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Sources Pathways and Loading Workgroup Meeting

November 13th, 2006 10 am – 4 pm
SFEI Downstairs Conference Room
7770 Pardee Lane 1st Floor (See attached map)
Oakland CA 94621

Minutes

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Welcome

Lester explained the objectives of the day were two-fold: 1. to present our methods and results of analysis of PCBs and PBDEs in the Sacramento R. at Mallard Is., Coyote Creek at Hwy 237 and Guadalupe R. at Hwy 101, and 2. to update the WG of progress on analysis of Hg concentrations and loads on the Sac R. at Mallard Is. He then welcomed Barbara Mahler, USGS Austin, Eric Stein, SCCWRP and Vincent Pettigrove, visiting from Melbourne Water (Australia), key advisory members for the day.

Attendees (n=24): John Oram, SFEI; Jon Konnan, BASMAA; Lester McKee, SFEI (Chair); Vince Pettigrove, Melbourne Water (Australia); Richard Looker, RWQCB; Trish Mulvey, Clean South Bay; Jim Kuwabara, USGS; Paul Salop, AMS; Andy Gunther, AMS; Mike Connor, SFEI; Meg Sedlak, SFEI; Nicole David, SFEI; Barbara Mahler USGS, Austin; James Downing, CSJ; Jim McGrath, SFEI Board; Neil Ganju USGS, Sacramento; Luisa Valiela, EPA; Jay Davis, SFEI; Eric Stein, SCCWRP; Mitch Craig, CSU East Bay; Rainer Hoenicke, SFEI; Kat Ridolfi, SFEI; Don Yee, SFEI; Seth Shonkoff, UCB; Terry Cooke, URS; Carrie Austin, RWQCB.

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PCB and PBDE loads at Mallard Island during WY 2002, 2003, 2004, 2005, and 2006 and estimates of long term averages and inter-annual variability.

Nicole began with a short presentation on the basic methods of data collection and data manipulation, including sampling location, available data, and the loads calculation methods common to suspended sediment, Hg, and trace organics. Jon K asked for clarification about the satellite photo depicting sediment flushing out the GG. Jim M remarked that during floods you can sometimes dip your hand in the water at Marin Islands and taste freshwater. Jim K asked if we have MeHg samples for Mallard Island. Nicole answered no but we have 4 dissolved Hg samples. Jim K asked our opinion on the representativeness of sampling near the side of the channel. Lester M and Neil G described the efforts by USGS and R5 RWQCB to characterize the variability in the x-section. At present we have no reason to reject the hypotheses that samples from the pier adequately represent the x-section. Further work is still needed.

John Oram then went on to discuss specific methods for PCBs, OC pesticides, PAHs, and PBDEs and followed with a presentation of our most recent PCB and PBDE loads estimates and long term averages. He finished with a discussion about how discharge during WY 05 and 06 compared to the last 50 years of flow at Mallard Island. Barbara M asked how good the regression line is between organics and SSC. She had found it is often poor in her work. John O agreed that this is also what we see at Mallard Island. Barbara M further commented that in Austin they had a small range of TOC and a large range of PCB concentrations. However, on a mass by mass basis they could observe differences between source areas. She urged us to check this in our data. Richard L and Jim K built upon this theme asking about hysteresis and watershed hydrology (source waters). Neil G suggested we compare dry season and wet season to see what that tells us and Jim K suggested that would also help tease out the effects of the Bay from the watershed. Barbara suggested we try plotting mass per unit mass through time as an indicator of source. Lester remarked that is what we do as part of the Guadalupe R. analysis.

Richard made a worried comment about not taking into account attenuation of loads over time. Lester reminded the WG that we only use historical hydrology to model what we might expect if a flow of a given magnitude was to occur today – we are never claiming a true estimate for a 1997 flood, just an estimate of Hg load should a flood of similar character occur again today. Eric S and Barbara M agreed and Jim M suggested we make better use of probability plots rather than time series plots.

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Barbara M commented that improved accuracy is achieved if data is stratified on a storm by storm basis. Eric S commented that we might be over estimating loads if we do not do storm specific FWMCs. Trish M commented that perhaps focusing on floods for organics may be less appropriate. Lester commented we do this because of the 80/20 rule. Approximately 80% of the sediment mass gets transported in 20% of time but perhaps this is less valid for organics. Eric suggested we take a look at the non-storm data and see if there are phase differences or congener patterns that are different under different flow conditions. Vince P commented that PCBs are more associated with point sources in Melbourne. That is the same here, but perhaps in the CV, the atmospheric component ends up being more important. Eric S asked about how the loads numbers get used in the TMDLs. Richard L said they are related to sediment targets set using a food web model. Jon K added that the estimated loads are compared to a fate model's scenarios of external load vs. long-term fate of PCBs in the Bay.

WG recommendations:

1. Continue to support studies on the fate of sediment as it passes through the Bay from the CV. John O to report on the outcomes of his pilot study on sediment fate to the WG
2. Continue to support improving our understanding of variation in the cross section
3. Use particle concentrations for organics (just like we do for Hg) to test for source
4. Make more use of dry season data to better understand the role of SF Bay as a source and to better describe seasonality
5. Use probability plots to discuss loadings and report time series only for our data collection period

Item #2

PCB and PBDE loads in Guadalupe River during WY 2003, 2004, 2005, and 2006 and estimates of long term averages and inter-annual variability.

Lester M presented a quick overview of the history of the project and general field conditions and methods. There were few questions given the WG is very familiar with this work. John O then went on to present the specific methods for PCB and PBDE analysis. Eric commented that it is common to see highest concentration very early in the rising stage in urban systems because the lower concentration water derived from pervious (upper) parts of mixed land use urban watersheds takes longer to get to the sample location. Lester agreed that this is what we see in Guadalupe River and Coyote Creek. Seth also commented that there is some literature that suggests that "old water" sitting in the soil between rain events might pick up pollutants ready for flushing during rains. He cited a paper by Sklash and Forvoland 1973? John talked about our regression estimator method and Eric commented that we should just consider using a dynamic simulation model. Andy asked what effect reservoirs have on the concentrations. Lester explained that reservoir releases cause small spikes in the turbidity 4 hours after a release from either Guadalupe or Almaden but that these spikes are short lived and very small compared to the effects of rainstorms. Lester interprets these as material from channel resuspension not sediment or contaminants from the reservoirs themselves. John discussed homolog patterns and Eric S commented that our regression model is not capturing these types of patterns and using them in the calculation of loads. Eric S also commented that what we are really modeling is sediment load and really the 20 micron fraction of sediment load. Trish M remarked that the reservoirs were well full before the April storm so all water from the watershed was getting to our sampling location.

WG recommendations:

1. Consider using a dynamic simulation model during future analysis of loads that includes sources, homolog patterns, timing of water from as many origins as possible
2. Tease out the effect of reservoir releases in our future analyses

Item #3

PCB and PBDE loads on Coyote Creek – concentration patterns and comparison to Guadalupe River – confirmation of sources and methods for data extrapolation to unmonitored areas.

Lester gave a presentation on a small data set collected in Coyote Creek for SSC, PCBs, PBDEs, and Hg. He focused just on the organics. Jon K asked how the SSC compared to Guadalupe. Lester said they were

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lower but largely because we only have 7 samples so only a small snapshot during wading stage events. At this time there is no more sampling planned. Vince P suggested we try using fluorine or something else? to tease out reservoir contributions. Mike C commented that FI was used in the Boston work. Don Y suggested Cu. Lester M commented that perhaps Ni can be used. Mike C suggested we try a cluster analysis. Trish M suggested Zn, Richard L suggested Cu used in Chabot Res. but Trish M said not in S. Bay. Eric S suggested Fe ratios might be useful and added cumulative rainfall or flow might be useful. Lester M said we don't collect Fe but that we have looked at cumulative rainfall for Hg. Mike C asked how the "clean PCB samples" compared to TMDL targets. Jim commented only three clean samples. Lester M said they average 17 ng/g. The TMDL target is being discussed but around 2 ng/g so even the clean samples appear to be elevated. Barbara M questioned the use of a power function instead of a linear function in the flow-loads regression estimate that Lester M used for extrapolating the data to derive long term average loads. Lester M commented that he uses it for two reasons – 1. Because the sediment loads literature says it's the best model and 2. Because it avoids the issue of negative numbers in the loads predictions. Discussion then moved onto coyote Guadalupe comparisons of land use. Trish M suggested we think more carefully about change in land use in each watershed (modern versus historic uses). Lester commented that a reconnaissance that Don Y and Lester M did several months ago revealed much of the old industrial land use is in the Guadalupe drainage. There was general discussion and comments by Trish M, Andy G, Mike C, Jon K trending towards agreement by the WG that the use of "classic land use data" is no longer valid for understanding PCBs in the landscape. We need a greater level of sophistication. Lester M commented that we are doing this through our SFEI prop 13 project. We have developed a GIS layer of "old industrial" and "new industrial" as well as locations of car wreckers and PGE facilities but perhaps the most compelling layer is the locations of 1950s railway lines. These products are not quite ready for prime time but will be presented in the next 12 months. Lester M then went on to discuss the methods used for regional extrapolation and the results. Rainer H asked if the exports ratios were about 2x too high for the Guadalupe – Lester M said "yes – I had to scale them down". Trish asked if atmospheric deposition is a large source for PBDEs. Don Y said interpretation of the CARB data suggests no. Jim M said depends on the surface, concrete versus soil. Eric S, Lester M, Barbara M, and Jim M all commented about different aspects of the urban landscape and how water and sediment are routed – low roughness, low storage, fast runoff etc. Jim asked how do the new loads estimates compare to Jay PCB 1 box model? Don Y/ John O say 50-80 kg in the ball park. Eric S summed up the general tone of his input through the last two presentations and commented that our annual loads estimates are probably pretty good but once we start to ask how to manage these watersheds to reduce loads we will need more sophistication. To begin to tease out management scenario options, we will need other factors such as timing, plumbing, routing, source locations in addition to land use. Your data set is good - it was a good decision to use discrete sampling rather than composite samples. Jon K remarked that the BASMAA estimates were is the same ball park. Eric S asked – where does the WG want to go next in terms of priorities? Lester M said he needs to hear that from the WG. Eric S – what questions to the managers have? Trish M – the managers/check writers are not in the room. Eric S – should get the discharge community in the room. Lester M – many of these people used to come to the WG – perhaps we are ready to ask them to attend again? James D – if they were in the room they would all give a slightly different answer. Jim M – before we spend \$\$ on solutions – need to spend \$\$ on the science. Maybe we are at a point where the science is good enough? Eric S – what has worked in SoCal is ensuring open communication all the time. Lester M – said we have many forums in which open communication is possible - SPL is but one of them. Lester M welcomed Terry Cooke and Carrie Austin who just arrived. Jon K pondered on what managers want during the Nicole D Hg presentation and then answered: New 5-year permit will largely influence what BMPs or suits of them will be applied. Inviting managers into the SPLWG will not work because we are not producing results that provide simple choices on how they could get cities to implement certain BMPs. If modeling got to clear choices about cost-effectiveness of BMPs we could present that information to the managers. Until then – it is not a good idea. Eric S – we have a coalition in SoCal that included stormwater, wastewater, and community and industry reps. Jon K – we are not there yet. Lester M objected – that is what the RMP as a whole is – just it's not being used at the BMP management level. Eric S – we started with questions, then applied data + models then modified Qs then moved onto analyzing management options. Trish M – we started with relative loads to the Bay – we have moved on just not as far as SoCal. Carrie – Do we need manager buy in now or just consensus at the technical level in this WG? WG generally agreed that this WG is about technical level consensus guided by broad RMP management questions.

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WG recommendations:

1. Consider collecting more samples in Coyote Creek to verify hypotheses
2. Use cluster analysis to tease out relationships better
3. Consider analyzing for substances that can be used as tracers in future studies such as FI.
4. Always check residuals when using regression models
5. Move to developing watershed models so that BMPs management scenarios can begin to be incorporated – so we begin to get to choices for managers
6. Revisit management questions as we embark on modeling so that the right BMPs can be considered.

Item#4

Progress towards Hg loads at Mallard Island for WYs 1994 – present.

Nicole presented our latest findings on Hg loads from the CV. She started with Hg specific methods. Richard L asked about the several outliers. Nicole D said they may be from sampling issue but less likely. Lester M suggested at high flows there might be chunks of really contaminated sediment “breaking free” in the system that occasionally get sampled. Neil G asked could it be from Yolo Bypass? Jim M suggested we do not have enough samples – while now better off than ever before – still only have one large storm sampled and nothing now to compare it to. James D – flow is heterogeneous – what about eddies? Neil G – we saw highly mixed flow during this event. Jim M – probably mobilization of previously deposited material? Neil said mixing is too fast – must be a local source. Barbara M – look at OC data and see what that tells you. Eric S – need to sample more storms of this large magnitude. Neil G asked Nicole D what WY 06 is going to look like – Nicole D – need to wait for more data before we can answer. Eric S – do you have low flow data for Hg. Lester M – not through this study but we have RMP data and R5 Foe data. Eric S – it seems that 10% of the Hg load is during the dry season – may be important for management if 10% clean up is important for the TMDL.

WG recommendations:

1. Continue the study so that another large storm is sampled to provide comparisons and improve data interpretations
2. Continue to support X-section analysis work
3. Use all available data to better understand wet versus dry and sources during floods (OC data, particle concentrations, dry season data from other workers).

Item #5

Summary of Hg data gathered by SFEI in Guadalupe River and tributaries. Proposed model development

Lester summarized data that SFEI has been collecting on Hg concentrations in a variety of locations in the Guadalupe River watershed. Eric S asked for a clarification on how the particle concentrations were calculated. Lester M said there are really ratios of HgT: SSC not true particle concentrations however we know that 97% of the Hg is in particulate form. Lester M then went on to explain the current loads calculation methods and how we stratify the data for source using particle concentrations, rainfall and runoff distribution, routing times, but that essentially it is a binary stratification. He explained that the existing data collected by SFEI in addition to other available data sets really support a more complex model of source, release, transport and loads. He provided a conceptual model diagram and set of equations to demonstrate his point. Carrie A asked what would this new model do for us? Lester M said it would tell us relative magnitudes from each of about 10 sources in the watershed and provide a better loading estimate. Eric S commented there are plenty of modeling choices for understanding the system better and testing management scenarios. Models need to be portable so that they can be applied to other constituents and in other watersheds. He recommended that management questions should be used to drive the modeling approach. Otherwise managers will continue to spend M\$/year and apply BMPs by trial and error often with little monitoring of how the BMP is doing for loads reduction. Jim M agreed we need some capacity to judge the effectiveness of management measures. Jon K – commented that we currently lack the institutional arrangements to link selection of urban runoff BMPs to load reduction goals. Trish M asked how could we frame questions for Guadalupe? And remarked it might be different to other watershed because it has its own TMDL. Carrie A commented that our loading info gets better as we go downstream but she did not see a need to resolve this issue based on comment letter received during the review of the

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TMDL document – largely because the implementation plan did not conflict with other peoples understanding of the watershed, what is most important and what needs to be done. Discussion then shifted to if the WG supports modeling for reasons other than the TMDL such as regional loads estimation, better understanding of contaminant sources and release etc. Neil G suggested we incorporate climate change (for example Knowles/Dettinger work). Jim M suggested we include storage terms. Terry Cooke remarked that for \$50k he would support developing a basic model as presented by Lester as part of a process of learning. Trish suggested we need to talk to the managers. Overall consensus by those present was to support a special study proposal.

WG recommendations:

1. Check in with managers on information needs with regards to data analysis, modeling and reporting
2. Try to write future reports so that there is better connection to management alternatives as an endpoint
3. Develop a concept proposal for a Guadalupe River model that provides a stepping stone in the learning curve about contaminant sources, release, and loading.

Item #6

Starting a new Small Tributaries Loading Study at Zone 4, Line A (Hayward) - Progress to-date.

Lester briefly presented progress to-date on the new “Small Tributaries Loading Study” on Zone 4 Line A in Hayward. He started with the history of why it is needed and how the location was selected. He described the land use in the watershed, his conceptual models with regard to sediment supply and time of concentration. He showed a series of slides of the sampling location, the equipment installed that includes a pressure transducer for state, a rain gauge, a turbidity sensor, and a pumping sampler. Richard L asked if the pump sampler would be representative. Lester explained that just like in the first year of the Guadalupe study we would do a number of paired samples this year to test the variability in the x-section and ISCO pump samples versus depth integrated samples taken using the D-95. We would test this of Hg only as the ISCO cannot be used to take PCB samples (volume too small). Barbara M and Eric S asked about the trigger for the sampler, flow versus time options. Lester said is it presently set to sample at turbidities great than 50 NTU and based on stage increments there after. Lester showed a little of the preliminary data so far and there was lots of WG discussion on the quality of the data and causes for anomalies – Lester stressed that it is very preliminary at this point and that some of the issues will be resolved by lab testing the ISCO samples.

4:10 pm Adjourn