



DELTA TRIBUTARIES MERCURY COUNCIL

Tuesday, September 15, 2020

Via GoToMeeting virtual meeting (<https://www.gotomeet.me/McCordEnv/dtmc>)

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

Meeting Summary by: Stephen McCord, MEI

Attendees

Stephen McCord, MEI
Lindsay Whalin, SF Bay RWQCB
Bert Mulchaey, EBMUD
Joe Domagalski, USGS
Todd Muelhoefer, Kinder Morgan, Inc.
Jon Miller, Albemarle
Se Hye Kim, Albemarle
Heidi Oriol, Regional San
Dylan Stern, Delta Sci. Program
Carol DiGiorgio, DWR
Petra Lee, DWR
Nicholas Graham, The Sierra Fund
Greg Reller, Burseson Consulting

Robin Merod, CV RWQCB
Jay Davis, SFEI
Mark Marvin-DiPasquale, USGS
Peggy O'Day, UC Merced
Mark Seelos, UC Merced
Stefanie Helmrich, UC Merced
Edwin Rivas Meraz, UC Merced
Shelby Defeo, UC Merced
Brett Albert Poulin, Davis
Elisabeth Wilkinson, Valley Water
Olivia Trevino, Valley Water
Danielle Jones, UC Merced
Naivy Rodal, Valley Water

I. Introductions and Agenda Review

No comments on the summary of the January 14, 2020 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

- The Westside Sac Coordinating Committee is applying for another brownfields coalition assessment grant (due Oct. 28) to continue identifying and assessing abandoned mine sites, and plan for site cleanups.
- USEPA announced the creation of the Office of Mountains, Deserts and Plains located in USEPA’s office in Lakewood, Colo. This western lands-focused office will address cross-cutting issues unique to the region, and more effectively leverage existing USEPA staff, expertise and resources in hardrock mining cleanup. The Office of Mountains, Deserts and Plains will assume oversight responsibilities for federal hardrock mining cleanup sites west of the Mississippi River; serve as a central contact for other federal

agencies, states and tribes with responsibility for or impacted by these sites; and develop innovative technologies and adaptive management approaches to address legacy pollution. Additionally, the office will support efforts of conservation organizations to voluntarily undertake projects to improve conditions at abandoned mines (Good Samaritan projects). For more information on the Office of Mountains, Deserts and Plains: <https://www.epa.gov/mountainsdesertspains>.

- The California Legislative Analyst's Office (LAO) recently published report “Improving California’s Response to the Environmental and Safety Hazards Caused by Abandoned Mines” (<https://lao.ca.gov/reports/2020/4258/abandoned-mines-080420.pdf>) underscores the important work of The Sierra Fund and partners to protect public health from legacy mining hazards and advocate for increased investment in projects that work to remediate Abandoned Mine Lands.
- Albemarle, working with MEI and Burleson Consulting, is starting field trials of a proprietary treatment for mercury-rich soils on a mercury mine site in Sonoma County.

Mercury Studies and Monitoring Activities

- Jay Davis (SFEI): The Delta Regional Monitoring Program plans to continue to sample fish annually, throughout the Delta, in fall. A new component, monitoring fish mercury accumulation near restored wetlands, was supposed to begin in spring 2020 but has been delayed. An interpretive report on the first three years of mercury monitoring remains in progress.
- Joe Domagalski (USGS): (1) Monitoring continues for mercury loads by USGS for inflows and outflows of the Cache Creek Settling Basin near Woodland and at Rumsey. Results from the first ten years (2010-2019) will be compiled in 2020 to support DWR’s report to the CV-RWQCB for the Delta MeHg TMDL. (2) USGS 5-year project at the Sulphur Bank Mercury Mine to evaluate total and methyl mercury isotopes in Clear Lake fish to quantify relative sources. Coordinating with Clear Lake nutrients study by UC Davis with co-located sampling of mercury, zooplankton and fish.
- An international research team, led by Monash University and ANSTO (Australia), has created an ultrathin porous membrane to completely separate potentially harmful ions, including mercury, from water.
- Petra Lee (DWR): DWR submitted tidal wetland methylmercury control study report (4 sites, 1 year of monthly monitoring each), finding minimal net annual methylmercury export. One site did not export THg while tidal; but did possibly export when serving as floodplain.
- Carol DiGiorgio (DWR): DWR submitted Yolo Bypass/Delta mercury open water characterization study report. Study results identified decaying vegetation, under long-term flood water inundation, as a potentially large contributor to the internal creation of MeHg in the upper reach of the Yolo Bypass. Disking vegetation into the soil appears to be a promising control measure to reduce internal MeHg production in the flooded Yolo Bypass. Other approaches to reduce vegetation mass should be examined. The Delta mercury model simulated suspended sediment and uHg(II) concentrations under the highest Sacramento and Yolo Bypass flows in the simulation period and found that both parameters showed similar patterns to previously published fish tissue bioaccumulation

patterns, i.e., lower concentrations in the Central Delta and higher concentrations on the periphery.

Regional and Statewide Mercury Regulation

- Robin Merod (RWQCB): The Delta Stewardship Council's Independent Scientific Review Panel's second review phase will address recent study reports by DWR on open water modeling and tidal wetlands methylmercury production. The review web page is <https://deltacouncil.ca.gov/delta-science-program/independent-science-review-and-advice-of-the-delta-mercury-control-program>. The Advisory Panel will not be convened. Staff is anticipating that a CEQA scoping meeting will occur in fall 2020/winter 2021.
- The statewide reservoirs mercury TMDL remains stalled, pending staff assignment at the State Board.
- The draft 2018 integrated report (a.k.a. the 303(d) list) is posted at https://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/2018_integrated_report.html. Be warned, it's 3,160 pages.
- The State Board released a proposed statewide Suction Dredge Mining General Permit for public comment (https://www.waterboards.ca.gov/water_issues/programs/npdes/suction_dredge_mining.html).

Recent & Upcoming Conferences

- The CALMS conference will be held Oct. 19-23 online only, and free. One session will be longer version of today's presentation by Seelos. <https://www.california-lakes.org/calms-conference>.
- The Sierra Fund's conference "Sierra 2020: Headwater Mercury Source Reduction" was postponed to Nov. 12, online only. <https://www.sierrafund.org/reclaiming-the-sierra-conference/>.

Grant Funding Opportunities

- The State Board's draft Nonpoint Source Program Implementation Plan for 2020-2025 (https://www.waterboards.ca.gov/water_issues/programs/nps/docs/plans_policies/draft2020_2025nps_plan.pdf) does not include mercury as a priority anywhere in the state. As such, mercury-focused nonpoint source reduction projects addressing mercury impairments will not be prioritized under the 319(h) grant program anywhere in CA. Furthermore, the Central Valley Water Board did not submit any Program Preferences, which are required for funding, thus there will be no solicitation for any Central Valley project proposals this year.

Other News & Updates

- OEHHA recently issued new fish advisories with safe eating advice for several lakes: Pinto Lake in Santa Cruz County, Lake Palmdale in Los Angeles County, Bishop Creek in Inyo County, Topaz Lake and Bridgeport Reservoir in Mono county, Fallen Leaf Lake in El Dorado County, and the Sacramento River and Northern Delta. <https://oehha.ca.gov/fish/advisories>.

- The Property and Environment Research Center recently published a report “Prospecting for Pollution: The Need for Better Incentives to Clean Up Abandoned Mines”.
<https://www.perc.org/2020/02/11/prospecting-for-pollution-the-need-for-better-incentives-to-clean-up-abandoned-mines/>.
- SRWP’s new website (including the DTMC website) will soon be live at
<http://www.sacriver.org/>.

III. Presentations

Four presentations were given.

1 – Assessment and Remediation of Mercury Contaminated Sites (Lindsay Whalin, SF Bay Reg. WQ Ctrl. Bd.)

This presentation summarizes a synthesis of approaches for assessing and remediating mercury mine sites. Higher fish Hg has been attributed to more mining influence in the watershed and in our region we see a link between unremediated, hydrologically connected mines and downstream impairment. Stable isotopic signatures can be used in downstream sources to identify upstream sources. Use of stable isotopes in lower concentration matrices like pore water can be difficult to tease out and or fish are complicated by fractionation in the transformation mercury undergoes during bioaccumulation. Downstream fish data to evaluate efficacy of source control of mercury sources is rare, but what data exists suggest significant fish Hg reductions, but rarely to levels below regulatory standards (in the Bay: 0.03 mg/kg for small fish; 0.2 mg/kg for large fish).

Site soil characterization can be facilitated by use of an X-Ray Fluorescence Spectrometer to delineate the extent of contamination for mercury and other elements. The article recommends protocol for producing quality data, including aggregating measurements (analogous to incremental soil sampling) and site-specific reference materials. Speciation, thermal desorption, and chemical extraction and analyses are recommended to identify environmentally available mercury, to support risk assessments and target mercury that could be harmful.

Flux from source sites via water is dominated by large storm events that mobilize particulate mercury. These must be captured in any estimate of loading and mass-wasting may be as important as baseflow erosion, which should be considered before sieving. For some sites, flux to air can be a significant loss.

Improved site remediation options include enhanced erosion control and vapor barriers (for volatile mercury). Options that sequester mercury require less long-term monitoring and maintenance. Lab- and pilot-scale tests demonstrate the promise of several techniques. Field scale tests are needed.

The paper summarizing this work is:

Eckley, CS, CC Gilmour, S Janssen, TP Luxton, PM Randall, L Whalin, C Austin (2020). “The assessment and remediation of mercury contaminated sites: A review of current approaches.” *Science of The Total Environment*, 707, 10 March, 136031.
<https://doi.org/10.1016/j.scitotenv.2019.136031>.

For more information: Lindsay Whalin, Lindsay.Whalin@waterboards.ca.gov.

2 – 2022-2026 Delta Science Action Agenda (Dylan Stern, Delta Sci. Program)

The Science Action Agenda (SAA) addresses key management needs, framed by management questions, ultimately leading to science actions that address management questions and needs. The schedule leading to a new SAA calls for outreach this past spring/summer, collection of management questions this summer/fall, creation of key content through winter 2021, and finally publication by winter 2022.

Suggested management questions are being screened for applicability to the intended scope of the SAA, will be discussed and refined at the workshop, and then selected based on selection criteria. Science actions will be solicited and screened for fulfilling the management needs and general feasibility. In a subsequent public workshop (spring 2021), science actions will be discussed and prioritized, then selected based on general need, opportunity cost, timeliness, and scientific merit.

The DTMC Facilitator and several members volunteered to draft questions, which were reviewed by Delta Science Program staff and distributed to DTMC members for input.

An open public workshop will be held on September 29, 2020. The link to register was distributed via the DTMC listserv.

For more information: Dylan Stern, dylan.stern@deltacouncil.ca.gov.

3 – Reservoir Mercury Control with Hypolimnetic Oxygenation (Mark Seelos, Valley Water)

Four mercury-contaminated reservoirs in the Guadalupe River Watershed (San Jose area) have had hypolimnetic oxygenation systems (HOS) installed and operating for several years, with the objective of reducing methylmercury (MeHg) production in deeper waters to lead to reduced fish MeHg levels. Three of the reservoirs receive runoff from the most productive Hg mine in US history. All four reservoirs have higher fish Hg levels than almost all other reservoirs monitored statewide with at least one Hg mine in their watersheds.

Extensive, multi-year monitoring of all four lakes now provide the most comprehensive dataset available for the effects of HOS on reservoir conditions (including Hg). Key findings include:

- Volume-averaged temperature and turbidity increased
- Even though HOS is often used to reduce primary productivity, it increased here, likely because nutrients were mixed by the HOS bubbles from the hypolimnion into the mixed layer where algae reside
- Even though dissolved oxygen (DO) increased at all depths, ORP decreased in surface waters
- Even though MeHg in the hypolimnions (below the thermocline) decreased, it did not change on a volume-averaged basis
- Fish Hg decreased in some species in some reservoirs (although still well above TMDL targets), predominately it did not change.

While the HOS may continue to be operated, other options for reducing fish Hg will be considered, including a Speece cone, food web manipulations, and sediment amendments.

For more information: Mark Seelos, mseelos@valleywater.org.

4 – The Biogeochemical Cycling of Mercury within Lake Powell, Glen Canyon National Recreation Area, Utah-Arizona (Mark Marvin-DiPasquale, USGS)

A team of USGS and other scientists studied mercury cycling and speciation in Lake Powell, a large reservoir (220 m deep, 300 km long) on the Colorado River in the arid southwest. The reservoir's 113,347 square miles watershed contains 2650 mines (mercury, gold, silver). The relatively low mine density (among other Hg-impaired reservoirs) leads to consistently low sediment Hg concentrations.

Specific study goals were to:

- a) Determine underlying processes that lead to fish Hg spatial trends
- b) Investigate spatial differences (upper vs lower reservoir / arms vs mainstem)
- c) Investigate seasonal differences (high flow vs low flow)

Sampling was conducted in spring 2014 and early fall 2015 at many stations along the length and in side arms, at up to five depths, in many matrices (water, sediment, plankton), and analyzed for a wide range of water quality conditions. Over 300 fish were sampled by others in the same time period, indicating higher fish Hg in striped bass in the lower (nearer the dam) region.

Primary conclusions include:

- Fish Hg is higher in the downstream region of Lake Powell due to a decreased in turbidity (from upstream to downstream) associated with inorganic and terrestrial particulates, leading to increases (from upstream to downstream) in 1) percent water column particulate organic matter associated with autochthonous (within reservoir) primary production, 2) MeHg associated with the organic particulate fraction, and 3) MeHg uptake into the base of the food web, for the lower-reservoir region.
- Benthic MeHg production also increased from upstream to downstream, which is likely driven by the dominance of in-situ primary production relative to inorganic or terrestrial organics delivered to the benthos in the lower portion of the reservoir.
- Side arms to Lake Powell (incoming rivers and side canyons) exhibited more MeHg in the bulk plankton than in the mainstem of the reservoir. Striped bass collected from the San Juan R arm had higher THg levels than fish collected from either the upper or lower ends of the mainstem of Lake Powell. These suggests that side canyons and river inputs to the main reservoir may represent a previously unrecognized Hg 'hot spot' for MeHg production and bioaccumulation."

The study report is referenced as:

Naftz, D.L., Marvin DiPasquale, M., Krabbenhoft, D.P., Aiken, G., Boyd, E.S., Conaway, C.H., Ogorek, J., and Anderson, G.M., 2019, Biogeochemical and physical processes controlling mercury methylation and bioaccumulation in Lake Powell, Glen Canyon National Recreation Area, Utah and Arizona, 2014 and 2015: U.S. Geological Survey, Open-File Report 2018–1159, 81 p.

For more information: Mark Marvin-DiPasquale, mmarvin@usgs.gov.

IV. Meeting Wrap-Up

View our “live” table of mercury-related projects in the region at:

docs.google.com/document/d/1EzeDOiS-vrM1MsjfNZC18Zoz9XWOSiorPSI3RJxrS9s/edit#heading=h.ty4xp7tlnrhi

Future agenda item suggested:

- Real-time monitoring for predictive mercury proxy development at the Lake Combie Mercury and Sediment Removal Project (Nick Graham, The Sierra Fund)
- Lake Mercury improvement projects—Klau & Buena Vista Mines Superfund site, and Sulphur Bank Mercury Mine Superfund site (Carter Jessup, USEPA)
- Monitoring and modeling effects of wildfires on mercury loadings and methylation, Cache Creek watershed (Charlie Alpers, USGS)
- MnO soil coating for Hg control (John Collins, AquaBlok)
- Delta mercury simulations (Carol DiGiorgio, DWR)
- Measuring mercury loads across a tidal wetland inlet (Petra Lee, DWR)
- Mercury from SPACE project high-res maps (Mark M-diP) – later 2021

Next Meeting

- **Date:** Tentatively January 19, 2021.
- **Location:** likely online only