

**Summary Minutes of the United States Environmental Protection Agency (U.S. EPA)
Science Advisory Board (SAB) Quality Review Teleconference
July 5, 2011**

Meeting of the Chartered SAB and SAB Liaisons¹

Date and Time: July 5, 2011, 11:00 a.m. – 300 p.m. Eastern Time

Location: By Teleconference

Purpose: to conduct a quality review of a draft SAB report entitled *Review of EPA’s Draft Hydraulic Fracturing Study Plan* (June 14, 2011 Quality Review Draft).”²

SAB Members and Liaison Participants:

SAB Members

Dr. Deborah Swackhamer, Chair
Dr. Timothy Buckley
Dr. Thomas Burke
Dr. Costel Denson
Dr. Otto Doering
Dr. David Dzombak
Dr. T. Taylor Eighmy
Dr. Jeffrey Griffiths
Dr. Bernd Kahn
Dr. Nancy Kim
Dr. Kai Lee

Dr. Cecil Lue-Hing
Dr. Lee D. McMullen
Dr. Judith Meyer
Dr. James Mihelcic
Dr. Horace Moo-Young
Dr. Eileen Murphy
Dr. Amanda Rodewald
Dr. James Sanders
Dr. Katherine Segerson
Dr. John Vena
Dr. Thomas Zoeller

SAB Staff Office Participants

Dr. Angela Nugent, Designated Federal Officer (DFO)
Dr. Vanessa Vu, Director
Mr. Edward Hanlon, DFO for SAB Hydraulic Fracturing Study Plan Review Panel

Teleconference Summary:

The teleconference was announced in the Federal Register³ and discussion generally followed the issues and timing as presented in the agenda.⁴

Convene the meeting

Dr. Angela Nugent, SAB DFO, convened the advisory meeting and welcomed the group. She noted that the meeting had been announced in the Federal Register, which provided an opportunity for public to provide oral and written comments. She noted that no individuals had requested to provide oral public comments and that three sets written comments had been

provided to SAB members and posted on the website.⁵ She asked members of the public participating by teleconference to contact her so that their names could be listed in the minutes (Attachment A).

Purpose of meeting and review of the agenda

Dr. Deborah Swackhamer, the SAB Chair, welcomed SAB members and reviewed the purpose of the meeting, to conduct a quality review of a draft SAB report entitled *Review of EPA's Draft Hydraulic Fracturing Study Plan* prepared by an SAB *ad hoc* panel.

Overview of draft report

Dr. David Dzombak, Chair of the SAB Hydraulic Fracturing Study Plan Review Panel, provided an overview of the draft report and the activities of the panel. The panel reviewed a draft study plan developed by EPA's Office of Research and Development (ORD). ORD's draft study plan drew on advice provided by the SAB in 2010 on an earlier scoping document (*Advisory on EPA's Research Scoping Document Related to Hydraulic Fracturing*, EPA-SAB-10-009). He acknowledged the contributions of the DFO, Mr. Edward Hanlon, in supporting the panel's work.

The panel addressed five charge questions relating to water acquisition, chemical mixing, well injection, flowback and produced water, and wastewater treatment and waste disposal. Panel members focused on whether ORD identified the correct research questions to determine whether hydraulic fracturing affects drinking water resources and the nature and extent of any impacts. The large panel had a broad range of scientific and engineering perspectives and the panel report sought to represent the areas of consensus. Panel members agreed that not all the research described in the study plan can be accomplished. The report recommends that EPA should be guided by a risk assessment model to focus studies on areas where the most significant exposures would happen. The panel recommended that ORD not conduct toxicity testing described in the plan and instead evaluate existing sources of information on chemicals used in hydraulic fracturing. Dr. Dzombak highlighted that the panel's report also recommended that ORD: 1) clarify that its research should focus on hydraulic fracturing in shale gas and other kinds of fossil fuel production; 2) collect baseline hydrologic quality and baseline data before hydraulic fracturing activity begins so that any significant changes in water availability and water quality can be documented; and 3) gather all available information on the composition of "post fracturing produced water" and any available obtainable proprietary information on chemicals introduced in hydraulic fracturing.

Dr. Dzombak thanked SAB members for their detailed quality review comments.⁶ He committed to reviewing the letter, executive summary, and draft report to reduce redundancies and to make many of the editorial changes described in the comments. He noted, however, that some of the comments offered by chartered SAB reviewers were of scientific nature beyond the charge questions posed to the panel and beyond the scope of panel discussions. He also explained that the panel understood the review to focus on ORD's plans to generate a study of hydraulic

fracturing in 2012. ORD plans to generate another report in 2014, but those activities were beyond the scope of the SAB panel's current review.

Chartered SAB Discussion

Dr. Swackhamer invited the lead reviewers to begin the SAB discussion by summarizing their significant comments.

Dr. Taylor Eighmy, the first lead reviewer, commended the panel for its fine job. He emphasized three points. He encouraged the panel to add "post closure and abandonment" to the water life cycle figure in the report and do identify research questions related to this phase. He encouraged the panel to expand its emphasis on well construction and to identify additional research activities. And he recommended that the committee expand its discussion of hydraulic fracture mapping related to geological structure.

Dr. Cecil Lue-Hing, the second lead reviewer, also praised the draft report. He noted that it was well-written, well-structured, and well-formatted. He commended the report for its acknowledgement of public comment and public input on identification of issues and candidate sites. The report identifies the appropriate research issues, such as the impact of hydraulic fracturing on watershed mass balance.

Dr. James Mihelcic, the third lead reviewer, agreed that the report was well written and organized. He strongly supported the panel's consideration of water quantity and agreed with Dr. Eighmy that post closure well abandonment should be added to the water life-cycle. Given ORD's emphasis on green chemistry, he expressed surprise that the study plan did not include research on green chemicals, green activities, or sustainability. Similarly, he found that ORD's approach to research on waste disposal and treatment in the study plan took a traditional (and not a sustainability-based) approach in focusing on treatment, rather than pollution prevention alternatives. Dr. Mihelcic emphasized that hydraulic fracturing will likely be used in all fifty states and that EPA must consider how this technology affects drinking water. He supported the panel's recommendations, including recommendations regarding environmental justice, and found no errors or omissions.

Dr. H. Keith Moo-Young, the fourth lead reviewer, expressed approval of the report and provided personal comments and recommendations for Dr. Dzombak's consideration. He recommended that ORD consider long-term research to support toxicity testing, either through extramural grants or a Cooperative Research and Development Agreement (CRADA). He emphasized the importance of long-term monitoring of the possible impacts of hydraulic fracturing on geology and groundwater. He also suggested that EPA partner with the Department of Energy on such long-term research and also consider potential radiation risks.

Dr. Eileen Murphy, the fifth lead reviewer, agreed that the report was thoughtful and contained significant recommendations that were decision relevant. She expressed concern over the report's recommendation that EPA not conduct toxicity testing as part of the study plan and asked for better explanation of the rationale for removing toxicity testing. She noted the

potential of computational and cellular testing for generating toxicity data and cited the success of such testing during the Gulf Oil Spill. In her view, use of the risk assessment paradigm requires evaluation of toxicity.

Dr. Thomas Zoeller, the sixth lead reviewer, noted the April 2011 report entitled “Chemicals used in Hydraulic Fracturing” provided by the U.S. House of Representatives Committee on Energy and Commerce Minority Staff provides a list of the chemicals that might be “most germane” for toxicity testing. He suggested that the panel report reference this information source. He asked whether the panel had considered the types of computational toxicity evaluation that Dr. Murphy described. He also recommended that the panel report ask ORD to provide a timeline and expected outcomes for the activities described in the study plan.

Dr. Swackhamer asked Dr. Dzombak, the panel chair, to respond to lead reviewer comments. Before he spoke, Dr. Swackhamer noted that many of comments received were outside the scope of the quality review questions to be decided by the chartered SAB during the teleconference. She summarized the quality review questions.

1. Were the original charge questions adequately addressed?
2. Are there any technical errors or omissions in the report or issues that are not adequately dealt with in the panel’s report?
3. Is the panel’s report clear and logical?
4. Are the conclusions drawn or recommendations provided supported by the body of the panel’s report?

Dr. Dzombak expressed appreciation for the thoughtful comments. He agreed with panel members’ emphasis on post-closure and well abandonment, although he noted that public comment did not support including those issues. He agreed with Dr. Moo-Young’s comment that consideration of seismic conditions was important and suggested that the report be revised to identify the need for high quality long-term monitoring of the relationship of hydraulic fracturing and seismic conditions. He noted that the panel had consensus on its recommendation that EPA should not conduct detailed toxicity testing for the 2012 study, although he agreed that the report could better justify the rationale for this recommendation. There is a long list of chemicals currently used for hydraulic fracturing or being considered for that purpose and particular operations involve different combination of chemicals selected for a location of interest. The panel was most concerned about the need to characterize exposures and through that analysis determine the chemicals of most significant interest. He also noted that the panel recommended that EPA start with existing toxicity profiles and screen those to determine chemicals of most interest. These science-based considerations could be more clearly described. He committed to incorporating as many recommendations from members’ written and oral comments as possible, consistent with the panel’s discussion. Drs. Nancy Kim and Jeffrey Griffiths, chartered SAB members who also served on the panel, spoke of their support for the panel’s recommendation and Dr. Dzombak’s summary of the supporting rationale. They agreed that the report could be strengthened by a clearer description of the supporting scientific rationale. Dr. Dzombak also agreed with SAB Members’ comments that the recommendation in the report could be sharpened to recommendation toxicity evaluation in the context of screening, combining

screening results with the results of case study to develop a toxicity testing plan, rather than recommend that no toxicity testing be done.

Other chartered SAB members provided oral comments that Dr. Dzombak addressed. One member recommended that the report describe more clearly EPA's proposed criteria for choosing case studies and clarify whether private wells, in addition to public water supplies, were to be included in the proposed study. Dr. Dzombak responded that the study plan did describe clear criteria for case studies, both prospective and retrospective, and that the panel's report could present the agency's proposed criteria more clearly. He also agreed to check to determine whether private wells were included in the study plan and make that scope clearer in the panel's report.

Another member suggested that the SAB report clearly indicate that the scope of the study plan concerned EPA's report to be completed in 2012 and that there were potentially important long-term issues that were outside the scope of the study plan and the SAB report under consideration. He also noted that state and local public health officers provide a reservoir of knowledge that may be useful to EPA for the FY 2012 study. Dr. Dzombak agreed that it was important to frame the current study within the larger perspective of long-term research, especially acknowledging the scoping discussion on page 4 of EPA's draft study plan. He also stated that he would revise the panel report to include a recommendation for accessing local and state knowledge bases.

SAB members commended the panel support for the environmental justice component of the draft study plan. One member commented that the panel report should study the correlation of hydraulic fracturing sites, toxicity, and income level around sites. Dr. Dzombak responded that the panel report could include this recommendation as one option to be considered.

Members also discussed issues of format and emphasis. The SAB Chair recommended that the letter to the Administrator be shortened by removing detail about the panel's meetings and teleconferences so that the letter focused on substantive recommendations. Members also recommended that the letter and executive summary be edited so that the tone and major messages were consistent. Both documents should communicate enthusiasm for EPA's approach in the study plan and identify the SAB's major recommendations. Members asked that the letter and Executive Summary identify more clearly what is meant by the terms "most" and "some." Members agreed that the bullets at the end of the letter should each be shorter. They also noted that it would be helpful to provide more details in the Executive Summary about the numbers of case studies planned and their major types. Members also agreed that key figures in the Study Plan that were a focus of discussion in the panel report should be reproduced in an Appendix to the report.

After discussion had concluded, Dr. Swackhamer asked for a motion to dispose of the report. A motion was made that the panel Chair work with the SAB staff to make changes consistent with written comments and oral discussion during the teleconference and then provide the report to the SAB Chair for approval. The move was seconded and was approved unanimously with three members abstaining (Drs. Dzombak, Kim, and Griffiths). After the vote, a member noted that

the report was exemplary of the high quality work that the SAB can do in a tight timeframe. Dr. Swackhamer concluded the teleconference by congratulating the panel chair and thanking SAB members for their contributions to the quality review.

The Designated Federal Officer adjourned the meeting at 12:55 p.m.

Respectfully Submitted:

Certified as True:

/Signed/

/Signed/

Dr. Angela Nugent
SAB DFO

Dr. Deborah L. Swackhamer
SAB Chair

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by committee members during the course of deliberations within the meeting. Such ideas, suggestions, and deliberations do not necessarily reflect definitive consensus advice from the panel members. The reader is cautioned to not rely on the minutes represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters, or reports prepared and transmitted to the EPA Administrator following the public meetings.

Materials Cited

The following meeting materials are available on the SAB Web site,

<http://www.epa.gov/sab>, at the following address:

<http://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/05c7f36fc25b90cd852578a800617dd2!OpenDocument&Date=2011-07-05>

¹ Roster, Chartered SAB Members and Liaisons

² Draft SAB report entitled *Review of EPA's Draft Hydraulic Fracturing Study Plan* (June 14, 2011 Quality Review Draft).

³ Federal Register Notice Announcing the Meeting

⁴ Agenda

⁵ Written public comments:

- Comments from America's Natural Gas Alliance (ANGA) provided by Nancy Tujague.
- Comments from Jean Public, June 16, 2011.
- Comments from John Satterfield, Chesapeake Energy Corporation

⁶ Preliminary Comments from Members of the Chartered SAB as of July 5, 2011