American River Watershed
Mercury Total Maximum Daily Load

Stakeholder Meeting
Auburn – April 13, 2011
Agenda

• Mercury Reduction Strategy
• Scientific Background
• Allocation Strategy
• Implementation Program
• Next Steps
TMDL Definition

• The amount of a specific pollutant that a water body can receive and still meet water quality standards.

Also called assimilative (or loading) capacity

\[ \text{TMDL} = \text{wasteload allocations} + \text{load allocations} \]

(point sources) (nonpoint sources)

TMDL must have a “margin of safety” to account for uncertainty.
ARW Assimilative Capacity:

~40-90% lower than existing conditions, depending on the fish tissue target

- 40-50% reduction will protect wildlife and humans eating about 1 meal/week of mixed trophic level fish.

- 90% reduction will protect humans eating 4 to 5 meals/week of fish.
Translate fish to water with bioaccumulation factor (BAF)

\[
BAF = \frac{[\text{MeHg}]_{\text{fish}}}{[\text{MeHg}]_{\text{water}}}
\]

- Ratio of concentrations of MeHg in fish to water
- Use available AR fish and water data or other local and regional BAF values

Fish Target

\[
\frac{\text{Fish Target}}{\text{BAF}} = \frac{[\text{MeHg}]_{\text{water Goal}}}{[\text{MeHg}]_{\text{water}}}
\]
Mercury Reduction Strategy

- Reduce concentrations of methylmercury in water column to reduce fish tissue mercury concentrations.
  - Reduce discharges of MeHg
  - Reduce methylation
    - Adjust factors that control the rate of methylation production or bioaccumulation
    - Promote methylmercury loss
  - Reduce concentrations of THg in sediment (one factor controlling MeHg)
Scientific Background

Influence of inorganic mercury additions in the laboratory on methylmercury production rates in sediment.

From Rudd et al., 1983
### Scientific Background

#### Fish Tissue Mercury Concentration Reductions After Mercury Source Controls

<table>
<thead>
<tr>
<th>Mercury Source</th>
<th>Control Measures</th>
<th>Biotic Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal and industrial discharge</td>
<td>Reduced or Eliminated discharge</td>
<td>22 to 96% reductions in fish tissue</td>
</tr>
<tr>
<td></td>
<td>Natural burial or dredging of contaminated sediments</td>
<td></td>
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<tr>
<td></td>
<td>Treated groundwater or pond discharge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>River bank erosion controls</td>
<td></td>
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<tr>
<td>Atmospheric deposition</td>
<td>Reduced atmospheric mercury input by 60%</td>
<td>30% reduction in 6 years</td>
</tr>
</tbody>
</table>

Summary of Delta TMDL Table 3.2.
Scientific Background

• Lake bioaccumulation study.
• Data suggest that:
  – Total mercury in sediment was the largest predictor of LMB tissue mercury.
  – Other predictors of LMB tissue mercury:
    • Positive: THg in soil, % forested area, aqueous [MeHg]
    • Negative: specific conductivity
  – Aqueous [MeHg] was driven by degree of $O_2$ stratification in Sierra Nevada lakes.
Scientific Background

Delta Subarea Aqueous MeHg vs. LMB MeHg

$y = 20.365x^{1.6374}$

$R^2 = 0.91$

Graph showing the relationship between Average Aqueous MeHg (ng/L) and Standardized 350-mm LMB MeHg (ppm) for different subareas of the Delta:
- Central Delta
- West Delta
- Mokelumne River
- Sacramento River
- San Joaquin River
Scientific Background

Biosentinel Fish Tissue Mercury Concentrations and Aqueous Methylmercury Concentrations

Summarized from: Foe, 2008; SFEI, 2007; and Slotton, 2008.

Biosentinel Tissue [Hg] (ppb)

Aqueous [MeHg] (ng/L)

SJR Fish
Cosumnes Fish
Prospect Slough Fish
SJR H2O
Cosumnes H2O
Prospect Slough H2O

869
Allocation Strategy

Allocations

– Non-point sources: Assigned to 303d watershed(s) or source categories, not individual non-point sources. Concentration-based ~ [MeHg] in water.

– Point Sources (NPDES WWTPs and MS4s): Either mass or concentration-based MeHg concentration in effluent.
Allocation Strategy

Allocations

– Developed from aqueous methylmercury goals.

– % reductions needed to meet goal in each 303(d)-listed waterbody

– Allocations could be met by methylmercury and/or total mercury reductions

– Incorporate an evaluation of background conditions
Implementation

• Adaptive management approach
  – Review new information
  – Revise management plans
• Focus on controllable sources
• Develop long-term plans to meet allocations or targets
• Include short-term actions
• Consider current mandates & regulations
Possible Actions

• Develop management plans within 1-2 years. Implement plans in 5 yrs and periodically update plans.
  – Identify sources
  – Evaluate cleanup strategies
  – Provide schedules
Possible Actions

• Inorganic mercury removal or sequestration
  – Cleanup mines that still discharge to surface waters
  – Erosion control for contaminated soil/sediment
    • Stabilize banks
    • Construct settling basins below highly erosive areas
  – Cleanup of mine tailings adjacent to the American River or its tributaries
  – Cleanup or cap contaminated sediment in lakes and river bottoms
Possible Actions

• Evaluate lake and reservoir management
  – Flows, water depth, diurnal fluctuation, aeration
  – Dredge depositional areas
  – Improve primary productivity to reduce methylmercury accumulation
  – Example: Guadalupe River Watershed Mercury TMDL
Possible Actions

• Land development-
  – Develop plans to minimize or reduce mercury impacts from land use changes
  – Low Impact Development

• NPDES point sources
  – Cap on mercury discharges
  – Implement mercury minimization programs
  – Mercury recovery programs

• Storm water
  – Redundant BMPs for sediment
  – Evaluate storm water collection system operations to reduce MeHg production
  – Implementation of or increase pre-treatment activities
Possible Actions

• Conduct studies
  – Identify mercury hot spots
  – Understand local bioaccumulation, food web dynamics
  – Develop feasible control actions for total and methylmercury

• Fisheries management
  – Adjust stocking practices
  – Promote anadromous species
  – Fishing practices
Possible Actions

• Education
  – Fish consumption advisories
  – Landowners
  – Industries

• Other non-point sources
  – Sediment BMPs

• Air Deposition
  – Minimize transfer from land to water.
  – Regional Board and State Board to work with CA ARB to develop a statewide Hg reduction program
  – US EPA working on greatly reducing US emissions
Potential agencies and entities responsible for TMDL activities

• Water and land management agencies
• NPDES WWTPs
• NPDES Storm water agencies
• Other NPDES Permitees
• Fisheries management agencies
• Landowners of mines
• Other non-point dischargers to surface waters
Next Steps

• Cancellation of May 18 Meeting
• CEQA Scoping Meeting ~July 2011
• Revision of Straw Proposal