WRITTEN COMMENTS

Role	Organization	Comment Letter No. (date)
Co-Chair		
	SCVWD	None transmitted
	RWQCB	N/A
Liaison to WAMS, Santa Clara Basin Watershed Management Initiative		
	City of San Jose	No. 1 (July 31, 2006)
Member		
	Buckhorn (ENVIRON)	None transmitted
	Clean Water Fund	No. 2 (August 15, 2006)
	DFG	None transmitted
	DTSC	None transmitted
	EPA	No. 3 (June 12, 2006)
	Guadalupe Landfill / Waste Mgmt	No. 4 (August 14, 2006)
	MROSD	None transmitted
	New Almaden Quicksilver County Park Assoc.	No. 5 (August 17, 2006)
	NMFS	None transmitted
	Regional Monitoring Program SPLG	No. 6 (July 31, 2006 from SFEI)
	Santa Clara County	No. 7 (June 26, 2006)
	SCVURPPP (EOA)	None transmitted
	USFWS	None transmitted
	USGS	No. 8 (February 6, 2006)
Consultant		
	TetraTech	None transmitted

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

Environmental Services Department

Watershed Protection Division

July 31, 2006

Carrie Austin
San Francisco Bay Regional Water Quality Control Board
1515 Clay St., Suite 1400
Phone: (510) 622-1015
E-mail: CAustin@waterboards.ca.gov

SUBJECT: Comments on the Guadalupe River Watershed Mercury TMDL Project Report

Dear Ms Austin:

The City of San José (City) appreciates the opportunity to submit comments on the January 2006 Guadalupe River Watershed Mercury Total Maximum Daily Load (TMDL) Project Report. The City recognizes the role of municipal storm sewer systems and wastewater treatment facilities in addressing the issue of mercury. The City has been involved in a variety of activities aimed at the reduction of mercury in the environment and understanding mercury sources and processes. The City of San Jose is clearly committed to reducing water quality impacts related to mercury. The City's efforts include the following:

- Significant outreach efforts to residents, businesses, and municipal staff to change behaviors related to use of mercury containing products.
- Development and implementation of monitoring studies to characterize mercury concentrations and processes in urban runoff and wastewater effluent.
- Participation in regional organizations (e.g., Clean Estuary Partnership and Regional Monitoring Program) addressing mercury-related issues.
- Operation of the National Atmospheric Deposition Network for mercury at Moffett Field.
- Participation in the Guadalupe Mercury TMDL Workgroup.

The City of San Jose commends the Water Board and the Santa Clara Valley Water District for their committed, science-driven approach to development of the Guadalupe River Watershed TMDL for Mercury, and making participation in its development accessible to all stakeholders. The City believes that the involvement of the Guadalupe River Watershed Mercury TMDL Workgroup has helped produce a more robust TMDL and a level of technical understanding among stakeholders uncommon in other TMDL projects. The City commends the Santa Clara Valley Water District for their support of the production of technical products that form the foundation of this TMDL.

General Comments:

The City requests that the Water Board ensure that stormwater implementation steps related to the Guadalupe River Watershed Mercury TMDL be accomplished within the context of the currently-developing Municipal Regional Permit for stormwater. The City encourages the Water Board to maintain a flexible approach to the implementation strategies for both the Guadalupe TMDL and the San Francisco Bay TMDL with respect to stormwater and all source categories, and consider creative and efficient ways in which overall allocations can be met.

It is clear that because of the local mercury-enriched soils, the Guadalupe watershed presents a unique opportunity to improve water quality through current stormwater management practices. It is expected that stormwater control measures now in effect for new and redevelopment projects will reduce releases of all sediment-bound pollutants, including mercury. Concurrently, these measures will reduce creek erosion by retaining/detaining runoff on site, and reducing the peak of flows to the creeks. Since much of the mercury delivered to the Bay by the Guadalupe watershed is liberated from eroding stream banks, The City believes that these erosion-reducing activities should be taken into account and weighed appropriately with respect to mercury in this unique watershed.

Technical Comments:

The relationship of flow to TSS based on data from the "Data Collection Report" (figure 6-1) is relatively weak. The City recommends a high degree of caution should be used in applying a simple regression analysis technique to this relationship. Clearly, other factors strongly affect the mobilization of sediments in streams, such as short-term rainfall intensity and timing. Stormwater in particular often has higher TSS earlier in a storm, even when flows remain constant or increase later in the storm (first flush phenomenon).

Although there are clearly some common characteristics among all impoundments in the Guadalupe watershed, City staff believes that the same 3.0 ng/l max hypolimnion allocation may not be appropriate for each. Differences in basic hydrology, operational patterns, and trophic structures are large among the impoundments. It is therefore unlikely that they will all respond similarly to management actions. In addition, interannual variability in reservoir levels, seasonal temperatures, and rainfall patterns may have large effects on the timing of turnover and methylmercury production. For example, the time of the 2004 turnover indicated on figure 6.9 seems much later than the previous year. Since the extrapolated hypolimnion methylmercury concentration in Lexington reservoir was based on only one year's data, significant uncertainty remains regarding this relationship. This uncertainty should be addressed in the monitoring plan.

Lexington Reservoir largemouth bass contain 0.6 ppm mercury. This relatively high concentration and the possibility of controllable, non-mining sources may warrant reconsideration of Lexington as a reference or baseline, or assuming that 0.6 ppm is the best achievable for the watershed. As stated in the Staff report (pg S-5), Clear Lake bass are also 0.6 ppm, the driver for that mercury TMDL. Using standard consumption rates, calculations in the

Project Report conclude that the fish in Lexington are safe for human consumption. However, it is unknown whether these rates used are locally appropriate. Although staff recognize that the standard consumption rates are the best currently available, the City supports the idea of a consumption study as an adaptive implementation step to better estimate the risk to the local community posed by eating fish caught in the impoundments and creeks.

Presumably, one approach to the control of methylmercury production in impoundments will entail mixing the water column so that oxygen in the hypolimnion is not as significantly depleted during the warmer months. There may be ecological effects of keeping these impoundments well mixed through the warm, dry season. Such changes in circulation may change primary productivity, fish behavior, and other factors. The potential resultant population effects on fishes and birds should be considered in relation to the mercury cycling benefit derived from the mixing. These potential effects should be discussed in the technical report.

Editorial Comment:

Citation for table 3.1 should either document published sources or reflect a “pers. comm.” Pers. comm. references should not appear in the literature cited (references) section.

The City is committed to participation in this important TMDL effort and looks forward to working with Water Board staff to accomplish the goals of the TMDL in an efficient and cost effective manner. Questions regarding these comments may be directed to James Downing at (408) 277-2765 or James.Downing@sanjoseca.gov.

Sincerely,

Steven Osborn,
Acting Deputy Director
Environmental Services Department
Watershed Protection

CLEAN WATER ACTION

August 15, 2006

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

Re: ***Clean Water Action Commentary on Guadalupe River Watershed Mercury TMDL Implementation Plan as Articulated in Staff Report (Sections 7 And 8)***

Dear Ms. Austin,

On behalf of Clean Water Action I would like to thank you for this opportunity to provide comments on the draft implementation plan for the Guadalupe River Watershed's mercury TMDL. What follows are general comments, recommendations, and questions that we believe require clarification. Please be assured that we recognize the hard work that has gone into creating this plan, and our intent is to contribute to those efforts with constructive feedback.

General Comments

1.) Risk Reduction

Though risk reduction is covered in Section 8, we begin these comments with that topic because of its importance. The TMDL implementation plan must include risk reduction considerations. Because the degree of fishing, particularly subsistence fishing for economic or cultural reasons, is unknown, the plan should specify that the Regional Board will explore and implement a means to study the degree and type (subsistence or recreational) fishing in the watershed. For this reason, we heartily support the basic intentions of *Section 8.1, Risk Management*.[1] Based on the findings, the Regional Board would then be responsible for investigating and implementing strategies "to address public health impacts of mercury [in the watershed], including activities that reduce actual and potential exposure of and mitigate health impacts to those people and communities most likely to be effected by mercury in [watershed] caught fish, such as subsistence fishers and their families."[2] (emphasis added)

[1] Section 8.1, Risk Reduction, p. 8-1.
[2] Based on State Board Resolution 2005-0060 remanding the initial San Francisco Bay mercury TMDL, September 7, 2005.

CALIFORNIA OFFICE
111 New Montgomery St. Suite 600
San Francisco, CA 94105
415.369.9160 • 415.369.9180 fax

www.CleanWaterAction.org/ca
cwasf@cleanwater.org

NATIONAL OFFICE
4455 Connecticut Ave. NW Suite A300
Washington, DC 20008
202.895.0420 • 202.895.0438 fax

It should be remembered that the goal, as directed by the State Board, is not to simply warn people of potentially harmful effects of eating fish caught in parts of the watershed, but to reduce impacts on those who rely on this fish for basic nutrition, without other alternatives available to them. While the details of how to study and implement such strategies will be developed later, we disagree with the emphasis on identification of methods of communicating advice or the effectiveness of advisories. We therefore recommend editing this section to prioritize the characterization of groups with potentially high levels of exposure and identification/ implementation of community based, culturally appropriate methods that actually reduce exposure to the mercury and to address the health impacts when they occur. Our suggested language for this section is as follows:

"The highest priority human health risk management activity for the Guadalupe TMDL is to implement community based, culturally appropriate methods that reduce actual and potential exposure of and mitigate health impacts to those people and communities most likely to be effected by mercury in [watershed] caught fish, such as subsistence fishers and their families. To begin this process, a consumption study will be done that will define the nature and extent of community risk, focusing on characterizing groups with potentially high levels of exposure and the identification of methods to reduce that exposure and the health impacts that result. We see input from the Guadalupe Mercury Work Group on the priorities and components of the risk management plan, as well as members of impacted communities themselves. Upon completion of this study, we will implement, or facilitate the implementation, of the appropriate strategies where necessary."

We further recommend that Staff seek out community based organizations, especially those serving the various ethnic groups most likely to fish in the watershed, for data on fishing habits; to determine economic and/or cultural need; to elicit ideas on what risk reduction strategies, if necessary, will be effective; and to create implementation avenues in the future.

2.) <u>Annual Mass Loads and Risk Reduction</u>

One question that arises from our concern about health impacts and risk reduction are the public health ramifications of stating the TMDL, not as a daily load, but combining concentration limits within the watershed and annual mass loads.[3] While we understand the argument that such an annual view will account for such things as seasonal variability and soil erosion, and account for the effects of long-term bioaccumulation, we are concerned that this does model not consider the impacts of catching and eating fish on days during high methylmercury concentration periods. While this may not appear to be a problem for an adult angler who fishes occasionally, it could

[3] Section 7, TMDL, Allocations and Implementation Strategy, p. 7-1.

be problematic for families, especially with small children and women of child-bearing age, who fish regularly—particularly during those times of the year when methylmercury concentrations are highest. If they are consuming fish at those times, the annual averages, which would be lower than the levels of mercury people would be exposed to, are not relevant to public health.

3.) Fish Tissue Targets

It is our view that fish tissue targets in this TMDL do not reflect adequate precaution in the absence of fish consumption data. Because no fishing data is available for the Guadalupe Watershed, any reliance on default fish targets is questionable given that consumption may require lower rates per fish to protect human health? Given this reality, it is reasonable to view the Lexington Reservoir as out of compliance. It should be remembered that the goal of a TMDL is not to protect the waterway from being listed as non-compliant, but to protect the beneficial uses of all the nation's waters.

4.) Methylmercury control

We commend Regional Board staff's inclusion of methylmercury reduction allocations in both deep and shallow impoundments and support this strategy to protect human health and wildlife in the short term. However, as laid out in section 7.1, the allocations do raise some questions that we would like clarified in the Staff Report:

- Given the concerns raised in comment 2 above, is the 3.0 ng/l MeHg in the hypolimnion of the deep impoundments adequate?
- We understand that methylation remains a little understood process, but Phase 1 of Section 7.1 relies on current potential actions that can be implemented based on current knowledge. Given this and that studies of the watershed have led staff to believe interference with methylation in the impoundments is possible and beneficial, what further studies are required (under Phase 1) and why will it take 10 years to study and implement strategies?
- Potential Actions under Phase 1 need to be more specific as to actions to be taken based on current knowledge. For instance, point 2 should read, "Deploy methylmercury controls, such as…{insert potential actions based on current}…and evaluate whether fish tissue mercury levels will meet targets through monitoring within {insert timeframe}. Point 3 should require both in situ and downstream measurements of aqueous MeHg and fish tissue mercury levels.
- Why are implementation strategies for MeHg in shallow impoundments put off until Phase 2 (after 10 years)? We advocate that these strategies be implemented immediately, and revised as new information comes to light that would make such actions more effective.

As already stated, we support the development of technologies to limit methylation as a way to protect public health and wildlife. However, the TMDL cannot rely on the feasibility of such strategies either as a means of mitigation or even risk reduction too heavily at this time, given the uncertainties involved. We would expect the following questions to be addressed in the TMDL

as explanation and defense of decisions being made about bringing the watershed back into compliance:

- Who are the responsible parties for both Phase 1 and 2 of the impoundment allocations and what is their specific time frame to complete technical analysises of hypolimnion methylmercury controls?
- Section 7.1, Phase 1 states that "if the technical analysises indicate it is possible to control hypolimnion methylmercury, responsible parties shall develop and submit for Water Board approval feasibility studies to control methylmercury production. Hasn't this been already to the degree that methylmercury control is being proposed in this TMDL? If not, then this document's assertions on the impact of methylation interference is overly premature. In fact, CWA advocates implementing reasonable pilot programs immediately. While we support the need for sound science throughout the TMDL process, we believe that much is to be gained, both in terms of data collection and actual mitigation by field strategies, such as those being proposed by Water District personnel now, since evidence is available about such strategies' viability. We reject the model whereby we study an issue to death before taking reasonable actions.
- Under "Potential Actions", we advocate spelling out potential methylmercury controls based on current understanding of methylation in the watershed, and specifically in the impoundments.
- Finally, and most importantly, we believe the TMDL must focus ultimately on reducing what impact will natural attenuation have on mercury levels in the impoundments and once total mercury is reduced in the watershed through implementation of this TMDL plan over 20 years, will fish be safe to eat if interference of methylation in the impoundments were to cease? We are not suggesting that cessation is necessary or desirable. We do wish to state, however, our belief that the goal of this TMDL is to bring the watershed into a state where mercury contamination does not pose a threat. Because of the uncertainties regarding methylation, as well as the impacts of future policies, budget constraints, and other social and economic factors, we cannot depend on mitigation over remediation to protect our watershed, wildlife, or the human population.

5.) Section 7.2, Mining Waste Total Mercury Allocations

Our comments regarding this section are as follows:

- The section includes the statement, "We assume that implementation actions taken to address total mercury in mining waste will effectively address dissolved mercury from mining waste…"[4] We recommend adding a sentence justifying this assumption.

- Regarding erosion controls, to what degree are such controls permanent? In other words, will vegetation and other erosion controls ensure that over time, the mine wastes that have not been excavated will remain out of the waters? How will those that are chosen for implementation be evaluated to ensure that we realize permanent control (or the longest time period possible)?

[4] Section 7.2, p. 7-3

- It is our understanding that Phase 1 of the implementation for downstream mining waste will take 10 years, with evaluation of the down stream control actions proposed by responsible parties taking place in the second half of that period. If this is correct, why such a lengthy period of time. We understand the desire to "ensure effective upstream source control before downstream projects are undertaken"[5], but does this infer that no downstream actions are useful in the interim? How do we know that we are being as aggressive as possible in addressing the mercury problem in the watershed and how will we meet the limits set by the San Francisco Bay mercury TMDL in a timely fashion without addressing downstream mining wastes within the next decade?

5) Section 7.3, Urban Runoff Total Mercury Allocation

It is stated in this section that atmospheric deposition and naturally occurring mercury in background soils are difficult to control. Is this always true? Regional air sources can certainly be controlled through air pollution regulations. To this end, we support the Water Board's intention of requesting a Guadalupe River watershed-specific mercury emission inventory from the Air District, as discussed in Section 7.5, Atmospheric Deposition Total Mercury Allocation[6]. Additionally, cannot erosion controls be implemented to reduce contributions of mercury from background soils?

6) Section 7.4, Background Soil Total Mercury Allocation

This section is again, unclear to us. The questions that arise from this section are:

- To what degree are the loads from background soil controllable?[7]
- How permanent are such controls?

If the background levels of mercury in the soil are used as the soil load allocation, that would imply that we are not moving ahead with controls. If this is correct, we would in fact suggest that controls are implemented so as to ensure that we are doing everything possible to eliminate mercury from the watershed's sediment (suspended or otherwise) and water column. Our rationale is based on two points. While the amount may be miniscule compared to other sources, the reduction demands to bring the watershed back into Clean Water Act compliance and to meet the needs of the Bay are very great and we are depending on technologies that are yet to be proven to reduce methyl mercury in the system. Secondly, it is unclear from this document whether pre-mining background concentrations we such that when accumulated in the water and sediment, fishing was actually safe. Since fishing is a stated beneficial use for the watershed, this must now be examined before it can be accepted.

7) Section 7.5, Atmospheric Deposition

See comments under #5

8) Section 7.6, Integration with San Francisco Bay Mercury TMDL

[5] Section 7.2, Phase 1, pp. 7-4, 7-5.
[6] Page 7.8
[7] Section 7.4, p. 7-7. "…the loads are somewhat controllable."

- A number of questions arise out of this section that we would like clarification on. Specifically, what will the interim and final allocation for urban runoff be given discussions regarding the Bay TMDL? How realistic are these goals? In other words, are they reachable, or conversely, aggressive enough?

- While we support dischargers' implementation of technologies that reduce methylation, we wish to point out that this TMDL measures total mercury. Consequently, it is unclear how average mercury load reductions can be measured though "efforts to reduce methylation or mercury-related risks to humans and wildlife."[8]

- There is no discussion on the potential impacts of the salt ponds on the fate and form of mercury going from the Guadalupe Watershed and the Bay. This could be a potentially critical issue if the salt ponds increase methylation, and we view giving it such short shrift as a major flaw. Simply saying that the issue will be addressed is not adequate, even though our understanding of methylation and transport may be limited. Based on our current knowledge, what does the Regional Board have in mind in order to tackle this thorny problem? We naturally would expect that Adaptive Implementation will further inform this process as we learn more.

We thank your for your consideration of our comments and hope to continue working with you to ensure not only that the TMDL provides the best plan to address the mercury problem, but that the future implementation will lead to a safer, healthier watershed.

Sincerely,

Andria Ventura
Program Manager

[8] Section 7.6, Integration with San Francisco Bay Mercury TMDL, p. 7-9.

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

Dear Mr. Wolfe:

Thank you for the opportunity to review the proposed Guadalupe River Watershed Mercury Total Maximum Daily Load (TMDL) Project Report, dated January 2006. We appreciate the hard work to develop this Project Report, and have met with staff to discuss our review and comments. We are concerned that in their current form, the TMDLs do not appear to meet all federal TMDL requirements. The TMDLs do not appear to meet Basin Plan or CTR water quality standards, as noted below.

We are concerned that the Project Report does not sufficiently demonstrate that the TMDLs would result in attainment of applicable water quality standards. With respect to numeric standards, the TMDL report does not demonstrate how the numeric Basin Plan objective of 0.025 ug/l (4-day average) and the CTR human health numeric criterion will be attained throughout the affected water bodies. We recognize that formal adoption of a Basin Plan amendment is months away, and wanted to inform you of our review. Detailed comments and recommendations are provided in the attachment.

We again commend your staff for their hard work on this difficult mercury TMDL report. We are committed to working with the State to identify approaches that address our shared goals of accomplishing reductions of mercury levels in the Guadalupe River watershed while ensuring that legal requirements are met. If you have any questions concerning these comments, please call me at (415) 972-3572 or refer staff to Diane Fleck at (415) 972-3480.

Sincerely yours,

Alexis Strauss
Director, Water Division

cc: John Muller, Chair, San Francisco Bay Regional Water Quality Control Board
Michelle Pla, BAWQA
Kevin Buchan, WSPA
Geoff Brosseau, CASQA

Attachment
US EPA Comments on Guadalupe River Watershed Mercury TMDL
Project Report, January 2006

1. Attainment of Water Quality Standards: The CTR human heath criterion and the Basin Plan objectives are the legally applicable water quality standards for these water bodies. These standards are in total mercury in the water column, not in fish tissue. These applicable numeric water column standards must be achieved by the TMDL. The analysis does not clearly show how these water column standards will be attained and maintained, especially during winter storm events. The analysis must clearly show that the applicable water quality standards will be attained, in order for EPA to approve the TMDL under the Clean Water Act.

2. Allocations: a. Allocations for mercury from mining waste are included as concentrations, while other allocations for mercury are included as mass per unit time, or kilograms per year. The allocation for the Guadalupe River from the San Francisco Bay Mercury TMDL is 2 kg/year, excluding the categories of sources that include loads from the Guadalupe River watershed. In order to show that the allocations in this TMDL do not exceed the allocation given in the Bay TMDL, please include the calculations to show that the mining waste allocations do not exceed the 2 kg/year allocation, and clearly explain that the other categories of allocations for mercury (excluding methylmercury) are included in the respective categories from the Bay TMDL. The allocations in this TMDL must achieve the allocations adopted in the San Francisco Bay Mercury TMDL.

   b. For clarity, we recommend that targets, loads, and allocations for methylmercury be shown separately from those for total mercury.

   c. Allocations for Stormwater NPDES Dischargers: If the San Francisco Bay Mercury TMDL included waste load allocations for stormwater (or other) NPDES dischargers that discharge within the Guadalupe River watershed, please include these waste load allocations in your allocations section, for completeness.

3. Impaired Water Bodies: On page S-5, the report says that the TMDL addresses water bodies impaired for mercury in the Guadalupe River Watershed, and that six water bodies within the watershed are currently listed on the Clean Water Act 303(d) list as impaired: Almaden Reservoir, Alamitos Creek, Calero Reservoir, Guadalupe Reservoir, Guadalupe Creek and Guadalupe River. The report states that additional water bodies are considered impaired but have not yet been listed, and that this TMDL document addresses those water bodies as well.

   If the Regional Board will be adopting TMDLs for water bodies that are not included on the current 303(d) list, the Board must clearly identify each water body as water quality limited for mercury and needing a TMDL for mercury. The Board should provide a specific record supporting this conclusion for each water body, and why it is important to adopt a TMDL for each water body at this time.

The Board should notice the identification of each water body as water quality limited and needing a TMDL either before or as part of the public notice for this TMDL, and the record of impairment for each water body should be available for public review during the public comment period.

We recommend this process as a way to ensure that TMDL development is clear and transparent to the general public. We also believe it will serve to increase pubic awareness of impairments in water bodies that have not been previously identified as water quality limited.

4. Lexington Reservoir: On page S-6 (and elsewhere throughout the report), it states that since Lexington Reservoir does not receive mining waste or urban runoff, it can serve as a "reference reservoir" indicative of natural background conditions. We agree it can serve as a "reference reservoir" in this watershed since it does not receive, and has never received any direct mining or urban runoff, but we do not agree that it should be described as indicative of natural background conditions. Lexington Reservoir receives local and global atmospheric deposition, and because of its proximity, received historical atmospheric deposition from the New Almaden Mining District when it was operational, from the many retorts and furnaces.

5. Targets: The analysis uses 0.3 mg/kg in "fish typically consumed" as a numeric target for the protection of human health. We assume that since site-specific data are not available to determine current or historical consumption rates and trophic level breakouts, EPA's default rate of 17.5 g/day for the general population was used, as well as EPA's default trophic level breakout of fish being consumed. This results in an allowable trophic level (TL) 4 fish tissue level of 0.66 mg/kg and an allowable TL3 fish tissue level of 0.17 mg/kg.

   Although the reservoirs are man-made, nonetheless it is widely known that these water bodies are popular fishing spots, and have been for quite some time. Thus, they must be protected for their beneficial uses which include human consumption of fish. The analysis indicates that largemouth bass of around 40 cm are believed to be representative of the size consumed by humans (page 2-3). Since these are TL4 fish, the analysis indicates that the "allowable" level in these fish is 0.66 mg/kg, based on EPA's default assumptions.

   However, EPA's guidance strongly advises that site-specific consumption data be used where available, and that where consumption data on individual trophic levels are not available, the criterion be applied to the highest trophic level consumed (Water Quality Criterion for the Protection of Human Health: Methylmercury, Office of Water, U.S. EPA 2001, EPA-823-R-01-001, Chapter 7; and 66 FR 1334, January 8, 2001, page 1355). EPA recommends that the default 0.3 mg/kg criterion be applied to the highest trophic level fish believed to be currently consumed (or previously consumed if known and if results are more stringent) from the reservoirs, to be protective of the existing human health

beneficial uses. For the reservoirs, a TL4 fish tissue level of 0.66 mg/kg would not be protective of human health, if anglers are eating primarily 40 cm largemouth bass.

Since fish advisories were first posted in 1987, it is very likely that "fish typically consumed" today are not the same as the fish consumed in 1987 and earlier, before it was known that the fish posed a human health risk. Therefore, it would be inconsistent with the goals of the Clean Water Act to set a target for human protection based on decreased consumption rates due to knowledge of contamination. We assume that no data on consumption rates prior to 1987 are known to exist; thus, we recommend setting a target for the protection of human health at 0.3 mg/kg in 40 cm largemouth bass. This would be reasonable, and protective of both current and past recreational consumption of fish from the reservoirs. If subsistence fishing is occurring or has occurred on any of the water bodies, EPA recommends that a higher consumption rate be used to determine protective fish tissue levels for human health.

Although a fish tissue level of 0.3 mg/kg in TL4 bass is lower than existing fish tissue levels in Lexington Reservoir, a reference reservoir, Lexington Reservoir may not represent fish tissue levels solely from naturally occurring background mercury levels in the area. Since Lexington Reservoir may represent levels attainable from currently controllable sources, it may represent a level currently achievable. This may be an issue for discussion in the implementation section.

6. Targets: On page 5-2, the report says, "US EPA's approach for developing its fish tissue criterion includes several additional conservative assumptions, including incorporating a factor of 10 in the reference dose to account for uncertainties related to mercury health effects and its metabolism within the body." The reference to "several additional conservative assumptions" appears to be an overstatement. We recommend that the statement be changed to "EPA's approach for developing its fish tissue criterion includes incorporating a factor of 10 in the reference dose." For mercury, this factor of 10 includes a factor of 3 for pharmacokinetic variability and uncertainty, as well as factors for other areas of concern including the inability to quantify possible long-term sequelae for neurotoxic effects, questions as to the possibility of observing adverse impacts (such as cardiovascular effects) below the Benchmark Dose Lower Limit or BMDL, and lack of a two-generation reproductive effects assay. Thus, our factor of 10 is scientifically substantiated. See Water Quality Criterion for the Protection of Human Health: Methylmercury, Office of Water, U.S. EPA 2001, EPA-823-R-01-001.

7. Margin of Safety: The first part of the discussion concerning an implicit margin of safety states that since the numeric targets were made using conservative assumptions, an implicit margin of safety is created. It is inappropriate to include a discussion of whether the underlying water quality standard (or target if the same as the water quality standard) is conservatively established in the margin of

safety analysis. Conservative assumptions included in standards calculations for noncarcinogens such as mercury are intended to account for the uncertainty and variability in the reference dose i.e., the dose response relationship of the pollutant to the human population. Margins of safety in a TMDL analysis are to account for analytical uncertainty in the TMDL analyses such as uncertainty in the source analysis, linkage analysis, attainment of standards analysis and the like. We recommend you focus on conservative assumptions in the TMDL analytical analyses to establish an implicit margin of safety.

8. Methylmercury: The impoundment hypolimnion methylmercury allocation of 3.0 ng/l as a seasonal maximum appears inconsistent with data in the Final Conceptual Model Report (FCM). The FCM contains data relating methylmercury fish tissue levels with methylmercury water column values for age-1 largemouth bass and for adult largemouth bass (Tetra Tech, April 2005, pages 3-44 to 3-48). For example, 3.0 ng/l in the hypolimnion water column correlates to a fish tissue level of 1.5 mg/kg in adult largemouth bass (p. 3-45). However, the numeric target in adult largemouth bass is 0.66 mg/kg; the correlation shows that hypolimnion concentrations of 3.0 ng/l will yield fish tissue concentrations more than double the numeric target.

   Similarly, 3.0 ng/l in the hypolimnion water column correlates to a fish tissue level of over 0.4 mg/kg in 8 cm (age-1) largemouth bass which are considered TL2-3 fish (p. 3-47). However, the numeric target for 5 to 15 cm TL2-3 fish for wildlife is 0.05 mg/kg, significantly lower. Both yield positive correlations (R(2) equals 0.82 for age-1 bass).

   We note that the 3.0 ng/l allocation is a seasonal maximum, while the data used in the above correlations are not (they appear to be seasonal or yearly averages). We recommend you clearly discuss why a seasonal maximum is appropriate and why the value, which appears high, is appropriate and will result in protective fish tissue values, given the data in the FCM.

9. Implementation Schedule: The TMDL Project Report in the Summary at page S-8, and in the body of the report at pages 7-9 and 7-11, indicates that the allocation for urban runoff will not be required for 20 years. We recommend that a statement be added to the Project Report similar to that in the San Francisco Bay Mercury Staff Report that the Regional Board will seek EPA approval of the implementation schedule under 40 CFR Part 131.13.

Editorial Comments

1. On page 1-4, the report says that EPA promulgated a methylmercury criterion of 0.3 mg of methylmercury per kg of fish tissue. EPA has published a Clean Water Act section 304(a) guidance criterion for methylmercury; we have not promulgated this criterion for California. Please correct this sentence.

2. Oversized Figure 3-8, Map of Mercury Concentrations Remaining After Park Clean-up, does not indicate the units of the soil concentrations. Please add the units of measurement.

801 Second Avenue, Suite 614
Seattle, WA 98104
(206) 264-8207
(206) 264-8212 Fax

ANDREW M. KENEFICK
Senior Legal Counsel, Western Group
Admitted in Washington
Direct (206) 264-3062 Fax (866) 863-7961
akenefick@wm.com

August 14, 2006

BY U.S. MAIL AND E-MAIL: caustin@waterboards.ca.gov

Carrie M. Austin, P.E., Project Manager
San Francisco Bay Regional Water Quality Control Board
1515 Clay St., Suite 1400
Oakland, CA 94612

RE: Comments on Preliminary Draft of *Guadalupe River Watershed: Mercury Total Maximum Daily Load (TMDL) Project Report* (January 2006)

Dear Ms. Austin:

Guadalupe Rubbish Disposal Company, Inc. ("GRDC") appreciates the opportunity to review and comment on the January 2006 preliminary draft of the Regional Water Quality Control Board's *Guadalupe River Watershed: Mercury Total Maximum Daily Load (TMDL) Project Report* (the "Report"). As you know, GRDC owns and operates the Guadalupe Landfill and is therefore very interested in the development of an appropriate, scientifically-based TMDL for the Guadalupe Watershed. We also recognize and appreciate the amount work that you and others at the Water Board have devoted to this process and to working with various constituencies in the Watershed, including regulated businesses like GRDC.

Nonetheless, you will see from our comments that GRDC is very concerned with – indeed quite critical of – the Report as it is currently drafted. We believe that there are several fatal defects to the overall TMDL and a number of areas where there is not an adequate technical or scientific basis for the conclusions reached or recommendations offered. For example, one major problem with this TMDL is that it does not in fact establish a "total maximum daily loading" or "allocations" as required by the federal Clean Water Act. Nowhere does the Report establish a total "daily loading" of allowable mercury to the watershed, and nowhere does it establish daily load allocations. Rather, it establishes certain concentration-based "allocations" in some areas, and annual mass-based loading rates in other areas. We are also very concerned because many of the conclusions and recommendations of the Report are based on scant data, data gaps, and large degrees of uncertainty.

We have tried to capture the most significant comments that we have identified in our review of the Report; however, we anticipate that there are other issues that we will continue to identify as we spend more time reviewing the Report and related documents. We have not tried to comment on less significant issues or more technical areas of concern where more scientific expertise may be necessary. While we hope that the Water Board considers our comments and will address them in

the next draft of the Report, GRDC does reserve the right to submit additional comments when the final draft Report is published for full public comment.

1. EPA may not be able to approve a TMDL that is not stated as a "daily load."

The Report states, "A TMDL need not be stated as a daily load (Code of Federal Regulations, Title 40, §130.2[i]). Other measures are allowed if more appropriate." Report at 7-1. While GRDC generally favors the Board's preference for adopting TMDLs based on other appropriate and more flexible considerations, the recent decision in *Friends of the Earth, Inc. v. EPA*, 446 F.3d 140 (D.C. Cir. Apr. 25, 2006) dictates otherwise. In that decision, issued after the publication of the Report, the D.C. Circuit held that the Clean Water Act requires that TMDLs must be set based on "daily limits", not annual or seasonal discharges. "Daily means daily, nothing else." 446 F.3d at 142. The Board needs to be aware of this significant vulnerability in its proposed TMDL, which adopts seasonal, annual, and concentration-based load allocations, but no daily loads.

2. GRDC supports the general approach of the implementation strategy for the downstream historical mining areas.

GRDC is generally supportive of the implementation strategy for historical mining areas downstream of the impoundments, including the Guadalupe Creek area adjacent to the Guadalupe Landfill. The proposed implementation strategy is similar to existing stormwater strategies, including implementation of best management practices for controlling stormwater run-off. GRDC supports implementation of reasonable actions to control sediment discharges to Guadalupe Creek and requests that the Report clarify that implementation of best management practices will be sufficient for these limited "downstream areas" of potential concern. Conversely – and as more fully discussed in subsequent comments – GRDC continues to disagree with the adoption of the 0.2 mg/kg erodable soil standard as an appropriate "allocation" under the TMDL for such downstream properties.

3. A TMDL cannot be set based on mercury concentration in "erodable soil."

Fundamentally, a TMDL is a "daily load" or a quantity of material that can be discharged into navigable waters on a daily basis, typically expressed as units per day. The Report establishes a TMDL based not on a daily discharge rate, but rather on a static concentration of mercury in soil, regardless of what total quantity of mercury discharges to navigable waters or at what rate. As such, the 0.1 ppm and 0.2 ppm "mining waste total mercury allocations" are not allowable bases for establishing waste load allocations under the Clean Water Act. EPA Region 9's guidance on TMDLs states, "The loading capacity reflects the maximum amount of a pollutant that may be delivered to the waterbody and still achieve water quality standards." EPA Region 9, *Guidance for Developing TMDLs in California* at 4 (Jan. 7, 2000) ("EPA Region 9 Guidance"). In stark contrast to this directive from EPA, the Report admits:

> [T]he Guadalupe Linkage Analysis (see Section 6) for inorganic mercury is qualitative, so it does not provide a scientific basis for a mass load in the Guadalupe River watershed. Report at 7-3 (emphasis added).

This admission is tantamount to conceding that the TMDL does not provide the very information that it is required to provide, namely "an understanding of pollutant loading sources and the amounts and timing of pollutant discharges [that] is vital to the development of effective TMDLs." EPA Region 9 Guidance at 4.

4. A standard based on "erodable soils" is vague and unworkable.

Even if a TMDL based on mercury concentrations in erodable soils were lawful, the standard is unworkable as a practical matter. How does one determine which soils are "erodable?" Aren't all soils erodable to some degree? The Report defines "erodable soil" as "soil that is transported by storm runoff to receiving waters." Thus, for a landowner to know whether certain soils are "erodable soils" those soils must have already been transported by stormwater runoff to receiving waters, making *post hoc* control of those discharges impossible. Conversely, if all soils are – in theory – erodable, then GRDC is concerned that the Water Board could treat the 0.1 ppm and 0.2 ppm standards as *de facto* cleanup standards. The majority of soils throughout the Guadalupe Watershed would likely exceed this excessively stringent standard, thereby requiring removal or some other form of remediation to ensure that the soils would never become "erodable."

While GRDC does not read the Report as actually establishing mercury soil cleanup standard, the Report should clearly state so. Otherwise, there is a significant risk that others will interpret the 0.1 and 0.2 mg/kg "erodable soil" standards as being *de facto* cleanup standards.

5. An "erodable soil" standard of 0.1 ppm or 0.2 ppm is excessively and unjustifiably stringent.

Through this TMDL, the Board is imposing "erodable soil" cleanup standards that are two to three orders of magnitude more stringent than cleanup standards developed and typically applied by EPA and the State of California for cleanup of mercury contamination of soils. For example, EPA Region 9 has developed "preliminary remediation goals" or "PRGs" for mercury concentrations in residential and industrial soils. These PRGs are not cleanup standards *per se*; rather, they are "tools for evaluating and cleaning up contaminated sites" and "risk-based concentrations that are intended to assist risk assessors and others in initial screening-level evaluations of environmental measurements." For mercury, EPA has set the PRGs at 23 mg/kg for residential soils and 310 mg/kg for industrial soils. Similarly, the California Human Health Screening Levels sets screening levels of 180 mg/kg for commercial/industrial properties and 18 mg/kg for residential properties.[1] Even this Board's Environmental Screening Levels ("ESLs") are set substantially higher, at 37 mg/kg for industrial properties and 3.7 mg/kg for residential properties.[2]

While the Report lacks any valid basis for setting the erodable soil standard at 0.1 mg/kg, it explains the 0.2 mg/kg erodable standard as being based on the San Francisco Bay TMDL. Yet, there is no explanation in the Report as to why a marine mercury sediment standard is appropriate for a freshwater "erodable soil" standard, especially given that the locations are substantially different in terms of potential to methylate mercury. Other standards are more supportable than this arbitrary 0.2 ppm standard. For example, the Report references a standard of 3 ppm for erodable fines in the Sulphur Creek Watershed Mercury TMDL. Why is this higher standard less suitable than the marine sediment standard in San Francisco Bay?

In other words, a substantial amount of scientific investigation and evaluation has been undertaken to derive appropriate screening and cleanup levels for soils contaminated with mercury. In contrast, the Report admits that it has not undertaken any kind of scientific evaluation of the purported "standards" other than adopting a background concentration of 0.1 mg/kg from

---

[1] http://www.epa.gov/region9/waste/sfund/prg/files/04prgtable.pdf at 9.

[2] http://www.waterboards.ca.gov/sanfranciscobay/esl.htm

"background" sediment concentrations in the Lexington Reservoir and the San Francisco Bay TMDL concentration of 0.2 mg/kg. With respect to sediment standards, there is likewise a substantial amount of scientific study available for setting appropriate mercury concentrations, little of which is referenced or considered.

6. Lexington Reservoir is not an appropriate background reference.

The Report's decision to use Lexington Reservoir sediments to represent background sediment concentrations is neither justified nor logical. First, any scientific valid exercise must first establish criteria that define a "background" standard. This was never done. The reservoir was not characterized as to the controlling physical processes that determine the movement and distribution of sediment or mercury or the inorganic and biochemical processes that cause methylation. The Report does not present the necessary scientific studies required to define background areas or quantitative background limits.

Second, the Report itself does not support using Lexington Reservoir as an appropriate background location. It states,

> Lexington Reservoir, for example, does not receive mining wastes or urban runoff and therefore serves as the "reference reservoir" indicative of natural background conditions. Report at S-6.

The Report also notes that, other than a small silica deposit, "there were no other potential mercury deposits identified in the Lexington Reservoir watershed." Report at 3-12 (emphasis added). The Report therefore cannot justify using Lexington Reservoir – or the areas draining into it – as representative of background conditions in the New Almaden Mining District due to the absence ofmining activities or naturally existing cinnabar concentrations in the soil that would otherwise support mining activities. Obviously, mercury-mining activities will occur in areas where there are significant amounts of cinnabar\mercury to be mined. Conversely, areas where mercury mining took place will more likely have naturally-occurring background levels of mercury in rocks, soils, and sediments than those areas where no mercury mining occurred. Thus, it is neither supported nor valid for the Report to conclude that Lexington Reservoir is an appropriate reference reservoir because there is no evidence that natural background conditions for the Lexington Reservoir are representative of the conditions of the New Almaden Mining District in the absence of mining activities.

7. The TMDL does not support adopting a 0.1 ppm "natural" sediment concentration from the Lexington Reservoir and applying it to the Guadalupe Watershed.

It appears from the Report that the sole basis for establishing a 0.1 mg/kg erodable soils standard for the upper mining areas in the Guadalupe Watershed is the average sediment concentration of 0.1 ppm in the Lexington Reservoir. Yet, the Report provides scant information to justify whether these waterbodies are comparable. There are a myriad number of variables that can differ between the Lexington Reservoir and the Guadalupe Watershed, including depth of sediment samples, time of year of sampling, spatial and temporal variability in samples, rate of sediment deposition, average sediment grain size, methylation rates, location of samples, temperature, oxygen content, pH, types and sizes of fish, etc. For example, the Report itself recognizes that the presence of mineral springs or acid mine drainage can cause significant differences in mercury concentrations and methylation rates. Report at 3-16. Given the significance of the 0.1 mg/kg erodable soils

standard, the Report must provide a much more substantive and scientifically-supported basis for the decision to treat the Lexington Reservoir sediment samples as suitable to use as the basis for an erodable soil standards.

8. The TMDL will punish dischargers who reduce sediment loading.

A significant problem with the TMDL Report is that it establishes an erodable soil concentration limit without considering the amount of sediment being discharged. High concentrations of mercury in erodable soils will have *de minimis* impacts on mercury loading into the Guadalupe Watershed if the quantity of erodable soils discharged is negligible. Conversely, largequantity discharges of sediment to the Watershed could substantially increase overall mercury loads to the Watershed even if themercury concentration inthose erodable soils is low.

For example, Table 4.2 of the Report summarizes particulate mercury data. A comparison of North Los Capitancillos Creek Sample E1-9b with Randol Creek Sample E2-16 highlights the perverse results if the TMDL is based on an erodable soil concentration. Sample E1-9B has the lowest concentration of mercury, yet one of the highest total suspended solids ("TSS") concentrations. Conversely, Sample E2-16 has a higher mercury concentration, yeta substantially lower TSS concentration. When judged on the basis oftotal quantity of mercury in soil, the first sample fares substantially better than the second. However, when compared based on the actual mercury concentrations per liter of discharged water, the second sample contains one-tenth the mercury loading of the first sample. Thus, even though the second discharge is one-tenththe quantity of the first, the second discharge will likely require greater remediation efforts than the first under the current Report. In other words, it is fundamentally unfair to regulate discharges of mercury based on only the concentration of mercury in erodable soil without any consideration of the actual TSS discharges.

9. The Report confirms that there is no need to assign allocations to mining sources downstream of the reservoirs.

In spite of many of the problems in the Report, the Report makes the following significant observation:

> Although there may be sites for methylation in the stream and river channels …, their total contribution to methylmercury production is much smaller than the exports from the reservoirs and Lake Almaden during the dry season. This suggests that <u>reducing methylmercury production to attain TMDL targets in impoundments in the mining district and Almaden Lake will likely also attain targets in downstream waters</u>. Report at 6-23 (emphasis added).

Thus, the Report itself acknowledges that allocations are not necessary for downstream sources in order to meet the TMDL targets. In that case, there is no justification for requiring downstream mining sources to implement load reduction strategies to meet the TMDL target.

10. The allocation for mining waste discharges from areas below the reservoirs should be increased substantially.

Even if the Report continues to assign allocations to downstream mining sources, those "erodable soil" concentrations should be increased substantially. For facilities located in mining areas downstream of the reservoirs (such as the Guadalupe Landfill), the Report arbitrarily selects an

erodable soils standard of 0.2 mg/kg mercury. Indeed, the Report candidly admits that it has little basis for this number, other than the fact that the proposed San Francisco Bay TMDL uses a 0.2 mg/kg standard. The Report admits that, for the mining areas that do not drain to impoundments, "The Linkage Analysis (Section 6) does not provide a quantitative linkage for this segment of the watershed." Report at 7-4 (emphasis added). At most, the Report concludes that those areas downstream of impoundments contribute far less to the production of methylmercury than what the reservoirs contribute:

> Although there may be sites for methylation in the stream and river channels, it appears that their total contribution to methylmercury production and bioaccumulation is <u>much smaller</u> than the reservoir exports during the dry season. Report at 6-15 (emphasis added).
>
> [T]he methylmercury discharged from the deep impoundments is <u>much greater</u> than the in-stream production (Section 6.3). Report at 7-4 (emphasis added).

Thus, the 0.2 mg/kg erodable soils standard is arbitrary and unnecessarily stringent for these limited downstream areas.

11. The derivation of the 0.1 ppm/0.2 ppm standards is arbitrary and logically flawed.

The Report has established target mercury concentrations in "erodable soil" based on the flawed logic that: (1) fish in the Lexington Reservoir have acceptable mercury levels, (2) average mercury levels in the Lexington Reservoir sediments are less than 0.1 ppm; therefore, (3) locations where sediment mercury concentrations exceed 0.1 ppm or even 0.2 ppm will result in (4) fish with unacceptably high mercury concentrations. This logical progression is invalid. One cannot reason that if fish with acceptable mercury burdens live in a reservoir with average mercury concentrations of 0.1 mg/kg, then locations where mercury concentrations exceed 0.1 mg/kg will result in fish with unacceptably high mercury burdens. In other words, there is no basis or evidence for the Report to conclude that fish in areas with sediment mercury concentrations higher than 0.1 ppm or 0.2 ppm will necessarily have mercury concentrations above the fish tissue targets.

12. Fish in Lexington Reservoir – the purported background reservoir – do not appear to meet the 0.3 ppm target.

In spite of the discussion in Section 6.6 of the Report, it is unclear why the Board has concluded that the fish from the purported background reservoir meet the 0.3 ppm mercury average in "fish typically consumed." As noted, TL4 fish are the larger species – *e.g.*, largemouth bass – that are typically consumed by humans; therefore, the 0.3 ppm mercury standard would presumably apply to these TL4 fish. If that were the target, then the 0.3 ppm mercury fish concentration would be virtually impossible to achieve in the Guadalupe basin given that this standard cannot even be achieved in the purported background reservoir.

The Report also suggests that by changing the assumptions about what fish types are eaten, the standard may be changed. Are we to conclude that if one trophic level has extremely high tissue numbers, those samples can be omitted from the erodable soils "allocation"? Additionally, the report provides no seasonal or year-to-year variation values. In order for the fish in Lexington Reservoir to serve as the basis for the entire TMDL, regular sampling and analysis (at least every

winter and summer season) of all trophic levels should be conducted throughout the implementation period of 20 years as established by the report.

13. The TMDL should use the USFDA's 1.0 ppm mercury action level for fish, not the 0.3 ppm target.

The Report notes that the Basin Plan's numeric water quality objective for mercury is derived from the US Food and Drug Administration's action level for mercury of 1.0 ppm,[3] yet nonetheless uses the more stringent value of 0.3 ppm as the target based on EPA's criteria, which has not been adopted for California. Because the water quality objective is based on USFDA's number, this TMDL should use the 1.0 ppm number as its TMDL target.

14. The Report has numerous data gaps.

Fundamental to the development of a technically and scientifically supportable TMDL is developing a sound understanding of the sources of pollutant discharges, the amounts of those discharges, and the timing of those discharges. EPA Region 9 writes,

> An understanding of pollutant loading sources and the amounts and timing of pollutant discharges is vital to the development of effective TMDLs. The TMDL document must provide estimates of the amounts of pollutants entering the receiving water of concern or, in some cases, the amount of pollutant that is bioavailable based on historic loadings stored in the aquatic environment. These pollutant sources or causes of the problem need to be documented based on studies, literature reviews or other sources of information. Because the source analysis provides the key basis for determining the levels of pollutant reductions needed to meet water quality standards, and the allowable assimilative capacity, TMDL, wasteload allocations, and load allocations, quantified source analyses are required. EPA Region 9 Guidance at 4.

While the Report includes discussion and some analysis of pollutant loading sources, we do not believe that the amount of information or analysis is sufficient for purposes of developing a TMDL. For example, there are numerous statements throughout the TMDL acknowledging the data gaps, lack of calibration, and potentials for significant uncertainties. Examples include:

> Because of the absence of flow gauge information at any of the subwatersheds modeled, the SWAT model could not be calibrated, which is considered a source of uncertainty (see Section 4.3). Report at 4-4.
>
> Lack of high flow sample data may lead to an underestimation of the load, which is discussed in the uncertainty section (4.3), below. Report at 4-4.
>
> Like the Monte Carlo simulation for one year, the Monte Carlo simulation for 1960 – 2001 wet seasons (Figure 4.6) is also biased low due to lack of data for high flow events, when the greatest loads occur. Report at 4-20.
>
> The 2003-04 wet season loads exiting the Guadalupe River to San Francisco Bay (10,000 g) are far higher than the total loads entering the river from all its tributary

[3] See, *e.g.*, http://www.cfsan.fda.gov/~lrd/fdaact.html#merc

> creeks and from its watershed (800 g). This is a strong indication of uncertainties in the upstream contributing loads, in loads from the highly urbanized area, and in the mobilization of internal sediment loads. Report at 4-11.
>
> This lack of calibration adds to the uncertainty, and there is insufficient information to determine whether it might contribute to under- or overestimating the load. Report at 4-17.
>
> [T]he Guadalupe Linkage Analysis (see Section 6) for inorganic mercury is qualitative, so it does not provide a scientific basis for a mass load in the Guadalupe River watershed. Report at 7-3.

More fundamentally, we believe that there is a significant lack of information in the TMDL for assessing temporal and spatial contributions of mercury to the watershed. For example, fish tissue information provides very little information as to what sources are contributing to mercury loads and when those discharges occur. This is especially problematic for sources downstream of the reservoirs where fish tissue concentrations would fail to distinguish between methylmercury generation in the upstream impoundments and generation in the downstream segments.

As another example, the TMDL sweeps huge areas of the watershed into the "Mining District" without describing or mapping in more detail the locations of mining areas, mining waste, mining impacts, soil types, background mercury concentrations in soil, and mercury bearing rocks.

15. The Report fails to adequately quantify loading from wet weather storm events in the upper watershed.

One glaring – and admitted – defect in the Report is the lack of upper watershed load estimates, particularly during wet weather when increased flows result in higher sediment transport and therefore higher mercury transport. Without this kind of information, it is not possible to develop a defensible TMDL. Indeed, even the consultant assisting in the preparation of the Report "strongly recommended" further study:

> Although approximate, this calculation highlights the significance of the storm event loads in the upper watershed, and indicates a major source of uncertainty in the estimated loads presented here: the contribution of large winter storms. Based on this assessment, it appears that the calculated loads presented here are more likely to be underestimates than to be overestimates. Tetra Tech strongly recommended further quantification of the upper watershed loads through additional wet weather data collection in future stages of this project. Tetra Tech also noted that the numerical values of the loads presented in this section are best considered only as estimates useful in comparing the relative magnitudes of different sources in the watershed. Report at 4-17 (emphasis added).

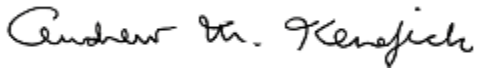
The problems with the limited wet season sampling provide an unreliable basis for establishing a proper TMDL. The wet season data was collected during only one wet season making it difficult to understand long-term temporal variability in pollutant loading and stream flows. Furthermore, the data collected is dispersed over the whole watershed and provides at best a snap shot of mercury concentrations at one point in time. Even for the samples collected, it is unclear why flow rates and

suspended sediment values were not also collected. Understanding flow rates and sediment loading is critical to understanding the mercury loadings into the watershed.

* * *

As should now be evident, GRDC is extremely concerned with the adequacy of the TMDL Report. Given how important this TMDL will be to everyone within the Guadalupe Watershed, we believe that it is critical that the Water Board address these issues in order to ensure that the TMDL is well-supported legally, technically, and scientifically. We look forward to continuing to work with you and the Board staff to improve the Report.

Sincerely,



Andrew M. Kenefick

cc: Eddie Pettit
Steve Janes
Todd Maiden

LL re Comments on Guadalupe TMDL (8/14/06)

NEW ALMADEN
QUICKSILVER COUNTY PARK ASSOCIATION
P.O. Box 124, New Almaden, CA 95042

August 17, 2006

Carrie M. Austin, P.E.
Project Manager - Hg TMDL in Guadalupe
SFB Water Board
1515 Clay St., # 1400
Oakland, CA 94612

Dear Ms. Austin,

On behalf of the New Almaden Quicksilver County Park Association ("NAQCPA") and as a resident of New Almaden, California, I am pleased to provide the Regional Water Quality Control Board, San Francisco Bay Region ("the Board"), with comments regarding the Guadalupe River Watershed Mercury Total Maximum Daily Load Report ("Report") dated January 2006. This review includes the *Final Conceptual Model Report*, TetraTech, May 20, 2005, but only to the degree the Model is referenced in the Report. My comments follow the order of the Report, with reference to the page and paragraph, but first general comments are provided.

I think the report has ably identified the key issues of "hot spot" sediment and methyl mercury production that should be controlled. I think the Report has found as good a balance as can be achieved between an ideal TMDL load allocation and the problem of assigning a "load" to the complex methylation process. I encourage the USEPA and all of the parties involved to support the transition of activities from the investigations to prepare the TMDL to those of implementing controls in the field.

The Report is a very good synthesis of considerable scientific and technical investigations and remedial work carried out since 1985, when the New Almaden Mines in Almaden Quicksilver County Park first came under mandated regulatory investigations for mercury pollution. The report also represents the fusion of significant contributions from a world-class panel of scientific and engineering experts. Even as early as 1970 New Almaden was being used as a field laboratory to advance the understanding of mercury as a pollutant, and the experts collected and considered the significant available studies.

The data collection effort and Conceptual Model that underlie the Report represent a substantial and adequate body of work from which to propose the TMDL, however, there are data gaps, as noted in the Report. The suggestion to address these during the implementation phase is reasonable, especially because it is understood that the purpose is to focus effort on the most immediate and controllable impacts. Together with the scientific literature and field studies that are its basis, the Report represents a world-class contribution to the advancement of the science of aquatic mercury pollution characterization and control.

The contributors to the Report deserve praise for their steadfast work. Special praise goes to the Santa Clara Valley Water District ("SCVWD"), San Francisco Estuary Institute (SFEI), U.S. Geological Survey ("USGS"), U.S. Fish and Wildlife Service ("USFWS"), and U.S. Environmental Protection Agency ("USEPA") for their contributions of money, field resources, etc., often as thoughtful considerations made during the progress of other studies, such as the San Francisco Bay Regional Monitoring Program. The SCVWD in particular is to be praised for their effort to boldly fund and pursue the necessary studies to move the TMDL forward toward the implementation of controls. It is hoped

that the other primary responsible parties in the matter will be no less bold in contributing to the implementation.

Some mechanism to unite and fund the primary entities involved is worthy of consideration during implementation. A cooperative approach will produce a more substantial and faster result than will be achieved if each responsible party is pursued, or pursues their interests, independently. It is unfair for the SCVWD to have to bear the majority of the burden of the issue just because the SCVWD controls the waterway operations. So too is it unfair to place the sole burden on the upland source area responsible parties, for if not for the water bodies their sediments would be of no consequence to fish mercury concentrations. The mercury problem is regional and therefore a societal issue.

The Report has well illuminated the fact that the key TMDL issues are: 1) the control of the natural transformation of inorganic mercury to the highly toxic organic methyl mercury, where it accumulates into fish food chains; and, 2) the control of further significant release of mercury contaminated sediments into the system. The methylation issue is difficult to reconcile against the classic TMDL approach of finding the pollution source and cutting it off, especially when the mercury comes from diffuse and widespread sources. The key issue is not pollution pouring from a pipe, but rather a biological process throughout the system that can transform minute amounts of mercury from any source into elevated fish tissue concentrations. One cannot easily assign a daily load to the later.

I think the Report has found as reasonable a middle ground as any between the extremes of no action and placing a rigid load cap on sediment discharge. How does one give TMDL credit to an action that reduces the potential for methylmercury accumulation in fish but does not necessarily reduce the amount of mercury entering the impoundment? Activities such as the SCVWD proposal to install SolarBee© aerators at Lake Almaden is a case in point. The Report is intelligent where it proposes to use of average methylmercury in age-1 fish to provide a more expedient means to monitor for results from implementation activities. The target ties the action (sediment removal) to the primary concern (mercury in fish), thereby focusing implementation on the control of sediment sources most likely to reduce methylmercury concentrations in fish. This allows the benefits to be properly accounted for without resorting to complex and questionable load allocation calculations. On the other hand, sediment control is an expedient means to achieve easily quantified reductions in daily mass loading, but paradoxically it is not clear these actions will have a significant effect of reducing the bioaccumulation of mercury in fish and the associated food chains.

The Report makes it clear that the issue of demonstrating the efficacy of local upland sediment and fish controls will necessarily have to be pursued during the TMDL implementation. There is some question regarding how to do this. Is the report clear that it should not be necessary to sample in order to delineate areas for attention? Mining waste is obvious in the field and sampling will not be required to locate it. If it is unstable and prone to erosion, it should be stabilized. This principle will adequately locate areas for focused erosion control measures. The Jacque Gulch calcine (burnt mercury ore) removal being carried out by the SCVWD as part of the Natural Resources Damage Assessment ("NRDA") settlement is an example of a well thought out project to remove a waste (calcines) from potentially entering Almaden Reservoir, a methylation "hot spot." Although sampling was done to estimate waste removal volumes, sampling was not needed to locate the area and verify that it is a priority hot spot.

Regarding fish methylmercury, the report demonstrates that the aquatic food chain is phenomenally efficient at bio-concentrating mercury. Because of the efficiency, there is some question as to whether there will ever be a reduction of fish tissue concentrations to levels below any threshold of no adverse effect. This is because, as the Report notes, the system already has large amounts of mercury in it, both naturally occurring and from mining discharges. Equally important is the fact that the system is also being impacted with a growing invasion from the global atmospheric mercury pollution reservoir.

Because of the complexity of mining impacts combining with atmospheric and non-mined but mineralized sediment impacts, it would be helpful if the Report were examined to be sure the intent of the Board is clear. First, it is assumed that the focus of TMDL sediment control will be on known areas of mining waste that are actively eroding. Second, it is assumed there might be some additional areas of erosion that might be prioritized for control based on storm water suspended sediment sampling data or other empirical data demonstrating an obvious and significant sediment mercury source. Third, it is not the intent to assign numeric effluent limits to suspended sediment discharge, but rather to implement erosion control for the significant sources and to demonstrate effectiveness through proper installation and maintenance. A further consideration for prioritization of action might be whether the discharge is to a body of water with a known higher potential for methylation, all other factors being equal.

The control of sediments eroding from areas of concentrated mercury that have or are being disturbed by human activity could be undertaken purely on the grounds that removal should be done wherever it can be done (is technically feasible, the monetary costs is not overly burdensome, and the action will not cause significant ecosystem damage). The problem, however, becomes what to remove and what to leave when the sediment total mercury concentration of almost every background soil sample from the mining area, let alone the average concentration (more about this in the specific comments below), exceeds 0.1 mg/Kg. This supports the need to focus sediment controls on reducing mercury inputs to methylation "hot spots." Without this focus, the target may be misinterpreted and cause unnecessary sediment controls throughout the upland areas. The primary focus should be on slope stabilization to curtail erosion in areas of known mining waste.

Specific comments now follow, starting with comments that apply to all sections and then comments referenced to particular pages and paragraphs.

Overall:

It would be helpful to have the data stated in one set of consistent units and scale. The Report would be easier to read if, when comparing or discussing data, it used a single set of units (English versus metric) and scale (ppb or ppm or mg/Kg or etc.). It also needs to be clear as to whether the values are average or median, the range of values, the population size, the exact material sampled (whole tissue, specific tissue, whole sediment, certain size fraction, filtrate, etc.), and whether the testing methods were equivalent (wet or dry weight, same size fraction, etc.). Sometimes this frustration is alleviated by reference to a data appendix, but more often it is not.

For the Bay TMDL, the San Francisco Estuary Institute commented that the mean rather than the median should be used for both evaluation of loads and achievement of concentration targets so that data is comparable and the fact that the characteristics of the ultimate target, methylmercury in consumed fish, support a mean rather than a median (Dr. Mike Connor, SFEI, July 09, 2003).

In March of 2006, the SCVWD collected background samples in Jacques Gulch as part of the mining waste removal studies in that area. The samples are as far removed from processing and mining sites as is possible within the park. The background samples all exceed 0.10 ppm total mercury wet weight using EPA Method 7471A. Excluding one outlier, the range is 0.13 mg/Kg to 0.56 mg/Kg, the average is 0.23 mg/Kg, and the median is 0.15 mg/Kg. These results would have been even higher if presented as dry weight in the soil fraction less than 63 microns. This and other data leaves me uncertain about why upland sediment targets are lower rather than higher than the Bay target. None the less, the soil sample results from the remedial investigations of the Park conducted by Dames and Moore in 1988-1989, clearly show that "hot-spot" concentrations are two orders of magnitude above the proposed target. The gap is so dramatic that there should be no need to attempt to assess and require controls between background and the concentrations typical of mining waste and mined areas of mercury ore.

Comments to the Bay TMDL in 2003 expressed similar concerns about higher levels of background mercury in mining areas as opposed to other areas. Comments to this effect were made by Seyfarth Shaw on behalf of the Guadalupe Rubbish Disposal Company, and the SCVWD. The Report provides some relief by tying the sediment targets to a fish target, and clarifying that it is the fish target that is the ultimate goal, but again, I am concerned that something more specific needs to be said regarding the mining waste target and how the sediment targets are to be used. If the more generic approach of sediment controls is adopted in the Basin plan, will this prevent misuse of the sediment target for toxic torts brought by third parties?

Background, Page S-4:

PP1: Mercury is still used in dental, industrial, and gold mining processes, not "was used."

PP3: I am not sure where the term "mobile furnace" came from. I am not aware of any mobile furnaces used in New Almaden. They were all stationary, although parts from one might be used to build another elsewhere.

PP4: Methylmercury may be among the largest of all known chemical bioaccumulations, but it cannot be argued it is the largest of all known chemical compounds. Relatively few chemical compounds, as compared to the number of compounds, have been studied for bioaccumulation.

PP5: I understand that additional fish sampling will occur at Lexington Reservoir because if fish methylmercury concentrations there are "closer to 0.6 ppm," it may not make sense to adopt a target of 0.3 ppm average methylmercury wet-weight for Guadalupe watershed fish of the "typical size and species of fish consumed," even if that target is well explained based on calculations from associated data and response thresholds.

PP6: Fish data is especially hard to compare, because of the sensitivity to the size of the fish, number of samples, type of tissue analyzed, chemical analysis methodology, etc. Cache Creek is said to be the largest contributor of mercury to the Sacramento River, then fish data is provided to back up a claim that the Guadalupe Reservoir is a "larger producer and bioaccumulator of methylmercury" but the data cited only shows that 40-cm Clear Lake bass have less average methylmercury concentrations than the Guadalupe Reservoir. The comparison does not seem necessary. In comparison to EPA guidelines, the Guadalupe fish tissue concentrations are clearly a concern and warrant attention. If there is a need to emphasize priority, it would be better to illuminate the position of the Guadalupe data within a box of comparable data from mercury-impaired impoundments across the state.

Page S-5:

PP2: "The young, and reproductive problems," is better read as "Impacts to reproduction and the young,"

PP5: Was the advisory truly about not eating fish from "water bodies containing mining wastes?" My recollection was that the advisories were simply to not eat fish from certain reservoirs. The reservoirs were selected based on fish tissue mercury concentrations, not because of characterizations of contained mining waste.

Page S-7:

More could be said here and in the full text of the report as to whether the targets are average or median, the confidence interval to be used (this will drive sample size, the exact media to be tested (whole fish or specific parts), the sample preparation method to be used, and the

analytical technique. If the author feels it is problematic to constrain the responsible parties to specific methods, something needs to be said about the process (how, when, where, who) for making sure data will be usable and comparable.

Page S-8:

Table S-2: The very specific definition of erodable soil states that the size fraction to be tested is to be less than 63 microns, but it is unclear whether any of the soil sampling data that is used to derive the TMDL actually conformed to this size limitation. The reality and practicality of the target is unknown if the sampling from the underlying studies did not conform to the definition, and the target may be wildly conservative compared to the average total mercury concentration of silts and clays in the river system.

Page 1-7:

Bullet two mentions COMM, REC1, RARE, and WILD, but page 1-4, PP5, does not mention COMM.

Page 2-1:

PP1: The statement that fish from the Guadalupe have the highest methylmercury concentrations in the State is interesting. Please reference the data set that leads to this statement, and also whether this is on average or based on the upper limit of the range, and based on fish data that is, in fact, comparable. Obviously, the issue here is that such statements should be avoided unless a thorough statistical assessment has demonstrated that the difference is statistically significant and the statement can be made. A comparison of average values for the study area impoundments suggest the difference is not as dramatic as the statement implies. None the less, if there is a large and statistically valid difference, it begs the question as to why?

The only significant waste received by the Guadalupe Reservoir is overburden soil cleared from open cut mining areas from 1940 through 1974, but the overburden is no more significant in volume, and perhaps even much less so, as compared to waste in the waterways draining elsewhere, so the dramatic difference in the average fish tissue concentration remains a point of curiosity. The situation suggests some yet undefined factor that elevates the amount of bioaccumulation in the reservoir. Is the reservoir watershed more prone to peak flow events that move larger amounts of sediment? Are there methylmercury inputs to the reservoir from elsewhere? Does the reservoir's location, operation, and/or biogeochemical conditions somehow increase methylation rates relative to other reservoirs?

Page 2-4:

Table 2.1 leaves me uneasy about whether there is enough data to make statistically valid arguments about whether one reservoir or another is not impacted by significant mercury mineralization and mining, and therefore is or is not appropriate to use as a reference "safe" reservoir for the Guadalupe watershed. The additional sampling proposed for Lexington Reservoir may help alleviate any concerns. Anderson and Stevens Creek are deemed unsafe, yet I am not aware of any significant mercury mining in their water shed either, although I am aware that Anderson lies on a mineralized fault zone.

Without corresponding sediment and other data, I am not sure much can be derived from the comparison of mercury levels in fish between reservoirs, but there is an uneasy reality when fish from some reservoirs with little mining impact have unsafe fish methylmercury concentrations and fish from another are safe. The Report implies that there will be

opportunity to make adjustments for reality during the implementation phase, but how will this truly be the case if the targets derived using the Lexington data will be codified in the Basin Plan and applied to the rest of the watershed?

Page 3-3:

PP3: Please qualify the statement that Alamitos Creek has probably received the most mining waste of any creek. This is only true for mercury mining waste within the watershed. There are certainly mines outside the watershed, such as gold mines in the Sierra Nevada, that have received far more "mining waste." You may want to reference my paper on the mine emissions and simply note the range of potential discharge of mercury losses. This paper was used by TetraTech and others during the course of the TMDL preparation. (*The History of Mercury Emissions from the New Almaden Mines, Santa Clara County, California*, November 2000, in proceedings from the U.S. EPA Conference "Assessing and Managing Mercury from Historic and Current Mining Activities," San Francisco, California.)

Page 3-11:

PP3: The theories of Professional Paper 360 regarding ore deposition are very outdated. Dr. James Rytuba of the U.S. Geological Survey will be able to correct any geological errors in the historical summary drawn from PP360.

PP4: While over 99% of the mercury produced may have come from ore mined underground, some large portion of the ore processed came from above ground. Most mining that occurred after 1939 was open cut mining and involved moving large quantities of material. Power equipment became readily available, and rotary furnaces could process ore of much lower grade. The miners began to favor excavating old dumps and surface areas after these two factors came together. Under separate cover I have sent you a figure from PP360 and data regarding the mining operations. If I recall correctly, the paper I wrote on historical emissions discusses the issue, but I think Professional Paper 360 also notes the interval at which most mining switched to surface work.

Be careful not to confuse the total amount of material moved through mining with the tons of ore processed. Underground mining ratios were very low, on the order of several tons of material moved for each ton of ore processes and flask produced. Ore was sorted at New Almaden, and waste rock was discarded typically near the mine opening. Surface mining ratios were much higher, on the order of 40 tons of material moved for each flask produced. The mine kept careful track of the amount of ore sent to the furnaces for processing, but not the amount of unprocessed waste dumped on the hillsides adjacent to the mine openings, nor the amount of overburden discarded from open cut operations.

Please note that the placer deposit was cinnabar gravel.

Page 3-12:

PP4: The need and value of the text is questionable, as it does not contribute that much to an understanding of the extent or scale of the mining operations, but it is entertaining.

Page 3-13:

PP2: Stegner's *Angle of Repose* is not based on his grandfather. It is a rewriting of the personal memoirs of Mary Hallock Foote, a famous illustrator and writer in the Victorian west. Her husband was Arthur DeWint Foote, a famous mining engineer who served a brief year as

chief engineer at New Almaden in 1876. Much of the content of Stegner's work is drawn from Mary's writing, including the title, having stated in her memoirs that she and Arthur reached their "angle of repose" when they settled at the North Star mine in Grass Valley and ceased their all too frequent moves about the American west in Arthur's capacity as an engineer. Abundant material about Mary Hallock Foote is available on the Internet, including *A California Mining Camp*, her poignant story about New Almaden written during her "one year on the inside."

PP3: For the record, I think the historical facts and figures are drawn from several sources and not just Professional Paper 360, including my own work, but credit was not assigned in the reports.

PP5: I take it that "in accordance with common mining practices at the time" means that the operators of the day were simply doing what was not known to be a problem back then, as opposed to meaning that creekside disposal was the common practice at all mines.

The statement about silica-carbonate rock being used to make cement is odd and oddly out of place. In any case I do not think silica-carbonate rock is common, or commonly used to make cement. Calcines do cement weakly owing to the hydrated magnesium carbonate content being reduced in the roasting process. Because it tends to cement up, especially after repeated wetting and compaction, calcines were spread on many of the mining property roads.

Page 3-14:

PP1: As a point of clarification, even though for the purposes of erosion control all waste might be somewhat equal, calcines is ore that was roasted to extract its mercury content. Waste rock, mine dump, or spoils is material separated from the ore during mining and simply deposited at the mining site without further processing. It includes overburden soil and waste rock separated from the ore during open cut mining. Furnace dust and soot is the material separated out of the furnace gasses in order to prevent the condensers from clogging. Sludge is the material separated from the condensed mercury prior to bottling and the material left over from wet milling operations to concentrate the cinnabar ore. There is a final category, which is accidental spillage of ore and mercury.

Based on historical assay and sampling data, if one were to assign erosion control priority based on potential mobility and significance, I would guess the following would be the order: 1) accidental spillage of mercury; 2) furnace dust and processing sludge; 3) calcines; 4) accidental spillage of ore; 5) ore-concentration milling waste; 6) mineralized soil spoils; 7) waste rock dump; and 8) overburden soil elevated in mercury. Fortunately, at least in Almaden Quicksilver County Park, the areas of potential mercury spillage, furnace dust, and calcine dumps have all been capped.

The mine dump at Hicks Flat is soil and rock that had collapsed into a vertical shaft (horizontal shafts are called tunnels) and was subsequently removed to rehabilitate the shaft around 1970. The material is of the lowest priority for attention based on my proposed ranking. Making a special note of it in the report seems odd relative to other areas of higher priority that go unmentioned. In the implementation phase, action should be focused on priorities established by some sort of consistent methodology.

PP2: In 1942, miners excavated two new mine openings, they did not "drill two new holes."

Page 3-15:

PP3: The peak concentrations in water are interesting, and show that even a small mine can produce a single sample with very high mercury concentrations, but when making comparisons, time-integrated load estimates would be more useful to put the Guadalupe loads into perspective. As it stands, the examples only serve to illuminate the extreme variability and therefore the highly uncertain targets of the TMDL.

Page 3-16:

PP1: The mines may be of significant concern because they are of only a few extensively studied. Until all impoundments at all mines are studied in the same way, all one can say is that the New Almaden mines are the largest in North America, that the losses and discharges associated with the processing are correspondingly large, and that the fish mercury concentrations are high and warrant action.

PP2: The point is not clear until one reads the next page. The New Almaden Mines do not have significant acid mine drainage (AMD) potential because of the absence of the associated iron sulfide minerals that contribute to AMD. The iron sulfide minerals are more common at the Guadalupe mine, but the prevalent silica-carbonate rock probably quickly buffers any acid that is formed.

Page 3-17:

PP2: It should be noted that although DTSC would have allowed limited removal and capping of hot-spots within the calcine waste piles, the County elected to completely stabilize and cap each pile, thereby addressing the issues of soil erosion and potential bioaccumulation of the eroded material. The next several paragraphs confirm this and contradict the statement that "the issues if soil erosion and transport of mercury to water bodies and bioaccumulation were not addressed."

Page 3-18:

PP3,4,&5: It seems odd to make an issue of mining roads and mine seeps when atmospheric deposition is largely dismissed from the Report, because it is stated that atmospheric invasion will be addressed by the controls for soil erosion, impoundment methylation potential, and discharges under permit. The same can be said for roads and seeps: erosion and discharge controls will surely address these very local sources.

Figure 3.8 is dubious. It certainly is not an accurate rendering of mercury concentrations remaining after cleanup. For one thing, calcine piles on the figure were graded and covered with clean clay fill, or excavated and buried at an authorized engineered disposal site on Mine Hill. For another, the Dames and Moore sampling was designed to investigate the soil and wastes most likely to pose a potential risk to park users and horses. The mines were never investigated to characterize the overall distribution of mercury in soils. The Guadalupe mine was not investigated at all, because it was a private landfill, not a public park.

Page 4-2:

Figure 4.1: The map showing the "Locations of Primary Mercury Sources" should be replaced with the figure showing the principle mining locations. This is especially the case for the outside mines called out by name in the Report, such as the Bernal, Santa Teresa, and Hillsdale mines. The term "Mining District" is simply a convenience to group mercury mining activities in an area for the purpose of reporting. Bailey and Everhart defined the district as a

rectangle of some 80 square miles. Rather than try to define a district, it is better to simply show the known mercury deposits in relation to the water bodies. It might be a beneficial improvement to use some form of coding to show relative size and type (underground, opencut, both) of the deposit. It must also be noted that the amount of production is an indicator of the potential impact from mining activities, but not necessarily the potential extent of naturally elevated mercury concentrations.

Page 4-3:

PP1: Although the statement may be true that whatever the source the mercury to the water column, most of it is bound to particles, it does not follow that therefore mercury loads can be quantified on the basis of sediment loads and suspended sediment mercury concentrations unless the sampling is done carefully, as is illuminated by the work of Dyan Whyte et al. at the Gambonini mine. I also wonder what has become of the true aqueous phase mercury (both organic and inorganic) in the equation 4.1 used to calculate the mining waste load. Not all of the mercury is due to mining waste, and not all mercury behaves the same with regard to the ultimate concern of methylmercury concentrations in fish.

As the report states on page 4-14, "even small amounts of total mercury can produce substantial amounts of methylmercury if the right aquatic conditions are present." One also wonders if there are forms of mercury that are more readily transformed to methylmercury. Section 6.2 of the Report notes that uncharged mercury-sulfide complexes are most likely to be taken up by bacteria and methylated. What are examples of these complexes and can tests distinguish them from other forms of mercury? Shouldn't the focus be on these complexes if they can be discerned in the field?

Page 6-14, paragraph 3 also notes that dissolved mercury from small storms represents 25% or more of the total mercury load, and that dissolved mercury loads are more than adequate to account for all of the methylmercury produced in and exported from Almaden and Guadalupe reservoirs. The Report methodology for target setting and load allocation does not seem to take this information and use it to set targets that distinguish labile (transformable) from non-labile load. Controls may be wasted on impressive loads of non-labile mercury that ultimately matter less to fish targets than smaller amounts of highly transformable mercury.

The SCVWD made substantial comments about "not all mercury being equal" in their comments to the Bay TMDL (July 14, 2003, Beau Goldie to Mr. Richard Looker and Mr. Bill Johnson). The comments contain information worthy of consideration, and the Report seems to have considered two concerns. First, it does discuss the identification and control of bio-available mercury, second, it defines erodable sediments as a size fraction likely to reach the Bay (<63 microns). Regardless, the Bay TMDL imposes the need to cut Guadalupe River discharges of mercury by 98%, and it remains unclear whether there is any practicable means to do so.

Page 4-5 through 4-7, and 4-11

It is a surprise that in Table 4.2 Greystone Creek has as much particulate mercury as Deep Gulch Creek, but the reason seems to be that the Greystone TSS are over twice as high. The bottom line is that the high variability requires a larger set of samples before a true mean or median can be reliably estimated. Many may question the load estimates due to the difficulty. On page 4-17, PP3 the Board clarifies that load estimates are useful for comparing the relative loads from different sources, but no need is anticipated for more precise load estimates from the upper watershed. It could be further clarified that the reason is because it is easy to identify mining waste that is eroding in the field. Because the mining areas are the main

concern, additional studies to focus sediment source controls within the areas of mining should be left to the responsible parties during implementation activities.

Page 4-24:

Bullet 3): I am still having difficulty reconciling the fact that the Bay TMDL provides for a suspended sediment <63 micron target of 0.2 mg/Kg total mercury, yet the Report prescribes a target of 0.1 mg/Kg for the mining uplands. This makes no sense. As mentioned previously, sample data from the Park suggests that 0.1 mg/Kg total mercury is below even un-mineralized background area soils. It is likely far too low relatively to an average for undisturbed soils across the mining area.

There is a lack of data for pre-mining alluvial deposits within the mining areas, data similar to the Bay studies that derived the 0.2 mg/Kg target, yet the Report notes the presence of a placer deposit of cinnabar gravels in New Almaden. The presence of Plio-Pleistocene cinnabar gravels strongly suggests that even before human activity there was a natural gradient of mercury sourcing from the mining lands. Section 9.4, PP2, details the establishment of a mineralized zone for the Sulphur Creek Mercury TMDL, so I wonder why a similar approach cannot be used here.

It should also be noted somewhere that dated sediment cores from the Bay confirm a pattern of historic mercury contamination which declined strongly after about 1980. This is noted by the US EPA in their December 18, 2000 comment letter to the Board regarding the Bay TMDL.

Page 5-2:

PP3: the use of a “no adverse effects level” for the targets seems more appropriate than a “no observable effects level,” because the calculations are already conservative enough, especially with the safety factors that the EPS built into the reference does equation.

Page 5-5:

Table 5.3: The phrase “Typical Size and Species of Fish Consumed” needs to be defined relative to the fish data set for the watershed. Other wise, it is unclear what fish data falls into the definition and what does not.

Page 6-16:

Figure 6.8: Provides a set zooplankton bioaccumulation factor, yet the report indicated that the factor can vary to up to greater than 2 million (paragraph 2, page 6-17).

Page 6-19:

PP4: There is mining in the Lexington Reservoir watershed, but not mercury mining.

PP6: If TL4 Largemouth Bass are not “typically consumed,” what is?

Page 6-22:

PP4: I surmise that fish do not accumulate methylmercury primarily from the water column, albeit there is likely some intake through the gills. More likely is that fish accumulate methylmercury by eating what lives in the water and shallow bottom sediment. Calculations and discussions that go directly from a water column value to a fish value do not make sense to me, because there is no direct link between the two until there is enough data to

demonstrate a statistically valid correlation. Until then, the method of making assumptions about biomagnifications between trophic levels seems reasonable, but the first step, the accumulation in zooplankton, appears to be subject to the greatest uncertainty and range. This impacts all subsequent calculations and even multiplies as one advances through the equations. The fact that the report uses a single biomagnification factor of 100,000x for zooplankton is questionable. Elsewhere the report mentions a zooplankton factor of 2,000,000x having been measured in the field.

Page 6-23:

Forth bullet: Same comment as previous section, the biomagnification of methylmercury is among the largest of all know biomagnification factors for chemical compounds, not all known chemical compounds. Relatively few chemical compounds have been studied for biomagnification factors.

Page 7-1:

PP4: It is unclear how much value there is in trying to establish a sediment concentration target for mining waste source control when so much mercury has already entered the water system, and when biomagnification are so high that even small amounts of load are effectively transformed to fish concentrations that exceed target. The parties may have to simply agree that it makes sense to pursue sediment erosion source control where it is practicable to do so in areas that are comparatively high in mercury.

Page 7-7:

Section 7.4: For reasons mentioned above, the Bay Area open space mercury concentration of 0.06 mg/Kg is inappropriate for the mining areas. It is not clear where and how this value was derived. Even the estimated pre-mining background of 0.08 ppm (the switch from mg/Kg to ppm is from the text) is too low to accept as background in the mining areas. An acceptable resolution might be to collect additional data to establish the existing un-mined soil sediment loads more conclusively.

Page 8-1:

The implementation plan lacks substantive detail. The deadline for input from the Work Group has passed, and this invitation should not be in the final document in any case. It is hoped that another meeting of the Work Group might be able to add some details. It remains uncertain how credit will be given for the voluntary sediment removal actions that might take place, because there is no direct tie to fish mercury concentrations. It is supposed that the same formulas used in the Report can be run backward to calculate a net improvement in fish mercury concentrations, but what does this mean relative to the Bay TMDL goal of reducing all and any mercury discharge to the Bay by 98%. Regardless, the Work Group should try to add some meat to the bones of the plan, at the very least a more descriptive process to develop and maintain a plan.

Page 9-5:

Last paragraph: The point is unclear here. In any case, it was commented previously that there were no “mobile” furnaces at New Almaden. A furnace or a retort might be dismantled and its parts used elsewhere, but there was no portable furnace in the strict sense.

Page 9-7:

Last paragraph: If this paragraph were stated earlier, I would have commented less on the soil targets being inappropriate for the mining areas. I support the idea. I understand that the two soils types are: 1) soil derived from silica-carbonate rock; and, 2) soil derived from other types of rock.

I hope these comments are useful to the Board and the participants in the TMDL. I look forward to the opportunity to comment on the Basin Plan amendments that will codify the TMDL.

Sincerely,

Michael Cox
New Almaden Quicksilver County Park Association

San Francisco Estuary Institute

7770 Pardee Lane
2nd Floor
Oakland, CA 94621-1424
Office (510) 746-7334
Fax (510) 746-7300

July 31st 2006

Regarding request for review of the document:
"Guadalupe River Watershed Mercury Total Maximum Daily Load (TMDL) Project Report"

Dear Ms Austin,

I am pleased to provide you with review comments that I hope you will find constructive. Overall, I believe this is an important piece of work and provides a vital link between scientific investigations and an important societal problem facing Bay Area residents. However, I have some concerns over the data reviewed by you in the document that appear to conflict with some of the conclusions and implementation recommendations. I hope that the authors of the primary reports cited in the TMDL document are able to assist you in reconciling these issues.

General comments

The budget diagrams (Figure 4.2, 4.3, and 4.4) detract from the overall quality of the document and directly conflict with the conclusions that the reservoirs are the main sources of meHg influencing biota in the watershed and the Mining District is the main source of total Hg entering the Bay. It is my opinion that such a diagrammatic display of the existing data should never have been attempted given the limited input data used and lack of a model the extrapolate what data there is. However, based on my own observations of the system over the past 4 years and knowledge of data collected by the Park District, I think your conclusions and implementation plan are reasonable, my main concern being that data displayed in section 4, in some cases, does a disservice to your arguments.

Specific comments

S-4 1st paragraph: Hg use in batteries was the Bay Areas largest use. Dental uses fall well behind Hg uses in paint>instruments>switches/thermostats

S-4 3rd paragraph: ~~myriad~~ many

S-6 4th paragraph: These statements conflict with Figure 4.3 page 4-15. This figure shows that the channels provide the majority of Hg.

S-8 2nd text box: 11 kg/year seems possible. Our data for San Pedro storm sewer (McKee unpublished) indicates a first flush concentration of 0.5-1.1 mg/kg. Please note that unlike the North Bay that had 1:20 year storms during WY 2006, the South Bay had mostly 1:1 year return storm events. That said I estimate the sediment load coming from the urban areas of Guadalupe River is on average somewhere between 2,000-4,000 t/year. Therefore I think it is entirely possible to achieve <11 kg loading with minimal to moderate effort even without reaching a 0.2 mg/kg sediment concentration target.

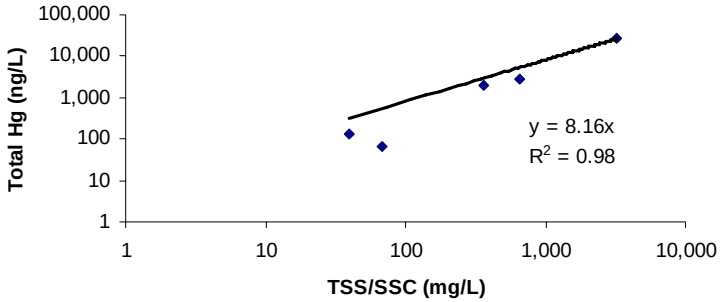
p1-4 last paragraph: My work implies that the 1 hour average of 2,400 ng/L might be exceeded during a first flush almost any year (~1:2 years) at Hwy 101. My work implies that the 4-day 25 ng/L average would be exceeded many times a year at Hwy 101.

p3-15 3rd paragraph: During WY 2006, SFEI collected water samples at several locations adjacent to the Mining District and had them analyzed for total Hg. The SFEI data (McKee unpublished) show similar concentration ranges to those collected by the Park District (see the following table).

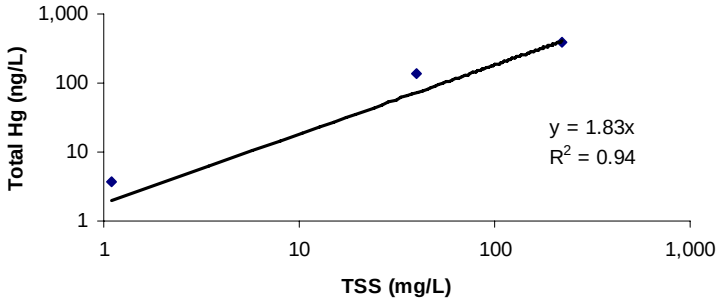
For example, the range of particulate concentrations downstream from Senador observed by the Park District is 3.3-8.4 mg/kg and similar to my unpublished data (1-4.3 mg/kg). In Alamitos Creek the Park District has observed 16.9-111.5 mg/kg. I have observed 25.5-31.9 mg/kg. In Jacques the Park District observed 1-2 mg/kg and I have observed 0.9 mg/kg. My conclusion from reviewing all this data together is that the Park District data is of high quality and represents a great indicator of Hg fluxes from the tributaries in the Mining District. It is interesting to graph up what we know about the relationship between suspended sediment and HgT based on the data in the table + data collected by TetraTech (See figures below). Note that especially the data for Randol Ck and Jacques Gulch have not spanned the same breadth of SSC, but in fact all these creeks are certainly capable of much higher SSC than presently observed and so are probably not fully representing Hg release characteristics under larger storm conditions. That said, I can make two suggestions from these graphs – Firstly I agree that it appears that the channel itself of Alamitos Creek is a net source to the downstream watershed and secondly that, the Senador Mine area is an ongoing source of Hg to Alamitos Creek. I suggest that further work is needed to isolate the sources within the Senador area and other locations in the mining District and prioritize clean up. It is important that this prioritization be based on their likely magnitude of release during rainstorm magnitudes when all the processes of release are operating (I suggest 1:5 year return event is a minimum magnitude). The processes of release likely include groundwater interflow, flow from mine shafts, flow through tailings piles, bed erosion, bank/ terrace collapse, shallow landslide sediment supply to 1st and 2nd order creeks, and failure of cap materials, setbacks, and artificial channel grading. All these processes must be observed under a rainfall intensity of >2 inches in 6 hours in the Mining District by a team that should at least include a fluvial/hillslope geomorphologist, and a hydrogeochemist who is familiar with the scientific literature of Hg mine drainage.

Sample ID	Date Source	Sample Date	Total Hg (ng/L)	TSS (mg/L)	SSC (mg/L)	Ratio HgT:TSS (or SSC) (mg/kg)
SENADOR SITE	Park District	2/12/2003	130	40		3.3
SENADOR	Park District	2/25/2004	27,000	3,230		8.4
MCABBEE SENADOR 01	Park District	2/2/2004	2,000	360		5.6
MCABBEE Ck at little stone bridge	McKee unpublished	4/3/2006	69		69	1.0
MCABBEE Ck at little stone bridge	McKee unpublished	4/4/2006	2,812		657	4.3
MOCKINGBIRD 05	Park District	2/2/2004	140	40		3.5
MOCKINGBIRD	Park District	2/25/2004	390	220		1.8
LOWER ALAMITOS 02	Park District	2/2/2004	2,900	26		111.5
LOWER ALAMITOS	Park District	2/12/2003	58	3		17.1
LOWER ALAMITOS	Park District	4/4/2003	91	5		16.9
LOWER ALAMITOS	Park District	2/25/2004	110,000	1,790		61.5
ALAMITOS Ck at Graystone Lane	McKee unpublished	1/1/2006	1,954			
ALAMITOS Ck at Graystone Lane	McKee unpublished	4/3/2006	1,243		49	25.5
ALAMITOS Ck at Graystone Lane	McKee unpublished	4/4/2006	19,805		622	31.9
LOS CAPITANCILLOS 04	Park District	2/2/2004	850	2,000		0.4
LOS CAPITANCILLOS	Park District	4/4/2003	11	5		2.0
LOS CAPITANCILLOS	Park District	2/25/2004	5,300	8,890		0.6
LANDFILL GULLY	Park District	2/12/2003	60	21		2.9
LANDFILL GULLY	Park District	4/4/2003	12	2		6.3
LANDFILL GULLY	Park District	2/25/2004	2,500	3,410		0.7
JAQUES GULCH 03	Park District	2/2/2004	120	74		1.6
JACQUES GULCH	Park District	2/12/2003	7	3		2.0
JACQUES GULCH	Park District	2/25/2004	440	440		1.0
JACQUES GULCH at parking lot	McKee unpublished	4/4/2006	357		396	0.9

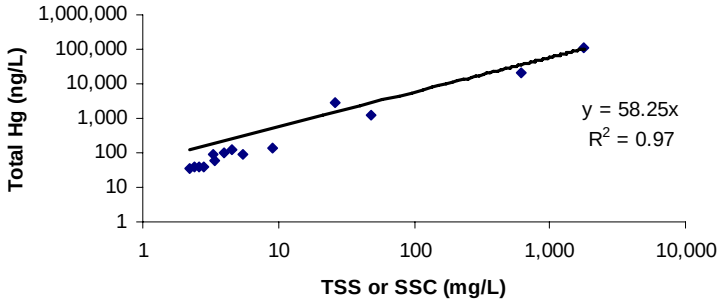
"McAbbee Ck below Senador Mine"



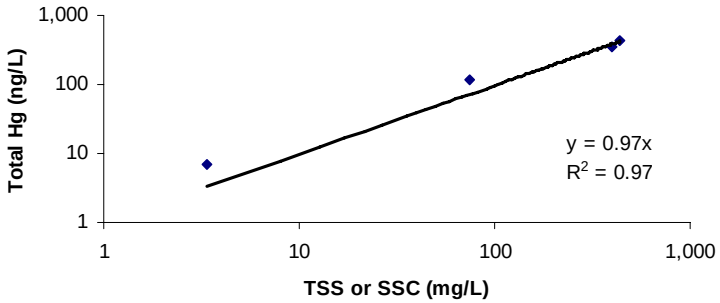
Randol Creek below Randol Mine



Alamitos Creek (all locations)



Jacques Gulch



p3-16 last paragraph: I have observed concentration of meHgT at Hwy 101 of 2.2 ng/L and particulate concentrations of up to 20 ng/g (typically 5 ng/g). In terms of particulate concentrations, these are not dissimilar to those found in the Baylands of the South Bay but appear to be well below those found in the Almaden or Guadalupe reservoirs (Tetra Tech data). Highest concentrations at Hwy 101 occur during the first flush of the wet season.

p3-19 1st paragraph: The Park District data should have been used to more effectively understand concentrations and loads issuing from the Historic Mining areas. I think the loads used in the source analysis section have been severely underestimated for two reasons. 1. Data collection was insufficient to characterize Hg processes during intense rainfall when all processes of release are operating, and 2. The method of relating concentrations to flow that was used by Tetra Tech bias the loads estimate low because it does not take into account processes that occur during larger rainstorms that supply sediment derived from outside the channel. At best the current loads estimates might be considered those derived only from the channels during low to moderate flows.

p4-4 last paragraph: This method lacks credibility. Concentrations in one creek have no relation to those found in another. This method leads to a random result that has no relation to the processes Tetra Tech was trying to describe.

p4-5 3rd paragraph: I find no relationship between dissolved and total mercury in data at Hwy 101. At best I can get a r^2=0.25 for HgT v meHgT. I suspect the results of this methodology should be used with great care. Add the fact that the data input did not span a reasonable range of flows and suspended sediment concentrations and the loads generated might reasonable be construed as questionable. Most importantly however, does it influence the TMDL recommendations and implementation plan. I suspect not given the very high concentrations of meHg found in the Guadalupe and Almaden reservoirs.

P4-5 2nd to last par: This seems reasonable for dissolved Hg. For total, I would expect greater than 40x background. For Guadalupe R. at Hwy 101, the Hg unit area exports for WYs 2003, 2004, and 2005 are between 30-500 ug/m^2/y and between 100 and 1000 x greater than for other non-mining watersheds in the world with varying degrees of urbanization or industrial inputs. Given the proximity of Los Capitancillos ck to the mines, I think this is bias low by an unknown amount again because high flows were not sampled.

Table 4.2: Please quote the particulate Hg concentrations in mg/kg or ug/g and quote just 2 significant figures. e.g. 29,463 ng/g becomes 29 mg/kg or ug/g. 630 becomes 0.63 mg/kg. Right now you are claiming the data are more accurate than they really are and detracting from the main point of the data.

p4-7 last paragraph: I am disappointed that Tetra Tech did not compare their loads to the literature or even use reasonable estimates from the literature. My own quick review of the literature suggests that unit loads from urban areas could be between 1-24 ug/m^2/y and most typically 3-5 ug/m^2/y.

p4-10 last paragraph: This counterbalance might have been the case in the year of observation. But that does not represent the long term process. This could have produced a random result based on the reservoir management for that year. Again, in all these calculations, what matters is the bottom line. I doubt reservoir releases would be a large contribution to the Hg budget even during the wettest of years nor over the long term, but that does not discount the error in the method.

p4-13 Figure 4.2: This figure provides results that appear to conflict with the conclusion that the Mining District is the largest source of Hg load to the system. The diagram shows that there is net deposition in Guadalupe Ck of 125 g. The diagram suggest that Alamitos Ck between the reservoir and the confluence with Calero Ck is a net source of 278 g of Hg. The figure suggests that Guadalupe River below Almaden lake to St Johns st is a net source of 9,302 g Hg. Based on this diagram, it appears that money and effort should be directed at Guadalupe River, yet the implementation strategies focus more on the upper watershed.

This is an apparent conflict, based on Figure 4.2. In my mind, the lower Guadalupe channel appears depositional (indeed the Water District expends considerable effort each year to maintain its capacity). It is my opinion that the loads in the system derive from the upper watershed – there is no indication in the data I have collected over the past 4 years that the lower River is the largest source.

p4-14 paragraph 2: I don't agree. Loads estimated without an understating of the processes of release in the mining District and its adjacent channels are not even useful for understanding relative magnitudes. During years of small floods, only channel reworking is occurring. There might be minor supply from bank collapse, and late in the season there might be some ground water flow, but other important processes such as supply from the terrace deposits along creeks and supply from shallow landslides and failing tailings piles will not be in play. This lead not to an error in the loads from each source area but rather a unknown bias. I wish I could come up with some suggested rewording – but my only suggestion is that you remove the last sentence.

p4-14 last paragraph: My measured load even for the dry year Tetra Tech made their observations was approximately 1.5x greater (15 kg). My estimate for the maximum load for the system at Hwy 101 is around 1,000 kg, or 10x greater than the Tetra Tech estimate. My data suggest that the Tt estimates are bias very low. The term uncertainty allows the reader to interpret the data as having an error about a mean, I suggest they are bias low. At least I suggest that you say the Tt loads are highly uncertain in all cases given the input data they used and methods they used to calculate the loads (flow based rather than sediment based). You could also say that the term uncertainty includes both random errors, bias low estimates, so that the reader is not at all confused.

P4-15 Figure 4.3: Again this figure conflicts with the conclusions and implementation recommendations. It shows that 20.3 g of MeHg is produced in the Guadalupe River between Almaden Lake and St. John St. This is more than all other areas in the system and should lead a reader to ask why effort is not being focused in the lower channel to reduce the Guadalupe R. impact to SF Bay. I think the best solution at this time is to remove Figure 4.2, 4.3, and 4.4. You clearly have used data and information other than these figures to come up with your load allocations. It would be better to show that other info than to confuse the the reader with this conflict. I suggest that all the data collected over the past 20 years needs to be organized properly using a model that takes into account channel and watershed surface processes. Such a model could be used to predict system response to management effort and help to prioritize further careful data collection and where to spend $$. At present, for example, I think the existing data suggest Senador Mine provides a large load of Hg yet it was never measured by Tetra Tech. The question is, which is more important, Alamitos Creek or Senador Mine during a 1:5 year return event (or larger). Which other parts of the mining district are supplying load during event scales that actually matter for this kind of system. I guess the main point I am making is that the data collection to answer these questions is relative cheap compared to the cost of fixing the problem. I would like to see further problem definition in the implementation plan. For example, money set aside for focused opportunistic data collection during large storms.

p4-17 2nd paragraph: Peak flow for our SF Bay systems is a lot more than 4x the average daily flow. As an example, zone 6 line B is a 2 km^2 watershed in the South Bay that has an average flow of between 0.4-1.4 cfs for 3 water yeas of data. Peak flow for those same 3 years was 79 cfs. If we look at Guadalupe River at St. John st. then we see an average ranging from 0-27 cfs with an average annual of 46 cfs. Peak flows for that system can reach 11,000 cfs and even daily means have been observed at 7,870 cfs. The fact of the mater is, there need not ever be a relationship between peak flow of a system and its average daily flow. Based on these two comparisons, if one must use a factor to adjust data, it appears somewhere between 100x and 250x might be more reasonable. That is flow alone, if you take into account sediment loads, the factor would be even greater perhaps 3,4,5, or even 6 orders of magnitude. So in short, I agree with your suggestion that loads are underestimated but I would suggest by a larger bias.

p4-17 3rd paragraph: I don't agree with the last sentence for reasons I have cited above. I suggest you remove.

p4-19 last paragraph: Even though I suggest 12 kg is too low, why was it not used in figure 4.2?

p4-22 Figure 4.7: This is not my data, yet it is quoted as such. This is worrying to me. Please call me to discuss.

p4-26 bullet 2: I don't agree, the loads as estimated cannot be compared to each other because they represent different levels of activation of processes and I suspect some key processes were not operating at all. Figure 4.2 and 4.3 indicate the lower river is the largest source. I agree with you, the Mining areas are the largest source. This conflict needs to be rectified.

p7-5 bullet 4: ~~run on~~

p7-6 section 7.3: I think based on our measured data, the sediment loads in the system average 15,000 – 20,000 t/y. 44 Mt is certainly an over estimate. I suggest about 2,000-4,000 t is from urban runoff. The world literature ranges up to about 32 $t/km^2/y$ for urban areas. Your estimate suggests 190 $t/km^2/y$. My own observations of Guadalupe River at Hwy 101 do not support your estimate and my casual observations of Guadalupe Ck and Alamitos ck suggest the upper watershed supply a lot of suspended sediment load.

p7-8 first 3 sentences: Does not take into account an enrichment ratio associated with the preferential erosion and transport of fine particles. For phosphorus this can be up to a factor of 8. For Hg I have seen up to 90 but at least 2-10x seems reasonable. That said the data on this subject are scarce at best and I am not presently aware of any that have looked at uncontaminated areas. The literature I am aware of focuses on contamination when discussing enrichment factors (EFs) or enrichment ratios (ERs).

p7-9 Table 7.1: Urban runoff load allocation might already be lower than this. This needs to be observed properly before effort goes into reducing it. A systematic data collection program could sort this out in several wet seasons if the right sampling program we employed with the right modeling effort to assist in data interpretation.

p7-11 second bullet: 0.1 ppm for the Mining District seems unattainable. Coyote Creek based on 7 samples collected in WY 2005 (McKee unpublished data) has a particulate concentration of 0.2 mg/kg. San Pedro storm drain that drains an old urban area of San Jose is higher than this also.

Lester McKee (PhD)
Watershed Program Manager/ Senior Environmental Scientist
San Francisco Estuary Institute

June 26, 2006 **Sent by Fax and U.S. Mail**

Ms. Carrie Austin
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612
Fax: (510) 622-2460

Subject: Comments on *Guadalupe River Watershed: Mercury Total Maximum Daily Load (TMDL) Project Report* (SFBRWQCB 2006)

Dear Ms. Austin:

The County of Santa Clara, Parks and Recreation Department, offers the following comments on the *Guadalupe River Watershed: Mercury Total Maximum Daily Load (TMDL) Project Report* (SFBRWQCB 2006), dated January 2006.

It has been the County's experience throughout the development of mercury TMDLs for the San Francisco Bay and the Guadalupe River Watershed, that all parties – regardless of the interest being represented - have had the common goal of establishing workable and effective regulations to improve the conditions of the watershed and bay. The interest driving Santa Clara County's involvement in this process is to determine how scarce resources can be effectively directed toward the restoration effort.

In reviewing the most recent report, the County's overarching concern with the proposed TMDLs for both the bay and watershed continues to be the lack of a scientifically validated connection between the concentrations of mercury in sediment, the resulting methylmercury levels in the water and biota, and observed impacts on exposed biota. This is a continuing concern for the County.

The recommendation for reduction of methymercury concentrations in reservoirs is clearly an important objective in restoring beneficial uses within the watershed and the bay. However, a TMDL allocation based on a seasonal maximum value seems to miss the mark. Bioaccumulation of methylmercury in aquatic food webs is the result of exposure over the entire growing season. Furthermore, during certain times of the year, most aquatic life is concentrated in the upper water layers (epilimnion) where dissolved oxygen is more plentiful rather than the anoxic bottom water layer (hypolimnion). Neither measurement alone is likely to be perfect, but a methylmercury TMDL based on seasonal average concentrations in the epilimnion would better represent actual "average" exposure. Monitoring of methylmercury concentrations in the

epilimnion and hypolimnion could lead to a better understanding of methylation and bioaccumulation in reservoirs and produce a more effective control strategy.

Likewise, Guadalupe Reservoir is a useful reference for comparison to Almaden, Calero, and Guadalupe reservoirs. One should not expect, however, that any apparent relationship between mercury concentrations in sediment, water and fish in Guadalupe Reservoir will be the same in other reservoirs. Other site-specific factors – diet, foraging behavior, predator abundance, adaptation, to suggest only a few – contribute to the behavior and effects of mercury in the Guadalupe River drainage. Stringent targets and implementation strategies that fail to consider these factors, albeit well-intentioned, may be ineffective in achieving the ultimate goal of restoring bay and watershed resources.

In addressing control of mercury impacts on biota, the Guadalupe River Watershed TMDL report relies on an earlier approach used by the U.S Fish and Wildlife Service (FWS) to determine "target" mercury levels in fish tissue. In the County's June 5, 2006 comments to the San Francisco Bay Basin TMDL, we noted a concern with this study's limited parameters. We also noted that personnel from the same FWS office are engaged in a new study that could address some of the inadequacies with the earlier approach. While the Regional Board may not wish to delay adoption of a TMDL as we have suggested, the prospect of this additional information could provide a more reasonable basis for adopting a more moderately based TMDL until the mercury methylation process in the food chain is better understood.

As detailed in the June 5, 2006 letter, work will soon be starting to remove the last significant areas of calcines in Almaden Quicksilver County Park. The County has undertaken this action as well as past removal efforts, at great public expense, and with the firm belief that the expenditure is warranted and justified for the benefit public health and environmental protection. In that same spirit, the County proffers these comments with the objective of assisting in the development of an effective and workable TMDL program.

Sincerely,

Lisa Killough, Director
Santa Clara County Parks and Recreation Department

c: Gerald F. George, Pillsbury Winthrop Shaw Pittman
Katherine Harasz, Deputy County Counsel
Jane Decker, Deputy County Executive

Water Resources Division
345 Middlefield Road, Mail Stop 439
Menlo Park, California 94025
Ph: (415) 329-4485 FAX: (415) 329-4623
email: kuwabara@usgs.gov

February 6, 2006
d:\adm\us\admin\HgTMDL020606.doc

Carrie M. Austin, P.E.
Project Manager - Hg TMDL in Guadalupe
SFB Water Board
1515 Clay St., # 1400
Oakland, CA 94612
caustin@waterboards.ca.gov
(510) 622-1015
fax 622-2460

Dear Carrie:

In response to your call last week, I enclose my review of the "Guadalupe River Watershed Mercury TMDL Project Report." There is considerable information to summarize, and I have suggested some clarifications of the major points made. To facilitate referencing, I have tabulated my comments on the attached pages.

Hope this helps you and the project. It was good that you called, because my "to do" queue keeps growing despite extended weekdays and weekend efforts.

James S. Kuwabara
Hydrologist

Manuscript Review

California Regional Water Quality Contrl Board, SF Region

Guadalupe River Watershed Mercury Total Maximum Daily Load (TMDL) Project Report
Author: C.M. Austin

Part 1 (General Comments): This report summarizes results from a variety of field and laboratory studies to develop targets for a Water-quality Control Plan for the Guadalupe River watershed. Of particular focus is the concern of mercury trophic transfer in the watershed leading to unacceptably elevated methyl-mercury concentrations in native-fish populations. The data sets from these studies provide a wonderful foundation from which iterative water-quality management decisions may begin (presumably what you meant by "Adaptive Implementation"). The detailed comments are tabulated below for your quick reference, but I'd like to offer three general comments. The first general comment is that it should be clear in the overview and background sections that the biomagnification of mercury is initiated through the dissolved phase (here and in every other aquatic system that I have read about), then proceeds up the food web at much lower (by orders of magnitude) accumulation factors per step. The fish accumulation regression models are important initial results and are relationships based on a single low-flow sampling. If I were being regulated on such scientific basis, I might want to understand the variablility of those relationships over multiple time scales, as covered by the proposed "Concentration-based allocations". Second, it maybe a stretch to call Lexington Reservoir a "reference reservoir" when the small fish have concentrations of 450±90 ng/g (greater than the fish targets in Table S-1). I think Lexington Reservoir may represent a reference reservoir in terms of direct mining sources, but as with San Francisco Bay and many mid-western lakes, other processes contribute to elevated concentrations of mercury in those fish. Third and finally, the targets appear to me to be incongruous. For example, our study of the reservoirs did not report total methylmercury concentrations above 1.5 ng/L (half the proposed seasonal impoundment allocation). Yet mercury concentrations in each of the trophic levels examined in the study consistently produced concentrations in excess of the biological targets; and that was just a one-time sampling.

Part 2 (Detailed Comments):

Com-ment #	Page	Paragraph	Line	Comment
1	S-1	4	2	The summer, low flow conditions, is also when the dissolved-phase Hg relative to particulate Hg in downstream channels is highest.
2	S-1	6	1	Suggest inserting the word "dissolved" between the words "of" and "methylmercury". I believe you want to shunt the initial bioavailability of mercury at the trophic base that drives transfer to upper-level target organisms. Realizing the politically sensitive nature of these management decisions, it may be worthwhile considering a future complementary focus on base-level Hg uptake for improved cost and sampling efficiency. I am thinking in terms of how the effectiveness of the control plan can be monitored. Do you want to focus sampling on 1-year juvenile fish?
3	S-4	4	3-4	Replace "garden-variety (inorganic) mercury" with "inorganic (geologically derived) mercury"
4	S-4	4	8-10	The biomagnification of mercury is "astonishing" because of the bioavailability of dissolved mercury species to algae. The intensification by other trophic levels is not astonishing.
5	S-5	2	2	Insert the clarification that "Mercury in fish tissue is predominantly biologically reactive methylmercury (~90%)".

6	S-5	4	8	Human health and wildlife consumption issues dictate consideration of fish as an end-member focus of the TMDL. It is worth keeping in mind that as a system dynamics problem, the process regulating the mercury in fish may be far removed from mercury transfer into those fish.
7	S-6	3	6	The concentration for 1-year large-mouth bass from Lexington Reservoir was 450± 90 ng/g (n=20). As a "reference site", the fish do not pass the proposed biological target concentrations. Some clarification of this discrepancy may be warranted.
8	S-8	1	1	We never saw total methylmercury concentrations above 1.5 ng/L and no more than 0.4 ng/L dissolved (i.e., considerable below the proposed "impoundment-based allocations" of 3.0 ng/L for a seasonal maximum. Yet the mercury accumulated by phytoplankton, zooplankton and fish were, as you aptly term, "astonishing".
9	S-9	2	4-7	With the knowledge acquired for the watershed, I support your idea of "Adaptive Implementation". As innovative engineering measures are tested to reduce methymercury production in the impoundments, it will be useful to monitor population dynamics and interdependent uptake processes so that the many linkages between water-based allocations and fish-concentration targets can be delineated for subsequent management applications.

END OF REVIEW

Accumulation of methylmercury by lower trophic level organisms (phytoplankton, zooplankton and small fish) was determined in a single sampling of 5 impoundments within the watershed in September 2004 (Kuwabara et al. 2005). For example, in Almaden Reservoir, where both phytoplankton and zooplankton methylmercury were measurable, the total and dissolved methylmercury concentrations were approximately 1.25±0.25 and 0.32±0.07 ng/l, respectively (n=2). Methylmercury in the phytoplankton and zooplankton were 4 and 860±1 ng/g, respectively, with only one phytoplankton measurement made due to an aggregation of three replicate samples. Using total methylmercury concentrations, the BAFs for phytoplankton and zooplankton would therefore be approximately 3,200 and 690,000, respectively. That is, the concentration factor between phytoplankton and zooplankton (trophic ratio) would be approximately 200 (~690,000/3200), an order of magnitude lower than the initial accumulation by phytoplankton, but an order of magnitude greater than subsequent accumulation steps by fish. The highest BAF for adult fish in all impoundments relative to surface concentrations of total methylmercury was 12 million based on wet weight (see next page). With consistent dry to wet weight ratios for fish between 0.20 and 0.25, the converted fish BAF on a dry weight basis may be as high as 60 million (i.e., 12 million times 1/0.20). Therefore, the accumulation of mercury in all trophic steps between zooplankton and adult fish may approach 90 (i.e., ~60 million/690,000). Using dissolved rather than total methylmercury concentrations in this example from Almaden Reservoir, the BAFs for phytoplankton and zooplankton would be approximately 12,000 and 2.7 million, respectively. One would not expect particle-bound methylmercury to be as bioavailable as dissolved methylmercury. In this case, the concentration factor between phytoplankton and zooplankton would be 220 (similar to the estimate based on total methylmercury concentrations), again much smaller than the initial uptake step by phytoplankton (12,000) but greater than the subsequent fish uptake steps (90). Results reported by Kuwabara et al. (2005) provide only an initial, temporally constrained look at mercury trophic transfer in the watershed. For example, methylmercury in phytoplankton was only detected in two of the five impoundments. Existing data does demonstrate, however, the high uptake of methylmercury specific to transfer steps involving lower trophic levels. Therefore, predictive capabilities of Hg-uptake models for the watershed may greatly benefit from a quantitative understanding, over multiple temporal and spatial scales, of processes that account for the greatest variability in the BAF.

>>> James S Kuwabara <kuwabara@usgs.gov> 2/8/2006 9:06 AM >>>
Carrie - I did read those sections and it is appropriate to mention efforts to examine dissolved-Hg transport based on regressions from total-concentration data (p. 4-7 and 4-9). It may also be appropriate to say that loads of total and dissolved mercury must be reduced (p. 6-18 and 6-19). But given those recognitions, it would be useful to briefly explain, right up front why the allocations are based on total concentrations. For example, you might say in the upper part of Table S-2 (p. S-8), that allocations are based on total concentrations with the recognition that particulate and dissolved Hg forms are not equally available for biological uptake and subsequent transfer up the food chain, but modeling of the partitioning data show that concentrations of dissolved forms of mercury can be predicted with certainty based on total mercury concentrations (r-squared>***; insert reference).

In summary, with a recognition that dissolved-mercury species are important in terms of end-member (fish and wildlife) targets, the "bottom line" so to speak is that allocations are based on total concentrations, so that apparent incongruity should be clarified as the targets are presented.

Very glad to help, and I think you generally understand my scientific concerns (perhaps ad naseum) . I, on the other hand, do not fully understand your management constraints in developing this TMDL document, so you should incorporate my comments as you see fit. This is not a journal publication, and the community you have to answer to is different.
- Jim

"Carrie Austin" <caustin@waterboards.ca.gov>
02/07/2006 07:28 PM

To
<kuwabara@usgs.gov>
cc
<tom.grieb@tetratech.com>, <btopping@usgs.gov>
Subject
Re: Follow up comments

Thank you - this is very valuable input and I appreciate your time and efforts on this additional analysis.

Your influence on the project extends beyond this phyto/zooplankton sampling effort - for examle, there are several areas in Section 4 (Source Analysis) and in Section 6 (Linkage "implications for TMDL") where I specifically addressed dissolved total mercury.