormwater loading is grossly estimated with basin-wide averages and steady-state calculations, which do not provide the temporal and spatial variability critical to understanding the impact of stormwater loading.**
- **The loading assessment developed for the point source dischargers, specifically, the municipal dischargers, does not utilize site-specific information when appropriate and therefore, underestimates the impact of larger dischargers into the Bay.**
- **Not requiring any reduction in the point source dischargers (specifically the publicly owned treatment works [POTWs]) ignores the localized impact of the larger dischargers on the Bay recovery.**
- **Some areas of elevated PCB concentration may be controlled by external sources and external source controls may allow relatively rapid natural recovery to main Bay PCB levels (i.e., about 10 ug/kg).**
- **A site-specific assessment is necessary to determine where in-Bay sediment remediation would have a meaningful benefit and how localized that benefit would be.**

URBAN STORMWATER RUNOFF

The Staff Report provides estimates of external loads from urban stormwater and point source dischargers (i.e., POTWs and industries). However, these loads were established using gross averages that lack the specificity needed for a proper and precise load allocation in a TMDL. Reliance on gross estimates of Bay-wide loads from stormwater, tributaries, and POTWs leads to an impractical and potentially ineffective load allocation. Consequently, this approach could lead to the failure to achieve water quality goal in some areas of the Bay and to the overachievement in others.

The 40 kg/yr PCB load from urban stormwater is based on an analysis using a steady-state rainfall-runoff model, estimates of total suspended sediment (TSS) concentrations originating from different land uses, and sediment PCB concentrations (that is the median of PCB concentration measured in storm pipe sediments draining different types of land uses, e.g., residential, industrial, commercial; Kinetic Laboratories, Inc. [KLI] 2002). By applying the median PCB concentration for each land use to all sub-watersheds, the analysis ignores the spatial variation in stormwater PCB concentrations that is evident from site-specific data. For example, in San Mateo County, the average PCB concentration (not normalized to percent fines) is 1042 ug/kg (614 ug/kg when dropping one high outlier; KLI 2002), whereas the average from Alameda County is 156 ug/kg (KLI 2002) – four times lower than San Mateo County. Given these differences, loads from each sub-watershed should have been estimated using the site-specific information and the basin-wide median (or perhaps average) should have been applied only in sub-watersheds lacking data. This site-specific approach would allow the load allocation to be more site-specific and focus on areas of the Bay that have the greatest potential of recontamination by stormwater runoff.

Reliance on a steady state rainfall-runoff model compromises the urban stormwater load estimate, because it does not account for the peaking that is inherent in stormwater loads, nor the variability of PCB concentrations during a storm event (see McKee et al. 2005 for discussion; PCB concentrations tend to be higher on the rising limb of a storm event). Previous research on stormwater loading indicates that a majority of the loads enter systems through storm events (see McKee et al. 2005; Longabucco and Rafferty 1998). By assuming the loads enter in a steady fashion (both in concentration and volume), the full impact of the load to the Bay during storms is not incorporated. In order to understand the impact of these stormwater loads on the Bay and allocate the load appropriately in the implementation, both the spatial and temporal variability need to be considered. If we believe the 40 kg/yr loading, but say, 80% of it enters the Bay during a relatively short period and is concentrated within a few specific areas; the approach to reducing those loads would be different than if we were to assume the load is evenly distributed in both space and time. McKee et al. (2005) highlight the importance of understanding the timing of stormwater loads as well:

> *In understanding the impact of runoff from Guadalupe River (and other tributaries) on water quality in the Bay, it is important to consider how Bay waters and sediments assimilate contaminant load pulses of varying time duration. It is reasonable to hypothesize that short-duration pulses of a certain magnitude of contaminant load entering the South and Lower South Bays will create greater localized storage of contaminated sediment compared to longer-duration loads of an equal magnitude that allow more time for in-Bay processes of dilution, deposition, burial, and/or advection to mitigate the impacts of the contaminant load. The differences that may occur due to this phenomenon, along with added complexities of transport of constituents from freshwater to tidal waters, highlight a need for greater understanding of the fate of runoff-derived contaminant loads entering the Bay.*

To capture the spatial and temporal variability, site-specific and time variable models should be developed to understand those areas that are believed to have the most impact on the Bay. In addition, data should have been collected to allow direct estimates of flow, TSS load, PCB load from storm drains by monitoring stormwater coming from the storm drains entering the Bay (similar to the work performed by McKee et al. [2005] on the Guadalupe River). Only after these types of models are developed and calibrated to site-specific data can a proper and logical load allocation and implementation plan be proposed and tested.

PUBLICLY OWNED TREATMENT WORKS (POTWS)

The loading attributed to point source dischargers is inaccurate due to the use of non-facility specific average PCB concentrations assigned by treatment level and effluent flows that do not account for seasonal variability or permitted flow limits. The Staff Report uses annual average current flows per facility and average concentration to establish load from the point source dischargers, which, for the most part, underestimate the load to the Bay. A proper estimation of these loads would utilize site-specific PCB concentrations where available and treatment level-appropriate averages when site-specific data are not available. To account for future growth, the flows used in the loading calculation should be the fully permitted amounts and should consider wet weather permitted flows, instead of current, annual operating averages that are based on monthly averages of daily flow data from the plants. For example, the Staff Report uses PCB water column averages applied across treatment level and annual daily operating flows, based on an unspecified year to calculate the total load for POTWs at 2.3 kg/yr. Applying site-specific averages for the largest dischargers (Central Costa County Sanitary District [CCCSD]; East Bay Dischargers Authority [EBDA]; East Bay Municipal Utility District [EBMUD]; and City and County of San Francisco [CCSF]) and treatment level averages for the rest of the POTWs with fully permitted dry weather flows, the total load is 3.1 kg/yr or 35% higher than the estimate in the TMDL. This 0.8 kg/yr increase corresponds to 8% of the targeted 10 kg/yr and would impact the implementation plan, as currently presented in the Basin Plan Amendment. The Staff Report should have considered site-specific information, where available and accounted for future growth by using permitted flows in their loading calculation. By applying gross averages to all facilities, even those that have site-specific information available, the proposed implementation plan does not provide the assurance that the water quality objective can be attained in all portions of the Bay – especially for the major point source dischargers to the Bay. Localized contributions of POTWs are significant and should be considered.

For example, the load from the EBMUD POTW can be analyzed relative to its surrounding watershed load and localized sediment concentrations near its discharge. The EBMUD POTW located near Oakland discharges into San Francisco Bay adjacent to the San Francisco-Oakland Bay Bridge, approximately 5,700 feet from the eastern shore. Assuming the northern third of the East Bay Cities Watershed contributes to the load in the Bay near the EBMUD POTW discharge, urban runoff can be directly compared to the EBMUD POTW contribution of PCBs in this area. Urban runoff loading from the East Bay Cities' sub-watershed has been estimated from a low value of 1.2 kg/yr to a high of 16 kg/yr with a median of 5.7 kg/yr (KLI 2002). If one-third of the East Bay cities' load is assumed to contribute to the load in the vicinity of EBMUD POTW's discharge, then the sub-watershed load that contributes to the Bay within this area is approximately 0.4 kg/yr (low), 1.9 kg/yr (median), and up to 5.3 kg/yr (high). The EBMUD POTW loading calculated using permitted daily annual dry weather flow and site-specific PCB concentration is 1.1 kg/yr. Consequently, the EBMUD POTW's discharge contributes 17% to 73% of the total regional load, with a contribution of 37% at the median watershed load estimate of 1.9 kg/yr. These proportions are using dry weather permitted flow; use of a wet weather flow for the treatment plant would result in an even higher proportion of the PCB load that enters the Bay within the vicinity of EBMUD being attributed to the POTW. Given the 17% to 73% contribution of the EBMUD POTW discharge within its vicinity, it is illogical to ignore this contribution, while at the same time calling for extreme reductions in watershed loadings. In the median case, EBMUD is a significant contributor to the regional load and, under the low watershed load; EBMUD POTW controls the regional load. It is reasonably anticipated that that reductions in stormwater loads will not be beneficial without EBMUD POTW load reductions.

The Staff Report, by applying averages and not requiring reductions in loads from POTWs, does not address localized loads generated by municipal POTW discharges. For example, the PCB concentration on sediments due to the EBMUD POTW's discharge is approximately 340 ug/kg based on an average TSS (as reported by EBMUD for 2006) of 20 mg/L and the site-specific PCB water column average of 6788 pg/L. Comparing this value of 340 ug/kg to the nearest RMP sampling location, BC11 (Table 1), shows that EBMUD contributes solids with a PCB concentration more than 20 times higher than is present in sediments in the region of the discharge. Consequently, even if dredging were to occur in the vicinity of the EBMUD discharge, the sediments would become recontaminated by the POTW's discharge.

Table 1. Average surface sediment PCB concentrations at RMP station BC11[a].

Period of Record	1993 – 2005	2001 – 2005
Number of Samples	18	3
PCB Average (ug/kg)	15.4	9.4
PCB Minimum (ug/kg)	4.3	6.1
PCB Maximum (ug/kg)	33.4	14.2

[a] *Sampling location of BC11: 37.826°, -122.348°; Location of EBMUD discharge: 37.817°, -122.349°*

Load assessments and allocations for the municipal dischargers and watersheds should be established using site-specific information and should account for future growth. Applying gross averages across the basin ignores localized impacts of both specific sub-watersheds and large point source dischargers. The current approach also ignores the temporal and "peaking" nature of stormwater flow. Accurate point source loadings and localized loading contributions must be considered and evaluated in developing load allocations to the Bay; otherwise it will not be possible to attain the water quality objectives in all portions of the Bay and recontamination is likely to occur.

Some areas of elevated PCB concentration may be controlled by external sources on the sub-watershed level and controlling such sources may allow for relatively rapid natural recovery to open Bay levels. For example, near-shore surface sediments in the Bay adjacent to the San Rafael watershed contain an average PCB concentration of 14 ug/kg;[4] however, the PCB concentration of incoming sediment from urban runoff is approximately 410 ug/kg (KLI 2002). This indicates that PCB concentrations in the near-shore surface sediments are not completely

[4] See Footnote #2.

regulated by stormwater runoff; however, control or reduction of external sources may allow for rapid natural recovery in this region to open Bay PCB levels of 10 ug/kg.

All of these analyses indicate that site-specific assessments are necessary to determine where in-Bay and near-shore remediation would have a meaningful benefit to the recovery of the Bay. Assessments must include reducing the uncertainty in load estimation, characterizing local sediments and external sources on sub-watershed levels, and evaluating specific remediation alternatives to identify expected recovery and impacts on and from adjacent sediments.

Comment 5: The Staff Report does not account for the uncertainty of the external loading estimates and the implication of that uncertainty on the implementation plan.

- **The stormwater loading estimate is based on a model that is not calibrated to data, making the loading assessment estimate speculative.**
- **The stormwater loading assessment ignores the load from non-urban land, which, based on recent San Francisco Bay studies, is the same order of magnitude as the urban stormwater loads and may exceed the 10 kg/yr target load.**
- **The loading attributable to municipal dischargers is uncertain and does not account for site-specific information and future growth.**
- **The Central Valley load is incorrect and highly uncertain, given that the load developed uses averages developed from sampling stations that are tidally influenced and flows that are unrealistic.**

The Basin Plan Amendment and Staff Report do not address the uncertainty in the external loading calculations. Instead, Table A-1 in the Basin Plan Amendment provides one number for each quantified external load and then proceeds to allocate loads based on a 10 kg/yr target. The Basin Plan Amendment needs to address and annotate the uncertainty in each of these loadings, in particular the "Urban Stormwater Runoff," "Municipal Wastewater Dischargers," and "Central Valley Watershed" loads. The municipal discharger loads do not consider future growth, which is uncertain, and do not account realistically for the total loads entering the Bay from these sources. The urban runoff and Central Valley loads are dependent upon stormwater flows that are difficult to quantify and predict, given their dependence on meteorological conditions. In addition, the contribution of different land uses to the PCB load is also wrought with uncertainty because of averaging that occurs on a basin-wide basis in order to characterize PCB concentrations from specific land uses. McKee et al. (2005) highlight the uncertainty in stormwater loading to San Francisco Bay in their recent report:

> *...Current load estimates of PCBs...entering the Bay from urban runoff are only approximate due to the complexities in characterizing the spatial heterogeneity of sources in the watershed. Furthermore, the temporal dynamics of contaminant concentrations and loads has not been well-defined for Bay Area tributaries on varying time scales from hours to decades. Thus, it is difficult to estimate a*

realistic range of seasonal or annual contaminant loads entering the Bay and how those loads will change over a period of decades...

Because the uncertainty of the external loading estimates was not quantified and little effort was made to minimize uncertainty, it is difficult – if not impossible – to ascertain the benefit of the proposed Basin Plan Amendment. In other words, it is unclear whether the loading reduction required by the Basin Plan Amendment for the different external sources are necessary, given the inaccuracies and uncertainties in the current loading assessment

URBAN STORMWATER RUNOFF LOAD UNCERTAINTY

The "Urban Stormwater Runoff" load is based on a steady state, rainfall-runoff model and an estimate of PCB concentrations on sediments and TSS concentrations originating from different land uses (See Specific Comment 4; KLI 2002). The analysis that established this load incorporates basic assumptions that lead to significant uncertainty in the final loading estimate. First and foremost, the loading model is not calibrated to any data. As a result, the RWQCB cannot determine whether the calculated load is a reasonable representation of the non-point source urban load entering the Bay. The PCB values assigned to the sediment particles originating from different land uses are established using PCB data taken from area storm drains over a two-year period (see KLI 2002 for further discussion). To do this assignment, a statistical model was applied to those storm drain data in order to establish a distribution of PCB concentrations originating from each land use. This distribution is then used to estimate a range of PCB concentrations for a particular land use. For example, the statistical model indicates that the sediment PCB concentrations originating from industrial land use vary from about 90 ug/kg (25^{th} percentile) to above 2,000 ug/kg (75^{th} percentile; see Table 17; KLI 2002). Given these ranges of PCB concentrations from different land uses, KLI (2002) calculates the range of total PCB load to the Bay is somewhere between 8.6 kg/yr and 104 kg/yr. The Staff Report and the Basin Plan Amendment ignore this uncertainty and simply use the median estimate of 39.6 kg/yr (rounded up to 40 kg/yr in the Basin Plan Amendment, Table A-1). Moreover, no attempt was made to reduce uncertainty by measuring loadings at points of discharge to the Bay to provide a basis for model calibration.

The KLI (2002) model required an estimate of TSS from each land use. The TSS information used by KLI (2002) is based on previous work (Davis et al. 2000) that is also uncalibrated and therefore suffers from the same problems as the PCB concentrations. Furthermore, the KLI (2002) approach assumed that all PCBs were attached to fine sediments (less than 62.5 microns) and that the TSS concentrations provided by the Davis et al. (2000) analysis are all less than 62.5 microns. This would be correct only if the measurements taken to establish the TSS concentrations originating from each land use measured only fine sediments. The KLI (2002) indicates the "controversy" involved in this assumption, but does not attempt to quantify the uncertainty such an assumption introduces. Data could have been collected that determined what percentage of TSS during storms is fine sediments (or less than 62.5 microns). Work conducted in Bellevue, Washington, found that only 64% of sediments associated with TSS during storm events were less than 62.5 microns in size (Pitt and Bissonette 1984). If that result was applied to the San Francisco Bay urban stormwater load, the total load would be 26 kg/yr. Further analysis on the particle size distribution of the TSS in the San Francisco Bay stormwater flows is warranted. As with the PCB concentrations, the uncertainty associated with the TSS loading estimate, including the assumption regarding percent fines, is not mentioned in the Staff Report nor was there any attempt to minimize uncertainty by performing a model calibration with specific sub-watershed data.

To develop TSS or PCB load, a flow volume is necessary. The runoff volume calculations in the model require a measure of rainfall over a given watershed, combined with a model parameter (i.e., a runoff coefficient) that establishes how much of that rainfall becomes runoff. The runoff from each sub-watershed predicted by the KLI (2002) model is questionable. The land use distribution used is identical to that established by Davis et al. (2000), but the runoff coefficients set for each land use differ from Davis et al. (2000), which leads to a deviation in the predicted runoff volumes between the two studies; (KLI (2002) predicts 25% less flow entering San Francisco Bay than predicted by Davis et al. (2000)). The runoff coefficients in Davis et al. (2000) are calibrated on a limited basis using runoff volumes in three different watersheds that had available data. However, KLI (2002) modified the runoff coefficients from the values determined by Davis et al. (2000), but did not recalibrate the model. In fact, an analysis of available United States Geological Survey (USGS) flows indicate the KLI (2002) runoff volumes overestimate the runoff in the Novato Creek sub-watershed by 10% and underestimate the measured runoff volumes by 70% for the Sonoma Creek sub-watershed (See Table 2). For the one watershed in which Davis et al. (2000) performed a quantitative calibration (Alameda Creek), the KLI (2002) flow and the Davis et al. (2000) flow differ by factor of 2.1 (KLI [2002] predicts 67 x 10^6 m^3/yr; Davis et al. [2000] predicts 140 x 10^6 m^3/yr), further calling the KLI (2002) runoff volumes into question.

Table 2. Comparison of runoff volume predicted by KLI (2002) analysis to USGS measured flows.

	Novato Creek		**Sonoma Creek**	
Period of Record at USGS Gauge	1948-2000		1955-1981	
USGS Drainage Area (mi^2)	17.6		58.4	
Drainage Area of Entire Basin (mi^2)	71.0		166.9	
Proration of USGS Basin to Basin Outlet	4.0		2.9	
	Average Annual Flow	**Average Annual Runoff**	**Average Annual Flow**	**Average Annual Runoff**
KLI (2002) Predicted Flows at Basin Outlet (m^3/yr)		32,534,208		30,284,733
USGS Flows at Gauge (m^3/yr)	11,639,190	7,343,313[a]	61,105,985	35,753,699[a]
Prorated USGS Runoff at Basin Outlet (m^3/yr)	46,975,578	29,637,489	173,622,399	101,588,134
% Difference		10%		-70%

[a.] *Runoff volumes determined by base flow separation program outlined in Benaman (1996).*

The runoff predictions are dependent on the prediction of rainfall across the basin. For the KLI (2002) model, 25 National Climatic Data Center gages were used to estimate rainfall. In the analysis, the annual average rainfalls of anywhere from one to five gages were averaged to represent a given sub-watershed in the model. The periods of record among the 25 rainfall stations vary, with 14 of them representing 1948-2000, but the other 11 stations varying in the years that they represent, with some having half as much data (e.g., 1970-2000) and others representing periods that are not captured by any other station (e.g., one station represents 1914-2000). The mixing of these periods of record introduces uncertainty in the rainfall the model is meant to represent. Although with a long enough period of record, the flooding and drought events should "average out," it is unclear if any such analysis was done to ensure that using these differing periods of record across rainfall stations does not introduce a bias at one station or another. This lack of clarification introduces further uncertainty in the runoff predicted by KLI (2002).

Each input required by the model, whether it is data such as rainfall or a model parameter such as a runoff coefficient, has uncertainty. The accepted way to reduce uncertainty in a modeling effort is to calibrate the model, focusing on the model parameters that are both uncertain and important to the model results, and to establish a best fit, given the available data. Although model calibration does not eliminate uncertainty, it reduces it and provides the modeler with some sense as to the accuracy and reliability of the model predictions, as well as the model's potential limitations. Not only does the KLI (2002) approach fail to perform a calibration, which introduces significant question regarding the accuracy of their loadings, the Staff Report does not address this uncertainty or mention that the loads developed by KLI (2002) are uncalibrated. This uncertainty in the loading would present a problem when trying to assess the attainability of the load allocated to urban runoff, as well as to understand any localized impact of the sub-watershed loads.

NON-URBAN STORMWATER RUNOFF LOAD UNCERTAINTY

The loading assessment in the Staff Report discounts the loading from non-urban land, citing the KLI (2002) loading study that established the non-urban land load as 0.1 kg/yr. However, other studies have placed a much higher estimate on the non-urban PCB loading. For example, McKee et al. (2005) estimated a non-urban load of PCBs of 2 to 11 kg/yr for water years 2003 and 2004 from all non-urban land uses in the Bay basin. The water years monitored in the McKee et al. (2005) study represented about normal discharge in the Guadalupe River, with water year 2003 being about 10% above normal and water year 2004 at 96% of normal discharge (using an average of 1971 to 2000 to describe normal). Given the McKee et al. (2005) results, it is obvious that assigning 0.1 kg/yr as the load from non-urban land is not only an underestimation, but an oversight that needs to be corrected. Further study and research into the non-urban load should be conducted. The current information such as the McKee et al. (2005) results should be incorporated into the assessment. By discounting the non-urban load, which is within the same order of magnitude based on McKee et al. (2005) as the proposed load "target" of 10 kg/yr, the benefit of the proposed implementation plan and the practicality of the 10 kg/yr target are called into question.

MUNICIPAL DISCHARGER (POTW) LOAD UNCERTAINTY

The Staff Report allocates the municipal dischargers PCB load at 2 kg/yr to reflect an estimate of current loads. However, this approach rounded down the municipal dischargers current load based on average daily flows and average PCB concentrations (by treatment level) to 2 kg/yr and allocated the total load according to each facility's fraction of the total yearly wastewater discharged. This "rounding down" of the estimated load of 2.3 kg/yr to 2 kg/yr to represent a single significant digit is inappropriate and introduces uncertainty into the load allocation. The basis for rounding to a single significant digit is not justified. In the multiplication step of determining load, there are at least two significant digits for the average PCB concentration and the annual daily flow, yielding at least two digits in the estimated load. Summation of significant digits is based on the precision of the data, or the place value represented, where the final value reflects the least precise level of measurement. In this case, the loads on pg/L level are significant to the one-hundredth place, which gives 2.30 kg/yr rather than 2 kg/yr. Allocating the 2 kg/yr among the dischargers on the basis of effluent flow underestimates the load from the largest load contributors, such as EBMUD. Under the Staff Report approach, the EBMUD is allocated 0.3 kg/yr; whereas their load at permitted dry weather daily flows and measured PCB concentrations is 1.1 kg/yr. This illustrates the problematic application of treatment level average PCB concentrations for all facilities, especially when site-specific data are available for the largest dischargers. In addition, the current load allocation is based on current flows, not permitted flows, which does not account for future growth.

CENTRAL VALLEY LOAD UNCERTAINTY

The Staff Report uses an estimate of the Central Valley PCB load made in an earlier version of the San Francisco Bay TMDL (SFBRWQCB 2003). This load, 42 kg/yr[5] (see Table A-1 in the Basin Plan Amendment), is uncertain because of inappropriate estimates of PCB concentration and river flow. The PCB concentrations used to establish the load are taken from RMP stations that are tidally influenced and whose sampling times are biased toward dry weather months (see further discussion in Comment 6, below). It is unlikely that the concentrations used to establish the load are representative of the freshwater inflow from the Central Valley, given the strong tidal influence in the area of sampling. The annual load from the Central Valley is likely influenced by high flow events which typically carry the bulk of the loading, yet the 42 kg/yr estimate includes no consideration of such events. In fact, the RWQCM recognizes the uncertainty in the Central Valley load in the 2003 TMDL Project Report (SFBRWQCB 2003):

> *PCBs loads estimates from the Central Valley are currently being refined by the RMP in collaboration with the USGS. The findings of this study will be*

[5] Page 39 of the Staff Report indicates that "For the TMDL, we are using the mean levels of 14.5 kg/yr for these two years, as the loading to the Bay from the Central Valley." However, elsewhere in the Staff Report, Central Valley's current load is estimated at 42 kg/yr and thus it is assumed that this value is what the TMDL is using.

incorporated into the PCBs TMDL report when they become available, and are likely to result in a different estimate of the Central Valley loads to the Bay.

However, no mention of this RMP/USGS study is made in the 2007 Staff Report and no explanation as to why the loads have not been refined is provided. Finally, the flow used to establish this load is unrealistic and not representative of the net freshwater inflow into the Bay from the Central Valley (see further discussion in Comment 6, below).

Comment 6: The Central Valley Load in the Staff Report and the Basin Plan Amendment is meaningless because the load was estimated using erroneous river flows and PCB concentrations not representative of the river.

- **The origin of the flow used to establish the Central Valley PCB load from the Sacramento and San Joaquin Rivers is unclear, cannot be independently confirmed, and grossly overstates the net freshwater inflow to the Bay.**
- **The PCB samples used to establish the Central Valley PCB load were sampled from stations that are tidally influenced and not representative of the freshwater inflow from the Central Valley. In addition, it appears that these PCB samples do not represent both dry and wet weather and are biased towards dry weather flows.**
- **The 42 kg/yr established in the Staff Report is questionable and most likely, an overestimate, given the gross overestimation of flow from the Central Valley.**

FLOW ESTIMATES FOR CENTRAL VALLEY

The 2003 TMDL, which is the basis for the Central Valley Load presented in Table A-1 of the Basin Plan Amendment, indicated that average PCB concentrations and loads for the Sacramento and San Joaquin were 243 pg/L and 38 kg/yr and 200 pg/L and 46 kg/yr; respectively.[6] These loads (Table 17, 2003 TMDL; SFBRWQCB 2003) were determined by taking the combined flow of the two rivers and multiplying it by the PCB concentration of the Sacramento River to get one load (46 kg/yr), and then taking the same combined river flow and multiplying it by the PCB concentration of the San Joaquin River to get the second PCB load (38 kg/yr). The two loads, determined for each river, were then averaged in order to get the 42 kg/yr PCB load listed in Table A-1 in the Basin Plan Amendment. To generate the PCB loads from the associated concentrations, one has to use a freshwater flow of 212,000 cfs.

The Sacramento and San Joaquin rivers – also referred to as the Delta outflow or, as in the Basin Plan Amendment, the Central Valley – provide almost 90% of the freshwater flow to the San Francisco Bay. The watersheds of the Sacramento and San Joaquin rivers drain the majority of

[6] Note: Table 17 in the 2003 TMDL (SFBRWQCB 2003) indicate an average 1993-2001 water column PCB concentration for the Sacramento River and San Joaquin RMP stations of 200 pg/L and 240 pg/L, respectively. However, analysis of the RMP data indicates that these numbers were flipped in the table and the correct averages are 240 pg/L for the Sacramento River and 200 pg/L for the San Joaquin River. The final loading established by the 2003 TMDL does not change because the flow applied to each average concentration was a "total Delta flow" from both rivers.

the Central Valley area of California (Fox et al. 1990). These two rivers vary hydrologically. Most of the flow from the Sacramento River comes from direct runoff (water that does not infiltrate the ground and runs directly off the land into the river during a storm event) producing a peak flow with the winter/spring rainy season. However, the San Joaquin, which is smaller and flows through higher elevations, has flow dominated by melting snow pack (snow that melts off the mountains) causing a peak flow in late spring and early summer when temperatures are warmer at higher elevations. As water travels from the headwaters of each river to the Bay some is lost in agricultural irrigation and reservoirs; the remaining Delta outflow that reaches the Bay is estimated to be about 22,387 cfs (Knowles 2000). The study by Fox et al. (1990) calculated the Delta outflow through gaged stream flows and net uses to be approximately 30,240 cfs. These flows are only about one-seventh of the flow determined by the load/concentrations from the 2003 TMDL. The basis for the 212,000 cfs is not stated, but we suspect that it represents the average of down river flows measured at USGS gauging stations in the tidal portion of the two rivers. The flows at these gages fluctuate greatly and range from positive (i.e., down river) to negative (i.e., up river). For example, in July 2007 the San Joaquin ranged from a positive ~60,000 cfs to a negative ~60,000 cfs and the Sacramento fluctuated about +/- 150,000 cfs. It is incorrect to estimate flow by considering only the positive flows. The net freshwater inflow to the Bay is the difference between the positive and negative flows. When the flow data are correctly analyzed, the gage information indicates that the annual average net freshwater flow is in the range of 22,000 to 30,000 cfs. It is this magnitude of flow that should be used when estimating the Central Valley PCB load to the Bay.

PCB SAMPLING BIAS

The PCB concentrations used to establish the Central Valley load presented in Table A-1 of the Basin Plan Amendment do not represent either wet weather flow or freshwater inflow from the rivers. PCB concentrations and loadings in the 2003 TMDL were determined from RMP data collected from 1993-2001 (Table 3).

The data were collected at various times through out the year, but there is a bias toward July and August (see Table 4). This bias is important because July and August are the driest months of the year. A summary of one rain gage station within the San Francisco Basin is shown in Table 5. These average rainfall data, combined with the frequency of sampling indicated in Table 4, suggest a potential low-bias in PCB concentrations, because no sampling occurred during the fall rainy season when high PCB loads would likely occur. Recent data (2001-2005) indicate a decrease in PCB and TSS concentrations for each river system (Table 4). However, it should also be noted that since 2001, most PCB and TSS sampling has occurred only in the summer months of July or August on both rivers, which, again, represents primarily dry weather flows.

Table 3. Summarized RMP data.

	Sacramento River	San Joaquin River
PCBs (pg/L)		
1993-2001	243	201
2001-2005	97	126
TSS (mg/L)		
1993-2001	38.8	29.4
2001-2005	30.8	24.4

Table 4. PCB sampling trends in RMP data.

	Sacramento River	San Joaquin River
	Number of Samples	Number of Samples
1993-2001		
January	1	1
February	5	5
March	1	1
April	6	6
July	4	4
August	4	4
2001-2005		
January	0	0
February	1	0
March	0	0
April	0	0
July	2	2
August	2	2

Table 5. PCB sampling trends in RMP data.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual Total
Average Total Precipitation (in.)	3.93	3.68	3.04	1.05	0.47	0.11	0.02	0.06	0.21	0.88	2.66	3.59	19.70

[a] *Data downloaded from: http://www.wrcc.dri.edu/cgi-bin/cliRECtM.pl?camart*

In addition to inconsistent temporal sampling, the RMP sampling locations chosen to represent the Central Valley inflow are located in the tidal portions of the rivers and therefore reflect some combination of Bay water and river water. These RMP sampling stations are not representative of the Central Valley river water.

CURRENT LOAD ASSESSMENT AND ALLOCATION QUESTIONABLE

These biases in the PCB concentration data, combined with the gross overestimation of the freshwater inflow to the Bay, cause the 42 kg/yr used in the Basin Plan Amendment loading assessment to be an unreliable estimate of the Central Valley load. It is likely that the RMP PCB water column concentrations are biased low, given their temporal sampling and location in the tidal rivers. As a result, it is not possible at this time to establish a better understanding of the true PCB load from the Central Valley. Sampling over wet and dry weather flow conditions, as well as throughout different tidal cycles, is critical to understanding the load from the Central Valley.

Comment 7: The Staff Report wrongly contends that remediation of Bay margin or "hot spot" sediments would meaningfully accelerate recovery of the Bay.

- **On average, surface sediment PCB concentrations in the Bay margin are only slightly higher than main Bay sediments (18 ug/kg versus 10 ug/kg).**
- **About 60% of the PCB mass in Bay surface sediments is located outside the Bay margin and would serve to recontaminate remediated Bay margin sediments.**
- **Sheltered Bay margin sediments have the greatest potential for natural recovery because they tend to experience net sedimentation.**

Despite not assessing whether meaningful benefits could accrue by remediating Bay margins (near-shore areas) or "hot spot" sediments, the Basin Plan Amendment suggests that such remediation will accelerate recovery of the Bay. The RWQCB has presumed that remediation would reduce PCB concentrations in the remediated area to an extent that would have whole Bay benefits. However, the RWQCB has failed to recognize the following facts:

1. overall, surface sediment PCB concentrations are only slightly higher in the Bay margin than in the main Bay;
2. recontamination will prevent remediation reducing sediment PCB concentration below the ambient concentration in the Bay of about 10 ug/kg;
3. in areas where external sources are responsible for elevated surface sediment PCB concentrations, the only effective strategy is source control; and
4. sheltered near-shore areas are likely net-depositional and will recover to ambient concentrations following source control.

PCB CONCENTRATIONS IN BAY MARGIN SEDIMENTS

On average, Bay margin surface sediments have a PCB concentration of about 18 ug/kg,[7] whereas open Bay surface sediments have a concentration of about 10 ug/kg. Many areas are not elevated beyond open Bay levels and elevated concentrations are found in only a small fraction of the area of the Bay. Because of this fact, it is not likely that the areas of elevated concentration have much influence on the Bay-wide average PCB concentration in fish.

RECONTAMINATION

Analysis of recent surface sediment data[8] indicates that the 60% of the PCB mass in the Bay surface sediments is located outside the Bay margin and would serve to re-contaminate remediated Bay margin sediments. The open Bay area covers nearly 200,000 acres and while "hot spot" remediation may remove PCBs from a local area, recontamination of the margin sediments is highly likely due to the overwhelming area and mass of sediments with ambient PCB concentrations. This recontamination would occur relatively rapidly due to the ongoing resuspension of open Bay sediments and the flushing of Bay margin sediments by the tides.

INFLUENCE OF EXTERNAL SOURCES

It is well known that sediment remediation is ineffective if surface sediment contaminant concentrations are controlled by external sources. For this reason, the USEPA Contaminated Sediment Guidance (USEPA 2005a) states, "Identifying and controlling contaminant sources typically is critical to the effectiveness of any Superfund sediment cleanup." A site-specific assessment of external sources (see Comment 4) and evaluation of adjacent open Bay sediment PCB levels must be completed before any conclusions are drawn about the appropriate strategy for accelerating natural recovery in the Bay as a whole or in discrete areas of elevated surface sediment PCB concentrations. The recommendation of Bay margin sediment remediation is unsupportable.

NATURAL RECOVERY POTENTIAL IN BAY MARGIN SEDIMENTS

Bays and estuaries are widely regarded as sediment traps and as such, sheltered Bay margin sediments have the greatest potential for natural recovery. Within San Francisco Bay, evidence is available that shows specific sediment deposits in the Bay are erosional (Jaffe et al. 1998), mixing-dominated, and depositional (Fuller et al. 1999). Even in mixing-dominated sediments, such as deposits in Richardson Bay, net burial is occurring (Fuller et al. 1999). Net burial should be greatest in the Bay margin, because many near-shore areas, by virtue of their configuration, are somewhat sheltered from the wind waves that account for most of the resuspension in the Bay.

[7] See footnote #2.
[8] See footnote #2.

Burial is a primary factor in natural recovery and certain Bay margin sediments may have the greatest potential for natural recovery. As such, natural recovery must be a consideration in any evaluation of these sediments.

Comment 8: The load allocations presented in the Basin Plan Amendment and Staff Report are impractical, unrealistic, and may be unattainable.

- **The amount of stormwater that would require treatment to reach the allocated 2 kg/yr is too large to be effectively captured and stored.**
- **The assumption that all the urban stormwater load is permitted under MS4/ National Pollution Discharge Elimination System (NPDES) is wrong and implies a level of control that is not attainable.**
- **The non-urban stormwater load is too large to be ignored in the load allocation.**
- **Allocating urban stormwater load by county, after the loading estimates were established by sub-watershed is illogical and places an undue burden on those counties with small populations and relatively large amounts of urban land.**
- **The implication that the POTWs will not have to reduce their loads to meet the current load allocations is misleading, due to inaccuracies in the original loading assessment. In addition, the implied required load reductions are done without any site-specific analysis.**

The Basin Plan Amendment presents the proposed load allocation within each load category in Table A-2. This load allocation is set to attain a loading target of 10 kg/yr. Many of the allocations would require unrealistic load reductions, especially from the stormwater dischargers. The load allocation for the urban stormwater in particular is illogical – allocating load from watershed by county, based on population, and assuming that all runoff will be able to be captured or treated. In addition, the approach to establish the urban stormwater assumes that no PCB load is coming in from non-urban land or through base flows in creeks and streams. Finally, the load allocation for the municipal dischargers claim "no load reductions," but close analysis of the site-specific municipal loads indicate reductions would be required of certain dischargers to meet the POTW allocation. The approach to allocation is inaccurate and misleading and needs to be corrected in order to realistically allocate PCB loads among these sources.

URBAN STORMWATER LOAD ALLOCATION ISSUES

Based on the flow volumes used by KLI (2002) to establish the stormwater loads, more than 700 million gallons per day (MGD) of water would have to be treated to achieve the 2 kg/yr load allocation. This volume is calculated from the total runoff volume from all of the watersheds in San Francisco Bay calculated by KLI (2002). The Staff Report indicates that all *current* point source dischargers to the Bay amount to 630 MGD (total permitted municipal and industrial discharges are around 750 MGD, although the exact amount permitted was not determined for this analysis). However, the KLI (2002) approach, upon which the RWQCB relies, ignores the temporal variability inherent in stormwater loading and ignores peaking effects of stormwater. If peaking is considered and a design storm is used that is accepted as Regional Board guidance for designing a stormwater ponds, the peak flows for this design storm would be more than 70 times higher than 740 MGD, at around 59,000 MGD (Anderson 2007) that would have to be treated to around 2,300 pg/L. Requiring this level of treatment for such a large volume of stormwater flow is unrealistic and indicates that the 2 kg/yr allocated in Table A-1 of the Staff Report is not attainable.

Not all stormwater flow enters the Bay through outfalls or controlled channels. Some portion of the estimated 40 kg/yr load attributed to urban land enters the Bay from creeks and smaller rivers. The Staff Report treats stormwater as if it were all controllable through MS4/NPDES permitting. In reality, a portion of this flow should be attributed to non-point source loading (i.e., "LA" in the TMDL equation). Lacking this designation, the Staff Report and Basin Plan Amendment incorrectly imply that it will be "easy" to reach the 2 kg/yr allocation because the flow is all permitted and controlled in some way. The distinction must be made that not all urban land drains to controllable stormwater channels, ditches, or outfalls.

As mentioned in Specific Comment 4, it is inaccurate and illogical to assume that only 0.1 kg/yr of PCB load originate from non-urban land. Although the KLI (2002) analysis made this conclusion based on their modeling, it is strongly dependent on two assumptions: 1) that the soil eroding off open and agricultural land has a PCB concentration of only 1.1 ug/kg PCB; and 2) that the flows coming from agricultural and open land are much lower than predicted by the Davis et al. (2000) calibrated model (see discussion on runoff coefficients in Specific Comment 4). If you apply Davis et al.'s (2000) runoff coefficients for agricultural and open land to the KLI (2002) analysis, the KLI (2002) runoff volumes from those land uses increase 3.5 fold. The PCB load from these areas (using the 1.1 ug/kg median estimate on sediments) increases from 0.1 kg/yr to 0.17 kg/yr. However, if the KLI (2002) upper bound estimate of PCB concentration on agricultural and open soils (75th percentile) is used with the Davis et al. (2000) runoff coefficients, the non-urban PCB load contribution increases to 1 kg/yr. This is a full 10% of the target load of 10 kg/yr. The larger non-urban storm load is supported by work from McKee et al. (2005), who estimated non-urban PCB stormwater loads in the San Francisco Bay watershed at 2 kg/yr to 11 kg/yr.

Some PCB load will be delivered to the Bay in base flow, not just runoff load. Although little, if any, data exist to establish PCB loads during base flow conditions, data should be collected to aid in establishing this load. This source may be difficult to control and needs to be accounted for in the loading allocation. Analysis of two USGS gages within the San Francisco Bay watershed indicate that base flow can account for 37% to 42% of the flow in the creeks analyzed (see Table 2). Although the base flow component of flow tends to be less in highly urbanized areas due to lack of pervious cover and infiltration, it is typically not zero. Even if it were just 25% of the total flow entering the Bay, using the KLI (2002) estimates of runoff, the base flow would account for potentially 0.65 kg/yr of PCB load, assuming a water column concentration of

1900 pg/L. Consequently, it is not reasonable to ignore this potential source without data to support its exclusion from the load allocation.

Finally, the load allocation presented in the Basin Plan Amendment for the urban stormwater load is apportioned throughout the watershed on a county basis, based on population within each county (Table 25 of the Staff Report). This approach is illogical because the counties do not have similar land use distributions and because the original loading analysis is land use-based. The resulting required reductions places undue burden on large counties with relatively high industrial or commercial land, but small populations. Table 6 presents the urban stormwater loads estimated from each county along with the required load reductions and resulting PCB water column and particulate PCB concentrations, based on the load allocation presented in Table 25 of the Staff Report. The PCB water column concentrations were found by estimating the volume of runoff in each county based on the fraction of area of each sub-watershed within each county boundary and applying the volumes predicted by KLI (2002). In the same way, the total TSS load from each county was determined by apportioning the KLI (2002) TSS load by sub-watershed to the counties on an area-weighted basis. The particulate PCB concentrations were found by dividing the water column concentrations by the TSS load.

Table 6. Load allocation by county and resulting PCB concentrations in county runoff.

County	Estimated Current Load (kg/yr) [a]	Load Allocation (kg/yr)	Required % Reduction	Resulting PCB Water Column Concentration (pg/L) [b]	Particulate PCB Concentration (ug/kg) [b]
Alameda	8.86	0.5	94	2,370	19
Contra Costa	6.23	0.3	95	3,250	27
Marin	4.07	0.1	98	890	7
Napa	2.08	0.05	98	640	2
San Francisco	1.08	0.2	81	8,050	79
San Mateo	4.91	0.2	96	1,800	17
Santa Clara	8.94	0.5	94	2,270	18
Solano	1.97	0.1	95	1,530	4
Sonoma	1.55	0.05	97	870	2

[a] *Load for each county estimated by multiplying KLI (2002) watershed load by a fraction of each watershed contained within a given county.*

[b] *Assumes volumes and TSS load from the watersheds as predicted by the KLI (2002) model do not change.*

As shown in Table 6, the load coming from Napa County is about 2 kg/yr. Their allocated load based on population is 0.05 kg/yr, which translates to a 97% reduction in load and a PCB water column concentration of about 550 pg/L (assuming the flow volumes do not change). However, San Francisco County, which is more densely populated over a much smaller area has a current load (according to KLI [2002] analysis) of 1.5 kg/yr and a target wasteload allocation (WLA) of 0.2 kg/yr, requiring an 81% reduction and allowing a water column PCB concentration of about

8,000 pg/L. This difference is mainly due to the approach of allocating load on a population basis. In addition, none of PCB concentrations on particles after the load reduction meet the 1 ug/kg target, which highlights a mistake in the Staff Report's original reasoning of the 2 kg/yr target for urban load.[9] If the loading assessment is based on land use, then the load allocation should be as well; the result would be a more even distribution in required percentage reductions and resulting PCB water column and particulate concentrations across the counties.

POTW LOAD ALLOCATION ISSUES

As indicated in Specific Comments 4 and 5, the loading assessment for the POTWs provided in the Staff Report is inaccurate and not representative of site-specific data and permitted flows (to account for future growth). In most cases, the simplified assumptions that the Staff Report applied to obtain an estimate of POTW load results in an underestimate of current loading from POTWs, especially for relatively large dischargers. Consequently, the Staff Report indicates that no load reductions will be required of POTWs. However, comparing the site-specific loads to the proposed load allocation, load reductions will be required. For example, the EBMUD discharges about 1.1 kg/yr of PCB into the Bay based on permitted dry weather flow and plant-specific discharge data. The load allocation in the Staff Report for EBMUD is 0.3 kg/yr. If a permitted flow is assumed, a reduction in PCB concentrations in the POTW discharge from 5800 pg/L to about 1800 pg/L would be required. As mentioned in Specific Comment 4, these implied reductions are done without any site-specific analysis and treat the Bay on an "average" basis, instead of considering potential localized impacts. For example, even the implied EBMUD treatment level of 1,800 pg/L may potentially maintain a "hot spot" of sediments near the EBMUD outfall (i.e., compare 90 ug/kg to values presented in Table 3), assuming the average TSS concentration in the discharge remained at 20 mg/L.

Comment 9: The Basin Plan Amendment fails to apply adaptive implementation (AI).

- **The uncertainty in the external sources of PCBs to the Bay support the use of AI.**
- **The Basin Plan Amendment, while mentioning AI, fails to fully address and implement such a process in the Amendment. This omission leads to the implementation of unnecessary reductions once the ongoing natural recovery of the Bay is considered.**

AI is a "learning while doing" approach to watershed management, which implements initial control actions followed by an ongoing assessment of the efficacy and costs of the actions, improvements of the system models made with new information, and then revisions of the implementation plan (if needed) based on new analysis (Shabman et al. 2007). The Staff Report

[9] Page 61 of the Staff Report states that the 2 kg/yr allocation for stormwater load was developed assuming the sediments coming from urban lands would reach the target concentration of 1 ug/kg and the soils loading from the land surface would not change. However, if one applied the KLI (2002) model and assumes all land use contributes sediments with a PCB concentration of 1 ug/kg (i.e., the PCB concentration on soils coming from each land use is set to 1 ug/kg, but TSS concentrations from each land use and flow volumes remain the same), the load is 0.2 kg/yr, not 2 kg/yr.

provides some text related to AI (Staff Report, page 66), but then the Basin Plan Amendment ignores AI in the actual implementation. There is some text dedicated to AI on pages A-11 and A-12 of the Amendment, but the text presented in those pages does not agree with the approach and allocations provided in the Staff Report or implementation presented on previous pages of the Amendment.

For example, the Board indicates they will "...evaluate new and relevant information that become available through monitoring, special studies, and the scientific literature and consider modification to the PCBs TMDL..." Yet, the existing TMDL presented in the Staff Report did not incorporate the multi-box TMDL model of the Bay that is currently available (Leatherbarrow et al. 2005), did not consider the recent analysis supporting natural recovery in the Bay (see Specific Comment 1), and did not account for the recent stormwater loading assessments performed on the Guadalupe River (McKee et al. 2005, see Specific Comment 5). In other words, this AI principle is not being applied to the present TMDL outlined in the Staff Report.

The Basin Plan Amendment does not specifically address AI in its implementation. Table A-2 merely allocates the allowable loads from each external source based on limited and inconsistent rational, with no indication of the uncertainties in the original source assessment, in the ability to reduce the estimated loads to the levels indicated, or in the impact (or lack thereof) of reducing loads without considering site-specific Bay responses. A recent USEPA-supported study proposes implementation for TMDLs that should be adaptive, including those where the source assessment is uncertain and the costs of making a "mistake" in implementation are high (Shabman et al. 2007). Shabman et al. (2007) further states,

> *AI begins with installation of certain controls to move the watershed in the direction of reducing pollutant loads, while also providing information on their effectiveness in improving water quality and different geographic and time scales. With new knowledge, the original watershed analysis, water quality analyses, and models can be revised to update the estimates of current and future pollutant loads and the resulting water quality in the impaired water body.*

The uncertainties in the current load assessment and the costs involved with capturing and treating the large amounts of stormwater that would be necessary to meet the 2 kg/yr goal allocated for urban stormwater justify an adaptive approach. For San Francisco Bay, this approach would start with monitoring to fully understand natural recovery. In addition, an adaptive approach would entail better defining the stormwater runoff sources, so that initial controls can be implemented and sources monitored in areas where load reduction will provide the most efficient and effective recovery for the Bay. If the implementation plan were adaptive, the demonstration of progress for the stormwater permittees listed on page A-9 of the Basin Amendment would first address the uncertainty in the original loading by allowing the stormwater permittees to quantify their load with data and site-specific modeling before unrealistic controls are implemented.[10]

Adaptive implementation principles are important, but are hollow unless the use of AI in the Basin Plan Amendment is spelled out clearly. Site-specific and focused monitoring should be stated in the Basin Plan Amendment, along with proposed initial controls, if justifiable. The monitoring that needs to be undertaken should be designed to reduce the uncertainty in the original load assessment (specifically for the Central Valley, urban stormwater, and POTW loads) and in the quantification of the Bay's natural recovery. Then, the proposed plan can be adapted, as new information is gained and an understanding of the Bay's response to these initial controls is understood.

Comment 10: Other implementation alternatives were not considered in the Basin Plan Amendment.

- **The 2007 PCB Basin Plan Amendment does not include alternatives for TMDL implementation as required by Public Resources Code Section 3777 of the Title 23 California Code of Regulation.**
- **Implementation and load allocation alternatives should consider remediation and load allocation methods previously adopted by the USEPA.**
- **Feasibility should be considered in developing implementation alternatives for the San Francisco Bay PCB TMDL.**

The Basin Plan Amendment fails to consider other feasible implementation alternatives to achieve the allocations set in the TMDL. The alternatives presented in Chapter 12 of the Staff Report are not implementation alternatives, but rather alternatives to establishing a TMDL and a TMDL target in fish tissue. The first alternative is simply to not adopt a TMDL, which is not acceptable to the extent a TMDL is required by Section 303 of Clean Water Act for impaired water bodies. The second alternative is the load allocation and implementation plan presented in the Basin Plan amendment and the final alternative considers arbitrarily adjusting the TMDL and fish tissue targets, but does not address implementation alternatives to achieve the TMDL.

Other feasible implementation and load allocation alternatives should be investigated by the Board. In particular, these alternatives have been applied to other USEPA-approved TMDLs and some are mentioned in the recent USEPA-supported Adaptive Implementation white paper published by Duke University (Shabman et al. 2007). Three such alternatives are applicable to the San Francisco Bay PCB TMDL:

- Monitored Natural Recovery (MNR);

[10] The third method promulgated by the Basin Plan Amendment to "demonstrate progress toward attainment of the wasteload allocations" is not mathematically correct. If all stormwater dischargers were to attain 1 ug/kg on sediments, then the stormwater load would be 0.2 kg/yr, not 2 kg/yr (see Footnote 9, Comment 8).

- equitable distribution of reductions; and
- phased implementation based on refined models and monitoring data.

Each of these alternatives should be evaluated for feasibility and compared to the feasibility analyses of the implementation plans included in the Basin Plan Amendment.

MNR ALTERNATIVE

MNR is a call for extensive monitoring and modeling of the fate and transport in the watershed and water body. This alternative is not the Basin Plan Amendment's "No Project" alternative. The "No Project" alternative presented in the Amendment does not establish a TMDL or regulate external sources. The USEPA has adopted several PCB TMDLs using MNR. These include the following:

- Shenandoah River PCB TMDL, approved September 2001 (USEPA and Virginia Department of Environmental Quality, [VDEQ] 2001);
- TMDL for Chlordane and Polychlorinated Biphenyls in the Missouri River, approved November 2006 (Missouri Department of Natural Resources Water Protection Program 2006); and
- TMDL for PCBs in fish tissues in Lake Worth approved October 2005. (Texas Commission on Environmental Quality [TCEQ] 2005).

In the Shenandoah River PCB TMDL, the VDEQ states (USEPA and VDEQ 2001):

> *Natural attenuation is usually considered to be an appropriate action alternative to ensure that the TMDL targets are met and water quality standards are achieved.... The alternative option, mechanical or vacuum dredging, is not currently justified as a viable approach given the possible habitat destruction, resuspension of PCBs, and high cost involved. It is suggested that in order to assess the progress made towards achieving the Shenandoah River PCB TMDL, monitoring of fish tissue should be continued.*

As discussed in Specific Comment 1, the MNR alternative is applicable for large portions of the Bay and should be specifically addressed and included in the implementation plan.

EQUITABLE DISTRIBUTION OF POLLUTANT REDUCTIONS

The Board must consider alternatives to the presented implementation plans that evaluate equitable distribution of pollutant reductions. In the plan presented, municipal and industrial dischargers were allocated loads equivalent to their current loads as estimated by staff. Whereas, Central Valley Watershed runoff is to be reduced from an estimated current load of 42 kg/yr to

5 kg/yr and the remaining urban runoff into the Bay is to be reduced from 40 kg/yr to 2 kg/yr. These current allocations result in an inequity of reductions among the sources: 95% for stormwater; 88% for the Central Valley and 0% for the other dischargers. Size-based equal marginal percent removal allocation is a commonly used method to distribute TMDL reductions.

One such method, Equal Marginal Percent Reduction (EMPR), developed by the Pennsylvania Department of Environmental Protection, is a two-step pollutant load allocation method used during a TMDL study which involves baseline and multiple discharger analysis steps. The baseline analysis involves determining the current loads and allowable load (TMDL). If the baseline load exceeds the allowable load, equal percent reduction is made to all dischargers' baseline loads until the water quality objective is met (Zhang et al. 2006).

The Basin Plan Amendment purports to utilize a similar approach; however, it falls short in applying equal reductions by excluding the municipal and industrial discharges. Applying the same 88% reduction required of the non-point source dischargers to the point source dischargers would reduce their loads from 2.3 kg/yr to 0.3 kg/yr,[11] a reduction of 2.0 kg/yr which would represent 20% of the target 10 kg/yr.

PHASED TMDL APPROACH

USEPA supported and approved a phased TMDL approach for the upper portions of the Delaware River (Zones 2 through 5) and more recently for the tidally influenced portion (Zone 6) (USEPA 2006). A phased approach, combined with adaptive implementation[12] was employed through execution of external load reduction strategies while additional monitoring and modeling efforts proceed in order to refine the waste load and load allocations. This approach recognizes that additional monitoring data and modeling results will be available following issuance of the Stage 1 TMDL to enable a more refined analysis to form the basis of the Stage 2 TMDL (USEPA 2006). The Stage 1, Zone 6 TMDL was developed through a seven-step process outlined in the TMDL. Allowable loadings from all point and non-point sources were initially calculated from estimated inflows and the water quality target and then adjusted through an iterative process to account for ocean influence and upstream water quality constraints. In Zone 6 of the Delaware River system, the largest portion of the LA is attributed to the relatively large influence of the ocean on pollutant concentration within the Bay.

Following the adoption of the Stage 1 TMDL, the water quality-based effluent limitations (WQBELs) in NPDES permits that are issued, reissued, or modified must be consistent with the Stage 1 WLAs. The phased approach to the PCB TMDL for Zone 6 was justified due to the lack of PCB data on some point sources as well as tributaries to Delaware Bay, the need to collect additional ambient data in Delaware Bay, and the need for modifications to the water quality

[11] Using a more accurate representation of the POTW load presented in Specific Comment 4 (3.1 kg/yr), an 88% reduction would amount to a 2.7 kg/yr reduction in PCB loading to the Bay.

[12] The USEPA differentiates between Phased TMDLs and adaptive implementation. For further clarification, see Shabman et al. (2007).

model to better describe the processes occurring in the Bay. Most of these same points apply to the San Francisco Bay PCB TMDL.

Finally, the implementation plan must present alternative remedies that can reasonably achieve the allocations set in the TMDL. The three alternatives presented above should be considered as part of the implementation plan development. The first, MNR calls for monitoring natural recovery. The second addresses equal reduction allocation and the third, a phased TMDL, in which additional monitoring and modeling are used in an AI process. In addition, guidance from the USEPA on assigning load reductions is available in the form of 19 potential allocation schemes (USEPA 1991). These methods are presented as alternatives for developing load allocations and stress that allocation objectives should focus on flexible endpoint measurements such as source loads and costs. Some of the USEPA-recommended allocation schemes that can be applied to point and non-point sources are listed below:

- Equal Percent Overall Removal;
- Equal Percent Incremental Removal;
- Equal Overall Reduction of Raw Load;
- Equal Cost per Pound of Pollutant Removed;
- Percent Removal Proportional to Raw Load per Day;
- Seasonal Limits based on Cost-effectiveness; and
- Minimum Total Compliance Cost.

The USEPA identifies several allocation options that are based on cost analyses. Cost/benefit analyses are required in conjunction with the implementation of a regulation designed to achieve an established TMDL (Farrell 2006). Cost/benefit analyses of remediation alternatives have been recently used in the development a Comprehensive Jamaica Bay Water Quality Plan for New York City Department of Environmental Protection (NYCDEP). In this plan, costs were developed for several alternatives and scenarios were analyzed using cost benefit curves developed for improvements in dissolved oxygen, chlorophyll, and unionized ammonia (Isleib et al. 2007).

As noted in the Basin Plan Amendment, economics must be considered as part of an environmental analysis of reasonably foreseeable means of compliance. The Amendment does not evaluate any other alternatives for implementation. Nor does the Basin Plan Amendment consider the potential environmental and economic costs of the TMDL and balance those costs against the benefits the RWQCB expects the TMDL to achieve. Those benefits appear to be limited and are not quantified or described in a manner that makes balancing competing environmental and economic costs possible. Instead, the Amendment states that "many of the implementation measures are part of ongoing programs, and will only result in incremental increases to costs of these existing programs" and "existing overall annual wastewater management costs exceed $500 million. These dischargers may incur incidental increases in costs associated with identifying and managing controllable sources." However, considering the TMDL allocates 0.3 kg/yr to EBMUD, when the actual load is closer to 1.1 kg/yr, meeting this allocation will most likely result in substantial increases in treatment costs.

Failure to include proper documentation and presentation of alternatives for the San Lorenzo River TMDL Basin Plan required the California Central Coast Regional Water Quality Control Board (RWQCB) to re-adopt the TMDL Basin Plan (Central Coast RWQCB 2003) after alternatives were documented and presented to the public for comment. Without adequate documentation of alternatives considered for the implementation of the San Francisco Bay PCB TMDL, the 2007 PCB TMDL Basin Plan should not be adopted.

ADDITIONAL COMMENTS

Additional Comment 1: Method 1668A Critique

The Basin Plan Amendment recognizes that conventional methods for measuring PCBs (e.g., USEPA Method 8082 or Method 608) have reporting limits that are higher than current ambient conditions and the 170 pg/L water quality standard. RMP monitoring has employed high-volume water sampling and USEPA Method 1668, Revision A ("Method 1668A"), a highly sensitive method for detecting PCB congeners at extremely low levels in an effort to determine ambient PCB concentrations. The draft TMDL indicates that NPDES permits will require quantification of PCB loads to the Bay every five years using a low-detection method "such as Method 1668A." Monitoring and assessment programs for PCBs will require the use of this method or a similar method to verify attainment of TMDL goals. USEPA has yet to promulgate Method 1668A as an approved method under the Clean Water Act; to our knowledge the results of the USEPA Method 1668A inter-laboratory validation study have not been released in a report. While the method is state-of-the-art, there are serious issues concerning variability of analytical results and the application of the method that have yet to be addressed. As discussed below monitoring programs will face three major issues:

1. high costs for sampling and analysis;
2. quality control issues related to blank/background contamination; and
3. imprecise results and/or comparisons for trends due to inter-laboratory differences.

The cost for sample collection and analysis by Method 1668A exceeds $1,000 per sample and could approach $2,000 per sample if large volumes of water must be collected to meet low detection limit requirements. Routine application of this method to all wastewater and stormwater streams discharging to the Bay would result in huge ongoing expenditures.

Method 1668A is capable of minimum detection limits (MDLs) in the tens to hundreds of picograms per liter range for summed individual and co-eluting congener PCBs in aqueous matrices when the analysis is conducted on large volume water samples. This capability has contributed to the false impression that Method 1668A can routinely measure extremely low concentrations. When sample volume is only 1 liter, a typical volume collected for PCB analysis by most methods, total PCBs cannot be reliably quantified below the range of 5,000 to 10,000 pg/L because each peak's error propagates to the calculated total PCB. To achieve the target MDL for the RMP of 5 pg/L per PCB congener, the RMP collects 100 liters of water per sample (Lowe et al. 1999). While this improves the sensitivity of the method, background contamination, such as is sometimes found in field rinsate blanks, can drive quantitation limits to values similar to or exceeding the water quality standard. In order to obtain sample volumes greater than a few liters, field programs have employed one of three methods:

- Moderate volume samples have been formed by combining two or more samples pumped into pre-cleaned four-liter amber reagent bottles, which are then either subjected to liquid-liquid extraction at the laboratory (limited to one to two-liter aliquots, which must then be combined during sampling processing), or to a solid phase extraction (SPE) procedure by first pumping the sample through XAD-2 resin.
- Higher volumes can be achieved through the use of special containers. The Delaware River Basin Commission (DRBC) pumped raw water into 20-liter stainless steel containers and sent those containers to a laboratory equipped to perform high-volume SPE.
- Lastly, as in the RMP, in-situ solid phase extraction employing a flow-controlled pump and a glass fiber filter and XAD-2 resin column assembly. Axys Technologies' (Sidney, BC, Canada) Infiltrex™ is a commercial example of this equipment.

Sampling by any of these methods is time-consuming and either requires significant effort to collect and ship large quantities of liquid samples or requires the purchase of specialized equipment to perform in-situ SPE. SPE requires pump rates of less than two liters per minute for effective PCB extraction onto XAD-2 resin and frequent filter changes in high-particulate waters to prevent clogging; while a 20-liter sample can be obtained in approximately 20 minutes, larger samples of up to 1,000 liters are known to take 12 to 24 hours each, depending on particulate concentrations. For the large liquid volumes, few laboratories are prepared to perform liquid-liquid extractions on large volumes of water. There will be cost, time and resource trade-offs in trying to achieve low blank contamination and low reporting limits with sufficient samples to adequately characterize spatial patterns or temporal trends.

As is acknowledged in USEPA's description of the method, quantitation limits are more dependent upon background contamination than on instrument response. Use of any of these methods increases processing time during collection, extraction, and contact with larger or more sampling containers. Field blank or equipment rinsate blank samples should be included and processed identically to the field samples as a control on background contamination. It is known that DRBC, during their PCB TMDL study of Delaware Bay waters (with low ambient PCB levels), had troubles achieving low reporting limits as a result of high blank contaminant levels in high-volume (20 liter) samples taken with the stainless steel containers mentioned above. Similarly, increased laboratory processing of large or multiple liquid samples increases the likelihood of high background contamination. Problems with background contamination such as these can compromise an entire sampling event and, therefore, subsequent data interpretation when evaluating ambient conditions at or near the water quality standard.

Experience with this method has shown that contamination levels in equipment rinsate and sampling media (e.g., XAD-2 resin columns and glass fiber filters) trip blanks can be in the 10s to 100s of pg/L total PCB. Spurious contamination from even a few congeners can reach these levels. USEPA's National Functional Guidelines for Organic Data Review (USEPA 1999) and USEPA Regions 10 and 3 regional data validation guidelines for Method 1668A specify that sample results less than five-fold that of any associated blank must be qualified as non-detect. Current DRBC quality control guidelines use a three-fold blank concentration rule. For example, quantifiable results in the range of the water quality standard from field samples with an associated blank sample value of 100 pg/L would have to be flagged as non-detect. Depending on the field sampling methods, low-concentration, large volume samples may be susceptible to relatively high blank values. Even though the method is sensitive enough to detect values below the water quality standard, background contamination may interfere with a determination of whether ambient conditions meet the TMDL's water quality objective.

Experience has also shown that contract laboratories advertising Method 1668A capabilities do not always meet the requirements of the performance-based methods, including use of an incorrect column, insufficient resolution of congeners, and lack of resolution of specific congeners. To our knowledge, USEPA has not yet released a final inter-laboratory comparison report that would document the reliability and precision of analyses among laboratories using this method. It is unclear whether meaningful comparisons of results reported from different laboratories and monitoring activities will be achievable in order to effectively evaluate spatial patterns and temporal trends during implementation of the TMDL.

As there are no minimum standards in place for the design of an appropriate sampling program, and as Method 1668A is a performance-based method allowing for variations in extraction and sample processing; data quality and comparability are significant concerns as multiple entities plan and initiate monitoring. The RWQCB cannot recommend the routine use of Method 1668A without first developing and presenting a plan to ensure reliability, reproducibility, and quality assurance through the use of standardized procedures and periodic assessments of laboratory performance. The RWQCB must demonstrate that such routine use can be accomplished given available accredited laboratory capacity and the extreme costs of the sampling and analysis.

Additional Comment 2: Atmospheric PCB Deposition Estimate Is Not Believable

In Point 2 (Staff Report, Appendix C – Peer Review Evaluations) of Dr. Carpenter's peer review of the technical basis for the polychlorinated biphenyls TMDL in San Francisco Bay, he states that it is "simply not believable that only 0.35 kg/yr enter the Bay by atmospheric transport of gas phase PCBs." We agree with his assessment, given that the area near is densely urbanized with light industry (land use distributions provided in Davis [2000] indicate about 24% of the contributing watershed is residential, 10 % is commercial and industrial land, and the remaining watershed is open and agricultural land use; however land use maps indicate the majority of the urbanized land is near the Bay). While the atmospheric deposition study for San Francisco Bay presented in the Staff Report relied on standard methods for measurement of PCBs in air (Tsai and Baker 2005), there was a general lack of site-specific measurements of PCBs in the air and water and a lack of wet deposition measurements available for the study. Some important limitations of the study which were stated in the Tsai and Baker (2005) report are listed below:

- Of the four site-specific input parameters used in calculating fluxes, only water concentration and water temperature were based on segment-specific data.

- Flux estimates are based on air data (June through November 2000) and water data (July and August 1995-1999) for the dry season only. Air concentrations were measured at only one station close to the north Estuary (over land). Estimating fluxes for the Central and South Bays assumed that air concentrations measured at the Concord station and wind measurements from a meteorological station also situated in the northern Estuary are representative of the entire Bay. It is doubtful that the Concord station is representative of the entire Bay. Given the large size of the Bay and the very distinct wet and dry seasons and changes in wind direction and speed associated with them, it seems important to obtain air data year round and in additional locations in the North, Central and South Bays. The monthly average air concentrations from the sampling station at Concord range from 0.21 ng/m^3 to 0.28 ng/m^3 total PCB. These values are on the low end, but within the range of PCB air concentrations measured in other areas. Eisenreich (2000) summarized urban and over-water or background atmospheric PCB concentrations in Chicago, Baltimore, the New York-New Jersey area, and Camden/Philadelphia. Urban concentrations ranged from 0.1 ng/m^3 to 14 ng/m^3 and over water or background from 0.045 ng/m^3 to 3.2 ng/m^3. Average total PCB water concentrations (Table 13, Tsai et al. 2005) were more than four times higher in the South Bay (365 ng/L) compared to the Central Bay (85 ng/L) and twice as high as the North Bay (160 ng/L). It is likely that the atmospheric PCB concentrations over these bays would reflect these differences. Hornbuckle et al. (1993) showed that shoreline sampling is not appropriate for modeling air/water exchange in aquatic systems because atmospheric PCB concentrations are higher over contaminated water than nearby land.

- The TMDL states that "...direct atmospheric deposition does not contribute a significant load to the Bay" (Staff Report, Page 38). However, this statement refers only to dry deposition. Major atmospheric pathways for PCBs to large water bodies such as the Great Lakes, Chesapeake Bay, the Hudson River-Harbor Estuary, and coastal waters include wet deposition, dry deposition, and gaseous air/water exchange (Eisenreich 2000). Wet deposition of PCBs (via rainfall) was not measured and would contribute additional deposition to the estuary and decrease the estimated net volatilization. The magnitude of the effect is unknown without empirical measurements; however, others have found that wet deposition can be as important, if not more, than dry deposition. Van Ry et al. (2002) report that "Wet deposition ... is a significant if not major fraction of the total atmospheric deposition of [soluble organic compounds] SOCs to many ecosystems, particularly those that lie distant from local sources." Their specific study in New Jersey (Van Ry et al. 2002) found that wet deposition fluxes of total PCBs were on the same order of magnitude as dry particle deposition fluxes for urban and non-urban areas.

- Water samples were not collected concurrently with air samples. Average concentrations of dissolved PCBs in the Bay collected 1m below the surface (July and August cruises) were used (RMP data collection 1995-1999). Therefore, PCB fluxes could be calculated only for congeners previously measured in water by the RMP. Nineteen resolved congeners and 16 unresolved co-eluting groups were measured in the water (Tsai and Baker 2005, Table 13, page 48) and 49 resolved congeners and 31 unresolved co-eluting groups were measured in the air (Tsai and Baker 2005, Table 9, page 43). Tsai et al. (2002) states that "...summary fluxes of PCBs and poly-aromatic hydrocarbons (PAHs) represent a subset of those compounds measured in air" (Tsai et al. 2002). It appears that atmospheric PCB fluxes do not represent total PCBs, but a limited subset of congeners/peaks. For example, if one sums only those PCB congeners and coeluting groups that were measured in water for the air data in Table 9 (Tsai and Baker 2005), the average monthly gaseous air concentrations for June-November drop by 36-44%. Without knowing the concentrations of these particular congeners and coeluting groups in water it is not possible to estimate how the answer would change if all congeners were measured, however, this demonstrates that the flux calculations are not quantitative.

- In the absence of detailed particle size distribution data, there is uncertainty in the deposition velocity (V_d) of 0.2 cm/s used. Wide ranges of V_d have been reported for trace organics (0.05 cm/sec to 6.7 cm/sec; see Tsai et al. 2005), depending on particle size and micrometeorological conditions. Wide ranges of V_d have been reported for trace organics (0.05 cm/sec to 6.7 cm/sec; see Tsai et al. 2005), depending on particle size and micrometeorological conditions. The deposition velocity was based on an average wind speed of 2 m/sec and approximately 50% of the PM_{10} in the fine particle size of 2.5 um or smaller. Tsai and Baker (2005) reference the range for V_d reported by Caffrey et al. (1999) as coinciding with their choice of 0.2 m/s for V_d. Caffrey et al. (1999) report a V_d for a particle size of 2.5 um as 0.02 cm/s at twice the mean wind speed calculated for this study (4 m/s vs 2 m/s). Both Hoff et al. (1996) and Hillery et al. (1998) assumed a V_d of 0.2 cm/s for calculating PCB particulate flux to the Great Lakes. Van Ry et al. used 0.5 cm/s for V_d, but stated it may be conservative based on the work by Franz et al. (1998).

The sensitivity analysis focused on the four site-specific input parameters that affect the flux estimates:

- gaseous contaminant concentrations;
- water contaminant concentrations;

- ambient temperature; and
- wind speed.

Tetrachlorobiphenyl was used as the representative PCB for this analysis. The analysis showed that the measured air and water concentrations exert the most influence on the direction and magnitude of the flux. For example, increasing the dissolved water concentration from 0.096 ng/L to 0.26 ng/L increases the volatilization rate by a factor of 6.

The authors openly admit that "Obtaining comprehensive measurements of the site-specific parameters is critical to the accurate estimate of the magnitude as well as direction of the fluxes for PAHs and PCBs over the Estuary" (Tsai and Baker 2005). Without seasonal, site-specific measurements of PCBs in air (wet and dry) and water it is difficult to estimate how representative Tsai's and Baker's (2005) calculations are of the entire Bay, but based on other studies, seasonal and spatial effects can be large (e.g., Hoff et al. 1992; Hornbuckle et al. 1997; Hillery et al. 1997; and Van Ry et al. 2002).

As a means of evaluating the potential impact of background concentrations of atmospheric PCBS on Bay fish levels, the proposed fish screening value of 10 µg/kg was compared to ambient background concentrations from areas where aquatic PCB concentrations derive solely or predominantly from atmospheric inputs. Both measured and computed background fish PCB concentrations were used in this comparison. The computed concentrations are the result of the application of bioaccumulation factors (BAFs) to measurements of water column PCB concentrations.

Based on a literature review of studies of recently collected data, mean total PCB concentrations in surface water and precipitation from remote areas range from 0.08 to 0.52 ng/L (Table 7). Using the BAF methodology provided in the *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (USEPA 2003) and the average fraction lipid in sport fish collected from SF Bay through the Regional Monitoring Program (RMP), the water-based PCB concentrations provided on Table 1 translate to fish total PCB concentrations ranging from 14 µg/kg to 360 µg/kg[13], which exceeds the proposed SF Bay PCB TMDL screening value, even at the extreme low end. Thus, background water column PCB concentrations suggest that even with the removal of all loads to SF Bay, with the exception of atmospheric sources, fish PCB concentrations below the proposed PCB TMDL may not be achieved everywhere in the Bay depending on the extent to which dilution with ocean water produces concentrations less than those presented in Table 7.

[13] This calculation incorporates a composite baseline bioaccumulation factor (BAF) for a short food web (trophic level 3; [TL3]) and an overall average lipid fraction of 2% for 2003, resulting in an approximate site-specific total composite log BAF of 5.9.

QEA
Quantitative Environmental Analysis, LLC.

Table 7. Summary of literature reported PCB concentrations in background surface waters and precipitation.

Location	Collection Date(s)	Surface Water[1]		Precipitation		Citation
		Mean Total PCB Concentration (ng/L)	Sample Size	Mean Total PCB Concentration (ng/L)	Sample Size	
Chester, NJ (light suburban)	1998 - 2001	-	-	0.52 (S.E. = 0.10)[2]	12	VanRy et al. 2002
Pinelands, NJ (background forest)		-	-	0.38 (S.E. = 0.076)[2]	27	
Tuckerton, NJ (coastal, light residential)		-	-	0.35 (S.E. = 0.11)[2]	13	
Savannah River	2004 - 2005	0.0832 (0.0214 - 0.145)	2	0.29	12	Glaser et al. 2006
Oconee River		0.170 (0.101-0.239)	2	-	-	
Ocmulgee River		0.376 (0.249 - 0.504)	2	-	-	
Etowah River	2003	0.29	NA	-	-	USEPA 2005b
Oostanaula River		0.28	NA	-	-	
Aquia Creek	2005 - 2006	0.16 (0.05 - 0.26)	2	-	-	Interstate Commission on the Potomac River Basin (ICPRB) 2007
Chopawamsic Creek		0.31 (0.06 - 0.64)	3	-	-	
Coan Mill Stream		0.27 (0.19 - 0.34)	2	-	-	
Monroe Creek		0.37 (0.35 - 0.39)	2	-	-	
Nomini Creek		0.16 (0.13 - 0.19)	2	-	-	
Occoquan River		0.18	1	-	-	
Pohick Creek		0.12 (0.08 - 0.16)	2	-	-	
Potamac Creek		0.12 (0.08 - 0.16)	2	-	-	
Powel Creek		0.24 (0.17 - 0.32)	2	-	-	
Quantico Creek		0.16 (0.04 - 0.37)	3	-	-	
Upper Machodoc Creek		0.045 (0.04 - 0.05)	2	-	-	
Williams Creek		0.19 (0.18 - 0.20)	2	-	-	

Notes:
[1] Values in parentheses represent ranges, unless otherwise noted -- S.E. = standard error; S.D = standard deviation.
[2] Volume Weighted Mean.
NA = Sample size not available.

REFERENCES

Anderson, T., 2007. Personal communication with Arcadis-US. Baltimore, MD, July 2007.

Benaman, J., 1996. *Modeling of Dissolved Oxygen in the Houston Ship Channel Using WASPs and Geographic Information Systems*. Master's degree thesis, The University of Texas at Austin, Austin, TX.

Caffrey, P.F., J.M. Ondov, M.J. Zufall, and C.I. Davidson, 1998. Determination of size-dependent dry particle deposition velocities with multiple intrinsic elemental tracers. *Environ. Sci. Technol.* 32(11):1615-1622.

California Department of Fish and Game, 2007. http://www.delta.dfg.ca.gov/baydelta/monitoring/fishlist.asp

Central Coast Regional Water Quality Control Board, 2003. *Readopting the San Lorenzo River TMDL for Sediment as a Basin Plan Amendment.* Staff Report for Regular Meeting May 16, 2003. http://www.swrcb.ca.gov/rwqcb3/TMDL/documents/staffrptMay16.pdf

Connolly, J.P., C.K. Ziegler, E.M. Lamoureux, J.A. Benaman, and D. Opdyke, 2005. Comment on "The long-term fate of polychlorinated biphenyls in San Francisco Bay, USA". *Environ. Tox. Chem.* 24(10):2397-2400.

Davis, J.A., L.J. McKee, J.E. Leatherbarrow, and T.H. Daum, 2000. *Contaminant Loads, From Stormwater to Coastal Waters in the San Francisco Bay Region.* San Francisco Estuary Institute, San Francisco, CA.

Davis, J.A., F. Hetzel, and J. Oram, 2006. *Final Report, PCBs in San Francisco Bay: Impairment Assessment/Conceptual Model Report.* Prepared for the Clean Estuary Partnership, SanFrancisco, CA.

DiToro, D.M. and P.R. Paquin, 1984. Time variable model of the fate of DDE and lindane in a quarry. *Environ. Tox. Chem.* 3:335-353.

Eisenreich, S.J., 2000. *Polychlorinated Biphenyl Emissions to Urban Atmospheres: Enhanced Concentrations, Atmospheric Dynamics and Controlling Processes.* Joint Workshop, Milwaukee.

Farrell, J., 2006. *California Court Trashes Plan to Reduce Litter in the Los Angeles River*, City of Arcadia v. State Water Res. Control Bd., 38 Cal. Rptr. 3d 373. National Sea Grant Law Center. http://www.olemiss.edu/orgs/SGLC/National/SandBar/5.1losangeles.htm.

Fox, J.P., T.R. Mongan, and W.J. Miller, 1990. Trends in freshwater inflow to San Francisco Bay from the Sacramento-San Joaquin delta. *Water Resources Bulletin* 26(1):101-116.

Franz, T.P. and S.J. Eisenreich, 1998. Snow scavenging of polychlorinated biphenyls and polycyclic aromatic hydrocarbons in Minnesota. *Environ. Sci. Technol.* 32(12):1771-1778.

Fuller, C.C., A. van Geen, M. Baskaran, and R. Amina, 1999. Sediment chronology in San Francisco Bay, California as defined by ^{220}Pb, ^{234}Th, ^{137}Cs, and ^{239,240}Pu. *Mar. Che.* 64(1-2):7-28.

Glaser, D., M. Meyers, J. Connolly, R. McAlister, 2006. Are Water Quality Standards Achievable and Necessary for Reaching Risk-Based Goals? A PCB Example. Paper presented at SETAC, Montreal. November 2006.

Gobas, F.A.P.C. and J. Arnot, 2005. *San Francisco Bay PCB Food Web Bioaccumulation-Final Report.* Prepared for the Clean Estuary Partnership.

Greenfield, B.K., J.A. Davis, R. Fairey, C. Roberts, D.B. Crane, G. Ichikawa, and M. Petreas, 2002. *Contaminant Concentrations in Fish from San Francisco Bay, 2000.* San Francisco Estuary Institute. SFEI Contribution 77.

Hillery, B.R., M.F. Simcik, I. Basu, R.M. Hoff, W.M.J. Strachan, D. Burniston, C.H. Chau, K.A. Brice, C.W. Sweet, and R.A. Hites, 1998. Atmospheric deposition of toxic pollutants to the Great Lakes as measured by the Integrated Atmospheric Deposition Network. *Environ. Sci. Technol.* 32(15):2216-2221.

Hoff, R.M., D.C.G. Muir, and N.P. Grift, 1992. Annual cycle of polychlorinated biphenyls and organochlorine pesticides in air in southern Ontario. 2. Atmospheric Transport and Sources. *Environ. Sci. Technol.* 26(2):276-283.

Hoff, R.M., W.M.J. Strachan, C.W. Sweet, C.H. Chan, M. Shackleton, T.F. Bidleman, K.A. Brice, D.A. Burniston, S. Cussion, D.F. Gatz, K. Harlin, W.H. Schroeder, 1996. Atmospheric deposition of toxic chemicals to the Great Lakes: A review of data through 1994. *Atmospheric Environ.* 30(20):3505-3527.

Hornbuckle, K.C., D.R. Achman, and S.J. Eisenreich, 1993. Over-water and over-land polychlorinated biphenyls in Green Bay, Lake Michigan. *Environ. Sci. Technol.* 27(1):87-98.

Hornbuckle, K.C., J.D. Jeremiason, C.W. Sweet, and S.J. Eisenreich, 1997. Seasonal variations in air-water exchange of polychlorinated biphenyls in Lake Superior. *Environ. Sci. Technol.* 28(8):1491-1501.

Interstate Commission on the Potomac River Basin (ICPRB), 2007. *Calculation of Polychlorinated Biphenyl (PCB) External Loads for the Potomac PCB Model Draft.* Prepared by C. Haywood and C. Buchanan for the Tidal Potomac PCB TMDL Steering Committee.

Isleib, R., J.J. Fitzpatrick, and J. Mueller, 2007. The Development of a Nitrogen Control Plan for a Highly Urbanized Tidal Embayment. Paper presented at the 2007 TMDL Specialty Conference, Water Environment Federation., Bellevue, WA, June 24-27, 2007.

Jaffe, B.E., R.E. Smith, and L. Torresan, 1998. *Sedimentation and Bathymetric Change in San Pablo Bay, 1856 – 1983.* U.S. Geological Service Open-File Report 98-759.

Kinetic Laboratories, Inc., 2002. *Final Report: Joint Stormwater Agency Project to Study Urban Sources of Mercury, PCBs and Organochlorine Pesticides.* Santa Cruz, CA.

Knowles, N., 2000. *Modeling the Hydroclimatology of the San Francisco Bay-Delta Estuary and Watershed.* Ph.D. Dissertation in Oceanography, University of California, San Diego, CA.

Leatherbarrow, J.E., J.J. Oram, and J.A. Davis, 2005. *Draft Report: A Model of Long-Term PCB Fate and Transport in San Francisco Bay, CA.* SFEI Contribution 388. San Francisco Estuary Institute (SFEI), Oakland, CA.

Longabucco, P. and M.R. Rafferty, 1998. Analysis of material loading to Cannonsville Reservoir: Advantages of event-based sampling. *J. Lake and Resv. Mgmt.* 14(2-3):197-212.

Lowe, S., R. Hoenicke, and J. Davis, 1999. *1999 Quality Assurance Project Plan Regional Monitoring Program for Trace Substances.* SFEI, Oakland, CA.

McKee, L.J., J.E. Leatherbarrow, and J. Oram, 2005. *Concentrations and Loads of Mercury, PCBs, and OC Pesticides in the Lower Guadalupe River, San Jose, CA: Water Years 2003 and 2004.* SFEI Contribution 409, San Francisco, CA.

Missouri Department of Natural Resources Water Protection Program, 2006. *Total Maximum Daily Loads (TMDLs) for Chlordane and Polychlorinated Biphenyls in the Missouri River.* Completed: October 5, 2006, Approved: November 3, 2006.

National Cancer Institute (NCI), 2007. Cancer Statistics. http://www.cancer.gov/statistics/

Pitt, R. and P. Bissonnette, 1984. *Bellevue Urban Runoff Program, Summary Report.* United States Environmental Protection Agency (USEPA) and the Storm and Surface Water Utility, Bellevue, WA.

San Francisco Bay Regional Water Quality Control Board (SFRWQCB), 2003. *PCBs in San Francisco Bay, Total Maximum Daily Loads Project Report.*

San Francisco Bay Regional Water Quality Control Board, 2007. *Total Maximum Daily Load for PCBs in San Francisco Bay, Proposed Basin Plan Amendment and Staff Report.* San Francisco, CA.

SFEI, 2001. *San Francisco Bay Seafood Consumption Report-Technical Report.* California Department of Health Services, SFEI.

Shabman, L., K. Reckhow, M.B. Beck, J. Benaman, S. Chapra, P. Freedman, M. Nellor, J. Rudek, D. Schwer, T. Stiles, and C. Stow, 2007. *Adaptive Implementation of Water Quality Improvement Plans: Opportunities and Challenges.* Draft report to the Nicholas School of the Environment and Earth Sciences, Duke University, Durham, NC.

Texas Commission on Environmental Quality (TCEQ), 2005. *One Total Maximum Daily Load for Polychlorinated Biphenyls (PCBs) in Fish Tissue in Lake Worth.* Adopted: August 10, 2005, Approved: October 2005.

Tsai, P. and J.E. Baker, 2005. *San Francisco Bay Atmospheric Deposition Pilot Study, Part 3: Dry Deposition of PAHs and PCBs.* SFEI Contribution 408.

Tsai, P., R. Hoenicke, D. Yee, H.A. Bamford, and J.E. Baker, 2002. Atmospheric concentration and fluxes of organic components in the northern San Francisco estuary. *Environ. Sci. Technol.* 36:4741-4747.

USEPA and Virginia Department of Environmental Quality, 2001. *Final Report, Development of Shenandoah River PCB TMDL.*

USEPA, 1996. *PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures.* National Center for Environmental Assessment Office of Research and Development, USEPA, Washington, DC. EPA/600/P–96/001F.

USEPA, 1991. *Technical Support Document for Water Quality-based Toxics Control.* U.S. Environmental Protection Agency, Office of Water Enforcement and Permits, Washington, D.C. EPA-505/2-90-001.

USEPA, 1999. *USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review.* U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA-540/R-99/008.

USEPA, 2003. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000).* U.S. Environmental Protection Agency, Office of Water, Washington, D.C. EPA-822-R-03-030.

USEPA, 2005a. *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites.* U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. EPA-540-R-05-012.

USEPA, 2005b. National Study of Chemical Residues in Lake Fish Tissue Years 1-4. U.S. Environmental Protection Agency, Office of Water, Washington, D.C.

USEPA, 2006. *Total Maximum Daily Load for PCBs for Zone 6 of the Delaware River.* Prepared by the Delaware River Basin Commission, West Trenton, NJ.

Van Ry, D.A., C.L. Gigliotti, T.R. Glenn, IV, E.D. Nelson, L.A. Totten, and S.J. Eisenreich, 2002. Wet deposition of polychlorinated biphenyls in urban and background areas of the mid-Atlantic states. *Environ. Sci. Technol.* 36(15):3201-3209.

Zhang, H.X., L.A. Fillmore, M. Kuo, and T. Henry, 2006. *Nutrient TMDL Allocation by Equal Marginal Percent Reduction Method in an Urban Stream.* Presented at Adaptive Management of Water Resources AWRA Summer Specialty Conference, Missoula, MT., June 2006.

Expert Opinions regarding Human Health Issues associated with *2007 Total Maximum Daily Load for PCBs in San Francisco Bay: Basin Plan Amendment and Staff Report*
Prepared by Natalie D. Wilson
August 17, 2007

Qualifications

I earned a M.S. in Environmental Sciences and Engineering from the School of Public Health at the University of North Carolina at Chapel Hill following a B.S. in Chemistry and History from Carnegie Mellon University. I have 19 years of experience in the fields of environmental science and health risk assessment. I am an author of 15 peer-reviewed papers in the fields of risk assessment and applied statistics. I am presently employed by ARCADIS BBL as a Senior Scientist. My practice is primarily focused on human exposure and health risk assessment issues involving chemicals in sediments and waterways. A true and correct copy of my Curriculum Vitae is attached. The opinions expressed here are based on my education and experience in risk assessment, exposure assessment, and related fields.

Natalie D. Wilson

Summary of Opinions

Opinion 1. The level of PCBs that FDA regulations permit in commercial fish and shellfish greatly exceeds the proposed TMDL numeric target. Meeting the TMDL numeric target would not significantly reduce the amount of potential risk inherently accepted for consumers of commercial fish. Among Bay Area Residents commercial fish consumers far outnumber San Francisco Bay.

Opinion 2. The existence of the OEHHA interim fish consumption advisory is not an indication that levels of PCBs in fish within San Francisco Bay are detrimental to human health or that the COMM beneficial use is impaired. Risk assessments indicate very low risk of potential health effects within the angling population or the general population from consuming San Francisco Bay fish containing PCBs.

Opinion 3. On an equivalent risk-level basis, the TMDL's fish tissue target is much more stringent than the California Toxics Rule and hence overprotective of the general sport fishery.

Opinion 4. The TMDL screening value, numeric target, and attainment measures for PCBs in fish tissue rely on a hypothetical scenario that results in an extreme overestimate of exposure by anglers. When taken together, the calculation of the screening level, its use as a numeric target for PCBs in fish tissue, and the proposed method for measuring its attainment presume a human exposure scenario that is not supported, and in fact is

contradicted by the underlying data and auxiliary information sources. The proposed screening value and numeric target are so low and the attainment measures so focused that the resulting TMDL is extremely overprotective of the angler population and the general population.

Opinion 5. When the need for costly remedies is suggested by simplistic or streamlined risk assessment approaches, it is customary and appropriate to conduct more sophisticated analyses to better understand risks and benefits prior to initiating any remedial decisionmaking. The risks associated with implementing any sediment management strategies to meet the TMDL, which can be substantial in the cases of capping or dredging, should be quantified prior to remedy selection to assess whether a real risk reduction can be achieved.

Opinion 6. The TMDL screening value and numeric target for PCBs are based on estimates of *potential* cancer risks. The TMDL policymaking process should also consider the real observed health benefits of fish consumption.

Overview

The June 22, 2007 report by the San Francisco Regional Water Quality Review Board proposes a Total Maximum Daily Load (TMDL) for polychlorinated biphenyls (PCBs) in San Francisco Bay ("TMDL report" SFRWQCB 2007). The TMDL report states that ocean, commercial, and sport fishing (COMM), estuarine habitat (EST), preservation of rare and endangered species (RARE), and wildlife habitat (WILD) are beneficial uses that are impaired by PCBs in the bay (TMDL report p. 19), and the TMDL is based on protection of human health, wildlife, and aquatic life (TMDL report p. 1). These comments focus on the human health aspects of beneficial use COMM, and the narrative objective that, "Controllable water quality factors shall not cause a *detrimental* increase in toxic substances found in bottom sediments or aquatic life" (emphasis added, TMDL report pp. 19-20), and the numeric target for total PCBs in fish tissue that is presented as a "direct measurement of impairment of commercial (COMM) beneficial uses" (TMDL report p. 50).

Opinion 1. The level of PCBs that FDA regulations permit in commercial fish and shellfish greatly exceeds the proposed TMDL numeric target. Meeting the TMDL numeric target would not significantly reduce the amount of potential risk inherently accepted for consumers of commercial fish. Among Bay Area Residents commercial fish consumers far outnumber San Francisco Bay.

The United States Food and Drug Administration (FDA) has established a Tolerance Level for PCBs in fish and shellfish of 2 parts per million, equivalent to 2,000 ng/g (21 CFR 109.30). FDA's tolerance levels apply to food shipped and marketed in interstate commerce. The methodology used by FDA in establishing tolerances is to determine the health risks of chemical contaminants in fish and shellfish that are bought and sold in interstate commerce rather than in locally harvested fish and shellfish (USEPA 2000). USPEA (2000) explains the orders-of-magnitude differences between its screening values (SV) for PCBs in fish in comparison to the FDA Tolerance Level as follows:

> "FDA action levels and tolerances are indicators of chemical residue levels in fish and shellfish that should not be exceeded for the general population who consume fish and shellfish typically purchased in supermarkets or fish markets that sell products that are harvested from a wide geographic area, including imported fish and shellfish products. However, the underlying assumptions used in the FDA methodology were never intended to be protective of recreational, tribal, ethnic, and subsistence fishers who typically consume larger quantities of fish than the general population and often harvest the fish and shellfish they consume from the same local waterbodies repeatedly over many years.... The EPA SV for each chemical contaminant is defined as the concentration of the chemical in fish tissue that is of potential public health concern and that is used as a threshold value against which tissue residue levels of the contaminant is fish and shellfish can be compared." (USEPA 2000, pp. 1-4 and 1-5)

At 10 ng/g, the TMDL report's numeric target for PCBs is 200 times lower than the FDA tolerance level for PCBs in fish and shellfish, and half as large as USEPA's screening value for recreational anglers (USEPA 2000). USEPA (1997a) reported that 88 percent of all adults consume fish and/or shellfish at least once per month, 58 percent of adults consume at least once per week, between 13 percent and 23 percent consume two or three times per week, an estimated 3 percent indicated that they eat fish and shellfish six times per week, and 1 percent of all respondents reported consuming fish and shellfish daily. In the Bay Area, the number of people who eat fish from stores or restaurants, and the amount of seafood that is purchased, are both much larger than the number of anglers and the amount of seafood that is recreationally caught from San Francisco Bay. The level of theoretical health risk from PCBs that would be eliminated among anglers by meeting the TMDL numeric target is much lower than the amount of the public health risk inherently accepted by the FDA Tolerance Level (though not necessarily experienced by commercial fish consumers). This conclusion is supported by results for the angler population from the San Francisco Bay Seafood Consumption Study. A larger proportion of survey respondents (53 percent; SFEI 2000, p. K-59) reported consuming fish from a store or restaurant during the previous 4 weeks than from the Bay (40 percent). Average rates of recent commercial fish consumption were similar for all respondents and for recent consumers of Bay fish (26.62 g/day and 26.54 g/day, respectively).

Another useful perspective is provided by angler population information. In the *Proposed Basin Plan Amendment and Staff Report for Revised TMDL and Proposed Mercury Water Quality Objectives* (SFRWQCB 2006), the San Francisco Bay Regional Water Quality Control Board indicates that there are 170,000[1] estimated Bay Area sport and subsistence fishers representing about 3 percent of the roughly 6.5 million people who live in the Bay Area. Based on the

---

[1] The 170,000 figure is cited by SFRWQCB (2006) to USEPA (1997b). The angler population figure for San Francisco Bay quoted in USEPA (1997b) is 125,000. The discrepancy is not explained by SFRWQCB (2006); All Bay Area angler population references and calculations that appear in this set of opinions assume a size range from 125,000 to 170,000.

findings reported by USEPA (1997a), approximately 5.7 million Bay Area residents can be presumed to be consumers of commercial fish and shellfish. Even if San Francisco Bay fish and shellfish were free from PCBs, thereby entirely eliminating the potential health risk to the anglers and those with whom they share their catch, the PCB risk level inherently accepted by the FDA Tolerance Level for millions of Bay Area residents would remain unchanged.

Opinion 2. The existence of the OEHHA interim fish consumption advisory is not an indication that levels of PCBs in fish within San Francisco Bay are detrimental to human health or that the COMM beneficial use is impaired. Risk assessments indicate very low risk of potential health effects within the angling population or the general population from consuming San Francisco Bay fish containing PCBs.

The 1998 303(d) listing of San Francisco Bay that initiated the TMDL process was based on the existence of an interim health advisory for fish consumption (TMDL report p. 3). The advisory does not place any legal limits on the act of fishing, or even the consumption of fish; the advisory provides consumption recommendations to anglers. The interim fish consumption advisory for San Francisco Bay was issued in 1994 "because of elevated levels of mercury, PCBs, and other chemicals" (http://www.oehha.ca.gov/fish/general/sfbaydelta.html; viewed July 16, 2007). In summary, for women beyond childbearing years and for men, the advisory recommends consumption of no more than two 8 oz. meals per month of San Francisco Bay and Delta sport fish. For women of childbearing age, the advisory recommends consumption of no more than one meal per month. In the Richmond Harbor Channel area, the advisory recommends that no one eat any croakers, surfperches, bullheads, gobies, or shellfish. No consumption is advised for large striped bass and sharks. This "interim" advisory has been in effect for more than 12 years.

The California Office of Environmental Health Hazard Assessment (OEHHA) indicated in a 1999 report (OEHHA 1999) that the fish consumption advisory was issued after OEHHA conducted a preliminary evaluation of health hazard based on the results of a 1994 pilot study (SFRWQCB et al. 1995) of levels of chemical contaminants in fish in San Francisco Bay. No details are available regarding exactly how this health hazard was assessed. OEHHA did not release a baseline risk assessment either prior to or since issuing the interim advisory, or provide any other estimate or evaluation of the levels of health risk posed by PCBs to the population of individuals who consume fish from San Francisco Bay. In 2006, OEHHA released a draft document containing screening levels for PCBs (and other chemicals) in fish. This document stated with respect to its findings that, "When screening values are exceeded, it is an indication that additional site-specific monitoring and/or human health risk assessment should be performed" (OEHHA 2006, p. 1).[2] The pilot study specifically states that it "is not a risk

[2] The analysis in the OEHHA (2006) draft document is not a risk assessment for any defined population. Instead the document presents levels of chemicals in fish (derived using risk assessment methods) that can be used to provide meal consumption advice. For PCBs, the guidance tissue levels, which range from 20 to 1560 ng/g, are based on a 1×10^{-4} cancer risk level and a cancer slope factor of 2.0 $(mg/kg\text{-}day)^{-1}$ or a reference dose of 2×10^{-5} mg/kg-day for noncancer effects, an 8-oz. fish portion at consumption frequencies of 1 to 12 meals per month, 70-year exposure duration, 30 percent cooking loss, and 70 kg body weight.

assessment and should not be interpreted as guidance for the safety of consuming fish caught from the Bay" (SFRWQCB et al. 1995, p. 1-2).

In 1997, as part of its analysis of implementation of the California Toxics Rule, USEPA conducted a case study analysis of health risks associated with exposure to chemicals in fish among San Francisco Bay anglers (USEPA 1997b). This assessment considered exposure to PCBs as measured in the 1994 pilot study (SFRWQCB et al. 1995) for seven fish species (white croaker, striped bass, shiner perch, walleye surfperch, white surfperch, brown smoothhound shark, and leopard shark). Consumption rates of 21.4 to 49.6 g/day every day for 70 years were assumed for "typical" consumers of San Francisco Bay fish and 107.1 g/day for high-end consumers. These rates, which were based on a 4-week recall study of Santa Monica Bay anglers (SCCWRP and MBC, 1994), are equivalent to from 5 oz. to 12 oz. to more than 26 oz. of self-caught fish per *week* (in contrast to the advisory recommendations of 8 to 16 oz. per *month*).

USEPA's conservative assessment (meaning it is likely to overestimate risk) assumed that white croaker consumption comprised a large 43 percent of the diet. This assessment calculated individual incremental cancer risks due to PCBs ranging from roughly 1 in 5,000 to 1 in 11,000 for "typical" consumption rates, and up to 1 in 2,000 for high-rate consumers. Based on these risk estimates, USEPA (1997b) found that the number of excess cancer cases that could potentially occur within the San Francisco Bay angler population due to exposure to PCBs in fish was less than one per year; over a 70-year period at those exposure levels somewhere between 11 and 26 Bay Area anglers might contract cancer due to PCBs in fish (USEPA 1997b).[3] Consumption at the advisory level of 8 oz. per month would reduce the estimated of potential number of cases over 70 years to less than 4.[4]

The USEPA (1997b) assessment upon which these estimates are based is very conservative and presumes a population-wide level of exposure unlikely to be experienced by anyone. These predictions of potential health effects from fish consumption contrast with the national average cancer incidence rate of 1 in 2.5,[5] or roughly 40 percent (American Cancer Society 2007), which predicts that 2.6 million of the approximately 6.5 million Bay Area residents (CDF 2000) will contract cancer (*excluding* basal and squamous cell skin cancers) over their lifetimes. Even if USEPA's risk scenarios were plausible, which they are not, completely eliminating all potential risk that USEPA attributes to consumption of San Francisco Bay fish containing PCBs would not make a detectable difference in the overall cancer incidence rate for Bay Area residents.

---

[3] USEPA (1997b, p. 3-38) indicates that PCBs contribute 49 percent of the cancer risk that yields their expectation of 23 to 53 excess cases of cancer over 70 years. The PCB contribution is thus 11 to 26 excess cancer cases.
[4] The one 8-oz. meal per month consumption recommendation from the advisory is equivalent to 7.5 g/day (8 oz. x 12 months x 28.35 g/oz. / 365 days). The 7.5 g/day consumption rate is 35 percent of the 21.4 g/day rate used to calculated the low end of USEPA (1997b)'s expected number of cancer cases. The <4 cancer cases estimate is 35 percent of the 11 cancer cases associated with PCBs at the 21.4 g/day consumption rate. Analogously, the two 8-oz. meal per month consumption recommendation would yield an expectation of 8 additional cases of cancer within the population over 70 years.
[5] Per American Cancer Society (2007) the rate is 1 in 2 for males and 1 in 3 for females, yielding 1 in 2.5 for combined males and females.

While the presence of chemicals in fish indicates that a health hazard is possible, the establishment of an advisory is not in itself indicative that a real health hazard exists, that risk reduction is required, or, in the language of the TMDL, that the COMM beneficial use is impaired. An advisory simply asserts that risk might be present at a certain exposure level, based on information on the potential health effects of a chemical at that exposure level. Given that there are chemicals in fish, and assuming that those chemicals could cause health effects at some exposure level, then the existence of chemicals in fish admits the possibility of potential health effects to some individuals. However, unless that exposure is achieved, even the potential risk is insignificant. Whether risk due to chemical contamination is a public health concern is a function of the degree of risk experienced by the population of concern. The conservative USEPA (1997b) study reported a very low level of risk within the San Francisco Bay angler population due to PCBs in fish. These risk findings indicate that with respect to widespread population public health concerns, or detrimental human health effects, the COMM beneficial use does not appear to be impaired.

Opinion 3. On an equivalent risk-level basis, the TMDL's fish tissue target is much more stringent than the California Toxics Rule and hence overprotective of the general sport fishery.

The TMDL's fish tissue numeric target is 34 to 89 times more stringent than the California Toxics Rule (CTR) water column standard. The CTR water-column standard considered to be protective of human health is 170 picograms per liter (pg/L) PCBs (40 CFR 131.38). According to the RWQCB (see TMDL report Table 21, p. 52), the numeric target of 10 ng/g in fish is equivalent to a water quality concentration of 19 to 49 pg/L, or 3.4 to 8.9 times below the generic, state-wide level set by USEPA for a sport fishery. The CTR standard was based on achieving a 1×10^{-6} (1 in 1,000,000) cancer risk, whereas the fish-tissue target is based on achieving a 1×10^{-5} (1 in 100,000) cancer risk. If both benchmarks are compared at the same risk level, the TMDL's fish-tissue target is 34 to 89 times more stringent than the CTR. In comparison to the CTR, the TMDL is overreaching in protecting the general sport fishery.

Opinion 4. The TMDL screening value, numeric target, and attainment measures for PCBs in fish tissue rely on a hypothetical scenario that results in an extreme overestimate of exposure by anglers. When taken together, the calculation of the screening level, its use as a numeric target for PCBs in fish tissue, and the proposed method for measuring its attainment presume a human exposure scenario that is not supported in fact, and is contradicted by the underlying data and auxiliary information sources. The proposed screening value and numeric target are so low and the attainment measures so focused that the resulting TMDL is extremely overprotective of the angler population and the general population.

The specifics of the calculations of screening level, numeric targets, and attainment measures severely limits the number of people whose COMM beneficial uses might possibly be impaired. Key problematic elements of the screening level calculation (TMDL report, Equation 1, p. 23), its use as a numeric target, and the proposed attainment measure are discussed below.

Risk Level of 1 in 100,000. The TMDL screening value for fish tissue is calculated based on an "acceptable" individual incremental cancer risk level of 1 in 100,000 (TMDL report, p. 23). In this setting, a risk of 1 in 100,000 means that a person exposed according to the underlying scenario has a 0.001 percent increased chance of contracting cancer. This risk level is on the order of the risk of being struck by lightning in any given year (1 in 280,000 or 0.0004 percent; http://www.lightningsafety.com/nlsi_pls/probability.html, viewed July 30, 2007). Again considering the background cancer rate of 40 percent, with the addition of this level of additional risk due to PCB exposure, a person's hypothetical cancer risk would be 40.001 percent. If there are fewer than 100,000 persons who meet the exposure conditions upon which the risk estimate is based, then no excess cases of cancer would be statistically expected due to PCB exposure.

Time Scale Errors. Standard carcinogen risk assessment models such as the one used in the TMDL report for calculating the Screening Value (TMDL report, p. 23) are based on the premise that risk is proportional to cumulative lifetime dose (USEPA 2005a, 1989a). Because the slope factors used to estimate cancer risk, including the cancer slope factor of 2.0 $(mg/kg\text{-}day)^{-1}$ for PCBs used in the TMDL report, are derived based on lifetime exposure (USEPA 2005a, 1996), only a lifetime average daily dose, which is an estimate of the average daily intake of a carcinogenic agent throughout the entire life of an individual, is properly matched in time scale to the slope factor. In other words, to estimate the risk of cancer, slope factors must be multiplied by lifetime average exposure levels (USEPA 1996). It is common practice within USEPA's Superfund program to consider doses calculated for exposures of 7 years or longer as chronic and thus appropriate for application of a long-term toxicity criterion such as a cancer slope factor or reference dose (USEPA 1989a). Nearly all risk-based regulatory programs, including those in California, utilize chronic toxicity criteria from USEPA's Integrated Risk Information System (IRIS) database and thereby embrace this principle. Exposures lasting 2 weeks to 7 years are typically considered subchronic, and application of long-term toxicity criteria to estimate likelihood of health effects due to such short-term exposures is suspect.

There is no term for exposure duration in the screening value calculation that supports the numeric target. Exposure duration is typically included in exposure assessment equations to represent the length of time over which the intake rate (e.g., fish consumption rate) is maintained and is used, along with a term for averaging time, to construct in the equation the fraction of a lifetime during which the exposure is maintained at that intake rate. Absent a specific term for exposure duration, the intake rate used by RWQCB to calculate the screening value, which is acknowledged to be based on 4-week recall, is taken to represent the average intake rate over an entire lifetime.

Not including an exposure duration term in calculating the screening value limits the applicability of the numeric target to those who eat fish from San Francisco Bay over an entire lifetime at 95th percentile short-term rates. The San Francisco Bay Seafood Consumption Study data do not support the existence of such a population. The study found that 41 percent of all consumers had been consuming San Francisco Bay fish for less than 5 years; over 50 percent of Vietnamese, Chinese, Filipino, Pacific Islander, and Latino consumers reported consumption of fish for five years or fewer (SFEI 2000, p. 36). Given the mobility of human populations and less-than-lifetime exposures of most anglers, lifetime exposure is an unreasonable assumption for this angler population.

The use of any 4-week recall consumption rate, particularly a 95th percentile short-term rate, is another serious time-scale error in the screening value calculation that severely limits its applicability to any real angler population. One of the most important methodological issues in fish consumption surveys is to adequately address the dual objectives of obtaining accurate recall of consumption and capturing and smoothing individual variation over time so that an appropriately long-term average (over at least one full year to account for seasonal cycles) can be developed (USEPA 1998, 1989b). For accuracy of recall, the San Francisco Bay Seafood Consumption Study chose to measure an angler's consumption over the previous 4 weeks. However, it is not reasonable to assume that an extreme statistic like the 95th percentile from a 4-week recall period is equivalent to an annual average rate, let alone a lifetime average rate for anyone. In any given 4-week period, only 5% of anglers consume as much or more fish than the 95th percentile rate. For any angler to consistently fall in that uppermost consuming group for all 910 4-week periods during the implicit 70-year exposure period would require an incredible run of determination to fish and extraordinary success at doing so.

The San Francisco Bay Seafood Consumption Study data further demonstrate the near impossibility of such fishing and consumption behavior. Of the 1,080 respondents who said they ever eat fish from San Francisco Bay, only 537 (50 percent) reported eating Bay fish in the previous 4 weeks. There are 13 4-week periods in a year. If the survey data are taken as a snapshot of 4-week periods, then the likelihood of an angler's consuming Bay fish in any 4-week period is 50 percent. According to very basic probability theory,[6] the likelihood of consuming fish in all 13 of these periods is on average 0.5^{13} or less than 1 in 8,000. This is the same as the probability of getting 13 "heads" in a row when tossing a balanced coin. Applying that likelihood across all of the estimated 125,000 to 170,000 San Francisco Bay anglers yields the prediction that 15 to 21 anglers would eat fish in every period during that year.

These calculations assume that each period is independent, just like each toss of a balanced coin would be an independent event. This assumption presents a bounding case because personal preference plays a role that would tend to correlate probabilities for individual anglers across periods, just like a weighted coin might be more likely to come up "heads" on successive flips than a balanced one. It is extremely unlikely however, that data from one measured 4-week period are perfectly correlated to all other 4-week periods over 70 years, as implicitly assumed by the RWQCB's application of a 4-week recall rate in its calculation of the screening value and numeric target. Fishing and consumption behavior are more complex and variable than that. Whether or not an angler eats fish from San Francisco Bay in any 4-week period is a function of whether or not he or she tries to catch fish to eat and whether or not he or she is successful in

[6] The binomial random variable counts the number (k) of "successes" in n independent trials. In this case, the probability (p) of success, i.e., eating fish in a four-week period, is 0.5. Eating fish in all 13 4-week periods is represented by 13 successes, each with probability 0.5, in 13 periods. Using the equation for the binomial random variable (see, e.g., Walpole and Myers 1993 or most basic probability and statistics texts), the probability of 13 successes in 13 trials is $P[X=13] = (13!/13!*0!)*0.5^{13}*0.5^{0} = 0.5^{13} = 0.000122$. $1/0.000122 = 8{,}192$. So the probability of eating fish in each of 13 periods is less than 1 in 8,000.

catching fish he or she wants to eat. Over all the 4-week periods over a 70-year lifetime there are bound to be interruptions in fishing due to personal circumstances and interruptions in consumption due to failure to catch desired species in sufficient quantities. The survey data do not support extending a 4-week consumption rate, especially an extreme consumption rate statistic such as the 95th percentile, to every period of one year, let alone a 70-year lifetime exposure.

There is a proven method for using the short-term information from a recall study to develop long-term average fish consumption rates appropriate for the cancer risk calculation the RWQCB seeks to make. With colleagues, I applied a trip-based data analysis and statistical modeling approach to data from the 4-week recall Santa Monica Bay Seafood Consumption Study (Wilson et al. 2001) to estimate long-term consumption behavior and associated fish consumption risks to southern California angler populations. Such an approach could be applied in this case and would provide an appropriate alternative to the overly simplistic export of survey results presently used to support development of the screening value and numeric target in the TMDL report.

32 g/day Fish Consumption Rate. Results of the San Francisco Bay Seafood Consumption Study (SFEI 2000) conducted from July 1998 through July 1999 are used to support the 32 g/day fish consumption rate used in deriving the TMDL numeric target for concentrations in fish tissue designed to restore beneficial use COMM. There are numerous serious problems associated with using this study, and especially this consumption rate from it, for establishing the TMDL numeric target.

First, the study queried adult angler respondents, 90 percent of whom were male, regarding the amount of San Francisco Bay fish they consumed. No information was collected regarding the consumption rates of anglers' families and friends who may also consume fish from San Francisco Bay. Hence the study is based only on anglers: not their families or friends, women or children, and certainly not the general population. It is generally acknowledged that consumption rates for recreationally-caught fish are higher within the angling population than the general population due to enhanced access and interest (USEPA 1998, 1989b). An angler-based consumption rate thus overestimates consumption of San Francisco Bay fish among the general population and thus is a substantial overestimate of fish consumption rates is not representative of, and overstates, with respect to the goals of TMDL policymaking.

Further, the 32 g/day consumption rate is an extremely high rate even for the selective angler group. The 32 g/day rate, equivalent to one 8-oz. meal of self-caught fish per week, is the 95th percentile of the set of consumption rates over the previous 4 weeks for those survey respondents who indicated that they ever eat fish from San Francisco Bay. By definition, only 5 percent of this respondent group reported consuming more than 32 g/day in the 4 weeks preceding their interviews. A 95th percentile is not representative of the population. Central tendency measures such as the mean or median are values around which data tend to cluster, and as such are informative population summaries (Walpole and Myers 1993). Matthews and Kinnell (2004) addressed this issue in some detail. Their concluding point, with which I concur, merits emphasis: Using the 95th percentile rate as typical of even anglers in the TMDL is like using the 95th percentile home value in the Bay area as a typical value of all Bay area homes.

There is a mismatch between species included in consumption rate derivation in the San Francisco Bay Seafood Consumption Study (SFEI 2000) and those species proposed for monitoring to determine attainment of the TMDL. The use of PCB concentrations in white croaker and shiner surfperch as the attainment measures (TMDL Report, p. 51) effectively applies the 32 g/day lifetime consumption rate to those species individually. The 32 g/day rate was derived across all recent consumers of all species, not a single species. The San Francisco Bay Seafood Consumption Study reported that white croaker ranked 5th and shiner surfperch ranked 11th among species reportedly consumed within the past 4 weeks. Only 86 survey respondents indicated that they ate white croaker in the past 4 weeks out of 318 who reported they ever ate it. In other words, the frequency of recent white croaker consumption among the 28 percent willing white croaker consumers was 27 percent. The frequency of recent white croaker consumption among all consumers of Bay fish was 7.5 percent. Extending the calculation above, subject to the same caveats, the probability of consuming white croaker in every 4-week period within a year is on average 0.27^{13} or less than 1 in 24 million among white croaker consumers. And, it necessarily follows that the probability of consumption of shiner surfperch in every four week period is even lower.

The San Francisco Bay Seafood Consumption Study (SFEI 2000) indicates that white croaker and surfperch are predominantly harvested by shore-based anglers. Concentrating on these two species creates a bias by overemphasizing human exposure to the Bay margins and underemphasizing boat-based fishing in the larger main expanse. The survey data indicate that fish are caught from a wide variety of locations and habitats within the Bay and hence many fish caught and consumed by anglers may be exposed to lower ambient concentrations than those present at Bay margins. According to SFEI (2000; p. K-47), striped bass, halibut, and sturgeon are consumed by more anglers than either white croaker or surfperches. Consumption of the more popular species is more equally distributed across fishing modes, including boat-based modes.

There are also numerous design and analysis flaws with the San Francisco Bay Seafood Consumption Study that bias its consumption rates upward, and limit its representativenes and applicability to supporting numerical target development for the TMDL. Matthews and Kinnell (2004) review in detail mismatch problems between units sampled (days and times) versus units measured (anglers), limited and biased sampling location coverage, unaddressed length-of-stay biases, leading questions related to the portion size model, and others. Taken together with the issues highlighted above, there is overwhelming evidence that the 32 g/day fish consumption rate from the San Francisco Bay Seafood Consumption Study is not a valid statistic to use development of the screening value, numeric target, and attainment measures in the proposed TMDL for PCBs.

Cooking loss. There is no term to account for loss of PCBs during cooking in the screening value or numeric target. Thus, as derived, the screening value and numerical target assume that fish are not cooked, or are prepared via a method that does not result in cooking loss. The San

Francisco Bay Seafood Consumption Study data indicate that this is an invalid assumption for nearly all fish consumers, and especially white croaker consumers. The San Francisco Bay Seafood Consumption Study report indicates that greater than 99% of white croaker consumers *never* eat it raw (SFEI 2000, p. K-48). Preparation method information was not collected or reported for surfperches. Laboratory data, including 8 studies reviewed in a paper I authored with colleagues (Wilson et al., 1998), indicate that baking, boiling, broiling, frying, and smoking fish all result in removal of PCBs from the edible portion. The average PCB loss across these methods was on the order of 40 percent. Failure to consider cooking loss thus reduces the screening value and numeric target by a factor on the order of 2.5.

Summary. When taken together, the calculation of the screening level, its use as a numeric target for PCBs in fish tissue, and the proposed method for measuring its attainment presume a human exposure scenario that is not supported in fact, and is contradicted by the underlying data and auxiliary information sources. The presumed exposure scenario is simplistic and unrealistic, and, due to compounding conservatism, it overstates the exposure and potential risk posed by PCB levels in fish to the vast majority, if not all, San Francisco Bay anglers, let alone the general population in the San Francisco Bay area. The number of additional people protected by reducing PCB levels in San Francisco Bay fish from the current levels to the TMDL numeric target is likely very small due to the low levels of risk predicted under current conditions and the extreme nature of the exposure scenario underlying the numeric target.

Many scientists have recognized that combining conservative or "reasonable" worst-case values for exposure factors overestimates true exposures and risks (Cullen 1994, Slob 1994, McKone and Bogen 1991), and that this overestimation occurs even when each exposure factor (be it consumption rate, exposure duration, or cooking loss factor) is itself "reasonable" (USEPA, 1992, McKone and Bogen, 1991). By the laws of probability, combining high-end exposure factor values, as in the TMDL report's ignoring cooking loss and exposure duration, and essentially repeating 95th percentile short-term consumption rates for every period of a 70-year exposure, yields results that are more extreme than any one of the individual values. In other words, results are often produced that are beyond the 99th or 99.99th percentile values of potential exposures and approach impossibility. Many researchers have observed that combining conservative high-end exposure factor values results in unrealistic scenarios with little or no chance of occurring (Cullen 1994, Hattis and Burmaster 1994, Lloyd et al. 1992, Whitmyre et al. 1992).

I recommend that the RWQCB examine the underlying survey data to determine from individual angler responses from the San Francisco Seafood Consumption Study whether there is any likelihood that its hypothesized exposure scenario of long-term, high-rate consumption of raw white croaker and shiner surfperch occurs at all. Survey data can and should be evaluated to develop a more thorough understanding of angler fishing and consumption behavior, including taking into account seasonal variations and correlations among angler behaviors to realistically portray long-term angling and consumption behavior. In addition, the RWQCB should correct the time-scale errors in its screening value calculations using contemporary methods for analysis and modeling of the angler survey data.

Opinion 5. When the need for costly remedies is suggested by simplistic or streamlined risk assessment approaches, it is customary and appropriate to conduct more sophisticated analyses to better understand risks and benefits prior to initiating any remedial decisionmaking. The risks associated with implementing any sediment management strategies to meet the TMDL, which can be substantial in the cases of capping or dredging, should be quantified prior to remedy selection to assess whether a real risk reduction can be achieved.

As discussed in my Opinion 4, the methodology applied by RWQCB in the TMDL report is simplistic and representative only of a hypothetical angler population that likely does not exist. Given the large geographic footprint of the Bay and the large expenditures contemplated to achieve the TMDL as proposed, RWQCB has an obligation to apply more sophisticated risk assessment techniques to better understand the true risks posed by Bay sediments and also to quantify risks associated with TMDL implementation so that risks and benefits can be comprehensively understood prior to establishing any water- and sediment-quality management plan for the Bay.

Different types of risk assessments can be performed based on the goal of the study and the type and amount of data available. As discussed the by the National Research Council (NRC 1994) and USEPA (1992a), the management of environmental risk calls for the iterative, or "tiered" use of risk assessments. Typically, risk assessors first employ the simplest, most basic techniques in order to determine in the broadest sense whether exposure to chemicals might pose a health risk. Basic techniques and simple assumptions generate "screening" assessments that can be useful in identifying trivial risks and focusing attention on more important risk sources. Most screening assessments generate highly uncertain, but presumably conservative upper bound estimates of the true risk. The assessment underlying the TMDL screening value and numeric target falls into this "screening level" category.

Because of the potential for screening approaches to overstate risk, risk assessors use more refined, or higher tier, exposure and risk estimates where the costs and impacts of addressing the health risk are significant. Such refined risk assessments may be based on the development and use of information not considered in the screening assessment and more detailed approaches to modeling exposure. The refined assessments should be used to produce new, less uncertain risk estimates. As long as the risks are not considered to pose an imminent threat (which should be able to be determined in the screening step), this process of refining risk estimates should continue until the risks of both the baseline conditions and potential interventions are well understood to the satisfaction of all stakeholders. These basic risk assessment principles are directly applicable to the calculation of the screening value and the numeric target proposed in the TMDL for PCBs.

RWQCB has proposed a catalog of various methods for reducing PCB loads, and by extension via risk assessment, associated water quality impairments. The methods identified for reducing PCB loadings include no action (regarding atmospheric exchanges of PCBs with the Bay), monitored natural attenuation (for PCBs arising in soils of the Central Valley Watershed), limitations on nonpoint and point discharges, cleanup of sites with known PCB contamination, sediment dredging (discussed in the context of navigational dredging) and institutional controls and notifications to potential anglers and other users of the Bay. The TMDL report also calls for ongoing monitoring to support adaptive implementation of the TMDL.

The TMDL report acknowledges the potential for negative impacts to arise from the TMDL implementation, and provides a CEQA checklist regarding certain such impacts. In addition, the Plan states that "the Water Quality Board will not require any actions or projects to implement the PCBs TMDL that would lead to significant, permanent, negative impacts on the environment. Furthermore, [the TMDL] anticipate[s] that all reasonably foreseeable potential environmental impacts will be mitigated to less-than-significant levels..."

Eliminating and/or constraining negative impacts of TMDL implementation are important objectives. However, the implementation program as presented in the Plan appears to be overly general and to offer a "shopping list" of technologies that may or may not be applied. The TMDL report identifies an "adaptive" process for advancing the TMDL without providing specifics regarding adaptive thresholds, response measures, or feedbacks.

It is important for the TMDL to be specific regarding adaptive management protocols and adaptive response technologies. In estuarine sediment systems like the Bay, the balance between negative impacts and reduction of chemical exposure risks is particularly difficult to strike in the context of decisions for managing contaminated sediments. Remediation of in-place sediments is technically challenging, and all available technologies are inherently destructive of the ecosystem in place and have potential to exacerbate, rather than reduce, chemical exposure as a net outcome. It is thus crucial that the overall risk reduction benefits of sediment management alternatives be weighed rationally and objectively against technology-specific threats to human health and the environment associated with water- and sediment-quality management methods.

Regarding sediment management methods, the list of methods for sediment remediation is short. Options include no-action, monitored natural attenuation, capping, and dredging, or combinations of one or all of these.

The primary risk associated with no-action alternatives is continuation of chemical exposure and associated adverse toxicological effects, if any are predicted at the levels of exposure experienced by the population. In the context of exposure reduction, no-action and monitored natural attenuation are equivalent. The difference is that monitored natural attenuation includes data collection to support ongoing evaluation of changes in exposure and exposure risk, and is inherently useful for adaptive management. A critical parameter determining the applicability of either is the baseline level of risk, and potential changes in risk levels over time. As noted previously, a comprehensive, realistic risk assessment for exposure to PCBs in San Francisco Bay is sorely missing from the TMDL process as it currently stands. The National Research Council (NRC) (2001, page 171) noted that accurate risk analyses, with reasonable accounting for technical uncertainty, are needed for effective decision making: "Overstated risks [which, for purposes of this paragraph would lead to more active intervention than no-action or monitored natural attenuation] can unduly alarm the public and force an active management solution that will not reduce risk and thus will be inappropriate." Because active sediment management alternatives such as capping or dredging are all inherently destructive, this is an important consideration.

As discussed extensively above, the TMDL's screening level, numeric target for fish, and attainment measures are not representative of, and grossly overestimate the true risk experienced by the angler and general populations. Exaggerated risks such as these do not provide a "margin of safety" within the TMDL because active intervention is inherently destructive, and time, effort, and money allocated to a spurious issue are not available for other, more objectively realized, risks. In addition, active intervention can interfere with natural attenuation processes and slow ecosystem recovery without commensurate risk reduction. The NRC pointed out, for example, that dredging in Manistique Harbor, Michigan to remove PCBs halted ongoing natural recovery in the dredged areas (while recovery continued in areas not dredged) and reduced PCB mass but not exposure risks (NRC 2001, p. 285).

One of the most important conclusions drawn by the NRC in 2001 was to call into question a narrow risk assessment focus on chemical exposure. The NRC report states that "...the current regulatory regime focuses on the type of sediment management activity—removal, containment, or treatment—and not on the management of all risks to humans and the environment" (NRC 2001, p. 245). The NRC recommended a much broader risk-based framework: "...a comprehensive approach is needed to address all the risks—societal, cultural, economic, ecological, and human health...as well as the changes in risk that occur with various management approaches" (NRC 2001, p. 9). The limited CEQA process, documented in Appendix B to the TMDL report partially addresses this issue. However, neither the risk analysis on which the TMDL report's proposals are based nor the minimally applied CEQA process evaluate the spectrum of risk issues that arise in a sediment management context. Clearly missing is a full consideration of the "risks of remedy"—the direct and indirect impacts on people and the environment that result from implementing the PCB management alternatives. In a policy directive issued after publication of the NRC (2001) report, EPA directed site managers to make risk-based decisions using an iterative process "...that evaluates the short-term and long-term risks of all potential cleanup alternatives" (USEPA 2005b, 2002).

Such risks are not limited to chemical exposure. The "hidden," often unconsidered, risks of remedial technologies can be more severe. For example, Hoskin et al. (1994) found that the risk of one worker fatality occurring during typical remediation activities may be higher than assumed chemical exposure risks under residential land use assumptions. Leigh and Hoskin (2000) demonstrate that capital costs associated with worker fatalities and disabling injuries for a hypothetical sediment removal site were over an order of magnitude higher than the capital costs associated with residential cancer risks less than 1×10^{-4} (1 in 10,000) for exposed populations of 100,000 individuals. In addition to direct worker injury and fatality, remediation risks include vehicle accidents, hazardous material releases during transport, and others (Scott et al. 2001, Cohen et al. 1997, Leigh and Hoskin 2000).

Recently, the National Research Council revisited the topic of contaminated sediment management, focusing on dredging technologies (NRC 2007). Findings of this updated assessment were consistent with those from the earlier effort. Among other things, the 2007

NRC report concludes that dredging can be "effectively implemented to remove contaminants, but technical limitations often constrain its ability to achieve expected outcomes." This is an important consideration for the TMDL process. For dredging to serve as a wide-area PCB risk reduction technology, the method must be able to achieve target levels, an ability that, given present understanding, is unlikely.

The 2007 NRC report continues: "...dredging has encountered systematic difficulties in achieving specified cleanup levels...," and that this phenomenon is associated with residual contamination due either to dredge operations or to exposure of contaminated sediments deeper in the sediment column. This is a critically important concern for PCB management in San Francisco Bay sediments. Figure 13 (TMDL Report, p. 33) illustrates that natural recovery processes, e.g., covering of PCB-laden sediments deeper in the column with cleaner sediments over time, has reduced surface sediment concentrations of PCBs. Concentration reduction (unlike mass reduction) means lower risk levels. Applying dredge technologies to such sediments without accounting for the natural recovery processes already operating might well exacerbate, rather than reduce, risks. The 2007 NRC report also concludes that contaminant resuspension during dredge operations is inevitable and should be considered in the risk assessment process on which technology selection is based.

As a summary statement, this quote from the 2001 NRC report (p. 171) is appropriate: "...if some risks are overstated while others are not considered, such as those associated with active remediation, a biased decision will be reached, and the environment might be damaged with a reduction in risk, or in some cases, risks might be increased due to inappropriate or unnecessary remedial actions".

Opinion 6. The TMDL screening value and numeric target for PCBs are based on estimates of potential cancer risks. The TMDL policymaking process should also consider the real observed health benefits of fish consumption.

Another important policy consideration is balancing the potential chemical exposure risks with the proven health benefits of including fish as an important part of a healthy diet.

Fish are an excellent, low-fat source of protein. Among the proven human health benefits of omega-3 fatty acids in the diet are reduced triglyceride levels, reduced risk of both fatal and non-fatal heart attacks, and reduced blood pressure. There is also good scientific evidence that omega-3 fatty acids are protective against cardiovascular disease in both men and women, that they reduce rheumatoid arthritis symptoms in affected persons, and that they improve kidney function and lower blood pressure in transplant patients (http://www.mayoclinic.com/health/fish-oil/NS_patient-fishoil; viewed July 30, 2007). People who reduce fish consumption in response to an overly cautious advisory or based on general fear of contamination may substitute lower quality, higher fat protein sources, and thereby forego real measured health benefits because of fear of potential cancer risks.

I recently attended the 2007 National Forum on Contaminants in Fish in Portland, Maine. Many speakers emphasized the health benefits of eating fish because of the omega-3 fatty acids they contain, even in the presence of chemical contamination. One recent study (Foran et al. 2005) found that per 100,000 individuals, consumption of farmed or wild salmon would result in 24 or 8 excess cancer cases, respectively, due to the presence of persistent organic chemicals, while consumption of either type of salmon would result in 7,125 fewer deaths due to coronary heart disease. Mozaffarian and Rimm (2006) built upon those results and found that for all ages 25 through greater than 85 years, the measurable health benefits outweighed the cancer risks by 100- to 370-fold for farmed salmon and by 300- to more than 1,000-fold for wild salmon. Although the specific levels of PCBs and other chemicals in San Francisco Bay fish and the levels of omega-3 fatty acids are surely different from farmed and wild salmon included in these analyses, the results are informative. As Mozaffarian and Rimm (2006) emphasize, the estimated coronary heart disease benefits are based on prospective studies and randomized trials in humans while the estimated cancer risks include a 10-fold safety factor and are based on animal-experimental data and limited studies in humans at high doses. They also note that prospective studies in humans have seen little evidence for effects of fish intake on cancer risk. This is not surprising given the 40 percent background cancer rate previously cited.

References

American Cancer Society. 2007. *Cancer Facts & Figures 2007*. Atlanta: American Cancer Society.

Cohen, J.T., B.D. Beck, and R. Rudel. 1997. Life years lost at hazardous waste sites: remediation worker fatalities vs. cancer death to nearby residents. *Risk Anal* 17:419-425.

Cullen, A.C. 1994. Measures of compounding conservatism in probabilistic risk assessment. *Risk Anal* 14:389-393.

Foran, J.A., Good, D.H., Carpenter, D.O., Hamilton, M.C., Knuth, B.A., and S.J. Schwager. 2005. Quantitative analysis of the benefits and risks of consuming farmed and wild salmon. *J Nutr* 135:2639-2643.

Hattis, D.B. and D.E. Burmaster. 1994. Assessment of variability and uncertainty distributions for practical risk assessments. *Risk Anal* 14:713-730.

Hoskin, A.F., J.P. Leigh, and T.W. Planek. 1994. Estimated risk of occupational fatalities associated with hazardous waste site remediation. *Risk Anal* 14:1011-1017.

Leigh, J.P. and A.F. Hoskin. 2000. Remediation of contaminated sediments: a comparative analysis of risks to residents vs. remedial workers. *Soil and Sediment Contamination* 9:291-309.

Lloyd, K.J., Thompson, K.M., and D.E. Burmaster. 1992. Probabilistic techniques for backcalculating soil cleanup targets. In *Superfund Risk Assessment in Soil Contamination Studies*; Hoddinott, K.B.; Knowles G.D. Ed.; ASTM: Philadelphia, PA, 1992.

Matthews, K.E. and J.C. Kinnell. 2004. Comments on the Draft San Francisco Bay PCB TMDL. Memo to Paul N. Singarella, Esq. Triangle Economic Research, Durham, NC. February 19.

McKone, T.E. and K.T. Bogen. 1991. Predicting uncertainties in risk assessment. *Environ Sci Technol* 25: 1674-1681.

Mozaffarian, D. and E.B. Rimm. 2006. Fish intake, contaminants, and human health: evaluating the risks and benefits. *JAMA* 296:1885-1899.

National Research Council. 1994. *Science and Judgment in Risk Assessment.* National Academy Press, Washington, D.C.

National Research Council. 2001. *A risk-management strategy for PCB-contaminated sediments.* National Academy Press, Washington, D.C.

National Research Council. 2007. *Sediment Dredging at Superfund Megasites: Assessing the Effectiveness.* Prepublication copy. Washington, D.C: National Academy Press.

OEHHA (Office of Environmental Health Hazard Assessment). 1999. Overview of San Francisco Bay Sport Fish Contamination and Response Activities. Office of Environmental Health Hazard Assessment. California Environmental Protection Agency. Oakland, CA. August.

OEHHA. 2006. Development of Guidance Tissue Levels and Screening Values for Common Contaminants in California Sport Fish: Chlordane, DDTs, Dieldrin, Methylmercury, PCBs, Selenium, and Toxaphene. Draft. Office of Environmental Health Hazard Assessment. California Environmental Protection Agency. February.

SFEI (San Francisco Estuary Institute). 2000. *San Francisco Bay Seafood Consumption Report. Technical Report.* San Francisco Estuary Institute. Richmond, CA.

SFRWQCB (San Francisco Regional Water Quality Control Board), State Water Resources Control Board, and California Department of Fish and Game. 1995. *Contaminant Levels in Fish Tissue from San Francisco Bay: Final Report.* San Francisco Regional Water Quality Control Board, Oakland, CA.

SFRWQCB. 2006. *Mercury in San Francisco Bay: Proposed Basin Plan Amendment and Staff Report for Revised Total Maximum Daily Load (TMDL) and Proposed Mercury Water Quality Objectives*. California Regional Water Quality Control Board. San Francisco Bay Region. August 1.

SFRWQCB. 2007. *Total Maximum Daily Load for PCBs in San Francisco Bay: Proposed Basin Plan Amendment and Staff Report.* California Regional Water Quality Control Board. San Francisco Bay Region. June 22.

Scott, P.K., A. Pittignano, and B.L. Finley. 2001. Evaluation of physical hazards associated with two remedial alternatives at a Superfund site. *Risk Anal* 21:53-61.

Slob, W. 1994. Uncertainty analysis in multiplicative models. *Risk Anal* 14:571.

Southern California Coastal Water Research Project (SCCWRP) and MBC Applied Environmental Sciences. 1994. *Santa Monica Bay Seafood Consumption Study.* Prepared for the Santa Monica Bay Restoration Project. Southern California Coastal Water Research Project, Westminster and MBC Applied Environmental Sciences, Costa Mesa, CA.

USEPA 1989a. *Risk Assessment Guidance for Superfund.* Volume 1, Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1-89/002. December.

USEPA. 1989b. *Assessing Human Health Risks from Chemically Contaminated Fish and Shellfish: A Guidance Manual.* EPA-503/8-89-002.

USEPA. 1992. 57 Federal Register 104:22888-22938.

USEPA. 1996. *PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures.* EPA/600/P-96/001F. September.

USEPA. 1997a. *Mercury Study Report to Congress. Volume IV: An Assessment of Exposure to Mercury in the United States.* Office of Air Quality Planning and Standards and Office of Research and Development. U.S. Environmental Protection Agency. Washington, DC: Document No. EPA -452/R-97-006. December 1997.

USEPA. 1997b. *Analysis of the Potential Benefits Related to Implementation of the California Toxics Rule.* Office of Policy, Planning, and Evaluation. Office of Sustainable Ecosystems and Communities. U.S. Environmental Protection Agency. Washington, DC. June 1997.

USEPA. 1998. *Guidance for Conducting Fish and Wildlife Consumption Surveys.* EPA-823-B-98-007. November.

USEPA 2000. *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories, Volume 2: Risk Assessment and Fish Consumption Limits, Third Edition.* U.S. Environmental Protection Agency. Washington, DC: Document No.EPA 823-B-00-008. November 2000.

USEPA 2002. Principles for managing contaminated sediment risks at hazardous waste sites. OSWER Directive 9285.6-08.

USEPA 2005a. *Guidelines for Carcinogen Risk Assessment.* EPA/630/P-03/001F. March.

USEPA 2005b. *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites.* EPA-540-R-05-012. December.

Walpole, R.E. and R.H. Myers 1993. *Probability and Statistics for Engineers and Scientists*, 5th ed. Englewood Cliffs, NJ: Prentice Hall.

Whitmyre, G.K., Driver J.H., Ginevan M.E., Tardiff, R.G. and S.R. Baker. 1992. Human exposure assessment. I: Understanding the uncertainties. *Toxicol Ind Health* 8:297-320

Wilson, N.D., Shear, N.M., Paustenbach, D.J., and P.S. Price. 1998. The effect of cooking practices on the concentration of DDT and PCB compounds in the edible tissue of fish. *J Expos Assess Environ Epidemiol*, 8, 423-440.

Wilson, N.D., P.S. Price, and D.J. Paustenbach. 2001. An event-by-event probabilistic methodology for assessing the health risks of persistent chemicals in fish: a case study at the Palos Verdes Shelf. *Journal of Toxicology and Environmental Health, Part A*. 62: 595-642.

Comments of the General Electric Company on Human Health Issues Concerning:

Total Maximum Daily Load for PCBs in San Francisco Bay: Proposed Basin Plan Amendment and Staff Report

Expert Opinion

prepared by:

Russell E. Keenan, Ph.D.
Vice President & Technical Director
AMEC Earth & Environmental, Inc.
15 Franklin Street
Portland, ME 04107

August 17, 2007

I. INTRODUCTION

On June 22, 2007 the California Regional Water Quality Control Board for the San Francisco Bay Region (Water Board) published and made available for public comment a document entitled, *Total Maximum Daily Load for PCBs in San Francisco Bay: Proposed Basin Plan Amendment and Staff Report* (Staff Report). The Staff Report presents the supporting documentation for a proposed Basin Plan amendment that will be considered by the Water Board for establishing a Total Maximum Daily Load (TMDL) and implementation plan for Polychlorinated Biphenyls (PCBs), including PCBs with dioxin-like properties, for all of San Francisco Bay. The TMDL is based on attainment of a fish tissue target PCB concentration which purportedly is protective of human health, wildlife, and aquatic life. The Staff Report states that it contains the results of analyses of PCB impairment assessments, sources and loadings, linkage analyses, load reductions, and implementation actions. Further, the Staff Report states that it was submitted for external peer review, which concluded that "the scientific basis of the proposed Basin Plan amendment is based on sound scientific knowledge, methods, and practices." [Staff Report, p. 1-2]

We appreciate the opportunity to comment on the Staff Report. Risk assessment standards, such as a target PCB concentration in fish that is protective of human health, and the establishment of a TMDL based on that target fish concentration, can have a substantial impact on both the public's perception of risk and expenditures by government agencies and the private sector in responding to perceived risks. It is essential that such standards be technically defensible, and neither materially underestimates nor substantially overstates potential risk. Any standard that claims to risk-based must conform to a basic and fundamental principle of toxicology, which was articulated long ago by Paracelsus (1493-1541) when he noted, "All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy." (Amdur et al., 1991, p. 13)

The proper technical conditions to support the proposed target PCB concentration in fish, the TMDL, or the implementation plan for PCBs are not present. The following comments pertain to the deficiency of the Staff Report in its characterization of both potential human exposure and PCB toxicity. This deficiency is so material that the Staff Report does not provide a reasonable, or technically defensible basis for developing a target PCB concentration in fish, a TMDL for PCBs or an implementation plan for PCBs.

The second section of this document provides an Opinion Summary of the substantive comments that follow. The third section provides our substantive comments on the Staff Report. References are listed in the final section and provided in electronic format as an Exhibit to these comments.

II. OPINION SUMMARY

A. The Staff Report discusses the use of a toxic equivalency (TEQ) method to relate the toxicity of the designated "dioxin-like" PCB congeners to the cancer potency of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), believed to be the most potent dioxin congener. Under this method, concentrations of the various non-ortho-substituted 'coplanar' and mono-ortho-substituted PCB congeners are converted to equivalent concentrations of TCDD through the use of toxicity equivalence factors (TEFs). The Staff Report discusses the use of the TEQ method for "dioxin-like" PCBs as a possible approach for "estimating the risk from environmental exposures to PCBs," and then it calculates a fish tissue screening value of 0.14 pg/g TEQ based on the TEQ approach [p. 24-25; Figure 9]. The critical calculation of this screening value is not described in a transparent fashion. For example, the Ahlborg et al. (1994) paper is cited as a source for the TEF values used in the computation, which are commonly known as the WHO_{94} (World Health Organization) 1994 TEFs. However, setting aside the question as to whether this method should be used at all, the Staff Report does not explain why the TMDL uses the older WHO_{94} TEFs, rather than the updated WHO_{98} (van den Berg et al., 1998) values, or the latest set of WHO_{06} (van den Berg et al., 2006) TEFs. In addition, no mention is made as to what cancer slope factor (CSF) for TCDD was used in the calculation, nor is there any justification for the selection of whatever CSF was chosen. Such deficiencies should not pass an independent peer review of the document.

In addition, the Staff Report does not address the scientific limitations associated with the application of the TEQ approach to PCBs, including the following:

- The TEQ approach is based on the incorrect assumption that TEFs are constants across species, individuals, organ systems, tissue types, and health endpoints, covering both carcinogenic and noncarcinogenic effects;

- The use of the TEQ approach requires assumptions about the cancer slope factor (CSF) for dioxin despite the fact that there is no consensus in the scientific community as to what the CSF should be;

- The TEQ approach relies on the questionable assumption that all of the congeners for which TEFs are assigned are carcinogenic, and that this carcinogenicity can be predicted based on noncarcinogenic endpoints;

- The TEQ approach assumes, without sufficient support, that the dose-response curves for the noncarcinogenic effects are parallel to the carcinogenic dose-response curve for TCDD;

- The TEQ approach assumes, without basis, that the toxic effects of all the congeners in a mixture are additive; and

- The TEQ approach assumes, incorrectly, that there is no inter-species variability in sensitivities to so-called 'dioxin-like compounds' (DLCs), and, specifically, that the potency of TCDD in human cells is equivalent to that in animal cells.

For these, among other, reasons inclusion of selected PCB congeners using the TEQ approach is not scientifically justified.

B. Substantial evidence indicates that the TEQ approach does not accurately predict the toxicity of the so-called "dioxin-like" PCB congeners. Such evidence includes the following:

- The application of the WHO TEFs to "dioxin-like" PCB congeners results in risk predictions that are not verifiable, even within the confines of traditional rodent dose-response analyses (Keenan, 2000; Keenan, 2001; Keenan et al., 2003; Silkworth and Keenan, 2005). A basic premise of the TEQ approach is that a given dose of TEQ has equal biological potency irrespective of the chemical mixture that makes up the dose (Van den Berg, et al., 1998). Evidence indicates, however, that the CSFs for the TEQ in PCB mixtures are not equal to the CSF for TCDD in either rodents or humans; in fact, the CSFs for the TEQ component within each type of commercial PCB mixture varied over a 24-fold range (Keenan, 2000; Keenan, 2001; Keenan et al., 2003; Silkworth and Keenan, 2005). This discordance demonstrates that the TEQ approach for evaluating cancer risks associated with exposure to PCB mixtures is seriously flawed.

- Recent two-year bioassays performed by the National Toxicology Program ("NTP") evaluated the chronic toxicity and carcinogenicity of dioxin, "dioxin-like" compounds, structurally-similar PCBs, and mixtures of these compounds. NTP stated that it conducted its evaluation to address "the lack of data on the adequacy of the TEQ methodology for predicting relative potency for cancer risk" (NTP, 2006a). The initial NTP bioassay results provided evidence of non-additive interactions among DLCs, inconsistencies in dose-response depending on the dose metric analyzed, and different relative potencies depending on the endpoint observed. Further analysis of the NTP results showed that any of the WHO TEF values (e.g., WHO_{94}, WHO_{98}, or WHO_{06} TEFs), which were derived from data on noncancer endpoints evaluated on an administered dose basis, substantially overpredict the cancer potency of 4-PeCDF and PCB 126 on a body-burden basis.

- The National Academy of Science review of EPA's draft Dioxin Reassessment (NAS, 2006), stated that "[i]t remains to be determined whether the current WHO TEFs, which were developed to assess the relative toxic potency of a mixture to which an organism is directly exposed by dietary intake, are appropriate for body burden toxic equivalent quotient (TEQ) determinations."

- Recent studies have shown that human liver cells respond differently to both PCB and TCDD than do rat cells. Human cells require higher doses to elicit a response, and the potency of the most potent "dioxin-like" PCB congener (PCB 126) relative to dioxin in human cells is much less than the currently assigned TEF value of 0.1, which is based on data from rodent studies. In addition, genomic studies in rats indicate that dioxin elicits responses from a unique set of genes that are not similarly affected in animals exposed to TEQ equivalent Aroclor mixtures of PCBs.

C. The proposed numeric target PCB fish concentration for the TMDL of 10 ng/g is not based on sound science, and does not provide a reasonable basis for regulating PCBs in San Francisco Bay. The numeric target is based on a hypothetical, worst case, maximum daily exposure over a 70-year lifetime, leading to an unrealistic estimate of individual risk. The numeric target, based on these computations, is unreasonably conservative, and the hypothetical population risks are greatly overstated. These points are detailed and discussed in the companion Expert Opinion report of Natalie D. Wilson. In addition to the substantive deficiencies in the exposure assessment, which are described in Ms. Wilson's report, the Staff Report's presentation and computational details for the TMDL calculation are deficient and fail to meet an acceptable level of transparency.

III. OPINION DETAIL

A. *The approach taken by the Staff Report [p. 24-25; Figure 9] of selecting certain PCB congeners in fish tissue and using the WHO_{94} TEFs, presumably in conjunction with a CSF for TCDD, is not scientifically justified for "estimating the risk from environmental exposures to PCBs," or for deriving a fish tissue screening value of 0.14 pg/g TEQ [p. 24-25; Figure 9]. The use of this approach is subject to a number of critical scientific limitations inherent in the application of the TEQ approach to PCBs.*

The use of the TEQ approach for evaluating health risks or deriving health-based screening levels for PCBs in fish tissue is not advisable because there is enormous uncertainty associated with the application of this approach to these compounds, and the reliability in doing so has not been established.

EPA originally developed the Toxic Equivalency (TEQ) approach as an "interim" screening tool to evaluate the toxicity of mixtures of dioxins and furans because many congeners lacked specific toxicity data. Because 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) had been well-studied and was shown to be carcinogenic in laboratory animals, a scheme was devised to relate the toxicity of all other dioxins and furans to the cancer potency of TCDD, so that a single CSF could be used for screening-level risk assessments of these compounds. When the approach was first developed in 1986, EPA's Science Advisory Board supported its use as an interim approach, but noted that it might "lack scientific validity" and recommended that it be regularly revisited (EPA, 1989). In 1989, EPA stated that the TEQ approach 'remains "interim" in character and should be replaced as soon as practicable with a bioassay method.' (EPA, 1989).

There have been some modifications to the TEQ scheme since the 1989 approach was published. In 1994, the WHO proposed its own TEFs, which were based largely on EPA's TEFs, but included TEFs it had derived for 14 PCB congeners (Ahlborg et al., 1994). In 1998, WHO revised its TEFs, but included 12, instead of 14, PCB congeners in the list (Van den Berg et al., 1998). In 2006, WHO modified a number of TEF values for selected PCBs, increasing the values for PCBs 81, 167 and 169 and decreasing them for PCBs 105, 114, 118, 123, 156, 157 and 189 (Van den Berg, et al., 2006). The WHO has no formal guidelines for stakeholder notice, comment, and participation, and no apparent mechanism for ensuring that the process by which the TEFs were developed was objective and comprehensive.

The TEQ approach is based on a number of assumptions, the truth of which has not been established, and which are not well supported by scientific evidence. The key assumption is that all of the compounds to which TEFs have been assigned have a similar mechanism of toxic action, and that the initial step for any and all of these endpoints is binding with a biological macromolecule, the aryl hydrocarbon receptor (AhR). The use of TEFs implies that all noncarcinogenic endpoints or, in some cases, biological markers of exposure can be used as valid, quantitative predictors of carcinogenic potential. The TEQ approach also assumes that:

(1) all of the congeners for which TEFs are assigned are carcinogenic, and that this carcinogenicity can be predicted based on noncarcinogenic endpoints;
(2) the dose-response curves for the noncarcinogenic effects are parallel to the carcinogenic dose-response curve for TCDD;
(3) the toxic effects of all the congeners in a mixture are additive;
(4) there is no inter-species variability in sensitivities to these compounds, and specifically that the potency of TCDD in human cells is equivalent to that in animal cells; and
(5) there is a reliable estimate of the carcinogenic potential of TCDD itself.

As discussed below, none of these assumptions has been proven; evidence indicates that they might be incorrect. For all of these reasons, PCBs should not be treated as a form of dioxin, even as an optional method. The uncertainties associated with application of the TEF approach to PCBs are discussed in more detail below.

1. <u>Predicting Carcinogenicity of Individual Congeners Based on Noncancer Endpoints</u>

The TEQ approach is designed to estimate the carcinogenic risks of mixtures of dioxin-like compounds (DLCs). Thus, the TEQ approach assumes that all DLCs and their various congeners are carcinogenic, and that the TEFs will accurately predict that carcinogenicity. In fact, TEFs are based on a number of different endpoints, most of which are ***not*** related to carcinogenic activity.

Chronic oncogenicity bioassays have only been conducted for a relatively few DLCs and only TCDD, the 2,3,7,8-substituted hexaCDDs, 1,2,3,7,8-pentaCDD, 2,3,4,7,8-pentachlorodibenzofuran (PeCDF), and 3,3',4,4',5-pentachlorobiphenyl (PCB 126) have tested positively for cancer-related endpoints. However, even this finding is not without controversy. As discussed by Popp et al. (2006), the pathological evidence indicates that TCDD, the most potent of these compounds, produced tumors in laboratory rodents only in the presence of tissue damage. These authors argue that such tumor induction has a biological threshold, which, if present, would not support the use of EPA's linear risk assessment model. The linear model is used as the basis of cancer risk estimates in the TEQ approach. To develop TEFs for most PCB congeners, one or more of the following endpoints were used: enzyme induction, hepatic vitamin A reduction, thymic atrophy, body weight gain, potential bioaccumulation, teratogenicity, immunotoxicity, and lethality (EPA, 1989; Van den Berg et al., 1998; 2006). Thus the validity of the TEQ approach rests upon the questionable practice of extrapolating from endpoints as diverse as lethality and enzyme induction to tumorigenicity.

2. Shape of the Dose-Response Curve

Because TEFs are used to equate the toxicity of individual congeners to that of TCDD at any dose or concentration, the TEQ approach necessarily assumes that the noncarcinogenic dose-response curves for PCB congeners are parallel to the carcinogenic dose response curve for TCDD. There are indications, however, that this assumption is not correct (Putzrath, 1997; Pohjanvirta et al., 1995). In addition, it appears that the doses required to produce toxic effects vary considerably among congeners and endpoints, so that the use of a range of different noncarcinogenic endpoints as a means of predicting potential carcinogenic activity is unreliable.

Safe (1990) evaluated the relative dose response for various dioxin and furan congeners in terms of the potencies associated with different endpoints. The relative potencies varied by more than an order of magnitude depending on the endpoints considered. For example, when comparing the relative potency of TCDD to that of 2,3,7,8-TCDF at the EC50 level in rats, Safe reported that TCDD is four times more potent for receptor binding, 40 times more potent for thymic atrophy, 64 times more potent for body weight loss, and 163 times more potent for AHH induction. Similarly, when comparing TCDD with 1,2,3,4,7,8-HxCDF, the relative potency for 2,3,7,8-TCDD is higher than the relative potencies for 1,2,3,4,7,8-TCDF by factors ranging from 5 to 73, depending on the endpoints considered.

As a part of a NTP 2-year rodent carcinogenicity study, Toyoshiba et al. (2004) looked at the effects of TCDD, 4-PeCDF, PCB-126, and a mixture of the three on the activity of two liver enzymes known to be induced by TCDD and DLCs. They concluded that the dose-response curves for each of the three compounds and for the mixture were significantly different from one another.

Walker et al. (2005) analyzed cancer incidence data from the same NTP 2-year rodent carcinogenicity study. The dose-response curves were modeled using four different model conditions. When each data set was modeled with parameters that allowed the individual curves to provide an independent optimal fit, none of resultant dose-response curves were parallel.

Walker et al. (2005) also modeled the data sets using parameters that forced the curves to assume the same shape, then conducted a statistical analysis of the error associated with the fit of each model and concluded that the hypothesis that the dose-response curves were all the same shape could not be rejected. The researchers did admit, however, that the statistical power of the tests used to determine whether the null hypothesis could be rejected was rather low, ranging from 0.1 to 0.5.

3. <u>The Toxic Additivity of Congener Mixtures</u>

The TEQ approach assumes that the toxicities of all individual DLCs in a mixture are additive. While WHO has concluded that the available evidence supports the additivity of congeners, WHO also acknowledges that deviations from the additivity model are not uncommon (Van den Berg et al., 2006). In fact, the additivity of mixtures is questionable.

Knowledge of the mechanisms by which AhR-active chemicals cause effects suggests that the congeners' toxicities represented by TEFs should not be additive. The AhR binds with a variety of molecules. Whether the AhR binds with a chemical, and the strength of the bond, is a function of the shape of the chemical molecule. A chemical that binds weakly to the AhR may be replaced by a "competitor" chemical that forms a stronger bond with the AhR, so that the binding is competitive rather than additive (Gray et al, 2006; Safe, 1990; Walker et al., 2005).

The fact that a chemical binds with the AhR does not indicate that it will cause an adverse effect. In fact, chemicals that bind with the AhR can have a beneficial effect (e.g., triggering a normal physiological response like enzyme induction), an adverse effect (e.g., triggering chloracne), or no effect. The adverse effects caused by chemicals that bind with the AhR can range from minor (e.g., inhibiting the production of certain cells useful in fighting infection) to major (e.g., causing reproductive disorders). A chemical that binds to the AhR and causes any effect is called an "agonist." A chemical that binds but has no effect (or inhibits a "normal" event) is called an "antagonist." The term "antagonist" results from the fact that chemicals that bind with a receptor with no adverse effect compete with agonists for sites on receptors – while an antagonist occupies the site, an agonist cannot occupy it and cause its effect. Moreover, even agonists can have antagonistic properties. For example, if an agonist that produces either a normal physiological effect or a minor adverse effect competes for a receptor and blocks it from another agonist that causes a more serious adverse effect, substantial harm has been avoided (Newsted et al., 1995; Walker et al., 1996; 2005). Agonists that have antagonistic properties are sometimes called "partial" or "weak" agonists.

This understanding of the AhR mechanism substantially weakens the primary assumption of the TEQ approach that the potencies of individual agonists can be summed to predict the potency of a mixture of agonists in the body. Where antagonists are present in concentrations higher than the concentration of agonists, it is difficult for agonists to bind to receptors. Moreover, partial agonists or incomplete agonists compete with complete agonists for receptor binding sites. Thus, whenever a human body contains a mixture of complete agonists, partial agonists, and antagonists, the total impact on the body cannot possibly be predicted by the sum of the various agonist concentrations.

Empirical data indicate that some congeners might have antagonistic properties. For example, Starr et al. (1997) reported that "some PCDFs antagonize AhR-mediated responses including fetal cleft palate, hydronephrosis, immunotoxicity, embryotoxicity and induction of CYP1A1-dependent activities." Thus, additivity does not appear to be demonstrated across congeners and endpoints in animal studies, and the applicability of this assumption to human dose response is even less certain. In these circumstances, it is unwarranted to assume that the toxicity of dioxin/furan mixtures can be predicted by summing the TEFs for the individual congeners.

This issue of additivity is further complicated when PCBs are considered as part of the TEQ scheme. At sites where PCBs and PCDD/F are both present, PCBs are often present at substantially higher concentrations than are PCDD/F, and can overstate potential risks greatly when they are included in the total TEQ in a sample. In his consideration of the potential additivity of mixtures of these compounds, Safe (1993) concluded that "the TEF approach may significantly overestimate the TEQs for environmental extracts containing PCB, PCDD and PCDF mixtures in which the concentrations of the PCBs were >100-fold higher than the PCDDs and PCDFs." Other studies have indicated that additivity in PCDD/F and PCB mixtures has not been demonstrated across congeners and endpoints in animal studies (Harper et al., 1995; Safe, 1990; Starr et al., 1997).

4. Inter-species Variability

The TEQ approach assumes that the level of enzyme induction seen in animal studies is equivalent to the level of induction that occurs in exposed humans and, therefore, that the responses observed in animal studies are predictive of human responses on a one-to-one basis. As a result, the approach makes no adjustment for variability in species' sensitivities.

When looking at different species, Safe (1990) reported differences in potency for enzyme induction. In summarizing ED_{50} levels for AhR induction in rat liver, Safe reported that the potency for TCDD was 368 times higher than the potency for 1,2,3,7,8-pentaCDF. However, when the same endpoint was considered in guinea pigs, the potency of 2,3,7,8-TCDD was only 21 times higher than the potency of 1,2,3,7,8-pentaCDF. Thus it appears that there is substantial inter-species variation in sensitivity of response to PCDD/F congeners.

WHO reports that some studies have suggested that humans are "among the more dioxin-resistant species, but the human data set is too limited to be conclusive" (Van den Berg et al., 2006). Evidence presented by Aylward et al. (1996) and by Silkworth et al. (2005) indicates that humans are less sensitive to certain DLCs than are animals. Accordingly, the TEQ approach is likely to overestimate potential risks to humans who are exposed to mixtures of DLCs.

5. Use of the Cancer Slope Factor for TCDD

The TEQ approach was originally developed so that TEQ concentrations of dioxins and furans could be summed and used with the empirically-based cancer slope factor (CSF) for TCDD to estimate potential cancer risks. While EPA has historically used a CSF of 156,000 $(mg/kg\text{-}day)^{-1}$ based on the cancer incidence in the Kociba et al. (1978) study and a linear, non-threshold model, more recent information has resulted in a lack of consensus within the scientific community as to the appropriate CSF for TCDD. EPA has never published a CSF for TCDD in its Integrated Risk Information System (IRIS) database – an indication that the carcinogenic potential of TCDD has been a matter of much debate within EPA and among the scientific community for over 20 years.

A wide range of CSFs have been proposed for TCDD based on animal studies and using a linear, non-threshold cancer model to extrapolate risks to humans at environmentally relevant doses. The proposed CSFs have ranged from 9,000 to 156,000 $(mg/kg\text{-}day)^{-1}$, with differences in values resulting largely from the tumor classification scheme and interspecies scaling factor applied (EPA, 1994, 2000; FDA, 1993, 1994; Keenan et al., 1991). Recently, in two subsequent revisions of the draft Dioxin Reassessment, EPA proposed a CSF for TCDD of 1,000,000 $(mg/kg\text{-}day)^{-1}$ based on its evaluation of human epidemiological data (EPA, 2000; 2003), but did not identify and discuss the full range of plausible cancer slope factors for TCDD that could be based on peer-reviewed scientific studies. The 2000 draft Dioxin Reassessment was reviewed by EPA's Science Advisory Board, which could not "reach consensus on a single value for a dioxin potency factor" (EPA, 2001; p. 6).

More recently, the National Academy of Sciences (NAS) completed its review of the draft Dioxin Reassessment (NAS, 2006). Among its conclusions, NAS determined that the available data support a threshold, nonlinear relationship rather than the default non-threshold linear model that EPA has used historically. NAS concluded:

> The committee unanimously agrees that the current weight of evidence on TCDD, other dioxins, and DLCs [dioxin-like compounds] carcinogenicity favors the use of nonlinear methods for extrapolation below the point of departure (POD) of mathematically modeled human or animal data. [NAS, 2006, p. 135]

NAS further commented that --

> [A] risk assessment can be conducted without resorting to default assumptions. To the extent that EPA favors using default assumptions for regulating dioxin as though it were a linear carcinogen, such a conclusion should be supported with scientific evidence.
>
> The committee concludes that although it is not possible to scientifically prove the absence of linearity at low doses, the scientific evidence, based largely on mode of action, is adequate to favor the use of a nonlinear model that would include a threshold response over the use of the default linear assumption. The committee concludes that four major considerations of the scientific evidence support the use of a nonlinear model for low-dose extrapolation. [NAS, 2006, pp. 85, 100]

The "four major considerations" listed by NAS as supporting a nonlinear relationship rather than the default linear model that EPA (2003) had used in the draft Dioxin Reassessment were that:

- TCDD, other dioxins, and DLCs are not directly genotoxic;

- Receptor-mediated agents have sublinear dose-response relationships;
- Liver tumors are secondary to hepatotoxicity; and
- Bioassays provide evidence of nonlinearity.

In light of NAS's finding that scientific evidence supports the use of a nonlinear model for low-dose extrapolation of the carcinogenicity of DLCs, NAS recommended that EPA consider the full range of animal bioassay data, "including the new NTP animal bioassay studies on TCDD, other dioxins, and DLCs for quantitative dose-response assessment," when deriving a new CSF for TCDD using nonlinear methods. [NAS, 2006, p. 136]

Thus, at present, there is no consensus within the scientific community as to the appropriate CSF for TCDD or the DLCs. Without a reliable estimate of an appropriate CSF, the TEQ approach cannot be used to reliably estimate potential cancer risk posed by selected PCB congeners.

B. *Substantial evidence indicates that the TEQ approach does not accurately predict the toxicity of the so-called "dioxin-like" PCB congeners. There is no need to apply the TEQ approach to PCBs because plentiful empirical data on PCB toxicity can be used to derive target PCB concentrations in fish tissue. More than 50 peer-reviewed, epidemiological cancer studies specific to PCBs have been published over the past 30 years. Many of those studies involved thousands of workers with occupational exposures far greater than those that would result from environmental exposures. Those studies do not support a finding that PCBs are human carcinogens.*

The application of the WHO TEFs to "dioxin-like" PCB congeners results in risk predictions that are not verifiable, even within the confines of traditional rodent dose-response analyses, as explained below. A basic premise of the TEQ approach is that a given dose of TEQ has equal biological potency irrespective of the chemical mixture that makes up the dose (Van den Berg, et al., 1998). Evidence indicates, however, that the CSFs for the TEQ in PCB mixtures are not equal to the CSF for TCDD in either rodents or humans; in fact, the CSFs for the TEQ component within each type of commercial PCB mixture varied over a 24-fold range (Keenan, 2000; Keenan, 2001; Keenan et al., 2003; Silkworth and Keenan, 2005). This discordance demonstrates that the TEQ approach for evaluating cancer risks associated with exposure to PCB mixtures is seriously flawed.

The TEQ approach's lack of predictive ability regarding the carcinogenicity of PCB mixtures is confirmed by the results of recent two-year bioassays performed by the National Toxicology Program ("NTP"). NTP's first set of bioassays used TCDD, PCB 126, 2,3,4,7,8-pentachlorodibenzofuran, and a mixture of these three compounds (NTP, 2006a; 2006b; 2006c; 2006d). A second set of bioassays used PCB 153, a mixture of PCB 153 and PCB 126, and a mixture of PCB 118 and PCB 126 (NTP, 2006e; 2006f; 2006g). NTP conducted this series of bioassays in female Harlan Sprague-Dawley rats to evaluate the chronic toxicity and carcinogenicity of dioxin, "dioxin-like" compounds, structurally-similar PCBs, and mixtures of these compounds. NTP stated that it conducted its evaluation to address "the lack of data on the adequacy of the TEQ methodology for predicting relative potency for cancer risk" (NTP, 2006a). The initial NTP bioassay results (2006a; 2006b; 2006c; 2006d) provide evidence of non-additive interactions among DLCs, inconsistencies in dose-response depending on the dose metric analyzed, and different relative potencies depending on the endpoint observed. For example, Gray et al. (2006) conducted dose-response modeling of the results of the NTP bioassays. The authors concluded that the WHO_{98} TEF values, which were derived from data on noncancer endpoints evaluated on an administered dose basis, substantially overpredict the cancer potency of 4-PeCDF and PCB 126 on a body-burden basis. Thus, comparisons of measured human TEQ body burdens to body burdens in animal studies using TCDD alone would overstate carcinogenic risk. These results undermine the assumptions involved when applying the TEQ approach to PCBs.

In the NAS (2006) review of the draft Dioxin Reassessment, NAS reached a similar conclusion to that of Gray et al. (2006) concerning the use of the WHO_{98} TEF values for evaluating risks based on a body burden dose metric:

> It remains to be determined whether the current WHO TEFs, which were developed to assess the relative toxic potency of a mixture to which an organism is directly exposed by dietary intake, are appropriate for body burden toxic equivalent quotient (TEQ) determinations, which are derived from the concentrations of different congeners measured in BF [body fat]. If body burdens are to be used as the dose metric, a separate set of body burden TEFs should be developed and applied for this evaluation. Without these corrected values, the overall TEQs estimated by use of intake TEFs might be substantially in error. [NAS (2006) p. 138]

Given NAS's doubts regarding the use of the WHO TEFs in TEQ determinations, the Staff Report should not suggest the use of the TEQ approach to derive target PCB concentrations in fish tissue.

Evidence from human studies also demonstrates that the TEQ approach does not accurately predict health risks posed by PCBs. In fact, the TEQ approach ignores the vast body of human epidemiological studies, which indicates that PCBs are very likely not human carcinogens. More than 50 peer-reviewed, epidemiological cancer studies specific to PCBs have been published over the past 30 years. Many of those studies involved thousands of workers with occupational exposures far greater than those that would result from environmental exposures. None of those studies support a finding that PCBs are human carcinogens. One study, Kimbrough et al. (1999), as updated by Kimbrough et al. (2003), is particularly noteworthy.

The Kimbrough et al. (1999) study represents one of the largest studies ever conducted of workers who were heavily exposed to PCBs. The cohort consisted of 4,062 men and 3,013 women who worked between 1946 and 1977 at two General Electric capacitor manufacturing facilities. Jobs at the two facilities were classified as either high or low exposure. The average follow-up time for the workers was 31 years, providing the longest latency period of any PCB-exposure occupational study. The cohort was followed through 1993, providing 120,811 person-years of observation for men and 92,032 person-years observation for women. There were 763

(19%) deceased males and 432 (14%) deceased females. Kimbrough et al. (1999) found that, compared to the general U.S. population, among all workers, including those classified as having the highest PCB exposure, there was no statistically significant increase in deaths due to cancer or any other disease. The death rate due to all types of cancer combined was at or below the expected level.

The Kimbrough et al. (2003) study followed the same cohort through 1998, providing 133,845 person-years of observation for men and 102,139 person-years observation for women. There were 1022 (25%) deceased males and 632 (20%) deceased females. The Kimbrough et al. (2003) update similarly found that, among all workers, including those classified as having the highest PCB exposure, there were no statistically significant increases in deaths due to cancer. There were also no statistically significant increases in cancer or other mortality associated with length of employment or latency.

Golden et al. (2003) prepared a summary paper that discusses the findings of Kimbrough et al., as well as all of the other human evidence relating to the potential carcinogenicity of PCBs. This paper concluded that "[a]pplying a weight-of-evidence evaluation to the PCB epidemiological studies can only lead to the conclusion that there is no causal relationship between PCB exposure and any form of cancer." A more detailed review of all the relevant human cancer studies involving exposure to PCBs, performed by Golden and Shields (2000) concluded that the weight of the human evidence does not support an association, much less a causal relation, between PCB exposure and any type of cancer. All of this information indicates that application of the TEQ approach to PCBs would lead to human health risk assessments that exaggerate risk, and lead to misallocation of societal resources.

Recently, scientists at GE's Global Research Center investigated whether the TEQ approach and animal bioassays accurately predict the human carcinogenicity of PCBs (Silkworth et al., 2005). These studies showed that human liver cells respond differently to both PCB and TCDD than do rat cells. Human cells require higher doses to elicit a response, and the potency of the most potent "dioxin-like" PCB congener (PCB 126) relative to dioxin in human cells is much less than the currently assigned TEF value of 0.1, which is based on data from rodent studies. In addition, this work shows, based on genomic studies in rats, that dioxin elicits responses from a unique set of genes that are not similarly affected in animals exposed to TEQ equivalent Aroclor mixtures of PCBs. These results provide empirical evidence that the assumption of equivalent inter-species toxic response, which underlies the TEQ approach, is incorrect.

Although the TEQ approach does not accurately predict the health risks of PCBs, EPA (1996) has nevertheless suggested that the TEQ approach may be applied to PCBs to ensure that risks are not underestimated as a result of weathering of PCB mixtures or preferential accumulation of dioxin-like congeners in fish tissue and other biota. The idea behind this suggestion is that certain more toxic congeners might accumulate to a greater degree than other less toxic congeners found in the original commercial mixtures, thus enriching the toxicity of the mixture in fish tissue. According to this theory, the PCB CSF that is based on the original test mixtures might not be protective of potential risks posed by the altered mixture of congeners. This theory would have no validity, however, if the TEQs of the altered environmental mixtures are no greater than the high TEQ levels of the PCB test mixtures upon which the PCB upper bound CSF of 2 $(mg/kg\text{-}day)^{-1}$ is based.

The EPA CSFs for PCBs are based on bioassay data from studies of Aroclors 1254, 1242, 1260 and 1016 (EPA, 1996; Cogliano, 1998). According to Cogliano (1998), the TEQ concentration from coplanar PCBs in the Aroclor 1254 mixture used in the bioassays was 46.4 mgTEQ/kgPCB. This test mixture had the highest TEQ level of all mixtures tested. Similarly, the PCB TEQ in the tested Aroclor 1242, 1260, and 1016 mixtures were lower at 8.1, 7.1, and 0.14 mgTEQ/kgPCB, respectively (Cogliano, 1998). By design, the PCB CSF was established to be protective of all four PCB mixtures tested and, because the TEQ content is highest in Aroclor 1254, it follows that the PCB CSF is protective of any mixture that has a total TEQ of 46.4 mgTEQ/kgPCB or less.

Numerous fish and soil samples taken from San Francisco Bay and other waterways with elevated PCB concentrations[1] were analyzed and their total PCB concentrations were determined as well as the total TEQ for each sample (Keenan and Samuelian, 2005). These samples had TEQ levels lower than the level of TEQ found in the test material upon which EPA's CSF for PCBs is based. Consequently, the use of the PCB CSF to evaluate potential cancer risks is not inadequate compared with the TEQ approach to ensure that risks are not underestimated.

To summarize these points, the TEQ approach relies upon material, unsubstantiated assumptions that undermine its utility. These uncertainties include the following:

- The Staff Report's recommendations are based on the implicit assumption that TEFs are constants across species, individuals, organ systems, tissue types, and health endpoints, covering both carcinogenic and noncarcinogenic effects. There is no indication that the dose response for the cancer endpoint for each congener is the same as the dose response for noncancer effects in a single species, let alone different species.

- The TEQ approach assumes that the potential toxic effects of individual congeners are additive, even though it is likely that certain congeners may interfere with the potential of other congeners to exert any effect.

- The TEQ approach assumes that the toxic potential for individual congeners in test species is similar to that which would be expected for humans, despite the fact that substantial variability among species has been demonstrated, and there is evidence that humans are less sensitive to the toxic effects of dioxins and furans than are other species.

- The TEQ approach uses the CSF for dioxin, but there is no scientific consensus regarding the appropriate CSF for dioxin. CSFs ranging from 9,700 to 1,400,000 $(mg/kg\text{-}day)^{-1}$ have been developed by different scientific groups and agencies, using the same dose-response information but different linear non-threshold modeling approaches to estimate

[1] Samples were analyzed from San Francisco, Newark, Green, and Saginaw Bays; the Delaware, Hudson, Housatonic, Fox, Kalamazoo, Sheboygan, Spokane, and Christiana Rivers; the South California Bight, the Great Lakes; Long Lake (WA), and Dick's Creek (OH). The analysis focused on enrichment in fish tissues as these were found to have higher TEQ contents than corresponding soil samples in these watersheds.

carcinogenic potential at low doses. The NAS (2006) has indicated, however, that it is likely that there is a threshold for the toxic effects of dioxin, so that the use of a non-threshold model is likely to overestimate carcinogenic potential at low doses.

- The application of the TEQ approach to PCBs is not supported by available data, which indicate that the available toxicity criteria for PCBs do not underestimate potential health risks.

C. *The Staff Report's proposed numeric target PCB fish concentration for the TMDL of 10 ng/g is not based on sound science and should be not be used. The numeric target is based on a hypothetical, extreme case, maximum daily exposure over a 70-year lifetime, leading to an unrealistic estimate of individual risk. The numeric target, based on these computations, exaggerates risk for several reasons. The hypothetical population risks are greatly overstated. These points are detailed and discussed in the companion Expert Opinion report of Natalie D. Wilson. In addition to the substantive deficiencies in the exposure assessment, which are described in Ms. Wilson's report, the Staff Report's presentation and computational details for the TMDL calculation are deficient and fail to meet an acceptable level of transparency.*

The numeric target of 10 ng/g for the TMDL was calculated based on the following equation:

Numeric target = [(RL/CSF)*BW]/CR

where,

RL = Risk level, 1 x 10^{-5};
CSF = Cancer slope factor, 2 $(mg/kg\text{-}day)^{-1}$;
BW = Body weight, 70 kg; and
CR = Fish consumption rate, 32 g/day.

This equation appears on page 23 of the Staff Report and is used in Section 8 to derive the numeric target. Section 8.1, page 50 incorrectly references the equation as Equation 2. In addition, Section 8.1 reports that a CSF of 1 $(mg/kg\text{-}day)^{-1}$ was used to derive the numeric target, when, in fact, a CSF of 2 $(mg/kg\text{-}day)^{-1}$ was used as reported correctly in Section 6.2. Unit errors are present in the discussion of parameter values on page 23, Section 6.2. With the units as stated, the appropriate units for the screening value (SVc) should be reported as g/kg; more appropriate would be to express CR as kg/day. The units for the CSF should be reported as 2 $(mg/kg\text{-}day)^{-1}$.

The overall discussion in Section 6.2 lacks transparency. It is unclear how either the 1994 screening level of 3 ng/g or the updated screening level of 23 ng/g was derived. The CSF used as the basis of the 23 ng/g is provided; otherwise no other parameter values (e.g., risk level, fish consumption rate) are given. If one assumes that the approach used in deriving the 1994 screening level was the same as the one used for the updated level except for the revised CSF, then one can infer that the 1994 screening level was based on a CSF of 7.7 $(mg/kg\text{-}day)^{-1}$.

However, it is unwarranted to require the reader to make these kinds of assumptions. Furthermore, beyond the CSFs, it is not possible to compare the exposure values used to calculate the 10 ng/g to those used in previous calculations.

Similar issues with transparency occur in the discussion regarding the calculation of the dioxin toxic equivalent (TEQ) screening level of 0.14 pg/g for PCBs with dioxin-like properties (page 24). Reference is made that the same method and assumptions are used; however, it is unclear as to what are the assumptions. For example, no mention is made as to what CSF for TCDD was used in the calculation, nor is there any justification for the selection of whatever CSF was chosen.

IV. CONCLUSION

For all of the reasons set forth above, the Water Board should not approve adoption of the proposed Staff Report and require that it be rewritten and the proposed TMDL revised, consistent with sound science.

V. REFERENCES

Ahlborg, U.G., G.C. Becking, L.S. Birnbaum, A. Brouwer, H.J.G.M. Derks, M. Feely, G. Golor, A. Hanberg, J.C. Larsen, S.H. Safe, C. Schlatter, F. Waern, M. Younes, and E. Yrjanheikki. 1994. Toxic equivalency factors for dioxin-like PCBs. *Chemosphere* 28(6):1049-1067.

Amdur, M.O., J. Doull, and C.D. Klaassen. 1991. *Casarett and Doull's Toxicology: the Basic Science of Poisons*. 4th ed. Pergamon Press. New York. 1033 p.

Aylward, L.L., S.M. Hays, N.J. Karch, and D.J. Pautenbach. 1996. Relative susceptibility of animals and humans to the cancer hazard posed by 2,3,7,8-tetrachlorodibenzo-p-dioxin using internal measures of dose. *Environmental Science and Technology* 30(12):3534-3543.

Cogliano, V.J. 1998. Assessing the cancer risk from environmental PCBs. Environmental Health Perspectives. 106 (6): 317-323.

EPA. 1989. *Interim Procedures for Estimating Risks Associated with Exposure to Mixtures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans (CDDs and CDFs) and 1989 Update.* Risk Assessment Forum. U.S. Environmental Protection Agency. EPA 625/3-89/016. NTIS PB90-145756. Washington, DC.

EPA. 1994. *Health assessment document for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and related compounds.* U.S. Environmental Protection Agency, Office of Research and Development, Washington, DC. EPA/600/BP-92/001c. August.

EPA. 1996. *PCBs: Cancer Dose Assessment and Application to Environmental Mixtures*. U.S. Environmental Protection Agency, Office of Research and Development. EPA/600/P-96/001. Washington, D.C.

EPA. 2000. *Exposure and human health reassessment of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and related compounds. Part III. Integrated summary and risk characterization for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) and related compounds*. Environmental Protection Agency. SAB Review Draft EPA/600/P-00/001Bg. September.

EPA. 2001. *Dioxin Reassessment – an SAB review of the Office of Research and Development's Reassessment of dioxin*. U.S. Environmental Protection Agency, Science Advisory Board, Washington, DC. EPA-SAB-EC-01-006. May.

EPA. 2003. *Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) and Related Compounds*. December. National Academy of Sciences (NAS) Review Draft. National Center for Environmental Assessment. www.epa.gov/ncea/dioxin

FDA (Food and Drug Administration). 1993. *Report of the quantitative risk assessment committee. Subject: FAP OT4192, Update: Upper bound lifetime carcinogenic risks from exposure to dioxin congeners from foods contacting bleached paper products with dioxin levels not exceeding 2 ppt*. January 27.

FDA (Food and Drug Administration). 1994. *Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans in bleached food-contact paper products; response to referral for action by the Environmental Protection Agency and Request for Comment*. Federal Register. 59(70):17384-17389. April 12.

Golden, R., J. Doull, W. Waddell, and J. Mandel. 2003. Potential Human Cancer Risks from Exposure to PCBs: A Tale of Two Evaluations. Critical Reviews in Toxicology, 33(5):543–580.

Golden, R. and P.G. Shields. 2000. *Technical Report: A Weight-of-Evidence Review of the Human Studies of the Potential Cancer Effects of PCBs*. April 10.

Gray, M.N., L.L. Aylward, and R.E. Keenan. 2006. Relative cancer potencies of selected dioxin-like compounds on a body burden basis: Comparison to current Toxic Equivalency Factors (TEFs). *J. Toxicol. Environ. Health* 69: 907-917.

Harper, N., K. Connor, M. Steinberg, and S. Safe. 1995. Immunosuppressive activity of polychlorinated biphenyl mixtures and congeners: nonadditive (antagonistic) interactions. *Fundamental and Applied Toxicology* 27:131-139.

Keenan, R.E., D.J. Paustenbach, R.J. Wenning, and A.H. Parsons. 1991. A pathology re-evaluation of the Kociba et al. (1978) bioassay of 2,3,7,8-TCDD: Implications for risk assessment. *Journal of Toxicology and Environmental Health*. 34:279-296.

Keenan, R.E. 2000. Applying Dioxin TEQs for PCBs. Presentation of comments on behalf of the Polychlorinated Biphenyls Panel of the American Chemistry Council, the Utility Solid Waste Activities Group, and the National Electrical Manufacturers Association to the *U.S. EPA Science Advisory Board, Dioxin Reassessment Review*, Arlington, VA, November 1.

Keenan, R.E. 2001. Dioxin TEQs Overstate the Carcinogenic Potency of PCBs. Public hearing testimony to the *Executive Committee of the U.S. EPA Science Advisory Board,* Washington, D.C. May 15.

Keenan, R.E., J.M. Hamblen, J.B. Silkworth, M.N. Gray, P.O. Gwinn, and S.B. Hamilton. 2003. An empirical evaluation of the potency of dioxin toxic equivalents (TEQs) in several PCB mixtures. 2003. Organohalogen Compounds 65: 312-315. Proceedings Dioxin 2003 – the 23rd International Symposium on Halogenated Environmental Organic Pollutants and Persistent Organic Pollutants, Boston, Massachusetts, USA. August 24-29.

Keenan, R.E and J.H. Samuelian. 2005. Is TEQ enrichment of PCBs in fish tissue a common phenomenon? *Organohalogen Compounds* (2378) 1763-1765.

Kimbrough, R. D., M.L. Doemland, and M.E. LeVois. 1999. Mortality in male and female capacitor workers exposed to polychlorinated biphenyls. *Journal of Occupational and Environmental Medicine* 41:161-171.

Kimbrough, R., M.Doemland, J.Mandel. 2003. A Mortality Update of Male and Female Capacitor Workers Exposed to Polychlorinated Biphenyls. J. Occup. Environ. Med. 45:271-282.

Kociba, R.J., D.G. Keyes, J.E. Beyer, R.M. Carreon, C.E. Wade, D.A. Dittenber, R.P. Kalnins, L.E. Frauson, C.N. Park, S.D. Barnard, R.A. Hummel, and C.G. Humiston. 1978. Results of a two-year chronic toxicity and oncogenicity study of 2,3,7,8-tetrachlorodibenzo-p-dioxin in rats. *Toxicol. Appl. Pharmacol.* 46:279-303.

NAS. 2006. Health Risks from Dioxin and Related Compounds: Evaluation of the EPA Reassessment. Committee on EPA's Exposure and Human Health Reassessment of TCDD and Related Compounds, National Research Council of the National Academies. Washington, DC.

National Toxicology Program (NTP). 2006a. NTP Technical Report on the Toxicology and Carcinogenesis Studies of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) (CAS No. 1746-01-6) in Female Harlan Sprague-Dawley Rats (Gavage Studies) (NTP TR 521), National Toxicology Program. April.

National Toxicology Program (NTP). 2006b. NTP Technical Report on the Toxicology and Carcinogenesis Studies of 3,3'4,4',5-Pentachlorobiphenyl (PCB 126) (CAS No. 57465-28-8) in Female Harlan Sprague-Dawley Rats (Gavage Studies) (NTP TR 520), National Toxicology Program. January.

National Toxicology Program (NTP). 2006c. NTP Technical Report on the Toxicology and Carcinogenesis Studies of 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) (CAS No. 57117-31-4) in

Female Harlan Sprague-Dawley Rats (Gavage Studies) (NTP TR 525), National Toxicology Program. September.

National Toxicology Program (NTP). 2006d. NTP Technical Report on the Toxicology and Carcinogenesis Studies of a Mixture of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) (CAS No. 1746-01-6), 2,3,4,7,8-Pentachlorodibenzofuran (PeCDF) (CAS No. 57117-31-4), and 3,3'4,4',5-Pentachlorobiphenyl (PCB 126) (CAS No. 57465-28-8) in Female Harlan Sprague-Dawley Rats (Gavage Studies) (NTP TR 526), National Toxicology Program. September.

National Toxicology Program (NTP). 2006e. NTP Technical Report on the Toxicology and Carcinogenesis Studies of 2,2',4,4'5,5'-Hexachlorobiphenyl (PCB 153) (CAS No. 35065-27-1) in Female Harlan Sprague-Dawley Rats (Gavage Studies) (NTP TR 529), National Toxicology Program. May.

National Toxicology Program (NTP). 2006f. NTP Technical Report on the Toxicology and Carcinogenesis Studies of a Binary Mixture of 3,3',4,4'5-Pentachlorobiphenyl (PCB 126) (CAS No. 57465-28-8) and 2,2',4,4'5,5'-Hexachlorobiphenyl (PCB 153) (CAS No. 35065-27-1) in Female Harlan Sprague-Dawley Rats (Gavage Studies) (NTP TR 530), National Toxicology Program. August.

National Toxicology Program (NTP). 2006g. NTP Technical Report on the Toxicology and Carcinogenesis Studies of a Binary Mixture of 3,3',4,4'5-Pentachlorobiphenyl (PCB 126) (CAS No. 57465-28-8) and 2,3',4,4'5-Pentachlorobiphenyl (PCB 118) (CAS No. 31508-00-6) in Female Harlan Sprague-Dawley Rats (Gavage Studies) (NTP TR 531), National Toxicology Program. November.

Newsted, J.L., J.P. Giesy, G.T. Ankley, D.E. Tillitt, R.A. Crawford, U.W. Gooch, P.D. Jones, and M.S. Denison. 1995. Development of toxicity equivalence factors for PCB congeners and the assessment of TCDD and PCB mixtures in rainbow trout. *Environmental Toxicol. Chem.* 14(5):861-871.

Pohjanvirta, R., M. Unkila, J. Linden, J.T. Tuomisto, and J. Tuomisto. 1995. Toxic equivalency factors do not predict the acute toxicities of dioxins in rats. *European J. Pharmacol., Environ. Toxicol. Pharmacol.* 293:341–353.

Popp, J.A., E. Crouch and E.E. McConnell. 2006. A weight-of-evidence analysis of the cancer dose-response characteristics of 2,3,7,8-tetrachlorodibenzodioxin (TCDD). *Toxicological Sciences* 89(2):361-369.

Putzrath, R.M. 1997. Estimating relative potency for receptor-mediated toxicity: reevaluating the toxicity equivalence Factor (TEF) model. *Regulatory Toxicology and Pharmacology* 25:68-78.

Safe, S.H. 1990. Polychlorinated biphenyls (PCBs), dibenzo-p-dioxins (PCDDs), dibenzofurans (PCDFs), and related compounds: Environmental and mechanistic considerations which support the development of toxic equivalency factors (TEFs). *Crit. Rev. Toxicol.* 21(1):51-88.

Safe, S.H. 1993. Development of bioassays and approaches for the risk assessment of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin and related compounds. *Environmental Health Perspectives* 101(supplement 3):317-325.

Silkworth J.B., A Koganti, K. Illouz, A. Possolo, M. Zhao, and S.B. Hamilton. 2005. Comparison of TCDD and PCB CYP1A induction sensitivities in fresh hepatocytes from human donors, Sprague-Dawley rats, and rhesus monkeys and HepG2 cells. *Toxicological Sciences* 87(2): 508-519.

Silkworth, J.B. and R.E. Keenan. 2005. The TEQ approach ignores empirical evidence regarding PCB toxicity and substantially over-predicts risks. Invited speaker to the *National Academy of Science*, Third Meeting of the Committee on EPA's Exposure and Human Health Reassessment of TCDD and Related Compounds, Washington, DC. March 21.

Starr, T.B., T.R. Zacharewski, T.R. Sutter, S.H. Safe, W.F. Greenlee, and R.B. Connolly. 1997. Concerns with the use of a toxicity equivalence factor (TEF) approach for risk assessment of "dioxin-like" compounds. *Organohal. Comp.* 34:91–94.

Toyoshiba, H., N.J. Walker, A.J. Bailer and C.J. Portier. 2004. Evaluation of toxic equivalency factors for induction of cytochromes P450 CYP1A1 and CYP1A2 enzyme activity by dioxin-like compounds. *Toxicol. Appl. Pharmacol.* 194(2):156-168.

Van den Berg, M., L. Birnbaum, A.T.C. Bosveld, B. Brunstrom, P. Cook, M. Feeley, J.P. Giesy, A. Hanberg, R. Hasegawa, S.W. Kennedy, T. Kubiak, J.C. Larsen, F.X. R. van Leeuwen, A.K. Djien Liem, C. Nolt, R.E. Peterson, L. Poellinger, S. Safe, D. Schrenk, D. Tillitt, M. Tysklind, M. Younes, F. Waern, and T. Zacharewski. 1998. Toxic equivalency factors (TEFs) for PCBs, PCDDs, PCDFs, for humans and wildlife. *Environmental Health Perspectives* 106(12):775-792.

Van den Berg, M., L.S. Birnbaum, M. Denison, M. De Vito, W. Farland, M. Feeley, H. Fiedler, H. Hakansson, A. Hanberg, L. Haws, M. Rose, S. Safe, D. Schrenk, C. Tohyama, A. Tritscher, J. Tuomisto, M. Tysklind, N. Walker, and R.E. Peterson. 2006. The 2005 World Health Organization reevaluation of human and mammalian toxic equivalency factors for dioxins and dioxin-like compounds. *Toxicological Sciences* 93(2):223-241.

Walker, M.K., P.M. Cook, B.C. Butterworth, E.W. Zabel, and R.E. Peterson. 1996. Potency of a complex mixture of polychlorinated dibenzo-*p*-dioxin, dibenzofuran, and biphenyl congeners compared with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in causing fish early life stage mortality. *Fundamental and Applied Toxicology* 30:178-186.

Walker, N. J., Crockett, P. W., Nyska, A., Brix, A. E., Jokinen, M. P., Sells, D. M., Hailey, J. R., Easterling, M., Haseman, J. K., Yin, M., et al. (2005). Dose-additive carcinogenicity of a defined mixture of ''dioxin-like compounds''. Environ. Health Perspect. 113, 43–48.

Comments of the General Electric Company on Human Health Issues Concerning:

Total Maximum Daily Load for PCBs in San Francisco Bay: Proposed Basin Plan Amendment and Staff Report

Expert Opinion prepared by:

Jay B. Silkworth, Ph.D.
Senior Toxicologist
GE Global Research Center
One Research Circle
Niskayuna, NY 12309

Draft: August 14, 2007

Comments regarding the significance of recent scientific literature not considered in this proposal-

Introduction:

The "**Proposed Basin Plan Amendment and Staff Report**" is a support document for a plan called a "Total Maximum Daily Load," or "TMDL," to address PCBs in San Francisco Bay. The report proposes target levels of PCBs in fish that the agency intends to be protective of human health. The target levels are based on a fish consumption exposure pathway and certain assumptions about the human toxicology of PCBs. The report is so deficient in its characterization of both exposure and PCB toxicity that potential benefits to human health from the agency's proposed TMDL are not apparent and may not be present.

In part, this result is due to the way PCBs are measured in the report. First, the report uses several metrics for determining PCB levels in fish (total PCB, 3 PCB congeners, TEQ), but does not explain why any one particular method would provide better guidance for decision making, and lacks transparency by providing very little information on how these values were determined. Second, the report uses more than one way to calculate risk (PCB vs TEQ CSFs), again, without explaining why one approach would provide better risk assessment than any other. Third, the report apparently sets, without justification, a new safe level for PCBs in water that is up to 9 times lower than existing standards [p C-4].

Most importantly, the report contains no evaluation of substantial recent literature regarding the potential health risks of PCBs. Absent consideration of this literature, the agency's analysis of human toxicology is outdated, deficient, and not supported by proper technical conditions. The agency must consider this literature not only to render its evaluation of human toxicology technically defensible, but also to satisfy its own commitment of considering the most relevant and recent information. Because this proposal is so deficient in its evaluation of current PCB toxicology, the agency should obtain peer review of this specific issue by qualified reviewers.

In the past few years a number of advances have been made in the characterization of potential human health risks posed by PCBs. None were cited in the report. These advances include:

1. the publication of several epidemiologic studies reporting no association between PCB exposure and non-cancer effects,

2. the publication of several epidemiologic studies reporting no association between PCB exposure and cancer effects, and

3. the publication of studies showing that human cells are less sensitive to PCBs than rodents and monkeys.

These advances, as described below, would, if appropriately considered or implemented, significantly impact the report's assumptions about human toxicology.

<u>Recent Publications</u>:

In 2001, the General Electric Company conducted a comprehensive review of the available scientific literature regarding the human health effects of PCBs. The extensive review examined over 40 cancer studies, over 90 studies of non-cancer effects, and over 25 studies that examined the potential associations between PCB exposure of mothers and neurodevelopmental effects of their children. The review found no credible evidence that PCBs cause cancer or any other illness in humans. The results of the review were submitted to the EPA.

Since 2001, additional studies have been published, many of which show no associations between PCB exposure and health effects. It is particularly noteworthy that several of the authors who had previously reported an association between PCBs exposure and health effects, including cancer and noncancer effects, now report that they find no association. This trend is particularly true for earlier reported neurodevelopmental effects in children. Such an outcome is consistent with the criticisms that the findings of the earlier studies were attributable to poor study design, confounding variables, chance findings, and statistical weakness, rather than to PCB exposure (Cicchetti *et al.*, 2006).

Non-cancer effects:

The research teams, the work of which is cited below, previously have published papers reporting health effects from PCBs. As illustrated from the quotes below, some of these authors now seem to think that the effects they claimed were transient. Alternatively, such effects may have never existed in the first place, as poor study design and over-interpretation of weak data may have resulted in false positives. These recent papers are consistent with my evaluation of the earlier literature and provide further evidence that PCBs are not causally associated with neurodevelopmental effects. Relevant conclusions from these studies are as follows:

"Prenatal PCB was associated with range of state, but in an unexpected direction. **Increasing PCB level was positively associated with an improved** range of state, in a dose-dependent manner." (Engel *et al.*, 2007)

"The PCB-IQ association was examined in multivariate models. Among those in the lowest exposure category (<1.25 ug of PCB/liter of serum), the fully adjusted mean IQ score was 93.6 (standard error: 1.8); among those in the highest exposure category ($\geq$5µg of PCB/liter), the mean IQ was 97.6 (standard error: 1.2); and **overall the increase in IQ per unit increase in PCB level (µg/liter)** was 0.22 (95% confidence interval: -0.28, 0.71)). In these data, in utero exposure to background levels of PCBS was not associated with lower IQ at age 7 years." (Gray *et al.*, 2005)

"CONCLUSIONS: In these data, **maternal levels of PCBs during pregnancy were essentially unrelated to preterm birth, birth weight, or length of gestation**." (Longnecker *et al.*, 2005)

"Based on our own findings from a previous study we aimed to establish if cognitive deficit, shown to be induced by perinatal exposure to polychlorinated biphenyls (PCBs) at earlier ages, persists into school-age.... At this point, and contrary to the results at 30 and 42 months **no adverse PCB-effects were found**." (Winneke *et al.*, 2005)

"We conclude that overt neurological abnormalities found in the neonatal period are not caused by either direct effects of PCB or dioxin exposure or lowered thyroid hormone levels induced by these pollutants." (Koopman-Esseboom *et al.*, 1997)

Cancer effects:

Cancer risk is estimated in "Proposed Basin Plan Amendment and Staff Report," but without reference to a number of cancer epidemiology studies that have been published recently. Some studies report associations between PCB exposures and cancer risk that are very weak. A number of studies report no associations between PCB exposure and cancer. It is not apparent that these studies have been considered by the agency. Relevant conclusions from these studies are as follows:

"Therefore, studies on occupational exposure to PCBs do not show any excess in all cancer mortality, or in mortality for specific cancer sites of interest" (Bosetti *et al.*, 2003).

"Our results confirm exposure to organochlorines [including PCBs] among Alaska Native women but do not identify these exposures as a significant risk factor for breast cancer." (Rubin *et al.*, 2006)

"While generally not statistically significant, PCB and HCB levels were inversely associated with risk of breast cancer in this highly exposed population." (Pavuk *et al.*, 2003)

"The results do not support that higher organochlorines body levels increase the risk of breast cancer in postmenopausal women." (Raaschou-Nielsen *et al.*, 2005)

"Applying a weight-of-evidence evaluation to the PCB epidemiological studies can only lead to the conclusion that there is no causal relationship between PCB exposure and any form of cancer, thereby confirming the conclusions of the ATSDR(1999)." (Agency for Toxic Substances and Disease Registry, 1999; Golden *et al.*, 2003)

"The majority of studies have concluded that exposure to PCBs is unlikely to be a major cause of breast cancer, but these findings indicate that further studies of genetically susceptible populations are warranted". (Laden *et al.*, 2002)

"These results expand on our previous observations and as before the data fail to demonstrate any causal association between occupational PCB exposure and excess cancer mortality or any other causes of death." (Kimbrough *et al.*, 2003a)

"The results of this study provide some evidence that serum levels of these organochlorine compounds are not associated with an increased risk of endometriosis in infertile Japanese women." (Tsukino *et al.*, 2005)

"This study lends no support to the case for a role of ...PCBs in breast cancer aetiology." (Lopez-Carrillo *et al.*, 2002)

"Overall, the data fail to demonstrate conclusive adverse health effects of PCBs at concentrations encountered with human exposures." (Kimbrough *et al.*, 2003b)

"Exposure to high levels of both EMFs and PCBs showed no association with prostate cancer mortality." (Charles *et al.*, 2003)

Human sensitivity:

The current approach to human health risk assessment is based on the premise that it is appropriate to extend the results from animal studies to humans. Since this process involves cross species extrapolations, safety factors are applied to adjust for the uncertainties and gaps in knowledge. These factors are purposely biased in the direction that assumes that humans are more sensitive than animals. However, studies are now providing evidence that humans are not more sensitive to dioxin and PCBs but, rather, far less sensitive than the currently used estimates. A body of sound evidence has accumulated that clearly demonstrates this fact. A series of studies, using standard biomarkers of Ah receptor activation by dioxins and PCBs, have shown that human cells requires as much as 10 times more dioxin to produce the same response as observed in rat-derived cells (Lipp *et al.*, 1992; Peters *et al.*, 2004; Schrenk *et al.*, 1995; Vamvakas *et al.*, 1996; Wiebel *et al.*, 1996; Xu *et al.*, 2000; Zeiger *et al.*, 2001).

In a recent study, the responsiveness of fresh human liver cells to both 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) and PCB 126 was compared directly to the responsiveness of fresh rat and monkey cells (Silkworth *et al.*, 2005). In the study, fresh human hepatocytes and a hepatocellular carcinoma cell line both required more TCDD than either rat or monkey cells to produce the same levels of response. This means that the human cells are less sensitive to TCDD than the cells of either of the other species. Furthermore, when PCB126 was tested, the human cells required about 50-100 times more PCB than either of the other two species. This suggests that humans are less sensitive to TCDD than other species and, further, that human cells are even less sensitive than are other species to PCBs than is predicted by their lower sensitivity to TCDD. It was suggested that the current rodent-derived TEF for PCB 126 of 0.1 be replaced by the human-derived TEF of 0.002 to better reflect the recent findings (Silkworth *et al.*, 2005). The National Academy of Sciences, upon reviewing this body of work, recommended that: "If significant differences in the REP of DLCs [relative potency factors of dioxin like compounds] are found between humans and other species, then adjustments should be made in the TEFs, and these should be acknowledged in the Reassessment" (National Research Council, 2006) (pg 61).

Conclusion:

Human health risk assessment of PCBs is a dynamic process. New information regarding the potential associations between PCB exposure and various human health effects is becoming available on nearly a daily basis. It is critical that such new findings be considered in any large-scale proposal such as is being proposed here. Unfortunately, it is not apparent that the more recent literature was evaluated before or even during the preparation of this proposal. Therefore, this proposal suffers from a lack of scientific rigor and does not appear to be scientifically defensible.

Reference List

1. Agency for Toxic Substances and Disease Registry. Toxicological Profile for Polychlorinated Biphenyls. 1999. Washington, DC, U.S. Department of Health & Human Services, Public Health Service.

2. Bosetti, C., Negri, E., Fattore, E., and La Vecchia, C. Occupational exposure to polychlorinated biphenyls and cancer risk. *Eur. J. Cancer Prev.* 12(4), 251-255. 8-3-2003.

3. Charles, L. E., Loomis, D., Shy, C. M., Newman, B., Millikan, R., Nylander-French, L. A., and Couper, D. Electromagnetic fields, polychlorinated biphenyls, and prostate cancer mortality in electric utility workers. *Am. J. Epidemiol.* 157(8), 683-691. 4-15-2003.

4. Cicchetti, D. V., Kaufman, A. S., and Sparrow, S. S. PCBs and Developmental Outcomes: A Critical Debate. *PSYCHOLOGY IN THE SCHOOLS* 41(6), 589-723. 2006.

5. Engel, S. M., Berkowitz, G. S., Barr, D. B., Teitelbaum, S. L., Siskind, J., Meisel, S. J., Wetmur, J. G., and Wolff, M. S. (2007). Prenatal organophosphate metabolite and organochlorine levels and performance on the Brazelton Neonatal Behavioral Assessment Scale in a multiethnic pregnancy cohort. *Am. J. Epidemiol.* **165**, 1397-1404.

6. Golden, R., Doull, J., Waddell, W., and Mandel, J. Potential human cancer risks from exposure to PCBs: A tale of two evaluations. *Crit. Rev. Toxicol.* 33(5), 543-580. 2003.

7. Gray, K. A., Klebanoff, M. A., Brock, J. W., Zhou, H. B., Darden, R., Needham, L., and Longnecker, M. P. In utero exposure to background levels of polychlorinated biphenyls and cognitive functioning among school-age children. *Am. J. Epidemiol.* 162(1), 17-26. 7-1-2005.

8. Kimbrough, R. D., Doemland, M. L., and Mandel, J. S. (2003a). A mortality update of male and female capacitor workers exposed to polychlorinated biphenyls. *J. Occup. Environ. Med.* **45**, 271-282.

9. Kimbrough, R. D. and Krouskas, C. A. (2003b). Human exposure to polychlorinated biphenyls and health effects: a critical synopsis. *Toxicol. Rev.* **22**, 217-233.

10. Koopman-Esseboom, C., Huisman, M., Touwen, B. C., Brouwer, A., Sauer, P. J. J., and Weisglas-Kuperus, N. (1997). Newborn infants diagnosed as neurologically abnormal with relation to PCB and dioxin exposure and their thyroid-hormone status. *Dev. Med. Child Neurol.* **39**, 785.

11. Laden, F., Ishibe, N., Hankinson, S. E., Wolff, M. S., Gertig, D. M., Hunter, D. J., and Kelsey, K. T. Polychlorinated biphenyls, cytochrome P450 1A1, and breast cancer risk in the nurses' health study. *Cancer Epidemiol. Biomarkers Prev.* 11(12), 1560-1565. 12-2-2002.

12. Lipp, H.-P., Schrenk, D., Wiesmüller, T., Hagenmaier, H., and Bock, K. W. (1992). Assessment of biological activities of mixtures of polychlorinated dibenzo-*p*-dioxins (PCDDs) and their constituents in human HepG2 cells. *Arch. Toxicol.* **66**, 220-223.

13. Longnecker, M. P., Klebanoff, M. A., Brock, J. W., and Guo, X. (2005). Maternal levels of polychlorinated biphenyls in relation to preterm and small-for-gestational-age birth. *Epidemiology* **16**, 641-647.

14. Lopez-Carrillo, L., Lopez-Cervantes, M., Torres-Sanchez, L., Blair, A., Cebrian, M. E., and Garcia, R. M. Serum levels of beta-hexachlorocyclohexane, hexachloro benzene and polychlorinated biphenyls and breast cancer in Mexican women. *Eur. J. Cancer Prev.* 11(2), 129-135. 4-2-2002.

15. National Research Council (2006). Health Risks from Dioxin and Related Compounds- Evaluation of the EPA Reassessment, pp. 1-239. The National Academies Press, Washington DC.

16. Pavuk, M., Cerhan, J. R., Lynch, C. F., Kocan, A., Petrik, J., and Chovancova, J. Case-control study of PCBs, other organochlorines and breast cancer in Eastern Slovakia. *J Exp Anal Environ Epidem* 13(4), 267-275. 7-3-2003.

17. Peters, A. K., van Londen, K., Bergman, A., Bohonowych, J., Denison, M. S., van den, B. M., and Sanderson, J. T. (2004). Effects of polybrominated diphenyl ethers on basal and TCDD-induced ethoxyresorufin activity and cytochrome P450-1A1 expression in MCF-7, HepG2, and H4IIE cells. *Toxicol. Sci.* **82**, 488-496.

18. Raaschou-Nielsen, O., Pavuk, M., LeBlanc, A., Dumas, P., Weber, J. P., Olsen, A. A., Tjonneland, A., Overvad, K., and Olsen, J. H. Adipose Organochlorine concentrations and risk of breast cancer among postmenopausal Danish women. *Cancer Epidemiol. Biomarkers Prev.* 14(1), 67-74. 1-5-2005.

19. Rubin, C. H., Lanier, A., Kieszak, S., Brock, J. W., Koller, K. R., Strosnider, H., Needham, L., Zahm, S., and Harpster, A. Breast cancer among Alaska

Native women potentially exposed to environmental organochlorine chemicals. *INTERNATIONAL JOURNAL OF CIRCUMPOLAR HEALTH* 65(1), 18-27. 2-6-2006.

20. Schrenk, D., Stüven, T., Gohl, G., Viebahn, R., and Bock, K. W. (1995). Induction of CYP1A and glutathione S-transferase activities by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in human hepatocyte cultures. *Carcinogenesis* **16**, 943-946.

21. Silkworth, J. B., Koganti, A., Illouz, K., Possolo, A., Zhao, M., and Hamilton, S. B. Comparison of TCDD and PCB CYP1A induction sensitivities in fresh hepatocytes from human donors, Sprague-Dawley rats, and rhesus monkeys and HepG2 cells. *Toxicol. Sci.* 87(2), 508-519. 10-5-2005.

22. Tsukino, H., Hanaoka, T., Sasaki, H., Motoyama, H., Hiroshima, M., Tanaka, T., Kabuto, M., Niskar, A. S., Rubin, C., Patterson, D. G. J., Turner, W., Needham, L., and Tsugane, S. Associations between serum levels of selected organochlorine compounds and endometriosis in infertile Japanese women. *Environmental Research* 99(1), 118-125. 9-5-2005.

23. Vamvakas, A., Keller, J., and Dufresne, M. (1996). In vitro induction of CYP 1A1-associated activities in human and rodent cell lines by commercial and tissue-extracted halogenated aromatic hydrocarbons. *Environ. Toxicol. Chem.* **15**, 814-823.

24. Wiebel, F. J., Wegenke, M., and Kiefer, F. (1996). Bioassay for determining 2,3,7,8-tetrachlorodibenzo-*p*-dioxin equivalents (TEs) in human hepatoma HepG2 cells. *Toxicol. Lett.* **88**, 335-338.

25. Winneke, G., Kramer, U., Sucker, K., Walkowiak, J., Fastabend, A., Heinzow, B., and Steingruber, H. J. (2005). PCB-related neurodevelopmental deficit may be transient: Follow-up of a cohort at 6 years of age. *Environ. Toxicol. Pharmacol.* **19**, 701-706.

26. Xu, L., Li, A. P., Kaminski, D. L., and Ruh, M. F. (2000). 2,3,7,8 tetrachlorodibenzo-*p*-dioxin induction of cytochrome P4501A in cultured rat and human hepatocytes. *Chemico-Biological Interactions* **124**, 173-189.

27. Zeiger, M., Haag, R., Hockel, J., Schrenk, D., and Schmitz, H.-J. (2001). Inducing effects of dioxin-like polychlorinated biphenyls on CYP1A in the human hepatoblastoma cell line HepG2, the rat hepatoma cell line H4IIE, and rat primary hepatocytes: Comparison of relative potencies. *Toxicol. Sci.* **63**, 65-73.

Expert Opinions regarding Wildlife and Aquatic Live Issues associated with the *2007 Total Maximum Daily Load for PCBs in San Francisco Bay: Basin Plan Amendment and Staff Report*

Prepared by Kenneth D. Jenkins, Ph.D.

8/15/07

The 2007 Total Maximum Daily Load for PCBs in San Francisco Bay: Basin Plan Amendment and Staff Report (Staff Report) indicates that the proposed Total Maximum Daily Load (TMDL) for PCBs in San Francisco Bay is based upon "attainment of fish a tissue target PCB concentration protective of human health, wildlife and aquatic life" (Page 1). The 2007 Staff Report justifies the need for the proposed TMDL, based on the assumption that current concentrations of PCBs in surface waters and sediments are sufficient to impair beneficial uses of the Bay. Specific beneficial uses identified as impaired by PCBs in the Staff Report are commercial and ocean sports fishing (COMM), estuarine habitat (EST), preservation of rare and endangered species (RARE), and wildlife habitat (WILD) (page 19); the TMDL is based on protection of human health, wildlife, and aquatic life (page 1). In preparing this report, I have focused on evaluating whether current data on PCB concentrations in San Francisco Bay provide evidence of injuries to aquatic life and wildlife such that a TMDL is required to attain associated beneficial uses (e.g. EST, RARE and WILD).

Based on my review of the Staff Report and available data on concentrations of PCBs in surface water, sediment and fish tissue data from San Francisco Bay and information on PCB toxicity to aquatic life and wildlife, I have concluded that these data do not support the Staff Repot position that the proposed PCB TMDL is required to protect wildlife, aquatic life or RARE, WILD, and EST beneficial uses in San Francisco Bay. The specific opinions I have formed in arriving at these conclusions are provided in the following sections of this report.

1. **Current concentrations of PCBs in surface water of San Francisco Bay are below levels that would affect RARE, WILD, or EST beneficial uses in San Francisco Bay and likely are declining.**

The California Toxics Rule (CTR) saltwater criterion continuous concentration (CCC) for PCBs is 30 ng/L (or 30,000 pg/L). The CCC for PCBs is a federal standard intended to be protective of aquatic life over long term (chronic) exposure. The Staff Report acknowledges that "PCB concentrations in Bay waters are generally below the CCC water quality standard, indicating that current conditions are protective of aquatic from chronic toxicity" (Page 20). The Staff Report summarizes median concentrations PCBs in waters collected from sub areas of the Bay in Table 10 (Page 32). These median concentrations (which are based on data collected more than 10 years ago in 1993 and 1994) range from 0.13 to 3.7 ng/l (e.g., 130 to 3,700 pg/L). Temporal data presented in Figure 11 (Staff Report, Page 30) suggest that concentrations of PCBs in surface waters entering the Bay and in sub areas of the bay have declined in recent years. Consistent with this trend, maximum water column concentrations since 2000 are even lower, falling below 2 ng/L (e.g., 2,000 pg/L; Figure 12, Page 32). Based on these data, the concentrations of PCBs in surface waters are one to two orders of magnitude below the CCC. Thus, concentrations of PCBs in receiving waters provide no basis for finding that the RARE, WILD or EST beneficial uses are not being met in the Bay.

2. **Current concentrations of PCBs in tissues of fish are below conservative toxicity benchmarks and would not affect RARE, WILD, or EST beneficial uses in San Francisco Bay.**

There are no promulgated numeric standards (objectives) defining levels of PCBs concentrations in fish tissue that would be required for the protection of RARE, WILD or EST beneficial uses in San Francisco Bay. In the absence of a numeric standard, I have relied on the narrative standard, which indicates that, "Controllable water quality factors shall not cause a **detrimental increase** in toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered" (2007 Staff Report, Pages 19-20; emphasis added).

In order to conservatively evaluate the potential for a detrimental increase in PCB concentrations in fish tissues on the fish themselves, I have compared recent data on concentrations of PCBs in fish tissue (Figures 6, 7, and 8; 2007 Staff Report) against fish tissue Ecotoxicity Reference Values (ERVs) that were developed in consultation with USEPA Region 9[1]. These ERVs represent conservative estimates of concentrations of PCBs in fish tissues that would be protective of fish.

---

[1] To evaluate potential effects to fish, ecotoxicity reference values (ERVs) based on effects-based critical body residues were developed for the U.S. Navy for the risk assessment at Pearl Harbor (DON, 2002). It is assumed that the ERVs can be considered as surrogates for general bottom fish in San Francisco Bay because the ERVs are based on a review of critical body residues from available studies from commonly recognized databases such as the Environmental Residue and Effects Database and ECOTOX and included species in temperate systems.

They were developed from studies published in the literature, in support of the Pearl Harbor Baseline Ecological Risk Assessment (BERA) (DON, 2002).

Based on this review, lake trout were found to be most to be most sensitive of all fish species to PCBs (DON, 2002). The lowest concentration of PCBs in fish tissues at which adverse effects are observed is 7.6 ug/g dry weight (e.g., the lowest observable effects concentration or LOAEL). The concentration selected to represent a no effect level is 3.8 ug/g dry weight (e.g., the no observable adverse effects concentration or NOAEL). These values translate to a 1.5 ug/g LOAEL and 0.76 ug/g NOAEL wet weight[2]. These threshold vales are considered to represent very conservative thresholds for effects (i.e., there is high confidence that no deleterious effects are expected at fish tissue concentrations below these thresholds).

The observation that trout are among the most sensitive species to PCBs, and the characterization of NOAEL and LOAEL values discussed above as "very conservative" are consistent with conclusions reached by US EPA in the final Ecological Risk Assessment for the Housatonic River (US EPA, 2004), and with data presented in *Environmental Contaminants in Wildlife: Interpreting Tissue Concentrations* (Beyer et al., 1996).

US EPA's risk assessment for the Housatonic River (US EPA, 2004) concluded that lake trout and some other trout species appear to be more sensitive to chlorinated hydrocarbons than other fish based. This conclusion is supported by PCB tissue effect concentrations presented (in Table F3-2) in US EPA's risk assessment, which included tissue effect concentrations ranging from 1.53 ug/g wet weight (for lake trout) to 645 ug/g wet weight (for coho salmon). US EPA's risk assessment ultimately arrived at a whole body tissue concentration of 31 ug/g for the protection of reproductive and developmental endpoints for fish. US EPA additionally commented that the 31 ug/g effect threshold was consistent with a review of PCB toxicity conducted by the National Oceanic and Atmospheric Administration (NOAA) which concluded that PCB concentrations between 25 and 70 ug/g (in liver, whole body, or eggs which are all expected to have similar PCB concentrations) interferes with reproductive functioning of adult fish (US EPA, 2004, Monosson, 1999). Chapter 5 in *Environmental Contaminants in Wildlife: Interpreting Tissue Concentrations* (Beyer et al., 1996) addresses potential effects associated with PCBs in aquatic organisms based on a review of the available data and concludes that PCB tissue concentrations of greater than 25

[2] Conversion from dry weight to wet is based on the 0.2 g dry wt/1 g wet weight ratio used in DON (2002) to convert the dry weight LOAEL to a wet weight LOAEL.

mg/kg in macroinvertebrates and greater than 50 to 100 ug/g fish may be required to adversely affect the growth and reproduction of fish, which also supports the characterization of the 0.76 mg/kg NOAEL as very conservative.

Concentrations of PCB in fish tissues collected in San Francisco Bay since 2000 are all below the conservative 0.76 ug/g wet weight NOAEC for lake trout discussed above (Figures 7 and 8; 2007 Staff Report). The only historical data that exceed the 0.76 ug/g conservative lake trout NOAEL are single sample results from 10 years ago (1997) for surfperch and croaker, and the Staff Report acknowledges that concentrations of PCBs in surfperch have declined with time (Staff Report, Page 24).

In evaluating these comparisons, it is important to recall that the PCB NOAEL and LOAEL are not promulgated water quality standards or objectives. Thus, an isolated exceedance of the lake trout NOAEL by data collected a decade ago should not be considered evidence of a current of a detrimental increase in tissue concentrations, especially given that US EPA (for the Housatonic River ERA) and NOAA have used fish tissue effects thresholds that are more than 50 times higher than the lake trout NOAEL to evaluate potential impacts to fish from PCBs, and at no time in San Francisco Bay have fish tissue PCB data been collected at levels above these thresholds, or thresholds published in *Environmental Contaminants in Wildlife: Interpreting Tissue Concentrations* (Beyer et al., 1996).

As lake trout are among the most sensitive to PCBs of all fish species tested to date, the lack of any exceedances of a very conservative lake trout NOAEC in the past 7 years demonstrates that there is no basis for concluding that current concentrations of PCBs in tissues of fish from the Bay are currently causing detrimental effects to resident or migratory fish species in the Bay.

3. **The proposed goal of 1 ng/g PCBs in sediments is not required to protect RARE, WILD, or EST beneficial uses in San Francisco Bay.**

As with fish tissues, there are no promulgated numeric standards (objectives) defining PCBs concentrations in sediments that would be required for the protection of RARE, WILD or EST beneficial uses in San Francisco Bay. In evaluating the potential effects of PCBs in sediments RARE, WILD, or EST beneficial uses in San Francisco Bay the Staff Report relies on a screening level of 160 ng/g developed by USEPA (1997). This EPA screening level is 160 times the 1 ng/g sediment goal for PCBs proposed in the Staff Report (Page 22-23).

The Staff Report estimates that that the ambient concentrations of PCBs in sediments are about 10 ng/g (page 17). Other studies conducted for the regional board have estimated that ambient concentrations fall between 18 and 20 ng/g in the open bay, and between 26 and 66 ng/g in near shore areas (i.e., within 500 meters of shore) to have average ambient concentrations between (CEP, 2005). As part of their review of the Staff Report QEA (QEA, 2007) has developed estimates of ambient concentrations of PCBs in the Bay using 2000-2001 NOAA EMAP and 2000, 2001, 2004, and 2005 RMP surface sediment data. Based on QEA's calculations surface weighted average ambient PCB concentrations range from 10 ppb (in the open bay) to approximately 18 ppb in nearshore areas.

All of these estimates of ambient PCB concentrations in surface sediments fall well below the 160 ng/g screening level presented in the Staff Report for evaluating potential impairment RARE, WILD or EST beneficial uses in San Francisco Bay (page 24).

As the USEPA screening level of 160 ng/g is not a promulgated standard and is not specific to San Francisco Bay, I have also reviewed the results of recent ecological risk assessments that have been conducted in San Francisco Bay for further perspective. These risk assessments have been conducted at sites in the Bay with elevated concentrations of PCBs in sediments[3], and which consider higher trophic level organisms which have the potential to be exposed to PCB *via* consumption of contaminated prey. The risk-based sediment concentrations (RBCs) of PCBs from these studies range from 97 to 24,000 ng/g PCBs in sediments (Table 1). These screening values are orders of magnitude higher than the 1 ng/g PCB screening level for sediments proposed in the Staff Report. As indicated above, estimates of ambient PCB concentrations of PCBs in San Francisco Bay range from 10 to 66 ng/g. The highest estimates of ambient concentrations of PCB in near shore sediments (66 ng/g), falls well below the most conservative most conservative estimate of a risk based threshold of toxicity (97 ng/g). These comparisons demonstrate ambient concentrations of PCBs in sediments are protective of RARE, WILD or EST beneficial used. There is thus no justification for establishing a TMDL with a 1 ng/g PCB goal,

[3] It is important to note that these risk based sediment concentrations (RBCs) reflect site-specific estimates of potential risk to wildlife species and rather than actual measured detrimental effect on those species.

which is an order of magnitude or more lower than ambient conditions, for the protection of RARE, WILD or EST uses.

Table 1 - Examples of Available Risk-Based Concentrations (RBCs) for PCBs Protective of Ecological Receptors Developed for Sites in San Francisco Bay Using Site-Specific Data to Estimate Exposure

Habitat	Site Name	Receptor [1]	Diet Composition	PCB Basis	Sediment PCB RBC (ug/kg dw) [2]	Reference
bay margin (shallow) surface sediments	Sea Plane Lagoon	Least Tern	100% fish	Total PCBs	110	Feasibility Study Report Sea Plane Lagoon (Battelle, 2004)
	Hunter's Point Parcel F	Surf Scoter	100% invertebrate		620	Draft Final Hunters Point Shipyard Parcel F Validation Study Report (Battelle, 2004)
		Double-crested Cormorant	100% fish		230	
bay margin surface sediments surrounded by salt marsh	Moffett Field Site 25	Mallard	70% plant / 30% invertebrate		664	Technical Memorandum for Developing and Applying Site-Specific Sediment Preliminary Remediation Goals for the Addendum to the Station-Wide Feasibility Study Site 25, Former Naval Air Station Moffett Field, CA (SulTech, 2005)
		Black-necked Stilt	100% invertebrate		97	
		Great Blue Heron	90% fish / 10% invertebrate		236	
salt marsh sediments	UC Berkley Richmond Field Station [3]	Clapper Rail	100% invertebrate	Aroclor 1016	4200	Human and Ecological Tiered Risk Evaluation, UCB Richmond Field Station/Stege Marsh Richmond CA (URS, 2001)
				Aroclor 1248	5900	
				Aroclor 1254	24000	

1 - Relevant/appropriate receptors were selected for each of these sites based on site-specific considerstion including habitat and receptor use. Although these receptors were selected based on site-specific consideraitons, they are generally relevant to the larger SF Bay. In cases where PCBs had potential risk to ecological receptors based on an ERA, it was generally determined that risk-based concentrations developed to be protective of birds were protective of fish and invertebrates. Aquatic feeding mammals were not quantitatively evaluated at any of these sites.

2 - The PCB RBCs protective of ecological receptors summarized in Table 1 were all developed assuming a SUF of 1 (i.e., 100% of exposure is from each of the sites). Actual cleanup/protective levels used at each of these sites were generally higher and were based on a site-specific SUF consideirng a range of SUFs and/or based on receptor home range and the size of the site. RBCs were calculated using no observable advesre effect level (NOAEL) toxicity refernce values (TRVs).

3 - These values are "Site-Specific Target Levels" (SSTL) not "proposed cleanup levels." SSTLs were used to determine areas of concern (a SUF of one was used).

4. **Recent 303(d) lists for San Francisco Bay do not include impairment designations for EST, RARE and WILD beneficial uses.**

Section 303(d) of the 1972 Federal Clean Water Act (CWA) requires states to identify waterbodies where technology-based effluent limits are insufficient to meet water quality objectives, including beneficial uses, and to submit an updated list of impaired waterbodies to the

U.S. EPA every two years. The proposed 2006 CWA Section 303(d) list of water quality limited segments, as well as the 2002 and the 2004 303(d) list, do not include any impairment designations (for any water quality segments in San Francisco Bay) for EST, RARE or WILD due to PCBs.

The requirements for developing the 303(d) list are described in the *Water Quality Control Policy For Developing California's Clean Water Act Section 303(d) List* (SWRCB, 2004) which provides "guidance for interpreting data and information as they are compared to beneficial uses, existing numeric and narrative water quality objectives, and anti-degradation considerations". This guidance includes the following recommendations/requirements (this is not a comprehensive list of requirements):

a. States are required to assemble and evaluate all existing and readily available water quality-related data and information to develop the list and to provide documentation for listing or not listing a state's waters as impaired.

b. The quality of the data used in the development of the section 303(d) list shall be of sufficient high quality to make determinations of water quality standards attainment. Only data supported by a Quality Assurance Project Plan (QAPP) pursuant to the requirements of 40 CFR 31.45 are acceptable for use in developing the section 303(d) list.

c. All data and information shall be evaluated using specific decision rules provided in the Policy.

d. The 2001 Budget Act Supplemental Report required the use of a "weight of evidence" approach in developing the Policy for listing and delisting waters and to include criterion to ensure that data and information used are accurate and verifiable.

e. For toxicants, the Policy identifies a minimum number of exceedances (representing a 15% "effect size") needed to place a water on the section 303(d) list for toxicants. Minimum numbers of exceedances are provided (based on a binomial distribution) for sample sizes ranging from 2 to 129. Considering a sample size of 129, there would need to be 11 exceedances of an applicable standard to indicate impairment.

f. Each RWQCB shall include a standardized fact sheet for each water and pollutant combination that is proposed for inclusion in the section 303(d) list. The fact sheet must address 15 specific elements which include (but are not limited to) the beneficial use affected, a summary of the data and information used as a basis for the impairment determination, a quality assurance assessment of numeric data, and a data evaluation consistent with the listing factors contained within the Policy.

Most of the data considered in the development of the Staff Report were collected in the 1993 to 2003 time period (Figures 5, 7 and 11) and at least a subset of these data should have been available for review for during the development of each of these 303(d) lists. The lack of listing San Francisco Bay for impairment of EST, RARE or WILD designated uses is consistent with my first 3 conclusions that were based on my independent review of the same data sets.

5. **The proposed TMDL cannot be justified based on purported impairment of EST RARE, or WILD beneficial uses in San Francisco Bay.**

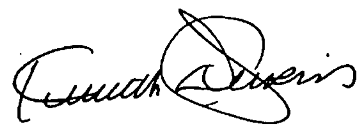
As discussed in the previous comments, ambient concentrations of PCBs in surface water and fish tissue are all well below conservative thresholds for effect on EST, RARE and WILD beneficial uses. Ambient concentrations of PCBs in sediments are also well below thresholds for effect on EST, RARE and WILD beneficial uses. Localized areas of elevated sediment concentrations are addressed by other regulatory programs and are not considered in the allocation process proposed in the Staff Report. There is thus no basis for requiring a TMDL for the protection of EST, RARE and WILD beneficial uses, My conclusions are consistent with the most recent 303(d) lists which do not show impairment of EST, RARE or WILD beneficial uses in San Francisco Bay.

Given that PCB loading reductions are not likely to provide significant benefit to ecological resources (as current impairment has not been established), and the stated objectives of the PCB TMDL which include "avoid actions that will have unreasonable costs relative to their environmental benefits" and " avoid imposing regulatory requirements more stringent than necessary to meet the targets designed to attain water quality standards", the PCB TMDL should not be based on the objective of protecting estuarine habitat (EST), preservation of rare and endangered species (RARE), and/or wildlife habitat (WILD) beneficial uses.

Testimonial

I am a Principal Toxicologist and Senior Vice President with the firm of ARCADIS-BBL. I have more than 30 years of experience in the field of environmental toxicology. A true and correct copy of my Curriculum Vitae is attached as an exhibit to Appendix A. I have personal and firsthand knowledge of the facts stated in this technical paper, and I could and would testify competently thereto if called upon to do so. I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 15th day of August, 2007, in Petaluma California.



Kenneth D. Jenkins, Ph.D.

References

Battelle, 2004. Final Remedial Investigation Report, Sea Plane Lagoon, Alameda Point, California.

Battelle, 2005. Final Hunters Point Shipyard and Parcel F Validation Study Report, San Francisco Bay, California.

Beyer, W., G. Heinz, and A. Redmon-Norwood, 1996. Environmental Contaminants in Wildlife. Interpreting Tissue Concentrations. SETAC Special Publication, Lewis Publishers.

CEP, 2005. Final Report - Existing Data on PCB Concentrations of Nearshore Sediments and Assessment of Data Quality.

Department of the Navy (DON), 2002. Pearl Harbor Sediment RI – Step 3b/4 BERA, Appendix A – Ecotoxicity Reference Values (ERVs) for Bioaccumulation Risk Estimates in the BERA.

Monosson, E. 1999. Reproductive, Developmental and Immunotoxic Effects of PCBs in Fish: Laboratory and Field Studies. Prepared for Damage Assessment Center, National Oceanographic and Atmospheric Administration, Silver Springs, MD NOAA Contract 50-DSNC-90032. March 1999.

QEA, 2007. Comments on 2007 PCB TMDL Staff Report and Basin Plan Amendment.

SFEI, 2006. Regional Monitoring Program (RMP) Annual Monitoring Results.

SulTech, 2005. Technical Memorandum for Developing and Applying Site-Specific Sediment Preliminary Remediation Goals for the Addendum to the Station-Wide Feasibility Study Site 25, Former Naval Air Station Moffett Field, CA.

SWRCB, 2004. Water Quality Control Policy For Developing California's Clean Water Act Section 303(d) List.

URS, 2001. Human Health and Ecological Tiered Risk Evaluation, University of California Berkeley, Richmond Field Station/Stege Marsh, Richmond, CA.

USEPA 1997. The Incidence and severity of Sediment Contamination in Surface Waters of the United States. Volume 1: National Sediment Quality Survey. Office of Science and Technology. Washington D.C. EPA 823-R-97-006.

USEPA 2004. Ecological Risk Assessment for General Electric (GE)/Housatonic River Site, Rest of River, November 12, 2004.

SHORT AND LONG-TERM IMPACTS OF DREDGING RELATED TO IMPLEMENTATION OF THE PROPOSED SAN FRANCISCO BAY PCB TMDL

Prepared for

General Electric Company

3135 Easton Turnpike

Fairfield, Connecticut 06431

Prepared by

Anchor Environmental CA, L.P.

28202 Cabot Road, Suite 620

Laguna Niguel, California 92677

August 2007

Table of Contents

List of Tables

List of Figures

List of Appendices

1 INTRODUCTION AND SCOPE OF REVIEW

This report presents technical analyses performed by Anchor Environmental, L.L.C. (Anchor) regarding the San Francisco Regional Water Quality Control Board's (hereinafter "Regional Board's") Proposed Polychlorinated Biphenyl Total Maximum Daily Load (PCB TMDL) Basin Plan and Staff Report for San Francisco Bay (Plan). The Regional Board's Plan provides an overview of proposed PCB allocations, as well as a checklist evaluation under the California Environmental Quality Act (CEQA) assessment of impacts of implementing the TMDL. The Checklist evaluation contained in the Regional Board's Plan reaches the conclusion that the project, defined as implementing the TMDL through a number of foreseeable in-bay and upland scenarios, will result in no significant adverse environmental effects.

The Regional Board's Plan addressed in only a cursory manner a number of key technical issues. For example, in-bay dredging/capping and construction-related impacts associated with implementation of the Plan were not discussed at a level of detail sufficient to support the conclusion of no adverse environmental effects. As these issues are fundamental to project implementation and CEQA determinations of effects, Anchor performed additional technical analyses that considered a range of potential implementation scenarios (e.g., dredging/capping locations and volumes) that could occur if the Plan were to be adopted. These scenarios considered the realities and logistical constraints that will affect implementation of the Plan, including:

- Availability, number, types, and size of equipment
- Locations and suitability of upland and aquatic disposal sites
- Regulatory and permitting processes
- Mitigation negotiation, design, construction, and monitoring

For the different implementation scenarios, Anchor evaluated the significance of key issues such as landfill volume requirements, beneficial reuse opportunities, dredging residuals, benthic community impacts and habitat modifications, air, global warming, and impacts to sensitive biological communities in San Francisco Bay. Based on our evaluation as presented herein, we conclude that the Regional Board's Plan and combined CEQA evaluation failed to address significant impacts associated with a number of environmental and logistical issues. Significant adverse environmental effects that would result from Plan implementation include:

- Consumption of available regional landfill space
- Impairment of beneficial reuse opportunities
- PCB releases and sediment residuals impacts resulting from dredging
- Benthic community and habitat impacts resulting from dredging
- Impacts to threatened and endangered species and their habitat
- Impacts to air quality, including cumulative impacts and global climate change

In light of these impacts, and consistent with current U.S. Environmental Protection Agency (USEPA) sediment remediation guidance, TMDL guidance, and available scientific data, a number of alternatives to dredging should be included as part of the Plan, including:

- Monitored natural recovery with institutional controls
- Optimization of PCB load reductions based on a more careful engineering-based assessment of construction realities, logistical constraints, and cost-effectiveness

2 IMPLEMENTATION OF THE PROPOSED PLAN

This section presents an evaluation of key logistical and infrastructure constraints regarding the Plan. In order to facilitate our analyses of equipment, logistics, infrastructure, and overall effectives of dredging, we relied upon presumed dredging scenarios.

2.1 Dredging Scenarios

The Regional Board's Plan discusses a general combination of external load reductions and in-bay sediment dredging to achieve a sediment quality goal of 0.001 milligrams per kilogram (mg/kg; 0.001 parts per million [ppm] or 1 microgram per kilogram [μg/kg]) and a fish tissue target of 10 μg/kg over time. While specific sediment remediation action levels and remedial alternatives were not presented in the Plan, two general conceptual programs were discussed at a relatively cursory level of detail: (1) dredge and dispose of PCB-containing sediments offsite; or (2) dredge and dispose offsite the PCB-containing sediments, and backfill the dredge prism with an in situ cap. The CEQA analyses presented in the Regional Board's Plan concluded that impacts associated with all of the reasonably foreseeable implementation strategies would have no significant adverse environmental impacts after taking into account presumed impacts, best management practices (BMPs), or other mitigation actions.

The "project" as defined in the TMDL included only a cursory description of the implementation plan for dredging, which was not sufficient for CEQA analysis. As discussed on pages 76 to 78 of the Plan, dredging, possibly in combination with capping, was assumed to be performed in a manner that would achieve the project objectives. No additional details describing in-water operations were included however in the Plan. As the realities and logistical constraints affecting implementation of the Plan are fundamental to project implementation and CEQA determinations of effects in this case, a more detailed evaluation of the Plan is necessary. Technical analyses were performed for this report that considered a range of potential implementation scenarios (e.g., dredging/capping locations and volumes) that could occur if the Plan were to be adopted. Available data on the distribution of PCBs in San Francisco Bay is sparse for consideration of Bay-wide initiatives. Therefore, three implementation scenarios representing a range of possible outcomes for a reasonable range of contamination resulting from Plan implementation were evaluated, including:

1. Dredging all sediments in San Francisco Bay that exceed 0.01 ppm PCBs (i.e., 10 times the long-term sediment quality goal described in the Regional Board's Plan);
2. Dredging sediments in the San Francisco Bay margins that exceed 0.01 ppm, with margins defined based on the geographic extent of Bay Protection and Toxic Cleanup Program (BPTCP) screening surveys; and
3. Dredging sediments in the 22 particular contaminated sediment areas within San Francisco Bay identified in the TMDL that exceed 0.01 ppm (i.e., proximal to historical upland sources, with average sediment PCB concentrations in such areas of roughly 0.5 ppm).

Available sediment quality data for San Francisco Bay were reviewed to develop estimates of possible sediment remediation areas and volumes associated with each of the potential Plan implementation scenarios listed above. Sediment data sources considered in this evaluation included:

- BPTCP. 1998. Sediment Quality and Biological Effects in San Francisco Bay: Bay Protection and Toxic Cleanup Program Final Technical Report. California State Water Resources Control Board, Sacramento, CA.
- San Francisco Estuary Institute Regional Monitoring Program Status and Trends Monitoring data - http://www.sfei.org/RMP/report.
- DMMO (Dredged Material Management Office). 2006. Long Term Management Strategy (LTMS) Six Year Program Review. May 2006.
- EVS, Battelle, MEC, and Aquifer Sciences. 1998. Comprehensive Final Sediment Analyses Report-Port of Oakland 50-Foot Harbor Deepening Project. Prepared for the Port of Oakland. EVS Environment Consultants, Seattle WA. June 1998. pp. 6-40, 77-81.
- NOAA (National Oceanic & Atmospheric Administration) Watershed Database and Mapping Projects/ San Francisco Bay
  http://response.restoration.noaa.gov/book_shelf/1242_CPRD_SanFran_1pager.pdf
  http://archive.orr.noaa.gov/cpr/watershed/sanfrancisco/sfb_html/projectbackground.html.

The available core sampling data suggest that sediments in San Francisco Bay exceeding 0.01 ppm largely are restricted to the top 3 to 4 feet of the sediment bed. Since a 4-foot sediment removal depth has been typical for recent San Francisco Bay sediment cleanup projects, consistent with operating characteristics of modern dredging equipment, our evaluations assumed that dredging actions performed under the Plan would remove an average of 4 feet of sediment material. For the dredging-only option, the sediment bed would be left in a deepened condition, while under the dredge-and-cap option the sediment bed would be backfilled to its current grade, in part to minimize habitat impacts (see Section 3.4 below). Estimated sediment remediation areas and volumes associated with implementation of the Regional Board's Plan are summarized in Table 1.

Table 1
Estimated Sediment Remediation Areas and Volumes

Plan Implementation Scenario	All Bay Sediments > 0.01 ppm PCBs	Bay Margins > 0.01 ppm PCBs	"Hot Spots" (22 total) > 0.05 ppm PCBs
Area (acres)	110,000	36,000	16,000
Volume (cubic yards)	710,000,000	240,000,000	110,000,000

Scenarios were created based on consideration of the data sources above as well as best professional judgment, and provide a reasonable estimate of the area and volume of dredging, though the actual area and volume of dredging could be somewhat greater or less. Depending on the implementation scenario, prospective dredging volumes in San Francisco Bay under the Regional Board's Plan may range from roughly 110 to 710 million cubic yards (cy). For comparison, the largest sediment PCB cleanup projects currently targeted for implementation in the U.S. range up to approximately 4 million cy (e.g., Lower Fox River, WI; USEPA 2007), with a projected 10-year in-water construction duration. That is, prospective dredging volumes in San Francisco Bay under the Regional Board's Plan are 30 to 200 times larger than any other prior sediment PCB remediation project performed or contemplated within the U.S. While the hot-spot scenario is likely a conservative estimate based on available data, and thus actual hot-spot volume is likely less than proposed in this report, even a large reduction likely remains a massive project.

Similarly, as noted in the Regional Board's Plan, between 2001 and 2005 an average of approximately 4 million cy of relatively clean sediment material was dredged per year from

San Francisco Bay for navigation channel maintenance, with nearly half of this volume disposed in open water at designated in-Bay or out-of-Bay locations (DMMO 2006). (The Regional Board's Plan estimated that the sediment PCB concentration in recently-dredged materials averaged approximately 0.01 ppm [10 μg/kg], equivalent to the action level used to develop the scenarios above.) The realities and logistical constraints that will affect implementation of the Plan, including strains on existing infrastructure (e.g., consumption of available regional landfill space, contractor labor and equipment, traffic patterns, backfill sources), elimination of beneficial reuse opportunities, and other environmental impacts resulting from such a massive dredging project are discussed in the sections below.

2.2 Operational and Infrastructure Considerations

Despite the indefinite nature of the Regional Board's Plan, in order to inform a more appropriate CEQA evaluation of environmental effects, a conceptual assessment of the magnitude of potential dredging operations was performed to identify components of the TMDL that may present implementation challenges or other environmental effects (e.g., impacts to air quality, including cumulative impacts and global climate change). In order to make relative estimates of the volumes and durations associated with the three implementation scenarios outlined above, we evaluated typical equipment sets that would be needed for large-scale dredging, including the number and types of machinery that reasonably might be assembled for a dredging project of this magnitude. Typical operational parameters were incorporated into the analyses, in part to estimate project duration. Assumed equipment and operational parameters for all three scenarios are summarized in Table 2.

Table 2
Anticipated Dredging Equipment and Operational Parameters

Major Mechanical Dredging Equipment	Fuel	Typical HP	Estimated Number in Concurrent Operation
Crane barge and tug	Diesel	1,350	5 – 10
Crane/derrick	Diesel	2,300	5 – 10
Environmental Clamshell Bucket	–	–	5 – 10
Placing Grid	–	–	5 – 10
Material Barges	–	–	50 – 100
Work Boat	Diesel	400	5 – 10

Table 2
Anticipated Dredging Equipment and Operational Parameters

Major Mechanical Dredging Equipment	Fuel	Typical HP	Estimated Number in Concurrent Operation
Winches	–	–	Varies
Debris grapple	–	–	5 – 10
Tug Boat	Diesel	1,350	10 – 20
Skiff	Gasoline	200	5 – 10
Silt Curtain	–	–	Varies
Survey Boat	Gasoline	200	5 – 10
Positioning system	–	–	5 – 10
Surveying system	–	–	5 – 10
Processing Equipment (one processing area)			
Loader	Diesel	270	5 – 10
Bulldozer	Diesel	700	5 – 10
Excavator	Diesel	316	5 – 10
Skid-steer	Gasoline	100	5 – 10
Articulated dump truck	Diesel	426	5 – 10
Fractionation tanks	–	–	Varies
Additive equipment	–	–	Varies
Scale	–	–	5 – 10
Piping/water handling equipment	–	–	Varies
Light plant	–	–	5 – 10
Water Treatment System	–	–	5 – 10
Dewatering equipment (filter press, hydrocyclone)			5 – 10
Monitoring Equipment			
Miscellaneous WQ Monitoring Equip	–	–	Varies
Effluent Quality Monitoring (ISCO)	–	–	Varies
Sampling Vessel	Gasoline	200	5 – 10
Water Sampling Equipment	–	–	Varies
Tissue Sampling Equipment	–	–	Varies
Operational Parameters	Unit	Value	
Bucket Capacity	CY	12	
Bucket Load Efficiency	Percent	80%	
Cycle Time	MIN	<10	
Hours Per Shift		12	

Table 2
Anticipated Dredging Equipment and Operational Parameters

Major Mechanical Dredging Equipment	Fuel	Typical HP	Estimated Number in Concurrent Operation
Shifts Per Day		1	
Working Days per Week	Days	6	
Percent "Up Time"/Day	Percent	75%	
Operating Hours (per day)	HR/Day	9	

Designing, constructing and operating the processing area needed to support even one dredging operation is a substantial undertaking, equal to or exceeding the magnitude and complexity of the dredging operation itself. The largest dredging projects performed or contemplated in the U.S. (e.g., Fox River) require processing areas on the order of tens of acres to support dredging up to several million cubic yards over a duration of 10 years. We estimate that based on a ten-plant program, dredging the hot spots would take 14 years; dredging the margins would require 29 years; and dredging the entire bay would require 88 years. Capping in combination with dredging would not reduce project duration, and in fact may increase the duration due to operational controls required for precise cap placement.

A major concern regarding the Regional Board's Plan is the availability of enough land for processing areas, likely requiring thousands of acres. Land availability is significant project constraint, particularly in light of the growing scarcity of available nearshore land in the San Francisco Bay area. The size of the equipment sets contemplated above would be at the upper limit of precedent; it is not at all certain that local contractors would be able to support this size dredging fleet without importing/ constructing dredges, barges, or other specialized equipment, or that contractors would be able to devote continuous effort to these projects. Implementation of the Regional Board's Plan likely would result in significant impacts to other dredging projects in the region and in other areas of the U.S., given the current contractor labor and equipment base. These complications and environmental effects are in addition to other logistical challenges described elsewhere in this report.

To evaluate potential landfill requirements, sediments with PCB concentrations greater than 0.023 ppm (23 μg/kg; the current Effects Range Low [ERL] sediment benchmark) were assumed to be unsuitable for disposal in open water at designated in-Bay or out-of-Bay locations, and thus would need to be transported to an approved Class III landfill for disposal. Based on our review of the available data, estimated landfill disposal volumes and minimum truck traffic trips (assuming a maximum volume of 80 cy of sediment per truck trip) for each of the three Plan scenarios are summarized in Table 3.

Table 3
Estimated Landfill Disposal Volumes and Truck Traffic Impacts

Scenario	Total Volume (cy)	Volume > ERL (cy)	% to Class III Landfill	80-cy Truck Round Trips
1. Dredge all sediments > 0.01 ppm PCBs	710,000,000	330,000,000	50%	4,200,000
2. Dredge Bay margin sediments > 0.01 ppm	240,000,000	140,000,000	60%	1,800,000
3. Dredge 22 "hot spot" areas > 0.01 ppm PCBs	110,000,000	110,000,000	100%	1,400,000

The results of these conceptual assessments indicate that dredging activities associated with the Regional Board's Plan will require millions of truck trips to landfill dredged sediments, over a period of at least multiple decades. This level of truck traffic alone is likely to have unprecedented impact on local traffic patterns and circulation, and contribute significantly to regional air quality issues. It is likely that major modification, maintenance and repair of roads and ancillary structures would be needed throughout the life of the project. The contribution of truck trips, as well as dredging operations, to air quality issues is discussed in Section 3.

The volume of material required for backfilling/restoration also presents implementation challenges. Depending on the implementation scenario, prospective backfill volumes required under the Regional Board's Plan may range from roughly 110 to 710 million cy (Table 1), assuming that backfill volumes would approximate removal volumes to minimize habitat impacts. Thus, significant upland sources of clean materials would be required under the Plan. Considering the limited available supply of backfill sources in the San Francisco Bay area, the majority of these sources would need to be developed – which would involve land acquisition, permitting, and site development. It is also possible that such clean sediment sources may not be available within feasible proximity to support the

Plan. The logistical challenges and implementation impacts related to backfill/restoration would be as prohibitive as those associated with dredging – cumulative air emissions from loading/hauling equipment, potential need to augment materials on a very large scale for marine placement, widespread traffic impacts, etc.

2.3 Regional Disposal Alternatives

As discussed above, the majority of sediments dredged to comply with the requirements of the TMDL will not likely be suitable for in-water, unconfined disposal at either one of the approved in-Bay or Ocean disposal sites. Relative to the 0.023 ppm ERL benchmark discussed above, a relatively small portion of sediment targeted for dredging under the Regional Board's Plan would be considered marginally contaminated and may be suitable for one or more in-Bay beneficial reuse opportunities. However, the majority of dredged sediments dredged under the Plan would require Class III landfill disposal, with estimated disposal volumes ranging from approximately 110 to 330 million cy (see Table 3).
Table 4 presents a list of active Class III landfills operating in the San Francisco Bay area along with a summary of remaining total disposal capacity and daily limits. The locations of each landfill relative to the study area are presented in Figure 1 for the purposes of evaluating overall proximity to the Bay.

Landfill disposal and available capacity is a politically sensitive issue in the San Francisco Bay area, even without considering the substantial increases in disposal volumes that would result from implementation of the Regional Board's Plan. Public Resources Code, Division 30, Chapter 4, Article 1, Section 41701 was enacted into law to ensure that each county plans for adequate safe disposal capacity for a minimum of 15 years. If a county determines that existing capacity will be exhausted within 15 years, then an area or areas for the location of new solid waste disposal facilities, or existing facilities that will be expanded must be identified. Disposing of the range of volumes anticipated under the Regional Board's Plan (see Table 3) would likely exhaust the available disposal capacity at many regional landfills, without even considering the need for continued disposal of municipal waste. If landfill capacity is diminished, a process of creating and identifying new landfills would need to occur, with its own attendant impacts (as well as permitting, CEQA process and other associated efforts by city and state staff). This effort would in turn increase tax loads and financial burden on many cities, districts, and counties around the Bay area.

Table 4 Landfill Summary

County	Landfill	Address	Total Remaining Capacity (cy)	Daily Capacity (tons/day)	Latitude	Longitude
Alameda	Tri-Cities Recycling and Disposal Facility	7010 Auto Mall Pkwy. Fremont, CA 94538	1,081,500	2,346.00	37.50056	-121.98167
	Altamont Landfill & Resource Recovery	10840 Altamont Pass Road Livermore, CA 94550	124,400,000	11,150.00	37.75389	-121.65165
	Vasco Road Sanitary Landfill	4001 North Vasco Road Livermore, CA 94550	12,279,865	2,518.00	37.75333	-121.72333
Contra Costa	Stonyford Disposal Site	Lodoga/Stonyford Rd; 1 Mi S Stonyford Stonyford, CA 95979	55,683	10.00	39.36167	-122.54833
	West Contra Costa Landfill	Parr Blvd & Garden Tract Rd Richmond, CA 94806	1,300,000	2,500.00	37.972	-122.37639
	Acme Landfill	950 Waterbird Way Martinez, CA 94553	175,000	1,500.00	38.034	-122.09056
	Keller Canyon Landfill	901 Bailey Road Pittsburg (unincorporated), CA 94565	68,279,670	3,500.00	38.00472	-121.93611
	Union Mine Disposal Site	5700 Union Mine Road El Dorado, CA 95623	140,000	300.00	38.648	-120.8298
Santa Clara	NORCAL Waste Systems Pacheco Pass	3665 Pacheco Pass Highway Gilroy, CA 95020	33,013	1,000.00	36.99577	-121.4789
	City of Palo Alto Refuse Disposal	2830 Embarcadero Road Palo Alto, CA 94303	789,182	200.00	37.44932	-122.1074
	Zanker Material Processing Facility	675 Los Esteros Road San Jose, CA 95134	540,100	350.00	37.43615	-121.95122
	Newby Island Sanitary Landfill	1601 Dixon Landing Road Milpitas (SJ), CA 95035	18,274,953	4,000.00	37.45897	-121.94108
	Zanker Road Class III Landfill	705 Los Esteros Road, Near Zanker Rd San Jose, CA 95134	700,000	1,300.00	37.43325	-121.95713
	Guadalupe Sanitary Landfill	15999 Guadalupe Mines Road San Jose, CA 95120	12,662,789	3,650.00	37.21481	-121.89837
Solano	Hay Road Landfill Inc.	6426 Hay Road; ¼ mi W Hwy 113 Vacaville, CA 95687	22,476,431	2,400.00	38.312	-121.83722
	Potrero Hills Landfill	End of Potrero lane Suisun City, CA 94585	60,000	850.00 (cy)	38.21188	-121.98081
Stanislaus	Fink Road Landfill	4000 Fink Road Landfill Crows Landing, CA 95313	10,000,000	1,500.00	37.38816	-121.13633
	Bonzi Sanitary Landfill	2650 West Hatch Road Modesto, CA 95358	291,124	200.00	37.60566	-121.03684
San Mateo	Ox Mountain	2 mi N-E Half Moon Bay Off Hwy 92 Half Moon Bay, CA 94019	44,646,148	3,598.00	37.50057	-122.41078

Insert

Figure 1 Landfill and Beneficial Reuse Site Locations

Dredged materials destined for landfill disposal will require some form of mechanical or physical dewatering to reduce free water in the sediments and comply with CALTRANS regulations (i.e., paint filter test). As such, several off-loading and dewatering facilities would need to be constructed around the Bay to handle the expected volume of material requiring removal under the Regional Board's Plan. Under the most likely scenario, the sediments would be transported to these sites via barge, offloaded using mechanical excavators or clamshell buckets, and then either actively or passively dewatered until little or no free water remains. Once dry, the sediment would be re-handled into truck or railcars for transport to one or more Class III landfill. In addition, the Water Boards typically require marine sediments to undergo some form of active or passive washing to reduce chlorides prior to being placed in an upland landfill.

2.4 Implications for Regional Beneficial Reuse

The Regional Board's Plan did not evaluate the impacts of categorizing sediments that may exceed the TMDL removal criterion (e.g., 0.010 ppm or 10 μg/kg) with respect to regional beneficial reuse initiatives. Successful beneficial reuse of dredge material has been the key to overall success of the San Francisco Bay Long Term Management Strategy (LTMS) program. Since the inception of the LTMS, several beneficial reuse sites have been permitted or are currently seeking permits and well over 7 million cubic yards of dredged material have been delivered to various beneficial reuse sites to date. A list of some examples of beneficial reuse sites is provided below and Figure 1 also provides the general locations of these sites within the Bay.

- Hamilton Wetlands Project (Marin County), Hamilton Wetland Restoration project will likely have a capacity of approximately 10 million cy starting in the fall of 2007 (California Coastal Conservancy 2007).
- Montezuma Wetlands (Solano County), Montezuma Wetland Restoration project has a capacity of 17 million cy (USACE et al. 2001) and can accept both cover and non-cover dredged material.
- Levee Maintenance: Levee maintenance is a crucial need in the state of California (California Executive Order S-17-06). The State of California and the Federal government have identified placement of dredged material on levees as a valid alternative for supporting the levee system. (Long Term Strategy for Dredged Material in the Delta 2007).

  - Winter Island in Contra Costa County is permitted by the Regional Water Quality Control Board and has specific material acceptance criteria established in its permit that allows material with some levels of contaminants not normally suitable for unconfined aquatic disposal the ability to be managed there. However, due to recent subsidence issues, criteria for acceptability has become more stringent and the capacity has been decreased to address concerns related to subsidence as well as chemical concentrations. Current capacity is 150,000 cy per year and this volume is expected to be decreased significantly.
  - Sherman Island in Sacramento County has been discussed as the recipient of dredge material for levee restoration and maintenance. Currently, the Central Valley Water Board has not approved or permitted Sherman Island, thus it is currently not available as an alternative disposal site.
- The Oakland Middle Harbor Habitat Area (Alameda County) had the capacity to beneficially reuse approximately 5.8 million cy of dredged material and as of June 2007 has been filled.
- A portion of the SF-8 disposal site (San Francisco County) has quality constraints and only material that is characterized as clean sands are acceptable for placement at this site.

Table 5 provides capacity and acceptance criteria for each potential beneficial reuse site identified as regionally appropriate, and as shown, there are very few beneficial reuse sites existing and or proposed for dredgers in the San Francisco Bay area to beneficially reuse material with detectable chemical concentrations. The limitation in sites and capacity clearly cannot support the relatively large dredging volumes targeted under the Regional Board's Plan.

Table 5
Beneficial Reuse Sites

Beneficial Reuse Site	Status	Capacity (cy)	Total PCBs Acceptance Criteria
Montezuma Wetlands Project	Permitted; accepting material	17 million	Wetland cover < 0.05 ppm and noncover < 0.4 ppm
Hamilton Wetlands Restoration Project	Permitted; accepting material in 2008 - will require an ATF after initial placement of material from the Oakland Harbor 50 ft Deepening Project	7.1 million	0.023 ppm
Levee maintenance	Site by site basis	unknown	Site specific
Bair Island	Not permitted; Port of Redwood City utilizing capacity	1 million	Wetland cover < 0.05 ppm
South Bay Salt Ponds	Planning stages	unknown	

Sources:
Montezuma Wetlands Project: SF Water Board File No. 2129.2064(TRG) http://www.waterboards.ca.gov/rwqcb2.
Hamilton Wetlands Restoration Project Biological Opinion.

By defining sediments with more than 10 ppb PCBs as "contaminated," the TMDL could generate a conflict with clean-up mandates. Such sediments may be classified as "waste" subsequent to adoption of the TMDL. As a result of this classification, sediments generated from cleanup programs may be disallowed for beneficial reuse at wetland sites. The low-threshold value could preclude any volume from being delivered to available sites. The Regional Board's *Draft* Staff Report "Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines" (Regional Board 2000) cites a proposed PCB criteria of 0.023 ppm for surface material and 0.18 ppm for foundation material. The TMDL plan contradicts this strategy by suggesting sediments with lesser PCB concentrations are now waste.

2.5 Dredging Residuals

Residual contamination is typical in surface sediments following the completion of dredging activities. The presence of residual contaminants is inevitable when dredging sediments due to the inability of any dredging equipment to completely remove all sediment within a dredge prism. Resuspension of sediment during bucket impact and retrieval, or disturbance during hydraulic excavation, results in fine-grained sediment becoming suspended and transported away from the immediate location of the dredge. Dredging residuals result in a veneer of relatively high-concentration sediments remaining on the post-dredging surface or adjacent to the dredging footprint. Because of the bioavailability of such residual sediments, PCB exposure and bioaccumulation often has increased as a result of dredging (USEPA 2005; National Academies 2007; Patmont and Palermo 2007).

Using a mass balance-based measure of residuals from a series of well-documented dredging projects, realistic expectations of residuals can be used to plan how to anticipate and respond to dredge residuals (Patmont and Palermo 2007). For cleanup projects using modern dredging equipment and BMPs, the amount of sediment loosened by the dredge head but not effectively captured, has ranged from approximately 2 to 8 percent of the mass of sediment (or contaminant) dredged. That is , a range of 2 to 8 percent of the mass of sediments and PCBs loosened by the dredge under the Regional Board's Plan likely will settle back within or immediately adjacent to the newly cut surface of dredge prism. Assuming an average 4-foot-thick dredge cut under the Regional Board's Plan, and also considering the relatively high water content of generated residuals, approximately 5 to 15 centimeters of residuals generated from dredging would be expected to be present on the post-dredge surface under the Plan. Based on detailed observations at a range of sediment cleanup sites (Patmont and Palermo 2007), the concentration of PCBs within the surface residual veneer would be expected to be approximately equal to the average concentration of the sediment dredged (e.g., 0.5 ppm in the "hot spot" scenario outlined above).

A recent, comprehensive review by the National Research Council (NRC) of environmental dredging projects concluded that about half of all cleanup sites could not achieve their target sediment quality or bioaccumulation goals using dredging alone, largely as a result of dredging residuals. Notably, post-dredge surface sediment PCB concentrations were unable to be reduced to below the commonly-accepted risk-based cleanup goal for PCBs of 1 ppm, which is 100 times higher than the prospective Regional Board's contamination threshold of 0.001, as described above. The NRC concluded that dredging can often "create additional exposures by stirring up buried toxicants and creating residual contaminants..." (National Academies 2007).

It is highly likely that dredging will result in residuals substantially exceeding the Plan's PCB sediment goal. The Regional Board's sediment goal is low enough that dredging will likely not be able to achieve the target. Repeated dredging passes or later addition of other remedial technologies (e.g., sand caps) increases overall environmental impacts associated with implementation of the Plan (e.g., infrastructure and air, water quality, sensitive species disturbances), and also increases the length of time of construction. Residuals also have significant implications for benthic communities and food-web issues (see Section 3.3).

2.6 Implementation Feasibility

Based on our evaluation of logistical and infrastructural limitations to the Plan, the Regional Board's TMDL has not adequately addressed a number of key considerations in concluding that there are no significant environmental impacts resulting from the Plan. Implementation feasibility issues include:

- The magnitude of the dredging operation potentially required is prohibitive in terms of equipment needs, volume, and duration
- Key attendant considerations were not addressed, including need for backfill, and time for design and permitting processes
- Landfill capacity is insufficient relative to the volume of material anticipated to be generated
- Regional beneficial reuse sites could alternatively be overwhelmed with material, or be the subject of a regulatory contradiction
- Dredging residuals are a significant limitation on the effectiveness of dredging that was not considered

Specific environmental impacts and resource issues are summarized in the following section.

3 ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE PROPOSED PLAN

3.1 Air Quality

In order to evaluate whether the Regional Board's conclusions that air quality impacts related to dredging projects could be successfully mitigated to below significance, we evaluated emissions of criteria pollutants and carbon dioxide for 1 year of operations for the equipment described in Table 2. We included truck emissions based on round-trip truck traffic taken from Table 3, and we evaluated the potential benefit of utilizing an all-electric dredge fleet. We estimated the following construction related air quality impacts over 1 year of implementation, both with and without electric dredges:

Table 6a
Construction Emissions Associated with Dredging Operations

Pollutant	ROG (lb/day)	CO (lb/day)	NOx (lb/day)	SO2 (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2-eq (ton/yr)
Emissions	566	5,662	5,256	273	266	244	59,604
BAAQMD Significance Thresholds[1]	80	NA	80	NA	80	NA	NA

[1] Bay Area Air Quality Management District (BAAQMD) significance thresholds for CEQA (1999). http://www.baaqmd.gov/pln/ceqa/ceqa_guide.pdf
NA = not applicable

Table 6b
Construction Emissions Associated with Dredging Operations Using Electric Dredges

Pollutant	ROG (lb/day)	CO (lb/day)	NOx (lb/day)	SO2 (lb/day)	PM10 (lb/day)	PM2.5 (lb/day)	CO2-eq (ton/yr)
Emissions	519	5,511	4,825	273	252	232	59,598
BAAQMD Significance Thresholds	80	NA	80	NA	80	NA	NA

NA = not applicable

Based on the data presented, it is clear that the magnitude of the dredging operations required make it infeasible for air quality impacts, including cumulative impacts, to be mitigated below significance, even including the use of an all electric-dredge fleet. Note that overall emissions do not substantially decrease even with the use of an all electric-dredge fleet due to the substantial contribution of the remaining equipment (tugs, work boats, etc.).

In addition, particulate matter (PM) is considered a Toxic Air Contaminant (TAC) in the State of California, and based on emissions of this magnitude, a detailed human-health risk assessment should be performed prior to undertaking any dredging. In comparison, the Oakland Harbor Deepening Project's (-50 ft Project's) NOx emissions were limited to 100 tons per year to dredge approximately 14 million cy of material over a 7-year period (2002 – 2009) where minimal volume (1 percent) was transported to landfills.

3.2 Global Climate Change

The state legislature has passed a number of bills that target greenhouse gas (GHG) emissions, including AB1493, which requires the state to develop and implement greenhouse gas limits for vehicles, and SB32, which requires the state to establish a statewide GHG emissions cap for 2020. Guidance on this subject also comes from international and federal legislation, regional initiatives, and Governor's Executive Order S-3-05. The impacts of the TMDL on GHG emissions clearly should be evaluated, and based to the fullest extent on scientific and factual data (CEQA Guidelines §15064(b)).

The likelihood that a project of this scale would produce a significant quantity of GHG emissions is sufficient to trigger analysis by the Regional Board. Our analysis of just one GHG, CO_2, has shown that emissions from dredging and disposal operations could contribute significantly to GHG emissions and global climate change. More in-depth analysis would consider emissions from extraction and transportation of clean fill to the dredged area, transportation of contaminated sediments to the upland, and mitigation activities. Additionally, impacts to the Project from global climate change (GCC) also need to be analyzed, such as the ramifications of a rise in sea level.

To assist CEQA authors, several alternative approaches to analyze GHG emissions and GCC in CEQA documents have been developed by the California Association of Environmental Professionals (Hendrix and Wilson 2007). The Qualitative Analysis without Significance Determination would have provided the minimum level of analysis of the impacts of Plan implementation as well as any impact GCC may have once implementation is complete. The Plan provides no such discussion.

Additionally, for a project of this magnitude, a quantitative analysis should be considered. We evaluated GHG emissions based on carbon dioxide (CO_2) equivalence for marine emissions, as well as direct emissions of methane (CH_4) and CO_2 from trucks based on the EMFAC 2007 model. Tables 6a and 6b above shows the CO_2 equivalent emissions from dredging as 59,604 tons/year, and 59,598 tons/year using electric dredges. These numbers do include the contribution to GHGs of electricity generation based on 2,300 hp main engines on the dredges converted to a 1,716 kW energy requirement.

Table 7 shows modeled GHG emissions for trucks associated with hauling dredged material to landfills as described in Section 2.2.

Based on the data, it is clear that a quantitative analysis of the impact of the TMDL on global warming is warranted when considering the necessary massive-scale dredging operations.

3.3 Benthic Communities Impacts

Typically, the PCB concentration and body burden within the benthic community of San Francisco By is correlated with sediment PCB levels in the upper-most layers, i.e., the top 15 centimeters in which benthic fauna are feeding and burrowing. As a result of dredging residuals, dredging of PCB-containing sediments would be expected to at least temporarily reverse the trend, documented in the Plan, of recent improvement of tissue PCB levels in bivalves.

Table 7
GHG Emissions Associated with Dredging Operations

Mode	Pollutant	Idling Emissions (g/idle-hr)	Traveling Emissions (g/mile)	Idling Emissions (g/yr)	Traveling Emissions (g/yr)	Total (Idling + Travel) Emissions (g/yr)	Total Emissions (lb/yr)	Pollutant
Running Exhaust	ROG	13.593	1.002	54372	320640	375012	829	ROG
Running Exhaust	CO	52	5	208768	1655040	1863808	4148	CO
Running Exhaust	NOx	107	16	427716	5196800	5624516	12402	NOx
Running Exhaust	CO2	6542	1924	26166184	615743680	641909864	1415187	CO2
Running Exhaust	SO2	0	0	248	5760	6008	13	SO2
Running Exhaust	PM10	2	1	8416	191360	199776	486	PM10
Running Exhaust - Tire Wear	PM10	0	0	0	11520	11520		
Running Exhaust - Break Wear	PM10	0	0	0	8960	8960		
Running Exhaust	CH4	1	0	2524	15040	17564	40	CH4
Running Exhaust	PM2.5	2	1	7744	176320	184064	421	PM2.5
Running Exhaust - Tire Wear	PM2.5	0	0	0	2880	2880		
Running Exhaust - Break Wear	PM2.5	0	0	0	3840	3840		
			(g/trip)					
Starting Emissions	ROG		0		1184	1184		
Starting Emissions	CO		2		17648	17648		
Starting Emissions	NOx		0		1208	1208		
Starting Emissions	CO2		2		18936	18936		
Starting Emissions	SO2		0		0	0		
Starting Emissions	PM10		0		0	0		
Starting Emissions	CH4		0		800	800		
Starting Emissions	PM2.5		0		0	0		
Assumptions:								
Truck Trips per year (one-way)	8000							
Miles Traveled (one way) per trip	40							
Average Temperature (F):	60							
Average Humidity (%):	0.5							
Idling Time per Trip (hr):	0.5							

The Plan outlines a variety of habitats generally present in the Bay, but does not specifically quantify the quality of existing habitat that could be impacted by dredging (rather relying on the assumption that PCB remediation would improve habitat). In fact, recolonization of benthic communities following dredging is dependent on a number of factors. Based on data presented by Iadanza (2002), the time to sustained function for epibenthic invertebrates, i.e., species that might be recreationally or commercially important, or provide a significant biomass of food for higher trophic levels, is approximately 4 years. Dredging of PCBs in San Leandro Bay may have the potential to degrade the benthic community due to residuals and/or physical habitat alterations, as well as eliminate an important food biomass for higher trophic levels for a period of up to 4 years. Capping would be expected to smother existing benthic infauna, and over time result in a substitution of communities towards species typical of the capping substrate. Thus, the Regional Board's Plan did not properly consider the impact of dredging on bivalve tissue PCB levels, or implications for current improving trends that may in fact be locally disrupted by dredging.

3.4 Biological Resources

Habitat loss is a significant environmental issue in San Francisco Bay. The Regional Board's Plan concludes that there would be no significant impact to biological resources, including threatened and endangered species, after consideration of standard mitigation measures and expected consultations. The Plan correctly states that federal, state, and local laws and regulations are written to protect and conserve sensitive biological resources. These laws directly influence the feasibility of Project implementation, and compliance requires a more thorough analysis of the potential impacts than the Plan acknowledges. A list of the relevant laws and regulations is shown below.

- Endangered Species Act of 1973, 16 U.S.C. 1531, *et seq.*
- California Endangered Species Act, California Fish and Game Code §§ 2050 to 2097
- Magnuson-Stevens Fishery Conservation and Management Act, Public Law 94-265, as amended through October 11, 1996, Public Law 104-267
- Migratory Bird Treaty Act, 16 U.S.C. 703-712
- Marine Protection, Research, and Sanctuaries Act, 33 U.S.C. 144-1445
- Fish and Wildlife Coordination Act, 16 U.S.C. 661, *et seq.*

The Plan does not factor the magnitude of the project as described, and the likely project-specific mitigations which would reduce further the feasibility of massive-scale dredging of PCBs.

3.4.1 Regional Regulatory Processes

Agencies with responsibility to evaluate and manage dredging activities in San Francisco Bay are listed below. Each of these agencies, while working in concert for dredge material management, has specific BMPs and mitigation requirements that must be met to receive a permit to dredge.

- U.S. Environmental Protection Agency (USEPA)
- U.S. Army Corps of Engineers (USACE)
- San Francisco Regional Water Quality Control Board (Regional Board)
- Bay Conservation and Development Commission (BCDC)
- State Lands Commission (SLC)
- U.S. Fish and Wildlife Service (USFWS)
- National Marine Fisheries Service (NMFS)
- California Department of Fish and Game (CDFG)

The Plan presents a cursory overview of the permitting and environmental review processes. The Plan assumed "that all reasonably foreseeable potential environmental impacts will be mitigated to less-than-significant levels either through the Water Board's regulatory and permitting authorities or under those of other agencies with jurisdiction in relevant areas." To fully analyze the Plan and Project impacts, a comprehensive analysis of existing resources, timing restrictions, BMPs, and mitigation requirements would be needed. Additionally, the Plan depends on the actions of other agencies to ensure that negotiated environmental protection measures are adequate for Project impacts, and does not acknowledge that by following the requirements of other agencies, significant impacts to biological resources may result.

3.4.1.1 Protected Species

While the Plan identifies "sensitive anadromous fish species such as sturgeon and coho salmon" and "waterfowl and other wildlife" and their habitats as species that could be affected by the Project, the Plan does not acknowledge the entire list of state- and federally-listed species that would be affected. Given the magnitude of disturbance from Project activities and the diversity of sensitive species and habitats, a more analysis is warranted. While the Plan references established policies that regulate the impacts and mitigation to protected species, the actions of other agencies cannot be a substitute for the Water Board's analysis of Project impacts.

The list of protected species and habitat found in the San Francisco Bay (as defined in the Plan) is provided in Table 8 below.

Table 8
Special Status Species Potentially Occurring in San Francisco Bay

Common Name	Legal or Conservation Status
Mammals	
Salt marsh harvest mouse *Reithrodontomys raviventris)*	FE/SE
Salt marsh wandering shrew *(Sorex vagrans halicoetes)*	FSC/CSC
Southern sea otter (*Enhydra lutris nereis*)	FE/SE
Suisun ornate shrew *(Sorex ornatus sinuosus)*	FSC/CSC
Harbor seal (*Phoca vitulina richardi*)	MMPA
Birds	
Alameda song sparrow *(Melospiza melodia pusilla)*	FSC/CSC
California black rail *Laterallus jamaicensis coturniculus)*	FSC/SE
California clapper rail *(Rallus longirostris obsoletus)*	FE/SE
California least tern *(Sterna antillarum browni)*	FE/SE
California brown pelican *(Pelecanus occidentalis californicus)*	FE/SE
Salt marsh common yellowthroat *(Geothylpis trichas sinuosa)*	FSC/CSC
San Pablo song sparrow *(Melospiza melodia samuelis)*	FSC/CSC
Suisun song sparrow *(Melospiza melodia maxillaris)*	FSC/CSC
Western snowy plover *(Charadrius alexandrinus nivosus)*	FT/CSC
Reptiles and Amphibians	
California red-legged frog *(Rana aurora draytoni)*	FT/ CSC
San Francisco garter snake *(Thamnophis sirtalis tetrataenia)*	FE/SE
Northwestern pond turtle *(Clemmys marmorata marmorata)*	FSC/CSC

Table 8
Special Status Species Potentially Occurring in San Francisco Bay

Common Name	Legal or Conservation Status
Fish	
Coho salmon *(Oncorhynchus kisutch)*	FT/
Delta smelt *(Hypomesus transpacificus)*	FT/ST
Green sturgeon *(Acipenser medirostris)*	FPT/CSC
Longfin smelt *(Spirinchus thaleichthys)*	FSC/ CSC
Pacific lamprey *(Lampetra tridentata)*	FSC/
River lamprey *(Lampetra ayresi)*	FSC/
Sacramento splittail (*Pogonichthys macrolepidotus)*	FT/CSC
Steelhead trout (coastal central populations) *(Oncorhynchus mykiss)*	FT/
Tidewater goby (*Eucyclogobius newberryi*)	FE/CSC
Spring-run chinook salmon *(Oncorhynchus tshawytscha)*	FT/ST
Fall/late fall-run chinook salmon *(Oncorhynchus tshawytscha)*	FSC/
Winter-run chinook salmon *(Oncorhynchus tshawytscha)*	FE/SE
Invertebrates	
Tiger beetles (*Cicendela senilis senilis*), (*C. oregona*), (*C. haemmoragica*)	FSC/--
Plants	
Alkali milk-vetch *(Astragalus tener* var. *tener)*	FSC/CSC/1B
Brittlescale *(Atriplex depressa)*	FSC/CSC/1B
California seablite *(Suaeda californica)*	FE/SE/1B
Contra Costa goldfields *(Lasthenia conjugens)*	FE/CSC/1B
Delta tule-pea *(Lathyrus jepsonii* var. *jepsonii)*	FSC/CSC/1B
Hispid bird's-beak *(Cordylanthus mollis* ssp. *hispidus)*	FSC/CSC/1B
Marin knotweed *(Polygonum marinense)*	FSC/CSC/3
Mason's lilaeopsis *(Lilaeopsis masonii)*	FSC/SR
Northern salt marsh (Point Reyes) bird's-beak (*Cordylanthus maritimus ssp. palustris*)	FSC/CSC/1B
Soft bird's beak *(Cordylanthus mollis* ssp. *mollis)*	FE/CSC/1B
Suisun Marsh aster *(Aster lentus)*	FSC/CSC/1B
Suisun thistle (*Cirsium hydrophilum* var. *hydrophilum)*	FE/CSC/1B
Valley spearscale, San Joaquin Saltbush *(Atriplex joaquiniana)*	FSC/CSC/1B

Notes:
FE = Federally-listed Endangered; FT = Federally-listed Threatened; FD = De-listed under the Federal Endangered Species Act
FPE = Proposed for Federal listing as Endangered; FPT = Proposed for Federal listing as Threatened
FSC = Federal Species of Concern
SE = State-listed Endangered; ST = State-listed Threatened; SR = State-listed Rare
CSC = California Species of Special Concern
MMPA = Marine Mammal Protection Act (Federal)
CNDDB = California Natural Diversity Database (1A = Plants Presumed Extinct in California; 1B = Plants Rare, Threatened, or Endangered in California and Elsewhere; 3 = Plants about Which There is Not Enough Information)

Impacts to habitat also must be analyzed for the Project. The Magnuson-Stevens Fishery Conservation and Management Act and the 1996 Sustainable Fisheries Act require an evaluation of the impacts to Essential Fish Habitat (EFH) from dredging and disposal activities. Consultation with NMFS on the impacts to EFH that supports aquatic species in San Francisco Bay would need to occur prior to the Project, which could affect implementation timeline and mitigation requirements. Table 9 lists the species for which essential fish habitat has been identified by the NMFS.

Table 9
Species Relevant to Essential Fish Habitat Protection

Coastal Pelagic Species	
Arrowtooth Flounder	(*Atheresthes stomias*
Butter Sole	(*Isopsetta isolepis*)
Curlfin Sole	(*Pleuronichthys decurrens*)
Dover Sole	(*Microstomus pacificus*)
English Sole	(*Parophrys vetulus*)
Flathead Sole	(*Hippoglossoides elassodon*)
Pacific Sanddab	(*Citharichthys sordidus*)
Petrale Sole	(*Eopsetta jordani)*
Rex Sole	(*Glyptocephalus zachirus)*
Rock Sole	(*Lepidopsetta bilineata and L. polyxystra*)
Sand Sole	(*Psettichthys melanostictus*)
Starry Flounder	(*Platichthys stellatus*)
Rockfishes	
Aurora Rockfish	(*Sebastes aurora*)
Bank Rockfish	(*Sebastes rufus*)
Black Rockfish	(*Sebastes melanops*)
Black-and-Yellow Rockfish	(*Sebastes chrysomelas*)
Blackgill Rockfish	(*Sebastes melanostomus*)
Blue Rockfish	(*Sebastes mystinus*)
Bocaccio	(*Sebastes paucispinis*)

Table 9
Species Relevant to Essential Fish Habitat Protection

Coastal Pelagic Species	
Bronzespotted Rockfish	(*Sebastes gilli*)
Brown Rockfish	(*Sebastes auriculatus*)
Calico Rockfish	(*Sebastes dalli*)
California Scorpionfish	(*Scorpaena guttata*)
Canary Rockfish	(*Sebastes pinniger*)
Chilipepper	(*Sebastes goodei*)
China Rockfish	(*Sebastes nebulosus*)
Copper Rockfish	(*Sebastes caurinus*)
Cowcod	(*Sebastes levis*)
Darkblotched Rockfish	(*Sebastes crameri*)
Dusky Rockfish	(*Sebastes variabilis*)
Dark Rockfish	(S. *ciliatus*)
Flag Rockfish	(*Sebastes rubrivinctus*)
Gopher Rockfish	(*Sebastes camatus*)
Grass Rockfish	(*Sebastes rastrelliger*)
Greenblotched Rockfish	(*Sebastes rosenblatti*)
Greenspotted Rockfish	(*Sebastes chlorostictus*)
Greenstriped Rockfish	(*Sebastes elongatus*)
Harlequin Rockfish	(*Sebastes variegatus*)
Honeycomb Rockfish	(*Sebastes umbrosus*)
Kelp Rockfish	(*Sebastes atrovirens*)
Longspine Thornyhead	(*Sebastolobus altivelis*)
Mexican Rockfish	(*Sebastes macdonaldi*)
Olive Rockfish	(*Sebastes serranoides*)
Pacific Ocean Perch	(*Sebastes alutus*)
Pink Rockfish	(*Sebastes eos*)
Quillback Rockfish	(*Sebastes maliger*)
Redbanded Rockfish	(*Sebastes babcocki*)
Redstripe Rockfish	(*Sebastes proriger*)
Rosethorn Rockfish	(*Sebastes helvomaculatus*)
Rosy Rockfish	(*Sebastes rosaceus*)
Rougheye Rockfish	(*Sebastes aleutianus*)
Sharpchin Rockfish	(*Sebastes zacentrus*)
Shortbelly Rockfish	(*Sebastes jordani*)
Shortraker Rockfish	(*Sebastes borealis*)
Shortspine Thornyhead	(*Sebastolobus alascanus*)
Silvergray Rockfish	(*Sebastes brevispinis*)
Speckled Rockfish	(*Sebastes ovalis*)
Splitnose Rockfish	(*Sebastes diploproa*)
Squarespot Rockfish	(*Sebastes hopkinsi*)
Starry Rockfish	(*Sebastes constellatus*)
Stripetail Rockfish	(*Sebastes saxicola*)
Tiger Rockfish	(*Sebastes nigrocinctus*)

Table 9
Species Relevant to Essential Fish Habitat Protection

Coastal Pelagic Species	
Treefish	(*Sebastes serriceps*)
Vermilion Rockfish	(*Sebastes miniatus*)
Widow Rockfish	(*Sebastes entomelas*)
Yelloweye Rockfish	(*Sebastes ruberrimus*)
Yellowmouth Rockfish	(*Sebastes reedi*)
Yellowtail Rockfish	(*Sebastes flavidus*)
Roundfish	
Lingcod	(*Ophiodon elongatus*)
Cabezon	(*Scorpaenichthys marmoratus*)
Kelp Greenling	(*Hexagrammos decagrammus*)
Pacific Cod	(*Gadus macrocephalus*)
Pacific Hake (Pacific Whiting)	(*Merluccius productus*)
Pacific flatnose (finescale codling)	(*Antimora microlepis*)
Pacific Grenadier	(*Coryphaenoides acrolepis*)
Sharks, Skates, and Chimaeras	
Leopard Shark	(*Triakis semifasciata*)
Soupfin Shark	(*Galeorhinus galeus*)
Spiny Dogfish	(*Squalus acanthias*)
Big Skate	(*Raja binoculata*)
California Skate	(*Raja inornata*)
Longnose Skate	(*Raja rhina*)
Spotted Ratfish	(*Hydrolagus colliei*)

An example of the relevance of EFH consultation to the Plan is a specific BMP prescribed for the protection of coastal pelagic species developed by the Pacific Fisheries Management Council in 1998 for dredging and disposal: "cumulative impacts of past and current dredging operations on EFH should be considered and described by federal, state, and local resource management and permitting agencies and considered in the permitting process." The CEQA Checklist did not address the cumulative impacts on EFH.

3.4.1.2 Work Windows as Mitigation

Work windows are imposed to limit dredging and placement activities for the protection of threatened and endangered species during various life stages (migration, breeding, etc.). In San Francisco Bay, if dredging or disposal occurs outside the established work windows, consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (collectively the Services) must occur. If the Services determine that the Project activities would likely result in harm or take of any listed species (such as working outside the work windows), implementation would be delayed unless the consulting parties can agree on alternatives to eliminate jeopardy. Consultation with the Services would need to occur prior to dredging and disposal projects, which could affect implementation timeline and mitigation requirements. These potential impacts on the Project were not identified in the Plan.

Table 10 shows the restricted work period, dredge types, and the rationale for imposing the timing restrictions for federally-listed species.

Table 10
Restricted Work Periods in San Francisco Bay
for the Protection of Threatened and Endangered Species

Species	Restricted Work Period	Dredge Types	Rationale
California Clapper Rail	1/1 – 12/31 (all year)	All types; disposal activities	Avoid degradation of eelgrass beds (least tern foraging habitat); destruction of breeding and nesting habitat (clapper rail); degradation of mudflats (snowy plover foraging habitat).
California Least Tern	1/1 – 12/31 (all year)	All types; disposal activities	Avoid degradation of eelgrass beds (least tern foraging habitat); destruction of breeding and nesting habitat (clapper rail); degradation of mudflats (snowy plover foraging habitat).
Delta Smelt	1/1 – 12/31 (all year)	All types; disposal activities	Avoid entrainment, degradation of spawning habitat, direct habitat loss.
Eelgrass	1/1 – 12/31 (all year)	All types; disposal activities	Avoid impacts associated with turbidity, sedimentation, burial and physical removal of plants; restricted period varies.
Sacramento Splittail	1/1 – 12/31 (all year)	All types; disposal activities	Avoid entrainment, degradation of spawning habitat, direct habitat loss.
Salt Marsh Harvest Mouse	1/1 – 12/31 (all year)	All types; disposal activities	Avoid loss of salt marsh habitat and adjacent refugial cover.
Western Snowy Plover	1/1 – 12/31 (all year)	All types; disposal activities	Avoid degradation of eelgrass beds (least tern foraging habitat); destruction of breeding and nesting habitat (clapper rail); degradation of mudflats (snowy plover foraging habitat).
Longfin Smelt	1/1 – 12/31 (all year)	All types; disposal activities	Avoid entrainment; avoid entrainment of juvenile longfin smelt (San Pablo Bay).
Dungeness Crab	5/1 – 6/30	All types	Entrainment of early juvenile stages.
Coho Salmon	9/30 – 6/1	All types	Avoid disturbance of migrating adults and smolts (specific projects unknown).
Pacific Herring	11/1 – 3/1	All types	Avoid disturbance to spawning, fishing, and roe collecting industries (North Coast).
Steelhead	12/1 – 5/31	All types	Avoid disturbance of migrating adults and smolts (specific projects unknown).
Chinook Salmon	12/1 – 5/31	All types; disposal activities	Avoid interference with migration, degradation of water quality, direct habitat loss or degradation, interference with foraging or food resources, entrainment (juveniles).
Pacific Herring	12/1 – 2/28	All types	Avoid entrainment and interference with spawning activities and habitat.

The Plan acknowledges that existing timing restrictions must be complied with to mitigate the impacts to biological resources to below the significance level, although it does not identify the work windows. The typical dredging window in the San Francisco Bay is generally open for four months, September through December (with consultation on the species that have year-round restrictions, including negotiations on mitigation measures). It is reasonable to assume that the Project however, cannot proceed strictly within the dredging window; at only four months per year the time required to complete the dredging would triple the likely dredge durations described in Section 2. Given the magnitude and duration of dredging year-round, it is probable that the Project would result in significant impacts to protected species and/or their habitat. Analysis of the impacts of dredging outside of the work windows and the resultant impacts that cannot be mitigated to below significance was not included in the Plan.

3.5 Other Impacts not Analyzed by the Plan

The Plan did not identify potential on land impacts from dredging activities. Examples of these impacts include those associated with (1) construction of a new landfill once the existing landfills have reached capacity; (2) impacts associated with mining/extracting clean fill material; (3) land that must be used to temporarily store dredged material for dewatering or other purposes; and (4) air and transportation impacts from transporting fill and dredged material.

The Plan identified in-Bay impacts as (1) disturbance of near-shore tidal wetlands; and (2) short-term habitat disturbances such as vegetation removal, noise, presence of humans. By identifying only these two impacts to the Bay, the Plan does not demonstrate an understanding of the dredging process, the direct and indirect impacts to the aquatic environment from dredging activities, impacts associated with dewatering dredged material in the nearshore, impacts associated with compensating for habitat loss and modification, and resuspension of other contaminants in the Bay. Given that the dredging likely will occur outside the restricted windows, and the duration of dredging may be decades, these impacts should have been identified and analyzed in the CEQA document.

Potential significant impacts to biological resources that have not been adequately addressed include (*see* Ecosystems Services Group 2004):

- **Habitat conversion.** Based on past dredging and cleanup projects within the Bay, BCDC, Regional Board, USACE, NOAA Fisheries, and USFWS each have required habitat removal and/or conversion to be mitigated by either re-establishing the original habitat elevations (i.e., backfilling) and species composition or providing habitat elsewhere (dredging would constitute removal and capping would constitute conversion). The Plan did not examine the impacts associated with locating, extracting, and placing suitable clean material to mitigate for the habitat loss that would occur with virtually all dredging, including potential impacts to listed bird and terrestrial species.
- **Loss of benthic communities.** Loss of benthic communities is discussed in Section 3.3 above. Replacing benthic communities could potentially be a long process (long-term impact) depending on many factors, including the availability of individuals for recruitment. The sheer volume of dredging likely would reduce recruitment and subsequent recolonization of the benthic community from neighboring areas due to the massive-scale removal of organisms. This impact may be a significant, indirect impact on the prey-predator relationship established in the Bay.
- **Change of species composition.** Short-term impacts of habitat modification include local changes in species abundance or community diversity during or immediately after dredging. Long-term impacts could include permanent species abundance or community diversity changes caused by changes in hydrodynamics or sediment type. Indirect effects to species composition include population changes in one species that are caused by the effect of dredging on its predators, prey, or competitors.
- **Turbidity.** Turbidity-induced impacts to habitat from year-round dredging, even if isolated to the immediate project area, could result in significant impacts to the survival of the larval or juvenile stages of sensitive fish species, as well as the feeding and migration of adults. Excess turbidity could result in a reduction of the survival of herring eggs (which are attached to hard surfaces on Central Bay shorelines) and potentially result in reduced recruitment and, ultimately, reduced abundance of this important resource species in the Bay. Suspended sediments can have other impacts, including abrasion of the body and clogging of the gills.

- **Resuspension of contaminants.** Where dredging occurs in relatively polluted areas, contaminants in the sediments are likely to be dispersed into the water column, resulting in localized, temporary increases in contaminant concentrations that may affect fish and invertebrates.
- **Impacts to non-aquatic species.** Short-term impacts on critical foraging areas from turbidity or direct loss, such as eelgrass beds, during the nesting season of marine birds such as the endangered California least tern, can affect the birds' nesting success. Dredging in the Central Bay during summer can affect juvenile Dungeness crabs, for which the Central Bay provides an important nursery habitat.

4 CONCLUSIONS AND RECOMMENDATIONS

The analyses outlined above have identified a number of deficiencies in the Regional Board's Plan as presented. The principal issue arises from the relatively large amount of sediment dredging required under the Plan, necessitating an unprecedented dredging operation. This massive-scale dredging operation would produce a number of significant effects, including:

- Consumption of available regional landfill space
- Elimination of some beneficial reuse opportunities
- Limited effectiveness of dredging due to residuals
- Significant impacts to threatened and endangered species, and their habitat
- Significant impacts to air quality, including cumulative impacts and global climate change
- Significant issues related to dredging residuals and benthic communities
- Interruption of ongoing observed natural recovery

In light of these impacts, the Plan's stated evidence that natural recovery is occurring, and the fact that PCBs have been banned for 25 years, a number of alternatives to dredging should be considered. Alternatives that should be considered include, but are not limited to, equal reduction of PCBs across all sources, lowest-cost allocation of PCB Loads, and monitored natural attenuation with institutional controls. Below we supply further information on natural attenuation with institutional controls.

4.1 Monitored Natural Attenuation with Institutional Controls

Data presented in the Regional Board's Plan demonstrates that PCB concentrations in bivalves and surface sediments are steadily recovering over time. The California Chamber of Commerce, in a letter to the Regional Board (California Chamber of Commerce 2004), cites expert testimony that concludes that sediments in San Francisco Bay are recovering, and there does not appear to be a slow-down in recovery. Coupled with the mussel-watch program data presented in the Plan, it is reasonable to conclude that ongoing natural recovery is a viable alternative, given that PCB source reductions continue to improve as a result of natural processes (PCBs were banned from further use in the 1970s). Due to uncertainty with the efficacy of dredging for PCB cleanup, especially given the extremely low sediment target, and the potential for site recontamination or interruptions in recovery of benthic communities due to residuals, continued natural recovery support by temporary institutional controls must be considered as an alternative to the Plan. Continuing efforts to manage external loads, coupled with ongoing natural recovery, has the potential to reduce long-term PCB loads without the cost or risk of extensive clean-up operations.

5 REFERENCES

California Chamber of Commerce. February 20, 2004. "Comments on the RWQCB's January Report on a TMDL for PCBs in San Francisco Bay." Letter to RWQCB.

California Coastal Conservancy. 2007. Hamilton Wetland Restoration Plan, File No. 94-003. March 8, 2007.

California Executive Order S-17-06. September 2006.

DMMO (Dredged Material Management Office). 2006. Long Term Management Strategy (LTMS) Six Year Program Review. May 2006.

Ecosystems Services Group. 2004. Framework for Assessment of Potential Effects of Dredging on Sensitive Fish Species in San Francisco Bay, Final Report (001-09170-00), August 5, 2004, Prepared for U.S. Army Corps of Engineers San Francisco District, San Francisco, California

Hendrix, M. Cori Wilson. 2007. Alternative Approaches to Analyzing Greenhouse Gas Emissions and Global Climate Change in CEQA Document. Prepared for the Association of Environmental Professionals by Michael Brandman Associates. June 29, 2007.

Iadanza, N. 2002. Time to Full Habitat Function. In: Hylebos Waterway Natural Resource Damage Settlement Proposal Report (Public Review Draft dated March 14, 2002). Prepared by Commencement Bay Natural Resource Trustees, NOAA.

Kenneth D. Jenkins. 2002. Letter to Latham and Watkins "Observations of BPTCP Relative Benthic Index Data."

Long Term Management Strategy for Dredged Material in the Delta. February 2007.

National Academy of Sciences. 2007. Sediment Dredging at Superfund Megasites: Assessing the Effectiveness. National Academies Press.

Patmont, C. and Palermo, M. 2007. Case Studies of Environmental Dredging Residuals and Management Implications. Presented In: Proceedings of the Fourth International Conference on Remediation of Contaminated Sediments (Savannah, Georgia; January 2007). ISBN 978-1-57477-159-6, published by Battelle Press, Columbus, OH, www.battelle.org/bookstore.

PFMC (Pacific Fisheries Management Council). 1988. Essential Fish Habitat Coastal Pelagic Species (Modified from: Coastal Pelagics Species Fishery Management Plan [Amendment 8 to the Northern Anchovy Fishery Management Plan], Portland, OR.

Regional Board (San Francisco Regional Water Quality Control Board). 2000. Draft Staff Report Beneficial Reuse of Dredged Materials: Sediment Screening and Testing Guidelines. Prepared May 2000.

USEPA (U.S. Environmental Protection Agency). 2005. Contaminated Sediment Remediation Guidance for Hazardous Waste Sites. December 2005. http://www.epa.gov/superfund/resources/sediment.

USEPA. 2007. Record of Decision Amendment, Operable Unit 2 (Deposit DD), Operable Unit 3, Operable Unit 4, and Operable Unit 5 (River Mouth), Lower Fox River and Green Bay Superfund Site. June 2007. http://dnr.wi.gov/org/water/wm/foxriver/documents/Complete_ROD_Package_062807-signatures.pdf.

Comments on California Regional Water Quality Control Board's Total Maximum Daily Load for PCBs in San Francisco Bay Proposed Basin Plan Amendment and Staff Report, June 22, 2007

Submitted by:
Dr. David Sunding
Berkeley Economic Consulting, Inc.
2550 Ninth Street, Suite 102
Berkeley, CA 94720

Date: August 20, 2007

I appreciate the opportunity to submit this comment to the California Regional Water Quality Control Board, San Francisco Bay Region, in response to the Board's issuance of a Proposed Basin Plan Amendment and Total Maximum Daily Load for PCBs in San Francisco Bay. I am submitting these comments on behalf of General Electric Company and the California Chamber of Commerce.

My background and qualifications are listed on the curriculum vitae attached as an exhibit to this comment. I am a principal of Berkeley Economic Consulting, Inc., an economics research firm specializing in energy, labor, environmental and natural resource economics. I am also a professor of environmental and natural resource economics at UC Berkeley, and the Co-Director of the Berkeley Water Center. From 1996 to 1997, I served as senior economist at President Clinton's Council of Economic Advisers, where I had responsibility for environmental, agricultural, natural resource and energy policy.

1. Summary of Comments

The following summarizes my comments contained in this letter:

- The staff of the Regional Board has not met its burden under Porter-Cologne to consider economics in the development of the TMDL. The plan for implementing the proposed regulation is not described in enough detail to permit an adequate calculation of costs. The report makes no mention of who will bear the costs of complying with the regulation (for example, public or private entities), or of the potential regional economic implications of the action. The report does not acknowledge the potential employment impacts of the proposed TMDL, or the effect of the cleanup plan on competitiveness of California businesses. It does not attempt to gauge the significance of the action and does not discuss costs in relation to the level of benefits likely to be achieved. There is no mention of discounting, let alone any actual attempt to control for the fact that positive and negative impacts will occur over a period lasting perhaps decades into the future. All of these errors and omissions place the Staff Report analysis outside the bounds of standard economic analysis, and should be remedied.

- The costs of the proposed regulation are not adequately described in the staff report. Available information demonstrates that the assertions of the Staff Report regarding the costs of compliance are misleading. For example, the report does not accurately reflect dredging costs at other locations in the Bay and nationwide. The report also mischaracterizes the actual costs of impounding and treating stormwater to the levels required by the TMDL. Using more accurate information, the costs of the TMDL could reach into the hundreds of millions or billions of dollars.

- The Regional Board staff erred in its description of the benefits of the proposed TMDL. The proposed screening levels are based on a flawed survey of recreational anglers, and the survey results were misapplied to the problem at hand. Controlling for actual exposure to PCBs in fish tissue, and recognizing that the proposed TMDL is designed to benefit only a small group of people engaging in an extreme behavior, I conclude that the action does not significantly reduce human health risk, and therefore does not result in significant benefits. This circumstance is in violation of the State requirement that major regulations are subject to a demonstration of economic value.

- The proposed action is likely to result in an unacceptably high level of costs in relation to the actual benefits achieved. The staff report fails to demonstrate that the Regional Board considered alternatives to the proposed TMDL that would be less burdensome, or that it considered the relative cost effectiveness of alternative standards. This is inconsistent with basic principles of economic analysis of regulation, and in contradiction to established federal guidelines promulgated by the US Environmental Protection Agency and the Office of Management and Budget. It is also inconsistent with the stated objectives of the proposed action listed in the staff report.

- The high costs of the proposed TMDL, coupled with its insubstantial benefits, means that the regulation will result in a net increase in human health risk. Regulatory costs pose their own risks to human health as money is diverted away from actions that reduce health risk and improve wellbeing. Recent research in environmental economics shows that regulations with a cost in excess of around $21 million per life saved pose more health risk than the harms they are intended to address. The proposed TMDL fails this test and will thus do more harm than good. There are also direct health risks posed by the measures to implement the TMDL. For example, contaminated sediment will need to be trucked to landfills around the Bay Area, and dredging equipment will need to operate for a period of years. These machines emit particulate matter and other pollutants that pose their own health risks. The Staff Report does not adequately address such direct health risks in its benefits analysis, or net them out of the claimed improvements in human health resulting from the regulation. Finally, the proposed TMDL also poses risks to the environment that should be considered. Numerous wetland restoration projects at the Bay margins may be jeopardized by the Regional Board's labeling of large swaths of the Bay as contaminated zones.

2. Failure to Consider Economics

Under the Porter-Cologne Water Quality Control Act, the State Water Resources Control Board has the ultimate authority over State water rights and water quality policy. Porter-Cologne also establishes that the nine Regional Water Quality Control Boards shall oversee water quality on a day-to-day basis at the local and regional level. The Regional Boards engage in a number of water quality functions in their respective regions. One of the most important is preparing and periodically updating Basin Plans. Each Basin Plan establishes beneficial uses of water designated for each water body to be protected; water quality objectives for both surface water and groundwater; and actions necessary to maintain these standards in order to control nonpoint and point sources of pollution to the State's waters.

Porter-Cologne requires that when determining water quality targets the Regional Boards shall consider the following factors: "the beneficial uses to be protected, the water quality objectives reasonably required for that purpose, other waste discharges, the need to prevent nuisance, and the provisions of Section 13241." Section 13241 in turn lists six "factors to be considered," including "economic considerations" and "water quality conditions that could reasonably be achieved through the coordinated control of all factors which affect water quality in the area."

CEQA also requires the Regional Boards to consider costs when establishing a performance standard. Discussing the application of CEQA to TMDLs, the State Board has acknowledged that "numeric targets and load allocations would probably fall into the category of performance standards." Thus, CEQA requires that the Regional Board should detail the likely methods and costs of compliance with the proposed TMDL.

2.A. Economic Assessment of Environmental Regulations

Over last 200 years, economists have developed a rigorous methodology to assess the impacts of government actions. The approach derives from the basic principles of public finance and welfare economics. It takes a holistic perspective by considering many groups in society, and articulates the tradeoffs among policy alternatives. The economist's approach to assessing government actions also combines considerations of efficiency and equity, and has been widely applied to problems of environmental regulation. At its heart, economic analysis of regulation is an accounting of the consequences of a governmental action. This accounting is often quantitative, but many first-rate economic analyses also treat impacts qualitatively, especially for nonstandard commodities. Ideally, economic analysis will also give information on the distributional impacts of the intervention, or a description of which groups in society are affected by the action, and how much.

A requirement to "consider economics" is not the same as a directive to adopt only those regulations that pass a cost-benefit test. Agencies can use the results of economic analysis, but not be bound by "bottom-line" numbers. Most economists would not argue that quantified costs and benefits tell the whole story, or that precise measurements of either are always possible. But when economic analysis reveals low or nonexistent benefits and high costs, something seems amiss. Indeed, the California legislature sought to avoid just such a socially undesirable outcome by mandating a consideration of economics when setting water quality standards.

The federal government has maintained a decades-long commitment to economic analysis of regulation. This practice began in the Nixon Administration, which initiated Quality of Life

Reviews of federal regulations in 1970. The two main events in the history of economic analysis at the federal level, however, occurred in the Reagan and Clinton Administrations. President Reagan issued Executive Order 12,291, perhaps the most decisive step in the cost-benefit record. This Executive Order established a set of principles for agencies to follow to the extent permitted by law, including a commitment to cost-benefit analysis. The order required Regulatory Impact Analysis of major rules, and also established a formal mechanism for OMB oversight of interventions. President Clinton issued Executive Order 12,866, which reaffirmed the basic commitments to economic analysis and conferred bipartisan legitimacy. This order also introduced some reforms to the economic analysis process that were designed primarily to assuage fears of industry capture. These reforms included procedures for conflict resolution and inclusion of equity considerations.

2.B. Standards for Consideration of Economics under Porter-Cologne

While the requirement to consider economics under Porter-Cologne is absolute, the water boards have done little to particularize it. For statutes like Porter-Cologne in which economic impacts are to be "considered," there is a threshold level of assessment that should be performed.

The most basic type of economic analysis is a cost-effectiveness analysis that evaluates alternatives that are presumed to produce similar levels of benefits. This type of analysis is relatively uncontroversial in that it avoids a comparison of benefits and costs, and in particular avoids value judgments about the worth of benefits produced by regulation, although such benefit-cost comparisons are commonplace and a standard part of environmental economics. The basic steps to be followed in a cost-effectiveness analysis include the following:

- Identify a baseline,
- List the benefits to be achieved,
- Identify alternative strategies to achieve the benefits,
- Estimate costs for each alternative,
- Assess uncertainty,
- Compare the cost effectiveness of each alternative,
- Identify the most cost-effective alternative,
- Compare costs to the benefits likely to be produced.

The Staff Report shows that the Regional Board has failed to meet these requirements for a meaningful consideration of economic factors.

Starting with the first step in the list above, the Staff Report does not adequately describe the baseline. A baseline should describe the current situation without the proposed rule, in this case the proposed TMDL. This is one of the most important steps in an economic analysis, which is by nature incremental.[1] There are numerous data inconsistencies in the Staff Report, and exhibits that are poorly explained, or not explained at all. To take one example, the Staff Report contains

[1] *Guidelines for Preparing Economic Analyses*. U.S. Environmental Protection Agency, Report Number 240-R-00-003. 2000.

numerous references to "hot spots" in the Bay, or areas with high concentrations of PCBs in sediments. However, there is no definitive list of these sites in the Report. In fact, the Staff Report contains three separate tables listing hot spots, each with a different group of sites. Staff needs to do a much better job of characterizing current conditions for the economic analysis to have meaning.

The second step in an economic analysis is an identification of alternatives, regulatory and otherwise, to the proposed intervention that would achieve approximately the same level of benefits. For example, the Staff Report acknowledges that PCB levels are declining at many locations throughout the Bay as a result of physical processes. One alternative to the proposed TMDL could be a natural recovery option that would allow sedimentation, tidal action and other processes to reduce the risks from PCB exposure; this approach could be coupled with other measures to reduce risks to recreational anglers such as education and outreach. The relative costs of such an approach are not discussed even though it could be designed to produce an equivalent level of benefits.

Similarly, with respect to the wasteload allocations, the Staff Report acknowledges that abatement costs are different for the various sources of PCB loads to the Bay. However, it does not include any discussion of alternative wasteload allocations, and contains little description of why the proposed allocation was selected, despite the enormous cost falling on agencies that control and treat stormwater.

The most important step when considering economic factors is the third one above, calculation of the costs of compliance. Here too, the Regional Board staff has not demonstrated that economic factors were considered. The proposed implementation plan is so vague that its cost cannot be quantified with any certainty. With respect to control of in-Bay sources of PCBs, for example, the Staff Report contains only a single paragraph on cost, and the only figures presented in this paragraph have to do with sediment disposal costs, not any of the other costs associated with dredging. The discussion of the cost to impound and treat stormwater, which the Regional Board acknowledges is "substantial," consists solely of an inapt comparison to the total cost of collecting and treating municipal wastewater.

The Staff Report contains no information on who is likely to bear the costs of complying with the proposed TMDL. The scope of the proposed regulation means that it will affect municipalities, private industry and other entities. Most likely, some or all of these costs will be passed on to taxpayers and consumers. It is also likely that expenditures to comply with the TMDL will crowd out other programs, particularly in the public sector. The report makes no attempt to gauge the regional economic impacts of the TMDL, and does not even hint at job losses, even though such analyses are commonly performed by economists when assessing environmental regulations.[2]

In summary, the Regional Board has failed to show that it has considered economics in the drafting of this proposed TMDL, at odds with the requirements of both Porter-Cologne and CEQA.

---

[2] *Ibid.*

3. Costs of Implementing the TMDL

The vagueness of the proposed TMDL makes it impossible to accurately calculate its costs. However, a reasonable assessment of potential costs leads to the conclusion that compliance expenditures may well reach into the billions of dollars.

3.A. Sediments

The Staff Report downplays the costs of the TMDL relating to contaminated sediment. A review of the available information, for example information on actual and planned dredging projects in the San Francisco Bay, suggests that these costs will be substantial. The TMDL reports that sediment disposal costs should range from $10 to $100 per cubic yard removed, and presents no information at all on dredging costs.[3] Readily available information, however, indicates that unit costs of dredging are significantly higher. The range of costs reported for selected sites in the Bay is from $111/cy to $1014/cy.

The TMDL calls for conducting or causing to conduct monitoring and special studies to fill critical data gaps and to participate in risk management activities.[4] These studies cost hundreds of thousands of dollars.[5] There are a few studies available that have been conducted recently to meet these data gaps. The site studies available for comparison are Alameda Seaplane Lagoon (SPL), Moffett Airfield (MF), and Hunters Point Shipyard (HPS).

The general structure of each of these studies is the same. The feasibility study begins with sediment sampling to assess the extent of contamination and the risk to human health. Once this is determined the extent of contamination is translated into remediation goals and remediation action objectives. The remediation activities are then designed to target the specific areas of contamination and the contaminants of concern at the location. No site had an incidence of a single contaminant. In addition other chemicals were present which contribute to the degradation of the environment and human health. Estimated costs for the studies for SPL, HPS and MF included capital costs, engineering and contingency plans, and operations and maintenance costs.

Generally, an examination of these sites demonstrates the need for site-specific investigations to determine cleanup costs. For example, when comparing sites such as Seaplane Lagoon (SPL), Hunters Point Shipyard (HPS) and Moffett Field (MF), it is clear that dredging and capping may not be the preferred alternative for all sites. In addition, there is a wide variation in the volume of material dredged, making it difficult to estimate costs based on the skeletal information presented in the Staff Report.

The development of the remediation activities proposed in the feasibility studies prepared for SPL, HPS and MF are based on all the applicable best management practices (BMP) designed to

[3] *San Francisco Regional Water Quality Control Board Final TMDL, June 2007* (P. 100)
[4] *Ibid.*
[5] *Ibid.*

protect the environment and human health. The alternatives examined are No action, Institutional Controls and Long-Term Monitoring, Non-Removal (monitored natural recovery and containment), In Situ Treatment, In Situ Stabilization, Removal Management of Removed Sediments (dewatering and transportation), Ex Situ Treatment, and Disposal Actions. The outcome for each site could be one or a combination of each of these alternatives.

The following summary discusses the differences in remediation alternatives and dredging costs for SPL, HPS and MF.

Seaplane Lagoon
SPL underwent a thorough examination in 2005 and based on the 2007 Record of Decision (ROD) the sediment remediation alternative chosen was a combination of activities described as Dredging, Monitoring, Dewatering, and Upland Confinement. In addition the 2005 feasibility study estimated the costs of this alternative to be between $7.6 million and $8.9 million.[6] However, according to the ROD the actual costs for the remediation alternative selected were $24.6 million which is approximately 30 to 35% higher than the totals estimated in the 2005 feasibility study.[7]

Hunters Point
HPS finished the final feasibility study in 2007. The sediment remediation alternatives developed were similar to SPL but the actions suggested to best meet the desired remediation goal combined Focused Removal, Off-Site Disposal, Armored Cap, Monitored Natural Recovery, and Institutional Controls. The costs associated with this remediation alternative range from $26,880,000 to $28,970,000.[8] The final costs of this cleanup have yet to be determined as this feasibility study is currently under review.

Moffett Field
The feasibility study for MF was completed in 2005. The remediation alternatives were different than the previously discussed sites, primarily due to the area being described as a tidal marsh or wetland. The remediation activities best suited to MF are In Situ/Ex Situ Treatment, Excavation, Off-Site Disposal, Restoration, and Ecological Monitoring. The costs associated with this suite of alternatives are estimated to be $6.7 million to $6.8 million.[9]

Table 1 reports a summary for the locations listed above that included costs data from the Feasibility Studies and Records of Decision.

[6] Prepared by Battelle for Base Realignment and Closure Program Management Office West, *Final Feasibility Study Report, Seaplane Lagoon, Alameda Point, California, Appendix E,* July 22, 2005 (P. 20, 24)
[7] *Record of Decision for Site 17 Seaplane Lagoon.* U.S. Environmental Protection Agency, October 2006 (P. 12-2)
[8] Prepared by Barajas & Associates, Inc. for Base Realignment and Closure Program Management Office West, *Revised Draft Feasibility Study Report for Parcel F Hunters Point Shipyard, San Francisco, California,* May 11, 2007 (P. 5-2, 5-5)
[9] . Prepared by SulTech and Tetra Tech EM, Inc. for Base Realignment and Closure Program Management Office West, *Draft Addendum to the Revised Final Station-Wide Feasibility Study Site 25*, June 21, 2005, (P. D-8.)

Table 1: Summary of Remediation Costs for Selected Sites in the SF Bay

Site	Sediment Removed in cy	Total Cost in $ Millions	Cost per cy	Lead Agency
Oyster Point[10]	9,860	10	1,014	SFRWQCB
Sea Plane Lagoon	63,000	25	390	EPA / Navy
Moffett Air Field	47,400 - 61,500	6.5 - 8.3	111 - 146	Navy
Hunters Point Shipyard[11]	51,910 - 161,000	23.9 - 43.6	226 - 639	Navy

The Staff Report characterizes a total of 22 locations in the Bay as contaminated with PCBs.[12] Five of these contaminated sites have been classified as completed.[13] The remediation to pre-TMDL standards has been completed. However, it is not understood that these sites have been cleaned up to levels relevant to the proposed TMDL (i.e., a 10µg/kg level distinguishing "ambient" from contaminated sites. The costs presented in Table 1 likely would have been much more had cleanup to these levels been undertaken.

The following information was gathered from Feasibility Studies, publicly available documents and conversations with caseworkers at the Regional Board.

Emeryville Crescent
Environmental investigations were carried out more than 10 years ago. The site is now part of the Eastshore State Park. According to the TMDL there was at least one sample observed at some point in time with total PCB concentrations of greater than 1000µg/kg.[14] No post-remediation measurements were available to compare the effectiveness of the remediation activities.

Oyster Point
This site was completed in 2001 and significant sediment removal took place. Approximately two acres were removed at a depth of 2-3 feet with a twelve inch cap put in place for a total cost of $10 million.[15] According to the TMDL, there was at least one sample observed at some point in time with total PCB concentrations of greater than 1000µg/kg.[16] No post-remediation measurements were available to compare the effectiveness of the remediation activities.

Peyton Slough
The contaminants of concern at Peyton Slough were copper and zinc. There is no real evidence of PCB contamination at this site.[17] This site underwent extensive environmental investigation,

[10] The costs per cubic yard for Oyster Point are for all dredging and capping activities
[11] Hunters Point Shipyard are composite costs that range from the complete dredging scenario to comparative unit cost of sediment removed for other alternatives.
[12] *San Francisco Regional Water Quality Control Board Final TMDL June 2007*, (P. 71)
[13] *Ibid* (P. 55)
[14] *Ibid* (P. 36)
[15] Correspondence with Randy Lee SFRWQCB July 25, 2007
[16] *San Francisco Regional Water Quality Control Board Final TMDL June 2007* (P.36)
[17] Correspondence with Lindsay Whalin SFRWQCB July 26, 2007

and significant sediment removal was completed in November 2006.[18] The extent of sediment removed and post-remediation sample information was not available.

Redwood City Harbor
This site was dredged about 10 years ago. The sediment was not classified for in-bay disposal due to 1 composite sample with about 2ppm PCBs. Follow-up analyses could not confirm that PCB concentration. Sediment was disposed of upland and consequently paved over.[19] According to the TMDL there was at least one sample observed at some point in time with total PCB concentrations of greater than 2000μg/kg.[20] Post remediation samples were unavailable for comparison.

Hamilton Army Airbase – Coastal Salt Marsh
Limited information was available regarding this site. It was expected to be completed in 2003.[21] According to the Wetland Tracker website approximately 900 acres of former Hamilton Airfield is planned for wetland restoration.[22] No information was listed in the TMDL as to the extent of PCB contamination or remediation activities that were completed.

Richmond Harbor/Potrero Point
Point Potrero was designated for clean up due to high concentrations of PCBs and DDT.[23] According to the TMDL there was at least one sample observed at some point in time with total PCB concentrations of greater than 10,000μg/kg.[24]

Stege Marsh
Preliminary investigations have found elevated concentrations of arsenic, cadmium, copper, lead, selenium and zinc at Stege Marsh. Organic compounds detected at concentrations above San Francisco Bay ambient sediment concentration include chlordanes, dieldrin, hexachlorohexanes, DDTs and PCBs.[25] According to the TMDL there was at least one sample observed at some point in time with total PCB concentrations of greater than 1,000,000μg/kg.[26]

Mission Creek
Chromium, lead, and chlordane, mercury, copper, silver, zinc, dieldrin, PCBs, phenanthrene, and PAHs were found in Mission Creek. In addition, chlorpyrifos and mirex levels were in the top 10% of samples in the statewide BPTCP database.[27] According to the TMDL there was at least

[18] *Ibid*
[19] Correspondence with Fred Hetzel SFRWQCB July 20, 2007
[20] *San Francisco Regional Water Quality Control Board Final TMDL June 2007* (P.36)
[21] http://www.swrcb.ca.gov/cwphome/dod/docs/hamilton.pdf
[22] http://www.wetlandtracker.org/GISInfoCatalog/servlet/org.sfei.GISInfoCatalog.UserInterface?directive=viewproject&project_name=Hamilton+Airfield
[23] State Water Resource Control Board, State of California; Draft Consolidated Toxic Hot Spots Cleanup Plan August 2003 Volume II: Regional Cleanup Plans. (P. 2-77)
[24] *San Francisco Regional Water Quality Control Board Final TMDL June 2007* (P.36)
[25] State Water Resource Control Board, State of California; Draft Consolidated Toxic Hot Spots Cleanup Plan August 2003 Volume II: Regional Cleanup Plans. (P. 2-62)
[26] *San Francisco Regional Water Quality Control Board Final TMDL June 2007* (P. 36)
[27] State Water Resource Control Board, State of California; Draft Consolidated Toxic Hot Spots Cleanup Plan August 2003 Volume II: Regional Cleanup Plans. (P. 2-89-90)

one sample observed at some point in time with total PCB concentrations of greater than 200µg/kg.[28]

Islais Creek
Dieldrin, PCBs, and low molecular weight PAHs and endosulfan sulfate were found at levels of concern in Islais Creek.[29] According to the TMDL there was at least one sample observed at some point in time with total PCB concentrations of greater than 200µg/kg.[30]

San Leandro Bay
San Leandro Bay has been designated as a toxic hotspot in the *State Water Resource Control Board, State of California; Draft Consolidated Toxic Hot Spots Cleanup Plan August 2003 Volume II: Regional Cleanup Plans*. Samples from this report established ambient conditions; however, the actual extent of contamination and remediation necessary are unknown at present.[31] According to the TMDL there was at least one sample from San Leandro Bay observed at some point in time with total PCB concentrations of greater than 1,000µg/kg.[32]

The following sites had limited information available and are not summarized in this comment letter: Yosemite Slough Channel, Moffett Field/NASA Ames-Northern Channel, Cerrito Creek, Codornices Creek, Guadalupe Slough, Oakland Harbor, Richardson Bay, San Francisco Airport, Oakland Army Base, and Vallejo Ferry Terminal.

Costs of Environmental Dredging Projects in Other Areas of the Nation

There have been about 65 major sediment remediation projects throughout the United States as of 2005.[33] The remediation methods employed have consisted of dredging and wet/dry excavation. Six sites have had remediation quantities removed of greater than 200,000 cy.[34] The total volume of sediment remediated is approximately 1.2 billion cy.[35] Sites of notable significance in volume of sediment removed are summarized in Table 2.[36] Sites range from 425,000 cy to over 10 million cy. A summary of cost information for completed projects is summarized in Table 3.[37] The costs of dredging range from $174/cy to $1635/cy.

---

[28] *San Francisco Regional Water Quality Control Board Final TMDL June 2007* (P.36)
[29] State Water Resource Control Board, State of California; Draft Consolidated Toxic Hot Spots Cleanup Plan August 2003 Volume II: Regional Cleanup Plans (P. 2-102)
[30] *San Francisco Regional Water Quality Control Board Final TMDL June 2007* (P.36)
[31] State Water Resource Control Board, State of California; Draft Consolidated Toxic Hot Spots Cleanup Plan August 2003 Volume II: Regional Cleanup Plans (P. 2-11)
[32] *San Francisco Regional Water Quality Control Board Final TMDL June 2007* (P.36)
[33] Steven C. Nadeau, *A National Contaminated Sediment Update*, May 2005 http://www.smwg.org/ (P. 6)
[34] *Ibid*
[35] *Ibid* (P. 5)
[36] *Ibid* (P. 8)
[37] *Ibid* (P. 4)

Table 2: Large Site Dredging Projects

Site Name	Sediment Removal Completed or Planned
Hudson River (NY)	2.65 million cubic yards
Fox River (WI)[38]	7.1 million cubic yards
Grand Calumet (IN)	> 2 million cubic yards
Detroit River (MI)	2-4 million cubic yards
River Raisin (MI)	425,000 cubic yards

Source: Nadeau, 2005

Table 3: National Sites with Dredging Underway or Completed and Estimated Cost

National Sites	Sediment Removed in cy	Total Cost in $ millions	Cost per cy ($)
New Bedford Harbor, MI	14,000	20.1	1,435
Sheboygan River, WI	3,800	2.6 (w/o disposal)	700 (w/o disposal)
Ruck Pond/Cedar Creek, WI	7,500	7	935
St. Lawrence River, NY	13,250 (1,800cy boulders)	7 (w/o disposal)	460 (w/o disposal)
Waukegan Harbor, IL	32,000 and 18,000(soil)	21	420 (including soil)
Grasse River, NY	2,600 + 400 boulders	4.9	1,635
Manistique Harbor, MI	117,000 – 13,0000	48	EOP unit cost 276
Hudson River, NY[39]	2,650,000	460	174

Source: Nadeau 2005

Upon examination of various sites post-remediation, the remediation goals were not readily achieved in that sediment sampling showed higher average PCB concentration after remediation, as well as increased short-term bioavailability of PCBs in the water column as a result of remediation projects.[40]

As discussed above, the lack of definition in the TMDL implementation plan makes it impossible to quantify the costs of the regulation with any certainty. Nonetheless, a review of the available evidence suggests that sediment remediation costs could range into the hundreds of millions or even billions of dollars. Comments submitted by Anchor Environmental quantify the possible range of dredge volumes by examining three scenarios: cleanup of all Bay sediments with PCBs contamination above 0.01 ppm, cleanup of Bay margins above 0.01 ppm, and cleanup of 22 "hot spots" defined in the Staff Report. The most modest scenario, the "hot spot" case, may involve over 16,000 acres and 110 million cubic yards of sediment. In the event that 10 percent of these "hot spots" require remediation and dredging costs are $200 per cubic yard (at the lower end of the range of costs reported above), dredging costs would exceed $2 billion.

---

[38] *Lower Fox River and Green Bay Superfund Site,* Record of Decision Amendment, June 2007; U.S. Environmental Protection Agency

[39] *Hudson River Record of Decision*, U.S. Environmental Protection Agency (P. 94)

[40] Steven C. Nadeau, *A National Contaminated Sediment Update*, May 2005 http://www.smwg.org/ (P. 9-14)

3.B. Urban Stormwater Runoff

Comments submitted by ARCADIS shed light on the possible costs of capturing and treating stormwater from a reasonably foreseeable rain event. Costing assumptions include the following:

- Maximum flow rate = 1,070 mgd per treatment system (Total for 55 systems = 58,870 mgd).
- Design flow rate = 74,300 gallons per minute (gpm) based on emptying the retention ponds in 10 days.
- Storage capacity = 330-acre retention basin 10 feet deep per treatment system (Total for 55 systems = 18,065-acre or 28-square mile retention basin, 10 feet deep).
- Influent concentration = 38,600 pg/L calculated based on the loading assessment presented in KLI (2002).
- Effluent target concentration of 170 pg/L.
- Treatment by settling, filtration and Granular Activated Carbon (GAC).
- Costs for a stormwater collection and conveyance system are not included.
- Carbon disposal as a hazardous waste in a properly permitted landfill.

ARCADIS produces a low-end cost estimate by assuming that the retention basins store the stormwater and provide the settling function of the treatment system. After settling, the solids are further reduced by sand or dual media filtration. GAC adsorption will follow the sand filters to remove soluble PCBs. Each of the 55 retention systems will require a separate treatment system. Each system will also require dewatering equipment to reduce the volume of solids that will require disposal. The result of ARCADIS's analysis is an estimated cost of $145 million for each stormwater treatment system. The total cost for all 55 systems in the Bay Area is almost $8 billion, not including land acquisition, stormwater collection and annual O&M costs for the treatment systems.

In addition to infrastructure for collecting and treating stormwater collection, the Staff Report hints at remediation of upland industrial sites, but is not specific enough to quantify compliance costs. These costs can be substantial as well, and should be discussed in greater detail in the Staff Report if such cleanup efforts are under consideration.

4. Benefits of the Proposed TMDL

4.A. Summary

The Staff Report does not explicitly define the benefits associated with the proposed TMDL. Consequently, economic analyses of benefits can be conducted based directly on the report. Thus, the report fails to allow for an evaluation of objective 9 of the report – to avoid actions that will have unreasonable costs relative to the environmental benefits. The report simply claims that by reducing PCB concentrations, the risk of cancer from PCB exposure will reach an acceptable level of 1 in 100,000 over a 70-year period. No reference is made as to how this compares with the existing cancer risk and consequently to the magnitude of any reduction. Health benefits are not presented in terms of reduced risk or in terms of expected morbidity or mortality. As a result there is no way to quantify, let alone monetize, the benefits of the TMDL as required for an adequate economic analysis.

The report notes that since the TMDL concentration target is substantially below the level necessary to protect plant and animal life that additional benefits associated with their protection can also be claimed. There is, however, no measurement of specific improvement to plant and animal species found in the SF Bay or any specific attribution to the proposed TMDL. Finally, no specific impacts of the proposed TMDL on other beneficial uses that may apply to the SF Bay are calculated.

Although the Staff Report does not provide any form of benefits estimate, it does provide sufficient information regarding staff assumptions to crudely estimate human health benefits associated with reaching the proposed TMDL. As shown below, these benefits are very small.

4B. Benefits Calculation

Health benefits should be measured in terms of the cancer cases avoided by adopting the TMDL. This can be calculated as follows:

$$R_{Current} - R_{TMDL} \times \text{ Population at Risk} = \text{ avoided cancer cases} \quad (1)$$

Where: R_{TMDL} is the risk of cancer per 100,000 once the TMDL is implemented
$R_{Current}$ is the risk of cancer per 100,000 under current coniditons
The Population at risk is the number of people exposed to the carcinogen

The R_{TMDL} according to the Staff Report is one in 100,000 or 10^{-5} representing the maximum acceptable risk level that will be reached under the TMDL because PCB concentrations in fish are expected to fall to 10ng/g. This level is calculated based on the following equation:

$$SVc = [(RL/CSF)]*BW]/CR \quad (2)$$

Where:

SVc is the screening value for PCB concentration expected in fish under the TMDL (mg/kg)

RL is the maximum acceptable risk level 1/100,000, or R_{TMDL}

CSF is the oral cancer slope factor, upper bound estimate is 2mg/kg-day

BW is mean body weight of the population (70g)

CR is the fish consumption rate by all consumers, 32g/day

The Staff Report assumptions for each of these variables can be found in the report or in references to the report (with some exceptions noted below) where the calculation of the screening value for a carcinogen is presented.[41] Table 4 summarizes the Staff Report assumptions.

Table 4: Staff Assumptions for Cancer Risk

Variable	Value	Units	Source
Concentration (SVc)	0.01	mg/g	Target fish concentration (P. 23); TEQ = 0.14 pg/g, (P. 24)
Consumption Rate (CR)	32	g/day	maximum consumption (P. 23)
Exposure Duration	30	years	Not stated, but consistent with screening level calculation
Body Weight	70	kg	P. 23
Cancer Slope Factor (CSF)	2	mg/kg-day	P. 23, (although value of 1 at P. 50)

Source: TMDL

The Staff Report, however, does not provide a value for the current risk of cancer from fish consumption ($R_{Current}$). This value can be calculated though, solving equation (2) for RL rather than SVc :

$$RL= (SVc*CSF*CR)/BW \quad (3)$$

To solve for RL ($R_{Current}$) the screening value concentration (SVc) must be replaced by the current PCB concentration found in fish. To determine this concentration, PCB concentration data and fish consuming population data were collected and analyzed. The San Francisco Estuary Institute (SFEI) catalogs all Regional Monitoring Program results on their website. SFEI data are collected from stations expected to be representative of the entire Bay. Data are collected every three years. The data contains the PCB concentration levels for the species identified in the TMDL, namely the California Halibut, Jacksmelt, Leopard Shark, Shiner Perch, Stripped Bass, White Croaker and White Sturgeon. As a result the average PCB concentrations can be calculated for the species of interest. The average fish tissue concentration for the species of interest from the SFEI RMP data for sampled years is provided in Table 5.

[41] *San Francisco Regional Water Quality Control Board Final TMDL June 2007* (P. 23)

Table 5: PCB Fish Tissue Concentrations in ng/g

Species	1994	1997	2000	2003
California Halibut	26	16	22	10
Jacksmelt	0	70	39	28
Leopard Shark	27	12	17	9
Shiner Surfperch	110	216	161	157
Striped Bass	98	25	43	54
White Croaker	230	259	206	228
White Sturgeon	55	31	40	197

Source: SFEI RMP data

Data collected by the Pacific Coast Recreational Fishing Network (RECFIN) provides the basis for calculating weighted average fish consumption by species. The RECFIN Database collects information related to fish catch, angler population, desired species sought, and a variety of other information related to sport fishing. Data are compiled by field observations as well as intercept interviews and phone interviews. According to RECFIN there is a small percentage of anglers fishing for the reference species. Table 6 includes the percentages of anglers in the Bay who were seeking to catch a particular species. The species in bold are those identified in the Staff Report.

Table 6: Percent of Anglers Trying to Catch a Given Species in 2006

Species	**Percent**
Bat Ray	0.51%
California Halibut	**4.81%**
Chinook Salmon	0.10%
Jacksmelt	**4.05%**
Leopard Shark	**2.28%**
Monkeyface Prickleback	0.05%
Pacific Herring	0.15%
Pacific Sanddab	1.16%
Rockfish Genus	0.71%
Rubberlip Seaperch	0.05%
Sanddab Genus	0.86%
Shiner Perch	**0.56%**
Silverside Family	0.20%
Striped Bass	**13.71%**
Sturgeon Genus	29.76%
Surfperch Family	6.68%
Unidentified (Sharks)	2.23%
Unidentified Fish	26.67%
White Croaker	**1.57%**
White Sturgeon	**3.90%**

Source: RECFIN database

As shown by Table 6, relatively few anglers fish for the species exhibiting high PCB concentrations. Fewer than 2% seek white croaker – the species exhibiting the highest PCB concentration. Although a greater number fish for striped bass, only the larger bass have elevated concentrations.

These preferences are reflected in the actual fish caught. RECFIN also reports the total weight of fish caught. The data used from the RECFIN database represent kilograms of dead fish either observed in the field or reported in an interview. Fish caught and released were excluded as a result of posing no threat to humans. Table 7 displays the percent of species of interest caught during the period 2004 to 2006.

Table 7: Percent of Species of Concern Caught

Species	2004	2005	2006
California Halibut	15.32%	21.29%	5.16%
Jacksmelt	7.19%	5.14%	9.47%
Leopard Shark	9.17%	5.95%	2.86%
Shiner Perch	0.64%	0.37%	0.29%
Striped Bass	11.37%	35.59%	8.76%
White Croaker	3.91%	1.07%	0.87%
White Sturgeon	0.19%	1.98%	1.97%

Source: RECFIN database

Using the information in Table 7and the concentrations presented in Table 5 for 2003, the weighted average PCB concentration in fish tissue can be calculated. The results are shown in Table 8. The overall average concentration for fish actually consumed for the years 2004-2006 is 21ng/g. (This assumes the PCB concentration in fish not classified as fish of concern is zero.) Applying this value to equation (3) reduces the current risk level to a more reasonable 1.9 per 100,000. Thus, the proposed TMDL would only reduce cancer risk from 1.9 to 1 per 100,000.

Even 1.9 per 100,000, however, overstates current risk because it does not represent the attributes of the entire population. The affected population can be characterized in two categories: high-risk and low-risk. High-risk populations are those consuming more than 32 g/d as described in the SFEI study as the top 5% of respondents. The low-risk population is the remaining 95% of the population that consumes fish. According to the SFEI study, the average consumption rate of Bay fish is the measure of fish consumption reported within a 4-week and 12-month recall period. The 4-week period is presumed to be a more accurate and is thus used in our analysis.[42] As a result, the mean consumption rate for the remaining 95% of fish-consuming anglers is 6.3 g/d.[43] Using this average consumption rate (6.3 g/d) and tissue concentration (21ng/g) results in a current risk of 0.37 per 100,000. However, given the target fish tissue concentration of 10ng/g and the current average fish consumption of 6.3 g/day, the risk level would be 0.18 per 100,000. Thus, the TMDL would effectively reduce the risk of cancer from 0.37 to 0.18 per 100,000 a total change of 0.19 per 100,000. This finding suggests that using this

---

[42] SFEI *San Francisco Bay Seafood Consumption Study 2001* (P. 42)

[43] *Ibid*

lower number would be inclusive of the entire Bay Area population and imply that current risk levels are even lower.

Table 8: Weighted Average of PCBs in ng/g for Fish of Concern

	Year		
Species	**2004**	**2005**	**2006**
California Halibut	1.469246	2.04119	0.494739
Jacksmelt	2.018626	1.444351	2.659951
Leopard Shark	0.819753	0.531721	0.255241
Shiner Perch	1.008328	0.580068	0.448474
Striped Bass	6.100659	19.08982	4.696258
White Croaker	8.892883	2.43964	1.984865
White Sturgeon	0.382898	3.89763	3.878849
Total Average PCBs	**20.69239**	**30.02442**	**14.41838**

4.B. Consumption of Fish from the San Francisco Bay

Incidence rate change alone, however, does not provide a useful measure of potential benefits. The population affected by the change must be considered. As shown in equation 1, benefits should be measured as the product of the incidence change and the affected population. Although the Staff Report does not make such a calculation, it implies that the health of the entire Bay Area population is affected by the proposed TMDL. Clearly this is not the case. Only those who consume SF Bay fish are potentially affected. Among this population, moreover, only those who consume certain fish with PCB concentrations above current advisory levels on a regular basis are affected.

Nowhere in the Staff Report is there any reference to such a number. Indeed, the staff asserts that the SVc level of 1 in 100,000 is conservative and designed to provide a margin of safety because it is based in part on the fish consumption level of those who consume the most SF Bay fish rather than on consumption levels for the general population of the Bay Area.[44] The staff claims that this margin implicitly recognizes the long-term goal of increasing the viability of fish consumption and commercial harvest from the Bay.[45] This is an unsubstantiated claim. There is no basis to claim that meeting the proposed TMDL will have any sizable impact on general or commercial consumption. Sport fishing rates, measured by fishing licenses issued, have fallen modestly in the Bay Area Counties since before the first fish advisories were issued. Note that there is a general nationwide trend of declining participation in fishing.[46] Observed reductions are in part attributable to mercury rather than PCB advisories. Consequently, PCB concentration reductions are unlikely to influence substantially sport fishing demand in the Bay. Commercial fishing in the Bay is also unlikely to be influenced by the proposed TMDL. PCB concentrations

[44] The Staff assumes a 32g/day consumption level that represents consumption at the 95% upper bound of the SFEI survey. Thus, 95 percent of those surveyed consumed less than 32 g/day.

[45] *San Francisco Regional Water Quality Control Board Final TMDL June 2007* (P. 23)

[46] American Sportfishing Association
http://www.asafishing.org/asa/statistics/participation/fishlicense_2001_05.html

have not been demonstrated as a cause for the decline in commercial fishing. Concentrations are below the advisory level in fish historically caught commercially. Declining fish populations have not been attributed to PCB concentrations either.

A careful accounting for exposure is critical for accurate measurement of benefits. According to California sport fishing license data reported by the California Department of Fish and Game, there are approximately 125,259 licensed anglers in Alameda, Contra Costa, Marin, Santa Clara, San Francisco and San Mateo counties. Furthermore RECFIN surveys report that 33% of interviewed anglers reported fishing in saltwater. This suggests that the angling population of the Bay is approximately 41,700 (125,259 * 0.33). Thus, if it is assumed that the average household size of anglers is the average for the SF CMSA or 2.7 and every member of the household is consuming fish the potential affected population is 112,552. However, according to the SFEI study only 5 percent of the high-risk anglers or about 2,100 consumes greater than 32g/d of Bay-caught fish. The total affected population increases to perhaps 5,600 assuming that families consume as well. The low-risk population would be the remaining population, or less than 107,000 people. The actual number is probably far smaller because not all licensed anglers fish in the Bay nor consume fish caught in the Bay. The available evidence indicates that the population of anglers and their families potentially exposed to PCBs is small.

Table 9: Fishing License Data

California Resident Fishing License Sales for 2005

County	2005
Alameda	33,406
Contra Costa	34,648
Marin	10,525
San Francisco	3,972
San Mateo	12,240
Santa Clara	30,468
Total	**125,259**

Source: CA DFG
http://www.dfg.ca.gov/licensing/pdffiles/county_101_2005.pdf

Fish catch data collected by the RECFIN survey indicates that fish species presenting the highest PCB concentration (white croaker, jacksmelt, leopard shark, and shiner perch) account for only 16.9 percent of total Bay catch over the period 2004-2007). This circumstance also suggests a modest exposure. As shown in Table 6, white croaker – the fish with the highest PCB concentration – accounts for under 2 percent of the catch. The shiner perch accounts for less than 1 percent. The SFEI survey found that only 5 percent of those surveyed consumed 32g/day or more of Bay-caught fish. Therefore, most anglers consume much less than the acceptable risk level calculation assumes. Mean consumption rates for all low risk anglers were reported at 6.3g/day and the median value was 0g/day, reflecting the fact that over half the respondents reported eating no Bay-caught fish over the 4 weeks prior to their interview (SFEI, p.40-42).

Setting a concentration target based on 32g/day is clearly grossly conservative. It does not merely create a "safety margin," as suggested by Staff.

Staff's reliance on the SFEI survey is problematic for other reasons as well. The survey itself is seriously flawed. The sampling design relies on incorrect weights for fishing location. SFEI reports that 62 percent of fishing is shore based (SFEI, p15). According to RECFIN data, however, pier locations account for only 17.6 percent of fish caught by weight and beaches account for another 8.9 percent. Therefore, only 26.5 percent of fish are caught from shore-based sites. The SFEI weight biases the results toward on-shore locations where higher shares of high-contamination fish are caught. Further, the survey's approach to determining typical fish consumption by amount and species is biased. The initial focus on high-PCB concentration species (i.e., white croaker, leopard shark and striped bass) rather than identifying all fish types reveals a bias on the part of the interviewer. The failure to ask about all forms of disposition of fish caught is also a problem. Respondents, for example, could be questioned whether they use a particular fish as bait or whether they throw them back as a means to test the accuracy of their responses regarding consumption.

4.C. The Benefits of the Proposed TMDL are Insubstantial

The benefits associated are composed of two groups of anglers: the allegedly high-risk population consuming greater than 32g/d and the low-risk population consuming an average of 6.3g/d. As a result, the total net present value of the benefits associated with the TMDL is approximately $380,000. This benefit accounts for 0.004 avoided incidence of cancer per year.

The following calculations are based on equation 1 and the following equation:

((Change in risk x population at risk) / 70 years) x $7 million = benefit in dollars (4)

The high risk group faces a current risk level of 1.9 per 100,000. Assuming the proposed TMDL does achieve a risk level of 1 cancer cases in 100,000 over 70 years and that current risk level is reduced by 0.9 cancer cases in 100,000 over 70 years, using this risk level the benefits associated with the TMDL can be estimated. The reduction in cancer cases for the affected population, including households, of 5,627 indicates that ((0.00001*5,627)/70) or 0.0008 cancer cases are avoided per year. If we further assume very conservatively that each cancer case is fatal, the proposed TMDL will avoid the equivalent number of deaths. The benefits of the TMDL spreading the avoided deaths over the 70 years results in an annual benefit of approximately $5,660. This represents a present value of $80,144. This value reflects a value of $7 million per statistical life, consistent with US EPA guidelines, and assumes that every incidence of cancer results in mortality.[47]

When calculating the benefits for the low risk population, the population size including those in the household is 106,925. The average consumption level is 6.3g/day. The current risk level the low risk population faces is 0.37 per 100,000. The reduced risk level as a result of the TMDL is 0.18 per 100,000 thus reducing the risk level by about half. The reduction in cancer cases for the

[47] US EPA, *Guidelines for Preparing Economic Analyses*, EPA 240-R-00-003, September 2000.

affected population of 106,925 indicates that ((0.19*106,925)/70) or 0.003 cancer cases avoided per year. The benefits of the TMDL spreading the avoided deaths over 70 years results in an annual benefit of $21,171 or a net present value of $299,792.

The total benefits of the TMDL are calculated by adding the benefits from the high risk group and the low risk group for a total net present value of $379,937 ($80,144 + $299,792 = $379,937). Avoided deaths are calculated similarly by adding the avoided deaths per year of the high risk and low risk populations (0.0008 + 0.003 = 0.004).

5. Cost-Effectiveness and Consistency with Other Interventions

The proposed TMDL imposes an unacceptably high level of costs in relation to the actual benefits achieved. Requiring society to spend hundreds of millions or even billions of dollars to achieve less than one million dollars of benefit over 70 years is not reasonable public policy.

The proposed TMDL is far outside the mainstream of health and safety regulations in the United States, even for environmental regulations that are often relatively expensive in terms of dollars per lives saved. That is, most heath and safety regulations promulgated at the federal and state level are vastly more cost effective. For example, a recent study conducted by an official of the Office of Management and Budget and published in the *Journal of Risk and Uncertainty*, examined 76 regulatory actions aimed at saving lives. The proposed TMDL for PCBs is more expensive per life saved than all 76 interventions studied.[48]

The staff report fails to demonstrate that the Regional Board considered alternatives to the proposed TMDL that would be less burdensome than the one proposed, or that it considered the relative cost effectiveness of alternative standards. This omission is inconsistent with basic principles of economic analysis of regulation, and is contradictory to established federal guidelines promulgated by the US Environmental Protection Agency and the Office of Management and Budget.

The selection of a TMDL with an insubstantial level of benefits and possibly enormous cost is also inconsistent with the stated objectives of the proposed action listed in the Staff Report.

6. Competing Risks

Risks almost never exist in isolation, and attempts to deal with one risk usually affect the level of other risks. The benefits of the proposed TMDL are so small, and the direct and indirect costs so large, that it is likely the regulation will do more harm than good. That is, taking all effects of the proposed TMDL into account, it is likely that the regulation will generate more risks than it reduces. Further, while the Staff Report does not emphasize the effects of the TMDL on the aquatic environment, it is also possible that the TMDL will impede projects that move or disturb sediment in the Bay. This restricted movement may affect numerous environmental restoration projects and other activities that depend on the ability to move sediment around the region.

---

[48] John Morrall, *Saving Lives: A Review of the Record, The Journal of Risk and Uncertainty*, 27:3; 221-237, 2003

6.A. Health-Health Analysis

The performance of the proposed TMDL is poor in that it has a high implicit cost per life saved, being far more expensive than the $7 million per life saved threshold adopted in standard economic analyses of health risks. Another key threshold is the cutoff point at which cost-ineffective regulations do more harm than good in that they pose more risk to society than the problems they intend to address. The proposed TMDL fails this test as well, and by a wide margin.

Relatively new research in environmental economics suggests a technique for assessing regulation that does not involve monetizing benefits. The technique of "health-health" analysis allows analysts to estimate non-monetized benefits and evaluate regulations without passing judgment on the value of a statistical life. The logic of this technique rests on two principles. First, risk reduction is a so-called normal good, or one where purchases rise with the level of income. Second, regulations have to be financed. Money for compliance must ultimately come from individuals, and paying the costs of regulation reduces individuals' ability to purchase risk reduction privately.[49]

Best estimates of the threshold of cost per life saved above which regulations do more harm than good are around $21 million per life saved.[50] That is, every $21 million of compliance cost induces one fatality. The proposed TMDL fails that health-health test by a wide margin. To see this, recall that the TMDL is expected to result in 0.004 cancer cases avoided per year. Taking cancer cases as equivalent to deaths, compliance costs would need to be less than $84,000 annually to pass the health-health test (0.004 x 21,000,000= 84,000). Even if one if mindful of the uncertainties surrounding compliance costs for this proposed TMDL, it is not possible that they will be below this threshold.

6.B. Effects on Sediment Movement in the Bay and Wetlands Restoration Projects

Even though the TMDL does not recognize any impacts to habitat restoration plans it fails to explain the existence of a number of plans at the Bay margin which may be caused harm by the establishment of this TMDL. As is stated in the TMDL,

> [s]ignificant impacts to land use and planning would occur if a project ... caused conflict with a habitat conservation plan. There are no projects related to the PCBs TMDL that would be of a type or scale to cause any impacts in this category. Projects anticipated by the PCBs TMDL implementation plan would occur on industrial sites or on the Bay margin and would not result in substantial

[49] Lutter, Randall and John Morrall. *Health-Health Analysis: A New Way to Evaluate Health and Safety Regulations. Journal of Risk and Uncertainty* 8, pp. 43-66, 1994.
[50] Lutter, Randall, John Morrall and W. Kip Viscusi. *The Cost per Life Saved Cutoff for Safety Enhancing Regulations. Economic Inquiry* 37, pp. 599-608, 1999

changes to established communities or land use patterns. There are no known or reasonably foreseeable impacts to land use and planning.[51]

According to the Bay Area Wetland Tracker, there are approximately 150 sites that are planned for restoration, mitigation, creation, and enhancement projects.[52] A map of selected sites completed and planned is shown in Figure 1. The majority of these sites are located at the Bay margins with sediment mitigation being an integral part of restoration activities. There is only limited information on sediment management for the Bay as a whole. Several projects listed remediation activities ranging from natural attenuation of sediment through active monitoring to incorporating 10.6 million cubic yards of sediment into the restoration project.[53]

There are many sites that are currently classified as both hotspots and designated for habitat restoration activities. Two such sites are the South Bay Salt Ponds Project and the Hamilton Army Base. Each site has plans to undergo creation of tidal wetlands habitat and have PCBs present. The passage of this TMDL may require that these sites forego the restoration activities and furthermore necessitate remediation action. The potential scope of damages is unknown because the TMDL does not provide an adequate description of how remediation locations at the Bay margin designated for other uses will be handled.

Restoration projects range in size and scope, with sites of less than an acre to nearly 9,000 acres. For example the South Bay Salt Ponds Project has about 25 sites and a total of approximately 4,700 acres designated for a variety of remediation projects aimed at restoring the salt ponds. The main problem with the current status of the salt ponds being that the tidal lands have subsided from above sea level and currently require sediment deposition to create tidal wetlands.[54] Natural deposition could take as much as 120 years for full recuperation and determining the most cost effective way of accelerating it may be difficult. In addition the presence of mercury in the sediment poses environmental problems of its own. Figure 2[55] illustrates the diversity of the projects surrounding the South Bay Salt Ponds.

Additionally Hamilton Army Base has been designated as a toxic hotspot as well as a restoration project. The nearly 800 acre project is aimed at providing a range of wetlands such as subtidal open water, intertidal mudflats, low, middle and high intertidal marsh, channels, interior tidal ponds, and tidal panes. The precise wetland use has yet to be determined but the potential for restoring wetlands requires 10.6 million cubic yards of sediment to raise site elevations necessary to encourage vegetation growth[56].

---

[51] *San Francisco Regional Water Quality Control Board Final TMDL June 2007* (P. 93)

[52] www.wetlandtracker.org

[53] Philip Williams and Associates; *Hamilton Airfield Tidal Wetland Restoration* http://www.pwa-ltd.com/ProjectSummaries/HamiltonField.html

[54] Zimmerman, Richard; Restoring *the South Bay Salt Ponds,* The Loma Prietan March/April 2004 http://lomaprieta.sierraclub.org/lp0403_SaltPonds.html ;

[55] http://maps.southbayrestoration.org/sbsp/viewer.htm

[56] Philip Williams and Associates *Hamilton Airfield Tidal Wetland Restoration* (P. 2) http://www.pwa-ltd.com/ProjectSummaries/HamiltonField.html

Figure 1: Wetland Tracker Restoration Projects

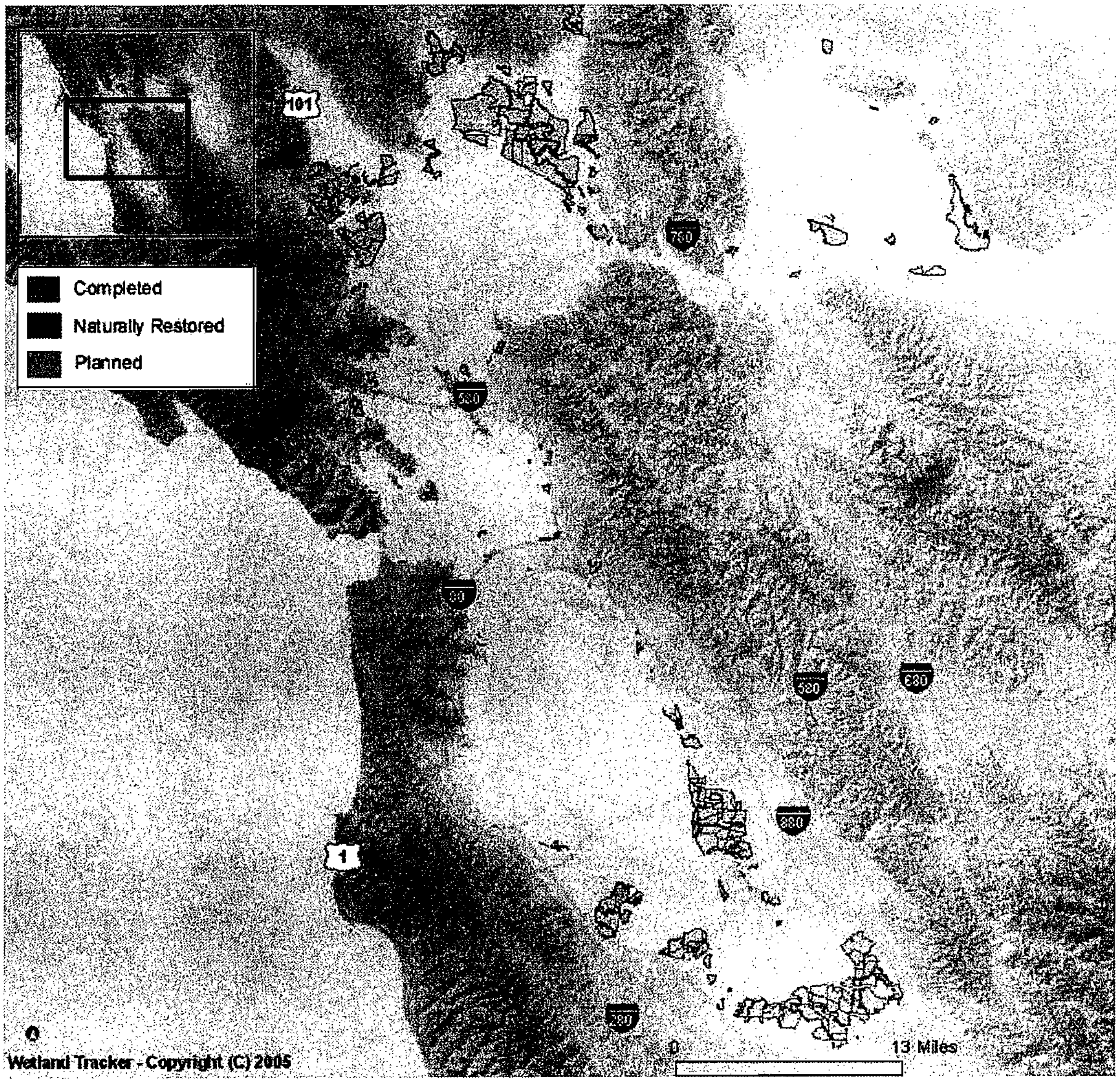


Figure 2: South Bay Salt Ponds

In addition the *Long Term Management Strategy for the Placement of Sediment in the San Francisco Bay, "Management Plan 2001"* outlines goals related to limiting the disposal of sediments in the bay and disposing of dredged material in the most environmentally sound manner. The TMDL states that projects should have preliminary work started in 5 years and site completed within 10. In addition the LTMS targets limiting in Bay disposal of sediments to 1 million cy per year by 2012.[57] This would suggest that there would be limiting factors on the quantity of disposed remediated sediment in the Bay and imply that disposal would have to be in an upland storage facility such as a landfill.

7. Documents Relied On

In reaching these conclusions, I have relied on the following documents:

- *Total Maximum Daily Load for PCBs in San Francisco Bay: Proposed Basin Plan Amendment and Staff Report.* California Regional Water Quality Control Board, San Francisco Bay Region. June 22, 2007.
- Bay Area Wetland Tracker. Website developed by the San Francisco Estuary Institute, Wetlands and Water Resources, Inc. and the Point Reyes Bird Observatory.

[57] EPA, SFRWQCB *Long Term Management Strategy for the Placement of Sediment in the San Francisco Bay, Management Plan 2001* (P. 1-14)

http://www.wetlandtracker.org/GISInfoCatalog/servlet/org.sfei.GISInfoCatalog.UserInterface?directive=viewproject&project_name=Hamilton+Airfield

- *Draft Consolidated Toxic Hot Spots Cleanup Plan Volume II: Regional Cleanup Plans.* California State Water Resources Control Board. August 2003.

- *Final Feasibility Study Report, Seaplane Lagoon, Alameda Point, California.* Prepared by Battelle for Base Realignment and Closure Program Management Office West, July 22, 2005

- *Draft Addendum to the Revised Final Station-Wide Feasibility Study Site 25.* Prepared by SulTech and Tetra Tech EM, Inc. for Base Realignment and Closure Program Management Office West, June 21, 2005.

- *Revised Draft Feasibility Study Report for Parcel F Hunters Point Shipyard, San Francisco, California.* Prepared by Barajas & Associates, Inc. for Base Realignment and Closure Program Management Office West, May 11, 2007

- Nadeau, S., *A National Contaminated Sediment Update,* Presentation to the American Chemistry Council, May 19, 2005

- Daum, T., et al. *Sediment Contamination in San Leandro Bay, CA*, San Francisco Estuary Institute, December 2001

- *Record of Decision for Site 17 Seaplane Lagoon.* U.S. Environmental Protection Agency, October 2006

- *Record of Decision for Hudson River PCBs Site New York.* U.S. Environmental Protection Agency, February 2002. http://www.epa.gov/hudson/d_rod.htm#record

- Zimmerman, R. *Restoring the South Bay Salt Ponds The Loma Prietan* March/April 2004 http://lomaprieta.sierraclub.org/lp0403_SaltPonds.html

- South Bay Salt Pond Restoration Project. California Department of Fish and Game, The Coastal Conservancy, The U.S. Fish and Wildlife Service. http://maps.southbayrestoration.org/sbsp/viewer.htm

- Philip Williams & Associates. *Hamilton Airfield Tidal Wetland Restoration* http://www.pwa-ltd.com/ProjectSummaries/HamiltonField.html

- *Long-Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region.* Prepared by U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, San Francisco Bay Conservation and Development Commission, San Francisco Bay Regional Water Quality Control Board, 2001.

- Freeman, A. Myrick. *Environmental Policy since Earth Day I: What Have We Gained? The Journal of Economic Perspectives,* Vol. 16, No. 1. (Winter 2002), pp. 125-146

- Morrall, John F. *Saving Lives: A Review of the Record; Journal of Risk and Uncertainty* 27:3; pp. 221-237, 2003

- *Guidelines for Preparing Economic Analysis*; U.S. Environmental Protection Agency, September 2000

- *2006 Report to Congress on the Costs and Benefits of Federal Regulations and Unfunded Mandates on State, Local, and Tribunal Entities;* Office of Management and Budget 2006

- Lutter, Randall and John Morrall. *Health-Health Analysis: A New Way to Evaluate Health and Safety Regulations. Journal of Risk and Uncertainty* 8, pp. 43-66, 1994.

- *San Francisco Bay Seafood Consumption Report,* Environmental Health Investigations Branch of the California Department of Health Services, San Francisco Estuary Institute, 2000

- Pacific States Recreational Fisheries Monitoring (RECFIN). www.recfin.org

- American Sportfishing Association http://www.asafishing.org/asa/statistics/participation/fishlicense_2001_05.html

- Lutter, Randall, John Morrall and W. Kip Viscusi. *The Cost per Life Saved Cutoff for Safety Enhancing Regulations. Economic Inquiry* 37, pp. 599-608, 1999.

- *Lower Fox River and Green Bay Superfund Site,* Record of Decision Amendment, June 2007; U.S. Environmental Protection Agency

- San Francisco Estuary Institute, Regional Monitoring Project. http://www.sfei.org/rmp/

- California Department of Fish and Game, Sportfishing license statistics http://www.dfg.ca.gov/licensing/pdffiles/county_101_2005.pdf

TMDL COMMENTS
San Francisco Bay PCBs TMDL

Prepared by
Evan K. Nyer
Donald F. Sauda, P.E.
ARCADIS U.S., Inc.

August 20, 2007

Executive Summary

- Best Management Practices (BMPs) can reduce sediment loading in stormwater and, to a degree, should reduce polychlorinated biphenyl (PCB) loading associated with sediment in stormwater to the San Francisco Bay (the Bay).

- BMPs alone will be insufficient to achieve the concentrations/loading reductions required by the total maximum daily load (TMDL); thus, active collection and treatment of stormwater will be required across the Bay.

- The Best Available Technology (BAT) for PCB removal is activated carbon; however, even with advanced technologies used in conjunction with activated carbon, achievement of the target PCB stormwater concentrations of 640 – 8,050 picograms per liter (pg/L) corresponding to the TMDL stormwater waste load allocation is not feasible in full-scale applications.

- The collection and treatment of stormwater across the San Francisco Bay is technically impracticable and infeasible. The approach would require storage of almost 59,000 million gallons of water, which would require 28 square miles of land around the San Francisco Bay. This land is not likely available and use of this land for stormwater storage could cause environmental damage to sensitive areas.

- ARCADIS has significant concerns with a number of mathematical errors that directly affect the magnitude of the TMDL and the implementation plan. In order to accurately assess the impact of the TMDL, these mathematical errors need to be corrected.

Expert Report

The Total Maximum Daily Load (TMDL) for polychlorinated biphenyls (PCBs) in the San Francisco Bay Proposed Basin Plan Amendment and Staff Report ("PCB TMDL Amendment and Staff Report") (California Regional Water Quality Control Board [CRWQCB] 2007) indicates that waste load allocations for municipal and industrial wastewater discharges will be implemented through National Pollutant Discharge Elimination System (NPDES) permits. These permits require implementing Best Management Practices (BMPs) to maintain optimum treatment performance for solids removal and to identify and manage controllable PCB sources. The regulatory analysis section of the PCB TMDL Amendment and Staff Report states: "These BMPs and other forms of mitigation, which are both feasible and already in common use as standard industry practice, are expected to reduce all potentially significant impacts to less than significant levels." (p. 75)

Controlling PCBs in stormwater is largely dependent on the removal of PCB-containing solids; ARCADIS agrees that BMPs are an important tool for removing PCBs from stormwater in the San Francisco Bay Area (the Bay Area). However, the PCB TMDL Amendment and Staff Report states that stormwater collection and treatment also will need to be employed to address PCBs in stormwater, including urban runoff. The collection and treatment of urban runoff from the entire Bay Area drainage is a monumental task, which is technically impracticable and economically infeasible for municipalities and industries that may be subject to this requirement. Removal of PCBs from stormwater to the target concentrations corresponding to the TMDL stormwater waste load allocation at the scale and magnitude necessary to attain the TMDL has not been demonstrated to be achievable. These concerns are discussed further below.

The scientific basis for many of the assumptions used in the PCB TMDL Amendment and Staff Report is suspect due to the number of significant math errors. While ARCADIS was not able to perform a thorough review of the data and calculations in the entire report, we discovered significant math inaccuracies. The mathematics presented in the PCB TMDL Amendment and Staff Report are critical to the overall evaluation of PCBs in the Bay Area, and, as such, deserve their own commentary.

ARCADIS's Expert Report focuses on three main topics:

- The use of BMPs to achieve the TMDL for PCBs in the Bay.
- The technical feasibility of achieving the TMDL using the current best available technology (BAT).
- The presence of mathematical errors in the formulation of the Bay TMDL in the PCB TMDL Amendment and Staff Report.

A more detailed discussion of each of these three areas is presented below.

<u>Use of Best Management Practices</u>

As BMPs have been developed for a variety of applications, case studies have demonstrated not only the success, but also the flexibility of the BMP approach in controlling waste loading to receiving waters. Currently available BMPs are often general in nature and focus on such topics as good housekeeping, management, construction practices and sediment control. BMPs specifically discussed in the PCB TMDL Amendment and Staff Report are routine maintenance BMPs to reduce the discharge of sediment to the Bay (e.g., storm drain inlets, detention basins, street sweeping and construction site maintenance) (pp. 69, 81, 82, 85, 88). The PCB TMDL Amendment and Staff Report states that ongoing attainment of suspended solids effluent limits provides a surrogate indicator of PCB control. Thus, BMPs used to decrease suspended solids loading are appropriate to assist in the achievement of the PCB TMDL in the Bay Area.

Additional state-specific guidance regarding BMPs is provided in a series of four Stormwater Best Management Practices Handbooks (California Stormwater Quality Association [CSQA] 2003): New Development and Redevelopment, Construction, Industrial and Commercial, and Municipal. These four handbooks represent the current practices and standards in California. The purpose of the Industrial and Commercial handbook is "…to provide general guidance for selecting and implementing BMPs to reduce the discharge of pollutants in runoff from industrial facilities and selected commercial businesses to waters of the state." (CSQA 2003, p. 1-1) This handbook further states that it "…provides guidance on the identification and selection of BMPs that are the cornerstone of an effective Storm Water Pollution Prevention Plan. Due to the diversity in receiving waters, site conditions, and local requirements across California, it is not the intent of this handbook to dictate the actual selection of BMPs…but rather to provide the framework for an informed selection of BMPs." (p.1-1)

The BMPs listed in the Industrial and Commercial Handbook are divided into four categories: non-structural, structural, source control and treatment control. The source control BMPs focus on: spill prevention, control and cleanup, vehicle and equipment management, material and waste management (e.g., loading, storage, handling, and safer alternatives) and building and grounds management. The treatment control portion of the handbook addresses the inspection and maintenance requirements for treatment control BMPs that may be in use at industrial and commercial facilities, particularly those BMPs in the public domain (e.g., those that are readily available without proprietary technology such as infiltration trenches and basins). A limited discussion is included in the handbook on general categories of proprietary technologies such as media filters, vortex separators and wet vaults. The BMPs described in the Industrial and Commercial Handbook represent broad classes of measures, many of which may already be in use by industries for reasons unrelated to stormwater pollution.

Additional BMP resources are provided below.

The California Environment Protection Agency provides access to BMP databases (http://www.swrcb.ca.gov/stormwtr/bmp_database.html) from sources such as the American Society for Civil Engineers, the Metropolitan Council of Minnesota and North Carolina State University.

The International Stormwater BMP database contains several studies focusing on the use of inlet filter traps and wet ponds (http://www.bmpdatabase.org/index.htm) that list PCBs as analytical parameters among a large suite of inorganic and organic pollutants. Only one of these studies contained sufficiently detailed BMP information to allow the evaluation of the effectiveness of the BMP for specific analytes; PCBs, however, were not detected in the influent or effluent in this study. Although lacking PCB-specific information, this database contains over 140 BMPs, including a performance evaluation of select BMPs' effectiveness at removing total suspended solids. Although influent concentrations were not provided, total suspended solids between 10 and 20 milligrams per liter (mg/L) were reported by the United States Environmental Protection

Agency (USEPA) in the effluent of BMPs such as retention ponds and wetland basins (USEPA 2007).

The Metropolitan Council of Minnesota's Urban Small Sites Best Management Practices Manual (http://www.metrocouncil.org/environment/watershed/bmp/manual.htm) includes information on 40 BMPs for managing stormwater pollution at small urban sites in cold climates. The BMPs described are divided into two categories: runoff pollution prevention BMPs and stormwater treatment BMPs, with specific fact sheets for each BMP. Each fact sheet includes a graphical depiction of the degree of design benefit for the removal of total suspended solids.

The North Carolina State University BMP information (http://www.bae.ncsu.edu/stormwater/) also focuses on general BMPs such as bioretention areas, green roofs, stormwater wetlands, permeable pavers and water harvesting systems.

The USEPA maintains a National Menu of Stormwater BMPs (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm), is divided into six areas: public education and involvement, illicit discharge detection and elimination, construction and post-construction practices, and pollution prevention/housekeeping operations for municipal facilities.

The USEPA defines a stormwater BMP as "…a technique, measure or structural control that is used for a given set of conditions to manage the quantity and improve the quality of storm water runoff in the most cost-effective manner" (USEPA 1999a). The USEPA's NPDES program provides several general documents regarding the development, design and cost of BMPs, including:

- Guidance Manual for Developing Best Management Practices (USEPA 1993).

- Preliminary Data Summary of Urban Stormwater Best Management Practices (USEPA 1999a).

- Stormwater Management Fact Sheet: Non-Stormwater Discharges (USEPA 1999b).

Much of the industry-specific information included in these documents encourages good housekeeping, water use reduction, and appropriate chemical handling, storage and disposal.

One common BMP in urban areas like much of the Bay Area is street sweepings. USEPA (1999a) reported that mechanical street sweepers can reduce sediment loading by up to 30% and vacuum-assisted wet sweepers can reduce sediment loading by up to almost 90%. Another common BMP is removal of sediment from storm drains and catch basins. These common BMPs focus on removing sediment before storm water washes the particles away from the source. However, while there is a large body of knowledge that exists regarding the selection, implementation and effectiveness of BMPs for the removal of total suspended solids, there is no information on the effectiveness of BMPs alone to meet the target PCB stormwater concentrations of 640 – 8,050 picograms per liter (pg/L). Therefore, treatment of stormwater will be required as discussed below.

Technical Feasibility of Achieving the TMDL Using Best Available Technology

Implementing BMPs will reduce the overall PCB waste load to the Bay; however, active treatment methods will be required to approach the effluent levels consistent with the proposed total PCB waste load of 10 kilograms per year (kg/yr). Of the proposed 10 kg/yr total PCB waste load, 3.0 kg/yr is allocated to stormwater runoff (2.0 kg/yr – through public storm drains; 0.9 kg/yr treated through publicly-owned treatment works) and non-urban stormwater runoff (0.1 kg/yr) (see Table 22, p. 60 of the PCB TMDL Amendment and Staff Report).

The PCB TMDL Amendment and Staff Report notes that stormwater collection and treatment will need to be employed to address PCBs in stormwater, particularly urban runoff. We concur with the CRWQCB's implication that BMPs alone will not result in compliance with the TMDL. We disagree, however, with the CRWQCB's conclusion that adding stormwater capture and treatment will achieve such compliance. In reality, achieving the stormwater PCB waste load of only 3.0 kg/yr is not feasible even with complete capture and treatment of the stormwater to effluent concentrations below current analytical method detection limits.

The collection and treatment of urban runoff from the entire Bay Area drainage is a monumental task which is technically impracticable and economically infeasible for municipalities and industries that may be subject to this requirement. As an example of the technical impracticability, the area required to store the water that will require treatment is estimated at 28 square miles, primarily for retention basins (see calculation below); these land requirements cannot likely feasibly be met in the Bay Area, and the CRWQCB makes no attempt to characterize or address this issue. The Alameda Countywide Clean Water Program (2004) concurred by stating that "stormwater detention ponds, swales and constructed wetlands would likely be infeasible for built-out areas in which undeveloped land is at a premium." Further discussion of the collection and treatment of the urban runoff from the Bay Area is presented below. The impracticability and feasibility of the collection and treatment of urban runoff needs to be considered as part of the implementation plan for the PCB TMDL.

As discussed above, BMPs alone will not remove PCBs in water in order to achieve the target PCB concentrations corresponding to the proposed TMDL stormwater waste load allocation (i.e., 640 – 8,050 pg/L PCBs in stormwater discharge). Therefore, collection and treatment of stormwater will be required. ARCADIS has conducted a thorough review of available treatment technologies for the removing PCBs from water, which included literature reviews, engineering evaluations of existing treatment systems and interviews with technology vendors. As noted in the PCB TMDL Amendment and Staff Report, a critical component in the treatment effectiveness is solids removal. The more efficiently a system removes solids, the more efficiently the system will remove PCBs associated with solids. Thus, most systems designed to remove PCBs from water will first include aggressive solids removal systems (e.g., settling, sand filters, coagulation/flocculation, etc.) to remove solids prior to subsequent treatment processes. A number of systems then include advanced oxidation processes to further reduce (through chemical destruction) the concentration of PCBs in water. However, upon evaluating available information, ARCADIS determined that activated carbon is the most widely used technology as the final treatment process and constitutes BAT for PCB removal. USEPA (2000) concurred with this finding by stating that "granular activated carbon (GAC) adsorption has been used successfully for the advanced (tertiary) treatment of municipal and industrial wastewater…to adsorb the relatively small quantities of soluble organics (see Table 1)." Table 1 in this document provides a list of organic compounds that are amenable to adsorption by carbon, which includes PCBs.

As noted above, using readily available information, ARCADIS examined the feasibility of capturing and treating the stormwater runoff flow resulting from a 24-hour rain event equal to at least 0.2 inches per hour intensity in the Bay Area watershed. While ARCADIS realizes that the entire basin will not have this amount of rain at the same time, we cannot design a single capture system for the entire basin. ARCADIS based the design on dividing the basin into 55 equal sections. Each section will have to be ready for a full rain event. Thus, the total design numbers are based upon each of the sections being designed for 0.2 inches of rain per hour in their area. While the 55 treatment systems will not all be needed at the same time, they all have to be designed to be ready for the design-basis rain event. Additional activities involved selecting a stormwater flow rate, determining the necessary storage capacity, calculating the influent PCB concentration, investigating treatment processes, and calculating a cost estimate to implement a system to store and treat the Bay Area stormwater. These activities are described in greater detail in subsequent sections.

Stormwater Flow Rate

ARCADIS initially examined the stormwater flow rate contained in a Kinnetic Laboratories, Inc. (KLI) report upon which the PCB TMDL Amendment and Staff Report based its estimates of PCB loads to the Bay (KLI 2002). KLI utilized a simple area-weighted model to generate average runoff volumes from the 17 Bay Area watersheds based on estimates of annual average rainfall taken from long-term records from the National Climatic Data Center Cooperative rain gauges located throughout the region. The overall range of rainfall was 14 – 49 inches per year and the most consistent range was 20 – 25 inches rainfall per year. Using this method, KLI (2002) calculated a total stormwater runoff flow rate by first estimating the percentage of 5 different land uses (i.e., residential, commercial, industrial, agricultural and open) of each of the 17 Bay Area watersheds and then multiplying by the total area in each watershed to get the drainage area by land use. Each of these drainage areas by land use in each watershed were multiplied by the average annual rainfall in each watershed and a runoff coefficient for each type of land use (range from 0.94 for commercial use to 0.01 for open land). Following unit conversion, the result is a stormwater runoff flow rate of 744 million gallons per day (mgd) for the Bay Area.

Annual average rainfall from KLI (2002) is the value that the PCB TMDL Amendment and Staff Report used to calculate the loadings to the Bay. The problem with the KLI (2002) approach, however, is that stormwater runoff is not well approximated by this statistic of using rainfall totals on an annual basis. Rain doesn't fall in small volumes each day throughout the year but instead rainfall occurs during a limited number of storm events. In the case of the Bay Area, the climate concentrates these storm events almost exclusively to the winter period of November to March. To account for this, standard practice is to base stormwater treatment volume on the system being able to store the runoff water from a design rain storm (e.g., 25-year, 24-hour), and then subsequently treat the water. Typically, historical rain records are reviewed and the design is based upon a level of rain that occurs on a certain frequency. CRWQCB did not follow this standard practice.

In order to obtain a representative volume and flow rate for urban and non-urban stormwater runoff in the Bay Area, ARCADIS examined several alternative data sources including:

- Precipitation-Frequency Atlas of the Western United States (U.S. Department of Commerce 1973).
- San Francisco Maximum Daily Rainfall (Golden Gate Weather Services 2005a).
- San Francisco Storm Return Periods (Golden Gate Weather Services 2005b).

These sources indicated that it is reasonable to assume a design storm event that can produce 4 – 5 inches of rainfall per day. This rainfall is about the volume expected by a 25-year, 24-hour storm event in this area.

ARCADIS investigated existing stormwater design criteria for the State of California to determine if a previously-approved method of determining stormwater flow rates exists. ARCADIS identified one applicable set of design criteria previously used in the Bay Area for municipal stormwater dischargers.

The CRWQCB for the Bay Area ordered the San Mateo County Municipal Stormwater dischargers to design pollutant removal treatment systems based on either a volume or flow hydraulic basis (CRWQCB 2003). In the volume design basis, the maximum stormwater capture volume for the area is approximated by the 85^{th} percentile 24-hour storm runoff event or the volume of annual runoff required to achieve 80 % or more stormwater capture based on local rainfall data. In the flow design basis, treatment measures should be sized to treat either:

- 10% of the 50-year peak flow rate; or
- the flow of runoff produced by a rain event equal to at least two times the 85th percentile hourly rainfall intensity for the applicable area, based on historical records of hourly rainfall depths; or
- the flow of runoff resulting from a rain event equal to at least 0.2 inches per hour intensity.

Using the flow design basis presented by the CRWQCB (2003), a 24-hr storm event would produce 4.8 inches of rainfall. While ARCADIS understands that the entire Bay Area will not likely be subject to 4.8 inches of rain simultaneously, a series of stormwater retention systems for the Bay Area would be sized and designed for that flow rate. Because any given 24-hour storm event could occur anywhere in the Bay Area watershed, each stormwater retention system must be able to collect runoff from the design storm event. ARCADIS used this rainfall input in the KLI (2002) model to derive a total stormwater runoff event flow of 58,870 mgd across the 17 Bay Area watersheds. As described above, this calculation used the same methods (e.g., 5 different land use types and 17 Bay Area watersheds) as KLI (2002), but the design 24-hour rainfall of 4.8 inches was used in place of the average annual rainfall. This approach is consistent with the reality that rainfall occurs during a limited number of storm events throughout the year.

Stormwater Storage Capacity

Using 58,870 mgd as the stormwater flow design basis, ARCADIS calculated the amount of storage capacity necessary to hold this water prior to and during active treatment. Assuming a 10-foot deep retention basin and not accounting for treatment during the rainstorm event, a total of 18,000-acres or 28-square miles of retention basins would be required to collect the stormwater. Stormwater collection and conveyance systems would also need to be constructed for stormwater collection and treatment.

Because a single 28-square mile stormwater retention basin is not practical for the entire Bay Area, ARCADIS assumed 55 retention units of about 330 acres each with a maximum flow rate of 1,070 mgd (1/55th of the total stormwater flow for the Bay),. Using this much land for stormwater retention would have a significant environmental effect on the Bay Area. It should also be noted that each of the systems would be required to obtain effluent levels sufficiently low to reach the proposed PCB TMDL stormwater allocation of 3 kg/yr (i.e., 640 – 8,050 pg/L PCBs in stormwater discharge).

Available Treatment Options

ARCADIS examined treatment options for attaining effluent levels consistent with the proposed reduction of the total PCB waste load from stormwater runoff from 40.1 kg/yr to 3.0 kg/yr (a 93% reduction in PCB waste load). Available treatment technologies rely on the physical and chemical properties of PCBs; the most important PCB property, from a treatment, perspective, is aqueous solubility. PCBs have a low solubility in water with solubility generally decreasing with increasing congener chlorine content. PCBs have a much greater affinity for suspended materials in a solution than for the water phase. Thus, any treatment train needs to consider the two main categories of PCB-impacted water: PCBs attached to suspended solids/particulates in water; and PCBs dissolved in water.

The currently available and/or potentially applicable technology for PCB removal generally involves a two-step process: the conventional treatment, which is to pre-treat PCB-containing water and follow-up with chemical precipitation and/or biological removal; and advanced treatment, which consists of advanced oxidation, membrane technology and/or activated carbon treatment. Additionally, the application of coagulation, sedimentation and filtration forms the basis of many water treatment processes for PCBs.

Conventional treatment technologies for removing PCBs attached to suspended solids/particulates include: source solids removal (prior to water treatment), broad solids removal (e.g., oil-water separation, gravity settling), and/or enhanced solids removal (e.g., chemical or biological clarification, sand/multi-media filtration). These treatment technologies can remove PCBs down to the range of 1,000,000 to 100,000,000 pg/L.

Following the conventional treatment, advanced treatment systems such as advanced oxidation, membrane processes or activated carbon treatment, can then be applied to further reduce PCB levels. However, treatment effectiveness of most advanced technologies can be greatly impacted by feed water quality so effective removal of solids using conventional treatment is required.

Advanced oxidation processes (AOPs) attempt to degrade organic compounds, including PCBs. Common AOPs include: UV/H_20_2, $UV/0_3$, UV/TiO_2, Fenton's, O_3/H_2O_2, and combinations of these processes. The purpose of most AOPs is to produce hydroxyl radicals (OH) in water, which are highly reactive oxidizing agents that react with and destroy most organic pollutants in water. AOPs can destroy waterborne contaminants with no secondary disposal requirements. The limitations of AOPs are the high capital and operating cost requirements and the limited field demonstrations of PCB removal effectiveness.

Membrane processes use a thin layer of material capable of separating PCBs as a function of their physical and chemical properties when a driving force is applied across the membrane. Membranes can be classified into four types: reverse osmosis, nanofiltration, ultrafiltration, and microfiltration. Reverse osmosis can remove PCBs to effluent concentrations of less than 50,000 pg/L, making it the most likely membrane technology candidate for achieving extremely low effluent levels; however, this process produces large volumes of highly concentrated waste materials containing PCBs and many other hazardous substances in the treated water, making it unattractive from a financial and regulatory perspective

GAC adsorption, currently the BAT for PCB removal, is often used at the end of a PCB removal treatment train, following other conventional and/or advanced treatment processes. GAC treatment can typically achieve effluent concentrations of PCBs of less than 65,000 to 1,000,000 pg/L, and generally requires moderate capital and moderate to high operating expenses. As one example, GAC treatment has been successfully used following UV/H_20_2 in Hudson Falls, New York to consistently achieve an effluent PCB concentration of less than 65,000 pg/L. However, in this case, the influent concentration is 38,600 pg/L, as calculated based on the loading assessment presented in KLI (2002), is already below the BAT for PCB removal. Assuming 75% solids removal, which corresponds to 75% PCB removal, the effluent using BAT may be in the range of 10,000 pg/L. The GAC would likely only provide marginal reduction of PCBs at these levels, although there is no analytical data to verify this.

GAC treatment effectiveness can be limited by the presence of solids/particulates carrying PCBs in the influent. Solids removal is necessary to: decrease solids loading during GAC treatment; increase GAC operating life; and decrease GAC backwashing, which reduces the probability of PCB-containing solids in the effluent.

Based on the available information for performance and cost, the BAT for the treatment of PCBs to levels below 1,000,000 pg/L is a conventional solids removal step(s) followed by GAC treatment. However, a database does not exist to demonstrate that this BAT will achieve the extremely low levels of PCBs required by the PCB TMDL Amendment and Staff Report.

The treatment technologies discussed above are not typically used in Publicly Owned Treatment Works (POTWs). POTWs efficiently remove solids and typically provide biological treatment and, therefore, would remove a portion of the PCBs present in the influent; however, treatment of stormwater in POTWs to effluent concentrations below current analytical method detection limits has not been documented. Although the TMDL indicates that the POTWs are discharging relatively low concentrations of PCBs in their effluent, the TMDL does not present the associated influent data. Thus, we can not evaluate the removal efficiencies of the existing POTW systems. Due to the large volumes of stormwater storage and treatment necessary under the proposed TMDL, it is highly unlikely that the existing POTWs can handle the addition of any significant stormwater flow; in fact, most POTW systems are designed and operated to minimize/eliminate stormwater inflows due to storage and treatment capacity limitations. Even if treatment capacity is available, storage of stormwater would still be needed for the municipal systems and their use for treatment will not lower the total land requirements discussed above. The TMDL needs to address the storage and treatment capacity limitations, as well as the PCB removal efficiencies, of the existing POTWs. Removal of PCBs from stormwater to the target concentrations corresponding to the TMDL stormwater waste load allocation at the scale and magnitude necessary to attain the TMDL has not been demonstrated to be achievable.

Cost Estimating

ARCADIS examined the feasibility of capturing and treating stormwater from a reasonably foreseeable rain event by calculating a cost estimate. Costing assumptions include the following:

- Maximum flow rate = 1,070 mgd per treatment system (Total for 55 systems = 58,870 mgd).
- Design flow rate = 74,300 gallons per minute (gpm) based on emptying each retention basin in 10 days.
- Storage capacity = 330-acre retention basin 10 feet deep per treatment system (Total for 55 systems = 18,065-acre or 28-square mile retention basin, 10 feet deep).
- Influent concentration = 38,600 pg/L, which is calculated based on the loading assessment presented in KLI (2002).
- Effluent target concentration = 640 – 8,050 pg/L.
- Treatment by settling, filtration and GAC.
- Costs for a stormwater collection and conveyance system are not included.
- Carbon disposal in a properly permitted landfill or carbon regeneration.

In order to produce a reasonable cost estimate, ARCADIS assumes that the retention basins serve a dual purpose of storing the stormwater and acting as the settling function of the treatment system. While this will significantly reduce the capital costs of the treatment system, it will require higher operations and maintenance (O&M) as the solids settled in the basins will need to be removed via dredging and disposed of in a properly permitted landfill on a periodic basis.

After settling, the solids will have to be further reduced by sand or dual media filters. GAC adsorption will follow the sand filters to remove soluble PCBs. Each of the 55 retention systems will require a separate treatment system. Each system will also require dewatering equipment to reduce the volume of solids that will require disposal. The result of this analysis is an estimated cost of $145,000,000 for each stormwater treatment system designed to reduce PCB effluent concentrations using BAT. The total cost for all 55 systems is almost $8 billion. These costs are understated because they don't included land acquisition, stormwater collection (e.g., stormwater conveyance systems) and annual O&M costs for the treatment systems.

In addition to the implementation costs, the O&M costs would be high for the following reasons. All of the sludge collected would have to be disposed of in a landfill. By dividing the total suspended solids loading by the total average flow listed in the KLI report (2002) and converting units, an average suspended solids concentration of about 170 mg/L is calculated. Using the average flow from the KLI report (2002), this suspended solids concentration and assuming an average 30% cake solids with a density of 2,500 kilogram per cubic meter (about 21 pounds per gallon), the treatment plants would annually produce a total of about 300,000 cubic yards of waste sludge for area landfills. The second major O&M cost would be GAC. Most carbon is replaced every other year as a minimum or as the system becomes saturated with the PCBs. Assuming the minimum amount of the approximately 3,000,000 pounds of carbon is replaced, the treatment system would require about 700 tons of carbon per year.

Additional key considerations regarding the implementability of such a project that would require further consideration include the following:

- Acquisition of vast amounts of land required to provide storage capacity in the Bay Area, which is an already densely populated area.
- Supply, transport and disposal/regeneration of large volumes of GAC.
- Disposal of the large volume of solids generated during the settling and filtration process.
- Impracticality of routinely monitoring compliance with extremely low level effluent limits.

In summary, the collection and treatment of stormwater runoff during a reasonably foreseeable rainfall event appears to be infeasible at present. As stated above, even with an extraordinary expenditure, the extremely low levels of PCBs required by the PCB TMDL Amendment and Staff Report would not be achieved.

Potential Environmental Impacts of Treating Urban Stormwater Runoff

Potentially significant environmental impacts are likely to result from the construction, and operation and maintenance of 55 stormwater treatment systems in the Bay Area. These impacts include: removal of significant acreage from other potentially beneficial uses within the Bay Area for the construction of retention basins (e.g., conflict with habitat conservation plans); alteration of local hydrology and drainage patterns; emission of construction-related particulates and diesel/vehicle exhaust; transport and disposal of large volumes of soil generated during retention basin construction; increased noise from the construction and operation of the treatment systems; generation, transport, and disposal of large volumes of potentially hazardous material (i.e., spent GAC and sludge); and increased energy consumption due to system construction and operation.

PCB Analytical Challenges

There are challenges associated with the detection of PCBs at the low levels required for compliance with the TMDL. The PCB TMDL Amendment and Staff Report notes that PCBs are a "difficult to measure pollutant that is present at very low levels." (p. 67) A numeric effluent limit of 0.5 µg/L is proposed for inclusion in NPDES permits as an "enforceable backstop against poor performance." (p. 67)

The numeric effluent limit of 0.5 µg/L proposed in the PCB TMDL Amendment and Staff Report reflects the level of achievable quantitation with USEPA Method 608. The PCB TMDL Amendment and Staff Report calls for the use of USEPA Method 1668A on a periodic basis to verify continued attainment of PCB waste load allocations. The detection limits and quantitation levels in this method are usually dependent on the level of interferences and laboratory background levels, rather than instrument limitations (USEPA 1999c). This method can achieve a method detection limit of 5 pg/L for select PCBs with no interferences present, although the estimated minimum levels of quantitation (the lowest concentration at which individual PCBs can be measured reliably with common laboratory interferences present) are typically higher (range = 10 – 1,000 pg/L) (USEPA 1999c). Current analytical limitations prevent verification through testing that PCB waste loads in effluents are being achieved.

Mathematical Errors in Formulating the TMDL

The mathematics presented in the PCB TMDL Amendment and Staff Report significantly impact the overall evaluation of PCBs in the Bay Area. Specific comments regarding mathematical errors reflected in the PCB TMDL Amendment and Staff Report are presented below.

The PCB TMDL Amendment and Staff Report contains several significant math inaccuracies. Specific examples of these math inaccuracies follow.

- Dredging – (p. 46) – the PCB TMDL Amendment and Staff Report states that material containing 23 kg of PCBs are dredged from the Bay each year. Of this material 13 kg are disposed outside of the Bay Area and 10 kg are disposed inside of the Bay. The report erroneously reports the math to state that 13 kg are removed and 10 kg are placed in the Bay each year. The report concludes that the two amounts cancel each others respective positive and negative effects and that dredging does not have to be included in the overall calculation of PCBs in the Bay.

This is inaccurate. Since all of the 23 kg originally came from the Bay, the 13 kg disposed outside the Bay represent a net removal of 13 kg each year. This 13 kg represents over 15% of the 80 kg of PCBs entering the Bay as calculated by the PCB TMDL Amendment and Staff Report, which means this number is extremely significant and needs to be included in the subsequent calculations.

This particular math mistake was already spotted by one of the Board's own reviewers as noted in Appendix C of the PCB TMDL Amendment and Staff Report. Kevin Farley in his May 27, 2007 review of the TMDL states, "Based on the current wording, shouldn't the net loss be 13 not 3, kg of PCBs?" There is no explanation of why this was not corrected in the PCB TMDL Amendment and Staff Report.

- Cost of Treatment for Stormwater – (p. 99) - the PCB TMDL Amendment and Staff Report states:

> *Overall, the proposed urban stormwater runoff allocations will likely require the largest implementation costs. At this time, we project an upper bound to urban stormwater runoff expenditures of approximately $500 million annually. This is the current overall cost associated with municipal wastewater management. Municipal and industrial wastewater dischargers are not likely to have significant new implementation costs since their allocations reflect current treatment performance*

The Staff did have data on flows, concentrations and effluent requirements for stormwater and PCBs. ARCADIS used the data provided in the reports to calculate our cost estimates presented previously in these comments. The costs of wastewater treatment in POTWs are very different than the costs of stormwater treatment for PCBs. The main costs of stormwater treatment are collection and storage, while the main costs of wastewater treatment are collection and treatment. There are no similarities between the two types of treatment systems (POTWs do not typically employ BAT for PCB removal) and we are not aware of any existing references that even try to compare these two systems. Therefore, there is no basis for using $500 million.

- Total PCBs in the Bay – (p. 99) - the PCB TMDL Amendment and Staff Report states:

> *In-Bay sources of PCBs are primarily associated with Bay-margin sites that have concentrated localized deposits of PCBs-contaminated sediment. Efforts to remediate these "hot spots" are currently underway at a number of locations and some projects have already been completed. Costs to remediate these sites may be substantial, but they are costs that would be incurred with or without the PCBs TMDL. (pg. 99, PCB TMDL)*

ARCADIS' concern with this statement is that it states that the efforts to remediate these "hot spots" are already underway. However, we did not see any place where the staff tried to include the amount of PCBs removed with these efforts in their calculations presented in the PCB TMDL Amendment and Staff Report.

- PCBs in sediment – (p. 61, third paragraph) - the PCB TMDL Amendment and Staff Report states:

> *Existing PCBs loads from urban stormwater runoff are estimated at 40 kg/yr. The proposed total waste load allocation for urban stormwater runoff is 2 kg/yr. It reflects the resulting PCBs load when all sediment in urban stormwater runoff has a concentration of 1 µg/kg [microgram per kilogram], the sediment PCBs concentration goal, assuming the sediment loads used to calculate the current PCBs load do not change.*

This statement is incorrect. If the PCB estimated mean concentration coming from all land uses is 1 µg/kg and the TSS load is unchanged, then the proposed urban stormwater runoff PCB load is actually 0.2 kg/yr, representing an order of magnitude difference from the proposed urban stormwater runoff waste load allocation as presented in the PCB TMDL Amendment and Staff Report.

ARCADIS concludes that the conclusions reached in this report are not adequately based upon actual conditions in the Bay and the several parts of the evaluation process should be redone with careful and standardized review of each calculation. These parts include:

1. The amount of PCBs currently being removed by dredging

2. The cost of stormwater collection and treatment

3. The environmental impact of stormwater collection and treatment

4. The calculation of the proposed urban stormwater PCB waste load allocation

In summary, ARCADIS believes that had the external PCB load to the Bay been calculated more accurately and a true cost estimate of treating urban stormwater runoff been generated, the PCB TMDL Amendment and Staff Report may have reached a different conclusion regarding reliance on stormwater treatment as a necessary method to reach the TMDL.

References

Alameda Countywide Clean Water Program. 2004. A Review of Source Control Options for Selected Particulate-Associated TMDL Pollutants, August 2004.

California Environmental Protection Agency, State Water Resources Control Board. 2004. BMP Databases. http://www.swrcb.ca.gov/stormwtr/bmp_database.html, August 5, 2004.

CRWQCB, San Francisco Bay Region. 2007. Total Maximum Daily Load for PCBs in San Francisco Bay Proposed Basin Plan Amendment and Staff Report.

CRWQCB. 2003. San Mateo Countywide NPDES Municipal Stormwater Permit Amendment. Order No. R2-2003-0023 Amending Order No. 99-059. NPDES Permit No. CAS0029921. http://www.waterboards.ca.gov/sanfranciscobay/Agenda/02-19-03/02-19-03-14finalto.doc

CSQA. 2003. California Stormwater BMP Handbook – Industrial and Commercial. http://www.cabmphandbooks.org/

Golden Gate Weather Services. 2005a. San Francisco Maximum Daily Rainfall. http://ggweather.com/sf/max_daily.html

Golden Gate Weather Services. 2005b. San Francisco Storm Return Periods. http://ggweather.com/sf/return.html

International Stormwater BMPs Database. 2007. http://www.bmpdatabase.org/index.htm.

KLI, 2002. Joint Stormwater Agency Project to Study Urban Sources of Mercury, PCBs and Organochlorine Pesticides. Final Report. Santa Cruz, California, April 2002.

Metropolitan Council. 2001. Minnesota Urban Small Sites BMP Manual – Stormwater Best Management Practices for Cold Climates. http://www.metrocouncil.org/environment/watershed/bmp/manual.htm

NEMI. 2007. National Environmental Methods Index. http://www.nemi.gov/

North Carolina Sate University. 2007. BMP information. http://www.bae.ncsu.edu/stormwater/.

U.S. Dept. of Commerce. 1973. Precipitation-Frequency Atlas of the Western United States. National Oceanic and Atmospheric Administration, Atlas 2 Volume XI California. (http://www.weather.gov/oh/hdsc/currentpf.htm#TP40)

USEPA. 1993. Guidance Manual for Developing Best Management Practices. Office of Water, Washington DC, EPA-833-B-93-004.

USEPA. 1999a. Preliminary Data Summary of Urban Stormwater Best Management Practices. Office of Water, Washington DC, EPA-821-R-99-012.

USEPA. 1999b. Stormwater Management Fact Sheet: Non-Stormwater Discharges. Office of Water, Washington DC, EPA-832-F-99-022.

USEPA. 1999c. Method 1668, Revision A: Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS. Office of Water, Washington DC, EPA-821-R-00-002.

USEPA. 2000. Wastewater Technology Fact Sheet: Granular Activated Carbon Adsorption and Regeneration. Office of Water, Washington DC, EPA-832-F-00-017.

USEPA. 2007. National Menu of Stormwater Best Management Practices. http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm.

COMMENT LETTERS
PUBLIC COMMENT PERIOD TWO
DECEMBER 3, 2007 to JANUARY 22, 2008

Comment Letters Received:

US Environmental Protection Agency, Region IX

California Department of Transportation

Bay Area Stormwater Management Agencies Association

Bay Area Clean Water Agencies

San Francisco Public Utilities Commission

East Bay Municipal Utility District

BayKeeper, Clean Water Action, Citizens for a Better Environment, Friends of Five Creeks

California Chamber of Commerce and General Electric submitted by
Latham and Watkins

Quantitative Environmental Analysis

Dr. David Sunding, Berkeley Economic Consulting, Inc.

Latham and Watkins, Briefing Paper, October 31, 2007

Dr. David Sunding, Berkeley Economic Consulting, Inc. dated October 30, 2007

This Page Left Intentionally Blank

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

January 16, 2008

Naomi Feger
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street
Oakland, CA 94612

Dear Ms. Feger:

Thank you for the opportunity to review and comment on the proposed Basin Plan Amendment and Staff Report for the Total Maximum Daily Load for PCBs in San Francisco Bay, dated December 3, 2007. We appreciate the hard work to develop this proposed TMDL and its implementation provisions. Attached are our comments concerning the TMDL.

Regarding NPDES permit requirements for municipal and industrial dischargers, EPA understands that the NPDES permitting approach for municipal and industrial dischargers under the proposed TMDL has not been fully developed, and we agree that it is not necessary to do so as part of the TMDL language. However, the Water Board should be aware that numeric water quality–based effluent limits, consistent with the wasteload allocations in the TMDL, will need to be placed in permits. We look forward to working with you further on an approach for NPDES permits.

Our comments in the letter and its attachment do not constitute an approval, disapproval or determination by EPA under Clean Water Act section 303(d). We will act upon any TMDL submittal following State adoption and submittal to EPA.

In closing, we are pleased to see the proposed TMDL package for PCBs, and believe it will enhance the Board's ability to protect human health and the environment. It you have any questions, please call me at (415) 972-3452, or refer staff to Diane Fleck at (415) 972-3480; for permitting issues, please contact Nancy Yoshikawa at (415) 972-3535.

Sincerely,

(original signed by)

Janet Hashimoto
Chief, Monitoring and Assessment Office

cc: Fred Hetzel

Attachment

US EPA Region 9 Comments on December 3, 2007 Proposed Basin Plan Amendment and Staff Report for the Total Maximum Daily Load for PCBs in San Francisco Bay

1. Revised Source Loads
On page 48 of the Staff Report, it states that the urban and non-urban stormwater runoff load estimate is revised from 40 kg/yr to 20 kg/yr. It states, "PCBs loads estimate for the Guadalupe River have been estimated from 0.7 to 1.2 kg/yr between 2003 and 2005 (McKee et al., 2005). SFEI extrapolated these loads to small urban tributaries and estimated a total load of 20 kg/yr (SFEI, 2007). We use this newer load estimate for combined urban and non-urban stormwater runoff." Without further description of the calculations, it is not clear that it is appropriate to extrapolate estimates from the Guadalupe River over the entire Bay area, to estimate the total PCB load from urban and non-urban stormwater runoff.

2. Fish Tissue Numeric Target
On page 27 of Staff Report, Fish Tissue Studies, the report calculates a screening value using a risk level of 10(-5), defined as the maximum acceptable risk level. This screening value is later used as the numeric target for the TMDL. However, the CTR promulgated PCB human health criteria at a 10(-6) risk level (10 times more stringent).

The CTR criterion was derived to protect the general population at a 10(-6) risk level. The TMDL Staff Report, at page 58, states that the fish tissue numeric target used in the TMDL analysis, although based on a 10(-5) risk level, is protective of the general population in the Bay area, because only a small fraction of the overall population catch and consume fish in the Bay; and that the numeric target is also protective of subpopulations, because other factors used in the calculation were more conservative (fish consumption rate, etc.). While it is true in this specific instance that the fish consumption rate used in the TMDL is higher than that used in the CTR, we strongly recommend numeric targets be set at the same risk level as the underlying water quality standard, to clearly ensure protection of both the general population (at the same risk level) and any subpopulations.

On page 58, under section 8.1 Fish Tissue Target, the last sentence in the first paragraph references Equation 2 in section 7.1; however, the discussion appears to reference Equation 1, in section 6.2.

3. Total Maximum Daily Load
On page 67 of the Staff Report, in Section 10.1, Total Maximum Daily Load, the report expresses the TMDL as an average annual load. As discussed in EPA's guidance memorandum dated November 15, 2006, EPA recommends that TMDLs and associated load allocations and wasteload allocations be expressed in terms of daily time increments. TMDLs and allocations may also be expressed in terms of both daily and non-daily time increments to help facilitate implementation of the applicable water quality standards.

4. Allocations and Wasteload Allocations
We have reviewed the proposed load and wasteload allocations. Before approving a TMDL in which some of the load reductions are allocated to nonpoint sources in lieu of additional load reductions allocated to point sources, there must be specific reasonable assurances that the nonpoint source reductions will in fact occur. The TMDL analysis should explain and

demonstrate why the necessary reductions are reasonably expected by the Water Board to be achievable, and to occur within a reasonable time frame. The TMDL analysis shows that the second largest source of PCBs to San Francisco Bay is the Central Valley Watershed (11 kg/yr) (the largest is Urban and Non-Urban Stormwater Runoff at 20 kg/yr). The Central Valley allocation is 5 kg/yr, and will be achieved through “natural attenuation” within 40 years, but this time estimate does not appear to be documented. Staff Report, page 74. The TMDL report states that “verification of ongoing loads and load reductions [from the Central Valley] will be a regular component of the Regional Monitoring Program.” Staff Report, page 77. It is necessary for the Regional Board to explain and demonstrate in greater detail in this TMDL, with specific reasonable assurances, how the Central Valley load reduction will be achieved within 40 years and/or verified that it is occurring through natural attenuation, through specific RMP monitoring.

5. Superfund TBCs

On page A-11 of the Draft Basin Plan Amendment, it states, “The fish tissue target of 10 ug/g and the sediment goal of one ug/kg are not cleanup standards, nor should they be considered appropriate, relevant, applicable requirements (ARARs) or a “to be determined” ARAR under the federal Superfund law.” However, as lead agency on a Superfund cleanup, if EPA finds either the TMDL numeric target value or the sediment goal value to be a technically suitable numeric value to use as a to-be-considered criterion (TBC), under the National Contingency Plan, 40 CFR Part 300 et.seq., EPA as lead agency has the authority to so designate the value as a TBC.

DEPARTMENT OF TRANSPORTATION
DIVISION OF ENVIRONMENTAL ANALYSIS, MS 27
1120 N STREET
P. O. BOX 942874
SACRAMENTO, CA 94274-0001
PHONE (916) 653-7507
FAX (916) 653-7757
TTY (916) 653-4086

Flex your power!
Be energy efficient!

January 22, 2008

Mr. Fred Hetzel
California Regional Water Quality Control Board
San Francisco Bay Region,
1515 Clay Street, Suite 1400
Oakland, CA 94612
Fax: 510-622-2460
by e-mail: fhetzel@waterboards.ca.gov

SUBJECT: Comments on the Proposed San Francisco Bay Basin Plan Amendment to Establish a TMDL and Implementation Plan for PCBs in San Francisco Bay

Dear Mr. Hetzel:

The California Department of Transportation (Department) appreciates this second opportunity to comment on the proposed Basin Plan Amendment incorporating a Total Maximum Daily Load (TMDL) for polychlorinated biphenyls (PCBs) for San Francisco Bay. We understand that these comments are to focus on changes from the June 2007 draft and on economic issues. As we noted in our previous comments, this TMDL proposes substantial reductions in the loadings of PCBs carried by storm water and is likely to significantly impact the Department's runoff control program in the Bay Area. Approximately 27 square miles of Department right-of-way within Region 2 drains to San Francisco Bay. This area represents 0.67 percent of the total watershed (4,000 square miles).

We support efforts to improve water quality in the Bay, and we continue to implement a statewide program to control pollutants in highway runoff and sediment carried from construction sites. This program is outlined in our Storm Water Management Plan (SWMP). This proposed TMDL might require significant changes to the SWMP as implemented in the Bay Area. In addition, we are concerned that our previous comments were not addressed. To the best of our knowledge, the Regional Board has not posted the responses to comments and we request that these be made available.

Our comments are enclosed. We hope they are helpful. The Department will continue to work with the Regional Board to address PCBs issues and to implement the TMDL. We urge the Regional Water Quality Control Board (RWQCB) to address the enclosed comments, as well as the comments we submitted with our letter of August 20, 2007. If you have any questions, please contact Jagjiwan Grewal of my office at 916-653-2115.

Sincerely,

Paul A. Lafont

for G. SCOTT McGOWEN
Chief Environmental Engineer
Division of Environmental Analysis

Enclosure

Comments on the Proposed San Francisco Bay Basin Plan Amendment to Establish a TMDL and Implementation Plan for PCBs in San Francisco Bay

1) ***Caltrans compliance alternatives.*** The PCB TMDL lacks the necessary flexibility respecting the Department's compliance activities. We request that this TMDL use a similar approach to that used in the Mercury TMDL. The Mercury TMDL assigns specific allocations to municipalities and counties within the watershed. These urban runoff management agencies are generally responsible for overseeing various discharges within the agencies' geographic boundaries, including those from the Department. However, the Mercury TMDL includes a provision that provides the Department with the option of implementing a Department-specific allocation:

    > Alternatively, Caltrans may choose to implement load reduction actions on a watershed or regionwide basis in lieu of sharing a portion of an urban runoff management agency's allocation. In such a case, the Water Board will consider a separate allocation for Caltrans for which they may demonstrate progress toward attaining an allocation or load reduction in the same manner mentioned previously for municipal programs. [1]

    We strongly urge the RWQCB to include a similar provision in the PCB TMDL in the Implementation Plan subsection for Stormwater Runoff (pp. A-10, A-11). This provision will allow the Department to implement a consistent regionwide PCB control program, if this approach is more effective at controlling PCBs.

2) ***Allocations basis.*** The discussion on Page A-5 of the BPA has deleted the statement:

    > Load and wasteload allocations to Central Valley inflow, and urban and non-urban stormwater runoff are based on sustained constant sediment mass input with a sediment PCBs concentration of one μg/kg.

    This statement was useful because it established that attainment of one μg/kg PCBs in runoff sediment would effectively provide compliance with the TMDL. We request that the statement be retained.

3) ***Urban PCB loading.*** The current loading from urban (and now non-urban runoff) has been reduced from 40 kg/yr to 20 kg/yr. We will appreciate to know the reasoning for the reduction in current loading.

4) ***Municipal wastewater PCB loading.*** The document indicates that the current loading from Municipal Wastewater Dischargers is 2.3 kilograms per year but the allocation is 2 kg/yr. The previous draft stated, "Wasteload allocations to municipal and industrial wastewater dischargers are set at current loads." This statement has been deleted; presumably, the current document indicates a reduction and not just a change in significant figures. However, the BPA should clarify the RWQCB's intent. This issue is relevant to stormwater dischargers

[1] Approved Basin Plan amendment, pp. 16-17, item iii
(http://www.waterboards.ca.gov/rwqcb2/TMDL/SFBayMercury/bpa080906.pdf)

because the RWQCB intends for the municipal wastewater (sewage) dischargers to additionally discharge diverted stormwater.

5) ***New three-phase compliance approach.*** A new addition to the Implementation Plan (p. A-9) states:

> The plan will be implemented in phases via an adaptive implementation strategy founded on requiring actions in each category based on the current state of knowledge of PCBs sources and control measures, while also conducting studies to improve our understanding of PCBs sources, control options, and fate in the environment. [Emphasis added]

The specific actions required for the municipal runoff category include the following new addition:

> In the first five-year permit term, stormwater permittees will be required to implement control measures on a pilot scale to determine their effectiveness and technical feasibility. In the second permit term, stormwater permittees will be required to implement effective control measures, that will not cause significant adverse environmental impacts, in strategic locations, and to develop a plan to fully implement control measures that will result in attainment of allocations, including an analysis of costs, efficiency of control measures and an identification of any significant environmental impacts. Subsequent permits will include requirements and a schedule to implement technically feasible, effective and cost efficient control measures to attain allocations. If, as a consequence, allocations cannot be attained, the Water Board will take action to review and revise the allocations and these implementation requirements as part of adaptive implementation.

These proposed actions are required independent of any demonstration that a PCB problem exists. For example, if runoff sediment from a jurisdiction carries less than one μg/kg of PCBs, we question whether it should be required to implement pilot controls in the first permit cycle and then "effective control measures" (undefined) in the second permit cycle. In effect, this TMDL establishes a program of implementing measures haphazardly with no assurance that they present effective solutions to real problems.

6) ***Deleted list of compliance options.*** On page A-11, this draft deletes the list of measures, which, if kept, could have been used to demonstrate progress toward attaining the wasteload allocations.

> 1. Quantify the annual average PCBs loads reduced by implementing (a) pollution prevention activities, and (b) source and treatment controls. The Water Board will recognize such efforts as progress toward achieving the wasteload allocations and the PCBs-related water quality standards upon which the allocations and corresponding load reductions are based. Loads reduced as a result of actions implemented after 2001 may be used to estimate load reductions.
>
> 2. Quantify the PCBs loads as a rolling five-year annual average using data on flow and water column total PCBs concentration.
>
> 3. Quantitatively demonstrate that the total PCBs concentration of suspended sediment that best represents sediment discharged from drainage areas is

> below the in-Bay surface sediment PCBs concentration goal of 1 μg/kg, which is the basis for the urban stormwater runoff wasteload allocations.

This list, that has been deleted, would have enabled stormwater dischargers to show compliance by implementing one of these measures. As discussed above, the list was replaced with a vague provision to implement pilot programs followed by "effective control measures," followed by "technically feasible, effective and cost efficient control measures to attain allocations." The new draft replaces a relatively clear goal-based TMDL with pro forma implementation activities not clearly directed at any goal or based on a demonstrated problem. This is a step backward, does not improve the TMDL, and does not provide any direction for the dischargers trying to comply with the TMDL.

7) ***Contaminated sediment.*** With respect to In-Bay PCB-Contaminated Sites, the BPA has new text inserted emphasizing:

> The fish tissue target of 10 μg/kg and the sediment goal of one ug/kg are not cleanup standards, nor should they be considered appropriate, relevant, applicable requirements (ARARs) or a "to be determined" ARAR under the federal Superfund law.

In a later paragraph, the BPA adds new text stating that the RWQCB will advise EPA and DTSC "that the fish tissue target and sediment goal do not constitute clean-up standards for ARARs."

We will appreciate to know the reasoning for addition of above statements. The BPA should identify cleanup standards in order to allow for remediation actions to proceed. By not establishing standards, the BPA makes compliance assessment, planning, and cleanup implementation much more difficult.

8) ***Adaptive implementation.*** This section notes (new text underlined):

> The Water Board<u>, within ten years of the effective date of the TMDL,</u> will review the San Francisco Bay PCBs TMDL and evaluate new and relevant information that becomes available through <u>implementation actions,</u> monitoring, special studies, and the scientific literature and consider <u>amending</u> modifications to the PCBs TMDL <u>and implementation plan as necessary to ensure attainment of water quality standards in a timely manner while considering the financial and environmental consequences of new control measures</u>.

We support the consideration of financial and environmental consequences. This TMDL requires a 90% reduction in stormwater loading. While measures necessary to meet this allocation could become very costly, clarifying more specific objectives as discussed above would make more effective use of the public funds that will be required to comply with the TMDL.

B A S M A A

Alameda Countywide
Clean Water Program

Contra Costa
Clean Water Program

Fairfield-Suisun
Urban Runoff
Management Program

Marin County
Stormwater Pollution
Prevention Program

San Mateo Countywide
Stormwater Pollution
Prevention Program

Santa Clara Valley
Urban Runoff Pollution
Prevention Program

Vallejo
Sanitation and Flood
Control District

Bay Area
Stormwater Management
Agencies Association
1515 Clay Street
Suite 1400
Oakland, CA 94612
510.622.2326
www.basmaa.org

January 22, 2008

Naomi Feger
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

Subject: PCBs Total Maximum Daily Load (TMDL) in San Francisco Bay-Proposed Basin Plan Amendment and Staff Report, December 2007 Revisions

Dear Ms. Feger:

This letter is submitted on behalf of the Bay Area Stormwater Management Agencies Association (BASMAA) in response to the invitation to submit comments on the December 2007 revisions to the document entitled *Total Maximum Daily Load for PCBs in San Francisco Bay, Proposed Basin Plan Amendment and Staff Report* (hereinafter referred to as the "PCB Report/BPA"). The revised PCB Report/BPA was prepared by staff of the California Regional Water Quality Control Board, San Francisco Bay Region (Water Board) and, in addition to providing details on the development of the Bay PCBs TMDL, includes a plan to implement the TMDL.

BASMAA member agencies appreciate the opportunity to comment on the PCB Report/BPA and commend Water Board staff on the hard work put into this challenging project. BASMAA is committed to addressing urban runoff-related impairments to beneficial uses of San Francisco Bay. We agree that reducing impairment of the Bay's beneficial uses by PCBs should be a high priority to all Bay Area public agencies and citizens. As public agencies we recognize the importance of this task, and therefore seek a fair, objective and transparent PCBs TMDL. A TMDL development process based on the best available information, sound science, feasibility, and cost-effectiveness will help establish the legitimacy and legality of the TMDL and inspire the public's confidence.

BASMAA previously submitted comments on the PCBs TMDL in a letter dated August 20, 2007. Many of the comments in that letter remain highly pertinent, but are not repeated herein since the current scope of comments is limited to changes made by Water Board staff to the June 22, 2007 version of the PCB Report/BPA and economic issues and factors as they may relate to the proposed amendment. We request that our August comments be included as appropriate by reference in the record of the upcoming public hearing on the PCBs TMDL. Please note that some of the below comments are relevant to the upcoming public hearing since they are related to our ongoing discussions with Water Board staff about staff's responses to BASMAA's previous comments.

Our goal is to continue to work cooperatively with Water Board staff to reach common ground in establishing this important TMDL and the related implementation plan. BASMAA and Water Board staff met recently (in January 2008) to discuss some of BASMAA's concerns and issues with the PCBs TMDL. We found this meeting and subsequent communications informative and constructive and appreciate that Water Board staff was willing to work with us on resolving some of these issues. BASMAA's understanding of the actions agreed upon during these recent communications are described below, along with some of our remaining concerns.

Adaptive Implementation

With regard to periodic updates of the TMDL, the PCB Report/BPA calls for evaluation of new information and incorporation into the TMDL as needed any time within ten years. While this does not preclude review and potential update within a shorter period of time, BASMAA has requested that Water Board staff commit to a shorter timeframe. It is particularly important that the forthcoming results of modeling the fate of PCBs in the Bay, using a new multi-box pollutant fate model calibrated to upcoming Bay sediment coring data, are incorporated into the TMDL as soon as possible. Water Board staff recently informed BASMAA that a requirement will be added for an annual update to the Water Board on the status of the TMDL's implementation, including any relevant new studies (such as the multi-box modeling and the Bay sediment coring). BASMAA additionally requests public noticing of the annual updates and that stakeholders be given the opportunity to present new information at the annual updates and request modification of the TMDL as appropriate.

Cleanup of On-land PCBs Sites

BASMAA requests clarification and revision of the language on p.80 (first bullet) of the PCB Report/BPA with respect to the roles of agencies in investigating and abating on-land PCBs sites. Stormwater runoff management agencies and municipalities should not be held responsible for abatement of PCBs in areas with elevated PCBs in soils/sediments. Instead, municipal agencies would be available to assist with identification of on-land sites with PCBs contamination, and would report investigation results, including identifying contaminated properties and/or potentially responsible parties to the Water Board and/or DTSC, and/or potentially in some instances to Certified Unified Program Agencies, which are local agencies with the authority to conduct oversight of hazardous materials. The Water Board, DTSC, or, if they have the available resources, CUPA would be expected to follow up on further investigation and oversee any necessary abatement. We understand that staff will be recommending clarifications and revisions to this language at the upcoming public hearing that would address these concerns and objectives. This clarification and revision is very important to the BASMAA member agencies.

Stormwater Runoff Implementation Cost Estimate

BASMAA appreciates that staff added language to the PCB Report/BPA specifying additional phasing and flexibility in the implementation schedule (e.g., p. A-10, "Subsequent permits will include requirements and a schedule to implement technically feasible, effective and cost efficient control measures to attain allocations."). However, the PCB Report/BPA projects that municipal wastewater management costs of approximately $500 million annually provide an upper-bound cost for stormwater dischargers to address PCBs and other pollutants of concern. This highly speculative estimate represents an annual cost well beyond anticipated future municipal resources and, according to the PCB Report/BPA, is a factor of five higher than estimated total current costs associated with all aspects of urban stormwater pollution management in the Bay Area. We continue to emphasize that municipal actions to address PCBs in stormwater runoff will be constrained by available funding and that Proposition 218 severely limits the ability of local government to generate additional revenues for urban stormwater runoff programs.[1]

[1] Section 6 of Article XiII D of the California Constitution, a part of Proposition 218, requires that property-related fees or charges shall not be imposed or increased unless such fee or charge is approved by either a majority vote of the

Load Reductions

Table 19 (p.74) and Table A-5 (p.A-9) in the PCB Report/BPA show wasteload allocations for each Bay Area county, but do not include associated load reductions, as was done in the mercury Basin Plan Amendment. BASMAA requests inclusion of these load reductions by county to potentially compare to loads avoided that may be calculated by each countywide stormwater program. Calculating loads avoided on a countywide basis will be a possible means of demonstrating compliance with the wasteload allocations.

BASMAA Requests to Investigate Potential PCBs Sites

BASMAA agencies previously identified several potential PCBs release sites and requested that Water Board staff work with appropriate parties (e.g., PG&E, the Department of Toxic Substances Control and the Toxics division within the Water Board) to investigate the possibility that PCBs from these sites had entered storm drains.[2] One example is the Delta Star site in the City of San Carlos in San Mateo County. Relatively high levels of PCBs were found in a storm drain sediment sample collected by BASMAA agencies downstream of this site. Electrical equipment containing PCBs was formerly manufactured at the Delta Star property and PCBs have been found in soil and groundwater at the site. Thus this site may be a source of PCBs in storm drain sediments. The Water Board is the lead agency overseeing an ongoing site cleanup.

BASMAA understands that Water Board TMDL staff has recently brought the potential PCB sites identified in our letters to the attention of the Water Board's Toxics division staff, which is now following-up on investigating these sites. Water Board staff has also informed BASMAA that after adoption of the TMDL, actions to implement the TMDL such as addressing these sites are likely to have a higher priority. BASMAA strongly supports the Water Board raising its priority for addressing such sites to expedite reducing impairment of the Bay's beneficial uses by PCBs.

Thank you for the opportunity to submit these comments. Please contact me at 925-313-2373, Jon Konnan (BASMAA PCBs representative) at 510-832-2852 x.108, or Geoff Brosseau (BASMAA Executive Director) at 510-622-2326 if you have any questions.

Sincerely,

Donald P. Freitas
BASMAA Executive Board Chair and CCCWP

---

owners of the affected properties or, at the option of the agency imposing the fee or charge, by a 2/3 vote of the voters residing in the area affected by the fee or charge.

[2]See June 27, 2003 letter to Mr. Habte-Mariam T. Kifle, California Regional Water Quality Control Board, San Francisco Bay Region, from Robert Davidson, San Mateo Countywide Stormwater Pollution Prevention Program and July 30, 2003 letter to Ms. Jan O'Hara, California Regional Water Quality Control Board, San Francisco Bay Region, from Adam Olivieri, Santa Clara Valley Urban Runoff Pollution Prevention Program.

cc: Jim Scanlin, ACCWP
Kevin Cullen, FSURMP
Matt Fabry, SMCWPPP
Lance Barnett, VSFCD
Terri Fashing, MCSTOPPP
Kevin Booker, SCWA
Adam Olivieri, SCVURPPP
Jon Konnan, BASMAA PCBs Representative
Geoff Brosseau, BASMAA Executive Director
Tom Mumley, SFBRWQCB
Bruce Wolfe, SFBRWQCB
Mike Connor, SFEI

Bay Area Clean Water Agencies

Leading the Way to Protect Our Bay
A Joint Powers Public Agency

P.O. Box 24055, MS 702
Oakland, California 94623

January 22, 2008

Ms. Naomi Feger
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

SUBJECT: Comments on Proposed Basin Plan Amendment and Supporting Staff Report Incorporating a TMDL for PCBs in All Segments of San Francisco Bay

Dear Ms. Feger:

The Bay Area Clean Water Agencies (BACWA) appreciates the opportunity to provide comments to the San Francisco Bay Regional Water Quality Control Board (Water Board) regarding the proposed polychlorinated-biphenyls (PCBs)-related TMDL Basin Plan amendment. Our comments pertain to the proposed requirements for municipal wastewater dischargers. Specifically, BACWA has serious concerns about the aggregate allocation to municipal dischargers, the allocations to individual municipal dischargers, and the clarity of the language regarding implementation of these requirements for municipal wastewater dischargers that are specified in the Basin Plan Amendment. NPDES permit language in the previous TMDL included an NPDES permit limit of 0.5 μg/L as part of the implementation plan for the TMDL. The current version replaces that number with municipal discharger current performance. BACWA is concerned that this change results in a different perspective of the individual waste load allocations to municipal dischargers contained in the TMDL. Our comments regarding these issues are discussed below.

WASTE LOAD ALLOCATIONS

The December 2007 Basin Plan Amendment for the PCB TMDL includes a waste load allocation (WLA) for municipal wastewater dischargers of 2 kg/year in Table A-2. However, the estimated aggregate loading from municipal dischargers based on 2003 flow data is 2.3 kg/yr (Table A-1). Table A-3 further divides this WLA into waste load allocations for individual dischargers. The proposed allocations are based on a very limited data set, as acknowledged by Water Board staff on page 78 of the December 2007 Staff report. BACWA believes that the analytical data set is inadequate to establish either the proposed total waste load allocation or individual waste load allocations due to the great uncertainty associated with the available concentration data.
The proposed individual allocations were developed based on PCB effluent concentration data for select dischargers as presented in the PCBs TMDL Project Report (December, 2003). Data was collected from four (4) dischargers with advanced secondary treatment and five (5) dischargers with secondary treatment. Two to four samples were analyzed for each the selected

dischargers. A total of fourteen (14) samples were collected over a nine (9) month period to characterize PCB effluent levels for advanced secondary treatment in 1999-2000 and a total of nine (9) samples were collected over a three (3) month period in 2000-2001 to characterize PCB effluent levels for secondary treatment. No data is available to characterize the remaining 31 water treatment facilities listed in Table A-3 of the proposed Basin Plan amendment.

By contrast, characterization of mercury effluent levels for the Mercury TMDL, which contains a group allocation and conditional individual waste load allocations, was based on a minimum of twelve (12) high quality data points collected for **each** major discharger over a one year timeframe or greater. In many cases, the mercury data was much more robust and representative of current treatment performance. This level of effort equates to over 600 data points from municipal dischargers by which the waste load allocations were developed versus the 23 for this PCB TMDL – or about 4% of the data used for mercury. This PCB data set is statistically irrelevant and it is simply not representative or responsible to use as a basis for Waste Load Allocations and probable compliance determinations.

In addition to the limited data, it should be noted that the analytical methods used were quite different for the advanced secondary and the secondary treatment plant characterizations. The PCB analysis for the four advanced secondary treatment plants was part of a special SFEI research study with the objectives of analyzing trace organics in effluent using ultra low-level analytical techniques and to 'assess sources of variation in the results from three different laboratories'.[1] In that study, a pre-concentration of large volume effluent samples (using sample volumes ranging from 130 to 400 liters) was required. One laboratory used a gas chromatographic separation with high resolution mass spectrometry (GC-HRMS) method. The other two laboratories used gas chromatographic separations followed by electron-capture detection (GC-ECD) methods. The analytical methods were different from and pre-dated the current proposed USEPA Method 1668 and were not EPA approved methods for compliance determinations. The results from the three analytical laboratories used were averaged to come up with the values presented in the Staff report for PCBs. It is not known whether these results are representative of current long term average performance of these four POTWs, nor how the results would compare with proposed USEPA Method 1668 results. Similarly, these technical arguments hold true for the concentration data measured for the secondary treatment plants.

BACWA Cannot Support Either the Aggregate WLA for Wastewater Or the Individual WLAs for Each POTWs at this Time

In summary, BACWA strongly agrees with the conclusions stated in the Staff Report that individual allocations do not accurately represent the actual performance of individual dischargers due to the very limited data set that is currently available. BACWA requests that the

[1] San Francisco Estuary Institute, 2001. South Bay/Fairfield-Suisun Trace Organic Contaminants in Effluent Study. March 28,2001.

Basin Plan amendment language be amended to technically qualify that the aggregate loading for Municipal Wastewater is:

1. an estimate based on the limited concentration data presently available;
2. that the aggregate waste load allocation for POTWs be based upon this estimate while adequate technical information is collected, and
3. that the table of individual allocations be eliminated from the TMDL, due to severe data inadequacies which do not provide a path for calculating these individual WLAs with any degree of confidence.

NPDES PERMIT REQUIREMENTS RESULTING FROM TMDL

In the Implementation Plan section of the Basin Plan Amendment on p. A-10, it is stated that the WLA for Municipal and Industrial Dischargers will be implemented through NPDES permits. Furthermore, the staff report contains language to qualify the use of the waste load allocation for municipal wastewater dischargers in NPDES permits. BACWA requests that the implementation language from the Staff Report be fully incorporated into the Basin Plan amendment language under "**Implementation Plan,** Municipal and Industrial Wastewater Dischargers", as follows:

- Waste load allocations shall be implemented through NPDES permits that require Best Management Practices (BMPs) to maintain optimum treatment performance for solids removal and the identification and management of controllable sources of PCBs in the service areas of individual POTWs. Ongoing attainment of suspended solids effluent limits provides a surrogate indicator of PCBs control by municipal treatment systems.
- Effluent limits in NPDES permits shall be based on current performance. However, it is not feasible to calculate such limits at this time based on data limitations. Similarly, implementation of individual waste load allocations as effluent limits is not feasible at this time.
- NPDES permits shall require municipal dischargers to collect data to characterize current performance levels. Such monitoring is complicated by the lack of a USEPA approved low detection level analytical method. Monitoring should be performed pending approval of such a method by USEPA.
- Compliance with effluent limits in NPDES permits shall be determined using USEPA Method 608 until other methods are approved in accordance with the regulatory analytical procedures promulgated under 40 CFR 136. The level of quantification for Method 608 is 0.5 μg/L.

BACWA believes Regional Water Board staff's review of the recently adopted PCB TMDL for the Tidal Potomac[2] will provide additional regulatory support for the approach being requested.

---

[2] USEPA, Region III, 2007. Decision Rationale Total Maximum Daily Loads For Polychlorinated Biphenyls (PCBs) Tidal Potomac & Anacostia River Watershed in the District of Columbia, Maryland, and Virginia. October 31, 2007.

This EPA approved TMDL takes a similar BMP-based approach for implementing a PCB TMDL in Wastewater NPDES permits. The Potomac approach is intended to be based on additional data collection and BMPs and relies on EPA's NPDES regulations at 40 CFR 122.44(k) that allow permits to use non-numeric, BMP-based WQBELs under certain conditions. This regulation states that BMP-based WQBELs can be used where "Numeric effluent limitations are infeasible; or the practices are reasonably necessary to achieve effluent limitations and standards or to carry out the purposes and intent of the CWA".

Risk Reduction Management Changes Should be Deleted

BACWA does not agree with the changes to the section on Risk Reduction Management (page A-13) of the Basin Plan Amendment. BACWA believes that the requirement for Risk Reduction should be consistent with the Mercury TMDL so that there is no question that these are not two different programs. Risk Reduction management is not a discharger's responsibility, rather a responsibility of all resource management and protection agencies and especially the State of California whose policies, programs and projects have contributed to the San Francisco Bay fisheries concerns. As with the Mercury TMDL, BACWA recommends that TMDL participants work with resources agencies and SFEI to establish a new regional approach toward risk reduction. We fully believe that this program should reside at SFEI because it is critical that such a program be based on the most current scientific and social science information; and that it be governed by a cross section of interested parties (dischargers; dredgers; regulators, resource management agencies and NGOs). The addition of the new language in bullet number four is pre-determining what the scientific and communication team at SFEI will recommend for this program and it makes this Risk Reduction program appear to be new and different from the one required by the Mercury TMDL. We request that this new language be deleted from the Basin Plan amendment so that the regional interested parties can determine the best approach to this program.

Thank you again for the opportunity to comment on the proposed PCB Basin Plan amendment and staff report. We look forward to reviewing any additional drafts and the final proposed documents.

Yours Truly,

Michele Pla
Executive Director

C: Tom Mumley
BACWA Board
BACWA Permit Committee Chair

SFPUC
WATER
WASTEWATER
POWER

SAN FRANCISCO PUBLIC UTILITIES COMMISSION

1155 Market St., 11th Floor, San Francisco, CA 94103 • Tel. (415) 554-3155 • Fax (415) 554-3161 • TTY (415) 554.3488

January 22, 2008

Ms. Naomi Feger
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612
By: email - nfeger@waterboards.ca.gov

SUBJECT: Comments on Proposed Basin Plan Amendment and Supporting Staff Report Incorporating a TMDL for PCBs in All Segments of San Francisco Bay

Dear Ms. Feger:

The City and County of San Francisco Public Utilities Commission (PUC) appreciates the opportunity to comment on the December 03, 2007 revised Proposed Basin Plan Amendment for the San Francisco Bay PCB TMDL. We understand that these comments are to address economic issues and changes from the June 2007 draft.

We have several concerns:

1. *Need to correct reference to San Francisco facilities*. The footnote to Table A-5 should be modified to correctly address the facilities:

> c. Does not account for treatment provided by San Francisco's combined sewer system. The treatment provided by the City and County of San Francisco's Southeast Plant <u>and combined sewer control facilities</u> (NPDES permit CA0037664) will be credited toward meeting the allocation and load reduction.

Wet weather treatment, which removes particulates and associated PCBs, is also provided by the North Point Wet Weather Facility and the Storage/Transport Facilities.

2. *Inappropriate use of limited data on POTW performance*. We are concerned that changes made in the December 2007 revision of the proposed PCB TMDL use limited and insufficient data from a few facilities to estimate current performance by municipal wastewater agencies and to determine allocations. Table A-3 of the proposed PCB TMDL lists individual wasteload allocations for municipal wastewater dischargers within Region 2. These individual allocations are calculated from the averages of as few as fourteen samples from advanced secondary treatment facilities and as few as nine samples from secondary treatment facilities.

   The high degree of variation among these few data points makes the determination of averages for the wasteload allocations completely inappropriate from a statistical perspective. San Francisco was one of the municipal wastewater treatment plants that participated in the study. Given the very few data points collected from our facility, we do not feel confident that our data adequately represent the concentrations of PCBs that would be measured in the Southeast Water Pollution Control Plant effluent.

We do not believe it is possible to translate averages from a handful of municipal dischargers into individual wasteload allocations for every San Francisco Bay Area POTW discharger. The previous version of the PCB TMDL included language that the NPDES permits implementing the TMDL would include an effluent limit of 0.5 μg/L. Why was this changed? (San Francisco also recommends that any effluent limit that is determined be established as a mass limit rather than a concentration limit).

The text establishing a standard effluent limit was deleted and replaced with text stating that NPDES permits shall include effluent limits based on current performance. Unfortunately, enough data points are simply not available to establish current performance. Without any other information in the PCB TMDL, we have concerns that the wasteload allocations in Table A-3 will default to current performance. The San Francisco PUC recommends that Table A-3 be deleted as having no basis, or otherwise be explicitly qualified as not being representative of current performance for municipal wastewater dischargers.

3. *POTWs to address PCBs by optimizing treatment.* Given that PCBS are legacy pollutants, San Francisco strongly supports the implementation of the PCB TMDL through best management practices of maintaining optimal treatment performance for solids removal.

4. *Consolidation of stormwater and wastewater alloca*tions. The TMDL assumes that stormwater is a significant contributor of PCB pollutants to San Francisco Bay, because of legacy hotspots. Consequently, San Francisco PUC recommends that for this PCB TMDL and for future TMDLs developed, wasteload allocations established for San Francisco should allow the stormwater and wastewater wasteload allocations to be combined to be met collectively by the wastewater and stormwater effluent loads. This may require that a footnote be added to Table A-5 stating: "*For San Francisco's combined stormwater and wastewater system, stormwater and wastewater wasteload allocations can be combined and met collectively*."

5. *Actions required for each discharge category.* On page A-9 the new version of the Amendment states that "The plan will be implemented in phases via an adaptive implementation strategy founded on requiring actions in each category based on the current state of knowledge of PCBs sources . . ." If POTWs are already achieving the optimum removal, we do not see the need for additional measures, which may not be cost-effective and may decrease the amount of funds available for higher

priority pollution control efforts. Prior to requiring control efforts (including source control and studies), there needs to be a demonstrated problem, i.e., the source being addressed must be a significant source and the expected result must be a significant reduction in loading.

6. *Obligations of POTWs*. If POTWs are not a significant original or current source of PCBs, why are they being targeted for paying for educational efforts, studies, etc. We believe the manufacturers and users of PCBs should bear these costs. (See page A-10)

7. *Deletion of list of stormwater compliance options*. San Francisco does have small areas of separate sewers which will need to comply with the TMDL's stormwater provisions. This version of the amendment has deleted the list of compliance options on pageA-11. This list provided useful options and helped discharges assess the alternatives for compliance.

In addition to these comments, the San Francisco PUC supports comments made by the Bay Area Clean Water Agencies, of which San Francisco is a principal member. Thank you very much for your consideration of these comments. If you have any questions please call me at 415 934-5731.

Sincerely,

Arleen Navarret
Regulatory Manager

BARG
COFFIN
LEWIS &
TRAPP
ATTORNEYS
LLP

350 California Street
22nd Floor
San Francisco, CA
94104-1435
tel 415 228 5400
fax 415 228 5450
www.bcltlaw.com

January 22, 2008

Via Facsimile (510-622-2460) and Email (nfeger@waterboards.ca.gov)

Naomi Feger
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612
510.622.2328 (ph.)
510.622.2460 (fax)

Re: EBMUD Comments on PCB TMDL

Dear Ms. Feger:

East Bay Municipal Utility District ("EBMUD") hereby submits the following comments concerning the December 3, 2007 Total Maximum Daily Load for PCBs in San Francisco Bay, Proposed Basin Plan Amendment and Staff Report.

EBMUD supports the four key elements of the proposed Basin Plan Amendment's approach to controlling PCB discharges from municipal wastewater dischargers ("POTWs"), as reflected in the following language from page A-10 of the current draft of the Amendment:

> "Wasteload allocations shall be implemented through NPDES permits that require [1] implementation of best management practices to maintain optimum treatment performance for solids removal and [2] the identification and management of controllable sources. ... In addition, municipal ... wastewater dischargers will be required [3] to support actions to reduce the health risks of people who eat PCBs-contaminated, San Francisco Bay fish and [4] to conduct or cause to be conducted monitoring, and studies to fill critical data needs identified in the adaptive implementation section."

There are, however, other elements of the proposed Amendment and Staff Report that should be changed. Some of those elements are addressed in a comment letter being submitted contemporaneously by Bay Area Clean Water Agencies ("BACWA"), of which EBMUD is a member. EBMUD agrees with and incorporates here by this reference BACWA's comments and writes separately to emphasize the following points.

1. **Available data are inadequate to support the Staff Report's 2.3 kg/yr estimate of POTWs' annual PCB loading to the Bay.**

According to the Staff Report (pp. 44, 46), the 2.3 kg/yr estimate is based on 23 data points, including nine data points from five secondary treatment POTWs and 14 data points from four advanced treatment POTWs. These data are insufficient to support the estimate for several reasons. First, the data were collected using a low-level analytical method that even pre-dated method 1668, which is not itself a method approved and promulgated under 40 CFR 136 (see Staff Report p. 78). Further, the Staff Report recognizes that:

- such analysis "can have poor precision" (p. 20);
- POTW treatment "system variability" necessitates "a substantial data set" (pp. 78);
- it is "difficult to measure" a pollutant, such as PCBs here, "that is present at very low levels" (p. 78);
- the 23-point "data set was limited due to the technical difficulty and associated costs of measuring very low concentrations of PCBs in wastewater" (p. 78); and
- "the daily, monthly, and even annual variability of PCBs in wastewater is unknown" (p. 78).

2. **The proposed categorical load allocation of 2.0 kg/yr for the POTW source category is improper.**

Even if the 2.3 kg/yr estimate of current POTW loading were supported by adequate data, which it is not, the proposed 2.0 kg/yr categorical load allocation for the POTW source category would be improper. The Staff Report states:

- "Wasteload allocations for municipal and industrial wastewater discharges reflect current PCBs loads" (p. 78);
- "the proposed individual wasteload allocations for municipal wastewater dischargers reflect current performance levels" (pp. 71-72); and
- "Effluent limits in NPDES permits will be based on current performance" (p. 78).

(See also, Amendment p. A-10.) EBMUD agrees that POTW waste load allocations and permit limits should be based on current performance. Therefore, if 2.3 kg/yr were the correct estimate of current POTW loading, which is very much uncertain, then the categorical load allocation for the POTW source category should also be 2.3 kg/yr, rather than 2.0.

Moreover, the Staff Report's only explanation (p. 71) regarding the difference between the 2.3 and 2.0 figures is that the latter represents the former rounded down to the nearest whole number. No explanation is given as to why this rounding was performed, what statistical justification there might be for it, or how it could be consistent with the stated goal of basing wasteload allocations on current performance. Further, no other figure in the entire Staff Report or Amendment was subjected to such rounding. For all of these reasons, the rounding was improper, and if the data are developed at some point to justify the 2.3 kg/yr loading estimate, the categorical load allocation should be set equal to the same figure.

3. The waste load allocation of 0.3 kg/yr for EBMUD is improper.

As noted above, the Staff Report repeatedly states that wasteload allocations for POTWs should be set equal to "current PCBs loads" (p. 78), i.e., they should "reflect current performance levels" (p. 72). EBMUD agrees. Yet Staff Report Table 17 and Amendment Table A-3 list EBMUD's wasteload allocation as 0.3 kg/yr, approximately 42% of the best estimate of EBMUD's current performance – 0.72 kg/yr – based on available data. By contrast, other POTWs were given wasteload allocations of over 1000% of their estimated current performance. It is unclear what method was used to calculate the individual POTW wasteload allocations. The best estimate of current performance is the product of known flow volumes and the best (though, due to data inadequacies discussed above, imperfect) available estimates of PCB concentrations (see BACWA's comment letter), yielding the following:

Permit Holder	Annual Flow (MGD)	Estimated PCB Conc (pg/L)	Estimated Current Perf (kg/yr)
American Canyon	0.72	208	0.00021
Angel Island State Park (CDPR)	0.01	3459	4.8E-05
Benicia, City of	2.9	3459	0.0139
Burlingame, City of	4.3	3459	0.02055
Calistoga, City of	0.72	3459	0.00344
Central Contra Costa Sanitary District	45	1250	0.078
Central Marin Sanitation Agency	11	3459	0.05257
Delta Diablo Sanitation District	13	3459	0.06212
East Bay Dischargers Authority (EBDA)	77	4218	0.4487
East Bay Municipal Utilities District (EBMUD)	77	6783	0.72156
East Brother Light Station	0.00025	3459	1.2E-06
Fairfield-Suisun Sewer District	17	191	0.00449
Las Gallinas Valley Sanitary District	3.6	3459	0.0172
Marin County Sanitary District	0.72	3459	0.00344
Millbrae, City of	2.2	2576	0.00783
Mountain View Sanitary District	2.2	208	0.00063
Napa Sanitation District	12	3459	0.05734

Permit Holder	Annual Flow (MGD)	Estimated PCB Conc (pg/L)	Estimated Current Perf (kg/yr)
Novato Sanitary District	5.8	3459	0.02772
Palo Alto, City of	27	294	0.01097
Petaluma, City of	5.8	3459	0.02772
Pinole, City of, and Hercules, City of	2.9	3459	0.0139
Port Costa Wastewater Treatment Plant	0.03	3459	0.00014
Rodeo Sanitary District	0.72	3459	0.00344
Saint Helena, City of	0.36	3459	0.00172
San Francisco International Airport	0.72	3459	0.00344
San Francisco, City and County of, Southeast Plant	79	2470	0.26958
San Jose/Santa Clara WPCP	119	179	0.02943
San Mateo, City of	14	3459	0.0669
Sausalito-Marin City Sanitary District	1.45	3459	0.00693
Seafirth Estate	0.003	3459	1.4E-05
Sewerage Agency of Southern Marin	3.6	3459	0.0172
Sonoma Valley Sanitary District	3.6	3459	0.0172
South Bayside System Authority	20	3459	0.09557
South San Francisco/San Bruno WQCP	10	3459	0.04779
Sunnyvale, City of	16	167	0.00369
Treasure Island WWTP	0.72	3459	0.00344
Vallejo Sanitation & Floor Control District	15	3459	0.07168
West County/Richmond	17	3459	0.08124
Yountville, Town of	0.36	3459	0.00172
Totals	**612**		**2.3**

4. The proposed Basin Plan Amendment should be modified to clarify that performance-based effluent limits in NPDES permits should use TSS until it is feasible to use PCBs.

The Amendment states (p. A-10), POTW "NPDES permits shall include effluent limits based on current performance …." The Amendment does not specify, however, what measure of current performance should be used. Noting that calculating PCB effluent "limits is not feasible at this time," the Staff Report (p. 78) concludes:

> "The primary PCBs treatment mechanism is solids removal, and as such, ongoing attainment of suspended solids effluent limits provides a surrogate indicator of PCBs control."

Therefore, the Amendment (p. A-10) should be clarified to provide, POTW "NPDES permits shall include effluent limits based on current performance, with TSS being used as a surrogate for PCBs until such time as it is feasible to use PCBs."

* * *

EBMUD appreciates the opportunity to submit these comments. If you or your colleagues have any questions, please do not hesitate to contact the undersigned.

Very truly yours,

Brian S. Haughton

BSH/efp

BAYKEEPER.
Defending Our Waters—from the High Sierra to the Golden Gate

CLEAN WATER ACTION
Our Water, Our Health, Our Future

COMMUNITIES FOR A BETTER ENVIRONMENT

January 22, 2008

California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Suite 1400
Oakland, CA 94612

Sent via electronic mail to nfeger@waterboards.ca.gov

RE: Proposed Basin Plan Amendment Establishing a Total Maximum Daily Load for PCBs in the San Francisco Bay

Dear Members of the Regional Board:

On behalf of San Francisco Baykeeper, Communities for A Better Environment, Clean Water Action, Friends of Five Creeks, and our thousands of Bay Area members, we submit these comments on the proposed Basin Plan Amendment ("BPA") incorporating a Total Maximum Daily Load ("TMDL") for Polychlorinated Biphenyls ("PCBs") in San Francisco Bay. While we support the San Francisco Bay Regional Water Quality Control Board's ("Regional Board") efforts to complete an overdue TMDL for PCBs, significant changes must be made to the BPA and accompanying staff report to ensure that this TMDL and implementation plan are based on sound legal and policy principles.

We believe that there is an urgent need to address all bioaccumulative contaminants in the Bay, including PCBs, through aggressive reductions from all sources given the severity of the pollution, the legal ramifications of not bringing the waterbody into compliance in a timely manner, and most importantly, the serious threat these chemicals pose to people who regularly consume Bay fish. We are disappointed that the issues we have raised and improvements we have suggested throughout the development of this plan have not been addressed, making the public input process little more than a bureaucratic exercise without substance.

While we recognize the challenges inherent in developing a TMDL for historic pollutants, many PCBs sources are controllable. Every effort should be made to abate even the relatively small sources as, according to the authors of the model upon which the TMDL is

WATERKEEPER ALLIANCE FOUNDING MEMBER
Pollution hotline: 1-800 KEEP BAY
www.baykeeper.org
785 Market Street, Suite 850
San Francisco, CA 94103
Tel (415) 856-0444
Fax (415) 856-0443

based, **even relatively small PCBs inputs to the Bay will significantly delay recovery**.[1] Frustratingly, this TMDL contains many of the same flaws as the mercury TMDL adopted by this Regional Board in 2004 and remanded by the State Water Resources Control Board ("State Board") in 2005. It is unreasonably vague with respect to implementation, fails to require wastewater load reductions, relies on natural attenuation for significant reductions, and will not result in attainment of water quality standards for **more than 100 years.** By approving a series of vague cleanup plans for bioaccumulative pollutants, the Regional Board is essentially allowing the status quo of Bay pollution for another century and once again risks delays in adoption and implementation.

To ensure that this TMDL results in tangible and meaningful reductions in PCBs loading and complies with all applicable legal requirements, we ask that the Regional Board carefully consider and address the concerns raised in this comment letter, as well as the letters we submitted on August 17, 2007 and on February 20, 2004. Specifically, the following crucial issues remain and must be addressed prior to adoption of this TMDL:

- The fish tissue target is insufficiently protective because it fails to use appropriately conservative assumptions.
- The more than century-long timeframe for attainment of water quality objectives is unreasonable.
- The sediment target, necessary for ensuring attainment of the fish tissue target, was removed without any scientific or policy rationale.
- The TMDL and implementation plan violate federal law by failing to provide reasonable assurances that nonpoint source controls and natural attenuation will result in attainment of load allocations.
- The TMDL and implementation plan lack sufficient detail regarding implementation of storm water reductions.
- The TMDL erroneously and improperly restricts effluent limits in storm water permits to those based on the maximum extent practicable standard.
- The TMDL fails to require reductions in wastewater loading and inappropriately provides that permit limits will be based on current performance only.
- The TMDL fails to assign load allocations for in-Bay hotspots, erosion and dredging as required by law.
- The implementation plan lacks a schedule for clean-up of in-Bay contaminated sites.
- The implicit margin of safety is inadequate because the TMDL fails to quantitatively describe how the TMDL assumptions account for uncertainty in .
- The BPA and staff report describe a phased TMDL approach but the BPA does not identify a schedule for revising the TMDL based on model refinements and fulfillment of critical data needs.

---

[1] J.A. Davis. The Long Term Fate of PCBs in San Francisco Bay. RMP Technical Report: SFEI Contribution 47. San Francisco Estuary Institute, Oakland, CA, p. 25 ("Davis 2003").

A. FISH TISSUE TARGET

The target does not adequately implement all applicable water quality standards and is not sufficiently protective of all populations.

A TMDL and associated wasteload and load allocations must be set at levels necessary to result in attainment of all applicable water quality standards, including designated beneficial uses, narrative water quality objectives, numeric water quality objectives, and State anti-degradation policies.[2] It is unclear, however, whether the fish tissue target implements the California Toxics Rule's ("CTR") criterion for protection of human health for consumption of organisms (170 pg/L)[3] because the fish tissue target is assumes a higher risk level than the CTR. More importantly, we strongly believe that the assumptions relied upon by the Regional Board in calculating the fish tissue target are not sufficiently conservative. Currently, the 10 ng/ g target does not adequately take into consideration actual fish consumption rates in subsistence fishing communities and the cancer risk that high levels of consumption pose considering the potential cumulative impacts of other carcinogens present in Bay fish.

The fish tissue target for this TMDL was calculated using a risk level of 10^{-5} and a Bay-specific fish consumption rate of 32 grams per day. While EPA recognizes as acceptable fish screening values based on a risk level ranging from 10^{-4} to 10^{-6}, we do not understand (and the staff report does not explain) why the Regional Board has chosen a "middle of the road" approach in terms of the risk level, especially considering the high rates of subsistence fishing in the watershed. While we recognize that staff based this calculation on a SFEI fish consumption report, it must be recognized that such studies are limited due to the difficulty in identifying subsistence fishers, their sometime reluctance to describe their reliance on the Bay for basic nutrition, and determining the consumption rates of the more vulnerable members of the communities such as pregnant women and children.

In fact, a subsequent study showed subsistence consumption rates can be as high as 100-450 g/day of Bay-caught fish. [4] This demonstrates the need to accept that there is always a high degree of uncertainty related to real world fish consumption rates and the need to be especially conservative when establishing a rate on which to base goals and strategies in the TMDL. So, while the 32 g/ day consumption rate used in calculating the fish tissue target is more conservative than that used by EPA in calculating the CTR criterion, it is still lower

[2] 40 CFR 130.7(c)(1).
[3] 40 C.F.R. §131.38; Water Quality Control Plan for the San Francisco Bay Basin § 3.3.2.
[4] APEN, 1998, "A Seafood Consumption Survey of the Laotian Community of West Contra Costa County, CA." Asian Pacific Environmental Network, Oakland, CA.

than the rate of consumption of many subsistence anglers. Failure to account for real world consumption by subsistence anglers, who are predominantly low income people and people of color, perpetuates environmental injustice.

Not only do we question the use of a 10^{-5} risk level, we note that both EPA and one peer reviewer also expressed concern about the calculation of the fish tissue target based on this risk level. Dr. David Carpenter noted that the risk level does not account for the increase in cancer risk attributable to the other contaminants—such as PBDEs, dioxins, and DDT—also found in white croaker and shiner surfperch. EPA's concern is that the fish tissue target is twice as high as the fish tissue target calculated using the CTR criterion of 170 pg/L, which assumes a lower fish consumption rate but also defines as acceptable the lower 10^{-6} cancer rate. Even if Bay specific bioaccumulation factors could account for the discrepancy, the Regional Board has an obligation to the public to select a fish tissue target that will provide the most at-risk populations with the most protection.

Recommendation: The Regional Board must prioritize protecting the health and safety of those most at risk from consuming Bay fish, especially within subsistence fishing communities. Consequently the Board should take a more protective approach and calculate the fish tissue target using more conservative assumptions; i.e. a Bay area fish consumption rate of at least 32 grams per day and an acceptable increase in cancer rates of one in 1,000,000 (or 10^{-6}). This should result in a fish tissue target of at least 1.1 ng/g, which would provide a higher level of protection to the most at risk populations and ensure that the TMDL is calculated to implement the CTR criterion for the protection of human health.

B. TIMEFRAME FOR ATTAINMENT

The schedule for attainment of water quality standards is too long.

EPA policy requires that TMDL implementation plans "be sufficient to implement all wasteload and load allocations in a *reasonable* period of time," and that all TMDLs provide "reasonable assurances that wasteload allocations and load allocations will be implemented in a timely manner."[5] While neither the BPA nor the staff report explicitly state the timeframe in which implementation of this TMDL will result in attainment of water quality standards, our understanding of the mass budget model is that the TMDL will not result in achievement of the sediment "goal" until at least 2108. Actual reduction of PCB concentrations in fish tissue to safe levels is likely to take even longer because a decrease in sediment concentrations does not result in immediate decreases in fish tissue concentrations. Additionally, the century-long timeframe is conservative as it assumes an immediate 90% reduction in storm water loads, but the BPA allows storm water agencies at least twenty years to implement these reductions.

[5] U.S. EPA, Region IX, Guidance for Developing TMDLs in California, p. 11 (January 7, 2000) ("Cal. TMDL Guidance") (emphasis added).

A more than century-long timeframe for attainment is entirely unreasonable because the TMDL fails to require aggressive load reductions from all sources. The model on which the TMDL is based indicates that even small PCB inputs to the Bay will significantly delay declines over the long term,[6] but the TMDL fails to require reductions from all sources of PCBs. Wastewater dischargers are allowed to continue discharging at current levels, no actions will be required to reduce Central Valley loads, no schedule has been identified for remediation of in-Bay hotspots, and the twenty-year schedule for implementation of storm water discharges is likely to be extended.[7]

We understand the political challenges inherent in requiring public agencies and companies to implement potentially costly cleanup actions, but aggressive and immediate action is necessary to protect the health of the current and future generations of Bay residents. Certainly the public expects responsible parties, especially for-profit companies, to be held accountable by the Regional Board for their impacts on the watershed. By refusing to require reductions from all sources and to identify and require specific implementation actions this TMDL indicates a disregard for the impacts on our communities and a reluctance to do all that is possible to address them. In the meantime, PCBs and the host of other pollutants which are impairing the Bay will continue to threaten the health and safety of our communities.

Recommendation: The Regional Board should develop an implementation plan that results in attainment of the fish tissue target as soon as possible. The expected timeframe for attainment should be explicitly stated in the BPA, as well as an explanation of why this timeframe is reasonable.

C. SEDIMENT GOAL

The TMDL should include a sediment target, not a sediment goal.

In 2004, this Regional Board issued a draft PCBs TMDL staff report that included a sediment target.[8] Not only does this draft remove the target without offering any justification, it creates a fictional TMDL sediment "goal" and emphasizes that the goal cannot and should not be used in any meaningful regulatory way.[9] Removal of the sediment target is inappropriate and appears done solely to accommodate the very entities whose actions

[6] "With an annual PCB input of just 10 kg, it would take about 25 yr for concentrations to fall to 50% of present values …; it would take about 55 yr to fall to 25% (15 yr longer than with no input); and with continual annual inputs of this magnitude concentrations would never fall to the 90% benchmark. With annual inputs of 20 kg it would take 30 yr to reach the 50% benchmark, and concentrations would never fall below 25% of present concentrations. With annual inputs of 40 kg, concentrations would never fall below about 50% of present concentrations." Davis 2003 at p. 25.
[7] December 2007 Proposed Basin Plan Amendment at p. 14.
[8] San Francisco Bay Regional Water Quality Control Board, "PCBs San Francisco Bay Total Maximum Daily Load Project Report," p. 47 (January 8, 2004). ("2004 Staff Report")
[9] December 2007 Proposed Basin Plan Amendment at p. 14.

contributed significant amounts of PCBs to San Francisco Bay and waterbodies around the country. The result is that this TMDL excludes a valid way to measure success in bringing the Bay back into compliance and attempts to provide assurances to responsible parties that cleanup levels will not be as stringent as possible.

TMDL targets are numeric values for specific media that represents the TMDL's goals or endpoints.[10] They are used to quantitatively interpret applicable water quality standards when the standards are expressed in narrative terms or when a listing is based on impairment of beneficial uses.[11] The 2004 report makes it clear that a sediment target is a valuable tool in determining implementation of the TMDL and attainment of applicable standards.[12] As recognized repeatedly in the report, sediments are the largest environmental reservoir of PCBs in the Bay and **PCBs uptake by biota from sediment is "likely to be the most important pathway for PCBs bioaccumulation in fish."**[13] Sediment concentrations, therefore, are an ideal indicator of whether the TMDL's objectives are being achieved. Moreover, a sediment target is arguably more useful than a fish tissue target in determining TMDL effectiveness because decreases in sediment concentrations will be observable substantially before decreases in fish tissue concentrations. Considering the relationship between bioaccumulation and sediment concentrations, removal of the sediment target without any scientific or policy rationale is questionable.

We also object to the new BPA and staff report language emphasizing that the sediment goal is not a cleanup standard. Not only does the BPA stress that the sediment goal and fish tissue target are not cleanup standards, the BPA commits the Regional Board to affirmatively advising cleanup agencies that the fish tissue target and sediment goal do not constitute cleanup standards or appropriate, relevant, applicable requirements under Comprehensive Environmental Response, Compensation and Liability Act of 1980. We strongly question the rationale for this language as it appears at odds with the Regional Board's obligation to assist cleanup agencies in ensuring that cleanups proceed to levels that are protective of water quality.

Recommendation: The Regional Board should reinstate the sediment target and remove all language from the Basin Plan Amendment stating that the sediment goal and fish tissue target should not be used as cleanup standards.

D. Reasonable Assurance

The TMDL fails to provide reasonable assurances that nonpoint source controls and natural attenuation will result in required load reductions.

[10] *Id.*
[11] Cal. TMDL Guidance at p. 3.
[12] 2004 Staff Report at p. 46.
[13] *Id.*

Federal law and policy state that TMDLs must require point sources to bear the burden of all necessary load reductions unless the State can provide "reasonable assurance that nonpoint source controls will be implemented and maintained."[14] Where point sources—such as municipal and industrial wastewater dischargers—receive less stringent wasteload allocations because nonpoint source reductions are expected, the TMDL must include a demonstration that the nonpoint source controls are practicable and "reasonably assured of being implemented in a reasonable period of time."[15] Reasonable assurances must include an "actual demonstration that the measures identified will result in the predicted reductions and that the State is able to *assure* this result."[16] Assurances include "the application or utilization of local ordinances, grant conditions, or other enforcement authorities."[17]

In developing this TMDL, the Regional Board has assigned municipal and industrial wastewater permittees a wasteload allocation based on their current performance. As discussed in more detail below, this means that wastewater dischargers are not required to reduce their PCB discharges and will not be required to comply with water quality-based effluent limitations. **In place of wastewater load reductions, the TMDL assumes that load reductions will occur almost entirely through the use of nonpoint source controls and natural attenuation. The TMDL implementation plan, however, lacks any assurances that these load reductions will occur.**

The reductions attributable to natural attenuation of Central Valley loads and in-Bay sediments are based on relatively rudimentary calculations. The sole mechanism for reduction of loading from the Central Valley and in-Bay sediments is natural attenuation but the concept of natural attenuation as a bioremediation tool or as a solution to PCB contamination is not well established in existing literature. While laboratory studies provide some support for this assumption,[18] little evidence from field studies exists to support the notion that it is a predictable process. At least one recent study concluded that natural attenuation is site-specific and unlikely to result in uniform decreases in surface sediment concentrations.[19] Additionally, PCB congener half-lives in the water column are not well quantified so the half-life value (56 years) used in the mass budget model may not be reflective of actual degradation rates in the Bay. This half life value is from a model developed for Lake Ontario, and given the very significant differences between the two ecosystems, it stands to reason that this half-life may not be accurate for the Bay.

---

[14] *See* Cal. TMDL Guidance at p. 12; U.S. EPA, EPA440-4-91-001, Guidance for Water Quality-Based Decisions: The TMDL Process, ch. 3 at pp. 5-6, 1991 (available at http://www.epa.gov/OWOW/tmdl/decisions). ("EPA TMDL Guidance")
[15] Cal. TMDL Guidance at p. 10.
[16] *Id.*
[17] EPA TMDL Guidance, ch. 3.
[18] Master et al., 2002 E.R. Master, V.W.M. Lai, B. Kuipers, W.R. Cullen and W.W. Mohn, Sequential anaerobic–aerobic treatment of soil contaminated with Aroclor 1260, Environ. Sci. Technol. 36 (2002), pp. 100–103; Lambo, AJ; Patel, TR. 2007. Biodegradation of polychlorinated biphenyls in Aroclor 1232 and production of metabolites from 2,4,4'-trichlorobiphenyl at low temperature by psychrotolerant Hydrogenophaga sp. strain IA3-A Journal of Applied Microbiology. Vol. 102, no. 5: 1318-1329.
[19] Sivey, J.D. and C. M. Lee. 2007. Polychlorinated biphenyl contamination trends in Lake Hartwell, South Carolina (USA): Sediment recovery profiles spanning two decades . Chemosphere Volume 66 (10): 1821-1828.

The load reductions attributable to implementation of storm water controls are just as uncertain. The BPA and staff provide no assurances that (and contain no discussion of whether) the wasteload allocations for municipal sanitary sewer systems ("MS4s") are technically feasible or that the twenty-year timeframe for implementation is reasonable. The BPA even **expressly recognizes that the implementation plan for MS4s may be inadequate to achieve the required reductions and states that the assigned load reductions will be revised if allocations cannot be achieved**.[20] Moreover, as discussed below, the draft TMDL would require MS4s to control PCBs in stormwater to the maximum extent practicable ("MEP"), a standard which is not necessarily based on water quality considerations. Seeing that the TMDL is to be achieved primarily through reductions in storm water loading and through natural attenuation, the Regional Board's failure to offer reasonable assurances that those reductions can occur undermines the entire TMDL. The BPA and implementation plan should require aggressive reductions from wastewater and provide specific, detailed assurances that storm water reductions will occur within a reasonable timeframe.

Recommendation: The BPA and staff report must discuss, in detail, how the timeframe for implementation was selected and how the implementation plan will achieve the required load reductions. This discussion must include identification of specific actions that the Regional Board will take and/or require of others to ensure that the total maximum daily load of 10 kg/year will occur within a reasonable timeframe. We further recommend that the TMDL be revised to include interim wasteload allocations for storm water that will act as milestones to evaluate progress towards attainment of reductions.

E. STORM WATER

Reductions in loading from storm water are the keystone of this TMDL. The proposed BPA and staff report identify storm water as the greatest source of external loading to San Francisco Bay and assign it the greatest load reductions. The TMDL and implementation plan, however, do not describe a specific strategy to ensure these reductions will be realized. In fact, they actually hinder success by not requiring permitees to go beyond the minimum level of effort required by federal law and by failing to provide assurances that monitoring will be sufficient to demonstrate the required load reductions.

The TMDL implementation plan needs more detail regarding implementation of storm water load reductions.

We appreciate the revisions made in attempt to clarify the schedule for implementing storm water controls through MS4 permits. We believe, however, that the level of detail in the BPA and the implementation plan is still lacking in necessary detail with respect to what actions storm water permittees and the Regional Board will undertake to ensure load reductions will occur. A 2006 publication by the Clean Estuary Project ("CEP report") identifies a number of specific actions that permitees and the Regional Board should consider in implementing this PCBs TMDL.[21] Identification of these actions and a Regional Board commitment to implementation—either through Regional Board action or storm water permits—is necessary to provide assurance that storm water load reductions will be achieved.

The report identifies several regulatory actions not mentioned in either the TMDL implementation plan or the draft municipal regional storm water permit recently issued by this Regional Board. Specifically, the report notes that municipalities have the legal authority to require property owners to take action to contain PCBs or clean up a site if the site has the potential to discharge PCB-contaminated storm water.[22] Many municipalities, however, have not established the necessary regulatory authority through adoption of ordinances or have not yet established the mechanisms and procedures needed to facilitate and oversee such actions. [23] The TMDL implementation plan, then, should state that all municipalities will be required to establish such authority before the end of the next permit cycle.

The Regional Board also has regulatory authority to investigate and abate on-land contaminated properties. It is unclear to us how the Regional Board plans to exercise this authority to assist municipalities and other agencies in identifying and abating sites. The implementation plan should outline a program for (1) using section 13267 requests for information to assist municipalities in gathering information about potentially contaminated sites, (2) tracking and prioritizing sites requiring remediation, (3) using Cleanup and Abatement and Cease and Desist Orders to clean up privately-owned sites, and (4) working with other regulatory agencies to ensure that on-land cleanups occur to a level and in a manner that does not frustrate TMDL implementation.

Another limitation of the TMDL, the draft municipal regional storm water permit, and current stormwater programs is that they do not require stormwater inspections of industrial facilities that are abandoned or no longer in operation. The implementation plan should require permitees to expand their industrial inspections program to include inspections of inactive industrial sites[24] and a description of what will be done at such sites when PCBs pose a threat to Bay water quality. The TMDL should specify the regulatory actions the Water Board and permittees will take to ensure all sites which are potentially significant sources of PCBs (i.e., industrial sites active at any time from the 1940s through the early 1980s) will be identified, investigated, prioritized for sampling and inspection, and followed up with appropriate cleanup action.

---

[21] Clean Estuary Project, PCBs TMDL Implementation Plan Development, prepared by Larry Walker Associates; TDC Environmental, LLC; and Ann Blake, Ph.D (may 2006) ("CEP Report").
[22] CEP Report at pp. 47-48.
[23] *Id.*
[24] *See id.* at 26.

Finally, the TMDL implementation plan should describe screening guidelines (or commit the Regional Board to establishing screening guidelines) for implementing control or abatement measures for on-land sites.[25] The draft storm water permit requires permitees to qualitatively rank and map potential PCBs sources, confirm elevated levels by testing, and develop criteria for identifying areas for expedited abatement.

The Regional Board, not storm water agencies, should establish screening guidelines that are based on water quality considerations for several reasons. First, the Regional Board has the expertise to determine what factors should be considered in prioritizing sites for abatement action. Second, the development of screening guidelines will ensure consistency across storm water permittees in prioritizing and remediating sites. As discussed in the CEP report, potential screening values for identifying and prioritizing further action could be based on the upper percentile of values found in sediments from Bay Area urban land use or the Regional Board's own screening values for coarse and fine grain sediments.[26]

<u>Recommendation</u>: Revise the TMDL implementation section to require municipalities and the Regional Board to establish programs for investigating and abating on-land contaminated properties. The program should include inspections of inactive or abandoned sites, Regional Board-developed screening guidelines, and procedures for identifying contaminated sites and any necessary control actions.

Attainment of wasteload allocations for stormwater should be demonstrated using multiple methods.

In the most recent draft BPA and staff report, the requirement that MS4 permitees quantify load reductions using specific methods was removed. As currently drafted, the BPA merely requires storm water permitees to "develop and implement a monitoring system to quantify PCBs urban stormwater runoff loads and the load reductions achieved through treatment, source control and other actions."[27] Urban stormwater is by far the largest Bay Area source of PCBs and is responsible for the greatest reductions in loading. For the TMDL to be successful, therefore, loading from urban stormwater must be dramatically reduced and that reduction must be quantifiable and demonstrable.

The TMDL should provide a list of methods for quantifying the actual load of PCBs in runoff. The methods should produce results that are consistent and comparable among different permitees. This consistency will enable a more accurate determination of whether storm water load reductions are cumulatively progressing as expected by the TMDL

[25] CEP Report at p. 49.
[26] *Id.* Notably, the draft storm water permit suggests that guidelines may be based on California Human Health Screening Levels. These levels are an inappropriate basis for any guidelines as they do not take into account water quality considerations. In fact, guidelines on the use of Human Health Screening Values specifically notes that the value for PCBs is not protective of environmental health. California EPA, Use of California Human Health Screening Levels (CHHSLs) in Evaluation of Contaminated Properties, pp. 4-1 and Table 1 (January 2005).
[27] 2007 Proposed BPA at pp. 11-12.

implementation plan. Accurate quantification of loading is a key factor in predicting when or if the TMDL fish tissue target will be attained because it is the sole basis for determining whether load reductions are occurring as expected.

Recommendation**:** The multiple methods approach should be reinstated and stormwater agencies should be required to use all of the methods consistently to demonstrate progress towards achieving wasteload allocations.

The BPA inappropriately codifies the MEP and BAT standards.

The most basic purpose of a TMDL is to clean up a waterway that, despite imposition of all required technology and performance-based controls, fails to meet water quality standards.[28] To this end, a TMDL requires identification of wasteload allocations that, in conjunction with load allocations and taking into account background sources, will ensure attainment of water quality standards. The NPDES permits for a point source must be consistent with and based on that point source's wasteload allocation in the TMDL. Federal regulations emphasize this point, defining a wasteload allocation as "a type of water quality-based effluent limitation."[29]

The proposed TMDL paradoxically requires MS4 permittees to comply with wasteload allocations, i.e. water quality-based limitations, but states that MS4s will not be required to go beyond the feasibility-based maximum extent practicable ("MEP") standard.[30] MEP has not been defined by either the EPA or the State Board, but it suggests a level of effort that varies across municipalities and takes into account current financial considerations. EPA has identified MS4 size, current ability to finance a program, and current capacity to perform operation and maintenance as factors to be considered in determining MEP.[31] In another Clean Water Act context—that of discharges of dredge and fill—a practicable alternative is one that is available and capable of being done after taking into account cost, existing technologies, and logistics.[32]

As discussed in *Building Industry Association of San Diego County et al. v. State Water Resources Control Board et al.*, the State and Regional Boards have authority to go beyond the MEP standard and impose water quality-based conditions in MS4 permits.[33] In *BIA*, the Court reasoned that the legislative purpose underlying the Water Quality Act of 1987, and section 1342(p) in particular, reflects Congressional intent to provide EPA (or the regulatory agency of an approved state) with the discretion to require compliance with water quality

[28] *See* 33 USC 1313(d).
[29] 40 C.F.R. § 130.3(h).
[30] 2007 Proposed BPA at p. 10.
[31] *See* 64 Fed. Reg. 68722, 68754 (December 8, 1999)
[32] 40 C.F.R. § 230.10(a)(2).
[33] *Building Industry Assn. of San Diego County v. State Water Resources Control Bd.*, 124 Cal. App. 4th 866 (Cal. Ct. App. 2004).

standards in a municipal storm water permits.[34] Restricting permit conditions to the MEP standard is illogical as those standards are not intended to implement Bay-specific water quality standards. The language in the draft TMDL unnecessarily and inappropriately restricts the Regional Board's ability to impose conditions that go above and beyond MEP but that which may be necessary to implement the wasteload allocations in the TMDL.

Recommendation: The TMDL should state that stormwater permits shall contain requirements based on MEP and any more stringent requirements necessary to implement the wasteload allocations in the TMDL. This change will ensure that the Regional Board retains its ability to include in permits more stringent requirements should they be necessary to implement the TMDL and achieve water quality standards.

F. WASTEWATER

Permits for wastewater dischargers should contain numeric effluent limits based on water quality, not current performance.

We strongly recommend that this Regional Board not adopt a TMDL that fails to require any reductions in loading from wastewater. Unlike the mercury TMDL context, municipal wastewater is a significant source of PCBs loading as compared to other sources. It currently comprises an estimated 7% of total loading and, after implementation of the TMDL, will comprise 20% of total loading. Despite the fact that wastewater is a significant source of PCBs, the TMDL does not require any reductions in loading and provides that effluent limits will be based on current performance.

Federal regulations require that all NPDES permits contain effluent limitations for pollutants which "are or may be discharged at a level which will cause, have the reasonable potential to cause, or contribute to an excursion above any State water quality standard, *including State narrative criteria for water quality*."[35] The sole exception to this requirement is when effluent limits are "consistent with the assumptions and requirements of any available wasteload allocation for the discharge prepared by the State and approved by EPA" as part of a TMDL.[36] As discussed above, however, when point sources receive less stringent wasteload allocations because nonpoint source reductions are expected, the TMDL must provide reasonable assurance that those nonpoint source reductions will occur.[37]

Any wastewater permit issued by this Regional board must contain water-quality based effluent limits that will be more stringent than current performance. Any discharge

[34] *Id.* at 883. *See also* 55 Fed.Reg. 47990, 47994 (Nov. 16, 1990); *Defenders of Wildlife v. Browner* (9th Cir. 1999) 191 F.3d 1159, 1165-1167. *Building Industry v. Ass'n of San Diego Cty v. State Water Resources Control Board*, 124 Cal. App. 4th 866 (Cal. Ct. App. 2005); *City of Rancho Cucamonga v. Regional Water Quality Control Board, Santa Ana Region*, 153 Cal. App. 4th 1377 (Cal. Ct. App. 2006).
[35] 40 C.F.R. § 122.44(d)(1)(i) (emphasis added).
[36] 40 C.F.R. §122.44(d)(1)(vii).
[37] Cal TMDL Guidance at p. 10.

containing PCBs will cause or contribute to a violation of the Basin Plan's narrative bioaccumulation objective. Additionally, data collected on the PCBs concentrations in Bay area wastewater shows that most wastewater permitees discharge effluent with PCBs concentrations in excess of the CTR's 170 pg/L criterion for protection of human health from consumption of aquatic organisms,[38] and almost all in-Bay samples collected by the Regional Monitoring Program also exceeded the criterion.[39] **All wastewater discharges, therefore, have reasonable potential to cause or contribute to a violation of either the Basin Plan objective and/or the CTR criterion and must contain water quality-based effluent limits.**

Legally, because the TMDL fails to provide reasonable assurances that nonpoint source controls will result in attainment of the TMDL, all permits issued by this Regional Board must contain limits based on water quality and not current performance. More importantly, it is illogical from a policy perspective to not require reductions from a significant and controllable PCBs source. We hope that the Regional Board will learn from the mercury TMDL proceedings and ensure that wasteload allocations, and wastewater permit limits, reflect the most effective treatment methods and pollution prevention practices practicable.[40]

Permit limits should also be numeric. The most recent revisions to the proposed BPA removed a statement that the wasteload allocations would be implemented via numeric effluent limits. Numeric limits provide permittees with a clear objective and provides the regulatory community and the public with transparency in determining compliance. Without numeric effluent limits, it will be impossible to determine whether permitees' discharges are in compliance with numeric CTR water quality criteria or are consistent with the TMDL wasteload allocations.

It is important to note that many municipal permitees could come close to complying or even comply with an effluent limit based on the 170 pg/L CTR criterion if they invested in long-overdue treatment improvements. As is evident from the data in Tables 13 and 14 of the staff report, increased wastewater treatment dramatically decreases concentrations of PCBs in effluent.[41] These tables summarize data collected from five Bay Area treatment plants with secondary treatment and four with advanced treatment. The secondary treatment plants had PCBs concentrations ranging from 1,000 to 7,900 pg/L, whereas the advance treatment plant concentrations ranged from 120 to 320 pg/L. The technology exists to significantly decrease loading from municipal wastewater and facilitate compliance with water quality–based standards should the regulatory driver for these improvements exist.

---

[38] 2007 Staff Report at p. 46.
[39] *Id.* at p. 31.
[40] State Water Resources Control Board, Resolution No. 2005-0060 Remanding an Amendment to the Water Quality Control Plan for the San Francisco Bay Region to Incorporate a Total Maximum Daily Load for Mercury in San Francisco Bay (September 7, 2005).
[41] 2007 Staff Report p. 46.

Recommendation: The Regional Board must reduce wasteload allocations and include numeric water quality-based effluent limits in permits.

At a minimum, the TMDL should set wasteload allocations at a level that would require municipal and industrial point source dischargers to incorporate the most effective treatment methods and pollution prevention practices practicable for their discharges.

The wasteload allocation for wastewater must account for wet weather discharges.

As noted in our August 2007 comments, a clear relationship exists between PCBs concentration in wastewater effluent and increased treatment.[42] Most, if not all, Bay Area publicly-owned treatment works discharge untreated or partially treated wastewater in the form of sewer overflows, combined sewer overflows, and bypasses and blending events. The estimates of loading from municipal wastewater, however, fails to take into account loading from these frequent events.

Recommendation: In order to accurately estimate loading from municipal wastewater, the TMDL must consider PCBs loading from wet weather events and then assign load reductions accordingly.

The BPA should set a deadline for refinement of loading from wastewater using Method 1668A.

In our previous comments, we requested that the BPA and staff report require wastewater dischargers to quantify PCBs in their wastewater using EPA's method 1668A, which has a picograms per liter detection limit. Currently, the method used by most wastewater dischargers to determine compliance with effluent limitations has a method detection limit of 0.5µg/L. While the staff report requires quantification of loading using a method with a detection limit below 0.5µg/L, this requirement is not included in the BPA. Additionally, the staff report does not establish any deadlines for monitoring sufficient to refine the loading estimates.

Recommendation: The BPA should require permittees to generate sufficient data using Method 1668A to more accurately estimate wastewater loading within five years.

Compliance with effluent limits should be demonstrated using a method with a picograms per liter detection limit.

As stated in preceding section, most permitees have PCBs effluent concentrations of less than 0.5µg/L but use an analytical method that has a detection limit of 0.5µg/L to quantify PCBs in their effluent for compliance purposes. The BPA states that NPDES permits for wastewater dischargers will have effluent limits based on current performance (i.e. effluent limits less than 0.5µg/L), but that compliance with effluent limits shall be determined using a

[42] *Id.* at 46-47.

method that has a detection limit of more than 0.5µg/L. Illogically, this means that most permitees will never be in violation of their effluent limits because their sample results will always be non-detect, even if their effluent concentrations exceed their permit limits.

This approach is illegal. Our comments on many NPDES permits issued by this Regional Board have emphasized the illegality of a scheme wherein an effluent limitation is essentially replaced with a method detection limit. In *Waterkeepers Northern California v. State Water Resources Control Board*, the First Division of the California Court of Appeal agreed, holding that the State and Regional Boards lack authority to "frame effluent requirements to reflect the technological limits for detection in discharge samples."[43] To be consistent with applicable legal precedent, a method detection limit can be used only for purposes of reporting and the exercise of Regional Board enforcement discretion. It cannot be used to broadly determine compliance with an effluent limitation.

Recommendation: The BPA should be revised to state that compliance with numeric effluent limits will be determined using a method with a detection limit below the applicable effluent limit.

G. In-Bay Hotpots, Erosion & Dredging

The TMDL must include a load allocation for in-Bay hotspots, erosion, and dredging.

The TMDL must include load allocations for all sources, including Bay hotspots, erosion, and dredging. TMDLs are defined as the sum of individual wasteload allocations and load allocations.[44] Load allocations are "best estimates" of loading from all sources other than point sources, and include background sources.[45] In-Bay hotspots, erosion, and dredging are all sources of PCBs loading and therefore must be assigned load allocations, even if these allocations are merely estimates.

Identifying the current loading and load allocation for these sources may have a significant impact on TMDL implementation. In-Bay hotspots and dredging are believed to contribute substantially to localized impacts and PCBs mobilized from erosion of previously buried sediments may have an impact on fish tissue that is comparable to each of the two largest sources of loading, urban runoff and Central Valley inputs.[46] While we appreciate the challenges in calculating loading from these sources, federal law is clear that load allocations must be assigned to these sources.

---

[43] *Waterkeepers Northern California v. State Water Resources Control Bd.*, 102 Cal. App. 4th 1448, 1461 (Cal. Ct. App. 2002).
[44] 40 C.F.R. § 130.2(i).
[45] 40 C.F.R. § 130.2(g).
[46] Davis 2003 at pp. 28, 29.

Recommendation: The TMDL must include estimates for current loading and load allocations for in-Bay hotspots, dredging and erosion.

The TMDL must specify a timeframe for clean-up of in-Bay contaminated sites.

In-Bay contaminated sites are known to cause increased PCB bioaccumulation on a local scale and may have a disproportionately large influence on food web contamination because they tend to be present near the shoreline, an area that provides habitat for many sport-fish species.[47] Remediation of in-Bay hotspots is one of the few concrete and feasible implementation actions identified in the TMDL and staff report yet the TMDL does not establish a timeframe for prioritization or remediation of these hotspots.

Recommendation: The TMDL implementation plan should identify the information needed to finish prioritizing sites for remedial action, possibly using the food-web model to evaluate the potential local impacts due to high sediment concentrations. To drive timely action, the implementation plan should also identify a schedule for remediating sites.

H. CENTRAL VALLEY

Load reductions should not occur solely from natural attenuation.

The draft TMDL identifies the Central Valley as the second largest source of PCBs loading to the San Francisco Bay, yet neither the TMDL nor the staff report explain how the load allocation will be achieved other than through natural attenuation. As discussed above in the context of storm water, the TMDL must provide reasonable assurances that load reductions will occur[48] but natural attenuation is not yet well-understood.

Recommendation: In order to provide reasonable assurances that the Central Valley load allocation will be met, the TMDL and staff report should explicitly discuss the uncertainty in estimating load reductions from natural attenuation, identify specific critical data needs and specify a schedule for fulfilling those needs. The TMDL should also commit the Regional Board to working collaboratively with the Central Valley Regional Board to revise load estimates as necessary and to identify and reduce controllable sources of PCBs in the Central Valley.

I. MARGIN OF SAFETY

The implicit margin of safety is inadequate.

---

[47] J.A. Davis, F. Hetzel, J.J. Oram, L.J. McKee, Polychlorinated byphenyls (PCBs) in San Francisco Bay, *Environ. Research* 105: 67, 80 (April 2007).
[48] 40 C.F.R. § 130.2(i); 40 C.F.R. § 122.44(d).

TMDLs must include a margin of safety which takes into account any lack of knowledge concerning the relationship between pollutant discharges and water quality.[49] The margin of safety may be implicit or explicit.[50] Where the margin of safety is implicit, the TMDL must "include a specific discussion of sources of uncertainty in the analysis and how individual analytical assumptions or other provisions adequately account for these specific sources of uncertainty."[51]

The TMDL's discussion of the margin of safety is deficient for two reasons. First, it fails to discuss the various sources of uncertainty in the TMDL and explain how these sources are accounted for in the TMDL's implicit margin of safety. There is a great amount of uncertainty in the assumptions on which this TMDL is based: the current loading estimates are based on relatively little data and models that still need refinement. Nowhere in the TMDL or staff report, hwoever, does the Regional Board attempt to quantify this uncertainty or articulate how other assumptions in the TMDL mitigate it.

Second, none of the assumptions identified in the staff report can be relied upon as the basis for the margin of safety. As noted previously in these comments and by EPA, it is unclear whether the fish tissue target is conservative enough to implement CTR criterion or to protect the most vulnerable populations, including subsistence anglers. The other two cited bases are actually irrelevant to the margin of safety. Attainment of the fish tissue target during the summer relates to seasonality, which is a separate and distinct legal requirement. Similarly, reservation of 1 kg/year for treated urban storm water cannot be the bases for the margin of safety either because it is a future wasteload allocation and cannot be used as a kind of temporary explicit margin of safety.

Recommendation: The Regional Board should revise the TMDL to include an explicit margin of safety that mitigates the uncertainty in load estimates and allocations. Additional explanation of how the margin of safety quantitatively relates to uncertainty in the TMDL must be added to the staff report.

J. PHASED TMDL & ADAPTIVE IMPLEMENTATION

The Regional Board should specify a schedule for revising the TMDL based on model refinements and evaluating the implementation plan effectiveness.

A fundamental problem with the proposed TMDL is its weak implementation program. Part of the reason given for this weakness is that we do not yet have complete data. While a robust implementation plan should be outlined and executed based on current understanding, a phased approach and adaptive implementation will be necessary to ensure the integration of future data in order to optimize clean up. However, here too the plan is unacceptably vague.

[49] 40 C.F.R. § 130.7(c).
[50] Cal TMDL Guidance at p. 7.
[51] *Id.*

In 2006, EPA clarified its 1991 guidance regarding phased TMDLs and explained the distinction between "phased TMDLs" and "adaptive implementation."[52] A phased TMDL is "used in situations where limited existing data are used to develop a TMDL and…the use of additional data or data based on better analytical techniques would likely increase the accuracy of the TMDL load calculation."[53] Phased TMDLs are appropriate where significant uncertainty exists, such as when "the State is using a surrogate to interpret a narrative standard, or because there is little information regarding the loading capacity of a complex system such as an estuary."[54] Adaptive implementation, on the other hand, "is an iterative implementation process that makes progress towards achieving water quality goals while using any new data and information to reduce uncertainty and adjust implementation activities."[55]

The proposed TMDL incorporates aspects of both a phased approach and adaptive implementation but does not clearly differentiate between the two or commit the Regional Board to a phased approach. Although the BPA and staff report are vague on this point, the current loading estimates from various sources and their effect on the Bay recovery are "preliminary."[56] Significant data gaps related to sources, pathways, and loading exist, including with respect to the magnitude of loads from urban runoff, municipal wastewater, and the Central Valley, as well as the potentially large effect of remobilization of PCBs in buried bed sediments.[57] Our understanding is that this TMDL is based on a one-box mass budget model, which is "useful in illustrating some general concepts but [is] based on a highly simplified representation" of the complex and dynamic San Francisco Bay estuary.[58] In the near future the multi-box model will be completed and data will be available to more accurately calculate current loading. Considering the limited information used to develop this TMDL, the BPA should specifically state the Regional Board's intent to undertake a second phase TMDL and establish a timeframe for completion of the next phase.

<u>Recommendations</u>: The Basin Plan Amendment should state that a revised TMDL will be undertaken the earlier of ten years or upon completion of the multi-box model and fulfillment of the critical data needs identified in the TMDL.

---

[52] U.S. Environmental Protection Agency, Clarification Regarding 'Phased' TMDLs, Benita Best-Wong, Director of Assessment and Watershed Protection Division (August 2, 2006).
[53] *Id.* at 3.
[54] *Id.*
[55] *Id.* at 4.
[56] Davis 2007 at p. 82.
[57] *Id.* at 83.
[58] *Id.* at 83.

***

Based on the issues raised in these comments, we strongly recommend that the Regional Board decline to adopt the proposed PCBs TMDL until significant changes are made. Thank you for your consideration of these comments.

Sincerely,

Amy Chastain, Staff Attorney
Sejal Choksi, Baykeeper and Program Director
San Francisco Baykeeper

Andria Ventura, Program Manager
Clean Water Action

Shana Lazerow, Staff Attorney
Communities for a Better Environment

Susan Schwartz, President
Friends of Five Creeks

COMMENTS ON CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD'S

TOTAL MAXIMUM DAILY LOAD FOR PCBs IN SAN FRANCISCO BAY

PROPOSED BASIN PLAN AMENDMENT AND STAFF REPORT

December 3, 2007

Submitted by: Date: January 22, 2008

LATHAM & WATKINS LLP
600 West Broadway, Suite 1800
San Diego, California 92101-3375
Tel: (619) 236-1234
Fax: (619) 696-7419
Gene Lucero, Esq.
Paul N. Singarella, Esq.
Daniel Brunton, Esq.

On behalf of the California Chamber of Commerce (the “Chamber”) and General Electric Company, we are submitting these comments to the California Regional Water Quality Control Board, San Francisco Bay Region (“RWQCB”) in response to RWQCB’s December 3, 2007 staff report, draft basin plan amendment, and total maximum daily load (“TMDL”) for polychlorinated biphenyls (“PCBs”) in San Francisco Bay (the “Bay”).

We recognize and appreciate the improvements that have been made to the TMDL and its documentation, and we appreciate having had the opportunity to work with staff and RWQCB. Our prior comment letters, however, identify important legal and technical problems with the TMDL that remain unaddressed. We believe that the TMDL would be materially improved if RWQCB were to make the following changes:

- Measure compliance with the TMDL against the mix of fish species that people actually eat, rather than against shiner surfperch and white croaker—two species that are a very small part of the typical angler’s diet. The approach we are recommending is the same one that the U.S. Environmental Protection Agency (“EPA”) prescribes in its guidance.

- Recognize, consistent with the available empirical data, that PCBs are declining in the Bay with a half life of approximately 10 years. The half-life of 56 years used in the TMDL is based on an estimate of the rate of chemical degradation of PCBs, and ignores other processes that are demonstrably diminishing PCBs in the Bay.

- Acknowledge that PCBs loads into the Bay will not drop instantaneously when the TMDL is adopted. As drafted, the TMDL assumes that the day the TMDL is adopted, PCBs loads into the Bay immediately will drop to 10 kg/yr. This assumption is unrealistic for a phased TMDL involving many non-point sources, and causes the TMDL documentation to misstate and overestimate the benefits of the TMDL.

Revising the TMDL to reflect these comments—all of which reflect the empirical, physical reality in contrast to the TMDL’s current assumptions—is important so that the TMDL can be feasibly achieved and is based on a proper characterization of the potential benefits of the TMDL, as well as of natural attenuation with institutional controls. These changes will promote effective management of PCBs in the Bay, such that management decisions are informed by a sound understanding of the processes driving remaining PCB levels.

I. BY MEASURING COMPLIANCE WITH SHINER SURFPERCH AND WHITE CROAKER, THE TMDL GOES AGAINST EPA GUIDANCE, PROJECT OBJECTIVES, AND THE EMPIRICAL DATA.

The TMDL proposes to measure compliance by comparing the concentration of PCBs in the two species with the highest PCBs concentrations—white croaker and shiner surfperch—to the fish tissue target of 10 ppb. These two species are an insignificant part of the average consumer’s diet. The San Francisco Estuary Institute study that the TMDL relies on indicates that only 16 percent of anglers eat white croaker—and only 3.7 percent eat shiner surfperch. Data from the Pacific Coast Recreational Fishing Network indicate that white croaker and shiner surfperch comprise less than 2 percent of the fish caught by Bay anglers, yet by measuring compliance with only these two species, the TMDL implicitly assumes that these two fish are the only species that people catch from the Bay and eat.

Using this incorrect assumption has the effect of lowering the fish tissue target from 10 ppb to roughly 3.2 ppb. White croaker and shiner surfperch have higher (often much higher) levels of PCBs than the fish people typically eat, and if the PCBs level in those two species reaches 10 ppb, the PCBs concentration in the typical basket of fish people consume will be about 3.2 ppb. Ignoring key empirical data and driving the de facto fish tissue target to less than a third of the already conservative 10 ppb target is not a "conservative assumption" or a margin of safety—it is unsupported by the science and inconsistent with the RWQCB's obligations to consider the empirical data. Chemical Mfrs. Ass'n v. EPA (D.C. Cir. 1994) 28 F.3d 1259 at 1265.

It also goes against EPA guidance, which recommends assessing risk by using data on local fish consumption patterns—data that are readily available from the SFEI study. RWQCB's own project objectives call for basing decisions on readily available information about fish consumption patterns. RWQCB should revise the TMDL to comply with EPA guidance and the project objectives and to reflect the empirical data.

Using the white croaker and shiner surfperch to measure attainment of the water quality objectives also results in a TMDL that may be unattainable. The PCBs levels in these species must be reduced 20-fold to meet the 10 ppb target. The 4- to 5-fold reduction in sediment PCBs concentration used as the metric for success will not achieve a 20-fold reduction in croaker and shiner surfperch PCB levels. So the revised TMDL may still be impossible or infeasible to meet—and the burden is on RWQCB to show that it can be met. See, e.g., Cal. Water Code § 13241; Consolidated Gas Co. of New York v. Prendergast (S.D.N.Y. 1925) 6 F.2d 243, 277, modified and affirmed, 272 U.S. 576 (1926).

II. THE RATE OF NATURAL ATTENUATION ASSUMED IN THE TMDL IS INCONSISTENT WITH THE RATE OF ONGOING, ACTUAL ATTENUATION DOCUMENTED TO BE OCCURRING IN THE BAY.

The TMDL assumes that PCBs naturally attenuate with a half life of 56 years. The available data, however, indicate that the half life could be as short as between five and ten years. There is no relevant support for half life of 56 years; that value is a crude estimate of the rate of chemical degradation, and ignores other processes that are known to be contributing to natural attenuation of loads, including precipitation, burial, and land use changes.

By using the wrong rate of natural attenuation, the TMDL documentation dramatically misstates the likely benefits of the TMDL and the implementation plan. The TMDL claims that it will take nearly 100 years to reach the sediment goal if no efforts are made to reduce PCBs loads into the Bay, but that implementing the TMDL will reduce this to about 40 years. Using a realistic, data-supported estimate of the rate of natural attenuation, however, QEA calculated that the TMDL of 10 kg/yr could be met in about 20 years and, if so, that the TMDL's water quality objective would be met in less than 60 years even in the absence of measures to reduce PCBs loads into the Bay. In other words, the TMDL documentation exaggerates the need for the TMDL by mischaracterizing the effectiveness of natural attenuation.

III. BY ASSUMING THAT PCB LOADS TO THE BAY WILL BE INSTANTANEOUSLY REDUCED TO 10 KG/YEAR, THE TMDL CLAIMS BENEFITS THAT DO NOT EXIST.

The TMDL documentation also overstates the effectiveness of the TMDL by assuming that once the TMDL is approved, PCBs loads into the Bay immediately will decline to 10 kg/yr. This is not only physically impossible, it is contrary to the structure of the TMDL itself, which contemplates a phased implementation strategy over several decades. With realistic assumptions about how quickly the TMDL implementation plan can achieve load reductions, the TMDL may achieve the water quality objective in about 50 years, rather than the 40 that the TMDL documentation describes. That 50 years is very close to the roughly 60 years that it might take for natural attenuation alone to achieve the water quality objective.

Correctly accounting for natural attenuation and the timing of load reductions from implementing the TMDL will likely show that the TMDL's implementation plan would have little effect—a modest acceleration of the ongoing reduction of PCBs loads into the Bay, at best. The TMDL documentation has not grappled with whether spending hundreds of millions of dollars to achieve this modest acceleration meets the Porter Cologne Act's economic balancing requirements—especially when institutional controls could be similarly effective in reducing risk to consumers of white croaker and shiner surfperch—because it overstates the TMDL's effectiveness and understates the improvements that will occur whether the TMDL is adopted or not.

IV. THE TMDL PROCEEDINGS SHOULD BE REFORMED TO REFLECT THEIR QUASI-JUDICIAL NATURE.

Although portions of the TMDL may be quasi-legislative, the TMDL is aimed at a small group of known individuals—and as such, it quasi-judicial. For example, that the TMDL is targeting GE and San Leandro Bay was confirmed at the September 12, 2007 hearing on the draft basin plan amendment when RWQCB staff, among other things, specifically addressed the quantities of PCBs allegedly handled by GE.

Portions of the TMDL are focused on determining the rights and obligations of specific entities. This is the essence of a quasi-judicial proceeding. Department of Alcoholic Beverage Control v. Alcoholic Beverage Control Appeals Bd. (1987) 195 Cal. App. 3d 812, 817 ("the determination of specific rights in regard to a specific fact situation" is quasi-judicial conduct); Graves Advice Letter, 1998 WL 473136 at *7 ("The issuance of regulatory letters by the regional board (and subsequent compliance by responsible parties) for the purpose of investigating and remediating UST contamination are properly characterized as quasi-judicial proceedings since the regulatory actions involve specific parties.").

Since RWQCB is mixing quasi-legislative and quasi-judicial determinations in the TMDL proceedings, it must bifurcate the proceedings or adopt the procedural protections of a quasi-judicial proceeding for the entire action. See, e.g., L & M Professional Consultants, Inc. v. Ferreira (1983) 146 Cal. App. 3d 1038.

V. **CONCLUSION.**

The revised staff report and basin plan amendment fixed some of the TMDL's problems, but many of our prior legal and technical comments still apply to the revised documents, and the revised documents have introduced new problems. If RWQCB implements the comments in this letter, it will improve the TMDL materially.

QEA
Quantitative Environmental Analysis, LLC
∂c/∂t

MEMORANDUM

TO:	Paul Singarella, Latham & Watkins	**DATE:**	January 21, 2008
FROM:	Deborah Chiavelli, Ph.D. Elizabeth M. Lamoureux John P. Connolly, Ph.D., P.E., D.E.E.	**RE:**	Comments on San Francisco Bay Basin Plan Amendment and Related Staff Report
CC:	Files	**JOB#:**	GENfra:110

Introduction

The revised San Francisco Bay (Bay) Total Maximum Daily Load (TMDL) for PCBs Staff Report (Staff Report; SFBRWQCB 2007) addresses a number of deficiencies identified through previous comments (QEA 2007). The comments presented herein focus on some of the remaining issues; the overly conservative fish tissue target and the time to achieve this target under the current TMDL.

Comment 1. The use of white croaker and shiner surfperch for impairment assessment violates project objectives and the USEPA guidance upon which the water quality objective is based

- **By not using the fish species commonly consumed by Bay anglers as the metric for assessing impairment, the Board is violating United States Environmental Protection Agency (USEPA) guidance and some of the project objectives identified in the Staff Report**
- **The use of white croaker and shiner surfperch to evaluate attainment of the TMDL undermines evaluation of achievement of the BPA water quality objective**
- **Arguing that the use of white croaker and shiner surfperch introduces a margin of safety into the TMDL is not defensible, given acceptable approaches to the margin of safety in other USEPA-approved TMDLs.**

QEA contends (QEA 2007, Specific Comment 3, p. 19) that evaluation of the fish tissue target of 10 µg/kg total PCBs is flawed in part because it only considers PCB data from the Bay's two most contaminated fish species, white croaker and shiner surfperch, while disregarding the

305 West Grand Avenue, Suite 300, Montvale, NJ 07645, (201) 930-9890, (201) 930-9805 *fax*
290 Elwood Davis Road, Suite 230, Liverpool, NY 13088, (315) 453-9009, (315) 453-9010 *fax*
80 Glen Street, Suite 2, Glens Falls, NY 12801, (518) 792-3709, (518) 792-3719 *fax*
800 Brazos Street, Suite 308, Austin, TX 78701, (512) 707-0090, (512) 275-0915 *fax*

remainder of the fish species assemblage consumed by anglers, including more frequently consumed species.

This proposed approach violates two of the project objectives identified in the Staff Report (p. 6):

> Objective 11. *"Base decisions on readily available information on ambient conditions, PCBs loads, **fish consumption patterns**, and PCBs fate and effects."*
>
> Objective 16. *"Avoid imposing regulatory requirements more stringent than necessary to meet the targets designed to attain water quality standards".* (also on p. 91)

Furthermore, considering data from only two infrequently consumed fish species goes against USEPA guidance. The USEPA provides clear risk assessment guidance for using information about local fish consumption and contamination in developing fish targets:

> "*An exposure assessment may be overprotective if an individual's diet is a mix between contaminated and uncontaminated species. Use of local information to the extent possible to characterize mixed diets can prevent some of this uncertainty.*" (USEPA 2000, p. 2-43), and;
>
> "*Local information on the consumption of multiple fish species and fish contamination levels can be used to assess exposure and establish consumption limits for consumers with multiple species diets*." (USEPA 2000, p. 2-32)

The California Department of Health Services conducted an extensive, meticulously-designed survey of SFB anglers in 1998 and 1999. The survey report (SFEI 2001) provides fish consumption rate data used by SFBRWQCB (2007) to set target tissue contamination levels. The report also includes results of a survey of which fish species anglers consumed within the last four weeks and the last year. The resulting proportion of anglers reporting consumption of each species can be used in conjunction with contamination data for each species for TMDL fish tissue contamination evaluation. PCB tissue contamination data are available for a large number of SFB fish species for the years 1994, 1997, 2000, and 2003 from the SFB Regional Monitoring Program (RMP).

White croaker and shiner surfperch are minority choices for consumption by the surveyed anglers (SFEI 2001). Of the 14 fish species consumed by more than 1% of fish-consuming anglers in the four weeks prior to their survey date, white croaker was the 5th most commonly consumed (16% of anglers consumed white croaker) and shiner surfperch was the 11th most commonly consumed (3.7%). By comparison, the two most commonly consumed fish by SFB anglers were striped bass (54%) and California halibut (24%).

PCB tissue contamination data are available for 13 of the 14 most commonly consumed SFB fish species (there are no data for Pacific sandab, the 12th most commonly consumed species at 2.2%). QEA used RMP data to calculate the average PCB concentrations for these 13 species.

For many species, this included all four collection years (1994, 1997, 2000, and 2003), but for some as few as one year of data were available.

The combined average PCB concentration in white croaker and shiner surfperch is 196 µg/kg, which is 6.4 times the combined average of 31 µg/kg PCBs in the other 11 species. The average PCB level for all 13 species is 56 µg/kg, which is 29% of the average PCB level in white croaker and shiner surfperch alone.

USEPA guidance recommends weighing contaminant levels by the relative proportions of each species consumed by anglers (USEPA 2000, equation 2-3). Using the SFEI (2001) survey results regarding fish species consumed by anglers on a four-week recall (what anglers consumed within the last four weeks of the survey), weighting can be assigned by dividing the proportion of anglers consuming a species by the sum of proportions for all species. The average PCB fish tissue level weighted for SFB consumer preference is 63 µg/kg, which is 32% of the average PCB level in white croaker and shiner surfperch alone.

Considering the entire assemblage of consumed fish, as indicated by USEPA guidance, would result in a lower estimate of fish tissue contamination, with the potential to influence the Bay TMDL. By considering only the two most contaminated fish species in the Bay, regardless of their relevance to human consumption, the Board effectively lowers the fish tissue target of the TMDL. In essence, the Board arbitrarily changed the impairment threshold. Using white croaker and shiner surfperch as the measures of impairment forces achievement of an average exposure concentration for the SFB consumer of 3.2 µg/kg (based on existing data), rather than the 10 ppb target set out in the Basin Plan Amendment.

The USEPA guidance for fish advisory assessment mandates use of a mixed diet representative of local consumption. The TMDL water quality objective reflects this guidance: *"The numeric target (also referred to as the TMDL target) to protect both human health and wildlife is an* ***average fish issue concentration*** *of 10 micrograms total PCBs per kilogram* ***of typically consumed fish****, on a wet weight basis (10 µg/kg wet weight)."* (p. A-4). Thus, use of the most contaminated species to evaluate attainment of this target undermines the water quality objective identified for the TMDL. Additionally, it violates project objective 16 (see above) from the Staff Report; that the BPA should avoid the use of regulatory requirements more stringent than required to meet water quality standards.

Despite ignoring the SFEI (2001) data on fish species consumption patterns, the Board used the study data without reservation or qualification to obtain the total fish consumption rate of 32 g/d. If the Board feels that the information regarding fish consumption patterns in SFEI (2001) is inadequate for fish tissue target assessment, then the Basin Amendment Plan should provide a reasonable critique of these data, and it should justify why the fish consumption data are acceptable for determination of the daily fish consumption rate.

Finally, the Board argues on page 59 of the revised Staff Report that use of white croaker and shiner surfperch introduces an implicit margin of safety into the TMDL. While the designation of a margin of safety is required by the USEPA, the approach proposed by the Board is overly-conservative and inappropriate, given the approaches taken by other USEPA-approved TMDLs.

A margin of safety can either be implicit (i.e., captured by using conservative assumptions related to the modeling of the system's response to proposed load reductions) or explicit (i.e., a specific amount of the TMDL is reserved and not allocated to any load allocation or waste load allocation in the TMDL equation). Although an implicit margin of safety does not specifically allocate a portion of the load to an "un-allocated" category, it does effectively reduce the TMDL by using conservative assumptions in establishing the total allowable load. The Board has already acknowledged on page 27 of the Staff Report that conservative assumptions on fish consumption (e.g., 32 g/d, use of fish anglers as consumers, etc.) introduce an implicit margin of safety into the TMDL. Adding the use of shiner surfperch and white croaker as the indicator species to this implicit margin of safety, introduces *another* overly-conservative assumption into the TMDL. Essentially, using these two species forces the TMDL to be much lower than the 10 kg/yr that is indicated in the Staff Report. As mentioned above, the use of these two species pushes the fish target to 3.2 ppb and consequently, would most likely require greater load reductions than proposed in the TMDL. If one were to assume a linear relationship between the fish and the load, then the load would need to be on the order of 3 kg/yr to reach 3.2 ppb in the fish, as opposed to 10 kg/yr to reach 10 ppb in the fish. This essentially allocates over 60% of the load to the margin of safety, removing it from the allocateable portion of the TMDL. This approach is far and above other margins of safety used throughout the United States in other TMDLs. A study that reviewed 176 USEPA-approved TMDLs suggests that margins of safety below 20%, unless justified otherwise, are most appropriate (Freeman et al. 2003; Dilks and Freeman 2004). In fact, it is noted in Zhang and Yu (2001) that margins of safety over 10% tend to be overly conservative.

Comment 2. The Staff Report overstates the benefit of the TMDL because it misrepresents the loading time trends that would occur without and with implementation of the TMDL.

- **TMDL implementation will take considerable time**
- **PCB loadings are naturally attenuating more quickly than accounted for**
- **The difference in time to reach the TMDL target between the current loading rate and the proposed TMDL may not be significant**

The Staff Report chooses a TMDL of 10 kg/y because it contends that the sediment concentration goal of 1 µg/kg will be attained about 60 years sooner than would occur with no active load reductions (p. 125). According to the One-Box model used to make the time projections, it will take nearly 100 years to reach the sediment goal if no effort is made to reduce loading. The model predicts that the goal would be reached in about 40 years if loading was **instantly** reduced to 10 kg/y.[1]

The Staff Report is wrong because of two fundamental errors: 1) loads are declining more quickly than the Staff Report assumed in assessing trends in the absence of the TMDL; and 2)

[1] Note the one-box model results presented in the revised BPA has been revised, although documentation is not provided. Additionally, the text on p. 65 has not been revised to reflect the revised loadings, the revised initial PCB condition in the SF Bay sediments, or the revised model predictions.

loads cannot be reduced to the TMDL in the blink of an eye assumed in the Staff Report and such an unrealistic idea is not contemplated by the Basin Plan Amendment.

The conclusion that it will take nearly 100 years to reach the sediment goal if no effort is made to reduce loading is predicated on the assumption that without controls it will take 56 years for PCB loads to decline to half the present level (i.e., the half-life is 56 years). This assumption has no factual grounding. PCB loads decline because precipitation contains progressively lower PCB concentrations, surface soil concentrations are becoming progressively lower due to burial and cover, land uses change and the watershed is actively managed. The Staff Report considers none of these factors is setting a rate of load decline. Instead it erroneously applies a rate of decline meant to represent the slow rate at which PCBs in the Bay are destroyed by light and chemical reaction (see Davis 2003 at page 15).

Although the true rate of decline for PCB loads is unknown, the existing data suggest a much shorter half life. Atmospheric PCB levels in the United States and elsewhere are being halved every five to ten years (Meijer et al. 2003; Sun et al. 2006 and 2007). San Francisco Bay data (see our previous comments) and data from many other sites show declines with similar half-lives. If the PCB load declines by half every ten years, the TMDL will be reached within 20 years even in the absence of the controls laid out in the Basin Plan Amendment.

Implementation of the TMDL will, at best, modestly accelerate the load decline. The Basin Plan Amendment lays out a realistic implementation strategy that will not be completed for a decade or more. This strategy does not address the Central Valley load, which according to the Staff Report constitutes about one-third of the current load and half of the TMDL[2]. It uses a logical phased approach that will take more than ten years to achieve the load allocations for Municipal and Industrial Waste discharges and stormwater discharges. Indeed, the stormwater allocations may be unattainable.[3]

The stark difference between the realistic scenario described above and the scenario used in the Staff Report has led to the false expectation that the TMDL will provide a time benefit of 60 years. The time benefit will be much less. For example, at a no action load half-life of 10 years, the TMDL will be reached in less than 20 years and the PCBs already in the Bay will be buried or flushed out at rates that result in the sediment goal being achieved in less than 60 years. The best the TMDL could achieve with an instantaneous reduction scenario was 40 years. Under a realistic TMDL implementation scenario this estimate will be something like 50 years. The board needs to develop a realistic assessment of benefits, particularly in view of the tremendous costs associated with TMDL implementation.

In its assessment of benefits, the board also needs to recognize that the croaker and shiner surfperch will not meet the fish tissue target when the sediment goal is reached. The PCB levels in these species must be reduced 20-fold to meet the 10 ug/g target. The 4- to 5-fold reduction in sediment PCB concentration used as the metric for success will not achieve a 20-fold reduction in croaker and shiner surfperch PCB levels. According to the TMDL model, a 20-fold reduction would take considerably longer than 100 years and might be unachievable under the TMDL

[2] The Staff Report assumes the Central Valley load will decline on its own with a half-life of 56 years (p. 74).
[3] Please see QEA comments on the June 2007 BPA document for details.

(ignoring the problems discussed in the last paragraph). Interesting, if the TMDL relied on the mixed diet recommended by USEPA (see Comment 1 above), a 6-fold reduction in fish tissue PCB is needed, much more in line with the reduction in sediment PCB concentration on which the Staff Report relied.

References

Davis, J.A., 2003. *The Long Term Fate of PCBs in San Francisco Bay.* San Francisco Estuary Institute Contribution 47.

Dilks, D. and P. Freeman. 2004. "Improved Consideration of the Margin of Safety in Total Maximum Daily Load Development." *ASCE Journal of Environmental Engineering.* 130:6, 690 – 694.

Freeman, P., et al. 2003. *Navigating the TMDL Process: Evaluation and Improvements.* Water Environment Research Foundation. 360 pp.

Meijer, S.N., W.A. Ockenden, E. Steines, B.P. Corrigan and K.C. Jones, 2003. Spatial and temporal trends of POPs in Norwegian and UK background air: implications for global cycling. *Environ. Sci. Technol.* 37, 454-461.

Quantitative Environmental Analysis, LLC, 2007. August 17, 2007 Memorandum to Paul Singarella, Latham & Watkins. *Comments on San Francisco Bay Basin Plan Amendment and Related Staff Report*

San Francisco Bay Regional Water Quality Control Board, 2007. *Total Maximum Daily Load for PCBs in San Francisco Bay, Proposed Basin Plan Amendment and Staff Report*. San Francisco, CA. December 2007.

SFEI, 2001. *San Francisco Bay Seafood Consumption Report-Technical Report*. California Department of Health Services, SFEI.

Sun, P., I. Basu and R.A. Hites, 2006. Temporal trends of polychlorinated biphenyls in precipitation and air at Chicago. *Environ. Sci. Technol.* 40, 1178-1183.

Sun, P., I. Basu, P. Blanchard, K.A. Brice and R.A. Hites, 2006. Temporal and spatial trends of atmospheric polychlorinated biphenyl concentrations near the Great Lakes. *Environ. Sci. Technol.* 41, 1131-1136.

USEPA, 2000. *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories.* Volume 2. Risk Assessment and Fish Consumption Limits. Third Edition. Environmental Protection Agency, Washington, D.C. Office of Water. EPA 823-B-00-008. November 2000.

Zhang, H. X., and S.L. Yu. 2001. ''Uncertainty analysis of margin of safety in a nutrient TMDL modeling and allocation.'' *Proc., Watershed 2002 Specialty Conf.*, Fort Lauderdale, FL.

Additional Comments on Regional Water Quality Control Board's Total Maximum Daily Load for PCBs in San Francisco Bay Revised Basin Plan Amendment

Submitted by: Date: January 14, 2008
Dr. David Sunding
Berkeley Economic Consulting, Inc.
2550 Ninth Street, Suite 102
Berkeley, CA 94720

I appreciate the opportunity to submit this comment to the California Regional Water Quality Control Board, San Francisco Bay Region, in response to the Board's issuance of a Revised Basin Plan Amendment and Total Maximum Daily Load for PCBs in San Francisco Bay. I am submitting these comments on behalf of General Electric Company and the California Chamber of Commerce.

The Basin Plan Amendment is based on the notion that the TMDL should be protective of the shiner surfperch and white croaker fisheries in the San Francisco Bay. As the Regional Board staff acknowledge, PCB concentrations in fish tissue vary widely by species. The average fish tissue concentration for the species of interest from the SFEI's RMP data for sampled years is provided in Table 1.

Table 1: PCB Fish Tissue Concentrations in ng/g

Species	1994	1997	2000	2003
California Halibut	26	16	22	10
Jacksmelt	0	70	39	28
Leopard Shark	27	12	17	9
Shiner Surfperch	110	216	161	157
Striped Bass	98	25	43	54
White Croaker	230	259	206	228
White Sturgeon	55	31	40	197

Source: SFEI RMP data

White croaker and shiner surfperch have the highest concentrations over the sample period shown, although reported concentrations in white sturgeon exceeded that of shiner surfperch in 2003.

While white croaker and shiner surfperch contain relatively high levels of PCBs, they are of little interest to anglers. The Pacific Coast Recreational Fishing Network (RECFIN) reports information related to fish catch, angler population, desired species sought, and a variety of other information related to sport fishing. Data are compiled by field observations as well as intercept interviews and phone interviews. According to RECFIN there is a small percentage of anglers fishing for the reference species. Table 2 includes the percentages of anglers in the Bay who were seeking to catch a particular species. The species in bold are those identified in the Staff Report.

Table 2: Percent of Anglers Trying to Catch a Given Species in 2006

Species	Percent
Bat Ray	0.51%
California Halibut	**4.81%**
Chinook Salmon	0.10%
Jacksmelt	**4.05%**
Leopard Shark	**2.28%**
Monkeyface Prickleback	0.05%
Pacific Herring	0.15%
Pacific Sanddab	1.16%
Rockfish Genus	0.71%
Rubberlip Seaperch	0.05%
Sanddab Genus	0.86%
Shiner Perch	**0.56%**
Silverside Family	0.20%
Striped Bass	**13.71%**
Sturgeon Genus	29.76%
Surfperch Family	6.68%
Unidentified (Sharks)	2.23%
Unidentified Fish	26.67%
White Croaker	**1.57%**
White Sturgeon	**3.90%**

Source: RECFIN database

As shown by Table 2, roughly 2% of anglers seek white croaker and shiner surfperch combined, making these two species of marginal interest from in terms of the economic surplus generated by recreational angling.

These stated preferences are reflected in the actual fish caught by Bay anglers. RECFIN also reports the total weight of fish caught. The data used from the RECFIN database represent kilograms of dead fish either observed in the field or reported in an interview. Fish caught and released were excluded as a result of posing no threat to humans. Table 3 displays the percent of species of interest caught during the period 2004 to 2006.

Table 3: Percent of Species of Concern Caught

Species	2004	2005	2006
California Halibut	15.32%	21.29%	5.16%
Jacksmelt	7.19%	5.14%	9.47%
Leopard Shark	9.17%	5.95%	2.86%
Shiner Perch	0.64%	0.37%	0.29%
Striped Bass	11.37%	35.59%	8.76%
White Croaker	3.91%	1.07%	0.87%
White Sturgeon	0.19%	1.98%	1.97%

Source: RECFIN database

Basing the TMDL on shiner surfperch and white croaker, as opposed to a more representative mix of species, is likely to significantly reduce the wasteload allocations and increase the costs of complying with the TMDL. Using the information in Table 3 and the concentrations presented in Table 1 for 2003 (the most recent year), the weighted average PCB concentration in fish tissue can be calculated. The results are shown in Table 4. The overall average concentration for fish actually consumed for the years 2004-2006 is 21ng/g.

Table 4: Weighted Average of PCBs in ng/g for Fish of Concern

	Year		
Species	**2004**	**2005**	**2006**
California Halibut	1.469246	2.04119	0.494739
Jacksmelt	2.018626	1.444351	2.659951
Leopard Shark	0.819753	0.531721	0.255241
Shiner Perch	1.008328	0.580068	0.448474
Striped Bass	6.100659	19.08982	4.696258
White Croaker	8.892883	2.43964	1.984865
White Sturgeon	0.382898	3.89763	3.878849
Total Average PCBs	**20.69239**	**30.02442**	**14.41838**

The average concentrations in Table 4 are roughly an order of magnitude higher than the concentrations reported for white croaker and shiner surfperch. Basing policy on these two species is therefore likely to have a high marginal cost relative to a policy that based on a more representative group of species of concern.

It is inefficient to protect the white croaker and shiner surfperch fisheries by imposing a TMDL. Anglers could be dissuaded from consuming these two species through outreach and educational programs, including signage and other measures. Even removal of the skin from white croaker prior to preparation has been shown to reduce PCBs by over one-third.[1] These measures are almost certain to be much less expensive than the proposed TMDL.

[1] Davis, J. et al., Polychlorinated biphenyls (PCBs) in San Francisco Bay, *Environmental Research* 105(2007): 67-86.

600 West Broadway, Suite 1800
San Diego, California 92101-3375
Tel: +619.236.1234 Fax: +619.696.7419
www.lw.com

LATHAM & WATKINS LLP

BRIEFING PAPER

WHY REGIONAL BOARDS MUST BALANCE ECONOMIC FACTORS WITH WATER QUALITY BENEFITS WHEN ADOPTING A TMDL

Submitted in Response to the Board's Request by:
Latham & Watkins LLP
Gene Lucero
Paul Singarella
Daniel Brunton
(October 31, 2007)

At the September 12, 2007 RWQCB hearing on the PCBs TMDL for San Francisco Bay, the Board requested on the record further input as to whether it is required to balance economic and other non-water quality considerations with the potential water quality benefits of a Total Maximum Daily Load, or TMDL. We appreciate the opportunity to address this important issue through this submittal, and respectfully offer this description of state law requirements that RWQCBs must consider economics when adopting a TMDL.[i] In addition, we attach a brief paper by Professor David Sunding, UC Berkeley Professor of Economics, which he has prepared for the Board's consideration regarding the economic impacts of the proposed TMDL.

I. THE PORTER-COLOGNE ACT REQUIRES ECONOMICS, AND OTHER NON-WATER QUALITY VALUES, TO BE BALANCED WITH THE POTENTIAL WATER QUALITY BENEFITS OF A TMDL

- The legislative history of the Porter-Cologne Act demonstrates that the Legislature seriously considered the relationship between society's environmental and economic needs by requiring the RWQCBs themselves to balance the environmental consequences of water quality regulations they propose to adopt with the economic and non-economic costs of those regulations:

> The regional boards must balance environmental characteristics, past, present and future beneficial uses, and economic

> considerations (both the cost of providing treatment facilities and the economic value of development) in establishing plans to achieve the highest water quality which is reasonable.[ii]

- As the public bodies tasked with ensuring reasonable water quality regulation, RWQCBs safeguard not only the environment, but also the public's economic interests:

> The recommended language (section 13000, paragraph 2) recognizes that efforts made toward accomplishing the ideal of clean water must accelerate but that economic progress and development is essential, not, however, at the sacrifice of the environment.
>
> The key to the proper balancing of these interests lies only partly in established statewide policy. The regional and state boards which, in their decisions in which policy is applied to specific cases, weigh the benefits and costs to society, are the ones who actually determine this balance. In performing this function, there is no substitute for sound judgment.[iii]

- The text of the Porter-Cologne Act embodies economic balancing principles. The first section of the Act states:

> The Legislature further finds and declares that activities and factors which may affect the quality of the waters of the state shall be regulated to attain the highest water quality which is reasonable, considering all demands being made and to be made on those waters and <u>the total values involved</u>, beneficial and detrimental, <u>economic</u> and social, tangible and intangible.[iv] (Emphasis added.)

- On top of the general requirement that the RWQCBs balance economics and costs whenever they adopt any regulation, the Porter-Cologne Act specifically directs RWQCBs to consider economics when they establish water quality objectives; and water quality objectives must be reasonable and achievable:

> Each regional board shall establish such water quality objectives in water quality control plans as in its judgment will ensure the reasonable protection of beneficial uses and the prevention of nuisance; however, it is recognized that it may be possible for the quality of water to be changed to some degree without unreasonably affecting beneficial uses. Factors to be considered by a regional board in establishing water quality objectives shall include, but not necessarily be limited to, all of the following:
>
> …
>
> (c) Water quality conditions that could reasonably be achieved

> through the coordinated control of all factors which affect water quality in the area.
>
> …
>
> (d) Economic considerations.[v]

- Read together, these two subsections indicate that water quality objectives must be reasonable and achievable, and that what is reasonable and achievable can only be determined in light of economic considerations. In other words, a RWQCB is without power to adopt a TMDL that is unreasonable or that imposes disproportionate costs. The legislative history is consistent with this mandate.

- Section 13242 of the Porter-Cologne Act reinforces the requirement that water quality objectives must be reasonable by requiring RWQCBs to describe a specific, concrete implementation plan to achieve the water quality objectives. Cal. Water Code § 13242. RWQCBs are prohibited from adopting a TMDL unless they meet the requirements of Sections 13241 and 13242 by describing a specific, concrete plan consisting of reasonable, economically proportionate measures that will result in the TMDL's attainment.

- The substantive balancing of the economic and non-economic costs of a TMDL requires more than a mere awareness of the costs. Balancing, by its nature, requires a weighing of the costs to implement a TMDL (including economic and environmental costs) against the benefits to be achieved.[vi]

II. THE CALIFORNIA ENVIRONMENTAL QUALITY ACT REQUIRES AN ANALYSIS OF THE COSTS OF IMPLEMENTING A TMDL

- CEQA also requires a consideration of costs when an agency establishes a performance standard. Cal. Pub. Res. Code § 21159. The SWRCB has acknowledged that TMDL "numeric targets and load allocations would probably fall into the category of performance standards."[vii] Thus, a RWQCB's environmental analysis of a TMDL must "take into account a reasonable range of environmental, economic, and technical factors, population and geographic areas, and specific sites." Cal. Pub. Res. Code § 21159(c). Moreover, RWQCBs must analyze the environmental impacts of "reasonably foreseeable alternative means of compliance" with a TMDL. Cal. Pub. Res. Code § 21159(a)(3).

III. THE CALIFORNIA ADMINISTRATIVE PROCEDURES ACT REQUIRES A CONSIDERATION OF ECONOMICS

- Under the California Administrative Procedures Act, "State agencies proposing to adopt, amend, or repeal any administrative regulation shall assess the potential for adverse economic impact on California business enterprises and individuals, avoiding the imposition of unnecessary or unreasonable regulations or reporting, recordkeeping, or compliance requirements." Cal. Gov't Code § 11346.3(a).[viii] On its face, this statute requires a RWQCB, at a minimum, to identify businesses that could be affected by a

TMDL, determine what costs they would be required to bear under the TMDL, and to weigh whether those costs are reasonable.

* * *

In sum, multiple, overlapping authorities—including the Clean Water Act, the Porter-Cologne Act, CEQA, and the California Administrative Procedures Act—require the RWQCBs to balance economics when adopting a TMDL. Balancing economics requires more than a mere awareness of the potential costs of a TMDL; at a minimum, it requires the RWQCBs to determine whether a TMDL is reasonable when its economic costs are weighed against environmental and other factors.

[i] While the federal Clean Water Act requires Regional Boards to prepare technical TMDLs, the Act does not require state officials to prepare and implement plans to implement TMDLs. *See, e.g., Pronsolino v. Nastri* (9th Cir. 2002) 291 F.3d 1123, 1140 ("California chose both if and how it would implement the Garcia River TMDL. States must implement TMDLs only to the extent that they seek to avoid losing federal grant money; there is no pertinent statutory provision otherwise requiring implementation of § 303 plans or providing for their enforcement."). Thus, the authority for TMDL implementation plans runs from state-law authority, in this case the Porter-Cologne Act. The California Supreme Court has recognized the importance of Porter-Cologne's economic requirements when a Regional Board is acting under Porter-Cologne, and not acting to satisfy a federal Clean Water Act mandate. *City of Burbank v. State Water Resources Control Bd.* (2005) 35 Cal. 4th 613, 625, 627 ("The plain language of sections 13263 and 13241 indicates the Legislature's intent in 1969, when these statutes were enacted, that a regional board consider the cost of compliance when setting effluent limitations in a wastewater discharge permit…. [W]hether the Los Angeles Regional Board should have complied with sections 13263 and 13241 of California's Porter-Cologne Act by taking into account 'economic considerations,' such as the costs the permit holder will incur to comply with the numeric pollutant restrictions set out in the permits, depends on whether those restrictions meet or exceed the requirements of the federal Clean Water Act."). A TMDL implementation plan is not required under the federal Clean Water Act and, as such, must satisfy the Porter-Cologne Act—including its economic-balancing requirements.

[ii]While the federal Clean Water Act requires Regional Boards to prepare technical TMDLs, the Act does not require state officials to prepare and implement plans to implement TMDLs. *See, e.g., Pronsolino v. Nastri* (9th Cir. 2002) 291 F.3d 1123, 1140 ("California chose both if and how it would implement the Garcia River TMDL. States must implement TMDLs only to the extent that they seek to avoid losing federal grant money; there is no pertinent statutory provision otherwise requiring implementation of § 303 plans or providing for their enforcement."). Thus, the authority for TMDL implementation plans runs from state-law authority, in this case the Porter-Cologne Act. The California Supreme Court has recognized the importance of Porter-Cologne's economic requirements when a Regional Board is acting under Porter-Cologne, and not acting to satisfy a federal Clean Water Act mandate. *City of Burbank v. State Water Resources Control Bd.* (2005) 35 Cal. 4th 613, 625, 627 ("The plain language of sections 13263 and 13241 indicates the Legislature's intent in 1969, when these statutes were enacted, that a regional board consider the cost of compliance when setting effluent limitations in a wastewater discharge permit…. [W]hether the Los Angeles Regional Board should have complied with sections 13263 and 13241 of California's Porter-Cologne Act by taking into account 'economic considerations,' such as the costs the permit holder will incur to comply with the numeric pollutant restrictions set out in the permits, depends on whether those restrictions meet or exceed the requirements of the federal Clean Water Act."). A TMDL implementation plan is not required under the federal Clean Water Act and, as such, must satisfy the Porter-Cologne Act—including its economic-balancing requirements.

[ii] State Water Resources Control Board, Final Report of the Study Panel of the California State Water Resources Control Board ("Study Panel Report") at 1 (1969); State Water Resources Control Board, Order WQ 2001 - 15 at 12 (2001) ("The Final Report of the Study Panel to the California State Water Resources Control Board (March, 1969) is the definitive document describing the legislative intent of the Porter-Cologne Water Quality Control Act.").

[iii] *Id.* at 7 (emphasis in original).

[iv] Cal. Water Code § 13000 (emphasis added). RWQCBs and the SWRCB must conform to and implement this policy in every action they take. Cal. Water Code § 13001 ("The state board and regional boards in exercising any power granted in this division shall conform to and implement the policies of this chapter…").

[v] Cal. Water Code § 13241(c), (d); Memorandum from William R. Attwater, Chief Counsel, State Water Resources Control Board, to Regional Water Board Executive Officers ("Attwater Memorandum") at 4 (January 4, 1994) (adoption of a TMDL must comply with Section 13241).

[vi] The SWRCB has acknowledged that the RWQCBs "cannot fulfill this duty [to consider economic impacts] simply by responding to economic information supplied by the regulated community." Attwater Memorandum at 4. Rather, RWQCBs have an affirmative duty to ferret out the costs of implementing a TMDL and to make that information available to the public.

[vii] Memorandum from William R. Attwater, Chief Counsel, Office of Chief Counsel of SWRCB, to Executive Officer of Santa Ana Regional Water Quality Control Board, "Do TMDLs Have to Include Implementation Plans?" at 7 (March 1, 1999).

[viii] The California Court of Appeal has confirmed that the requirements of the Administrative Procedures Act apply to the RWQCBs. *State Water Res. Control Bd. v. Office of Admin. Law* (1993) 12 Cal. App. 4th 697, 707 ("[A]ny new water quality control programs must comply with the APA.").

Berkeley Economic Consulting, Inc.
2550 Ninth Street, Suite 102
Berkeley, CA 94710

October 30, 2007

San Francisco Bay Regional Water Quality Control Board
1515 Clay St., Suite 1400
Oakland, CA 94612

To the Board of the San Francisco Bay Regional Water Quality Control Board through its Executive Officer Bruce Wolfe:

At the hearing on September 12, 2007, the Board requested further explanation as to the economic issues associated with the TMDL and the conclusions presented in my report entitled, "Comments on California Regional Water Quality Control Board's Total Maximum Daily Load for PCBs in San Francisco Bay Proposed Basin Plan Amendment and Staff Report, June 22, 2007," dated August 20, 2007. This supplemental discussion of economic issues is based on my report and information contained in the TMDL and other expert reports submitted on August 20, 2007.

I appreciate the opportunity to respond to the Board's requests and hope the Board finds this submittal to be useful. I am available to discuss this matter at the Board's convenience.

SUPPLEMENTAL STATEMENT – The TMDL, as proposed, is not supported by a meaningful economic analysis, and does not satisfy either the economic balancing requirements of the Porter-Cologne Act or economic analysis methodologies generally employed by federal authorities such as U.S. EPA or the federal Office of Management and Budget. The problems with the TMDL relate to both the potential costs of attempting to achieve its PCB targets and goals, and the benefits that might accrue from such compliance efforts. It likely will be very expensive to reduce PCBs in fish tissue from current levels to 10 ppb, the fish tissue target proposed in the TMDL. But the health benefits of achieving this reduction are very small. There are alternatives to the approach laid out in the TMDL that are far more reasonable from an economic point of view, including Best Management Practices ("BMPs") and measures designed to reduce human exposure to PCBs in fish.

<u>Reducing PCBs in Fish to 10 Parts per Billion Likely Will Be Very Expensive</u>

In order to achieve the fish-tissue target, the TMDL states that PCB loads to the Bay must be reduced from 83 kg/yr to 10 kg/yr. The vast majority of the load reduction is required from urban runoff entering the Bay along its margins, and from freshwater inflow entering the Bay from the Delta where the source of PCBs is the upstream Central Valley.

The TMDL assumes that PCBs in Delta inflow will be reduced through natural recovery from the TMDL's current estimate of 43 kg/yr to the proposed TMDL allocation of 5 kg/yr. The TMDL ascribes no cost to achieve this massive load reduction from the Central Valley. While this conclusion seems highly suspect, we did not try to develop an estimate of what the costs actually would be.

The TMDL requires PCBs in urban runoff entering the Bay from the counties that border the Bay to be reduced from the current TMDL estimate of 40 kg/yr to the proposed TMDL allocation of 2 kg/yr. The TMDL states that it may cost up to $500 million annually to achieve these PCB reductions in urban runoff, and requires these reductions to be achieved within twenty years. Assuming a real discount rate of 5 percent and a 20-year implementation period, an expenditure of $500 million per year translates into a net present value of roughly $6.2 billion.

We made an independent evaluation of the TMDL's cost projection for urban runoff as the TMDL contains little explanation of the projection. For purposes of our evaluation, we used the TMDL conclusions that Bay-area urban runoff transports 40 kg/yr of PCBs to the Bay, and that this amount must be reduced to 2 kg/yr. Although the science underlying each value is in dispute, for purposes of assessing the economic implications of the TMDL proposal, we took them at face value.

We also used the TMDL's implicit assumption that building stormwater collection and treatment plants would be necessary to achieve the proposed PCB reductions in urban runoff. We translated the TMDL's technical information into urban runoff PCB concentrations required to be achieved from each county. If current PCB levels are as posited in the TMDL, treatment works would be necessary to approach the PCB load reductions called for by the TMDL. Whether the PCB load reductions actually could be achieved for all urban runoff at all times is highly suspect, and never has been demonstrated on this scale.

For purposes of illustration, we assumed a scenario where the urban runoff from a particular design storm is collected and treated. We assumed that 55 regional plants would be constructed, each designed to accommodate a 25-year, 24-hour storm event that produced 4.8 inches of rainfall across the region. We assumed that the urban runoff would be treated with settling, sand filtration and activated carbon treatment technologies. This treatment scenario is not a worst case as urban runoff greater than the design storm would bypass the 55 plants without treatment, and as some of the time (if not the vast majority), the treated runoff likely would not achieve the TMDL's concentration requirements.

The capital cost to construct the plants is estimated to be more than $140 million per plant, or up to $8 billion for all 55 plants (in 2007 dollars). (See the engineering and cost analysis in the Arcadis/BBL report submitted August 20, 2007.) These estimates are for capital costs alone, and do not include any funds to purchase land for, or to operate and maintain, the 55 plants. Land acquisition and long-term operations and maintenance costs likely would add several billion dollars to these estimates, given the very high value of Bay-area real estate and the level of effort anticipated to run active treatment plants such as these.

It is instructive to consider these capital costs in terms of the implicit cost per unit of PCBs removed. Assuming a best case where the 55 plants successfully remove 38 kg/yr from Bay-area urban runoff (which appears unrealistic and is an unproven result with current treatment technologies and at this scale; see QEA LLC report submitted on August 20, 2007), capital costs for stormwater remediation are roughly $17 million per kg of PCBs removed. These calculations assume a 20-year payback period and a 5 percent interest rate. As discussed infra, such expenditures are far in excess of the human health risk posed by a single kilogram of PCBs in San Francisco Bay. It is also instructive to note that in 2001, the U.S. EPA estimated that the cost of implementing the entire national TMDL program (36,000 separate TMDLs) would range from $906 million per year to $4.3 billion per year.[1]

As discussed infra, we believe that BMPs and good housekeeping (e.g., sediment management, facility maintenance and improvements, etc.) effectively may reduce the PCB loads in urban runoff. But, even if BMPs reduced PCBs in urban runoff such that only half or a quarter of the 55 treatment plans were necessary, the costs remain massive.

Other major costs of complying with the TMDL include costs to remediate contaminated sediment hot spots. Dredging (or dredging with capping) is the only management measure identified in the TMDL to address these sediments, and the TMDL fails to take into account ongoing, vigorous natural recovery, which otherwise could serve as the remedy for many of these sites. In addition, the report authors fail to consider the harmful environmental impacts of remedial dredging, and fail to consider the limited success of such dredging. Although the authors claim that the TMDL would not be the cause of any such dredging, ostensibly because other programs would result in the same outcome, such other programs typically do not call for sediment cleanup anywhere near the stringent PCB goals of the TMDL. The proposed TMDL goal for contaminated sediments is one part per billion, which is far below typical leave-behind levels at cleanup sites (several hundred to several thousand ppb), and even typical concentrations present along the margin of the Bay (15 to 20 ppb).

The Benefits of the Proposed TMDL Appear Small

Average concentrations of PCBs in the Bay are well below levels cited in the TMDL as protective of the ecosystem. Thus, the TMDL bases its PCB fish-tissue target of 10 parts per billion on the protection of people who eat fish caught from the Bay.

The TMDL report does not argue that reducing PCB levels in fish tissue to the target of 10 ppb will produce a cognizable benefit to the general population of the Bay area. The general population eats too little fish from the Bay to be at a risk from consumption of these fish that has regulatory significance. In addition, people in the Bay area (and,

---

[1] U.S. EPA, *The National Costs of the Total Maximum Daily Load Program* (Draft Report), ii, 2001.

indeed, anywhere in the nation) can purchase fish in markets or restaurants with PCBs containing up to the federal Food and Drug Administration's threshold of 2,000 ppb.

Rather, the TMDL posits that a sub-population of avid subsistence fishermen eat large quantities of fish from the Bay. Available data indicate that, to the extent such a sub-population exists, it must be very small, no greater than 2,100 persons, or about 3.5 persons per 10,000 residents of the counties bordering the Bay.

As noted in my comments submitted on August 20, 2007, there are more data available on consumption of various species of Bay-caught fish than apparently utilized in developing the TMDL. For example, the Recreational Fisheries Information Network (RecFIN) collects information on the type of fish species caught by Bay anglers. Utilizing this information, coupled with average PCB concentrations by species reported by the San Francisco Estuary Institute, provides a more detailed picture of current risk levels, and those that would occur assuming the TMDL's fish tissue target was realized.

Taking such detailed information into account reveals that the health benefits of the TMDL are insubstantial. The change in health risk resulting from attainment of the 10 ppb fish tissue target is 0.004 avoided cancer cases per year, or one case of cancer over 250 years. This circumstance is reflective of the low levels of risk from PCBs at present. Even making the conservative assumption that every cancer results in death, applying the standard value of $7 million per life saved results in a value of health risk reduction of $542,000 over 70 years (0.004 * $7 million = $28,000 per year discounted over 70 years at 5 percent).[2] [3] It is unreasonable to require an expenditure of billions of dollars in capital costs alone to achieve a benefit of this magnitude.

The cost of implementing just the TMDL's urban runoff element may well exceed billion of dollars per cancer case avoided, placing the TMDL far outside the mainstream of environmental regulation in the United States. This can be seen from dividing $500 million in annual costs by 0.004 cancer cases avoided per year ($500 million / 0.004 = $125 billion). For perspective on just how large this figure is, my comment submitted on August 20, 2007 discussed a recent survey of 76 regulatory actions aimed at saving lives. The proposed TMDL for PCBs is more expensive per life saved than all 76 interventions

---

[2] The $7 million figure for the Value of Statistical Life is the midrange of the standard meta-analysis of willingness to pay market studies. W. Kip Viscusi and Joseph Aldy, The Value of Statistical Life: A Critical Review of Market Estimates Throughout the World, *Journal of Risk and Uncertainty*, 27:1; 5-76, 2003.

[3] Guidance provided by the Office of Management and Budget specifies the use of a real discount rate of 7 percent. U.S. Office of Management and Budget, *Circular A-4*, September 17, 2003; U.S. Office of Management and Budget, *Circular A-94*, October 29, 1992. Circular A-4 also recommends that sensitivity analysis be performed using a real rate of interest as low as 3 percent. 5 percent is the midpoint of the range between 3 and 7 percent and is the rate used for all discounting calculations in this supplemental statement.

studied. In fact, the TMDL is 25 percent more expensive per life saved than the *least* efficient regulation studied.[4]

The TMDL also violates a more basic criterion for the acceptability of regulation: regardless of cost, it should do more good than harm. This criterion is commonly referred to as health-health analysis, as distinct from cost-benefit analysis that compares the costs of regulation with the associated risk reduction. Economists have compiled an impressive body of evidence that expenditures to comply with regulations pose their own health risks as money spent on compliance is not available for consumption of other goods, including purchases of goods (such as sunscreen, airbags, bicycle reflectors, etc.) that reduce health risks. The most recent literature on this point concludes that regulations that impose more than $21 million per life saved create more health risk than they alleviate.[5] At $125 billion in compliance costs per life saved, the cost of the proposed TMDL would itself pose more of a risk to public health than current levels of PCBs in San Francisco Bay.

<u>Recommended Approach</u>

Reasonable Best Management Practices are available to further reduce PCB loads to the Bay. These BMPs could be employed in a Phase I TMDL during which the substantial uncertainty associated with the scientific and technical underpinnings of the current TMDL could be addressed. During Phase I, the Regional Board could address whether PCB loads truly are as high as the TMDL estimates, whether current loads need to be reduced as much as currently proposed, and whether measures other than BMPs should be deployed as part of Phase II.

A BMP-based TMDL is an appropriate approach in this case where there is no acute toxicity or imminent harm presented by the declining, residual levels of PCBs in the Bay. Further, the primary basis for the TMDL is to help a small, poorly defined subpopulation of subsistence fishermen who, to the extent they do exist, would be most benefited in the short term by such BMPs, including institutional controls.

The TMDL should be reformed to be a phased TMDL with a Phase I based on reasonable BMPs where the regulated community is not placed at risk of being subjected to massive costs that are not justified by any commensurate water quality benefit.

Sincerely,

David Sunding

---

[4] John Morrall, Saving Lives: A Review of the Record, *The Journal of Risk and Uncertainty*, 27:3; 221-237, 2003

[5] Randall Lutter, John Morrall and W. Kip Viscusi, The Cost-Per-Life-Saved Cutoff for Safety-Enhancing Regulations, *Economic Inquiry*, 37; 599-608, 1999.

SCIENTIFIC PEER REVIEWS:

Scientific peer review by Professor David O. Carpenter, M.D.
Scientific peer review by Professor Kevin J. Farley

This Page Left Intentionally Blank

PEER REVIEW OF THE TECHICAL BASIS FOR THE POLYCHLORINATED BIPHENYLS TOTAL MAXIMUM DAILY LOAD IN SAN FRANCISCO BAY

David O. Carpenter, M.D.
Director, Institute for Health and the Environment
University at Albany
5 University Place
Rensselaer, NY 12144

Fish Tissue Numeric Target:

1. Is our derivation of the numeric fish tissue numeric target based on sound scientific knowledge, methods, and practices?

The numeric fish tissue target is reasonable, with some qualifications, when one considers only PCBs. The screening level of 10 ng/g wet weight fish tissue falls within the risk-based consumption limit proposed by USEPA (2000) of 4 meals per month to avoid a risk of cancer beyond 1 in 100,000, or 12 meals per month to avoid excess in non-cancer health endpoints. However if one really wants to protect the public, the level for unlimited consumption given by USEPA (2000) is 1.5 ng/g (ppb) wet weight. There are certainly some sport fisherpersons, and especially some ethnic and immigrant groups who consume much more than 4 meals of fish per month. And it must be noted that the 1 in 100,000 limit is far from the 1 in 1,000,000 that is desirable. The EPA level given for unlimited consumption so as to avoid non-cancer adverse health effects is 5.9 ng/g (ppb), so even for non-cancer effects the screening level of 10 ng/g is somewhat high. Nevertheless setting this level is realistic, even if not ideal, and is consistent with other advisories throughout the country.

The bigger problem is that fish contain many other fat-soluble compounds that have carcinogenic and non-carcinogenic actions in addition to PCBs. Thus by setting the standards on the basis on consideration of only PCBs it is possible, indeed it is likely, that these standards are not protective of human health. In our study of farmed and wild salmon we found that there was a direct relationship between the levels of PCBs and those of hexachlorobenzene, lindane, heptaclor epoxide, dieldrin, endrin, trans-nanochlor, DDT, mirex, and dioxins (Huang et al., 2006). All of these substances are rated as probable human carcinogens, and all have non-cancer health effects as well. Furthermore we found that applying the EPA (2000) formula for recommended consumption rates based on consideration of all of these substances for which EPA gives cancer slope factors led to much more restrictive consumption advisories than when one considered only PCBs. Our studies also did not even consider emerging contaminants such as the polybrominated diphenyl ethers, which are also present in salmon at high concentrations (Hites et al., 2004) and are markedly rising in human breast milk in the US (Schecter et al., 2003). There are currently no confirmed cancer slope factor for the PBDEs, but they are similar in structure to PCBs and probably have similar actions. These considerations strongly suggest that the by consideration of only PCBs one is significantly underestimating the risk of consumption of fish from San Francisco Bay.

TMDL Problem Statement:

2. Is our description of the nature of the water quality problem caused by PCBs in San Francisco Bay based on sound scientific knowledge, methods, and practices?

Yes, the description of the water quality problem is sound and justified. The major problem is the large amounts of PCBs in the sediments. While PCBs are not very water soluble, they are in equilibrium with levels in the water. The report documents significant sediment contamination with PCBs, and even without additional input it will take generations before these levels decline. Removal of all of the contaminated sediments is not realistic with current technology.

I find the calculation that the direct PCB loads to the Bay are estimated at 0.35 kg/yr, but the loss due to atmospheric transport to be 7.4 kg/yr, to be very surprising and almost not believable. I have reviewed the paper by Tsai et al. (2002) and the report by Tsai and Baker (2005), and certainly don't find anything wrong in their analysis. However the input to the Bay is very much lower than that to Lake Michigan, reported to be about 3,200 kg/yr, with 330 kg coming from Chicago (Hornbuckle and Green, 2000). In their review of persistent organic pollutants in the Great Lakes, Hornbuckle et al (2006) state that "the atmosphere is the largest source of PCBs to Lake Michigan…..Atmospheric deposition (gas, dry particle, and wet deposition) is larger than inputs from resuspension of contaminated sediments and larger than inputs from direct discharge and contaminated tributaries". Kelly et al. (1991) estimated total atmospheric input to Lake Erie to be 257 kg/yr. The EPA has estimated input to Lake Ontario to be 64 kg/yr. (USEPA, 2003). Strachan and Eisenreich (1988) estimated that the atmosphere contributes about 90% of the PCBs found in Lake Superior. Hsu et al. (2003) show that between 2 and 70 kg of PCBs enter the Chicago atmosphere each day, and a significant percentage of this is deposited into Lake Michigan. Wethington and Hornbuckle (2005) report 120 kg of PCBs go into Lake Michigan just from the city of Milwaukee. I don't doubt but there is more contamination with PCBs in the Midwest and East than on the West Coast, but it is hard to believe that the input to the Bay is so small. However, the conclusion that there is more loss than input from vapor-phase PCBs is consistent with the results from the Great Lakes, and so does not alter the conclusion that there is a net loss through this route. Certainly the methods for measurement of PCBs in air used by Tsai and Baker (2005) are standard, and reports look fine. But their result is highly questionable, in my judgment. With all of the cities and waste sites around the Bay it is simply not believable that only 0.35 kg/yr enter the Bay by atmospheric transport of gas phase PCBs.

TMDL Development:

3. Are the source categories clearly defined?

Yes.

4. Are the source categories, source estimates and estimation methodologies clearly stated or each source category?

They are clearly stated, but as discussed above, I have difficulty believing that the atmospheric deposition is as small as reported here. The other estimates appear reasonable to me.

5. Are the linkages between sources and the numeric target clearly stated and based on sound scientific knowledge, methods and practices?

Yes, the linkages between sources and numeric target are clearly stated, and use of fish PCB concentration as the numeric target is appropriate. While the numeric target may not be optimally protective for those consuming excessive amounts of fish, they are reasonable and justified on the basis of target levels used throughout the country.

6. Are the load and wasteload allocations and calculation methodologies clearly stated for each source category?

The load and wasteload allocations are clearly stated for each source category. The calculation methodologies are less clearly explained, and for most of the source categories the allocation is simply given without any great discussion of how it was derived. The allocations appear reasonable, but it would have been more satisfactory to have a detailed explanation of the methodology for their derivation.

7. Is the method of ensuring an implicit margin of safety clearly stated?

Yes, the methods for ensuring a margin of safety are clearly stated and are reasonable.

TMDL Implementation:

8. Are the implementation actions clearly stated?

The implementation actions are clearly stated and are logical and appropriate. There is also a realistic time frame for implementation of these goals, which cannot be accomplished immediately because of surface contamination.

9. Is the proposed monitoring program adequate to evaluate progress toward achieving the fish tissue target?

This monitoring program is appropriate. There will be more or less continuous monitoring, followed by a more complete evaluation every five years of progress in each of the categories of input to the Bay.

10. Have we clearly stated the key management questions?

Yes, this is well done. The three major implementation categories of a) control of external loadings, b) control of internal source and c) actions to manage risks to Bay fish consumers are clearly stated and discussed. The strategy of regular monitoring is essential in order to determine whether goals are being met, and the proposed monitoring program is excellent. I do have some question as to whether the anticipated natural attenuation within the Central Valley watershed and from urban stormwater runoff is realistic, but having these as goals is appropriate. Our experience in the Great Lakes area indicates that cities are enormous reservoirs of PCBs, and that even old buildings contain significant amounts of PCBs in everything from paint, ceiling tile and caulking. The time frame for reduction from such sources is long. It is extraordinarily difficult to obtain the funds to clean up former and current industrial and especially military facilities. Dredging may only remove PCBs from one site and deposit them in another. Great care should be taken in dealing with dredged sediments.

Overarching questions:

11. In reading the staff report and proposed Basin Plan Amendments, are there any additional scientific issues that are part of the scientific basis of the proposed rule not described above? If so, are they based on sound scientific knowledge, methods, and practices?

I am rather pessimistic that the goals of this proposal will be achieved as easily as anticipated. I believe that this view would be shared by most of my colleagues who work on comparable issues around the Great Lakes. For example, Hornbuckle et al. (2006) in their recent review state "The atmosphere, especially near urban-industrial areas, is the major source to the open waters of the lakes. Other sources include contaminated tributaries and in-lake recycling of contaminated sediments. Until these remaining sources are controlled or contained, unsafe levels of PCBs will be found in the Great Lakes environment for decades to come." Part of our concern is that whereas PCB levels in Great Lakes fish declined dramatically for many years, they have now plateaued but at a level which exceeds any health-based standard. This is at least in part due to the failure to anticipate what an enormous source of PCBs urban areas are. But whether or not the goal of having fish from the Bay that are safe to eat is achieved in as rapid a time frame as proposed, the steps are all in the right direction. With load reductions and regular monitoring it will be possible at least to inform the public of the status of fish in the Bay.

12. Taken as a whole, is the scientific portion of the proposed rules based on sound scientific knowledge, methods, and practices?

Yes, the proposed rules are based on sound scientific knowledge, methods and practices. They use state-of-the-art approaches to anticipate loadings, and propose an excellent monitoring program to chart progress. While some of the problems may have been underestimated, this is an outstanding and innovative approach to regeneration of a fishery that does not pose health hazards to the public.

References:

Hites RA, Foran JA, Schwager SJ, Knuth BA, Hamilton MC and Carpenter DO (2004) Global assessment of polybrominated diphenyl ethers in farmed and wild salmon. Environ Sci Technol 38: 4945-4949.

Hornbuckle KC, Carlson DL, Swackhamer DL, Baker JE and Eisenreich SJ (2006) Polychlorinated biphenyls in the Great Lakes. In: The Handbook of Environmental Chemistry, Volume 5N, pages 13-70. RA Hites, Editor. Springer Berlin/Heidelberg.

Hornbuckle KC and Green ML (2000) The impact of Chicago on Lake Michigan: Results of the Lake Michigan mass balance study. Report to the International Joint Commission for the workshop on "Using models to develop air toxics reduction strategies: Lake Michigan as a test case." 10/23/00.

Hsu YK, Holsen TM and Hopke PK (2003) Locating and quantifying PCB sources in Chicago: Receptor modeling and field sampling. Environ Sci Technol 37: 681-690.

Huang X, Hites RA, Foran JA, Hamilton G, Knuth BA, Schwager SJ and Carpenter DO (2006) Consumption advisories for salmon based on risk of cancer and noncancer health effects. Environ Res 101: 263-274.

Kelly TJ, Czuczwa JM, Sticksel PR and Sverdrup GM (1991) Atmospheric and tributary inputs of toxic substances to Lake Erie. J Great Lakes Res 17: 504-516.

Schecter A, Pavuk M, Papke O, Ryan JJ, Birnbaum L and Rosen R (2003) Polybrominated diphenyl ethers (PBDEs) in US mother's milk. Environ Health Perspect 111: 1723-1729.

Strachan WMJ and Eisenreich SJ (1988) Mass balancing of toxic chemicals in the Great Lakes: The role of atmospheric depostion. Report to the International Joint Commission on Great Lakes Water Quality, International Joint Commisssion, Windsor, Ontario, Canada.

USEPA (US Environmental Protection Agency) (2000) Guidance for assessing chemical contaminant data for use in fish advisories. Vol 2. Risk assessment and fish consumption limits. Third Edition. Available at: www.epa-gov/ost/fishadvice/volume2/index.html

USEPA (US Environmental Protection Agency) (2003) Critical contaminants in the Great Lakes. http://www.great-lakes.net/humanhealth/fish/critical.html).

Wethington DM and Hornbuckle KC (2005) Milwaukee, WI, as a source of atmospheric PCBs to Lake Michigan. Environ Sci Technol 39: 57-63.

Peer Review of the Technical Basis for the Polychlorinated Biphenyls Total Maximum daily Load in San Francisco Bay

Kevin J. Farley

27 May 2007

Specific issues to be addressed in the peer review are outlined in Attachment 2 of Mr. Fred Hetzel's March 22, 2007 letter. These issues are addressed below based on the following materials:

Appendix A: Basin Plan Amendment-Draft (March 2007)

PCBs in San Francisco Bay, Total Maximum Daily Load (TMDL), Staff Report (March 2007)

In addition, the following reports were also considered in preparing this review:

Davis, J.A. 2003. The Long-term Fate of PCBs in San Francisco Bay: SFEI Contribution 47. San Francisco Estuary Institute, Oakland, CA.

Gobas, F.A.P.C. and J. Wilcockson. 2003. San Francisco Bay PCB Food Web Model, RMP Technical Report: SFEI Contribution 90. San Francisco Estuary Institute, Oakland, CA.

Gobas, F.A.P.C. and J. Arnot. 2005. San Francisco Bay PCB Food Web Model-Final Technical Report. Prepared for the Clean Estuary Partnership.

Davis, J.A., F. Hetzel, and J. Oram. 2006. PCBs in San Francisco Bay: Impairment Assessment/Conceptual Model report. Prepared for the Clean Estuary Partnership.

Fish Tissue Numerical Target

In this Basin Plan Amendment, we propose the use of a numeric polychlorinated biphenyls (PCBs) fish tissue numeric target. We propose that the human health protection provided by the proposed objective is consistent with, and as protective of human health as the water quality criterion in the California Toxics Rule.

a) *Is our derivation of the numeric fish target based on sound scientific knowledge, methods, and practices?*

The numeric fish target is based on standard risk assessment calculations using a 70-year lifetime, a mean body weight of 70 kg, a slope factor of 1 (mg/kg)/day, and a mean daily consumption rate of 320 g/day (based on the 95th percentile upper bound estimate of fish intake reported for all Bay fish-consuming anglers), and a 10^{-5} risk level. The resulting numeric fish target for total PCBs of 10 ng/g is applied to white croaker (20-30 cm in length) and shiner surfperch (10-15 cm in length) collected in summer and fall seasons. Species selection and fish collection times are justified based on: (1) previous fish sampling studies of San Francisco Bay and food chain model results which both indicate that white croaker and shiner surfperch are expected to have higher PCB body burdens than other fish species currently monitored in the Bay, and (2) on previous fish sampling studies of San Francisco Bay which indicate that PCB body burdens were highest in the summer and fall collection seasons.

Based on field-derived BioAccumulation Factors (BAFs) in Table 21 of the Staff Report, the numeric fish target of 10 ng/g is equivalent to a water quality criterion of approximately 20-50 pg/L. For comparison, the water quality criterion in the California Toxics Rule (CTR) is given as 170 pg/L. The numeric fish target is therefore considered to be more slightly more protective of human health.

Comments/Questions:

Since the use of the 95th percentile upper bound estimate of fish intake is important in establishing the margin of safety for the TMDL, further information should be given on fish intake. For example, a log probability plot of fish intake rates would be appropriate to show in the Staff Report so that the margin of safety for other segments of the population (e.g., the 50th percentile) can be readily quantified.

The slope factor used in establishing the TEQ screening level of 0.14 pg/g for dioxin-like PCBs should be cited (e.g., on page 24 of the Staff Report).

TMDL Problem Statement

In this section of the report, we describe the basis for concluding that PCBs impair San Francisco Bay beneficial uses. High concentrations of PCBs have been found in fish consumed by sport fishers. PCB concentrations in San Francisco Bay exceed the basin Plan narrative objective for bioaccumulation and impair beneficial uses, such as sport fishing, wildlife habitat, and preservation of rare and endangered species.

b) Is our description of the nature of the water quality problem caused by PCBs in San Francisco Bay based on sound scientific knowledge, methods, and practices?

Water quality problems caused by PCBs in San Francisco Bay are clearly stated in Section 2 of the Staff Report. Supporting information on measured PCB concentrations for water samples, fish and benthic organisms from the Bay are presented in Section 6, and are compared to CTR water quality criterion and screening levels for fish. This information is appropriately used to demonstrate the extent of impairments due to PCB contamination.

TMDL Development

In this section of the report, we describe the sources, loads and reservoirs of PCBs. This assessment relies on available information to describe and quantify relative contributions from many sources like wastewater and storm water discharges,

atmospheric deposition, Central Valley inputs, in-bay dredge material disposal, and contaminated sediments.

c) *Are the source categories clearly defined?*

Source categories are clearly defined and include: (1) direct atmospheric deposition; (2) Central Valley watershed discharge; (3) municipal and industrial wastewater discharges; (4) urban and non-urban storm water runoff; (5) internal cycling from the active sediment layer; and (6) sediment dredging.

d) *Are the source categories, source estimates and estimation methodologies clearly stated for each source categories?*

Estimates of PCB external loads were determined as follows:

Direct atmospheric loads: The annual rates for gaseous and particulate exchange rates were taken from SFEI (2001). Details of the estimation method are not given in the Staff Report.

Central Valley watershed: The annual PCB discharge rate was taken from SFB-RWQCB (2004) based on ten years of monitoring data for the Sacramento and San Joaquin Rivers. Details of the calculation are not provided in the Staff Report.

Municipal and Industrial Wastewater Dischargers: PCB loads were determined using average daily flows from POTWs and industries, and average PCB effluent concentrations for the following categories: (1) POTWs with secondary treatment; (2) POTWs with advanced treatment; (3) petroleum refineries; and (4) other industrial wastewater dischargers.

Urban and Non-urban Stormwater Runoff: PCB loads were estimated using model-generated runoff volumes and sediment loads from the 17 Bay Area watersheds along with median PCB concentrations on sediment for urban and for non-urban runoff.

Internal Cycling from the Active Sediment Layer: The inventory of PCBs in the active sediment layer was determined from the Bay surface area, an assumed active sediment layer of 15 cm, and a Bay-wide average PCB sediment concentration of 10 μg/kg.

Sediment Dredging: An annual estimate of PCB removal from the Bay by dredging is obtained from dredging records (given as 2.4 million cubic yards per year), and a Bay-wide average PCB concentration sediment concentration of 10 μg/kg. (The bulk density of the dredged material is not stated, but results appear reasonable.) A net removal of PCB by dredging is determined based on the amount of dredged material that is disposed at in-Bay disposal sites and the amount that is disposed at either upland sites or the deep ocean disposal site.

Comments/Questions:

For municipal and industrial wastewater dischargers, justification should be provided for using average concentrations in estimating PCB loading rates. A probability plot, or possibly a log probability plot of measured effluent concentrations would be very helpful.

For urban and non-urban stromwater runoff, justification should be provided for using median concentrations in estimating PCB loading rates. Again, a probability plot, or possibly a log probability plot of measured effluent concentrations would be very helpful.

Part of the discussion on sediment dredging needs clarification. In particular, the sentences on page 46 stating "… we estimate that, each year, about 10 kg/yr of PCBs are being disposed in the Bay at dredged sediment disposal sites. During the same period, placement of dredged sediment at either upland sites or the deep ocean disposal site removes about 13 kg of PCBs per year from the Bay resulting in a net loss of about 3 kg of PCBs each year" do not seem right. Based on the current wording, shouldn't the net loss be the 13, not 3, kg of PCBs? Also, shouldn't sediment dredging only be considered a loss from the active sediment layer if the underlying sediments are less contaminated? Has this issue been appropriately considered in subsequent TMDL mass balance calculations?

In this section of the report, we also propose a numeric target that will achieve attainment of water quality standards. A numeric target can be a numeric water quality objective or a numeric interpretation of a narrative objective. To this TMDL, we propose to use the fish tissue total PCB concentration as the numeric target.

In this section of the report, we also present the results of a food web bioaccumulation model used to predict the sediment PCB concentration when fish tissue concentrations achieve the numeric target. A steady-state PCB fate model is then used to establish the TMDL needed to attain the predicted sediment concentration. These two models provide the linkage analysis between the numeric target and the TMDL.

e) *Are the linkages between sources and the numeric target clearly stated and based on sound scientific knowledge, methods, and practices?*

Linkage between external PCB sources and PCB concentrations in water and sediment are clearly described in the Staff Report. Details of the simple mass budget model are not provided in sufficient detail. (A general description for the simple mass budget model however is provided in SFEI, 2003. Details of the final model calculation with tidal exchange (Figure 28) are not adequately described in the Staff Report or in the cited reference (Davis et al, 2006).) The use of a Bay-wide box model to describe PCB contamination in the Bay does not appear to be consistent with observed spatial variations in PCB contamination (e.g., see map of PCB contamination in sediments (Figure 23). More detailed modeling for the long-term fate of PCBs in the Bay should therefore be given a high priority.

Linkage between PCB sediment concentrations and PCB accumulation in fish are appropriately described in the Staff Report and in the cited references. Steady-state, food web bioaccumulation model calculations for specific PCB congeners are fully described in Gobas and Wilcockson (2003), and Gobas and Arnot (2005) and are appropriately justified.

Comparison of model results and field observations are also documented, as well as the overall uncertainty associated for bioaccumulation model calculations.

Comments/Questions:

Although simple mass budget model results can be used in evaluating the "average" response for PCB contamination in the Bay, it may be reasonable to expect that sediment contamination in northern portion of the Bay may response faster due to larger incoming sediment loads from the Sacramento and San Joaquin Rivers, while the southern and more contaminated portions of the Bay may response much more slowly. Factors such as this should be acknowledged accordingly in discussions of model uncertainty.

A further explanation of PCB degradation, particularly in the active sediment layer, should be provided in the Staff Report. (This issue is not adequately addressed in Davis (2003) or Davis et al. (2006).)

For future model development, the effects of estuarine circulation, sediment transport, and organic carbon cycling should be considered in evaluating spatial and temporal responses of PCB contamination in the Bay.

Congener-specific, or at least homolog-specific, fate and bioaccumulation behavior should be considered in future model development and TMDL model evaluations.

In this section of the report, we allocate a portion of the TMDL to each source category, reserving a portion of the load as a margin of safety. A load allocation is proposed for each source category and for individual discharges in certain source categories.

f) Are the load and wasteload allocations and calculation methodologies clearly stated for each source category?

The methodologies for establishing a TMDL of 10 kg/yr are clearly stated. (The specifications of PCB tidal exchange and PCB degradation in the active sediment layer however need further clarification. See previous comments on the simple mass budget model.)

The methodologies for establishing wasteload allocations for each source category are also stated clearly.

g) Is the method of ensuring an implicit margin of safety clearly stated?

The conservative approach used in deriving the fish tissue numeric target (based on the 95th percentile upper bound estimate of fish intake reported for all Bay fish-consuming anglers) appears to be reasonable in providing an implicit margin of safety. As stated above, a log probability plot of fish intake rates, or some other information, should be provided so that the margin of safety for other segments of the population (e.g., the 50th percentile) can be readily quantified.

TMDL Implementation

The implementation plan contains proposed actions to reduce PCB loads to the bay and to reduce PCB bioaccumulation by biota. The plan also specifies a program of monitoring and special studies to address the various areas of uncertainty.

h) *Are the implementation actions clearly stated?*

The implementation actions are clearly stated and appear to be appropriate based on an adaptive management approach.

i) *Is the proposed monitoring program adequate to evaluate progress toward achieving the fish tissue target?*

The proposed monitoring program appears to provide an adequate approach for evaluating progress toward achieving the fish tissue target. In addition to monitoring of San Francisco Bay fish, sediments, and water, monitoring of external sources and in-bay PCB-contaminated sites provide important information in evaluating progress, and if necessary, in re-evaluating the TMDL.

j) *Have we clearly stated the key management questions?*

Issues related to long-term management plans, interim risk management actions, periodic review, and adaptive implementation are clearly described in the report.

Overarching questions

Reviewers are not limited to addressing only the specific issues presented above, and are asked to contemplate the following "big picture" questions.

k) *In reading the staff report and proposed Basin Plan Amendments, are there any additional scientific issues that are part of the scientific basis of the proposed rule not described above? If so, are they based on sound scientific knowledge, methods, and practices?*

None noted.

l) *Taken as a whole, is the scientific portion of the proposed rules based on sound scientific knowledge, methods, and practices?*

Overall, development of the San Francisco Bay TMDL for PCBs appears to be based on sound scientific knowledge, methods, and practices. Portions of the analysis; e.g., the PCB fate model, should be considered as preliminary evaluations at this time, and should be developed in more detail under the adaptive implementation management strategy.

Some editorial corrections are also listed below:

Editorial Corrections: Appendix A Basin Plan Amendment

Page A8, first sentence, first paragraph: delete “will be required agencies”

Page A8, last sentence, first paragraph: delete “to and to conduct or cause … section.”

Page A9, last sentence, first paragraph: delete “to support actions”

Editorial Corrections: Staff Report

Page 10, last sentence: fix “PCb”

Page 15, five lines from bottom: delete “under”

Page 33, seven lines from bottom: “per cubic centimeter” should be “per square centimeter”

Page 39, last line, second paragraph: “g/kg” should be “μg/kg”

Page 50, third line, last paragraph: delete “in the”

Page 51, eighth line, first paragraph: fix “the entire and segment of the Bay”

Page 57, first line: “kgs” should be “kg/yr”

Page 59, last line: missing end of sentence