



## **DELTA TRIBUTARIES MERCURY COUNCIL**

**Tuesday, October 18, 2022**

**Via GoToMeeting virtual meeting**

**Facilitator:** Stephen McCord, McCord Environmental, Inc. (MEI)

**Meeting Summary by:** Stephen McCord, MEI

### **Attendees**

Stephen McCord, MEI  
Eden Pikowski, CSUC  
Thomas Mello, CSUC  
Joseph L Domagalski, USGS  
Marty Scholl, Sac Yolo MVCD  
Peter Graves, BLM  
Eleanor Bash, TFT  
Dave Pfuhrer, TFT  
Dave Krabbenhoft, USGS  
Mikala Tator, CSUC  
Maura Uebner, USGS  
Olivia Weimann, CSUC  
Tara Fitzgerald, USEPA  
Mark Porter, TFT  
Leah Jones, CV RWQCB  
Petra Lee, DWR  
Carrie Monohan, TSF

Damien Simonini, USACOE  
Ashley Carreno, CSUC  
Dylan Harp, TFT  
Hope Taylor, Sacramento Co.  
Josie Tellers, City of Davis  
Stefanie Helmrach, UC Merced  
Marc Beutel, UC Merced  
Debbie Webster, CVCWA  
Jacob Fleck, USGS  
Peggy O'Day, UC Merced  
Jay Davis, SFEI  
Mark Marvin-DiPasquale, USGS  
Ted Swift, DWR  
Dimitri Vlassopoulos, Anchor QEA  
Wayne Praskins  
Jessica Dyke, CSUC  
Michael Cox, Friends of Los Alamitos Watershed

## **I. Introductions and Agenda Review**

No comments on the summary of the May 17, 2022 meeting.

## **II. Project Updates & Upcoming Events**

Announcements are attributed to Stephen McCord (MEI) unless otherwise noted. Our “live” table of mercury-related projects in the region: <https://docs.google.com/document/d/1EzeDOiS-vrM1MsjfNZC18Zoz9XWOSiorPSI3RJxrS9s/edit?usp=sharing>.

### **Mine Site Cleanups**

- MEI and Terracon are overseeing the cleanup of Elgin Mine, an abandoned mercury mine in the Sulphur Creek watershed. The former owner had been issued a Cease & Desist Order from the Regional Board pursuant to the 2005 Cache Creek Mercury TMDL. The landowner is currently implementing the work plan with technical support from the

project team, MercLok contributed by Albemarle, and oversight from the Central Valley Regional Water Board.

- Peter Graves (BLM): The federal Bureau of Land Management received funding from the Infrastructure Bill to conduct assessment/studies/work at any AML site in the Cache/Bear watershed. The contractor is scheduling a site visit and will at least visit Harley Gulch (downstream from Abbott-Turkey Run Mine and Clyde Mine (upper Sulphur Creek watershed). BLM will also conduct a five-year CERCLA review of Rathburn Mine (Rathburn North and Rathburn South repositories).
- Michael Cox: The New Almaden cleanup of small piles of remaining calcines along Alamos Creek will take place in 2023, after the rainy season, but preliminary preparations are starting now. Note the spelling of Alamos Creek.
- Carrie Monohan (TSF): Two hydraulic mine sites (Tippa Canoe and Grizzley Creek) in Tahoe National Forest's Trapper Forest Health Planning Unit. Biochar soil amendment and soil erosion control work.

### **Mercury Studies and Monitoring Activities**

- Joe Domagalski (USGS): UC Davis received funding for a pilot a hypolimnetic oxygenation system (HOS) in Oaks Arm of Clear Lake with objective of reducing phosphorus flux from sediments. USGS will study mercury cycling concurrently. USGS will also be developing a mercury model (with Reed Harris) for the lake.
- Lake Nacimiento mercury cycling work to be published in *Environmental Pollution* journal.

### **Regional and Statewide Mercury Regulation**

- Leah Jones (RWQCB): On October 20 of this year, the Delta Mercury Control Program will officially enter Phase 2. The peer review of control study reports has been completed but the Delta MeHg TMDL phase 1 review remains underway. More recently, staff updated the mass balance estimates. Stakeholder/public meeting announcements are expected in early 2023. The staff report is being written in the course of work.
- Statewide reservoirs mercury TMDL project web page ([www.waterboards.ca.gov/water\\_issues/programs/mercury/reservoirs](http://www.waterboards.ca.gov/water_issues/programs/mercury/reservoirs)) is fairly dated.

### **Recent & Upcoming Conferences**

- South Bay Salt Pond Science Symposium (<https://www.southbayrestoration.org/science-symposium-2022>) on May 11-12, 2022, included a session on "Mercury and Water Quality". Presentations are recorded and available online for viewing.
- The 15<sup>th</sup> bi-annual International Conference on Mercury as a Global Pollutant (ICMGP; <https://www.ilmexhibitions.com/mercury2022/>) was held virtually on July 24-29, 2022.
  - Albemarle presented (1) a pilot treatment application of MercLok, updating what was presented to the DTMC in January 2022; (2) a former munitions site in Germany, and (3) poster presentation on a methylmercury bioaccumulation study of worms in sediments.

- Michael Cox presented on mercury minerals and mercury sources at Almaden Mine.
- Albemarle presenting on its MercLok technology at the International Conference on Remediation of Chlorinated and Recalcitrant Compounds on May 22-26, 2022, in Palm Springs.
- The U.S. EPA, Office of Water, will hold a virtual National Forum on Contaminants in Fish (Fish Forum) to bring together interested stakeholders to discuss the many issues related to human health and contaminants in fish. Register for the Fish Forum at: [https://usepa.zoomgov.com/webinar/register/WN\\_h\\_jw0futQ1GjDim2P51Ubg](https://usepa.zoomgov.com/webinar/register/WN_h_jw0futQ1GjDim2P51Ubg).

## Grant Funding Opportunities

- None identified

## Other News & Updates

- Mark Seelos and colleagues recently published a paper on mercury dynamics in the foodwebs of four Santa Clara County lakes. Available at <https://link.springer.com/article/10.1007/s10750-022-05018-0>.
- See interesting article “Ancient Maya Cities Appear to Have Been Riddled With Mercury Pollution” available at <https://www.sciencealert.com/ancient-maya-cities-appear-to-have-been-riddled-with-mercury-pollution>.
- Current Pollution Reports published a nice paper recently titled “The Causes and Effects of Mercury and Methylmercury Contamination in the Marine Environment: A Review” <https://doi.org/10.1007/s40726-022-00226-7>.
- OEHHA recently issued new fish advisories with safe eating advice for:
  - A new Statewide Advisory for Eating Fish from California Rivers, Streams, and Creeks without Site-specific Advice. <https://oehha.ca.gov/advisories/statewide-advisory-eating-fish-california-rivers-streams-and-creeks-without-site-specific>.
  - Antelope Lake in Plumas Co. (<https://oehha.ca.gov/advisories/antelope-lake>)
  - Lake Henshaw in San Diego Co. (Supporting documents: <https://oehha.ca.gov/advisories/lake-henshaw>)
- Just accepted for publication in *Environmental Pollution* based on work at Nacimiento Reservoir in California: “Evaluating the influence of seasonal stratification on mercury methylation rates in the water column and sediment in a contaminated section of a western U.S.A. reservoir” by Geoffrey Millard and others.

## Presentations

Four presentations were given.

### **1 –New insights into mercury cycling and bioaccumulation in western arid-arid region reservoirs (David Krabbenhoft, USGS)**

USGS has produced one of the most extensive dataset of mercury concentrations and related conditions, for the Hells Canyon Complex of three reservoirs along the Snake River on the ID-

OR border. The goal with this study is to develop a predictive model to test mercury responses to different management scenarios. Monitoring has spanned a wide range of hydrological conditions.

New and novel insights gained from the study include:

- MeHg concentrations in the reservoirs are the result of both turbid, organic-rich inflows and internal production, with the relative contributions shifting interannually, seasonally, vertically and longitudinally. Because water seeps into the lakebed, there is no significant efflux of MeHg from the sediments.
- Dissolved oxygen concentrations are the most significant driver of MeHg production in the water column, implying that adding DO to raise the redox status would greatly inhibit MeHg production.
- Watershed improvements appear to have improved conditions in the reservoir system. In particular, lowered phosphorus and algae have led to increased DO concentrations, which have lowered internal MeHg production.

A series of journal articles are in progress.

For more information: David Krabbenhoft, [dpkrabbe@usgs.gov](mailto:dpkrabbe@usgs.gov).

## **2 – Measurements of mercury imports and exports of four tidal wetlands in the Sacramento-San Joaquin Delta, Yolo Bypass, and Suisun Marsh (Petra Lee, DWR)**

The California Department of Water Resources (DWR) has been addressing requirements in the Delta MeHg TMDL to study controls on mercury from some of the 30,000 acres of Delta wetlands that they own and manage. Four tidal wetlands were selected for measuring net MeHg loadings (a first step for determining if controls were appropriate), based on their relatively constrained hydrodynamics. Approximately monthly, mercury and total suspended solids water samples were collected over one tidal cycle, and paired with continuous flow data to calculate loads for each tidal cycle. Additionally, the mercury concentration data was paired with the continuous flow data to estimate monthly loads. The study sites were: Yolo Bypass Wildlife Area Tidal Wetland located in the Yolo Bypass, Blacklock Tidal Wetland located in Suisun Marsh, North Lindsey Slough Tidal Wetland located in the Cache Slough Complex, and Westervelt Cosumnes River Tidal Wetland located at the confluence of the Cosumnes and Mokelumne Rivers.

Two hypotheses were tested (among others unrelated to mercury) and found to be as follows:

- Hypotheses 1: Tidal wetlands are a net source of total methylmercury on an annual basis. The four sites were not methylmercury sources on an annual basis, in the particulate nor filtered phase. Several sites and months indicated that the wetlands were sources of particulate MeHg while sinks of filtered MeHg, and vice-versa.
- Hypotheses 2: Tidal wetlands are a net source of total mercury on an annual basis—sometimes. Two wetlands were net annual sources of total mercury, mostly in the particulate phase, whereas one was a net sink and another was neither source nor sink. Particle transport appeared to be the dominant driver, such that sites where sediment accumulated tended to be Hg sinks as well.

For more information: Petra Lee, [Petra.Lee@waterboards.ca.gov](mailto:Petra.Lee@waterboards.ca.gov).

### **3 – Assessment of mercury methylation and demethylation in a mercury mine-impacted floodplain using a biogeochemical model (Stefanie Helmrich, UC Merced & Stanford Univ.)**

A comprehensive, numerical model (PHREEQC) of mercury speciation and cycling in sediments and overlying water was applied to a field dataset (2013-2016) from the Cache Creek Settling Basin to (1) evaluate conditions that affect MeHg production and (2) identify knowledge gaps and monitoring needs. The data period covered a broad range of hydrological conditions.

The model includes thermodynamic constants, kinetic variables (calibrated within plausible ranges from literature) and initial conditions. Key conditions evaluated were the influence of iron and sulfur concentrations and redox processes on total Hg and MeHg cycling.

Simulation results were compared to data. Model results were much more variable than measurements. The likely cause for monitored stability was likely the role of dissolved organic matter in solubility of HgS.

These results encourage monitoring over time, ionic mercury and MeHg concentrations, microbial activity and redox conditions, sulfide concentrations (in addition to Fe and SO<sub>4</sub>), and organic matter composition.

For more information: Stefanie Helmrich, [helmrich@stanford.edu](mailto:helmrich@stanford.edu).

### **4 – Support for Sierra Nevada municipalities to identify, assess and revitalize abandoned mine lands (Carrie Monohan, The Sierra Fund)**

The Sierra Fund (TSF) was funded by a USEPA Brownfields program grant to assess abandoned mine lands in the region as brownfields. They offered assistance on technical, regulatory and financial terms. Additional support for site mitigation is available through federal contractors and state agencies.

Remediated brownfield sites can become valuable community assets that protect public health and the environment, create usable public space, provide jobs and increase the local tax base, and in some cases restore cultural resources.

The 2022 Bipartisan Infrastructure Law included an unprecedented \$1.5 billion investment in Brownfields program—more funds will soon be available for such projects.

Key resources include:

- The Sierra Fund Web Page on Due Diligence <https://sierrafund.org/brownfields-revitalization/>
- The Sierra Fund Fact Sheet <http://sierrafund.org/wp-content/uploads/Brownfields-Fact-4Web.pdf>
- EPA Brownfields Web Site <https://www.epa.gov/brownfields/types-epa-brownfield-grant-funding>
- DTSC web site <https://dtsc.ca.gov/ecrg/>
- Our Work is Not Done web site <https://ourworksnotdone.org/>
- DOC Story Map on Mines in CA <https://www.arcgis.com/apps/Cascade/index.html?appid=00b3e73e2a11459588a6cd7a55524a9d>

For more information: Carrie Monohan, 530-265-8454 x214, [carrie.monohan@sierrafund.org](mailto:carrie.monohan@sierrafund.org).

## **III. Meeting Wrap-Up**

Agenda items suggested for the next meeting included:

- The CASCaDE Project ([www.cascade.wr.usgs.gov](http://www.cascade.wr.usgs.gov)) is a combined hydrodynamic and water quality model that was employed to evaluate the physical components (the model does not include a mercury cycling submodel) of mercury transport and dilution in the Bay-Delta estuary. (Robin Stewart and Lisa Lucas, USGS)
- Mercury components of 2022-2026 Delta Science Action Agenda for the Sacramento-San Joaquin Delta (Henry DeBey & Dylan Stern, Delta Council)
- Update and overview of USFS mine site cleanup activities (Rick Weaver? Carol Roning?, USFS) [ask Lindsay Whalin & Sarah Reeves]
- CAMLAG update (Sarah Reeves, DOC)
- USEPA Region VIII CAMLAG-like experience (Jean Wyatt, [Wyatt.Jean@epa.gov](mailto:Wyatt.Jean@epa.gov))
- Statewide reservoirs Hg TMDL (Rebecca Fitzgerald); OR Hg TMDL
- CA mercury mining history & emissions (Michael Cox)
- Recent progress addressing abandoned mines in the region (Sarah Acker, SFB RWQCB)
- Reservoir mercury study results (Mark Seelos, Valley Water)

**Next Meeting Date:** Tentatively February 2023 (online).