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

DEC 18 2000

Ms. Loretta Barsamian
Executive Officer
California Regional Water Quality Control Board
San Francisco Bay Region
1515 Clay Street, Ste. 1400
Oakland, CA 94612

Dear Ms. Barsamian:

We have completed our review of the document entitled, "Watershed Management of Mercury in the San Francisco Bay Estuary: Total Maximum Daily Load, Report to U.S. EPA." This document represents the first phase in a proposed two-phased process to complete a Total Maximum Daily Load (TMDL) and an associated implementation plan for San Francisco Bay for mercury. The document reflects an extraordinary effort by your staff and represents thorough and thoughtful analysis.

As mentioned earlier, we will not be establishing this TMDL at this time. This will give the Board an opportunity to complete the next phase of the TMDL which includes revisions to this first phase and an implementation plan. The current TMDL contains analyses which require additional analysis and modifications to be approveable under Clean Water Act (CWA) section 303(d). Attached is a detailed examination of those issues, as well as other issues that we felt were important to bring to your attention, but would not render the document unapprovable. These comments were developed with the assistance of Dr. Jon Butcher from Tetra Tech, Inc., Dr. Peter Kozelka of EPA's Richmond Laboratory as well as Doug Liden, Diane Fleck and David Smith of my staff. We also provided you with comments on the final draft document in June of 2000, many of which continue to apply to your final document. Please consider all of these issues and specific comments as you go forward with the second-phase of the TMDL which you indicated would be completed by June of 2001.

One important issue that needs immediate attention is the issue of the doubling of flows of current NPDES dischargers to San Francisco Bay. The current TMDL document allows waste load allocations to double the current mass of mercury discharged to the Bay, in order to allow the dischargers to increase (double) their flows at current concentrations of mercury. However, regulations do not allow us to approve of increasing waste load allocations of a pollutant to an impaired water body for that pollutant, where there is not sufficient reasonable assurance that decreases in appropriate load allocations will be met. We did not find sufficient reasonable assurance in our review of the current TMDL that load allocations would be met or that proposed load allocations were appropriate. Therefore, the next phase of the TMDL must reflect, at a

minimum, waste load allocations that equal current mercury loadings, or sufficient reasonable assurances that corresponding appropriate load allocations will be met. In the meantime, please note that the Region intends to disapprove of any permit application from dischargers to San Francisco Bay that reflect increases in mercury loadings (mass or concentration) from current levels.

We hope that our comments are helpful to you as you continue with the next phase of the TMDL. We look forward to continuing our work with you on this and other TMDLs. If you have any questions or would like to discuss this further, please do not hesitate to call me at (415) 744-1860, or have your staff call David Smith or Diane Fleck of my staff at (415) 744-2012 and (415) 744-1984, respectively.

Sincerely,

Catherine Kuhlman

Alexis Strauss
Director
Water Division

Attachment

Attachment: CRITICAL ISSUES IN THE MERCURY TMDL REPORT TO USEPA FOR SAN FRANCISCO BAY

1. Numeric Targets: The final TMDL document must be clear as to which water quality or other objectives it is discussing as potential targets but are not used further in the analyses, and which objectives it is applying as numeric targets to calculate assimilative capacity and load/waste load allocations. We support the discussion of all applicable objectives as well as the use of multiple targets. However, the final TMDL analysis must show a clear relationship between the target and the impairment (i.e., protection of a specific beneficial use, in this case protection of human and ecological health) and include a scientific justification (i.e., relationship to water column dissolved methyl mercury levels which relate to fish tissue levels).

Sediment: The TMDL document discusses a sediment target of the median concentration of mercury in sediments collected from the mouth of the Sacramento River, normalized to the percentage of fine material (< 63 um), or 0.40 ug/l of mercury. This is "based on the premise that mercury in San Francisco Bay sediments should reflect the nature of source material from the Central Valley." (page 48). However, no relationship of this target to attaining fish tissue concentrations to protect human and ecological health is shown to exist. Most notably, fish tissue concentrations in the North Bay, while lower than those in the South Bay, are still found to exceed targets (Figure 10), although your analysis implies that water column objectives may be met. In addition, the North Bay is stated to be net erosional (page 97), suggesting that the current influent loads may not be a good indicator of exposure and fish tissue concentration given historical inputs from gold mining.

The numeric target in the final TMDL document must show a direct relationship to attaining the water quality standards that are currently not being met, through an assimilative capacity and linkage analysis. The sediment target in the final TMDL must provide reasonable assurance that acceptable fish tissue concentrations will be attained throughout the Bay. If a proposed target is not consistent with full attainment of uses, it is not appropriate for use in establishing a TMDL.

Assuming for the purpose of discussion that the sediment target is appropriate, based on the data presented in Figure 23 at page 57, at least four segments of the Bay are above the sediment target and should be construed as "highly contaminated mercury systems" (Guadalupe River, Lower South Bay, San Pablo Bay and San Joaquin River). Error bars indicate that other segments may be exceeding the target as well. The document later only focuses on the Guadalupe River (which only has two data points) while the other segments (which have more data points indicating the mercury sediment level is over the target) are dismissed as "needs to be resolved" presumably in the final TMDL. All segments that are not meeting a target must be addressed in the final TMDL analyses.

Water Column: The document contains a discussion concerning water column criteria and a good discussion of the relationship of the FDA action level in fish tissue to a water column concentration of dissolved methyl mercury. The document proposes a target of 0.05 ng/l of

dissolved methyl mercury for the first phase of this TMDL. However, this target is not used in any further substantive analyses: the target is not used in the assimilative capacity analysis or linkage analysis. The final TMDL must result in attainment of all applicable water quality standards as represented by the most sensitive numeric target, through assimilative capacity analyses and linkage analyses.

In addition, the data in Table 13 on page 64 indicate that several locations are above the target for dissolved methyl mercury. The discussion infers that these exceedences are acceptable, and the analysis does not consider the areas "impaired" for TMDL purposes. This conclusion is inappropriate since the exceedences are not acceptable, even if only very limited data exist. If additional data are not forthcoming to further define the methyl mercury levels in the water column, it appears that these areas are impaired and must be addressed in the final TMDL. Further, the TMDL states that the methyl mercury target should not be applied to conveyances to the Bay because "within-bay production of methyl mercury drives bioaccumulation." However, no scientific justification is given to support this statement. If the final TMDL does not apply the methyl mercury target to conveyances, appropriate scientific justification is necessary.

Anti-Degradation Policy: The State's anti-degradation policy, which is part of its water quality standards, should be discussed and addressed in its TMDLs. This analysis should be included in the final TMDL.

2. Source Identification:

A. Contaminated sediment loading from the Central Valley is identified and characterized as background. These contaminated sediments are "due to mining in previous times," and are not truly "background" or naturally occurring. The document does not provide sufficient justification for its apparent conclusion that reductions in upstream mercury inputs from Central Valley sediments will not occur, but at the same time concludes that contaminated sediment loading from the Guadalupe River will be reduced. Although it currently may appear that the potential for reductions in contaminated sediment loading from the Guadalupe River and watershed is forthcoming, the potential for reductions in contaminated sediment loading from the Central Valley cannot be ignored or characterized as "background" in the analysis. The final TMDL should discuss the potential to reduce contaminated sediment loading from all major sources.

B. Sources of total mercury (v. methyl mercury) are identified in the TMDL document and should be clearly described as such in the final TMDL document. However, since bioavailable mercury (methyl mercury) is the cause of the impairment in the Bay, sources of bioavailable mercury, where known, should also be identified. Information on how translation occurs between different forms of mercury should be included. If a comprehensive understanding of these processes does not exist, the discussion should include a description of what is known and what is lacking, and reasonable solutions to the problems that the lack of information may present in a completing the final TMDL analyses.

C. The TMDL document contains substantial uncertainty regarding the quantitative analysis of several sources. These include:

1. At pages 85 to 88 in the TMDL document, the analysis of the Guadalupe River sediment load is uncertain. There is essentially no agreement between the land use-based models and flow-sediment calculations. Even though the resulting range in used as a bounding calculation, better agreement should exist. One potential cause of the discrepancy is that it is incorrect to assume that mercury concentrations are constant and independent of discharge. Instead, high flow years are likely to move a larger fraction of heavier, less-contaminated sediment. The estimate of loading concentration at page 87 may be too high when combined with the high-end estimate of sediment loading. Because of size fractionation, it may be more appropriate to combine a lower concentration with the higher sediment loading number. The final TMDL should address these issues.

2. At page 94, the TMDL document makes a "reasonable assumption" that less than 1 percent of mercury deposited onto undeveloped areas from the atmosphere is conveyed to the Bay, while 10 to 50 percent of deposition on developed areas is transmitted. If the final TMDL uses these estimates, they must be justified.

3. At page 97, an important point is made that dam construction on tributaries to the North Bay shifted conditions from depositional to erosional by depleting the sediment supply. This means that historic mining-related mercury in the sediments is now being re-exposed. A simple steady-state box model calculation may not be relevant to evaluating time to attainment of uses in the North Bay. The final TMDL must address this issue.

4. Starting at page 106 at Table 26, the mercury load summary to the Lower South Bay is key to the proposed allocations. The analysis does not contain sufficient documentation and explanation. In the final TMDL, the table must be sufficiently documented in the text and include further explanation. For example, the document assumes that no sediment remobilization of mercury occurs in the Lower South Bay, which must be better justified in the text of the final TMDL.

3. Linkage Analysis:

A. The document calculates assimilative capacity only for the Lower South San Francisco Bay. The final document must calculate assimilative capacity and TMDLs for all segments of the Bay, then calculate load and waste load allocations. The final TMDL cannot assign allocations to sources on parts of water bodies where no assimilative capacity analysis has been completed.

B. The TMDL analysis concludes that only the lower South Bay is impaired. First, the focus on sediment mercury levels and water column methyl mercury levels may not be sufficient to determine impairment. The final TMDL analysis must also look at whether each of the Bay segments is impaired due to total mercury water column exceedences based on applicable water

quality standards. As the document notes, the Bay segments were listed partly due to exceedences of these existing objectives, and the TMDL must reflect that fact in the selection and use of numeric targets.

If the final TMDL uses a dissolved methyl mercury target to identify impaired segments, then all of the impaired segments must be clearly identified and addressed in the final TMDL. The document's conclusion that only the Lower South Bay is "impaired" is based on a few dissolved methyl mercury samples (Table 1 at page 113). The manner in which these data are analyzed in the current TMDL is confusing and may set up inappropriate comparisons. For example, when the document looks at data and compliance rates with water quality targets, the document must look at a 90 or 95% compliance rate. A 50% compliance rate is too low. The water body must legally meet the water quality standard in the water column or it will be considered "impaired", and a TMDL will continue to be necessary as required by statute. In the final TMDL, the other parts of the Bay must be reviewed more thoroughly.

C. The TMDL analysis only looks at the assimilative capacity in the Lower South Bay for the sediment target. Not only may the sediment target be underestimated (see above discussion), thereby invalidating the analysis that the Lower South Bay is the only area that is significantly impaired, but the other parts of the Bay are dismissed in this analysis. Since much is unknown about methylation rates, it is inappropriate to conclude that the mercury levels in sediment are not contributing to an impairment. If we do not have sufficient information to perform a more detailed analysis or an analysis which looks at methyl mercury from sediment, this must be so stated and reasonable and conservative assumptions made to complete the analysis.

D. Load reductions in the Lower South Bay are targeted to come from the Guadalupe River, and it appears that significant reductions are expected (95%). A discussion of whether this is feasible is missing. The final document must look at the feasibility of the proposed reductions and a more detailed discussion must be included. Otherwise, these assumptions cannot be proposed as part of the basis for the overall load and waste load allocations. Federal regulations authorize less stringent wasteload allocations only to the extent that more stringent load allocations (such as those proposed for Guadalupe River) are shown to be practicable (40 CFR 130.2(i)).

E. Section 5.3 is inconsistent with other parts of the analysis. The section states that it may be appropriate to delist some segments of the Bay, except the Lower South Bay; but the data do not support this conclusion. For example, Table 1 (Table 30 in the Table of Contents) at page 113 uses statistics (by calculating medians and averages) to indicate that the data do not support impairment for many sections of the Bay - this is an inappropriate conclusion since the analysis relies on exceedence rates that are underprotective (as discussed above). The final TMDL must address this issue and be internally consistent.

F. For a mercury TMDL, the ideal linkage analysis is one that relates sequentially (1) external mercury loading sources (2) water body sediment and total water mercury concentrations to (3) exposure point methyl mercury concentrations to (4) fish tissue concentrations. The final TMDL

must include a complete linkage analysis.

The linkage analysis developed in the TMDL document assumes that there is a linear relationship between total mercury in water (and thus fish tissue concentration) and mercury concentration in influent fine sediment. Elevated mercury concentrations on suspended fine sediment and elevated fish tissue concentrations are evident in parts of the South Bay. However, there are gaps in the development of the linkage. Key points not addressed in the proposed linkage analysis are:

1. Mercury bioaccumulation does not occur solely from water column pathways. Accumulation from sediments into benthic organisms may also play a significant role. These benthic organisms are exposed to a mix of historic and new sediments.

2. In this system, much of the methylation of mercury to bioaccumulatable form likely occurs in the surface sediments, not in the water column.

3. Dated sediment cores (Fig. 21) confirm a pattern of historic mercury contamination of sediments, which appears to have declined strongly after about 1980. Historic sediment stores could account for a significant portion of the fish body burden, depending on rates of burial and vertical biomixing across the Bay.

4. Setting a target in influent sediments and applying it to the biological impacts of methylation occurring in bedded sediments is only equivalent under steady-state assumptions. The system is clearly not in steady-state, as evidenced by the core profiles.

In response to the above observations, for the final TMDL, we recommend developing and documenting a more detailed conceptual model of mercury cycling in the system. An evaluation of the need for additional quantitative modeling tools may then be appropriate. (While a process-based dynamic mercury cycling model of the system is potentially feasible, it may not be necessary or cost-effective for a system of this size and complexity.)

4. Proposed Allocations:

A. The TMDL does not propose any load reductions for the two largest sources by mass, which are estimated to be (from Figure 35 page 105) sediment remobilization and Central Valley watershed sources. This should be discussed and addressed in more detail in the final TMDL.

The discussion of load allocations from the Central Valley is not clear. The discussion reflects the assumption that was made earlier in the analysis that the sediment from the Central Valley cannot be changed - that the current levels of mercury in those sediments will continue. This is not consistent with the intent of this analysis which is to look at sources of impairment and to allot allocations to those sources in order to reduce the overall loading of mercury to the water body in order to attain the numeric target. At a minimum, the TMDL analysis for mercury in the Cental Valley must be reflected in the load allocations for Cental Valley sources in the final

TMDL analysis for the Bay.

B. The allocations section in the current TMDL is insufficient. For the final TMDL, allocation criteria must be identified, explained and applied in a clear manner. The allocations must sum up to less than or equal to the assimilative capacity in the final TMDL analysis.

C. The analysis that indicates that NPDES point sources (waste load allocations) may increase in load is not sufficiently supported. Increases in point source loadings from current dischargers is inappropriate until it is demonstrated that (1) controls needed to implement load allocations have been implemented and shown to be effective; (2) increases in point source loads are consistent with all applicable TMDL, NPDES, antidegradation and antibacksliding requirements; and (3) point source load increases, when considered along with other source loadings, will not result in adverse water quality impacts on a localized or generalized scale.

The document provides insufficient analysis to support the adequacy and practicability of the load allocations for several sources, most notably for the Guadalupe River. Since there is significant uncertainty in the analysis concerning the sources and their linkages between loadings and effects, it is inconsistent with existing regulations to allow NPDES point sources to increase their load of mercury to an impaired water body. It may also be inconsistent with existing antidegradation requirements and antibacksliding provisions to allow NPDES sources to increase their load of mercury to the Bay at this time. The final TMDL must address these issues.

D. On page 122, the second paragraph under 6.1 Approach, the analysis states that "For segments north of the Dumbarton Bridge, we will allocate wastewater loads such that the total mercury load from wastewater sources is less than or equal to 50 kg per year." It is not clear where this allocation came from. This must be explained more clearly and technically supported in the final TMDL document.

On page 128, it states that the sum of waste load allocations for wastewater should be less than 50 kg in the entire Bay watershed. (Again, this number is not explained or supported.) By using this mass limit, the analysis then justifies allowing the POTWs to double their flows, based on certain concentration limits. Again this analysis is not justified. The discussion points out that "segments north of the Dumbarton Bridge are below their assimilative capacity" but this appears to be another way of saying that the waters are not impaired north of the Dumbarton Bridge. As noted above, it is not clear that this is so, and more data are needed on the actual mercury levels in these waters as well as information on the bioavailability of the mercury in these discharges and the methods of methylation at the discharge locations. These issues must be addressed in the final TMDL analyses.

E. In the discussion of waste load allocations from urban runoff programs, the sediment target is discussed as a control measure, but there is no discussion of monitoring or limiting the methyl mercury in the discharge. If methyl mercury in the water column is a numeric target in the final TMDL, this must be discussed.

Also in the discussion of allocations for urban runoff, the waste load allocations must be more specific - and should include a discussion of each permitted entity. More specific information must be included in this discussion in the final TMDL analysis.

F. The discussion of load allocations for air sources is not clear. The analysis requests reductions of 70 kg/year, but does not discuss the sources of the reductions. If we know what the sources of mercury are, the analysis needs to discuss them and allocate a load to them; if we do not know what these sources are, then the analysis must so state and discuss.

5. Margin of Safety and Seasonal Variations:

In the final TMDL, individual sources of uncertainty must be listed and a margin of safety must be included to address each source of uncertainty. The final TMDL analysis must then systematically look at all of the uncertainty in the analysis and then provide a margin of safety for the analysis as a whole. This will eliminate any argument that the margin of safety was arbitrary.

Additional Comments

1. At pages 40 to 42, Figure 15 demonstrates a relationship between TSS and total mercury concentration in the Bay. Equation (1) shows the relationship between total mercury and "sediment" mercury. The surrounding discussion seems to imply that TSS-normalized mercury concentration in the water column is equivalent to (bedded) sediment mercury concentration. It should be clarified that these two measures are not equivalent, even when normalized to size fraction, because the system is not at steady state.

2. At page 56, the document states that "The median value $[Hg]_{norm}$ from ten sediment samples collected from the mouth of the Sacramento River...is 0.40 μg/g. This value will be used in the linkage analysis to calculate assimilative capacities and derive loads. Ambient water bodies...with concentrations above this value are considered to be over the target..." As noted above, the case for establishing this value as a target associated with assimilative capacity is not proven.

3. At page 63, the TMDL uses a generic mercury bioaccumulation factor (BAF), developed for the Great Lakes. It is unclear how applicable this BAF is to San Francisco Bay, a saline estuarine system with a rather different food chain. If methylation occurs primarily in the sediments in the Bay, a biota-sediment accumulation factor (BSAF) is likely to be more appropriate than a water column-based BAF. This is appropriately acknowledged as an outstanding issue on page 141.

4. At page 66, a situation in which 75 percent of the normalized sediment mercury concentrations are over the target value is defined as a significant exceedence, requiring load allocations. However, no discussion follows to justify the cut-off. EPA guidance concerning

water quality exceedences reflects a much higher percentage cut-off and may be analogous and applicable here.

5. At page 118, the box model evaluation of time to target is a very rough tool that may be too coarse to be of use in determining whether allocations are reasonable. The box model assumes a steady state, fully mixed reservoir – which is equivalent to a sediment profile in which no burial occurs. This is clearly not the case in much of the South Bay.

6. At page 120, assimilative capacity is equated to the loading rate that will lead to attainment of the target within fifty years. More discussion on why this time to target is appropriate should be included.

7. The US EPA guidance referenced at the bottom of page 125 and quoted does not support the implication that is made: that it supports allowing an increase in loadings from some sources into an impaired water body. It supports the concept that a phased approach may be appropriate when nonpoint source controls will be implemented and the point source waste load allocation will be based on implementation of nonpoint load allocations. This should be clarified.

8. The discussion on page 126 concerning the effect of allowing the POTWs to increase loadings with respect to time to attain the target is not particularly relevant. The discussion appears to imply that allowing the dischargers to increase loadings will have no net negative environmental benefit. This discussion does not belong in this technical TMDL analysis.

9. Chapter 8 lays out a list of issues and whether or not work is or will be in progress to address the issue (and by whom). If the final TMDL document contains such a section, it should be specific as to what work will be done, by whom and within what time frame. A discussion of how the additional work will impact the TMDL would be useful.