



## RMP Emerging Contaminants Workgroup Meeting

March 25<sup>th</sup>, 2011

San Francisco Estuary Institute

First Floor Conference Room

7770 Pardee Lane, Oakland

10:00am-4:00 pm

Lunch will be provided

### DRAFT AGENDA

1.	<b>Introductions and Goals for Today's Meeting</b> The goals for today: <ul style="list-style-type: none"><li>• Explain RMP planning process</li><li>• Update the group on existing PS/SS</li><li>• Obtain input on CEC profiles</li><li>• Discussion of ideas for future studies</li></ul>	10:00 Meg Sedlak
2.	<b>Update: RMP Planning Overview</b> A brief general overview of the latest on priorities and plans in the RMP, and explanation of how the ECWG fits in to the planning process.	10:10 Jay Davis
2.	<b>Update: Pro Bono Brominated Dioxins Pilot Study and Flame Retardants in Oyster Bay Sediments</b> A summary of recently acquired data from these two studies will be presented.	10:30 Susan Klosterhaus
3.	<b>Update: RMP 2009-2010 PFC Sources Special Study</b> A summary of data from the Sources of PFCs Special Study will be presented. Sediment, wastewater effluent, and tributaries were sampled. A journal article summarizing the findings will be circulated to the ECWG in April.	10:50 Meg Sedlak
4.	<b>Related Study – PFCs and Precursors in Urban Watersheds RMP 2010-2011</b> UC-Berkeley analyzed samples from the RMP 2010/2011 wet weather sampling for PFCs and precursors. Preliminary results will be presented.	11:20 Erika Houtz
	<b>LUNCH</b>	11:50
5.	<b>Update: AXYS/RMP Study on CECs in San Francisco Bay Mussels, Water, and Sediment</b> AXYS Analytical provided pro bono analysis of co-located Bay sediments, water, and mussels to support the NOAA Mussel Watch CA Pilot Study. A summary of the results will be presented.	12:20 Susan Klosterhaus

6.	<p><b>Update: 2010-2011 NOAA Mussel Watch CEC California Pilot Study and Water Board Advisory Panels Update</b> Keith will provide an update on the status of the statewide NOAA Mussel Watch project as well as activities of the Advisory Panels for CECs in Recycled Water and Coastal and Marine Ecosystems.</p>	12:50 Keith Maruya
7.	<p><b>Review: CEC Profiles and Triclosan Fact Sheet</b> (four attachments) In 2010, the ECWG approved the draft profile on antimicrobials. Two additional profiles on alkylphenol ethoxylates (APEs) and carbamazepine (CBZ) have been drafted and a 'Recommended Next Steps' section has been added to the antimicrobial profile. A fact sheet for triclosan was also developed and is intended to be a concise summary of the technical profile. <b>Desired Outcome:</b> Feedback on the profiles and fact sheet and next steps for development of additional profiles.</p>	1:20 Susan Klosterhaus
8.	<p><b>Update: Broadscan Screening of Bay Wildlife for Anthropogenic Pollutants (Year 2)</b> The RMP funded year two of this study (2011), which will focus on continued method development, sample analysis, and mass spectra interpretation. An update on the project will be presented to the group. An update on a parallel study led by SCCWRP will also be shared with the group.</p>	2:00 John Kucklick, Nathan Dodder, Keith Maruya, Susan Klosterhaus
9.	<p><b>CEC Strategy Development:</b> Discussion of ideas for future studies. <b>Desired Outcome:</b> Consensus on a mechanism for incorporating input from workgroup members into future RMP CEC studies and discussion of ideas for future studies.</p>	3:00 Meg Sedlak, All
	<b>Wrap up and Adjourn</b>	4:00
10.	<p><b>Continuation of Broadscan Screening Discussion</b> Additional time will be provided to discuss technical aspects of the project in more detail.</p>	

**RMP Emerging Contaminant Workgroup Meeting**  
**March 26<sup>th</sup>, 2010**  
**San Francisco Estuary Institute**  
**DRAFT Meeting Minutes**

**In Attendance**

Amy Chastain, Bay Area Clean Water Association  
Mike Connor, East Bay Dischargers Association  
Dave Crane, California Department of Fish and Game  
Eric Dunlavey, City of San Jose  
Naomi Feger, San Francisco Regional Water Quality Control Board  
Lee Ferguson, Duke University  
Jennifer Field, Oregon State University  
Denise Greig, The Marine Mammal Center  
Susan Klosterhaus, SFEI  
Keith Maruya, Southern California Coastal Water Research Program  
Derek Muir, Environment Canada  
Karin North, City of Palo Alto  
June-Soo Park, Department of Toxic Substances Control/Cal EPA  
Paul Salop, Applied Marine Sciences  
David Sedlak, University of California - Berkeley  
Meg Sedlak, SFEI  
Lars Tomanek, California Polytechnic State University  
Saskia van Bergen, East Bay Municipal Utilities District  
Luisa Valiela, US Environmental Protection Agency  
Simret Yigzaw, City of San Jose

*Via telephone:*

Richard Grace, AXYS Analytical  
John Kucklick, National Institute of Standards and Technology  
Dan Schlenk, University of California – Riverside

**1. Introductions and Goals for the Meeting**

Susan Klosterhaus outlined the main goals for the meeting: to update the group on 2009 and 2010 activities and to solicit input on proposed 2011 pilot and special studies.

Meg Sedlak indicated that regarding the 2009 Sources of Perfluorinated Compounds pilot study, most of the samples had been collected and sent to AXYS Analytical for analysis. Small fish samples were collected late Fall; surface water samples were collected late summer; and stormwater samples from Guadalupe River, Mallard Island, and Hayward Zone 4 Line A were collected in the winter. Meg indicated that sediment samples were currently being collected.

## 2. Update on 2008/2009 PSSS: Alternative Flame Retardants

Susan Klosterhaus updated the workgroup on the progress of the alternative flame retardants pilot study. Samples of sediment, harbor seal blubber, mussels, sport fish and bird eggs were analyzed for PBDEs, hexabromobenzene (HBB), pentabromoethylbenzene (PBEB), di(2-ethylhexyl) tetrabromophthalate (TBPH), Dechlorane Plus, tetrabromobenzoate (TBB), decabromodiphenylethane (DBDPE), and 1,2-bis(2,4,6-tribromophenoxy)ethane (BTBPE) in 2008/2009 and the hexabromocyclododecane (HBCD) isomers were recently analyzed by Mark La Guardia at the Virginia Institute of Marine Sciences (VIMS). Organophosphate flame retardants, which are being used as replacements for PentaBDE in furniture foam and foam from baby products, were also analyzed in sediments. These analytes were not part of the original analyte list and their analysis was provided pro bono by Heather Stapleton at Duke University. Tetrabromobisphenol-A was originally a target analyte for the project; however the contract lab initially selected for the project dissolved and VIMS was not able to do the analysis.

PBEB, Dechlorane Plus, and HBCD were detected in sediments and wildlife samples but the concentrations were generally orders of magnitude lower than the PBDEs. Concentrations of HBCD were within range of PBDEs however. The organophosphates TDCPP, TCPP, and TPP were detected in Bay sediments at all sites at concentrations comparable to PCBs and PBDEs (~1-20 ng/g dry weight). TBB and TBPH peaks were observed in seal samples though further analysis is needed to confirm the identity of these compounds. TBB and TBPH were not observed in other samples (MDLs 0.2-15 ng/g lipid).

### *HBCD*

Susan indicated that HBCD was detected in sediment (0.2 to 1.6 ng/g dry). It was also detected in sportfish (shiner surfperch and white croaker) at concentrations ranging from 3 to 25 ng/g lipid. These ranges were consistent with those observed in Lake Ontario fish (e.g., 16 to 33 ng/g). There is a shift in isomers from the sediment (largely gamma) to fish (largely alpha). There was some speculation on the causes of this shift (e.g., bioisomerization). Jennifer Field commented that this was a very distinct shift in the isomers. Derek Muir indicated that it is frequently observed with HBCD and HCH and that the shift is a result of selective degradation of the axial isomers. Susan noted that not surprisingly the alpha HBCD isomer is also the dominant isomer in the harbor seal blubber. The Tomales Bay samples (reference samples) were comparable to Bay samples. In general, Susan commented that the concentrations are quite low compared to European data. Mike Connor suggested that the sediment data be normalized for organic carbon.

### *Organophosphate Flame Retardants in Furniture Foam*

Susan also reported on the results of a survey of 26 furniture foam samples and 50 house dust samples for organophosphate flame retardants. These data were published in *Environmental Science and Technology* in 2009 (43: 7490). Fifteen of the furniture foam samples contained TDCPP (tris (1,3-dichloro-2-propyl) phosphate) and four samples contained TCPP (tris (1-chloro-2-propyl) phosphate). TDCPP, also known as Chlorinated Tris, was used in children's pajamas until the late 1970s when it was shown that it is adsorbed by humans. It has been

classified as a mutagen and probable carcinogen by two agencies. Approximately 10 to 50 million pounds of TDCPP are used annually in a variety of applications (e.g. furniture foam, foam in baby products). Much less information is available regarding TCPP. TCPP is similar to TCEP (Tris 2-chloroethyl phosphate, a carcinogen), which is on the California Prop 65 list.

Dust samples contained levels of Chlorinated Tris that were comparable to PBDEs. WWTP sludge samples analyzed for PBDEs and the alternatives showed the PBDEs and alternatives to be at similar levels (in the range of 500 to 3,500 ng/g). TDCPP was not detected in cormorant eggs and not analyzed in other matrices.

David Sedlak asked a question regarding sources of the alternatives. He cited a recent study of Italian volcanic lakes that received no wastewater effluent and nonetheless contained organophosphate flame retardants. There was some speculation about other uses of alternatives such as an additive in household floor wax.

David Sedlak also asked what we know about the ecological effects of these compounds. Susan said that the EU has developed draft ecotoxicological thresholds for TDCPP and TCPP in sediments but that the concentrations were one to two orders lower than what is currently being observed in Bay sediment samples. David asked about what is known about the effects of TDCPP and TCPP. Susan indicated that there is some suggestion that they exhibit developmental or neurotoxicity. June-Soo Park stated that the DTSC did not measure significant concentrations in human sera but the detection levels were somewhat elevated due to detection of compounds in the background samples.

Derek Muir indicated that tricresyl phosphates are listed as neurotoxins, specifically ortho substituted isomers, so there might be potential for substituted triaryl phosphates (most are para substituted) to have some toxicity issues if they contain ortho substituted impurities.

Susan Klosterhaus indicated that the information to date suggests that the alternatives are unlikely to be an ecological issue and that it may be more of a human health issue. A discussion ensued regarding human health issues and how to disseminate information regarding these new alternatives. The group concurred that this responsibility fell outside the purview of the workgroup but that nonetheless the group felt it was important to get the information out to others. Lee Ferguson asked whether Susan had plans to analyze for tetrabromobisphenol-A (TBBPA) or other brominated phenols. Derek Muir indicated that they can be degradation products. Susan noted that TBBPA was originally on the target list of compounds for this study but the original contract laboratory dissolved and the new lab (VIMS) does not have methods developed for this compound. AXYS indicated that it is able to analyze TBBPA.

Naomi Feger indicated that it would be good to produce a technical report and a summary memorandum that indicates that we have decided these compounds are of low priority.

### **3. AXYS Pro Bono Study: Brominated Dioxins in Bay Sediment and Wildlife**

Susan Klosterhaus indicated that SFEI and AXYS are conducting a pro bono project on brominated dioxins. Brominated dioxins are the analogs to the chlorinated dioxins and have a

similar toxicity although TEFs for these compounds have not yet been assigned. Brominated dioxins are the result of impurities in flame retardant mixtures, combustion of flame retardants, and photolysis of the OH-PBDEs. In addition, they can be naturally occurring. Six samples each of sediment, white croaker and harbor seal blubber will be sent to AXYS for analysis in April. The white croaker and sediment will also be analyzed for chlorinated dioxins as part of the 2009 RMP dioxin element. This will be an interesting data set (i.e., comparing chlorinated dioxin concentrations to brominated dioxin concentrations). Susan indicated that approximately 10 brominated dioxin compounds will be analyzed. She also indicated that following up on Derek Muir's recommendation to do homologue groups, that it is not feasible at this time for AXYS to characterize the homologues.

#### **4. Update on Archive Strategy**

Susan Klosterhaus reminded the group that the purpose of the archive is to allow the RMP to conduct time trends, to quantify contaminants of concern, and to evaluate potential QA issues. Currently, the RMP archived samples are stored in Oakland at a commercial facility at -18 °C (Shaeffer's Meat and Cold Storage). Susan outlined some of the disadvantages with the current storage (-18 °C freezer) including: the potential for chemical and/or biological degradation, moisture migration from the samples, and changes in tissue sample color suggesting degradation of the matrix. At -80 °C, absolute preservation is expected but it is more expensive.

Susan Klosterhaus approached the National Institute of Standards and Technology (NIST) about storing RMP samples in their archives in return for allowing NIST to use some RMP samples. NIST currently maintains an extensive archive, in part because they develop national standards from these materials. The NIST samples are stored at -150 °C using liquid nitrogen vapor freezers. Because they have extensive archives, they have developed the infrastructure to maintain these facilities. NIST is amenable to this arrangement and a contract is currently in development.

Susan outlined the strategy for archiving samples at NIST: sediment samples from all historic stations (seven sites) would be archived; all of the bivalve sites would be maintained (nine sites within the Bay, and two river sites); at least one sample from each fish composite will be archived; cormorant eggs from the three historic sites will also be maintained. Details of the archive strategy are located in the archive strategy document drafted in March.

Susan proposed that the tissue and sediment samples stored in the short-term archive (Oakland) will only be kept for 15 years and then will be discarded. All samples collected prior to 2010 will be maintained as no long term archive exists. Tissue and sediment samples added to the long term archive will be maintained for 40 years. After that, only sediment samples collected every three years and tissue every six years will be maintained.

Susan asked the group how the bivalve samples should be archived. At present, they are maintained as whole bivalves in the shell and not homogenized. One of the disadvantages with whole bivalves is that the shells are wrapped in foil and this tends to disintegrate over time. Susan recommended that AXYS do the homogenization and segregate a portion of this for the archive. Derek Muir indicated that there is a small group at the Swedish Museum (Anders

Birgnert) who is evaluating tissue storage. He suggested also contacting Paul Becker at NIST and Rob Letcher at NWRRC. He also recommended that the RMP consider joining the SETAC committee on sample archive storage that meets at SETAC. Derek Muir indicated that homogenization saves space (and therefore cost) but that there may be some ester hydrolysis due to the homogenization. The group recommended that the archive protocol reviewed by these outside groups.

The second question Susan posed to the group was how to evaluate chemical degradation of the samples. Susan outlined one option of periodically analyzing mussel SRMs on a routine basis (e.g., 6 chemical analyses (PAHs, PCBs, Pest, PBDEs, metals, other) of 3 SRM replicates every 4 years. The cost to conduct this every four years would be approximately \$25,000. Derek Muir suggested the RMP make its own SRM and periodically reanalyze it, which is a common practice. David Sedlak suggested that the RMP archive not only the samples but the SRMs that were analyzed with the samples to evaluate chemical degradation over time. Mike Connor agreed that this was a good way to address this issue. Derek Muir indicated that the SRM and archive would also be useful if in the future the RMP switched labs.

## **5. Update on Nonylphenol (NP) in California Coastal Waters**

Lars Tomanek gave a short presentation about the presence of tumors in arrow gobies (e.g., gonads, liver, etc.). Chemical analyses were conducted to see if a correlation existed between the presence of contaminants and the presence of tumors. Chemical analyses included PBDEs, PCBs, pesticides, and nonylphenol (NP). The strongest correlation was with NP although Lars did not conduct studies to demonstrate that NP was the causative agent. NP is used in a variety of applications including paper products, pesticides, household paints, detergents, cleaners, and personal care products (moisturizer, etc.). It is a well known endocrine receptor and enhances the growth of tumors. The group focused on septic fields and wastewater as being a source of NP. Concentrations of NP in various matrices were approximately: 40 ng/g dry weight in sediment; 700 ng/g wet weight (ww) in goby liver; 200 ng/g ww in oysters and mussels; 1,700 ng/g ww in Staghorn sculpin; 400 ng/g ww in Western grebe and 800 ng/g ww in sea lion liver.

Wastewater treatment effluent was found to have low concentrations of NP; however, relatively high concentrations were observed in the solids from septic tanks (ppm levels).

The Tomanek research group has evaluated arrow gobies from other sites including San Francisco Bay (approximately 170 ng/g ww) and Tomales Bay (approximately 200 ng/g). The group had a hard time finding gobies that don't contain NP. Canadian Bamfield inlet gobies had approximately 100 ng/g ww. Similar results were observed for oysters. They are beginning to evaluate proteomics and microarrays for gobies.

Lee Ferguson recommended looking for the alkylphenol polyethoxylates. Lee also indicated that the distribution of these compounds from secondary WWTPs versus septic fields will be different (low ethoxylates vs. a wider group of APEs). Lee indicated that mono and di ethoxylates dominate and the concentrations of these will be 10 times the amount of NP. Lee indicated that the lower ethoxylates are also accumulating. Mono and di are on the same order of estrogenicity as the alkylphenol itself. British Columbia might be one of the worst places to look

as the literature shows that very high concentrations of NP are observed in this area, likely due to the low level of treatment used. Jennifer Field asked whether there was intersex or whether there were effects that were observed that were not as severe as the tumors. Lars indicated that samples have been sent to Swee Teh at UC-Davis but they are largely males.

David Sedlak asked whether Lars had developed a dose response concentration relationship for NP. Lars responded that he has not. David indicated that NP is so pervasive that it seems unlikely to be causing the tumors in Morro Bay. Lars indicated that pathogens may also be responsible. Lee indicated that in his work in Jamaica Bay, New York he observed concentrations orders of magnitude higher (e.g., 50 ppm in sediment). They did a trawl of 100 flounder and only found two males. David Sedlak indicated that it is very important to first establish a causative relationship before singling out NP as the cause of the tumor. As an example, he stated that there were many other potential sources of contaminants in the immediate vicinity (e.g., nuclear power plants, oil spills, etc).

## **6. Update on Carbon Nanotube Analysis in Estuarine Sediments**

Lee Ferguson indicated that as part of a USEPA grant project he is developing a method for analyzing carbon nanotubes in sediment samples. He indicated that he will analyze RMP sediment samples once the methods have been refined. He clarified that they are looking at single-walled nanotubes (not Fullerene or multi-walled).

## **7. PS/SS 2011: Broadscan Screening of Bay Wildlife for Anthropogenic Pollutants**

John Kucklick gave a brief update on the progress of the 2010 project and outlined the proposal for 2011. New technologies such as two dimensional gas chromatography mass time of flight (GCGC TOF) have really enhanced our ability to search for new chemicals of concern. It is a huge advantage to allow the resolution of complex mixtures. The mass spectra libraries have increased substantially allowing for better detection of previously unidentified compounds.

This two-year project (2010 and 2011) will focus on determining which chemicals are of highest concern and will use biota to identify them. Harbor seals will be used because they are apex predators with high site fidelity. Samples from The Marine Mammal Center tissue bank will be analyzed (stranded animals collected in the Bay Area). Mussels will also be analyzed to provide information on contaminants that are less likely to bioaccumulate or be metabolized. A control site will be used to compare to SF Bay samples, which will allow the group to target their efforts on anthropogenic compounds specific to SF Bay. NIST is currently working on developing the methods using California sea lions. The appropriate tissue samples have been identified. Elizabeth McGaw in Gaithersburg (NIST), who used the technique for human sera screening, will begin extracting blubber samples in April.

To begin this exercise, Elizabeth will analyze a well characterized blubber homogenate from a 2001 round robin exercise. Minimal cleanup (e.g., size exclusion chromatography) will be conducted prior to using GCGC TOF. Polar compounds will need to be derivatized using MTBSTFA. NIST will also look at serum and liver that was part of the 2007 round robin. This

Fall/Winter NIST will apply the method to harbor seal samples. As NIST conducts the method development, they will add new compounds to the NIST library. Upon completion of the seal tissue, NIST will begin mussel tissue. John indicated that the mussel samples may be more challenging.

John Kucklick indicated that a SCCWRP/SDSU team led by Keith Maruya is beginning a similar endeavor looking at dolphins collected in and around the So Cal Bight, and the SFEI/NIST team has agreed in principle to collaborate and leverage resources with these researchers to enhance both projects.

For 2011, the proposed workplan will be analysis of mussels, continued expansion of the mass spectral library with new compounds, exploring the use of LC-QTOF, and writing a manuscript.

Jennifer Field asked for more details about the derivatization step. John indicated that the perfluorinated compound will not derivatize well. Jennifer asked about the extraction solvents used. John indicated that the group would vary the acidification and polarity of the extraction step and that Jennifer was correct that this would be very influential in the outcome of the analysis. Phenolic compounds do not necessitate the cleanup step.

Lee Ferguson recommended saving some of the sample for the LC and indicated it would be good to be able to compare GCGCTOF and LCQTOF. Jennifer Field mentioned that there will be a variety of ionization techniques that can be used (e.g., APPI source, ABI source) that may skew the end results. LCQTOF instrumentation is at the Gaithersburg NIST facility. John Kucklick indicated that the first priority will be GCGC and then the group will turn its efforts to LC. Lee suggested using the list of emerging chemicals in the Muir and Howard ES&T paper to build up the NIST library. Lee also stated that James Little at Eastman Chemical has an accurate mass database and recommended that John contact him.

David Sedlak asked why John is using dolphins for the Southern California study and harbor seals for Northern California study. He suggested that it would provide more information to use the same species. Keith Maruya explained that this was an opportunity to analyze dolphins and SCCWRP was augmenting this project and using the samples for this study. Jennifer Field and Lee Ferguson echoed that it would be good to have the same species. Denise Greig indicated that both animals (i.e., dolphins and seals) would begin to answer the question of which chemicals to focus on.

David Sedlak recommended that we document the contribution from NIST as it appears that they are making a substantial contribution and it would be good for the stakeholders to be aware of this.

## **8. Pilot and Special Studies for 2011: Screening Bay Fish for EDC Impacts**

Dan Schlenk from UC-Riverside presented a proposal to evaluate San Francisco Bay fish for endocrine disruption. As background, Dr. Schlenk indicated that he embarked on a study to evaluate sex changes in fish in the Delta based on the findings of a UC-Davis group that salmonids undergo sex reversals. After they received the funding for this project, it was determined that the sex change was a natural part of the fish lifecycle.

Dr. Schlenk indicated that the group collected water from 18 plus locations in the Delta and conducted in vitro and in vivo experiments using extracts from the water to evaluate in vitro hepatocytes and vitellogenin mRNA. (Applied Marine Sciences assisted in the collection of samples for this project.) The in vivo experiment involved injecting whole fish with the water extract. After injection, the plasma was collected and vitellogenin protein levels were determined. Two sites (Napa River and Sacramento Delta site) exhibited estrogenic activity. The cause of the estrogenic activity has not been determined although an extensive chemical screening has been conducted. Recently, the group collected water samples from these two sites to conduct whole animal exposures (approximately 30 gallons of water was collected). Napa River still exhibited vitellogenin production. The group also measured vitellogenin production in Japanese medaka exposed for seven days using the ELISA technique. They have consistently seen biological effects from this water.

Other research groups have observed evidence of estrogenicity. Inge Wermer (UC-Davis) conducted sampling as part of the pelagic organism decline (POD) work. Bioassays were conducted and some were found to exhibit estrogenicity. Gary Cherr (Bodega Bay Marine laboratory) and Jim Lazorchak (USEPA) have evaluated effects on caged animals and have seen vitellogenin induction. No one is looking at feral animals.

Dan Schlenk indicated that his group in collaboration with SCCWRP had undertaken a large study of EDC effects in fish in the So Cal Bight using English sole and horny head turbot. Dan proposed to do a similar study in San Francisco Bay using English sole. He will collaborate with Rusty Fairey (Moss Landing Marine Labs) for collection of fish at three sites (Yerba Buena Island and two reference locations, San Pablo Bay and Paradise Cove). Dan indicated that in part the location of sites is a function of where there are fish. Males and females will be collected. The second task will be to evaluate the gonad somatic index and histopathology.

David Sedlak asked what the follow up was from the previous work in the So Cal Bight. Dan indicated that there was one case of intersex in a fish in 2005/2006 (1 out of 300) and that they had seen a higher incidence in the Bight 2003 study. There were no changes in gender ratios or populations. They are following up with TIE.

A question was asked whether a site could be located further down south in Lower South Bay. The Yerba Buena Island site is in Central Bay and receives good circulation. Mike Connor asked why the sites were referred to as reference (San Pablo Bay and Paradise Cove) and EBMUD (YBI site) as these names did not reflect conditions at the sites. The group suggested that Dan check in with Rusty to see if there are other sites where he might be able to obtain fish.

## **9. 2010 NOAA Mussel Watch CEC California Pilot Study**

Keith Maruya described the pilot study that the NOAA Mussel Watch Program is undertaking in 2010 in collaboration with SCCWRP, SFEI, and state and federal agencies. Historically NOAA has conducted work on legacy contaminants (approximately 120 compounds) including PAHs, PCBs, DDTs, chlordanes and dieldrin, trace elements and butyl tins. Mussel Watch conducts these surveys on a biennial cycle. The trends over the last 25 years for most of these legacy contaminants suggest that they are declining.

Based in part on the detection of PBDEs in bivalves and the decline in legacy contaminants, NOAA is refocusing their efforts on chemicals of emerging concern (CECs) in 2010 in California. The national program will be suspended and an intensive effort will be undertaken in California. NOAA Mussel Watch is dedicating approximately \$360,000 in analytical costs to this project. Other partners including SCCWRP, SFEI, SWRQCB and USGS are augmenting this work. Samples will be collected from 69 sites, of which 25 sites are historical NOAA Mussel Watch sites. The remaining sites are being stratified by land use (e.g., urban, low development, agricultural) and targeted sites (e.g., POTWs, stormwater discharge).

The pilot study will also use passive samplers and co-deploy caged bivalves at some of the sites to compare the efficacy of the passive samplers. The group is also interested in genomics.

The analytes of interest include several PPCPs, alkylphenols, perfluorinated compounds, pesticides (including pyrethroids, triazines, diuron, strobilurins), flame retardants (PBDEs and their replacements), and nanomaterials.

Derek Muir asked whether NOAA is looking at the metals (platinum and palladium etc.). Keith Maruya stated that there were no plans at this point.

#### **10. Update on AXYS/RMP Study on CECs in San Francisco Bay Mussels, Water and Sediment**

Susan Klosterhaus indicated that to assist the NOAA effort, the RMP collected sediment, water and mussel samples from five locations in the Bay: Richmond, San Leandro Bay, Eden Landing, Foster City and Cooley Landing. All of the samples are being analyzed by AXYS Analytical pro bono for PPCPs (approximately 120 compounds), perfluorinated compounds, and alkylphenols. This information will be used to develop the analyte list for the statewide Mussel Watch study. Results are currently undergoing review by SFEI and AXYS. Susan shared some of the preliminary highlights. Carbamazepine was widely detected. Some seawater interference occurred with the sulfa compounds.

With regard to the perfluorinated compounds, water concentrations were mostly in the low ng/L. PFOS and PFOA were consistently detected in mussels at concentrations ranging from 0.5-5 ng/g wet wt, with the exception of Eden Landing where the mussels contained PFOS at 75 ng/g. PFOS and PFOA were consistently detected in sediments at concentrations <5 ng/g dry wt. Methyl and ethyl FOSA and FOCES (sulfamids), which are precursors, were analyzed but not detected.

Jennifer Field reminded the group that Chris Higgins identified PFC acetic acids in sediments and they were much higher than PFOS. Derek asked whether the perfluorophosphates had been analyzed; they are a major contribution in wastewater (they have not). Richard Grace stated that they are working on a method for biosolids.

Nonylphenols were detected in mussel tissue. The NPEO1 and NPEO2 were detected but not in substantially higher concentrations than NP.

The PPCPs consistently detected in water were caffeine, carbamazepine, clarithromycin, erythromycin, benzocetonine, DEET, meprobamate, metoprolol, gemfibrozil, triclocarban, and valsartan. The PPCPs consistently detected in mussels were carbamazepine, dehydronifedipine, diphenyldramine, sulfamethizole, DEET, sertraline, ibuprofen, and amphetamine. Richard Grace indicated that he was surprised that triclosan was not detected.

Jennifer Field recommended that methamphetamine be added to the list. She noted it will be in the water and higher than amphetamine.

Susan noted this data will be turned around quickly to inform the statewide effort and that she will be writing it up in collaboration with AXYS as a manuscript by the end of the year. David Sedlak asked what the hypothesis was and to be cautious with the interpretation as this may have potential policy and management implications. Susan responded that this data is likely to be treated like the other monitoring data generated by the RMP which is published in peer-reviewed journals. Richard Grace indicated that he was interested in writing this up to make the new methods available in the literature.

## **11. Update on the 2009 Pilot and Special Studies: White Paper on the Potential Impact of Select CECs in Wastewater Effluent on the Bay**

Susan Klosterhaus outlined the goals for this element: to develop consensus on the list of chemicals to include in the white paper, prioritize the chemicals, and to agree upon a plan for completion.

The current chemicals that the RMP is considering include: triclosan/triclocarban (antimicrobials); sulfamethoxazole (antibiotic); 17-estradiol and 17-ethinyl estradiol (hormones); atenolol (beta blocker); gemfibrozil (blood lipid lowering agent); carbamazepine (neuroactive compound); chlorinated organophosphate flame retardants (TDCPP, TCPP, TCEP) and atrazine or fipronil (pesticide).

Based on Susan's discussions with Naomi Feger, the following compounds were listed as a high priority: triclosan/triclocarban; sulfamethoxazole; hormones; carbamazepine; chlorinated organophosphate flame retardants, and alkylphenols (surfactants). Naomi Feger indicated that the following chemicals were a low priority for this project: pesticides (a lot of work is currently being conducted by other groups (UP3)); perfluorinated compounds (RMP is already doing a lot of work on these compounds); nanomaterials (there isn't sufficient information to evaluate and few labs can do the analysis) and quaternary ammonium compounds (for similar reasons).

A question was asked what the primary goal was -- communication or monitoring -- as this will result in different lists. Eric Dunlavy indicated that he originally envisioned the project as an outreach/communication tool. The TRC is currently discussing the development of fact sheets. One idea might be to turn the current antimicrobial chapter into a factsheet.

David Sedlak commented that Susan had done a nice job with the antimicrobial chapter. He mentioned that the white paper could serve as a living document to identify the current priorities

and could include a summary about whether the chemical should be a priority for the RMP. The document could document decisions of the ECWG and help prioritize our limited resources. Lee Ferguson recommended that as we develop information we should post this on our website after it had gone through external review.

Mike Connor recommended that Susan write up a few more chemicals over the next couple of months. He thought that the example Susan provided was about the right length and content and that it was a useful statement as to where we are. Karin North indicated that she would like to see a one paragraph summary of what the management implications are and that BACWA could work with SFEI on this aspect.

Keith Maruya indicated that there are several other groups conducting similar exercises. For example, the recycled water policy panel will be finalizing a list of CECs shortly. Packard Foundation has also funded SCCWRP to conduct a similar exercise for CECs for the ambient environment (e.g., oceans).

The group prioritized the list and recommended that alkylphenols, chlorinated organophosphate flame retardants and carbamazepine (in order of priority) be addressed over the next couple of months using the template that Susan developed. The group envisioned that the RMP would continually update the document.

Endocrine disrupting compounds are a driver for the stakeholders and although they might not be a scientific issue, it would be good to write up a section on them so that BACWA can use this for education purposes.

## **12. CECs in Large Aquatic Ecosystem (LAEs)**

Luisa Valiela indicated that the San Francisco Bay-Delta has been selected as a LAE similar to Chesapeake Bay, the Great Lakes, etc. and as a result additional funding for science support will be made available to this region. She posed the following question to the group: what data gaps do we have here that need to be filled by the USEPA ORD? It would be good if the ORD research related to the water quality improvement funds (e.g., LID, TMDL impact and wetland habitat) but it doesn't necessarily have to.

LAEs will cover chemicals such as emerging contaminants, PAHs, pesticides, PCBs, and methylmercury. USEPA is developing a document to guide the CEC research in LAE. The Great Lakes have sent an emerging contaminant list to ORD – methods development, effects of mixtures, toxicity of CECs, etc. The work will be targeted to ORD scientists.

The group made several recommendations. Luisa indicated that she would summarize them and send them out to the group. She also indicated that she was on a very short time frame (several weeks) for providing input.