

MTCA Science Advisory Board Meeting Summary
December 11, 2006
9:00 AM – 4:00 PM

University of Washington, Graham Visitor Center
Seattle, WA

Agenda:

Review 10/23/06 meeting summary

Annual Meeting

MTCA Rule Revision – Use of TEFs for Dioxin, cPAHs & PCB Mixtures

Establishing Moderate Soil Levels for Arsenic and Lead Protection of Groundwater

Attendees:

SAB Members Present: Dr. Hank Landau, Dr. Bruce Duncan, Dr. Marjorie Norman,
Dr. Elaine Faustman, Dr. Mike Riley

Agency Staff and Presenters: Dave Bradley, Dawn Hooper, Pete Kmet, Craig
McCormack; Eric Weber & Kris Hendrickson (Landau Associates)

Audience: Paul Agid, Jim W. White, Marcia Bailey, Annika Deutsch, Greg Glass,
Maureen Mitchell, Jim White

I. Agenda Review; Review of 10/23/06 Meeting Summary

Ecology reviewed the agenda and goals for the meeting. Ecology asked Board members for revisions to the October 23, 2006 meeting summary. Several members provided comments on the summary. The summary will be finalized based on the suggested revisions.

II. Annual Meeting

Ecology provided members with a copy of the SAB Charter.

Pete Kmet noted that Ecology is contemplating two changes/additions to the charter. The first change to the charter is to address potential conflicts of interest of Board members in more detail. The second change to the charter is to address how Ecology and the Board should respond to correspondence that solicits a response by the SAB on particular technical issues, such as the letter recently received from Rayonier's attorney requesting the Board address issues related to the rule revision currently under consideration. Ecology will provide language to the Board for review at a future meeting.

Dawn reviewed the members current appointment status:

Dr. Landau: On Board since it's inception in 1990, with current appointment due to expire July 31, 2007.

Dr. Duncan and Dr. Norman on the Board since 1995, with current appointments due to expire on July 31, 2007.

Dr. Faustman on the Board since 1991 and recently re-appointed to a new 3 year term due to expire July 31, 2009.

Dr. Riley just appointed to the Board to a 3 year term due to expire on July 31, 2009

Pete Kmet noted that the Governor has recently been requiring turnover in other Boards, appointing new members to replace existing members as terms have expired. While SAB members are not appointed by the Governor, it is unknown if this policy requiring of turnover of members appointed to Boards or Panels will extend to the SAB.

Pete Kmet then reviewed Ecology's anticipated SAB work plan for 2007 (handout). Ecology anticipates quarterly SAB meetings in 2007. A major focus in 2007 will be Ecology's 5 year review of the MTCA cleanup standards. Additional issues include: SAB Charter amendments, dioxin rule amendments, freshwater sediment standards, fish consumption, TPH guidance, area wide arsenic and lead terrestrial ecological issues, vapor guidance, WARM manual update.

Board members noted that because of conflicts it would be best not to schedule SAB meetings during the months of April and October. Also, Mondays were identified as the preferred day of the week for future meetings.

Dawn then requested members to disclose any potential conflicts of interest related to these issues.

Dr. Landau: Noted he currently is self-employed at GeoSphere, LLC, a company that specializes in providing consulting services on contaminated site cleanup. He is currently provided services to the Edmonds Community College regarding petroleum contamination, NOAA regarding a national resources damage assessment (NRD) case, Iron Mt. Quarry regarding assessment and cleanup of arsenic contamination and Lehigh Cement regarding a cleanup of cement kiln dust.

Dr. Duncan works for the USEPA. In this role he has recently worked on national guidance regarding ground water contamination of surface water, with emphasis on sediments, and guidance on use of TEFs for assessing ecological risk. He is also actively working on contamination of the upper Columbia River from releases by Teck-Cominco (Trail, BC) and other sources as well as sediment contamination issues in the lower Duwamish waterway and other sites. He is also providing technical support on an active NPDES enforcement case in Alaska.

Dr. Norman is currently self-employed as a toxicologist. She indicated she is not currently working on any cases that would present a potential conflict of interest.

Dr. Faustman is a professor in Environmental and Occupational Health Sciences, University of Washington School of Public Health and Community Medicine. Her department receives funding from AHS, USEPA, Dept of Energy and the National Academy of Sciences. She is currently working on research related to pesticides and children's health issues.

Dr. Riley works for, an environmental consulting firm (S.S. Papadopoulos & Associates, Olympia, WA) specializing in contaminated site cleanup. Several of the sites he works on involve contamination of fresh water sediments and arsenic contamination. He is also currently working on a site proposing monitored natural attenuation of TPH contamination, and another site with vapor contamination issues.

III. MTCA Rule Revision – Use of TEFs for Dioxin, cPAHs & PCB Mixtures

Dave Bradley used a power point presentation to lead a discussion of the current status of the SAB input on the MTCA rule revisions related to use of TEFs for Dioxin, cPAH & PCB mixtures. The results of these discussions are captured in the attachment entitled "Science Advisory Board Review of Issues Related to Mixtures of Dioxins/Furans, Polycyclic Aromatic Hydrocarbons & Polychlorinated Biphenyls" dated December 2006.

There was a general discussion regarding the distinction between mode and mechanism of action related to chemical toxicity. Mechanism of action for the toxicity of a chemical defines in detail the different molecular and cellular alterations leading to an adverse biological effect. While the mode of action for chemical toxicity defines a series of key events and processes through operational and anatomical changes that leads to an adverse biological effect. For example, many of the adverse biological effects (cancer and non-cancer) associated with the dioxins/furans are initiated by the activation of the Ah receptor without defining every molecular event or cellular alteration beyond receptor binding.

In addition, the following notes reflect the SAB's discussion of Ecology's proposal to use a bioavailability of 40% from soils for dioxin mixtures.

Dr. Faustman noted that Martin Van den Berg has mentioned in several presentations she has attended that the soil matrix does influence the bioavailability of dioxins and the absorption efficiency is different than that of dioxins in food and water.

Dr. Landau, in discussing available studies, noted that little information is available on the soils tested but given the range of soils present in WA State, it is likely these studies encompass the types of soils present in WA State. However, we don't know enough about the soils tested to know which parts of WA State are represented by these test results.

Dr. Landau noted there are four processes that affect the ability of a soil to hold a contaminant:

- Absorption: where the soil acts like a sponge
- Adsorption: where electrical charges on the soil bind the contaminant to the soil (common mechanism for metals binding to iron oxides and organics to bind to soil organic matter)
- Precipitation: The contaminant precipitates onto the soil. This is not relevant to the discussion.
- Part of soil matrix: Certain naturally occurring metals are present within the crystal matrix of the soil.

Based on follow up questions from other Board Members, Dr. Landau added that:

- The 2 mm standard and test methods typically used to measure soil metal contaminant levels measures the absorbed and adsorbed fractions but not metal precipitate or metals within the crystalline matrix.
- The clay type and content is important because clay has a much greater surface area to react with contaminants. Similarly, iron oxides are important for metal adsorption. Also, the organic content of a soil is important because organic lipophilic chemicals will bind to soils with high organic content.

Dr. Riley noted that several of the studies show bioavailability of over 100%, suggesting there were problems with these measurements.

Dr. Faustman countered by noting that an area of current research interest is the effect of soil type on the transit time of contaminants within the body. There is some evidence that sand will shorten the transit time but clay will increase the transit time. So, it is possible to have measurements greater than 100%.

Dr. Duncan noted that if liver concentration is the appropriate measurement to use, the studies would suggest a bioavailability value of 50% may be appropriate. If AHH binding or P450 induction is the appropriate measurement, then a bioavailability value of 90% may be more appropriate.

Pete Kmet presented a spread sheet noting the differences in bioavailability for the different end points (liver content, AHH receptor & the P450 enzymes). He noted that liver content measurements appear to support a 50% bioavailability. If the studies where

the animals died and measurements over 100% are not used, the studies appear to support a 60% bioavailability based on liver content.

The board concluded there was insufficient information to conclude 40% is an appropriate default value. They requested Ecology provide the following additional information:

- Effect of dose and how the doses used in these studies compare to concentrations typically encountered in WA State.
- The basis for EPA's conclusion that a 30% absolute bioavailability (40% relative bioavailability) was appropriate, including actual quotes from the EPA report. If insufficient information available in the latest report, Ecology should look at earlier EPA reports that discuss this issue.
- EPA's SAB review comments on bioavailability.
- Further evaluate Van den Berg literature regarding information on the bioavailability of dioxin congeners and toxicokinetics

Audience comments:

Marsha Bailey suggested that the Board and Ecology consider whether the bioavailability of dioxin is different for residential (child) exposure versus industrial (adult) exposure.

Maureen Mitchell from Rayonier asked if it is possible to assign a different bioavailability to different congeners if the mixture is treated as a single hazardous substance. Dave Bradley responded that this would be possible but would involve another step in the calculations.

IV. Establishing Moderate Soil Levels for Arsenic and Lead Protection of Groundwater

Dave Bradley used a power point presentation to provide introductory remarks providing a perspective on how Ecology is approaching area wide arsenic and lead contamination and how the leaching pathway fits into this approach. He noted that the concentrations being discussed are not cleanup levels. Rather they will be used to determine when it is appropriate to use administrative mechanisms other than the traditional MTCA approach when addressing area wide arsenic and lead contamination. Ecology's current operating assumption is that additional measures beyond those needed to prevent direct contact are not needed to protect ground water.

Eric Weber then used a power point presentation to discuss additional work Landau Associates has done on issues raised at the October, 2006 SAB meeting regarding the leaching pathway.

Ecology and Landau Associates have concluded area wide soil arsenic concentration of 200 mg/kg and area wide soil lead concentrations below 1000 mg/kg are unlikely to pose a threat to ground water based on the following lines of evidence:

- The geochemistry of these substances indicates the Kd for arsenic may be too conservative for the form of arsenic likely to be present (arsenate).
- In considering all factors, the 3 phase leaching model used by Ecology is conservative in estimating impacts of area wide soil contamination and may over predict ground water impacts.
- Soil profile data confirms area wide arsenic and lead have not significantly migrated even after over 50 years. This is indirectly confirmed by application rate calculations by Frank Peryea at WSU.
- Drinking water system data in the areas most impacted by areawide (smelter) contamination on Vashon and Maury Islands do not indicate impacts to ground water. This includes recently acquired spring fed water system data.
- Finite source modeling indicates arsenic and lead have not significantly migrated with depth.

Comments made by Board members include:

Dr. Landau reflected on earlier SAB discussions of arsenic Kd. He noted that the default value of 29 is based on arsenite, the more mobile form of arsenic. Whereas, areawide arsenic is likely to be in the arsenate form, so it is reasonable to consider a different Kd.

Dr. Landau also noted that the DAF default value of 20 used in the 3 phase model is not necessarily conservative as this is based on a ½ acre site. A larger site such as a 30 acre field or larger would have a much smaller DAF.

Dr. Riley noted that he has worked on a variety of sites in western WA with arsenic contamination. Work done at these sites tends to find arsenic Kd values that are greater than 1000. Only one site had an arsenic Kd less than 29 and this was a site with highly organic sediment.

The board concluded that it is scientifically defensible to conclude that area wide arsenic soil concentrations of 200 mg/kg are unlikely to pose a significant threat to ground water. Site conditions that could result in this conclusion being violated include:

- Reducing soil conditions resulting in the arsenic being present in the arsenite form rather than the arsenate form such as that created by:
 - ❖ Soils high in natural organic content like wetland and peat soils
 - ❖ The presence of biodegradable organic contaminants like petroleum
- Very high pH soil and waste material such as that created by cement kiln dust
- Addition of high levels of phosphate to the soil (super phosphate applications)
- Contamination present over substantial depth so the finite source assumption is violated

The discussion then shifted to lead.

Dr. Landau noted that data provided to the SAB by Ecology suggests the lead Kd is based on a pH of 6.8. This is of concern because soils in WA State, especially on the west side

tend to have a lower pH. He noted that while the 3-phase model indicates concentrations up to 3000 mg/kg are protective of ground water, this may not hold if the pH is significantly lower. He suggested that the conclusion this is protective should be conditioned on soil pH and where the breakpoint for lead solubility occurs.

Pete Kmet responded that studies he is familiar with suggest lead does not experience a significant change in solubility until the pH falls below 5.5.

The board concluded that it is scientifically defensible to conclude that area wide lead soil concentrations of 1000 mg/kg are unlikely to pose a significant threat to ground water. Site conditions that could result in this conclusion being violated include:

- Soil conditions increasing the lead mobility such as that created by:
 - ❖ Soils high in natural organic content like wetland and peat soils
 - ❖ The presence of biodegradable organic contaminants like petroleum
 - ❖ Very low pH waste material

Audience Comment:

Paul Agid noted that the Port of Seattle has experience with highly organic soils. They have seen changes in mobility occur over very short distances. While reducing conditions result in arsenic becoming mobilized, once the arsenic migrates to another location where the redox conditions change, the arsenic re-precipitates.

Greg Glass mentioned a landfill study for Ecology to consider.

Next Meeting:

Quarterly meetings to be scheduled. Next meeting is scheduled for March 19, 2007 in Seattle.

Meeting adjourned.

Approved with changes at the March 19, 2007 meeting.