

U.S. Environmental Protection Agency
Science Advisory Board
Radiation Advisory Committee (RAC)
Multi-Agency Radiation Survey and Assessment of Materials and Equipment
(MARSAME) Manual Review Panel
Summary Minutes of Public Conference Call Meeting¹
March 10, 2008

Committee: Radiation Advisory Committee (RAC) Multi-Agency Radiation Survey and Assessment of Materials and Equipment (MARSAME) Manual Review Panel of the U.S. Environmental Protection Agency's (EPA's) Science Advisory Board (SAB). (See Roster - Attachment A)

Date and Time: Monday, March 10, 2008 from 1:00 p.m. to 4:00 p.m. eastern standard time (See Federal Register Notice¹).

Location: This is a conference call with no location announced. All participants were connected via the conference lines.

Purpose: The purpose of this public conference call meeting is to review the RAC MARSAME Review Panel's second public draft document dated February 27, 2008 in response to review of the following document entitled "*Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual (MARSAME)*," dated December, 2006.

Background: The document being reviewed is entitled "*Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual (MARSAME)*," dated December, 2006 (NUREG-1575, Supp. 1; EPA 402-R-06-002; DOE/EH-9707), and is a supplement to the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM), EPA 402-R-97-016, Rev. 1, August 2000 and June 2001 update. MARSAME was developed collaboratively within the Multi-Agency Work Group over a 5-year time frame. The first conference call to prepare for the review was held on October 9, 2007. The second meeting was a face-to-face meeting held October 29, 30 and 31, 2007 where the Multi-Agency Work Group made presentations and the RAC MARSAME Review Panel began drafting their report (See Attachment D for the FR Announcement of the October 2007 public meetings). The third meeting was held on December 21, 2007 as public conference call of the U.S. EPA/SAB RAC MARSAME Review Panel to discuss edits to their first public draft report dated December 17, 2007. The fourth and final closure meeting RAC MARSAME Review Panel was held on Monday, March 10, 2008 to review the February 27, 2008 public draft in a public conference call.

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NOTE: Please note that these minutes represent highlights of comments that are individual statements and opinions and are not necessarily consensus comments at this stage of the process in the review of any given topic. In all cases, the final SAB report to the EPA Administrator represents the consensus on the topic.

SAB/RAC MARSAME Review Panel Members as Attendees: Dr. Bernd Kahn, RAC Chair, Dr. Thomas Borak, Dr. Antone Brooks, Mr. Bruce W. Church, Dr. Faith G. Davis, Dr. Brian Dodd, Mr. Kenneth Duvall, Dr. Shirley A. Fry, Dr. William C. Griffith, Dr. Janet A. Johnson, Dr. Jonathan M. Links, Dr. Jill Lipoti, Dr. Paul J. Merges, Dr. Daniel O. Stram, and Dr. Richard Vetter (Mr. Bruce Napier was not present.) (See Attachment A)

SAB Staff Office: Dr. K. Jack Kooyoomjian, Designated Federal Officer; Dr. Anthony F. Maciorowski, Deputy Director

Agency Staff Attendees: ORIA: Washington, DC: Dr. Mary E. Clark, Ms. Kathryn Snead, and Capt. Colleen F. Petullo, U.S. PHS assigned to the U.S. EPA/OSWER Staff office, and Azzam Nidal, EPA Region 2 Office.

Public Attendees: The MARSAME Multi-Agency Work Group members, including the following: Mr. David Alberth, U.S. Army - Aberdeen, MD; Lt. Col. Craig Bias, U.S. Air Force; Steve Doremus, U.S. Navy; Dr. Scott Hay, Cabera Services, Dr. Carl Gogolak, Consultant/Contractor to MARSAME Multi-Agency Work Group; Dr. Robert Meck, U.S. NRC; Washington, DC, and Dr. Alexander Williams, U.S. DOE.

Meeting Summary: The meeting followed the issues and general timing as presented in the meeting Agenda². Verbal comments were provided to the Panel by members of the MARSAME Multi-Agency Work Group during the course of the March 10, 2008 public conference call meeting. Other than the Multi-Agency MARSAME Work Group members, no members of the public attended the meeting.

Welcome and Introductions: Dr. K. Jack Kooyoomjian, Designated Federal Officer (DFO), opened the meeting at approximately 1:02 pm with identification of the participants logging into the call and with opening remarks. He introduced himself as the DFO for the Radiation Advisory Committee's (RAC) MARSAME Review Panel, explained the purpose of the call, indicating that the RAC and its MARSAME Review Panel operates under the requirements of the Federal Advisory Committee Act (FACA) and conducts business under the auspices of the chartered SAB. He explained that, consistent with FACA and with EPA policy, the deliberations of the RAC's MARSAME Review Panel are conducted in public meetings, for which advance notice is given. He explained that he is present to ensure that the requirements of FACA are met, including the requirements for open meetings, for maintaining records of deliberations of the RAC's MARSAME Review Panel, and making available the public summaries of meetings, as well as providing opportunities for public comment.

Dr. Kooyoomjian also commented on the status of this Panel's compliance with Federal ethics and conflict-of-interest laws. The RAC's MARSAME Review Panel follows the Committee and Panel Formation Process, as well as determinations made by the SAB staff and others pertaining to confidential financial information protected under the Privacy Act. Each

Panel member has complied with all these provisions; hence, there are no conflict-of-interest or appearance issues for any of the Panelists, nor did any individual need to be granted a waiver or be recused. Dr. Kooyoomjian further noted that the Form 3110-48 Financial Disclosure and Ethics Training was completed by all RAC MARSAME Review Panel members and is on file at the SAB, that there is no need for disclosure at this time, and that there is no particular matter that may pose a potential conflict of interest. He advised that the RAC's MARSAME Review Panel had on previous occasions (October 9, 2007 and October 29-31, 2007) introduced themselves and voluntarily disclosed their interests in relation to review of the MARSAME Manual dated December, 2006. Should interested parties from the public or any new participant join us, we would introduce ourselves, but each individual member's relations and experiences to the issues pertaining to the discussions to take place today were in fact disclosed fully in the previous public meetings, especially the October 29, 30 and 31, 2007 face-to-face meeting.

The U.S. EPA/SAB RAC MARSAME Review Panelists "logged-in," and at 1:02 p.m. Dr. Kahn provided some brief introductory remarks, thanking members and participants (Roster, Attachment A) for their contributions to the current February 27, 2008 public draft.

At 1:11 p.m., Dr. Kahn and Dr. Lipoti began the discussions of the current February 27, 2008 draft report³, focusing on Appendix A dealing with the statistical analysis issues. In overview remarks that followed, Dr. Borak drew the Panel members' attention to page 32, line 5 to the statement on the many equations for designing and interpreting survey procedures. He cautioned that the users need to be aware of the underlying assumptions and sampling requirements for proper applications of the equations. Dr. Stram emphasized that the earlier conversation with the Panel (the Dec 21, 2007 public conference call) assisted in preparation of a straight-forward approach and introduction to basic statistical approach and design concepts, such as measurement uncertainty and sampling uncertainty. The goal was to provide the statistical guidance in one place, rather than scattered throughout the MARSAME Manual. Further, it was provided in the Appendix, since it wasn't asked for directly in the charge questions to the Panel. The Appendix A text has been written by the Panel members in the Statistics Sub-Group more geared for a statistician who understands issues with respect to experimental design. It was thought that the Multi-Agency Work Group members could edit this text any way they want. A discussion followed on some of the edits that might be considered for Appendix A.

At 1:28 p.m., a discussion focused on the text page 17, and the current suggestions. One Panelist thought it might be helpful to add a suggestion (SUG 3-7) to address the overall bounds of the process. Dr. Kahn thought SUG 3-1 addressed this. The Panelist suggested an addition of a generic Figure 1 that describes the overall MARSAME process might be helpful to the reader. Dr. Kahn requested that the text description of the process be kept to one or two sentences in reference to the illustration.

Another Panelist congratulated Dr. Kahn on the overall document, and thought that the suggestions (SUG in the text) could be referred to as recommendations. There appeared to be support among the other Panel members for this change. Some other Panel members thought that

the case studies should be more correctly referred to as illustrative examples, since they were conceptualized situations that hadn't actually occurred. The Panel referred to the earlier discussion at the October face-to-face meeting, where it was recognized that there is utility in using actual case studies, if they can be incorporated into the MARSAME manual. It was acknowledged that genuine case studies and data files may be extremely difficult to obtain, and illustrative examples can be helpful, if they are carefully crafted to represent or approximate real-world decisions. It was suggested that such illustrative examples should be clearly labeled and noted as illustrative examples so the reader is not confused. It was recognized that every major clean-up activity that is documented represents volumes of data and decisions.

The Panel members observed that the recommendations in the Letter to the Administrator should be also in the Executive Summary, recognizing that it needs to be repeated here. The Panel recommended reviewing placement of the recommendations in the Letter to the Administrator, as well as in the body of the text, so that they are properly listed, referenced, and summarized.

It was observed that on p. 2, line 21 of the Executive Summary, that some clarification is needed regarding the discrimination level (DL) being below the action level (AL).

Dr. Kahn called for discussion of edits on each page at 1:50 p.m. There were no comments for pages 3 through 7. On page 8, it was suggested that disposition needs to be defined more clearly, and that an effort should be made to better distinguish between release and interdiction. On page 9, it was suggested that suggestions should be replaced with recommendations. Regarding page 9, lines 7-9, it was noted that sentinel measurements could be biased, and that many measurements are not adequately controlled.

On page 10 regarding Scenarios A & B, it was suggested that there should be more explicit guidance when the user should utilize Scenario A versus Scenario B. On page 11, and page 27 the drawings and terminology may need to be brought forward. Dr. Kahn will work with Dr. Borak on this. Also, on page 11, the case studies need to be referred to as illustrative examples.

Feedback from the Multi-Agency Work Group on the Panel's Feb 27, 2008 Draft Report:

At 2:15 pm, Captain Colleen Petullo thanked the Panel for their work on this draft. She advised the Panel that the Multi-Agency Work Group (MAWG) could not come up with a quantitative replicable value or method with regard to swipe samples. The Panel members then had a brief discussion with Captain Petullo and the MAWG members regarding their concern for lack of reproducibility of swipe samples. The Panelists and the MAWG acknowledged that once you remove material from a spot, you affect the measurement. A discussion followed regarding the MAWG's concern that the swipe sample is essentially not reproducible. It was acknowledged by the Panelists that once the swipe sample removes material from a spot, it affects the measurement. Some of the Panelists noted that the swipe sample still has value, even though there is a problem with reproducibility of a swipe sample. If the swipe involves sampling of a

large item, it requires a large set of swipes, and the measurement distribution of errors may be large. However, the statistics work the same.

The Panelists thought that the MAWG is leaving a large hole in the MARSAME manual by not directly addressing the swipe sampling issue. The Panelists thought that the MAWG should not “tip-toe” around the swipe issue, but face it directly, because of the potential for its very practical and useful measurement information. The Panel thought that, despite the imperfect nature of swipe sampling, it should be done. It was observed, for instance, that a large, bulky object will need a large number of swipe samples, which will include a distribution of measurements and errors, but at the conclusion of the process, the decision-maker will have a very good idea if it is contaminated or releasable. A discussion followed on the swipe sampling representing removable contamination, and it was observed that whether it is a manual wipe process or a monitoring machine, the sampling is the same. Using a second swipe sample typically will leave a smaller amount, but it is usually not “zero.” The MAWG was interested in obtaining any information, real-world data and/or protocol from the Panel which would show swipe sample protocol and how swipe samples might be quantified. The MAWG was interested in obtaining references and hard data wherever this might be available.

During the discussions, the MAWG noted that it is a lot more difficult to quantify what uncertainties might be with respect to a swipe sample. The Panel recognized that anything the Panel might provide may assist in raising the comfort level of the MAWG with respect to use of swipe tests. Some of the Panelists thought that they might not be able to solve the problems regarding such issues as reproducibility, but that the Panel might recommend that the MAWG work to develop such a protocol.

Dr. Kahn went to page 14, Figure 6.3 re-worked. The Panel had no comments on this re-worked figure. Page 15, re-worked Fig 6.4, the Panel observed that there is dependence on the amount of the radionuclides relative to background. The Panel discussed the distinctions between re-worked Figures 6.3 and 6.4, and suggested that a footnote would be easiest to direct the user to Scenario A or Scenario B. There were no further discussions or edits on the usefulness of the case studies. There were no Panel comments on page 16, which dealt with the case studies and Charge 2c. On page 17, the Panel offered the suggestions to make positive statements instead of questions.

Public Comments:

At 2:30 pm Dr. Kooyoomjian called for public comments. Dr. Carl Gogolak remarked that he was not expecting the SAB/RAC’s MARSAME Review Panel to solve a problem that people have been struggling with for decades, such as the issue of swipe sampling. He thought that there may be information that the MAWG might not be privy to, and that it would be helpful for what they conclude on this topic if the Panel members could provide references, reports, studies, etc. relevant to this topic, and they would follow up on this.

Mr. Steve Doremus, U.S. Navy, commented that releases are dose or risk-based, but swipes cannot be quantified for dose or risk estimates. The Panel members expressed some disappointment that the swipe issue did not get addressed by the MAWG in their development of the draft MARSAME manual. One Panelist observed that if you have removable activity, you can quantify some of this, and other Panelists observed that swipe samples are primarily qualitative measurements, and that swipe samples are not appropriate for dose measurements. One Panelist suggested that swipe samples are analogous to sampling select foods in a cafeteria when there is a broad variety of foods to choose from.

In further dialogue on the swipe sample issue, one Panelist suggested that it is really a control question. The question to be answered is whether the radioactive material of concern is staying within bounds. The same concept and analogy applies to a piece of equipment that could be released from a site. It was observed that every facility, in a real-world sense, has been involved at one time or another in a “go” or “no go” situation whether to release materials from a site. The flip side of this argument is that there are so many types of surfaces, and the application of swipes are so variable.

Captain Colleen Petullo admitted that the Panelists and the MAWG could talk all day on swipes and the various issues relating to this topic. In closing remarks, One Panelist observed that there is an NCRP Report on nasal swabs, and the document has very good language for what swipe tests can or cannot do.

Dr. Mary Clark of ORIA thanked the SAB/RAC MARSAME Review Panel for the pre-meeting conference call of October 9, 2007, the face-to-face meeting of the Panel on October 29-31, 2007, the December 21, 2007 public conference call, and this March 10, 2008 public conference call meeting. She remarked that listening to the discussions among the Panelists gives the MAWG a better sense about how to approach the solution to a variety of issues that have been discussed. In closing, one Panelist summed up the sentiment of all the Panelists to say that the MAWG did a remarkable job, and that the Panelists were providing advice from the perspective of a “new user,” and what might be needed for clarification and improvement to an already excellent manual.

The public comment period ended at 2:47 pm.

Continued Panel Discussion:

The Panelists reminded themselves to provide some additional references to the RAC DFO on swipes. These include such references as the DOT reference with respect to swipes, as well as the NCRP report on swipe sampling. It was recognized that there are some international references such as from the IAEA on the topic of swipe samples of surface contamination that would be useful to the MAWG staff.

A discussion followed on the statistical analysis in Appendix A on page 22. It was recognized that in the edits to follow, the Panel needs to take out the references to sampling dose

distribution. They are sampling activity, not dose or use. For instance, p. 22, lines 12, 21 and 38, take out the word “dose” and use “activity” or “radioactivity.”

On p. 22, line 28, on Statement #5, need to comment on selecting Alpha & Beta. Also, the draft report is silent on which shall we use. Need to know what Alpha and Beta to use and when they are appropriate. One Panelist observed that the Panel may not have to say more on point #5 on page 22.

Dr. Gogolak acknowledged that he and the MAWG members will try to address this comment, and observed that a lot of this goes back to the QAG4 document, as well as on the DQOs. He discussed the classic scenario of when the null hypothesis is true when it is not, or not true, when it is. He discussed common practices of many, and what happens if a consequence analysis would show that people would be killed. In that situation, a 5% or 1% consequence is inappropriate, but perhaps a one in a million risk might be appropriate. Such a survey might cost the Gross National Product (GNP) of the Earth, however, and where does one draw that line? The Panelists responded - - - is it for the user or the regulator to make this judgement? Dr. Kahn thought that this question can be raised by the Panel and they could ask that the MAWG pull this information together.

As an action item, Captain Colleen Petullo thought they could locate this issue in the MARSSIM Manual and the QA/GR reference and provide it to Dr. Kooyoomjian for distribution to the Panel.

Further discussion took place on page 23 where the standard deviation is repeated. It was suggested to remove the first reference. Additional edits were recommended on page 22, line 24 to remove the word “to.”

One Panelist questioned Dr. Gogolak regarding the sentences on measurement variability, and if it gets subtracted out, because you are using the same instrument for both measurement of background and the measurement itself. Dr. Gogolak responded that part of what is being referenced is detection bias, rather than “precision.” The phrase might be re-worded to say “if you have a bias, you should correct for it.” But what if you don’t know you have a bias? From a pragmatic and practical view, if the bias is less than 1/3 of the overall uncertainty, then it is Dr. Gogolak’s opinion that it is probably not worth to chase it down to be fixed. He further added that if you go to the Guide to the Expression of Uncertainty (GUM), and follow the GUM process, you will find that bias and uncertainty are not an issue, if the measurement error is not that large. Dr. Gogolak indicated that this concept is endorsed by the International Standards Organization (ISO), as well as the American National Standards Institute (ANSI). Further, the National Institute of Science and Technology (NIST) has adopted it. In Dr. Gogolak’s opinion, what is needed here is training.

One Panelist observed that if the bias appears when you subtract the measurement error from background, then the “sigma m” would never disappear completely. It was suggested by one Panelist as an action item that language be added to the draft text regarding two

measurements from the same instrument.

For page 23, Dr. Gogolak observed that the real error is zero, because they are correlated. There were no comments on pages 24 through page 27.

One Panelist recommended that language on MDQ guidance might need to be placed in Appendix A. Drs. Borak and Stram will work with Mr. Duvalls' materials for inclusion in some manner within Appendix A.

At approx. 3:13 pm, Dr. Kahn asked for comments on pages 28 through 33 of Appendix A. No further edits or comments were offered by the Panelists.

It was remarked that additional references need to be inserted into the Appendix and the Bibliography. The Panelists agreed to include additional references relative to the issues that arose in this closure conference call.

Some discussion took place of terms that should be dropped in Appendix B. Dr. Kooyoomjian agreed to re-work Appendix B and send this to the Panelists.

Dr. Kahn requested comments by the end of this week. Dr. Kooyoomjian advised the Panelists that they will see a pre-quality review draft for their final comments around the end of March.

At 3:23 pm, one Panelist drew the Panel's attention to page 10, lines 1-5 to recommend inclusion of clearance guidance to compare action levels, noting that the Panel may wish to cite all known regulations with respect to M&E. Dr. Kahn thought that some citations would be helpful, but did not see the compelling need to cite all regulations. A discussion followed on citing references that may become obsolete as new information is disclosed or as new regulations are implemented. In order to illustrate this point, Dr. Williams of DOE cited a specific case in point with the activity being undertaken with DOE which has begun implementing its Order 5400.5. They (DOE) expect in the next year to have a new protection order with a new number.

Captain Petullo advised the Panelists and participants that she had e-mailed information for Alpha and Beta, as well as MARSAME 4.2.5, MARSSIM, D-6, and the QA/GR Reference, Chapter 6.

Dr. Kooyoomjian noted that the SAB RAC MARSAME Review Panel will have the opportunity to provide additional polishing edits concurrent with the SAB Charter Board quality review.

Summary and Action Items: At 3:20 p.m., Dr. Kahn summarized the next steps in the schedule in preparation for the Quality Review Draft for the SAB Charter Board review. He asked everyone to get their materials to him by the end of this week (close-of-business March 14th, and in the worst case no later than Monday, March 17th). It is expected that the Panel will be

able to view the edits near the end of March for a final pass before creating an April draft for submitting to the SAB Charter Board for their quality review.

Summary & Action Items from the March 10, 2008 1:00 pm - 4 pm EST:

A discussion followed on assignments, and the following captures highlights of those discussions in summary fashion:

- 1) The Panel Members will forward all re-written materials and additions to Dr. Kahn by the end of this week (COB Friday, March 14), and no later than Monday, March 17, 2008. The respective Group Leads will provide their edited materials to Dr. Kahn no later than Monday, March 17th. The Panelists were reminded to be sure to e-mail all comments on any part of the MARSAME document to Dr. Kahn and cc Dr. Kooyoomjian, RAC DFO, so he can keep tabs of all the edits.
- 2) The final edits will most likely be completed by Dr. Kahn in by the end of March in preparation for a final scan of the pre-quality review draft by the Panelists in preparation of an April Quality Review Draft for distribution to the SAB Charter Board for a public conference call in May, 2008 (TBA).

- 3) Any Group can request an editing session at any time by contacting Dr. Jack Kooyoomjian, the DFO to the RAC MARSAME Review Panel.

- 4) The current Breakout Groups are listed as follows:

Breakout Group 1: **FRAMEWORK & DESIGN**, concentrating on Chapters 2-3, Charge Questions 1a and 1b. Chair is Dr. Paul Merges. Other participants include Drs. Tony Brooks, Faith Davis, Shirley Fry, Bill Griffith, and Dick Vetter.

Breakout Group 2: **IMPLEMENTATION**, concentrating on Chapters 4-5, Charge questions 1c and 2a. Chair is Dr. Janet A. Johnson. Other participants include Dr. Tom Borak, and Mr. Ken Duvall.

Breakout Group 3: **DECISION-MAKING, ASSESSMENT AND ROADMAP**, concentrating on Chapter 6, Charge question 2b. Chair is Mr. Bruce Church. Other participants include Drs. Brian Dodd, Bernd Kahn, Jill Lipoti, and Jon Links;

- 5) The informal Statistics Sub-Group, which is “infused” throughout the Breakout Groups is composed of Drs. Stram (Co-Lead) and Borak (Co-Lead), Davis & Griffith;
- 6) It was agreed that the entire Panel would tackle the **ROADMAP AND CASE STUDIES** as a “committee of the whole,” and that the Panelists should look over the whole draft report for final edits in preparation of the April Quality Review Draft.
- 7) Case studies will be referred to as illustrative examples.

- 8) The recommendations in the Letter to the Administrator should be repeated in the Executive Summary.
- 9) An effort should be made to better distinguish between 'release' and 'interdiction.'
- 10) Suggestions should be replaced with recommendations.
- 11) On p. 9, lines 7-9, it was noted that sentinel measurements could be biased, and that many measurements are not adequately controlled.
- 12) On p. 10, it was recognized that there should be more explicit guidance on when the user should utilize Scenario A versus Scenario B.
- 13) On p. 11, the drawings and terminology may need to be brought forward. Drs. Kahn and Borak will work with each other on this.
- 14) Considerable discussion took place on swipe samples. It was agreed that, in order to raise the comfort level of the MAWG regarding the swipe sample issue, the Panel would provide more logic, advice and references on this topic,. It was the sense of the Panel that the MAWG should not "tip toe" around the swipe issue.
- 15) The Panel suggested some modest footnote explanations in Figures 6.3 and 6.4 for Scenario A & B.
- 16) On page 17, the Panel agreed to make positive statements, instead of questions.
- 17) With respect to Appendix A, it was agreed to take out the reference to sampling dose distribution and to take out the word 'dose' and use 'activity' or 'radioactivity.'
- 18) With respect to Appendix A, on p. 22, line 24, remove the word 'to.'
- 19) With respect to Appendix A, on p. 22, line 28, Statement #5, need to comment on setting Alpha & Beta.
- 20) With respect to Appendix A, the MAWG will provide the QA/GR reference to Dr. Kooyoomjian for distribution to the Panel.
- 21) With respect to Appendix A, on p. 23, it was suggested to remove the first reference.
- 22) With respect to Appendix A, it was recognized to clarify the distinction between 'detection bias,' and 'precision.'
- 23) With respect to Appendix A, it was suggested to place clarifying language on MDQ

guidance. Drs. Borak and Stram will work with Mr. Duvall on this issue.

- 24) References Cited: It was recognized that additional references need to be included here, especially with respect to swipe samples.
- 25) With respect to Appendix B, Dr. Kooyoomjian will re-work this and send it to the Panelists as appropriate.

ADJOURN: There being no additional business to be discussed, Dr. Kahn thanked the participants and adjourned the meeting at 3:31 pm on Monday, March 10, 2008.

Respectfully Submitted:

Certified as True:

_____/s/
K. Jack Kooyoomjian, Ph.D.
Designated Federal Official
SAB Radiation Advisory Committee (RAC)
MARSAME Review Panel

_____/s/
Dr. Bernd Kahn, Chair
SAB Radiation Advisory Committee (RAC)
MARSAME Review Panel

Appendix A. Roster

**U.S. Environmental Protection Agency
Science Advisory Board
Radiation Advisory Committee (RAC) Augmented for Review of the
Multi-Agency Radiation Survey and Assessment of Materials and Equipment
(MARSAME) Manual**

CHAIR:

Dr. Bernd Kahn, Professor Emeritus, Nuclear and Radiological Engineering Program, and Director, Environmental Radiation Center, GTRI, Georgia Institute of Technology, Atlanta, GA

PAST CHAIR:

Dr. Jill Lipoti, Director, Division of Environmental Safety and Health, New Jersey Department of Environmental Protection, Trenton, NJ

RAC MEMBERS:

Dr. Thomas B. Borak, Professor, Department of Environmental and Radiological Health Sciences, Colorado State University, Fort Collins, CO

Dr. Antone L. Brooks, Professor, Radiation Toxicology, Washington State University Tri-Cities, Richland, WA

Dr. Faith G. Davis, Senior Associate Dean, Professor of Epidemiology, Division of Epidemiology and Biostatistics, School of Public Health, University of Illinois at Chicago, Chicago, IL

Dr. Brian Dodd, Consultant, Las Vegas, NV

Dr. Shirley A. Fry, Consultant, Indianapolis, IN

Dr. William C. Griffith, Associate Director, Institute for Risk Analysis and Risk Communication, Department of Environmental and Occupational Health Sciences, University of Washington, Seattle, WA

Dr. Jonathan M. Links, Professor, Department of Environmental Health Sciences, Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD

Mr. Bruce A. Napier, Staff Scientist, Radiological Science & Engineering Group, Pacific Northwest National Laboratory, Richland, WA

Dr. Daniel O. Stram, Professor, Department of Preventive Medicine, Division of Biostatistics and Genetic Epidemiology, Keck School of Medicine, University of Southern California, Los Angeles, CA

Dr. Richard J. Vetter, Head, Radiation Safety Program, Mayo Clinic, Rochester, MN

CONSULTANTS:

Mr. Bruce W. Church, President, BWC Enterprises, Inc., Hurricane, UT

Mr. Kenneth Duvall, Environmental Scientist/Consultant, Washington, D.C.

Dr. Janet A. Johnson, Consultant, Carbondale, CO

Dr. Paul J. Merges, President, Environment & Radiation Specialists, Inc., Loudonville, N.Y.

SCIENCE ADVISORY BOARD STAFF

Dr. K. Jack Kooyoomjian, Designated Federal Officer, 1200 Pennsylvania Avenue, NW, Washington, DC, 20460

Materials Cited

The following meeting materials are available on the SAB website, www.epa.gov/sab, at the [March 10, 2008 RAC MARSAME Meeting](#) Page.

¹ *Federal Register* Notice: November 30, 2007 (72 FR 67723-67724) announcing Two Public Teleconferences of the Science Advisory Board Radiation Advisory Committee MARSAME Review Panel

² Meeting Agenda, SAB Radiation Advisory Committee (RAC) MARSAME Review Panel, Conference Call March 10, 2008

³ February 27, 2008 SAB MARSAME Public Draft Report